SiD Solenoid

Plans for Snowmass

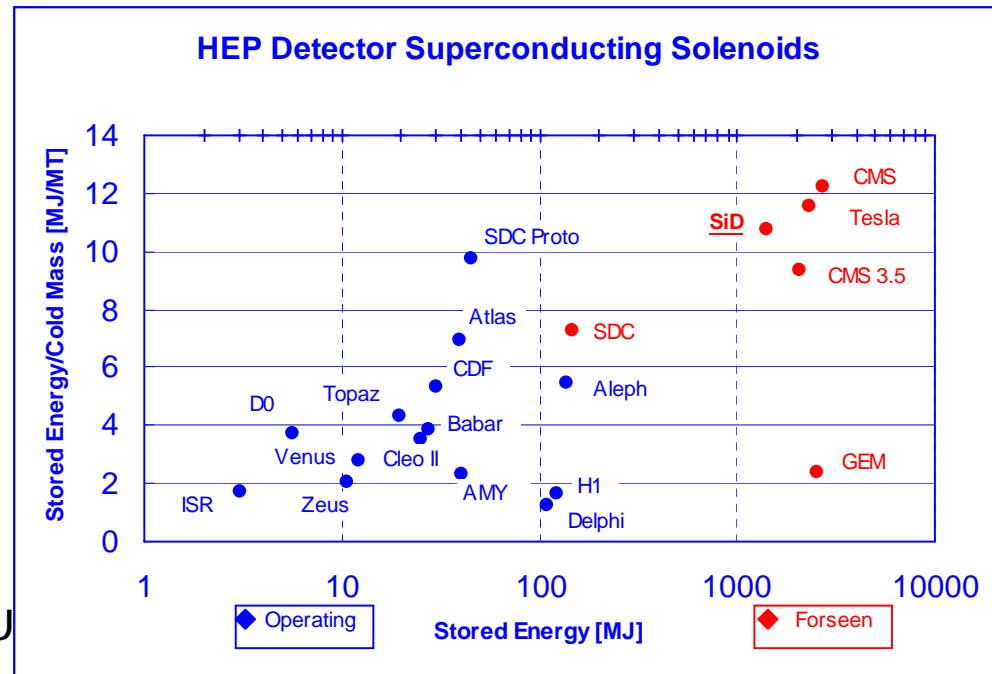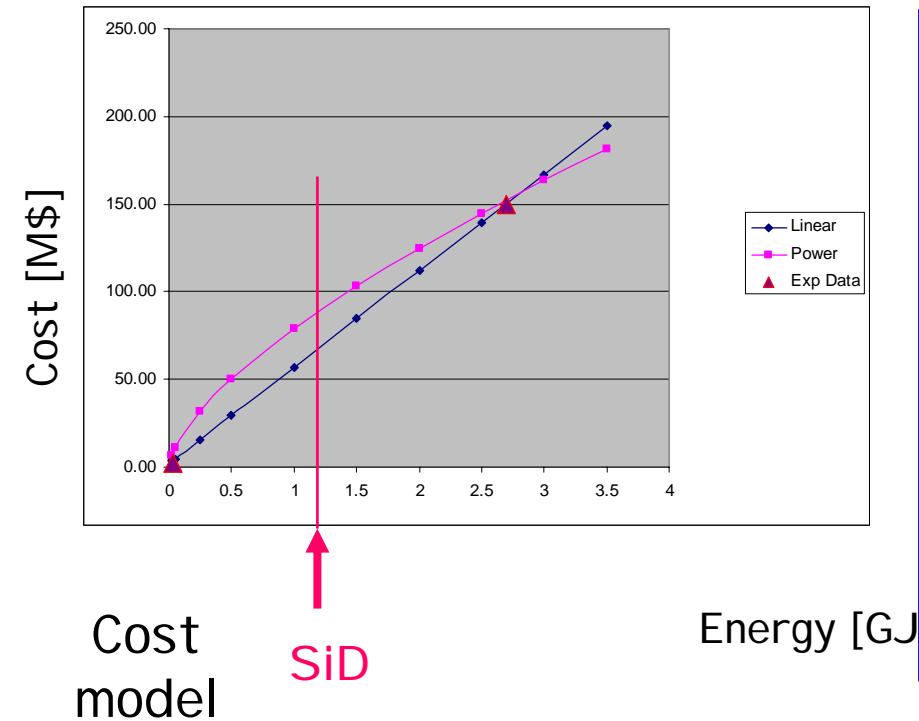*Work and plans of R.Smith*, *presented by H.Weerts*

Solenoid 1

This is what I used to show

Inner radius: ~ 2.5m to ~3.32m, L=5.4m; Stored energy ~ 1.2 GJ

Need feasibility study in next year to at least convince ourselves that this challenging 5T solenoid can be built .

Expertise not readily available. CMS solenoid sets current scale.

Cost model

SiD

Energy [GJ]
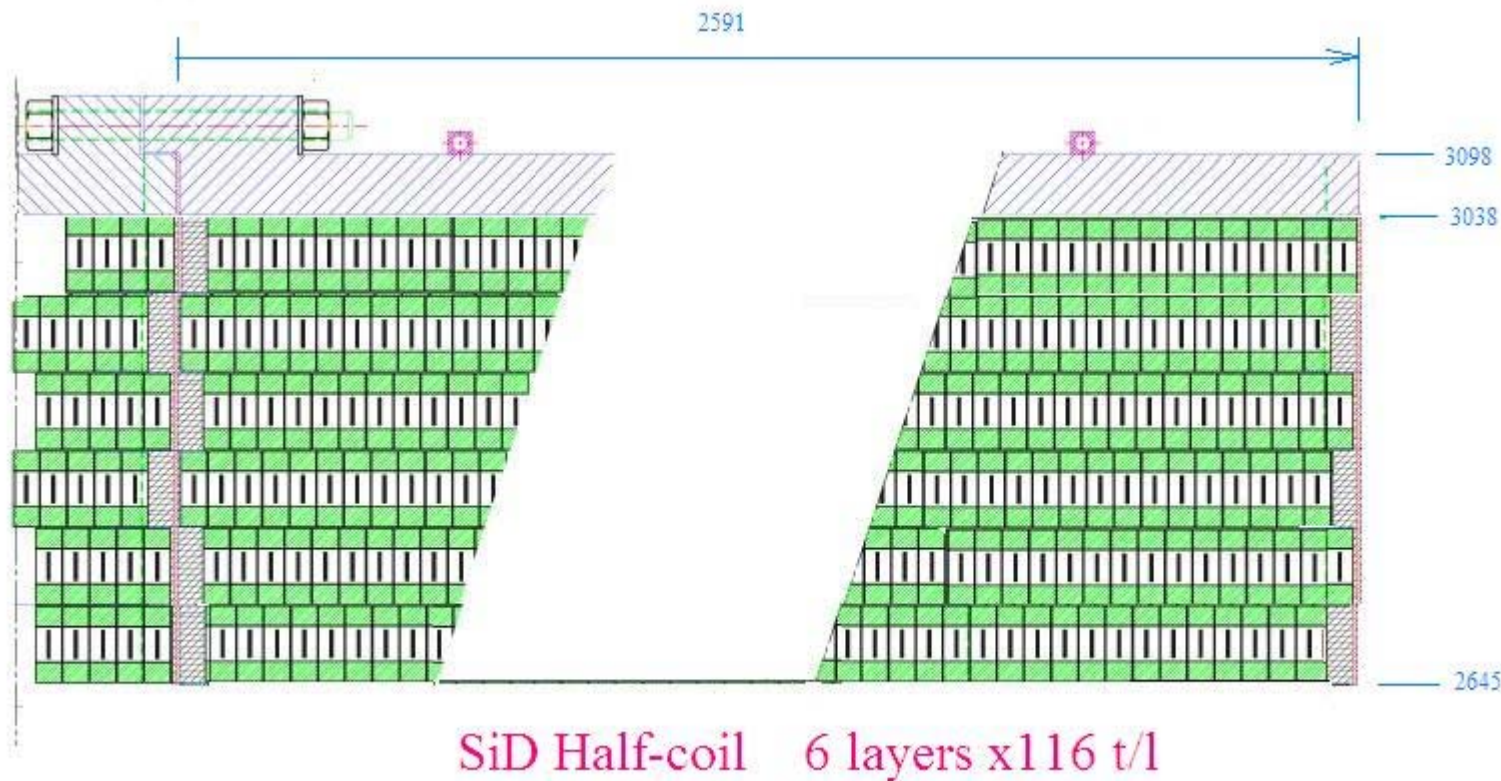
Does physics really require 5T?

Solenoid 2

Feasibility study has been done.   At FNAL: R. Wands & R.Smith

Use CMS conductor design and study stresses, in cooldown and energizing
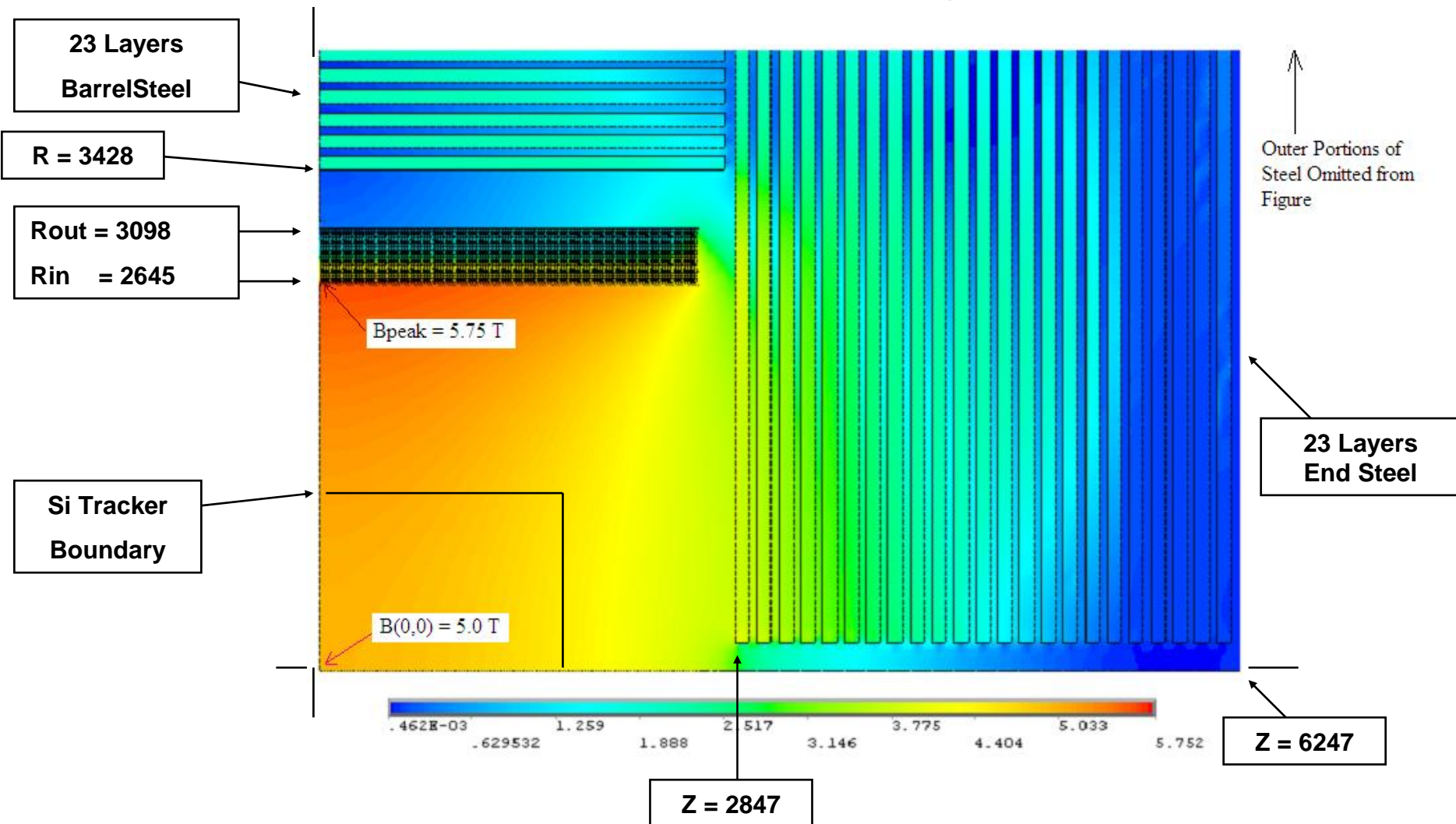
4 layers in CMS, go to 6 layers for SiD

SiD Half-coil   6 layers x116 t/l

Presented at LCWS05

Very nice results, experts agree that it pushes technology, but feasible

Solenoid 3

First ANSYS 2D, 3D Modeling

23 Layers BarrelSteel

R = 3428

Rout = 3098

Rin = 2645

Bpeak = 5.75 T

Outer Portions of Steel Omitted from Figure

23 Layers End Steel

Si Tracker Boundary

B(0,0) = 5.0 T

.462E-03   1.259   2.517   3.775   5.033
    .629532   1.888   3.146   4.404   5.752

Z = 6247

Z = 2847

Note: not same steel configuration as in baseline; change baseline
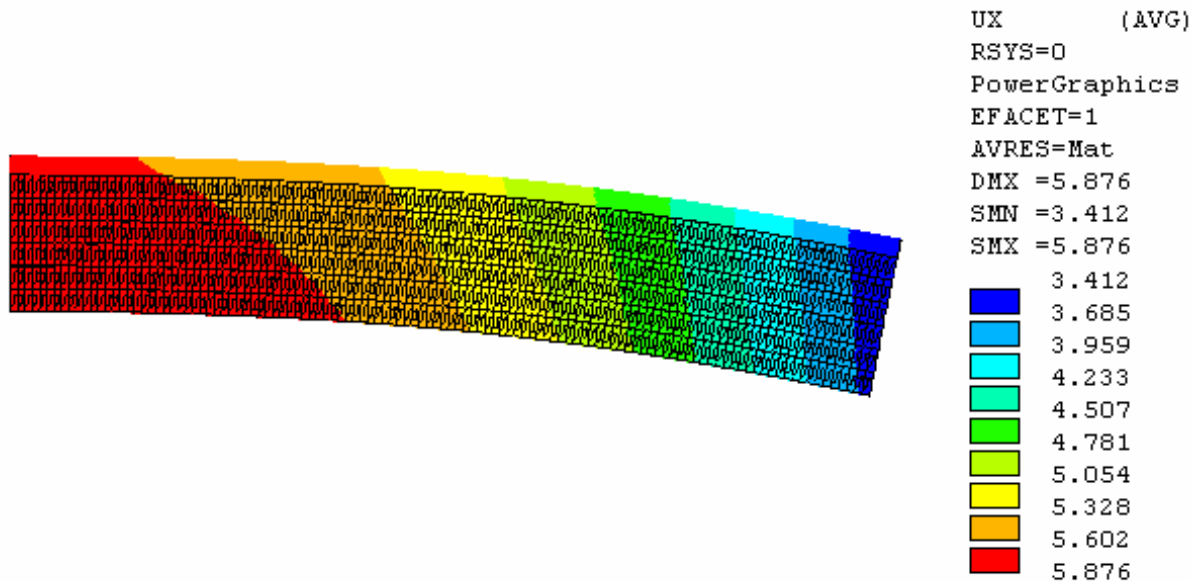
Solenoid; cooldown and energizing modeling
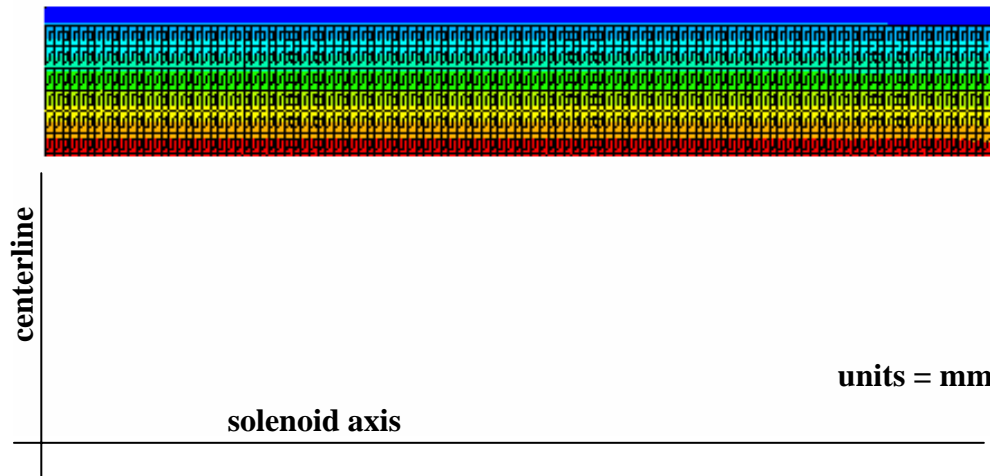
UX   (AVG)
RSYS=0
PowerGraphics
EFACET=1
AVRES=Mat
DMX =16.814
SMN =-12.764
SMX =-10.897
        -12.764
        -12.557
        -12.349
        -12.142
        -11.935
        -11.727
        -11.52
        -11.312
        -11.105
        -10.897

Cooldown; radial displacement

centerline

units = mm

solenoid axis

UX   (AVG)
RSYS=0
PowerGraphics
EFACET=1
AVRES=Mat
DMX =5.876
SMN =3.412
SMX =5.876
        3.412
        3.685
        3.959
        4.233
        4.507
        4.781
        5.054
        5.328
        5.602
        5.876

Energize; radial displacement

Snowmass; August 16, 2005

Stresses in CMS and SiD

| Quantity	SiD	CMS (from Desirelii CERN; Pes SACLAY)
Von Mises Stress in High-Purity Al	22.4 MPa	22 MPa
Von Mises Stress in Structural Al	165 Mpa	145 MPa
Von Mises Stress in Rutherford Cable	132 MPa	128 MPa
Maximum Radial Displacement	5.9mm	~5mm
Maximum Axial Displacement	2.9mm	~3.5mm
Maximum Shear Stress in Insulation	22.6 MPa	21 MPa

First cooldown of CMS in Fall is important step for this concept

DiD in SiD ?

What can be done with a dipole in detector (DiD) ?
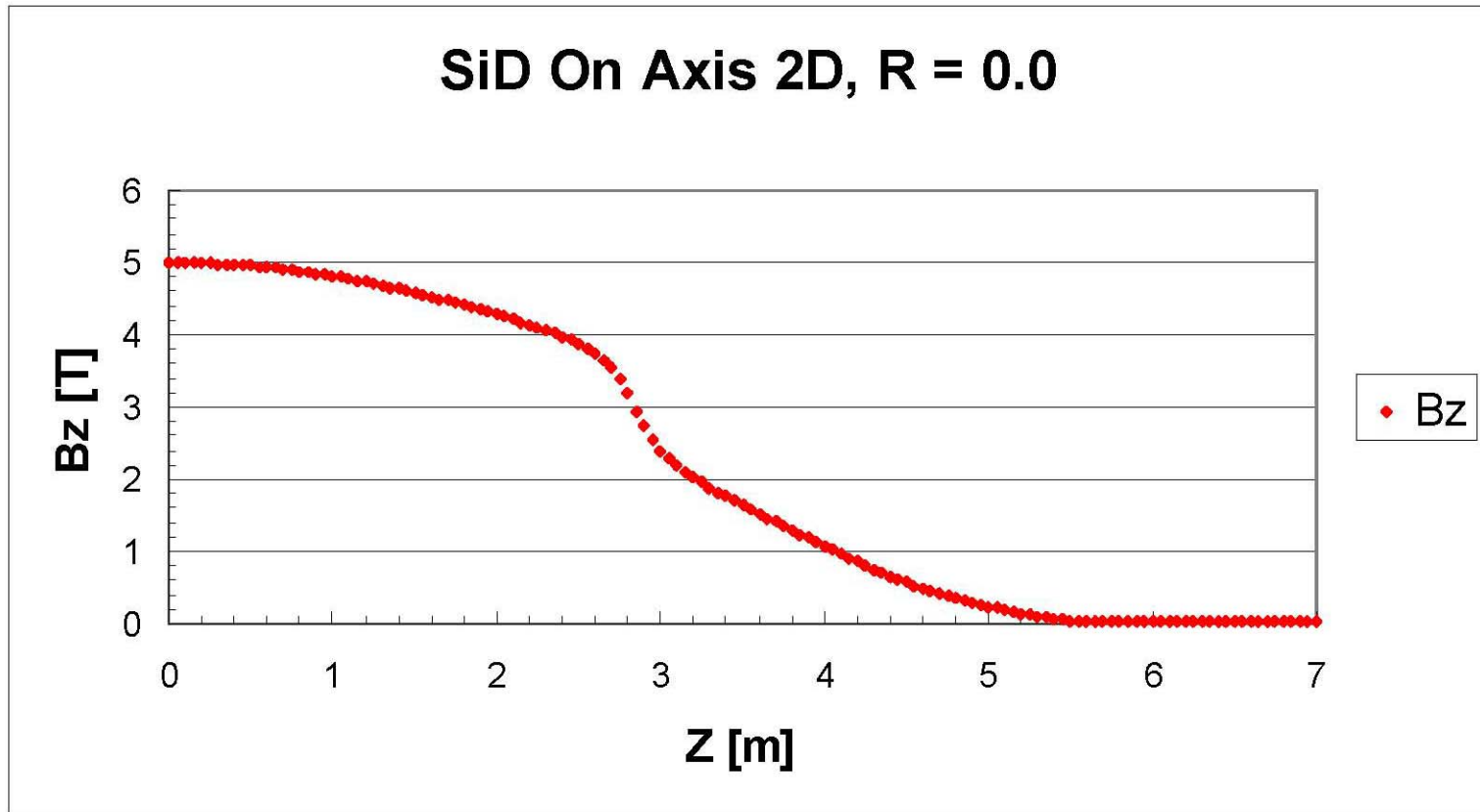## Compensate for crossing angle

- **What can be done with 400kA-turns dipole pairs on outer support cylinder:**

RP Smith, R Wands

Snowmass Preview Aug 10, 2005

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Field maps available for MDI
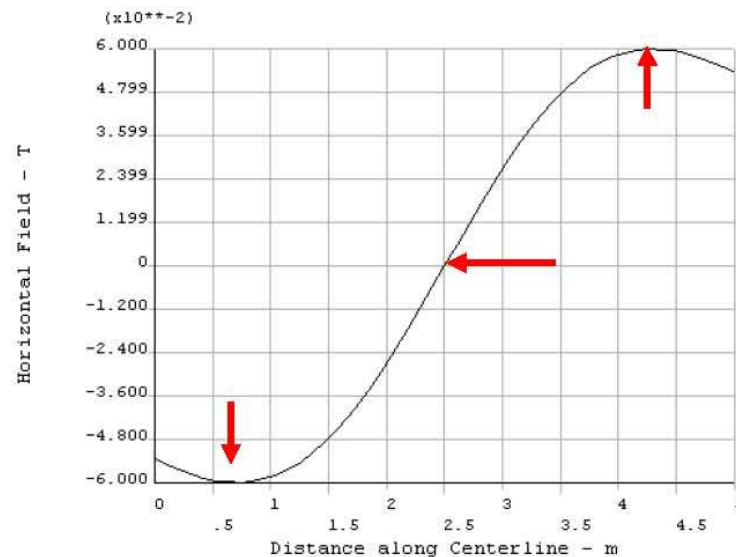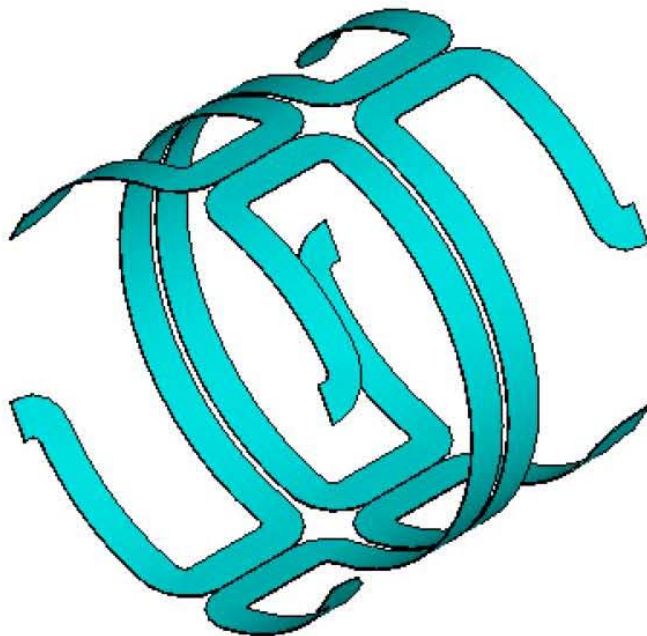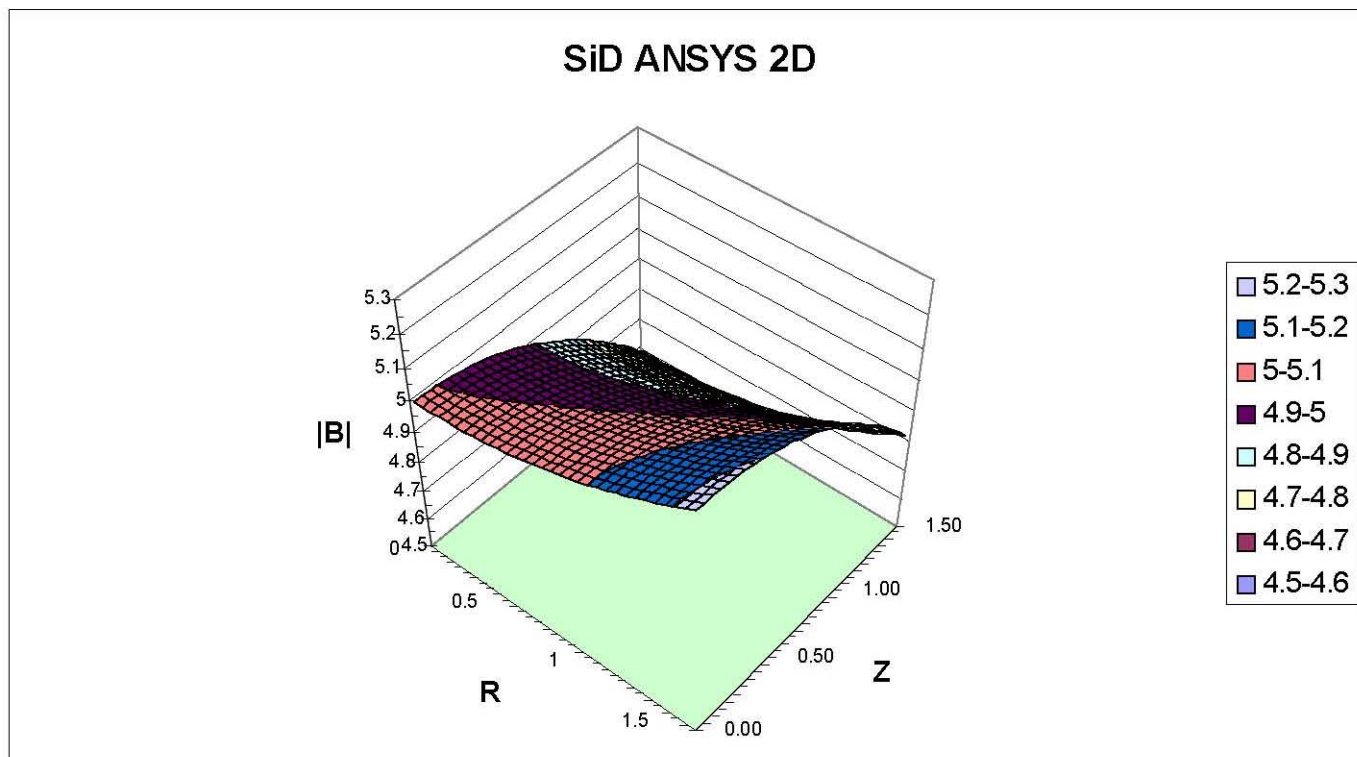
- **"On Axis" out to 20m: 2D model**

SiD On Axis 2D, R = 0.0

RP Smith, R Wands

Snowmass Preview Aug 10, 2005

Snowmass; August 16, 2005

Field maps available

- ## **Central Detector: 3D model; looks like**

RP Smith, R Wands

Snowmass Preview Aug 10, 2005

Snowmass; August 16, 2005

Questions

- Need iterations with Detector/Physics Groups to select "most probable" performance parameters
    - How to "Open" detector ?
    - Must Detector Roll "off beamline" ?
    - Anti-solenoids in forward region
    - EndCap Steel Details

Field Homogeneity not specified. Do we need to ?

Radiation Transparency not specified Same

"Fallback" field (below which physics is compromised) not specified. SiD should specify

Plans for Snowmass

Rich will be at Snowmass next week Monday - Thursday

Interact/Answer some of the questions on previous page

Interact with WG4/MDI group about correction dipoles(DID) & anti-solenoids

Develop cost model, based on CMS "as built" cost, which can be used to scale for different SiD configurations