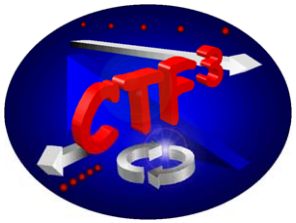
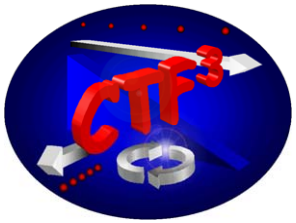


Status of CTF3

G.Geschonke
CERN

Collaborating institutes



Countries	*Funding Agencies*	*Laboratory*
	CERN	CERN
FINLAND		Helsinki Inst of Phys (HIP)
FRANCE	CEA	DAPNIA Saclay
	CNRS/IN2P3	LAL
		LAPP
		LURE
INDIA*	Indian DAE	RRCAT, Indore
ITALY	INFN	LNF
PAKISTAN	PAEC	NCP
RUSSIA		Budker Inst (BINP)
		IAP
	Dubna	JINR
SPAIN	Ministry of Education & Science (MEC)	CIEMAT
		UPC
		IFIC
SWEDEN	Swedish Research Council Wallenberg Foundation	Uppsala University
		TSL
SWITZERLAND		Paul Scherrer Inst (PSI)
TURKEY		Ankara Univ Group (2)
UNITED KINGDOM	STFC	J.Adams Institute
USA	DOE	Northwestern Univ Illinois (NWU)
		SLAC
		JLAB

18 members involving 24 Institutes

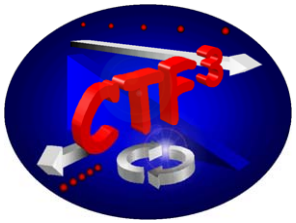
3 new institutes

* India and Pakistan have not signed the CTF3 MoU, but have an agreement with CERN

Discussions with : UK (Cockcroft Institute), EPFL, INFN Milan, Ukraine, Oslo

Past collaboration with RAL within PHIN

News



news from CERN:
"White Paper" has been approved by Council

		2008	2009	2010	Total
Material budget (kCHF)	Present MTP	4180	3550	3500	11230
	Additional LTP (White Paper)	4000	4000	4000	12000
	12 GHz power test stand	1050	1350	100	2500
	Total resources	9230	8900	7600	25730
Man-Power (kCHF/FTE)	Present MTP (175 kCHF/FTE)	8480/48.5	5355/30.6	5565/31.8	19400/110.9
	Add. White Paper (125 kCHF/FTE)	1250/10	3250/26	3000/24	7500/60
	12 GHz test stand	375/3	250/2	125/1	750/6
	Total resources	10105/61.5	8855/58.6	8690/56.8	27650/176.9
	Present staff (APT)	6055/33	6145/33	5923/31	18123/97
	New staff position	4050/28.5	2710/25.6	2767/25.8	9527/79.9

News

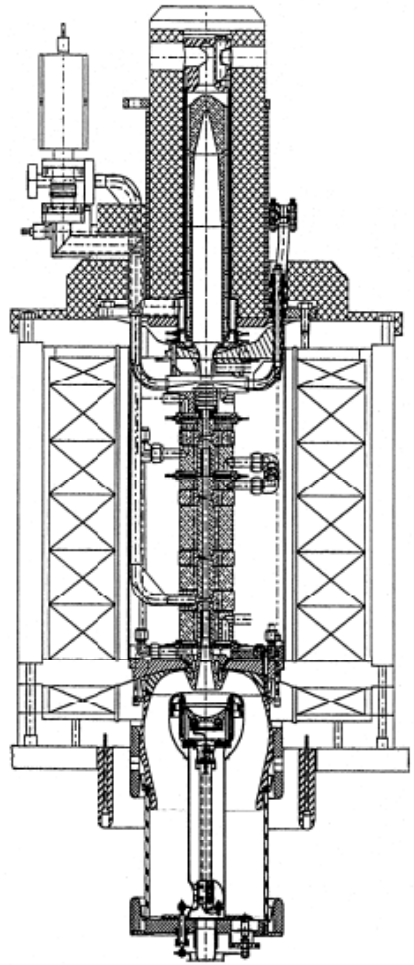
12 GHz stand-alone power source approved

klystron being ordered

Operating April 09 (at the earliest)

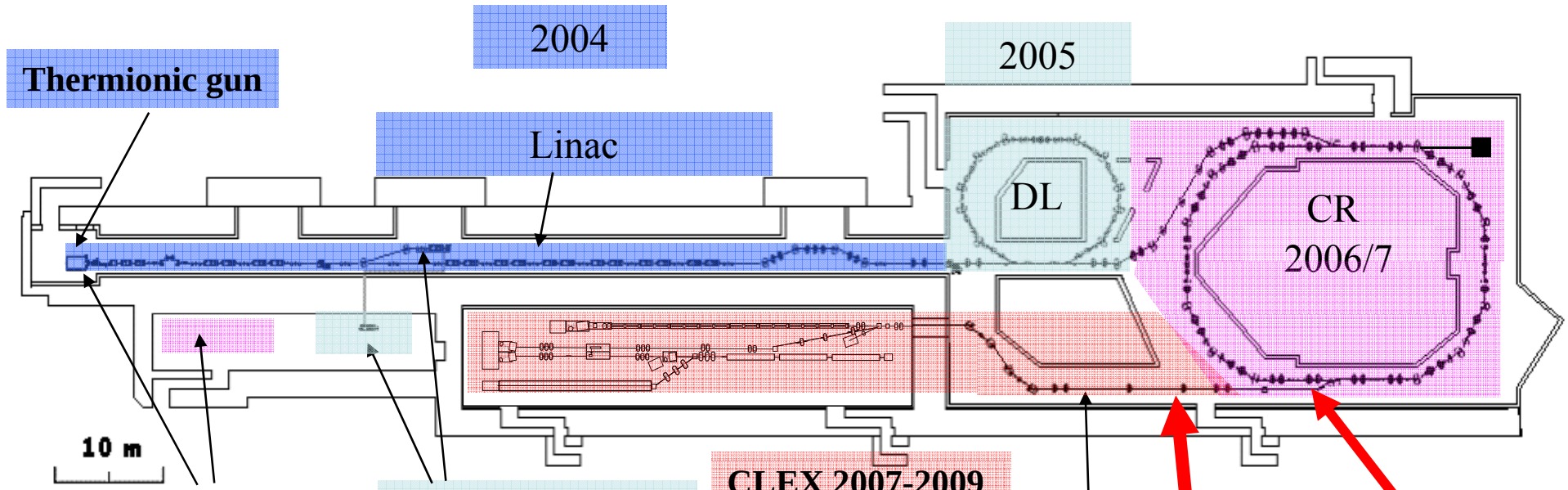
Independent 24/7 testing with fast turn around
Variable pulse length
High repetition rate
Easier to operate

30 GHz programme nevertheless continues in 2008



Derived from NLC 11.4 GHz klystron

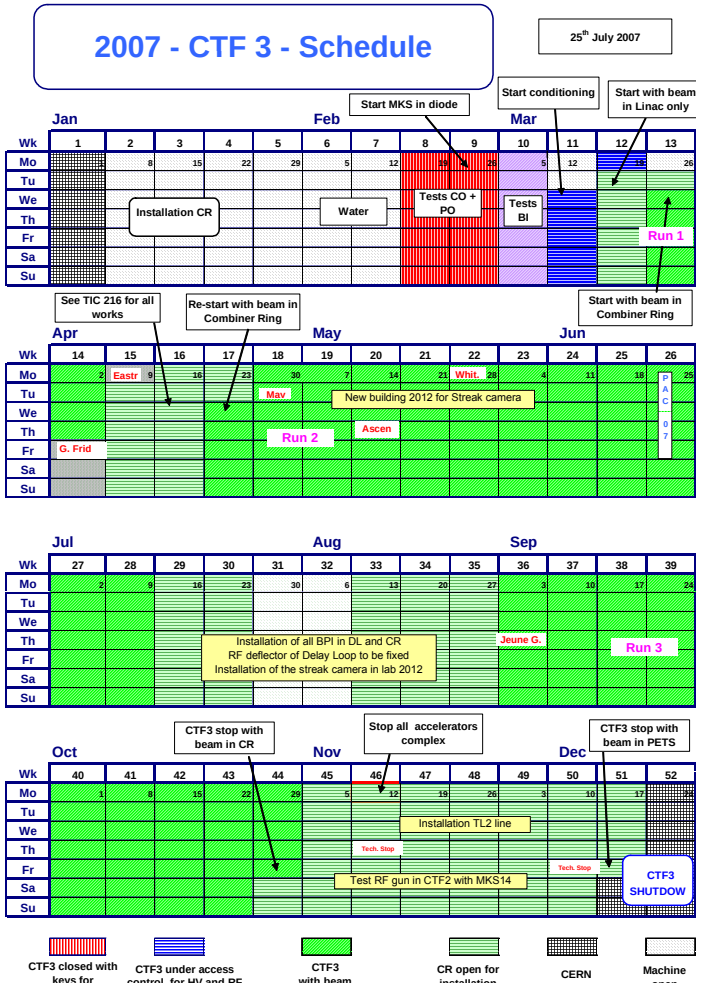
Present CTF3 status



Laser at CERN, not finished
RF gun under construction

TL2 / TL2' installation ongoing, commissioning start in April 2008

Operation 2007

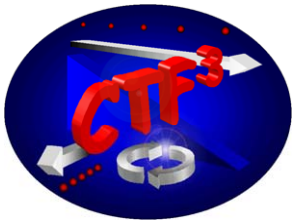


commissioning of CR:
a bumpy start with many problems,
optics studies,
finally good result.

challenging new instability discovered,
possible explanation: Vertical mode in RF deflector
Delay Loop not used

Operation for 30 GHz:
at nights and weekends, finally share with commissioning in bigger blocks

Operation 2007



- teething problems with modifications to the controls system (improved during the year)

- vacuum leak in dog-leg, ➔ **chamber to be replaced in shut-down**

- two vacuum leaks after injector in vacuum bellows
  cause: dark current from gun

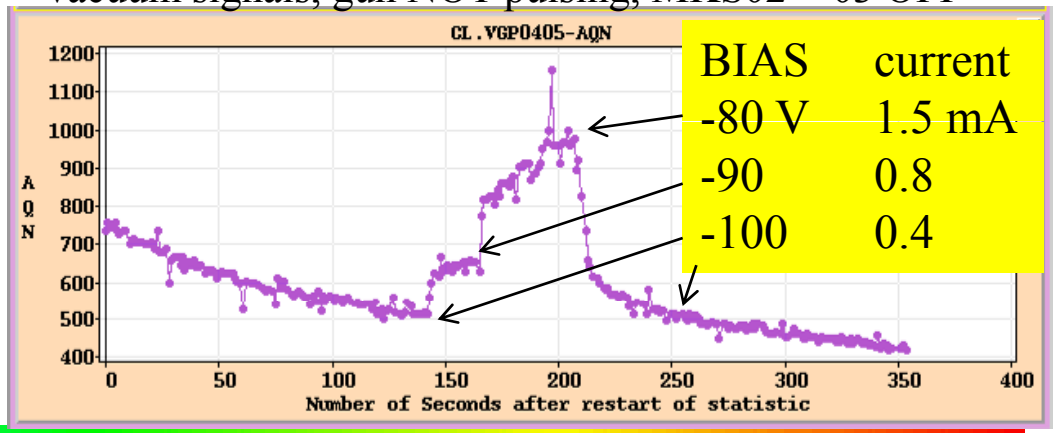
- e-gun problem:
  two cathodes had to be exchanged
  unstable operation ➔ **consolidate gun**

- RF power sources:
  three klystrons needed replacement
  several charging power supplies failed ➔ **new supplies**
  lower beam energy

Dark current

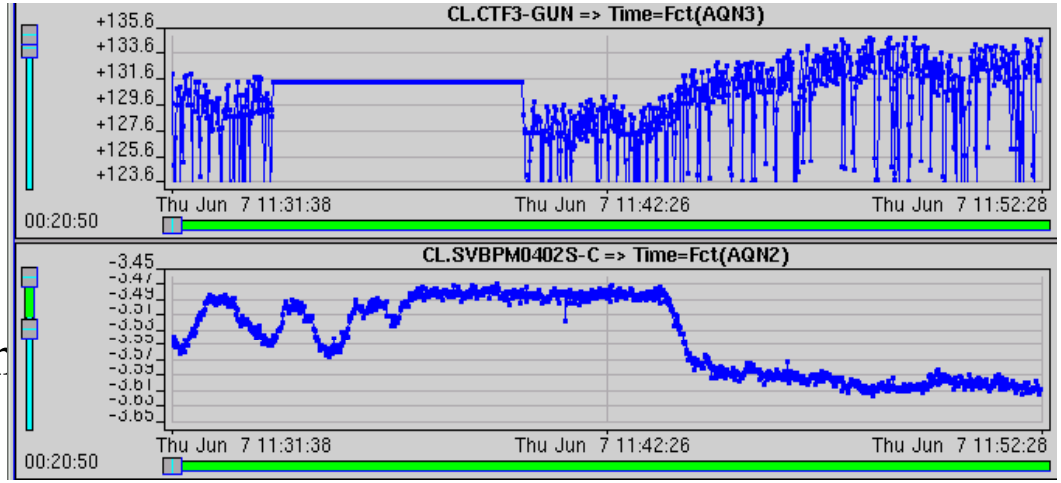
- 2 Oct: high dark current after cathode change
- 9 Oct: vacuum leak after solenoid exit (CL.0405)
- 15 Oct: restarting, almost 10 mA dark current, try to fix
- 23 Oct: restarting commissioning
- 20 Nov: new leak at same location
- 25 Nov: restart, temperature probe installed
- Conclusions: Vacuum activity and local temperature at the leak
  - NOT correlated to
    - beam pulsing or not
    - RF on or off
  - BUT are correlated to
    - gun average current readings
- Dark current (cw) from gun responsible for leaks

Vacuum signals, gun NOT pulsing, MKS02 + 03 OFF



Gun current variation

- We observed current variations caused by HV change
  - Small HV variations not obvious since acquisition is noisy



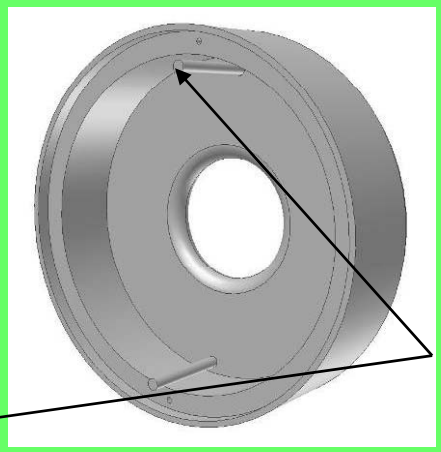
- Could trace them to the gun regulation:
  for a high dark current
  the gun changes from current to voltage regulation and lowers the HV to limit the current
- Could be fixed by increasing the threshold for switching
- But the problem reappeared …

Instability (cont.)

- The pattern is very repetitive
  - On the plot we see several consecutive shots

P.Skowronski

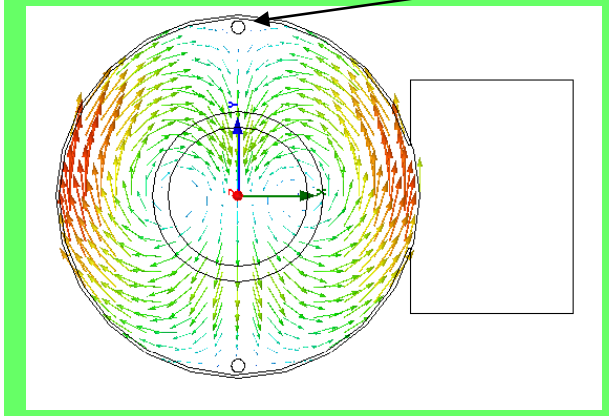
VERTICAL MODES IN THE RF DEFLECTORS (1/2)



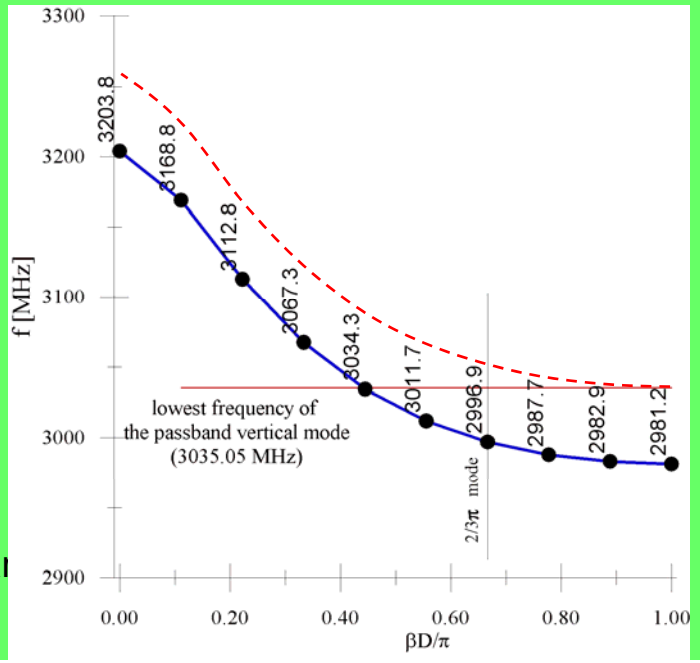
D.Alesini INFN

Metallic rods have been inserted to split in frequency the deflecting mode with vertical polarity.

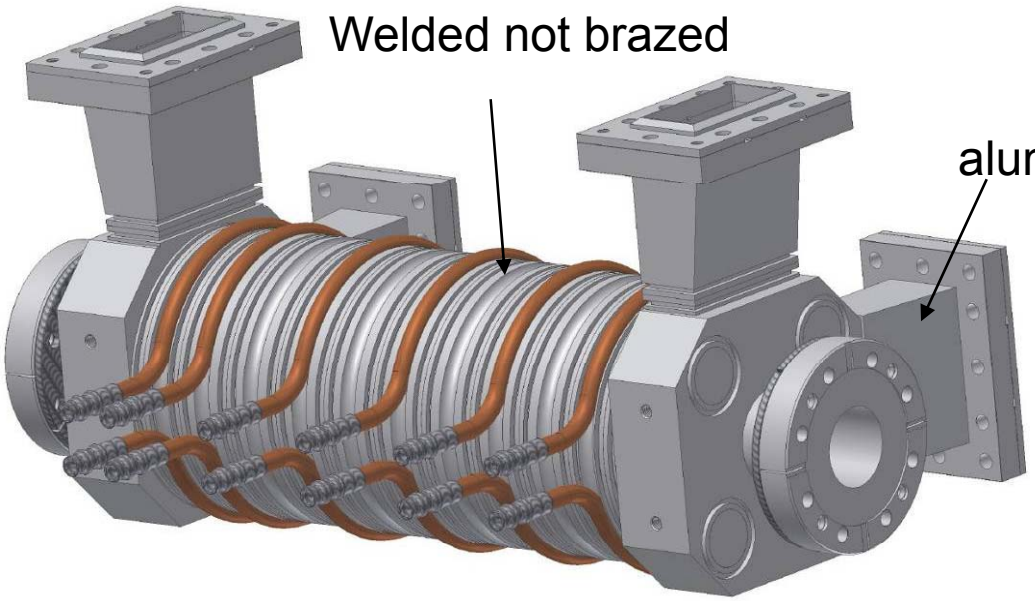
The dimensions and position of the rods have been choosed inorder to avoid the excitation of the vertical modes from the beam power spectrum line at 2.8855GHz and RF generator.



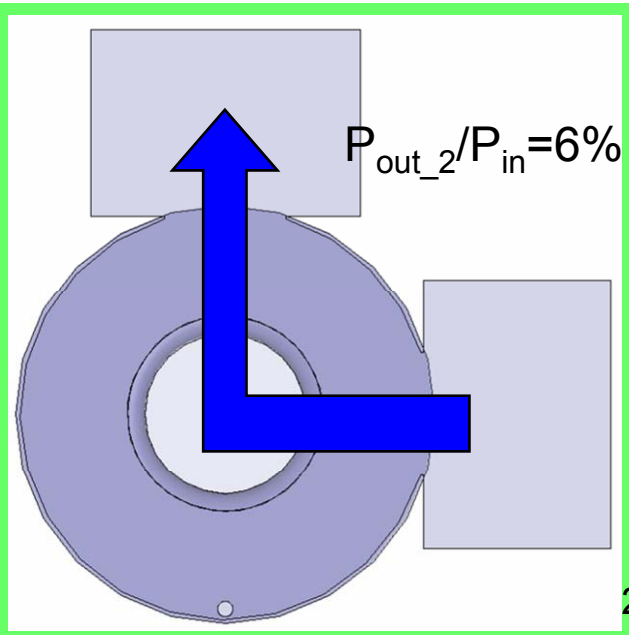
The vertical modes have been measured before the final assembling of the structure and the sampled dispersion curve has been obtained.

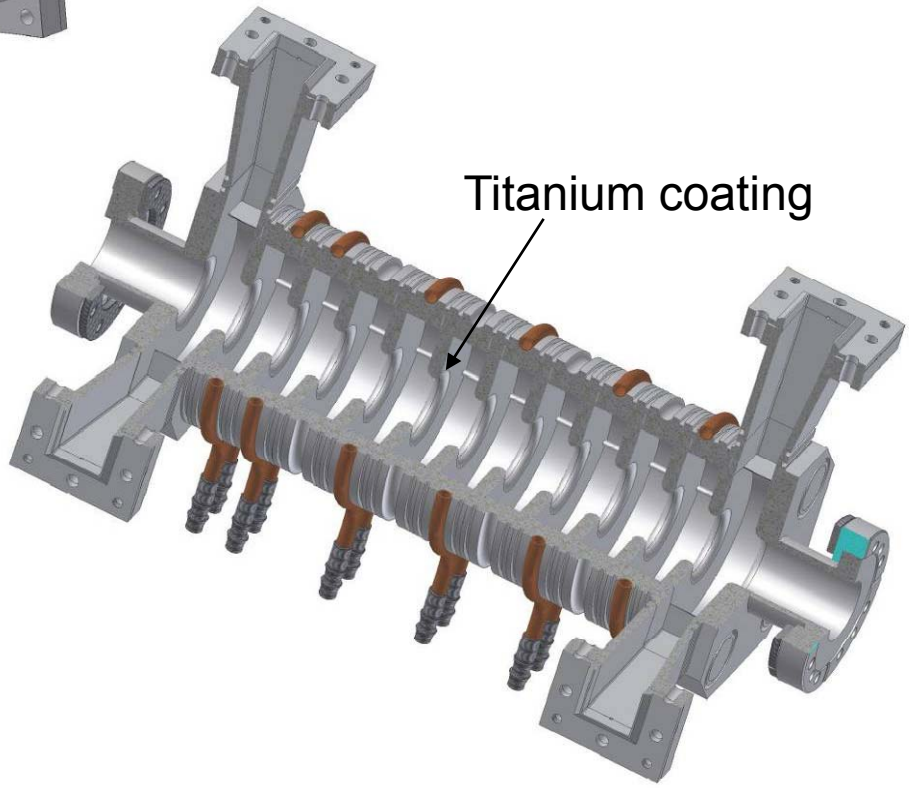


NEW RF DEFLECTORS



D.Alesini





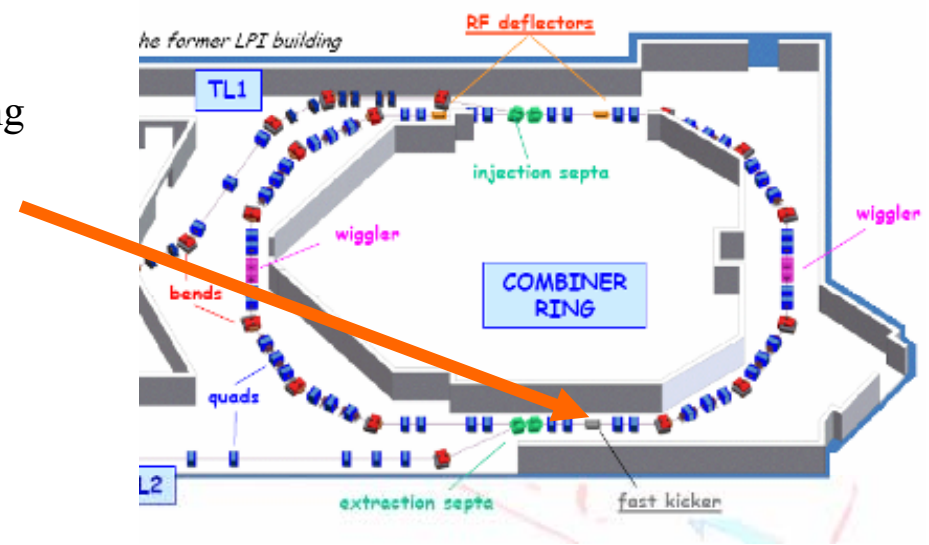
Collaborat
2008 G.Ge

Ongoing work: Combiner Ring

new extraction kicker for Combiner Ring
(lower impedance):

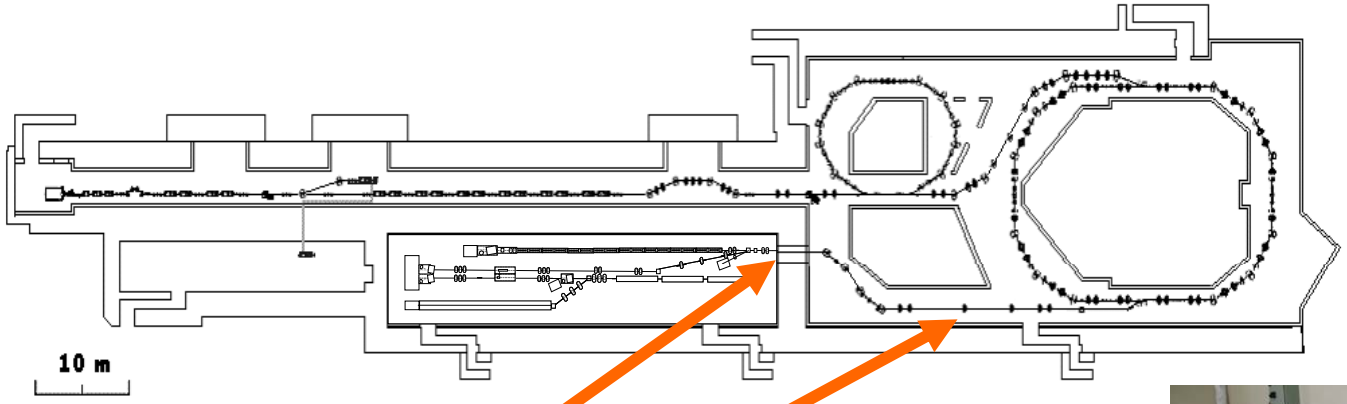
Stripline kicker made by Ciemat,
pulser from CERN

will be installed during this shut-down



Large campaign to align Beam Position Monitors
during this shut-down

Work for the next phase



Optics for TL2 (RRCAT)
Optics for TL2' (CERN)

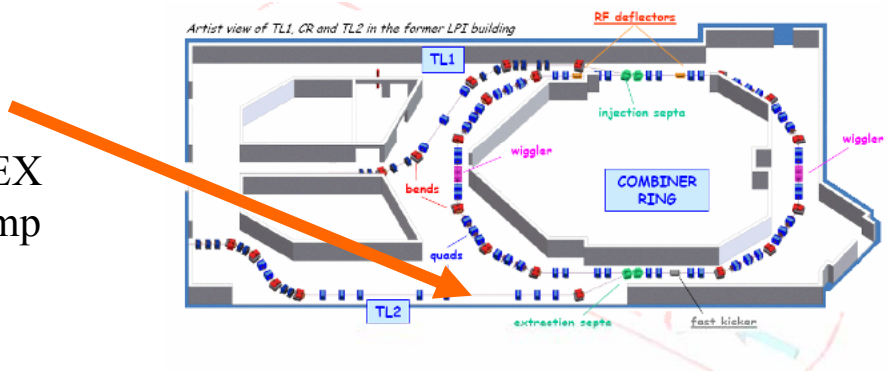
detailed layout TL2 and TL2' finished,

all components ordered
- magnets : RRCAT, TSL, CERN
- vacuum components: AL chambers: RRCAT
  Special components: LNF, CERN
  Stainless steel chambers: CERN
- Beam diagnostics: CERN, LNF, LAPP

Work for next phase

Tail Clipper

change length of bunch train going into CLEX
with fast transverse kickers – collimator/dump

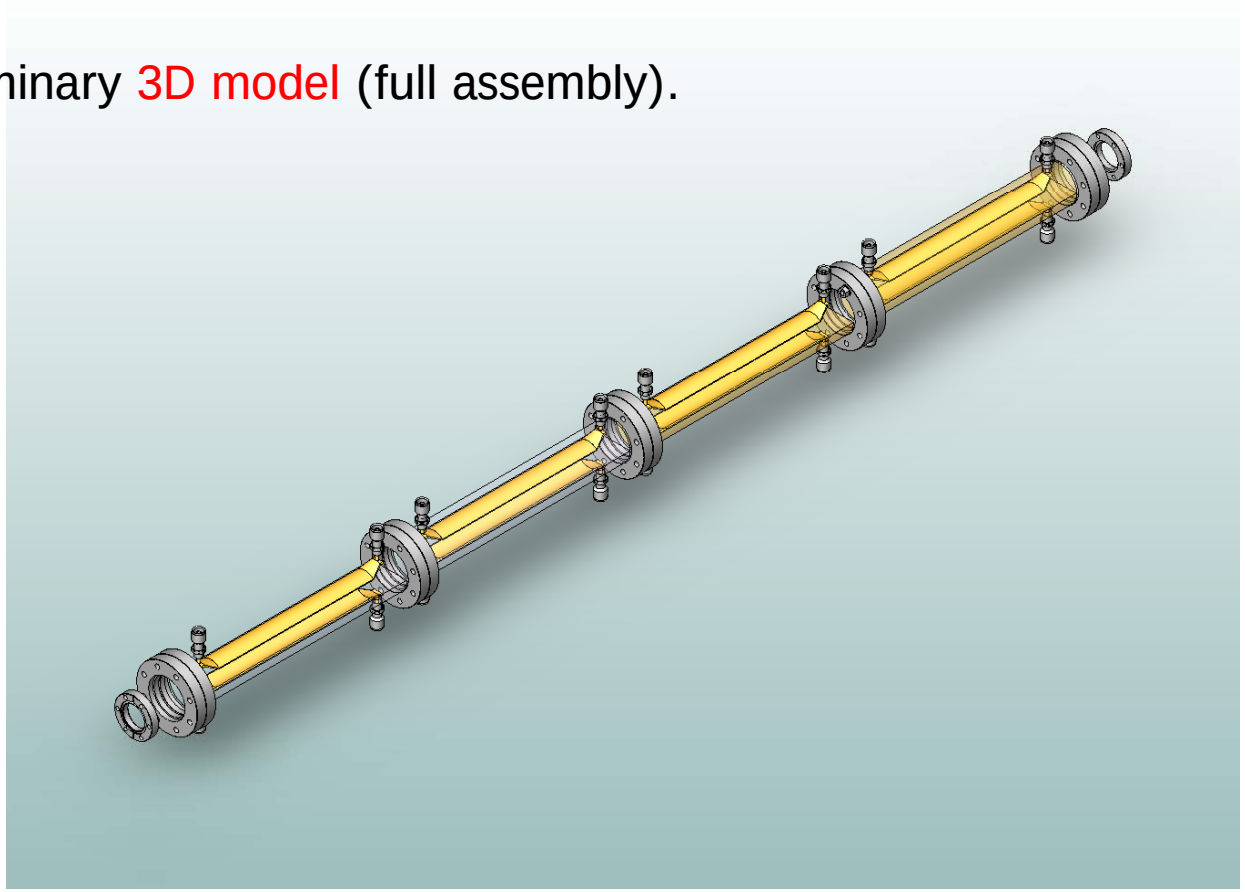


Strip-line kickers from CIEMAT,
pulser: collaboration CIEMAT-CERN

Collimator / dump (CERN):
serves also as safety element to inhibit beam into CLEX

CTF3 Kicker Status

- New Project: The Tail Clippers (VI)
  - Preliminary 3D model (full assembly).



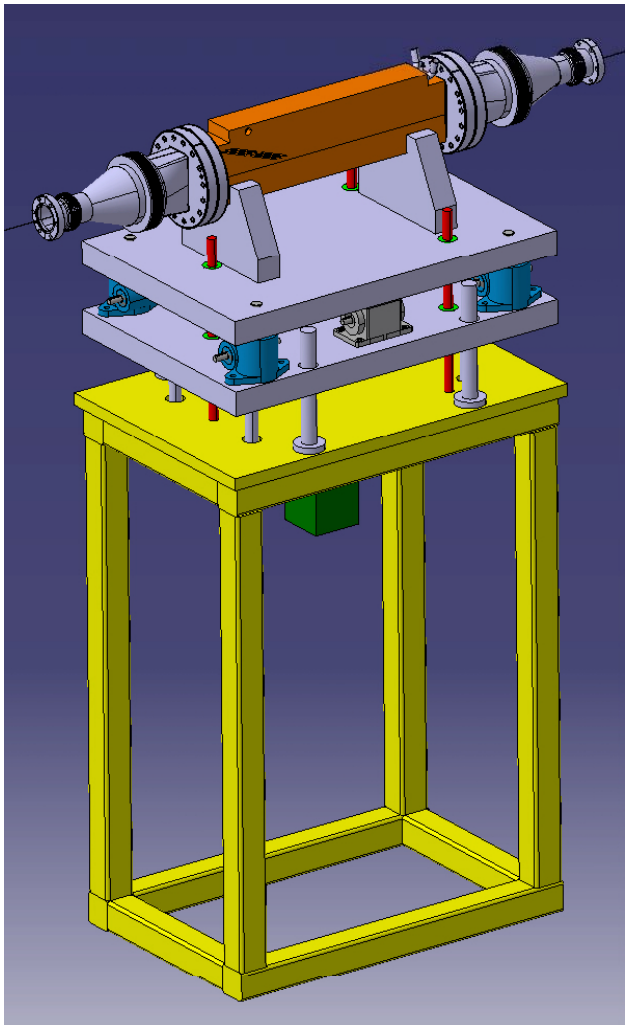
Preliminary mechanical design I

I. Movable vacuum chamber - Jaw

- The jaw is fixed to the vacuum chamber. The whole ensemble moves during the operation (tailclipper and dump)

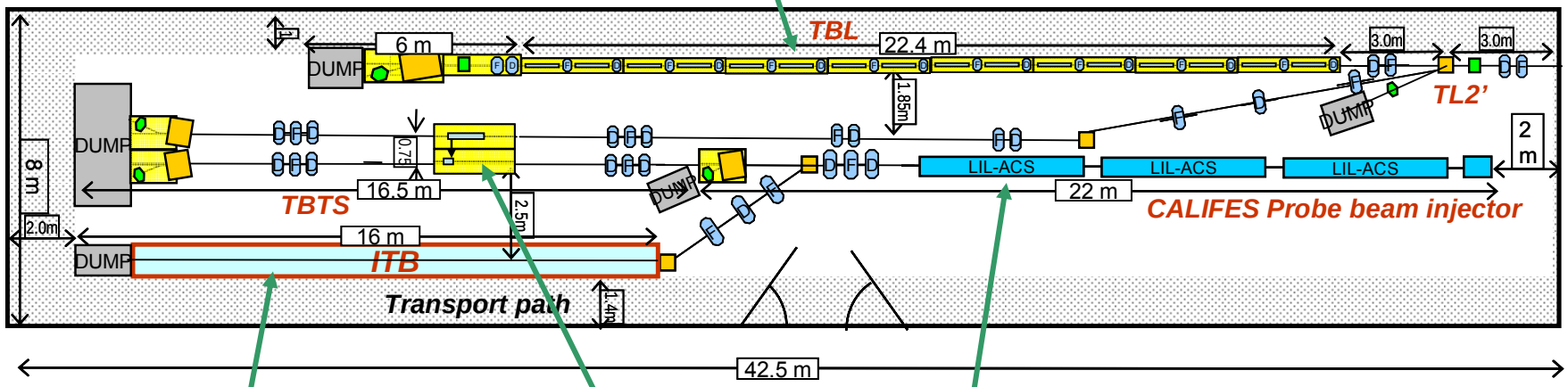
II. Support and mechanical tables

1. ***The upper table allows the movement ranges for the tailclipper operation with the required resolution and precision***
   - The movement range is procured by a stepper motor that commands 4 screw jacks
   - One potentiometer serves to monitor the displacement and detect a hypothetical motor failure.
   - The maximum and minimum range of movements are limited by end switches and mechanical stops
2. ***The lower table guarantees the positioning of the tailclipper for dump operation***
   - The pneumatic system guarantees that the dump position can always be reached (Tailclipper's own weight)
     - The rapidity of the system can be regulated. A safe movement is possible within 3s (safety requirements: within 30s)
   - The maximum and minimum range of movements are limited by end switches and mechanical stops



Ongoing work in CLEX (2007 and later)

CIEMAT magnet movers, PETS prototype,(+ series ????), PETS tank (series ???)
UPC & IFIC : BPM development + electronics (series ???)
CERN overall responsibility, optics, RF equipment, diagnostics, infrastructure, quadrupoles ???



Instrumentation Test Beam Line
not presently funded
(FP7 GADGET proposal)

CEA Dapnia Saclay overall responsibility
CERN
CEA laser beam line, laser beam conditioning
LAL RF gun for photo injector

Uppsala University Two Beam Test Stand
CERN PETS and Accelerating structure

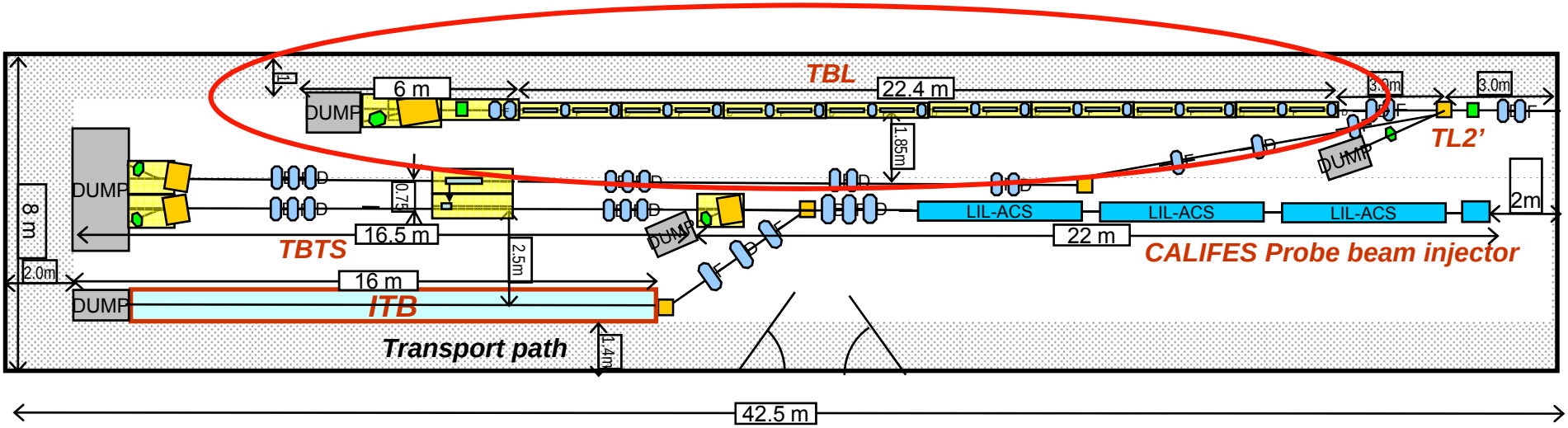
Pakistan: stainless steel vacuum components + ???
Iran: RF + Beam dynamics simulations

X bu

Construction on schedule
Equipment installation from May 2007,
Beam foreseen from April/May 2008

The CTF3 Test Beam Line (TBL)

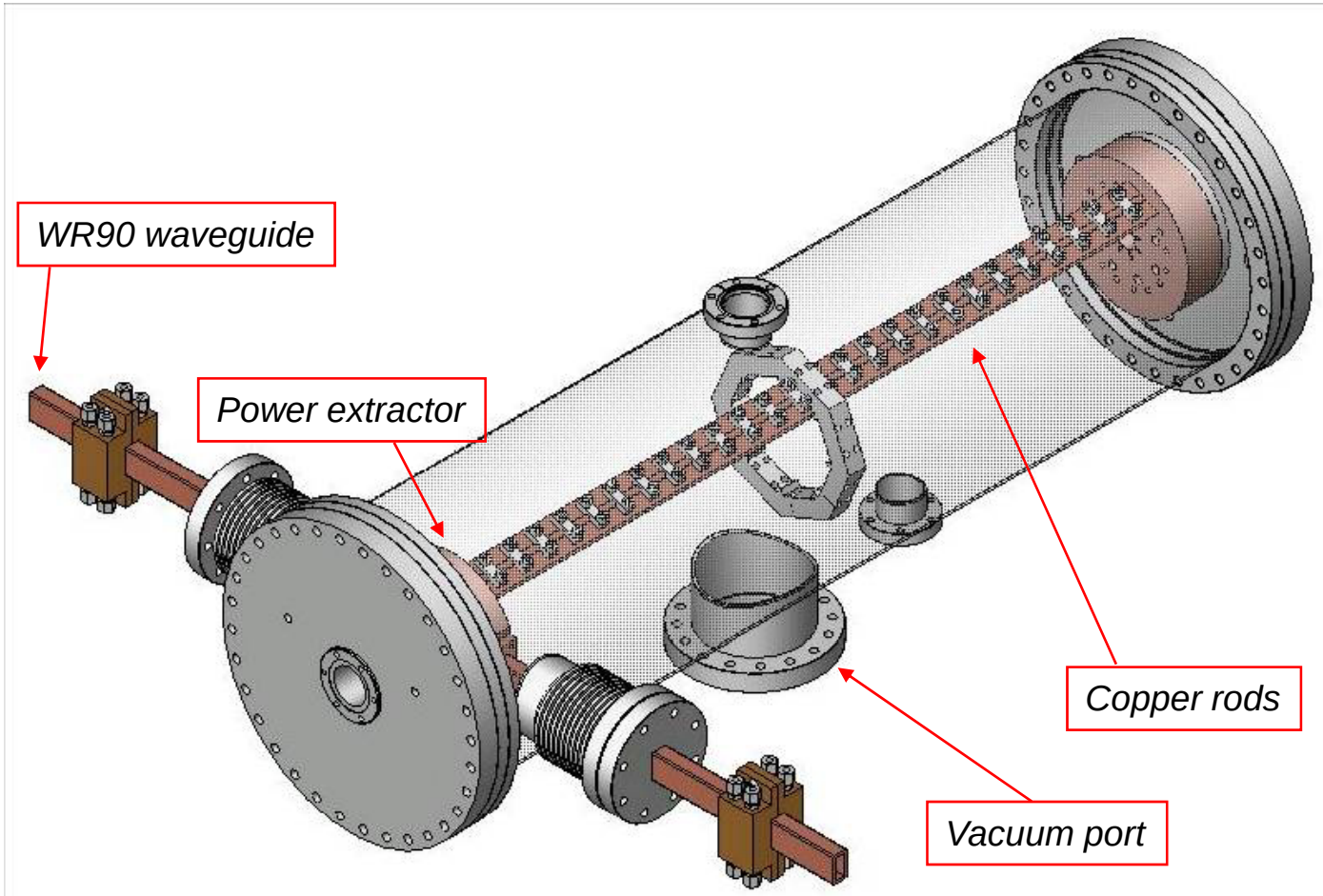
General and Planning



PETS tank (CIEMAT)

PETS tank, under mechanical design,

PETS test pieces successfully produced, full length bar ordered

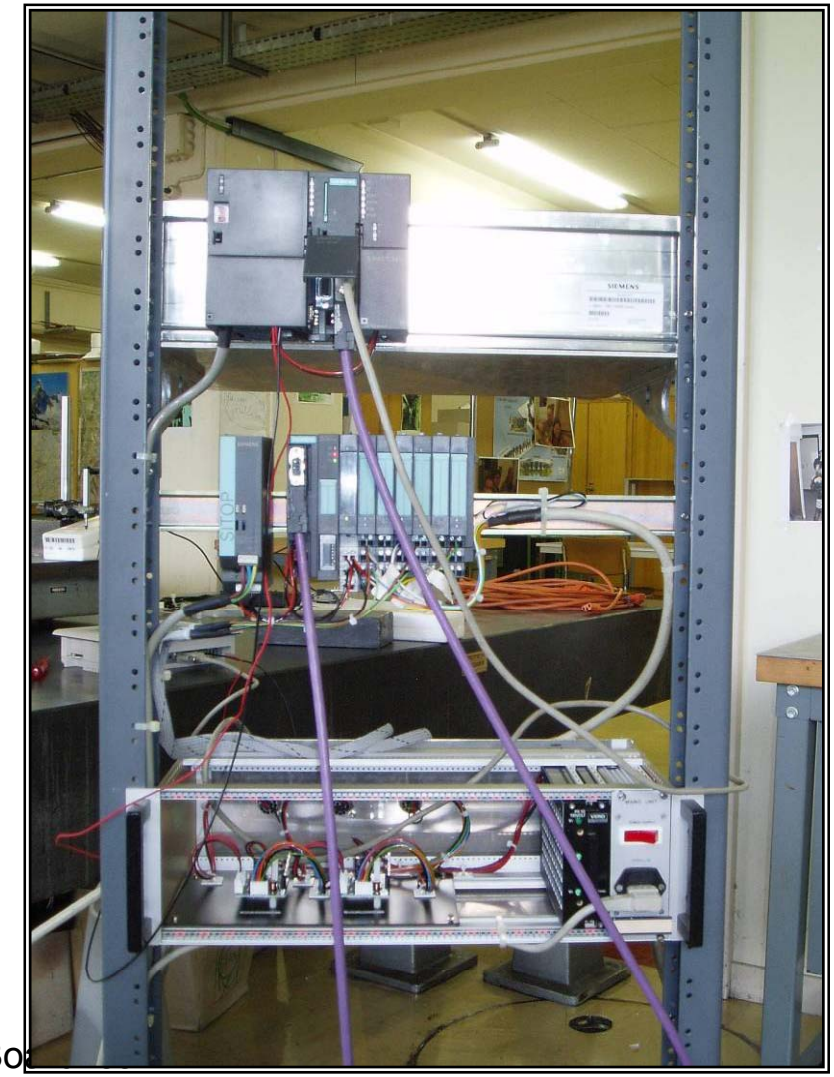


Quad movers (CIEMAT)

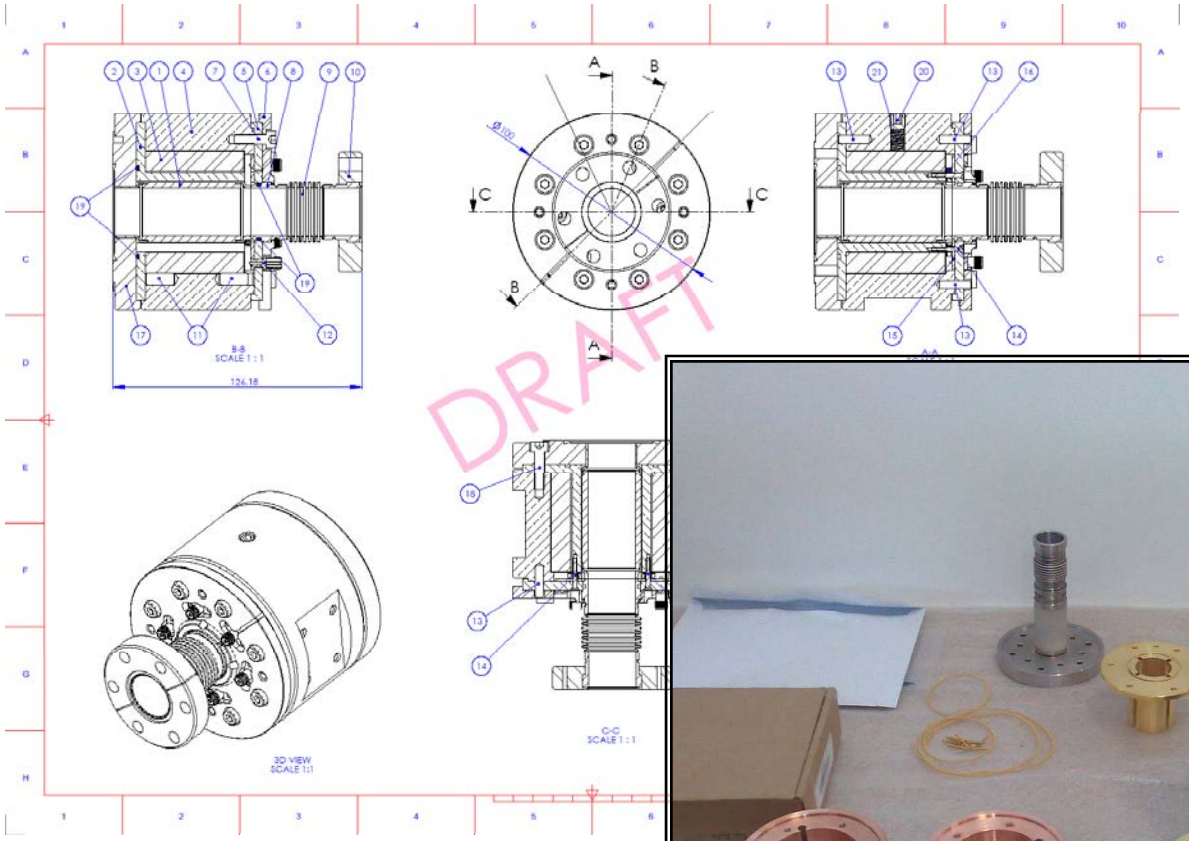
Quad moving table, Prototype finished'

Currently under test at CERN

< 5 μm reproducibility confirmed
horizontal excellent: rel. in one sense 2 μm
back lash ~ 5 μm



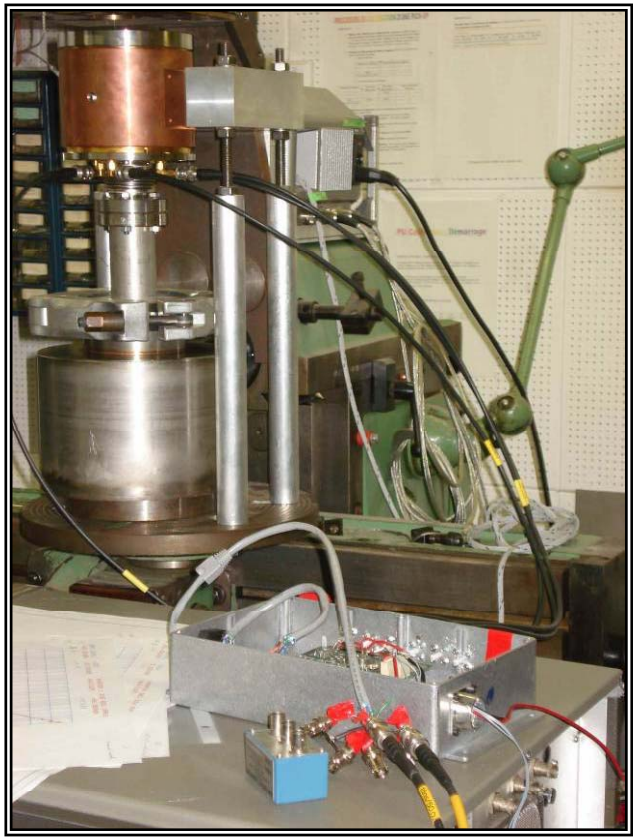
BPM (Valencia)

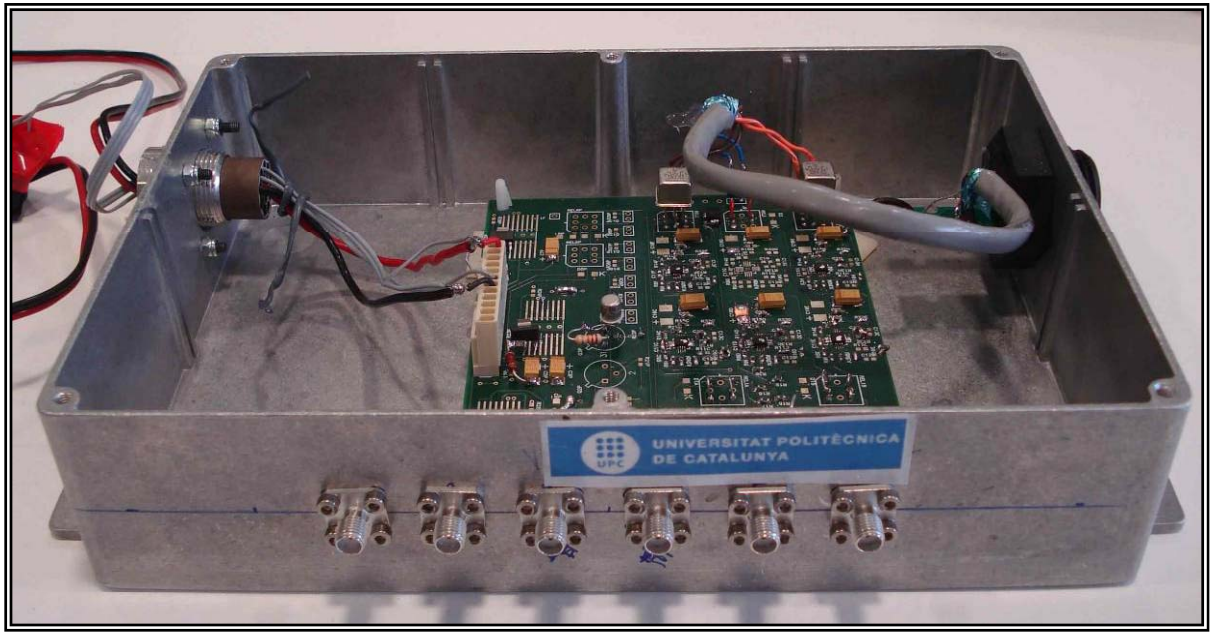


Two prototypes currently assembled in Valencia

BPM-analog electronics (Barcelona)

Prototype tested successfully at CERN in December,
final fine tuning under way before installation





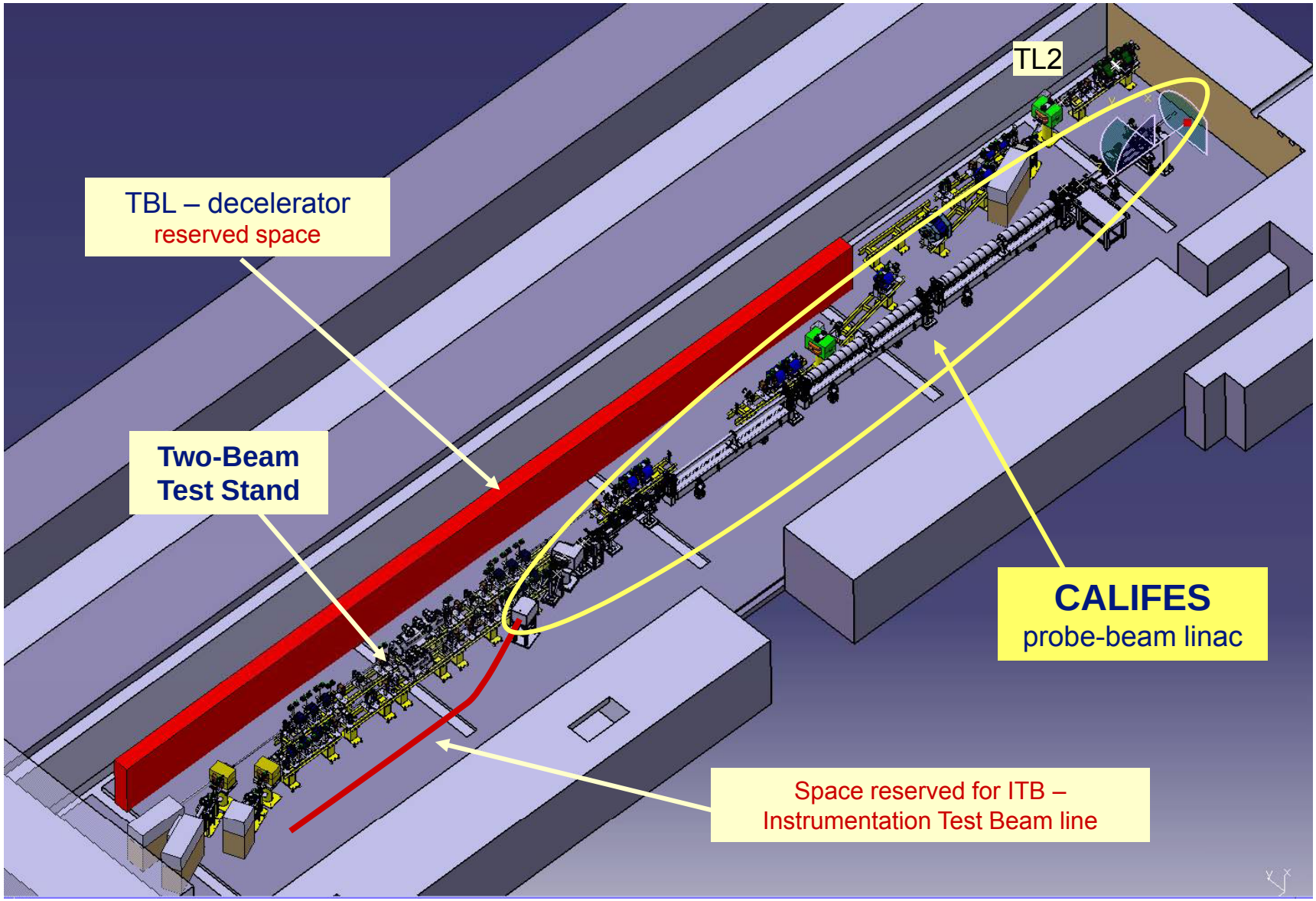
Tentative TBL-Schedule

	2008												2009
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dez	Jan
Task													
Diagnostic Beam line installation													
Module Design													
Construction of prototype PETS tank													
Prototype module installation													
Ptrotype module testing													
Series production													
Installation of more modules													
Commissioning													
Complete installation													
Commissioning													

											2010						
Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dez	Jan	Feb	Mar	Apr	May	Jun	Jul

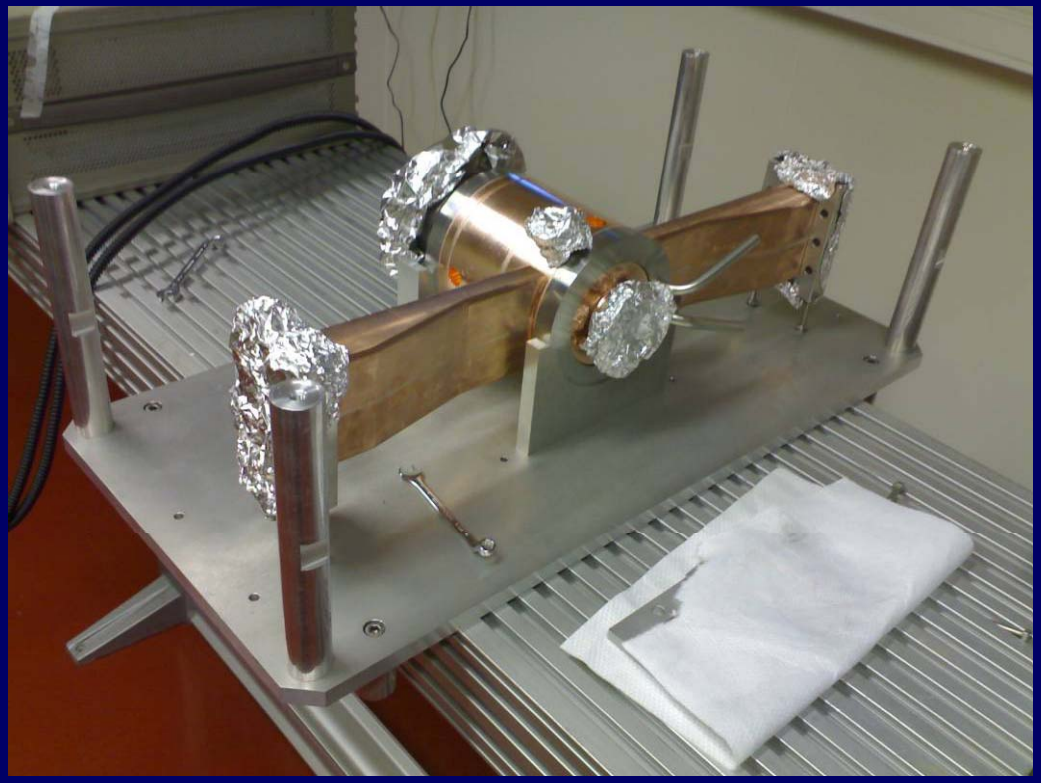
Series production of PETS, BPM+electronics still open

CLEX Layout : CALIFES line



2- Construction of the probe beam gun

Finally, gun was brazed just before Christmas and no leak at all



BUT

F_r = 2996.025 MHz !!

Before brazing, f = 2997.9 MHz

Fortunately, we have two holes/cell
Thickness of cavity wall ≈ 4 mm
=>deformation with a screw
to increase the frequency
in every cell to keep well balanced
electrical field.

Finally: fr = 2998.057 MHz for T = 20°C, H = 60 %, P = 1015 mbar
Width at -3 dB = 452 kHz => QL = 6633 => β = 0.96 => S11 = 0.02
Field (perturbation method):

Half cell: Δf = 780 KHz | Middle cell: Δf = 780 KHz | Coupling cell: Δf = 790 KHz

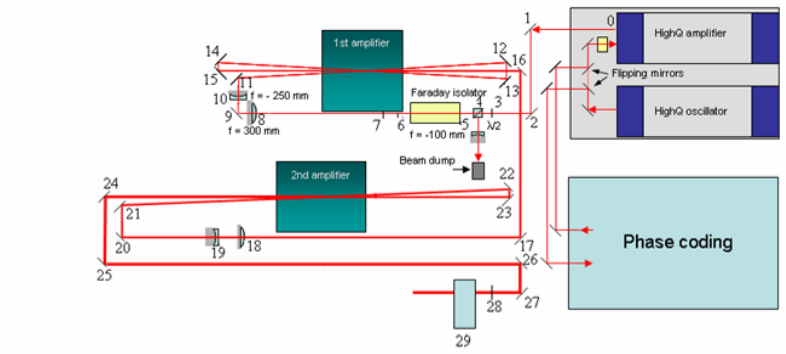
LASER system installation

Laser beam transportation under roof *(ground floor)*

- Pipes installed on ~80m
- completions foreseen end of Jan. 08

Installation on optical table In laser room *(1rst floor)*

- Measurements and beam optimization in progress end of 2007
- Specific Crystals IR→UV : order in progress
- Installation foreseen in Feb/March 2008



Laser layout for tests

Installation on optical table near Photo-injector *(ground floor)*

- all components are in Saclay
- Installation foreseen in February 2008

Installation of the modulator in CLEX

- Delivery at CERN (week 47)
- Mechanical installation (week 48 and 49)
  - racks and tank installed and connected
  - water cooling and line voltage installed by CERN
  - installation of a spare TH2100C klystron S/N 094011 with solenoid and PPT lead shielding
  - Test of the transportation of the tank+klystron+lead shielding to the maintenance area OK

- Control system
  - local control tested and explained to CERN
  - remote control: discussion on the connection and structuring the data
- Calibration
  - setting and calibration of all the auxiliary Power Supplies (PS) with the PLC values
  - problem with ion pump PS: defect on the HV cable → replaced by a CERN PS
- Tests
  - machine and person interlocks OK
  - Tests of the klystron in diode mode with loads on RF ports
  - High voltage up to 38kV / 2 Hz PFN voltage which corresponds to 250 kV – 280 A on the klystron
  - inverse voltage < 3% : OK
  - pulse length = 7.67 µs at 75%: OK
  - flat top = 5.5 to 5.7 µs: OK

S. Curt, JL. Jannin, J. Marques, G. Rossat, G. Yvon

CALIFES installation Milestones

End of January 2008 : **CALIFES will be almost complete**
(except the RF gun, Laser system and RF system)

- Mechanical supports + Dump → July 07
- 3 LIL sections → October 07
- Dipole → October 07
- Deflecting Cavity → October 07
- BPMs (6) + steerers (5/6) → November 07 → see Claire's talk for BPMs

the last steerer will be installed on the RF gun support

- Quadrupoles → October 07
- Beam Charge Monitor → November 07
- VPMs (3) → December 07
- Start installation of RF System : Modulator → December 07 → see Franck's talk
- Start installation of Laser System : mechanical part → Dec 07 → see Guy's talk

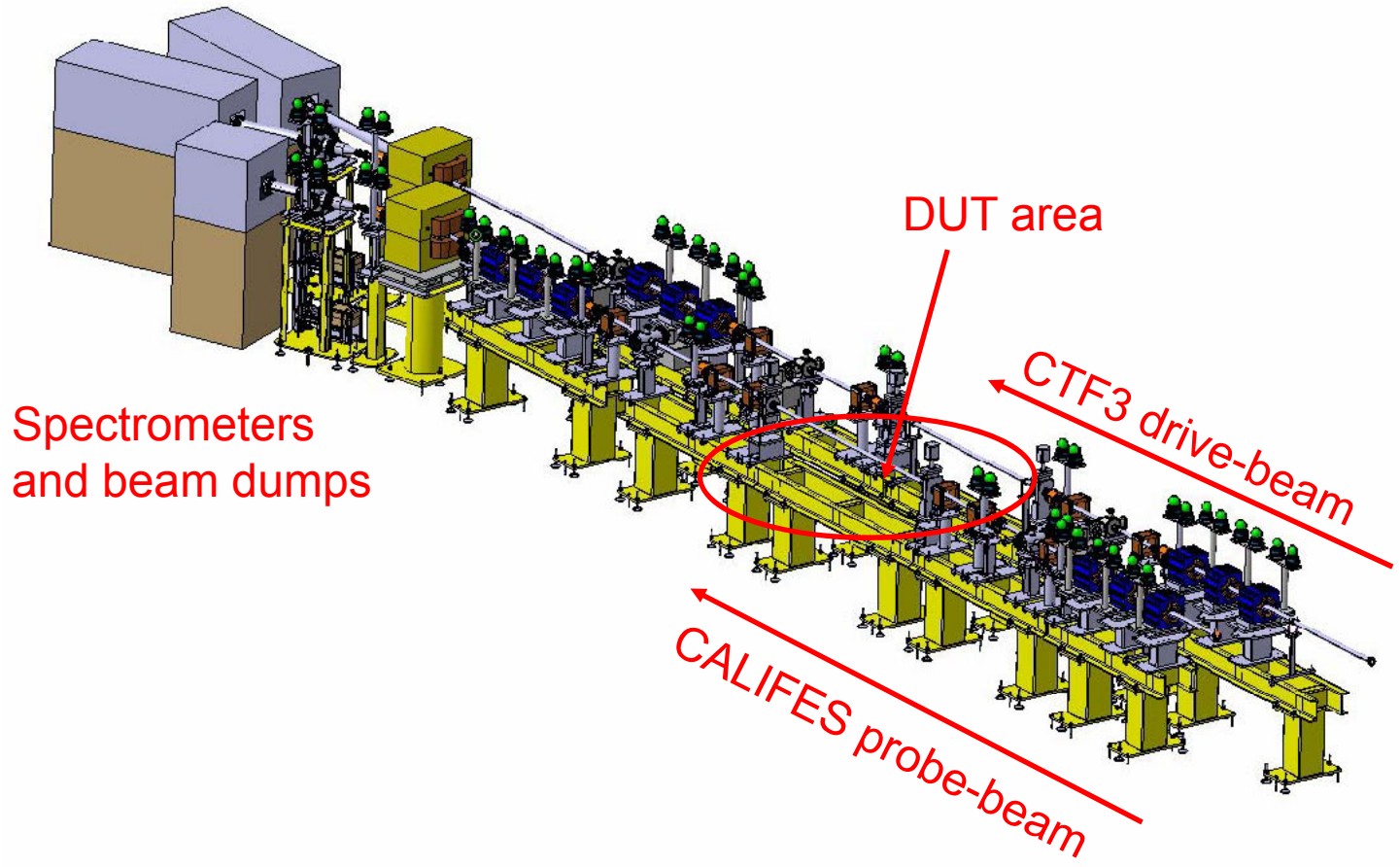
- Final Alignment of the line → February 08
- RF Gun → February 08 → see Raphael's talk
- Laser System → April 08
- RF System → June 08
- **Start commissioning (w/o power phase shifter) → June/July 08**
- **Start commissioning (with power phase shifter)→ October 08**

UPPSALA UNIVERSITET

TBTS
- intro
- design
- status

Summary

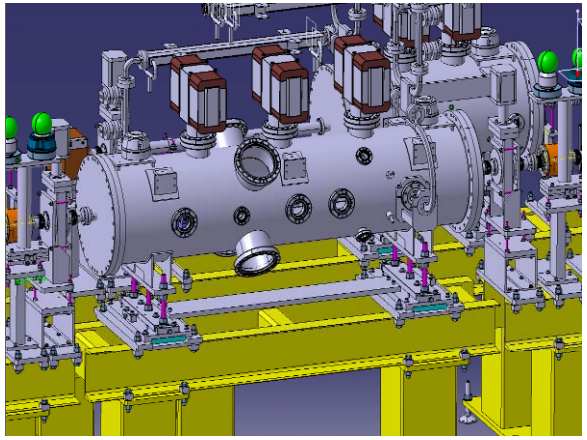
TBTS Design

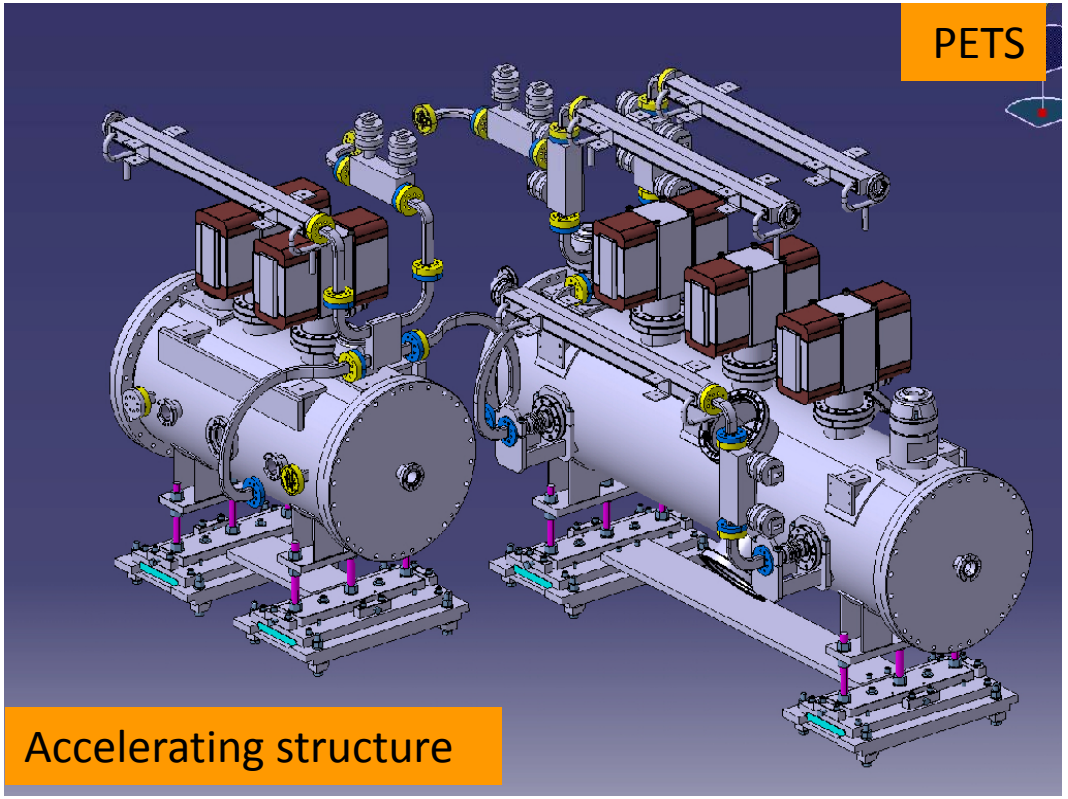


Roger Ruber

CTF3 Meeting

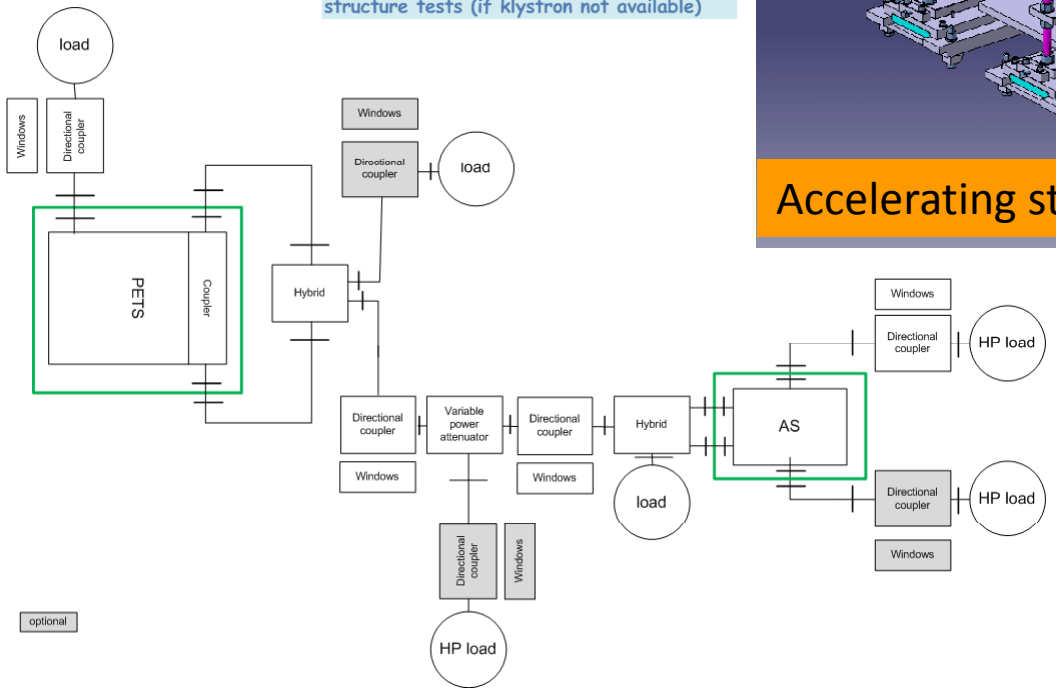
Structure test – Phase 2



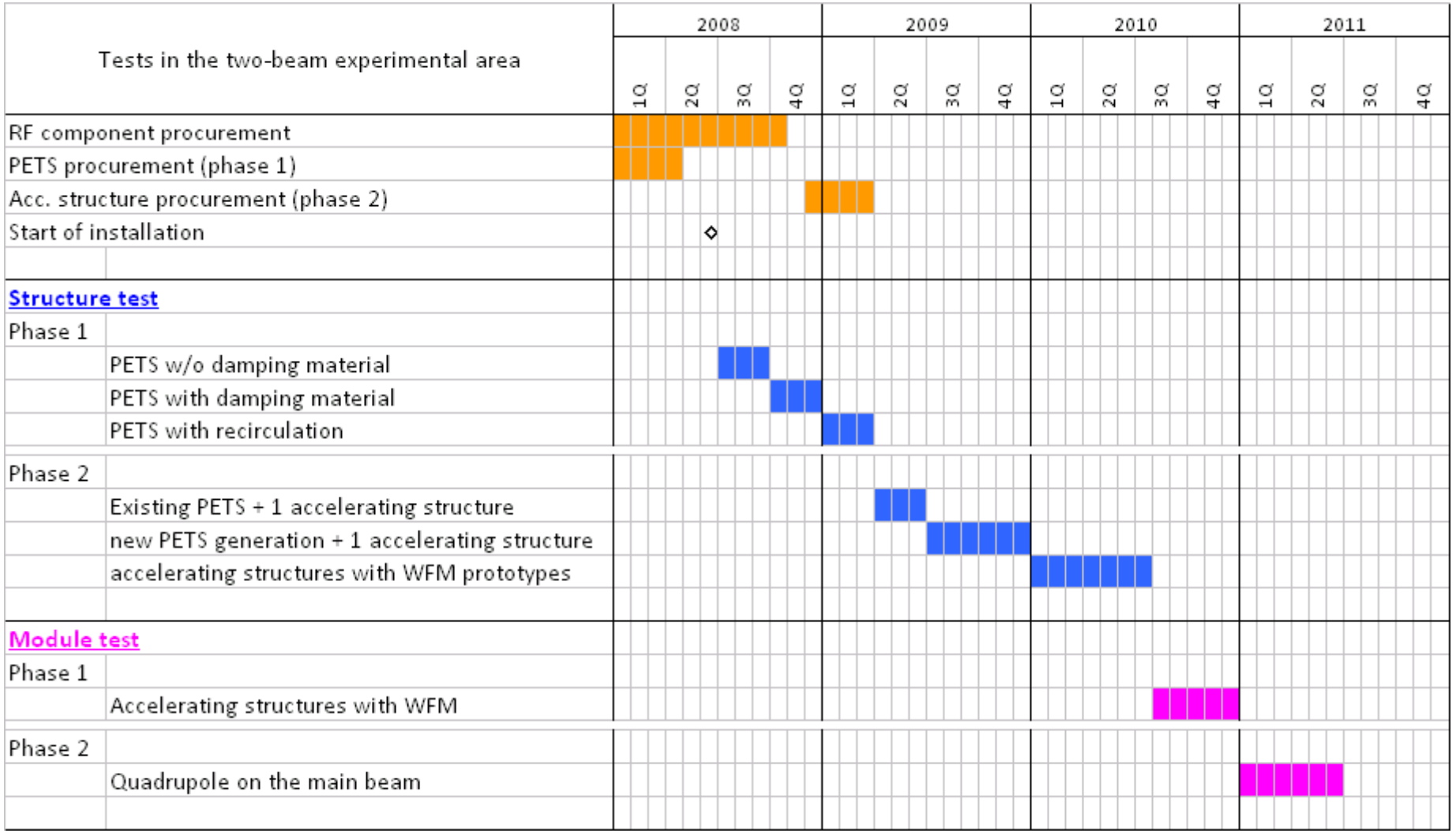


Two beam test stand – Phase 2

Main goal:
1/ kick and beam test
2/ reserve for CERN X-band accelerating structure tests (if klystron not available)



Test program



See also Igor's talk

Foreseen equipments

For April, LAPP electronics to be installed:

TL2: 6 analog + digital for BPIs.
5 digital for 40mm BPMs (analog provided by CERN).
2 digital for BPR & WCM.

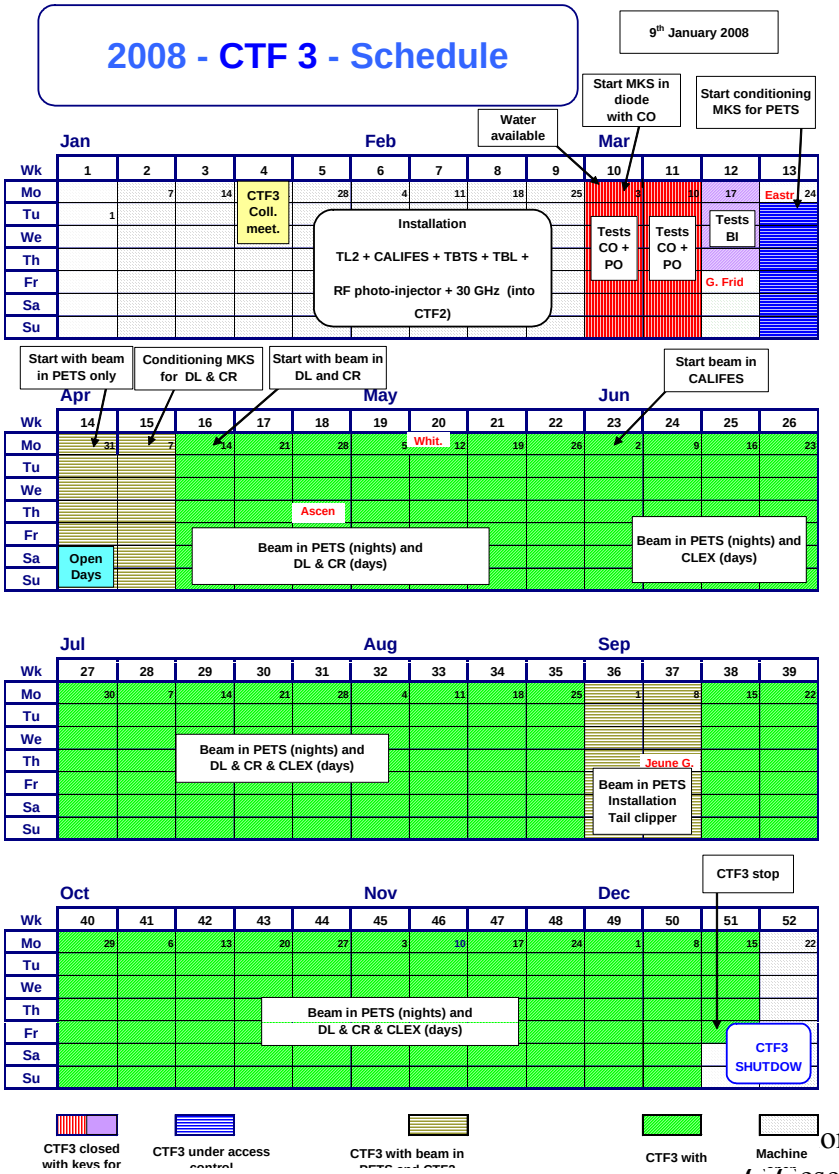
TL2': 4 digital for 40mm BPMs (analog provided by CERN).

TBL: 2 digital for 40mm BPMs (analog provided by CERN).

TBTS: 10 analog + digital for Uppsala 40mm BPMs.

Total of 16 analog modules and 29 digital front-end.

Operation in 2008



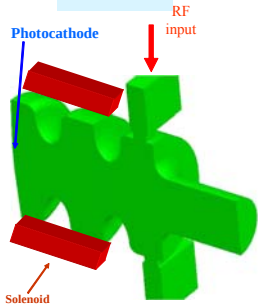
Operation all year,
one stop foreseen: Installation of tail clipper and collimator / dump
in September

30 GHz production will continue in 2008

Photo Injector

smaller emittance, faster phase coding, no "satellite bunches"

LAL

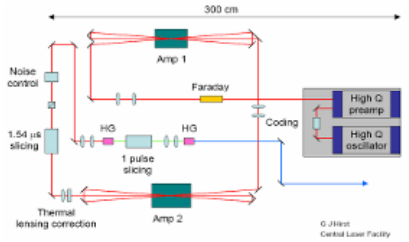


CERN

Cs_2Te photo cathode
3% QE
40 hours life time
pulse train: 1.5 µs,
charge per bunch: 2.33 nC
bunch spacing 0.67 ns
number of bunches: 2332

RAL

diode pumped
Nd:YLF laser
10 µJ IR / bunch
0.37 µJ UV on
cathode /bunch



Present status: RF gun under construction,
Laser at CERN, needs to be finished , power 50 % down, ripple
strong involvement from CERN, INFN Frascati and Milan

Phase 1:
off-line testing from 2008
test stand being built in CTF2

Phase 2:
Gun in CTF3: ?????
base-line optics has been prepared

Laser is needed also for CALIFES injector !

SERA

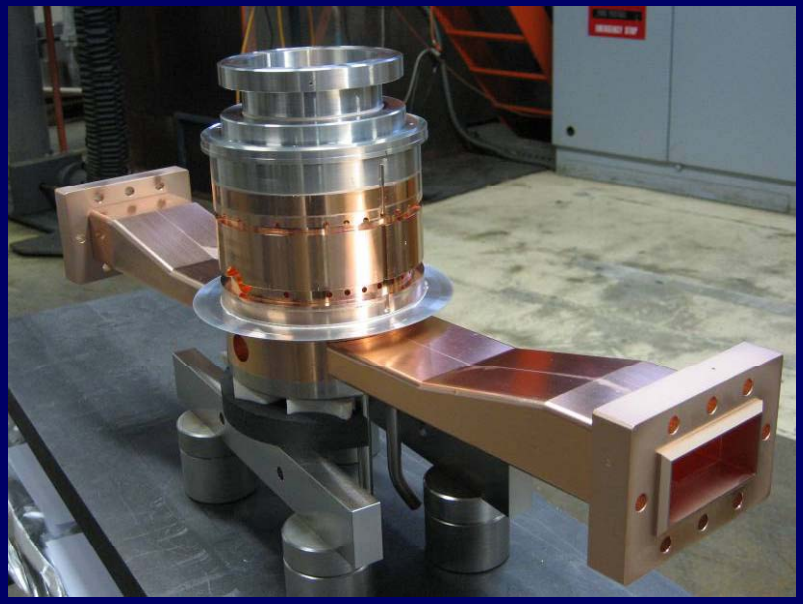
PHIN

1- Construction of the PHIN gun

Where are we since the last collaboration meeting?

All pieces of the gun sent to CERN to be brazed

=> gun brazed in December, 19th

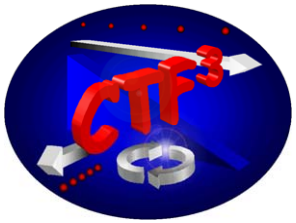


BUT:
Big leaks in the cooling tubes

CERN brazing workshop
hopes to fix the problem

Delivery date: ??

Conclusion



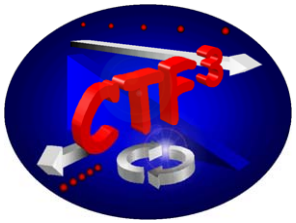
Programme basically on schedule:

- **Commissioning of Combiner Ring has started**
- **TL2 and TL2' will be completed in spring 2008**
- **CLEX : Califes and Two-Beam Test Stand will become operational in spring 2008**

The first cell of TBL will be available in first half of 2008

The other 15 cells of TBL are still missing

Conclusions



Exciting year ahead for operation:

- **Commission Combiner Ring,**
- **Full bunch combination with phase-coding, Delay Loop and Combiner Ring**
- **Commission TL2, TL2'**
- **Commission Two-Beam Test Stand incl. PETS tests**
- **Commission Califes**
- **Qualify TBL PETS**

****** Consolidate some critical equipment ******

Very good perspectives to meet our goals in 2010

Highly motivated team,
excellent collaboration between all partners