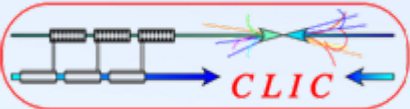


CTF3 COMMISSIONING STATUS OPERATION AND PERFORMANCE IN 2005

R. Corsini for the CTF3 team

Outline

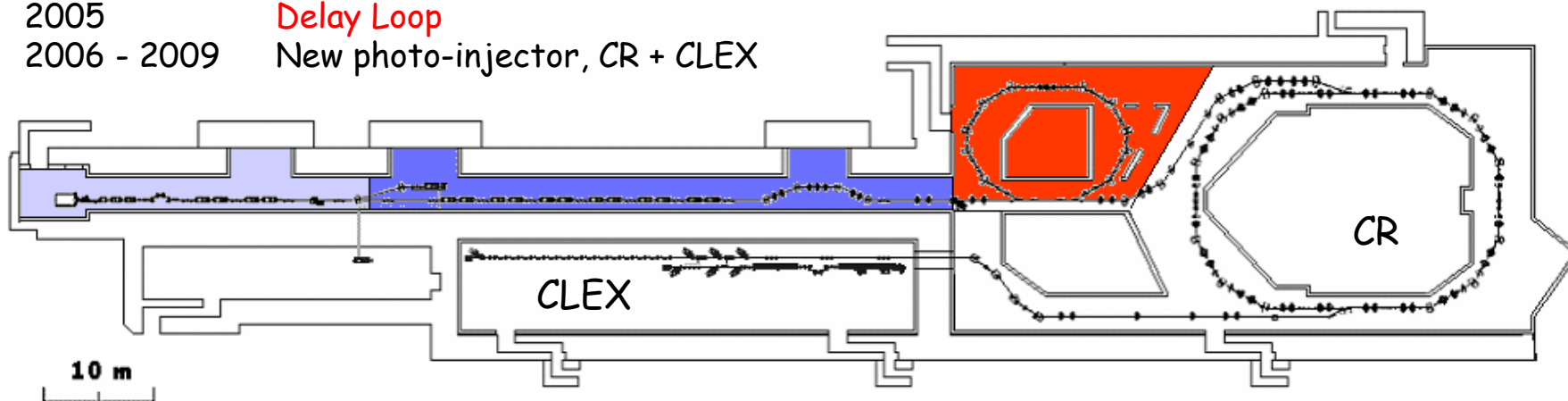
- CTF3 Status in 2004
- Commissioning & operation program in 2005
- Overview of 2005 runs - main results
- Conclusions



CTF3 evolution & past results



- 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 commissioning (2003)

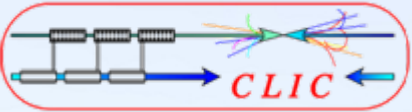
Nominal parameters achieved in injector and first part of linac

Stable operation in full beam loading condition, high beam current

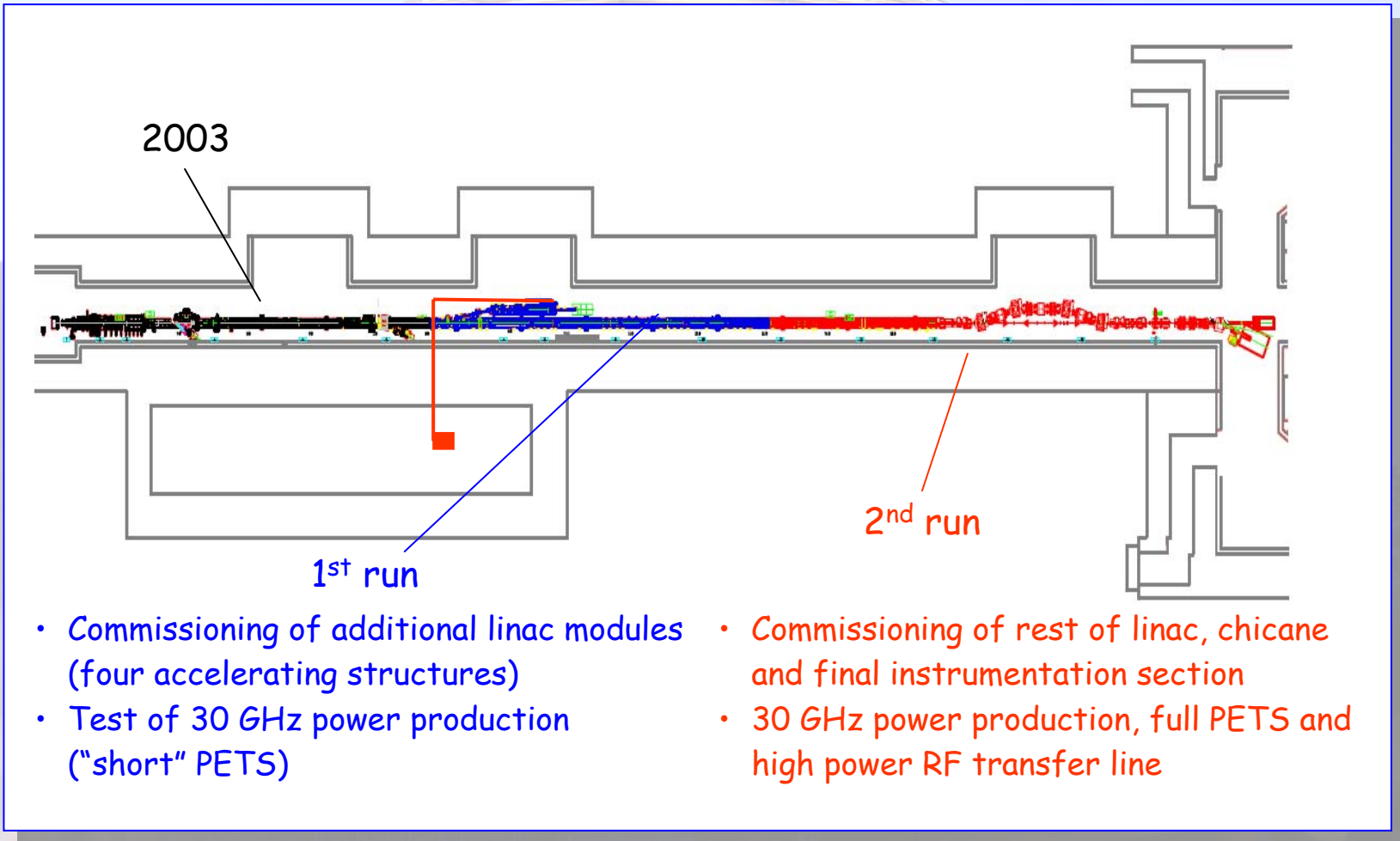
Linac and chicane commissioning, 30 GHz high-power test stand (2004)

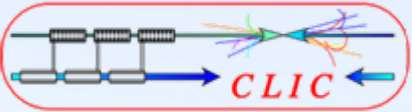
Nominal current at the end of linac, tunable R56 chicane commissioning, bunch length measurement by RF deflector

Production & transport of 30 GHz RF power (50 MW, 70 ns)



CTF3 status in 2004



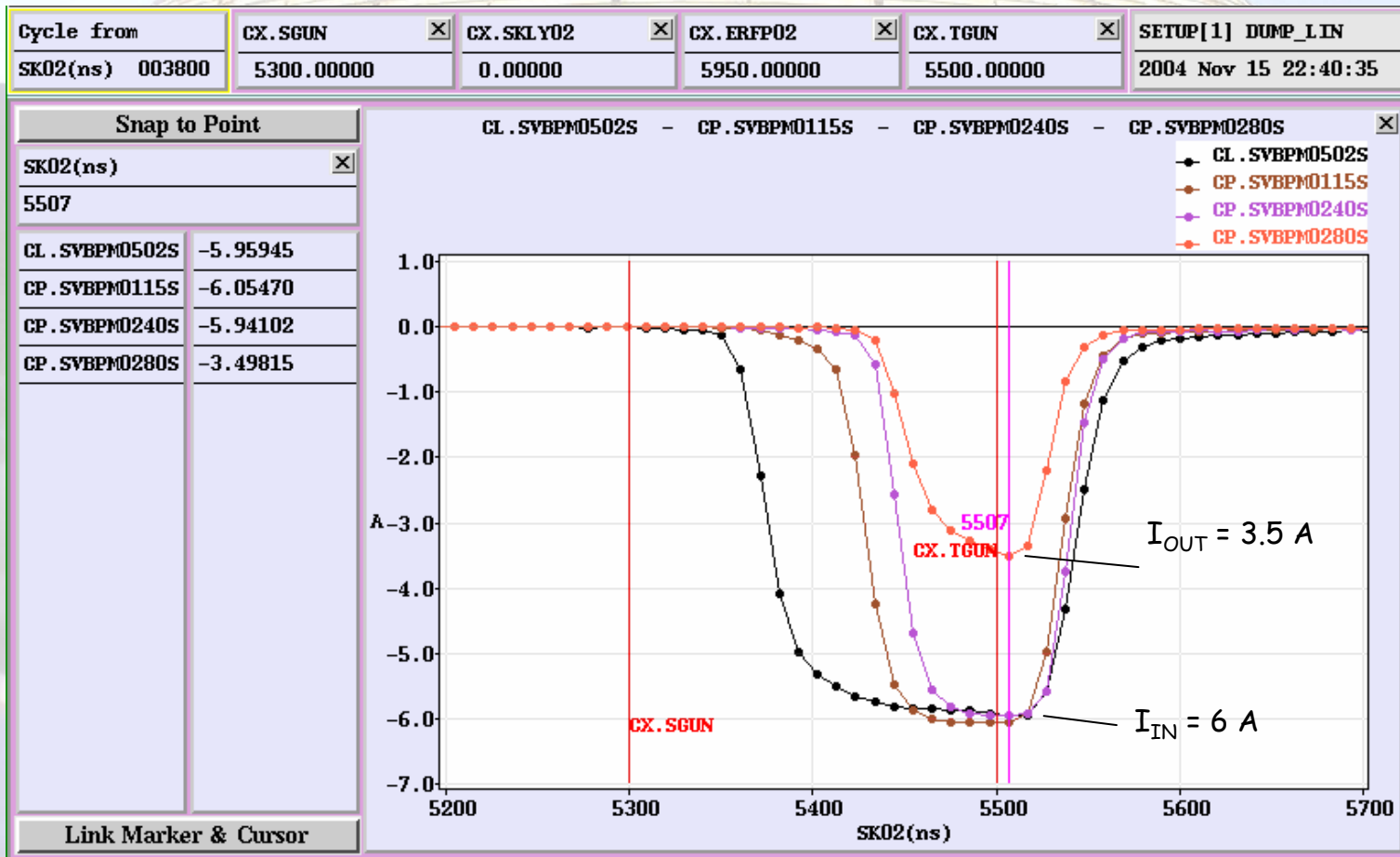


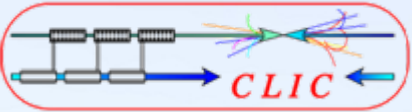
30 GHz power production - 2004



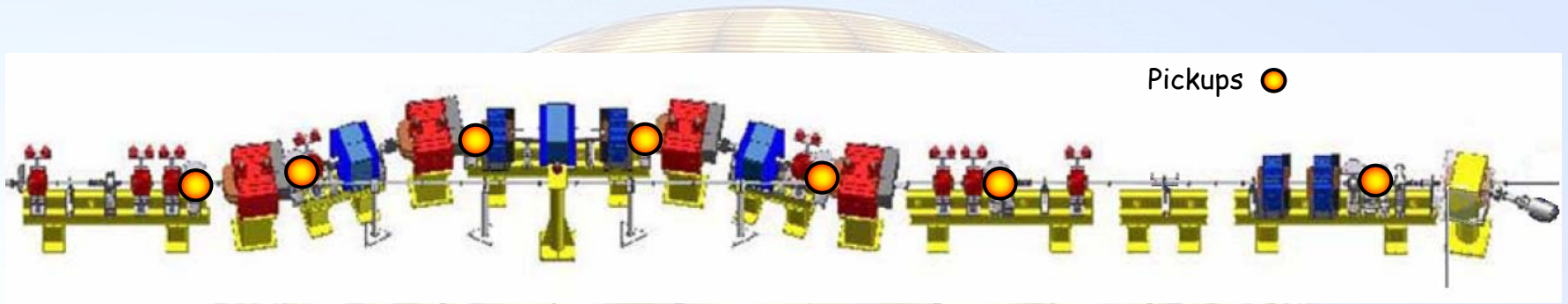
- Full PETS & High power transfer line installed
- RF Power to load (not yet accelerating structures)

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

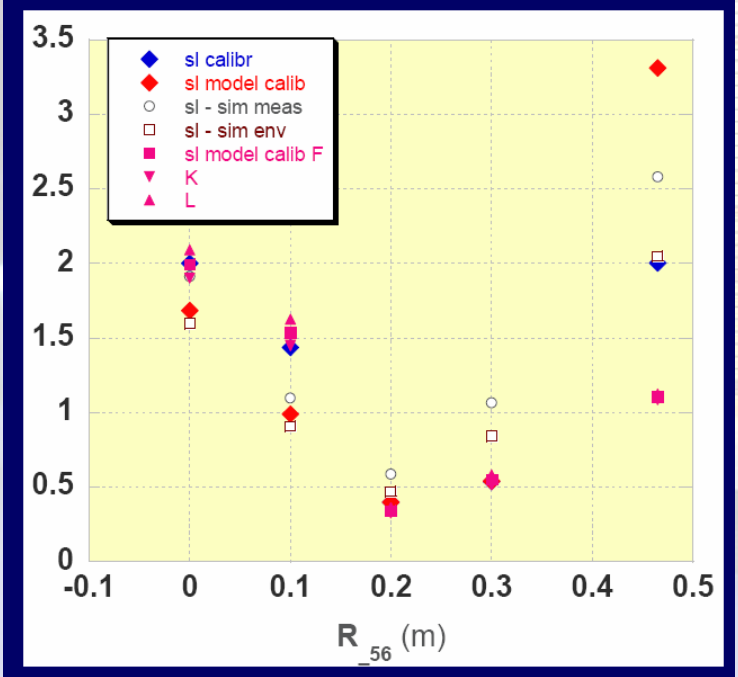




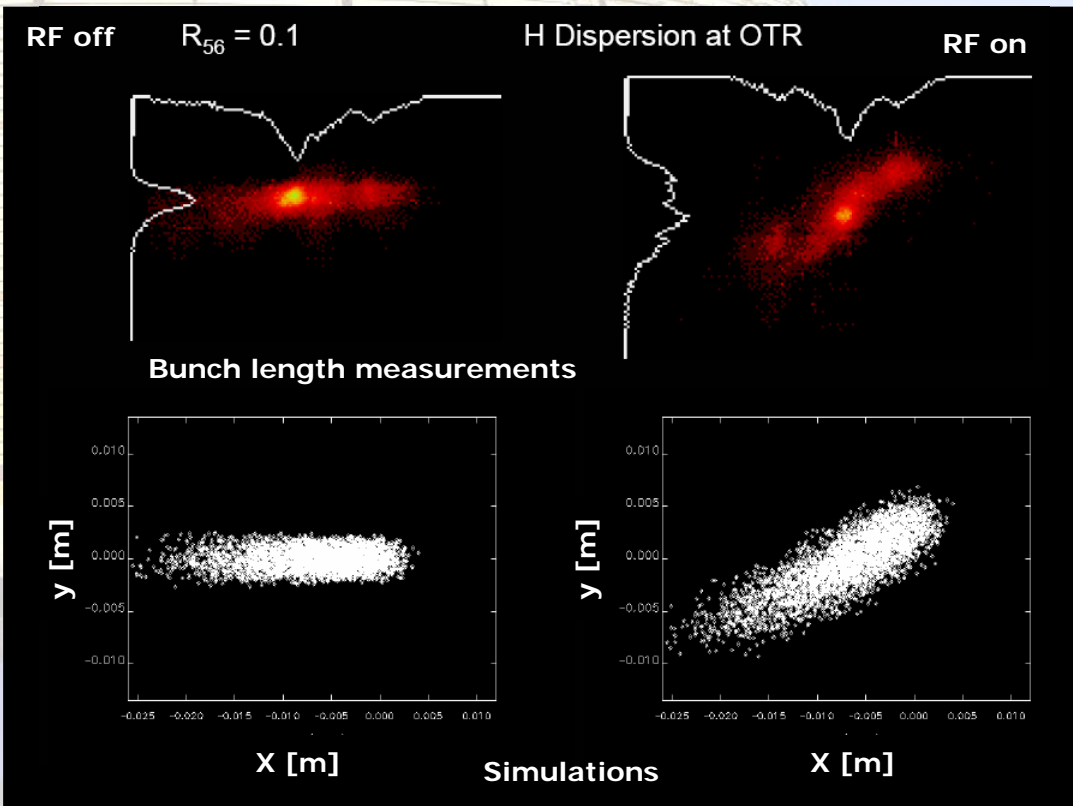
Chicane optics & bunch length measurements - 2004

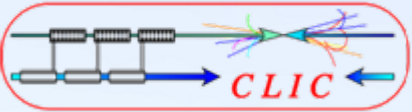


Bunch length (mm)



C. Biscari - INFN





- 30 GHz power production operation for accelerating structure test

Aim: produce **75 MW** pulses with duration above **70 ns**, **50 MW** delivered to a **Mo-iris** test accelerating structure, to reach the nominal CLIC gradient (**150 MV/m**).

- Commissioning of Delay Loop

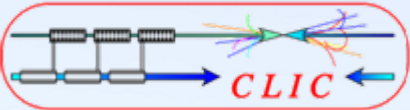
- Commissioning of modified injector (SH bunching system and bunch phase coding)

- 30 GHz RF pulse compression studies

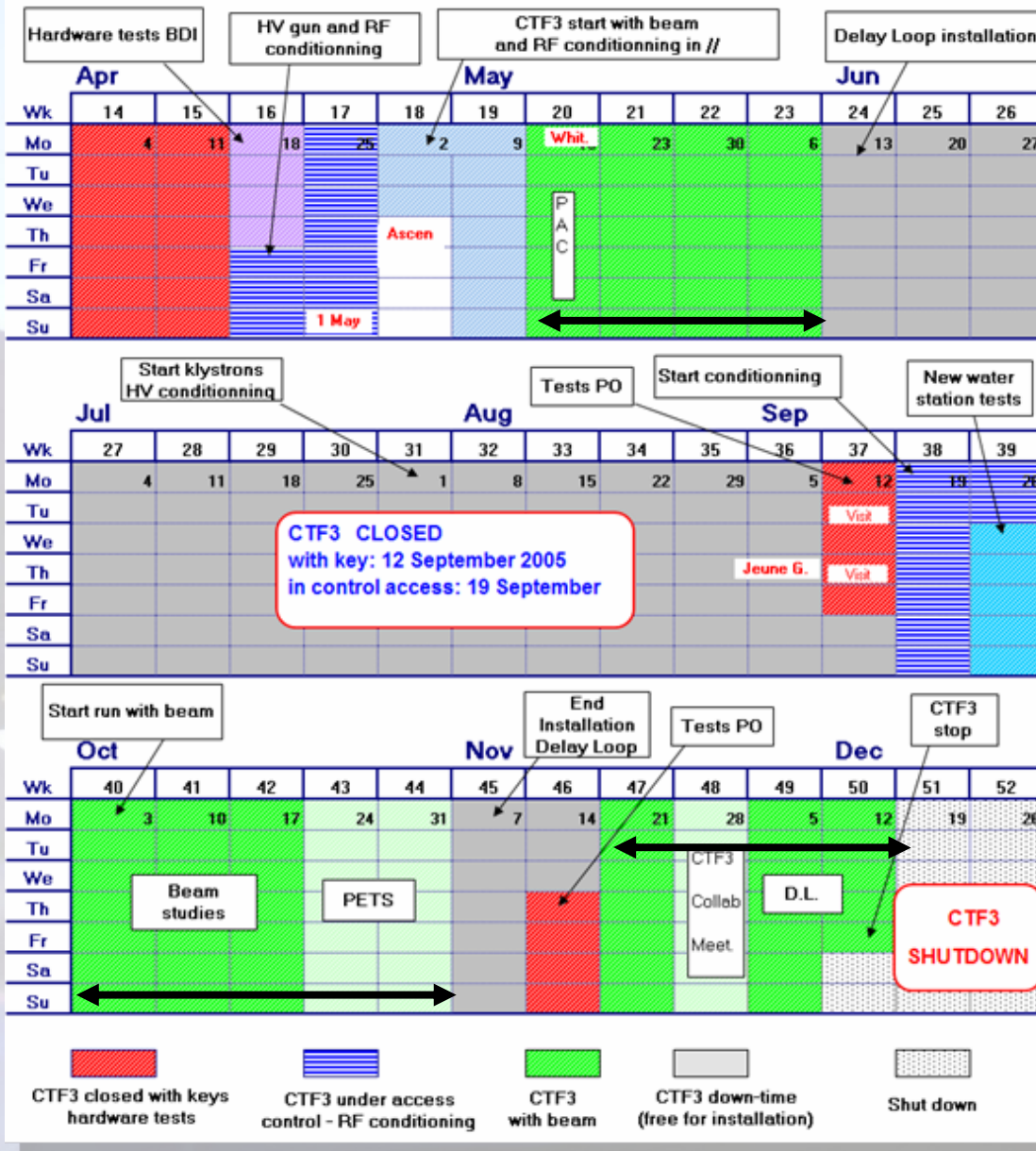
Long pulse from PETS, beam studies on phase jump suitable for RF pulse compression, pulse compressor conditioning.

- Continuation of CTF3 beam studies

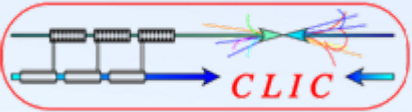
Emittance optimization, linac trajectory, bunch compression/lengthening, direct measurement of longitudinal phase space, RF-to-beam efficiency of high beam loading operation



2005 schedule



- Two runs:
 - 17 May - 10 June
 - 3 Oct - 16 Dec
- (Long) summer shut-down for installation
- Two week interruption during second run, to complete DL installation
- A total of ~ 13 weeks of beam operation
- Operation mainly during working days, **but**
- Several night & week-ends shifts for 30 GHz structure tests - precious help (two operators on shift) from Ankara U.
- Indeed, operation was much less limited by manpower than last year. New operators/machine experts were successfully trained.



1st run - 30 GHz production & structure tests



The first 2005 run was fully dedicated to Mo iris structure test, only partly satisfying:

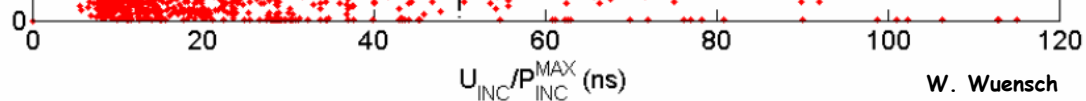
About 25 MW (100 MV/m) with 30 ns long pulses reached

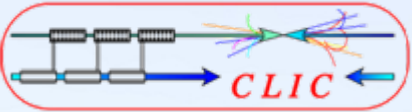
PEAK INCIDENT POWER vs PULSE LENGTH

45

PROBLEMS

- Short run time - no time for beam measurements and re-matching
- Coupled beam setting-up and conditioning of both PETS and accelerating structure
- Reliability and availability problems
- Stability problems (slow drifts, beam jitter)
- Radiation issues





In the second 2005 run, several improvements have been made:

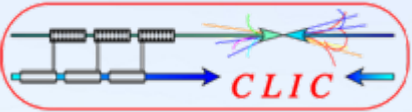
- Variable attenuator in the 30 GHz line allowed to (partially) decouple beam operation and PETS/accelerating structure conditioning
- Improved reliability (mainly klystrons) \Rightarrow *G. McMonagle talk*
- Stability problems \Rightarrow *F. Tecker*
 - Temperature stabilization of RF pulse compressors - also improves availability !
 - Re-optimized gun working point
 - Ripples from some power supplies stabilized
- Dedicated time for beam studies (better emittance, good beam knowledge) \Rightarrow *P. Urschütz*
- Beam loading compensation to minimize beam losses and radiation issues \Rightarrow *S. Doebert, P. Urschütz*
- Improved diagnostics (screens, spectrometers) \Rightarrow *T. Lefevre*

Reached (**almost**) nominal CLIC values :

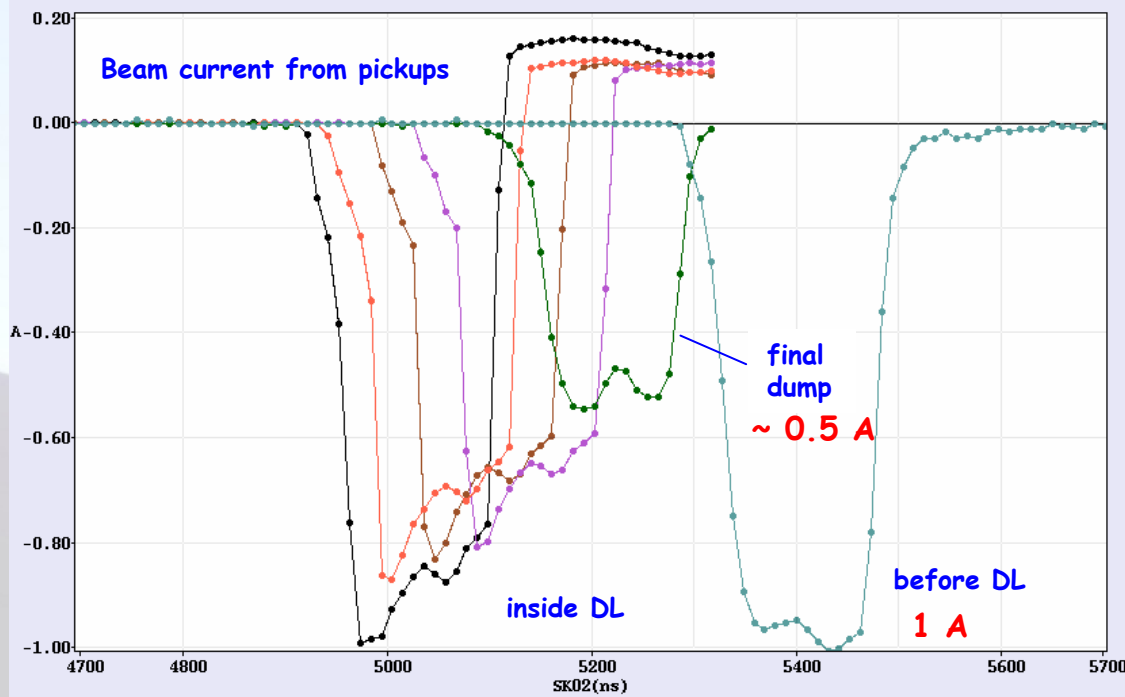
55 MW (**150 MV/m**) **70 ns** long pulses

and still positive slope of conditioning curve

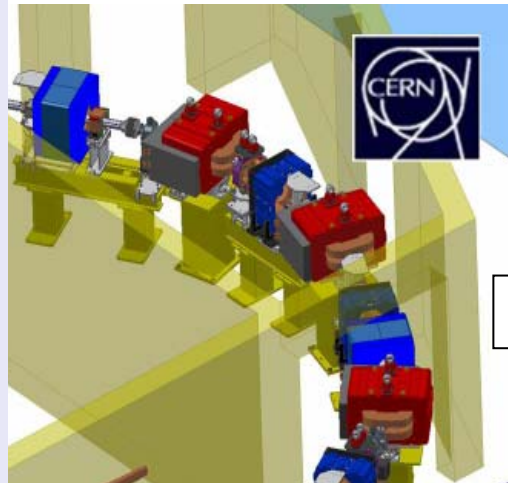
\Rightarrow *Many more details in A. Rodriguez and W. Wuensch talks*



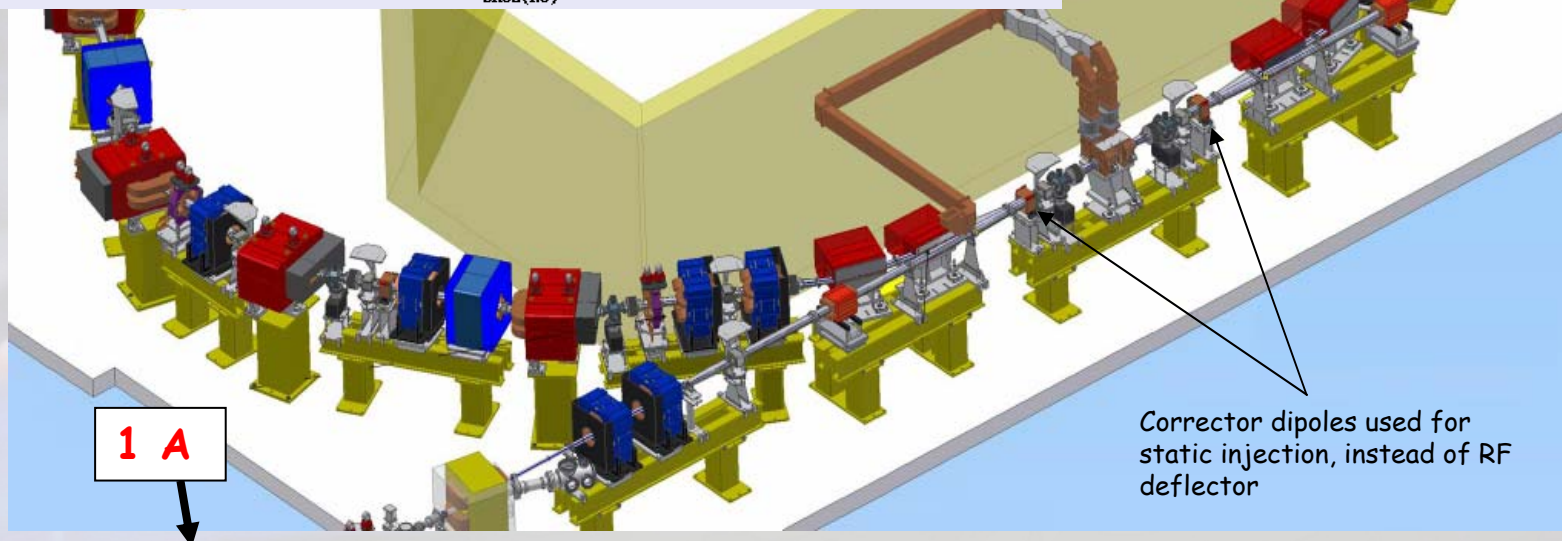
First beam circulating in the Delay Loop

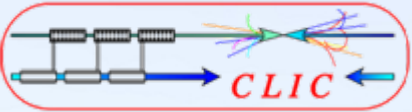


static injection, with dipoles)



0.5 A

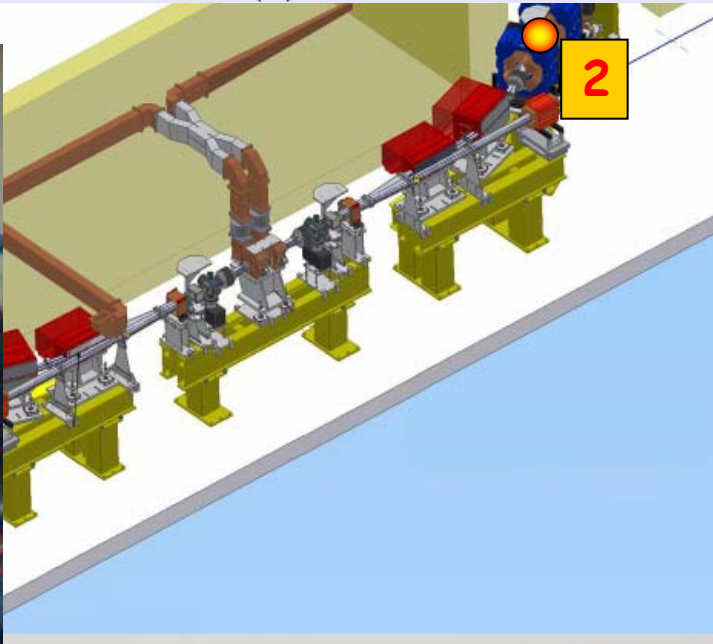
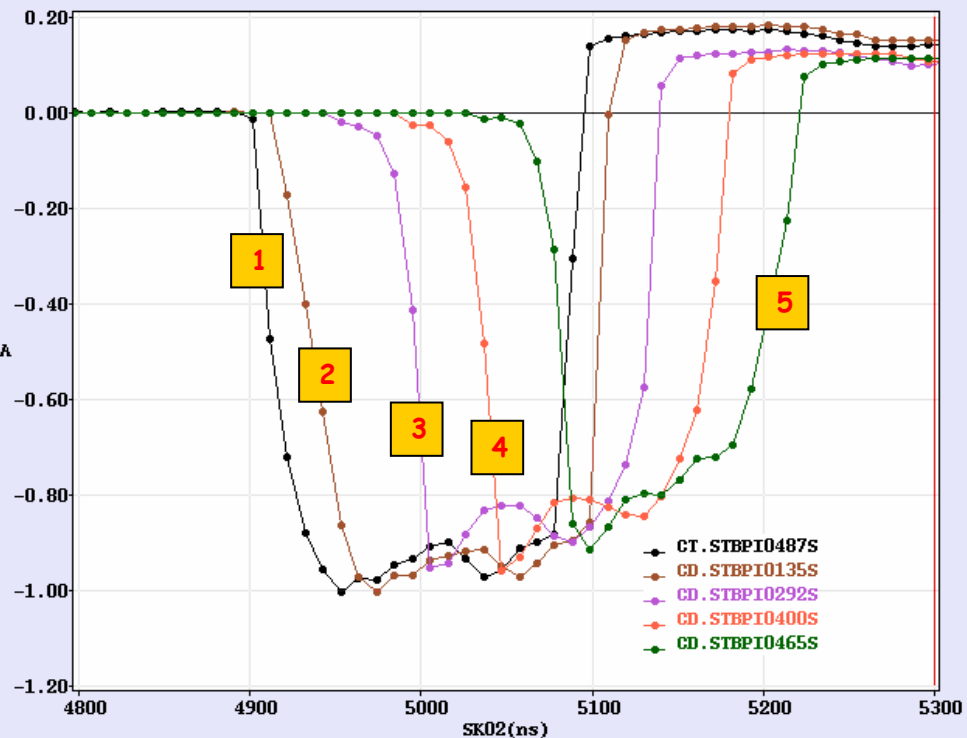
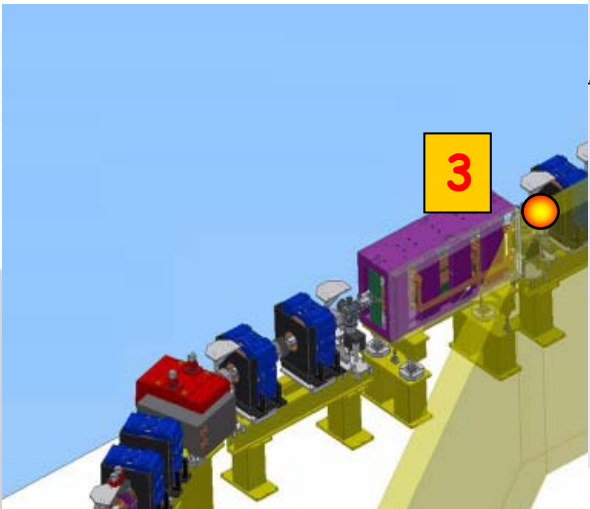


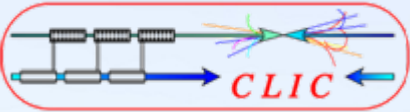


Losses



Next day, obtained a better trans optics (but more problems at ext

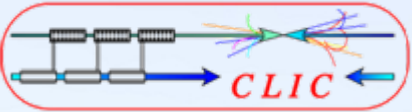




Conclusions



- After some initial problems, extremely good results for 30 GHz power production and accelerating structure conditioning
- Routine operation for 30 GHz power production established - but not enough manpower for longer running periods
- In a very short time, obtained the first beam circulating through the Delay Loop
- Still 2-3 weeks of operation left, will try to:
 - Inject in DL using the RF deflector
 - Progress with 30 GHz conditioning
 - Progress with beam studies (phase jump for 30 GHz pulse compression) and diagnostics development
- However, cannot fulfill all the goals of the very ambitious program (missing hardware, not enough beam time...) - DL commissioning to be concluded next year - decoupled linac operation/CR installation could help



Conclusions



**Many thanks to all the people that
have contributed to this successful
year of commissioning and operation !**