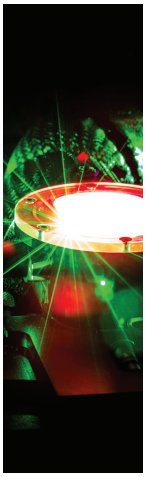
APOLLON


A reliable large-scale infrastructure for research

Apollon is a laser facility designed to reach the still unequalled power of 10 petawatts. Thanks to its extreme luminous intensity, it will produce highly relativistic particule beams and X-ray to gamma-ray radiations, allowing to push back the limits of the fundamental research. Open to the national and international scientific community on the horizon 2019, operated by LULI the Laboratoire pour l'utilisation des lasers intenses, Apollon will be an instrument of choice to explore new domains, from the relativistic to vacuum physics, using technologies of acceleration of particules and analysis of matter.

Initiated by the investement of 'Contrat Plan Etat Région (2006-2013) (2015-2020)' and the national program 'Investissements d'Avenir' as an 'Equipement d'Excellence' the Interdisciplinary center extreme light (Cilex), Apollon received funding from Institutions and local authorities. It involves 12 partners and 7 funding agencies of the Plateau de Saclay.

The main research fields and applications at APOLLON

A world-class facility, open to the international academic community to working on themes:

1. Acceleration of ions and applications
2. Acceleration of electrons and applications
3. Intense sources of ultra-short X-rays and applications
4. Physics at ultra-high intensity / high density of energy

Laser technology

Four independent beams based on a OPCPA front end and Ti:Sa amplification stages

- Main beam: 10 PW Laser System (150 J, 15 fs) with energy tunable from 25 to 150 J and pulse duration tunable from 15 fs to few ps
- Secondary beam: 1 PW Laser System (15 J, 15 fs) with energy tunable from 1 to 15 J and pulse duration tunable from 15 fs to few ps
- Creation beam: uncompressed 250 J
- Probe beam: 10 TW (150 mJ, 15 fs)

Repetition rate: 1 shot / min

Contrast ratio: better than 10^{12}

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

Synchronization

- Independently of their duration, the four beams can be synchronized at center of the vacuum chamber and delayed by ± 5ns 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

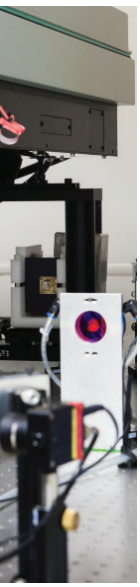
Two independent radio protected experimental area

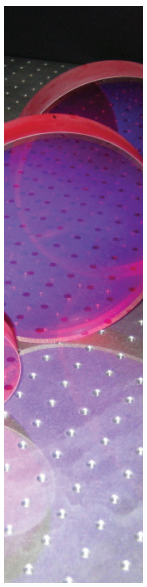
Short Focal area

- One interaction chamber
- Wavefront control on both main beams
- with aperture at F/2.5 (meaning F = 1m) for Ultra High Intensity : 10^{22} W/cm²

Long Focal area

- 2 independent interaction chambers (1 PW and 10 PW)
- Possibility to send the two main beams in the same chamber
- Compatible with focal length from 6 m to 30 m
- Wave front control on both main beams





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The location (Site de l'Orme des Merisiers, Saclay, France)

The facility is located on the site of the Orme des Merisiers 20 km south-west of Paris. It benefits from the environment and infrastructure of the Plateau de Paris-Saclay, which brings together about 10 engineering schools, the University of Paris Saclay, 3 world-leading laser research centers each in their field, more than 12 laboratories working in the field of laser-matter interaction, all together representing more than 1000 researchers and 22,000 students.

The APOLLON building complex

The Apollon facility occupies approximately 4,500 m² in the premises of the former Linear Accelerator of Saclay (ALS), thus enabling a sustainable development approach to be adopted by recycling existing buildings. The laser beams occupy an ISO8 cleanroom with a useful area of 800 m² and are distributed in two experimental rooms measuring 280 m² and 490 m² (allowing focal lengths of several tens of meters). Concrete walls of 5 meters thick provide full radio-protection. 520 m² are dedicated to support activities such as the control of optical components, a laser development space for new diagnostics, and a vacuum pollution control laboratory. Finally, there are 650 m² of control rooms, meeting rooms, offices for the operating teams and for the users.