

# 3-d Analysis of Q1BpF with Q1eF for 4K Operation

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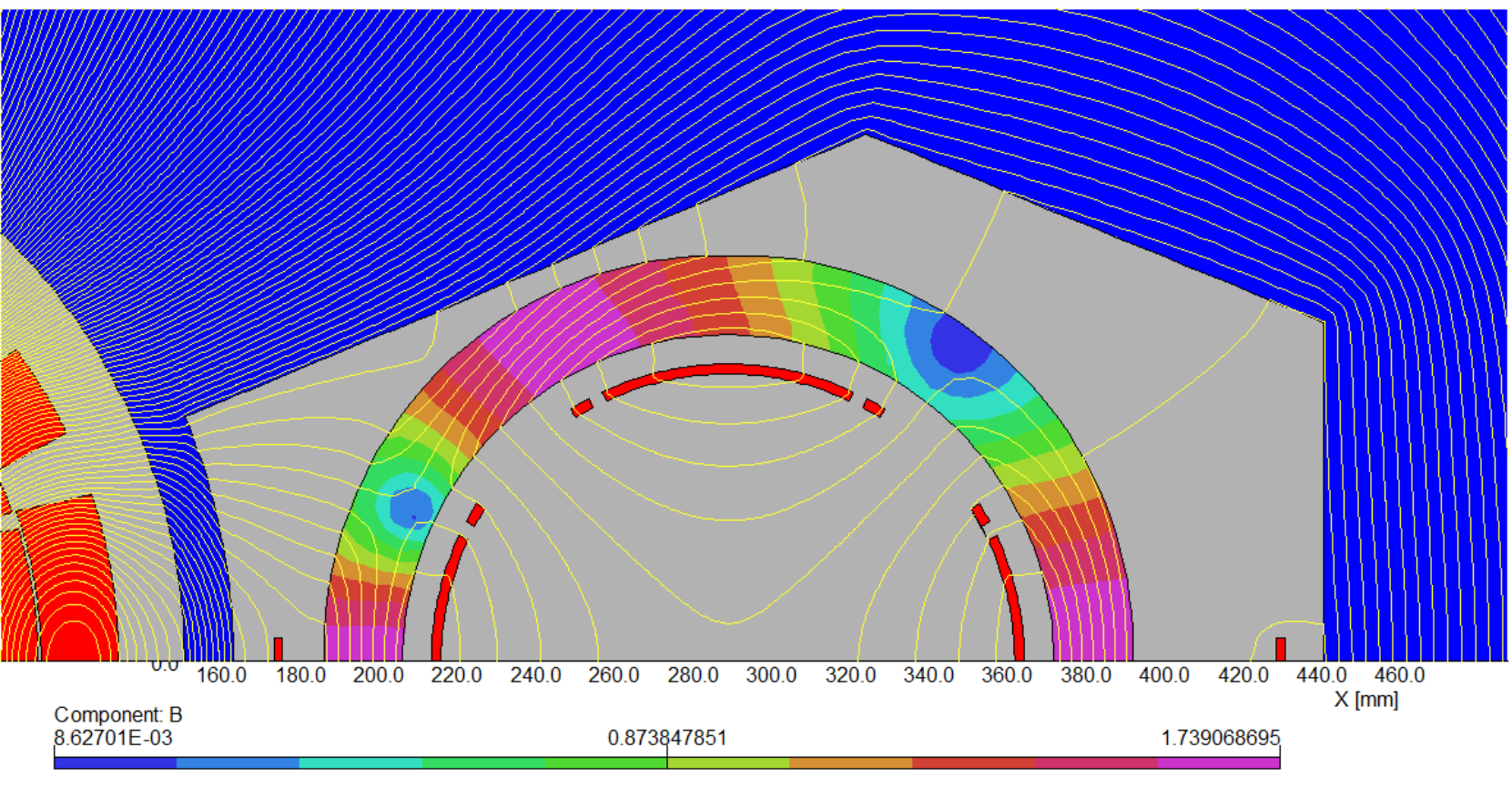
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# Overview

- **Work in progress for 3-d calculations of Q1Bpf with Q1eF to make sure that we have an acceptable 3-d solution for the interference between Q1BpF and Q1eF**
- **Earlier examination was for 2-d case only (cutout in the iron and additional tiny coils)**
- **Work in progress...**

# Q1BpF and Q1eF with opposite (bad) polarity and additional control coils



UNITS	
Length	: mm
Flux density	: T
Field strength	: A m <sup>-1</sup>
Potential	: Wb m <sup>-1</sup>
Conductivity	: S m <sup>-1</sup>
Source density	: A mm <sup>2</sup>
Power	: W
Force	: N
Energy	: J
Mass	: kg

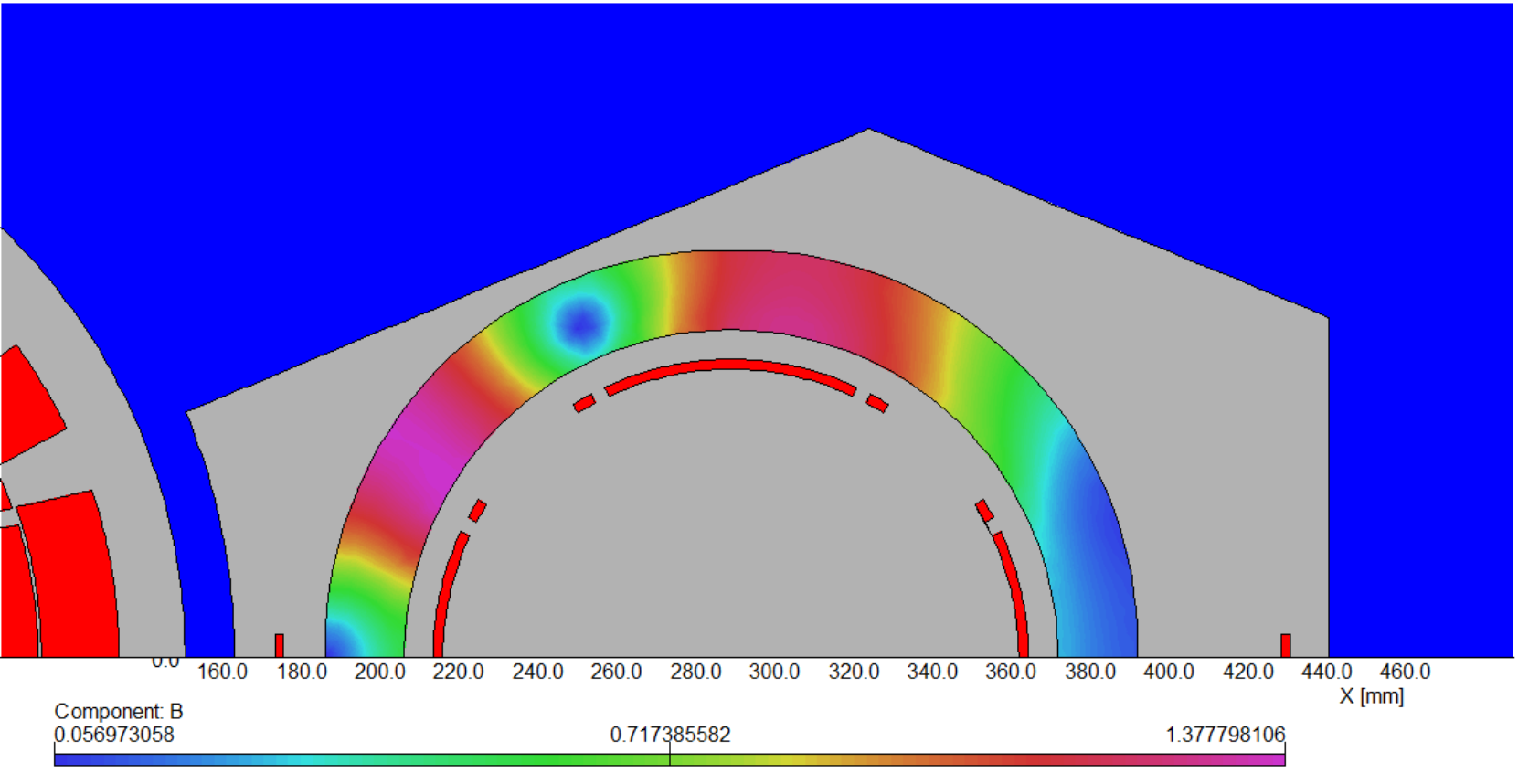
MODEL DATA	
C:\Users\gupta\OneDrive - Brookhaven National Laboratory\EIC\Q1BpF_Q2eF\opera\q1BpF_Q2eF-fn-a1.st	
Linear elements	
XY symmetry	
Vector potential	
Magnetic fields	
Static solution	
Case 2 of 2	
Scale factor: 2.4	
91725 elements	
46218 nodes	
96 regions	

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Additional little coil reduced the iron saturation (1.7 T rather than over 2 T)

**Q1BpF (Q1eF with good polarity AND stronger control coils)**



UNITS

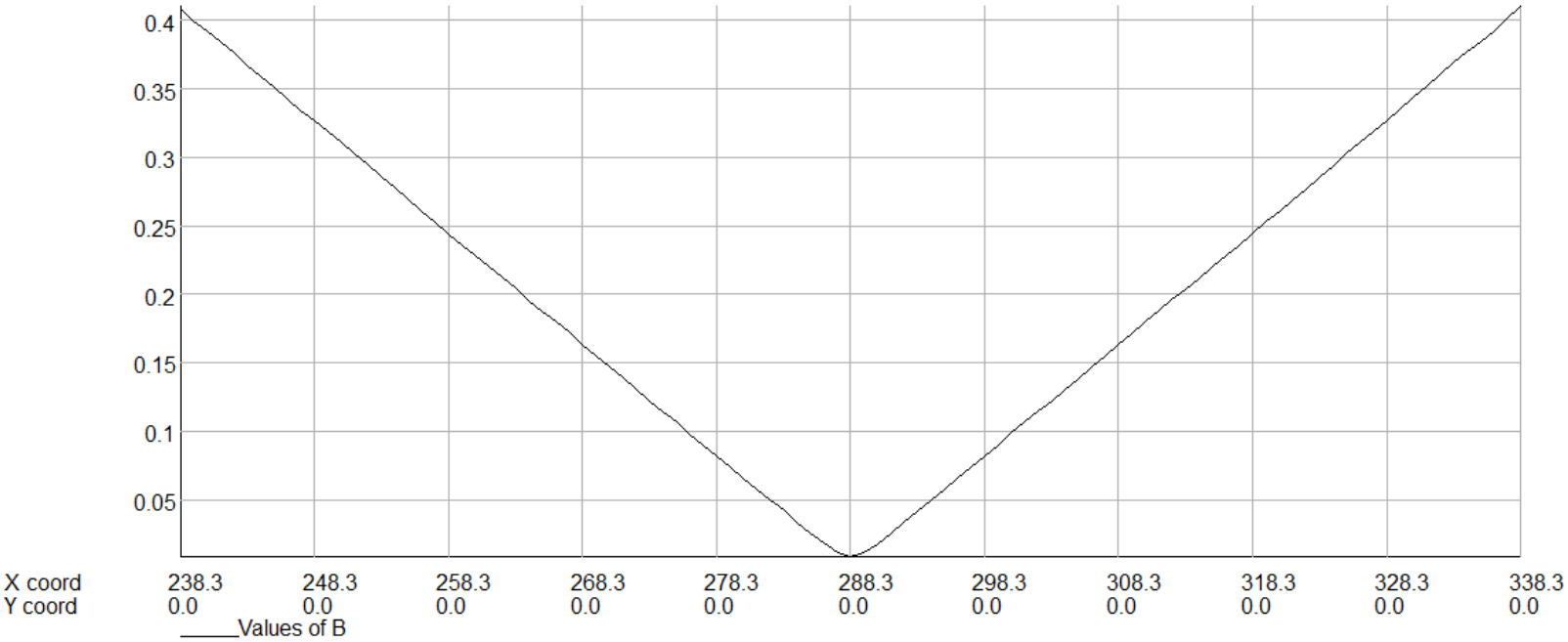
Length	: mm
Flux density	: T
Field strength	: A m <sup>-1</sup>
Potential	: Wb m <sup>-1</sup>
Conductivity	: S m <sup>-1</sup>
Source density	: A mm <sup>2</sup>
Power	: W
Force	: N
Energy	: J
Mass	: kg

MODEL DATA  
 C:\Users\gupta\OneDrive - Brookhaven National Laboratory\EIC\Q1BpF\_Q2eF\opera\q1BpF\_Q2eF-f-p-a1.st  
 Linear elements  
 XY symmetry  
 Vector potential  
 Magnetic fields  
 Static solution  
 Case 2 of 2  
 Scale factor: 2.4  
 91725 elements  
 46218 nodes  
 96 regions



Looks good as the iron providing the shielding is less saturated (1.3 T)

# Q1BpF (Q1eF with good polarity AND stronger control coils)



UNITS	
Length	: mm
Flux density	: T
Field strength	: A m <sup>-1</sup>
Potential	: Wb m <sup>-1</sup>
Conductivity	: S m <sup>-1</sup>
Source density	: A mm <sup>2</sup>
Power	: W
Force	: N
Energy	: J
Mass	: kg

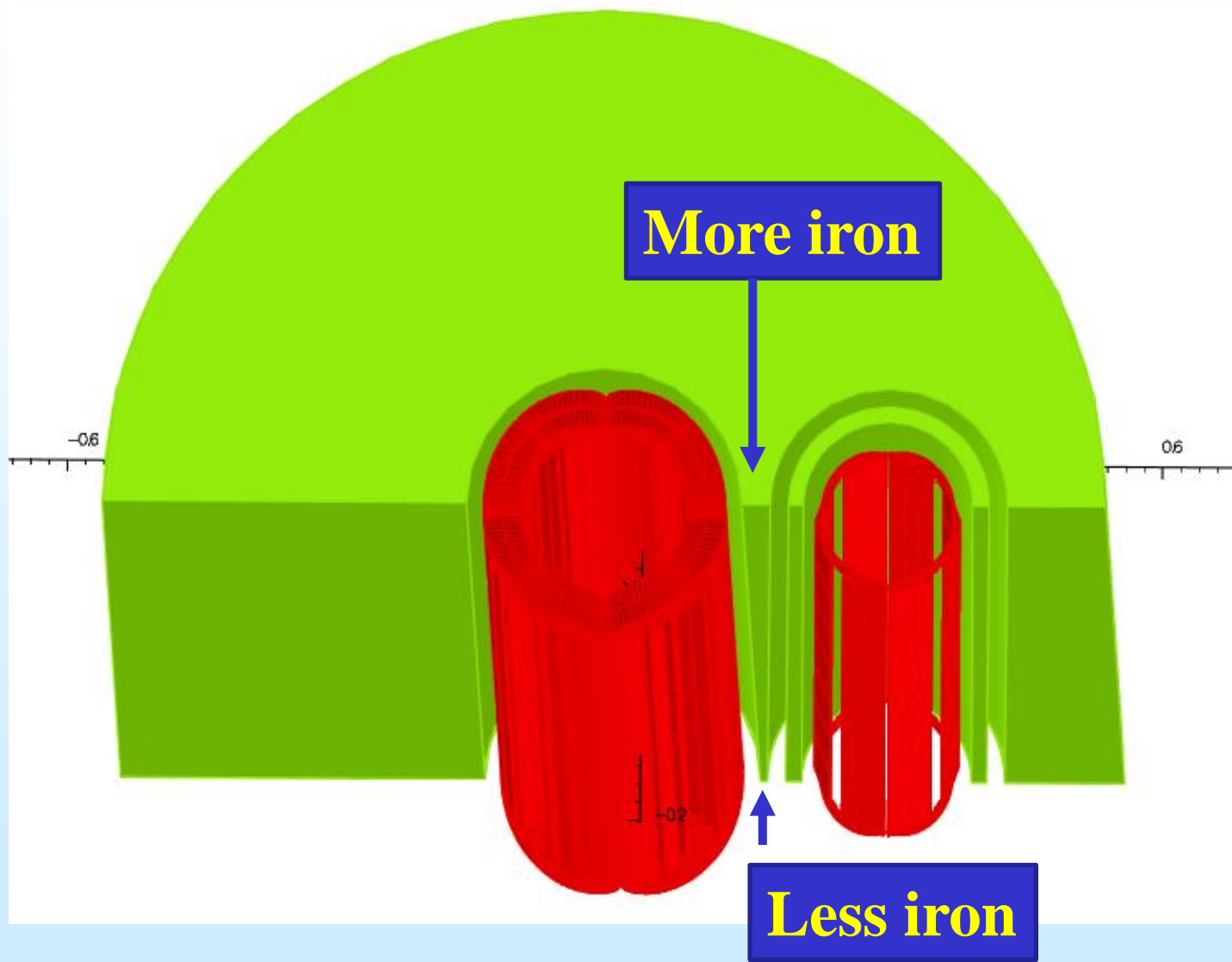
**MODEL DATA**  
 C:\Users\gupta\OneDrive - Brookhaven National Laboratory\EIC\Q1BpF\_Q2eF\opera\q1BpF\_Q2eF-f-p-a1.st  
 Linear elements  
 XY symmetry  
 Vector potential  
 Magnetic fields  
 Static solution  
 Case 2 of 2  
 Scale factor: 2.4  
 91725 elements  
 46218 nodes  
 96 regions



Field (gradient) on vertical axis looks good as well around the center of Q1eF (x=288.3)

# 3-d Initial Modelling (1)

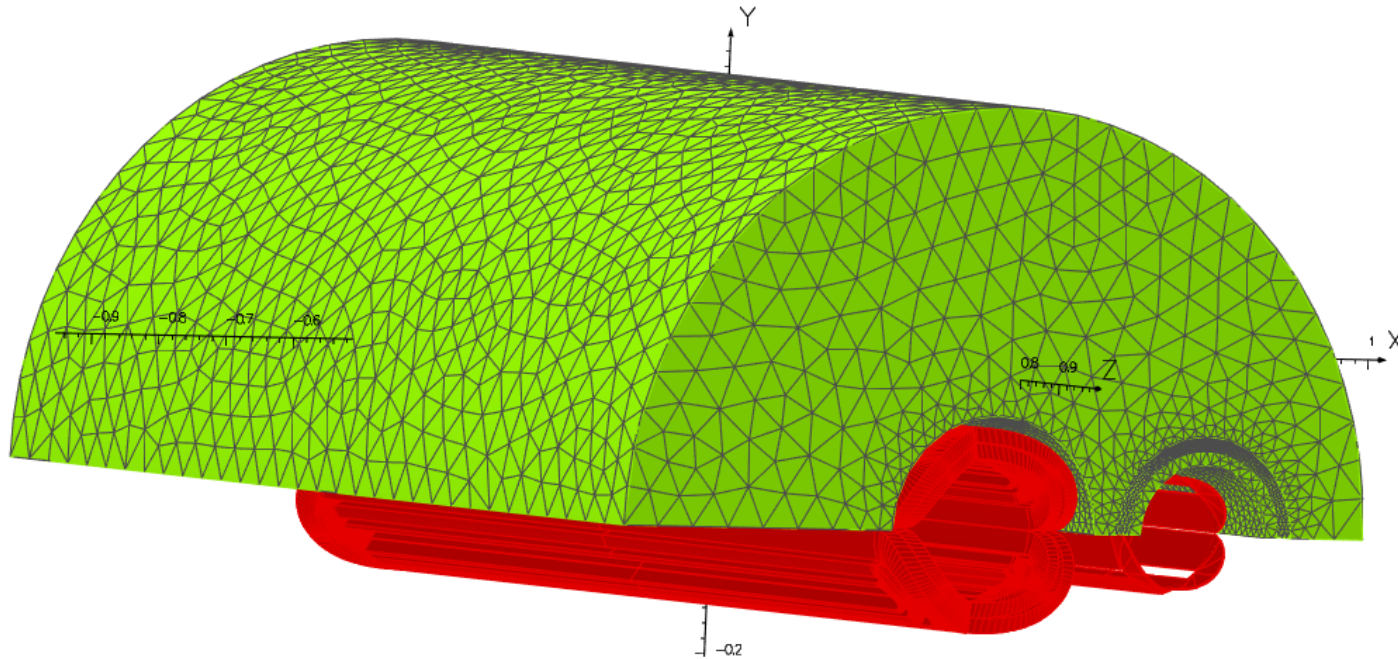
First run without additional coils  
(cutout for reducing cross-talk &  
also additional coils, as needed)





# 3-d Initial Modelling (2)

6/Oct/2020 12:35:43



Opera  
Simulation Software

Computer run in progress. For completeness sake, it will be better to use real Q1eF coils, when available (only representative coils used here)