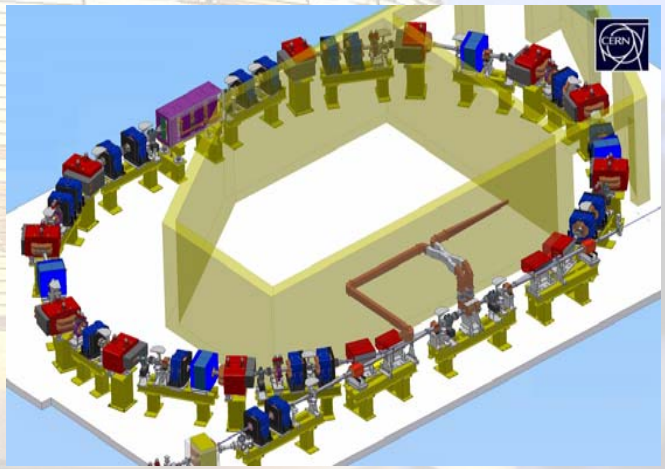
CTF3 COMMISSIONING STATUS

1st run 2006

R. Corsini for the CTF3 team

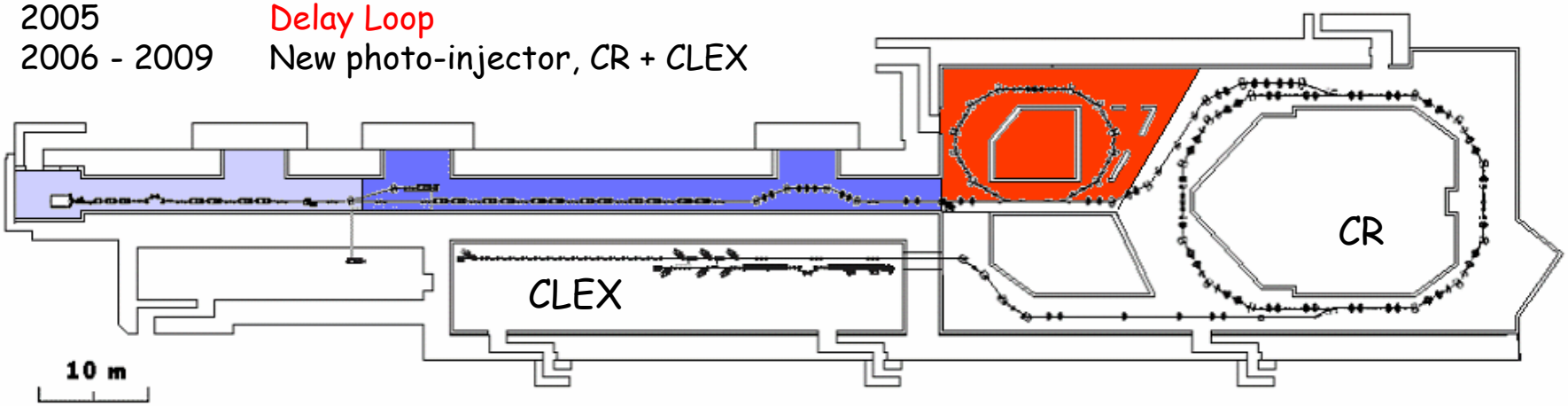
Outline

- CTF3 Status in 2005
- Commissioning & operation program in 2006
- Overview of 2006 runs – main results



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

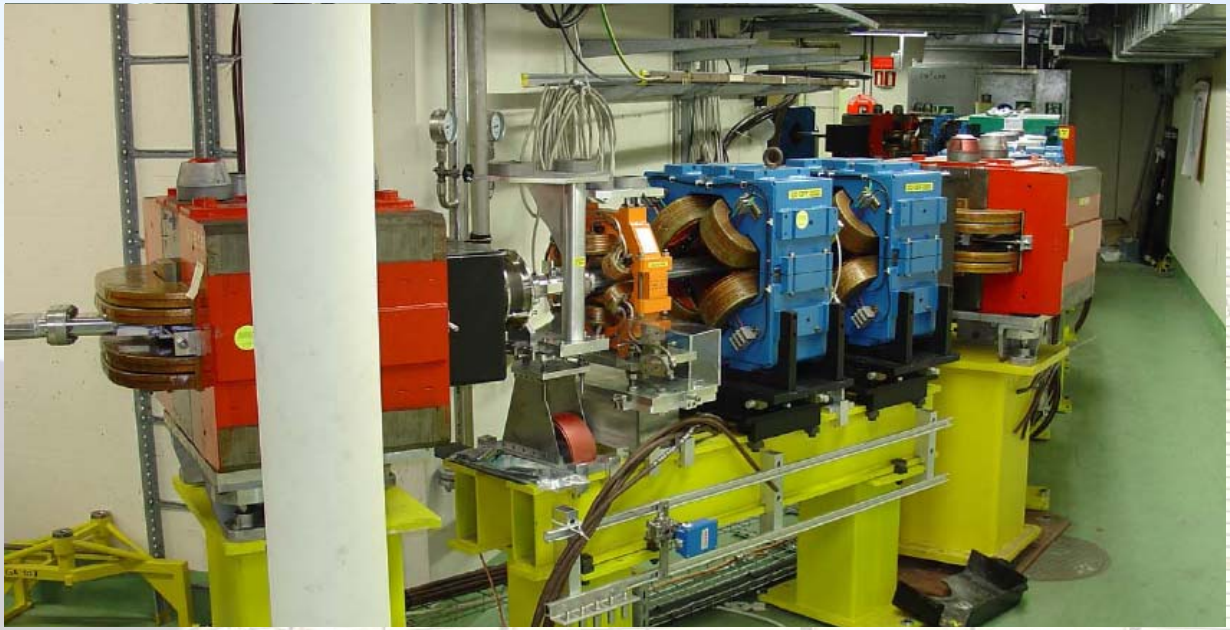


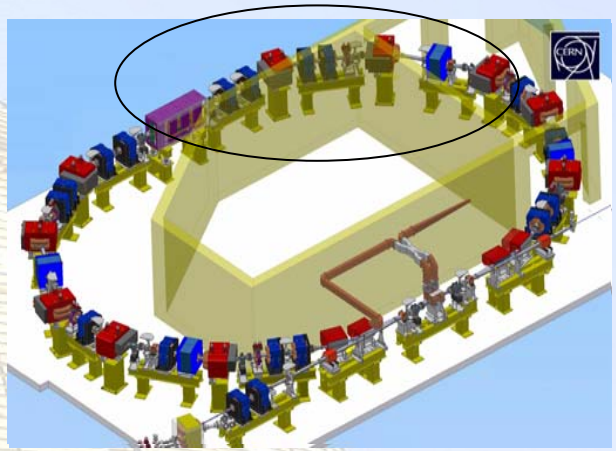
CTF3 Evolution

CTF3 main results until last year

Preliminary phase (2001-2002)	Low current bunch frequency multiplication by RF deflectors
CTF3 injector (2003)	Nominal parameters achieved in injector and first part of linac
	Full beam loading condition, high beam current
Linac, chicane & RF power station (2004)	Nominal current, tunable R56 chicane, bunch length measurements
	Production & tranport of 30 GHz RF power (50 MW, 70 ns)
Delay Loop & RF structure tests (2005)	First beam in DL, first phase-coded beam from SHB system
	First beam re-combination (1 A), routine RF power production
	Test of Mo structure to nominal pulse length & gradient (damage)

Commissioning of Delay Loop & SHB in 2005

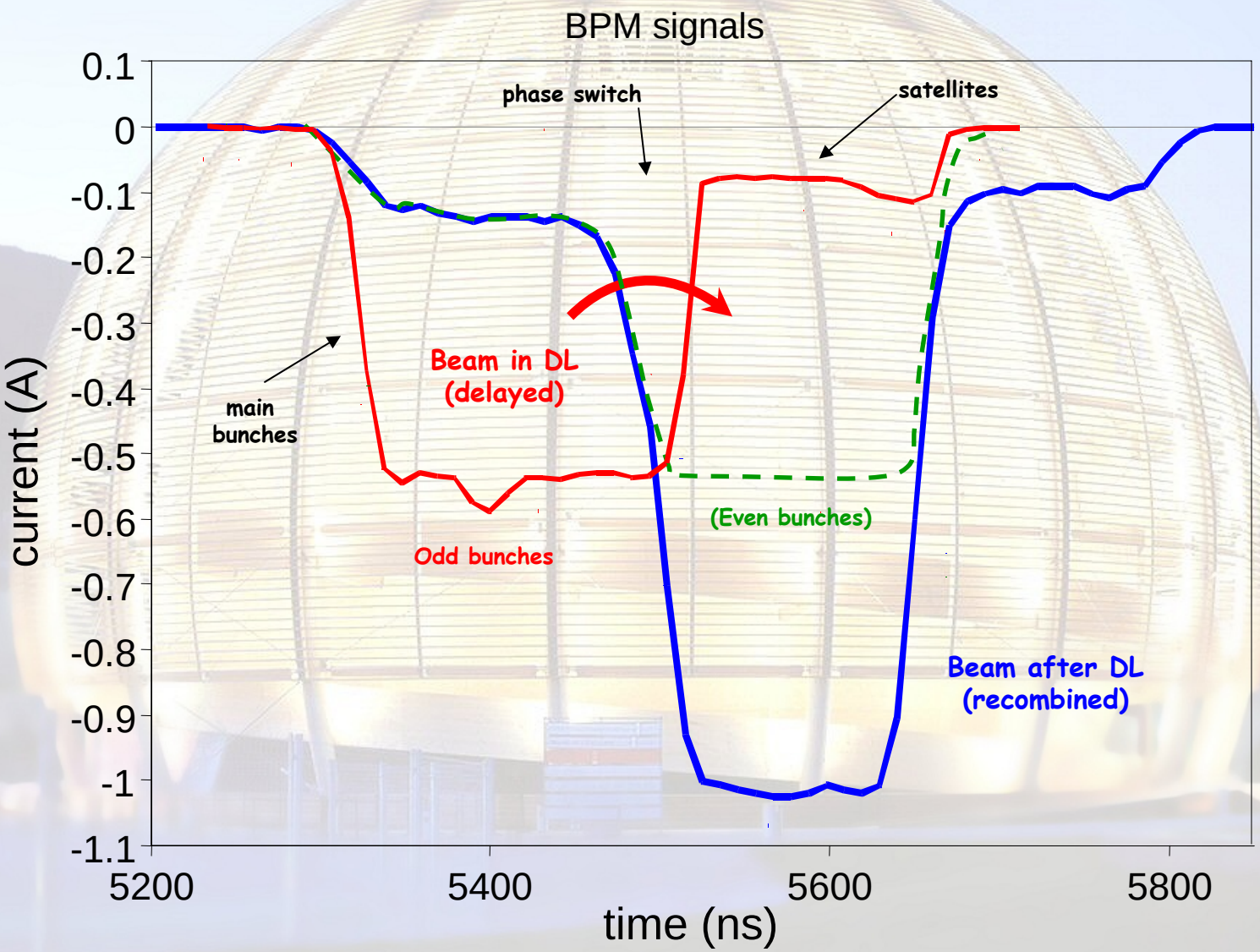




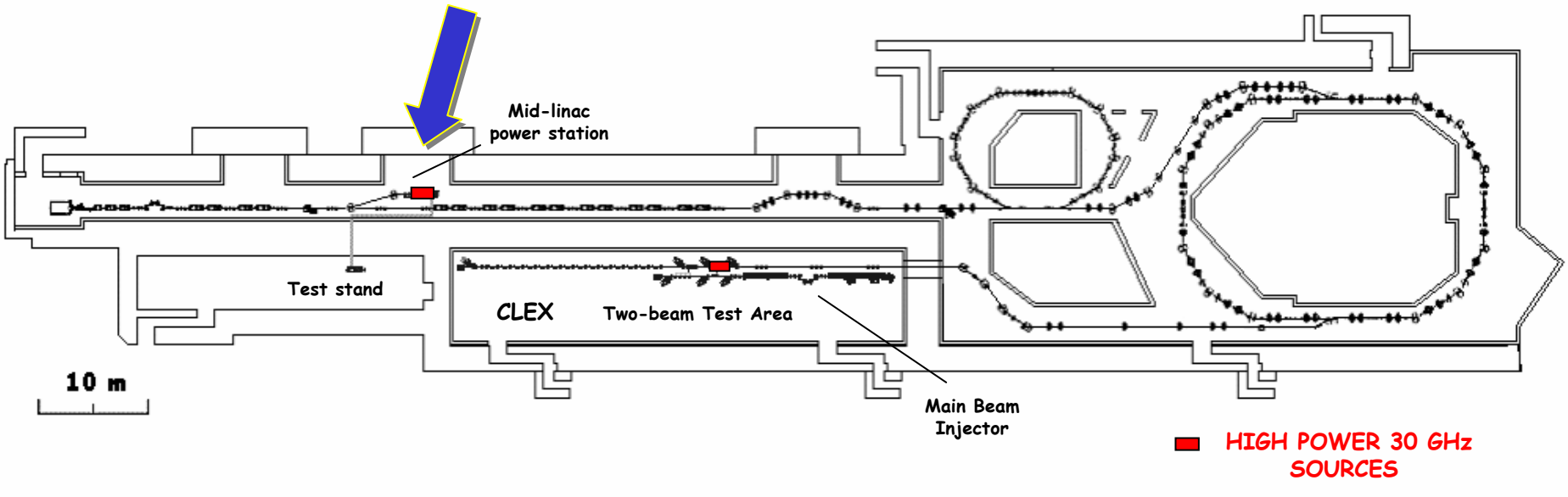
- Missing instrumentation: only 6 Beam Pickups installed out of 17 (one in CT line, 5 in DL)
- Beam limited to low current (1 A), short pulse (300 ns) for radiation protection
- Only one SHB cavity available out of three (TWTs missing)
- No Twiss parameter measurements done before sending beam (timing/software problems with cameras – frame grabber) - Matching based on initial condition measured in injector for higher current beam - Relaxed optics in Delay Loop (non-isochronous).

Delay Loop – first recombination (2005)

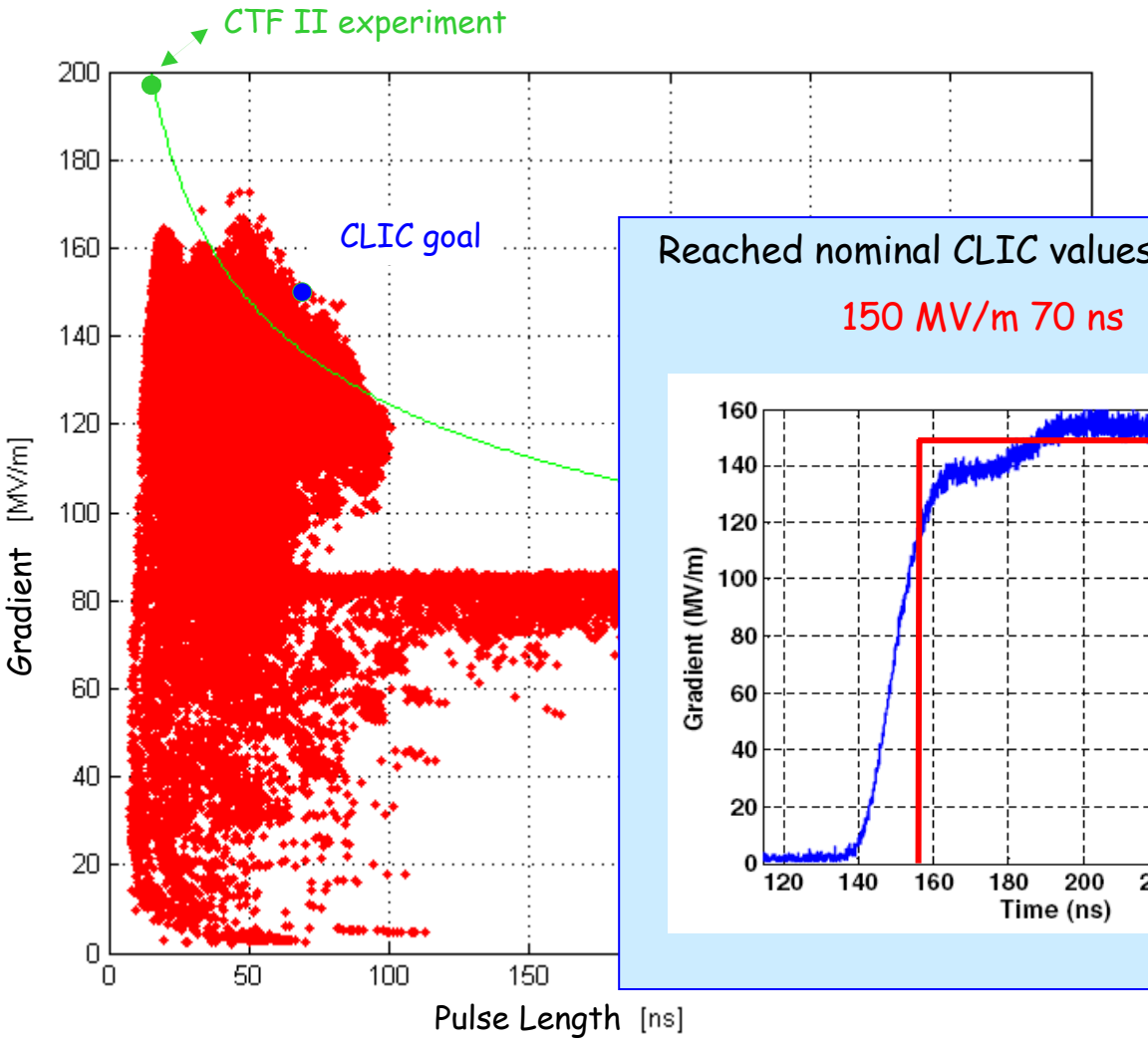
Nominal conditions, 1.5 GHz from SHB system (one cavity only), and phase switch



30 GHz power production in CTF3



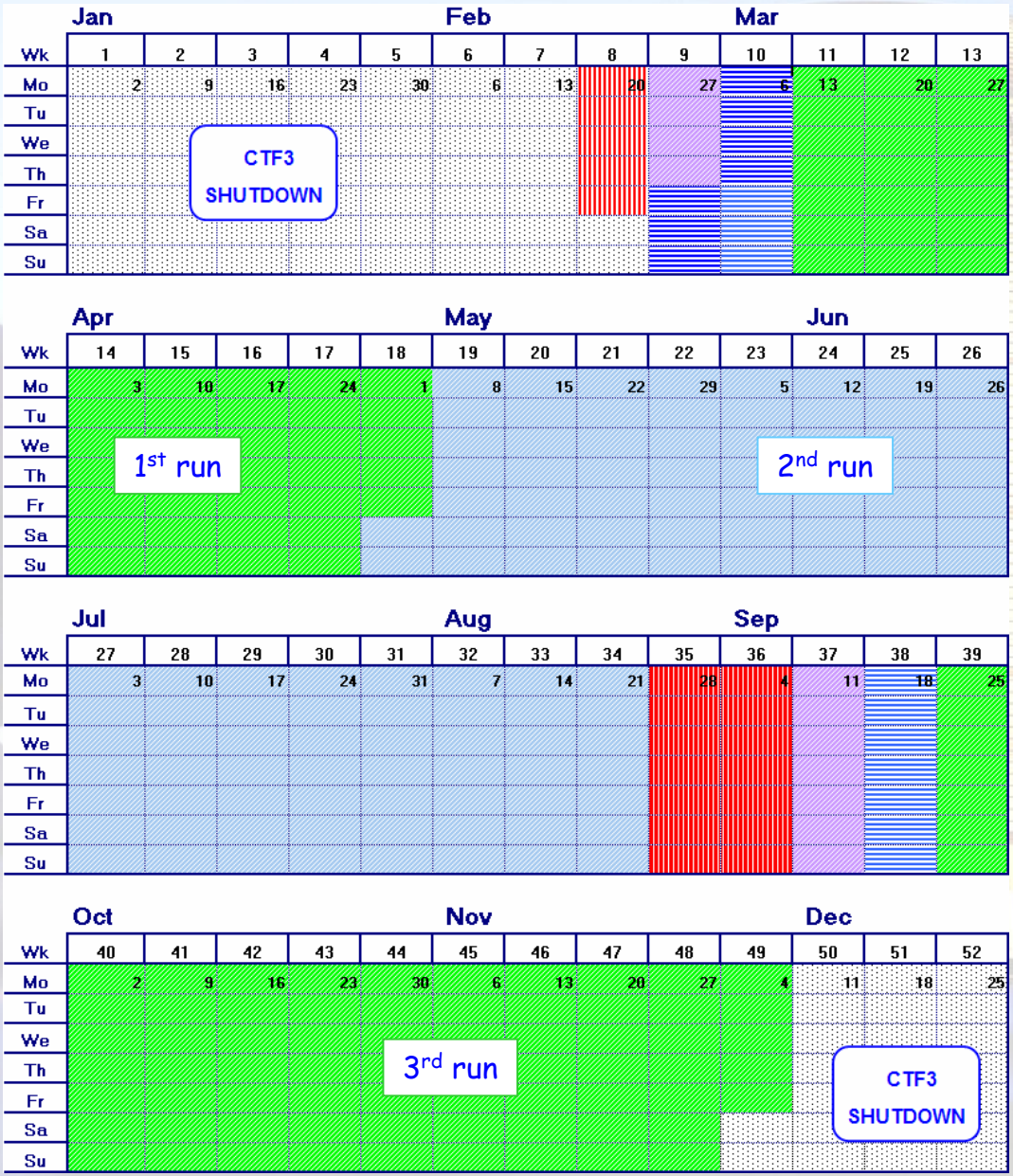
2nd run 2005 – 30 GHz structure tests



Reached nominal CLIC values :

150 MV/m 70 ns

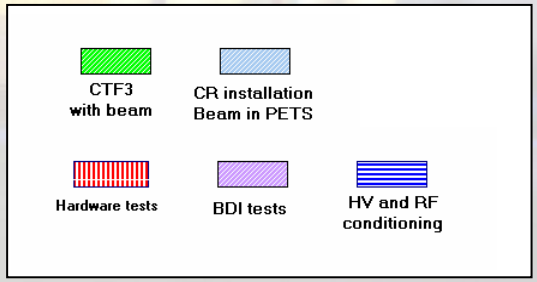
CTF3 schedule in 2006



This year, no summer shut-down but rather continuous operation

However, in summer only beam up to PETS in parallel to installation work for the CR

Sub-division in runs for sake of clarity, planning…



CTF3 – 1st run of 2006

Program 1st run

9 Weeks from controlled access to stop

- 1 Week RF Conditioning & preparation
- 2 Weeks PETS, 30 GHz
- 2 Weeks Beam Studies (Linac/chicane, emittance, DL optics)
- 3 Weeks Delay Loop recombination & SHB Commissioning
- 1 Week Reserve

COMMENTS:

- Actually started on time this year
- However, not all MKS available to nominal power, plus hardware problems…
- Two weeks extension (2nd one *almost* useless after big power cut)

CTF3 – 1st run of 2006

MAIN GOALS

1. PETS
   - ⇒ Test of copper structure (may continue in run 2)
   - ⇒ Commission automatic conditioning program
2. Beam Studies
   - ⇒ Solve emittance puzzle
   - ⇒ Well-known linac & chicane optics (energy profile, modeling..)
3. DL & SHB Operation
   - ⇒ DL isochronous optics – orbit, dispersion, matching
   - ⇒ SHB system optimization (satellites, bunch length)
   - ⇒ DL beam recombination with nominal beam

COMMENTS:

- Routine PETS operation, switch every evening (more from Steffen)
- Emittance & linac optics much better understood (more from Frank)
- However, bump after injector & steering at end of linac/chicane difficult (data to be analyzed)

COMMENTS (cont'd):

- New isochronous DL optics (wrong sign of combined function dipoles)
- Found calibration errors in three DL quad families after 1st dispersion measurement
- SHB system running in with 3 cavities – optimized on loading, BPR WG signal
- Satellite measurement ? – below 10 % as seen in DL
- "Correct" length of DL, measured with BPR phase ⇒ Frank
- But, wiggler setting with equal current in two power supplies, instead of ~ 2/3 (confirmed by magnetic measurements)

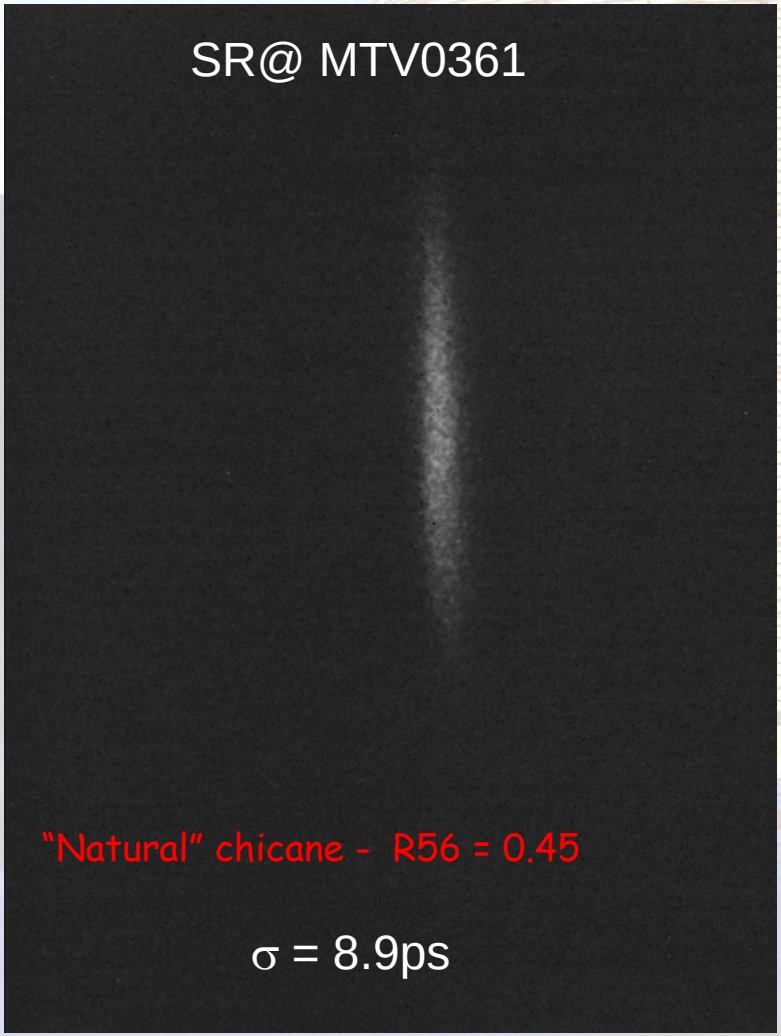
NOMINAL BEAM PARAMETERS ?

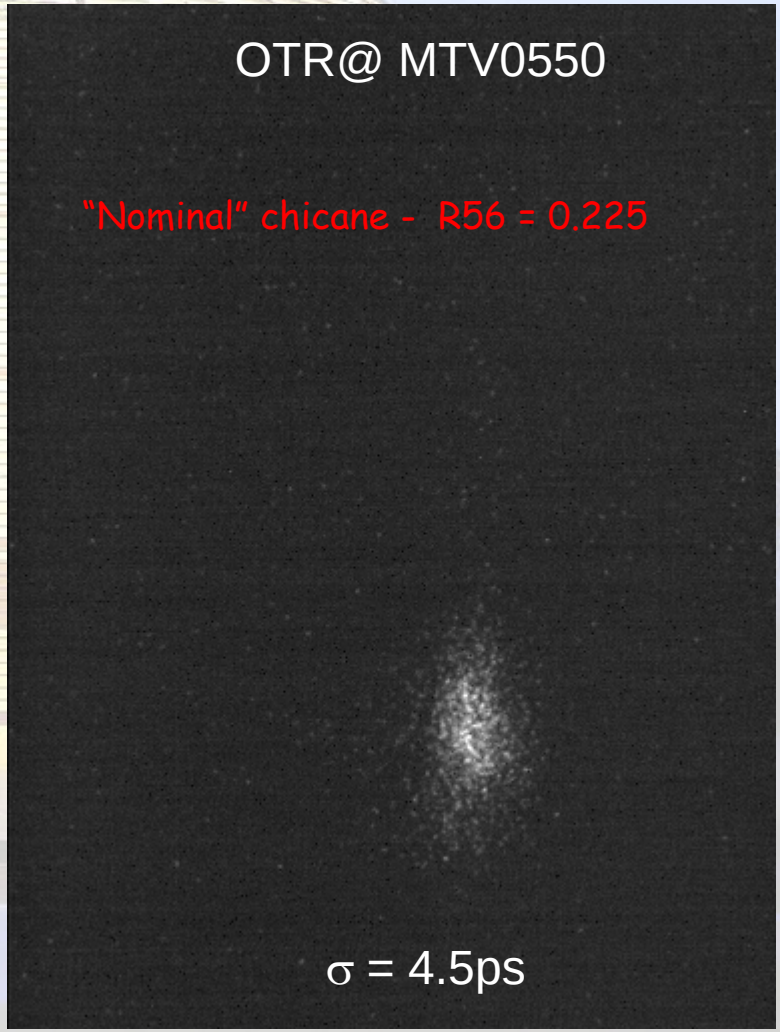
• Beam current	3.3 A max after chicane - ≤ 6 A after combination (satellites)
• Energy	~ 100 MeV – still miss MKS 15 – can gain something from others
• Emittance	now consistently below nominal (100 π mm mrad)
• Pulse length	"just" nominal (1.4 μs after chicane, 5 × 140 ns pulses after DL)
• Bunch length	⇒ see next slide

Bunch length measurement – streak camera

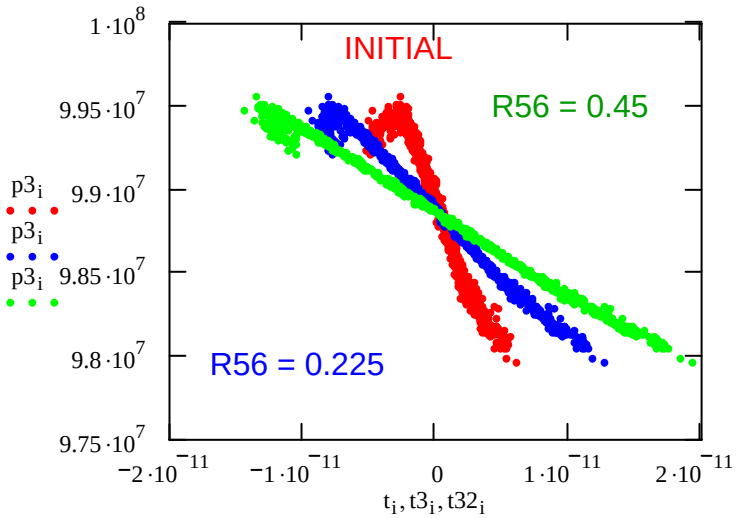
T. Lefevre – C. Welsch

Maximum Sweep speed @ 10ps/mm





Bunch length evaluation



stdev (t) = 2.473× 10^−12 stdev (t)·c·1000 = 0.741

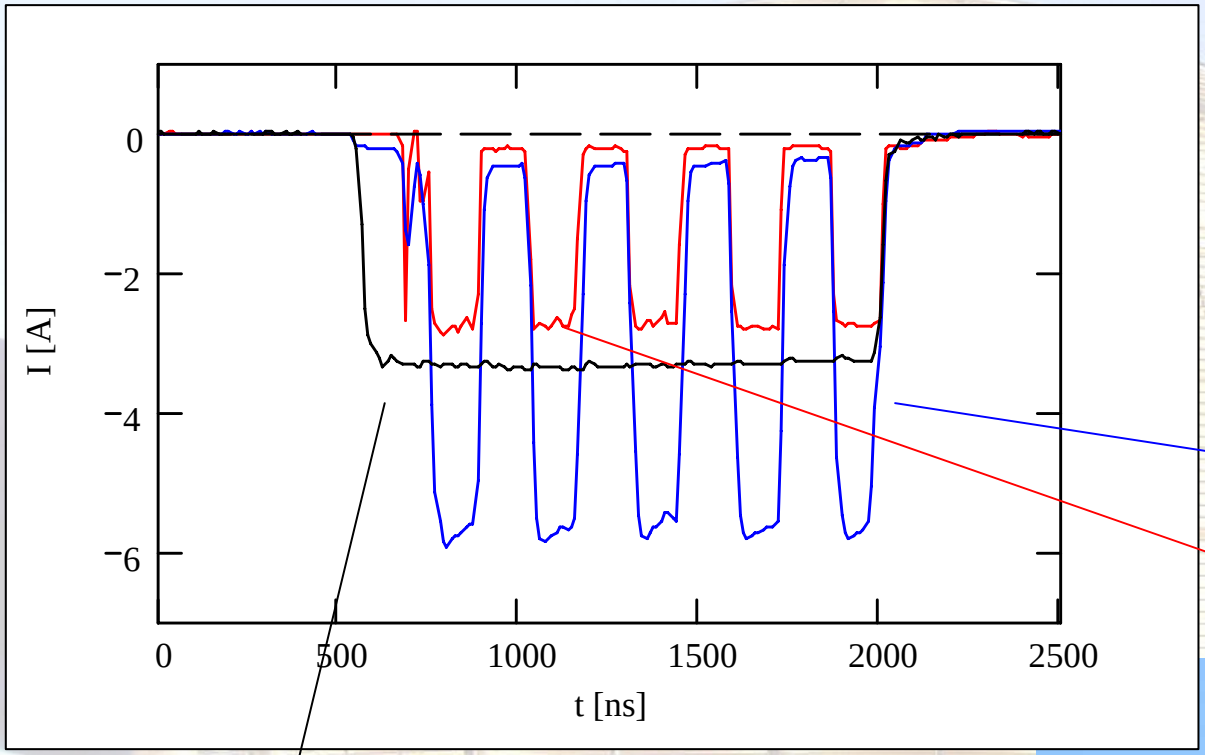
stdev (t3) = 5.683× 10^−12 stdev (t3)·c·1000 = 1.704

stdev (t32) = 8.937× 10^−12 stdev (t32)·c·1000 = 2.679

Streak camera

σ = 4.5ps σ = 8.9ps

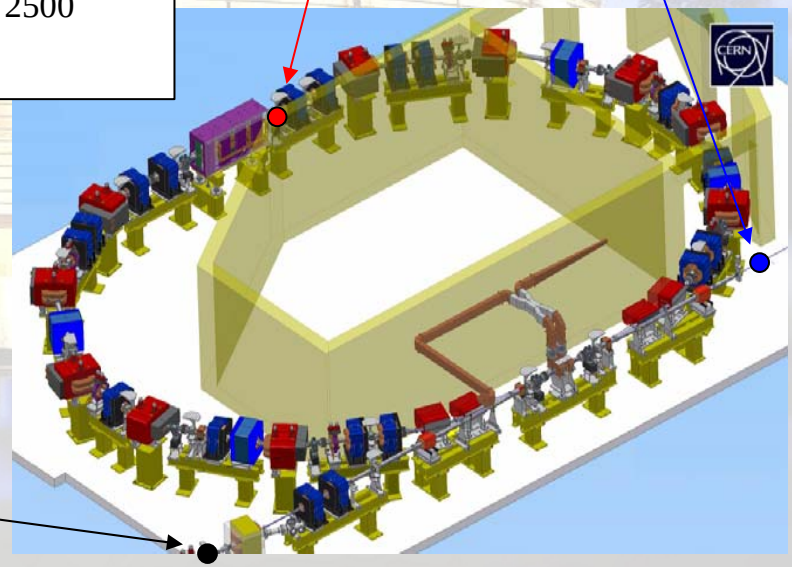
Main result: five pulse recombination



CT.BPM 515
5.8 A + 0. 5 A

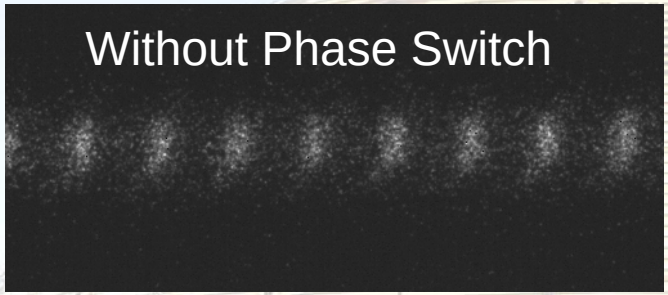
CD.BPM 292
2.9 A + 0.25 A

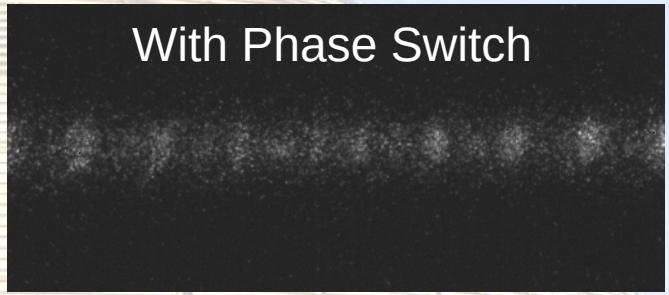
CT.BPM 430
3.3 A



Fast phase switch from SHB system

MTV0550 – 1.5GHz Beam – 500ps/mm – 17th May 2006

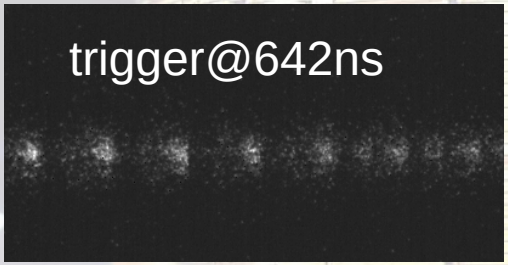


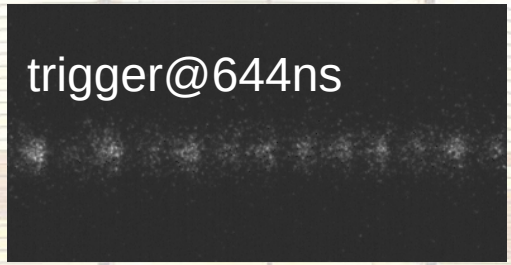


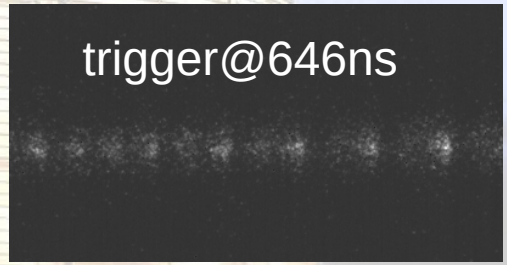
Streak camera

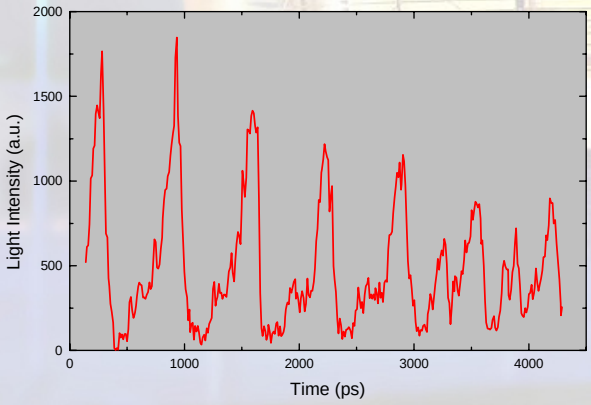
T. Lefevre – C. Welsch

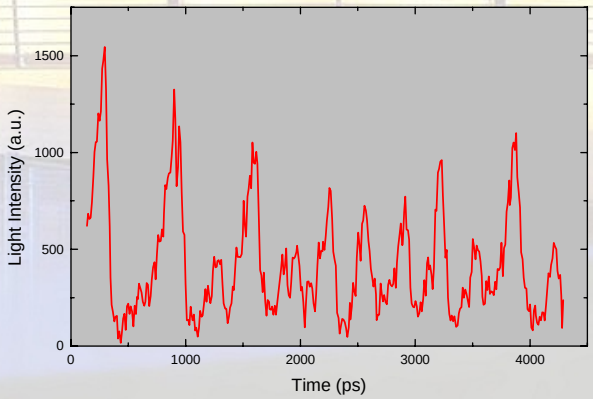
Phase Switch : ~ 5-6 ns

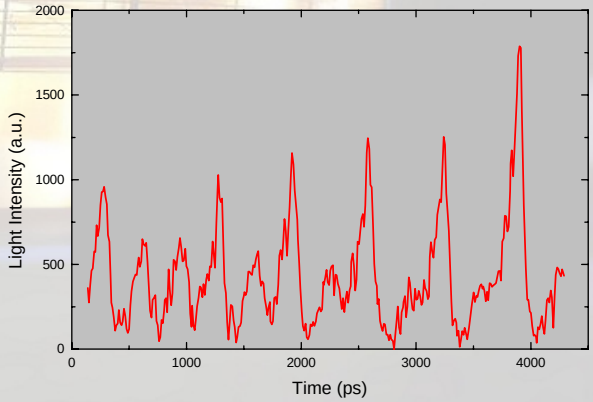






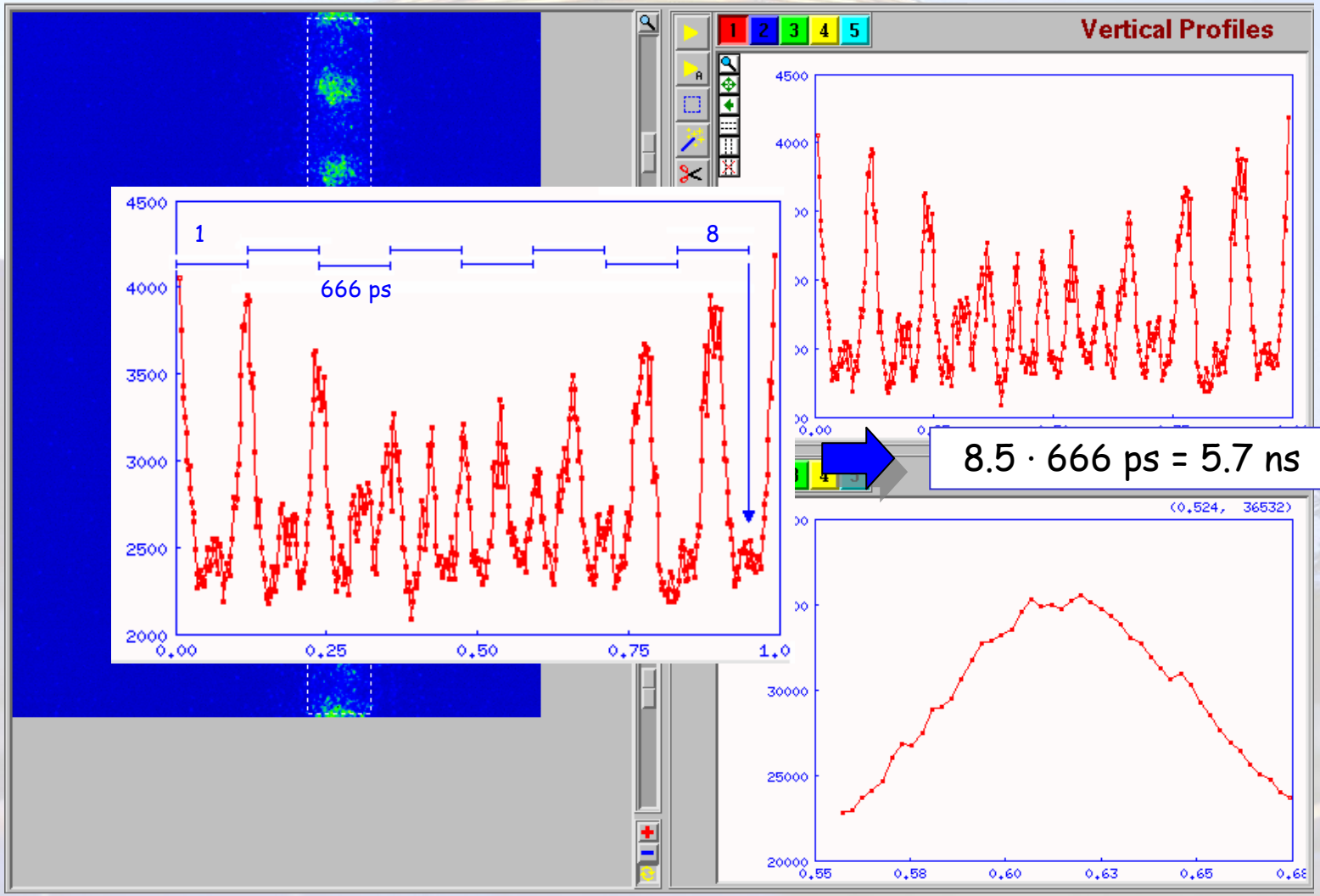




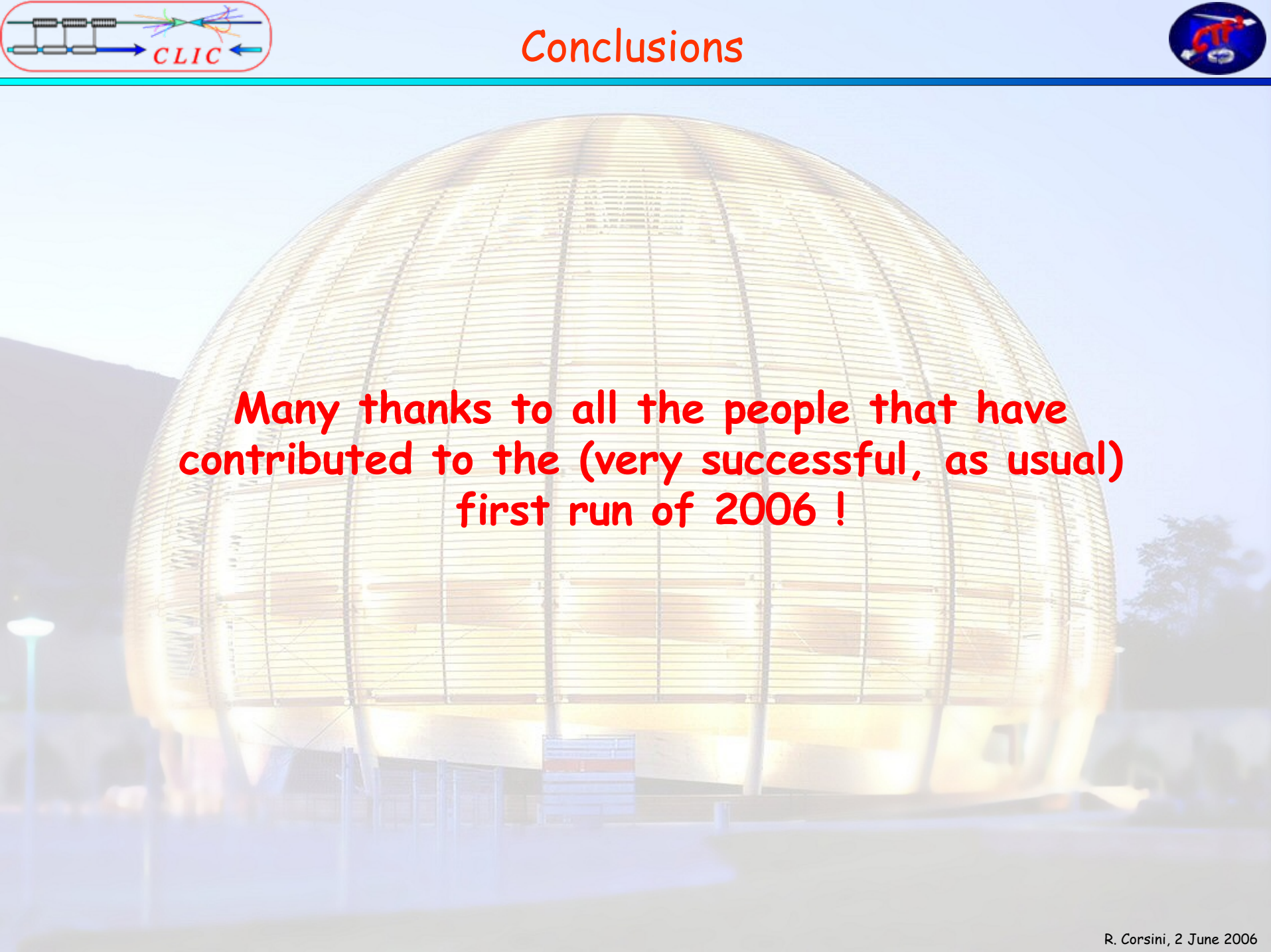


Fast phase switch from SHB system

Streak camera – MTV 550 - 500 ps/mm



Conclusions



Many thanks to all the people that have contributed to the (very successful, as usual) first run of 2006 !