CLEX Two Beam Module lessons learned

- Superstructure SAS
- Installation
- Integration
- Alignment
- Experimental Program in CFLEX

CLEX experience review

Summary of the CLEX module production and installation review
Review held the 25.2.2015 in the module working group
Presentation can be found at: http://indico.cern.ch/event/366835/

- Superstructure SAS too complicated and fragile object, design issues identified
  → SAS design needs to be reviewed fundamentally, taking into account rf design changes; will be followed by Nuria's team

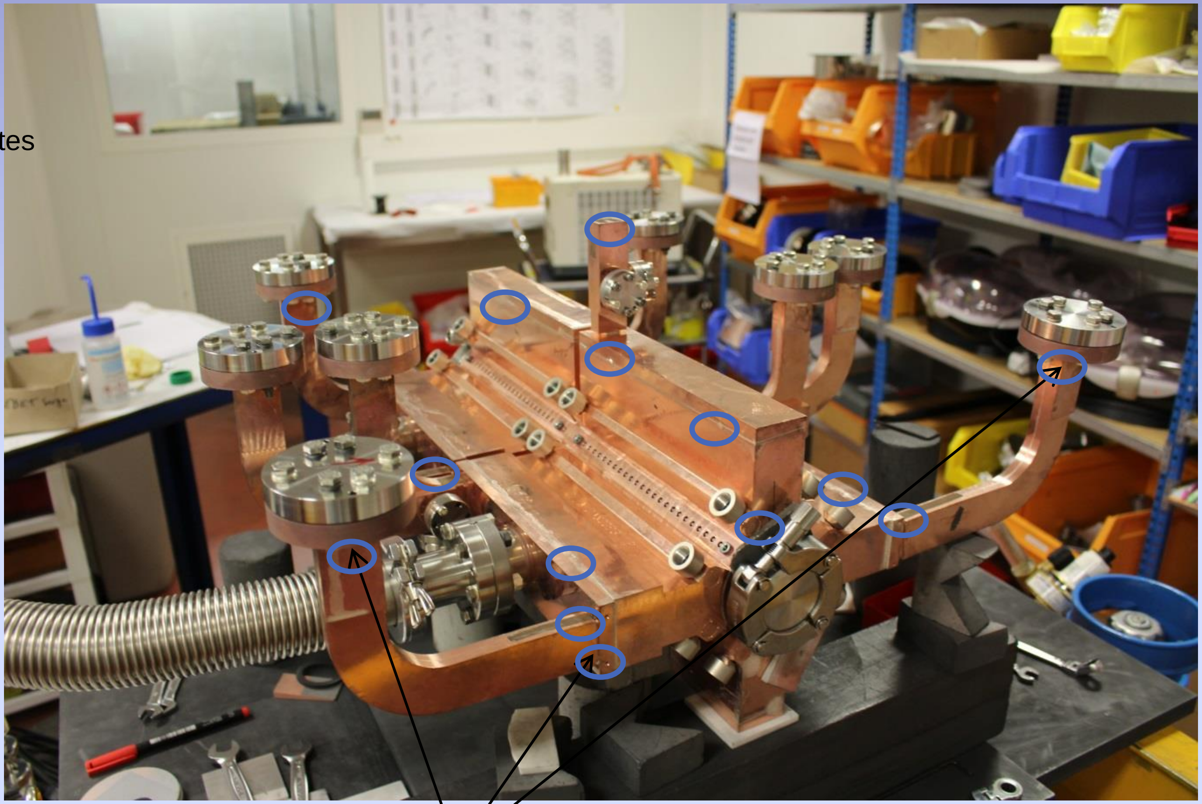
- Improve and integrate cooling system design of modules, fix BPM to quad, how to align the structures longitudinally, better integration of subsystems (BLM's, cables other sensors)

- Alignment issues identified, placing of fiducials, link between girder and cradles lost, motor failures, coupling of main and drive beam, BPM and Quad have o be linked
  → improve integrated design, follow up with more measurements

- Compact loads needed

- General communication issues, more exchange needed between rf-design, mechanical design, experimental team, diagnostics and magnets.
  Several waveguides had the wrong phase

Final leak check
CLEX Module experience review



Localisation principale des fuites

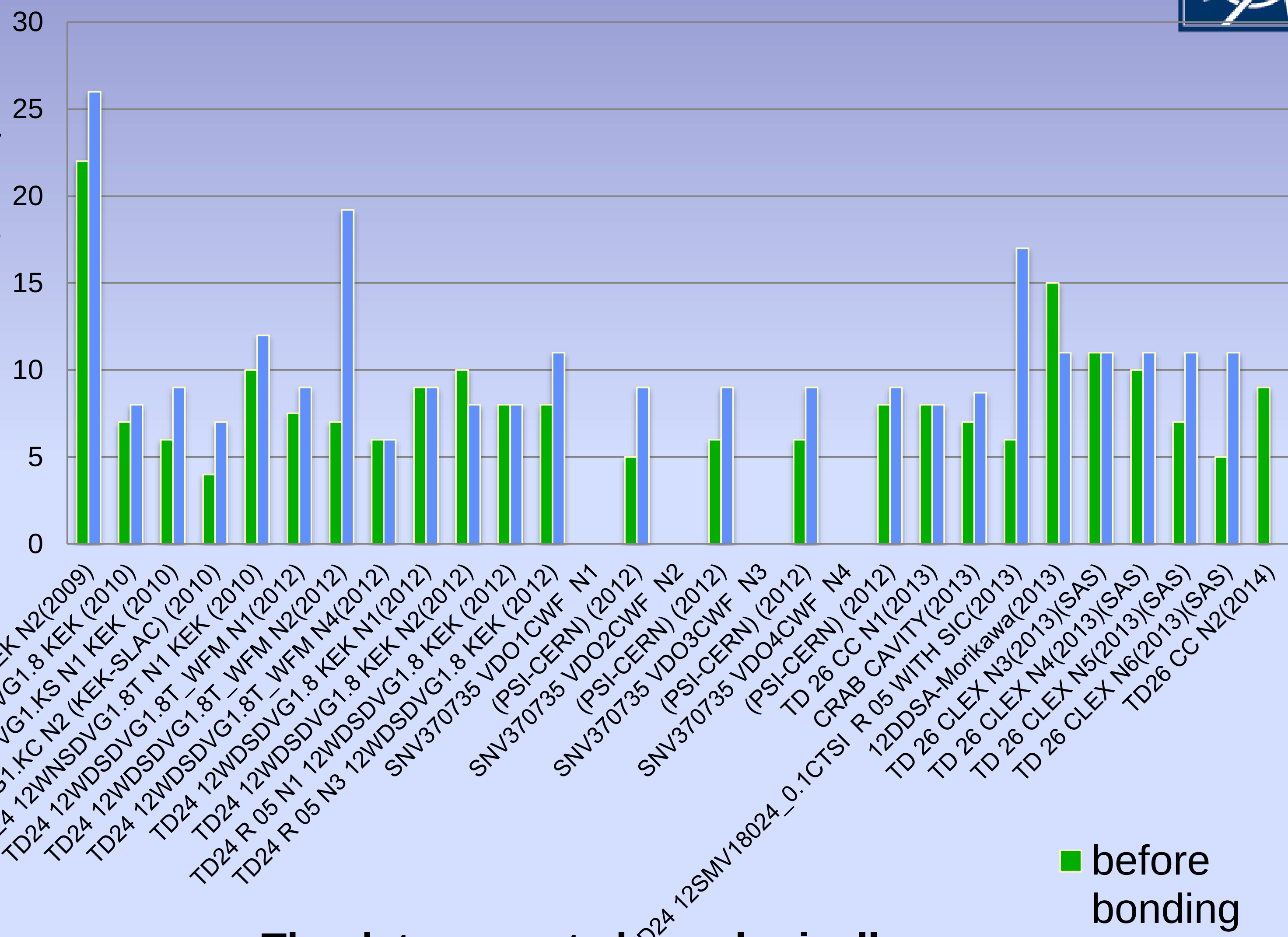
Attention au serrage des brides un gros risque de vriller les guides d'onde , risque de fissures en dessous des brides
Prévoir un outillage pour bloquer les guide et WFM

Serge Lebet

History Chart

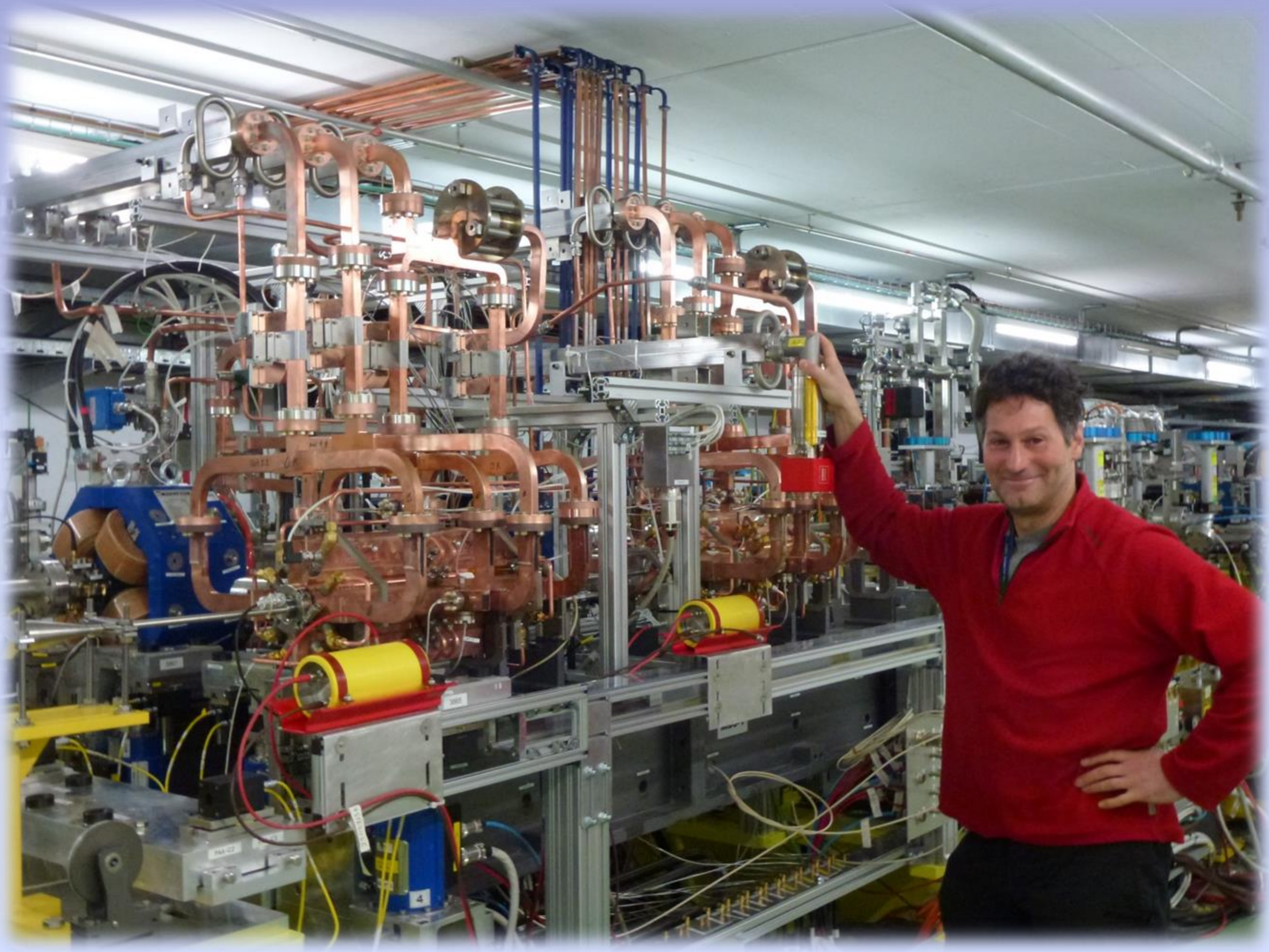
For the chart have been used the maximum measurements for each structure

μm



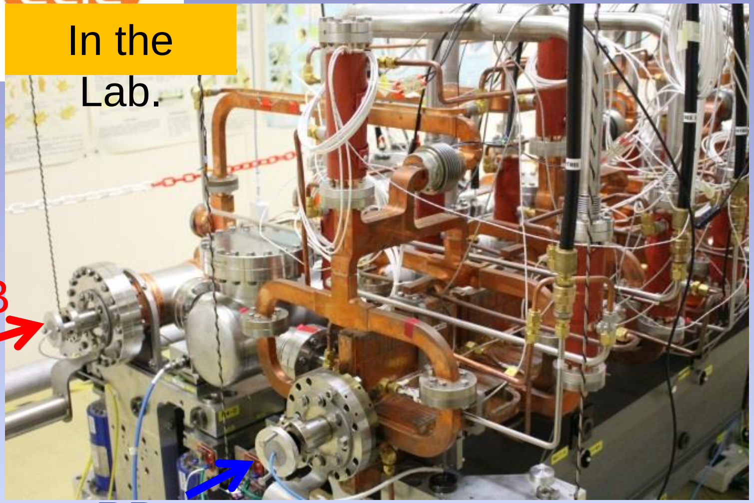
The data are set chronologically

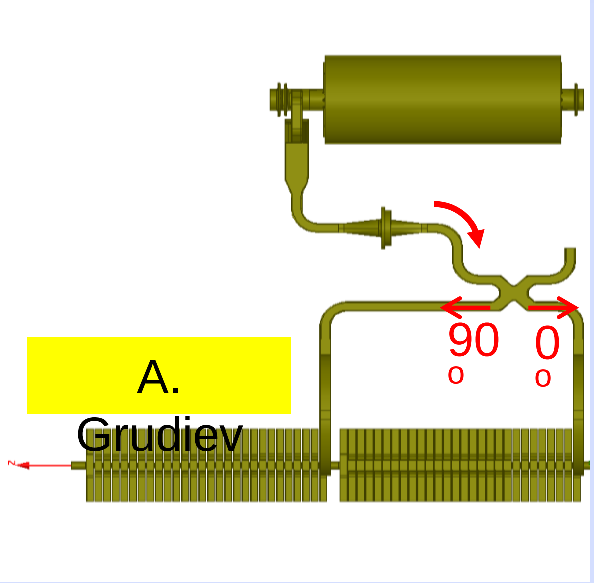
First CLIC prototype module completely installed in CLEX



Big thanks to everybody helping to get it done !

RF network

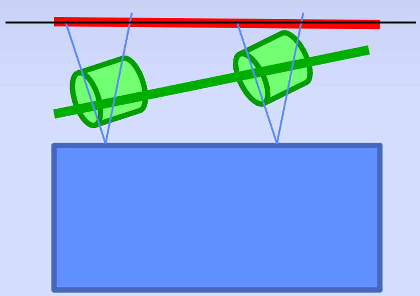


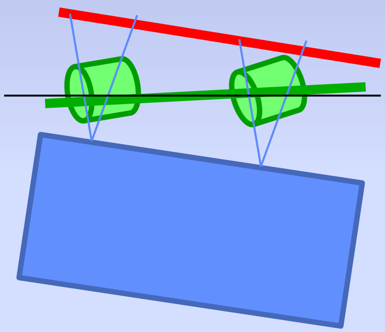


CLEX Alignement

Component Drive Beam		Radial (µm)	Vertical (µm)	Error budget (µm)
PETS1	Enter	65	37	100
	Exit	-27	15	100
DBQ1	Enter	-9	-4	20
	Exit	-2	19	20
PETS2	Enter	28	78	100
	Exit	-51	58	100
DBQ2	Enter	8	11	20
	Exit	-3	-14	20

Component Main Beam		Radial (µm)	Vertical (µm)	Error budget (µm)
AS1	Enter	-51	-59	10
	Exit	-161	-16	10
AS2	Enter	-68	-85	10
	Exit	-139	-103	10

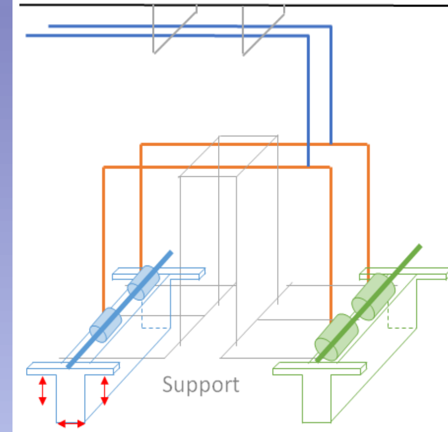




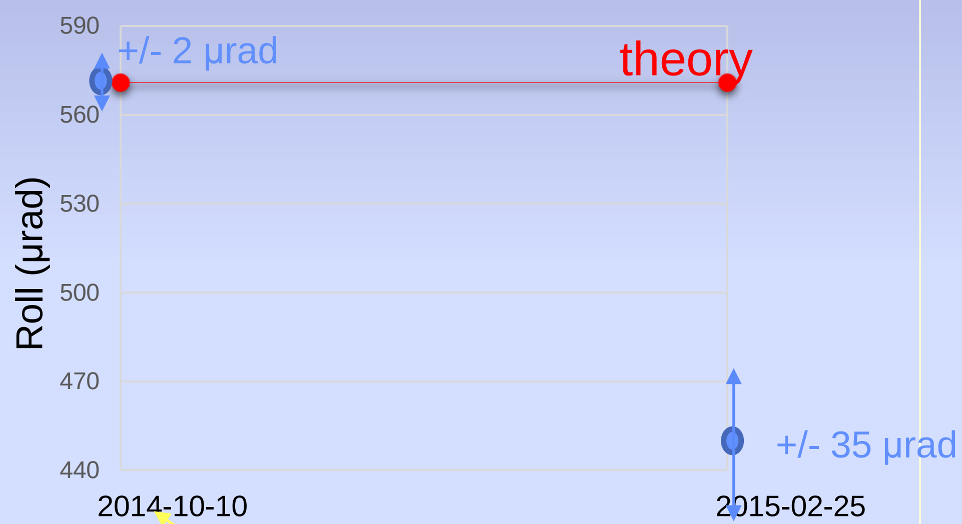
Component Main Beam		Radial (µm)	Vertical (µm)	Error budget (µm)
AS1	Enter	29	-24	10
	Exit	-65	39	10
AS2	Enter	46	-8	10
	Exit	-10	-7	10

Vivien Rude

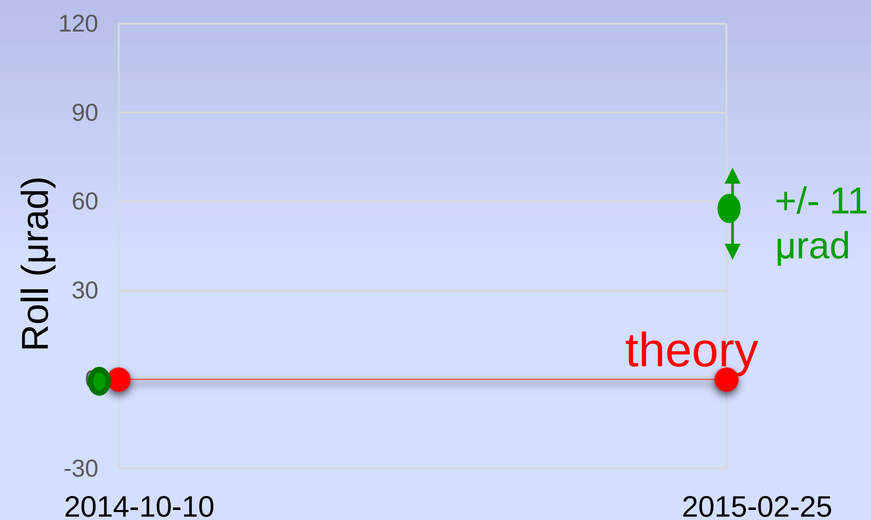
CLEX



Roll (Drive Beam)



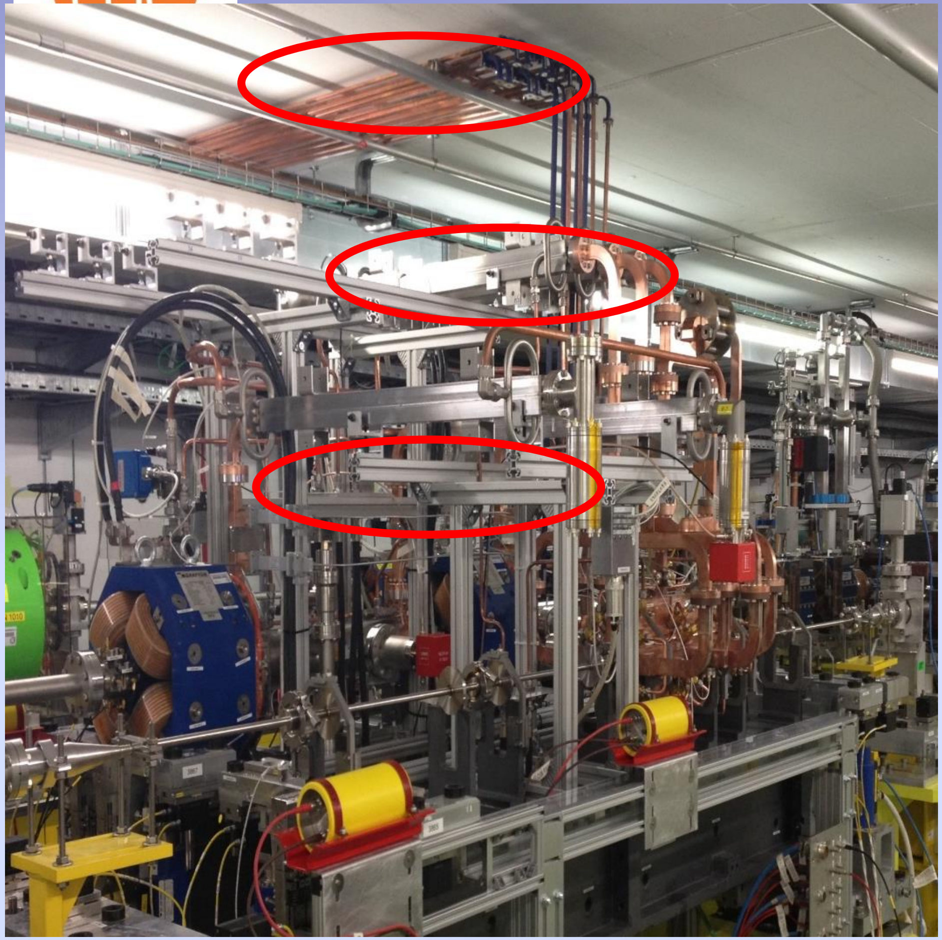
Roll (Main Beam)

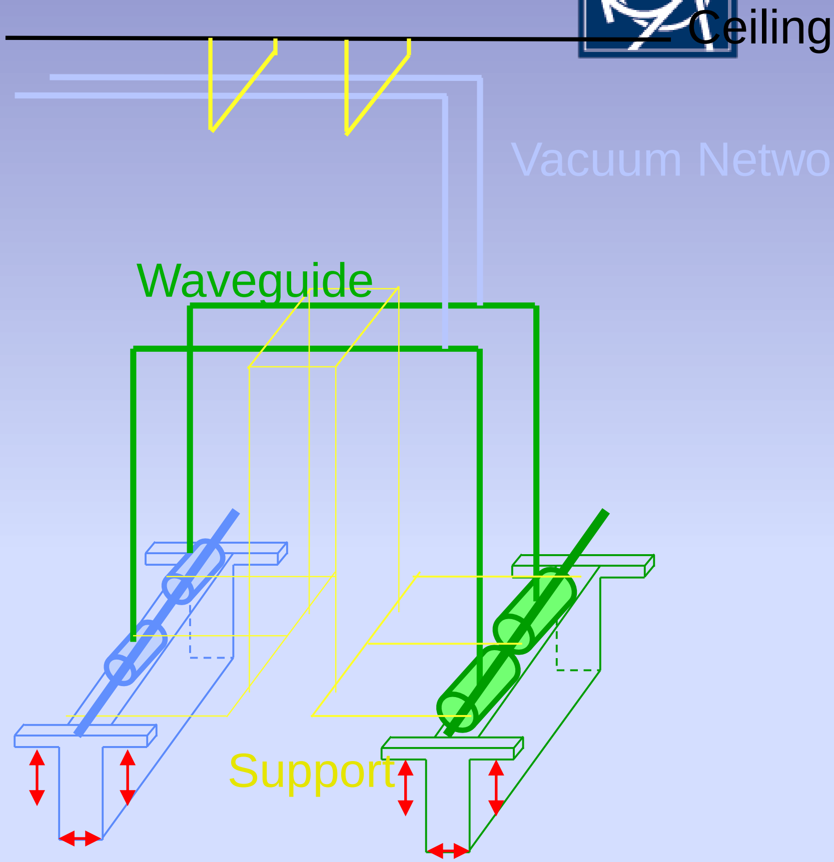


Drive Beam	Theory	Without constraints	End of installation	Difference
Roll (µrad)	571	573	449	*124 µrad*
Radial (µm)	232	237	173	*64 µm*
Vertical (µm)	0	0	1	*1 µm*

Main Beam	Theory	Without constraints	End of installation	Difference
Roll (µrad)	0	0	56	56 µrad
Radial (µm)	0	0	43	43 µm
Vertical (µm)	0	0	2	2 µm

CLEX constraints





Constraints due to :

- **Connection to the waveguide**
- **Connection to the vacuum network**
- **Support**

Experimental program for the CLEX module

List of ideas

- Two beam acceleration, rf signal consistency, power transfer, acceleration, phasing, breakdown handling, …
- Alignment studies, with and w/o beam, girder coupling, beam based alignment using WFM and BPM data, perturbation by accelerator noise, precision , reproducibility, fiducialisation, reliability
- BPM studies, resolution, performance
- Wake Field Monitor studies, electronics, resolution
- Temperature management, control flow rates, temperatures, measure changes in beam environment
- Find, understand and possibly solve shortfalls of present systems

Conclusions

- Huge piece of work but finally successfully installed
- Very valuable experience because much closer to the real requirements, vacuum, integration into a real machine, real rf structures which need right phase and calibration
- A big step towards a realistic module even if it is quite different then the CDR module
- First results with beam and from alignment confirm the importance of that module