Fermilab

FRIB cryomodule review
16-18 August 2011

Tom Peterson

22 Aug 2011

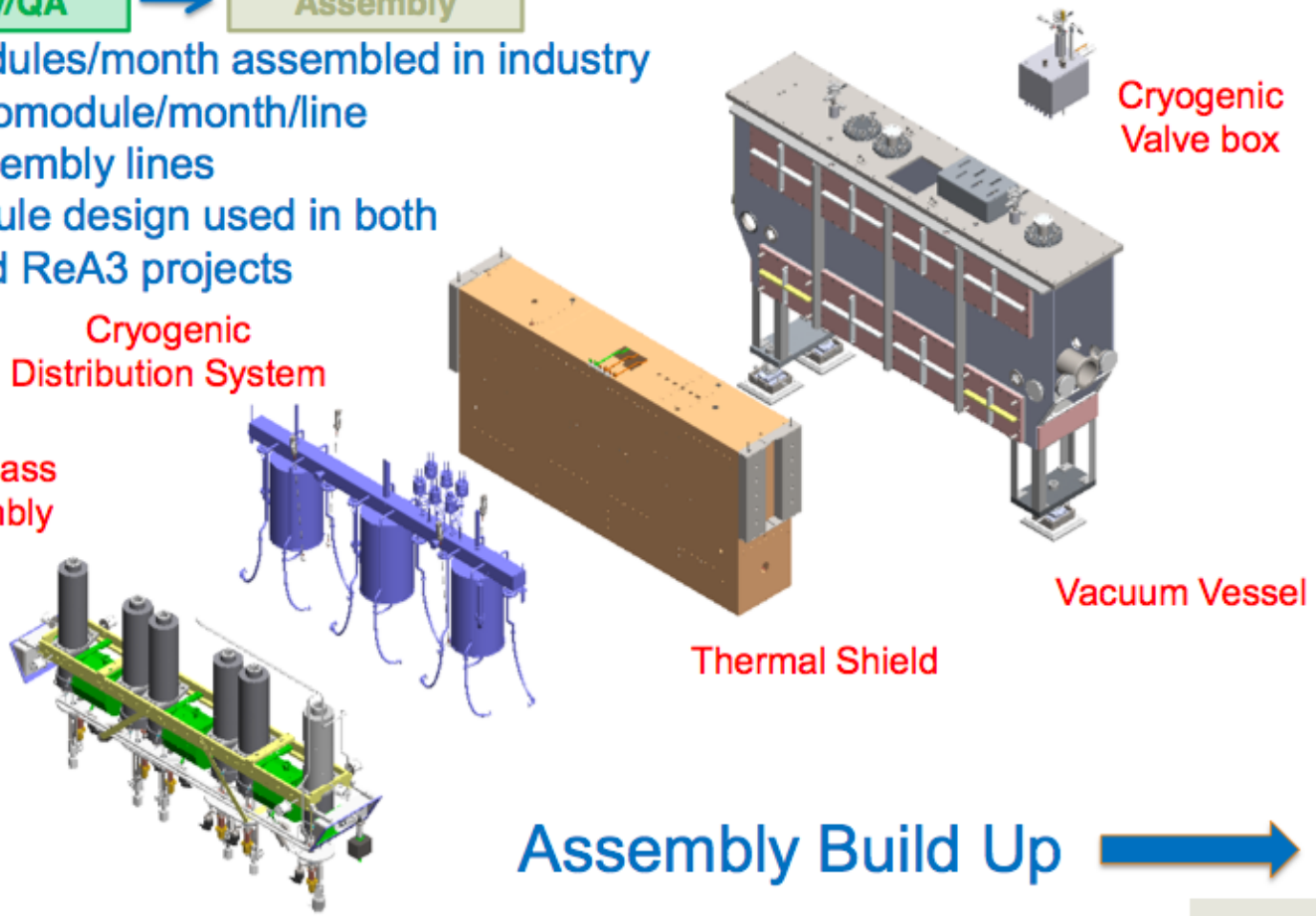
People

- Reviewers
  - John Hogan, Jlab
  - Tom Peterson Fermilab
  - Joe Preble, ITER (France)
- FRIB personnel (partial list)
  - John Weisend (Cryogenics & Cryomodules Department Manager)
  - Matt Johnson (Mechanical Engineering Group Leader)
  - Shelly Jones (Cryodistribution Group Leader)
  - Also -- Jie Wei (Accelerator Systems Division Director), Dan Stout (Chief Engineer), and ~8 mechanical engineers and designers

Acquisition: Cryomodule Assembly [1]

Inventory/QA → Assembly

- 2 cryomodules/month assembled in industry
  - 1 cryomodule/month/line
  - 2 assembly lines
- Cryomodule design used in both FRIB and ReA3 projects



Assembly Build Up →

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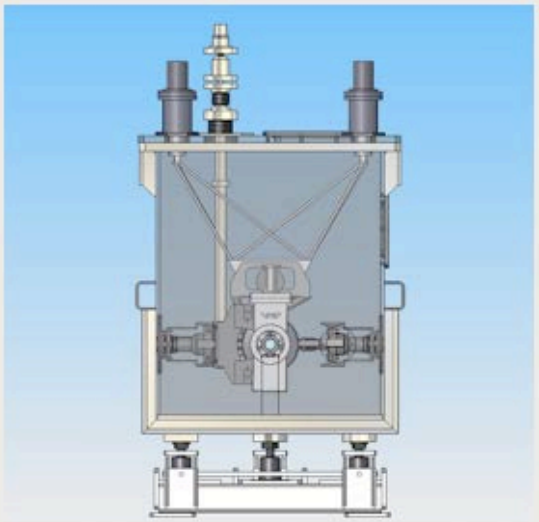
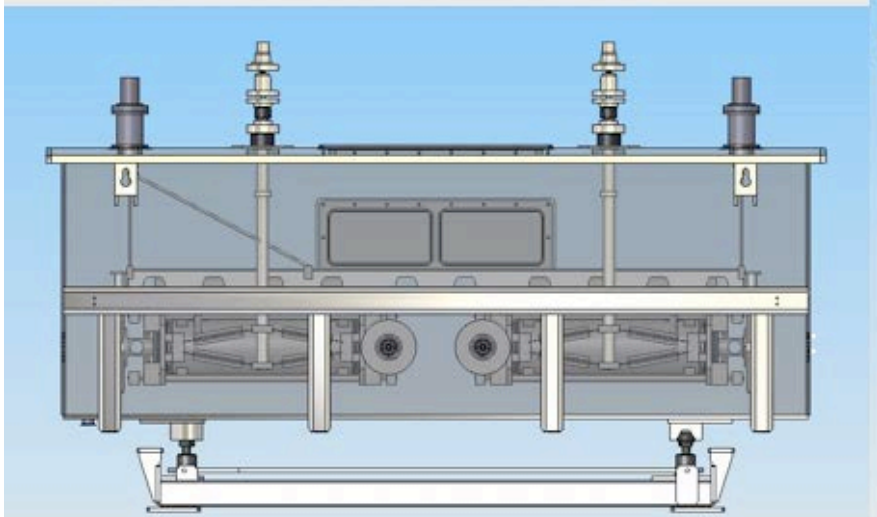
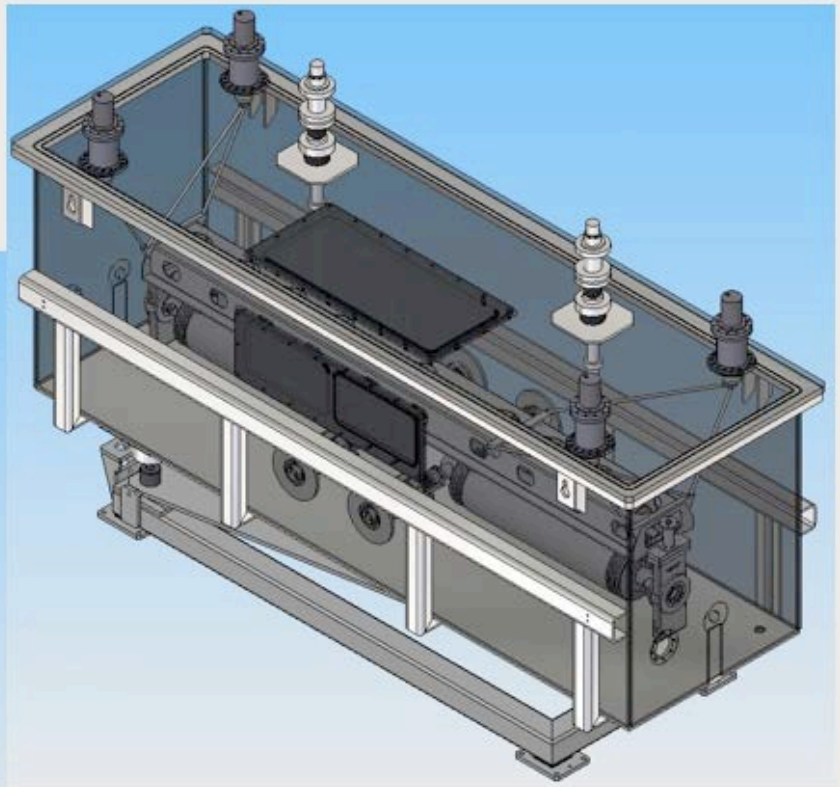
C. Compton, 28 July 2010, B05, Slide 15

e-Linac top-load box concept

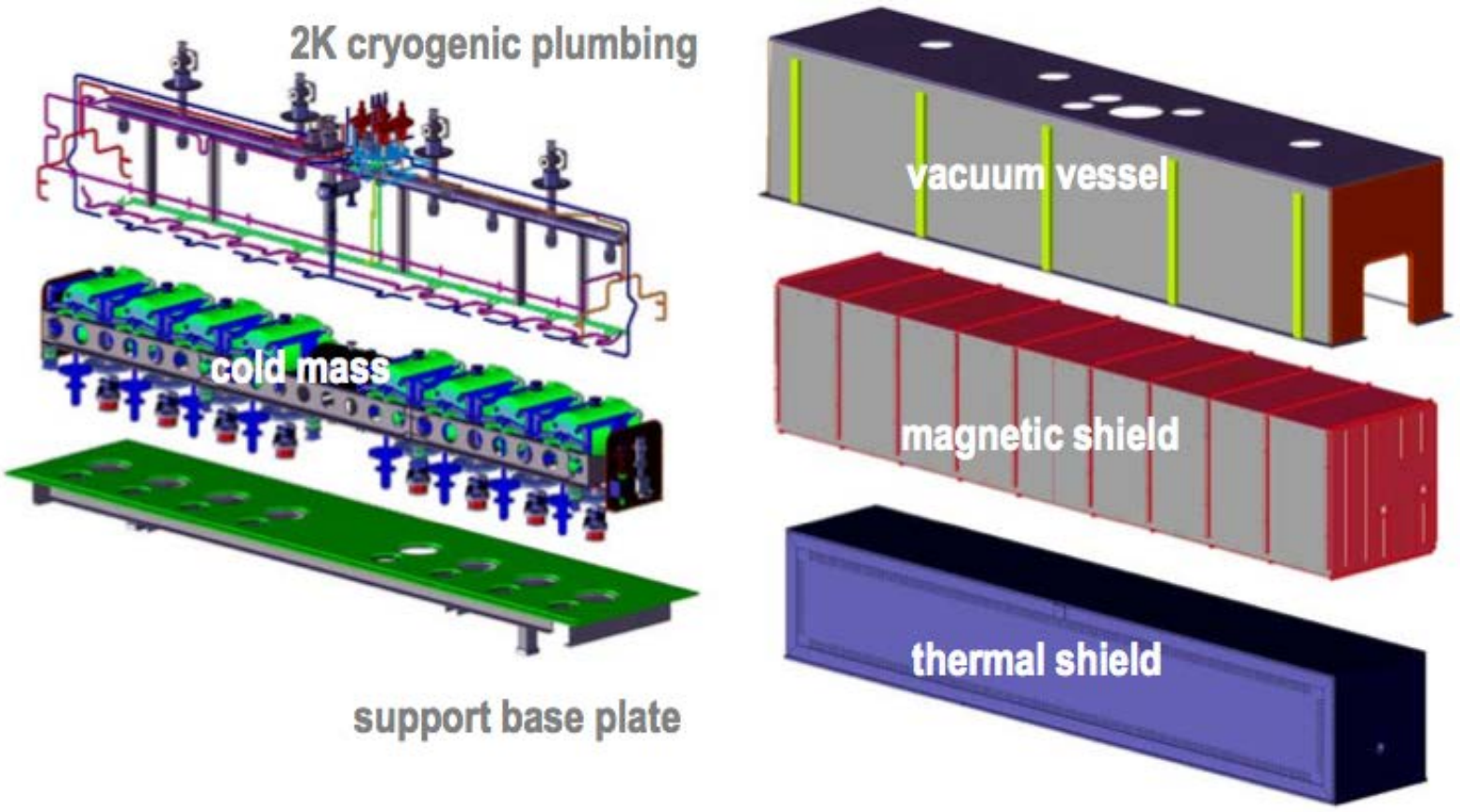


- Cold mass (cavity string, tuners) supported from strongback
- Strongback held in place by support posts strung from the lid





β=0.53 Preliminary Design



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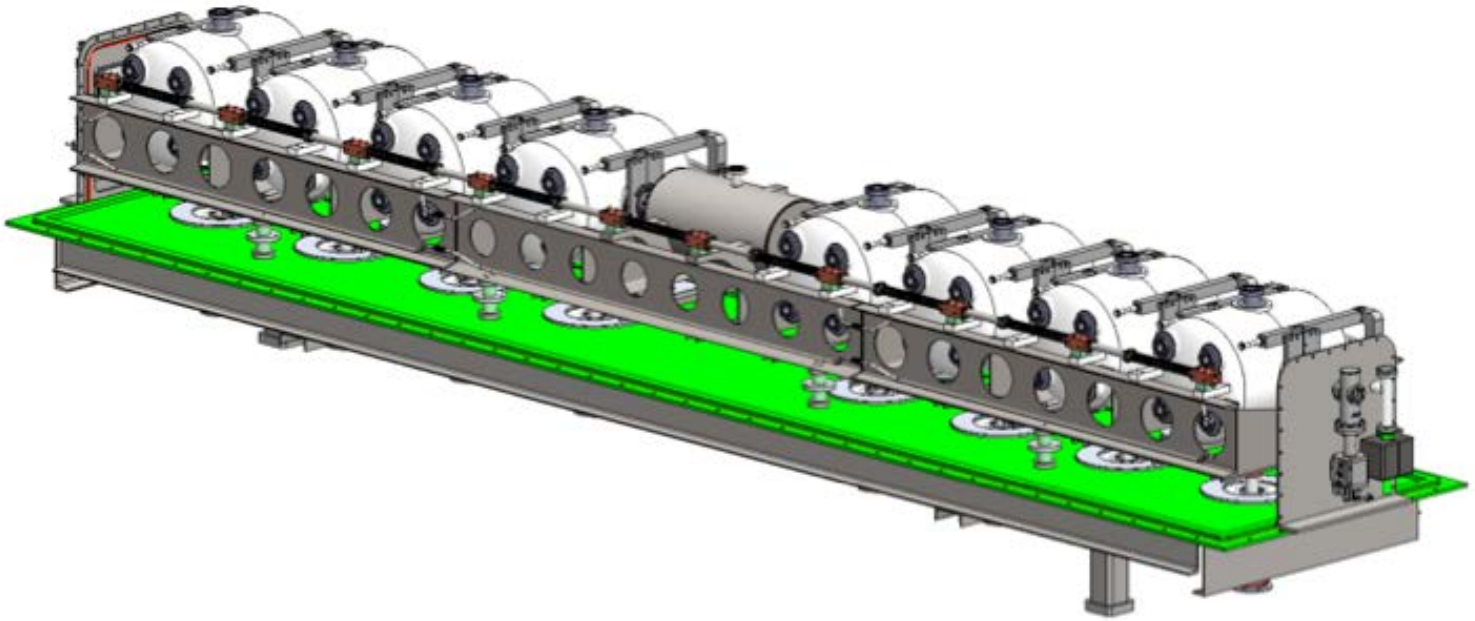
J. Weisend, 16 Aug 2011, Cryomodule Peer Review - 03, Slide 9

β=0.53 Lower Plate Assembly



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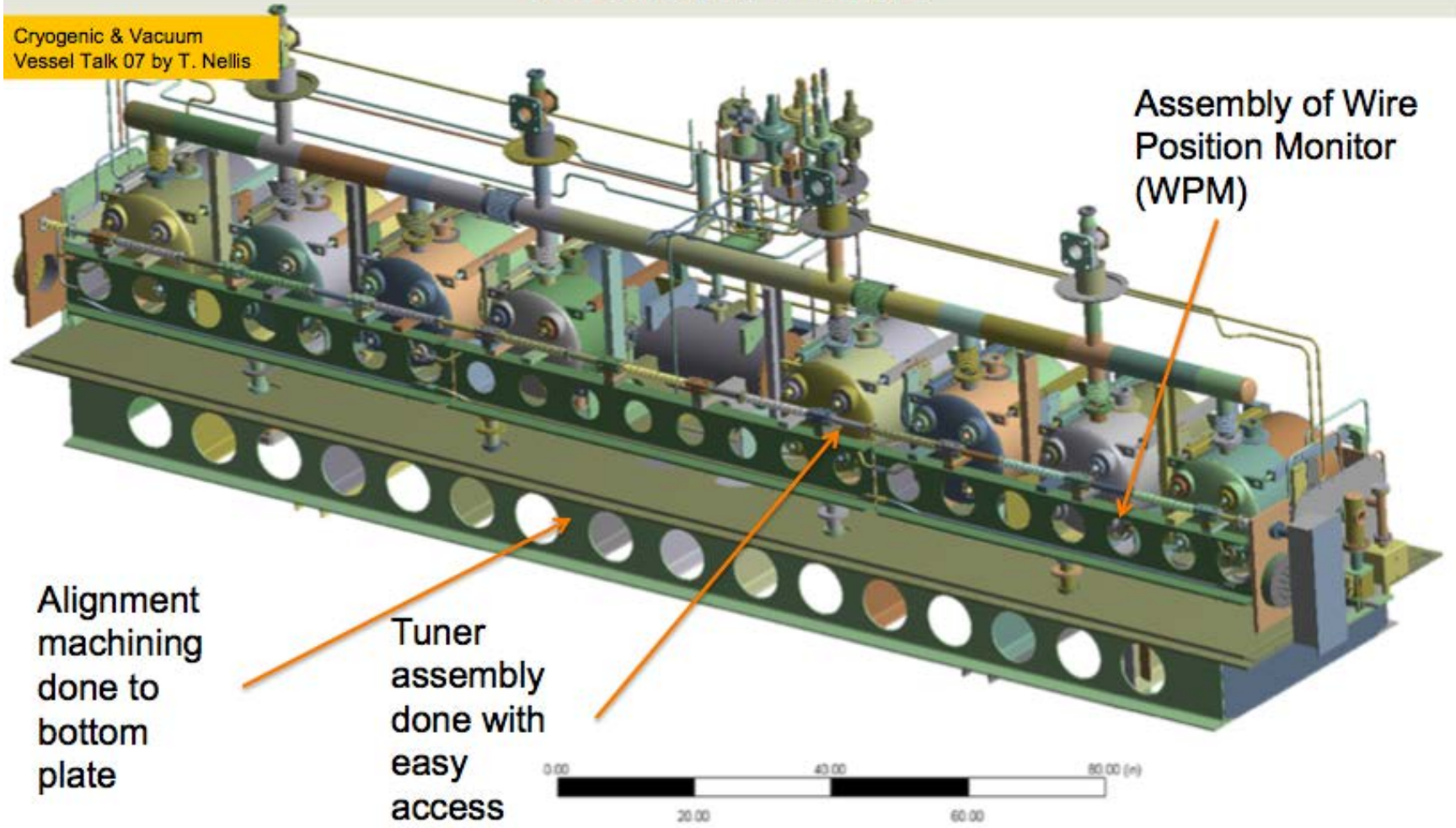
Cold Mass Assembly Installation onto Bottom Plate



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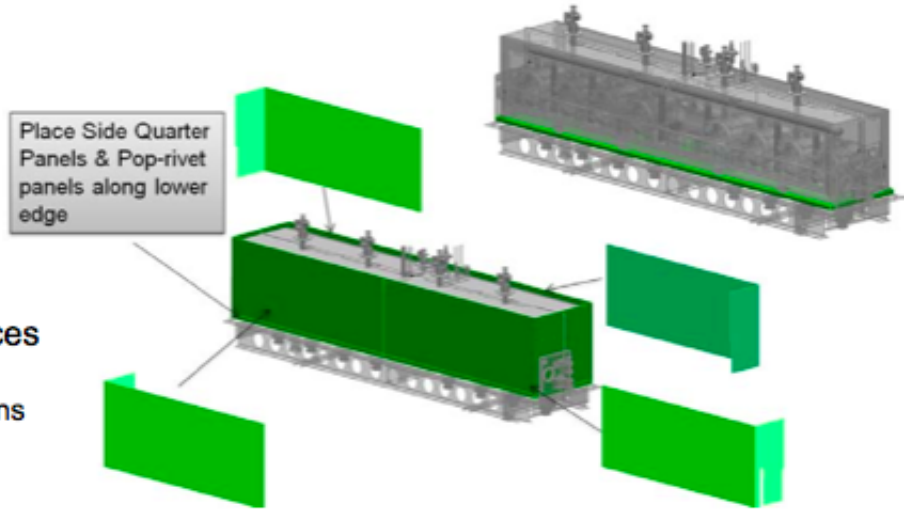
M.J. Johnson, 16 Aug 2011, Cryomodule Peer Review - 04, Slide 11

Benefits [1]

- Cold mass assembly
  - Less risk of damage to FPC and tuner as opposed to dropping entire assembly with shielding into vessel
  - Easier to attach tuners; nothing to restrict access
- Simplified alignment & positioning of components
  - ReA3 alignment process took 1 week where this dowel fit assembly eliminates that step
- Longer and wider bottom plate
  - » More room for orthogonal positioners/feet
  - » Lower center of gravity
- Safer; personnel not under hanging assembly
- MLI easier to manage and not hanging in the way during assembly

Benefits [2]

- μ-metal shield
  - Reduced part count
- Thermal shield
  - Aluminum 1100-O material savings
  - Simplified fastening with rivets
  - Dedicated cooling line removes soldering braids to sheet metal
  - No taping necessary
- Cryogenic headers
  - Attached to rails removes hanger rods which reduces heat load
  - Piping assembled and field welds done without MLI concerns
- Vacuum vessel
  - Bottom plate easily machined
  - Alignment accomplished before bell jar assembled
  - Sets on G10 legs/feet with no hanger rods to bring in heat
- Fewer assembly fixtures
  - No assembly stand needed for building therefore multiple modules can be assembled at the same time



μ-metal shield required less parts