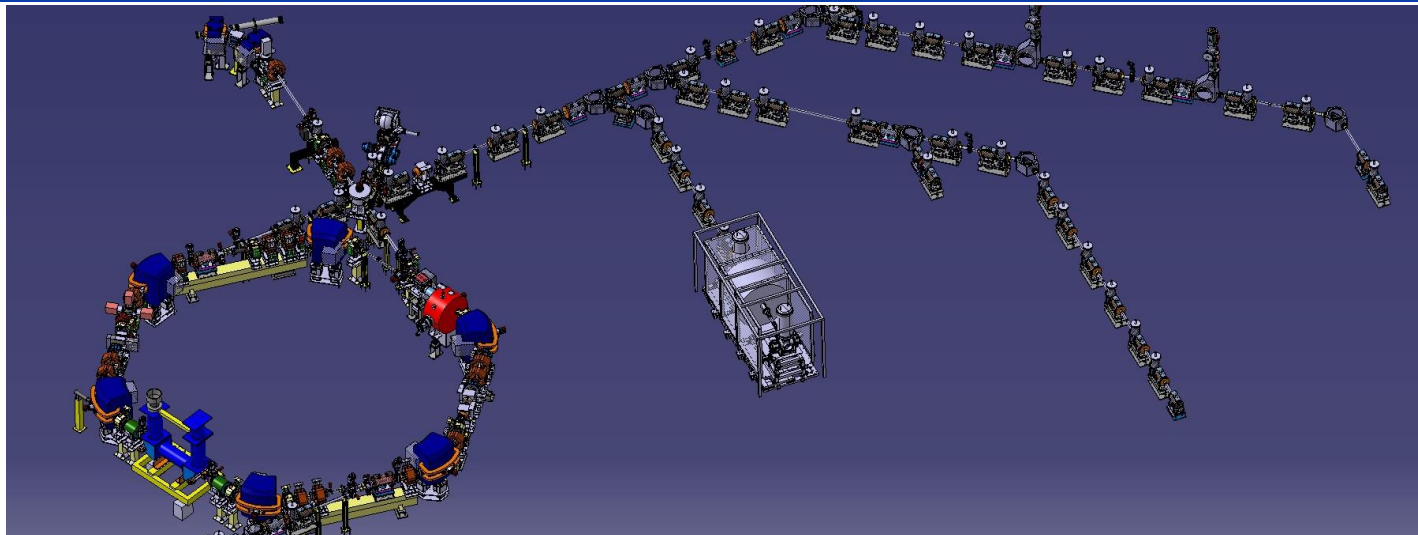


Progress with Pbars and H- beams



D. Gamba, on behalf of AD/ELENA team

ELENA Commissioning Meeting 13th Sep 2018

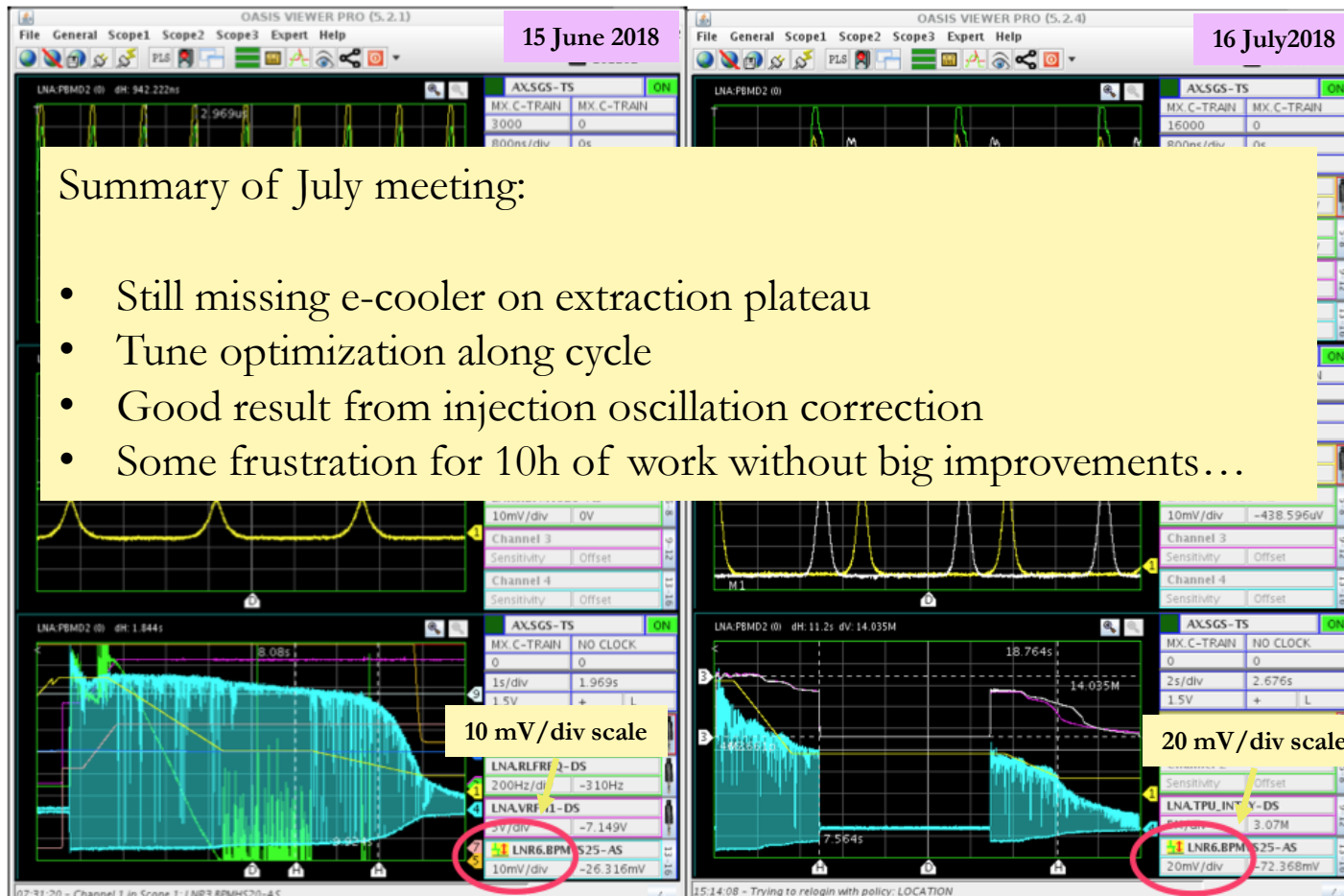


- Beam(s) status at a glance
 - Bunch rotation implementation
- Inj. line studies/steering
- Gbar transfer line studies and first SEM results
- Other studies

PBAR Status mid July

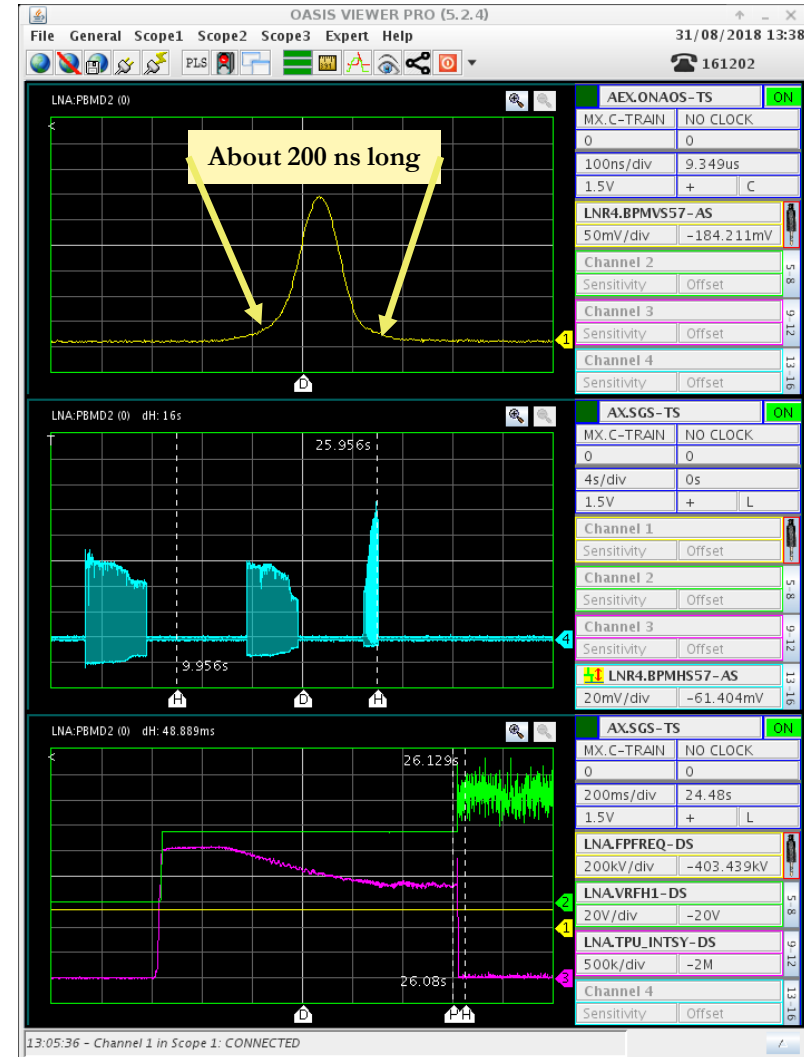
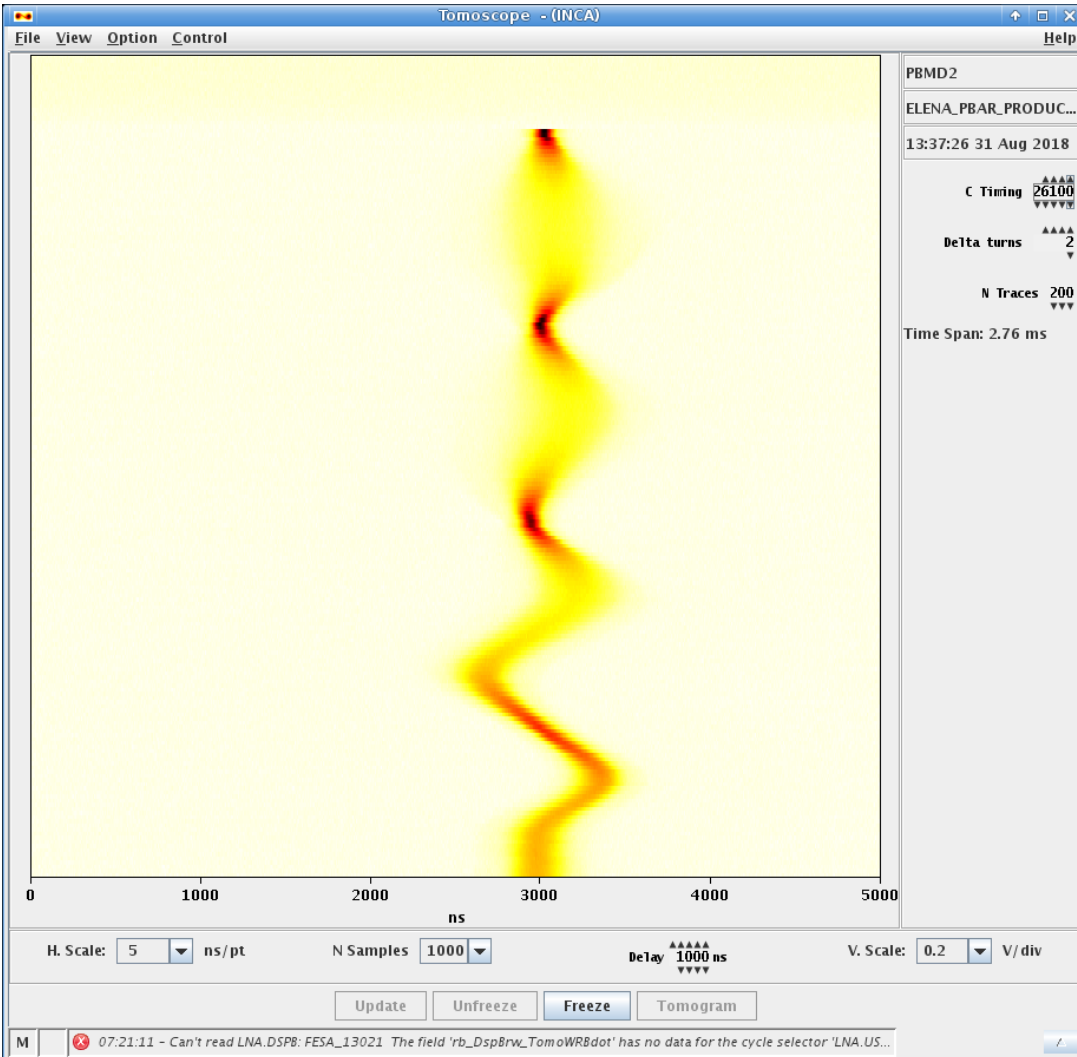


Where we are with pbar July



From L. Ponce - ELENA Commissioning Meeting - 19 July 2018

Possible bunch rotation

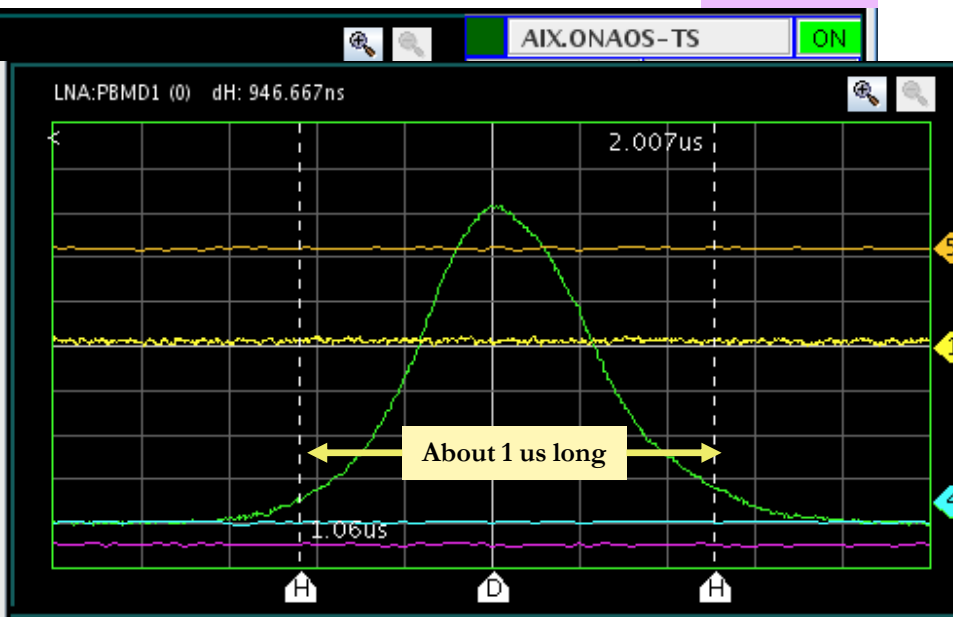
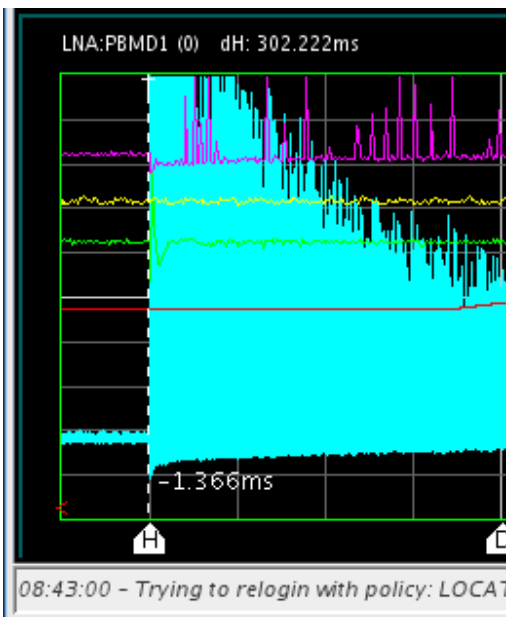


H- Status



24 July 2018

3 Sept. 2018



AEX.ONAOS-TS OFF

MX.C-TRAIN	NO CLOCK
0	0
200ns/div	1.5us
1.5V	+ C

LNR4.BPMHD07-AS

20mV/div	0V
----------	----

LNR2.BPMVS40-AS

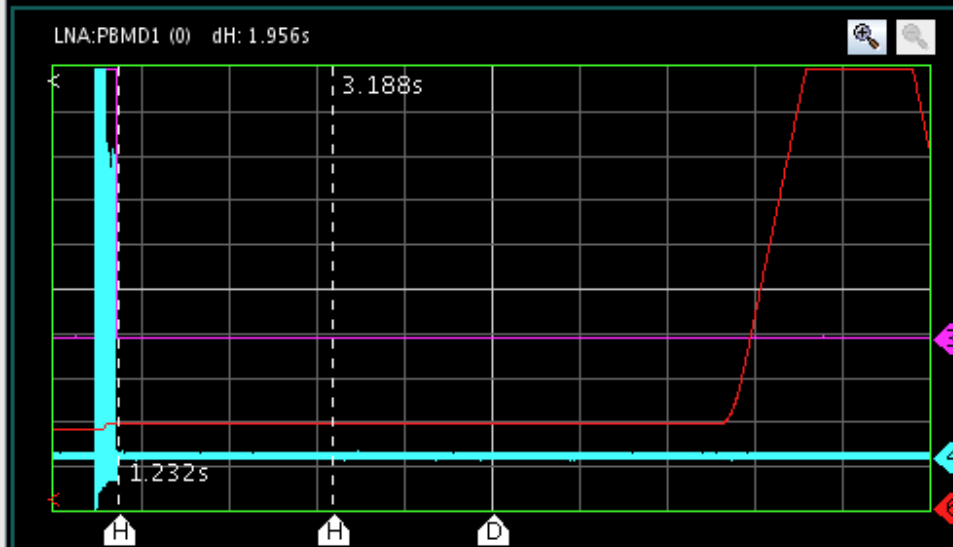
20mV/div	-70mV
----------	-------

LNR3.DFHE10N-AS

500mV/div	0V
-----------	----

LNR4.BPMVS07-AS

20mV/div	-69.298mV
----------	-----------



AX.SGS-TS ON

NO CLOCK	NO CLOCK
0	0
800ms/div	645.667ms
1.5V	+ L

Channel 1

Sensitivity	Offset
-------------	--------

Channel 2

Sensitivity	Offset
-------------	--------

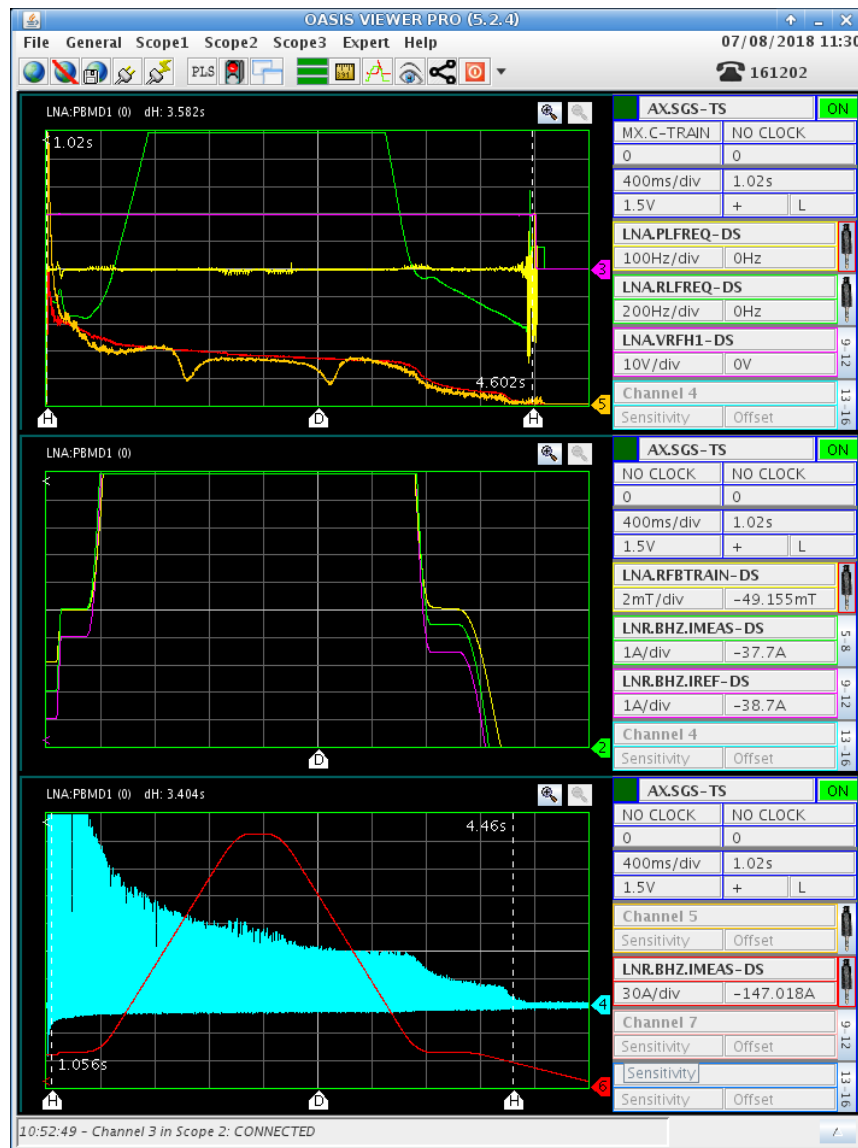
20 mV/div scale

200k/div	-219.298k
----------	-----------

LNR3.BPMVS25-AS

20mV/div	-75.439mV
----------	-----------

H- Status: a “full cycle”



- “Real” accelerating cycle:
 - From 85 keV to 100 keV
 - From 100 keV to 100 MeV/c
 - Back to 100 keV.
- Possible to have beam even for energies lower than 85 keV on the other side of the acceleration...
- Big radial loop contribution -> (more than 4 kHz! (see [logbook](#)))
- Cycle that could be suitable for B-train/hysteresis studies.

Injection line steering



- Study in collaboration with ABT (Yann Dutheil)

Resulting observations:

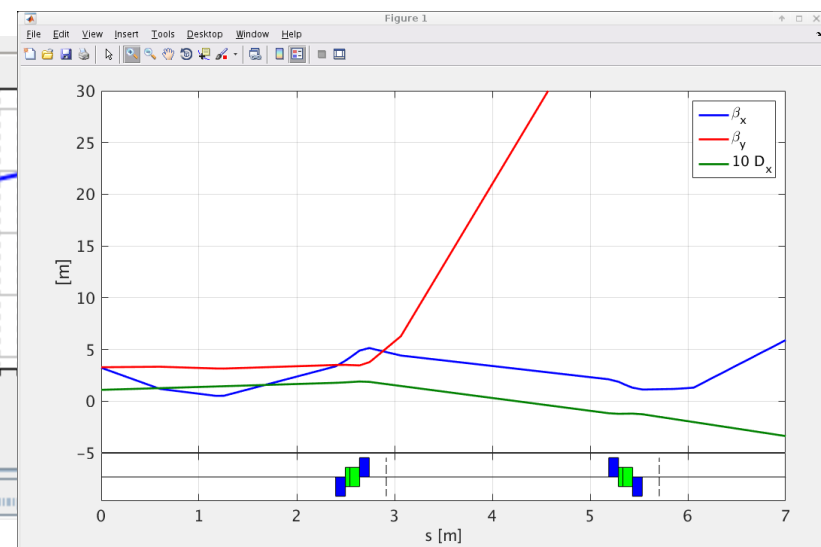
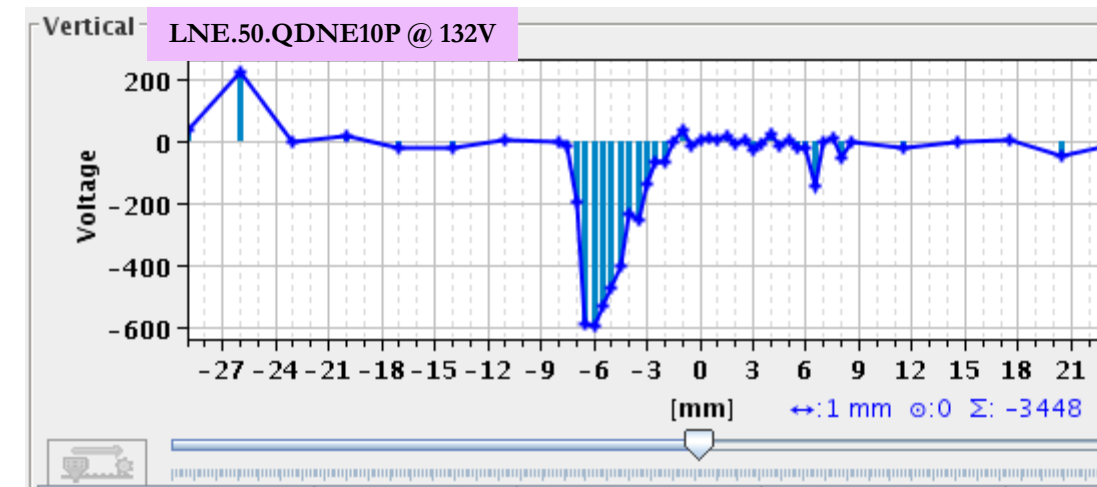
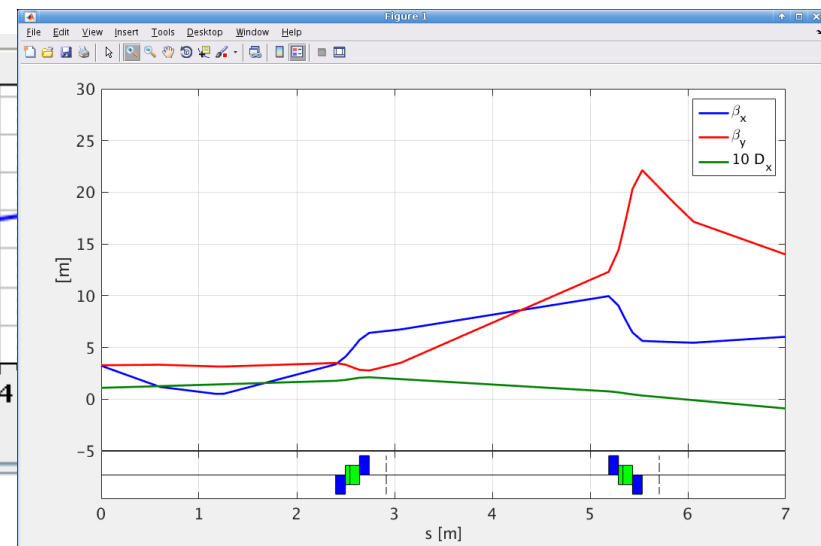
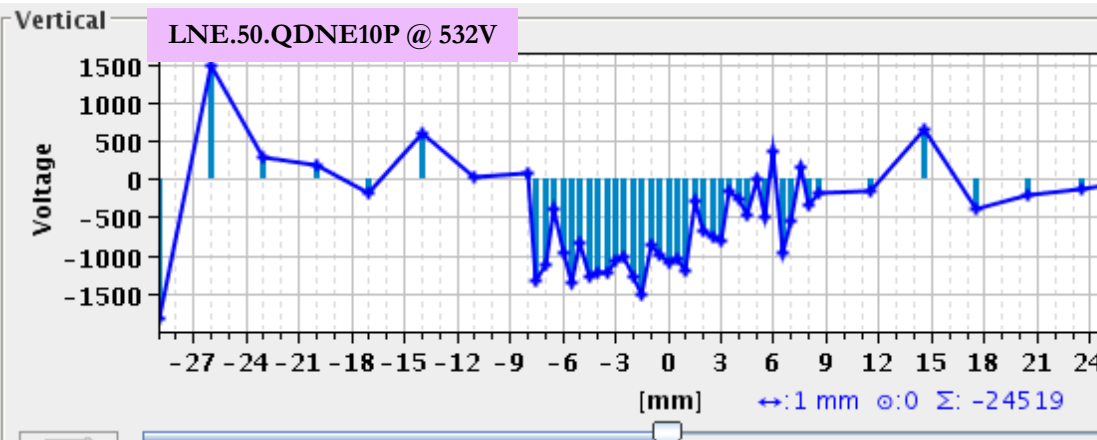
- DHZ7042 is an extremely strong corrector for the ELENA injection line.
 - we reduced its strength by acting on BHZ7010 upstream
 - It has big huge impact on alignment downstream
- With the steering we found (not optimal) we have less than 1 mm/A steering on BTV118 for each quadrupole of the LNI line (starting from LNI.QFN07)
- Double spot visible on LNI.BTV15 is confirmed to be a reflection
- For details, see [logbook](#) and [logbook](#) and [wikis](#)

Gbar line steering



- The **quadrupole voltages** used for getting **round beam** where **not symmetric** on each quadrupole plate
 - I.e. unknown optics...
- GBAR, wisely, set quadrupole voltages symmetric
 - Round beam was lost... steering...
- Last couple of days, trying to optimise steering through the center of the quadrupoles
 - Very difficult without instrumentation.
 - Strange that we need a 250 V lower (wrt 6000 V) lower voltage on fast deflector. But still giving best transmission.
- Possible to center the beam in the drift tube, but not great spot, yet...
- To be continued with SEM!

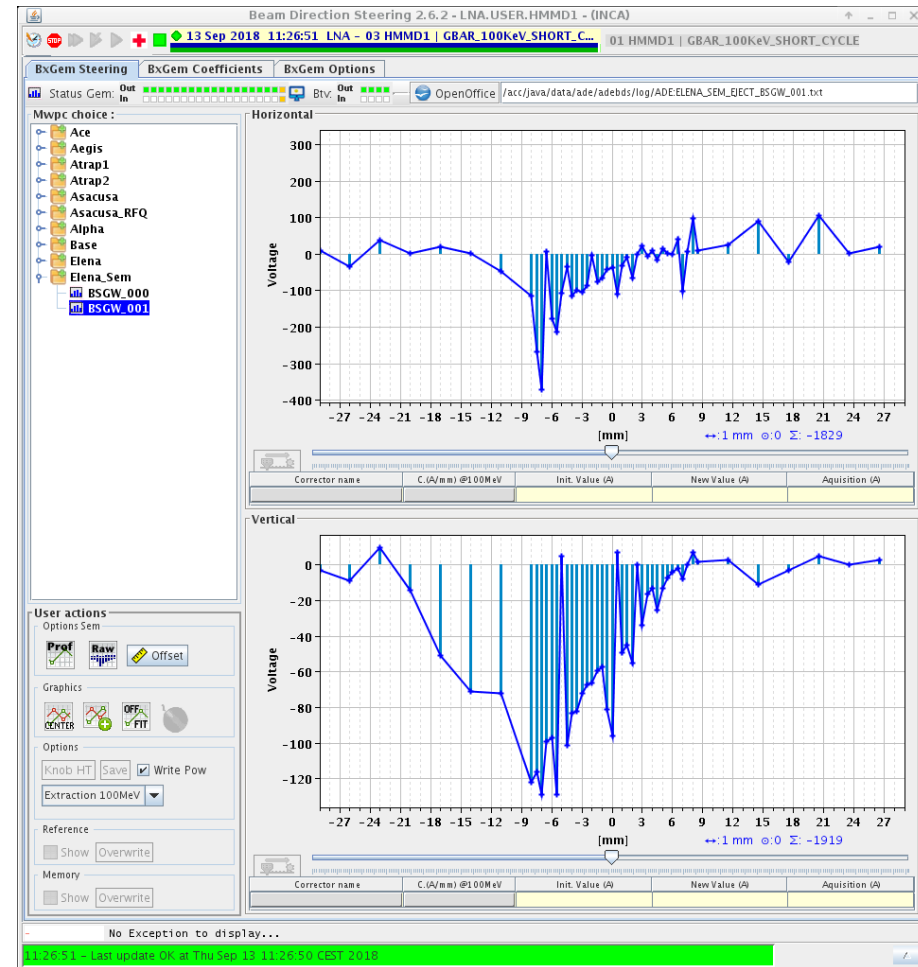
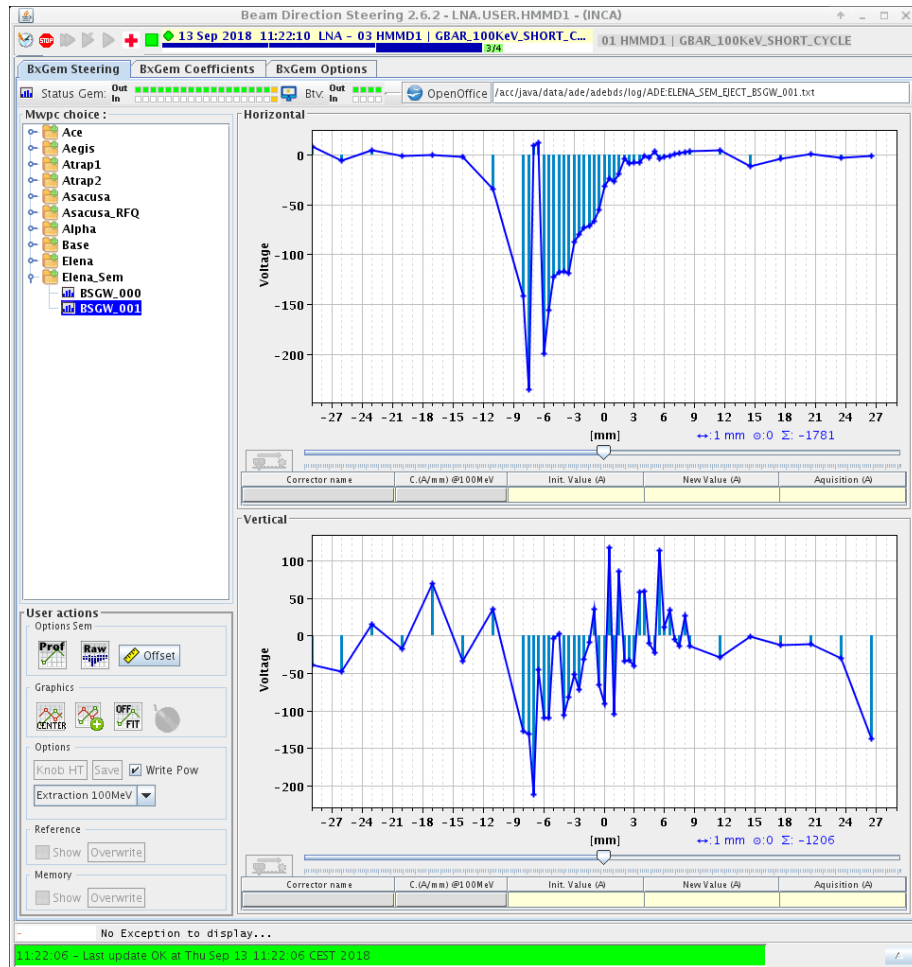
First signal on GBAR SEM



First signal on GBAR SEM



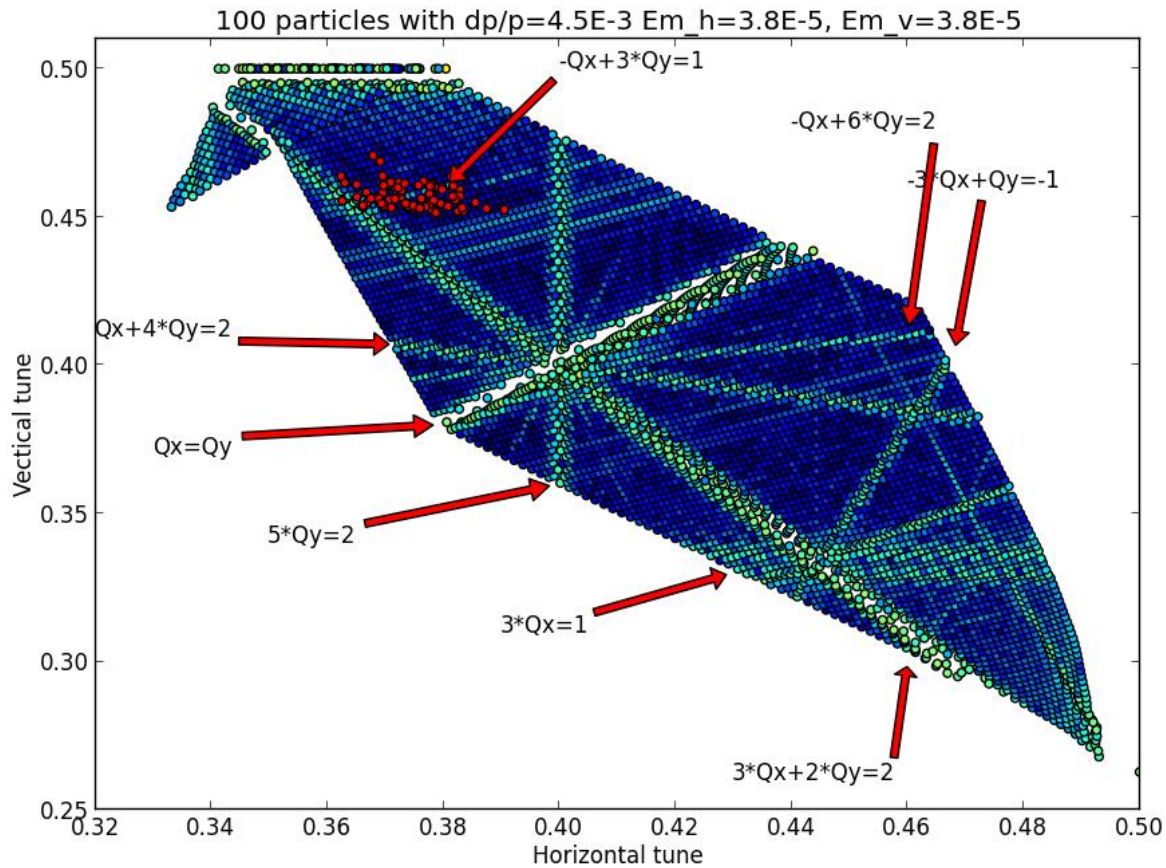
- Today, after further debugging of electric connection and adjusting gain in electronics we have both profiles and on the “correct” plane.



Studies ongoing: tune scan



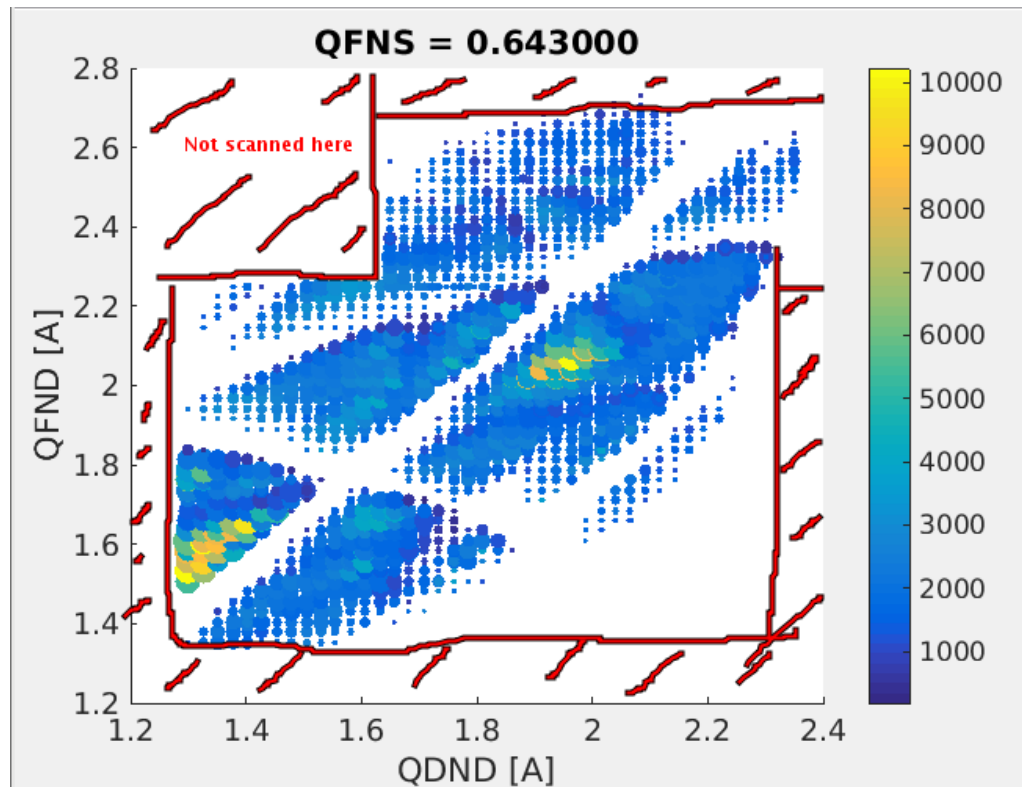
- Lajos' machine model predicts strong resonances/small portion of tune diagram "available" for beam.
- For details, see [logbook](#)



Studies ongoing: tune scan



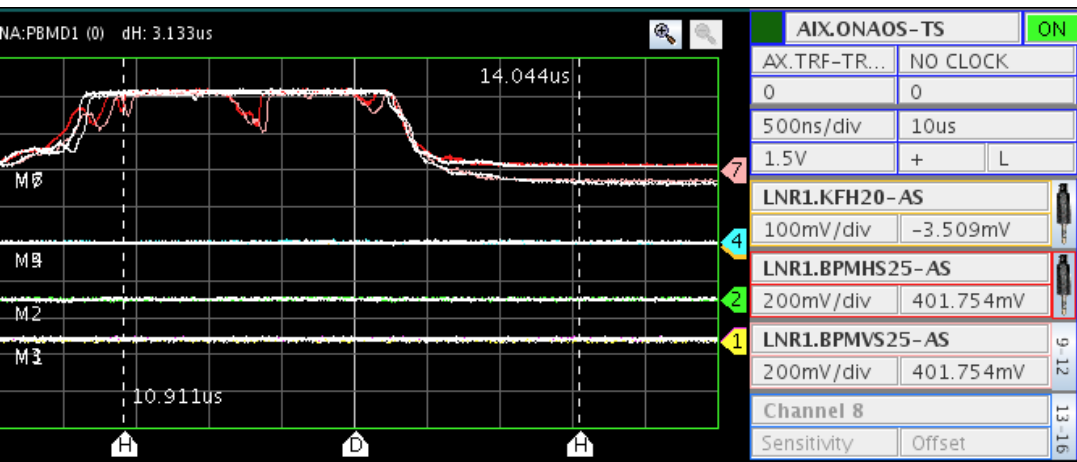
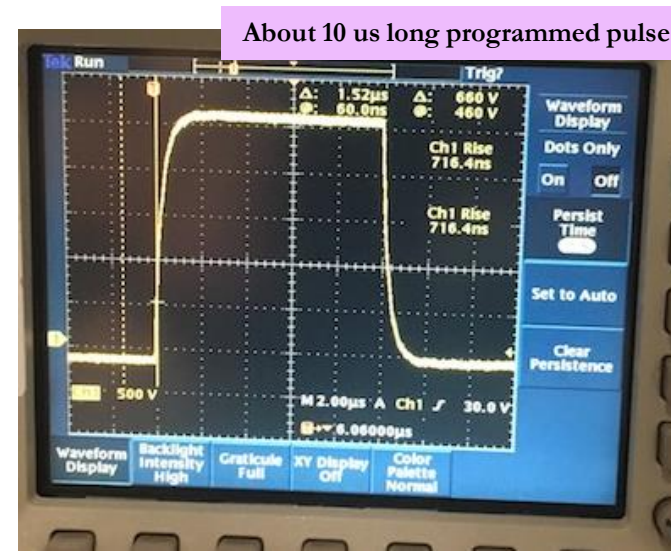
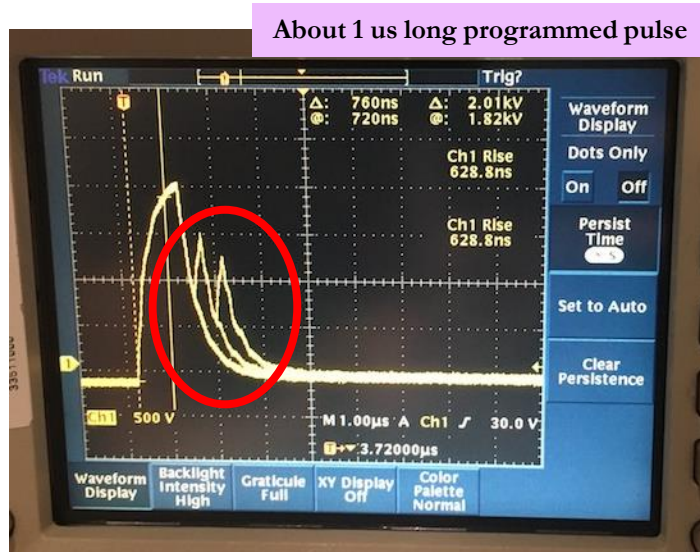
- Profiting of “fast” and “cheap” H- cycles to explore tune diagram with beam
- Here an example of measured lifetime as a function of different quadrupole settings at 85 keV
 - Lifetime computed on LLRF-TPU-generated intensity, which might be inaccurate for high intensities (yellow points are dominated by this)
 - **Still to be better analyzed and compared with machine model**



Studies ongoing: source



- Investigating stability of H- source puller voltage



Might be possible to see it on the beam by:

- Increasing septa and disabling inj kicker
- Seeing the signal on first BPM of injected beam. Here a first test in Aug:
 - Saturation of BPM electronic
 - Shot to shot oscillation in the pulse coming from source

Moreover



Developments

- **Extraction synchro** implemented and commissioned by RF team
- Estimate of **intensity based on TPU and LPU signals** by RF team
 - We observed some strange feature on TPU intensity signal, which might be due to saturation. Investigation still ongoing
- New **intensity and bunch length measurement** with 2 harmonics deployed see [logbook](#)
- **New voltage control** for cavity, allowing to go down to 120 kHz with RF.
 - i.e. allowing h1 injection with 85keV beam from source

Issues

- Struggling with **beam arrival time jitter** at GBAR due to some issue in LLRF reference frequencies generation. It seems solved for the time being.
- Needed to program **factor 2 higher voltage** to keep **H-** beam (see [logbook](#)). Why?!

Studies

- Some attempt to **measure chromaticity** (see [logbook](#) and [logbook](#)).
 - Lajos obtained values of about -2 in both planes
- Trying to study **alignment of electron beam and pbar beam** in cooler (see [logbook](#))
- Trying to start **e-cooler on H-** beam (see [logbook](#))

Beam size along cycle



at mid plateau:

- * the beam is maybe a factor 2 bigger in Vertical, but no big difference in Horizontal.
- * the debunching makes smaller beams in both planes.
- no RF means longer bunches and smaller energy spread I guess. Maybe some link with dispersion? But why in vertical?
- * the cooling is very effective in horizontal, reducing the beam sizes of about factor 3. It does something in vertical.
- * the re-bunching makes beams again bigger.

at extraction plateau:

- * the cooling reduces the beam size of a factor 2 in Vertical, is doing a little beam size reduction in Horizontal.

HORI

