Vertical cavity testing at DESY

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PIP-II Technical Workshop

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A Partnership of:
- US/DOE
- India/DAE
- Italy/INFN
- UK/UKRI-STFC
- France/CEA, CNRS/IN2P3
- Poland/WUST

Outline

- AMTF Hall
- Preparation area
- Cryostats
- VT Environment
- Measurement possibilities
- Cavity test workflow
- Summary

AMTF Hall

- Accelerator Module Test Facility (AMTF) was build to test SRF components (cavities and cryomodules) for E-XFEL
- 2 vertical cryostats
- 3 cryomodule test benches
- Between 2012 and 2016 over **1.000** VTs and over 100 cryomodule tests performed for E-XFEL

Different projects…

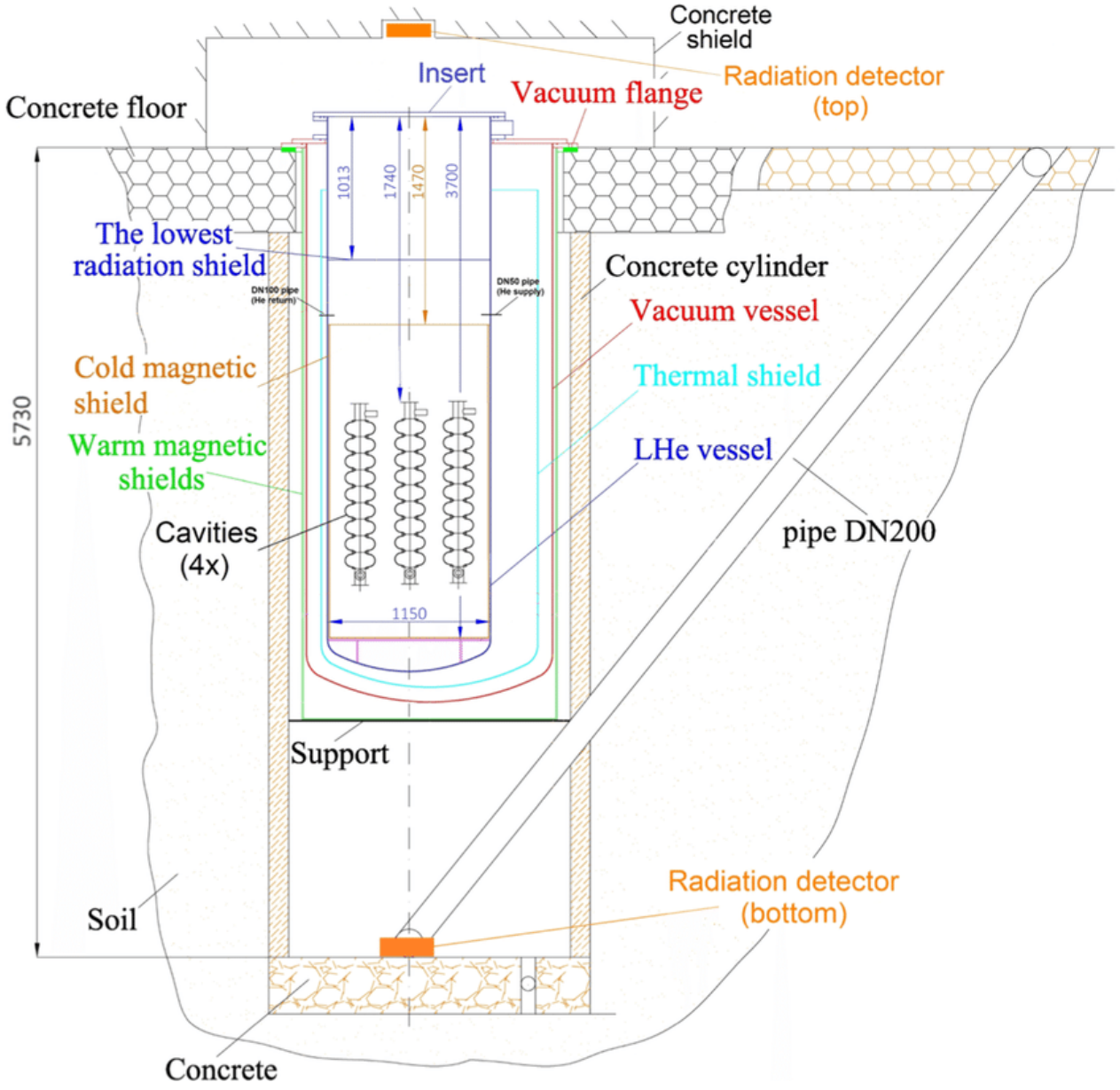
- After finishing serial tests for E-XFEL, cavities for several different projects were tested
  - LCLS II
  - MESA
  - ESS Medium Beta
  - ESS High Beta
  - R&D
    - Single cell cavities
    - SRF GUNS

Preparation area

- 6 inserts
  - Up to 4 x 1.3 GHz cavities
  - Up to 2 x 704MHz cavities
  - Some inserts used for R&D with more complex instrumentation

Vertical cryostats

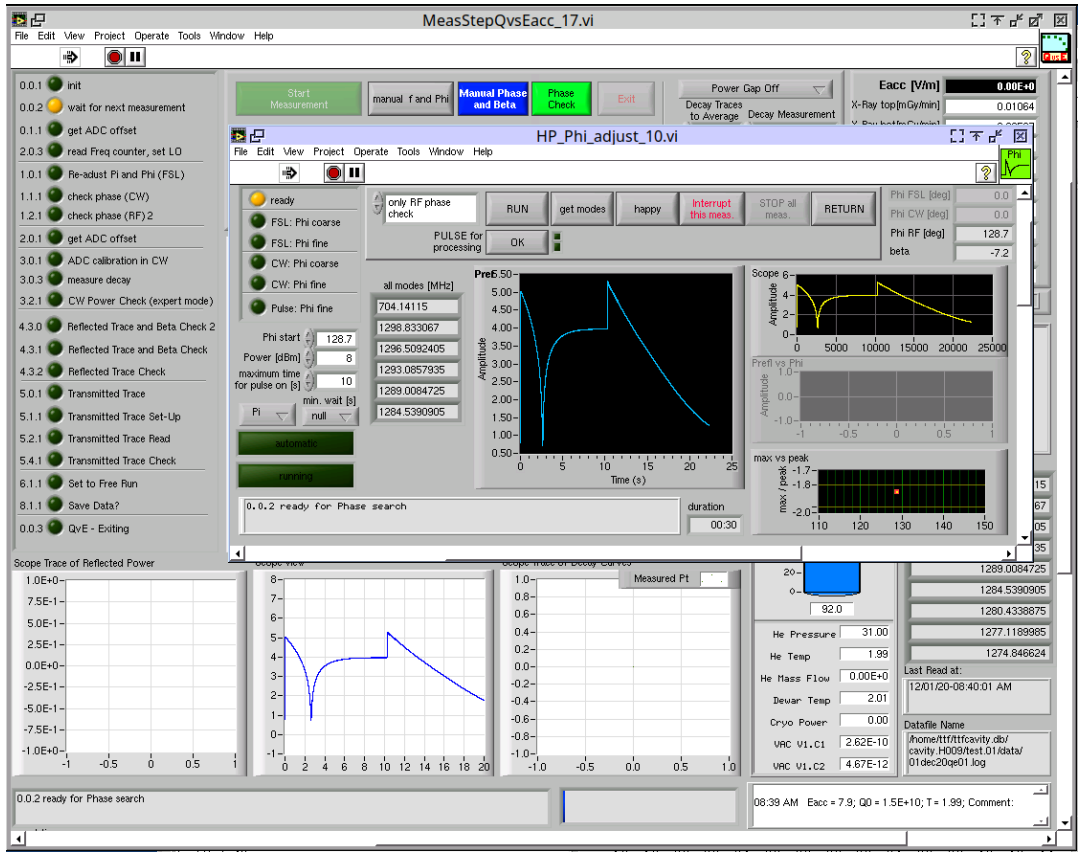
- Diameter: 1150mm
- Volume: ca. 2000 l LHe
- Working temperature: 4.2K – 1.5K



VT environment

Software

- Semi automatic software – Labview
- Additional VNA scripts/labview apps

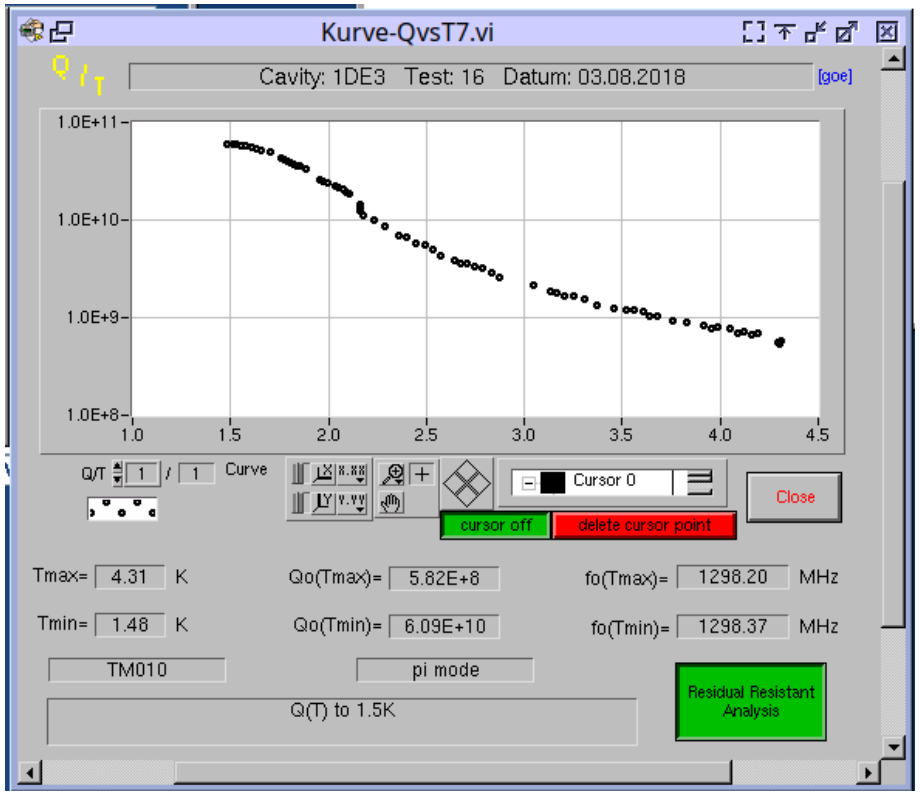


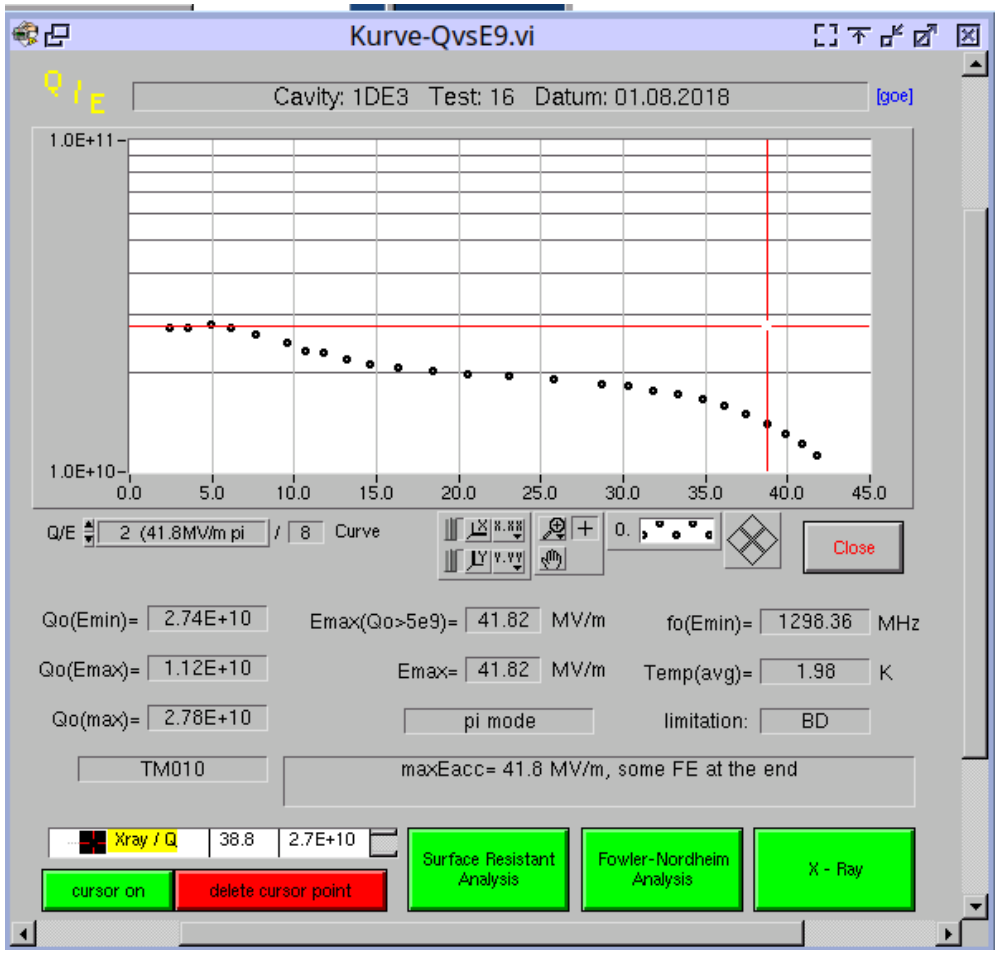
Hardware

- Analog system with PLL (new digital system in preparation)
- Some components frequency dependent

Measurement possibilities

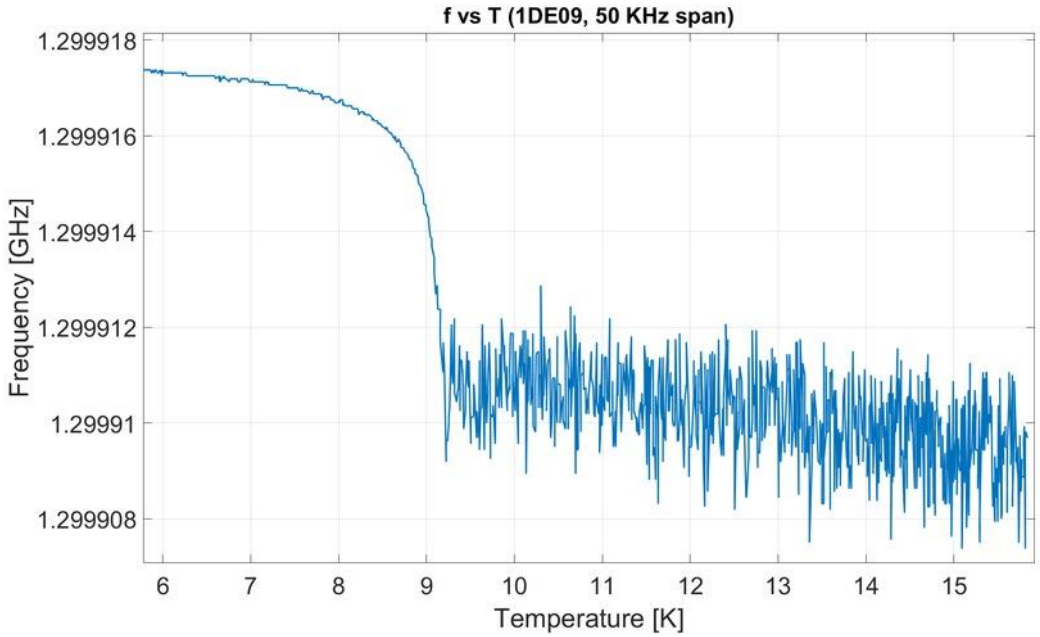
- QvsE
  - Mode measurement
- QvsT
  - 4.2K → 1.4K

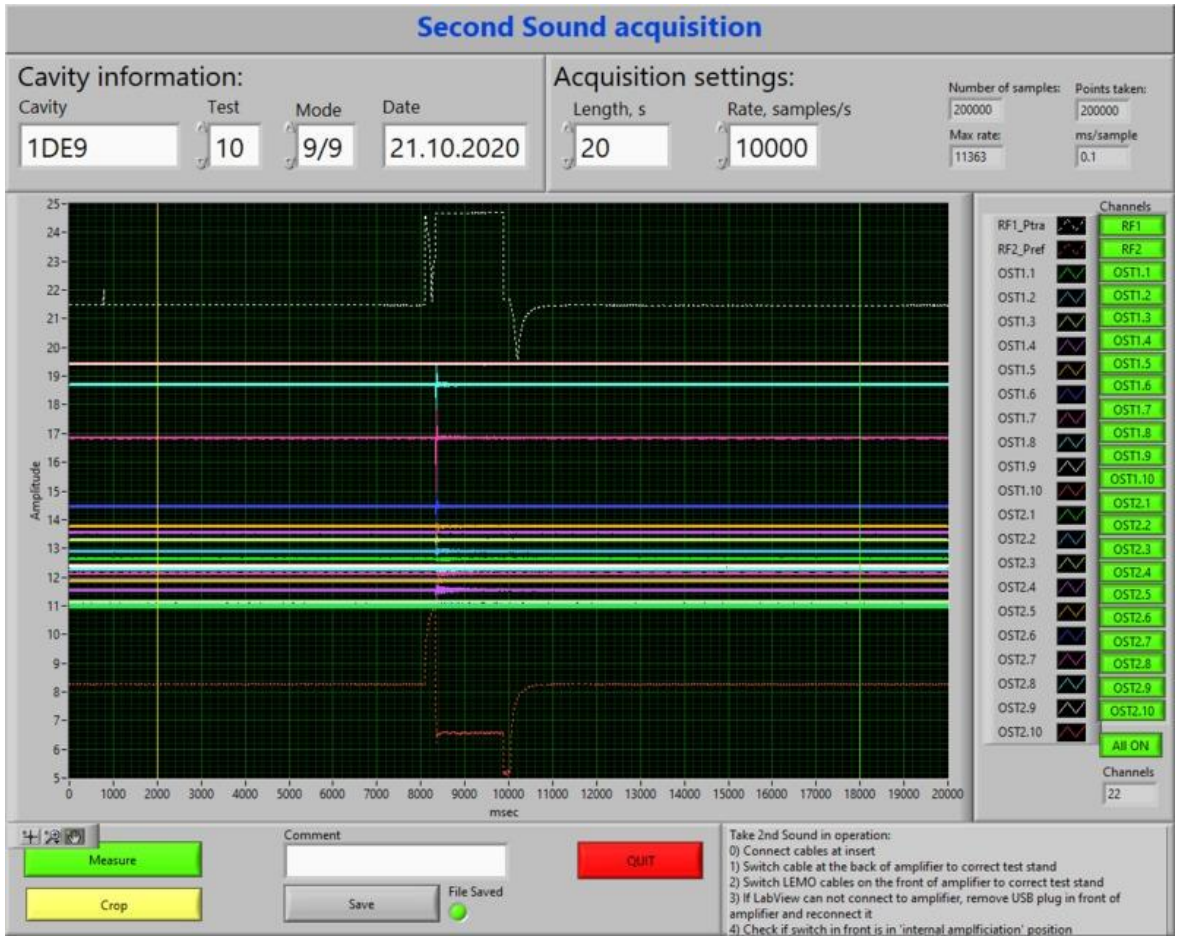




Measurement possibilities…

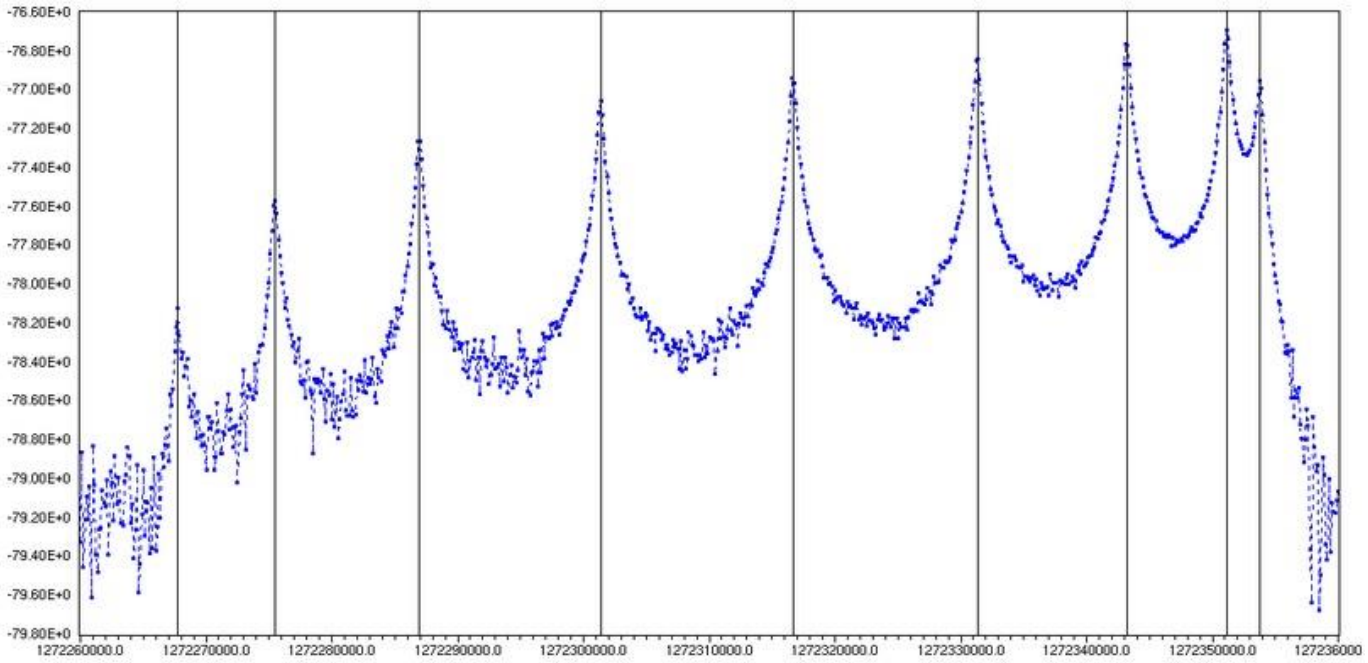
- HOM measurements
- Different cooldown speeds
- Second sound for R&D inserts
- FvsT for R&D cavities





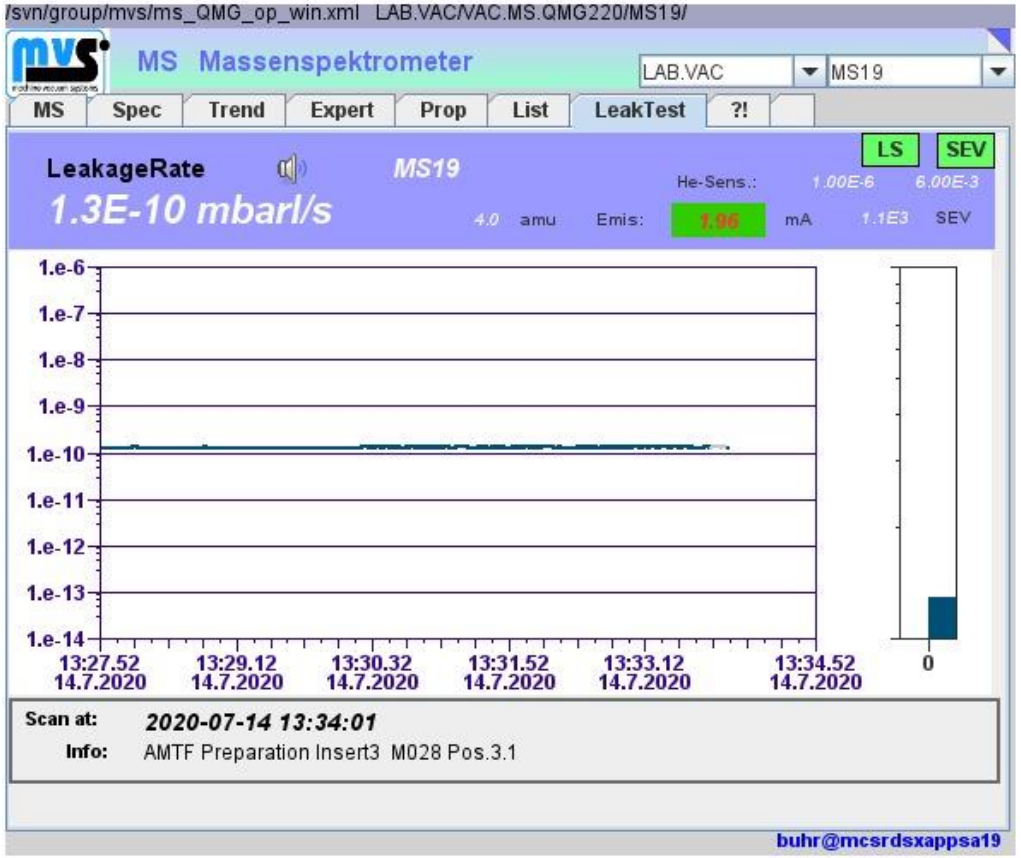
Cavity test workflow – Incoming inspection before assembly to the insert

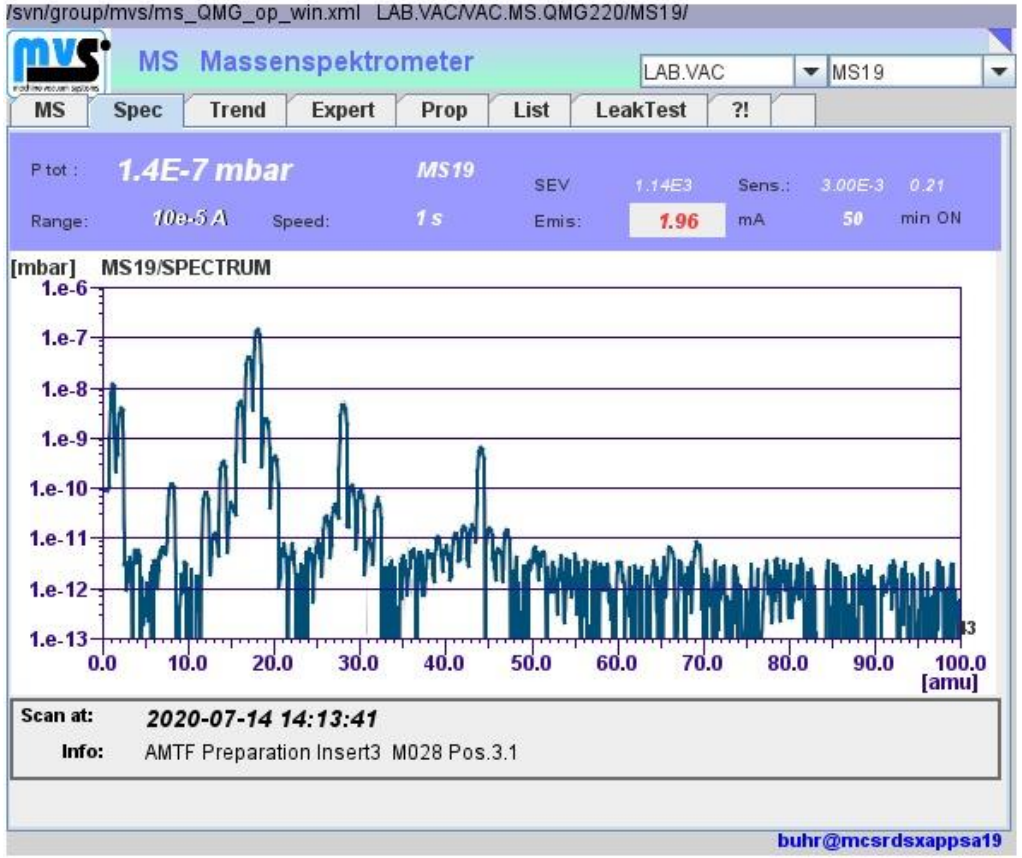
- RF measurement
  - FM Spectra
  - Antennas shortcuts
- Mechanical checks
  - Torques on screws
  - Positions of auxiliaries
  - AV closed properly?
  - etc…



Cavity test workflow – Incoming inspection at the insert

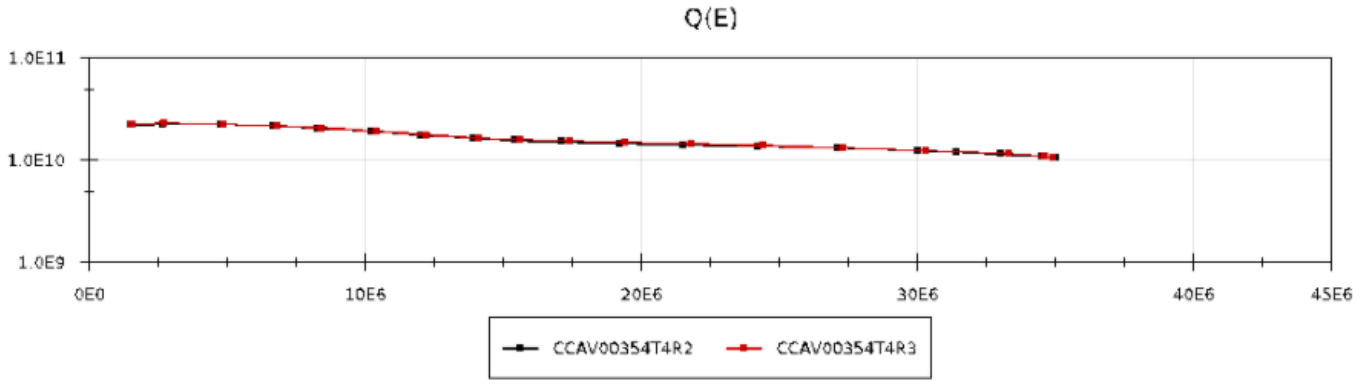
- HOM rejection filters tuning
- Vacuum incoming (Leak check and RGA)

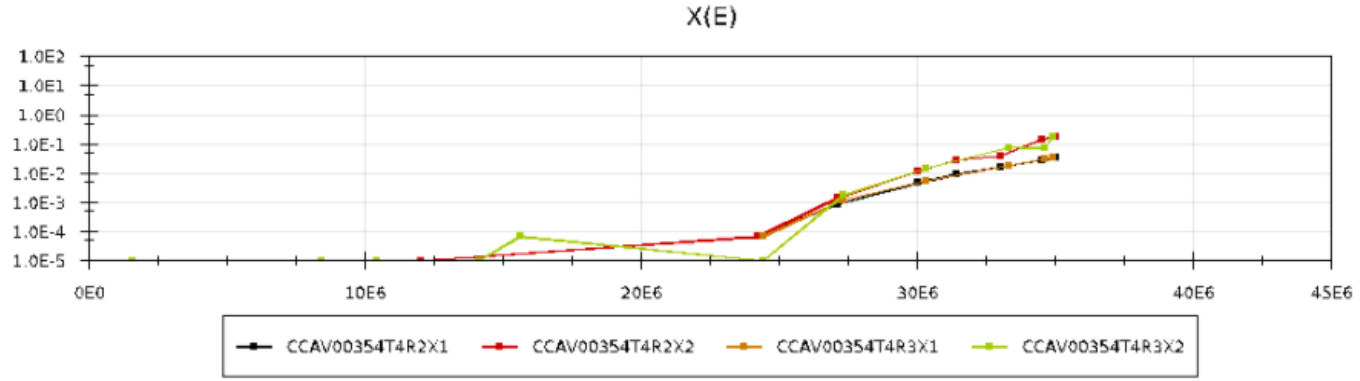




Cavity test work flow - VT

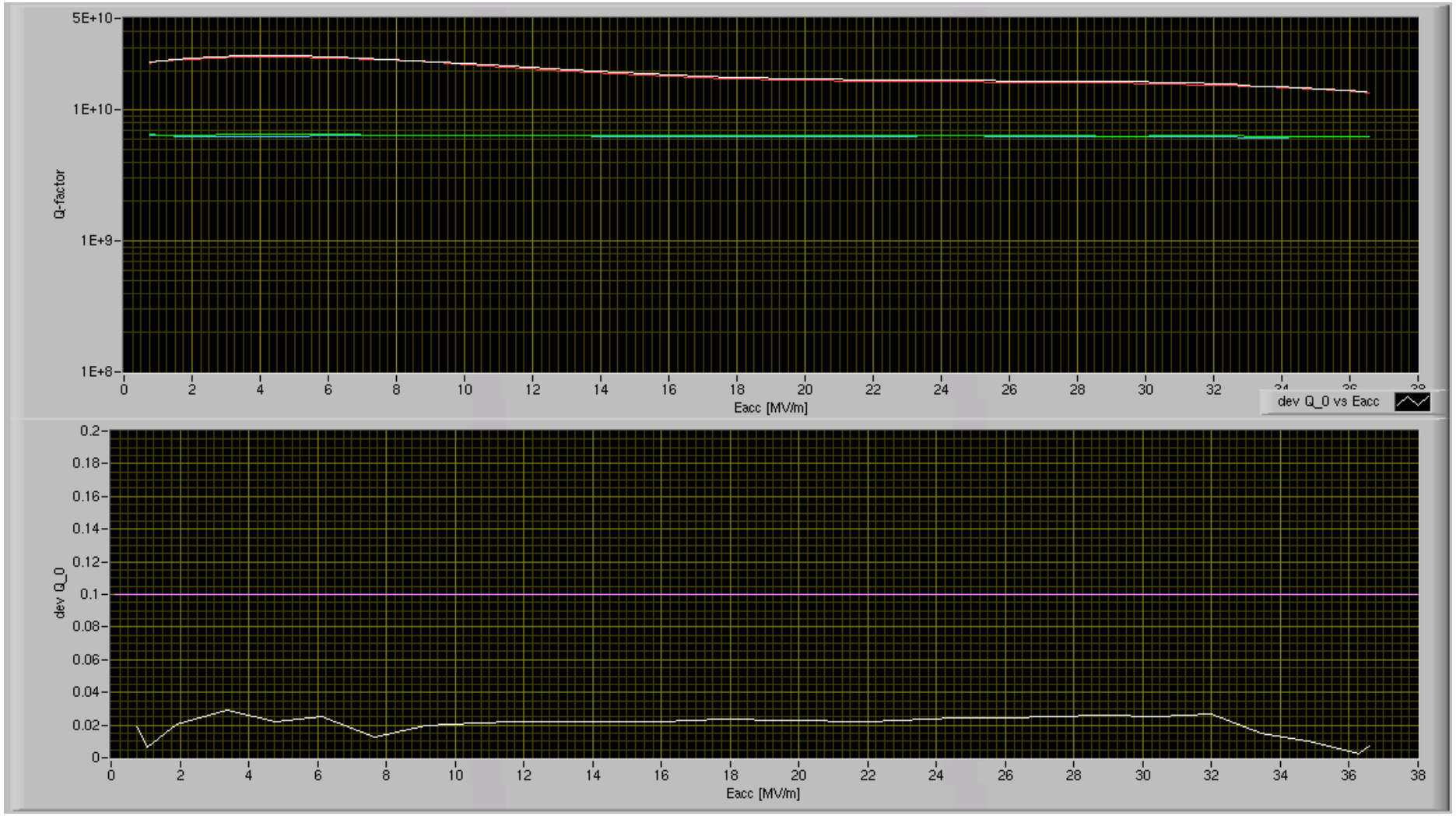
- Cavities acceptance test before assembly to cryomodules ➔ QvsE
  - In case of FE ➔ processing
  - In case of low field quench ➔ mode measurement





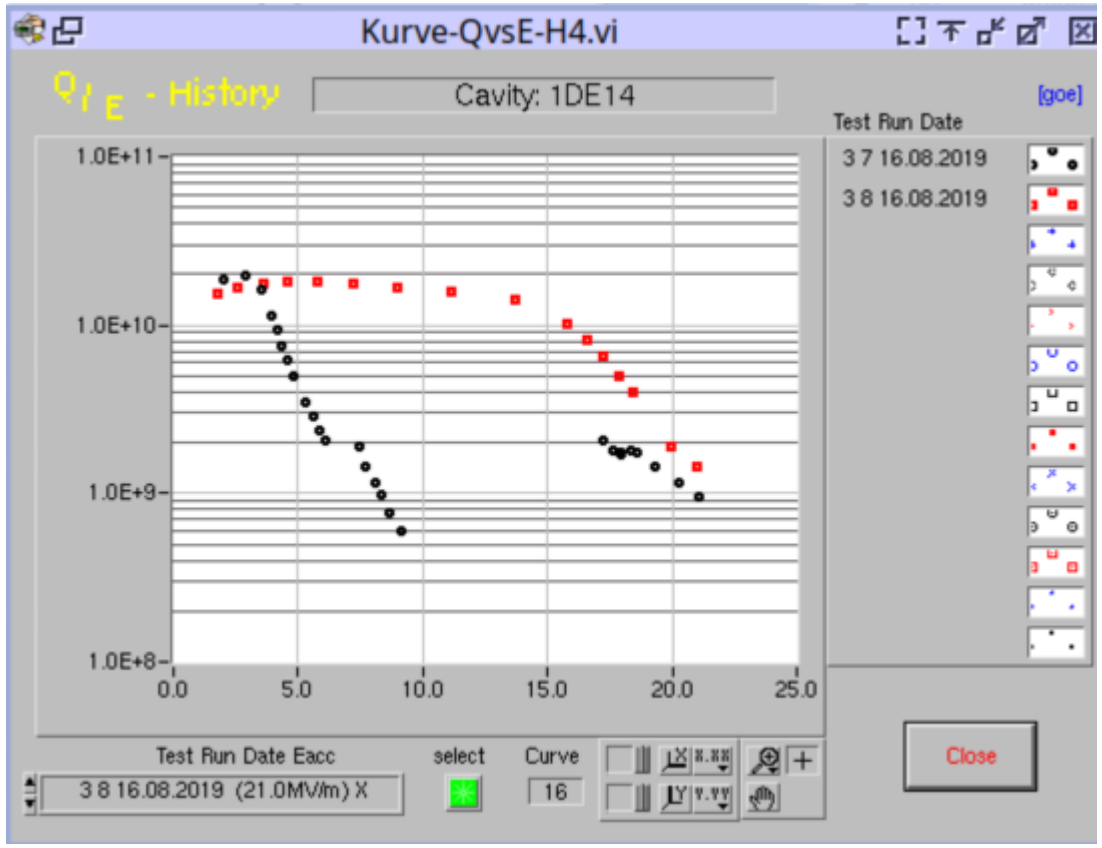
Cavity test work flow - VT

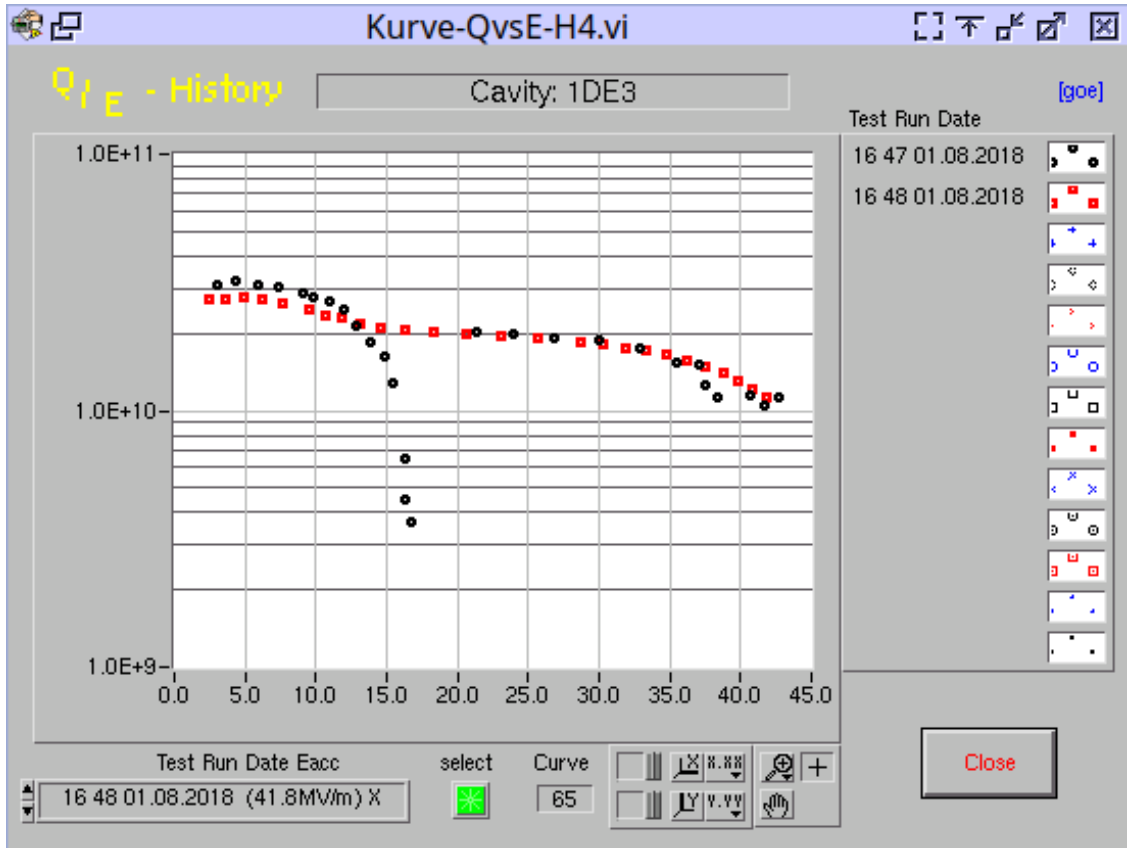
At least two similar QvsE power rises



Cavity test work flow - VT

- Processing





Cavity test work flow – Outgoing inspection

- RF checks
  - The same as incoming inspection
- Mechanical checks
- Preparation for shipment
  - Shock loggers
  - etc…

Summary

- At AMTF Hall in DESY Vertical tests are performed since 2012
- Relatively big cryostats allow testing cavities of different types
- Preparation area allows to handle big amount of cavities at the same time

Thank You…

Thank You very much for Your attention!