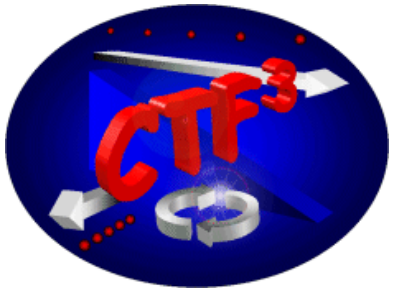


CTF3 Operation 2004/2005

Frank Tecker - AB/OP
for the CTF3 Team

- Different sub-systems
- General aspects

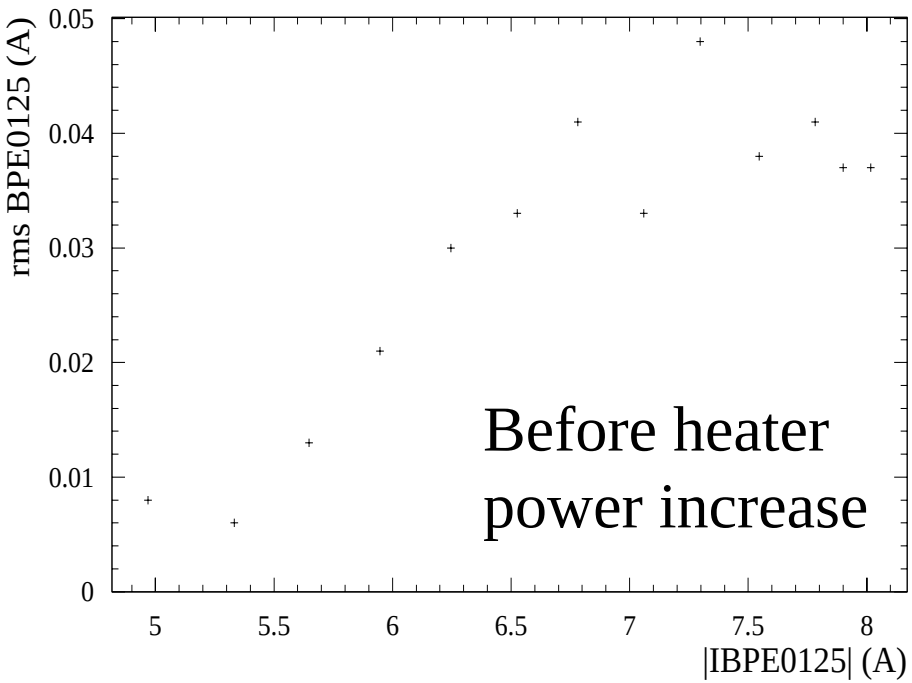
Gun

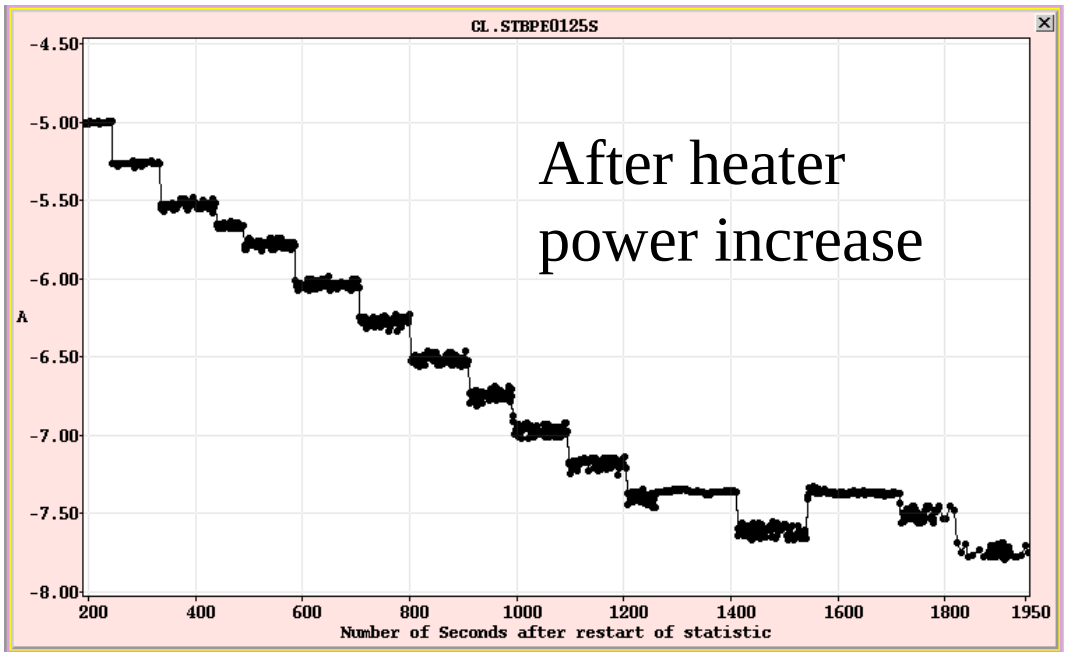
- broken at the beginning of 2nd run => ~1 week delay
- heater power supply, NO SPARE
- again problem after 'Open Day' Stop
- some problems due to bad contacts

- high dark current (0.3mA for 145kV)
  - was 0.12mA for 155kV in June
  - finally 0.19mA for 140kV

- running stably except when going above 5.5 A

Gun current instability



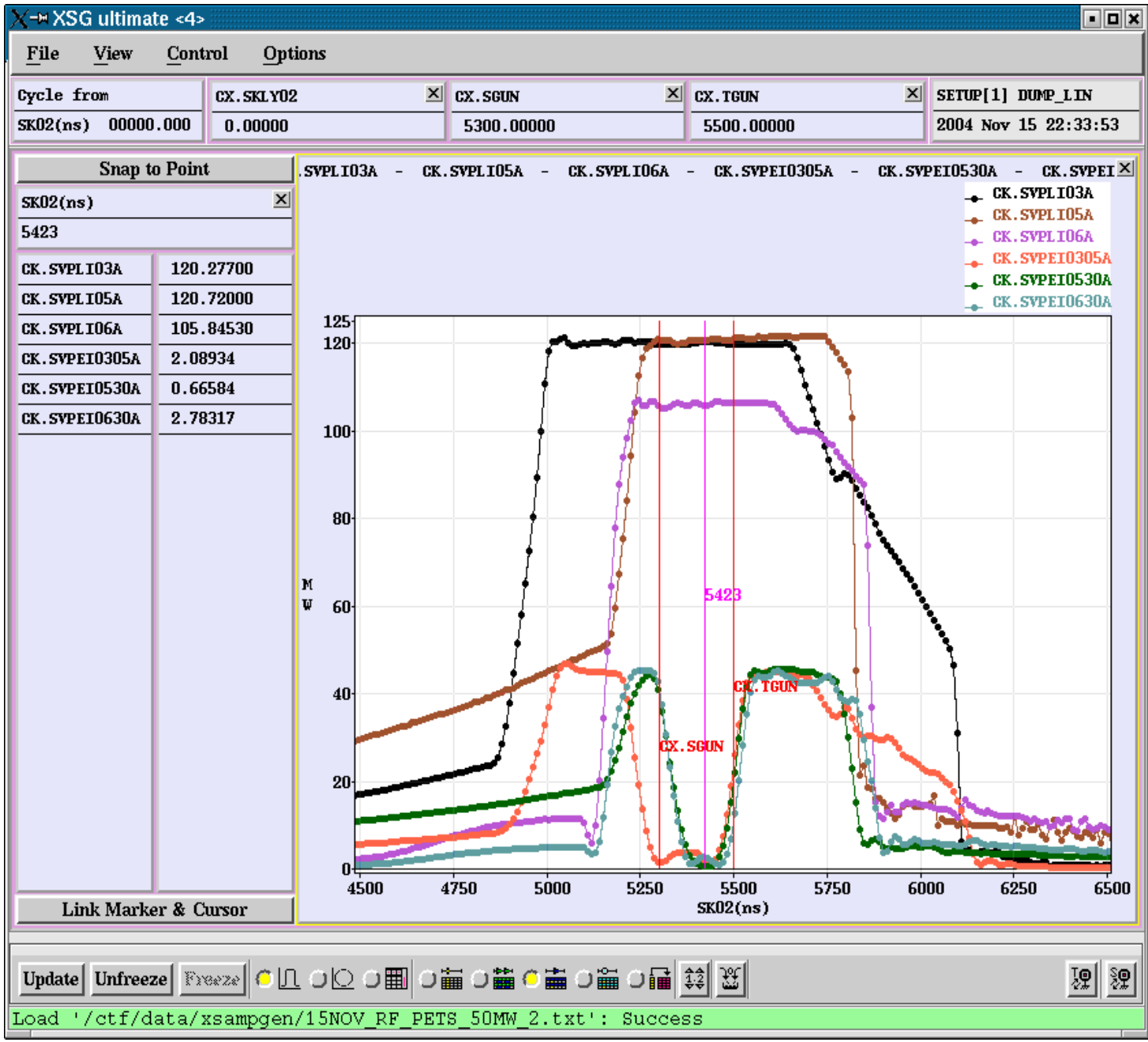


- observed energy fluctuations from beam-loading
- increasing heater power didn't change much
- stable high current set-point, but not reproducible

=> will be investigated

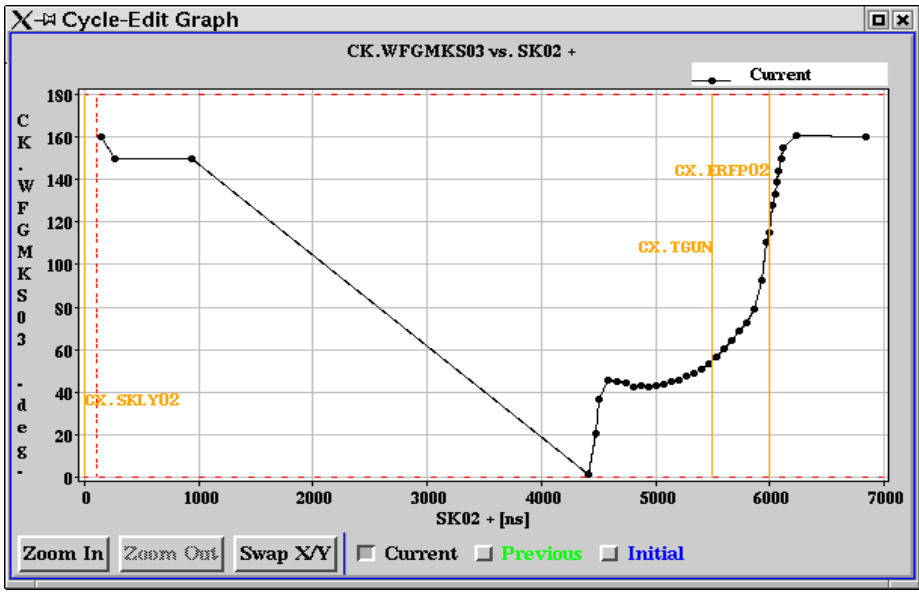
Sampled signal acquisition

- sampling ADCs 96 MHz
- generic sampler software for
  - BPM, WCM
  - RF (amp/phase)
  - BLM
  - segmented dumps/PMT
- very flexible
- time adjusted



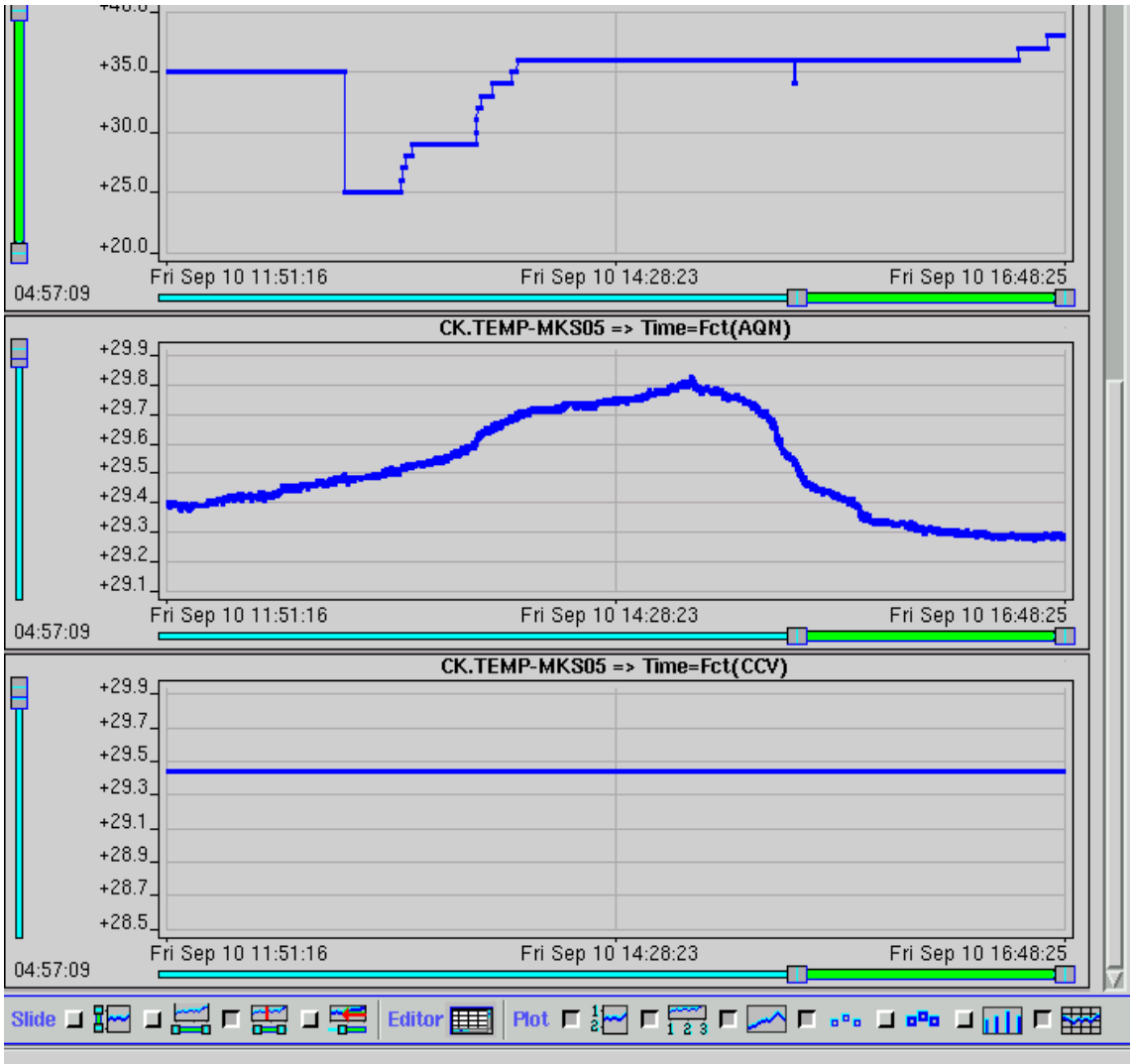
RF issues

- calibration not for all sampler signals
- RF pulse compression with LIPS and BOC works well
  - sensitive to temperature variations
  - no automatic feed-back, still needs specialist tweaking
- Joerger Waveform generators for phase program perform well
- many problems with MKS06 (new modulator type)
  - charging power supply short-circuits!
- several end-of-line diodes broken
  - review their design



Water Temperature

- RF pulse compression needs stable temperature (0.1°C)
- large temperature variations observed
  - mainly after switch-on
  - without any changes
  - primary water circuit oscillations
- temperature regulation did not work properly
  - didn’t reach set-point
  - didn’t regulate



Water Temperature (cont.)

- water stations not well adapted
  - existing hardware (from LPI)
  - over-dimensioned
  - designed for stable running conditions
- specialist follow-up
  - optimized regulation parameters
  - changed hardware
- => some improvement but still problematic

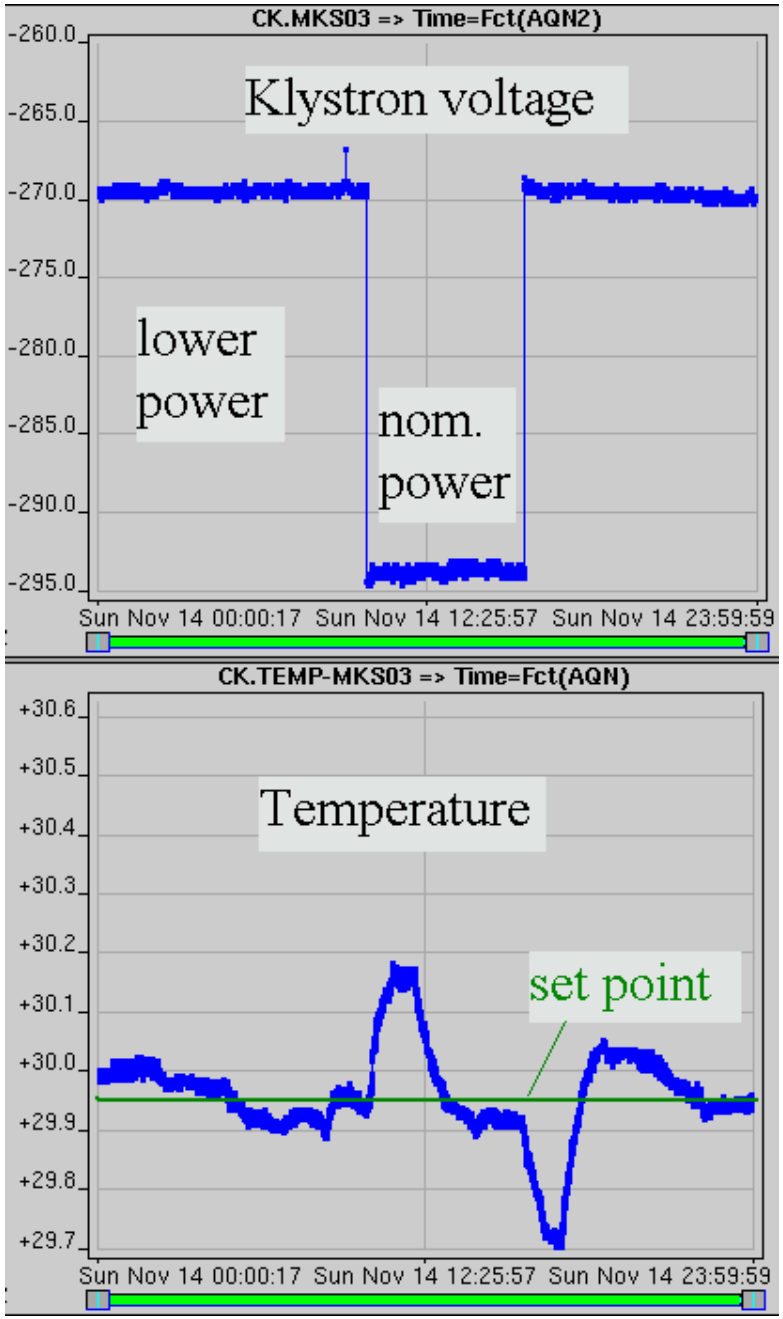
Water Temperature (cont.)

- stable running conditions!
- RF on over night at slightly reduced power

  =>

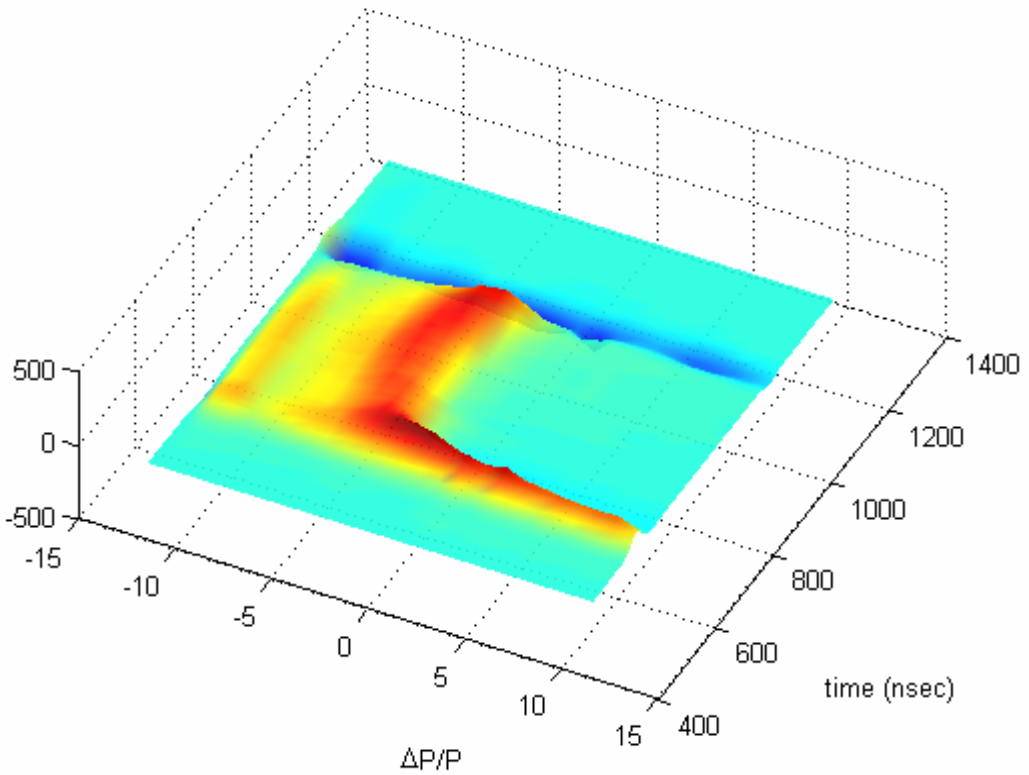
- smaller temperature variations
- still long time constants (2-3 hours)

  => review the system!!!

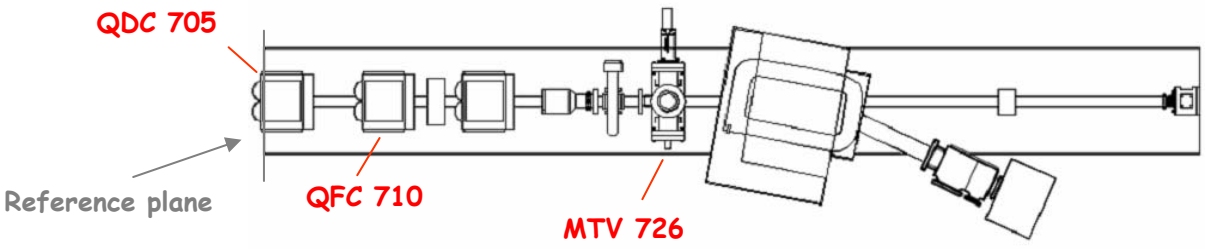


Beam Instrumentation

- Different OTR screens
  - some are not useful (damaged)
  - strong dependence of light intensity on position
- segmented dumps / photomultiplier
  - work OK
- more in T.Lefevre's talk
- BLMs:
  see A.Dabroswki
  tomorrow



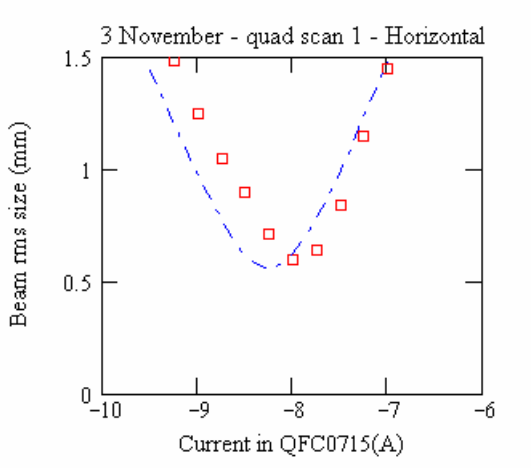
Quadrupole Scans

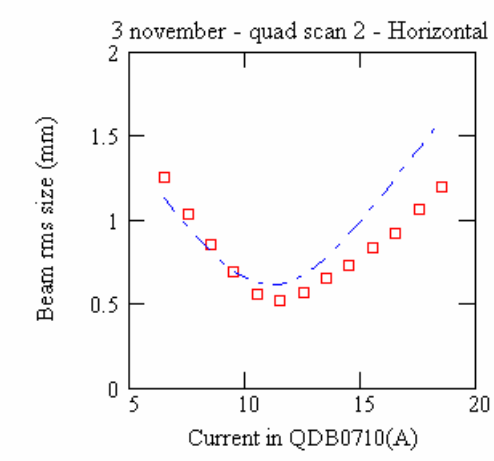


T. Lefevre

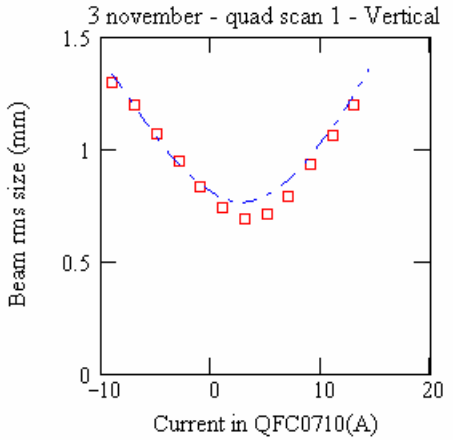
- Manual scans in the 1st period, automatic in 2nd
- frequently used on girder 7 (compared to previous periods)
- girder 5 scans limited by Vidicon camera
  => change for next year
- CT line scans made

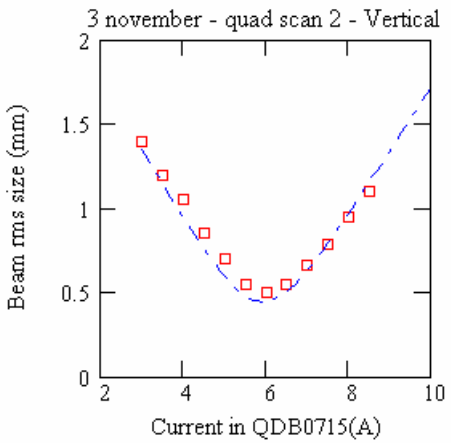
Quadrupole scan results





- on-line calculation checked with manual
- consistent scans
- emittance:
  - x: from 70 to ~400
  - y: from 80 to 280
  - high values for
    - high current
    - off crest for MKS03





$\beta = 2.8 / 2.2$

$\alpha = -0.9 / -1.4$

$\gamma\varepsilon = 540 / 360$ mm mrad

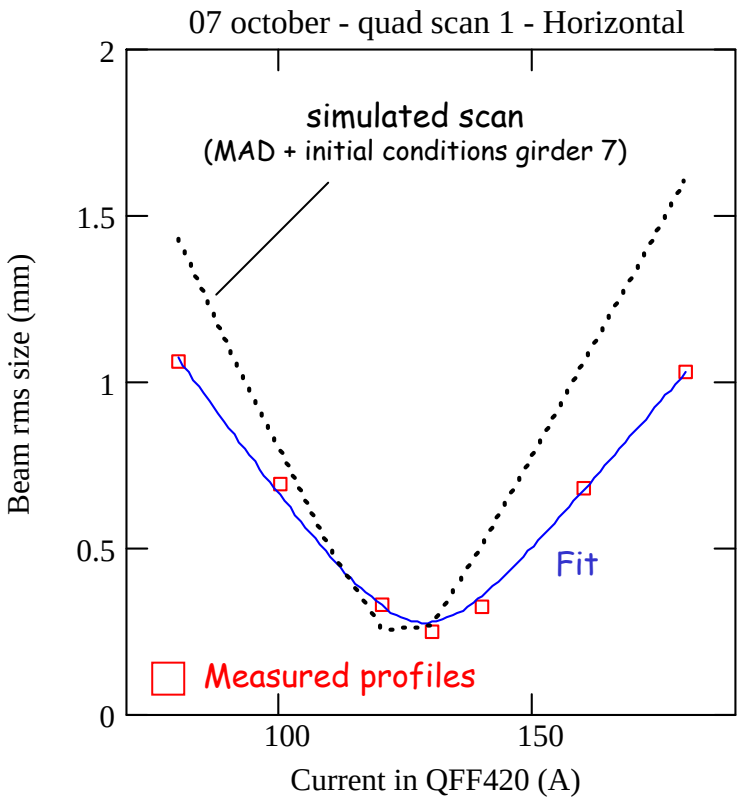
$\beta = 2.9 / 4.0$

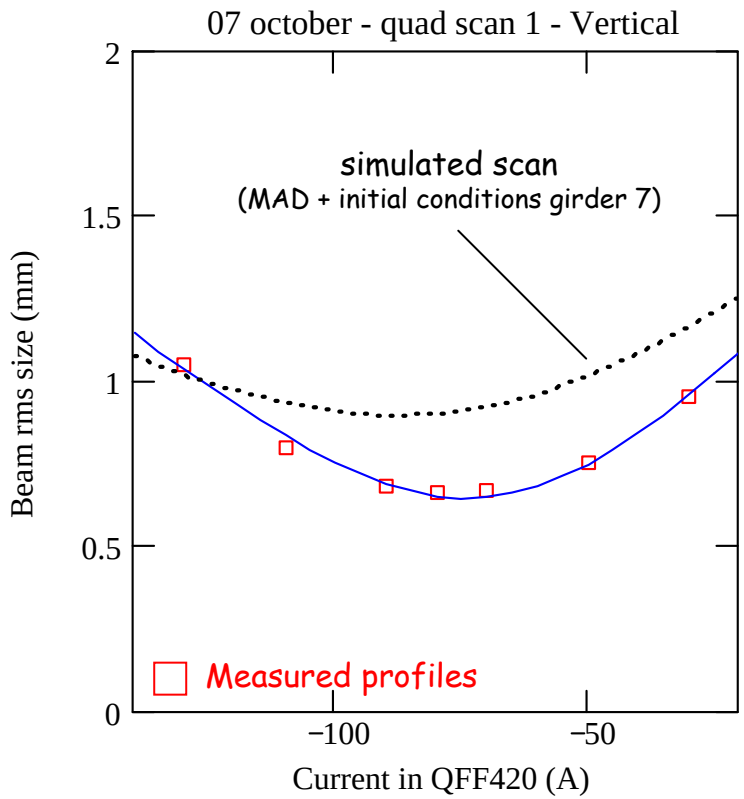
$\alpha = -0.5 / -0.6$

$\gamma\varepsilon = 160$ mm mrad

Quadscan results CT line

- CT scan result consistent with extrapolation from scan on girder 7 with the MAD model

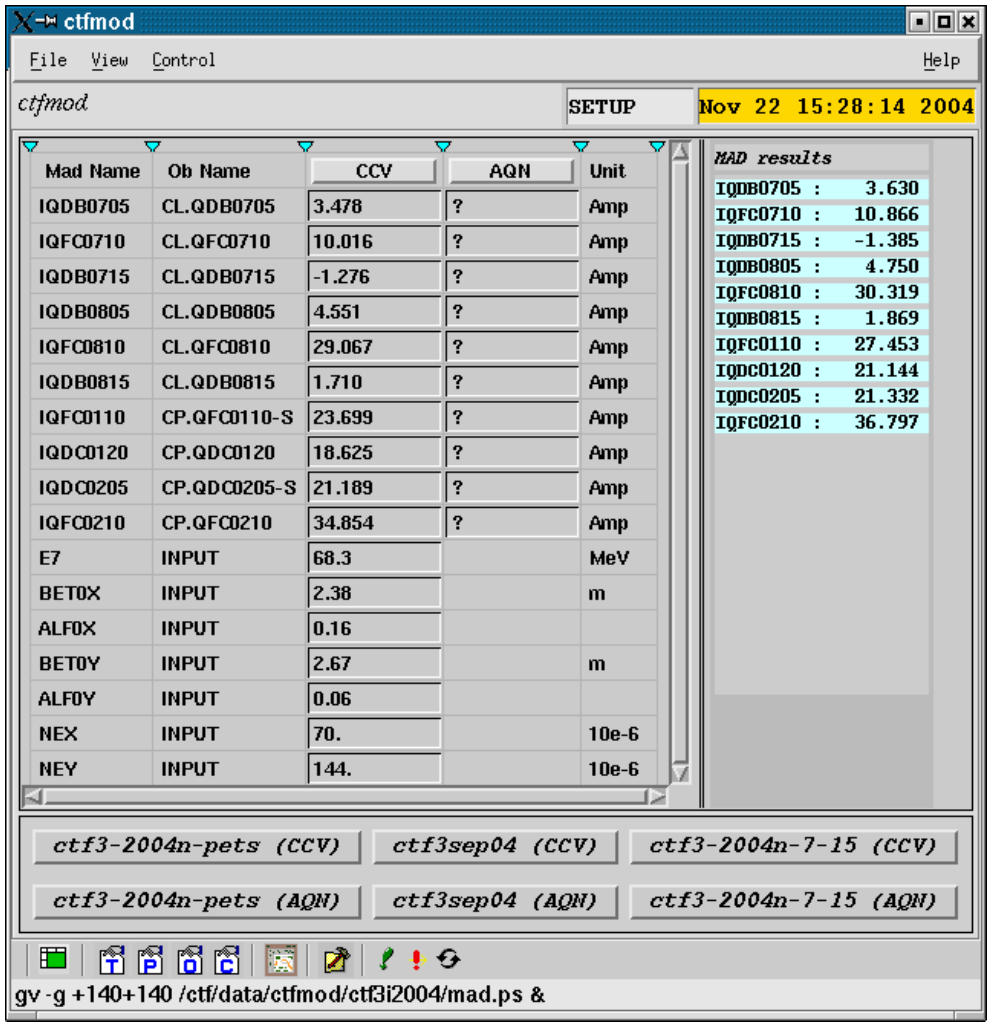




R.Corsini

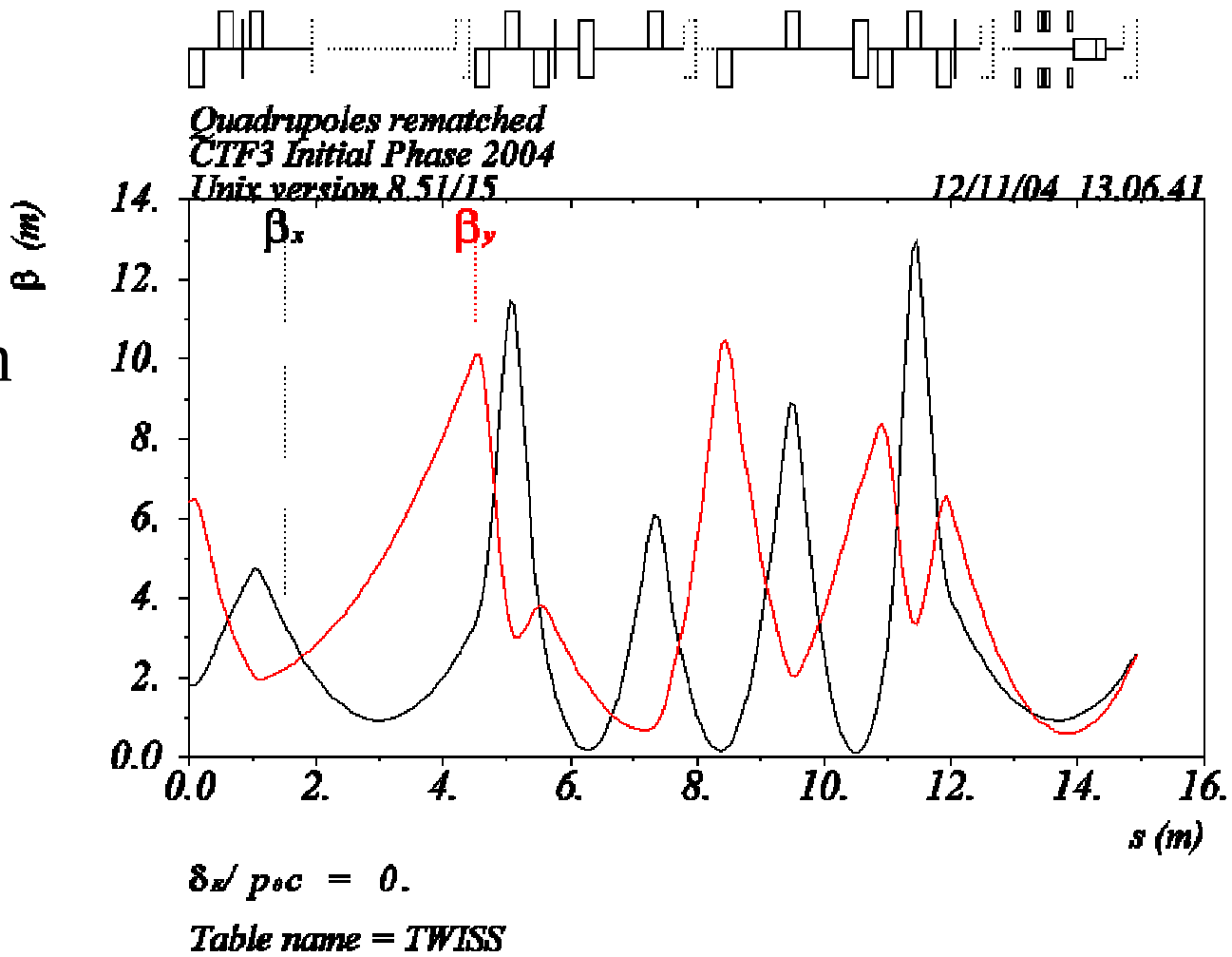
Modeling

- MAD model for the whole CTF3 existing (CT by INFN)
- used modeling based on quad scan results on girder 7
- MAD model starting there for PETS line and linac
- interfaced with machine settings as input and for output
- MAD rematches the optics



Modeling results

- used for PETS re-matching when increasing current
  - immediately good transmission (2.2A for 5A in)
  - starting point for further optimization



- used for linac and CT line
  - generally good transmission

PETS running

- Hans Braun will present details this afternoon

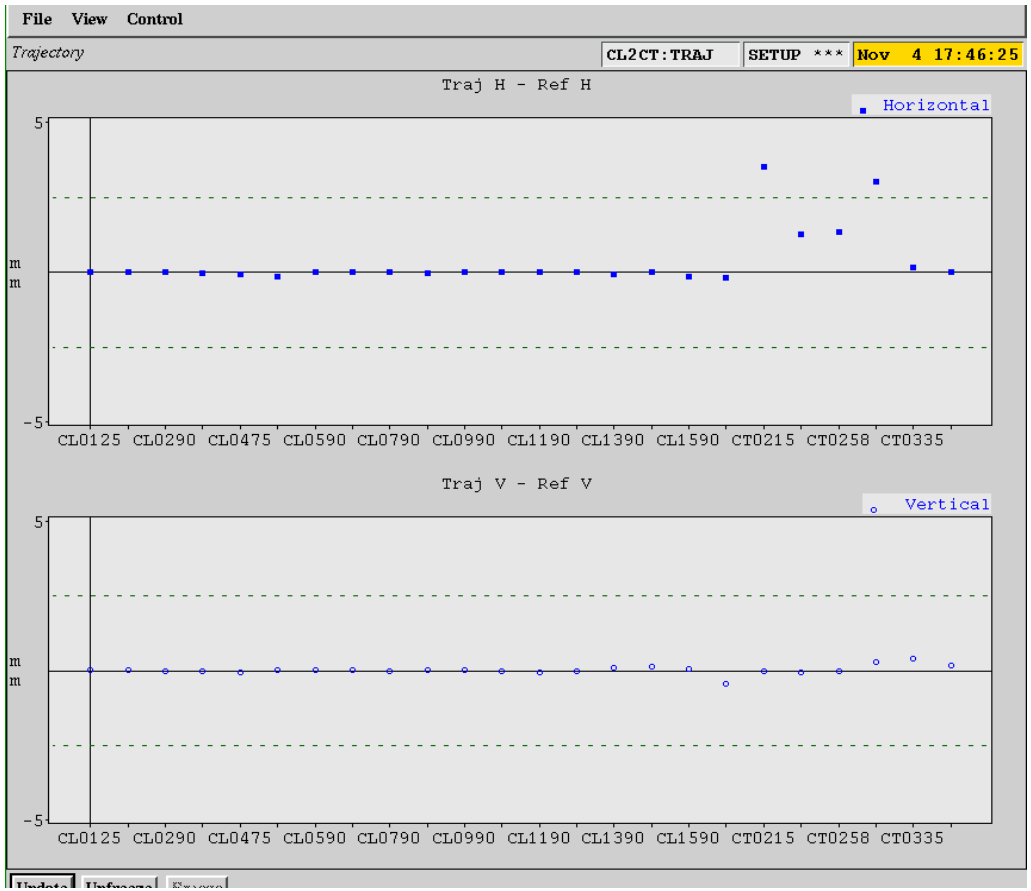
- modeling based on quad scans very useful
- going to higher current relatively fast (1 day)
  - initial set-up requires specialist
- running on week-end with ‘non-machine-experts’

- relative good reproducibility

- 18 degree phase switch for future 30 GHz RF compression

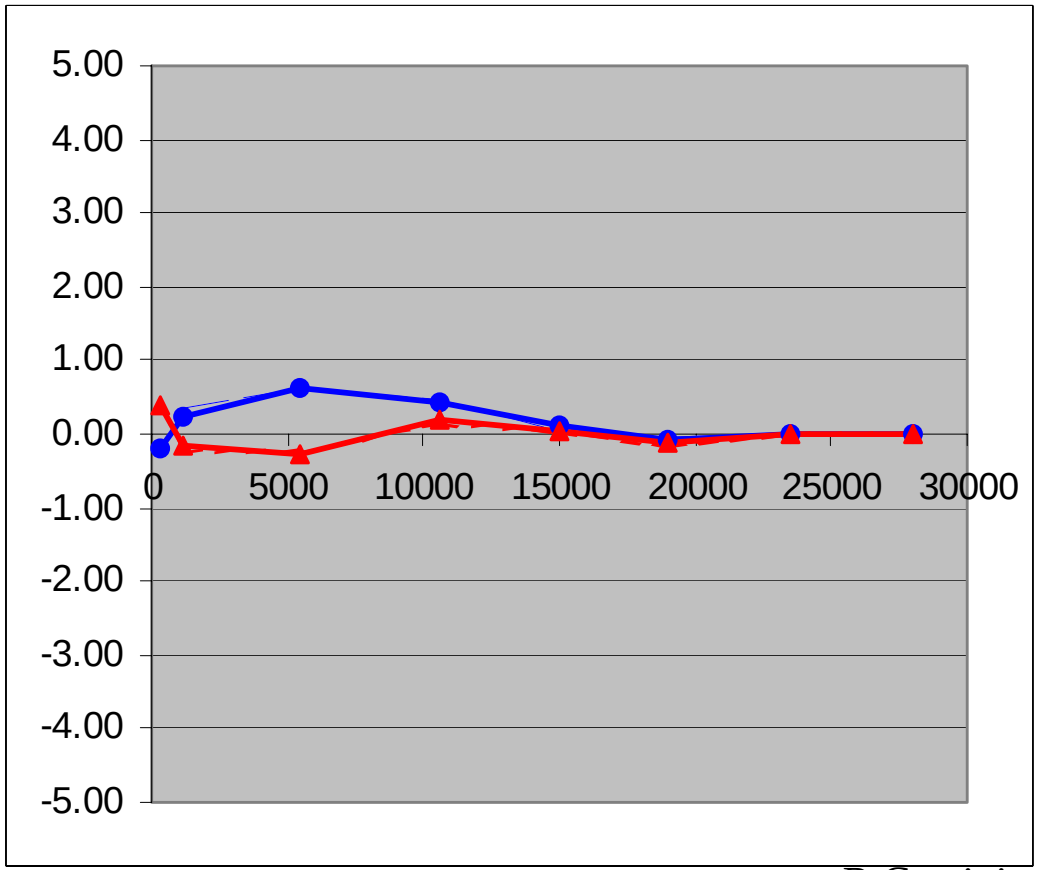
Linac and CT Line (Chicane)

- covered in detail by Caterina Biscari (INFN)
- studies together by Frascati visitors and us
- implemented CT line MAD deck in online model
- matching for R_{56}
- dispersion measurement on-line
  - magnet scaling
  - difference trajectory



Automatic Steering

- developed by R.Lifshitz
- automated response matrix measurement
- correction based upon

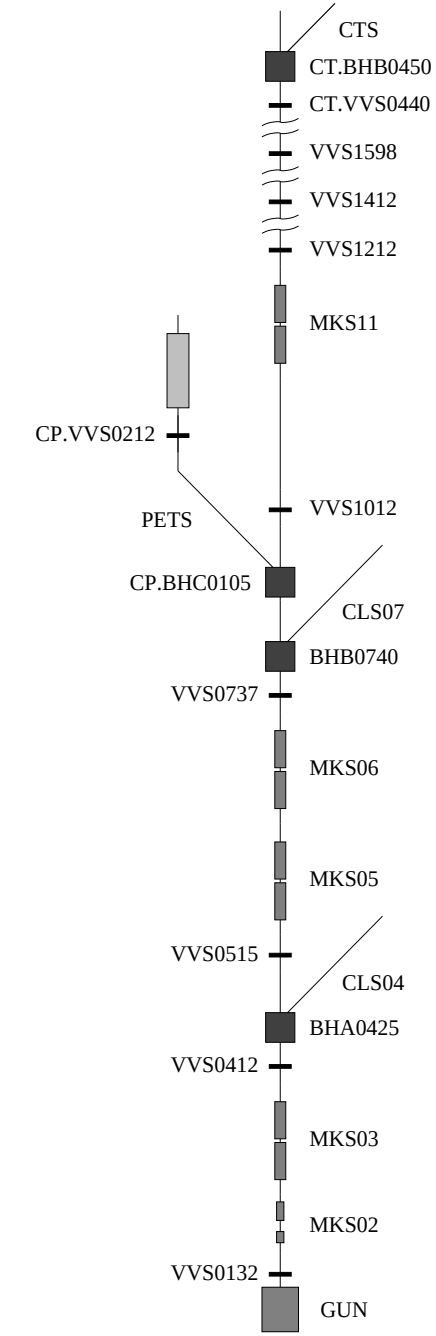


R.Corsini

- tested and works generally well
- not used regularly since measurement relatively long

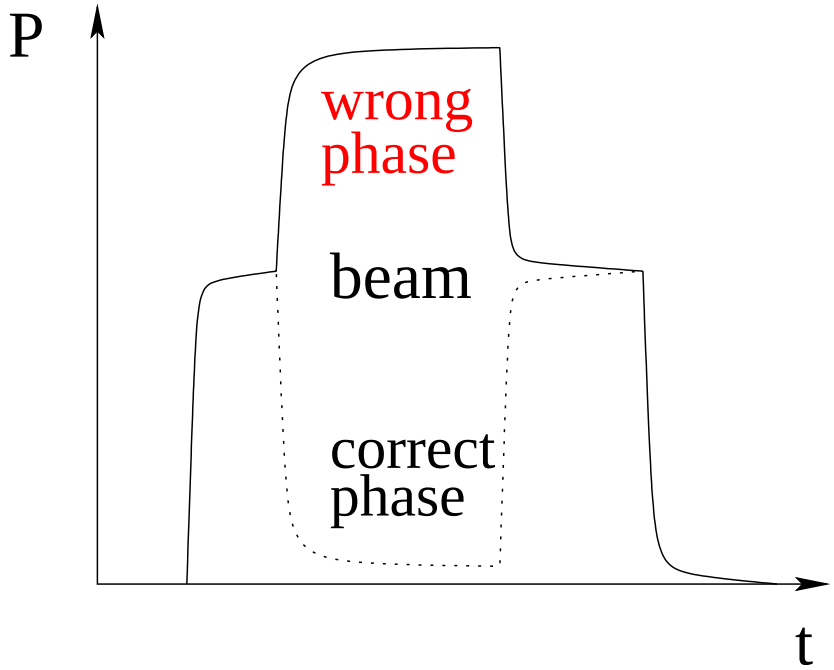
Interlocks: Vacuum valve protection

- vacuum valve destroyed last year
- new interlock
  - checks valve and bend magnet status
  - disables gun pulse when valve in the beam path is closed
  - software in 1st period
  - hardware in 2nd
- works reliably after initial setting-up



RF (-> Gun) Interlocks

- avoid beam loading with wrong phase!!!
  => overpower on RF loads
- RF phase depending on output power
- modulators ramp up



- interlock to inhibit beam from the gun
  - during RF problems
  - when overpower detected at the load
  - (vacuum valve interlock)
- working reliably
- some improvements foreseen, automatic PETS switch

RF Interlock Recovery

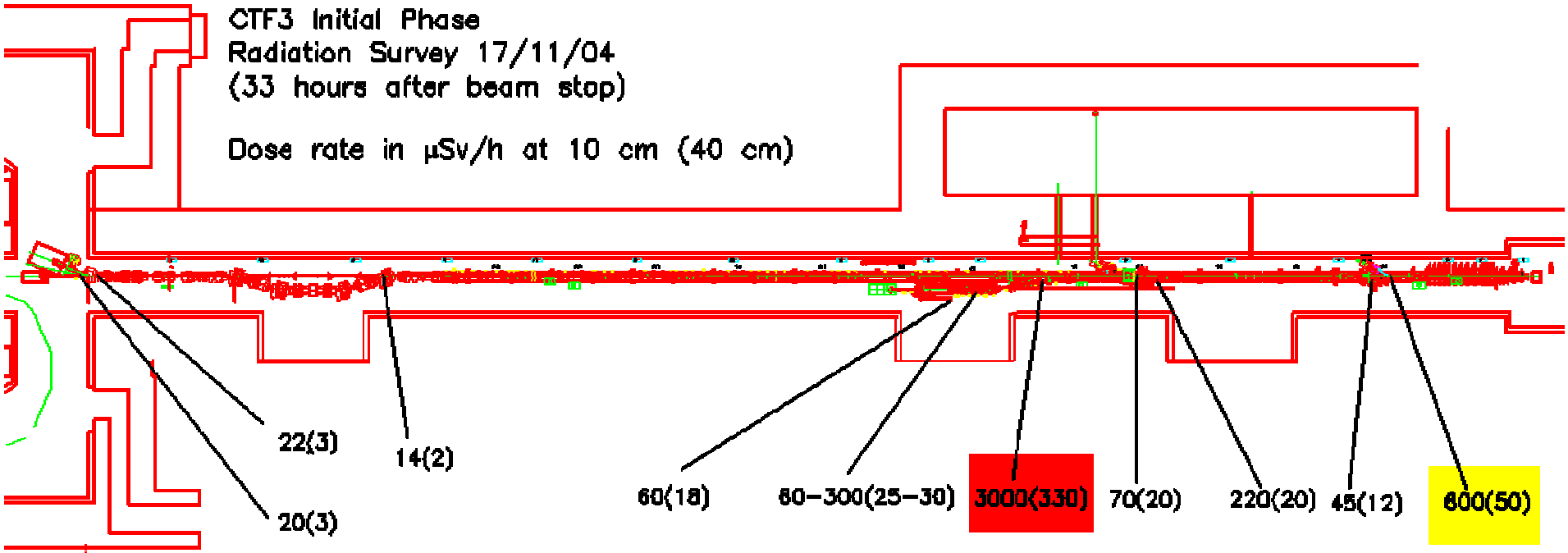
- recovery with wrong phase might be difficult
  - RF phase changing when increasing power
- operational experience:
  - set RF to nominal power => stable phase
  - switch on beam with low current => small loading
  - adjust phase => correct phase
  - rise beam current
- => fast recovery

Beam Loss Interlock

- based on Wall Current Monitors
- detects current difference
- inhibits the gun pulse (within the pulse!)

- present state:
  - WCM0490 and WCM0725 connected
  - tests performed
  - <200 ns reaction time
  - not yet connected to the gun

Radiation Levels



- high radiation levels after high current running
  - before the first chicane
  - PETS line entry
- => need cool-down time

Operation

- only three specialists run the machine!
- outside collaborators started performing measurements, model calculations
- non-machine-experts did PETS running
- fruitful for the machine operation

- but: still to be extended
- we envisage longer running for 30 GHz RF production

=> we need people that stay for extended periods

Conclusions

- a lot of progress
  - quad scans
  - modeling
  - digital signal acquisition
  - interlocks
- room for improvement
  - gun
  - water temperature
  - screens
  - operation

Thank you all for your collaboration!!!