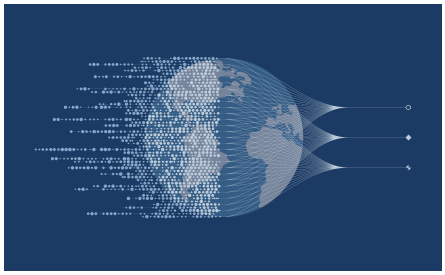

ID: Type: **Side Event**

The Role of Metrology in Seismic, Hydroacoustic, and Infrasound (SHI) Monitoring Activities

Wednesday 10 September 2025 09:00 (3h 30m)

This event will explore recent advances in metrology for SHI technologies and their application within the CTBTO verification regime. It will focus on the transfer of laboratory calibration methods to the field, address key technical challenges, and highlight the importance of strengthening calibration traceability to ensure reliable IMS data.

Session Objectives:
- Review the most recent developments in metrology related to IMS seismic, hydroacoustic, and infrasound (SHI) monitoring, representing the state-of-the-art.
- Consider how laboratory calibration capability can be transferred to the field calibration requirements of the IMS.
- Outline the technical challenges and highlight further research necessary to fully implement field calibration requirements and establish measurement traceability for IMS seismic, hydroacoustic and infrasound data.
- Encourage manufacturers of SHI equipment and operators of SHI systems outside the IMS to contribute to the developments in metrology related to instrumentation and adopt a unified approach to calibration techniques compatible with IMS methods and requirements.

Relevance to CTBTO:
PTS has been actively engaging with specialist measurement service providers and the global metrology community for nearly a decade . The result has been the rapid development of calibration capability across for some of the waveform technologies used in the IMS. In particular the National Measurement Institutes and Designated Institutes have been responsive in establishing new primary and secondary standards covering the IMS frequency range for seismic, hydroacoustic and infrasound monitoring.
However, laboratory methods continue to be developed, and in-situ calibration still presents significant technical challenges. The level of challenge and technical solution differs across the fields, but the benefits of collaboration and cross-seeding of principles and knowledge have obvious benefits.
- Seismic systems predominantly rely on electrically generated calibration signals built into field seismometers. While widely used, this method has inherent limitations and integration challenges. The side event will explore recent progress in laboratory calibration and how metrology concepts could enhance measurement traceability and instrumentation choices. Contributions from parent networks, manufacturers, and station operators are encouraged to support an open discussion on future directions.
- Full-chain in-situ calibration of hydrophone measurement systems installed at hydroacoustic stations is an emerging and extremely challenging task. As well as the low frequency requirements, the deep-water conditions present additional key challenges. Nevertheless, methods are being conceived in readiness for testing in both controlled underwater environments and in ocean conditions.
- Infrasound is the most advanced in terms of implementation with a bespoke method of side-by-side calibration using ambient infrasound as a calibration stimulus now being rolled out to sites. The PTS method can now be further enhanced by development in laboratory-based calibration.

Robust methods of traceable field calibration in all technologies supports station sustainment by ensuring that sensor systems remain operational. Measurement traceability derived from laboratory-based primary and secondary calibrations methods is a vital attribute in calibration, as it links IMS data with the SI providing consistency across the whole network. The universal challenge is how to transfer measurement traceability to the field on a regular basis to deliver on the IMS calibration requirements for the sensor systems.

This side event provides an opportunity to share experiences and successes from across technologies and from geophysical monitoring activities beyond the IMS.

E-mail

In-person or online preference

Presenters: Ms HELLWEG, Margaret (Seismological Society of America (SSA)); Mr BARHAM, Richard (Acoustic Sensor Networks Limited); ROBINSON, Stephen (National Physical Laboratory)

Session Classification: Side event "The Role of Metrology in Seismic, Hydroacoustic, and Infrasound (SHI) Monitoring Activities"