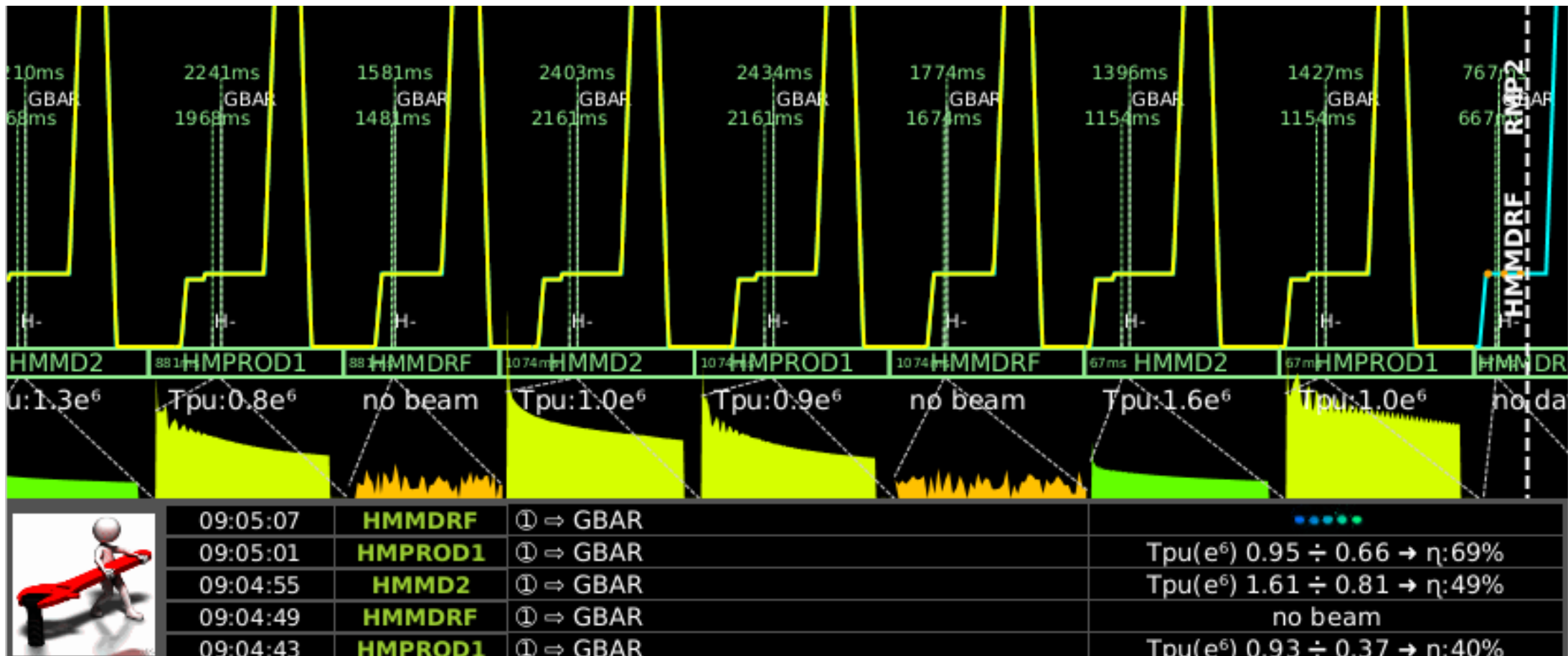
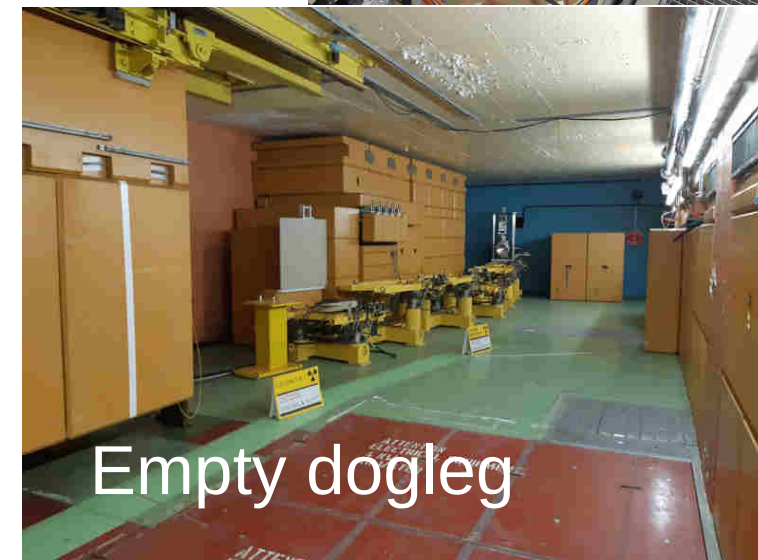


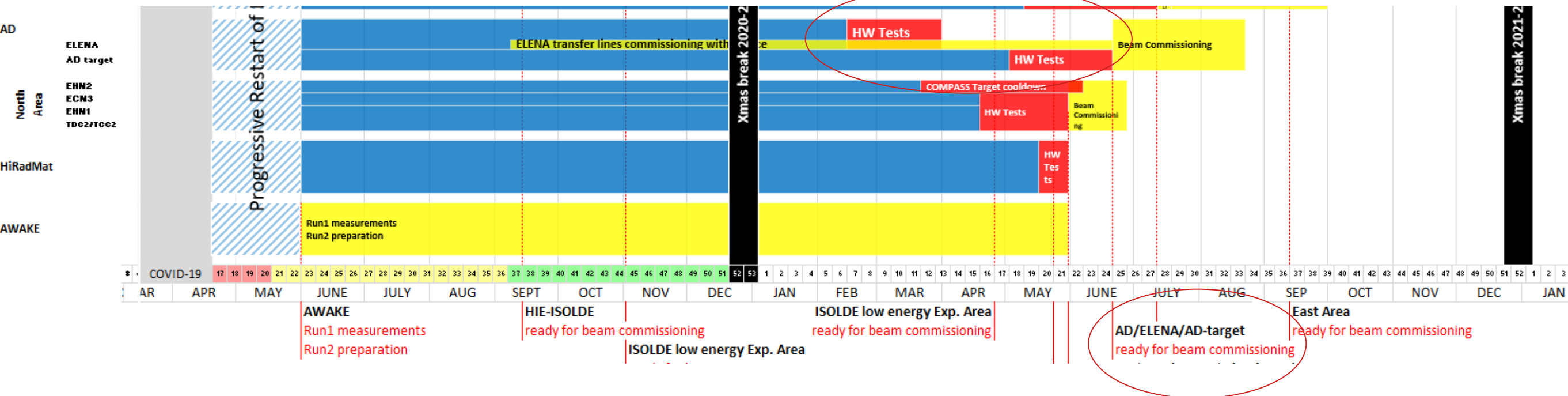
AD and ELENA beam commissioning in 2021

L. Ponce
for the AD-OP team

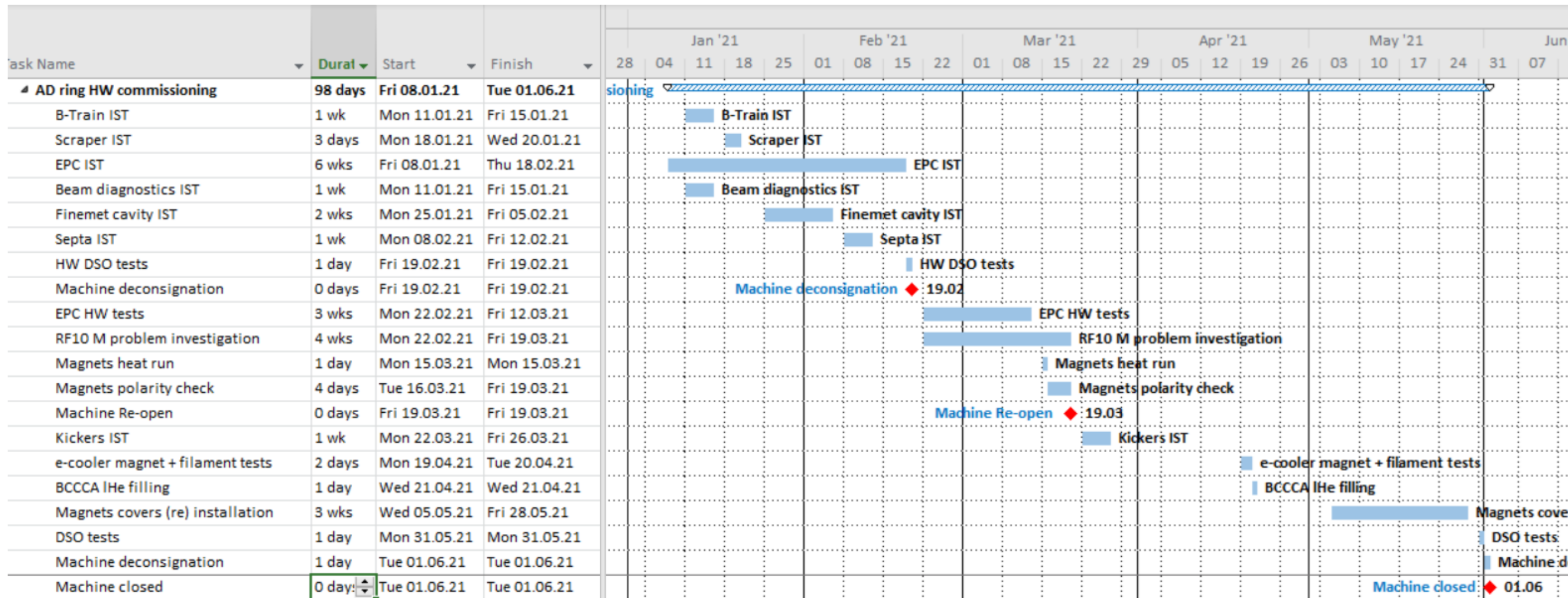


- o ELENA transfer line commissioning:
 - Completion of ion new transfer lines installation
 - ion source operation
 - Test of the profiles monitors with H- beam
 - o AD ring consolidation:
 - Magnets refurbishment, new finemet RF cavity, new LLRF,
 - o Full renovation of the AD target:
 - new target, new permanent quadrupoles, full re-alignment from Booster
- => rocky start-up of a chain of 2 synchrotrons:
Antiproton Decelerator Complex



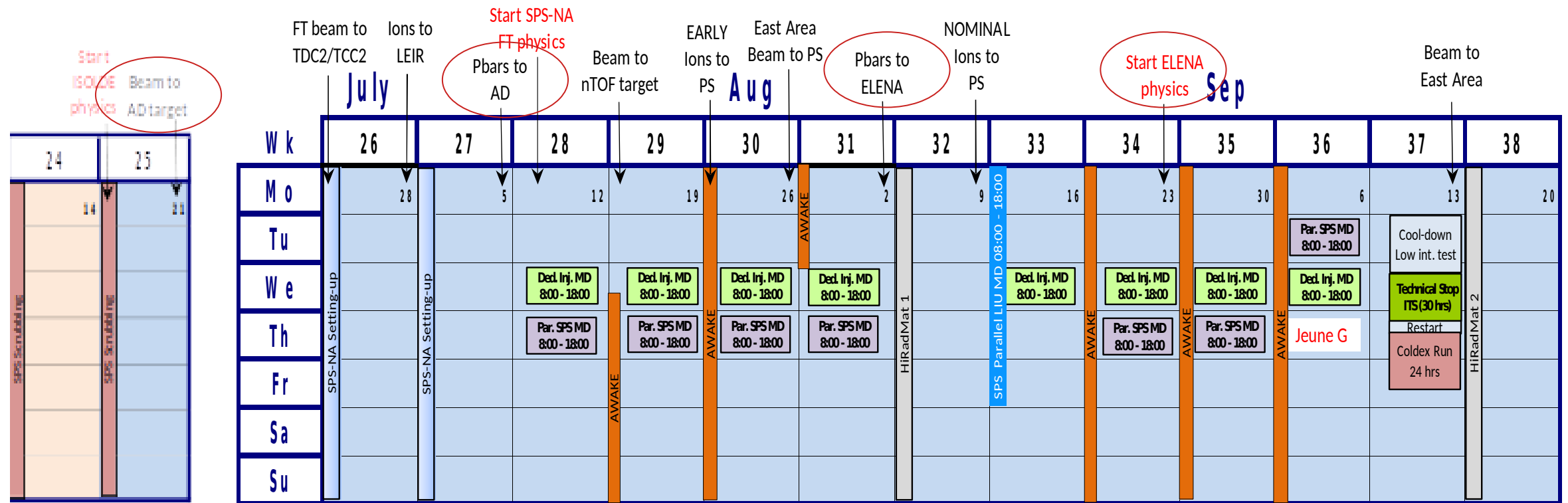


- HW test (AD ring in closed mode) – 4 weeks:
 - Power converters - 2 weeks
 - Rf cavity - 1 week
 - Kickers, instrumentation, etc... – 1 week
- AD target conditioning with beam + dogleg recommissioning – 2 weeks
- AD ring beam commissioning – 4 weeks
 - Stochastic cooling - 1 week
 - All RF (HL and LL) – 2 weeks
 - E-cooler + cycle optimization – 1 week
- ELENA ring + TL commissioning with pbar – 3 weeks



- HW tests starting mid February to be ready for beam 1st of June
 - Machine will be closed/opened/closed during the period
 - Critical path for the new ecooler collector

New 2021 Injectors schedule



- ELENA operation with Hminus beam from 11/1 till Wk 31 (3 weeks stops in Spring 2021 for profile monitors exchange in injection line)
- Wk 23: AD beam from PSB to PS, start AD beam set-up in the PS
- Wk 25: 21st June, Beam to AD target for new target area commissioning (2 weeks)
- Wk 27: 5 July, Antiprotons from AD target area to AD Ring, 4 weeks recommissioning
- Wk 31: Antiprotons beam to ELENA, start ELENA + TL recommissioning with pbars (3 weeks)
- Wk 34: 23rd August, Start ELENA physics
- Wk 46: Monday 15 Nov. at 06:00 Stop of all beams

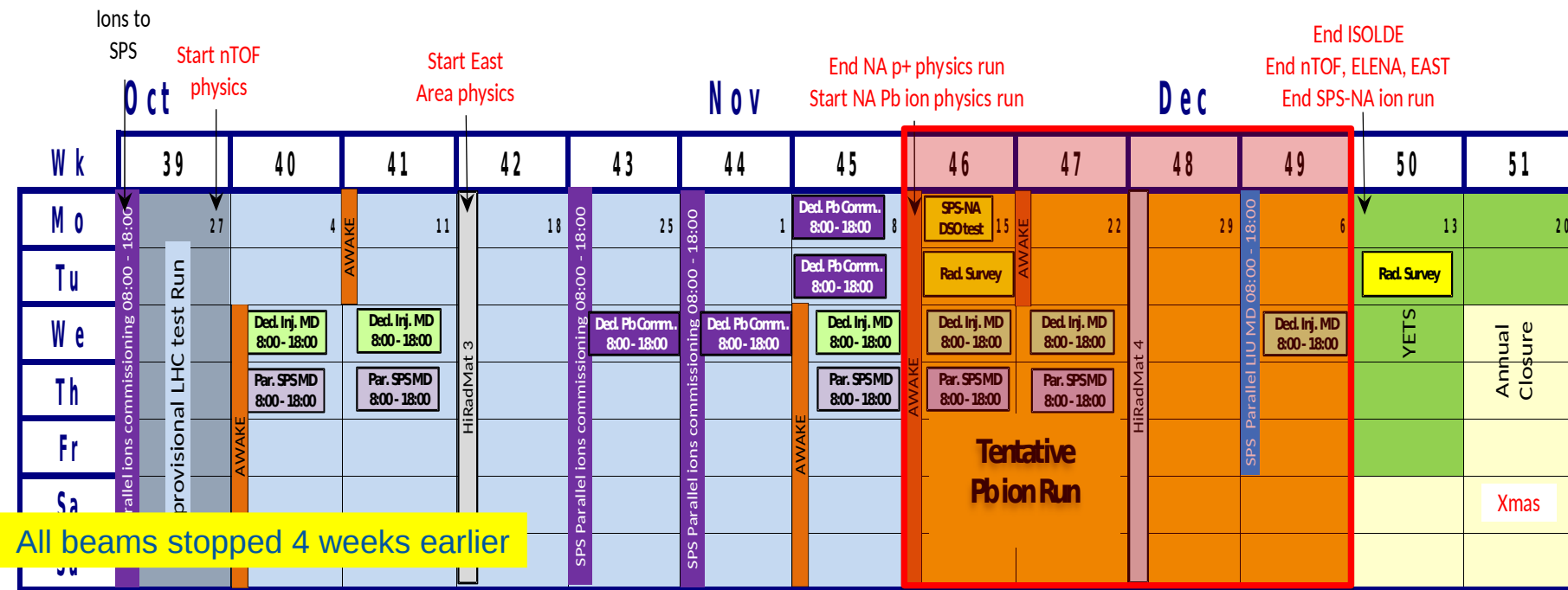
AD and ELENA beam commissioning over Summer period → experts availability issue ?



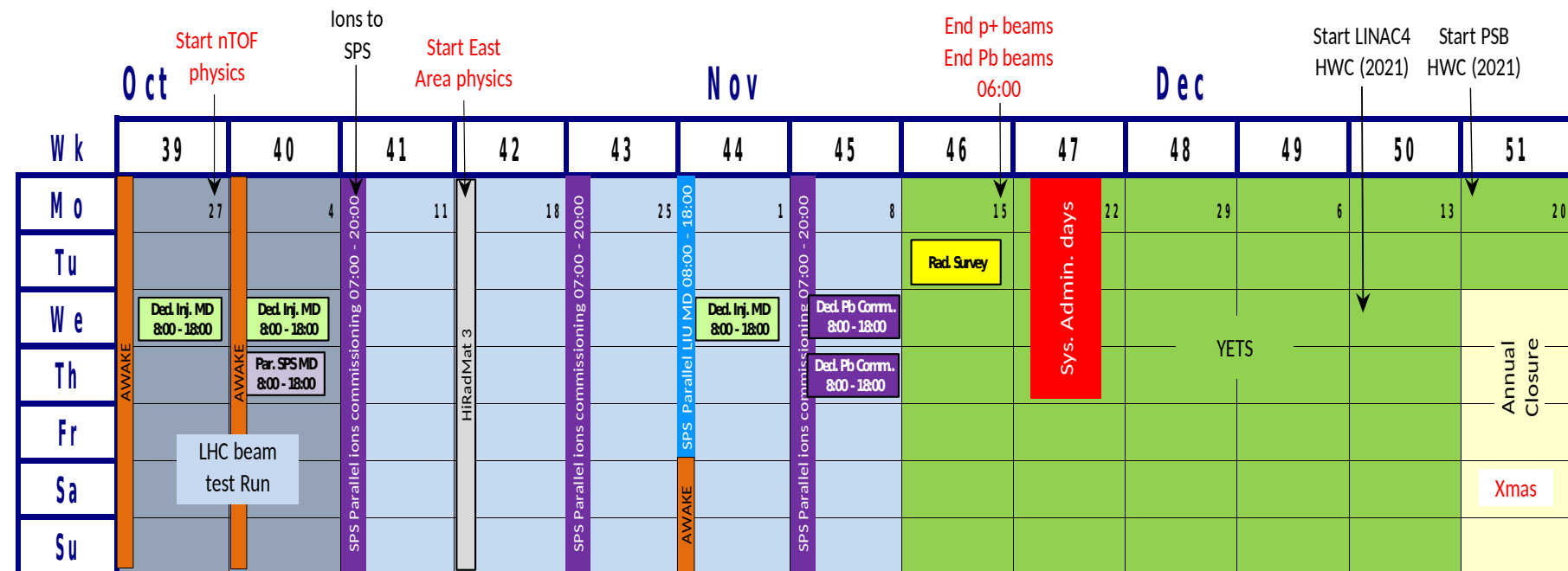
2021 Injectors schedule main change



2021 – Q4
Version 0.6



2021 – Q4
Version 0.8





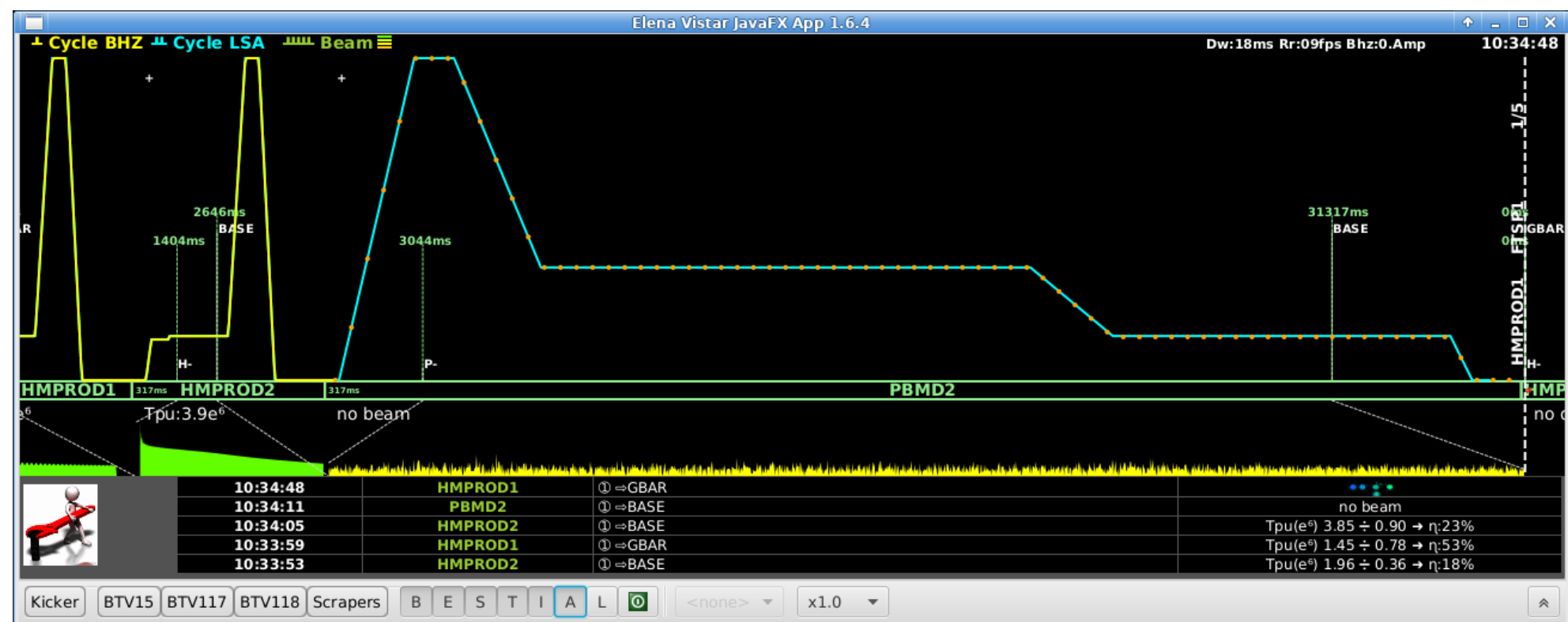
Present Physics accounting



Experimental facility	Start Physics	End Physics	Duration [days]*
ISOLDE	21.06.2021	15.11.2021	147
SPS North Area p ⁺	12.07.2021	15.11.2021	125
ELENA	23.08.2021	15.11.2021	98
nTOF	27.09.2021	15.11.2021	49
PS East Area	18.10.2021	15.11.2021	26
SPS North area Pb ions	-	-	0
AWAKE	-	-	51
HiRadMat	-	-	21

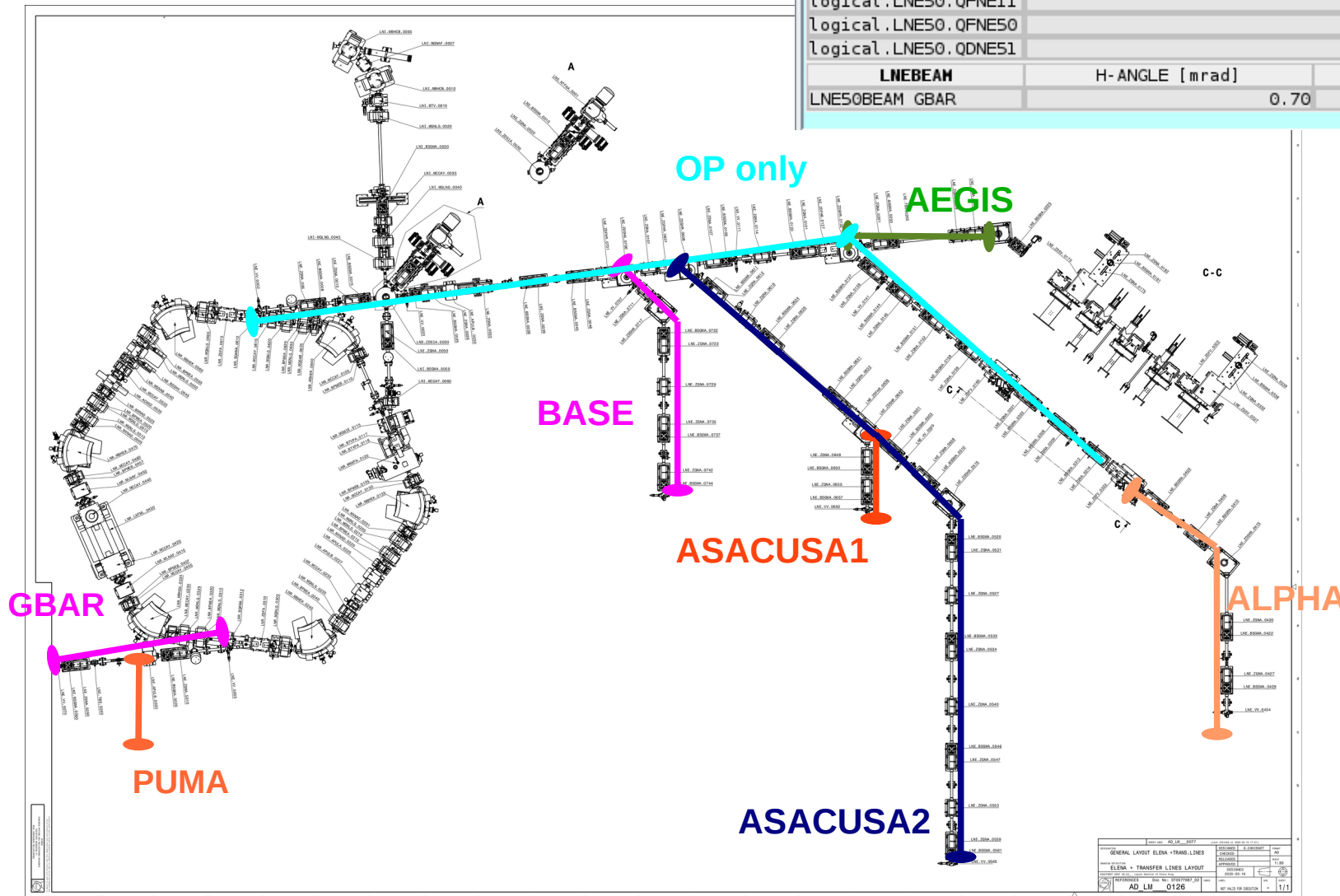
- MDs,TS, reduced duty cycles, etc. are not taken into account
- Changes with respect to version 0.6 in red

- A chain of decelerator to operate with the same team:
 - 1 machine supervisor for the week + 1 operator during working hours in ACR
 - PS operators reduced at 2 instead of 3 for nights and week-end
- ELENA will serve up to 4 different users per cycle:
 - no more 8 hours shift period dedicated to 1 user
 - If not more than 4 users, can get beam 24/7
 - You will share the same settings
- ELENA cycle and AD will need Machine development time to be optimized
 - Request to have 1 shift (8 hours) per week for MD in 2021
 - Could also insert Hminus cycle?



- Setting-up of the shared beam line by OP, each users can get control of the last “private” elements:
 - Control of the IN/OUT profile monitors + end line steering
 - Can provide knobs to adjust offset and angle on agreed hand-over point
 - Tested with Gbar and ALPHA

MULTIPOLE	Strength	Vd		
logical.LNE50.DHZE10	-1.4146E-3	-142.90656		
logical.LNE50.DVTE10	-2.9031E-3	-293.28202		
logical.LNE50.DHZE50	764.46E-6	77.22851		
logical.LNE50.DVTE50	4.1018E-3	414.38267		
MULTIPOLE	Strength	Vd		
logical.LNE50.QDNE10	-10.182E0	838.82115		
logical.LNE50.QFNE11	11.975E0	986.51015		
logical.LNE50.QFNE50	14.37E0	1183.85173		
logical.LNE50.QDNE51	-15.39E0	1267.88296		
LNEBEAM	H- ANGLE [mrad]	H-OFFSET [mm]	V- ANGLE-mrad	V-OFFSET-mm
LNE50BEAM GBAR	0.70	-3.00	3.60	-11.00



- BRS running on the TN
 - Service
 - Application
- Manage the ELENA sequencing
 - Schedule (Add or Remove cycle(s))
 - Prioritize cycles (production vs spare)
 - Cycles With or Without beam
 - Beam Destinations
 - Pauses
 - Status
- Interface between the Operators and the ELENA Central Timing

The screenshot displays the 'ADE & ELENA Beam Request Application' interface. It features two main windows. The top window shows 'Production Cycles' and 'Spare Cycles' lists with buttons for 'Insert', 'Remove', 'Move Up', and 'Move Down'. The bottom window provides detailed controls for a specific cycle (HMPROD2), including 'Cycle[HMPROD2]Infos', 'Cycle[HMPROD2]Pause(s)', 'Cycle[HMPROD2]Controls' (with 'WITH BEAM' and 'WITHOUT BEAM' options), 'Cycle[HMPROD2]Destination(s)' (with radio buttons for 'Round Robin Destination' and 'Force Destination(s)'), and 'Global Controls' (with 'SET ALL CYCLES WITH BEAM', 'SET ALL CYCLES WITHOUT BEAM', 'CYCLING', 'NOT CYCLING', 'ABORT Cycle', and 'RESUME Cycle' buttons). A 'Status Infos' section at the bottom shows 'Last Request' details and 'Server Heart Beat' and 'CT Heart Beat' status.

Courtesy of Sergio Pasinelli

- Profile monitors 'interface in the transfer lines
 - Calculate delay for each bunch destination
- Alpha
 - Warning timing 60[s] before ELENA Pbars extraction. Only if Alpha destination is selected in ELENA.
 - Cycle by cycle Alpha destination abort.
- All experiments
 - Cycle counting per experiment
 - ...

- Cycle by cycle, depending on the destination's requests, the position of the bunch in the bunch train can be different for experiment (Hardware limit on the fast delector).

Destinations	Possible bunch position in the train
Aegis	1
Atrap1	1 or 2
Atrap2	1 or 2 or 3
Alpha	1 or 2 or 3 or 4
Asacusa1	1 or 2 or 3 or 4
Asacusa2	1 or 2 or 3 or 4
Base	1 or 2 or 3 or 4
Gbar	1
Puma	1 or 2

- Abort beam destination must be set at least 1.2[s] before the start of the ELENA cycle.
- The warning timing 60[s] before ELENA Pbars extraction, must be set before the start of the ADE cycle and enabled/disabled at least 1.2[s] before the warning timing.

- Now
 - Destinations selection done by the control room
 - Validation of the Alpha needs with the full Pbar production path (PS-ADE-ELENA)
- During the year
 - Remote destinations selection thru a REST service
 - If validation OK then deploy Alpha needs

The screenshot displays the 'ADE & ELENA Beam Request Application' interface. It features several sections for controlling beam parameters and destinations:

- Cycle[HMPROD1]Infos:** Shows cycle details like 'c HMPROD1 v: 1606405467 h: 4 p: HMINUS m: LSOURCE'.
- Cycle[HMPROD1]Pause(s):** Includes control buttons for 'Activate' and 'Deactivate' for FT1 and FT4.
- Cycle[HMPROD1]Controls:** Features a 'BEAM' control with 'WITH BEAM' and 'WITHOUT BEAM' options.
- Cycle[HMPROD1]Destination(s):** Offers radio buttons for 'Round Robin Destination' and 'Force Destination(s)', with buttons for various destinations like AEGIS, ALPHA, ASACUS..., ATRAP1, ATRAP2, BASE, and GBAR.
- Global Controls:** Contains 'BEAM' (SET ALL CYCLES WITH BEAM / WITHOUT BEAM), 'RUN' (CYCLING / NOT CYCLING), and 'ABORT / RESUME' (ABORT Cycle / RESUME Cycle) buttons.
- Status Infos:**
 - Last Request:** Time: 20210119 10:58:08, User: elenaop, Comp: cwo-193-ad1.cern.ch, On: Cycle Control.
 - Server Heart Beat:** Time: 20210119 10:58:13, User: copera, Comp: cs-ccr-sta1.cern.ch.
 - CT Heart Beat (20210119 10:58:12):** USER: HMPROD2, BPNM: 5, DURN: 5, ELTAG: FTSP3, PARTY: HMINUS, SPCON: N/A, CYSTAT: INJRMP, HARMN: H1, DEST1: BASE, DEST2: N/A, DEST3: N/A, DEST4: N/A.

A status bar at the bottom shows: 10:58:14 - AXR.BEAMREQ5-CT.FINISHED => INFO Beam requested locally

- **Sequence of the restart of the AD complex unusual due to delays in AD target consolidation:**
 - AD ring will be ready to take antiprotons before they can be provided by AD target
 - 1 more machine to start with pbars
 - This gives a long beam commissioning period extending over summer period
 - Very short Physics run stopping mid November
- **Pbars operation mode with ELENA will be different:**
 - 4 users per cycle sharing the settings
 - We plan to provide remote beam request control allowing full 24/7 control by the users. If not OK, we will have to discuss beam time sharing and operation team will change the beam request “manually”

2021 will be a very short Physics Run, we will do our best to provide good quality pbars beam as soon as possible