FRENCH MEGAJOULE LASER (LMJ)

- 176 beams
- 1.4 MJ (UV)

8 beams bundle

- 1056 nm (IR)
- 351 nm (UV)

10 mm target
THE LMJ SYSTEM SEQUENCES ADAPTABILITY (FRENCH MEGAJOULE LASER)
1. Laser MegaJoule Shot Overview
2. Control system
3. Grafcets
4. Adjustments
5. GUI
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:
SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI
Shot:
Facility Preparation

- PreAmplifier: high energy fitting
- Inserters movements
- Alignment Laser thermalization

Timing shot 1s

Preparation

Post Shot
Facility Preparation | Alignment | Timing shot 1s | Preparation | Post Shot

- Beams Alignment
- Target Alignment
- Plasma Diagnostics Alignment
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:
SHOT OVERVIEW

- Facility Preparation
- Alignment
- Validation Shot
- Timing shot 1s

Preparation

Post Shot

- Non amplified shot
- Equipment Configuration
- Camera Arming
- Timing validation
- Data storage
 Facility Preparation  Alignment  Validation Shot  Power Shot

Timing shot 1s

Preparation  Post Shot

- Amplified shot
- Equipment Configuration
- Camera Arming
- Timing shot
- Data storage
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:
SHOT OVERVIEW

- Equipment Securing
- Power conditionning
- Lamp Test
- Data storage
1. Laser MegaJoule Shot Overview
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Resource

Name

Attributes
- Reserved
- Context
- Operational State
- Operational Mode

Methods
- Reserve()
- Release()

Functions

Membership of a perimeter
Perimeter: Resource group

Control Points
- 14 °C
- 10 kV

Alarms

Resource Manager
Supervisory Control System

- Chain01
- Chain22
- Upper Quadruplet
- Lower Quadruplet
- Injection
- Amplifiers
- Transport
- Focalization

PAM1
PAM2
Amplifiers
Transport
Focalization

Source
Beam1, Beam2, Beam3, Beam4
Sensors
Motors

Resource

System view

Utilisation relationship
The LMJ system sequences adaptability:

- Shot Overview
- Control System
- Adjustments
- Grafcets
- GUI

Supervisory Control System

- Injection
- Amplifiers
- Transport
- Focalization

- PAM1
- PAM2
- Amplifiers
- Transport
- Focalization

- Source
- Beam1
- Beam2
- Beam3
- Beam4

- Sensors
- Motors

Resource

System view

Utilisation relationship
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:

SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

- N3 Facility planning and operations
- N2 System control
- N1 Subsystem control
- N0 Equipment control

Sequence Manager

High level supervisory

Subsystem control command

Equipment

- Power Conditioning
- PEPC
- Timing
- Target Diagnostics
- Target Chamber Equipments
- Cryogenic Equipments
- Personal Safety
- Laser Diagnostics
- MO & PAM

Vaccum Control

Alignment

Laser Amplification

Primary Vacumm

Utilities
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:
SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

Common Framework Tools

- Configuration Manager
- Resource Manager
- Sequence Manager
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:

SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

N3 Facility planning and operations
High level supervisory
N2 System control

N1 Subsystem supervisory
Subsystem Control Command

N0 Equipment control
Equipment
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SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | ADJUSTMENTS | GUI

Shot sequence main grafcet

Laser configuration grafcet

Power shot grafcet

Power Conditioning Supervisory Function:
Configure
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:

SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | ADJUSTMENTS | GUI

Alarms

Power Conditioning Supervisory Function:
Configure
THE LMJ SYSTEM SEQUENCES ADAPTABLE:

SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | ADJUSTMENTS | GUI

Alarms

Power Conditioning Supervisory Function:

Configure
1. Laser MegaJoule Shot Overview
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THE LMJ SYSTEM SEQUENCES ADAPTABILITY:
SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | ADJUSTMENTS | GUI

**Shot Sequence model file**
- ✓ Sequence program name
- ✓ Supervisories concerned by sequence
- ✓ Main resource class
- ✓ Excluded resource class
- ✓ Resource class priority
- ✓ Supervisory
  - ✓ Main step
  - ✓ Settings name: Function Class

**Adjustment file**
- ✓ Sequence program name
- ✓ Supervisory
- ✓ Main resource
- ✓ Excluded resource
- ✓ Resource priority
- ✓ Supervisory
  - ✓ Main step
  - ✓ Settings value: Function

**Shot Requirements**

**Shot DataBase Manager**

**PARC Automatic Settings Prediction System**
Supervisory Control System

Main resources

Perimeter

Excluded resources

Resource

System view

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Détails de la séquence

Synthèse HE

SCOPAC

SID1

ER
RC
PR
PGNC

SID01
Entrer
en cours
10%

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Actions

Gestion
Frontale CP
Validation de l'insertion des DPM utilisés par la séquence

Réussite
Abandon

Rapport d'erreurs

Nom : Survet
Nom du participant
Délai : 10 minutes
Fonction : 20%
THE LMJ SYSTEM SEQUENCES ADAPTABILITY:

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Panorama
Grafct successful executions: 100th achieved power shots

Adjustment File: Easiness to drive new bundles.

GUI synthesis philosophy applies in 8 beams or 176 beams bundles.

System sequences are ready for the coming LMJ beams integration.