



CTF3 Progress

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Sketch of the program



- ◆ Restart after installations on Sept 13
 - 2 new accelerating structures in TBTS
 - 2 phase monitors in CT line
 - Alignment in CR
 - Modified layout of the RF compression cooling system
- ◆ Setup the beam transport through the new phase monitors
 - Aperture restriction: phase monitors have 2cm diameter while everywhere else aperture is 4cm
- ◆ Beam for new accelerating structures in TBTS
 - Conditioning
 - Diagnostic checks and calibrations
- ◆ Improvements of recombination in CR

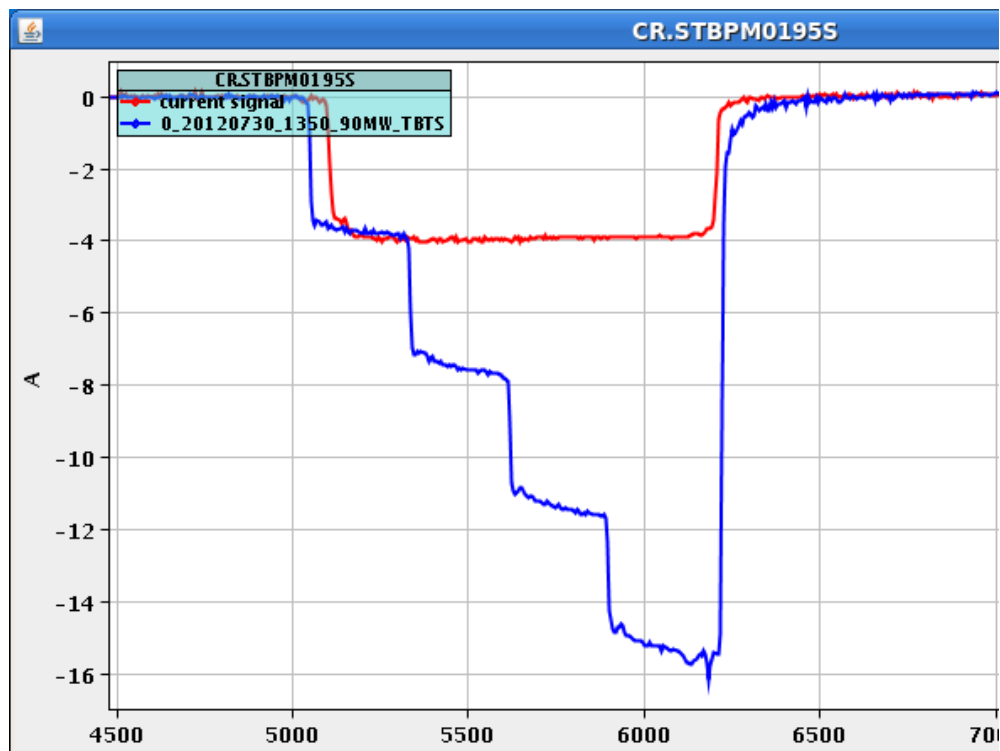


Additions to the program



- ◆ Klystron for MKS03 had to be replaced – 1 week
 - The replacement did not condition to the required power level and pulse length
 - After one week it was changed again
- ◆ Water/vacuum leak in the oldest TBL tank – 1 week
 - The cooling circuit inside the tank, impossible to access *in situ*
 - Several attempts to repair it (work arounds)
 - All failed, tank removed
- ◆ Vacuum leak at extraction septa of the Combiner Ring – 3 days
- ◆ Several other minor hardware faults

- ◆ Rapid restart after the shutdown
- ◆ No problem passing the 2cm aperture restriction in the new phase monitors
 - Initially, the easiest setting in the Stretching chicane was used
 - ◆ None of the quadrupoles inside the chicane powered
 - Last week also $R56=0$ was used and no additional losses were observed due to the monitors



The new TBTS containing 2 ACS

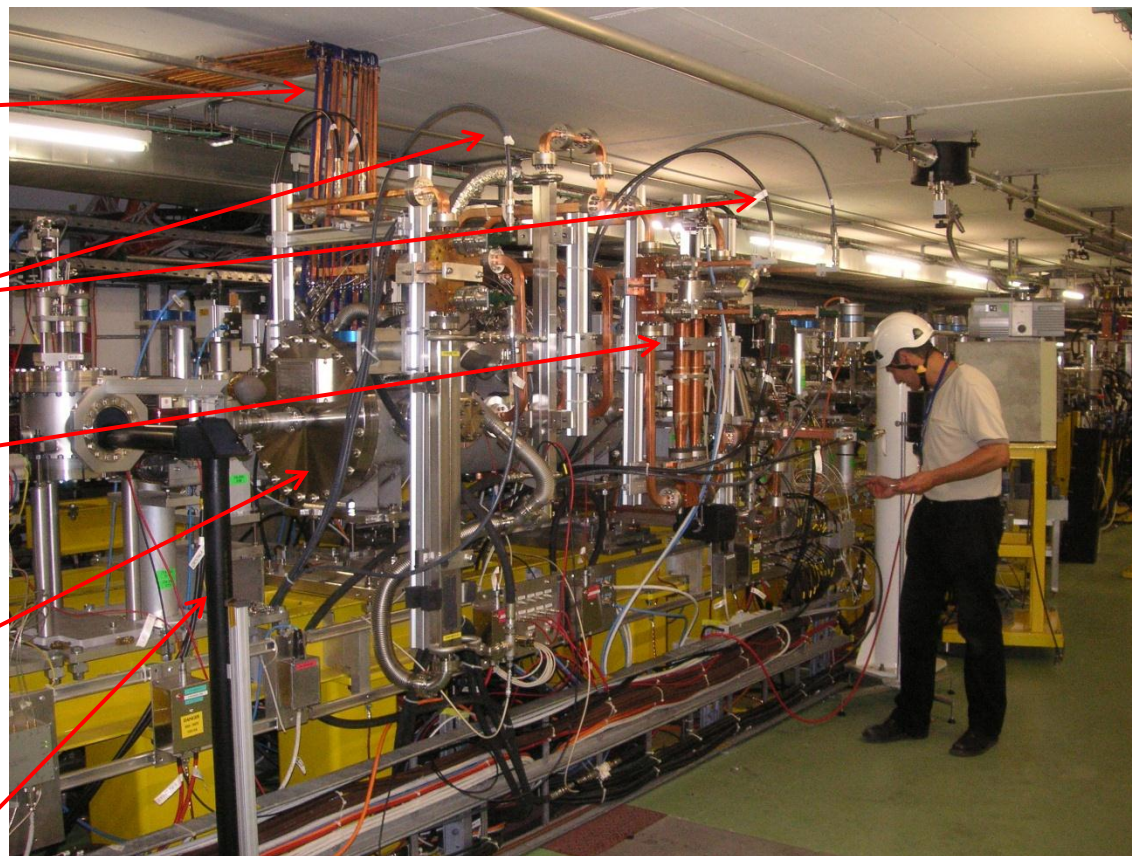
16 WFM waveguides

10 RF couplers

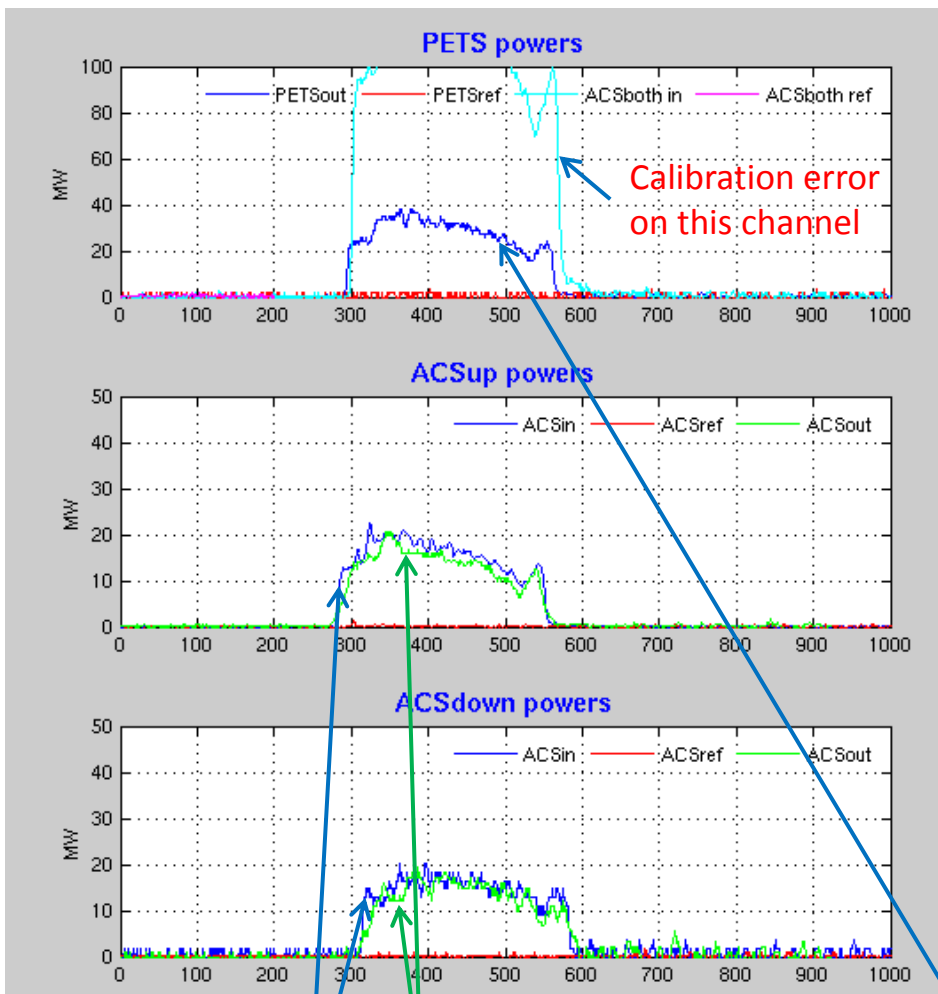
RF power distribution via a phase-shifter

Tank containing the 2 ACS

Many diagnostics (Flash box, PMs, FCU)



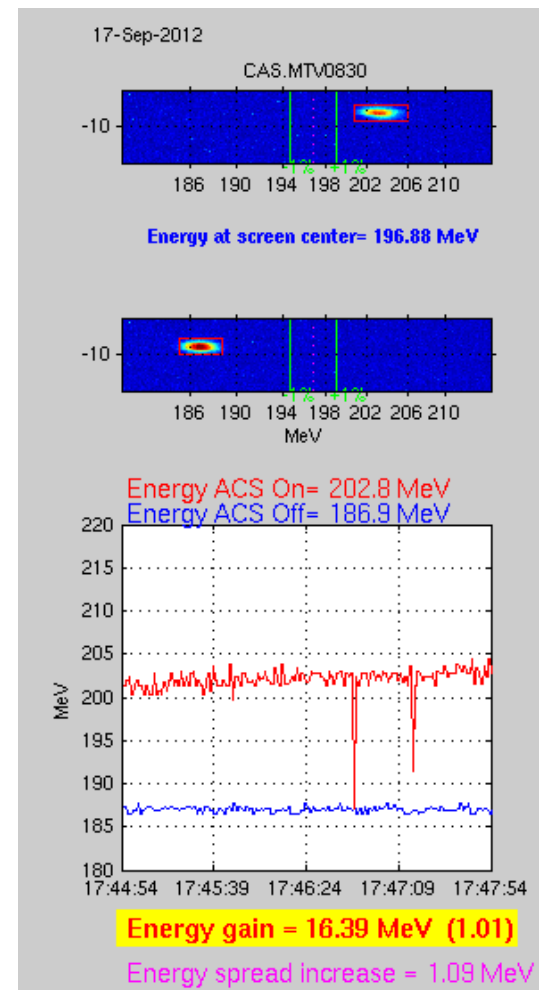
Credit R. Ruber, <http://ctf3-tbts.web.cern.ch/ctf3-tbts/photos/20120910/>



ACS 1 and 2 input power

ACS 1 and 2 output power (attenuation and delay compensated)

PETS output power



Resulting acceleration
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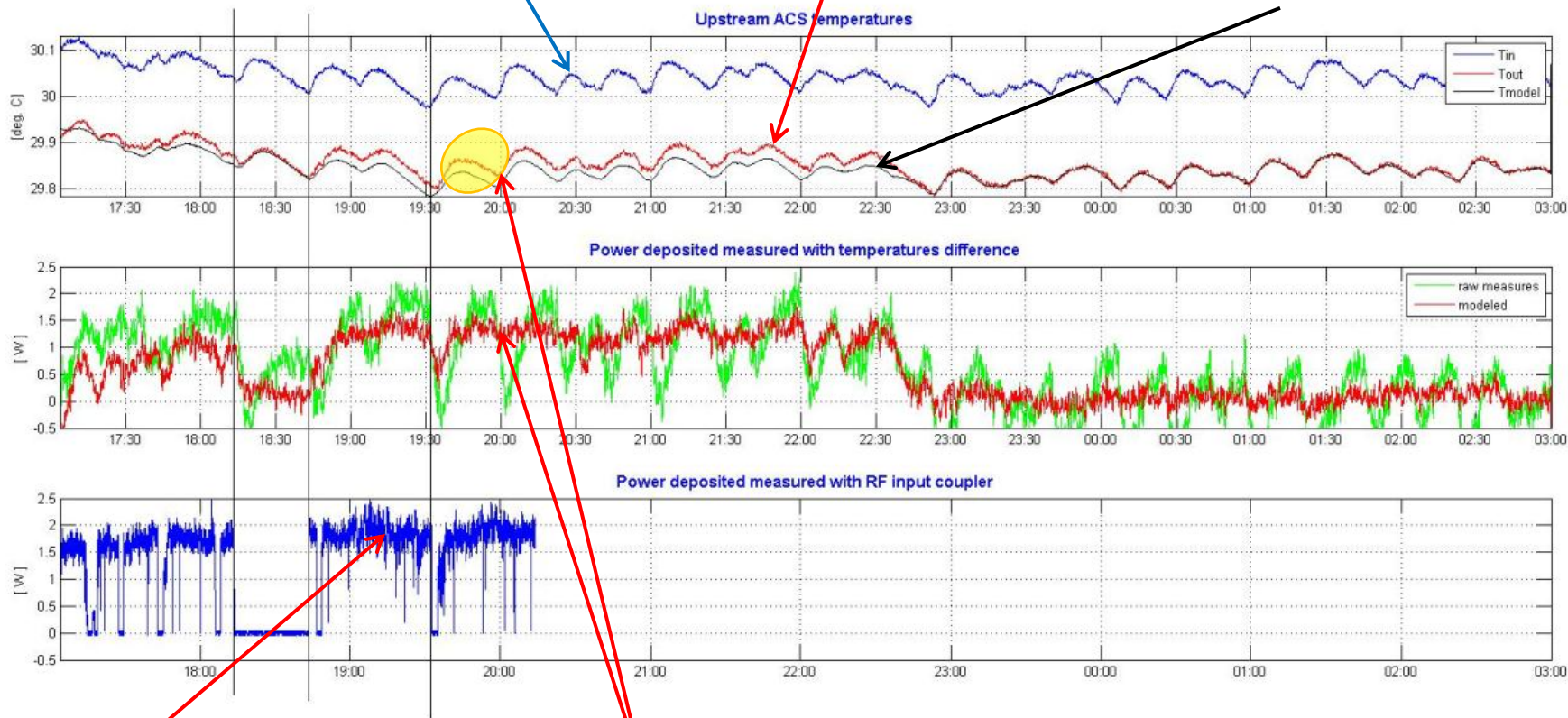
Thermal method compared to input RF coupler



Input water temperature

Output water temperature

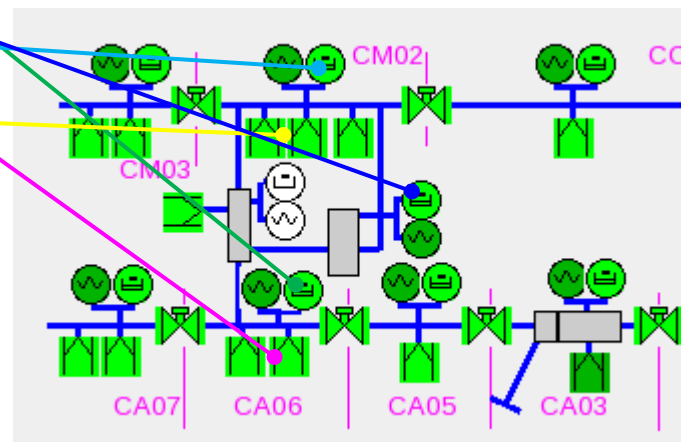
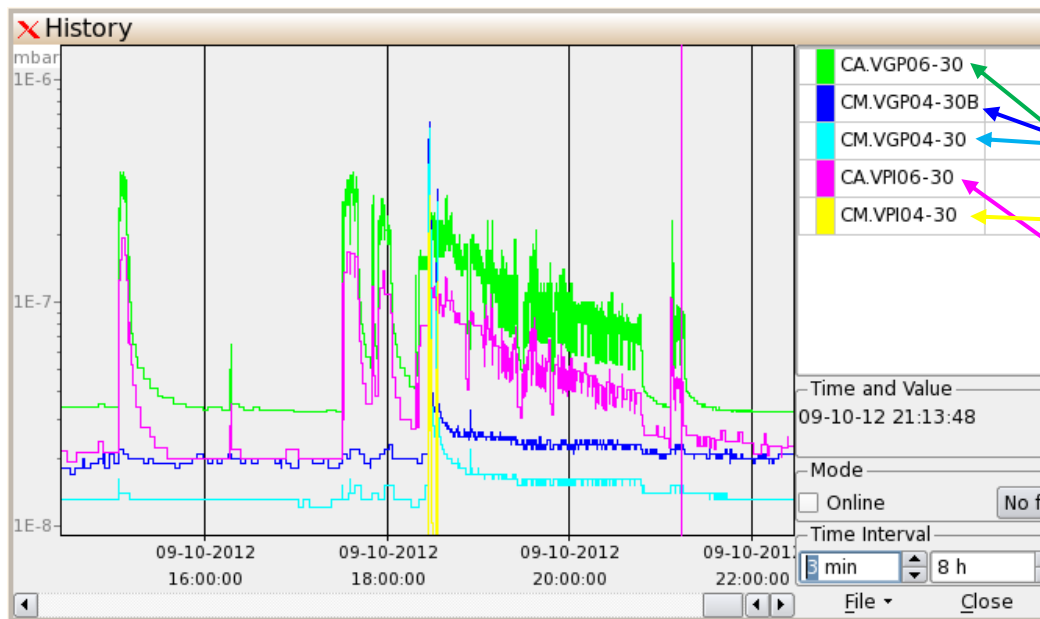
Output water temperature from finite difference model



Input coupler mean power
(1.8 W)

0.02 °C temperature
difference give 1.5 W mean
RF deposited power

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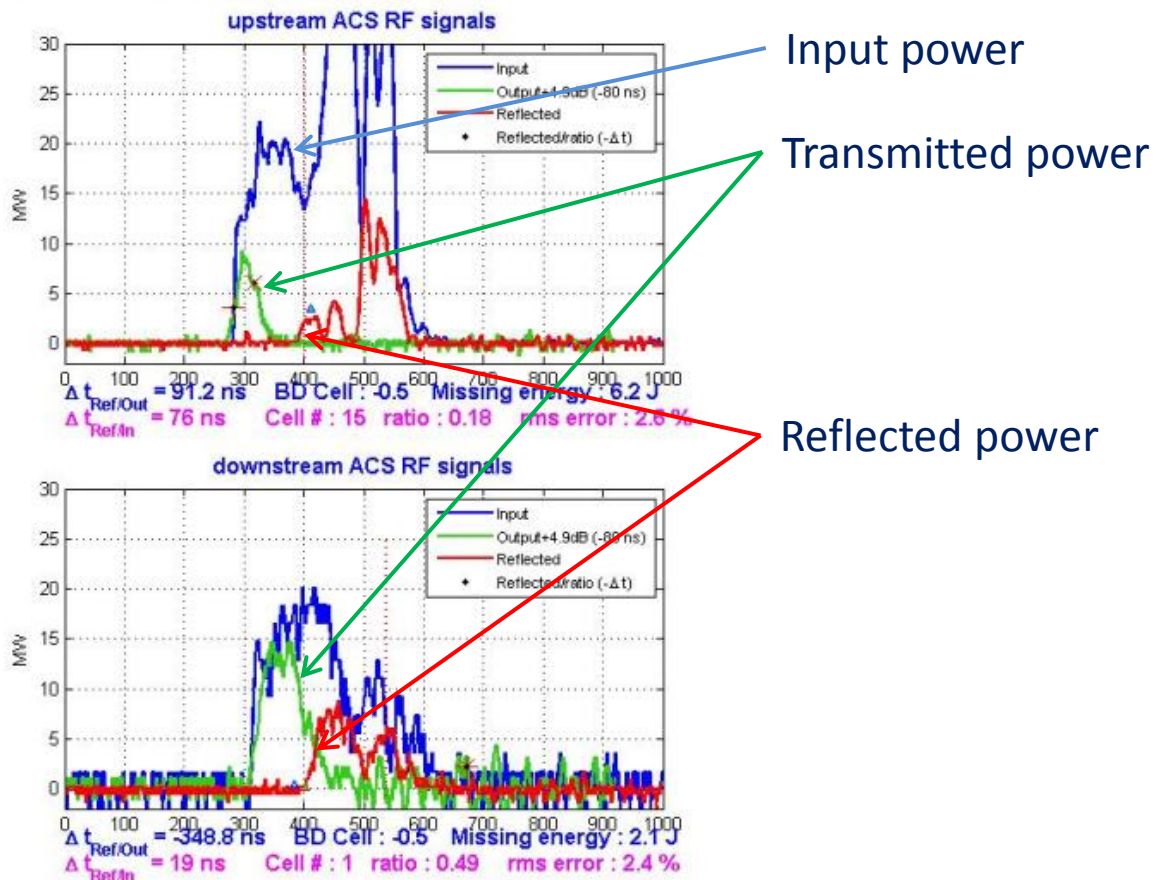


TBTS vacuum scheme

Pressure due to outgassing slowly decays during the conditioning

First breakdowns recorded

20-Sep-2012 18:22:33



Possible BDs coupling between the 2 ACS



TBTS Summary



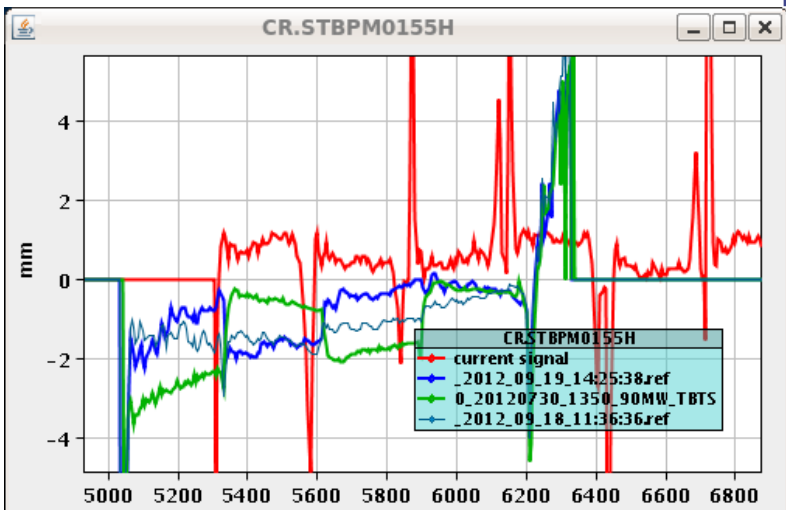
- ◆ **Installation of the tank** containing 2 ACS and connection of the Wake Field Monitors to the waveguide network (A. Andersson)
- ◆ **Power sent** from one PETS to the two ACS (up to 20 MW each, 220 ns)
- ◆ **Acceleration** up to 16 MeV measured after optimization of the phase between the 2 ACS
- ◆ Review of the **RF couplers and diodes calibration** (S. Rey), still some balancing to be performed between the various attenuators
- ◆ Improvement of the **thermal method** to derive the RF power deposited in the ACS (additional temperature probes, resolution 0.01 °C)
- ◆ **Long debug** (2 weeks) of the Aquiris crate due to the addition of 8 supplementary channels (A. Radeva)
- ◆ **BDs signals recorded** showing possible coupling between the 2 ACS, adaptation of the monitoring program in Matlab
- ◆ Measure of the **resonant frequency** of the downstream ACS by exciting it with a short probe beam bunch
 - At the currents stage measurements show the frequency is **within 1MHz**

- ◆ Work on orbit closure for the combined beam
 - Fine tuning of the RF bump with the lowered power for 2nd RFD

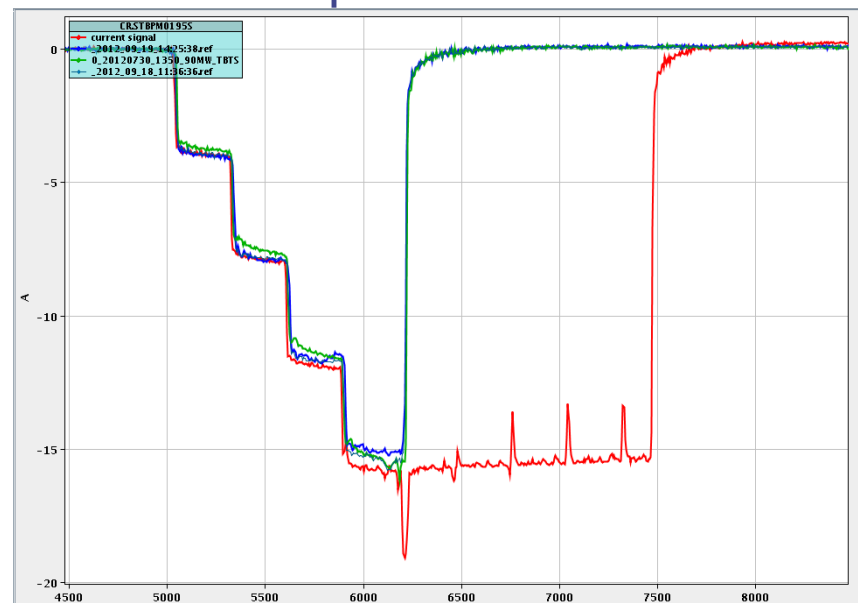


1. circulating beam

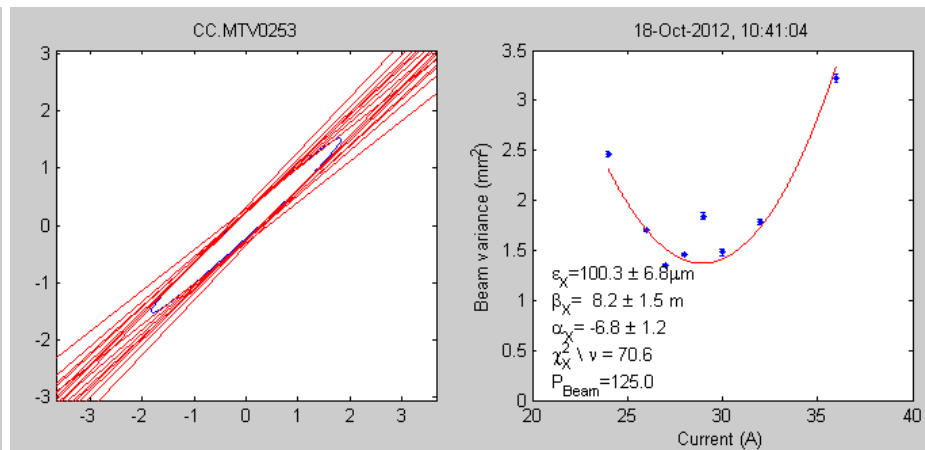
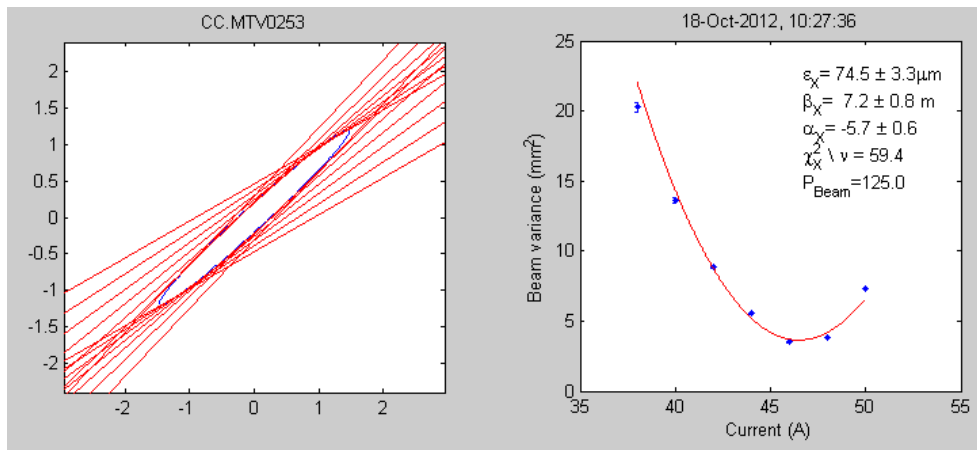
2. Tuned closure and RF bump



3. Improved recombination



- ◆ Additionally, new (weaker) optics for TL2 was commissioned
 - Thanks to it we also can do quad-scans just after Combiner Ring more easily
- ◆ The combined beam emittance was measured at 100 mm mrad level
- ◆ **It is a preliminary result and needs to be confirmed with more detailed measurements, using another screen, turn by turn extraction, etc**
- ◆ The measurements below were done with 2 different quad ranges
 - It makes the chance of being an artifact smaller

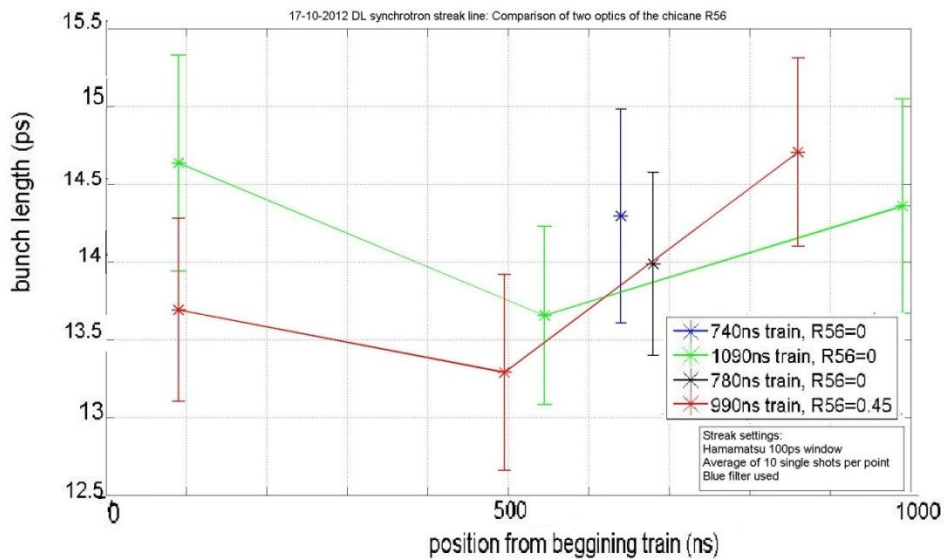
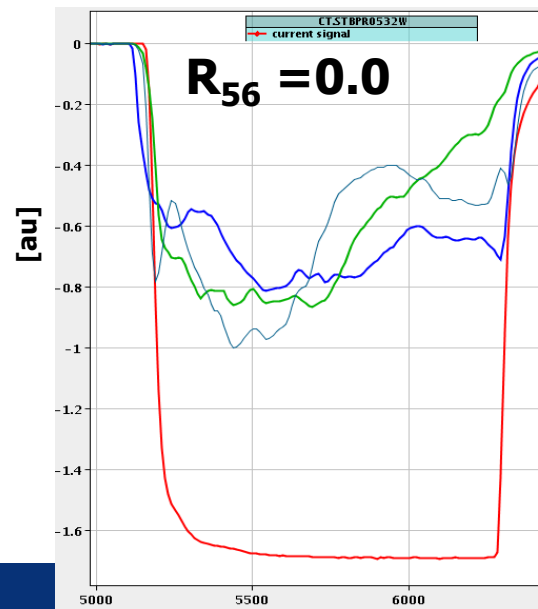
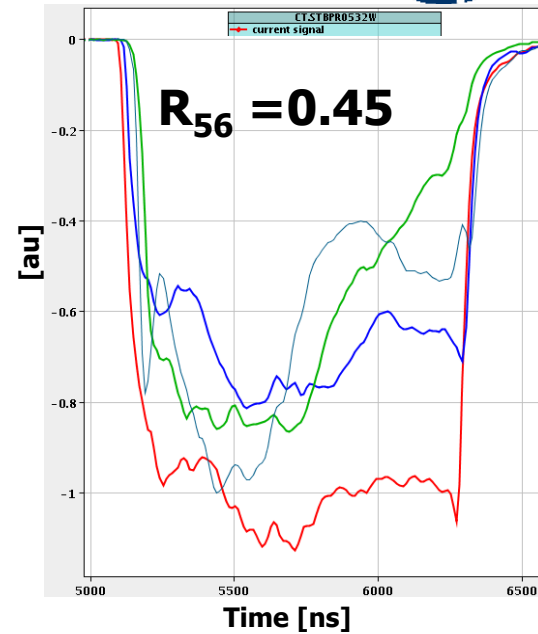




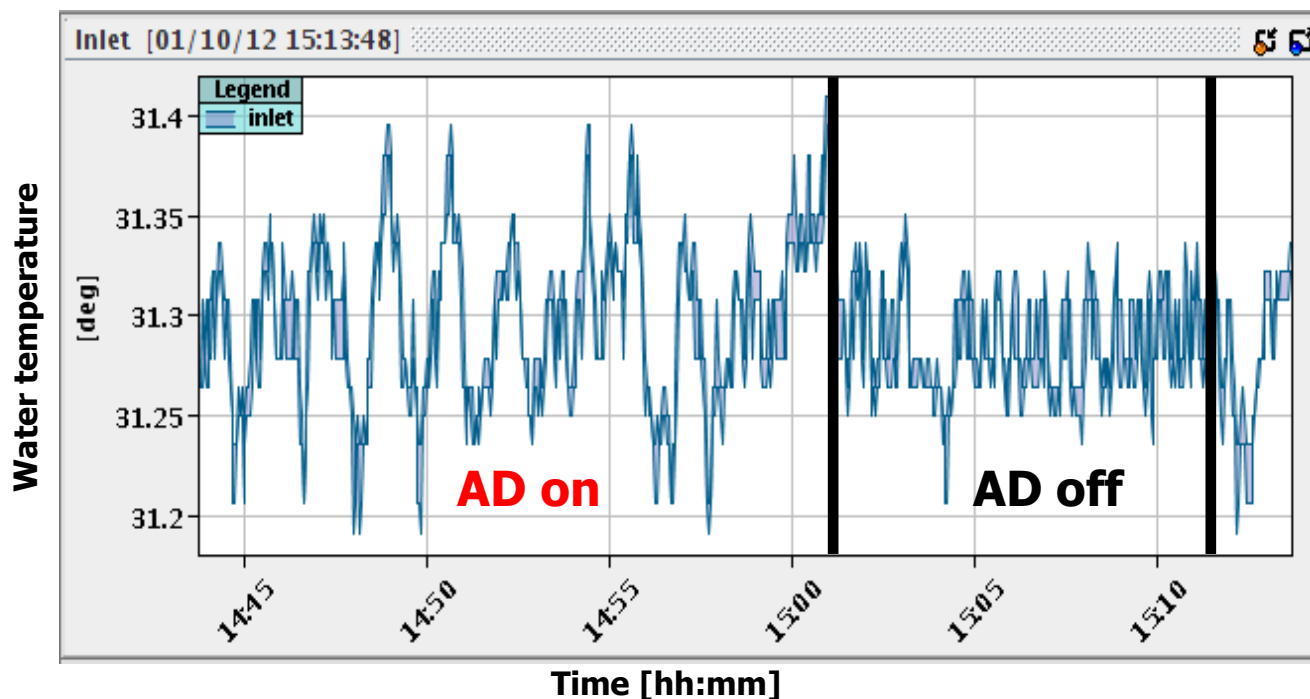
Bunch Length



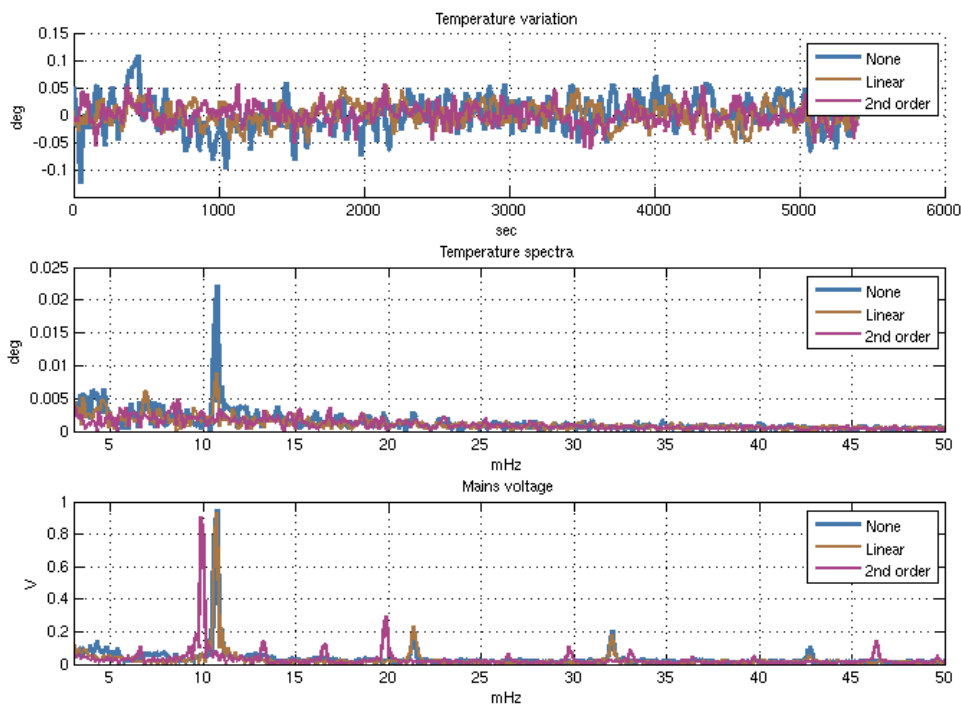
- ◆ Checks of the isochronous optics ($R_{56}=0$) in the Stretching Chicane
 - What shall lead to shorter bunches and higher form factors in 12GHz RF power production
- ◆ Resonant Monitor (BPRW) clearly indicates shorter bunches (higher amplitude signal) for $R_{56}=0$
- ◆ Streak camera in the middle of the Delay Loop measures no difference in bunch length
- ◆ Clear inconsistency, more detailed study needed
 - Streak camera measurements with Transition Radiation in CTS
 - Streak camera with Synchrotron Radiation in CR and CLEX
 - Power level produced in TBL (form factor)



- ◆ During modification works on cooling station it was found that the instability comes from the electric grid and is induced by the Antiproton Decelerator



- ◆ Device measuring the grid voltage was installed
- ◆ It feeds cooling station that takes the voltage into account now
- ◆ The beam stability was not measured yet
 - Modification deployed 2 days ago
 - Already the modifications of the cooling layout performed in August gave a big improvement
 - Hopefully, this change will finally resolve this long standing issue



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