ID: Type: **Oral**

-frequency calibration of hydrophones and acoustic recording systems

For absolute measurement of sound in the ocean, and for assurance of stability in long-term monitoring applications, the performance of the measurement system is a crucial factor governing the quality of the measured data. In validating that performance and providing traceability to the measurements, calibration is of vital importance to ensure noise monitoring strategies and in-situ source characterisations are underpinned by robust metrology. The need for enhanced traceability is particularly acute at frequencies below 1 kHz where high-amplitude anthropogenic sources of greatest concern radiate much of their sound energy, where regulation and international directives mandate that environmental monitoring shall be made, and where long-term monitoring applications such as those of the CTBTO focus their measurement strategy. Here, a description is given of the calibration methods and facilities available for low-frequency calibration of hydrophones and recording systems. The description covers the methods outlined in international standards such as IEC60565:2006, and novel methods and facilities which may be used. Consideration is given to the challenges involved in undertaking calibrations at very low frequencies, and how these calibrations may be validated through the international metrology infrastructure.

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Track Classification: Technology and engineering trends in Ocean Observatories, with emphasis on technologies and trends pertinent to the IMS hydroacoustic network