



The CNGS Target Handling Tests

Presented by **L. Bruno**

AB/ATB

**Experimental Areas, Targets
and Secondary Beams Group**

The CNGS Target Station
The CNGS Target Team



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The CNGS Target Handling Tests



OUTLINE

1. Procedures & Handling Equipment
2. Example 1: Switch exchange
3. Example 2: Collimator handling
4. Example 3: Target removal
5. Summary

Documentation

A quality assurance requirement



CERN
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CNGS

CNGS Project Document No.
CNGS-2006-04-

CERN Div./Group or Supplier/Contractor Document No.
AB/ATB

EDMS Document No.
706471

Date: 15/08/06

Test Procedure

CNGS TARGET HANDLING

Abstract

This document is meant to be the reference document for the commissioning tests and operation of the CNGS target handling system. All required target sub-systems for these tests must be previously checked in stand-alone mode and operational. All related CNGS systems (remotely-operated crane, cameras, lighting system, transport vehicles) are required to be in place and functional. Under these assumptions, this document defines the conditions required to start handling the target sub-assemblies, those required during the procedure in detail for each single handling step and those which determine its successful completion.

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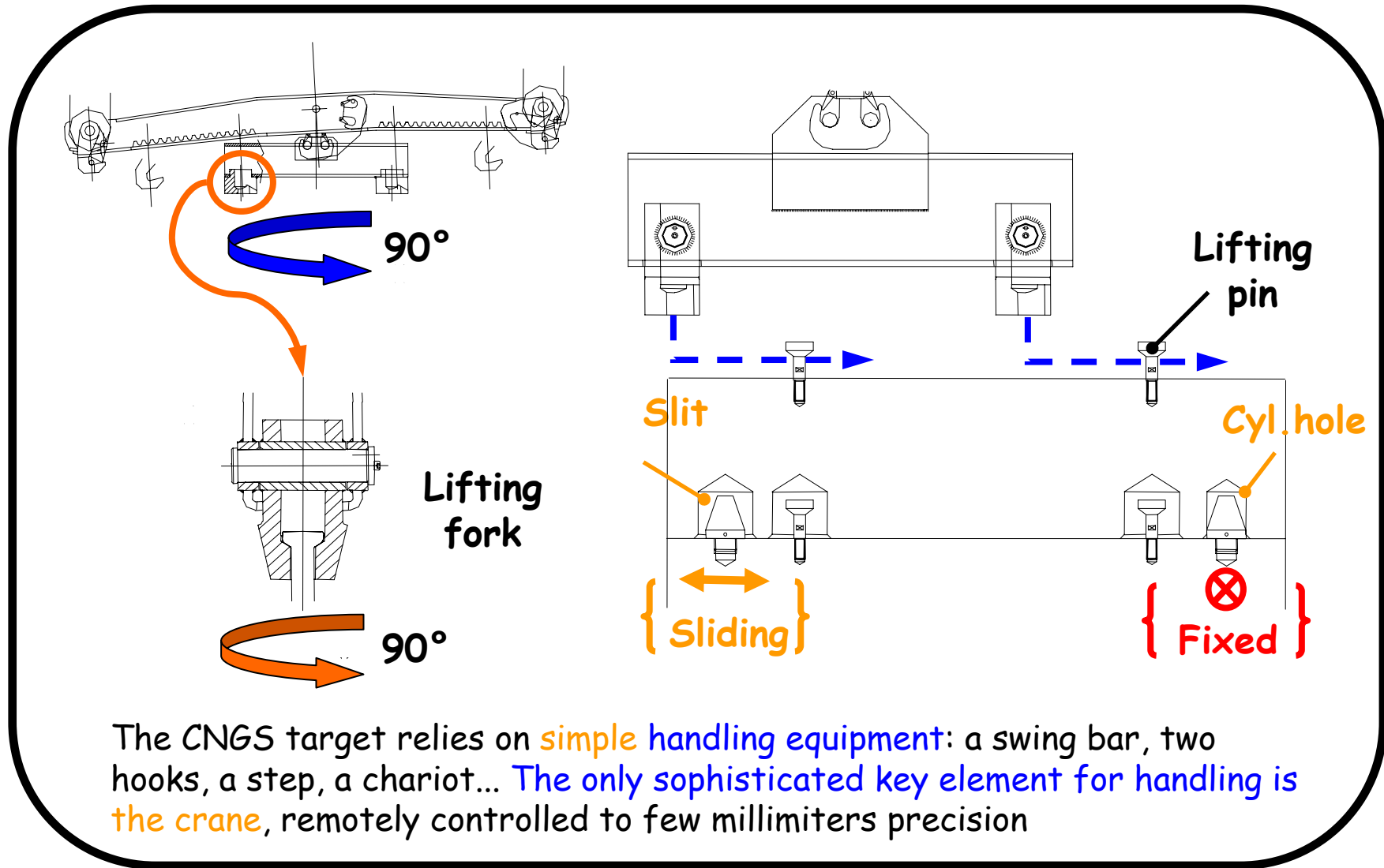
The CNGS project has greatly profited from the LHC knowledge and tools in quality assurance. In particular,

The **Engineering Data Management System (EDMS)** in particular has helped in checking, publishing and sharing reliable information throughout the CNGS project.

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Lifting equipment



The CNGS target relies on **simple handling equipment**: a swing bar, two hooks, a step, a chariot... **The only sophisticated key element for handling is the crane**, remotely controlled to few millimeters precision

Target magazine exchange 1/2

(Courtesy of S.Roesler - CERN SC-PP)



Handling steps

1. Install lights (1)
2. Disengage motorization shafts (1)
3. Disconnect cables on patch panel (1)

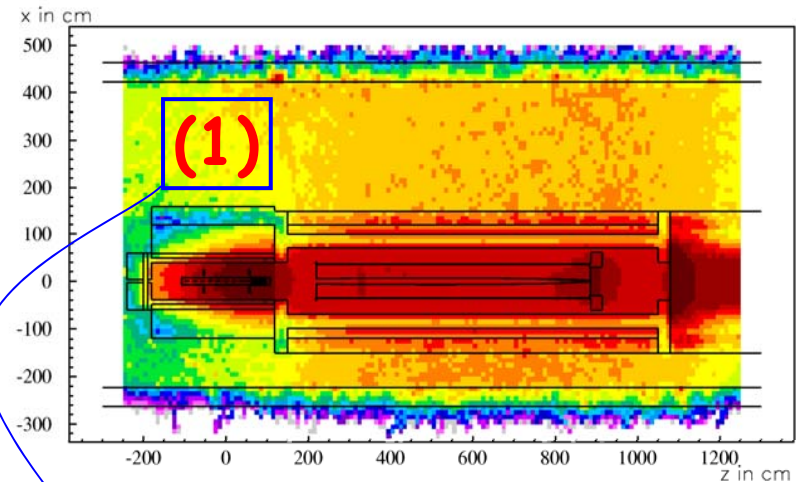
Remote

4. Open shielding cap
5. Lift target magazine with crane and transport to trailer
6. Close shielding cap
7. Move trailer to radioactive storage chamber
8. Transport of new target magazine
9. Open shielding cap
10. Lift new target magazine into target station
11. Close shielding cap

12. Open shielding plugs, insert alignment bars and place spheres (1)

Remote

13. Observe alignment spheres and adjust position
14. Remove spheres and alignments bars, close shielding plugs (1)
15. Engage motorization shafts (1)
16. Connect cables on patch panel (1)
17. Remove lights (1)



Residual Dose Equivalent Rate (mSv/h)

200 days irradiation, 1 day cooling

8×10^{12} protons/s

Dose Rate (μ Sv/h)

1 day	30494
1 week	470
1 month	254
2 months	190
4 months	149
6 months	124

Target magazine exchange 2/2

(Courtesy of S.Roesler - CERN SC-RP)

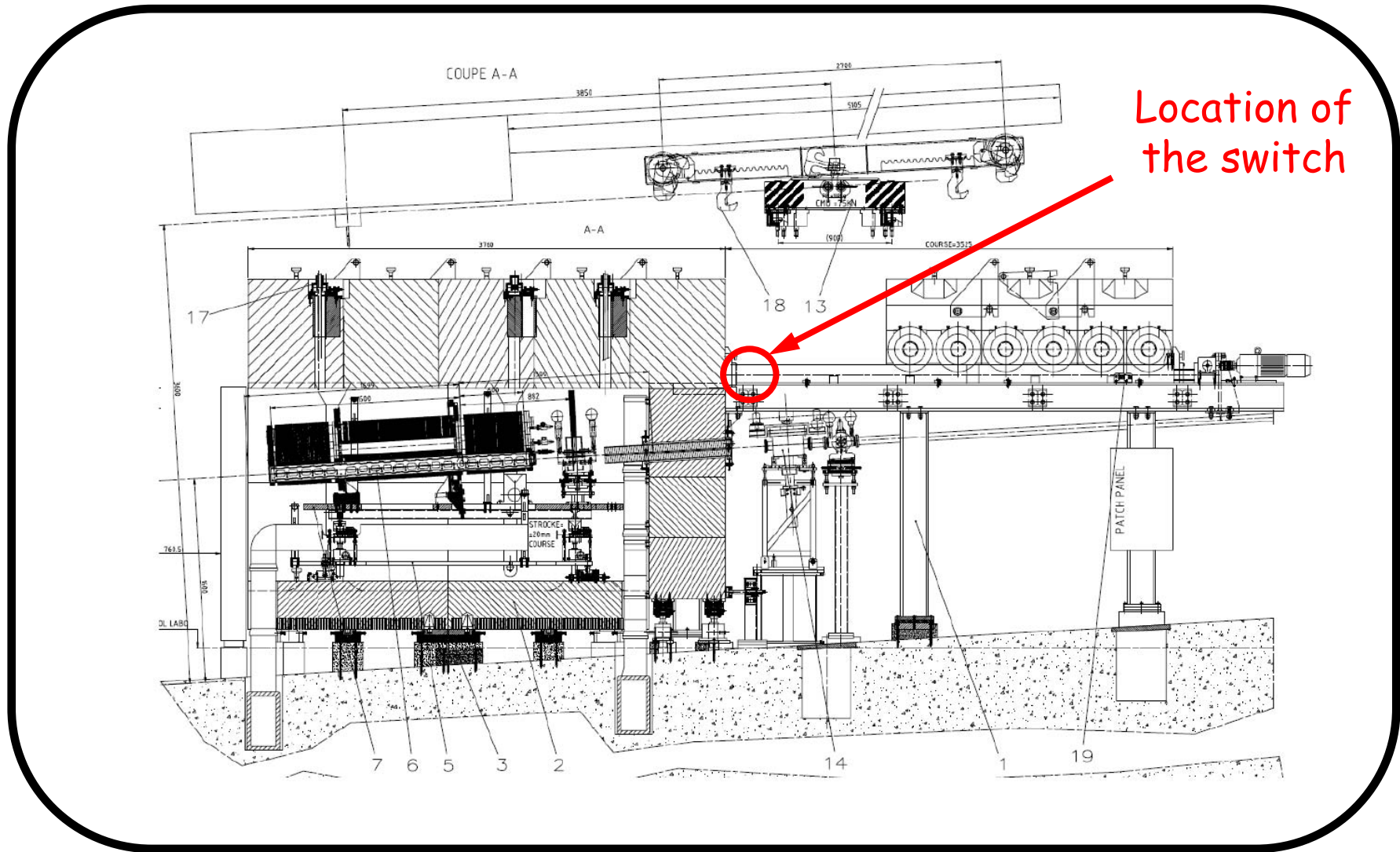


Intervention step	Duration (min)	Location	Accumulated		
			ld [μSv]	lw [μSv]	lm [μSv]
Install lights	1.	1	508	7	4
Disengage motorization shafts	5.	1	2541	39	21
Disconnect cables on patch panel	2.	1	1016	15	8
Open shielding cap	-	remote	0	0	0
Lift target magazine with crane...	-	remote	0	0	0
Close shielding cap	-	remote	0	0	0
Move trailer to radioactive storage chamber	-	remote	0	0	0
Transport of new target magazine	-	remote	0	0	0
Open shielding cap	-	remote	0	0	0
Lift new target magazine into target station	-	remote	0	0	0
Close shielding cap	-	remote	0	0	0
Open shielding plugs, insert alignment bars...	2.	1	1016	15	8
Observe alignment spheres and adjust position	-	remote	0	0	0
Remove spheres and alignments bars, ...	1.	1	508	7	4
Engage motorization shafts	5.	1	2541	39	21
Connect cables on patch panel	5.	1	2541	39	21
Remove lights	1.	1	508	7	4
Total:			11181	172	93

Checked by handling tests

CERN design criterion :
2 mSv/person/intervention

Change of a switch



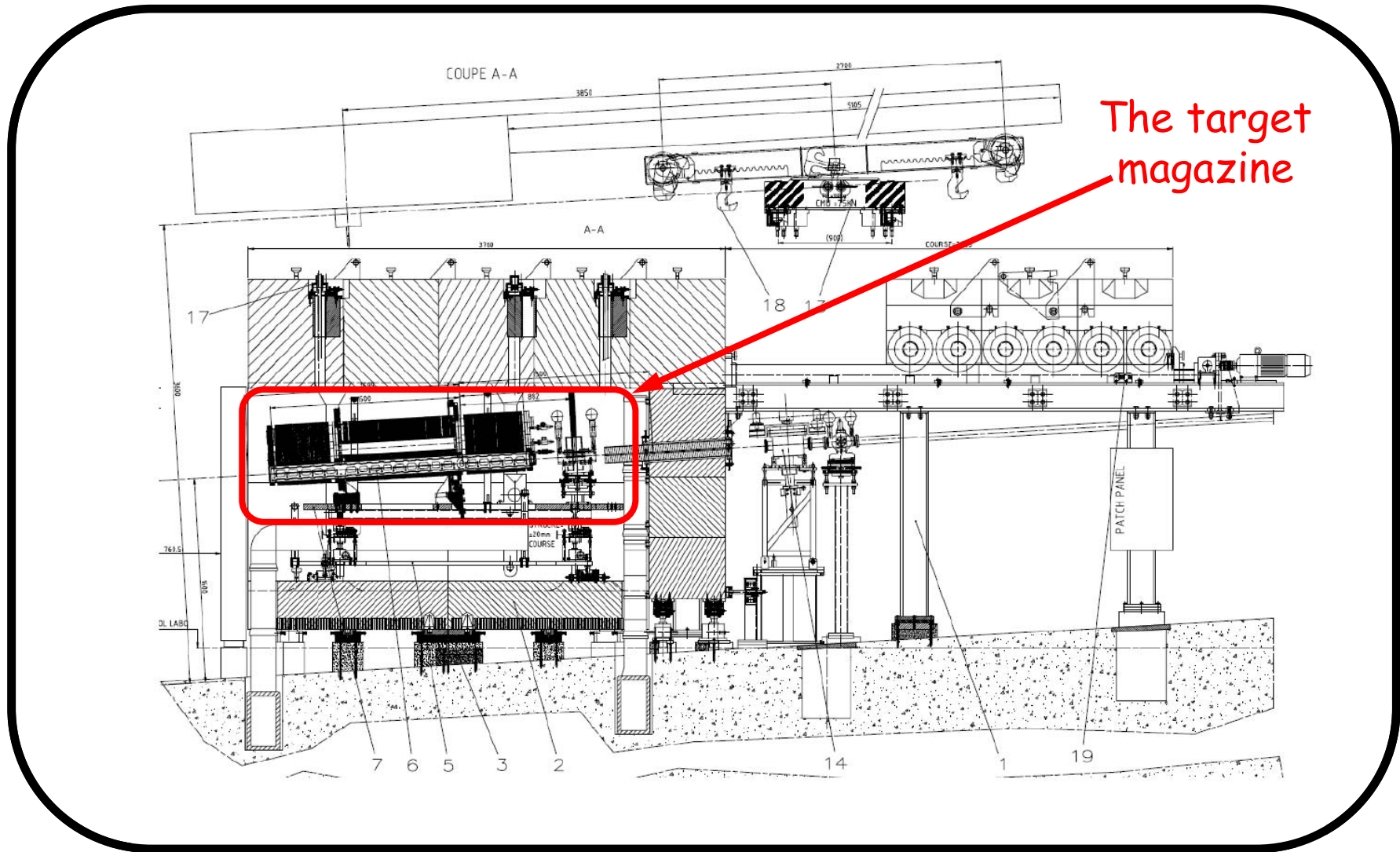
Change of a switch



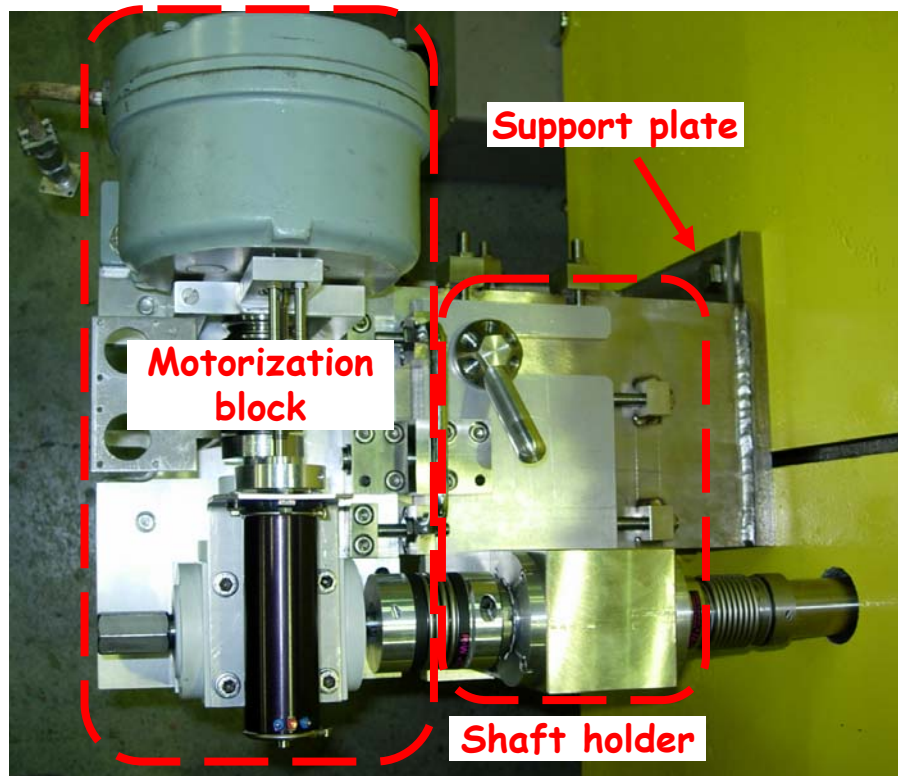
Handling the Collimator



Removing the target magazine



Alignment Motorization Assembly



Each motorization block is mounted together with a shaft holder on a support plate fixed to the shielding. The motorization and the holder can be easily (de)mounted (< 60 sec) for maintenance.

Removing the target magazine



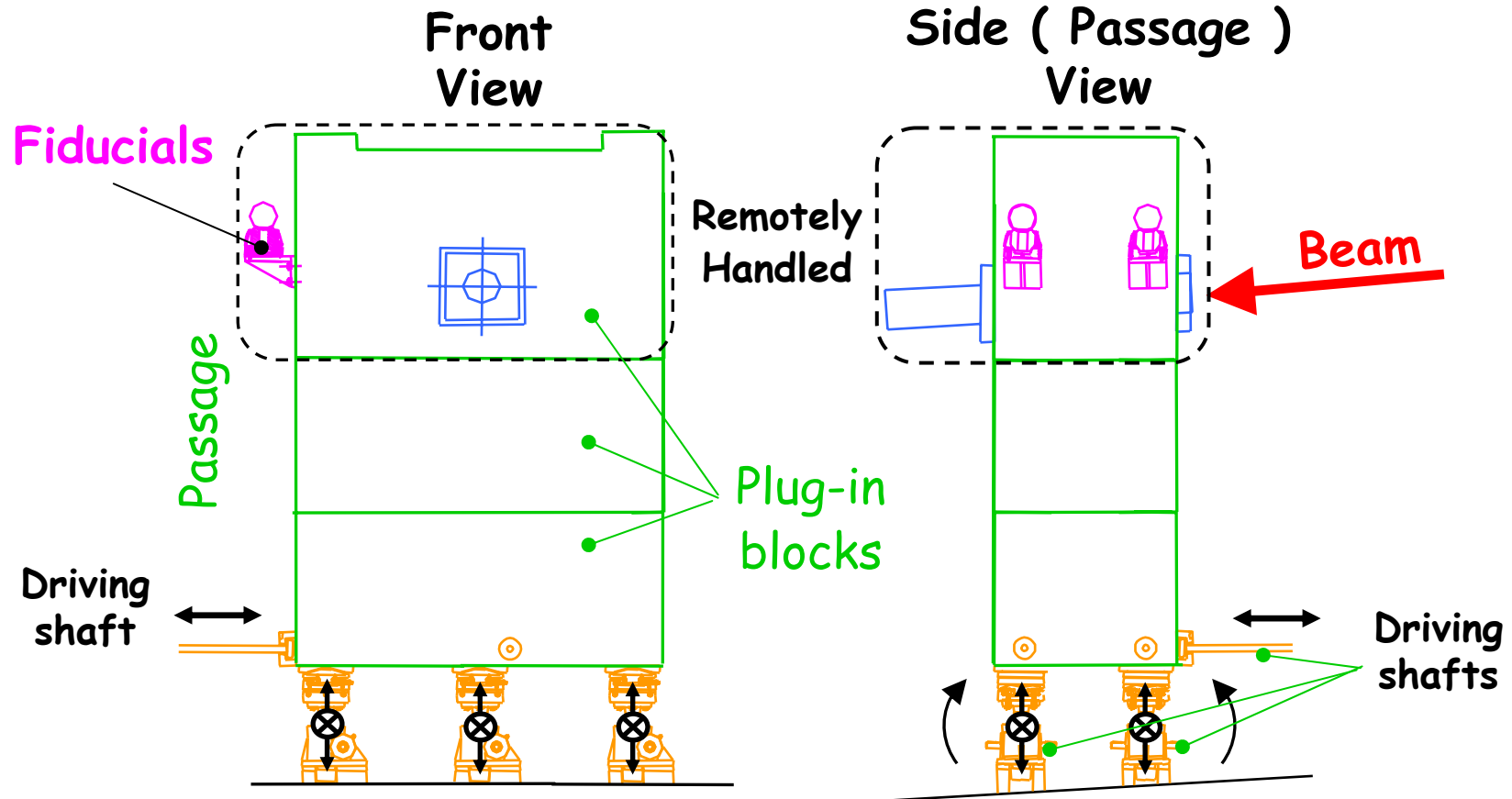
Summary

The project has delivered...



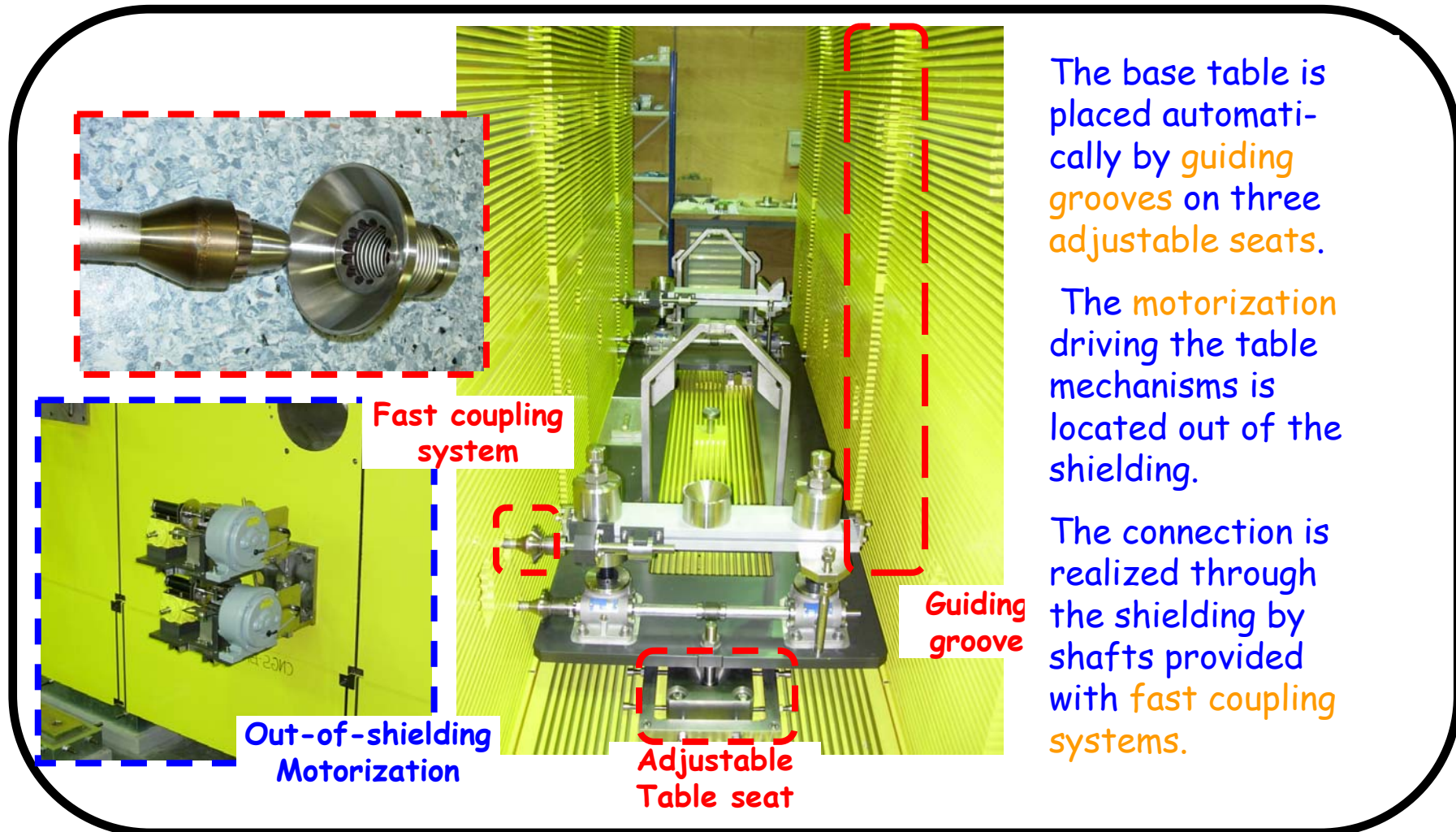
- **A new operational target station**
 - **Complying with** the specifications at **"ultimate"** beam intensity;
 - **Successfully tested** (mechanics, electronics, in local and remote);
- **Spare sub-assemblies**
 - A complete **spare target** assembly ("base+alignment tables");
 - A double of all **motorizations** and **potentiometers**;
 - A double of electronic components (**rack, cables**);
- **A set of tools to maintain it**
 - "Hardware" tools (handling, alignment, transport, testing);
 - "Software" tools (detailed procedures for testing and handling);
- **Trained personnel to operate the target**
 - **Preventive and exceptional maintenance**
4 technicians (2 Mech. + 2 Electr)
 - **Alignment** (2 Geometers);
 - **Remote operation** (1 Engineer);
 - **Radiation protection** (2 Technician);
 - **Handling** (2 crane/transport operators).

Handling the Collimator (the "Baffle")



The front shielding is conceived as an **independent, precisely aligned block**. The collimator is **fixed** to the topmost **plug-in block**, which is exchanged in case of need.

The base table



The base table is placed automatically by **guiding grooves** on three **adjustable seats**.

The **motorization** driving the table mechanisms is located out of the shielding.

The connection is realized through the shielding by shafts provided with **fast coupling systems**.