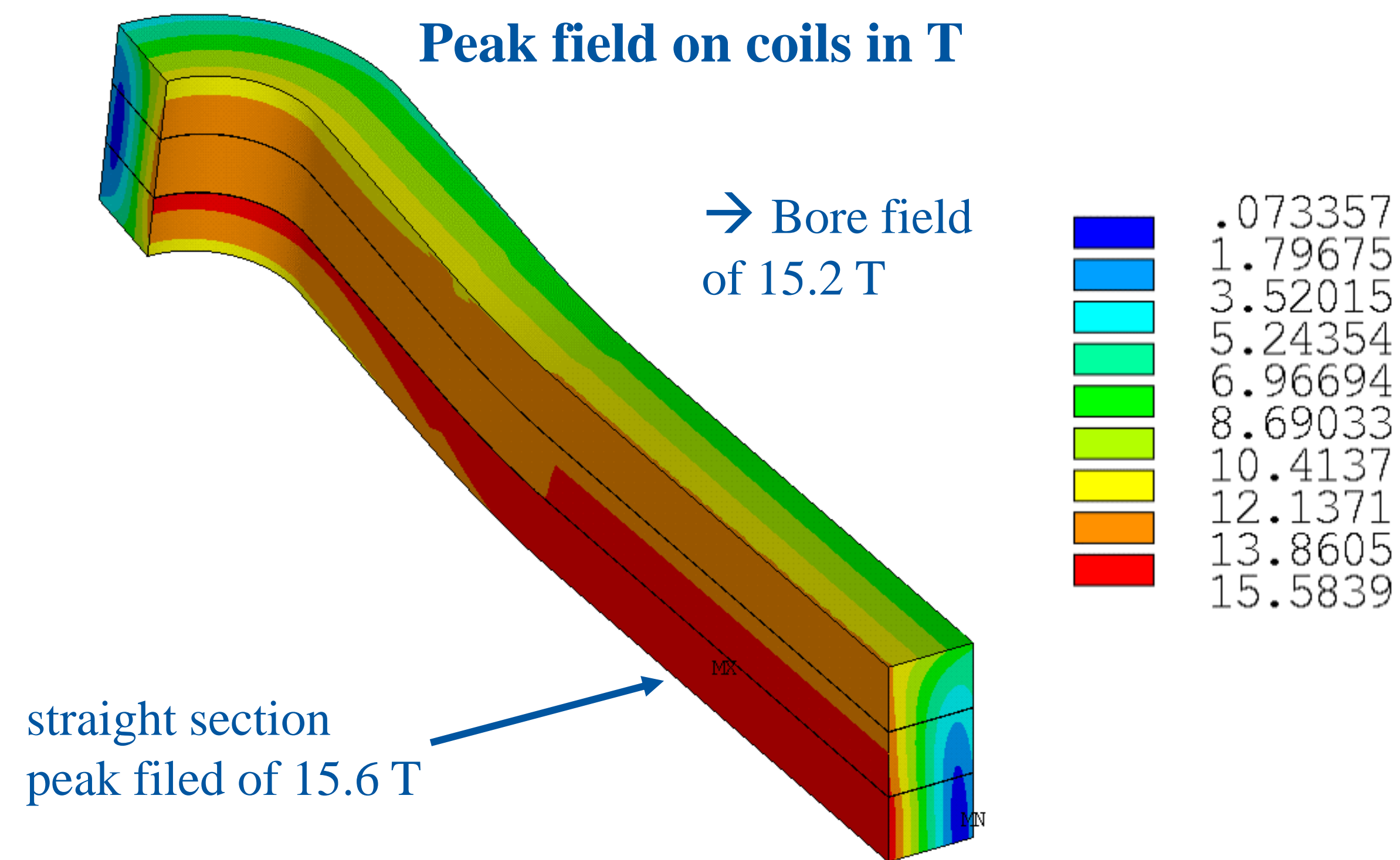
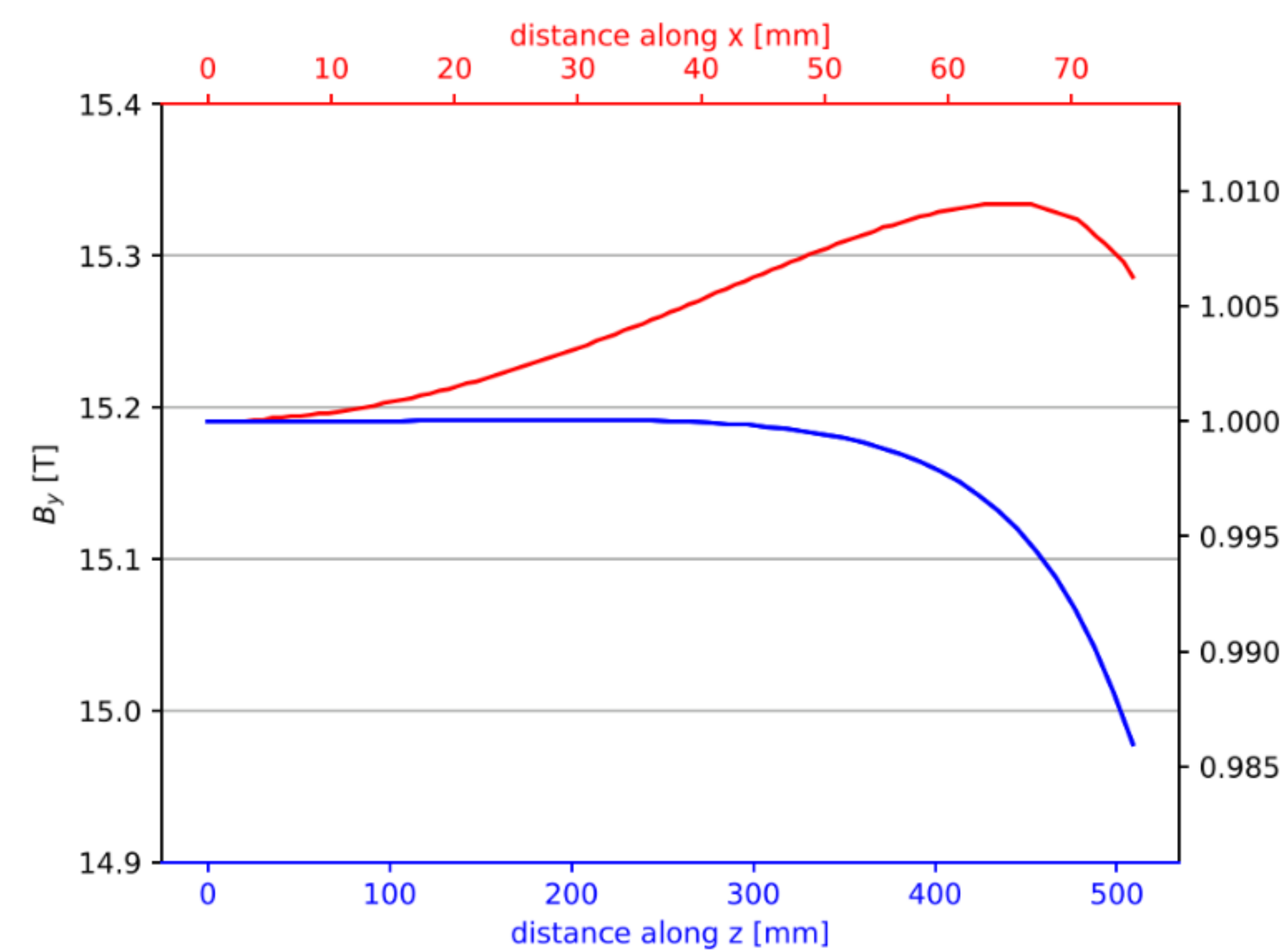


MAGNETIC DESIGN

Peak field on coils in T



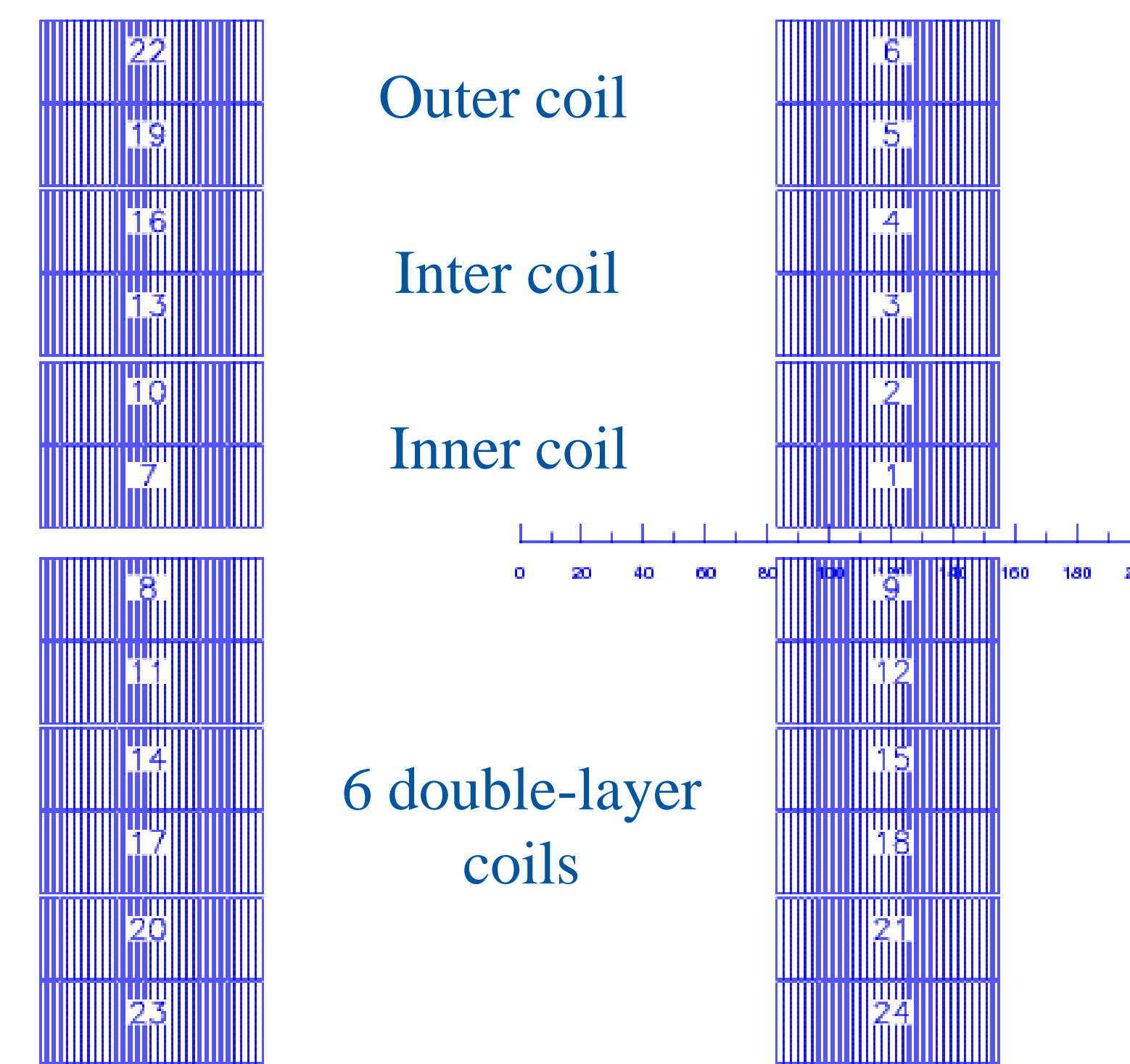
Homogeneity Study



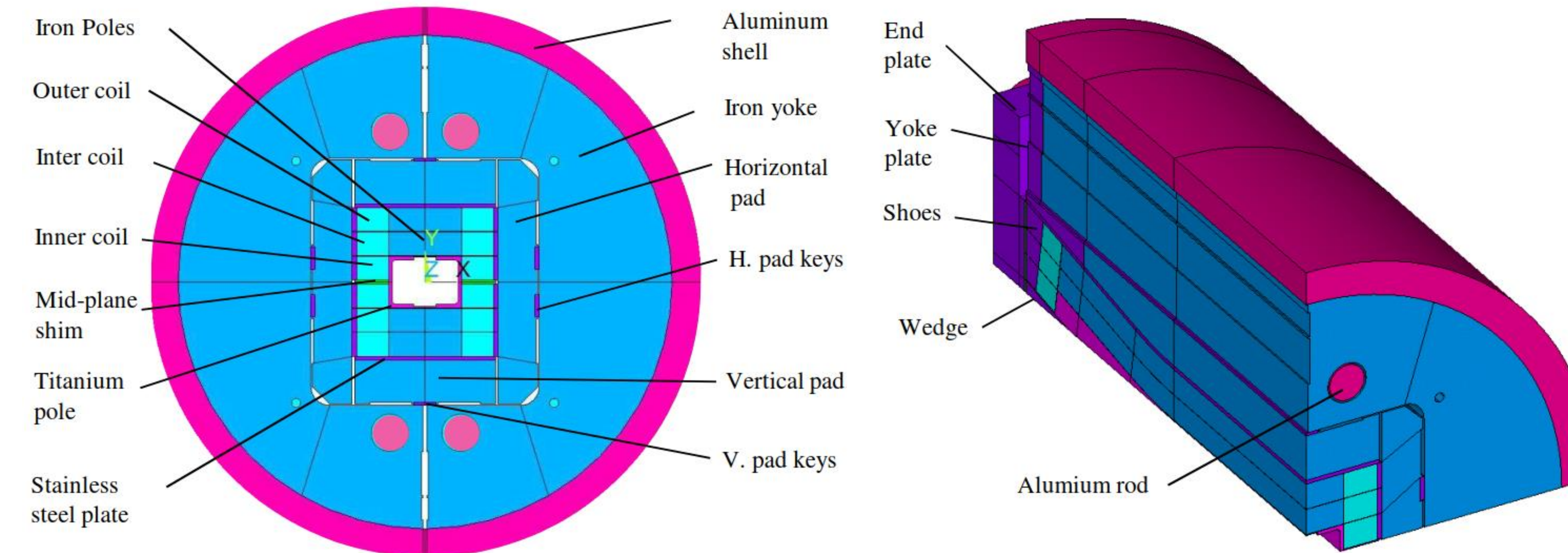
Lorentz and Iron forces in MN

Component	Fx	Fy	Fz
Inner coil	5.42	1.01	-0.36
Inter coil	4.83	-1.60	-0.62
Outer coil	4.23	-4.99	-0.83
Iron pole (inter coil)	-2.4	-0.08	0.26
Iron pole (outer coil)	-1.68	-0.36	0.17
Vertical pad	-1.44	-1.22	0.13

→ Lorentz and iron forces computed for the mechanical analysis



THE MAGNET STRUCTURE AND GOALS



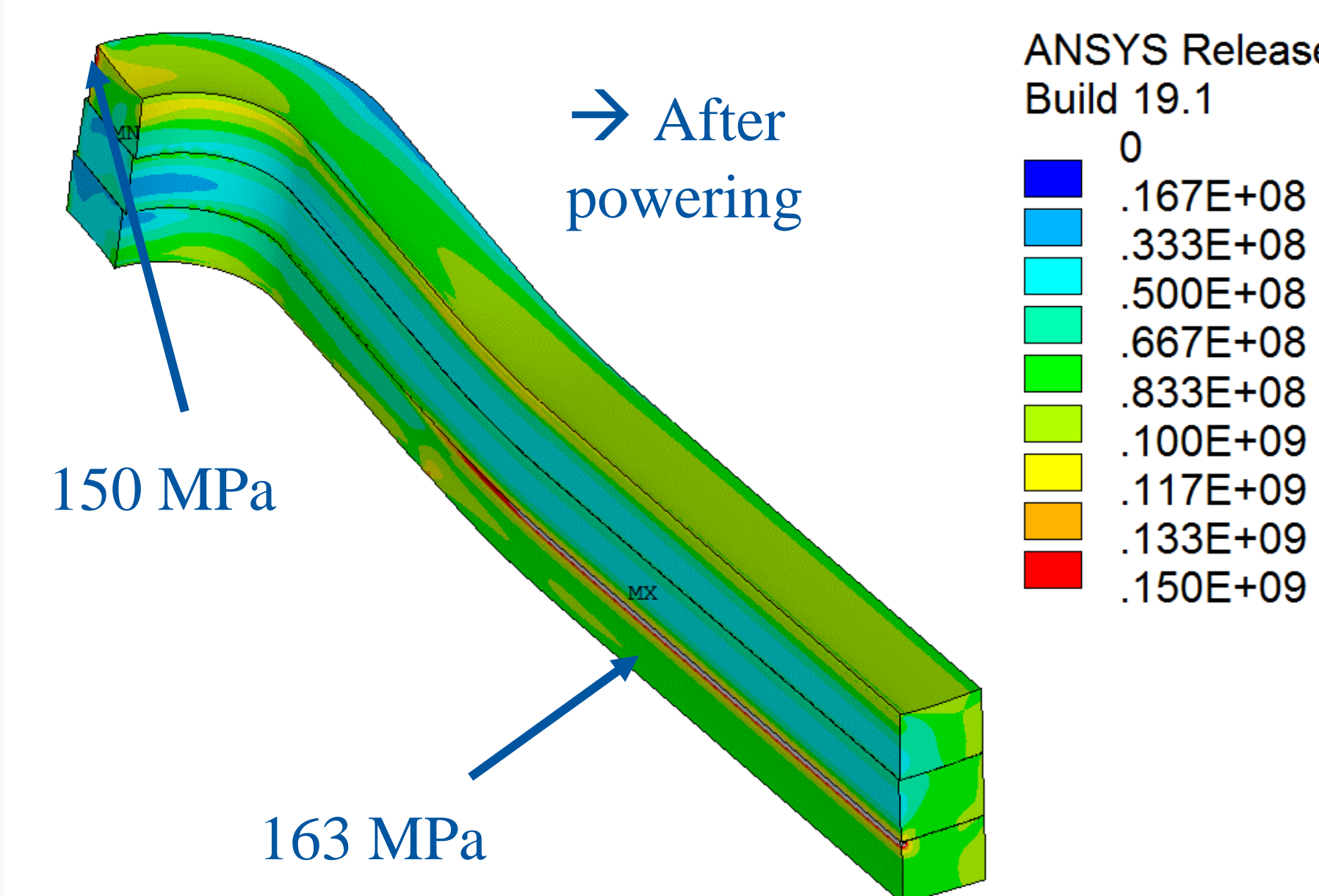
- 15 T Nb₃Sn dipole magnet
- Homogeneity of 1% over 1 m length
- Margin of 15% at 4.2 K
- RRP wire technology
- Rectangular aperture of 150 x 100 mm
- Double-layer impregnated coils
- Block-type magnet with flared-end coils
- Bladder and key pre-load system
- Energy Extraction quench protection system
- Magnet for the SPC-EPFL test facility

CABLE AND MAGNET PARAMETERS

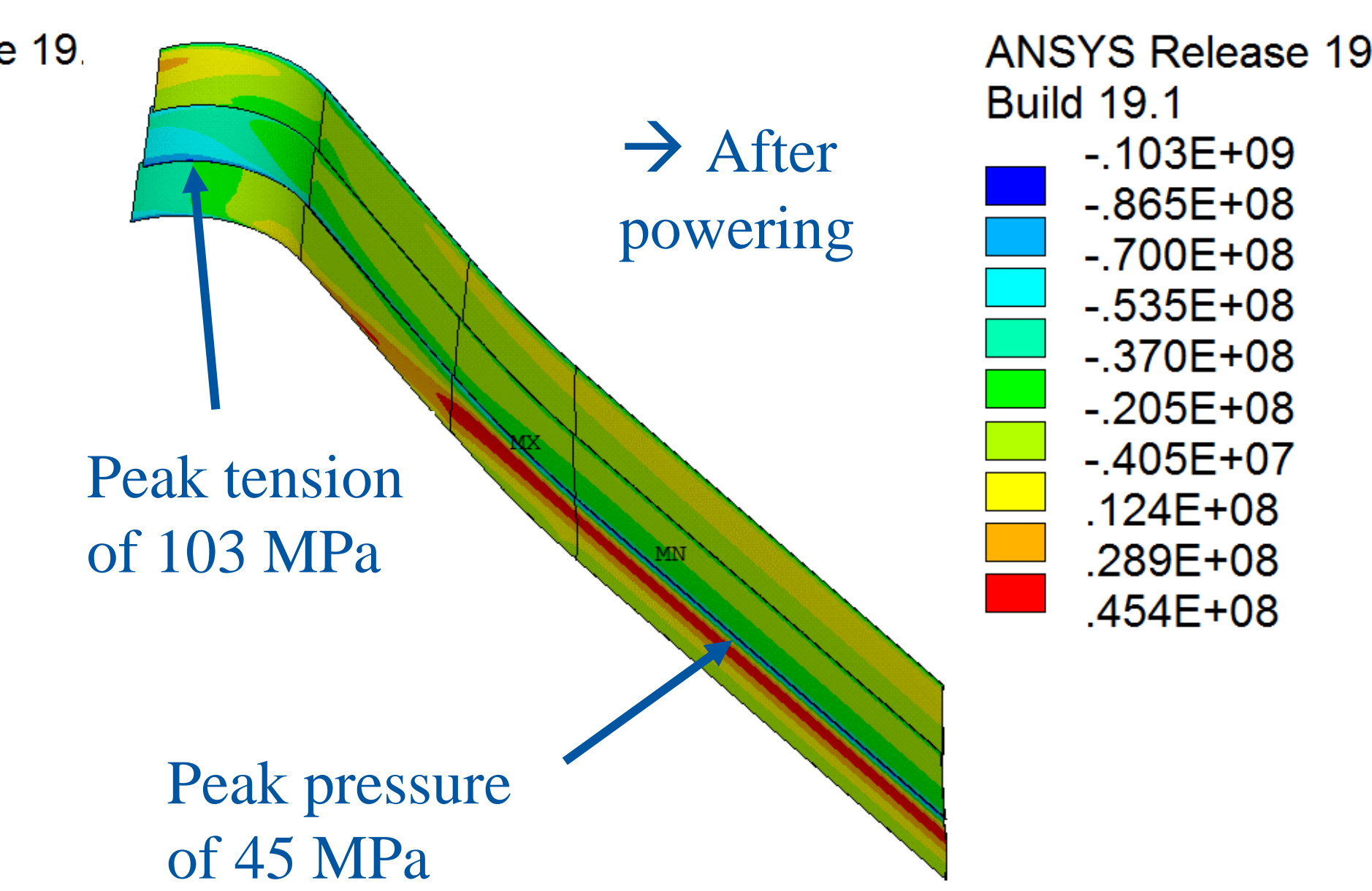
PARAMETER	VALUE
Wire diameter in mm	1.1
Cu:non-Cu ratio	1
RRR	> 150
Critical current density at 15 T 4.2 K in A/mm ²	1640
Critical current density at 12 T 4.2 K in A/mm ²	3000
C ₀ in AT/mm ²	255230
α	0.96
T _{C0} in K	16
B _{C20} in T	28.8
Number of wires per cable	44
Bare cable width in mm	26.2
Bare cable thickness in mm	1.95
Cable insulation thickness in mm	0.15
Number of turns per layer (quadrant)	32
Operating current I _{op} in kA	14.6
Total stored magnetic energy in MJ	12.7
Operational temperature T _{op} in K	4.2
I _{op} / I _{ss} at 4.2 K in %	85

MECHANICAL DESIGN

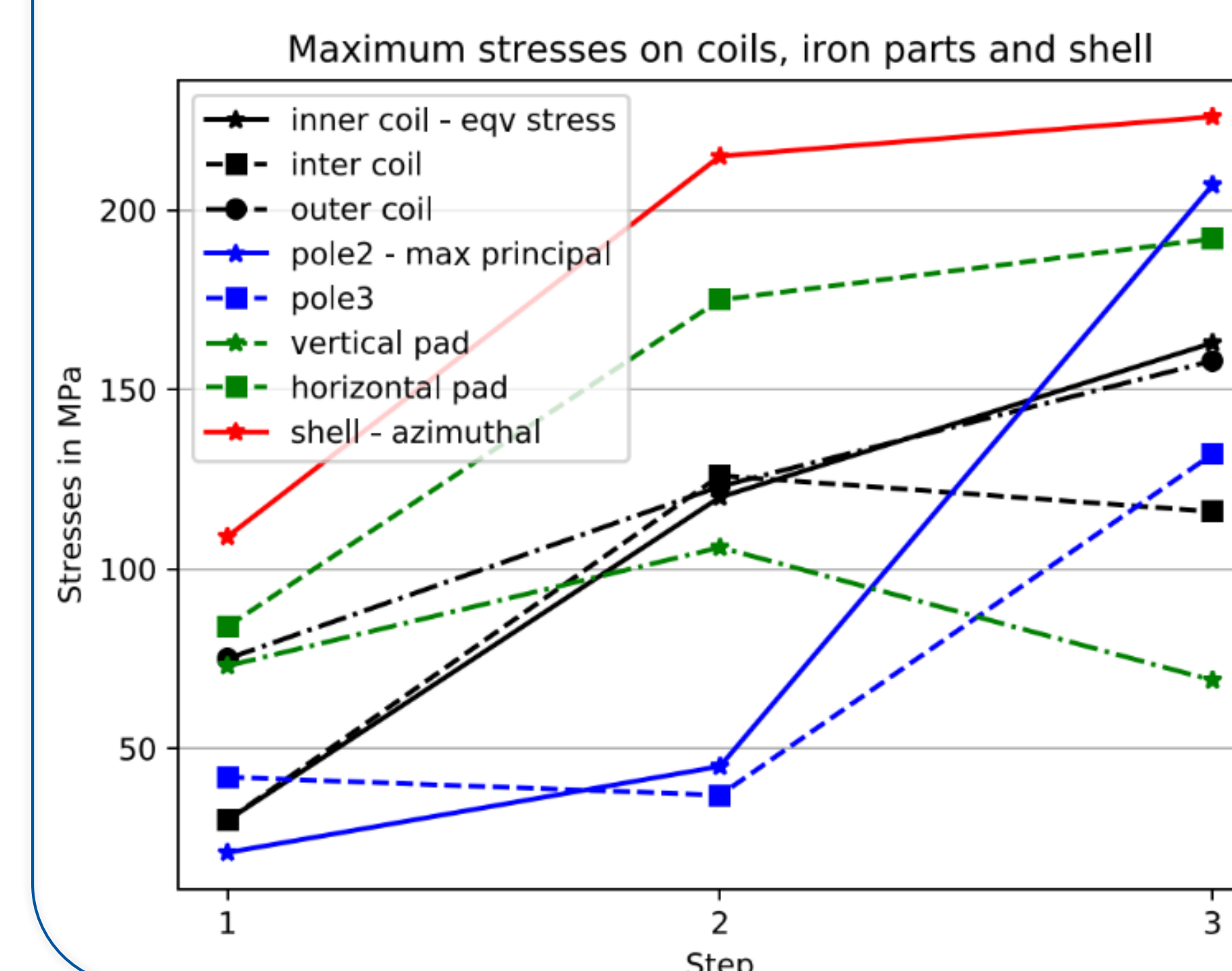
Von Mises Stress in MPa



Contact Pressure in MPa



Peak of stress on the structural parts in MPa



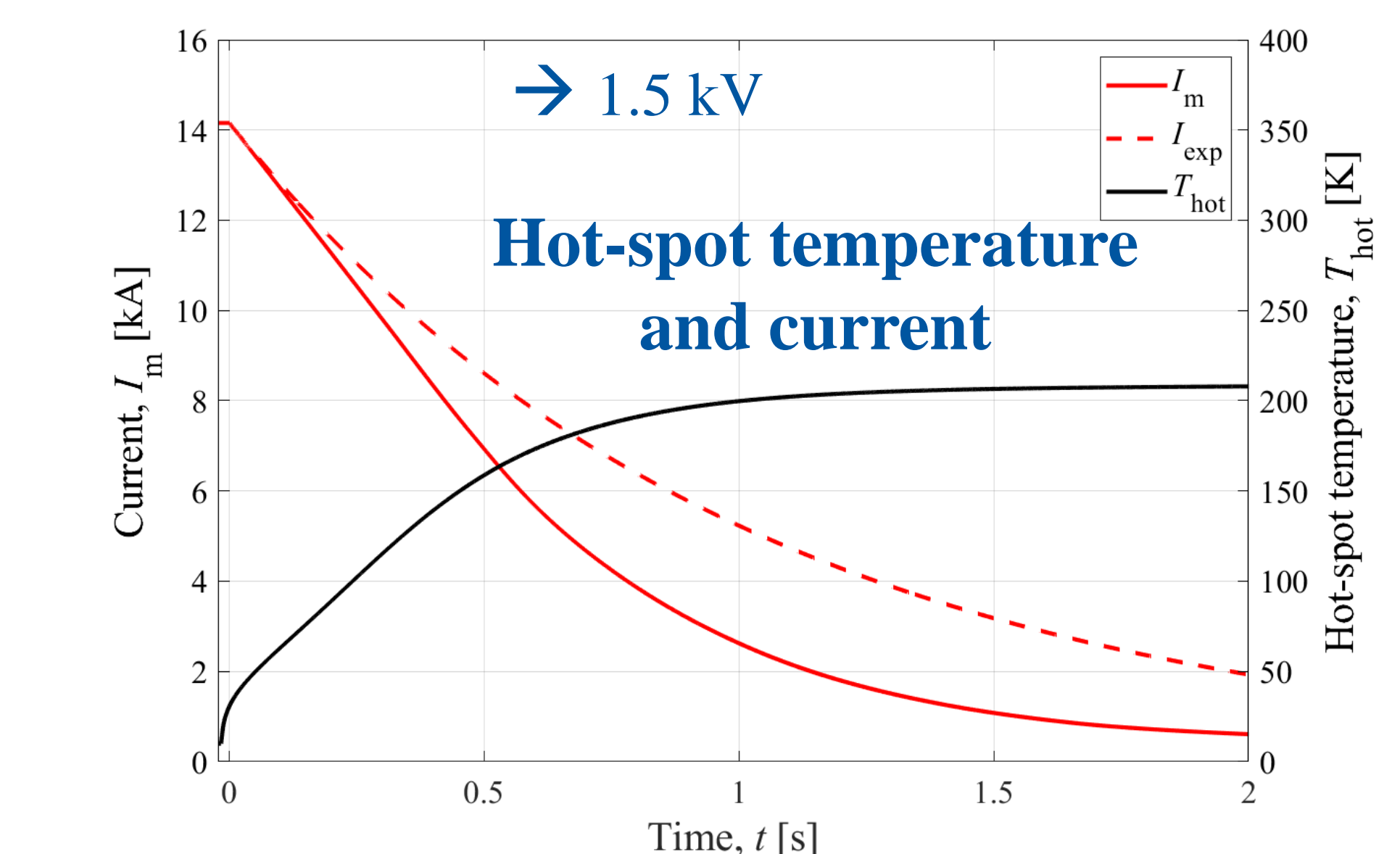
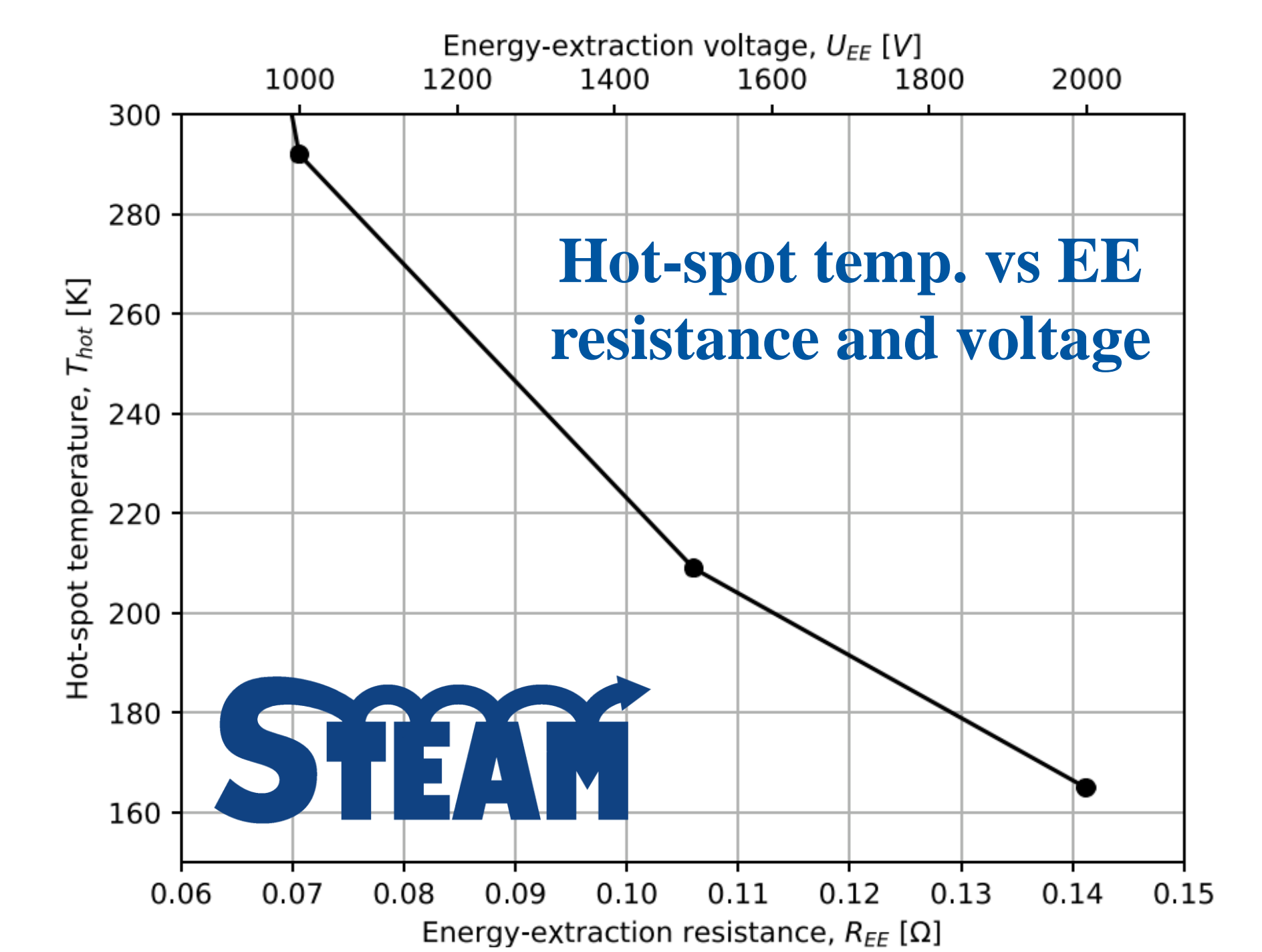
Average Contact Pressure in MPa

SECTION	INNER COIL	INTER COIL	OUTER COIL
Straight	1.4	-24	-5
Hard way bend	5.4	-21	-8.5
Ramp	-2.2	-20	-15
Easy way bend	-26	-48	-12

→ A shim can be added to decrease the inter coil easy way bend pole-coil tension

QUENCH PROTECTION ANALYSIS

Quench propagation performed using STEAM-LEDET <https://espace.cern.ch/steam>



→ EE voltage can be half of the indicated value if the symmetric grounding is adopted