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<i>Topic</i>	T1.2
<i>Poster Presentation</i>	poster

MICROWAVE METHOD FOR CLOSURE OF QUASI-SPHERICAL RESONATORS AT INRiM, LNE, NRC AND TIPC-CAS

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Quasi-spherical microwave cavity resonators are widely used in primary thermometry. By lifting the degeneracy of microwave resonance triplets, the well-characterized and well-understood shape of the triaxial ellipsoid allows very precise measurement of individual microwave resonance peaks (with a relative fitting uncertainty of 10^{-9} or better). For this reason, this type of instrument is used in acoustic gas thermometers, refractive index gas thermometers and single pressure refractive gas thermometers.

However, each of these resonators is initially fabricated as two separate quasi-hemispheres, and in order to realize high-accuracy microwave resonant frequency measurements, it is essential to combine the two quasi-hemispheres correctly while closing the quasi-sphere. Part of this procedure involves flowing a known gas inside the quasi-sphere while closing it, in order to help understand and predict the mechanical behavior of the resonator. For example, we show how we use the microwave resonance signals to monitor shape and sealing as torques to equatorial bolts are increased. By using the same technique, the installation of the acoustic and microwave sensors is possible without perturbing the shape of the resonator.

We report on the closure of several different resonators, with quasi-sphere closing processes executed at INRiM (Italy), LNE (France), NRC (Canada) and TIPC-CAS (China). All of these resonators have a 0.5-litre internal volume, were produced based on the same mechanical drawing, and were machined using diamond turning finishing techniques. We are confident that the assembly method described here could also be useful to monitor the closing of other quasi-spherical cavities.