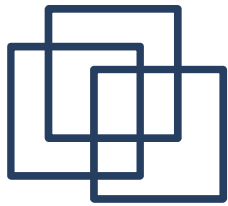


Coupled magneto-solid analysis of the beam elements.

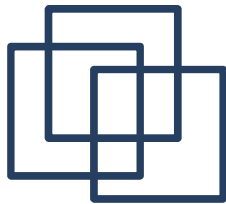


Coupled field methods

**ANSYS
Multi-Field
Solver**

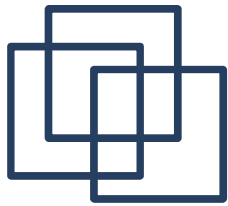
**ANSYS
Load Transfer
(Force – disp)**

ANSYS Elements:
EMAG: SOLID117, SOLID236
SOLID237
STRUCT: SOLID95

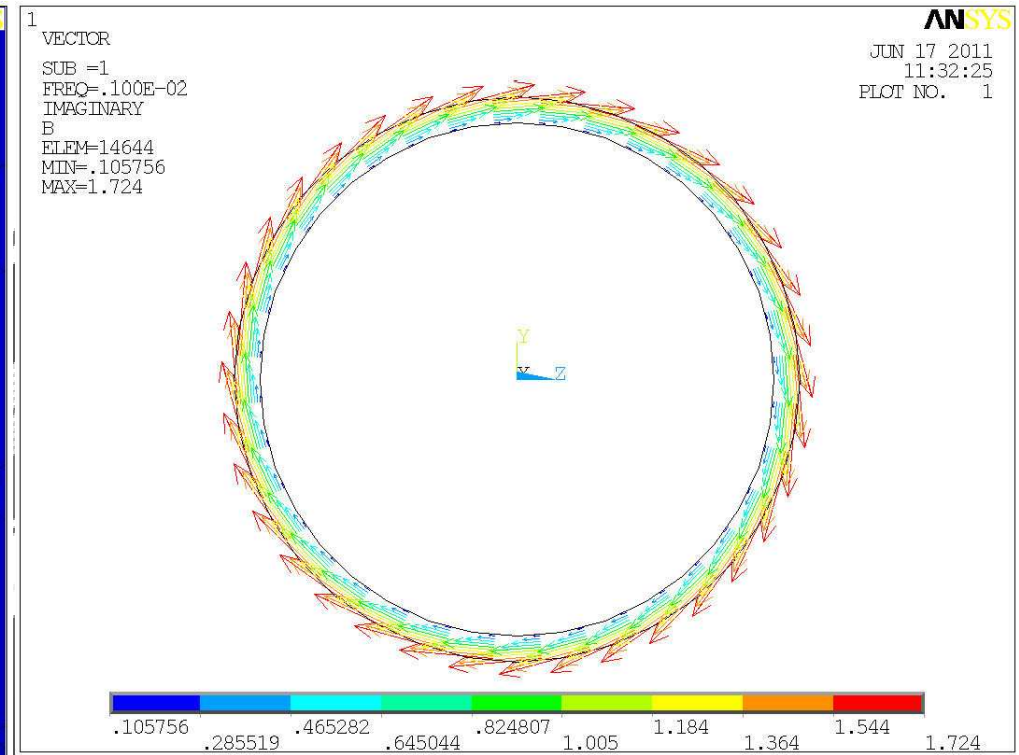
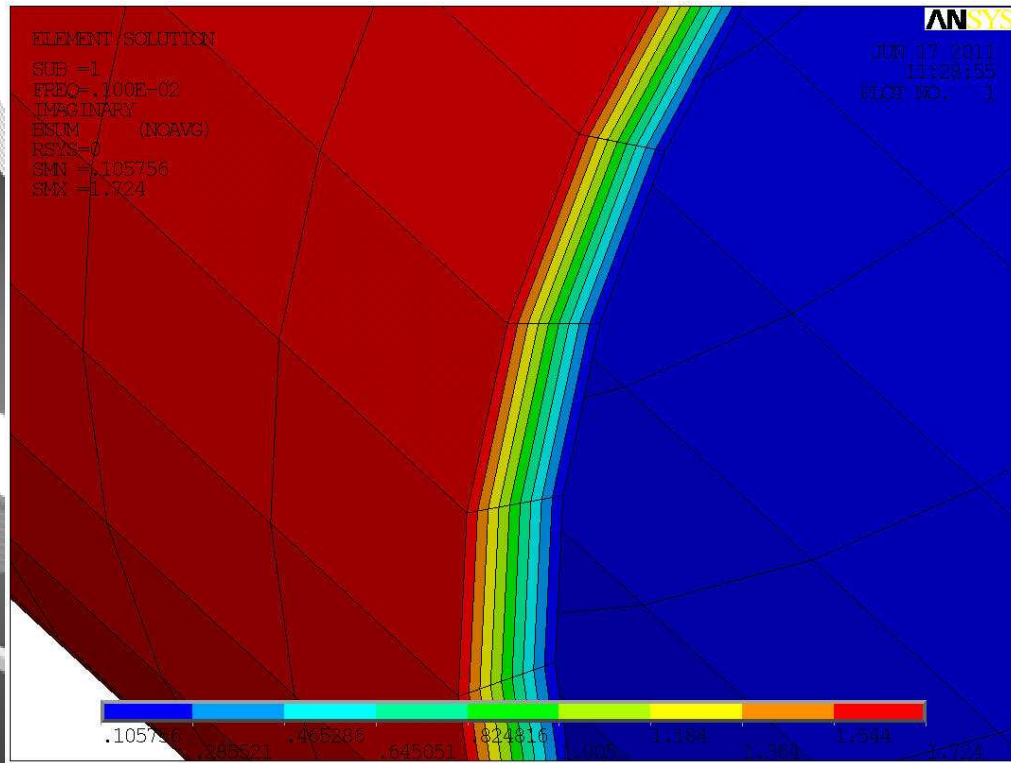


EMAG (static analysis) - current density



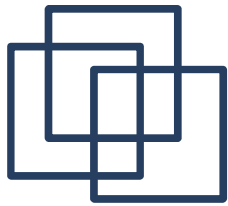


EMAG (static analysis) – mag. flux density

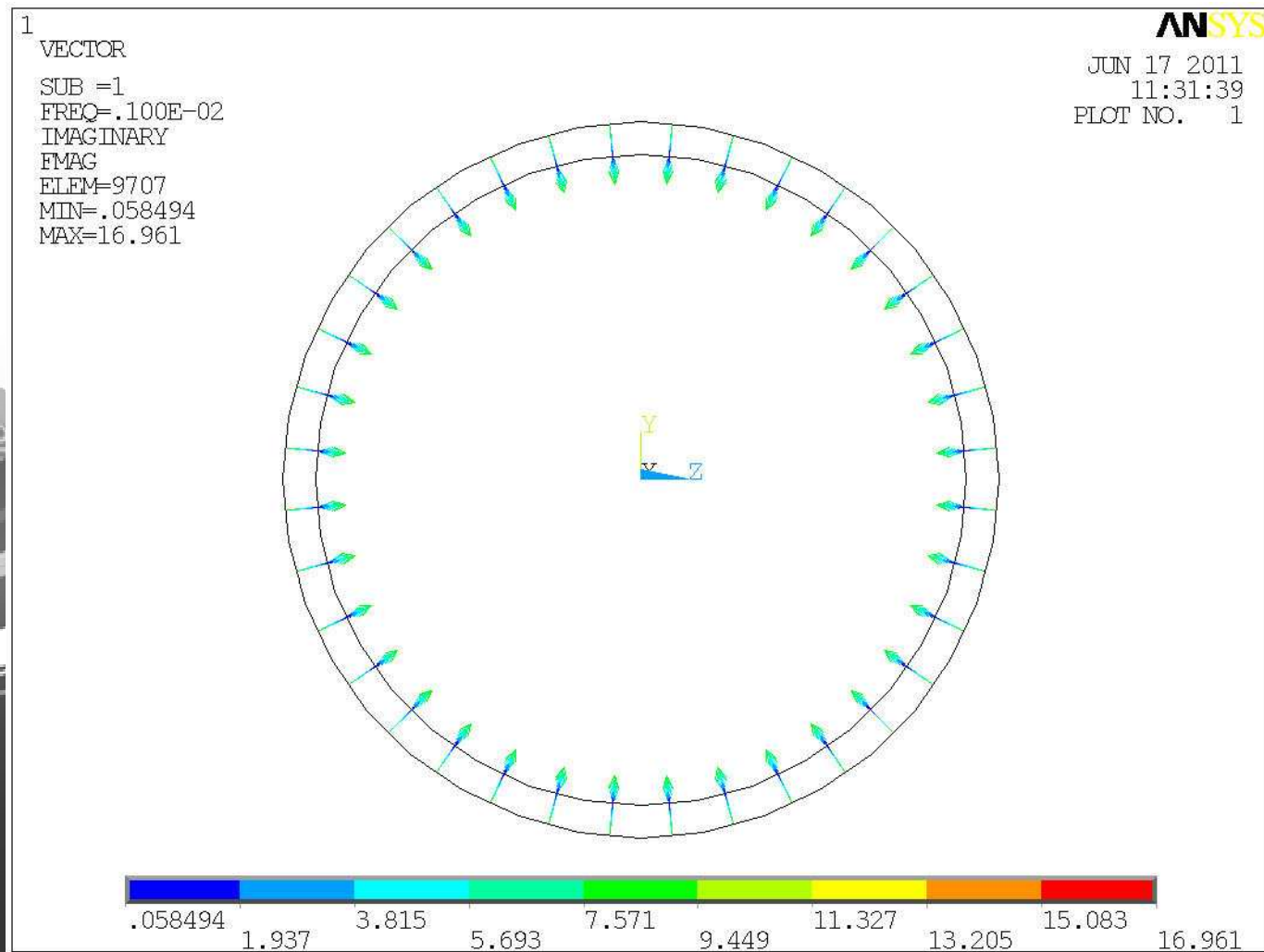


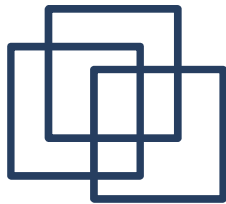
For 300 kA $\rightarrow B_{\max} = 1.73$ [T]

For 350 kA $\rightarrow B_{\max} = 1.92$ [T]

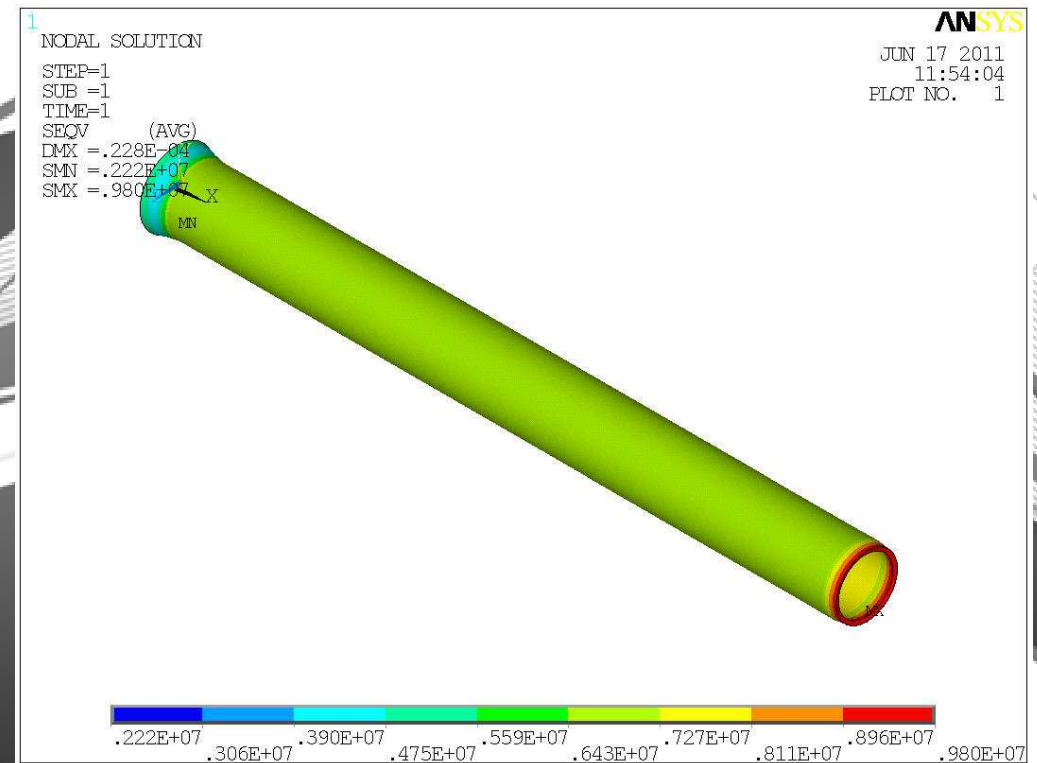
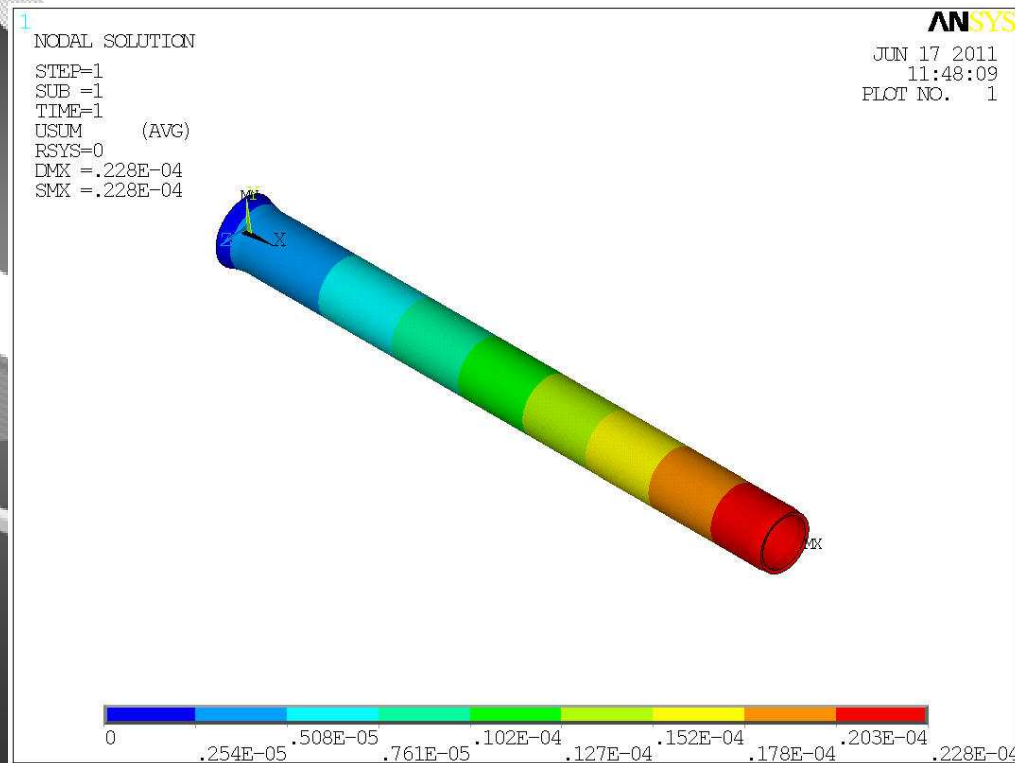


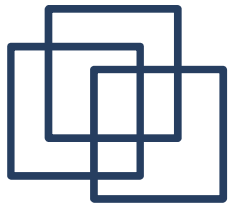
EMAG (static analysis) – mag. forces



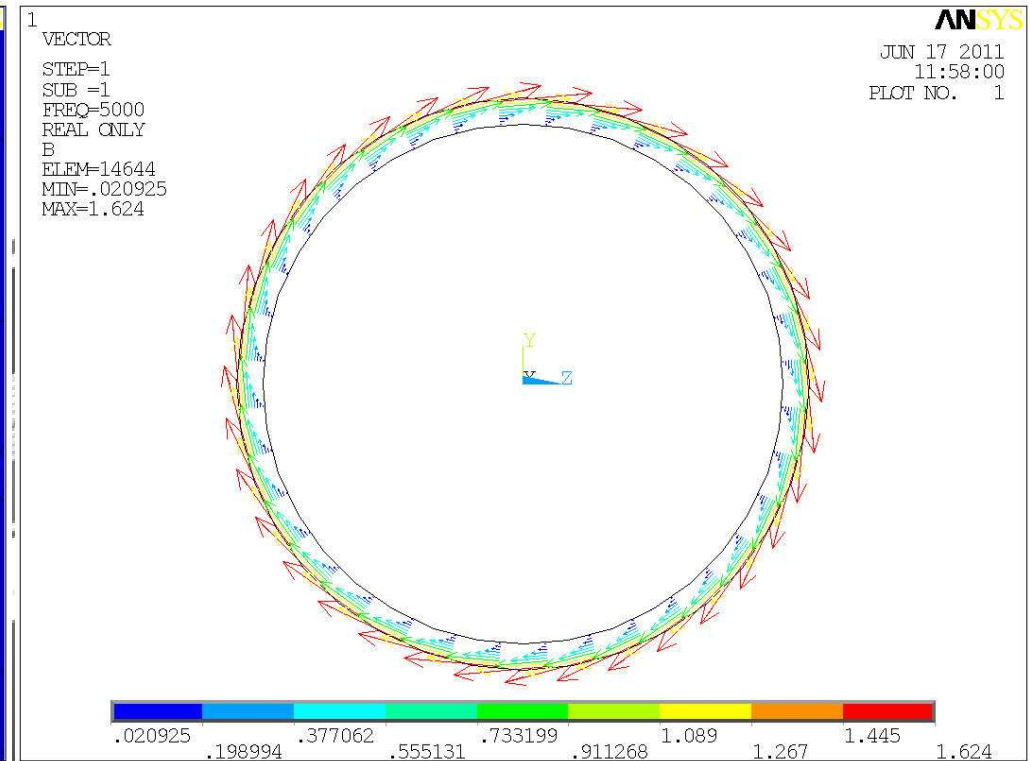
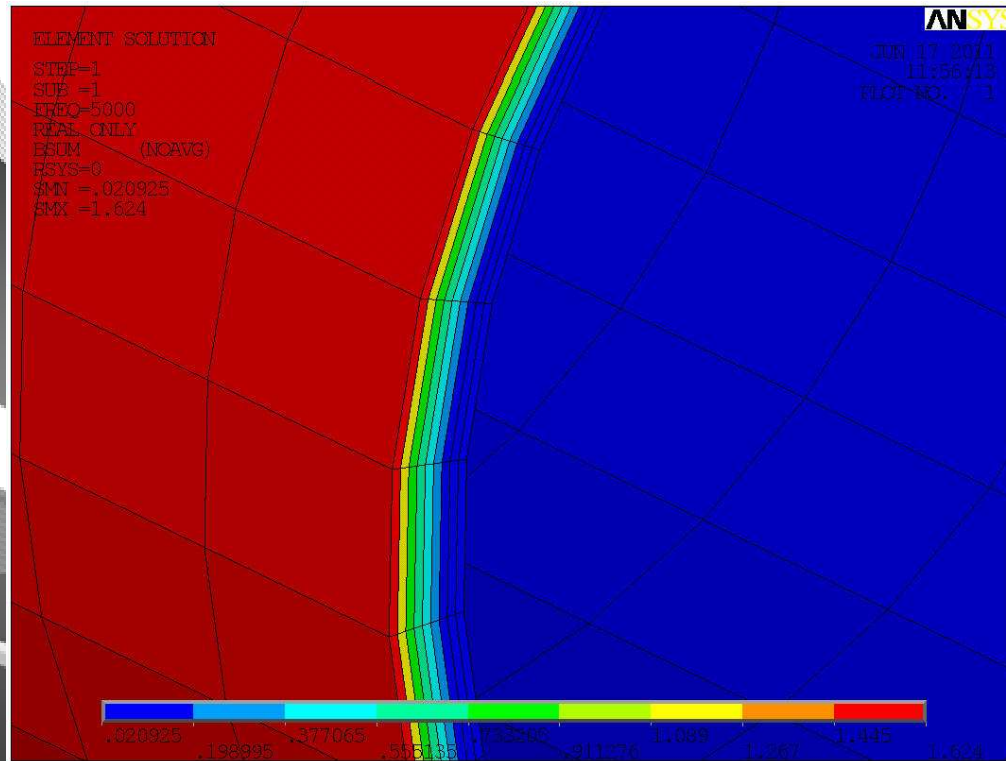


Structural (static analysis) – displacements & von Mises stress



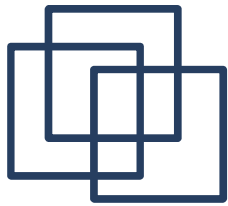


EMAG (harmonic analysis) – mag. flux density

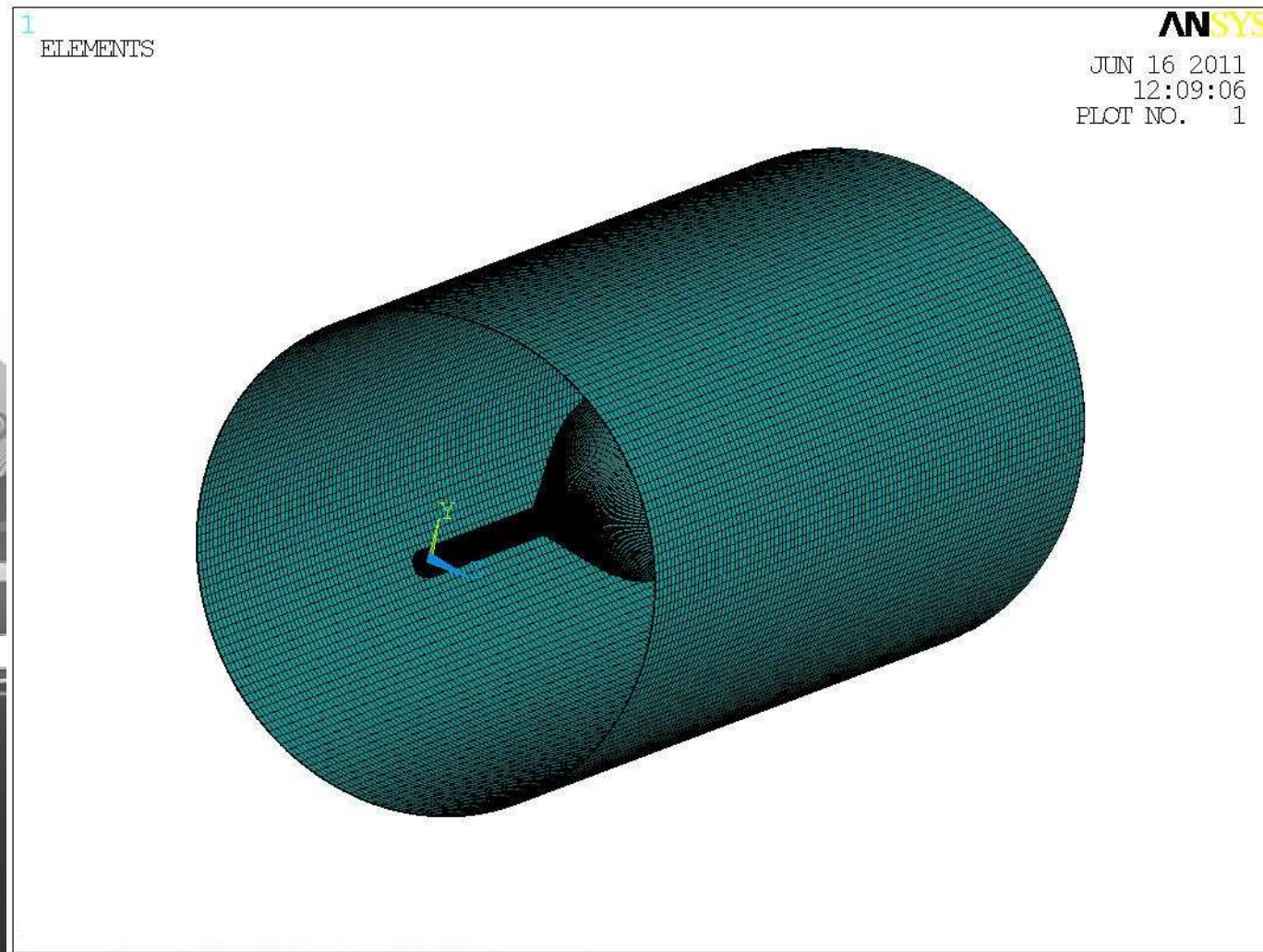


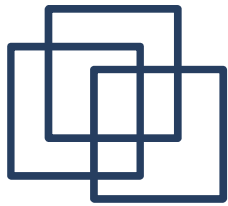
For 300 kA $\rightarrow B_{\max} = 1.47$ [T]

For 350 kA $\rightarrow B_{\max} = 1.71$ [T]

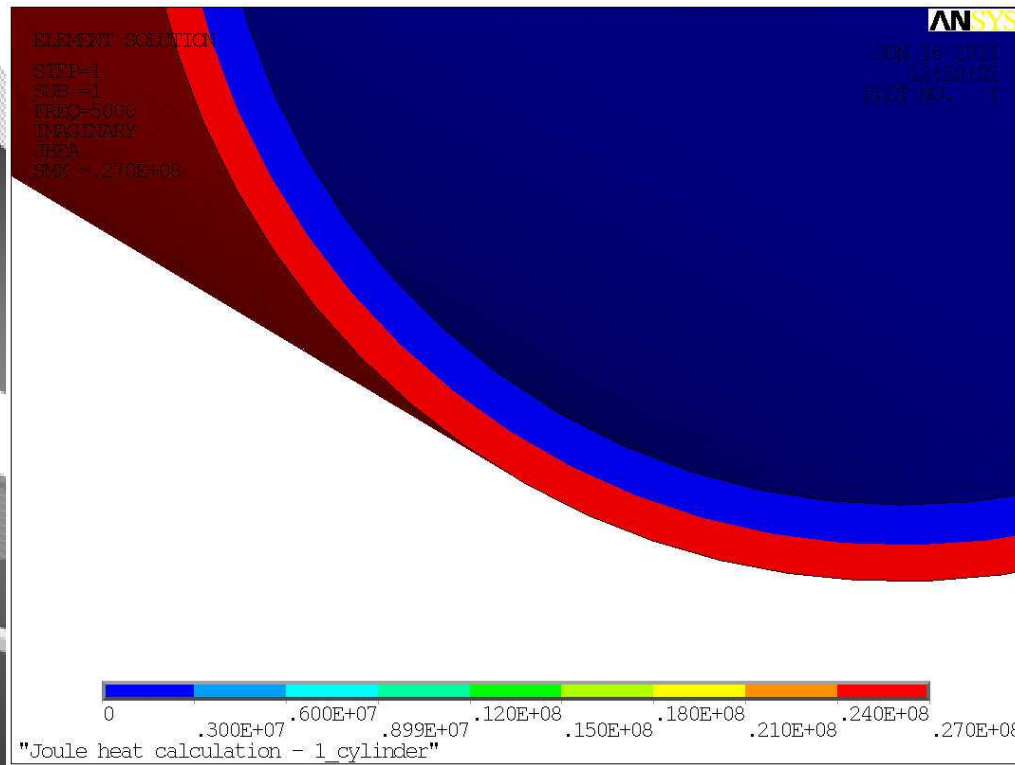


Mini-Boone (complete geometry)

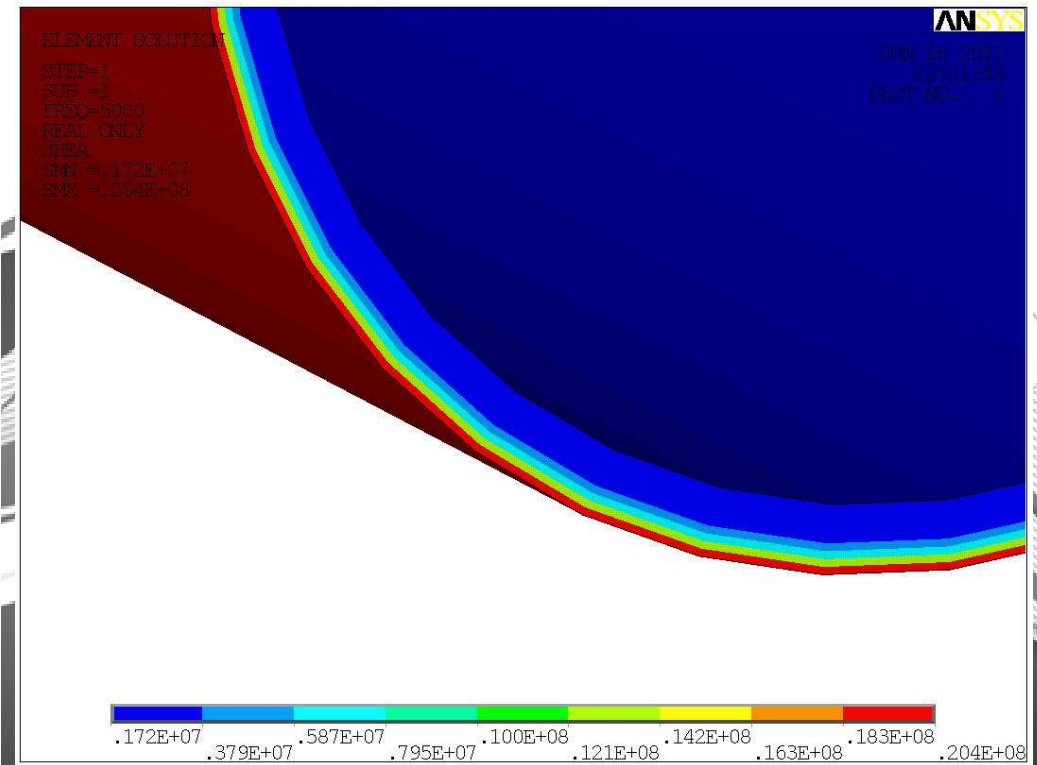




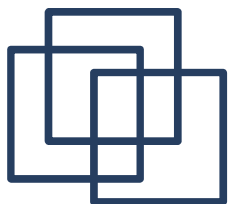
Joule heat losses



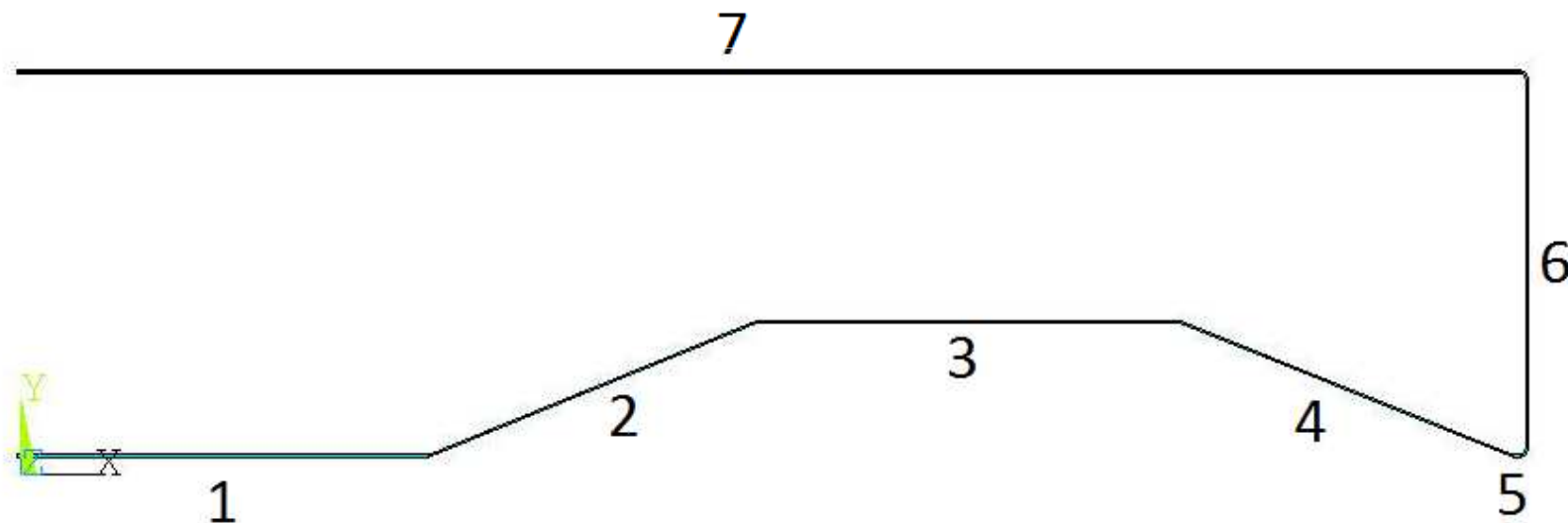
Approximate skin effect
($sd = 0.0014$ m)



Actual skin effect



Joule heat losses for $I_{\text{rms}} = 7500\text{A}$, $f = 5000\text{ Hz}$ ([kW])



	1_ CYL	2_ CONE	3_ CYL	4_ CONE	5_ CYL	6_ PLATE	7_ CYL
Approx. skin eff.	4.59	1.39	0.92	1.40	0.08	1.00	1.27
Actual skin eff.	4.40	1.22	0.65	1.24	0.08	0.71	0.89