ELENA Ring: test and preparation

From C. Carli@ECC March 2019

First Ideas on Activities with Beam in LS2 (Input for a Discussion and instead of Conclusions)

- Aims of possible tests in 2019 - mainly preparation of transfer line commissioning in 2020
  - Demonstration of reliable source operation at 100 keV with upgraded isolation transformer
  - Investigations on intensity fluctuation along pulse: requires line to ring for observation on 1st ring pick-up (can one increase the pick-up saturation level for this pick-up?)
  - Increase of intensity from source (sufficient intensity of extracted bunches for line commissioning possibly with scraping to adjust emittances)?
  - H^- injection matching (BTV after septum and possibly observation in SEMs)
  - Probably not possible (but would be of interest!): injection tests to optimize efficiency (even without RF), tests with beam on SEM in GBAR line

Test period in autumn? (plus earlier tests with source alone at 85 kV)

- Aims for 2020
  - Commissioning of transfer lines to experiments in "old" experimental zone with H^-
    - Profile monitors mandatory!!
    - Requires sufficient intensity H^- within appropriate transverse emittances
    - Show control of beam along lines and arrival with expected characteristics at the last monitor
    - Magnetic stray fields and shielding: plans for investigations and, possibly ?
  - Possible other tests with H^- and/or proton beams from source?
    - Electron cooling with protons or H^-
    - Lattice control and understanding, (loss on ramp at low energy?) …
    - Acceleration, deceleration ...

Christian Carli

Achievement

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Planning for 2019-2020

First Ideas on Activities with Beam in LS2
(as input for a discussion)

- Master planning of activities related to ELENA and the new transfer lines during LS (by Francois Butin who follows up all these activities)

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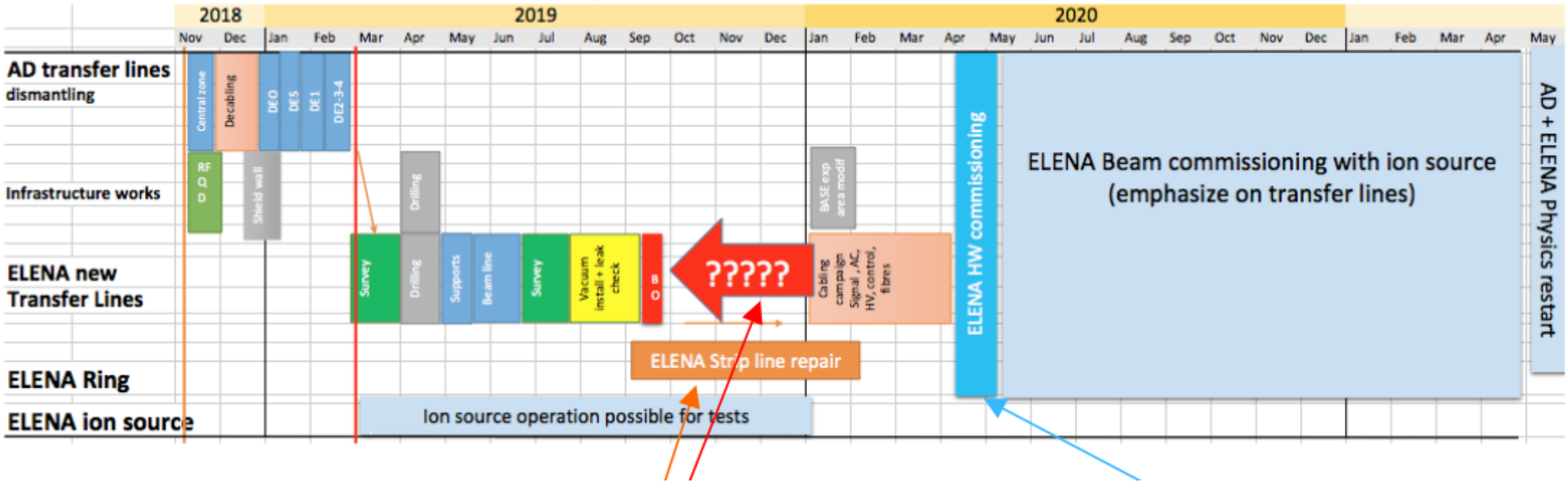


- Test with beam in 2019 delayed by HV transformer and mainly used for Profile monitors tests

Plan for 2020

- Aim for 2020 did not changed:
  - First priority : commissioning of ALL transfer lines with Hminus
- Pre-requisite:
  - Installation of TLs completed: Profile monitor mandatory
  - Restart of the ELENA ring with RF
- Extra constraints on beam request:
  - Test of Profile monitors electronics V3 with Hminus before production

    => test in LNE50 as in 2019 if needed
  - Availability of RF experts to test new LLRF to be deployed in AD

Restart of the source (April)

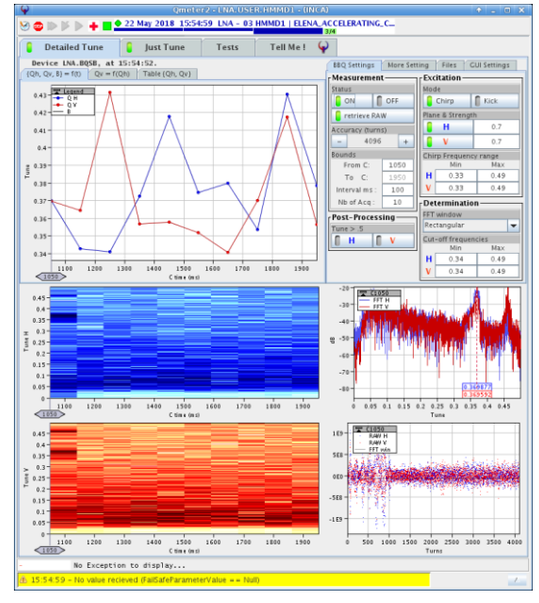
- Operational conditions:
  - As soon as TL cabling is completed => unlock-out in April
  - Beam up to BTV => compatible with access in the machine with the same conditions as in 2019
- Aim: complete what is left over from 2019
  - Reliable operation of the source at 100 KeV
  - Increase intensity, reduce intensity fluctuations
- Test Plan:
  - Establish operation @ 100 keV in DC mode, test of the pulsed mode?
  - Test of the Profile monitors electronics V3 in LNE50?
  - Improve injection efficiency, Injection matching studies
  - HW test of the ring: B-train, pause, etc...

Restart of the ELENA ring

- Operational conditions:
  - As soon as access system is validated (beginning of May)
  - Circulating beam in the machine with RF ON (bunched beam) and possibly accelerate => NOT compatible with access in zone
- Aim:
  - Prepare TL commissioning: establish cycle(s), test of instrumentation
  - Test new LLRF development (mandatory for AD restart)
- Studies:
  - Caracterisation of the beam at 100 keV: intensity, lifetime, emittance
  - Optics studies: kick response, working point optimization…
  - Debug of all software change...

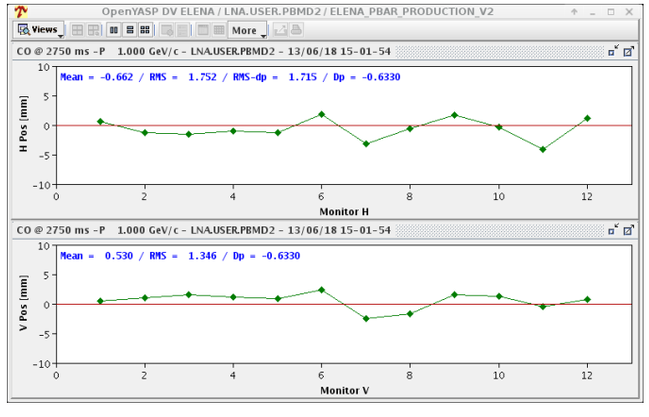
ELENA ring: May-July

- Establish the different cycles needed in 2020:
  - Extraction cycle for TL commissioning to optimize repetition rate: injection plateau length driven by ion switch pulsing time
  - Establish acceleration/deceleration cycle for LLRF test
  - Long plateau at 100 KeV for studies and debugging



- Restart/commissioning of instrumentation:
  - Intensity in the ring and in the TL: longitudinal pick-up
  - Orbit measurement, orbit correction, kick response
  - Tune measurement → test of the repair
  - Beam emittance and shaping : scrapers
  - All RF diagnostics

    => test, test, test



ELENA ring

- Setting-up of the multi-bunch extraction:
  - Test of timings, synchronisation
  - => to be planned as soon as possible but need the SEM electronics
- Whenever possible:
  - Validation of new settings management
  - Lattice control and understanding: optics studies
  - Investigation of losses in the ramp
  - Test and implement beam properties measurements: coupling/chroma measurement and correction, injection oscillations with Hminus
  - E-cooling magnetic elements influence on beam orbit

=> OP tests that can be performed anytime no access in the machine

Planning and organization

- The operation tem will be on duty in the ACR during working hours from May to end of the year:
  - As soon as the machine switched to access with key
- Monday morning briefings when required from March, weekly from May on to handle co-activities
- Planning to be scrutinized to arrange different activities:
  - Priority is clearly TL commissioning
  - but :
    - Extraction towards LNE50 needed for profile monitors test in May
    - Couple of weeks with circulating beam are needed before July