

The ESS Database for Elliptical Cavities



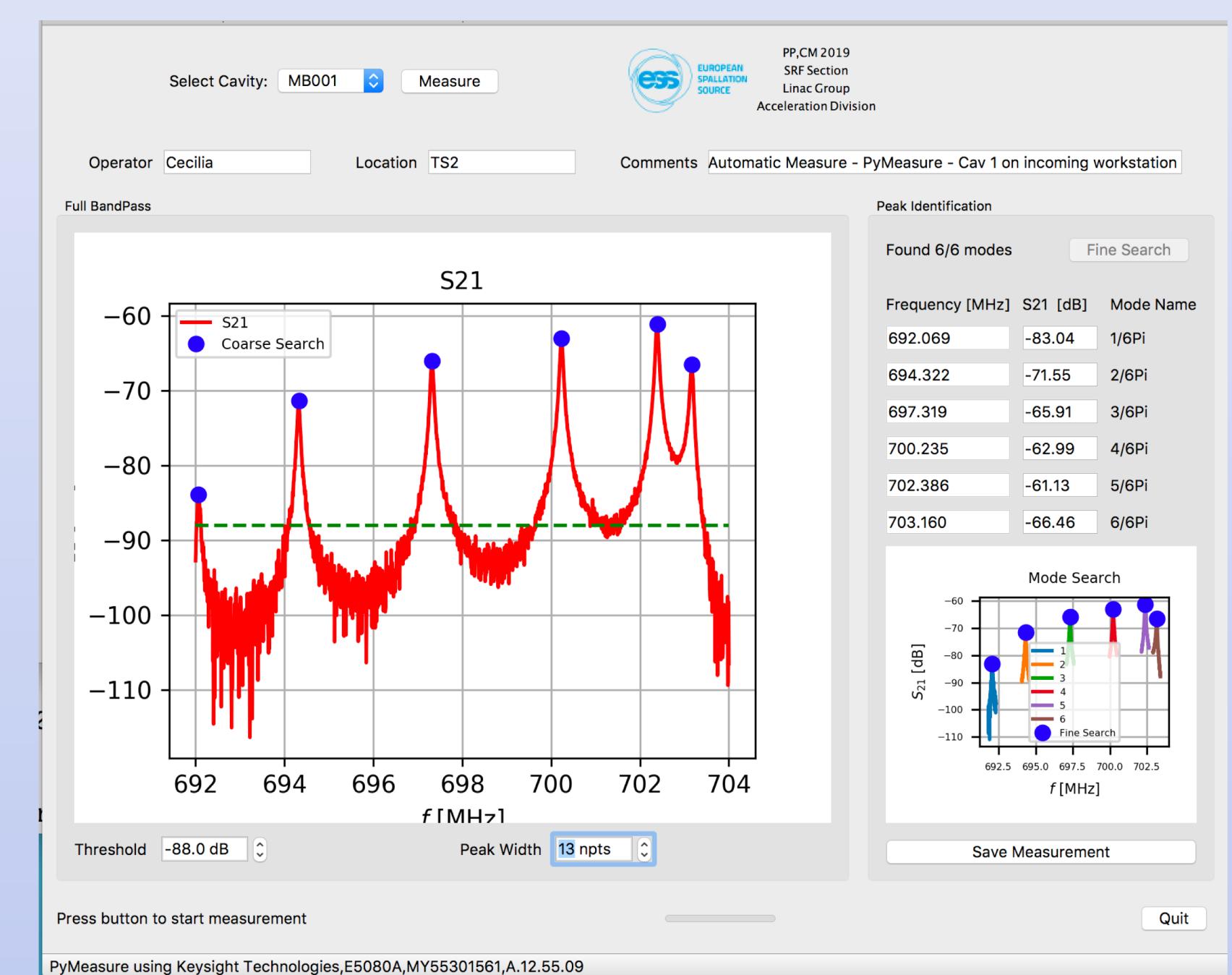
THP099

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The large in kind scope of the elliptical superconducting RF linac of the ESS facility implies the *handling of handover conditions between the cavities fabrication and testing phases performed at INFN and STFC, to the assembly of cryomodules at CEA and later to ESS in Lund*.

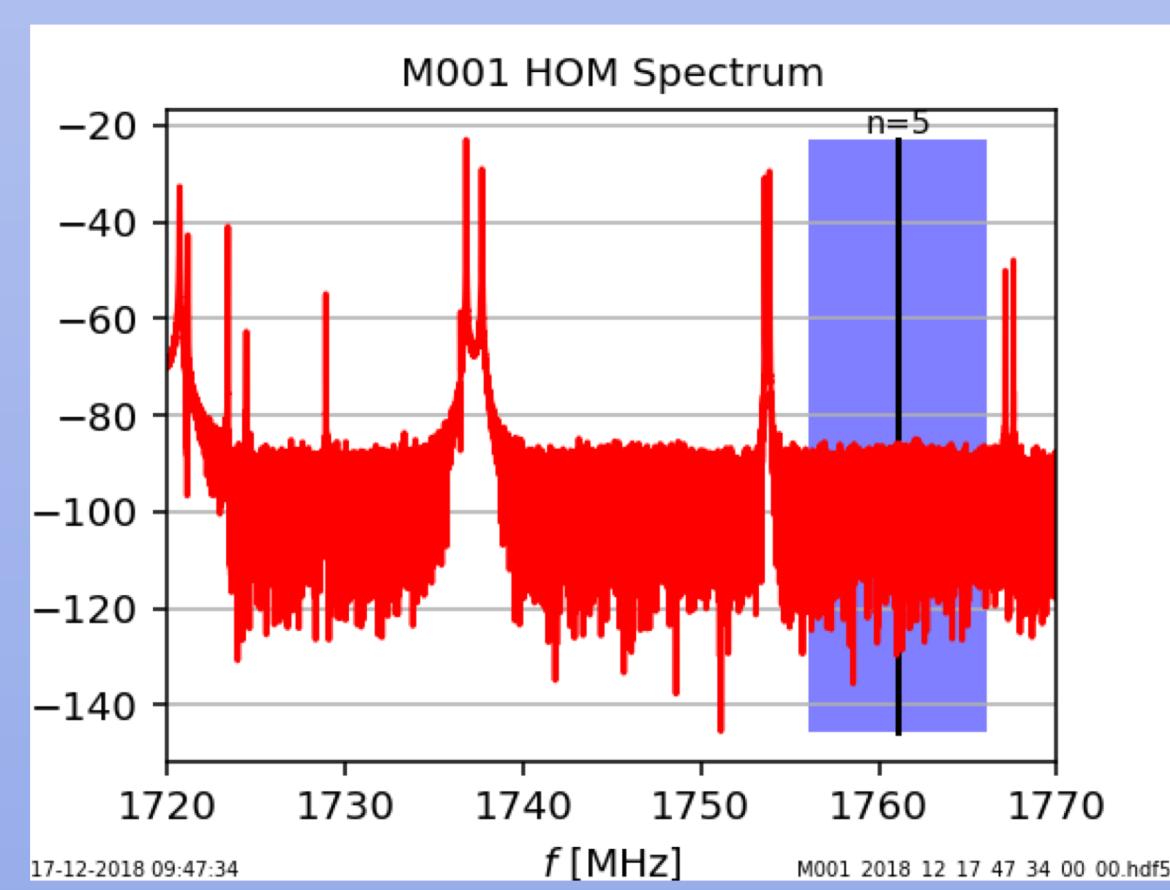
The performance qualification at the test stand, and later the commissioning and operation phases require the availability of the cavity performance and frequency data under all environmental conditions during preparation (e.g. temperature, vacuum in beam line/He vessel/vacuum vessel, tuner state). Availability of the data needs to be guaranteed for the long term maintainability of the accelerator. For these reasons a cavity database has been set up at ESS, integrating the data contained in the handover documentation from the in kind partners and extending it during the activities at ESS after receiving the modules. The database has been used to analyze the preparation steps of the prototype demonstrator cryomodule for the tests at ESS, by benchmarking with the data collected during the tests at CEA, and is currently used during the series cavities handover phases.

Measurement tools



The tool allows to measure cavities **S21** with VNA and store data automatically in the cavity DB

- Bandwidths
- Transmission
- HOM spectrum
- F tracker (e.g. pumpdown)



Architecture of Data Storage

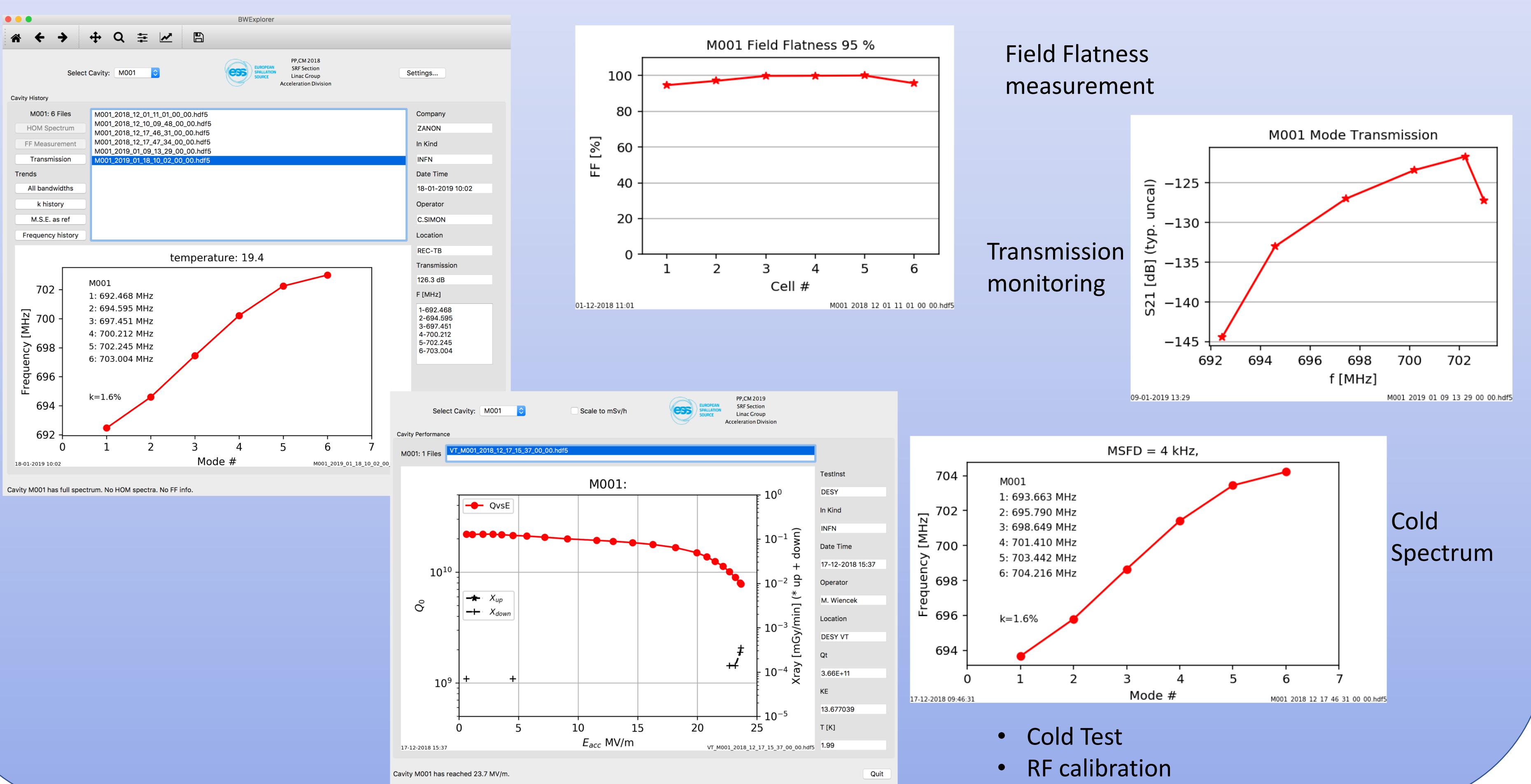
Storage Component	Usage	Comments	Location
Live Staging Area	Area used for the handover of documentation from IKC/QA/QC systems	1. Semantically download a. From Address of the INFN and CEA b. TBC for STFC 2. Export review on the incoming data. 3. Data can be stored in the cloud using/converting tools.	ESS shared network folder Accessible at ESS or via VPN
Normalized Data	Recovery of the datafiles, with corresponding agreed standards and metadata tagging	Can be accessed from the outside. Caveat: tools at the moment not as web services, but try on network access via ownCloud	http://meas01.esss.lu.se/owncloud/index.php

Existing Tools (ESS Gitlab), all open

Component	Language	Scope	GitLab Project	Branch
Cavity Reception	Python 3.7 with PyQIS	Transfer to ESS the Ansaldo data downloaded to the Share folder. Transfer data to Measurement DB, either one or more times.	https://gitlab.esss.lu.se/STFC_Section/repositories	master
Module Reception	Python 3.7 with PyQIS	Transfer the Cavity data produced from CEA with the module handover. W/H HDF data transformation.	https://gitlab.esss.lu.se/STFC_Section/repositories	master
VTFExplorer	Python 3.7 with PyQIS	Browses and analyzes the cavity data in the Measurement DB, either one or more times.	https://gitlab.esss.lu.se/STFC_Section/repositories	master
VTFExplorer	Python 3.7 with PyQIS	Measurement of cavity transmission properties. Data is taken from the HDF DB.	https://gitlab.esss.lu.se/STFC_Section/repositories	master
PyMeasureOptical	Python 3.7 with PyQIS and Python-VTF module	Measurement of cavity transmission properties. Possibilities to store W/H measurement data into the Measurement DB.	https://gitlab.esss.lu.se/STFC_Section/repositories	master
Library	Language	Scope	GitLab Project	Branch
InClasses	Python 3.7	Provides abstract classes for the VT, Handler objects, with serializers/deserializers to text and hdf, and data manager.	https://gitlab.esss.lu.se/STFC_Section/repositories	master

Browsers: Bandwidth & VT Measurements

To check fulfillment of specification or handling the handover conditions. Browse, display & analyze cavities measurements at cold & warm.



Field Flatness measurement

Transmission monitoring

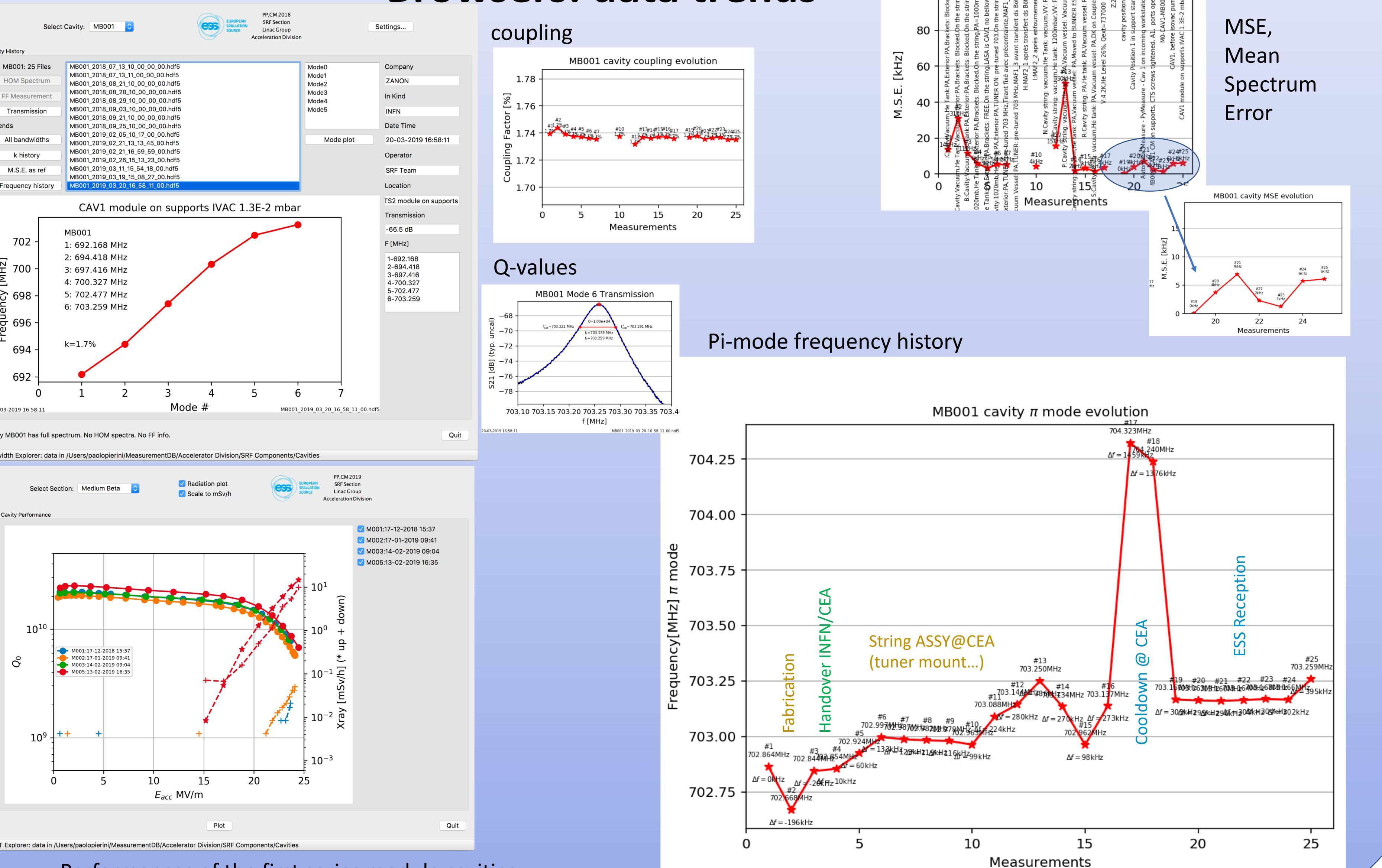


Cold Spectrum

• Cold Test

• RF calibration

Browsers: data trends

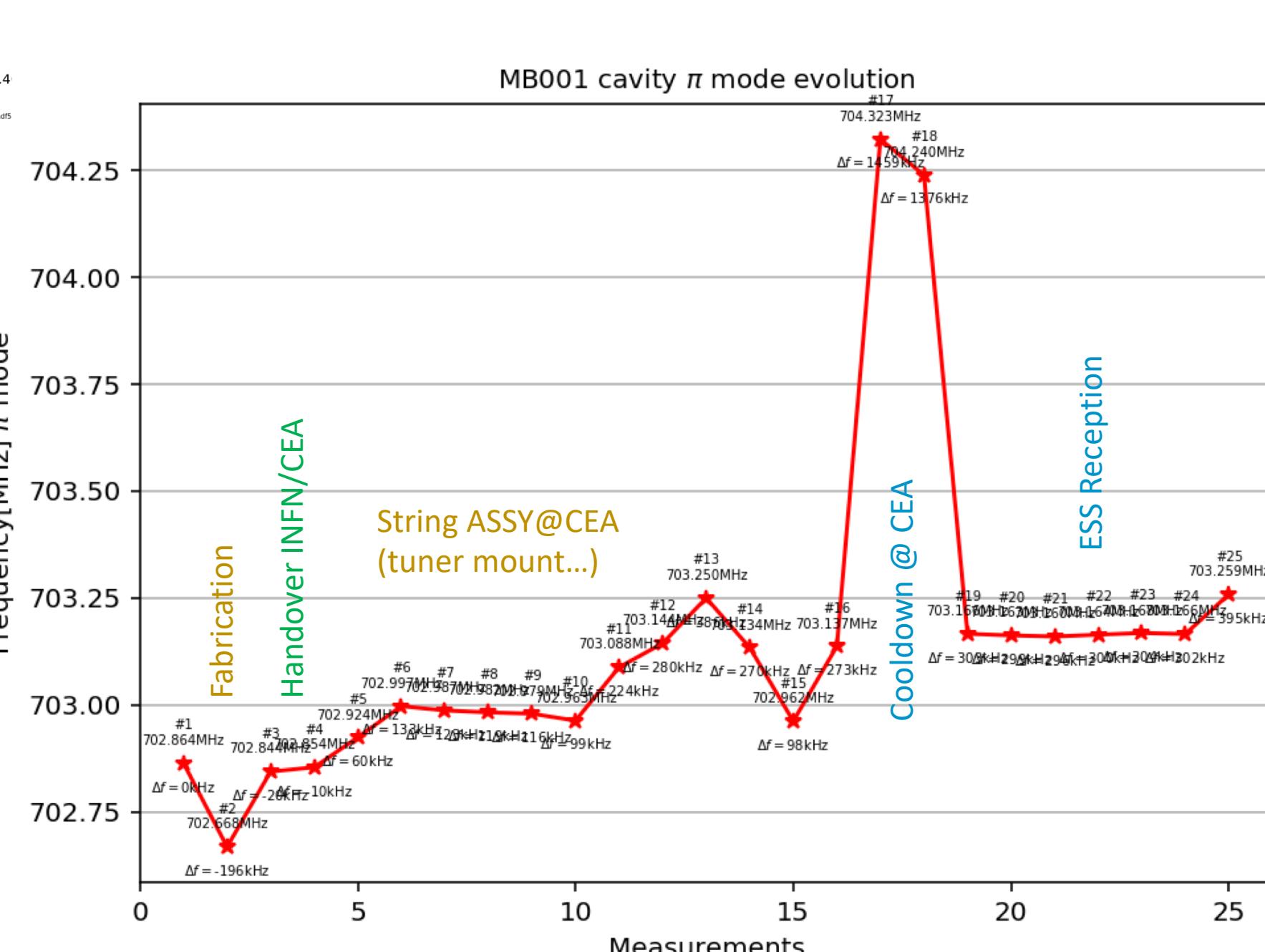


Pi-mode frequency history

MSE, Mean Spectrum Error

coupling

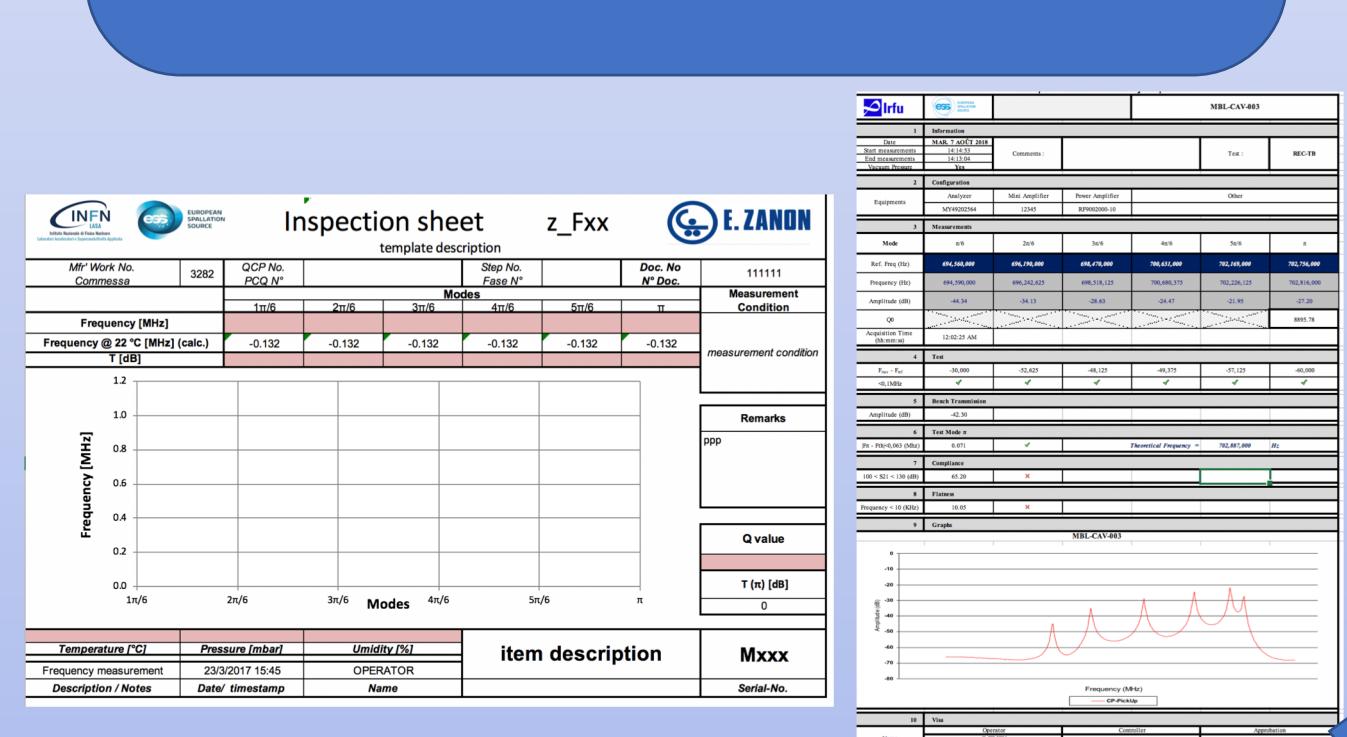
Q-values



ESS Scope

MEASUREMENTS @ IKC

- After fabrication
- Intermediate handover
- Outgoing



- Incoming
- Preparation TS2/Linac

Measurement&Calibration DB (ownCloud service)

<https://meas01.esss.lu.se/owncloud/index.php/login>

Live Staging Area (typ. text files or xls)

Normalized Data (HDF files, metadata)

ESS Asset Management ID Installation Structure

https://gitlab.esss.lu.se/STFC_Section

MEASUREMENTS @ IKC

- After fabrication
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EUROPEAN SPALLATION SOURCE