LASER SYSTEMS

FOUR INDEPENDENT BEAMS BASED ON AN OPCPA FRONT END AND Ti:Sa AMPLIFICATION STAGES

Main beam

2019: 3 PW Laser System (54 J, 18 fs) on target with energy tunable from 25 to 54 J and pulse duration tunable from 18 fs to a few ps

2020: 10 PW Laser System planned (150 J, 15 fs) on target with energy tunable from 25 to 150 J and pulse duration tunable from 15 fs to a few ps

Secondary beam

2018: 1 PW Laser System (18 J, 18 fs) on target with energy tunable from 1 to 18 J and pulse duration tunable from 18 fs to a few ps

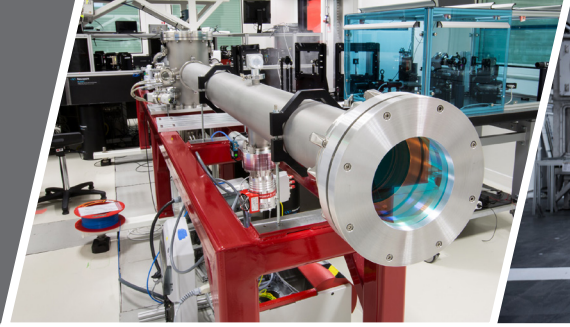
2020: 1 PW Laser System (15 J, 15 fs) on target with energy tunable from 1 to 15 J and pulse duration tunable from 15 fs to a few ps

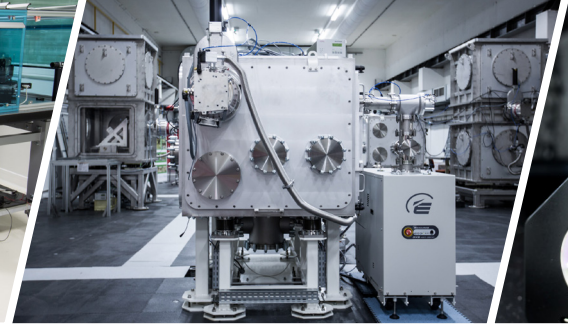
Creation beam

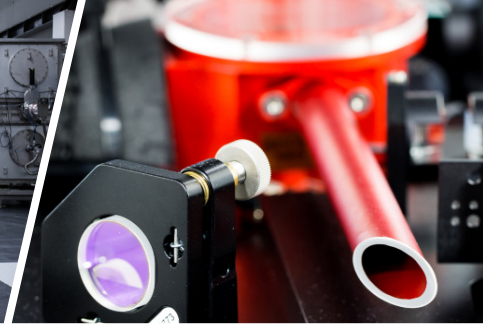
2020: uncompressed 250 J planned

Probe beam

2020: 10 TW (150 mJ, 15 fs)







BEAM POINTING AND STABILITY

Alignment on target (absolute):

1 focal spot size

Alignment on target (relative to the other beams):

better than 20% of the focal spot size

REPETITION RATE

1 shot / min

CONTRAST RATIO

normal conditions: better than 10^{12}

plasma mirrors planned

TWO INDEPENDENT RADIO-PROTECTED EXPERIMENTAL AREAS

Short Focal area

One aluminium interaction chamber
Wave front control on both main beams
with aperture at F/2.5 for Ultra High Intensity: 10^{22} W/cm²

Long Focal area

2 independent interaction chambers (1 PW and 10 PW)
Possibility to send all the beams in the same chamber
Compatible with focal length from 3 m to 30 m
Wave front control on both main beams

SYNCHRONIZATION

Independently of their duration, the four beams can be synchronized at center of the vacuum chamber and delayed up to ± 5 ns compared to the main beam

Jitter: less than 30% of pulse duration

Time step of delay line between the different beams: less than 20% of pulse duration

APOLLON BUILDING COMPLEX

The Apollon facility occupies about 4,500 m² on the site of Orme des Merisiers 20 km south-west of Paris. The laser hall is located in an ISO8 cleanroom with a useful area of 800 m² and the laser beams are distributed across two experimental rooms, covering surfaces of 280 m² and 490 m² (allowing focal lengths of several tens of meters). 5 m-thick concrete walls provide full radio protection. An area of 520 m² is dedicated to support activities such as the control of optical components, a laser development space for new diagnostics, and a vacuum outgasing control laboratory. Finally, there are 650 m² of control rooms, meeting rooms, and offices for operating teams and users.

RESEARCH FIELDS & APPLICATIONS

ION ACCELERATION

- warm dense matter physics
- relativistic laboratory astrophysics
- high-energy nuclear physics

ELECTRON ACCELERATION

- single-stage laser plasma acceleration
- multi-stage laser plasma acceleration
- positron acceleration

HIGH-FIELD PHYSICS

- high-energy photon emission and its back-reaction in laser-plasma interaction
- non-linear Compton / Thomson scattering from laser-created electron beams
- pair production in the presence of strong Coulomb fields

RADIATION SOURCES

- betatron radiation
- flying mirrors
- harmonics from solids

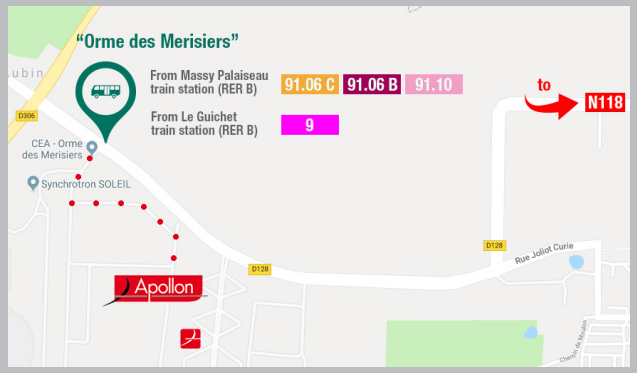
ACCESS GRANT

Access is granted only on the basis of Scientific Excellence

Proposals are reviewed annually by an international committee

Technical and practical assistance will be provided to applicants and users

VENUE



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SUPPORT

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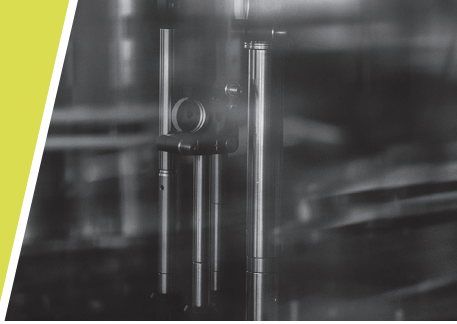

APOLLON

A RELIABLE LARGE-SCALE INFRASTRUCTURE FOR BREAKTHROUGH RESEARCH

Apollon is a laser facility designed to reach the still unequalled power of 10 petawatts. Due to its extreme intensity, it will be able to produce highly relativistic particle beams and X-ray to gamma-ray radiations, and tackle the non-linear quantum electromagnetic dynamic. Apollon will give outstanding opportunities to users in pushing forward the limits of the fundamental research.

With a view to being fully open to the national and international scientific community by the year 2019, Apollon will be operated by the Laboratoire d'utilisation des lasers intenses (LULI), which has decades of experience of running large-scale laser.

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