

OBJECTIVES

- Development plan:
 - SMC-11T non-graded
 - R2D2 12T graded
 - F2D2 16T graded
- R2D2 goals :
 - Demonstrate **block-coil with 2 grades**
 - Demonstrate **external joints**

Parameter	HF	LF	Unit
Strand diameter	1.1	0.7	mm
Jc at 16T and 4.2 K	1300	1100	A/mm ²
RRR	150	350	
Cu/non Cu ratio	0.9	1.8	
Number of strands	21	34	
Unreacted Bare width	12.579	12.579	mm
Unreacted Bare thickness	1.969	1.253	mm
Reacted Bare width	12.74	12.74	mm
Reacted Bare thickness	2.06	1.31	mm
Insulation Thickness	0.15	0.15	mm

Conductor parameters

Parameter	Nom. 4.2 K	Nom. 1.9 K	Ultimate 1.9 K	SS 4.2 K	SS 1.9 K	Unit
Current	13772	15055	16500	17215	18819	A
Margin HF	20.0	20.9	12.9	0.0	0.9	%
Margin LF	20.5	20.0	11.3	0.7	0.0	%
B center	10.42	11.15	11.98	12.46	13.29	T
B peak HF	11.82	12.69	13.67	14.27	15.23	T
B peak LF	7.68	8.32	9.05	9.49	10.21	T
Hotspot HF	104	135	210	260	580	K
Hotspot LF	141	203	350	450	1192	K
Max. VM stress	141	155	195	204	231	MPa

2D Magnet parameters

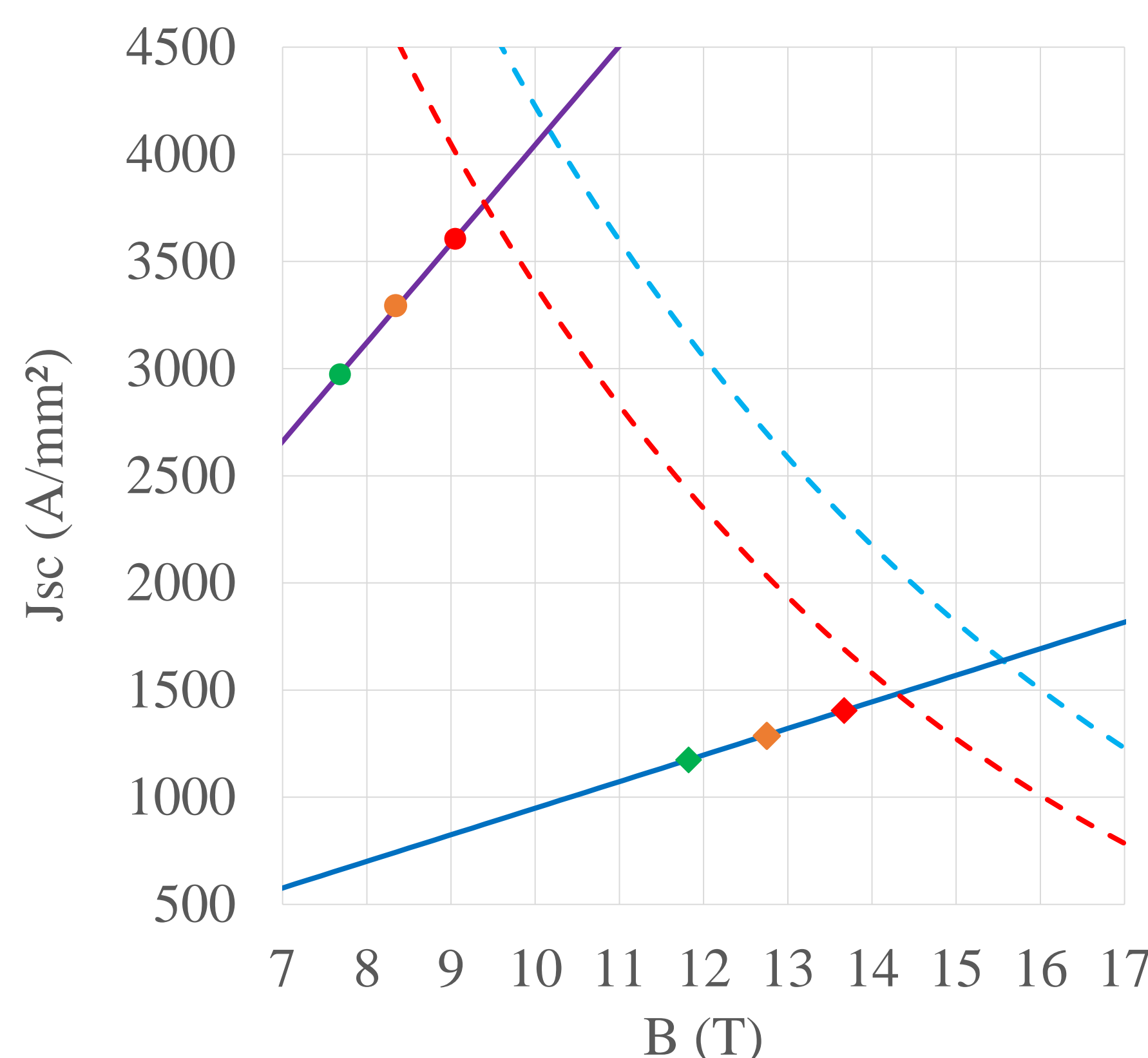
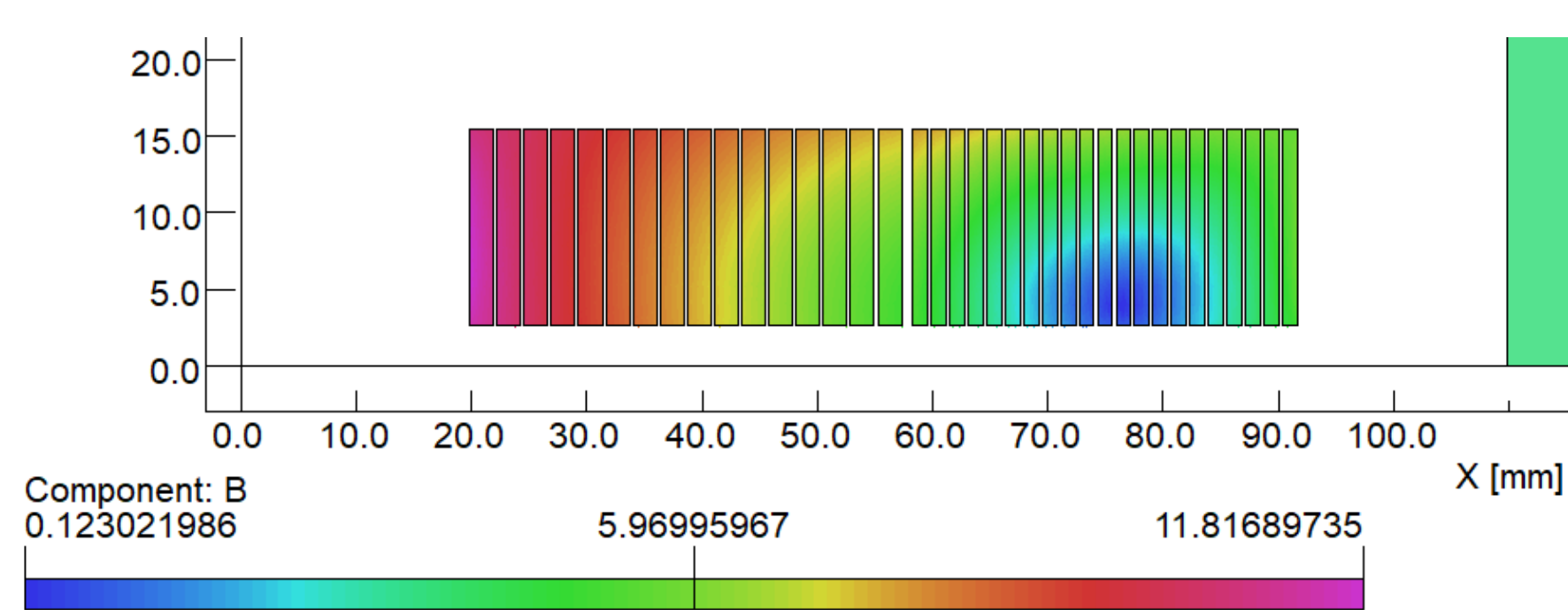
SUMMARY

- Simplified design: racetrack + single-layer coils**
- Exit jumps for external joints**
- 12T ultimate with some margins**
- Challenging quench protection**
- Long coil-ends due to flat racetrack**
- Difficult longitudinal pre-load**

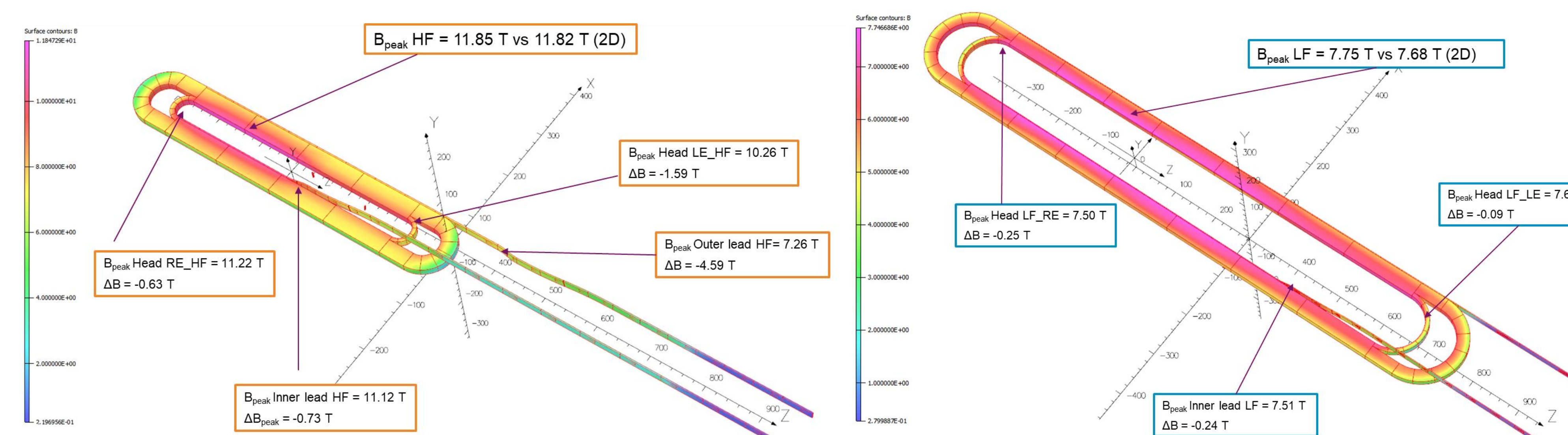
3D MAGNETIC DESIGN

Optimal shape of the coil-ends that satisfies:

- Max. field in the center
- Magnetic margins in coil-ends + cable exits
- Coil length < 1500 mm to fit in the oven at CEA.



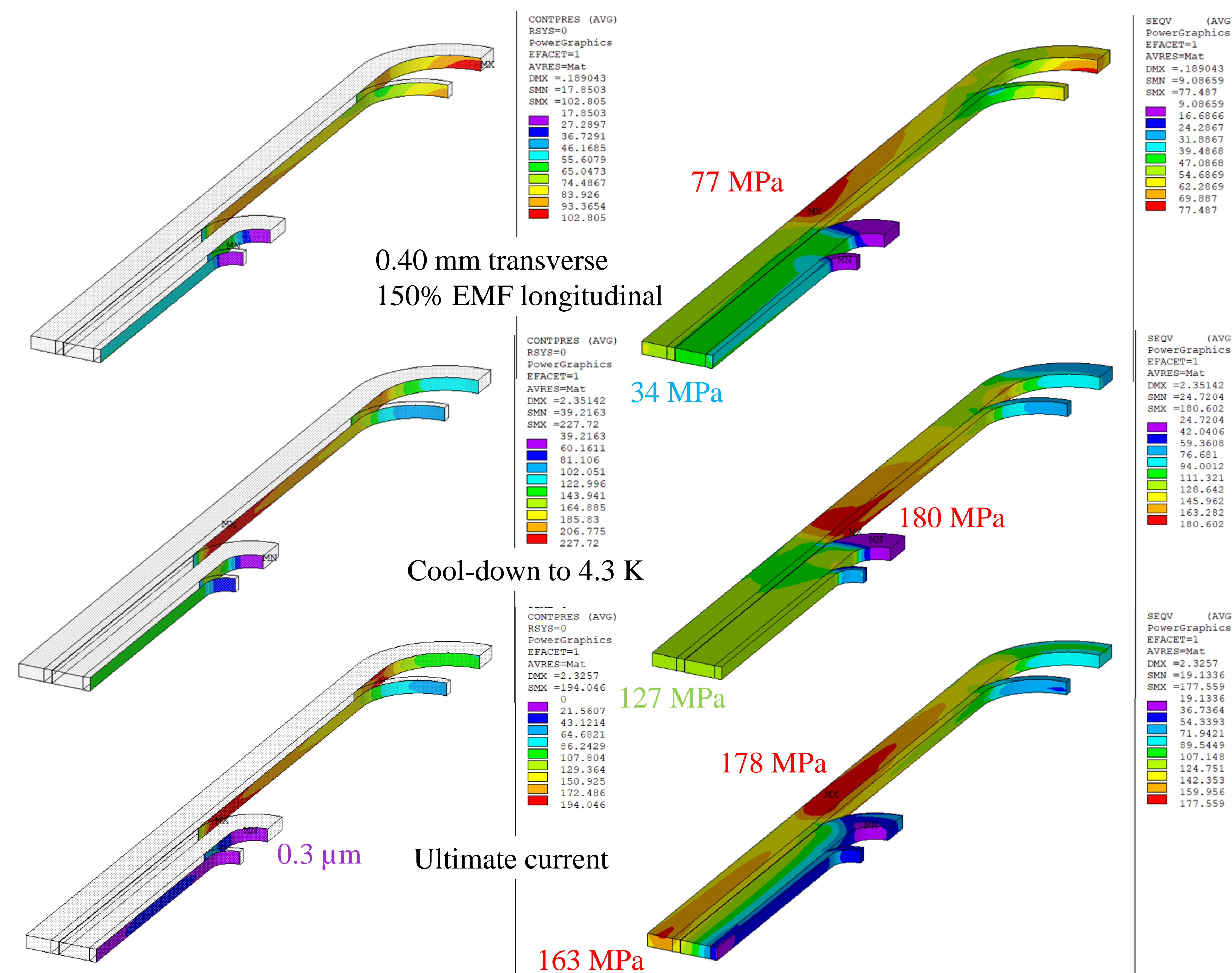
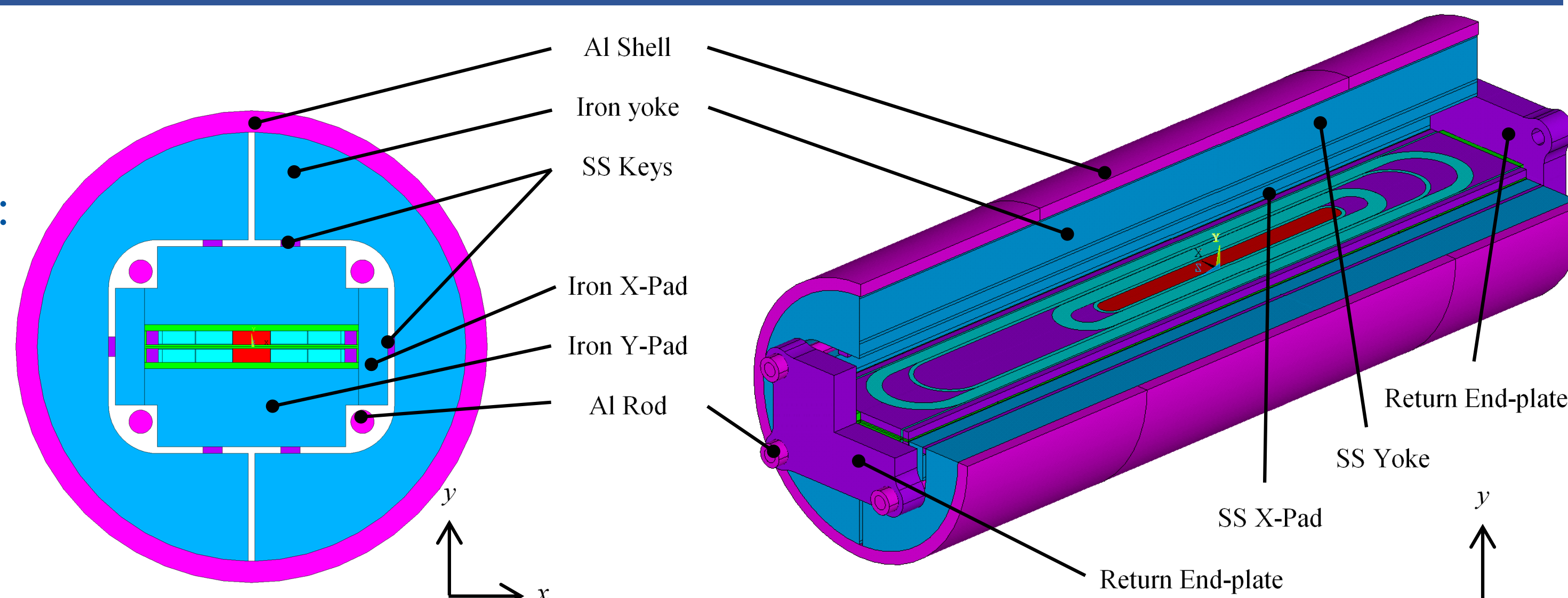
- Jc 1.9 K
- ◆ HF WP 1.9K
- LF WP 1.9K
- LL LF
- LL HF
- HF UWP
- LF UWP
- ◆ HF WP 4.2K
- LF WP 4.2K
- Jc 4.2 K



3D MECHANICAL DESIGN

Variable preload to guarantee, at different operations:

- Coil-pole contact pressure (no gap)
- Coil-spacers contact pressure (gap < 10µm)
- Peak stress < 150 MPa (safe)
- Peak stress < 200 MPa (limit)



RT Preload		4.2 K	Ultimate current 16.5 kA																
Transverse [mm]	Longitudinal %EMF	Contact pressure [MPa]						Contact gap [µm]						VM stress [MPa]					
		Center	End1	End2	End3	End4	Center	End1	End2	End3	End4	Center	End1	End2	End3	End4			
0.4	119%	176%	3.7	0	26.7	0.1	0	3.3	0	0	26.1	163.4	68.1	119	167	146.5			
0.4	153%	211%	3.5	10.7	0	57.6	85	0	0	0.3	0	163.6	69.1	116.2	165.6	142.3			
0.6	119%	176%	28.6	0	0	0	6.9	0	0.2	37	16.4	0	181.8	81.3	136.1	195.4	168.7		