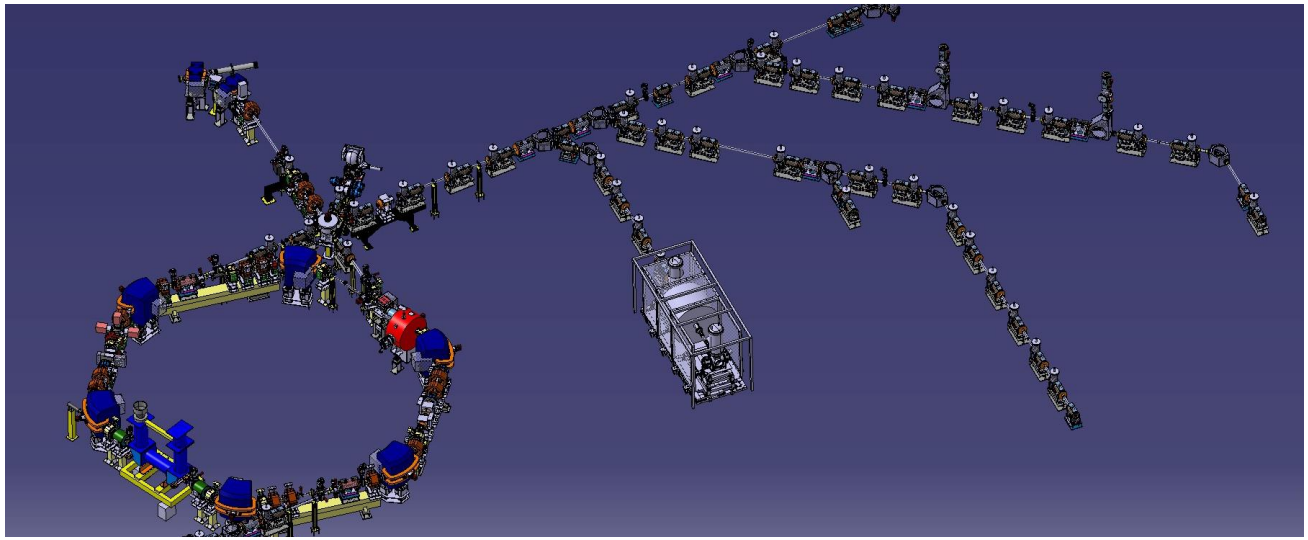
Installation of ELENA Beam Lines to existing experimental zone

C. Carli on behalf of the AD and ELENA teams

ADUC, 20th September 2016



- Present Situation in the AD Hall
- Status of electron cooler, injection kicker, magnetic pick-ups, profile monitors and corrector magnets
- ELENA Project Phases
- Two Scenarios for the Installation of the new Lines to the existing Experiments
- Recap, Summary, Discussion ..

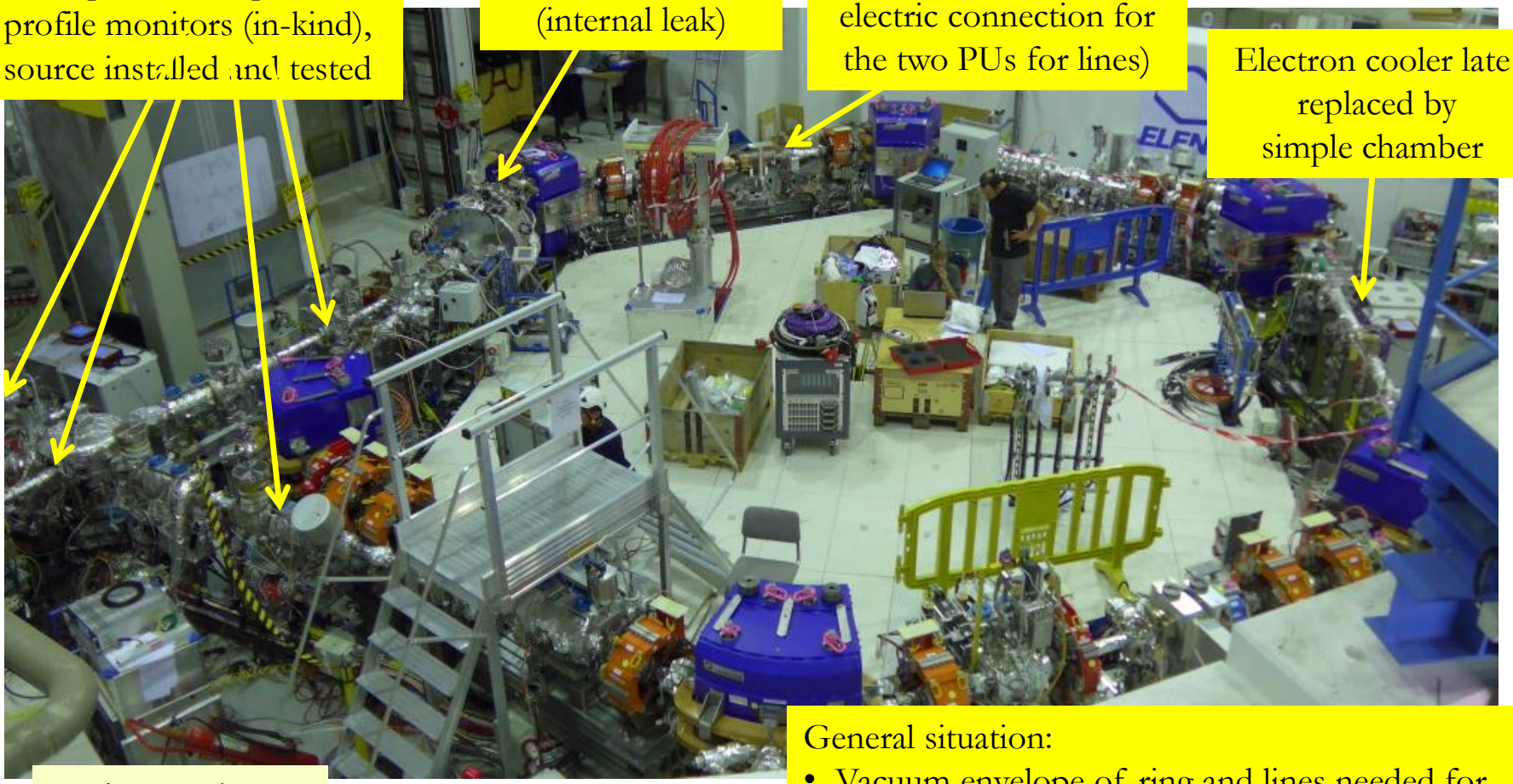
Present situation in the AD Hall

Transfer line: installation completed, except four profile monitors (in-kind), source installed and tested

Injection kicker: issue with pressure (internal leak)

Magnetic pick-ups: two for the ring o.k. (open electric connection for the two PUs for lines)

Electron cooler late replaced by simple chamber



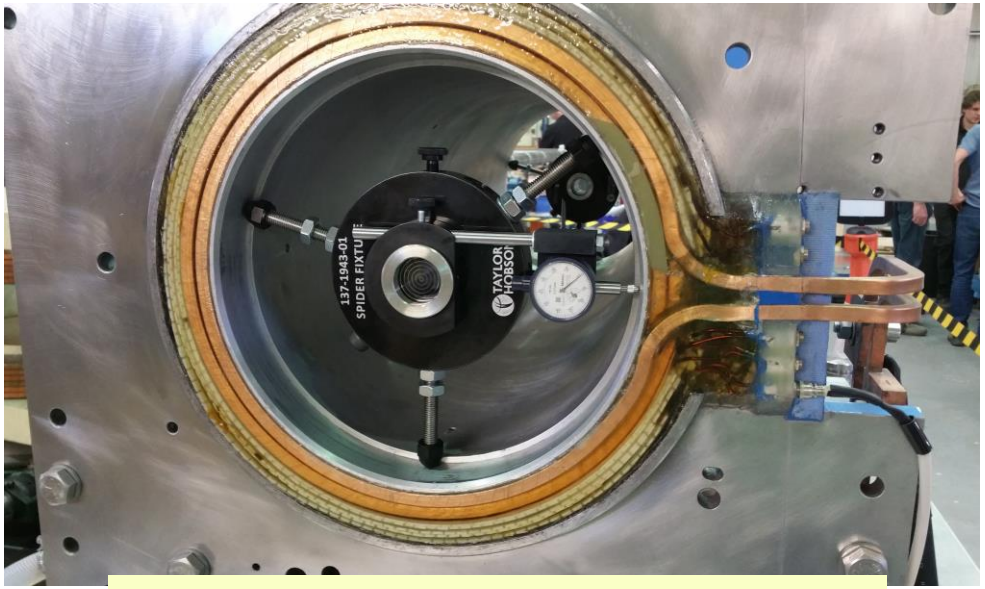
Picture taken on 19th September

General situation:

- Vacuum envelope of ring and lines needed for commissioning closed yesterday
- Most of the ring baked

Status of electron cooler

- Construction coordinated by CERN with
  - Magnetic System manufactured by industry
    - Field lines have to be perfectly straight in region where pbars interact with electrons
    - Magnetic field measurements delicate – reproducibility to be improved further
    - Minor problem with mounting of position pick-up (successful tests of mounting of assembly)
    - Delivery expected in November



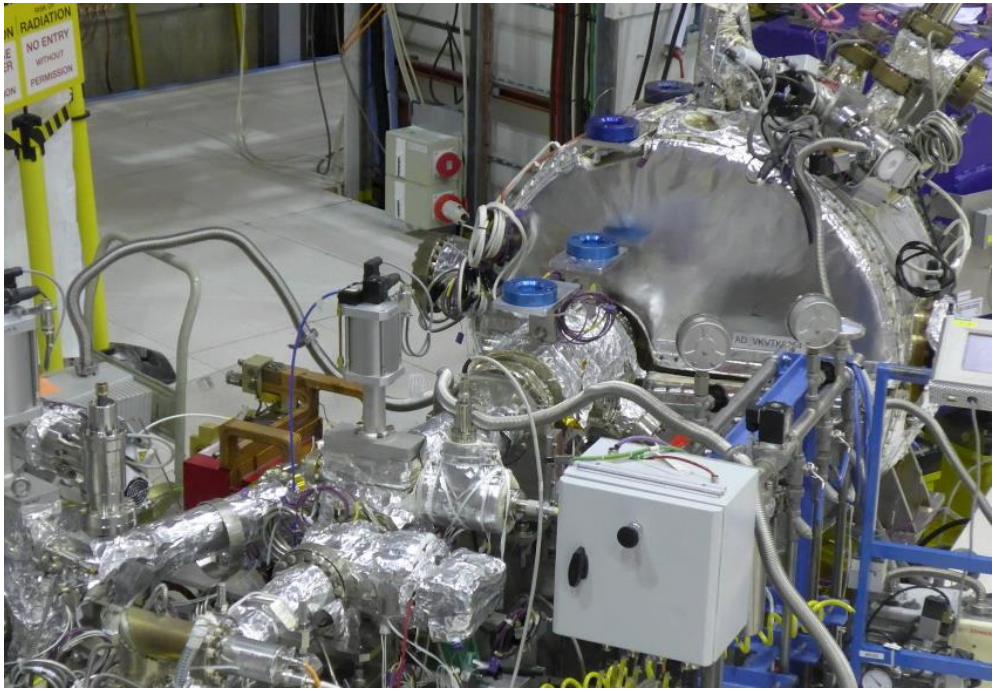
One single straight solenoid with equipment for magnetic field measurements

  - Vacuum system designed and manufactured at CERN
    - Issues with colorings (NEG not adhering) and projections from weldings
    - Method(s) to remove projections found, construction on-going
    - Expected to be completed in November
  - Installation early 2017
    - Tests to be done at CERN (transverse field measurement)?

Injection Kicker

- Vacuum issue likely due to an "internal leak"
  - In total five acceptance tests made all resulted in higher than expected pressures
  - NEG coated plates removed (cannot be activated in case of excessive gas load) and changed pumping configuration
  - In August, decision to vacuum fire and re-machine cover of tank

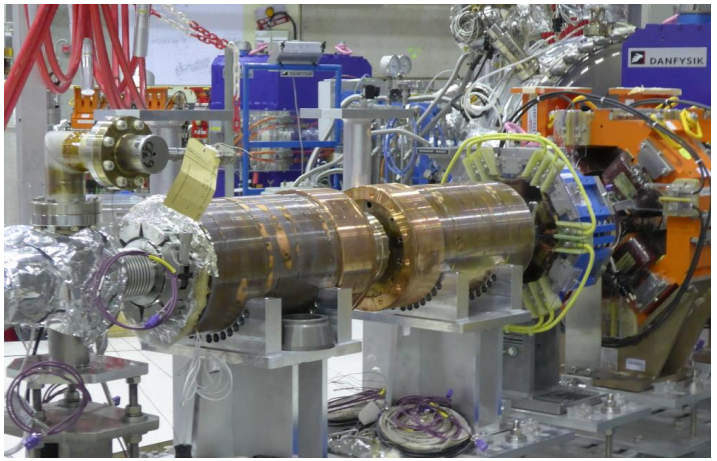
  => external leak removed successfully



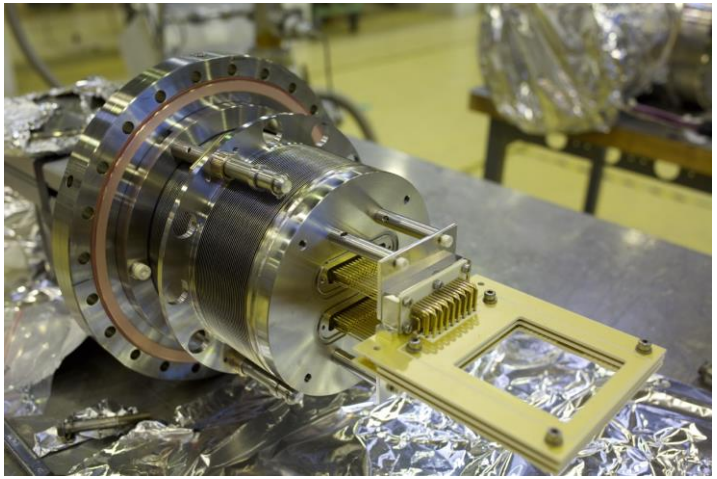
  - Kicker installed now as no "short-term" solution available
    - Expect pressures in low 10^{-9} mbar range after bake-out and decrease with time (time constant of 8-10 days seen in 4th test)
    - Long term solution to remove this non-conformity to be discussed

Magnetic Pick-ups and Profile Monitors

- Magnetic Pick-ups
  - Electrical issue on two pick-ups for extraction lines outside part needed for ring commissioning
  - Solution for line to be discussed – probably lengthy repair with opening of e-beam welded "cavities"
  - Pick-ups for ring found o.k. (good surprise) and installed



- Profile Monitors (SEM) for Lines
  - SEM Prototype installed in LNS (source) line
  - Waiting for four more monitors under preparation for LNI-LNE would delay start of commissioning
  - Bake-out of LNE-LNI without (all) SEMs installed to start ring commissioning as soon as possible?
    - Would have two monitor (SEM in LNS line and MTV after injection septum) out of three for injection via nominal injection channel
    - 2nd bake-out of sector once SEMs are available

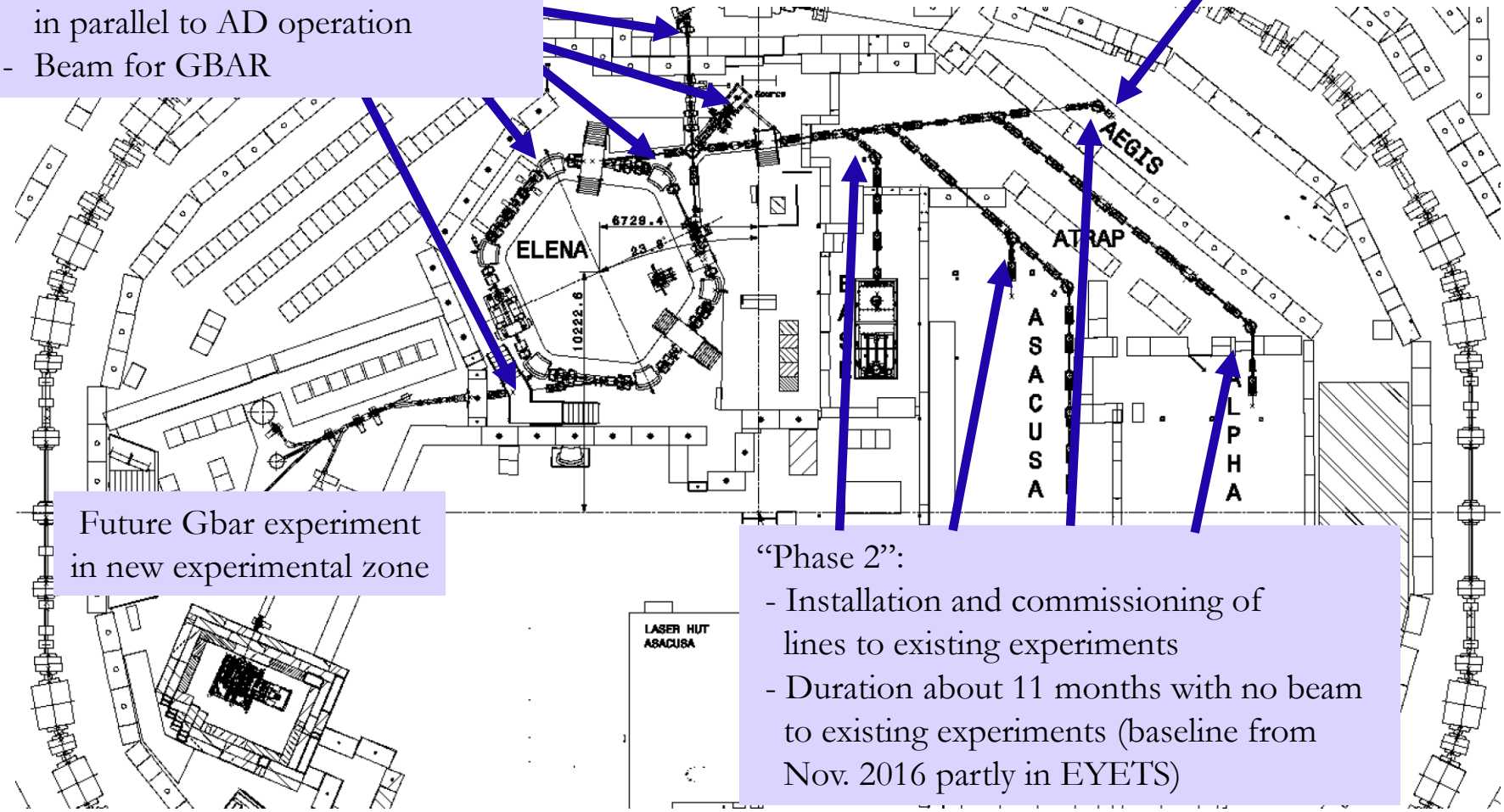


- H/V Corrector Magnets
  - Delay due to various technical problems, mitigated by installation around chamber after bake-out, no impact on start of commissioning expected

ELENA Project "Phases"

"Phase 1":
- Installation of ring with lines needed for commissioning
- Commissioning of ELENA ring in parallel to AD operation
- Beam for GBAR

(Note: proposal to move AEGIS to better location in new experimental area)

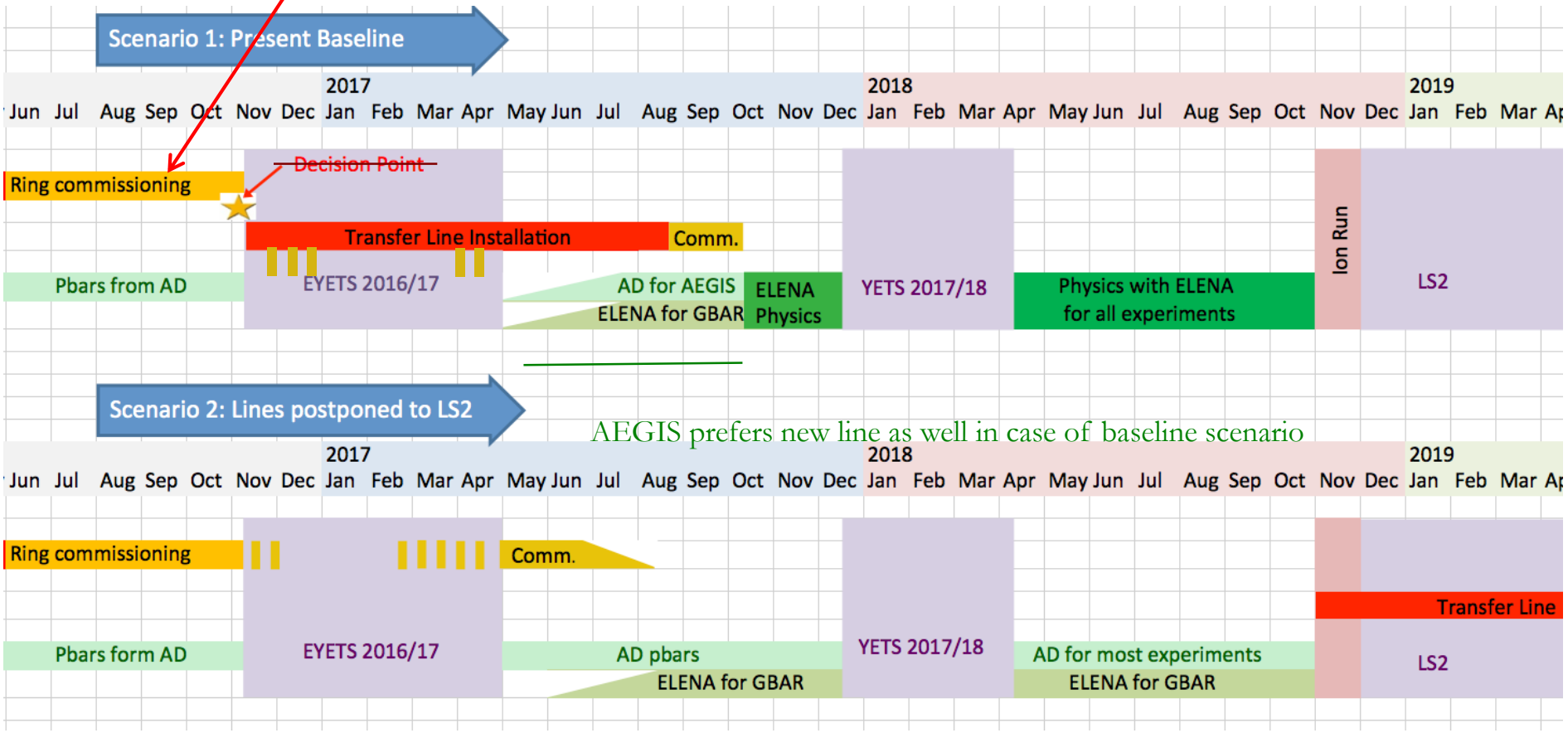


Future Gbar experiment in new experimental zone

"Phase 2":
- Installation and commissioning of lines to existing experiments
- Duration about 11 months with no beam to existing experiments (baseline from Nov. 2016 partly in EYETS)

Installation of the new Lines to the existing experiments over EYETS 2016/17 or in LS2

Decision point agreed with CERN groups via discussion at IEFC:
Two moths before start of intervention (mid-September at time of discussion)



Third scenario with installation starting later until end of YETS 2017/18 ?

Recap, Summary, Discussion …

- ELENA is a small machine, but has challenges due to the low energy and size
  - Modeling of small (bending with small curvature radius) magnets
  - Electron cooling at very low energies (with 55 eV electrons)
  - Perturbations of circulating beam due to electron cooler
  - Magnetic field quality at very low field, Instrumentation with very low intensities and energies …
- Status and present issues
  - Most of the ring ready with bake-out of last sector under preparation
  - Lines not yet baked
  - Issues with injection kicker (vacuum) and profile monitors (availability)
- Position of ELENA team on the scheduling of the installation of the new lines to existing experimental zone
  - With ELENA ring commissioning not yet started, not in favor of starting installations at the end of this year unless this would be clearly and strongly supported by users
    - What would be the risks we are ready to take?
  - Installation of lines to existing experiments during LS2 the likely option
  - Third scenario installation over YETS 17/18 in case of fast progress ELENA commissioning
  - Make sure that resources for installation of lines are available (PLAN tool)
    - Some additional cost for installation in LS2
- ELENA will be ready for GBAR in new experimental area from 2017 on