SnT 2021
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SSI Calibration Module

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Poster P4.1-159

POSTER

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ABSTRACT

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.

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INTRODUCTION

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

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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

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METHODS

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

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METHODS

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


Guralp DM24

EuropaT


Q330HR


STS-2


CMG-3T


GS13

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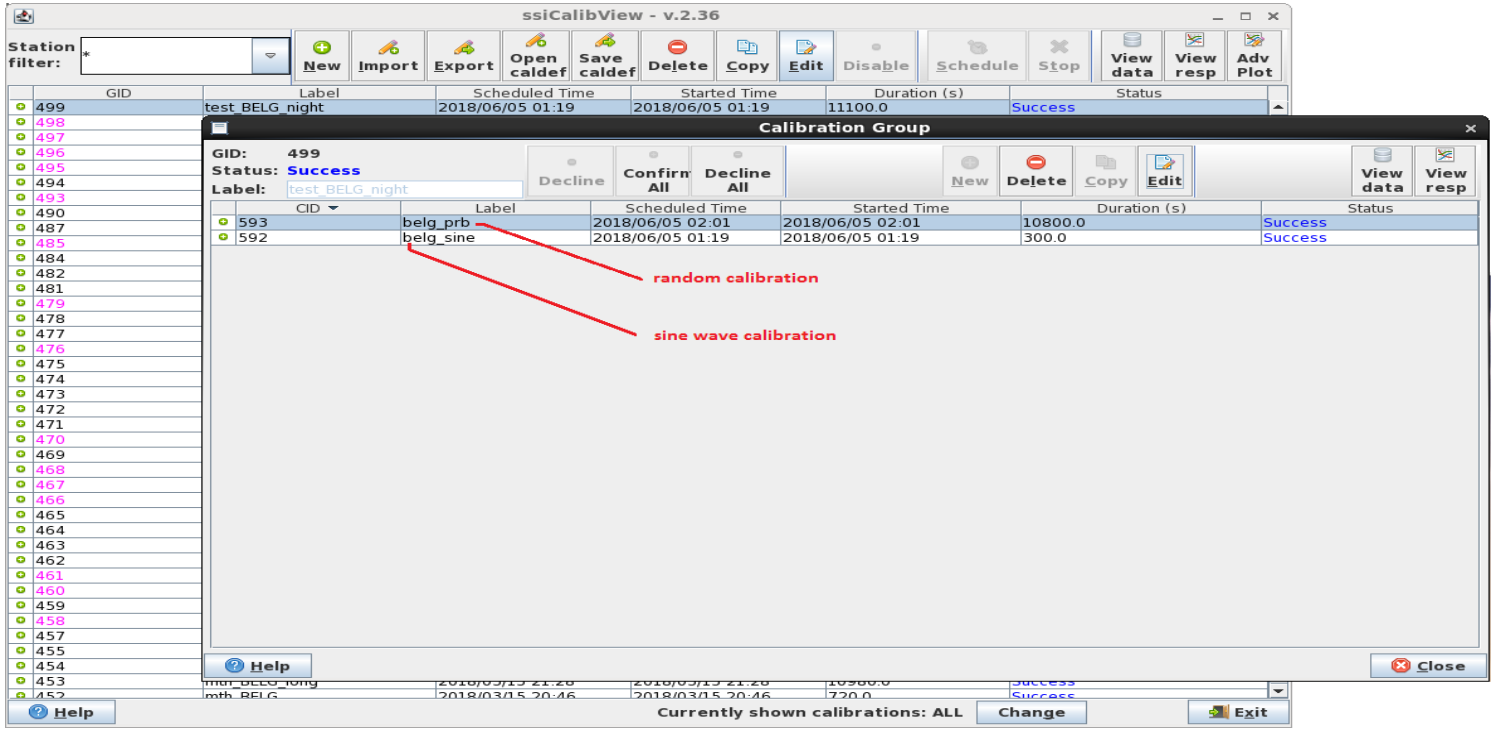
METHODS

Calibration Scenario Definition and Scheduling



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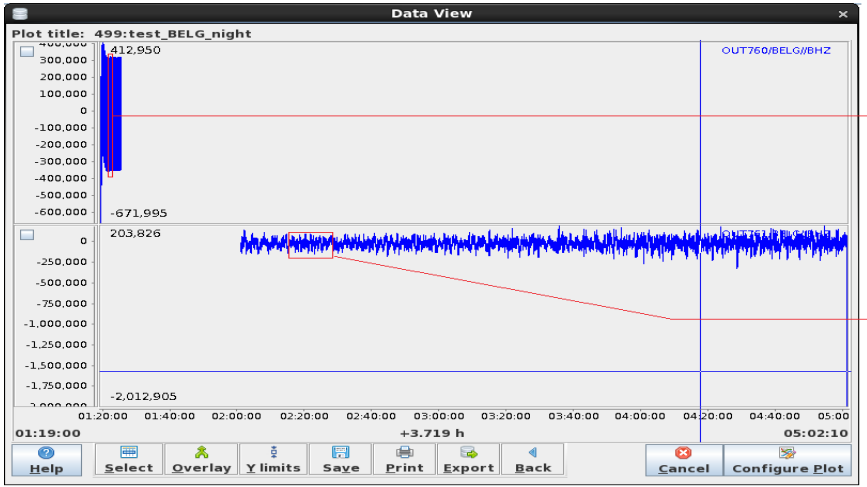
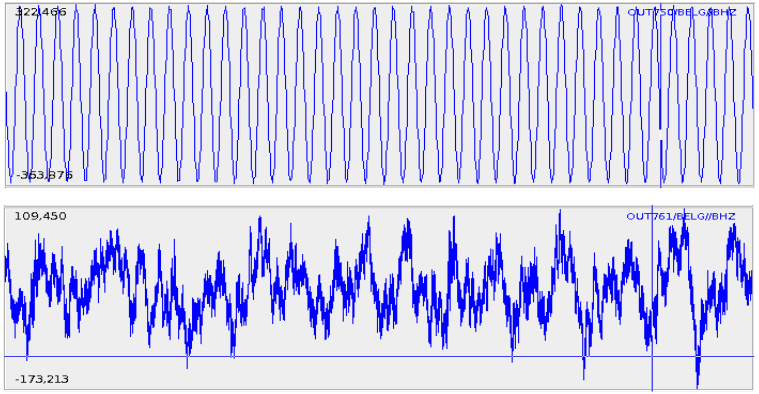
METHODS

Output Signal Review





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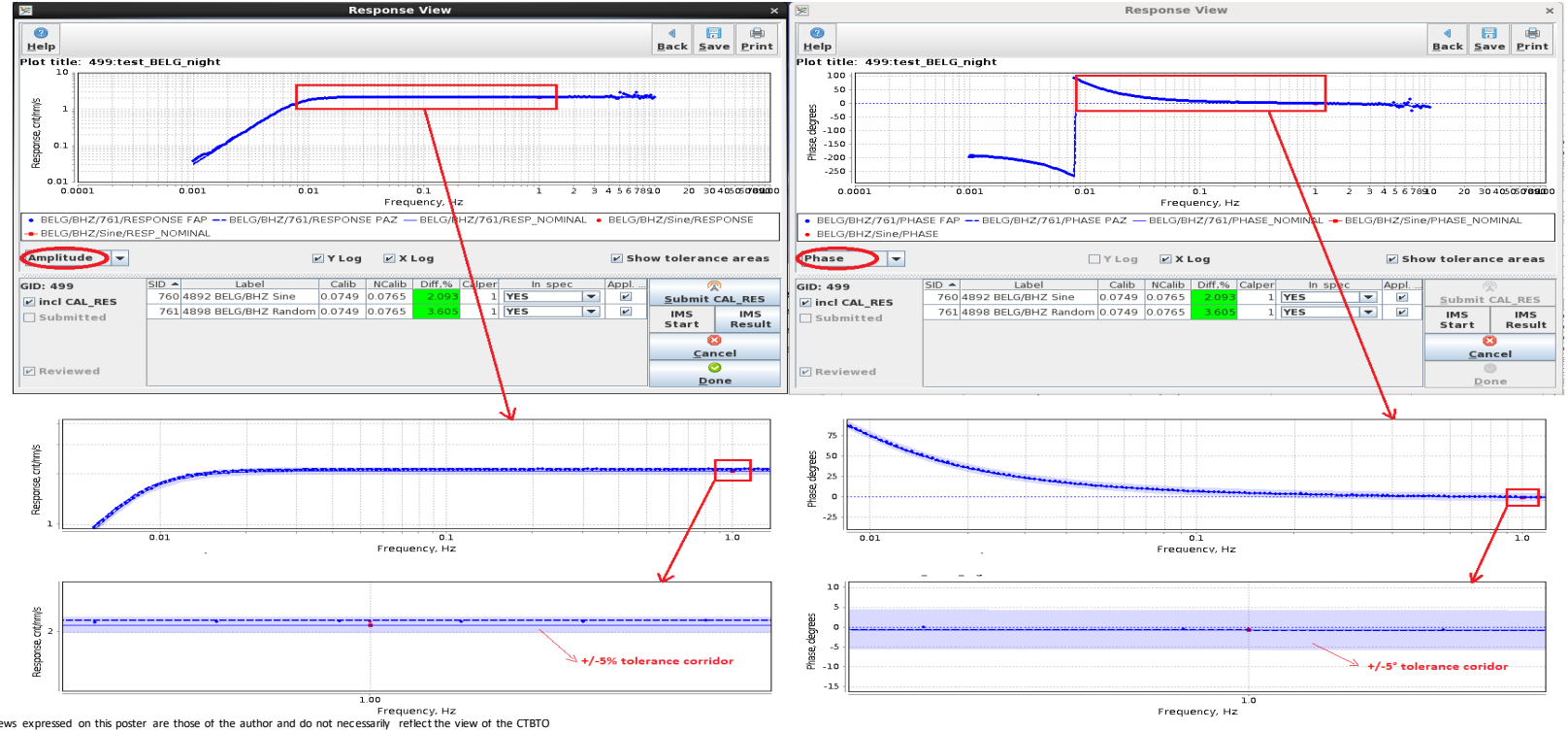
METHODS

Calibration Results Interpretation



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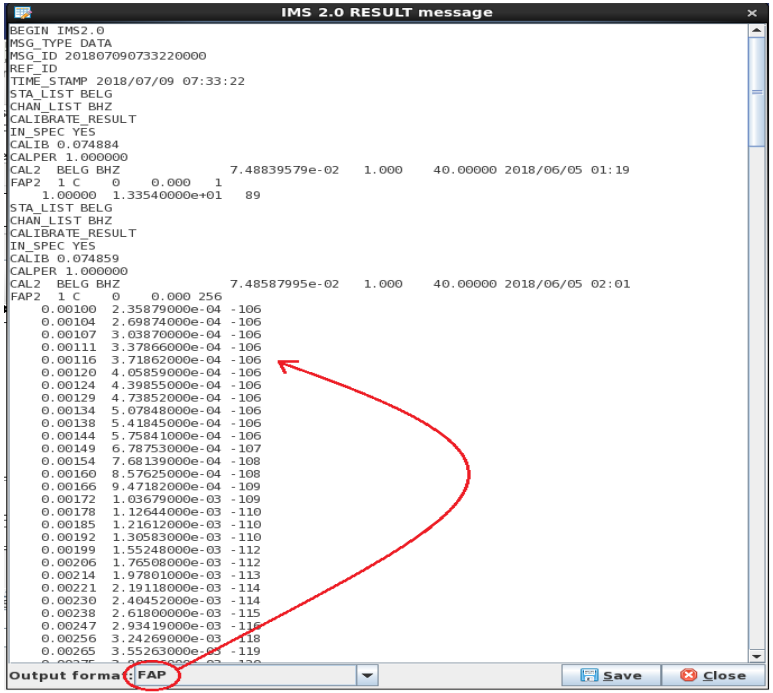
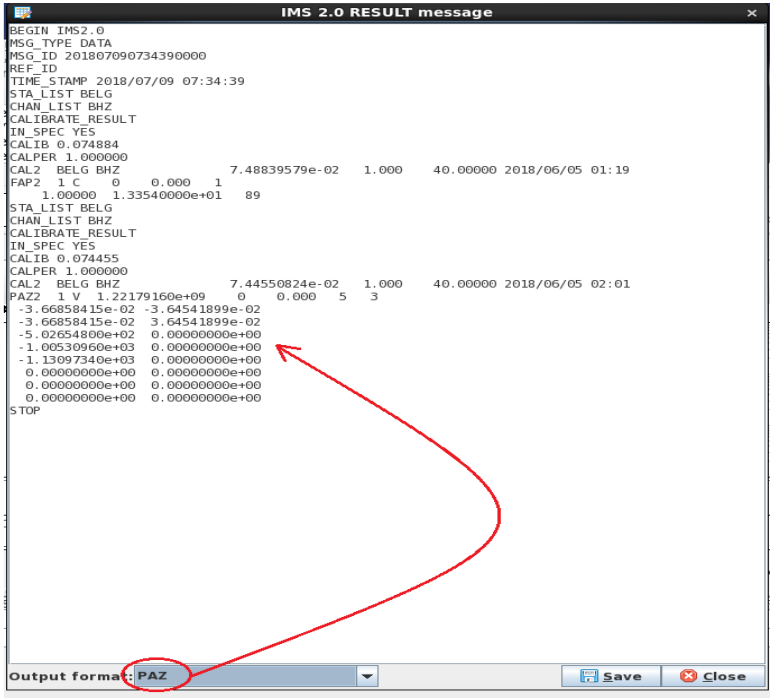
METHODS

IMS2.0 calibrate result message





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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**

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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!**