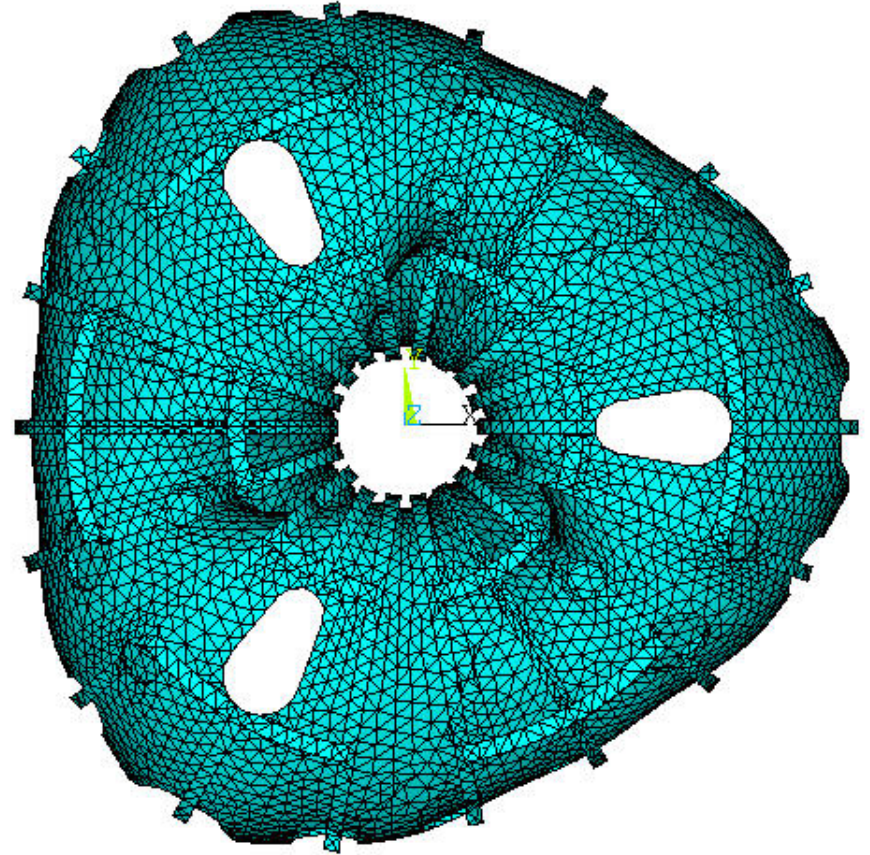
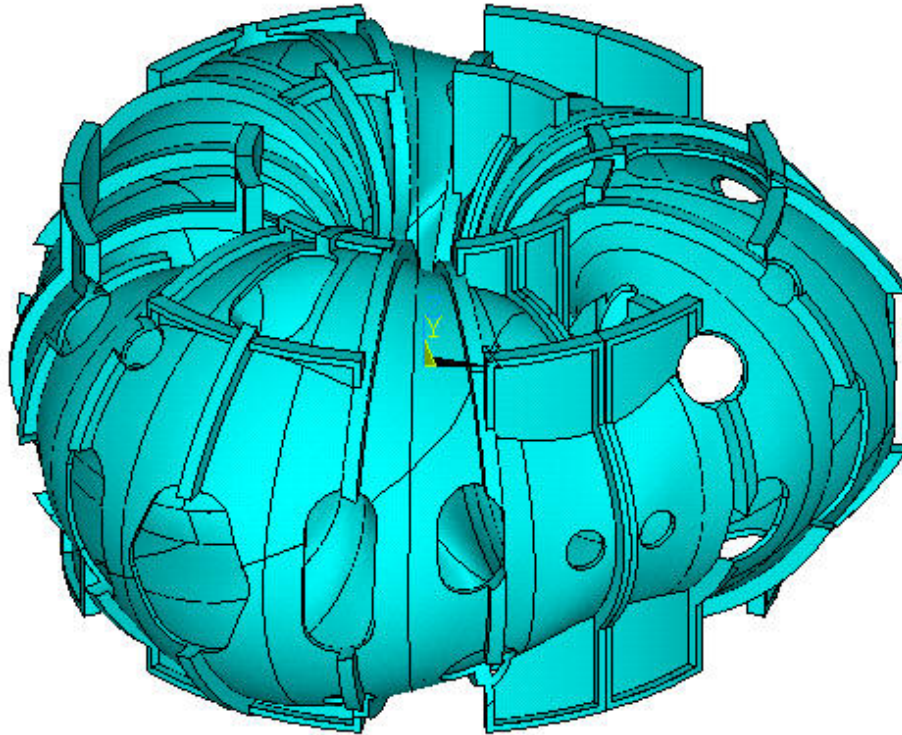
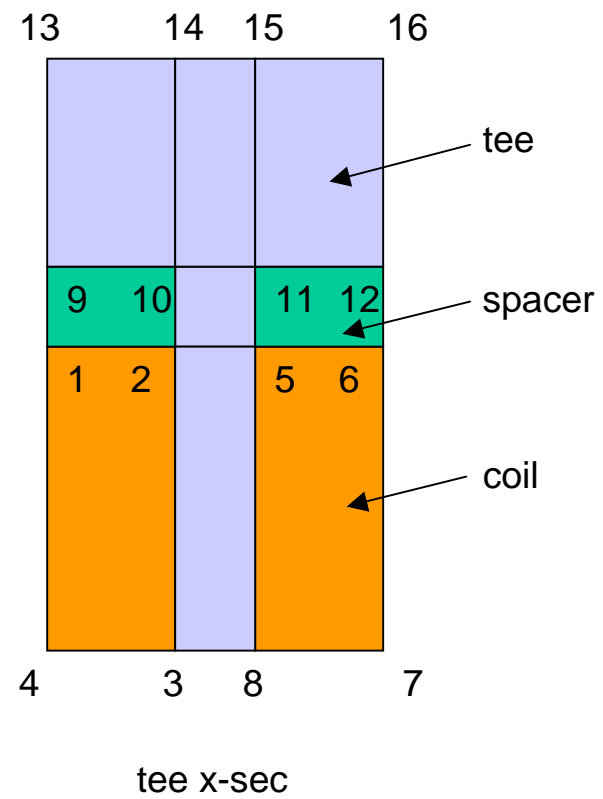
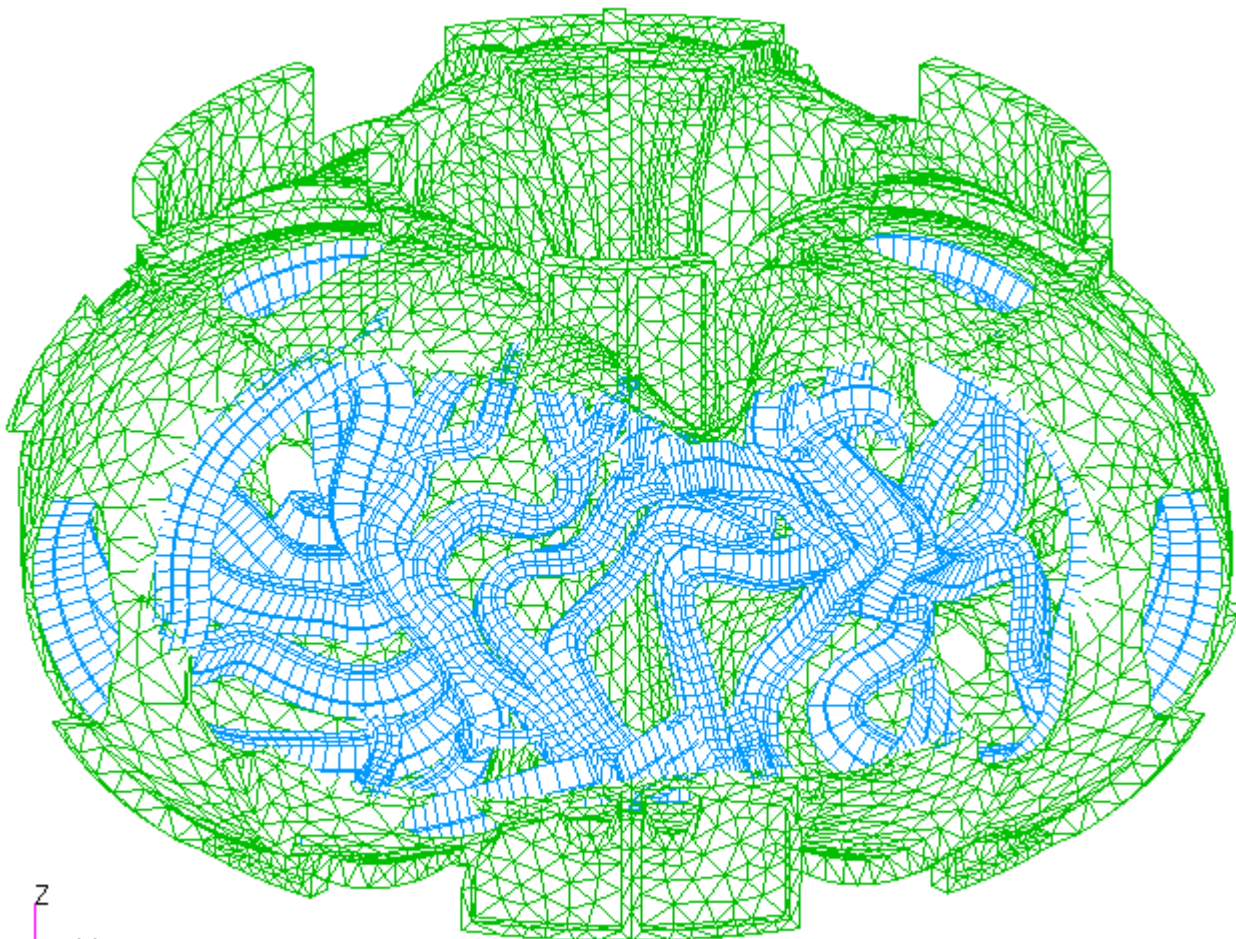


Modular Coil Structure

- Shell has been successfully meshed using Pro/E geometry (120-deg model)
- Interface constraint equations and loads for 2T, 0-s case ($M_2=23\text{kA/turn}$) are being applied
- Calculations will compare effect of coil modulus (5%, 50% of copper) on structure response

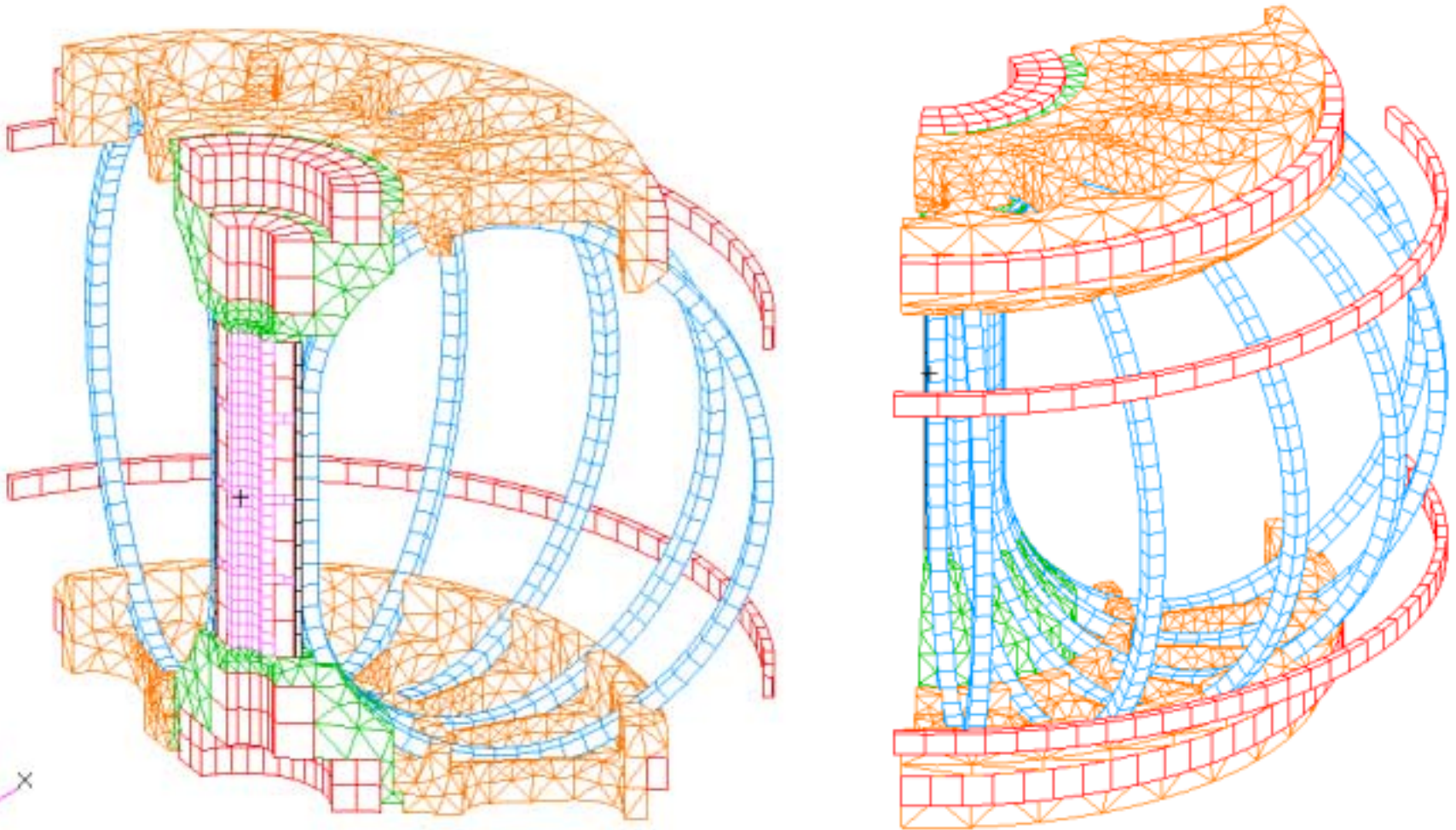


Modular Coil Structural Model

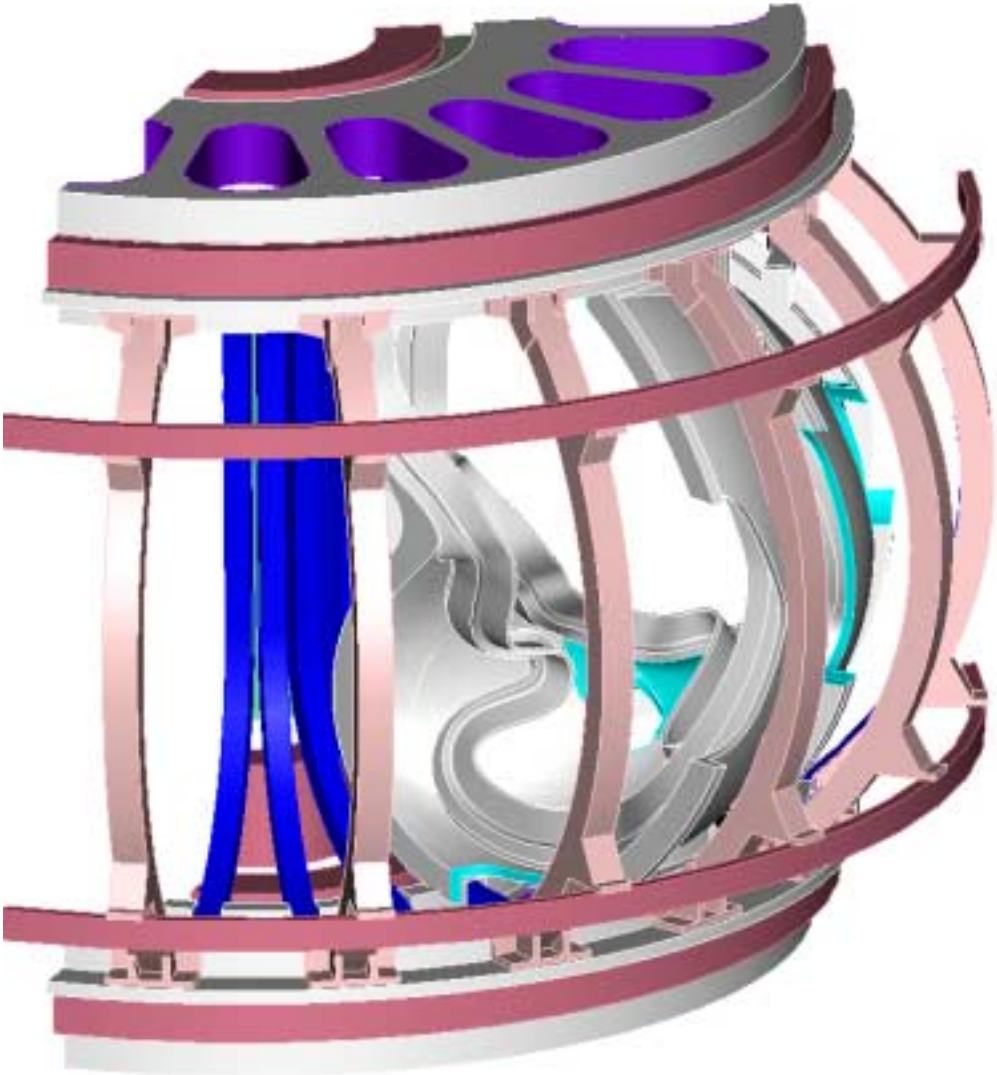
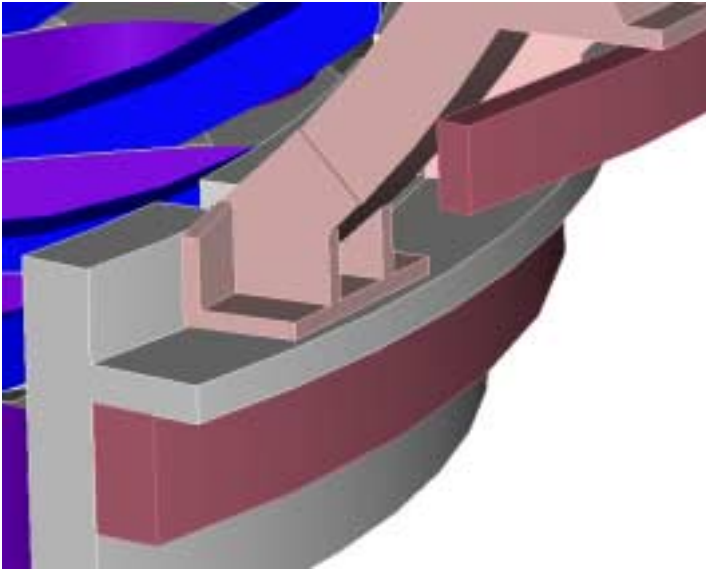


TF / PF Structure

- Coil and structural components, except for outer TF support, have been meshed
- Need to develop interface constraint equations, apply loads for max current cases (C. Jun)
- Max TF case is 350kA, .516-s (16kA/turn), Max PF case is 2T, .218-s (PF3=16kA/turn)













Pro/E models of PF / TF structure (T. Brown)

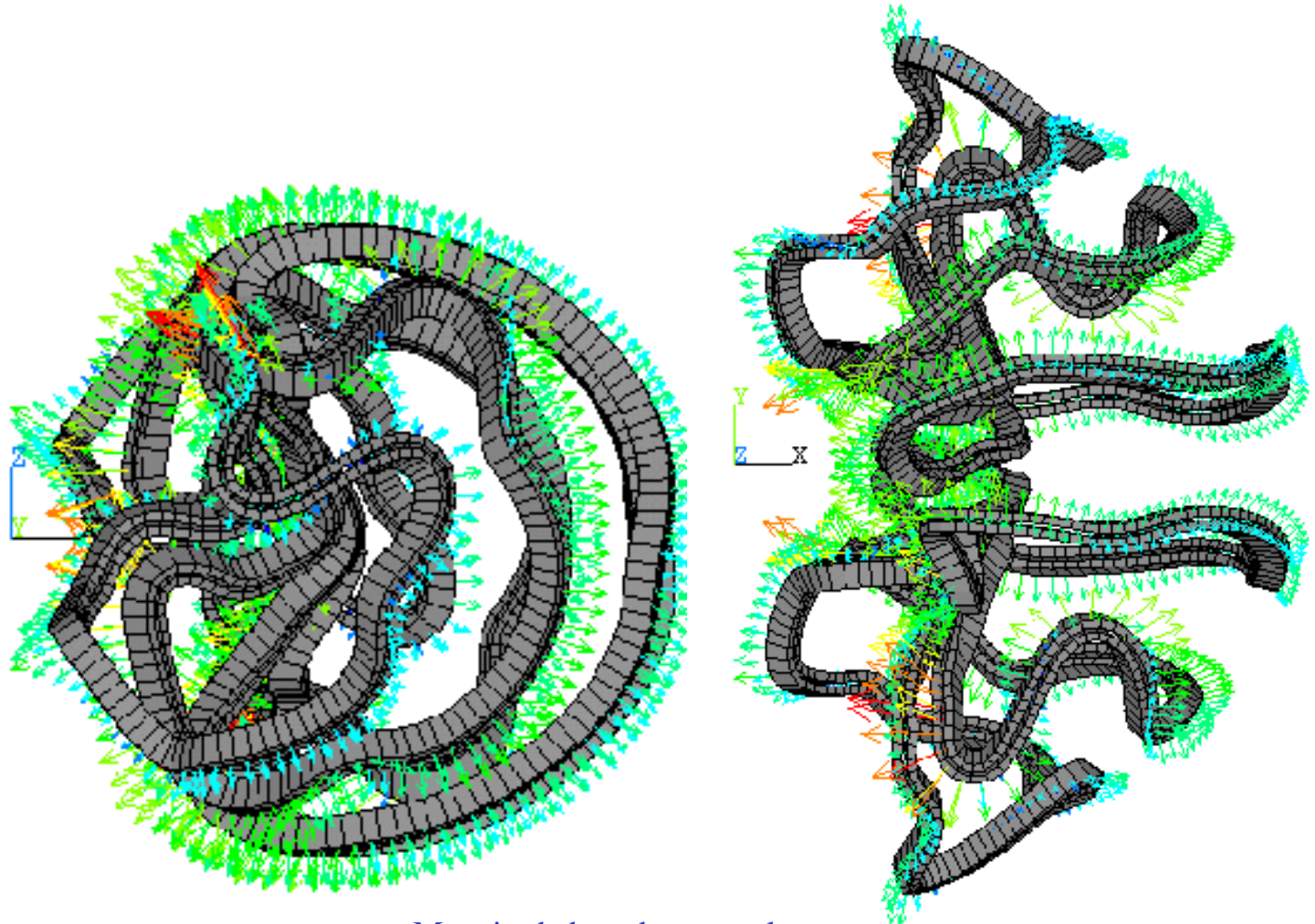


Element Magnetic Forces of Modular Coils

VECTOR
STEP=2
SUB =1
TIME =2
FMAG
ELEM=3961
MIN=1229
MAX=62439

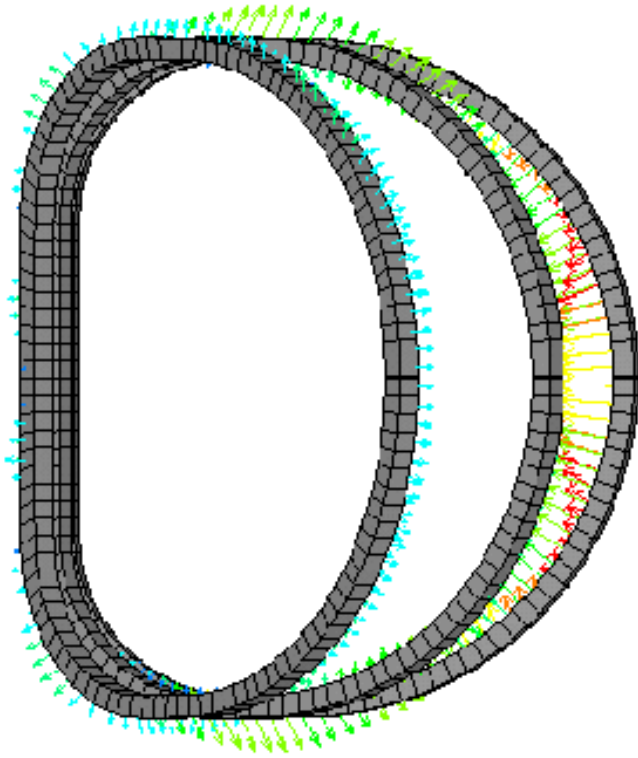
	1229
	8030
	14831
	21633
	28434
	35235
	42036
	48837
	55638
	62439

Magnetic force
unit in Newton

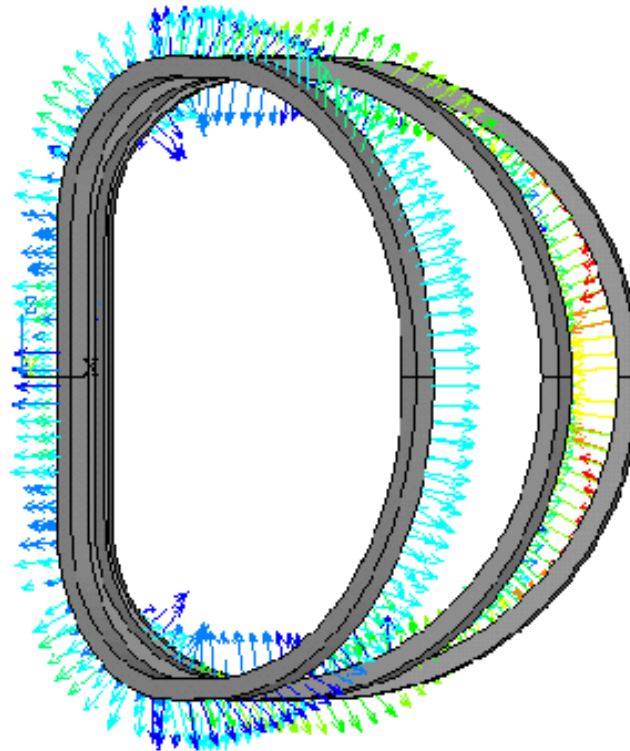


Magnitude based vector plot

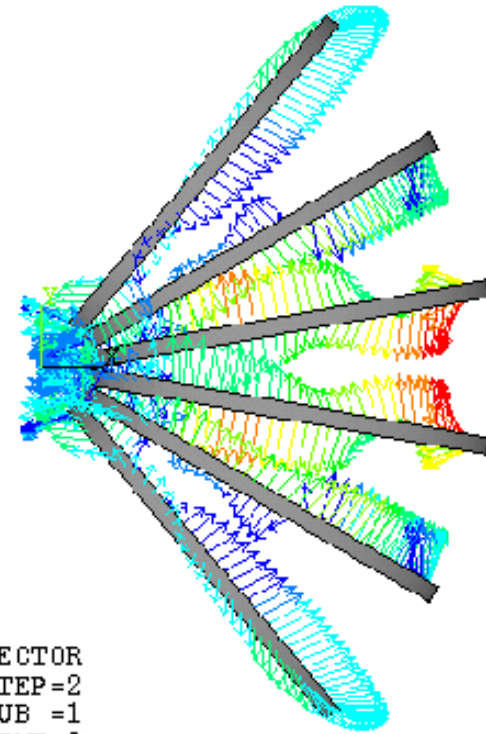
Element Magnetic Forces of TF Coils



Magnitude based vector plot



Uniform vector plot



Uniform vector plot

VECTOR
STEP=2
SUB =1
TIME=2
FMAG
ELEM=6992
MIN=34.458
MAX=1020
34.458
144.004
253.551
363.097
472.644
582.19
691.737
801.283
910.83
1020

Magnetic force
unit in Newton

Current waveforms (A)												
	t(s)	M1	M2	M3	PF1	PF2	PF3	PF4	PF5	PF6	TF	Plasma
350kA Ohmic Scenario												
	-0.700	0	0	0	0	0	0	0	0	0	0	0
<i>1.8T lowiota</i>	0.000	20068	20763	15815	-18404	-18404	-2797	-2533	-5656	-1986	1869	0
	0.100	20068	20763	15815	-18404	-18404	-2797	-2533	-5656	-1986	1869	0
	0.216	16201	14648	11590	6925	6925	4401	-1865	-2084	7626	16076	-350000
	0.316	16201	14648	11590	11008	11008	5332	-1009	-2013	7950	16076	-350000
<i>350kA</i>	0.516	16201	14648	11590	19174	19174	7193	702	-1870	8597	16076	-350000
Maximum		20068	20763	15815	19174	19174	7193	702	0	8597	16076	0
Minimum		0	0	0	-18404	-18404	-2797	-2533	-5656	-1986	0	-350000
Current direction		1	1	1	0	0	0	0	-1	0	1	
I ² t (A ² -s)		3.98E+08	3.78E+08	2.35E+08	3.20E+08	3.15E+08	2.71E+07	4.38E+06	1.62E+07	2.78E+07	5.50E+08	
t _{ESW}		0.99	0.88	0.94	0.87	0.86	0.52	0.68	0.51	0.38	2.13	
2T High Beta Scenario												
	-0.800	0	0	0	0	0	0	0	0	0	0	0
<i>Lowiota vacuum</i>	0.000	22228	22998	17518	16703	16703	5356	4967	-5614	740	2071	0
	0.050	22228	22998	17518	16703	16703	5356	4967	-5614	740	2071	0
<i>2T zero beta</i>	0.118	22697	21265	18432	17652	17652	15890	9241	1662	1691	2420	-205071
	0.213	22685	21392	18008	519	519	16129	13990	4676	-298	2729	-204989
<i>2T high beta</i>	0.218	22685	21392	18008	540	540	16133	13994	4677	-297	2729	-204989
Maximum		22697	22998	18432	17652	17652	16133	13994	4677	1691	2729	0
Minimum		0	0	0	0	0	0	0	-5614	-298	0	-205071
Current direction		1	1	1	1	1	1	1	0	0	1	
I ² t (A ² -s)		4.79E+08	4.75E+08	3.10E+08	2.24E+08	2.18E+08	1.11E+08	1.71E+08	2.14E+07	1.13E+06	2.02E+08	
t _{ESW}		0.93	0.90	0.91	0.72	0.70	0.43	0.87	0.68	0.40	27.16	
1.7T High Beta Scenario												
	-0.700	0	0	0	0	0	0	0	0	0	0	0
<i>High iota vacuum</i>	0.000	22139	20102	17621	3072	3072	13590	15081	-5865	-1678	-4770	0
	0.100	22139	20102	17621	3072	3072	13590	15081	-5865	-1678	-4770	0
	0.158	19292	18075	15668	16053	16053	13746	8074	1431	1521	2057	-174310
	0.258	19283	18184	15307	1569	1569	13966	12128	3995	-164	2320	-174241
	0.458	19283	18184	15307	2386	2386	14152	12299	4009	-99	2320	-174241
Maximum		22139	20102	17621	16053	16053	14152	15081	4009	1521	2320	0
Minimum		0	0	0	0	0	0	0	-5865	-1678	-4770	-174310
Current direction		1	1	1	1	1	1	1	0	0	0	
I ² t (A ² -s)		4.70E+08	3.98E+08	3.07E+08	2.17E+07	2.15E+07	2.04E+08	2.50E+08	2.36E+07	1.38E+06	1.61E+08	
t _{ESW}		0.96	0.99	0.99	0.08	0.08	1.02	1.10	0.69	0.49	7.09	
Initial Ohmic Scenario												
	-1.200	0	0	0	0	0	0	0	0	0	0	0
	0.000	19535	17737	15548	-7496	-7496	9665	11167	-5354	-2290	-4209	0
	0.100	19535	17737	15548	-7496	-7496	9665	11167	-5354	-2290	-4209	0
	0.196	17023	15949	13824	5788	5788	10219	5369	1116	678	1815	-153803
	0.291	17023	15949	13824	9666	9666	11103	6182	1184	985	1815	-153803
	0.296	17023	15949	13824	9871	9871	11150	6225	1188	1001	1815	-153803
Maximum		19535	17737	15548	9871	9871	11150	11167	1188	1001	1815	0
Minimum		0	0	0	-7496	-7496	0	0	-5354	-2290	-4209	-153803
Current direction		1	1	1	0	0	1	1	0	0	0	
I ² t (A ² -s)		4.70E+08	3.89E+08	2.92E+08	7.72E+07	8.07E+07	1.28E+08	1.23E+08	2.17E+07	4.66E+06	1.44E+08	
t _{ESW}		1.23	1.24	1.21	0.79	0.83	1.03	0.98	0.76	0.89	8.12	
1.7T Ohmic Scenario												
	-0.700	0	0	0	0	0	0	0	0	0	0	0
	0.000	22139	20102	17621	-11218	-11218	10333	12086	-6116	-2811	-4770	0
	0.100	22139	20102	17621	-11218	-11218	10333	12086	-6116	-2811	-4770	0
	0.158	19292	18075	15668	1763	1763	10489	5080	1181	388	2057	-174310
	0.258	19292	18075	15668	5846	5846	11419	5935	1252	712	2057	-174310
	0.458	19292	18075	15668	14012	14012	13281	7647	1395	1359	2057	-174310
Maximum		22139	20102	17621	14012	14012	13281	12086	1395	1359	2057	0
Minimum		0	0	0	-11218	-11218	0	0	-6116	-2811	-4770	-174310
Current direction		1	1	1	0	0	1	1	0	0	0	
I ² t (A ² -s)		4.70E+08	3.97E+08	3.13E+08	1.24E+08	1.25E+08	1.44E+08	1.24E+08	1.69E+07	4.29E+06	1.57E+08	
t _{ESW}		0.96	0.98	1.01	0.63	0.64	0.81	0.85	0.45	0.54	6.90	
Maximum		22697	22998	18432	19174	19174	16133	15081	4677	8597	16076	0
Minimum		0	0	0	-18404	-18404	-2797	-2533	-6116	-2811	-4770	-350000
Maximum I ² t (A ² -s)		4.79E+08	4.75E+08	3.13E+08	3.20E+08	3.15E+08	2.04E+08	2.50E+08	2.36E+07	2.78E+07	5.50E+08	
t _{ESW} (s)		0.93	0.90	0.92	0.87	0.86	0.79	1.10	0.63	0.38	2.13	

Current direction: 1=forward -1=reverse, 0=bidirectional