The Laser Megajoule Full Automated Sequences

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LMJ: LASER MEGA JOULE

- LMJ is a 176-beam laser facility developed by the French Nuclear Science directorate CEA, located at the *CEA CESTA site near Bordeaux Part of the French Simulation Program, it is designed to deliver about
 - 1.4 MJ of energy on targets, for high energy density physics experiments, including fusion experiments
 - Since 2022, the LMJ facility aims at carrying out experiments with 13 bundles of 8 laser beams and 20 target diagnostics.
 - In order to achieve daily shots including all the preparatory steps, the LMJ performs night activities without operators. These sequences work on vacuum windows inspection and beam alignment. They are scheduled automatically one after the other.

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LMJ Automated Night Sequences

As prerequisites to shots, two sequences are performed during the night without operator control :

vacuum windows damage inspection (SQMH sequence) alignment of laser beams (SQME sequence)



SQMH comes first and SQME waits. When SQMH ends, reservation mechanism unlocks SQMH resources for SQME use

Exit against all constraints



data analysis

Control GUI

FDS : SQME_ALL_GEN-20G-20230222202025 SQME : Séquence de préparation d'un tir de puissance					VUE SYNTHESE ALIGNEMENT LASER OF RESULTATS SQME								
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Enhancements

SQME GUI :

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- Displays actions that are carried out by the sequence in a single windows
- Details an indicator for each function of 4 beams bundle granularity
- Indicates alignment function states : running, successful or not
- Enables to set parameters : perimeter, alignment actions and SA SCF alignment start times

ALIGNMENT SYNTHESIS GUI :

- Based on control points and success date
- Overview of all SQME steps results with time-stamping
- Highlighting not matching SCF/RC set up, RC position and SCF position

SQME paralell scheduling and re-initialization availability improve succes probability.

They allow processing PAM tuning and SA reservation while SQMH is running.

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BORDEAL

LAST IMPROVEMENTS :

- SQME Reservation Check
- SOMH Error Resilience
- Inserter Anticollision Control
- Positioning System Availability

FUTURE DEVELOPMENT:

- Anticollision : Target Diagnostic Position Checking
- Alignment : Target Diagnostic Integration to RC Alignment

Commissariat à l'Energie Atomique et aux Energies Alternatives (CEA)

CEA, CESTA, F-33116 Le Barp.

Laser Mégajoule

