

LCFOA Technical Briefings: Cryomodules

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Outline

- **Cryomodules Status Report in the Three Regions**
- **Type IV (T4CM) Cryomodule Design**
- **An RF Unit for ILCTA at FNAL**

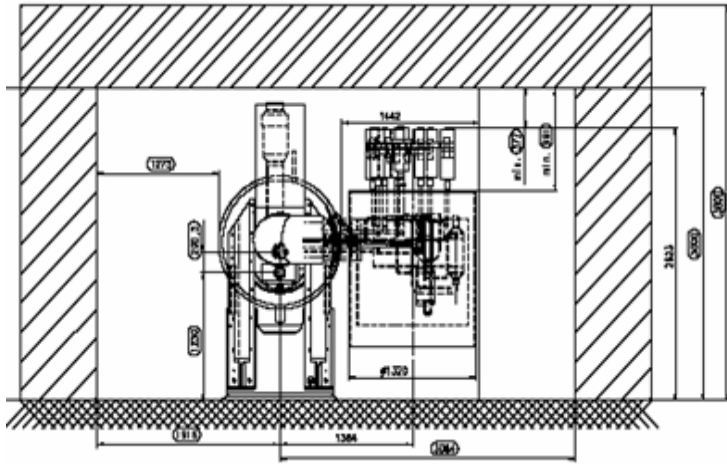


CM Status Report: European Region

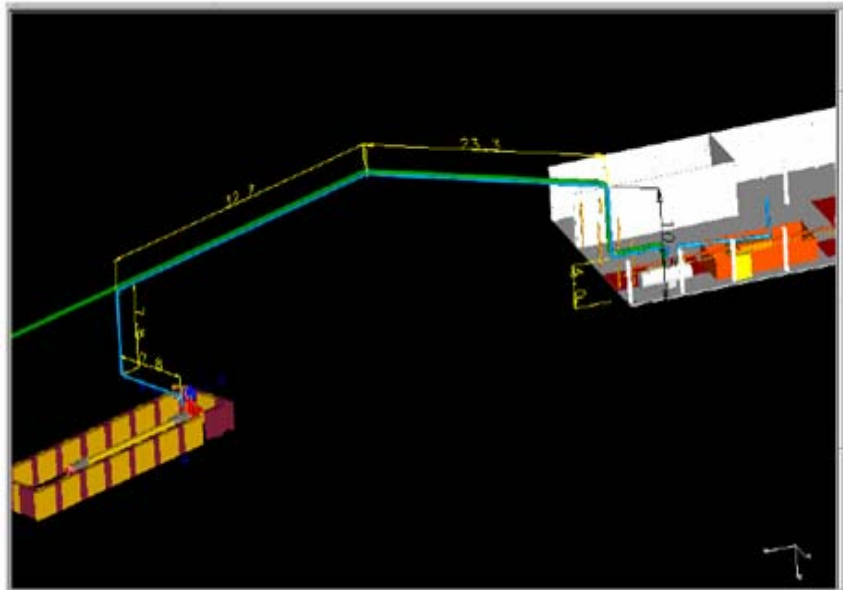
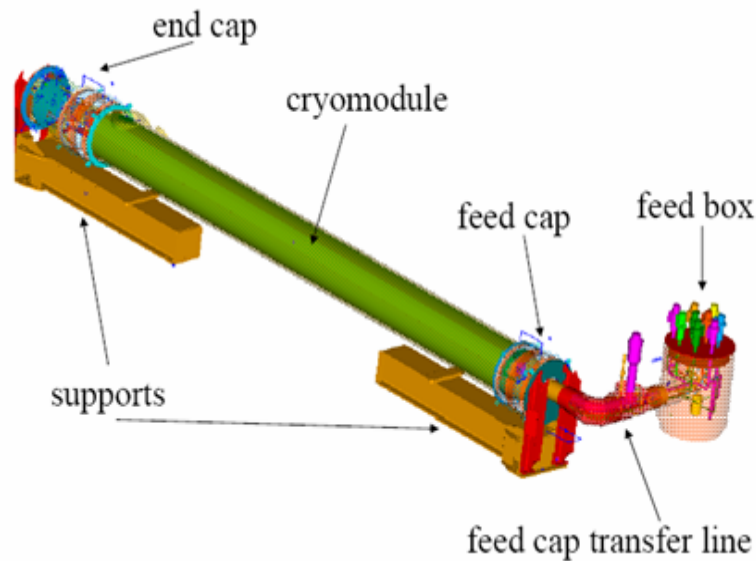
- Assembly of Cryomodule #6 at DESY begins today
 - Type III+ design using cavities qualified at 35MV/m (8?)
 - Estimated time to complete is six weeks
 - European industry is involved with this effort as part of industrialization for XFEL pre-production
 - Assembly of a Type III+ “kit” for ILCTA at FNAL to commence upon completion of Cryomodule #6
- Work well underway on a single cryomodule test stand--- scheduled for completion this summer (see next slide)
- R&D effort continues on EP of fine grain, large grain, and single crystal 1.3GHz niobium cavities


Module Test Stand

Lutz Lilje



- Allows cryogenic tests and RF measurements independent from the LINAC
 - No beam tests
 - Dark current measurements will be integrated





European Region: Industrial Studies on Module Assembly (Lutz Lilje)

- Prepare a study by industry on the cryomodule assembly
 - Involve industry early
 - Profit of industrial experience
- Results of the study will be published
- Specification of XFEL-Cryomodule Design & Assembly for Industrial Studies



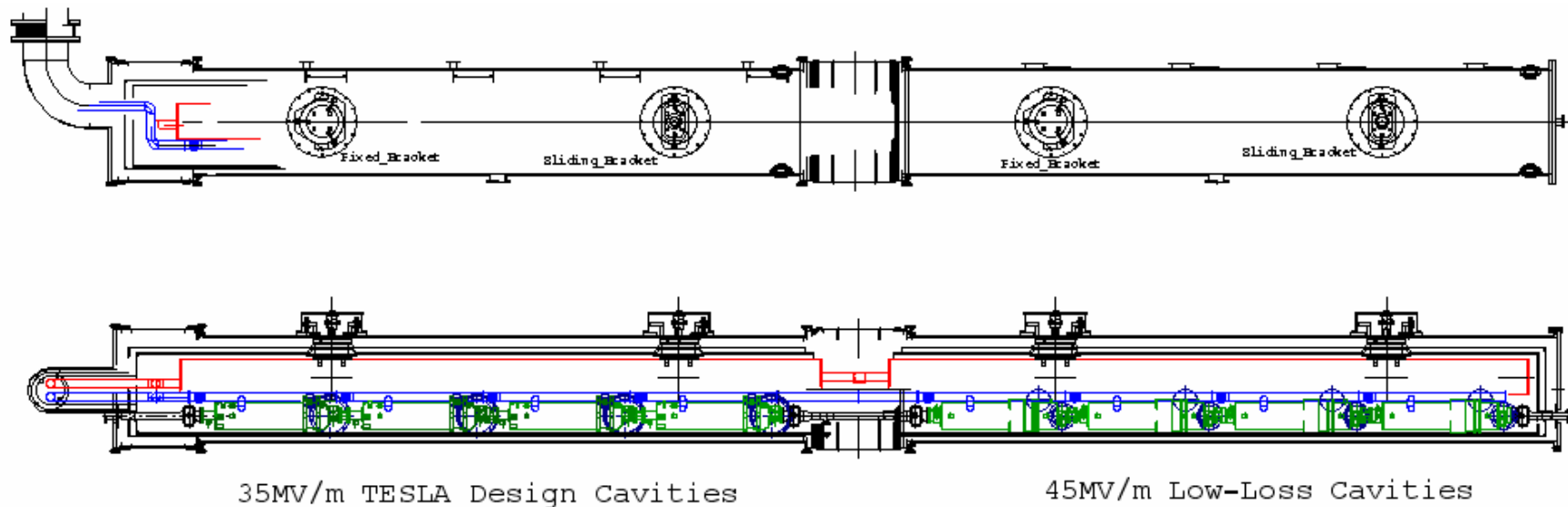
CM Status Report: Asian Region (KEK)

- Design of two four-cavity cryomodules has been completed (see next slide)
- Work underway on the STF
- R&D effort continues on mechanical polish (by tumbling) and EP of fine grain 1.3GHz niobium cavities (low loss design)

KEK Cryomodules

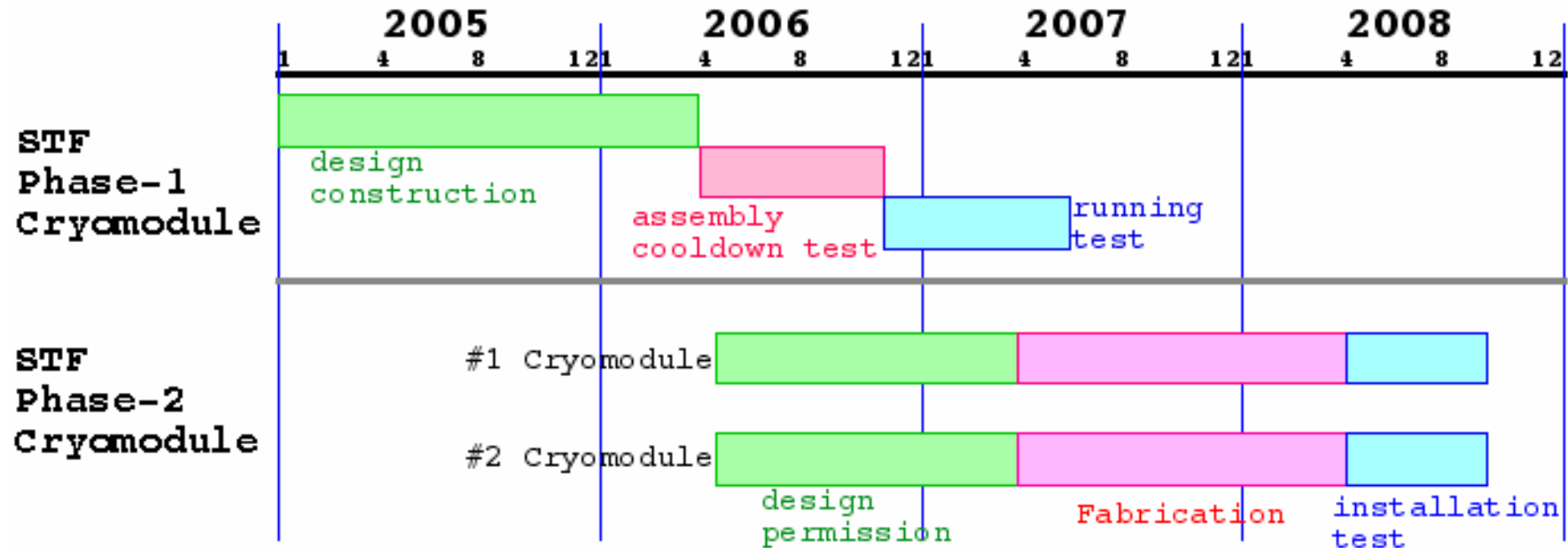
N. Ohuchi

- KEK is constructing two cryomodules of which cross-section designs are based on the TESLA Type III. (STF-Phase-1)
 - The cavities between the individual cryostats have the different design of gradients of 35 MV/m and 45 MV/m.
 - Two cryostats are connected with a bellows tube, and the total length is 13195 mm.
 - Four cavities are installed into the individual cryostat.
 - The designed distance between the input couplers of neighboring two cavities is 1337 mm.



KEK cryomodule status - long term schedule

N. Ohuchi



- The STF phase-1 cryomodule will be completed and tested in 2006, and the running test will be carried out in 2007.
- The STF phase-2 cryomodules are based on the design of the Type-4 cryomodule toward ILC, and the design will start in this year.



ILC Americas Cryomodule Status and Plans: Infrastructure Development

■ Fermilab

□ ILCTA-MDB

- Capture Cavity #2 initial testing at 4K completed
- Preparations underway for 2K operation: vacuum pumping system is installed
- Horizontal Test System (see next slide)

□ ILCTA-CAF

- New clean room installation and commissioning has been completed

□ ILCTA-NML

- Building preparation underway
- Interim cryo system installation is underway (but may fall victim to FY06 funding limitations)



ILC Americas Cryomodule Status and Plans: Infrastructure Development

■ Fermilab

- Horizontal Test Cryostat design essentially complete
 - Construction of vessel in progress
 - Planned to be operational by end of summer
 - Designed to accommodate 1.3 and 3.9GHz cavity testing
- Vertical Test System
 - Design effort is underway with civil construction planned in FY06
 - To be installed at TD IB1
 - Planned to be operational in Spring 2007

■ Argonne

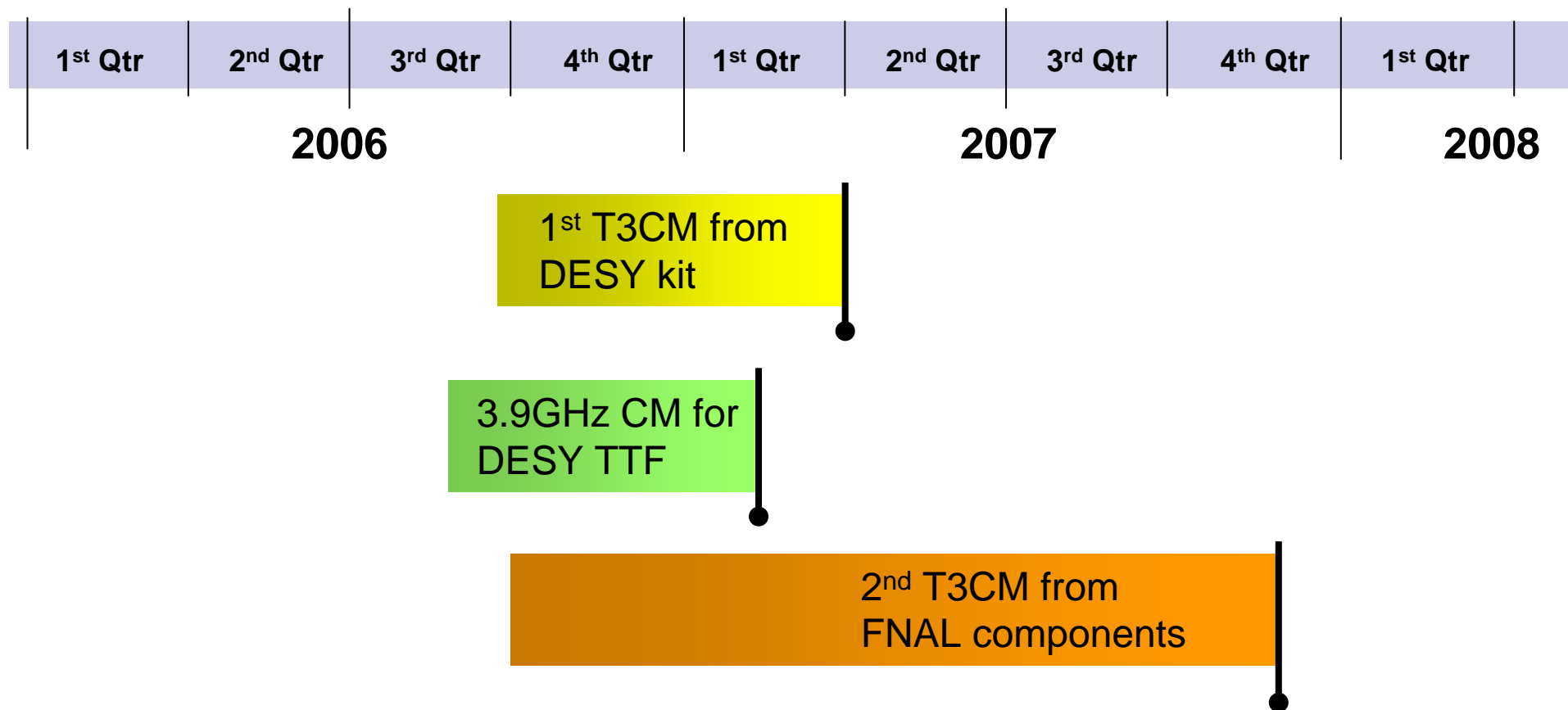
- Joint ANL/FNAL BCP Facility
 - Installation 95% complete
 - Safety review of ANL side underway
 - Safety review of FNAL side will follow successful completion of ANL review
- Joint ANL/FNAL EP Effort is under discussion
 - Emphasis to be on creating a prototype system design for industrialization



ILC Americas Cryomodule Status and Plans: Cryomodules

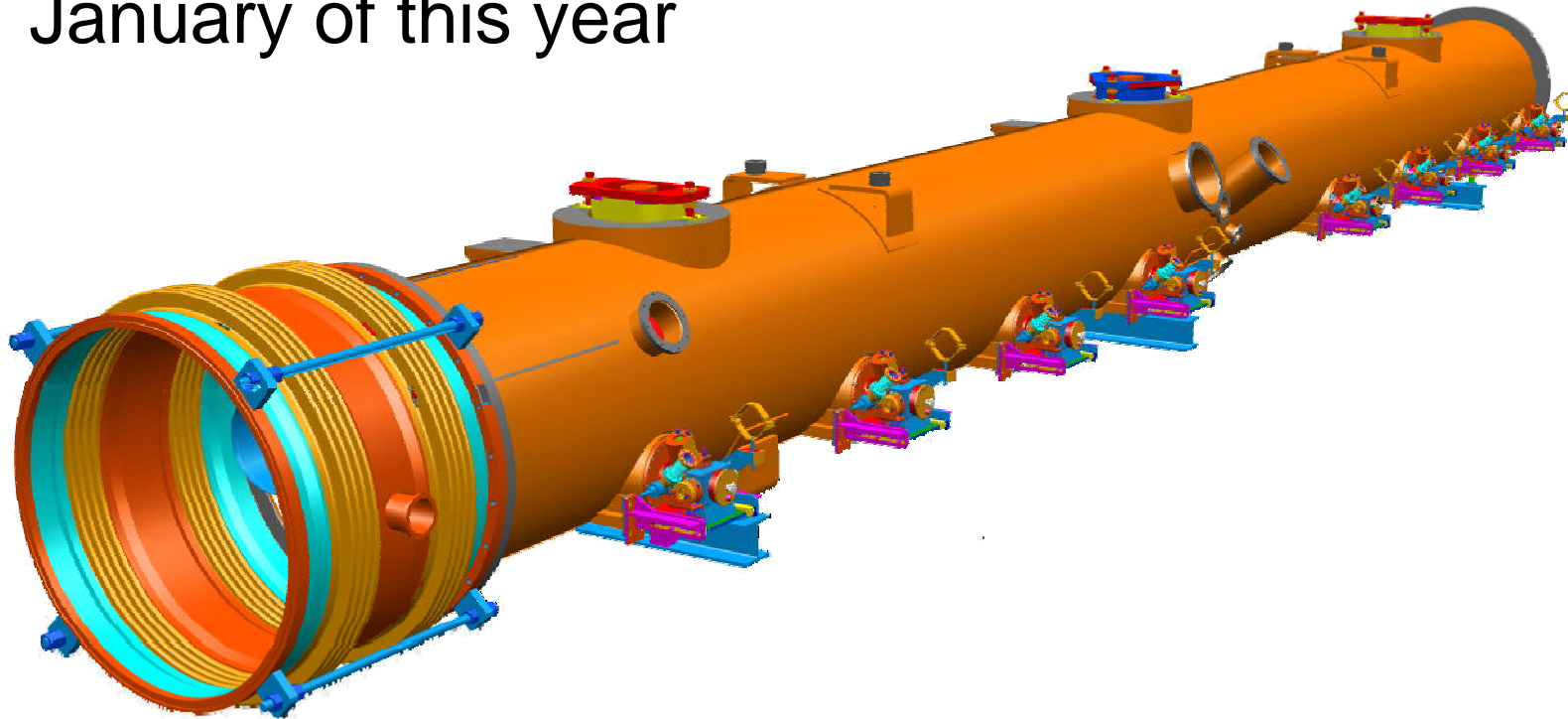
- CM1
 - Type III+ design
 - To be assembled from a Kit supplied by DESY
 - Completion date by March 2007
- CM2
 - Type III+ design
 - To be assembled from cavities procured by FNAL and processed by Cornell and JLab. Coldmass to be supplied by INFN (from Zanon)
- CM3
 - Type IV (T4CM) design effort has begun
 - 3-D preliminary model already created
 - T4CM design features will be described in the next few slides

Schedule for Cryomodules at FNAL



Type IV (T4CM) Cryomodule

- Don Mitchell Presented a Conceptual T4CM 3-D Model at the CERN cryomodule meeting in January of this year

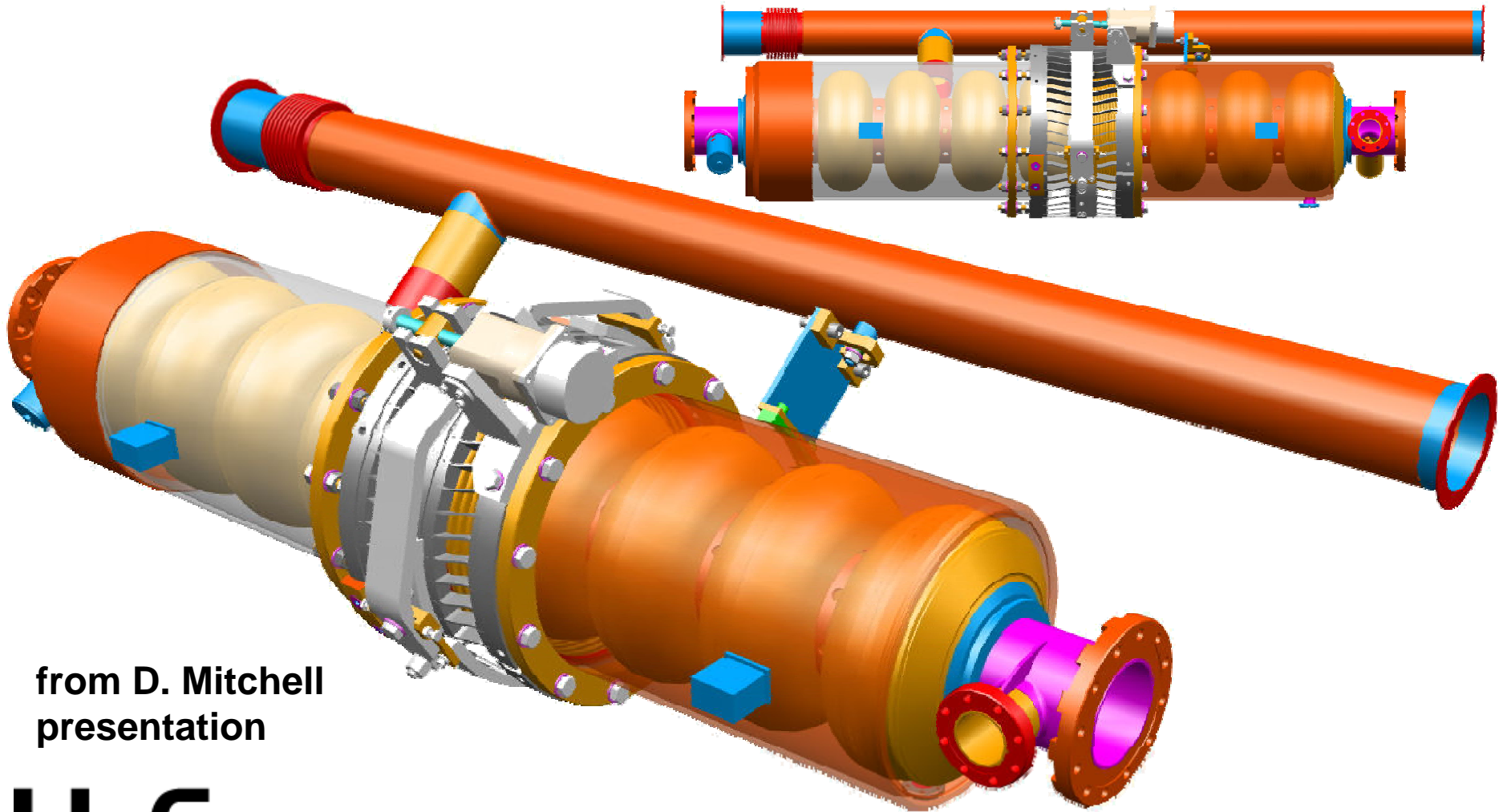




T4CM Features:

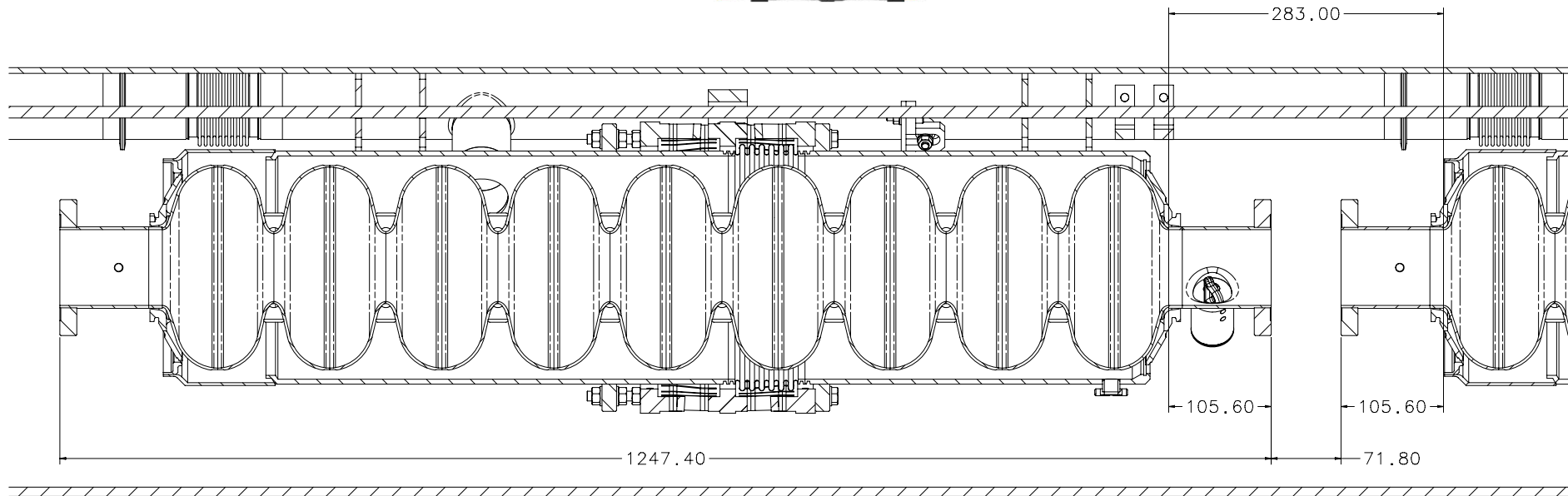
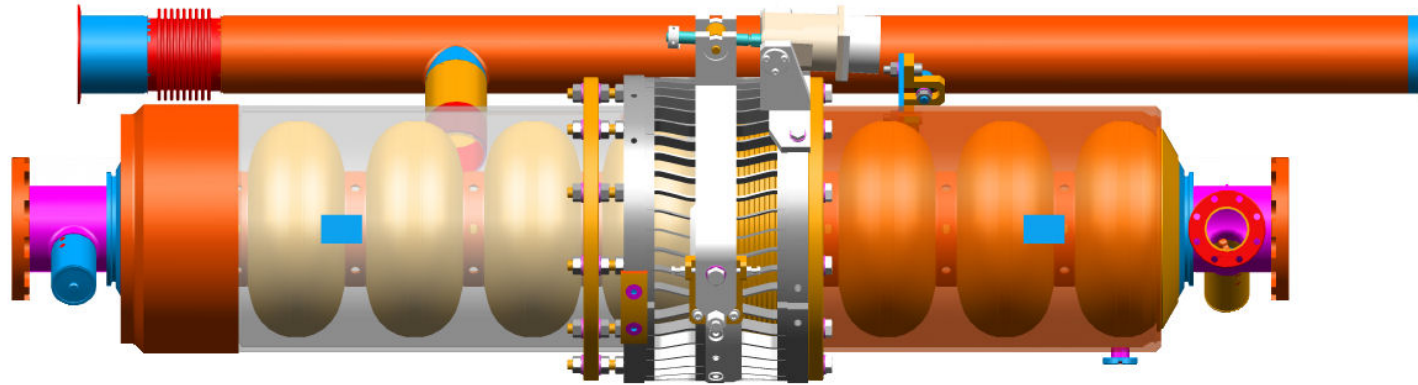
- The main features that distinguish the T4CM from the Type III+ CM are:
 - Closer cavity-to-cavity spacing due to decreased cavity overall length and a reduction in the space in the interconnecting region
 - Quadrupole/corrector/BPM package located in the center of the cryomodule rather than the end
 - Use of coaxial (blade) tuner rather than a lever-style tuner
- The T4CM design effort is an international effort

T4CM Proposed Cavity w/ Bladetuner



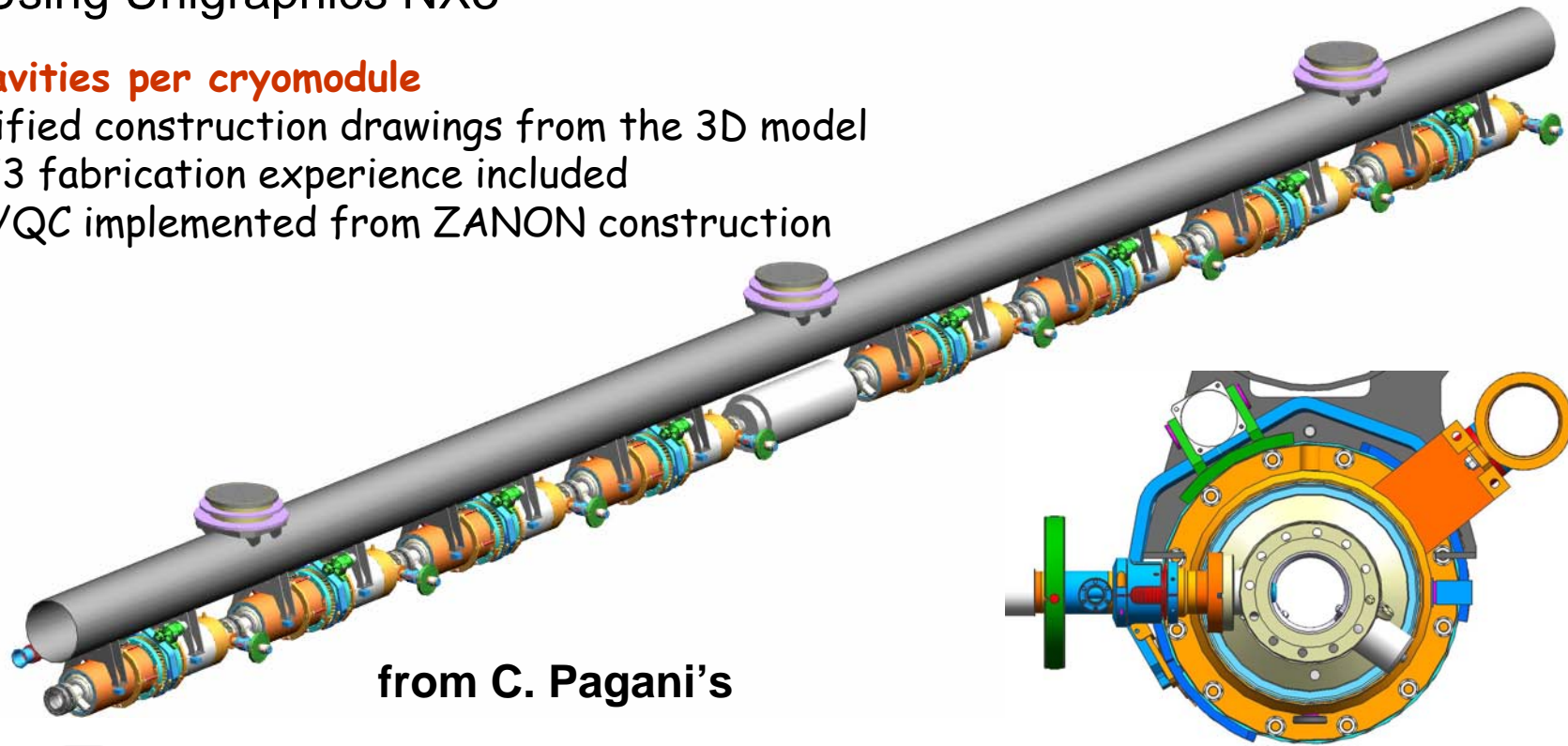
from D. Mitchell
presentation

T4CM Cavity Dimensions



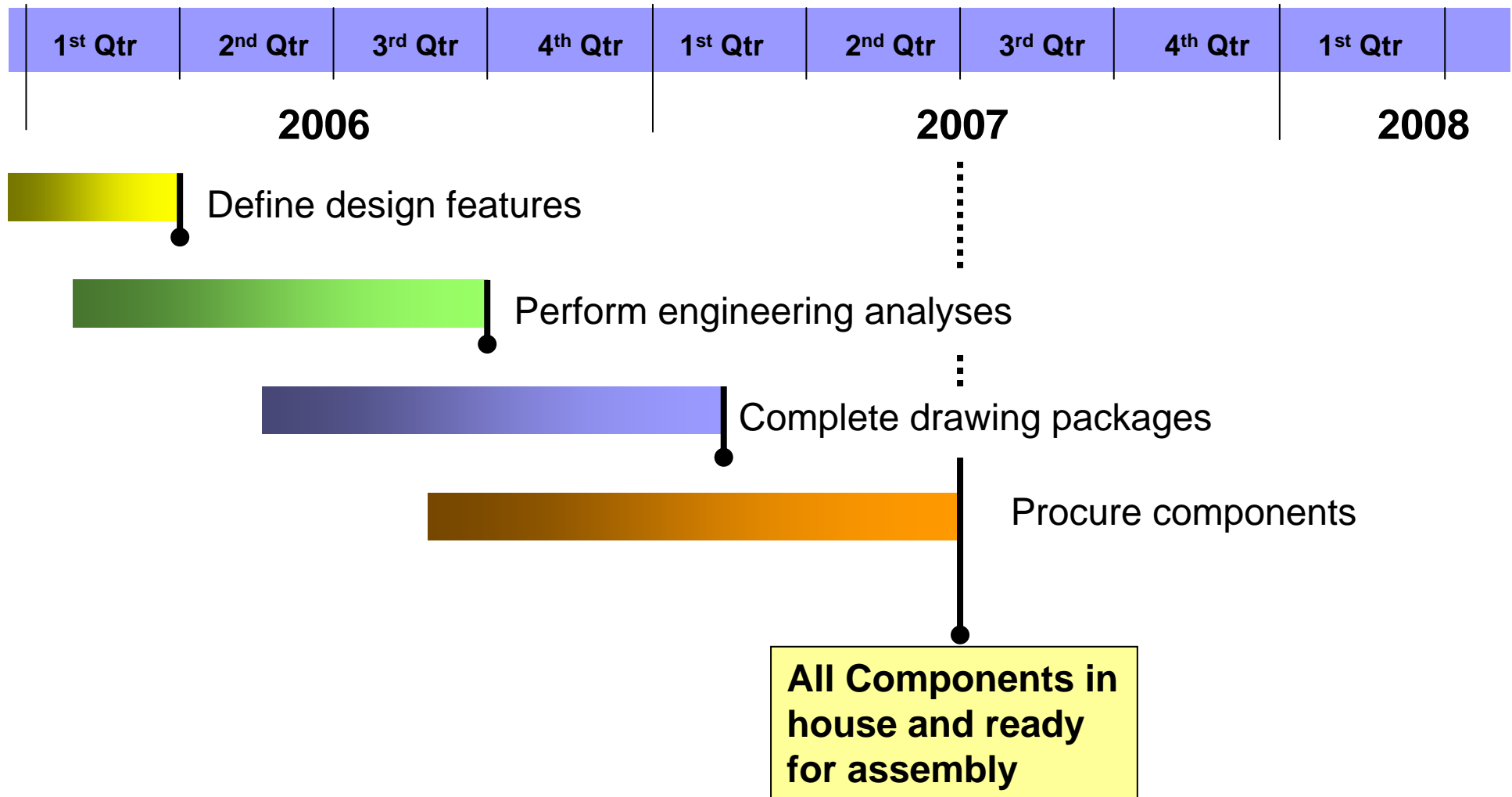
3D Parametric Model well advanced

- Starting from “original” INFN CRY3 AutoCAD DWGs used for all modules fabrication
- Rebuilding a CRY3 with “symmetric” quasi TESLA TDR string (8)
- Using Unigraphics NX3
- **8 cavities per cryomodule**
- Verified construction drawings from the 3D model
- CRY3 fabrication experience included
- QA/QC implemented from ZANON construction



from C. Pagani's

Arriving at a T4CM Design (Revised)

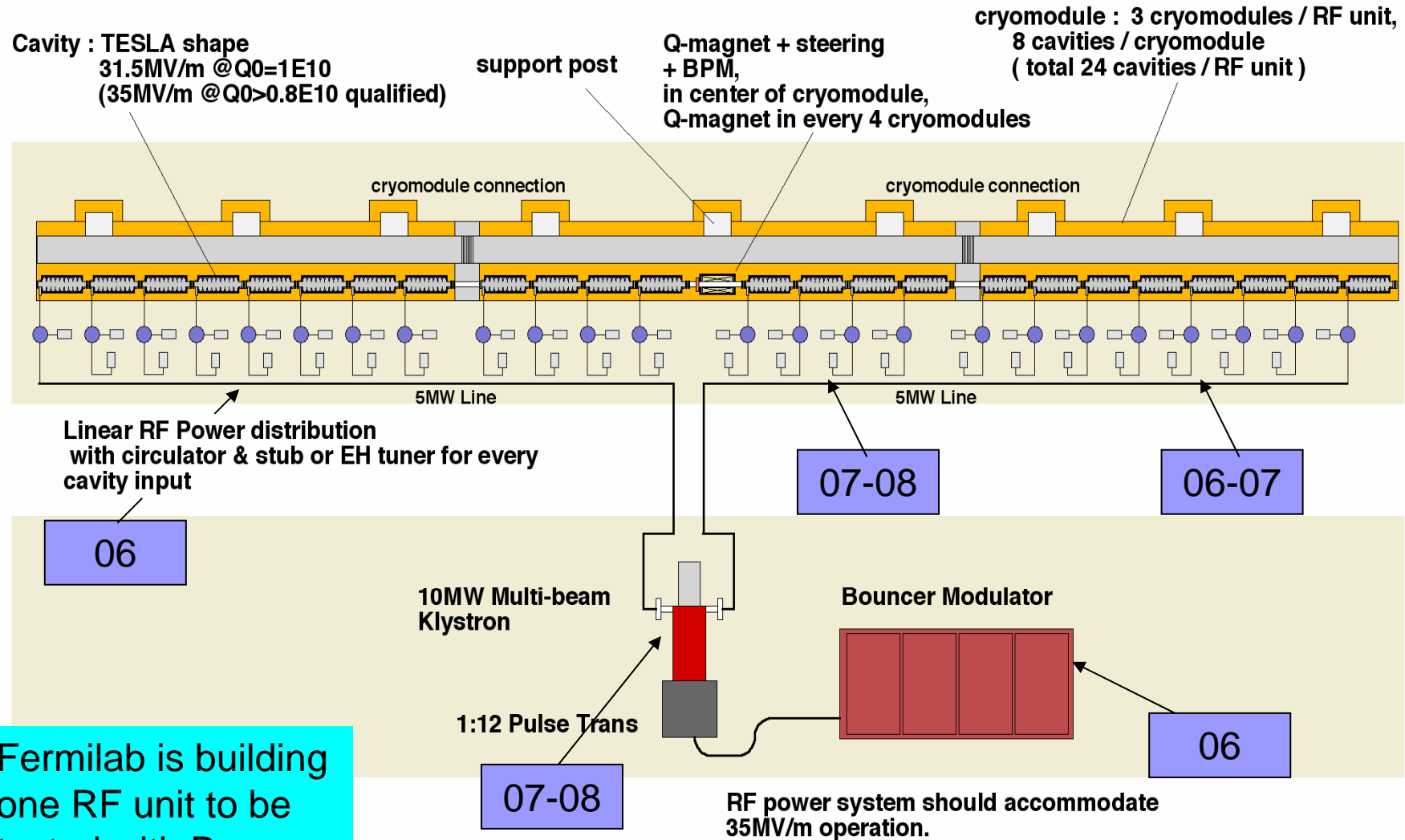




RDR: Cryomodule Cost Studies

- Cost studies are being conducted in all three regions
- In the ILC Americas Region, two studies are planned
 - A study at Fermilab has begun---led by Rich Stanek
 - A study by U.S. industry for an RF unit is in the process of being commissioned

ILC RF unit at Fermilab (at ILCTA-NML)



Fermilab is building one RF unit to be tested with Beam.



Summary:

- I have described some of the cryomodule work going on each of the three geographical regions
- The T4CM design effort is an international effort and is just now beginning in earnest
- Cryomodule cost studies are being undertaken in all three regions in support of the RDR costing effort

Thank you for your attention.

Any questions?