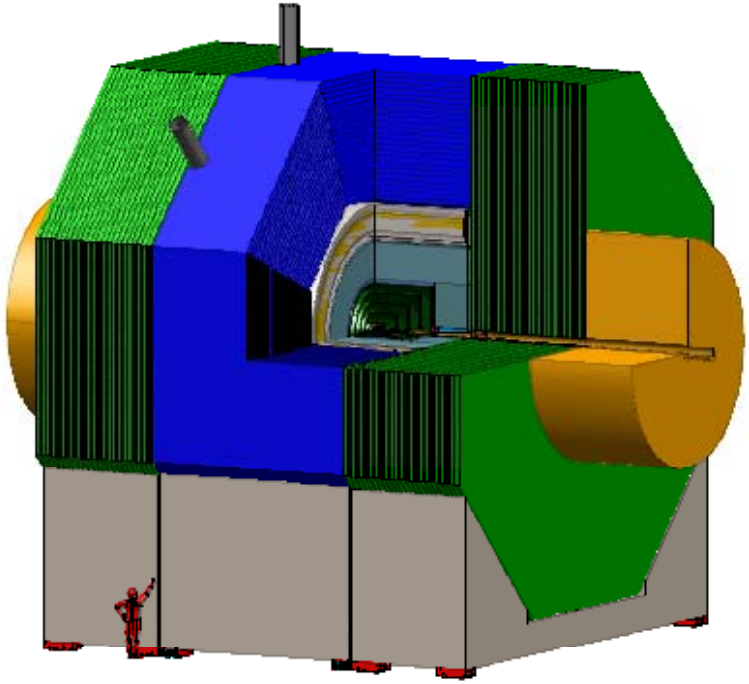
SiD Engineering Status Report

Kurt Krempetz



SiD Engineering Group

Engineers

- ANL
  - Victor Guarino→Hcal
- FNAL
  - Bob Wands→FEA
  - Joe Howell
  - Kurt Krempetz→Integration
  - Walter Jaskierny→Solenoid Electrical
- PSL
  - Farshid Feyzi→Muon Steel
- SLAC
  - Jim Krebs→EndDoors
  - Marco Oriunno→Ecal
  - Wes Craddock→Solenoid
- RAL
  - Andy Nichols→Tracking

Physicists

Bill Cooper

Marty Breidenbach

Tom Markiewicz

Phil Burrows

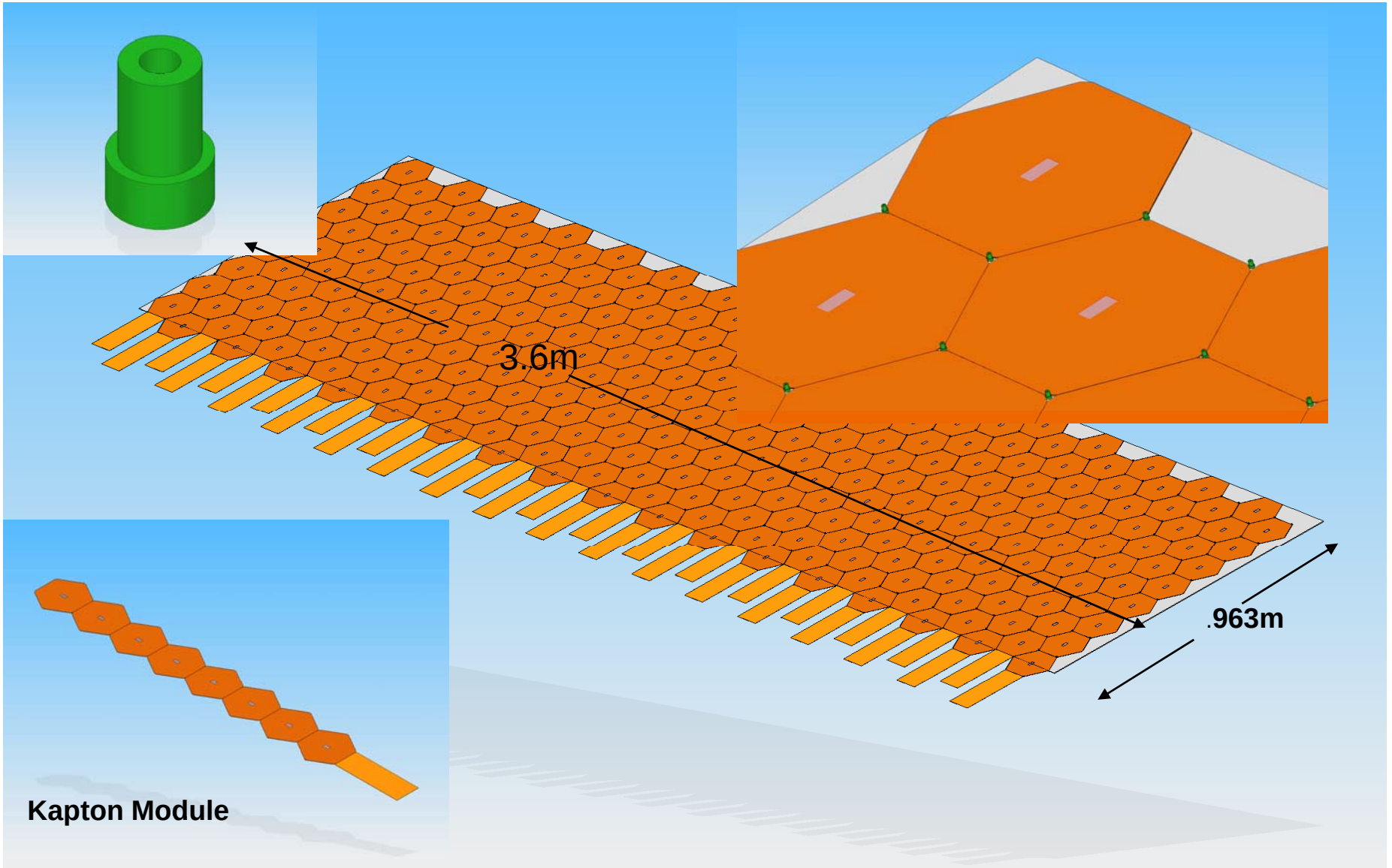
Subsystem Liaisons to the Engineering Group

- Vertex→ Bill Cooper
- Silicon Tracker→ Tim Nelson
- Ecal→Marty Breidenbach
- Hcal→Andy White
- Muons→Henry Band
- Forward→Bill Morse
- MDI→Tom Markiewicz

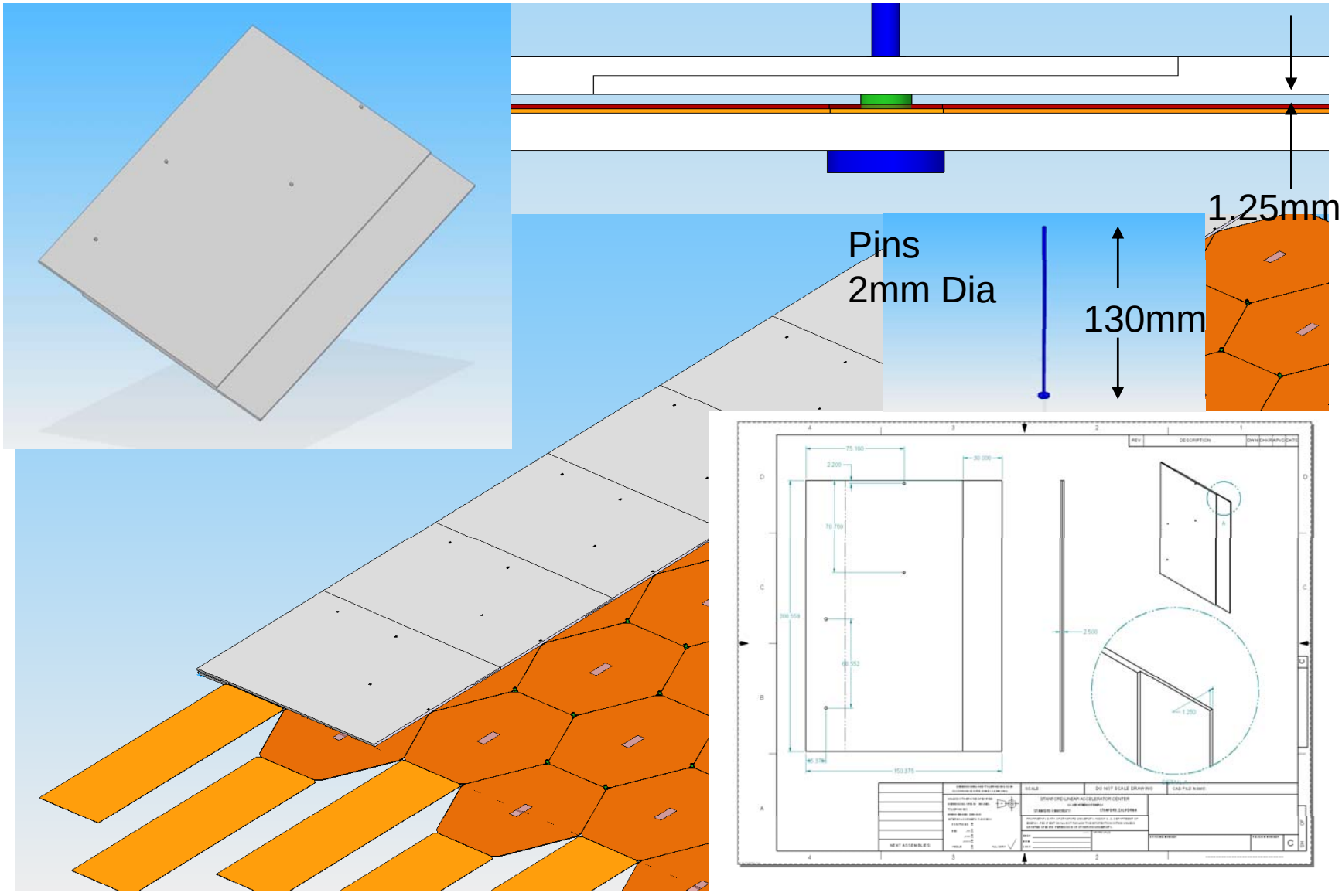
Ecal and Hcal-Support Concepts

- Ecal modules are individually supported off an adjacent Hcal Module, along its entire length
- Hcal modules are joined together to form a cylinder, this cylinder is support along the entire length at the 3 and 9 o'clock positions in the solenoid.
- Ecal starts with a detector module and ends with a detector module.
- Hcal ends with a detector module

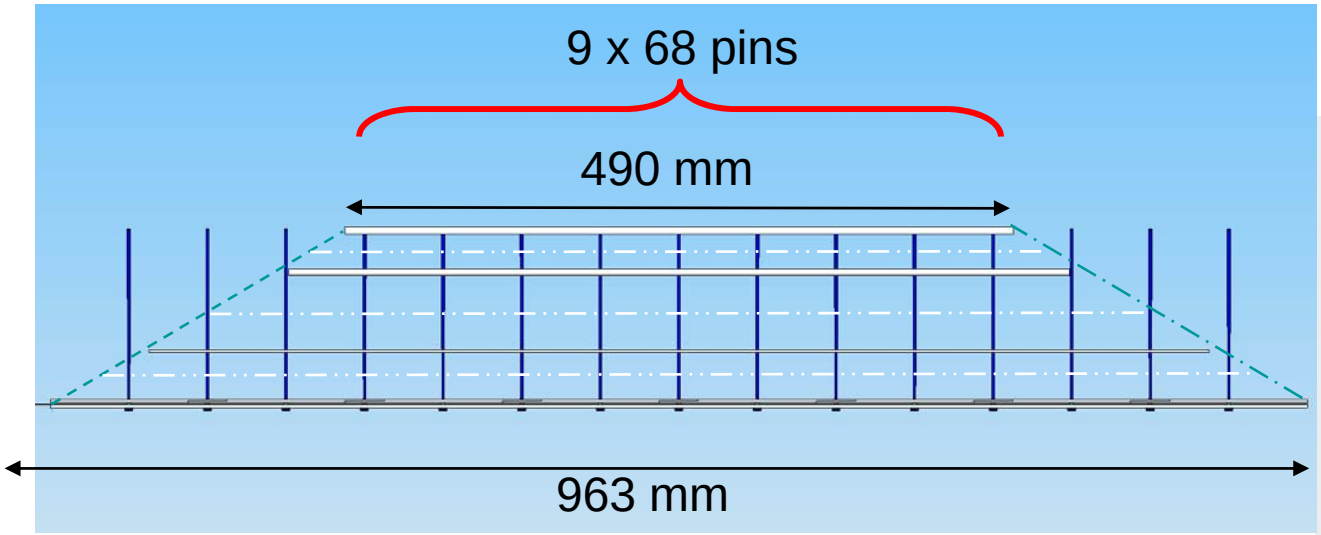
Ecal -Layout

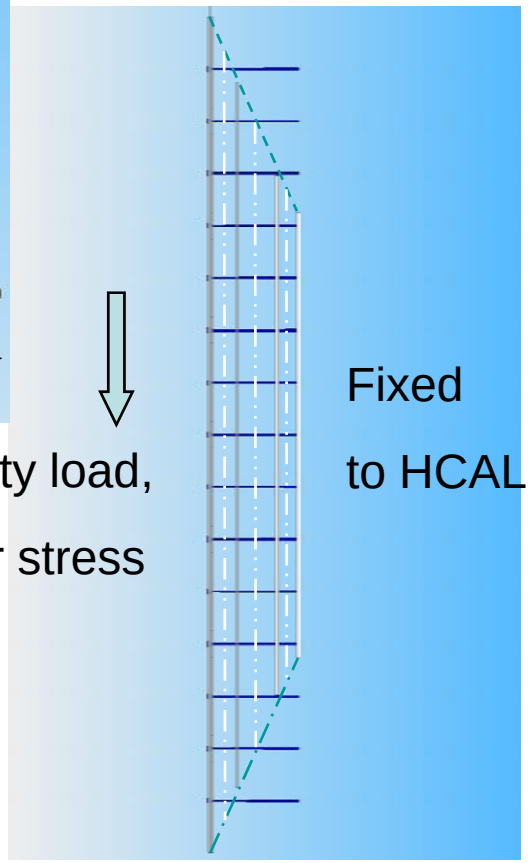


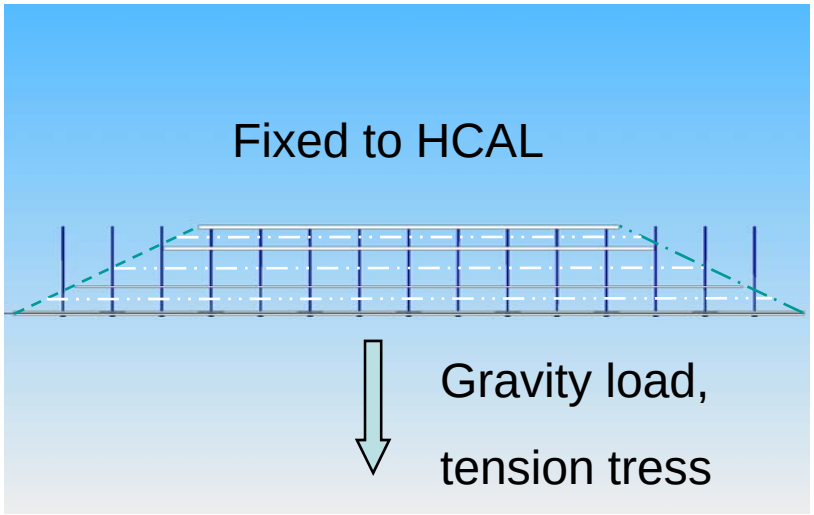
Ecal-Plate Structure and Gap



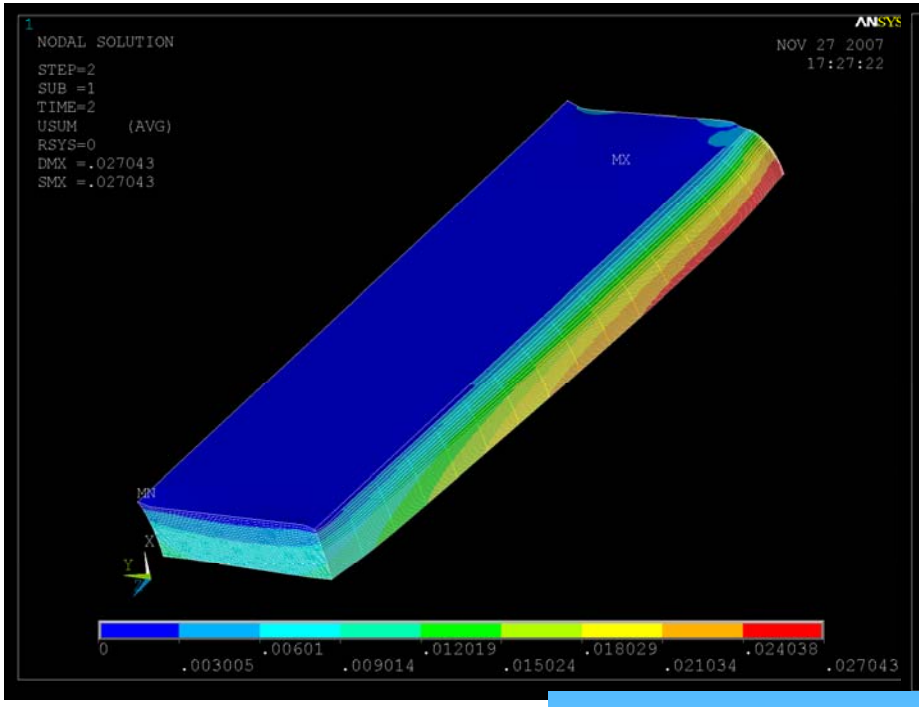
Ecal –Module Geometry

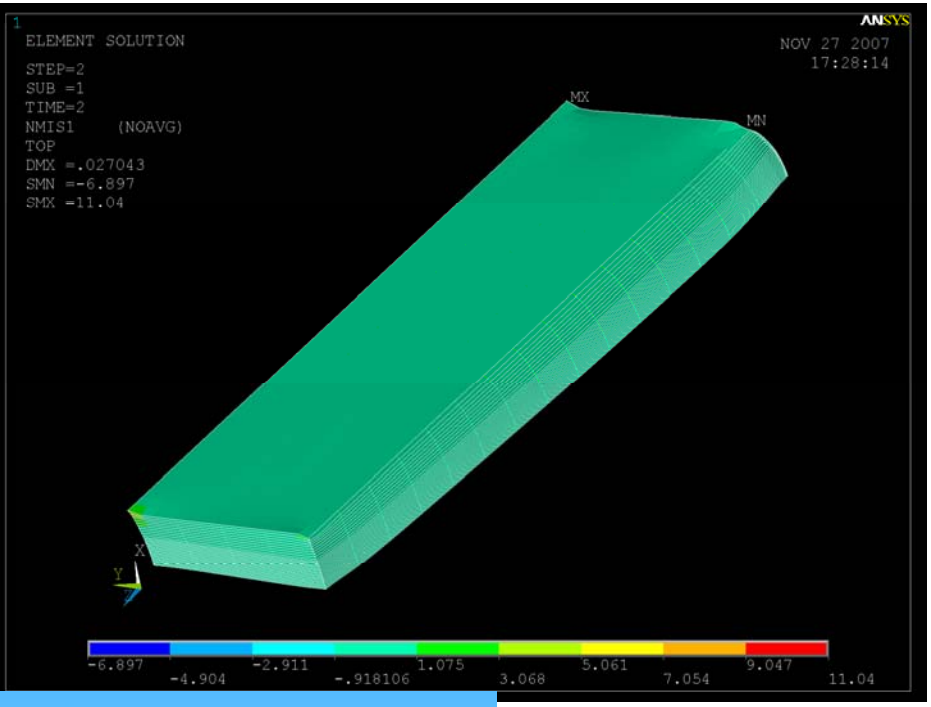




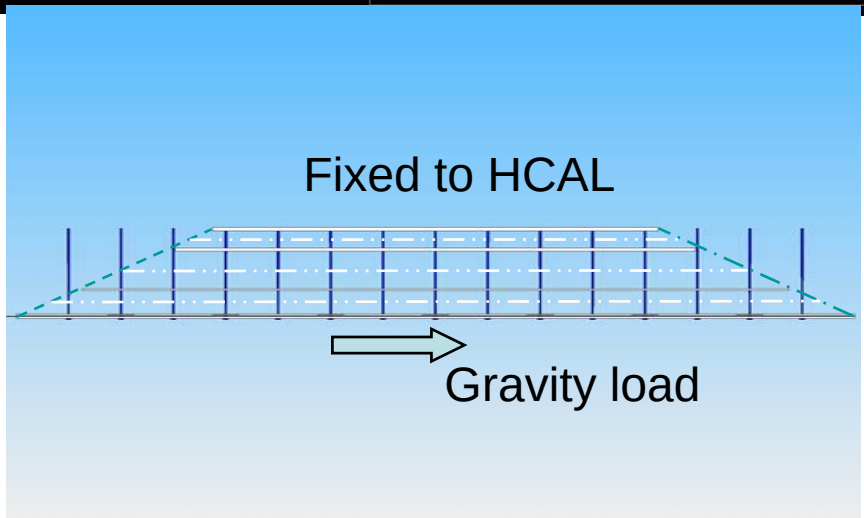


ECal FEA Results



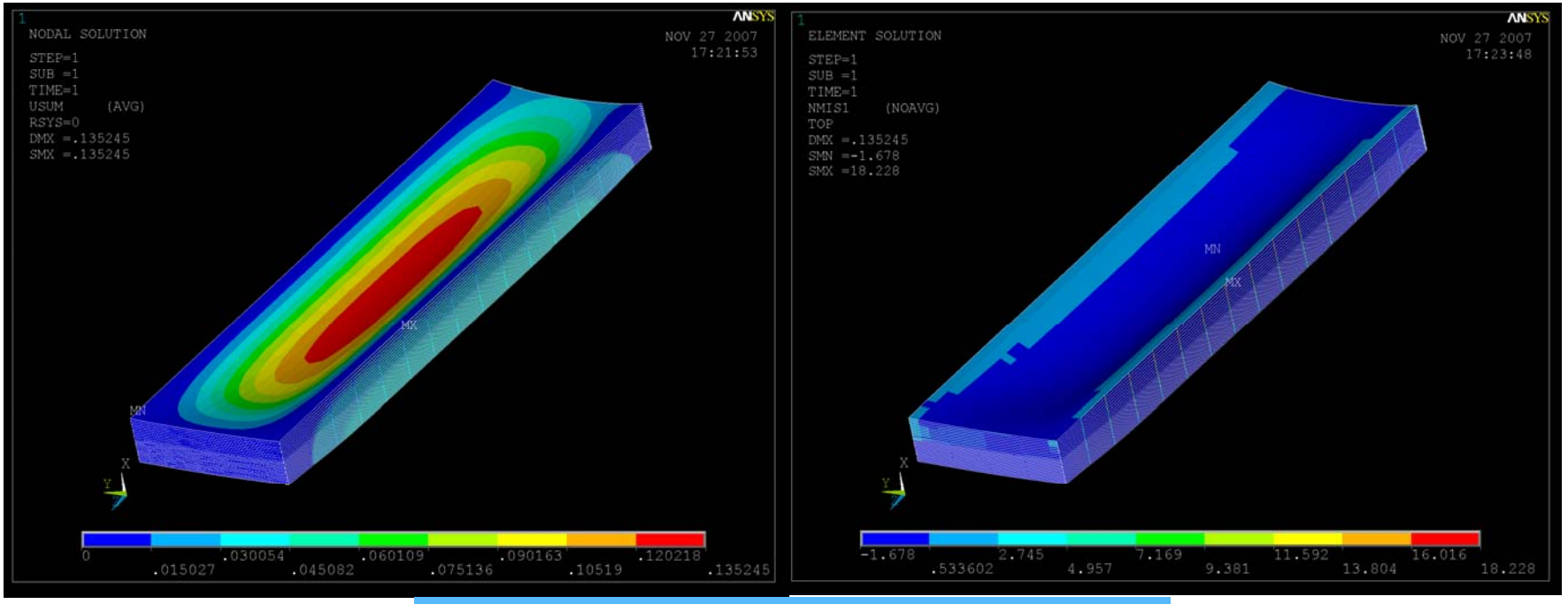


Max Deflection-
.027mm

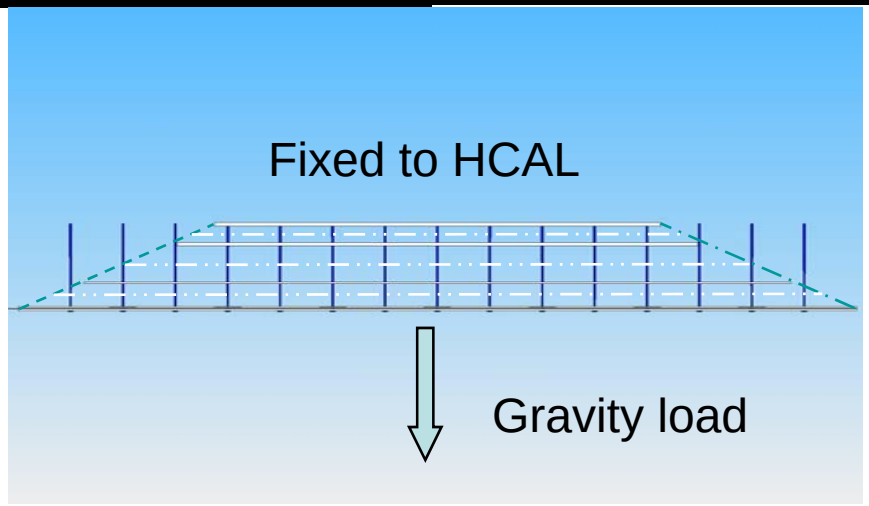


Max Stress on
Pins-110MPa

Ecal FEA Results

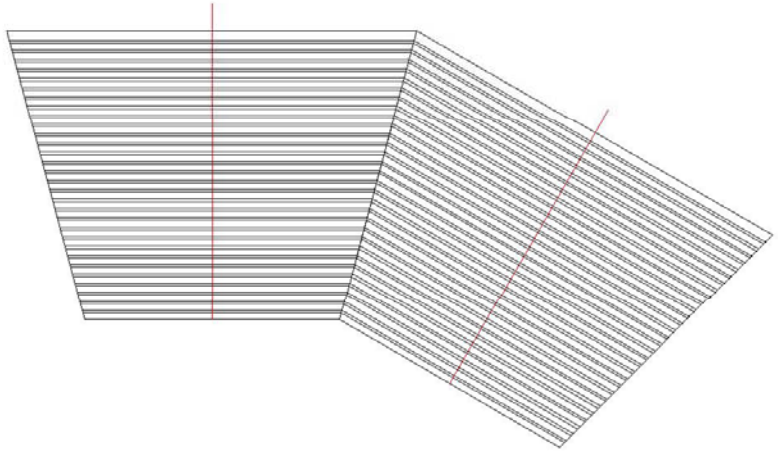


Max Deflections-
.135mm

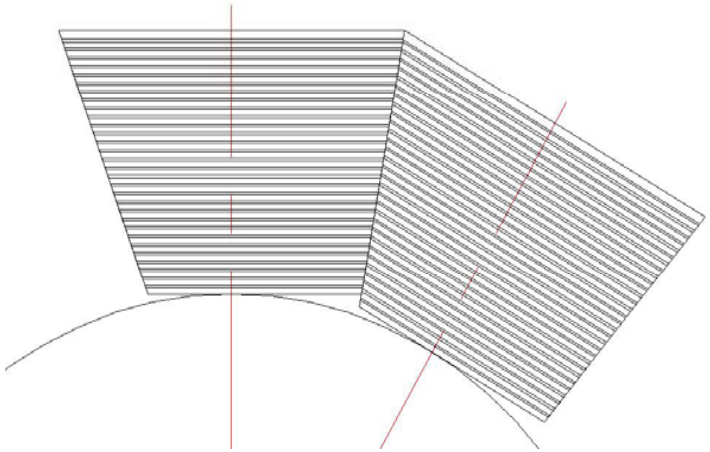


Max Stress on Pins-
180 MPa

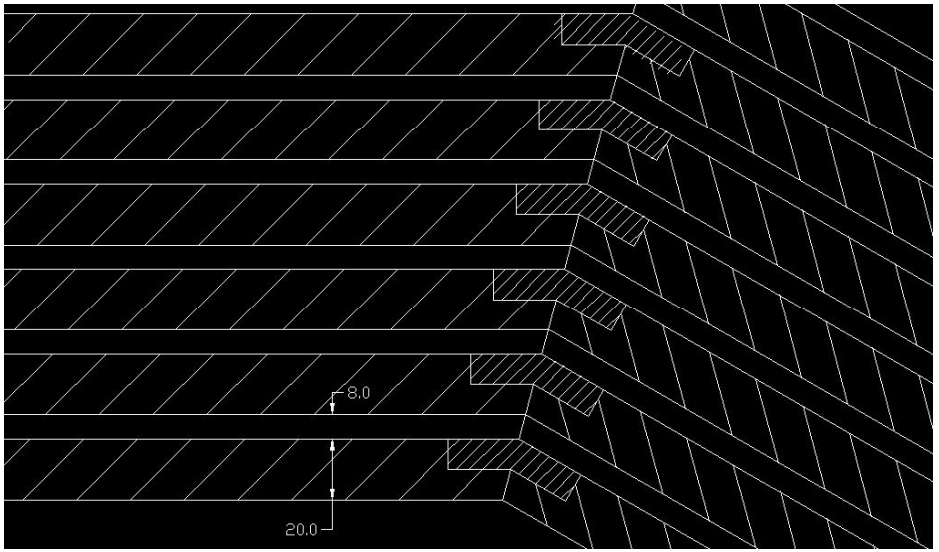
Hcal-Different Module Shapes



Trapezoidal Shape Modules with Projective Cracks



Trapezoidal Modules Rotated-non Projective Cracks

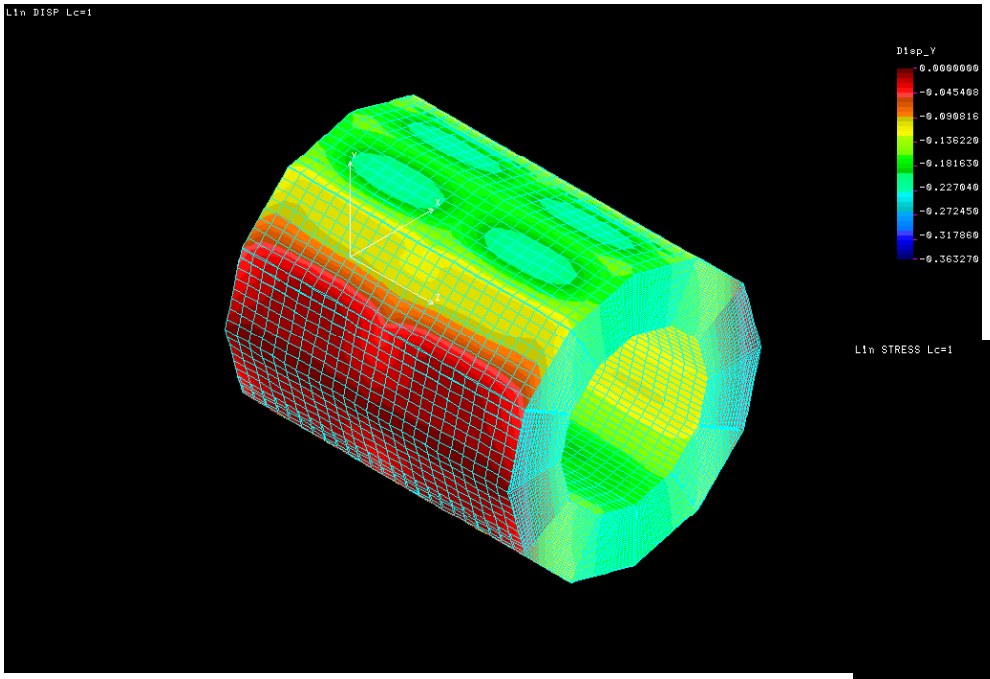


No Modules -absorber plates jointed by links or welded, no absorber plate cracks.

Hcal- Trapezoidal Shape Modules with Projective Cracks-Geometry Parameters

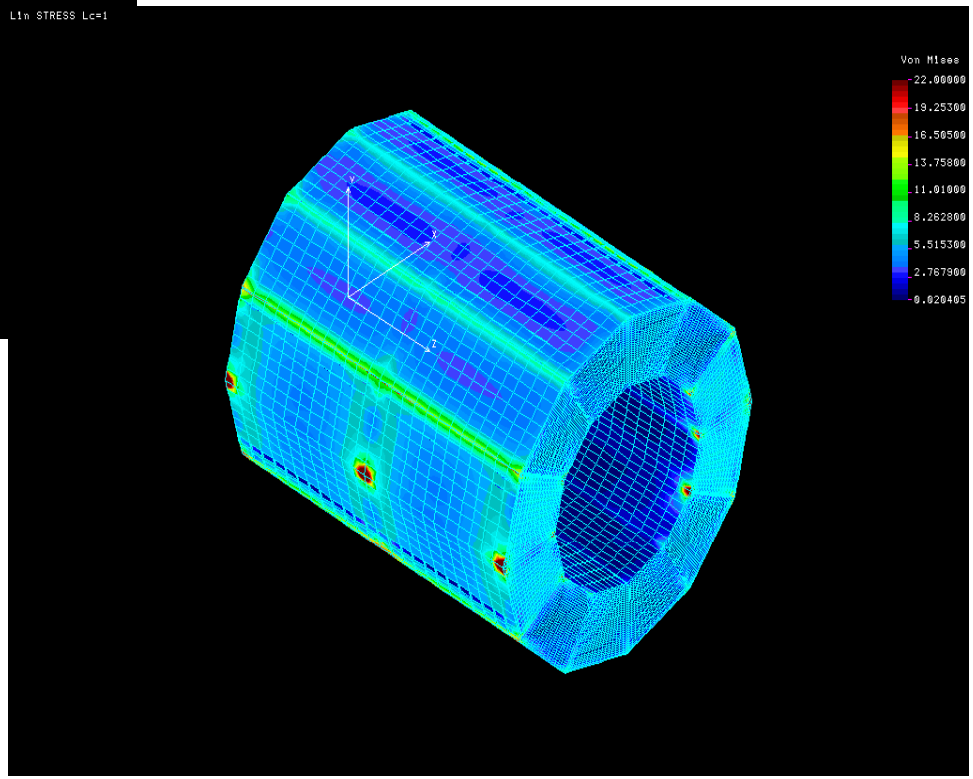
- IR=1420mm
- OR=2370mm
- Z=+/-2780mm
- HCAL divided into 12 trapezoid segments in phi
- 8mm gap – 20mm thick plates
- Weight per segment ~ 29tons
- Front plate and back plate only were connected together between modules to effectively form complete cylinders at the IR and OR.
- 1mm thick skins were placed on the sides of the modules to transfer load and fix spacing between plates.
- 5mm thick (in Z) keys were placed between plates at the ends and middle of each segment. These acted to transfer shear load (load in the plane of the plates) between plates.
- Support points were along the entire length of the HCAL at the 3 and 9 o'clock positions.

Hcal- Trapezoidal Shape Modules with Projective Cracks-FEA Results



Vertical Deflections-.36mm

Max. Stresses 12MPa



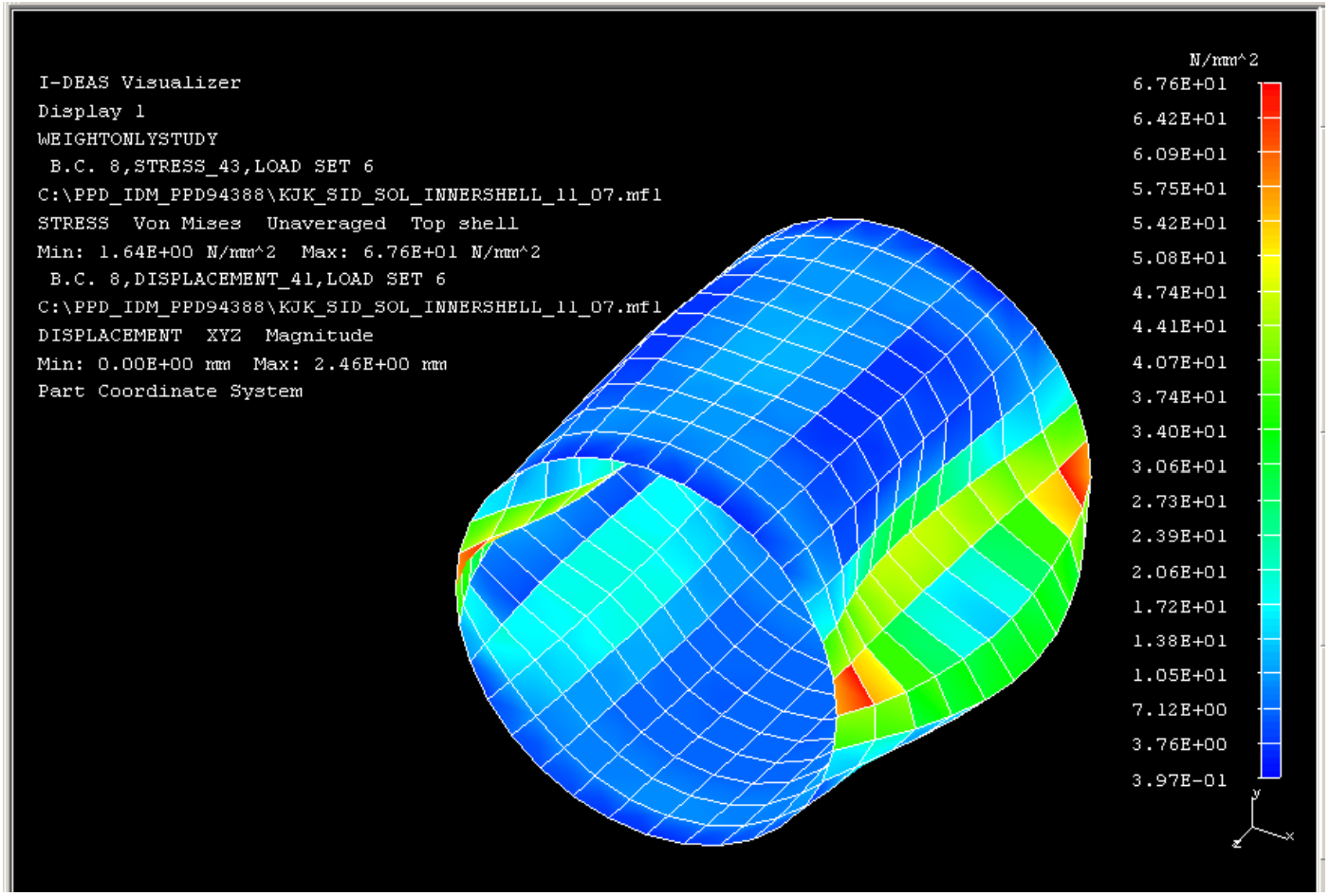
Hcal- Gas System and Pressure Issues

- Gas System Volume
  - RPC's →4.1m^3
  - GEM's→ 13.7 m^3
- 1 gas exchange / day is assumed
- Calculated flow rates and the gas system pressure drops are small
- MAWP of a detector is important→ also believe to be very small
- Rough Cost for a gas system -$60K

Solenoid Inner Shell-Geometry Parameters

- ID= 5000mm
- Length= 5552mm
- Wall thickness=30mm
- Material SS 304
- The weight of the inner shell, which is 20.5 E4 kg or 20.5 tonnes.
- The vacuum load which is .10342 N/mm^2 or 15 psi. This load acts on the inner shell as if pressure was being placed on the inside of the cylinder.
- The weight of the subsystems which exists inside the Solenoid. These systems are the Hcal, Ecal, Silicon Tracker and Vertex Detector. The combine weight of these other subsystem is assumed to by 500 tonnes. This weight is assumed to be evenly distributed along the length of the shell at two locations, 3 o'clock and 9 o'clock. The weight/length is 441.3 N/mm.

Solenoid Inner Shell-FEA Results



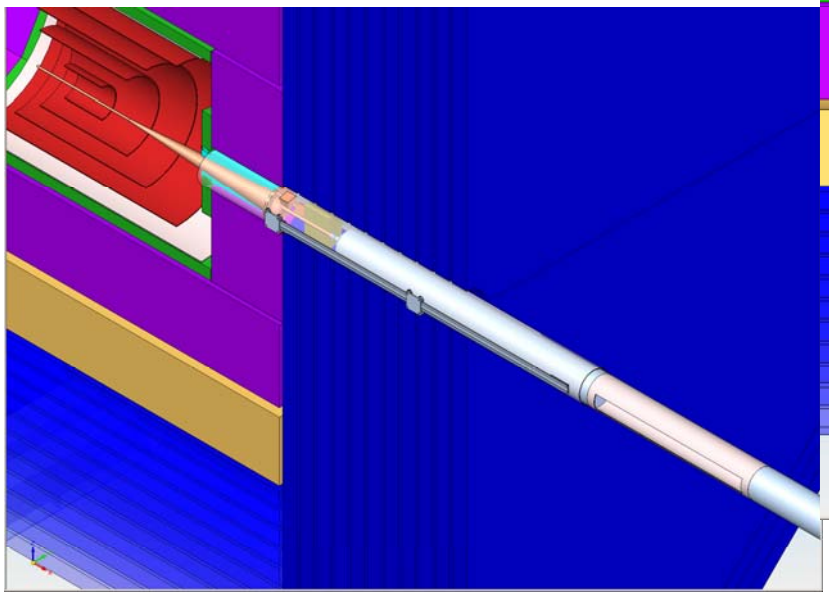
Max Deflections
2.46mm

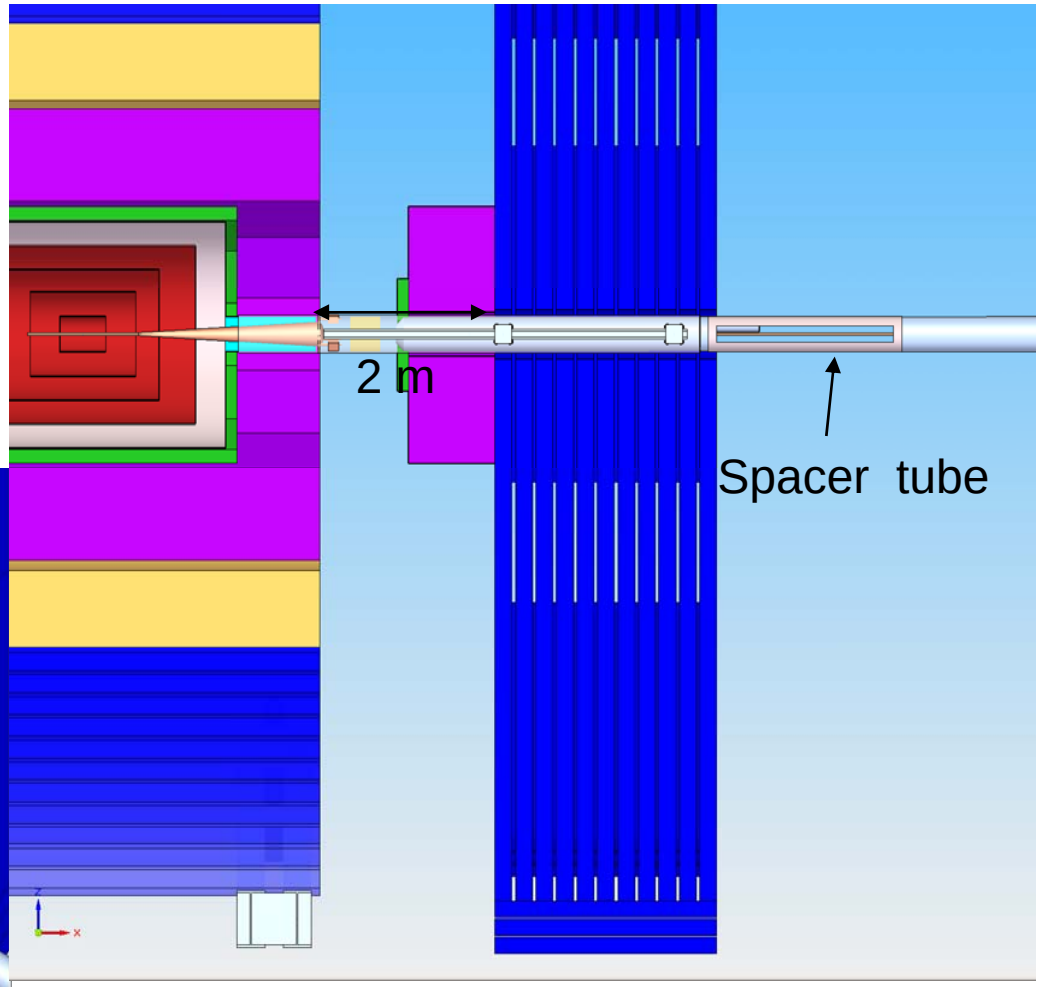
Max Stresses
68 Mpa

QD0/Forward Detector Support-New Concept

•QD0 Cryostat is support from the End Cap. The outer wall (tube) of the Cryostat is extended to support forward detectors and beam pipe.

•Spacer tube -supplies longitudinal support to the QDO in the Z(beam axis) Direction.





Summary

- Work is proceeding and progress is being made
- The working relationship between the subsystems and the Engineering Group needs to continue and expand.