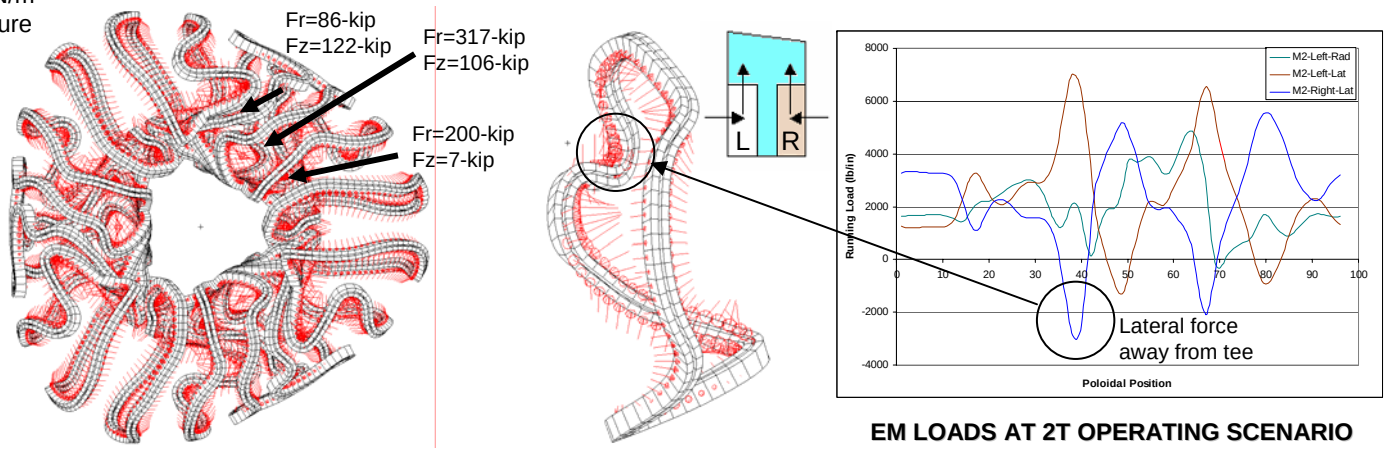
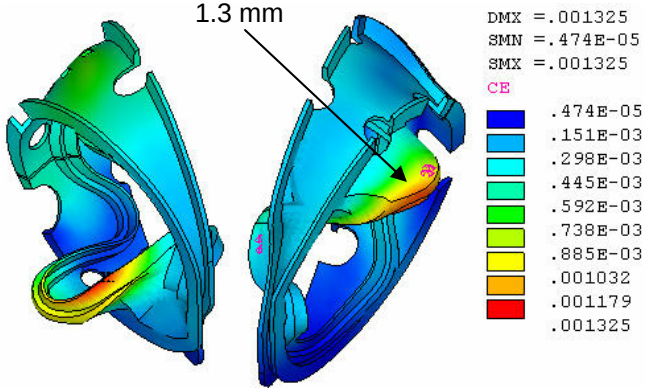
Operating Loads, Deflection and Stress

- Magnetic flux density at windings up to 4.7 T
- Heating to 130 K during pulse
- Cooling by conduction to 85 K in ~15 min
- Eddy currents reduced by segmentation
- Coil EM load up to 1.4-MN radial, .5-MN vert
- Maximum running load is 1.2 MN/m
- EM force is mostly toward structure
- Clamps provide winding preload

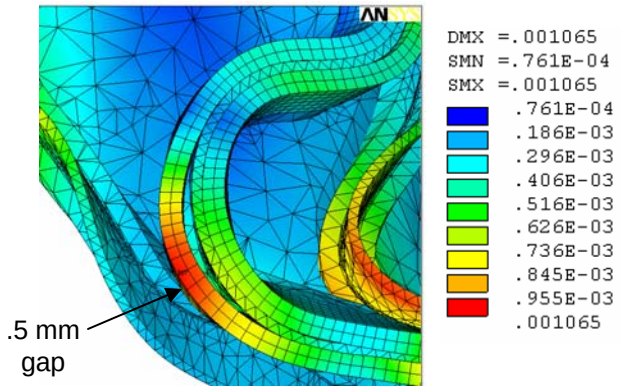


EM LOADS AT 2T OPERATING SCENARIO

- Windings track shell deflection in most places
- Local deflection depends on shape, initial strain
- Clamps help maintain contact in most regions
- Max stress in structure ~200 MPa (FS>2 at 80 K)
- Max stress in windings ~80 MPa

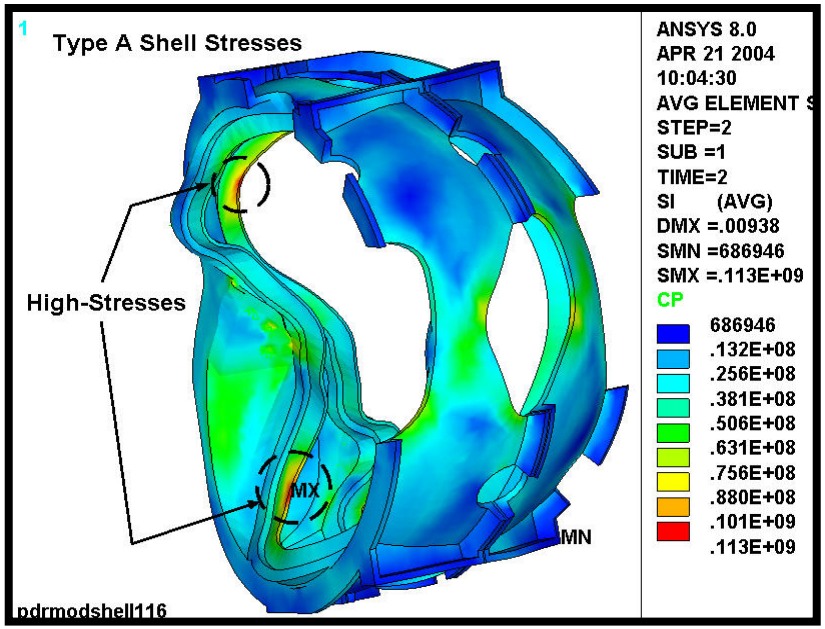


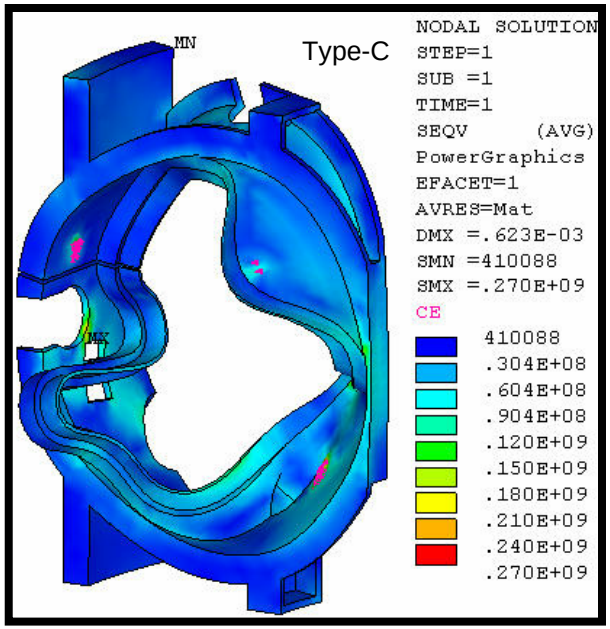
MODULAR COIL DISPLACEMENT

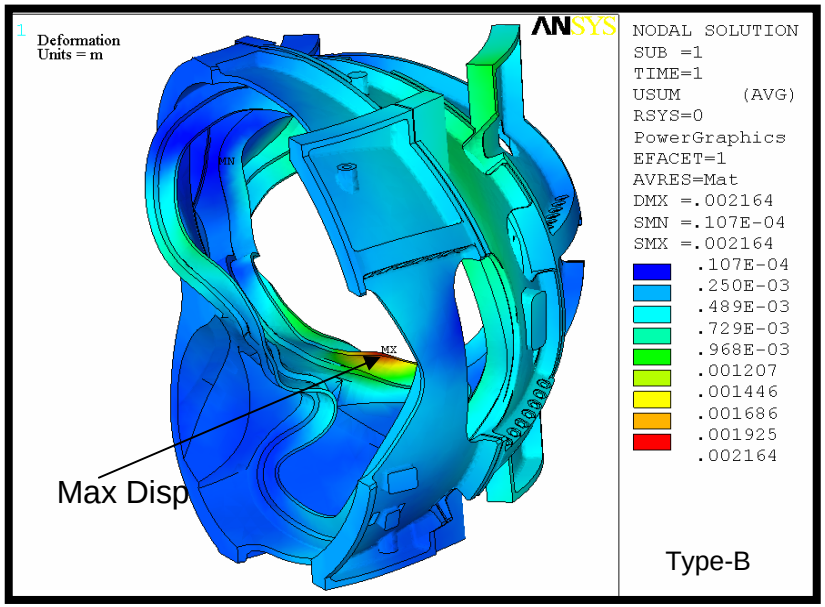


WINDINGS SEPARATION GAP

High Stress Regions







Specification

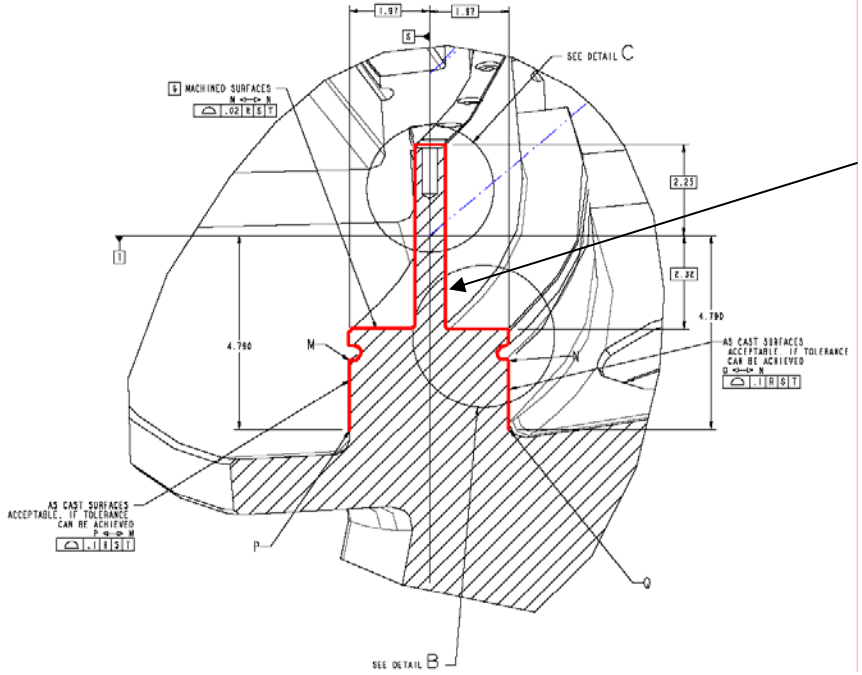
3.1.1.6.3 Liquid Penetrant Inspection of High Stress Regions

High stress regions (<10% of the machined surface) shall be free of external defects when checked by liquid penetrant inspection as defined in ASTM A903/A903M Level I. Discontinuities not meeting the evaluation criteria shall be repaired per Section 3.3.3.2.3 (Repairs in High Stress Areas).

3.2.3.2.3 Repairs in High Stress Areas

Any indications which do not meet the requirements of Section 3.2.1.6.3 (Liquid Penetrant Inspection of High Stress Regions) must be repaired. Defects which are less than 0.125" in depth shall be eliminated by grinding. Defects which exceed this depth shall be reported in a non-conformance report for evaluation by PPPL. When the non-conformance report disposition requires weld repair, it must be repaired per 3.3.3.2.2 (Weld Repairs).

High stress areas defined by center, radius of a spherical region



High stress areas defined by tee profile over entire length of coil

Approximately 1/3 of machined surfaces including the wing areas

Recommend defining high-stress region by tee profile