## Description of seakeeping trial carried out on CCGA Miss Jacqueline IV: October 2004

Fleming, T.; Cumming, D.



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**TITLE**

**DESCRIPTION OF SEAKEEPING TRIAL CARRIED OUT ON CCGA MISS JACQUELINE IV – OCTOBER 2004**


**AUTHOR(S)**

Cumming, D., Fleming, T.

**CORPORATE AUTHOR(S)/PERFORMING AGENCY(S)**

Institute for Ocean Technology (IOT), Memorial University of Newfoundland (MUN)



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**SUMMARY**

This report describes seakeeping experiments carried out on the 65 ft. (19.81 m) long inshore fishing vessel CCGA Miss Jacqueline IV off St. John's, NL October 17 and 18, 2004 as part of the Fishing Vessel Safety Project (Proj. 2017). The objective of the project is to acquire quality full-scale motions data on fishing vessels to validate physical model methodology as well as numerical simulation models under development. Eventually, tools will be developed and validated to evaluate the number of Motion Induced Interrupts (MIIs), induced by sudden ship motions, and their impact on crew accidents to develop criteria to reduce MIIs.

Collaborators involved in the fishing vessel sea trials include the Institute for Ocean Technology (IOT), Memorial University of Newfoundland (MUN), Oceanic Consulting Corp. (OCC), Canadian Coast Guard (CCG), the Offshore Safety and Survival Centre (OSSC) of the Marine Institute and SafetyNet – a Community Research Alliance on Health and Safety in Marine and Coastal Work. Primary financial support for the project is provided from federal funding sources including the Search & Rescue (SAR), New Initiatives Fund (NIF) and the Canadian Institutes of Health and Research (CIHR) in addition to significant in-kind contributions from the many participants.

This document describes the CCGA Miss Jacqueline IV, the trials instrumentation package, data acquisition system, test program, data analysis procedure and presents the results.



**ADDRESS** National Research Council
Institute for Ocean Technology
Arctic Avenue, P. O. Box 12093
St. John's, NL A1B 3T5
Tel.: (709) 772-5185, Fax: (709) 772-2462

National Research Council Canada
Institute for Ocean Technology

Conseil national de recherches Canada
Institut des technologies océaniques

# DESCRIPTION OF SEAKEEPING TRIAL CARRIED OUT ON CCGA MISS JACQUELINE IV – OCTOBER 2004

TR-2004-15

D. Cumming, T. Fleming

December 2004

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| AP | aft perpendicular |
| BOK | bottom of keel |
| ºC | degrees Centigrade |
| CAD | Computer Aided Design |
| CCG | Canadian Coast Guard |
| CCGA | Canadian Coast Guard Auxiliary |
| CCGS | Canadian Coast Guard Ship |
| CG | Centre of Gravity |
| CIHR | Canadian Institutes of Health and Research |
| cm | centimetre(s) |
| COG | Course Over Ground |
| DAS | Data Acquisition System |
| DC | Direct Current |
| deg. | degree(s) |
| DGPS | Differential Global Positioning System |
| DOT | Department of Transport |
| EPIRB | Emergency Position Indicating Radiobeacon |
| FFT | Fast Fourier Transform |
| FP | forward perpendicular |
| ft | foot, feet |
| Fwd | forward |
| F/V | frequency/voltage |
| g | acceleration due to gravity |
| gal. | gallon(s) |
| GEDAP | General Data Analysis Program |
| $GM_T$ | Transverse Metacentric Height |
| GPS | Global Positioning System |
| $H_S$, $H_{1/3}$,$H_{m0}$ | Significant Wave Height |

## LIST OF ABBREVIATIONS (CONT'D)

| | |
|---|---|
| HF | High Frequency |
| h, hr | hour(s) |
| Hz | Hertz |
| in | inch(es) |
| IOT | Institute for Ocean Technology |
| kg | kilogram(s) |
| kHz | kiloHertz |
| km | kilometre(s) |
| $KM_L$ | longitudinal metacentric height above datum |
| kt(s) | knot(s) |
| kW | kiloWatt(s) |
| l | litre(s) |
| lb(s) | pound(s) |
| LCG | Longitudinal Centre of Gravity |
| LT | long ton(s) |
| m | metre(s) |
| mag. | magnetic |
| mHz | megaHertz |
| MII(s) | Motion Induced Interrupt(s) |
| MUN | Memorial University of Newfoundland |
| MV | Motor Vessel |
| mW | megaWatt(s) |
| NIF | New Initiatives Fund |
| nm | nautical mile(s) |
| NMEA | National Marine Electronics Association |
| NRC | National Research Council |
| NSERC | Natural Sciences and Engineering Research Council of Canada |
| OCC | Oceanic Consulting Corporation |
| OEB | Offshore Engineering Basin |

## LIST OF ABBREVIATIONS (CONT'D)

| | |
|---|---|
| OSSC | Offshore Safety and Survival Centre |
| PPT | Parts Per Thousand |
| RF | Radio Frequency |
| RPM | Revolutions Per Minute |
| s, sec. | second(s) |
| SAR | Search And Rescue |
| SNAME | Society of Naval Architects and Marine Engineers |
| SOG | Speed Over Ground |
| Stbd. | starboard |
| St. Dev. | standard deviation |
| SWH | significant wave height |
| t | tonne(s) |
| $T_{av}$ | average period |
| $T_Z$ | zero crossing period |
| UHF | Ultra High Frequency |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UPS | Uninterruptible Power Supply |
| V, VAC | volt(s) |
| VCG | Vertical Centre of Gravity |
| VHF | very high frequency |

# DESCRIPTION OF SEAKEEPING TRIAL CARRIED OUT ON CCGA MISS JACQUELINE IV – OCTOBER 2004

## 1.0 INTRODUCTION

This report describes seakeeping experiments carried out on the 65 ft. (19.81 m) long inshore fishing vessel CCGA Miss Jacqueline IV off St. John's, NL October 17 and 18, 2004 as part of the Fishing Vessel Safety Project (Proj. 2017). The objective of the project is to acquire quality full-scale motions data on fishing vessels to validate physical model methodology as well as numerical simulation models under development. Eventually, tools will be developed and validated to evaluate the number of Motion Induced Interrupts (MIIs), induced by sudden ship motions, and their impact on crew accidents to develop criteria to reduce MIIs. Although the priority was to collect seakeeping data, a manoeuvring test program was also available in the event that calm seas prevailed.

Collaborators involved in the fishing vessel sea trials include the Institute for Ocean Technology (IOT), Memorial University of Newfoundland (MUN), Oceanic Consulting Corp. (OCC), Canadian Coast Guard (CCG), the Offshore Safety and Survival Centre (OSSC) of the Marine Institute and SafetyNet – a Community Research Alliance on Health and Safety in Marine and Coastal Work. Primary financial support for the project is provided from federal funding sources including the Search & Rescue (SAR), New Initiatives Fund (NIF) and the Canadian Institutes of Health and Research (CIHR) in addition to significant in-kind contributions from the many participants.

This document describes the CCGA Miss Jacqueline IV, the trials instrumentation package, data acquisition system, test program, data analysis procedure and presents the results. Fishing Vessel Research Project related seakeeping trials carried out in the Fall of 2003 are described in References 1-3.

## 2.0 BACKGROUND

The Fishing Vessel Safety Project is just a small component of the overall SafetyNet initiative to understand and mitigate the health and safety risks associated with employment in a marine environment. SafetyNet is the first federally funded research program investigating occupational health and safety in historically high risk Atlantic Canada marine, coastal and offshore industries. The Fishing Vessel Safety Project is conducting research on the occupational health and safety of seafood harvesters. Fishing is the most dangerous occupation in Newfoundland and Labrador and is increasingly so: over the past ten years, the rates of reported injuries and fatalities nearly doubled. These trends have the effect of reducing the sustainability of the fishery, increasing health care and compensation costs, and straining the available SAR resources. The development of effective solutions, to prevent or mitigate injury, fatality or SAR events, has been seriously hindered by the scarcity of the research needed

to understand the factors that influence seafood harvester occupational health and safety.

The Fishing Vessel Safety project is a multi-disciplinary, inter-departmental and inter-sectorial research project. The broad-based and multi-factorial approach in investigating the inter-related factors that influence fishing safety including: fishery policy and vessel regulations, vessel safety design and modeling, human relationships on vessels and health and safety program development, implementation and evaluation. The Fishing Vessel Safety project is composed of six integrated components:

1) Longitudinal Analysis: A statistical analysis of all fishing injuries, fatalities and SAR incidents from 1989 to 2000 to determine trends and influencing factors of seafood harvester occupational health and safety;
2) Perceptions of Risk: An interview-based study, conducted with seafood harvesters, on the perceptions of causes of accidents and near-misses - and the effectiveness of existing accident prevention programs;
3) Motion Induced Interruptions: Sea trials, physical and numerical modeling of the effects of MIIs, sudden vessel motions induced by wave action, on crew accidents and development of criteria to reduce MIIs;
4) Delayed Return to Work: an interview-based study on the psychological and social factors that delay previously injured seafood harvesters from returning to work;
5) Education Program: The development of an interactive, community-based occupational safety education program for seafood harvesters; and
6) Comparative Analysis: A comparative analysis of accident and fatality rates, and regulatory regimes for fisheries management and fishing vessel safety in Canada, the United States, Iceland, Norway, Denmark, France and Australia.

Several of the project components will yield results that can be directly used by stakeholder organizations for designing and implementing injury and fatality prevention programs. The applied nature of the overall project will be represented by a series of recommendations that will provide accessible and applicable information needed to make informed decisions. Additional information on SafetyNet may be found by visiting their web site [Reference 4].

The effort described in this report is part of Component #3 of the overall Fishing Vessel Research project. The tentative plan involves carrying out seakeeping trials on a total of five Newfoundland based fishing vessels ranging in lengths from 35 ft. to 75 ft. (10.67 m to 22.86 m) over two years. Data will be acquired on some of the vessels with and without roll damping devices deployed. Standard seakeeping parameters such as ship motions, speed, and heading angle will be recorded along with data on the ambient environmental conditions (wave height/direction, wind speed/direction). Physical models of three of the vessels (tentatively the 35, and two 65 ft. vessels) suitable for free-running operation in

the IOT Offshore Engineering Basin (OEB) will be fabricated and tested by IOT over three years in environmental conditions emulating the full scale conditions. Project participants at the MUN Faculty of Engineering will derive numerical models of all five hull forms and run simulations using their non-linear time domain ship motion prediction codes. Validated simulation tools will then be used to predict the expected level of MIIs for different fishing vessel designs.

Additional information on human factors in ship design is provided in References 5 to 8.

## 3.0 DESCRIPTION OF THE CCGA MISS JACQUELINE IV

The CCGA Miss Jacqueline IV [Figure 1] is a typical 65' steel fishing vessel and was built by Bay D'Espoir Enterprises Ltd., of St. Alban's, NL in 1989 to a design furnished by Maritime Marine Consultants of Rothesay, NB. The vessel primarily participates in the inshore snow crab and shrimp fisheries, but has the ability to harvest other species, such as codfish, turbot, and capelin when the stocks are available. The vessel is based in St. John's but operates out of different ports around the island to exploit various Newfoundland fishing grounds.

Nominal Principal Particulars:

| | |
|---|---|
| Length Overall: | 64' 11½" (19.80 m) |
| Beam: | 24' (7.32 m) |
| Draft: | 10' (3.05 m) |
| Installed Power: | 475 HP (354.2 kW) |
| Fish Hold Capacity: | 77 L. Tons (78,235.2 kg) |
| Fuel Capacity: | 2500 gal. (9463.5 l) |
| Fresh Water Capacity: | 350 gal. (1325 l) |
| Fish Hold Volume: | 2000 $ft^3$ (57 $m^3$) |
| Accommodations: | 7 berths |

One of the goals of this experiment is to measure the motions of the vessel while it is harvesting its catch, therefore a "half loaded" displacement condition was simulated by adding roughly 31,000 kg of sea water to two live catch tanks in the fish hold. Once the vessel was ballasted and most of the outfit items installed, an inclining experiment was performed on October 14, 2004 by Marine Services International Consultants Inc. to identify key hydrostatic properties for the trials condition.

The inclining experiment was carried out using standard procedures whereby two pendulums (aft pendulum was 2.200 m long in the fish hold, forward pendulum was 2.015 m long in the forward cabin) suspended with the weights in an oil bath were deployed to measure roll angle. Static roll angles were induced by the shifting of two 45 gal. plastic drums filled with fresh water, weighing a total of 0.4773 Long Tons (476 kg), laterally to various locations on the main deck.

The following is a summary of results:

| | |
|---|---|
| Draft: | 12.58 ft @ AP (3.834 m Aft) |
| | 9.17 ft @ FP (2.795 m Fwd.) |
| Displacement: | 247 Long Tons (246,482 kg) |
| Longitudinal Centre of Gravity (LCG): | 30.11 feet (9.178 m) Fwd. of AP |
| Vertical Centre of Gravity (VCG): | 11.13 feet (3.392 m) above base plane |
| Transverse Metacentric Height ($GM_T$): | 2.19 feet (0.993 m) |
| Transverse Metacentric Height ($KM_T$): | 13.32 feet (4.06 m) above base plane |

The inclining report delivered by the contractor is included in Appendix A.

The 'Miss Jacqueline IV' is a double hard chine, single screw (fixed pitch propeller), single flat plate rudder vessel with a very large centreline skeg and paravane anti-roll device. A photograph and drawing of the paravane are provided in Figures 2, 3 respectively. The vessel has a normal suite of navigation/ communications electronics including radar, GPS, VHF radio, depth sounder and electronic chart information as well as a ComNav 2001 autopilot. Heading angle information to the autopilot was input from an electro-magnetic gyrocompass. The vessel is fitted with an 18 person inflatable life raft, however the lifesaving equipment was augmented with floater suits on loan from the CCG for the trials period. A detailed list of the 'Miss Jacqueline IV's' principle particulars and list of outfit items can be found in Appendix B.

## 4.0 DESCRIPTION OF INSTRUMENTATION

IOT was tasked to provide the trials technical support to install and maintain primary on-board instrumentation, and a data acquisition system with limited online data analysis capability for all the trials. The instrumentation plan is provided in Appendix C while the analog channel calibration information is provided in Appendix D. Note that all analog channel calibrations were verified after completion of the trial. The instrumentation, signal cabling, and data acquisition system used along with the calibration method employed for each parameter is described in this section. The standard IOT sign convention is provided in Reference 9.

### 4.1 Data Acquisition System (DAS)

The Data Acquisition System (DAS) used in the 'Miss Jacqueline IV' was mounted on the galley table of the vessel [Figure 4]. The software package [Reference 10] designed for these trials were run on two ruggedized Panasonic notebook computers, which had the following software attributes:

Off-the-shelf Software:

- Windows 2000 – operating system
- WinZip 8.0 – data compression software

- Excel 2000 – spreadsheet software
- Daqview 2000 – for viewing the data graphically

Hardware:
- Daqboard 2000

Additional Devices:
- CompassPoint 2200 GPS – provides position along with heading, rate of turn, etc.
- IOTech Daqbook 2000 – provides analog-to-digital conversion for analog signals including rudder angle, MotionPak, accelerometers and inclinometers.
- Signal Conditioning and interfacing hardware for analog channels.
- Uninterruptible Power Supply (UPS)

Custom Software:
- FishingVesselLogger – the primary program used to acquire the analog data (data rate was generally 50 Hz for each of 16 analog channels).
- CompassPointGPS – a slave process to the FishingVesselLogger program. It receives data from the DGPS unit and also logs all the GPS data.
- FishingVesselCal – used to post-calibrate the acquired data.
- CompassPointNMEA Parser – used to post-parse the NMEA data stream from the CompassPoint 2200 GPS unit and save the resulting parsed data to ASCII.

### 4.2 Rudder Angle Measurement

The rudder angle was measured by winding the cable, with wax string extension, from a 10 inch yo-yo type potentiometer linear displacement transducer around a groove cut in a circular ½ inch (1.27 cm) thick Plexiglas plate. The plate was machined with a steel clamp at its centre so that it could be adjusted to any size rudderpost [Figure 5]. The transducer was clamped to a convenient vertical frame on the port side of the steering gear compartment.

Rudder angle was calibrated with respect to a protractor, drawn using CAD software, fixed to the top of the circular plate with zero degrees from the rudder indicator on the Bridge. The rudder angle indicator in the wheelhouse could not be used for calibration as it displayed approximately one half the actual rudder angle amplitude.

### 4.3 Ship's Motion Instrumentation

For the seakeeping trials carried out on October 15 to 18, a MotionPak I was used to measure ship motions with six degrees of freedom. The MotionPak was

mounted to a transverse deck head beam in the vessel's fish hold [Figure 6] and outputs the following motion channels:

- Roll Rate
- Pitch Rate
- Yaw Rate
- Surge Acceleration
- Sway Acceleration
- Heave Acceleration

From these six signals, dedicated MotionPak software was available to derive the following 18 channels in either an earth or body co-ordinate system, and move the motions to any point on the rigid platform:

- Roll Angle/Rate/Acceleration
- Pitch Angle/Rate/Acceleration
- Yaw Angle/Rate/Acceleration
- Surge Displacement/Velocity/Acceleration
- Sway Displacement/Velocity/Acceleration
- Heave Displacement/Velocity/Acceleration

The MotionPak angular rate channels were calibrated using manufacturer's specifications while the acceleration channels were physically calibrated by placing the sensors on a set of precision wedges and computing the acceleration. The accelerometers output zero $m/s^2$ when placed on a horizontal plane and $-9.808\ m/s^2$ (- 1 g) when oriented with the measuring axis vertical. The intermediate accelerations are computed as follows:

Acceleration = $-9.808\ m/s^2$ * sin (angle of inclination)

In addition, orthogonal linear accelerations [sway, surge and heave, Figure 7] were measured on the Bridge, behind the central circuit breaker panel and physically calibrated using the same procedure as was used for the MotionPak accelerometers. These instruments were used primarily to validate data collected by the MotionPak. From the inclining report, the position relative to the vessel centre of gravity is:

*MotionPak:* 1.86 m aft, 0.72 m below
*Accelerometers:* 5.40 m fwd, 0.912 m stbd, 3.10 m above

Two inclinometers used in the measurement of the pitch and roll angle were also mounted near the DAS and physically calibrated using the series of precision wedges. It should be noted that the inclinometers have a relatively low response rate and were fitted primarily to measure angular motion in the event that manoeuvring trials in calm water were carried out.

### 4.4 Differential Global Positioning System Data

The Global Positioning System (GPS) is a satellite based navigation system operated and maintained by the US Department of Defence. GPS consists of a constellation of 24 satellites providing worldwide, 24-hour, three-dimensional position coverage. Although originally conceived to satisfy military requirements,

GPS now has a broad array of civilian applications including becoming the standard tool for marine navigation.

GPS is currently the most accurate navigation technology available to the public. The GPS receiver computes the distance to a minimum of three GPS satellites orbiting the earth to accurately derive the ship's position. GPS receivers also output precise time, speed of the ship over the ground (SOG) as well as course over ground (COG) measurements. Additional general information on the operation of a GPS system is provided in Reference 11.

Differential GPS (DGPS) provides greater positioning accuracy than standard GPS since error corrections can be included using a GPS signal transmitted via HF from a receiver established at a known location on land. To acquire a DGPS correction, IOT installed a CompassPoint 2200 GPS (a rectangular antenna with dimensions 60 cm x 16 cm x 18 cm) with a fixed based mounting, which was clamped the railing above the wheelhouse [Figure 8]. Once the antenna was visually aligned parallel to the ship's longitudinal centreline, the system software was initiated by having the vessel perform multiple 360-degree rotations in the harbour.

The DGPS correction signal was acquired from a CCG broadcast at a frequency of 315 kHz from Cape Race, NL. Using DGPS, absolute position accuracies between 3 and 10 m can be achieved along with velocity accuracies within 0.1 knots.

The following digital data channels were acquired using the DGPS receiver in standard National Marine Electronics Association (NMEA) format:

Course Over Ground (COG) – degrees TRUE
Speed Over Ground (SOG) – km/hr
Latitude/Longitude - degrees/minutes/seconds

Using information in the inclining report, the position of the DGPS antenna relative to the vessel centre of gravity was:

*DGPS:* 2.328 m fwd, 3.456 m starboard, 6.12 m above

### 4.5 Directional Wave Buoy/Mooring Arrangement

Two directional wave buoys were used during the trials:

Neptune Sciences Sentry Wave Buoy
A small (0.75 m diameter, 15.7 kg) discus shaped directional wave buoy manufactured by Neptune Sciences, Inc. of Slidell, Louisiana and procured by MUN for previous sea trials using NSERC funding was used to acquire information on the wave conditions during the seakeeping trials [Figure 9]. The

buoy was moored in approximately 165 metres of water at 47° 33.713" N 52° 25.697" W. On the day of the trial, the buoy was manually deployed by lifting it over the side of the 'Miss Jacqueline IV'. Retrieval was accomplished at the end of the trial using the vessel's pot hauler.

The wave buoy was configured to acquire data for 17.07 minutes (1024 s) every half hour, process and store the data in an ASCII format file on an internal non-volatile flash disk. A radio modem was used to communicate between a base station on the 'Miss Jacqueline IV' and the buoy over line of sight range using a spread spectrum device operating in the UHF 902-928 mHz frequency band. The buoy assembly is composed of the following components:

- Instrument Housing: composed of a sealed aluminium cylinder with connections for the antenna and on/off plug on top. The housing contains the instrumentation package, onboard computer and onboard radio modem. All components of motion required to transform the buoy-fixed accelerations into an earth-fixed co-ordinate system (vertical, east-west and north-south) are measured using sensors mounted in the instrument package. Earth-fixed accelerations enable determination of non-directional wave information (wave heights, periods, and non-directional spectra) as well as directional wave information (wave directions and directional spectra) with all required computations executed within the onboard computer.

- Battery Housing: comprises a smaller sealed aluminium cylinder fitted below the instrument housing and contains the battery pack composed of 27 disposable D-cell alkaline batteries providing a 1 to 2 week lifetime with the buoy configured for data collection every ½ hour.

- Floatation Assembly: a rugged urethane foam and aluminium cage designed to provide the appropriate buoyancy for the instrument and battery housing. The floatation assembly was designed such that the instrument and battery housing combination can be removed and replaced without disturbing the mooring or recovering the entire system.

- Shipboard Modem: An RF modem with dedicated power supply and antenna is used to communicate from a ship based laptop computer to the wave buoy. A dedicated, windows based, user-friendly software package is supplied by the buoy manufacturer to facilitate the communication between the shipboard computer and the wave buoy. The data can also be retrieved using an umbilical connection to the buoy after the buoy has been recovered.

- Mooring Assembly: a mooring system for the wave buoy was designed for a 165 m depth of water by personnel from the MUN Physical Oceanography Group after discussions with the buoy manufacturer. The mooring is described as follows:

- Neptune Wave Buoy with floating tether
- 4 meter half inch nylon cord in parallel with 3 meter shock cord
- ½" stainless steel shackle and swivel
- 55 meters of ¼" jacketed wire rope and shackles
- 183 meters 9/16" polypropylene rope
- 10' ½" galvanized chain
- 40 lb. Danforth® anchor

Additional information on the Neptune directional wave buoy is provided in Reference 12 while further information and a typical output file is provided in Appendix E.

Datawell Waverider Mark II Wave Buoy

In previous trials the Neptune buoy proved to be unreliable. To ensure acquisition of the required directional wave data, a 0.9 m diameter Datawell Waverider Mark II wave buoy manufactured by Datawell b.v. of the Netherlands was leased from Oceans Ltd. of St. John's, NL. Oceans Ltd. was responsible for providing the buoy and mooring, supervising its launch/recovery from MV Louis M. Lauzier, as well as acquiring the data during the trial and generating a final data product.

The buoy was deployed in 165 m of water in position 47 34.126 N, 52 26.154 W – about 10 nm east of St. John's. Directional wave data was computed every half hour and transmitted to the base station at a frequency of 29.760 mHz with an output power of 150 – 200 mW. The high visibility yellow [Figure 10] buoy includes a flashing light that flashes 5 times every 20 seconds. The single point mooring provided by Oceans Ltd. was designed to ensure sufficient symmetrical horizontal buoy response with low stiffness permitting the buoy to follow waves up to a wave height of 40 m with a resolution of 1 cm, and wave periods between 1.6 and 30 s. The wave direction resolution was 1.5$^{o}$ while the wave frequency resolution was 0.005 Hz for frequencies less than 0.1 Hz and 0.01 Hz otherwise. The 212 kg buoy was anchored using two railway train wheels [Figure 10] weighing a total of 1400 lbs. (635 kg). The buoy was moored for approximately 2 months (October/November 2004).

The following sensors/equipment were included in the wave buoy:

- Hippy-40 pitch angle/roll angle/heave displacement
- Three axis flux gate compass
- Two fixed X and Y linear accelerometers
- Sea temperature sensor
- Micro-processor

The receiving system was installed ashore at the Cape Spear light station and consisted of a passive 3 m long (Kathrein) whip antenna with base. A dedicated laptop computer interfaced to the wave direction receiver for storing and displaying the acquired wave data. The receiver was set up to receive at 38.760

mHz (a higher frequency than being transmitted by the buoy). The base station was only monitored on the days when sea trials occurred. The specifications for the Datawell buoy, the mooring description and typical output data files are provided in Appendix F. Additional information on the buoy can be obtained from the Datawell b.v. web site (Reference 13) and user's manual that includes a description of the data file format provided by Oceans Ltd. (Reference 14).

### 4.6 Propeller Shaft Speed

Propeller shaft speed was measured using an optical sensor acting on a piece of reflective tape on the shaft in the engine room. The pulse train from the optical pickup was fed to an IOT designed and built frequency-to-voltage (F/V) circuit that converts the digital pulse train to a linear DC voltage proportional to shaft RPM. This instrumentation was calibrated using a laser tachometer that acted on the reflective target, which was then verified using the vessel's RPM gauge.

### 4.7 Directional Anemometer

A MUN "Weather Wizard III", manufactured by Davis Instruments, provides monitoring and logging of essential weather conditions such as temperature, wind direction, wind speed and wind chill [Figure 11]. This instrument was fixed to an aluminium mast furnished by IOT, which was in turn attached to a guardrail on the aft port side of the deckhouse. At dockside the directional indicator was aligned with magnetic north. Wind speed and direction were logged by hand for each run.

### 4.8 Sea Water Temperature/Density Measurement

To determine whether there are any large variations in water density (which would ultimately change the draft of the vessel) between St. John's harbour where the ship's draft is recorded and the trials area, a YSI model 30 battery powered hand-held salinity, conductivity and temperature meter was used to measure the parameters required to determine ambient water density. The YSI 30 unit, manufactured by YSI of Yellow Springs, Ohio, consists of a hand held display device and a weighted probe with 25 feet of cable connecting the two [Figure 12]. The required information, i.e. temperature and salinity, is collected by the probe and presented on the hand held display with an accuracy of $\pm$ 2% or $\pm$ 0.1 PPT (parts per thousand) for salinity and $\pm$ 0.1°C for the temperature. The instrument's range for salinity and temperature is 0 to 80 PPT and -5° to +95°C respectively.

To obtain a mean density of the sea water, the probe was deployed to test the water at about half the draft ~ 2 m. The density is then calculated using the Equation of State of Seawater given in Reference 15, which provided density as a function of temperature, salinity, and pressure. Additional information on the YSI instrument is provided in Reference 16.

### 4.9 Electrical Power

Acquiring quality 120 V electrical power was not a problem on the 'Miss Jacqueline IV'. IOT filtered all power used for IOT equipment through a UPS, however, to ensure that no power glitches or spikes impaired the data.

### 4.10 Signal Cabling

Belden 8723 two pair individually shielded cable was used to conduct signals from the MotionPak, accelerometers and inclinometers to the DAS. The inclinometers were located within the unit designed to accommodate the DAS therefore the distance for cable connection was short. The cable for the accelerometers extended from the DAS along the galley deckhead aft, up the stairway to the Bridge, then down into the wheelhouse forward console, slightly starboard of centreline. The cable to the MotionPak was fed from the DAS through an aft window in the galley, then down through the open fish hold hatch into the fish hold.

In addition, one cable was installed to accommodate the yo-yo potentiometer used to measure the rudder angle. This cable was run from the tiller flat forward to the fish hold, simply secured to the transverse beams strengthening the top of the hold and, bundled together with the cable for the MotionPak, was passed through the open hatch cover and finally through an aft window in the galley where the DAS was located. The cable for the shaft RPM signal extended from the DAS along the galley deckhead aft and through an aft window in the galley, and then down a ventilation duct into the engine room. This cable was run through existing cable trays along the engine room deckhead to the aft transverse bulkhead separating the engine room from the fish hold where it dropped down to the location of the shaft RPM instrumentation.

The DGPS antenna and the directional anemometer were both located on top of the deckhouse of the vessel. Cabling was simply extended from the DAS through an aft window in the galley up to the top of the deckhouse.

## 5.0 TRIALS DESCRIPTION

The test plan for the trial is given in Appendix G. Prior to proceeding to the trials area, a 10 minute zero speed run was carried out in St. John's harbour in an effort to determine the ship motion natural periods. The seakeeping trials were carried out approximately 10 nm due east of St. John's. Prior to departure, all instrumentation was inspected to ensure all sensors were functioning properly. The draft of the vessel was then measured at the bow and stern of the vessel and the salinity and sea water temperature measured, before departing for the Datawell wave buoy located at 47 34.126 N, 52 26.154 W.

Upon arrival at the wave buoy location, the sea conditions were found to be favourable for the experiment, although the wave direction was very difficult to determine visually and the general sea state was confused throughout the two days of seakeeping trials. The significant wave height was visually estimated at approximately 2 - 3 m on October 17th and 1 – 2 m on October 18th. Water was observed on the quarterdeck for some runs and the occasional bow slamming was noted. The run log of the trials events can be found in Appendix H. A set of manoeuvring experiments carried out on October 15th about 2 nm east of St. John's will be documented in a separate report.

Typical Procedure for a Set of Forward Speed Seakeeping Runs:

Each run pattern was carried out in the following manner for each nominal forward speed:

- The ship was first positioned in close proximity to the wave buoy and directional wave data acquired from the buoy to derive the dominant wave direction.
- After reviewing the wave data from the buoy, the dominant head sea direction (degrees magnetic) was corrected using a value of approximately 21 degrees to determine the direction relative to true north.
- The forward speed over the ground for the first run sequence was adjusted to 4 knots, (trawl speed). The heading angle was selected such that the vessel was heading directly into the sea (head sea run). The throttles were adjusted to achieve the desired course and speed. Data acquisition was initiated once steady state conditions were achieved. The course during all runs was maintained under autopilot control.
- After 25 minutes had elapsed on a steady course, data acquisition was terminated.
- The vessel then altered course by 180 degrees to complete the "following" sea run where the wave action is essentially pushing the vessel. The engine speed was adjusted to maintain a constant speed over ground in order to compare results between runs. Data acquisition was terminated after 40 minutes.
- Course adjustment of 135 degrees was selected to correspond with the next section of the run pattern (bow sea run). The engine speed was adjusted as necessary.
- After 25 minutes had elapsed on a steady course data acquisition was terminated.
- Course adjustment of 135 degrees was selected to correspond with the next section of the run pattern (beam sea run). The engine speed was adjusted as necessary.
- After 25 minutes had elapsed on a steady course data acquisition was terminated.

- Course adjustment of 135 degrees was selected to correspond with the next section of the run pattern (quartering sea run). The engine speed was adjusted as necessary.
- After 25 minutes had elapsed on a steady course data acquisition was terminated.
- After the five runs had been completed, the vessel returned to the wave buoy to verify that the dominant wave direction had not changed and confirm that the wave buoy was working correctly. A 25 minute zero speed drift run in nominally beam seas was carried out at this time.

A second set of runs at a forward speed of 8 knots (cruise speed) was carried out on October 17th using the same procedure as was used for the 4 knot runs. Three additional runs at 8 knots (beam, bow and quartering seas) were executed with the paravanes deployed.

On October 18th, two complete sets of runs were carried out at 8 knots – with and without the paravanes deployed.

The dedicated trials team included:

- MUN co-op student – data acquisition and verification
- one IOT research staff
- one IOT electronics staff – support in the event of problems with equipment at sea

## 6.0 DESCRIPTION OF ONLINE DATA ANALYSIS

The purpose of performing an online analysis during the trials is to ensure that all the instrumentation is working properly to identify potential problems with the various sensors that may lead to invalid results.

A network of two laptop computers was used in the Data Acquisition System. One computer logged the raw data from the data stream and, using the custom software FishingVesselCal, converted the data into a usable format stored with the appropriate physical units. The second computer was used to analyze the data from the previous acquired run to assess its integrity as well as communicate with the wave buoy. This was done to avoid overloading the computer logging the data, which could have led to program failure and potentially resulted in incomplete data files or even lost data.

Columns of acquired data were converted to Microsoft EXCEL[1] format and standard EXCEL plotting utilities were used to view the data in the time domain. An example time series plot of surge acceleration from the MotionPak and x acceleration from the accelerometers is provided in Figure 13.

[1] © Microsoft Corp.

## 7.0 DESCRIPTION OF OFFLINE DATA ANALYSIS

Once the trial was complete, the following data analysis was carried out at IOT:

### 7.1 Wave Data Analysis

Wave data was acquired from two sources during the trial. This section describes the data analysis procedure used to generate the Datawell and Neptune wave buoy data products:

#### 7.1.1 Datawell Wave Buoy Data Analysis

Oceans Ltd. carried out the wave analysis using standard software provided by the manufacturer of the buoy. The data was processed on the buoy and both raw and processed data then transmitted to the receiver on shore.

From the accelerations measured in the X and Y directions in the moving buoy reference frame, the accelerations along the fixed north and west axes are calculated. All three accelerations (vertical, north and west) are then digitally integrated to displacements and filtered to a high frequency cut off (0.6 Hz). Finally an FFT is performed on the data.

Raw data are compressed to motion vertical, motion north and motion west. Energy density, main sea direction, directional spreading angle and the normalized second harmonic of the directional distribution for each frequency band are computed on-board the wave buoy in addition to other standard sea state parameters such as significant wave height (SWH), $H_{mo}$ and mean wave period $T_Z$.

Note that within the wave buoy, sea direction is measured using a flux gate compass and thus the data is generated in degrees magnetic. The magnetic deviation for St. John's approaches during the trials period was ~21 degrees West and this correction was applied to derive wave direction in degrees TRUE.

A summary of wave statistics acquired using the Datawell wave buoy is provided in Appendix I. Nondirectional spectrum plots as well as Mean Wave Direction (corrected to degrees TRUE) versus Frequency plots are also provided in Appendix I for each half hour measurement cycle.

#### 7.1.2 Neptune Wave Buoy Data Analysis

Directional wave data is calculated from the motion of the buoy whereby these motions, recorded by onboard sensors for angular and vertical accelerations, accurately mimic the attitude of the ocean due to its discus shaped floatation device. The recordings are then analyzed using spectral analysis to provide directional and nondirectional wave spectra. A directional wave spectrum

describes the distribution of wave energy as a function of both frequency and direction, whereas the nondirectional wave spectrum is a function of frequency only.

More precisely, as a definition:

*Nondirectional Wave Spectrum* ($C_{11}$): is a one dimensional wave energy density that has its greatest value at the frequency where the nondirectional wave energy density is greatest.

This nondirectional wave spectrum is then used for computing wave energy where:

$S(f,\alpha) = C_{11}(f) * D(f, \alpha)$

By which, D is a directional spreading function with a dependency on both frequency f and direction α. S is a two dimensional wave energy density that has its greatest value at the frequency and direction where the directional wave energy is greatest. D(f, α) may be expanded in an infinite Fourier Series as a function of wave direction α. An approximation of the D(f, α) may be provided by computing the first two terms:

$D(f, \alpha) \approx [1/\pi] * [(1/2) + r_1 * \cos(\alpha - \alpha_1) + r_2 * \cos(2 * (\alpha - \alpha_2))]$

Where: alpha1 ($\alpha_1$) – mean wave direction
alpha2 ($\alpha_2$) – principal wave direction
$r_1$ , $r_2$ – frequency dependent parameters that theoretically lie between zero and one.

The following is a list of definitions needed to fully analyze wave data:

*Significant Wave Height*: Average height from wave crest to trough of the one-third highest waves measured. It is assumed that the nondirectional spectrum is relatively narrow and thus significant wave height is computed as:

*Significant Wave Height* = $H_{m0} = 4\ m_0^{1/2}$,
Where, $m_0$ is the area under the nondirectional wave spectrum $C_{11}$.

*Dominant Wave Period/Frequency* (Peak Wave Period/Frequency): is the period/frequency associated with center frequency of the frequency band that has the largest (peak) energy density in the nondirectional spectrum ($C_{11}$).

*Average Wave Period/Frequency*: The average wave period is computed from the spectral moments as follows:

$T_{av} = m_0/m_1$ and $f_{av} = 1/T_{av}$ where:

"$m_1$" – the first moment of area under the nondirectional wave spectrum $C_{11}$.

*Dominant Wave Direction*: the value of $\alpha_1$ for the frequency band where the largest value of $C_{11}$ occurs.

*Average Wave Direction*: is the weighted average over all frequency bands. This wave direction is the energy density weighted vector average of $\alpha_1$ over all frequency bands and is computed from:

$$\text{Average wave direction} = \tan^{-1}(Y, X)$$
$$\text{Where: } Y = \Sigma [C_{11}(f) * \sin(\alpha_1(f))]$$
$$X = \Sigma [C_{11}(f) * \cos(\alpha_1(f))]$$

Note that within the wave buoy, sea direction is measured using a flux gate compass and thus the data is generated in degrees magnetic. The magnetic deviation for St. John's approaches during the trials period was ~21 degrees West and this correction was applied to derive wave direction in degrees TRUE.

A summary of wave statistics acquired using the Neptune wave buoy is also provided in Appendix I. Nondirectional spectrum plots as well as Mean Wave Direction (corrected to degrees TRUE) versus Frequency plots are also provided in Appendix I for each half hour measurement cycle.

### 7.2 Interpreting the Raw Data

The data received by all the various instruments onboard the vessel was initially recorded as an analog DC voltage. A calibration file was then applied to the raw data using the custom software program FishingVesselCal. The calibration file included a five point linear regression curve and instrument offsets for each instrument. A summary of the calibration file along with the regression equations is provided in Appendix D. The data was converted to GEDAP format described in Reference 17 and standard IOT software used to analyze the data.

Example time series plots are provided as follows (8 knots (cruise speed), bow seas):

Figure 14: Surge, Sway and Heave Displacement vs. Time
Figure 15: Surge, Sway and Heave Acceleration vs. Time
Figure 16: Roll, Pitch and Yaw Angle vs. Time
Figure 17: Roll, Pitch and Yaw Rate vs. Time
Figure 18: Shaft Speed and Rudder Angle vs. Time
Figure 19: Speed Over Ground (SOG) and Course Over Ground (COG) vs. Time

### 7.3 Validation of MotionPak Software and Instrumentation

Within the software used to analyze MotionPak data, there is the capability to translate the accelerations recorded to any position onboard the vessel. To verify the ship motions data acquired, the motions were moved from the location of the MotionPak to the accelerometers located in the wheelhouse (7.26 m Fwd, 0.912 m Stbd, and 3.82 m above) and then analyzed in the "Body" fixed coordinate system.

| Instrument | Parameter | Unit | Mean | St. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Accelerometer | Surge Accel. | $m/s^2$ | 0.0 | 0.6391 | -3.4576 | 2.1231 |
| MotionPak | Surge Accel. | $m/s^2$ | 0.0 | 0.7629 | -3.8253 | 2.7126 |
| | | | | | | |
| Accelerometer | Sway Accel. | $m/s^2$ | 0.002 | 0.7432 | -3.4972 | 3.7439 |
| MotionPak | Sway Accel. | $m/s^2$ | 0.0 | 0.7844 | -3.6602 | 3.8655 |
| | | | | | | |
| Accelerometer | Heave Accel. | $m/s^2$ | 0.0 | 1.2795 | -5.1287 | 6.2008 |
| MotionPak | Heave Accel. | $m/s^2$ | 0.0 | 1.2798 | -5.0410 | 6.3772 |

**Table 1: MotionPak Validation**

Table 1 shows the comparison between the data from MotionPak and the linear accelerometers in beam seas at cruise speed (Run beam_20041018112216). From the values of standard deviation computed, it is demonstrated that the accelerations recorded were very similar for heave acceleration but deviate somewhat for surge and sway acceleration – probably due to the difficulty in accurately measuring the longitudinal and lateral displacements. Time series plots comparing the surge and sway acceleration provided in Figures 20 and 21 respectively indicate that there is a close correlation in the signals.

Note that a comparison between the MotionPak angular data and the inclinometer data was not considered valid for data collected in a seaway due to the inherently low response rate of the inclinometers.

### 7.4 Ship Motion Analysis

As stated above, there is the capability to translate the accelerations recorded to any position onboard the vessel using the MotionPak software. As part of this seakeeping experiment, data from the MotionPak was used to compute the motions at two positions on the vessel: the vessel's centre of gravity and the helmsman's position.

Location of Centre of Gravity (CG) Relative to MotionPak:

X: CG was 1.86 m forward of MotionPak
Y: CG and MotionPak were assumed to be on transverse centreline.
Z: CG was 0.72 m above MotionPak.

Location of Helmsman Relative to MotionPak:
X: Helmsman was 6.588 m forward of MotionPak.
Y: Helmsman was 1.776 m to starboard of MotionPak.
Z: Helmsman was 4.80 m above MotionPak.

Tables of detailed basic information and statistics [average, standard deviation, minimum and maximum) for each run are provided in Appendix J.

| Date | Speed (kts) | Run Heading | Roll Angle (deg) | Pitch Angle (deg) | Yaw Angle (deg) | Surge Accel. ($m/s^2$) | Sway Accel. ($m/s^2$) | Heave Accel. ($m/s^2$) |
|---|---|---|---|---|---|---|---|---|
| 17-Oct | 0 | Drift1 | 4.940 | 1.813 | 9.351 | 0.185 | 0.214 | 0.361 |
| 17-Oct | 0 | Drift2 | 4.563 | 1.832 | 11.053 | 0.176 | 0.218 | 0.400 |
| 17-Oct | 0 | Drift3 | 3.824 | 1.931 | 11.563 | 0.174 | 0.237 | 0.443 |
| 18-Oct | 0 | Drift4 | 3.959 | 2.223 | 13.877 | 0.174 | 0.309 | 0.499 |
| 18-Oct | 0 | Drift5 | 3.935 | 2.247 | 13.220 | 0.179 | 0.274 | 0.470 |
| 17-Oct | 4 | Head | 4.246 | 1.631 | 3.099 | 0.186 | 0.203 | 0.443 |
| 17-Oct | 4 | Following | 4.306 | 1.542 | 2.980 | 0.199 | 0.208 | 0.351 |
| 17-Oct | 4 | Bow | 4.658 | 1.261 | 2.889 | 0.142 | 0.242 | 0.386 |
| 17-Oct | 4 | Beam | 4.277 | 1.388 | 3.832 | 0.152 | 0.223 | 0.381 |
| 17-Oct | 4 | Quartering | 3.337 | 1.569 | 3.109 | 0.200 | 0.197 | 0.373 |
| 17-Oct | 8 | Head | 3.896 | 1.369 | 2.149 | 0.169 | 0.260 | 0.543 |
| 17-Oct | 8 | Following | 3.399 | 1.194 | 2.216 | 0.178 | 0.257 | 0.456 |
| 17-Oct | 8 | Bow | 4.162 | 1.158 | 2.087 | 0.170 | 0.268 | 0.561 |
| 17-Oct | 8 | Beam | 3.711 | 1.289 | 2.461 | 0.175 | 0.237 | 0.529 |
| 17-Oct | 8 | Quartering | 3.230 | 1.184 | 2.145 | 0.197 | 0.252 | 0.514 |
| 18-Oct | 8 | Head | 4.657 | 1.512 | 2.317 | 0.209 | 0.366 | 0.706 |
| 18-Oct | 8 | Following | 4.487 | 1.508 | 2.530 | 0.205 | 0.371 | 0.765 |
| 18-Oct | 8 | Bow | 5.150 | 1.519 | 2.711 | 0.207 | 0.292 | 0.484 |
| 18-Oct | 8 | Beam | 3.070 | 1.927 | 2.168 | 0.266 | 0.273 | 1.084 |
| 18-Oct | 8 | Quartering | 4.379 | 1.507 | 2.541 | 0.180 | 0.298 | 0.515 |

**Table 2: Standard Deviation of Motions – No Paravanes**

| Date | Speed (kts) | Run Heading | Roll Angle (deg) | Pitch Angle (deg) | Yaw Angle (deg) | Surge Accel. ($m/s^2$) | Sway Accel. ($m/s^2$) | Heave Accel. ($m/s^2$) |
|---|---|---|---|---|---|---|---|---|
| 17-Oct | 4 | Bow | 2.590 | 1.435 | 2.159 | 0.184 | 0.237 | 0.475 |
| 17-Oct | 4 | Beam | 2.431 | 1.877 | 2.967 | 0.186 | 0.192 | 0.359 |
| 17-Oct | 4 | Quartering | 2.385 | 1.661 | 2.436 | 0.217 | 0.261 | 0.518 |
| 18-Oct | 8 | Head | 2.231 | 1.452 | 1.933 | 0.209 | 0.309 | 0.826 |
| 18-Oct | 8 | Bow | 2.119 | 1.618 | 1.962 | 0.229 | 0.281 | 0.932 |
| 18-Oct | 8 | Beam | 2.688 | 1.394 | 2.454 | 0.169 | 0.245 | 0.379 |
| 18-Oct | 8 | Quartering | 2.262 | 1.458 | 2.099 | 0.196 | 0.310 | 0.738 |
| 18-Oct | 8 | Following | 2.685 | 1.377 | 36.435 | 0.226 | 0.268 | 0.555 |

**Table 3: Standard Deviation of Motions – Paravanes Deployed**

A plot of roll angle, pitch angle and heave acceleration standard deviation vs. heading at trawl and cruise speed, with and without paravanes deployed is shown in Figures 22, 23, and 24.

### 7.5 Roll and Pitch Frequency Analysis

A variance spectral density analysis was carried out on the roll rate and pitch rate data for the zero speed run carried out in St. John's harbour prior to the trial in an effort to determine the roll and pitch period. The following values of the spectral peak were output:

Roll Period: 7.9360 s
Pitch Period: 4.6521 s

## 8.0 DISCUSSION & RECOMMENDATIONS

The following is a series comments on how the trial was executed with recommendations on how to improve the quality of data collected.

Trial Schedule:
Originally, IOT was scheduled to carry out a trial on the 45' CCGA Nautical Twilight with outfit commencing October 4th in St. John's. During the weekend of October 2nd however, additional shrimp quota was allocated to the NF fishing fleet and all fishing vessels designated for trials went to sea disrupting IOT planning. Thus equipment was fitted to the CCGA Miss Jacqueline IV, the first vessel available after acquiring their quota, on October 12th - earlier than planned. IOT staff had to scramble to ensure mechanical components for this vessel were available while several critical staff were on leave. It is a credit to the trial's team and support staff that this vessel was fully outfit, ballasted, inclined and available for trials by October 15th.

Ballasting Effort:

The 'Miss Jacqueline IV' is fitted with four watertight refrigerated seawater wing tanks used for live crab storage and transportation. Two of these tanks were filled with approximately 31,040 kg of seawater to simulate a partially loaded condition. The tanks were pressed up to the hatches to reduce free surface affects. This proved to be a much easier ballasting method than loading flake ice used for other trials.

Overall Outfit:

Overall the outfit of the 'Miss Jacqueline IV' went well with few complications. Not having to install a portable generator to power IOT electronics certainty reduces the complexity of the outfit and operational risks. Although the vessel was 15 years old, it was in excellent condition and afforded a clean, attractive

work environment. The location of the DAS on the galley table was inconvenient to the crew and the table vibrated somewhat introducing some noise into the pitch and roll inclinometer data.

Paravane Deployment:

The crew of the vessel were able to deploy and retrieve the paravanes very quickly. All runs were conducted with the paravane arms extended out at about a 45 degree angle, although the vessel was inclined with the arms stowed in a vertical position. There was a very noticeable difference in the motion of the vessel when the paravanes were deployed.

Bulbous Bow:

A few years ago, a large bulbous bow was fitted to the vessel, which, according to the Master, had a positive effect on pitch motion.

Labour Action:

Immediately prior to the trials period, the Canadian Coast Guard was subjected to legal strike activity, which prevented the use of the Coast Guard base for moorage and vessel preparation. Luckily, the usual moorage for the vessel at No. 6 pier in the north west corner of the harbour proved to be convenient and secure, so that no delays or other problems were experienced. It did require that all equipment be securely stowed every night, and the DAS computers were only on board during set-up and for the actual trials periods.

Roll Angle Sign Convention:

During the offline data analysis, it was determined that there was a difference in the roll angle sign convention between the roll inclinometer and the MotionPak. There is no photograph available of the inclinometers mounted next to the DAS so it is impossible to verify the orientation of the sensor. After an extensive review of the data, it was determined that the sign convention for the inclinometer was incorrect. In future, it is recommended that photographs be taken of all sensors and care taken to clearly mark the sensor to prevent errors in orientation in future.

Gyrocompass:
The ‘Miss Jacqueline IV’ is one of the few small fishing vessels fitted with a gyrocompass and the signal from this unit was used to provide a very stable input to the ship’s autopilot. Using a gyrocompass input, according to the Master, significantly improved the course keeping characteristics of the vessel in a seaway and subsequently reduced fuel consumption. In future, it is advisable to record the type of sensor used to provide heading angle information as an

input to a ship's autopilot as this information may be useful especially if the performance of two similar vessels are being compared.

Comparison of Neptune & Datawell Wave Data:
A comparison of wave data acquired from both wave buoys for the same time period is provided in Table 4 below.

| | Neptune Directional Wave Buoy Data | | | | Datawell Directional Wave Buoy Data | | |
|---|---|---|---|---|---|---|---|
| **Date** | **Time (NF)** | **H1/3 (m)** | **Tavg (s)** | **DirMax (deg. TRUE)** | **Hs (m)** | **Tz (s)** | **DirMax (deg. TRUE)** |
| Oct. 17 | 12:30 | 2.38 | 7.72 | 47.4 | 2.58 | 7.69 | 45.2 |
| Oct. 17 | 13:00 | 2.46 | 7.93 | 50.2 | 2.71 | 7.84 | 18.5 |
| Oct. 17 | 15:30 | 2.22 | 7.20 | 64.4 | 2.61 | 7.27 | 18.5 |
| Oct. 17 | 16:00 | 2.21 | 7.09 | 23.1 | 2.68 | 7.41 | 32.5 |
| Oct. 17 | 16:30 | 2.14 | 6.90 | 5.3 | 2.53 | 7.14 | 64.9 |
| Oct. 17 | 17:00 | 2.19 | 7.27 | 298.2 | 2.26 | 6.90 | 84.6 |
| Oct. 17 | 17:30 | 1.97 | 6.79 | 293.0 | 2.49 | 7.02 | 48.0 |
| Oct. 17 | 19:30 | 2.28 | 7.13 | 271.5 | 2.25 | 6.56 | 38.2 |
| Oct. 17 | 21:30 | 2.05 | 6.39 | 281.0 | 2.14 | 6.06 | 32.5 |
| Oct. 17 | 22:00 | 2.06 | 6.43 | 255.6 | 2.23 | 6.25 | 55.0 |
| Oct. 17 | 22:30 | 2.23 | 6.58 | 247.7 | 2.31 | 6.15 | 43.8 |
| Oct. 17 | 23:00 | 1.96 | 6.12 | 91.9 | 2.26 | 6.15 | 41.0 |
| Oct. 17 | 23:30 | 2.08 | 6.08 | 33.8 | 2.22 | 5.97 | 38.2 |
| | | | | | | | |
| Oct. 18 | 00:00 | 1.89 | 5.72 | 57.0 | 2.38 | 6.06 | 31.1 |
| Oct. 18 | 00:30 | 2.16 | 6.14 | 24.6 | 2.39 | 5.88 | 52.2 |
| Oct. 18 | 02:30 | 2.06 | 6.18 | 79.2 | 2.16 | 5.71 | 77.5 |
| Oct. 18 | 03:00 | 1.95 | 5.90 | 249.2 | 2.20 | 5.88 | 60.7 |
| Oct. 18 | 06:00 | 1.81 | 5.60 | 208.9 | 2.19 | 5.80 | 63.5 |
| Oct. 18 | 06:30 | 1.99 | 5.95 | 342.0 | 2.09 | 5.71 | 71.9 |
| Oct. 18 | 07:00 | 1.92 | 5.88 | 250.7 | 2.11 | 5.80 | 69.1 |
| Oct. 18 | 07:30 | 1.82 | 5.79 | 244.4 | 2.17 | 5.80 | 52.2 |
| Oct. 18 | 08:00 | 1.93 | 6.06 | 232.9 | 2.11 | 5.71 | 62.1 |
| Oct. 18 | 09:00 | 1.81 | 5.76 | 238.0 | 2.16 | 6.06 | 69.1 |
| Oct. 18 | 13:30 | 1.64 | 5.67 | 215.8 | 1.98 | 5.80 | 84.6 |
| Oct. 18 | 14:00 | 1.77 | 5.67 | 221.7 | 1.94 | 5.71 | 86.0 |
| Oct. 18 | 14:30 | 1.80 | 5.91 | 232.0 | 1.97 | 5.56 | 80.4 |
| Oct. 18 | 15:00 | 1.78 | 5.90 | 258.6 | 1.92 | 5.56 | 83.2 |
| Oct. 18 | 15:30 | 1.77 | 5.93 | 266.0 | 1.86 | 5.63 | 41.0 |

**Table 4: Datawell/Neptune Directional Wave Data Comparison**

The results for both buoys were computed using spectral data. Minor differences can be expected for any two wave buoys moored 0.5 nm apart. The wave period

and significant wave heights are comparable however it is apparent that there is a major discrepancy in the wave direction derived.

Sea Conditions:
The seas on both trial days were very confused – it was impossible to determine the dominant sea direction visually and the data from both wave buoys exhibited widely varying data over time. These conditions will complicate modeling the performance of the 'Miss Jacqueline IV' physically and numerically. Although the significant wave height was somewhat lower on October 18th compared to the 17th, the measured motions were higher since the wave frequency was apparently closer to the vessels natural frequency for roll and pitch.

Datawell Wave Buoy Technical Issues:
Oceans Ltd. experienced technical problems with both wave data signal transmission as well as software during this sea trial, which resulted in serious gaps in the wave data from the Datawell buoy.

## 9.0 ACKNOWLEDGEMENTS

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# FIGURES


**Figure 1: CCGA Miss Jacqueline IV**


**Figure 2: Paravane**

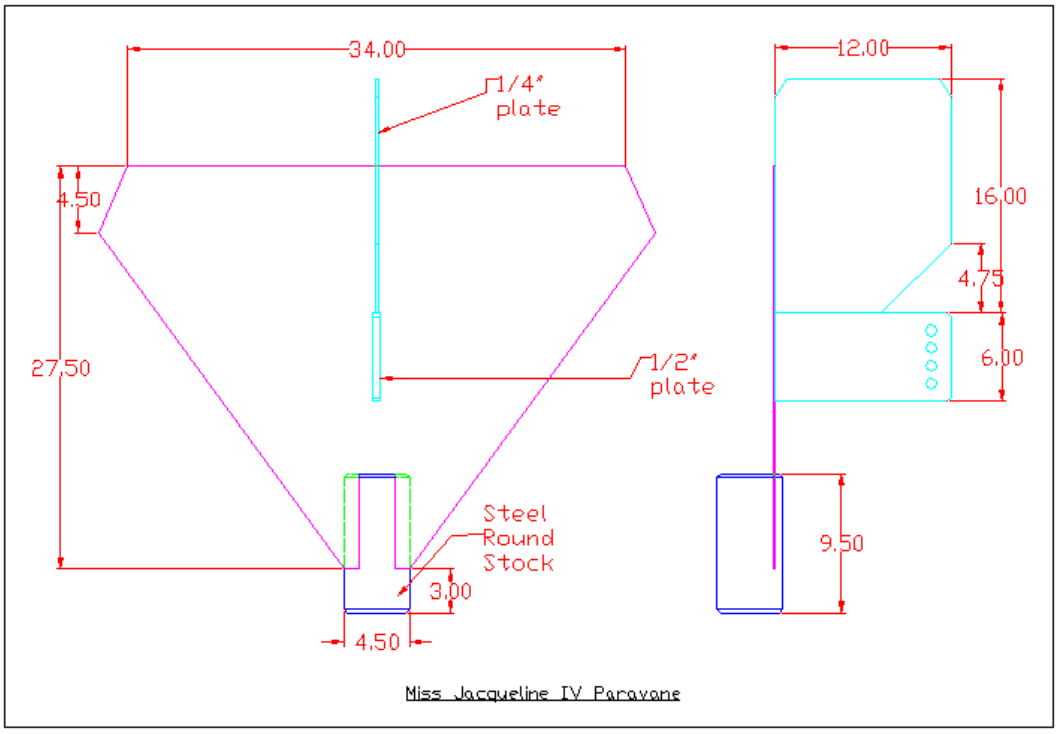



**Figure 3: Paravane Drawing**

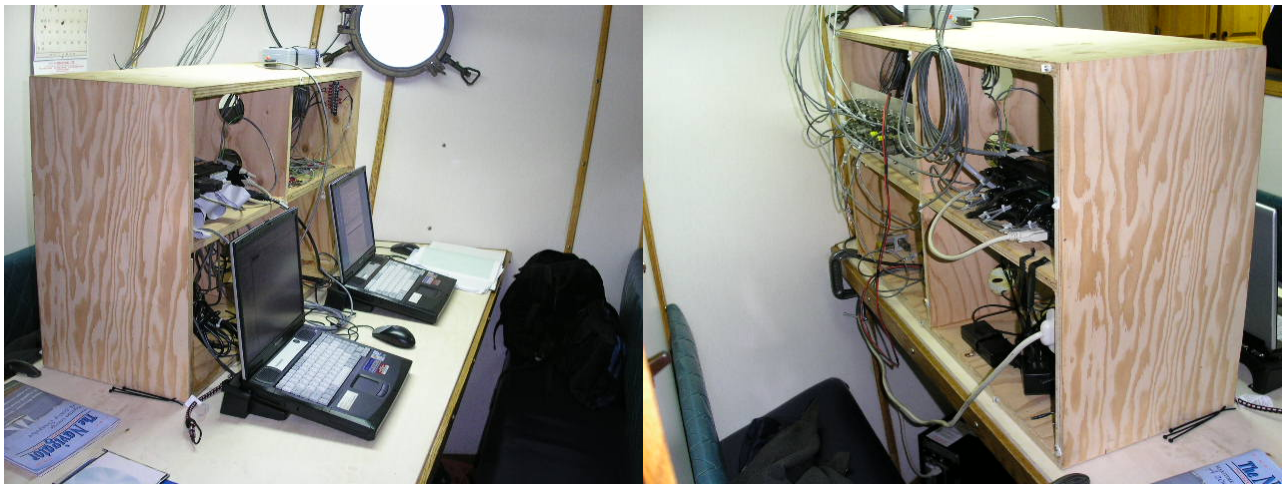


**Figure 4: Data Acquisition System**


**Figure 5: Rudder Angle Measurement**

**Figure 6: MotionPak Installation**

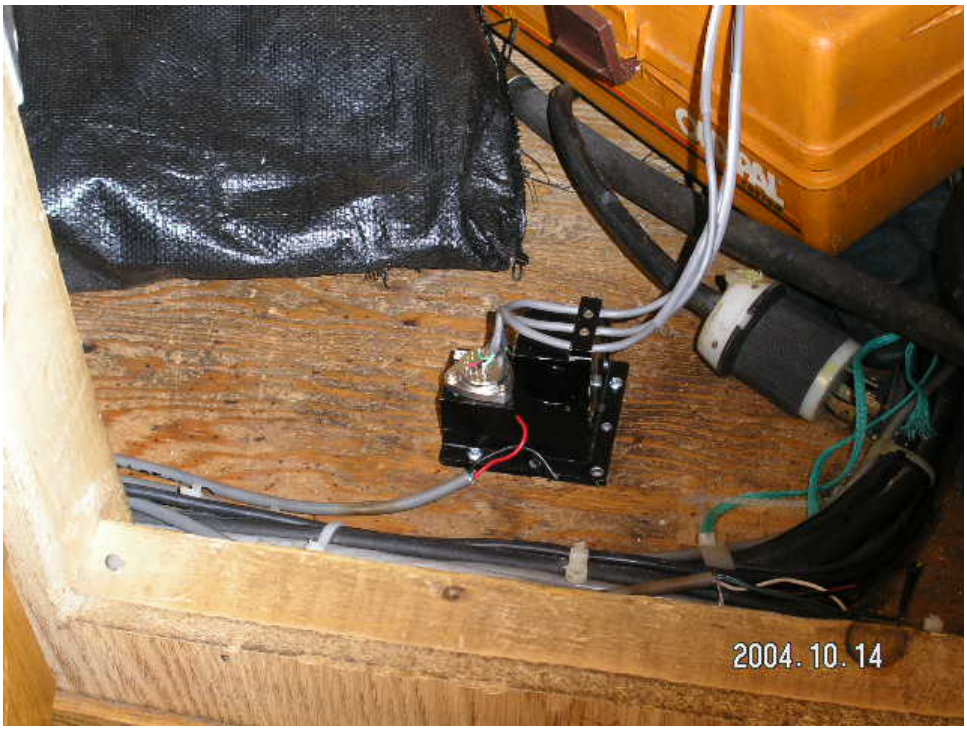



**Figure 7: Orthogonal Accelerometer Installation**


**Figure 8: DGPS Antenna Installation**


**Figure 9: Neptune Directional Wave Buoy**

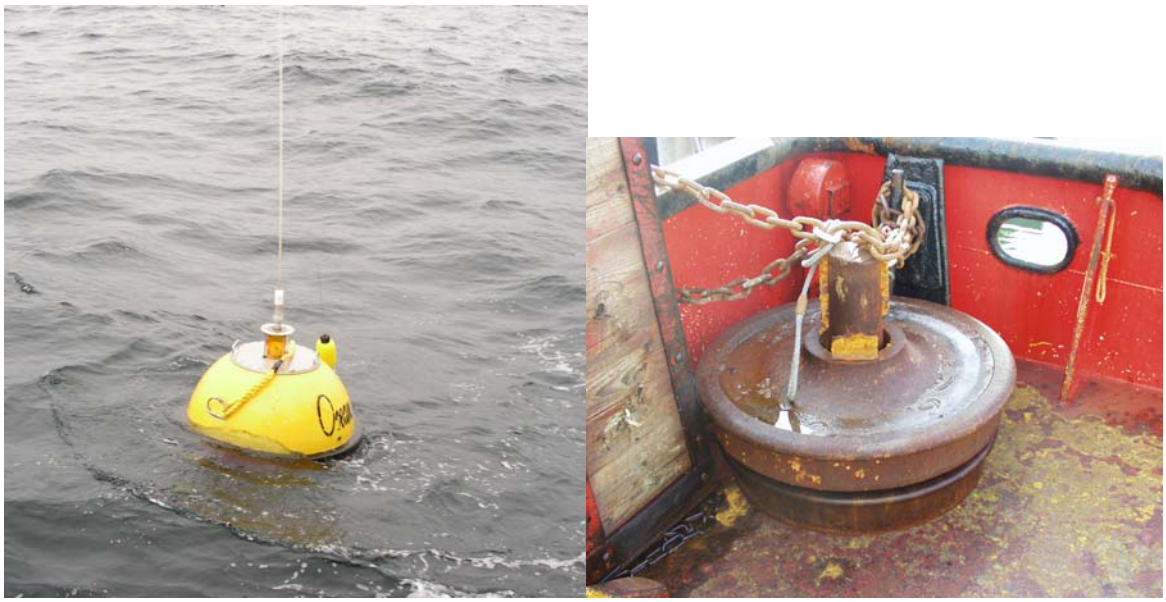


**Figure 10: Datawell Directional Wave Buoy and Anchor**


**Figure 11: Directional Anemometer Installation**


**Figure 12: Hand Held Salinometer**

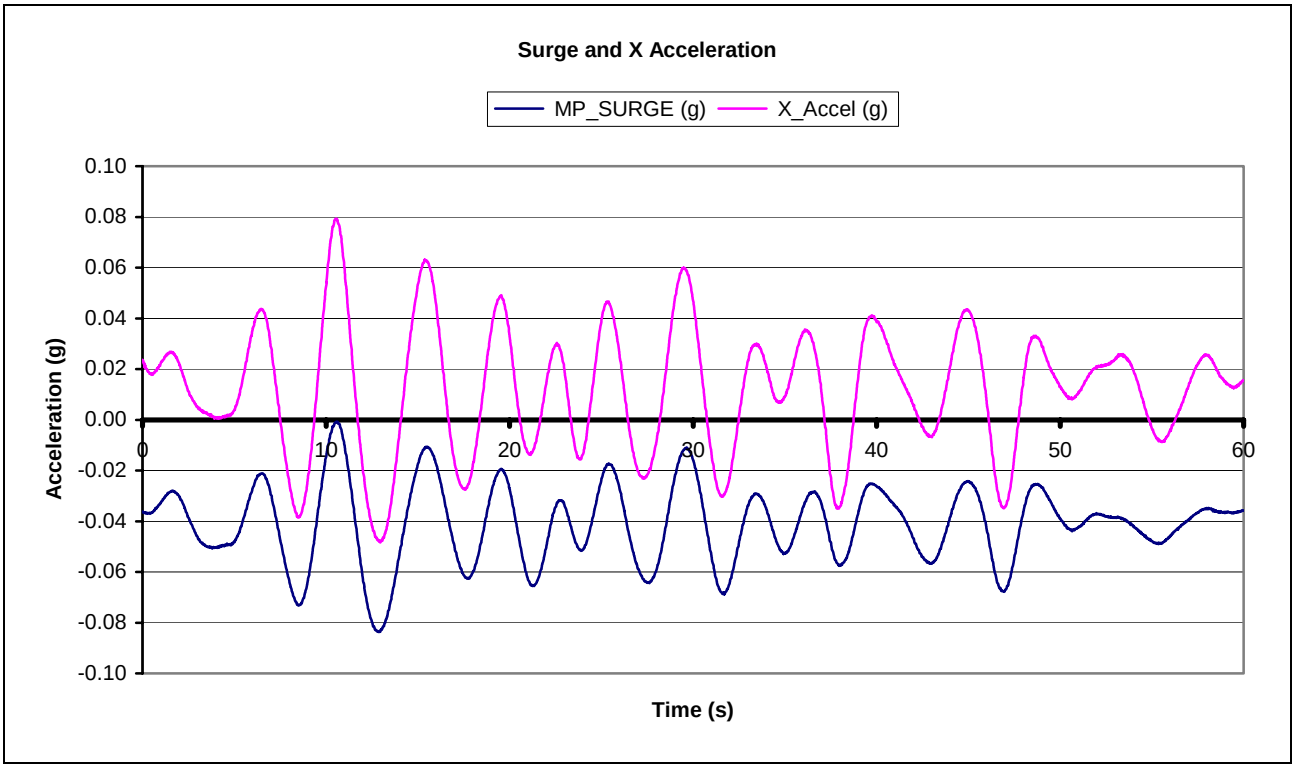



**Figure 13: Example of Online Data Analysis**

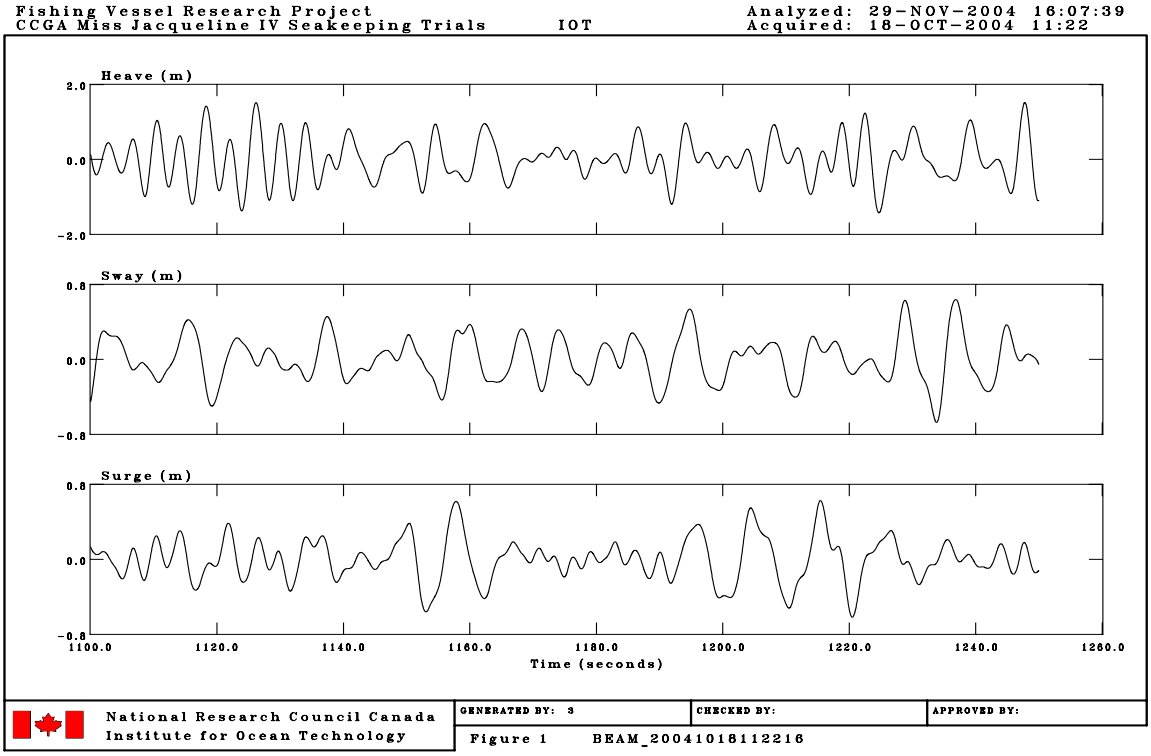



**Figure 14: Offline Data Analysis – Example Surge, Sway & Heave Displacement**

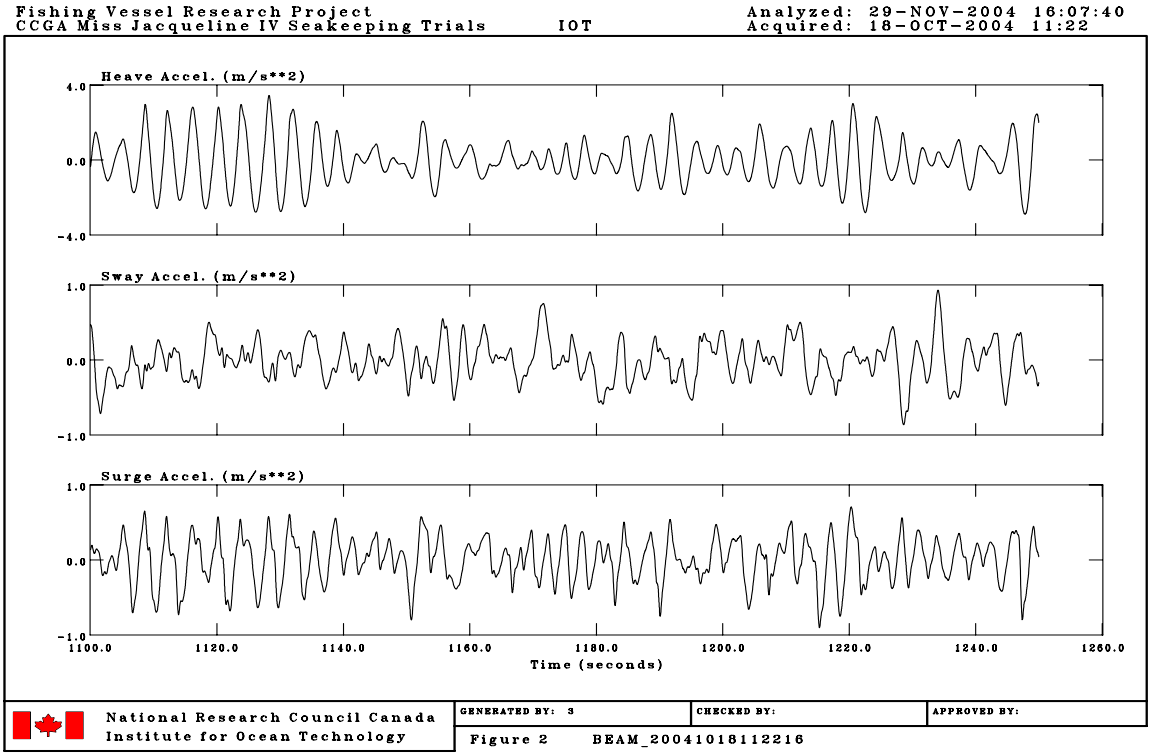



**Figure 15:Offline Data Analysis – Example Surge, Sway & Heave Acceleration**

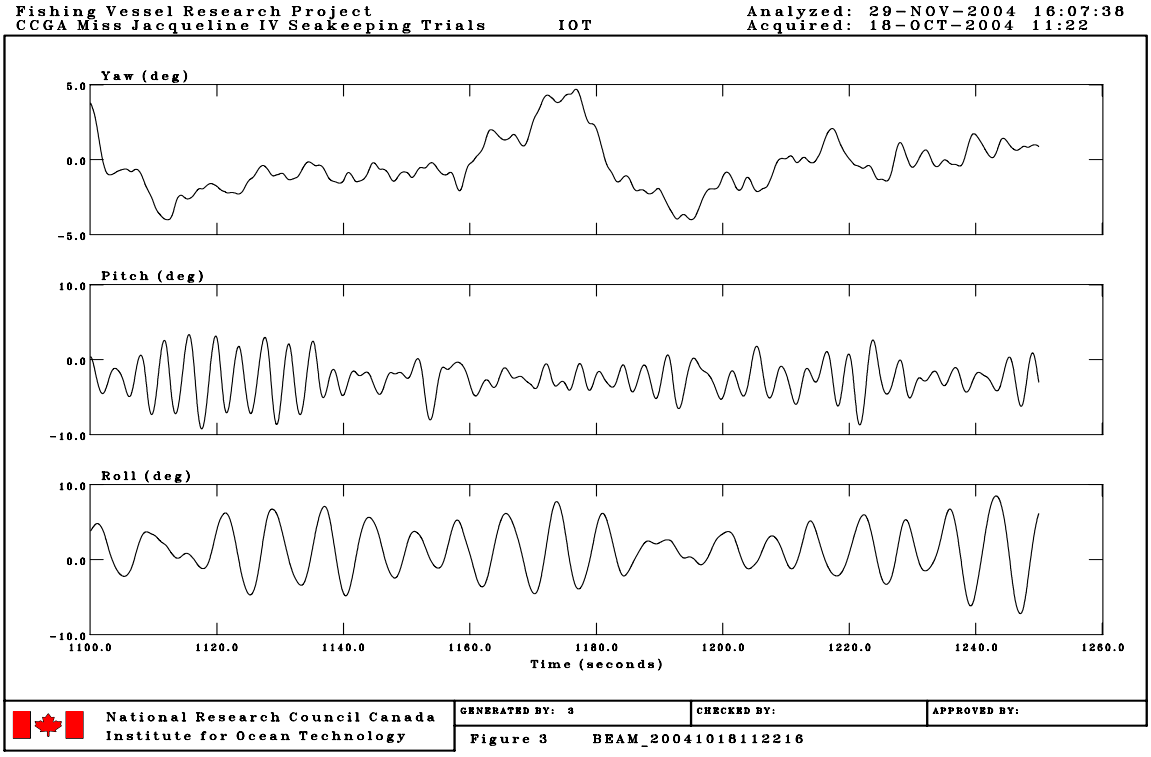



**Figure 16: Offline Data Analysis – Example Roll, Pitch & Yaw Angle**

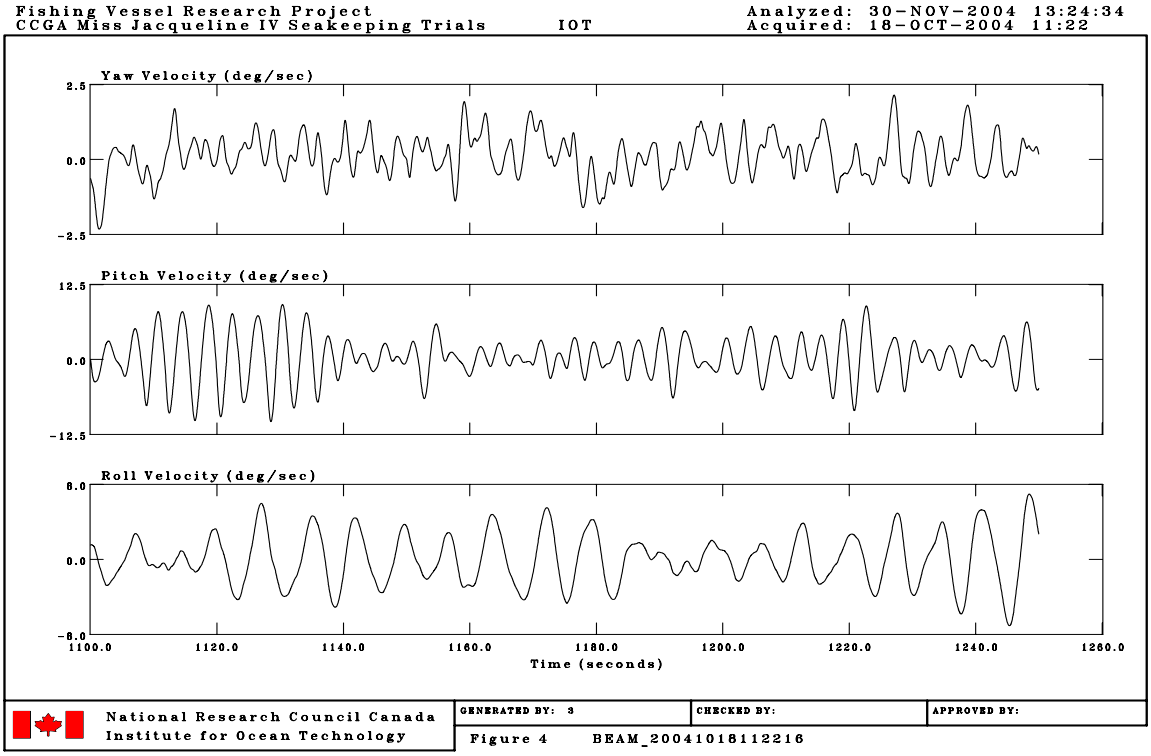



**Figure 17: Offline Data Analysis – Example Roll, Pitch & Yaw Rate**

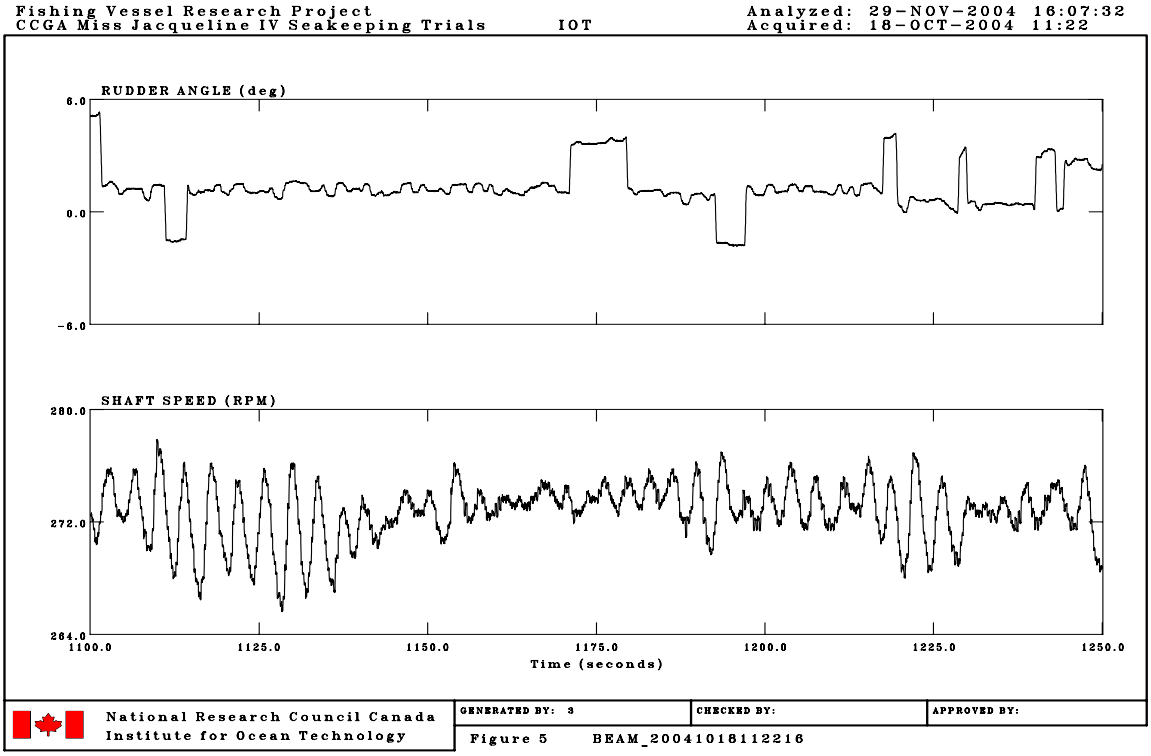



**Figure 18: Offline Data Analysis – Example Shaft Speed & Rudder Angle**

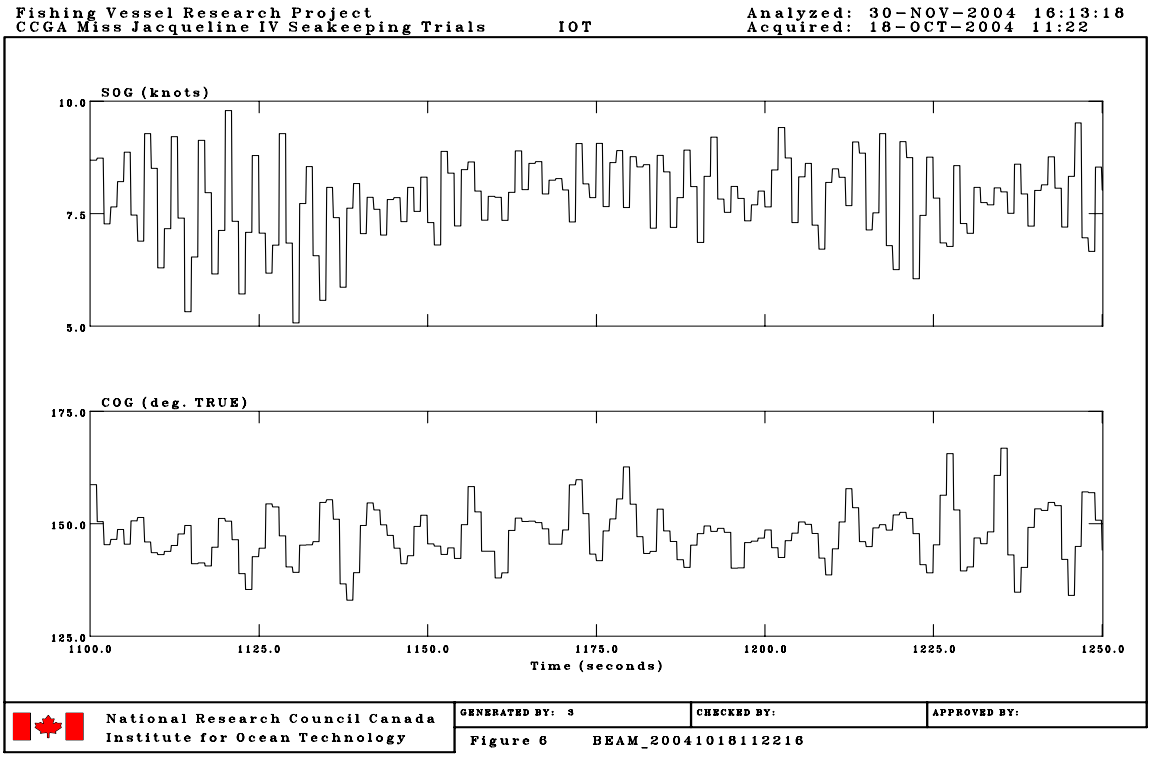



**Figure 19: Offline Data Analysis – Example Speed Over Ground (SOG) & Course Over Ground (COG**

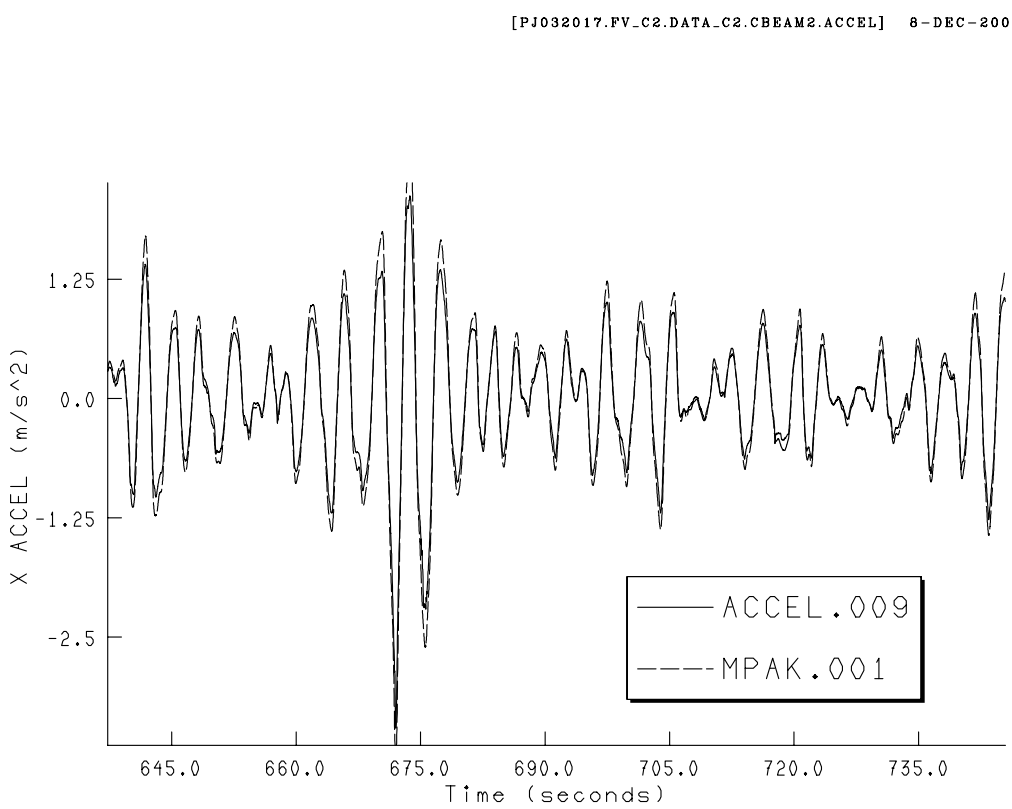



**Figure 20: Comparison of Surge Acceleration from MotionPak and Accelerometer**

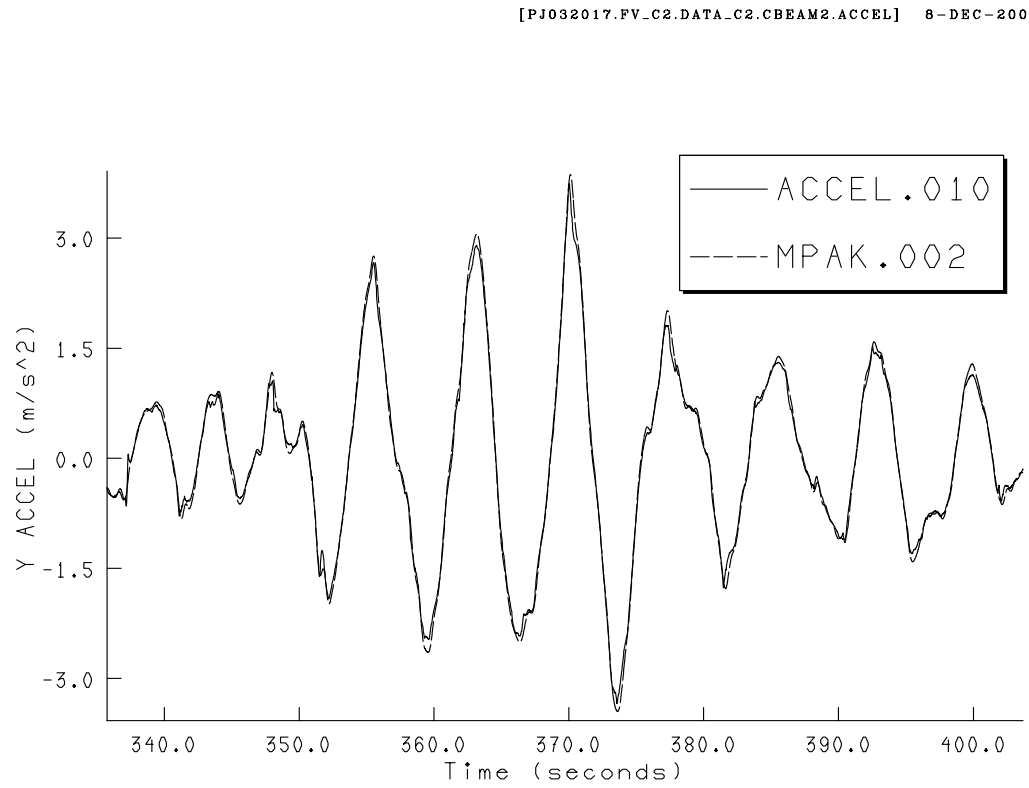



**Figure 21: Comparison of Sway Acceleration from MotionPak and Accelerometer**

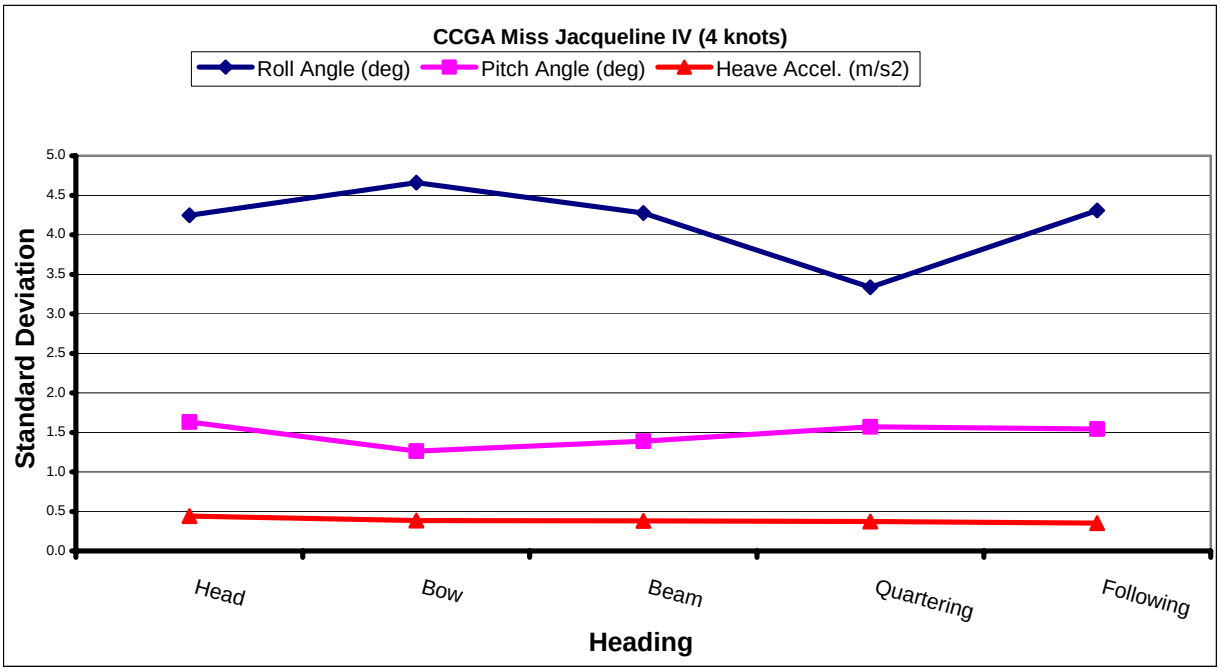



**Figure 22: Heading Versus Standard Deviation (4 knots)**

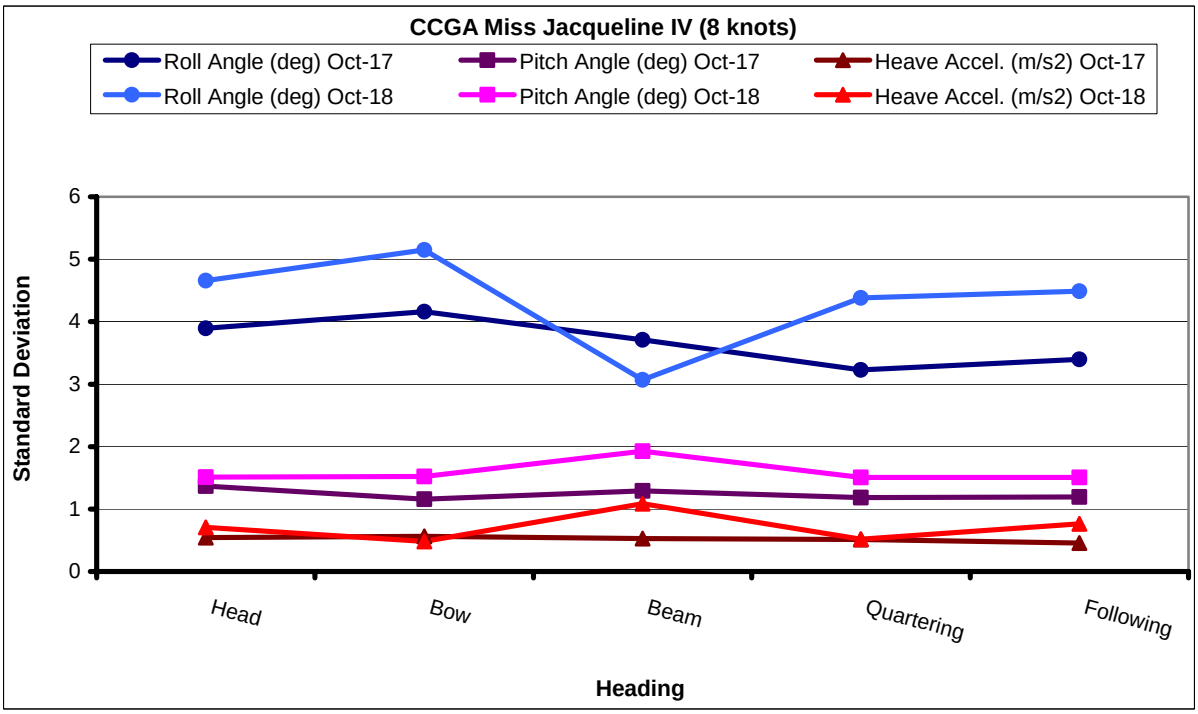



**Figure 23: Heading Versus Standard Deviation (8 knots – Oct. 17 & 18 2004)**

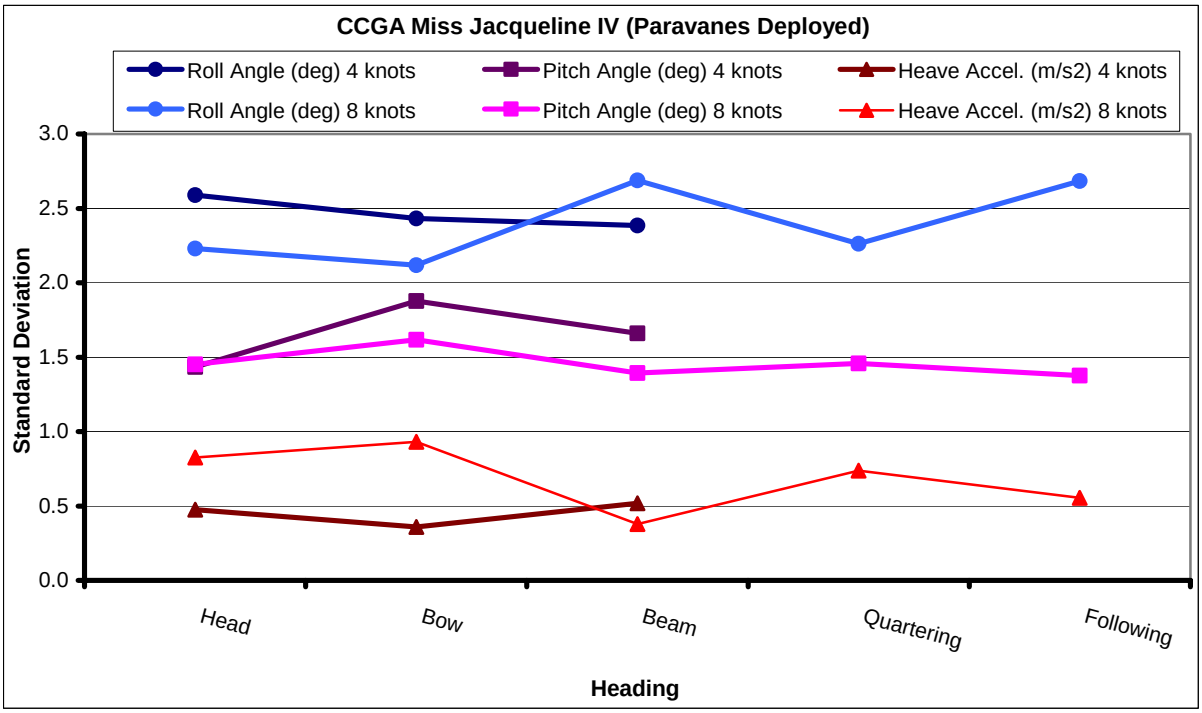



**Figure 24: Heading Versus Standard Deviation (Paravanes Deployed)**

# Appendix A
# Inclining Experiment Report

# *FISHING VESSEL*
# *"MISS JACQUELINE IV*

# *INCLINING REPORT*
# *DETERMINATION OF GM FOR SEA TRIAL CONDITION*

## *OCTOBER 2004*

***BY:***
***MARINE SERVICES INTERNATIONAL LTD.***
P.O. BOX 8274 STN "A"
ST. JOHN'S NL
A1B 3N4

***FOR:***
***NATIONAL RESEARCH COUNCIL***
P.O. BOX 12093, STN "A"
ST. JOHN'S, NL
A1B 3T5

PROJECT 808

MSI

REVISION 0

**Inclining Experiment of the Miss Jacqueline IV**
**On October 14, 2004**

## General Particulars at Time of Inclining

| | |
|---|---|
| Vessel Name: | Miss Jacqueline IV |
| Vessel Owner: | Mr. Frank Hutchings |
| Place of Inclining: | St. John's, NL |
| Date of Inclining: | October 14, 2004 |
| Personnel Present: | David Porter<br>Harris Lodge<br>8 Crew |
| Sea Conditions: | Calm |
| Wind Conditions: | Light Airs |
| Water Density: | 1.024 Measured |

### Drafts and Freeboard

| | |
|---|---|
| Draft Forward | 9'-2" on Bulb |
| Draft Aft | 12'-7" on Transom |

### As Inclined Vessel Details

Vessel Description
Vessel was free to incline.
Tank Description
Fuel Tanks – Full
Fresh Water Tanks – Full
RSW Forward – Full
After Ballast - Partial

### Inclining Particulars

Forward Pendulum Details
Length 2015 mm Location: Wheelhouse

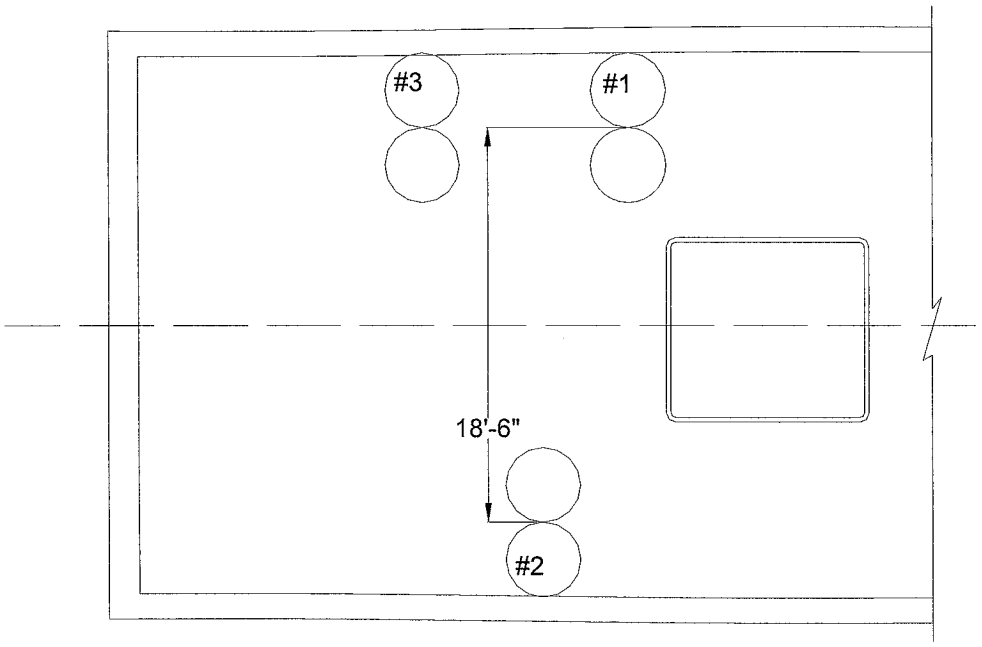
After Pendulum Details
Length 2200 mm Location: Fish Hold

**Inclining Experiment of the Miss Jacqueline IV**
**On October 14, 2004**

**Record of Shifts**

| Shift Number | Weight Number | Shift Direction | Weight For Shift | Shift Distance | After Pen. Deflection | For. Pen. Deflection |
|---|---|---|---|---|---|---|
| 1 | 1 | P – S | 1050 lbs | 18.5 ft | 35 | 37 |
| 2 | 3 | P – S | 1050 lbs | 18.5 ft | 34 | 30 |
| 3 | 3 | S – P | 1050 lbs | 18.5 ft | 34 | 36 |
| 4 | 1 | S – P | 1050 lbs | 18.5 ft | 35 | 34 |
| 5 | 2 | P – S | 1050 lbs | 18.5 ft | 34 | 29 |
| 6 | 2 | S – P | 1050 lbs | 18.5 ft | 34 | 34 |
| Averages | | | 1050 lbs | 18.5 ft | 34.33 | 33.33 |

**Diagram of Shift**



**Inclining Experiment of the Miss Jacqueline IV**
**On October 14, 2004**

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**Level Trim Hydrostatic Information**

10'-10" = 245.49 LT $\Delta$ = 6.06
11'-0" = 251.55 LT 0.25$\Delta$ = 1.515
10'-10 ½" = 247.00 LT

**Determination of GM**

Forward Pendulum Average Deflection Ratio
$33.33 \div 2015 = 0.01654$

After Pendulum Average Deflection Ratio
$34.33 \div 2200 = 0.01560$

Average Deflection Ratio $= 0.01607$

**Determination of Vertical Center of Gravity as Inclined**

| | | |
|---|---|---|
| Vessel Displacement (From above) | DIS | 247.00 LT |
| Moment per Shift $0.469LT(1050LBS) \times 18.5FT$ | MOM | 8.677 LT x ft |
| Average Deflection Ratio (from Above) | ADR | 0.01607 |

GM(Fluid) = (MOM/DIS) x (1/ADR)

GM(Fluid) = $(8.677/247)x(1/0.01607)$
= 2.19 Ft

GM (Fluid) = GM (solid)

GM (solid) = 2.19 Ft

## Fleming, Tim

**From:** David Porter [dmporter@canship.com]
**Sent:** November 5, 2004 2:16 PM
**To:** 'Fleming, Tim'
**Cc:** Greg Wiggins
**Subject:** RE: Inclining for Miss Jacqueline IV

Tim

Regarding the Miss Jacqueline IV, the VCG is the KMT less the GM. 13.32 - 2.19 = 11.13 feet.
The LCG is 0.69 feet aft of Midships.

Please find enclosed drawings I have of Franks Bulb.

I will be away next week and am asking Greg to conduct the Roberts and Sisters inclining.

Please keep us informed.

David

-----Original Message-----
**From:** Fleming, Tim [mailto:Tim.Fleming@nrc-cnrc.gc.ca]
**Sent:** Monday, October 25, 2004 1:26 PM
**To:** David Porter (E-mail)
**Subject:** Inclining for Miss Jacqueline IV

Dave,

Thanks for the report. I also need to know the locations for the VCG and LCG.

We are hoping to do an inclining for the Roberts Sisters II on November 10, probably someplace on the south side. Will someone from your office be available?

I am on a sea trial all this week, but I should be able to be reached on my cell.

Regards

Tim Fleming

National Research Council
Institute for Ocean Technology
Kerwin Place, PO Box 12093, Stn A
St. John's, NL, A1B 3T5
Canada
Phone: (709) 772-7413 or 8407
Cell: (709) 746-2346
Fax: (709) 772-2462
URL: <http://iot-ito.nrc-cnrc.gc.ca/>

# Appendix B
# Principle Particulars & List of Outfit Items

# CCGA MISS JACQUELINE IV

Principal Particulars:

| | |
|---|---|
| Length Overall: | 64’ 11½” (19.80 m) |
| Beam: | 24’ (7.32 m) |
| Draft: | 10’ (3.05 m) |
| Installed Power: | 475 HP (354.2 kW) |
| Displacement: | 77 L. Tons (78,235.2 kg) |
| Fuel Capacity: | 2500 gal. (9463.5 l) |
| Fresh Water Capacity: | 350 gal. (1325 l) |
| Fish Hold Volume: | 2000 $ft^3$ (57 $m^3$) |
| Accommodations: | 7 berths |

Machinery Description:

| | |
|---|---|
| Engine: | Caterpillar |
| Propulsion Power: | 624 HP |
| Trawl Speed: | 2 knots |
| Cruising Speed: | 9 knots |
| Maximum Rudder Angle: | ± 42.5° (nominal) |
| Electrical Power: | 120 VAC |

Life Saving Equipment:

| | |
|---|---|
| Life raft: | 18 person |

EPIRB
Full suite DOT approved firefighting and emergency equipment

# Appendix C
# Instrumentation Plan

# Instrumentation Plan for Fishing Vessel Trials

***See Proj PIP for additional info on instrumentation requirements incl. critical levels.***

**Proj. 2017** **Sept. 11, 2003** **V2.0**

| Signal | Device | Calibrated Range | Units | Comments |
|---|---|---|---|---|
| Vertical Acceleration | MotionPak | +/- 20 | $m/s^2$ | |
| Lateral Acceleration | MotionPak | +/- 20 | $m/s^2$ | |
| Longitudinal Acceleration | MotionPak | +/- 20 | $m/s^2$ | |
| Yaw Rate | MotionPak | +/- 50 | deg./s | |
| Roll Rate | MotionPak | +/- 50 | deg./s | |
| Pitch Rate | MotionPak | +/- 50 | deg./s | |
| Vertical Acceleration | Linear accelerometer | +/- 20 | $m/s^2$ | |
| Lateral Acceleration | Linear accelerometer | +/- 20 | $m/s^2$ | |
| Longitudinal Acceleration | Linear accelerometer | +/- 20 | $m/s^2$ | |
| Roll Angle | Inclinometer | +/- 30 | deg. | only required in manoeuvring trials are to be carried out |
| Pitch Angle | Inclinometer | +/- 20 | deg. | low critical parameter |
| Forward Speed | DGPS | 0-20 | knots | |
| Heading Angle | DGPS | 0-360 | deg. TRUE | |
| Planar Position | DGPS | - | m | |
| Rudder Angle | yo-yo potentiometer | +/- 45 | deg. | required if manoeuvring trials to be carried out, otherwise measure if convenient |
| Shaft RPM | freq./volt. converter | 0 - 1000 | RPM | low critical parameter |

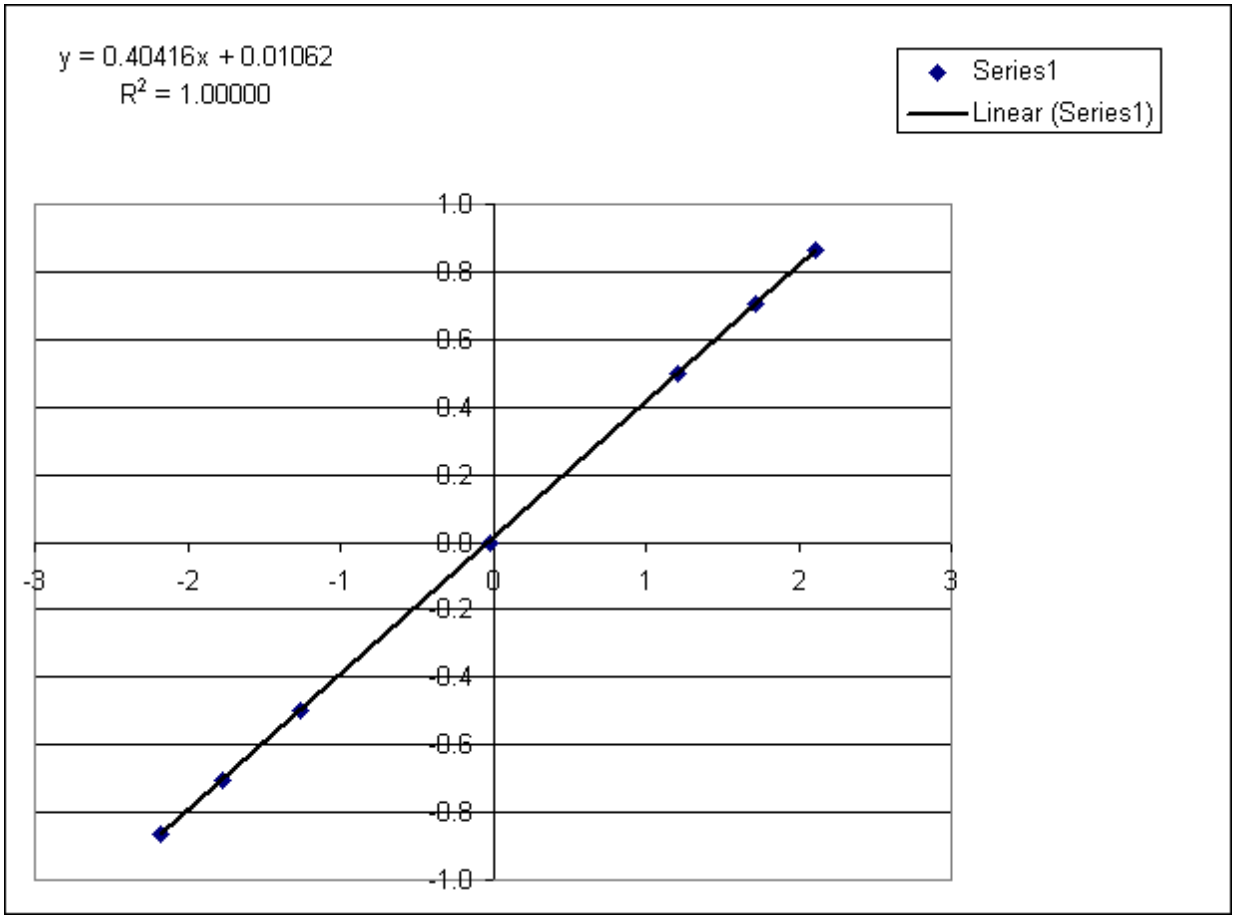
# Appendix D
# Calibration Information

**Ch. 01**
**X Accel, MotionPak**

S/N 0689

Gravity 1

| Angle | Sin(angle) | Acceleration | Voltage | slope | offset |
|---|---|---|---|---|---|
| 0 | 0 | 0.0000 | -0.026 | 0.4042 | 0.0106 |
| 29.994 | 0.499909307 | 0.4999 | 1.211 | | |
| 45.016 | 0.707304215 | 0.7073 | 1.723 | | |
| 59.9 | 0.865151421 | 0.8652 | 2.114 | | |
| -59.9 | -0.865151421 | -0.8652 | -2.17 | | |
| -45.016 | -0.707304215 | -0.7073 | -1.775 | | |
| -29.994 | -0.499909307 | -0.4999 | -1.261 | | |



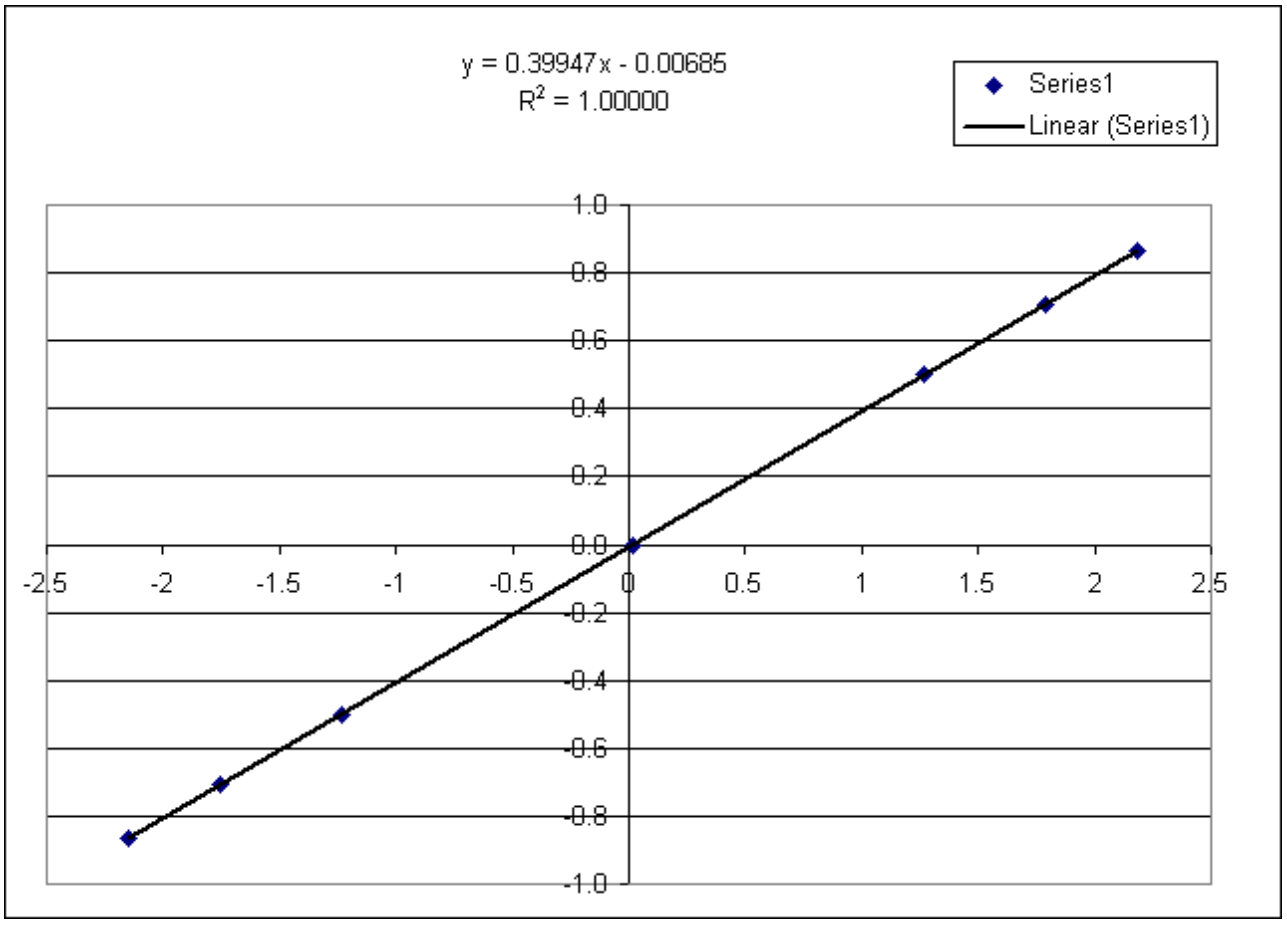
**Ch 02**
**Y Accel, MotionPak**

S/N 0689

Gravity 1

| Angle | Sin(angle) | Acceleration | Voltage |
|---|---|---|---|
| 0 | 0 | 0.0000 | 0.02 |
| 29.994 | 0.499909307 | 0.4999 | 1.269 |
| 45.016 | 0.707304215 | 0.7073 | 1.786 |
| 59.9 | 0.865151421 | 0.8652 | 2.182 |
| -59.9 | -0.865151421 | -0.8652 | -2.153 |
| -45.016 | -0.707304215 | -0.7073 | -1.753 |
| -29.994 | -0.499909307 | -0.4999 | -1.231 |

| slope | offset |
|---|---|
| 0.3995 | -0.0068 |



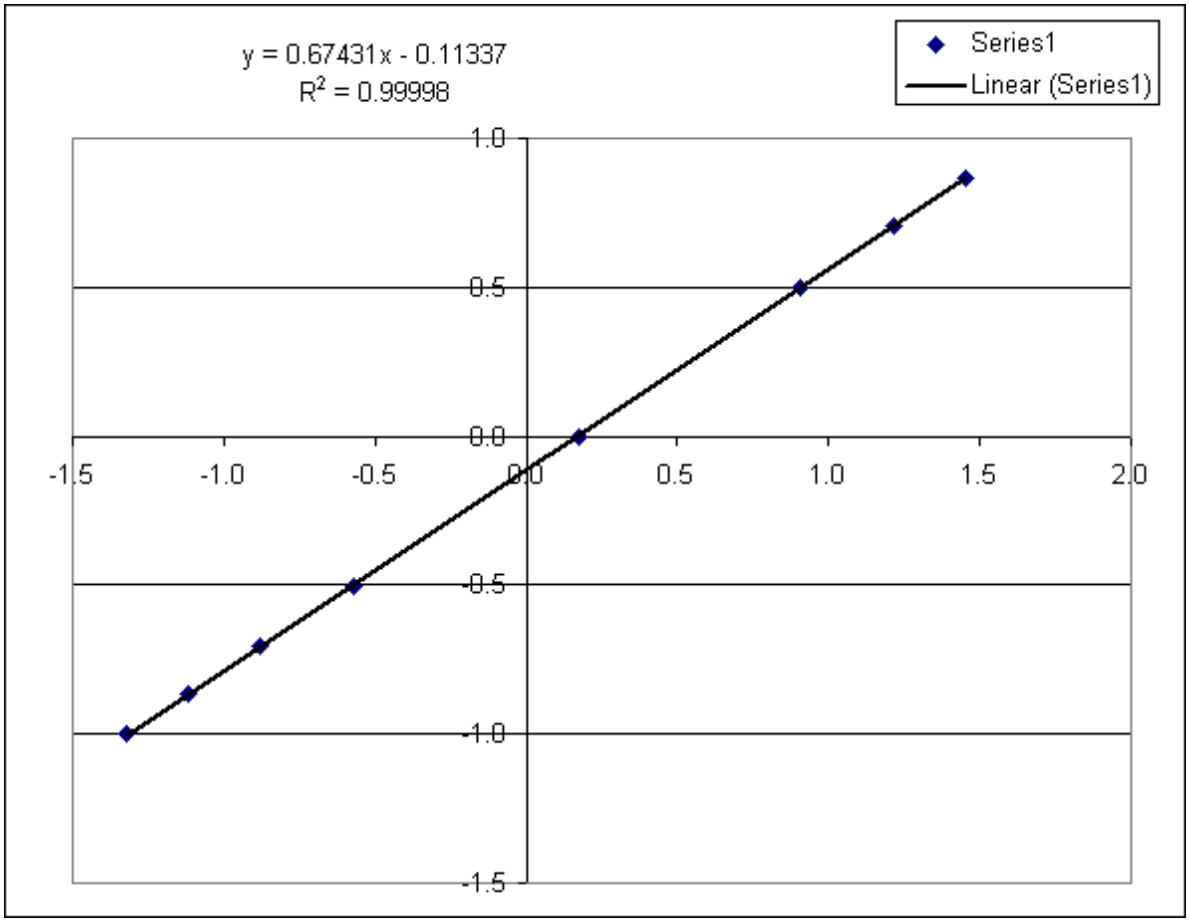
**Ch 03**
**Z Accel, MotionPak**

S/N 0689

Gravity 1

| wedge | Angle | -Sin(angle) | Acceleration | Voltage |
|---|---|---|---|---|
| 0 | 90 | -1 | -1.0000 | -1.321 |
| 29.994 | 60.006 | -0.866077759 | -0.8661 | -1.118 |
| 45.016 | 44.984 | -0.706909292 | -0.7069 | -0.879 |
| 59.9 | 30.1 | -0.501510737 | -0.5015 | -0.570 |
| 90 | 0 | 0 | 0.0000 | 0.177 |
| -59.9 | -30.1 | 0.501510737 | 0.5015 | 0.905 |
| -45.016 | -44.984 | 0.706909292 | 0.7069 | 1.215 |
| -29.994 | -60.006 | 0.866077759 | 0.8661 | 1.453 |

| slope | offset |
|---|---|
| 0.6743 | -0.1134 |



**Ch. 04**
**Roll Rate, MotionPak**

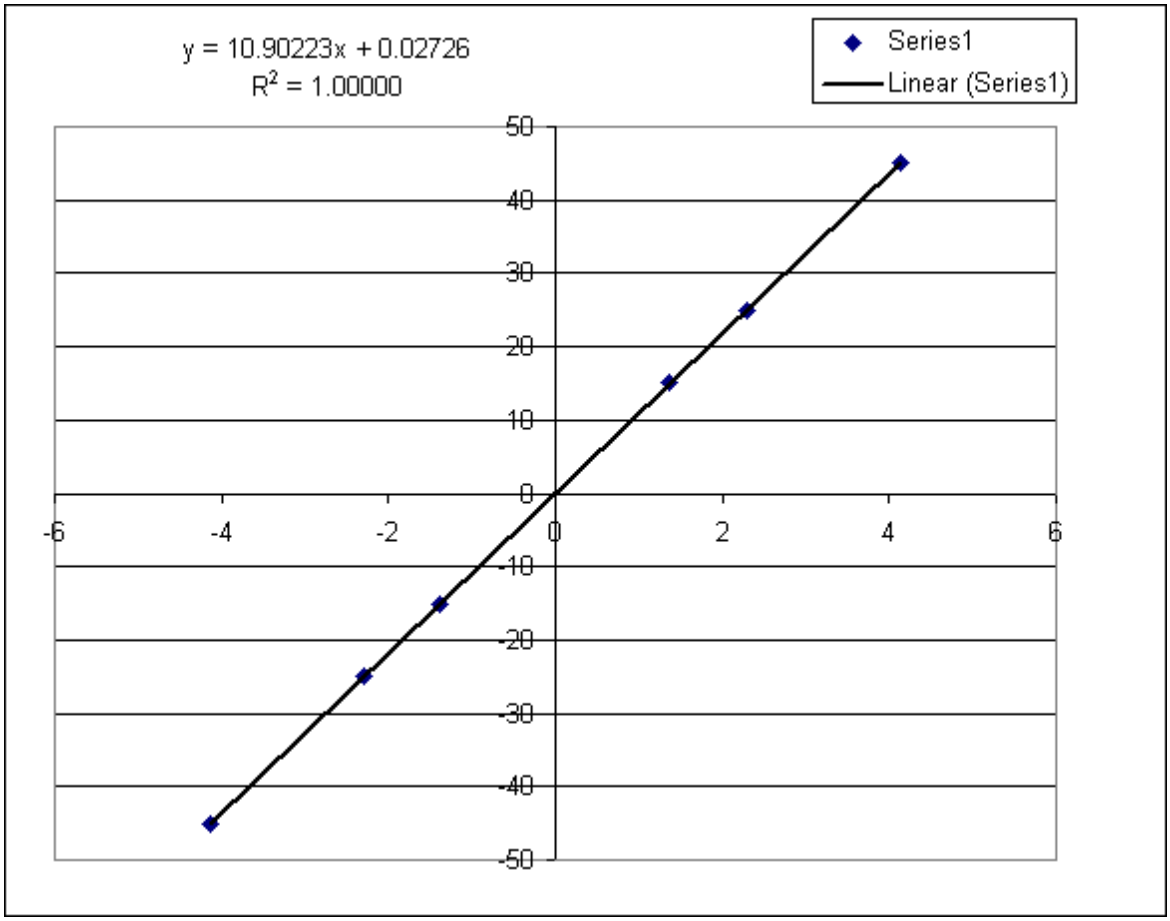
S/N 0689

Scale Factor 24.941 mV/deg/s

Universal Source 169644

| Deg/second | injected voltage Volts | Output, Volts |
|---|---|---|
| 45 | 1.1223 | 4.125 |
| 25 | 0.6235 | 2.291 |
| 15 | 0.3741 | 1.373 |
| -15 | -0.3741 | -1.378 |
| -25 | -0.6235 | -2.296 |
| -45 | -1.1223 | -4.130 |

| slope | offset |
|---|---|
| 10.9022 | 0.0273 |



**Ch. 05**
**Pitch Rate, MotionPak**

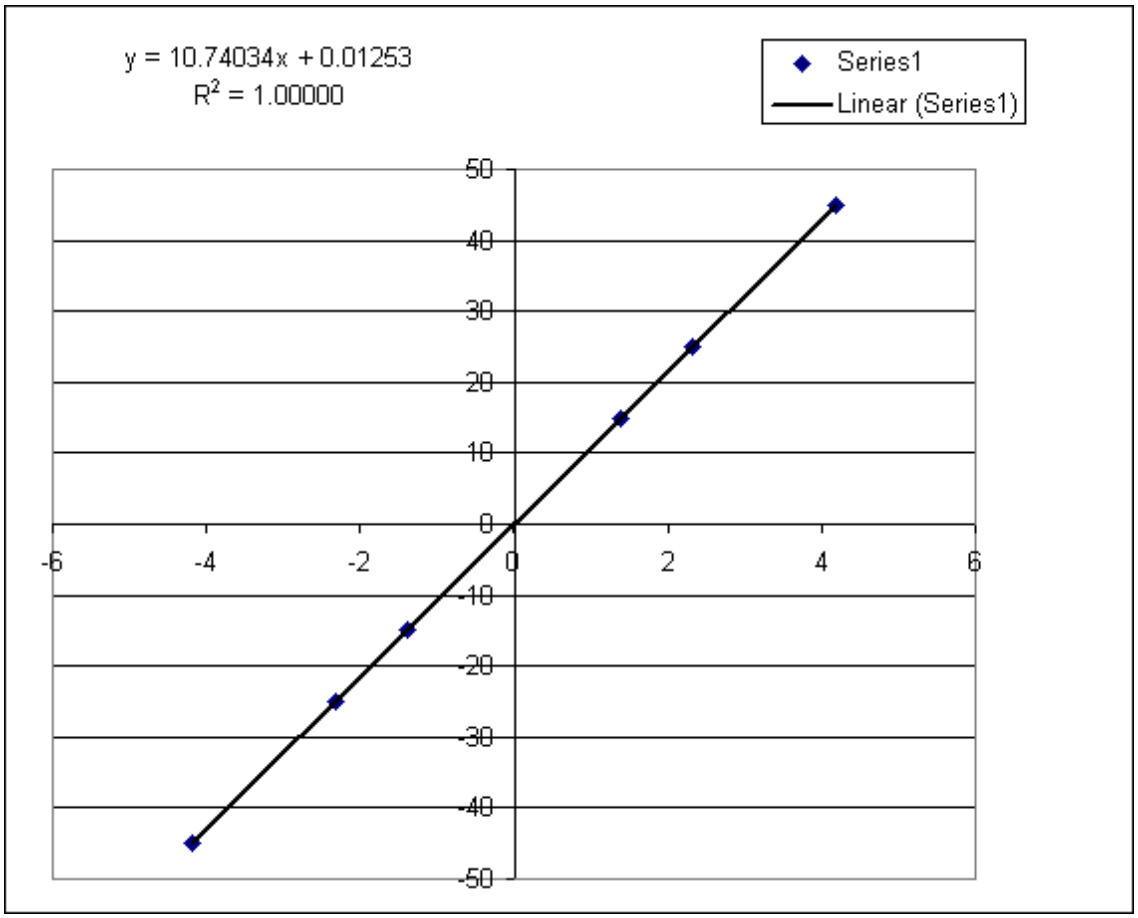
S/N 0689

Scale Factor 25.051 mV/deg/s

Universal Source 169644

| Deg/second | injected voltage, V | Output, Volts |
|---|---|---|
| 45 | 1.1273 | 4.188 |
| 25 | 0.6263 | 2.327 |
| 15 | 0.3758 | 1.396 |
| -15 | -0.3758 | -1.398 |
| -25 | -0.6263 | -2.329 |
| -45 | -1.1273 | -4.191 |

| slope | offset |
|---|---|
| 10.7403 | 0.0125 |



**Ch. 06**
**Yaw Rate, MotionPak**

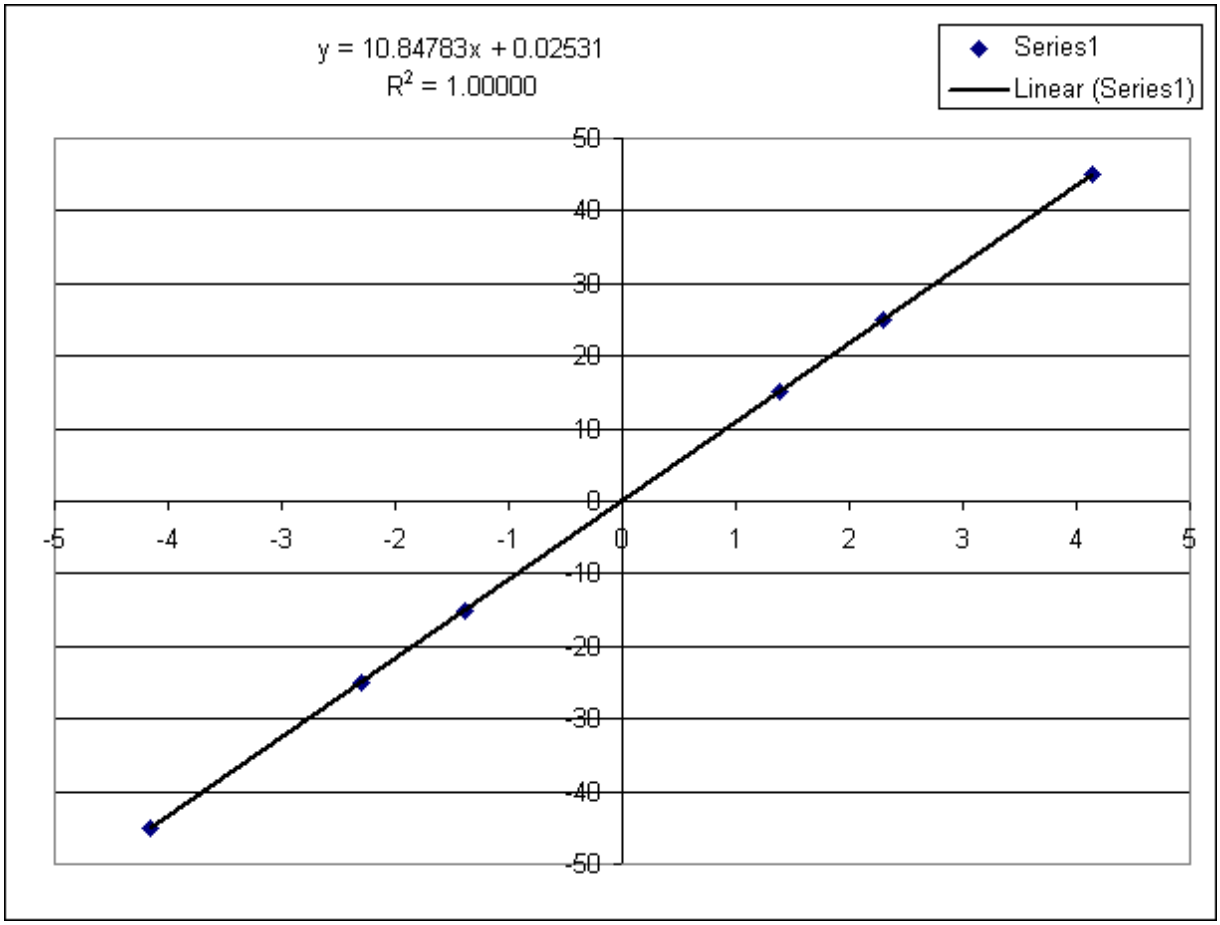
S/N 0689

Scale Factor 24.89mV/deg/s

Universal Source 169644

| Deg/second | injected voltage | Output, Volts |
|---|---|---|
| 45 | 1.1201 | 4.145 |
| 25 | 0.6223 | 2.303 |
| 15 | 0.3734 | 1.381 |
| -15 | -0.3734 | -1.385 |
| -25 | -0.6223 | -2.307 |
| -45 | -1.1201 | -4.151 |

| slope | offset |
|---|---|
| 10.8478 | 0.0253 |



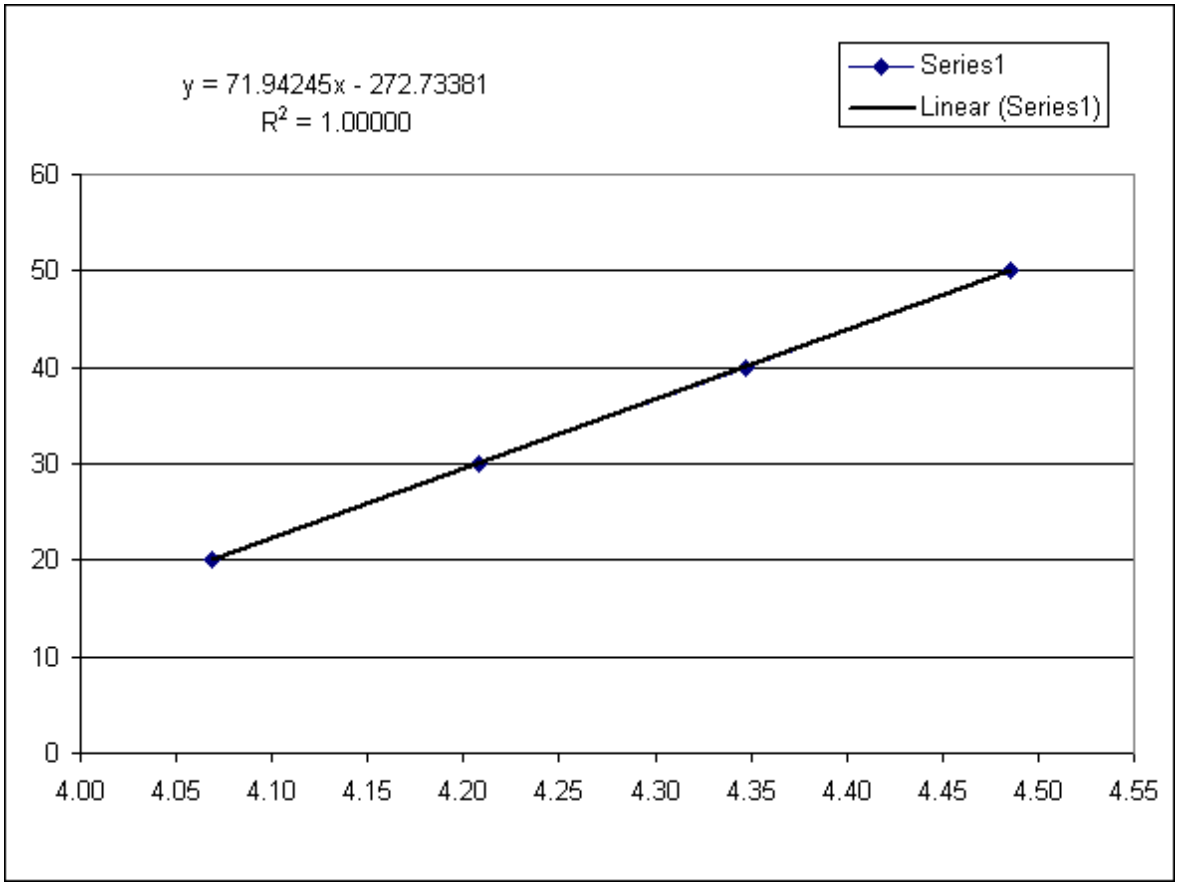
**Ch. 07**
**Temperature, MotionPak**

S/N 0326

| | |
|---|---|
| 1.00E-06 | A/°K |
| 13.91 | Kohms |

| Temperature | injected voltage | Output, Volts |
|---|---|---|
| Celsius | V | Volts |
| -10 | 3.660 | 3.652 |
| 0 | 3.800 | 3.791 |
| 20 | 4.078 | 4.069 |
| 30 | 4.217 | 4.208 |
| 40 | 4.356 | 4.347 |
| 50 | 4.495 | 4.486 |

| slope | offset |
|---|---|
| 71.9424 | -272.7338 |



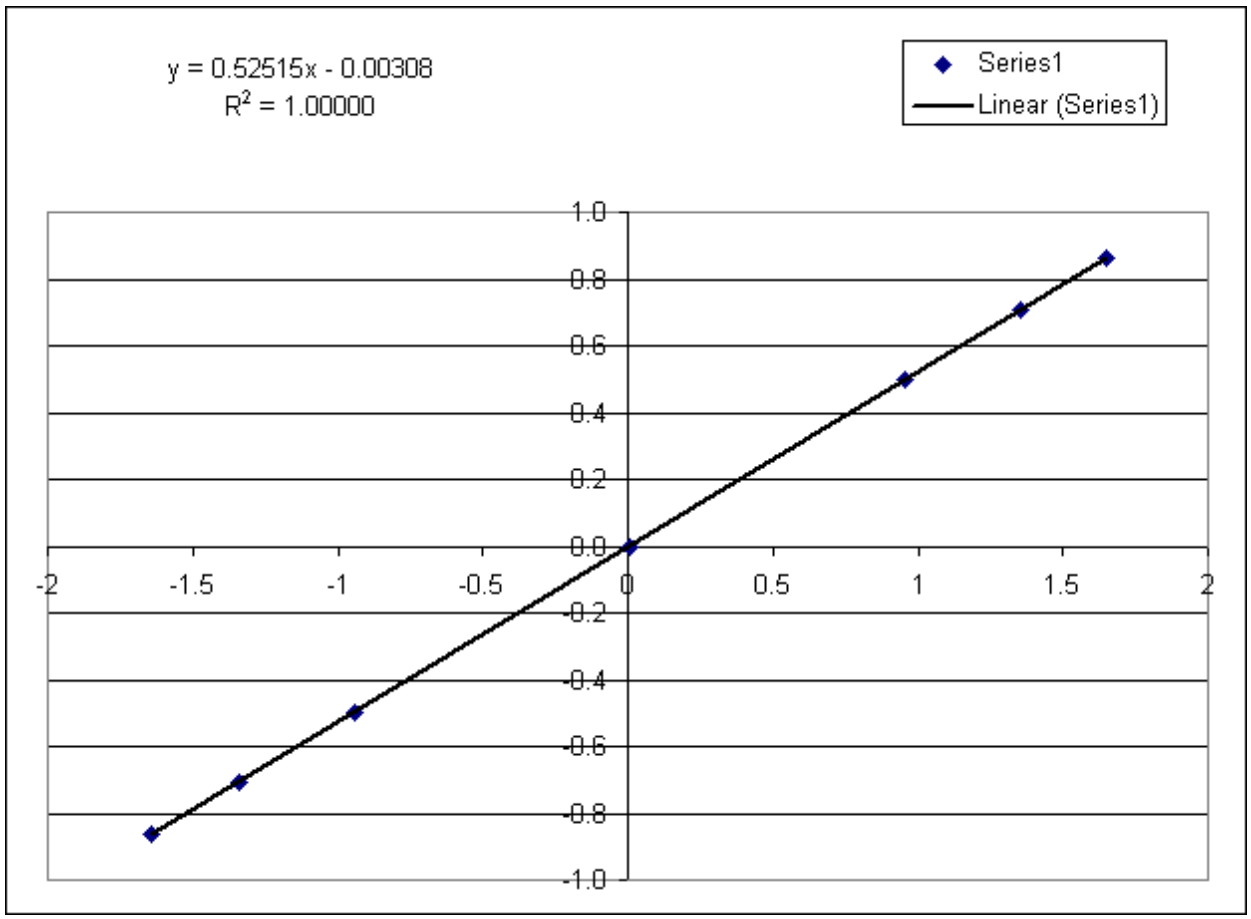
**Ch 08**
**X Accel (Surge)**

**Model** **QA1400**
**serial #** **1102**

Gravity 1

| Angle | Sin(angle) | Acceleration | Voltage |
|---|---|---|---|
| 0 | 0 | 0.0000 | 0.005 |
| 29.994 | 0.499909307 | 0.4999 | 0.956 |
| 45.016 | 0.707304215 | 0.7073 | 1.356 |
| 59.9 | 0.865151421 | 0.8652 | 1.652 |
| -59.9 | -0.865151421 | -0.8652 | -1.641 |
| -45.016 | -0.707304215 | -0.7073 | -1.342 |
| -29.994 | -0.499909307 | -0.4999 | -0.945 |

| slope | offset |
|---|---|
| 0.5252 | -0.0031 |



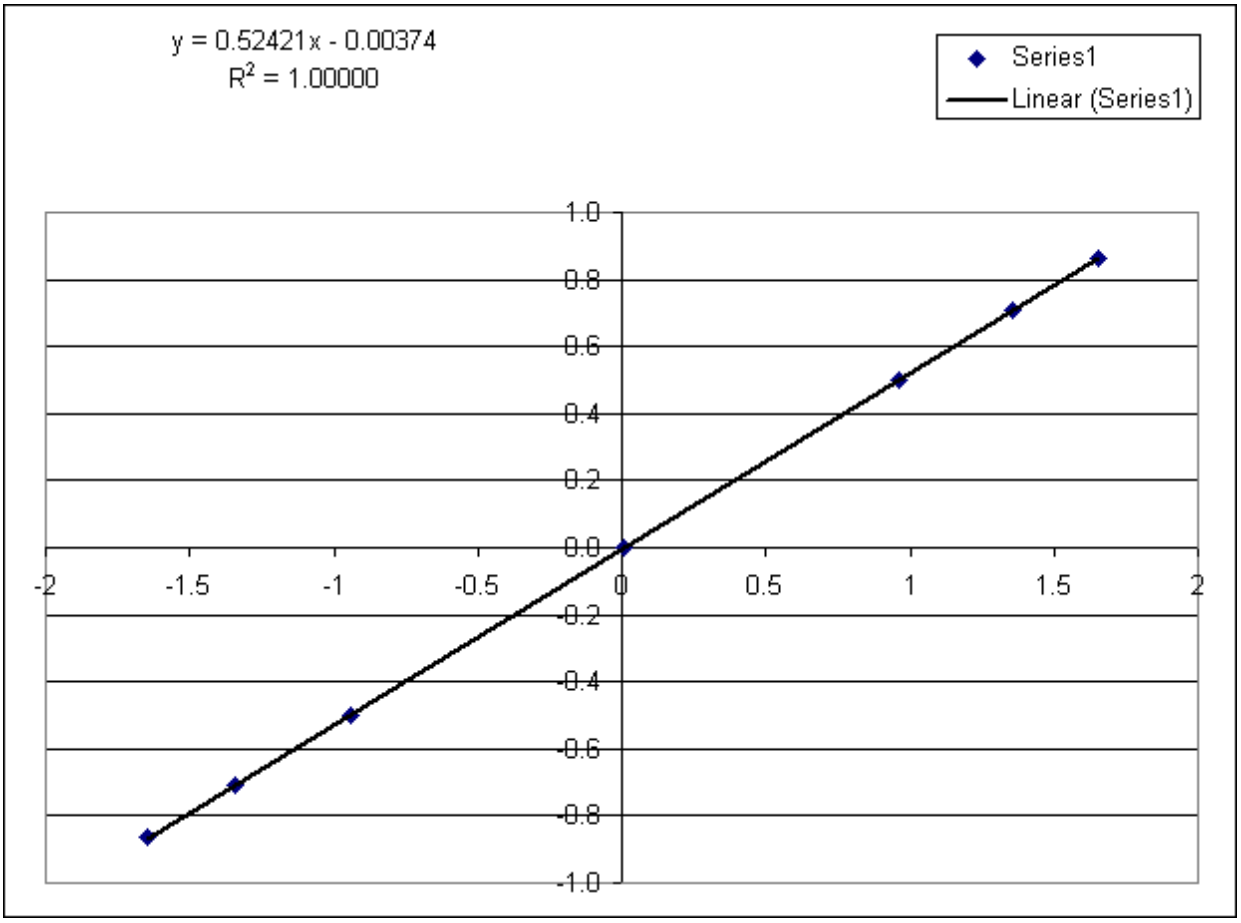
**Ch 09**
**Y Accel (Sway)**

**Model** **QA1400**
**serial #** **1101**

Gravity 1

| Angle | Sin(angle) | Acceleration | Voltage |
|---|---|---|---|
| 0 | 0 | 0.0000 | 0.009 |
| 29.994 | 0.499909307 | 0.4999 | 0.959 |
| 45.016 | 0.707304215 | 0.7073 | 1.359 |
| 59.9 | 0.865151421 | 0.8652 | 1.655 |
| -59.9 | -0.865151421 | -0.8652 | -1.647 |
| -45.016 | -0.707304215 | -0.7073 | -1.341 |
| -29.994 | -0.499909307 | -0.4999 | -0.944 |

| slope | offset |
|---|---|
| 0.5242 | -0.0037 |



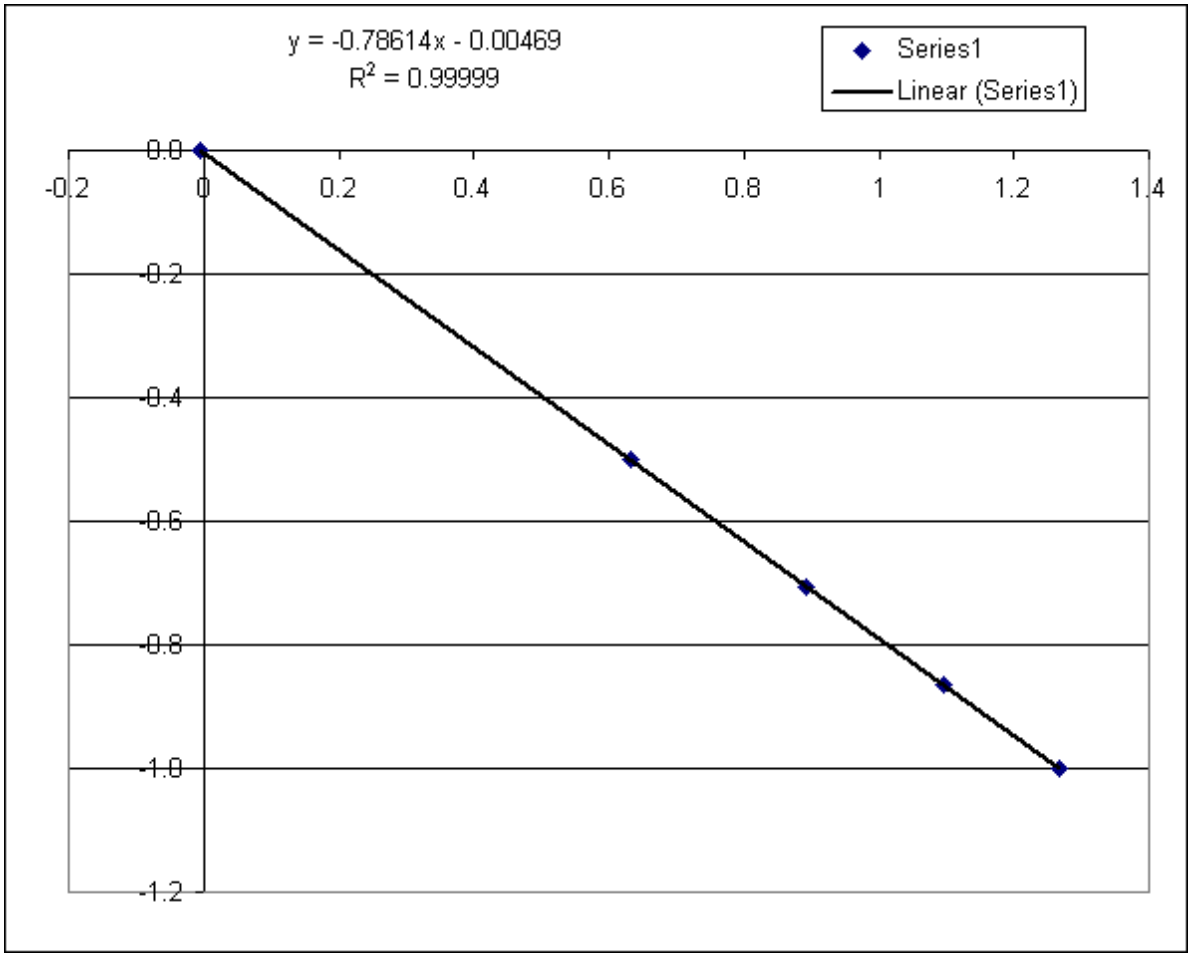
**Ch 10**
**Z Accel (Heave)**

**Model** **QA1400**
**serial #** **149**

Gravity 1

| wedge | Angle | SIN(angle) | Acceleration | Voltage |
|---|---|---|---|---|
| 0 | 90 | -1 | -1.0000 | 1.267 |
| 29.994 | 60.006 | -0.866077759 | -0.8661 | 1.097 |
| 45.016 | 44.984 | -0.706909292 | -0.7069 | 0.891 |
| 59.9 | 30.1 | -0.501510737 | -0.5015 | 0.631 |
| 90 | 0 | 0 | 0.0000 | -0.005 |

| slope | offset |
|---|---|
| -0.7861 | -0.0047 |



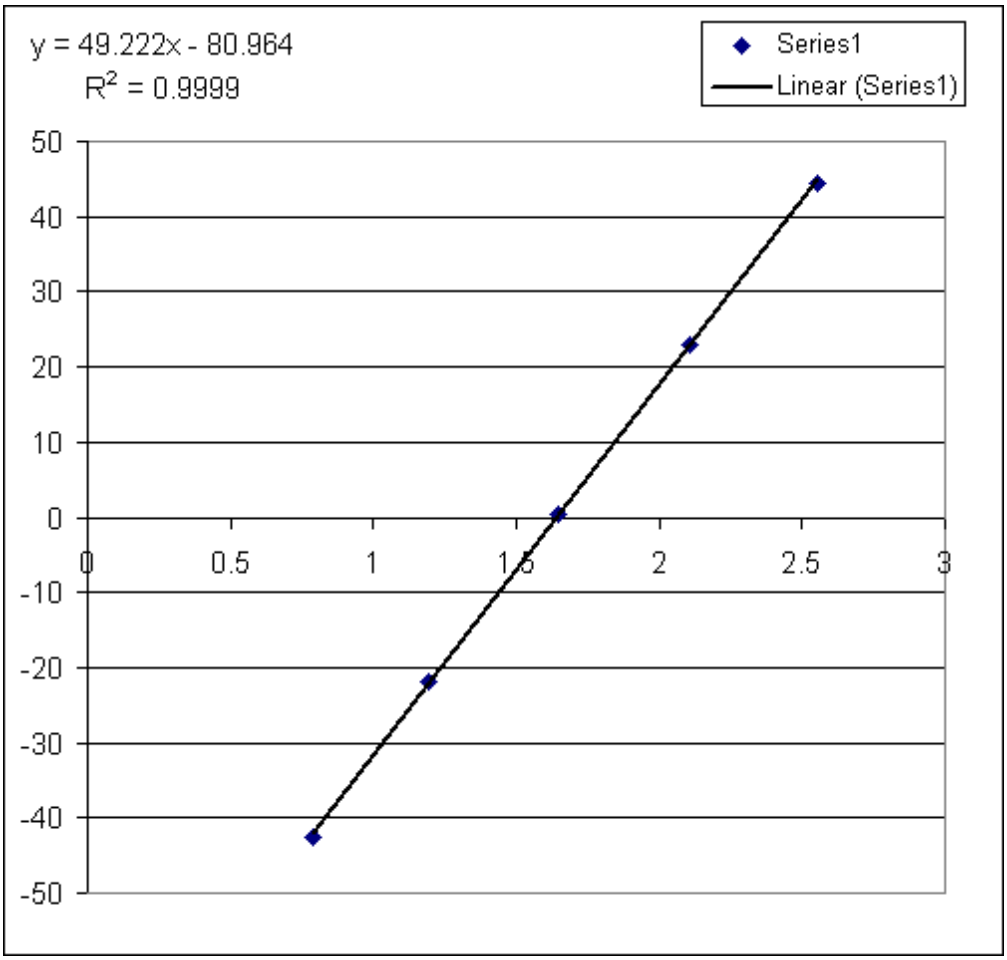
**Ch 11**
**Rudder Angle**

**Model** **PV-25A**
**serial #** **A1080703-2058206**

Gravity 1

| Angle | Voltage |
|---|---|
| 44.5 | 2.556 |
| 23 | 2.1085 |
| 0.5 | 1.648 |
| -22 | 1.194 |
| -42.5 | 0.789 |

| slope | Intercept |
|---|---|
| 49.2216 | -80.9636 |

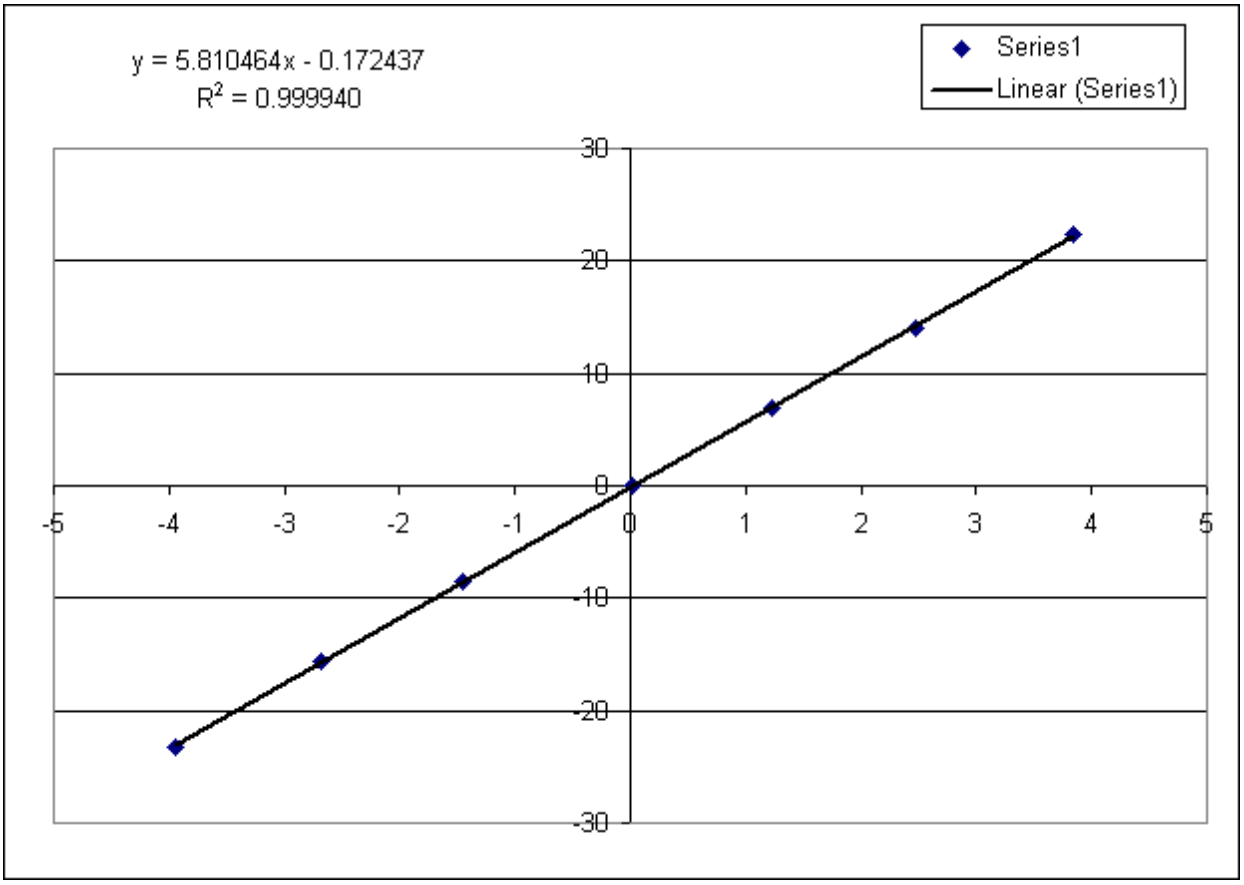


**Ch 12**
**Roll Angle (Inclinometer)**

| | |
|---|---|
| **Model** | **LSOC-30** |
| **serial #** | **52732** |

| Angle | Voltage |
|---|---|
| 22.3 | 3.849 |
| 14.1 | 2.482 |
| 6.85 | 1.224 |
| -0.04 | 0.019 |
| -8.47 | -1.452 |
| -15.6 | -2.675 |
| -23.2 | -3.938 |

| slope | offset |
|---|---|
| 5.8105 | -0.1724 |

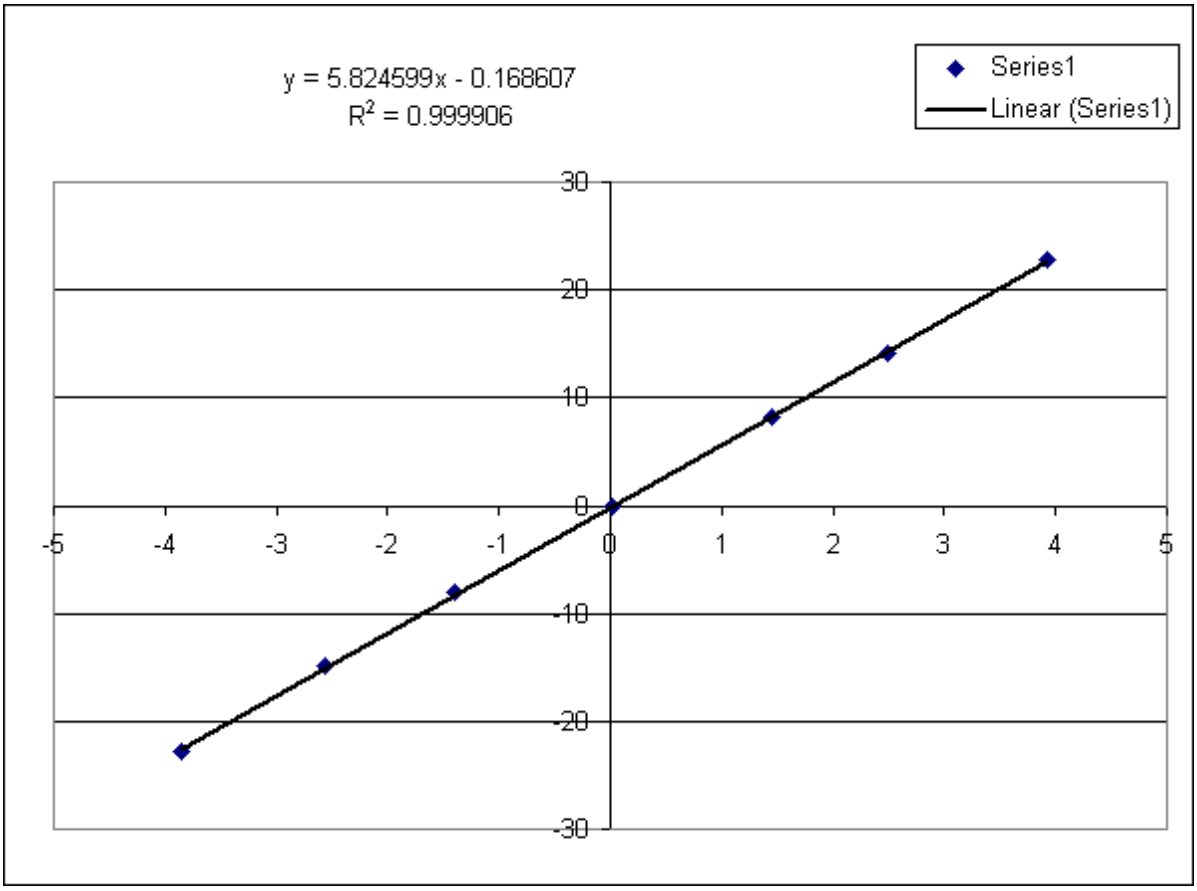


**Ch 13**
**Pitch Angle (Inclinometer)**

| | |
|---|---|
| **Model** | **LSOC-30** |
| **serial #** | **52734** |
| Gravity | 1 |

| Angle | Voltage |
|---|---|
| 22.80 | 3.918 |
| 14.10 | 2.485 |
| 8.16 | 1.446 |
| -0.03 | 0.021 |
| -8.12 | -1.393 |
| -14.90 | -2.554 |
| -22.80 | -3.856 |

| slope | Offset |
|---|---|
| 5.8246 | -0.1686 |

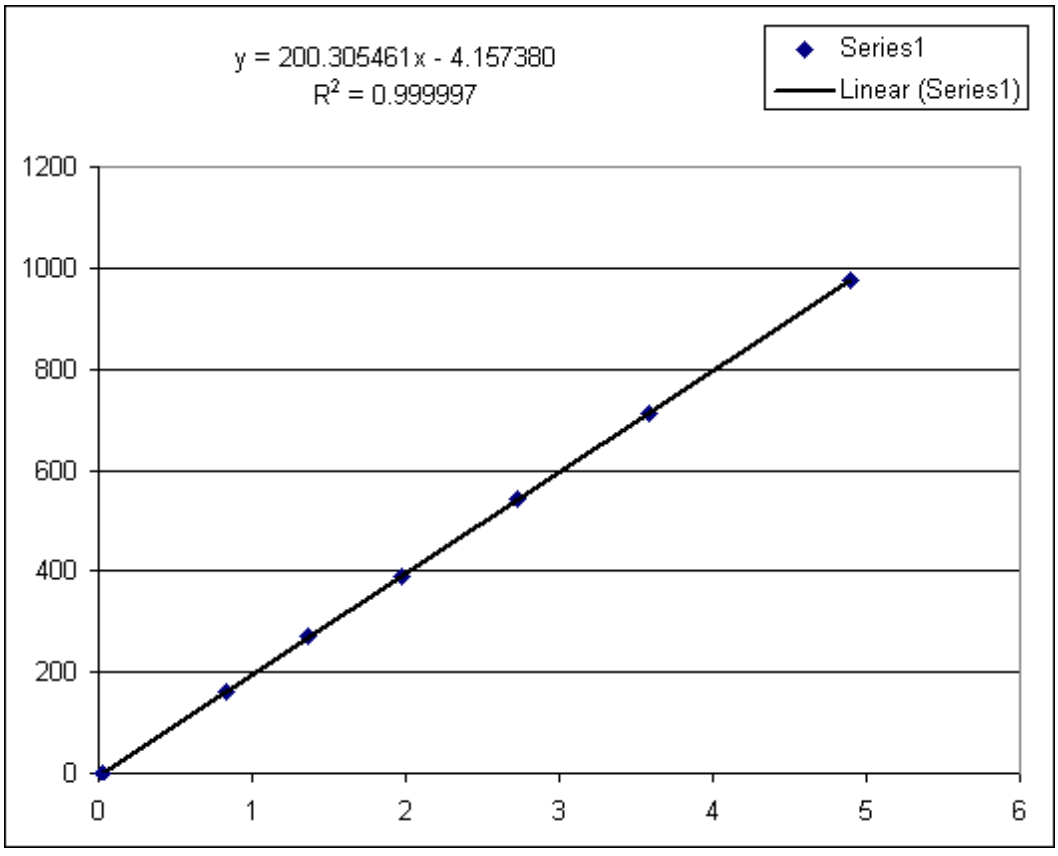


**Ch 14**
**Shaft RPM**
**Model** **IMD RPM to voltage converter**
**serial #**

| rpm | Voltage Out |
|---|---|
| 0 | 0.025 |
| *162* | *0.827* |
| *271* | *1.37* |
| *390* | *1.97* |
| *543* | *2.73* |
| *713* | *3.58* |
| *975* | *4.89* |

| slope | Offset |
|---|---|
| 200.3055 | -4.1574 |

Note: Model 198 lasetach ser no. 9509281, nrc # 018585 used as a reference



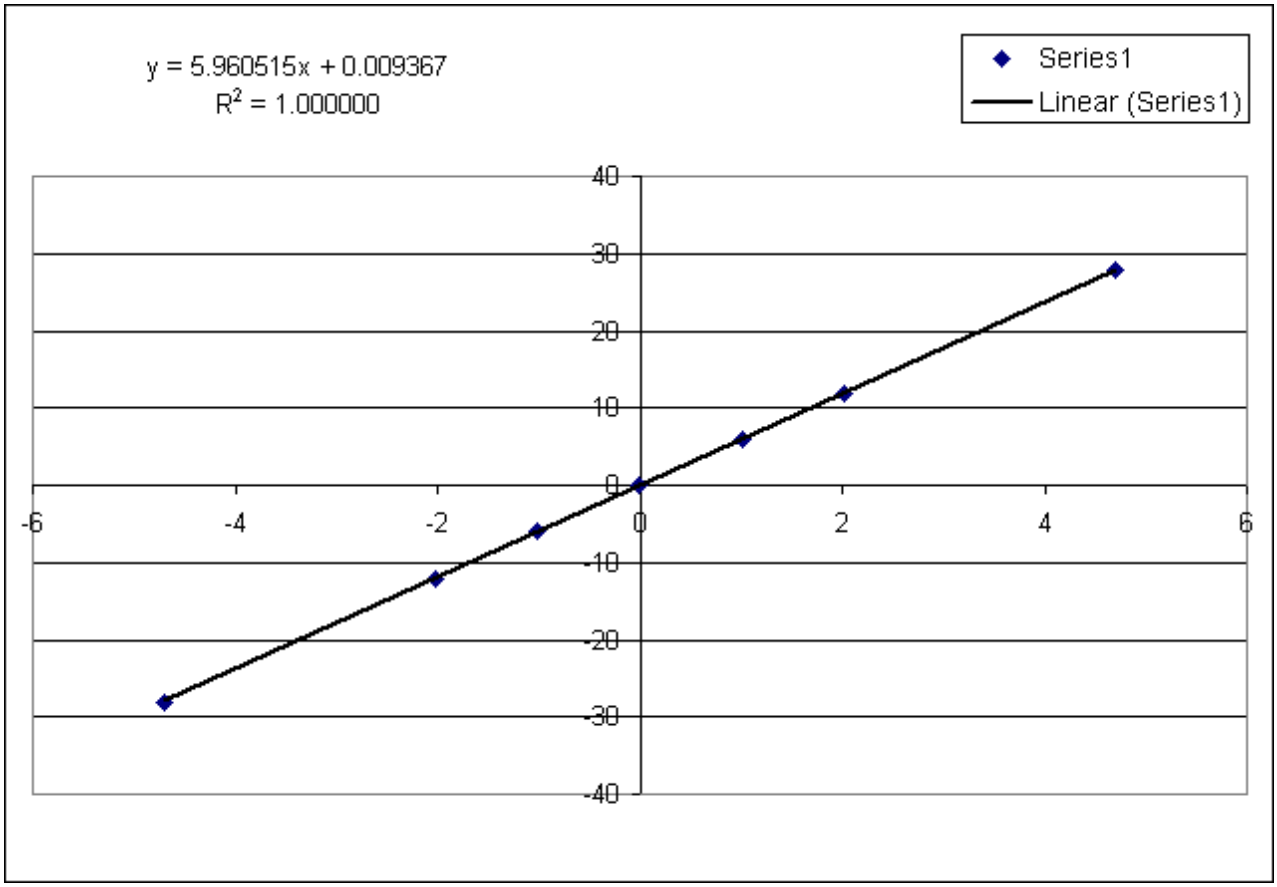
**Ch 15**
**Rudder Slew Rate**

**Model** **PV-25A**
**serial #** **0703-20582**

Gravity 1

| in/s | injected voltage | Voltage |
|---|---|---|
| 28 | 4.704 | 4.696 |
| 12 | 2.016 | 2.012 |
| 6 | 1.008 | 1.005 |
| 0 | 0 | -0.002 |
| -6 | -1.008 | -1.008 |
| -12 | -2.016 | -2.015 |
| -28 | -4.704 | -4.699 |

| slope | Intercept |
|---|---|
| 5.9605 | 0.0094 |



# Appendix E
# Neptune Wave Buoy Specifications and Typical Output Files

# Sentry Wave Buoy Specifications

### Physical

- Weight in air with batteries 15.7 kg (42 lb.)
- Mooring varies with location and deployment duration
- Hull size, 0.75 m (2.5 ft.) diameter
- Housing Material, PVC and aluminum
- Discus Hull, Urethane foam collar
- O-ring waterproof seal on battery and instrument housing

### Power / Batteries

27 Alkaline D cells provide an approximately 2-3 week lifetime with hourly data collection and processing. When not deployed, the buoy may be powered optionally by an external connector.

### Operating Temperature Range

0°C to 60°C (32°F to 140°F)

### Sensors

- Accelerations along antenna vertical, bow, starboard axes
- Magnetic field along vertical, bow, starboard axes
- Water Temperature (internal hull-contacting thermistor)
- Leak detector
- Sampling rate, 4.0 Hz.

- Record length, 4096 samples (17.1 min)

### Onboard Computer

Embedded 32-bit processor

### Radio Frequency

Spread spectrum, 902-928 MHz

### Outputs

- Nondirectional wave spectra
- Directional wave spectra
- Wave parameters: Significant wave height, dominant wave period, average wave period, dominant wave direction
- Data Quality Assurance (DQA) parameters: for measured time series, buoy internal temperature, leak detector

### Accuracies and Ranges

- Significant Wave Height ±0.03 m, 0-9 m (±0.10 ft., 0-30 ft.)
- Dominant and average wave period: ±0.5 s, 0 - 25 s
- Dominant wave direction: ±2°, 0° - 360°
- Nondirectional and directional spectra are limited by statistical confidence related to record length rather than the instrumentation.

## Typical Neptune Wave Buoy Output File:

```
NSI-Neptune Sciences, Inc - Wave Sentry Data Processing Software Version 1.33
Sun Oct 17 11:00:00 2004
VBat = 13.29, Leak = DRY, Temp = 9.1
Significant wave height             =   2.40 m
Dominant and average frequency      =   0.09 Hz   0.12 Hz
Dominant and average period         =  10.89 s    8.04 s

Wave directions are compass headings from which waves approach.
Dominant wave direction =   84.8 deg magnetic
Average wave direction  =   48.8 deg magnetic
--


--
```

| bnd | cfrq | c11 | r1 | r2 | 0 | alpha1 | alpha2 |
|---|---|---|---|---|---|---|---|
| 1 | 0.038 | 0.0000 | 999.9000 | 999.9000 | 0 | 999.9 | 999.9 |
| 2 | 0.049 | 0.0000 | 999.9000 | 999.9000 | 0 | 999.9 | 999.9 |
| 3 | 0.060 | 0.0000 | 999.9000 | 999.9000 | 0 | 999.9 | 999.9 |
| 4 | 0.070 | 4.7444 | 0.3753 | 0.2412 | 0 | 14.5 | 91.7 |
| 5 | 0.081 | 6.0094 | 0.2542 | 0.5294 | 0 | 92.3 | 108.6 |
| 6 | 0.092 | 7.2636 | 0.3818 | 0.7142 | 0 | 84.8 | 99.0 |
| 7 | 0.103 | 5.8444 | 0.3488 | 0.5637 | 0 | 302.8 | 278.3 |
| 8 | 0.113 | 3.0552 | 0.4300 | 0.6603 | 0 | 77.8 | 92.4 |
| 9 | 0.124 | 1.8820 | 0.3787 | 0.6811 | 0 | 292.8 | 273.5 |
| 10 | 0.135 | 0.6413 | 0.1445 | 0.2893 | 0 | 348.1 | 292.0 |
| 11 | 0.146 | 0.5313 | 0.3082 | 0.1294 | 0 | 116.7 | 88.4 |
| 12 | 0.156 | 0.5597 | 0.5231 | 0.4023 | 0 | 46.4 | 53.1 |
| 13 | 0.167 | 0.4211 | 0.1975 | 0.3689 | 0 | 229.7 | 269.1 |
| 14 | 0.178 | 0.3438 | 0.2008 | 0.3688 | 0 | 301.0 | 277.8 |
| 15 | 0.188 | 0.2643 | 0.4430 | 0.1492 | 0 | 343.2 | 281.5 |
| 16 | 0.199 | 0.0693 | 0.5855 | 0.2870 | 0 | 282.2 | 274.0 |
| 17 | 0.210 | 0.1496 | 0.2919 | 0.1041 | 0 | 335.1 | 330.1 |
| 18 | 0.221 | 0.0604 | 0.1283 | 0.5735 | 0 | 309.0 | 269.5 |
| 19 | 0.231 | 0.0652 | 0.2153 | 0.3479 | 0 | 186.6 | 171.4 |
| 20 | 0.242 | 0.0772 | 0.2703 | 0.3877 | 0 | 227.1 | 258.7 |
| 21 | 0.253 | 0.1055 | 0.4117 | 0.3117 | 0 | 204.8 | 163.0 |
| 22 | 0.264 | 0.0760 | 0.3987 | 0.0691 | 0 | 215.4 | 146.3 |
| 23 | 0.274 | 0.1702 | 0.6832 | 0.3541 | 0 | 193.7 | 194.6 |
| 24 | 0.285 | 0.0937 | 0.7562 | 0.4358 | 0 | 176.4 | 179.3 |
| 25 | 0.296 | 0.1658 | 0.7765 | 0.5154 | 0 | 185.8 | 181.0 |
| 26 | 0.307 | 0.1659 | 0.7884 | 0.5085 | 0 | 177.7 | 174.3 |
| 27 | 0.317 | 0.0671 | 0.5157 | 0.2361 | 0 | 196.9 | 227.9 |
| 28 | 0.328 | 0.1472 | 0.8236 | 0.6080 | 0 | 197.1 | 194.6 |
| 29 | 0.339 | 0.0456 | 0.7009 | 0.5243 | 0 | 189.4 | 191.6 |
| 30 | 0.350 | 0.0844 | 0.7218 | 0.3789 | 0 | 196.3 | 183.9 |
| 31 | 0.360 | 0.0555 | 0.7693 | 0.5303 | 0 | 197.7 | 198.8 |
| 32 | 0.371 | 0.0463 | 0.7093 | 0.3606 | 0 | 156.8 | 160.2 |
| 33 | 0.382 | 0.0457 | 0.7396 | 0.3248 | 0 | 197.2 | 204.1 |
| 34 | 0.393 | 0.0245 | 0.6522 | 0.6597 | 0 | 171.7 | 165.4 |
| 35 | 0.403 | 0.0264 | 0.5883 | 0.1037 | 0 | 180.2 | 177.8 |
| 36 | 0.414 | 0.0412 | 0.8284 | 0.6495 | 0 | 184.6 | 189.0 |
| 37 | 0.425 | 0.0363 | 0.7614 | 0.5169 | 0 | 173.3 | 168.9 |
| 38 | 0.436 | 0.0197 | 0.6973 | 0.3496 | 0 | 172.0 | 168.2 |
| 39 | 0.446 | 0.0173 | 0.7455 | 0.4232 | 0 | 183.7 | 183.3 |
| 40 | 0.457 | 0.0217 | 0.7924 | 0.5352 | 0 | 181.4 | 179.9 |
| 41 | 0.468 | 0.0178 | 0.6057 | 0.3783 | 0 | 168.1 | 143.9 |
| 42 | 0.479 | 0.0135 | 0.5434 | 0.1797 | 0 | 195.6 | 231.4 |
| 43 | 0.489 | 0.0151 | 0.8104 | 0.4948 | 0 | 180.0 | 183.4 |
| 44 | 0.500 | 0.0095 | 0.6900 | 0.3071 | 0 | 182.7 | 182.2 |

```
Mean, min, max acc (g)    = -0.01  -0.51   0.35
Mean, min, max pitch (deg)=  -0.0  -12.0    9.9
Mean, min, max roll (deg) =  -0.0  -12.3   12.8
Maximum tilt (deg)        =  15.0
```

# Appendix F
# Datawell Wave Buoy Specifications and Typical Output Files

## 1. General Description of the Datawell Directional Waverider Mark II

The directional waverider buoy is a spherical, 0.9 m diameter buoy which measures wave height and wave direction. The buoy is manufactured by Datawell bv of the Netherlands. The buoy used in the NRC trials transmitted on 29.760 Mhz. Output power is 150-200 mW. The buoy is powered by 85 Leclanche zinc-carbon batteries, 80 Wh per cell. The buoy contains a flashing light that flashes 5 times every 20 seconds.

The direction measurement is based on the translational principle which means that horizontal motions instead of wave slopes are measured. As a consequence the measurement is independent of buoy roll motions and therefore a relative small buoy can be used.

A single point vertical mooring ensures sufficient symmetrical horizontal buoy response also for small motions at low frequencies.

The buoy comes standard with sea surface temperature measurement.

### *Installed Sensors*

The buoy contains:
- heave-pitch-roll sensor Hippy-40
- three axis fluxgate compass
- two fixed “x” and “y” accelerometers
- temperature sensor
- micro-processor

### *Directional Measurement*

From the accelerations measured in the x and y directions of the moving “buoy reference frame” the accelerations along the fixed, horizontal, north and west axis are calculated. All three accelerations (vertical, north and west) are digitally integrated to get filtered displacements with a high frequency cut-off at 0.6 Hz.

Finally, every half hour, FFT transforms of 8 series of 256 data points (200 sec) are summed to give 16 degrees of freedom on 1600 seconds of data.

### *Data Compression*

To save transmitting power the real time data are compressed to motion vertical, motion north and motion west.

### *Data Reduction*

Onboard data reduction computes energy density, main direction, directional spread and the normalized second harmonic of the directional distribution.

Frequency resolution:
0.005 Hz from 0.025 to 0.1 Hz and
0.01 Hz from 0.1 to 0.59 Hz.

*Standard Transmission*

The Directional Waverider transmits HF in the 27-40 Mhz band continuously. The Directional Waverider transmits:

- Real time data:
  - motion vertical
  - motion north
  - motion west
- Quasi static data:
  - computed spectral density
  - directional parameters
  - Hmo (significant wave height)
  - Tz (mean zero crossing period)
  - Monitoring data such as sea temperature, battery voltage, system status, GPS position (optional) and parity bits for error checking purposes.

***Mooring***

The Directional Waverider is fitted with a 5 kg chain ballast attached to the mooring eye. This provides stability when only a small vertical mooring force is present (free floating or shallow water).

A single point vertical mooring with 30 m rubbercord ensures sufficient symmetrical horizontal buoy response also for small motions at low frequencies.

The low stiffness of the 30 m rubbercord allows the Directional Waverider to follow waves up to 40 m.

Current velocities of up to 3 m/sec (6 knots) can be accommodated. The static buoyancy of the buoy is 1630 N.

The mooring design used for the NRC trials is shown in Figure 1 at the end of this document.

## 2. Directional Waverider Mark II Specifications

| | |
|---|---|
| Hull diameter | 0.9 m |
| Buoy weight | 212 kg |
| Static buoyancy | 1630 N |
| Maximum current speed | 3 m/sec |
| Sampling frequency | 3.84 Hz |

Heave:

| | |
|---|---|
| Range | -20 to +20 m |
| Resolution | 1 cm |
| Scale of accuracy | 3 % of measured value |
| Zero offset | < 0.1 m |
| Period time | 1.6 sec – 30 sec |
| Cross sensitivity | < 3 % |

Direction:

| | |
|---|---|
| Range | 0 – 360 degrees |
| Resolution | 1.5 degrees |
| Buoy heading error | typical .5 degrees |
| Period time in free floating condition | 1.6 sec – 30 sec |
| Period time in moored condition | 1.6 sec – 20 sec |

## 3. General Description of the Directional Waverider Receiver System

The receiving system installed on the roof of OCEANS Ltd. offices at 85 LeMarchant Rd. St. John's consisted of an omnidirectional antenna (a 3 metre Kathrein radiator whip antenna and 3 radial antennae) and antenna mount connected via a coax cable (RG 213 U) routed from the antenna mount to the wave direction receiver installed in an office below. A laptop interfaced to the wave direction receiver for storing and displaying wave data. The receiver was receiving on 38.760 Mhz. Standard 120 volt AC was used to power the wave direction receiver.

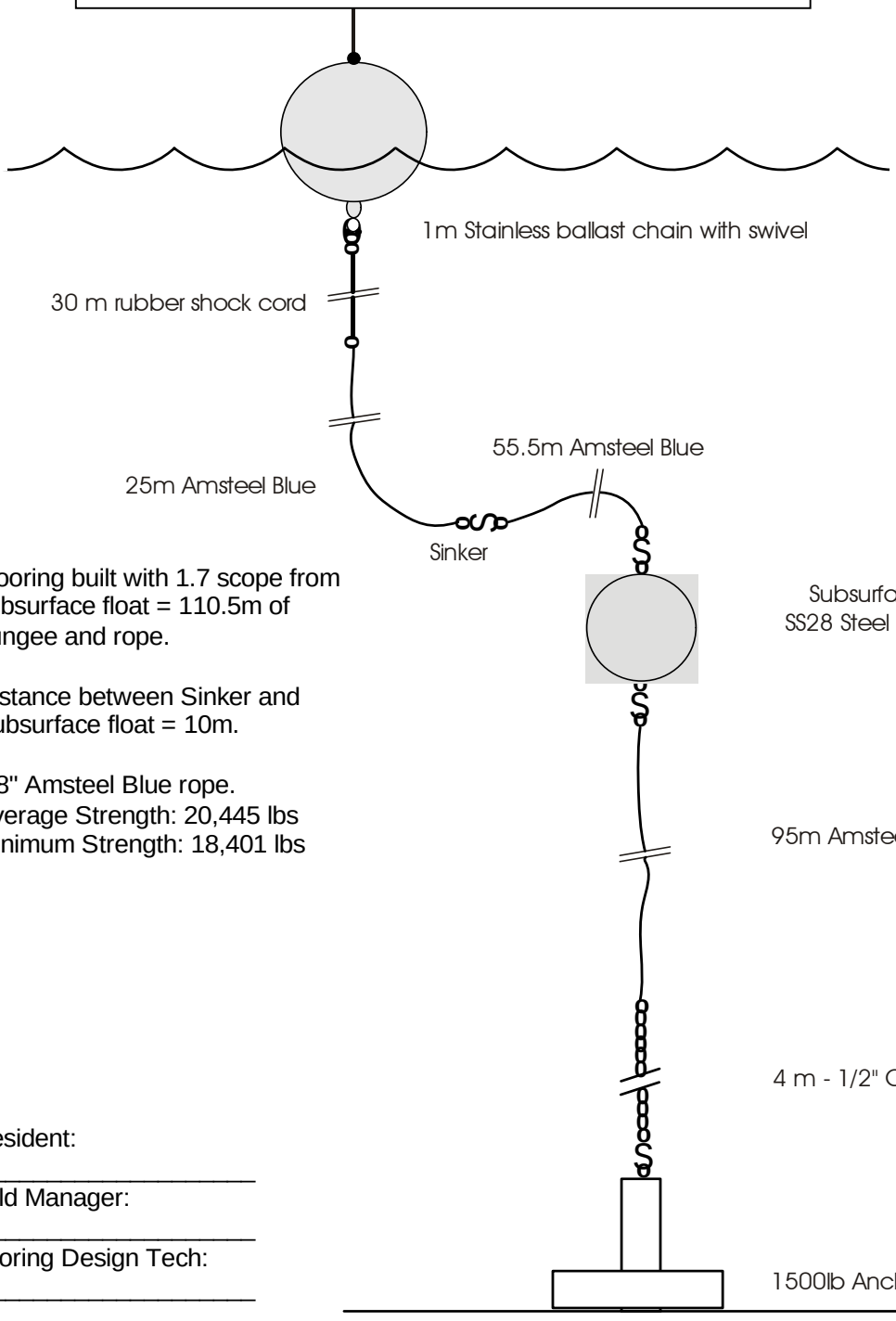
During the trials data was recorded every half hour. The recorded data included spectral, raw and statistics data. These data were passed to NRC within 48 hours after the end of a sea trial. In addition to other wave parameters the following basic wave parameters were included in the wave data provided to NRC:

start time of the data collection in UTC time
significant wave height in centimetres
mean zero crossing period in seconds
direction of the spectral peak in degrees magnetic
directional spread of the spectral peak in degrees

The directional waverider buoy was deployed October 8, 2004 at 17:00 UTC time by the 40 m long Marine Institute training vessel M/V Louis M. Lauzier in position 47 34.126 N 52 26.154 W in a water depth of 163 metres.

# NRC September 2004 - Directional Waverider Mooring
# Water Depth - 165 Metres

## Position 47 34.126 N  52 26.154




Mooring built with 1.7 scope from subsurface float = 110.5m of bungee and rope.

Distance between Sinker and Subsurface float = 10m.

3/8" Amsteel Blue rope.
Average Strength: 20,445 lbs
Minimum Strength: 18,401 lbs

President:
_____
Field Manager:
_____
Mooring Design Tech:
_____

* Diagram Not Drawn to Scale

## Typical Raw Datawell Wave Buoy Output Files:

### 10171100.dat

```
10-17-2004 1100 to 1120 ,100% , 442 ,10.0 , 340 ,11.1 , 272 ,11.1 , 169 , 8.8 ,0.82
  86 , +155 , -173 ,10.91
 126 , +147 , -202 ,11.86
  45 , +105 , -101 ,15.56
  85 ,  +97 , -146 ,14.55
   1 , +128 , -120 ,13.83
   0 , +181 , -141 ,11.92
 118 ,  +27 ,   -5 , 2.30
   5 ,  +71 ,  -61 , 9.96
  44 ,  +62 ,  -90 , 6.57
  87 , +111 ,  -81 ,11.44
 124 ,  +52 ,   -6 , 7.21
 130 ,   +6 ,  -38 , 4.31
 119 ,  +19 ,  -75 , 5.46
  82 ,  +82 , -116 ,13.05
  46 ,  +68 ,  -64 ,15.58
  79 , +110 ,  -39 , 8.55
  29 ,  +66 ,  -74 , 8.07
  90 ,  +38 ,   +0 , 1.08
 131 ,  +77 , -113 ,10.59
  81 ,  +77 ,  -48 , 8.10
  30 ,  +45 ,  -47 , 7.01
  76 ,  +17 ,  -64 , 6.06
  33 ,  +93 , -122 ,10.20
 127 ,  +44 ,   -5 , 1.86
 125 ,  +79 ,  -12 , 7.19
   4 ,  +25 ,  -78 , 5.73
  66 ,  +56 ,  -14 , 4.63
  28 ,  +22 ,  -56 , 5.03
   3 , +100 , -147 ,10.42
 122 , +144 , -131 ,13.73
  89 , +123 , -141 ,11.58
  94 ,  +66 ,   -7 , 6.64
 107 ,  +57 ,  -81 , 7.76
 134 , +148 , -110 , 8.34
  84 , +115 ,  -82 , 8.84
 129 ,  +65 ,  -39 , 6.76
  77 ,   +1 ,  -32 , 3.26
  80 ,  +55 ,  -34 , 2.43
  83 ,  +71 ,  -32 , 7.32
  65 ,  +19 ,  -32 , 2.36
  22 ,  +35 ,  -39 , 3.82
  75 ,  +58 ,  -52 ,10.33
   2 ,   +1 ,  -36 , 2.66
  62 ,  +67 , -138 ,11.01
  43 , +137 , -182 ,11.82
 116 , +184 , -204 ,11.34
 108 , +190 ,  -93 ,10.61
  13 ,  +84 ,  -61 , 9.87
  34 ,  +82 ,  -62 ,10.04
  78 ,  +22 ,  -36 , 3.00
 128 ,  +84 ,  -66 ,10.40
   9 ,  +23 ,  -17 , 1.17
  18 ,  +10 ,  -17 , 3.28
 117 ,  +61 ,  -90 , 9.50
 123 ,  +69 ,  -81 ,12.25
  67 ,  +81 ,  -74 ,10.20
  61 ,  +34 ,   -8 , 3.19
  70 ,  +39 ,  -80 , 7.45
  74 ,  +46 ,  -49 , 5.95
 121 ,  +73 ,  -92 , 8.90
 109 ,  +53 ,  -31 , 9.55
  69 ,  +64 , -114 , 6.83
  59 ,  +90 , -116 ,11.23
  88 ,  +81 ,  -27 , 7.90
 102 ,  +42 ,  -99 , 6.87
  92 , +127 ,  -92 ,11.02
```

```
104 , +123 , -125 ,10.30
132 ,  +89 ,  -93 ,11.25
 55 ,  +78 ,  -61 ,10.59
115 ,  +69 ,  -98 ,11.45
  8 ,  +95 ,  -80 , 9.08
 53 ,  +24 ,  -29 , 2.83
 50 ,  +32 ,  -34 , 8.37
 54 ,  +76 ,  -73 , 9.41
 95 ,  +76 ,  -95 ,10.05
 15 ,  +76 , -133 ,10.56
 73 , +138 , -124 ,11.54
 47 , +119 , -102 , 8.12
105 ,  +99 ,  -96 ,11.21
120 , +117 , -165 ,11.72
133 , +118 , -102 , 9.90
 48 , +139 , -130 , 9.95
 64 , +155 , -132 ,12.15
 16 , +116 , -104 ,13.92
 68 ,  +97 , -129 ,13.99
 32 , +206 , -182 ,10.51
101 , +213 , -229 ,10.01
  7 , +205 , -108 ,12.39
 14 , +112 ,  -53 , 7.45
100 , +100 , -139 , 8.73
 19 , +158 , -115 ,10.75
 57 ,  +38 ,  -13 , 2.34
 93 ,  +60 , -102 ,13.11
 97 ,  +56 ,  -63 ,10.70
 41 ,  +93 , -136 , 9.43
 63 ,  +89 ,  -61 ,14.51
 35 ,  +59 ,   -2 , 6.03
 25 ,  +28 ,  -83 , 6.34
 38 ,  +40 ,   +0 , 2.77
 58 ,  +42 ,   -1 , 2.34
114 ,  +56 ,  -70 , 8.42
 12 ,  +59 ,  -75 , 9.03
 20 ,  +86 ,  -77 , 6.75
 24 ,  +34 ,  -48 , 6.38
 37 ,  +48 , -113 , 8.98
 60 ,  +92 ,  -53 ,10.06
103 ,  +20 ,  -27 , 4.70
 21 ,  +98 , -130 , 9.50
 27 ,  +90 , -109 ,11.89
110 ,  +89 ,  -81 ,11.98
 40 ,  +65 ,  -10 , 6.49
 31 ,  +26 ,  -22 , 2.26
 26 ,  +20 ,  -45 , 3.19
 72 ,  +10 ,   -4 , 2.14
112 ,  +40 ,  -55 , 5.43
 96 ,  +74 ,  -81 ,10.31
 10 ,  +92 , -113 , 9.77
 49 ,  +96 ,  -92 ,13.06
 71 , +165 , -162 ,10.78
 39 , +151 , -146 ,10.39
 91 ,  +68 ,  -77 , 9.01
 23 ,  +90 ,  -81 ,12.30
111 , +137 , -106 ,10.08
106 ,  +82 , -102 ,15.85
 11 , +131 , -171 ,11.27
 99 ,  +84 , -169 ,14.63
 56 , +214 , -203 ,10.18
 51 , +148 , -107 , 9.95
 98 ,  +89 , -106 , 9.03
 17 , +100 , -122 , 7.90
 42 , +146 , -156 , 9.72
 36 , +163 , -107 ,11.22
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 52 ,  +63 ,  -82 ,10.88
113 , +122 , -106 , 9.23
```

**10171026.SPT**

8
296
8.695652
14.18512
24.95
10.15
7.125
.6275
-.48
-.125
184.2188
68.29102
.025,8.696544E-05,95.625,79.34118,-1.762304,1.590928
.03,3.207015E-04,355.7813,51.81236,2.346043,3.477841
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.045,2.357862E-03,61.875,73.29827,.7066005,1.523845
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.055,1.083472E-02,64.6875,52.93142,1.613002,3.09405
.06,2.351775E-02,63.28125,47.55994,-1.045397,4.093884
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.18,1.707739E-02,25.3125,65.46487,.2496473,1.982169
.19,1.221611E-02,2.8125,71.39587,-.718248,1.834045
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.35,3.96599E-03,171.5625,50.91712,.9248894,2.929232
.36,4.471641E-03,167.3438,47.00042,.7582065,3.485711
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.43,1.979324E-03,174.375,44.65039,8.639818E-02,2.561805
.44,1.57264E-03,164.5313,39.50273,2.950445E-02,3.81636
.45,2.265409E-03,149.0625,33.34792,1.103734,6.667895
.46,1.064766E-03,163.125,46.6647,.2619462,2.985128
.47,1.294022E-03,164.5313,41.40513,-.8572904,3.305247
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.55,1.230912E-03,156.0938,35.1384,.1373923,3.455565
.56,5.872853E-04,150.4688,44.09087,.1820585,2.666625
.57,8.333975E-04,153.2813,40.8456,.8533849,4.724912
.58,4.350716E-04,170.1563,48.11947,-1.056131,3.009303
```

# Appendix G
# Seakeeping Trials Test Plan

## Test Program for Seakeeping Trials on 65 ft. long Fishing Vessel CCGA Miss Jacqueline IV - Vessel C2 (fitted with paravanes)

**Proj. 2017 Oct. 6, 2004 V2.0**

Assumptions:

1) Vessel is docked in St. John's during trials preparation period & will sail from St. John's during trial.
2) Vessel will carry 4 crew members and a maximum of 10 trials personnel.
3) Vessel operator will be responsible for fuelling vessel & acquiring required supplies to operate vessel.
4) Assume vessel has sufficient quality AC power to operate trials instrumentation & DAS and thus no propane generator is to be fitted by IOT. Still require UPS to be fitted however.

Preliminary Preparations:

1) Fit out vessel with instrumentation as per instrumentation plan.
2) Set displacement condition roughly half load condition - this will require loading ballast - either ice or water pressed up in fish holds. Press up water & fuel tanks to minimize free surface.
3) Borrow sufficient lifesaving equipment from CCG for all trials personnel.
4) Carry out inclining experiment with all instrumentation, consumables & ballast in place.
5) Select location for trials. Permission from St. John's Traffic Control may be required. Design/compile mooring for wave buoy & sentry buoy once water depth is known (J. Foley/MUN Oceanography).
6) Decision/arrangements required with respect deploying wave buoy & sentry buoy prior to trial
7) Issue Notice to Mariners regarding deployment location (Lat., Long) of wave buoy & buoy identification info (color, dimensions, radar beacon, flashing light etc.) (to be done by CO of Lauzier)
8) Borrow a cell phone from D&F for trials preparation period & sea trial.(687-3541)
9) Determine/record location (X, Y, Z co-ordinates) of GPS antenna relative to some known ship location
10) Determine/record location (X, Y, Z co-ordinates) of MotionPak & any accelerometers relative to some known ship location.
11) Take digital photos of instrumentation/equipment set up.
12) A more complex process will be required for GPS antenna alignment & set up with new GPS system than previously experienced.
13) Carry out inclining experiment with all instrumentation, consumables & ballast in place.

Prior to departing port on day of trial:

1) Check all instrumentation and data acquisition system.
2) Note draft bow & transom as well as any static list.
3) Record harbour water temperature & salinity at dock.
4) Ensure all freeing ports are open and unobstructed. Ensure all hatches are closed so any water on deck can not accumulate.

5) Inform CCG traffic control that vessel is going to be on trials, name of vessel, location etc. so that vessels in vicinity can be warned.
6) 10 minute collection of data with mooring lines slack, engine off

At Trials Location - whenever vessel is stopped adjacent to wave buoy (ie: before each forward speed set):

1) Verify Communications with wave buoy & transfer any data files. Use initial wave buoy data to determine Average Wave Direction.
If there is a significant difference between dominant & average wave direction from the buoy, there are probably 2 major sea directions.
Some judgment including visual observation will be required to determine the actual sea direction.
Note the wave buoy outputs sea direction information in deg. Magnetic - roughly -21 deg. (exact number to be determined) deviation from deg. True North
2) Record sea temperature and salinity information adjacent to wave buoy.
3) Record wind speed and absolute direction.
4) Record estimated sea conditions from visual observation - sea state, direction.
5) Record general weather conditions, - fog, visibility, precipitation.

Execute Runs as per ITTC Recommended Pattern:

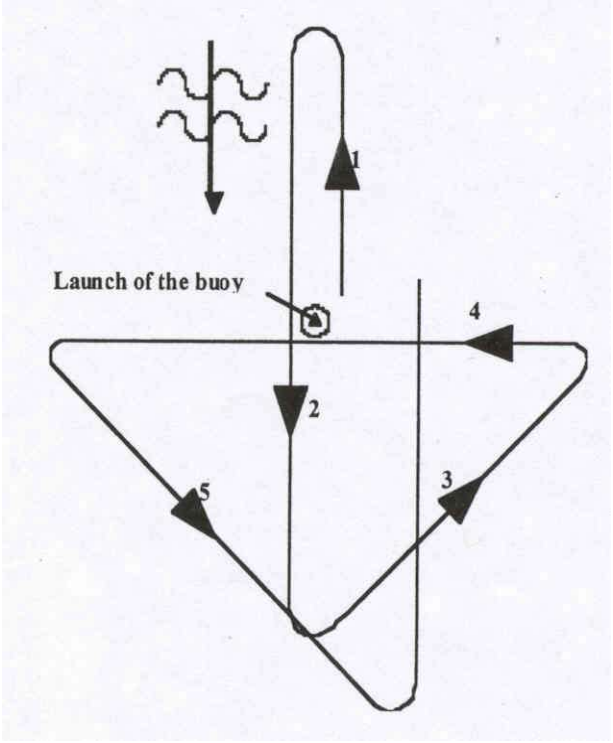
For each run, manually record the following information after vessel attained steady state speed/direction:
wind speed/relative direction
engine speed/ shaft speed from any onboard instrumentation
general motion behaviour of vessel (heavy roll, pitch etc.)
incidents of slamming, water on deck, spray - is water accumulating on deck?
difficulty for personnel to maintain balance, seasickness
take digital photos during trial of deployed wave buoy, taking salinity readings etc.

Run 1: 0 speed drift run, initial heading - beam seas

Run 2: trawl speed 4 knots, head seas, 25 minutes
Run 3: trawl speed 4 knots, following seas, 40 minutes
Run 4: trawl speed 4 knots, bow sea, 25 minutes
Run 5: trawl speed 4 knots, beam sea, 25 minutes
Run 6: trawl speed 4 knots, quartering sea, 25 minutes

Return to wave buoy location.

Run 7: cruise speed 9 knots, head seas, 25 minutes



Run 8: cruise speed 9 knots, following seas, 40 minutes
Run 9: cruise speed 9 knots, bow sea, 25 minutes ITTC Recommended Run Pattern
Run 10: cruise speed 9 knots, beam sea, 25 minutes ITTC Procedures Book, 22nd ITTC, Sept. 1999.
Run 11: cruise speed 9 knots, quartering sea, 25 minutes Run 1: Head Sea
Run 2: Following Sea
Return to wave buoy location. Run 3: Bow Sea
Run 4: Beam Sea
Run 12: 0 knots, beam seas, 25 minutes Run 5: Quartering Sea

Return to wave buoy location - download wave data.
Deploy paravanes.

Run 13: 0 knots, beam seas, 25 minutes
Run 14: trawl speed 4 knots, bow sea, 25 minutes
Run 15: trawl speed 4 knots, beam sea, 25 minutes
Run 16: trawl speed 4 knots, quartering sea, 25 minutes

Return to wave buoy location - download wave data - recover wave buoy.

<u>After vessel has returned to dock upon completion of trial:</u>

1) Note draft bow & stern as well as any static list.
2) Record harbour water temperature & salinity at dock.
3) Record fuel, water tank levels.
4) Remove all instrumentation, ballast from vessel.
5) Return all borrowed lifesaving equipment, cell phone.

NOTE: 180 deg. is defined as a head sea.
The 65 ft vessel likely has an autopilot & thus all data will be collected with the vessel on autopilot control (other than zero speed drift runs).
Trawl speed is actually 1.8-2 kts. however the autopilot linked to the mag. compass would not be able to provide good heading angle control
at this low forward speed without dragging trawl so will do 4 kts.
Paravane arms are extended at sea however paravanes are only dropped down during runs 13-16.

# Appendix H
# Seakeeping Trials Run Log

# Run Log for Seakeeping Trial on CCGA Miss Jacqueline IV - Vessel 'C2'

**Fishing Vessel Research Project (Proj. 2017)** **Date:** Oct. 17, 2004

05:00 Draft 9'2" (2.794 m) Fwd 12' 6" (3.81 m) Aft

Salinity 28.9 ppt, Sea Temp. 10.3 deg. C @ dock **Density: 1022.16 kg/m$^3$**

07:00 Deploy Neptune Wave Buoy @ 47 33.713 N, 52 25.697 W ~ 0.5 nm from Datawell Buoy operated by OCEANS Ltd. of St. John's, NL.

07:10 Salinity 30.8 ppt, Sea Temp. 10.0 deg. C @ wave buoy **Density: 1023.63 kg/m$^3$**

10:50 Salinity 30.7 ppt, Sea Temp. 10.0 deg. C @ wave buoy **Density: 1023.61 kg/m$^3$**

14:30 Salinity 30.6 ppt, Sea Temp. 10.9 deg. C @ wave buoy **Density: 1023.38 kg/m$^3$**

18:40 Salinity 29.2 ppt, Sea Temp. 10.5 deg. C @ dock. **Density: 1022.31 kg/m$^3$**

18:45 Draft 9'2" (2.794 m) Fwd 12' 5" (3.7846 m) Aft

| Run # | File Name | Start / Finish Time | Course Relative to Incident Waves | Location Start/Finish Latitude deg N | Location Start/Finish Longitude deg W | Nominal SWH (m) | Dominant Wave Period (s) | SOG (kts.) | COG (deg. TRUE) | Wind Speed (kts.) | Wind Direction (deg. mag.) | Engine RPM | Shaft RPM | Comments: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | beam_drift_20041017071402.csv | 07:14<br>07.39 | Beam Drift | 47.5604<br>47.5602 | 52.4269<br>52.4291 | 2.6 | 10.89 | N/A | N/A | 12 | 310 | N/A | 0 | SS3, swell & wind wave<br>Neptune Wave Buoy File P2910700 was acquiring 1st 5 min on q'deck |
| 2 | head_20041017074257.csv | 07.42<br>08.07 | Head | 47.5622<br>47.5790 | 52.4261<br>52.4021 | 2.44 | 10.89 | 3.6 | 42 | 15 | 290 | 800 | 130 | |
| 3 | fol_20041017081300.csv | 08:13<br>08:54 | Following | 47.5781<br>47.5478 | 52.4047<br>52.4442 | 2.4 | 10.89 | 3.6 | 222 | 14 | 140 | 700 | 112 | |
| 4 | bow_20041017085844.csv | 08.58<br>09:23 | Bow | 47.5460<br>47.5451 | 52.4432<br>52.4051 | 2.31 | 9.75 | 3.7 | 087 | 21 | 270 | 780 | 127 | some water on q'deck noted (to CL) |
| 5 | beam_20041017092919.csv | 09:29<br>09:54 | Beam | 47.5477<br>47.563 | 52.4070<br>52.4368 | 2.44 | 9.75 | 3.6 | 305 | 10 | 70 | 720 | 116 | |

# CCGA Miss Jacqueline IV Seakeeping Trials

| Run # | File Name | Start<br>Finish Time | Course Relative<br>to Incident Waves | Location Start/Finish<br>Latitude deg N | <br>Longitude deg W | Nominal<br>SWH (m) | Dominant Wave<br>Period (s) | SOG<br>(kts.) | COG<br>(deg. TRUE) | Wind<br>Speed (kts.) | <br>Direction (deg. mag.) | Engine<br>RPM | Shaft<br>RPM | Comments: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | quart_20041017095927.csv | 09:59<br>10.24 | Quartering | 47.562<br>47.5358 | 52.4395<br>52.4384 | 2.32 | 12.34 | 3.7 | 178 | 18 | 210 | 800 | 129 | |
| 7 | beam_drift_20041017104210.csv | 10:42<br>11.07 | Beam Drift | 47.5614<br>47.5635 | 52.4309<br>52.4304 | 2.4 | 10.89 | N/A | N/A | 10 | 100 | N/A | 0 | |
| 8 | head_2041017111922.csv | 11:19<br>11:44 | Head | 47.5635<br>47.5895 | 52.4304<br>52.3322 | 2.52 | 12.34 | 7.8 | 68 | 20 | 270 | 1600 | 261 | |
| 9 | fol_20041017114842.csv | 11:48<br>12:13 | Following | 47.5887<br>47.5509 | 52.3417<br>52.4642 | 2.52 | 12.34 | 8.2 | 247 | 11 | 140 | 1650 | 271 | Some water on q'deck noted. |
| 10 | bow_20041017123331.csv | 12:33<br>12:58 | Bow | 47.5449<br>47.5232 | 52.4596<br>52.3830 | 2.38 | 10.89 | 8.2 | 116 | 21 | 240 | 1590 | 259 | |
| 11 | beam_20041017130404.csv | 13:04<br>13:29 | Beam | 47.5280<br>47.5801 | 52.3793<br>52.4103 | 2.46 | 10.89 | 8.2 | 339 | 6 | 000 | 1580 | 257 | |
| 12 | quart_20041017133459.csv | 13:34<br>13:59 | Quartering | 47.5759<br>47.5234 | 52.4184<br>52.4502 | 2.36 | 10.89 | 8.3 | 205 | 19 | 180 | 1650 | 268 | |
| 13 | beam_drift_20041017142907.csv | 14:29<br>14:55 | Beam drift | 47.5631<br>47.5648 | 52.4276<br>52.4292 | 2.10 | 10.89 | N/A | N/A | 17 | 310 | N/A | 0 | |
| | **PARAVANES DEPLOYED** | 15:00 | | | | | | | | | | | | |
| 14 | beamp_20041017150414.csv | 15:04<br>15:29 | Beam | 47.5657<br>47.5893 | 52.4272<br>52.4374 | 2.13 | 9.75 | 3.6 | 344 | 13 | 004 | 800 | 130 | |
| 15 | quartp_20041017153514.csv | 15:35<br>16.03 | Quartering | 47.5886<br>47.5617 | 52.4406<br>52.4591 | 2.22 | 10.89 | 3.6 | 205 | 14 | 152 | 800 | 149 | long run |
| 16 | bowp_20041017161027.csv | 16:10<br>16:35 | Bow | 47.5562<br>47.5430 | 52.4609<br>52.4235 | 2.21 | 10.89 | 3.6 | 120 | 20 | 248 | 900 | 148 | |

- Paravane arms were extended at angle of ~ 45 deg. when paravanes not deployed.

- Wind speed is provided relative in knots, wind direction is magnetic deg.
- SOG - Speed Over Ground COG - Course Over Ground SWH - Significant Wave Height N/A - not applicable ppt - parts per thousand
- Trial carried out around two moored directional wave buoys nominally 10 nm east of St. John's, NL in 165 m of water.
- Dominant wave period and SWH values as recorded using Neptune wave buoy.
- Design Draft Aft: 3.67 m Design Draft Fwd.: 2.75 m Drafts measured relative to bottom of keel.
- CCGA Miss Jacqueline IV used a single flat plate section rudder and a single, 4 bladed propellor. Vessel has bulbous bow & paravane roll stabilizers.
- CCGA Miss Jacqueline IV moored at Pier 6 - north west St. John's harbour.
- The difference between deg. magnetic and deg. TRUE was approximately 20.94 deg.Thus True Direction = Mag - 21 deg.
- Heading angles with respect to incident waves was determined based on dominant wave direction as determined by Neptune wave buoy.

- Several cm of water on quarterdeck noted for many runs.
- Weather overcast with light drizzle, air temp. 8-10 deg. C, good visibility until 12:30 when fog moved in - 0.5 nm visibility. Shower @14:30. Cleared by 15:30.
- Waves were multi-directional with dominant swell as well as oblique wind driven wave.
- All fuel tanks and fresh water tanks pressed up. For ballast, two fwd. refrigerated sea water tanks pressed up with 31,043 kg Sea Water.
- Fwd. ballast tank empty, aft ballast tank ~ 1/4 full (no measurement of aft ballast tank possible).
- Autopilot controlled by gyro compass.
- Confused sea - difficult to visually determine sea direction.
- Sea Water Density calculated using temperature, salinity, and depth (2 m) and online calculator at: http://ioc.unesco.org/oceanteacher/resourcekit/M3/Converters/SeaWaterEquationOfState/Sea%20Water%20Equation%20of%20State%20Calculator.htm
- OCEANS Ltd. Datawell wave buoy moored at position: 47 34.126 N 52 26.154 W, in 165 metres of water

# CCGA Miss Jacqueline IV Seakeeping Trials

**Fishing Vessel Research Project (Proj. 2017)** **Date:** Oct. 18, 2004

07:00 Draft 9'2" (2.794 m) Fwd 12' 5" (3.7846 m) Aft

Salinity 28.9 ppt, Sea Temp. 10.5 deg. C @ dock **Density: 1022.12 kg/m$^3$**

12:45 Salinity 30.6 ppt, Sea Temp. 10.8 deg. C @ wave buoy **Density: 1023.43 kg/m$^3$**

16:15 Salinity 30.6 ppt, Sea Temp. 10.6 deg. C @ wave buoy **Density: 1023.40 kg/m$^3$**

16:15 Recover Neptune Wave Buoy

Salinity 29.0 ppt, Sea Temp. 10.4 deg. C @ dock **Density: 1022.18 kg/m$^3$**

Drafts: 9' 2" (2.794 m) fwd,12' 4" (3.759 m) aft

| Run # | File Name | Start Finish Time | Course Relative to Incident Waves | Location Start/Finish Latitude deg N | Location Start/Finish Long. deg | Nominal SWH (m) | Dominant Wave Period (s) | SOG (kts.) | COG (deg. TRUE) | Wind Speed (kts.) | Wind Direction (deg. mag.) | Engine RPM | Shaft RPM | Comments: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | beam_drift_20041018084919.csv<br>beam_drift_20041018085952.csv | 08:49<br>09:15 | Beam Drift | 47.5618<br>47.5624 | 52.4306<br>52.4338 | 1.81 | 8.83 | N/A | N/A | 15 | 310 | N/A | 0 | SS3, less swell, shorter period wave closer to vessel natural period is giving greaterroll. Accidentally S/D acquisition after 10 min. - will append 2 files to make 25 min. |
| 2 | head_20041018093925.csv | 09:39<br>10.04 | Head | 47.5613<br>47.5319 | 52.4411<br>52.5121 | 2.0 | 8.83 | 8.0 | 240 | 17 | 140 | 1620 | 266 | Some water on q'deck.<br>Spray up to bridge. |
| 3 | fol_20041018100821.csv | 10.08<br>10:48 | Following | 47.5316<br>47.5755 | 52.5101<br>52.3943 | 1.84 | 10.89 | 8.0 | 63 | 20 | 280 | 1640 | 268 | SS2 - waves dropping<br>Occasional green water on deck. |
| 4 | bow_20041018105247.csv | 10:52<br>11:17 | Bow | 47.5788<br>47.5894 | 52.3994<br>52.479 | 1.88 | 9.75 | 8.1 | 283 | 6 | 120 | 1650 | 269 | |
| 5 | beam_20041018112216.csv | 11.22<br>11:47 | Beam | 47.5851<br>47.5391 | 52.4803<br>52.4358 | 1.68 | 8.83 | 7.7 | 150 | 20 | 220 | 1680 | 273 | Occasional slam noted - spray over bow.<br>Feels more like head sea. |

# CCGA Miss Jacqueline IV Seakeeping Trials

| Run # | File Name | Start Finish Time | Course Relative to Incident Waves | Location Start/Finish Latitude deg N | Location Start/Finish Long. deg | Nominal SWH (m) | Dominant Wave Period (s) | SOG (kts.) | COG (deg. TRUE) | Wind Speed (kts.) | Wind Direction (deg. mag.) | Engine RPM | Shaft RPM | Comments: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | quart_20041018115135.csv | 11:51<br>12:16 | Quartering | 47.5435<br>47.5983 | 52.4307<br>52.4082 | 1.90 | 8.83 | 8.0 | 10 | 12 | 320 | 1620 | 263 | |
| 7 | beam_drift_20041018124052.csv | 12:40<br>13:05 | Beam drift | 47.5627<br>47.5659 | 52.4273<br>52.4254 | 1.81 | 8.83 | N/A | N/A | 8 | 130 | N/A | 0 | Waves have diminished significantly. |
| | PARAVANES DEPLOYED | 13:08 | | | | | | | | | | | | |
| 8 | headp_2041018131209.csv | 13:12<br>13:37 | Head | 47.5664<br>47.5739 | 52.4185<br>52.3393 | 1.64 | 9.75 | 7.9 | 82 | 23 | 260 | 1650 | 268 | |
| 9 | folp_20041018134554.csv | 13:45<br>14:26 | Following | 47.5794<br>47.5627 | 52.3385<br>52.4797 | 1.77 | 8.83 | 7.6 | 256 | 9 | 120 | 1670 | 274 | SS1-SS2 |
| 10 | bowp_20041018143101.csv | 14:31<br>14:56 | Bow | 47.5579<br>47.5288 | 52.4755<br>52.4096 | 1.80 | 8.83 | 7.7 | 120 | 23 | 230 | 1680 | 272 | Few minor slams noted. |
| 11 | beamp_20041018145815.csv | 14:58<br>15:23 | Beam | 47.5322<br>47.5875 | 52.4090<br>52.4200 | 1.78 | 8.83 | 8.0 | 350 | 8 | 350 | 1670 | 274 | |
| 12 | quartp_20041018152551.csv | 15:25<br>15:51 | Quartering | 47.5854<br>47.5433 | 52.4338<br>52.4669 | 1.77 | 8.83 | 7.6 | 215 | 10 | 150 | 1680 | 273 | |

- Paravane arms were extended at angle of ~ 45 deg. when paravanes not deployed.
- Wind speed is provided relative in knots, wind direction is magnetic deg.
- SOG - Speed Over Ground  COG - Course Over Ground  SWH - Significant Wave Height  N/A - not applicable
- ppt - parts per thousand
- Trial carried out around two moored directional wave buoy nominally 10 nm east of St. John's, NL in 165 m of water.
- Neptune Wave Buoy moored @ 47 33.713 N, 52 25.697 W ~ 0.5 nm from Datawell Buoy operated by OCEANS Ltd. of St. John's, NL.
- OCEANS Ltd. Datawell wave buoy moored at position: 47 34.126 N 52 26.154 W, in 165 metres of water

# CCGA Miss Jacqueline IV Seakeeping Trials

- Dominant wave period and SWH values as recorded using Neptune wave buoy.
- Design Draft Aft: 3.67 m Design Draft Fwd.: 2.75 m Drafts measured relative to bottom of keel.
- CCGA Miss Jacqueline IV used a single flat plate section rudder and a single, 4 bladed propeller. Vessel has bulbous bow & paravane roll stabilizers.
- CCGA Miss Jacqueline IV moored at Pier 6 - north west St. John's harbour.
- The difference between deg. magnetic and deg. TRUE was approximately 20.94 deg. Thus True Direction = Mag - 21 deg.
- Heading angles with respect to incident waves was determined based on dominant wave direction as determined by Neptune wave buoy.
- Impossible to determine dominant wave direction visually - seas very confused.
- Several cm of water on quarterdeck noted for many runs.
- Weather overcast with light drizzle, air temp. 8-10 deg. C, good visibility. Rain started in late afternoon.
- All fuel tanks and fresh water tanks pressed up. For ballast, two fwd. refrigerated sea water tanks pressed up with 31,043 kg Sea Water.
- Fwd. ballast tank empty, aft ballast tank ~ 1/4 full (no measurement of aft ballast tank possible).
- Autopilot controlled by gyro compass.
- Confused sea - difficult to visually determine sea direction.
- Sea Water Density calculated using temperature, salinity, and depth (2 m) and online calculator at:
  http://ioc.unesco.org/oceanteacher/resourcekit/M3/Converters/SeaWaterEquationOfState/Sea%20Water%20Equation%20of%20State%20Calculator.htm
- Note: Run #1 (Beam Drift) Data calibrated data files joined together as Beam_drift_20041018084919_CAL_A.CSV and Beam_drift_20041018084919_GPS_A.CSV

# Appendix I
# Wave Statistics, Nondimensional Spectrum Plots, and Mean Wave Direction vs. Frequency Plots

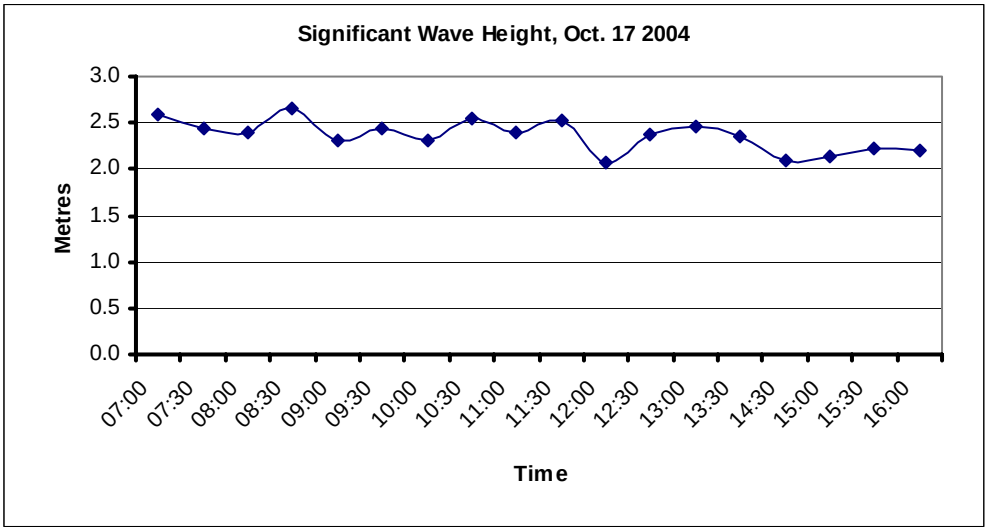
## Summary of Wave Statistics Collected Using Neptune Directional Wave Buoy

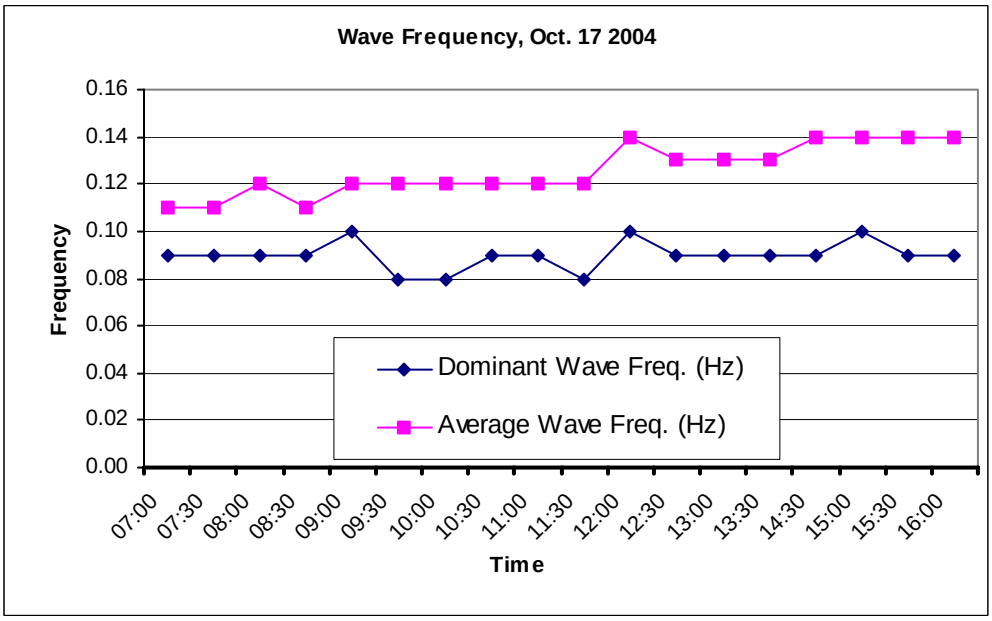
**CCGA Miss Jacqueline IV** **Proj. 2017**

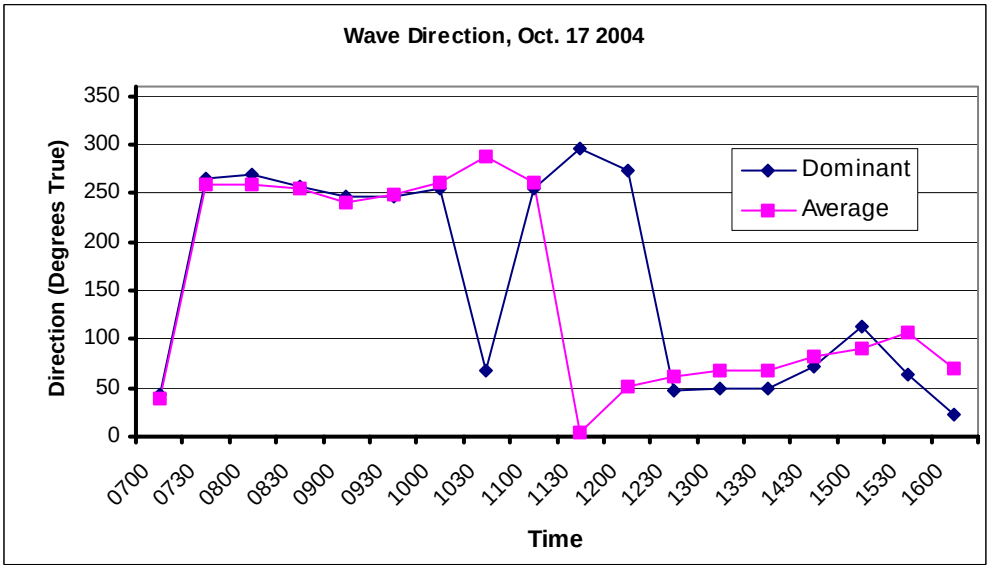
**October 17, 2004**

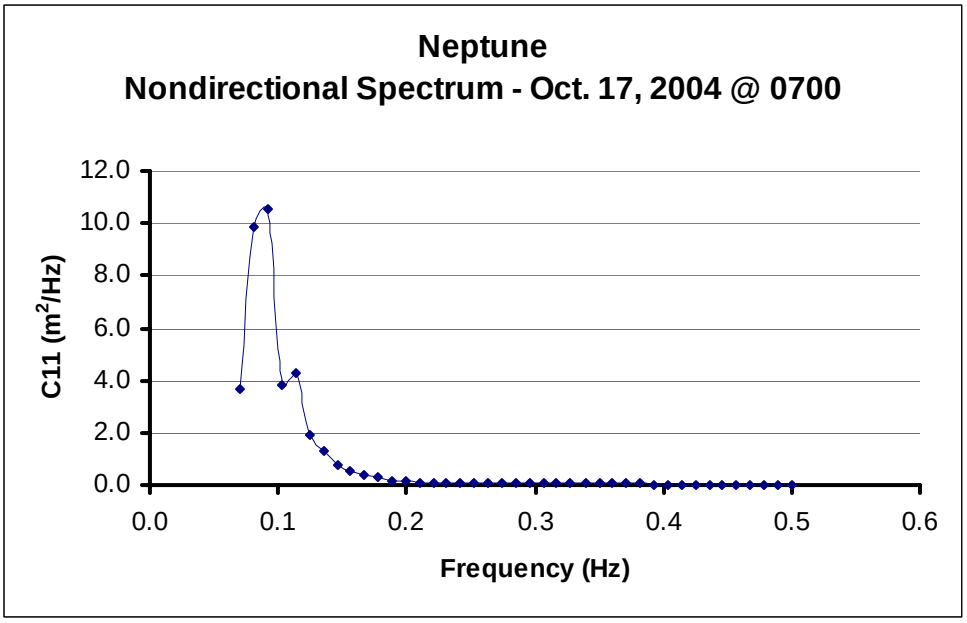
| NF Time | Sig. Wave Height (m) | Dominant Wave Freq. (Hz) | Average Wave Freq. (Hz) | Dominant Wave Period (s) | Average Wave Period (s) | Dominant Wave Dir. (deg. mag.) | Average Wave Dir. (deg. mag.) | Dominant Wave Dir. (deg. TRUE) | Average Wave Dir. (deg. TRUE) |
|---|---|---|---|---|---|---|---|---|---|
| 07:00 | 2.59 | 0.09 | 0.11 | 10.89 | 8.78 | 64.7 | 60.6 | 43.7 | 39.6 |
| 07:30 | 2.44 | 0.09 | 0.11 | 10.89 | 8.80 | 285.40 | -79.70 | 264.40 | -100.70 |
| 08:00 | 2.40 | 0.09 | 0.12 | 10.89 | 8.38 | 289.60 | -80.00 | 268.60 | -101.00 |
| 08:30 | 2.65 | 0.09 | 0.11 | 10.89 | 8.71 | 279.00 | -84.80 | 258.00 | -105.80 |
| 09:00 | 2.31 | 0.10 | 0.12 | 9.75 | 8.04 | 266.90 | -98.10 | 245.90 | -119.10 |
| 09:30 | 2.44 | 0.08 | 0.12 | 12.34 | 8.18 | 267.90 | -90.20 | 246.90 | -111.20 |
| 10:00 | 2.32 | 0.08 | 0.12 | 12.34 | 8.13 | 275.10 | -77.40 | 254.10 | -98.40 |
| 10:30 | 2.54 | 0.09 | 0.12 | 10.89 | 8.16 | 88.30 | -51.10 | 67.30 | -72.10 |
| 11:00 | 2.40 | 0.09 | 0.12 | 10.89 | 8.04 | 275.10 | -77.40 | 254.10 | -98.40 |
| 11:30 | 2.52 | 0.08 | 0.12 | 12.34 | 8.36 | 318.20 | 25.70 | 297.20 | 4.70 |
| 12:00 | 2.08 | 0.10 | 0.14 | 9.75 | 7.19 | 295.50 | 72.00 | 274.50 | 51.00 |
| 12:30 | 2.38 | 0.09 | 0.13 | 10.89 | 7.72 | 68.40 | 83.00 | 47.40 | 62.00 |
| 13:00 | 2.46 | 0.09 | 0.13 | 10.89 | 7.93 | 71.20 | 89.30 | 50.20 | 68.30 |
| 13:30 | 2.36 | 0.09 | 0.13 | 10.89 | 7.65 | 71.20 | 89.30 | 50.20 | 68.30 |
| 14:30 | 2.10 | 0.09 | 0.14 | 10.89 | 6.95 | 93.10 | 102.40 | 72.10 | 81.40 |
| 15:00 | 2.13 | 0.10 | 0.14 | 9.75 | 7.04 | 134.70 | 112.50 | 113.70 | 91.50 |
| 15:30 | 2.22 | 0.09 | 0.14 | 10.89 | 7.20 | 85.40 | 128.30 | 64.40 | 107.30 |
| 16:00 | 2.21 | 0.09 | 0.14 | 10.89 | 7.09 | 44.10 | 90.30 | 23.10 | 69.30 |

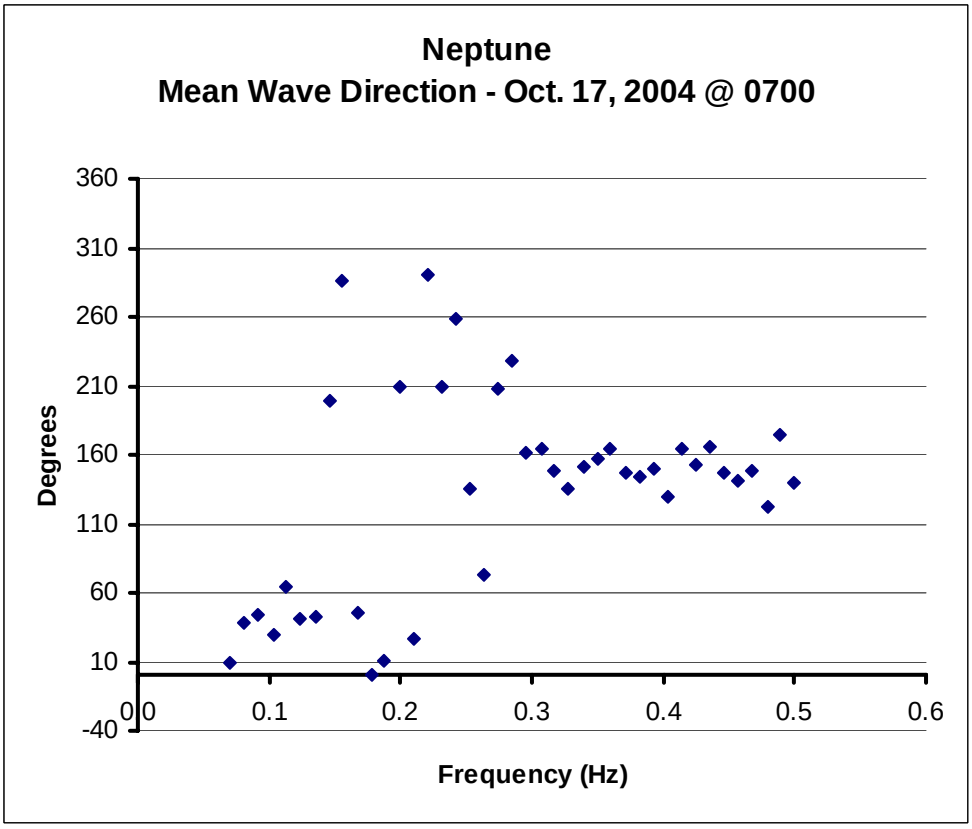
Note: File for 0800 has a file name time stamp of 0800, but a internal data time stamp of 0830
Note: File for 1330 has a file name time stamp of 1330, but a internal data time stamp of 1400
Note: The magnetic deviation during the trials time was 20.9 degrees West

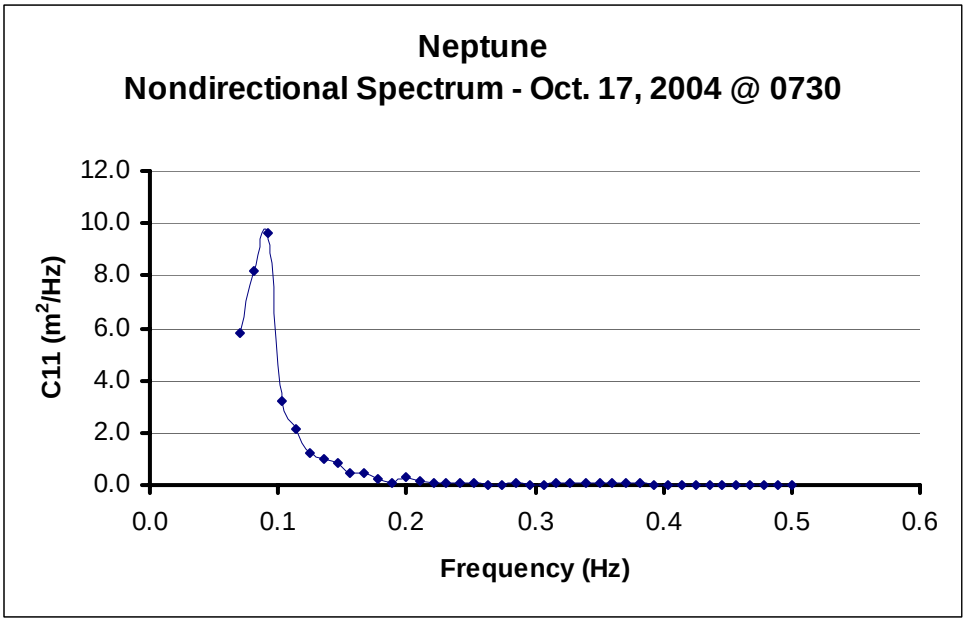

Significant Wave Height, Oct. 17 2004
Metres
3.0
2.5
2.0
1.5
1.0
0.5
0.0
07:00
07:30
08:00
08:30
09:00
09:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:30
15:00
15:30
16:00
Time

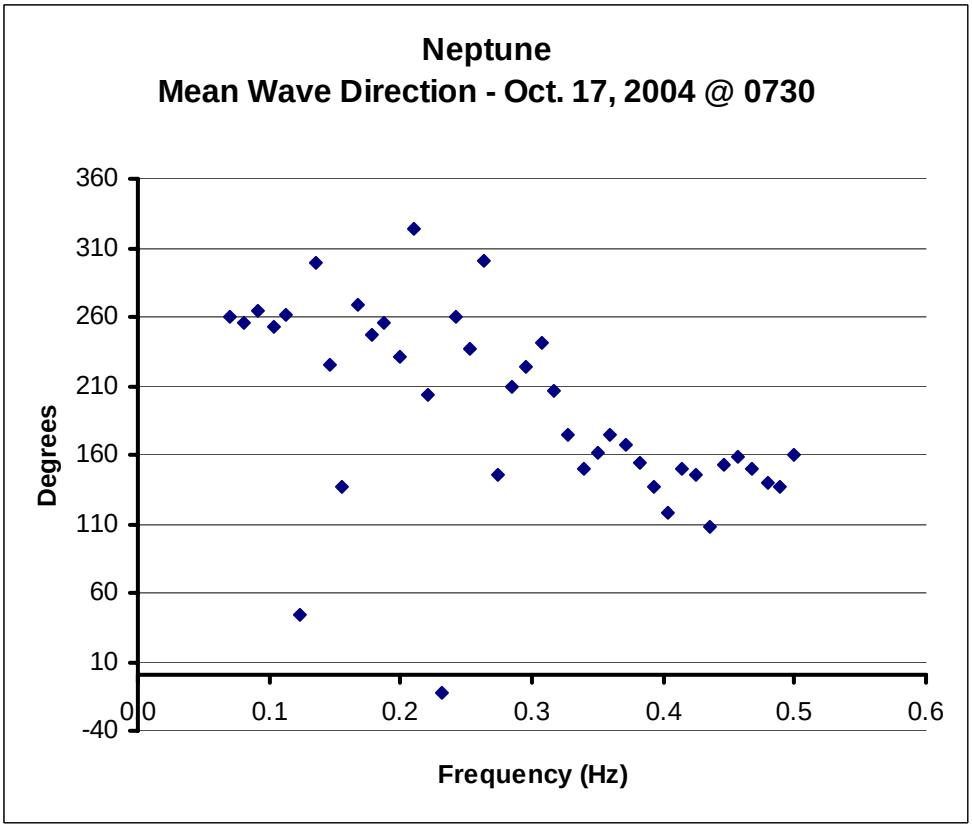

Wave Frequency, Oct. 17 2004
Frequency
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Dominant Wave Freq. (Hz)
Average Wave Freq. (Hz)
07:00
07:30
08:00
08:30
09:00
09:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:30
15:00
15:30
16:00
Time

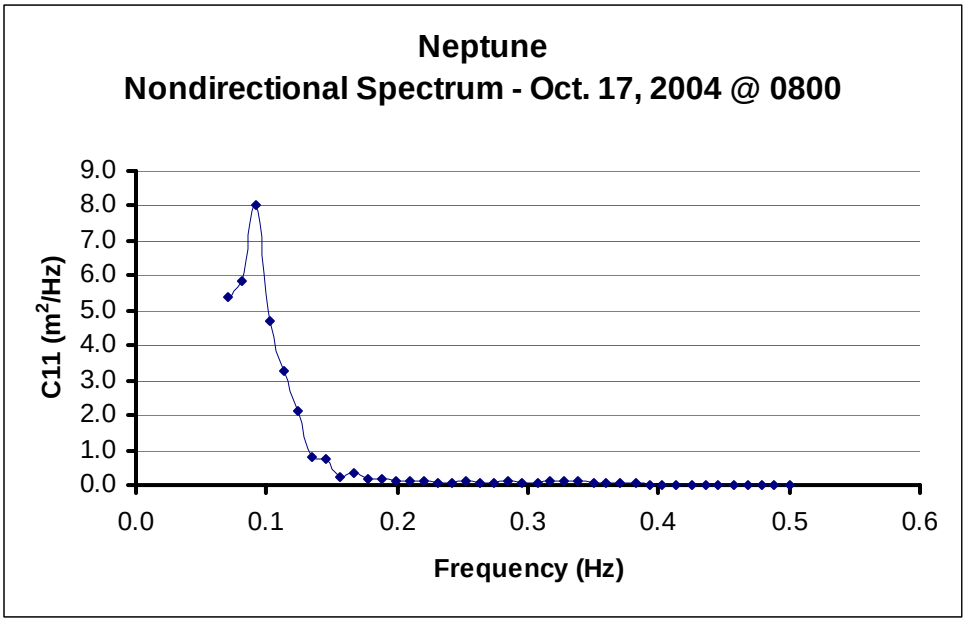

Wave Direction, Oct. 17 2004
Direction (Degrees True)
350
300
250
200
150
100
50
0
Dominant
Average
0700
0730
0800
0830
0900
0930
1000
1030
1100
1130
1200
1230
1300
1330
1430
1500
1530
1600
Time

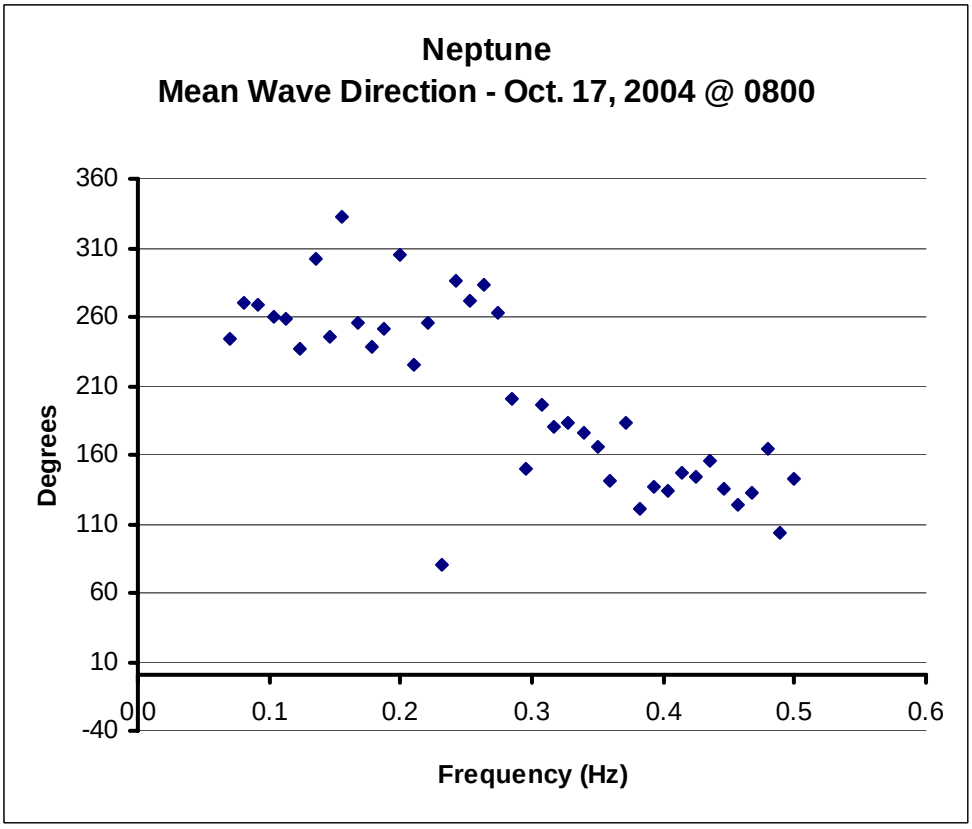

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 0700
C11 (m²/Hz)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

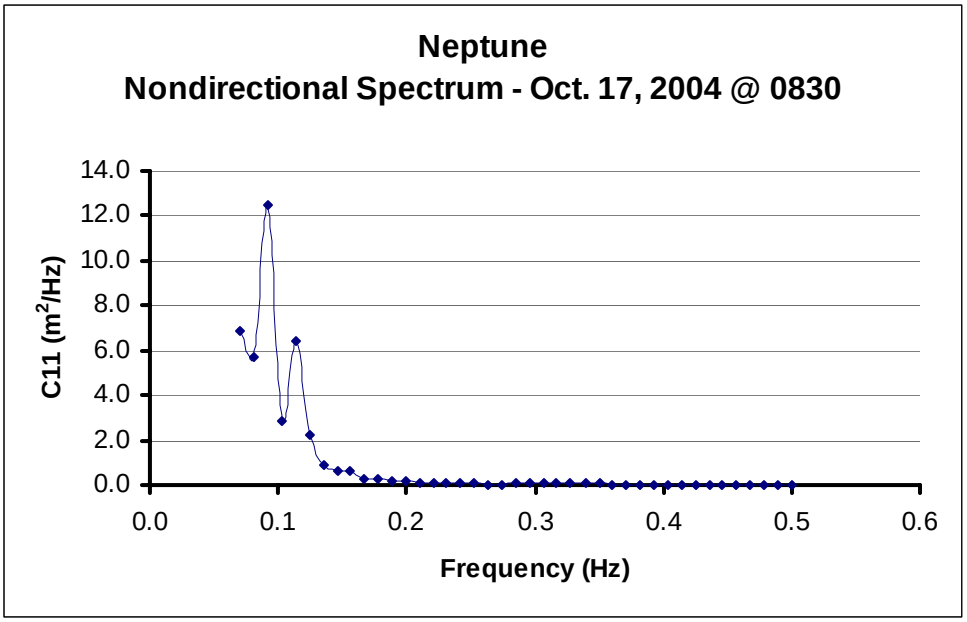

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 0700
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

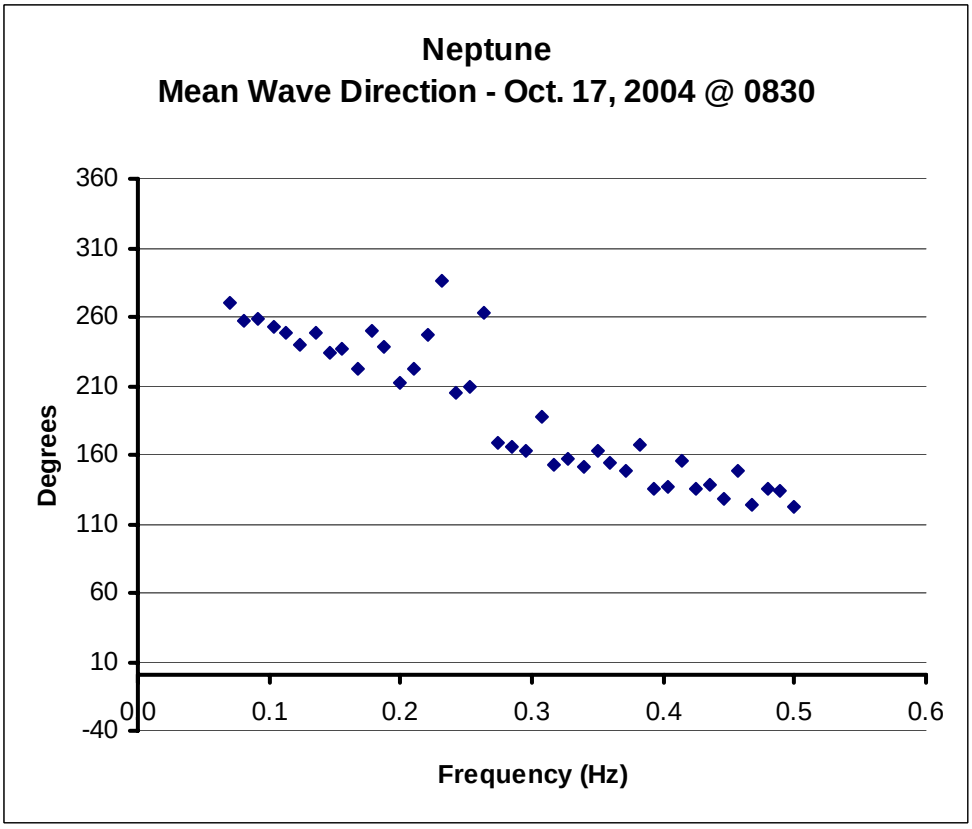

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 0730
C11 (m²/Hz)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

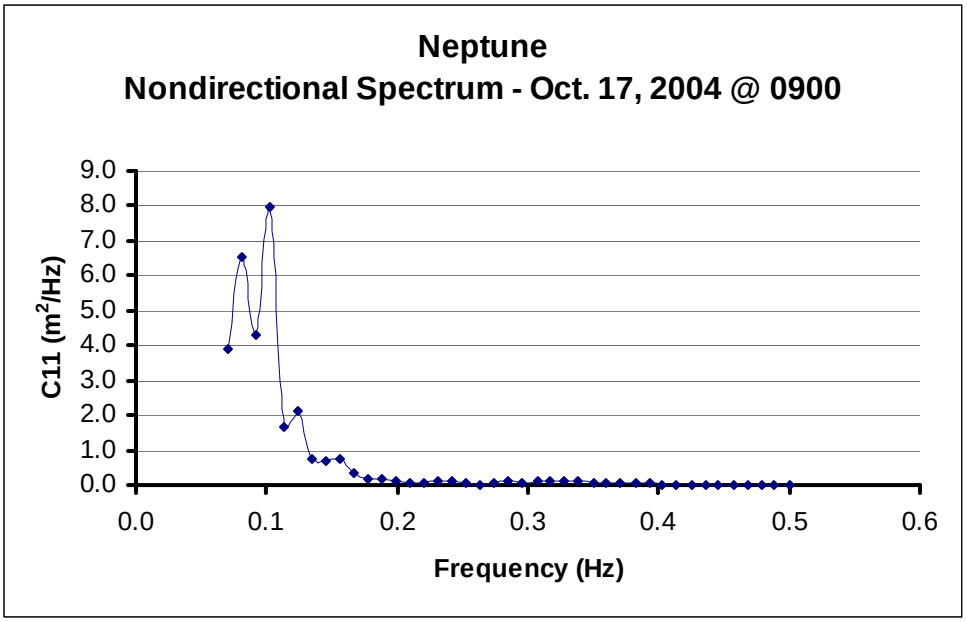

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 0730
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

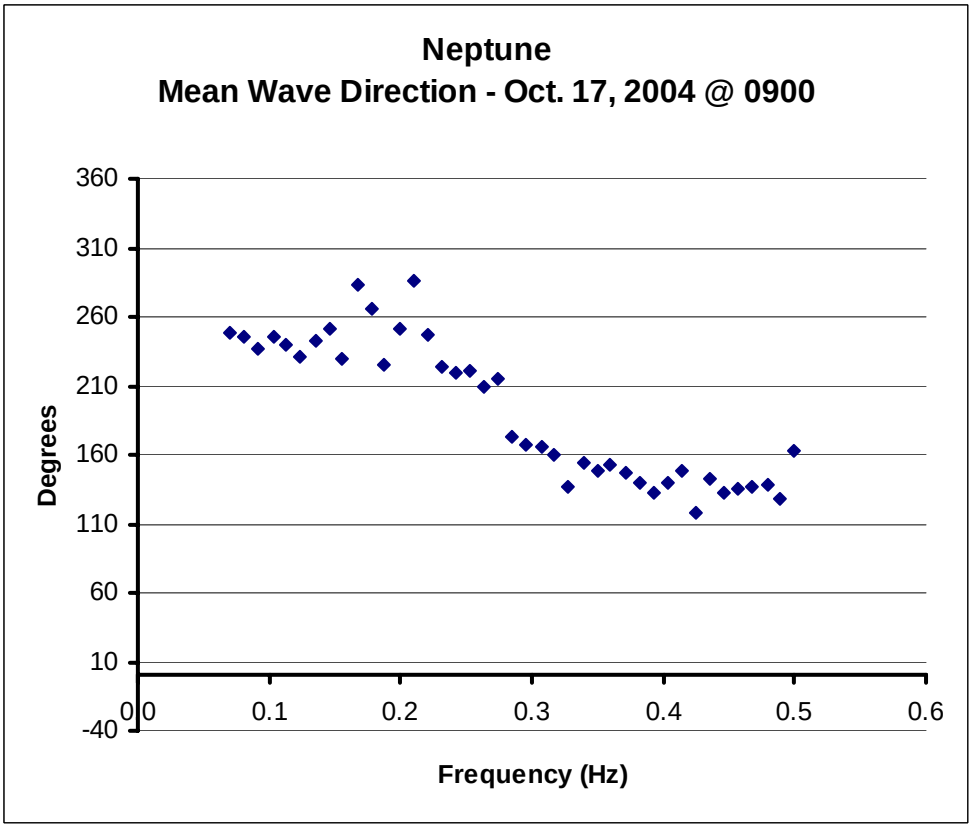

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 0800
C11 (m²/Hz)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

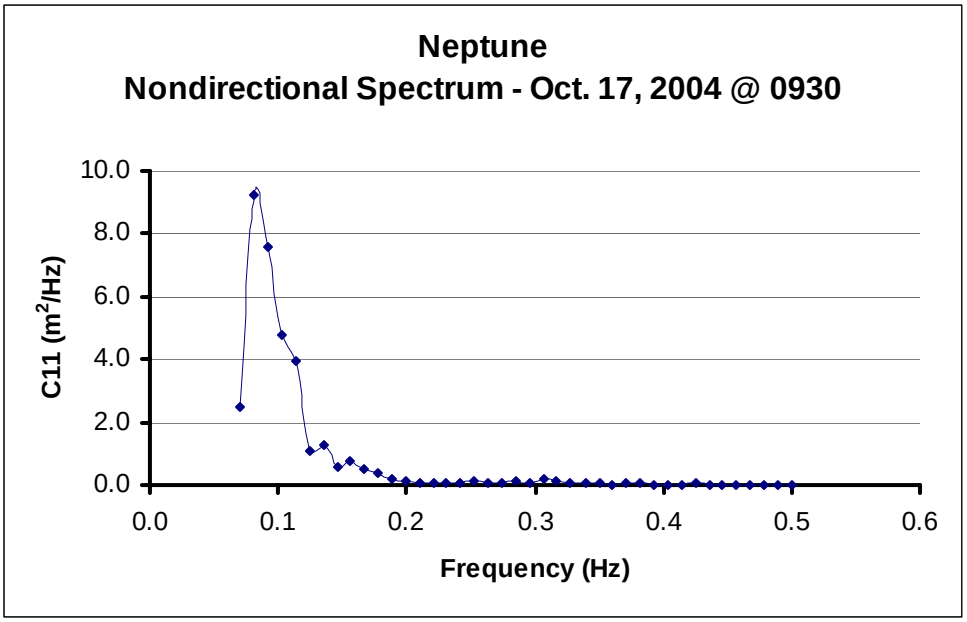

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 0800
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

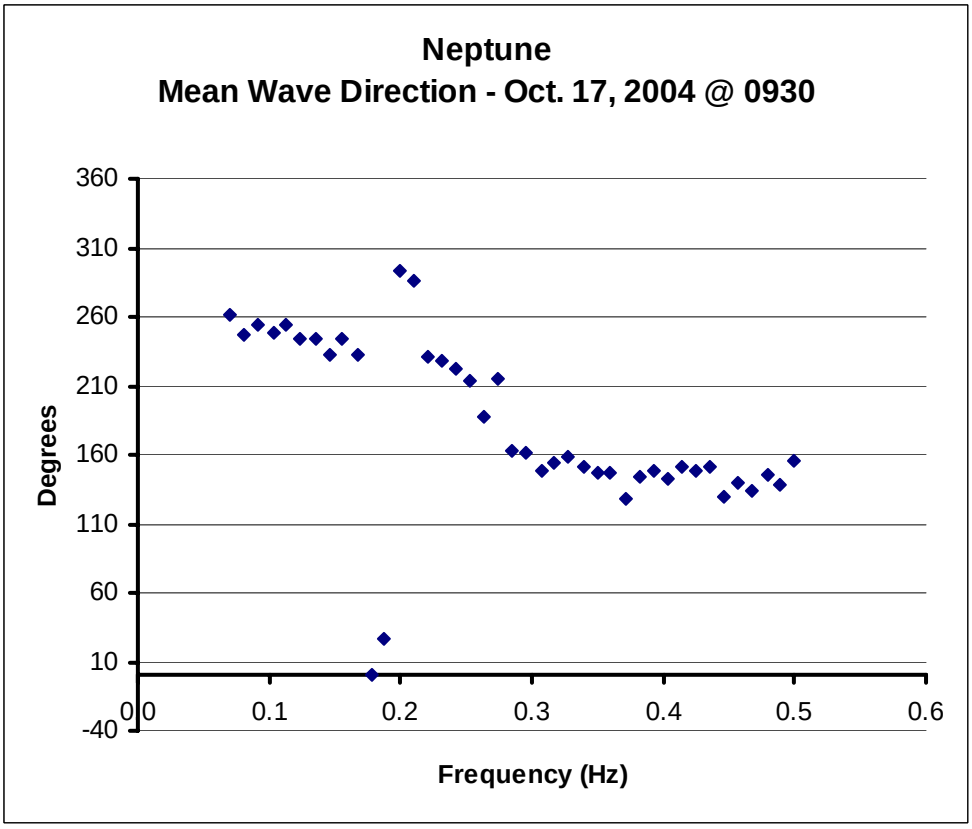

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 0830
C11 (m²/Hz)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

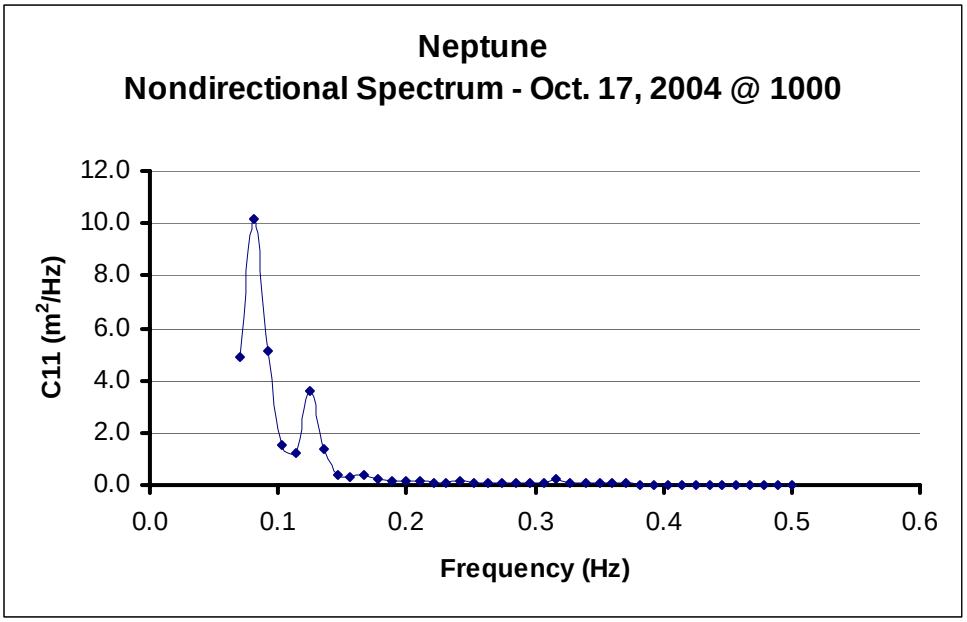

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 0830
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

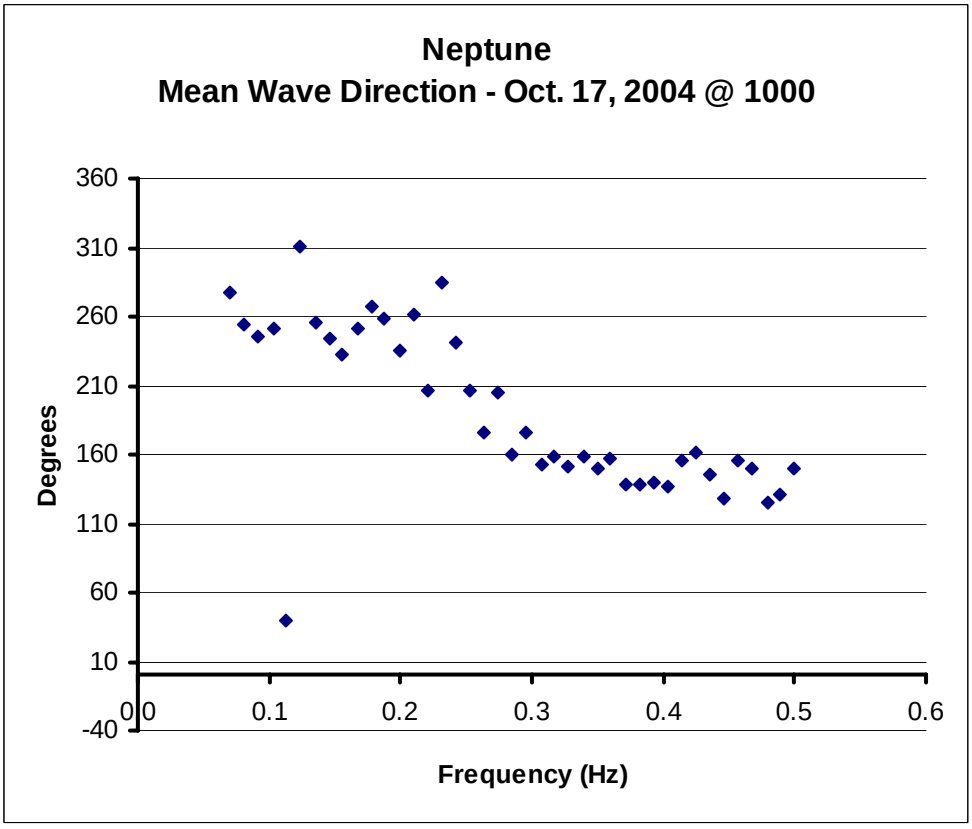

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 0900
C11 (m²/Hz)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

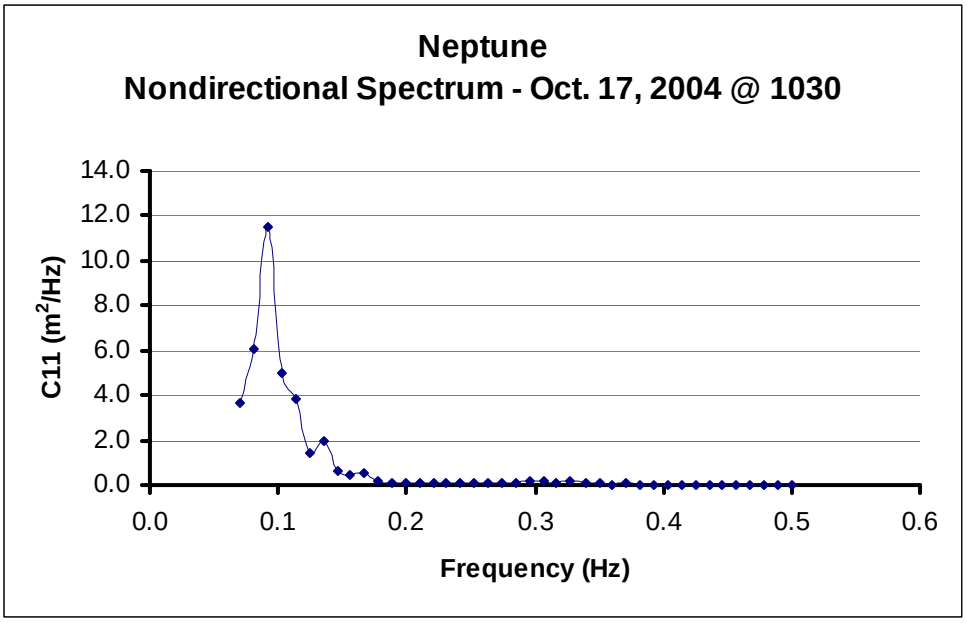

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 0900
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

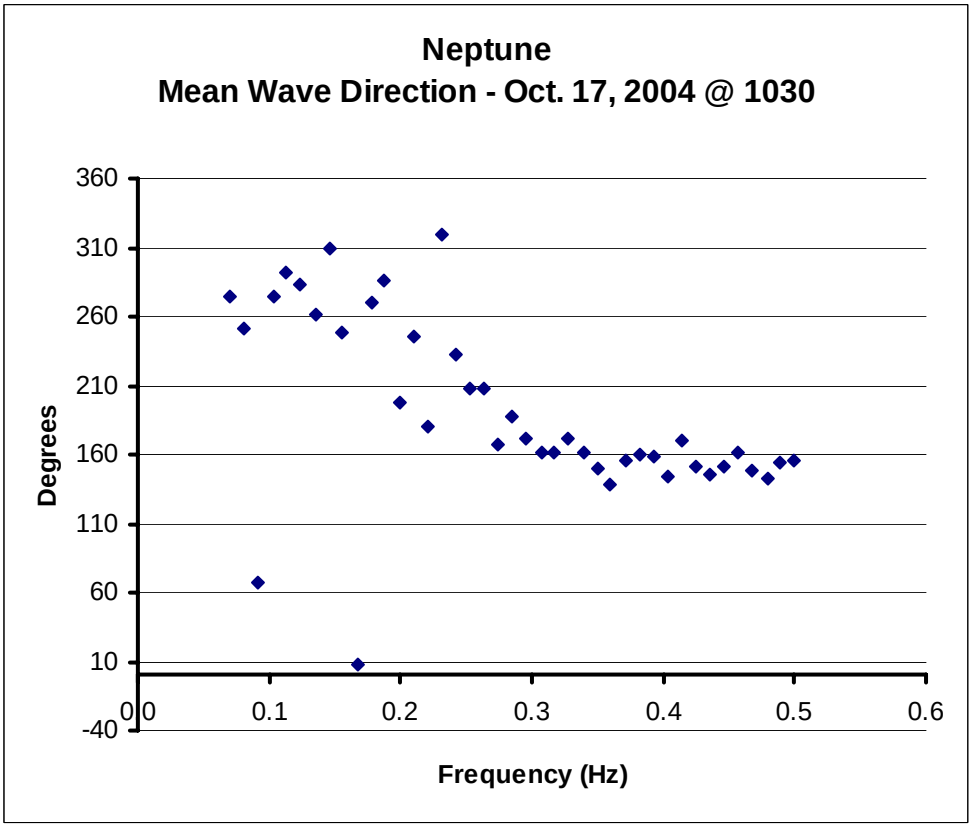

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 0930
C11 (m²/Hz)
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

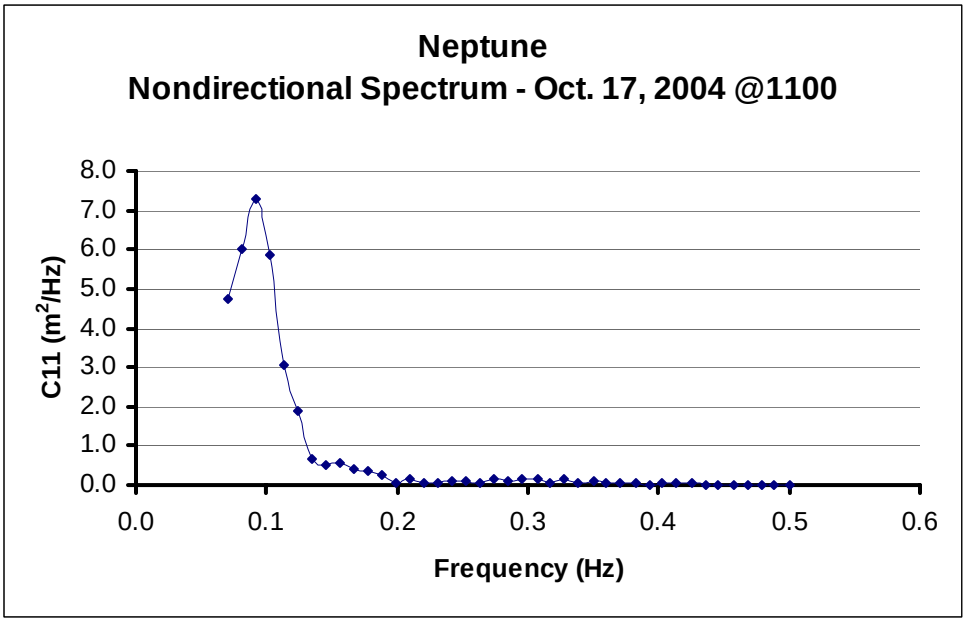

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 0930
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

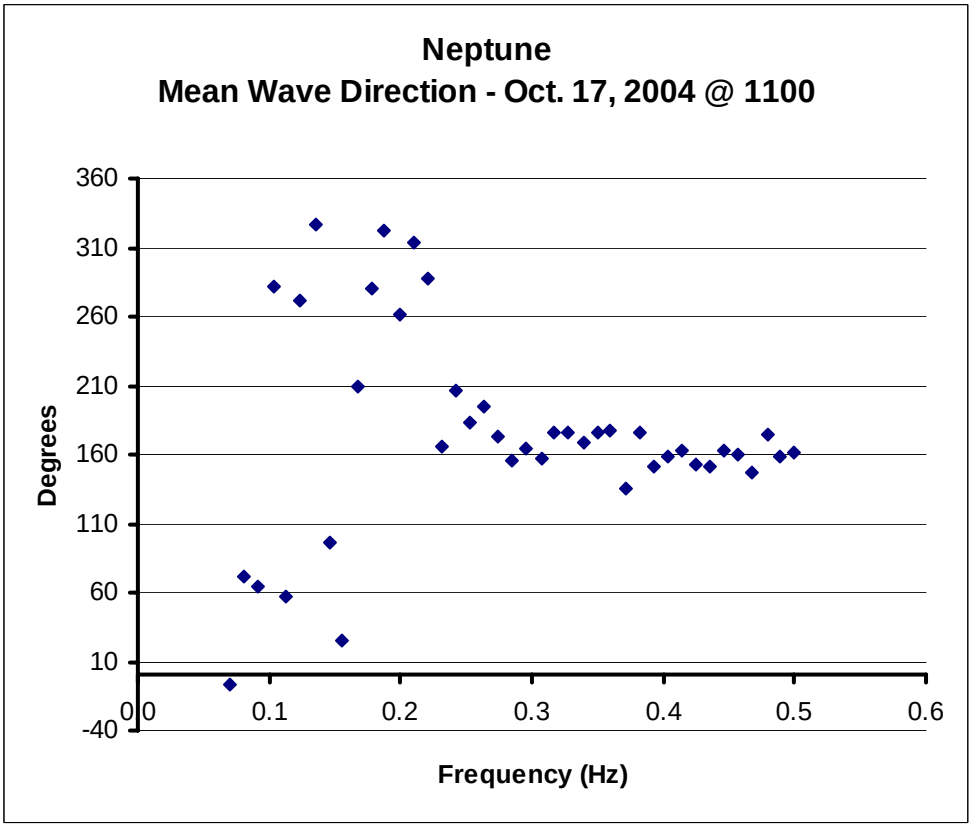

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1000
C11 (m²/Hz)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

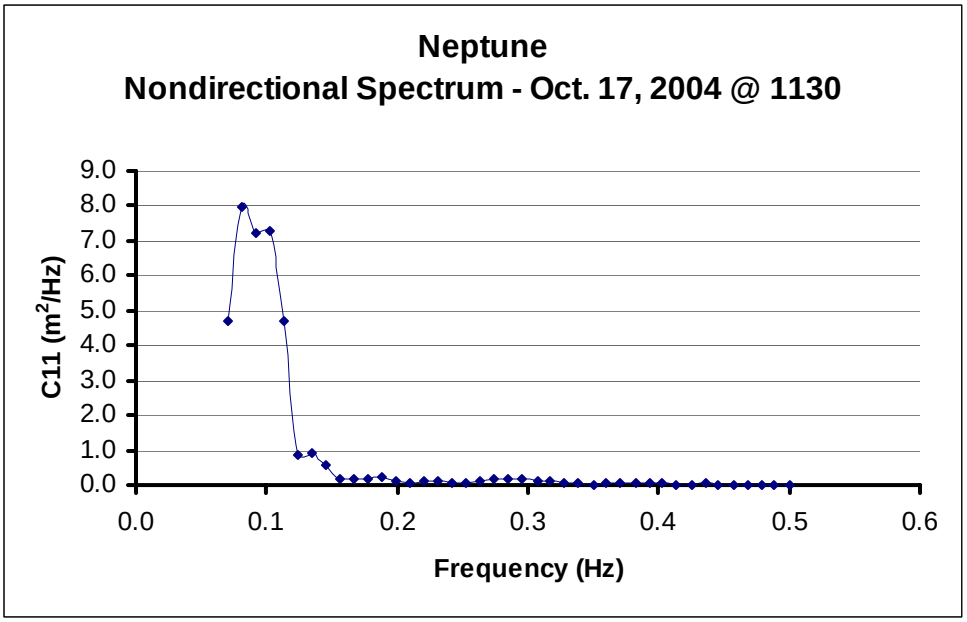

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1000
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

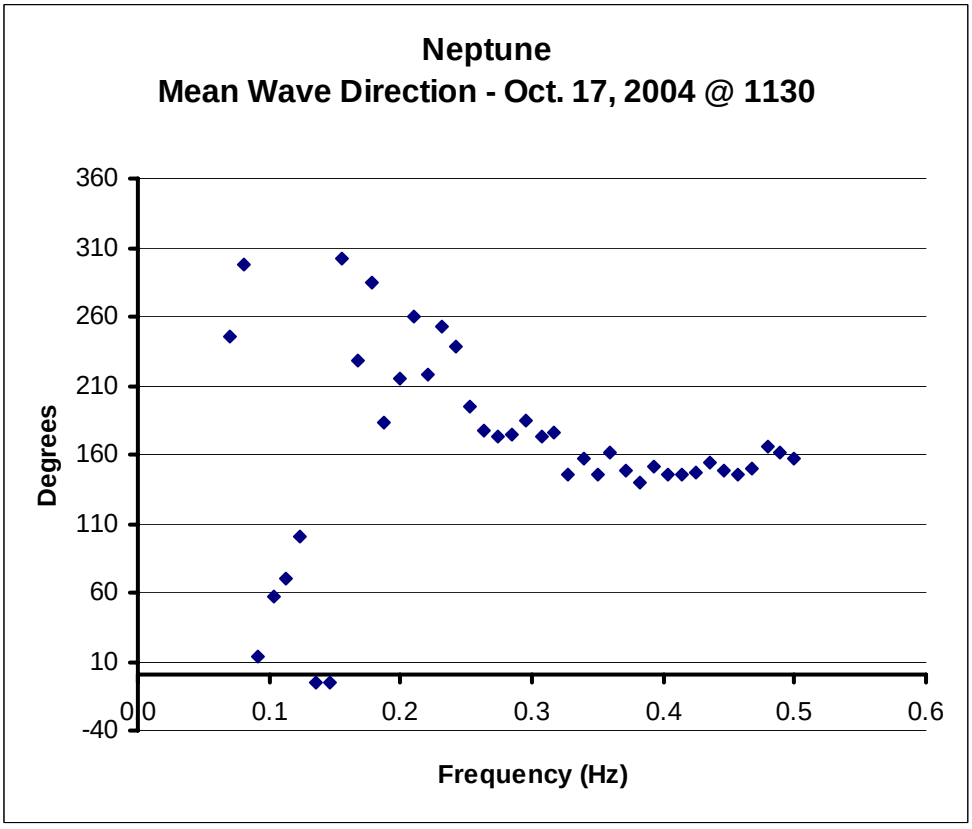

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1030
C11 (m²/Hz)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

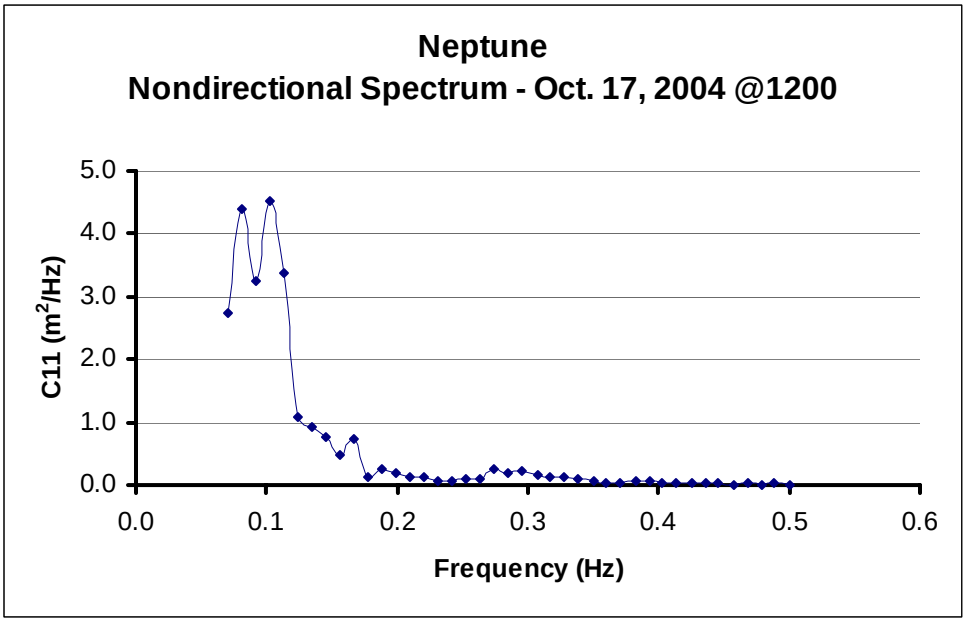

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1030
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

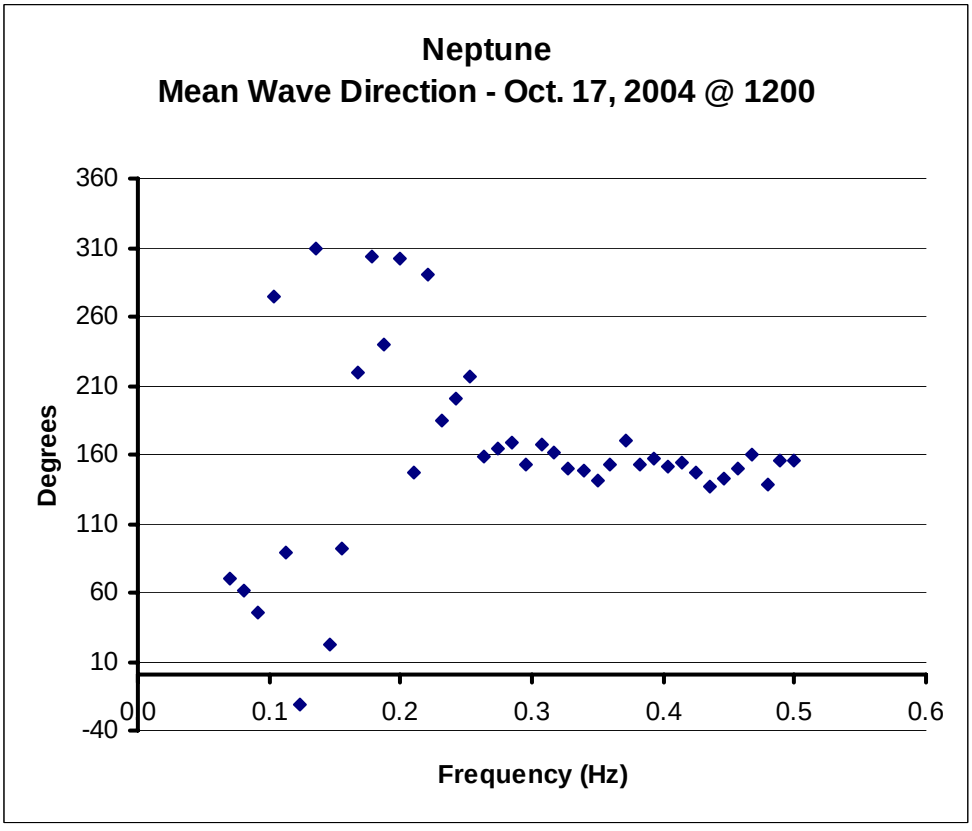

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @1100
C11 (m²/Hz)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

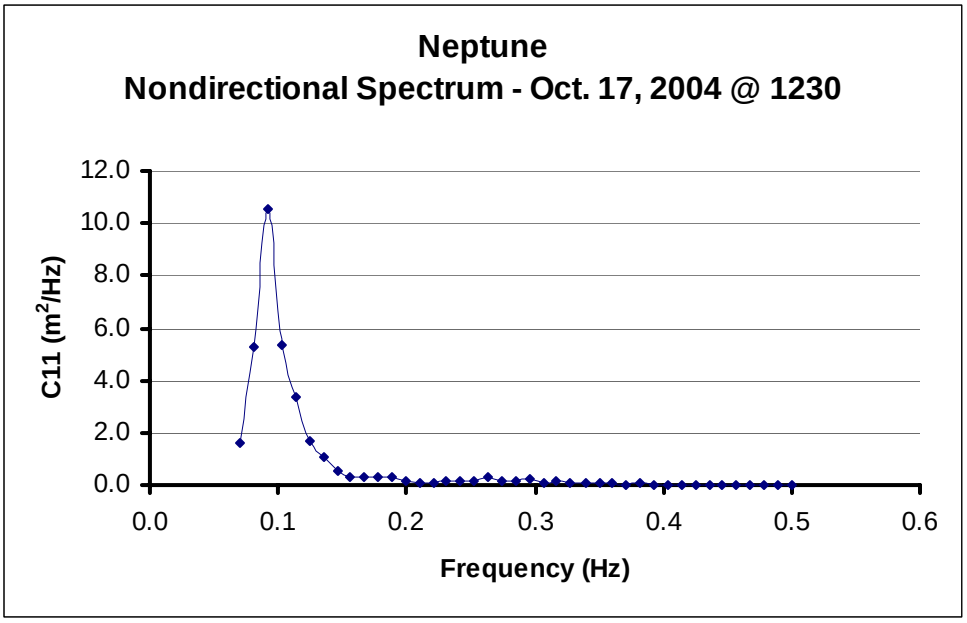

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1100
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

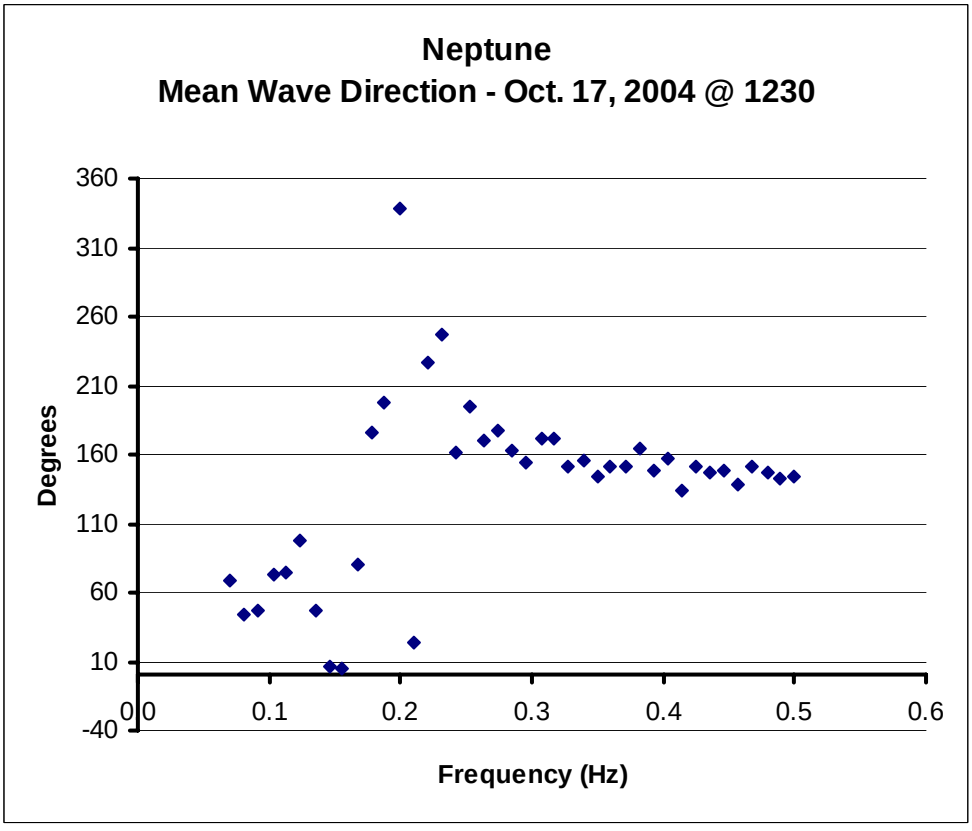

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1130
C11 (m²/Hz)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

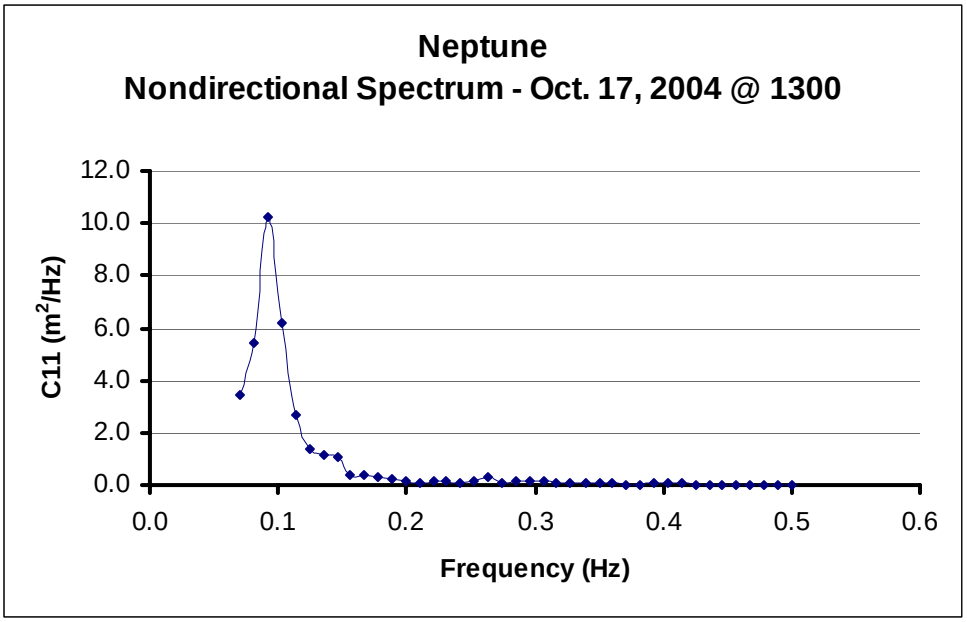

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1130
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

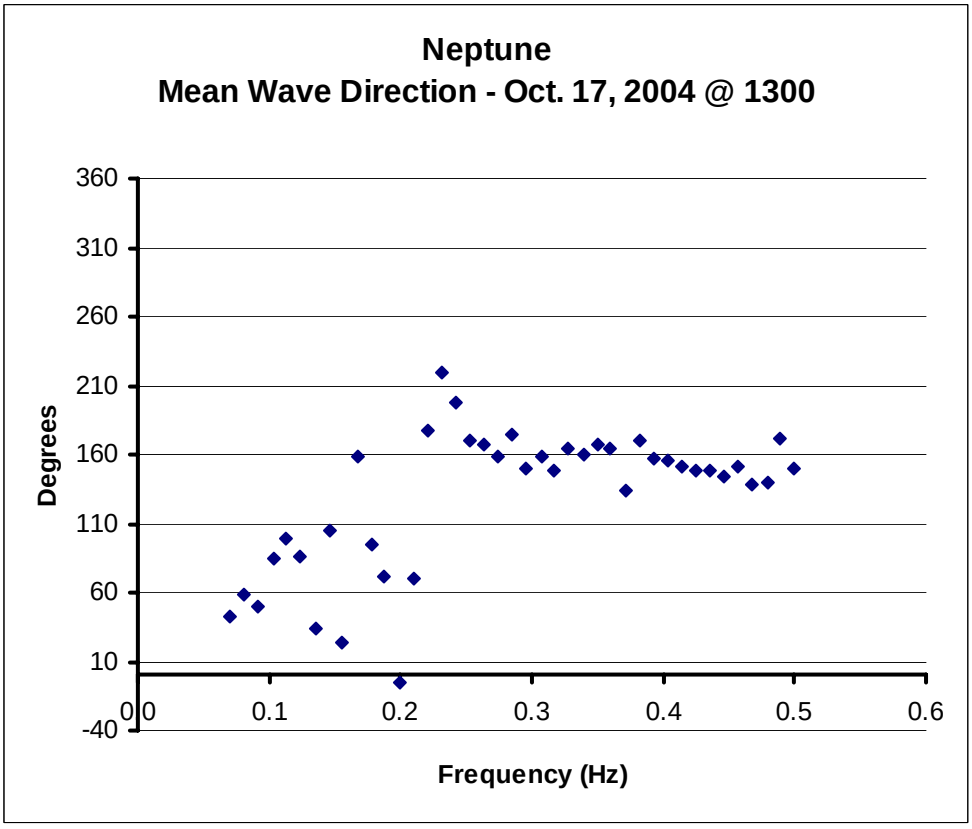

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @1200
C11 (m²/Hz)
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

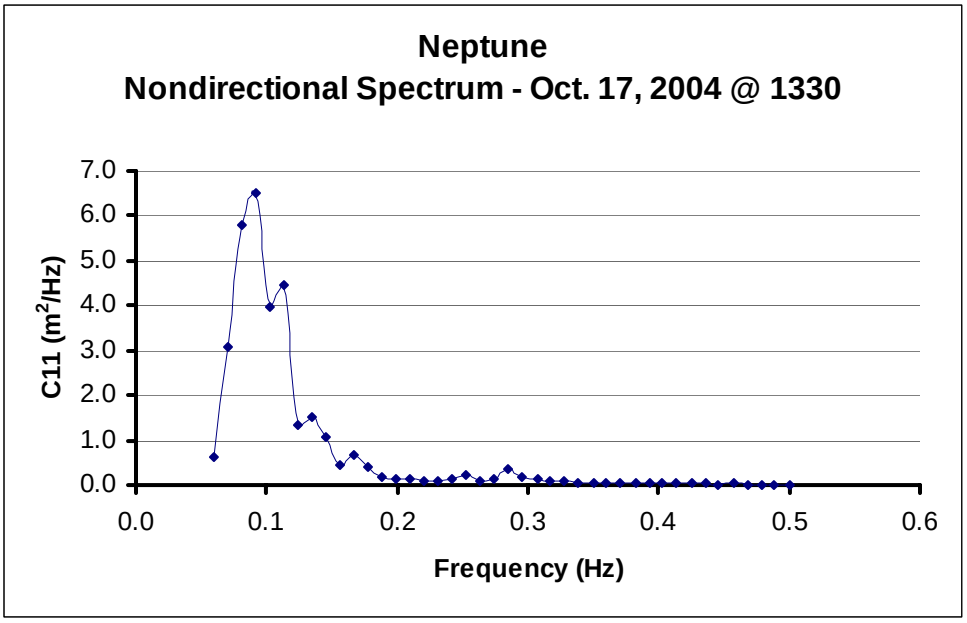

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1200
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

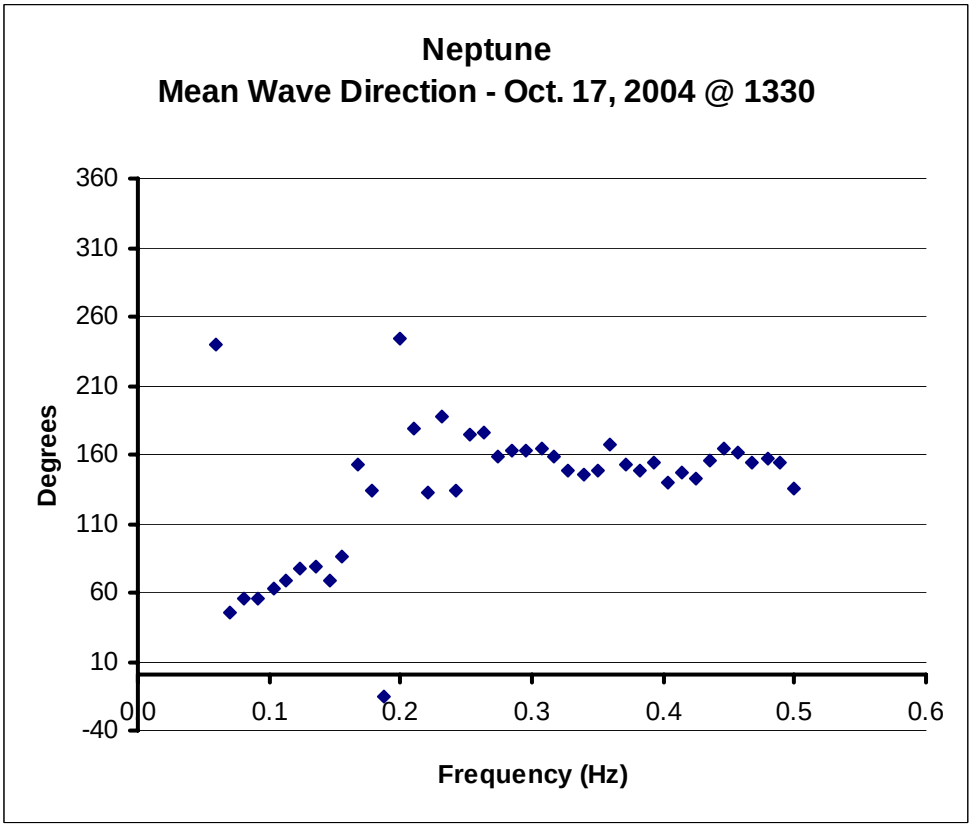

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1230
C11 (m²/Hz)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

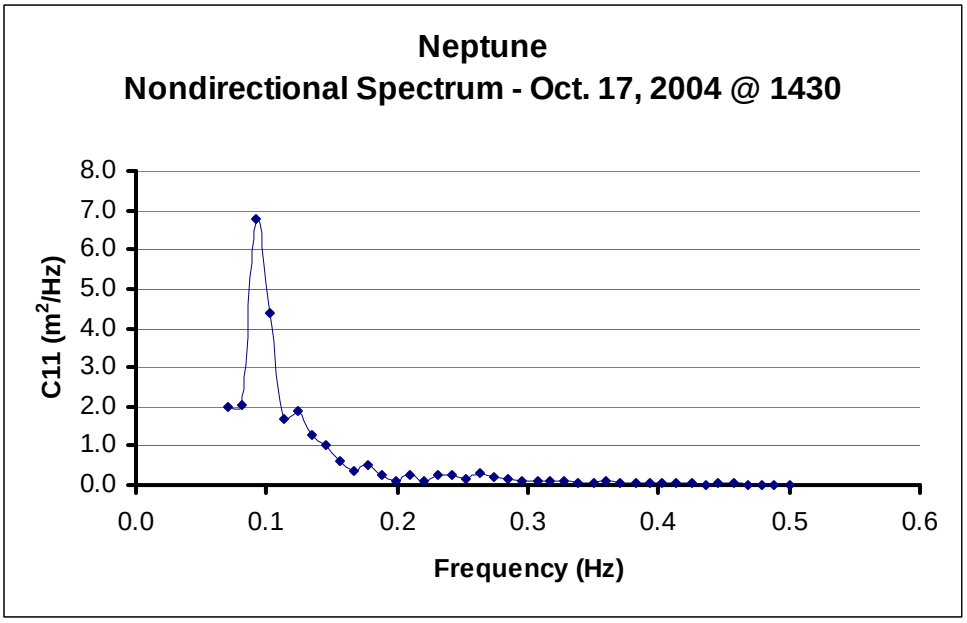

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1230
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

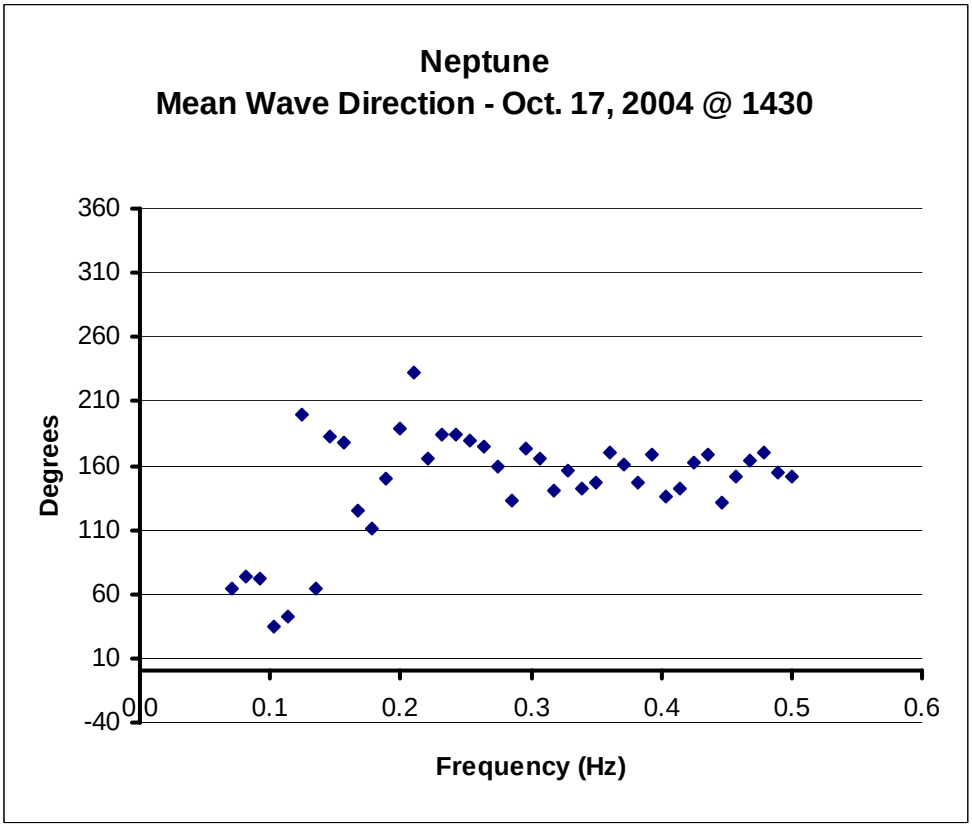

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1300
C11 (m²/Hz)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

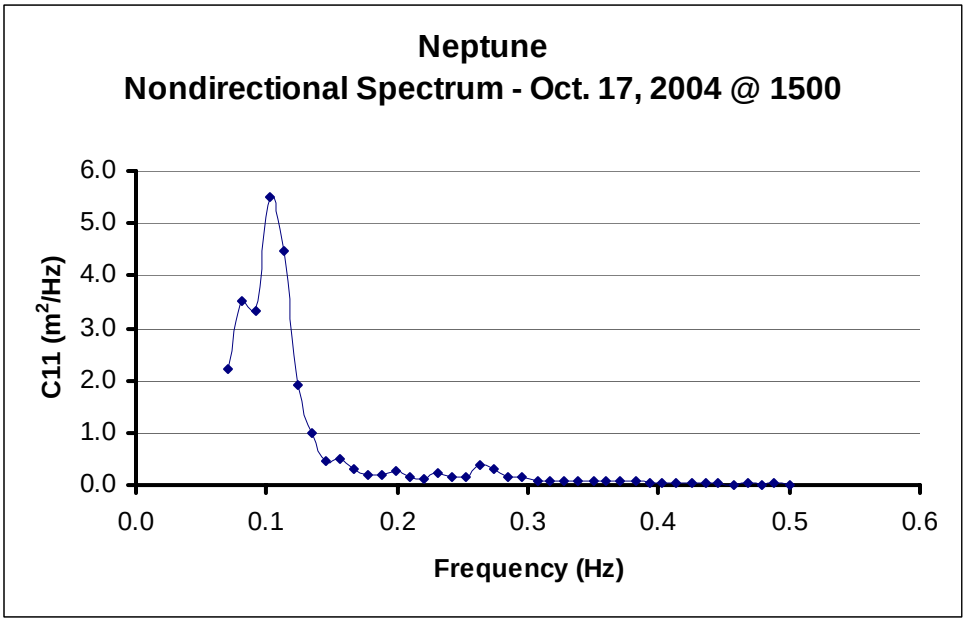

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1300
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

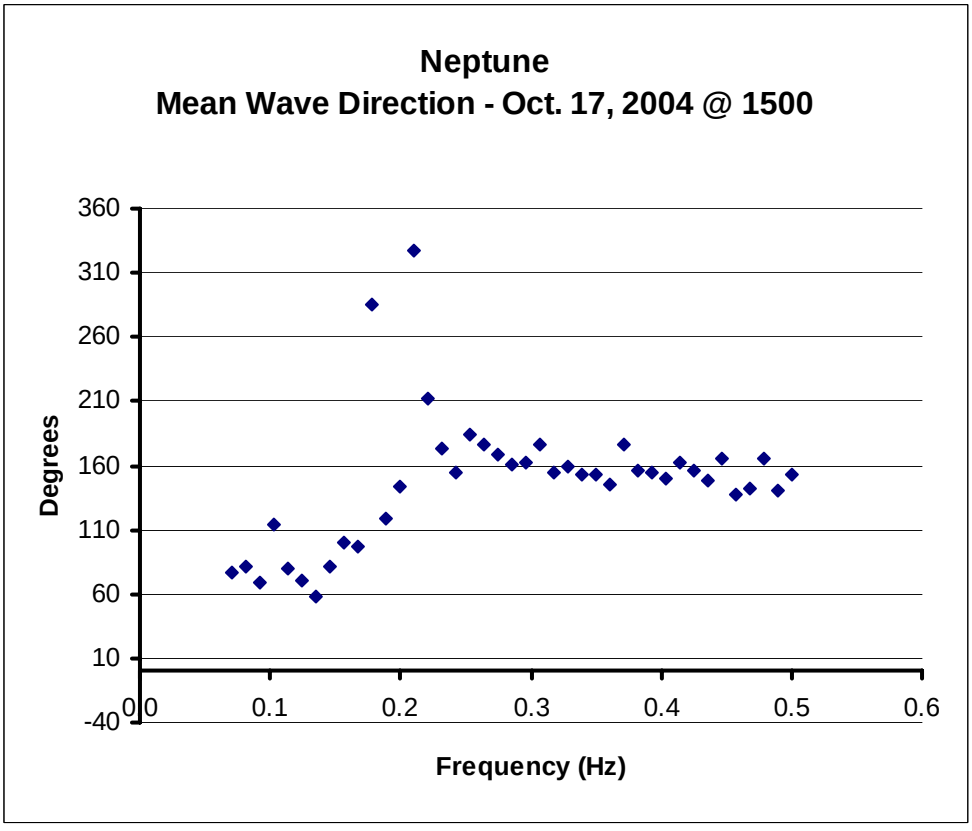

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1330
C11 (m²/Hz)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

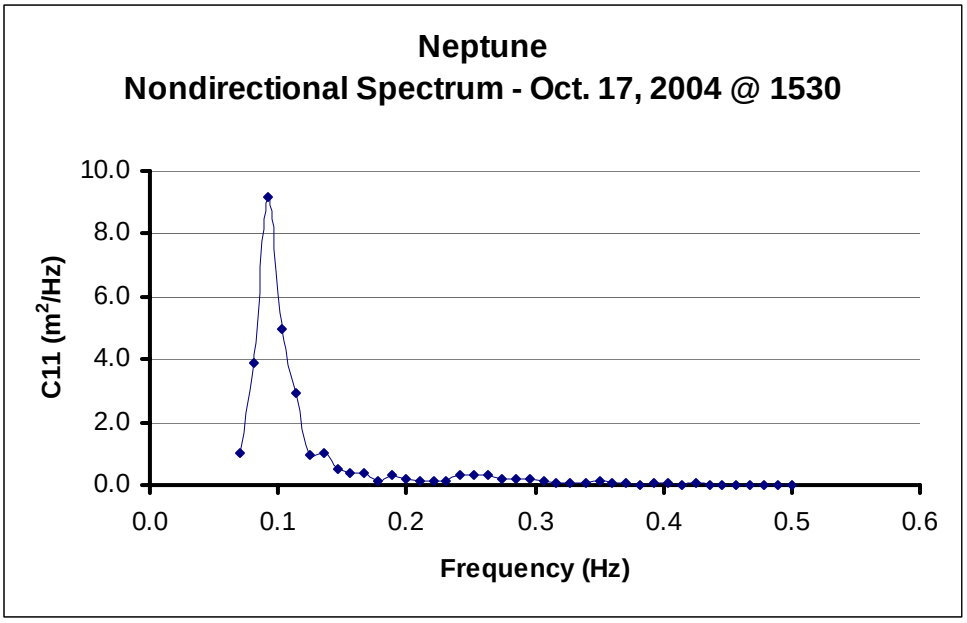

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1330
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

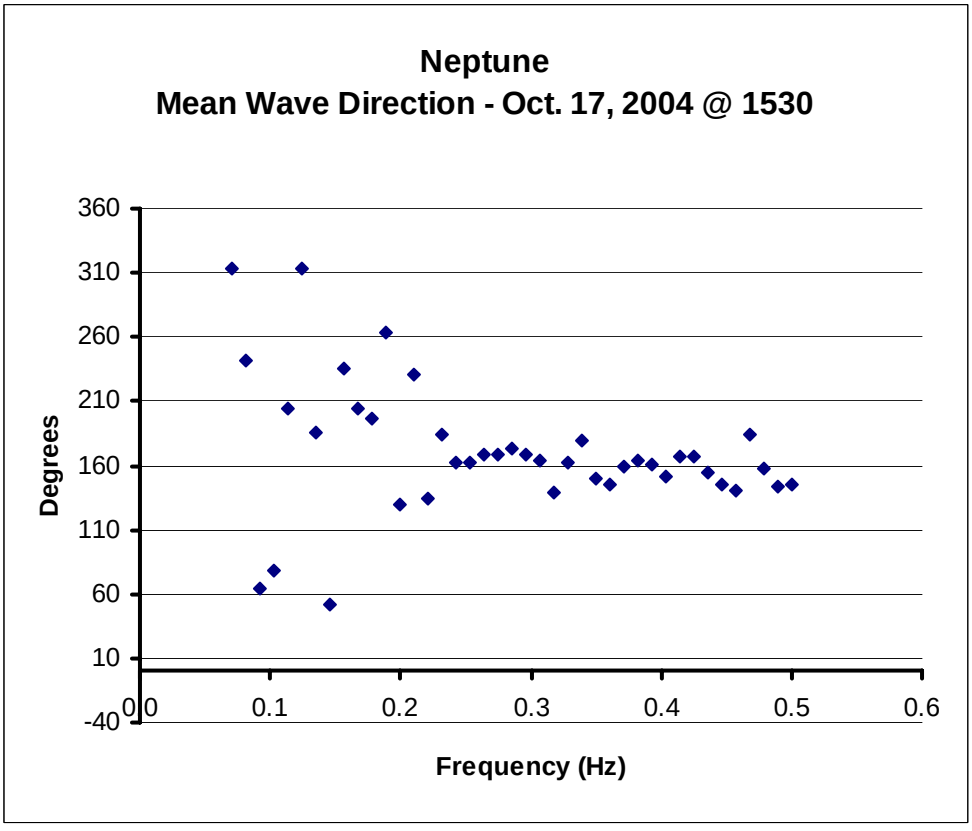

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1430
C11 (m²/Hz)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

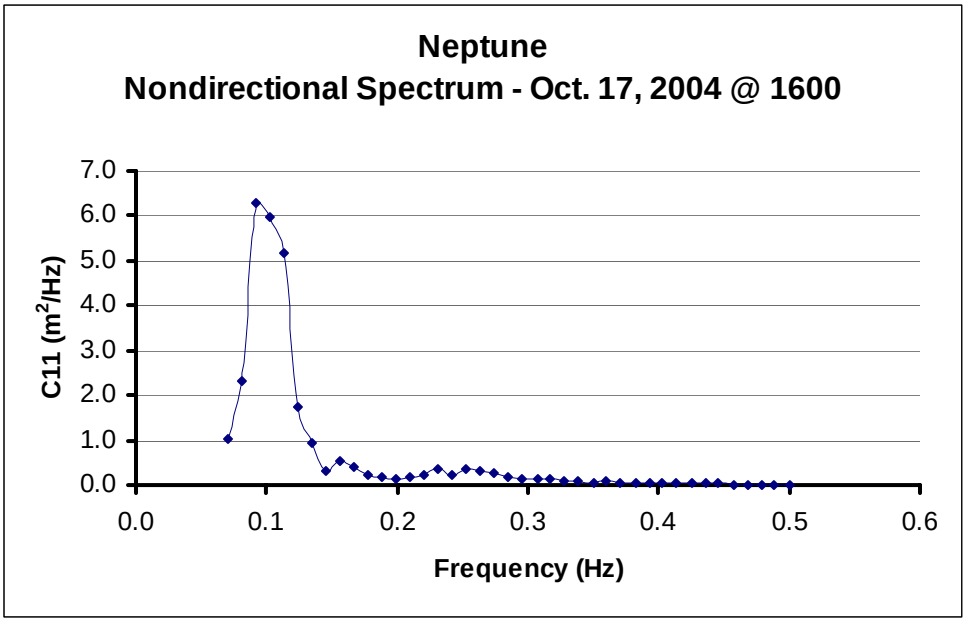

Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1430
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

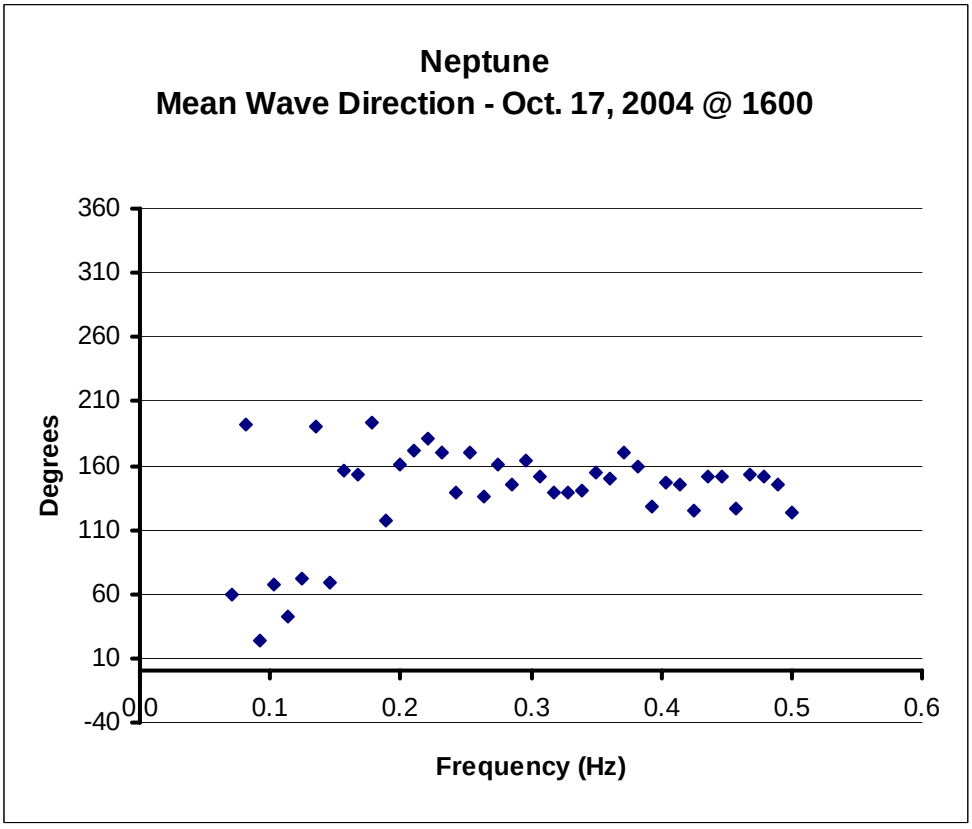

Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1500
C11 (m²/Hz)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1500
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1530
C11 (m²/Hz)
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1530
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Nondirectional Spectrum - Oct. 17, 2004 @ 1600
C11 (m²/Hz)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Mean Wave Direction - Oct. 17, 2004 @ 1600
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

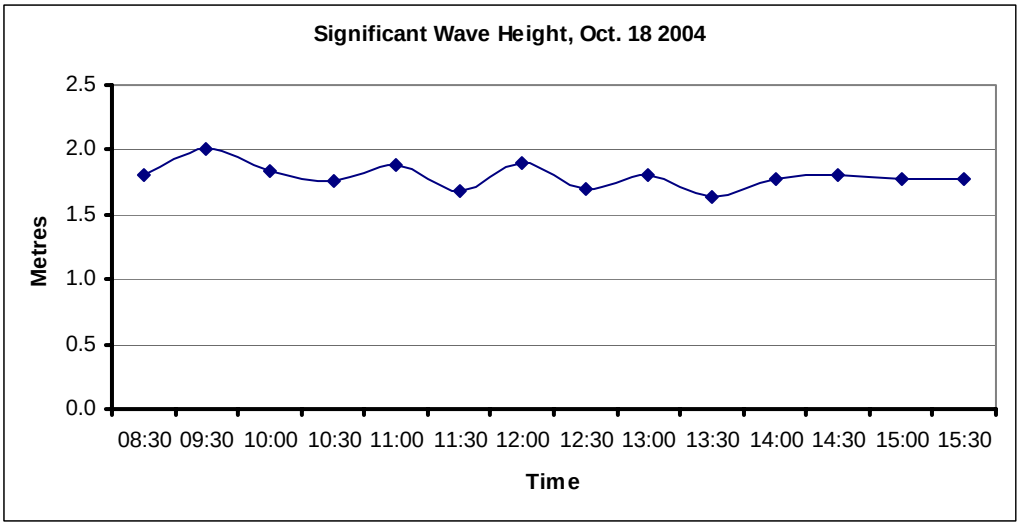
## Summary of Wave Statistics Collected Using Neptune Directional Wave Buoy

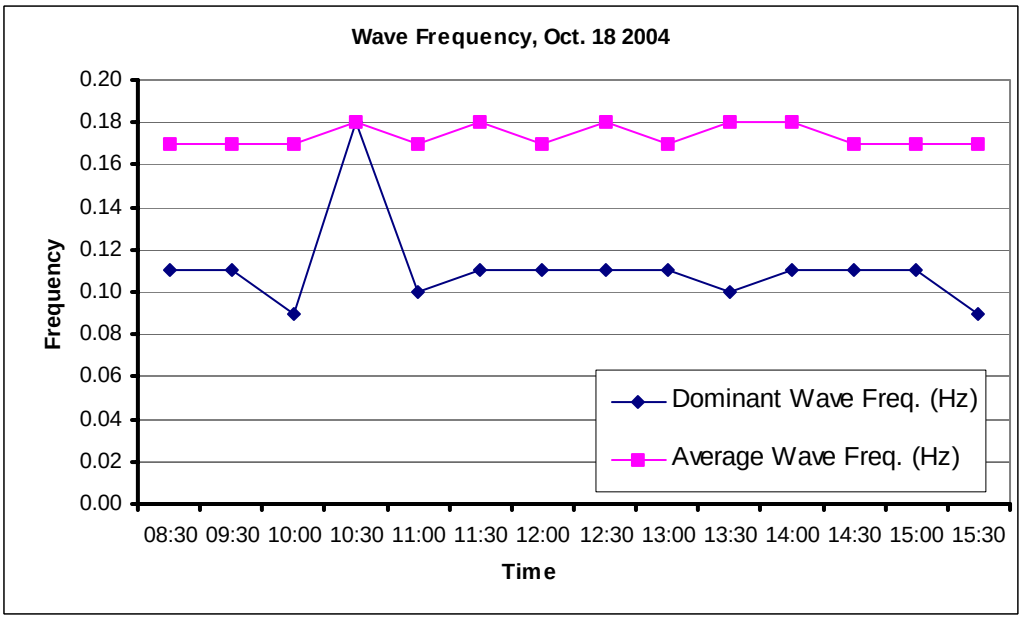
## CCGA Miss Jacqueline IV Proj. 2017

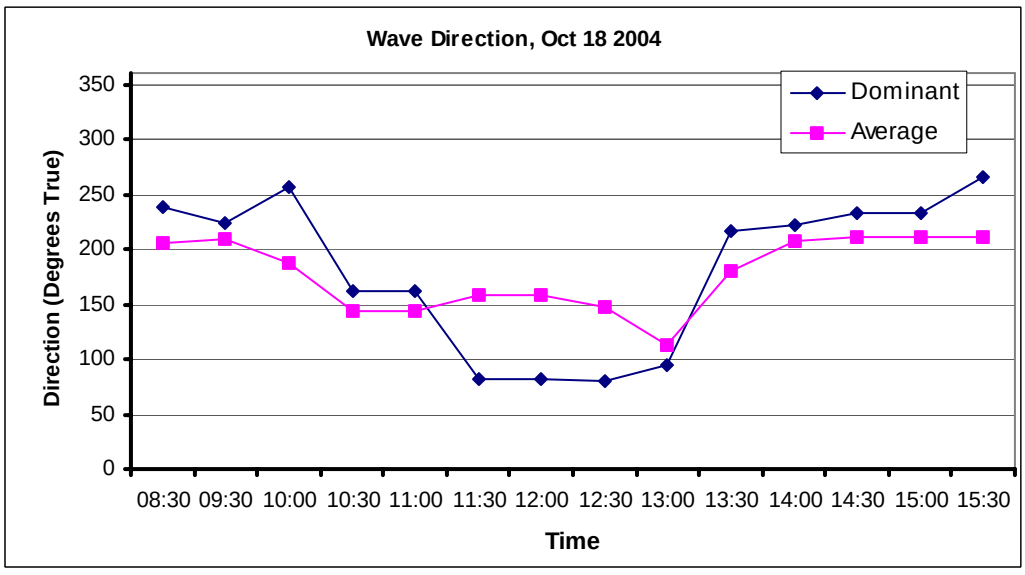
## October 18, 2004

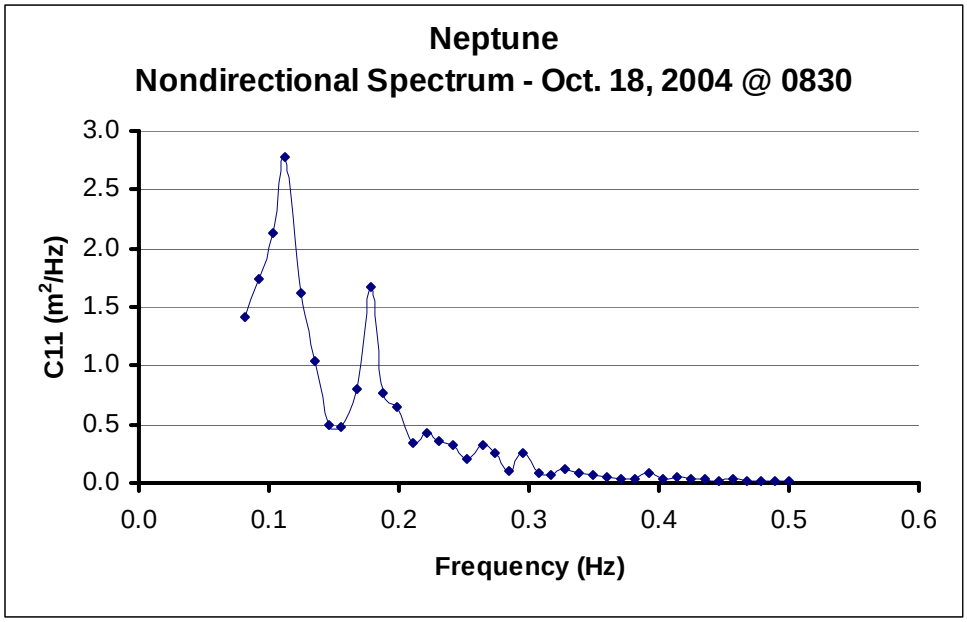
| NF Time | Sig. Wave Height (m) | Dominant Wave Freq. (Hz) | Average Wave Freq. (Hz) | Dominant Wave Period (s) | Average Wave Period (s) | Dominant Wave Dir. (deg. mag.) | Average Wave Dir. (deg. mag.) | Dominant Wave Dir. (deg. TRUE) | Average Wave Dir. (deg. TRUE) |
|---|---|---|---|---|---|---|---|---|---|
| 08:30 | 1.81 | 0.11 | 0.17 | 8.83 | 5.76 | 259.00 | -134.40 | 238.00 | -155.40 |
| 09:30 | 2.00 | 0.11 | 0.17 | 8.83 | 6.00 | 245.50 | -129.40 | 224.50 | -150.40 |
| 10:00 | 1.84 | 0.09 | 0.17 | 10.89 | 5.66 | 276.70 | -152.10 | 255.70 | -173.10 |
| 10:30 | 1.76 | 0.18 | 0.18 | 5.63 | 5.69 | 183.30 | 164.30 | 162.30 | 143.30 |
| 11:00 | 1.88 | 0.10 | 0.17 | 9.75 | 5.85 | 183.30 | 164.30 | 162.30 | 143.30 |
| 11:30 | 1.68 | 0.11 | 0.18 | 8.83 | 5.67 | 103.20 | 179.40 | 82.20 | 158.40 |
| 12:00 | 1.90 | 0.11 | 0.17 | 8.83 | 5.96 | 103.20 | 179.40 | 82.20 | 158.40 |
| 12:30 | 1.69 | 0.11 | 0.18 | 8.83 | 5.68 | 100.90 | 168.80 | 79.90 | 147.80 |
| 13:00 | 1.81 | 0.11 | 0.17 | 8.83 | 6.05 | 114.70 | 134.50 | 93.70 | 113.50 |
| 13:30 | 1.64 | 0.10 | 0.18 | 9.75 | 5.67 | 236.80 | -159.20 | 215.80 | -180.20 |
| 14:00 | 1.77 | 0.11 | 0.18 | 8.83 | 5.67 | 242.70 | -132.10 | 221.70 | -153.10 |
| 14:30 | 1.80 | 0.11 | 0.17 | 8.83 | 5.91 | 253.00 | -128.20 | 232.00 | -149.20 |
| 15:00 | 1.78 | 0.11 | 0.17 | 8.83 | 5.90 | 253.00 | -128.20 | 232.00 | -149.20 |
| 15:30 | 1.77 | 0.09 | 0.17 | 10.89 | 5.93 | 287.00 | -127.30 | 266.00 | -148.30 |

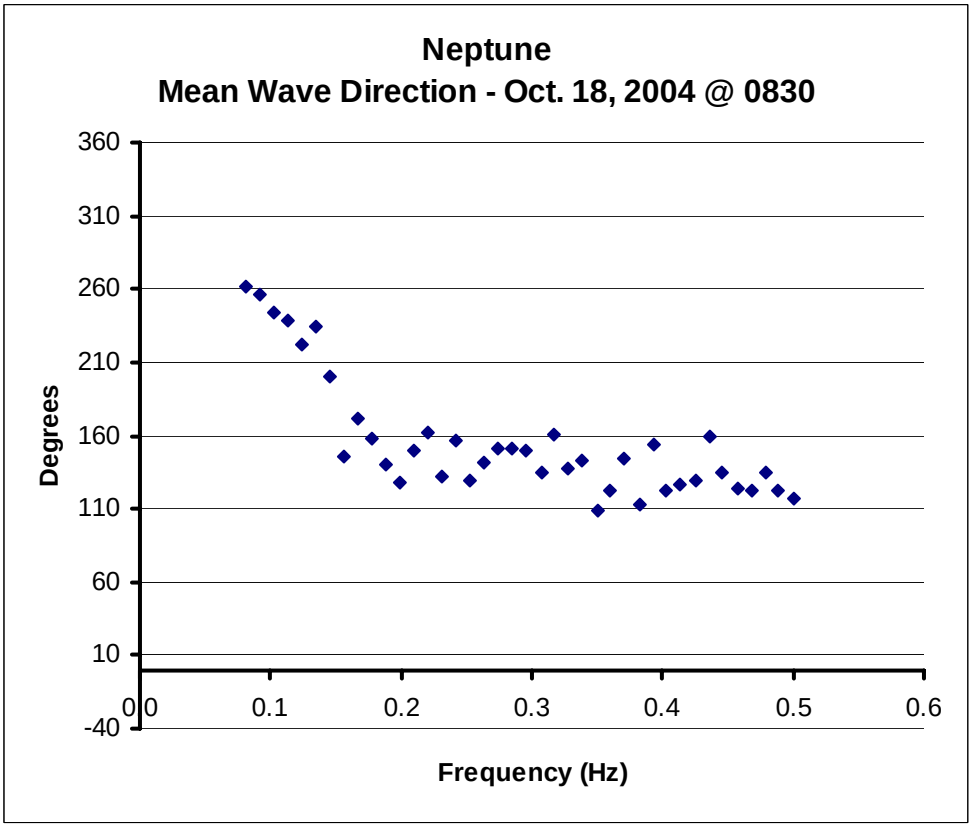
Note: The file for 0830 has internal time stamp of 0900 with a file name time stamp of 0830.

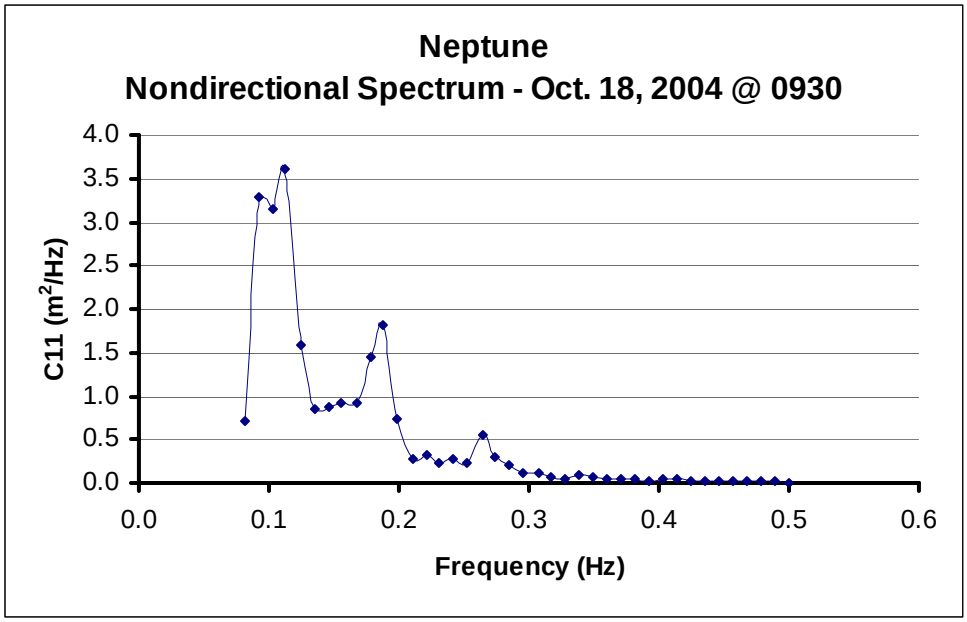

Significant Wave Height, Oct. 18 2004
Metres
2.5
2.0
1.5
1.0
0.5
0.0
08:30 09:30 10:00 10:30 11:00 11:30 12:00 12:30 13:00 13:30 14:00 14:30 15:00 15:30
Time

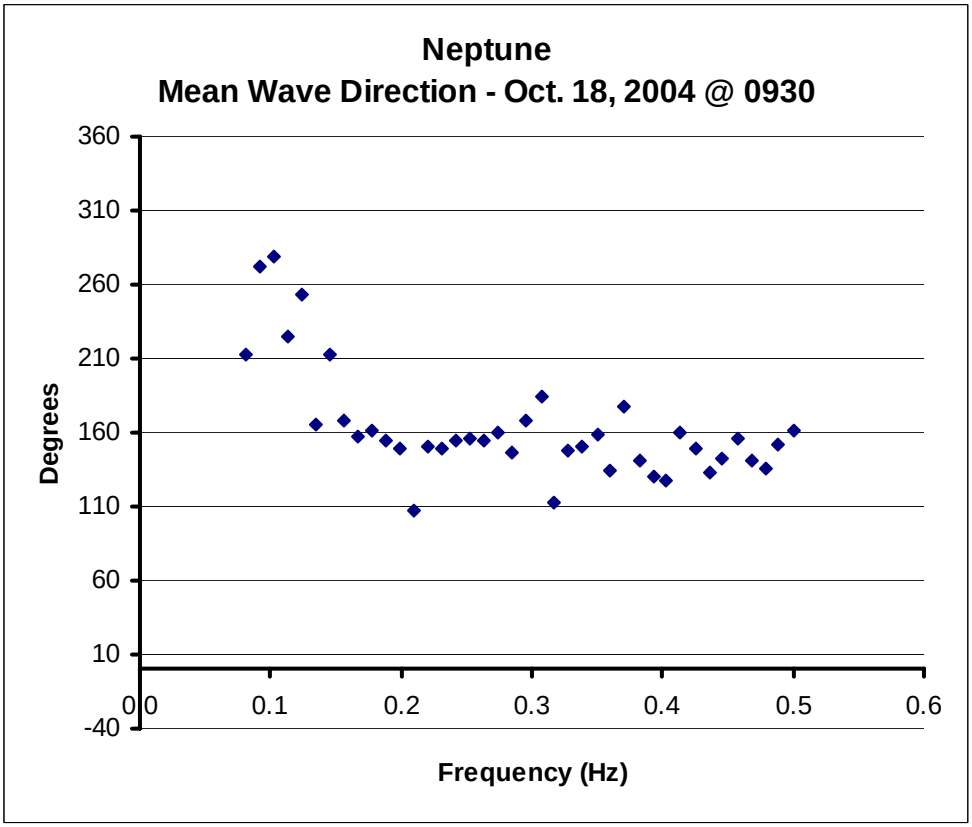

Wave Frequency, Oct. 18 2004
Frequency
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Dominant Wave Freq. (Hz)
Average Wave Freq. (Hz)
08:30 09:30 10:00 10:30 11:00 11:30 12:00 12:30 13:00 13:30 14:00 14:30 15:00 15:30
Time

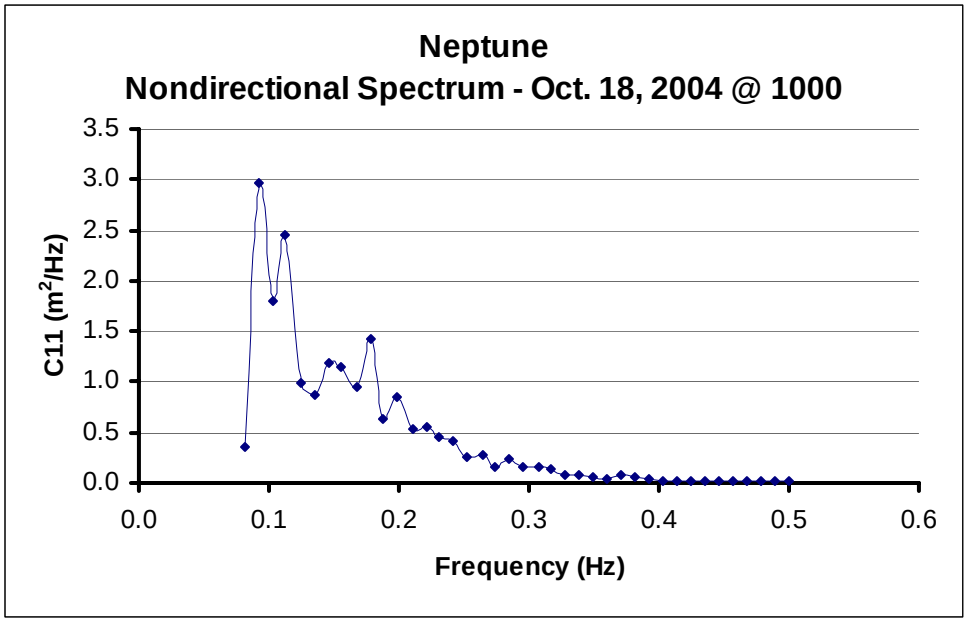

Wave Direction, Oct 18 2004
Direction (Degrees True)
350
300
250
200
150
100
50
0
Dominant
Average
08:30 09:30 10:00 10:30 11:00 11:30 12:00 12:30 13:00 13:30 14:00 14:30 15:00 15:30
Time

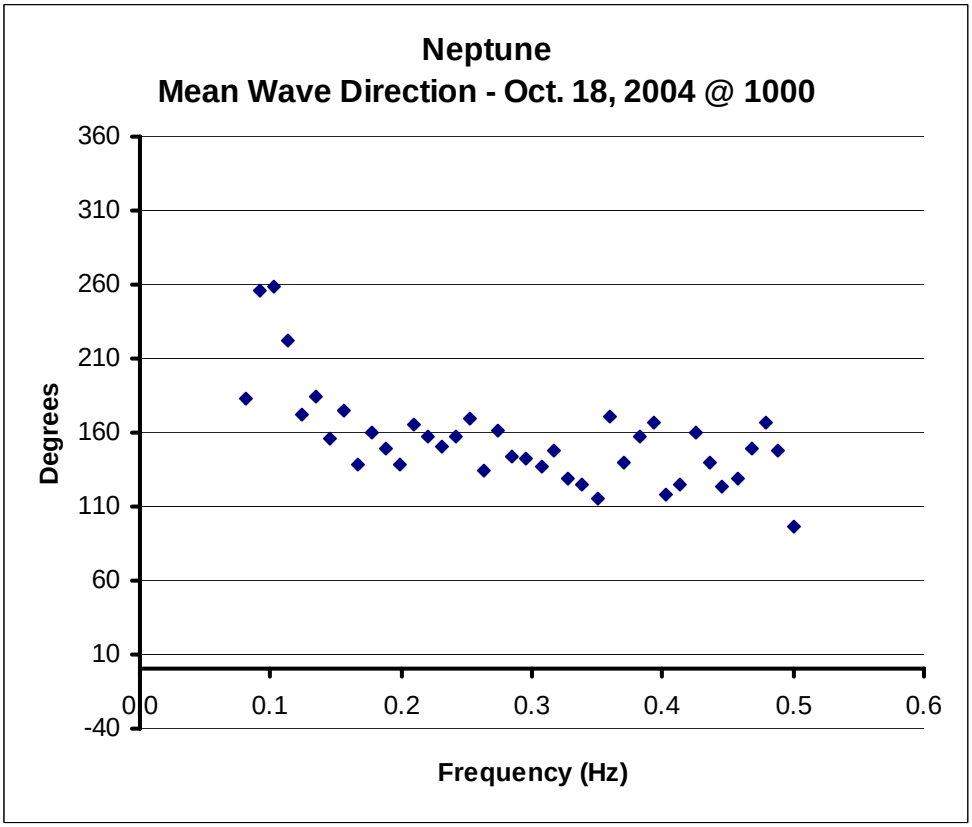

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 0830
C11 (m²/Hz)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

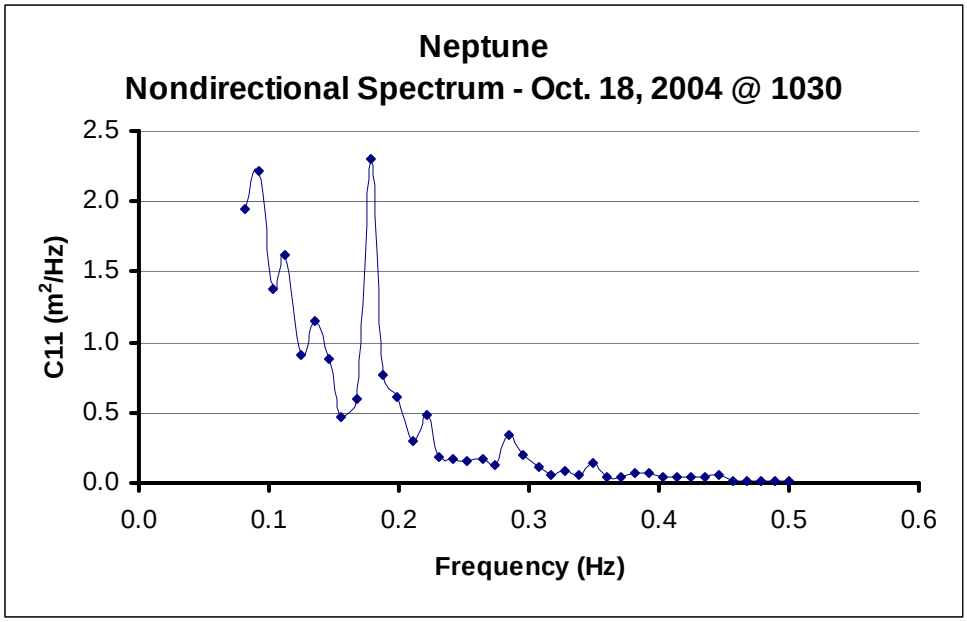

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 0830
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

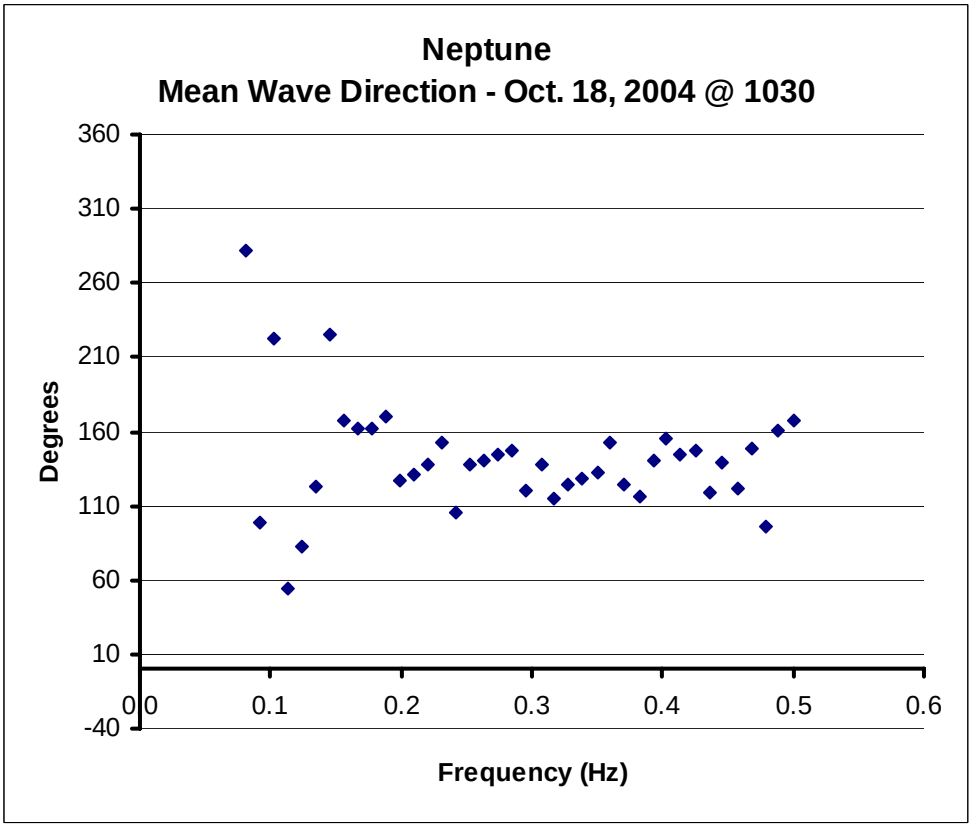

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 0930
C11 (m²/Hz)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

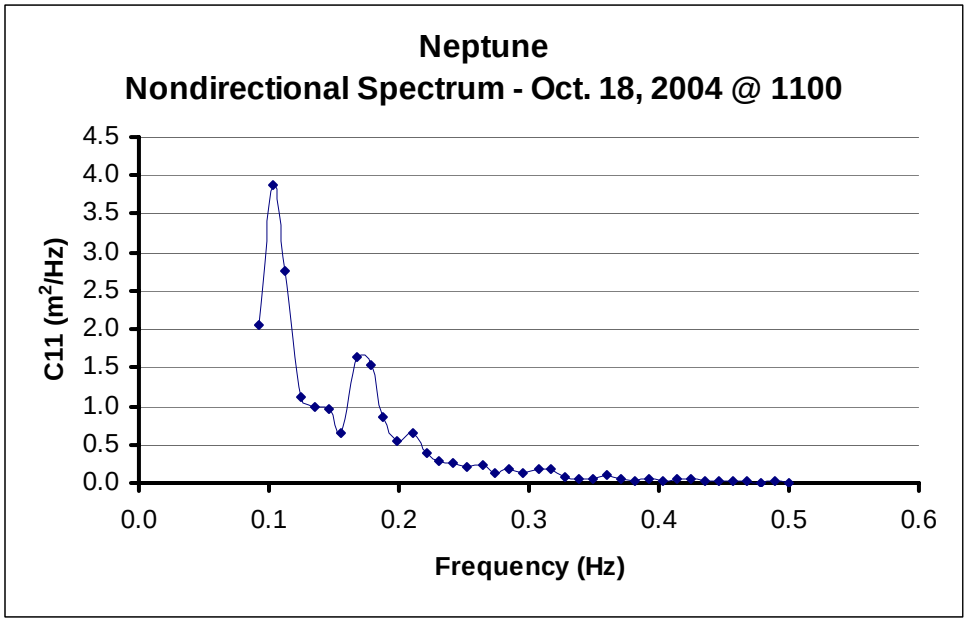

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 0930
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

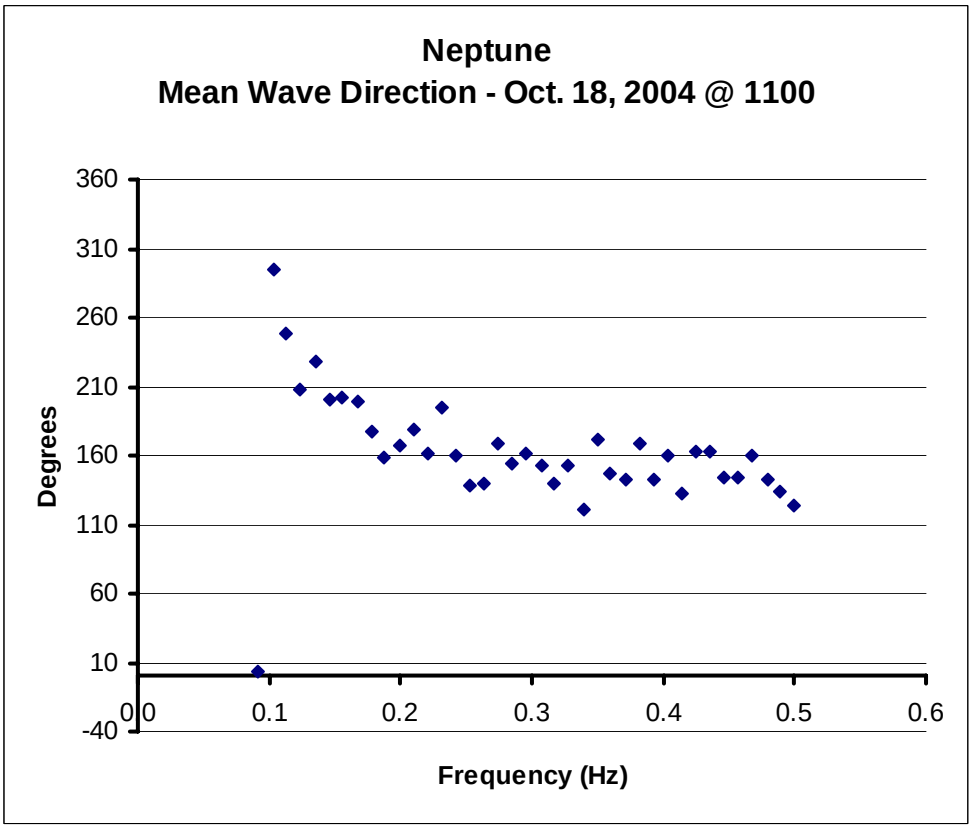

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1000
C11 (m²/Hz)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

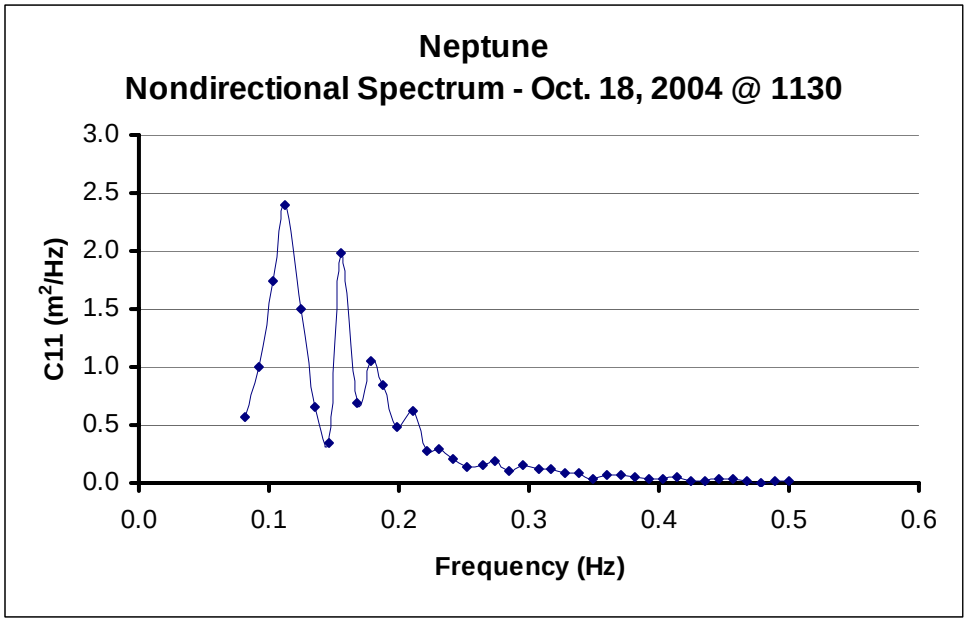

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1000
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

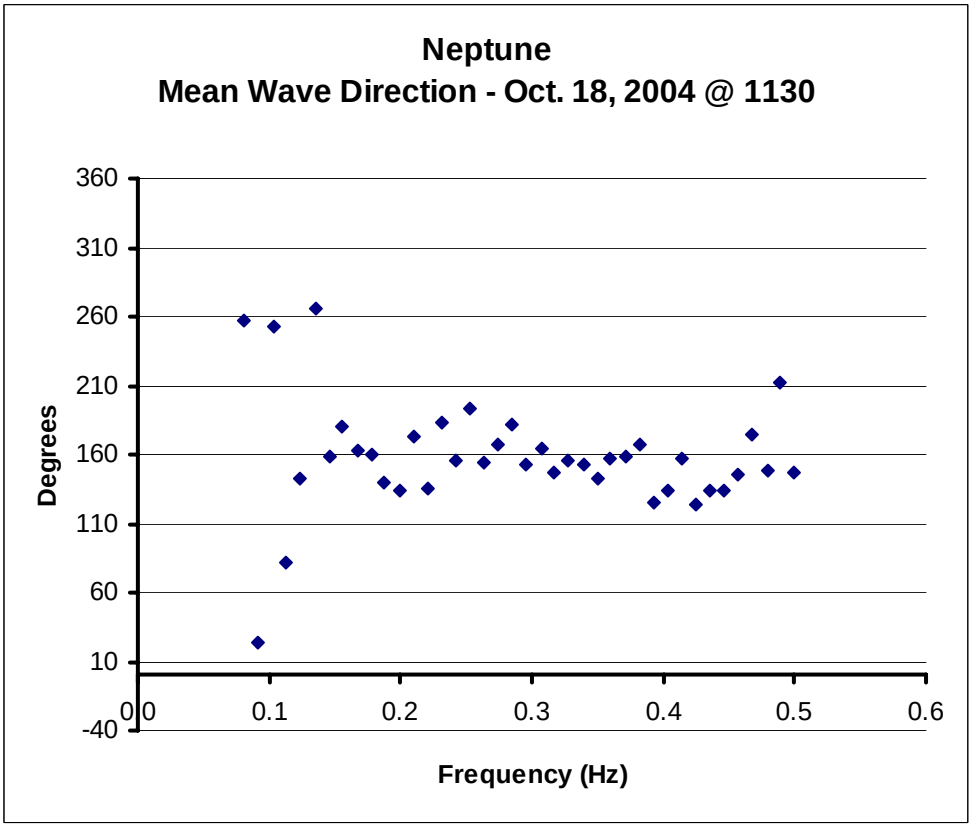

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1030
C11 (m²/Hz)
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

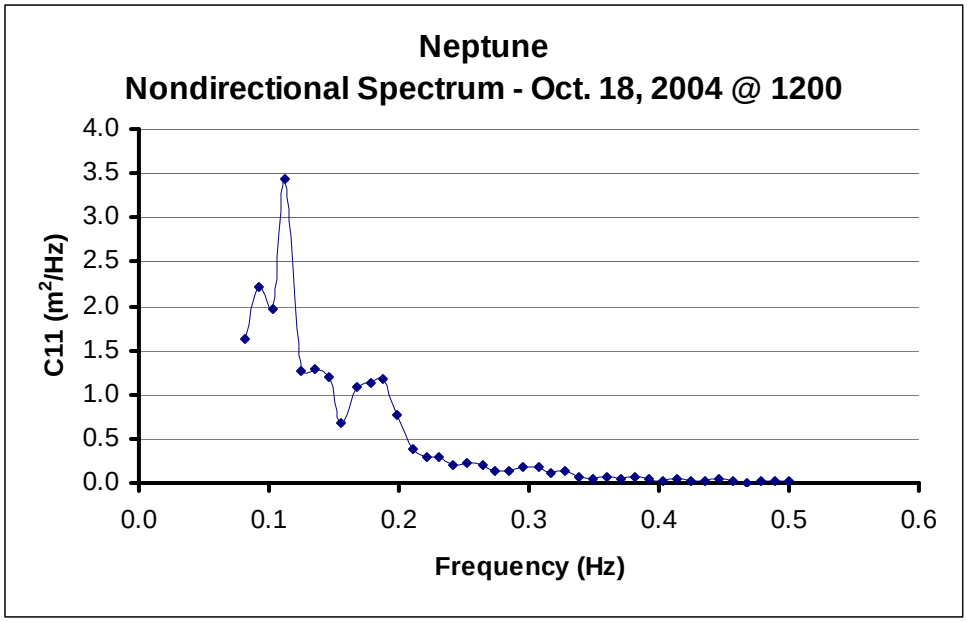

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1030
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

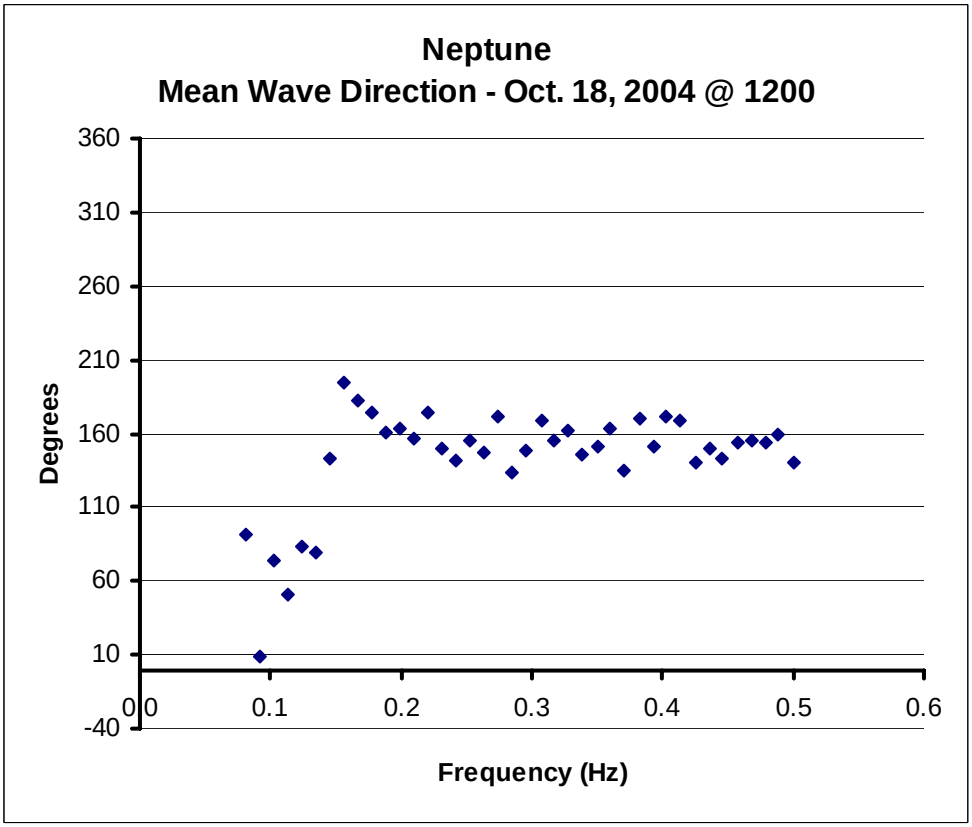

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1100
C11 (m²/Hz)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

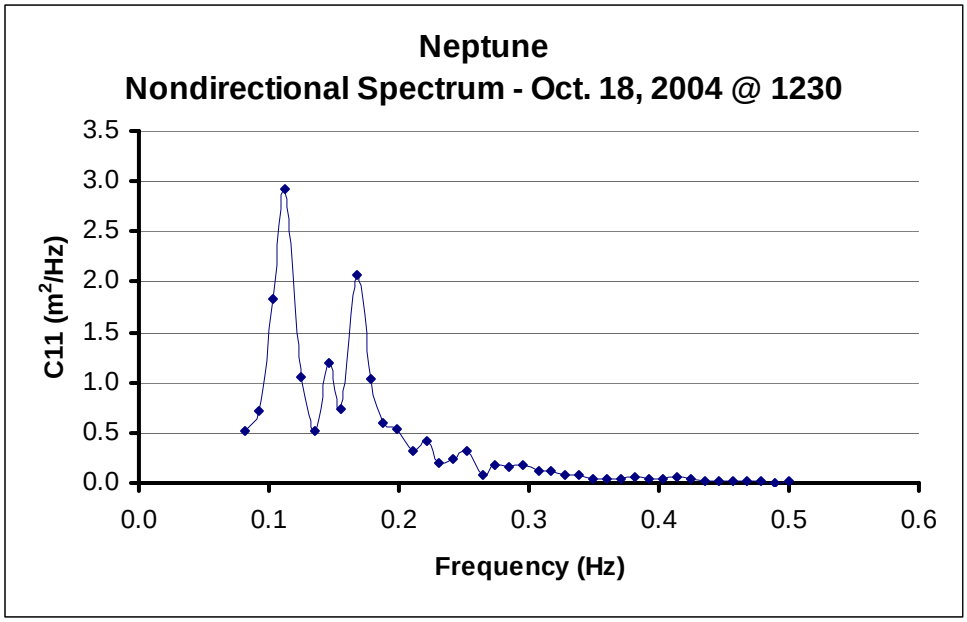

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1100
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

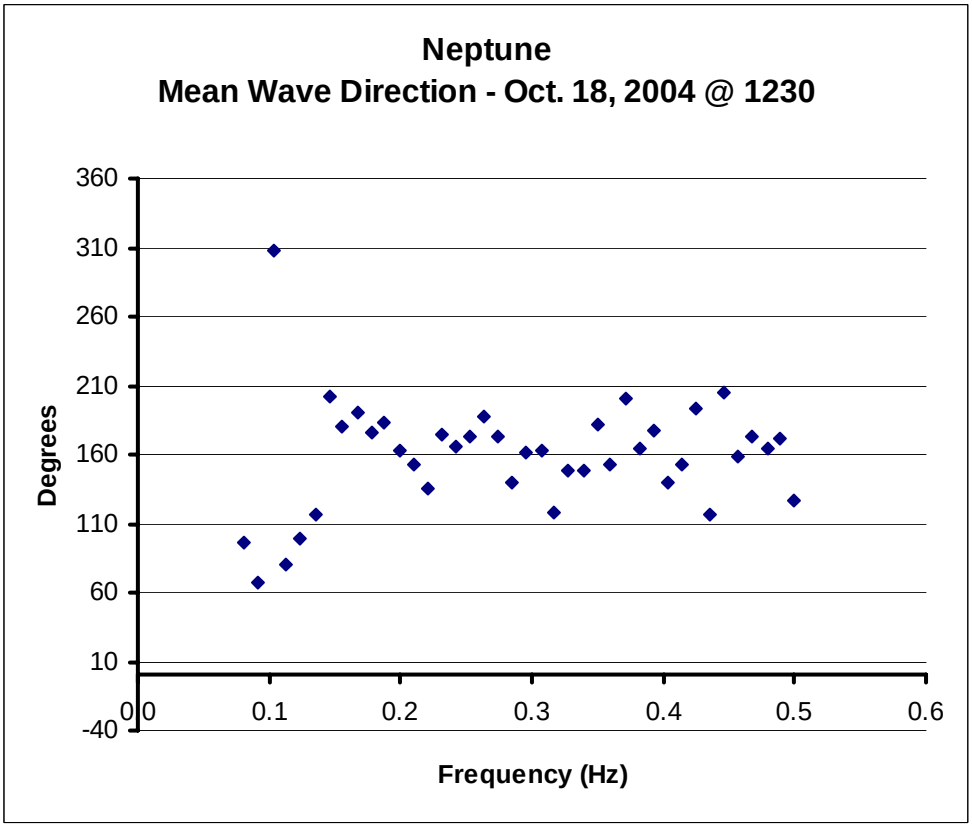

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1130
C11 (m²/Hz)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

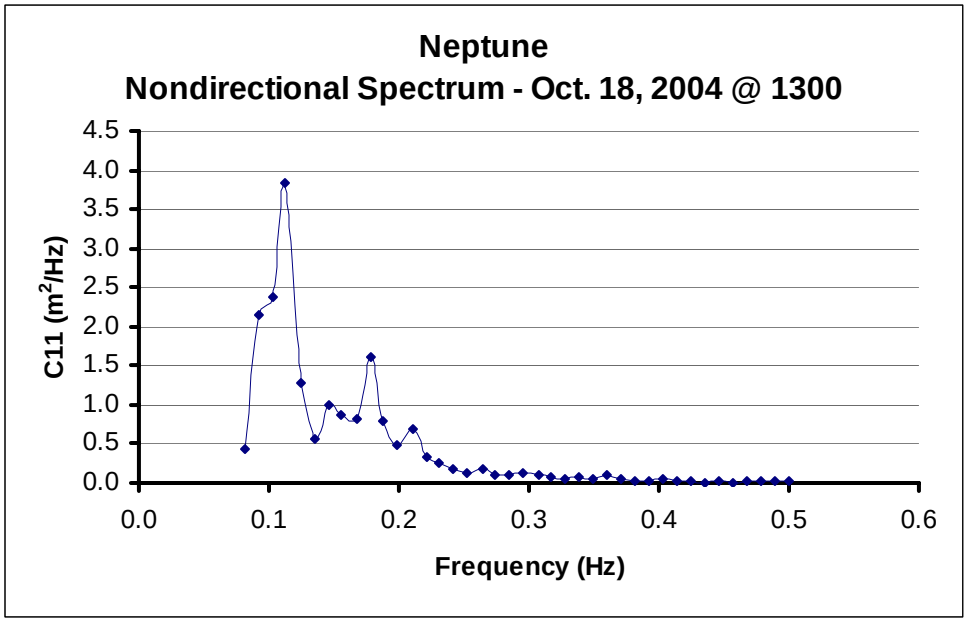

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1130
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

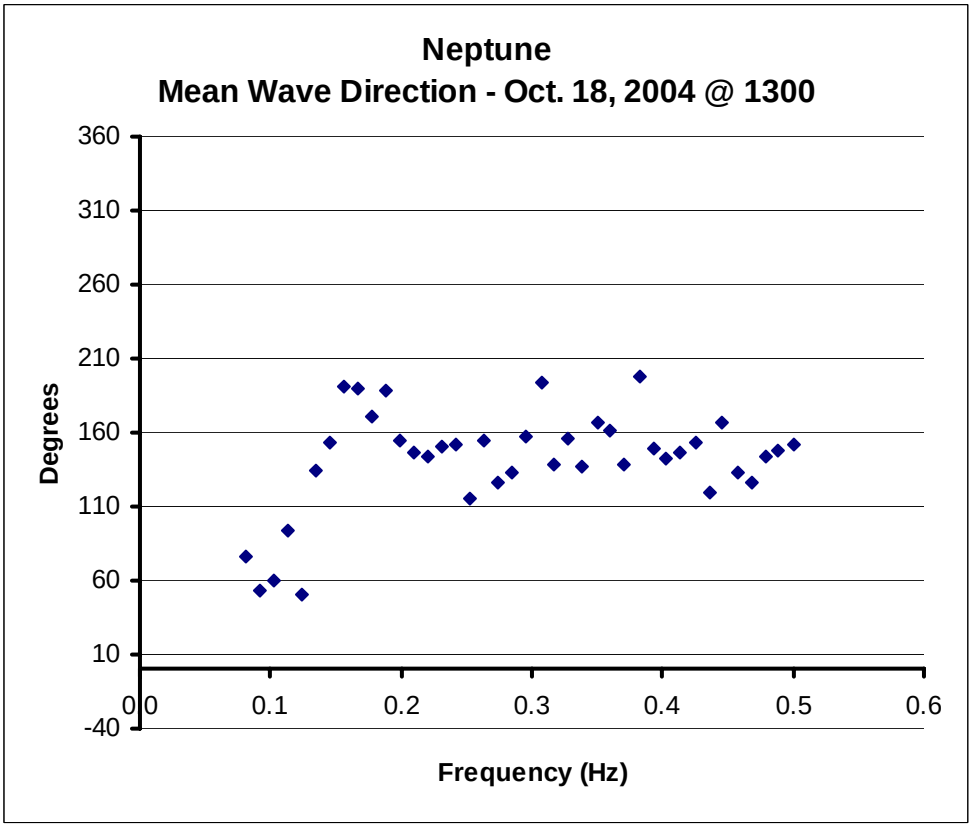

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1200
C11 (m²/Hz)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

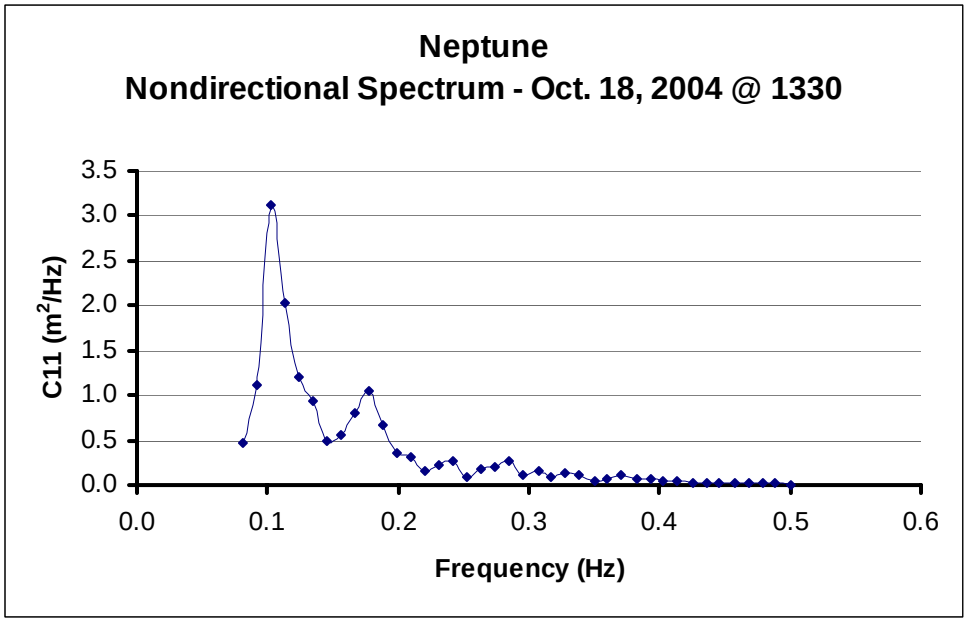

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1200
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

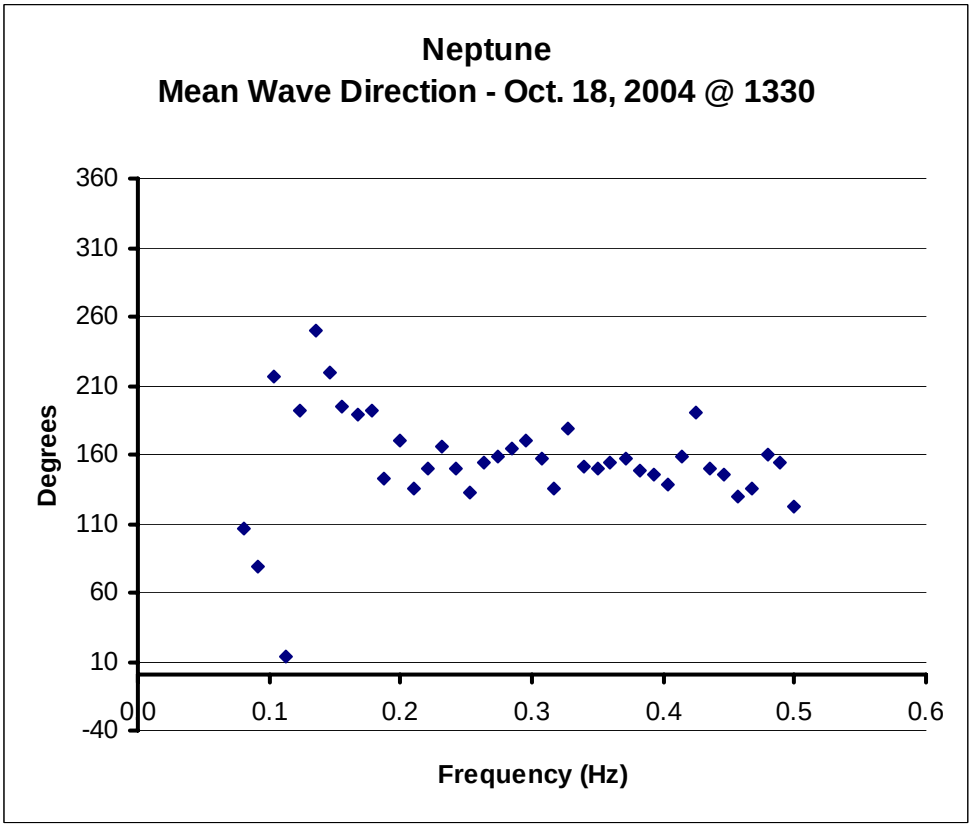

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1230
C11 (m²/Hz)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

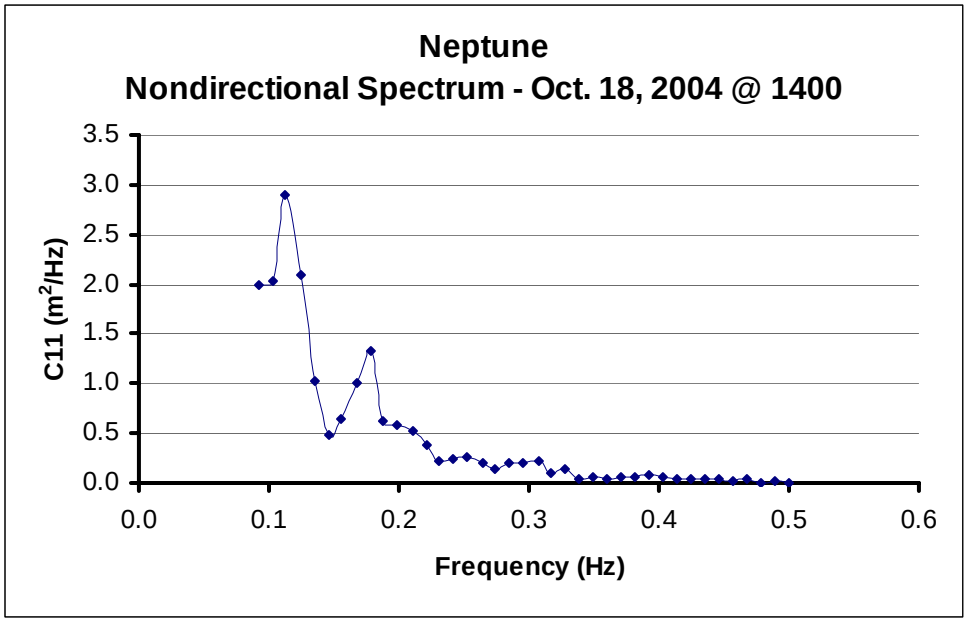

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1230
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

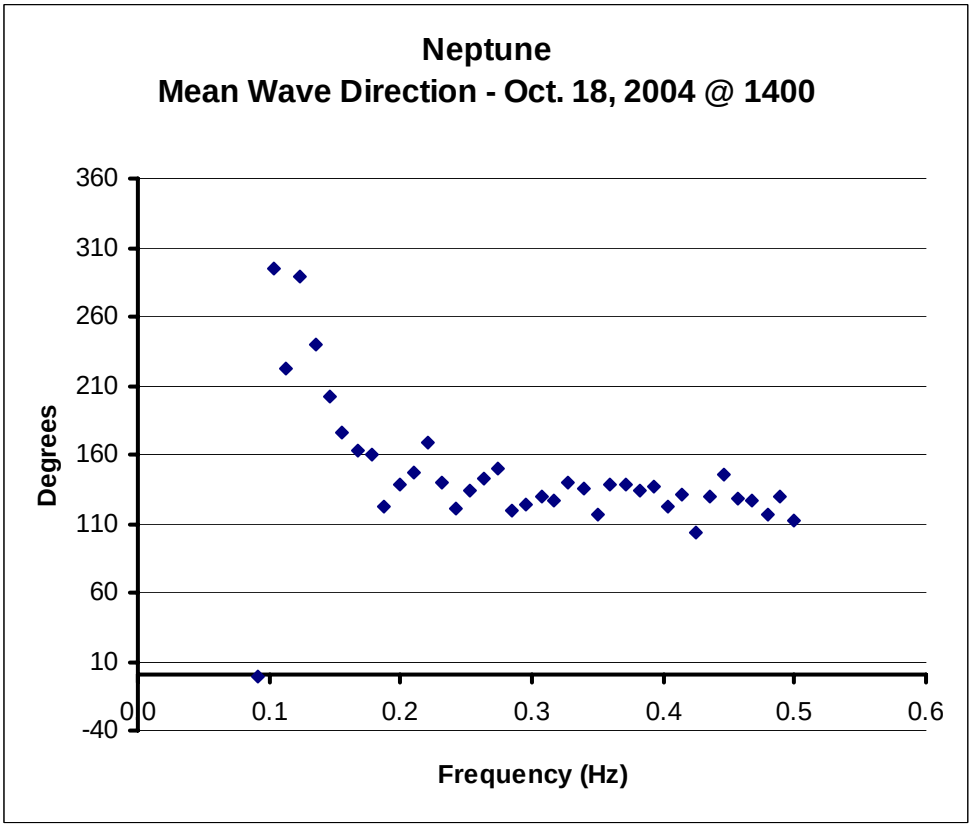

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1300
C11 (m²/Hz)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

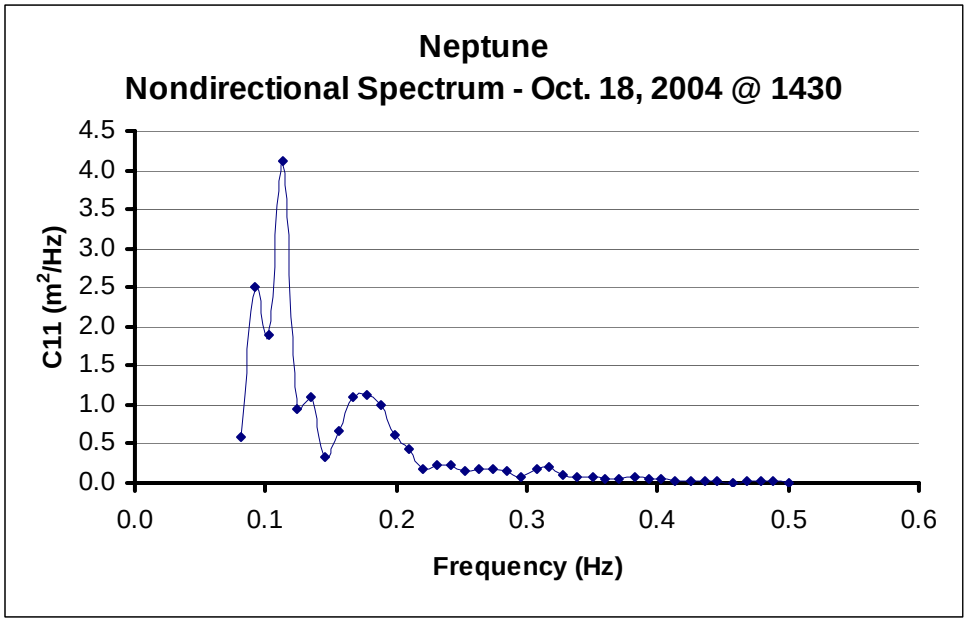

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1300
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

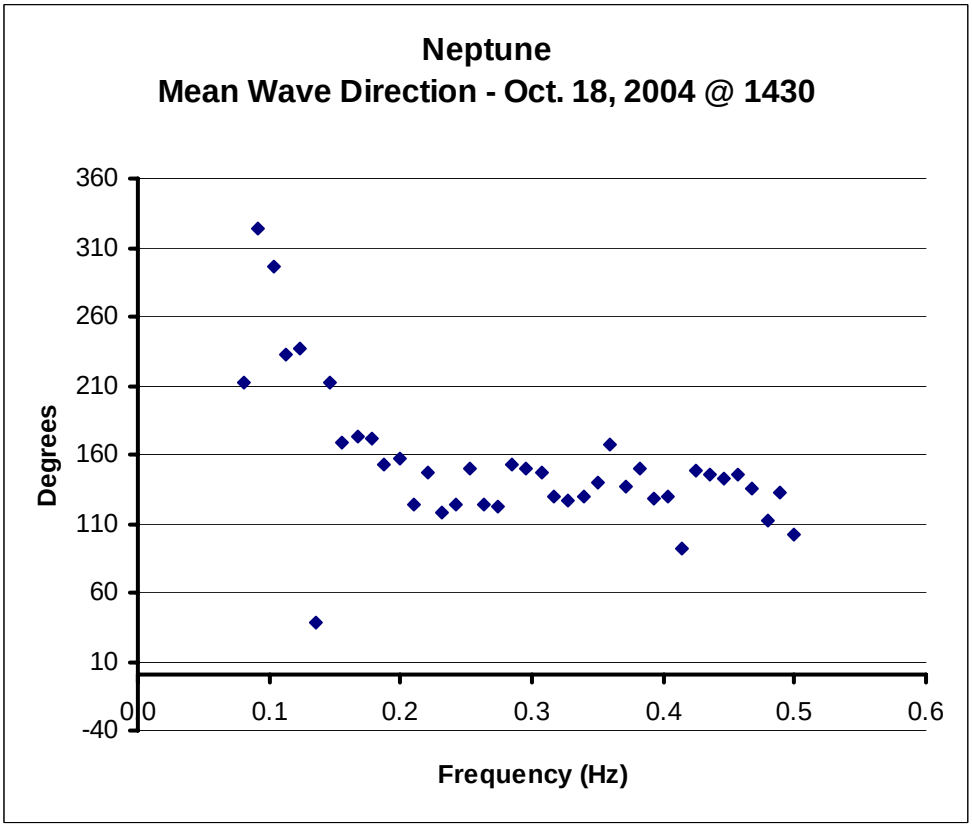

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1330
C11 (m²/Hz)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

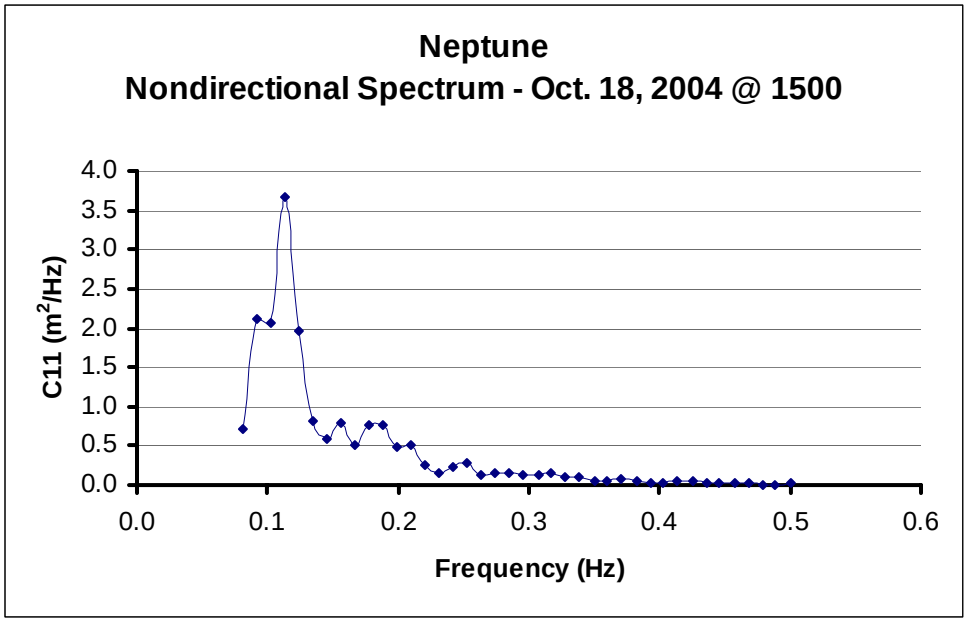

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1330
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

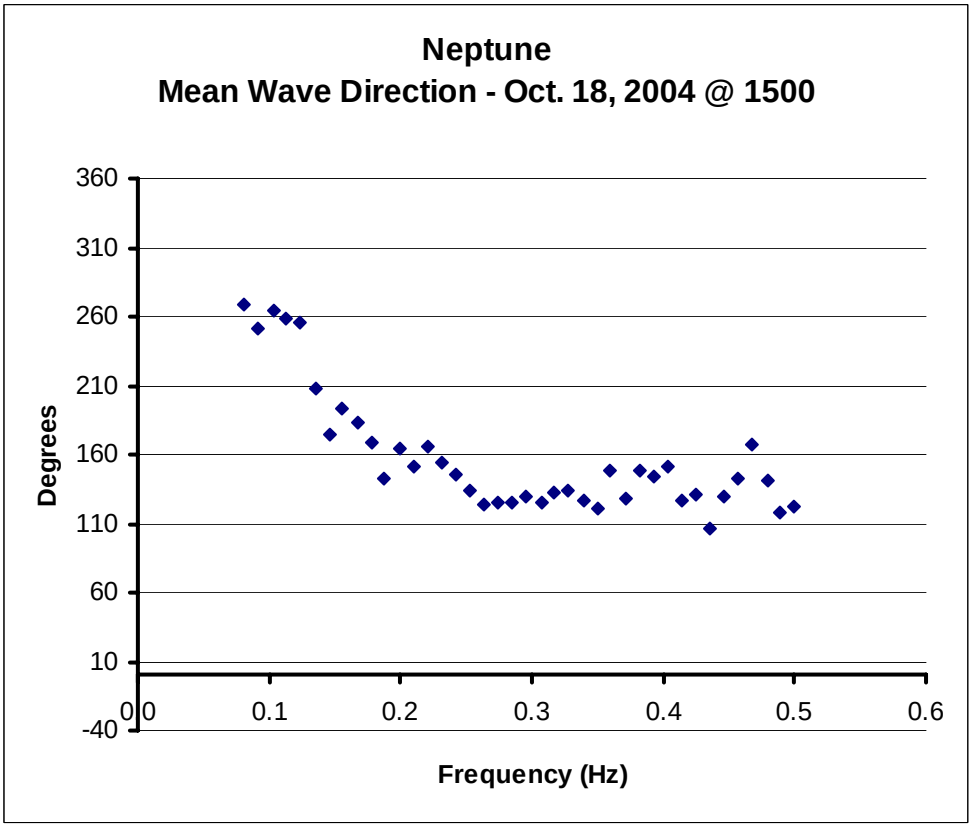

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1400
C11 (m²/Hz)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

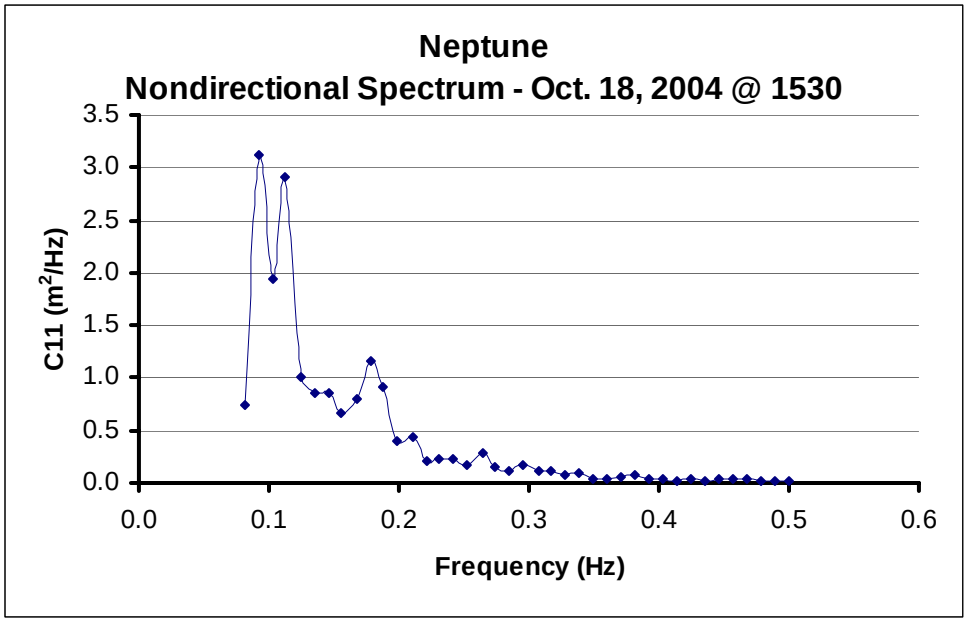

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1400
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

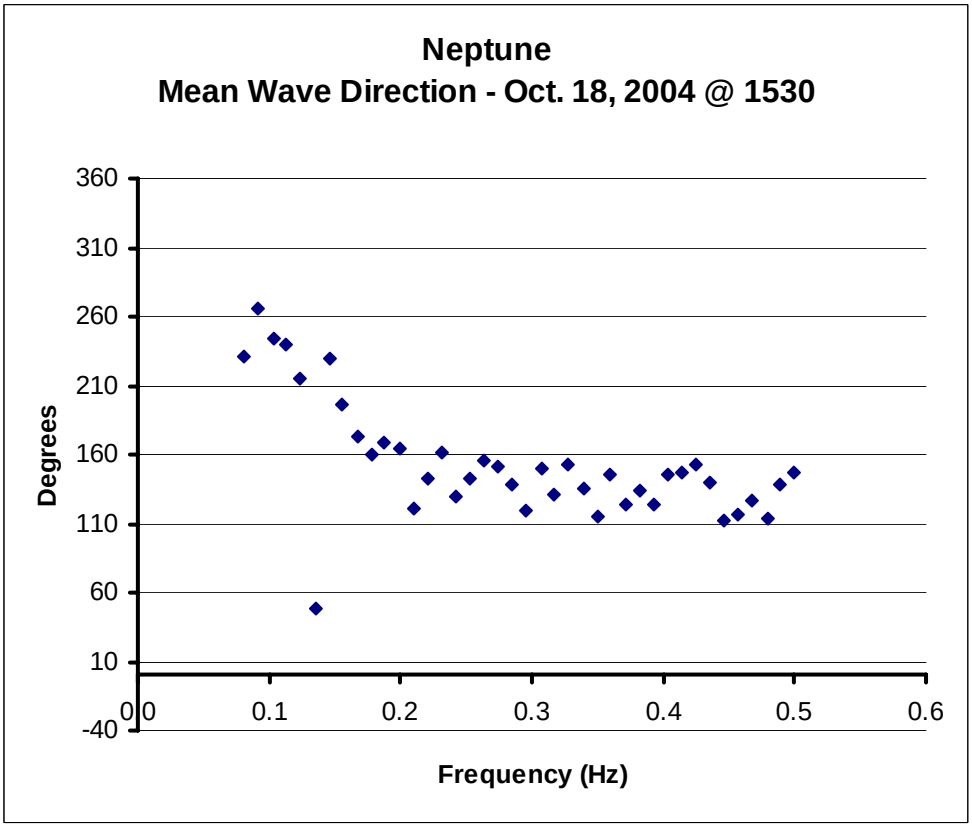

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1430
C11 (m²/Hz)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1430
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1500
C11 (m²/Hz)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)


Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1500
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

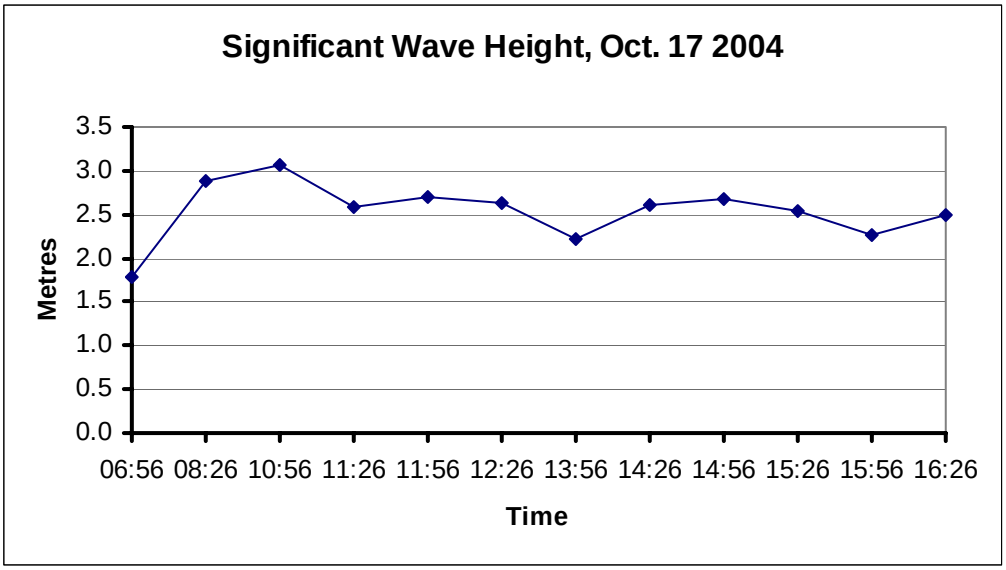

Neptune
Nondirectional Spectrum - Oct. 18, 2004 @ 1530
C11 (m²/Hz)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

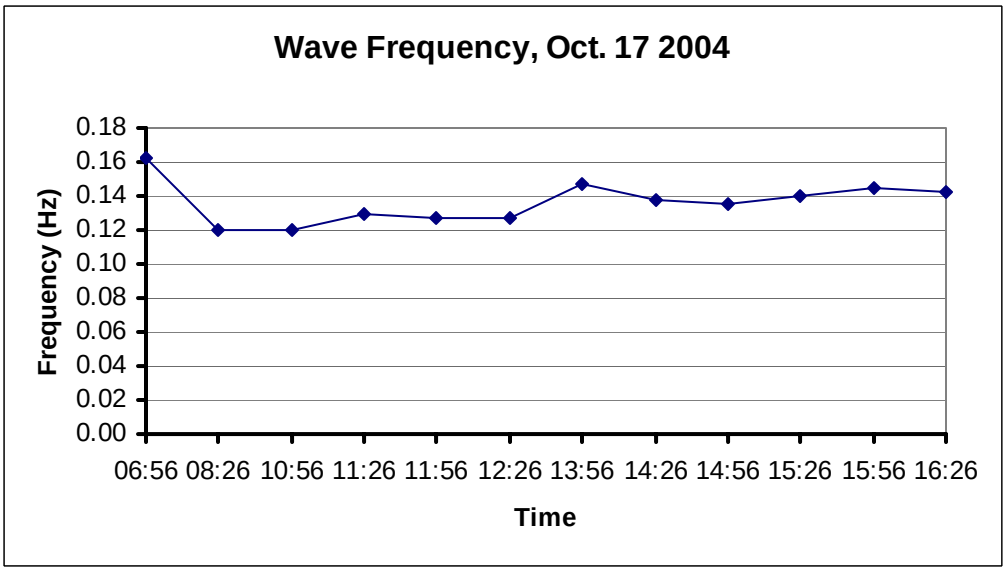

Neptune
Mean Wave Direction - Oct. 18, 2004 @ 1530
Degrees
360
310
260
210
160
110
60
10
-40
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Frequency (Hz)

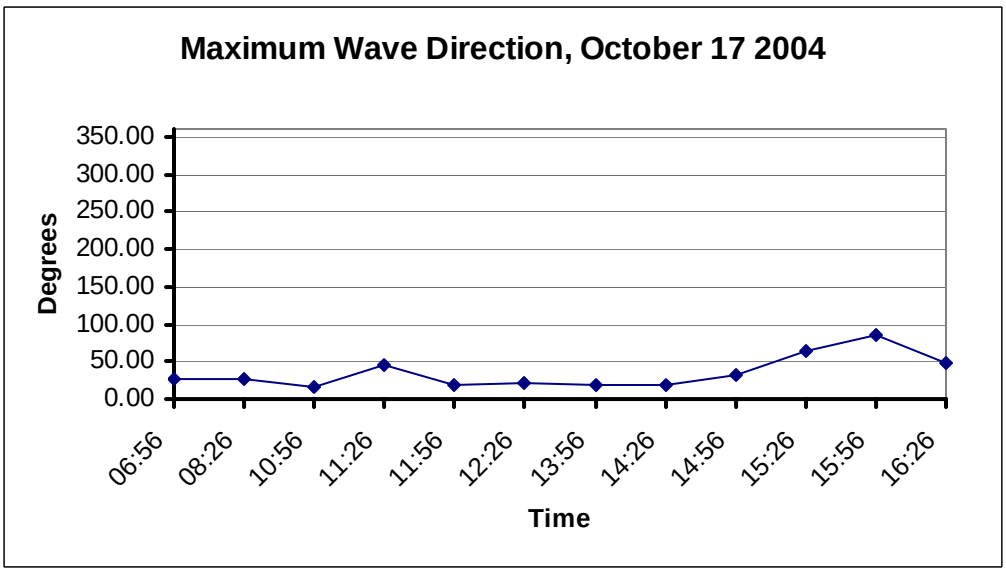
**Summary of Wave Statistics Collected Using Datawell Directional Wave Buoy**
**CCGA Miss Jacqueline IV** **Proj. 2017**

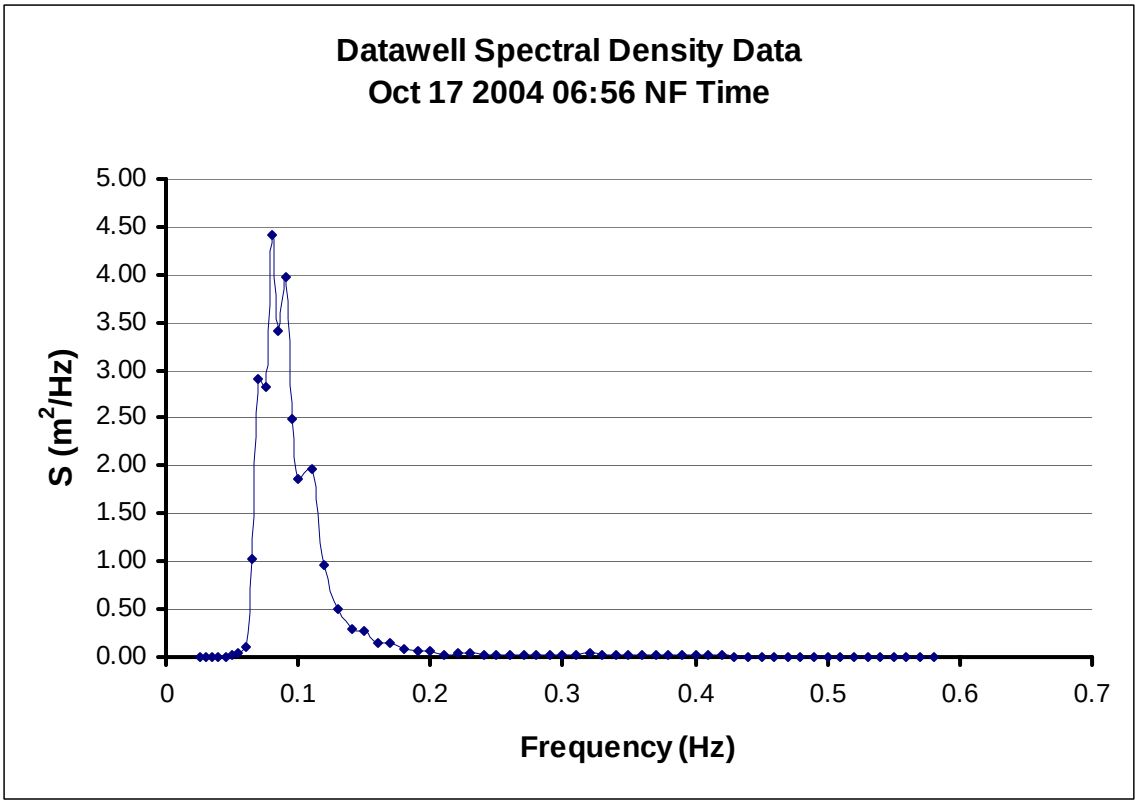
**October 17, 2004**

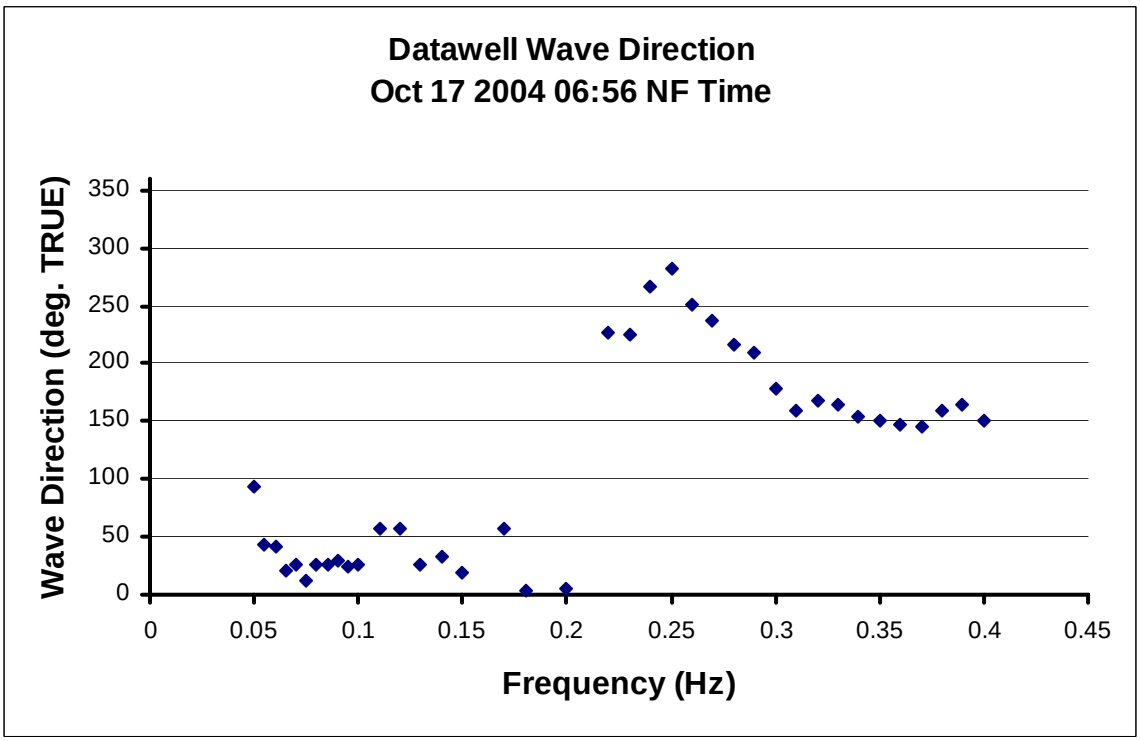
| NF Time | Sig. Wave Height (m) | Mean Wave Period (s) | Maximum Spectral Density ($m^2$/Hz) | Maximum Wave Dir. (deg. TRUE) |
|---|---|---|---|---|
| 06:56 | 1.78 | 6.15 | 4.42 | 26.81 |
| 08:26 | 2.88 | 8.33 | 14.33 | 26.81 |
| 10:56 | 3.06 | 8.33 | 17.07 | 15.56 |
| 11:26 | 2.58 | 7.69 | 14.04 | 45.09 |
| 11:56 | 2.71 | 7.84 | 11.05 | 18.38 |
| 12:26 | 2.62 | 7.84 | 18.12 | 22.59 |
| 13:56 | 2.23 | 6.78 | 6.25 | 19.78 |
| 14:26 | 2.61 | 7.27 | 12.52 | 18.38 |
| 14:56 | 2.68 | 7.41 | 16.98 | 32.44 |
| 15:26 | 2.53 | 7.14 | 8.27 | 64.78 |
| 15:56 | 2.26 | 6.90 | 7.26 | 84.47 |
| 16:26 | 2.49 | 7.02 | 8.69 | 47.91 |

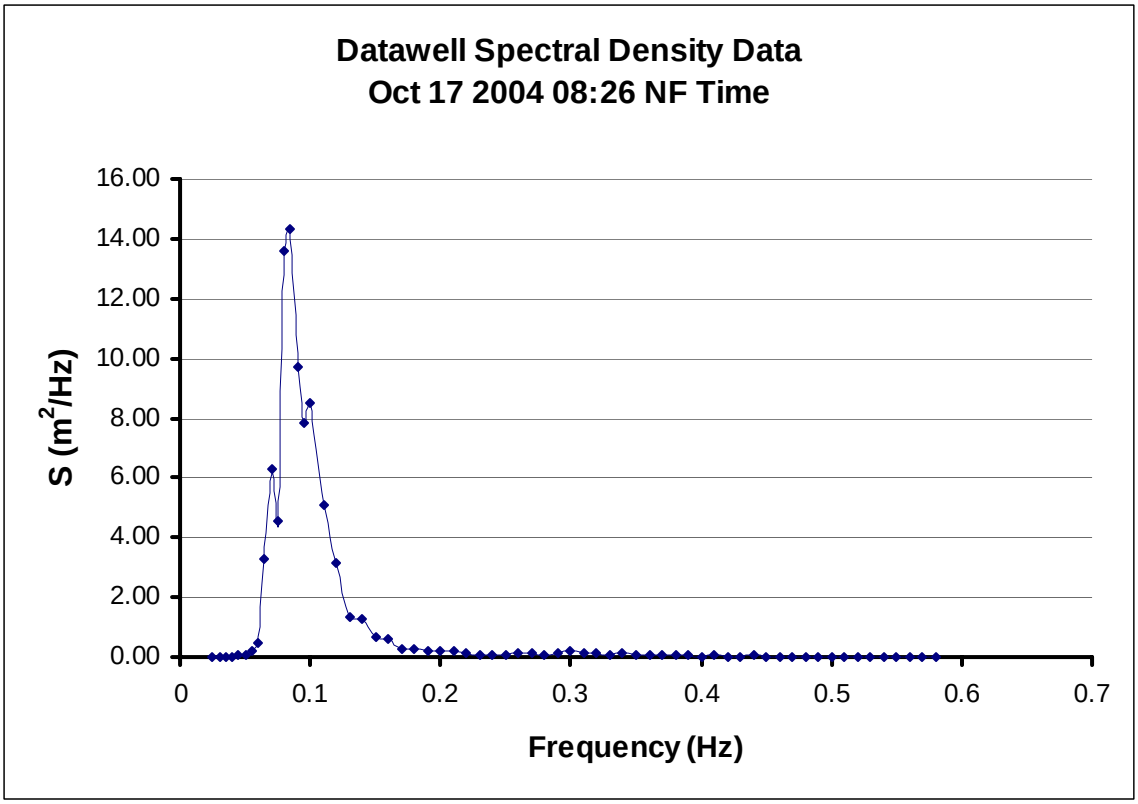

Significant Wave Height, Oct. 17 2004
Metres
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
06:56 08:26 10:56 11:26 11:56 12:26 13:56 14:26 14:56 15:26 15:56 16:26
Time

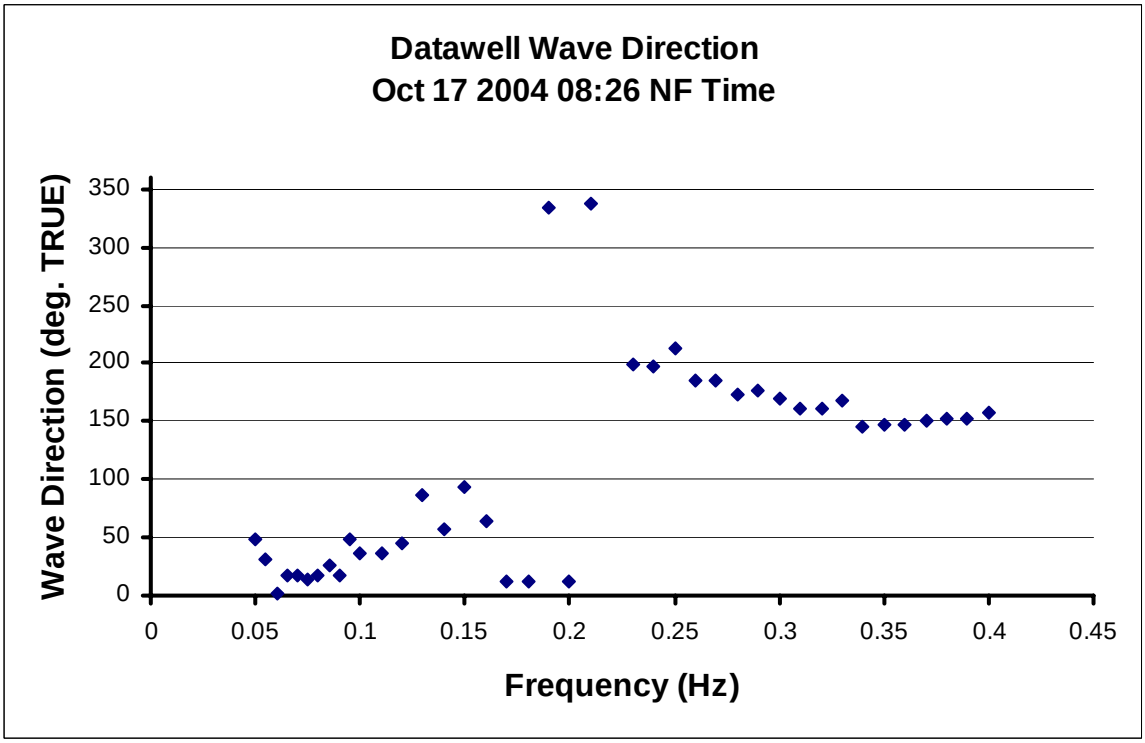

Wave Frequency, Oct. 17 2004
Frequency (Hz)
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
06:56 08:26 10:56 11:26 11:56 12:26 13:56 14:26 14:56 15:26 15:56 16:26
Time

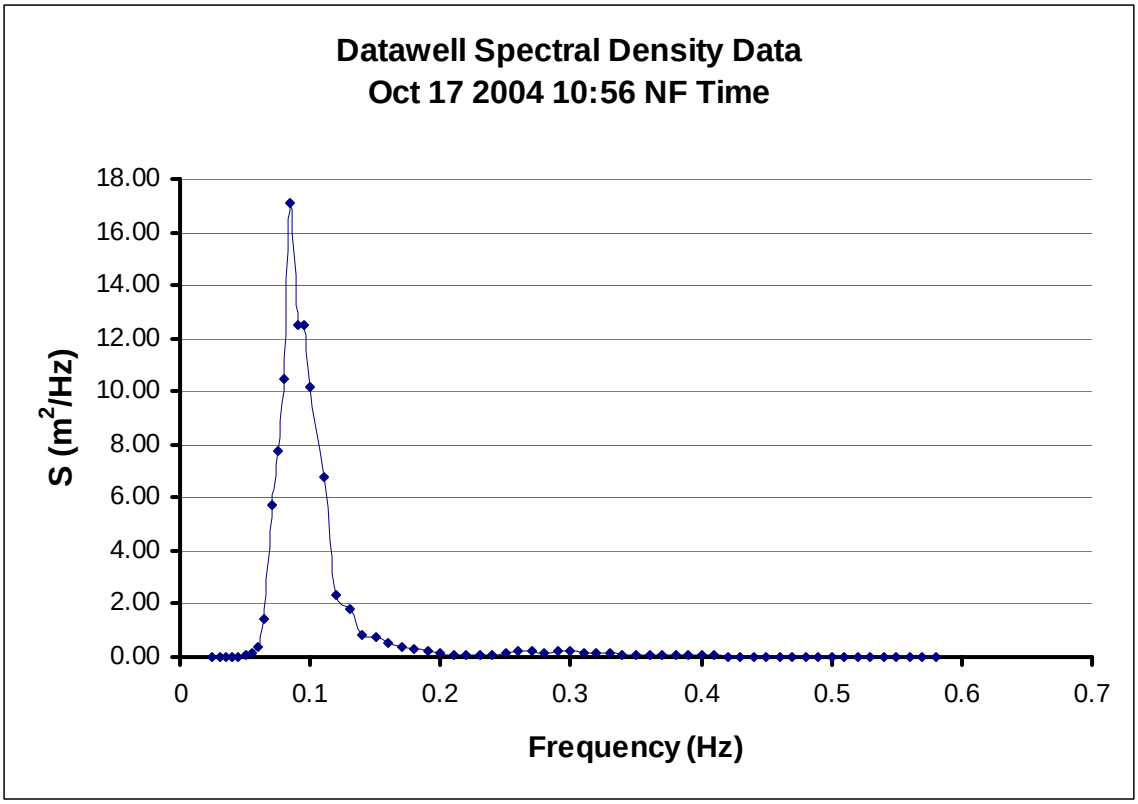

Maximum Wave Direction, October 17 2004
Degrees
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
06:56
08:26
10:56
11:26
11:56
12:26
13:56
14:26
14:56
15:26
15:56
16:26
Time

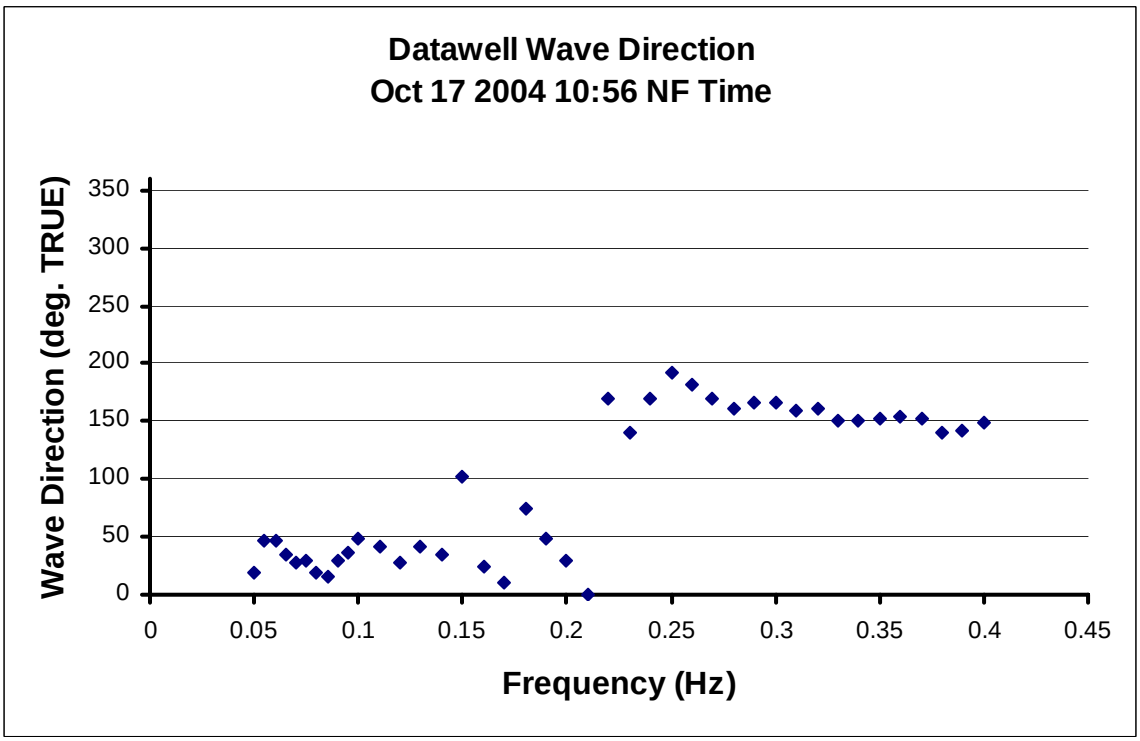

Datawell Spectral Density Data
Oct 17 2004 06:56 NF Time
S (m²/Hz)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

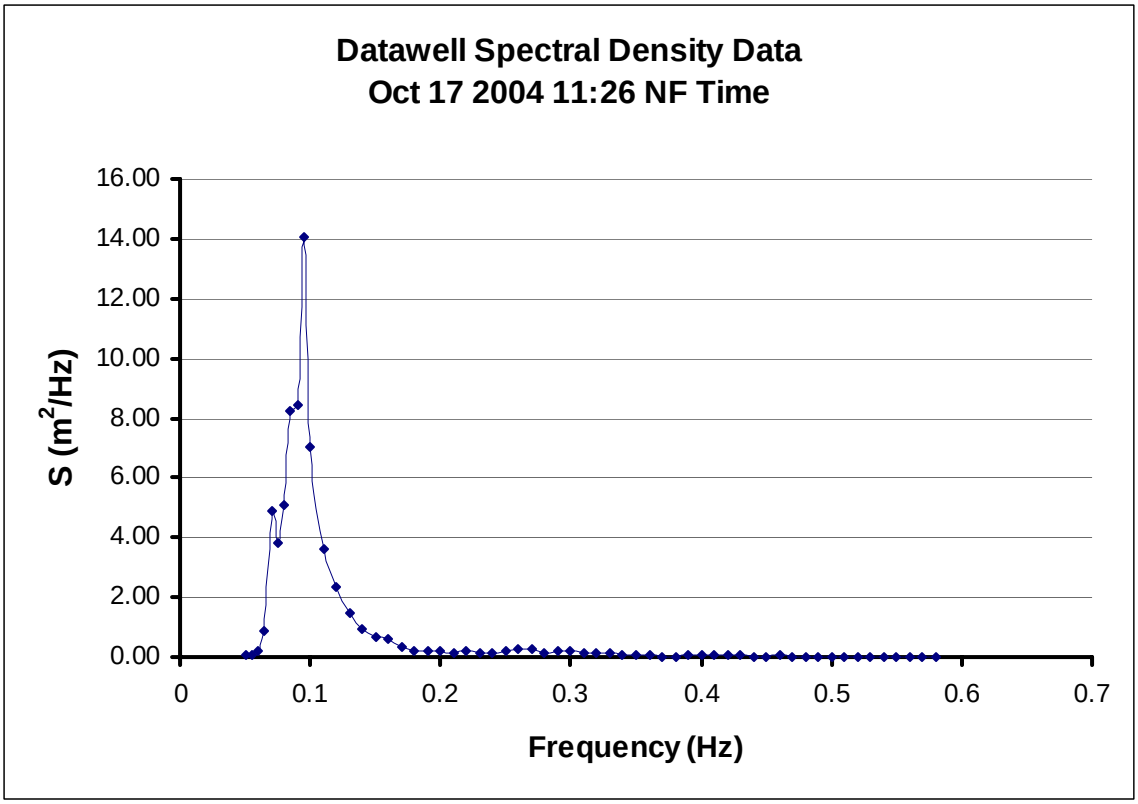

Datawell Wave Direction
Oct 17 2004 06:56 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

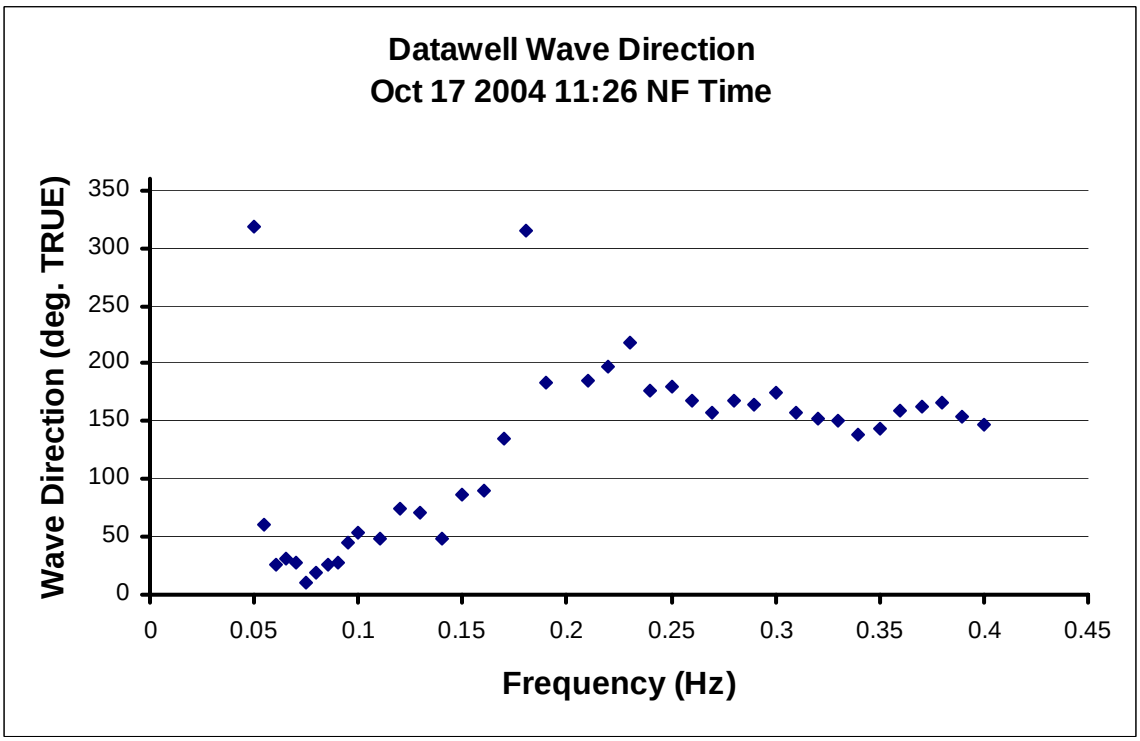

Datawell Spectral Density Data
Oct 17 2004 08:26 NF Time
S (m²/Hz)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

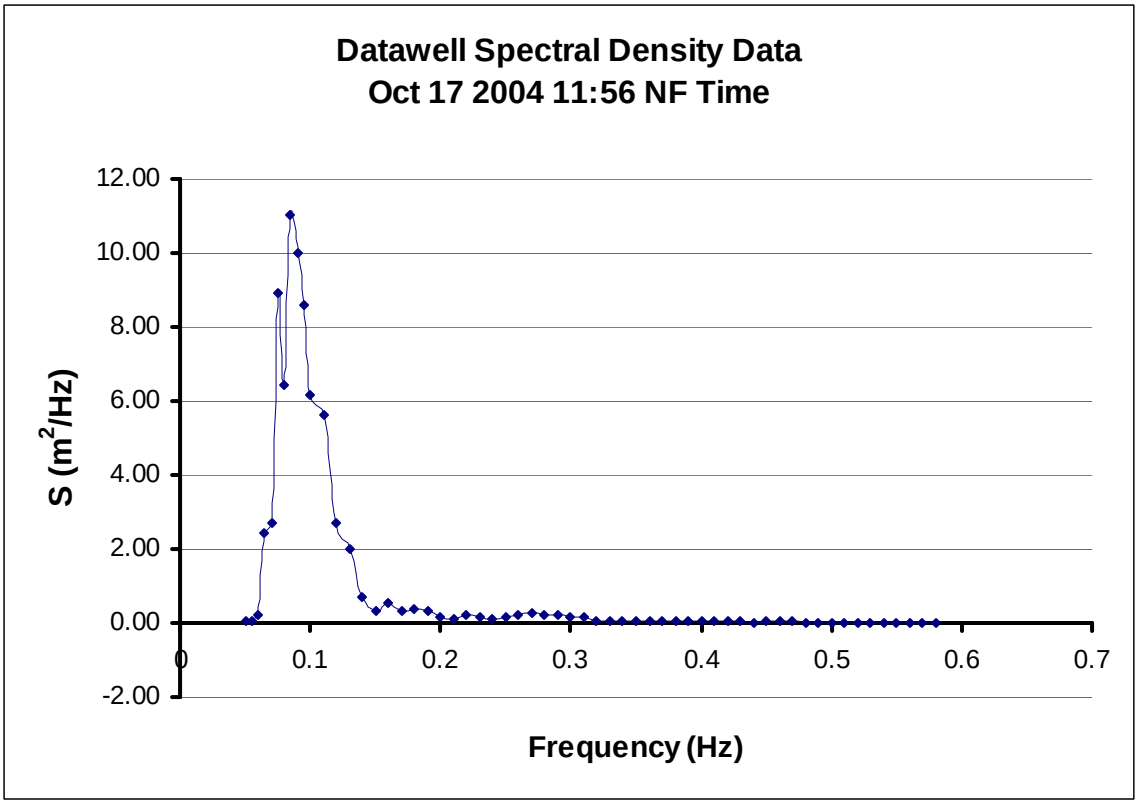

Datawell Wave Direction
Oct 17 2004 08:26 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

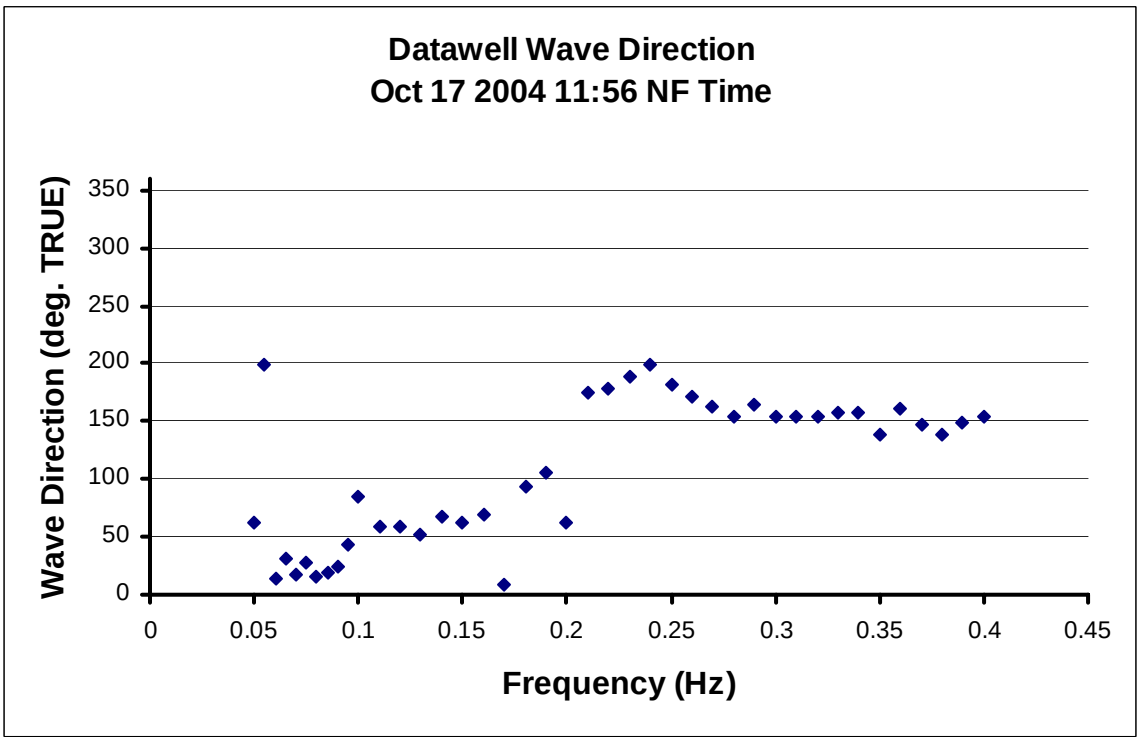

Datawell Spectral Density Data
Oct 17 2004 10:56 NF Time
S (m²/Hz)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

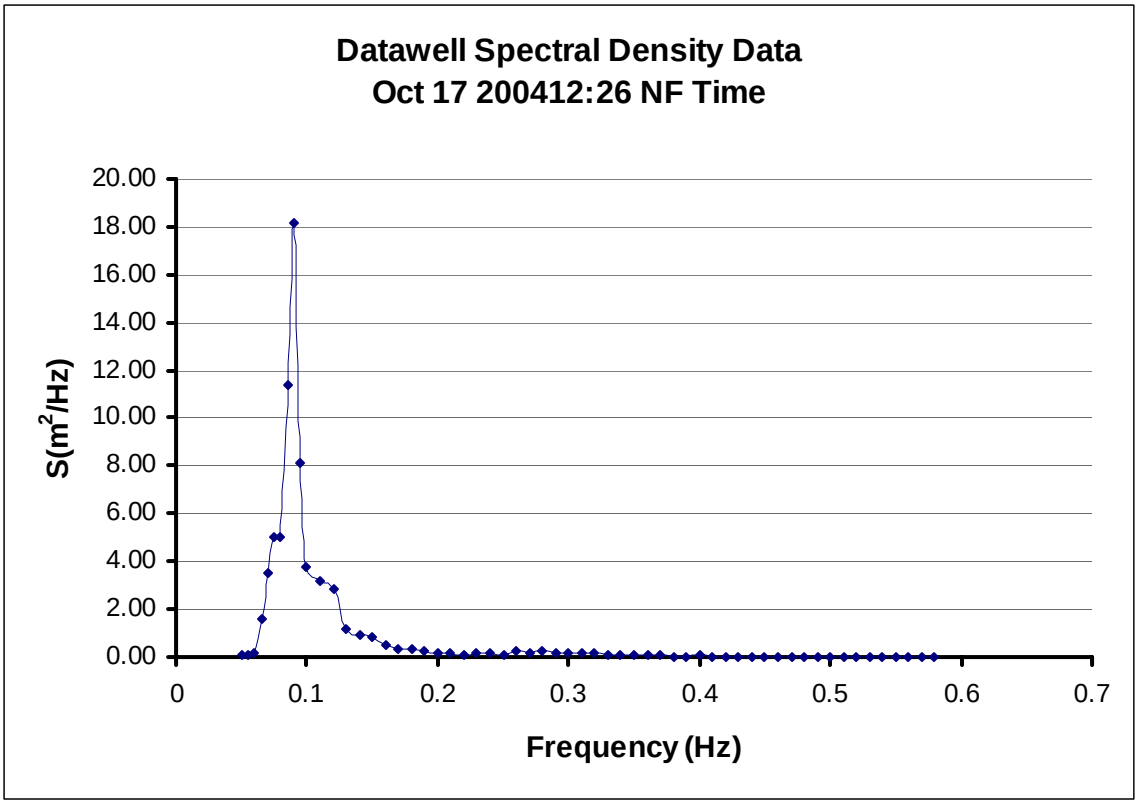

Datawell Wave Direction
Oct 17 2004 10:56 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

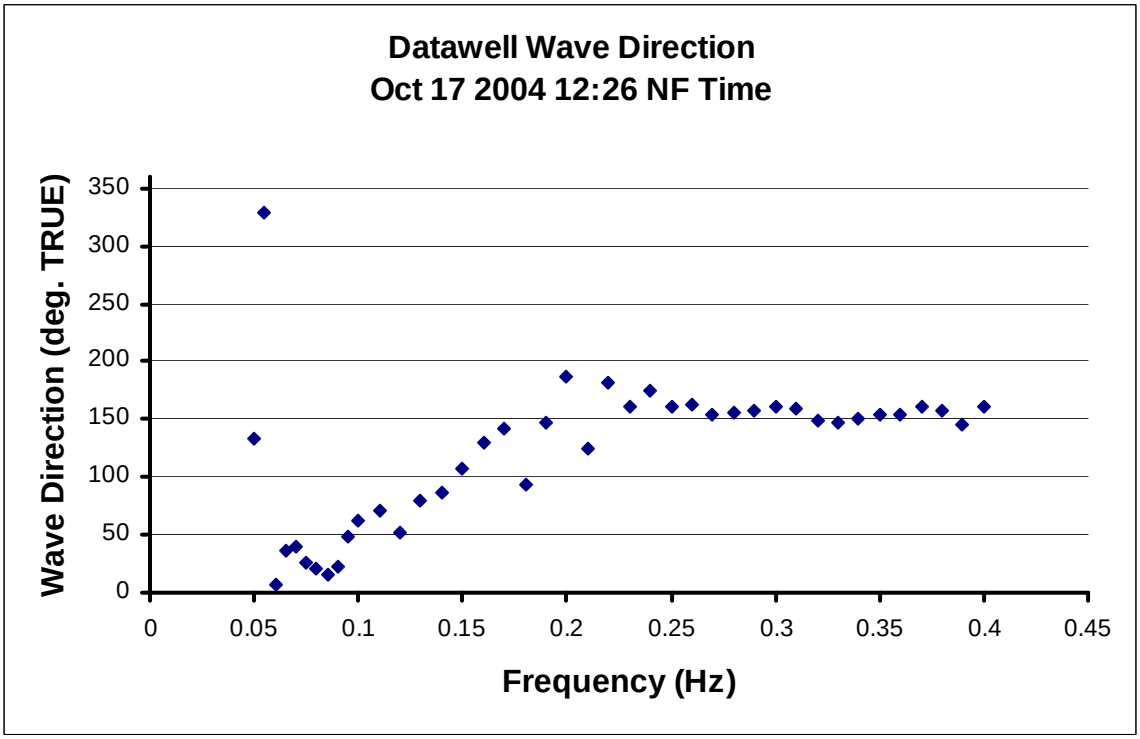

Datawell Spectral Density Data
Oct 17 2004 11:26 NF Time
S (m²/Hz)
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

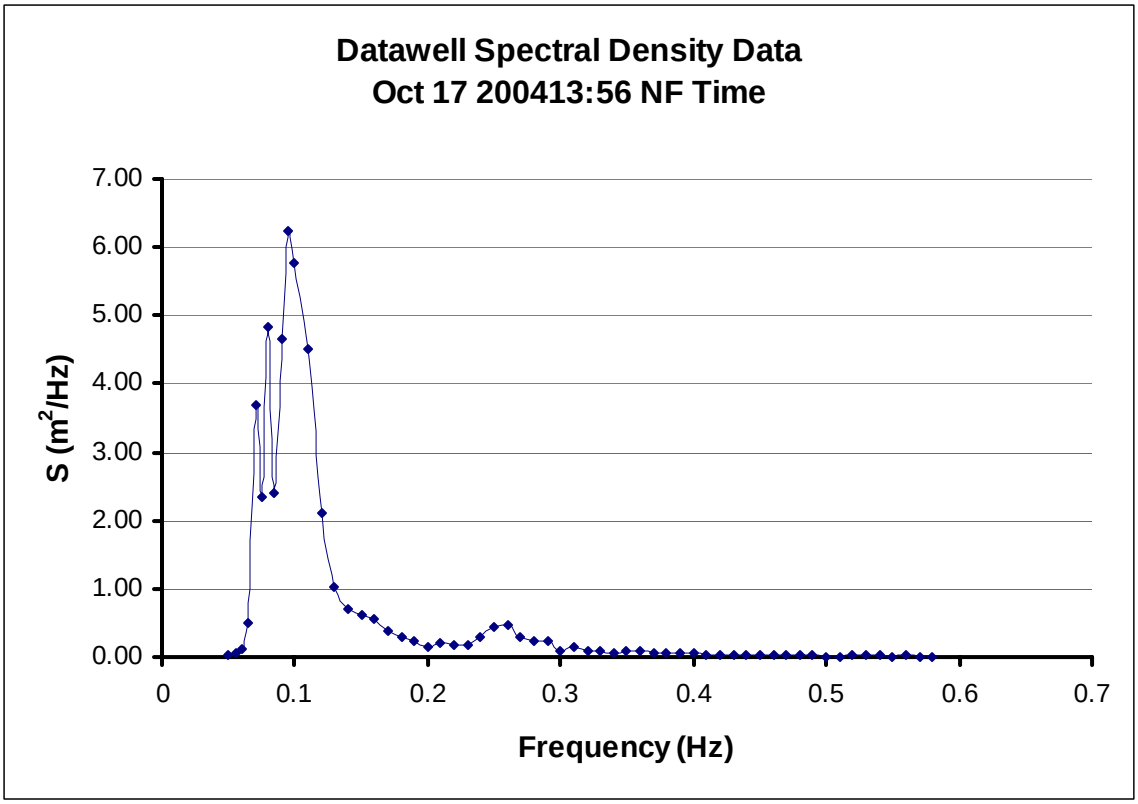

Datawell Wave Direction
Oct 17 2004 11:26 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

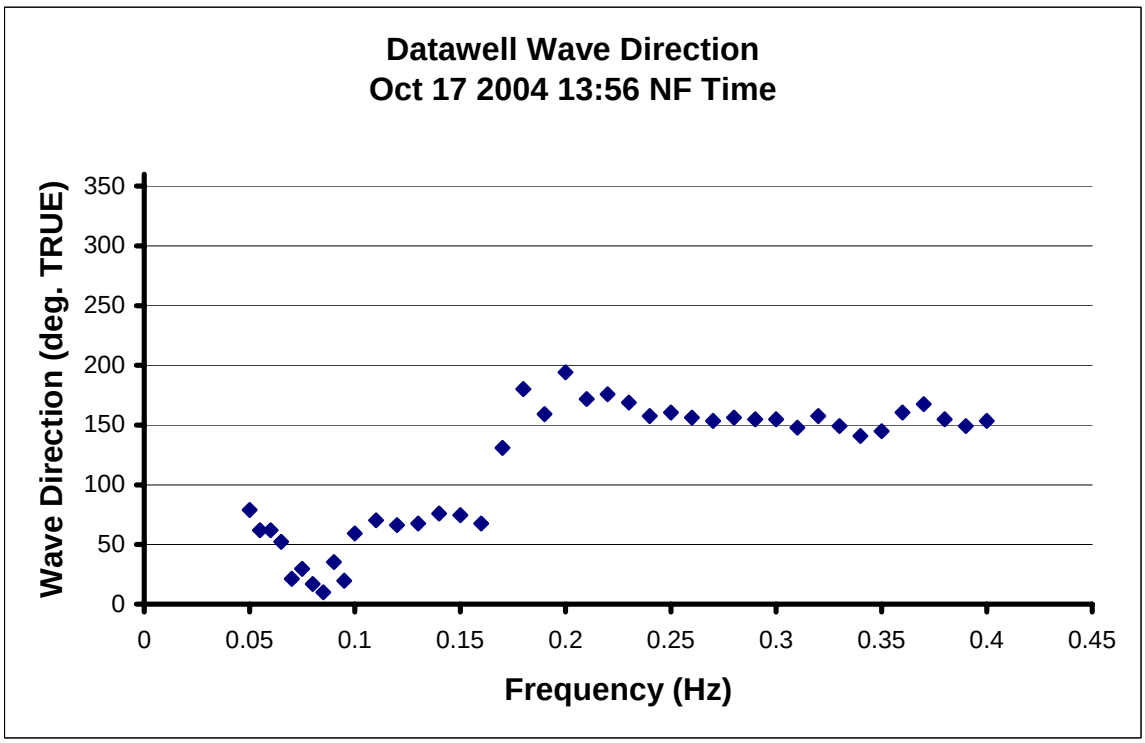

Datawell Spectral Density Data
Oct 17 2004 11:56 NF Time
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
S (m²/Hz)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

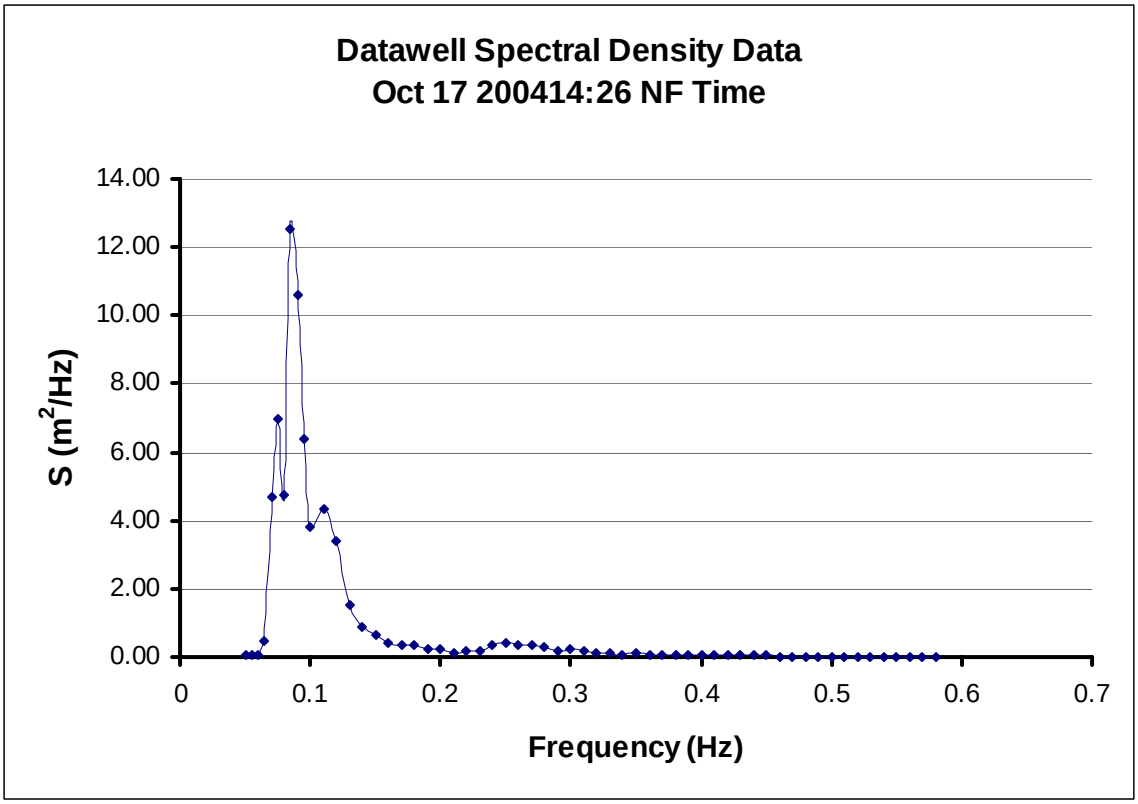

Datawell Wave Direction
Oct 17 2004 11:56 NF Time
350
300
250
200
150
100
50
0
Wave Direction (deg. TRUE)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

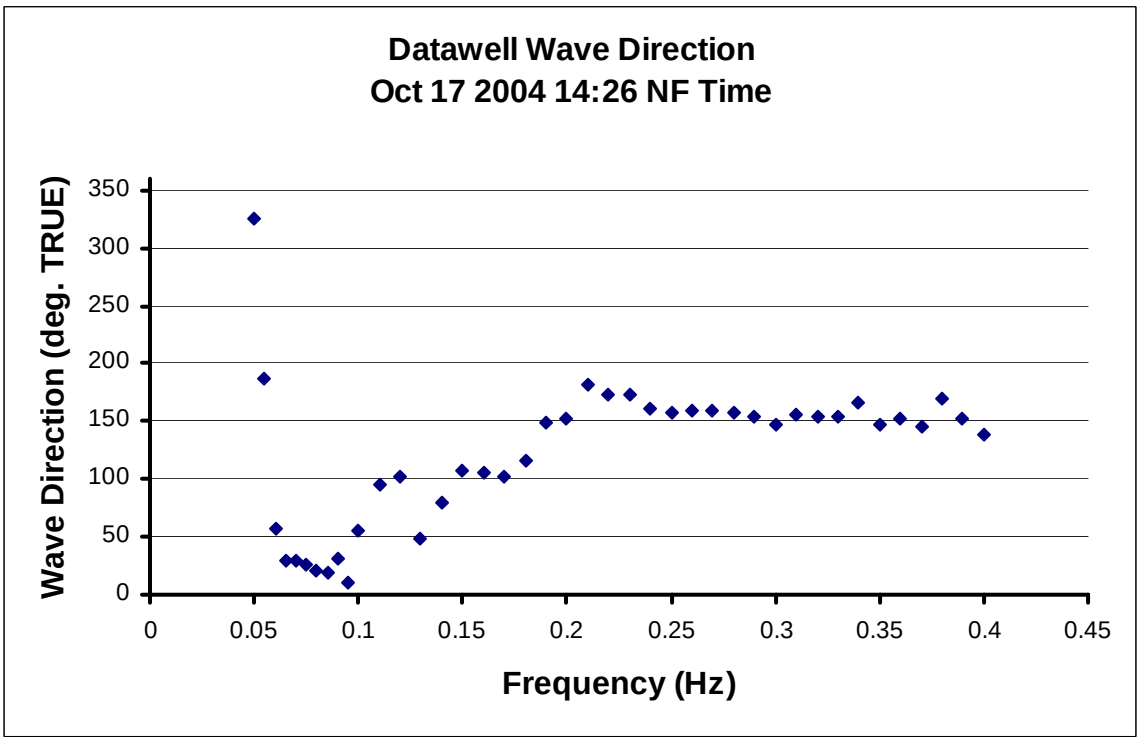

Datawell Spectral Density Data
Oct 17 200412:26 NF Time
S(m²/Hz)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

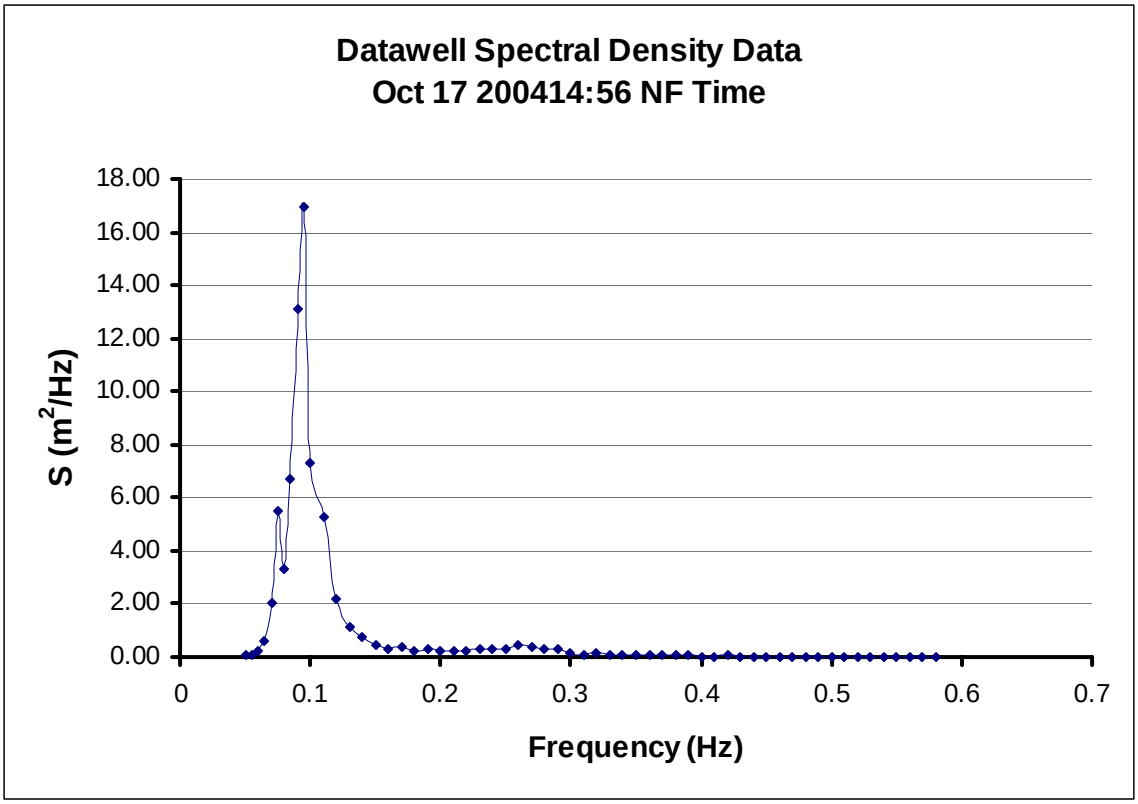

Datawell Wave Direction
Oct 17 2004 12:26 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

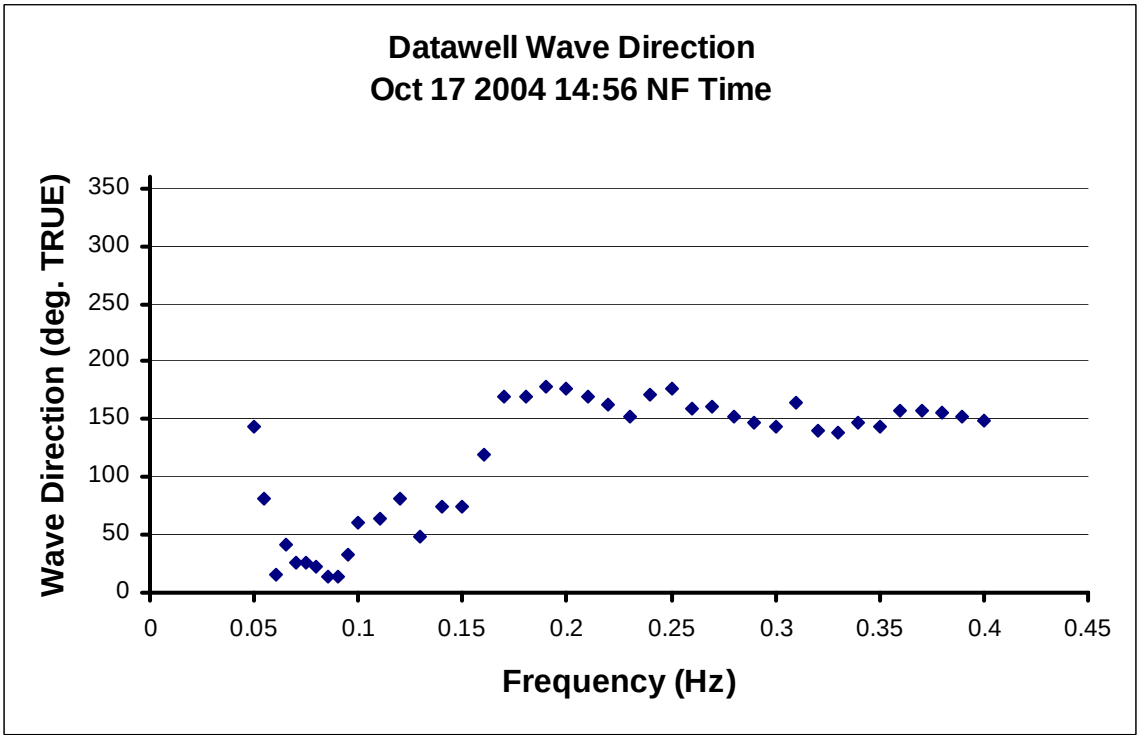

Datawell Spectral Density Data
Oct 17 200413:56 NF Time
S (m²/Hz)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

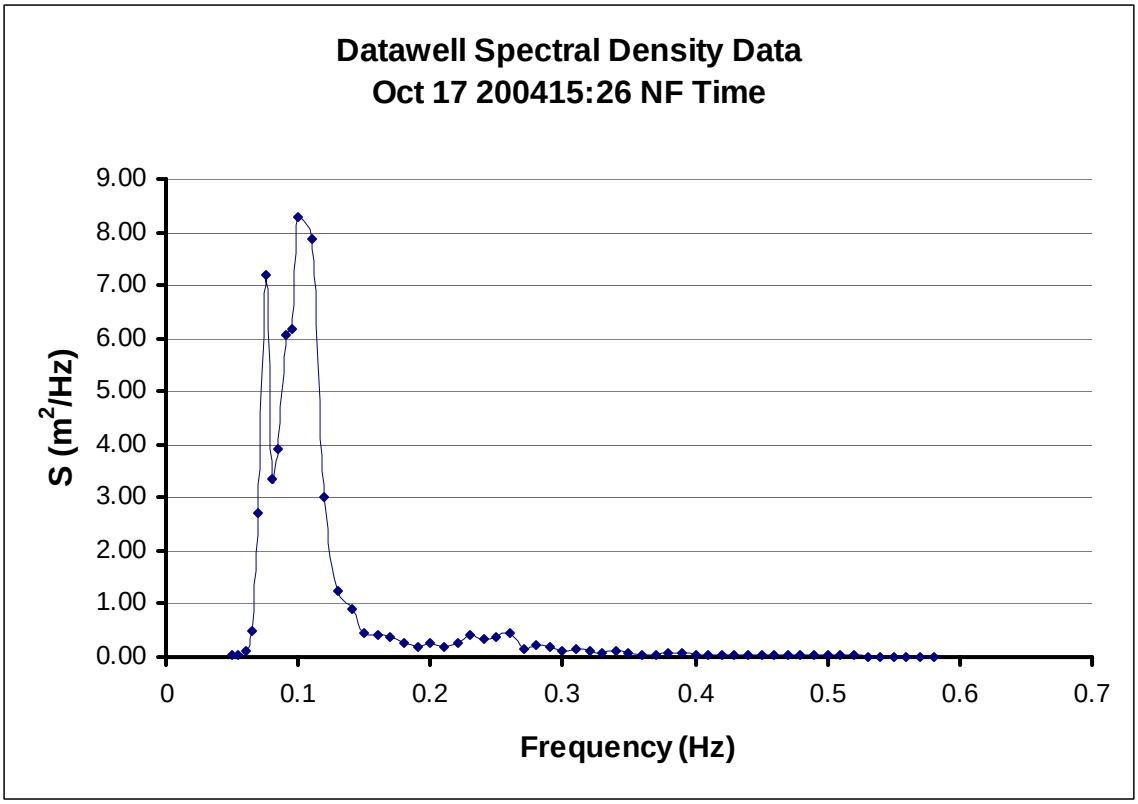

Datawell Wave Direction
Oct 17 2004 13:56 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

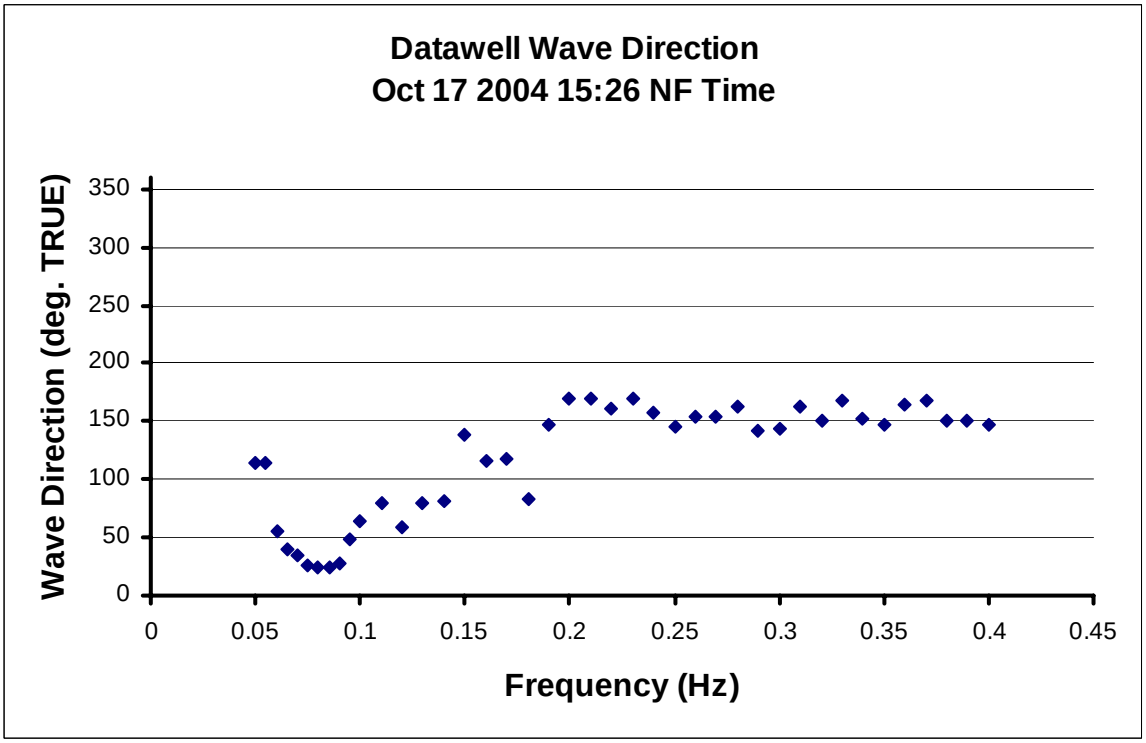

Datawell Spectral Density Data
Oct 17 200414:26 NF Time
S (m2/Hz)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

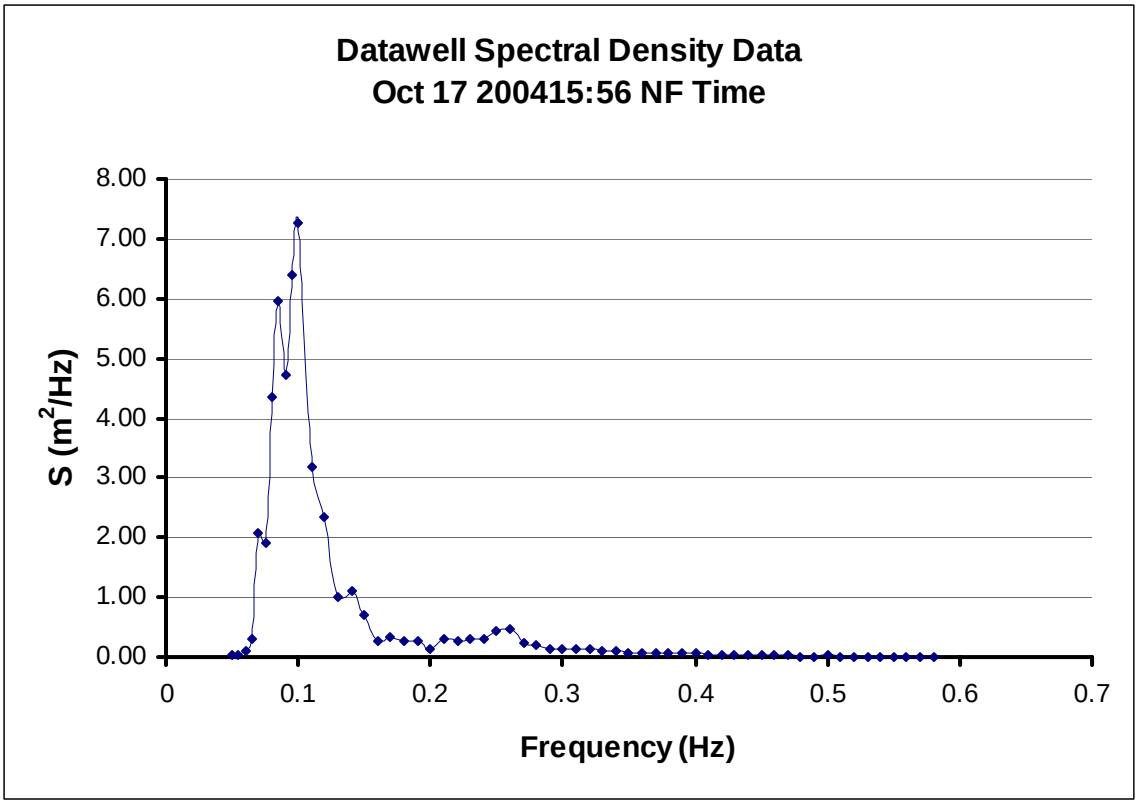

Datawell Wave Direction
Oct 17 2004 14:26 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

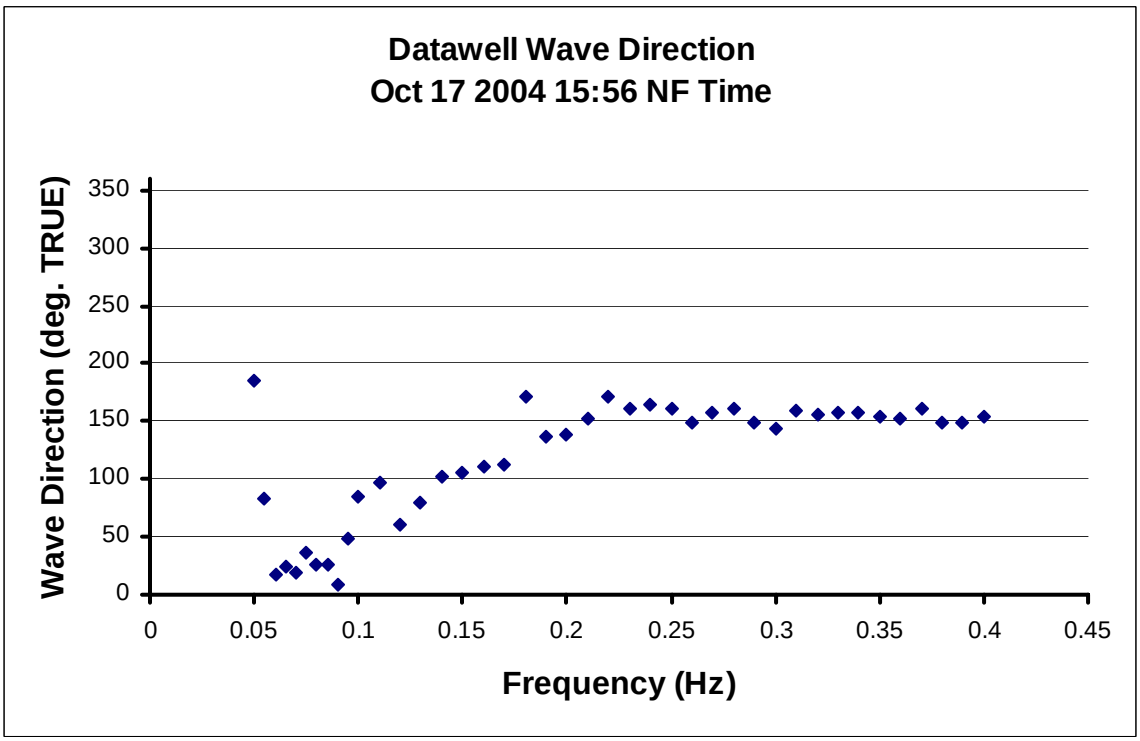

Datawell Spectral Density Data
Oct 17 200414:56 NF Time
S (m²/Hz)
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

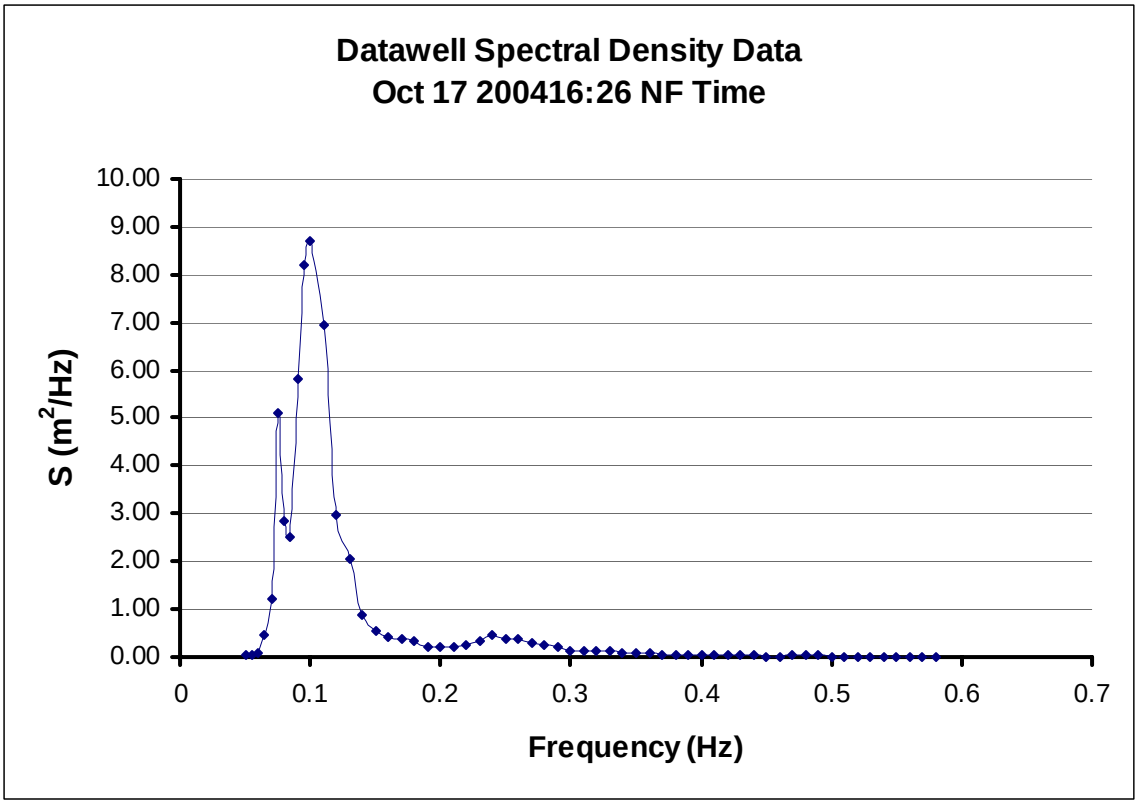

Datawell Wave Direction
Oct 17 2004 14:56 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

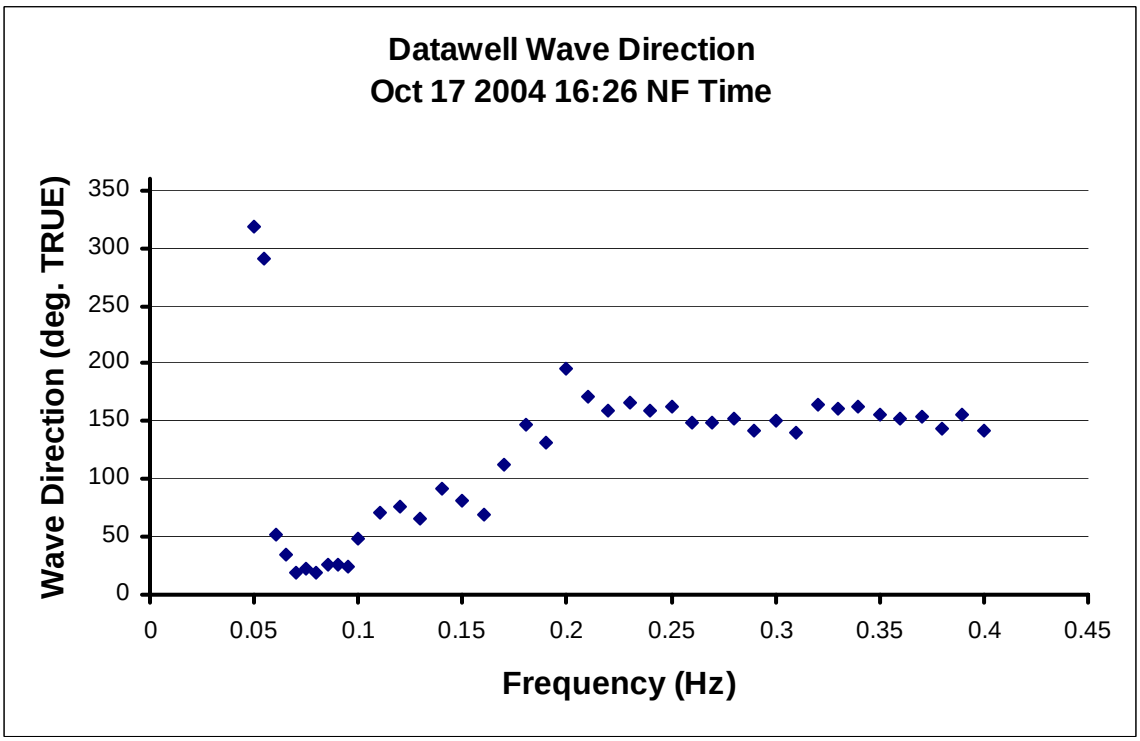

Datawell Spectral Density Data
Oct 17 200415:26 NF Time
S (m²/Hz)
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)


Datawell Wave Direction
Oct 17 2004 15:26 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)


Datawell Spectral Density Data
Oct 17 200415:56 NF Time
S (m²/Hz)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)


Datawell Wave Direction
Oct 17 2004 15:56 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

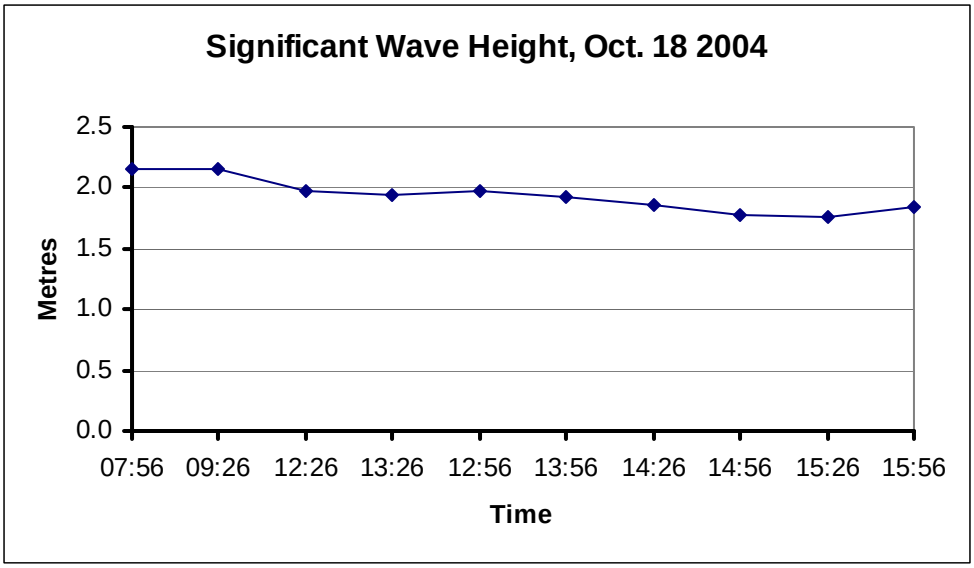

Datawell Spectral Density Data
Oct 17 200416:26 NF Time
S (m2/Hz)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

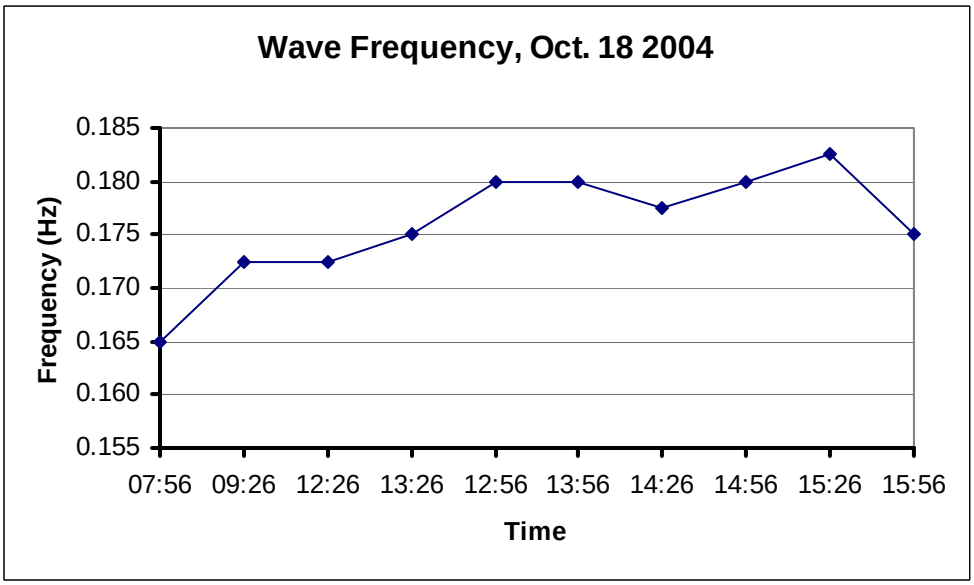

Datawell Wave Direction
Oct 17 2004 16:26 NF Time
Wave Direction (deg. TRUE)
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

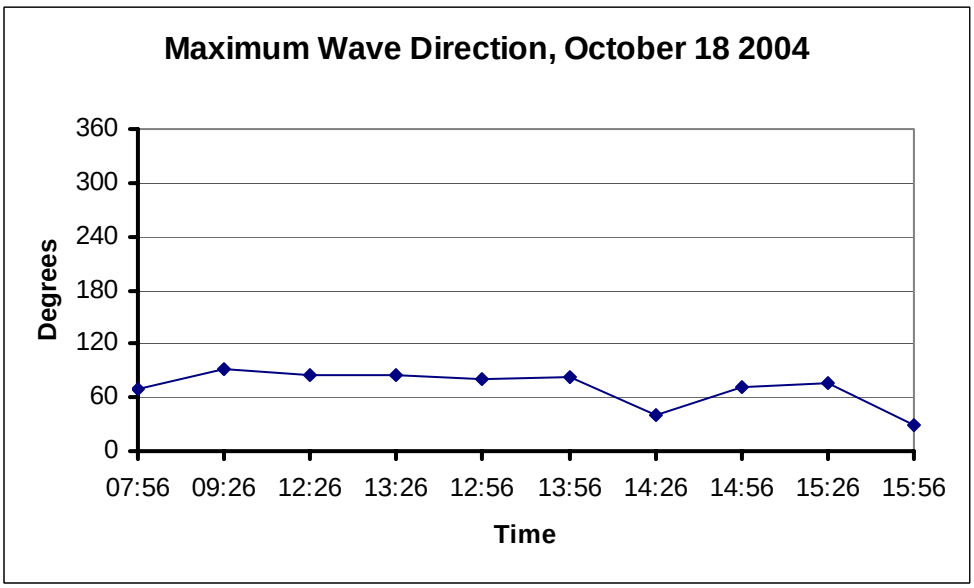
**Summary of Wave Statistics Collected Using Datawell Directional Wave Buoy**
**CCGA Miss Jacqueline IV** **Proj. 2017**

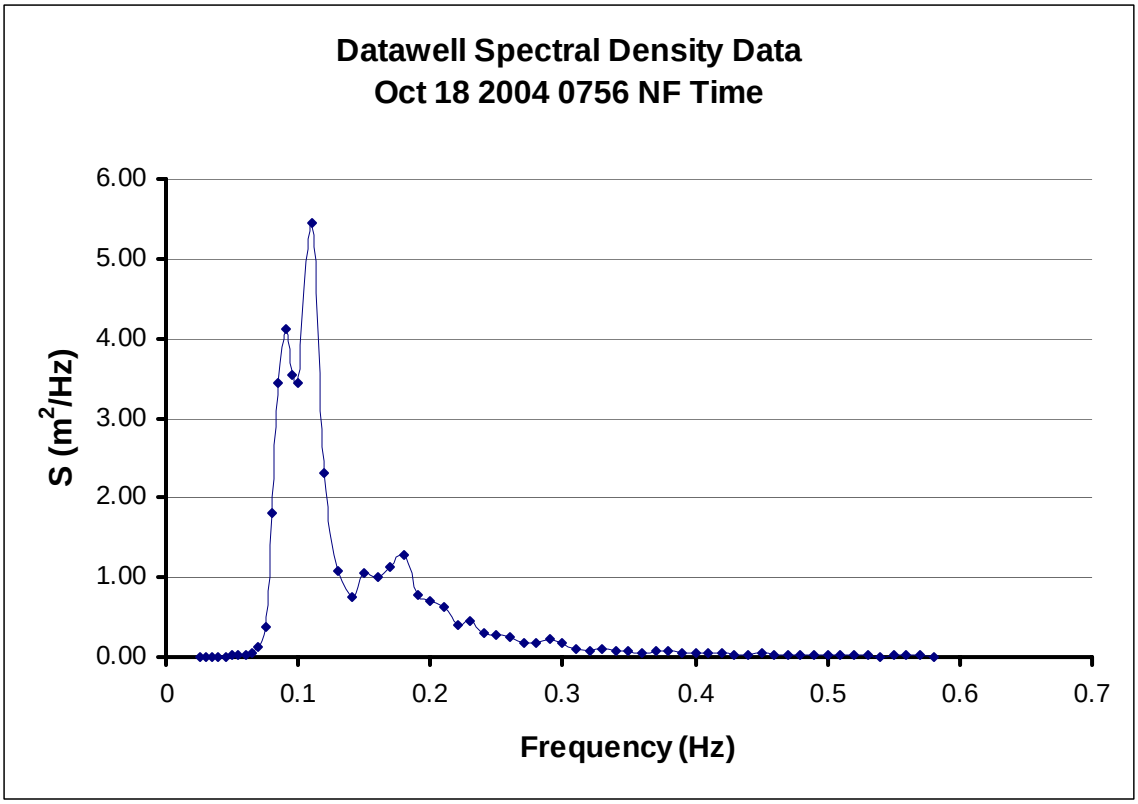
**October 18, 2004**

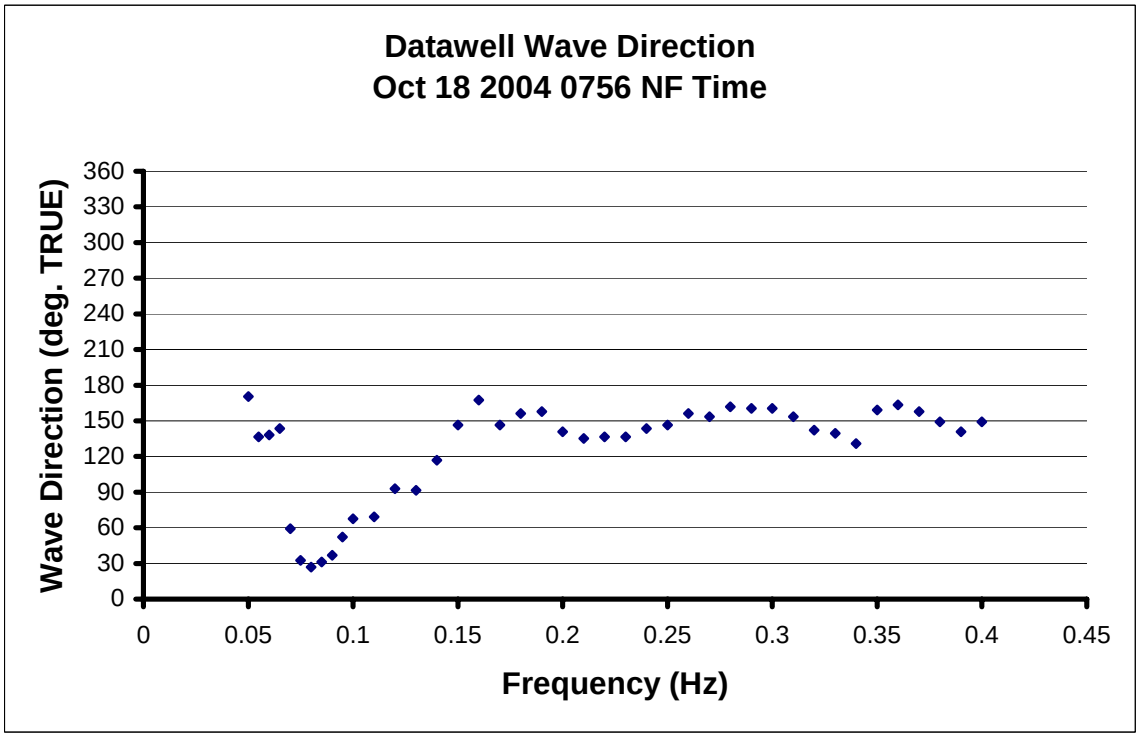
| NF Time | Sig. Wave Height (m) | Mean Wave Period (s) | Mean Wave Frequency (Hz) | Maximum Spectral Density ($m^2$/Hz) | Max. Wave Dir. (deg. TRUE) |
|---|---|---|---|---|---|
| 07:56 | 2.16 | 6.06 | 0.1650 | 5.46 | 69.10 |
| 09:26 | 2.15 | 5.80 | 0.1725 | 4.25 | 91.60 |
| 12:26 | 1.98 | 5.80 | 0.1725 | 4.34 | 84.57 |
| 13:26 | 1.94 | 5.71 | 0.1750 | 4.08 | 85.98 |
| 12:56 | 1.97 | 5.56 | 0.1800 | 3.96 | 80.35 |
| 13:56 | 1.92 | 5.56 | 0.1800 | 4.10 | 83.16 |
| 14:26 | 1.86 | 5.63 | 0.1775 | 3.43 | 40.98 |
| 14:56 | 1.78 | 5.56 | 0.1800 | 2.16 | 71.91 |
| 15:26 | 1.76 | 5.48 | 0.1825 | 2.55 | 76.13 |
| 15:56 | 1.85 | 5.71 | 0.1750 | 2.88 | 28.32 |

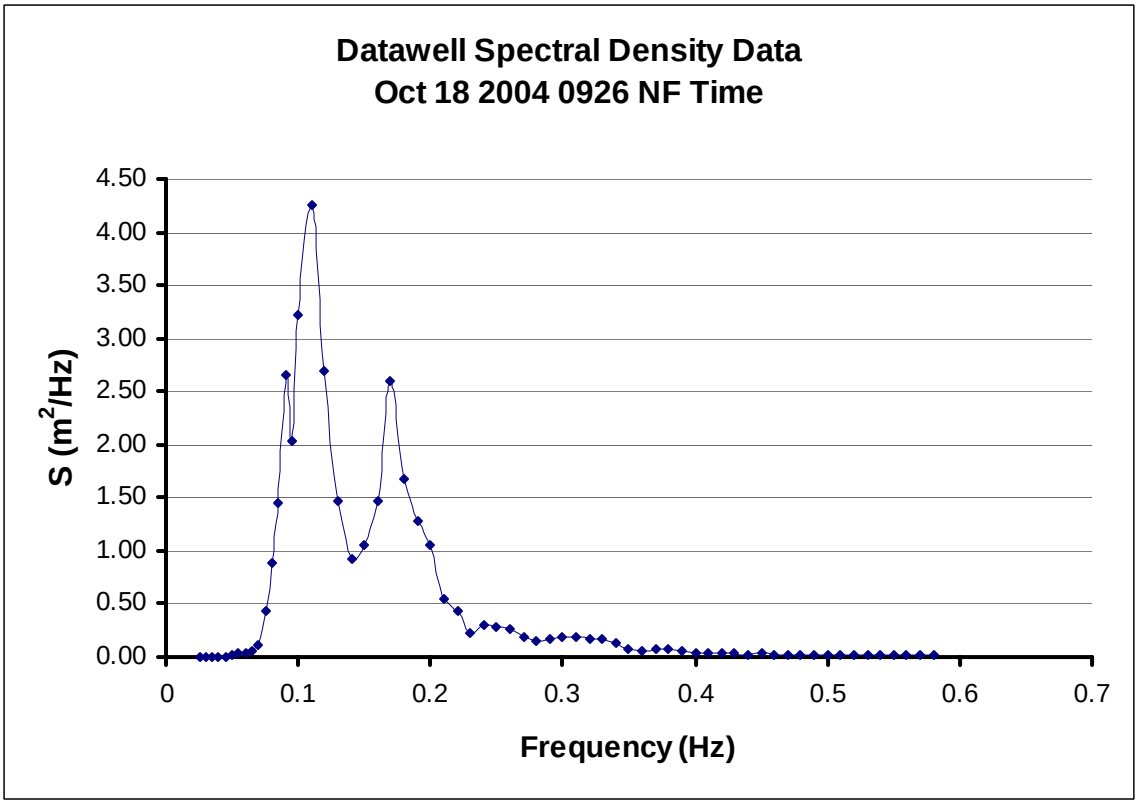

Significant Wave Height, Oct. 18 2004
Metres
2.5
2.0
1.5
1.0
0.5
0.0
07:56
09:26
12:26
13:26
12:56
13:56
14:26
14:56
15:26
15:56
Time

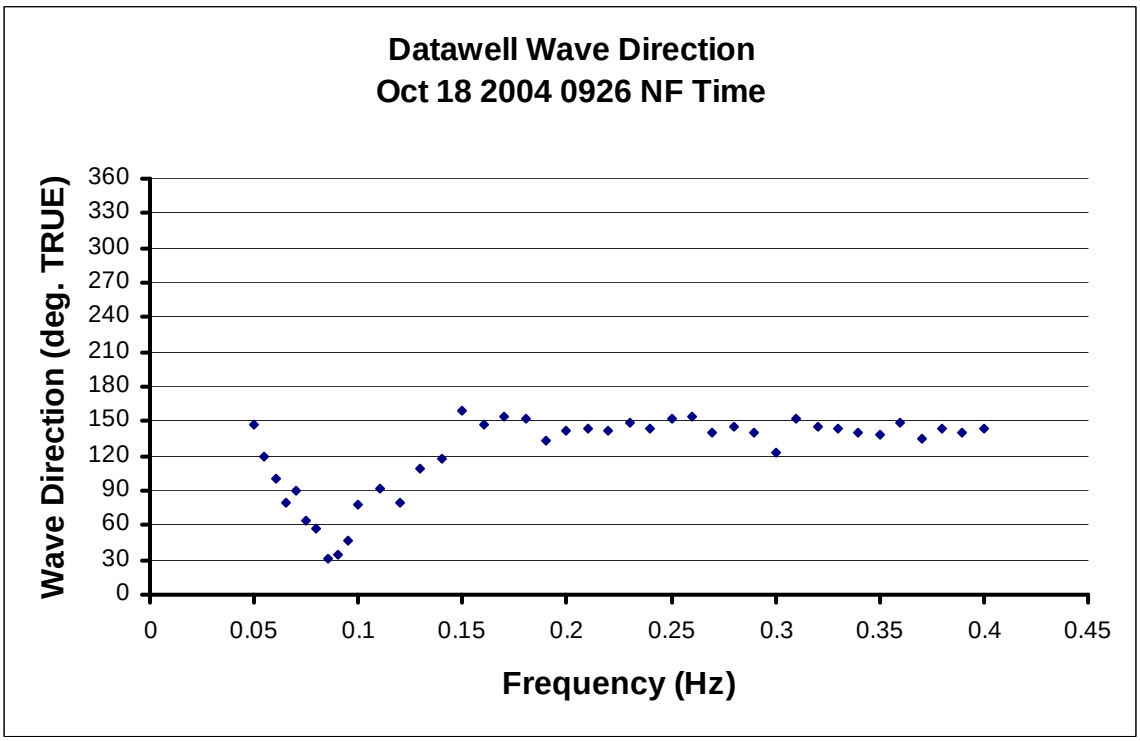

Wave Frequency, Oct. 18 2004
Frequency (Hz)
0.185
0.180
0.175
0.170
0.165
0.160
0.155
07:56
09:26
12:26
13:26
12:56
13:56
14:26
14:56
15:26
15:56
Time

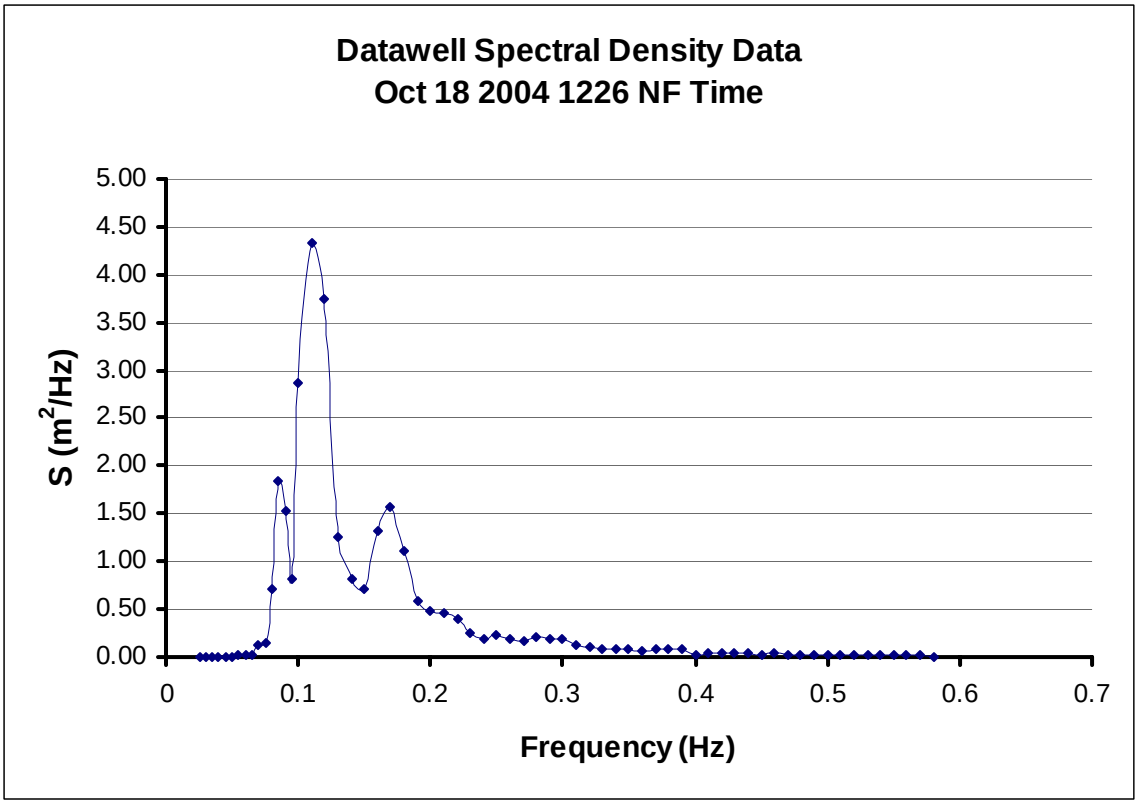

Maximum Wave Direction, October 18 2004
Degrees
360
300
240
180
120
60
0
07:56
09:26
12:26
13:26
12:56
13:56
14:26
14:56
15:26
15:56
Time

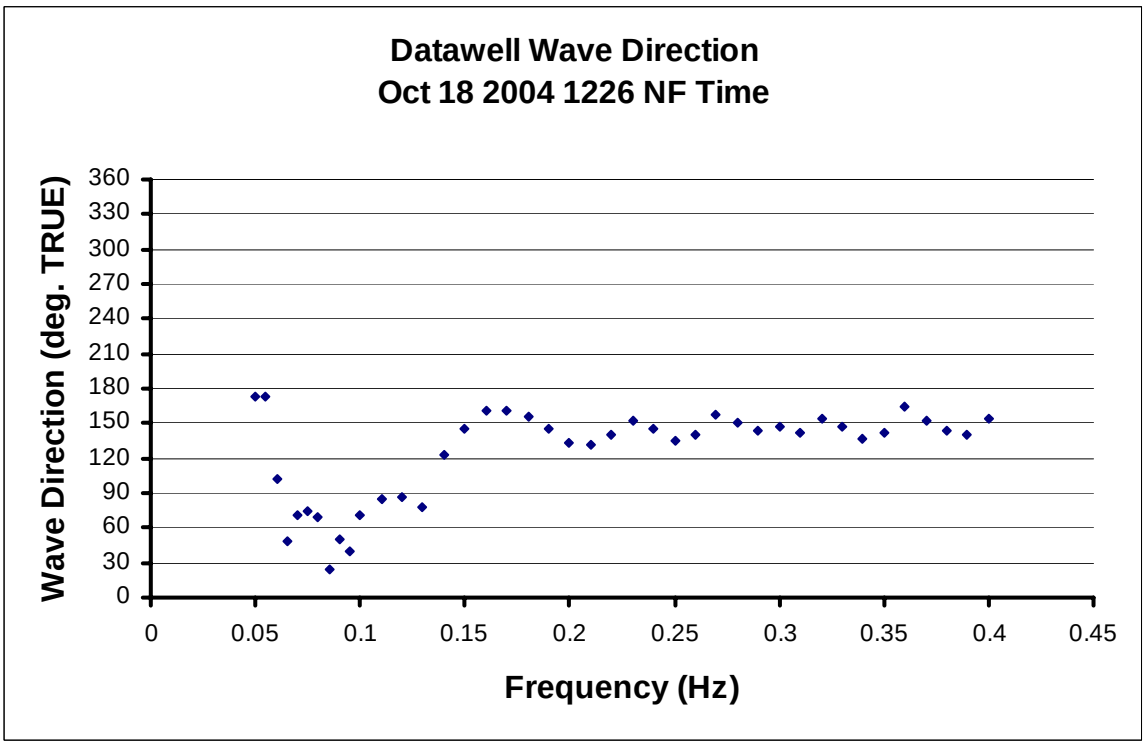

Datawell Spectral Density Data
Oct 18 2004 0756 NF Time
S (m²/Hz)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

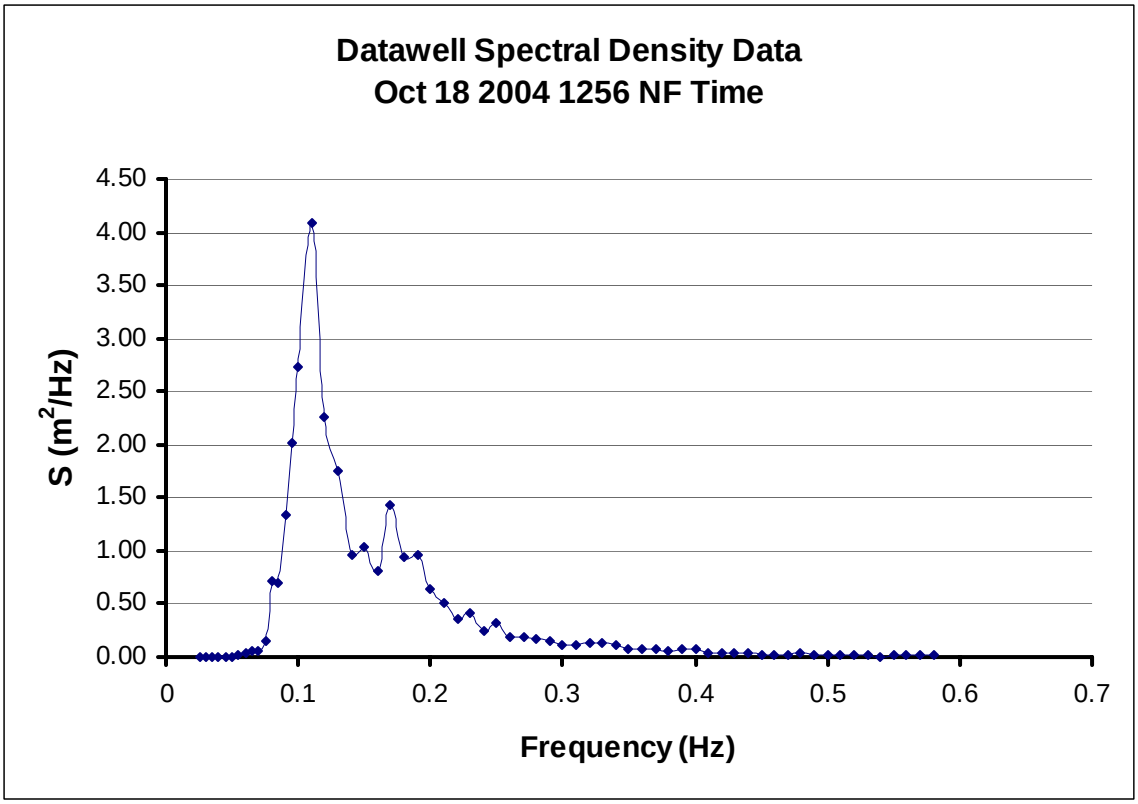

Datawell Wave Direction
Oct 18 2004 0756 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

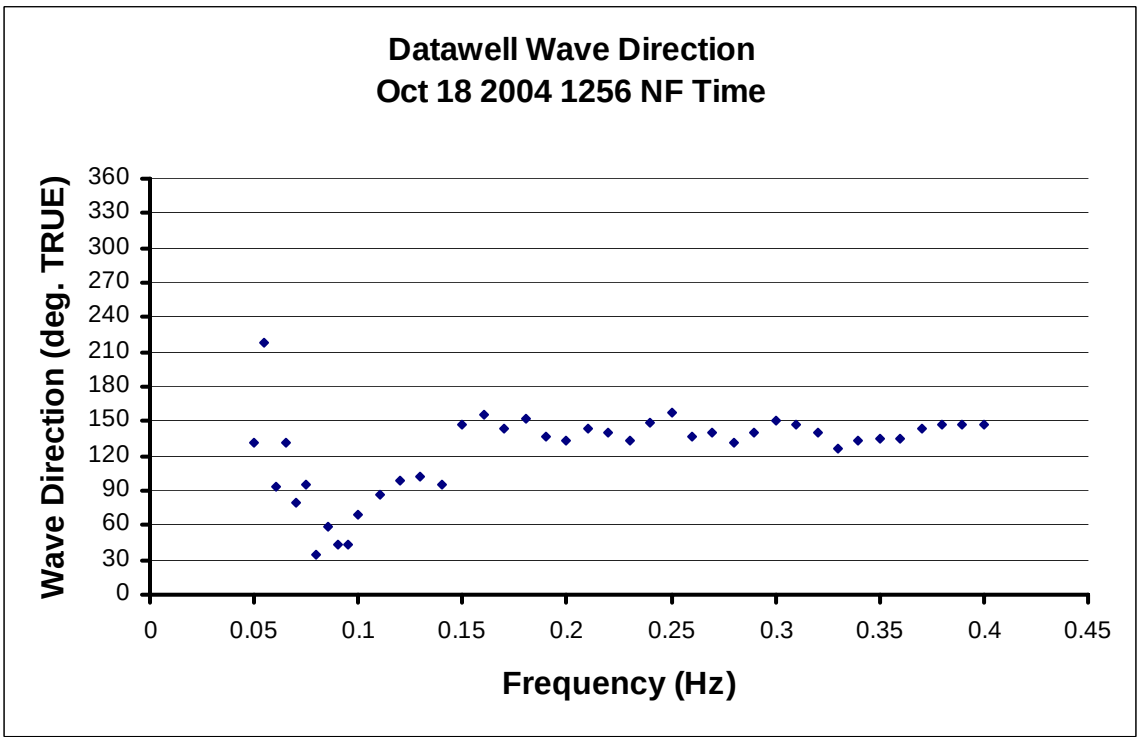

Datawell Spectral Density Data
Oct 18 2004 0926 NF Time
S (m²/Hz)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

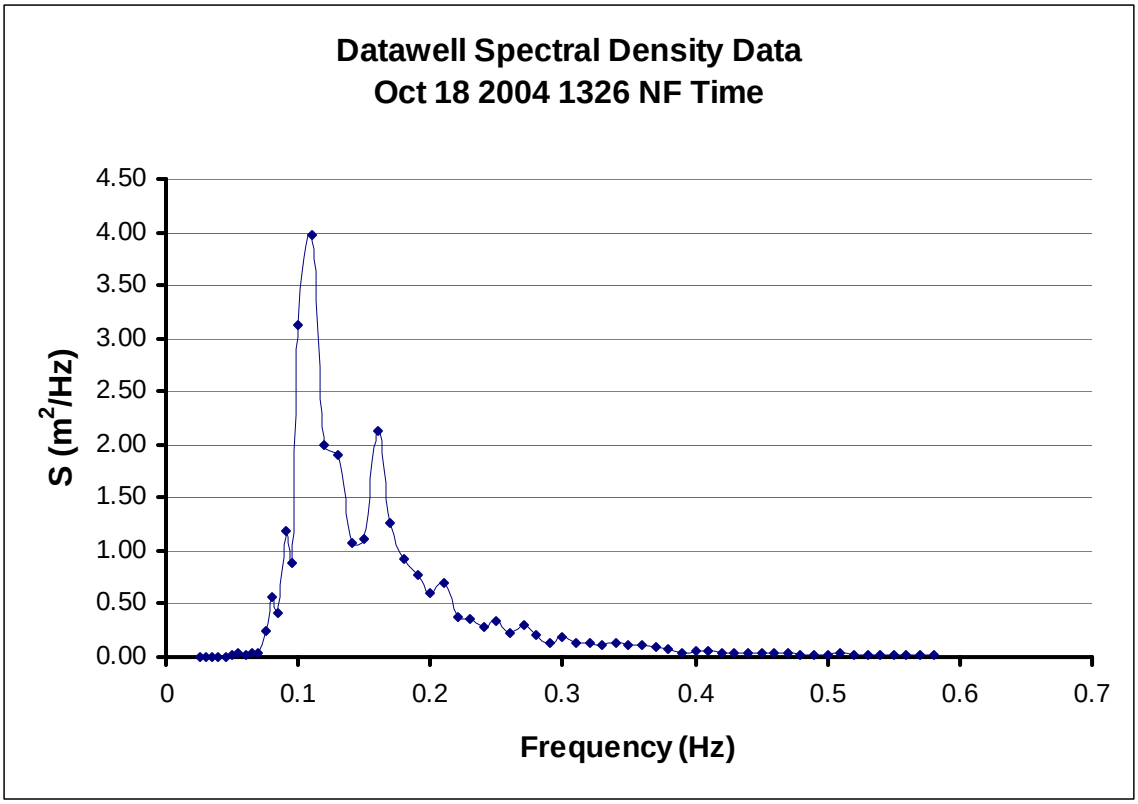

Datawell Wave Direction
Oct 18 2004 0926 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

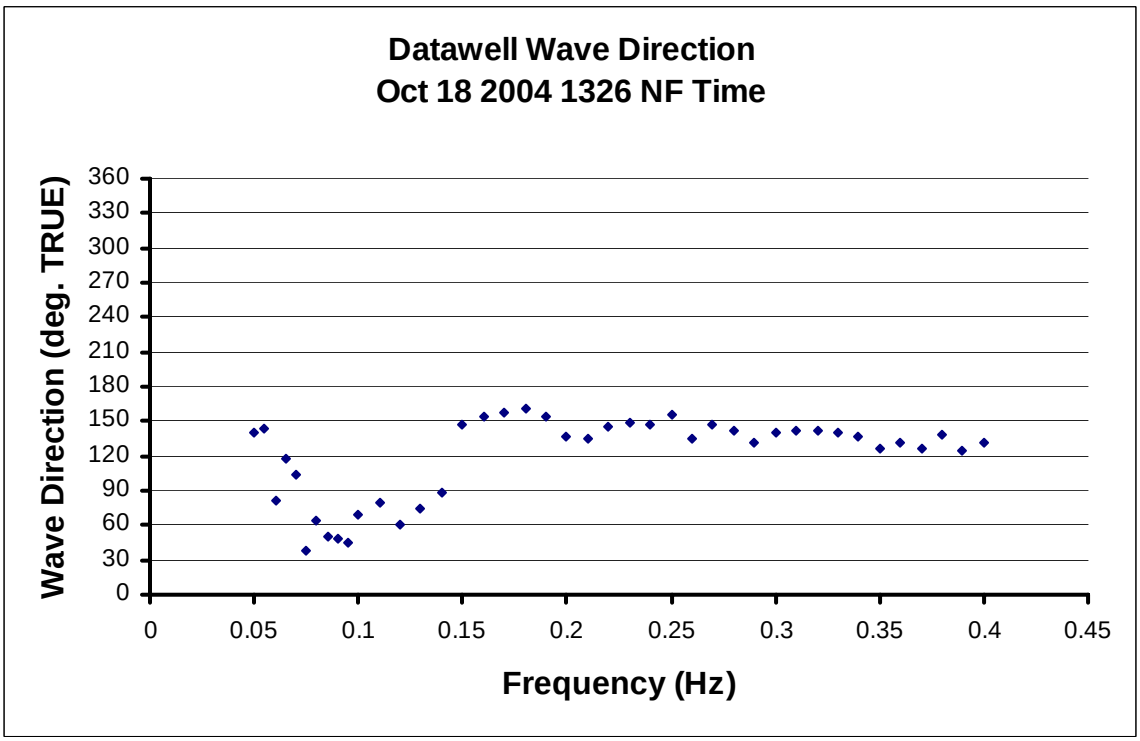

Datawell Spectral Density Data
Oct 18 2004 1226 NF Time
S (m²/Hz)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

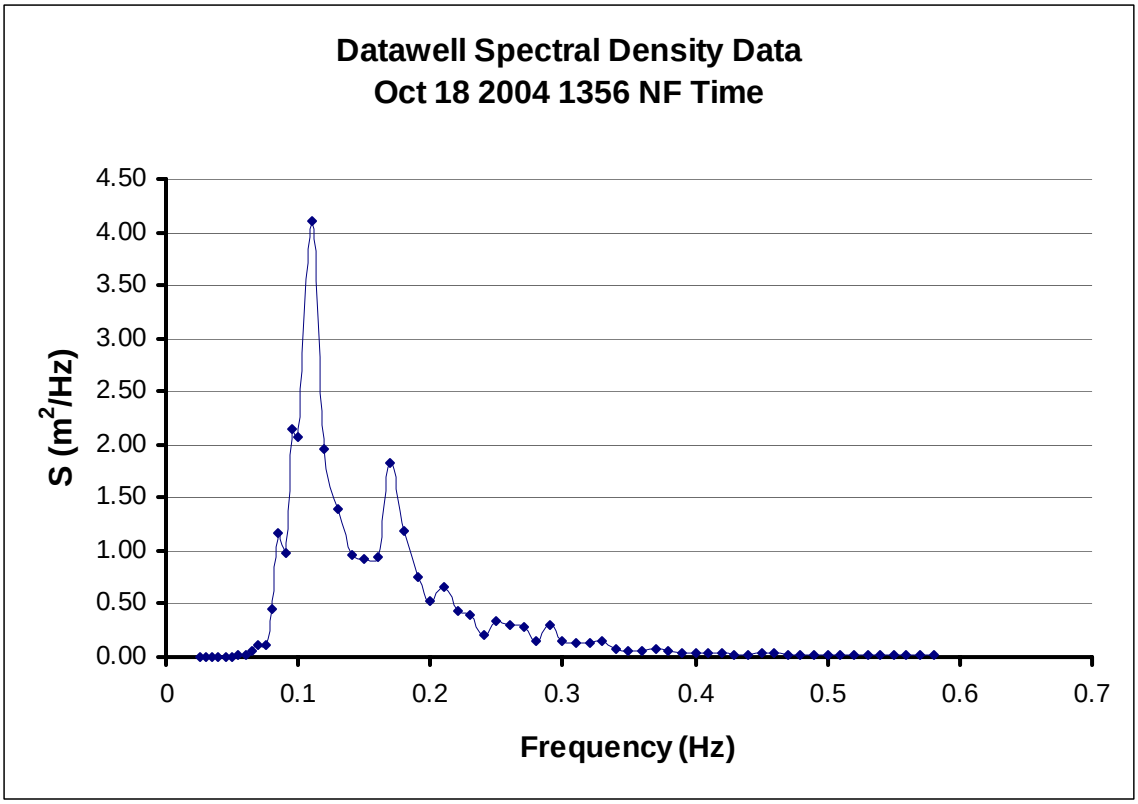

Datawell Wave Direction
Oct 18 2004 1226 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

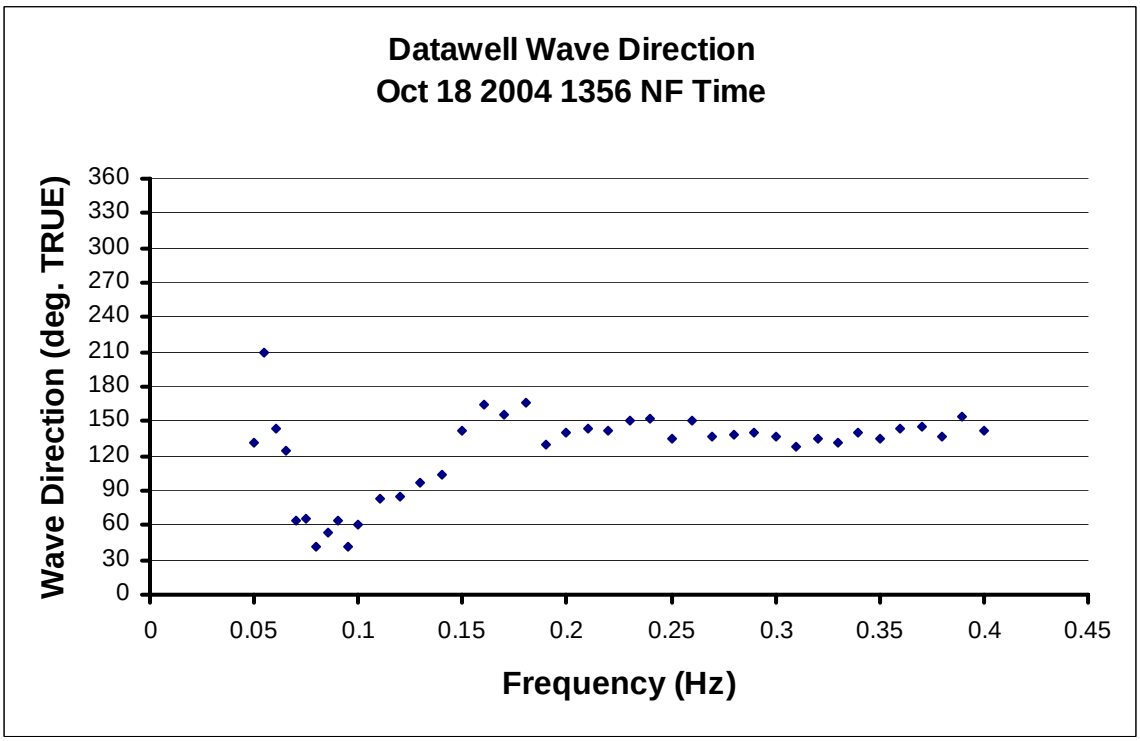

Datawell Spectral Density Data
Oct 18 2004 1256 NF Time
S (m²/Hz)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

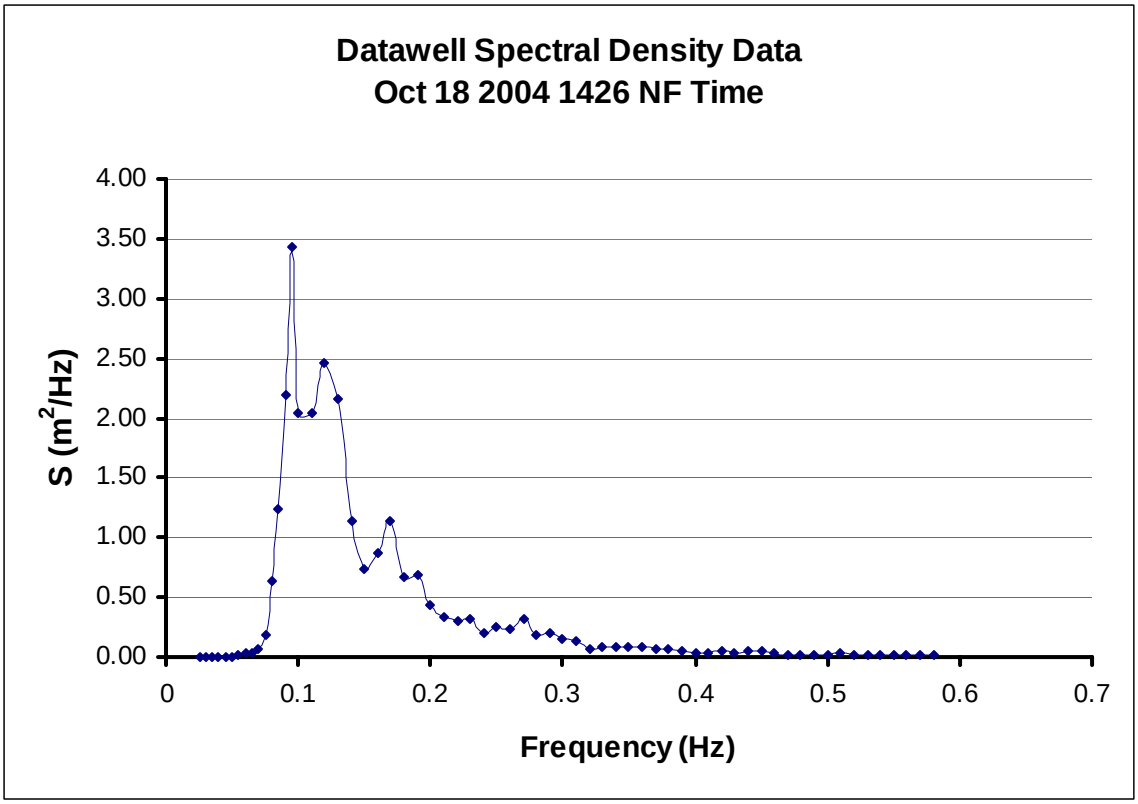

Datawell Wave Direction
Oct 18 2004 1256 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

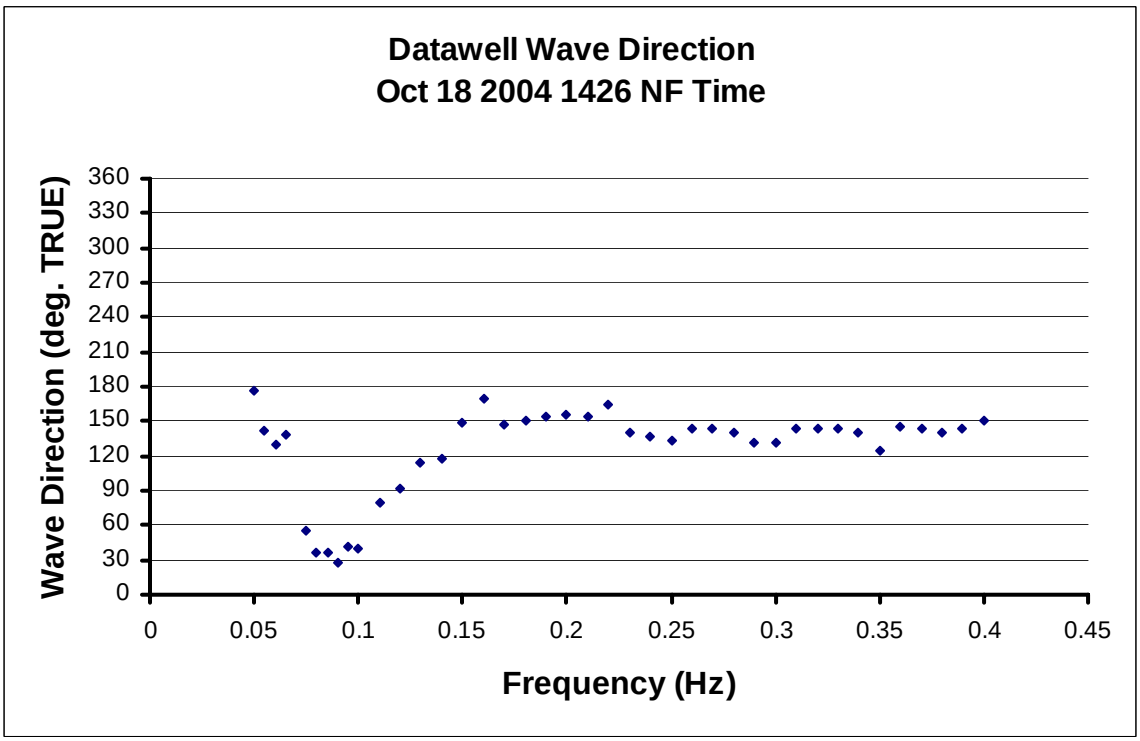

Datawell Spectral Density Data
Oct 18 2004 1326 NF Time
S (m²/Hz)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

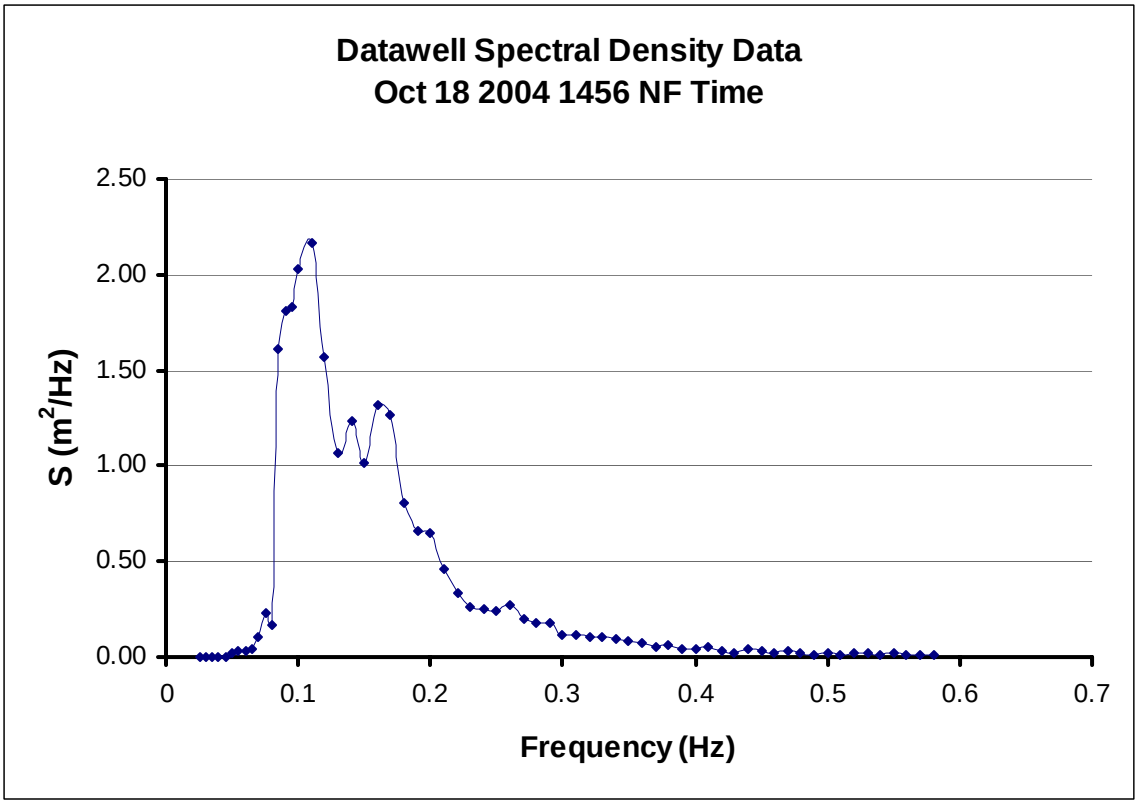

Datawell Wave Direction
Oct 18 2004 1326 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

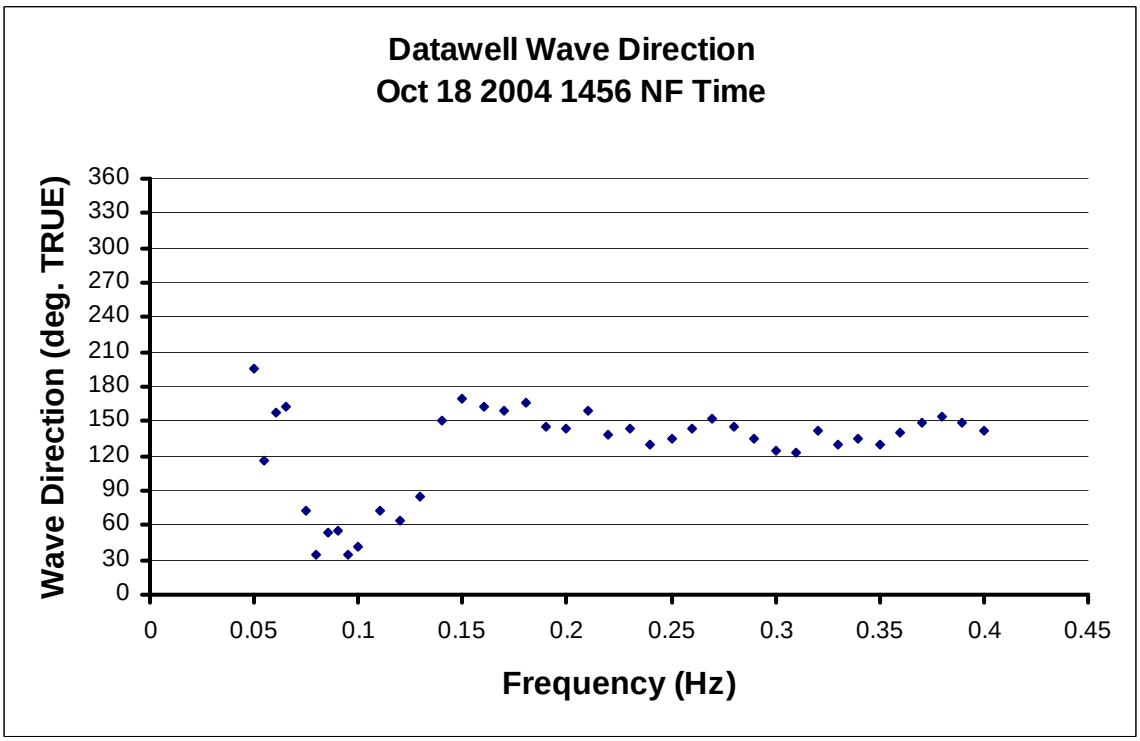

Datawell Spectral Density Data
Oct 18 2004 1356 NF Time
S (m²/Hz)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

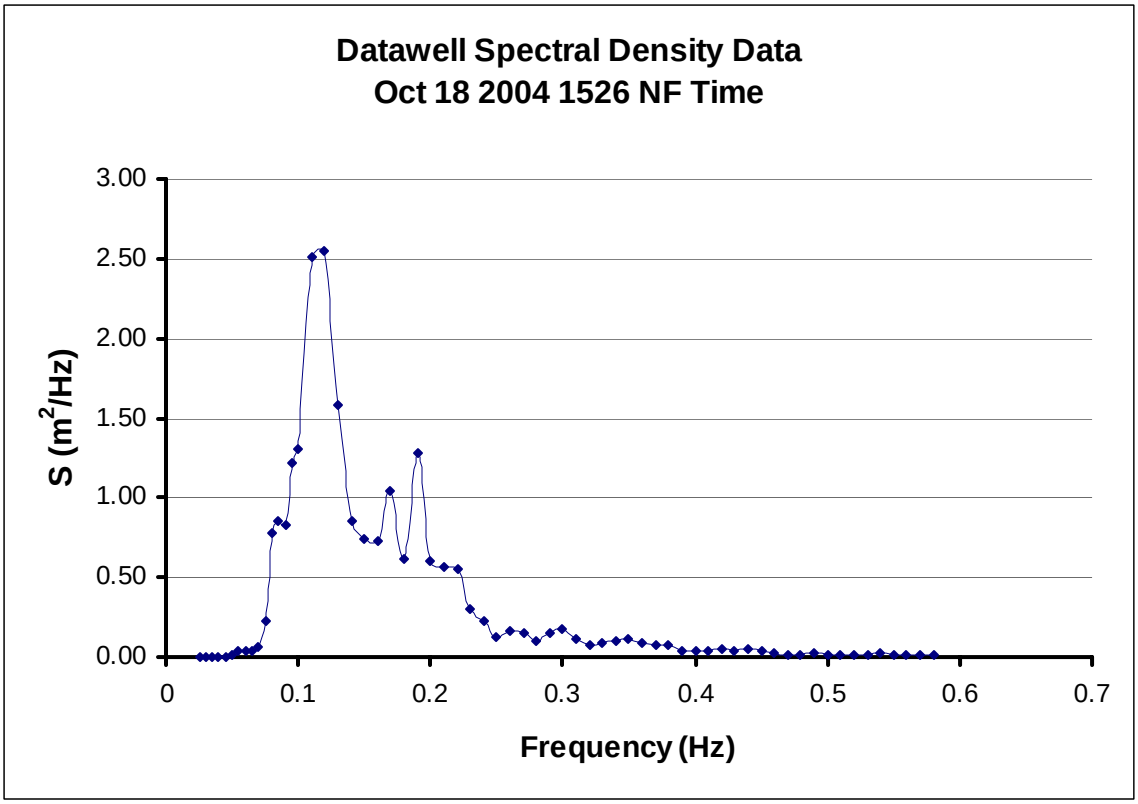

Datawell Wave Direction
Oct 18 2004 1356 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

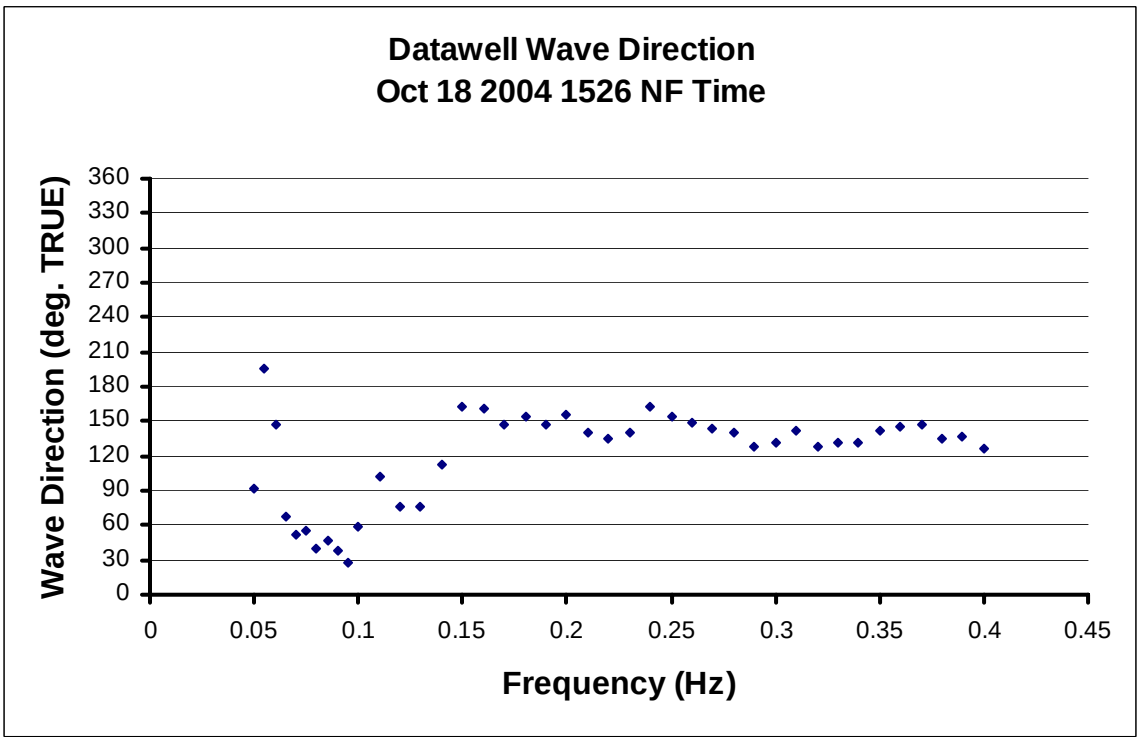

Datawell Spectral Density Data
Oct 18 2004 1426 NF Time
S (m²/Hz)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

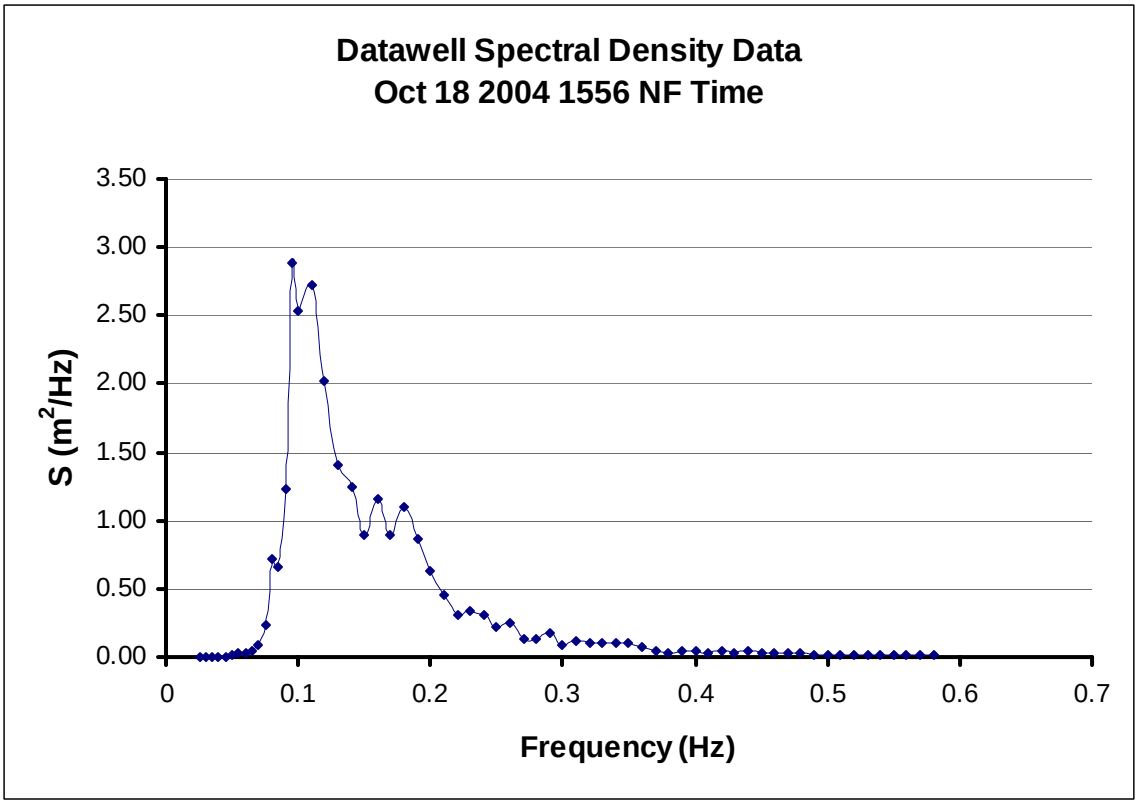

Datawell Wave Direction
Oct 18 2004 1426 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

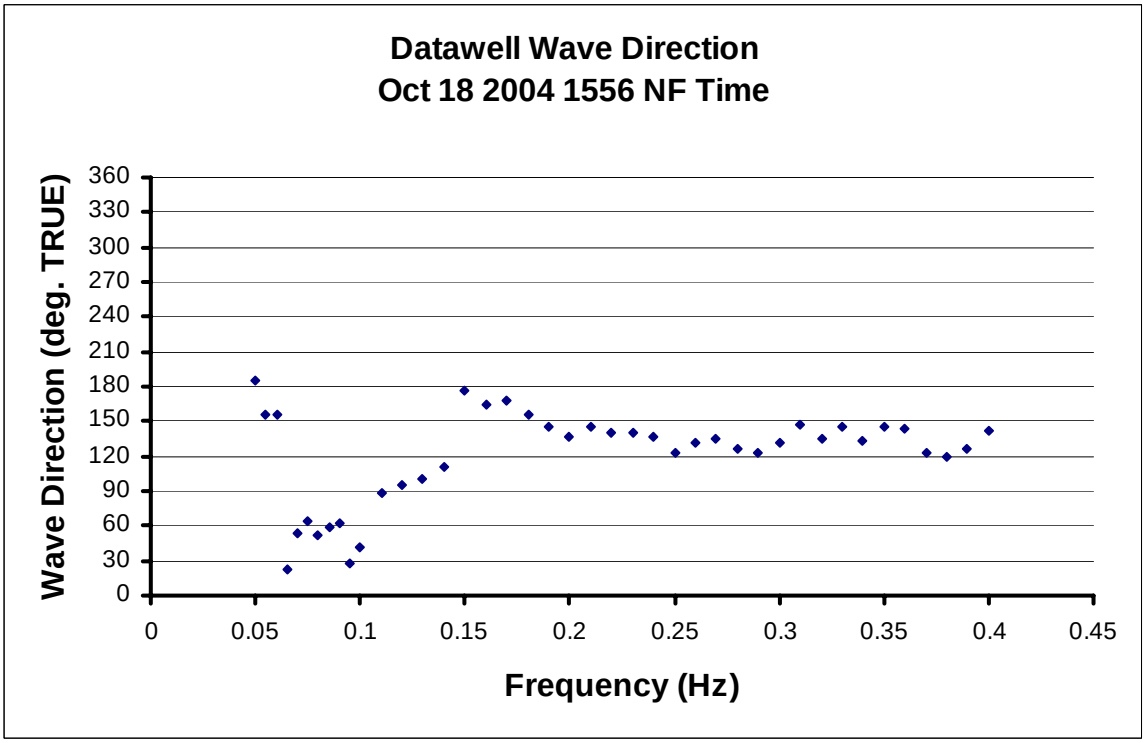

Datawell Spectral Density Data
Oct 18 2004 1456 NF Time
S (m²/Hz)
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)


Datawell Wave Direction
Oct 18 2004 1456 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)


Datawell Spectral Density Data
Oct 18 2004 1526 NF Time
S (m²/Hz)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

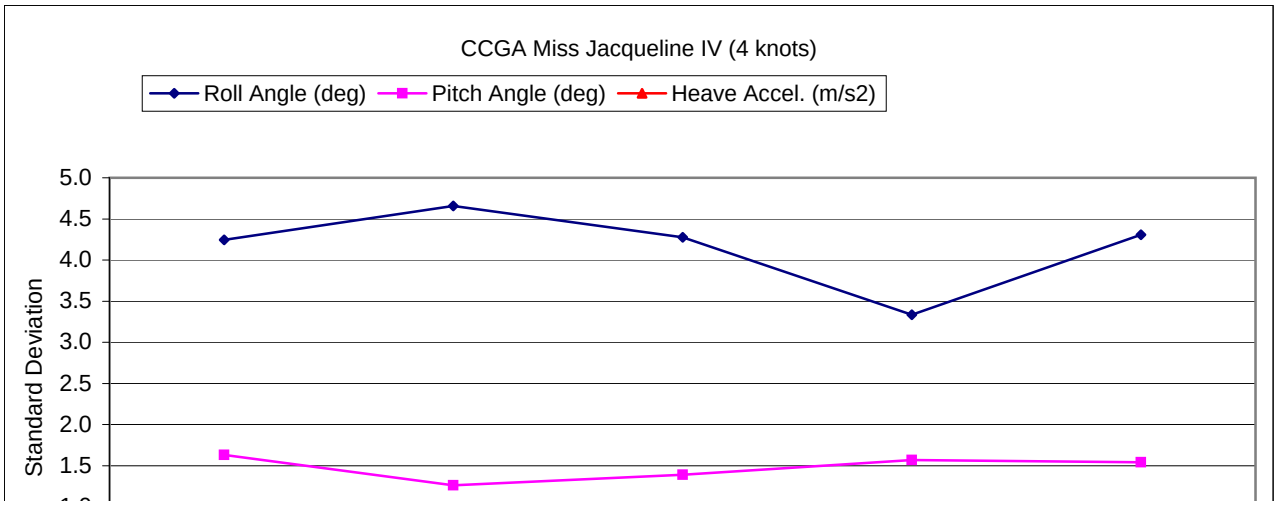

Datawell Wave Direction
Oct 18 2004 1526 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

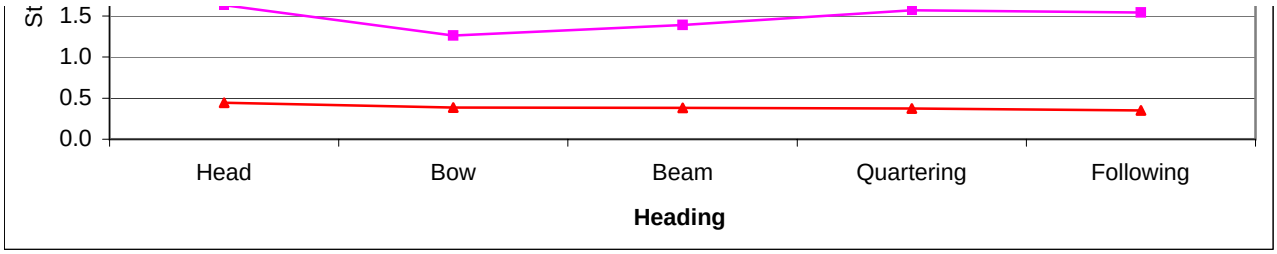

Datawell Spectral Density Data
Oct 18 2004 1556 NF Time
S (m²/Hz)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Frequency (Hz)

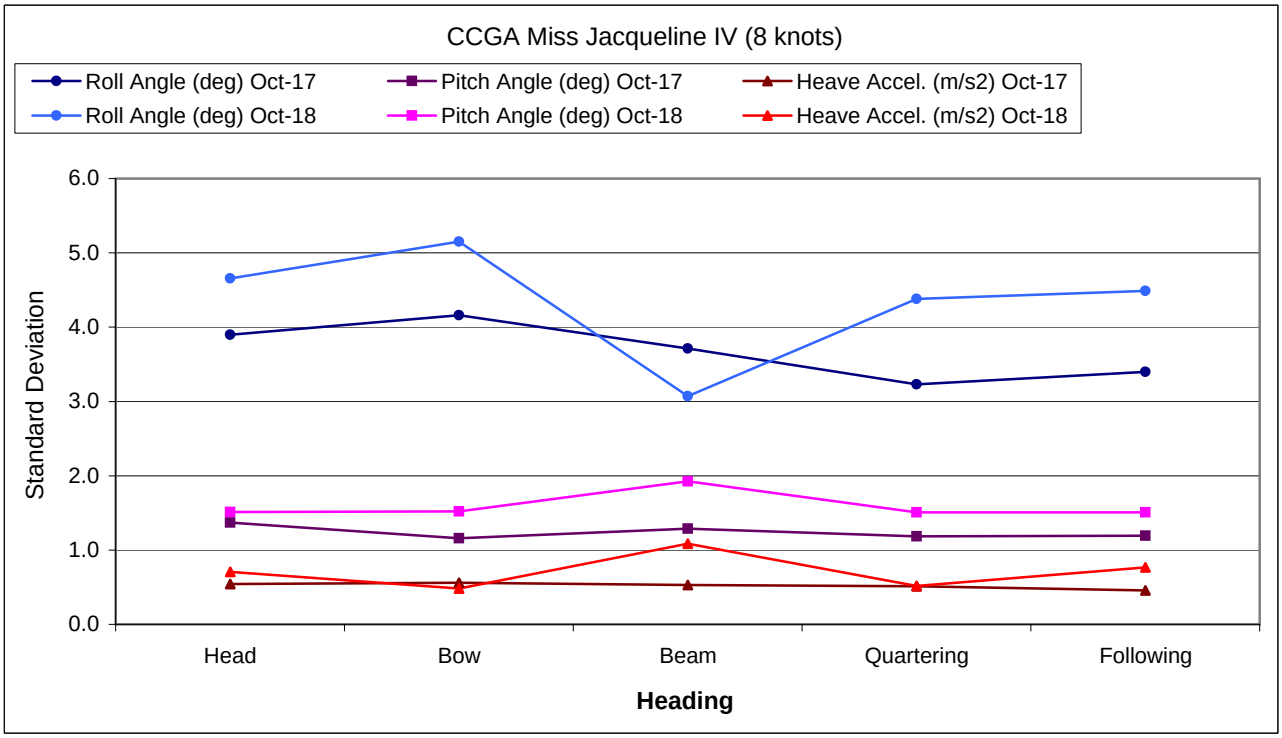

Datawell Wave Direction
Oct 18 2004 1556 NF Time
Wave Direction (deg. TRUE)
360
330
300
270
240
210
180
150
120
90
60
30
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Frequency (Hz)

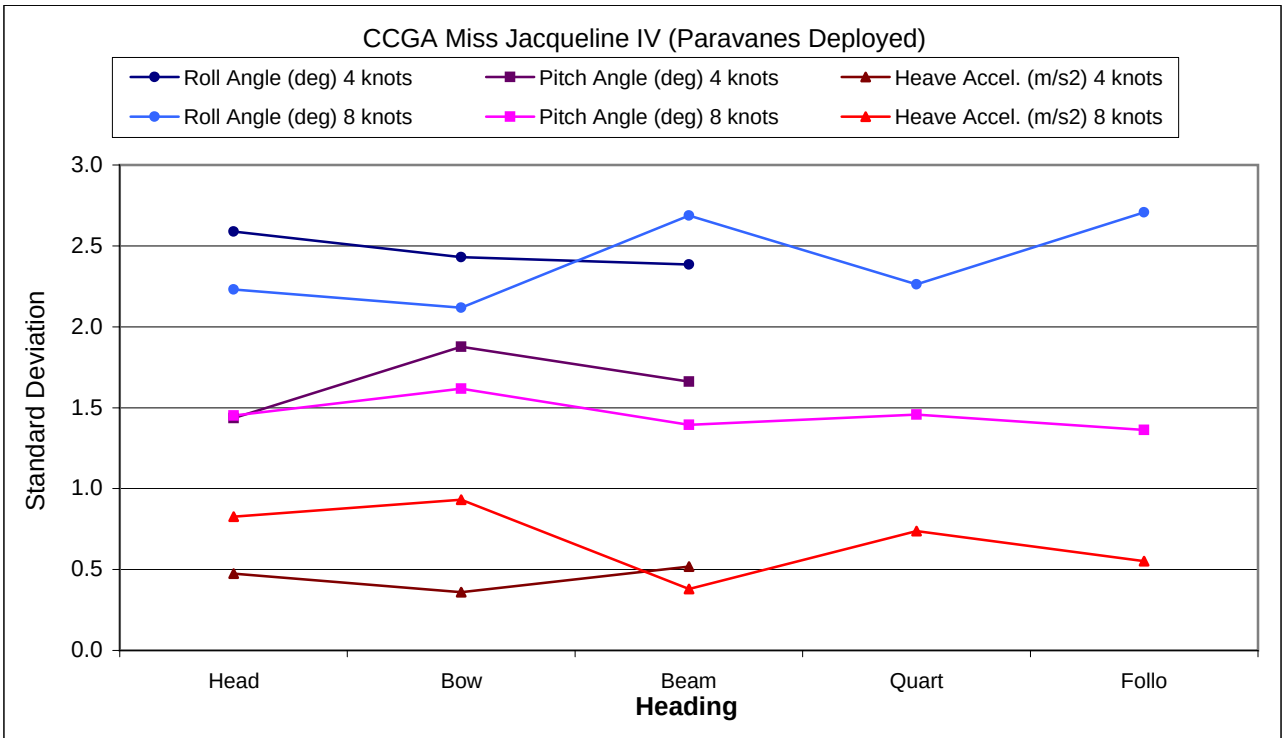
# Appendix J
# Tables of Basic Information and Statistics for Each Trial Run

| Date | Speed (kts) | Run Heading | Roll Angle (deg) | Pitch Angle (deg) | Yaw Angle (deg) | Surge Accel. ($m/s^2$) | Sway Accel. ($m/s^2$) | Heave Accel. ($m/s^2$) |
|---|---|---|---|---|---|---|---|---|
| 17-Oct | 0 | Drift1 | 4.940 | 1.813 | 9.351 | 0.185 | 0.214 | 0.361 |
| 17-Oct | 0 | Drift2 | 4.563 | 1.832 | 11.053 | 0.176 | 0.218 | 0.400 |
| 17-Oct | 0 | Drift3 | 3.824 | 1.931 | 11.563 | 0.174 | 0.237 | 0.443 |
| 18-Oct | 0 | Drift4 | 3.959 | 2.223 | 13.877 | 0.174 | 0.309 | 0.499 |
| 18-Oct | 0 | Drift5 | 3.935 | 2.247 | 13.220 | 0.179 | 0.274 | 0.470 |
| | | | | | | | | |
| 17-Oct | 4 | Head | 4.246 | 1.631 | 3.099 | 0.186 | 0.203 | 0.443 |
| 17-Oct | 4 | Bow | 4.658 | 1.261 | 2.889 | 0.142 | 0.242 | 0.386 |
| 17-Oct | 4 | Beam | 4.277 | 1.388 | 3.832 | 0.152 | 0.223 | 0.381 |
| 17-Oct | 4 | Quartering | 3.337 | 1.569 | 3.109 | 0.200 | 0.197 | 0.373 |
| 17-Oct | 4 | Following | 4.306 | 1.542 | 2.980 | 0.199 | 0.208 | 0.351 |
| | | | | | | | | |
| 17-Oct | 8 | Head | 3.896 | 1.369 | 2.149 | 0.169 | 0.260 | 0.543 |
| 17-Oct | 8 | Bow | 4.162 | 1.158 | 2.087 | 0.170 | 0.268 | 0.561 |
| 17-Oct | 8 | Beam | 3.711 | 1.289 | 2.461 | 0.175 | 0.237 | 0.529 |
| 17-Oct | 8 | Quartering | 3.230 | 1.184 | 2.145 | 0.197 | 0.252 | 0.514 |
| 17-Oct | 8 | Following | 3.399 | 1.194 | 2.216 | 0.178 | 0.257 | 0.456 |
| | | | | | | | | |
| 18-Oct | 8 | Head | 4.657 | 1.512 | 2.317 | 0.209 | 0.366 | 0.706 |
| 18-Oct | 8 | Bow | 5.150 | 1.519 | 2.711 | 0.207 | 0.292 | 0.484 |
| 18-Oct | 8 | Beam | 3.070 | 1.927 | 2.168 | 0.266 | 0.273 | 1.084 |
| 18-Oct | 8 | Quartering | 4.379 | 1.507 | 2.541 | 0.180 | 0.298 | 0.515 |
| 18-Oct | 8 | Following | 4.487 | 1.508 | 2.530 | 0.205 | 0.371 | 0.765 |
| | | | | | | | | |
| Paravanes Deployed | | | | | | | | |
| 17-Oct | 4 | Bow | 2.590 | 1.435 | 2.159 | 0.184 | 0.237 | 0.475 |
| 17-Oct | 4 | Beam | 2.431 | 1.877 | 2.967 | 0.186 | 0.192 | 0.359 |
| 17-Oct | 4 | Quartering | 2.385 | 1.661 | 2.436 | 0.217 | 0.261 | 0.518 |
| | | | | | | | | |
| 18-Oct | 8 | Head | 2.231 | 1.452 | 1.933 | 0.209 | 0.309 | 0.826 |
| 18-Oct | 8 | Bow | 2.119 | 1.618 | 1.962 | 0.229 | 0.281 | 0.932 |
| 18-Oct | 8 | Beam | 2.688 | 1.394 | 2.454 | 0.169 | 0.245 | 0.379 |
| 18-Oct | 8 | Quartering | 2.262 | 1.458 | 2.099 | 0.196 | 0.310 | 0.738 |
| 18-Oct | 8 | Following | 2.708 | 1.362 | 2.287 | 0.182 | 0.286 | 0.551 |




St
1.5
1.0
0.5
0.0
Head
Bow
Beam
Quartering
Following
Heading


CCGA Miss Jacqueline IV (8 knots)
Roll Angle (deg) Oct-17
Pitch Angle (deg) Oct-17
Heave Accel. (m/s2) Oct-17
Roll Angle (deg) Oct-18
Pitch Angle (deg) Oct-18
Heave Accel. (m/s2) Oct-18
Standard Deviation
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Head
Bow
Beam
Quartering
Following
Heading


CCGA Miss Jacqueline IV (Paravanes Deployed)
Roll Angle (deg) 4 knots
Pitch Angle (deg) 4 knots
Heave Accel. (m/s2) 4 knots
Roll Angle (deg) 8 knots
Pitch Angle (deg) 8 knots
Heave Accel. (m/s2) 8 knots
Standard Deviation
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Head
Bow
Beam
Quart
Follo
Heading

Roll Angle (deg) Oct-17 | Pitch Angle (deg) Oct-17 | Heave Accel. ($m/s^2$) Oct-17

Roll Angle (deg) Oct-18 | Pitch Angle (deg) Oct-18 | Heave Accel. ($m/s^2$) Oct-18

Roll Angle (deg) 4 knots
Roll Angle (deg) 8 knots
Pitch Angle (deg) 4 kr
Pitch Angle (deg) 8 kr
Heave Accel. ($m/s^2$) 4 knots
Heave Accel. ($m/s^2$) 8 knots

File Name: beam_drift_20041017071402
Date: October 17 2004 NF Time: 07:14

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0 c Water Density: 1023.63 kg/m$^3$
Latitude: 47.5604 North Longitude: 52.4269 West
Duration of Run: 1503.5 seconds Number of Samples: 75176
Nominal Forward Speed Over the Ground: 0.0 knots
Nominal Course Over the Ground: N/A (deg. TRUE)
Total Distance Traveled During the Run: 0.13 nautical miles
Nominal Relative Wind Speed: 12 knots
Nominal Relative Wind Direction: 310 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: N/A RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.59 m | N/A m |
| | Direction: | 043.7 (deg. True) | N/A (deg. True) |
| | Peak Period: | 10.89 s | N/A s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1293 Hz | |
| | Pitch Angle | 0.2217 Hz | major peak @ 0.08821 Hz |
| | Heave Accel. | 0.1035 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.100 | 359.990 | 255.343 | 79.899 |
| SOG (m/s) | 0.008 | 1.914 | 0.489 | 0.261 |
| SOG (knots) | 0.016 | 3.720 | 0.950 | 0.507 |
| | | | | |
| Rudder Angle (deg.) | -40.312 | -39.155 | -40.040 | 0.156 |
| Shaft Speed (RPM) | N/A | N/A | N/A | N/A |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -12.299 | 15.583 | 0.804 | 4.940 |
| Pitch Angle (deg) | -10.146 | 4.194 | -2.283 | 1.813 |
| Yaw Angle (deg) | -19.901 | 19.041 | 0.355 | 9.351 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.901 | 1.259 | 0.118 | 0.322 |
| Sway Acceleration (m/s$^2$) | -3.034 | 2.949 | 0.031 | 1.005 |
| Heave Acceleration (m/s$^2$) | -11.127 | -8.156 | -9.743 | 0.441 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: beam_drift_20041017071402
Date: October 17 2004 NF Time: 07:14

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.697 | 0.831 | 0.000 | 0.185 |
| Sway Acceleration ($m/s^2$) | -0.669 | 0.651 | 0.001 | 0.214 |
| Heave Acceleration ($m/s^2$) | -1.510 | 1.187 | -0.050 | 0.361 |
| Surge Displacement (m) | -1.876 | 1.691 | 0.000 | 0.471 |
| Sway Displacement (m) | -1.197 | 1.134 | 0.000 | 0.396 |
| Heave Displacement (m) | -2.770 | 3.308 | 0.001 | 0.700 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.82903 | 0.69187 | 0.000 | 0.233 |
| Sway Acceleration ($m/s^2$) | -0.95352 | 1.1775 | 0.001 | 0.346 |
| Heave Acceleration ($m/s^2$) | -1.4412 | 1.4882 | -0.050 | 0.450 |
| Surge Displacement (m) | -1.4625 | 1.4954 | 0.000 | 0.410 |
| Sway Displacement (m) | -1.3787 | 1.3455 | 0.000 | 0.491 |
| Heave Displacement (m) | -3.1634 | 3.4318 | 0.001 | 0.738 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: head_20041017074257
Date: October 17 2004 NF Time: 07:42

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0 c Water Density: 1023.63 kg/m$^3$
Latitude: 47.5622 North Longitude: 52.4261 West
Duration of Run: 1502.1 seconds Number of Samples: 75106
Nominal Forward Speed Over the Ground: 3.6 knots
Nominal Course Over the Ground: 042 (deg. TRUE)
Total Distance Traveled During the Run: 1.51 nautical miles
Nominal Relative Wind Speed: 12 knots
Nominal Relative Wind Direction: 310 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 800 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.44 m | 2.96 m |
| | Direction: | 264.4 (deg. True) | 026.81 (deg. True) |
| | Peak Period: | 10.89 s | 12.50 s |
| Peak Response Frequency: | Roll Angle 0.1272 Hz | | |
| | Pitch Angle 0.09764 Hz | major peak @ 0.1155 Hz | |
| | Heave Accel. 0.1065 Hz | major peak @ 0.09514 Hz, 0.2367 Hz | |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 4.430 | 99.770 | 44.110 | 13.154 |
| SOG (m/s) | 1.106 | 2.689 | 1.915 | 0.238 |
| SOG (knots) | 2.149 | 5.227 | 3.722 | 0.462 |
| | | | | |
| Rudder Angle (deg.) | -1.647 | 11.317 | 3.958 | 2.171 |
| Shaft Speed (RPM) | 125.790 | 133.800 | 130.040 | 1.056 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -11.856 | 12.613 | 0.572 | 4.246 |
| Pitch Angle (deg) | -7.569 | 2.547 | -2.321 | 1.631 |
| Yaw Angle (deg) | -7.634 | 7.205 | 0.002 | 3.099 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.704 | 0.954 | 0.121 | 0.249 |
| Sway Acceleration (m/s$^2$) | -2.978 | 2.818 | 0.080 | 0.909 |
| Heave Acceleration (m/s$^2$) | -11.473 | -7.764 | -9.765 | 0.519 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: head_20041017074257
Date: October 17 2004 NF Time: 07:42

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.639 | 0.558 | 0.000 | 0.186 |
| Sway Acceleration ($m/s^2$) | -0.703 | 0.701 | 0.001 | 0.203 |
| Heave Acceleration ($m/s^2$) | -1.470 | 1.424 | -0.043 | 0.443 |
| Surge Displacement (m) | -1.219 | 1.256 | 0.000 | 0.413 |
| Sway Displacement (m) | -1.053 | 1.261 | 0.001 | 0.302 |
| Heave Displacement (m) | -2.150 | 2.297 | 0.000 | 0.736 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.769 | 0.698 | 0.000 | 0.197 |
| Sway Acceleration ($m/s^2$) | -1.261 | 1.092 | 0.001 | 0.329 |
| Heave Acceleration ($m/s^2$) | -1.878 | 2.009 | -0.043 | 0.522 |
| Surge Displacement (m) | -1.038 | 0.981 | 0.000 | 0.343 |
| Sway Displacement (m) | -1.524 | 1.471 | 0.001 | 0.421 |
| Heave Displacement (m) | -2.271 | 2.443 | 0.001 | 0.779 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: fol_20041017081300
Date: October 17 2004 NF Time: 08:13

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0 c Water Density: 1023.63 kg/m$^3$
Latitude: 47.5781 North Longitude: 52.4047 West
Duration of Run: 2483.4 seconds Number of Samples: 124173
Nominal Forward Speed Over the Ground: 3.6 knots
Nominal Course Over the Ground: 222 (deg. TRUE)
Total Distance Traveled During the Run: 2.43 nautical miles
Nominal Relative Wind Speed: 14 knots
Nominal Relative Wind Direction: 140 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 700 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.40 m | 2.96 m |
| | Direction: | 268.6 (deg. True) | 026.81 (deg. True) |
| | Peak Period: | 10.89 s | 12.50 s |
| Peak Response Frequency: | Roll Angle 0.1298 Hz | | |
| | Pitch Angle 0.08277 Hz | | |
| | Heave Accel. 0.08277 Hz | major peak @ 0.08955 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 183.180 | 291.360 | 221.562 | 13.571 |
| SOG (m/s) | 0.906 | 3.786 | 1.865 | 0.315 |
| SOG (knots) | 1.760 | 7.360 | 3.624 | 0.612 |
| | | | | |
| Rudder Angle (deg.) | -8.977 | 4.798 | -1.920 | 2.090 |
| Shaft Speed (RPM) | 109.250 | 115.980 | 112.470 | 0.885 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -12.424 | 17.461 | 1.970 | 4.306 |
| Pitch Angle (deg) | -7.727 | 3.634 | -2.310 | 1.542 |
| Yaw Angle (deg) | -7.477 | 8.315 | -0.013 | 2.980 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.647 | 0.798 | 0.126 | 0.199 |
| Sway Acceleration (m/s$^2$) | -3.302 | 3.152 | -0.162 | 0.911 |
| Heave Acceleration (m/s$^2$) | -11.796 | -8.247 | -9.763 | 0.402 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: fol_20041017081300
Date: October 17 2004 NF Time: 08:13

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.757 | 0.627 | 0.000 | 0.199 |
| Sway Acceleration ($m/s^2$) | -0.715 | 0.741 | 0.001 | 0.208 |
| Heave Acceleration ($m/s^2$) | -1.740 | 1.232 | -0.049 | 0.351 |
| Surge Displacement (m) | -2.222 | 1.999 | 0.000 | 0.617 |
| Sway Displacement (m) | -1.085 | 1.270 | -0.001 | 0.345 |
| Heave Displacement (m) | -2.771 | 2.590 | -0.001 | 0.687 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.790 | 0.720 | 0.000 | 0.204 |
| Sway Acceleration ($m/s^2$) | -1.058 | 1.216 | 0.001 | 0.343 |
| Heave Acceleration ($m/s^2$) | -2.028 | 1.574 | -0.049 | 0.419 |
| Surge Displacement (m) | -1.945 | 1.710 | 0.000 | 0.541 |
| Sway Displacement (m) | -1.390 | 1.663 | -0.001 | 0.446 |
| Heave Displacement (m) | -2.639 | 2.689 | -0.001 | 0.719 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bow_20041017085844
Date: October 17 2004 NF Time: 08:58

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0 c Water Density: 1023.63 kg/m$^3$
Latitude: 47.546 North Longitude: 52.4432 West
Duration of Run: 1501.9 seconds Number of Samples: 75097
Nominal Forward Speed Over the Ground: 3.7 knots
Nominal Course Over the Ground: 087 (deg. TRUE)
Total Distance Traveled During the Run: 1.53 nautical miles
Nominal Relative Wind Speed: 21 knots
Nominal Relative Wind Direction: 270 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 780 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.31 m | 2.88 m |
| | Direction: | 245.9 (deg. True) | 026.81 (deg. True) |
| | Peak Period: | 9.75 s | 11.76 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1258 Hz | |
| | Pitch Angle | 0.1147 Hz | |
| | Heave Accel. | 0.1184 Hz | major peak @ 0.08588 Hz, 0.1996 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 51.830 | 130.010 | 91.972 | 13.649 |
| SOG (m/s) | 1.300 | 2.597 | 1.943 | 0.190 |
| SOG (knots) | 2.527 | 5.049 | 3.776 | 0.369 |
| | | | | |
| Rudder Angle (deg.) | -2.030 | 11.092 | 4.223 | 1.865 |
| Shaft Speed (RPM) | 123.28 | 137.01 | 127.310 | 1.806 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -15.115 | 14.455 | 0.325 | 4.658 |
| Pitch Angle (deg) | -7.207 | 1.892 | -2.272 | 1.261 |
| Yaw Angle (deg) | -9.439 | 6.201 | -0.093 | 2.889 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.617 | 0.908 | 0.128 | 0.213 |
| Sway Acceleration (m/s$^2$) | -2.875 | 3.433 | 0.129 | 0.958 |
| Heave Acceleration (m/s$^2$) | -11.376 | -8.067 | -9.761 | 0.440 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bow_20041017085844
Date: October 17 2004 NF Time: 08:58

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.466 | 0.419 | 0.000 | 0.142 |
| Sway Acceleration ($m/s^2$) | -0.831 | 0.961 | -0.001 | 0.242 |
| Heave Acceleration ($m/s^2$) | -1.301 | 1.370 | -0.049 | 0.386 |
| Surge Displacement (m) | -0.976 | 0.918 | 0.001 | 0.289 |
| Sway Displacement (m) | -1.666 | 1.415 | -0.001 | 0.413 |
| Heave Displacement (m) | -1.961 | 2.334 | 0.000 | 0.607 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.587 | 0.645 | -0.001 | 0.165 |
| Sway Acceleration ($m/s^2$) | -1.229 | 1.190 | -0.001 | 0.374 |
| Heave Acceleration ($m/s^2$) | -1.852 | 1.642 | -0.048 | 0.442 |
| Surge Displacement (m) | -0.747 | 0.768 | 0.001 | 0.242 |
| Sway Displacement (m) | -1.592 | 1.589 | -0.001 | 0.488 |
| Heave Displacement (m) | -1.909 | 2.218 | 0.000 | 0.616 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: beam_20041017092919
Date: October 17 2004 NF Time: 09:29

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0 c Water Density: 1023.63 kg/m$^3$
Latitude: 47.5477 North Longitude: 52.407 West
Duration of Run: 1502.4 seconds Number of Samples: 75120
Nominal Forward Speed Over the Ground: 3.6 knots
Nominal Course Over the Ground: 305 (deg. TRUE)
Total Distance Traveled During the Run: 1.51 nautical miles
Nominal Relative Wind Speed: 10 knots
Nominal Relative Wind Direction: 070 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 720 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.44 m | 2.88 m |
| | Direction: | 246.9 (deg. True) | 026.81 (deg. True) |
| | Peak Period: | 12.34 s | 11.76 s |
| Peak Response Frequency: | Roll Angle | 0.1272 Hz | |
| | Pitch Angle | 0.1035 Hz | |
| | Heave Accel. | 0.09762 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 269.560 | 349.110 | 307.379 | 12.982 |
| SOG (m/s) | 1.178 | 2.569 | 1.914 | 0.205 |
| SOG (knots) | 2.289 | 4.995 | 3.721 | 0.399 |
| | | | | |
| Rudder Angle (deg.) | -4.673 | 7.659 | 0.747 | 2.597 |
| Shaft Speed (RPM) | 112.1 | 121.170 | 116.480 | 1.058 |
| | | | | |
| ***Output from MotionPak for the Center of Gravity*** | | | | |
| Roll Angle (deg) | -11.751 | 13.381 | 1.243 | 4.277 |
| Pitch Angle (deg) | -8.976 | 3.145 | -2.375 | 1.388 |
| Yaw Angle (deg) | -8.862 | 8.683 | -0.033 | 3.832 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.841 | 1.225 | 0.114 | 0.239 |
| Sway Acceleration (m/s$^2$) | -2.692 | 2.766 | -0.040 | 0.859 |
| Heave Acceleration (m/s$^2$) | -11.250 | -8.281 | -9.768 | 0.443 |

File Name: beam_20041017092919
Date: October 17 2004 NF Time: 09:29

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak for the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.480 | 0.493 | 0.000 | 0.152 |
| Sway Acceleration ($m/s^2$) | -0.797 | 0.690 | 0.000 | 0.223 |
| Heave Acceleration ($m/s^2$) | -1.293 | 1.292 | -0.049 | 0.381 |
| Surge Displacement (m) | -0.950 | 1.004 | -0.001 | 0.335 |
| Sway Displacement (m) | -1.662 | 1.380 | 0.001 | 0.456 |
| Heave Displacement (m) | -1.920 | 2.210 | 0.000 | 0.654 |
| ***Output from MotionPak for the Helmsman steering position*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.714 | 0.780 | 0.000 | 0.188 |
| Sway Acceleration ($m/s^2$) | -1.106 | 1.070 | 0.000 | 0.330 |
| Heave Acceleration ($m/s^2$) | -1.775 | 1.495 | -0.049 | 0.458 |
| Surge Displacement (m) | -0.811 | 0.943 | 0.000 | 0.281 |
| Sway Displacement (m) | -1.632 | 1.637 | 0.001 | 0.489 |
| Heave Displacement (m) | -1.947 | 2.433 | 0.000 | 0.696 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: quart_20041017095927
Date: October 17 2004 NF Time: 09:59

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0 C Water Density: 1023.63 kg/m$^3$
Latitude: 47.562 North Longitude: 52.4395 West
Duration of Run: 1501.3 seconds Number of Samples: 75065
Nominal Forward Speed Over the Ground: 3.7 knots
Nominal Course Over the Ground: 178 (deg. TRUE)
Total Distance Traveled During the Run: 1.58 nautical miles
Nominal Relative Wind Speed: 18 knots
Nominal Relative Wind Direction: 210 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 800 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.32 m | 2.88 m |
| | Direction: | 254.1 (deg. True) | 026.81 (deg. True) |
| | Peak Period: | 12.34 s | 11.76 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1332 Hz | |
| | Pitch Angle | 0.08289 Hz | |
| | Heave Accel. | 0.1569 Hz | major peak @ 0.1011 Hz |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 142.790 | 213.900 | 178.329 | 10.576 |
| SOG (m/s) | 0.950 | 3.008 | 1.986 | 0.287 |
| SOG (knots) | 1.847 | 5.848 | 3.860 | 0.557 |
| | | | | |
| Rudder Angle (deg.) | -5.041 | 7.306 | 0.751 | 1.962 |
| Shaft Speed (RPM) | 125.51 | 132.18 | 128.820 | 0.878 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -11.184 | 14.884 | 1.674 | 3.337 |
| Pitch Angle (deg) | -7.936 | 4.391 | -2.285 | 1.569 |
| Yaw Angle (deg) | -7.870 | 7.550 | 0.098 | 3.109 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.734 | 0.953 | 0.129 | 0.248 |
| Sway Acceleration (m/s$^2$) | -3.047 | 2.646 | -0.107 | 0.714 |
| Heave Acceleration (m/s$^2$) | -11.331 | -8.108 | -9.780 | 0.457 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: quart_20041017095927
Date: October 17 2004 NF Time: 09:59

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.776 | 0.694 | 0.000 | 0.200 |
| Sway Acceleration ($m/s^2$) | -0.759 | 0.681 | 0.001 | 0.197 |
| Heave Acceleration ($m/s^2$) | -1.281 | 1.155 | -0.049 | 0.373 |
| Surge Displacement (m) | -1.729 | 1.923 | 0.001 | 0.543 |
| Sway Displacement (m) | -1.043 | 1.050 | -0.001 | 0.361 |
| Heave Displacement (m) | -1.829 | 2.269 | 0.001 | 0.641 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.876 | 0.894 | -0.001 | 0.234 |
| Sway Acceleration ($m/s^2$) | -0.988 | 1.008 | 0.000 | 0.297 |
| Heave Acceleration ($m/s^2$) | -1.577 | 1.629 | -0.049 | 0.456 |
| Surge Displacement (m) | -1.450 | 1.463 | 0.001 | 0.478 |
| Sway Displacement (m) | -1.121 | 1.180 | 0.000 | 0.390 |
| Heave Displacement (m) | -1.927 | 2.100 | 0.001 | 0.669 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: beam_drift_20041017104210
Date: October 17 2004 NF Time: 10:42

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0C Water Density: 1023.61 kg/m$^3$
Latitude: 47.5614 North Longitude: 52.4309 West
Duration of Run: 1502.5 seconds Number of Samples: 75124
Nominal Forward Speed Over the Ground: 0.0 knots
Nominal Course Over the Ground: N/A (deg. TRUE)
Total Distance Traveled During the Run: 0.13 nautical miles
Nominal Relative Wind Speed: 10 knots
Nominal Relative Wind Direction: 100 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: N/A RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.40 m | 3.06 m |
| | Direction: | 254.1 (deg. True) | 015.56 (deg. True) |
| | Peak Period: | 10.89 s | 11.76 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1294 Hz | |
| | Pitch Angle | 0.2219 Hz | major peak @ 0.1069 Hz |
| | Heave Accel. | 0.1072 Hz | major peak @ 0.2666 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.010 | 359.860 | 286.613 | 104.671 |
| SOG (m/s) | 0.008 | 1.578 | 0.478 | 0.266 |
| SOG (knots) | 0.016 | 3.067 | 0.928 | 0.518 |
| | | | | |
| Rudder Angle (deg.) | 0.704 | 1.546 | 1.205 | 0.100 |
| Shaft Speed (RPM) | N/A | N/A | N/A | N/A |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -13.077 | 15.645 | 1.659 | 4.563 |
| Pitch Angle (deg) | -8.323 | 3.406 | -2.313 | 1.832 |
| Yaw Angle (deg) | -21.163 | 25.407 | -0.276 | 11.053 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.008 | 1.232 | 0.117 | 0.336 |
| Sway Acceleration (m/s$^2$) | -3.189 | 2.905 | -0.114 | 0.957 |
| Heave Acceleration (m/s$^2$) | -11.410 | -8.103 | -9.753 | 0.496 |

File Name: beam_drift_20041017104210
Date: October 17 2004 NF Time: 10:42

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.602 | 0.617 | 0.000 | 0.176 |
| Sway Acceleration ($m/s^2$) | -0.671 | 0.774 | 0.000 | 0.218 |
| Heave Acceleration ($m/s^2$) | -1.476 | 1.127 | -0.050 | 0.400 |
| Surge Displacement (m) | -1.237 | 1.405 | -0.001 | 0.389 |
| Sway Displacement (m) | -1.267 | 1.180 | 0.001 | 0.354 |
| Heave Displacement (m) | -2.139 | 2.135 | 0.001 | 0.655 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.794 | 0.854 | 0.000 | 0.237 |
| Sway Acceleration ($m/s^2$) | -1.172 | 1.247 | 0.000 | 0.358 |
| Heave Acceleration ($m/s^2$) | -1.913 | 1.623 | -0.050 | 0.508 |
| Surge Displacement (m) | -1.142 | 1.036 | -0.001 | 0.340 |
| Sway Displacement (m) | -1.787 | 1.415 | 0.001 | 0.466 |
| Heave Displacement (m) | -2.382 | 2.658 | 0.001 | 0.709 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: head_2041017111922
Date: October 17 2004 NF Time: 11:19

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0C Water Density: 1023.61 kg/m$^3$
Latitude: 47.5635 North Longitude: 52.4304 West
Duration of Run: 1504.2 seconds Number of Samples: 75213
Nominal Forward Speed Over the Ground: 7.8 knots
Nominal Course Over the Ground: 068 (deg. TRUE)
Total Distance Traveled During the Run: 3.47 nautical miles
Nominal Relative Wind Speed: 20 knots
Nominal Relative Wind Direction: 270 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 1600 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.52 m | 3.06 m |
| | Direction: | 297.2 (deg. True) | 015.56 (deg. True) |
| | Peak Period: | 12.34 s | 11.76 s |

| Peak Response Frequency: | | |
|---|---|---|
| | Roll Angle | 0.1256 Hz |
| | Pitch Angle | 0.1440 Hz major peak @ 0.1551 Hz |
| | Heave Accel. | 0.2438 Hz major peak @ 0.1439 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 47.530 | 87.780 | 68.597 | 5.906 |
| SOG (m/s) | 3.664 | 4.967 | 4.295 | 0.212 |
| SOG (knots) | 7.122 | 9.654 | 8.349 | 0.412 |
| | | | | |
| Rudder Angle (deg.) | -2.345 | 7.426 | 2.651 | 1.545 |
| Shaft Speed (RPM) | 256.94 | 265.100 | 261.490 | 0.992 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -10.266 | 11.246 | 0.351 | 3.896 |
| Pitch Angle (deg) | -7.585 | 2.114 | -2.733 | 1.369 |
| Yaw Angle (deg) | -5.823 | 5.893 | -0.011 | 2.149 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.865 | 1.033 | 0.053 | 0.250 |
| Sway Acceleration (m/s$^2$) | -2.637 | 2.665 | 0.122 | 0.865 |
| Heave Acceleration (m/s$^2$) | -11.795 | -7.441 | -9.774 | 0.600 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: head_2041017111922
Date: October 17 2004 NF Time: 11:19

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.650 | 0.663 | 0.000 | 0.169 |
| Sway Acceleration ($m/s^2$) | -1.013 | 0.913 | 0.001 | 0.260 |
| Heave Acceleration ($m/s^2$) | -2.006 | 2.023 | -0.045 | 0.543 |
| Surge Displacement (m) | -1.124 | 1.209 | -0.001 | 0.314 |
| Sway Displacement (m) | -0.918 | 0.948 | 0.001 | 0.311 |
| Heave Displacement (m) | -1.915 | 2.100 | -0.001 | 0.641 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.732 | 0.723 | 0.000 | 0.203 |
| Sway Acceleration ($m/s^2$) | -1.346 | 1.321 | 0.001 | 0.388 |
| Heave Acceleration ($m/s^2$) | -2.111 | 2.306 | -0.044 | 0.609 |
| Surge Displacement (m) | -0.980 | 1.025 | -0.001 | 0.268 |
| Sway Displacement (m) | -1.290 | 1.344 | 0.001 | 0.419 |
| Heave Displacement (m) | -2.109 | 2.382 | -0.001 | 0.686 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: fol_20041017114842
Date: October 17 2004 NF Time: 11:48

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0C Water Density: 1023.61 kg/m$^3$
Latitude: 47.5887 North Longitude: 52.3417 West
Duration of Run: 2399.8 seconds Number of Samples: 119991
Nominal Forward Speed Over the Ground: 8.2 knots
Nominal Course Over the Ground: 247 (deg. TRUE)
Total Distance Traveled During the Run: 5.55 nautical miles
Nominal Relative Wind Speed: 11 knots
Nominal Relative Wind Direction: 140 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 1650 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.08 m | 3.06 m |
| | Direction: | 274.5 (deg. True) | 015.56 (deg. True) |
| | Peak Period: | 9.75 s | 11.76 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1278 Hz | major peak @ 0.1333 Hz |
| | Pitch Angle | 0.07408 Hz | |
| | Heave Accel. | 0.2852 Hz | major peak @ 0.2723 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 226.740 | 263.160 | 245.500 | 5.570 |
| SOG (m/s) | 3.331 | 5.331 | 4.303 | 0.275 |
| SOG (knots) | 6.474 | 10.362 | 8.365 | 0.535 |
| | | | | |
| Rudder Angle (deg.) | -6.581 | 8.418 | 1.446 | 1.766 |
| Shaft Speed (RPM) | 265.99 | 275.100 | 270.890 | 1.184 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -10.927 | 12.805 | 1.659 | 3.399 |
| Pitch Angle (deg) | -8.115 | 0.896 | -2.854 | 1.194 |
| Yaw Angle (deg) | -7.450 | 6.909 | 0.030 | 2.216 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.908 | 0.918 | 0.040 | 0.246 |
| Sway Acceleration (m/s$^2$) | -2.526 | 2.680 | -0.107 | 0.743 |
| Heave Acceleration (m/s$^2$) | -11.809 | -8.023 | -9.784 | 0.479 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: fol_20041017114842
Date: October 17 2004 NF Time: 11:48

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.739 | 0.673 | 0.000 | 0.178 |
| Sway Acceleration ($m/s^2$) | -0.956 | 0.845 | 0.001 | 0.257 |
| Heave Acceleration ($m/s^2$) | -1.911 | 1.714 | -0.048 | 0.456 |
| Surge Displacement (m) | -2.286 | 2.062 | 0.000 | 0.587 |
| Sway Displacement (m) | -1.701 | 2.063 | 0.000 | 0.504 |
| Heave Displacement (m) | -1.949 | 2.166 | 0.001 | 0.643 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.912 | 1.009 | 0.000 | 0.238 |
| Sway Acceleration ($m/s^2$) | -1.268 | 1.119 | 0.001 | 0.343 |
| Heave Acceleration ($m/s^2$) | -2.172 | 1.644 | -0.048 | 0.489 |
| Surge Displacement (m) | -2.003 | 1.817 | 0.000 | 0.519 |
| Sway Displacement (m) | -1.229 | 1.902 | 0.000 | 0.452 |
| Heave Displacement (m) | -2.093 | 2.164 | 0.000 | 0.671 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bow_20041017123331
Date: October 17 2004 NF Time: 12:33

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0C Water Density: 1023.61 kg/m$^3$
Latitude: 47.5449 North Longitude: 52.4596 West
Duration of Run: 1508.8 seconds Number of Samples: 75439
Nominal Forward Speed Over the Ground: 8.2 knots
Nominal Course Over the Ground: 116 (deg. TRUE)
Total Distance Traveled During the Run: 3.38 nautical miles
Nominal Relative Wind Speed: 21 knots
Nominal Relative Wind Direction: 240 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 1590 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.38 m | 2.58 m |
| | Direction: | 047.4 (deg. True) | 045.09 (deg. True) |
| | Peak Period: | 10.89 s | 10.53 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1289 Hz | |
| | Pitch Angle | 0.1142 Hz | |
| | Heave Accel. | 0.2209 Hz | major peak @ 0.2654 Hz |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 94.050 | 135.830 | 112.811 | 6.199 |
| SOG (m/s) | 3.497 | 4.797 | 4.181 | 0.194 |
| SOG (knots) | 6.798 | 9.325 | 8.126 | 0.377 |
| | | | | |
| Rudder Angle (deg.) | -1.549 | 7.201 | 2.467 | 1.513 |
| Shaft Speed (RPM) | 254.56 | 263.510 | 258.500 | 1.191 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -11.748 | 12.738 | 0.691 | 4.162 |
| Pitch Angle (deg) | -6.412 | 2.416 | -2.638 | 1.158 |
| Yaw Angle (deg) | -5.643 | 5.438 | 0.066 | 2.087 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.048 | 0.938 | 0.071 | 0.258 |
| Sway Acceleration (m/s$^2$) | -2.386 | 2.800 | 0.064 | 0.853 |
| Heave Acceleration (m/s$^2$) | -11.961 | -7.382 | -9.776 | 0.602 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bow_20041017123331
Date: October 17 2004 NF Time: 12:33

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.655 | 0.649 | 0.000 | 0.170 |
| Sway Acceleration ($m/s^2$) | -1.017 | 0.810 | 0.000 | 0.268 |
| Heave Acceleration ($m/s^2$) | -2.206 | 2.208 | -0.039 | 0.561 |
| Surge Displacement (m) | -1.093 | 0.980 | 0.000 | 0.266 |
| Sway Displacement (m) | -1.489 | 1.377 | 0.001 | 0.457 |
| Heave Displacement (m) | -2.165 | 1.918 | 0.000 | 0.654 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.860 | 0.825 | 0.000 | 0.228 |
| Sway Acceleration ($m/s^2$) | -1.365 | 1.321 | 0.000 | 0.378 |
| Heave Acceleration ($m/s^2$) | -2.233 | 2.403 | -0.039 | 0.611 |
| Surge Displacement (m) | -0.930 | 0.704 | 0.000 | 0.231 |
| Sway Displacement (m) | -1.526 | 1.581 | 0.001 | 0.472 |
| Heave Displacement (m) | -2.230 | 1.929 | 0.000 | 0.671 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: beam_20041017130404
Date: October 17 2004 NF Time: 13:04

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0C Water Density: 1023.61 kg/m$^3$
Latitude: 47.528 North Longitude: 52.3793 West
Duration of Run: 1511.8 seconds Number of Samples: 75590
Nominal Forward Speed Over the Ground: 8.2 knots
Nominal Course Over the Ground: 339 (deg. TRUE)
Total Distance Traveled During the Run: 3.39 nautical miles
Nominal Relative Wind Speed: 6 knots
Nominal Relative Wind Direction: 000 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 1580 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.46 m | 2.71 m |
| | Direction: | 050.2 (deg. True) | 018.38 (deg. True) |
| | Peak Period: | 10.89 s | 10.53 s |
| Peak Response Frequency: | Roll Angle 0.1286 Hz | major peak @ 0.1103 Hz | |
| | Pitch Angle 0.09922 Hz | | |
| | Heave Accel. 0.2572 Hz | major peak @ 0.2395 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 317.230 | 357.590 | 338.020 | 5.652 |
| SOG (m/s) | 3.278 | 4.908 | 4.176 | 0.233 |
| SOG (knots) | 6.371 | 9.541 | 8.118 | 0.453 |
| | | | | |
| Rudder Angle (deg.) | -4.381 | 9.635 | 2.045 | 1.834 |
| Shaft Speed (RPM) | 251.35 | 261.490 | 256.510 | 1.429 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -10.901 | 12.171 | 1.070 | 3.711 |
| Pitch Angle (deg) | -7.022 | 1.551 | -2.807 | 1.289 |
| Yaw Angle (deg) | -6.463 | 8.208 | -0.003 | 2.461 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.757 | 0.904 | 0.043 | 0.222 |
| Sway Acceleration (m/s$^2$) | -2.509 | 3.171 | -0.006 | 0.777 |
| Heave Acceleration (m/s$^2$) | -11.996 | -7.420 | -9.782 | 0.576 |

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File Name: beam_20041017130404
Date: October 17 2004 NF Time: 13:04

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.560 | 0.609 | 0.000 | 0.175 |
| Sway Acceleration ($m/s^2$) | -0.787 | 0.803 | -0.001 | 0.237 |
| Heave Acceleration ($m/s^2$) | -2.034 | 1.718 | -0.039 | 0.529 |
| Surge Displacement (m) | -1.295 | 1.118 | 0.000 | 0.413 |
| Sway Displacement (m) | -1.536 | 1.469 | -0.001 | 0.380 |
| Heave Displacement (m) | -2.106 | 1.979 | 0.001 | 0.625 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.807 | 0.732 | 0.000 | 0.200 |
| Sway Acceleration ($m/s^2$) | -1.097 | 1.169 | -0.001 | 0.326 |
| Heave Acceleration ($m/s^2$) | -2.266 | 1.914 | -0.039 | 0.589 |
| Surge Displacement (m) | -1.043 | 1.020 | 0.000 | 0.348 |
| Sway Displacement (m) | -1.523 | 1.456 | -0.001 | 0.405 |
| Heave Displacement (m) | -2.235 | 2.254 | 0.001 | 0.681 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: quart_20041017133459
Date: October 17 2004 NF Time: 13:34

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.0C Water Density: 1023.61 kg/m$^3$
Latitude: 47.5759 North Longitude: 52.4184 West
Duration of Run: 1502.4 seconds Number of Samples: 75121
Nominal Forward Speed Over the Ground: 8.3 knots
Nominal Course Over the Ground: 205 (deg. TRUE)
Total Distance Traveled During the Run: 3.45 nautical miles
Nominal Relative Wind Speed: 19 knots
Nominal Relative Wind Direction: 180 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: 1650 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.36 m | 2.62 m |
| | Direction: | 050.2 (deg. True) | 022.59 (deg. True) |
| | Peak Period: | 10.89 s | 11.11 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1294 Hz | |
| | Pitch Angle | 0.06656 Hz | major peak @ 0.07769 Hz |
| | Heave Accel. | 0.2847 Hz | major peak @ 0.2479 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 185.390 | 216.880 | 202.409 | 4.921 |
| SOG (m/s) | 3.394 | 5.294 | 4.268 | 0.304 |
| SOG (knots) | 6.598 | 10.292 | 8.296 | 0.591 |
| | | | | |
| Rudder Angle (deg.) | -4.486 | 6.473 | 1.285 | 1.565 |
| Shaft Speed (RPM) | 262.17 | 272.380 | 267.870 | 1.291 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -7.904 | 11.897 | 2.094 | 3.230 |
| Pitch Angle (deg) | -7.017 | 0.890 | -2.770 | 1.184 |
| Yaw Angle (deg) | -6.409 | 5.556 | 0.008 | 2.145 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.274 | 1.061 | 0.053 | 0.278 |
| Sway Acceleration (m/s$^2$) | -2.774 | 2.371 | -0.178 | 0.708 |
| Heave Acceleration (m/s$^2$) | -11.633 | -7.623 | -9.785 | 0.554 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: quart_20041017133459
Date: October 17 2004 NF Time: 13:34

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.738 | 0.731 | -0.001 | 0.197 |
| Sway Acceleration ($m/s^2$) | -0.774 | 0.772 | 0.000 | 0.252 |
| Heave Acceleration ($m/s^2$) | -1.608 | 2.124 | -0.045 | 0.514 |
| Surge Displacement (m) | -1.862 | 1.961 | 0.001 | 0.622 |
| Sway Displacement (m) | -1.260 | 1.150 | 0.000 | 0.311 |
| Heave Displacement (m) | -2.053 | 1.824 | 0.001 | 0.552 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.110 | 1.059 | -0.001 | 0.282 |
| Sway Acceleration ($m/s^2$) | -1.322 | 1.213 | 0.000 | 0.352 |
| Heave Acceleration ($m/s^2$) | -1.886 | 2.188 | -0.045 | 0.556 |
| Surge Displacement (m) | -1.738 | 1.786 | 0.001 | 0.571 |
| Sway Displacement (m) | -1.143 | 1.082 | 0.000 | 0.330 |
| Heave Displacement (m) | -2.103 | 1.924 | 0.001 | 0.564 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: beam_drift_20041017142907
Date: October 17 2004 NF Time: 14:29

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.9 C Water Density: 1023.38 kg/m$^3$
Latitude: 47.5631 North Longitude: 52.4276 West
Duration of Run: 1557.3 seconds Number of Samples: 77867
Nominal Forward Speed Over the Ground: 0.0 knots
Nominal Course Over the Ground: N/A (deg. TRUE)
Total Distance Traveled During the Run: 0.12 nautical miles
Nominal Relative Wind Speed: 17 knots
Nominal Relative Wind Direction: 310 (deg. Mag)
Nominal Sea State: 3
Nominal Engine RPM: N/A RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.10 m | 2.23 m |
| | Direction: | 072.1 (deg. True) | 019.78 (deg. True) |
| | Peak Period: | 10.89 s | 10.53 s |

Peak Response Frequency: Roll Angle 0.1356 Hz
Pitch Angle 0.2319 Hz major peak @ 0.2072 Hz, 0.09965 Hz
Heave Accel. 0.2604 Hz

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.080 | 359.810 | 285.204 | 92.583 |
| SOG (m/s) | 0.003 | 1.575 | 0.445 | 0.241 |
| SOG (knots) | 0.005 | 3.062 | 0.866 | 0.469 |
| | | | | |
| Rudder Angle (deg.) | -2.075 | -0.512 | -1.381 | 0.339 |
| Shaft Speed (RPM) | N/A | N/A | N/A | N/A |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -11.698 | 12.668 | 0.816 | 3.824 |
| Pitch Angle (deg) | -9.076 | 3.912 | -2.288 | 1.931 |
| Yaw Angle (deg) | -27.439 | 24.191 | 0.294 | 11.563 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.343 | 1.485 | 0.117 | 0.384 |
| Sway Acceleration (m/s$^2$) | -2.700 | 2.537 | 0.035 | 0.810 |
| Heave Acceleration (m/s$^2$) | -11.449 | -7.551 | -9.768 | 0.509 |

File Name: beam_drift_20041017142907
Date: October 17 2004 NF Time: 14:29

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.731 | 0.566 | 0.000 | 0.174 |
| Sway Acceleration ($m/s^2$) | -0.787 | 0.790 | -0.001 | 0.237 |
| Heave Acceleration ($m/s^2$) | -1.602 | 1.585 | -0.036 | 0.443 |
| Surge Displacement (m) | -1.173 | 1.235 | 0.000 | 0.386 |
| Sway Displacement (m) | -1.025 | 0.874 | 0.001 | 0.310 |
| Heave Displacement (m) | -1.869 | 2.205 | -0.001 | 0.586 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.780 | 1.023 | 0.000 | 0.265 |
| Sway Acceleration ($m/s^2$) | -1.192 | 1.463 | -0.001 | 0.347 |
| Heave Acceleration ($m/s^2$) | -1.733 | 1.954 | -0.036 | 0.514 |
| Surge Displacement (m) | -0.991 | 1.041 | 0.000 | 0.338 |
| Sway Displacement (m) | -1.304 | 1.191 | 0.001 | 0.390 |
| Heave Displacement (m) | -2.063 | 2.181 | -0.001 | 0.628 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: beamp_20041017150414
Date: October 17 2004 NF Time: 15:04

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.9 C Water Density: 1023.38 kg/m$^3$
Latitude: 47.5657 North Longitude: 52.4272 West
Duration of Run: 1504.2 seconds Number of Samples: 75213
Nominal Forward Speed Over the Ground: 3.6 knots
Nominal Course Over the Ground: 344 (deg. TRUE)
Total Distance Traveled During the Run: 1.48 nautical miles
Nominal Relative Wind Speed: 13 knots
Nominal Relative Wind Direction: 004 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 800 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.13 m | 2.23 m |
| | Direction: | 113.7 (deg. True) | 019.78 (deg. True) |
| | Peak Period: | 9.75 s | 10.53 s |
| Peak Response Frequency: | Roll Angle 0.1256 Hz | major peak @ 0.1330 Hz, 0.1070 Hz | |
| | Pitch Angle 0.1847 Hz | major peak @ 0.1737 Hz | |
| | Heave Accel. 0.1071 Hz | | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.120 | 359.960 | 343.466 | 9.416 |
| SOG (m/s) | 1.100 | 3.750 | 1.846 | 0.230 |
| SOG (knots) | 2.138 | 7.289 | 3.589 | 0.447 |
| | | | | |
| Rudder Angle (deg.) | -2.803 | 8.478 | 3.104 | 2.007 |
| Shaft Speed (RPM) | 124.26 | 134.840 | 129.730 | 1.210 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -5.876 | 8.851 | 1.006 | 2.431 |
| Pitch Angle (deg) | -9.029 | 4.121 | -2.391 | 1.877 |
| Yaw Angle (deg) | -8.186 | 8.092 | -0.010 | 2.967 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.084 | 1.099 | 0.107 | 0.285 |
| Sway Acceleration (m/s$^2$) | -1.695 | 1.615 | 0.002 | 0.518 |
| Heave Acceleration (m/s$^2$) | -11.310 | -7.955 | -9.793 | 0.447 |

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File Name: beamp_20041017150414
Date: October 17 2004 NF Time: 15:04

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.719 | 0.744 | 0.000 | 0.186 |
| Sway Acceleration ($m/s^2$) | -0.578 | 0.583 | 0.001 | 0.192 |
| Heave Acceleration ($m/s^2$) | -1.209 | 1.279 | -0.045 | 0.359 |
| Surge Displacement (m) | -1.188 | 1.230 | 0.000 | 0.381 |
| Sway Displacement (m) | -1.002 | 1.023 | 0.000 | 0.317 |
| Heave Displacement (m) | -1.747 | 1.823 | -0.001 | 0.560 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.678 | 0.705 | 0.000 | 0.193 |
| Sway Acceleration ($m/s^2$) | -0.747 | 0.873 | 0.001 | 0.247 |
| Heave Acceleration ($m/s^2$) | -1.653 | 1.784 | -0.045 | 0.454 |
| Surge Displacement (m) | -1.012 | 1.028 | 0.000 | 0.313 |
| Sway Displacement (m) | -0.993 | 1.059 | -0.001 | 0.321 |
| Heave Displacement (m) | -2.223 | 1.882 | -0.001 | 0.626 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: quartp_20041017153514
Date: October 17 2004 NF Time: 15:35

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.9 C Water Density: 1023.38 kg/m$^3$
Latitude: 47.5886 North Longitude: 52.4406 West
Duration of Run: 1700.2 seconds Number of Samples: 85009
Nominal Forward Speed Over the Ground: 3.6 knots
Nominal Course Over the Ground: 205 (deg. TRUE)
Total Distance Traveled During the Run: 1.79 nautical miles
Nominal Relative Wind Speed: 14 knots
Nominal Relative Wind Direction: 152 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 800 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.22 m | 2.68 m |
| | Direction: | 064.4 (deg. True) | 032.44 (deg. True) |
| | Peak Period: | 10.89 s | 10.53 s |
| Peak Response Frequency: | Roll Angle | 0.1242 Hz | |
| | Pitch Angle | 0.08169 Hz | |
| | Heave Accel. | 0.2582 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 176.980 | 247.950 | 205.117 | 8.675 |
| SOG (m/s) | 0.653 | 3.211 | 1.968 | 0.331 |
| SOG (knots) | 1.269 | 6.242 | 3.825 | 0.643 |
| | | | | |
| Rudder Angle (deg.) | -7.084 | 4.047 | -0.991 | 1.721 |
| Shaft Speed (RPM) | 144.19 | 153.050 | 148.840 | 1.125 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -5.041 | 8.973 | 2.274 | 2.385 |
| Pitch Angle (deg) | -8.016 | 3.323 | -2.323 | 1.661 |
| Yaw Angle (deg) | -9.446 | 7.716 | -0.004 | 2.436 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.189 | 1.386 | 0.122 | 0.346 |
| Sway Acceleration (m/s$^2$) | -2.021 | 1.741 | -0.208 | 0.536 |
| Heave Acceleration (m/s$^2$) | -11.822 | -7.216 | -9.791 | 0.619 |

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File Name: quartp_20041017153514
Date: October 17 2004 NF Time: 15:35

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.956 | 0.851 | 0.000 | 0.217 |
| Sway Acceleration ($m/s^2$) | -1.116 | 0.990 | 0.001 | 0.261 |
| Heave Acceleration ($m/s^2$) | -1.809 | 1.882 | -0.048 | 0.518 |
| Surge Displacement (m) | -1.667 | 1.880 | -0.002 | 0.582 |
| Sway Displacement (m) | -1.004 | 0.947 | 0.000 | 0.299 |
| Heave Displacement (m) | -1.926 | 1.833 | -0.001 | 0.632 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.277 | 1.695 | 0.000 | 0.325 |
| Sway Acceleration ($m/s^2$) | -1.714 | 1.346 | 0.001 | 0.347 |
| Heave Acceleration ($m/s^2$) | -2.039 | 2.387 | -0.048 | 0.609 |
| Surge Displacement (m) | -1.521 | 1.566 | -0.001 | 0.513 |
| Sway Displacement (m) | -0.891 | 0.943 | 0.000 | 0.284 |
| Heave Displacement (m) | -1.944 | 1.867 | 0.000 | 0.641 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: bowp_20041017161027
Date: October 17 2004 NF Time: 16:10

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.3 C Water Density: 1022.16 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.9 C Water Density: 1023.38 kg/m$^3$
Latitude: 47.5562 North Longitude: 52.4609 West
Duration of Run: 1537.4 seconds Number of Samples: 76871
Nominal Forward Speed Over the Ground: 3.6 knots
Nominal Course Over the Ground: 120 (deg. TRUE)
Total Distance Traveled During the Run: 1.71 nautical miles
Nominal Relative Wind Speed: 20 knots
Nominal Relative Wind Direction: 248 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 900 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.21 m | 2.53 m |
| | Direction: | 023.1 (deg. True) | 064.78 (deg. True) |
| | Peak Period: | 10.89 s | 10.00 s |
| Peak Response Frequency: | Roll Angle | 0.1265 Hz | major peak @ 0.09765 Hz |
| | Pitch Angle | 0.1265 Hz | major peak @ 0.1371 Hz |
| | Heave Accel. | 0.2602 Hz | major peak @ 0.1339 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 90.320 | 143.090 | 117.437 | 8.744 |
| SOG (m/s) | 1.194 | 2.739 | 2.084 | 0.224 |
| SOG (knots) | 2.322 | 5.324 | 4.051 | 0.436 |
| | | | | |
| Rudder Angle (deg.) | -3.081 | 7.997 | 2.803 | 1.608 |
| Shaft Speed (RPM) | 144.1 | 151.770 | 148.290 | 1.038 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -7.229 | 7.998 | 0.540 | 2.590 |
| Pitch Angle (deg) | -9.243 | 3.224 | -2.271 | 1.435 |
| Yaw Angle (deg) | -6.200 | 5.909 | 0.072 | 2.159 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.164 | 1.537 | 0.127 | 0.315 |
| Sway Acceleration (m/s$^2$) | -1.913 | 1.835 | 0.090 | 0.556 |
| Heave Acceleration (m/s$^2$) | -11.807 | -7.167 | -9.792 | 0.585 |

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File Name: bowp_20041017161027
Date: October 17 2004 NF Time: 16:10

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.629 | 0.676 | 0.000 | 0.184 |
| Sway Acceleration ($m/s^2$) | -0.918 | 0.786 | 0.002 | 0.237 |
| Heave Acceleration ($m/s^2$) | -1.648 | 1.888 | -0.044 | 0.475 |
| Surge Displacement (m) | -0.971 | 0.767 | 0.000 | 0.270 |
| Sway Displacement (m) | -1.284 | 1.535 | 0.000 | 0.406 |
| Heave Displacement (m) | -1.743 | 2.242 | 0.000 | 0.578 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.909 | 1.517 | 0.000 | 0.270 |
| Sway Acceleration ($m/s^2$) | -1.060 | 1.056 | 0.002 | 0.304 |
| Heave Acceleration ($m/s^2$) | -1.983 | 2.198 | -0.044 | 0.579 |
| Surge Displacement (m) | -0.662 | 0.695 | 0.000 | 0.222 |
| Sway Displacement (m) | -1.222 | 1.173 | 0.000 | 0.368 |
| Heave Displacement (m) | -1.954 | 2.431 | 0.000 | 0.600 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: beam_drift_20041018084919 beam_drift_20041018085952
Date: October 18 2004 NF Time: 08:49

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5618 North Longitude: 52.4306 West
Duration of Run: 1512.7 seconds Number of Samples: 75635
Nominal Forward Speed Over the Ground: 0.0 knots
Nominal Course Over the Ground: N/A (deg. TRUE)
Total Distance Traveled During the Run: 0.14 nautical miles
Nominal Relative Wind Speed: 15 knots
Nominal Relative Wind Direction: 310 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: N/A RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.81 m | 2.13 m |
| | Direction: | 238.0 (deg. True) | 107.07 (deg. True) |
| | Peak Period: | 8.83 s | 9.09 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1322 Hz | |
| | Pitch Angle | 0.2204 Hz | major peak @ 0.1592 Hz |
| | Heave Accel. | 0.1800 Hz | major peak @ 0.1910 Hz, 2645 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.190 | 359.870 | 264.848 | 81.670 |
| SOG (m/s) | 0.019 | 1.861 | 0.516 | 0.289 |
| SOG (knots) | 0.038 | 3.618 | 1.002 | 0.561 |
| | | | | |
| Rudder Angle (deg.) | 0.374 | 1.996 | 1.044 | 0.303 |
| Shaft Speed (RPM) | N/A | N/A | N/A | N/A |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -11.463 | 13.933 | 0.625 | 3.959 |
| Pitch Angle (deg) | -9.902 | 6.042 | -2.316 | 2.223 |
| Yaw Angle (deg) | -28.239 | 29.141 | 0.875 | 13.877 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.501 | 1.849 | 0.112 | 0.447 |
| Sway Acceleration (m/s$^2$) | -3.052 | 2.992 | 0.064 | 0.949 |
| Heave Acceleration (m/s$^2$) | -11.794 | -7.415 | -9.753 | 0.634 |

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| | | | |
|---|---|---|---|
| File Name: | beam_drift_20041018084919 | | beam_drift_20041018085952 |
| Date: | October 18 2004 | NF Time: | 08:49 |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.593 | 0.514 | 0.000 | 0.174 |
| Sway Acceleration ($m/s^2$) | -1.853 | 0.941 | -0.001 | 0.309 |
| Heave Acceleration ($m/s^2$) | -1.785 | 1.636 | -0.044 | 0.499 |
| Surge Displacement (m) | -0.784 | 0.840 | 0.000 | 0.257 |
| Sway Displacement (m) | -0.865 | 1.075 | 0.000 | 0.307 |
| Heave Displacement (m) | -1.812 | 2.193 | 0.000 | 0.505 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.458 | 1.133 | -0.001 | 0.289 |
| Sway Acceleration ($m/s^2$) | -2.188 | 1.506 | -0.001 | 0.461 |
| Heave Acceleration ($m/s^2$) | -2.086 | 2.251 | -0.044 | 0.637 |
| Surge Displacement (m) | -0.718 | 0.833 | 0.000 | 0.243 |
| Sway Displacement (m) | -1.393 | 1.391 | 0.000 | 0.444 |
| Heave Displacement (m) | -1.761 | 2.256 | 0.000 | 0.585 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward  y : '+' starboard  z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward  y : '+' starboard  z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m  $\Delta y$ : 0.000 m  $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m  $\Delta y$ : 1.776 m  $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m  $\Delta y$ : 0.912 m  $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: head_20041018093925
Date: October 18 2004 NF Time: 09:39

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5613 North Longitude: 52.4411 West
Duration of Run: 1504.4 seconds Number of Samples: 75219
Nominal Forward Speed Over the Ground: 8.0 knots
Nominal Course Over the Ground: 240 (deg. TRUE)
Total Distance Traveled During the Run: 3.37 nautical miles
Nominal Relative Wind Speed: 17 knots
Nominal Relative Wind Direction: 140 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1620 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 2.00 m | 2.16 m |
| | Direction: | 224.5 (deg. True) | 069.10 (deg. True) |
| | Peak Period: | 8.83 s | 9.09 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1330 Hz | |
| | Pitch Angle | 0.1211 Hz | major peak @ 0.07682 Hz, 0.1712 Hz |
| | Heave Accel. | 0.2836 Hz | major peak @ 0.2748 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 213.570 | 264.550 | 238.265 | 8.026 |
| SOG (m/s) | 3.089 | 5.100 | 4.192 | 0.293 |
| SOG (knots) | 6.004 | 9.914 | 8.148 | 0.570 |
| | | | | |
| Rudder Angle (deg.) | -5.034 | 8.816 | 1.216 | 1.934 |
| Shaft Speed (RPM) | 258.59 | 271.520 | 266.210 | 1.595 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -12.313 | 16.039 | 1.922 | 4.657 |
| Pitch Angle (deg) | -8.233 | 2.375 | -2.697 | 1.512 |
| Yaw Angle (deg) | -6.322 | 7.126 | -0.066 | 2.317 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.277 | 1.195 | 0.065 | 0.343 |
| Sway Acceleration (m/s$^2$) | -3.667 | 3.693 | -0.147 | 1.122 |
| Heave Acceleration (m/s$^2$) | -12.369 | -6.382 | -9.756 | 0.752 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: head_20041018093925
Date: October 18 2004 NF Time: 09:39

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.762 | 0.725 | 0.000 | 0.209 |
| Sway Acceleration ($m/s^2$) | -1.377 | 1.066 | 0.000 | 0.366 |
| Heave Acceleration ($m/s^2$) | -2.662 | 2.816 | -0.041 | 0.706 |
| Surge Displacement (m) | -1.274 | 1.278 | 0.000 | 0.371 |
| Sway Displacement (m) | -1.029 | 1.132 | 0.000 | 0.349 |
| Heave Displacement (m) | -1.529 | 1.463 | -0.001 | 0.462 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.175 | 0.977 | 0.000 | 0.310 |
| Sway Acceleration ($m/s^2$) | -1.676 | 1.868 | 0.000 | 0.545 |
| Heave Acceleration ($m/s^2$) | -2.872 | 3.232 | -0.041 | 0.758 |
| Surge Displacement (m) | -1.069 | 1.198 | 0.000 | 0.330 |
| Sway Displacement (m) | -1.566 | 1.443 | -0.001 | 0.504 |
| Heave Displacement (m) | -1.468 | 1.760 | -0.001 | 0.479 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: fol_20041018100821
Date: October 18 2004 NF Time: 10:08

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5316 North Longitude: 52.5101 West
Duration of Run: 2406.7 seconds Number of Samples: 120335
Nominal Forward Speed Over the Ground: 8.0 knots
Nominal Course Over the Ground: 063 (deg. TRUE)
Total Distance Traveled During the Run: 5.40 nautical miles
Nominal Relative Wind Speed: 20 knots
Nominal Relative Wind Direction: 280 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1640 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.84 m | 2.15 m |
| | Direction: | 255.7 (deg. True) | 091.60 (deg. True) |
| | Peak Period: | 10.89 s | 9.09 s |

Peak Response Frequency: Roll Angle 0.1302 Hz
Pitch Angle 0.1331 Hz major peak @ 0.1154 Hz
Heave Accel. 0.2396 Hz

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 28.130 | 87.800 | 60.690 | 8.098 |
| SOG (m/s) | 3.075 | 5.022 | 4.200 | 0.243 |
| SOG (knots) | 5.977 | 9.762 | 8.165 | 0.473 |
| | | | | |
| Rudder Angle (deg.) | -5.567 | 9.792 | 2.503 | 1.817 |
| Shaft Speed (RPM) | 262.01 | 273.480 | 268.030 | 1.455 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -17.732 | 17.656 | -0.007 | 4.487 |
| Pitch Angle (deg) | -7.620 | 2.161 | -2.654 | 1.508 |
| Yaw Angle (deg) | -8.537 | 9.260 | 0.068 | 2.530 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.379 | 1.260 | 0.065 | 0.347 |
| Sway Acceleration (m/s$^2$) | -4.369 | 4.484 | 0.172 | 1.096 |
| Heave Acceleration (m/s$^2$) | -12.944 | -5.919 | -9.761 | 0.829 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: fol_20041018100821
Date: October 18 2004 NF Time: 10:08

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.740 | 0.681 | 0.000 | 0.205 |
| Sway Acceleration ($m/s^2$) | -1.378 | 1.332 | 0.001 | 0.371 |
| Heave Acceleration ($m/s^2$) | -2.769 | 3.012 | -0.040 | 0.765 |
| Surge Displacement (m) | -0.850 | 0.823 | 0.000 | 0.230 |
| Sway Displacement (m) | -1.039 | 1.140 | 0.000 | 0.311 |
| Heave Displacement (m) | -1.826 | 1.796 | 0.000 | 0.514 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.957 | 1.133 | 0.000 | 0.288 |
| Sway Acceleration ($m/s^2$) | -1.936 | 1.911 | 0.001 | 0.559 |
| Heave Acceleration ($m/s^2$) | -3.366 | 3.664 | -0.039 | 0.861 |
| Surge Displacement (m) | -0.711 | 0.634 | 0.000 | 0.181 |
| Sway Displacement (m) | -1.795 | 1.776 | 0.000 | 0.511 |
| Heave Displacement (m) | -1.987 | 2.343 | 0.000 | 0.598 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bow_20041018105247
Date: October 18 2004 NF Time: 10:52

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5788 North Longitude: 52.3994 West
Duration of Run: 1502.4 seconds Number of Samples: 75123
Nominal Forward Speed Over the Ground: 8.1 knots
Nominal Course Over the Ground: 283 (deg. TRUE)
Total Distance Traveled During the Run: 3.29 nautical miles
Nominal Relative Wind Speed: 6 knots
Nominal Relative Wind Direction: 120 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1650 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.88 m | 2.15 m |
| | Direction: | 162.3 (deg. True) | 091.60 (deg. True) |
| | Peak Period: | 9.75 s | 9.09 s |
| Peak Response Frequency: | Roll Angle 0.1294 Hz | | |
| | Pitch Angle 0.1183 Hz | major peak @ 0.09609 Hz | |
| | Heave Accel. 0.2551 Hz | major peak @ 0.2847 Hz, 0.2403 Hz | |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 254.470 | 303.120 | 281.049 | 8.207 |
| SOG (m/s) | 3.308 | 4.928 | 4.095 | 0.270 |
| SOG (knots) | 6.431 | 9.579 | 7.961 | 0.524 |
| | | | | |
| Rudder Angle (deg.) | -5.417 | 8.651 | 1.946 | 2.023 |
| Shaft Speed (RPM) | 261.8 | 275.070 | 268.950 | 1.687 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -12.511 | 15.553 | 1.230 | 5.150 |
| Pitch Angle (deg) | -7.711 | 2.039 | -2.798 | 1.519 |
| Yaw Angle (deg) | -6.698 | 7.490 | -0.029 | 2.711 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.923 | 0.893 | 0.049 | 0.246 |
| Sway Acceleration (m/s$^2$) | -3.249 | 3.238 | -0.029 | 1.142 |
| Heave Acceleration (m/s$^2$) | -11.550 | -7.797 | -9.755 | 0.509 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bow_20041018105247
Date: October 18 2004 NF Time: 10:52

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.723 | 0.834 | -0.001 | 0.207 |
| Sway Acceleration ($m/s^2$) | -1.072 | 0.898 | -0.001 | 0.292 |
| Heave Acceleration ($m/s^2$) | -1.692 | 1.821 | -0.043 | 0.484 |
| Surge Displacement (m) | -1.257 | 1.230 | 0.001 | 0.426 |
| Sway Displacement (m) | -1.188 | 1.158 | 0.001 | 0.379 |
| Heave Displacement (m) | -1.470 | 1.404 | 0.001 | 0.421 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.836 | 0.903 | -0.001 | 0.239 |
| Sway Acceleration ($m/s^2$) | -1.597 | 1.526 | -0.001 | 0.447 |
| Heave Acceleration ($m/s^2$) | -1.792 | 2.001 | -0.043 | 0.511 |
| Surge Displacement (m) | -1.131 | 1.074 | 0.000 | 0.376 |
| Sway Displacement (m) | -1.585 | 1.692 | 0.001 | 0.535 |
| Heave Displacement (m) | -1.452 | 1.434 | 0.001 | 0.442 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: beam_20041018112216
Date: October 18 2004 NF Time: 11:22

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5851 North Longitude: 52.4803 West
Duration of Run: 1502.5 seconds Number of Samples: 75126
Nominal Forward Speed Over the Ground: 7.7 knots
Nominal Course Over the Ground: 150 (deg. TRUE)
Total Distance Traveled During the Run: 3.31 nautical miles
Nominal Relative Wind Speed: 20 knots
Nominal Relative Wind Direction: 220 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1680 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.68 m | 2.15 m |
| | Direction: | 082.2 (deg. True) | 091.60 (deg. True) |
| | Peak Period: | 8.83 s | 9.09 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1302 Hz | |
| | Pitch Angle | 0.2692 Hz | major peak @ 0.2488 Hz |
| | Heave Accel. | 0.2692 Hz | major peak @ 0.2514 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 127.300 | 168.750 | 146.829 | 5.531 |
| SOG (m/s) | 2.461 | 5.081 | 4.106 | 0.397 |
| SOG (knots) | 4.784 | 9.876 | 7.981 | 0.771 |
| | | | | |
| Rudder Angle (deg.) | -3.787 | 6.300 | 1.495 | 1.489 |
| Shaft Speed (RPM) | 263.48 | 279.010 | 273.030 | 1.808 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -11.012 | 12.340 | 1.278 | 3.070 |
| Pitch Angle (deg) | -9.965 | 4.119 | -2.595 | 1.927 |
| Yaw Angle (deg) | -5.017 | 6.515 | 0.121 | 2.168 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -3.396 | 2.185 | 0.062 | 0.639 |
| Sway Acceleration (m/s$^2$) | -3.529 | 3.712 | -0.034 | 0.743 |
| Heave Acceleration (m/s$^2$) | -14.903 | -3.574 | -9.775 | 1.280 |

File Name: beam_20041018112216
Date: October 18 2004 NF Time: 11:22

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.382 | 0.762 | -0.001 | 0.266 |
| Sway Acceleration ($m/s^2$) | -1.258 | 0.933 | -0.001 | 0.273 |
| Heave Acceleration ($m/s^2$) | -4.185 | 4.741 | -0.053 | 1.084 |
| Surge Displacement (m) | -0.736 | 0.628 | -0.001 | 0.189 |
| Sway Displacement (m) | -0.707 | 0.857 | 0.000 | 0.245 |
| Heave Displacement (m) | -1.742 | 1.929 | 0.000 | 0.515 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -2.507 | 2.299 | 0.000 | 0.531 |
| Sway Acceleration ($m/s^2$) | -1.802 | 1.614 | -0.002 | 0.395 |
| Heave Acceleration ($m/s^2$) | -5.311 | 6.027 | -0.052 | 1.279 |
| Surge Displacement (m) | -0.822 | 0.667 | -0.001 | 0.217 |
| Sway Displacement (m) | -1.498 | 1.157 | 0.001 | 0.325 |
| Heave Displacement (m) | -1.926 | 1.996 | 0.000 | 0.580 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: quart_20041018115135
Date: October 18 2004 NF Time: 11:51

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5435 North Longitude: 52.4307 West
Duration of Run: 1502.4 seconds Number of Samples: 75120
Nominal Forward Speed Over the Ground: 8.0 knots
Nominal Course Over the Ground: 010 (deg. TRUE)
Total Distance Traveled During the Run: 3.41 nautical miles
Nominal Relative Wind Speed: 12 knots
Nominal Relative Wind Direction: 320 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1620 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.90 m | N/A m |
| | Direction: | 082.2 (deg. True) | N/A (deg. True) |
| | Peak Period: | 8.83 s | N/A s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1302 Hz | |
| | Pitch Angle | 0.1331 Hz | major peak @ 0.1154 Hz |
| | Heave Accel. | 0.2396 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.090 | 359.880 | 15.464 | 7.133 |
| SOG (m/s) | 3.506 | 5.633 | 4.244 | 0.223 |
| SOG (knots) | 6.814 | 10.950 | 8.249 | 0.434 |
| | | | | |
| Rudder Angle (deg.) | -4.583 | 9.049 | 1.978 | 1.951 |
| Shaft Speed (RPM) | 258.22 | 268.370 | 263.450 | 1.321 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -13.331 | 15.658 | 0.478 | 4.379 |
| Pitch Angle (deg) | -7.604 | 1.923 | -2.782 | 1.507 |
| Yaw Angle (deg) | -7.017 | 6.815 | 0.008 | 2.541 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.893 | 0.783 | 0.050 | 0.233 |
| Sway Acceleration (m/s$^2$) | -3.376 | 3.173 | 0.088 | 1.008 |
| Heave Acceleration (m/s$^2$) | -11.877 | -7.727 | -9.765 | 0.563 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: quart_20041018115135
Date: October 18 2004 NF Time: 11:51

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.624 | 0.575 | 0.000 | 0.180 |
| Sway Acceleration ($m/s^2$) | -0.997 | 0.895 | 0.000 | 0.298 |
| Heave Acceleration ($m/s^2$) | -1.918 | 1.895 | -0.044 | 0.515 |
| Surge Displacement (m) | -1.124 | 1.135 | -0.001 | 0.359 |
| Sway Displacement (m) | -1.024 | 1.233 | 0.000 | 0.313 |
| Heave Displacement (m) | -1.558 | 1.619 | 0.000 | 0.456 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.590 | 0.604 | 0.000 | 0.182 |
| Sway Acceleration ($m/s^2$) | -1.374 | 1.404 | -0.001 | 0.439 |
| Heave Acceleration ($m/s^2$) | -2.203 | 1.892 | -0.044 | 0.577 |
| Surge Displacement (m) | -0.823 | 0.913 | -0.001 | 0.285 |
| Sway Displacement (m) | -1.432 | 1.430 | 0.000 | 0.457 |
| Heave Displacement (m) | -1.665 | 1.851 | 0.000 | 0.561 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: beam_drift_20041018124052
Date: October 18 2004 NF Time: 12:40

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5627 North Longitude: 52.4273 West
Duration of Run: 1502.4 seconds Number of Samples: 75123
Nominal Forward Speed Over the Ground: 0.0 knots
Nominal Course Over the Ground: N/A (deg. TRUE)
Total Distance Traveled During the Run: 0.21 nautical miles
Nominal Relative Wind Speed: 8 knots
Nominal Relative Wind Direction: 130 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: N/A RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.81 m | 1.98 m |
| | Direction: | 093.7 (deg. True) | 084.57 (deg. True) |
| | Peak Period: | 8.83 s | 9.09 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1294 Hz | |
| | Pitch Angle | 0.2256 Hz | |
| | Heave Accel. | 0.2071 Hz | major peak @ 0.1668 Hz, 2624 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.050 | 359.880 | 308.035 | 108.012 |
| SOG (m/s) | 0.028 | 3.111 | 0.538 | 0.304 |
| SOG (knots) | 0.054 | 6.048 | 1.046 | 0.591 |
| | | | | |
| Rudder Angle (deg.) | 24.363 | 25.287 | 24.803 | 0.130 |
| Shaft Speed (RPM) | N/A | N/A | N/A | N/A |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -14.061 | 16.483 | 1.806 | 3.935 |
| Pitch Angle (deg) | -9.971 | 5.528 | -2.359 | 2.247 |
| Yaw Angle (deg) | -25.325 | 24.261 | -0.243 | 13.220 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.687 | 1.816 | 0.110 | 0.449 |
| Sway Acceleration (m/s$^2$) | -3.380 | 3.549 | -0.132 | 0.928 |
| Heave Acceleration (m/s$^2$) | -11.666 | -7.484 | -9.763 | 0.600 |

File Name: beam_drift_20041018124052
Date: October 18 2004 NF Time: 12:40

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.572 | 0.543 | 0.000 | 0.179 |
| Sway Acceleration ($m/s^2$) | -0.978 | 0.948 | 0.001 | 0.274 |
| Heave Acceleration ($m/s^2$) | -1.459 | 1.700 | -0.040 | 0.470 |
| Surge Displacement (m) | -0.887 | 0.828 | 0.000 | 0.261 |
| Sway Displacement (m) | -0.881 | 0.926 | 0.000 | 0.257 |
| Heave Displacement (m) | -1.678 | 1.283 | 0.000 | 0.451 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.002 | 1.226 | 0.000 | 0.299 |
| Sway Acceleration ($m/s^2$) | -1.519 | 1.421 | 0.001 | 0.429 |
| Heave Acceleration ($m/s^2$) | -2.005 | 2.018 | -0.040 | 0.580 |
| Surge Displacement (m) | -0.846 | 0.784 | 0.000 | 0.231 |
| Sway Displacement (m) | -1.572 | 1.688 | 0.000 | 0.430 |
| Heave Displacement (m) | -1.855 | 1.465 | 0.000 | 0.498 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: headp_20041018131209
Date: October 18 2004 NF Time: 13:12

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5664 North Longitude: 52.4185 West
Duration of Run: 1503.3 seconds Number of Samples: 75168
Nominal Forward Speed Over the Ground: 7.9 knots
Nominal Course Over the Ground: 082 (deg. TRUE)
Total Distance Traveled During the Run: 3.24 nautical miles
Nominal Relative Wind Speed: 23 knots
Nominal Relative Wind Direction: 260 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1650 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.64 m | 1.98 m |
| | Direction: | 215.8 (deg. True) | 084.57 (deg. True) |
| | Peak Period: | 9.75 s | 9.09 s |
| Peak Response Frequency: | Roll Angle 0.1220 Hz | major peak @ 0.1331 Hz | |
| | Pitch Angle 0.1996 Hz | | |
| | Heave Accel. 0.2513 Hz | major peak @ 0.2697 Hz, 0.2777 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 60.780 | 101.630 | 81.927 | 5.628 |
| SOG (m/s) | 3.200 | 4.703 | 4.016 | 0.250 |
| SOG (knots) | 6.220 | 9.141 | 7.806 | 0.486 |
| | | | | |
| Rudder Angle (deg.) | -2.540 | 8.065 | 2.420 | 1.367 |
| Shaft Speed (RPM) | 261.8 | 272.040 | 268.070 | 1.368 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -9.443 | 9.913 | 0.116 | 2.231 |
| Pitch Angle (deg) | -7.035 | 2.831 | -2.436 | 1.452 |
| Yaw Angle (deg) | -5.616 | 5.359 | -0.044 | 1.933 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.410 | 1.408 | 0.102 | 0.402 |
| Sway Acceleration (m/s$^2$) | -2.652 | 2.701 | 0.159 | 0.619 |
| Heave Acceleration (m/s$^2$) | -12.468 | -6.169 | -9.796 | 0.941 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: headp_20041018131209
Date: October 18 2004 NF Time: 13:12

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.844 | 0.676 | 0.000 | 0.209 |
| Sway Acceleration ($m/s^2$) | -1.110 | 1.334 | 0.000 | 0.309 |
| Heave Acceleration ($m/s^2$) | -2.527 | 2.757 | -0.039 | 0.826 |
| Surge Displacement (m) | -0.639 | 0.704 | 0.000 | 0.176 |
| Sway Displacement (m) | -0.898 | 1.049 | 0.000 | 0.246 |
| Heave Displacement (m) | -1.536 | 1.614 | 0.000 | 0.487 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.371 | 1.481 | -0.001 | 0.334 |
| Sway Acceleration ($m/s^2$) | -1.821 | 1.929 | 0.000 | 0.414 |
| Heave Acceleration ($m/s^2$) | -2.788 | 3.591 | -0.039 | 0.938 |
| Surge Displacement (m) | -0.485 | 0.608 | 0.000 | 0.153 |
| Sway Displacement (m) | -1.194 | 1.183 | 0.000 | 0.309 |
| Heave Displacement (m) | -1.726 | 1.790 | 0.000 | 0.546 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: folp_20041018134554
Date: October 18 2004 NF Time: 13:45
**Revised Oct. 2005 as vessel entered turn prior to termination of DAS.**

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5794 North Longitude: 52.3385 West
Duration of Run: 2466.0 seconds Number of Samples: 123301
Nominal Forward Speed Over the Ground: 7.6 knots
Nominal Course Over the Ground: 256 (deg. TRUE)
Total Distance Traveled During the Run: 4.98 nautical miles
Nominal Relative Wind Speed: 9 knots
Nominal Relative Wind Direction: 120 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1670 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.77 m | 1.94 m |
| | Direction: | 221.7 (deg. True) | 085.98 (deg. True) |
| | Peak Period: | 8.83 s | 9.09 s |

Peak Response Frequency: Roll Angle 0.1180 Hz major peak @ 0.1283 Hz
Pitch Angle 0.1097 Hz
Heave Accel. 0.2380 Hz

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 234.550 | 281.810 | 258.470 | 5.902 |
| SOG (m/s) | 3.069 | 4.694 | 3.885 | 0.247 |
| SOG (knots) | 5.966 | 9.125 | 7.552 | 0.479 |
| | | | | |
| Rudder Angle (deg.) | -4.350 | 9.702 | 1.952 | 1.858 |
| Shaft Speed (RPM) | 172.31 | 594.620 | 273.710 | 3.140 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -8.988 | 10.367 | 1.365 | 2.708 |
| Pitch Angle (deg) | -8.462 | 2.338 | -2.604 | 1.362 |
| Yaw Angle (deg) | -6.597 | 8.017 | -0.013 | 2.287 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.972 | 1.034 | 0.083 | 0.265 |
| Sway Acceleration (m/s$^2$) | -2.375 | 2.912 | -0.047 | 0.655 |
| Heave Acceleration (m/s$^2$) | -11.751 | -7.540 | -9.797 | 0.578 |

File Name: folp_20041018134554
Date: October 18 2004 NF Time: 13:45
**Revised Oct. 2005 as vessel entered turn prior to termination of DAS.**

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.725 | 0.689 | -0.002 | 0.182 |
| Sway Acceleration ($m/s^2$) | -1.112 | 1.096 | 0.000 | 0.286 |
| Heave Acceleration ($m/s^2$) | -2.001 | 1.881 | -0.041 | 0.551 |
| Surge Displacement (m) | -1.203 | 1.238 | 0.000 | 0.362 |
| Sway Displacement (m) | -1.094 | 0.987 | 0.000 | 0.310 |
| Heave Displacement (m) | -1.436 | 1.445 | 0.000 | 0.417 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.875 | 0.891 | -0.002 | 0.238 |
| Sway Acceleration ($m/s^2$) | -1.357 | 1.567 | 0.000 | 0.366 |
| Heave Acceleration ($m/s^2$) | -1.969 | 2.062 | -0.041 | 0.570 |
| Surge Displacement (m) | -1.045 | 0.977 | 0.000 | 0.320 |
| Sway Displacement (m) | -1.136 | 1.234 | 0.000 | 0.334 |
| Heave Displacement (m) | -1.467 | 1.407 | 0.000 | 0.421 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true nc
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

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| | | | | | | |
|---|---|---|---|---|---|---|
| File Name: | folp_20041018134554 | | | | | |
| Date: | October 18 2004 | | NF Time: | 13:45 | | |
| Dockside | | | | | | |
| Location: | Pier 6, St. John's | | | | | |
| Nominal Draft AP: | 3.785m | | Nominal Draft FP: | | 2.794m | |
| Water Temperature: | 10.5 C | | Water Density: | | 1022.12 | kg/m$^3$ |
| Closest Stability Booklet Condition: | | Condition 14 | | | | |
| Static Stability Info: | | $GM_T$(Fluid): | 0.668 m | | | |
| Trials Site: *Start of the Run* | | | | | | |
| Trials Location: | 10 nautical miles East of St. John's | | | | | |
| Water Temperature: | 10.8 C | | Water Density: | | 1023.40 | kg/m$^3$ |
| Latitude: | 47.5794 | North | Longitude: | 52.3385 | West | |
| Duration of Run: | 2684.4 seconds | | Number of Samples: | | 134221 | |
| Nominal Forward Speed Over the Ground: | | | 7.6 | knots | | |
| Nominal Course Over the Ground: | | | 256 | (deg. TRUE) | | |
| Total Distance Traveled During the Run: | | | 4.98 | nautical miles | | |
| Nominal Relative Wind Speed: | | | 9 | knots | | |
| Nominal Relative Wind Direction: | | | 120 | (deg. Mag) | | |
| Nominal Sea State: | | | 2 | | | |
| Nominal Engine RPM: | | | 1670 | RPM | | |

| Dominant Wave Characteristics: | | Neptune | | Datawell | |
|---|---|---|---|---|---|
| | Significant Height: | 1.77 | m | 1.94 | m |
| | Direction: | 221.7 | (deg. True) | 085.98 | (deg. True) |
| | Peak Period: | 8.83 | s | 9.09 | s |

| Peak Response Frequency: | | | | |
|---|---|---|---|---|
| | Roll Angle | 0.1180 | Hz | major peak @ 0.1283 Hz |
| | Pitch Angle | 0.1097 | Hz | |
| | Heave Accel. | 0.2380 | Hz | |

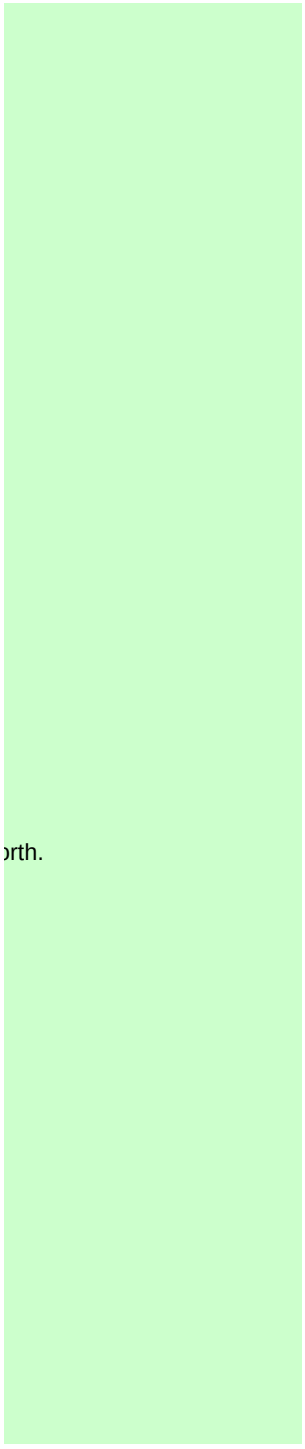
| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 109.900 | 281.810 | 249.449 | 33.720 |
| SOG (m/s) | 2.450 | 4.806 | 3.875 | 0.268 |
| SOG (knots) | 4.762 | 9.341 | 7.532 | 0.522 |
| Rudder Angle (deg.) | -4.981 | 16.980 | 2.121 | 2.400 |
| Shaft Speed (RPM) | 172.31 | 594.620 | 273.550 | 3.110 |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -8.921 | 10.432 | 1.425 | 2.685 |
| Pitch Angle (deg) | -8.413 | 2.359 | -2.598 | 1.377 |
| Yaw Angle (deg) | -65.234 | 70.437 | 3.307 | 36.435 |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.586 | 1.334 | 0.085 | 0.286 |
| Sway Acceleration (m/s$^2$) | -2.375 | 2.912 | -0.053 | 0.660 |
| Heave Acceleration (m/s$^2$) | -12.367 | -6.229 | -9.796 | 0.619 |

File Name: folp_20041018134554
Date: October 18 2004 NF Time: 13:45

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.941 | 1.047 | -0.002 | 0.226 |
| Sway Acceleration ($m/s^2$) | -1.330 | 1.113 | 0.000 | 0.268 |
| Heave Acceleration ($m/s^2$) | -2.000 | 1.882 | -0.041 | 0.555 |
| Surge Displacement (m) | -1.090 | 1.223 | 0.000 | 0.354 |
| Sway Displacement (m) | -1.129 | 1.093 | 0.000 | 0.315 |
| Heave Displacement (m) | -1.438 | 1.441 | 0.000 | 0.415 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.081 | 1.387 | -0.002 | 0.291 |
| Sway Acceleration ($m/s^2$) | -1.631 | 1.600 | 0.000 | 0.340 |
| Heave Acceleration ($m/s^2$) | -1.969 | 2.428 | -0.041 | 0.578 |
| Surge Displacement (m) | -1.133 | 1.126 | 0.000 | 0.324 |
| Sway Displacement (m) | -1.154 | 1.155 | 0.000 | 0.327 |
| Heave Displacement (m) | -1.467 | 1.411 | 0.000 | 0.422 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true no
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m



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CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bowp_20041018143101
Date: October 18 2004 NF Time: 14:31

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5579 North Longitude: 52.4755 West
Duration of Run: 1502.5 seconds Number of Samples: 75124
Nominal Forward Speed Over the Ground: 7.7 knots
Nominal Course Over the Ground: 120 (deg. TRUE)
Total Distance Traveled During the Run: 3.20 nautical miles
Nominal Relative Wind Speed: 23 knots
Nominal Relative Wind Direction: 230 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1680 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.80 m | 1.97 m |
| | Direction: | 232.0 (deg. True) | 080.35 (deg. True) |
| | Peak Period: | 8.83 s | 9.09 s |

| Peak Response Frequency: | | | |
|---|---|---|---|
| | Roll Angle | 0.1294 Hz | |
| | Pitch Angle | 0.2404 Hz | major peak @ 0.2884 Hz |
| | Heave Accel. | 0.2884 Hz | major peak @ 0.2560 Hz, 0.2441 Hz |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 104.530 | 138.680 | 123.111 | 4.973 |
| SOG (m/s) | 2.558 | 4.917 | 3.962 | 0.308 |
| SOG (knots) | 4.973 | 9.557 | 7.702 | 0.599 |
| | | | | |
| Rudder Angle (deg.) | -3.667 | 6.645 | 2.012 | 1.463 |
| Shaft Speed (RPM) | 263.91 | 276.350 | 272.290 | 1.594 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -6.719 | 7.103 | 0.875 | 2.119 |
| Pitch Angle (deg) | -8.440 | 4.139 | -2.441 | 1.618 |
| Yaw Angle (deg) | -5.809 | 5.322 | 0.001 | 1.962 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -2.210 | 1.853 | 0.096 | 0.502 |
| Sway Acceleration (m/s$^2$) | -1.876 | 2.226 | 0.035 | 0.570 |
| Heave Acceleration (m/s$^2$) | -13.387 | -4.502 | -9.797 | 1.067 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: bowp_20041018143101
Date: October 18 2004 NF Time: 14:31

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.125 | 0.766 | 0.000 | 0.229 |
| Sway Acceleration ($m/s^2$) | -0.876 | 0.959 | 0.000 | 0.281 |
| Heave Acceleration ($m/s^2$) | -3.024 | 3.717 | -0.043 | 0.932 |
| Surge Displacement (m) | -0.546 | 0.539 | 0.000 | 0.153 |
| Sway Displacement (m) | -0.685 | 0.687 | 0.000 | 0.239 |
| Heave Displacement (m) | -1.526 | 1.512 | 0.000 | 0.497 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.716 | 1.907 | 0.000 | 0.428 |
| Sway Acceleration ($m/s^2$) | -1.209 | 1.231 | 0.000 | 0.378 |
| Heave Acceleration ($m/s^2$) | -3.692 | 5.115 | -0.043 | 1.079 |
| Surge Displacement (m) | -0.572 | 0.626 | 0.000 | 0.169 |
| Sway Displacement (m) | -0.811 | 0.838 | 0.000 | 0.279 |
| Heave Displacement (m) | -1.920 | 1.588 | 0.000 | 0.543 |

**Notes:**

- Distance run is total straight line Distance from start position to end position, not actual route Distance
- Wave data is taken from buoy file with time stamp closest (before or after) to run start time
- If COG varies around 000 (True North) a 360 degree offset is added to values less than 90 degrees before the mean and St. Dev. are calculated.
- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: beamp_20041018145815
Date: October 18 2004 NF Time: 14:58

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m
Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5322 North Longitude: 52.409 West
Duration of Run: 1502.2 seconds Number of Samples: 75110
Nominal Forward Speed Over the Ground: 8.0 knots
Nominal Course Over the Ground: 350 (deg. TRUE)
Total Distance Traveled During the Run: 3.36 nautical miles
Nominal Relative Wind Speed: 8 knots
Nominal Relative Wind Direction: 350 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1670 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.78 m | 1.92 m |
| | Direction: | 232.0 (deg. True) | 083.16 (deg. True) |
| | Peak Period: | 8.83 s | 9.09 s |
| Peak Response Frequency: | Roll Angle 0.1257 Hz | | |
| | Pitch Angle 0.1036 Hz | | |
| | Heave Accel. 0.2552 Hz | major peak @ 0.2847 Hz | |

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 0.000 | 359.930 | 352.170 | 5.137 |
| SOG (m/s) | 3.517 | 4.831 | 4.160 | 0.210 |
| SOG (knots) | 6.836 | 9.390 | 8.087 | 0.409 |
| | | | | |
| Rudder Angle (deg.) | -5.980 | 9.004 | 2.145 | 1.919 |
| Shaft Speed (RPM) | 269.01 | 277.940 | 274.100 | 1.181 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -7.422 | 9.888 | 0.764 | 2.688 |
| Pitch Angle (deg) | -8.031 | 1.334 | -2.658 | 1.394 |
| Yaw Angle (deg) | -7.226 | 7.412 | 0.002 | 2.454 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -0.660 | 0.790 | 0.072 | 0.204 |
| Sway Acceleration (m/s$^2$) | -2.266 | 2.134 | 0.049 | 0.616 |
| Heave Acceleration (m/s$^2$) | -11.173 | -8.422 | -9.799 | 0.416 |

CCGA Miss Jacqueline IV Seakeeping Trials

File Name: beamp_20041018145815
Date: October 18 2004 NF Time: 14:58

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.601 | 0.547 | 0.000 | 0.169 |
| Sway Acceleration ($m/s^2$) | -0.880 | 0.898 | 0.000 | 0.245 |
| Heave Acceleration ($m/s^2$) | -1.254 | 1.266 | -0.040 | 0.379 |
| Surge Displacement (m) | -1.454 | 1.472 | 0.001 | 0.363 |
| Sway Displacement (m) | -0.999 | 0.927 | 0.000 | 0.289 |
| Heave Displacement (m) | -1.165 | 1.086 | 0.000 | 0.364 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.819 | 0.544 | 0.000 | 0.171 |
| Sway Acceleration ($m/s^2$) | -1.121 | 1.145 | 0.000 | 0.306 |
| Heave Acceleration ($m/s^2$) | -1.461 | 1.356 | -0.039 | 0.433 |
| Surge Displacement (m) | -1.165 | 1.397 | 0.000 | 0.296 |
| Sway Displacement (m) | -1.106 | 1.081 | 0.001 | 0.323 |
| Heave Displacement (m) | -1.386 | 1.297 | 0.000 | 0.435 |

**Notes:**

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- $GM_T$ value from inclining report
- The draft is referenced to the bottom of keel (BOK).
- The wave direction sign convention is stated as the direction from which waves come measured clockwise from true north.
- The motions of the vessel were computed by MotionPak in an earth fixed coordinate system.
- The sign convention for Accelerometer is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The sign convention for MotionPak is:
  x : '+' forward y : '+' starboard z : '+' downwards
- The distance to Center of Gravity from MotionPak:
  $\Delta x$ : 1.860 m $\Delta y$ : 0.000 m $\Delta z$ : -0.72 m
- The distance to the Master's steering position from MotionPak:
  $\Delta x$ : 6.588 m $\Delta y$ : 1.776 m $\Delta z$ : -4.8 m
- The distance to the triaxial accelerometer position from MotionPak:
  $\Delta x$ : 7.260 m $\Delta y$ : 0.912 m $\Delta z$ : -3.82 m

File Name: quartp_20041018152551
Date: October 18 2004 NF Time: 15:25

Dockside
Location: Pier 6, St. John's
Nominal Draft AP: 3.785m Nominal Draft FP: 2.794m

Water Temperature: 10.5 C Water Density: 1022.12 kg/m$^3$
Closest Stability Booklet Condition: Condition 14
Static Stability Info: $GM_T$(Fluid): 0.668 m

Trials Site: *Start of the Run*
Trials Location: 10 nautical miles East of St. John's
Water Temperature: 10.8 C Water Density: 1023.40 kg/m$^3$
Latitude: 47.5854 North Longitude: 52.4338 West
Duration of Run: 1502.3 seconds Number of Samples: 75116
Nominal Forward Speed Over the Ground: 7.6 knots
Nominal Course Over the Ground: 215 (deg. TRUE)
Total Distance Traveled During the Run: 3.07 nautical miles
Nominal Relative Wind Speed: 10 knots
Nominal Relative Wind Direction: 150 (deg. Mag)
Nominal Sea State: 2
Nominal Engine RPM: 1680 RPM

| Dominant Wave Characteristics: | | Neptune | Datawell |
|---|---|---|---|
| | Significant Height: | 1.77 m | 1.78 m |
| | Direction: | 266.0 (deg. True) | 071.91 (deg. True) |
| | Peak Period: | 10.89 s | 9.09 s |
| Peak Response Frequency: | Roll Angle 0.1257 Hz | | |
| | Pitch Angle 0.2219 Hz | major peak @ 0.08504 Hz | |
| | Heave Accel. 0.2587 Hz | | |

| **Channel** | **Minimum** | **Maximum** | **Mean** | **St. Dev.** |
|---|---|---|---|---|
| ***DGPS Antenna*** | | | | |
| COG (deg. TRUE) | 199.310 | 232.570 | 214.696 | 5.683 |
| SOG (m/s) | 2.569 | 4.994 | 3.804 | 0.302 |
| SOG (knots) | 4.995 | 9.708 | 7.395 | 0.587 |
| | | | | |
| Rudder Angle (deg.) | -4.493 | 6.645 | 1.286 | 1.702 |
| Shaft Speed (RPM) | 171.82 | 593.150 | 273.290 | 3.878 |
| | | | | |
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Roll Angle (deg) | -6.031 | 9.594 | 2.054 | 2.262 |
| Pitch Angle (deg) | -7.957 | 3.133 | -2.549 | 1.458 |
| Yaw Angle (deg) | -6.127 | 6.341 | -0.049 | 2.099 |
| | | | | |
| ***Output from Tri-Mounted Accelerometer positioned near steering position*** | | | | |
| Surge Acceleration (m/s$^2$) | -1.585 | 1.610 | 0.088 | 0.387 |
| Sway Acceleration (m/s$^2$) | -2.497 | 2.244 | -0.165 | 0.621 |
| Heave Acceleration (m/s$^2$) | -12.846 | -6.281 | -9.795 | 0.819 |

File Name: quartp_20041018152551
Date: October 18 2004 NF Time: 15:25

| Channel | Minimum | Maximum | Mean | St. Dev. |
|---|---|---|---|---|
| ***Output from MotionPak positioned at the Center of Gravity*** | | | | |
| Surge Acceleration ($m/s^2$) | -0.863 | 0.672 | 0.000 | 0.196 |
| Sway Acceleration ($m/s^2$) | -1.050 | 1.242 | 0.000 | 0.310 |
| Heave Acceleration ($m/s^2$) | -2.818 | 2.823 | -0.045 | 0.738 |
| Surge Displacement (m) | -0.916 | 0.932 | 0.000 | 0.301 |
| Sway Displacement (m) | -0.799 | 1.131 | 0.000 | 0.259 |
| Heave Displacement (m) | -1.382 | 1.355 | 0.000 | 0.422 |
| ***Computed for the Master's steering position from MotionPak*** | | | | |
| Surge Acceleration ($m/s^2$) | -1.622 | 1.250 | 0.000 | 0.330 |
| Sway Acceleration ($m/s^2$) | -1.451 | 1.785 | 0.001 | 0.403 |
| Heave Acceleration ($m/s^2$) | -3.079 | 3.342 | -0.045 | 0.804 |
| Surge Displacement (m) | -0.816 | 0.962 | 0.000 | 0.281 |
| Sway Displacement (m) | -1.069 | 1.284 | 0.000 | 0.298 |
| Heave Displacement (m) | -1.437 | 1.492 | 0.000 | 0.437 |

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