



MQXFB finite element model and action items

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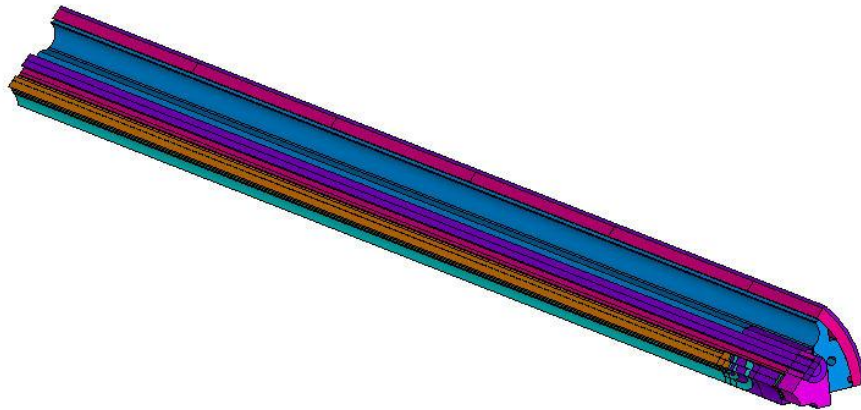
on behalf of the MQXF collaboration

Technical meeting on MQXF longitudinal mechanics
April 6th, 2021
LBNL, Berkeley, CA, USA

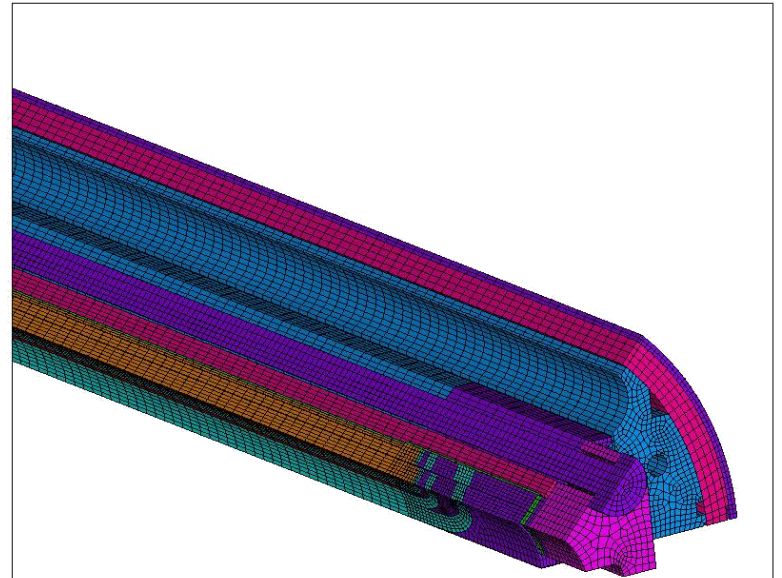
FEM Model

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3D Geometry



3D Geometry

Octant symmetric MQXFB magnet mechanical model

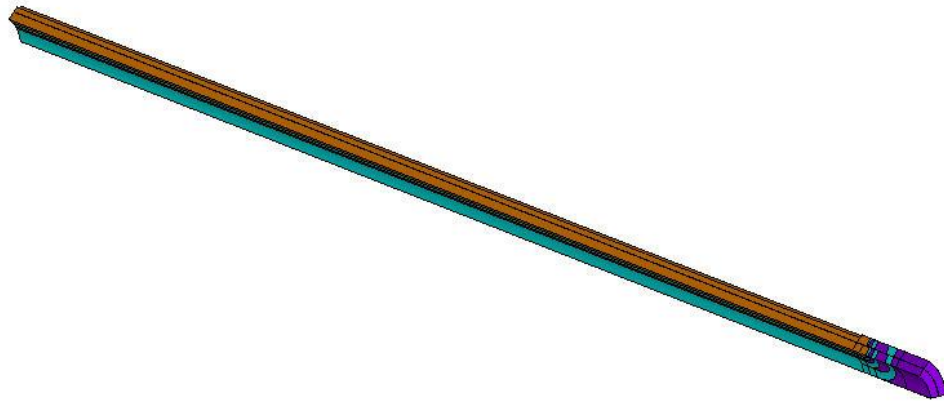
FEM Model

- Main characteristics:
 - Structural (static) model incorporating all magnet components and the longitudinal support system.
 - Yoke, pad and collars modelled as continuous blocks.
 - Aluminum shell segmented.
 - Contact element between all surfaces
 - Bonded or sliding/separation with friction
 - 4 steps
 - Magnet preload
 - SS-vessel welding
 - Cool-down
 - Powering

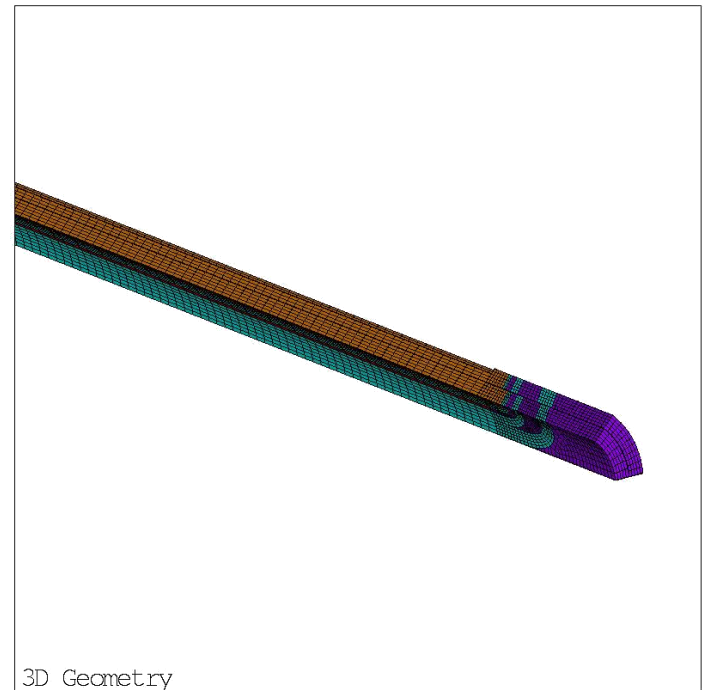
FEM Model - Coil

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3D Geometry

FEM Model - Collar

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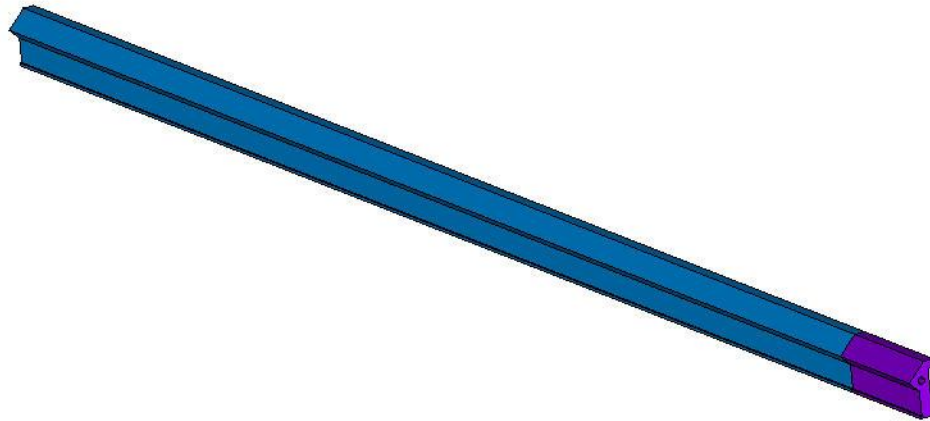


3D Geometry

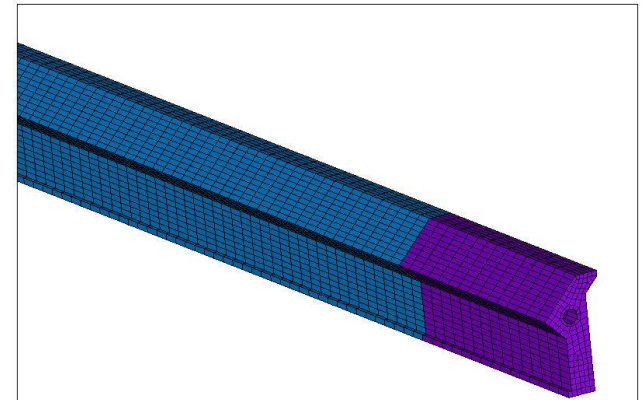
FEM Model - Pad

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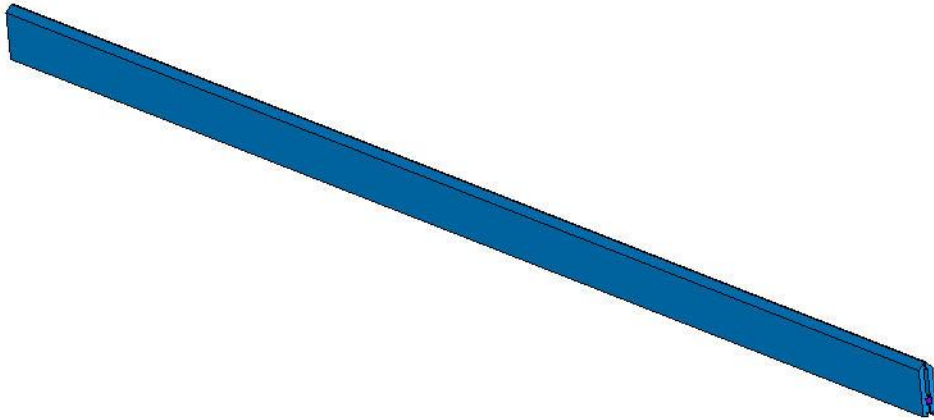


3D Geometry

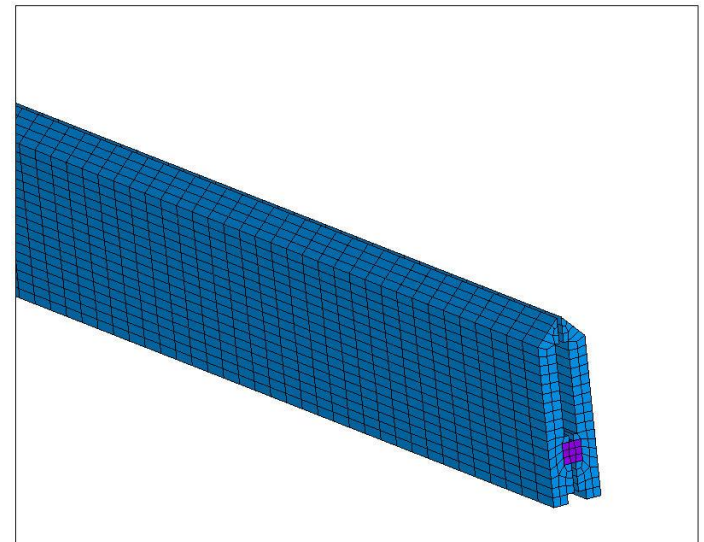
FEM Model - Master

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3D Geometry

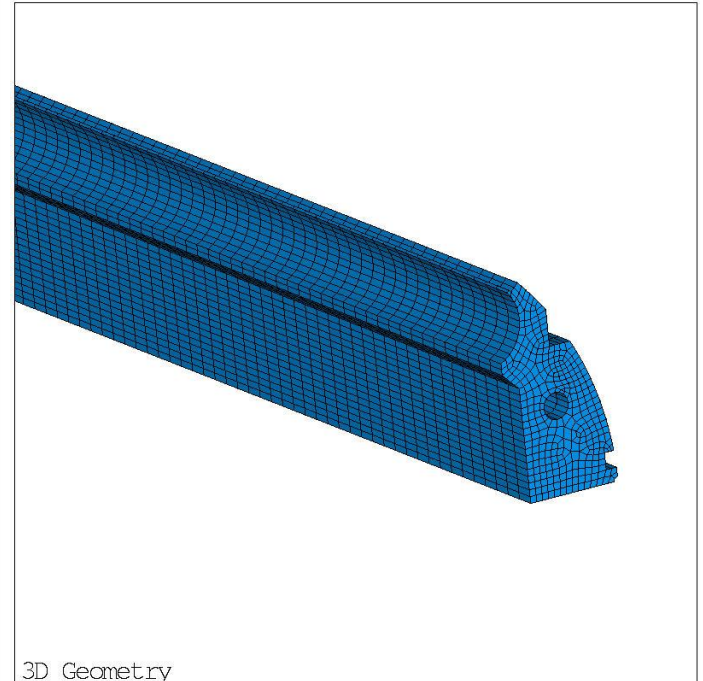
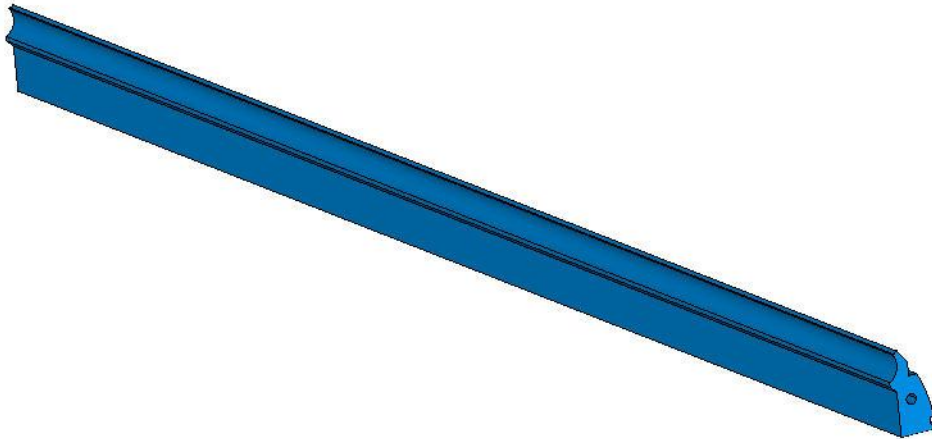


3D Geometry

FEM Model - Yoke

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3D Geometry

3D Geometry

FEM Model - Shell

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3D Geometry

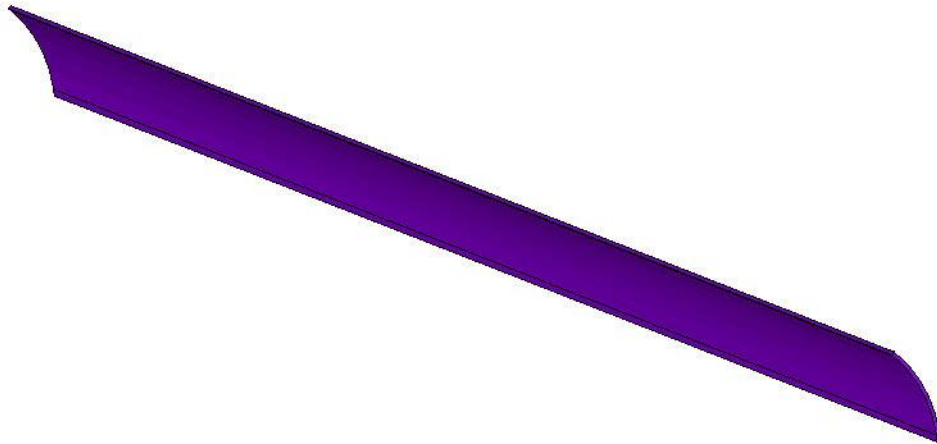


3D Geometry

FEM Model - Vessel

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3D Geometry

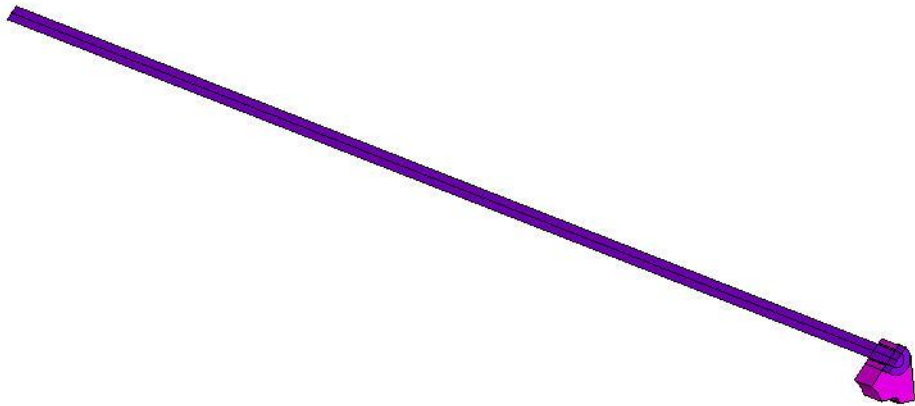


3D Geometry

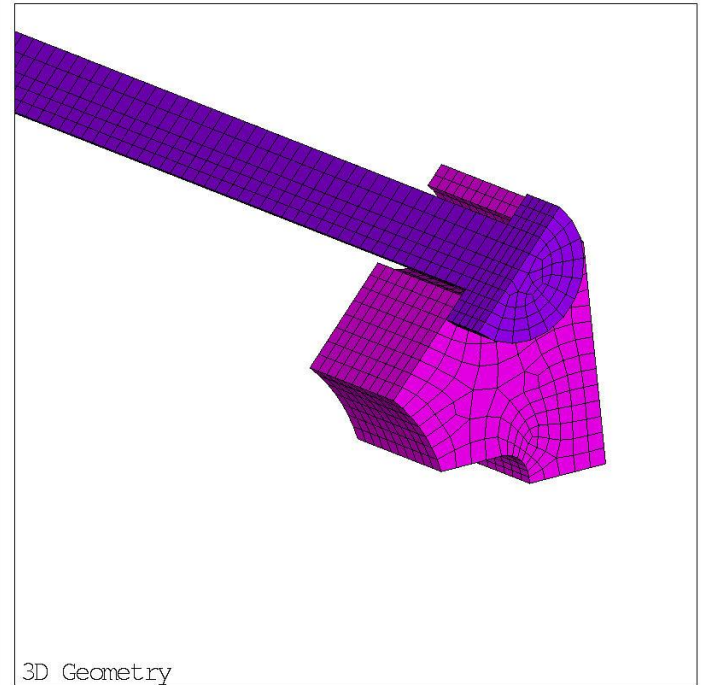
FEM Model – Axial support system

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3D Geometry



3D Geometry

Action items

- Run a case representative of **BP1, BP2, B01**
 - Both magnet and cold mass, warm and cold
 - Fine tune according to strain gauges, fiber optics, coil dimensional data, shell welding data
- Compare computations and experimental data to MQXFA and MQXFS
 - Coil azimuthal stress/strain
 - Coil axial stress/strain
 - Coil ends (axial rods)
- Investigate impact of yoke/pad/collar **laminations** and master **cuts** in the cold mass
- Additional analysis (specifically for MQXFB)
 - Cold mass assembly and tack welding block motion
 - Shell-yoke modules tilt
 - Any other difference with respect to MQXFA/S?
- Others?