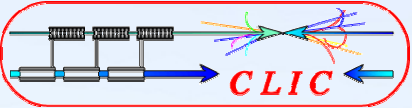


## CTF3 OPERATION AND PERFORMANCE IN 2004

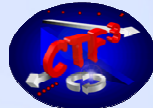
R. Corsini for the CTF3 commissioning team

### Outline

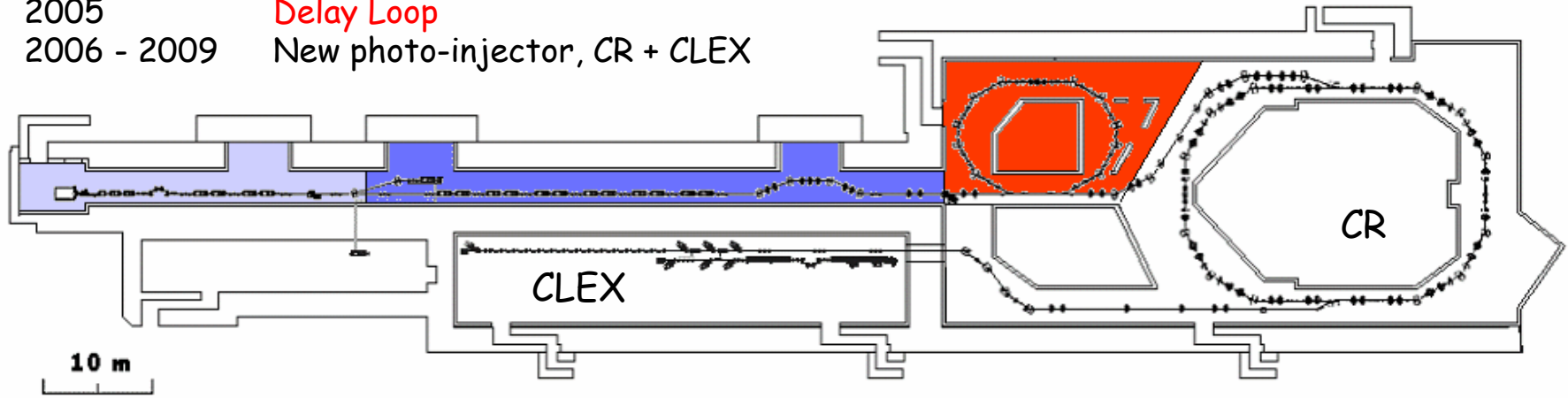
- CTF3 Status in 2003
- Commissioning program in 2004
- Overview of 1<sup>st</sup> and 2<sup>nd</sup> run - main results
- What's next ...



# CTF3 status in 2003



- 2003 Injector + part of linac
- 2004 Linac + 30 GHz test stand
- 2005 Delay Loop
- 2006 - 2009 New photo-injector, CR + CLEX



CTF3 Evolution

## CTF3 main results until last year

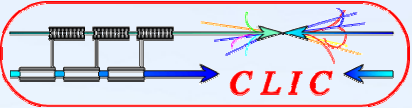
### Preliminary phase (2001-2002)

Low current demonstration of bunch frequency multiplication using RF deflectors

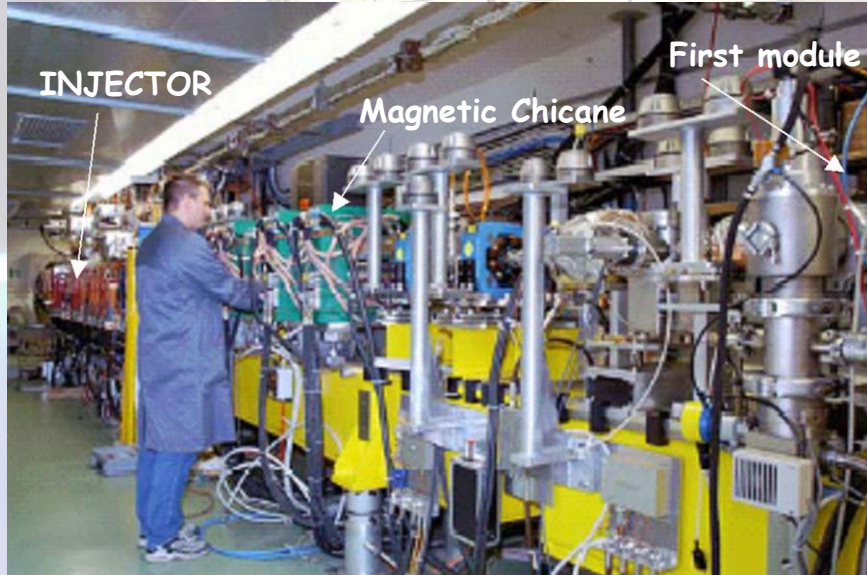
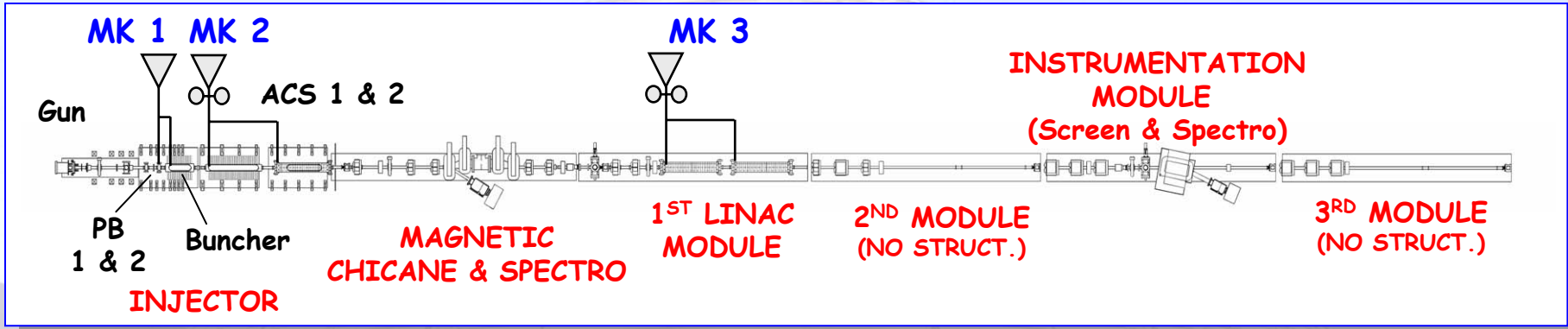
### CTF3 injector and linac commissioning (2003)

Nominal parameters achieved in injector and first part of linac

Stable operation in full beam loading condition, high beam current



# 2003 commissioning

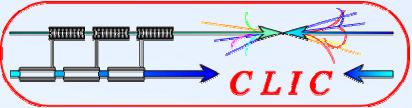


## Main beam parameters

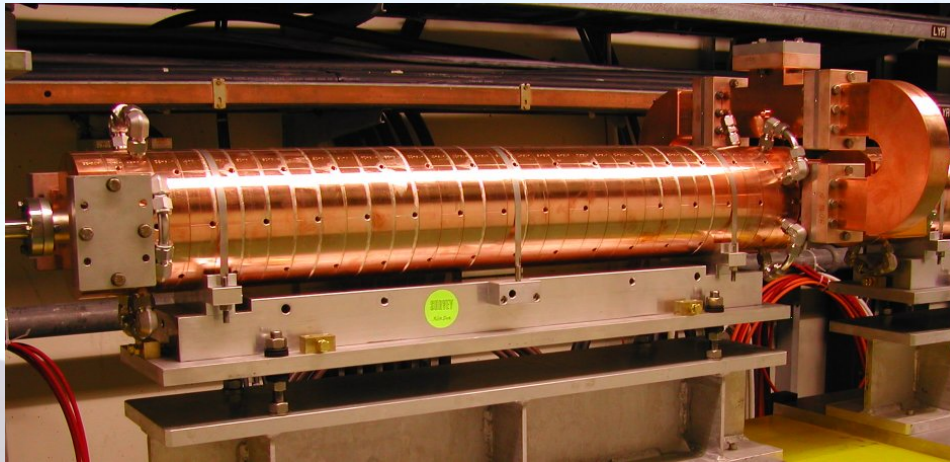
	Nominal	Achieved
I	3.5 A	5 A
$\tau_p$	1.5 $\mu$ s	1.5 $\mu$ s
E	35 MeV	35 MeV
$\epsilon_{n,rms}$	100 $\pi$ mm mrad	$\sim 110 \pi$ mm mrad *
$\tau_{b,rms}$	5 ps	$\sim 4$ ps *

\* Preliminary - for 3.5 A, 1.5  $\mu$ s beam

CTF 3 during 2003 installation period



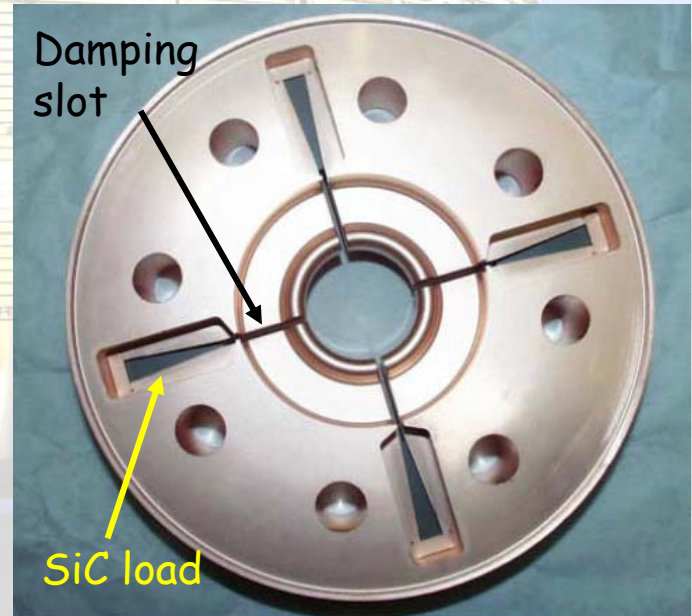
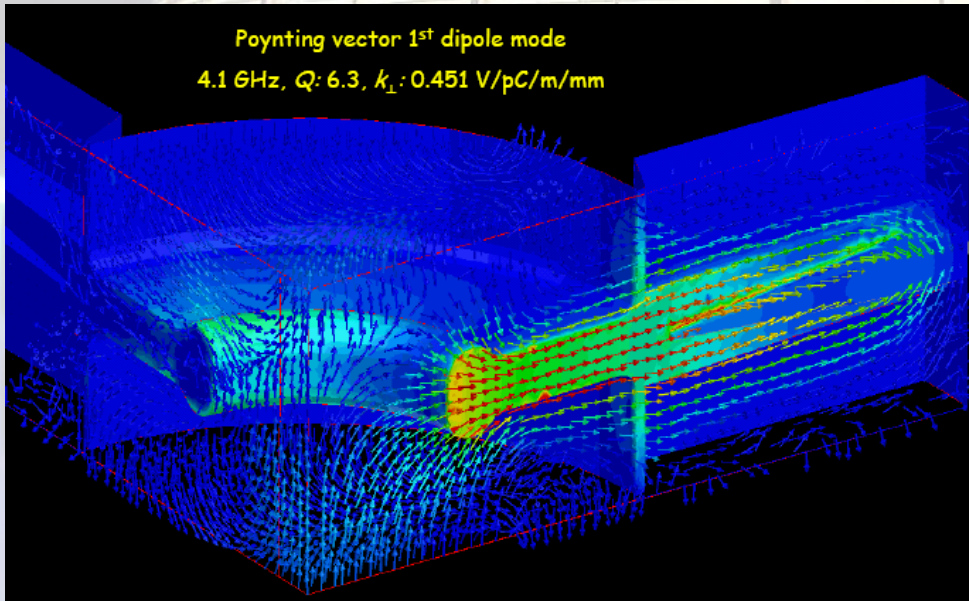
# Accelerating structures

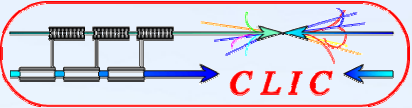


SICA Cavity during installation

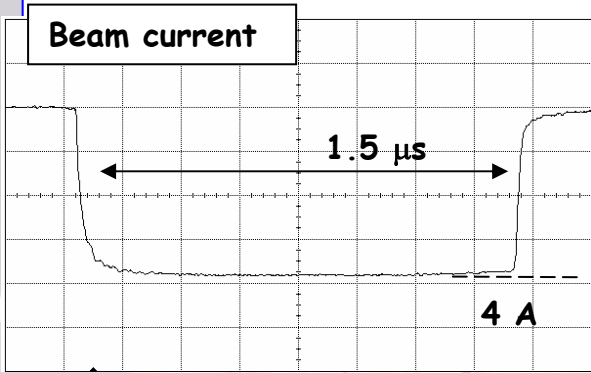
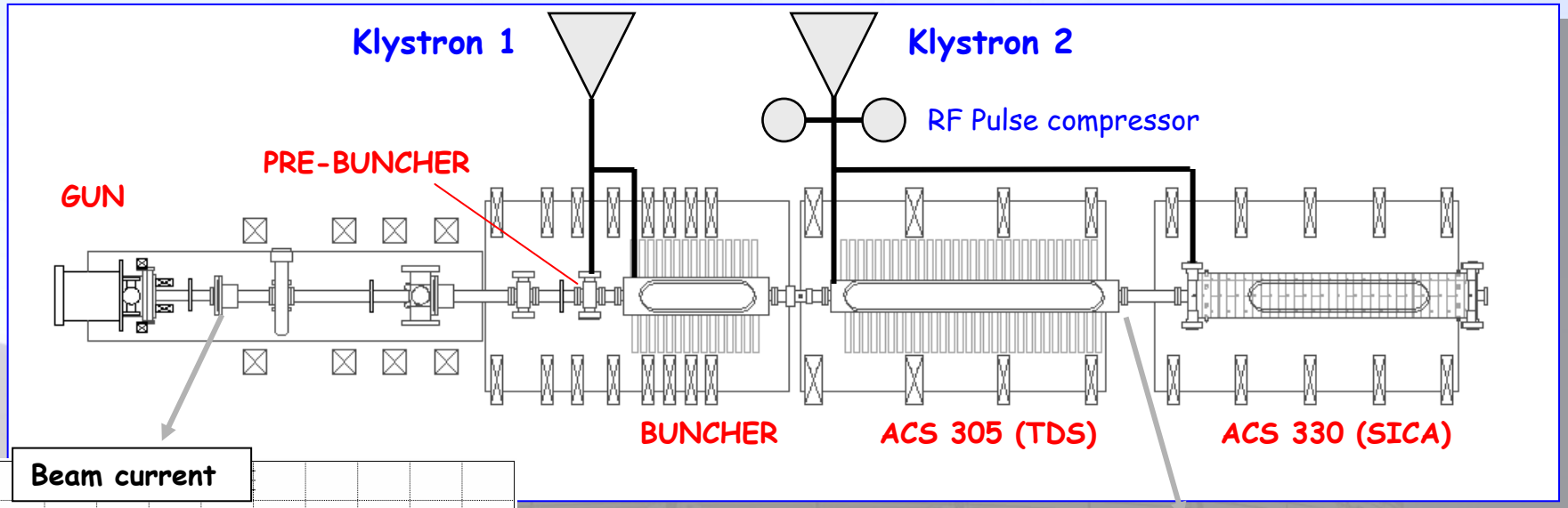
frequency 3 GHz  
 $2\pi/3$  mode  
total length 1.22 m  
loaded gradient 6.5 MV/m (nominal current)

Dipole modes suppressed by slotted iris damping (first dipole's Q factor < 20) and HOM frequency detuning

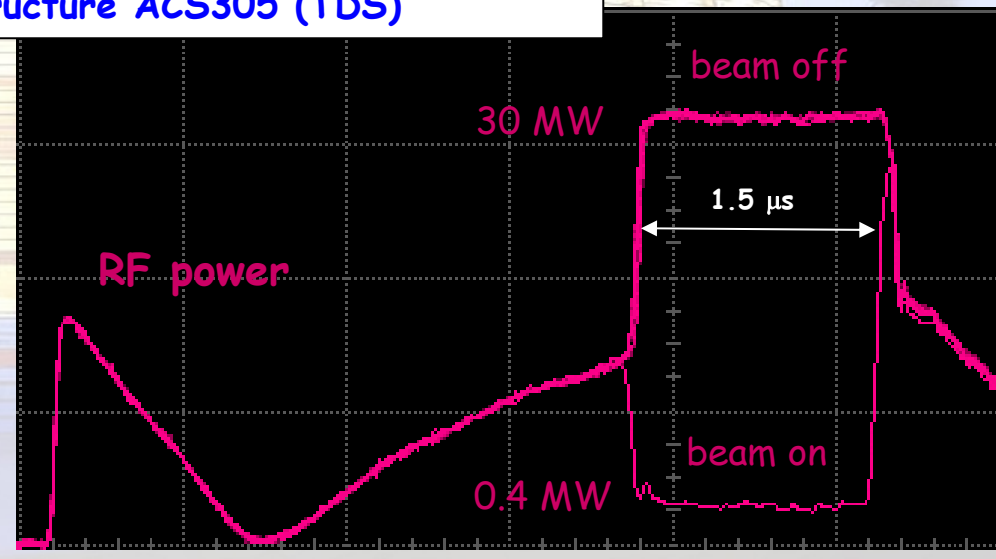




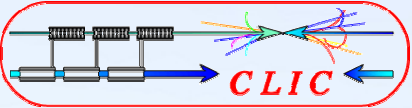
# First full beam loading operation



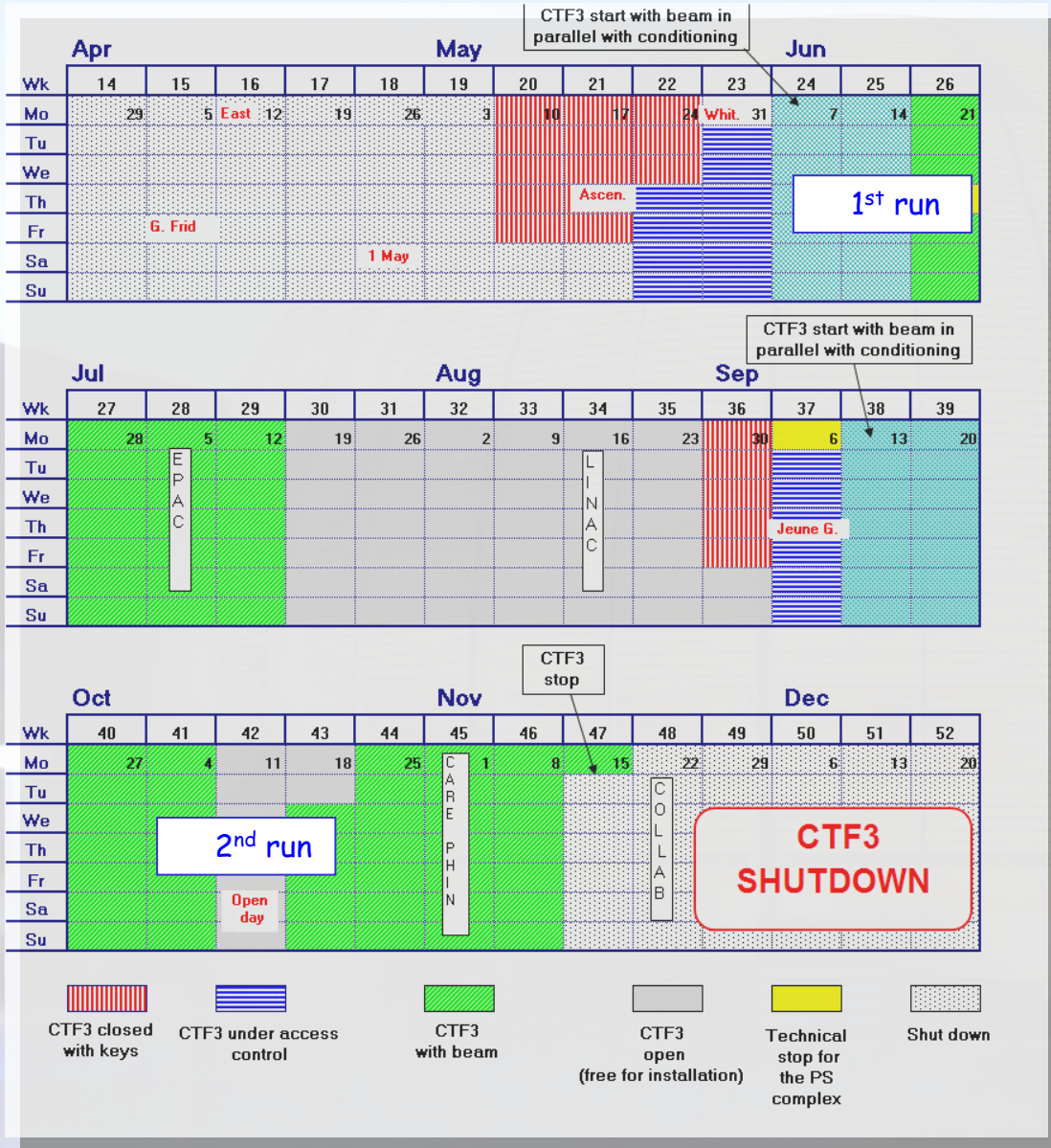
RF signals / output coupler of structure ACS305 (TDS)



Beam current	4 A
Beam pulse length	1.5 μs
Power input/structure	35 MW
Ohmic losses (beam on)	1.6 MW
RF power to load (beam on)	0.4 MW
RF-to-beam efficiency	~ 94%

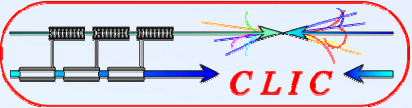


# 2004 schedule

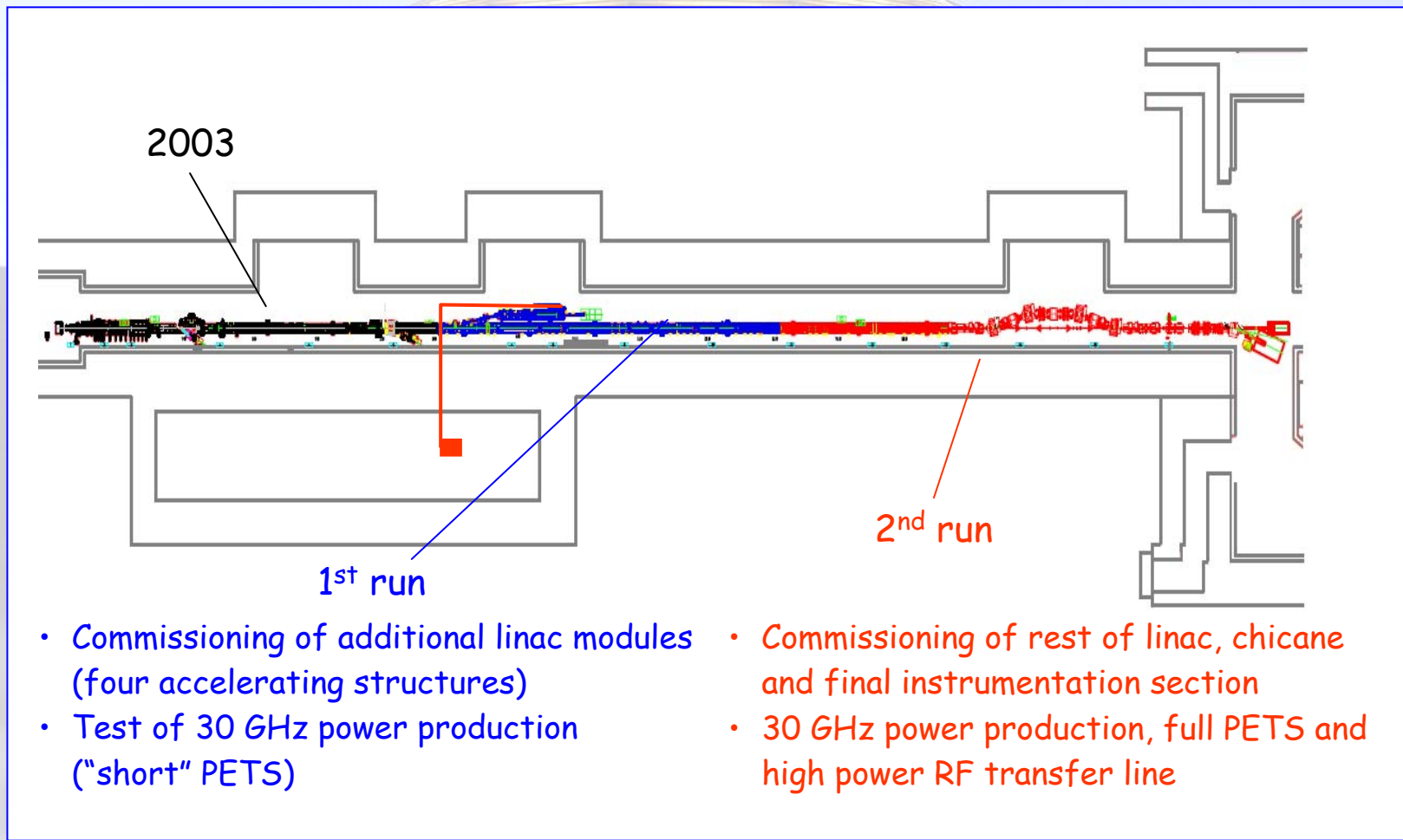


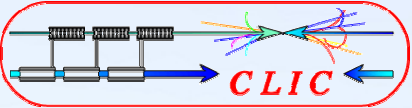
- Two runs:
  - 7 June - 18 July
  - 13 Sep - 15 Nov
- Summer shut-down for installation
- A total of 14 weeks of beam operation
- Operation during working days (no night shifts, *in general* no week-ends)
- Help from collaborators, especially in 2<sup>nd</sup> run
- One and  $\frac{1}{2}$  week stop in 2<sup>nd</sup> run to allow visits in CTF3 for the Open Day - CERN 50<sup>th</sup> anniversary
  - ...more than a thousand visitors, some waiting more than an hour to visit !

*Thanks to all who volunteered !*

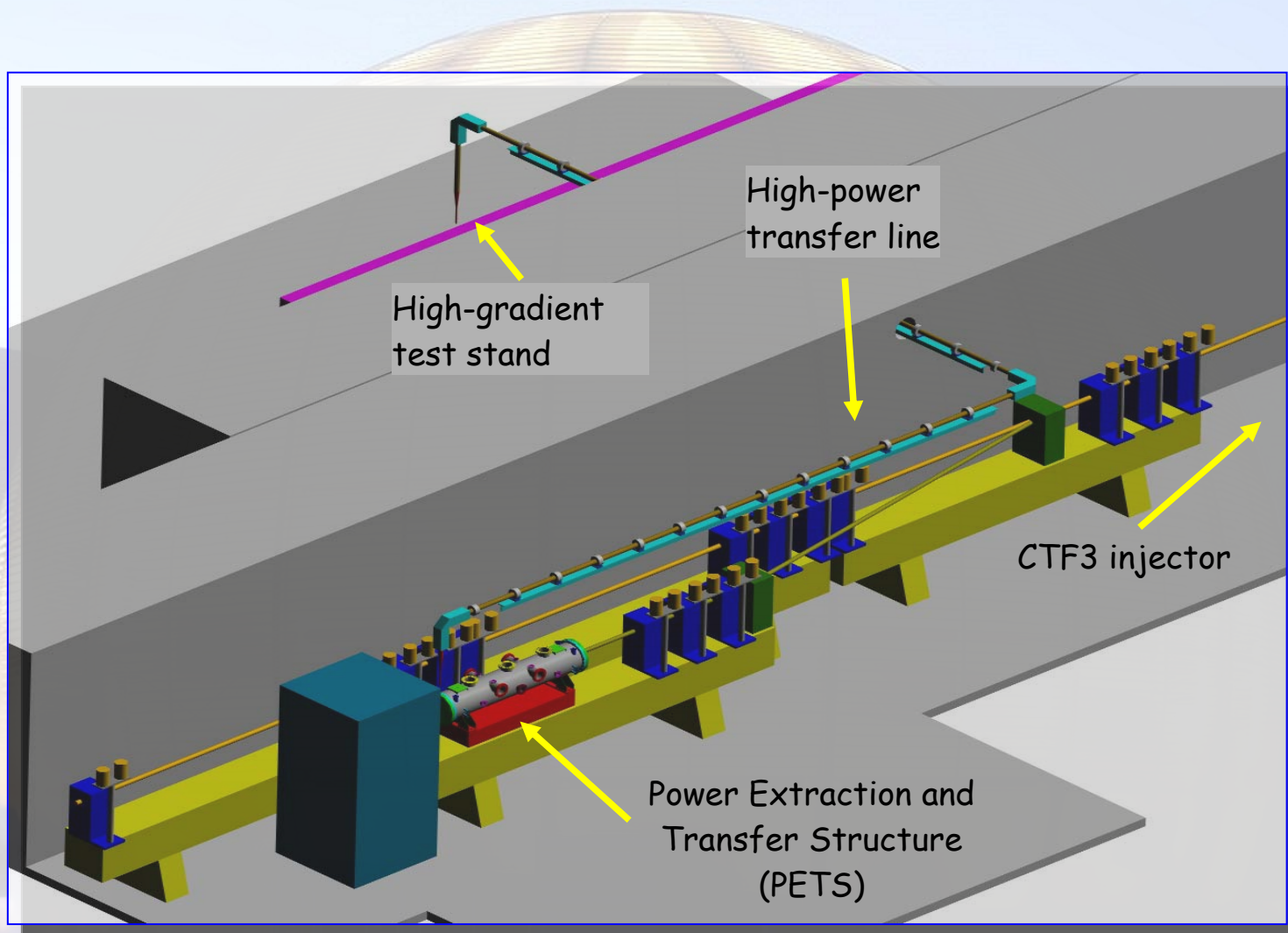


# CTF3 experimental program 2004



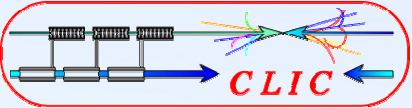


# 30 GHz power production

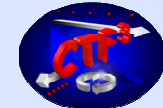


*Presentations this afternoon: H. Braun, I. Syratchev, W. Wuensch*



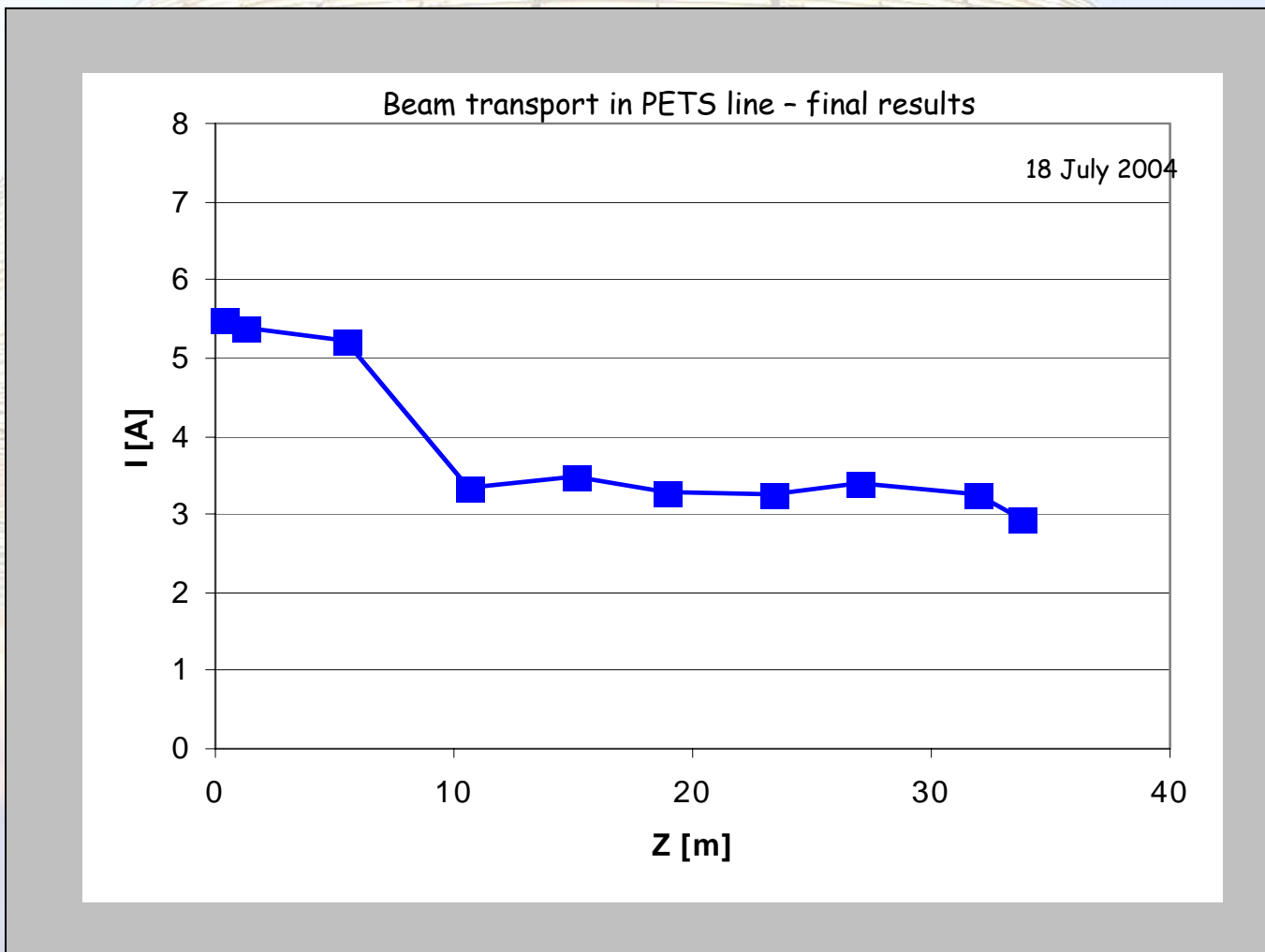


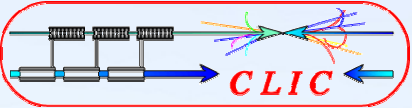
# 30 GHz power production - 1<sup>st</sup> run



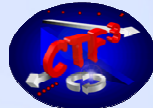
- "Short" PETS installed (1/3)
- No High power transfer line - RF Power to local load

Expected from 3 A beam current  $\Rightarrow$  about 2.5 MW



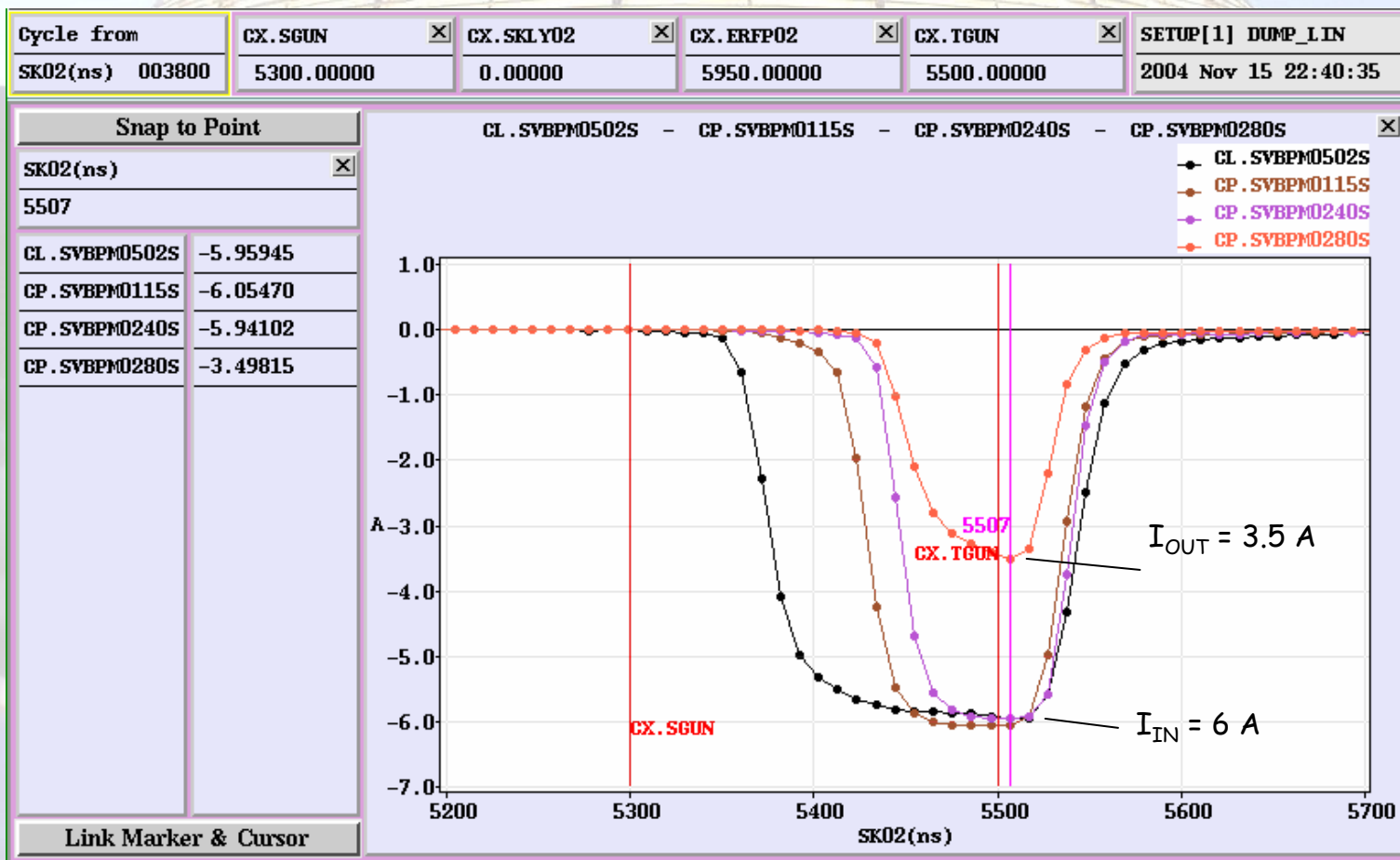


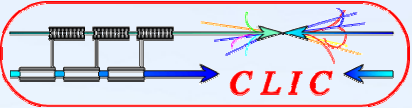
# 30 GHz power production - 2<sup>nd</sup> run



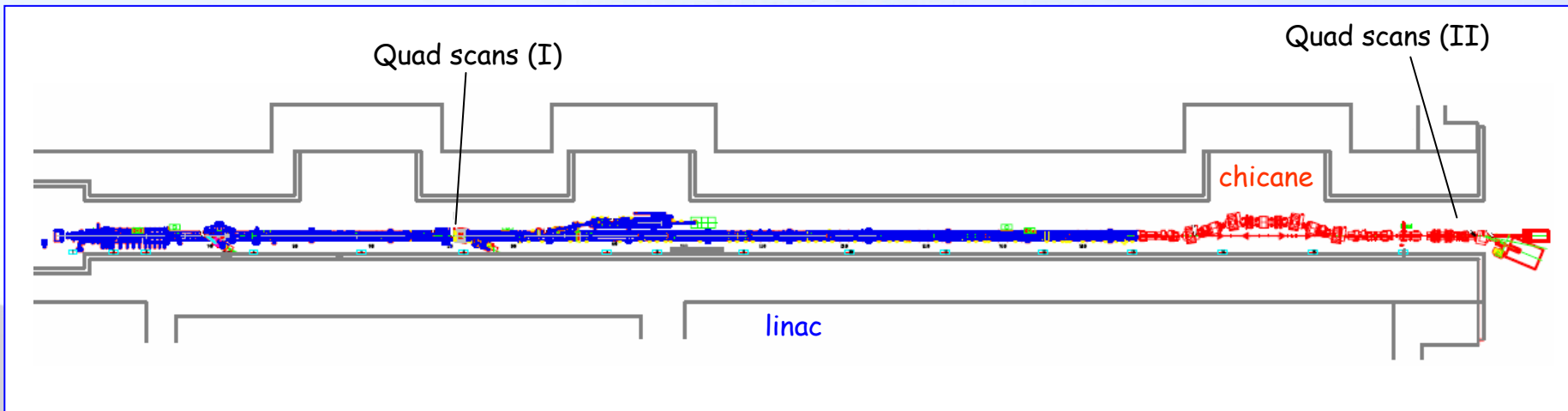
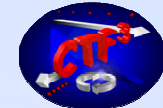
- Full PETS installed
- High power transfer line installed
- RF Power to load (not yet accelerating structures)

Design values for 5 A beam current  $\Rightarrow$  95 MW from PETS  $\Rightarrow$  70 MW @ load





# Linac and chicane



- Beam transport 100% (3.5 A - nominal current)

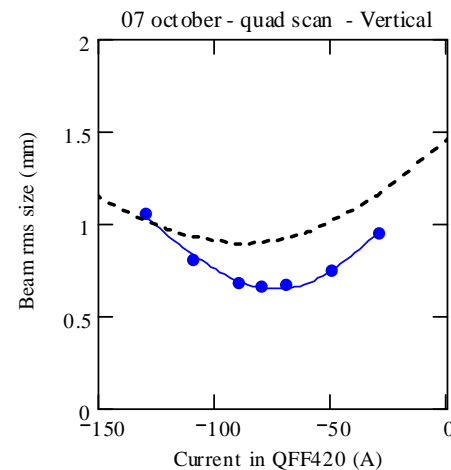
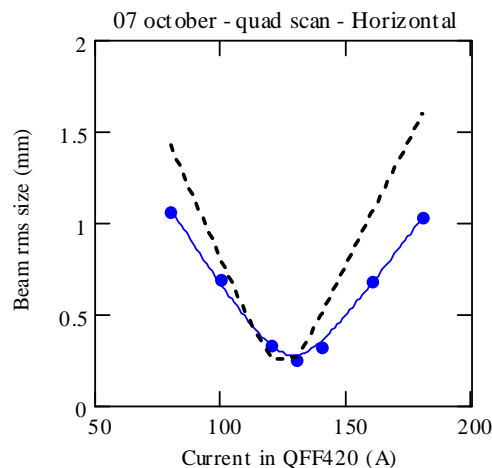
## Setting-up procedure:

- Quad scans (I) in girder 7
- Re-matching to regular triplet lattice (relaxed optics,  $\beta = 4\text{m}$ )
- Quad scans (II) in end-of-linac screen

### Measured rms normalized emittance:

$$\epsilon_x = 135 \Rightarrow 140 \pi \text{ mm mrad}$$

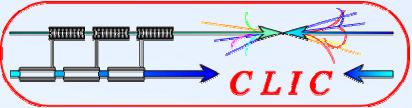
$$\epsilon_y = 130 \Rightarrow 200 \pi \text{ mm mrad}$$



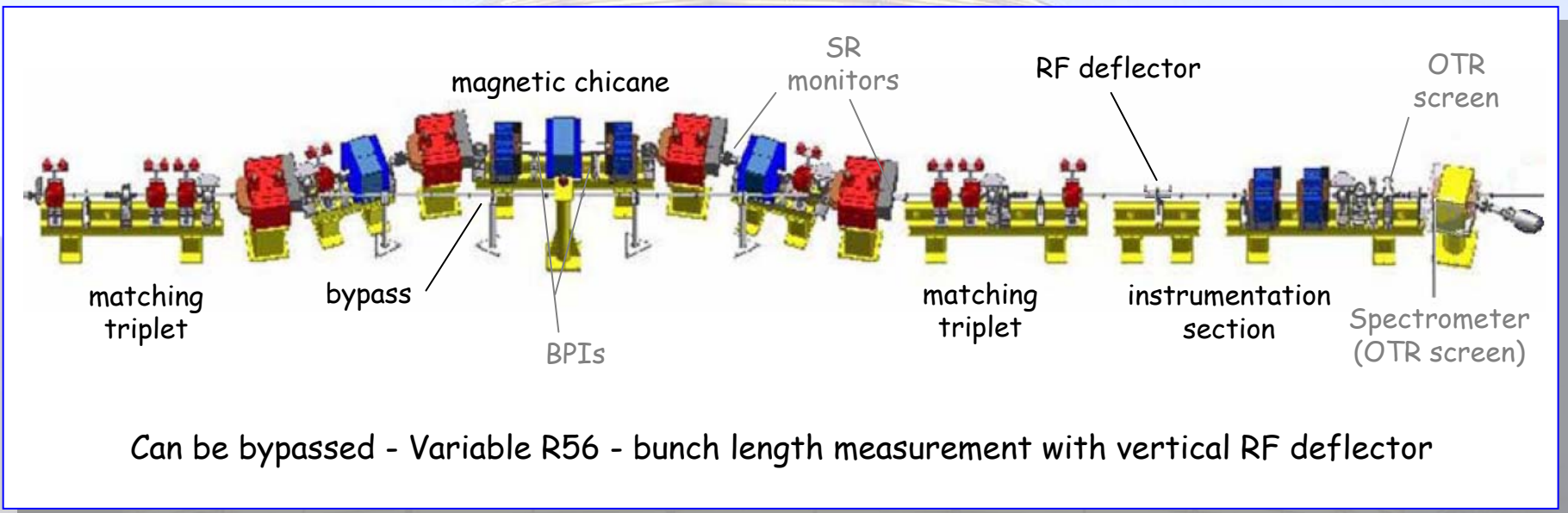
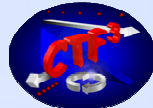
● Measurement (II)

— Fit (II)

--- Reconstructed with MAD from (I)



# INFN/Frascati chicane



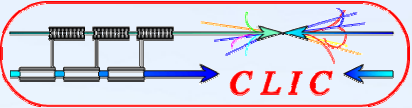
- Commissioning of INFN beam position monitors (BPI), synchrotron radiation monitors, new instrumentation section.

## Optics studies and measurements:

- Dispersion measurements (orbit difference)
- Bunch length measurements

*Presentation this morning: C. Biscari*

*Diagnostics - Presentation this afternoon: T. Lefevre*

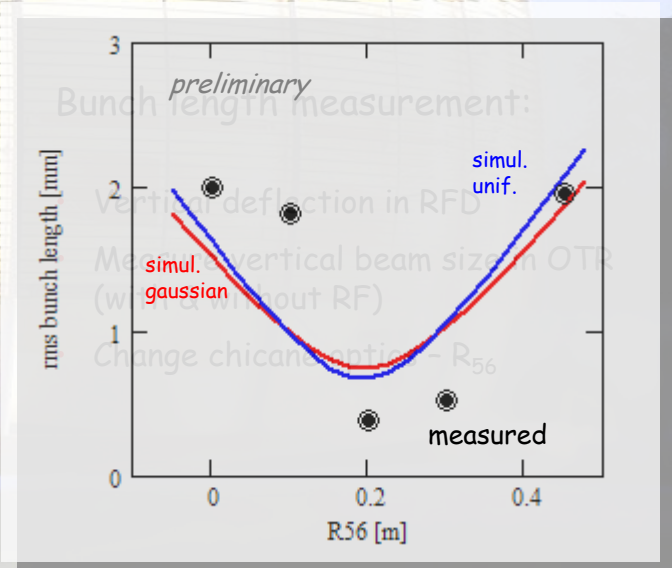
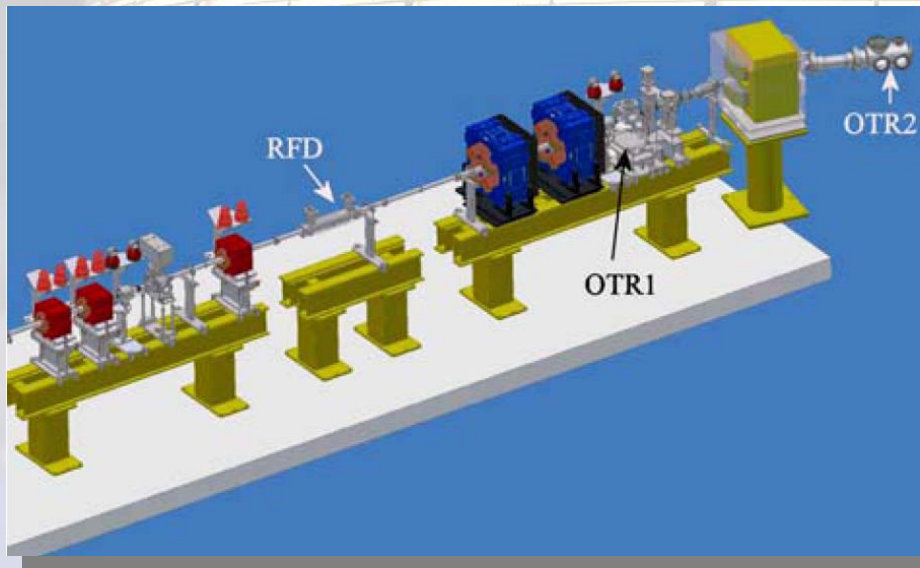
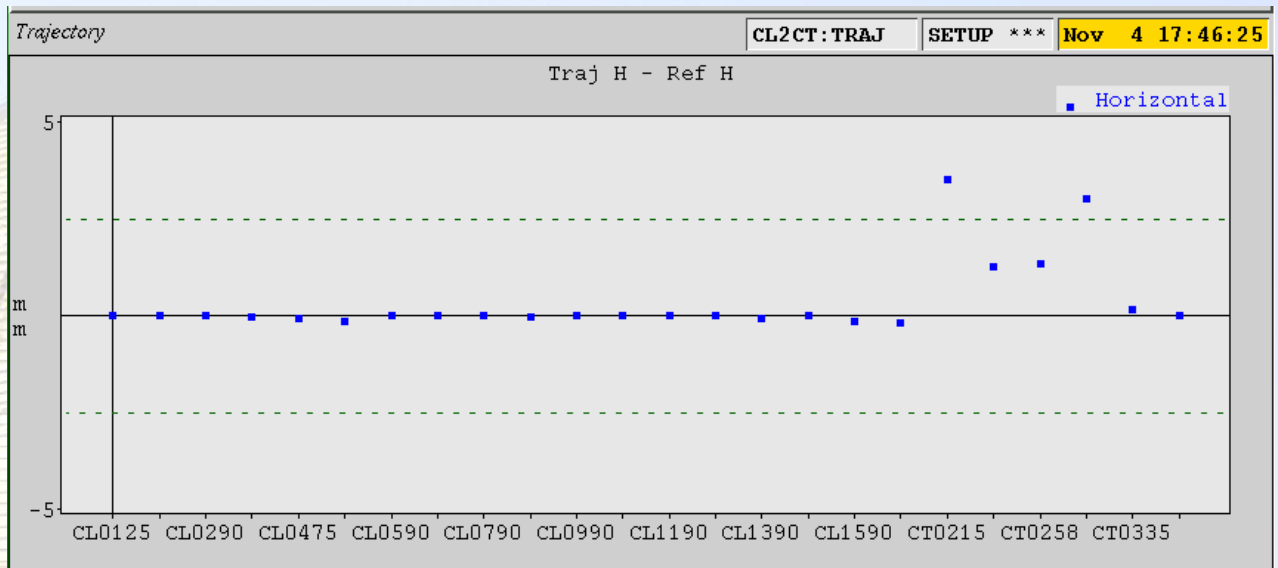


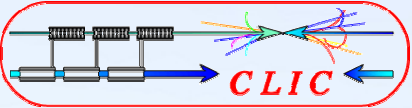
# Dispersion & bunch length measurements



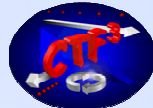
## Dispersion measurement:

- magnet current scaling 1%
- orbit difference





# Plans for 2005

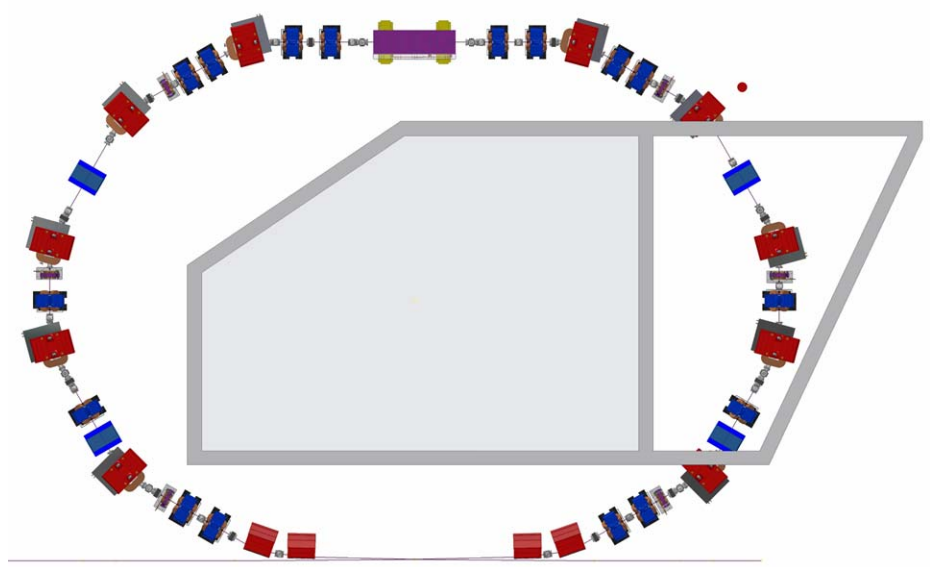


## 1<sup>st</sup> run:

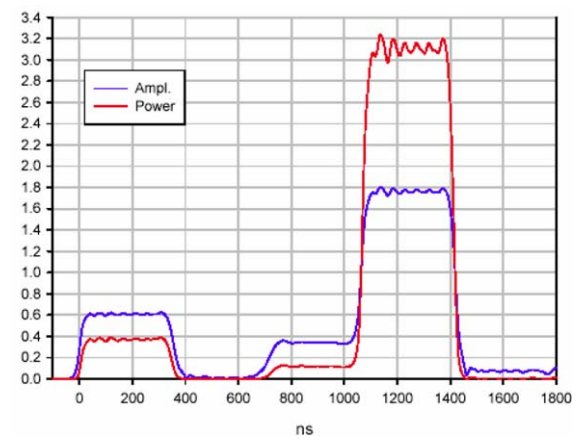
- SHB system commissioning
- Additional SICA structures
- 30 GHz accelerating structure tests

## 2<sup>nd</sup> run:

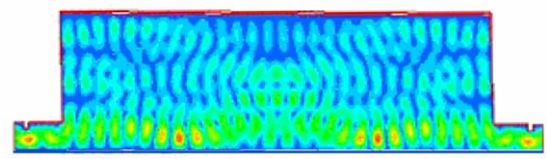
- DL commissioning
- 30 GHz RF pulse compression studies



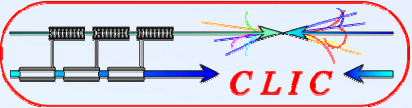
Delay Loop layout



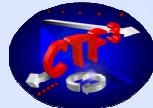
30 GHz pulse compression studies



*Presentation this afternoon : W. Wuensch  
+ Thursday morning session*



# A final word...



Thanks to everybody who participated to this year of very successful CTF3 operation !



**More details in the talks of Frank, Caterina, Hans, Igor, Thibaut ...**