Photon Science R&D plans in France

Laser Facilities

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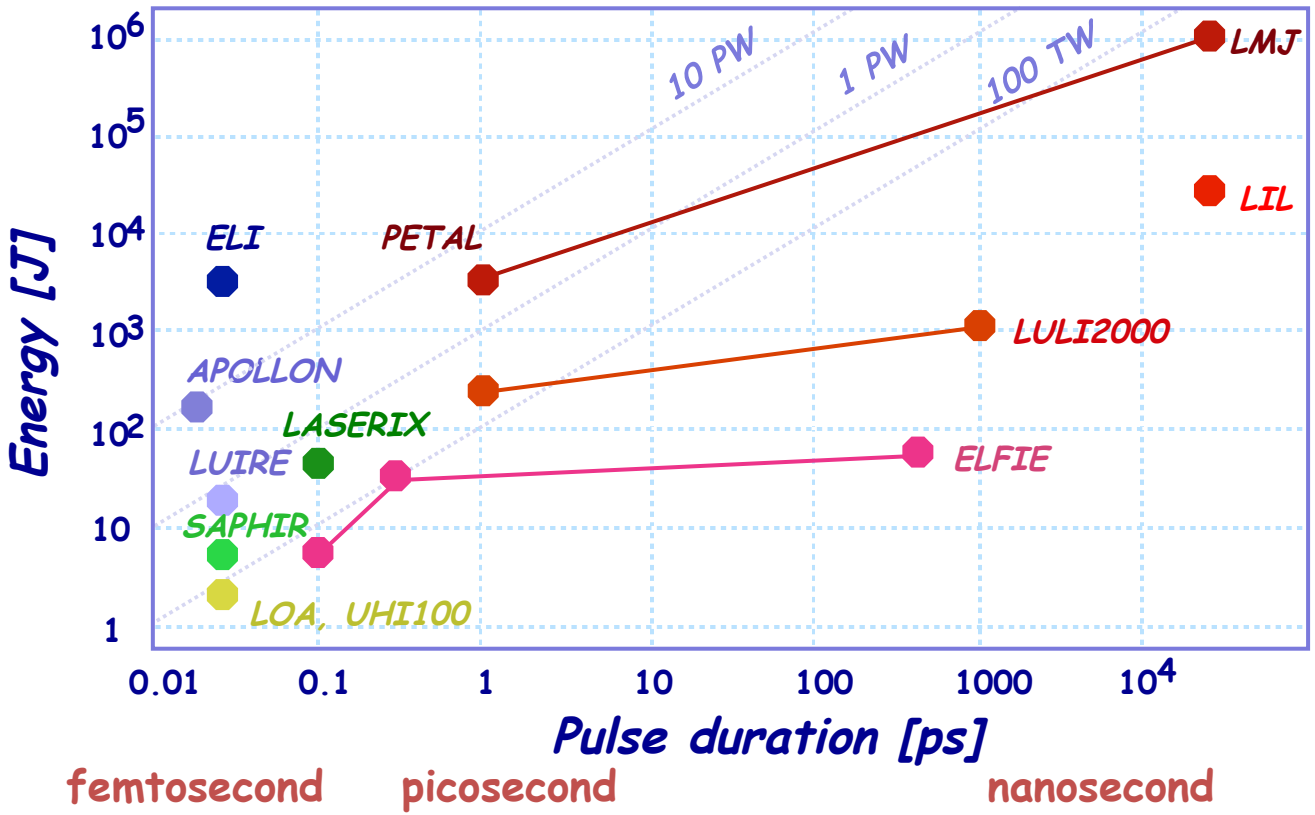
Laboratoire d'Utilisation des Lasers Intenses

EuCARD EuroNNac workshop 3-6 May '11

France operates and develops a set of high-power laser facilities for fundamental science and applications



ns + ps

- Inertial fusion
- HED physics (lab astro, planetary cores, …)

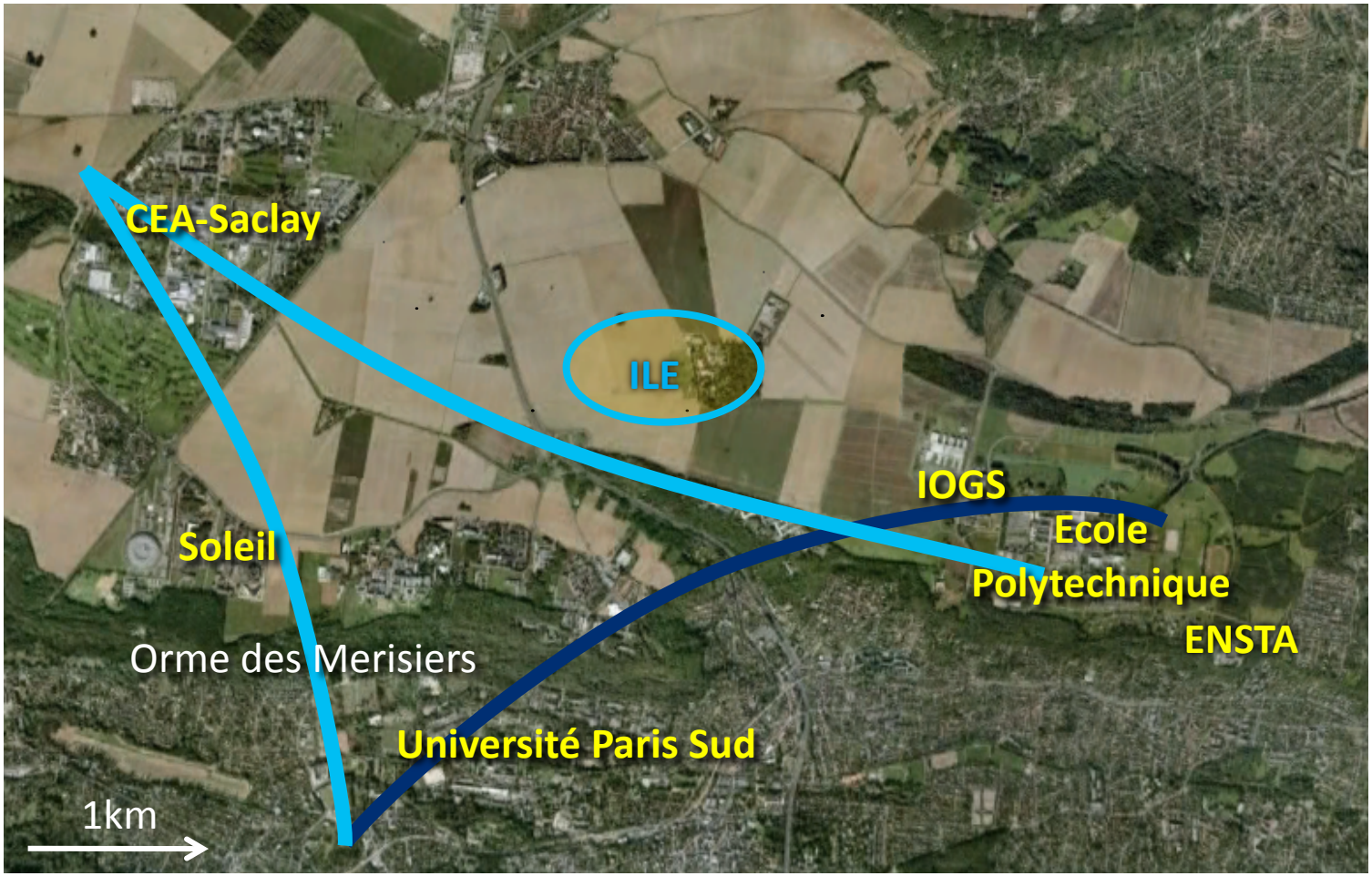
fs

- Ultrafast phenomena
- Ultra high intensities
- Particle and radiation sources & applications

A group of 13 laboratories with complementary expertise

ILE, LAL, LCFIO, LLR, LOA, LPGP, LULI, LUMAT, CPhT, IRAMIS, IRFU, CEA – Saclay, SOLEIL

to promote "high-intensity short-pulse science(s)" and develop new facilities



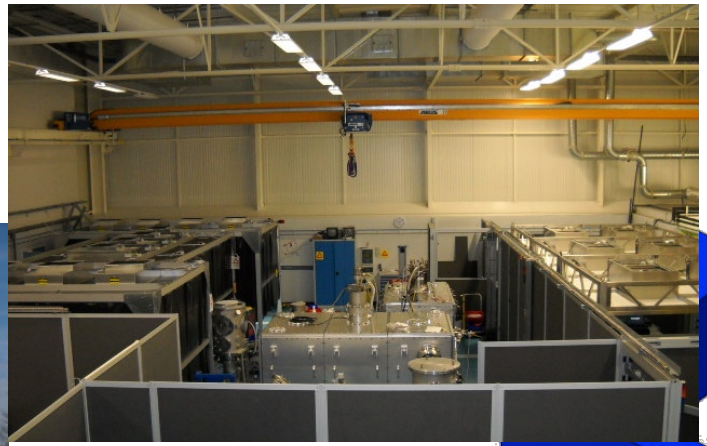
Two high-power short-pulse facilities at ½ PW and 10 PW

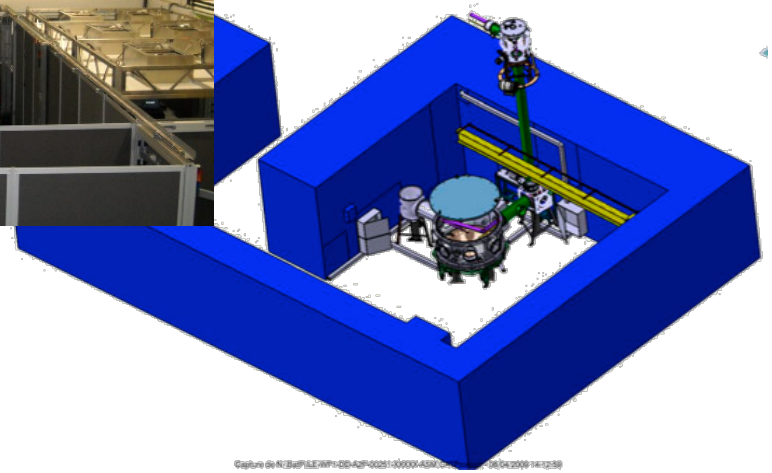
I. ½ PW - LUIRE *(ILE – ENSTA) : 2011*

15J / 30fs 1 shot/min 0.5 PW

1 shielded experimental area

electron & proton acceleration, x-rays



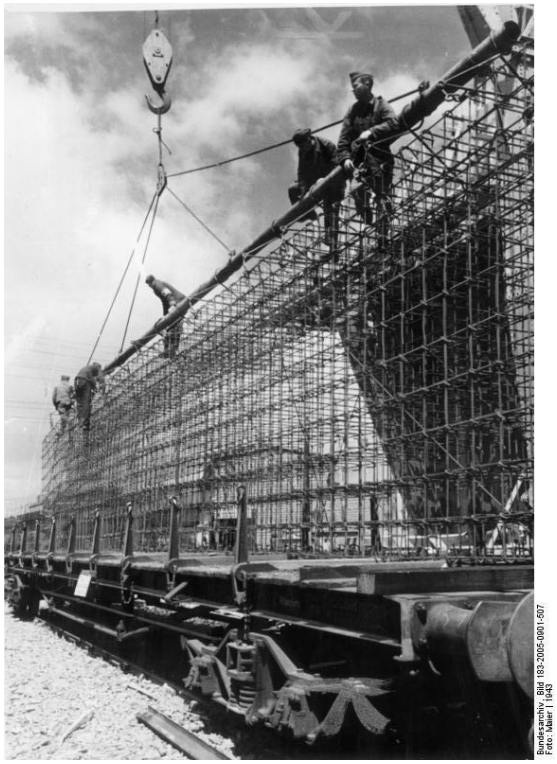


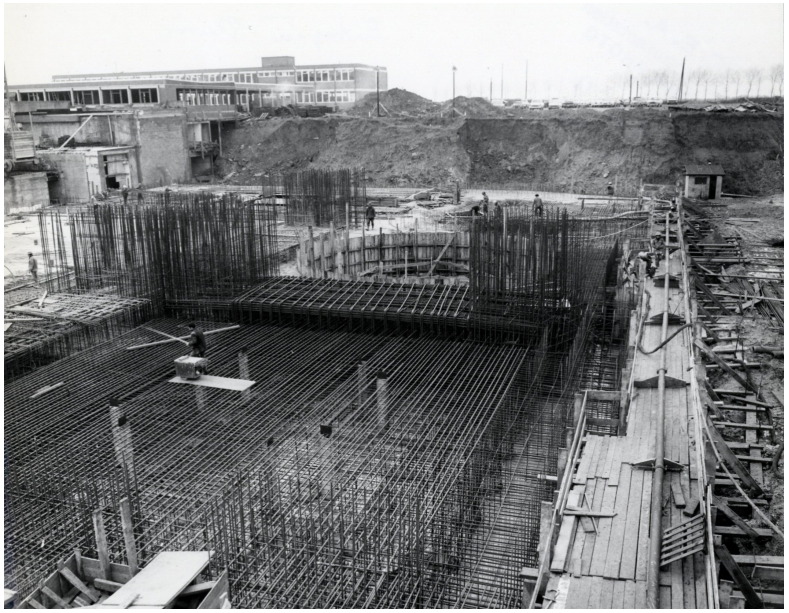
Two high-power short-pulse facilities at ½ PW and 10 PW

II. APOLLON *(ILE – 2014)*

150J / 15fs 1 shot/min 10 PW

10^{23} W/cm^2





CILEX : un Centre Interdisciplinaire Lumière Extrême

Development of a centre on intense lasers, plasmas & applications in l'Orme des Merisiers

including

APOLLON – 10 PW

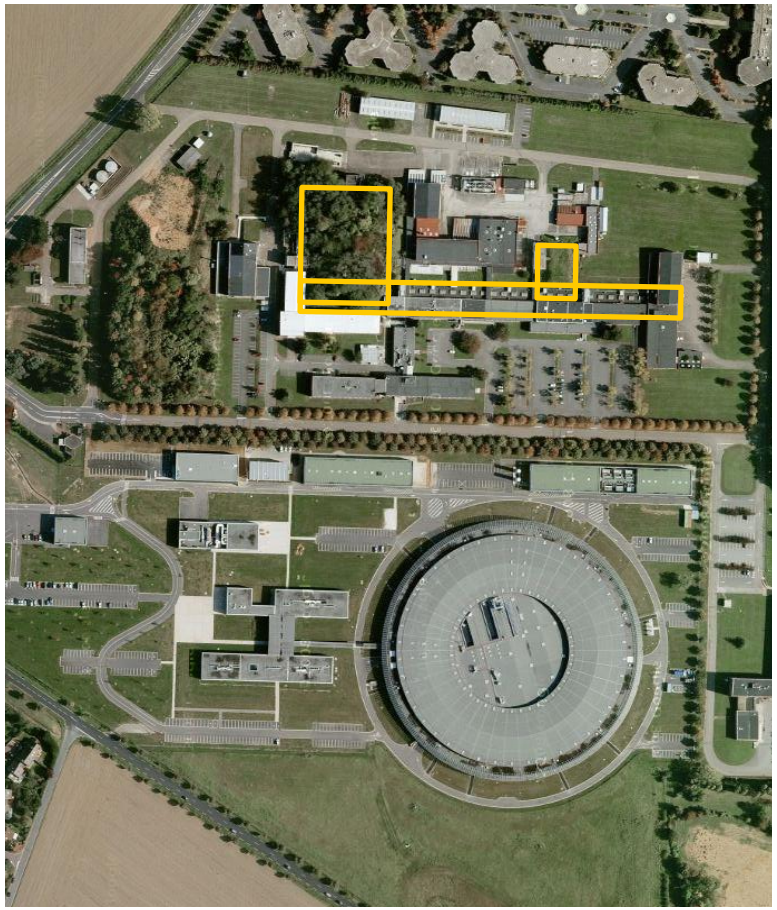
Dedicated experimental areas

supported by

Satellite facilities
at 100 TW – PW level

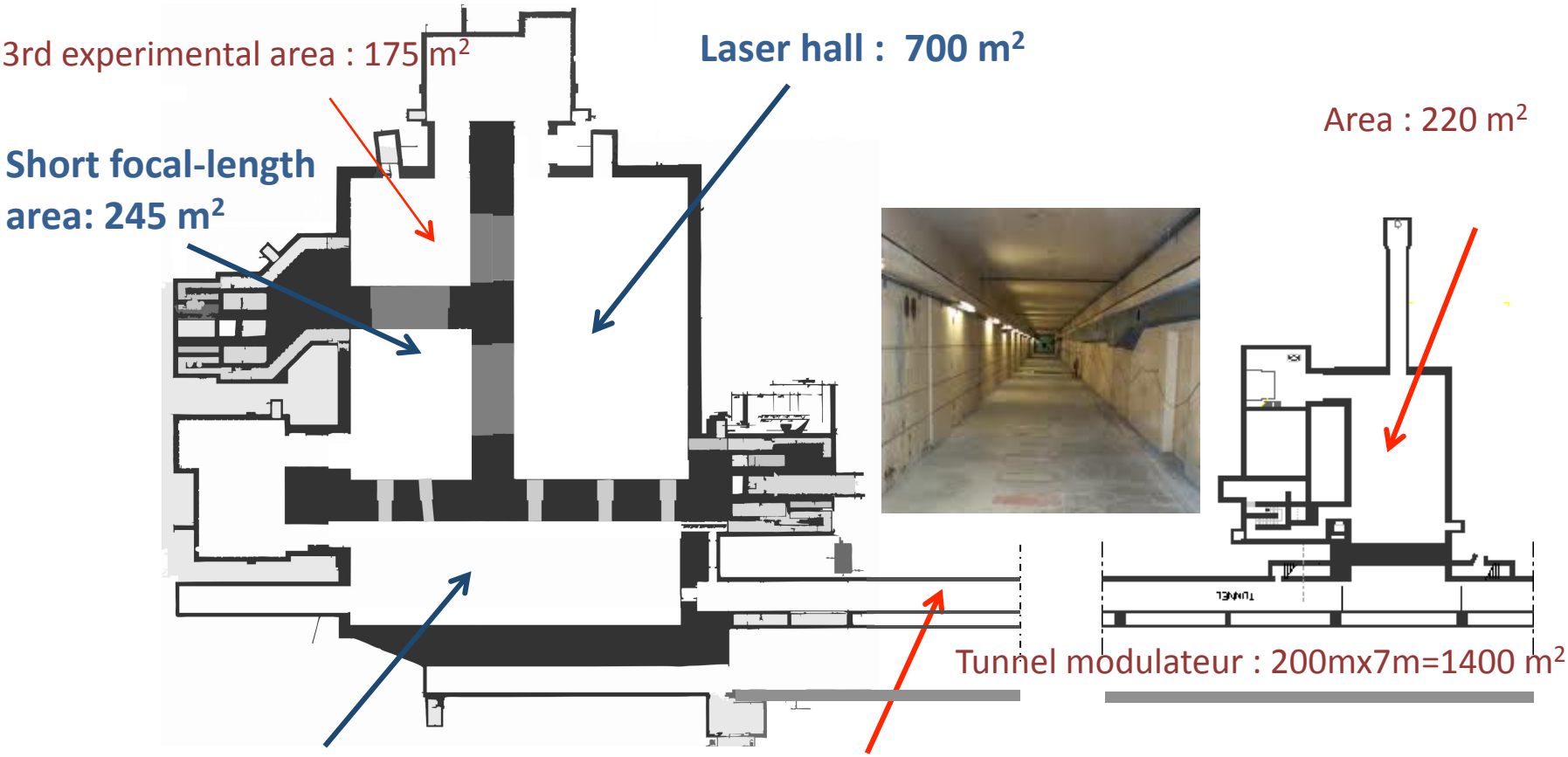
for ambitious programs

on fundamental science
& applications



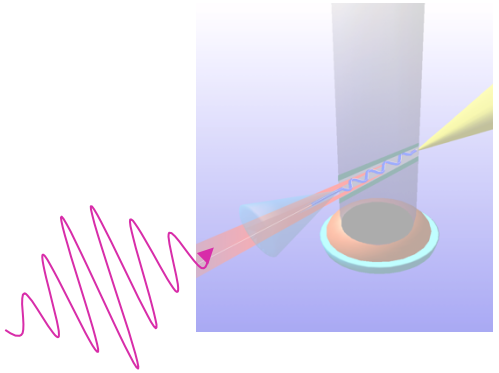
A marvellous radiation-shielded area in l'Orme des Merisiers

First step : laser hall + 2 experimental areas
Possibility of extensions including a long "acceleration tunnel"

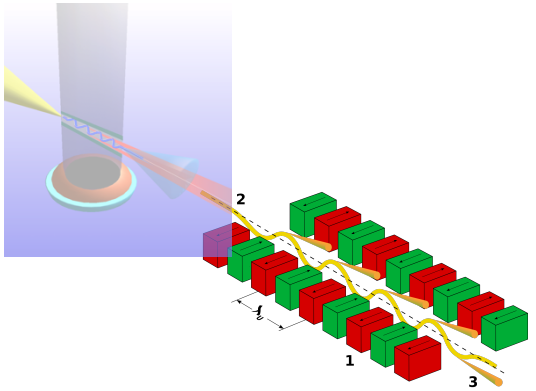


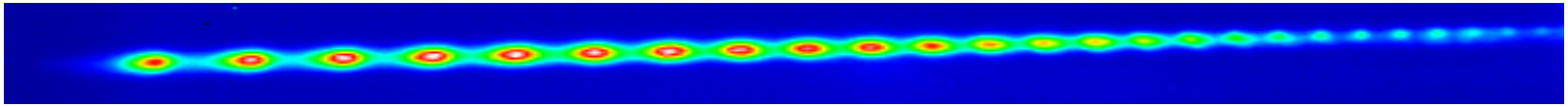
An experimental area dedicated to "long-focal-length" physics

- Electron acceleration (cf. next talk)
- Betatron x-ray sources
- Undulators to generate x-ray beams
- High-harmonic generation in gases
- Flying mirror in gases



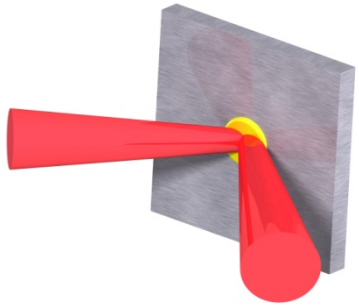
- f = 10-20 m
- $a_0 \approx 1 - 10$
- good contrast



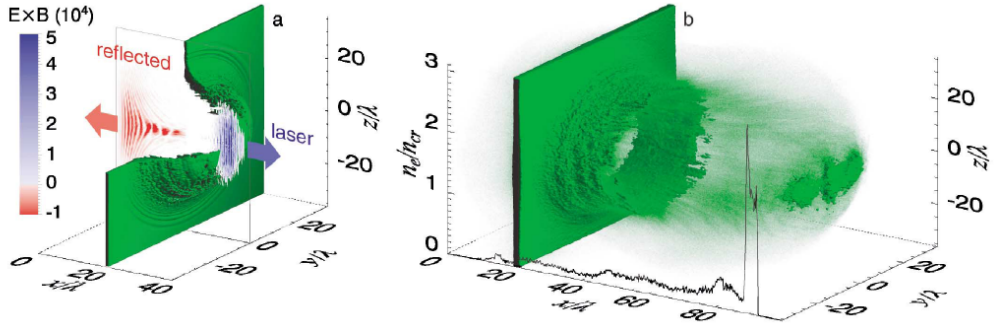


An experimental area dedicated to "short-focal-length" physics

- Ultrahigh intensities (ultra relativistic)
- Ion acceleration (e.g. RPA)
- High-harmonic generation on solids
- Ultrashort sources
- "Solid" flying mirror
- HED physics



- f ≈ 1 m
- A_0 >> 10
- maximum contrast



Some keywords of photon-science R&D in France

Laser development program - also in the context of ELI & HiPER

bottlenecks toward PWs

diode-pumped solid-state lasers

fibres

Facilities to be developed and used by an ensemble of scientists with complementary expertise (e.g. on electron acceleration, x-ray sources)

Exploration of physics in new intensity regimes

Development of reliable sources of particles and radiation

& access to these sources

Open to international collaborations to optimise the use of "unique" facilities

Ambition to be a major component of a coordinated effort on laser particle acceleration