

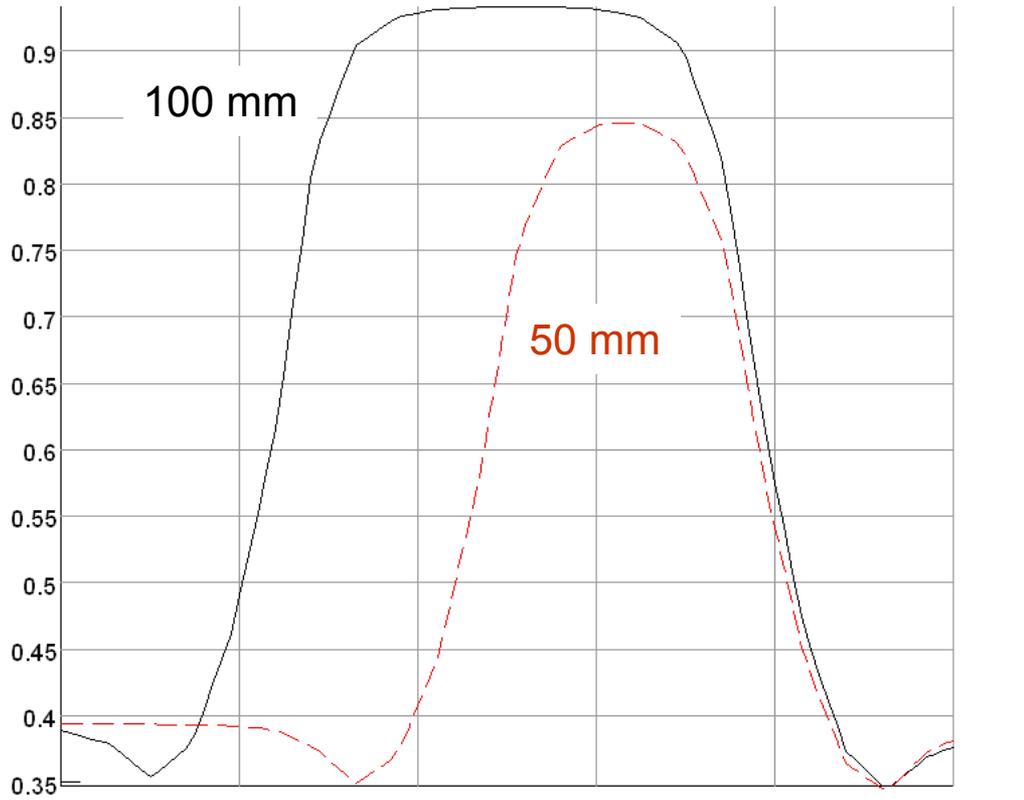
NSLS2 Dual Field Dipole

Ramesh Gupta
Superconducting Magnet Division

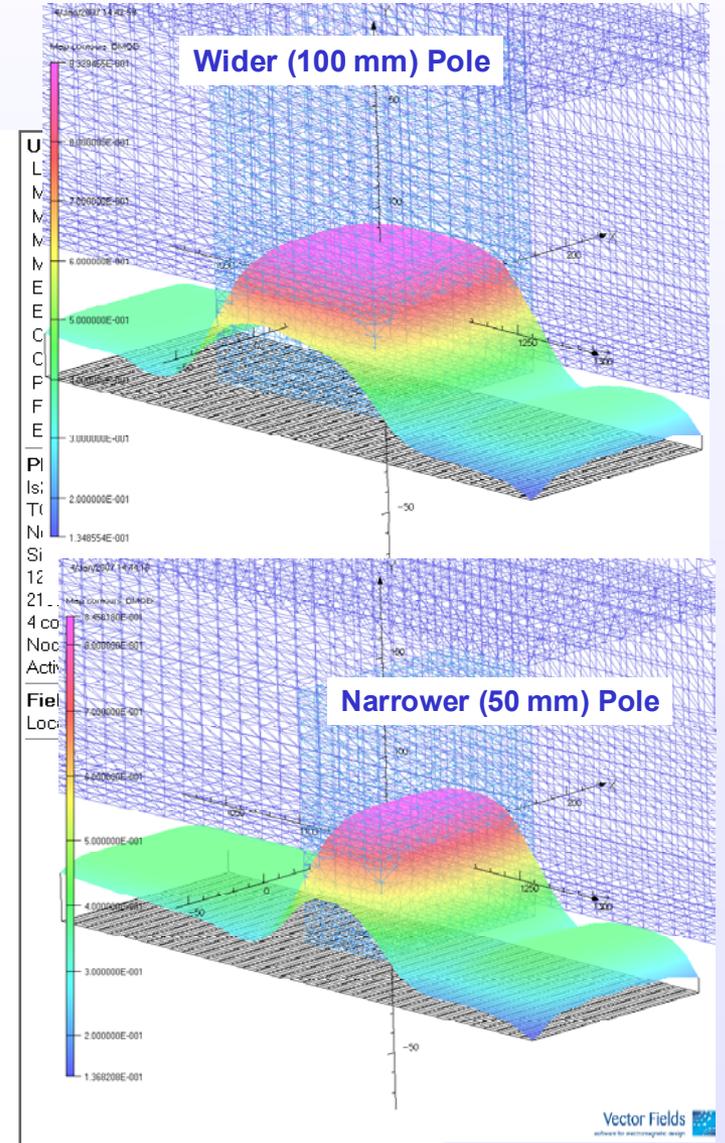
Case Study of Narrower Pole (50 mm instead of 100 mm wide)

Conclusion from the last meeting: 100 mm or even 50 mm wide pole was too big. For 2 mrad, we need more like 20 mm wide pole.

08:05:31

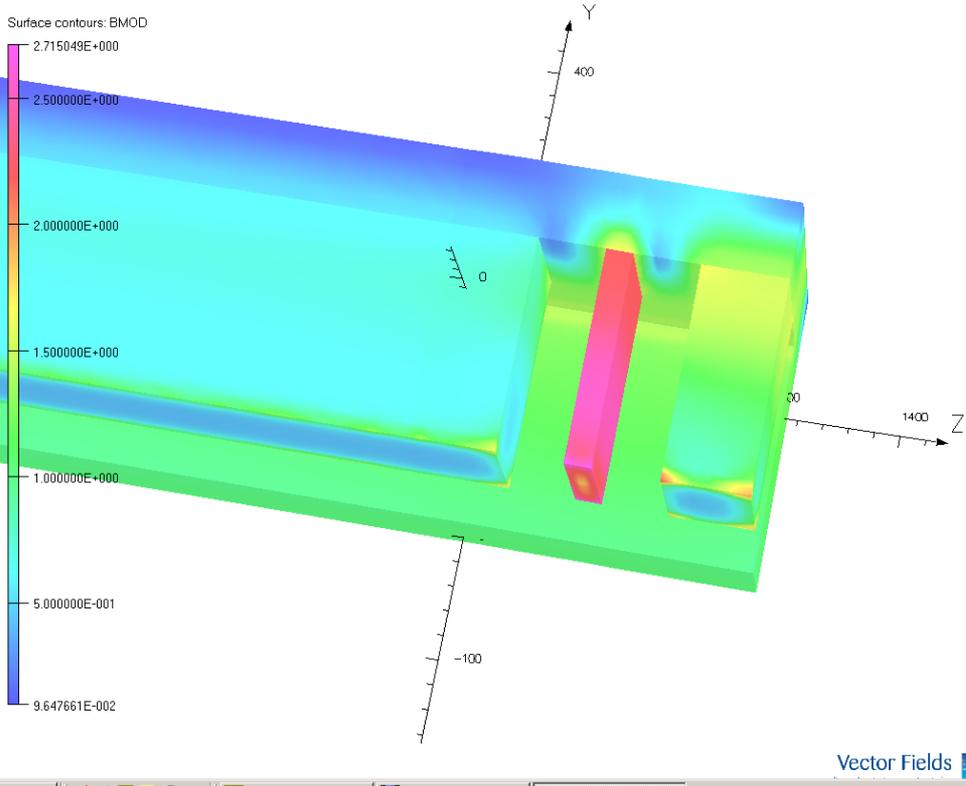


Component: BMOD, Integral = 146.464070883902
Component: BMOD, Integral = 113.733816534223



Computer Models with 20 mm Wide Powered Tooth

11/Jan/2007 14:24:51

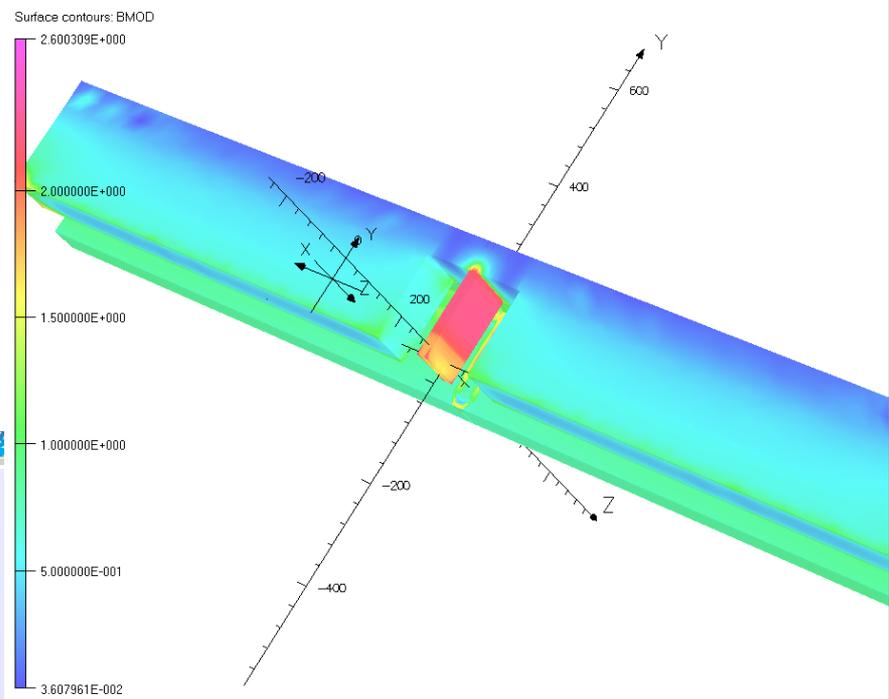


UNITS	
Length	mm
Magn Flux Density	T
Magn Field	A m ⁻¹
Magn Scalar Pot	A
Magn Vector Pot	Wb m ⁻¹
Elec Flux Density	C m ⁻²
Elec Field	V m ⁻¹
Conductivity	S mm ⁻¹
Current Density	A mm ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA	
Is2-cu4+5a3_1-20mm-a3.op3	
TOSCA Magnetostatic	
Nonlinear materials	
Simulation No 1 of 1	
12/Jan/2007 09:07:59	

Old model : Tooth towards one side
New model : Tooth in the middle

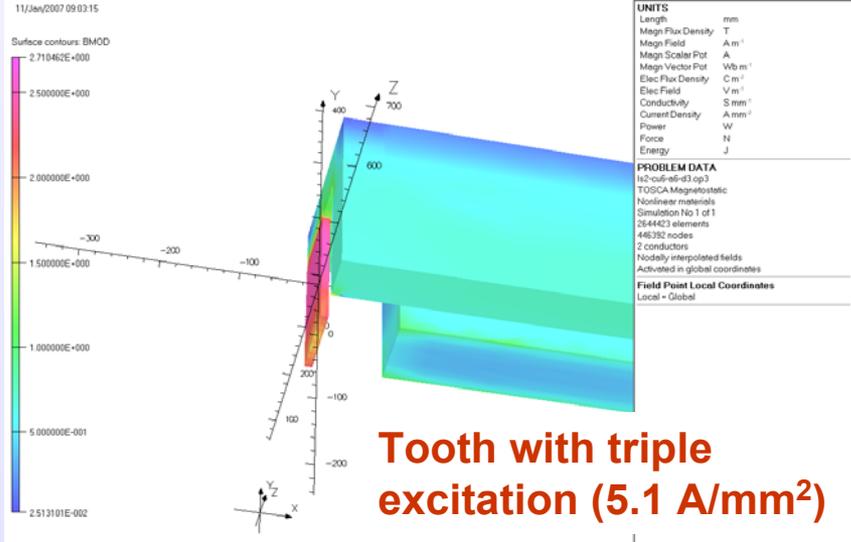
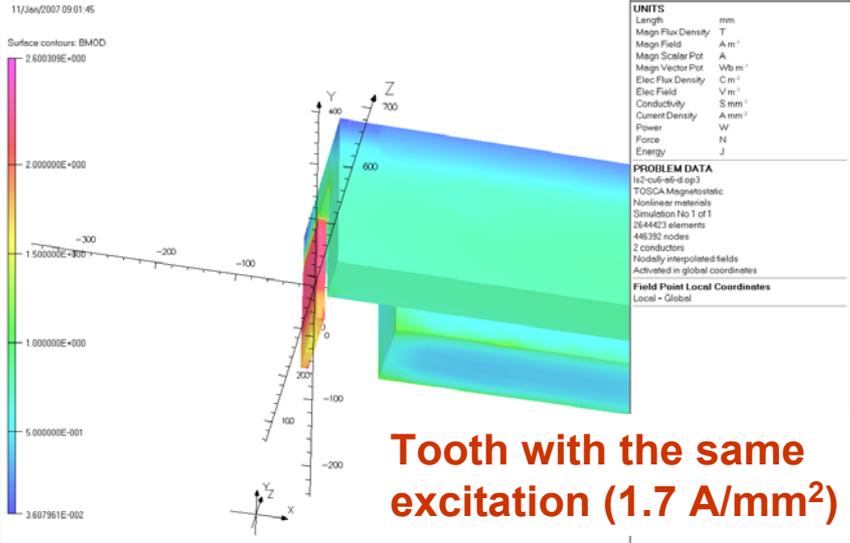
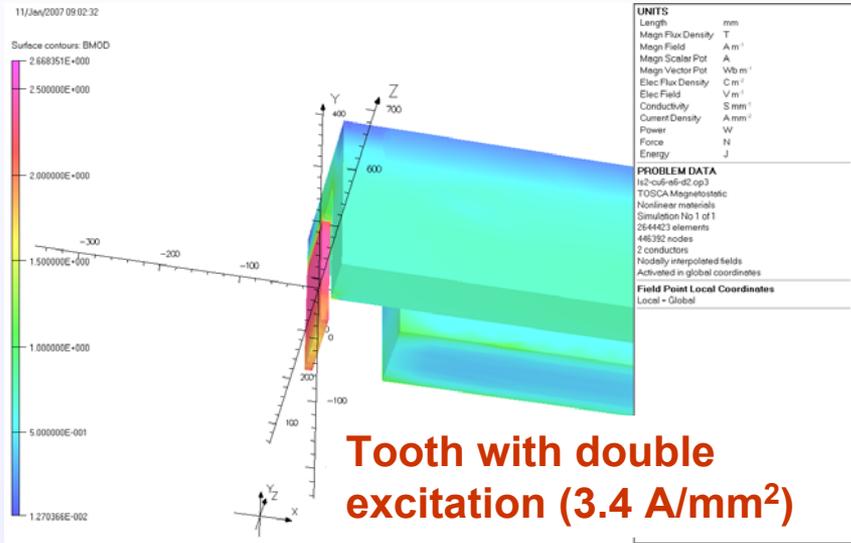
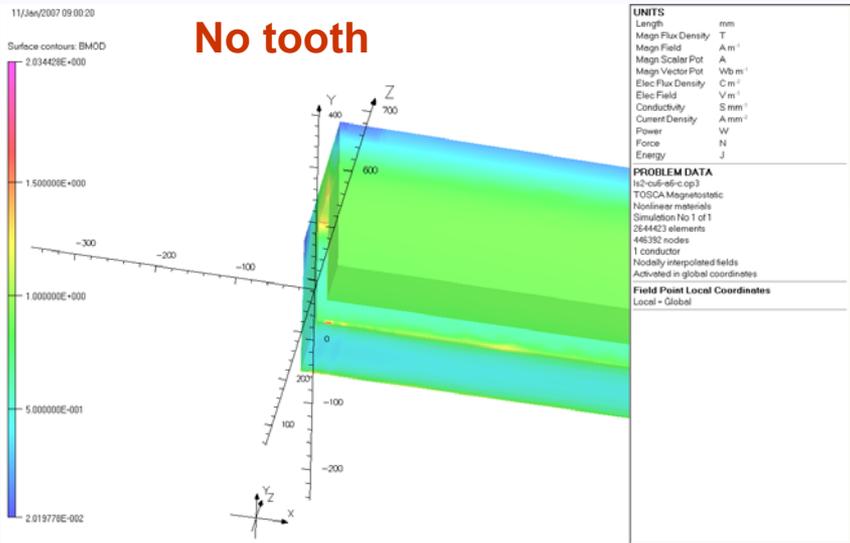
No major difference in final outcome



Coils and lower half of the model removed for clarity

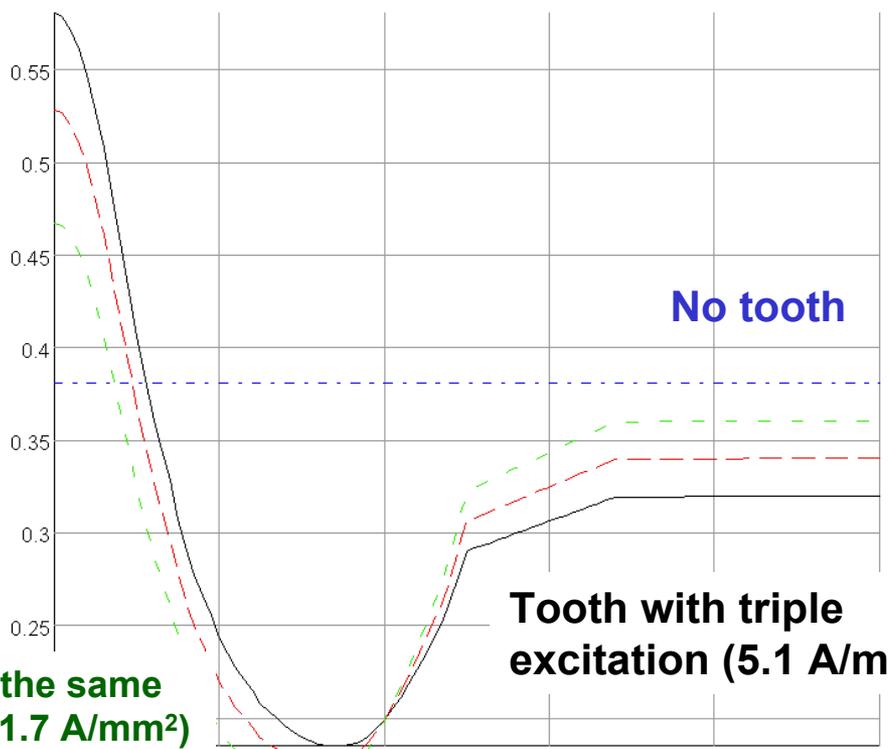
UF
Le
M
M
M
M
M
E1
C1
C1
P1
F1
E1
PF
Is2
TC
Nc
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Lo

Tooth Excited at Different Level (to understand the limit caused by saturating iron)



Axial Profile for Different Excitation of Tooth

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**Tooth with the same
excitation (1.7 A/mm²)**

No tooth

**Tooth with triple
excitation (5.1 A/mm²)**

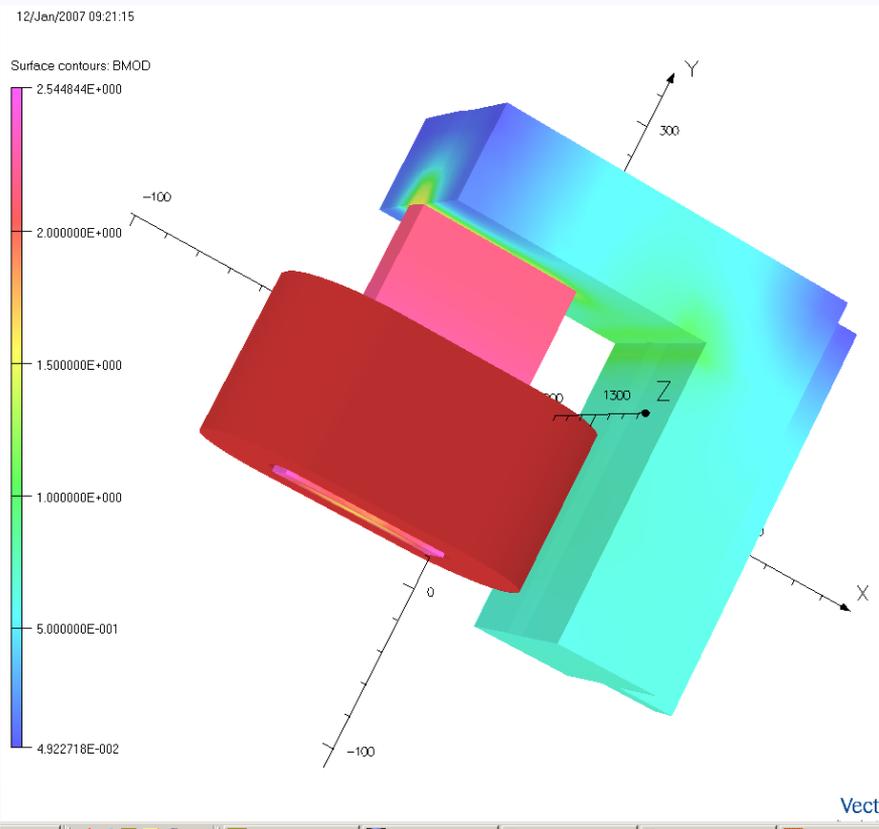
**Tooth with double
excitation (3.4 A/mm²)**

X coord	0.0	40.0	80.0	120.0	160.0	200.0
Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Z coord	350.0	350.0	350.0	350.0	350.0	350.0
—	Component: BMOD, Integral = 60.78669151149455					
- - -	Component: BMOD, Integral = 60.8210589986846					
- - -	Component: BMOD, Integral = 60.6183894413254					
- - -	Component: BMOD, Integral = 76.1657682905932					

UNITS	
Length	mm
Magn Flux Density	T
Magn Field	A m ⁻¹
Magn Scalar Pot	A
Magn Vector Pot	Wb m ⁻¹
Elec Flux Density	C m ⁻²
Elec Field	V m ⁻¹
Conductivity	S mm ⁻¹
Current Density	A mm ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA	
Is2-cu6-a6-c.op3	
TOSCA Magnetostatic	
Nonlinear materials	
Simulation No 1 of 1	
2644423 elements	
446392 nodes	
1 conductor	

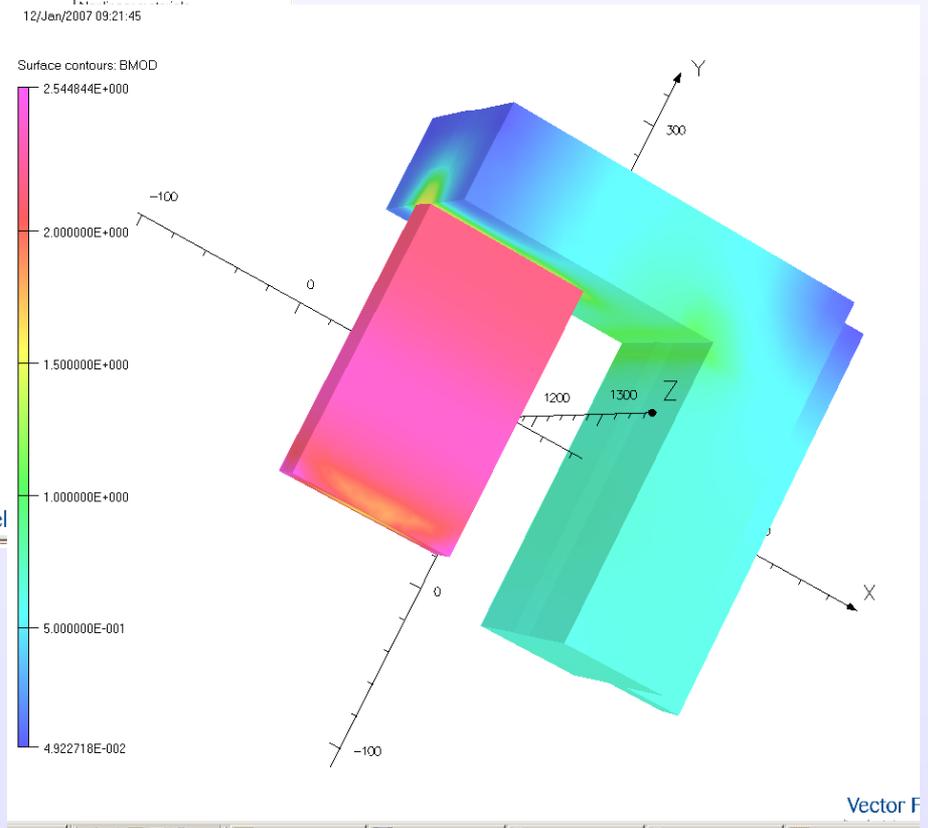
Very Narrow Pole Poses its challenges
Question: How much can we get by stand alone magnet?



UNITS	
Length	mm
Magn Flux Density	T
Magn Field	A m ⁻¹
Magn Scalar Pot	A
Magn Vector Pot	Wb m ⁻¹
Elec Flux Density	C m ⁻²
Elec Field	V m ⁻¹
Conductivity	S mm ⁻¹
Current Density	A mm ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA	
Is2-cu4-15a6_2-20mm-short.op3	
TOSCA Magnetostatic	

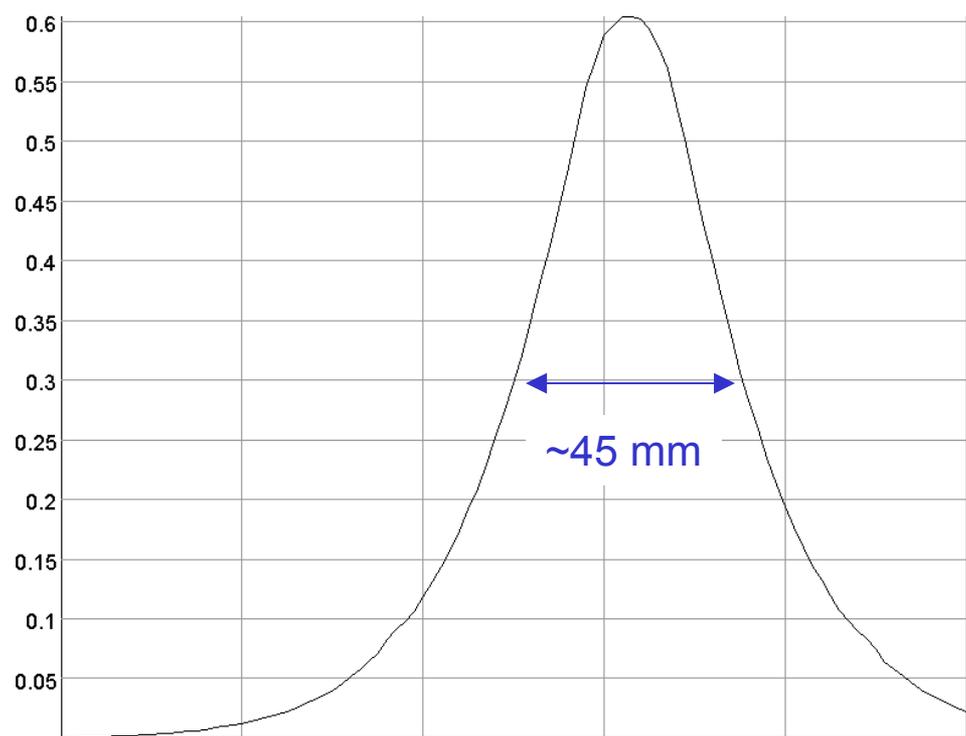
Powered at 6.1 A/mm²
(High number despite including the help from the base coil)



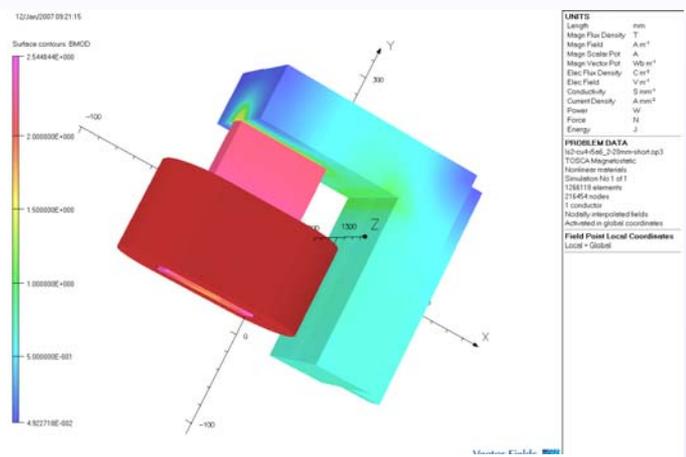
Note: High saturation at the pole.
Next step: Shaping the iron

12/Jan/2007 09:24:14

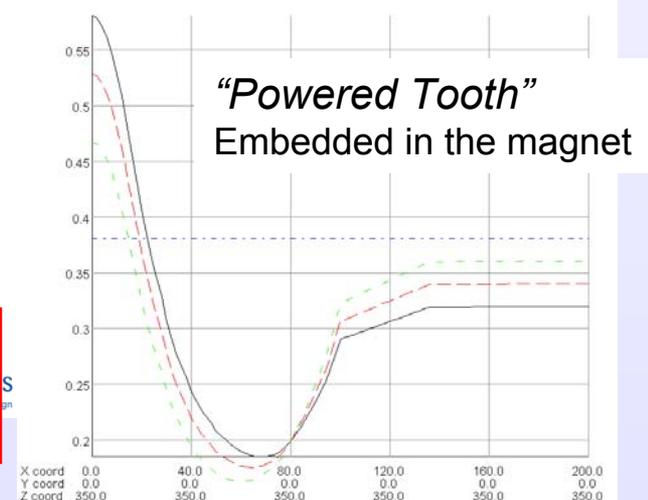
Is Field Profile Acceptable?



X coord 1.9460892 73.8190481 75.7684628 77.7943272 79.8966351 82.0753801
 Y coord 0.0 0.0 0.0 0.0 0.0 0.0
 Z coord 1048.0018 1091.67515 1135.34515 1179.01167 1222.67458 1266.33374
 Component: BMOD, Integral = 39.4085603979947



Powered at 6.1 A/mm²
(High number despite including the help from the base coil)



Remember we have: 20 mm wide powered tooth, 35 mm pole gap and 100 mm pole width.