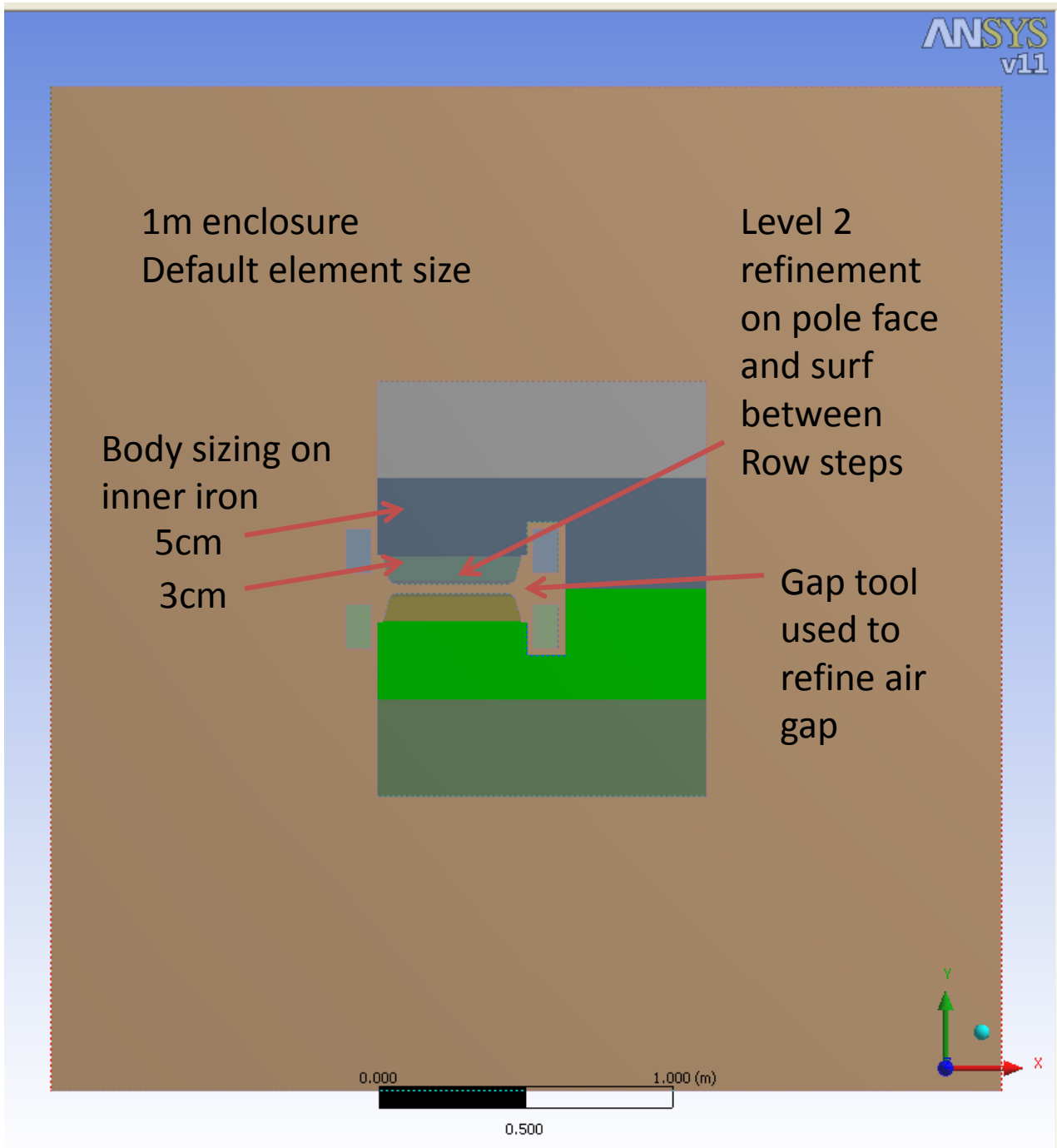
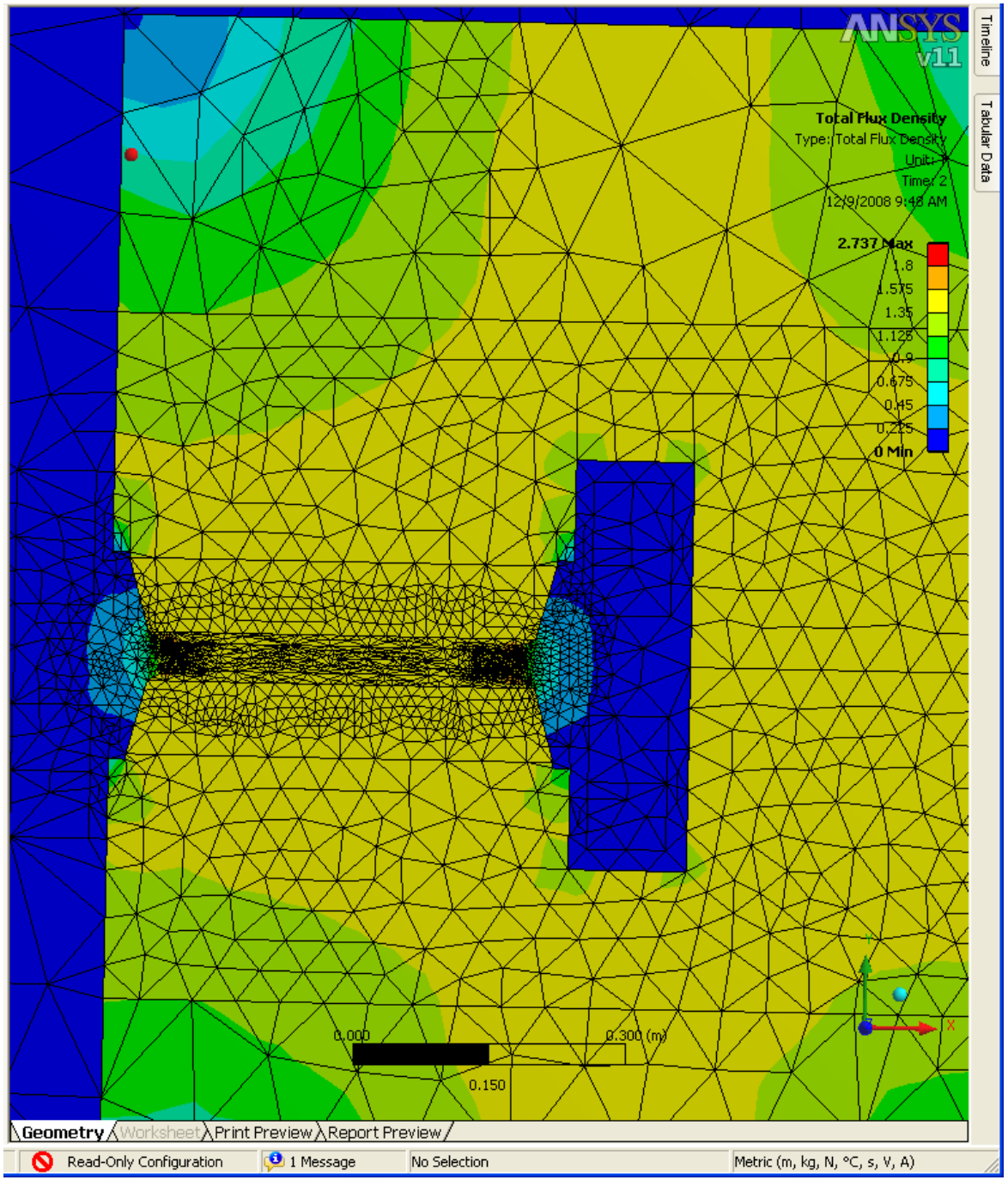
Solution description ANSYS11

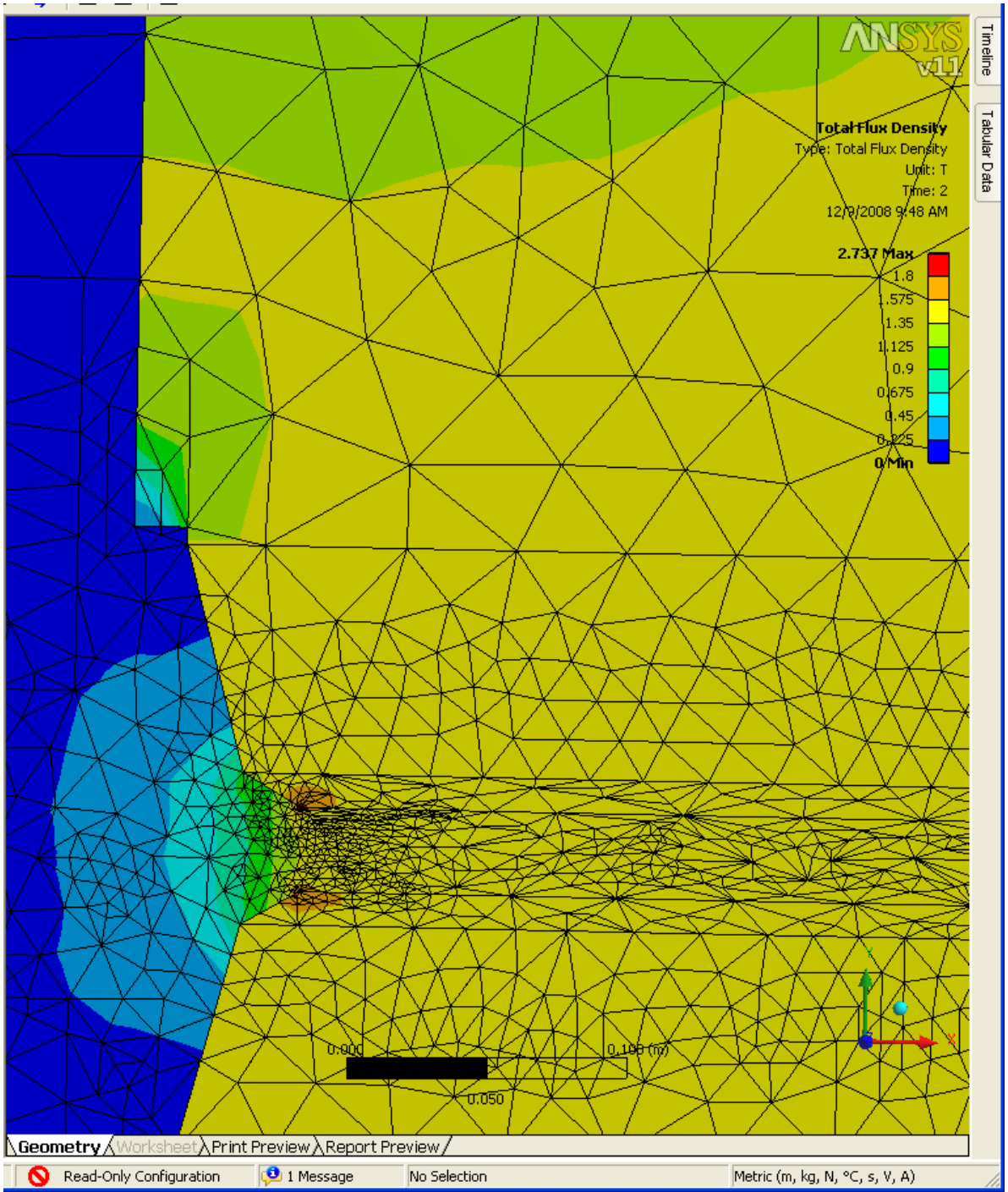
- Solution StgR7
  - 1006 iron used for whole magnet
  - Flux parallel BC at z=1.0m
  - 224 A 84 turn coil modeled as solid
    - Central field 1.514T for this current
  - Solution converged to 15% with 2.2M nodes
    - Adaptive meshing based on the nodes with the 10% highest energy and the nodes with the 20% with highest error
    - Three iterations required for 15% (rather sloe convergence)
  - 1m enclosure
  - Data extracted for -500<x<382mm and -500 < z < 1000 mm in 2mm steps. Planes from 0 to 15 mm in 1mm steps were extracted.

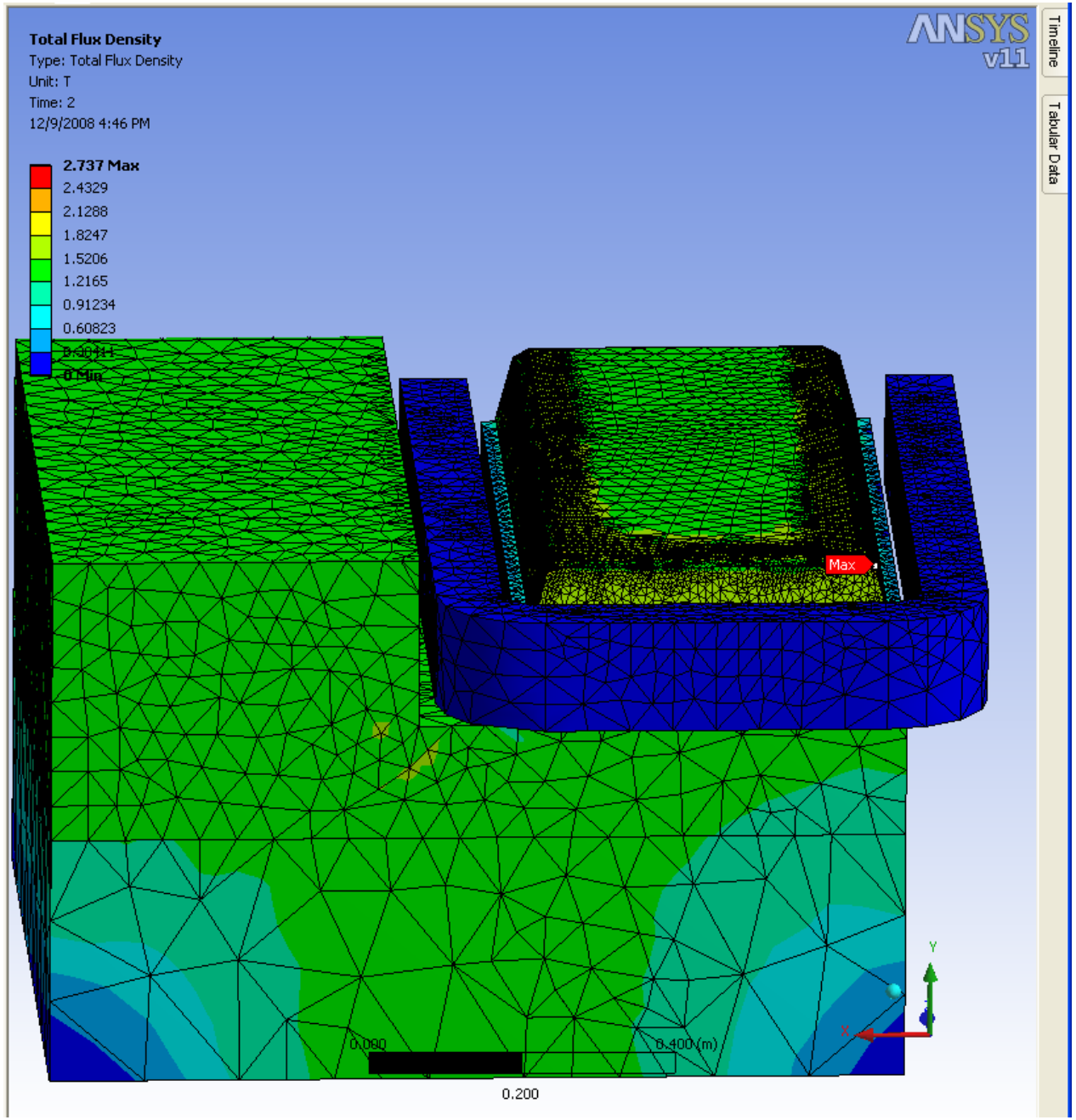
- Mesh setup

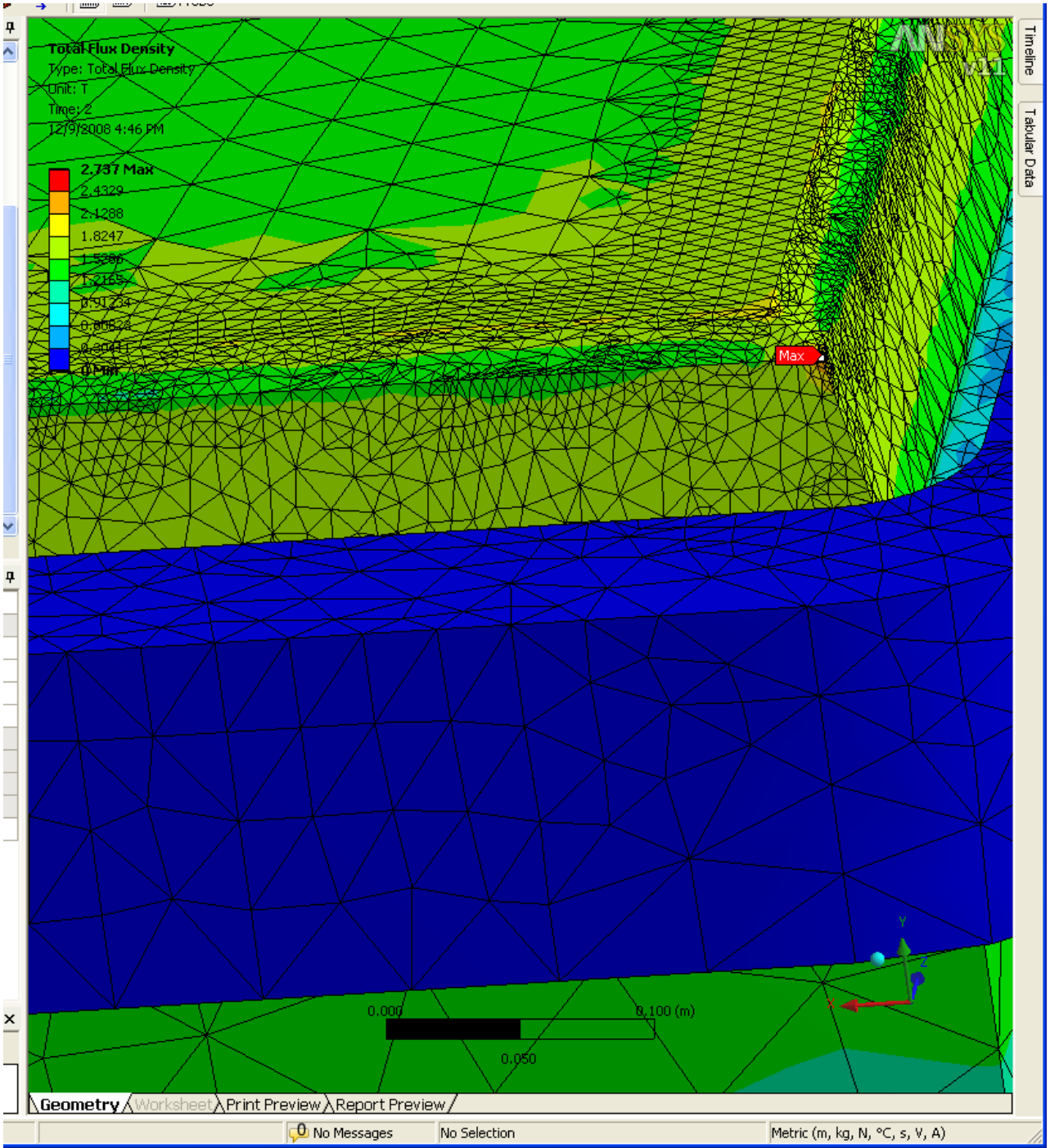

ANSYS
v11
1m enclosure
Default element size
Level 2 refinement on pole face and surf between Row steps
Body sizing on inner iron
5cm
3cm
Gap tool used to refine air gap
Y
X
0.000
1.000 (m)
0.500

Resulting mesh




ANSYS
v11
Total Flux Density
Type: Total Flux Density
Unit: T
Time: 2
12/9/2008 9:48 AM
2.737 Max
1.8
1.575
1.35
1.125
0.9
0.675
0.45
0.225
0 Min
0.000
0.100 (m)
0.050
Timeline
Tabular Data
Geometry
Worksheet
Print Preview
Report Preview
Read-Only Configuration
1 Message
No Selection
Metric (m, kg, N, °C, s, V, A)


Total Flux Density
Type: Total Flux Density
Unit: T
Time: 2
12/9/2008 4:46 PM
2.737 Max
2.4329
2.1288
1.8247
1.5206
1.2165
0.91234
0.60823
0 Min
ANSYS
v11
Timeline
Tabular Data
Max
Y
X
0.000
0.400 (m)
0.200

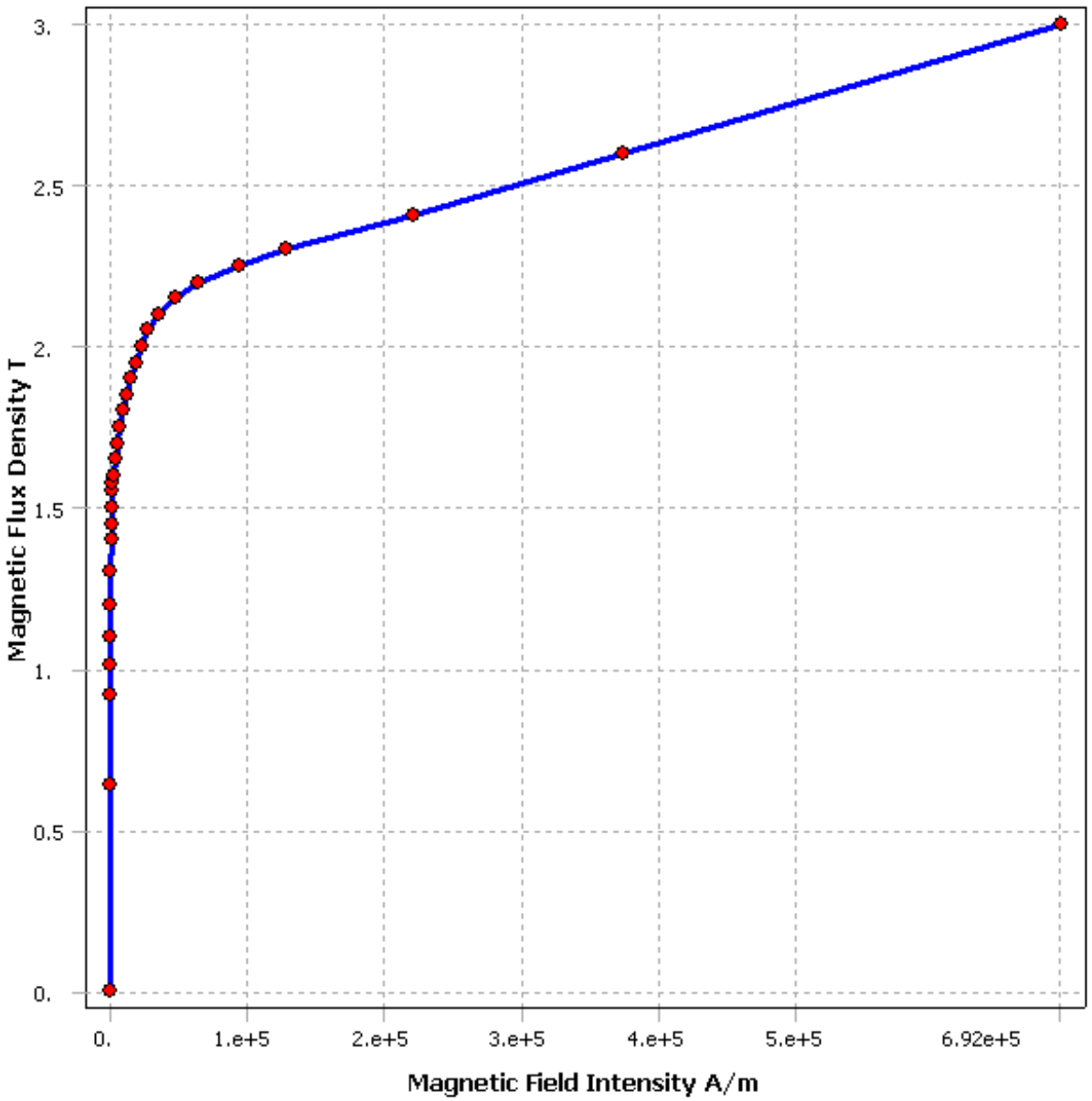

Total Flux Density
Type: Total Flux Density
Unit: T
Time: 2
12/9/2008 4:46 PM
2.737 Max
2.4329
2.1288
1.8247
1.5206
1.2165
0.91234
0.60823
0.30411
0 Min
Max
0.000
0.100 (m)
0.050
Y
Z
X
Timeline
Tabular Data
Geometry
Worksheet
Print Preview
Report Preview
No Messages
No Selection
Metric (m, kg, N, °C, s, V, A)

B-H curve used

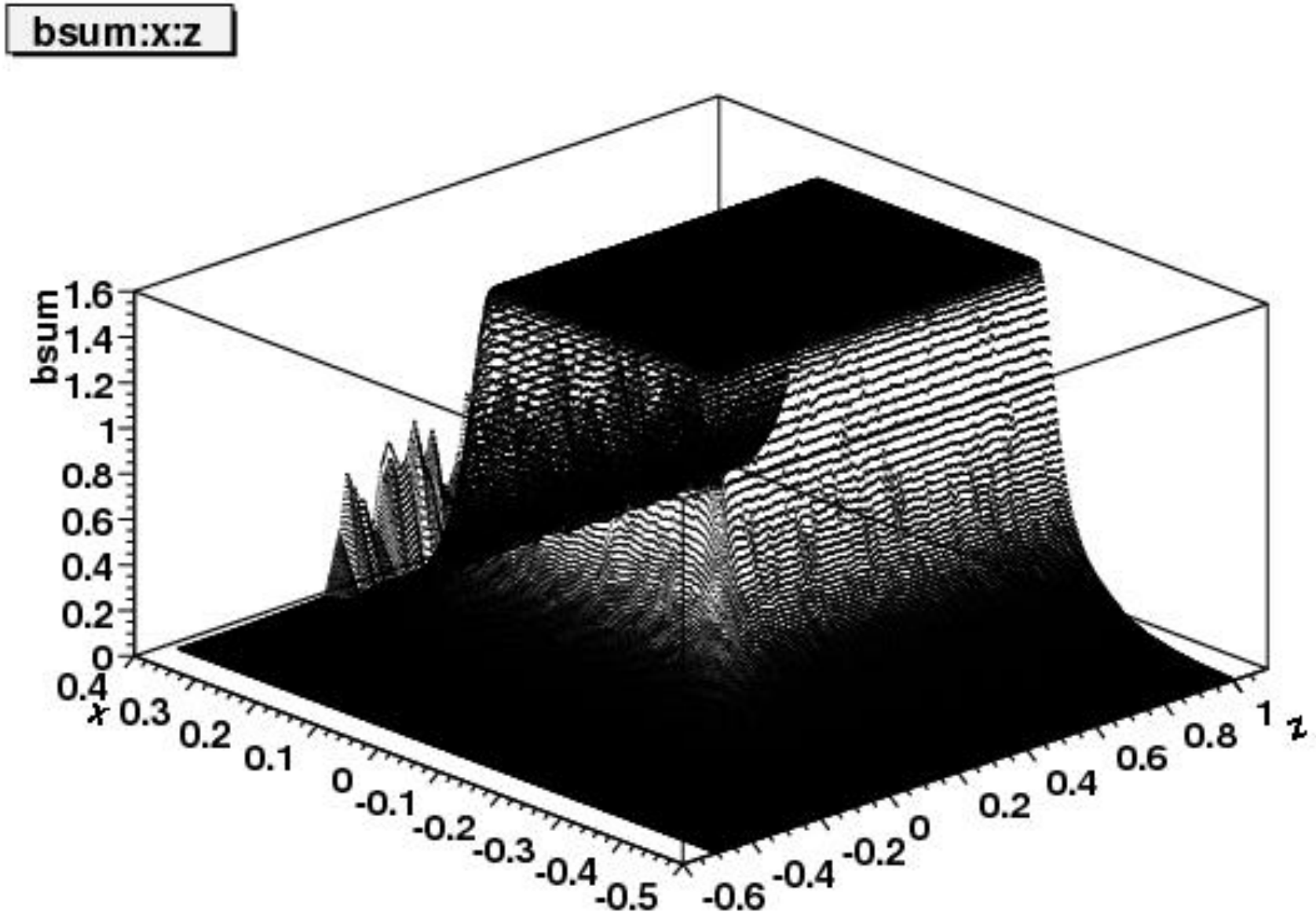
SA1006TOSCA - B-H Curve

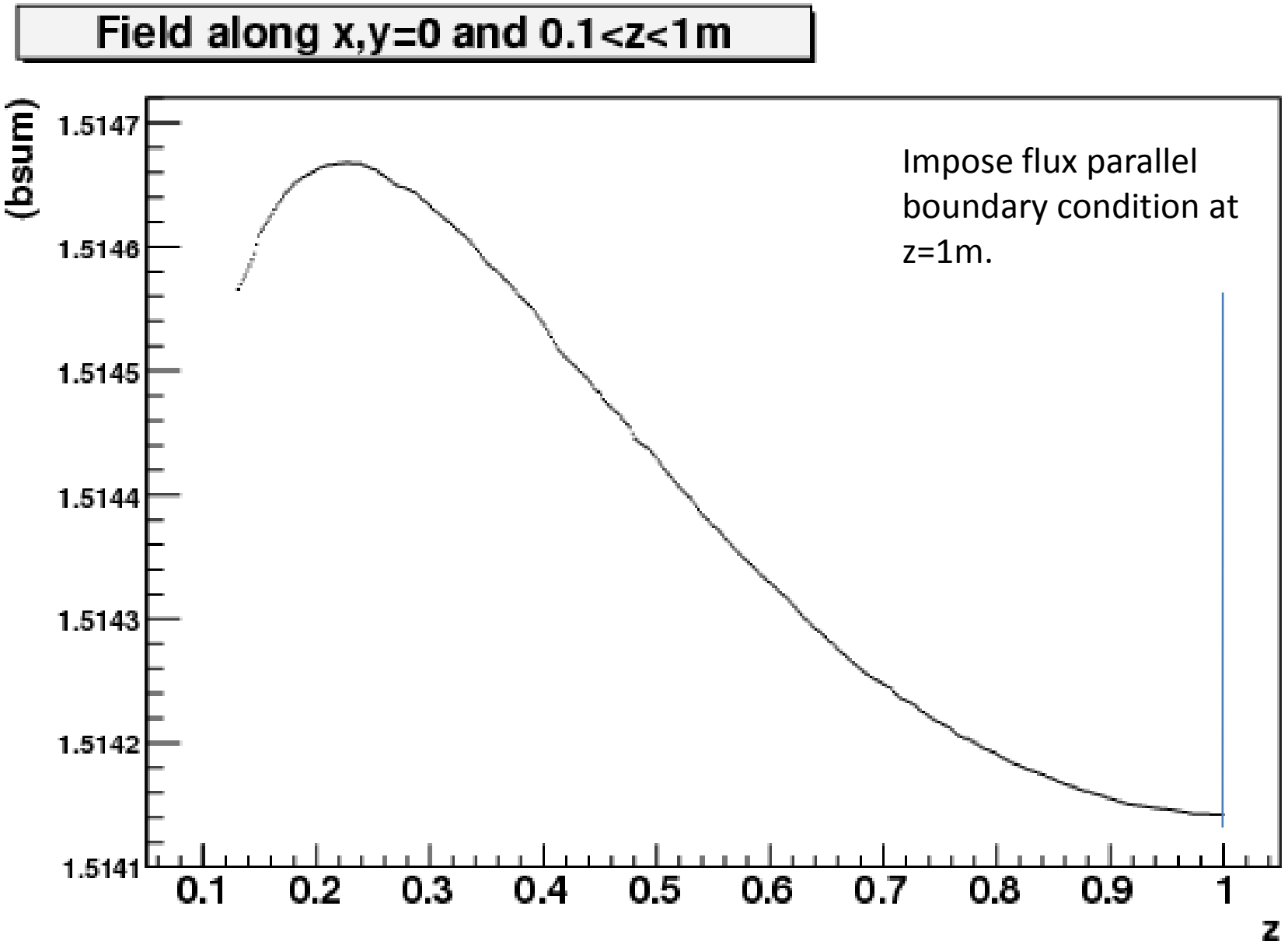
Magnetic Flux Density vs. Magnetic Field Intensity

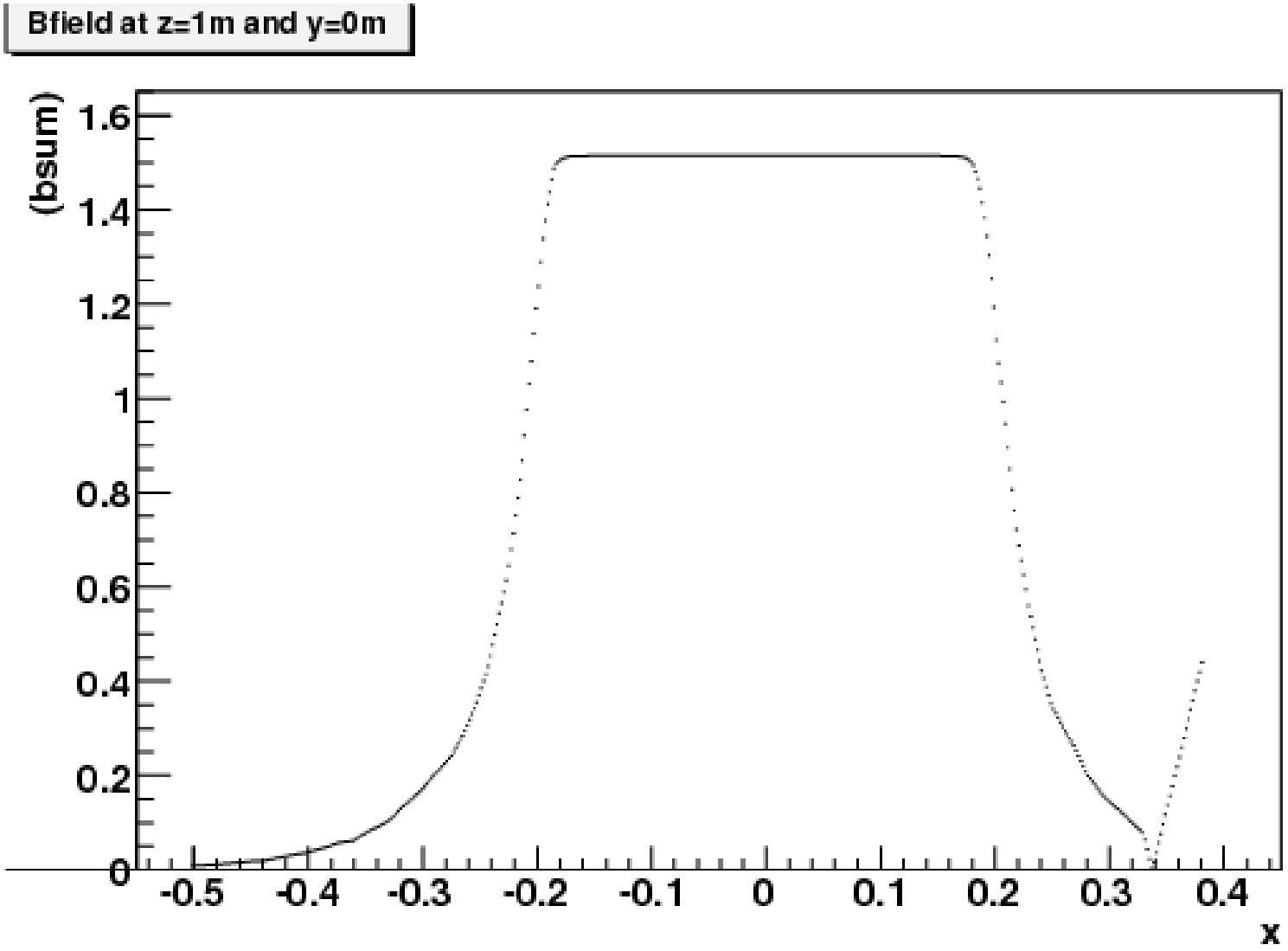
	ıetic Field Intensity	Magnetic Flux Density T
1	0.	0.
2	79.6	0.64
3	135.28	0.92
4	159.15	1.01
5	190.99	1.1
6	238.73	1.2
7	318.31	1.3
8	493.38	1.4
9	644.58	1.45
10	875.35	1.5
11	1273.2	1.55
12	1591.5	1.575
13	2148.6	1.6
14	3342.3	1.65
15	4774.6	1.7
16	6525.3	1.75
17	9151.4	1.8
18	11937	1.85
19	15120	1.9
20	18542	1.95
21	22282	2.
22	27545	2.05
23	35180	2.1
24	47746	2.15
25	63662	2.2
26	93901	2.25
27	1.273e+005	2.3
28	2.2079e+005	2.4075
29	3.7397e+005	2.6
30	6.9228e+005	3.
*		

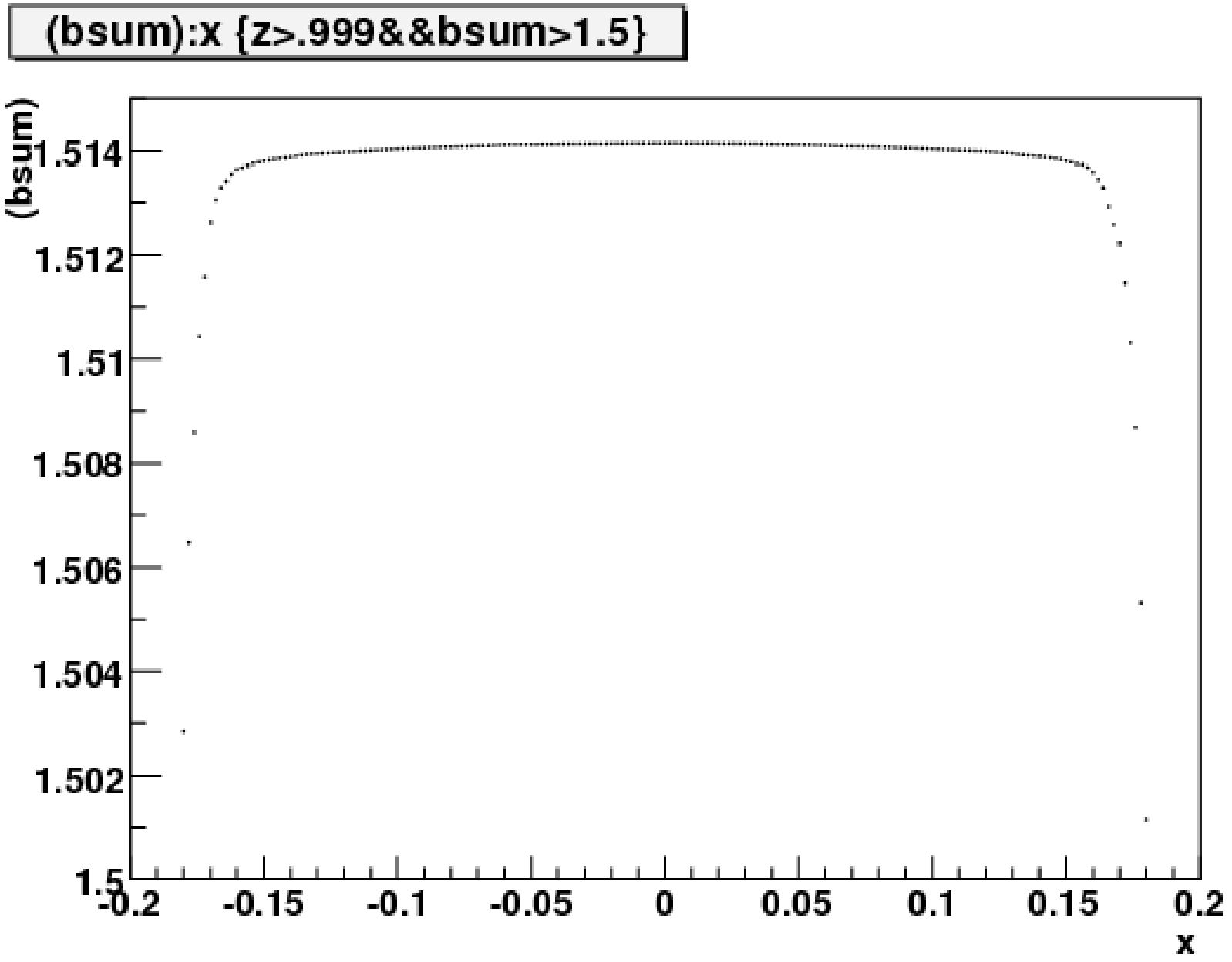


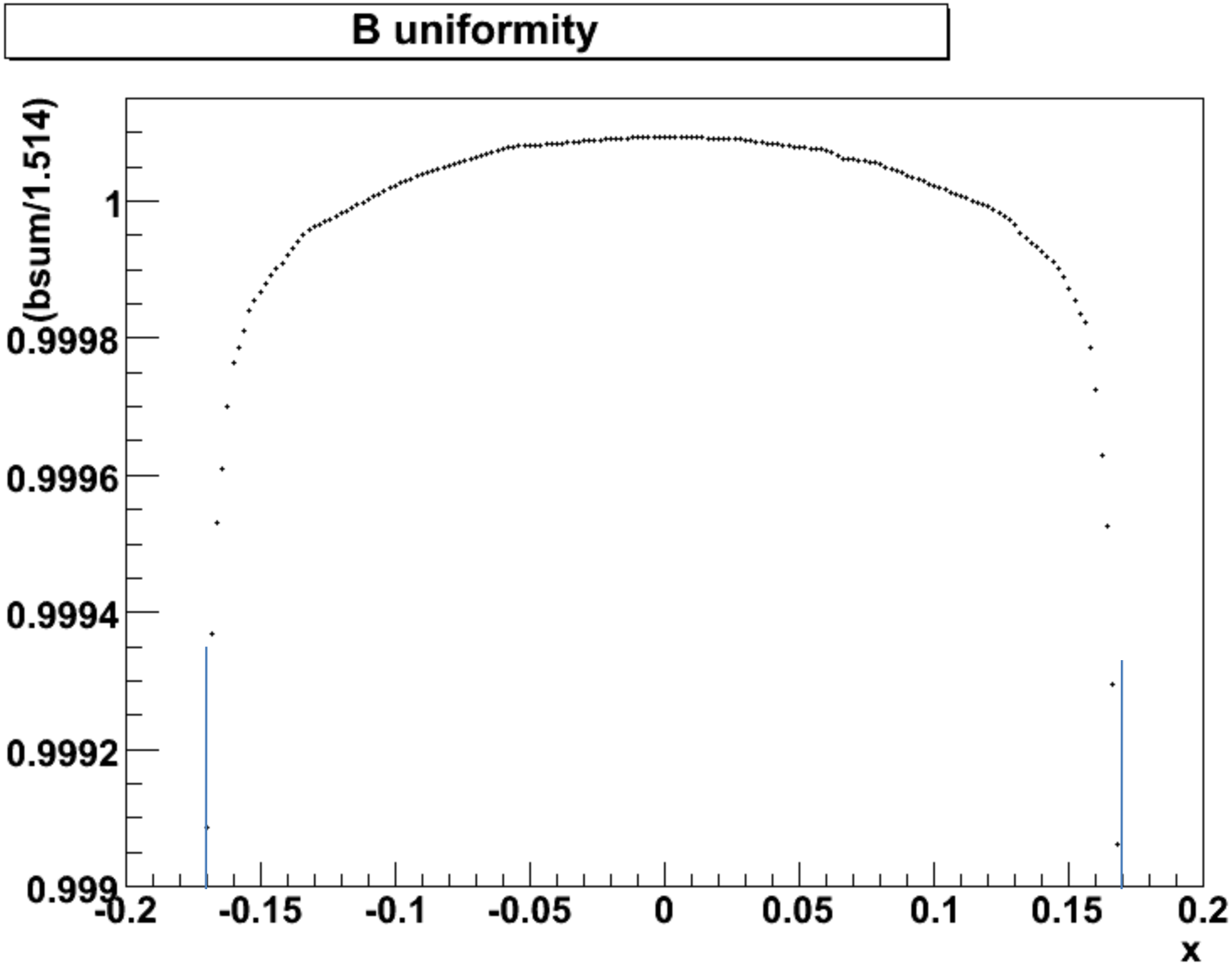
Calculated field profile




Field along x,y=0 and 0.1<z<1m
(bsum)
1.5147
1.5146
1.5145
1.5144
1.5143
1.5142
1.5141
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
z
Impose flux parallel boundary condition at z=1m.

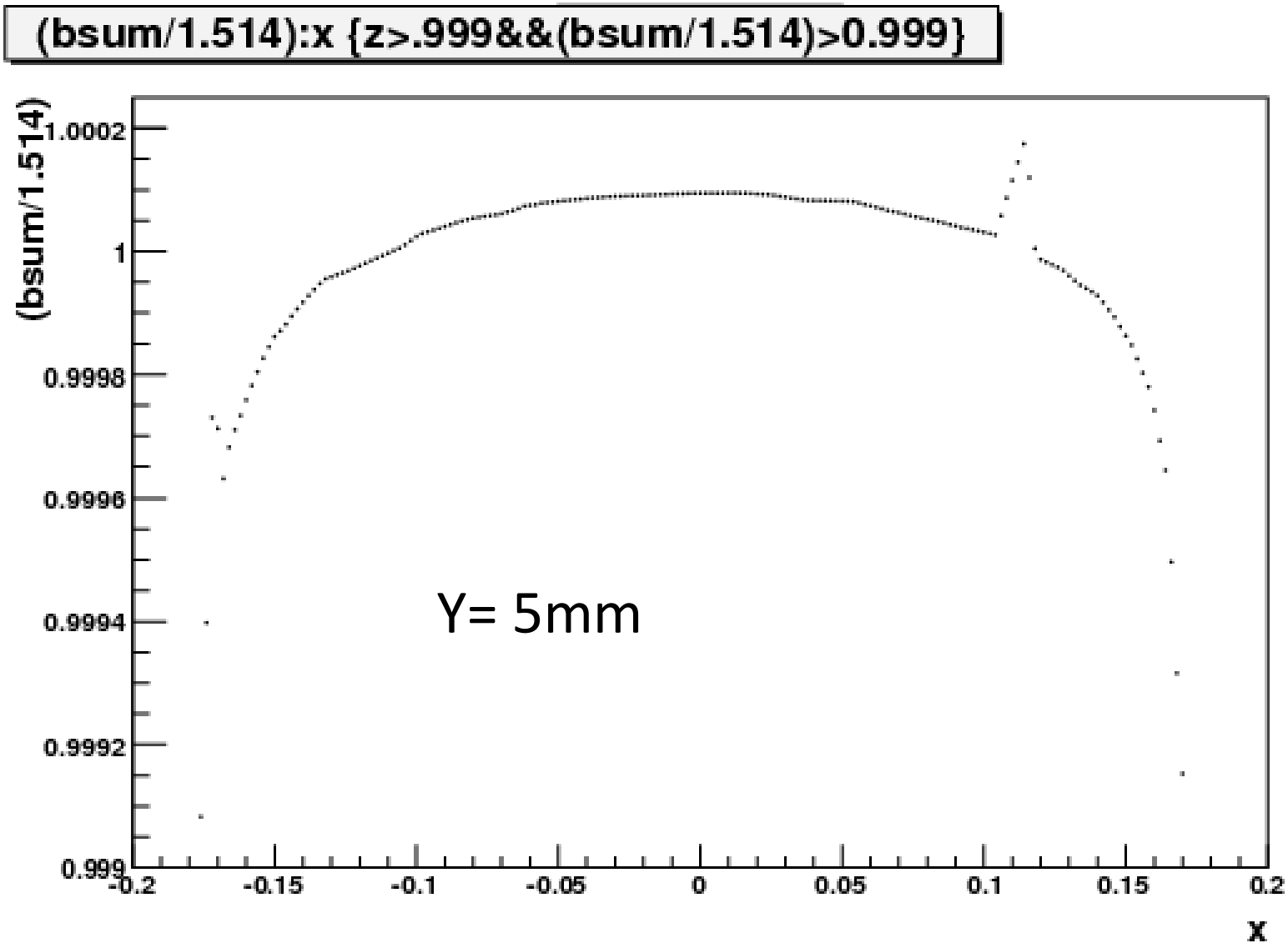

Bfield at z=1m and y=0m
(bsum)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
x


(bsum):x {z>.999&&bsum>1.5}
(bsum)
1.514
1.512
1.51
1.508
1.506
1.504
1.502
1.5
-0.2
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2
x



Z=0m y=0m Require B/1.514>0.999

Uniform to 1×10^{-3} over $170 \times 2 = 340$mm


(bsum/1.514):x {z>.999&&(bsum/1.514)>0.999}
(bsum/1.514)
1.0002
1
0.9998
0.9996
0.9994
0.9992
0.999
-0.2
-0.15
-0.1
-0.05
0
0.05
0.1
0.15
0.2
x
Y= 5mm