MUST Work Packages

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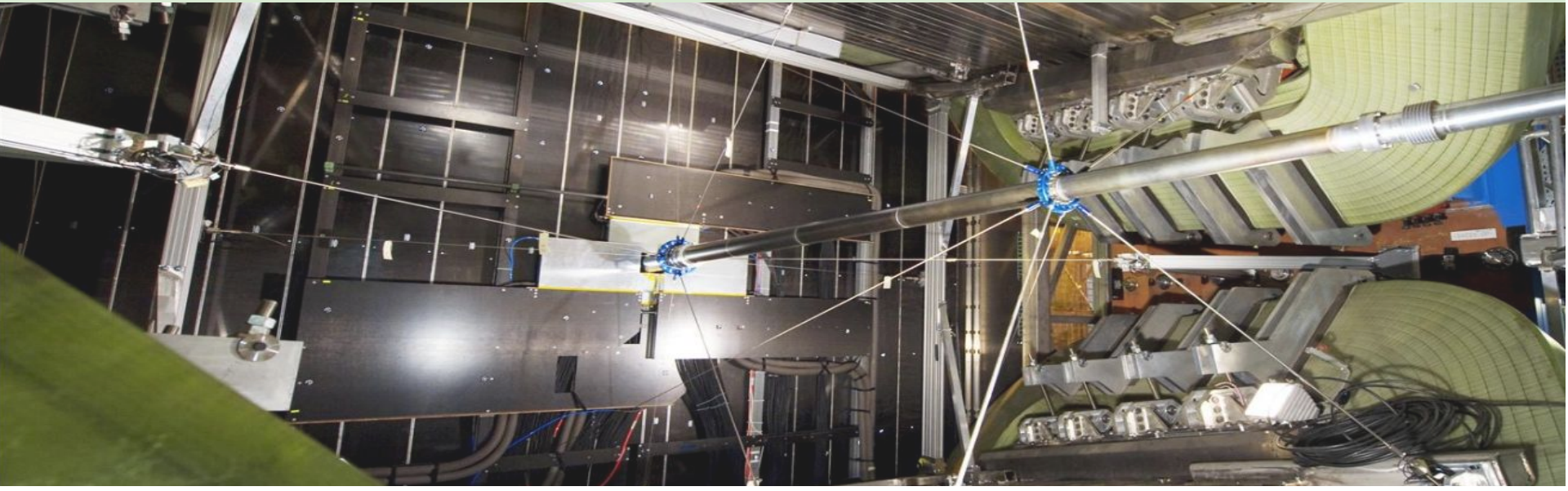


MUST Work Package Structure

1. Detector components and services
2. Mechanics
3. FEE, DAQ, DCS
4. Detector tests
5. MUST software integration in CBMROOT
6. Installation, Commissioning and Monitoring

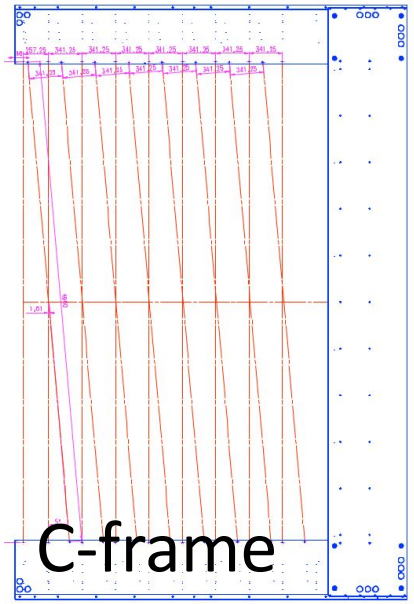
WP1 : Detector components and services

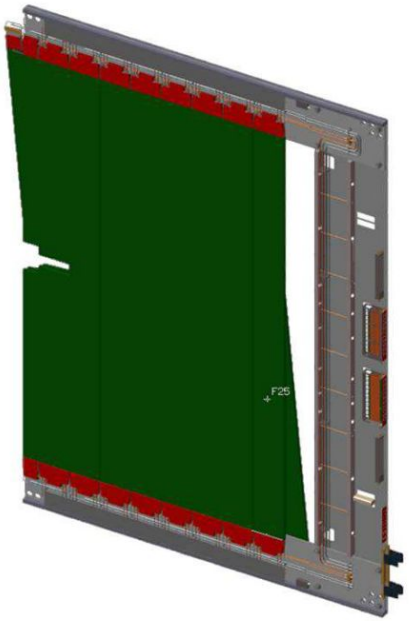
Objective:

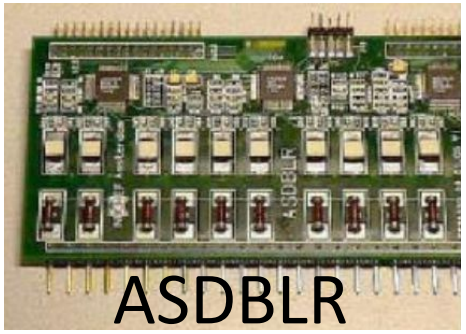
To validate and re-qualify all existing LHCb Outer Tracker (OT) hardware components—including straw modules, C-frames, and on-detector services—for reuse as the MUST detector in CBM.

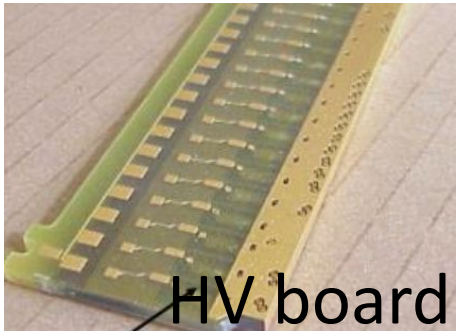
Tasks:

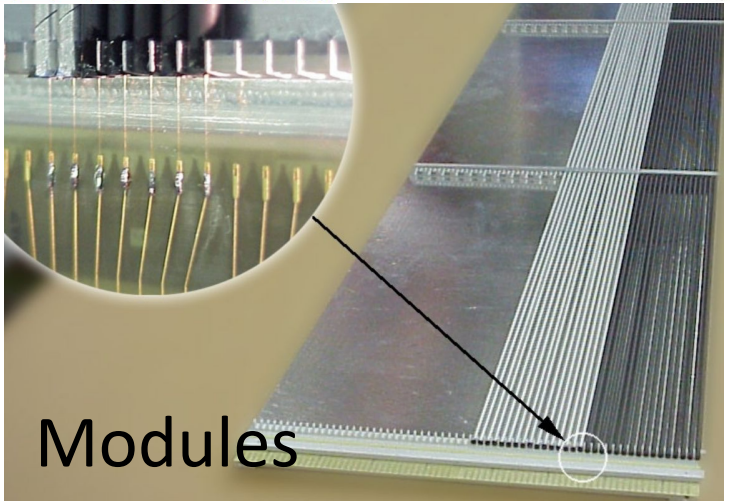
1.1 C-frames with straw modules (LHCb)
1.2 Straw modules with electronics box (LHCb)
1.3 On-detector services (LV)
1.4 On-detector services (HV)
1.5 MUST Gas system
1.6 On-detector services (Cooling)


C-frame




ASDBLR


HV board


Modules

https://www.slideserve.com/cady/the-lhcb-outer-tracker-front-end-what-does-it-look-like-and-what-is-the-status-powerpoint-ppt-presentation

WP2 : Mechanics

Objective:

Design, production, and integration of new mechanical structures required to install

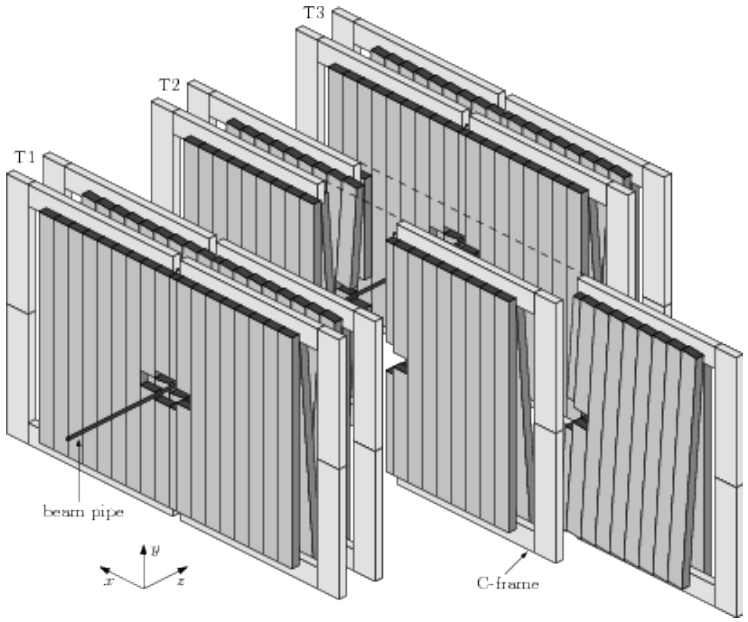
MUST inside the MUCH platform.

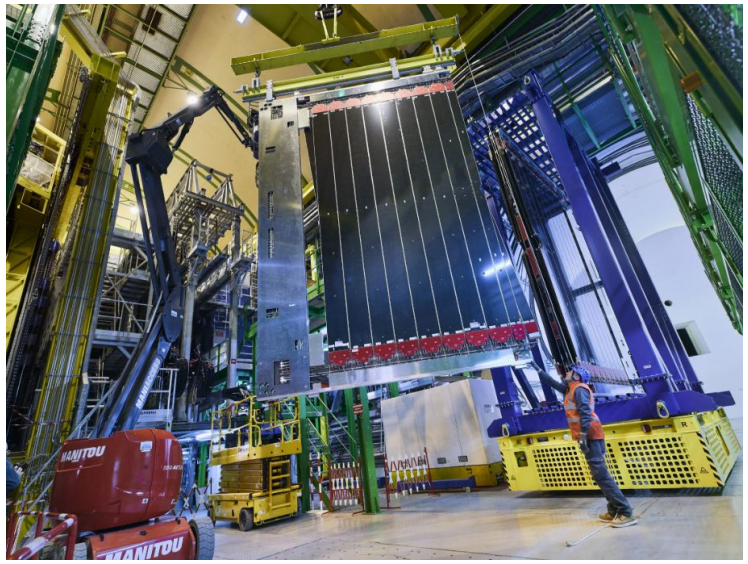
Tasks:

2.2 Revisit C-frame module assembly for MUST

2.2 Integration of C-frames to Stations for MUST

2.3 Mechanical integration of MUST in MUCH





WP3 : FEE, DAQ, DCS

Objective:

To develop and integrate all front-end electronics, digital readout, DAQ interfaces, and detector control systems needed to run MUST in the CBM environment.

Tasks:

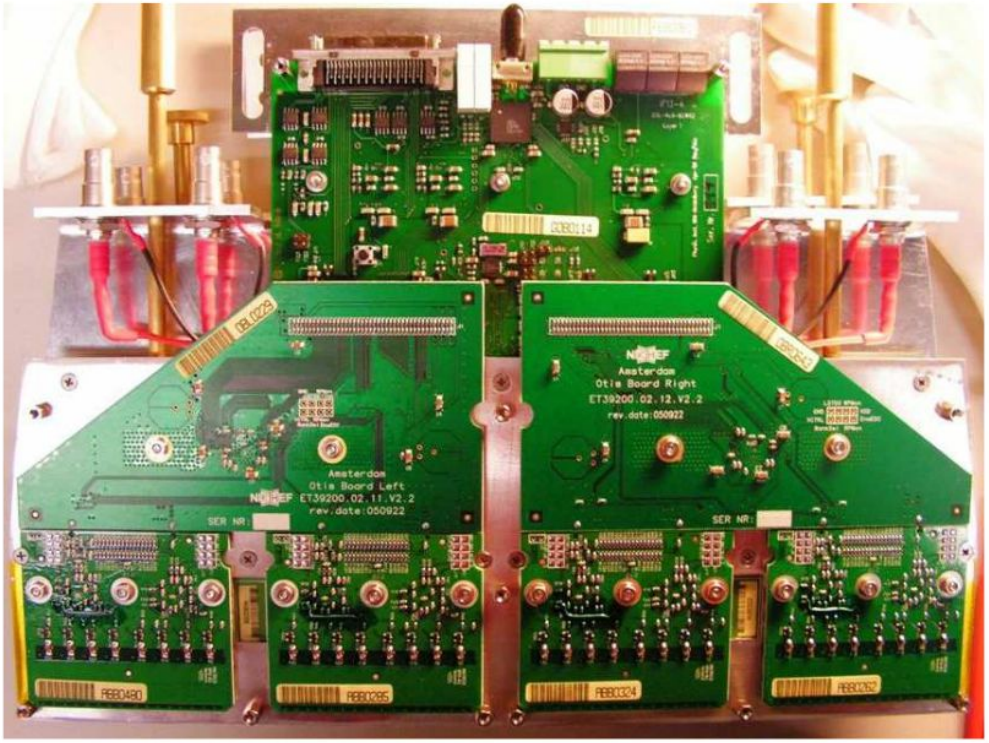
3.1 Analogue readout (LHCb ASICs)

3.2 Digital Readout DiRich (TRBnet based, with GSI-EE-Interface)

3.3 Digital Readout DiRich (DOGMA based, CBM-FAIR Interface)

3.4 DAQ and integration to CBM [DOGMA]

3.5 DCS and integration to CBM



https://www.slideserve.com/horace/the-readout-system-for-the-lhcb-outer-tracker

WP4 : Detector tests

Objective

Perform full functional and performance validation of all MUST hardware prior to installation and during commissioning.

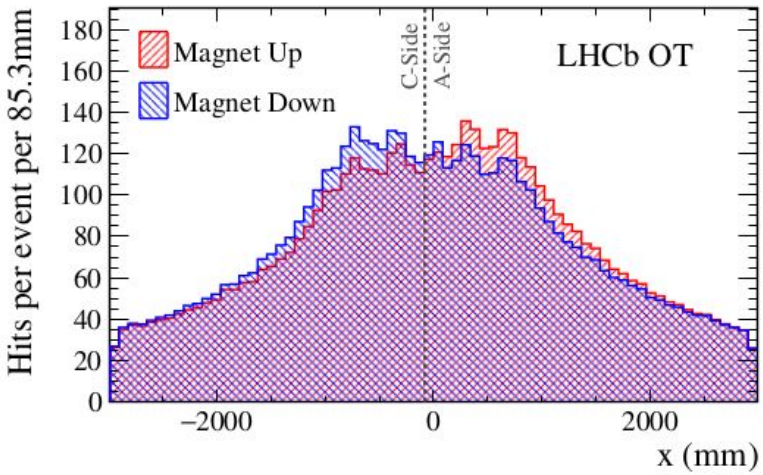
Tasks:

4.1 Dismounting of C-frames and modules

4.2 Testing of individual modules with electronics box (LHCb)

4.3 Detector data analysis & Quality Assurance(QA)

4.4 Acceptance tests of MUST modules



LHCb NOTE OTR-2005-014

WP5 : MUST software integration in CBMROOT

Objective:

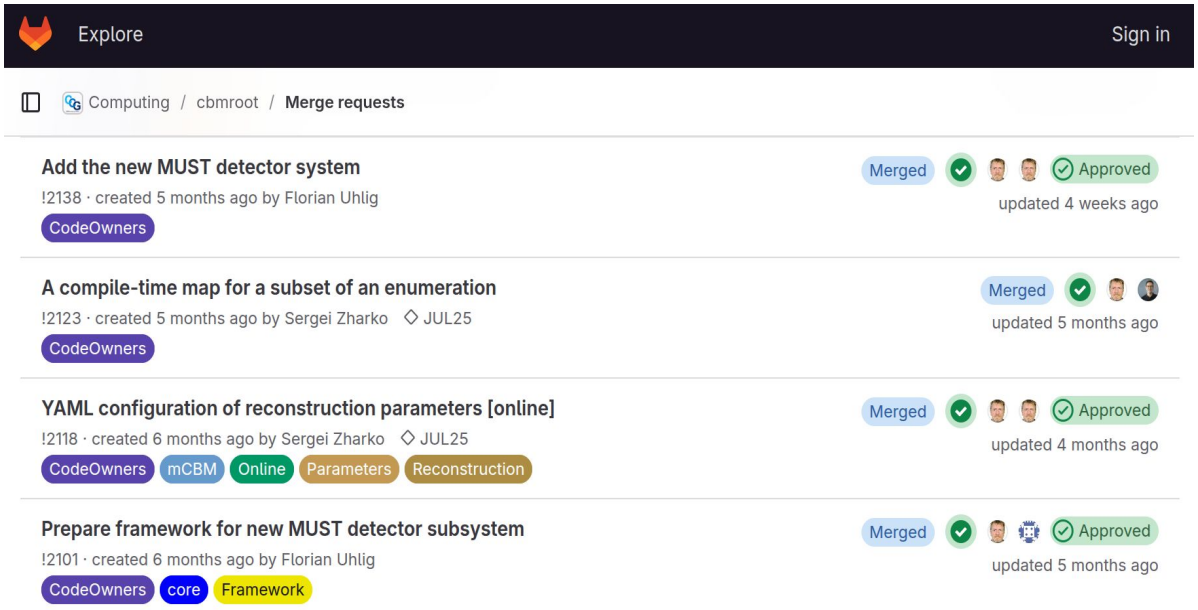
Develop and integrate the full simulation, digitisation, reconstruction framework in CBMROOT.

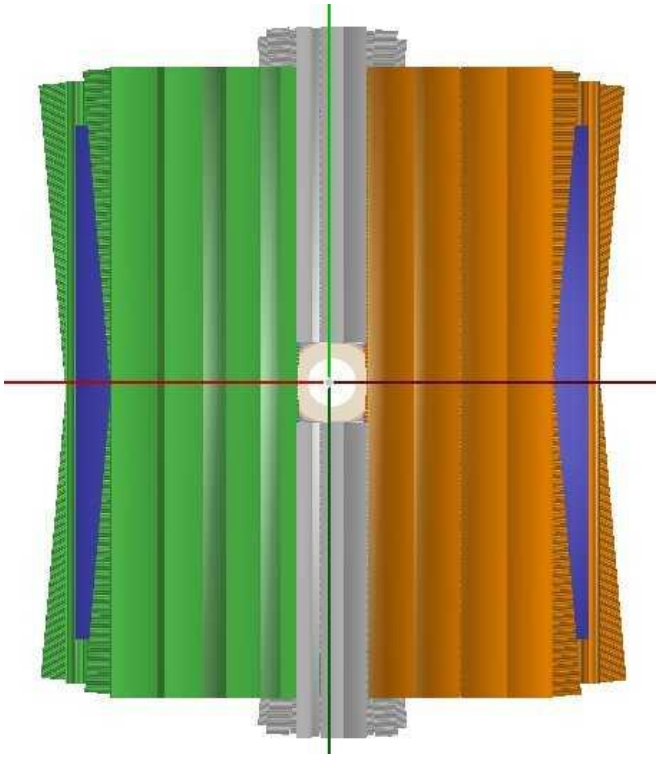
Tasks:

5.1 Simulation within the CBM Framework

5.2 Validation & Performance evaluation of the software

5.3 Computing tasks





6 Installation, Commissioning and Monitoring

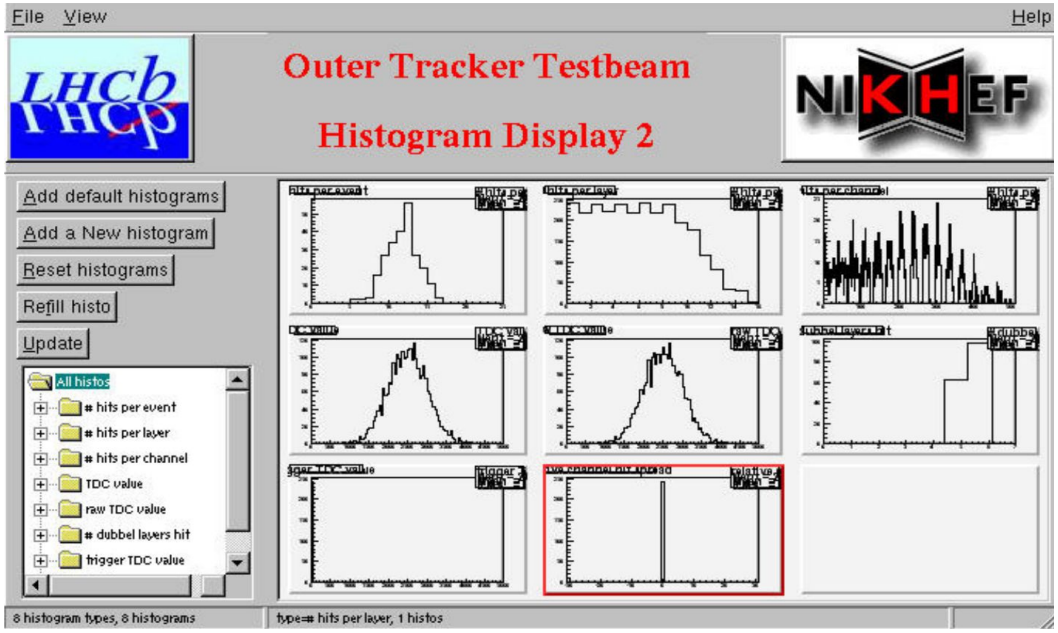
Objective:
Install MUST in the CBM cave, commission all services, and prepare continuous detector monitoring for data-taking.

Tasks:

6.1 Installation of gas system, LV, HV infrastructure in CBM

6.2 Integration into CBM DAQ (optical backbone)

6.3 Alignment & Calibration in CBM



Work package summary table

WP	Description	Exist	Location	WPL	Timeline
1	Detector components and services				
1.1	C-frames with straw modules (LHCb)	YES	GSI		
1.2	Straw modules with electronics box (LHCb)	YES	GSI		
1.3	On-detector services (LV)	No	GSI		
1.4	On-detector services (HV)	Part	GSI		
1.5	MUST Gas system	No	GSI		
1.6	On-detector services (Cooling)	Part	GSI		
2	Mechanics				
2.1	Revisit C-frame module assembly for MUST	NO			
2.2	Integration of C-frames to Stations for MUST	NO			
2.3	Mechanical integration of MUST in MUCH	NO			
3	FEE, DAQ, DCS				
3.1	Analogue readout (LHCb ASICs)	YES	GSI		
3.2	Digital Readout DiRich	Part	GSI		
3.3	Digital readout DOGMA (with interface)	NO			
3.4	DAQ and integration to CBM [DOGMA]	NO	GSI		
3.5	DCS and integration to CBM	NO			
4	Detector tests				
4.1	Testing of Individual Modules with LHCb electronics box	Part			
4.2	Acceptance tests of MUST modules	NO			
4.3	Dismounting of C-frames and modules	NO			
4.4	Detector data analysis & Quality Assurance(QA)	NO			
5	MUST software integration in CBMROOT				
5.1	Simulation within the CBM Framework	Part			
5.2	Validation & Performance evaluation of the software	NO			
5.3	Computing tasks	NO			
6	Installation, Commissioning and Monitoring				
6.1	Installation of gas system, LV, HV infrastructure in CBM	NO			
6.2	Integration into CBM DAQ (optical backbone)	NO			
6.3	Alignment & Calibration in CBM	NO			

Backup

5.1 Simulation within the CBM Framework

Detailed tasks :

- Implementation of MUST detector elements
- GEANT4 geometry of the modules and stations adapted to CBM
- Digitisation including noise + LHCb OT signal response
- Hit reconstruction algorithms
- Track-matching scheme with MUCH GEMs and STS

Work Package 6: Installation, Commissioning and Monitoring

Objective

- Install MUST in the CBM cave, commission services,
- and prepare full detector monitoring for operation.

Tasks

6.1 Installation of gas system, LV, HV infrastructure in CBM

6.2 Integration into CBM DAQ (optical backbone)

6.3 Alignment & Calibrations in CBM

arXiv:1708.00819v2, JINST 12 (2017) no.11, P11016

6.2 Integration into CBM DAQ (Optical Backbone)

Detailed tasks :

- Review number of optical fibres required for MUST → CBM DAQ

6.4 Alignment & Calibrations in CBM

Detailed tasks :

- Survey campaigns
- Time calibration, threshold tuning, HV optimisation
- Track-based alignment procedures
- Software for alignment and calibration (ask Sergey)