

AIDA

Infrastructure for very forward calorimeters

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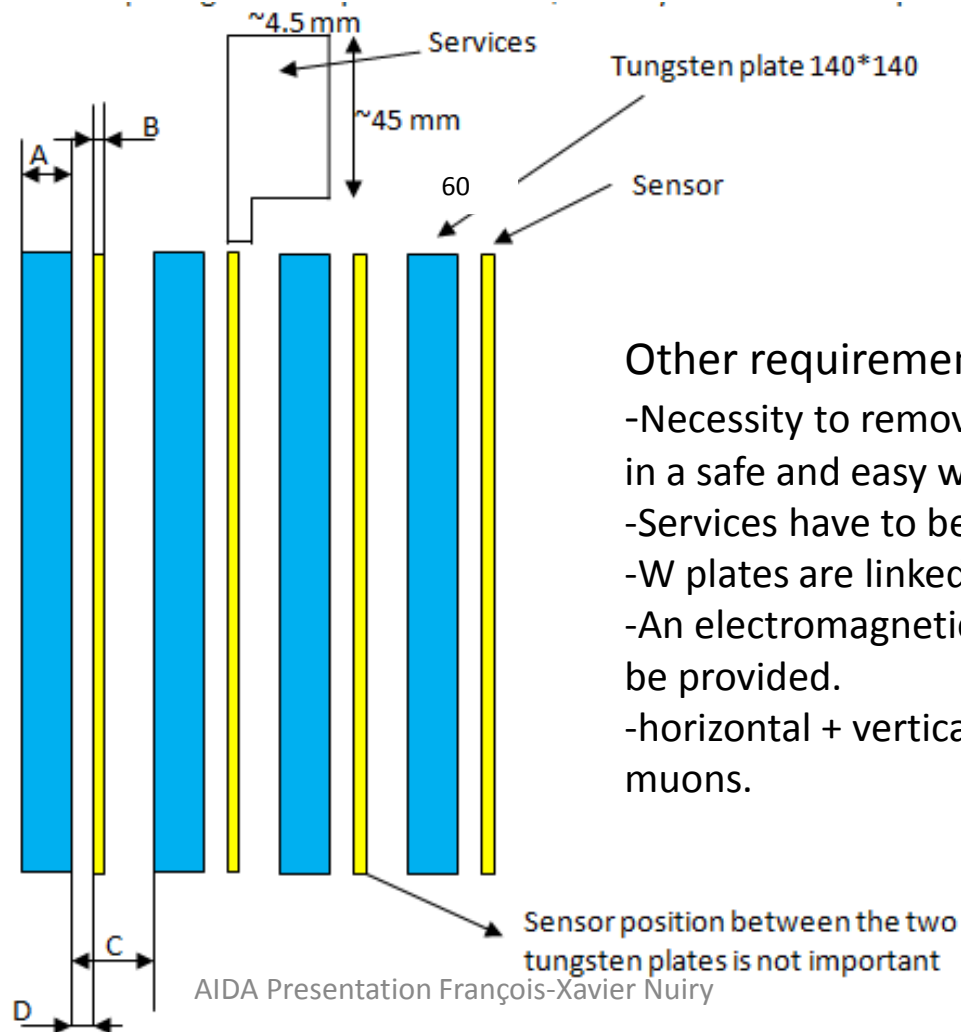
Overview

- Main requirements
- Global design
- Metrology with steel plates – Concept validation
- Tungsten plates (Plansee)
- Tungsten plates (MG Sanders)
- Final assembly: mounting on a marble
- General status

Requirements

AIDA forward calorimeter

- Design and manufacturing of a mechanical structure for tungsten plates and silicon sensors.
- $A=3.5\text{mm}$ $B=0.32\pm 0.015\text{mm}$ $C=2, 1, \text{ or } 0.5 \pm 0.05\text{mm}$ $D=\text{not really important}$

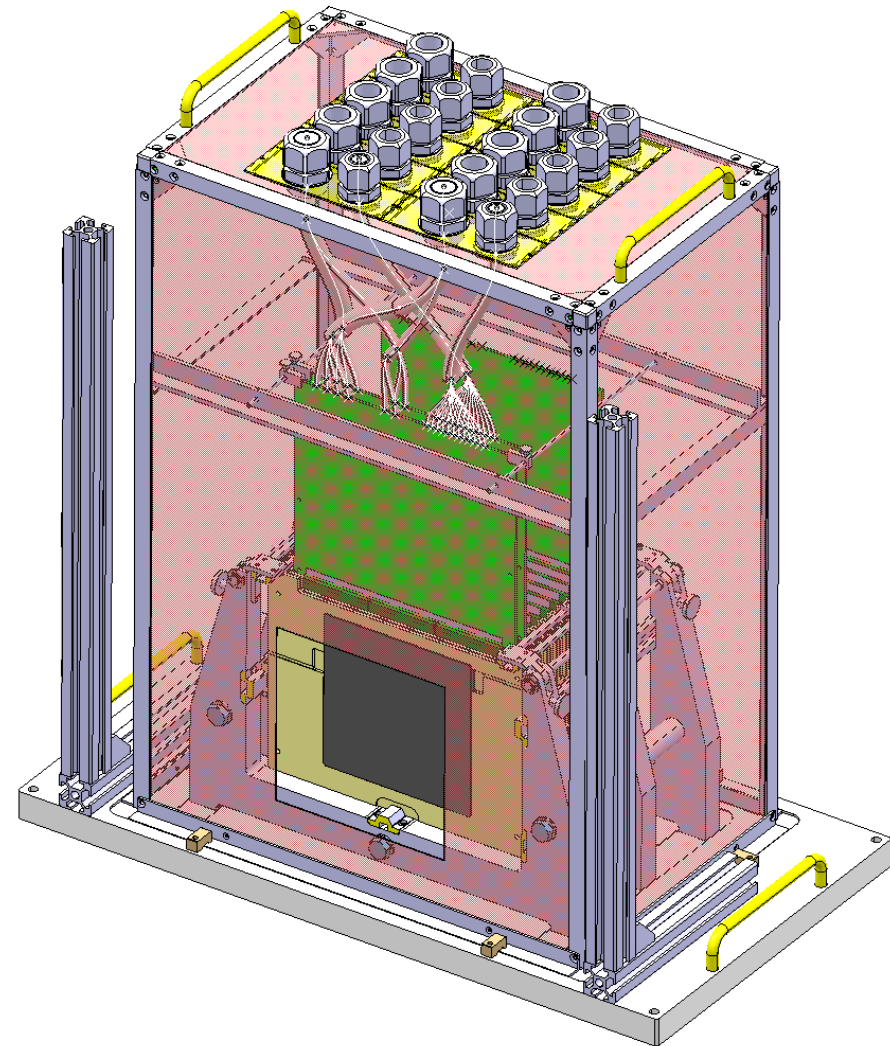
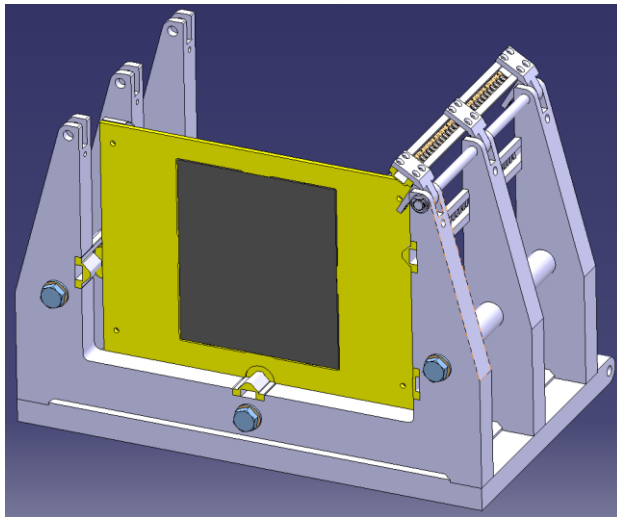
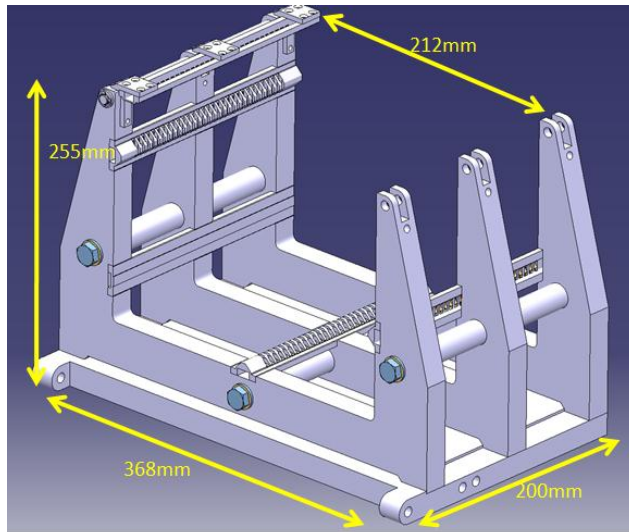


Other requirements:

- Necessity to remove sensors and tungsten in a safe and easy way.
- Services have to be held.
- W plates are linked to the ground.
- An electromagnetic + light shielding has to be provided.
- horizontal + vertical position for cosmic muons.

Global design

- Cradle, combs, permaglass frames + W plates, hood, services supports
- Able to work with 2mm and 1mm gap between tungsten plates

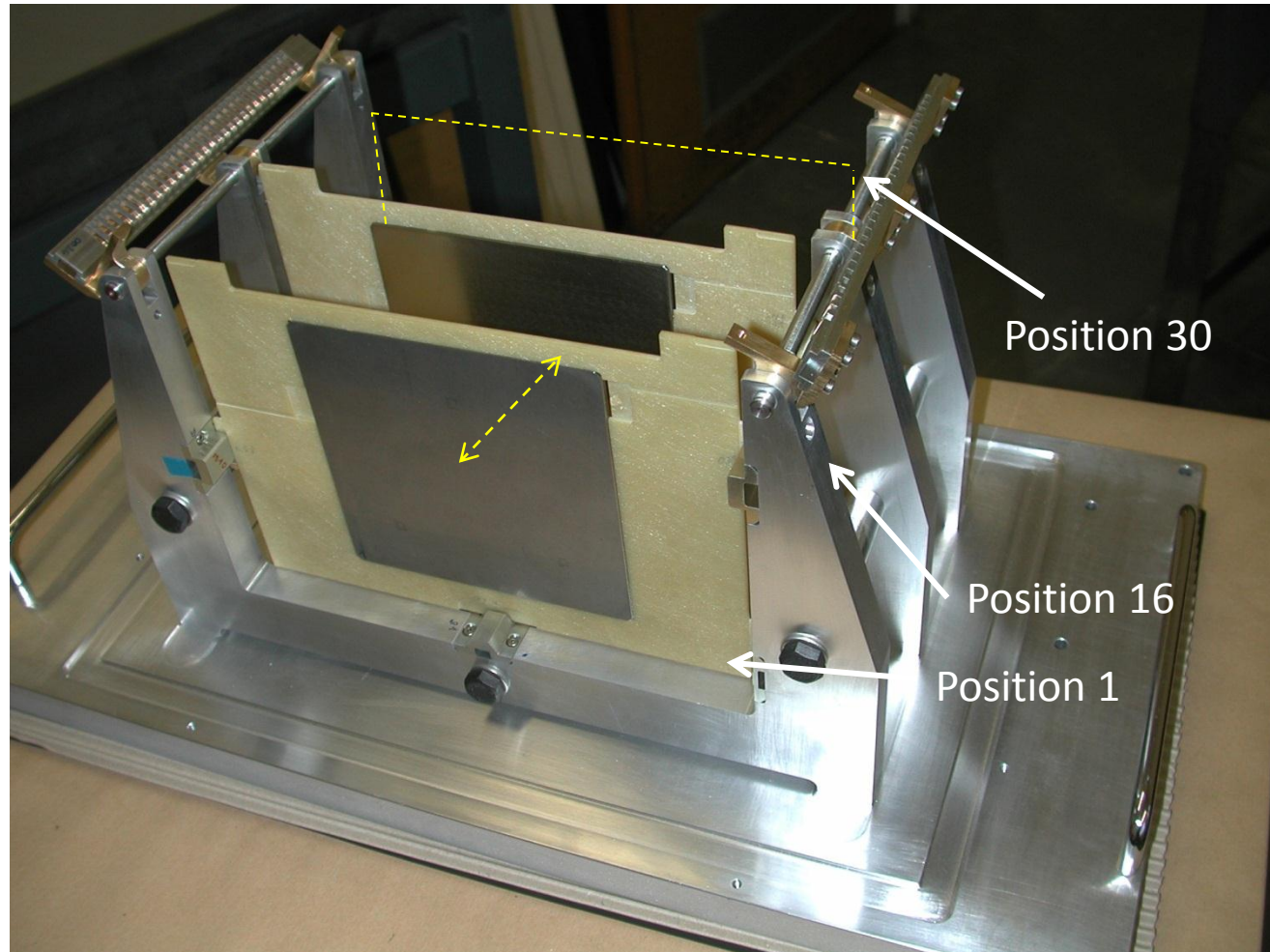


Metrology with steel plates

2 permaglass + steel plates assemblies are mounted in the cradle.
 Assemblies are installed in 3 different positions: position 1, 16 and 30.

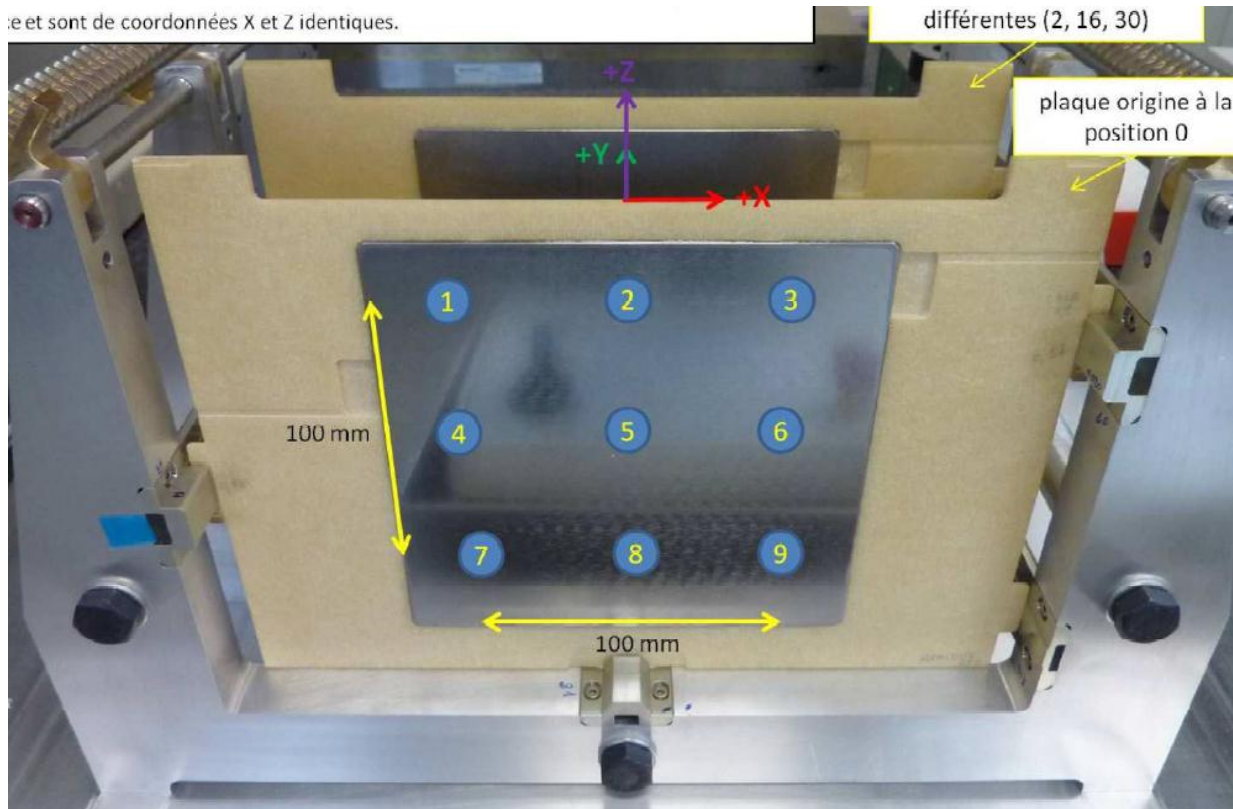
We measure the distance between 2 plates: from the back of plate 1 to the front of plate 2.

The reproducibility of the plate positioning in the same slot is also evaluated.



Metrology with steel plates

9 points are probed on each plate, with the MMT machine.
The distance point-point is measured by the machine.

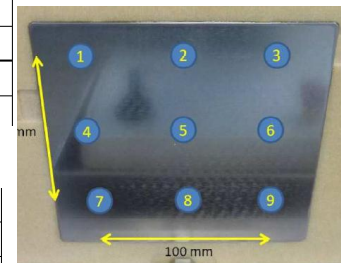


Positioning reproducibility

DIST-0-POINT/POINT-4	Distance	PLAQUE-ORIGINE-4.1 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	0.000	0.006	-0.050	0.050	0.006	
DIST-0-POINT/POINT-5	Distance	PLAQUE-ORIGINE-5.1 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	0.000	0.006	-0.050	0.050	0.006	
DIST-0-POINT/POINT-6	Distance	PLAQUE-ORIGINE-6.1 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	0.000	0.006	-0.050	0.050	0.006	
DIST-0-POINT/POINT-7	Distance	PLAQUE-ORIGINE-7.1 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	0.000	0.006	-0.050	0.050	0.006	

2mm gap - distance accuracy

DIST-2-POINT/POINT-4	Distance	PLAQUE-POSITION 2-4 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	2.000	1.994	-0.050	0.050	-0.006	
DIST-2-POINT/POINT-5	Distance	PLAQUE-POSITION 2-5 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	2.000	1.991	-0.050	0.050	-0.009	
DIST-2-POINT/POINT-6	Distance	PLAQUE-POSITION 2-6 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	2.000	2.005	-0.050	0.050	0.005	
DIST-2-POINT/POINT-7	Distance	PLAQUE-POSITION 2-7 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	2.000	1.980	-0.050	0.050	-0.020	



Mid-distance accuracy

DIST-16-POINT/POINT-4	Distance	PLAQUE-POSITION 16-4 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	79.000	78.990	-0.050	0.050	-0.010	
DIST-16-POINT/POINT-5	Distance	PLAQUE-POSITION 16-5 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	79.000	78.982	-0.050	0.050	-0.018	
DIST-16-POINT/POINT-6	Distance	PLAQUE-POSITION 16-6 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	79.000	78.990	-0.050	0.050	-0.010	
DIST-16-POINT/POINT-7	Distance	PLAQUE-POSITION 16-7 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	79.000	78.973	-0.050	0.050	-0.027	

Max-distance accuracy

DIST-30-POINT/POINT-4	Distance	PLAQUE-POSITION 30-4 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	156.000	155.998	-0.050	0.050	-0.002	
DIST-30-POINT/POINT-5	Distance	PLAQUE-POSITION 30-5 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	156.000	155.999	-0.050	0.050	-0.001	
DIST-30-POINT/POINT-6	Distance	PLAQUE-POSITION 30-6 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	156.000	156.014	-0.050	0.050	0.014	
DIST-30-POINT/POINT-7	Distance	PLAQUE-POSITION 30-7 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	156.000	155.993	-0.050	0.050	-0.007	

Positioning reproducibility

DIST-0-POINT/POINT-4	Distance	PLAQUE-ORIGINE-4.1 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	0.000	0.005	-0.050	0.050	0.005	
DIST-0-POINT/POINT-5	Distance	PLAQUE-ORIGINE-5.1 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	0.000	0.005	-0.050	0.050	0.005	
DIST-0-POINT/POINT-6	Distance	PLAQUE-ORIGINE-6.1 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	0.000	0.005	-0.050	0.050	0.005	
DIST-0-POINT/POINT-7	Distance	PLAQUE-ORIGINE-7.1 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	0.000	0.003	-0.050	0.050	0.003	

1mm gap - distance accuracy

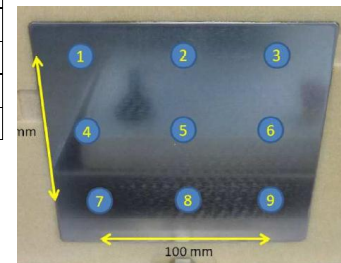
DIST-2-POINT/POINT-4	Distance	PLAQUE-POSITION 2-4 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	1.000	0.981	-0.050	0.050	-0.019	
DIST-2-POINT/POINT-5	Distance	PLAQUE-POSITION 2-5 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	1.000	0.981	-0.050	0.050	-0.019	
DIST-2-POINT/POINT-6	Distance	PLAQUE-POSITION 2-6 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	1.000	1.000	-0.050	0.050	0.000	
DIST-2-POINT/POINT-7	Distance	PLAQUE-POSITION 2-7 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	1.000	0.962	-0.050	0.050	-0.038	

Mid-distance accuracy

DIST-16-POINT/POINT-4	Distance	PLAQUE-POSITION 16-4 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	64.000	63.978	-0.050	0.050	-0.022	
DIST-16-POINT/POINT-5	Distance	PLAQUE-POSITION 16-5 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	64.000	63.985	-0.050	0.050	-0.015	
DIST-16-POINT/POINT-6	Distance	PLAQUE-POSITION 16-6 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	64.000	64.004	-0.050	0.050	0.004	
DIST-16-POINT/POINT-7	Distance	PLAQUE-POSITION 16-7 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	64.000	63.961	-0.050	0.050	-0.039	

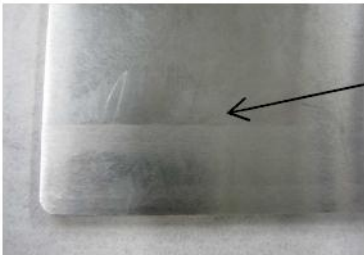
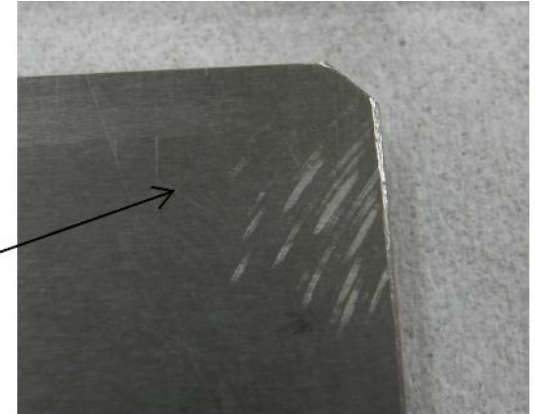
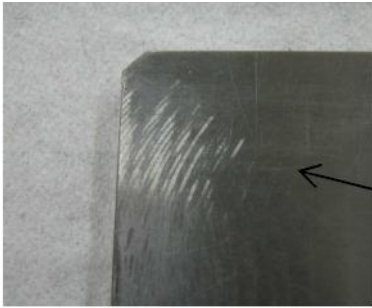
Max-distance accuracy

DIST-30-POINT/POINT-4	Distance	PLAQUE-POSITION 30-4 - PLAQUE-ORIGINE-4 / REP-ORIGINE					
	y	127.000	126.970	-0.050	0.050	-0.030	
DIST-30-POINT/POINT-5	Distance	PLAQUE-POSITION 30-5 - PLAQUE-ORIGINE-5 / REP-ORIGINE					
	y	127.000	126.968	-0.050	0.050	-0.032	
DIST-30-POINT/POINT-6	Distance	PLAQUE-POSITION 30-6 - PLAQUE-ORIGINE-6 / REP-ORIGINE					
	y	127.000	126.991	-0.050	0.050	-0.009	
DIST-30-POINT/POINT-7	Distance	PLAQUE-POSITION 30-7 - PLAQUE-ORIGINE-7 / REP-ORIGINE					
	y	127.000	126.948	-0.050	0.050	-0.052	



Plansee tungsten plates

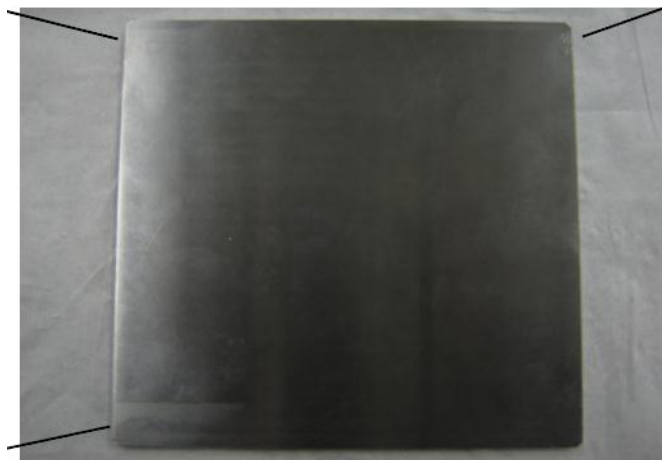
- Machined (with some delay...)
- According to the manufacturer, 4 over 5 are according the technical drawing (roughness issue)



Plansee tungsten plates

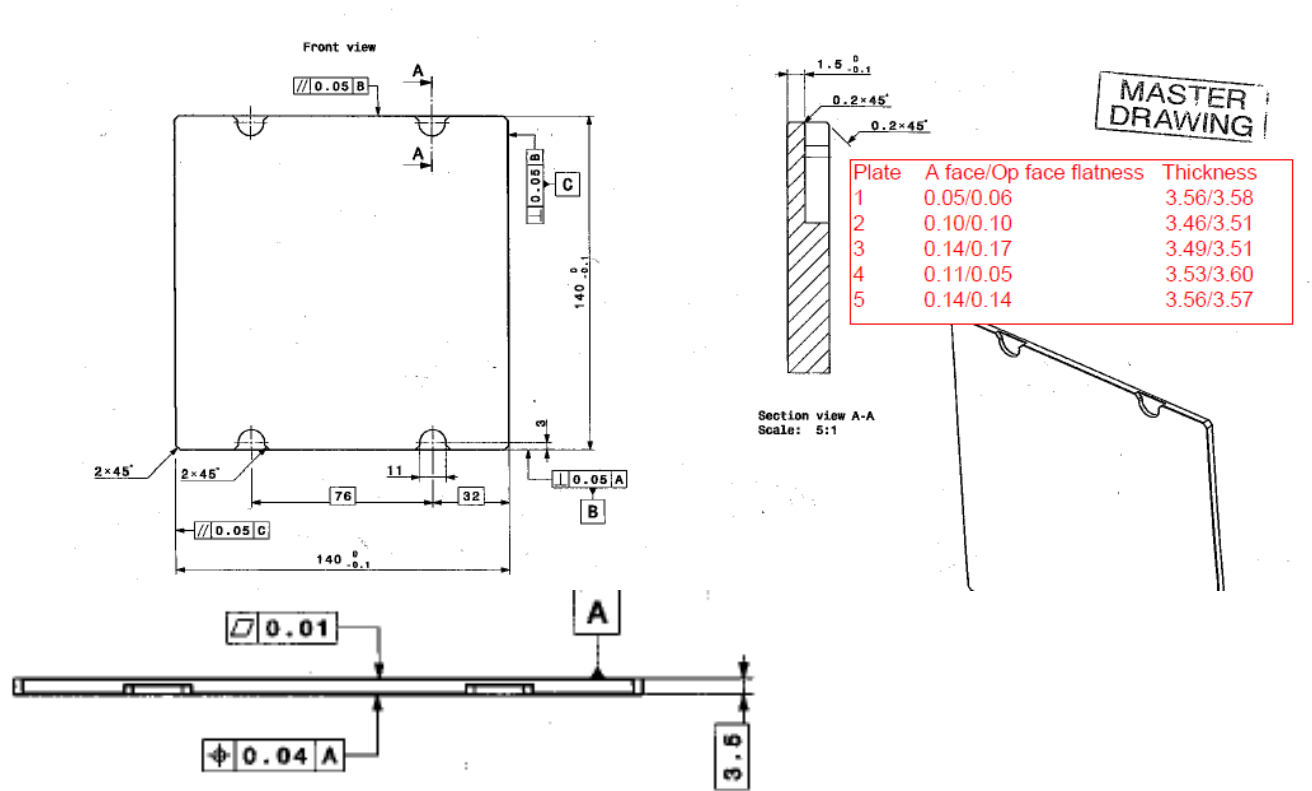
- Theoretically 1 plate (5) is exactly according to what we asked
- Final metrology tests we did in the frame, with permaglas and combs, were good, and have been realised with the two steel plates which have dimensions close to W Plansee plates.
- We could have locally some inaccuracies.
- Globally the distance between 2 plates should be within the +/-50 microns.

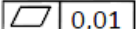
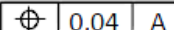
PLATES	ASKED	Plansee plate 1	Plansee plate 2	Plansee plate 3	Plansee plate 4	Plansee plate 5	Steel plate 1	Steel plate 2
Flatness plan A	10 μ m	90	10	9	3	7	13	14
Position opposite plan	40 μ m	40	68	48	56	24	48	46



Tungsten plates from MG sanders

- Current plates from MG Sanders are not delivered according to the specifications:



COTES DU PLAN	Tolérances		Position	RESULTATS				
				Piece 1	Piece 2	Piece 3	Piece 4	Piece 5
 0,01	0	0,01		0,036	0,070	0,108	0,138	0,137
 0,04 A	0	0,04		0,214	0,090	0,132	0,288	0,294

Proposal:

- Metrology has to be realised a new time
- Shipment to *Britte Mustad* compagny

Grinding process on both sides

It seems to be feasible.

BUT keep in mind that we needed 3 steel plates to get 2 rights!

So 1 or 2 could be wrong even after this process.

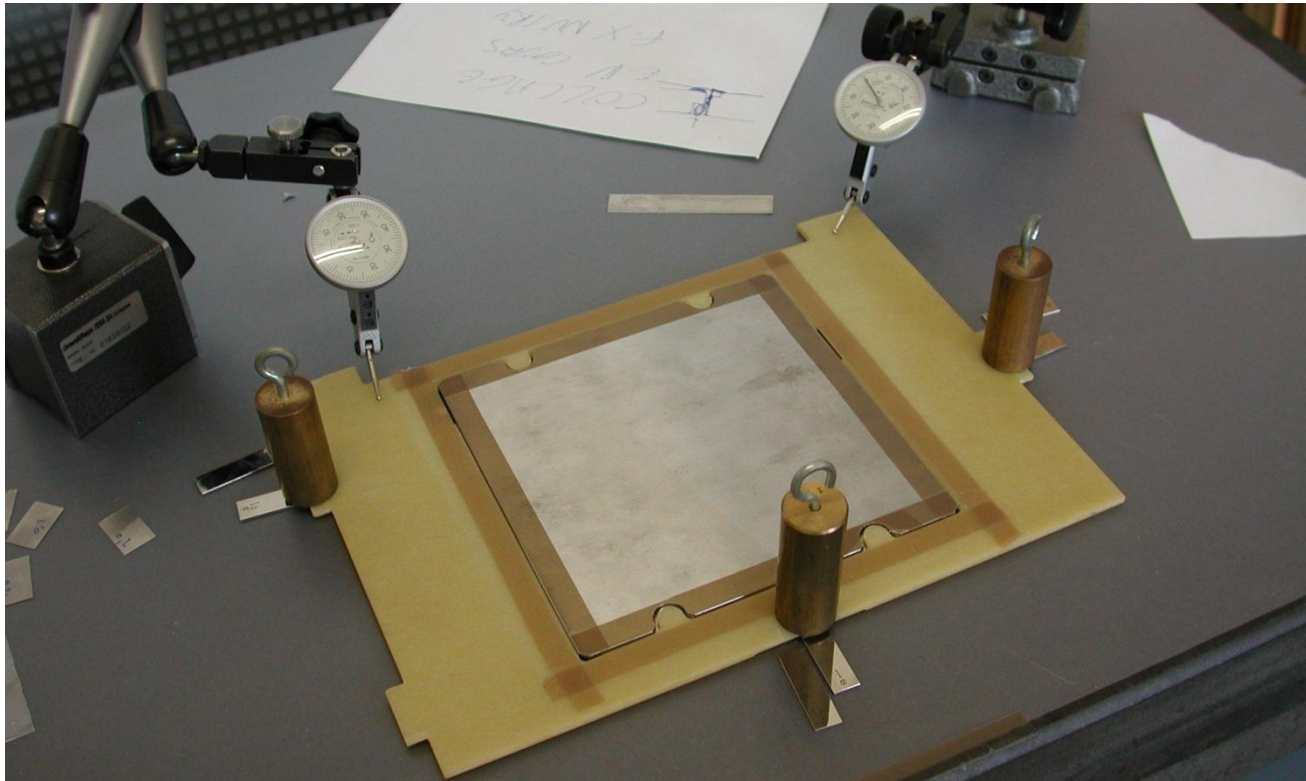
estimated price: 5 workdays and ~2500 Euros

Consequences:

- W plate will have a thickness of about 3.2mm
- Gap between 2 W plates will be ether 2.3mm ether 1.3mm (Instead of 2 and 1mm)
- Mixing it with future Plansee plates is not feasible, except if you accept having sometimes a gap of 2.3mm, then 2mm, etc.

Final assembly: mounting on a marble

- 3 stainless steel balls and the W plan are parallel and offset.
- Araldite 2011 glue is applied in the slit. (parts are protected with teflon tape).
- The frame level is controlled during the glue hardening.



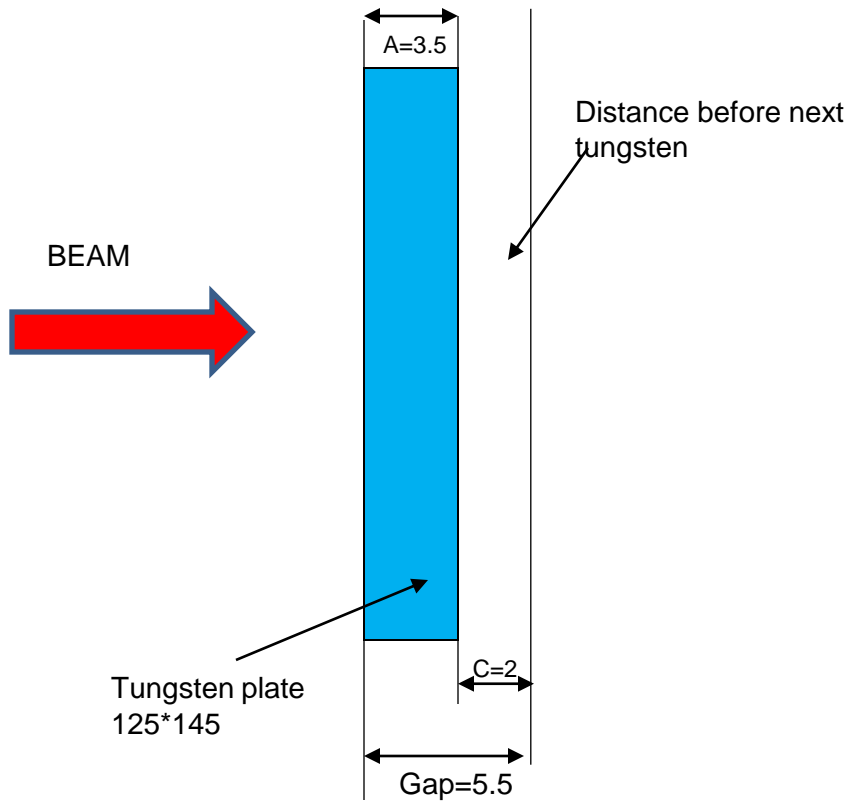
Summary

Group	Tasks / Parts	Manufacturer	Status	Delivery Dates
Manufacturing	Mechanical frame	Subcontractor + CERN	100% Manufactured	OK
	Combs	Subcontractor <i>BRITTE</i>	100% Manufactured	OK
	Springs	CERN	All springs are manufactured	OK
	Tungsten frame	Subcontractor <i>Resarm</i> + CERN	30 are manufactured	OK
	Silicon sensor frame	CERN	5 are manufactured	OK
	Hood and services support	CERN	Everything is done	OK
Assembly & tests	Integration tests with dummy SS plates	CERN	Done	OK
	W plates delivery	Plansee + MG sanders	MG sanders: delivered but wrong Plansee: delivered: under metrology	Plansee OK for 4 plates
	Hood assembly	CERN	Done	OK
	W & Si frames assemblies	CERN	Si frames assemblies: trivial W + permaglas assemblies: to be done	-

Additional information about the frame

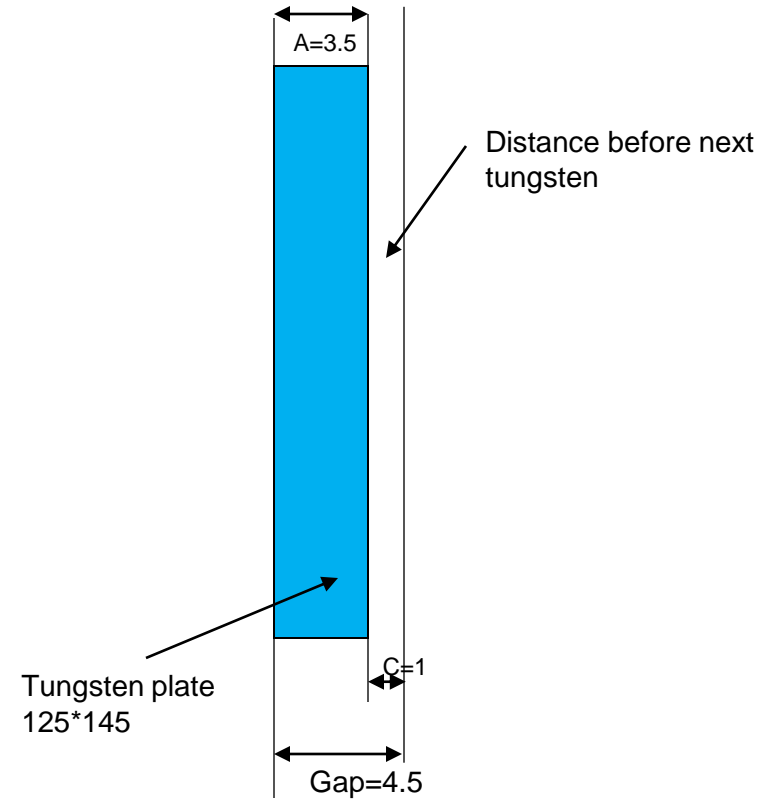
$C=2\text{mm}$

→ We work with an offset of 5.5mm



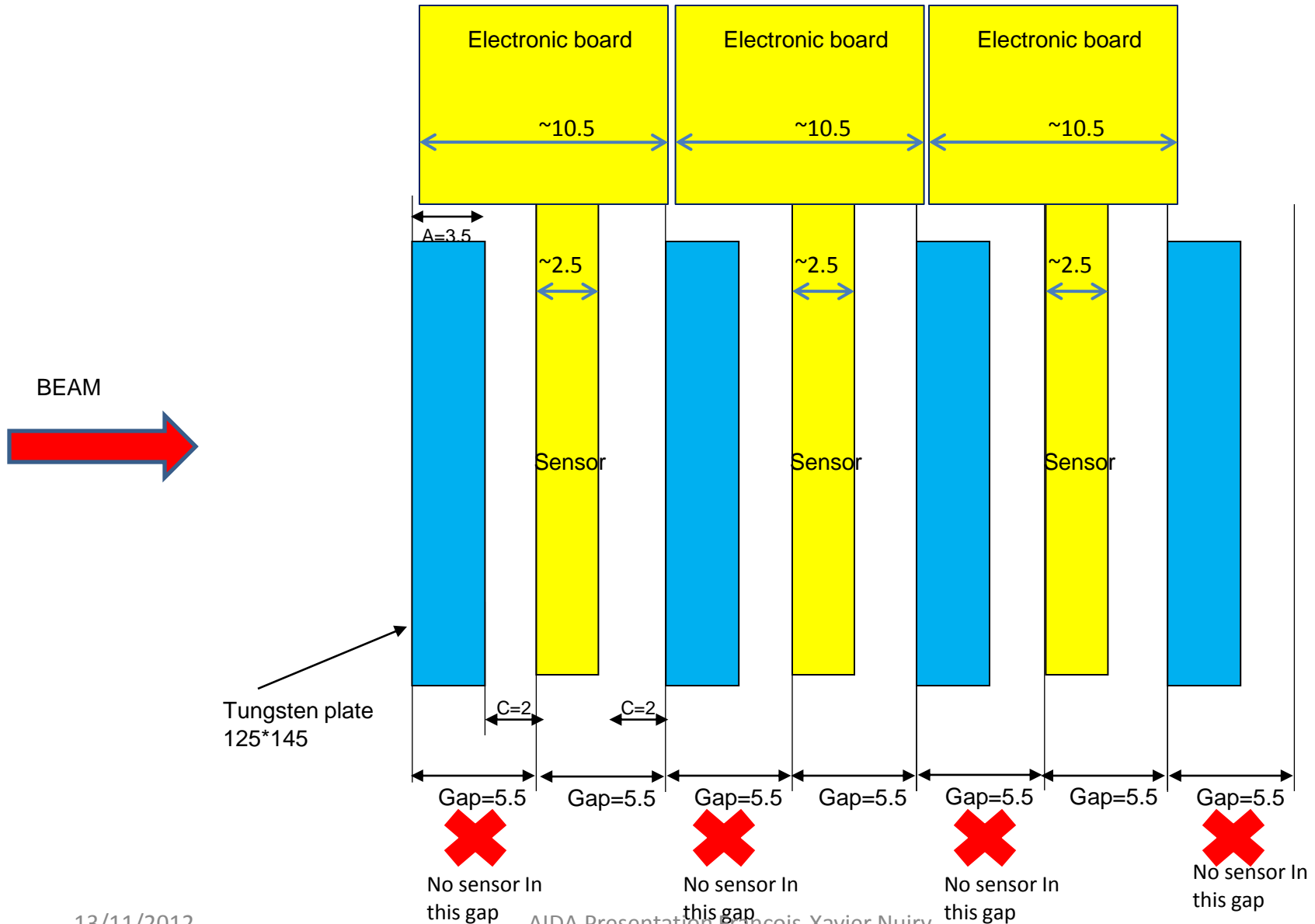
$C=1\text{mm}$

→ We work with an offset of 4.5mm



C=2mm between each tungsten

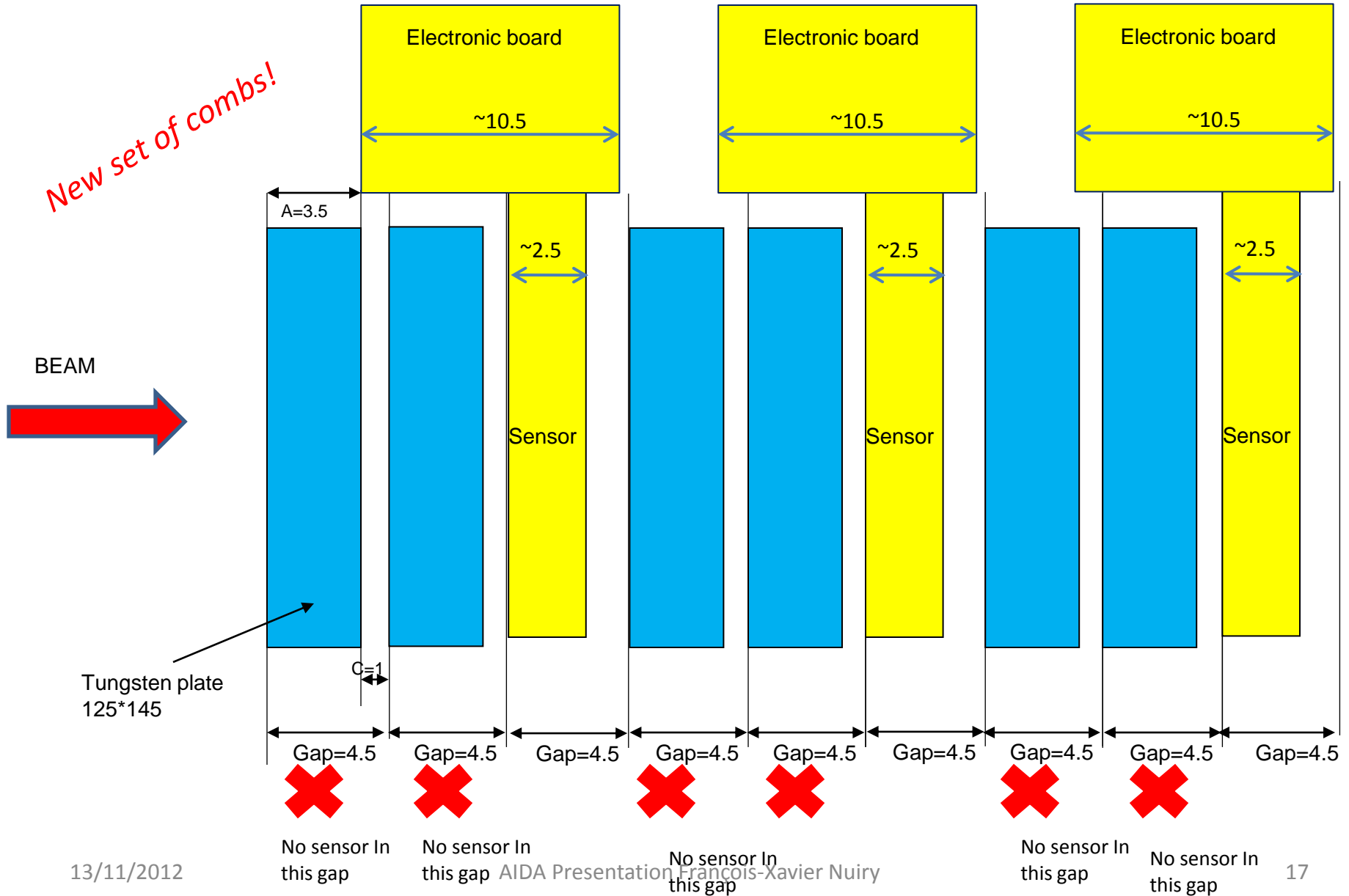
→ We work with an offset of 5.5mm



C=1mm between each tungsten

→ We work with an offset of 4.5mm

New set of combs!



Appendix 2: Additional information about the frame

What we can do with C=2mm:

→ We work with an offset of 5.5mm

