

MoEDAL MAPP at LHC's Run-3

A Progress Report

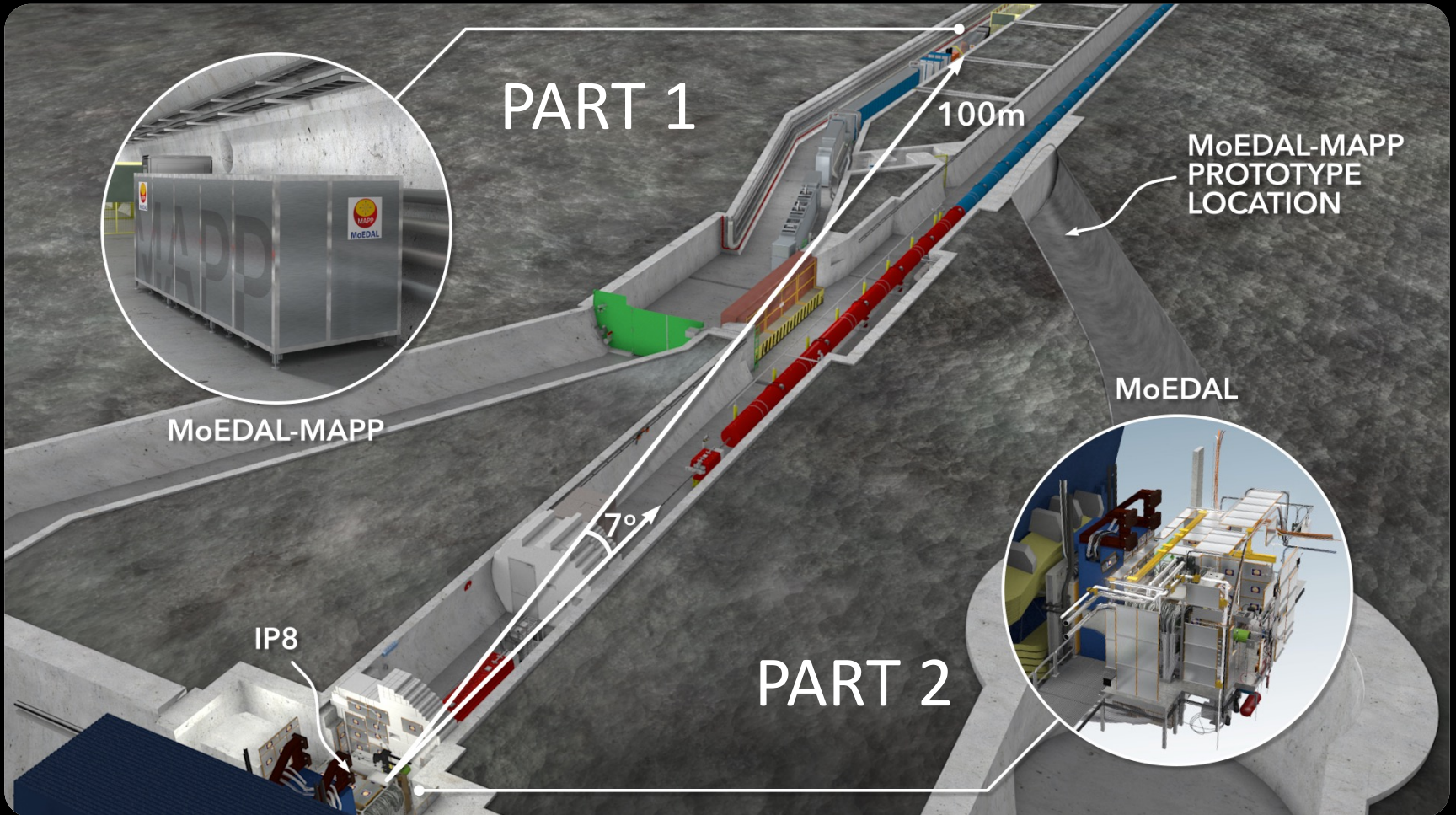


James L. Pinfold
For the MoEDAL Experiment



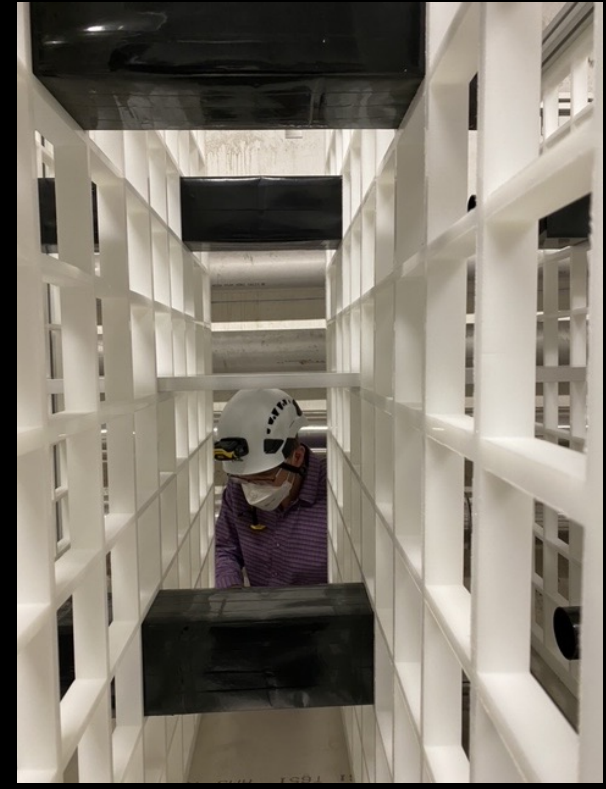
MENU

MAPP was approved by the CRB on December 1st 2021





- *The main bar detector consists of 4 sections each consisting of 100 10cm x 10cm x 75cm scintillator bars – 400 bars in total*
- *The detector is protected by a hermetic VETO counter system*
- *The whole detector is enclosed in an aluminium flame shield*



● installed so far:

- The complete MAPP support framework and 12/400 scintillator bars (to aid in alignment);
- Power connection, ethernet connection and fibre-optic cable carrying LHC signal



CERN Surveyors at Work

Part-1



UA83

The MAPP support structure being surveyed in by the CERN survey unit



Construction - Resource Loaded Spreadsheet

Part-1

MAPP-mQP Construction								2020																												2021												2022											
Project Lead: James Pinfold								Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7		
WBS	Task Name	Priority	Resource	Start	Finish	Duration	Percent Complete																																																				
▶ 1	Wrap 1st delivery of Sci. Bars (50)	NORMAL	Grad. Team A	Mon 20-Jul-20	Wed 29-Jul-20	8	100%																																																				
▶ 2	Wrap 2nd delivery of sci. bars (250)	NORMAL	Grad. Team A	Tue 15-Sep-20	Thu 19-Nov-20	48	100%																																																				
▶ 3	Wrap 3rd delivery of sci. bars (250)	NORMAL	Grad. Team A	Mon 22-Feb-21	Tue 06-Jul-21	94	100%																																																				
▶ 4	Wrap 4th delivery of sci. bars (250)	NORMAL	Grad. Team A	Wed 13-Oct-21	Mon 17-Jan-22	69	100%																																																				
▶ 5	Fabricate light guide molds	NORMAL	Staff Team A	Tue 15-Sep-20	Mon 14-Dec-20	65	100%																																																				
▶ 6	Fabricate light guides	NORMAL	Manufacture	Wed 08-Sep-21	Fri 22-Oct-21	33	100%																																																				
▶ 7	PMT testing	NORMAL	Staff Team A	Wed 02-Feb-22	Mon 27-Jun-22	104	24%																																																				
▶ 8	Manufacture PMT housings	NORMAL	Manufacture	Fri 15-Oct-21	Thu 11-Nov-21	20	100%																																																				
▶ 9	Place light guides + PMTs on sci bars	NORMAL	Grad Team B.	Wed 15-Dec-21	Fri 27-May-22	118	10%																																																				
▶ 10	Fabricate Cockroft-Walton bases	NORMAL	Elec. Techs	Tue 16-Feb-21	Fri 09-Apr-21	36	100%																																																				
▶ 11	Sci bar support grid fabrication	NORMAL	Machinists	Thu 14-Oct-21	Wed 03-Nov-21	15	100%																																																				
▶ 12	Support frame fabrication + test assembly	NORMAL	Staff Team A	Wed 15-Sep-21	Mon 04-Oct-21	14	100%																																																				
▶ 13	Aluminium flame shield fabrication	NORMAL	Machinists	Tue 05-Apr-22	Fri 29-Apr-22	19	0%																																																				
▶ 14	Fabricate sci. tile VETO panels	NORMAL	Grad Team B.	Wed 06-Apr-22	Fri 13-May-22	28	0%																																																				
▶ 15	Fabricate Pb-Sci. rad. panels	NORMAL	Staff Team B	Wed 23-Mar-22	Wed 20-Apr-22	21	0%																																																				
▶ 16	Fabrication of readout boards	NORMAL	Manufacture	Fri 25-Mar-22	Wed 18-May-22	39	0%																																																				
▶ 17	Calibration system electronics	NORMAL	Elec. Techs	Wed 21-Jul-21	Tue 17-Aug-21	20	100%																																																				
▶ 18	Cables + LV supplies	NORMAL	Elec. Techs	Tue 05-Oct-21	Fri 12-Nov-21	29	100%																																																				
▶ 19	Construction of Euro-crates for readout	NORMAL	Elec. Techs	Tue 05-Apr-22	Tue 12-Apr-22	6	0%																																																				
▶ 20	Testing of Electronics and powering system	NORMAL	Elec. Techs	Tue 10-May-22	Fri 10-Jun-22	24	0%																																																				

- Total delays of the order of 8 months cases by Covid related shutdowns and supply line problems
- However construction schedule is consistent with installation schedule



MAPP Installation to Completion

Part-1

Installation schedule affected by availability of access to UA83

1st Installation Trip December 14th -21st 2021

Power installed. Ethernet Installed. FO cable carrying LHC clock installed. Shipment of crates of equipped to be installed were delayed by SwissPort computer crash

2nd Installation Trip February 18th-27th 2022

Complete MAPP support frame installed. 12 scintillator bars installed to help with alignment. Three sections of detector surveyed in.

3rd Installation Trip March 16th-25th 2022

Complete survey of detector. install 24 scintillator bars. Install power supplies

4th & 5th trips for TS1 (Sept. 19th – 26th) & TS2 (Nov. 7th – 10th)

Installation of electronics + 100 bars. All bars equipped with PMTs + bases. Flame shield installed + temperature sensors. Remote CR tests start.

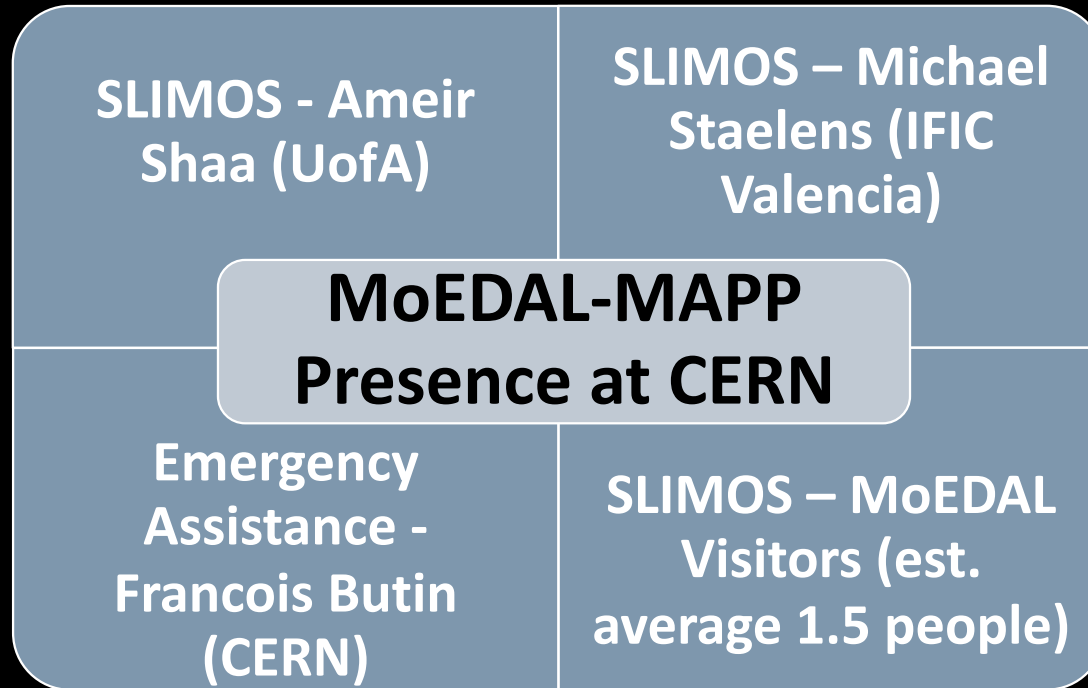
7th + Trip for YETS, starting December 12th 2022

Complete installation. Begin CR tests of complete system.



MoEDAL-MAPP Presence at CERN

Part-1



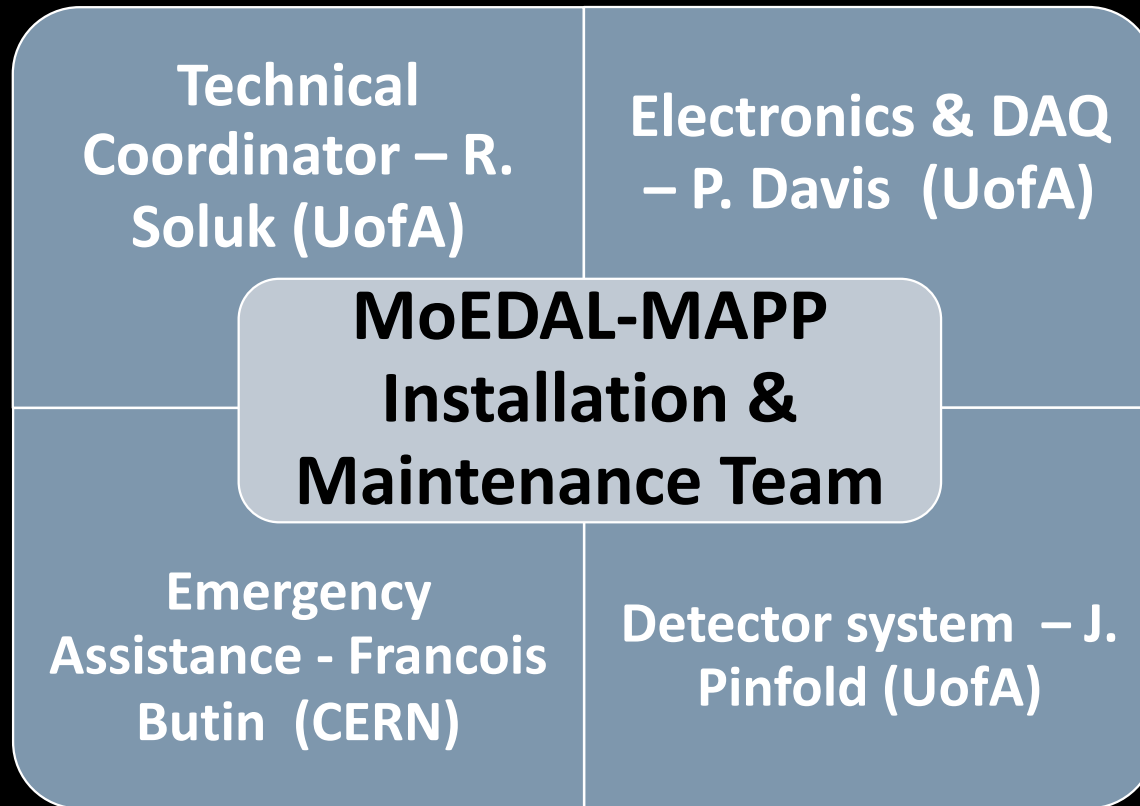
- *We will have 1 person on call 24/7 as soon as MoEDAL or MAPP is installed and under power, whichever comes first.*
- *We are seeking a CERN fellow or share of a fellow, we are currently discussing with a potential candidate.*
- *MoEDAL-MAPP will also be monitored from the UofA & IEAP (TPX)*



MAPP

Part-1

Installation & Maintenance Team



- *This Install. & Main. team would be deployed for TSs, YESDs and LSs.*
- *The CERN based team will assist the Install. & Maint. team if required*



MoEDAL Reinstallation

Part-2



The VELO Cavern as of Friday the 25th of February 2022



LHCb Requirements for MoEDAL Green Light (1)

Part-2

The requirements arising from the Addendum to MoEDAL's installation plan were summarized in an email by Rolf Lindner, LHCb's Technical Coordinator, dated October 7th 2021: *"...The installation of cable trays and cabling shall proceed as time is running short. Installation of the MoEDAL electronics and detector will get the green light once they are stored in CAD models and have received the acceptance by the TC and by the responsible for the detectors in the vicinity of MoEDAL.*

Due to the tight installation planning of LHCb and the delay in several areas compared to last year's schedule, the installation of MoEDAL will have to be delayed accordingly. The detectors close to MoEDAL will probably not be in place before February. Therefore, the installation of MoEDAL will most probably take place in February 2022, and under the assumption that the remaining drawings of MoEDAL equipment are stored in CATIA."

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installation of MoEDAL will most probably take place in February 2022, and under the
detectors close to MoEDAL will probably not be in place before February. Therefore, the



LHCb Requirements for MoEDAL Green Light (2)

Part-2

Gmail James Pinfeld <pinfoldster@gmail.com>

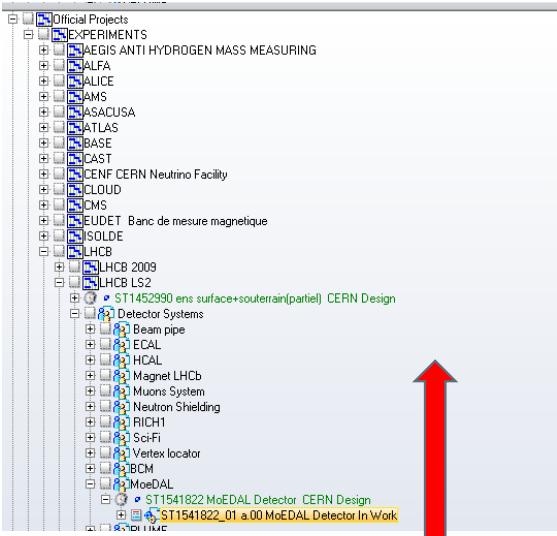
FW: Moedal model

Kevin Joseph Buffet <kevin.joseph.buffet@cern.ch> Wed, Feb 16, 2022 at 1:07 AM
 To: James Pinfeld <jpinfold@ualberta.ca>
 Cc: Francois Butin <Francois.Butin@cern.ch>, "rsoluk@gmail.com" <rsoluk@gmail.com>

Good morning James,

I can confirm the Moedal 3D model is now in the LHCb official list and in CATIA format. The number is ST1541822_01.

In SmarTeam it is linked here:



Best regards,
 Kevin
 [Quoted text hidden]

Notification that MoEDAL 3D designs are in official LHCb repository in CATIA format As required by LHCb's TC.

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 1211 Geneva 23 - Switzerland

EDMS NO. **2702435** | REV. **0.1** | VALIDITY **DRAFT**

REFERENCE
MoEDAL Experiment

Date: 2022-02-17

• **ENGINEERING CHANGE REQUEST**

INSTALLATION OF MoEDAL FOR RUN-3
3D Design of Updated Elements

BRIEF DESCRIPTION OF THE PROPOSED CHANGE(S):

The MoEDAL detector will be reinstalled in the VELO cavern at IP8, to take data during LHC's Run-3. Various elements of the MoEDAL detector have been updated to accommodate upgrades to LHCb's VELO detector and the installation of the LHCb's PLUME detector. This document describes the corresponding 3D Designs of the updated MoEDAL detector elements, that have been placed in the official LHCb design repository in CATIA format.

DOCUMENT PREPARED BY: Mitchel Baker (MoEDAL) James Pinfeld (MoEDAL) Richard Soluk (MoEDAL)	DOCUMENT TO BE CHECKED BY: Heinrich Schindler (LHCb) Freek Sanders (LHCb) Eric Thomas (LHCb) Sergey Barsuk (LHCb) Kazuyoshi Akiba (LHCb) Paula Collins (LHCb) Raphael Dumps (LHCb) Olivier Jamet (LHCb) Laurent Roy (LHCb) Augusto Sciuccati (LHCb) Josef Sestak (LHCb) Jacky Rochet (LHCb) Kevin Buffet (CERN)	DOCUMENT TO BE APPROVED BY: Rolf Lindner (LHCb)
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DOCUMENT SENT FOR INFORMATION TO:
 Veronique Wedlake, Francois Butin, Chris Parkes, Markus Brugger, LHCC referees for MoEDAL



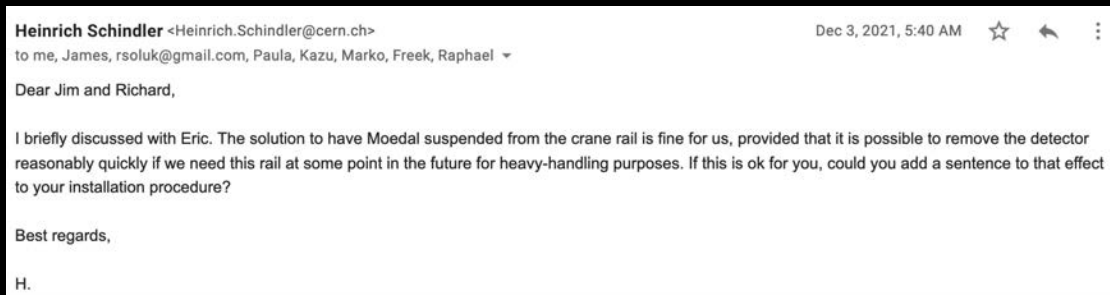
Recent LHCb VELO-region Design Changes (1)

Part-2

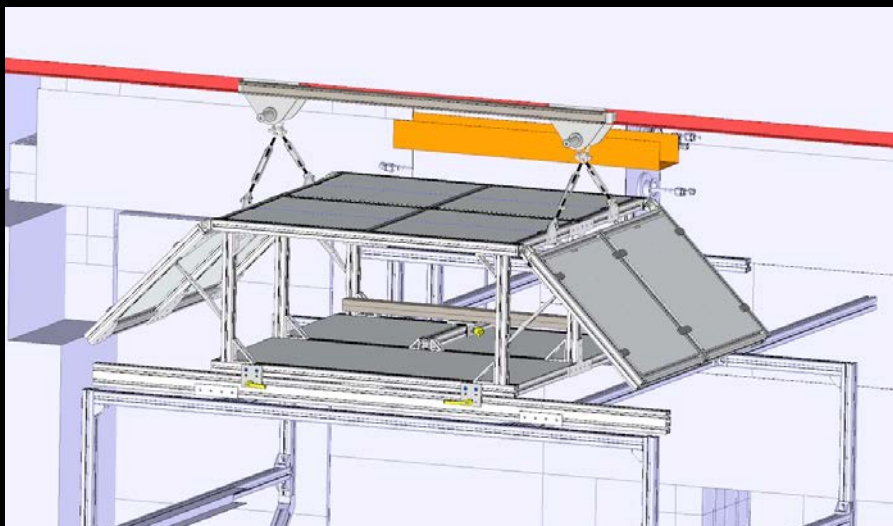
- *At a meeting with LHCb Technical people on December 1st 2021 we were informed that MoEDAL's VELO-Top NTD array needs to be removed to have access to a view-port in the VELO vacuum vessel.*
- *Mid-December 2021 or so, we were informed that our design has to be compatible with a platform inserted to aid access to this view-port*
- *Our new design for VELO-Top incorporates the necessary changes. Now the VELO-Top is suspended from the I-beam above LHCb so that it can rapidly be moved to the side to allow access to the viewport.*

Recent LHCb VELO-region Design Changes (2)

- *This design was accepted by LHCB subject to final agreement:*



- *The 3D VELO-Top design is included in the LHCb's official design repository, as required:*

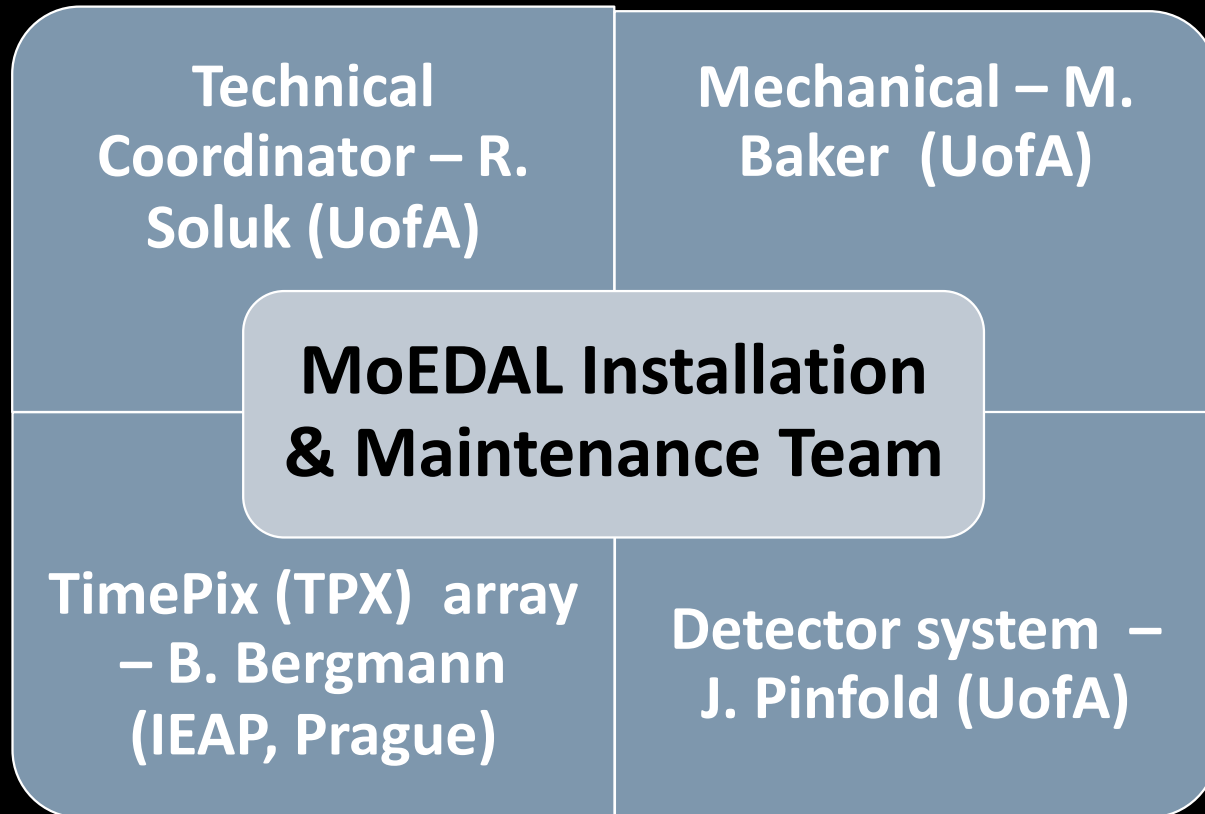




MoEDAL

Part-2

Installation & Maintenance Team



- *The MoEDAL detector is largely passive, except for the TPX detector*
- *The CERN based team will assist the Install. & Maint. team if required*



Installation Prior December 14th -21st 2021

Installed: Power for TPX; Ethernet for TPX readout; FO LHC clock signal



As of today (5th March 2022) VELO is still being installed. Wait for Green-light from LHCb to begin installation



Installation Trip March 16th-25th

Remeasure and check VELO cavern for final disposition of VELO detectors. Shim and Install wall mounted detectors, Install TPC crate and cables



TS1 (Sept. 19th – 26th) & TS2 (Nov. 7th – 10th)

Install wall mounted NTDs & VELO-Top, MMT detectors and TPX array

All detector elements are available according to the Installation timetable



Conclusion

- *Program delayed by Covid shutdowns and access issues*

BUT

- *MAPP installation is well underway and on track to be installed during 2022 and tested with cosmic rays by start of data taking in 2023*
- *MoEDAL will be up and running towards the end of 2022, assuming LHCb's VELO upgrades are installed prior to the start of Run-3*