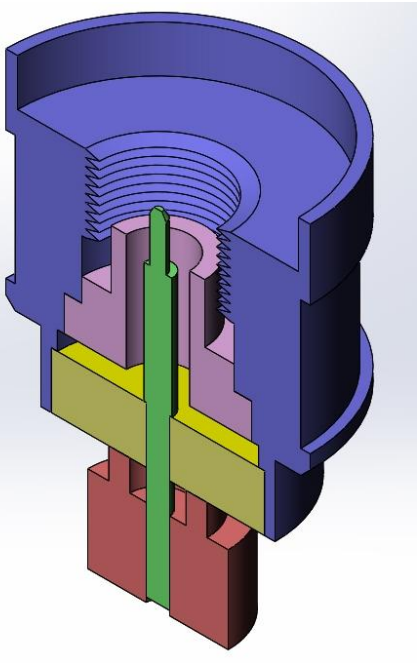
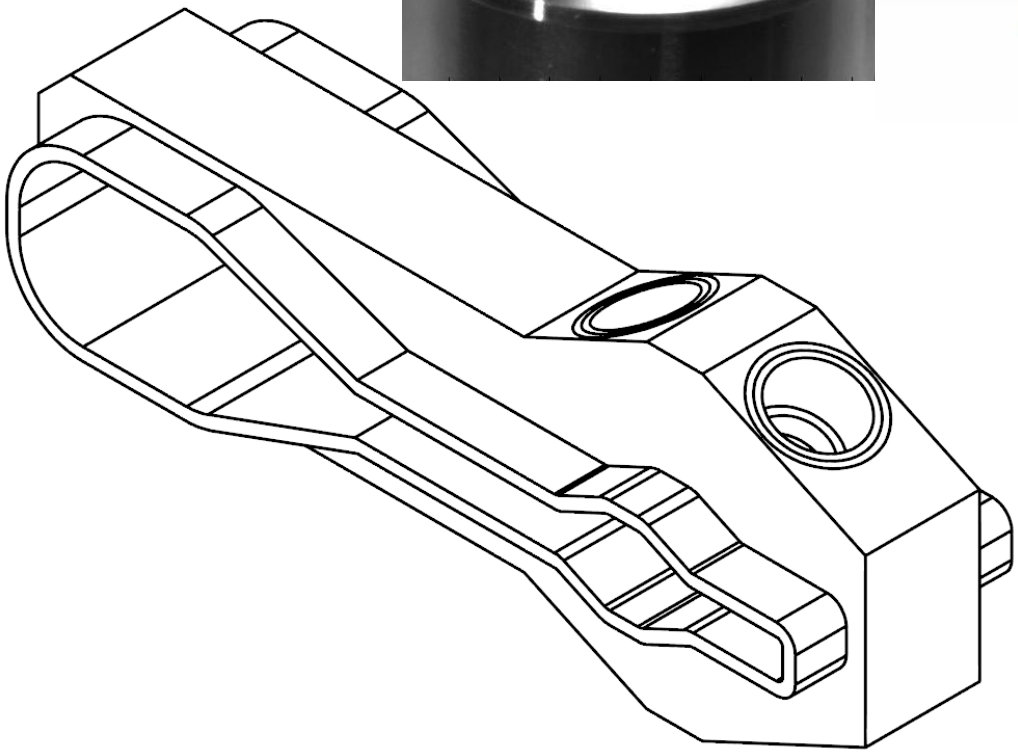
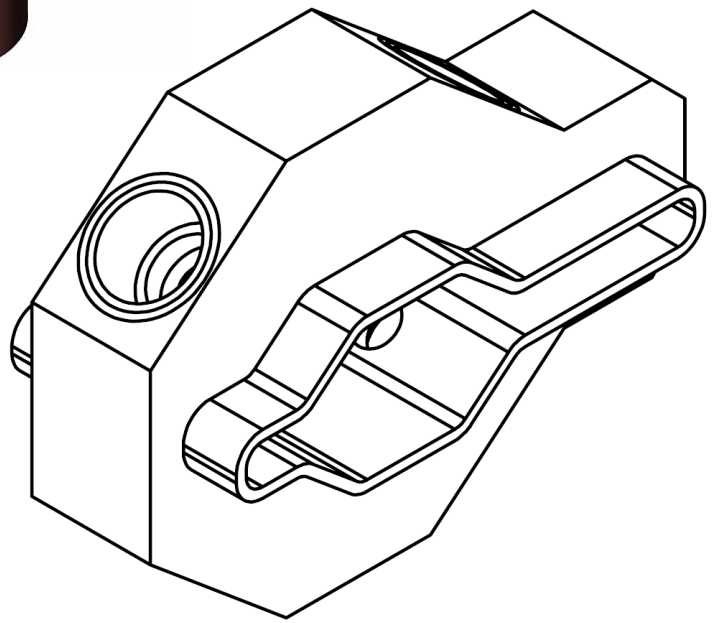
development of a new BPM Button feedthrough for the future LE-Ring

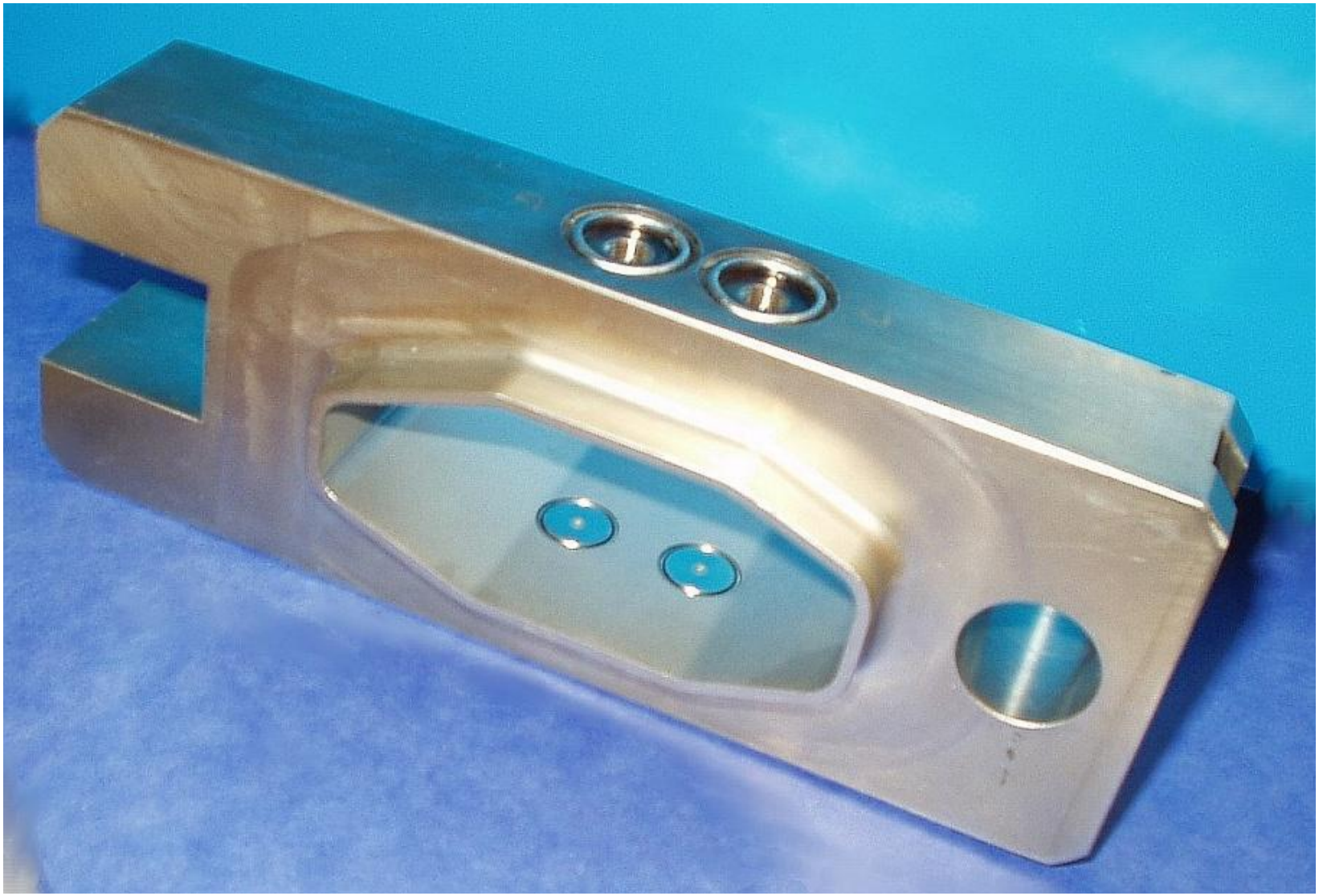


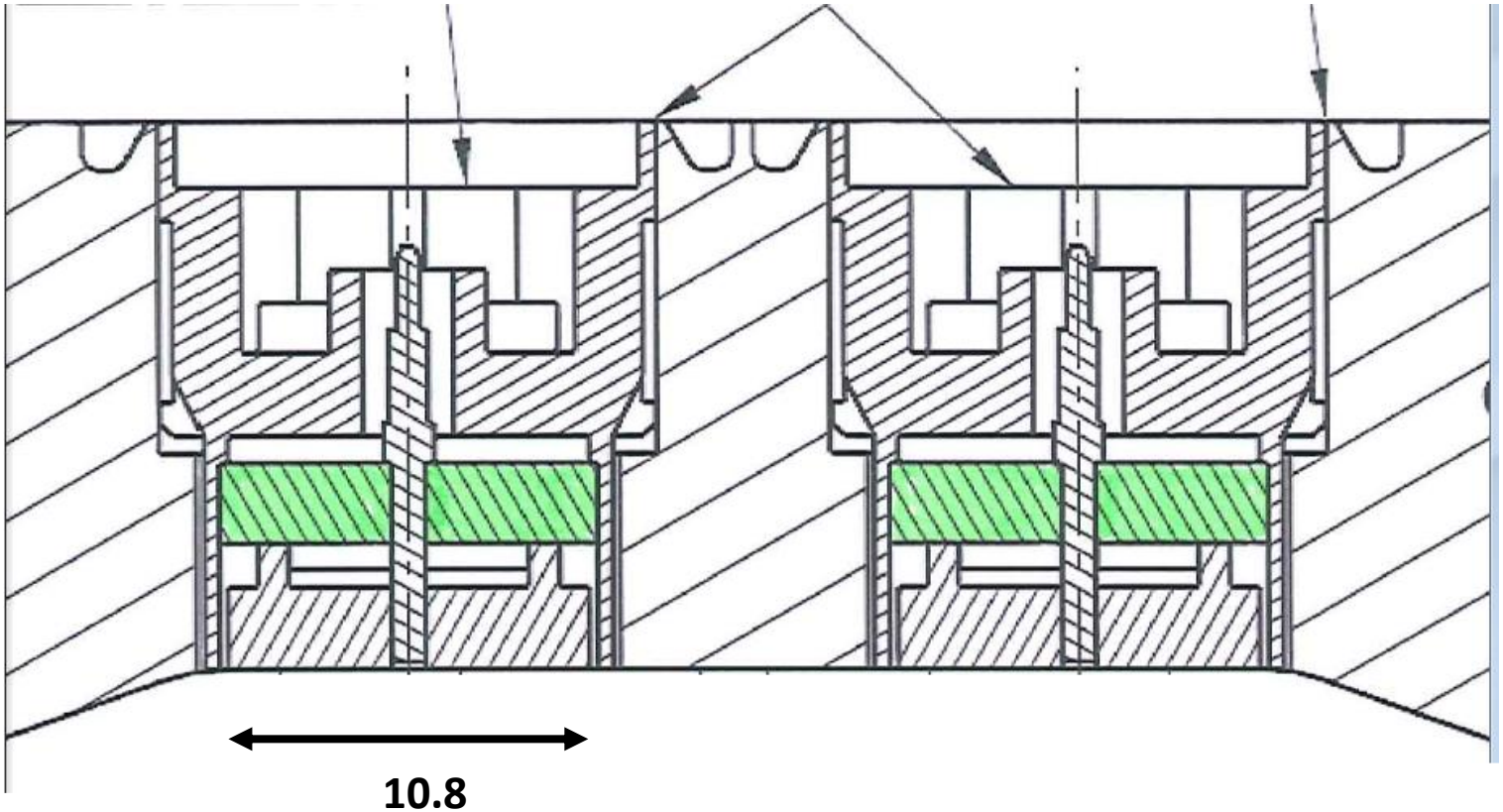




In our present Ring :

Steel	**:**	**BPM-Block**
Steel	**:**	**BPM- Feedthrough**
Ceramic (Al_2O_3)	**:**	**Isolator inside**



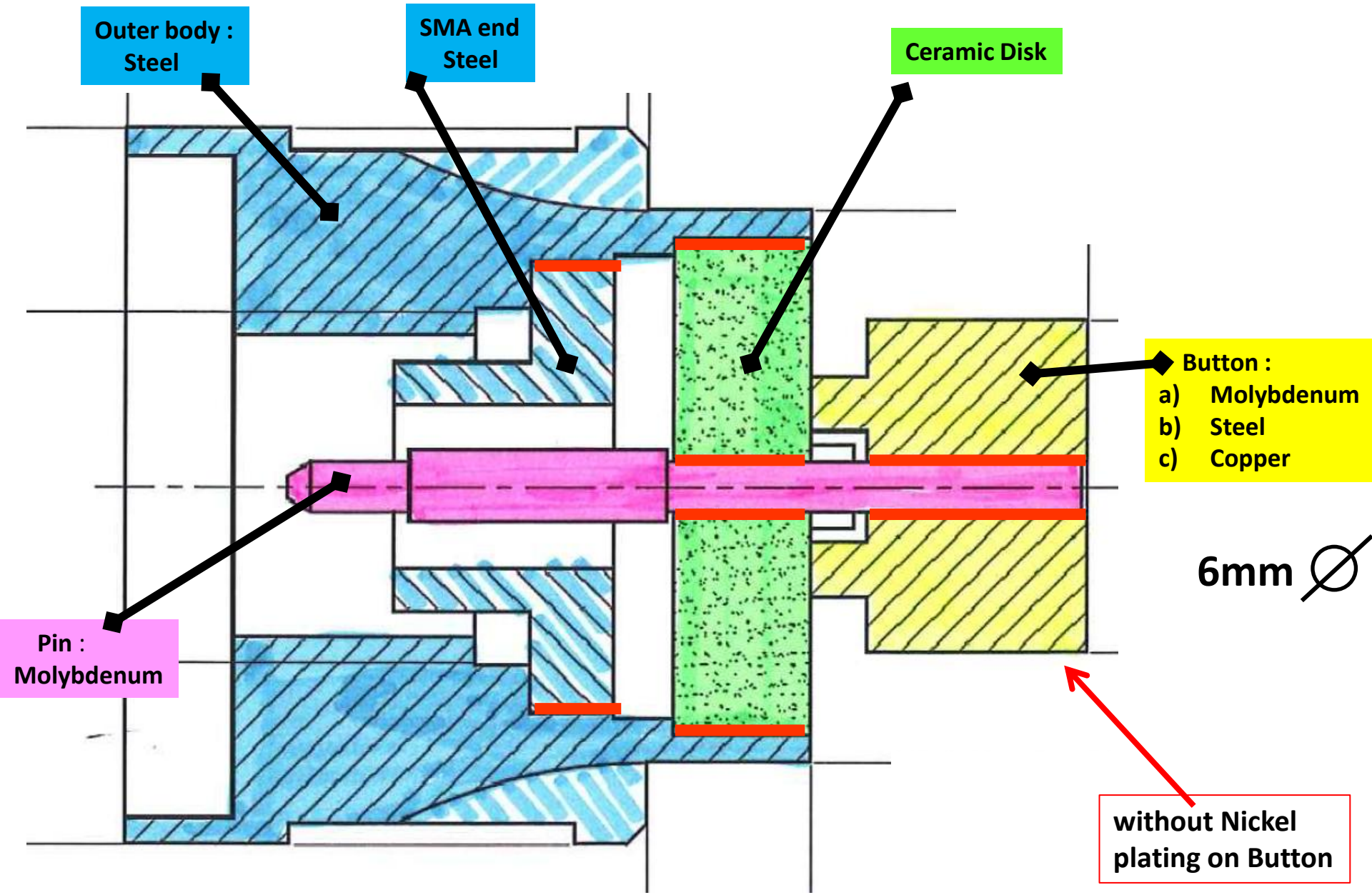


BPM Button feedthrough made by Meta-Ceram (now PMB-ALCEN) in 1990

Characteristics : button diameter= 10.8 mm
with skirt (and a gap of 250 um)
center-pin is Molybdenum
male-SMA connector

also made buttons for :
SLS , DLS , . . .
Elettra (?) , Delta (?)

but not for :
Soleil , Alba , Max4 , . . .



PMB version

= brazing points

PMB version

Price : 10 235 Euros for 15 units
682 Euros/unit

Expected unit price for >1000 units
229 Euros

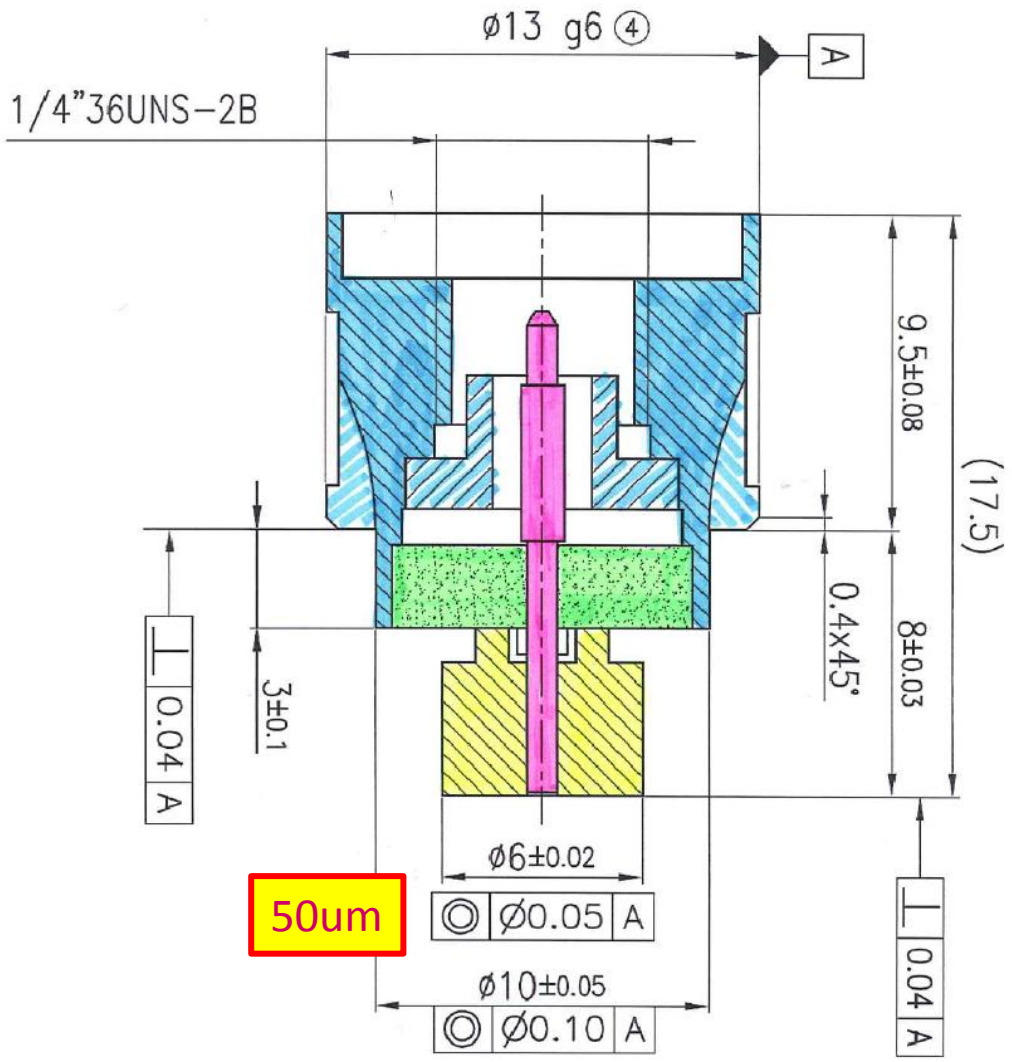
all tolerances accepted ,

ordered (4/12/2013) ,

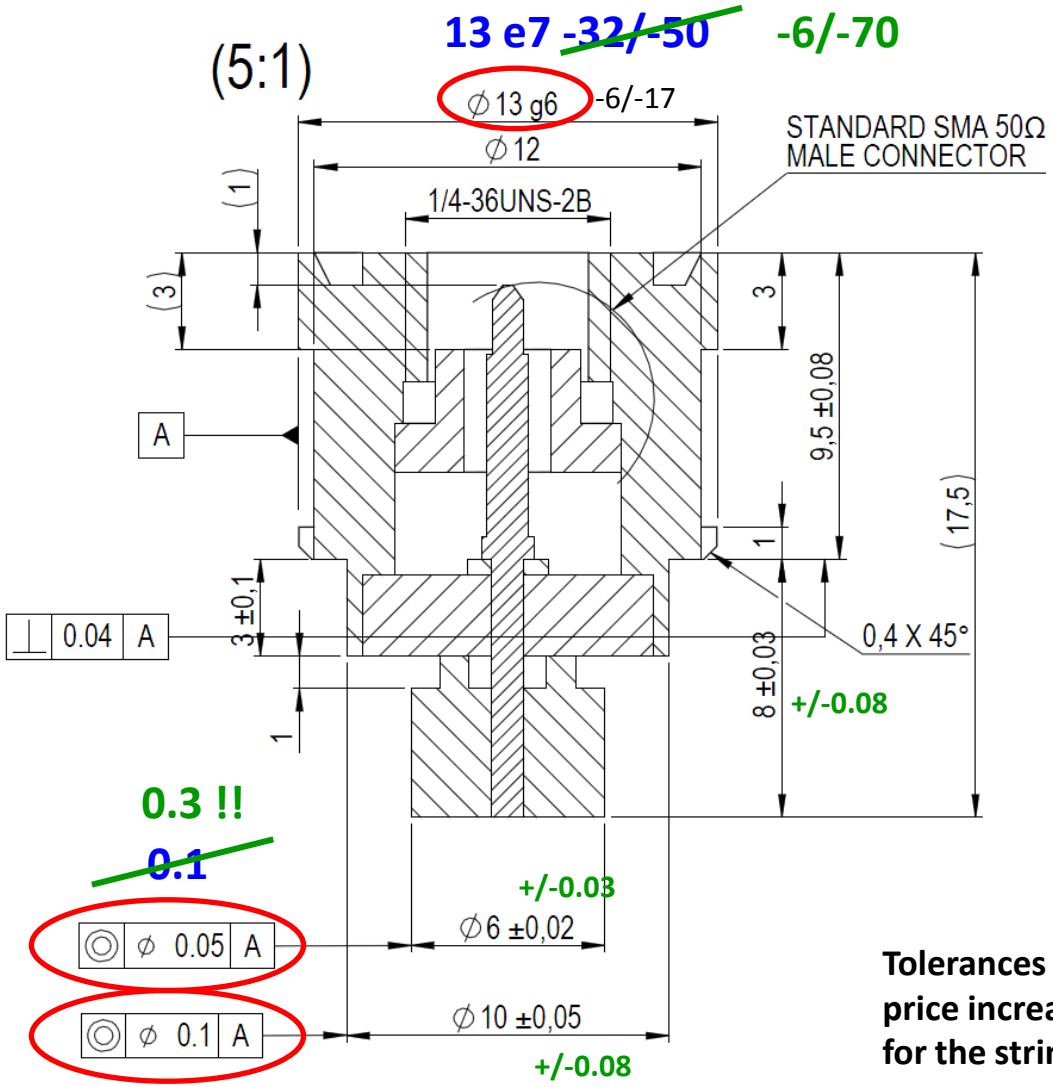
delivery next week,

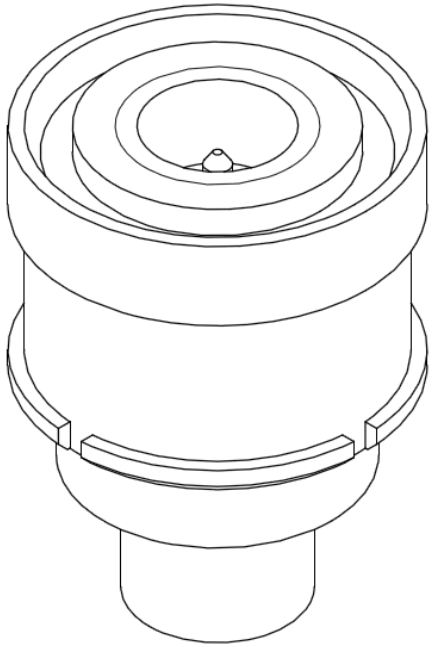
installation in May shut-down

g6 = -6/-17um



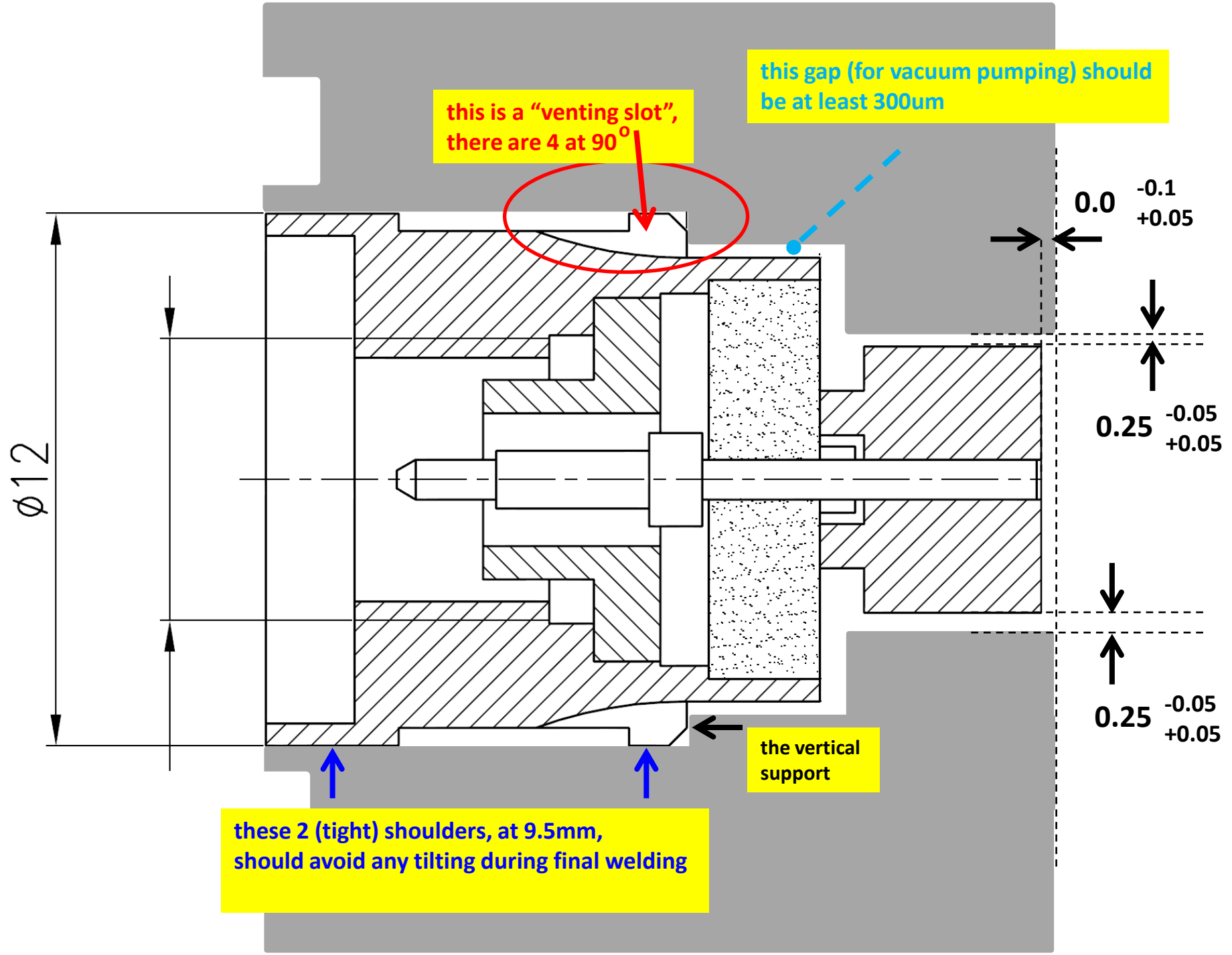
Kyocera version





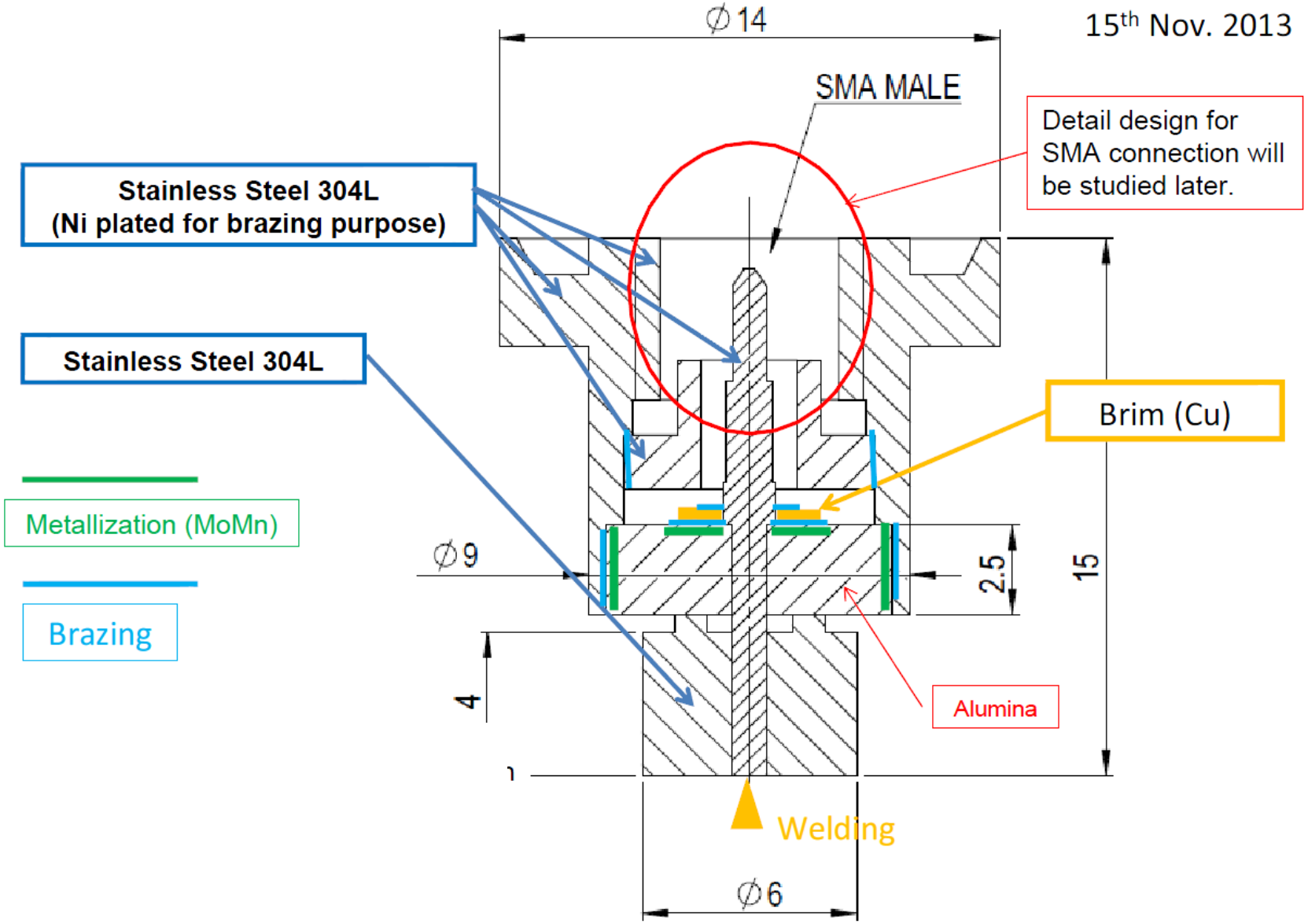
Tolerances are problematic :
price increase from 830 to 1900 Euros
for the stringent ESRF tolerances,

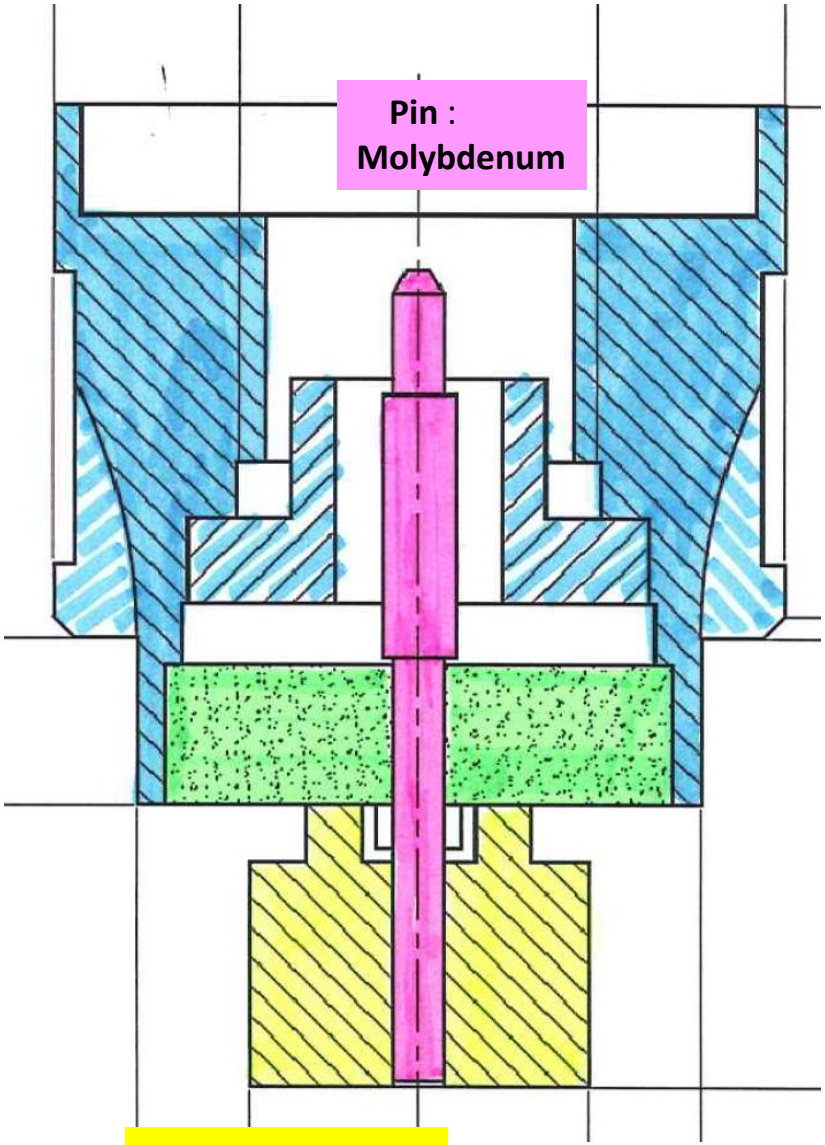
Finally agreement on button tolerance of 100um ...
(and price is back to 830 Euros)


this is a “venting slot”, there are 4 at 90°
this gap (for vacuum pumping) should be at least 300um
0.0 -0.1 +0.05
0.25 -0.05 +0.05
0.25 -0.05 +0.05
ϕ12
the vertical support
these 2 (tight) shoulders, at 9.5mm, should avoid any tilting during final welding

Brazing technology not the same with Kyocera :

15th Nov. 2013





why three different materials for the button ?

Heat issues linked with trapped-modes,
was discussed in internal WP meetings,
was discussed with other colleagues (outside ESRF)

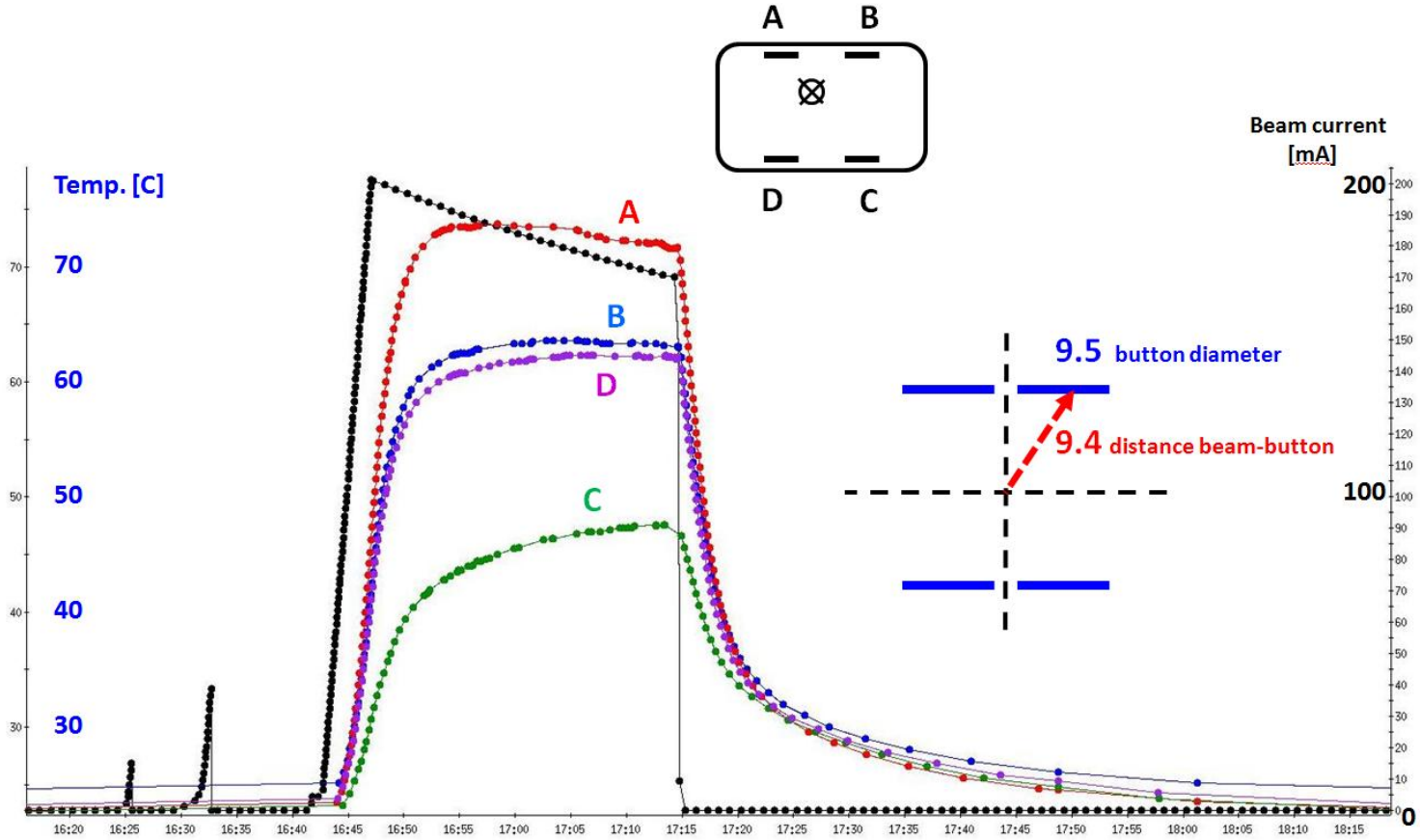
This effect is often calculated (outside ESRF) with different results (critical or non-critical ?)

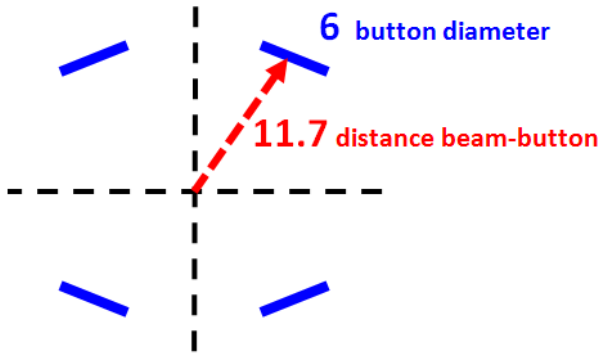
At the ESRF we can measure heat issues at the old-feedback buttons, Eric re-calculated the effect expected on the new (6mm) buttons :

New geometry is favourable so should be less critical,

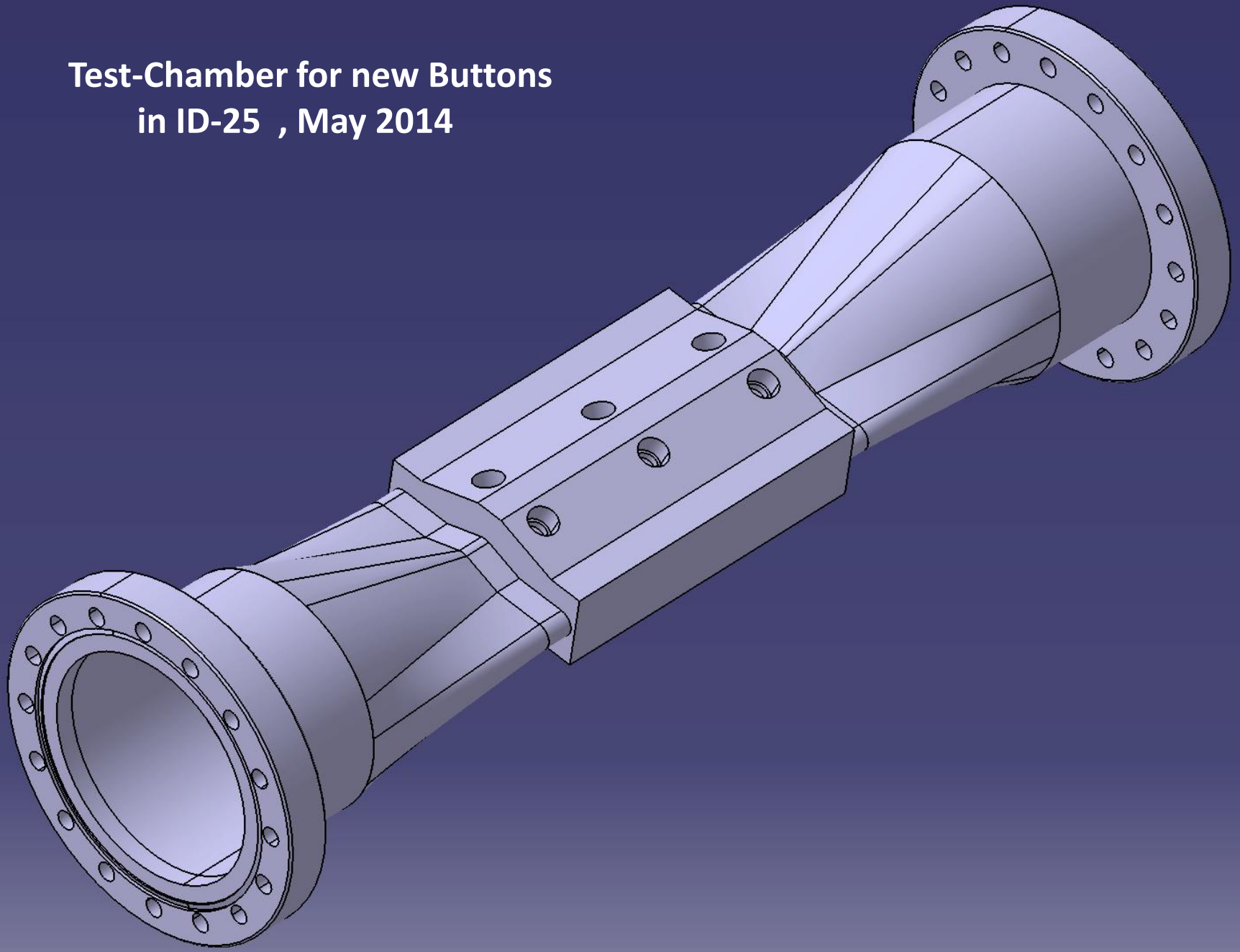
Nevertheless, if any real effect then Mo and Cu should be better then Steel.

Temperature effects can easily be measured if we make 3 BPMs for the ID-25 test BPM chamber (May 2014), each BPM with 4 buttons of : Steel / Cu / Mo


A
B
D
C
Temp. [C]
Beam current [mA]
A
B
D
C
9.5 button diameter
9.4 distance beam-button

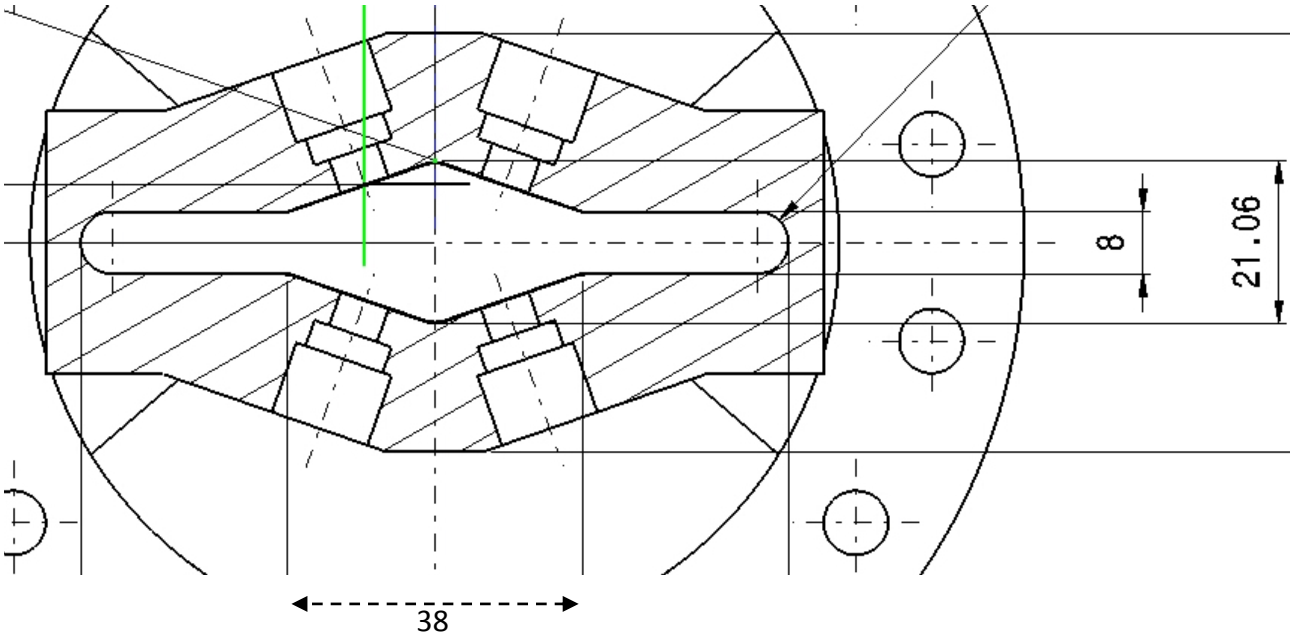

6 button diameter
11.7 distance beam-button

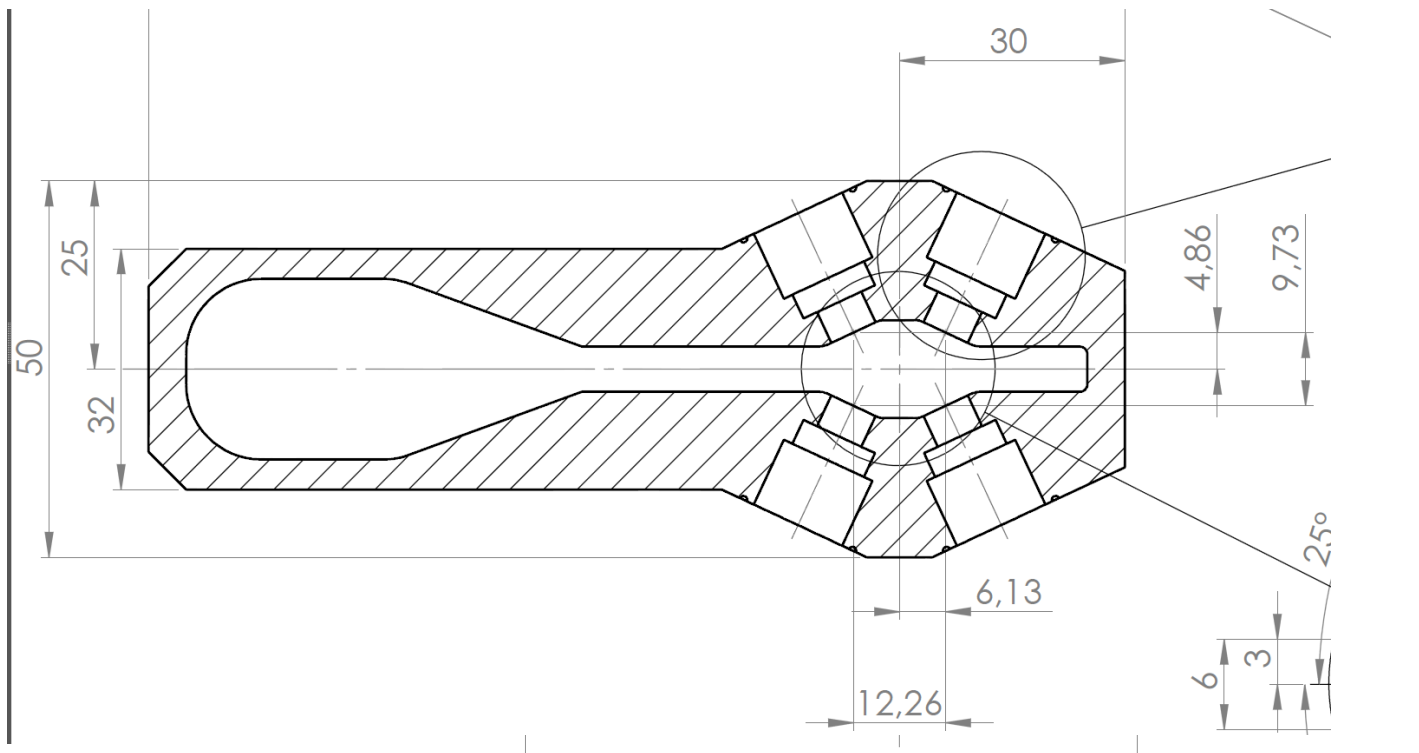
Test-Chamber for new Buttons in ID-25 , May 2014



Test-Chamber for new Buttons (in ID-25 May 2014)

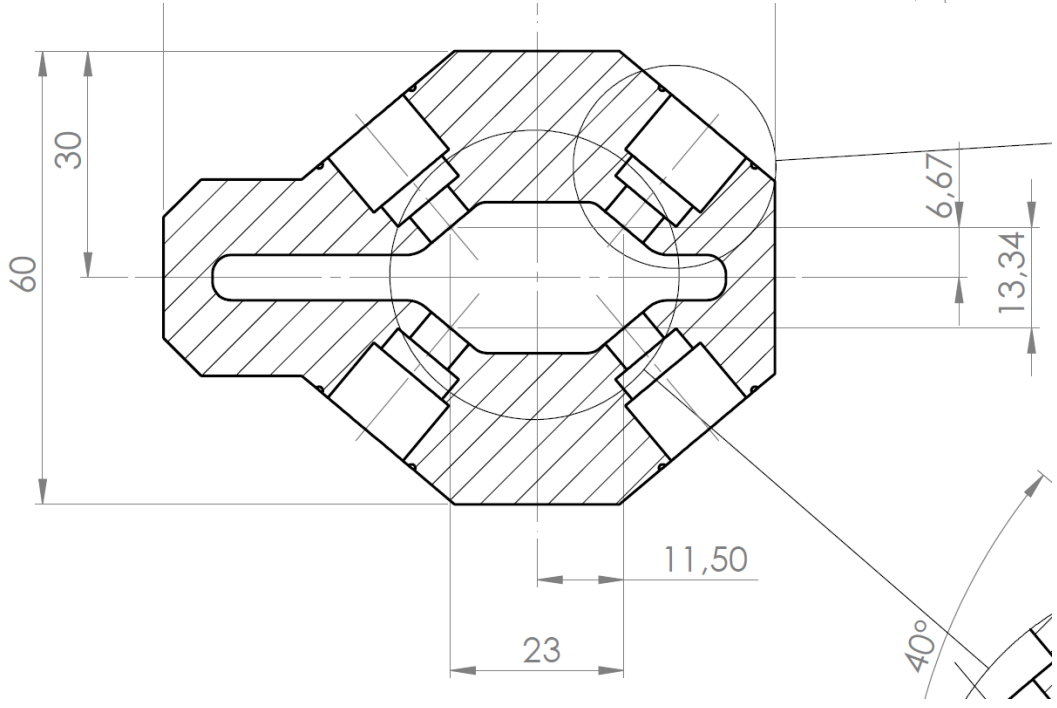
Beam-Button
11.7mm





Beam-Button
7.8mm

6mm Button too big
4 or 5 mm possible

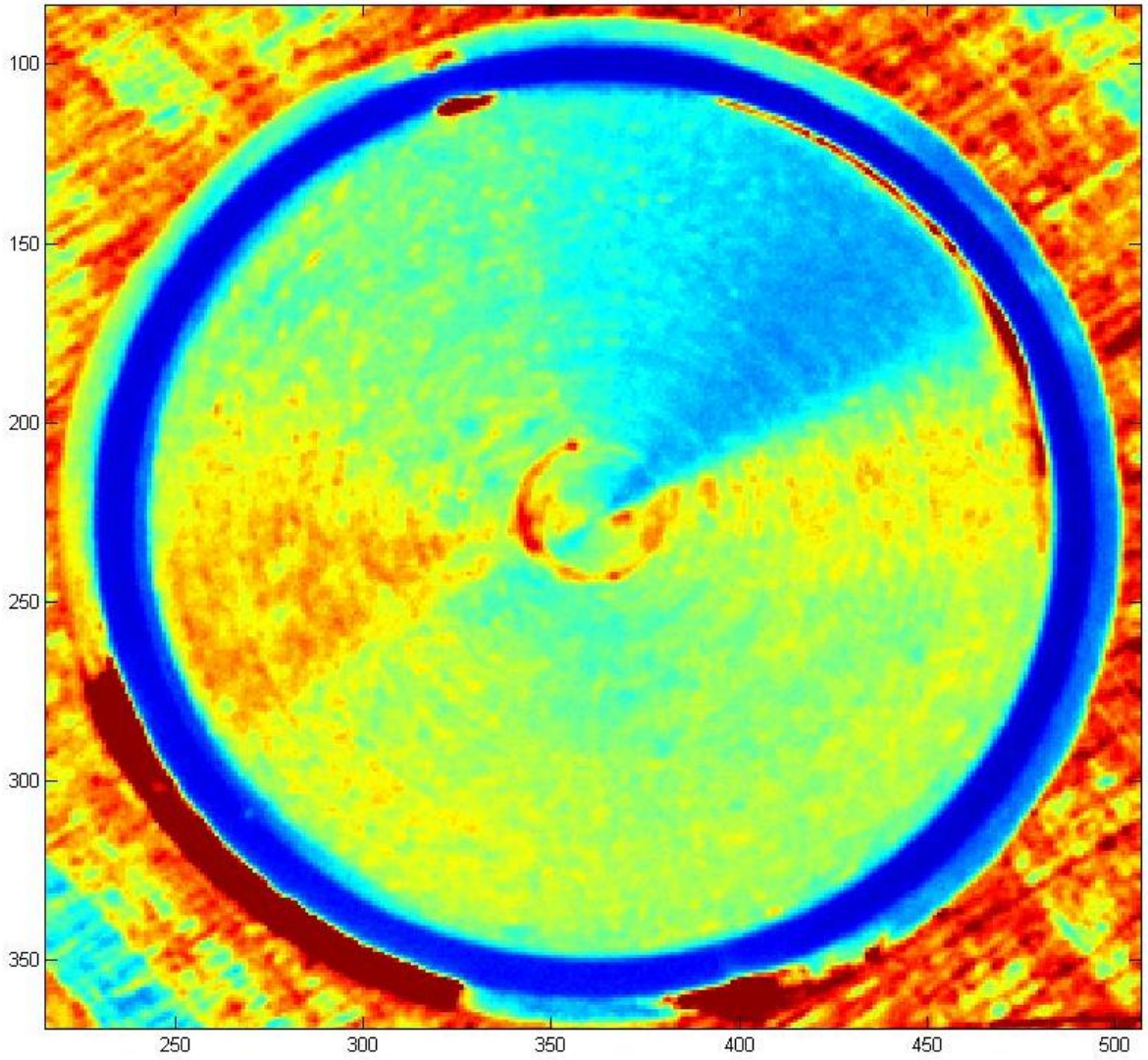


Beam-Button
13.3mm

6mm Button fine

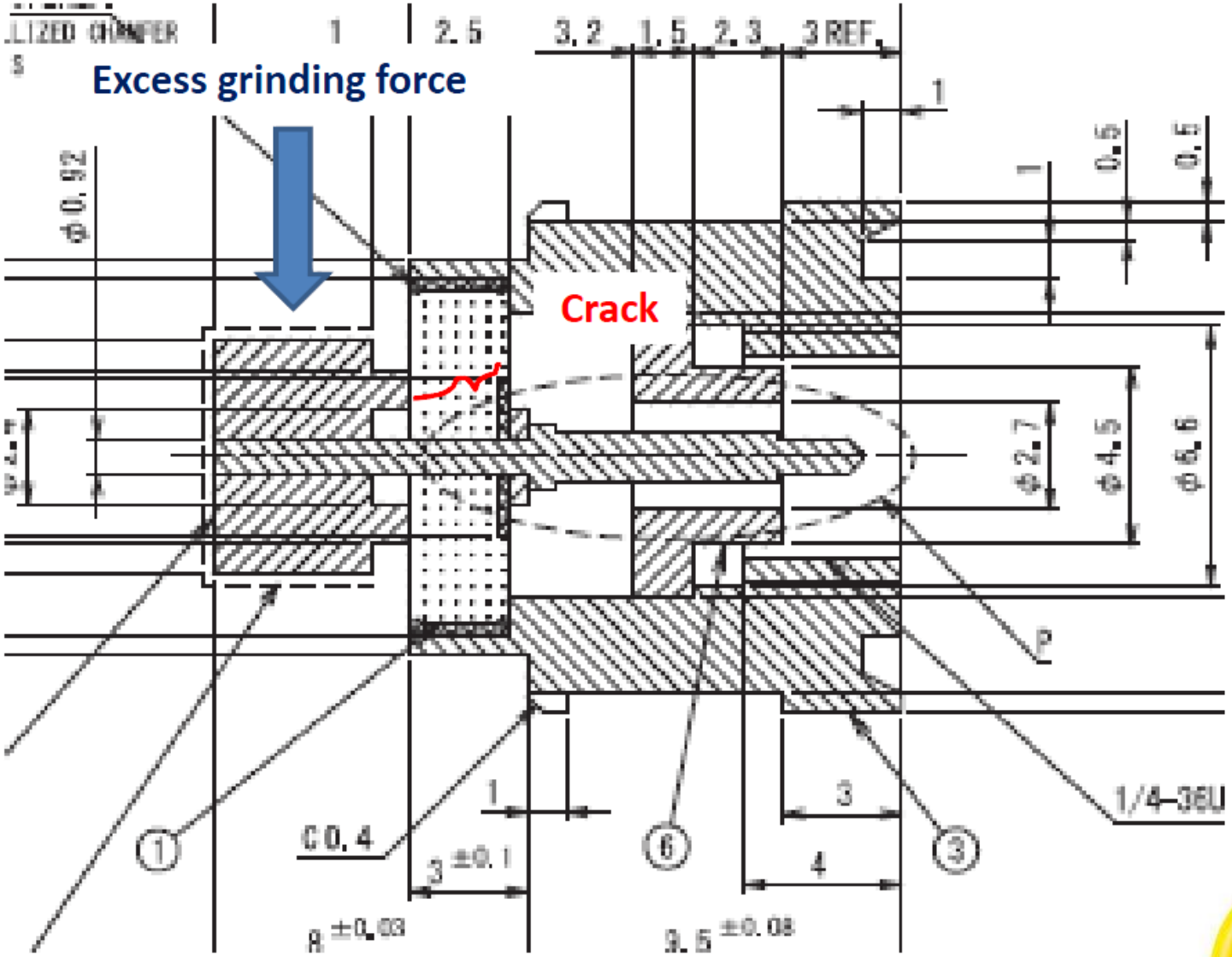
	Button diam. [mm]	Button-Beam [mm]	Ratio	Temp.* [C]
former-F-BPM : Steel	9.5	9.4	1.01	38
ID-25-Test-BPM : 3 materials	6	11.7	0.51	. . . .
real L.E. BPM (large) :	6	13.3	0.45	. . .
real L.E. BPM (small) :	6	7.8	0.77	. . .
real L.E. BPM (small) :	4	7.8	0.51	. . .

Temp.* is : the average of 4 buttons,
under the most extreme filling pattern & current,
and of the difference with respect to 0mA



gap = 250um

the first 6 (Molybdenum) BPM-buttons from Kyocera received 10 days ago,
all looks fine : finishing and the concentricity (<30um) although 100um contractual value . . .

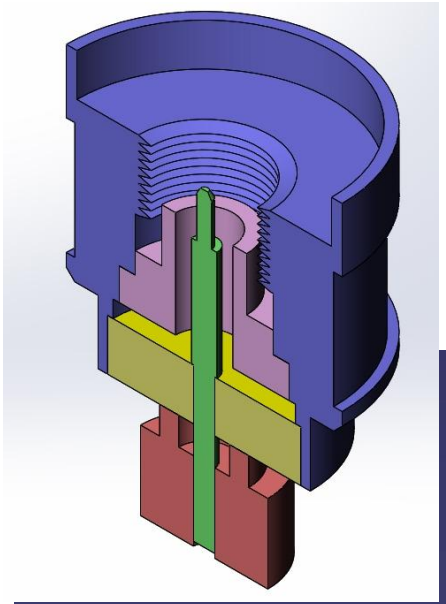


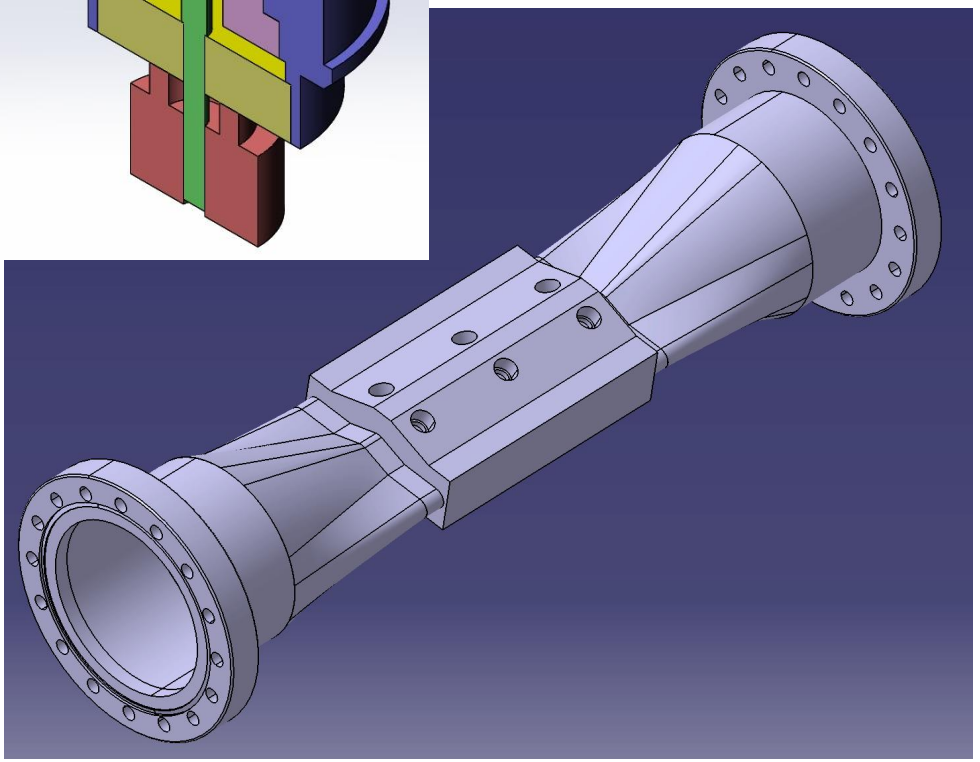
the next 6 (Steel) BPM-buttons from Kyocera have a problem . . .
(info Friday May 9)

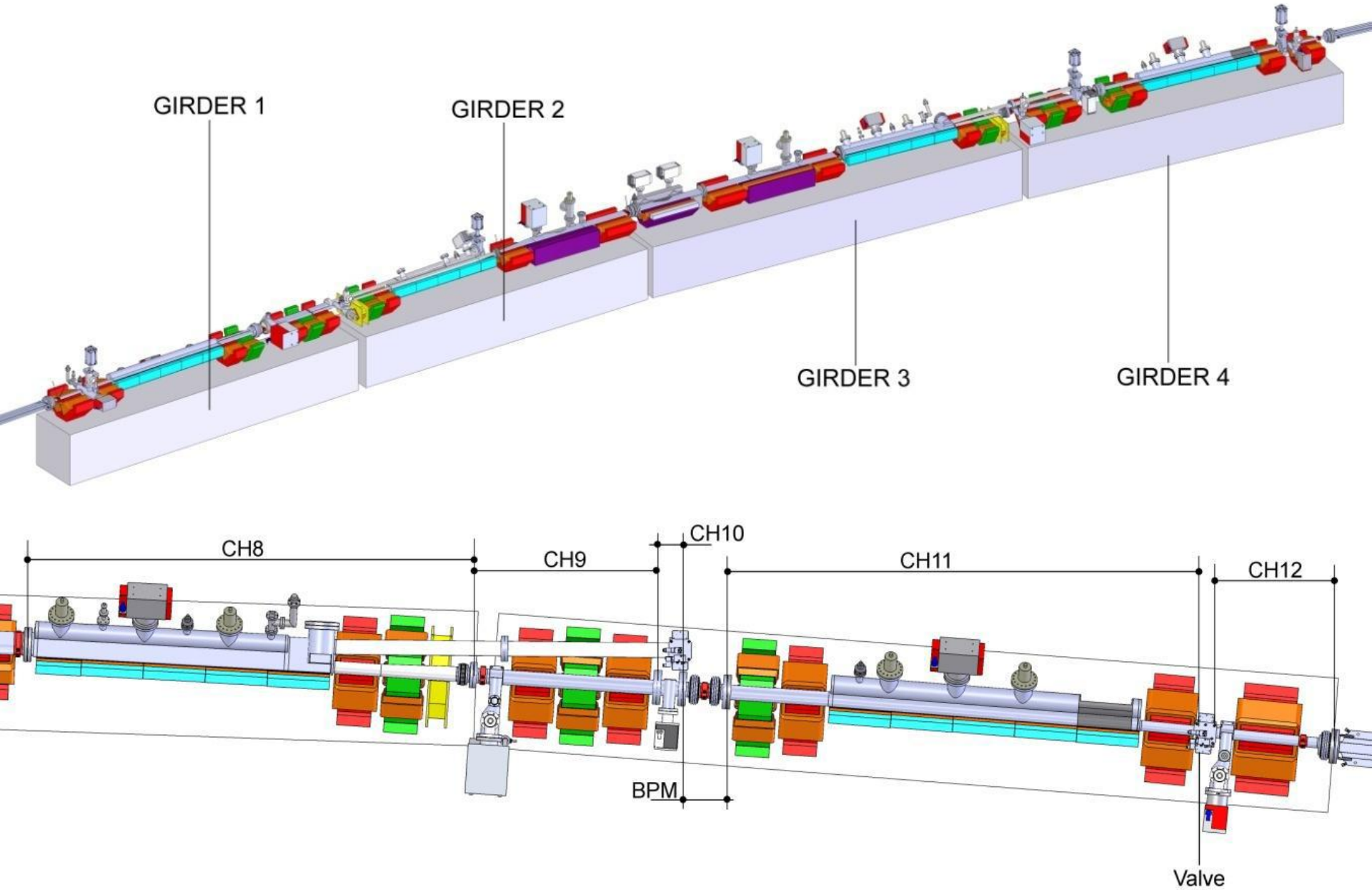
development of a new BPM Button feedthrough for the future LE-Ring

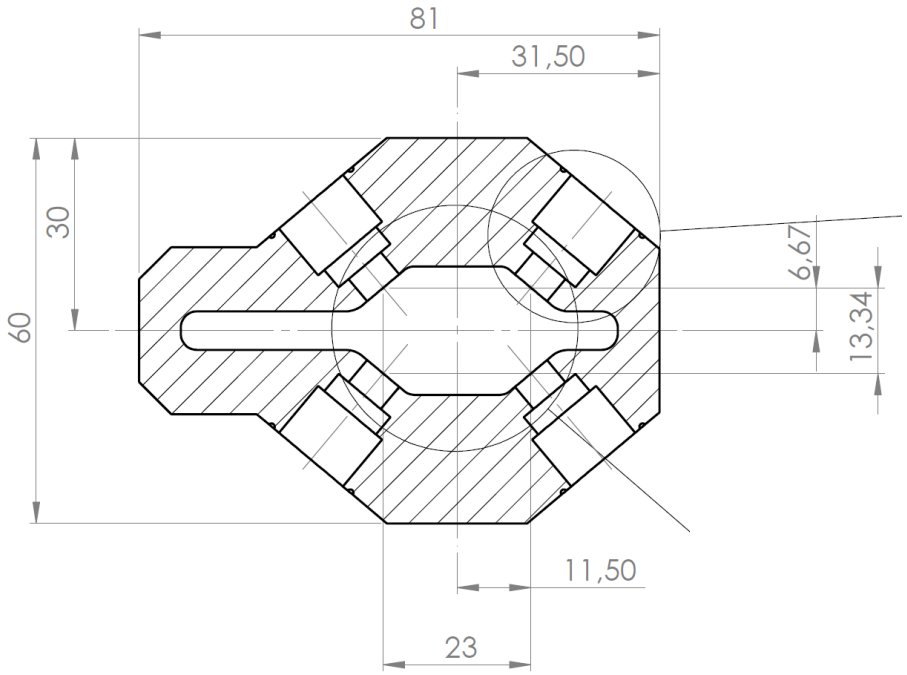
in a few weeks from now we shall gain crucial info on the real suitability of the 6mm button design,

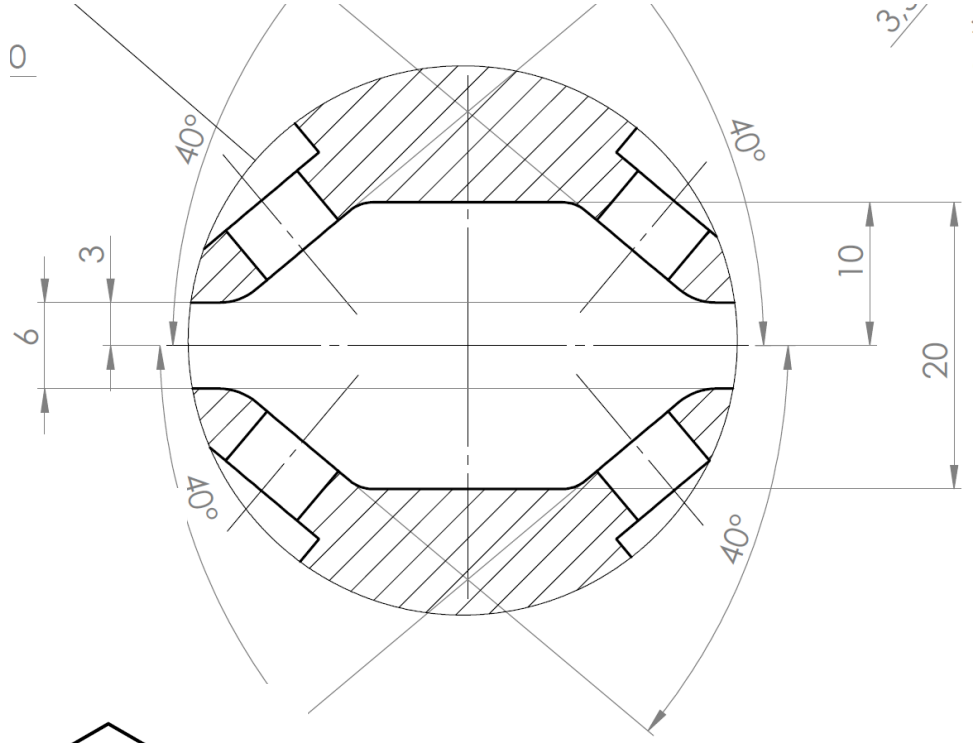
if all OK then we may order a large number in 2015

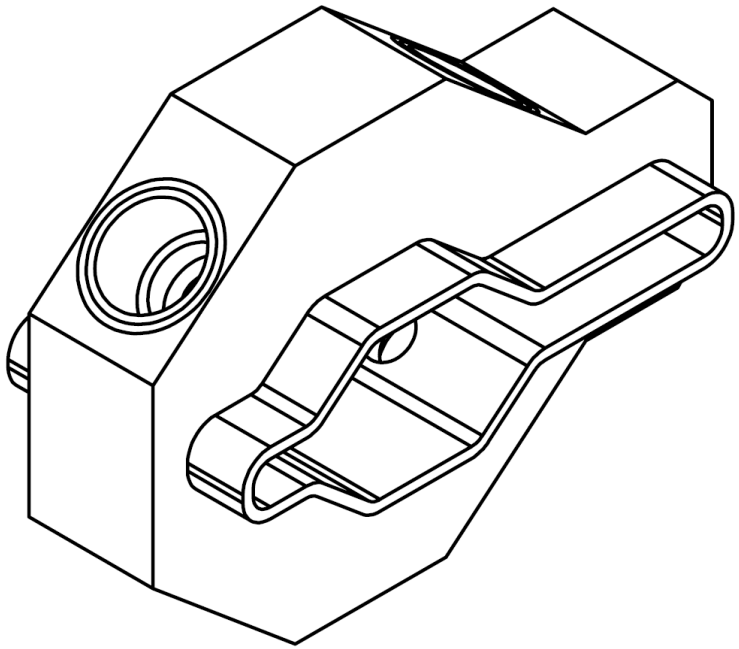


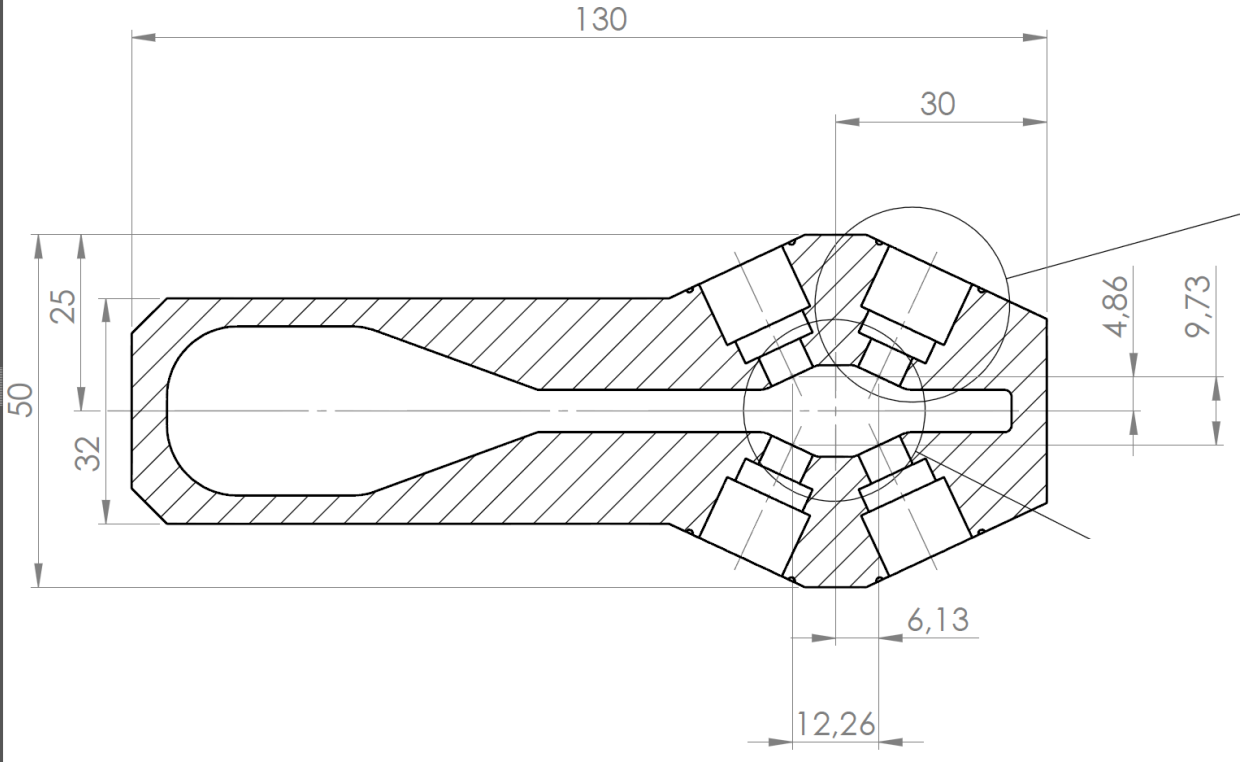


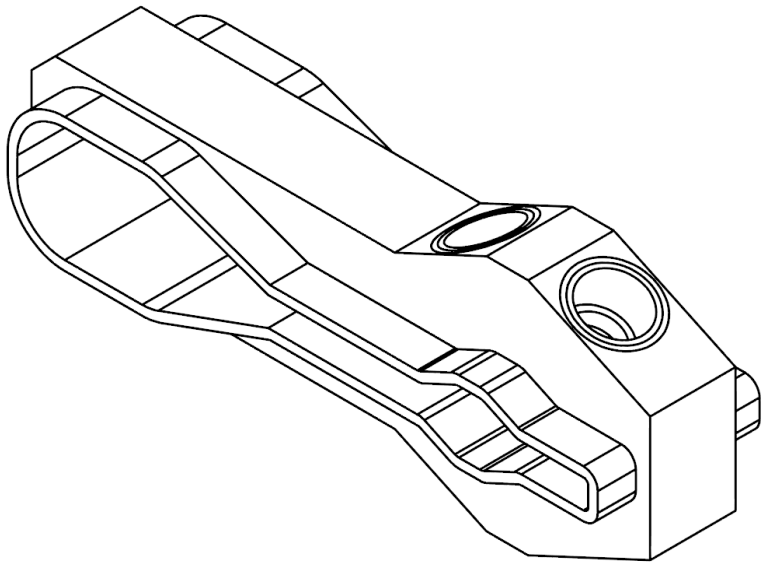

GIRDER 1
GIRDER 2
GIRDER 3
GIRDER 4
CH8
CH9
CH10
CH11
CH12
BPM
Valve

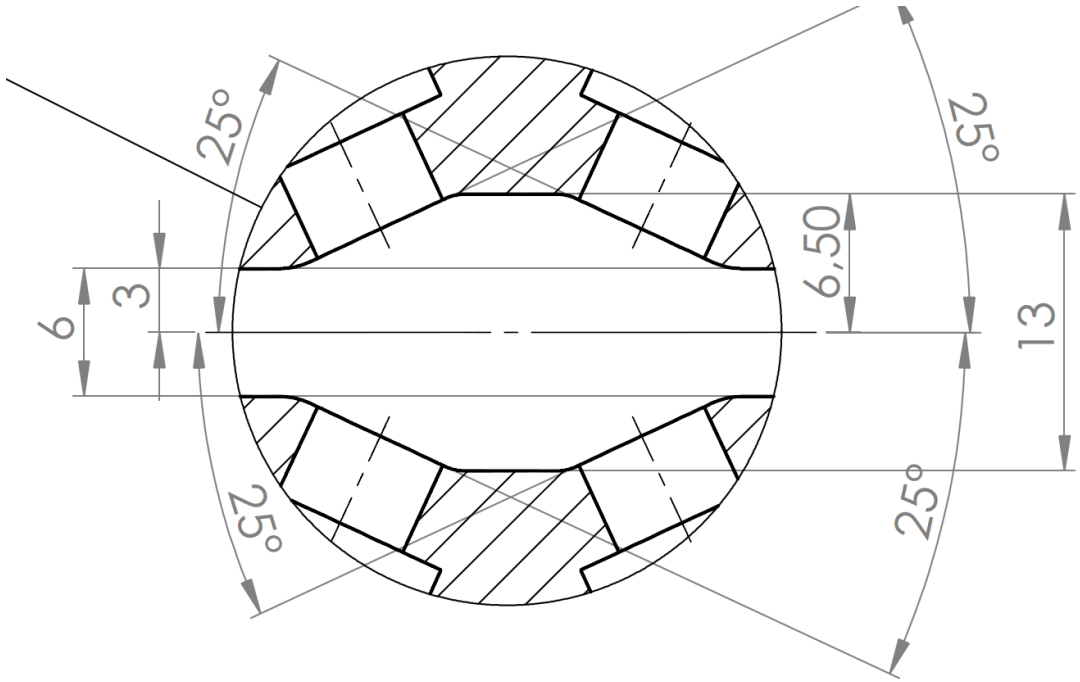

81
31,50
30
60
6,67
13,34
11,50
23


0
40°
40°
3
6
10
20
40°
40°

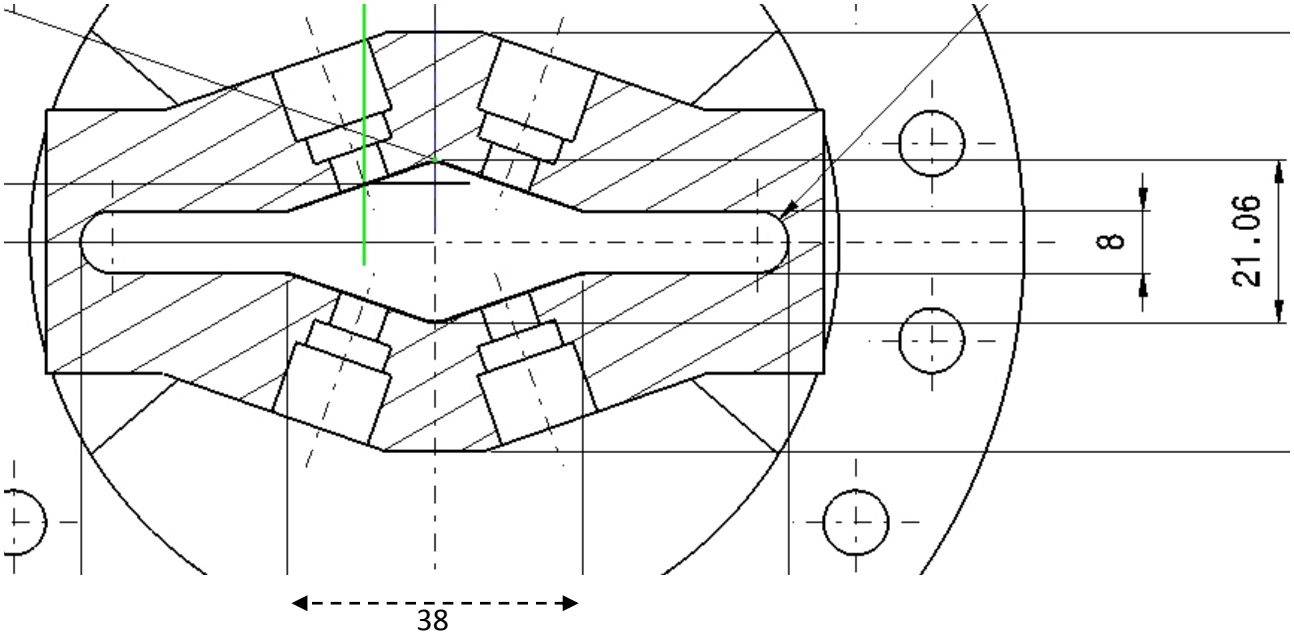



130
30
50
25
32
4,86
9,73
6,13
12,26

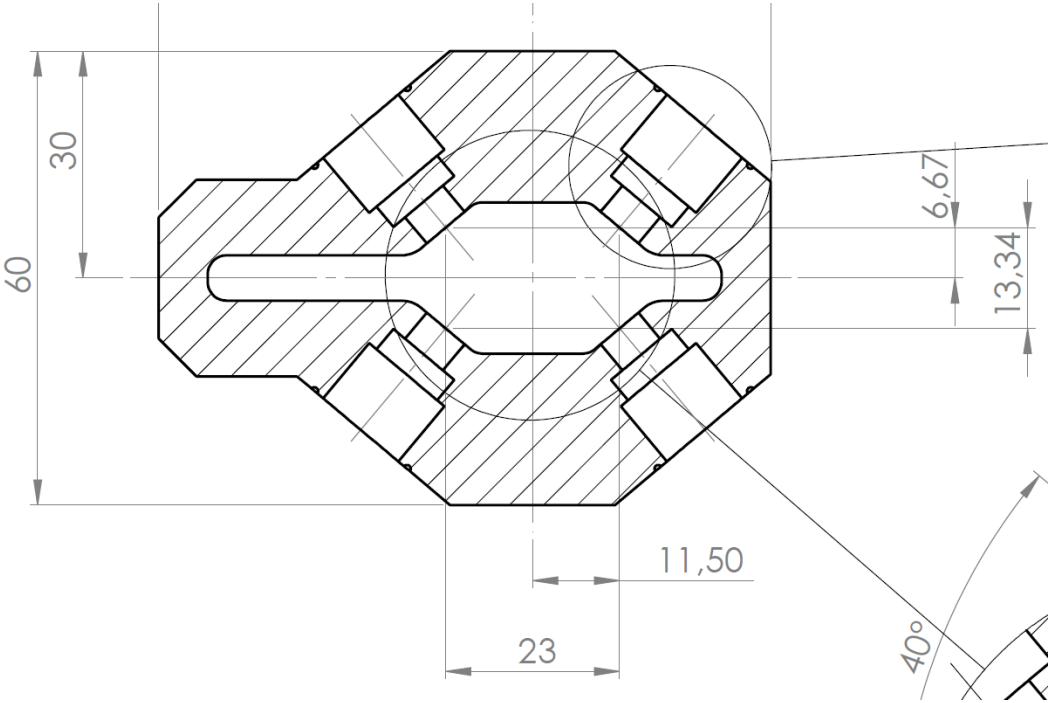


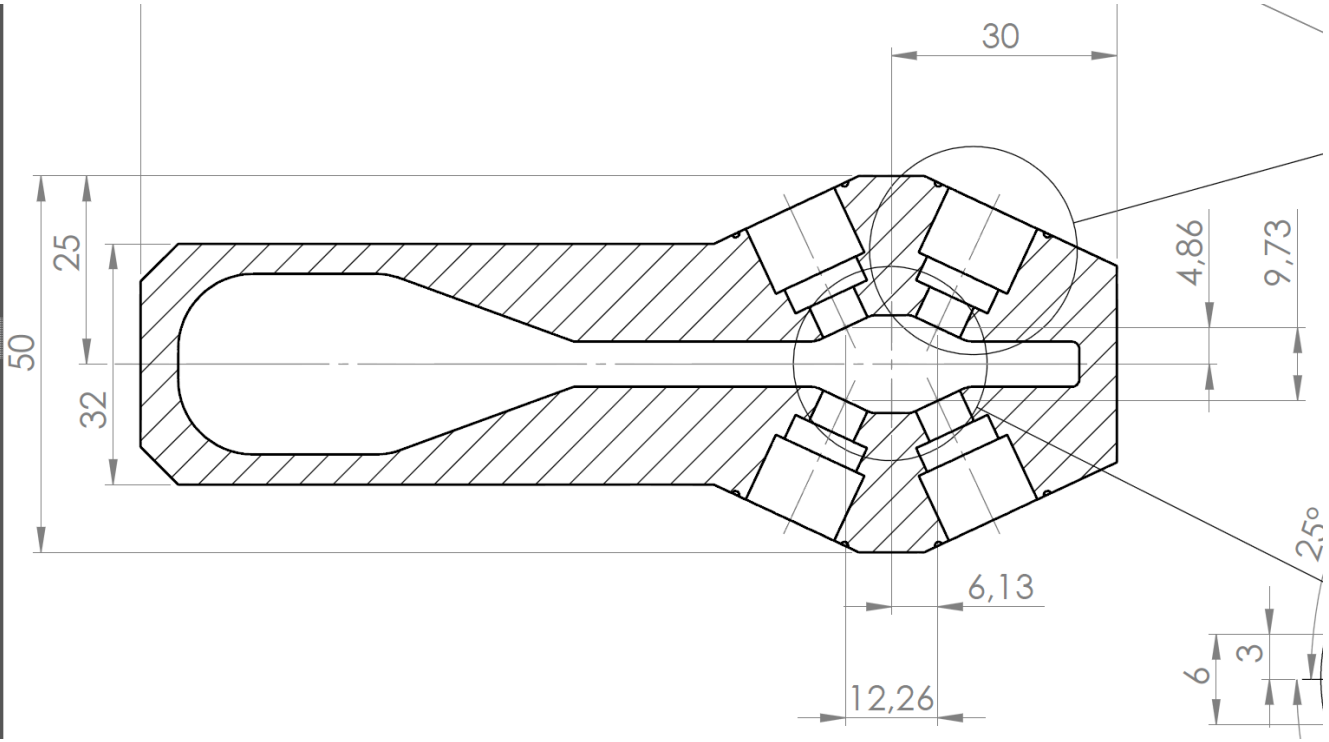

25°
25°
6,50
6
3
13
25°
25°

Beam-Button 11.7mm

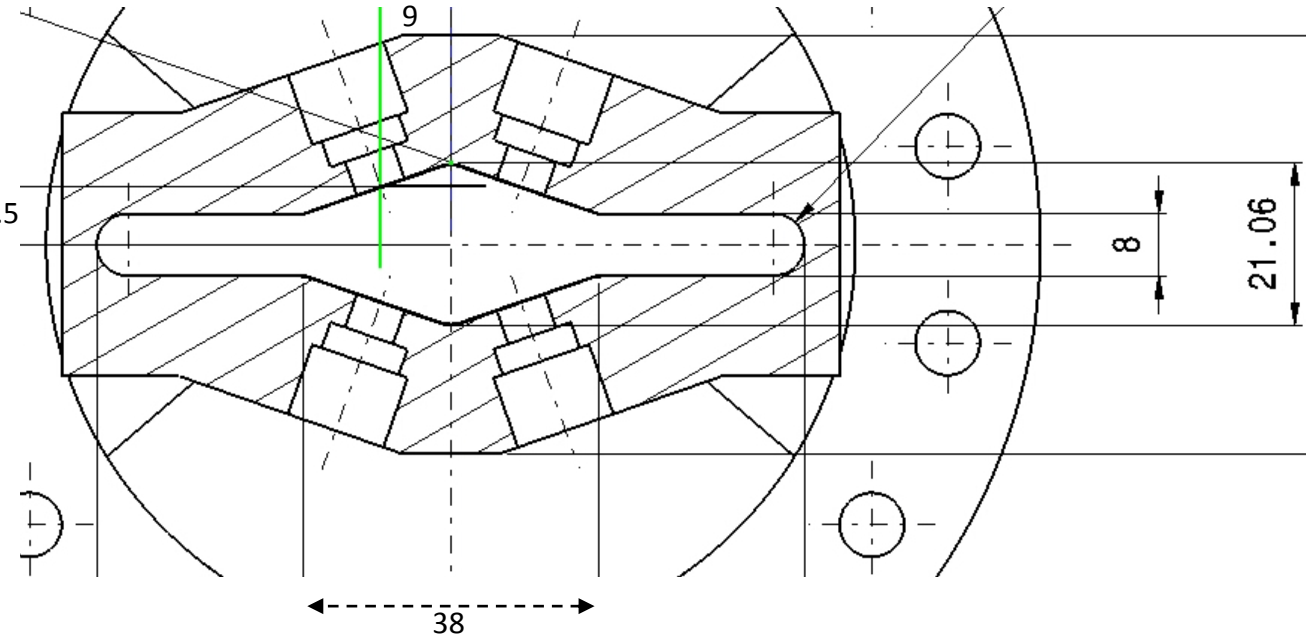


Beam-Button 13.3mm

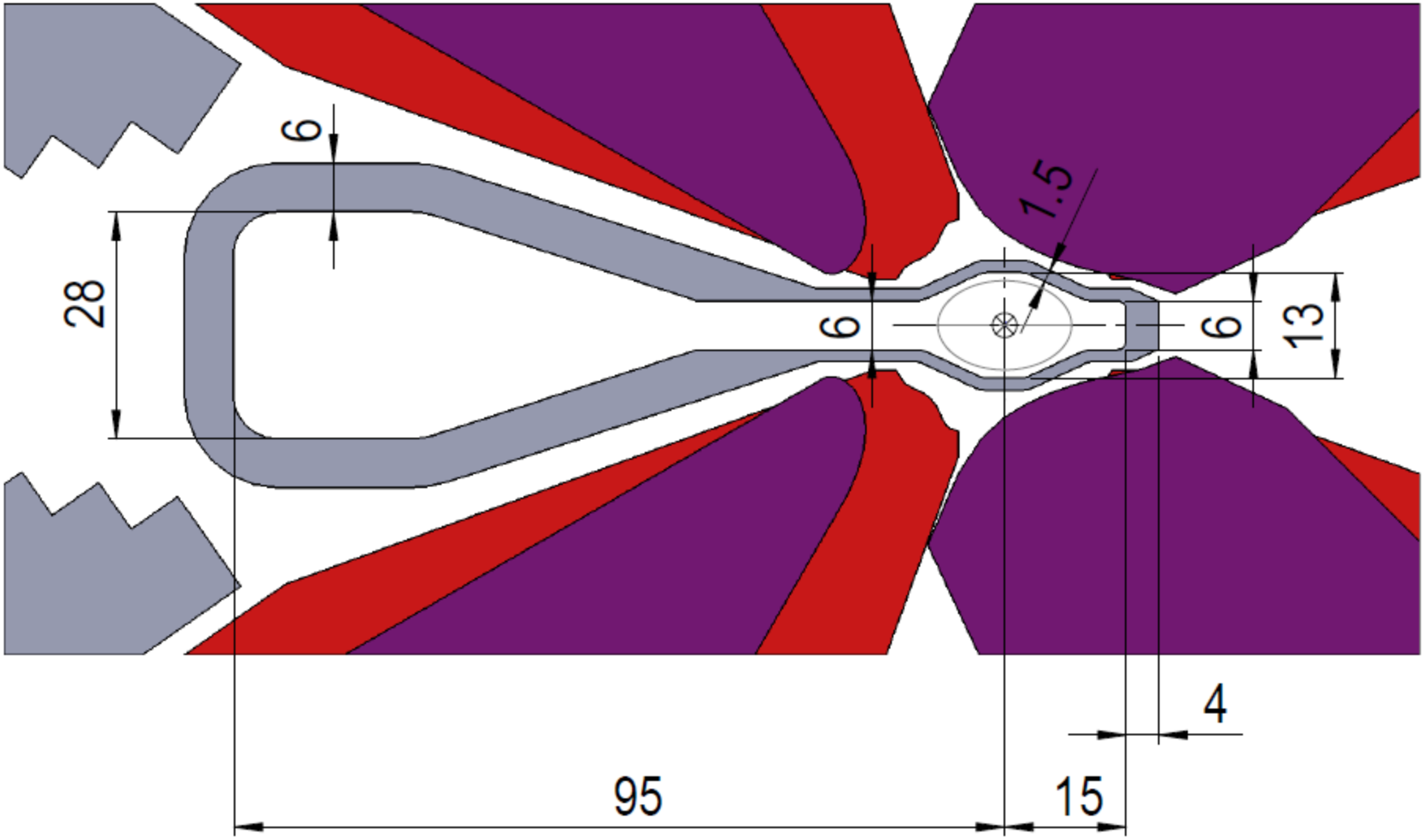


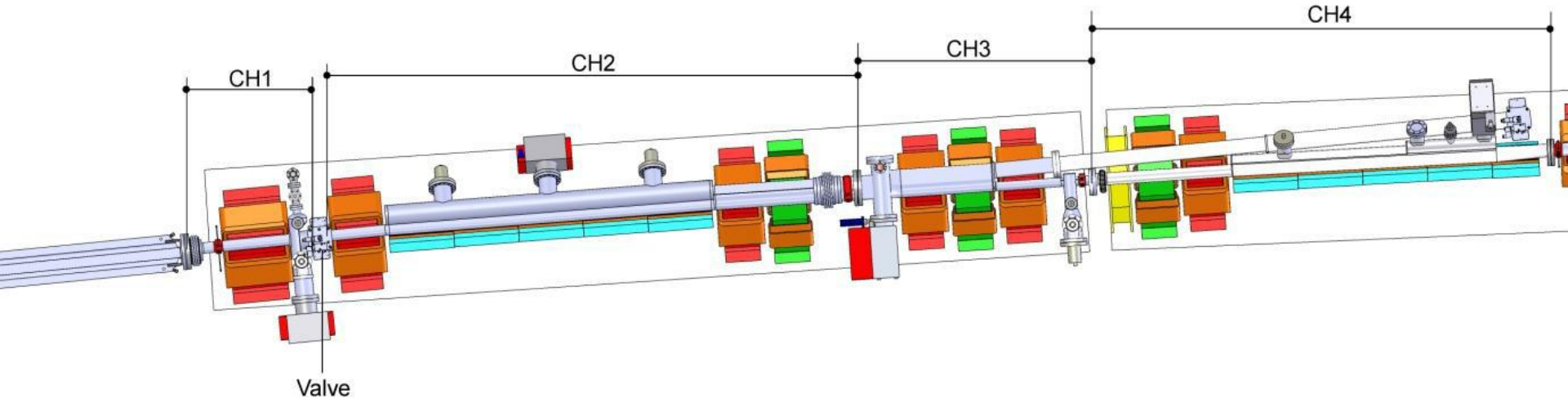


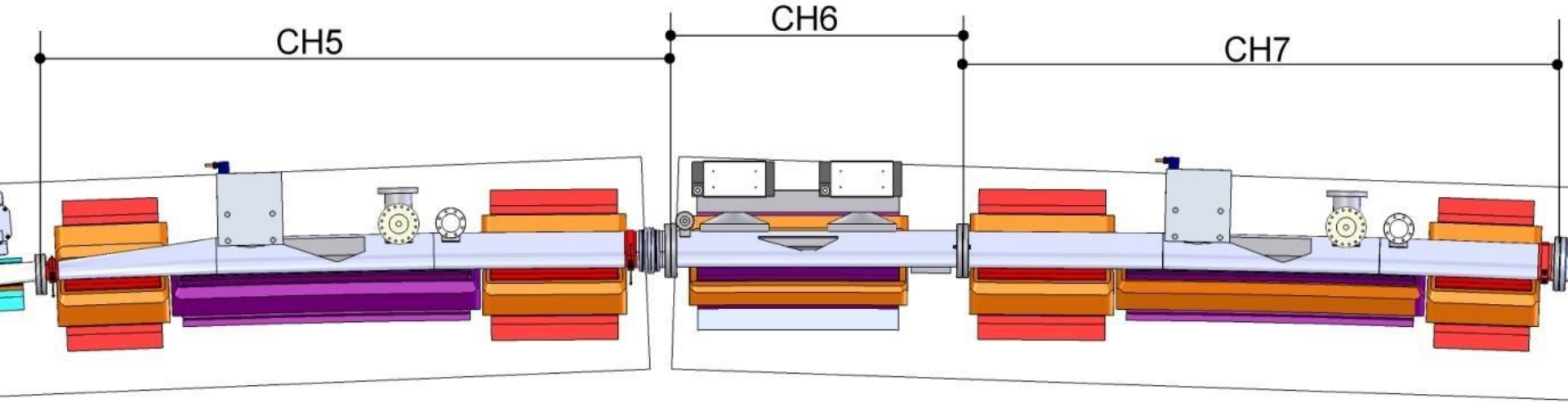
Beam-Button
7.8mm

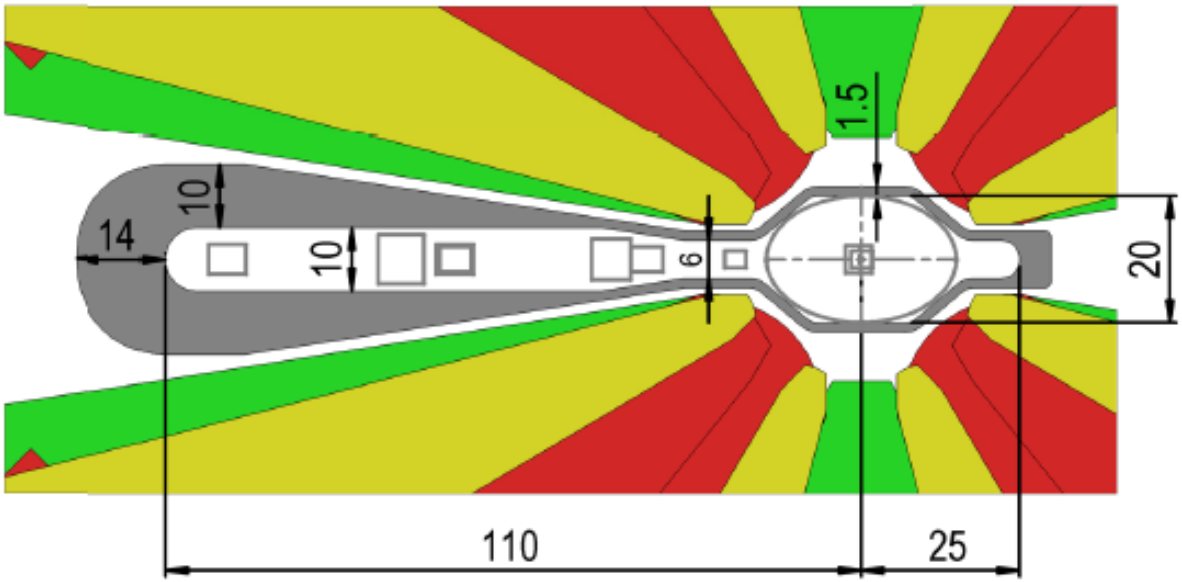


Beam-Button
11.7mm

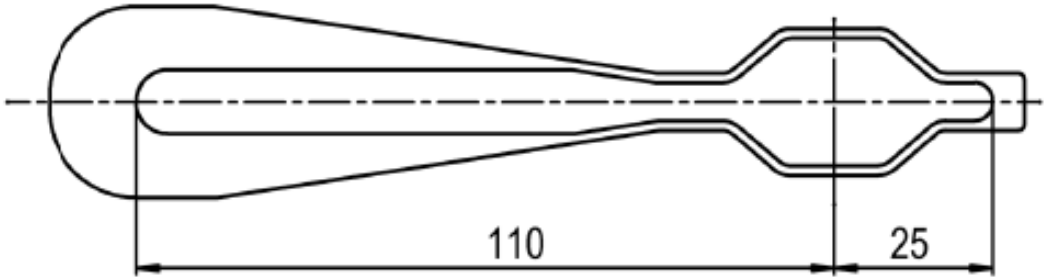

6
28
1.5
6
6
13
4
95
15


CH1
CH2
CH3
CH4
Valve

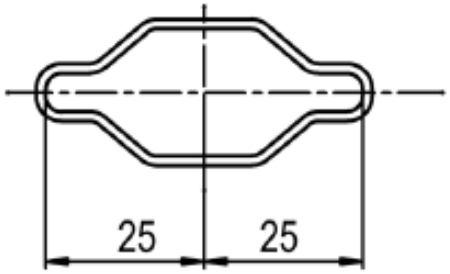

CH5
CH6
CH7

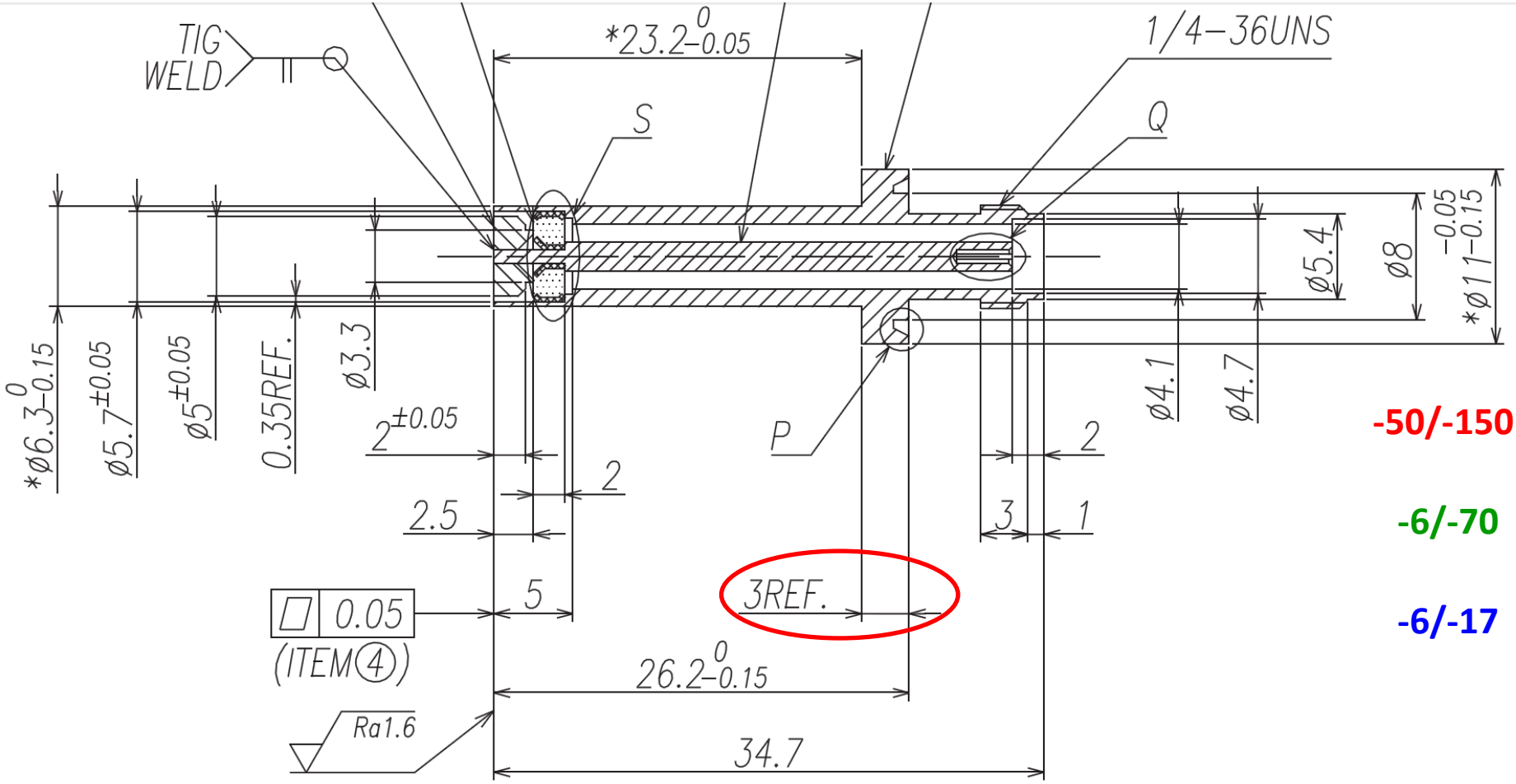


MAXIMUM WIDTH



MINIMUM WIDTH



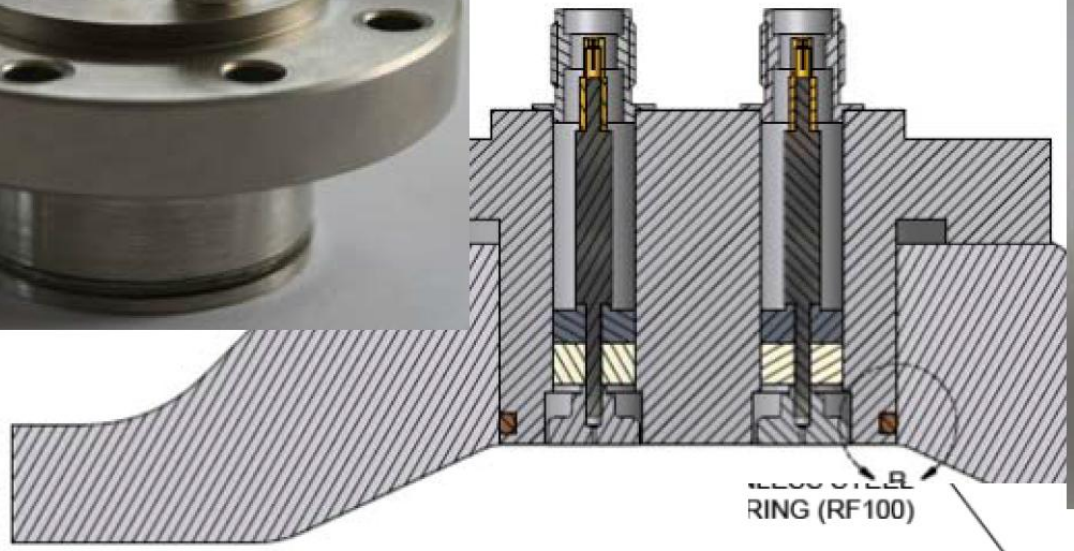


BPM button made for MAX-4 by Kyocera,

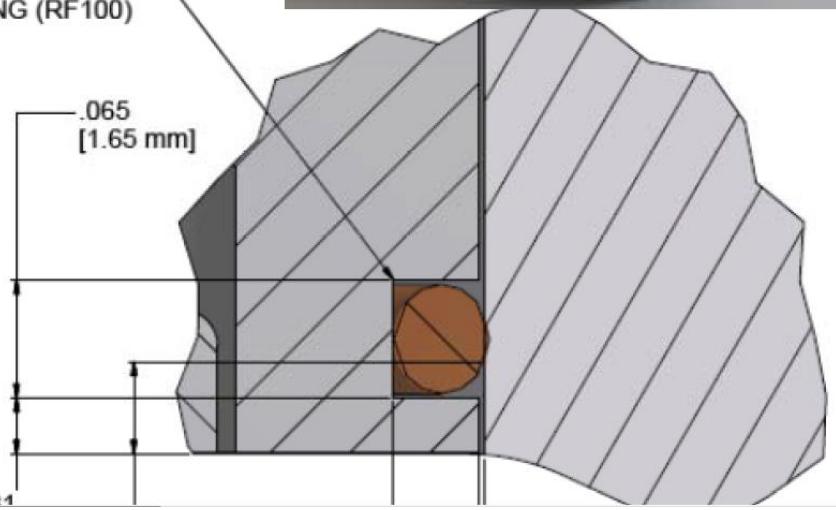
Large dimensional tolerances : e.g. -50/-150um
no tolerances of concentricity (less important with encapsulated button)

NSLS-2 Buttons : in Flange versions : (USA) manufacturors : Times Microwave and MPF

suppressing short & long range w



RING (RF100)

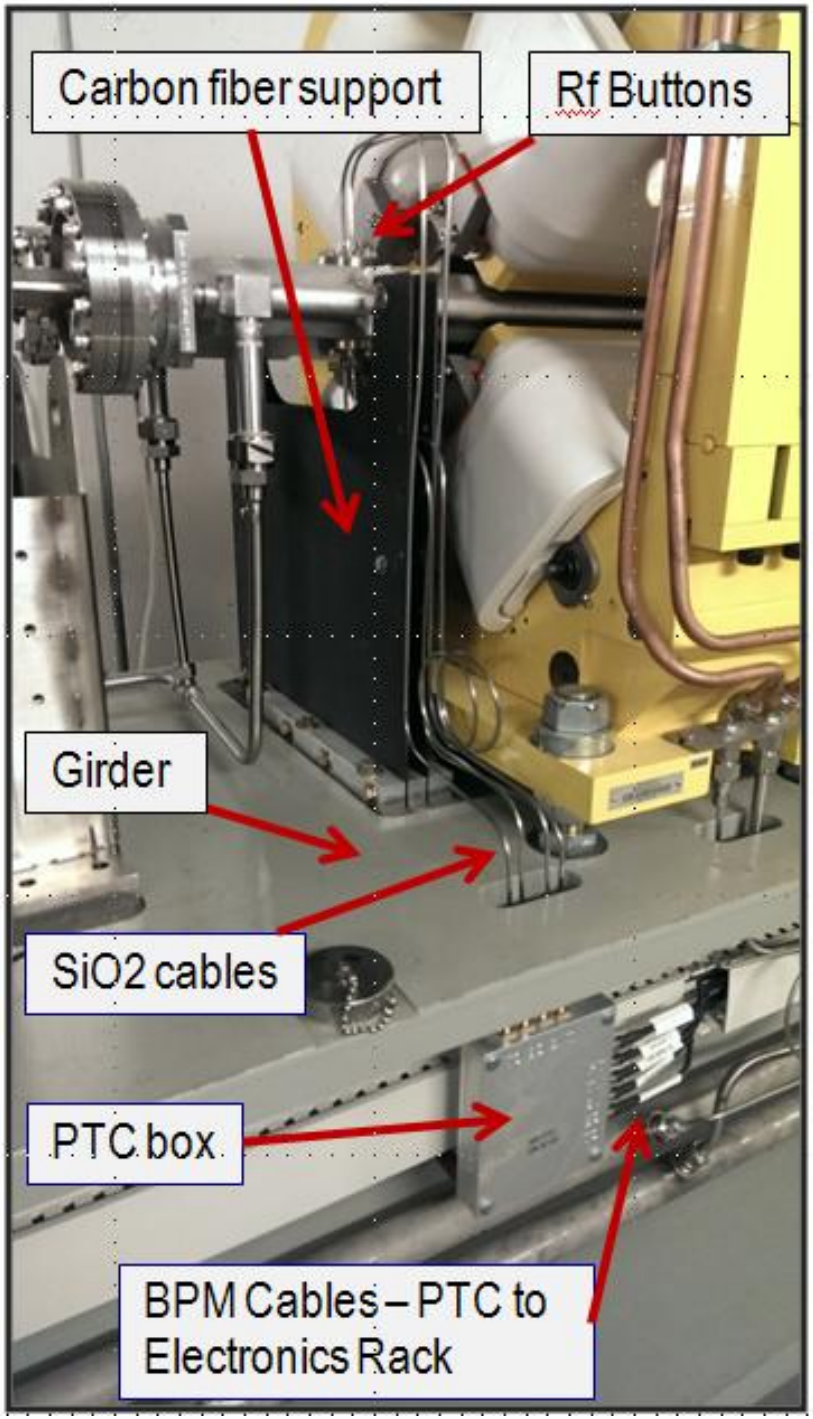


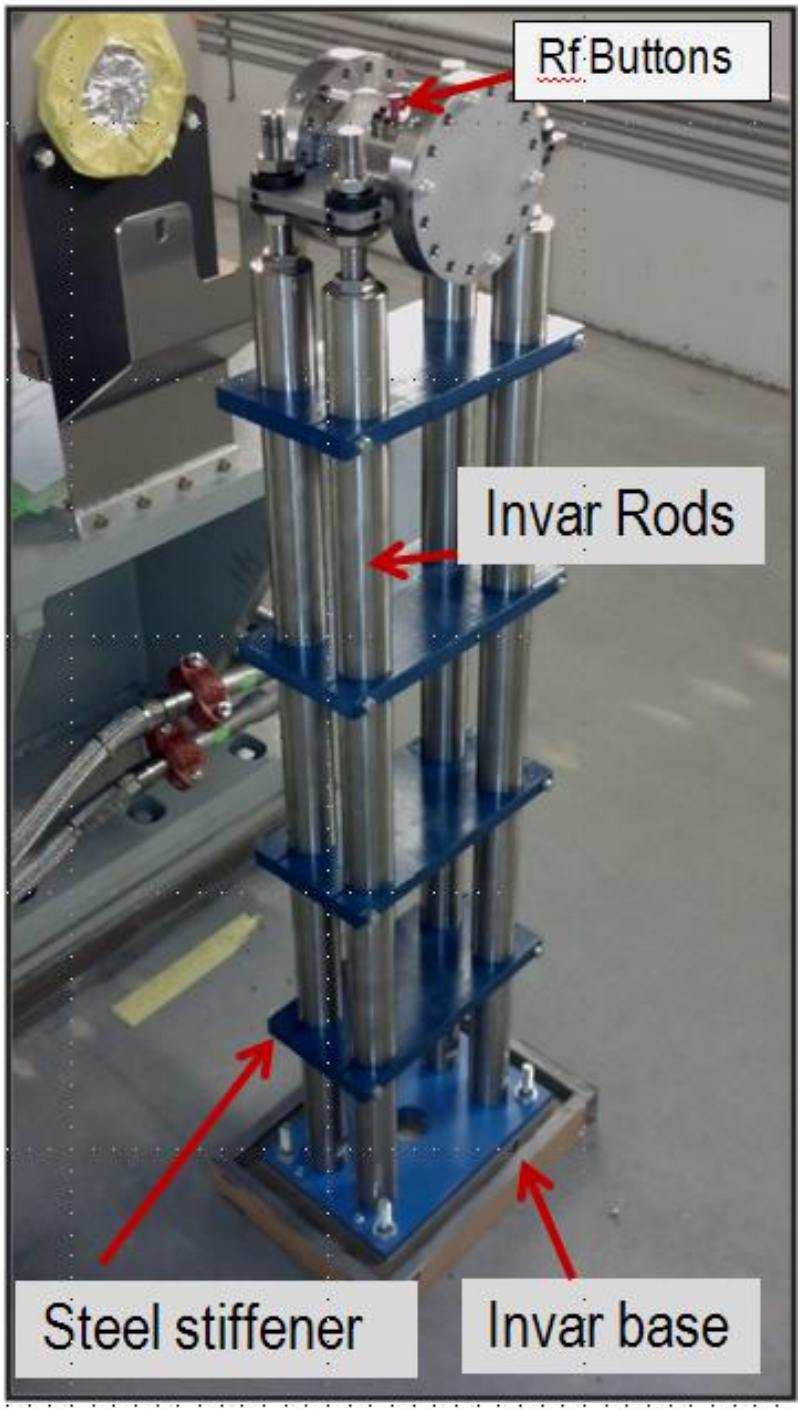
Geometric parameters:

g=100um and h=2mm

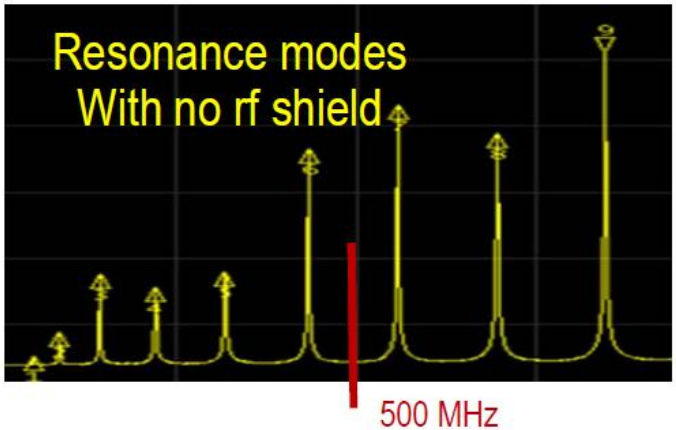
d1=30.5mm and d2=30.6mm

2a=76mm and 2b=25mm

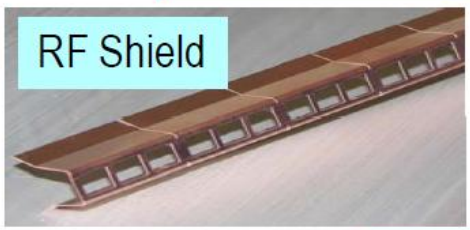

Carbon fiber support
Rf Buttons
Girder
SiO2 cables
PTC box
BPM Cables – PTC to Electronics Rack

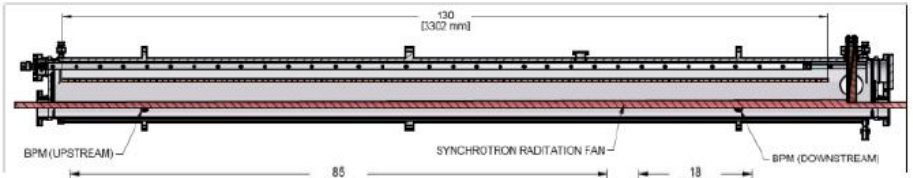

Rf Buttons
Invar Rods
Steel stiffener
Invar base

Multi-pole Chamber - Resonance modes optimization(RF shield)



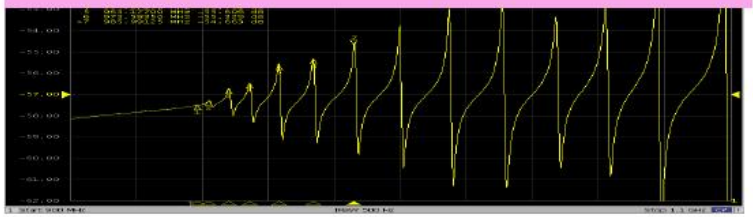
Flexible BeCu RF fingers with 50% of opening space

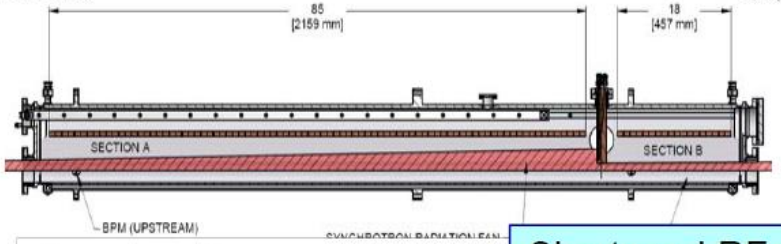




S2

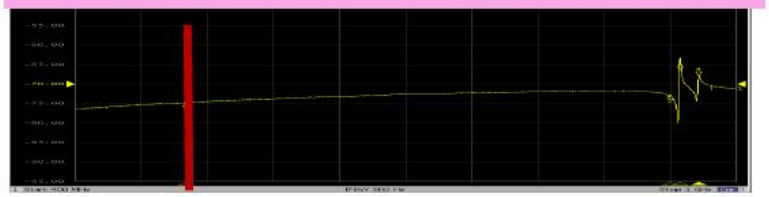
- S2 & S4 → shifts modes to > 800 MHz

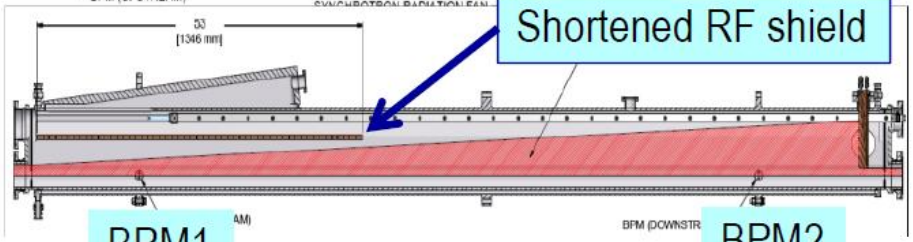




S4

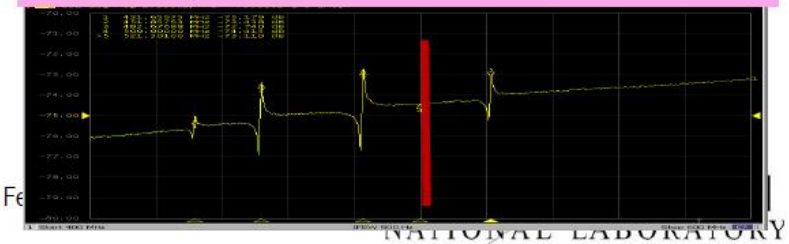
- S S6 upstream → shifts modes to > 800 MHz

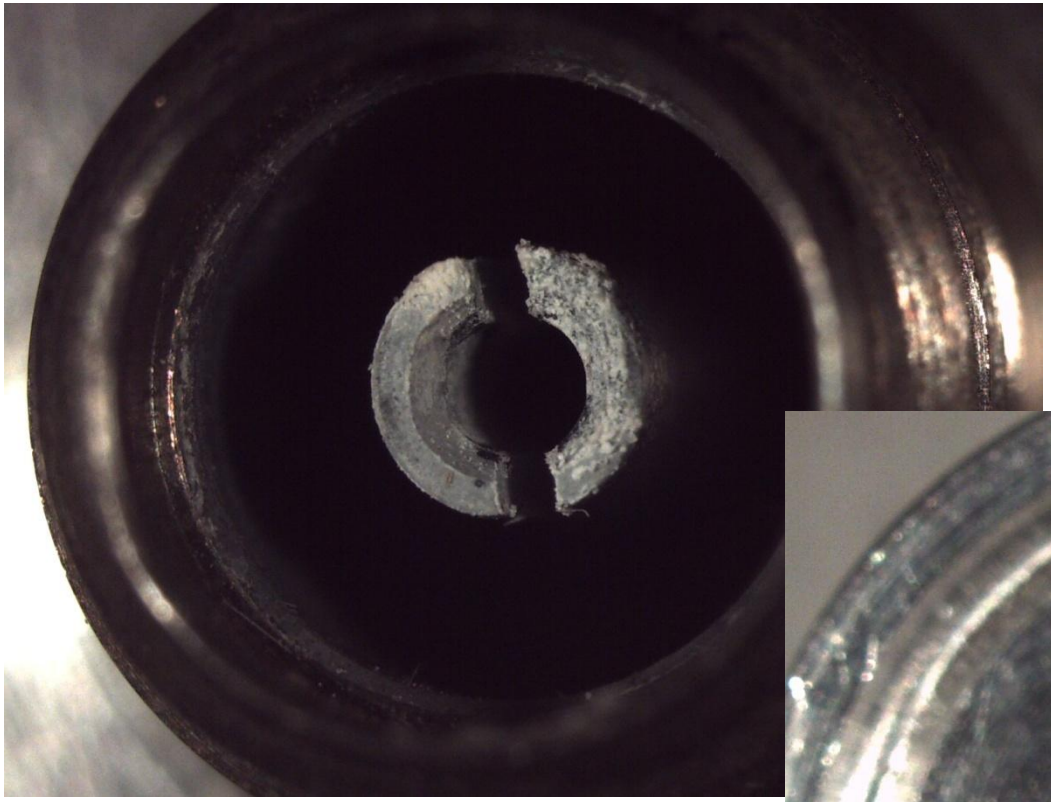


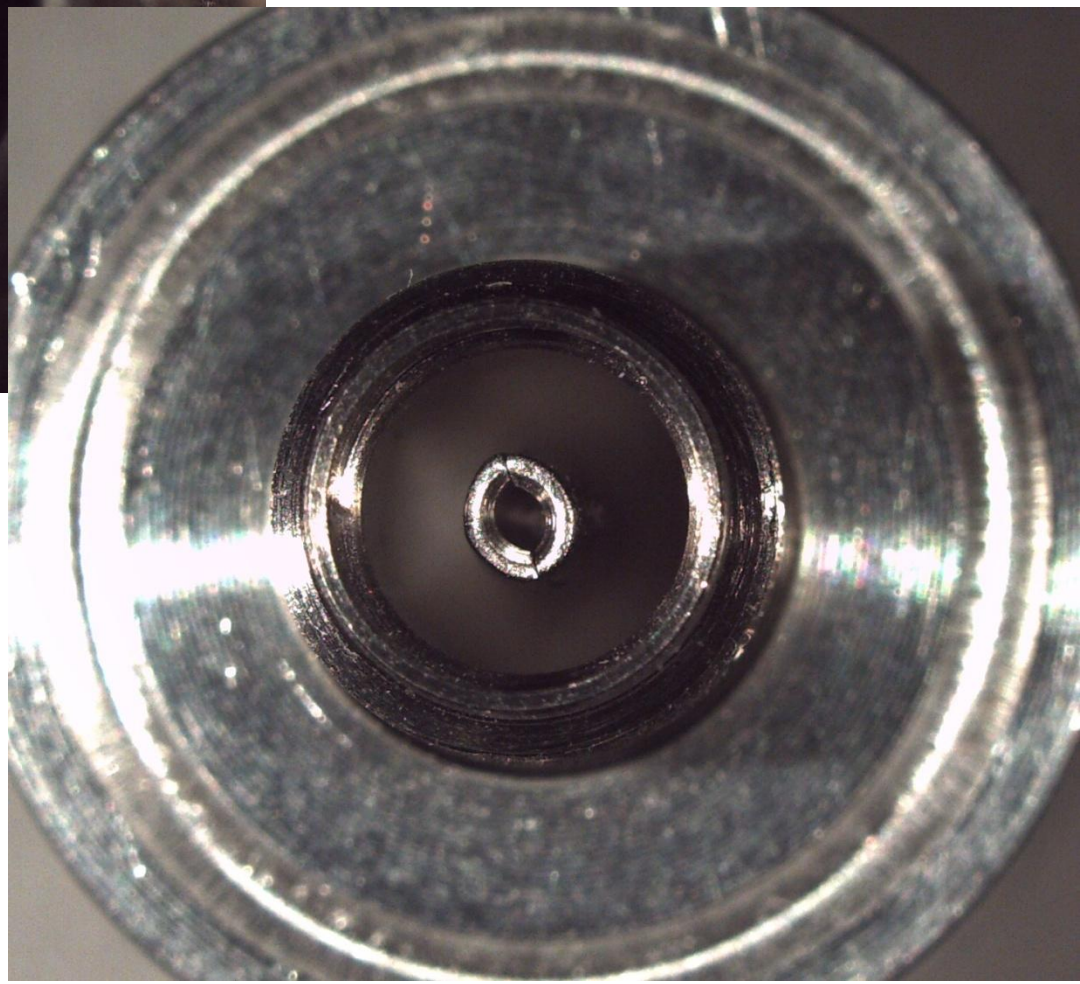


S6

- S6 downstream → does not shift out of band, may not be available







Titanium does not look
like a suitable material,

- Radiation damage to surface
- Poor elasticity