WG3 : Superconducting Linac Session

summary

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WG3 session agenda

(1) Industrialization of Cavity and Cryomodule

Initiation of specification document,
Production model of Cost effective and Risk mitigation,
Reliable cost estimation towards TDR,
Experience and Plans of industrialization : LHC, XFEL, US, Asia

(2) Cryomodule Test Status and Plans

On going S1-Global test, PXFEL-cryomodule
Plans of FNAL-CM and FLASH 9mA test

(3) Cavity : long-term R&D

R&D overview, LL-shape, RE-shape, Seamless-cavity, Dry-ice cleaning,
New materials, Atomic-layer deposition

(4) Joint with CFS: tunnel layout of mountainous site

Cryomodule and DRFS layout in tunnel cross-section

(5) Joint with NC-cavity: to seek common interest

SC cavity issues / NC structure study status

Industrialization

A. Yamamoto

Objective and Plan for Industrialization Study

- Objective
  - **Improve and establish "technical choice" and "cost estimate" and prepare for Technical Design Report (TDR) completed by the end of 2012,**
- Plan
  - **Technical guideline and parameters**
    - Prepare for "technical specification" based on guideline and boundary conditions,
  - **Communication with Industries**
    - Send the specification to possible manufacturers and receive technical feedback and vender's cost estimate,
  - **Technical Parameters and Cost Estimate**
    - Update the specification and cost estimate to be reflected to the TDR.

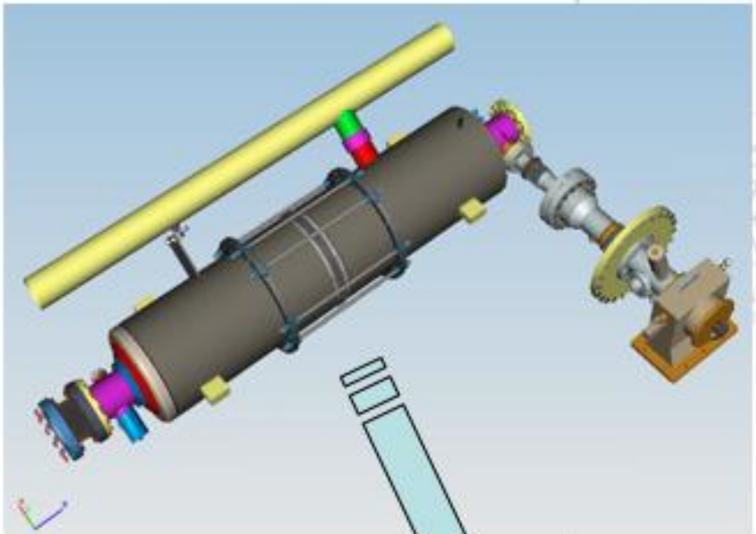
A. Yamamoto

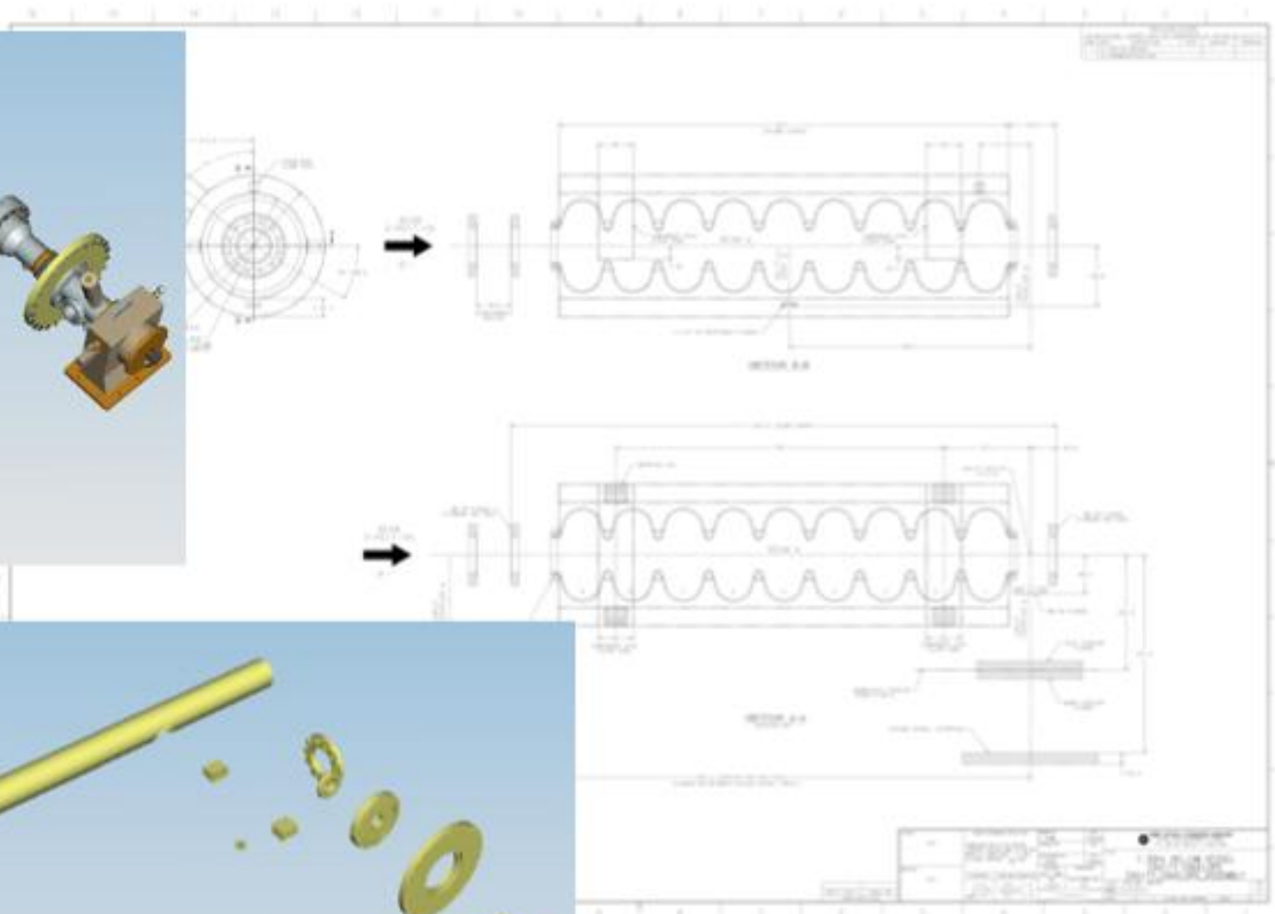
Guideline for Industrialization

- Global market expected for "components"
  - **Components, well defined and established**
    - may be supplied by at venders/manufacturers with no strong constraints for global balance
  - **Multiple venders (at least "two") desired for**
    - Healthy and continuous competitive cooperation,
    - Keeping control of cost and schedule,
- Regionally based contribution desired for "assembly/integration" with
  - **System engineering and the facilities for**
    - Fair return to financial contribution from each region,
    - Establishment of facilities hopefully hosted by laboratories for further development and applications in each region/countries

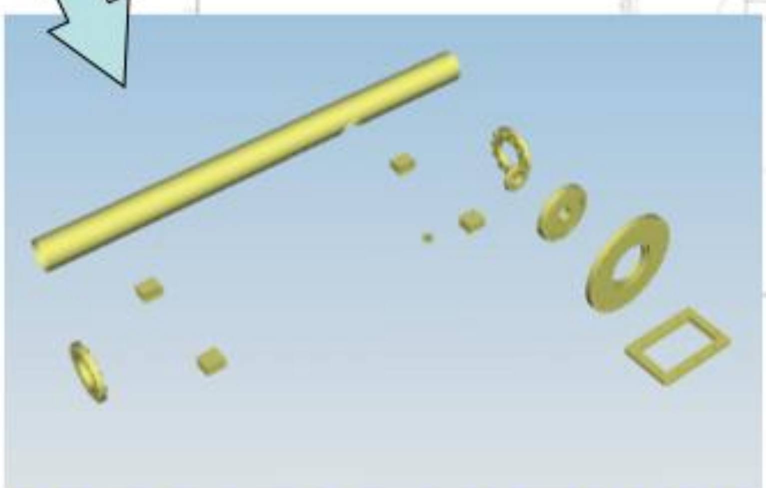
A. Yamamoto

Cavity: Plug-compatible Interface





Component interfaces are reduced to the minimum necessary to allow for system assembly



A. Yamamoto

Process of Industrialization Study

- Action:
  - **Prepare for Preliminary "Cavity Specification" and ask responses/advices from possible cavity/cryomodule venders (6 ~ 10 companies/laboratories), in parallel to our own industrial R&D efforts,**
- Period:
  - **2010 – 2011**
- Objectives of the Process
  - **Seek for the most practical industrial model including cost evaluation,**
    - Single (1)?, half each (2), regional (3), and multiple venders (6) vender models,
  - **Establish a plug-compatible specification ('process specification'), and hear of advice from industries including cost-effective manufacturing and quality control,**

A. Yamamoto

Two Processes to receive Responses from Industry

1: Call-for-Response/ Request for Information (un-paid)

- **Send technical specifications to possible vendors**
  - General design parameters, plug-compatibility, fabrication process : process specification
  - 2nd series of visit to cavity/cryomodule venders to explain the specification and to receive questions,
- **Request their response without commercial contract**
  - A standard process in advance of the call-for-tender process

2: Contracts with Specific Companies (paid)

- **Request specific studies of the industrial models and facilities**
  - receive best cost effective way of manufacturing including factory layout and working models ,

Cryomodule Test

E. Kako

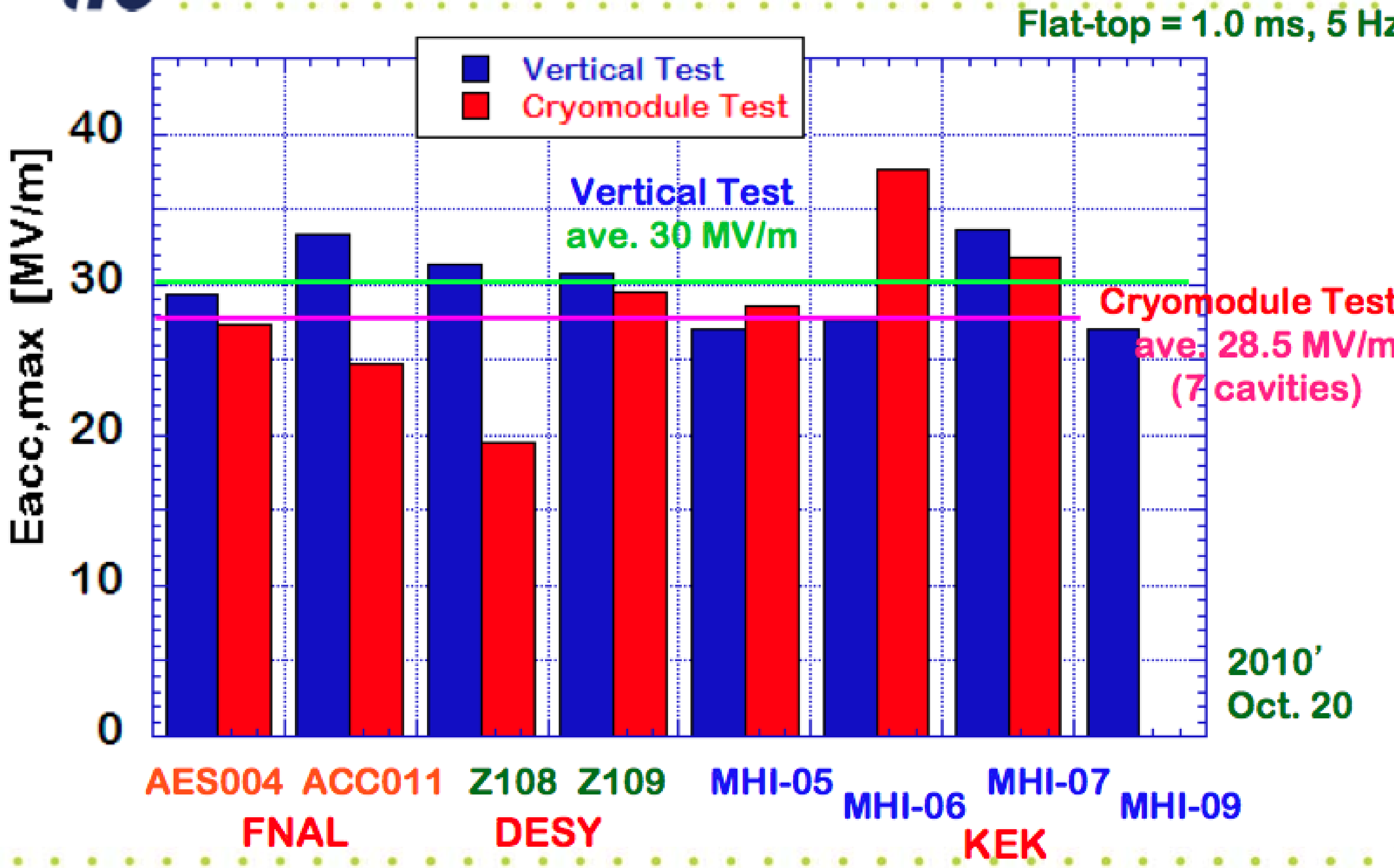
High power system in S1-Global

Cryomodule-A
4 KEK cavities
(MHI-05, MHI-06, MHI-07, MHI-09)
4 STF-II couplers
(coaxial disk rf window, 60ϕ)

Cryomodule-C
FNAL (AES004, ACC011) cav.
DESY (Z108, Z109) cavities
4 TTF-III couplers
(cylindrical rf window, 40ϕ)

E. Kako

Comparison of VT and CT

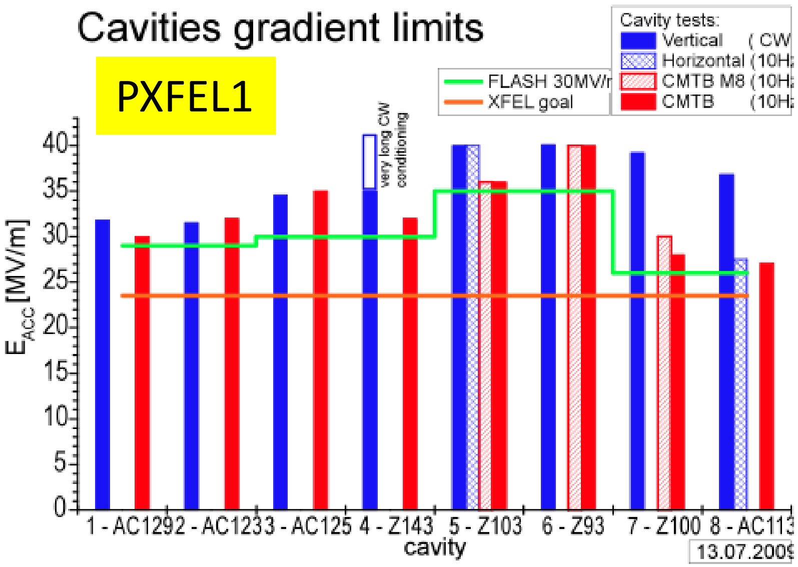


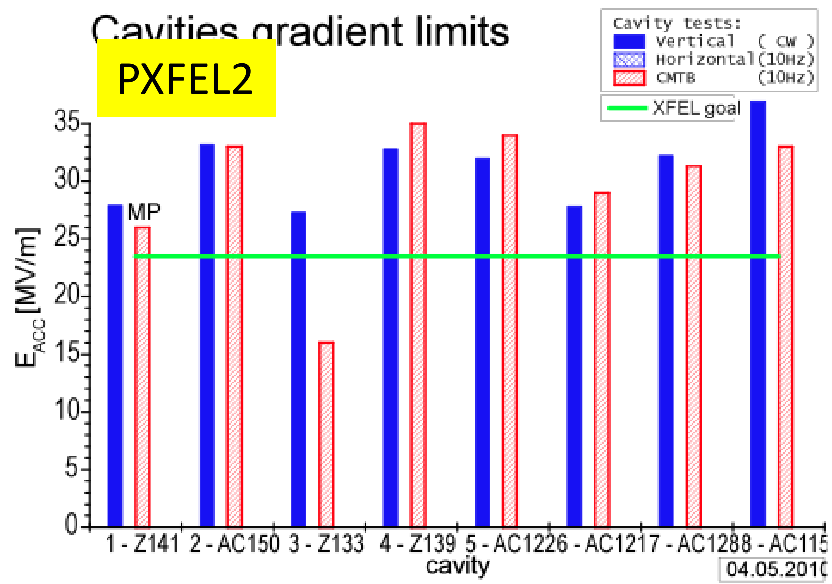
D. Kostin

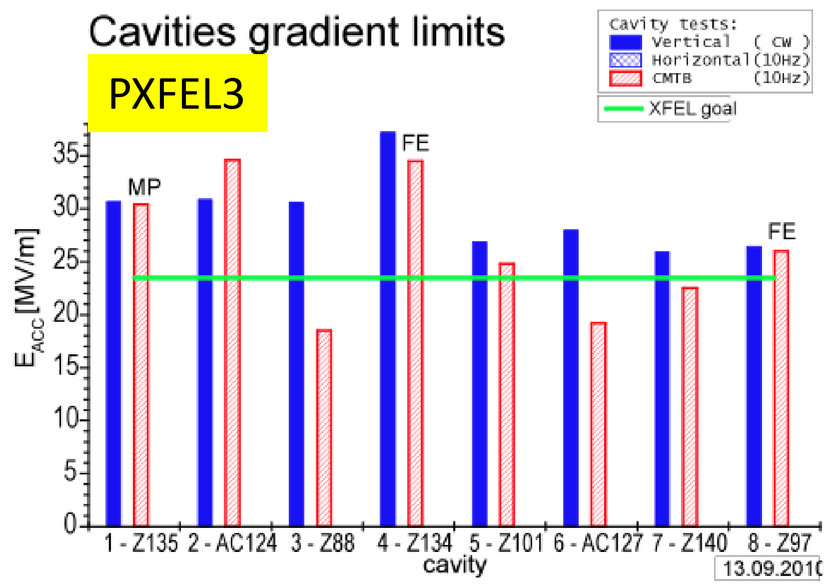
European XFEL

Cryo Module Test Bench

Summary of PXFEL cryomodule test







Three Pre-series Cryomodule were tested.

Average gradient go beyond XFEL spec.

One or two cavities degrease its gradient.

B. Kephart

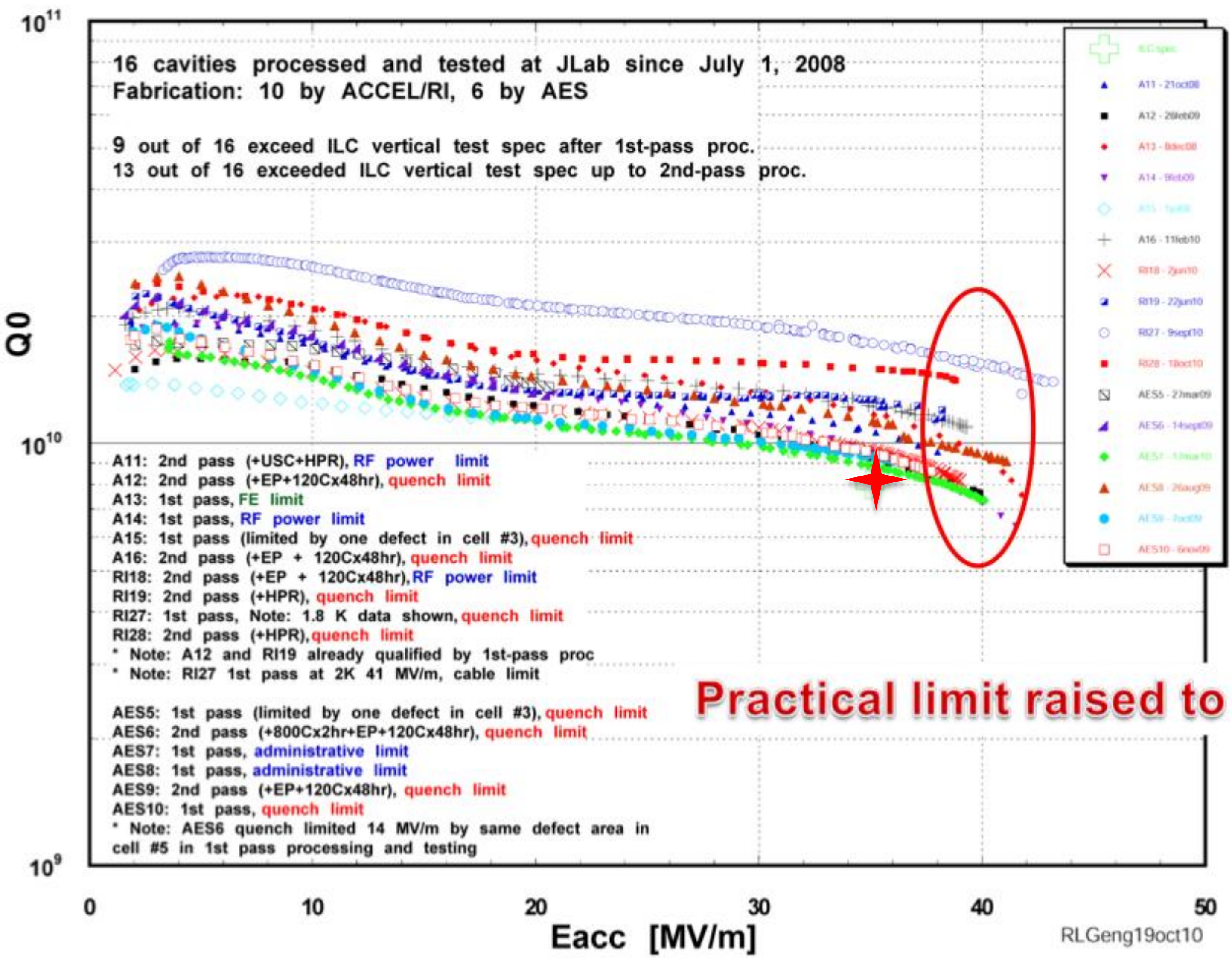
NML Accelerator - CM1

- **Cryomodule-1**
  - Installed
  - Aligned
  - Warm RF Conditioning Complete
  - Cryogenic Interconnects Complete
  - Insulating vacuum complete today & pumping
  - Preparing for Cool down

Cavity R&D

R. Geng

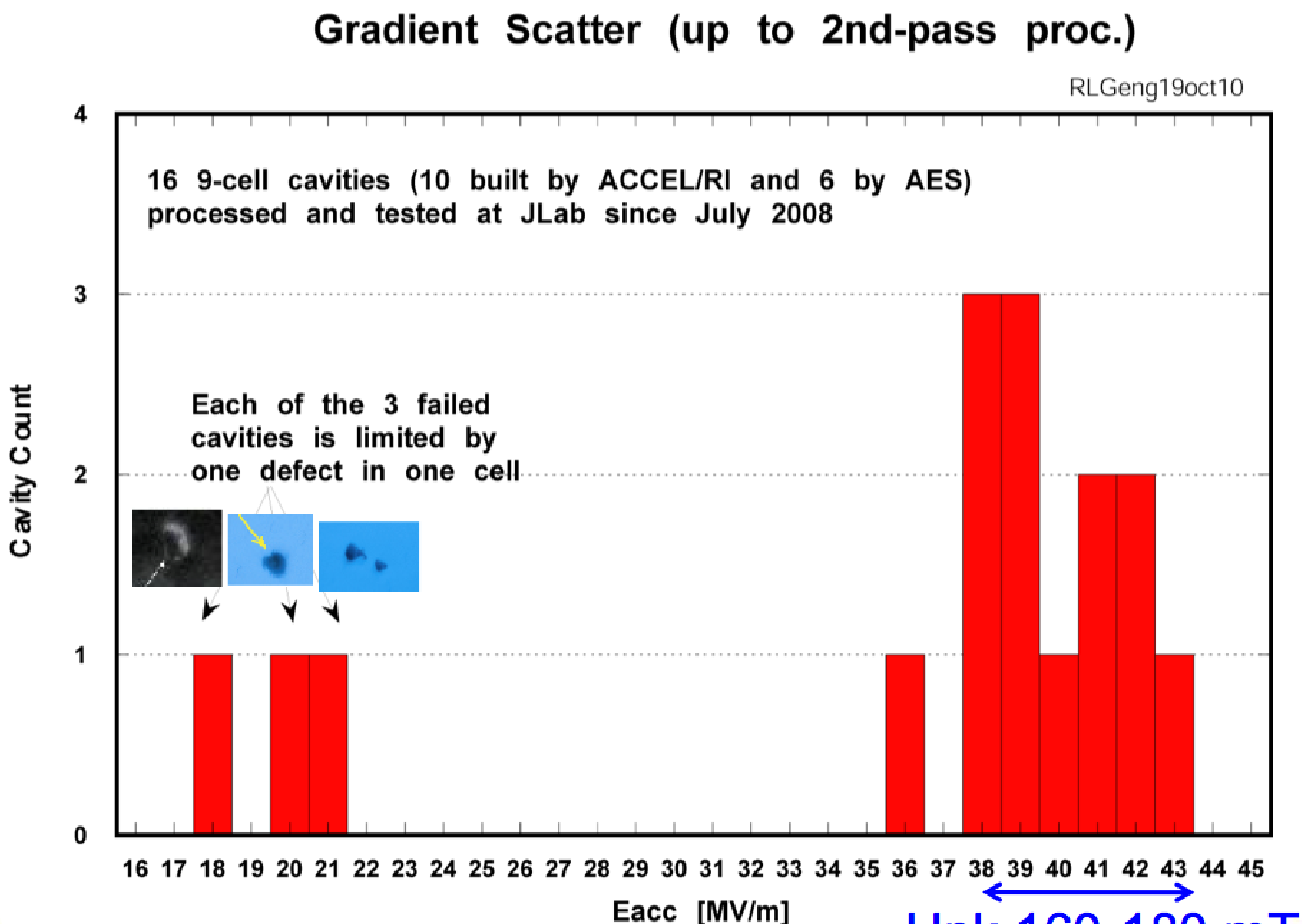
TESLA-Shape EP'ed 9-Cell Cavities



Practical limit raised to 38-42 MV/m

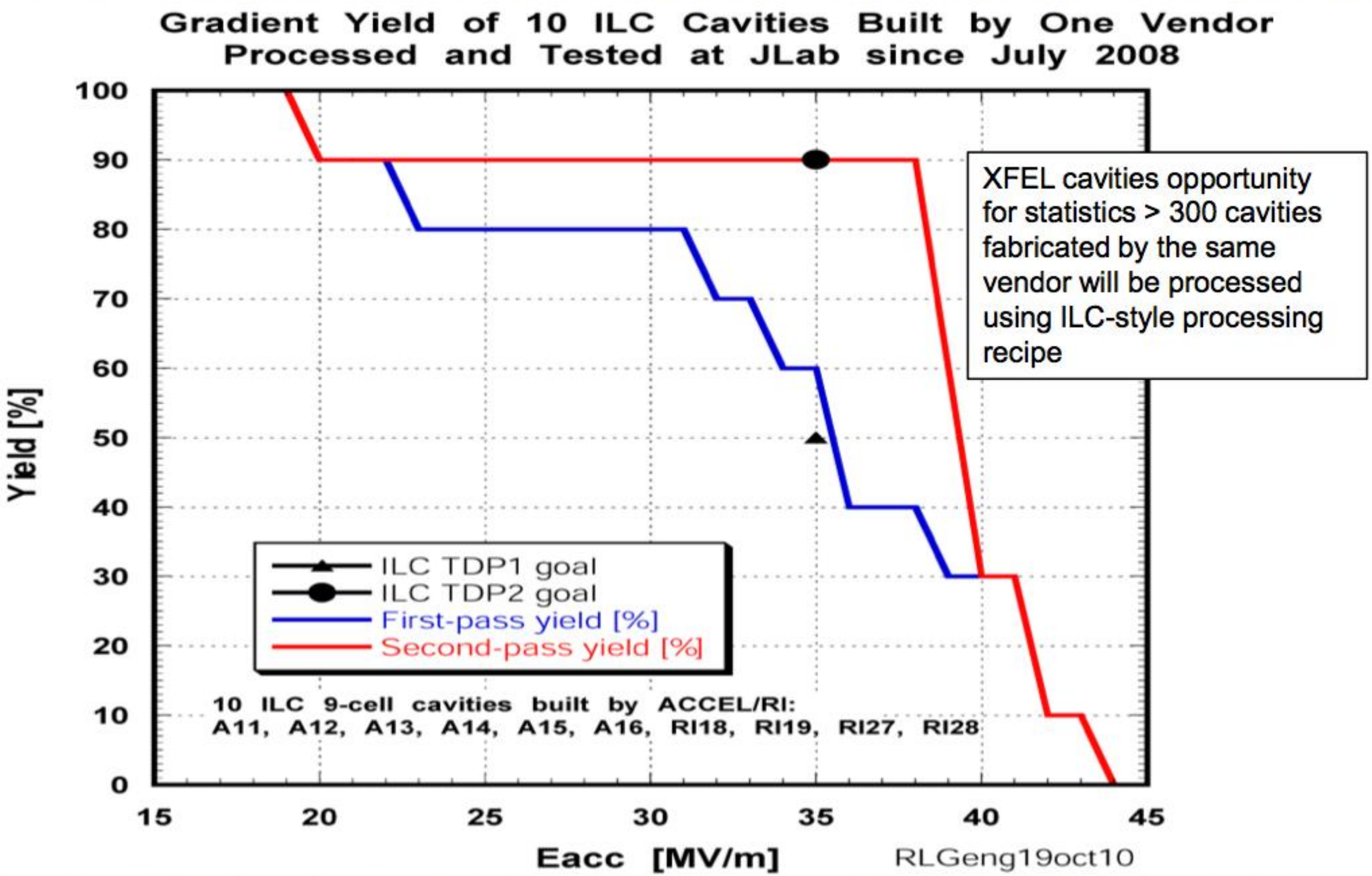
R. Geng

Main Issue: quench limit ~ 20 MV/m due to local geometrical defect (near equator EBW sub-mm dia.)



R. Geng

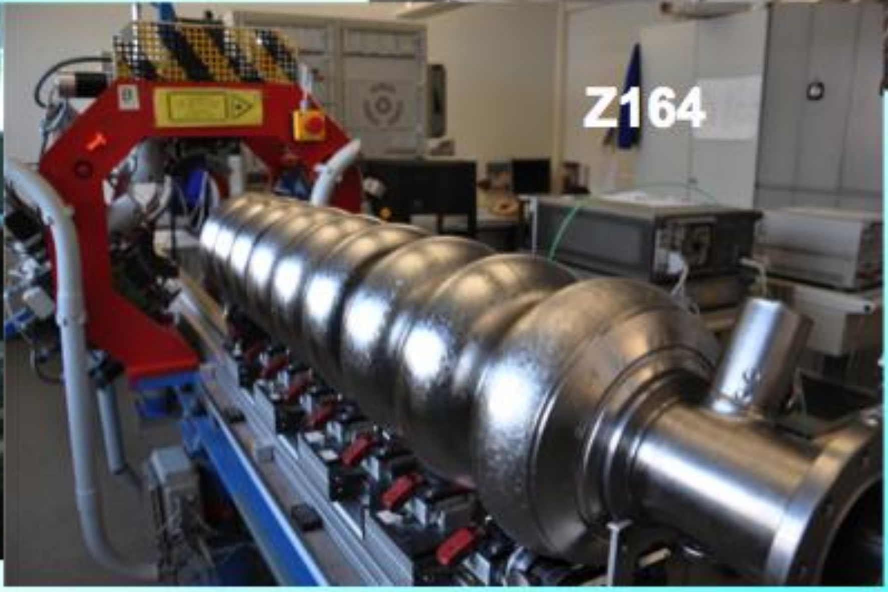
An Example of 90% Yield at 35 MV/m w/ Q0 ≥ 8E9



W. Singer

Three 9-cell cavities from hydroformed at DESY units completed at E.ZANON (Z145 reached Eacc~30 MV/m, Z163 and Z164 in work)

One 9-cell cavity from hydroformed at DESY units is completed at JLAB

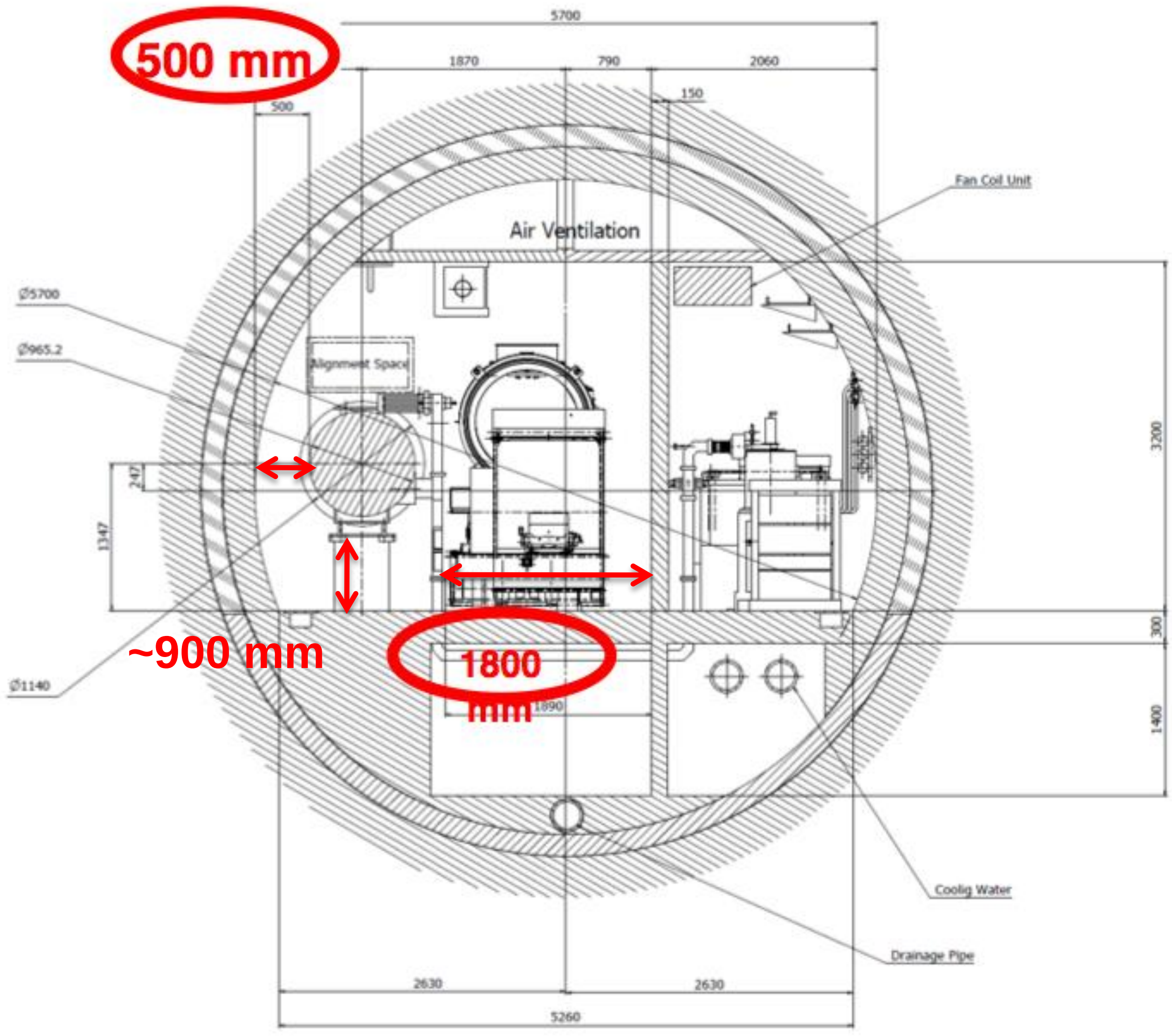


Completed at JLab 9-cell cavity

Joint Session

Joint session with CFS:
A. Enomoto

DRFS Single Tunnel Section Dimension



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Joint session with NC-structure:
W. Wuensch

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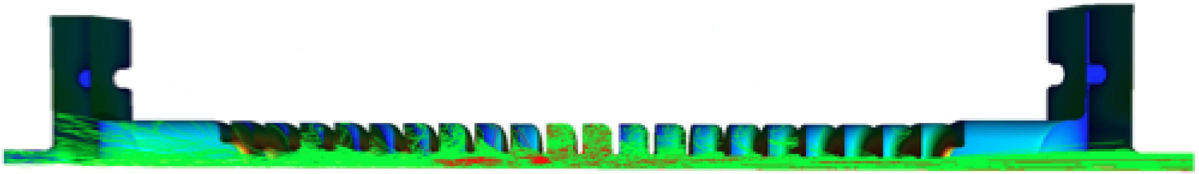
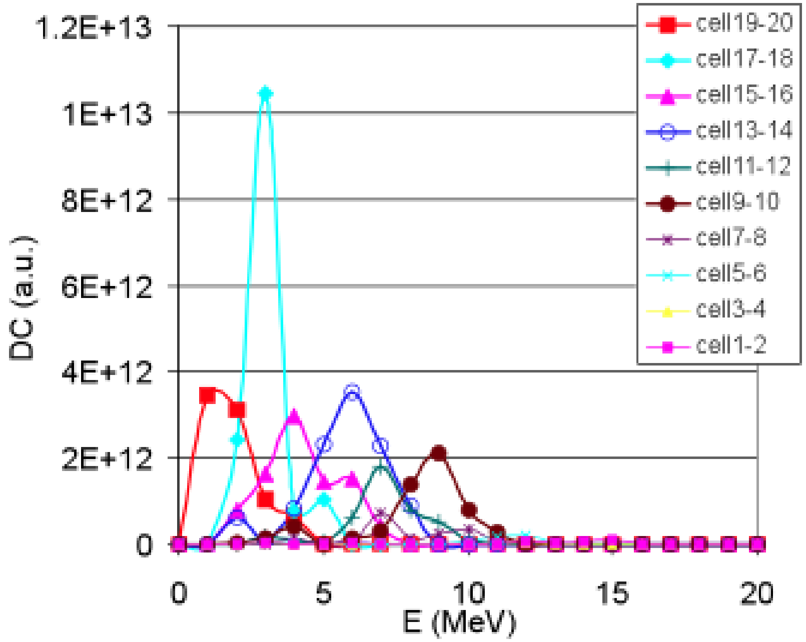


Cell # 1 20



Simulation

Electron energy as function of emission location.

- Eacc=97MV/m.
- Higher cell number indicates downstream location

Electrons emitted upstream are accelerated to higher energy (monitored at output end).

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