

SRF cavities are complex E-M resonators operating at cryogenic temperature and achieving world-class quality factors and accelerating fields. LASA designed, fabricated and tested many cavities for several research projects.

## Cavities for electrons

### 1.3 GHz cavities, TESLA technology

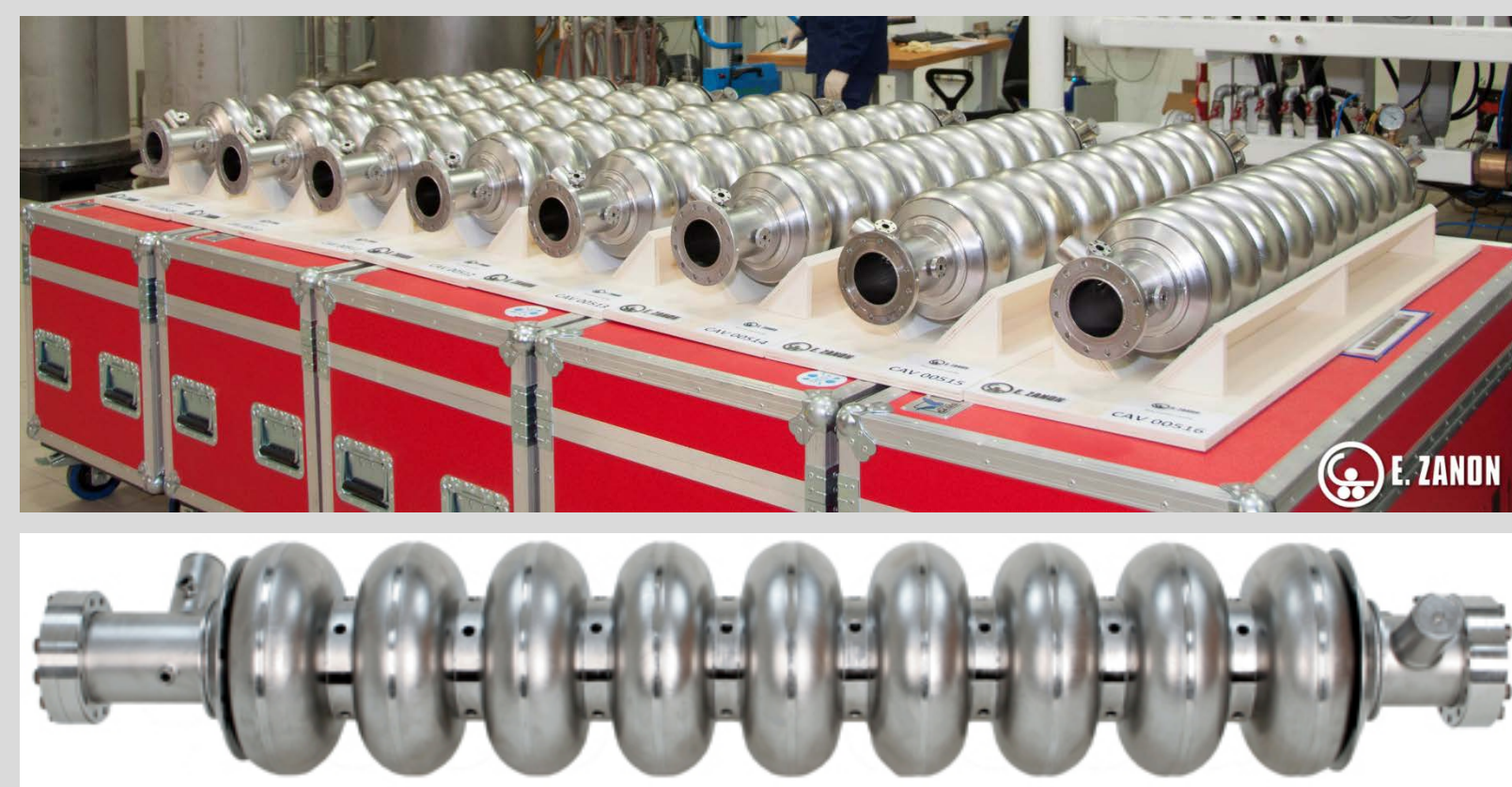
Many projects worldwide

- TESLA / TTF / FLASH / ILC / E-XFEL / LCLSII/...

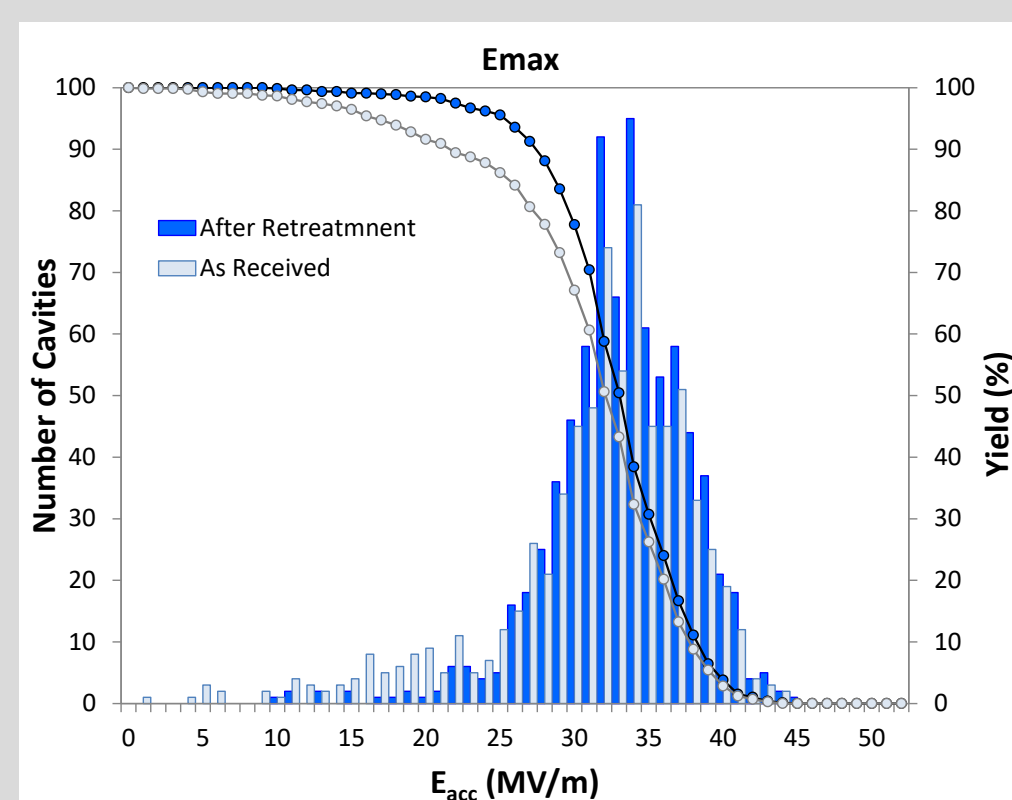
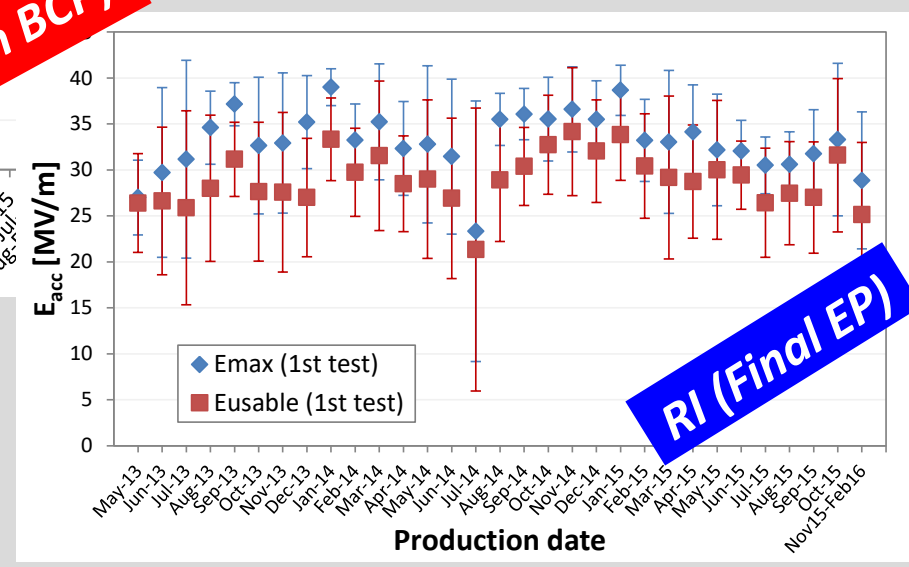
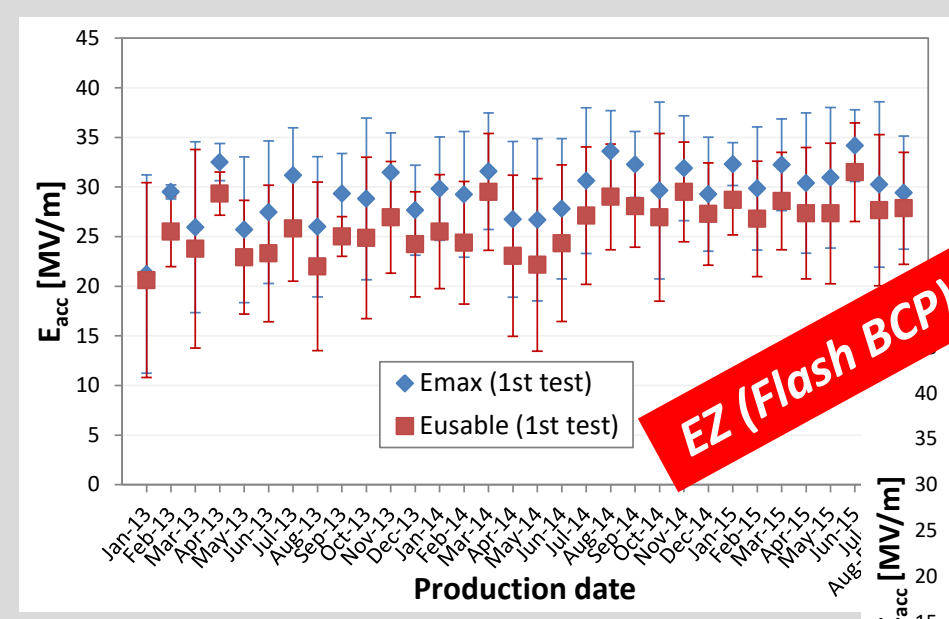
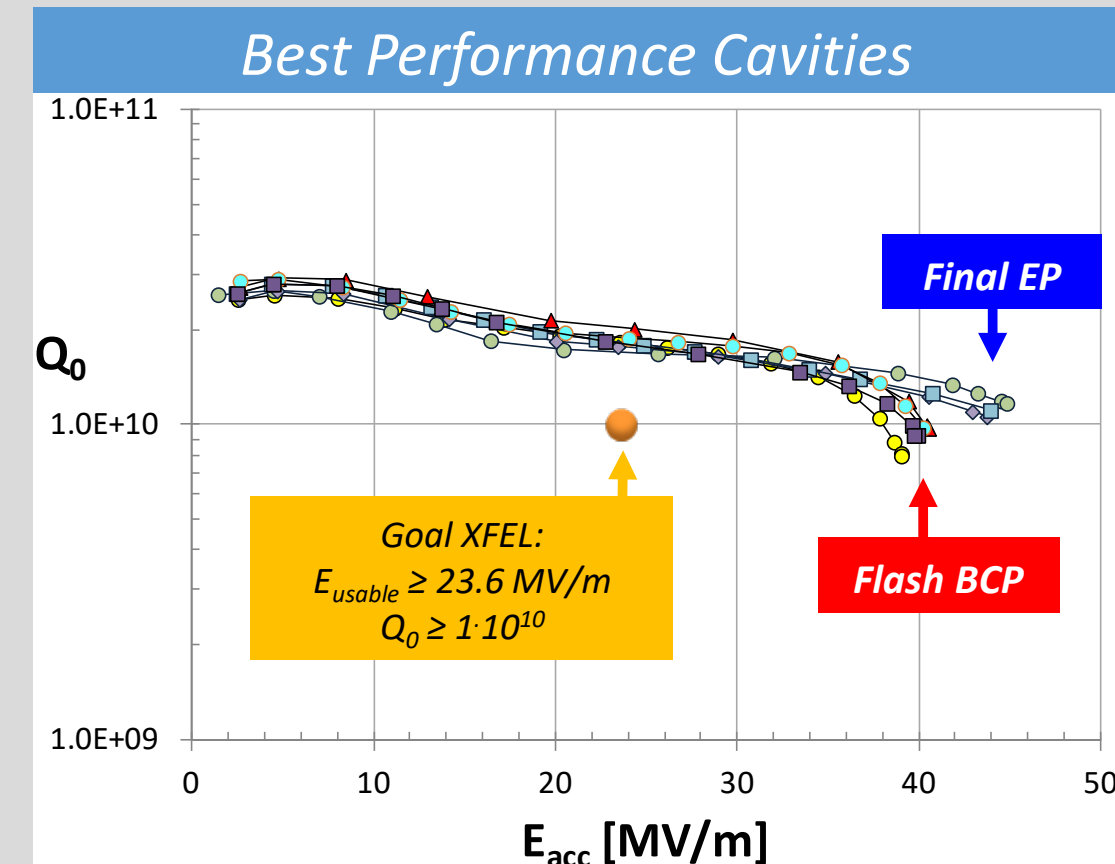
Many different contributions:

- Cryostats / Cryomodules
  - Design, blue prints and fabrication (training Industry)
  - Diagnostic and Assembly
  - Wire Position Monitors
- Superconducting 9-cell cavities :
  - Participation to the design
  - Fabrication procedure ("build-to-print") and tools with industry
  - Responsibility of the 50% of the 800 cavity delivery for the E-XFEL

Quality control of on going-production (test at the arrival)



The TESLA type SC cavity



After retreatments:  $33.2 \pm 4.7$  [MV/m]

### 3.9 GHz E-XFEL injector cavities

3rd Harmonic E-XFEL Cryomodule:

- 3.9 GHz, 9-cell, Cavities: design, fabrication and tests
- Cryomodule and cryogenics
- Cavity tuning systems (Blade-tuner type)

LASA provided all the steps

- Design, prototyping, RF measurements at RT
- Definition of surface treatments to be done at industry
- Cleaning and cavity preparation at the LASA Class 10 clean-room
- Qualification in a vertical cryogenic test at 2.0 K
- Assembly of cavity string into cryomodule



Cavities ready for Vertical Test @ LASA



## Cavities for protons

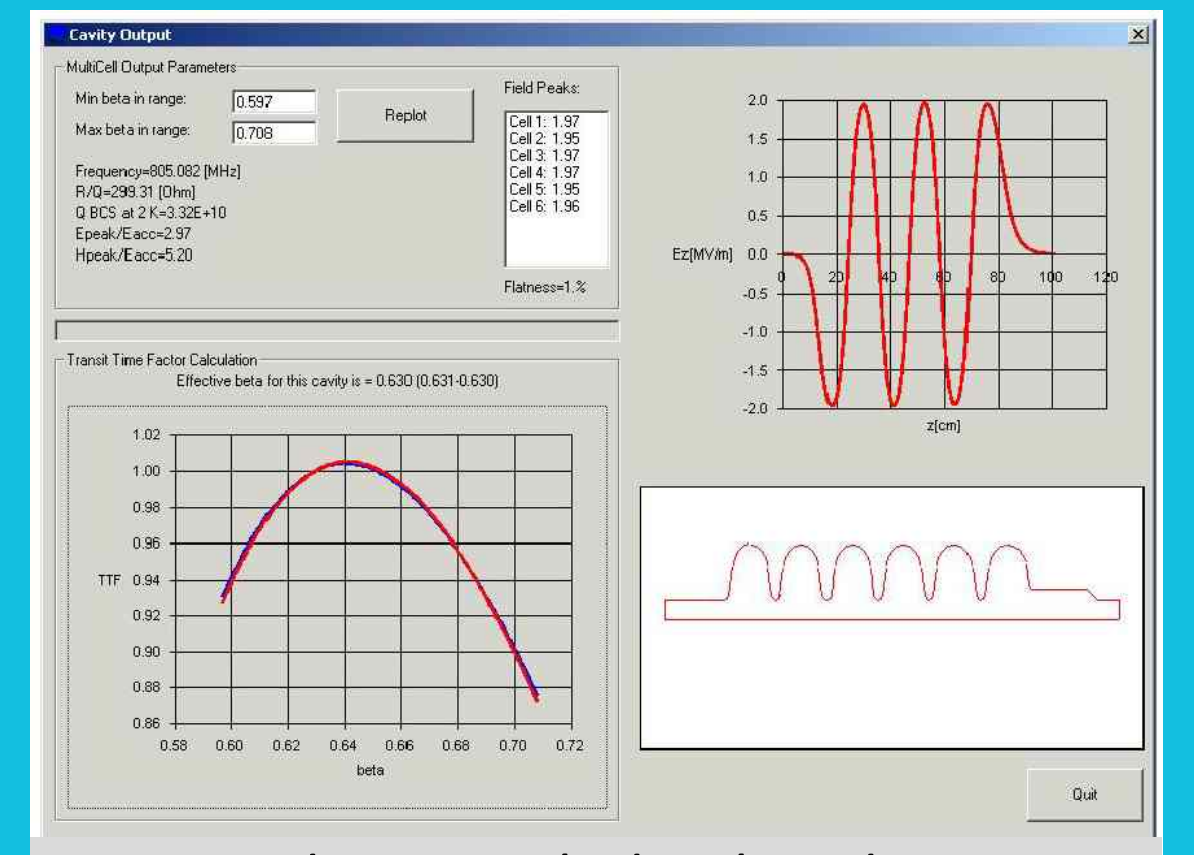
### Transmutation and ADS

Many projects worldwide:

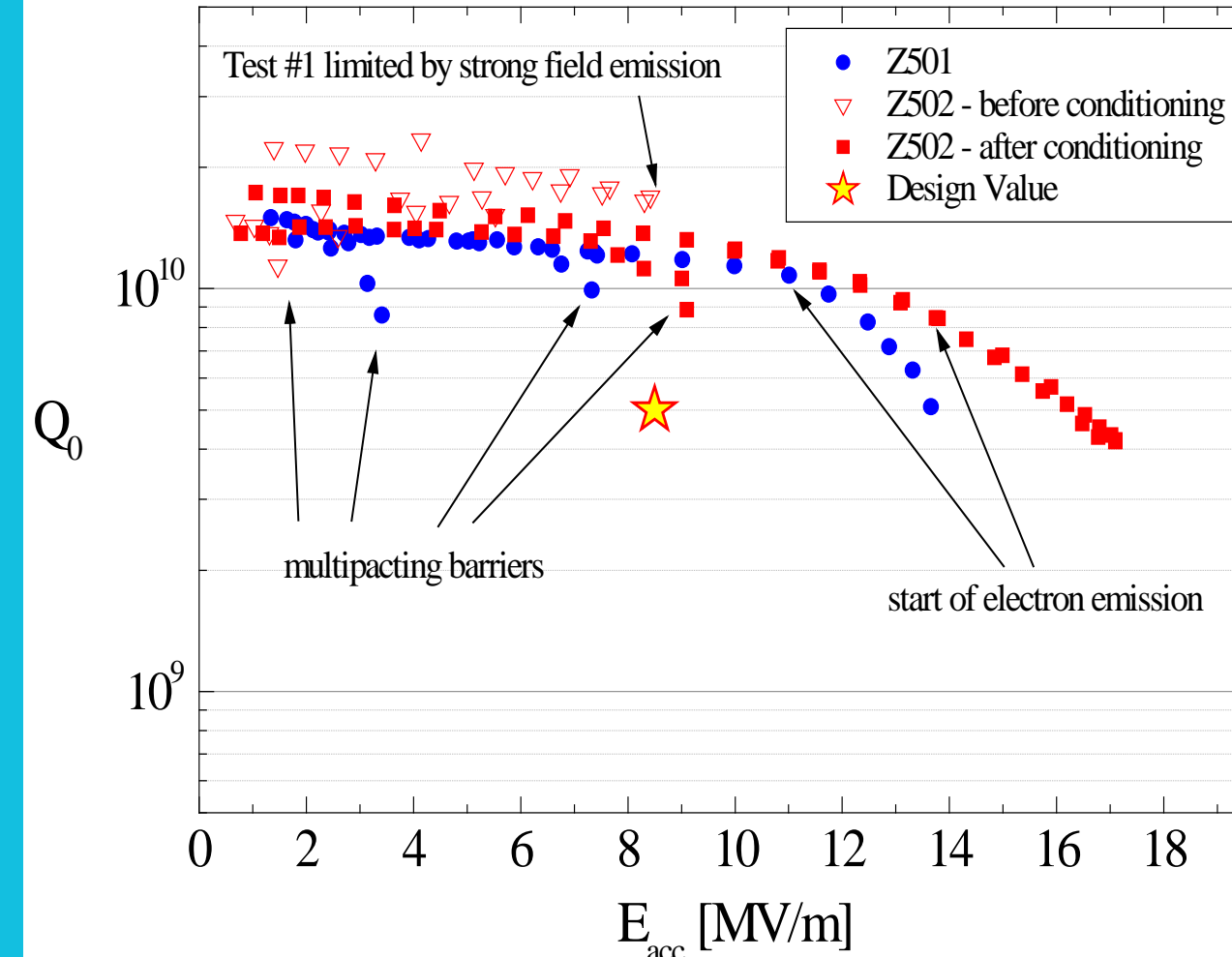
- TRASCO, MYRRAs, SNS, EUROTRANS

Several contributions in different fields:

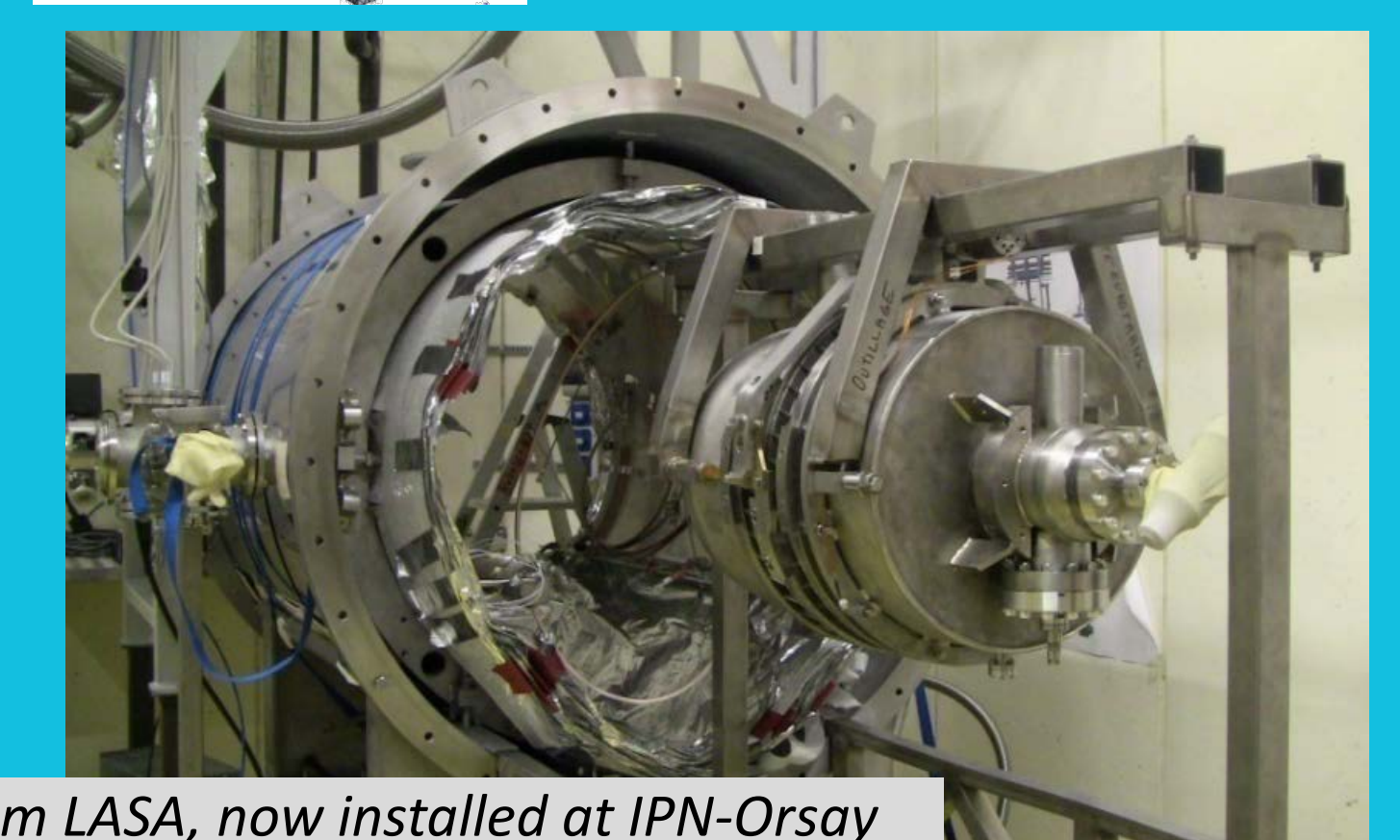
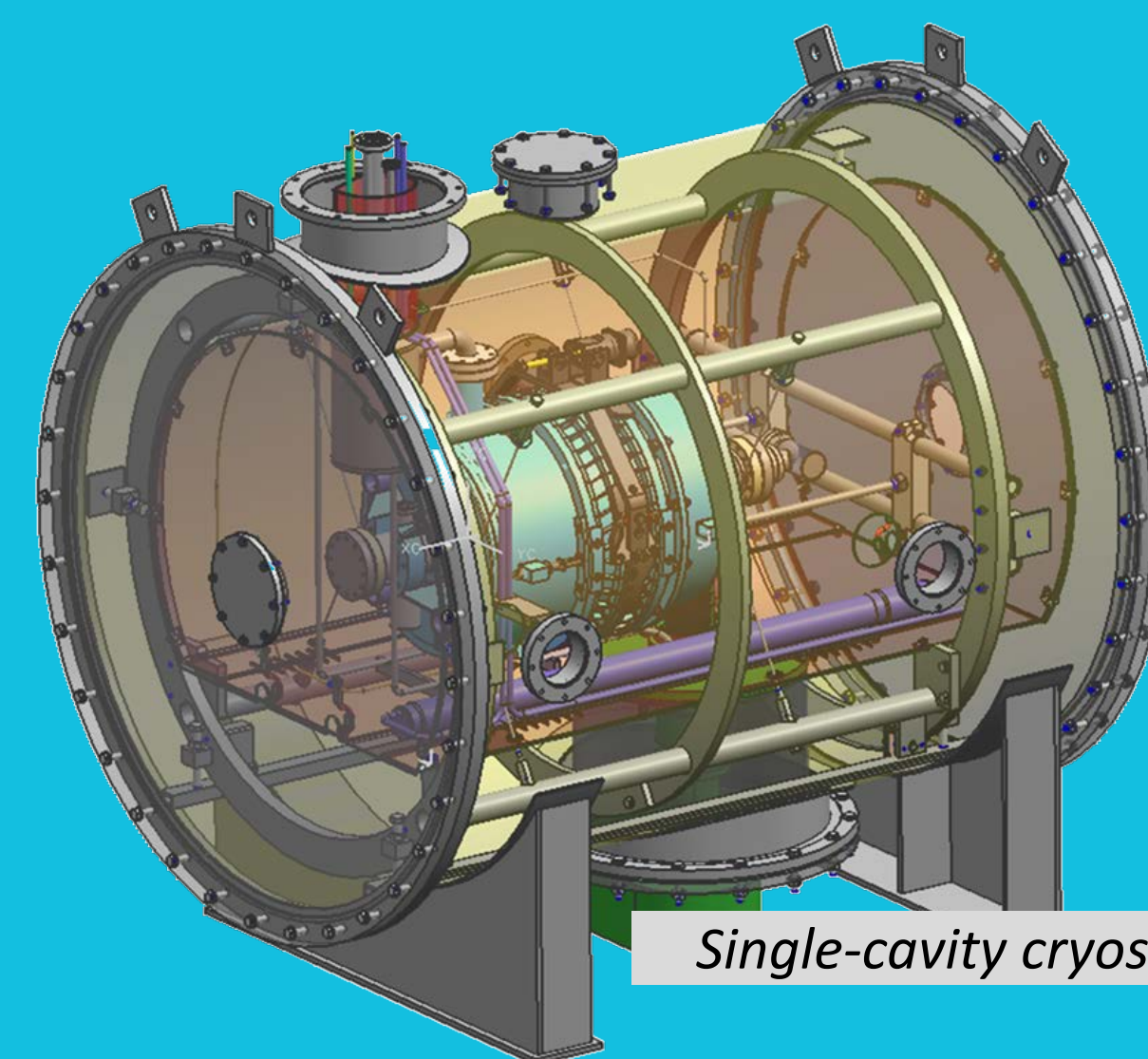
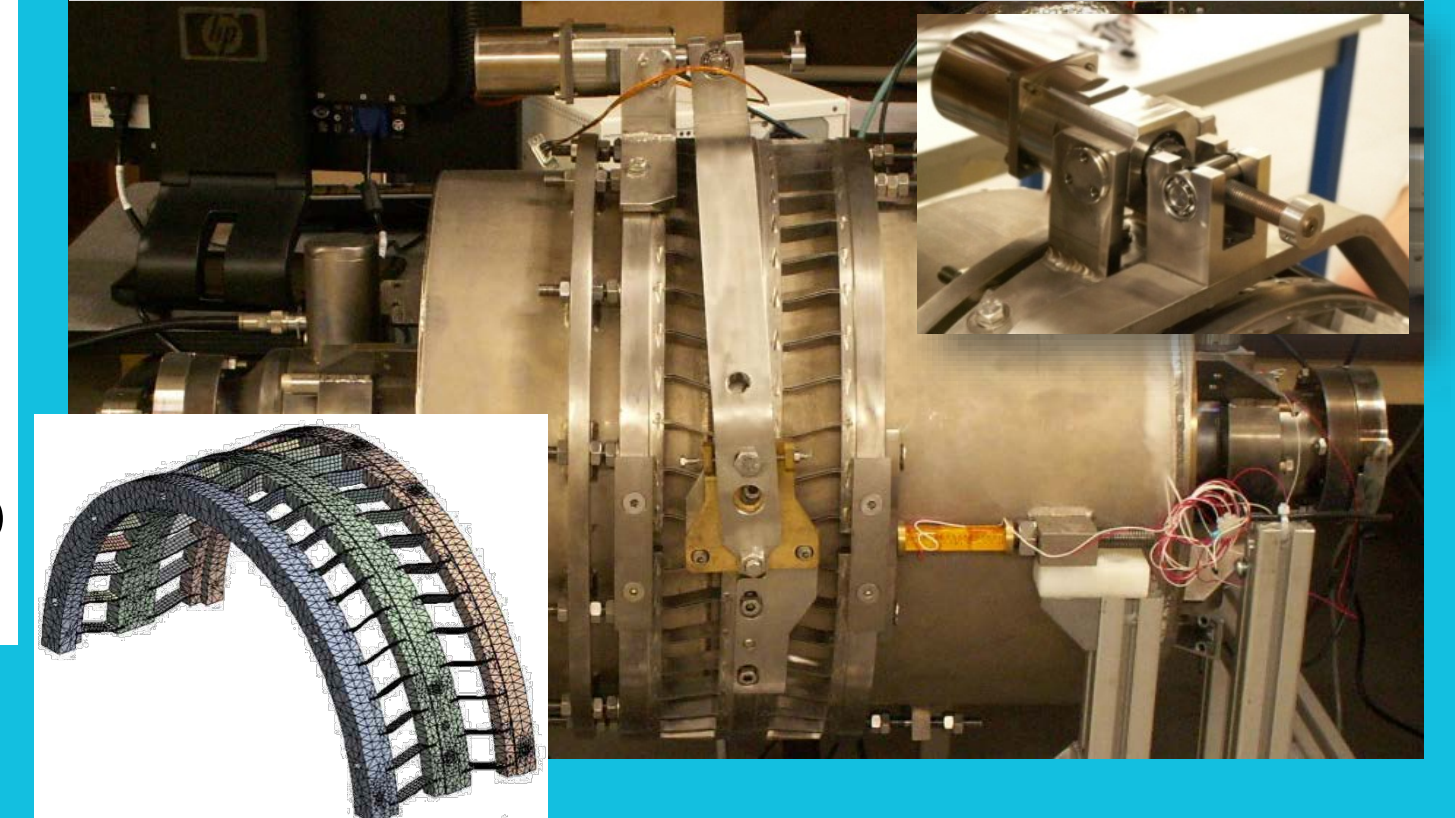
- High intensity proton linac design
- Beam dynamics, halos and reliability
- Low beta, elliptical, multi-cell cavity design, fabrication and tests
- On specs prototypes of cavity ancillaries: piezo-tuners, magnetic shield, helium tank, cavity package
- Cryomodule design and realization of a



Vertical test results of LASA beta 0.47 cavities



Z501 0.47 beta cavity dressed for cryostat, with Coaxial Blade tuning systems developed at LASA



## European Spallation Source – ESS

INFN Milano – LASA is in charge of the In-Kind contribution of the whole medium beta section of the linac:

- Niobium procurement for the fabrication of 36 cavities
- Cavity fabrication of 36 beta 0.67 cavities in the industry, including treatments, tuning, Helium tank integration. Full treatment at the vendor.
- Certification activities, documentation, ancillaries
- Cold test in a qualified infrastructure (DESY).



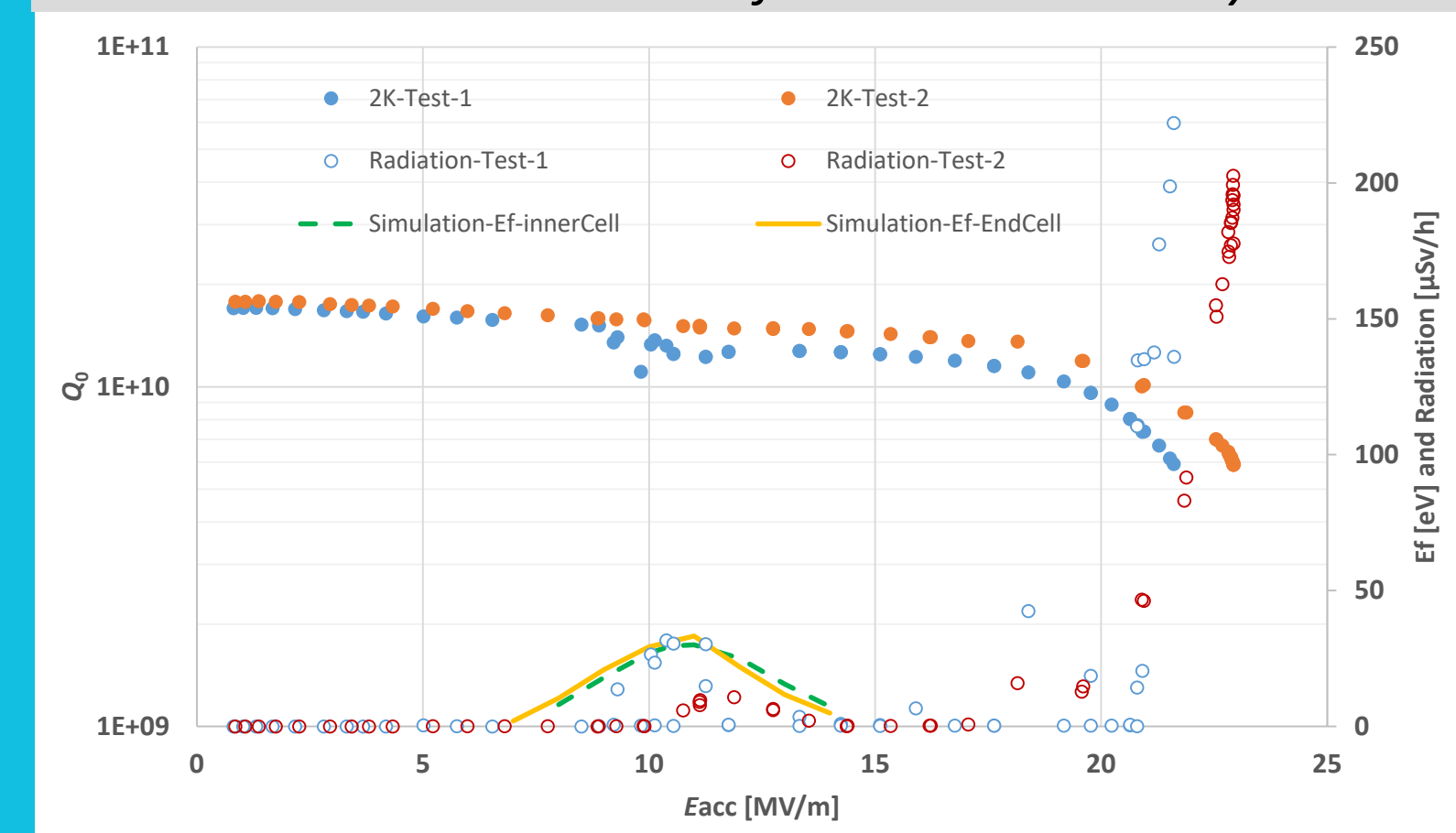
First LASA medium beta cavity is going to be delivered at ESS cryomodule installation site at CEA (France) by mid-2018!

R&D on prototypes ongoing at LASA:

- Two prototypes built and cold-tested
- INFN design, using different materials (Large and Fine Grain niobium)
- Full treatment industry.

New cavities under production in the framework of other proton projects as PIP-II at Fermilab.

Vertical test results of LASA ESS-MB cavity



Insertion of MB cavity into LASA test cryostat

