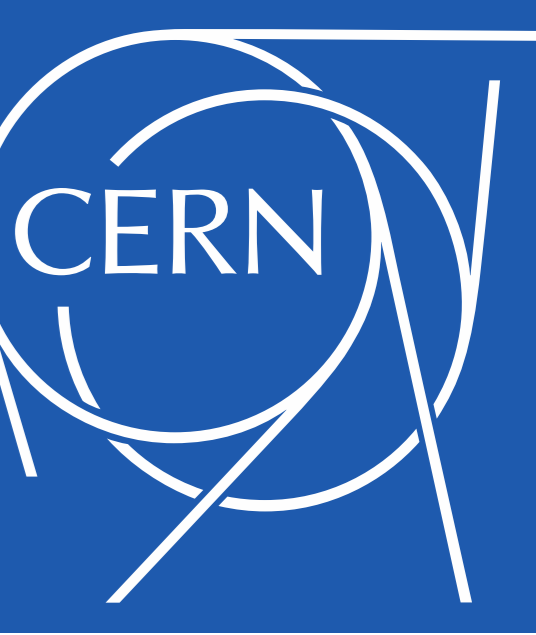


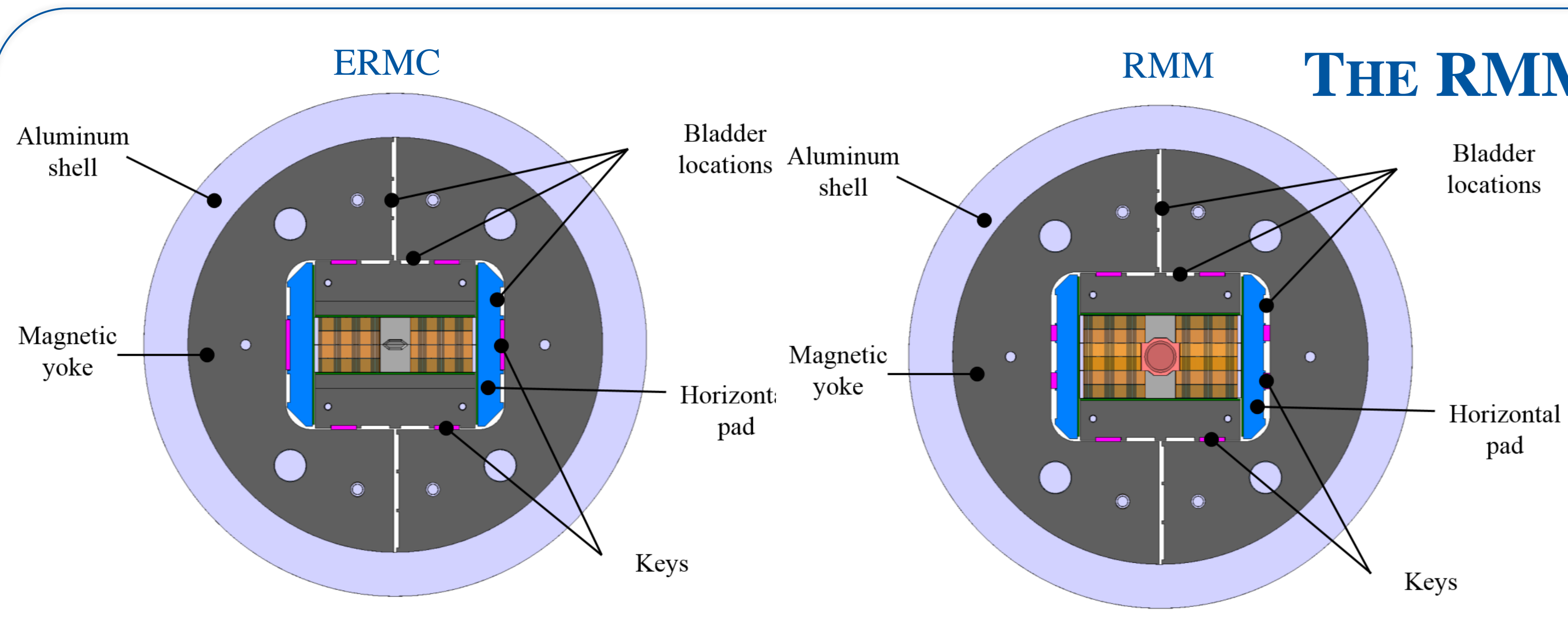


Wed-Af-Po3

# 3D Magnetic and Mechanical Design of Coil Ends for the Racetrack Model Magnet RMM



E. Rochepault, S. Izquierdo Bermudez, J. C. Perez, D. Schoerling, D. Tommasini.  
CERN, European Organization for Nuclear Research, Geneva, CH

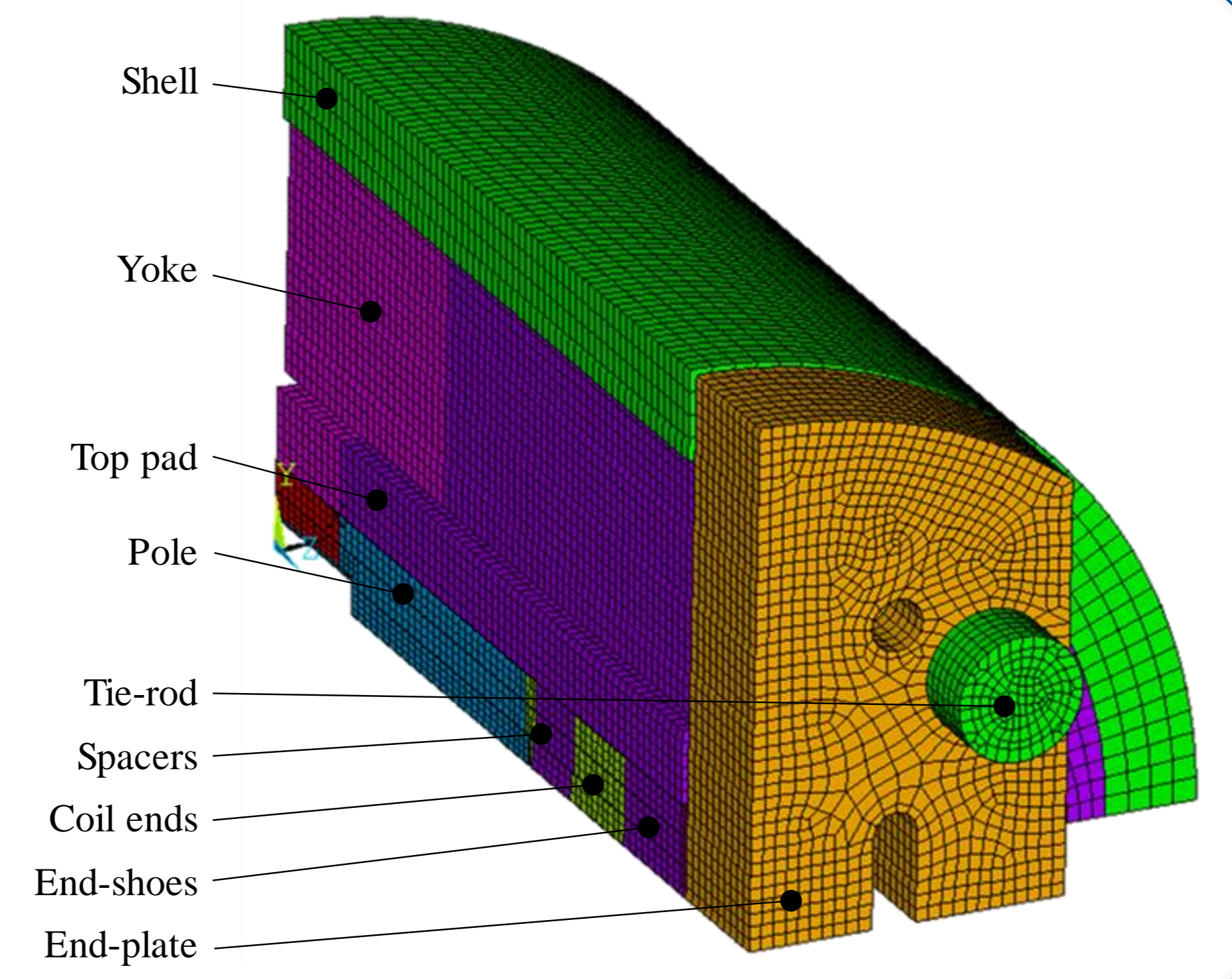


## THE RMM MAGNET [1]

- 16 T in an aperture of 50 mm
- margin of 10% at 4.2 K and 19% at 1.9 K
- Racetrack coils
- R&D magnet

EuroCirCol coil properties

	x	y	z
Coil Modulus [GPa] 293 K / 4.2 K	25/27.5	30/33	30/33
Thermal contraction [mm/m] 293 K - 4.2 K	3.4	3.1	3.1



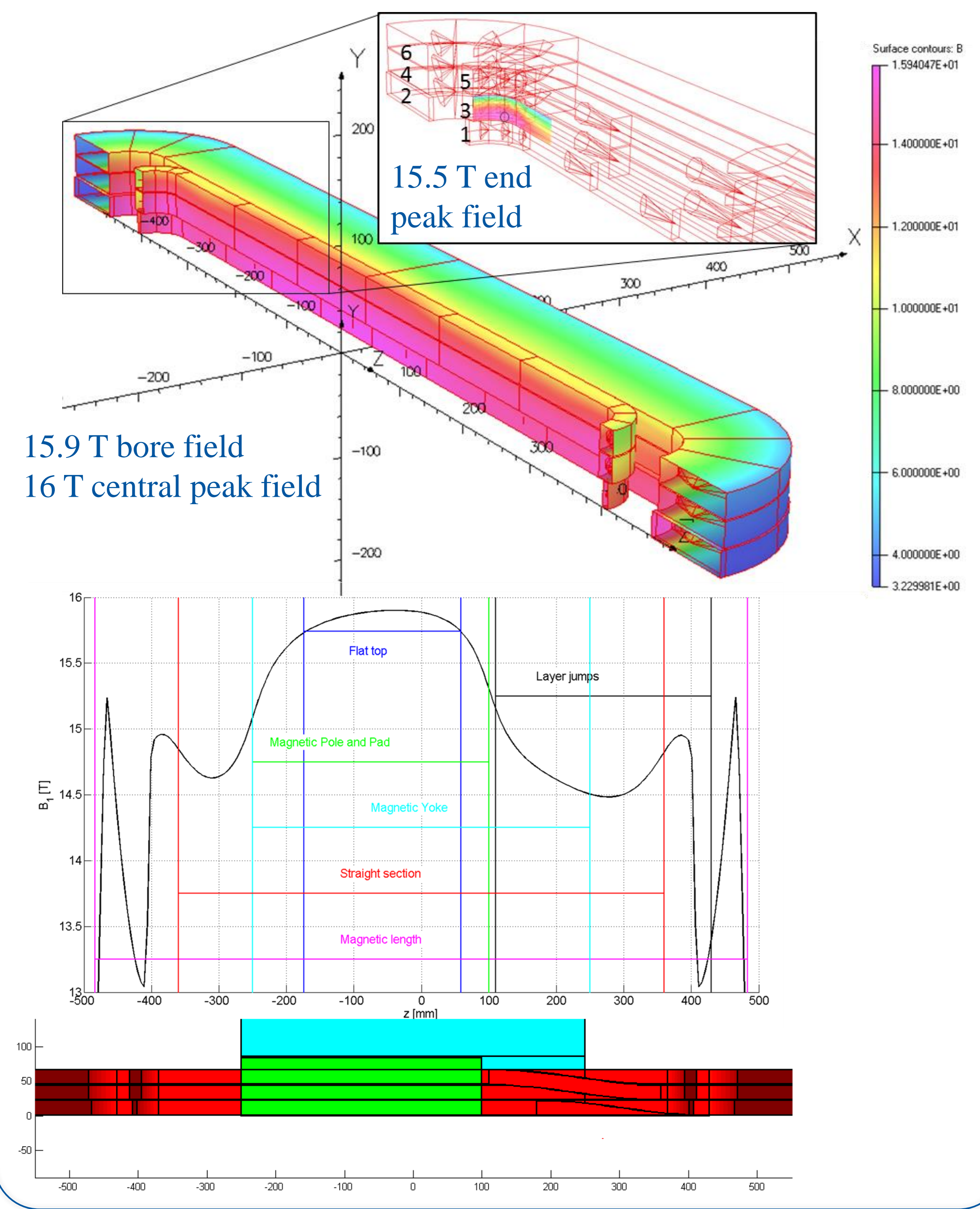
[1] S. Izquierdo Bermudez et al., "Design of ERM and RMM, the Base of the Nb3Sn 16 T Magnet Development at CERN", IEEE Trans. Appl. Supercond. Vol. 27, no. 4 (June 2017), 4002004

## SUMMARY

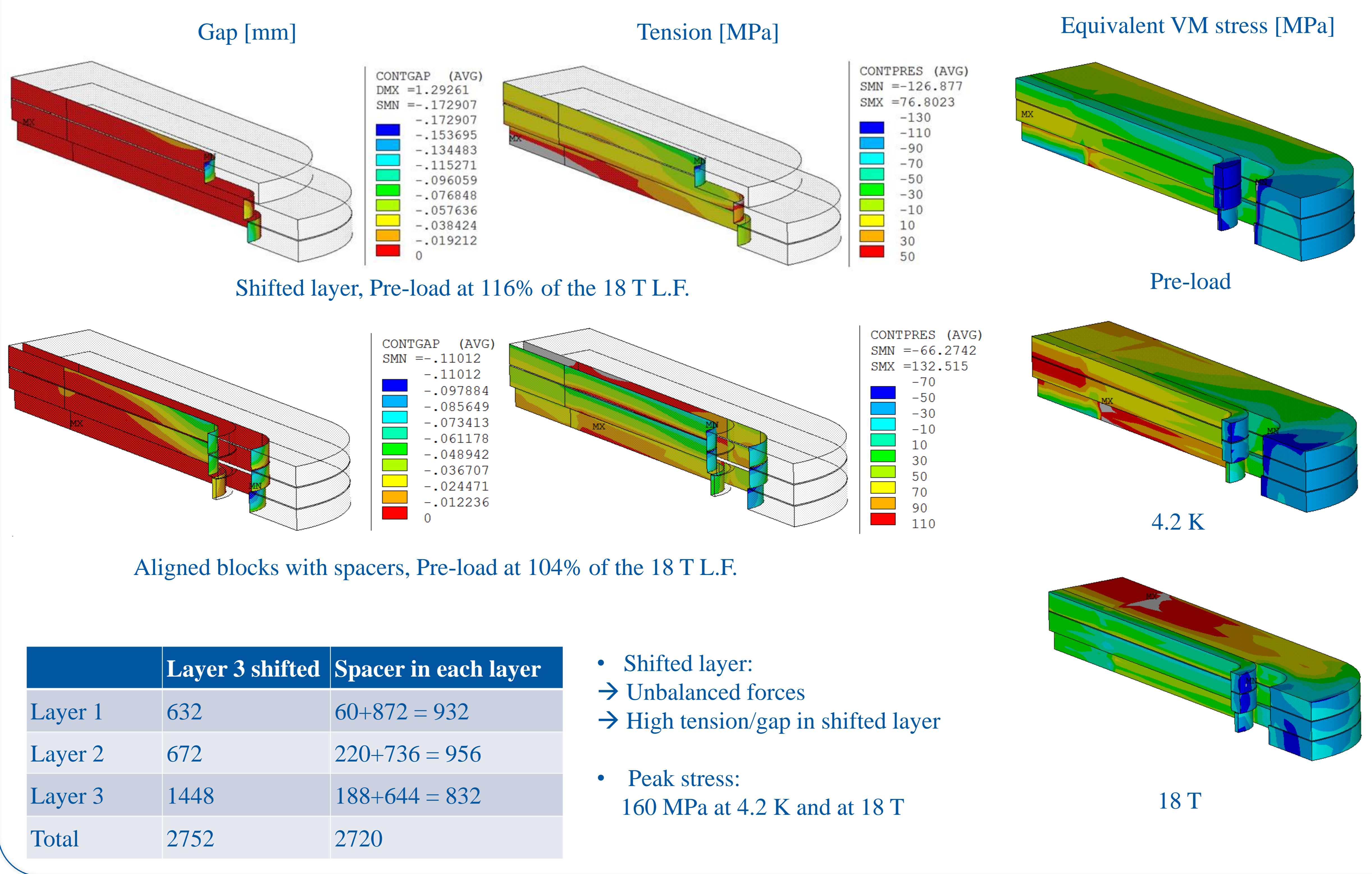
- Peak field **0.5 T lower in the ends** than in the straight section
- Aligned coil-ends with one spacer per layer to allow for **stress management**
- Axial support optimized to limit the coil motion and detachment in the ends
- Study the **impact of pre-stress** on training and ultimate performances.
- Axial support designed to be able to compensate fully the Lorentz forces up to 18 T

Pre-load Fz	Cool-Down Fz	Energization to 18 T	
		Max. Tension [MPa]	Max. Gap [ $\mu$ m]
	[% 18 T L. F.]		
11	56	90	150
53	104	66	110
100	155	30	75

## MAGNETIC DESIGN



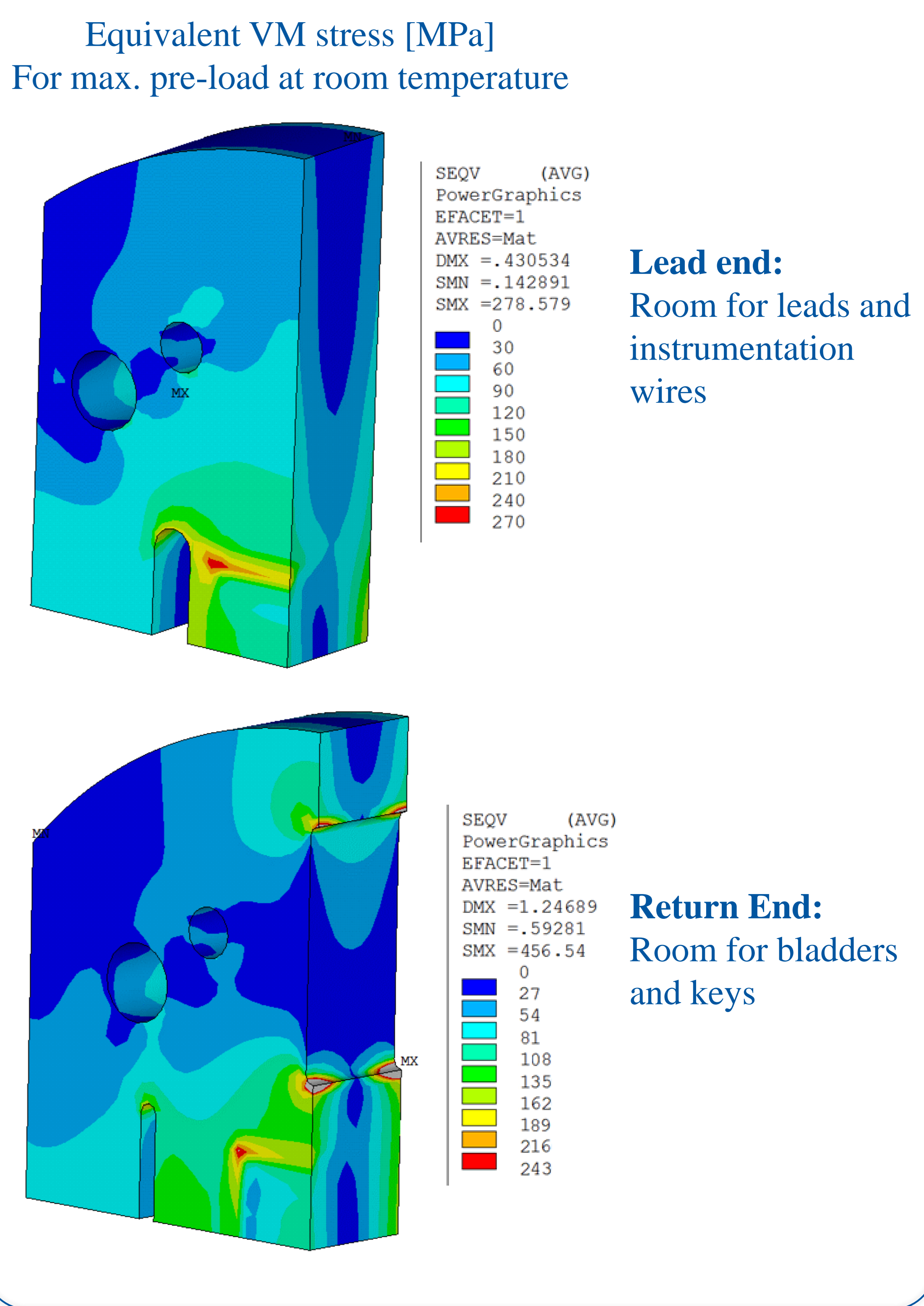
## MECHANICAL DESIGN



	Layer 3 shifted	Spacer in each layer
Layer 1	632	60+872 = 932
Layer 2	672	220+736 = 956
Layer 3	1448	188+644 = 832
Total	2752	2720

- Shifted layer:  
→ Unbalanced forces  
→ High tension/gap in shifted layer
- Peak stress:  
160 MPa at 4.2 K and at 18 T

## AXIAL SUPPORT



**Lead end:**  
Room for leads and instrumentation wires

**Return End:**  
Room for bladders and keys