

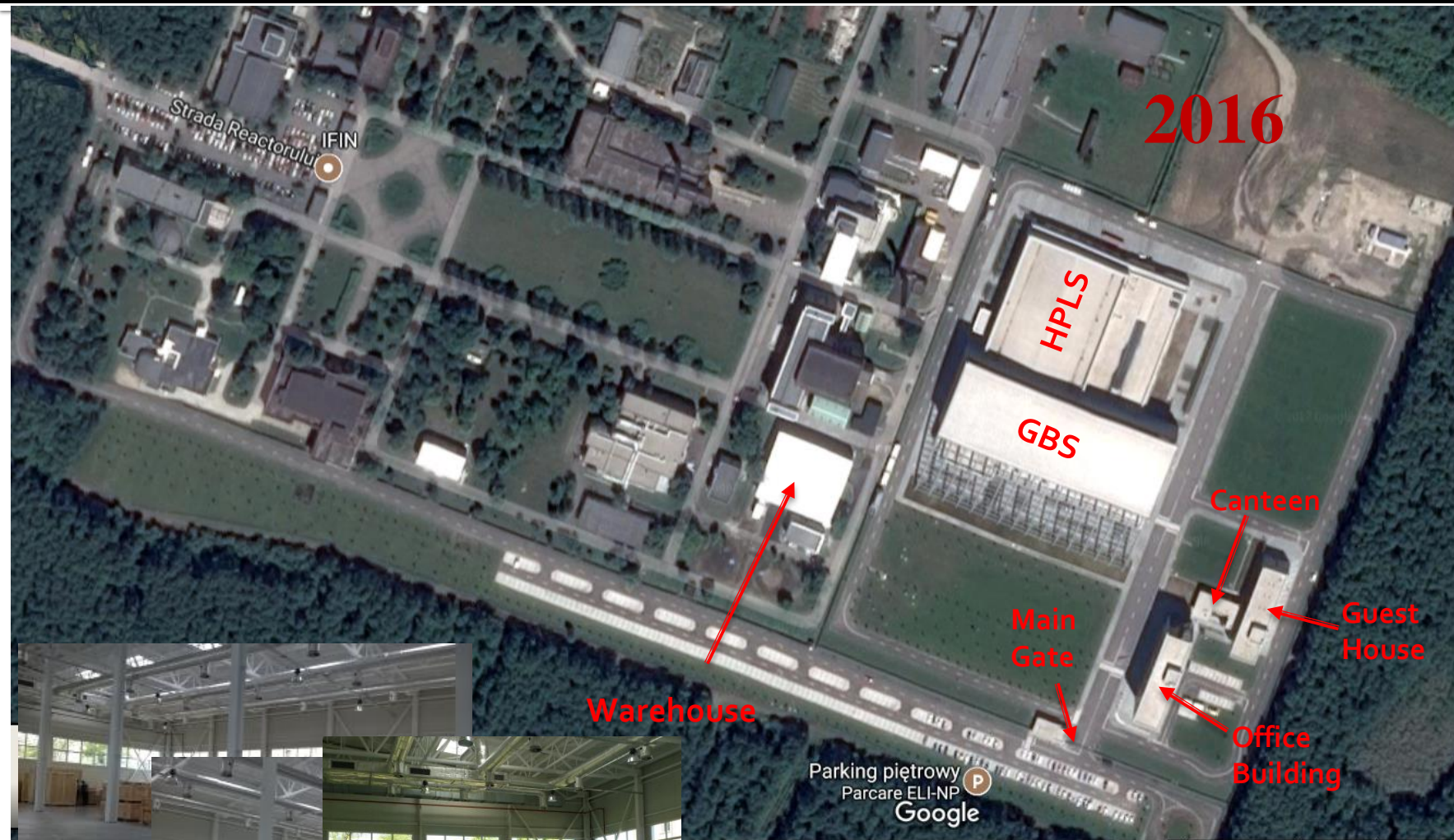


CURRENT STATUS OF RF LINAC FOR GBS-ELI-NP

November, 2017
NSRC SOLARIS, Krakow, Poland

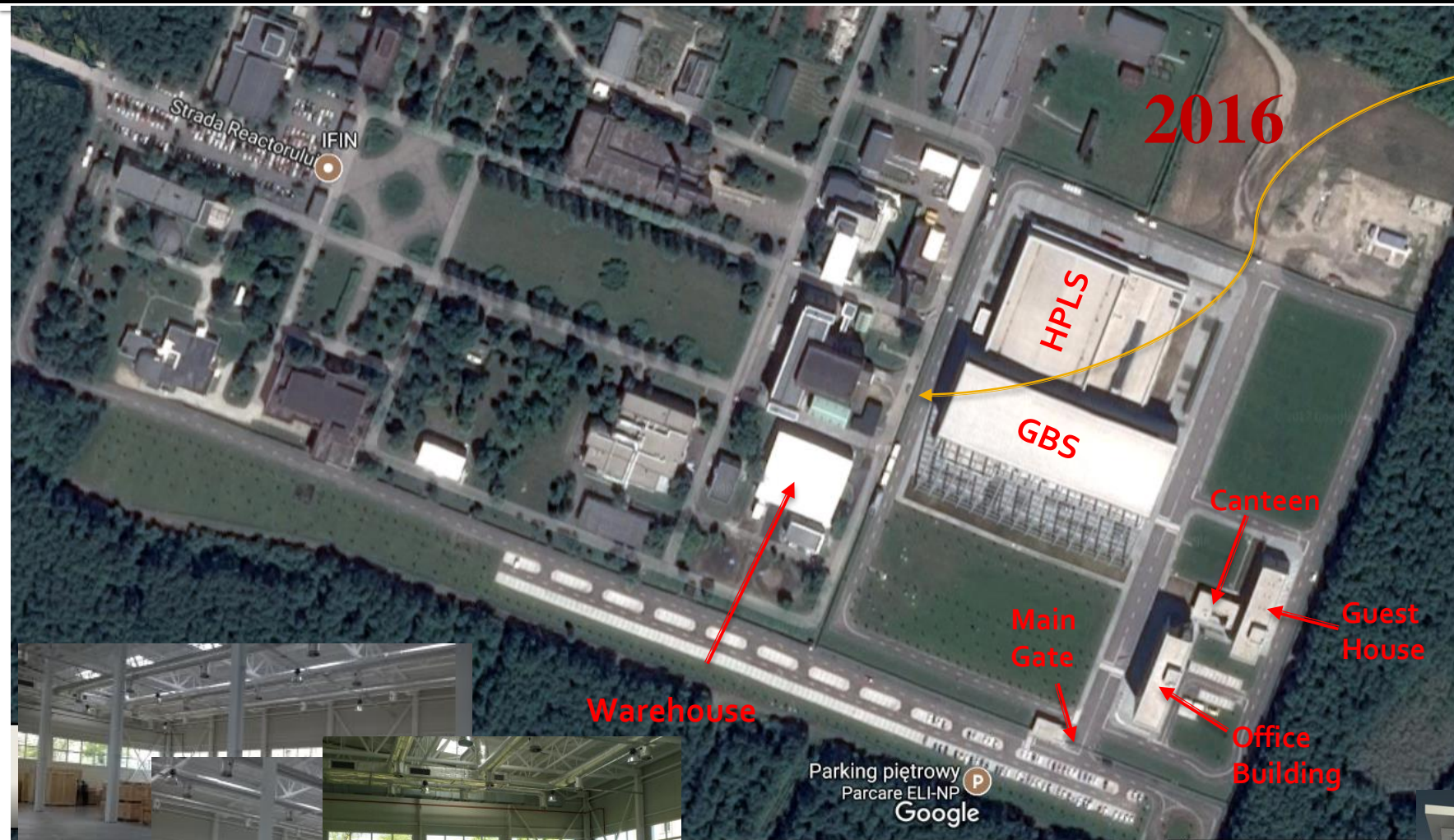
PIOTR.TRACZ@ELI-NP.RO
FOR THE ELI-NP TEAM
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ELI-NP Building



43m x 37m

ELI-NP Building



1. Extension of GBS building



2. Plan for new building

with auditorium for 350 people, 4 small conference rooms, room for virtual reality training, area for expositions.



GBS Project



Deadline for the eli-np building – March 2015
Extended by May 2016 – COMPLETED.

ART. 11 DELIVERY

11.1 The Supplier undertakes to deliver the contracted Components/GBS and Products and to provide the Services as per the Delivery Schedule set forth in Annex 3 to this Contract. The Parties agree that Components/GBS delivery and commissioning shall be performed by the Supplier on stages, as follows:

a) **Stage I:** delivery on the ELI-NP site and testing of the system components (a photogun with the related laser, an interaction laser, a linear electron accelerator and the corresponding command and control systems) corresponding to at least 1 MeV gamma beam energy which bears the technical capability for being expandable to the complete GBS which will be commissioned in Stage IV. The delivery deadline for the first Stage will be not later than 31st October 2015.

COMPLETED, on time in Oct. 2015

concluded with reception of components at provider's locations

b) **Stage II:** delivery on the ELI-NP site and testing of the interaction system between the laser photon beam and the intermediate energy electron beam, as well as the other equipment corresponding to a complete system able to produce a gamma beam of at least 3MeV energy. The delivery deadline for Stage II shall not exceed 31st August 2016.

Addendum to the contract
extending it by 31st Oct. 2017
(delay...)

c) **Stage III:** installation, assembling on the ELI-NP site and commissioning of the GBS with the intermediate parameters in Table 2 of the Technical Specification. This intermediate system must bear the technical capability for being expandable in Stage IV (complete GBS). The system delivered in Stage III will be functional and able to deliver a gamma beam of at least 3MeV energy, independently from the high-energy beam which will be delivered at the end of Stage IV. The delivery deadline for stage III shall not exceed 28th February 2017.

Extended by May 2018

Stage IV of the contract – the period from the signing of the Acceptance Certificate whereby confirming the completion of the delivery subject to Stage III and the date of delivery, installation, assembling and commissioning of the complete GBS to the parameters in the technical proposal which is in accordance with Table 1 of the Technical Specification (not later than 54 months after the Contract is signed). In addition to the gamma beam produced after the first acceleration section (Stage III), GBS will produce a gamma beam produced after the second interaction point located after the second section of the electron accelerator. Both gamma beams shall reach the parameters listed in Table 1. Until the date of completion of Stage IV the complete GBS will be commissioned on the ELI-NP site;

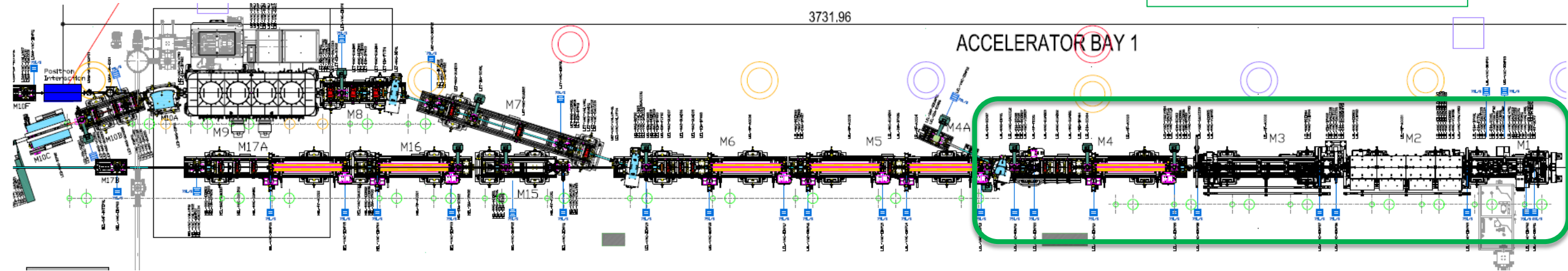
Extended by June 2019

RF Linac



Low Energy Line ($E_e \approx 350\text{MeV} \rightarrow E_\gamma \approx 3.5\text{MeV}$)

($E_e \approx 160\text{MeV} \rightarrow E_\gamma \approx 1\text{MeV}$)



3731.96

ACCELERATOR BAY 1

STAGE II

STAGE I

Addendum to the Contract extension by 31st Oct 2017

Still not concluded!

COMPLETED on time.
All components at ELI-NP site, ready for linac installation.

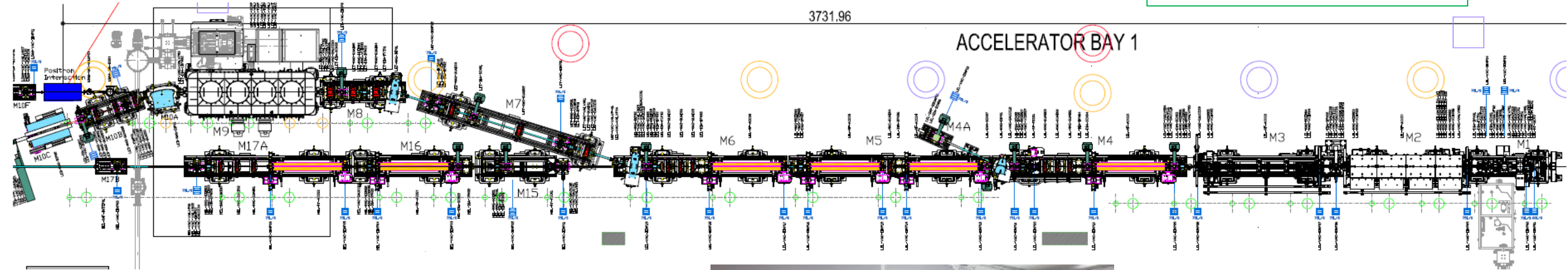
Laser beam recirculator is still not ready to be shipped to ELI-NP! It is still being assembled at manufacturer site ALSYOM. Vacuum tests of chamber were successfully performed. Optical elements for 16 passages are installed. The accelerator components' tests have not been done, yet!

RF Linac

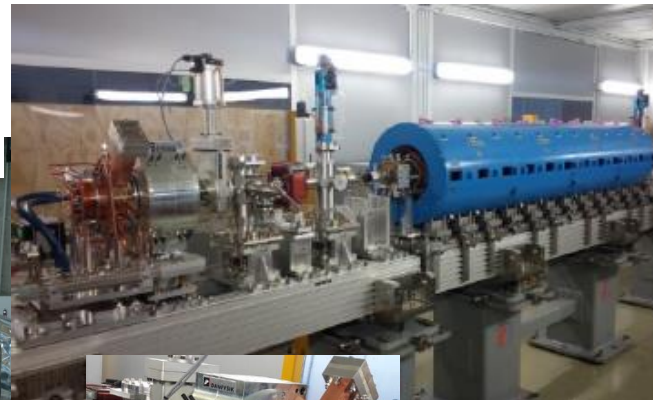
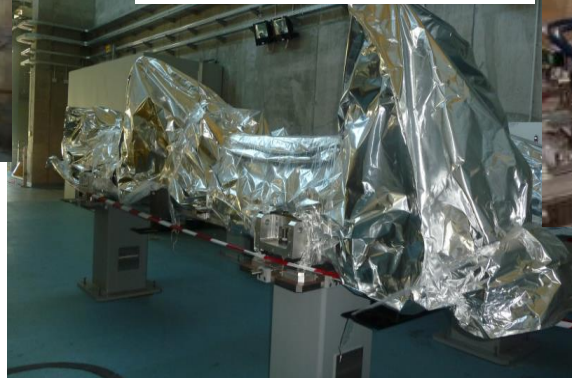


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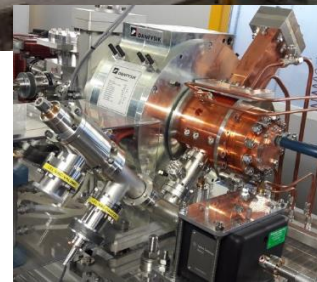


Linac Modules



STAGE II

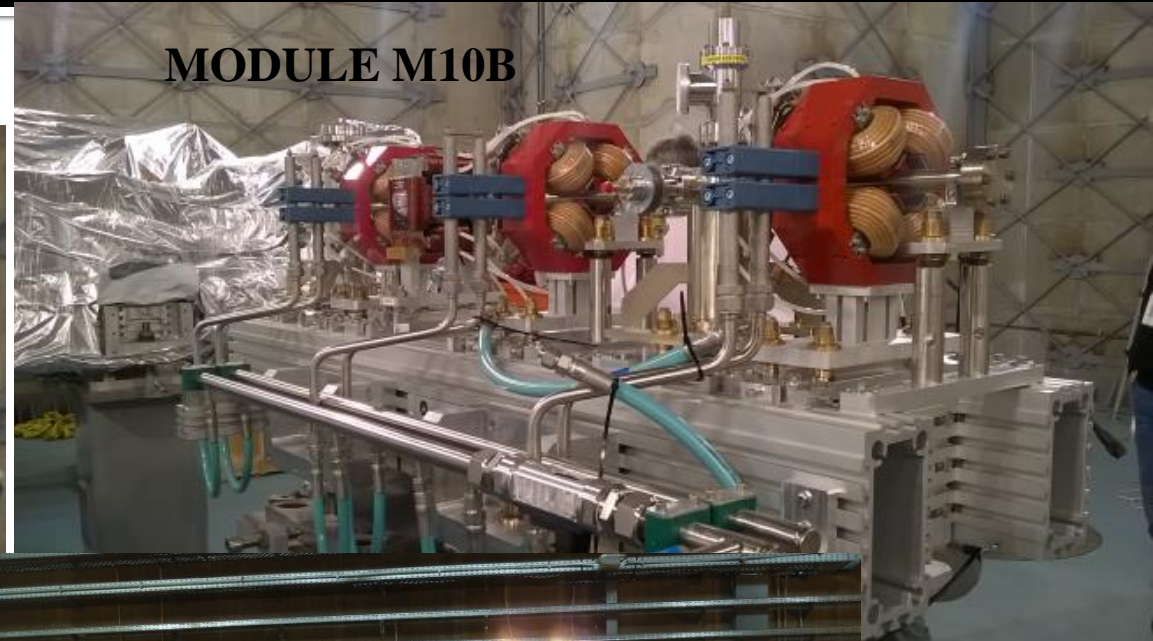
- a) RF Gun Module
- b) 2x Modules with S-band
- c) 3x Modules with C-band
- d) Optical Laser Beam Recirculator
- e) Transfer Line
(5x other modules with devices like quads, bends, diagnostics and other equipment/devices)



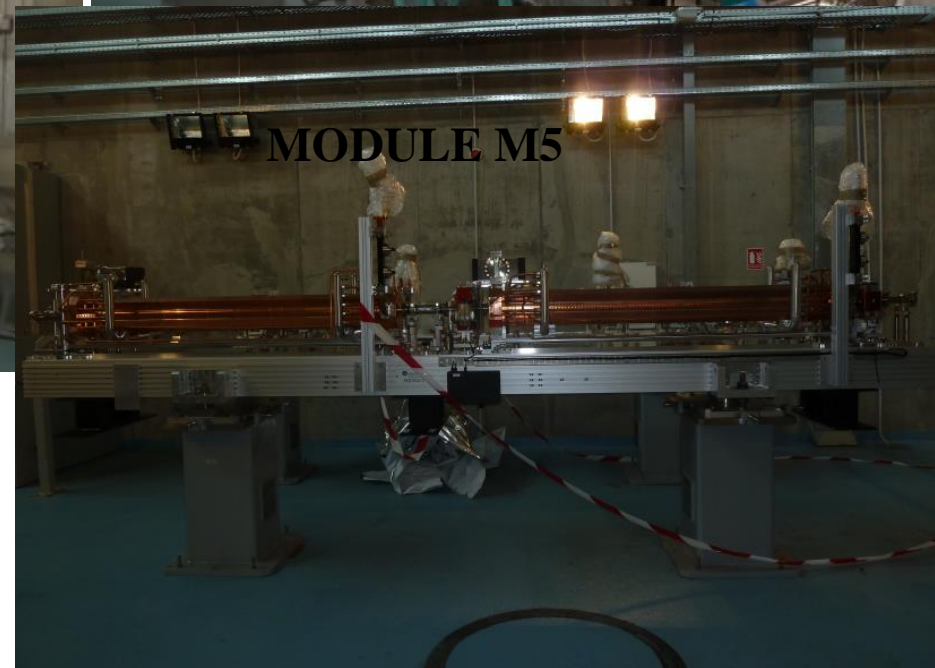
Linac Modules



MODULE M6



MODULE M10B



MODULE M5

Delivery of Linac Components

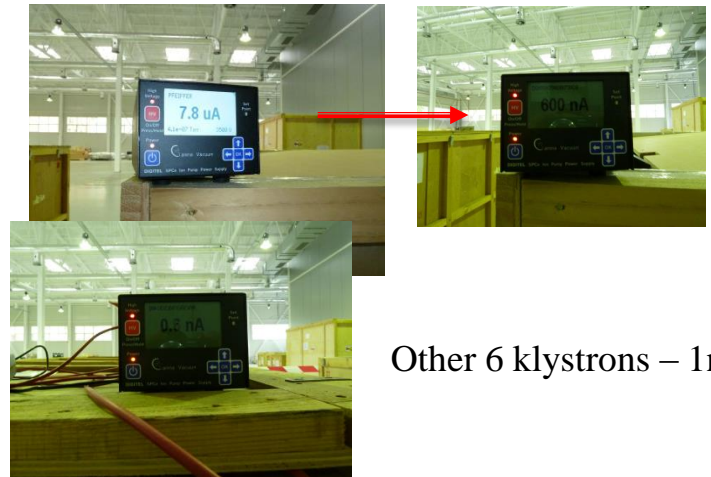


April 2017 –

- a) 3x modules M1-M3 (RF Gun, 2x S-band acc) – INFN
- b) Complete Waveguide system: waveguides (both S- and C-band), ion vacuum pumps, cooper gaskets etc., waveguide supports – RI
- c) Modulators MSB1-MSB3 and MCB1-MCB4 (complete units) – ScandiNova
- d) Hardware for controls – both for stage I and stage II – Cosylab
- e) Clean rooms (for lasers for photocathode and IPs) – Euroflux



LEL-RF-MS03:KLY 4.1×10^{-7} Torr (7.8 μ A), next day 600nA



RF gun, two S-band acc, and one C-band (prototype) were conditioned in high power in RI/Bonn, with klystrons MSB1 and MCB1.

Other C-band acc were tested in low power at INFN, Frascati and will be conditioned in high power in ELI-NP.

Other 6 klystrons – 1nA

Delivery of Linac Components



May, June 2017 –

- a) Modules M7 and M8, racks and power supplies – STFC
- b) Modules M4, M4A, M6, M10D – STFC
- c) Modules M5, M10A, M10B, M10F – STFC



LEL-RF-MS03:KLY - 840 nA

other klystrons - ~1nA

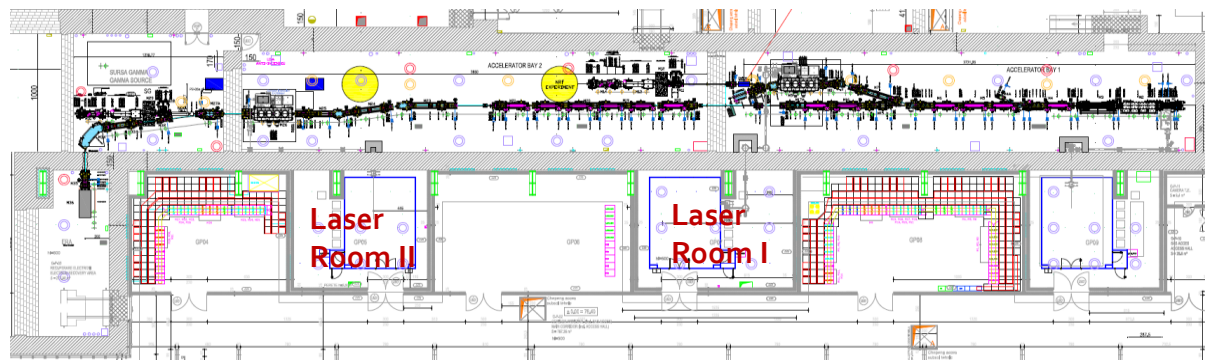
ScandiNova visited eli-np to check the klystron with another power supply and new HV cable. Nothing changed. Tests with increased power off period of ion pump power supply, and observing start up current after power off. Confirmation of the leak.

The results were sent to Toshiba/Japan for evaluation.

Finally the klystron was sent to Toshiba.

„small leak” – currently it is being repaired; will be shipped back to Magurele/Romania in March 2018.

Decision to mount both lasers for IPs in one room => tight space.



Delivery of Linac Components



July 2017

Movement of most linac components from warehouse to eli-np building.



May 2017

Amplitude Technologies installed clean rooms where the lasers for photo-cathode and IPs were installed.



June 2017

Amplitude Technologies installed the components of the photocathode laser system on the optical tables in the clean room. LAL/CNRS installed the laser beam transport line (LBTL1). MENLO Systems installed the electronics for synchronization system in the clean room for photo-cathode laser.

Delivery of Linac Components

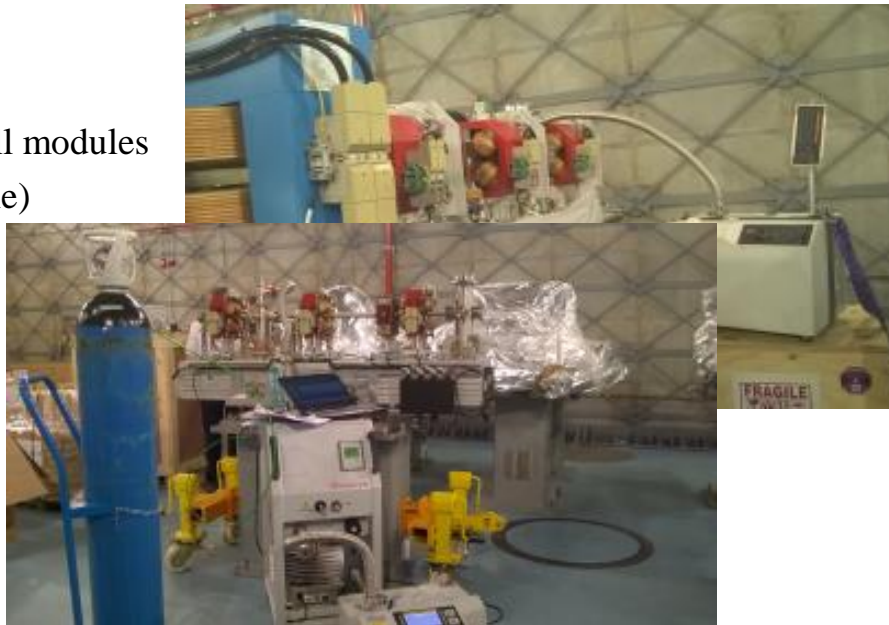


October 2017

- a) Installation of network of reference points in accelerator tunnels and realization of blue-lining, installation of supports for waveguides. (RI)
- b) Delivery of modules (M5, M10A, M10B, M10F, M15, M17B) and racks. (STFC)
- c) Delivery and installation of the optical tables and Ytterbium laser, $10mJ @ 100Hz @ 515nm$ for the low energy Interaction Point IP1. (ACP Pessac)
- d) Delivery and installation of the laser beam transport line (LBTL2) of the low energy interaction point laser. (CNRS/LAL Orsay)

November 2017

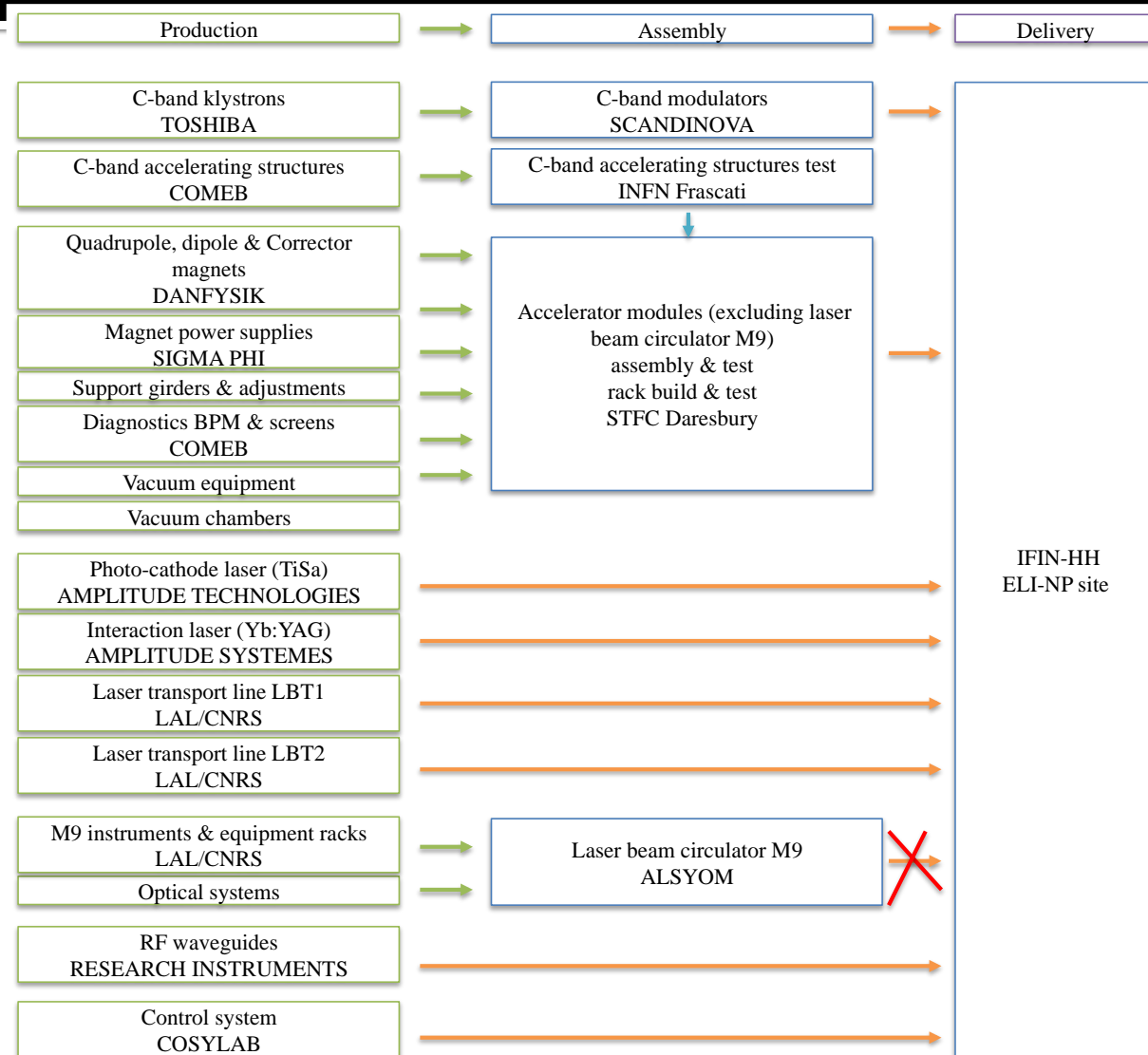
Vacuum test of all modules
(Low Energy Line)



Damaged vacuum chamber at bending magnet...

...also bellow at M10A

Conclusions



Schematic diagram of components production and delivery for Stage II.

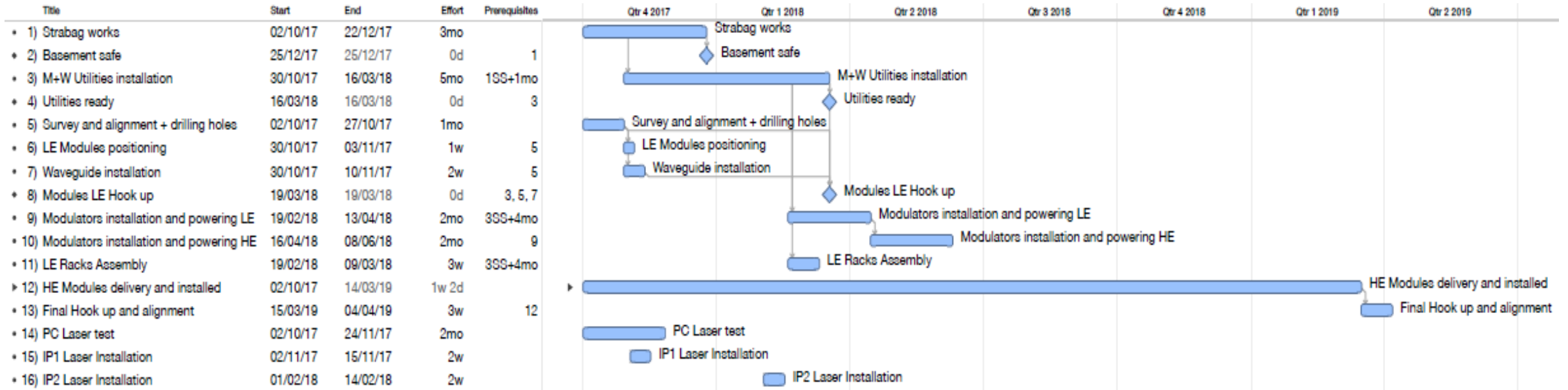
Progress on next stages components

- Modulators for all modules (LEL, HEL) are ready for installation.
- All diagnostics for electron beam is manufactured and ready for installation.
- C-band accelerating structures are under assembling now; all cups are produced and ready for brazing.
- All magnets, vacuum pumps, and all girders for modules are ready.
- Diagnostics for gamma beam is under assembly (collimator) and under tests (system of detectors) – at INFN Ferrara, Italy. Mechanical structure is ready, located at INFN, Ferrara.

Time schedule



Time schedule



**Thank You for Your
Attention**

www.eli-np.ro

