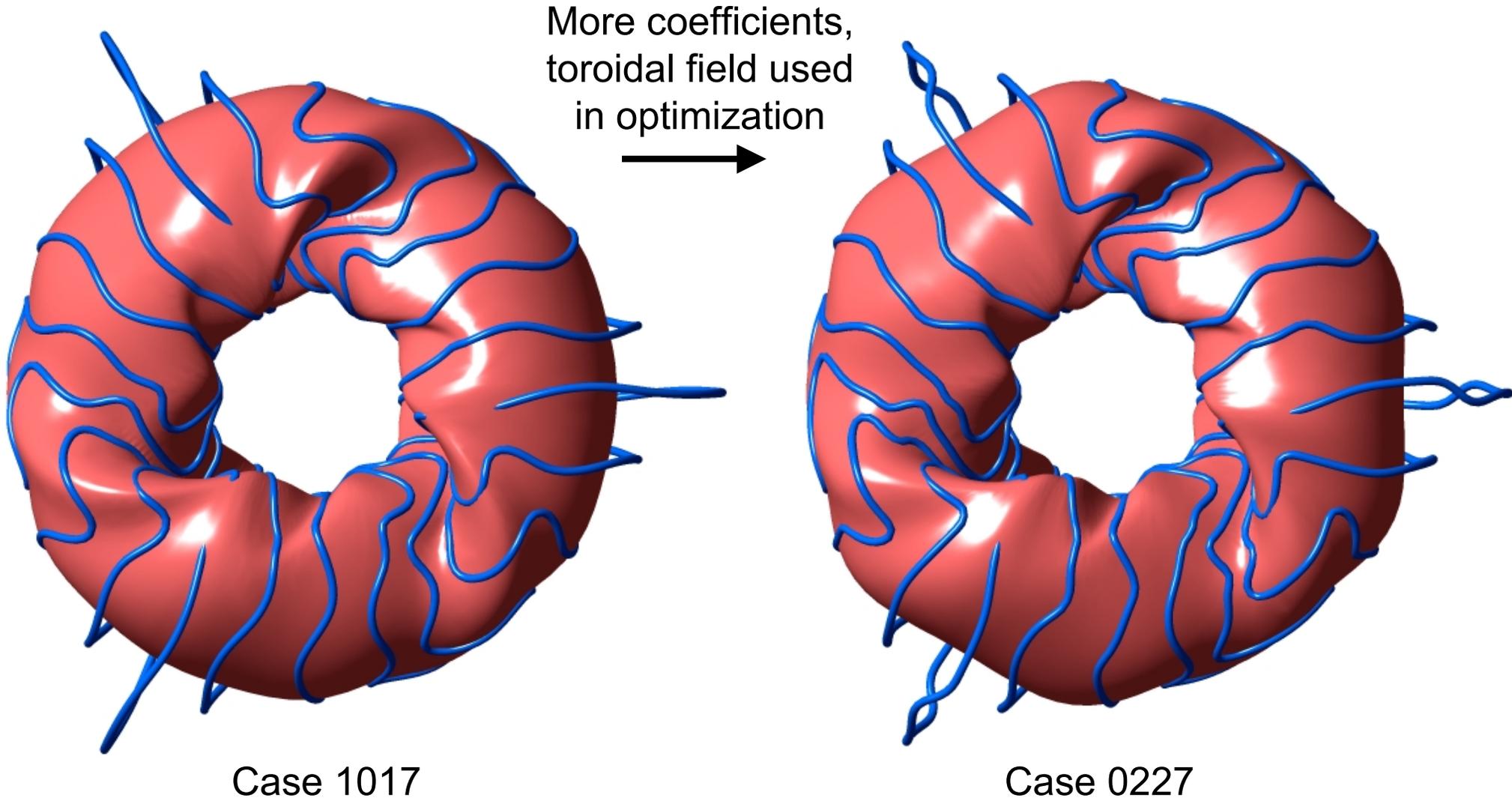


Coil Design Comparison

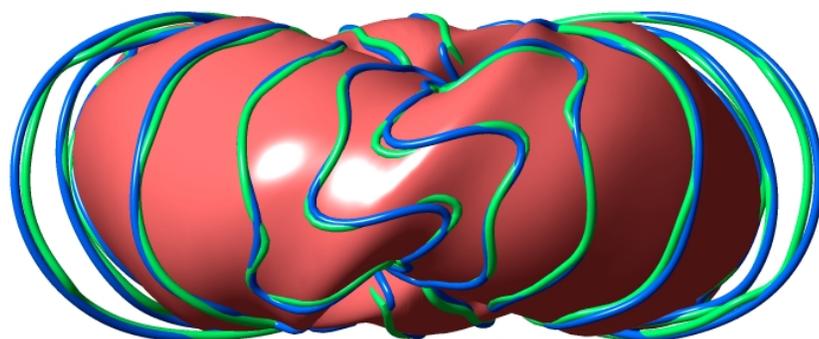
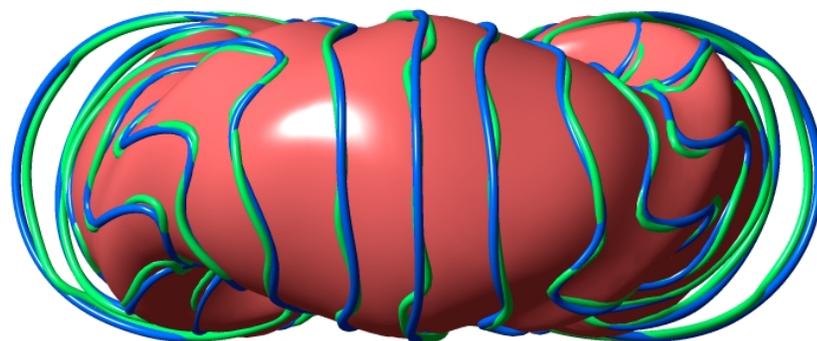
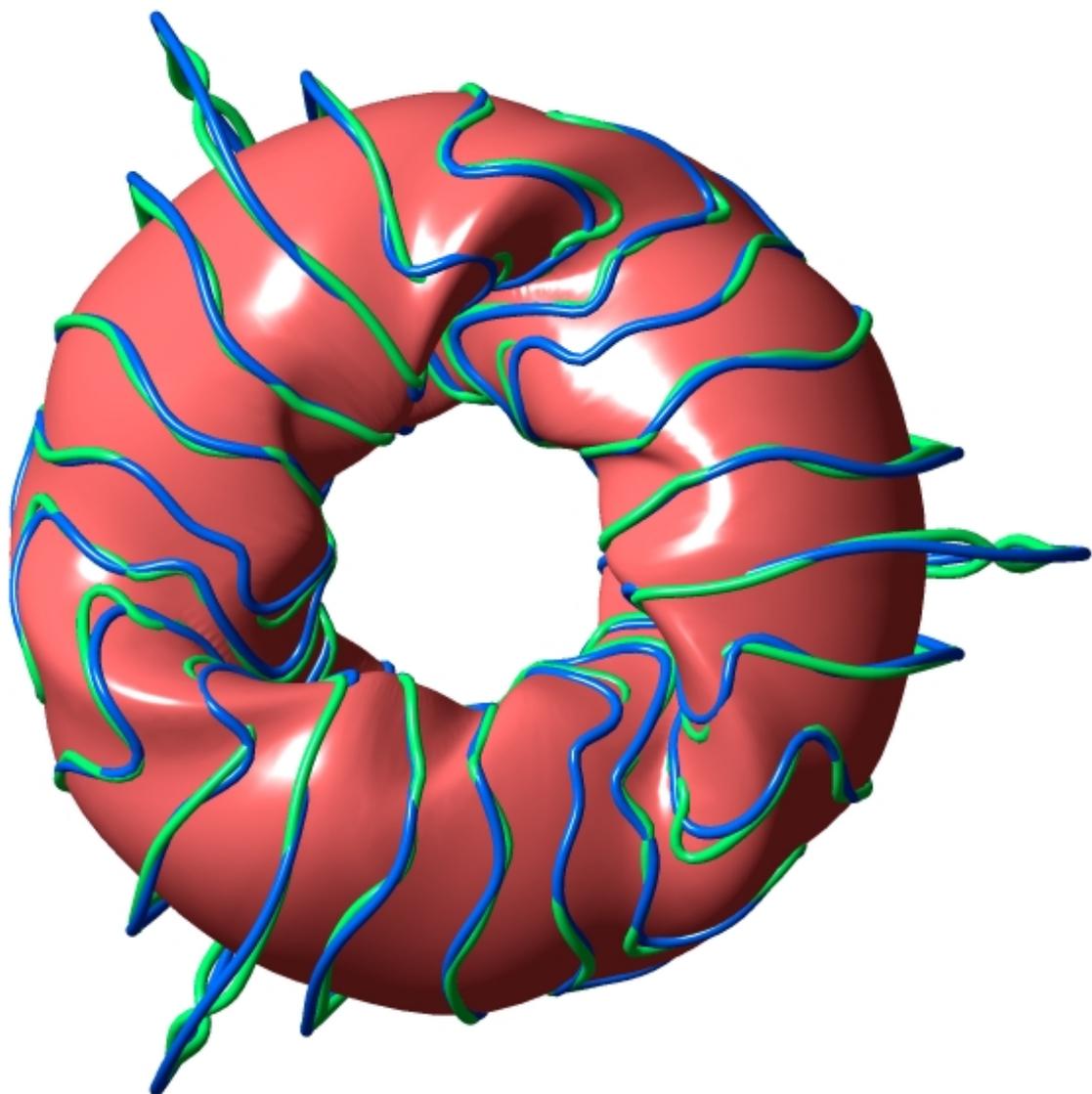
D. Williamson, D. Strickler, M. Cole, B. Nelson
NCSX Project Meeting
July 24, 2001

Case 0227 (m12) is similar to PVR concept

- Modular coils shown as 6-cm dia tubes on winding surface



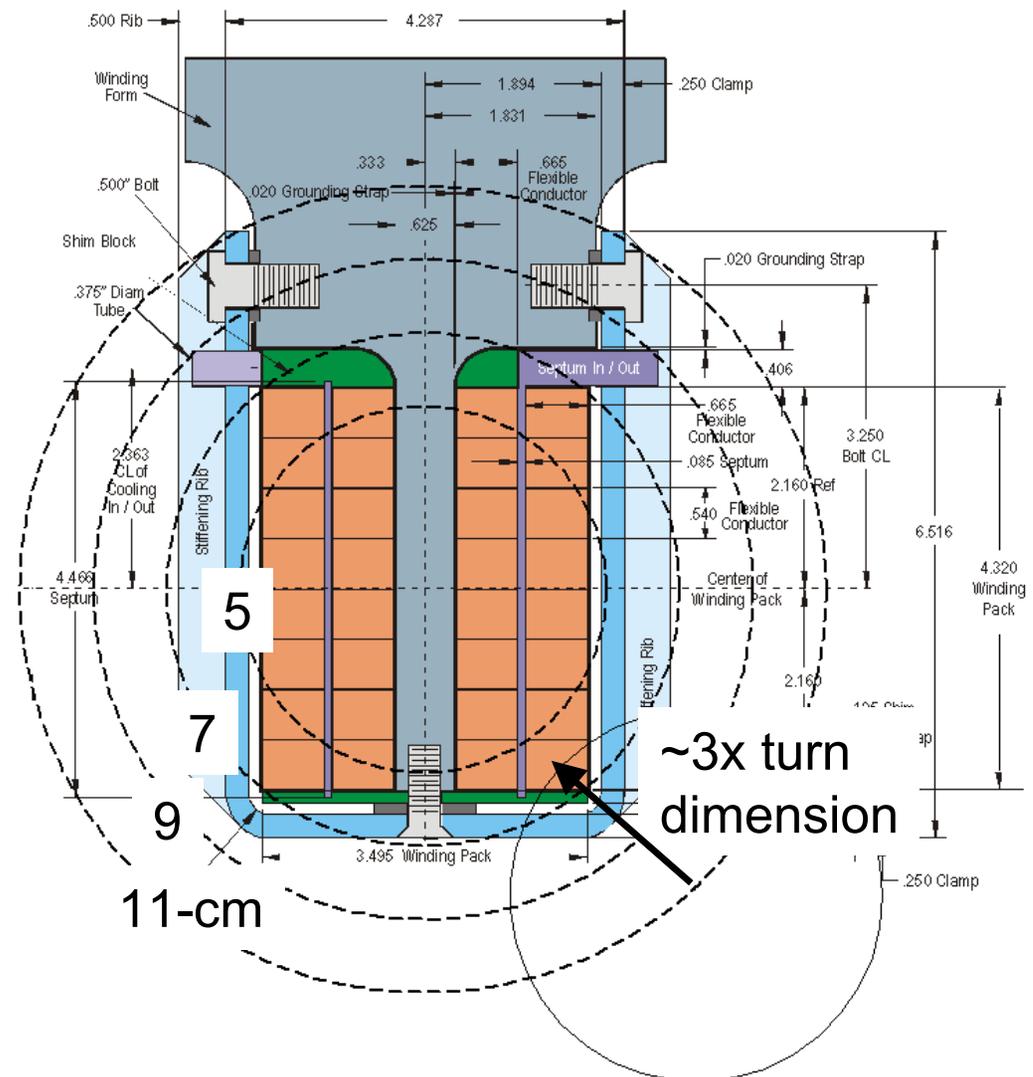
Coil sets 1017 (blue) and 0227 (green)



Issues are Bend Radius and Access

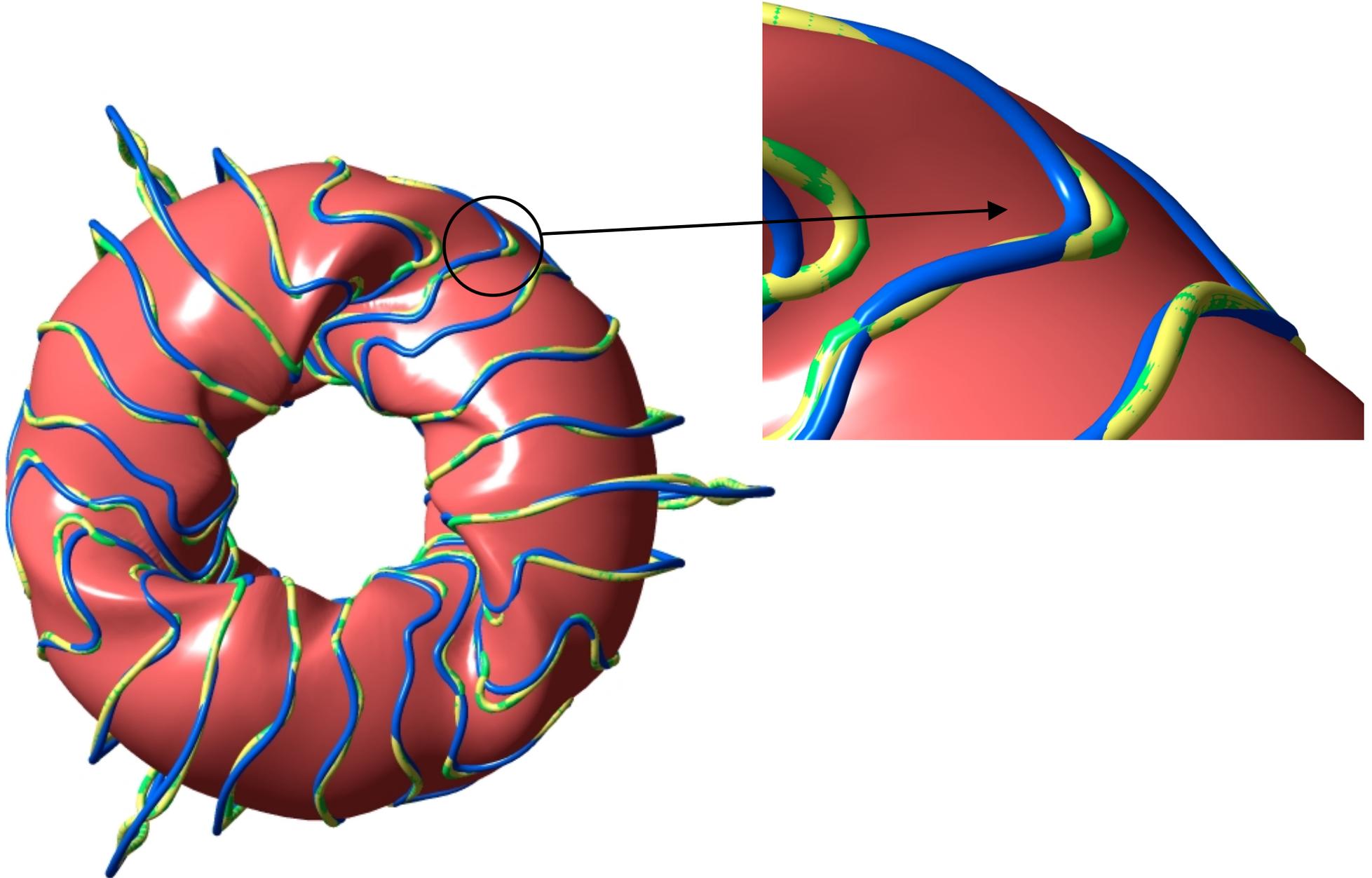
- Radius of curvature measured from winding center
- Case 0227 min radius of curvature is ~25% smaller than Case 1017
- Minimum occurs several places per coil but can be modified in ProE

case #	coil #	length (m)	min bend radius (cm)	max bend radius (m)	
1017	1	6.088	8.5	1.3	
	2	5.990	7.4	11.6	
	3	6.545	9.2	3.1	
	4	7.564	5.5	2.8	
0227	1	6.324	6.5	3.8	
	w/ TF	2	6.444	5.3	7.2
	3	6.612	8.0	4.7	
	4	7.565	5.5	2.1	
0227-modified	1	6.250	9.4	6.6	
	w/ TF	2	6.362	8.5	21.2
	3	6.597	10.4	2.8	
	4	7.427	11.8	2.2	

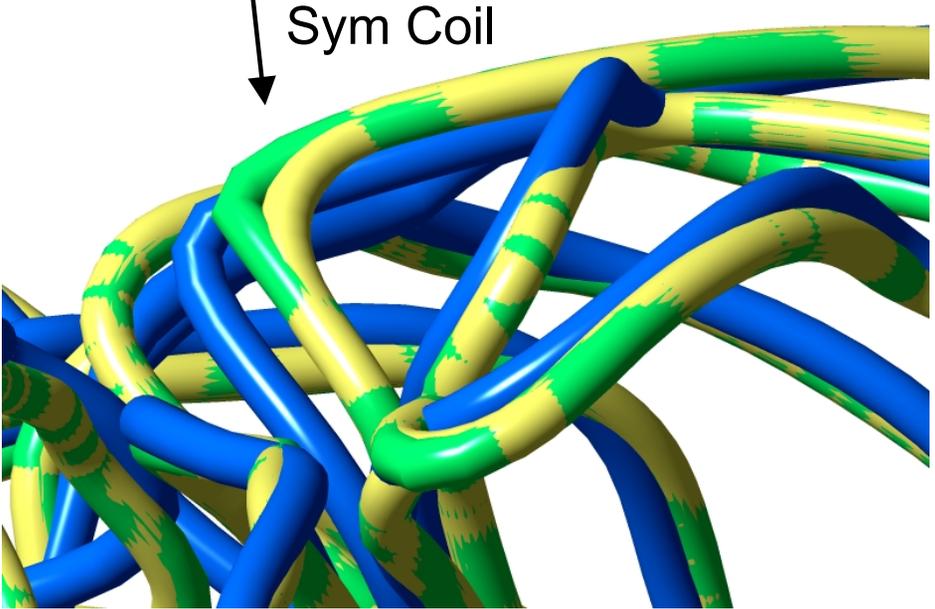
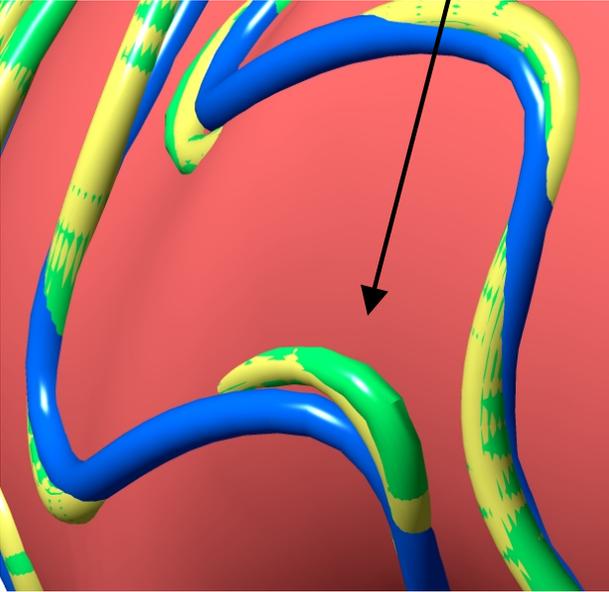
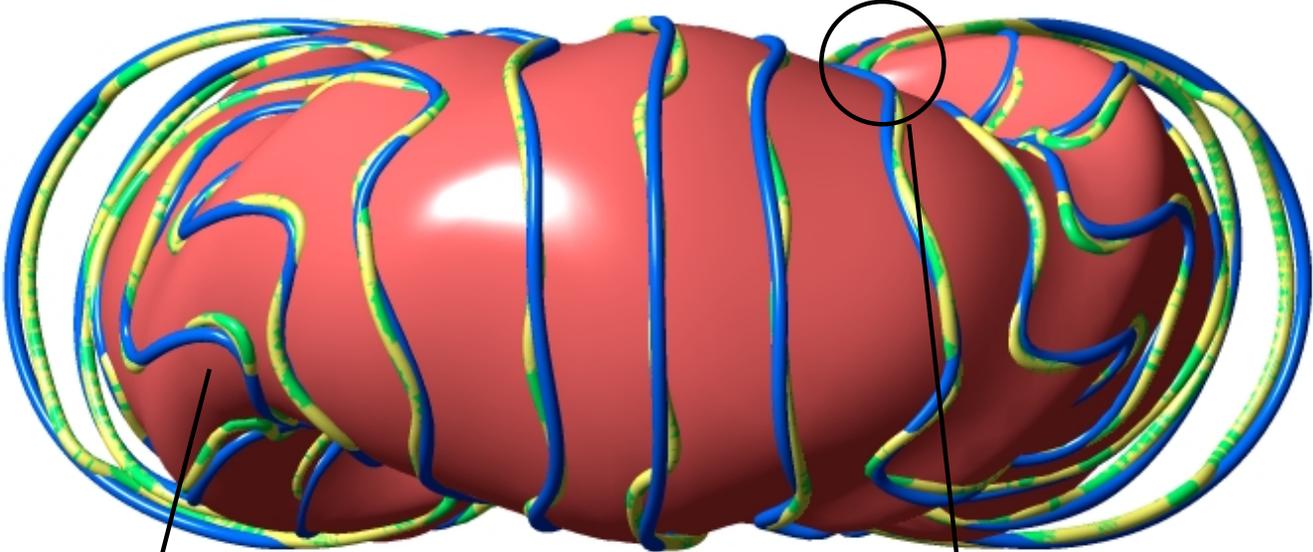


Coil sets 1017 (blue), 0227 (green), 0227-modified (yellow)

- Maximum deviation of modified winding center is 6.1-cm

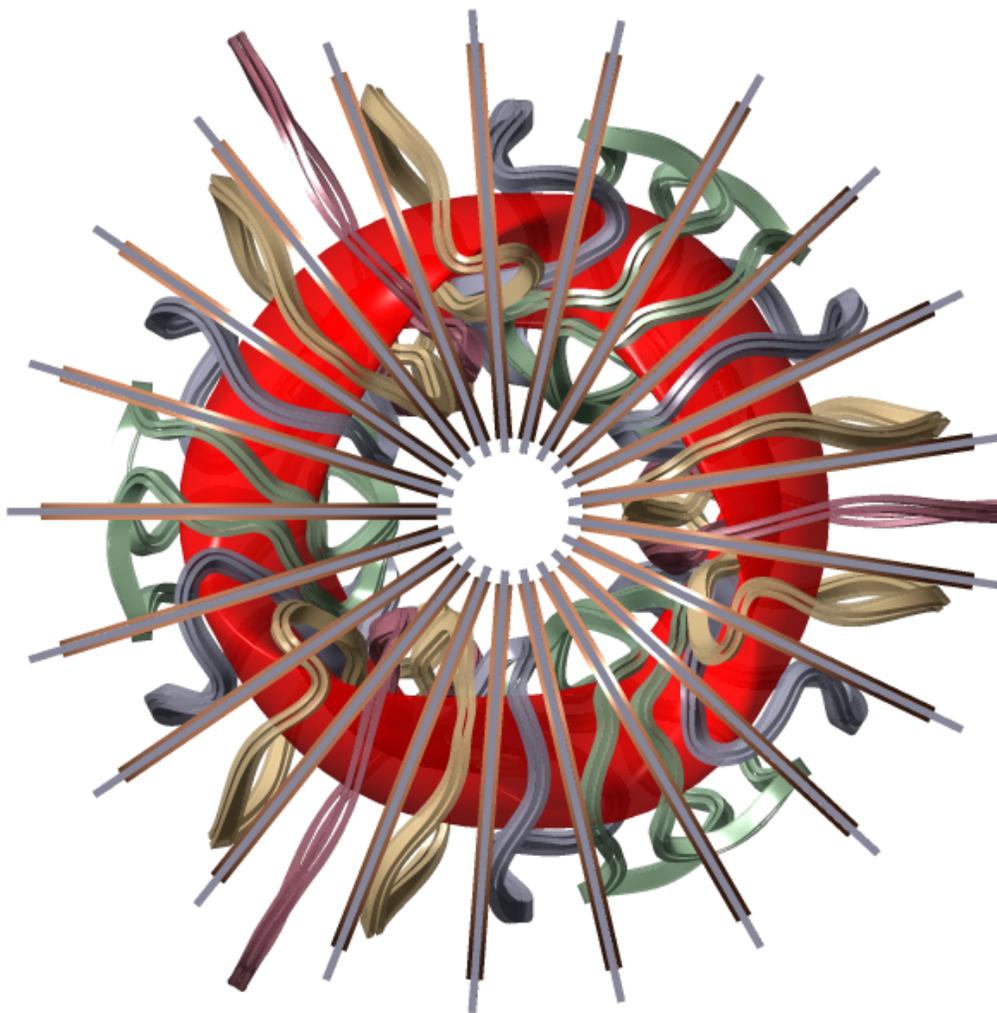


Coil sets 1017 (blue), 0227 (green), 0227-modified (yellow)

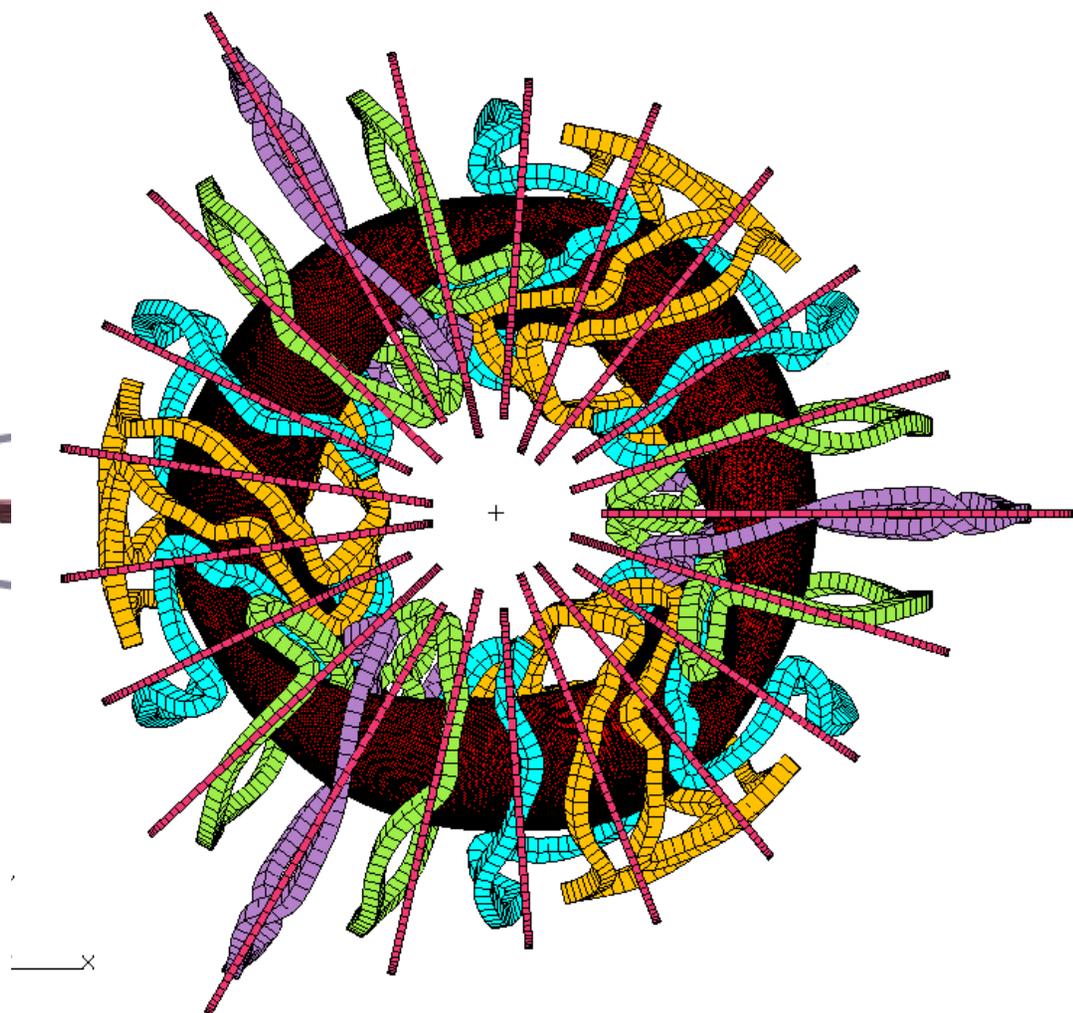


Access is Generic Issue with 21 Coil Design

- Centered TF coils, conformal shapes may improve access

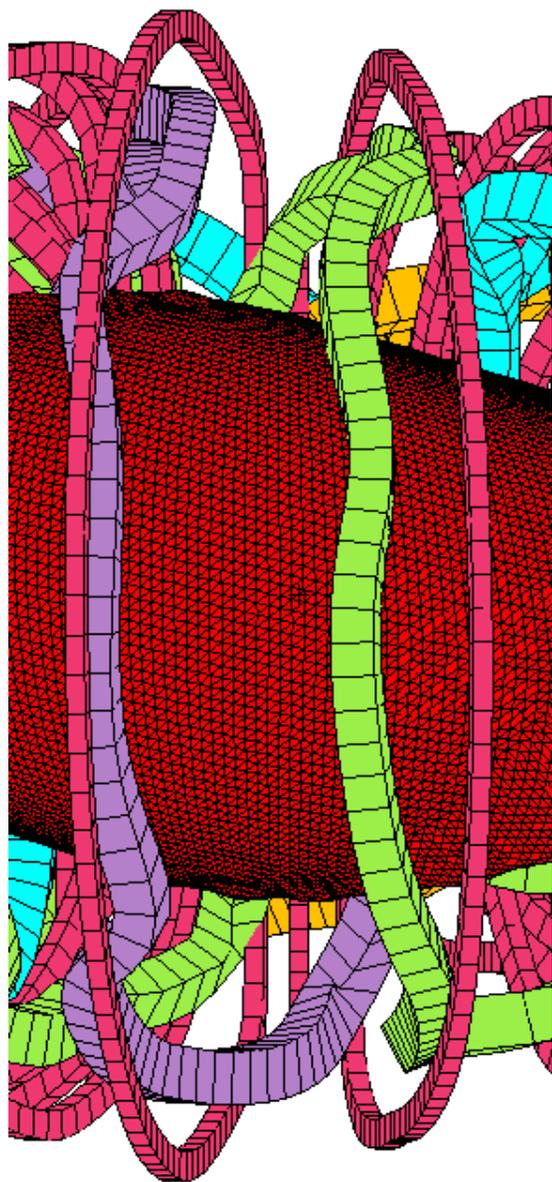


Case 1017 with TF
Between Modular Coils

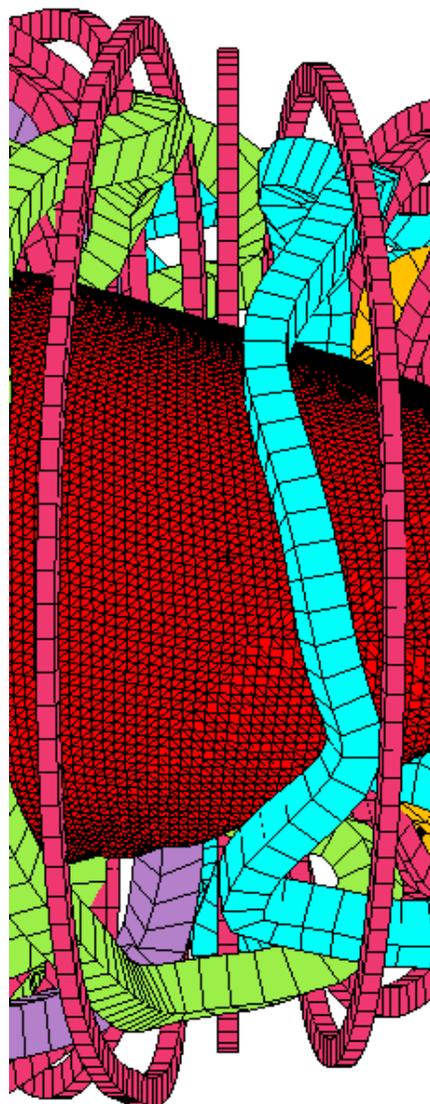


Case M12 with TF
Centered on Modular Coils

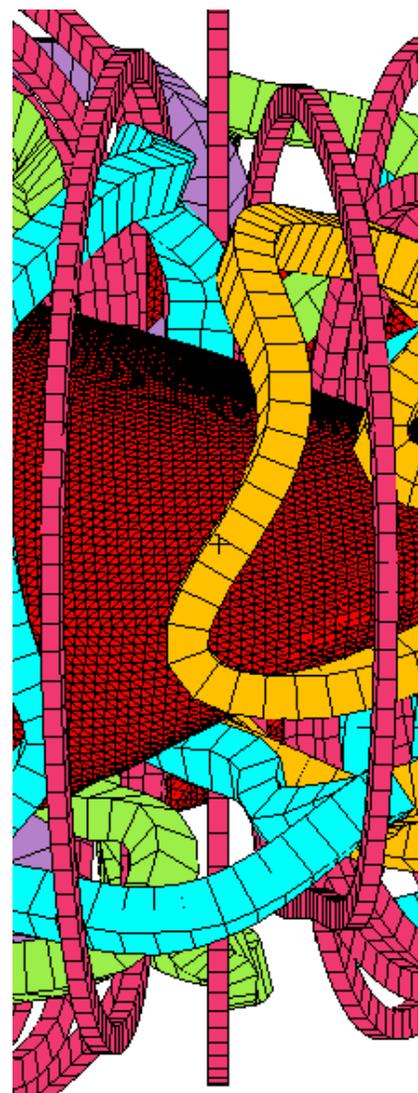
View Between Coils for Case 0227 (m12)



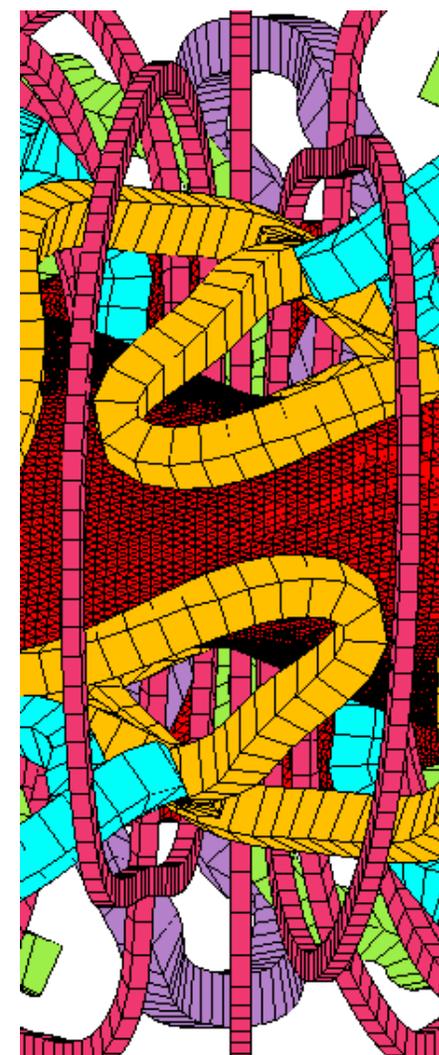
Phi = 8.571-deg



Phi = 25.71-deg

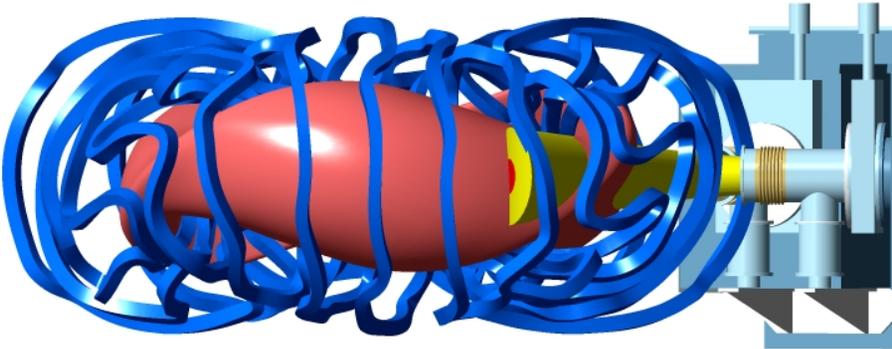
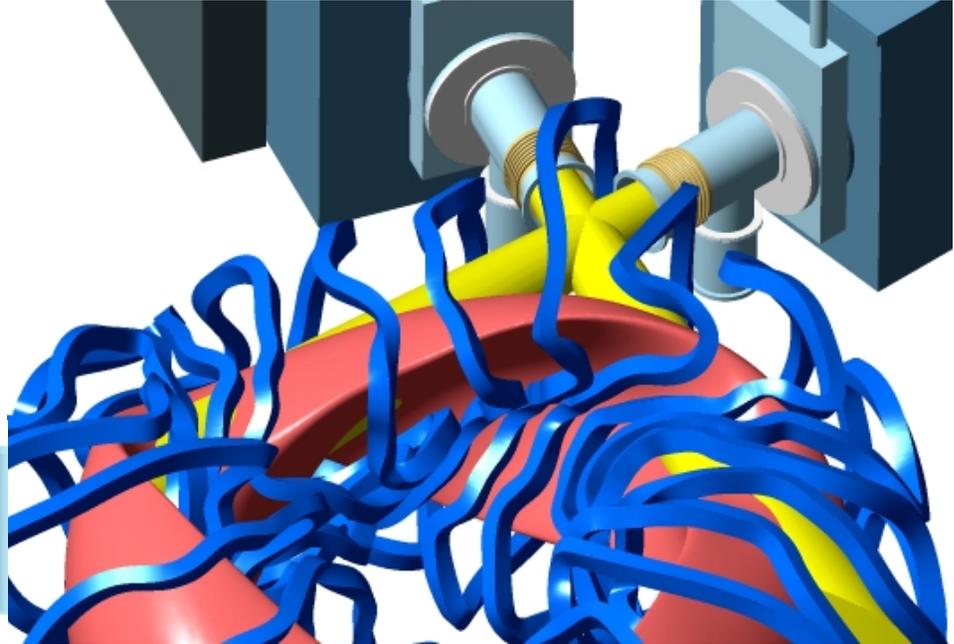
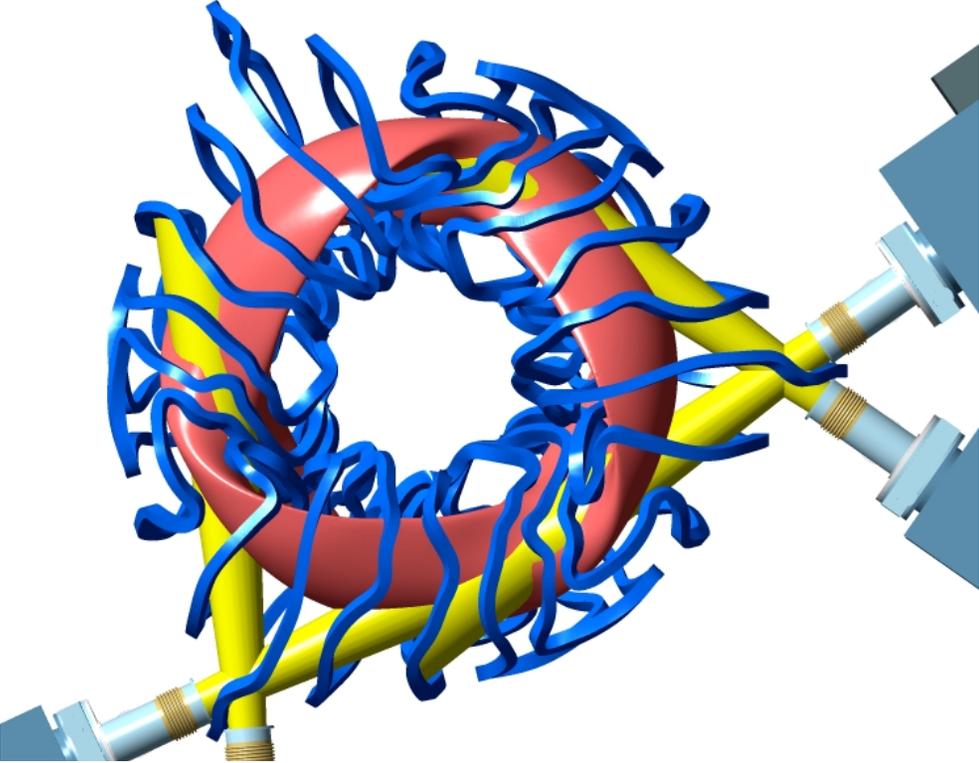


Phi = 42.86-deg



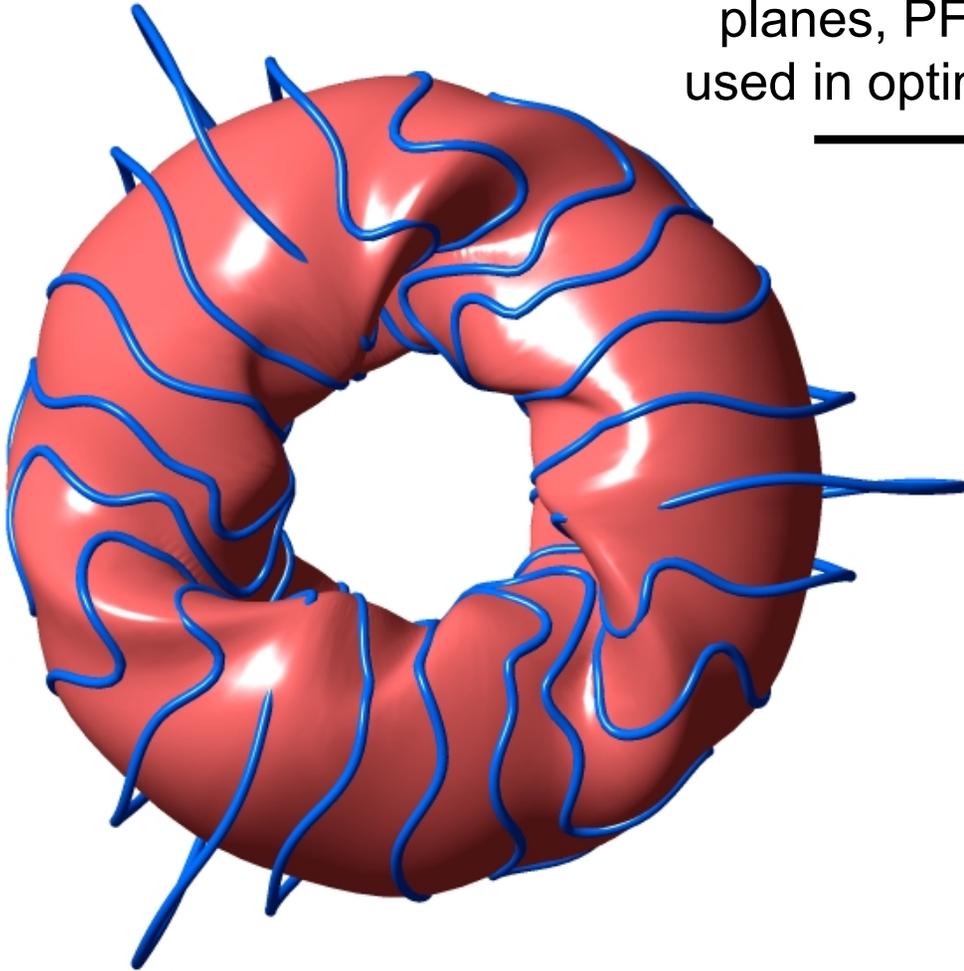
Phi = 60.-deg

Neutral Beam Access for Case 0227 (m12)

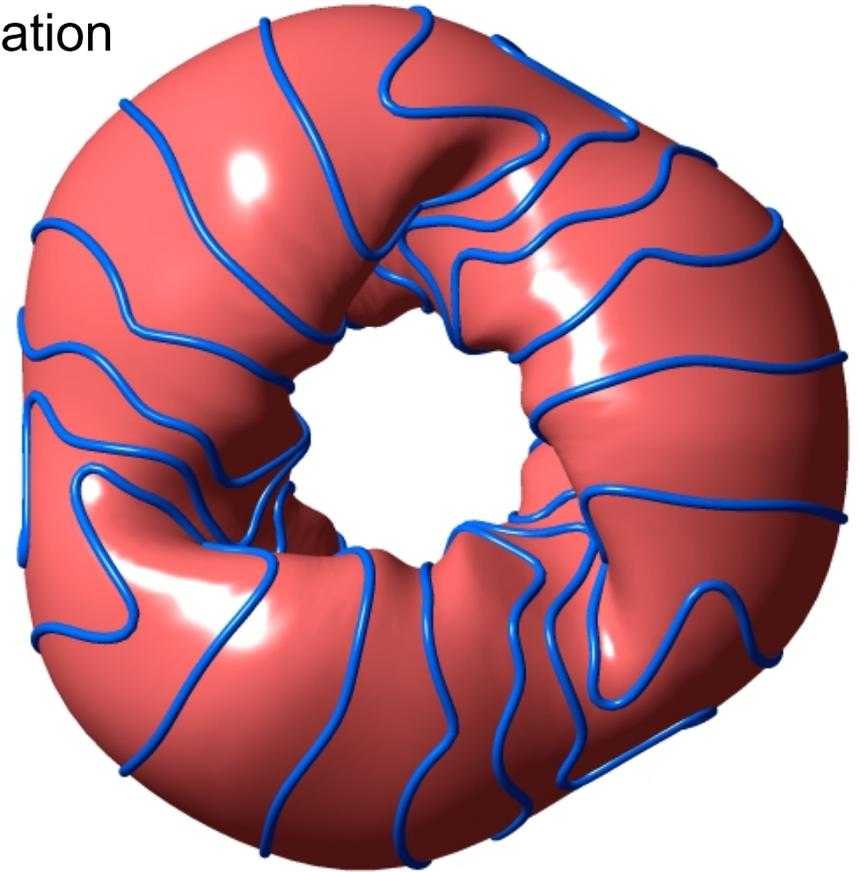


Case 0628 Illustrates 18-Coil Concept Features

No coil on symmetry
planes, PF & TF
used in optimization

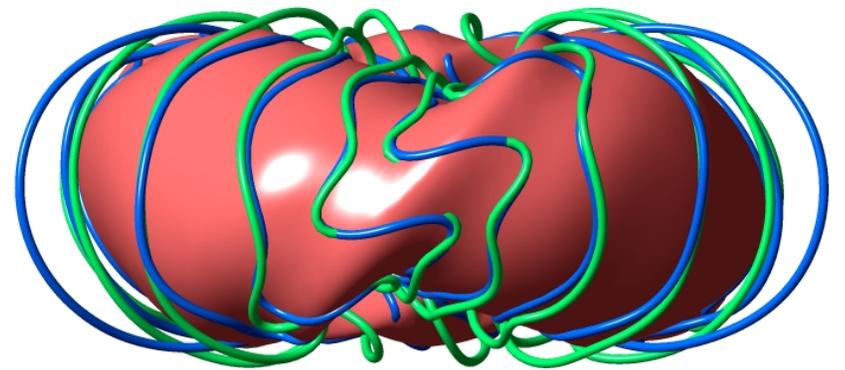
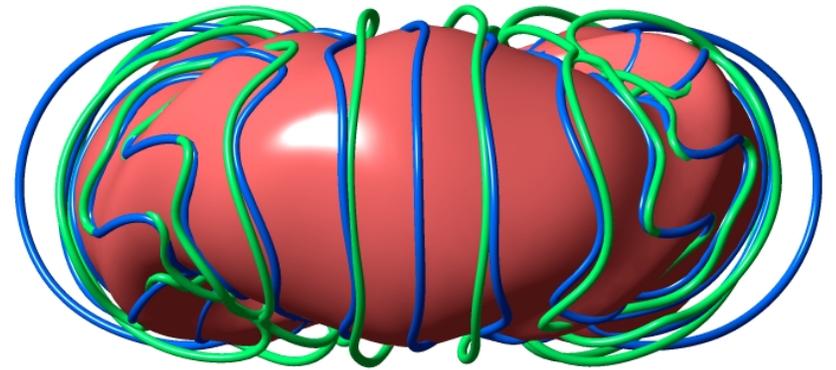
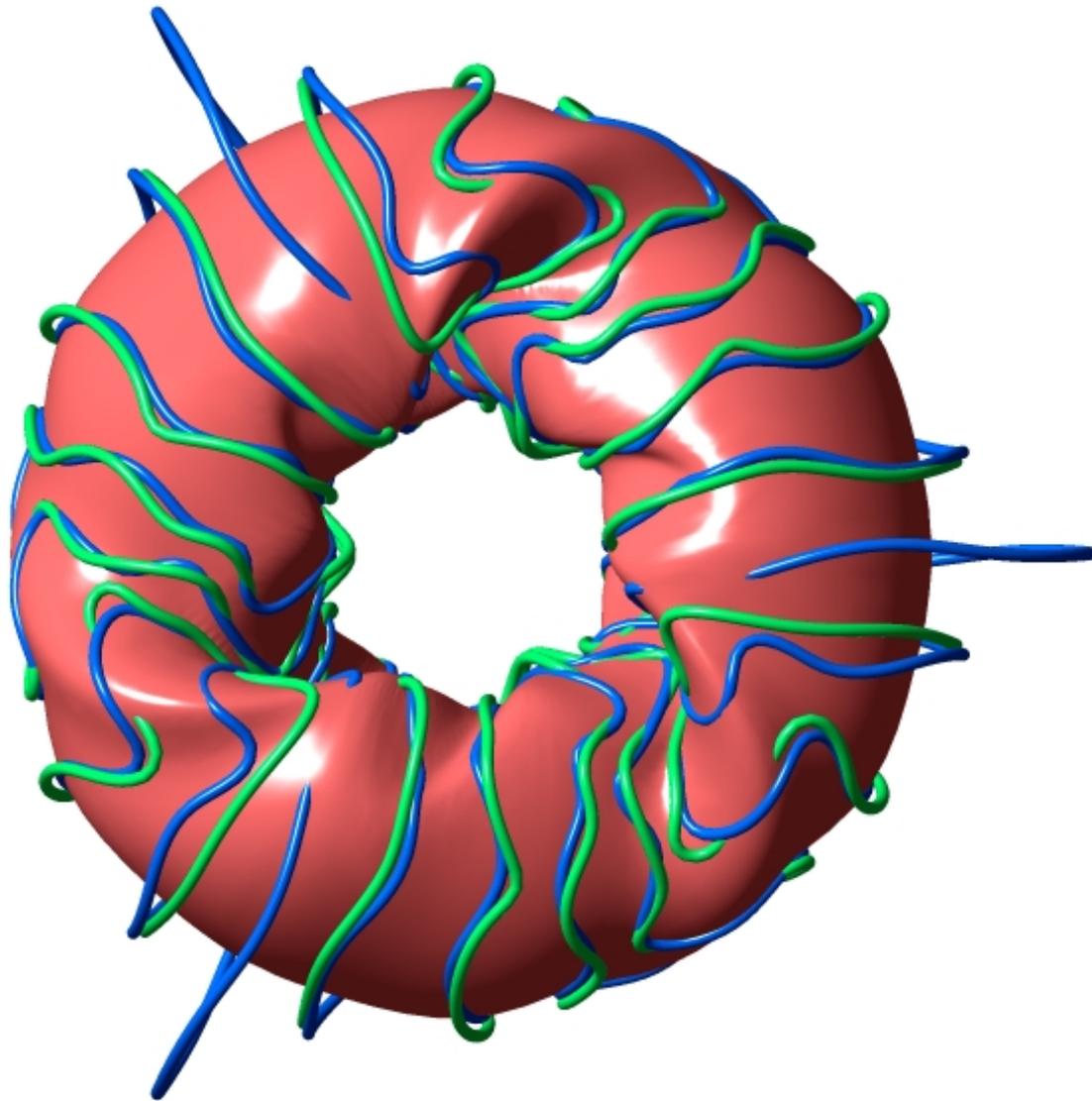


Case 1017



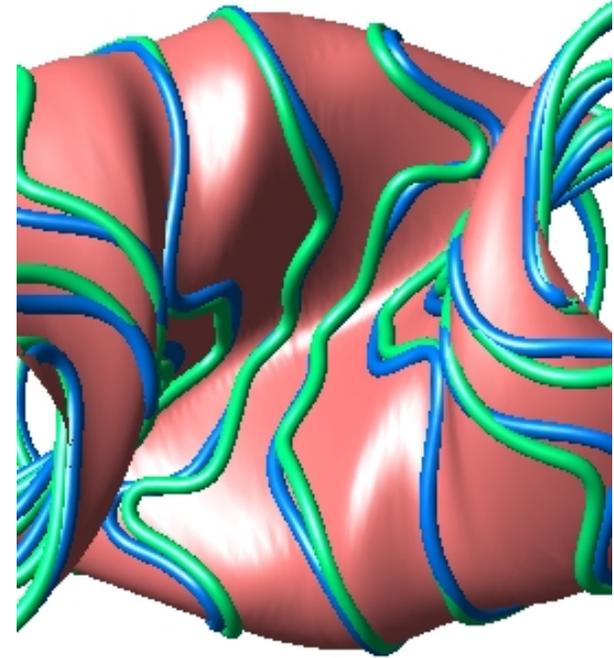
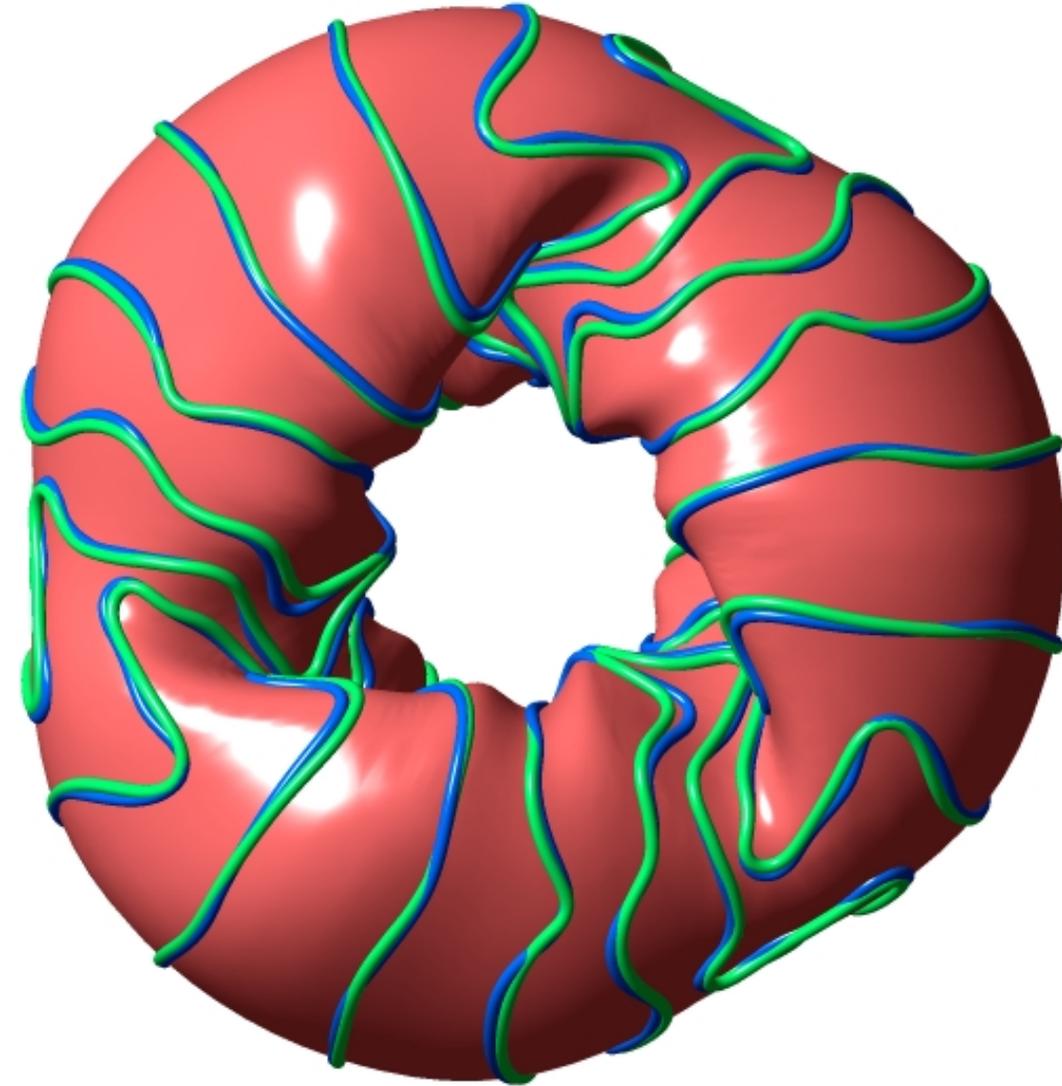
Case 0628

Coil sets 1017 (blue) and 0628 (green)

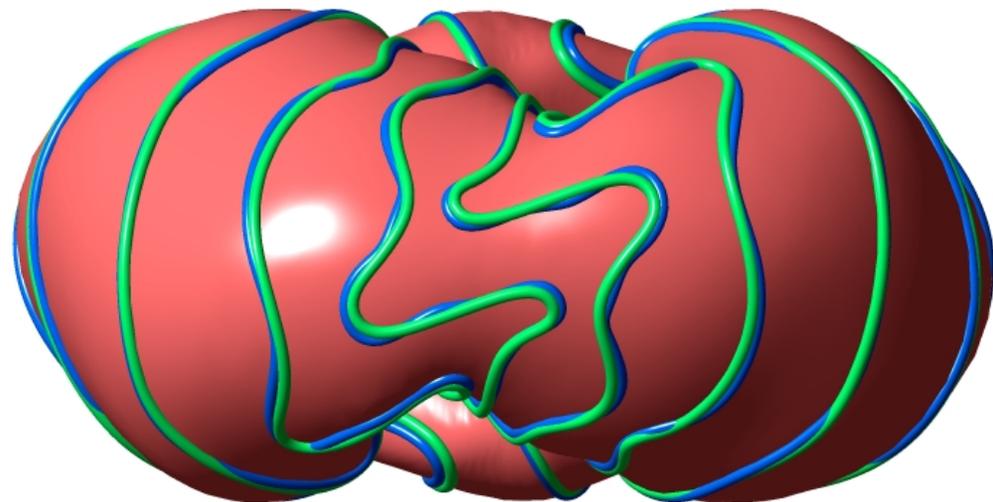


Coil sets 0711 (blue) and 0717 (green)

- Case 0711 TF in same direction as mod coils, Case 0717 is opposite

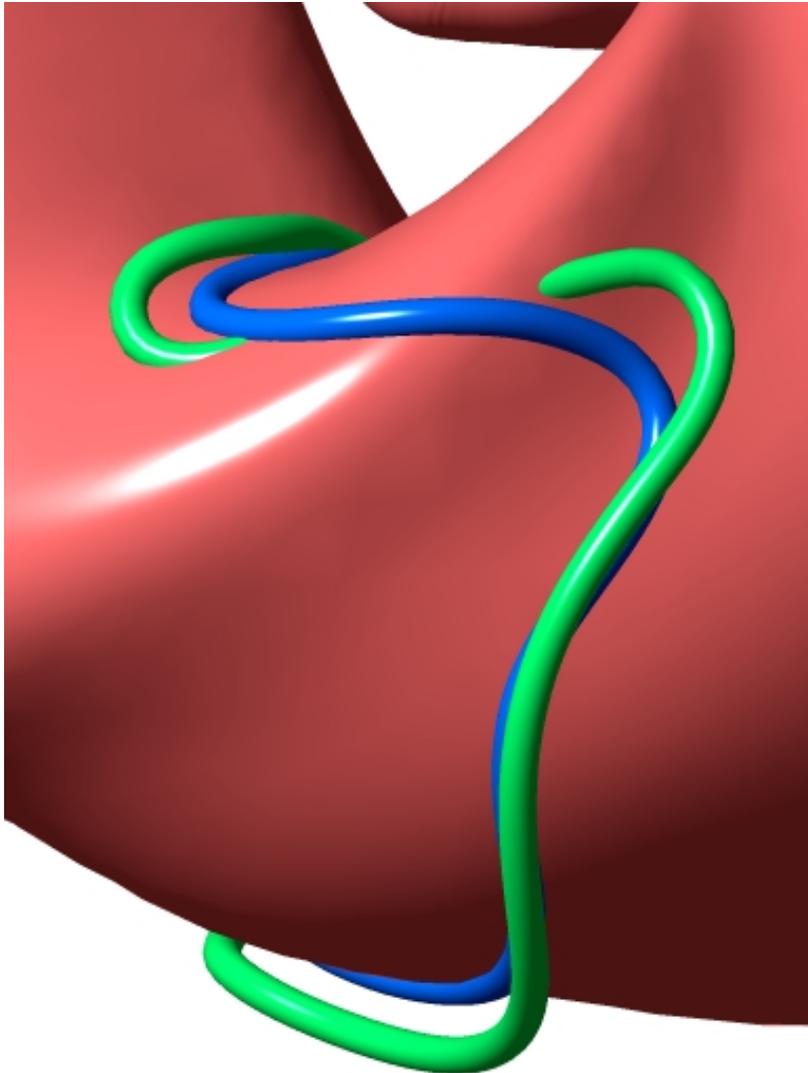


V=0 (inside looking out)



Bend Radius is Improved with 18-Coil Concept

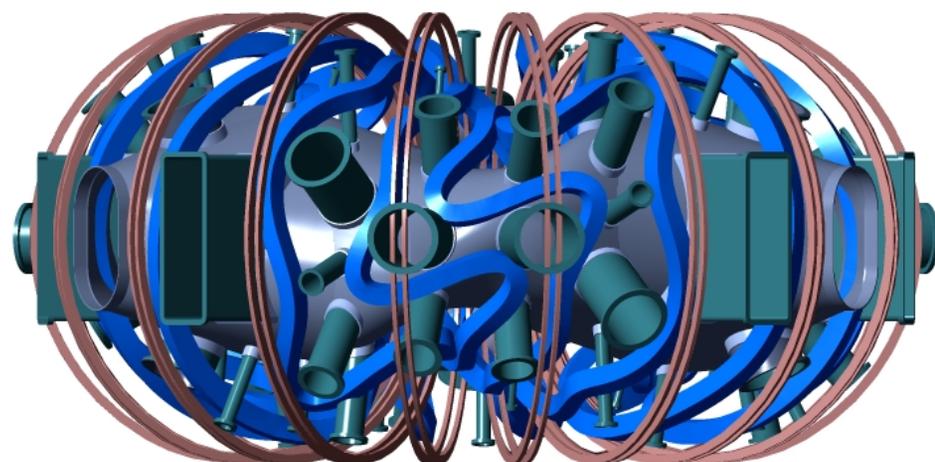
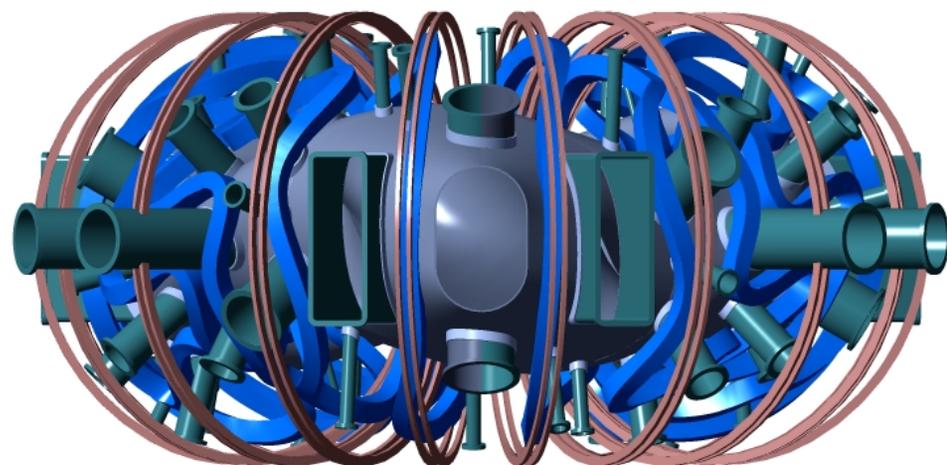
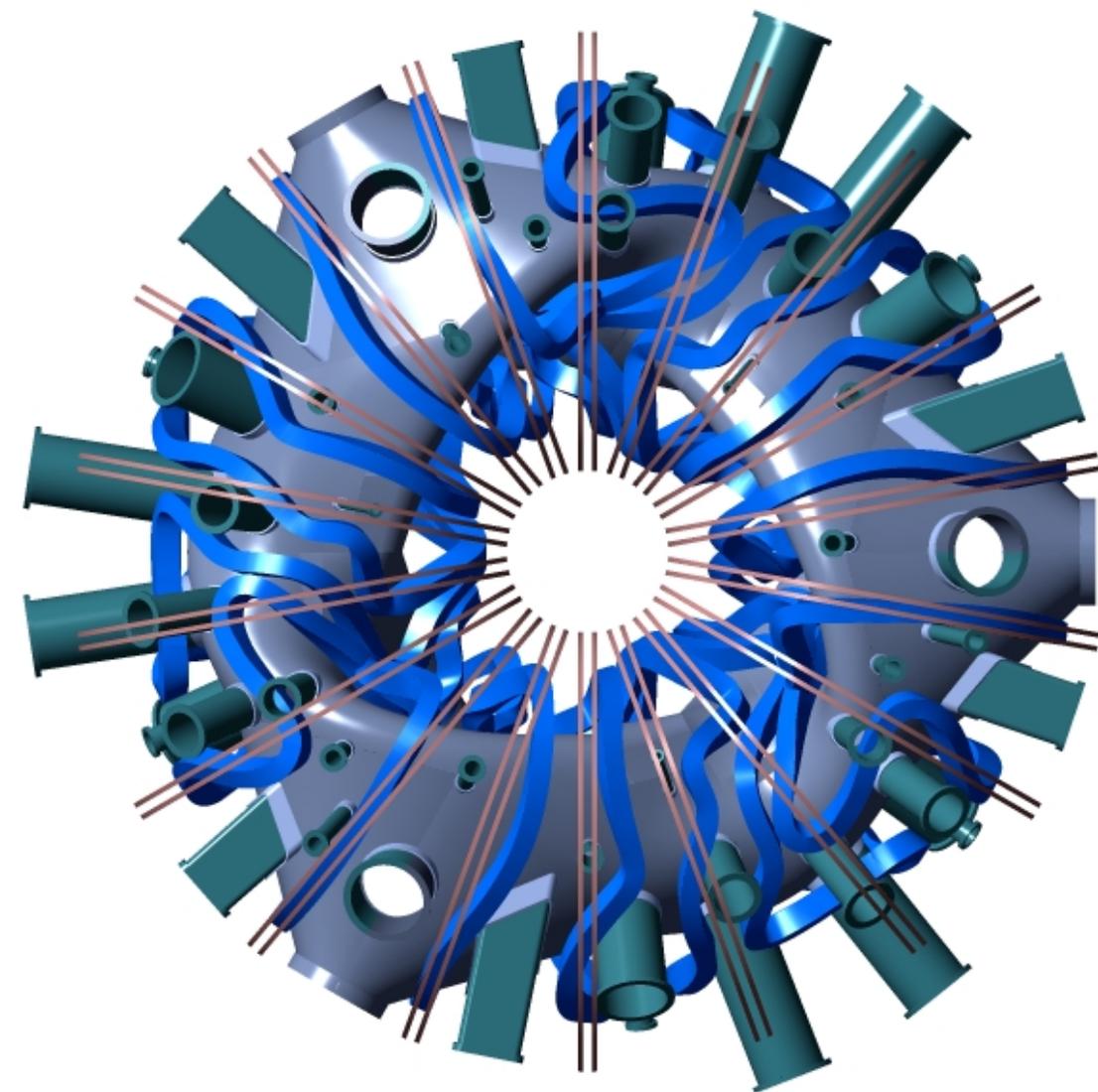
- Coil M2-1017 (blue) and M2-0708 (green)



case #	coil #	length (m)	min bend radius (cm)	max bend radius (m)	
1017	1	6.088	8.5	1.3	
	2	5.990	7.4	11.6	
	3	6.545	9.2	3.1	
	4	7.564	5.5	2.8	
0227	1	6.324	6.5	3.8	
	w/ TF	2	6.444	5.3	7.2
	3	6.612	8.0	4.7	
	4	7.565	5.5	2.1	
0227-modified	1	6.250	9.4	6.6	
	w/ TF	2	6.362	8.5	21.2
	3	6.597	10.4	2.8	
	4	7.427	11.8	2.2	
0628	1	6.445	9.8	19.0	
	w/ PF	2	6.961	9.2	20.0
	3	7.054	9.1	12.8	
0708	1	6.593	9.8	24.1	
	w/ PF, TF	2	7.062	9.4	14.9
	3	7.036	9.6	2.5	
0711	1	6.999	9.2	14.4	
	w/ PF, TF	2	7.034	8.6	13.1
	3	7.068	9.2	2.8	
0717	1	6.717	8.4	11.0	
	w/ PF, TF	2	6.880	7.9	5.6
	3	7.127	8.0	15.4	

Access is Improved with 18-Coil Concept

- Case 0620 shown with 18 centered TF coils and PVR vacuum vessel



Summary / Conclusions

Case 0227 (m12) geometry looks OK with local modifications; selection as reference design depends on physics evaluation.

18-coil concepts have some advantages:

- only 3 coil types
- larger min radius of curvature
- smoother winding surface, coils lay on surface
- improved access between coils