MDI Status

MDI/I (FFIR) meeting agenda/minutes（日本語）

http://ilcagenda.linearcollider.org/categoryDisplay.py?categId=103

ILD MDI Working Group Meeting Agenda

http://ilcagenda.linearcollider.org/categoryDisplay.py?categId=130

BDS Meeting, IR Interface Document, Agenda

http://ilcagenda.linearcollider.org/categoryDisplay.py?categId=9

T. Tauchi, 11th July 2008

Since the last monthly meeting;

ECFA08 : MDI/Integration informal mtg.

9-12 June 08 ; discussion (ILD Action Plan)

ILD1 : MDI/Integration (FFIR) meetings

xx July 08 ;

ILD : MDI/Integration meetings (Webex)

1 July 08 ; ILD Action plan, residual B field

Y. Suetsugu: Beam pipe design

Estimation of wakefield in the LDC cone beam pipe

- its strength and possible location of vacuum pumps

T. Abe: Background in IR

- estimation of minimum thickness of W-support tube
- vacuum at IP, 10n or 1n Torr, including hadron production in residual gas interaction

T. Sanami: Self-shielding property of ILD

CMS like structure : 3 rings with 5cm gap in barrel and
2.5cm gap to endcap 2 rings

Pacman performance

T. Okugi: Re-commissioning at push-pull

- estimation of time (flight simulation ?)

Y. Iwashita: Permanent magnet QD0

Future works

1. IR

M. Kawai, 3D Field calculation with anti-DID

2. Integration

K. Tsuchiya, joint cryo-system (detector solenoid, QD0 ?)

H. Yamaoka, QD0 support system and detector integration

3. Push pull

S. Kuroda, Optics of L*=4.5m from one of L*=3.5m

Minimum Functional Requirements

(1) Speed of push-pull operation

a few days, or less than a week, which includes time from the switch-off the beam until the moment when luminosity is restored to 70% level and at the same energy, after the detector exchange, but not includes detector calibration time.

(2) QD0 : L* is from 3.5m to 4.5m

QF1 : 9.5m from IP - the hall width

(3) Detector garage position : 15m from IP

detector : radiation and magnetic environment suitable for people's access during beam collision

(4) IR and detector : satisfy the beam parameters of nominal, Low N(Q), Large Y and LowP in the RDR

A. Yamamoto, December 12, 2006

Possible Move-in/out Time

	Day 1	2	3	4	5	6	7	8	9	10
Stop steady op.,B-off, Cryo. cold-box warm-up,										
Seal-off & disconnect pipe and cables										
Move-in/-out										
Reconnect pipes and cables										
Check safety (leak tight, interock)										
Cryogenics re-start cool-down,										
Check safety at cold, & pre-excitation test										
Re-start detector run										

One week would be a reasonable time for such critical operation for high-pressure gas system

Beam Parameters in RDR

TABLE 2.1-2
Beam and IP Parameters for 500 GeV cms.

Parameter	Symbol/Units	Nominal	Low N	Large Y	Low P
Repetition rate	f_{rep} (Hz)	5	5	5	5
Number of particles per bunch	N (10^{10})	2	1	2	2
Number of bunches per pulse	n_b	2625	5120	2625	1320
Bunch interval in the Main Linac	t_b (ns)	369.2	189.2	369.2	480.0
in units of RF buckets		480	246	480	624
Average beam current in pulse	I_{ave} (mA)	9.0	9.0	9.0	6.8
Normalized emittance at IP	$\gamma\epsilon_x^*$ (mm·mrad)	10	10	10	10
Normalized emittance at IP	$\gamma\epsilon_y^*$ (mm·mrad)	0.04	0.03	0.08	0.036
Beta function at IP	β_x^* (mm)	20	11	11	11
Beta function at IP	β_y^* (mm)	0.4	0.2	0.6	0.2
R.m.s. beam size at IP	σ_x^* (nm)	639	474	474	474
R.m.s. beam size at IP	σ_y^* (nm)	5.7	3.5	9.9	3.8
R.m.s. bunch length	σ_z (μm)	300	200	500	200
Disruption parameter	D_x	0.17	0.11	0.52	0.21
Disruption parameter	D_y	19.4	14.6	24.9	26.1
Beamstrahlung parameter	Υ_{ave}	0.048	0.050	0.038	0.097
Energy loss by beamstrahlung	δ_{BS}	0.024	0.017	0.027	0.055
Number of beamstrahlung photons	n_γ	1.32	0.91	1.77	1.72
Luminosity enhancement factor	H_D	1.71	1.48	2.18	1.64
Geometric luminosity	$\mathcal{L}_{geo}$ $10^{34}/\mathrm{cm}^2/\mathrm{s}$	1.20	1.35	0.94	1.21
Luminosity	$\mathcal{L}$ $10^{34}/\mathrm{cm}^2/\mathrm{s}$	2	2	2	2

Parameters for the Linear Collider

ILCSC Parameter Committee, Updated November 20, 2006

(1) approximately L_{eq} = 500 fb^{-1} in the first four years of running,
not counting year zero for machine commissioning and short pilot physics run

(2) a total of 1 ab^{-1} within two additional years of running,
without requiring an additional shutdown.

(3) We expect shutdowns to install the upgrades or options to take not more than two years after an initial physics running time of at least four years, including the commissioning of the upgrades or options.

(4) order of 1 ab^{-1} (equivalent at 1 TeV) in about 3 to 4 years.

2. Radiation Shield of Detector

Supervised area at KEK, CERN and GERT at SLAC

(1) Self-shielded or additional local fixed/movable shielding wall

(2) Nominal operation : < 0.5 μSv/hour near the offline detector

(3) Accident case :

< 250 mSv/hour for maximum credible beam

(simultaneous loss of both beams anywhere near IP)

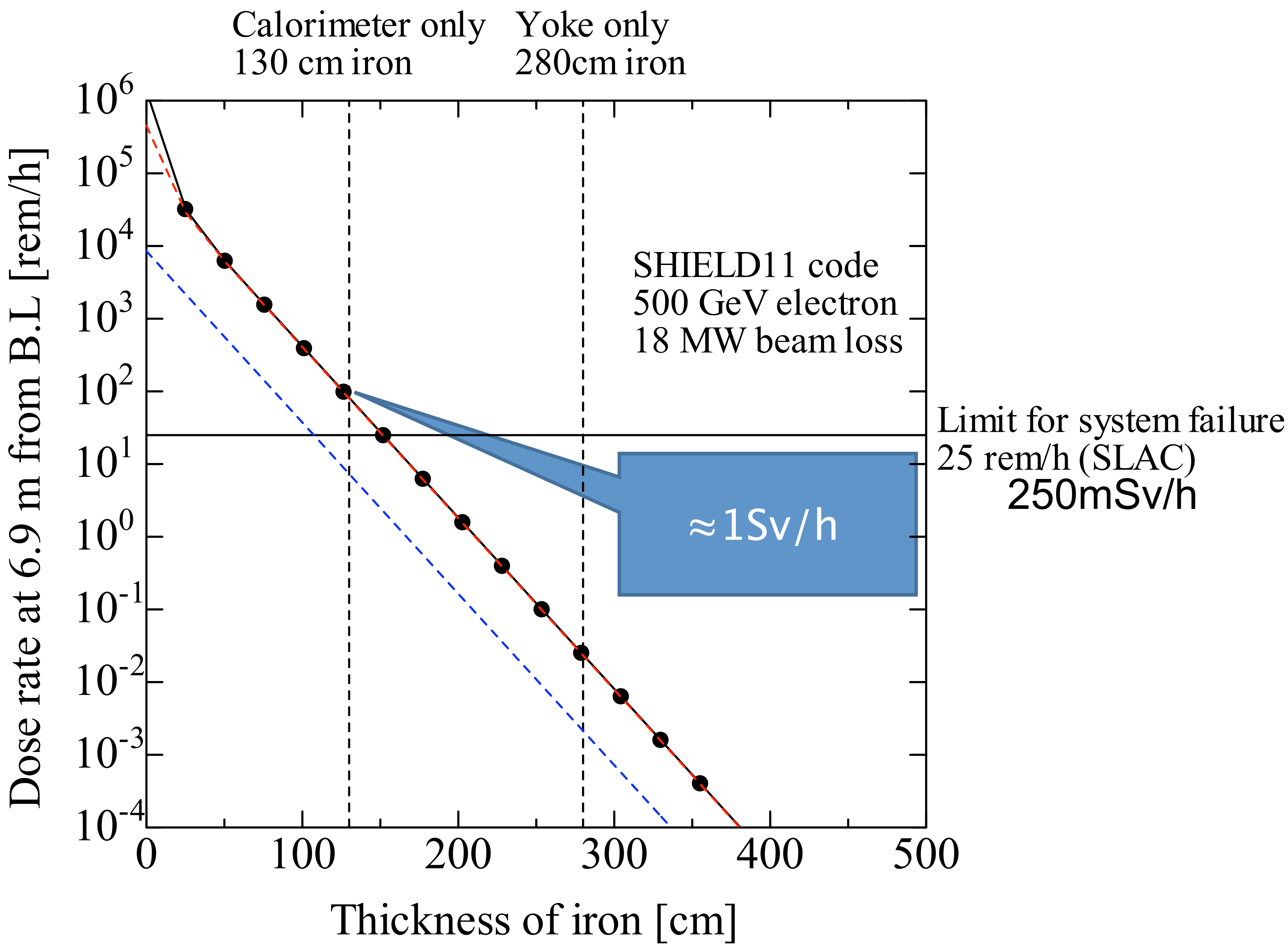
The integrated dose < 1mSv/ accident

- need of a robust emergency beam shut-off system

(4) Remarks

gaps in CMS style assembly and PACMAN at beam line

Normal operation	LHC	SLAC	KEK	ICRP Pub. 26
non-designated area or GERT access	0.1uSv/h	0.5uSv/h	0.2uSv/h 100uSv	1mSv/y
supervised area	1uSv/h	5uSv/h	1.5uSv/h	100mSv/5ys 50mSv/y
simple controlled area	3uSv/h		20uSv/h	
Total beam loss				
non-designated area	0.3mSv/h			
supervised area	2.5mSv/h			
simple controlled area	50mSv/h			
Mis-steering		4mSv/h	1.5uSv/h 1mSv/week	
System failure		250mSv/h 30mSv/evt		



To accommodate KEK rule, 1mSv/week :

1 [mSv/h] / 1000 [mSv/h] x 3600 [s] = 3.6 [s]

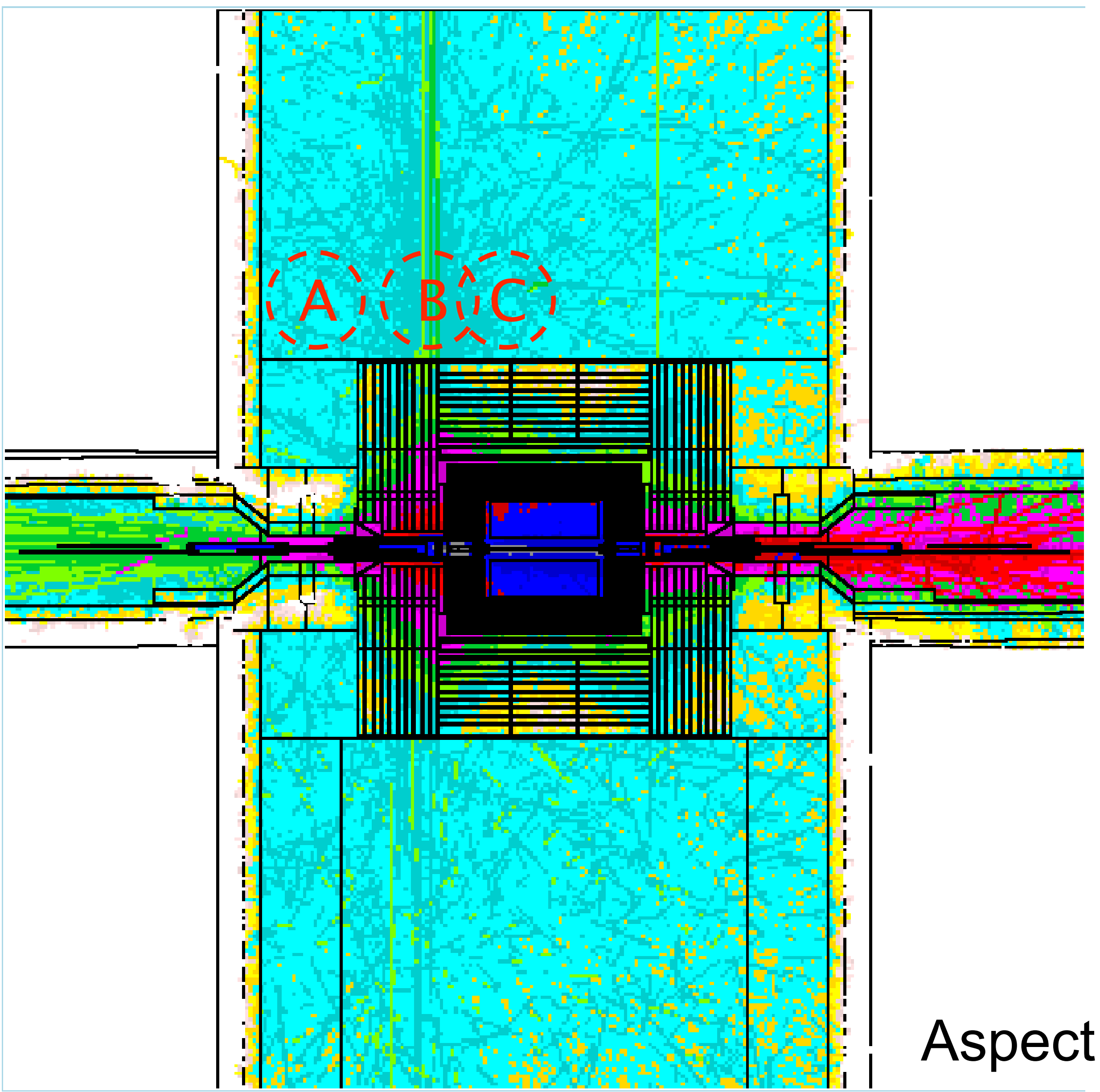
The system turning off both beam within 3.6 sec must be required

Accidental Case Study

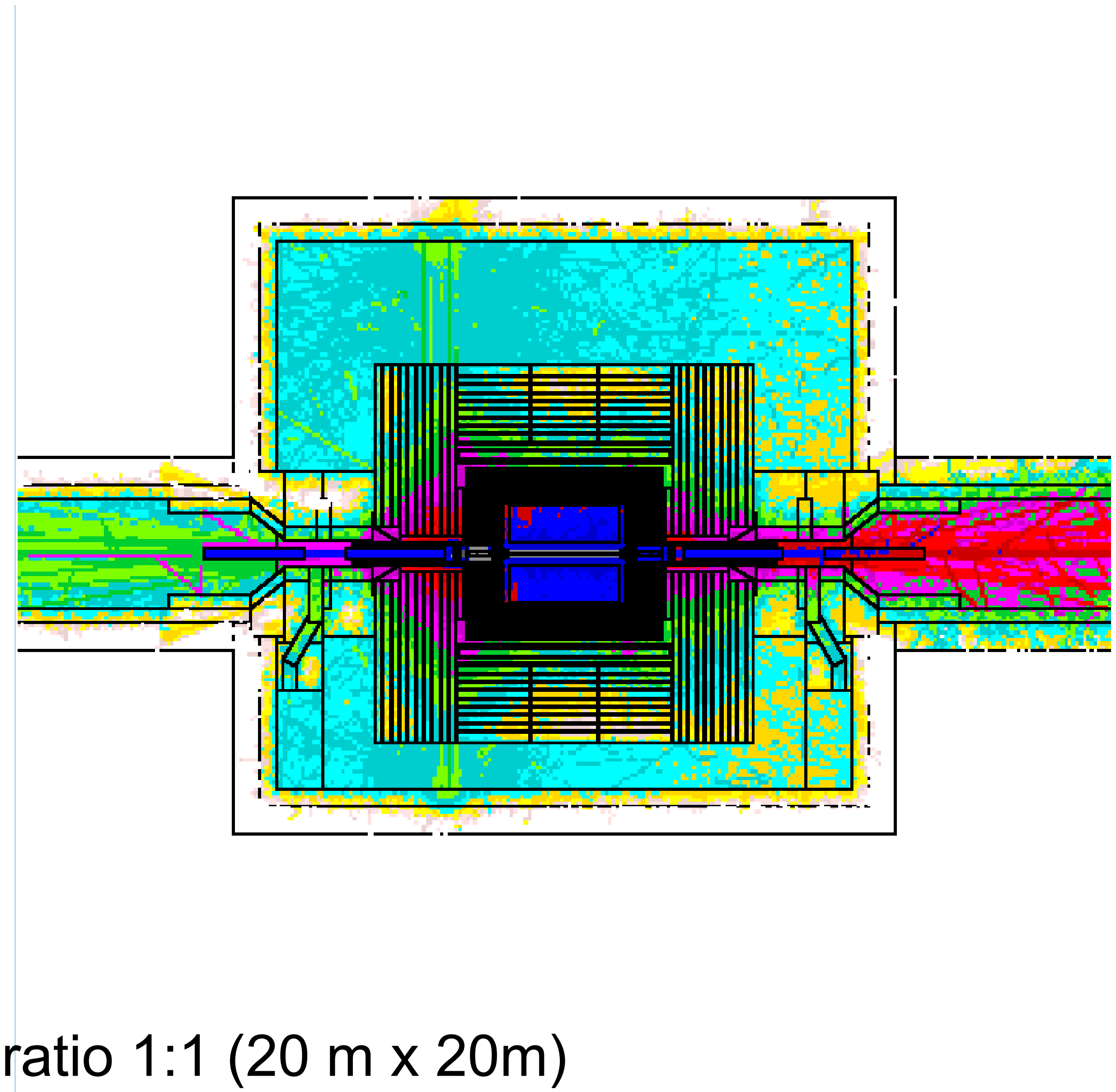
T. Sanami, May 23, 2008

Result of dose rate evaluation in IR hall

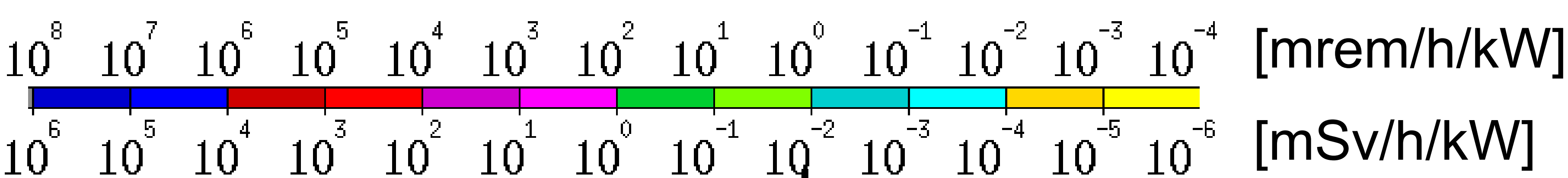
Plan view



Elevation view



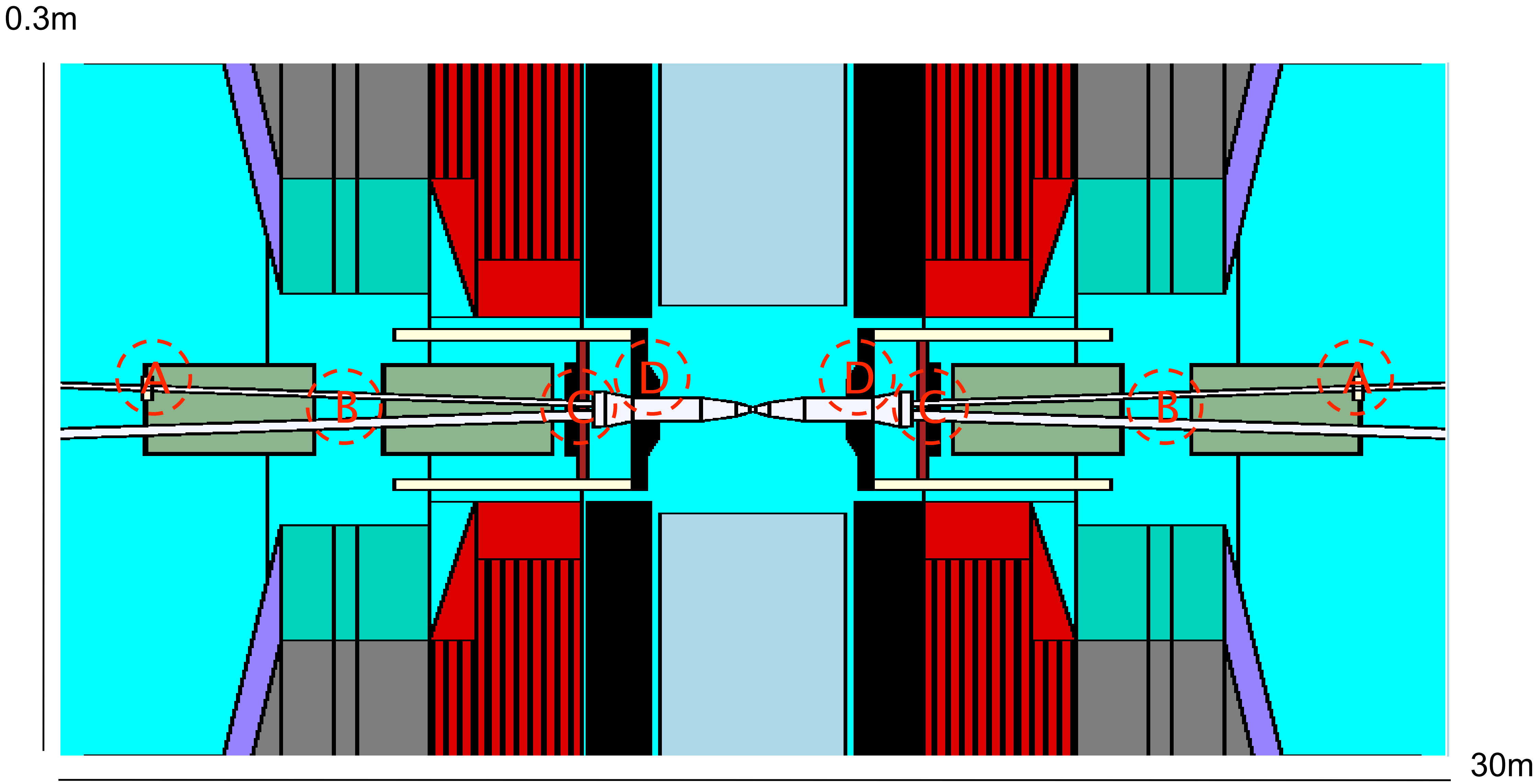
Aspect ratio 1:1 (20 m x 20m)



1.39×10^{-2} [mSv/h/kW] (250mSv/h / 18 MW)

T. Sanami, May 23, 2008

Source term of radiation in IR hall



Beam loss points with thick components (Normal, Accidental)

- A: Final doublet protection collimator (≈0 W, 18 MW)
- B: Vacuum valve and flange (≈0 W, 18 MW)
- C: Beam calorimeter (<1 W, 18 MW)
- D: Luminosity calorimeter (<1 W, 18 MW)

Pseudo target : Iron 12” L x 2” r (17 X_0 L x 2.8 X_0 r)

ILD action list :

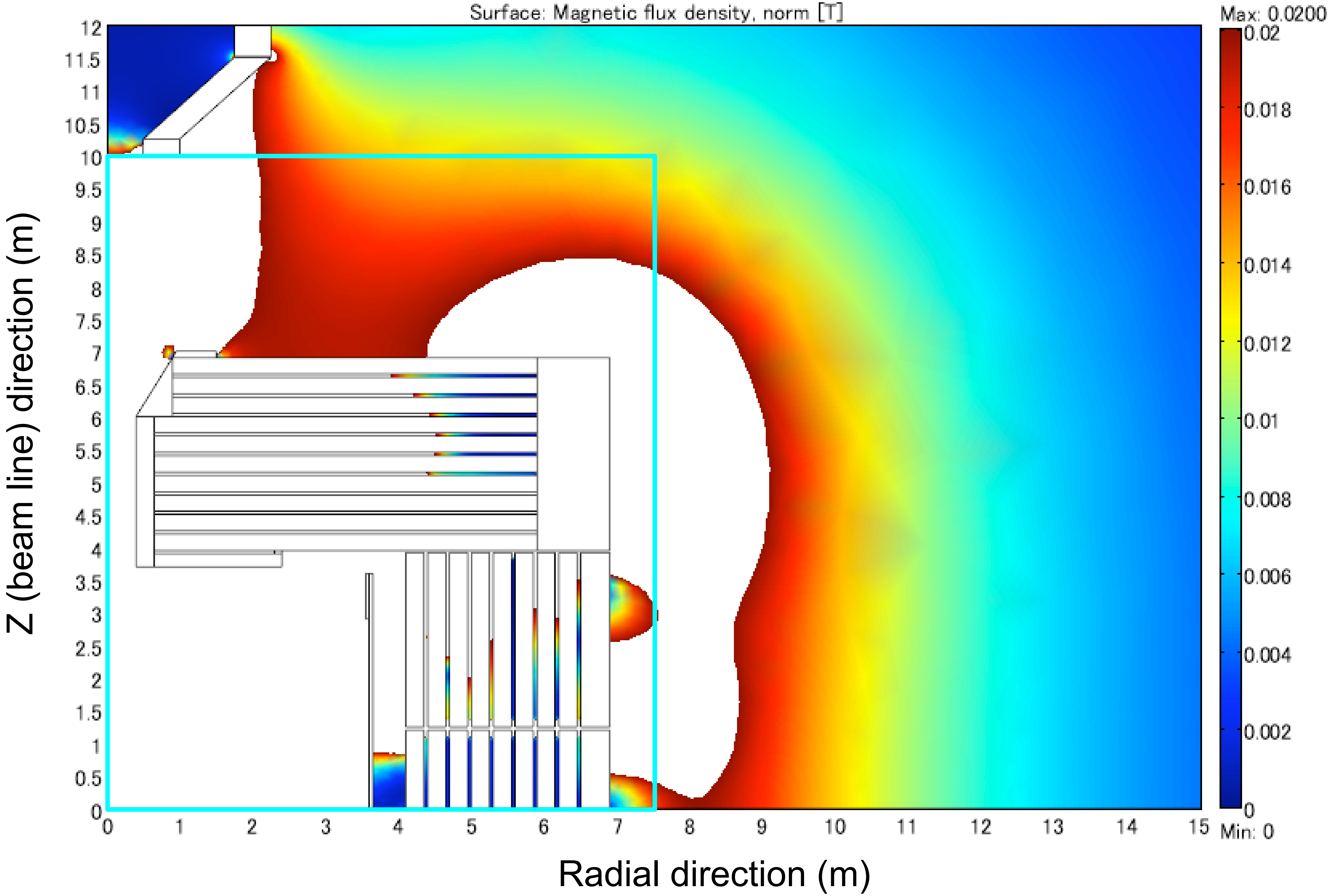
1. Magnet

- Prepare a list of questions to submit to F.Kircher during a meeting (+ videoconf with Japan)
- Real impact of the gaps
- Is it possible to cycle the field up and down to reduce remnant magnetization of the iron in order to reduce the gap necessary to separate the endcaps from barrel yoke. How long compare to a normal shut down ?
- **Stray field :**
  - Simulate the effect on the stray field of external iron around the gaps (not in touch with the barrel)
  - minimal thickness and radius for stray field constraints in z and R
  - 3D simulation of the stray field in particular, and study the possible impact of square holes on the field and effect on the beam.
  - Influence of the repartition of muons chambers in all thickness, or first half.

Y. Sugimoto, May 23, 2008

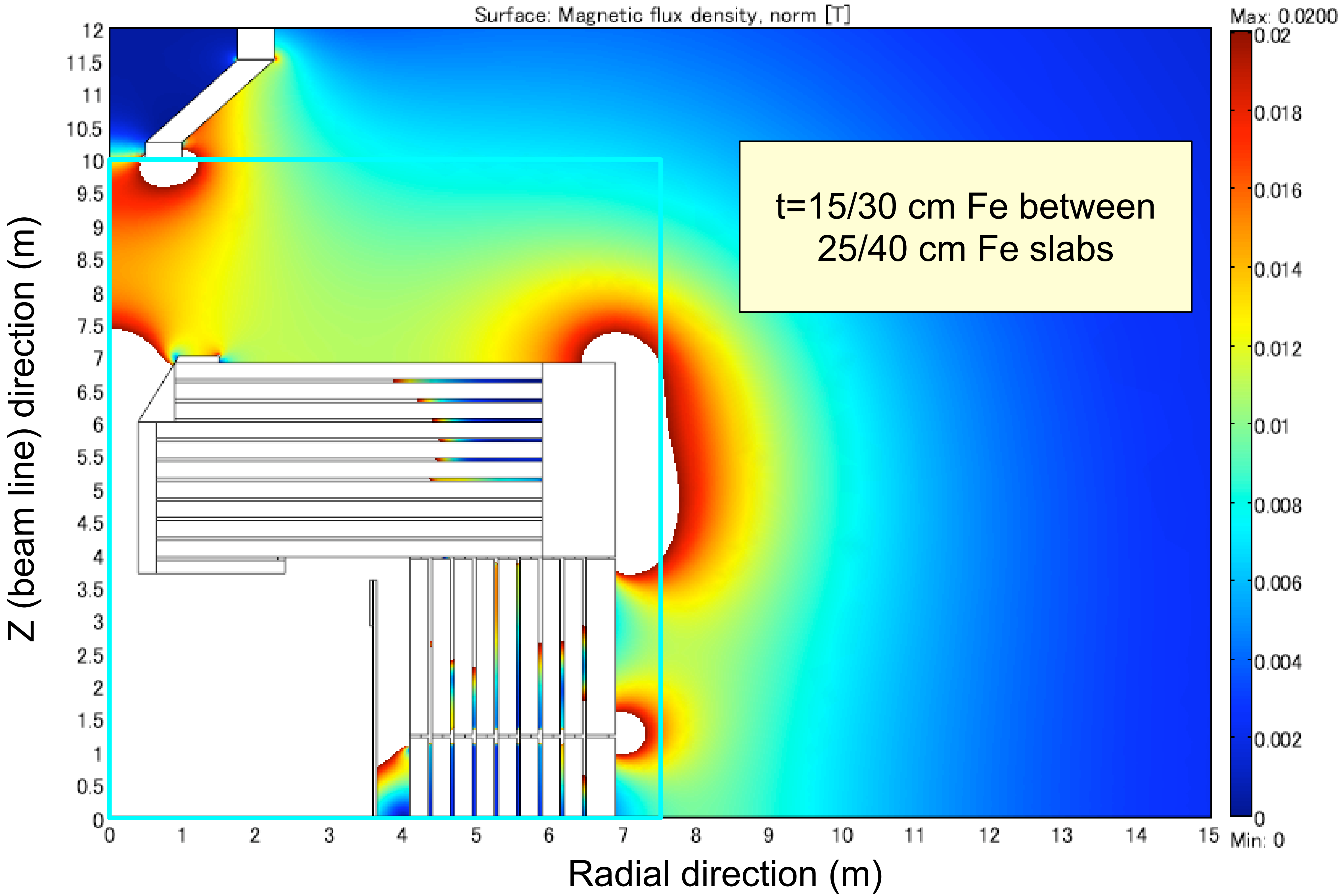
A maximum stray field of 200 G at 10 m in Z and yoke outer radius + 50 cm

GLDc



Y. Sugimoto, May 23, 2008

Gap partially filled with Fe



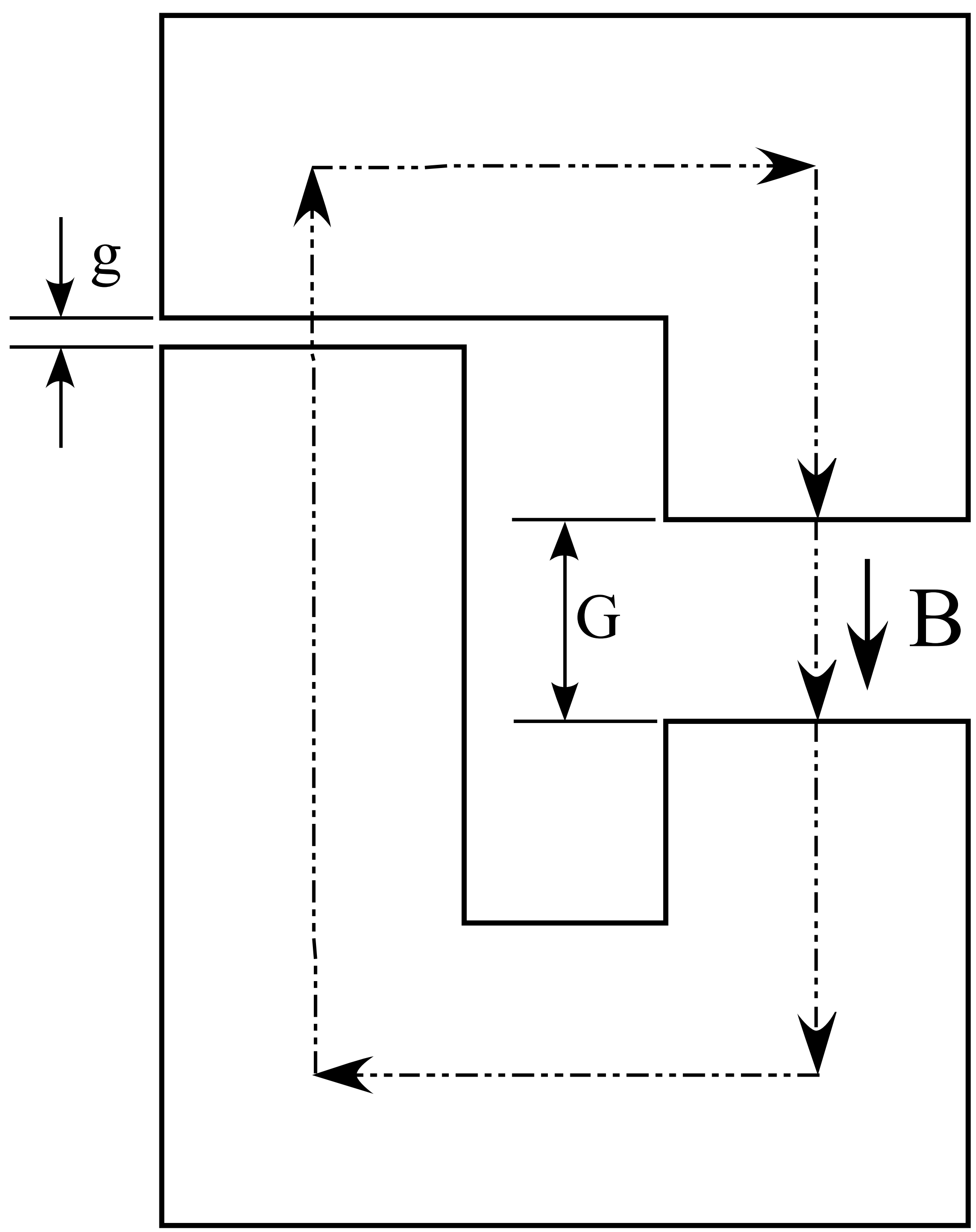
Much more Fe should be used, or

Gaps between rings should be partially (>50%) filled with Fe

Residual B field

Yasuhiro Sugimoto

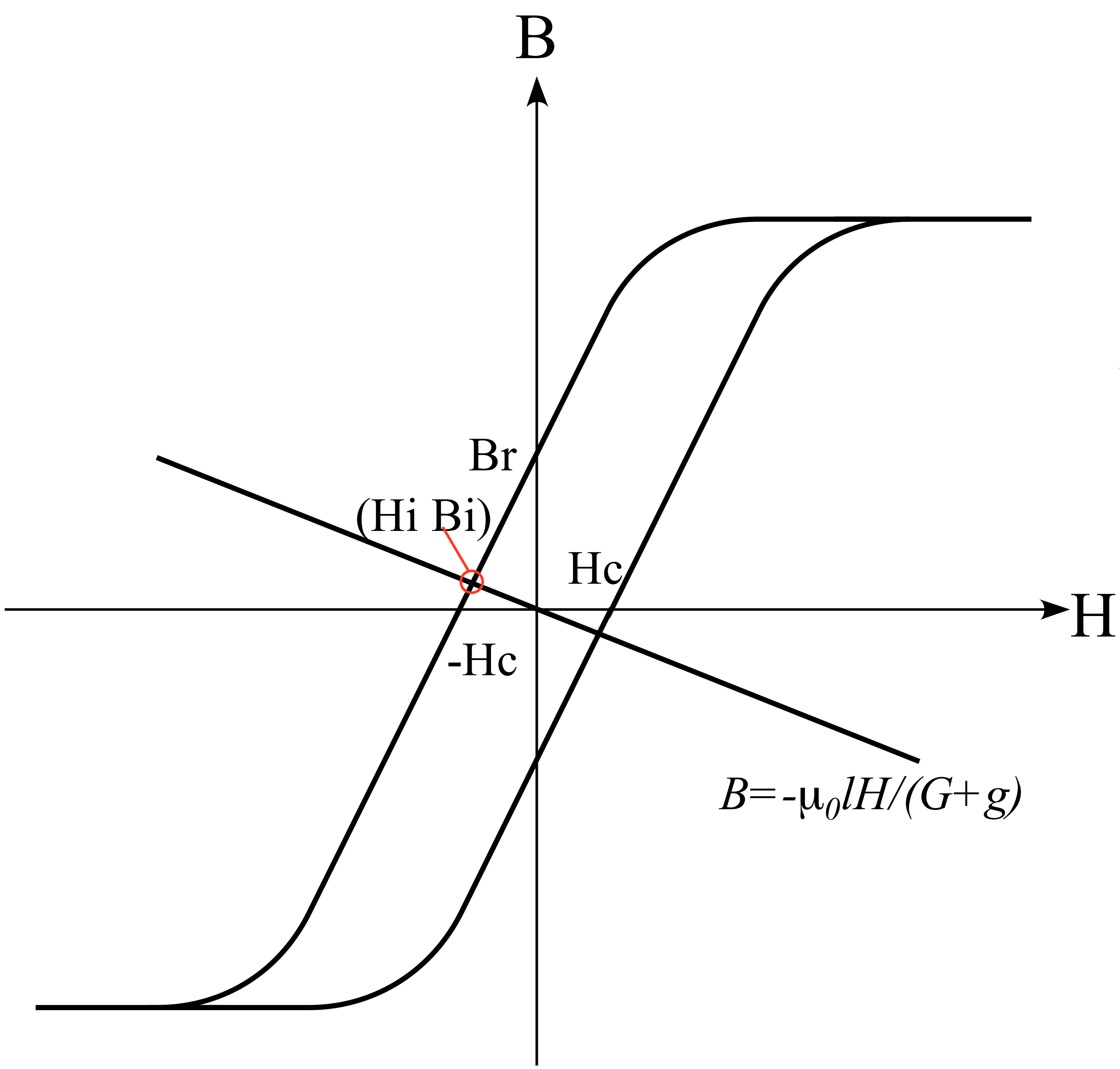
Model



- A simplified model
  - Cross section of the return yoke and the gaps (magnet bore) are same
  - No leakage field

  ➔ B has the same strength in the gaps and in the return yoke

B-field at I=0 A



Magnetic field H satisfies

$$\oint_c \vec{H} \times d\vec{s} = I$$

where I is the coil current and integration is done along the closed loop shown in dot-dash line in the previous page. For $I=0$, it leads to

$$\frac{B(G+g)}{\mu_0} + H_i l_i = 0$$

where H_i and l_i are magnetic field and path length in the return yoke, respectively. H and B inside the yoke is shown as a red circle in the left figure. Since B in the gap and in the yoke is same,

$$B = B_i = -\frac{\mu_0 l_i}{G+g} H_i < \frac{\mu_0 l_i}{G+g} H_c$$

Conclusion

- For iron with Hc=100A/m, B in the gap is just a few Gauss
- We need neither gaps between rings nor reversing polarity of the power supply

- Permeability curves, to be sent around.   - Done

(From Sendai summary) :TPC field uniformity , question of anti DID. In case of a L* of 7 m, so crossing angle of less than 10 mrad, is the antiDID still useful ?

- anti-DID is relevant for FCAL/BCAL rather than TPC.
- TPC does not require the field uniformity but the precise measurement.

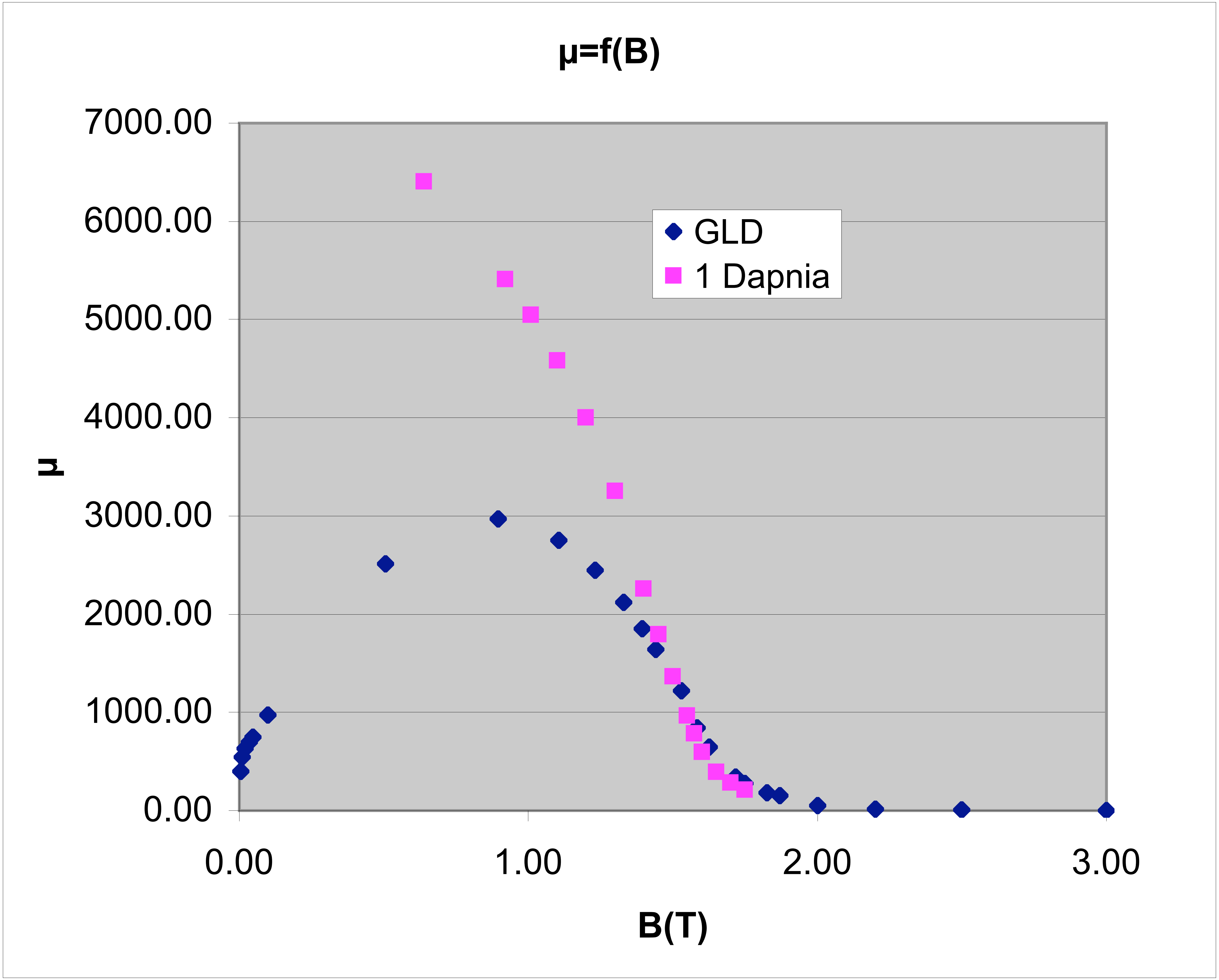
Coil :   - Yamaoka and KEK low-temperature group

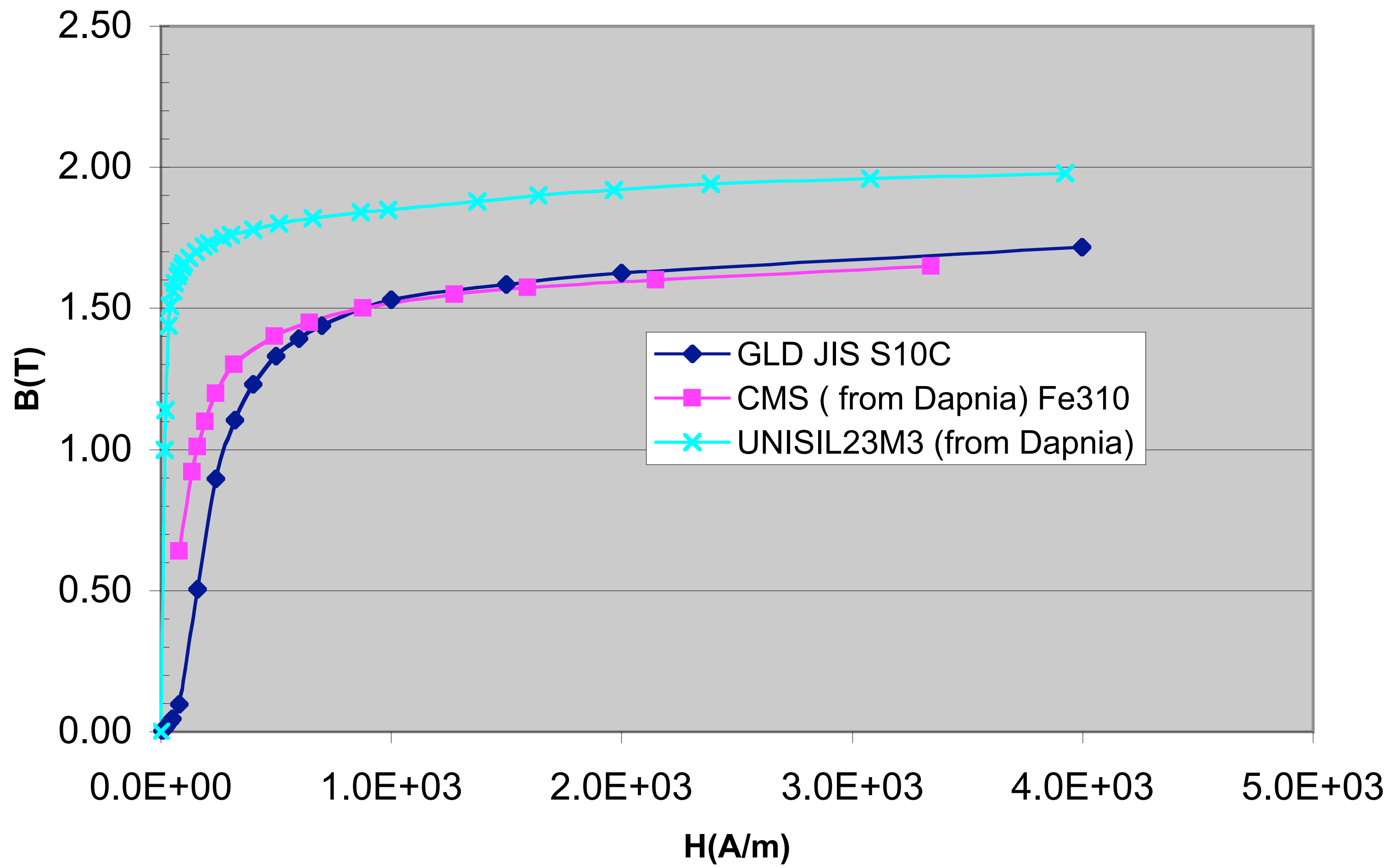
- o Mechanical deformation when loaded with calorimeters (less than 4-5mm), i.e. thickness of SS
- o Dimensioning for 4T, (even if work to 3.5 T) with 4 layers of windings (CMS like)
- o correction currents to control TPC homogeneity versus antiDID . Does it have an impact on stray field?

+Magnet :

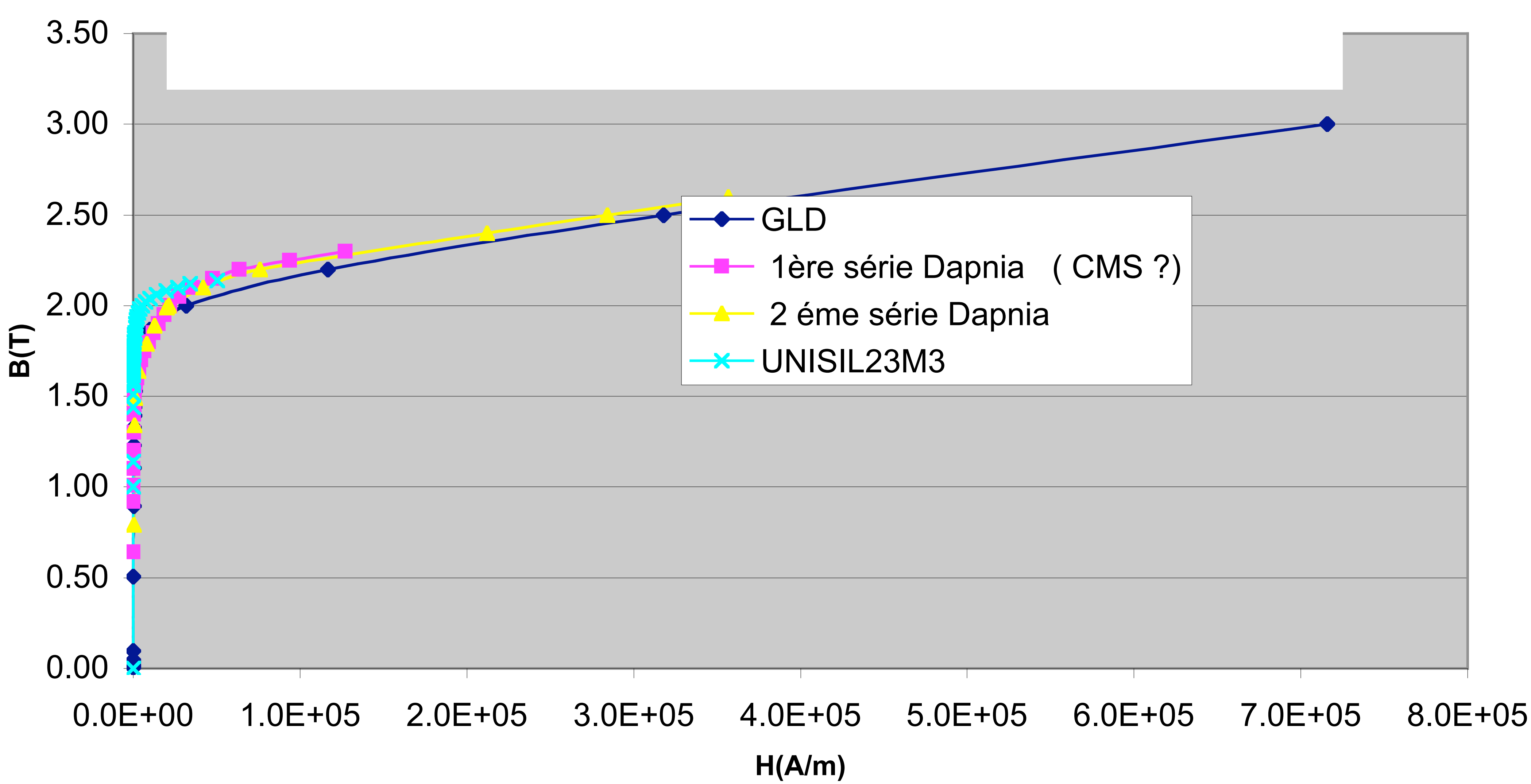
- o How to insure rigidity between the 3 rings of the yoke during push-pull (additional outer structure ?)
- o Thickness of the first layer of the yoke on the viewpoint from magnetic field and mechanical deformation.
- o Presence of gaps against self shielding. To be checked. - Sanami

C. Clerc, June 13, 2008



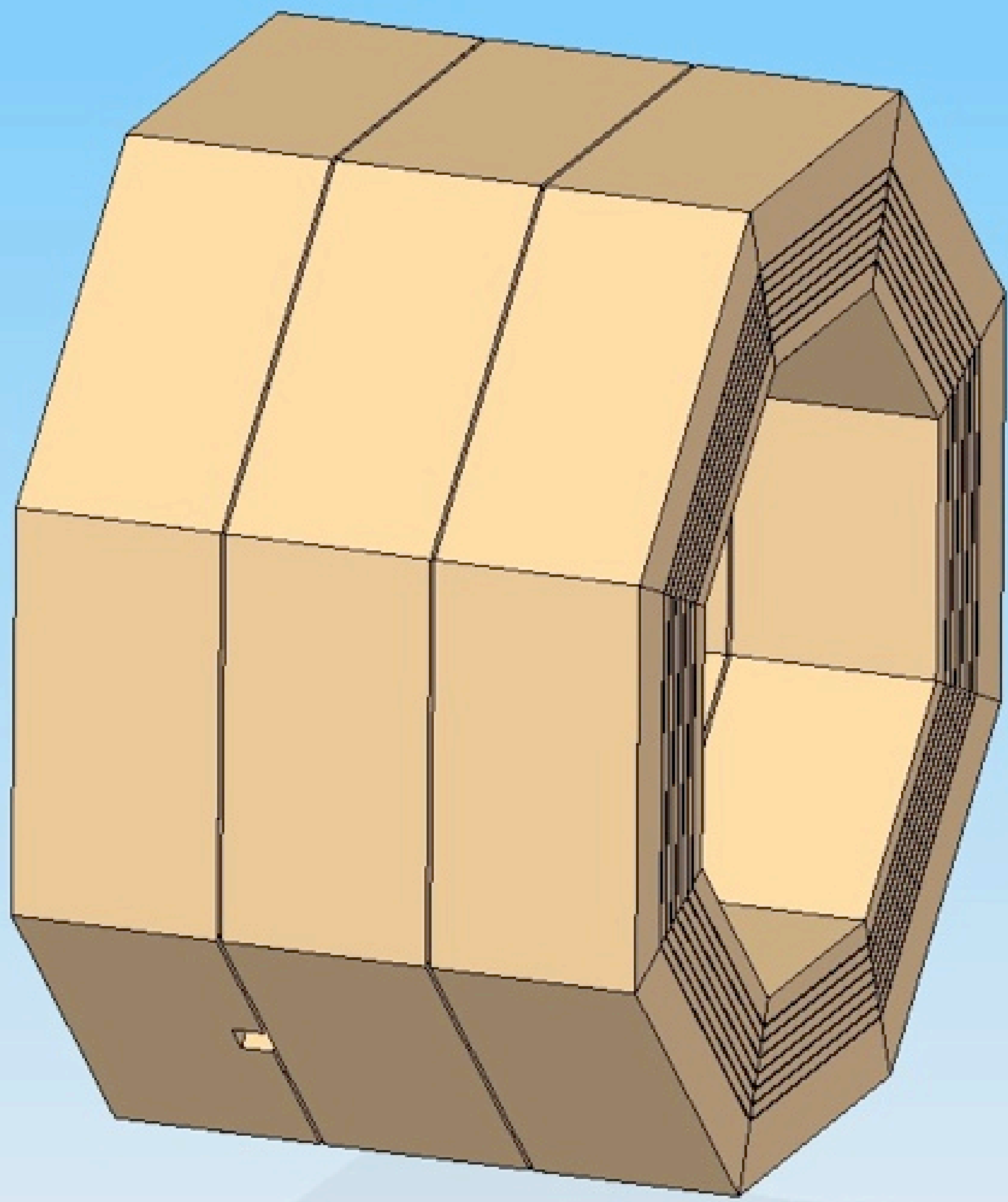


B(T)
H(A/m)
0.00
0.50
1.00
1.50
2.00
2.50
0.0E+00
1.0E+03
2.0E+03
3.0E+03
4.0E+03
5.0E+03
GLD JIS S10C
CMS (from Dapnia) Fe310
UNISIL23M3 (from Dapnia)

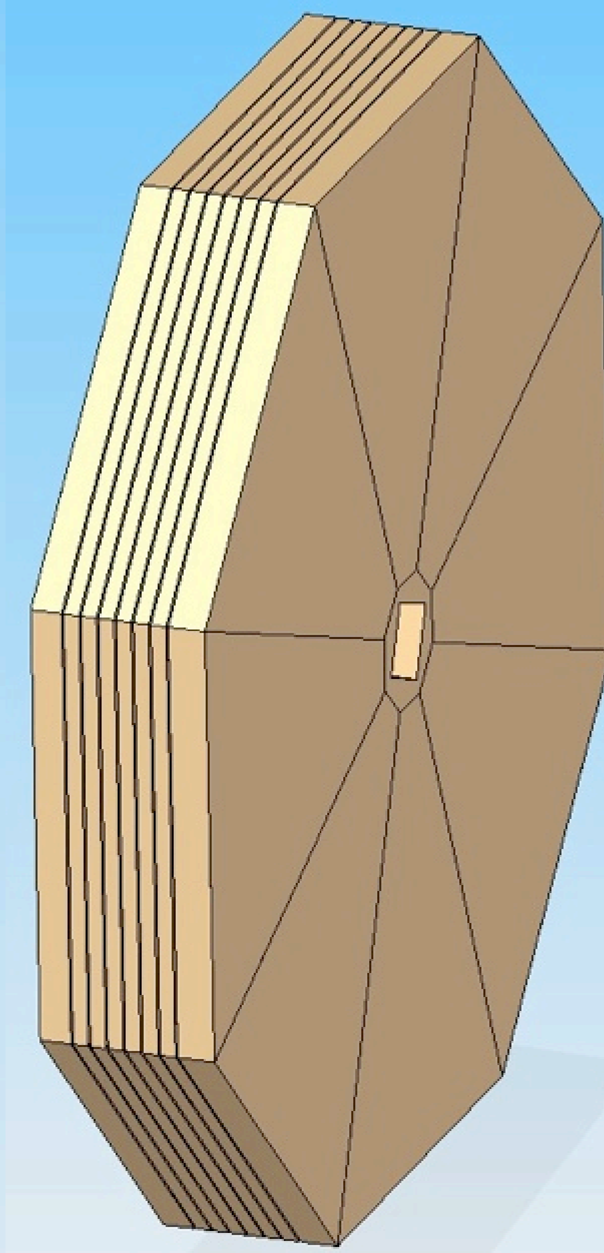


B(T)
H(A/m)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
0.0E+00
1.0E+05
2.0E+05
3.0E+05
4.0E+05
5.0E+05
6.0E+05
7.0E+05
8.0E+05
GLD
1ère série Dapnia (CMS ?)
2 éme série Dapnia
UNISIL23M3

3D CAD



Barrel Yoke



Endcap

2. Beam pipe

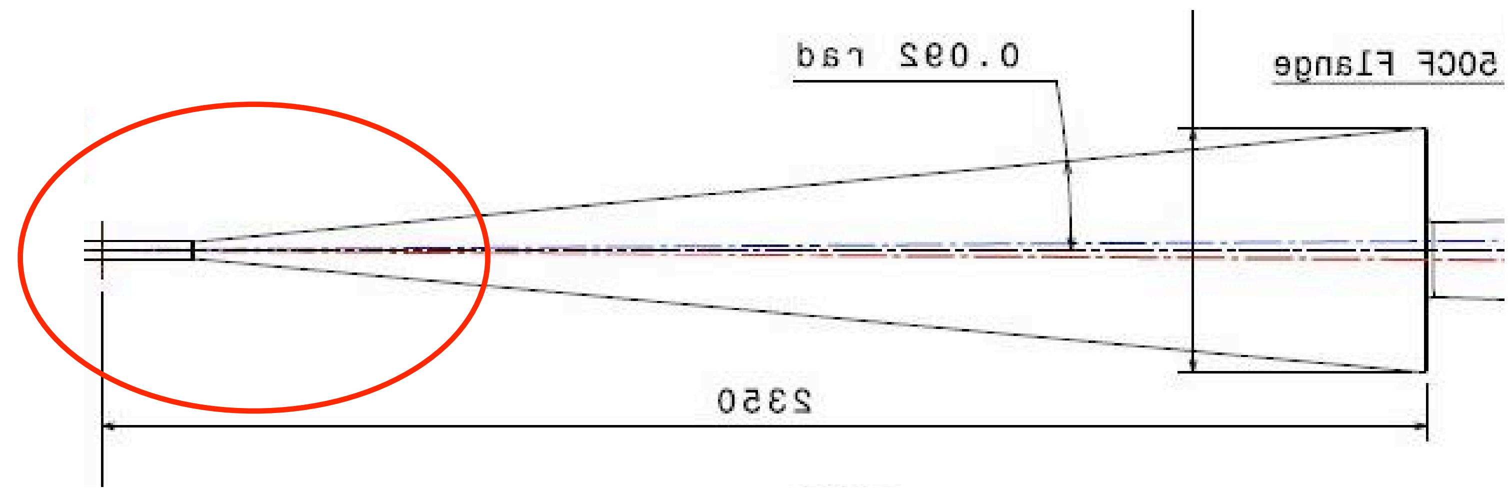
- See with Fcal people how small the lumical outer radius can be.
- Impact on forward detectors, thickness of the cone.
- Mechanical strength studies - Suetsugu
- How long can the Be part be ? - VTX
- Shape of the first angle at 10cm
- Beam pipe radius/first layer of the vertex - VTX
- Pumping solutions, also bellows - Suetsugu

3. 8 versus 12 fold; Calorimeters

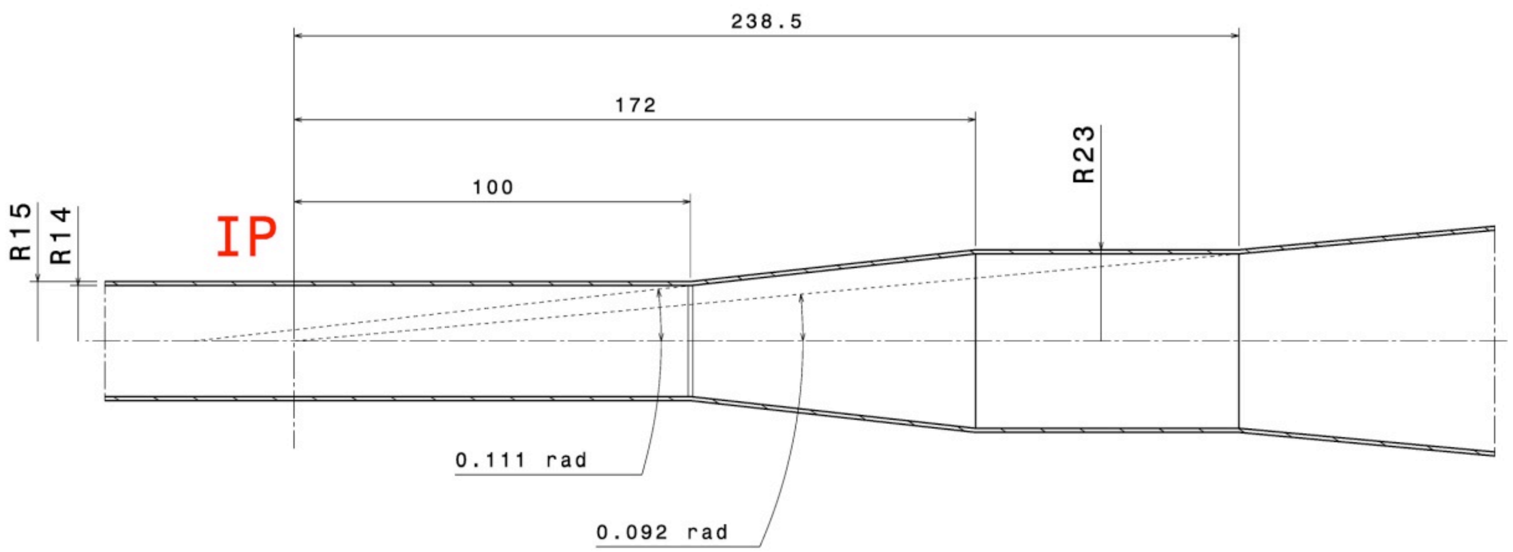
- symmetry for Calorimeters, compare constant and varying sampling simulations.
- Simulation and incidence on the HCal PFA performance - Takeshita
- Prepare a document to summarize the advantages/disadvantages of each version. - Takeshita, Sugimoto, optimization

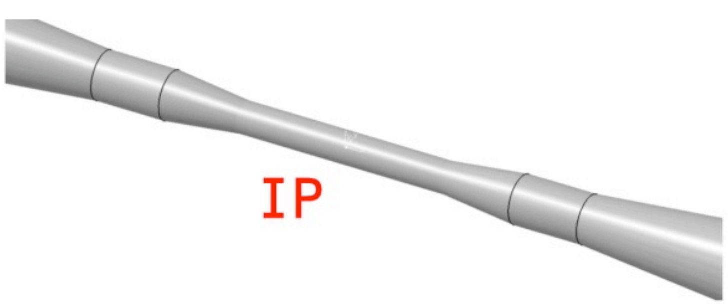
Loss factor

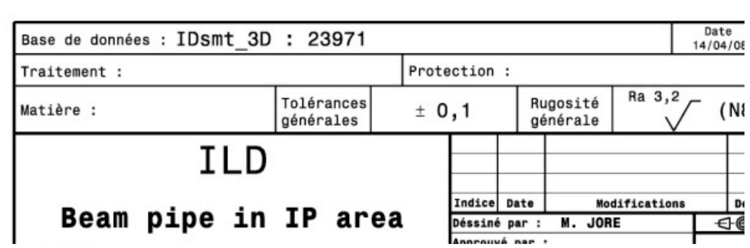
- Modified Model



With step



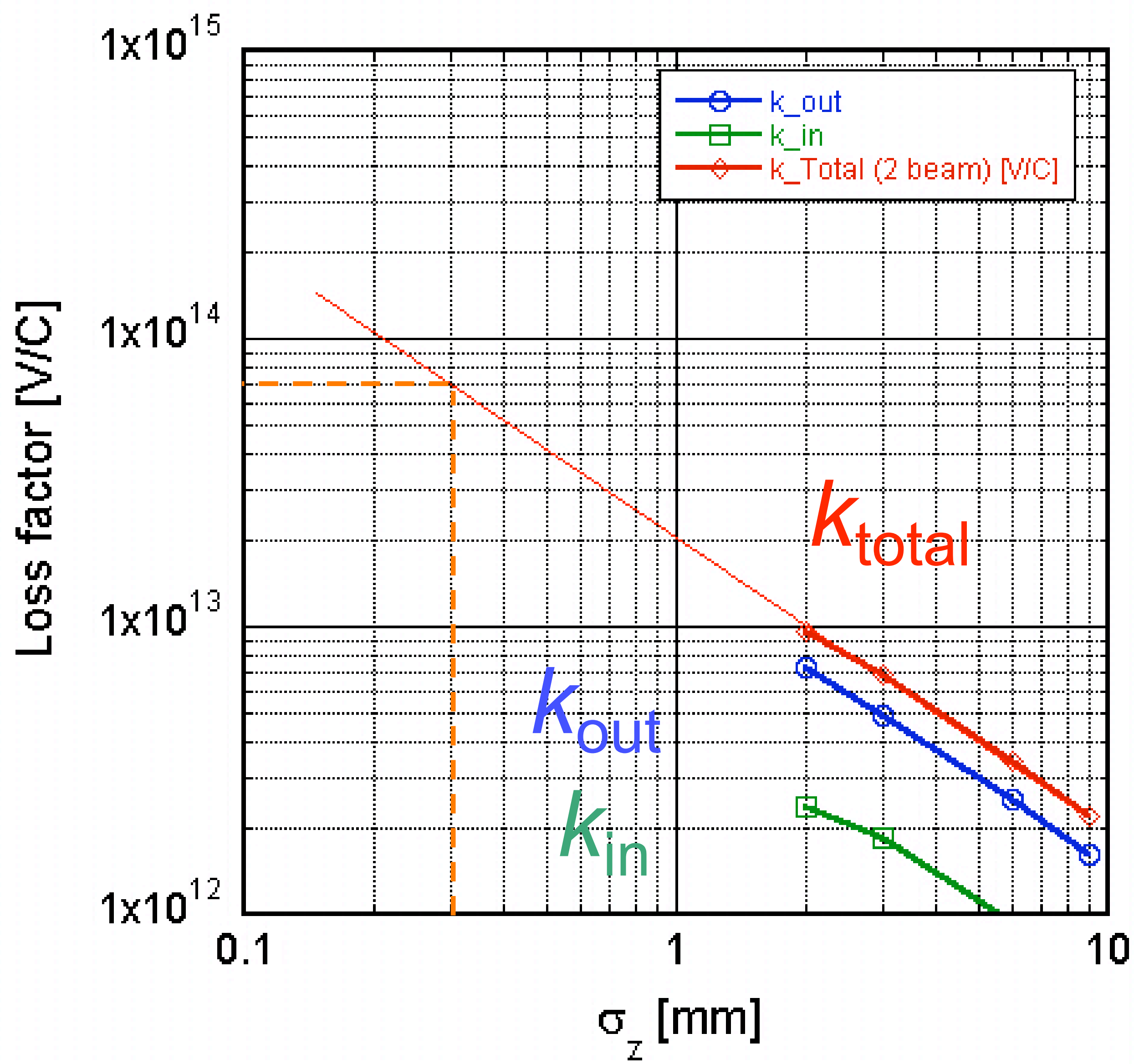




Calculations similar to those of TILC08 were performed.

Loss factor

- Results



k_{total} (two beams) ~$7\text{x}10^{13}$ V/C @ σ_z = 0.3 mm

If q = 3.2 nC, N_b = 5400 bunch, and f_r = 5Hz : I = $8.6\text{x}10^{-5}$ A

$\therefore P = kqI$ = ~20 W (one side)

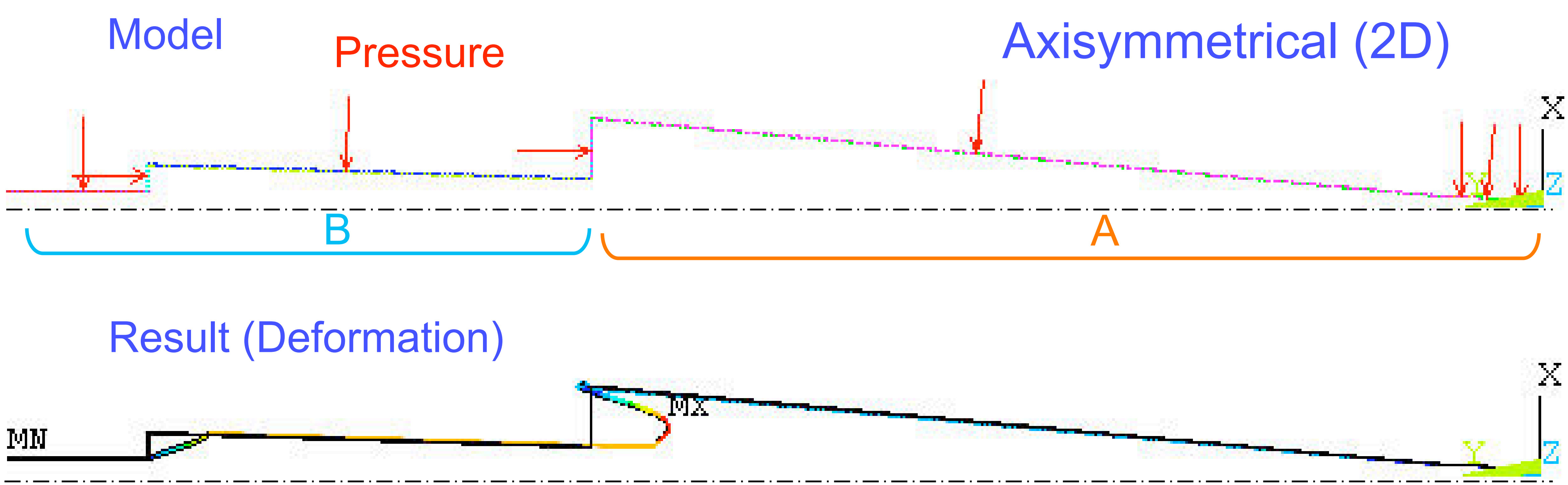
Almost the same to the result for LDC-1

k_{in} and k_{out} is different, since the apertures at both ends are different.

Structural strength

- Deformation and stress
  - **Material: Al alloy (Al5052, H34)**
  - **Thickness A: 1 mm, B: 3 mm**
  - **Load: Atmospheric pressure (1.013×10^5 Pa)**
  - **By ANSYS**

Total length = 3.8 m
$E = 7.056 \times 10^{10}$ N/m^2
$\nu = 0.3$
Axisymmetrical (2D)



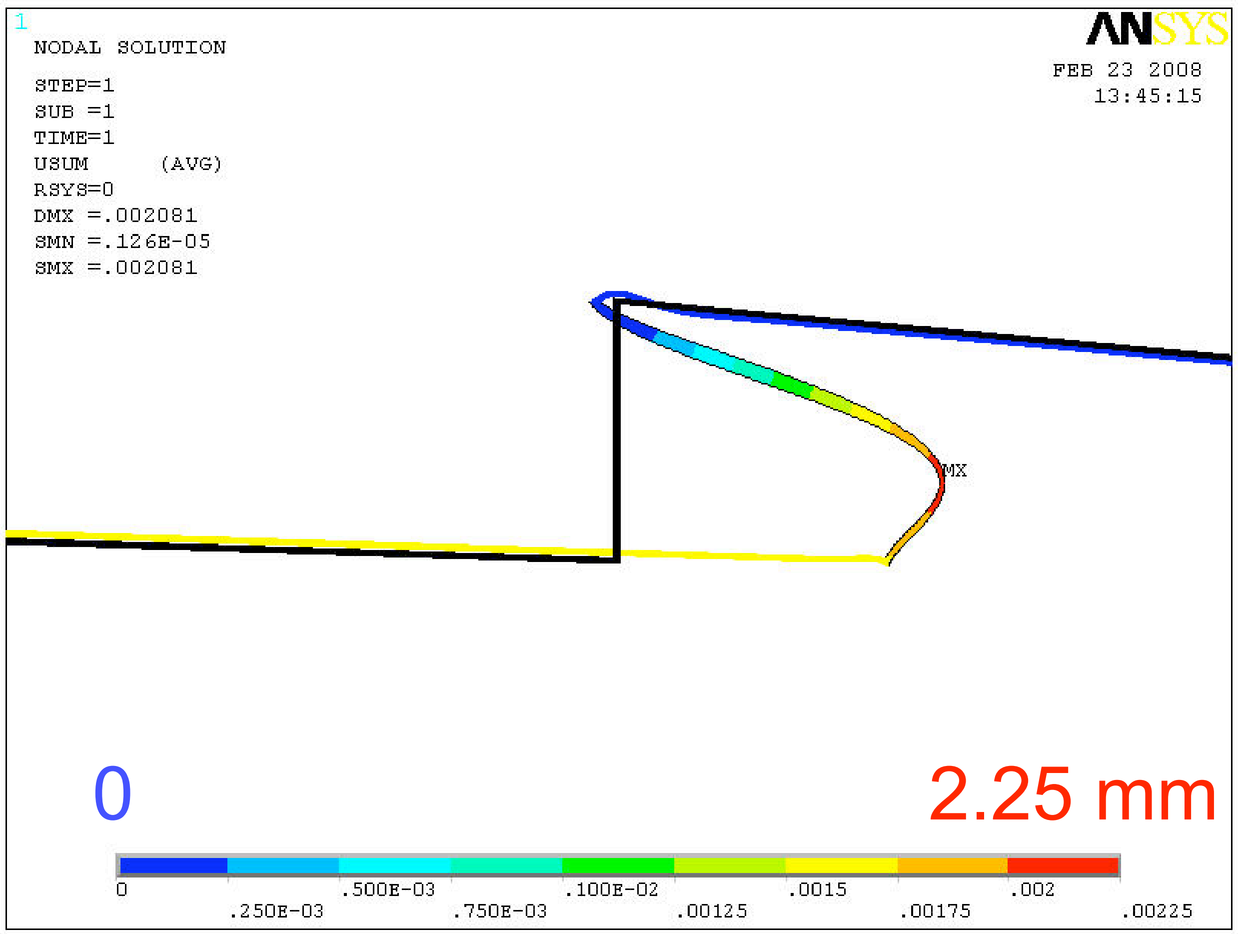
Structural strength

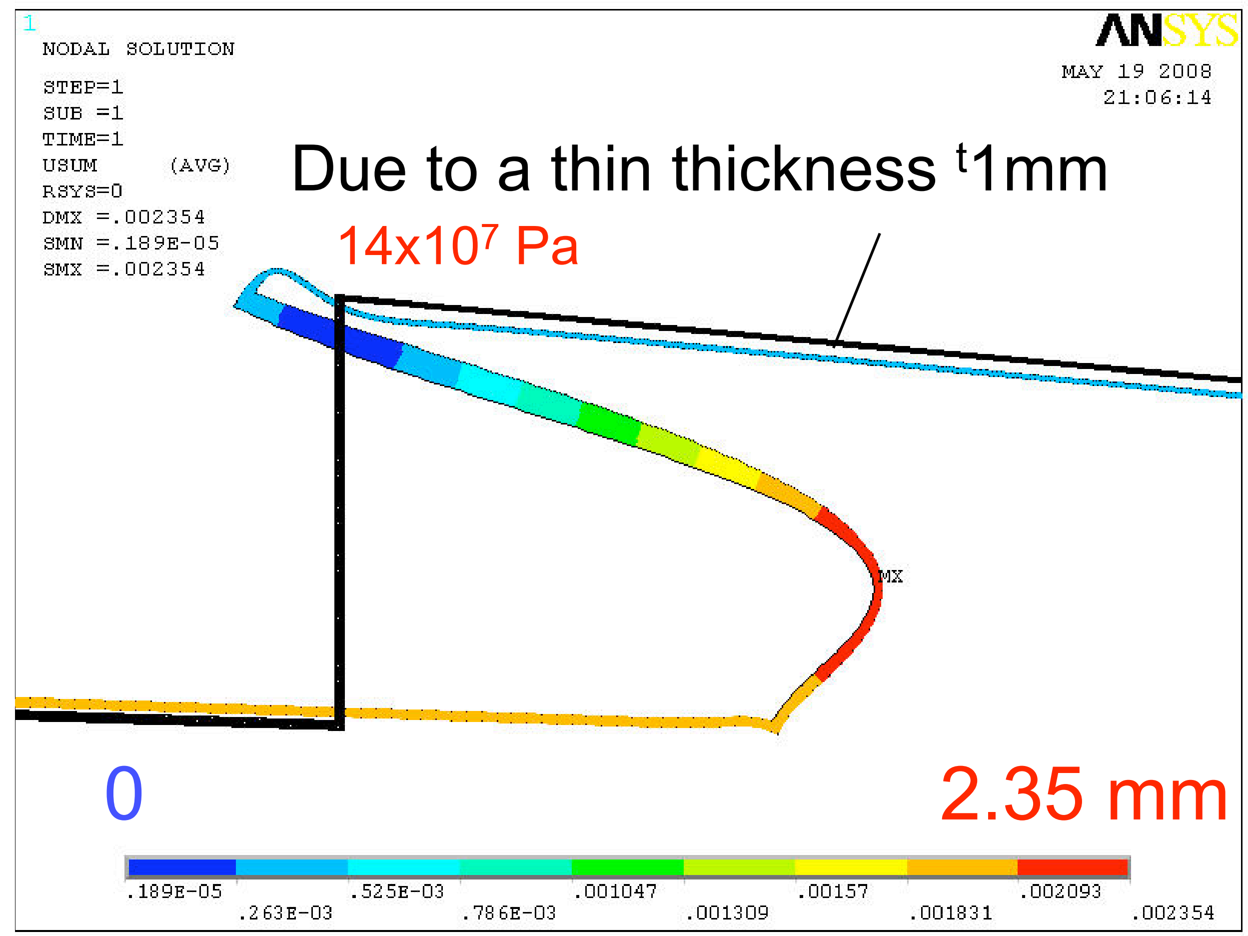
- Result: Deformation and **Stress**

LDC_1

Deformed shape is exaggerated.

Modified





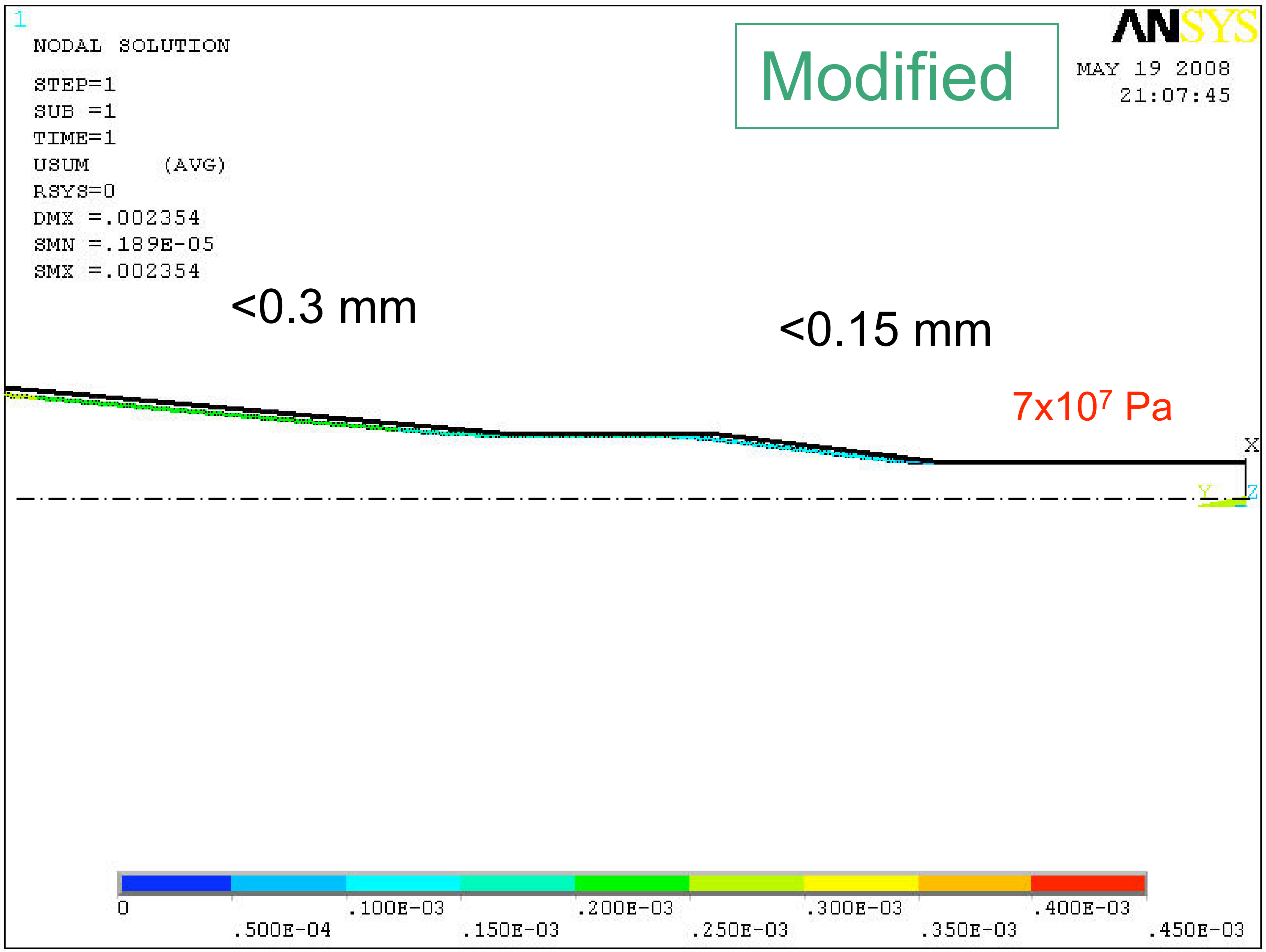
Deformation is a little bit large, but almost the same.

Be careful about the welding at the edge. 1mm?

for yield strength of Al alloy is 22x 10^7 Pa.

Structural strength

- Result: Deformation (near IP) and stress



Deformed shape is exaggerated.

Calculation for actual Be is required.

- From FJPPL08's summary :

a) <u>For Ecal</u>:

- o going from 8 to 12 fold symmetry increases the distorted area from 20 to 50 % (depending on the radius)
- o the ratio of surface devoted to DIF versus Surface of detection changes in the same way.
- o Study the DIF board and cooling in the 12 fold solution.

b) Hcal :

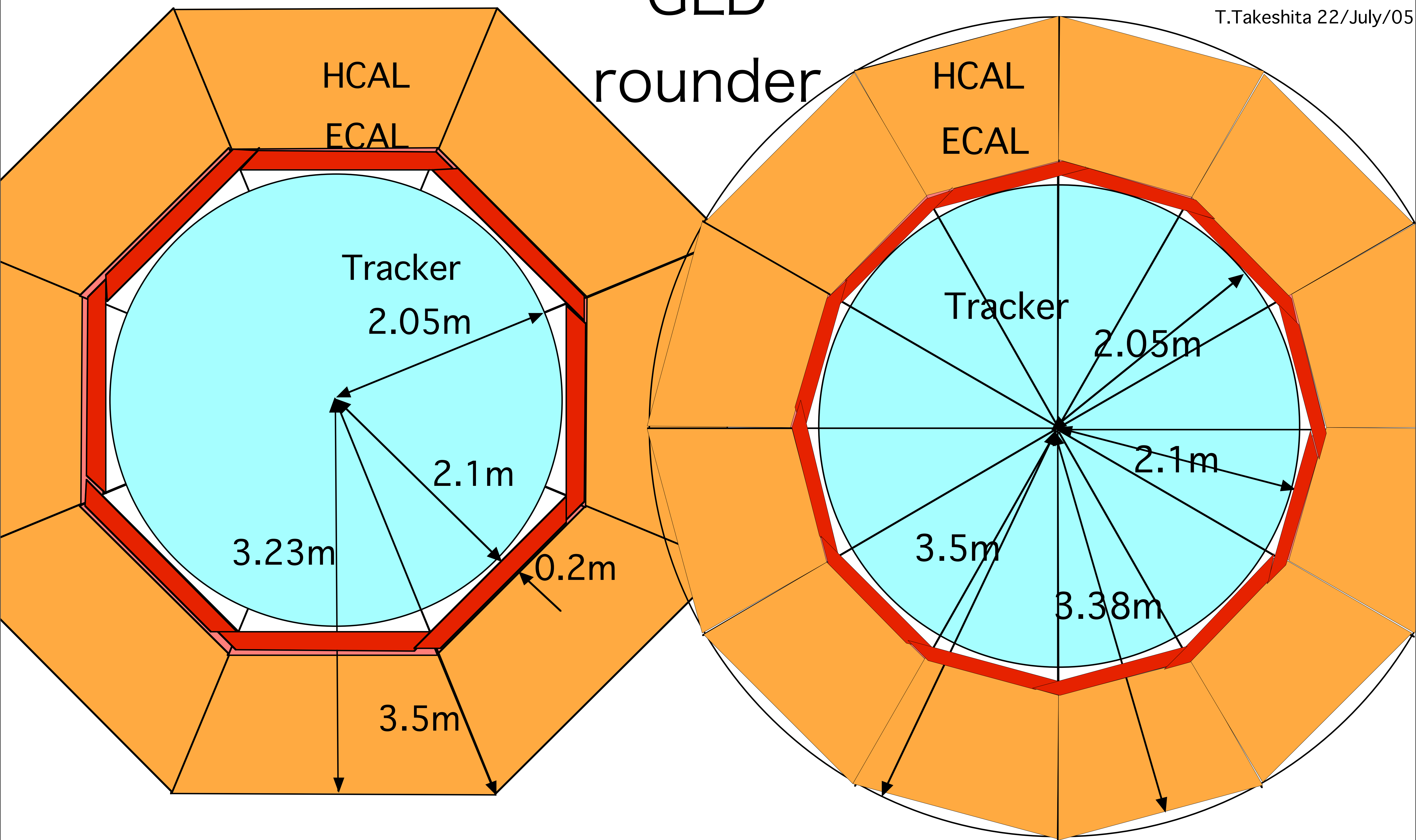
- o Obviously, a geometry closest to a cylindrical shape is the better case.
- o The actual AHcal structure of the barrel is 8X2 fold and has a dead zone but, as presented by K. Kschioneck, staggered spacers might be considered.
- o A 12 fold symmetry cannot be used in case of a design " a la Videau " as in Ecal, because of the resulting limitation in numbers of layers , and a much more delicate mechanical structure

Barrel: octagonal vs decagonal

GLD

rounder

T.Takeshita 22/July/05

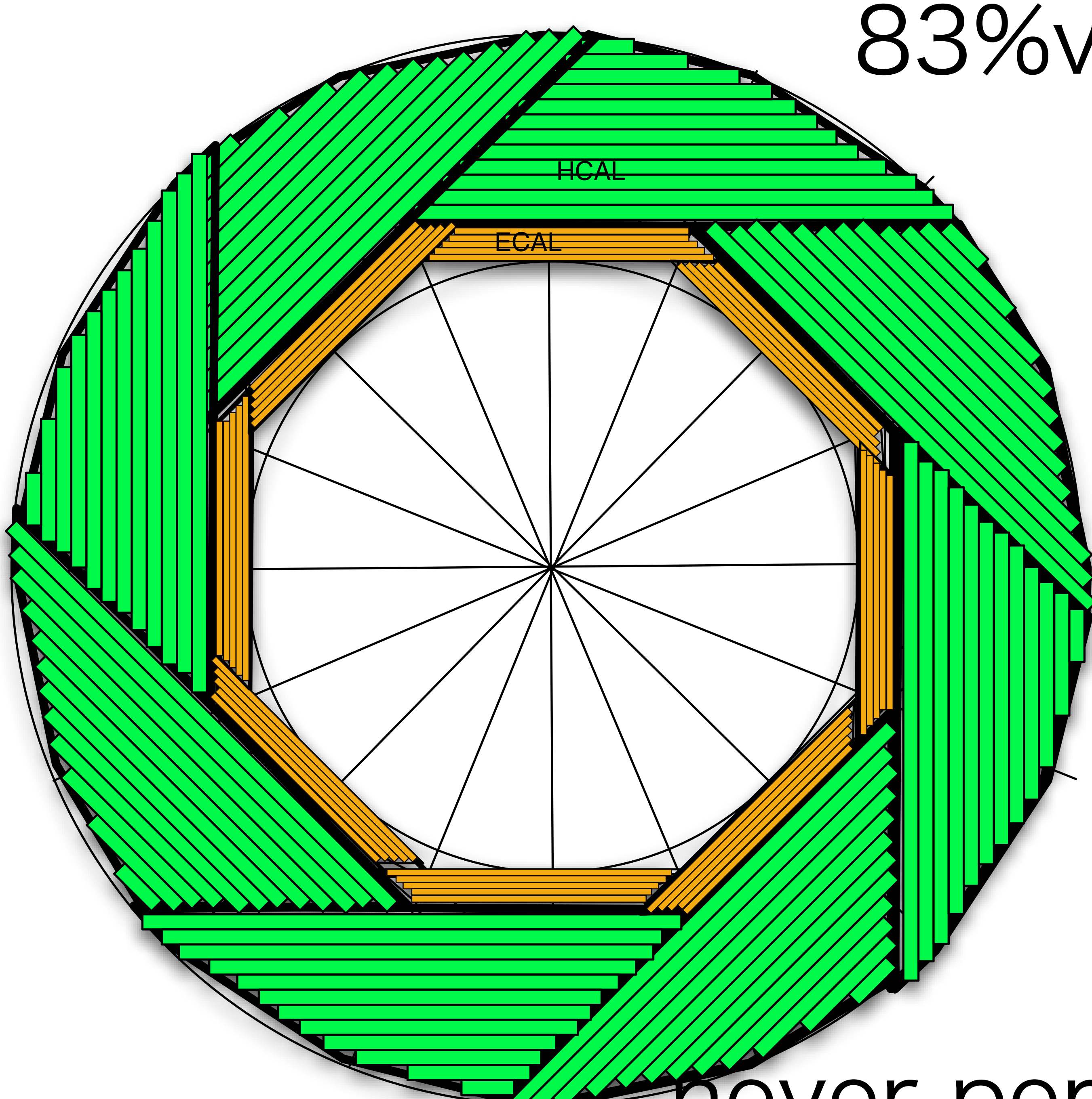


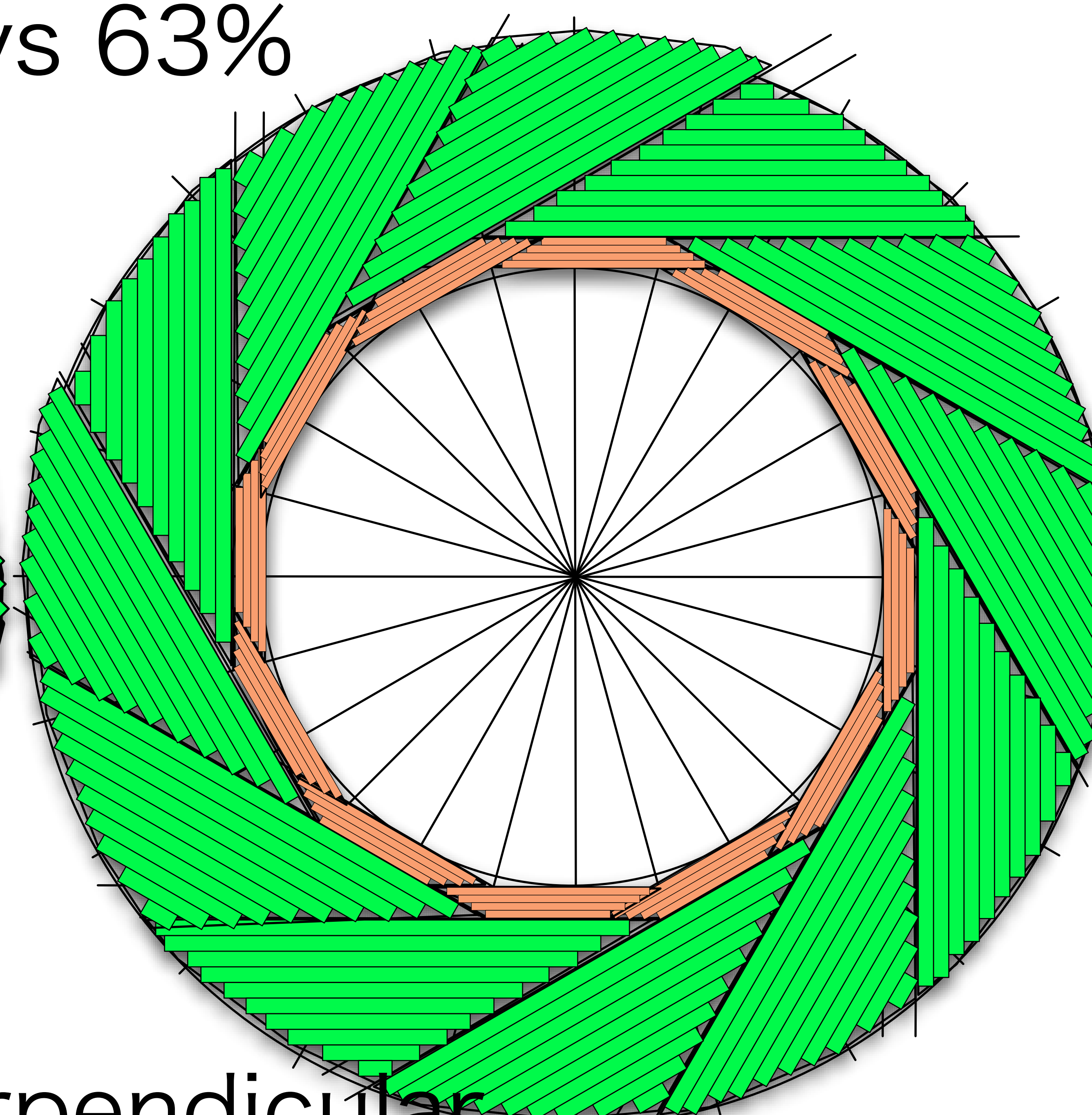
Barrel: octagonal vs decagonal

Henri-8
SiW

ECAL
transition
83%vs 63%

Henri-12
SiW





never perpendicular

Barrel: octagonal vs decagonal

	8	12
ECAL overlap	83%	63%
HCAL read out	side	Z-end

projective or Henri's idea ?

particle never pass

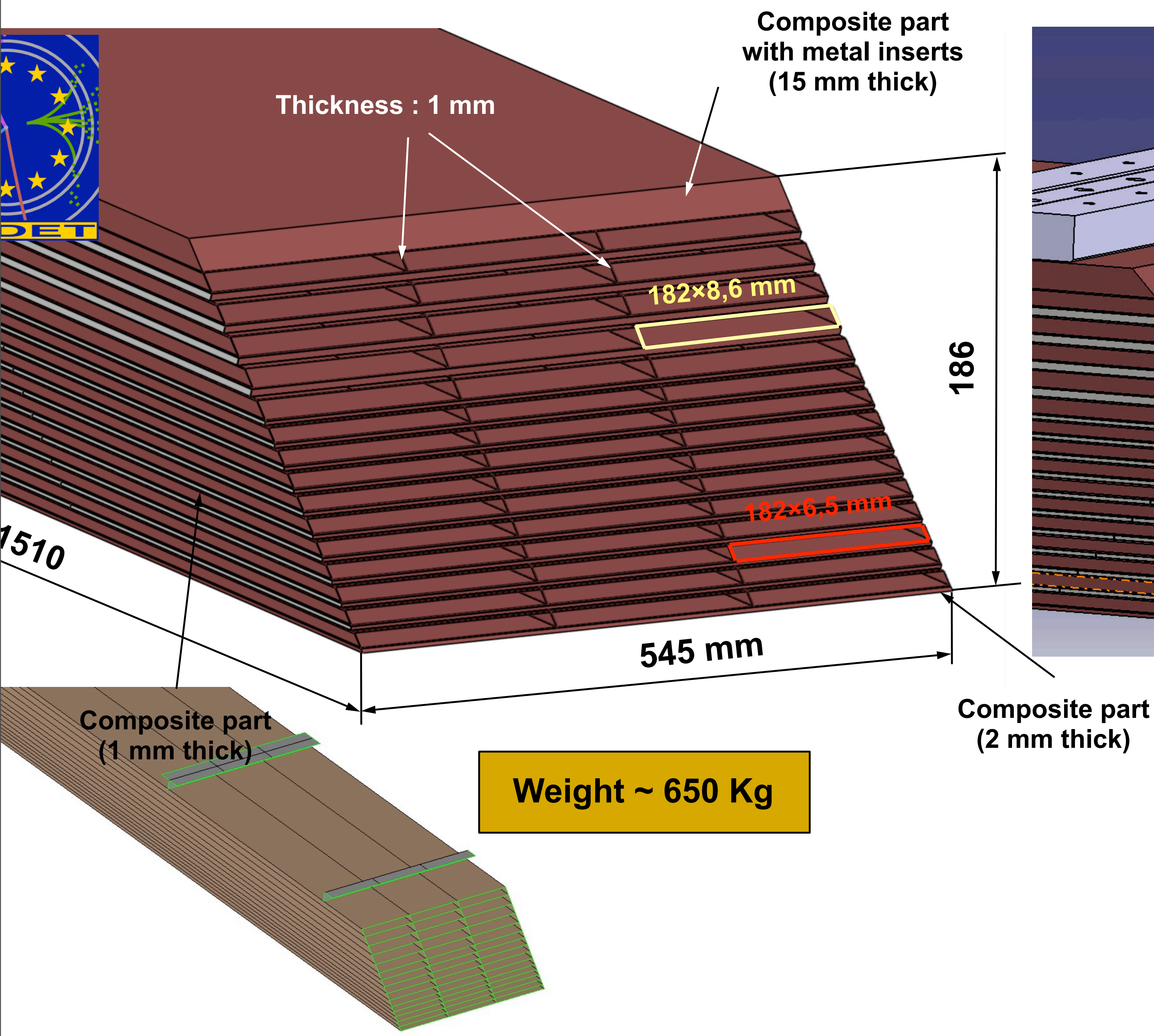
perpendicular in HCAL

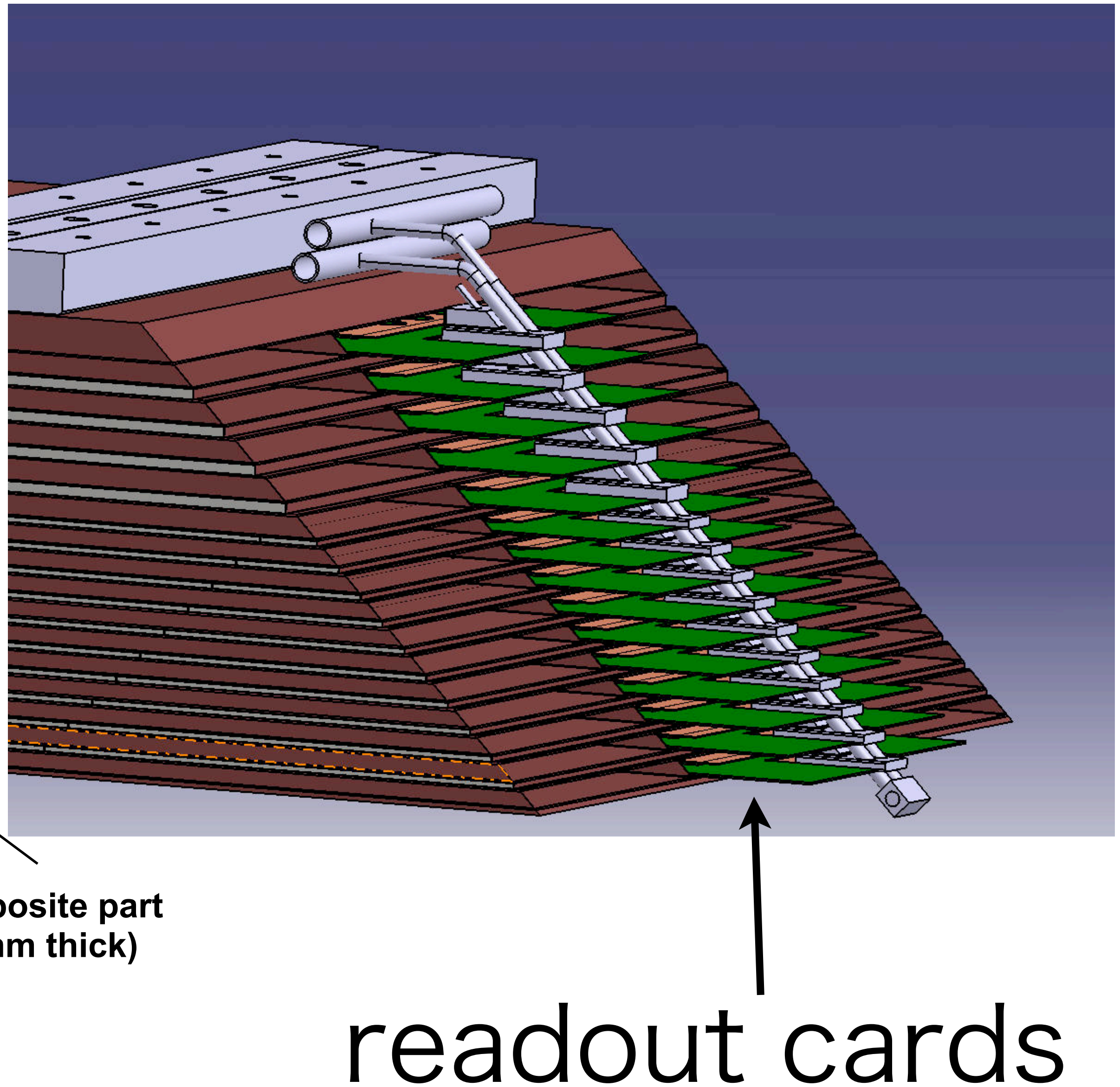
(inclined)

summary

- 8 or 12？
- SS （CMSはなぜか真鍮）
- アンリには注意が必要だ、彼だけが彼の意思でデザインを決めようとしている
- 物理シミュレーション結果など通用しない、（時間がないのも事実）
- 放射状、オーバーラップを嫌がる
- シリコンタングステンが全ての基準

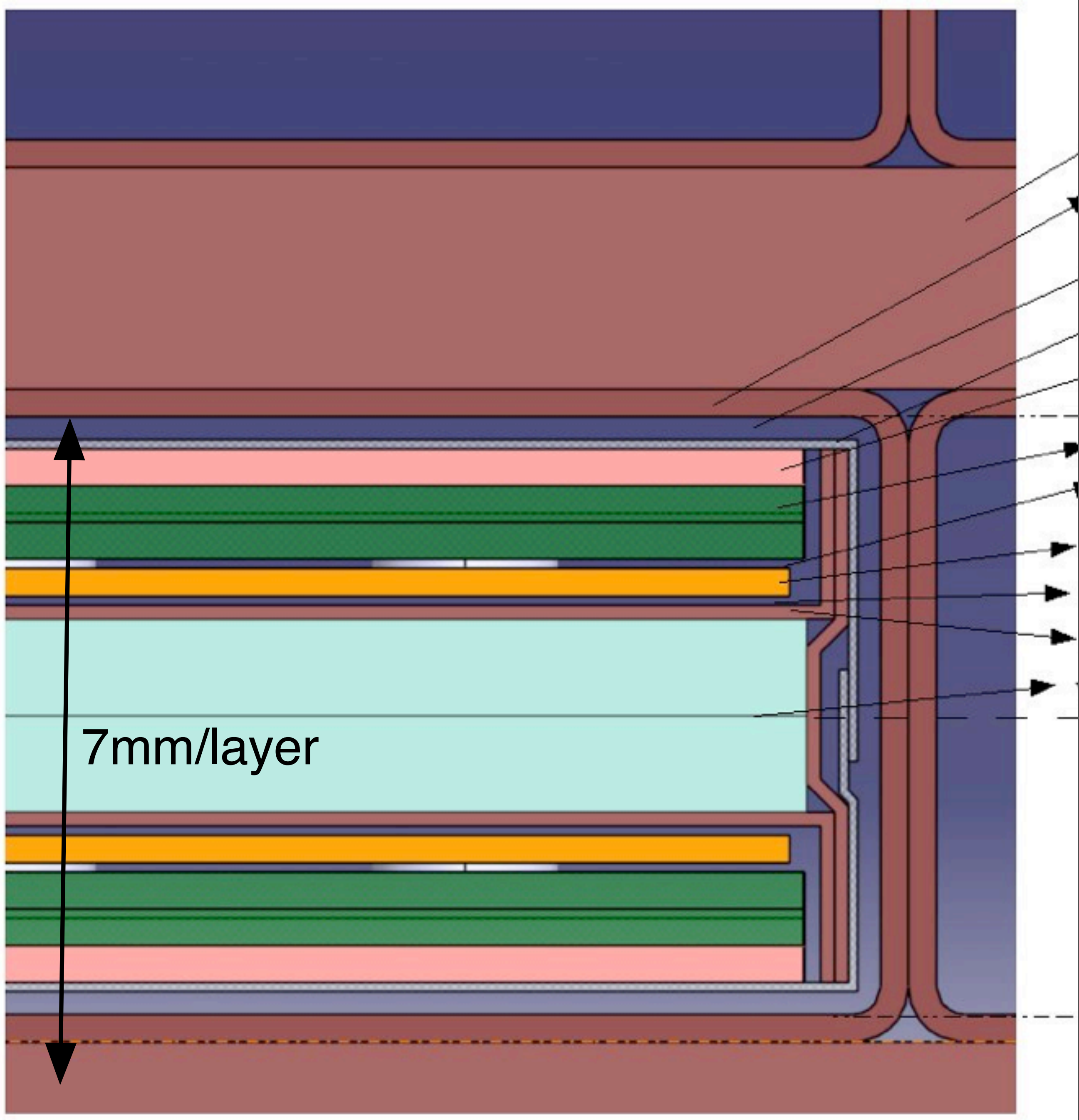
ECAL readout



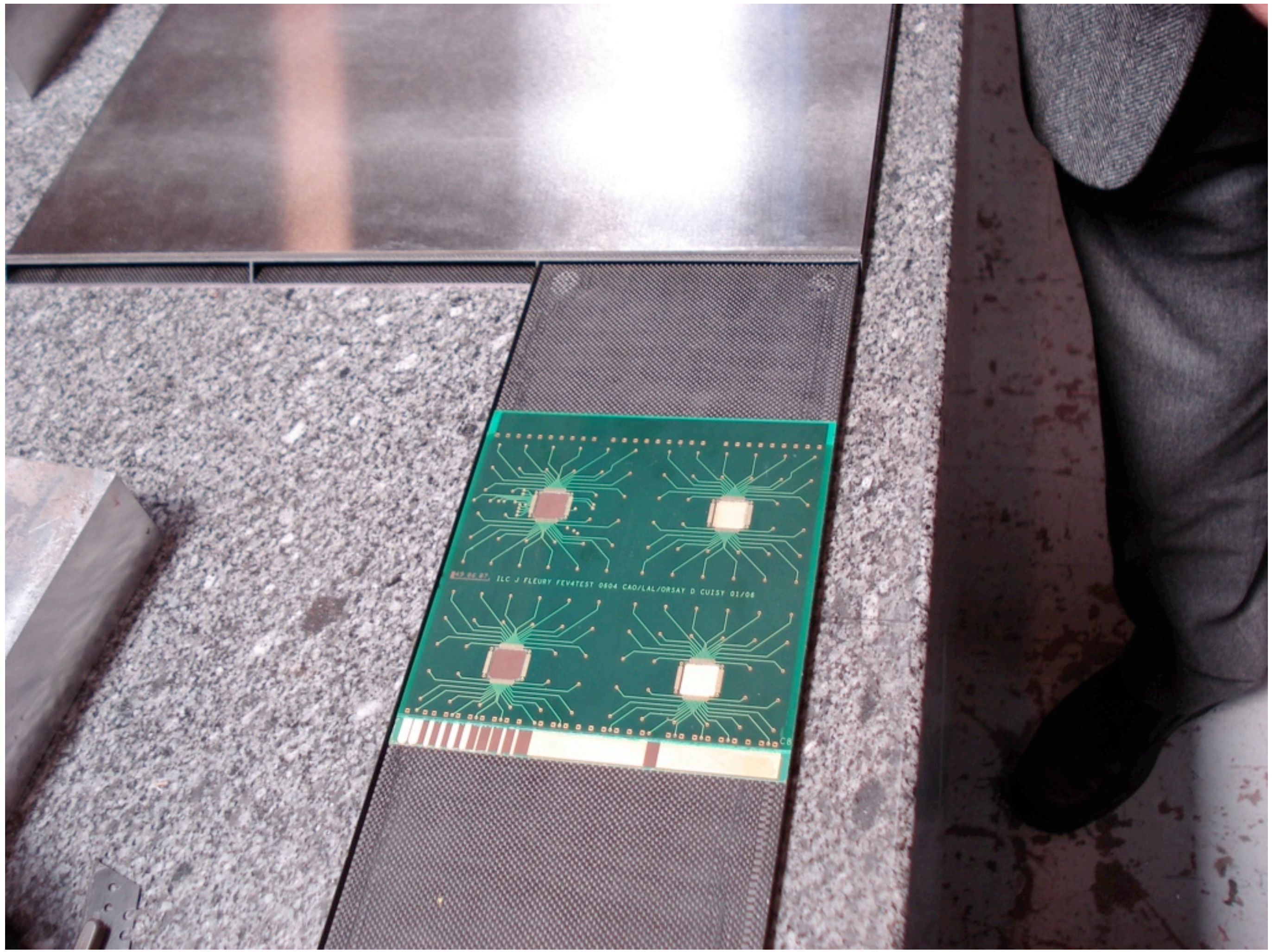


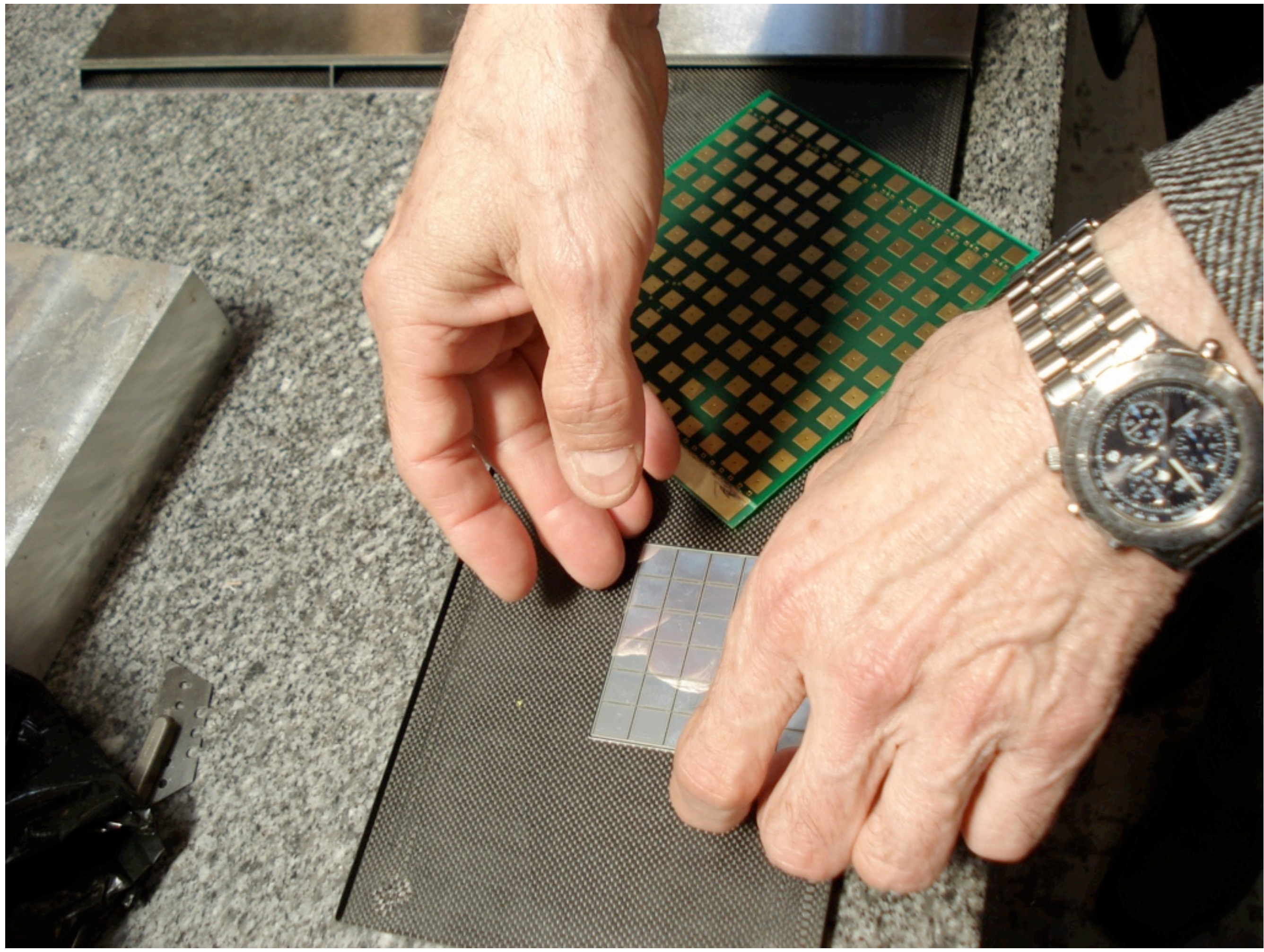
SC-ECAL

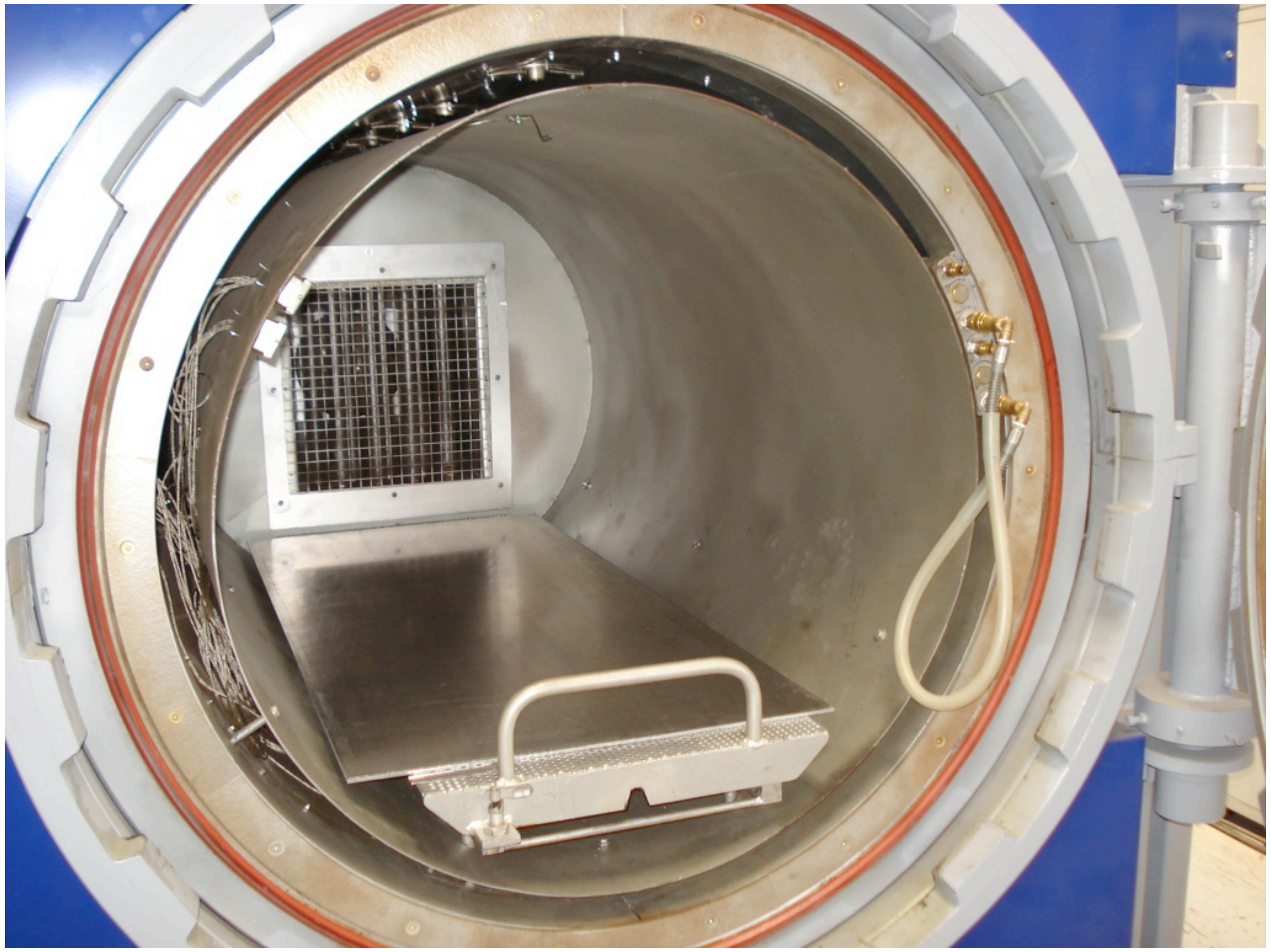
SiW/ECAL

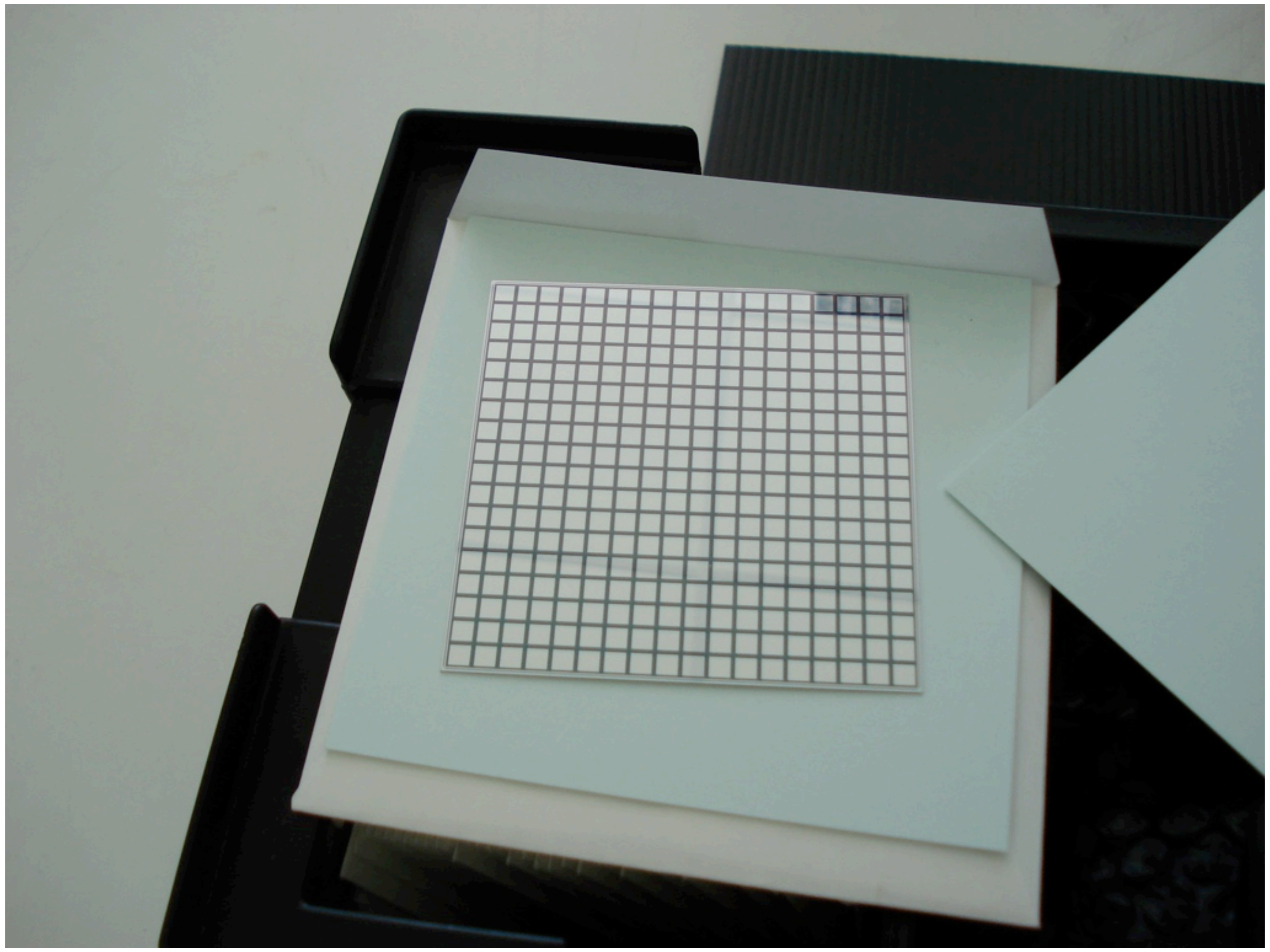


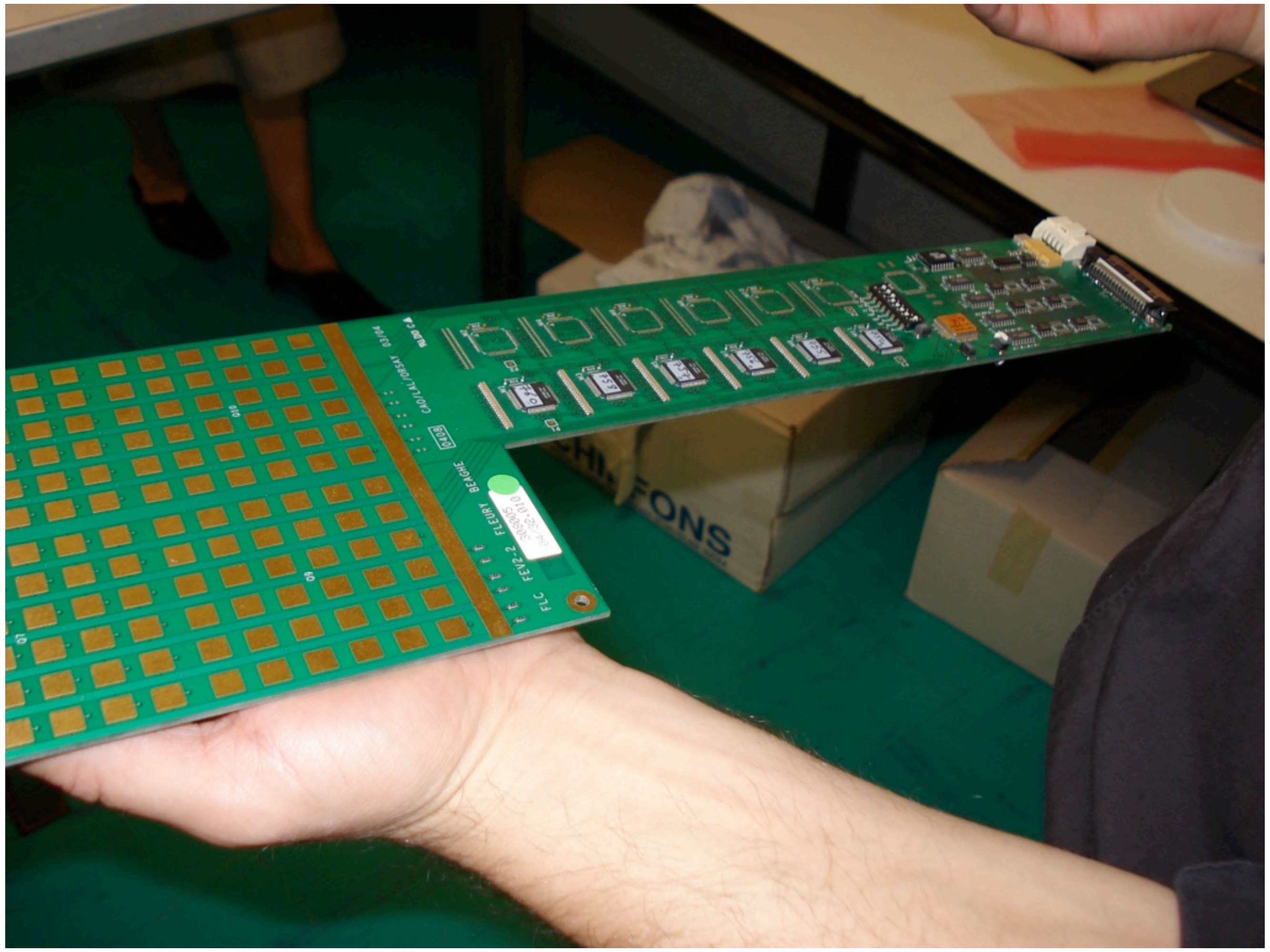

LLR tour, June 17, 2008











LLR tour, June 17, 2008

a) Along the beam direction:

- The main difference between the two solutions is mostly in the structuring in Z : AHcal in 2 rings, and in staves of 5 modules for 2nd version.
- Case one has the advantage of electronic connections directly accessible in the gap between Barrel and endcaps. While in 2nd solution, the electronic exits will be inside the coil and all the cables will go between this space. Thus, electronic won't be accessible at all during an "on beam position " opening, but then there will be less empty zone.

d) For Hcal structure, it should be noted, that even if SS is still considered as a baseline material, some points are still to be verified as its magnetic reminiscence , the saturation or not at 4 T, and above all, the evolution at welding points.

4. muon chambers

We need 10 between IP and the last muon chamber.

One muon chamber between coil and yoke, the last one outside the yoke. About 7 inside the Yoke.

5. Forward region :

How to support those detectors, their services, shielding.

From Sendai summary : Two solutions for this support structure are pursued and will be compared:

- a cylinder supported from the floor outside of the detector, studied at KEK (H. Yamaoka)
- a square structure (about 70cm x 70 cm) supported from the floor and the end caps studied at LAL (M. Jore)

6. TPC :

- Inner radius (see optimization group)
- Field homogeneity - not important but the precise measurement by R.Settles

7. Inner detectors :

Relevant to LPNHE, and/or Korean group (Prof. Hwanbae Park)

IDAG Charge from RD

ILD EB meeting minutes by H. Yamamoto, June 30, 2008

1. IDAG

Sakue is drafting IDAG charge which includes what to evaluate in order to 'validate' LOIs. Also, IDAG will add more items to be included in LOIs other than stated in the LOI call. They inclue:

* Machine backgrounds tolerances
* Calibration/alignment schemes
* R&D status and plan

These will be included in the agenda of Cambridge meeting. Each subdetector contacts will address these issues in their talks.

Discussion

plan for the ILD Cambridge meeting, 11-13 September