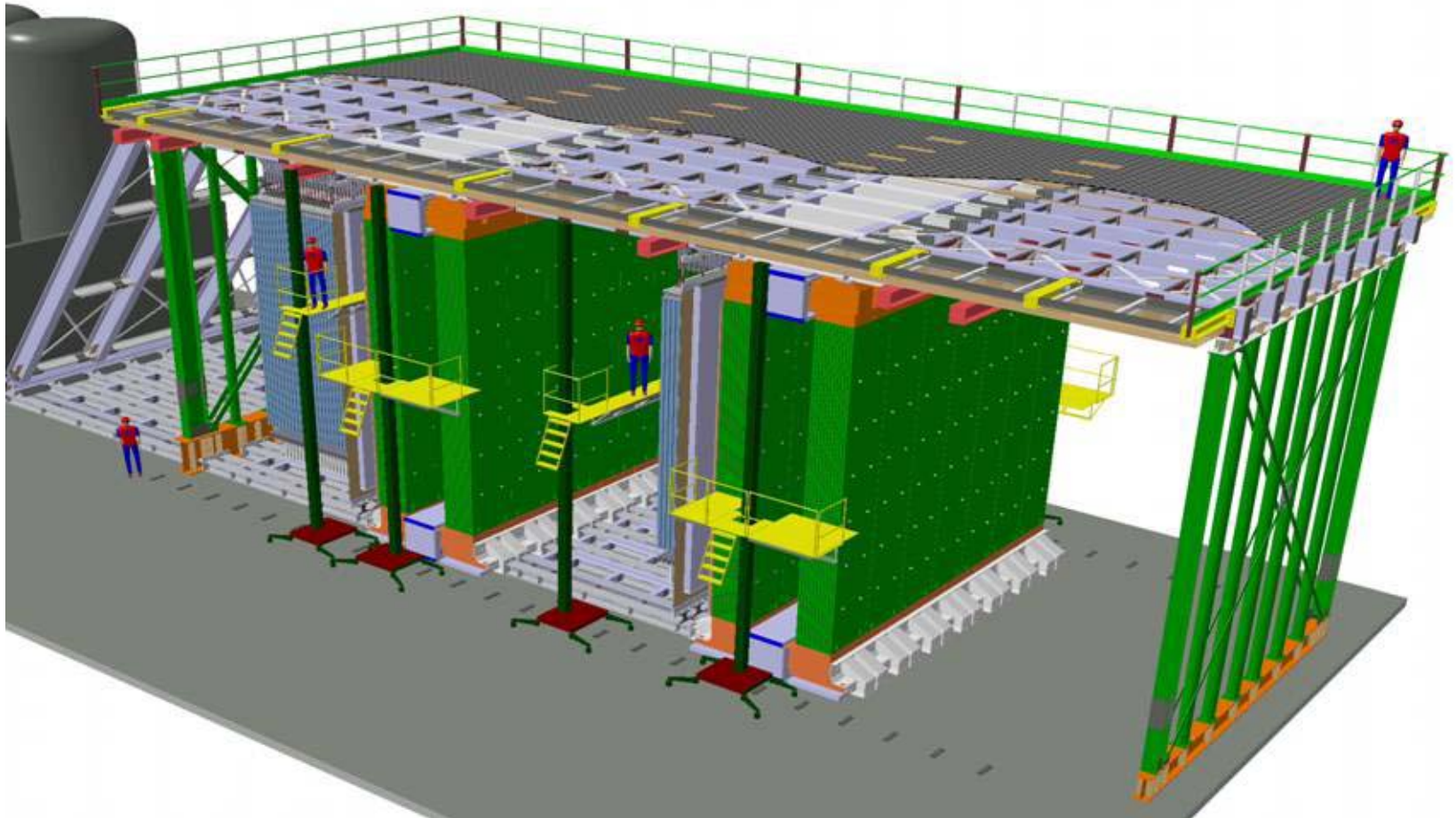




LNGS Scientific Committee

Status of OPERA/CNGS1

April 8th , 2005



Yves Déclais
on behalf of the OPERA Collaboration



Milestones shift

- **Target installation commissioning: sep 04 ⇒ April 05**
 - **Emulsion delivery @ LNGS : oct 04 ⇒ January 05**
 - **CS strategy changed**
 - **Lead Tender : december 04 ⇒ April 05**
 - **BAM commissioning @ factory : feb 05 ⇒ July 05**
 - **BAM Hall commissioning : dec 04 ⇒ July 05 ?**
 - **BMS automation validation : dec 04 ⇒ January 05**
 - **Start brick filling : sep 05 ⇒ January /February 06**
- 



OPERA installation status

Good news :

- **Magnet 2 completed**
- **SM2 mechanical structure ready by june 05**
- **XPC installed for spectrometer 1**
- **HPT installation test successful**
spectrometer 1 completed by december 05
- **Delivered emulsion : good quality**
- **SUTS commissioned @Nagoya university**
- **BAM and BMS commisioning @ factory and @Annecy**
progressing as expected
- **Automated emulsion changer commissioned @Bern**

Worries :

- **administrative and funding difficulties**
- **commissioner work interference**
- **human ressources**



OPERA status

Outline of the status report:

- 1. Target installation**
- 2. CS facility @ LNGS**
- 3. Revised schedule**
- 4. Funding and administrative issues**



Target Installation

- first TT wall inserted september 04
- first brick wall inserted december 04
- measurements of the geometry of the walls by photogrammetry

The photogrammetry is a powerful tool allowing us to understand the difficulties (50 μm resolution achieved)

We appreciated the support from LNGS
for providing
photogrammetry and automatic teodolite tools

December 04

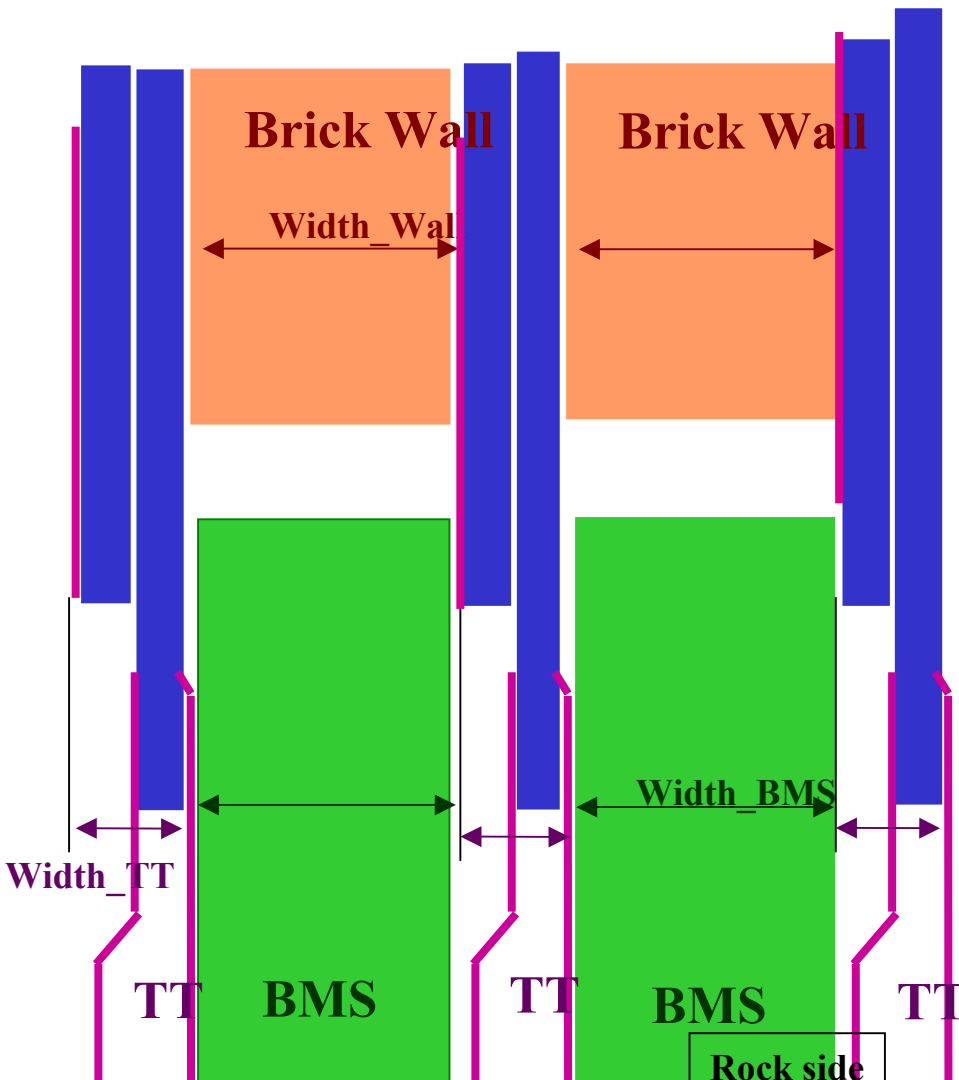
**We reached the conclusion
that we cannot fulfil the specs for the
target assembly**



Target : top view

$$\text{Pitch} = \text{width_TT} + \text{Max}(\text{width_wall}, \text{width_BMS})$$

Specs : 38.4 mm (TT) + 85.6 mm (wall) = 124 mm



↓

	thickness	clearance	
	↓	↓	
• wall	: 86	+ 2	= 88
• BMS	: 84.5	+ 3.5	= 88
• TT	: 42	+ 4	= 46
➔ new pitch : 134 mm			

↓

New target supporting rails

- ordered feb 05
- installation and alignment end of april
- resuming target installation may 2th

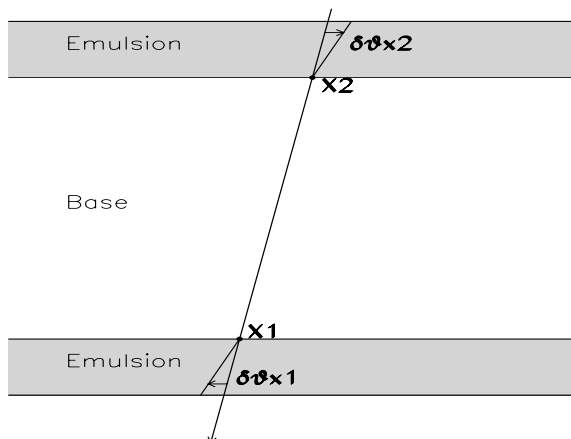


Target installation improvement : status

- **upgraded geodesic reference system installed**
- **online positioning tool (.3mm accuracy) available and tested**
- **Brick wall planarity inside the specs: 1mm clearance achieved**
- **BMS positioning accuracy for the 3 axes : better than 1mm**
- **TT wall tooling for improving planarity : produced and tested now**

Changeable sheet : baseline option

- R&D ~2004-Oct
 - BG rejection
 - Distortion : distortion itself, precise measurement, packing
 - Self-Refresh : parameter study
 - Aging test at high humidity
 - sensitivity , fog , etc.
- CS packing machine development started ~May 04
- Production starting May 05 ~ 1000CS/day
 - Humid packing at Nagoya.
 - Initialization at Gran Sasso (self-refresh acceleration, 30degC 1month etc)

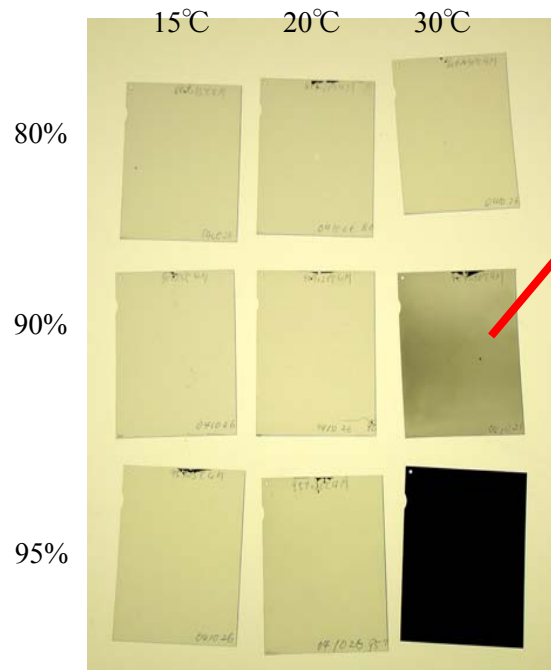


- **By tuning the development procedure the distortion is removed intrinsically.**
 - at the level of $\sigma_\theta < 2\text{mrad}$.
 - **Now the observed distortion is dominated by the stage accuracy and measurement.**



4 months CS self refreshing test result (march05)

Self-Refresh after 4 months



- High humidity packing
 - Accelerated self refreshing at high temperature
- Cannot be used**



CS should be refreshed @ LNGS underground

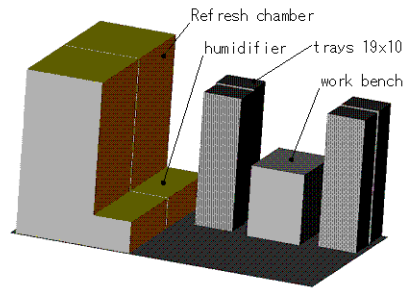
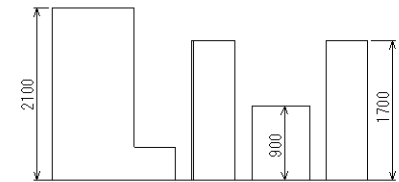
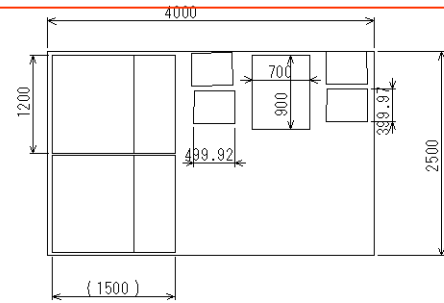
Goal →

	BG density / cm ²
Refresh in GS with new Gel	10
Refresh in GS with OPERA gel	50 (Tono mine data)
Refresh in Nagoya and weak Self-Refresh	~100
Refresh in Nagoya and no Self-Refresh	1000 (first shipping data)
No Refresh	4000

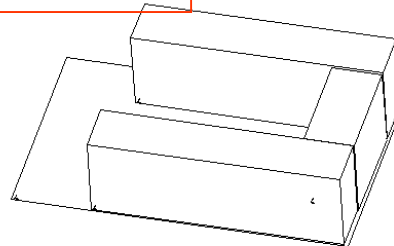
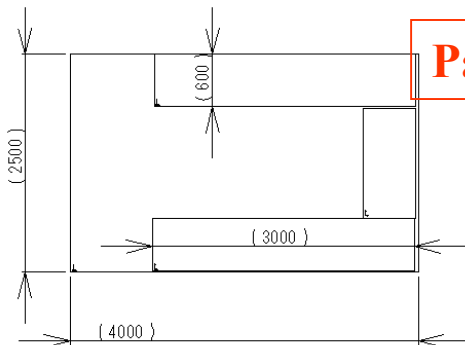


CS facility @LNGS

Refreshing 4x2.5 m²



Packing 4x2.5 m²



**Refreshing and packing facility
(under the responsibility of Nagoya group)**

- 200 000 CS
- Production time ~4 months
- Operational before BAM commissioning

**Build a new emulsion facility (12x3 m²)
underground containing :**

- an upgraded processing lab
(needed for the **BAM commissioning in waiting the new building**)
- the refreshing facility
- the CS packing facility

When the new one will be commissioned the existing facility in the TIR gallery would be removed



CS : complementary studies

- **singlet or doublet emulsion sheet in the CS enveloppe**
 - ➔ **random track number very low**
 - ➔ **This would allow to keep open the possibility to use it for brick finding validation**
- **positioning accuracy between CS and first brick emulsion**
 - ➔ **Xray gun : goal 10 μ m**
- **new gel**
 - ➔ **will reduce by a factor 5 the density of remnant tracks**

BAM schedule

- ✓ **Design, Construction and Tests in the firm: February 2004 to July 2005**
 - ➔ **Final lead not available for the commissioning @factory (lead tender delay)**
- **Delivery at Gran Sasso laboratory: August 2005**
 - ➔ **BAM hall commissioning july 05 ➔ cooling water available july 05**
- **Assembly, installation, commissioning: September to November 2005**
- **Production acceptance tests at Gran Sasso: December 2005**
 - ➔ **Lead delivery**
 - ➔ **CS production validated and started**
- **Brick mass production: January 2006 to January 2007**
 - ➔ **Space in Hall B**



Revised installation schedule

« **Assuming no interference with the commissioner work** »

- | | |
|---|---------------------------------|
| • Target SM1 installation : | may to november 05 |
| • BMS installation and commissioning | october 05 to january 06 |
| • CS facility commissioned | october 05 |
| • BAM fully commissioned | december 05 |
| • Spectrometer SM1 completed | december 05 |
| • SM1 Brick filling starting | january / february 06 |
| • SM2 Brick filling starting | july / august 06 |
| • RPC, XPC, HPT commissioning with gas | january 06 |



Precision Tracker : funding issues

- Present BMBF funding period: jan2004 – june2006

Uni Hamburg receives funds for march2004-june2006

~ 1.05 M Euro

(asked in 2004 for 1.6 M Euro: invest 900k, salaries 520k + travel & transp.)

Money flow from BMBF:

2004: 370kEuro, 2005: 490kEuro, 2006: 190kEuro

this is the cost for 1 SM

(~2/3 of full material cost, ~1/2 salaries, 1/2 tt)

Note:

HERA-B muon gas system
recuperated

(Updated) need to complete full detector in time:

330kEuro (Material) + 370kEuro (man power) = 700kEuro

The mass production of the first spectrometer will be completed by november 05

If the mass production for the second spectrometer is resumed mid 06 it will last upto mid 07 and so there will be no spectrometer for SM2 for the 2007 run !

The mass production should not be stopped !

Funding issues

October 04 situation:

still some funding issues (some are pending to the BMBF decision)

- 700 k€ for the Precision Tracker (2nd Spectrometer)
- 750 k€ for the German contribution to the lead
- 500 k€ for the Lead cleaning machine (overcost)
- Tax free regime for CNGS experiments @LNGS
 - VAT and custom for emulsion
 - VAT for Lead (1.2 M€)

April 05 situation:

- VAT and Custom for Emulsion: solved
- BMBF will restart discussions in may
- Lead Tender closed : 6 M€ + taxes
- no solution to escape VAT for lead
- INFN can endorse the overcost but not the German contribution



CNGS Laboratory Issues

- **interference with the commissioner work : highway closure, TIR gallery**
→ continuous coordination needed
- **gas system (RPC, XPC, HPT) autorisation**
- **Service space in the underground lab : Hall B**
- **BOREXINO loading station to be moved :**
PC use is supposed to be resumed by mid 06
- **External building completion in time : civil engineering september 05**
- **Computing support : network, mass storage, database**
- **Strengthening the LNGS Physics group**

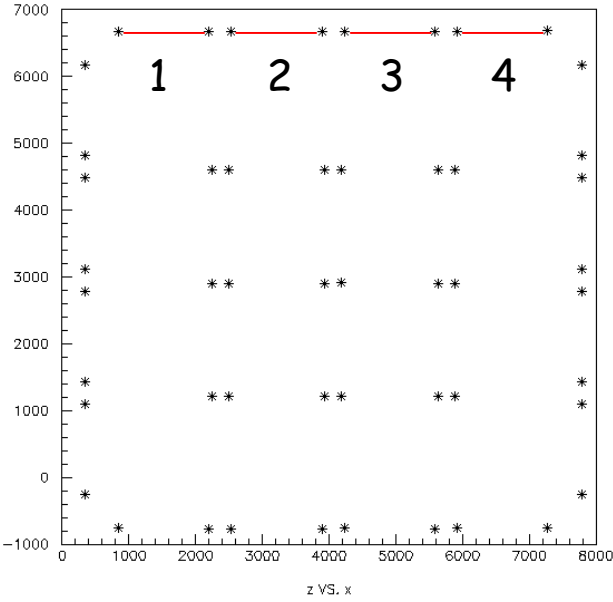


Human resources

- **Very heavy tasks in running phase due to:**
 - **emulsion processing**
 - **emulsion handling**
 - **emulsion scanning**
- **Weakening of the Collaboration strength expected for the running years**
 - **decreasing of staff members due to retirements (some institutions could disappear)**
 - **young people not ensured to remain in the Coll. due to difficulties of Funding Agencies**
 - **New generation of neutrino projects diverts resources**

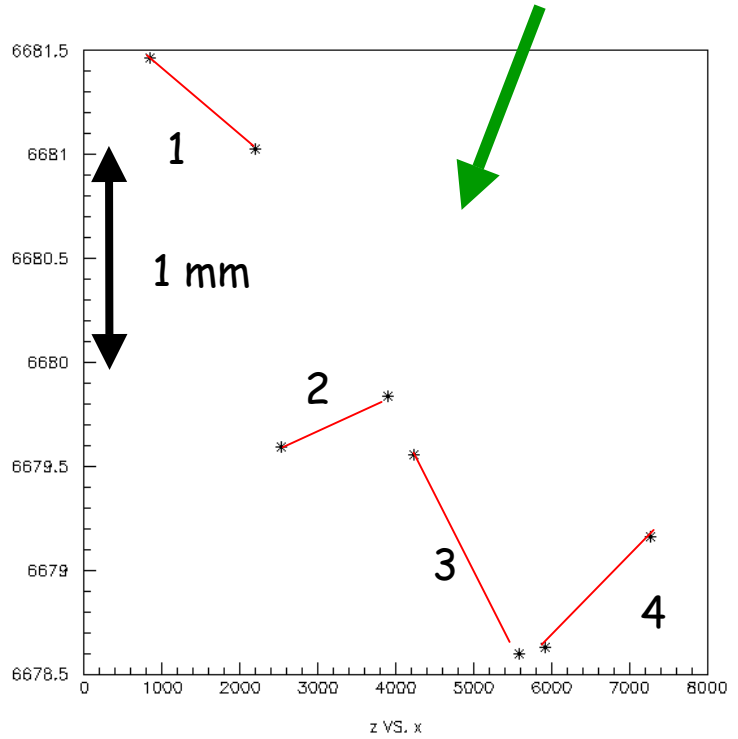
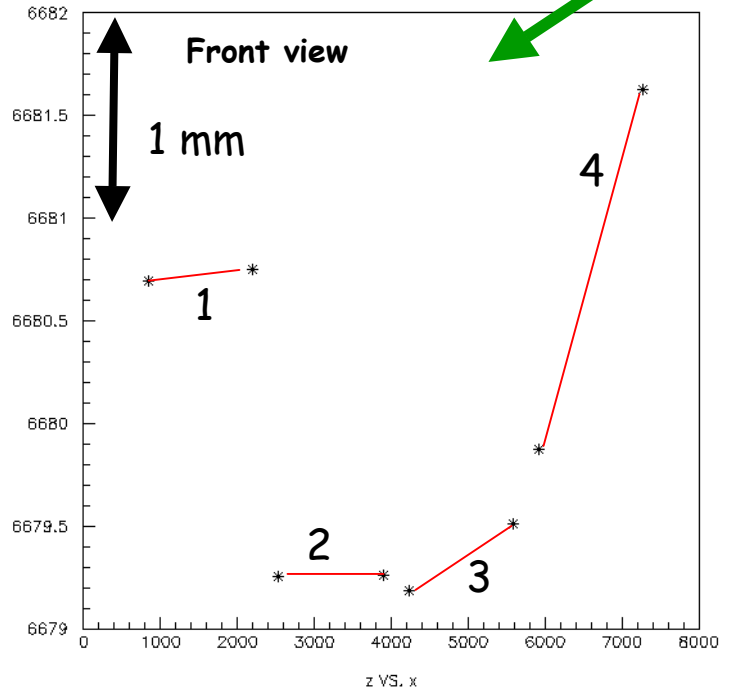
TT plane End caps survey Front View

Difficulties with the sagitta of the TT supporting beam

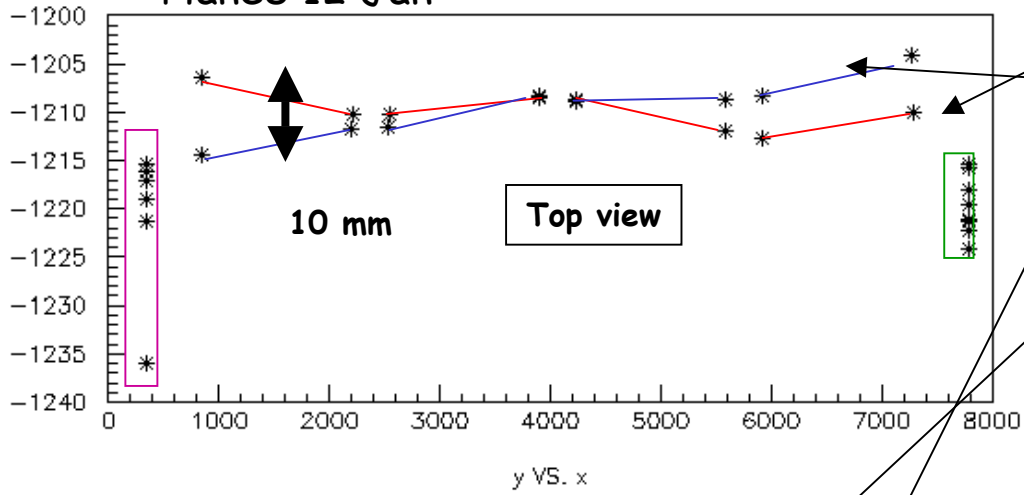


Plane 8 + wall 1
Sagitta shape

Plane 8 standalone
Trying to reduce the sagitta

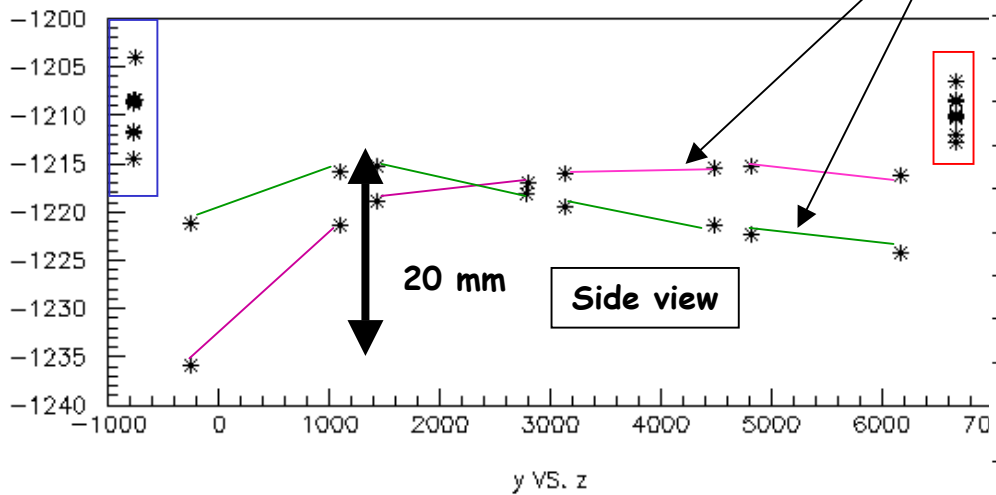


Plane8 12 Jan

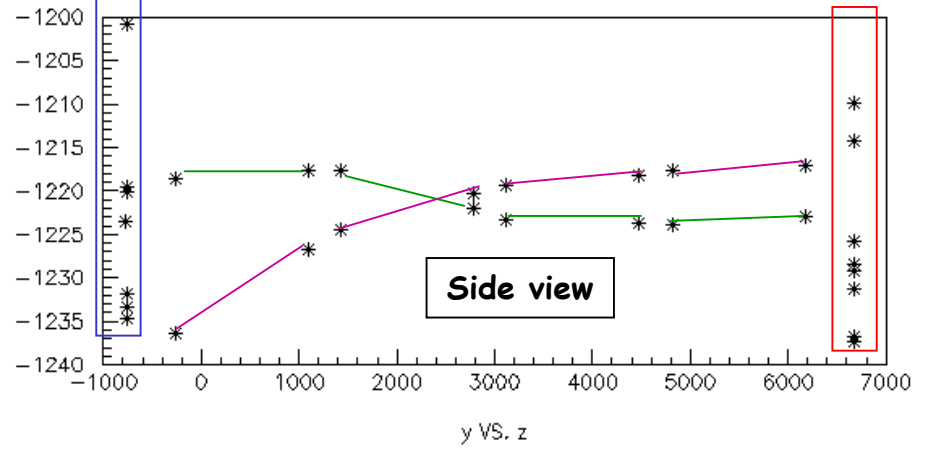
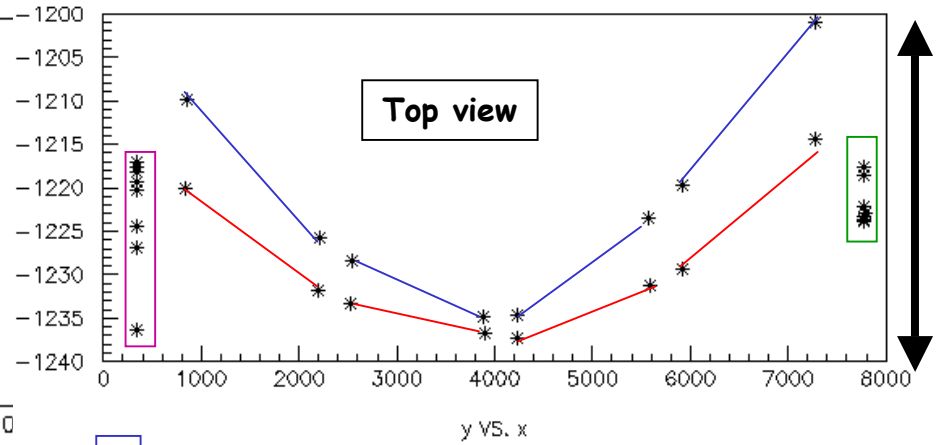


- Red: Top end-caps
- Blue: Bottom end-caps
- Green: Gallery end-caps
- Purple: Rock end-caps

Analysis of the precision points at the End-caps

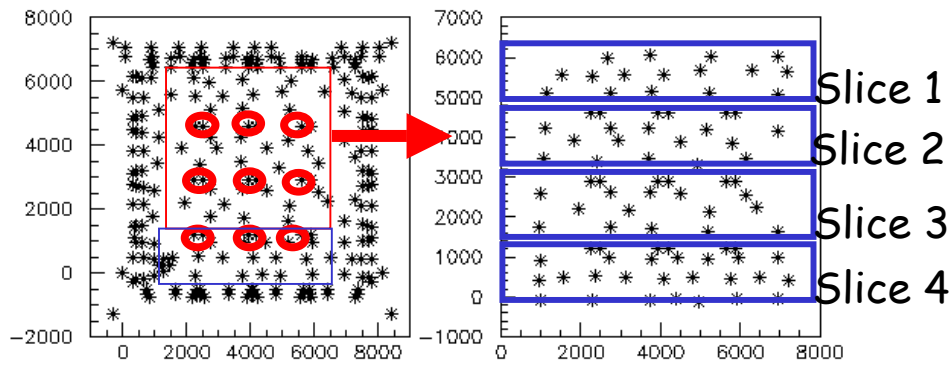


Plane8 alone 16 Dec

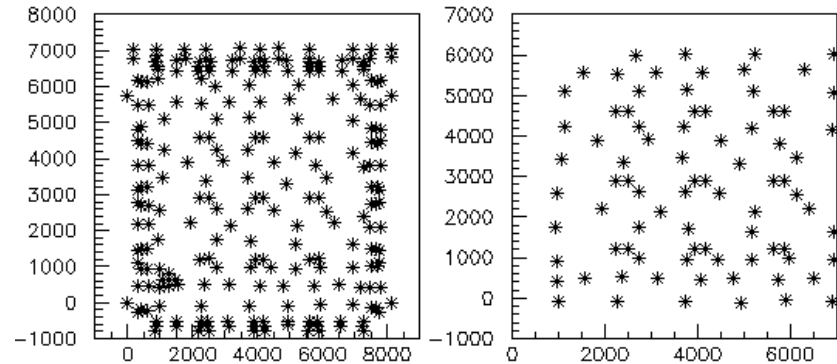
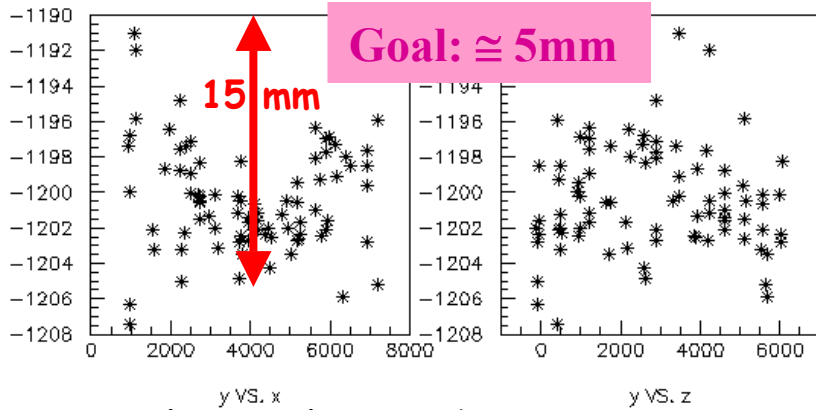


**TT plane
End caps survey
TOP and Side View**

Analysis of the points on the surface of the TT, targets are corrected for their thicknesses

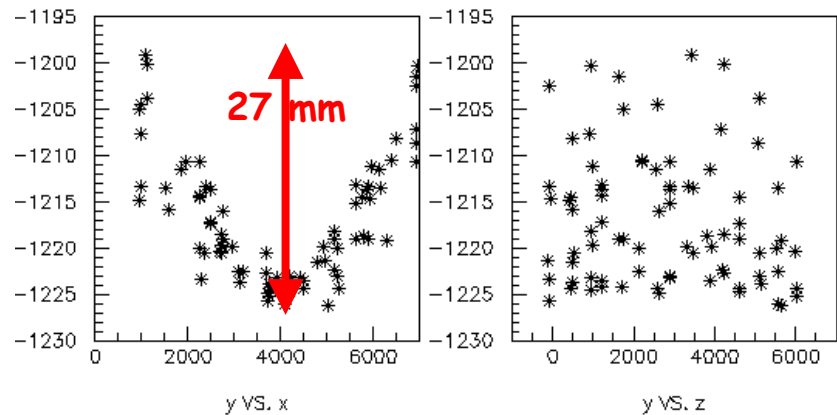


Plane8 alone 16/12



Plane8 alone 12/1

The central bump is reduced from 30 to about 15 mm but it is still there

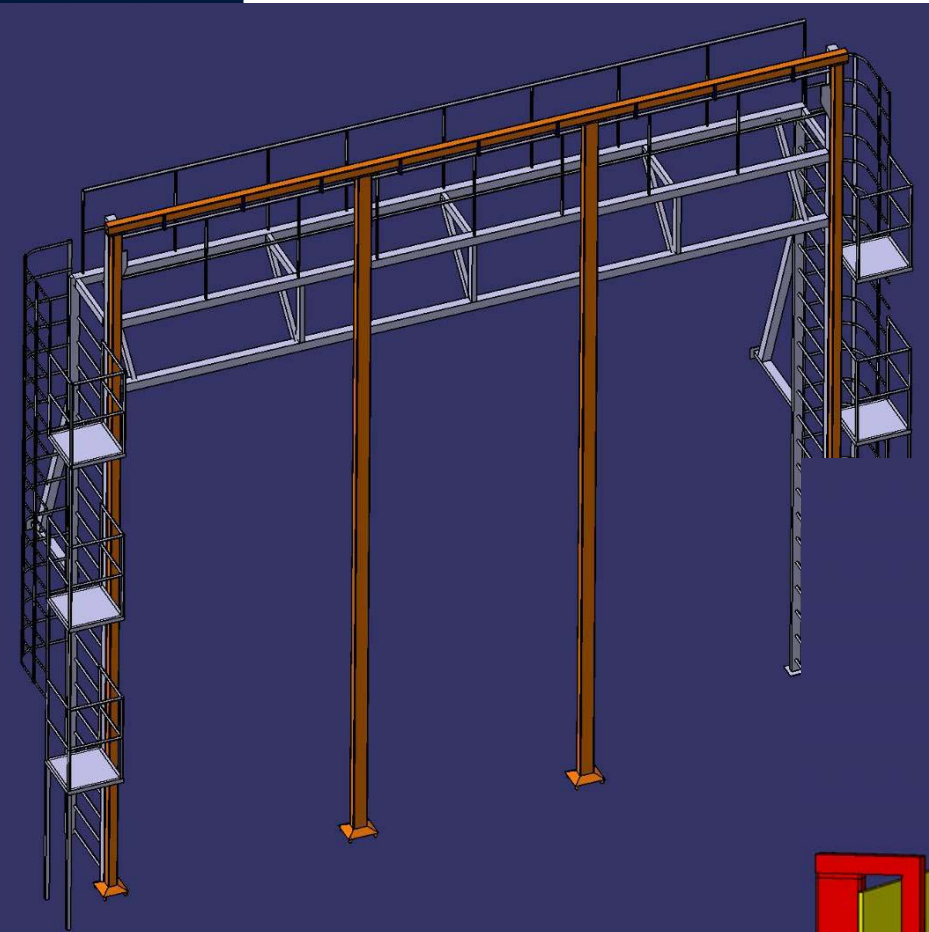


**TT plane
Surface Analysis**

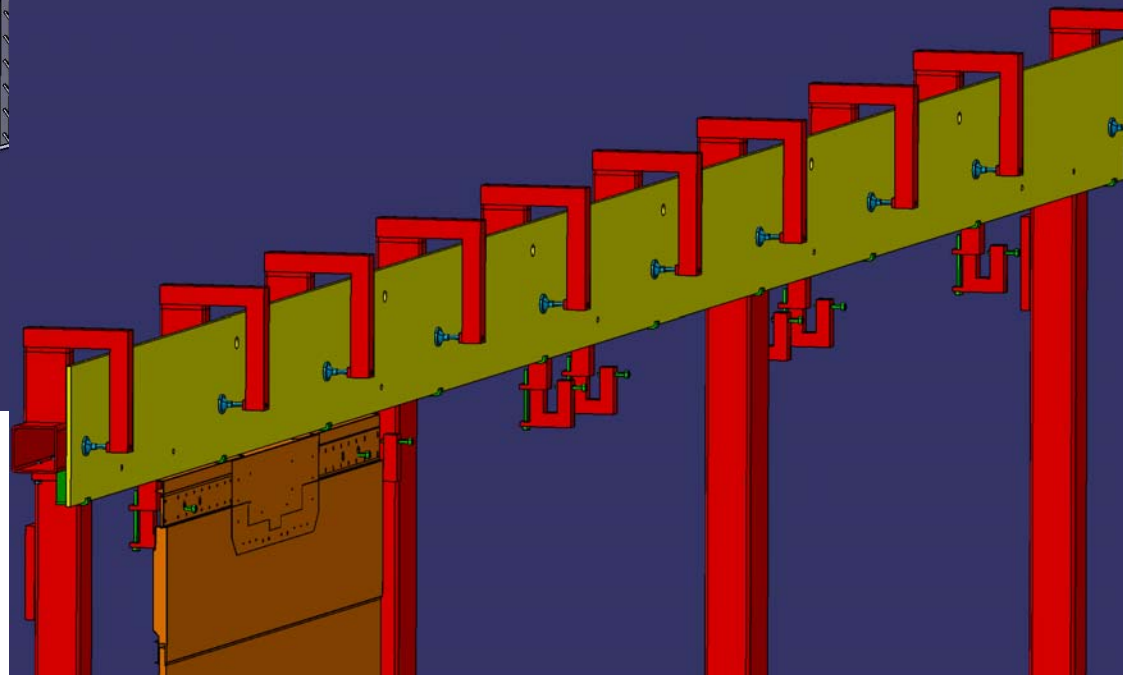


Improvement of the TT assembly tools

- better rigidity of the mechanical structure
- tooling for controlling the positioning of the modules
- online measurement with the automatic teodolite

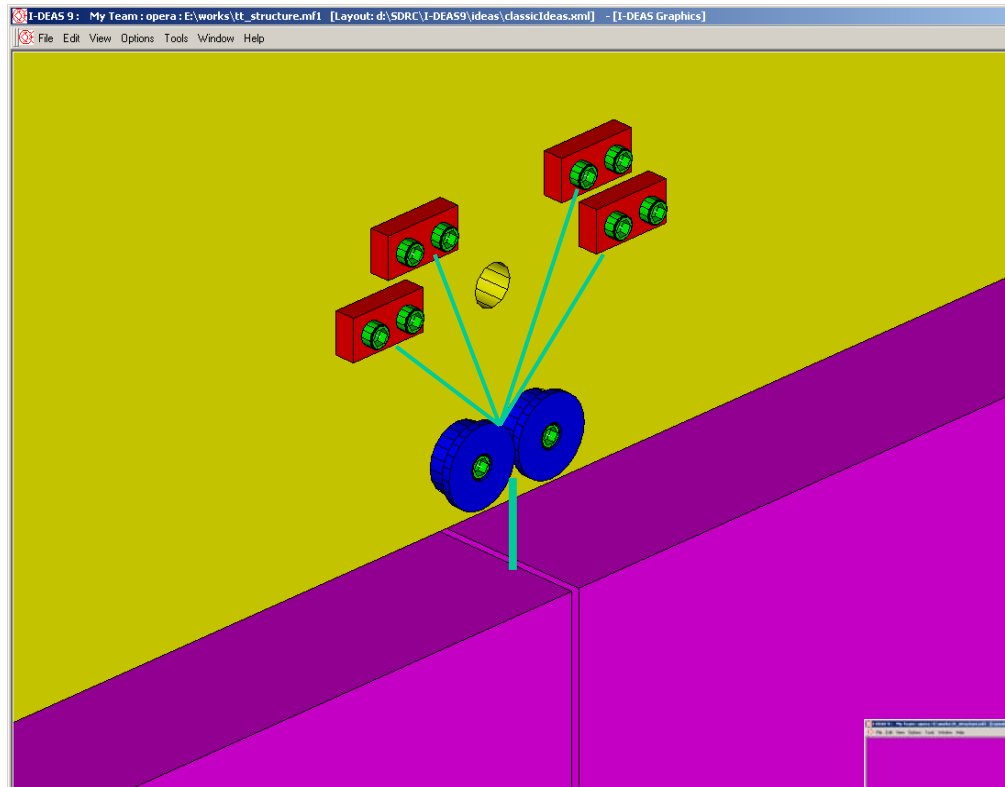


**Installed and tested
next week (April 11th)**



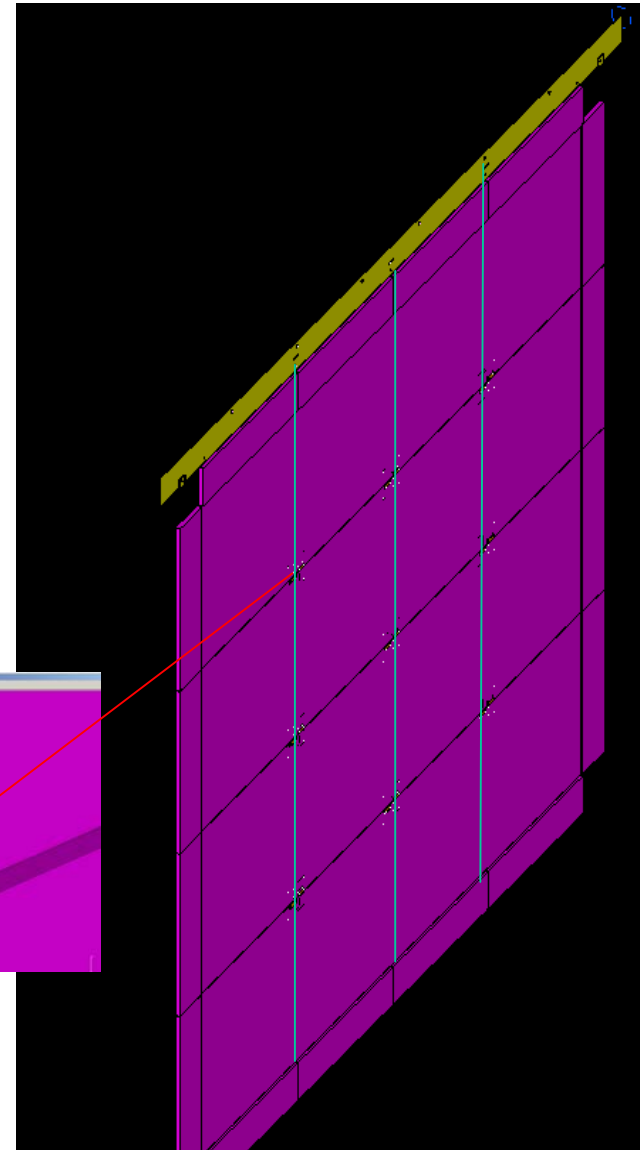
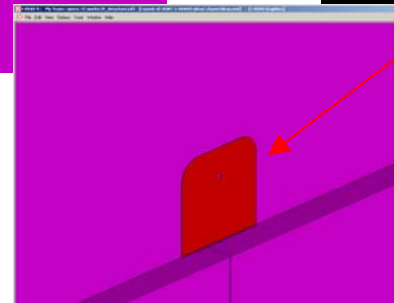


Improvement of TT plane assembly



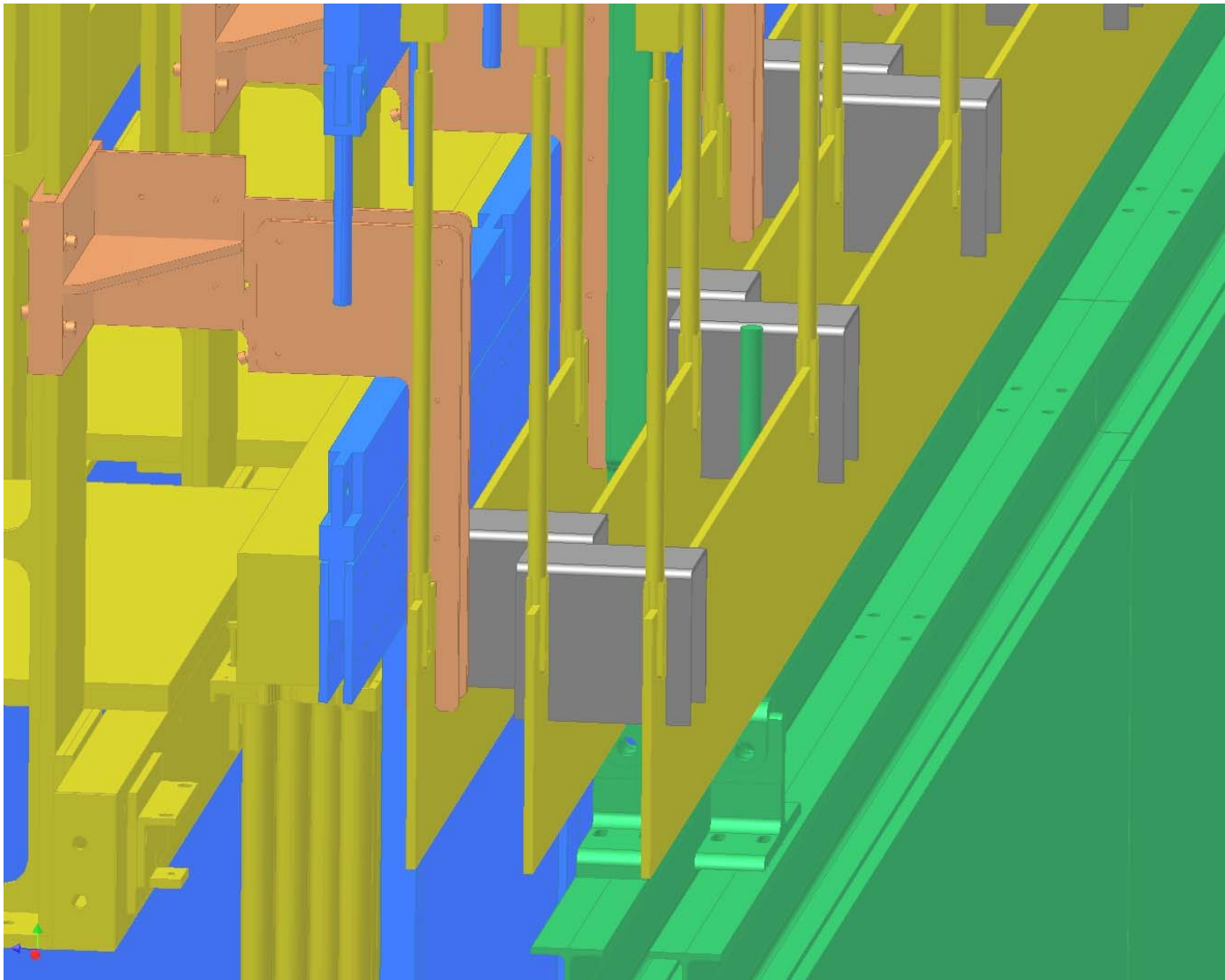
Install wires or ribbons to transfer homogeneously the load of the horizontal modules to the yellow flat beam to avoid stresses induced into the TT plane

Full test next week (April 11th)





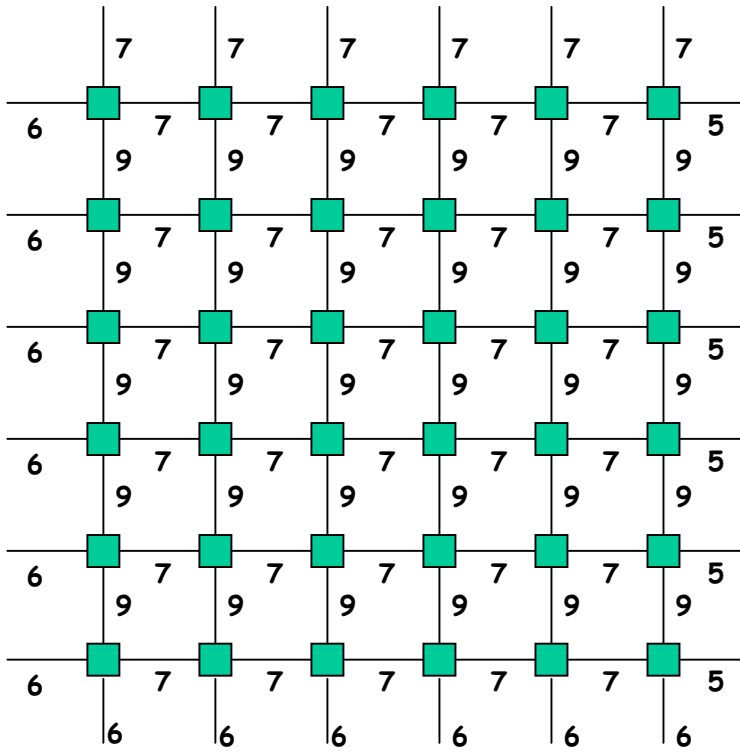
Improving TT planes hanging system



Linking the yellow flat beam of each TT plane to the reference structure in order to keep it flat inside the target

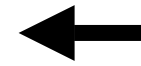
Tested next week

Brick Wall Survey



Wall horizontal:

$$6 + 1 + (7+1) \times 5 + 5 = 52$$

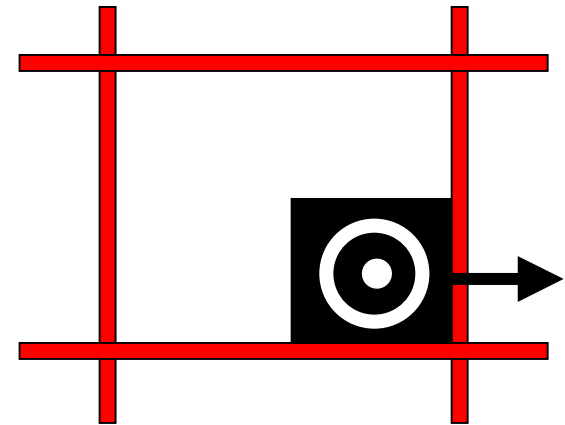


40 bricks
9/12-15/12

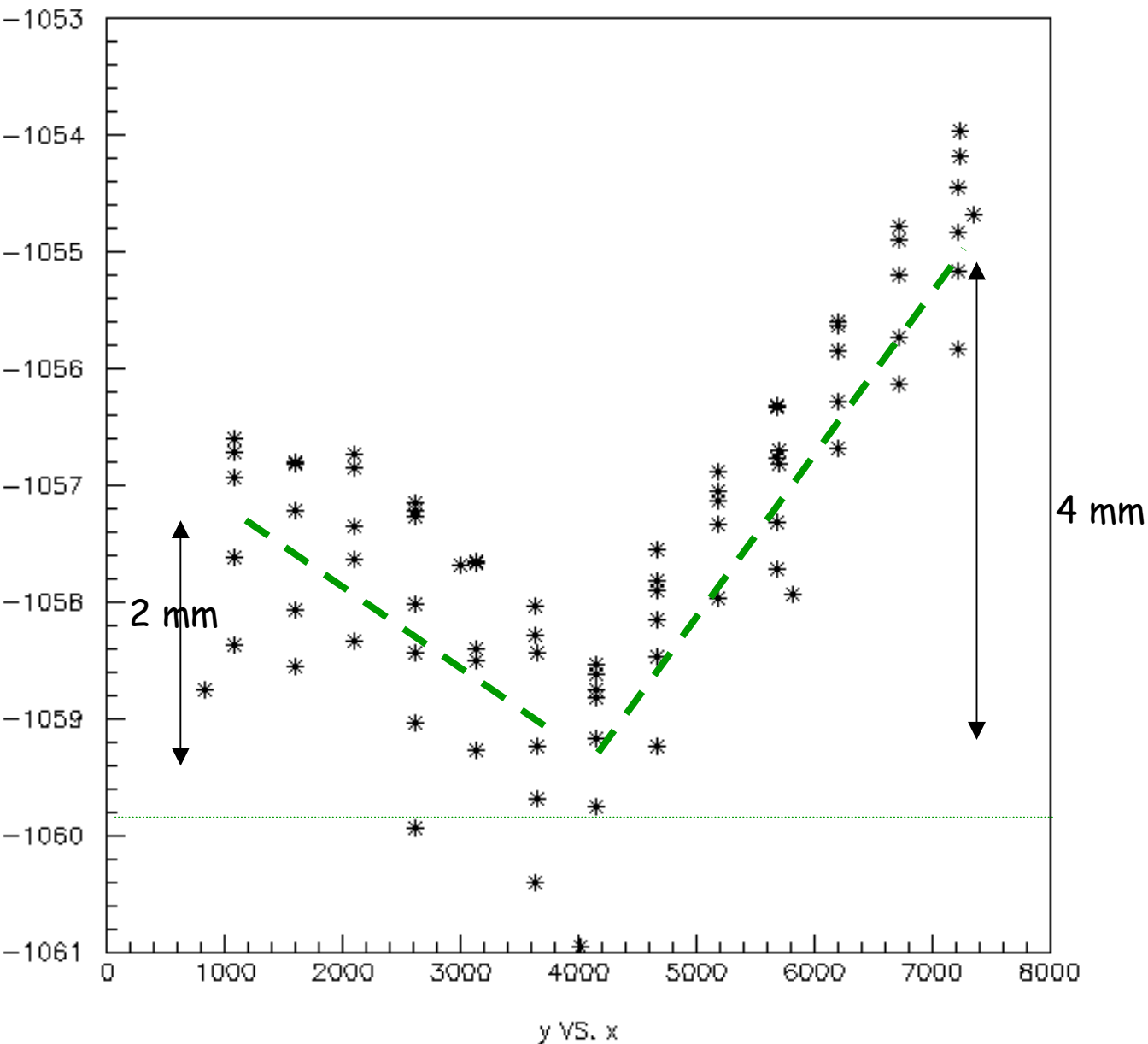
Wall vertical:

$$6 + 1 + (9 + 1) \times 5 + 7 = 64$$

Now
better grid
(79 bricks
14/1/05)

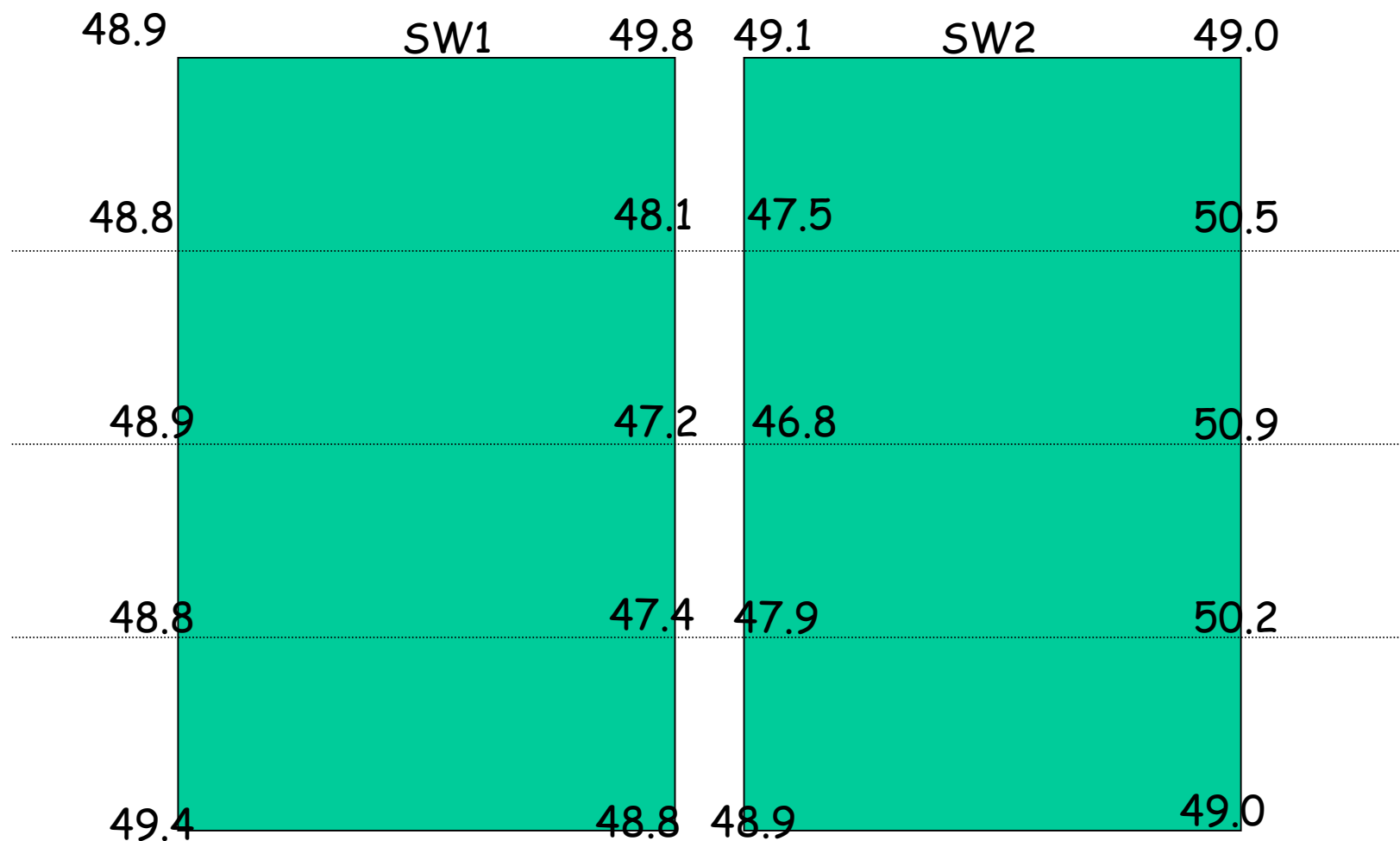


Top view of the Brick Wall



Kink seen with the
79 fake bricks

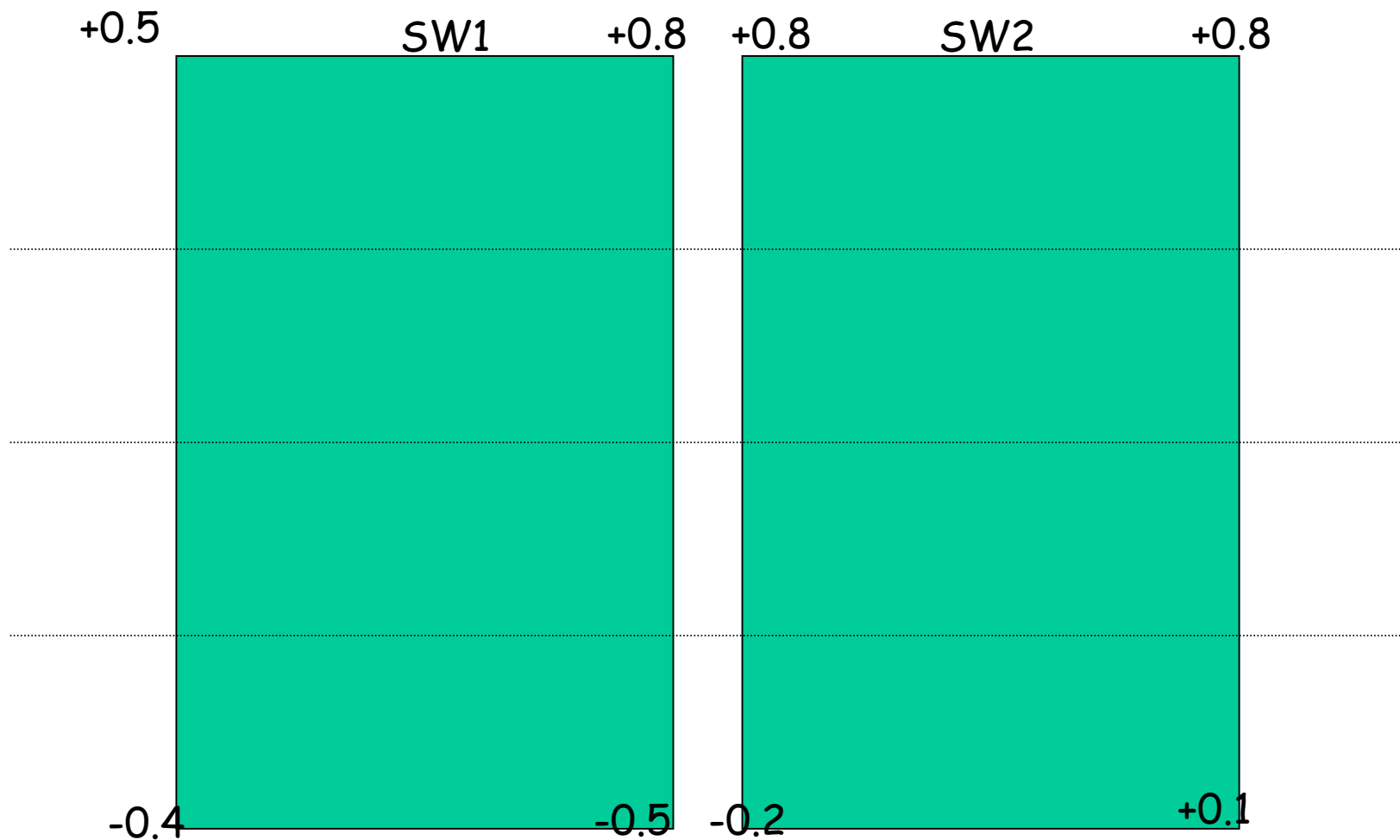
Wall 1 after realignment 7/3 (forcing on turnbuckles+ bottom regulations, origin of the kink not yet understood)



Top and Bottom are aligned (by forcing the top) but there is a bump at the middle

Offset of 3600 mm subtracted, nominal 3650, magnet positive, bottom rails system

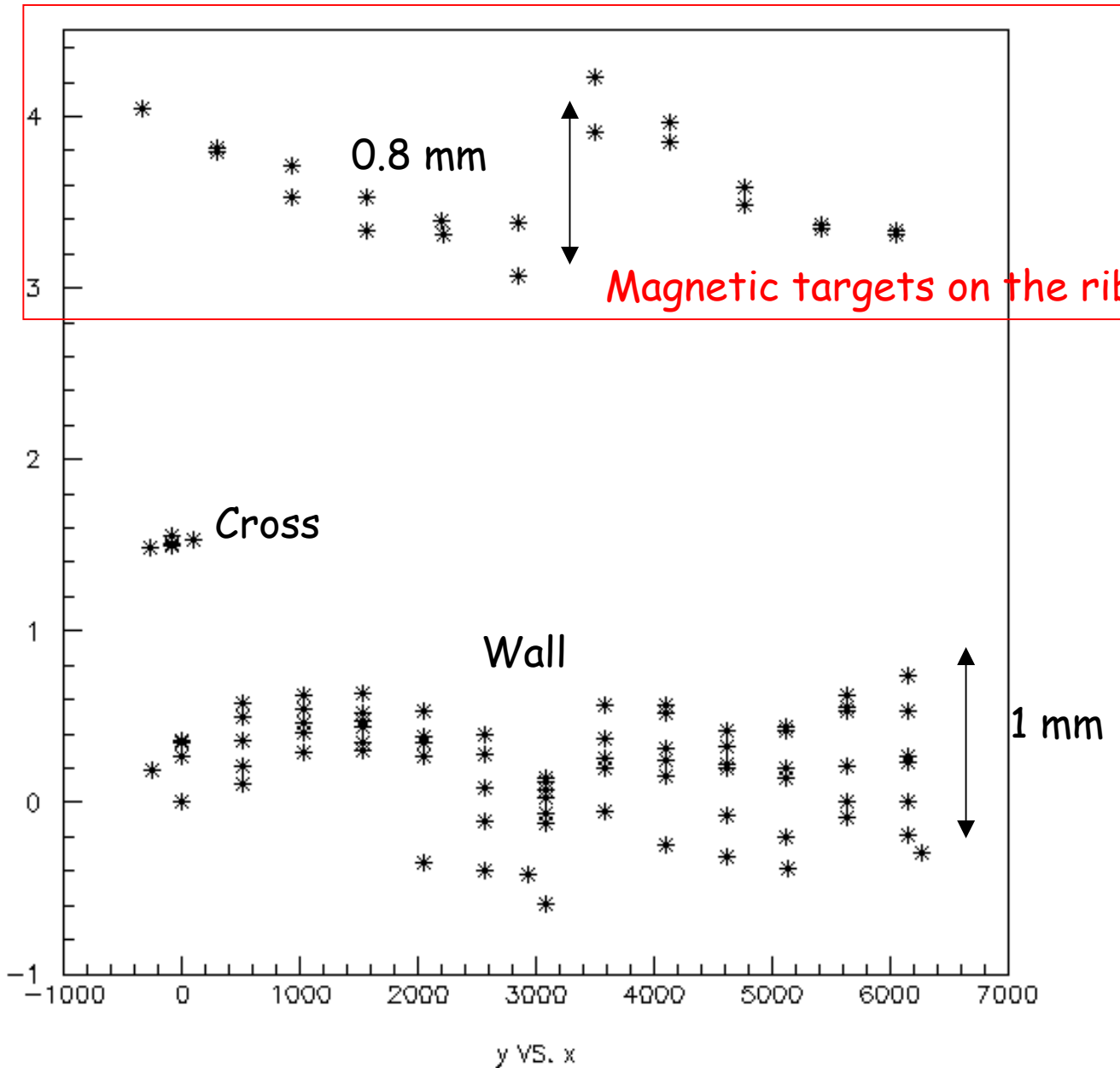
Wall 1 aligned on the 22nd of March by skipping one slot from TT7 (no more pressure from TT7)



Differences with respect to the nominal position

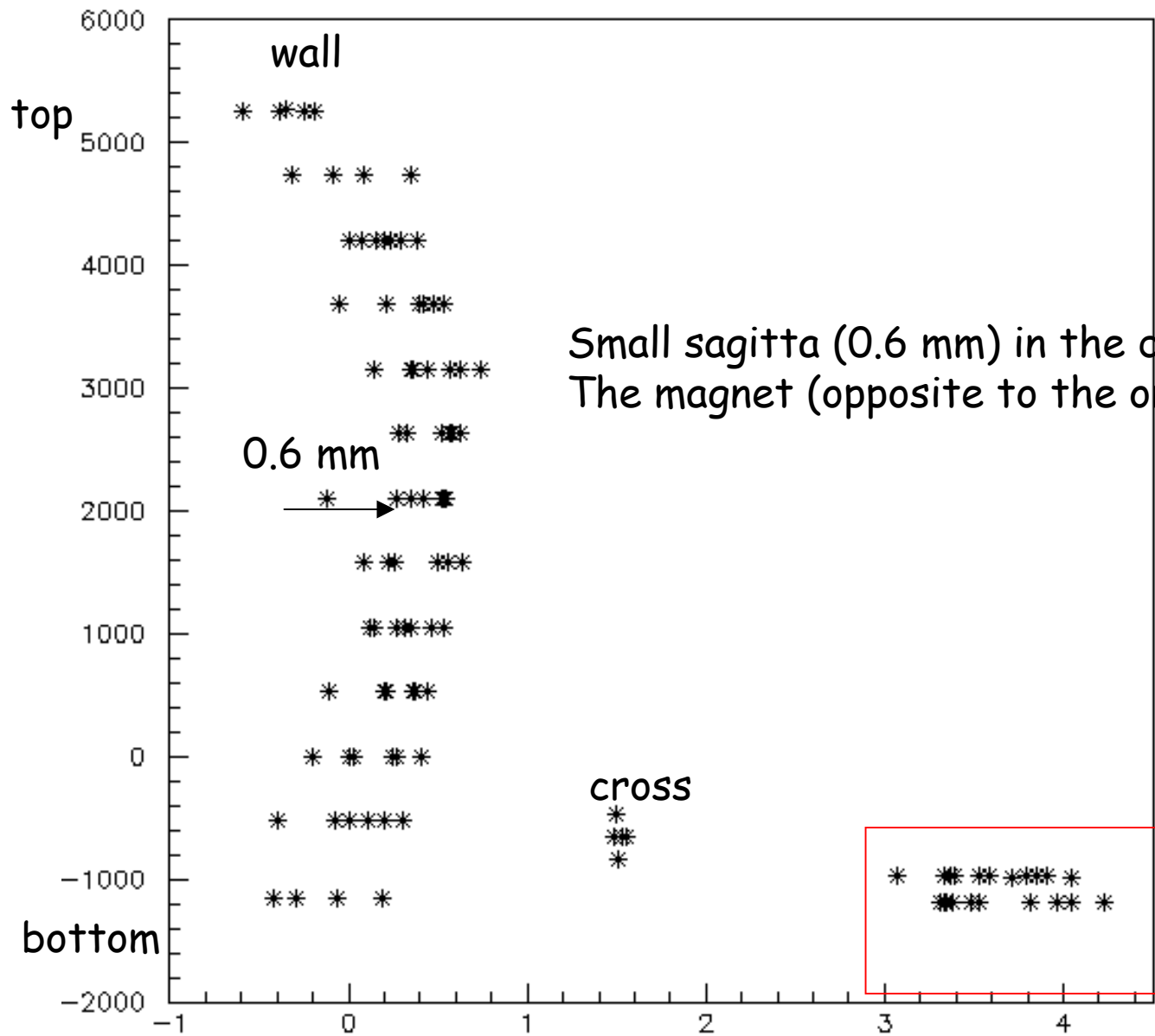
Just the alignment of the bottom I beams is enough to get the entire wall aligned !

TOP View



Beam

All the non planarity effects are within 1 mm !!!



Side View

Small sagitta (0.6 mm) in the direction of
The magnet (opposite to the one with TT7 pushing)

ribbons

Borexino

Beam

Magnet



The *Two-floor* hypothesis

Access to this platform by stair-cases & Lift

