The Laser MegaJoule Facility Status Report

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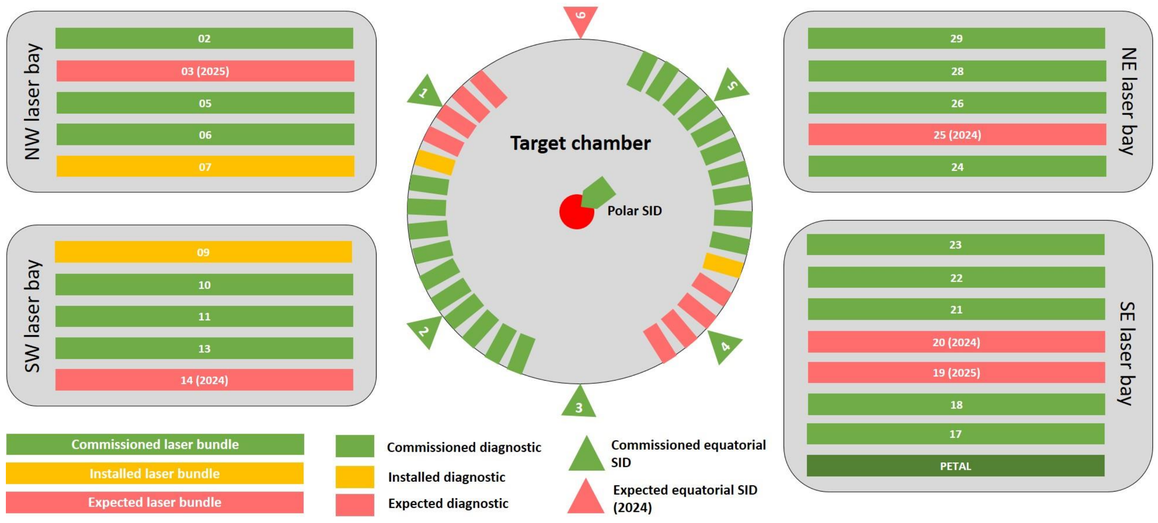
LMJ facility

The Laser MegaJoule (LMJ) is a **176-beam laser facility** developed by CEA and located near Bordeaux (FRANCE).

Main features of the LMJ facility:

- **22 bundles of 8 beams**
- **4 laser bays:** 3 bays with 5 bundles + 1 bay with 7 bundles
- **1 PetaWatt laser line** : a high energy multi-Petawatt laser beam with500 fs to 10 ps short pulse and a few kJ compressed energy

LMJ status & perspectives



By the end of 2023:

- **1 PETAL laser beam** fully operational
- **15 LMJ bundles** fully operational
- 2 new bundles assembled
- **20 Target Diagnostics** operational
- 2 new diagnostics under construction
- **Target shot** with **10 bundles and 12 TD**

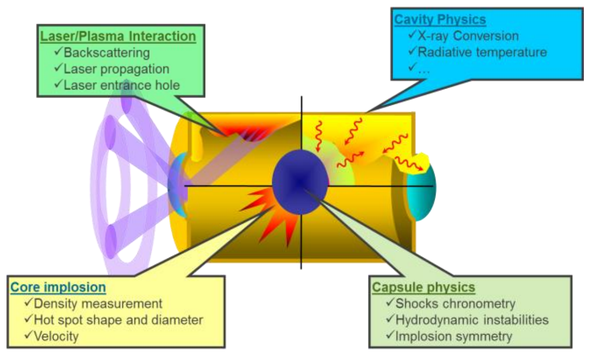
In the next 2 year (2025):

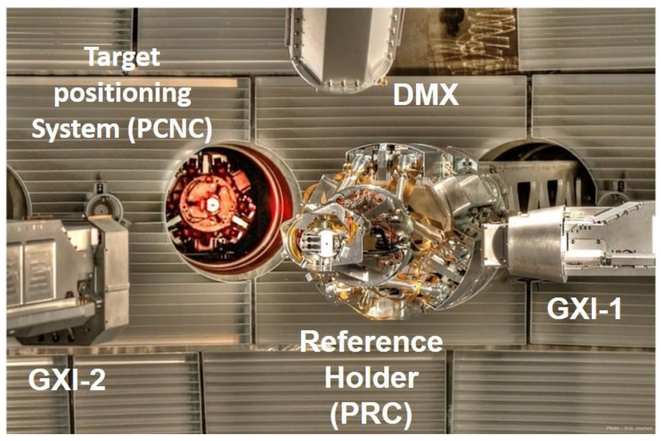
- Full completion of the 22 bundles
- Commissioning of 4 more Target Diagnostics
- Arrival of a 6th equatorial SID

Target Diagnostics

LMJ Target Diagnostics are classified into 4 main categories:

- X-ray imagers
- X-ray spectrometers
- Visible/UV diagnostics
- Particles diagnostics



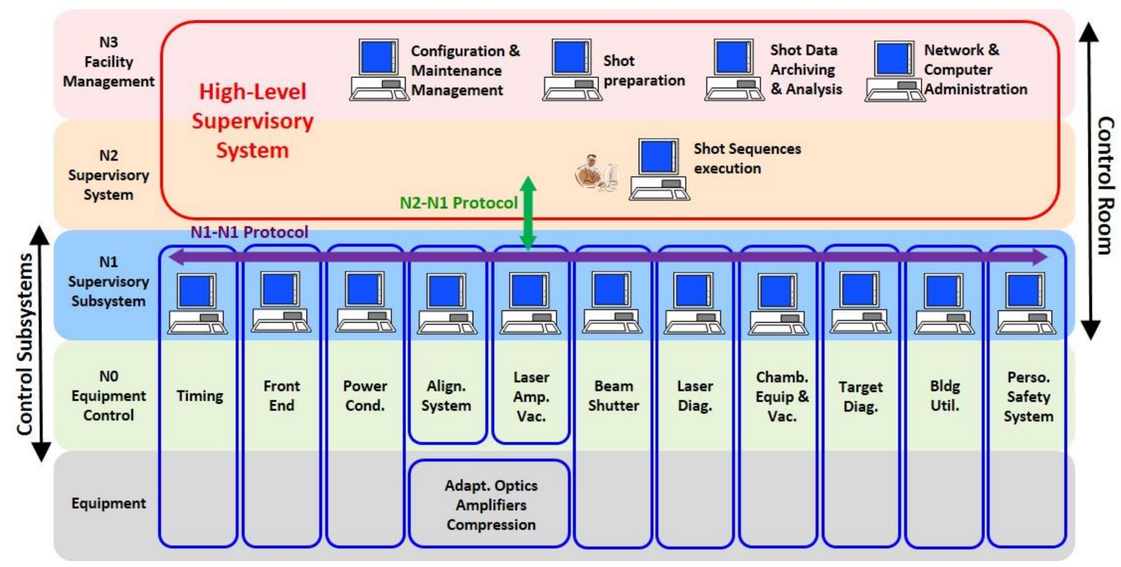


System for Diagnostic Insertion (SID)

SID: Telescoping system that provides a precise positioning of a target diagnostic close to the center of the target chamber

Main software evolutions

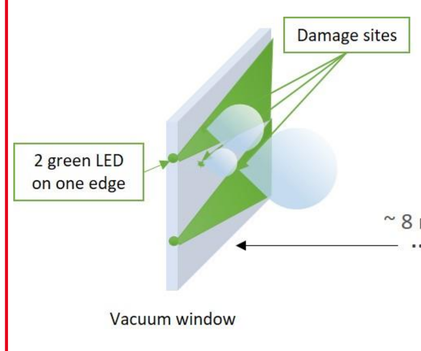
The LMJ facility has a control system which is divided into **4 layers**.



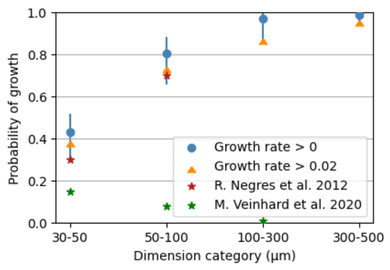
- Development of a full automated sequence for (1) final optics assembly inspection and (2) laser beam alignment during night activities without technical operators
- Upgrade of the Power Conditioning Module (PCM) in order to avoid safety shutdown during combined LMJ-PETAL experiments

Major experiments and results

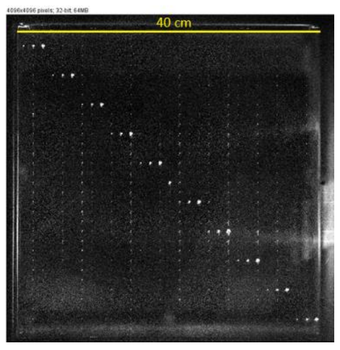
Final optics preservation experiments : For a better knowledge of the final optics laser damage phenomenon on LMJ facility

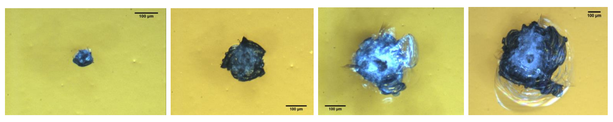


LMJ onsite camera system to observe laser damage on vacuum windows



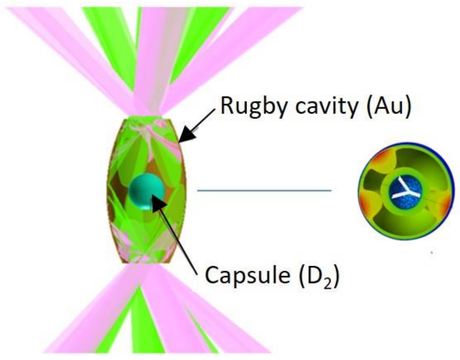
Accurate measurements before and after LMJ experiments



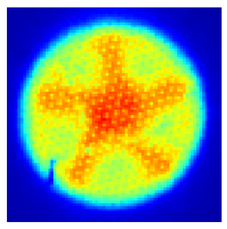


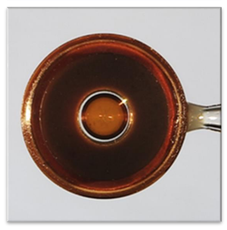
Damage sites seen under the microscope at the beginning at left and at the end of the LMJ onsite experiments

Fusion experiments: 10 baser beams + 12 target diagnostics

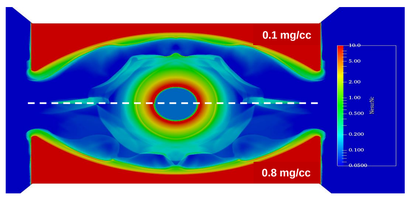


Polar view down Hohlraum axis

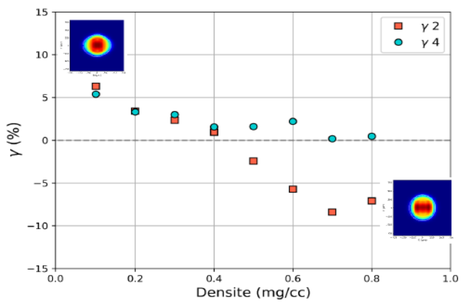




Indirect drive experiments with symmetric irradiation and for radiography sources10 laser



Fusion experiments with 5-fold symmetry in gas-filled Hohlraum



Variations of yield and implosion symmetry with filling gas density and beam pointing – with D_2 filled capsules

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LMJ

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