SSI Calibration Module

Yacine Sid Ahmed, Moctar Moumouni, Benoît Doury

Poster P4.1-159
The **SSI calibration module** is a tool that extends the Standard Station Interface (SSI) for **intuitive execution of instrumental calibrations** and **review of calibration results**.

- It aims to **support the complex planning, technical execution, evaluation and reporting** of the calibration of IMS seismic and T-phase stations.

- The SSI Calibration module also provides **a single and standard interface** that masks the heterogeneity of the hardware/software used at different IMS stations.

- Finally, the SSI Calibration module helps to **standardize the communication** through the full implementation of IMS2.0 format to dramatically ease the exchange, parsing and review of calibration messages, for both the Station Operator and PTS staff.

The module has been **deployed** at a number of stations and the PTS currently continues its **deployment** at other stations. This poster presents the SSI Calibration module and focuses on the functionalities **supporting Station Operators** during calibration activities.
The IMS Operational Manual includes strict requirements regarding calibration of IMS seismic stations:

- **On-site calibration** results are used as QC for instrument stability
  - “stability“: +/- 5% to the instrument nominal response in amplitude (and +/- 5° in phase)
  - QC performed over the full IMS passband
  - QC performed on a yearly basis

- **Planning and communication**
  - at the Network level: attribution of calibration time slots to Stations
  - at the Station level: calibration messages exchanged between SO and the IDC
INTRODUCTION

Calibration activities challenges:

• **high number** of sensor-digitizer **combinations** (hardware/software/procedures/training)

• PTS **resources to train** Station Operators on calibration activities

• **variety** and **complexity** of hardware/software issues

• compliance with the OM requirements for **full frequency calibration** and sending of results at the **IMS2.0 format**

• compliance with **command and control** and **authentication** requirements while performing on-site calibration activities
SSI Calibration Module features:

- Calibration operational **process** fully supported by the calibration module
- Communication between the PTS and the Station using standardized **IMS2.0** format (including full-frequency response submission)
- Command and Control **authentication** (through SSI Authentication module)
- Define, perform, review and report on calibrations performed
- **Auto-evaluation** of the calibration results (IN_SPEC YES or NO)
- Variety of the sensor/digitizer **combinations** supported (Nanometrics Europa, Guralp D24, Quanterra Q330, MariPro DDFI)
- GUI executed locally, all communications with the workstation are using CLI commands, thus minimizing the load on GCI **bandwidth** and allowing smooth calibration of remote sites from CRF or PTS
Supported Hardware:

- **Supported digitizers**
  - Güralp DM24
  - Nanometrics Europa-T / Europa HRD
  - Quanterra Q330HR

- **Tested configurations (digitizers/sensors)**
  - DM24 + CMG-3T ; DM24 + STS-2
  - EuropaT + CMG-3T ; EuropaT + STS-2 ; EuropaT + GS13
  - Q330HR + CMG-3T ; Q330HR + STS-2
Calibration Scenario Definition and Scheduling
Output Signal Review

![Graph showing data view and signal review](image)

**Disclaimer:** The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO.
**METHODS**

### Calibration Results Interpretation

![Image of Calibration Results](image_url)

**SSI Calibration Module**
Yacine Sid Ahmed, IMS division, yacine.sid.ahmed@ctbto.org
Moctar Moumouni, IMS division, moctar.moumouni.kountche@ctbto.org
Benoît Doury, IMS division, benoit.doury@ctbto.org

---

Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO.
**METHODS**

**IMS2.0 calibrate result message**

**P4.1-159**

Yacine Sid Ahmed, IMS division, yacine.sid.ahmed@ctbto.org

Moctar Moumouni, IMS division, moctar.moumouni.kountche@ctbto.org

Benoît Doury, IMS division, benoit.doury@ctbto.org

_SNI 2021_

**CTBTO.ORG**

Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO.
RESULTS

• 2020 results:
  • Additional digitizer model supported by the SCM (Quanterra Q330M+)
  • Q330M+ calibration testing with Streckeisen STS2.5 and Güralp CMG3T
  • Increase of full-frequency results sent to the PTS in IMS2.0 format (+ around 10 stations)
  • Support for large seismic arrays calibration (e.g. NOA 42-element array full-frequency responses sent for the first time)

• Perspectives (on-going)
  • Support of an additional digitizer model (Nanometrics Centaur)
  • Centaur calibration testing with Nanometrics Trillium120 and Guralp CMG3T

Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO.
CONCLUSIONS

• The purpose of On-site Calibration is to ensure **stability of measurement system responses over time**.

• The SSI Calibration Module is contributing to:
  - Increase the number of Stations sending **full-frequency** results in **IMS2.0** format
  - **Standardize** practices when performing a calibration task and sending results to the PTS
  - **Standardize** the validation of these results at the PTS
  - **Reduce** the number of technical issues (due to diversity of equipment / software / calibration results format)
  - Enhance PTS capability to provide **support** and perform calibration remotely on the SO behalf (troubleshooting, delegated calibration)

• Any SO can be supported for the installation, configuration and testing of the SCM. Please contact us!

Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO.