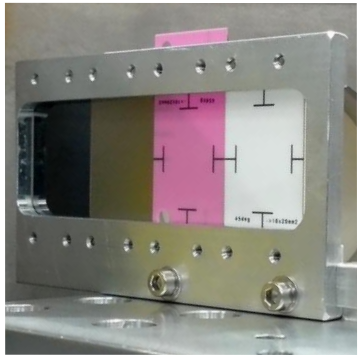
Installation new BTV HiRadMat from 2017

Stephane Burger et al

Installation new BTV HiRadMat from 2017

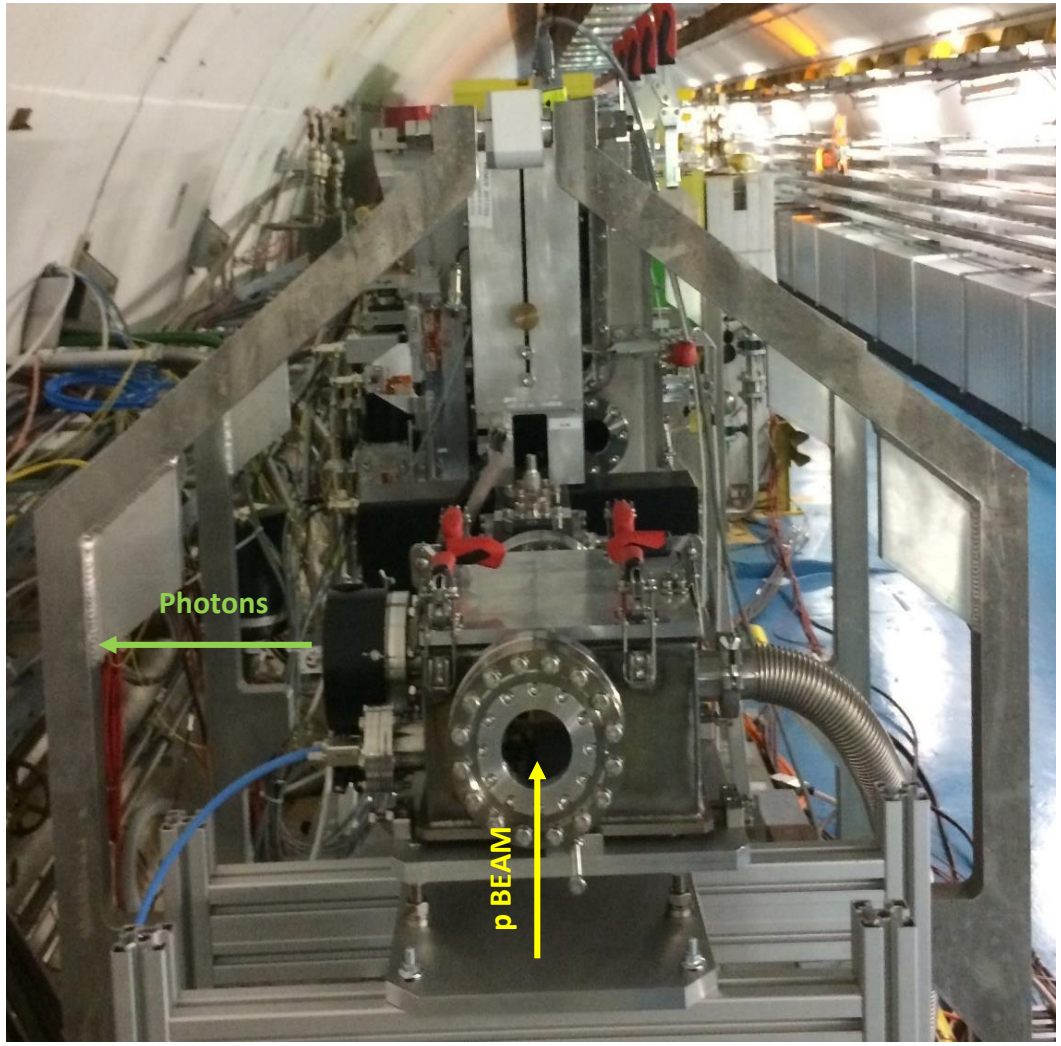
- Give beam position and size for all HRM extractions
  - **1-288 bunches / 1E9 to 1.7Ep per bunch**
  - **0.1 < σ < 1.5 mm**
  - → **Polished amorphous SiC material**

- **In vacuum** to avoid parasitic light
  (Energy threshold for Cherenkov emission in air: 37.4GeV)



Screen setup

New HRM BTV screen setup				
Position	**Material**	**Size [mm2]**	**Thickness [mm]**	**Fonction**
1	Al2O3	10x20	1	- Calibration reference - Measure low int. < 1E12p / mm2
2	Al2O3:CrO2	10x20	0.5	- Measure int. < 1E13p / mm2
3	Ti	10x20	0.1	- Measure int. < 1E14p / mm2
4	SiC (amorphe)	10x20	0.5	- Measure high int. > 1E14p / mm2

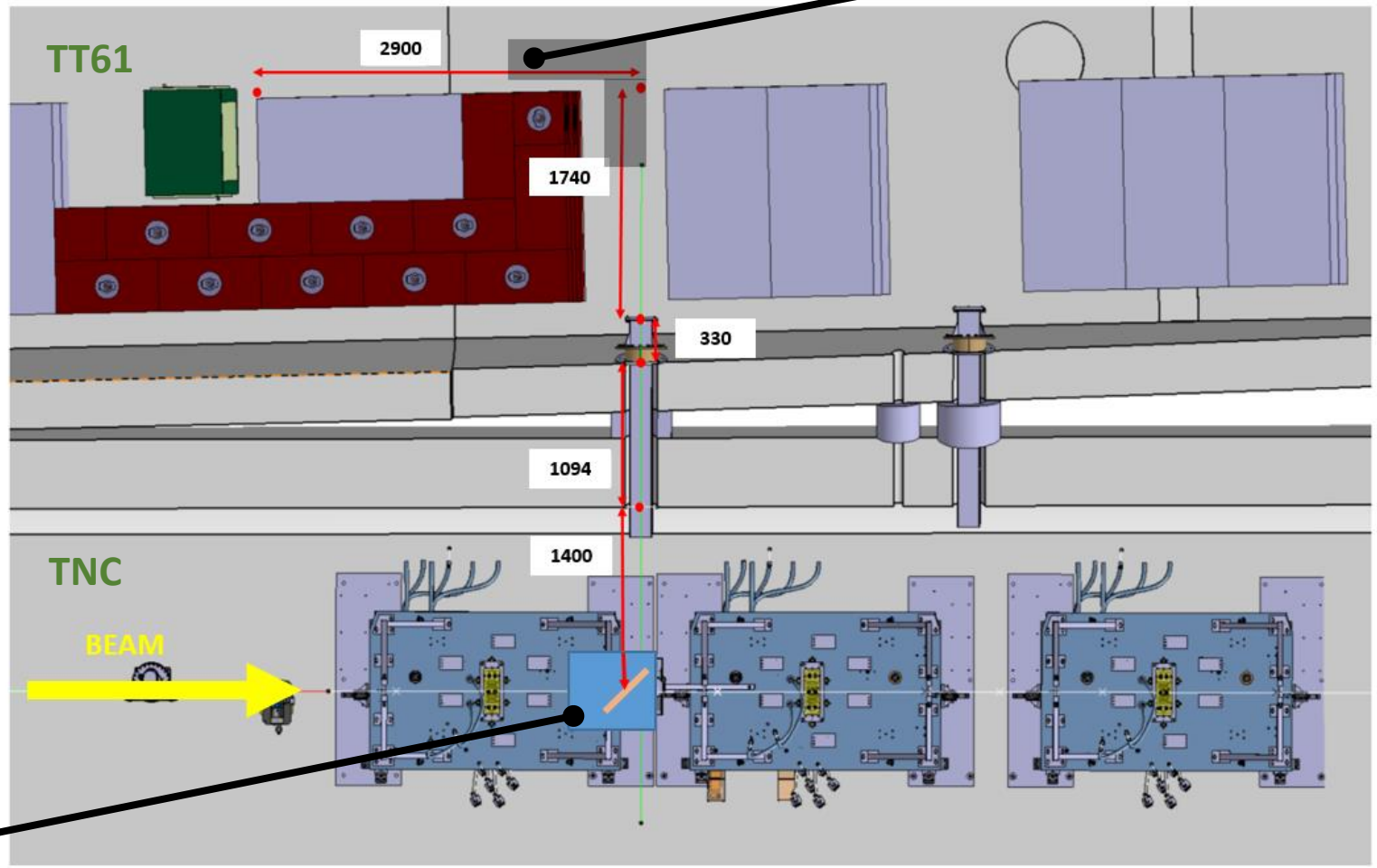


Installation of the new BTV HRM.
Located end of experimental table A

Optical line setup (1)

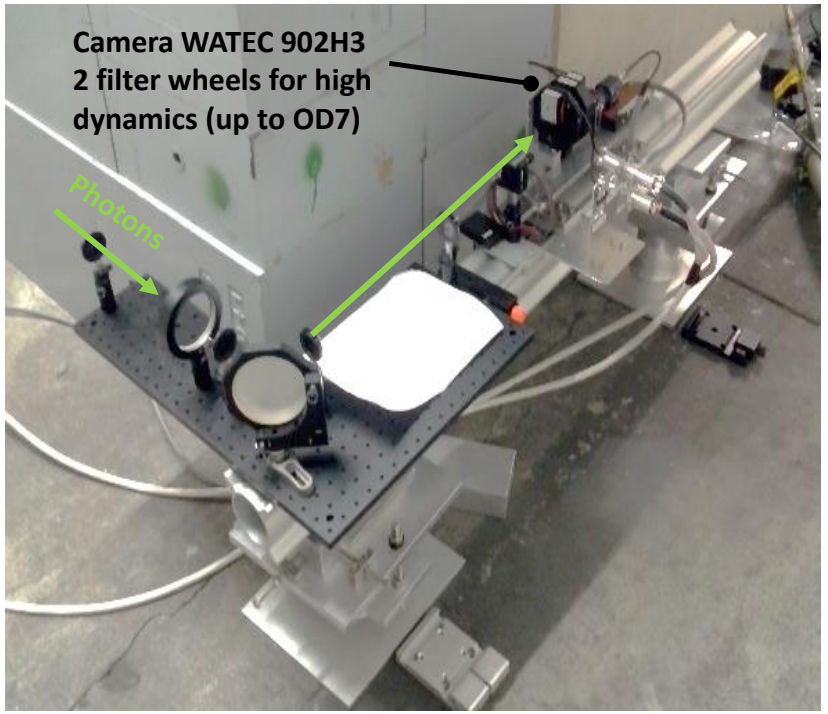
To move away the camera from the irradiated zone (TT61)

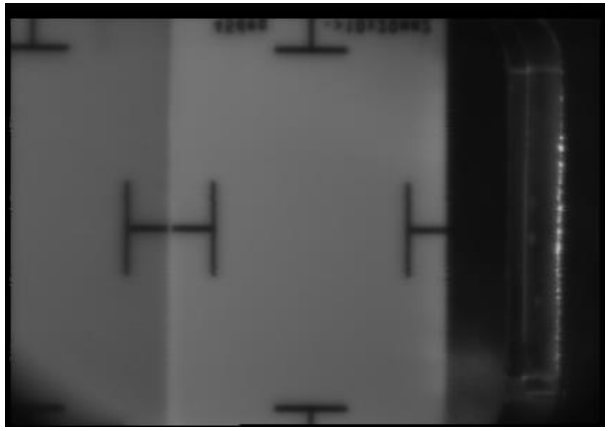
→ Optical line up to TT61, behind shielding



Optical line setup (2)

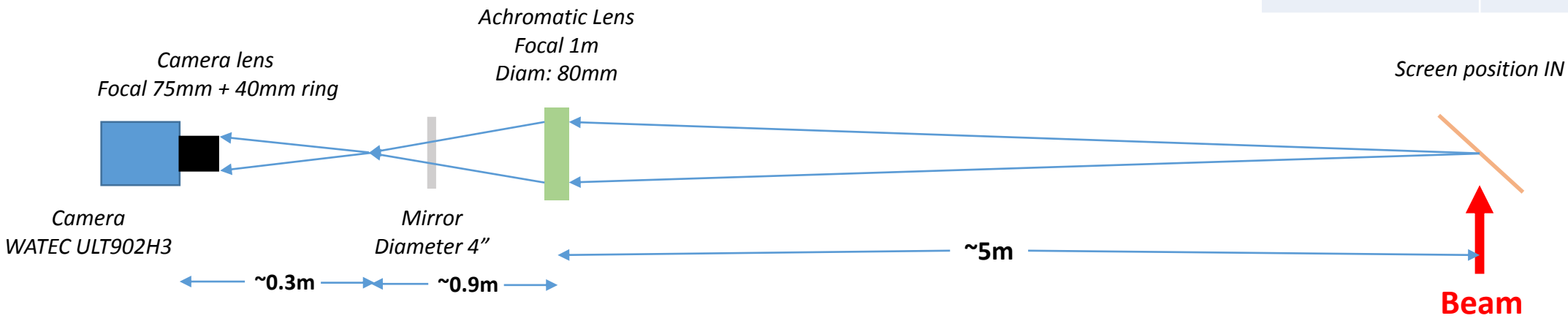
- A single lens (Focal length 1m).
- Magnification of ~0.2





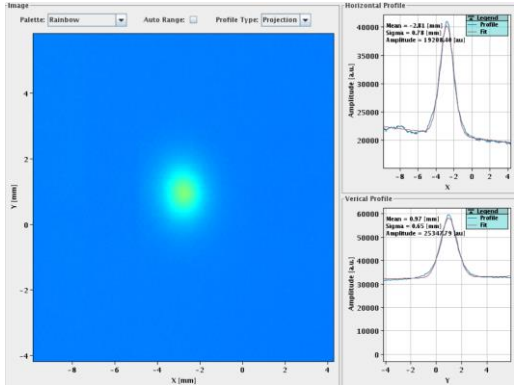
Reference image for calibration

Resolution [um/px]	
Horizontal	72
Vertical	79



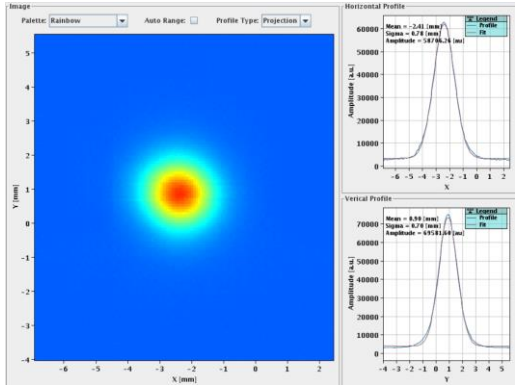
Beam measurements (1)

Screen: Alumina 1mm
Filter NO



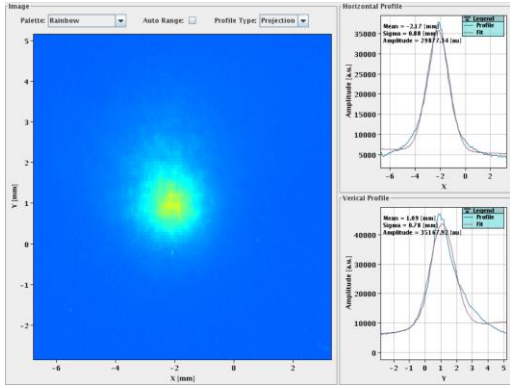
Single bunch (~1E11p)
FP2_0.5mm

Screen: Chromox 0.5mm
Filter OD4



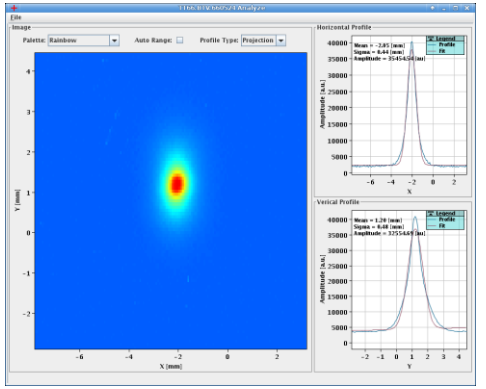
12bunch (~1.2E12p)
FP2_0.5mm

Screen: Ti 0.1mm
Filter OD1



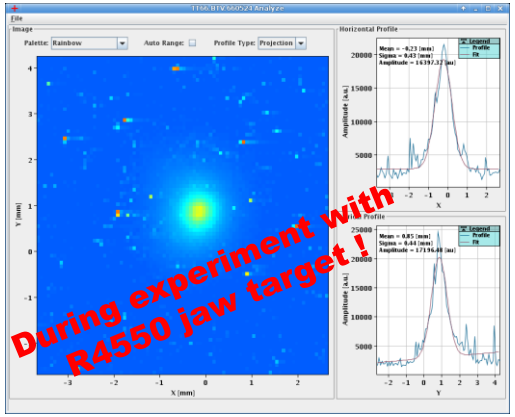
72bunch (~7.2E12p)
FP2_0.5mm

Screen: SiC 0.5mm
Filter OD3



216bunch (~2.4E13p)
FP2_0.25mm

Screen: SiC 0.5mm
Filter OD4



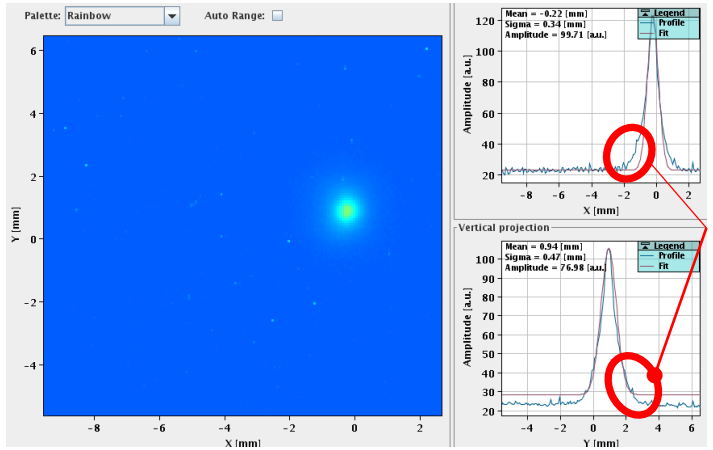
288bunch (~3.2E13p)
FP2_0.25mm

Light Emission type	Screen type	Bunch number (x1E11p)						
		Optics FP2_0.5mm					Optics FP2_0.25mm	
		1	12	36	72	144	216	288
Scintillation	Al2O3 (1mm)	NF	x	x	x	x	x	x
	Chromox (0.5mm)	3	4	x	x	x	x	x
OTR	Ti (100um)	NF	0.3	0.7	1	1.3	x	x
	SiC (0.5mm)	0.3	1.3	2	2	3	3	4

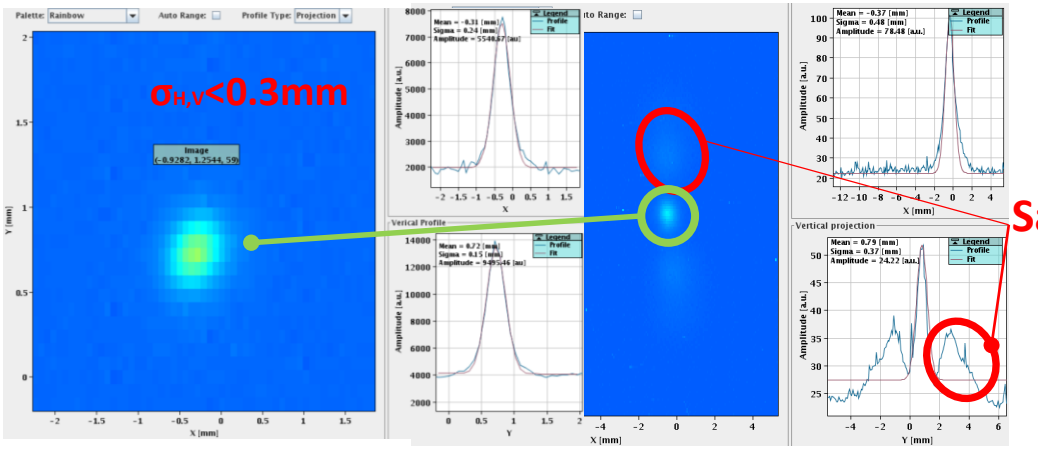
Screen to use VS beam type (intensity + optics)

Beam measurements (2)

Doubt on the beam sigma measured Always ~30% larger than the model (!?)



Tails



Satellites

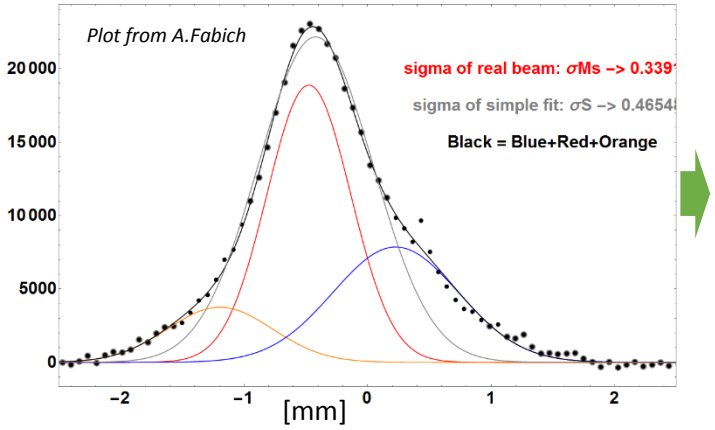
Measurements until Tuesday June 13th 18H27 → give tails

From Tuesday June 13th 18H43 → give satellites

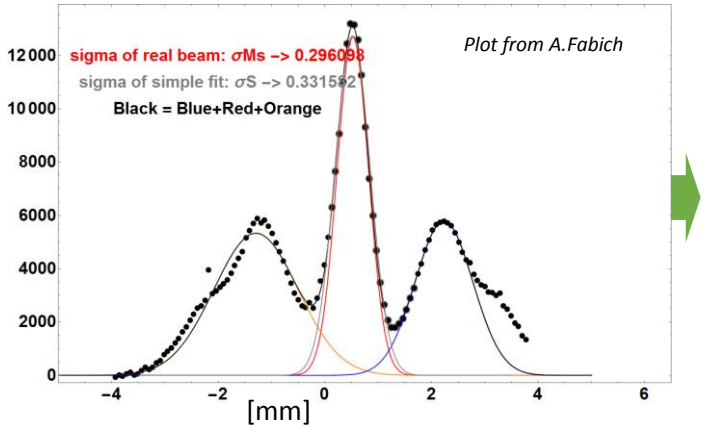
If tails and satellites are not beam but 'reflections' or forward OTR from entrance vacuum window (expected negligible from Zemax simulations):

→ work ongoing to define the source (mask, color filters, etc…)

→ Some post processing to derive the real beam size (optics used 0.25 & 0.3)



Tails
Error on beam size could be >35%



Satellites
Error on beam size could be >11%

TS2 work on BTV HRM (1)

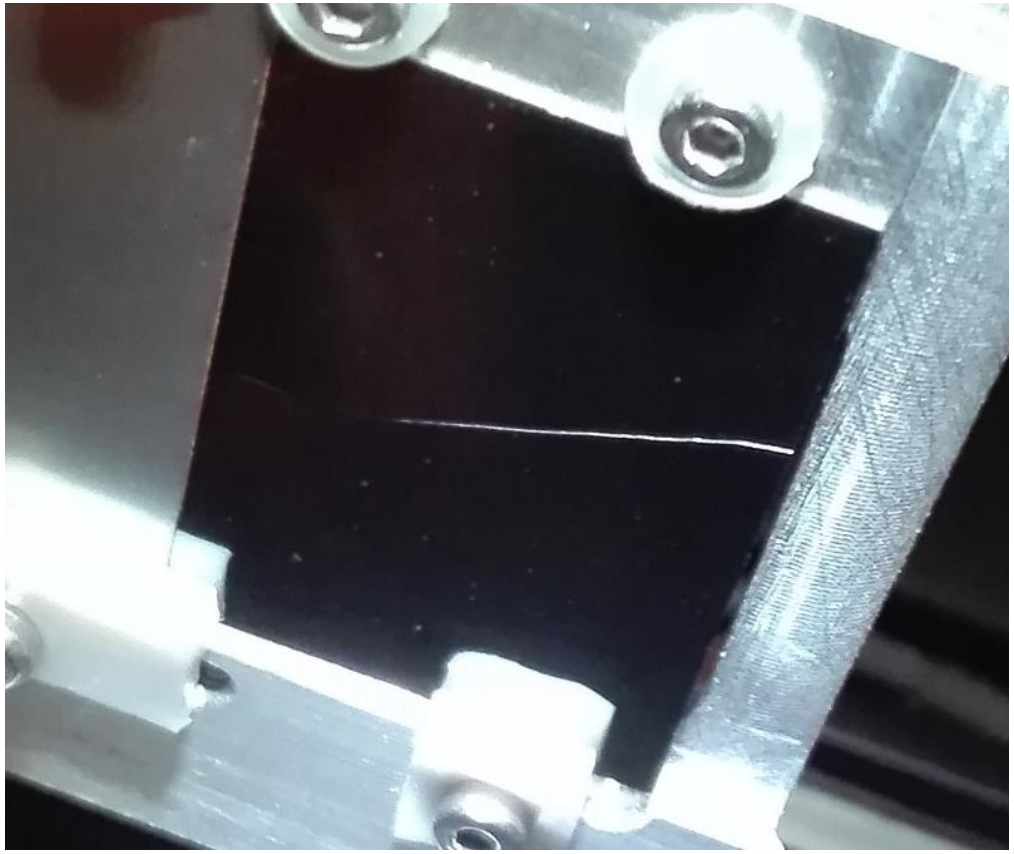
To do list

- Reflection ‘hunting’: get blackened the inside of the vacuum tank
- Put a foil in font of the screens to ‘block’ the forward OTR (calculations are checked again…)

After opening the tank, the SiC screen was found broken:

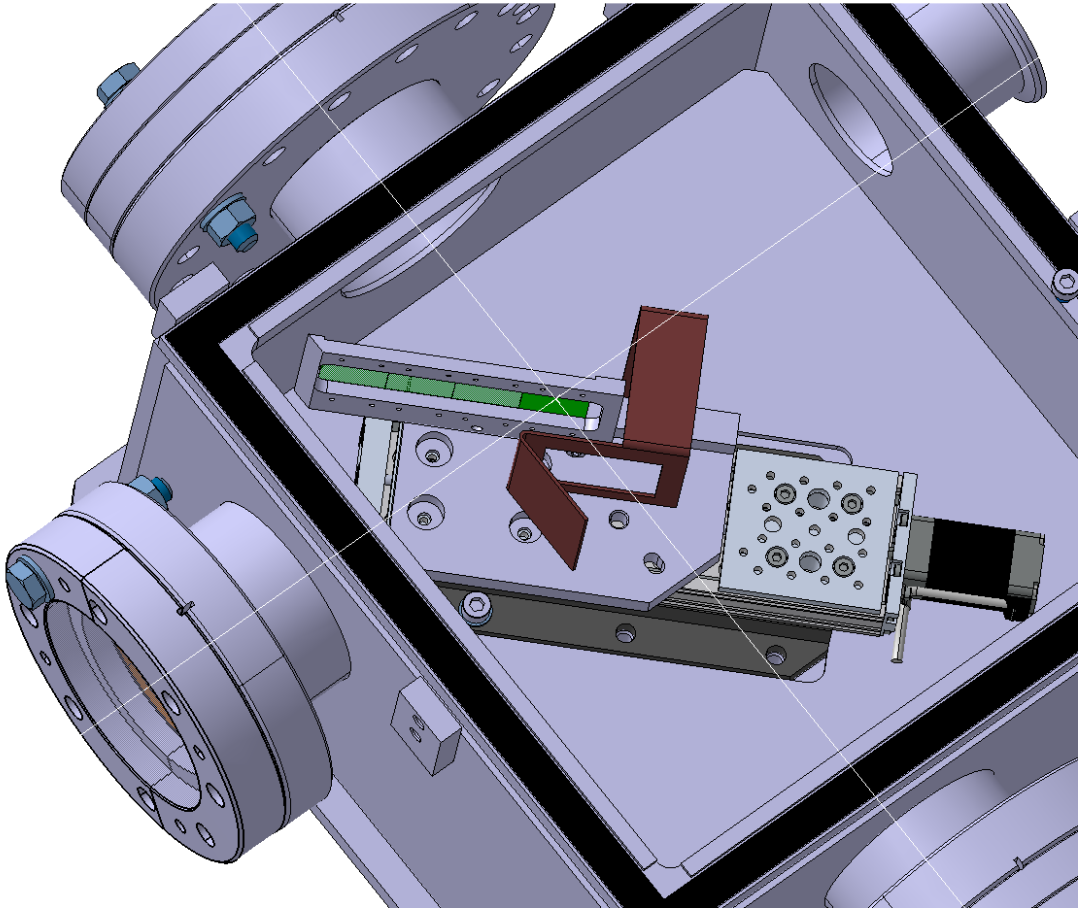
→ Due to beam or accident ?

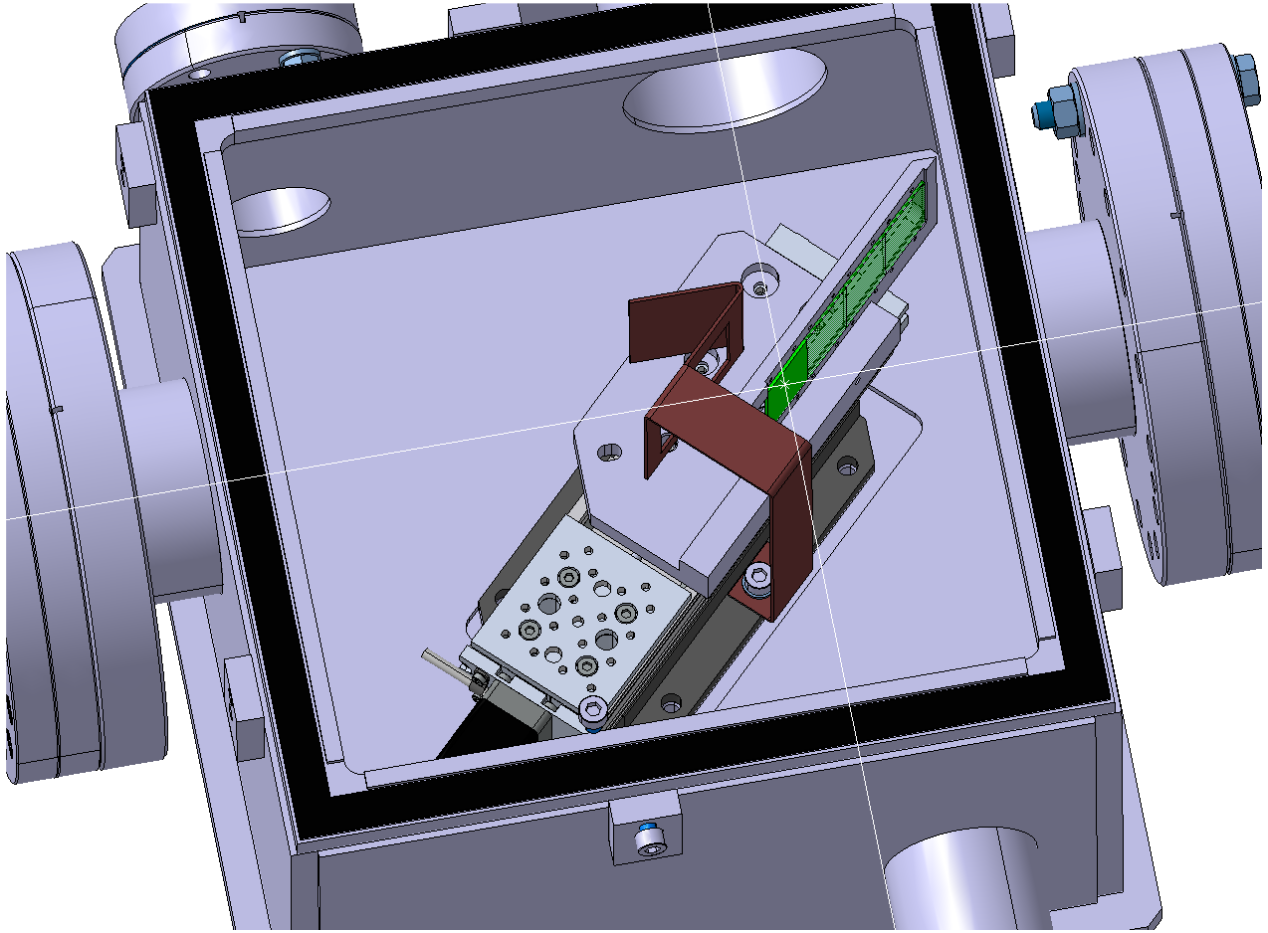
→ Can it explain the satellites ? Was replaced with spare…



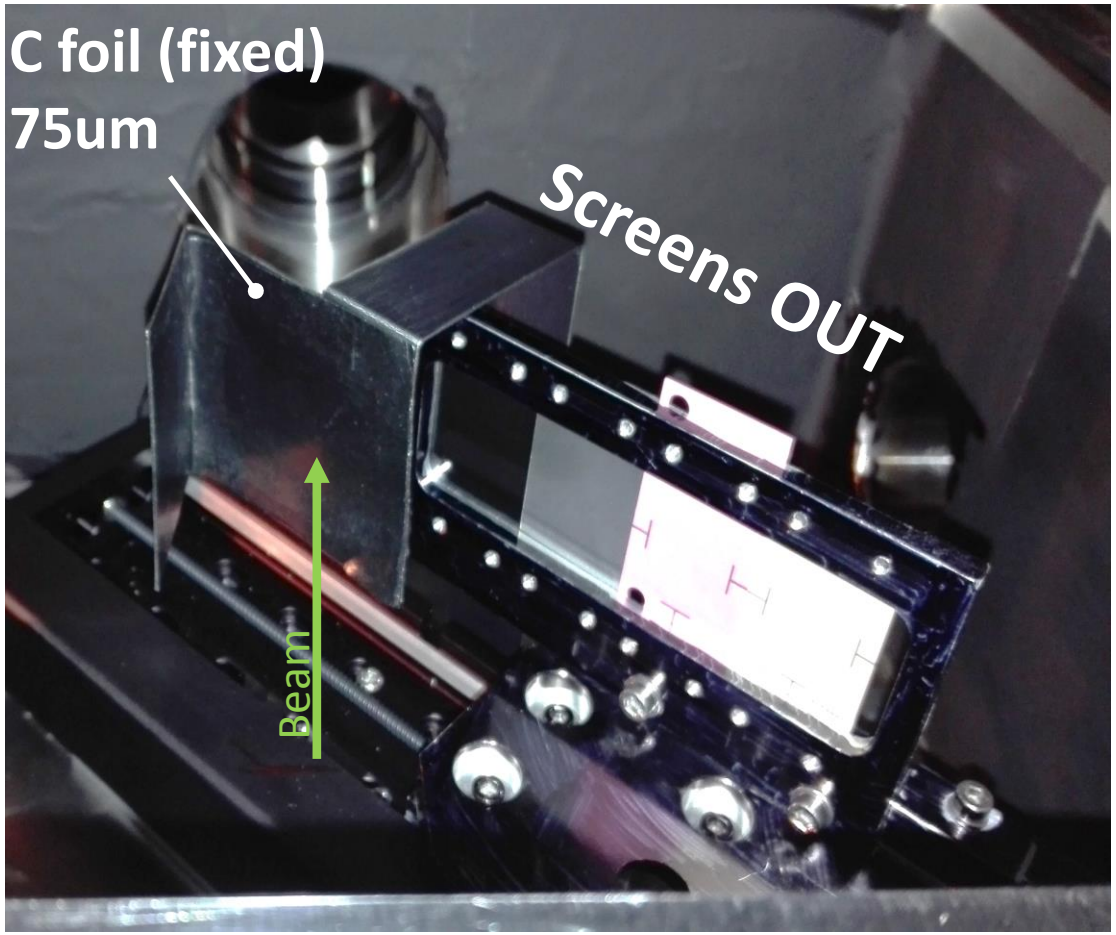
TS2 work on BTV HRM (2)

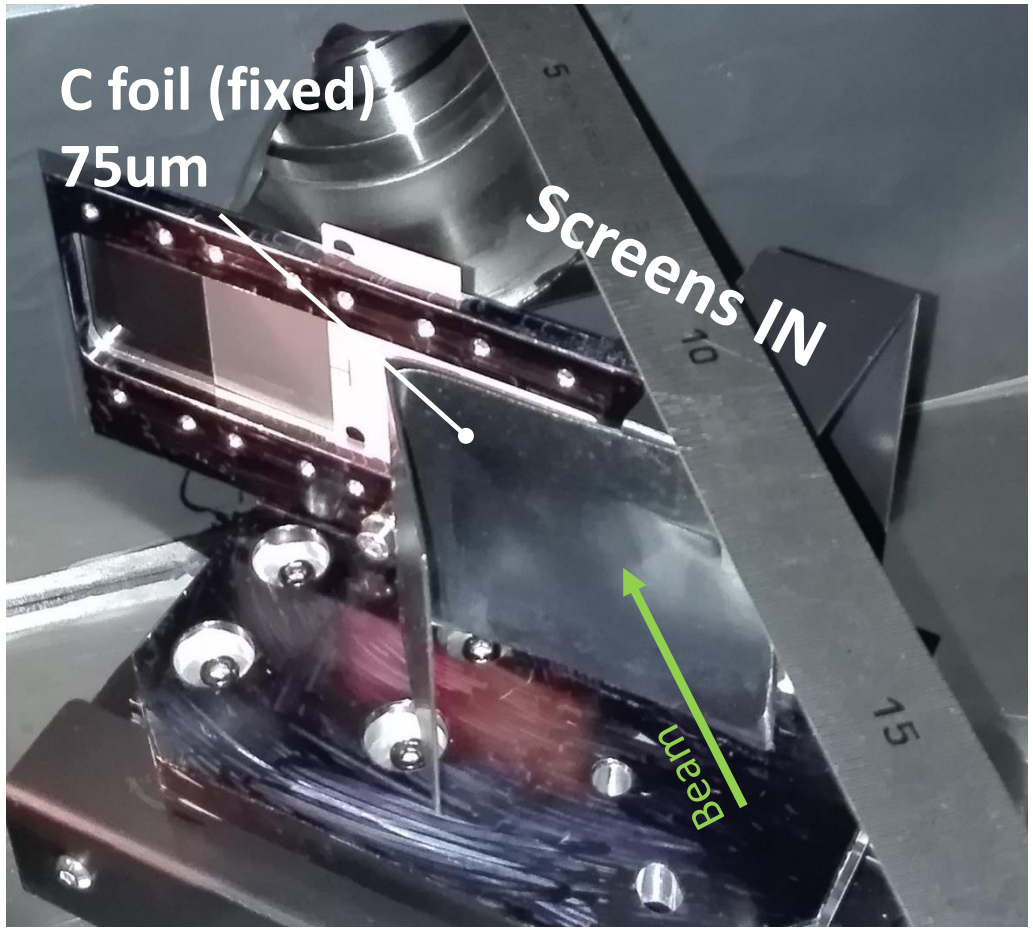
Images from V.Clerc





TS2 work on BTV HRM (2)





→ Next beam around mi July…

Conclusion

- In-vacuum system solve the issue with Cherenkov background light
- Can measure beam size of high intensity trains using SiC OTR screen
- Tails on the distribution coming most likely from forward OTR emitted by the entrance vacuum window
- Interventions this week
  - Replace broken SiC screen – reason of the damage should not come from direct beam heating – rechecking with simulations for small beam size
  - Adding an thin carbon foil to reduce the effect of tails

- Possibly checking the performance of the modified set-up next week