ELENA commissioning plans and status

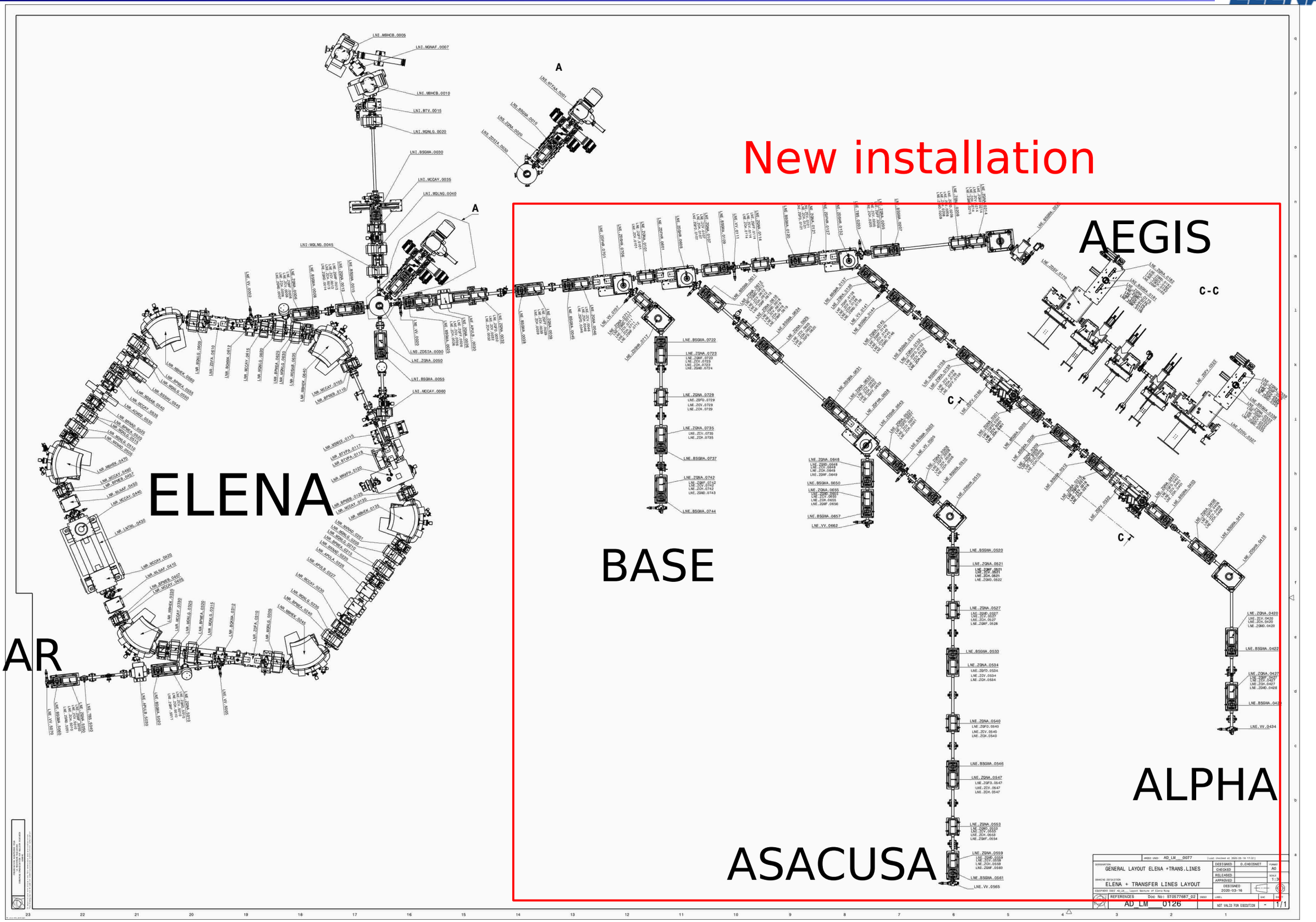
ELENA activities during LS2

- Connection of ALL AD users to ELENA:
  - Replacement of magnetic line between AD and experiments with new electrostatic lines

- Commissioning of the new lines with H- ions:
  - Establish reliable operation of the ion source
  - Restart of ELENA ring
  - Setting-up of the ion beam for efficient Transfer line commissioning

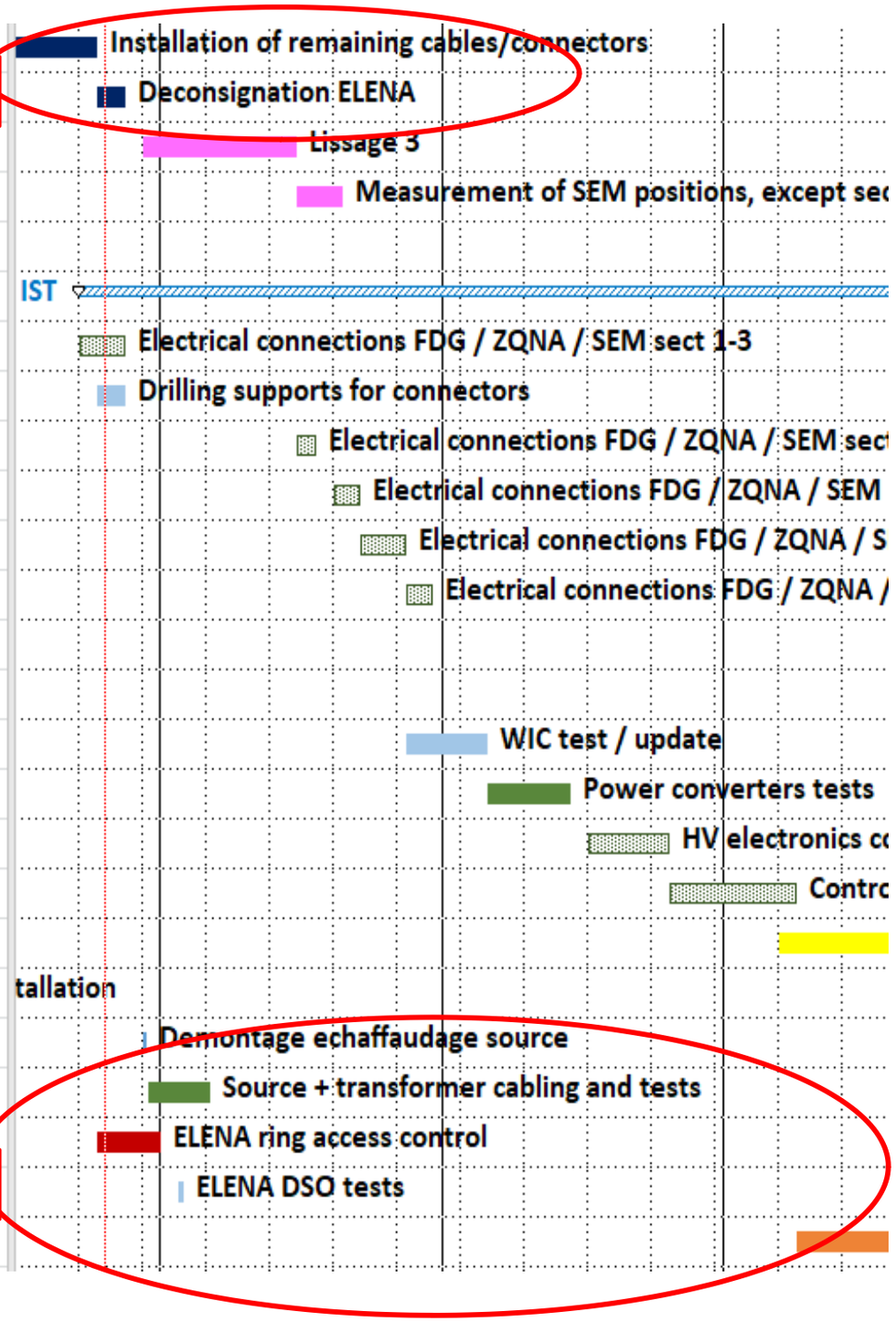
=> faster restart with pBars in 2021 (3 weeks planned for ELENA beam commissioning)

ELENA Layout



Status of TL installation

Installation of remaining cables/connectors	EN-EL	8 wks	Mon 20.01.20	Tue 23.06.20
Deconsignation ELENA	EN-EL	3 days	Wed 24.06.20	Fri 26.06.20
Lissage 3	EN-SMM	13 days	Mon 29.06.20	Wed 15.07.20
Measurement of SEM positions, except sect 5 6-5	EN-SMM	3 days	Thu 16.07.20	Mon 20.07.20
Measurement of SEM positions, sect 5 6-5 2	EN-SMM	3 days	Wed 27.01.21	Fri 29.01.21
Connections / IST		**139 days**	**Mon 22.06.20**	**Fri 15.01.21**
Electrical connections FDG / ZQNA / SEM sect 1-3	TE-ABT	5 days	Mon 22.06.20	Fri 26.06.20
Drilling supports for connectors	EN-MME	3 days	Wed 24.06.20	Fri 26.06.20
Electrical connections FDG / ZQNA / SEM sect 3-4	TE-ABT	2 days	Thu 16.07.20	Fri 17.07.20
Electrical connections FDG / ZQNA / SEM sect 0-1	TE-ABT	3 days	Mon 20.07.20	Wed 22.07.20
Electrical connections FDG / ZQNA / SEM sect 7	TE-ABT	3 days	Thu 23.07.20	Mon 27.07.20
Electrical connections FDG / ZQNA / SEM sect 1	TE-ABT	3 days	Tue 28.07.20	Thu 30.07.20
Electrical connections FDG / ZQNA / SEM sect 6-5	TE-ABT	1 wk	Mon 04.01.21	Fri 08.01.21
Electrical connections FDG / ZQNA / SEM sect 5	TE-ABT	1 wk	Mon 11.01.21	Fri 15.01.21
WIC test / update	TE-MPE	7 days	Tue 28.07.20	Wed 05.08.20
Power converters tests	TE-EPC	7 days	Thu 06.08.20	Fri 14.08.20
HV electronics commissioning	TE-ABT	7 days	Mon 17.08.20	Tue 25.08.20
Control & sofware commissioning	TE-ABT	2 wks	Wed 26.08.20	Tue 08.09.20
SEM connections and tests	BE-BI	2 wks	Mon 07.09.20	Mon 21.09.20
New transformer installation	TE-EPC	5 days	Mon 11.05.20	Fri 15.05.20
Demontage echaffaudage source	EN-EA	0,5 days	Mon 29.06.20	Mon 29.06.20
Source + transformer cabling and tests	TE-EPC	1 wk	Mon 29.06.20	Mon 06.07.20
ELENA ring access control	BE-ICS	1 wk	Wed 24.06.20	Tue 30.06.20
ELENA DSO tests	BE-ASR	0,5 days	Fri 03.07.20	Fri 03.07.20
TLs Commissioning with beam	BE-OP	16 wks	Wed 09.09.20	Wed 13.01.21



Planning

- 2 Important milestones:
  - 23/06/2020 End of cabling campaign allows:
    - ELENA ring unlock-out: restart of equipment racks
    - Access to source chamber
    - Completion of access system
  - 03/07/2020: ELENA ring DSO test allows:
    - Safe nominal beam operation while completing TL installation work

- 3 different operation periods:
  - 29/06/2020-31/07/2020: restart of ELENA source operation
    - Restart of the transformer
    - Set-up of the pulsed operation
    - Optimization of beam intensity and pulse stability
  - 15/07/2020-01/08/2020: ELENA ring HW test
  - 01/08/2020-15/09/2020: ion beam operation in alternance with TL installation completion

Recent issues

- Isolation transformer for the H^- source
  - Transformer, successfully used for H-end of 2019, sparked and broke during tests with positive polarity (for proton beams)
  - Transformer, which had worked in the past (DC at 85 kV in spring 2019?) is prepared
    - Aim is to pulse to 100 kV (with proper integration with CERN CO system)
    - (Back-up solution: injection at 85 keV followed by acceleration)
  - Another iteration in pipeline and expected to be available mid of August
- Profile monitors for the new transfer lines:
  - Hardware:
    - Last 11 monitors to equip ASAKUSA line should be ready for September
    - Repair of broken pieces on-going for spares assembly
  - Electronics:
    - Good results from front-end electronics tests without beam
    - Administrative issues (three competitive quotes) to launch front-end electronics series production
      → on critical path for mid-September

Hminus beam permit (2020)

- Up to DSO test (3/7/2020), BTV 117 locked IN beam: OP procedure
  - Restart of source HT, test of transformer
  - Hminus beam in LNS, LNI up to BTV118 and 1 turn in ELENA
- After DSO tests: ion source beam permit
  - ELENA ring + transfer lines can be put in BEAM ON mode
    - Beam operation when no access needed to complete TL installation
    - Allow nominal beam operation in ELENA ring and possibility of extraction
- Experimental zones can stay in access:
  - Hminus <= 100 keV, vacuum valves closed in the the lines
  - Beam permit for Gbar if requested by Gbar
  - EiS (fast deflector) validation later in the year

ELENA ring HWC

- 2 weeks of tests second half of July
- Hardware test without beam starting mid-July in parallel with source operation AND TL installation:
  - ELENA WIC revalidation
  - Vacuum system → SIS validation
  - Ion switch pulsing
  - Cycling of the machine, Btrain
  - Kickers pulsing
  - Scraper movement
  - Check of instrumentation
  - (Electron cooler restart).

Beam Commissioning in Summer

- Main objective is to prepare the H^- beam needed for the TL commissioning mid September:
  - Identify as soon as possible potential issues
- Priorities:
  - Establish stable H^- operation of the source at 100 keV (pulsed mode):
    - Restart of the transformer
    - New controls for pulsed mode
    - Optimize beam intensity and stability
  - Check H^- beam properties life-time versus ion switch decay time → launch action if needed
  - Measure/optimize emittance

- Other studies:
  - Test of new LLRF which will be also used for AD→gain AD recommissioning time
  - H^- extraction for Gbar
  - Test of profile monitors electronics

Beam in ELENA ring

- From mid-July on Machine can be put in Beam mode :
  - Alternance of access in the machine for TL installation with period of circulating beam → priority to installation
  - Expect not as much as time as wanted for beam operation
- Test with beam:
  - Optimize injection
  - Setting-up of the cycle for TL commissioning
  - Setting- up extraction to LNE50 for SEM electronics tests and Gbar setting-up
  - Prepare acceleration/deceleration cycles in case of need
  - Setting-up of extraction to LNE00

Summary

- Installation activities could finally resumed as planned after the 3 months stop
- Restart of the source on-going
- Start of the ELENA ring HW tests mid July
- Circulating beam in ELENA ring from beginning of August
  - In alternance of access in the machine for TL installation
    - → priority to installation
  - Main goal is to identify showstopper for TL commissioning
  - Possibility to extract beam for Gbar
- Start of new transfer lines commissioning mid September