FoCal Detector Lifting Frame on behalf of ALICE-FoCal

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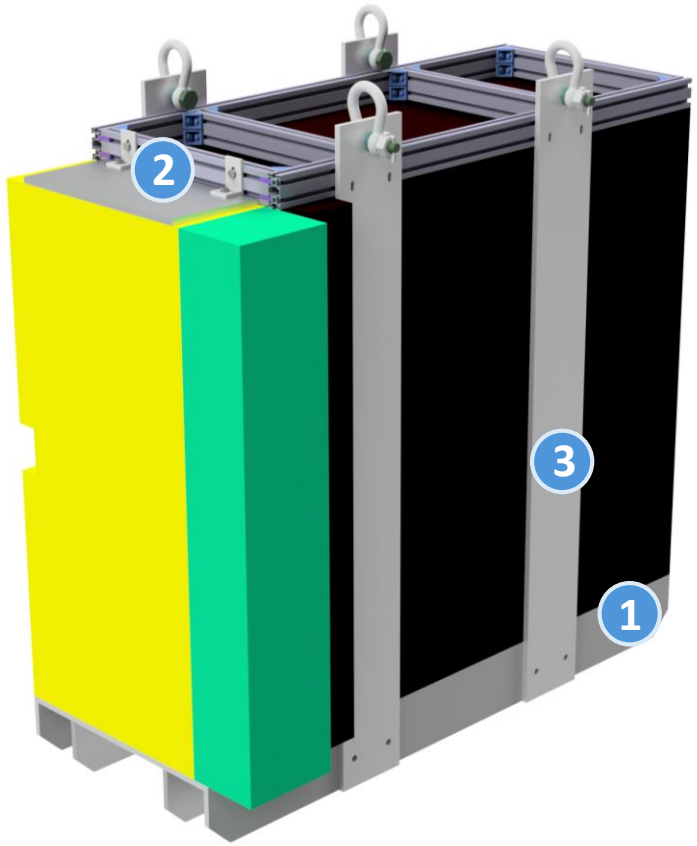
Main aims and objectives of the project

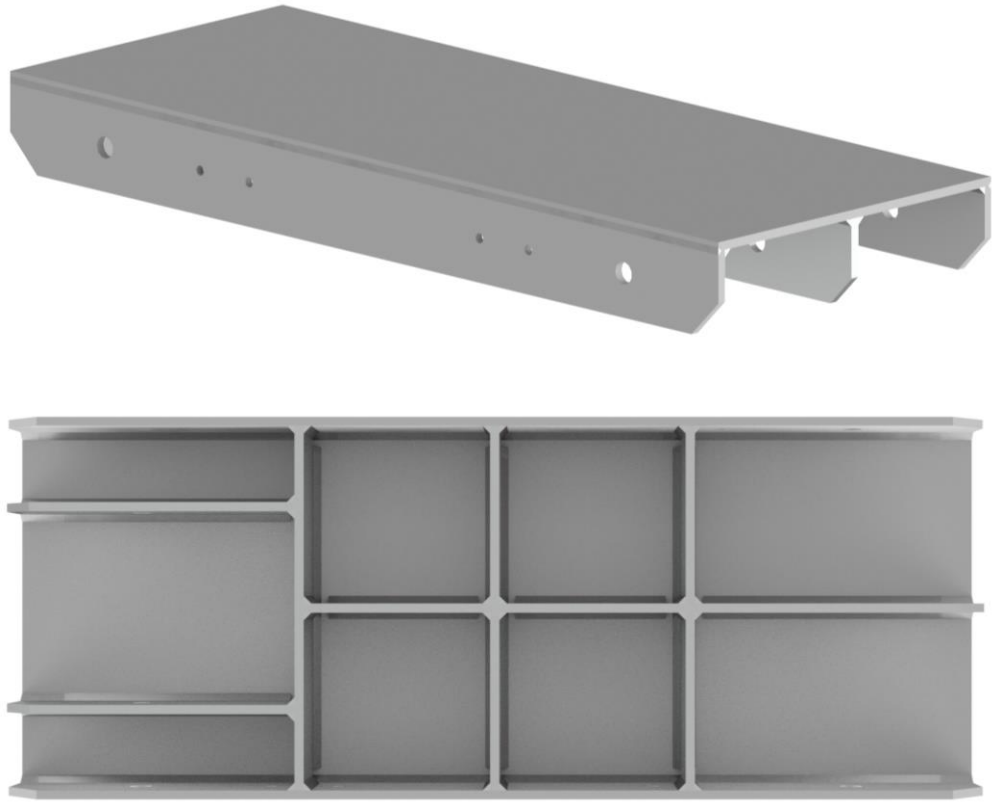
- An optimal design must be made to enable the detector to be carried and to allow for the installation of other components
- Structure must carry a load of 7 tons [Source: *Technical Design Report of the ALICE Forward Calorimetr*]
- Strive to minimize mass
- During lifting, the force must be transmitted axially upward, without introducing torsional torque into the structure
- Rules should be created for standardized naming and numbering of all detector parts
- There should be a document describing the procedure for placing the detector in final position

Structure description



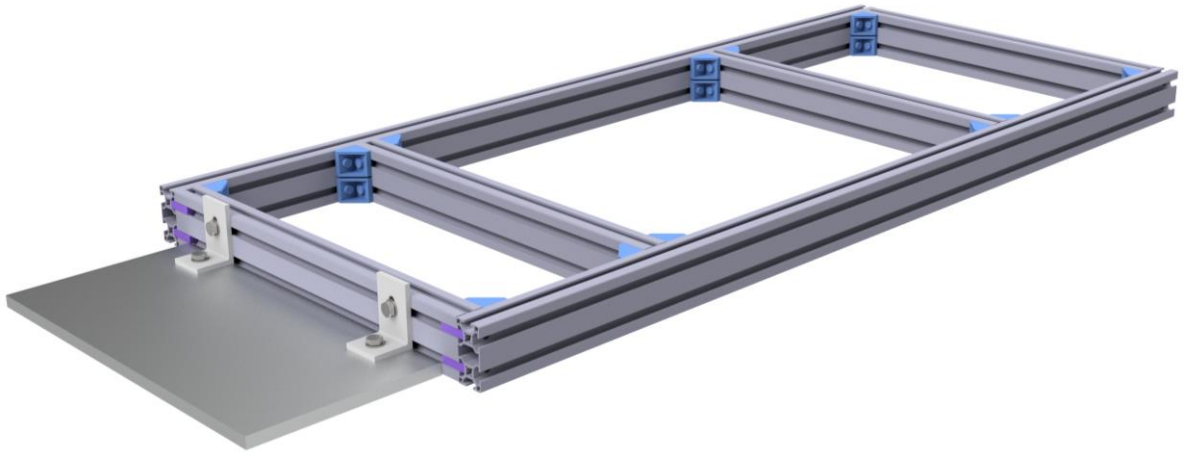
- The design is intended to allow the detector to be moved to it’s target location
- It can be divided into 3 main components: Support platform (1), Top Box (2) and Side Panels (3)
- The design is identical for both halves of the Detector
- Proper calculations and simulations have been made

Support platform



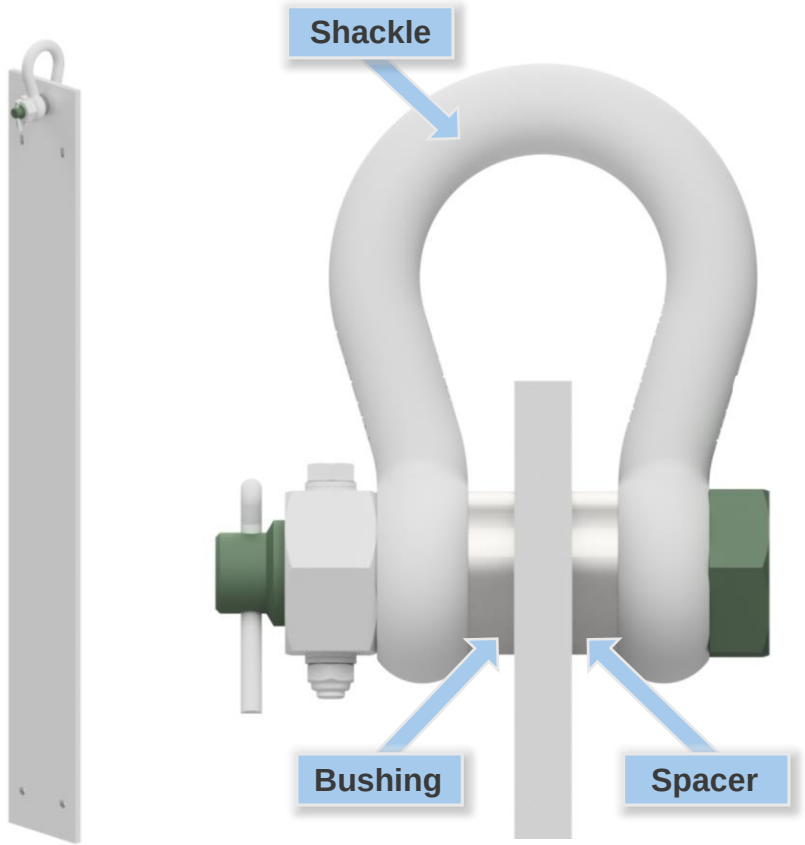
- Support platform consist of a plate, walls and ribs welded toghether
- Side panels are connected to the platform with M12 grade 8.8 bolts - the relevant calculations have been made
- Holes are provided in the walls to allow access to the positioning system

Top Box



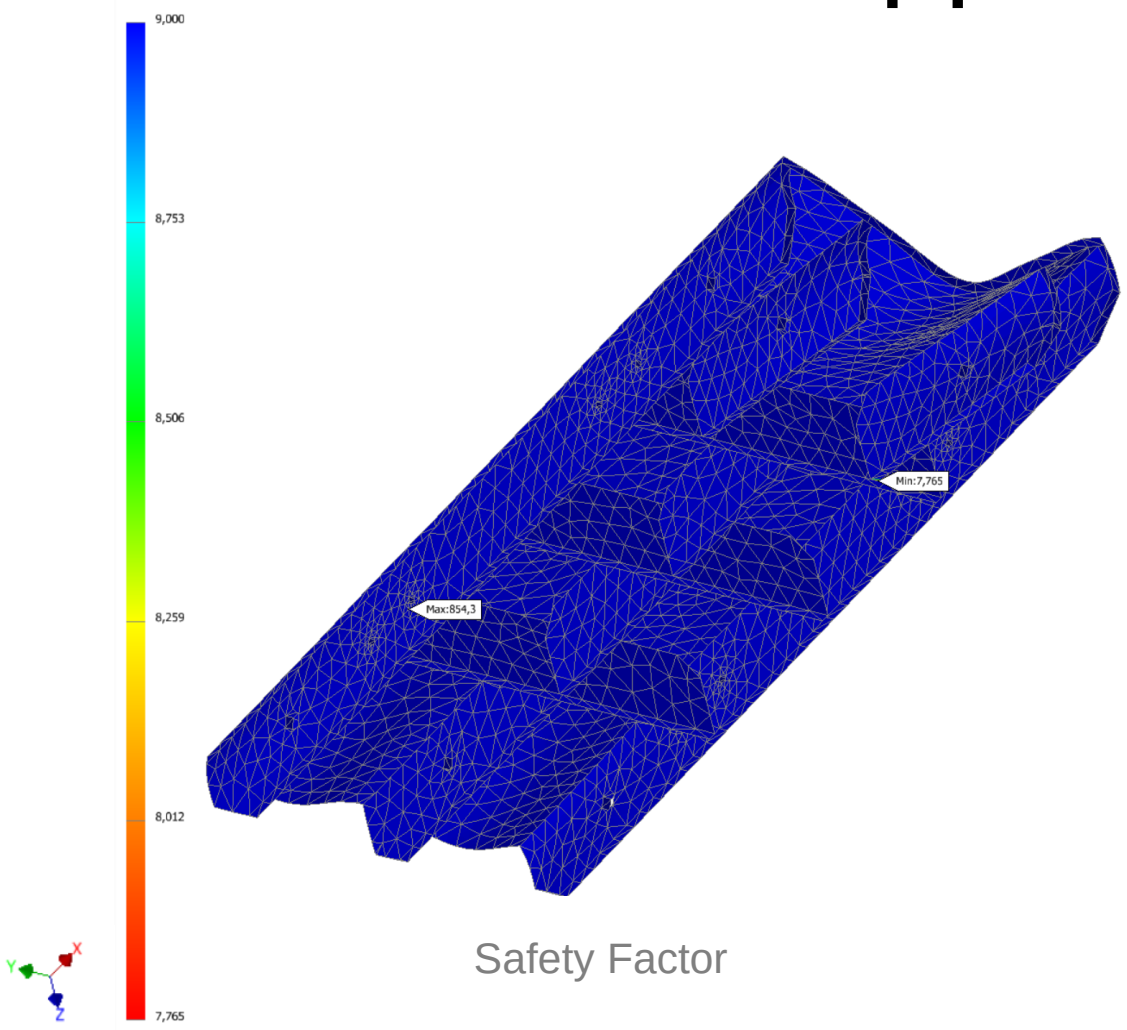
- Top box consist of aluminium profiles with dimensions of 30x60 mm
- The plate, which is tightened with angle brackets, is to allow the mounting of FoCal-E
- The design of the frame is intended to ensure easy attachment of side panels and that additional components are easily installed

Side Panels



- Four panels connect Top Box and Support Platform with bolt connections
- Shackles have been provided for lifting the detector
- Carbon steel flange bushings and spacers have been used to reinforce the material at the hole site

Simulations – Support Platform



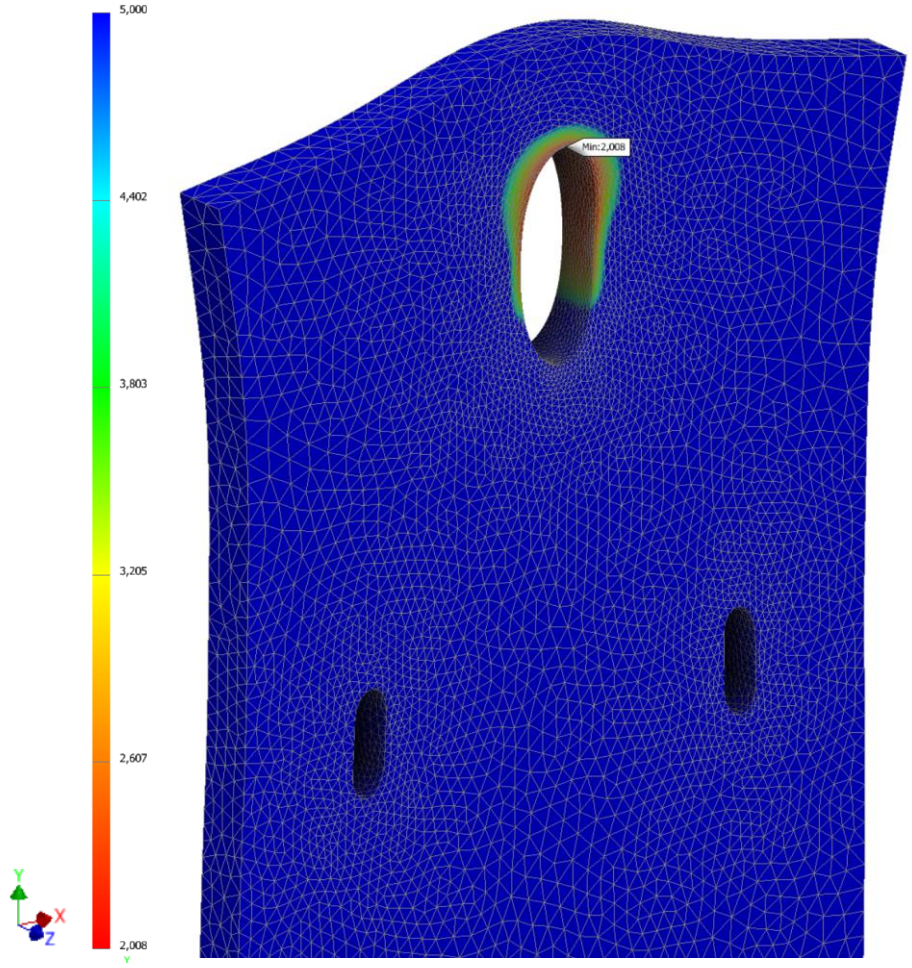
Safety Factor

Simulation assumptions:

- Surface load equal to 68670 N
- Force applied along the z-axis
- Locking movement in the z-axis

Maximum stress value – 36.042 Mpa
Maximum displacment value – 0.113 mm
Minimal safety factor value – 7.76
Component can work under given load with big safety margin.

Simulations – Side panels without bushing



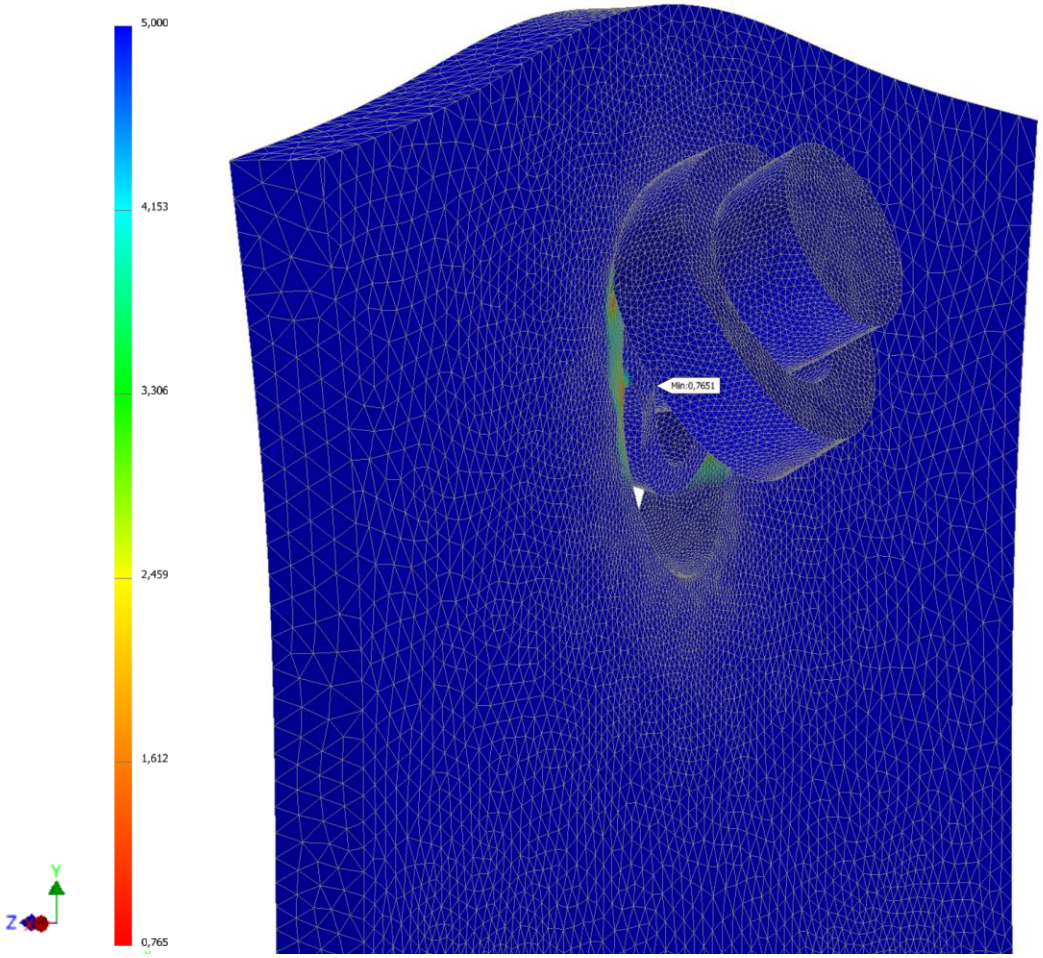
Safety Factor

Simulation assumptions:

- Surface load equal to 17167.5 N
- Bearing force applied along the y-axis, positively directed
- Locking movement in the z-axis

Maximum stress value – 110.2 MPa
Maximum displacment value – 0.07 mm
Minimal safety factor value – 2.008
Average safety factor value – 5
Component can work under given load, reinforcment bushing may not be needed.

Simulations – Side panels with the bushing



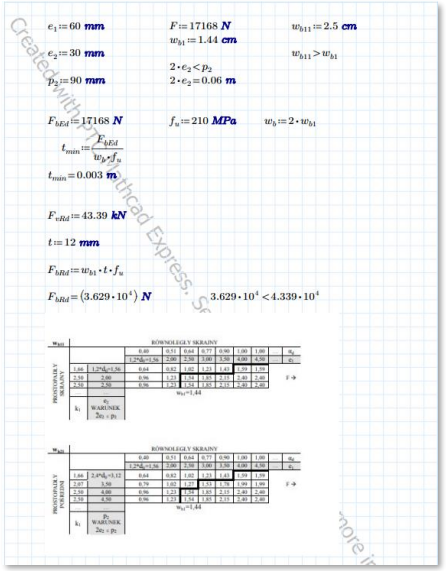
Safety Factor

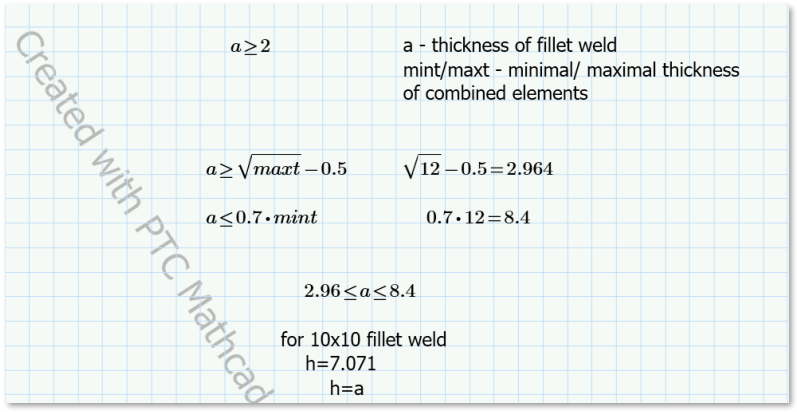
Simulation assumptions:

- Surface load equal to 17167.5 N
- Bearing force applied along the y-axis, positively directed
- Locking movement in the z-axis

Maximum stress value – 455.8 Mpa
Average stress value – 150 MPa
Maximum displacment value – 0.074 mm
Minimal safety factor value – 0.7651
Average safety factor value – 5
Component can work under given load. The use of reinforcement does not significantly increase mechanical properties.

Calculations





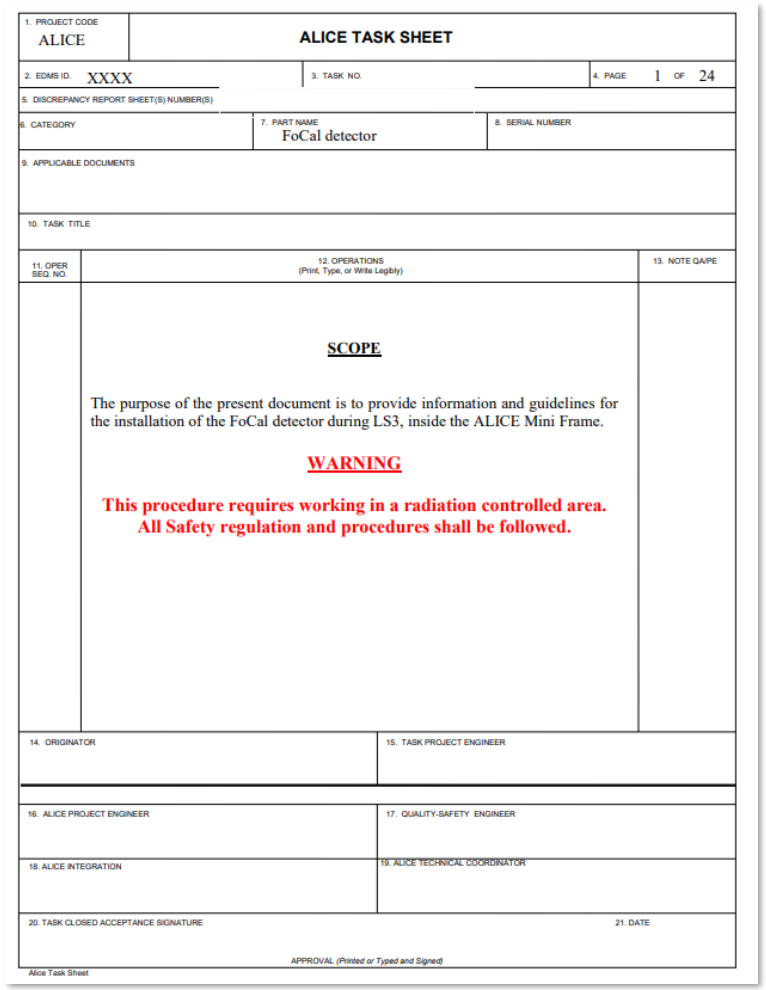
Bolt capacity calculations:

- Thickness of the parts - 12 mm
- Assumed 1/4 load per side panel
- There are 2 bolts per panel
- M12 grade 8.8 bolts have been selected

Fillet weld thickness calculations:

- Thickness of the parts - 12 mm
- The thickness of the weld must be within < 2.96;8.4 >
- A fillet weld of 10x10 was adopted

FoCal task sheet



1. PROJECT CODE: ALICE

ALICE TASK SHEET

2. EDMS ID. XXXX | 3. TASK NO. | 4. PAGE 1 OF 24

5. DISCREPANCY REPORT SHEET(S) NUMBER(S)

6. CATEGORY | 7. PART NAME: FoCal detector | 8. SERIAL NUMBER

9. APPLICABLE DOCUMENTS

10. TASK TITLE

11. OPER SEQ. NO.	12. OPERATIONS (Print, Type, or Write Legibly)	13. NOTE QA/PE
	SCOPE The purpose of the present document is to provide information and guidelines for the installation of the FoCal detector during LS3, inside the ALICE Mini Frame. **WARNING** **This procedure requires working in a radiation controlled area. All Safety regulation and procedures shall be followed.**	

14. ORIGINATOR | 15. TASK PROJECT ENGINEER

16. ALICE PROJECT ENGINEER | 17. QUALITY-SAFETY ENGINEER

18. ALICE INTEGRATION | 19. ALICE TECHNICAL COORDINATOR

20. TASK CLOSED ACCEPTANCE SIGNATURE | 21. DATE

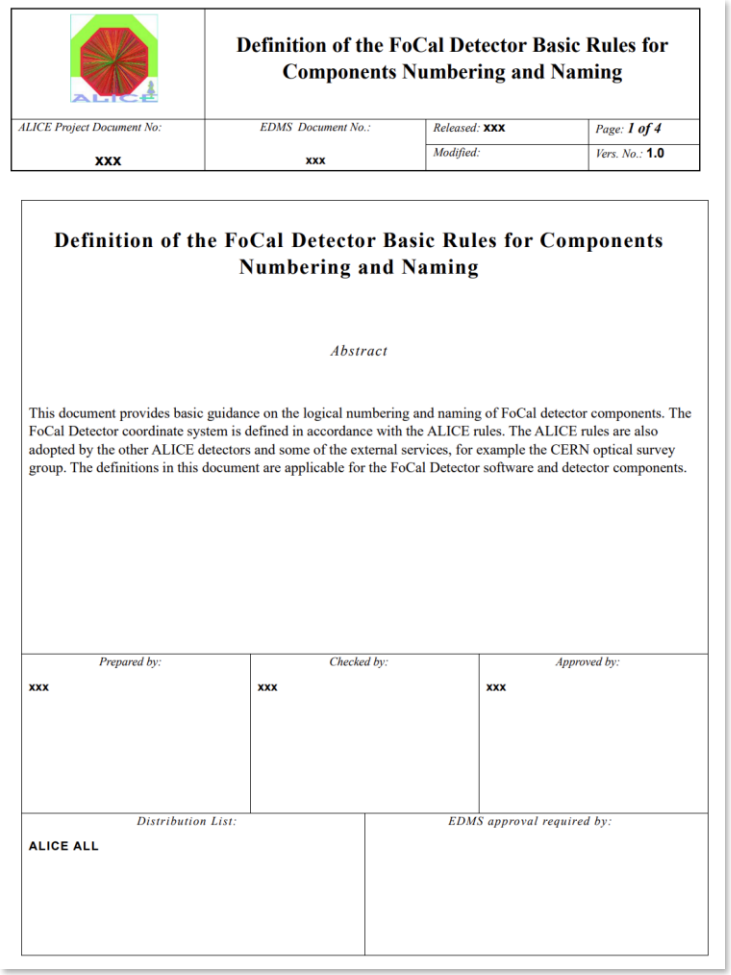
APPROVAL *(Printed or Typed and Signed)*

Alice Task Sheet

FoCal task sheet:

- Description of the procedure for assembling the structure
- Description of the procedure for placing the detector in the target position
- Assembly drawings
- Calculations

FoCal Naming and Numbering



	Definition of the FoCal Detector Basic Rules for Components Numbering and Naming		
ALICE Project Document No: xxx	EDMS Document No.: xxx	Released: xxx Modified:	Page: 1 of 4 Vers. No.: 1.0

Definition of the FoCal Detector Basic Rules for Components Numbering and Naming

Abstract

This document provides basic guidance on the logical numbering and naming of FoCal detector components. The FoCal Detector coordinate system is defined in accordance with the ALICE rules. The ALICE rules are also adopted by the other ALICE detectors and some of the external services, for example the CERN optical survey group. The definitions in this document are applicable for the FoCal Detector software and detector components.

Prepared by:	Checked by:	Approved by:
xxx	xxx	xxx

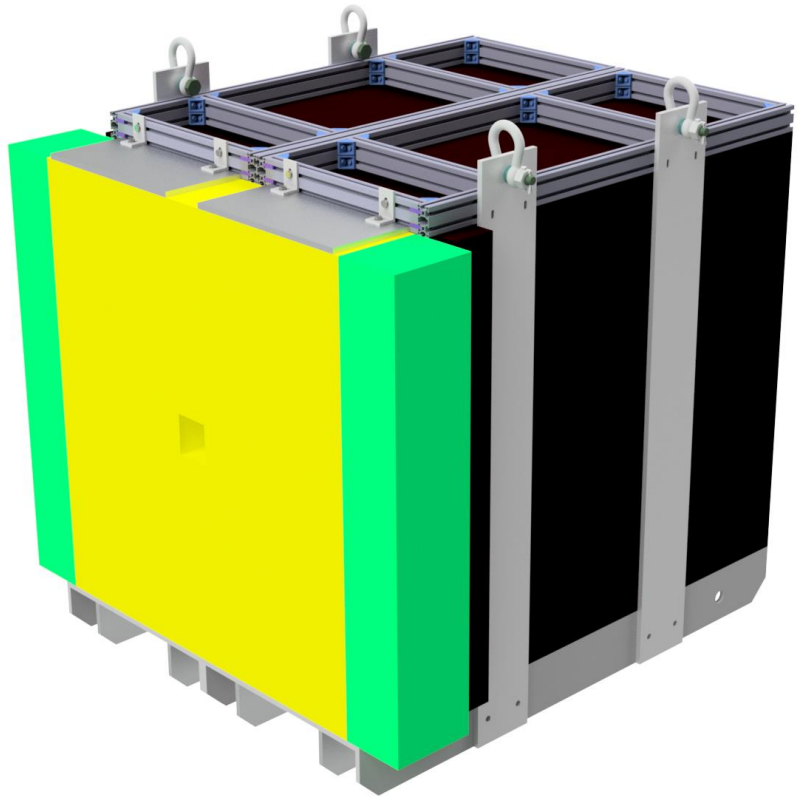
Distribution List:	EDMS approval required by:
ALICE ALL	

Definition of the FoCal Detector Basic Rules for Components Naming and Numbering:

- Description of distinguishing the detector halves
- Description of rules for naming components and parts
- Description of the principles of numbering components and parts

Summary

- During the design process, the most optimal solution was selected
- The performed simulations allow to confirm that the design data were selected correctly
- The documentation should be further developed to improve its functionality



Thank you for your attention

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