

Modular Coil Design Update

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NCSX Project Meeting
Jan 15, 2003

Status of Modular Coil Models

Modeling Tasks	Who	Finish
Orient winding packs, create winding center and x-vector curves	DW	10-Jan
Define maximum winding pack dimensions	DW	10-Jan
Define surfaces for main shell, wings for each coil	DW	15-Jan
Create integral shell and tee models	DW	22-Jan
Develop vessel model and port layout	AB/MC/DW	22-Jan
Add port openings, vessel support details	DW/TH/MC	29-Jan
Add poloidal break, flange and bolting details	DW/TH/MC	29-Jan
Add crossover, leads, and clamp machining details	DW/TH/MC	29-Jan
Add TF/PF interface and support features	DW/TH/MC	29-Jan
Create STL model of coils, vessel for asm verification	DW	14-Feb
Create overall dimension drawings for M1, M2, M3	TH/GL/GF	14-Feb
Create detail drawings for M1	TH/GL/GF	14-Feb
Develop FE models for EM, structural analysis	DW/HMF	28-Feb

Modular Coil Parameters

NCSX Coil Set# m50_256.z01									
Coil ID	M1		M1		M2		M3		M3
V-Toroidal			0.09		0.26		0.43		
Length (in)			290.7		283.4		263.2		
Min Bend Rad (in)			4.2		4.4		4.2		
Max Bend Rad (in)			94		168		480		
Min WS Radius (in)	3.7								
Min Plasma Dist (in)			tbd		tbd		tbd		
Max Plasma Dist (in)			tbd		tbd		tbd		
Min Coil- Coil Dist (in)		7.56		6.31		6.09		6.85	
Max Coil- Coil Dist (in)		35.0		36.4		30.7		26.7	
Nom Coil Current (kA)			537.7		651.9		652.3		

CDR

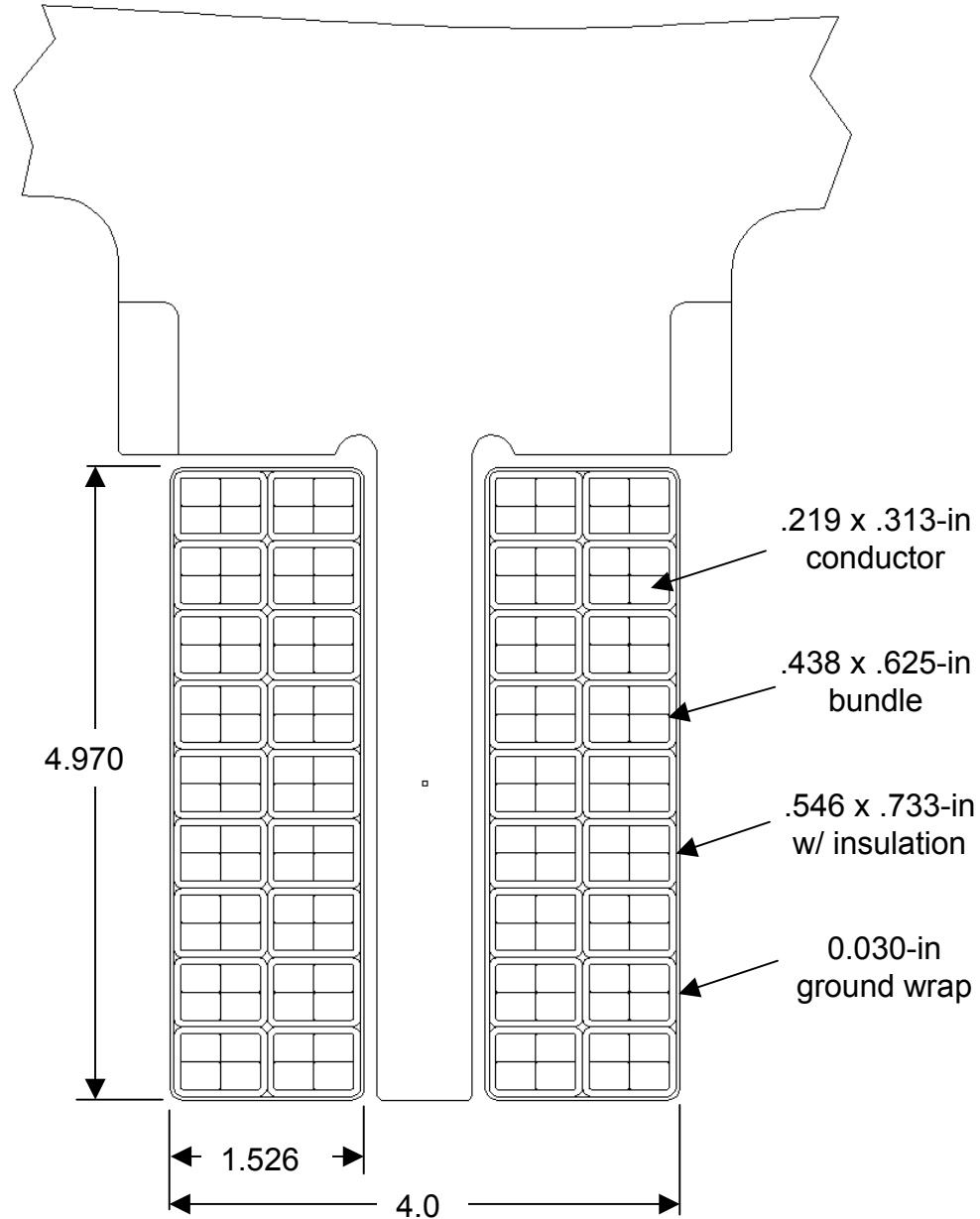
6.4

694

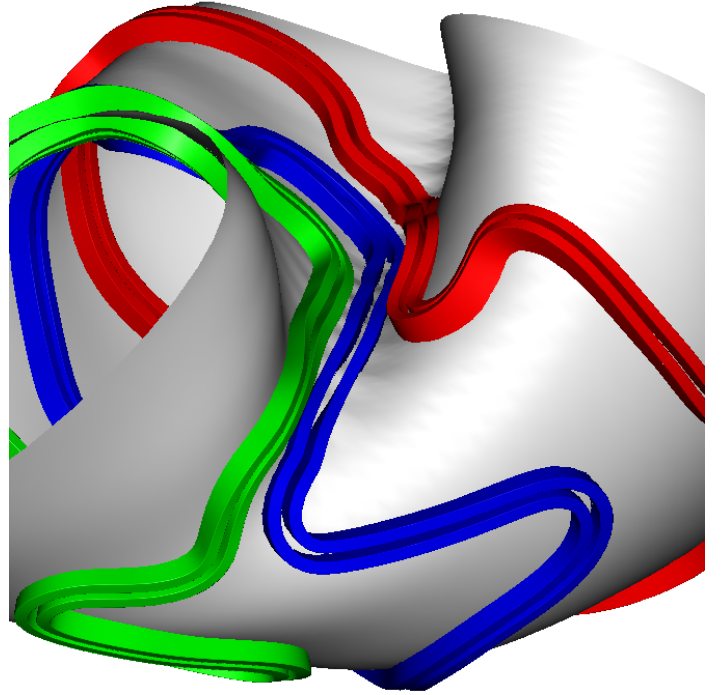
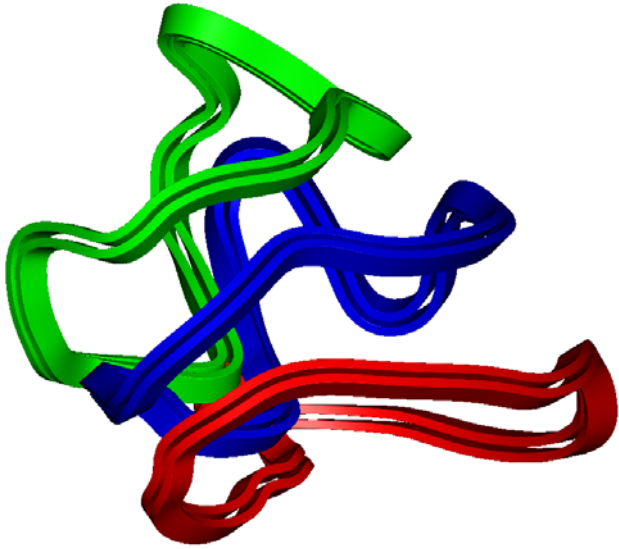
Winding Pack Dimensions

Current / Turn = 18.1-kA

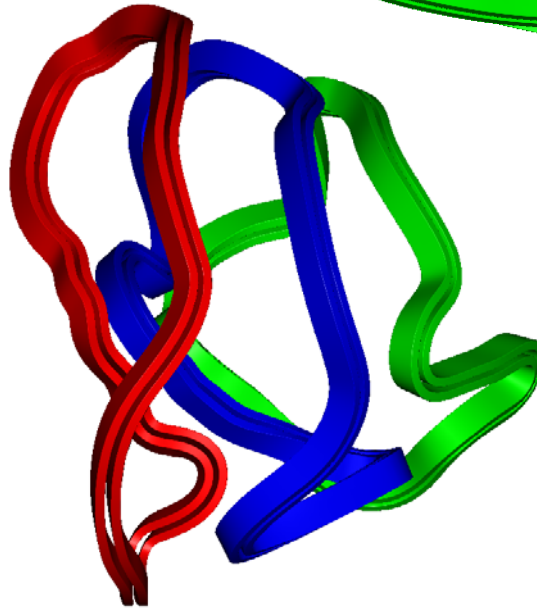
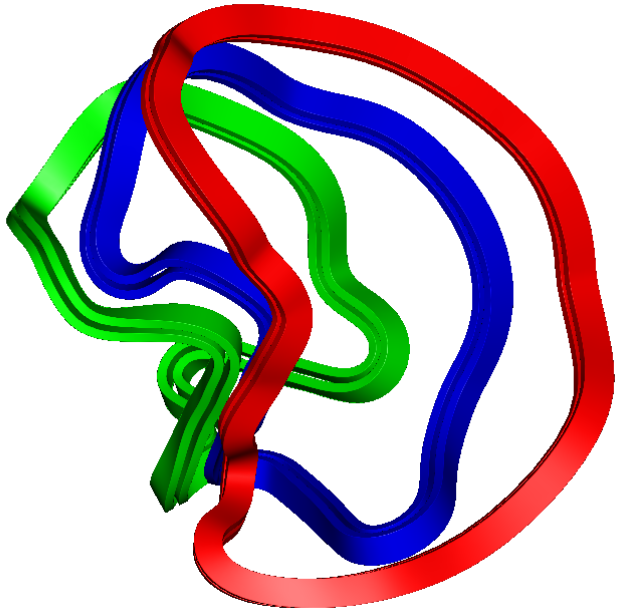
Cur Dens = 12.7-kA/cm²



Winding Pack Assembly

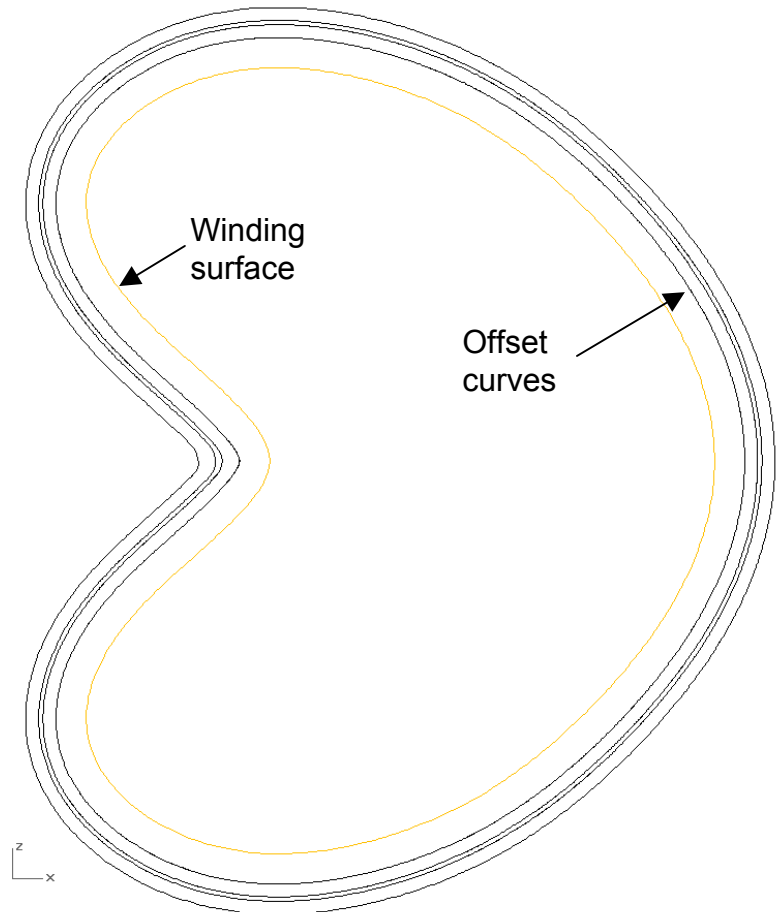
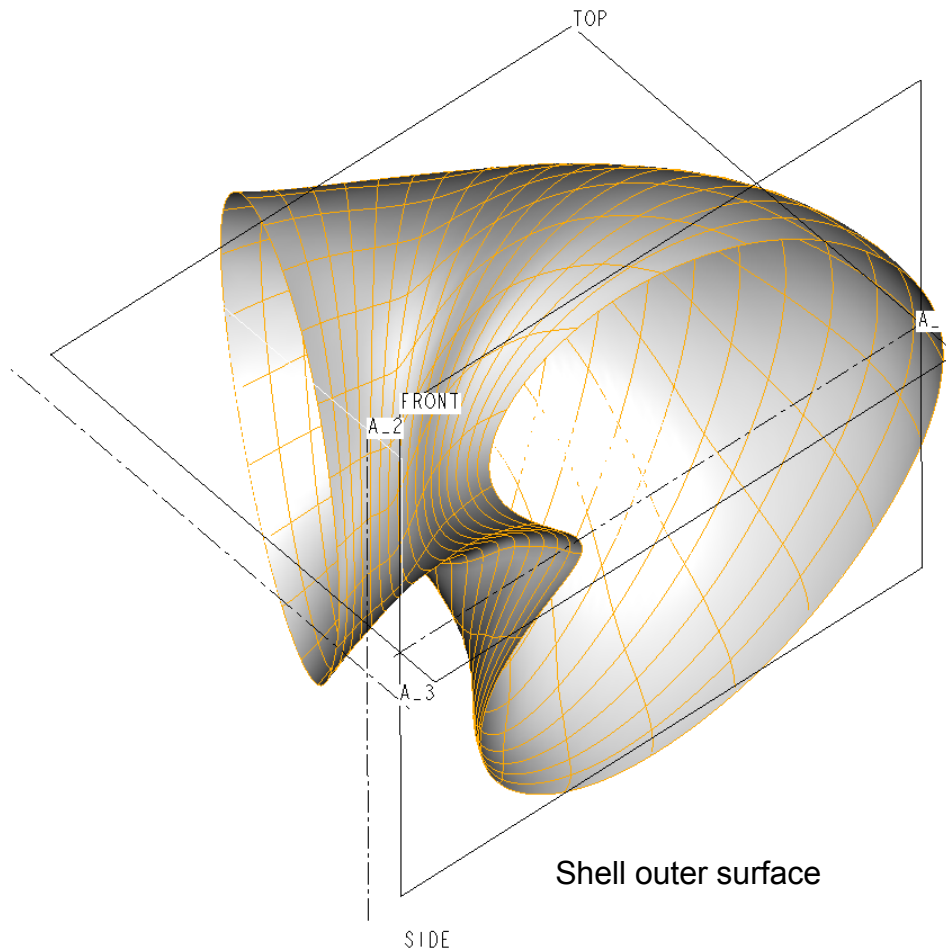


"Trough" View



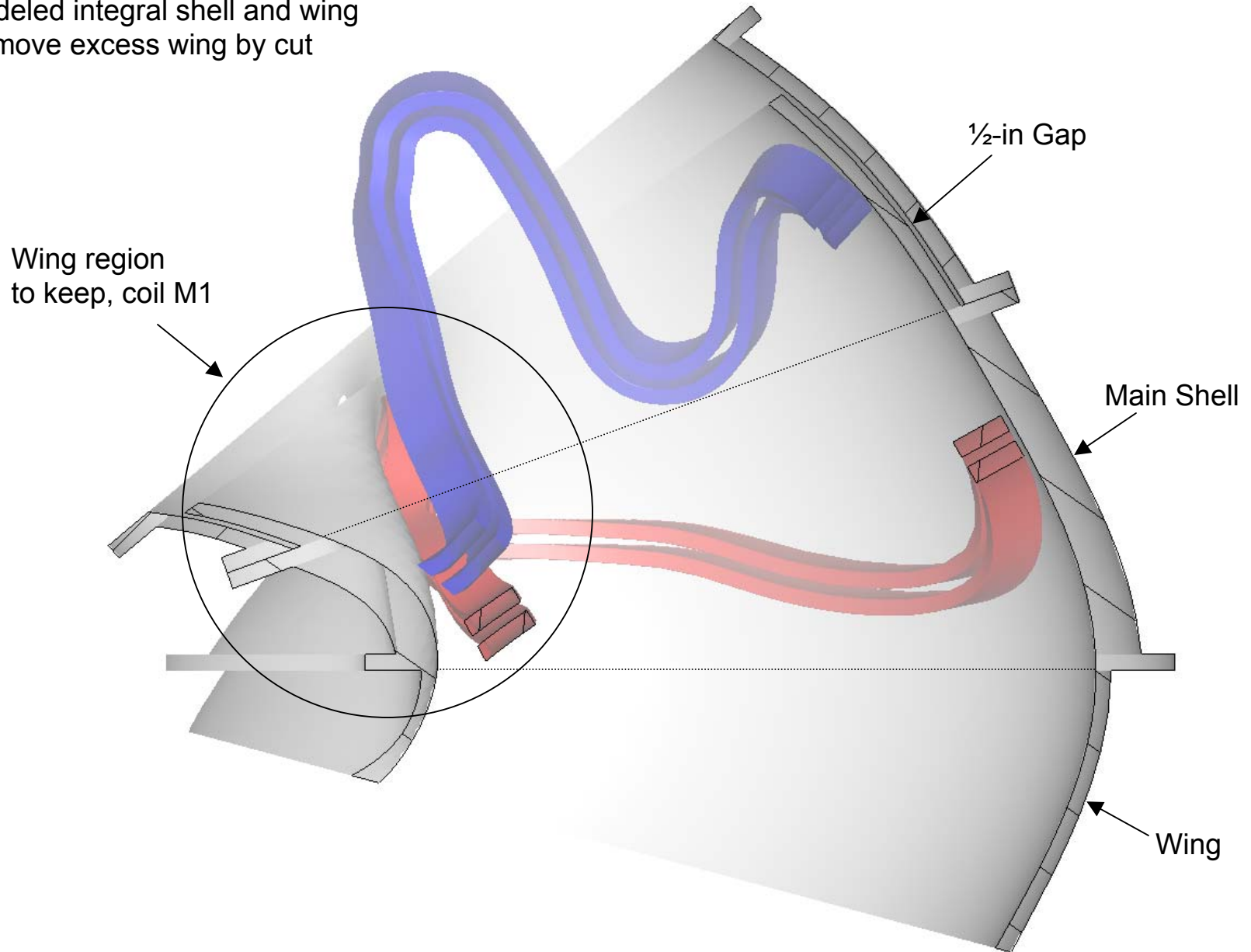
Method for Creating Shell Geometry

- Offset winding surface curves to get multiple independent surfaces
- Cut and blend curves to remove fold-over
- Create loft surface, smooth by global average of control points
- Create surface wireframe, use as 1st and 2nd direction curves
- Surface can be adjusted by editing the direction curves



Shell and Wing Geometry

- Modeled integral shell and wing
- Remove excess wing by cut



Issues

- ProE variable section sweep fails for M1-tee, inboard region
- Plan to segment the sweep, use blend in areas
- Inner/outer surfaces need checking to verify thickness

