European SCRF Infrastructure: Potential German Contributions

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-MPY-

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Overview

- Disclaimer
  - My knowledge of existing facilities, no commitments yet
- Labs
  - DESY
  - BESSY
  - University of Wuppertal
  - (Technical University of Darmstadt
    - Mostly 3GHz
  - FZ Rossendorf
    - Relied on DESY for cavity preparation)
  - I feel like I forgot somebody…
- Industry
  - Henkel
  - ACCEL

DESY

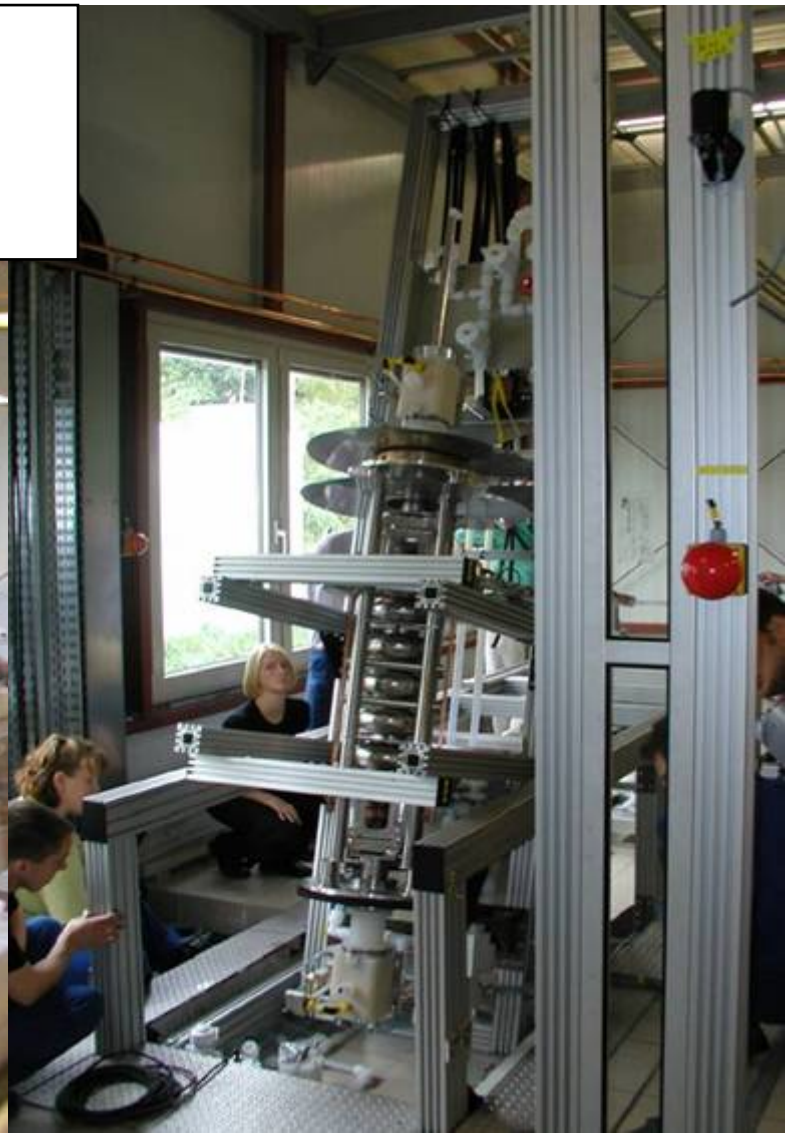
- Cavity Fabrication
  - Electron-beam welding
    - Mostly single-cells so far
    - Nine-cells: only part of the tank welding planned (currently at Lufthansa Technik)
  - Optical and mechanical inspection, frequency tuning
    - Includes frequency measurements on cavity sub-units

DESY

- Cavity Processing
  - Cleanroom
    - Class 10 areas for assembly (three pump stands)
    - Cavity string assembly
    - Separate cleanroom for single cells
  - Pure water plant
    - Pre-cleaning (‘Car wash’)
    - Low-pressure rinse
    - 2x High-pressure rinse
      - 2nd system under construction
    - Separate smaller water plant for single-cells
  - Chemical facilities
    - Etching
      - 2 acid circuits for ‘titanium’ and ‘final’ etching
    - Electropolishing
      - Horizontal system
  - Dry-ice cleaning for single-cells

Electropolishing setup at DESY

- 9-cell cavities were successfully treated.
- Facility runs continuously
- Next steps: improved quality control to achieve more reproducible performance



Cleanroom String Assembly

The inter-cavity connection is done in class 10 cleanrooms

The assembly of an 8 cavity string has been continuously improved

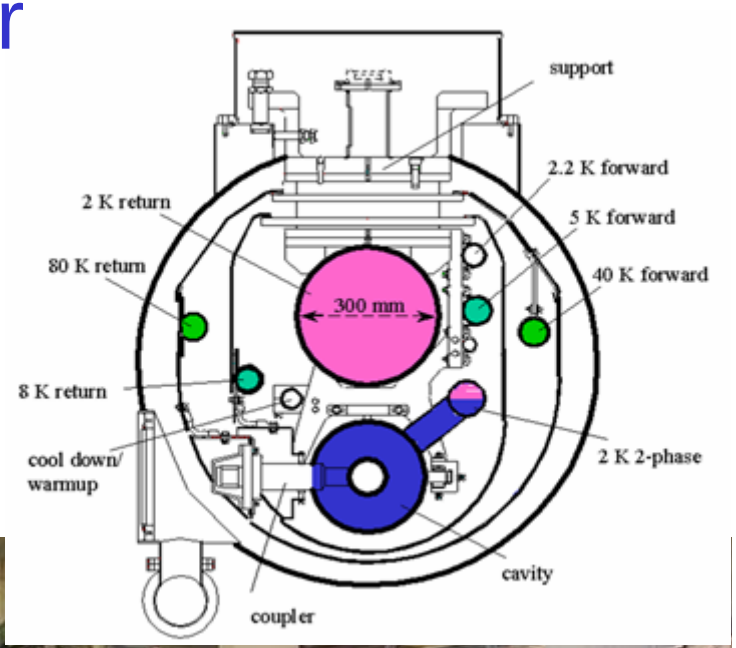
- quality control measures introduced (e.g. particle counts, monitoring of water quality)
- documentation with a cavity test database and an Engineering Data Management System
- was the basis for two industrial studies (for TESLA)
- Ongoing now: Introduction of Electropolishing as a standard process (industrial study in preparation)

DESY

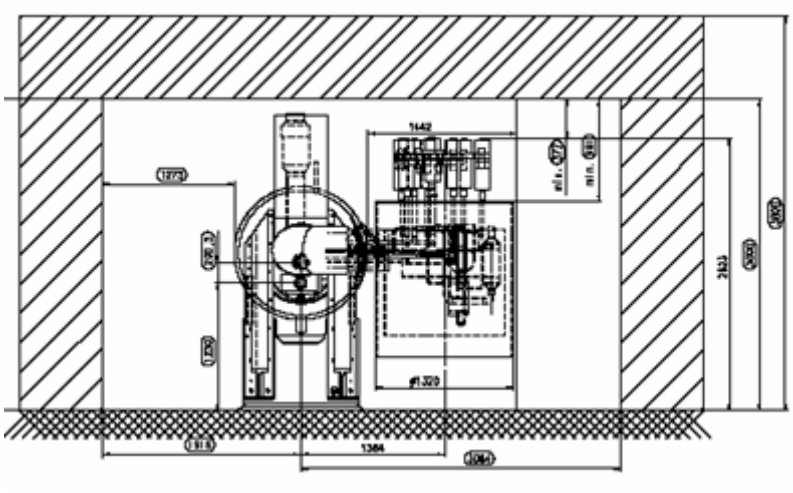
- Cryostat assembly tooling
- Cryogenics
  - 2 vertical bath dewars (+1 for single-cells)
  - CHECHIA
    - High-power test stand for dressed cavities
    - Tuner tests
  - Module test stand
- RF coupler test stand
  - Most of this work being done in Orsay
- FLASH/TTF/VUV-FEL…

High-power Test of a Single Cavity in CHECHIA (Horizontal cryostat)

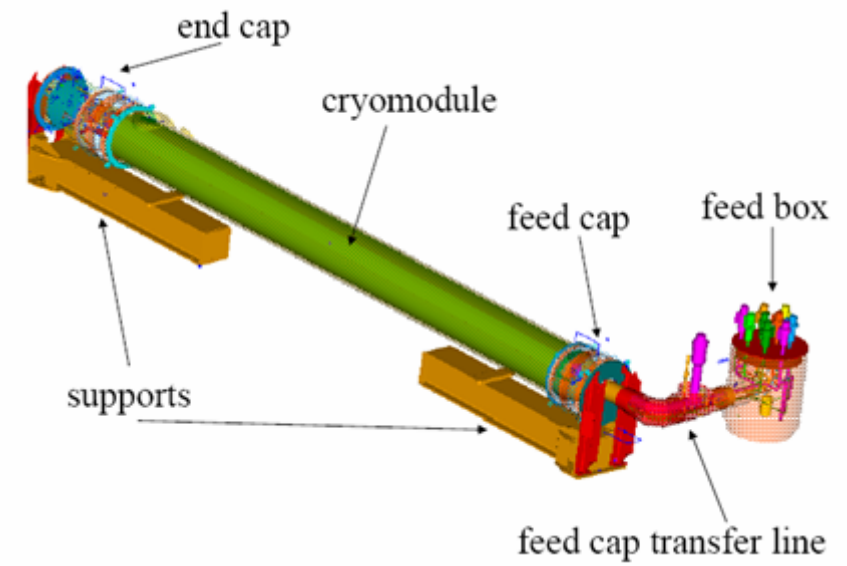
Accelerator Module Assembly

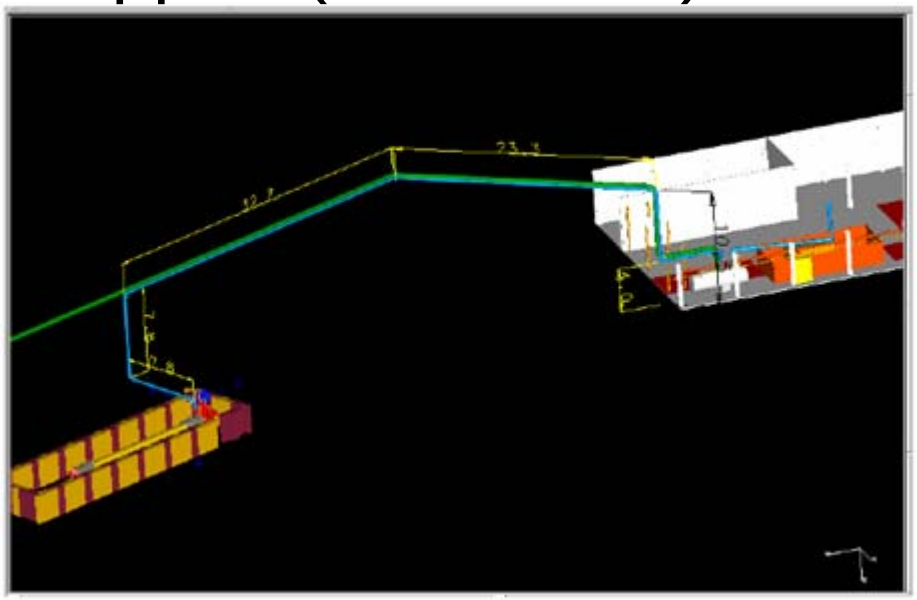


Module Test Stand



- Allows cryogenic tests and RF measurements independent from the LINAC
  - No beam tests
  - Dark current measurements will be integrated
- EU support (EUROFEL)

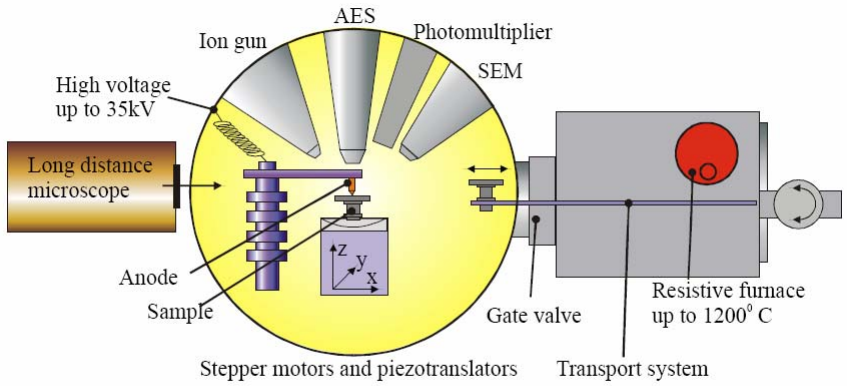




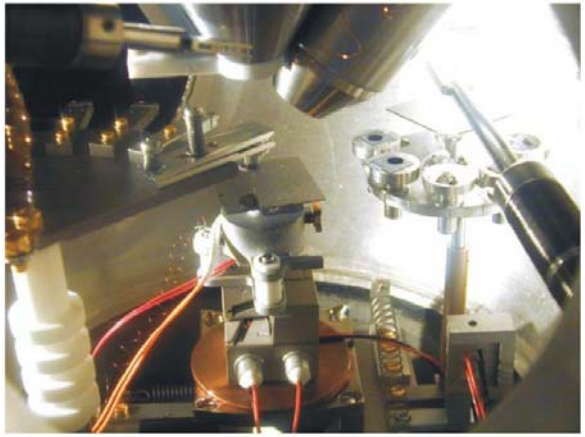
BESSY

- Several cavities have been built
- Test stand is CW
- Cryostat large enough for handling 2 cavities

University of Wuppertal



Scheme of the field emission scanning microscope (FESM)



View into the UHV analysis chamber of the FESM. The sample (center) is assembled in the focus of the SEM, AES and ion gun (top) on the 3D piezo translator which can be tilted on sliding XYZ stages (bottom). High voltage is supplied to selectable needle anodes (left), one of which can be exchanged by the manipulator (right).

- Long-standing collaboration with DESY (now within CARE)
- Surface studies especially on field emission
  - Important tool: Field-emission scanning microscope

Industry: ACCEL

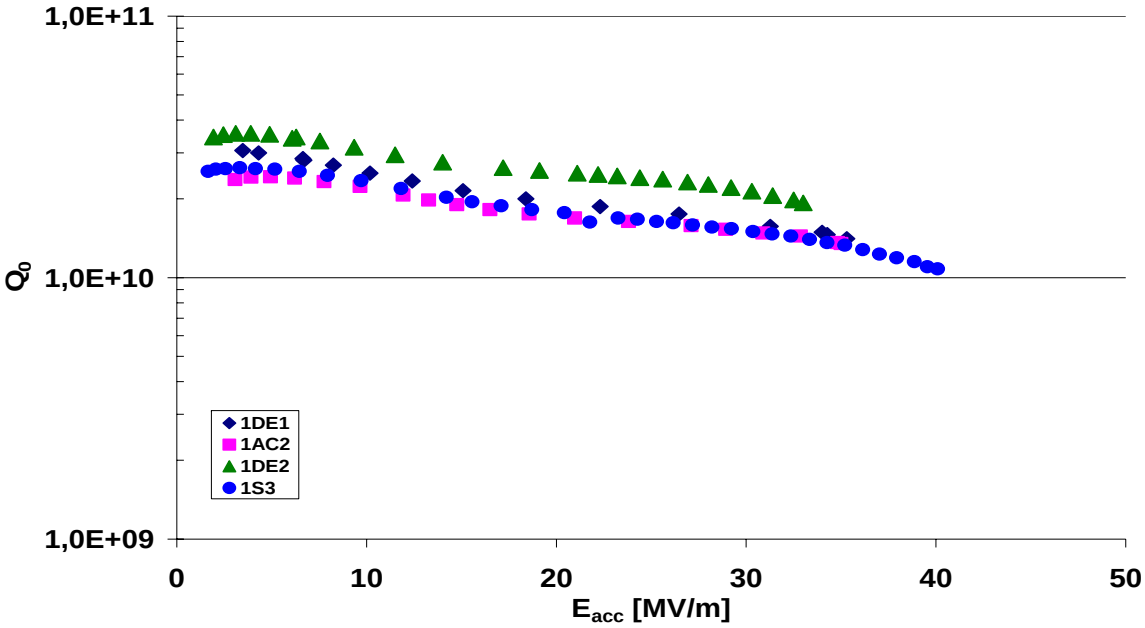
- Experience with cavity productions (LEP, JLab, SNS) i.e. fabrication
- Final surface treatments more recently being introduced e.g. HPR
- Aiming at turn-key systems

High pressure rinsing of a nine cell 1300 MHz TESLA cavity at ACCEL.

Manufacturing Premises

Assembly Hall and Clean Room

Industry: Henkel



- Electropolishing at Henkel can produce very high gradient (up to 40 MV/m), high Q0 cavities
- Improved quality control measures at DESY and Henkel
  - Electrolyte-Management
  - Improved parameter-control
- Upto three-cell 1.3 GHz cavities can be treated currently