CTF3 Brief Summary

W. Farabolini

on behalf of the CTF3 team

Summary

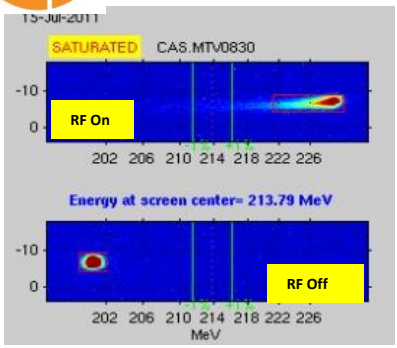
- Installation of the CLIC Module
  - Schedule, Pre-Work (holes and shelters (new CTF3 buildings), removal of TBTS lines, reinstallation of the lines, care to the alignments, problems with vacuum leaks (structures, waveguides, strip-line BPMs), module ready.
- First beams through
  - First results
- Other experiments
  - Cooling and thermal control
  - Strip-line BPMs
  - BLM
  - WFM
  - OTRI
  - Phase Feed Forward

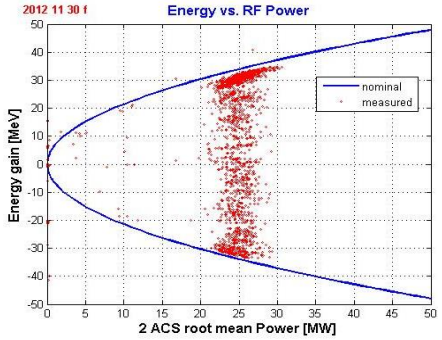
19th of June 2014: the TBTS passed away

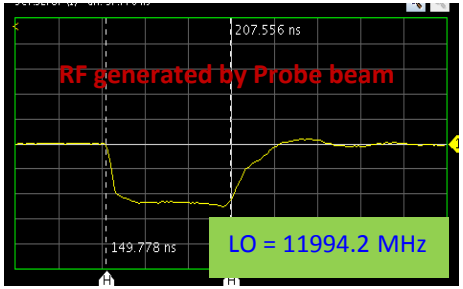
Dismantling of safety barriers	0.5 days	Mon 23/06/14	Mon 23/06/14
Commissioning	5 days	Thu 25/09/14	Thu 02/10/14

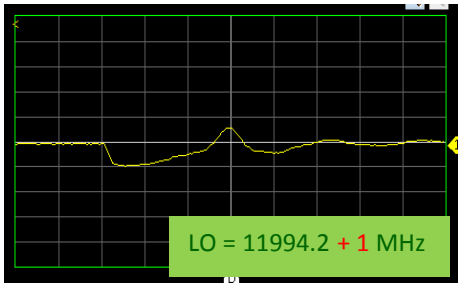
- Event preceded by an intense planning activity (D. Gudkov weekly CLIC Module WGM)
- Important issue: the summer holidays, to be included or not to be included ?
- Allocated time: 3 months

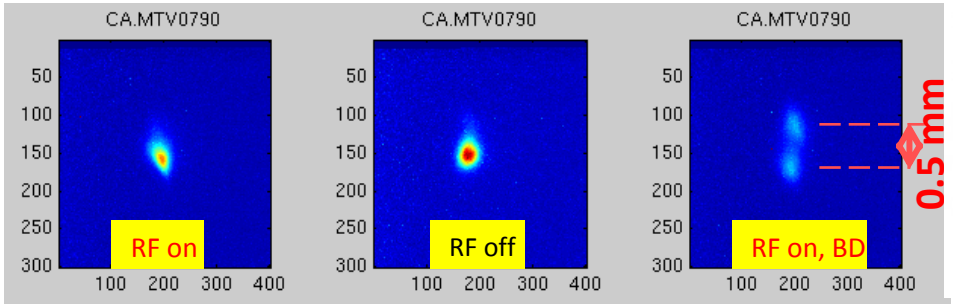
TBTS - in memoriam

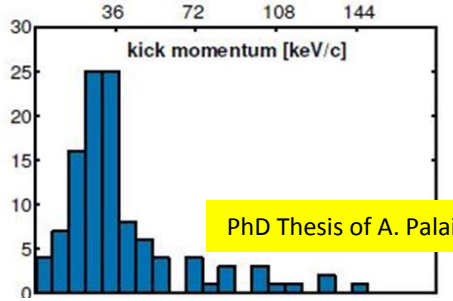


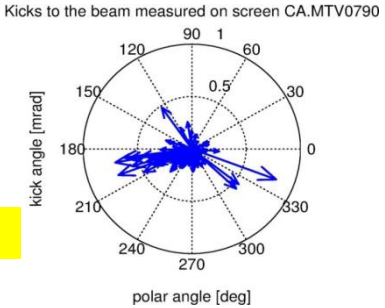


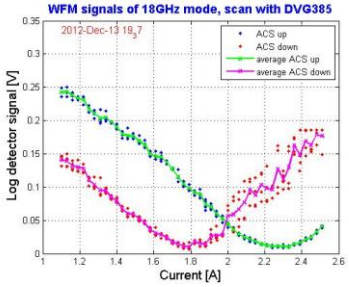


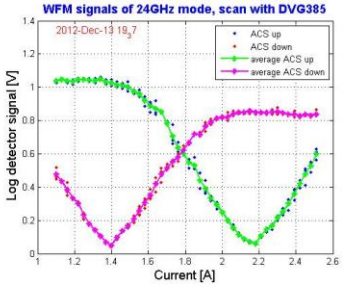


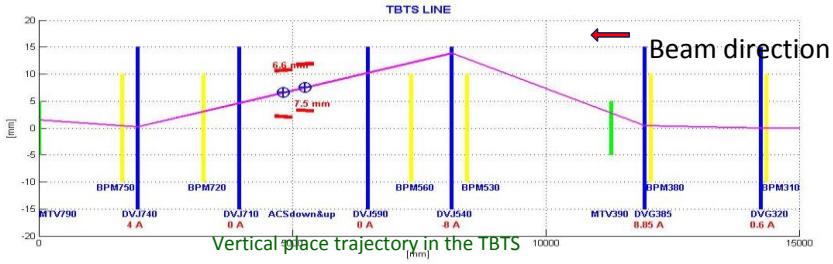


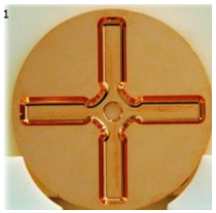


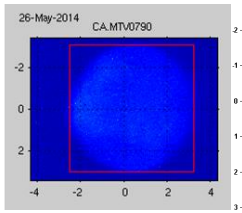


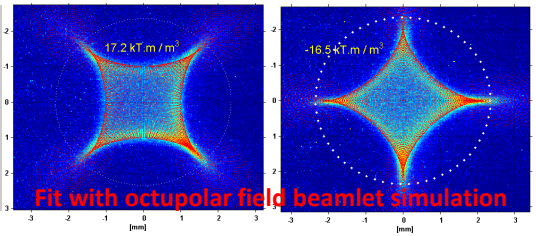


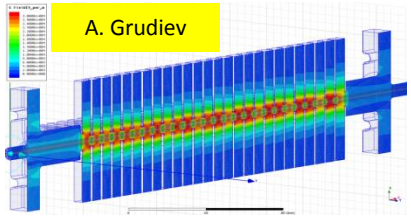


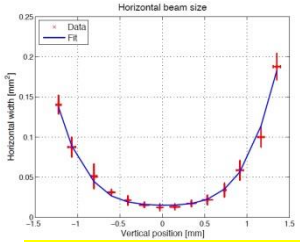






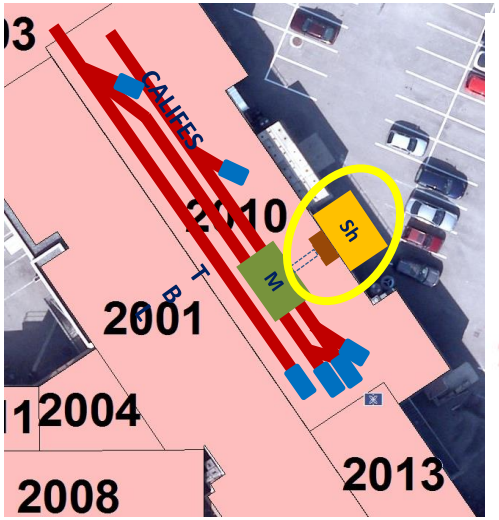


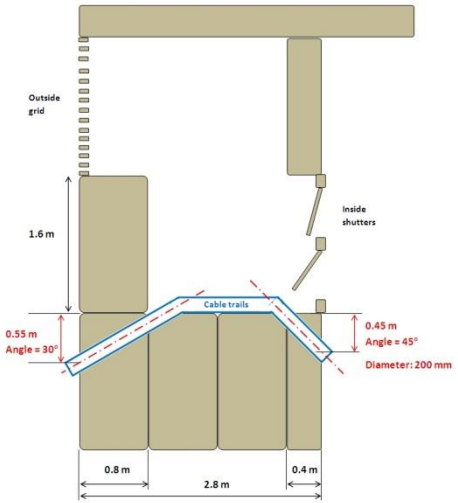




Pre-works had preceded in the CLEX

January 2014: Trench cut on the floor and holes drillings through the external wall (2.8 m)





New CTF3 buildings

CLEX construction

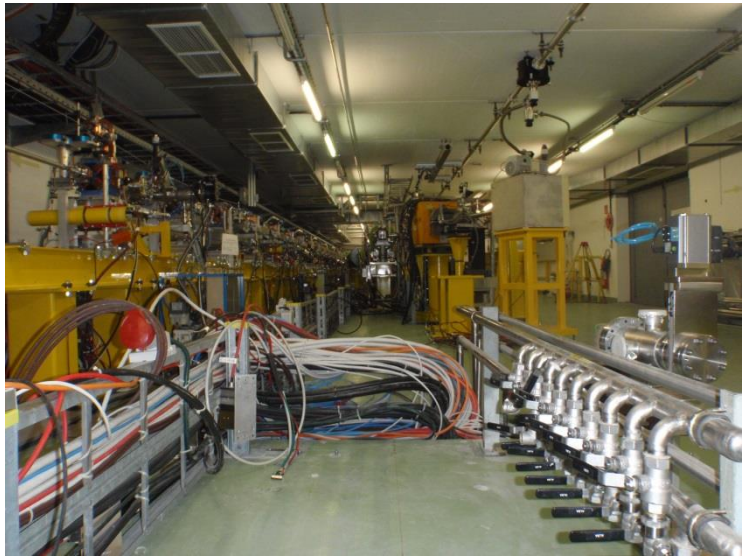
Klystron servicing hall

CLIC Module electronic shelter

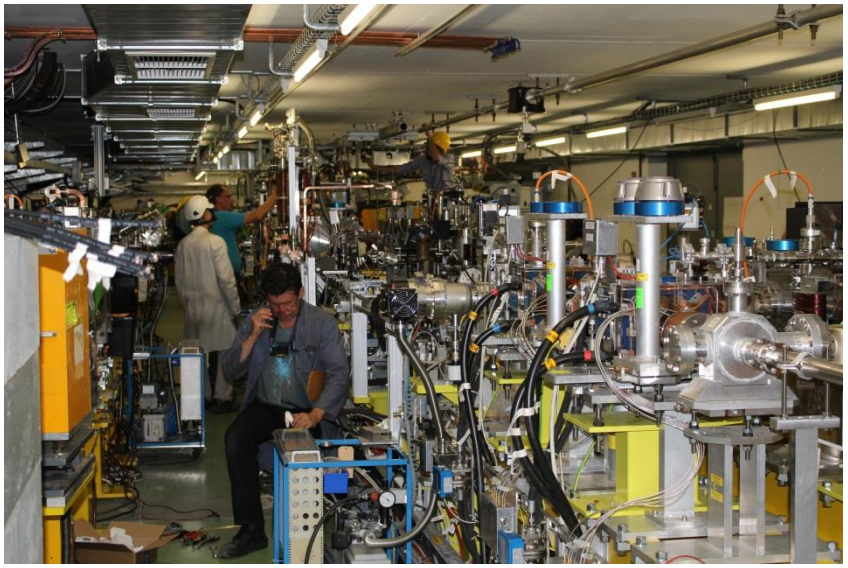
Nuclear buffer zone

TBTS lines removal (start)

TBTS lines removal (finished)



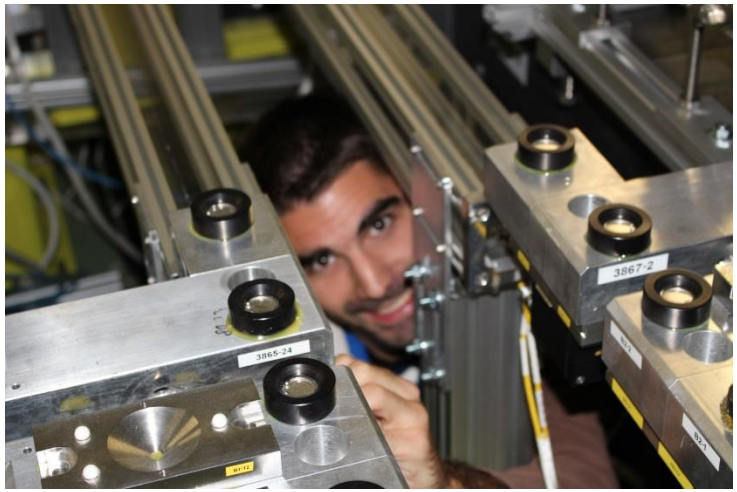
CLEX Reconstruction

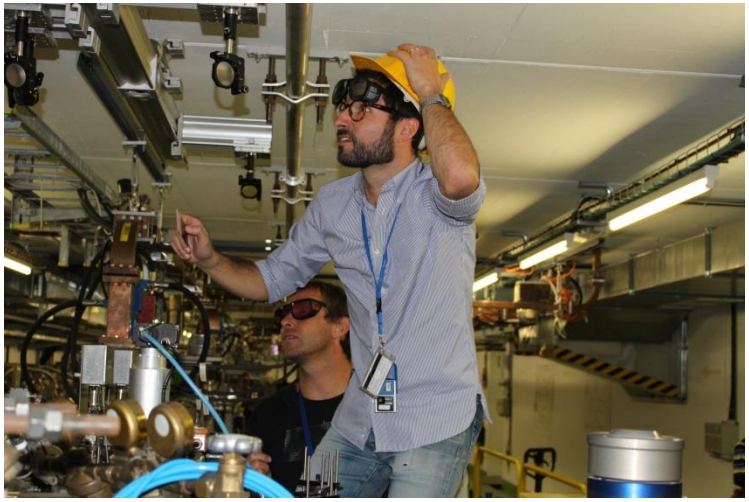


The vacuum leaks battle

- Leaks were detected on the superstructures and waveguide network just before installation and even on Strip-line BPMs after installation.
- 4 additional brazing were necessary to obtain a good vacuum quality on 1 of them (the second one will be installed during the winter shutdown).
- Some suggestions to improve the conception have emerged.

Easiness of the installation





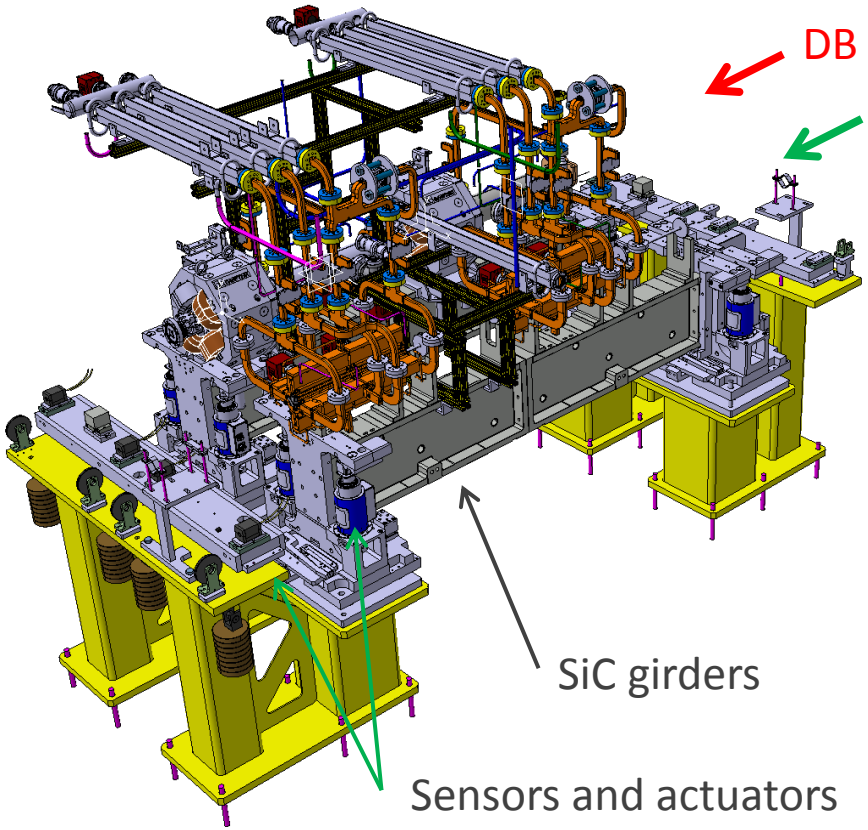
Construction effort

Activity	Number of people
Civil Engineering	6
Drawings	2
Planning	5
Magnetic measures	2
Survey	6
Cabling	7
Transport	4
Disassembling	3
Vacuum	4
Beam diagnostics	13
Mechanics	7
Thermal control	1
RF	3
RP	4
Cleaning	2
Shelter and Buffer Zone construction	10
Total:	**79**

And also:

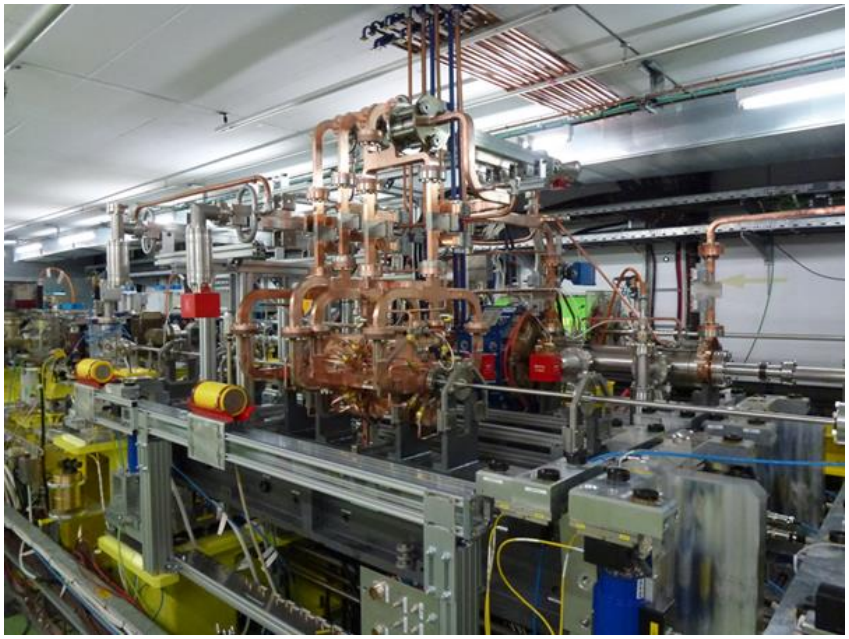
- 120 cables pulled (2400 m)
- 12 girders moved
- 12 quadrupoles magnetically measured and fiducialized
- Quasi-permanent survey of the equipment by 2 different teams

CLIC Module installed



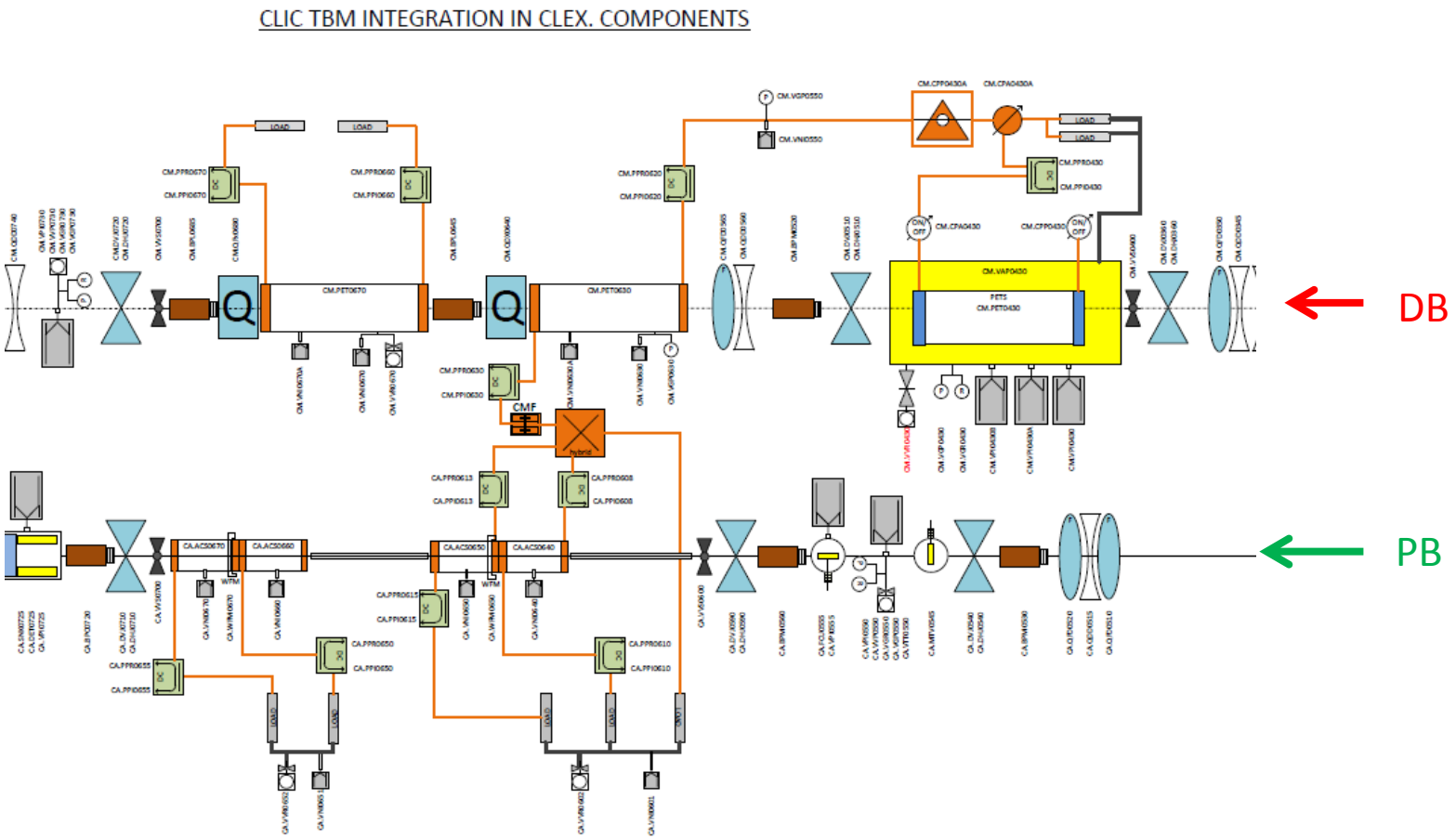
Drive beam:
2 PETS
2 Quads
2 Stripline BPMs

Probe beam:
2 superstructures
(4 ACSs)
2 WFMs



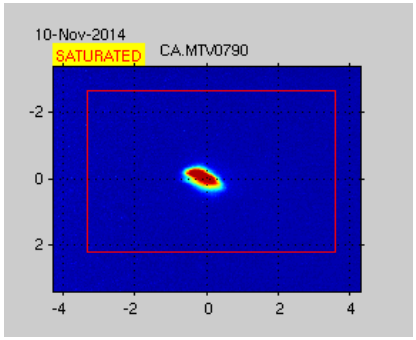
D. Gudkov

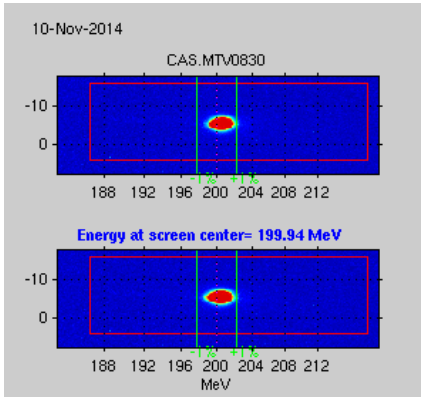
New Test Beam Module (TBM)

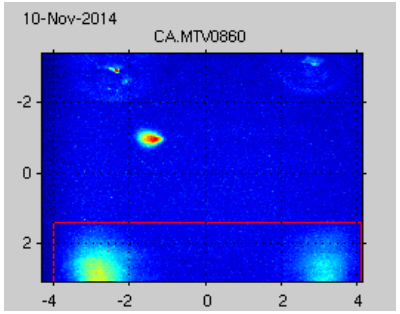


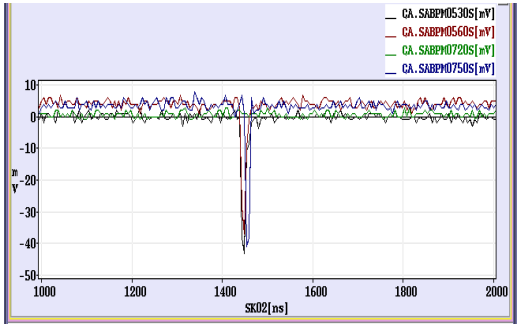
- 11 bidirectional RF Couplers (12 GHz)
- 4 RF controls (phase shifters and attenuators)
- 9 RF loads
- 11 additional pumps (ions and getter)
- 10 girder actuators
- 8 stretch wire position monitors
- 16 Wakefield monitors signals (18 and 24 GHz)
- Many beam loss monitors

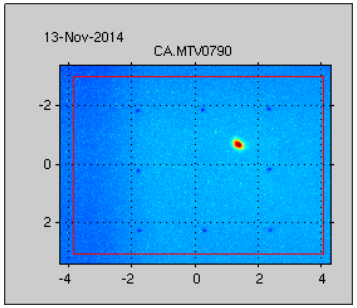
The first beams through



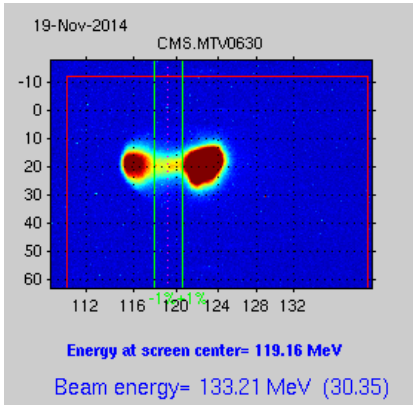


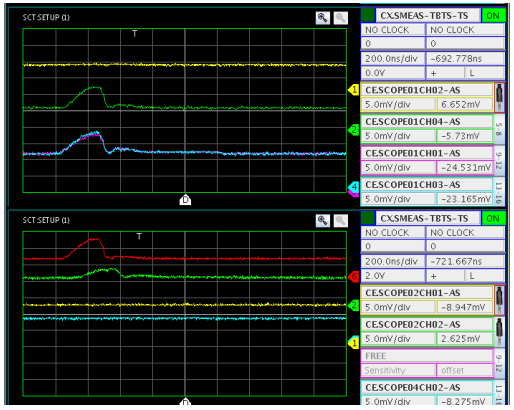


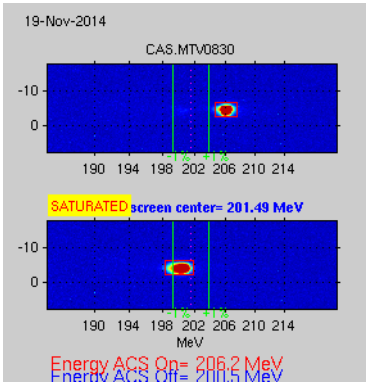




10 November: Less then 2 hours were necessary to send CALIFES beam through the superstructure. The equipment are very well aligned (no more need of the correctors).

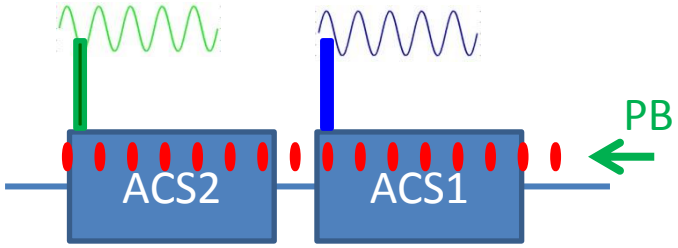




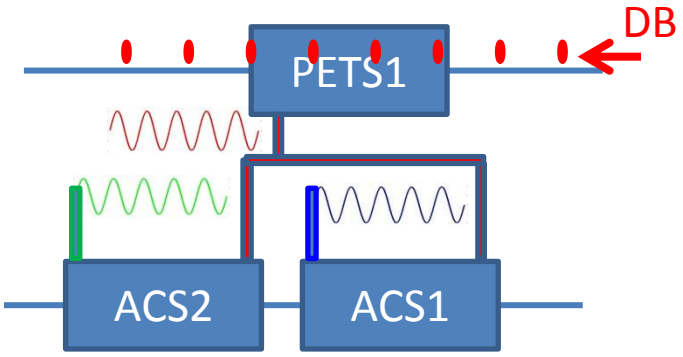


19 November: The drive beam is ready to go through the PETS and generates some RF power. However the energy gain of the PB is weak (less than 6 MeV) and the RF chains are not yet calibrated

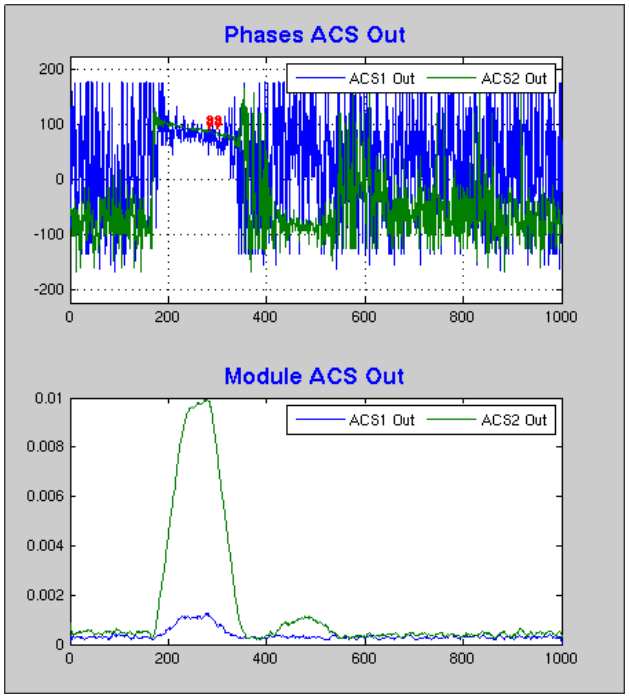
A possible phase problem between the 2 structures

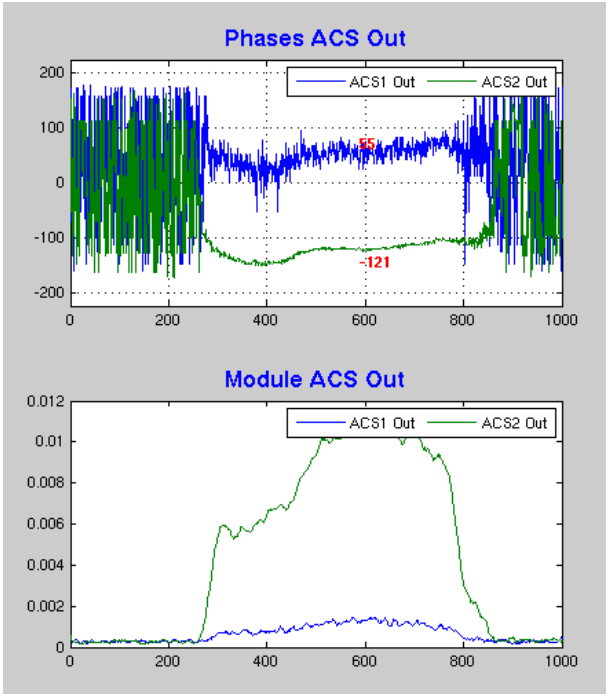


When generated by Probe Beam, RF phase difference between the 2 ACS measured on their output ports is 5 degrees.

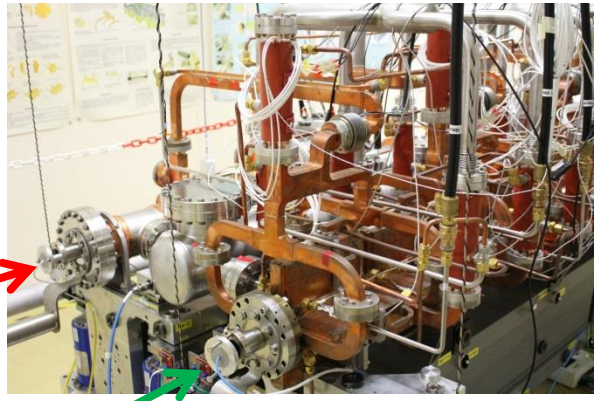


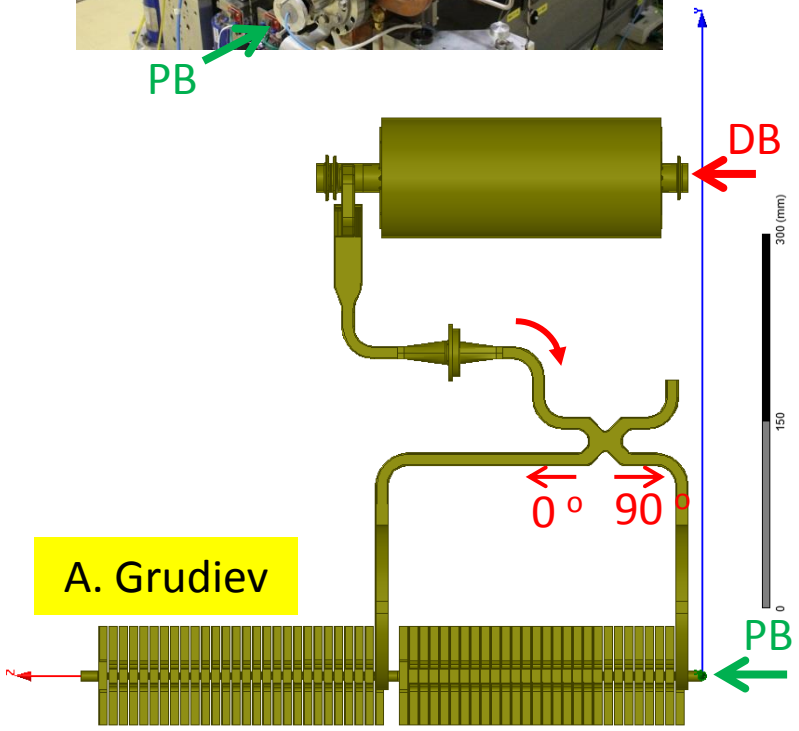
But when RF power comes from the PETS the phase difference is -175 degrees





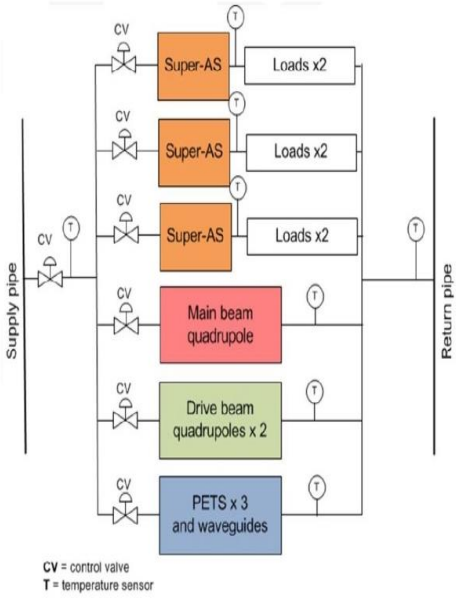
RF network (spot the difference)



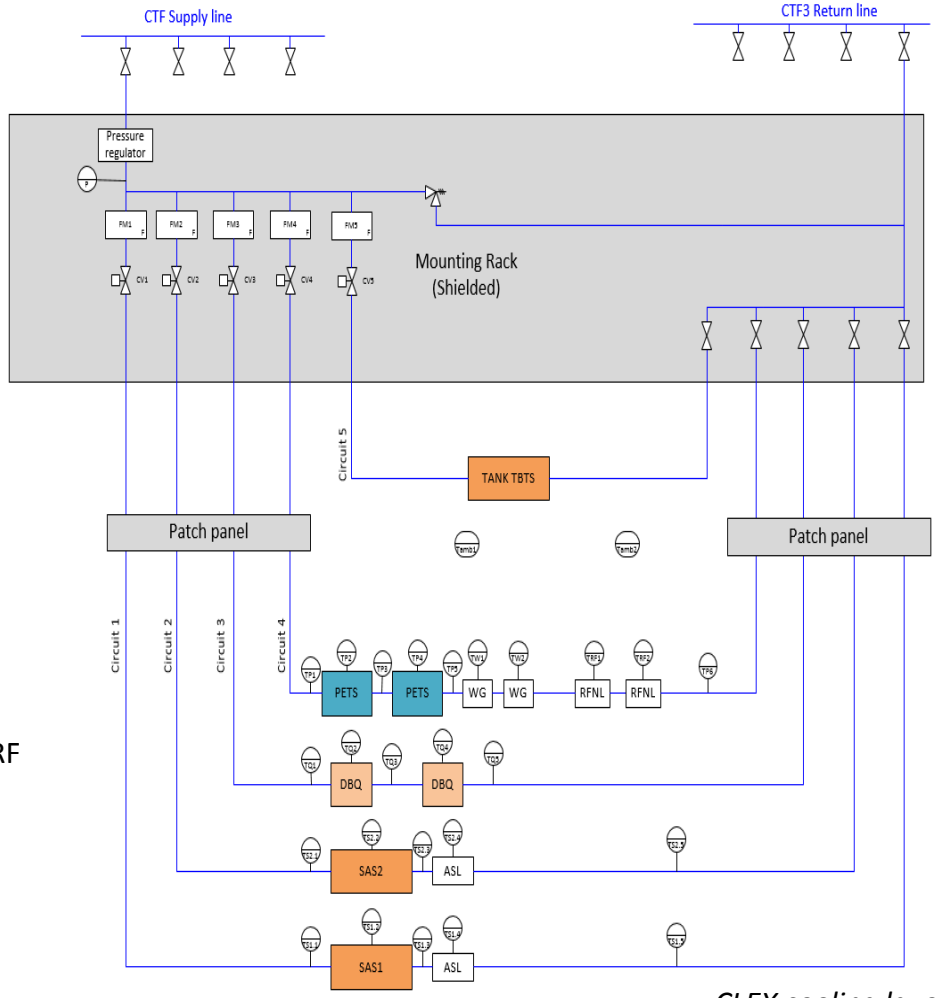


TBM cooling and thermal control

A. Vamvakas



CDR cooling layout (Fig. 5.144)



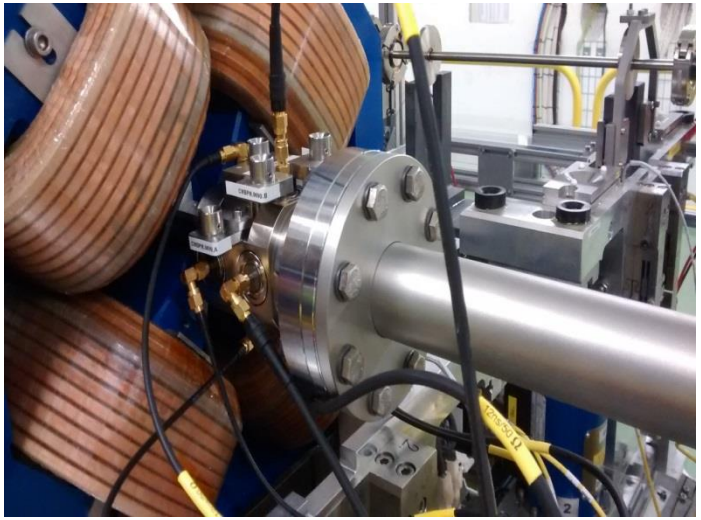
CLEX cooling layout

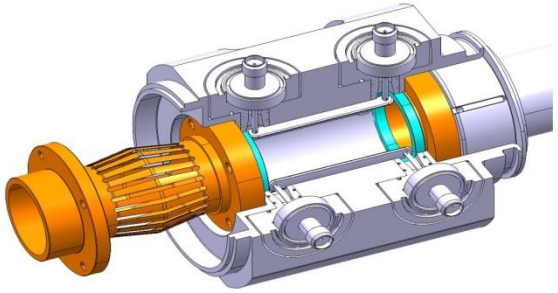
- Micron level stability requires accurate thermal control of the RF components
- 6200W to be dissipated
- Electronic control valves to regulate the cooling of each line separately
- Flow meters on each line to monitor the cooling capacity
- Multiple temperature sensors to monitor the temperature distribution over the module
- Provision for future upgrades
- Testing of the TBM thermal behaviour will take place with RF power for the first time

Stripline BPM for CLIC TBM

A. Benot Morell

Parameter	Shorted BPM	Terminated BPM
Stripline length	25 mm	37.5 mm
Angular coverage	12.5% (45°)	5.55% (20°)
Electrode thickness	3.1 mm	1 mm
Outer radius	17 mm	13.54 mm
Ch. Impedance	37 Ω	50 Ω
Duct aperture	23 mm	23 mm
Resolution	2 µm	2 µm
Accuracy	20 µm	20 µm
Time Resolution	10 ns	10 ns





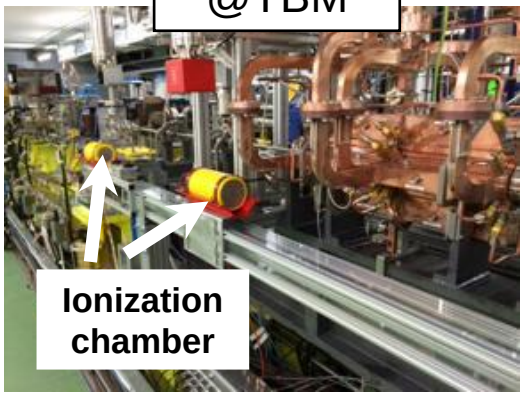
D. Gudkov BE-RF

- Two units installed: CM.BPL0645, CM.BPL0685
- New FESA class developed for BPM control and data acquisition (TBM and TBL): CLEXBPM.

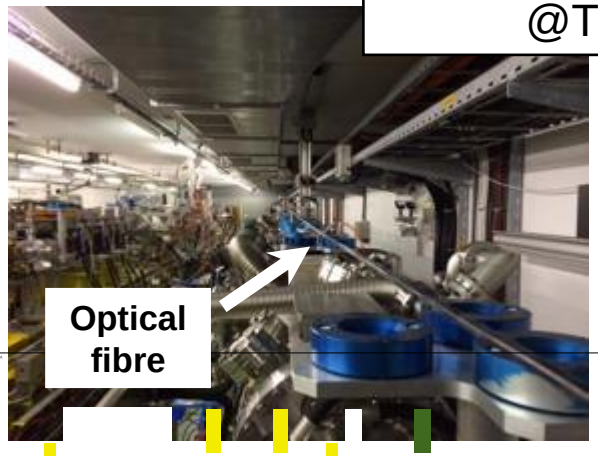
BLMs in CTF3

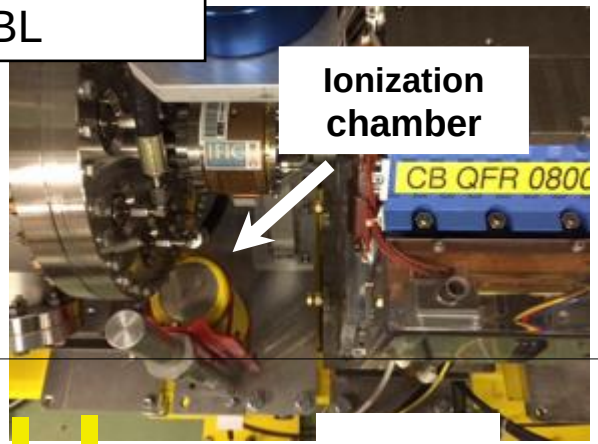
E. Nebot del Busto

@TBM

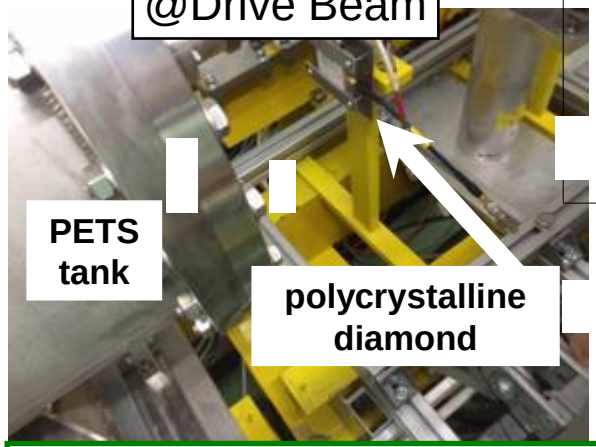


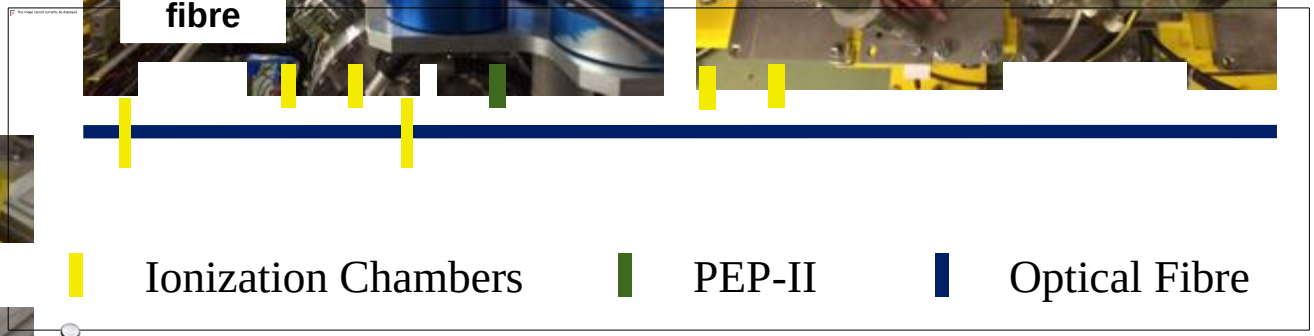
@TBL





@Drive Beam





BLMs accessible via:
OASIS
Generic Sampler
MATLAS scripts (preliminary)

Four technologies under investigation:

Ionization chambers
nominal BLMs (as specified in CDR)

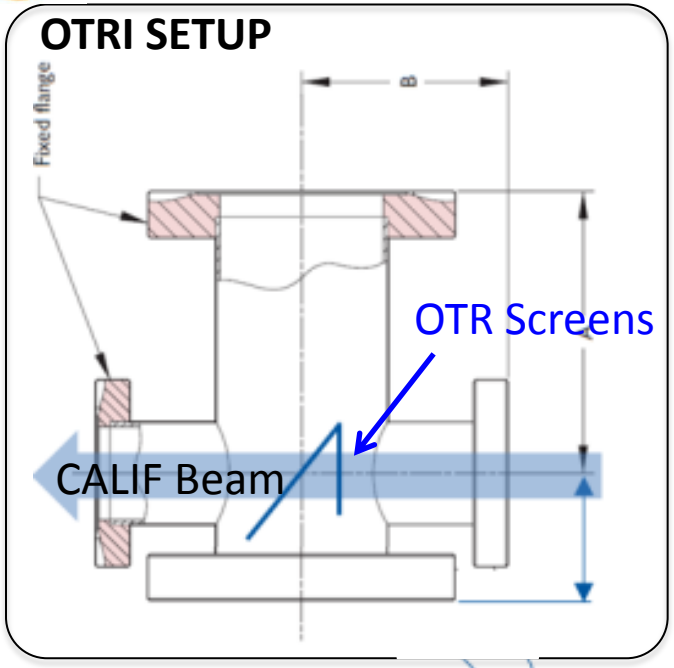
Quartz crystal (PEP -II) and optical fiber
Cherenkov light based: Fast (PEP-II ~ 1 ns) and distributed (optical fibre)

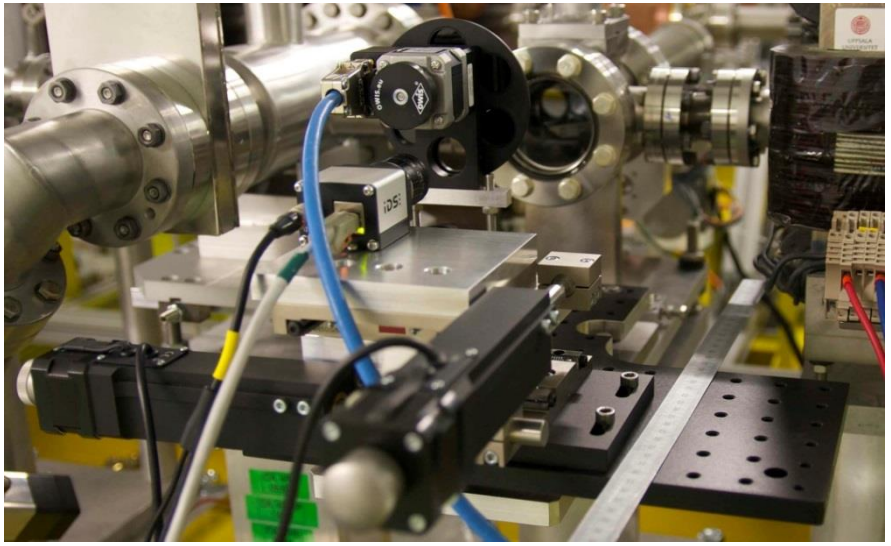
Diamonds
Fast (~ 1ns)

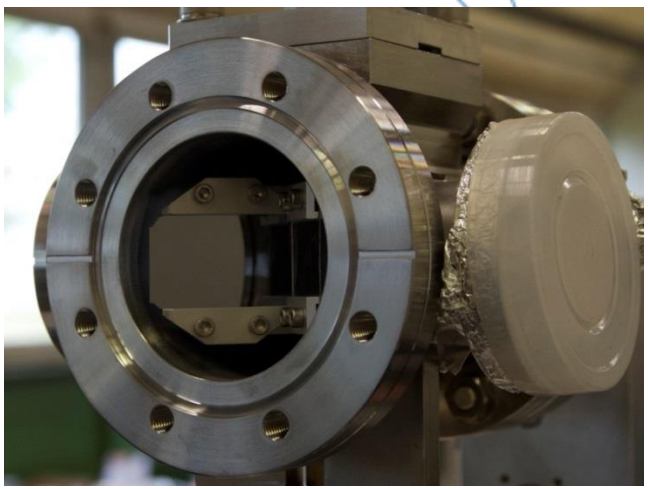
ACEMs (for cross calibration)

OTRI (BI) experiment on CALIFES

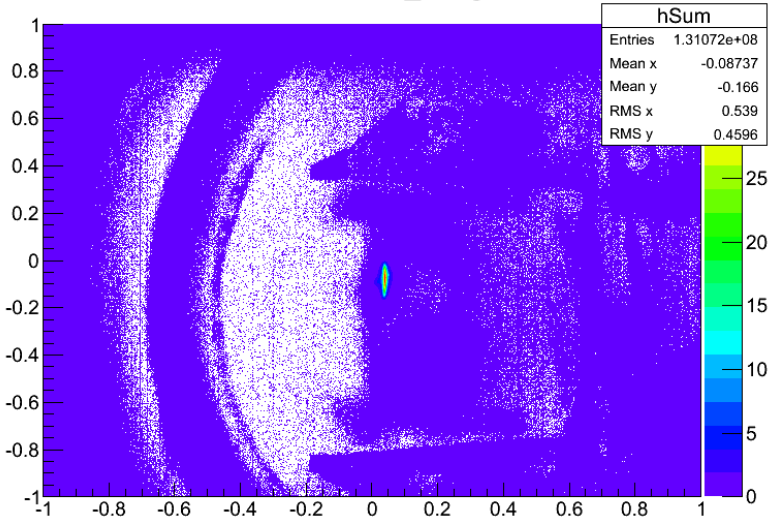
R. Kieffer, S. Mazzoni, E. Bravin T. Lefevre







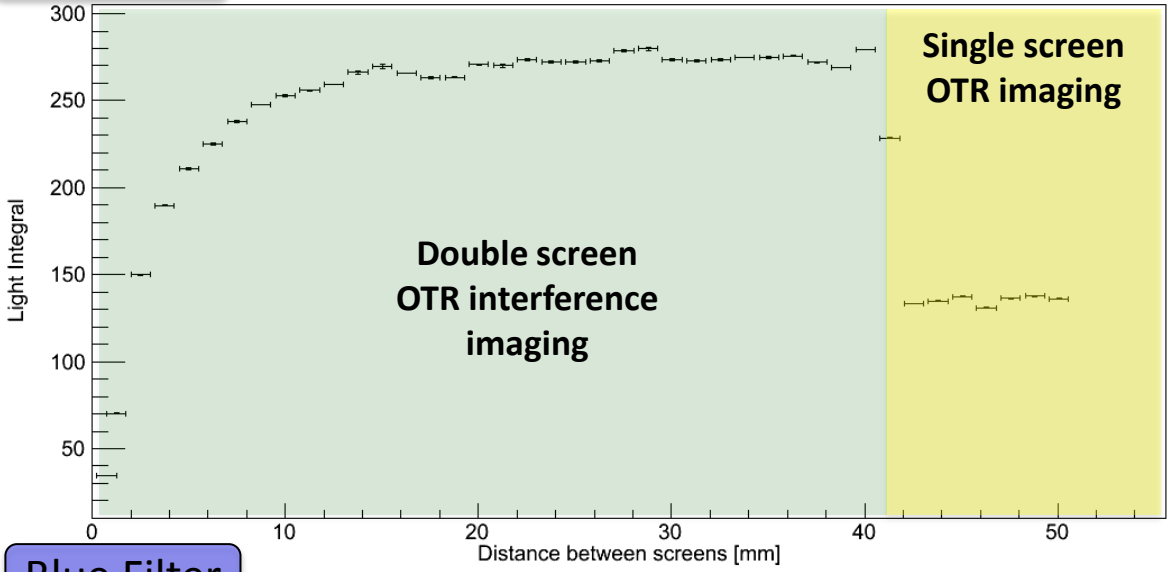
SumedOTRI_Image



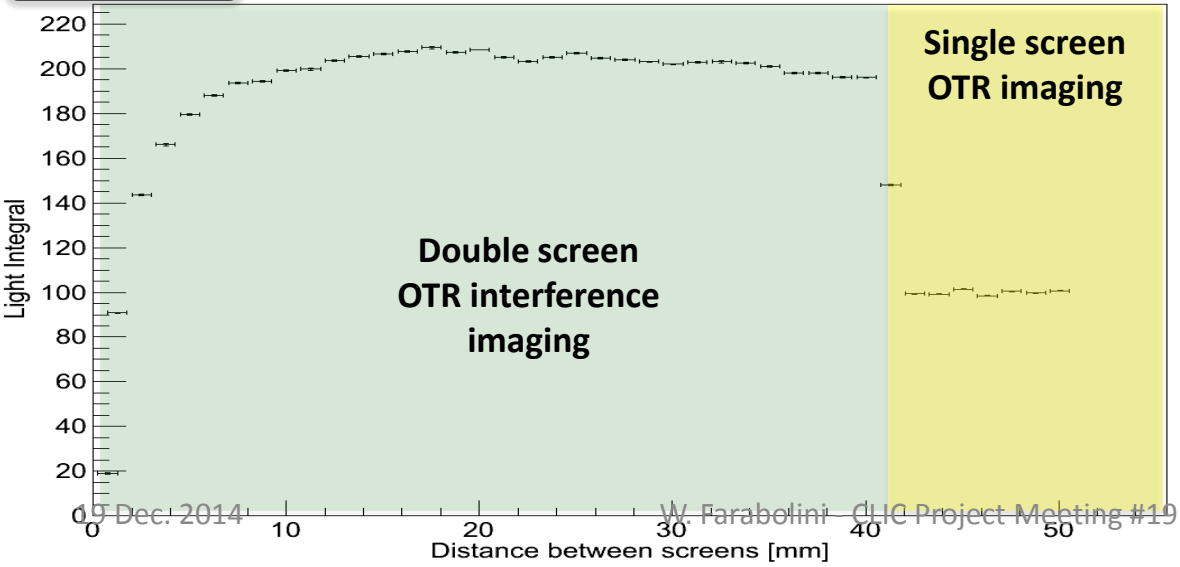
OTRI experiment First Results

R. Kieffer, S. Mazzoni, E. Bravin T. Lefevre

Red Filter



Blue Filter



Purpose:

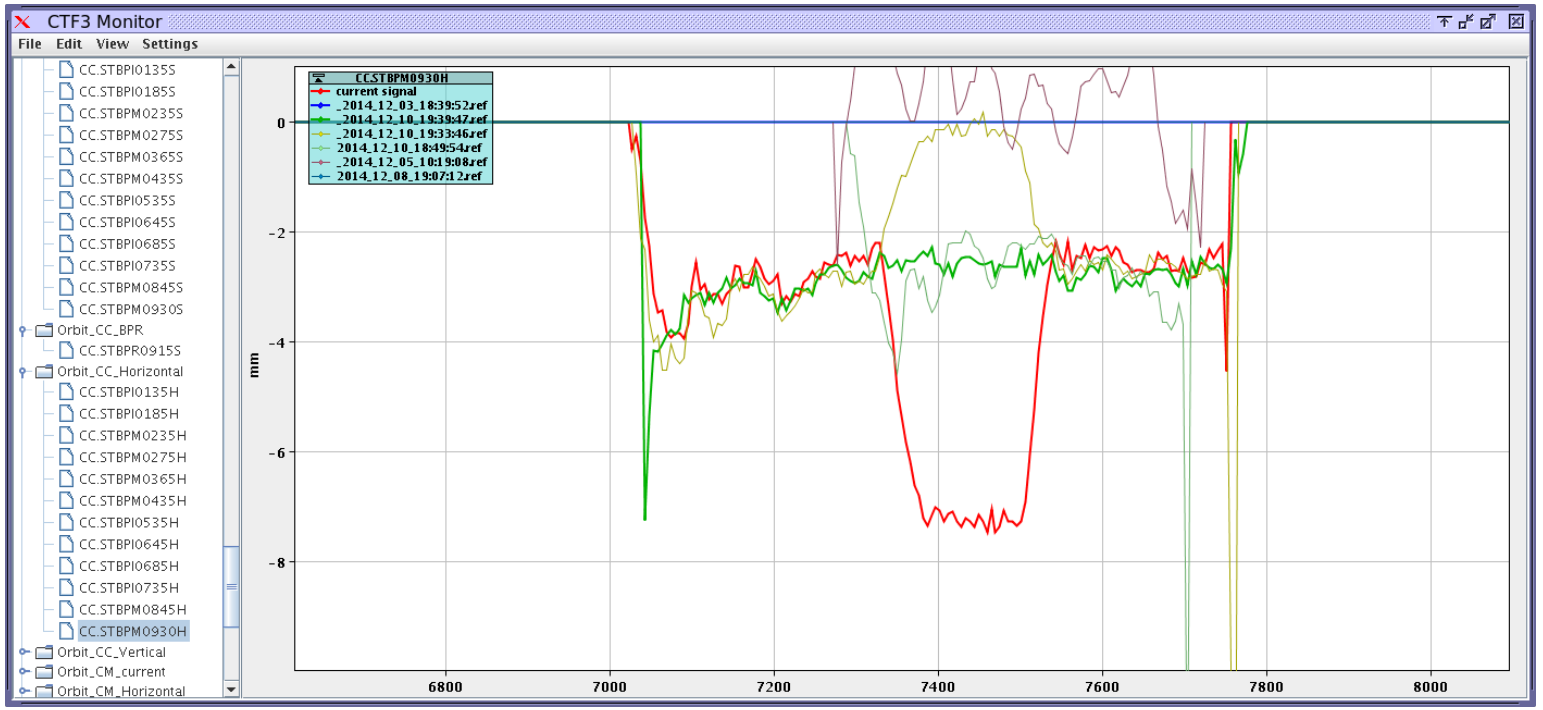
- **Measure the shadowing effect of OTR.**
- **The effect depend on:**
  - **Distance between screens**
  - **Wavelength**
  - **Beam energy**
- **The light is integrated over 100 images for each point.**
- **Light data was compensated according to the beam charge measurement of BPMs.**

Next step: Angular distribution =>Add a lens and put the camera on the focal plane (2015).

Phase Feed-Forward

P. Skowronski

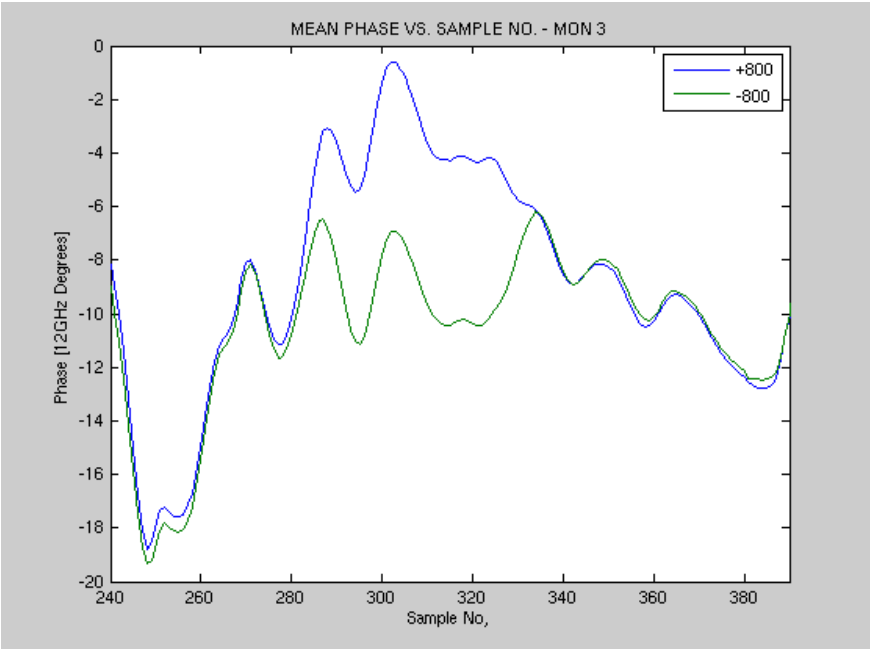
- In October the first amplifier prototype arrived from Oxford, making the PFF system complete
  - This version delivers ¼ of the target power, i.e. 16 kW, what corresponds to +/- 3 deg. range (at 12GHz)
- **Initial tests are very successful:** kicks clearly visible on beam position (response to a square pulse)

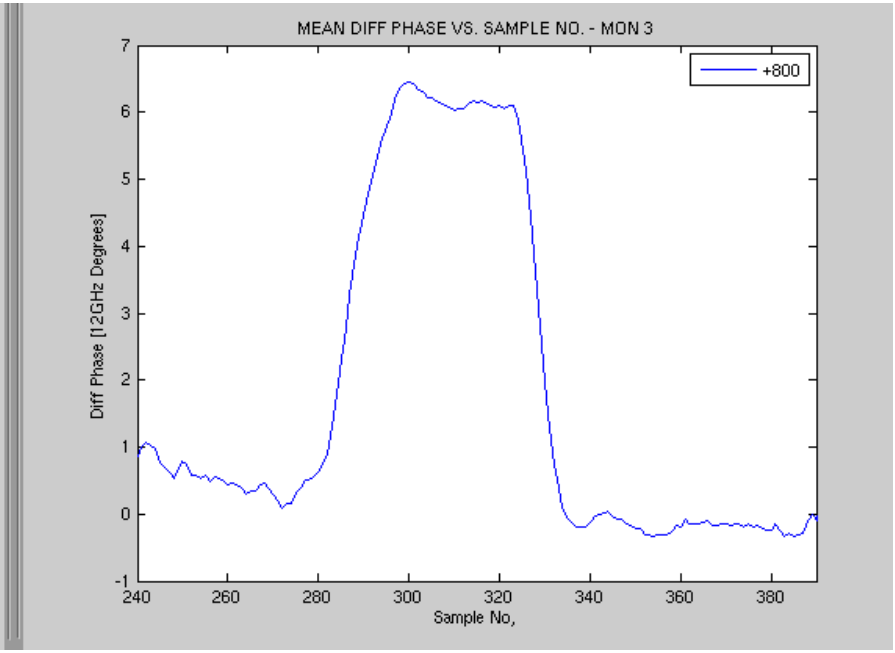


Phase Feed-Forward

P. Skowronski

- In October the first amplifier prototype arrived from Oxford, making the PFF system complete
  - This version delivers ¼ of the target power, i.e. 16 kW, what corresponds to +/- 3 deg. range (at 12GHz)
- **Initial tests are very successful**: and on beam phase

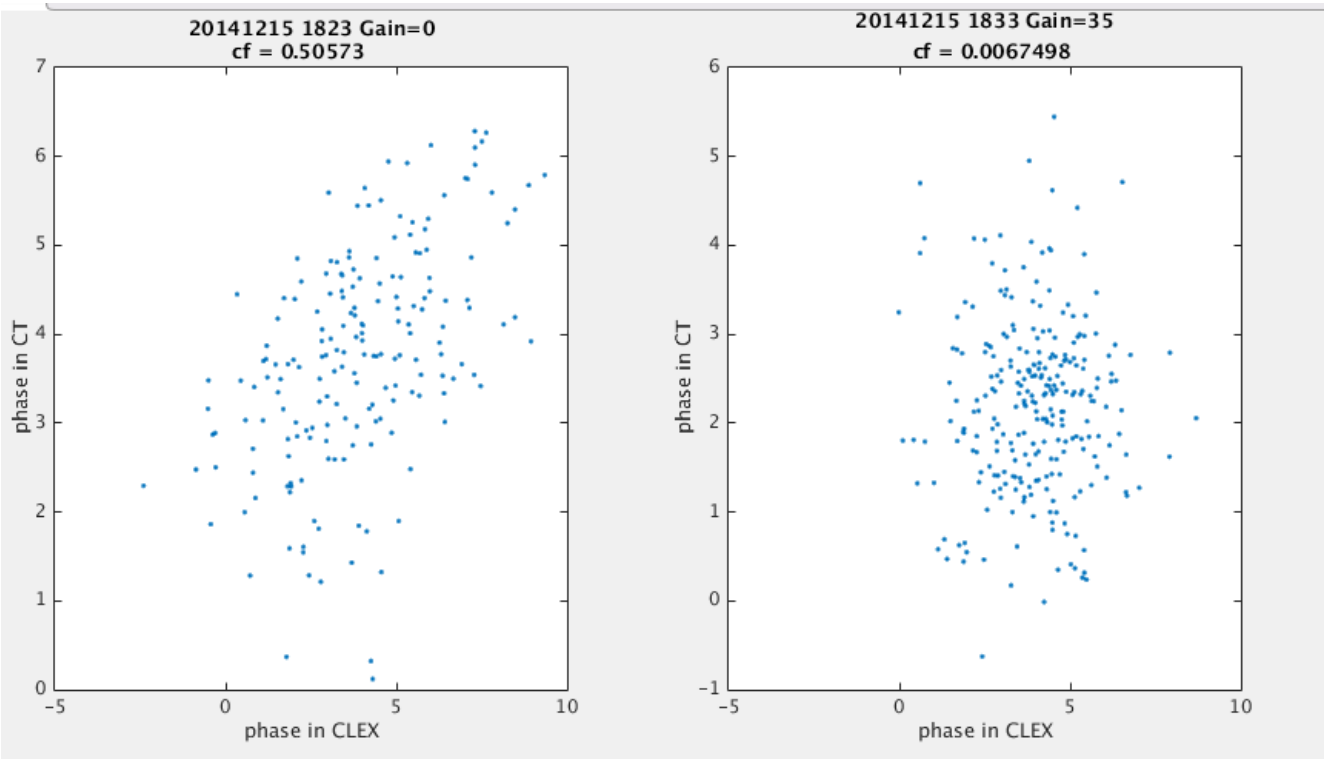




Phase Feed-Forward

P. Skowronski

- In October the first amplifier prototype arrived from Oxford, making the PFF system complete
  - This version delivers ¼ of the target power, i.e. 16 kW, what corresponds to +/- 3 deg. range (at 12GHz)
- **Initial tests are very successful**: the phase jitter observed behind the Stretching Chicane is removed

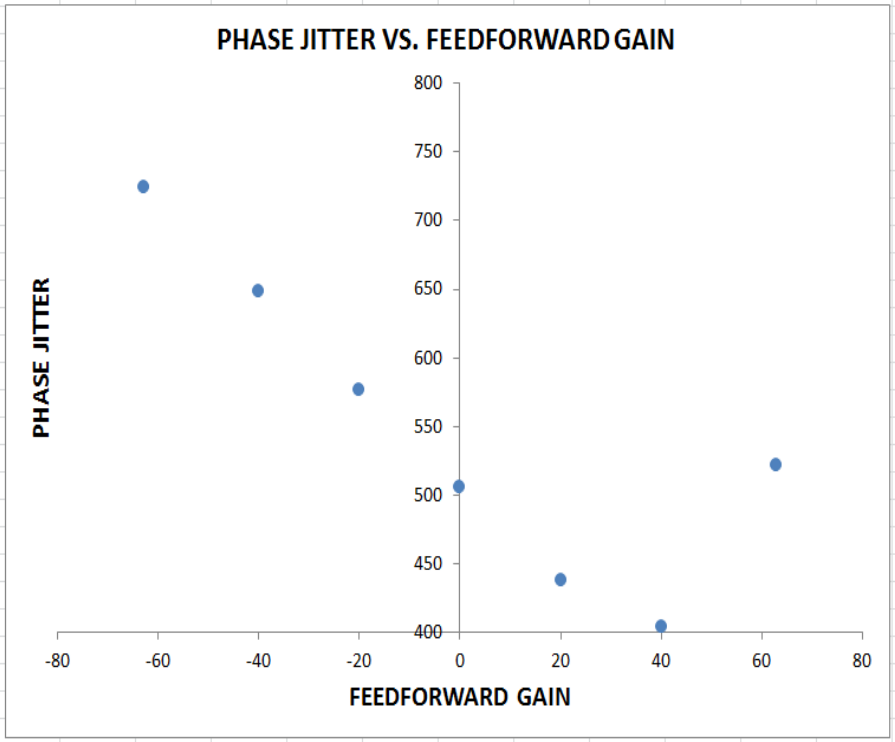


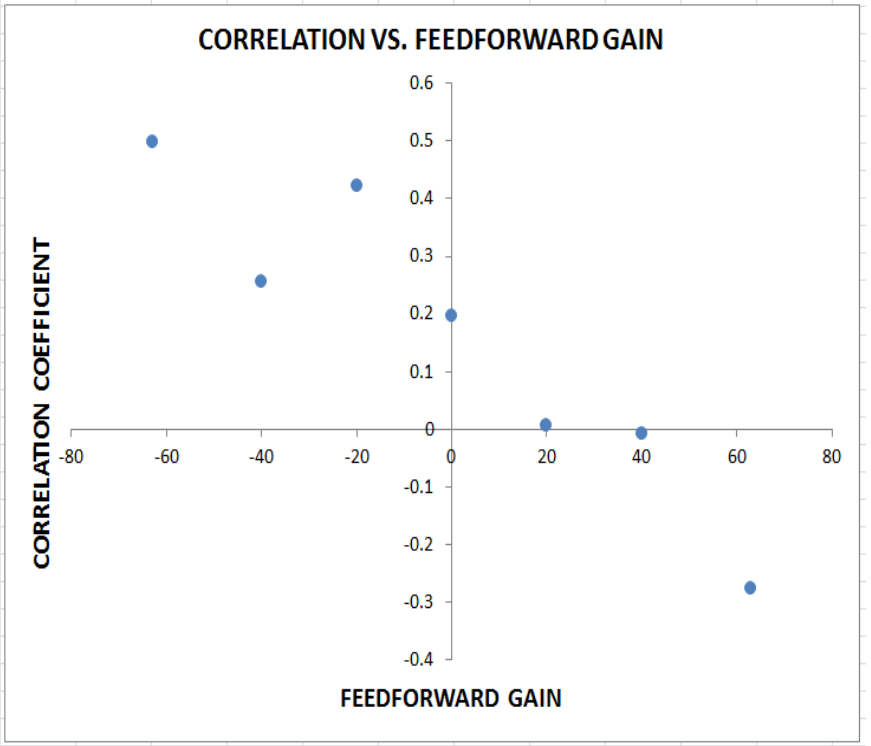
Phase Feed-Forward

P. Skowronski

- The correlation Gain scan
  - The jitter is minimized and the correlation removed at the same value of gain

[au]





Phase Feed-Forward

P. Skowronski

- Unfortunately, the phase error in CLEX is not 1 to 1 with the one from the linac
  - Only 50 – 60 percent of correlation
  - The source of the additional error not yet understood, it seems it is related to the gun current ripple
  - There are 2 independent monitors in CLEX and their readings are 90% correlated → it is not the monitor problem
  - Data for analyses were collected and hopefully we will be able to improve the situation for the next run
- In order to test the system we induced phase errors in the injector, both pulse to pulse and intra-pulse
- Detailed results to be presented during the workshop

Conclusion

- TBM has been successfully installed during summer shutdown. The difficulties encountered will drive some improvements in the conception of the module. Great care was paid to the alignment of all the equipment.
- TBM is fit with many diagnostics and controls that promise a lot of exciting experiments.
    - Long life to TBM ! – Long life to CTF3 !

And than you for your attention