



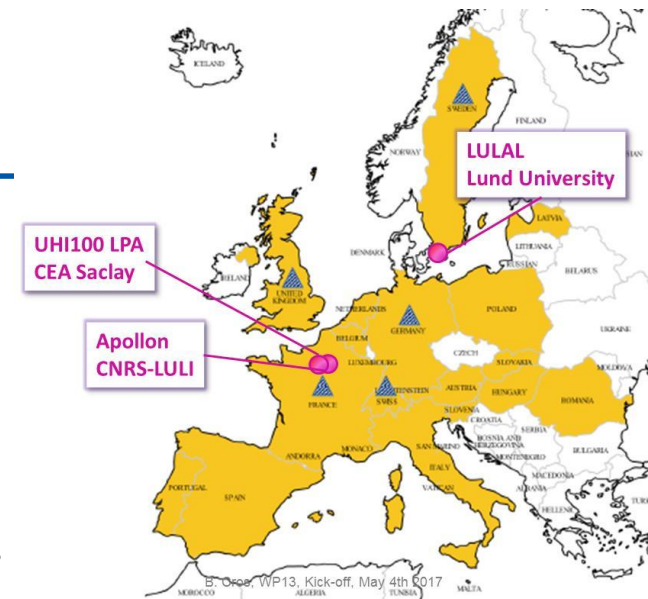
WP13: Access to Plasma Beam testing facilities

RTU / May 24th 2018 / 1st Yearly meeting

Brigitte CROS / CNRS - LPGP

Overview

- 3 facilities offering TA in WP13:
 - LULAL (Lund University)
 - UHI100 LPA (CEA LIDYL)
 - APOLLON MUST-LPA (CNRS LULI)
- ARIES TA advertised at several meetings
 - IPAC2017 Copenhagen
 - EAAC2017, Elba
 - Eupraxia, collaboration week
 - Journées accélérateurs 2017
- Status of WP13 access
 - Continuous submission for UHI100 LPA and LULAL
 - 1 project performed at UHI100 LPA
 - Discussion underway for LULAL
 - Proposals welcome for APOLLON



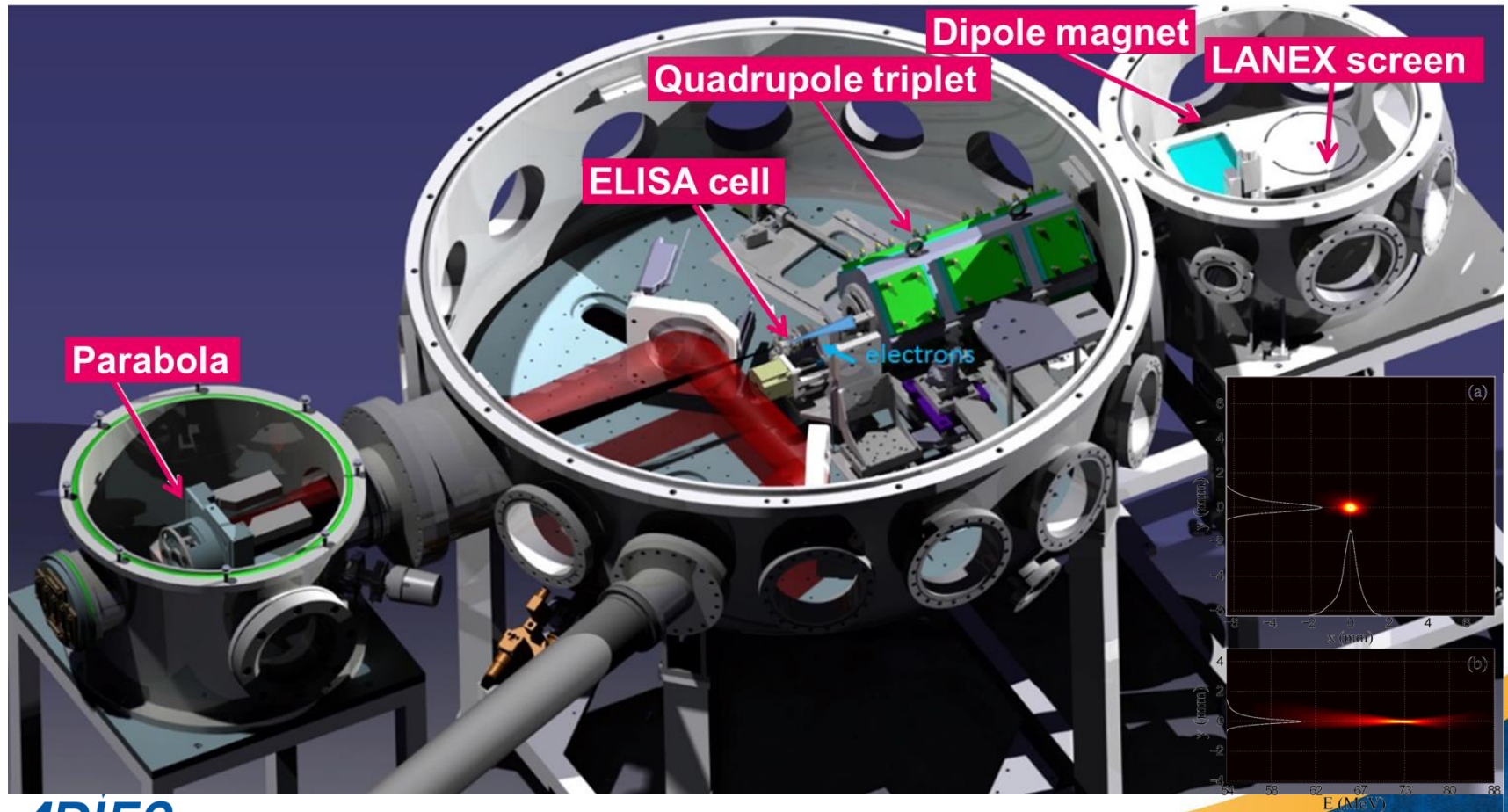
UHI100 Facility : electron bunch acceleration and transport

- **Currently in operation, CEA LIDYL**
- Total of 4 ARIES projects planned
- 1 done
- For ARIES users, access to
 - **UHI100 experimental area** devoted to electron acceleration
 - Laser plasma **electron beamline** equipped with state-of-the-art instrumentation
 - **Electron bunches** (50-200 MeV)
- Opportunity to test concepts or equipment before experiments with APOLLON facility
- Scientific contact: Sandrine Dobosz-Dufrénoy,
sandrine.dobosz@cea.fr



Set-up with magnetic line at UHI100

- Electron bunch imaged 1m away from the plasma source
- Other configurations are possible



1st campaign at UHI100 15 Jan- 9 Feb 2018

- Emittance characterisation of laser driven positron beams for injection in conventional accelerators (PI Gianluca Sarri, QUB)

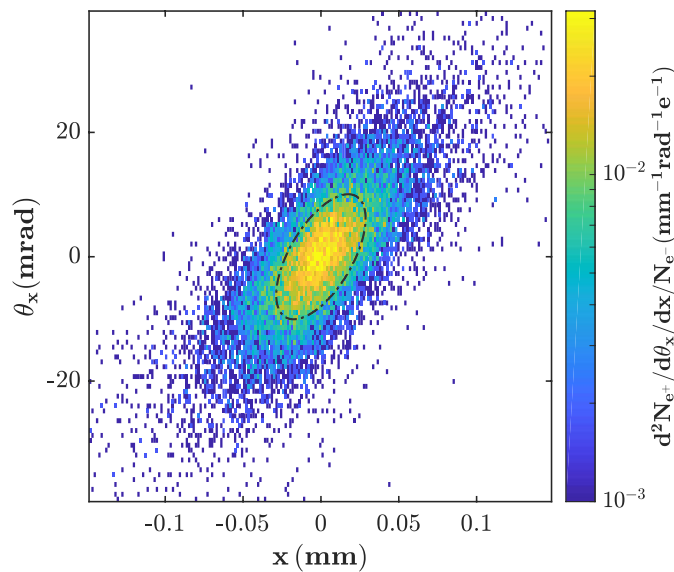
- **Context:**

Growing interest in compact accelerators of positrons, particularly towards future electron-positron colliders

Positrons produced using laser-driven electrons could be an alternative source for a compact injector in further acceleration stages.

- **Objective:**

Characterisation of positron beam quality by measuring its emittance

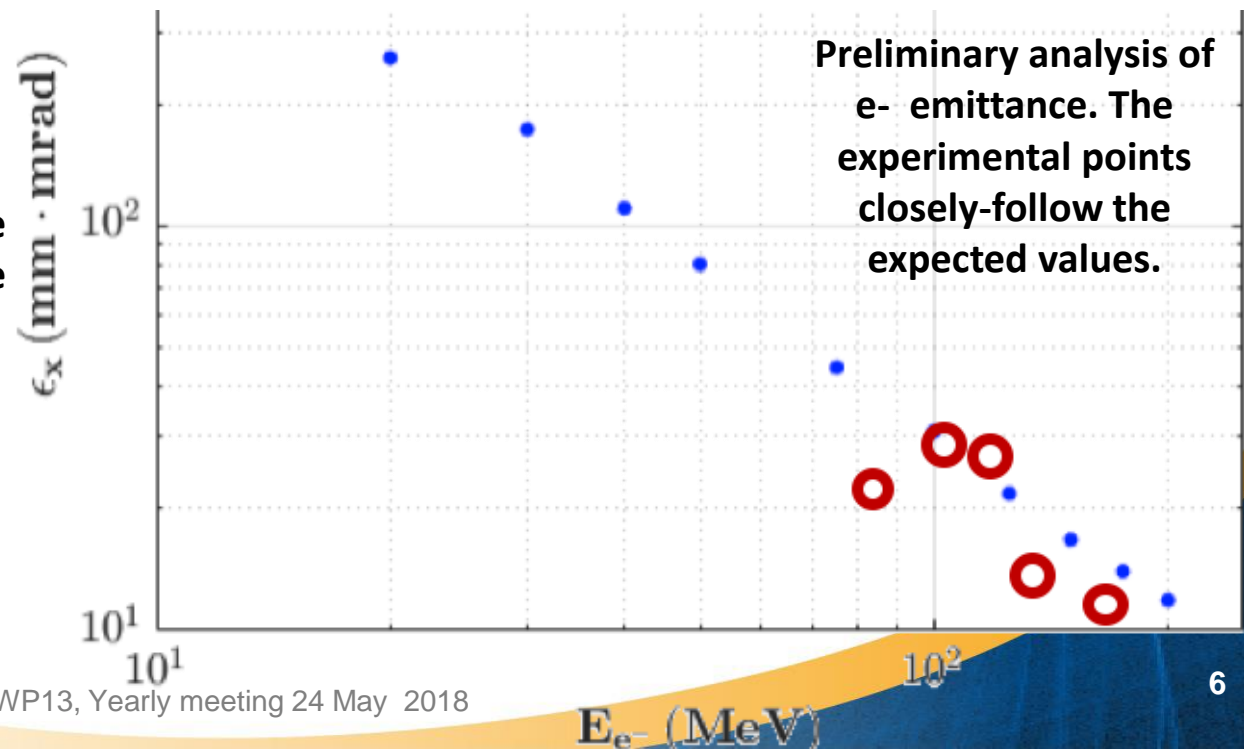
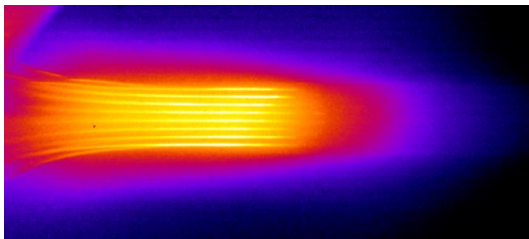


Simulated phase-space of the positrons generated by a laser-driven electron beam inside a high-Z converter

Main achievements

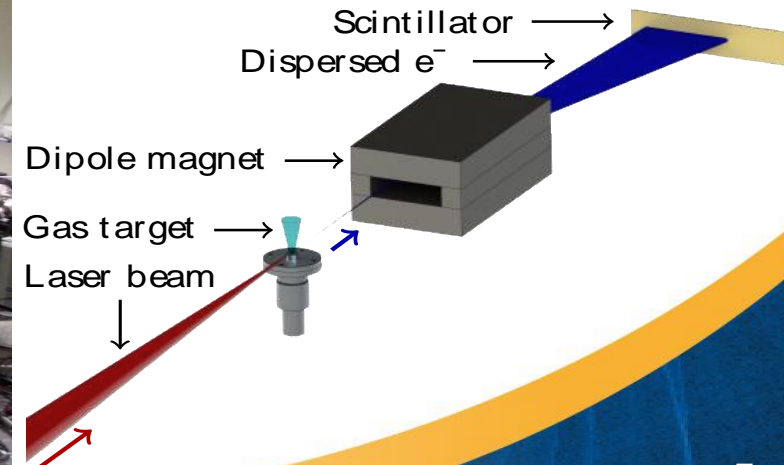
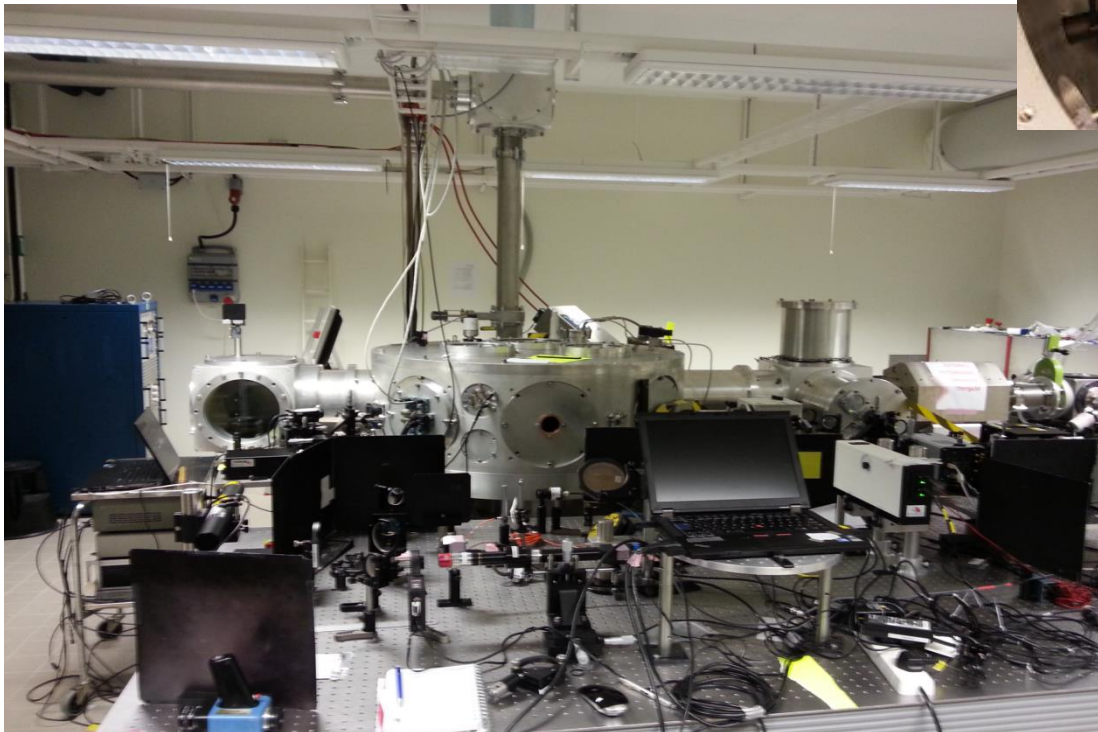
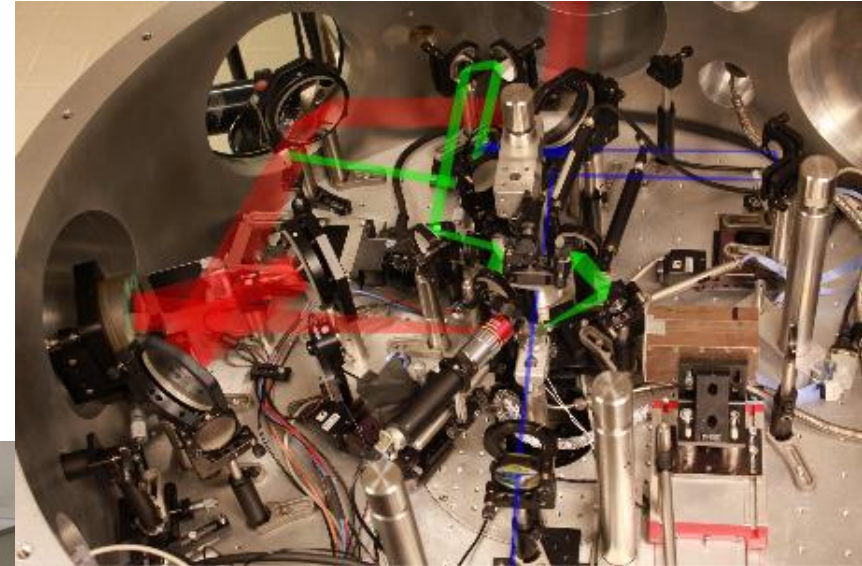
- A stable laser-driven electron beam with energy up to 250MeV, a few pC
- An electron-positron beam generated via quantum cascade inside a high-Z converter.
- Due to the low charge, the positron emittance couldn't be directly characterised.
- The emittance of the positron beam indirectly characterised by measuring the emittance of the electron beam, by 1D pepper-pot method.

1D Pepper-pot measurement of the emittance of the electrons after the converter



LULAL main features

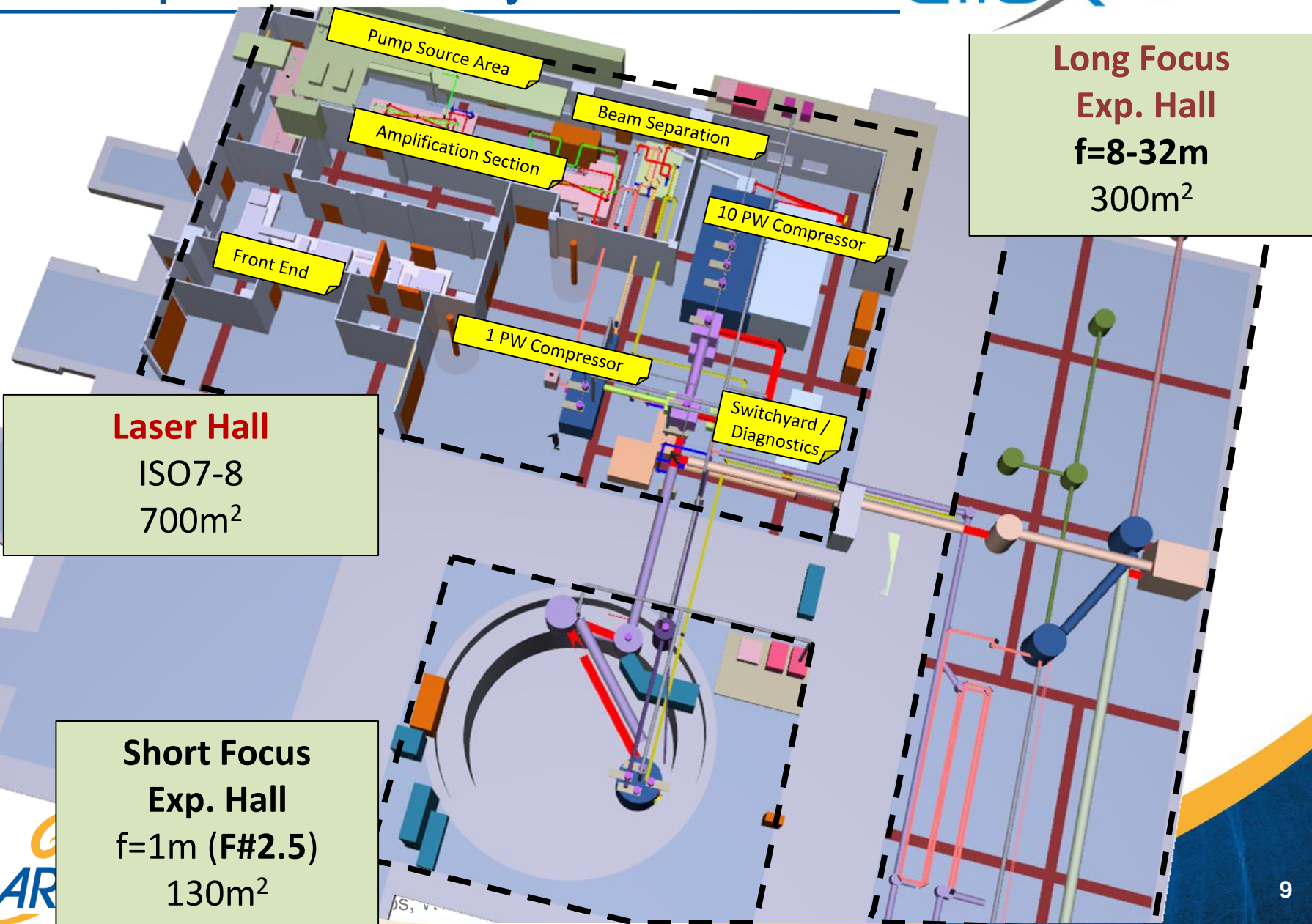
- Laser-accelerated electron beam (100 MeV, 10 pC, 10 fs, 1 mm.mrad)
- Flexible laboratory for laser-plasma acceleration experiments
- High-power laser (60 TW, 30 fs, 10 Hz)



LULAL offered access and status

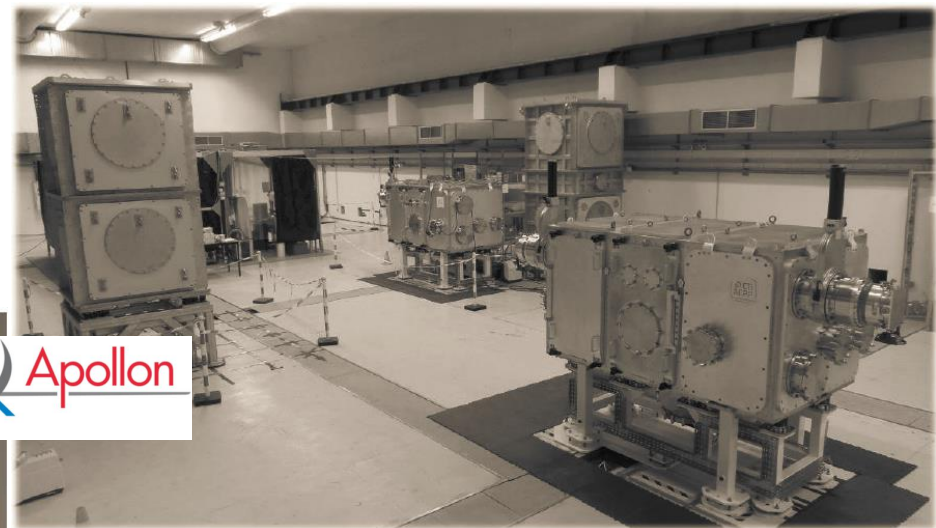
- Facility in operation: 2017-2021
 - Recent upgrade of laser energy (2J BComp now available)
 - Electron transport funded, will be installed end 2018
- Typical TNA experiment campaign
 - Scientific collaboration with the hosting research team
 - 3-5 weeks, 3-8 visitors from 1-3 institutes, supported by 3-6 staff
 - Scientific contact: Olle Lundh, olle.lundh@fysik.lth.se
- Aim for 2018: one campaign with 3-4 weeks of access
 - 3 proposals under discussion as of dec 2017 (to be updated):
 - IC (S Mangles): study WDM using X-rays produced by the e- beam
 - CPST Vilnius (Vidmantas Tomkus): study advanced targetry for LPA
 - Oslo U. (E Adli): testing plasma lenses

The Apollon Facility



Apollon CILEX : electron acceleration test facility

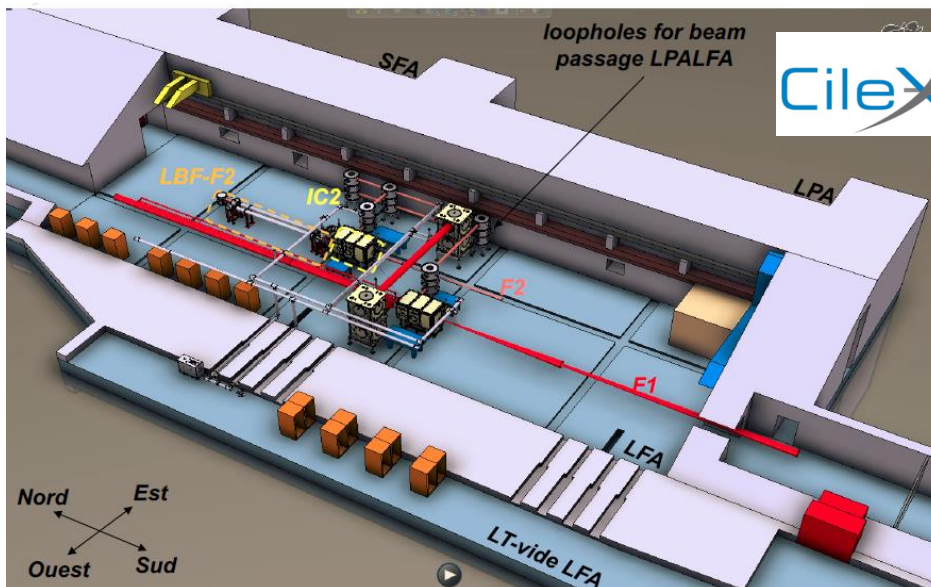
- Laser commissioning in progress toward the PW level
- Commissioning experiments in LFA starting end 2018
- Interested ARIES users are welcome during commissioning experiments



Vacuum chambers installed and aligned in LFA

Total of 6 ARIES projects
(30 hours each)

contact: B. Cros



Summary

- Access to electron bunches driven by laser in plasma at 3 different facilities, first users (1 project) in Jan-Feb 2018 at UHI100 LPA
- Users are invited to contact WP13 coordinator or facility contacts to prepare proposals
- Discussion underway for LULAL
- Experiments in preparation for APOLLON (contact BC for access): interested ARIES users are welcome during commissioning for collaborative projects with internal teams



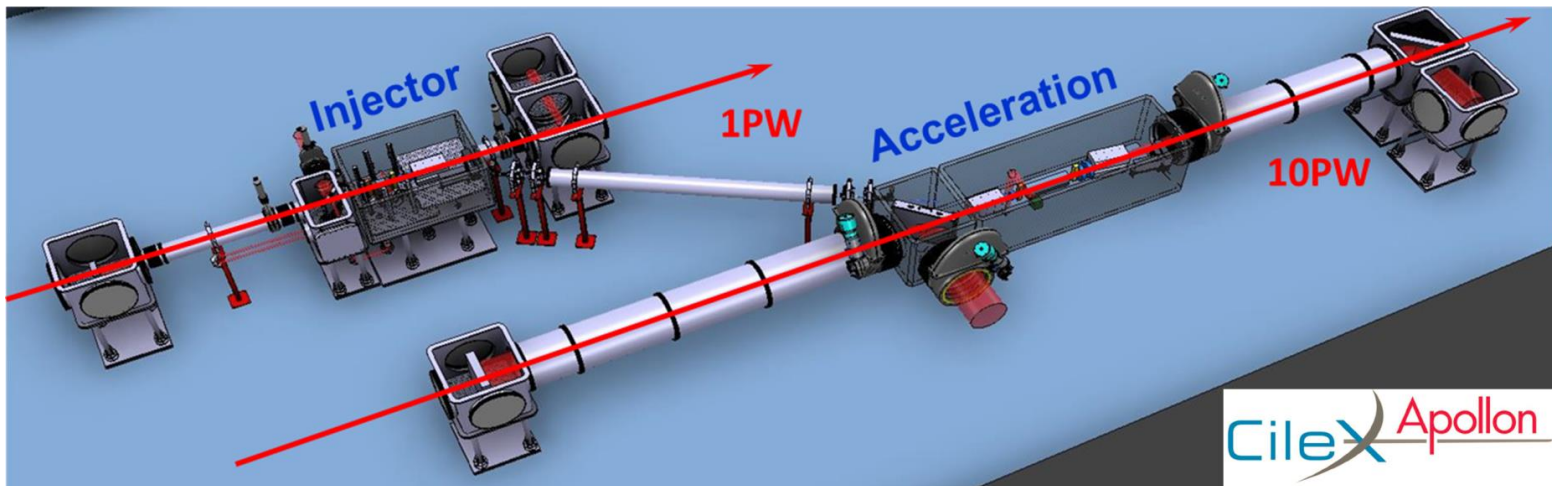
This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No 730871.



Thank for your attention

Apollon CILEX : electron acceleration test facility

- Opened to users after **2018 [from April 2019]**, CNRS-LULI – **contact: B. Cros**
- Total of 6 ARIES projects (30 hours each)
- **Electron bunches from the injector (50-200 MeV)**



- to test novel electron acceleration concepts
- to optimize the injector,
- to test innovative methods to measure its properties
- to manipulate the beam
- to study electron beam – plasma coupling processes, including synchronization and stability