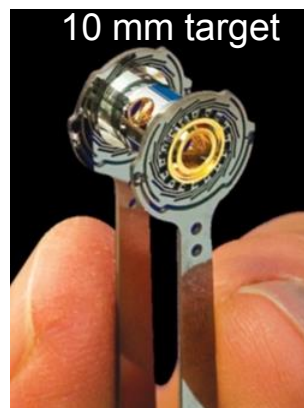
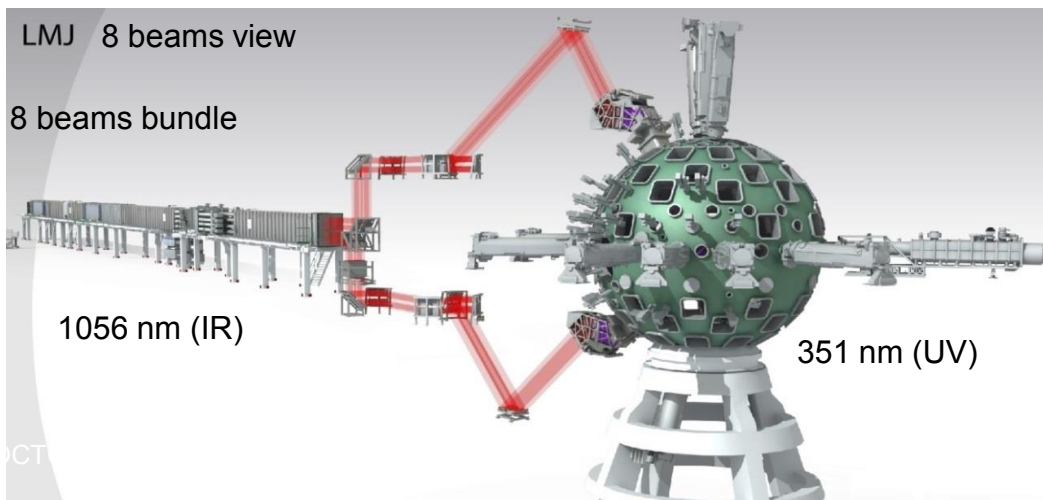
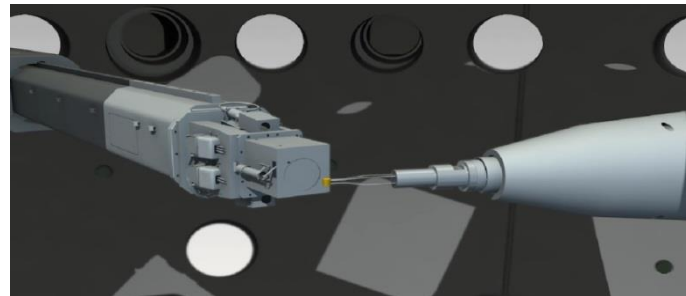
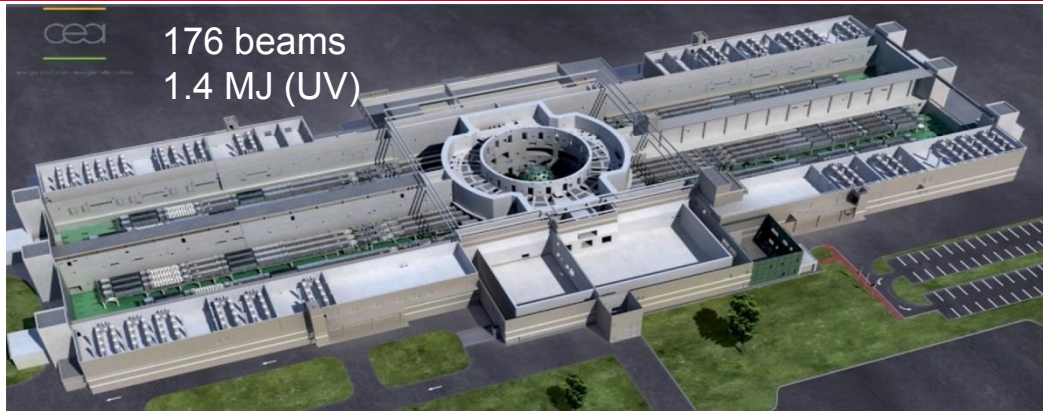


FRENCH MEGAJOULE LASER (LMJ)



DE LA RECHERCHE À L'INDUSTRIE



THE LMJ SYSTEM SEQUENCES ADAPTABILITY (FRENCH MEGAJOULE LASER)

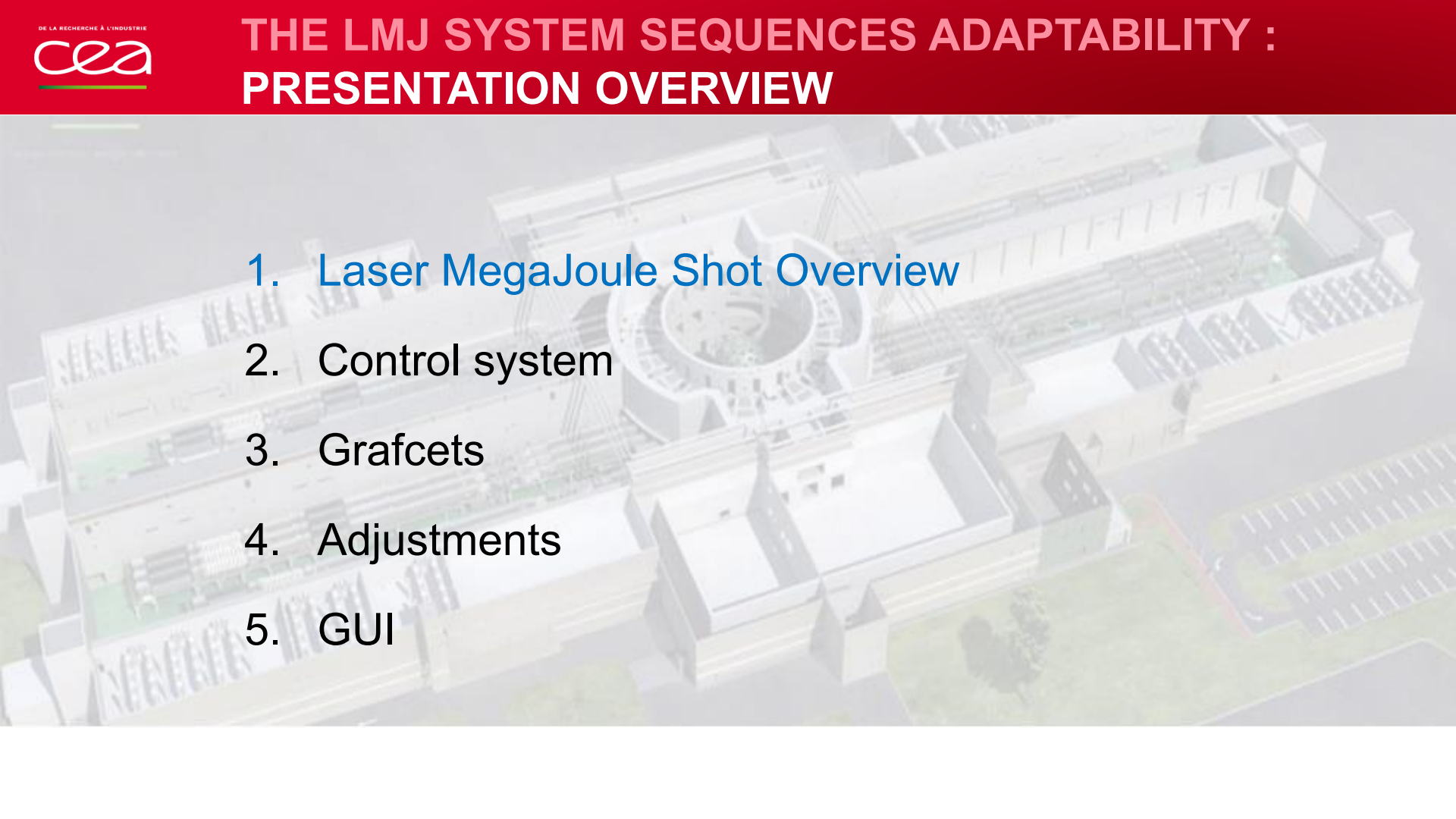


ICALEPCS 2015 | Yves TRANQUILLE-MARQUES

OCTOBER 20, 2015

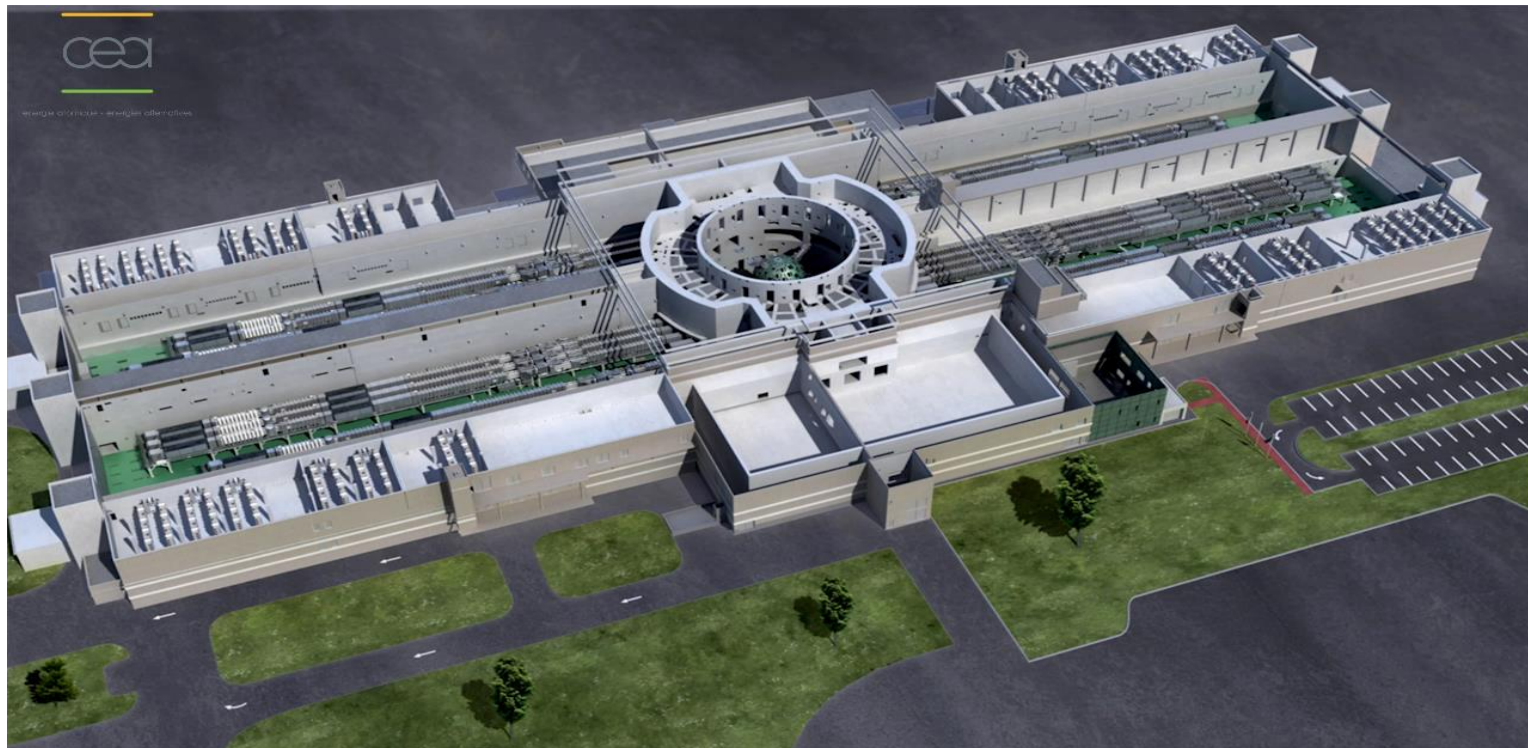
www.cea.fr

THE LMJ SYSTEM SEQUENCES ADAPTABILITY : PRESENTATION OVERVIEW

- 
- An aerial photograph of the Laser MegaJoule (LMJ) facility, showing a large complex of industrial buildings and a central circular structure. The image is faded and serves as a background for the presentation.
1. Laser MegaJoule Shot Overview
 2. Control system
 3. Grafquets
 4. Adjustments
 5. GUI

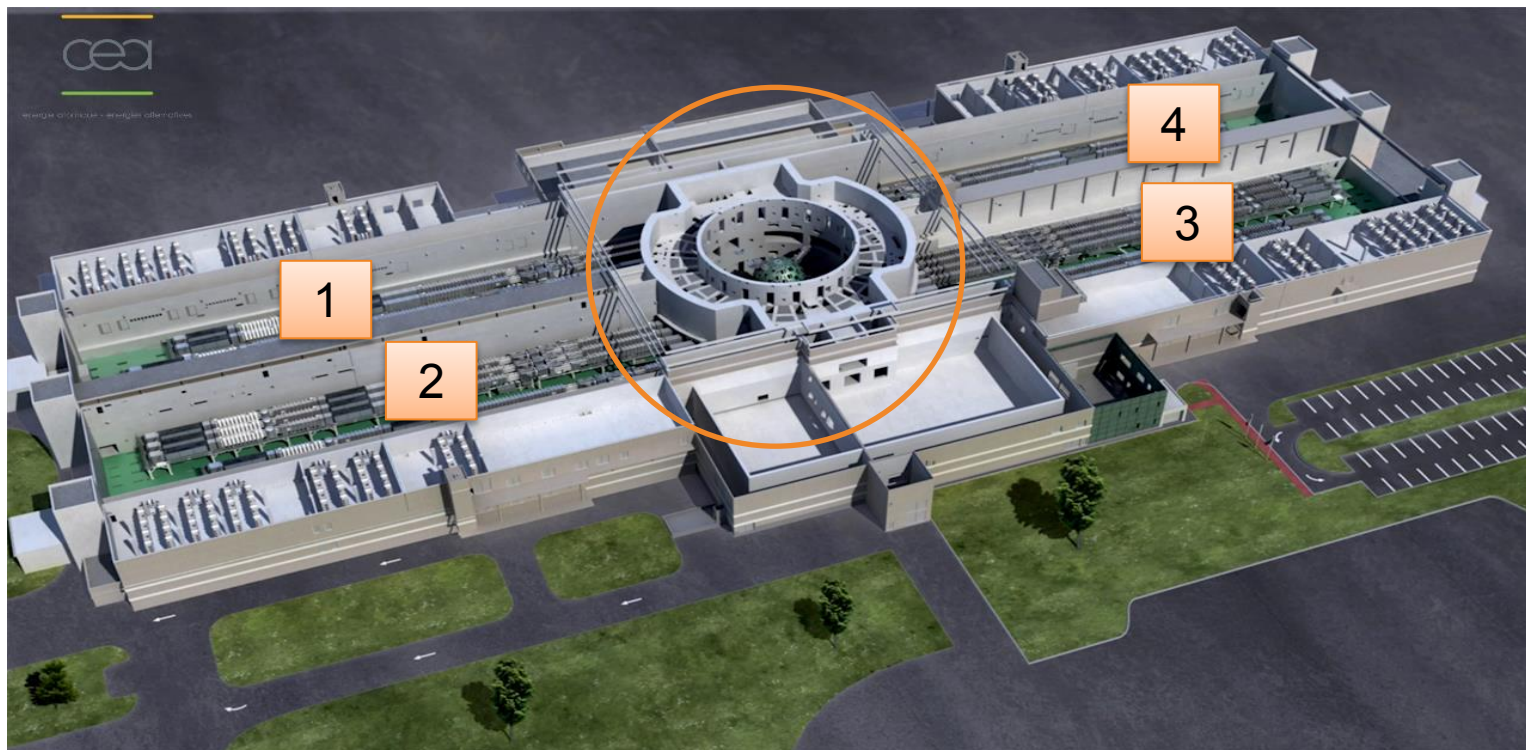
THE LMJ SYSTEM SEQUENCES ADAPTABILITY : SHOT OVERVIEW

| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI



THE LMJ SYSTEM SEQUENCES ADAPTABILITY : SHOT OVERVIEW

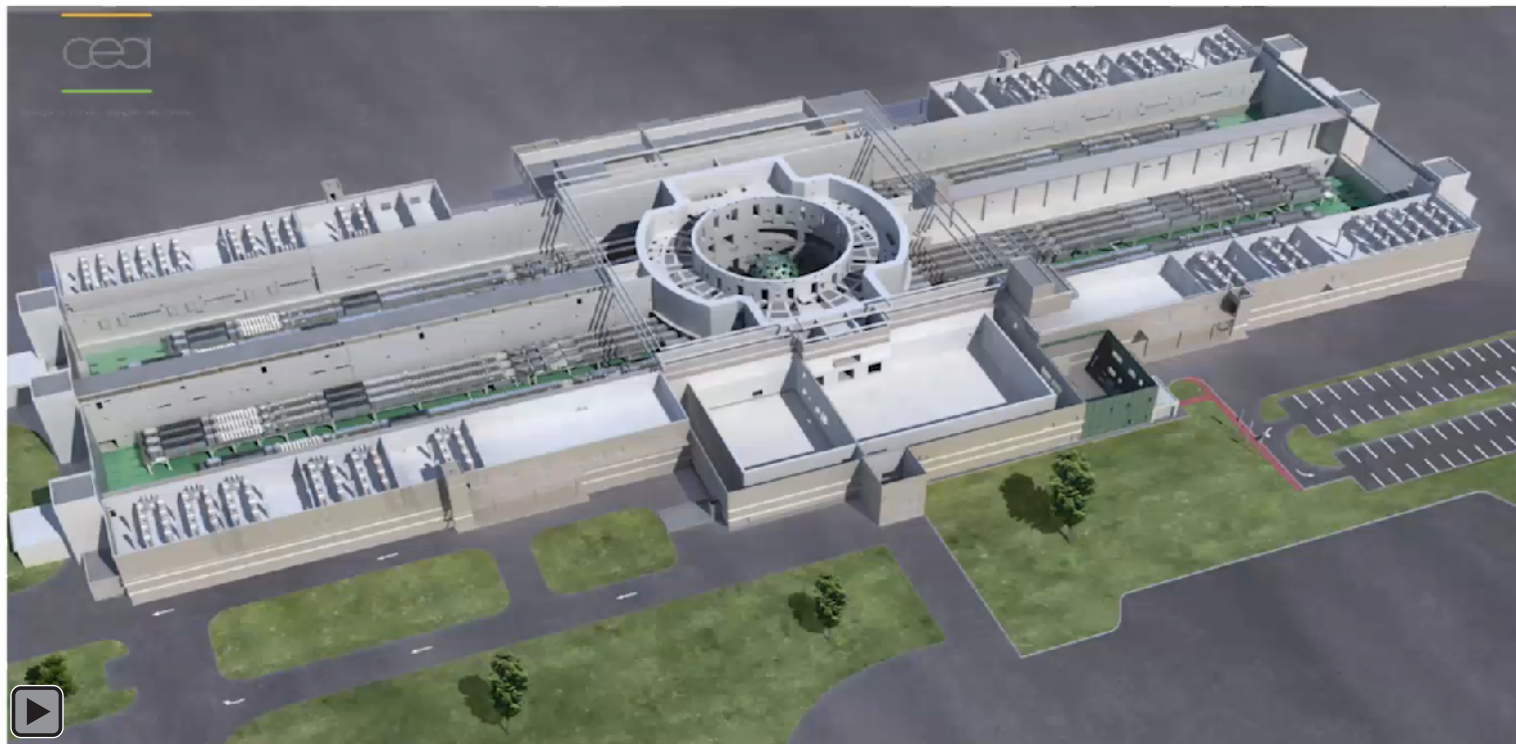
| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI



THE LMJ SYSTEM SEQUENCES ADAPTABILITY : SHOT OVERVIEW

| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

Shot :



THE LMJ SYSTEM SEQUENCES ADAPTABILITY : SHOT OVERVIEW

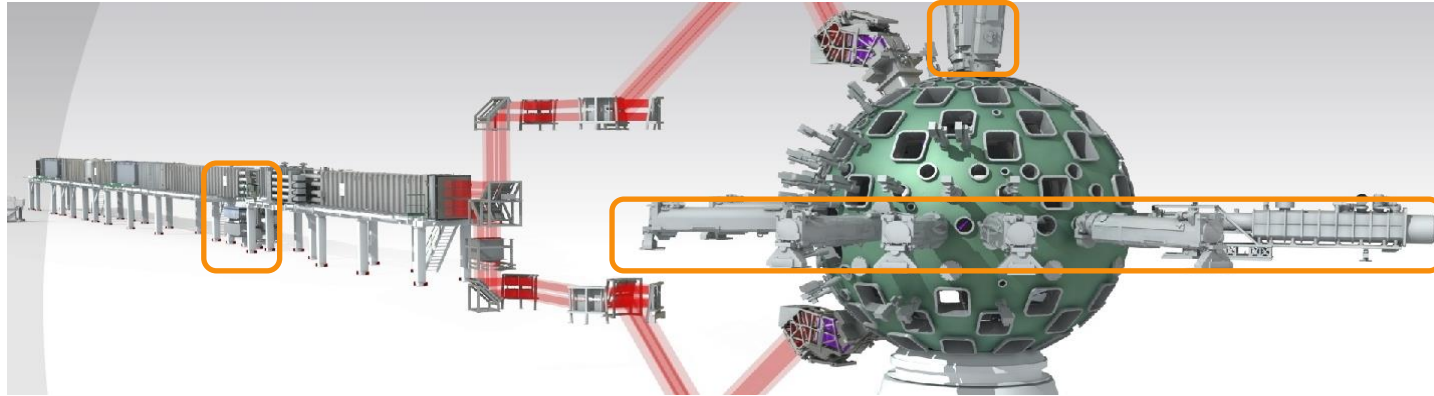
| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

Facility Preparation

Timing shot 1s

Preparation

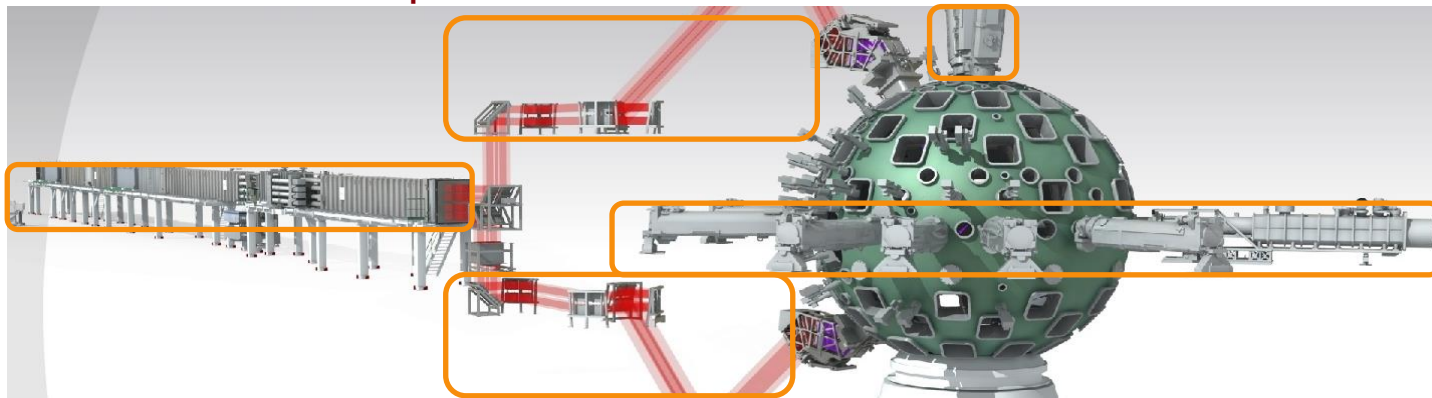
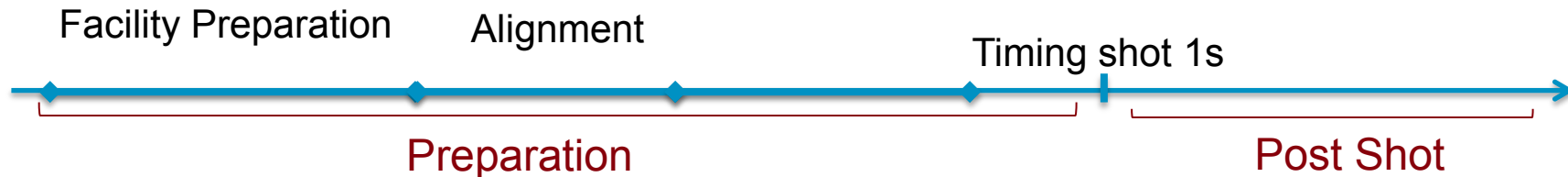
Post Shot



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

THE LMJ SYSTEM SEQUENCES ADAPTABILITY : SHOT OVERVIEW

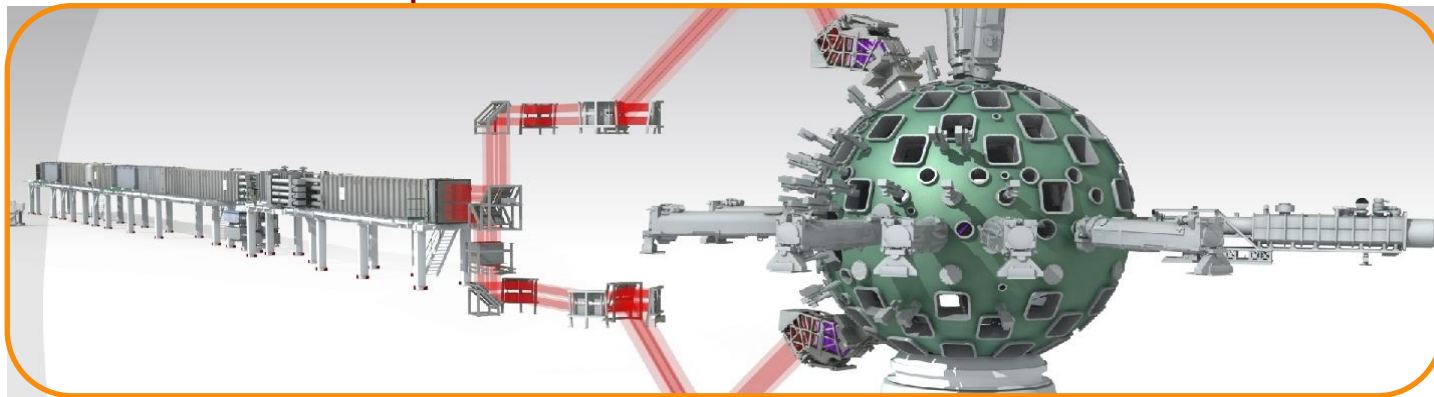
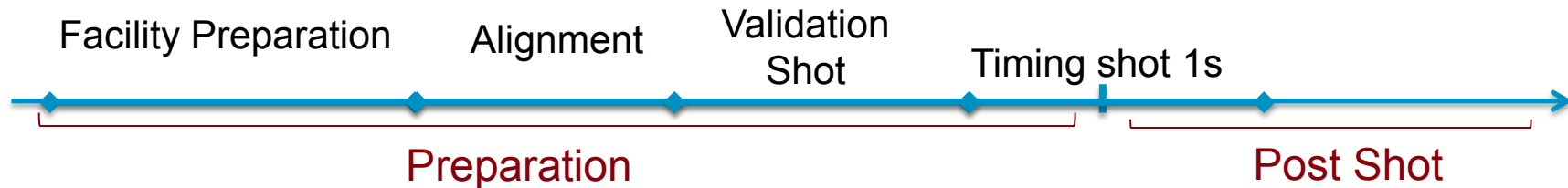
| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI



- Beams Alignment
- Target Alignment
- Plasma Diagnostics Alignment

THE LMJ SYSTEM SEQUENCES ADAPTABILITY : SHOT OVERVIEW

| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

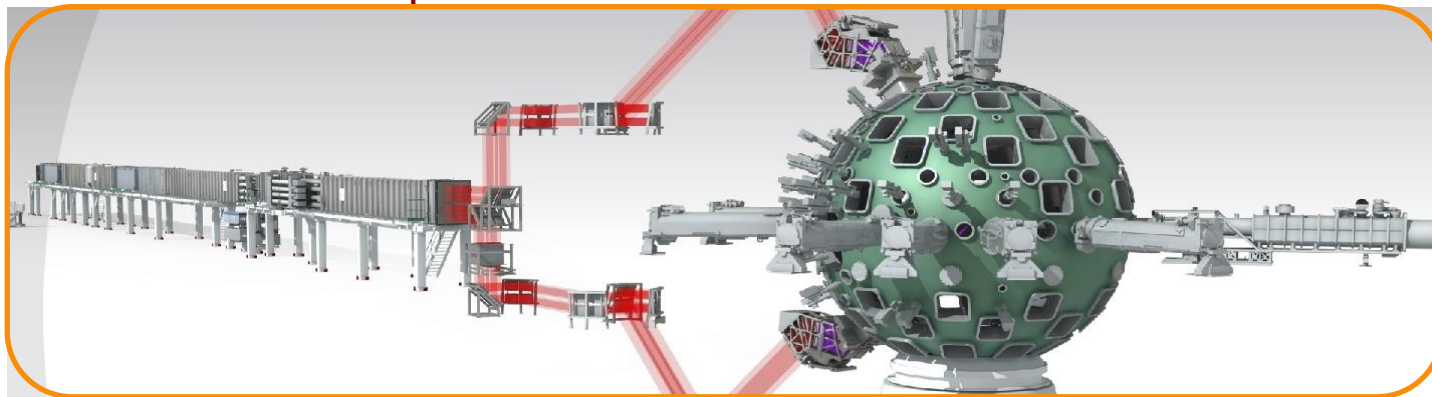


- Non amplified shot
- Equipment Configuration
- Camera Arming
- Timing validation
- Data storage

THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW

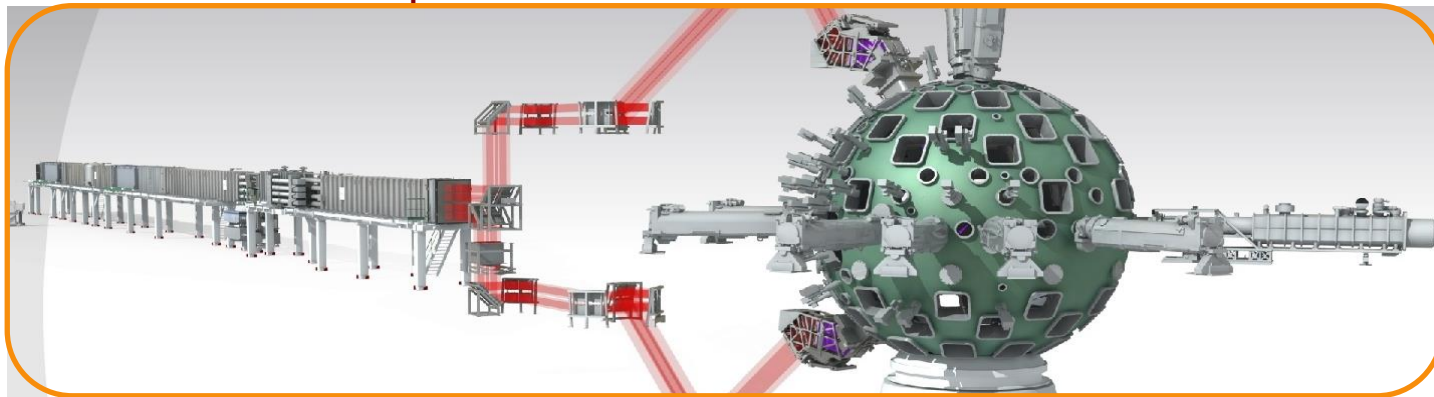
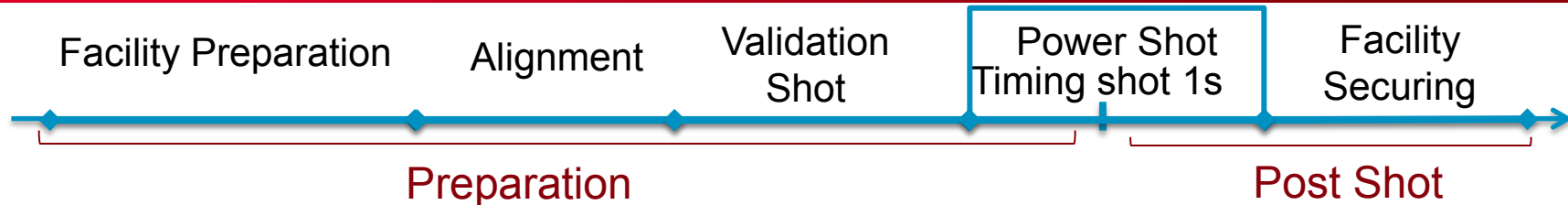
| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI



- Amplified shot
- Equipment Configuration
- Camera Arming
- Timing shot
- Data storage

THE LMJ SYSTEM SEQUENCES ADAPTABILITY : SHOT OVERVIEW

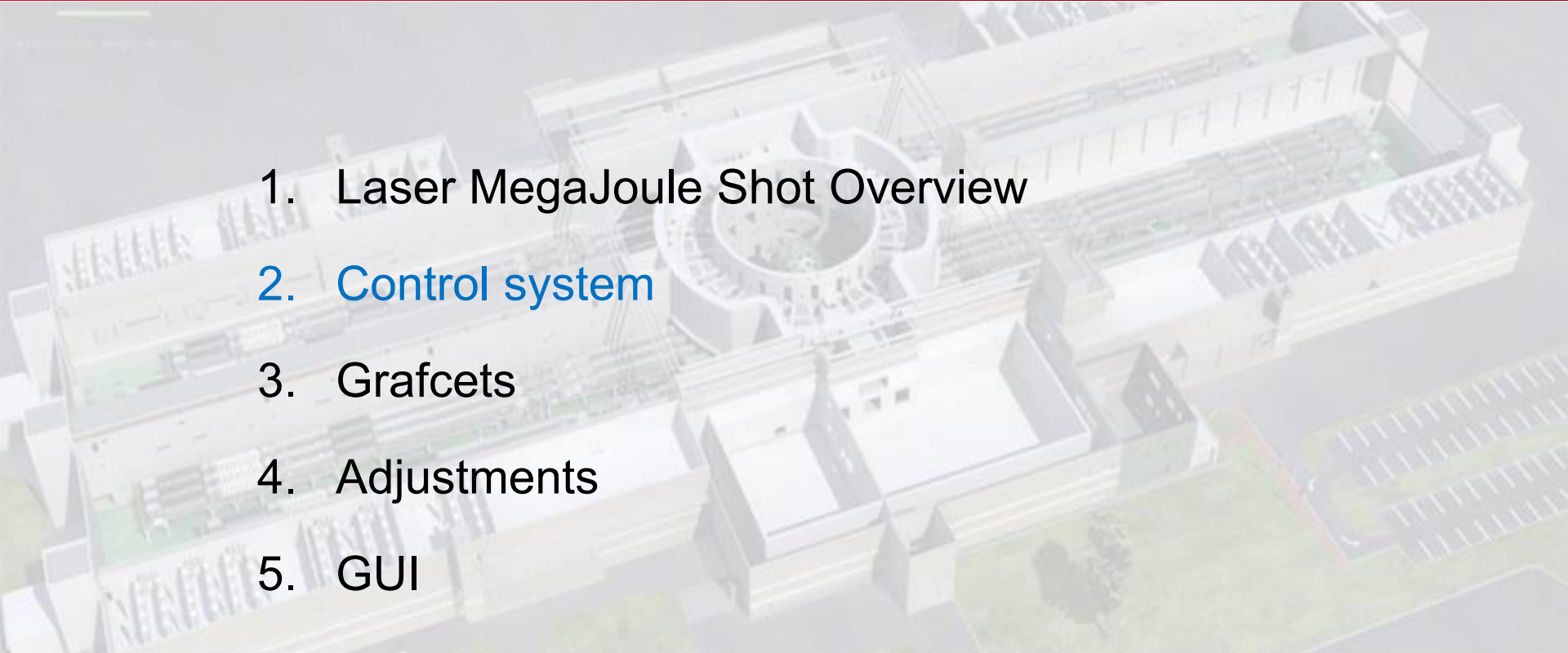
| CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

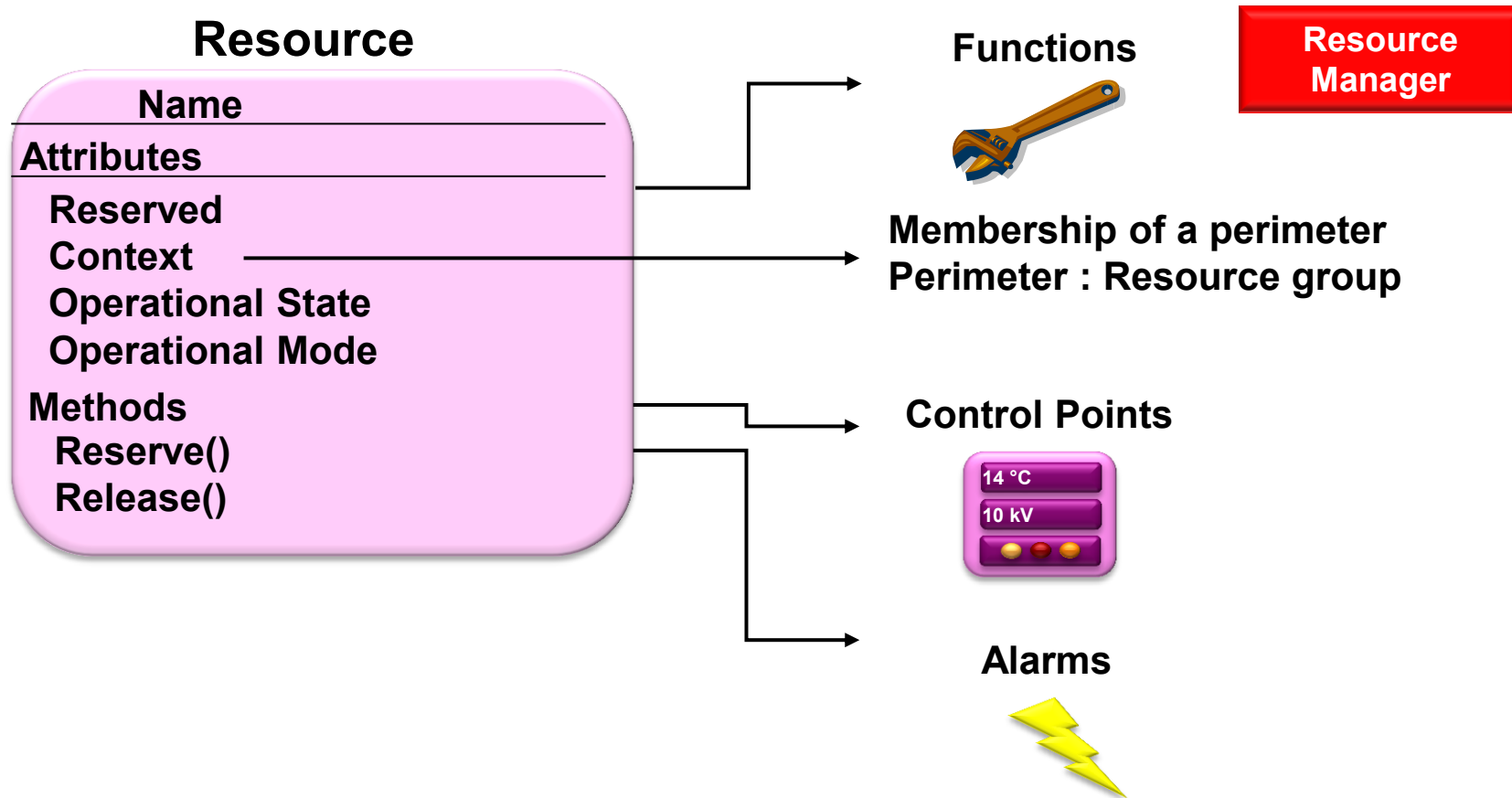


- Equipment Securing
- Power conditionning
- Lamp Test
- Data storage

THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | **CONTROL SYSTEM** | ADJUSTMENTS | GRAFCETS | GUI

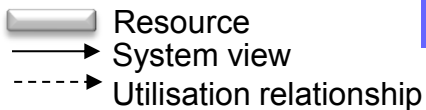
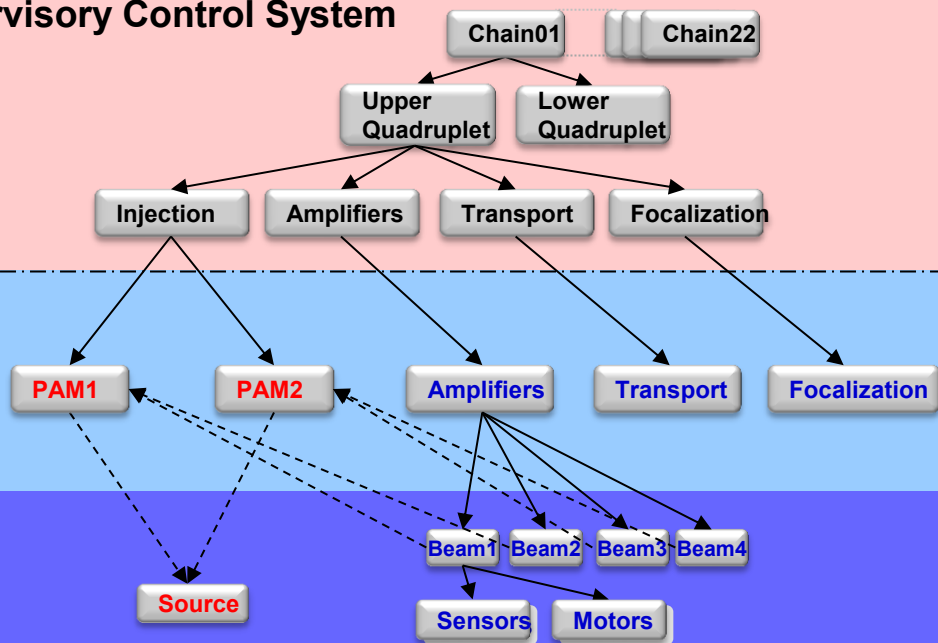
- 
- An aerial photograph of the Laser MegaJoule (LMJ) facility, showing a large complex of industrial buildings and a central circular structure. The image is faded and serves as a background for the text.
1. Laser MegaJoule Shot Overview
 2. Control system
 3. Grafcets
 4. Adjustments
 5. GUI



THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

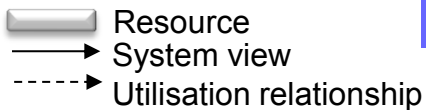
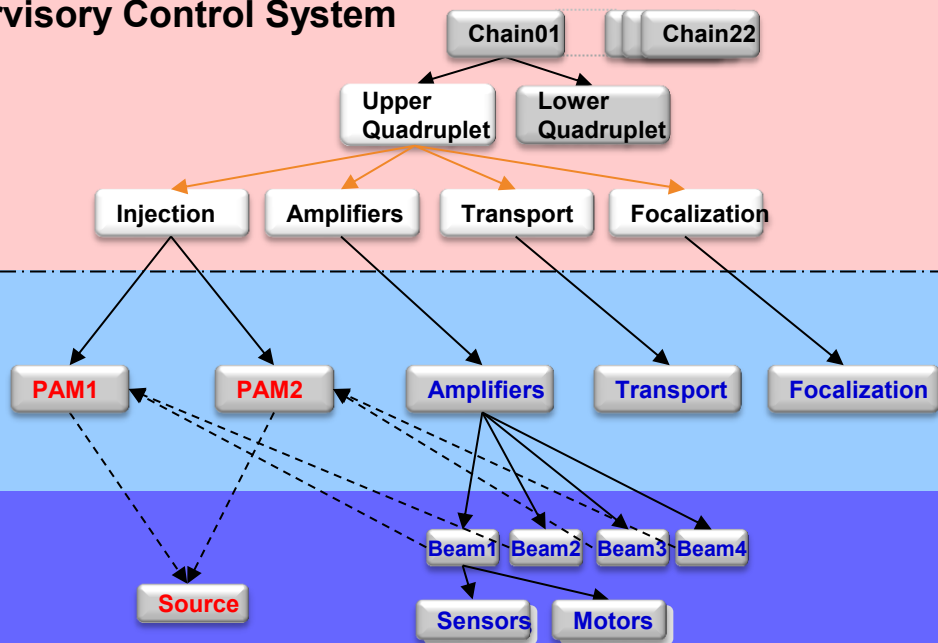
Supervisory Control System



THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

Supervisory Control System

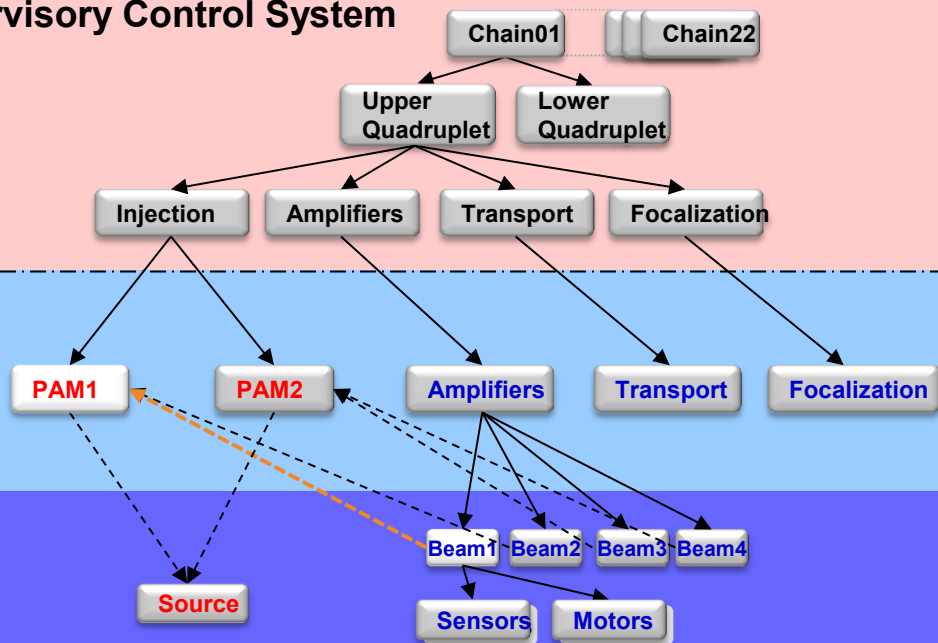


THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI

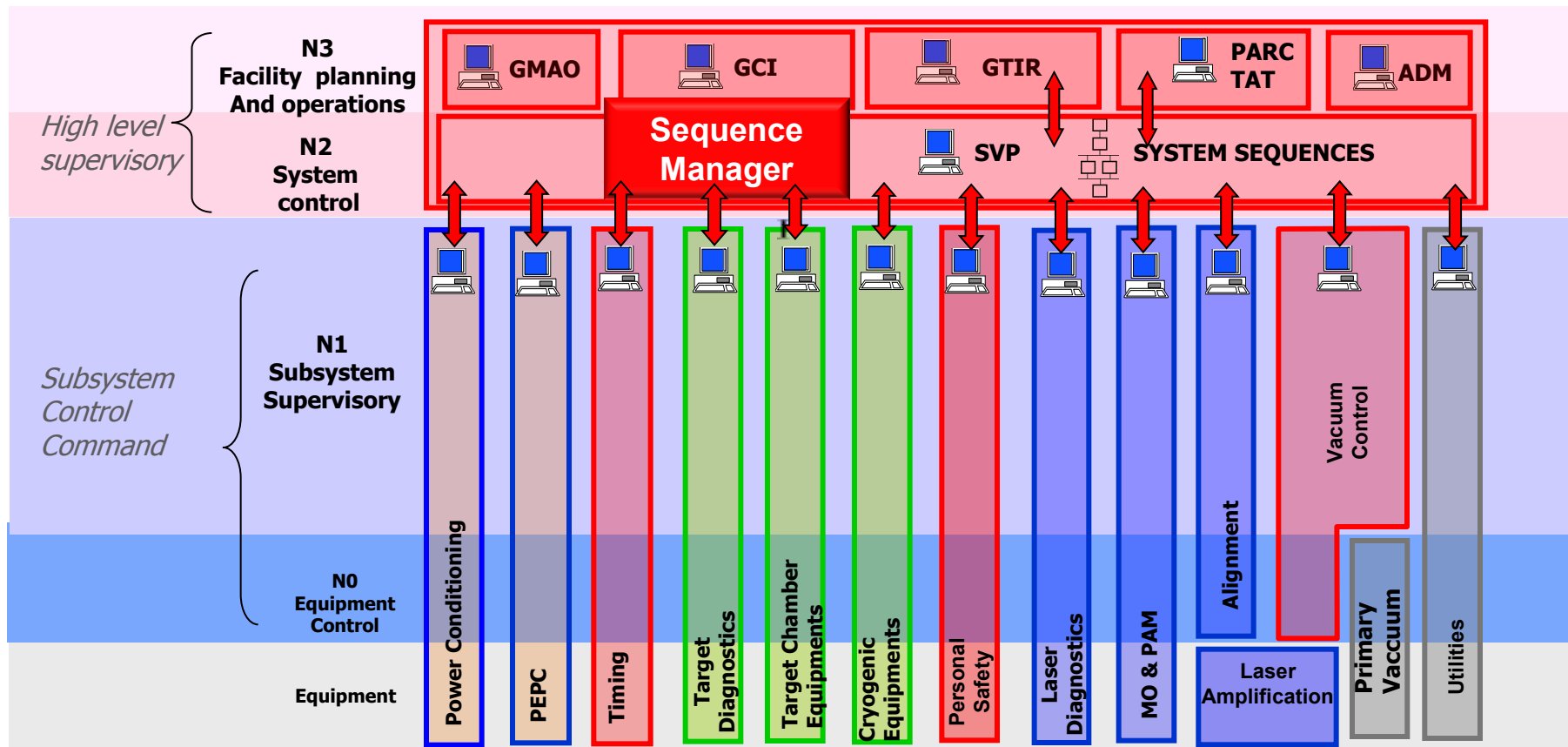
**Configuration
Manager**

Supervisory Control System



THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | ADJUSTMENTS | GRAFCETS | GUI



Common Framework Tools

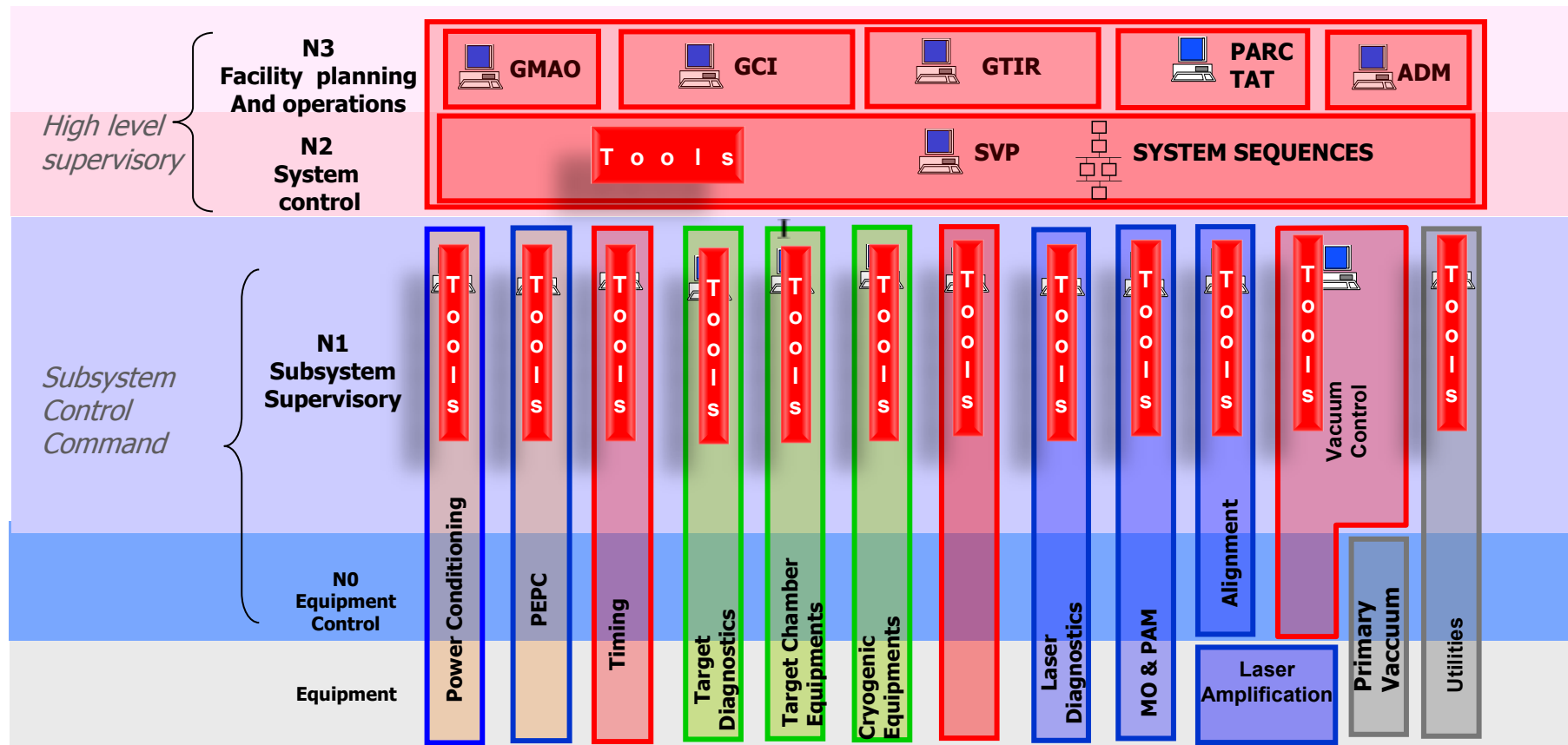
**Configuration
Manager**

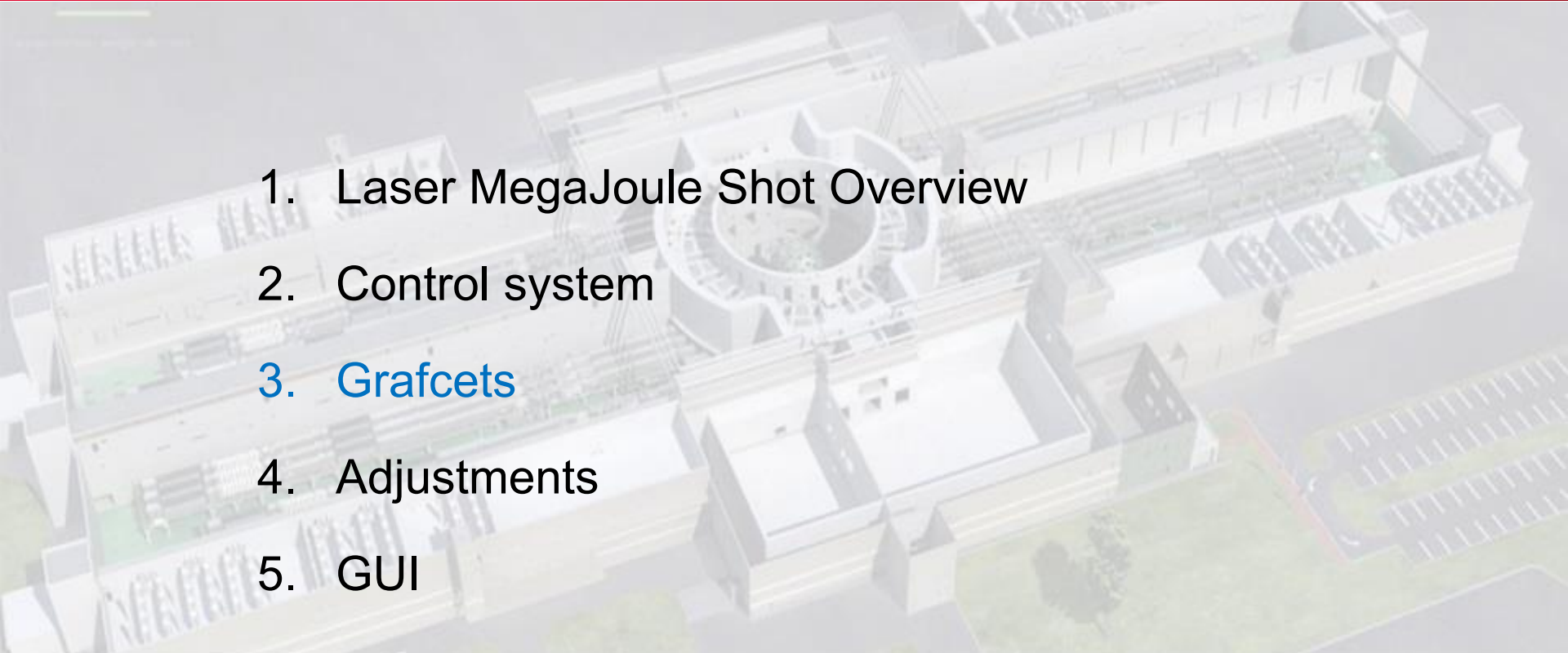
**Resource
Manager**

**Sequence
Manager**

THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | **CONTROL SYSTEM** | ADJUSTMENTS | GRAFCETS | GUI

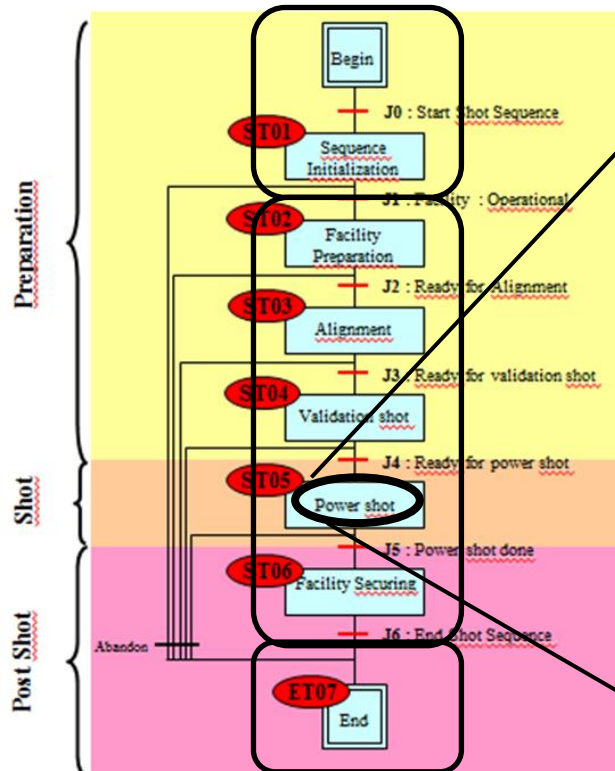


- 
1. Laser MegaJoule Shot Overview
 2. Control system
 3. **Grafcets**
 4. Adjustments
 5. GUI

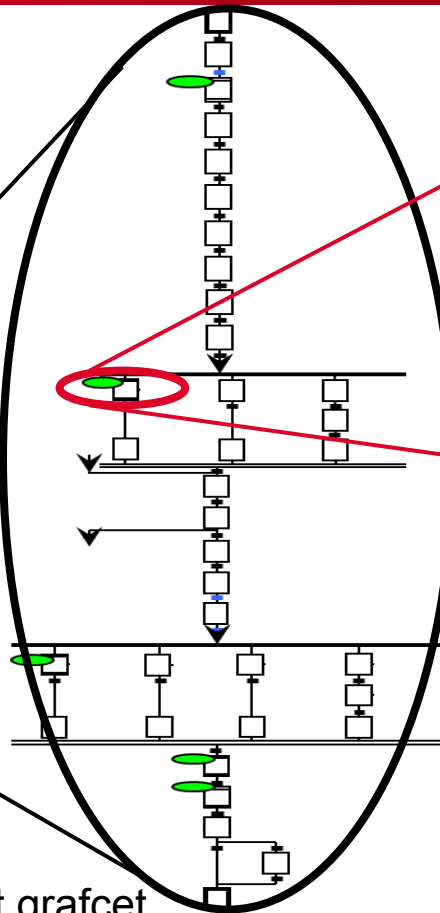
THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | **GRAFCETS** | ADJUSTMENTS | GUI

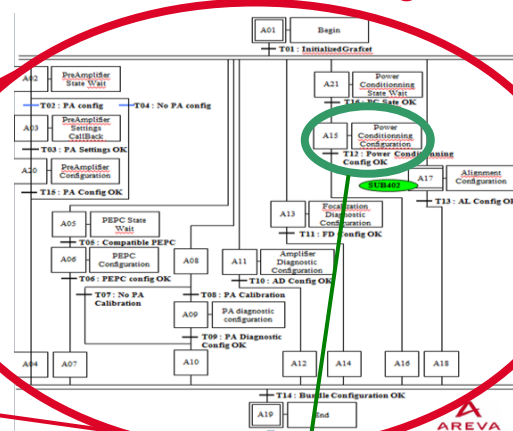
Shot sequence main grafcet



Power shot grafcet



Laser configuration grafcet



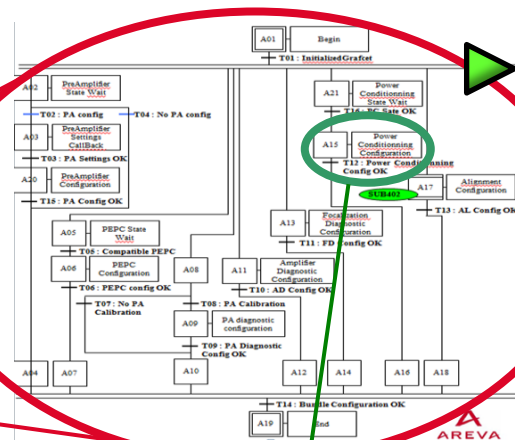
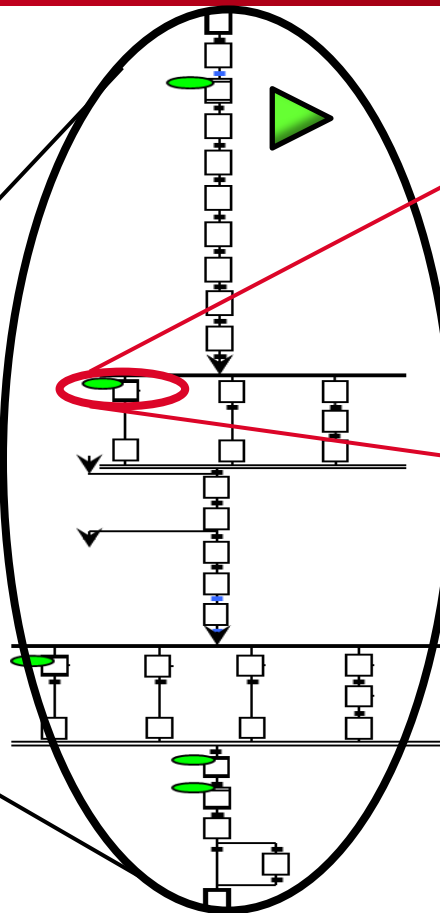
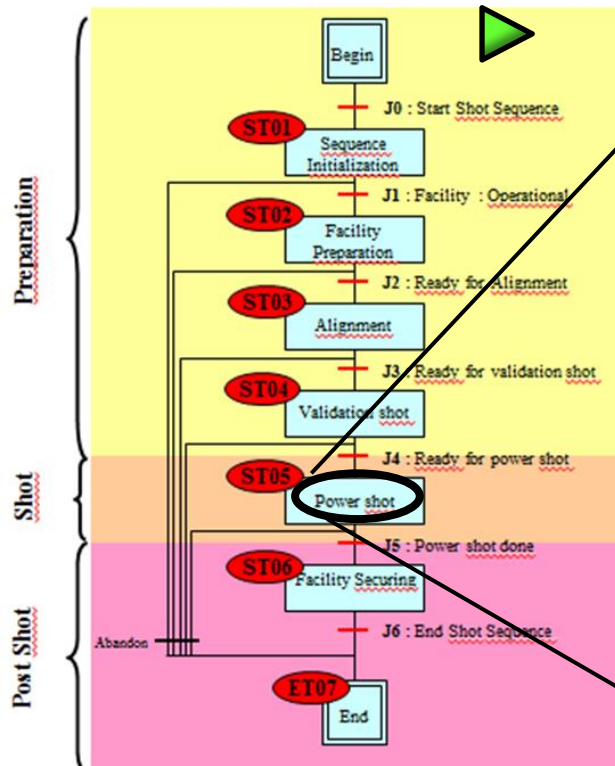
**Power Conditioning
Supervisory Function :**
Configure



THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | **GRAFSETS** | ADJUSTMENTS | GUI

Alarms



Power Conditioning Supervisory Function :

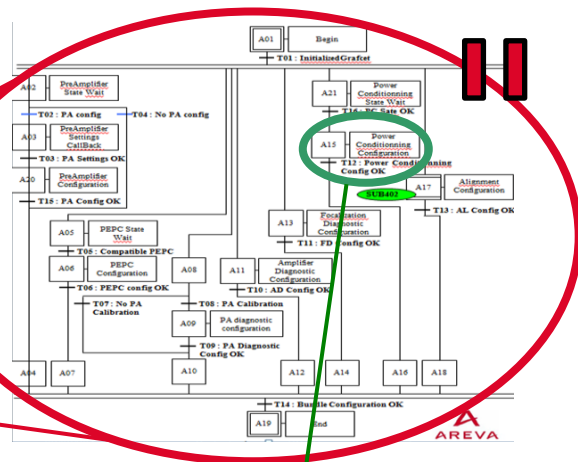
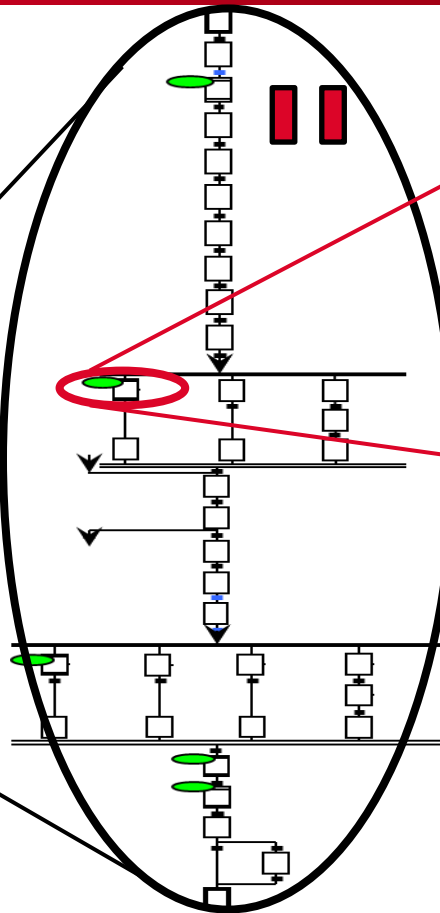
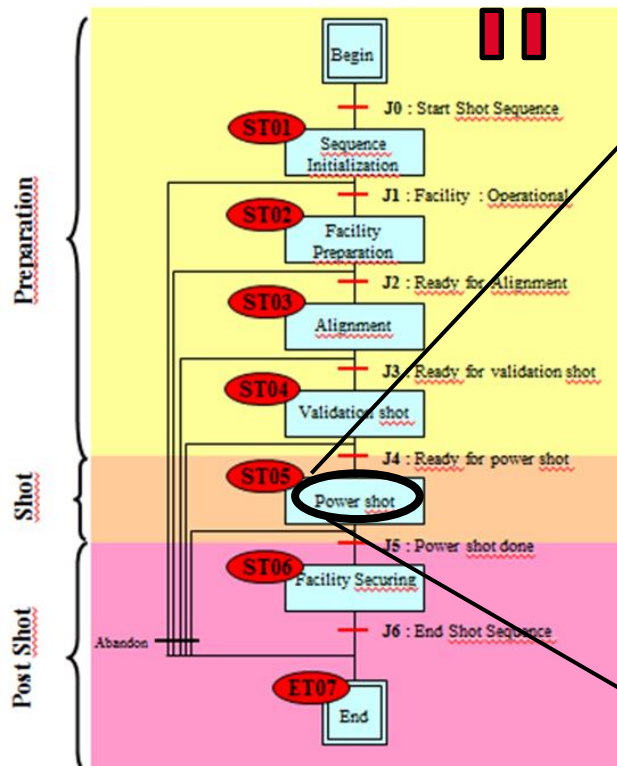
Configure



THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | **GRAFSETS** | ADJUSTMENTS | GUI

Alarms



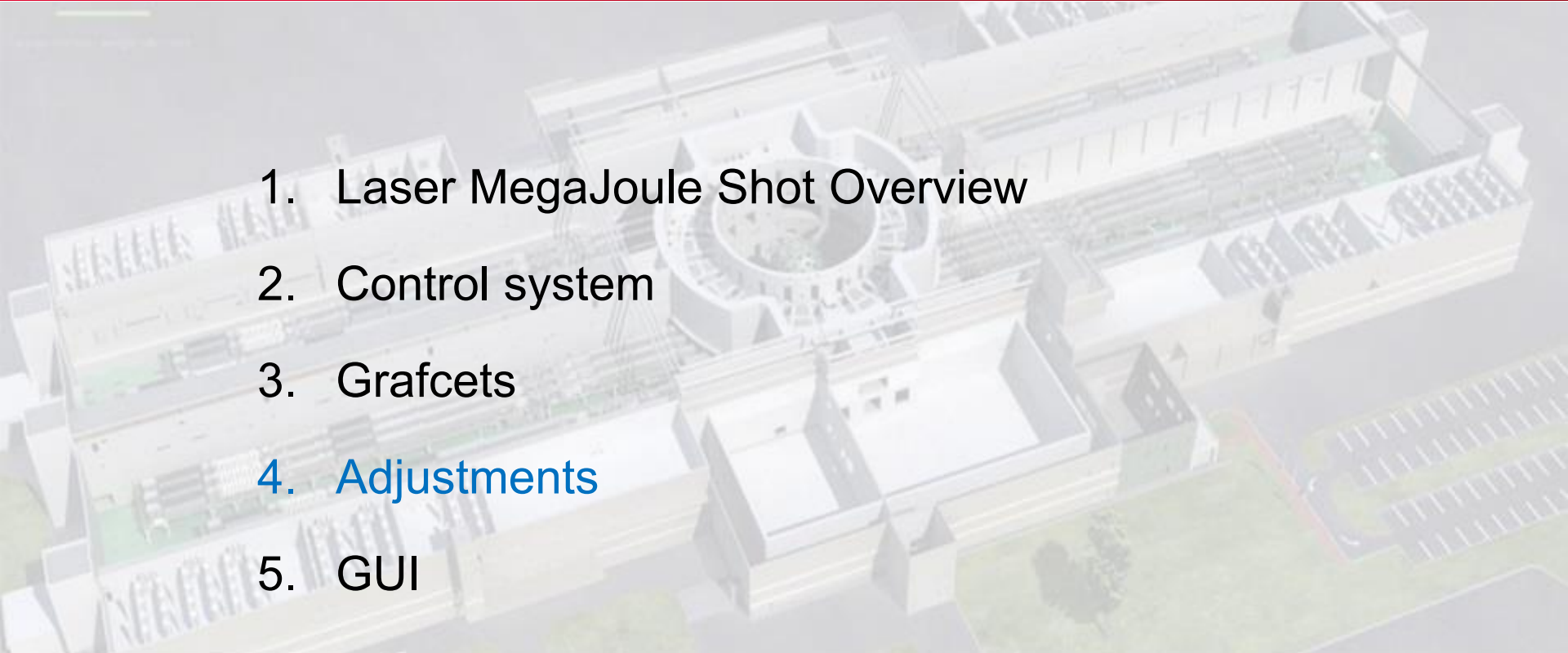
Power Conditioning Supervisory Function :



Configure

THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | **ADJUSTMENTS** | GUI

- 
1. Laser MegaJoule Shot Overview
 2. Control system
 3. Grafcets
 4. Adjustments
 5. 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

Shot
Requirements

Shot DataBase
Manager

PARC
Automatic Settings
Prediction System

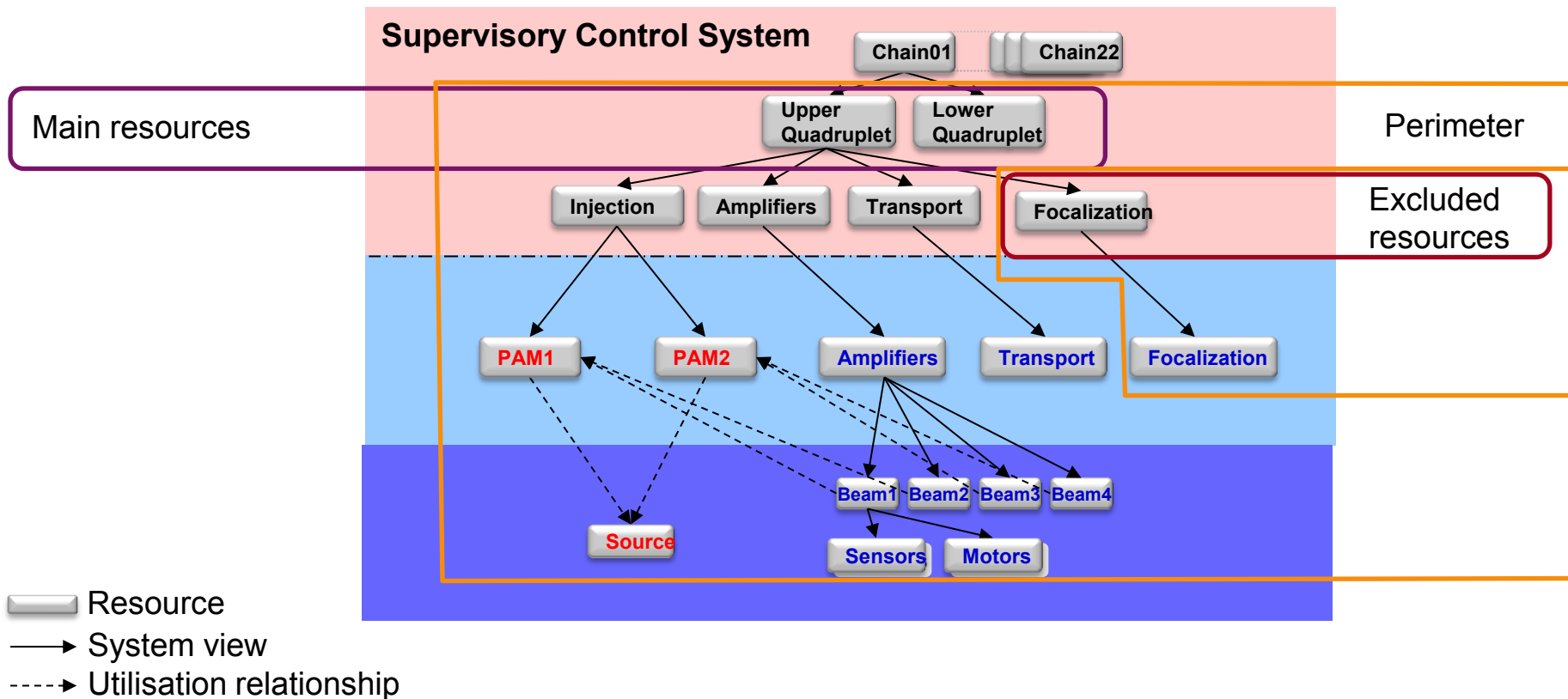
Adjustment file

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

THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

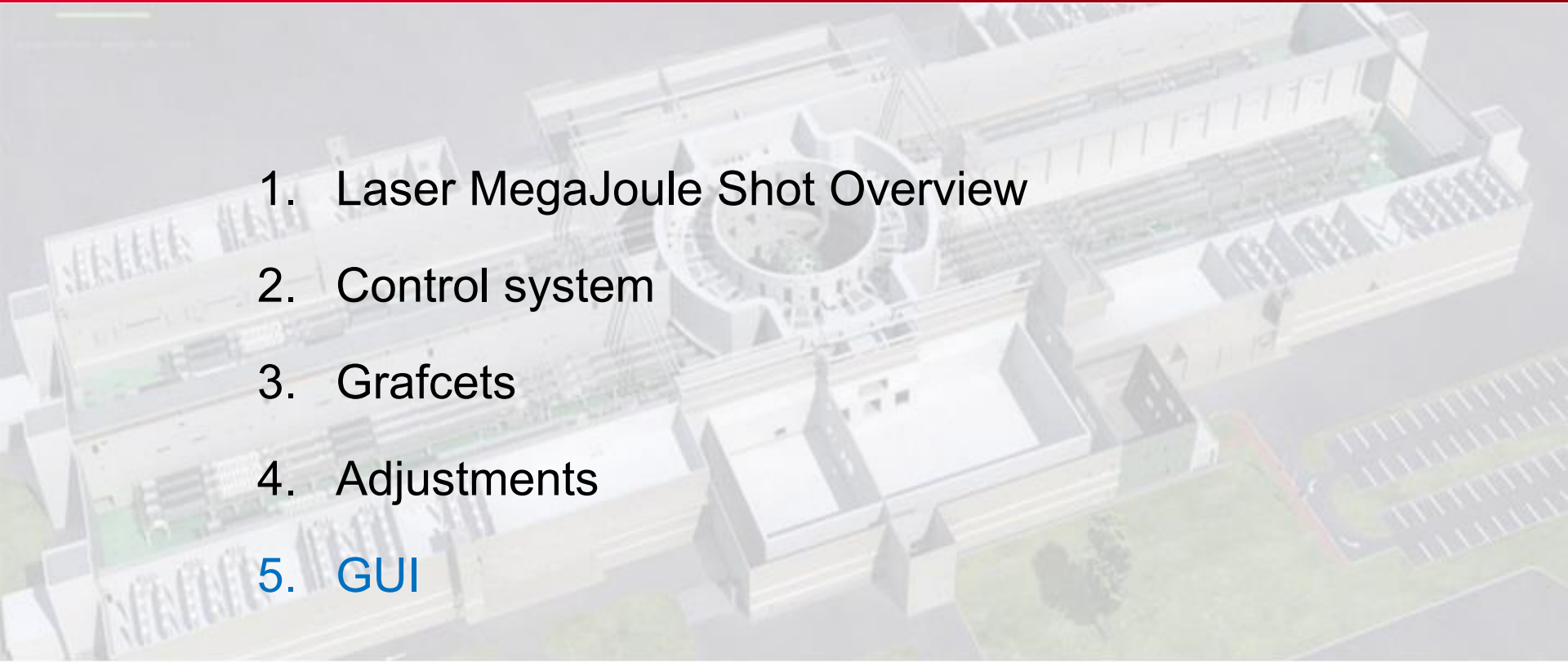
ADJUSTMENTS

SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | GUI



THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

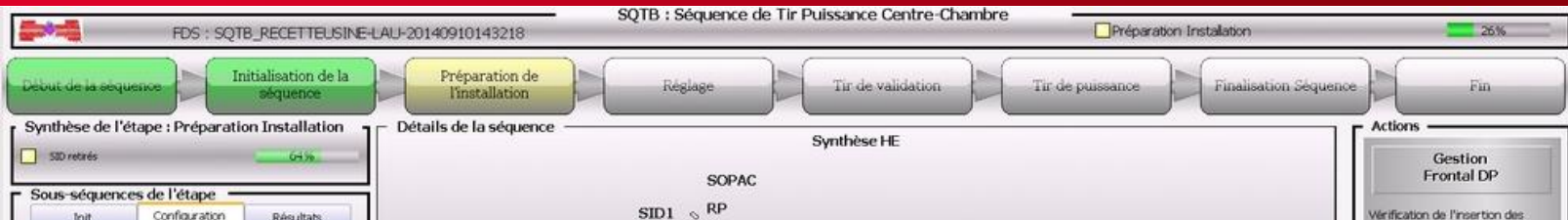
SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | ADJUSTMENTS | **GUI**

- 
- An aerial photograph of the Laser MegaJoule (LMJ) facility, showing a large complex of industrial buildings and a central circular structure. The image is faded and serves as a background for the text.
1. Laser MegaJoule Shot Overview
 2. Control system
 3. Grafcets
 4. Adjustments
 5. **GUI**



THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | ADJUSTMENTS | **GUI**



Retrait REC

- ☐ Reculer SCF
- ☐ Retirer REC
- ☐ Positionner SCF
- ☒ Positionner Point Focal SCF

Configuration Hall d'Expérience

- ☒ Charger réglages DP pour SID
- ☒ IHM Retrait DPMS et Téléc DP par SID
- ☒ Retrait SID non utilisés
- ☒ Insérer SID
- ☒ IHM Demande Insertion SID utilisés
- ☒ Remplacer PCNC par PR
- ☐ IHM Déploiement des télescopes DP utilisés
- ☐ Attente fin relaxation inserteurs
- ☐ Positionner RC
- ☐ Déplacer RC dans RTR
- ☐ Déplacer SID dans RTR
- ☐ IHM Demande de mesure Flèche

Sid01

2	☒	Sid02	Insérer
3	☒	Sid03	Insérer
4	☐	Sid04	
5	☐	Sid05	
6	☒	Sid06	Insérer
7	☒	Sid07	Insérer
8	☒	Sid08	Insérer
9	☒	Sid09	Insérer
10	☐	Sid10	
11	☐	Sid11	
12	☐	Sid12	
13	☐	Sid13	
14	☐	Sid14	

THE LMJ SYSTEM SEQUENCES ADAPTABILITY :

SHOT OVERVIEW | CONTROL SYSTEM | GRAFCETS | ADJUSTMENTS | GUI | **SUMMARY**

- Grafcet 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.