

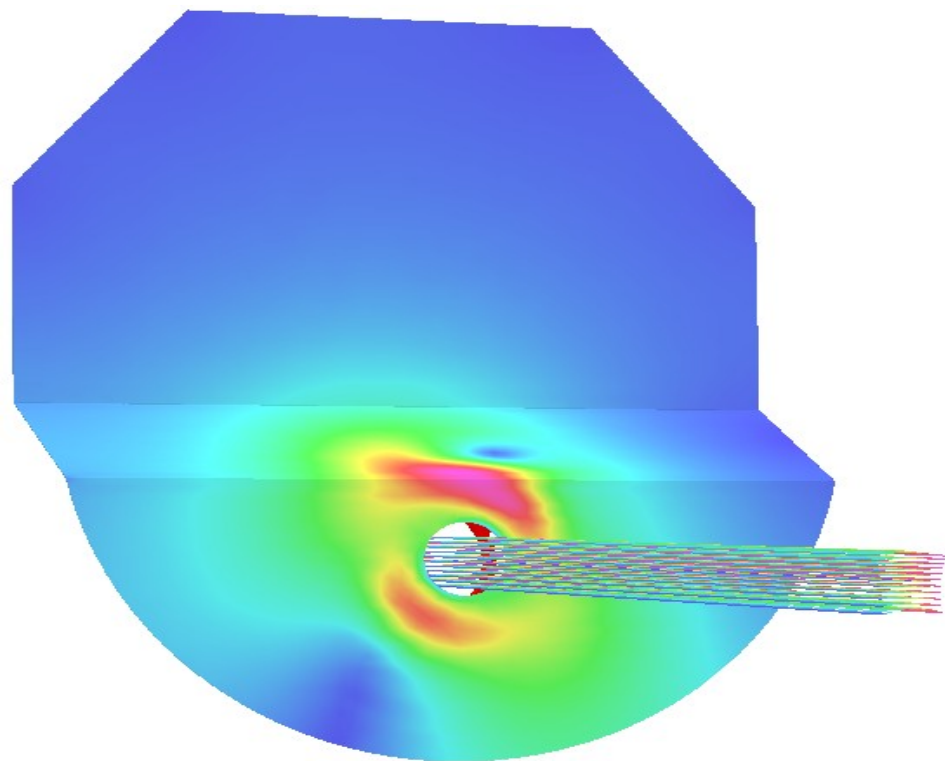


Followup to 4/2/09 Presentation of the 3D Model of the Injector Cryomodule Entrance Shield

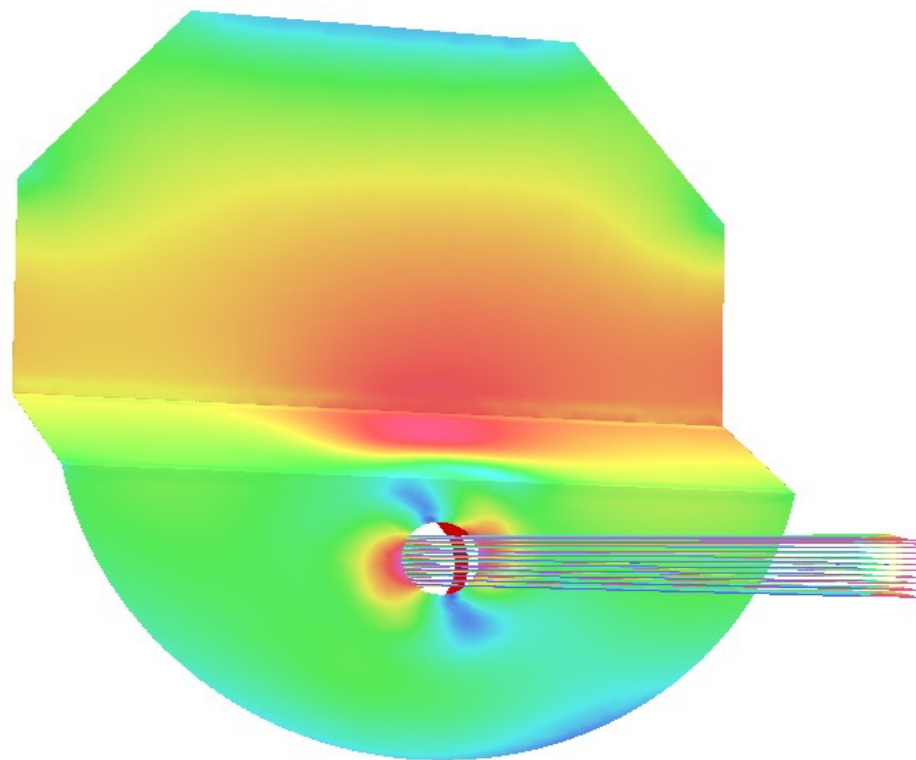
Jim Crittenden
3 April 2009

Kicker coil polarities corrected

External field included



Without external field



With 0.5 gauss vertical external field



Field Components on Beam Axis Without External Field

*100 Amps in both
horizontal and vertical
corrector coils.*

Shield at $Z = 0$ cm

$-25 < Z < 25$ cm

Horizontal Component

$$0 < B_x < 10 \text{ gauss}$$

Integral: 87 gauss-cm

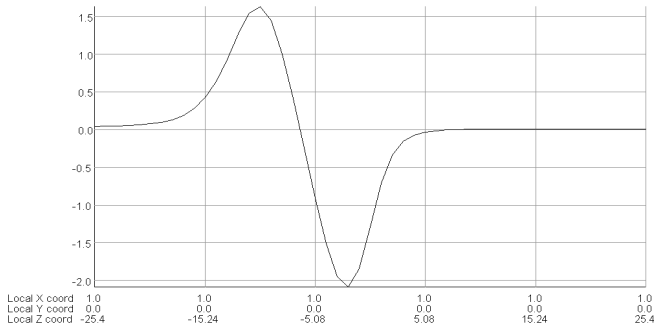
Vertical Component

$$0 < B_y < 8 \text{ gauss}$$

Integral: 77 gauss-cm

ERL Injector Cryomodule Shield with Corrector Magnet from file cm_06.ep3

2/Apr/2009 17:13:13



Local X coord 1.0
Local Y coord 0.0
Local Z coord -25.4
Component: Bx, from buffer: Line, Integral = -0.7925931514441

UNITS	
Length	cm
Magn Flux Density	gauss
Magn Field	oriented
Magn Scalar Pot	oriented cm
Magn Vector Pot	gauss cm
Elec Flux Density	C cm ²
Elec Field	V cm ²
Conductivity	S cm ²
Current Density	A cm ²
Power	W
Force	N
Energy	J
Mass	g

PROBLEM DATA	
cm_06.ep3	
TOSCA Magnetostatic	
Linear materials	
Simulation No 1 of 1	
2957247 elements	
512258 nodes	
4 conductors	
Fields by integration	
Activated in global coordinates	

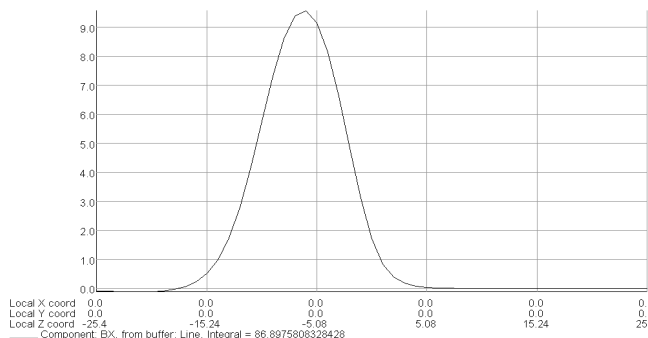
Field Point Local Coordinates	
Local = Global	

FIELD EVALUATIONS	
Line	LINE (integral) SI Cartesian
x=0.0, y=0.0, z=-25.4 to 25.4	

Vector Fields
software for electromagnetic design

ERL Injector Cryomodule Shield with Corrector Magnet from file cm_06.ep3

2/Apr/2009 17:13:00



Local X coord 0.0
Local Y coord 0.0
Local Z coord -25.4
Component: Bx, from buffer: Line, Integral = 86.8975808328428

UNITS	
Length	cm
Magn Flux Density	gauss
Magn Field	oriented
Magn Scalar Pot	oriented cm
Magn Vector Pot	gauss cm
Elec Flux Density	C cm ²
Elec Field	V cm ²
Conductivity	S cm ²
Current Density	A cm ²
Power	W
Force	N
Energy	J
Mass	g

PROBLEM DATA	
cm_06.ep3	
TOSCA Magnetostatic	
Linear materials	
Simulation No 1 of 1	
2957247 elements	
512258 nodes	
4 conductors	
Fields by integration	
Activated in global coordinates	

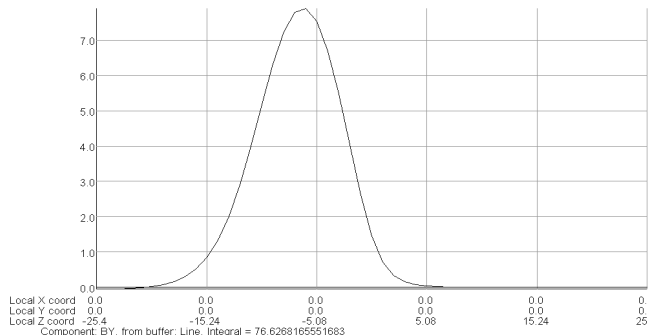
Field Point Local Coordinates	
Local = Global	

FIELD EVALUATIONS	
Line	LINE (integral) SI Cartesian
x=0.0, y=0.0, z=-25.4 to 25.4	

Vector Fields
software for electromagnetic design

ERL Injector Cryomodule Shield with Corrector Magnet from file cm_06.ep3

2/Apr/2009 17:13:07



Local X coord 0.0
Local Y coord 0.0
Local Z coord -25.4
Component: By, from buffer: Line, Integral = 76.6268165551683

UNITS	
Length	cm
Magn Flux Density	gauss
Magn Field	oriented
Magn Scalar Pot	oriented cm
Magn Vector Pot	gauss cm
Elec Flux Density	C cm ²
Elec Field	V cm ²
Conductivity	S cm ²
Current Density	A cm ²
Power	W
Force	N
Energy	J
Mass	g

PROBLEM DATA	
cm_06.ep3	
TOSCA Magnetostatic	
Linear materials	
Simulation No 1 of 1	
2957247 elements	
512258 nodes	
4 conductors	
Fields by integration	
Activated in global coordinates	

Field Point Local Coordinates	
Local = Global	

FIELD EVALUATIONS	
Line	LINE (integral) SI Cartesian
x=0.0, y=0.0, z=-25.4 to 25.4	

Vector Fields
software for electromagnetic design

Longitudinal Component

$$-2.1 < B_z < 1.6 \text{ gauss}$$

Integral: -0.8 gauss-cm



Field Components on Beam Axis With 0.5 Gauss Vertical External Field

*100 Amps in both
horizontal and vertical
corrector coils.*

Shield at $Z = 0$ cm

$-25 < Z < 25$ cm

Horizontal Component

$$0 < B_x < 10 \text{ gauss}$$

Integral: 87 gauss-cm

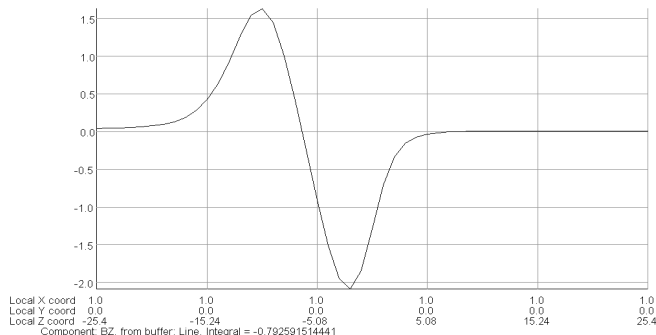
Vertical Component

$$0 < B_y < 8 \text{ gauss}$$

Integral: 92 gauss-cm

ERL Injector Cynomodule Shield with Corrector Magnet from file cm_06.ep3

2/Apr/2009 17:13:13



UNITS	
Length	cm
Magn Flux Density	gauss
Magn Field	oriented
Magn Scalar Pot	oriented cm
Magn Vector Pot	gauss cm
Elec Flux Density	C cm ²
Elec Field	V cm ²
Conductivity	S cm ²
Current Density	A cm ²
Power	W
Force	N
Energy	J
Mass	g

PROBLEM DATA	
cm_06.ep3	
TOSCA Magnetostatic	
Linear materials	
Simulation No 1 of 1	
2957247 elements	
512258 nodes	
4 conductors	
Fields by integration	
Activated in global coordinates	

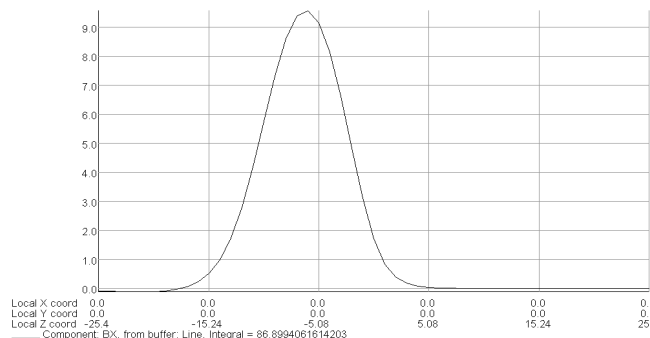
Field Point Local Coordinates	
Local = Global	

FIELD EVALUATIONS	
Line	LINE (integral) SI Cartesian
	x=1.0, y=0.0, z=-25.4 to 25.4

Vector Fields
software for electromagnetic design

ERL Injector Cynomodule Shield with Corrector Magnet from file cm_06.ep3

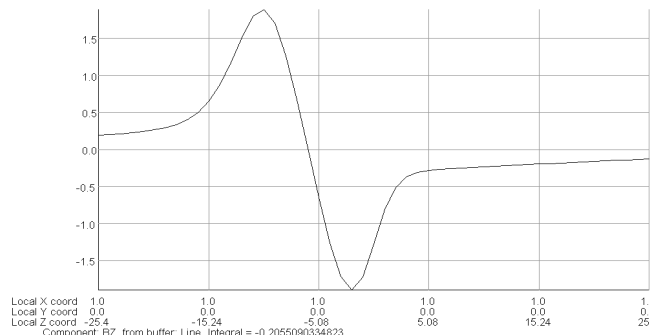
2/Apr/2009 18:05:43



Vector Fields
software for electromagnetic design

ERL Injector Cynomodule Shield with Corrector Magnet from file cm_06.ep3

2/Apr/2009 18:05:56



Vector Fields
software for electromagnetic design

Longitudinal Component

$$-1.8 < B_z < 1.8 \text{ gauss}$$

Integral: -0.2 gauss-cm

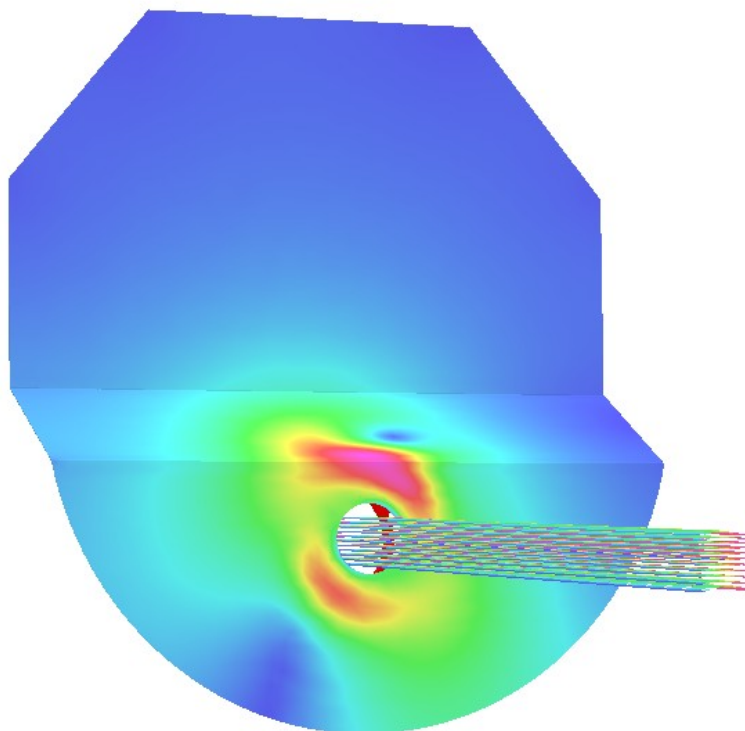
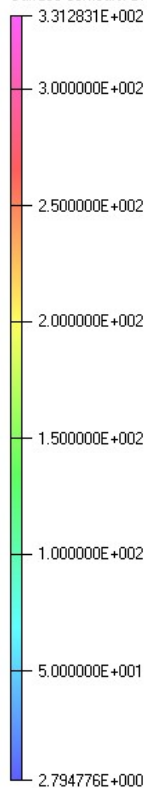


250 keV electrons

11 x 11 entrance grid over 2 x 2 cm tracked for 75 cm

3/Apr/2009 11:55:33

Surface contours: BMOD



UNITS

Length	cm
Magn Flux Density	gauss
Magn Field	oersted
Magn Scalar Pot	oersted cm
Magn Vector Pot	gauss cm
Elec Flux Density	C cm ²
Elec Field	V cm ⁻¹
Conductivity	S cm ⁻¹
Current Density	A cm ⁻²
Power	W
Force	N
Energy	J
Mass	g

PROBLEM DATA

icm_06.op3
TOSCA Magnetostatic
Linear materials
Simulation No 1 of 1
2997247 elements
512258 nodes
4 conductors
Nodally interpolated fields
Activated in global coordinates

Field Point Local Coordinates

Local = Global



Electron Tracking With 0.5 Gauss Vertical External Field

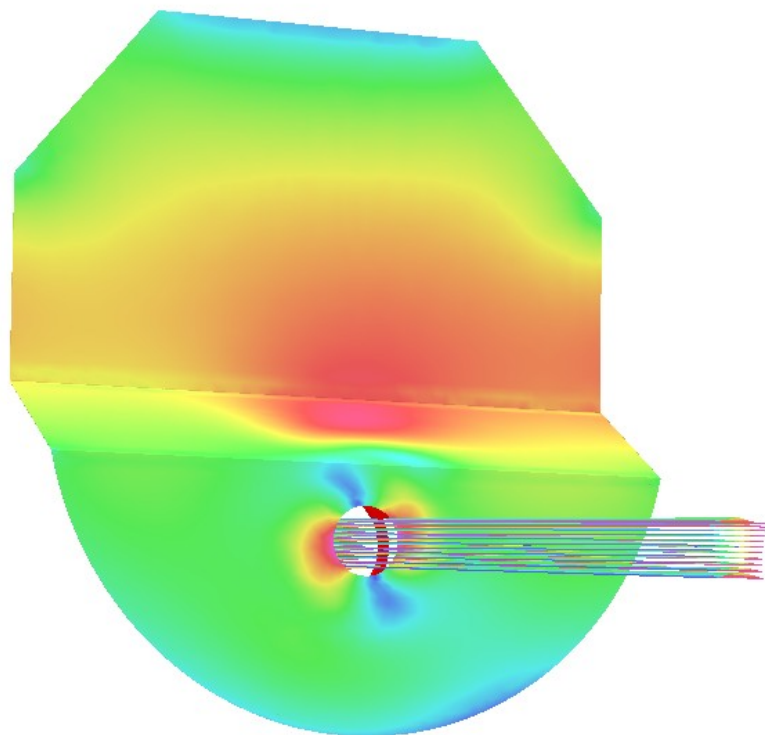
250 keV electrons

11 x 11 entrance grid over 2 x 2 cm tracked for 75 cm

3/Apr/2009 11:53:14

Surface contours: BMOD

4.657906E+002
4.500000E+002
4.000000E+002
3.500000E+002
3.000000E+002
2.500000E+002
2.000000E+002
1.500000E+002
1.000000E+002
5.000000E+001
1.540937E+001



UNITS

Length	cm
Magn Flux Density	gauss
Magn Field	oersted
Magn Scalar Pot	oersted cm
Magn Vector Pot	gauss cm
Elec Flux Density	C cm ²
Elec Field	V cm ⁻¹
Conductivity	S cm ⁻¹
Current Density	A cm ⁻²
Power	W
Force	N
Energy	J
Mass	g

PROBLEM DATA

icm_08.op3
TOSCA Magnetostatic
Linear materials
Simulation No 1 of 1
2997247 elements
512258 nodes
4 conductors
External field: 0.0, 0.5, 0.0
Nodally interpolated fields
Activated in global coordinates

Field Point Local Coordinates

Local = Global