Muon Forward Tracker

description and physics goals

Katarína Křížková Gajdošová
Czech Technical University in Prague

Third workshop on diffraction and ultra-peripheral collisions
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„International Mobility of Researchers MSCA IF III at CTU in Prague“
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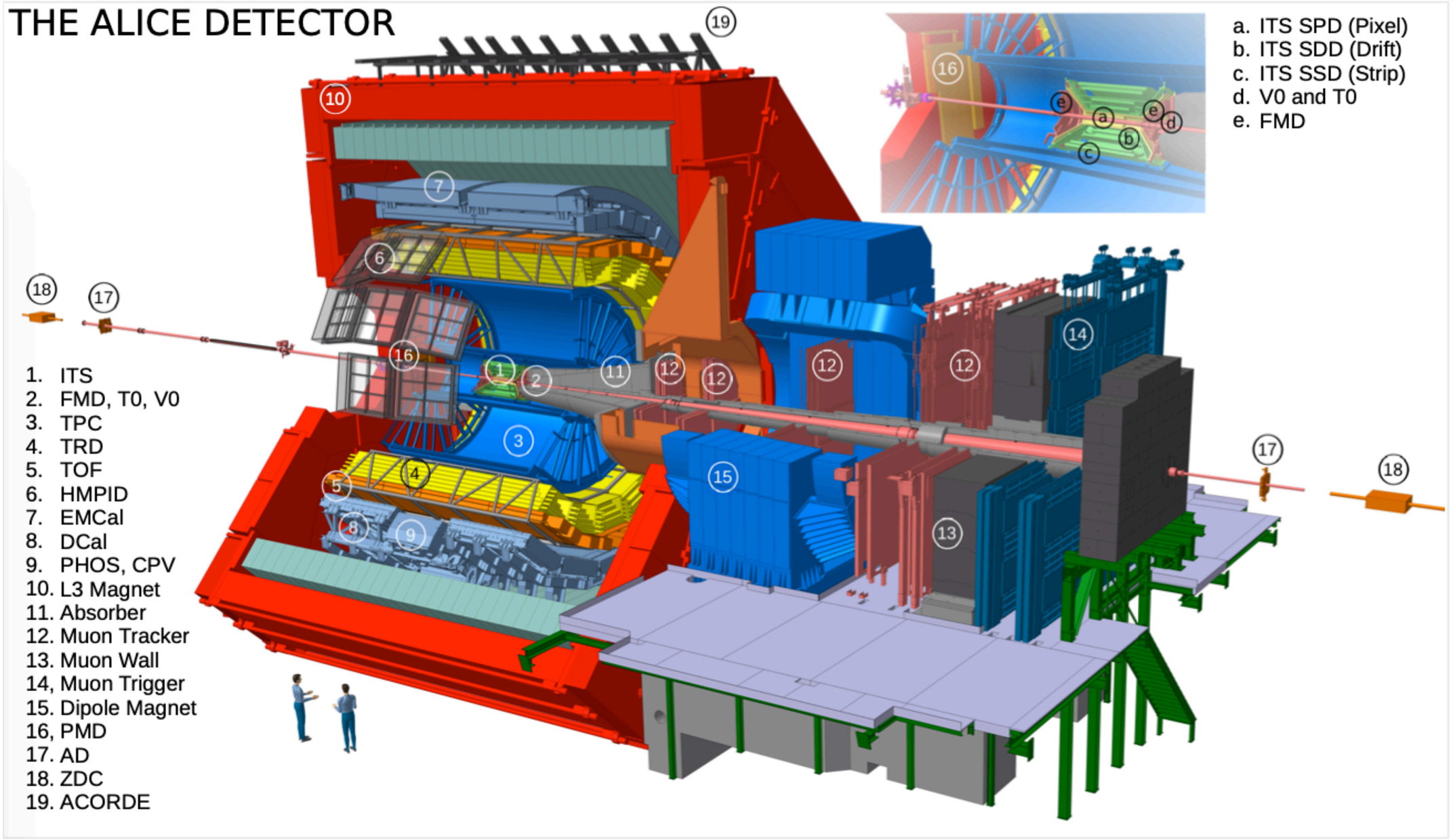
EVROPSKÁ UNIE
Evropské strukturální a investiční fondy
Operační program Výzkum, vývoj a vzdělávání

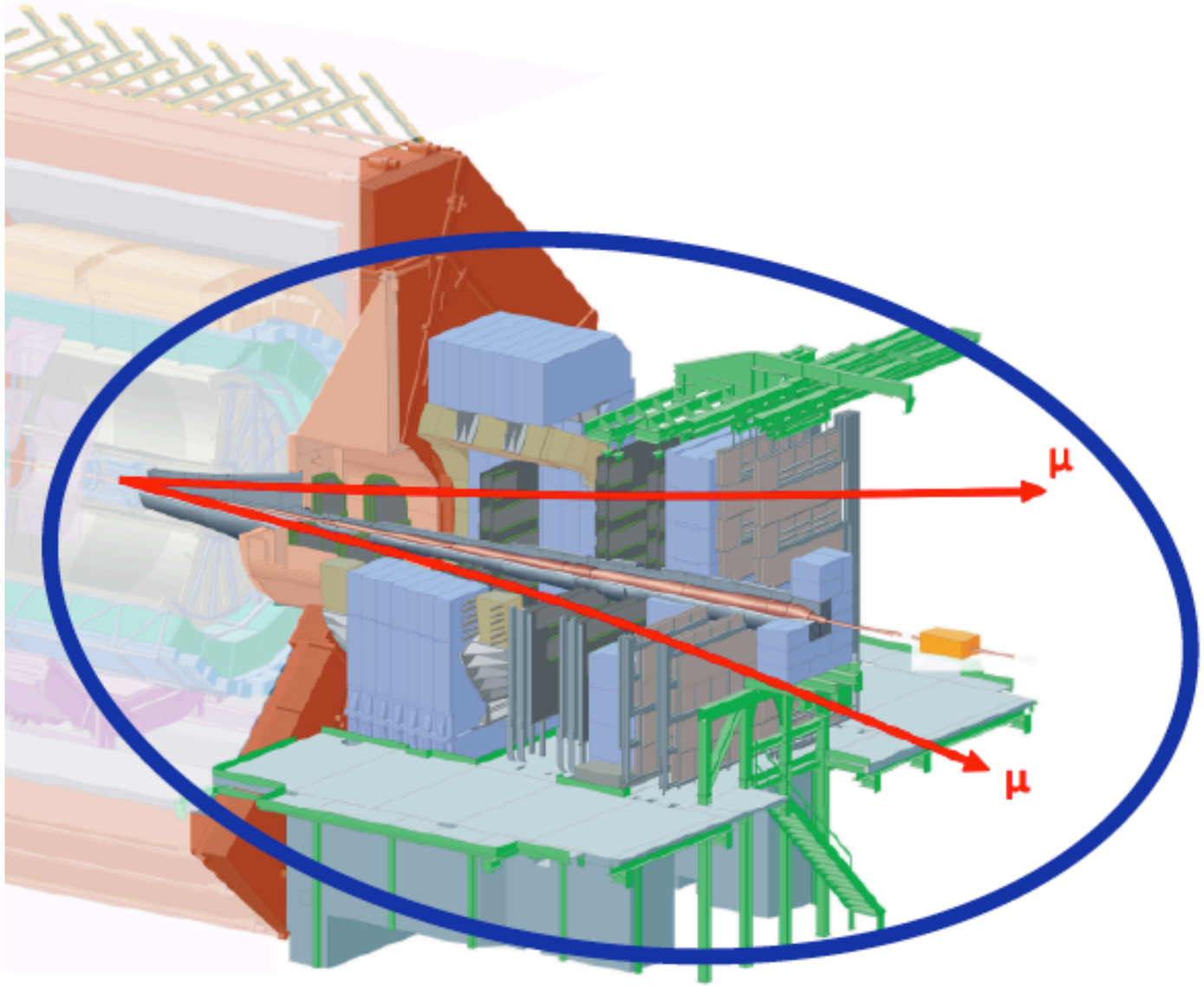
MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

ALICE in Run 1 & Run 2



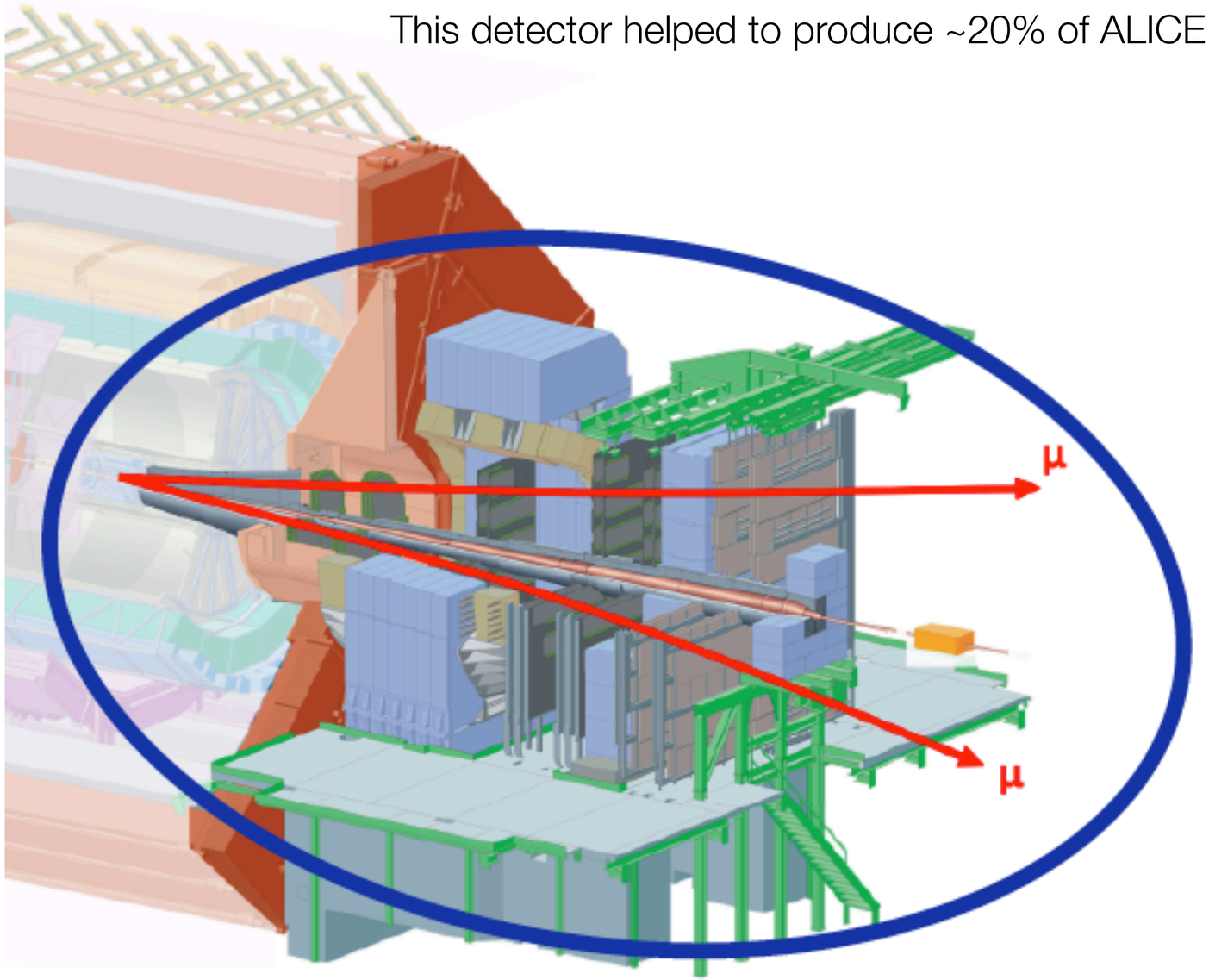
Muon spectrometer

- Quarkonium states decaying into dimuons
- Heavy flavor particles decaying into a single muon and something else
- Low-mass neutral mesons



Muon spectrometer

This detector helped to produce ~20% of ALICE publications

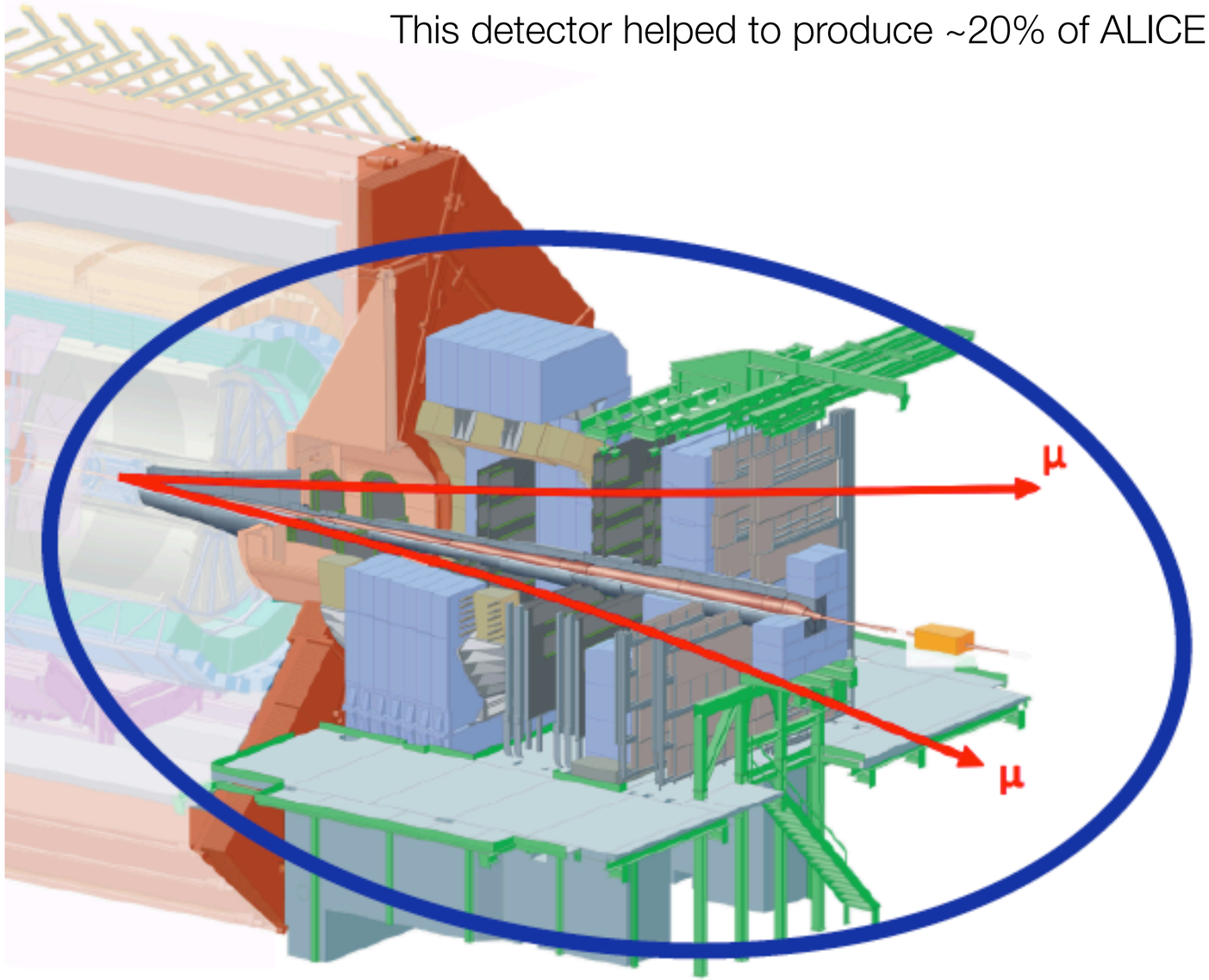


Muon spectrometer

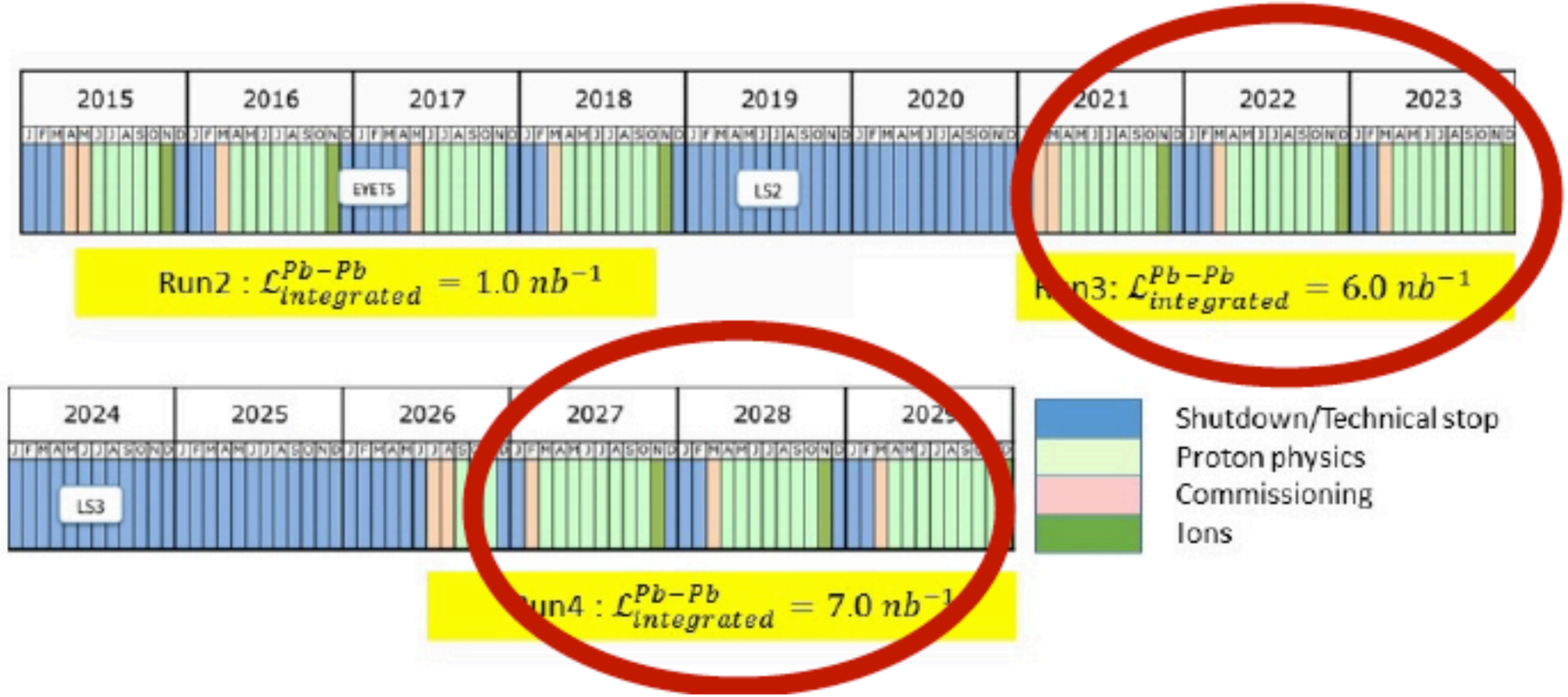
This detector helped to produce ~20% of ALICE publications

But, it had its limitations:

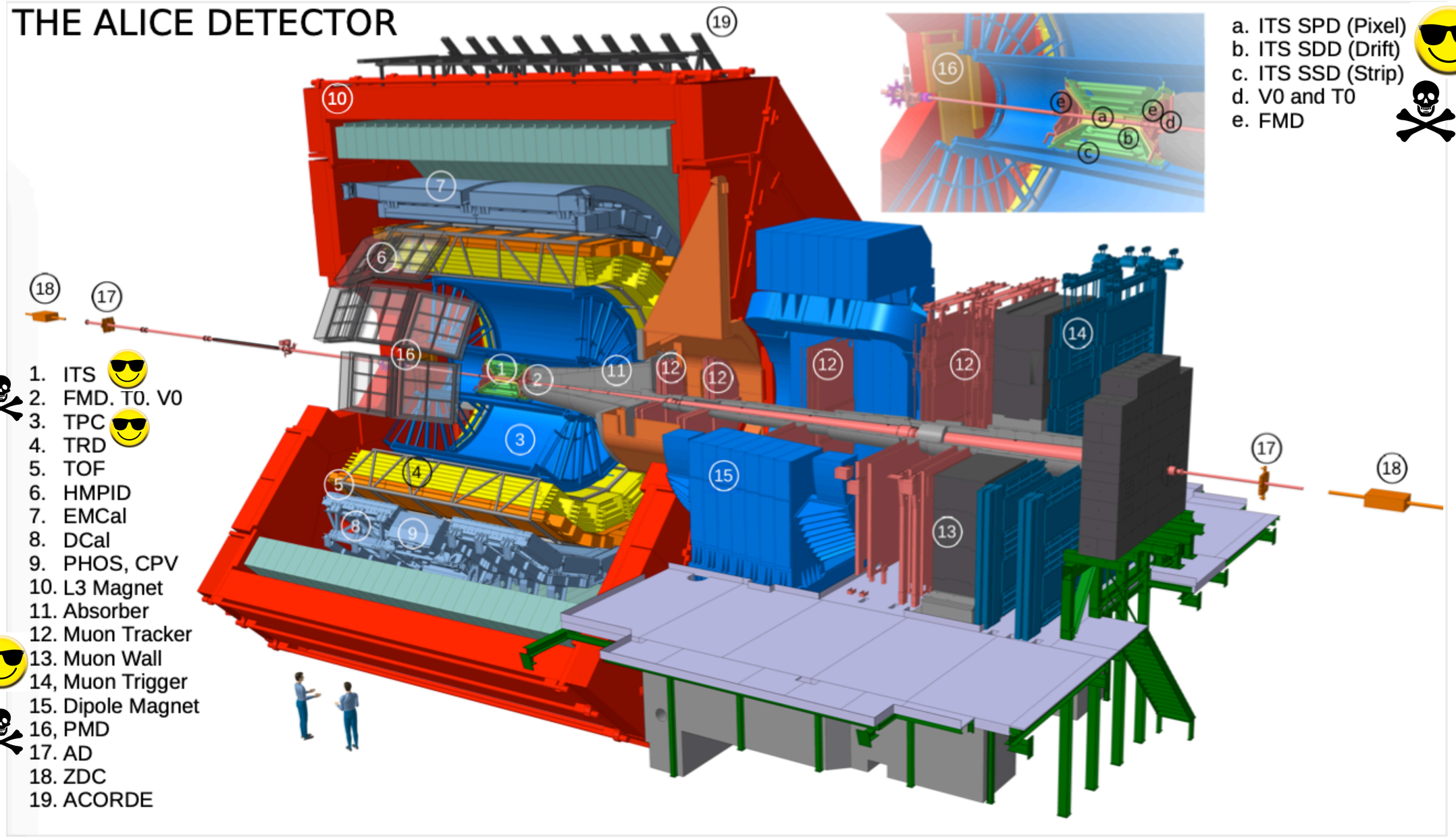
- Multiple scatterings induced on the muon tracks by the hadron absorber
- Not able to disentangle the open charm and open beauty production
- Not able to distinguish prompt and displaced J/Ψ production
- High background from semi-muonic decays of π and K, in particular at low p_T
- Low mass resolution for resonances



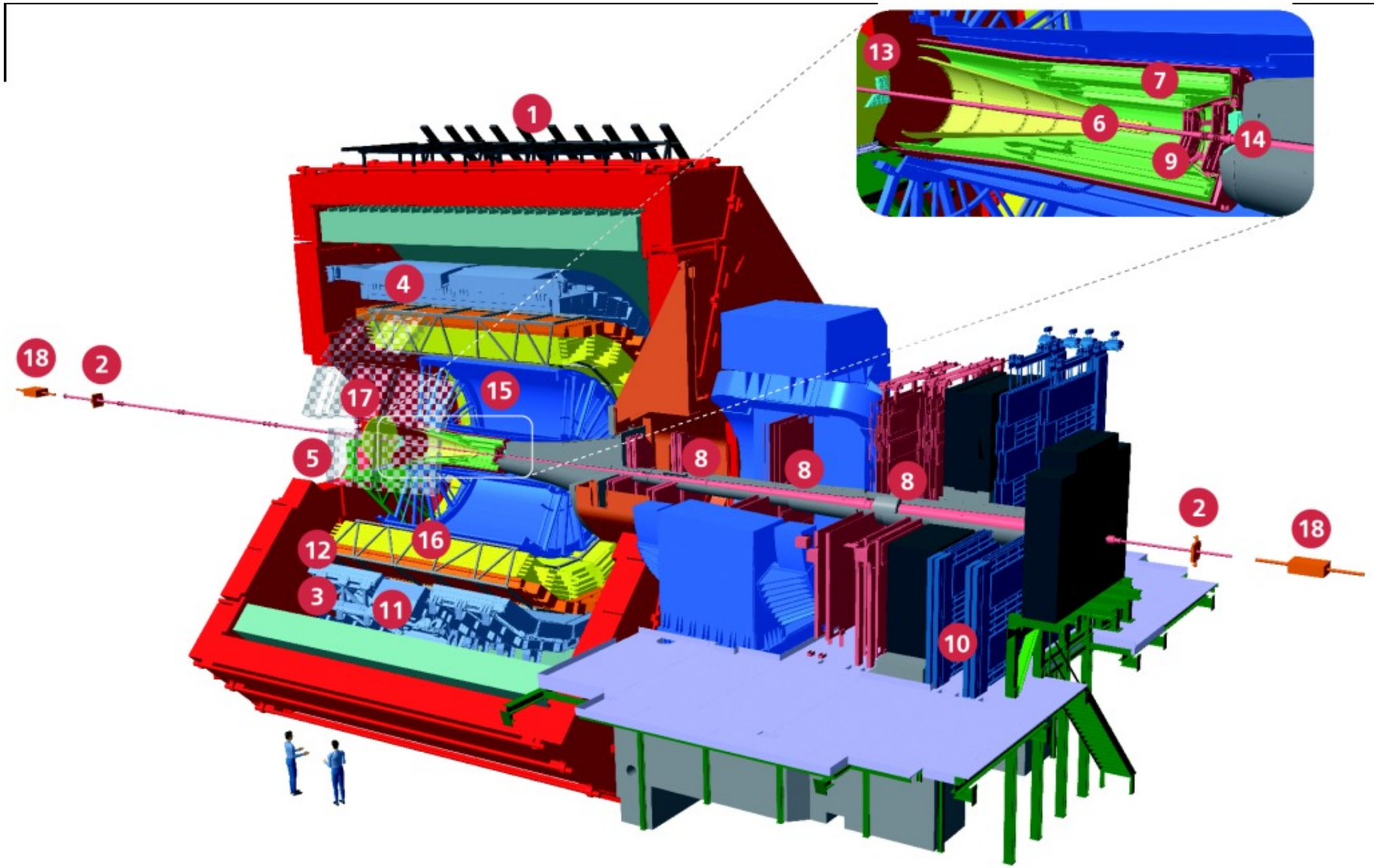
Future running periods of the LHC



ALICE in Run 1 & Run 2



ALICE in Run 3



1 **ACORDE** | ALICE Cosmic Rays Detector

FDD 2 **AD** | ALICE Diffractive Detector

3 **DCal** | Di-jet Calorimeter

4 **EMCal** | Electromagnetic Calorimeter

5 **HMPID** | High Momentum Particle Identification Detector

6 **ITS-IB** | Inner Tracking System - Inner Barrel

7 **ITS-OB** | Inner Tracking System - Outer Barrel

8 **MCH** | Muon Tracking Chambers

9 **MFT** | Muon Forward Tracker

10 **MID** | Muon Identifier

11 **PHOS / CPV** | Photon Spectrometer

12 **TOF** | Time Of Flight

13 **T0+A** | Tzero + A

14 **T0+C** | Tzero + C

15 **TPC** | Time Projection Chamber

16 **TRD** | Transition Radiation Detector

17 **V0+** | Vzero + Detector

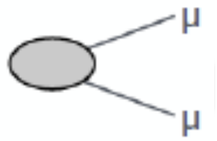
18 **ZDC** | Zero Degree Calorimeter

…and software upgrade to O^2

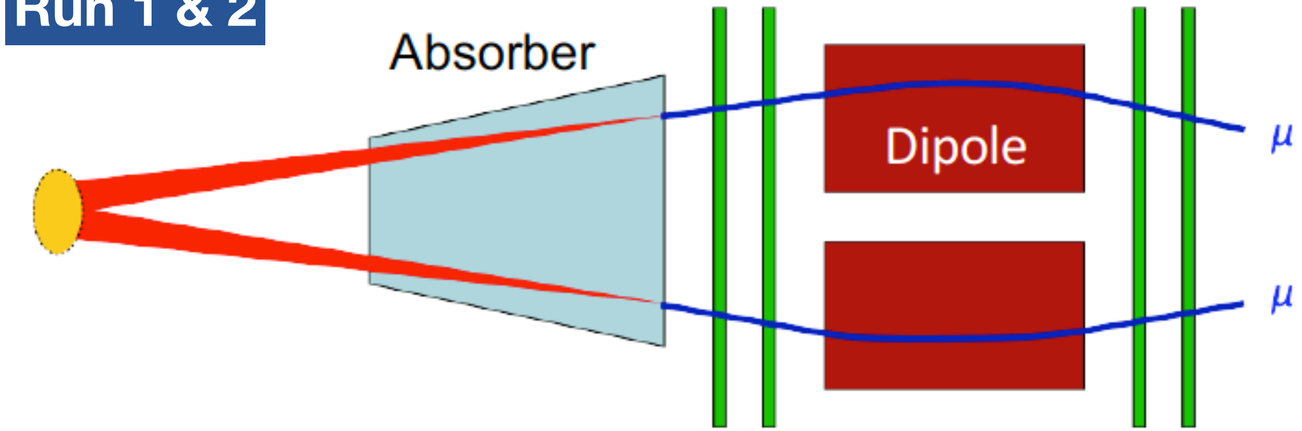
Muon Forward Tracker (MFT)

Poor determination of production vertex

- No charm/beauty discrimination
- No measurement of J/Ψ from B



Run 1 & 2



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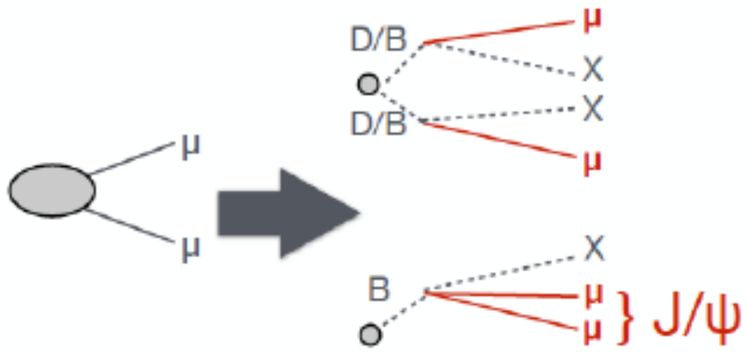
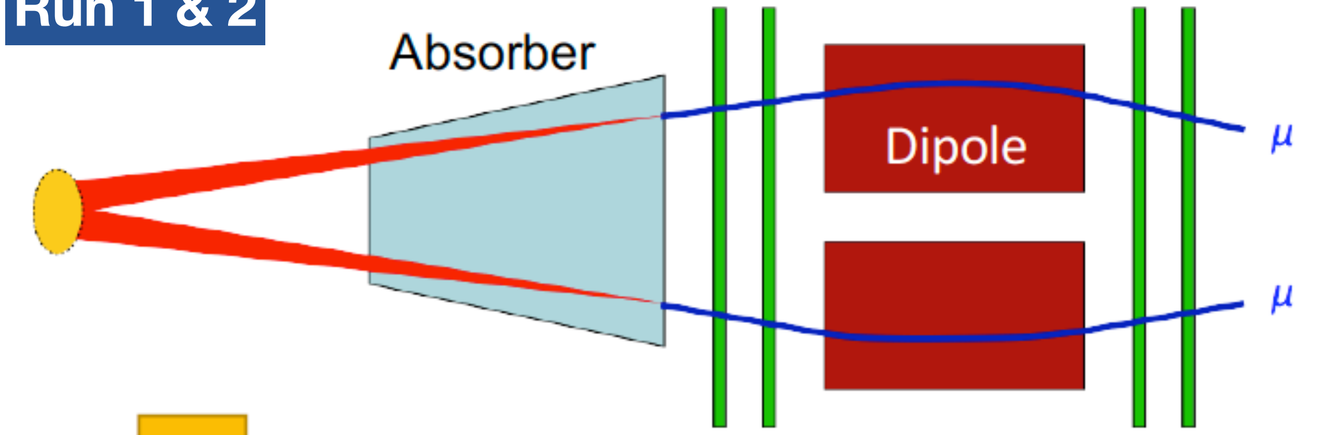
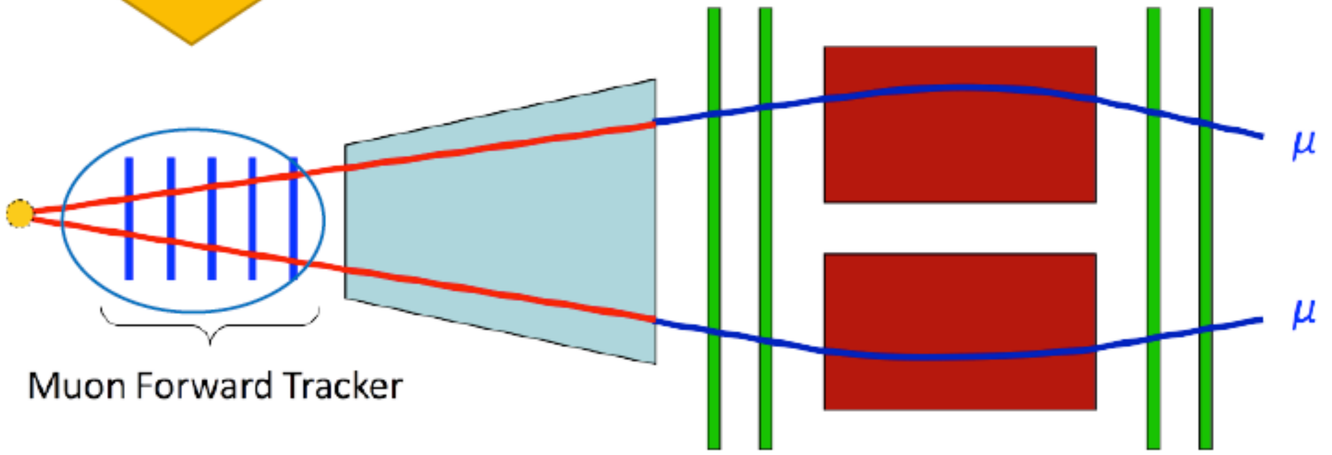


Precise determination of production vertex and tracking

- Measurement of muon offset at primary vertex
- Measurement of secondary vertices (discrimination of prompt J/Ψ and J/Ψ from B)

Run 1 & 2





Run 3

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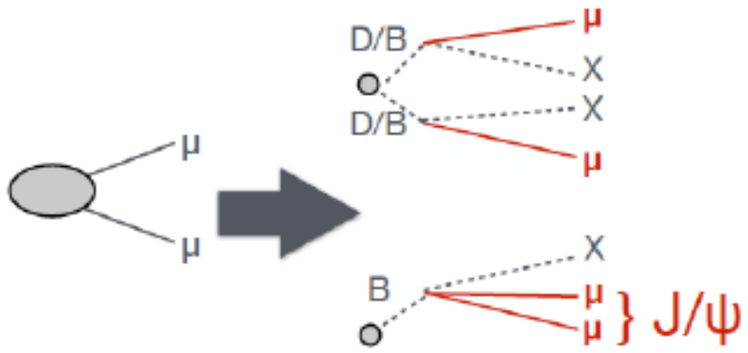

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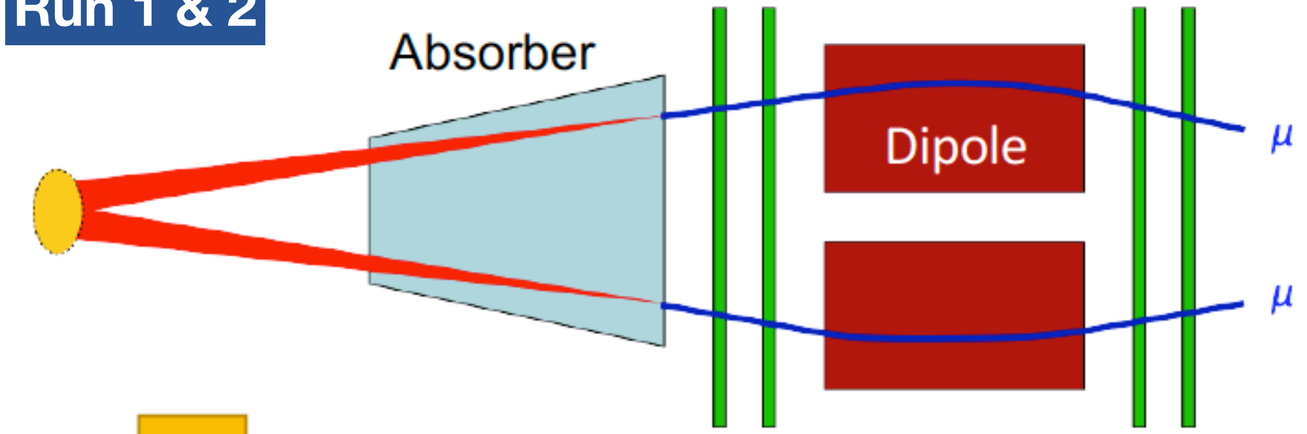
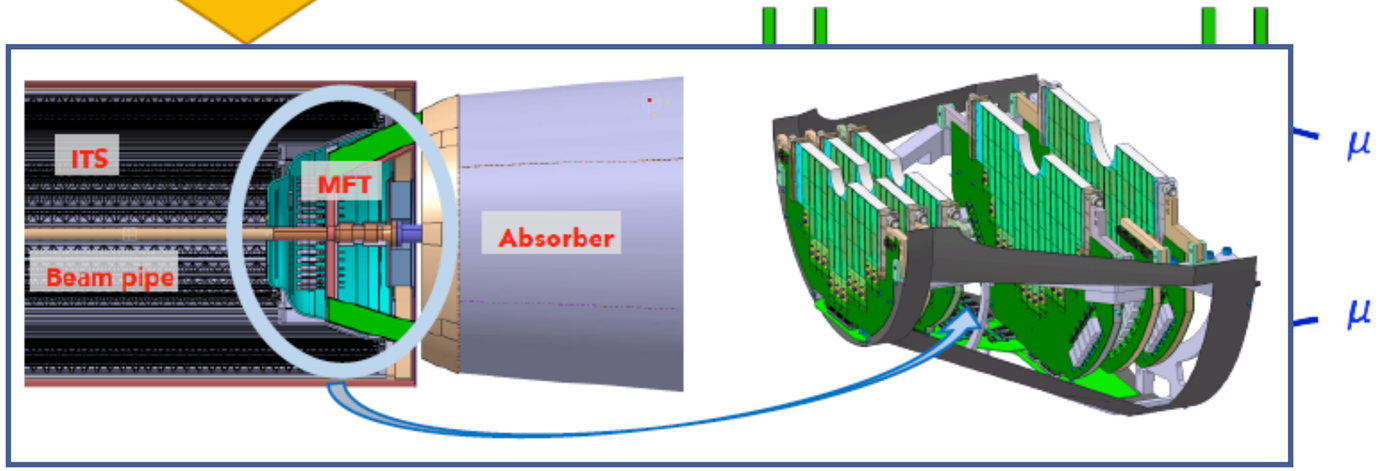
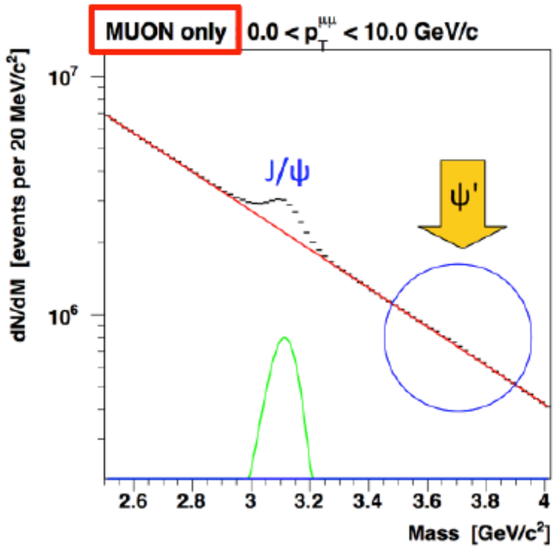


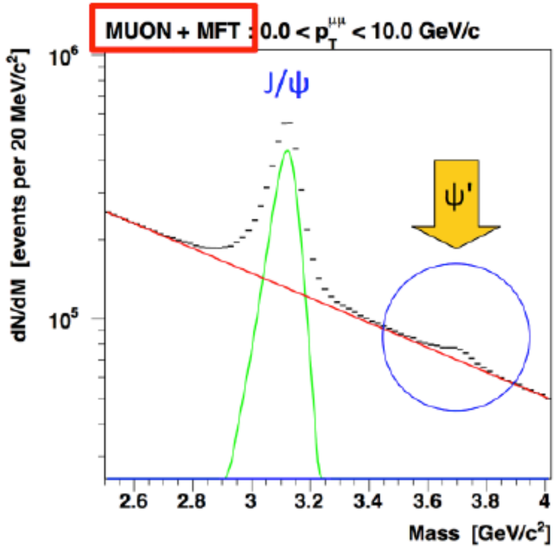


Run 3

Improvements of Run 3 physics results

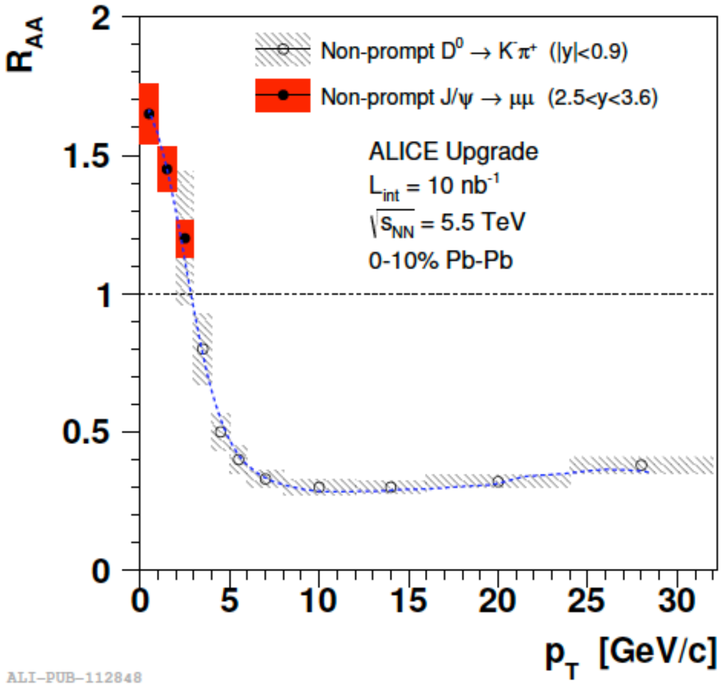
- Charmonium states into dimuons

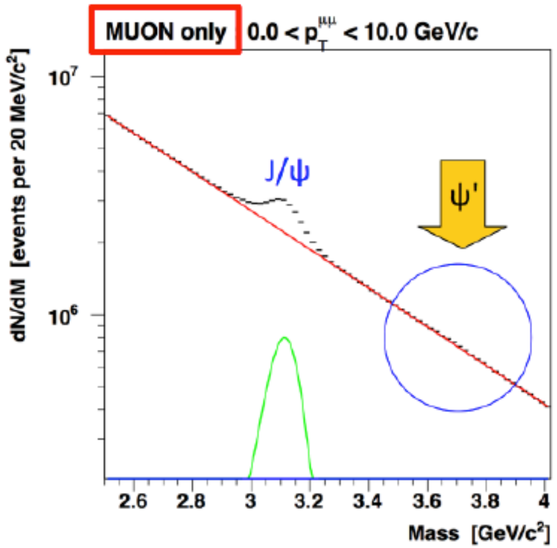


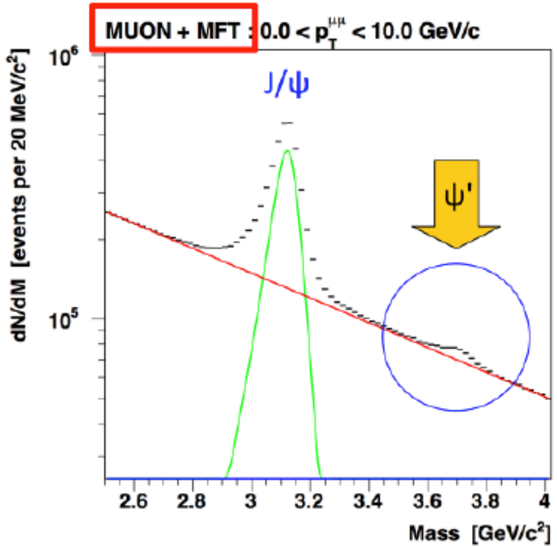


Improvements of Run 3 physics results

- Charmonium states into dimuons
- Non-prompt J/Ψ (from B)

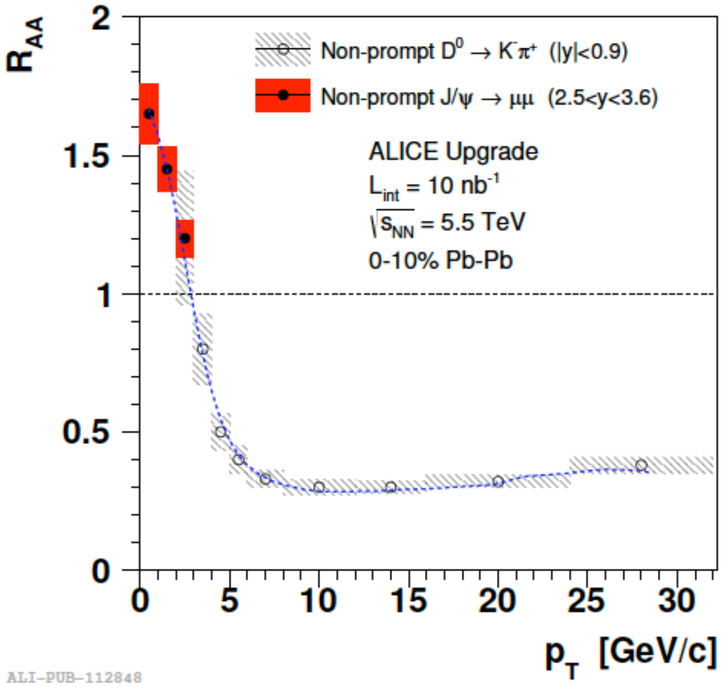


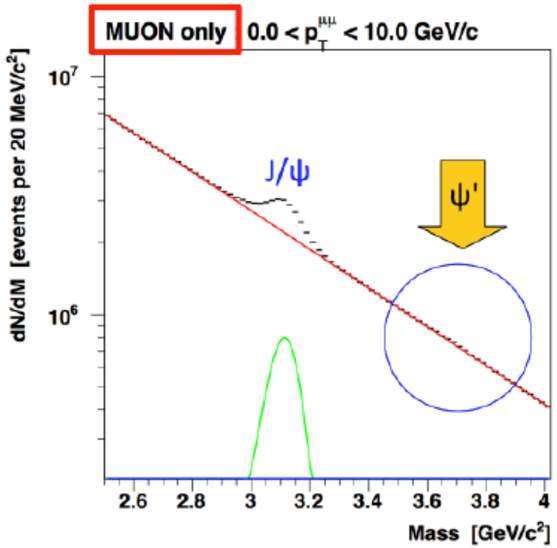


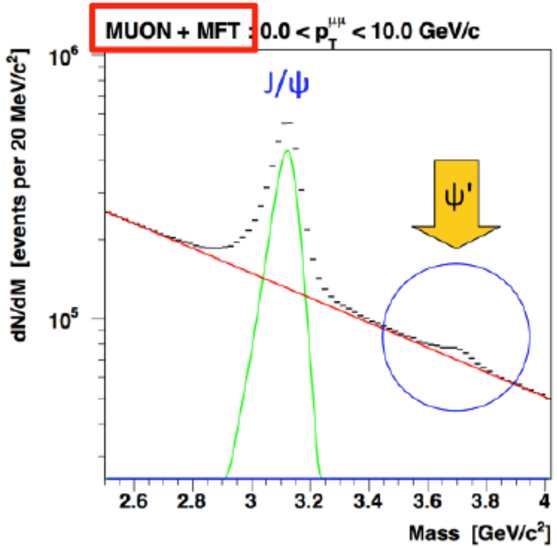


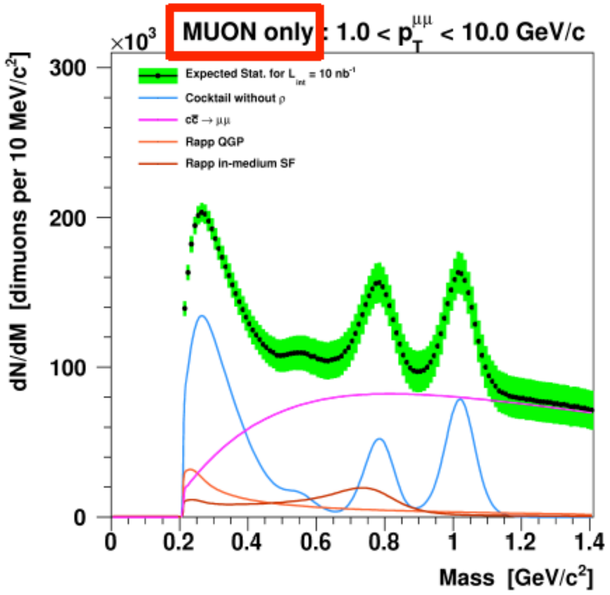
Improvements of Run 3 physics results

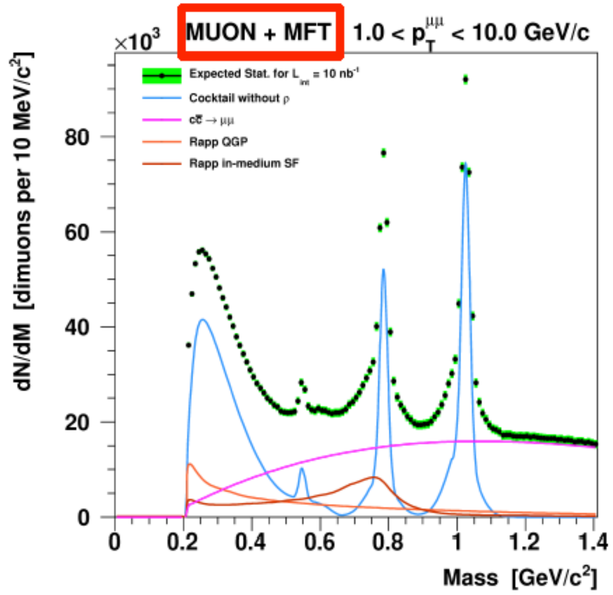
- Charmonium states into dimuons
- Non-prompt J/Ψ (from B)
- Low-mass neutral mesons











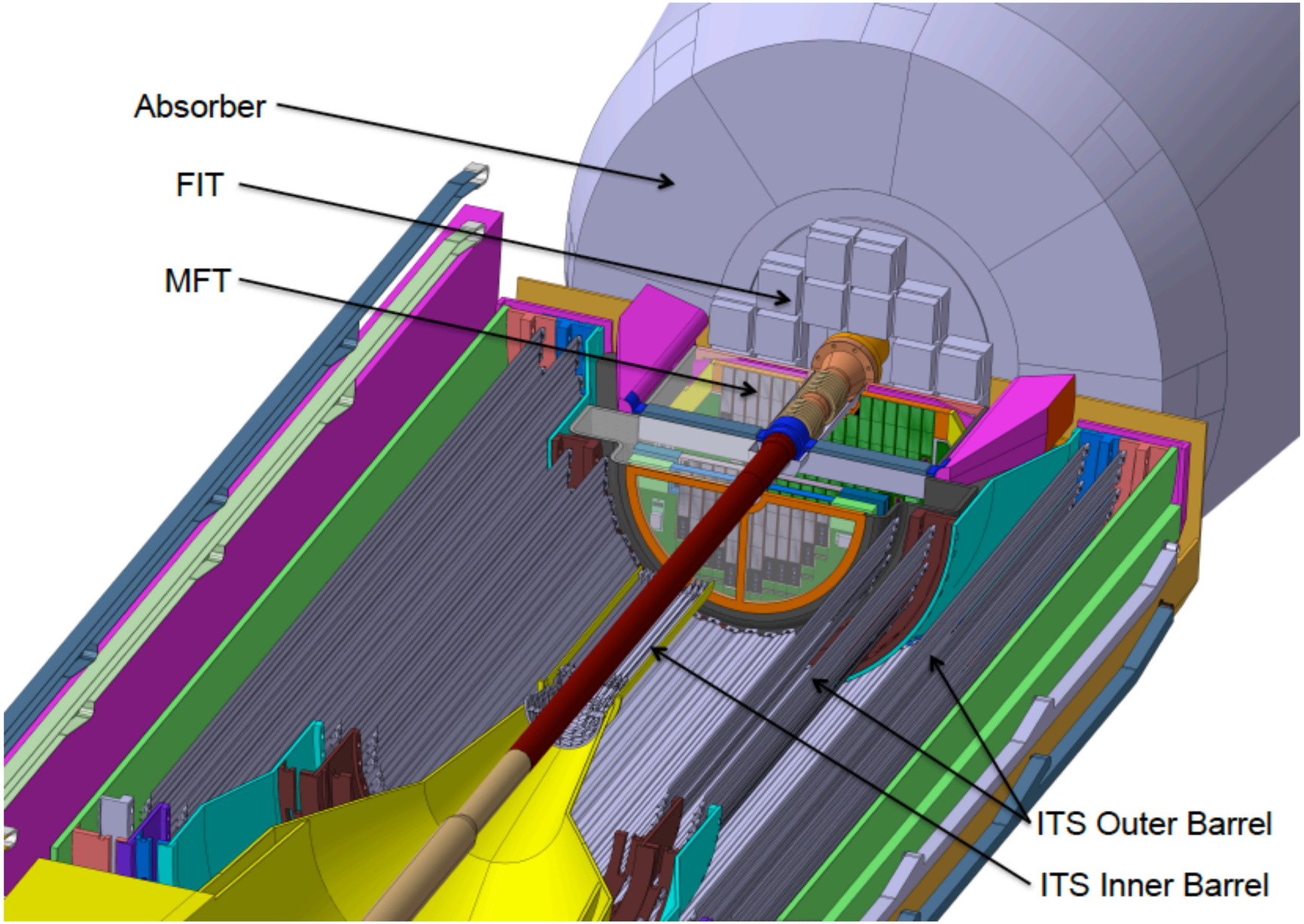
Muon Forward Tracker (MFT)

Collaboration of countries

- France (main contributor)
- Czech republic
- China
- Japan

MFT

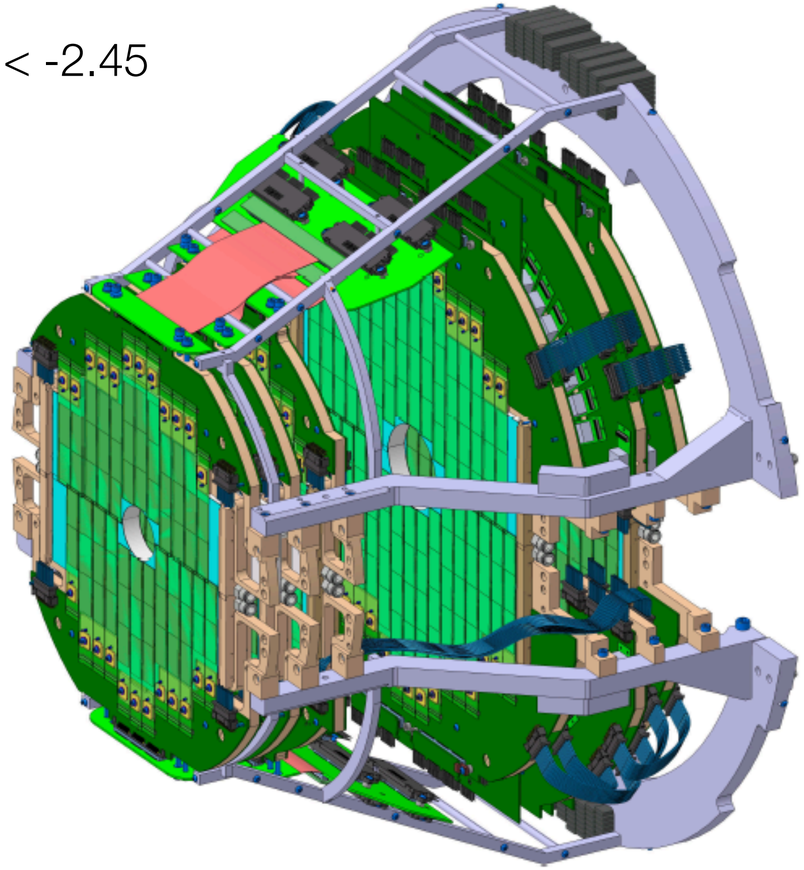
Muon Forward Tracker (MFT)



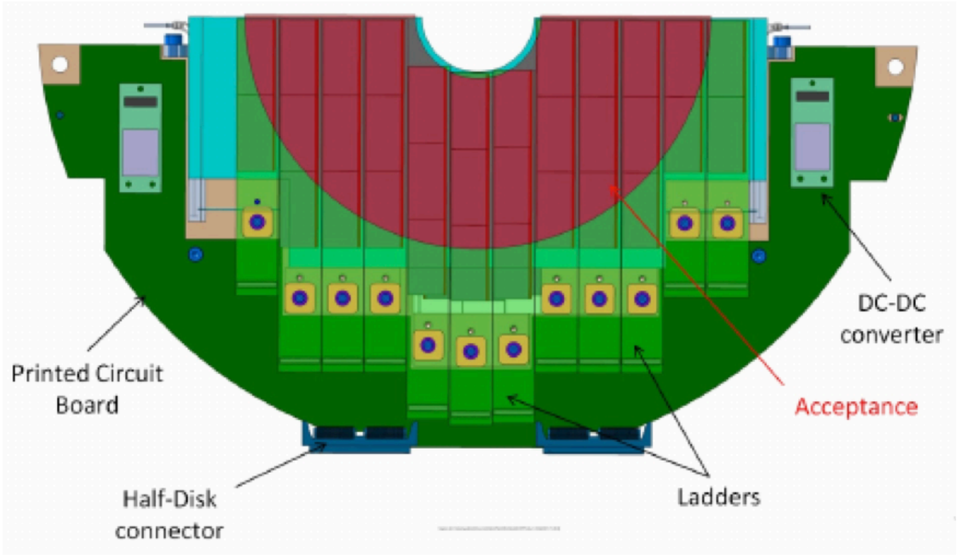
Muon Forward Tracker (MFT)

Coverage:

- Full azimuth
- $-3.6 < \eta < -2.45$



- 936 ALPIDE silicon pixel sensors (0.4 m^2)
- 280 ladders: 2-5 sensors each
- 10 half-disks: 2 detection planes each



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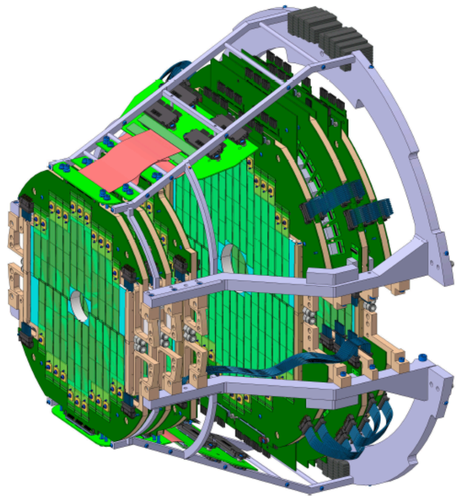
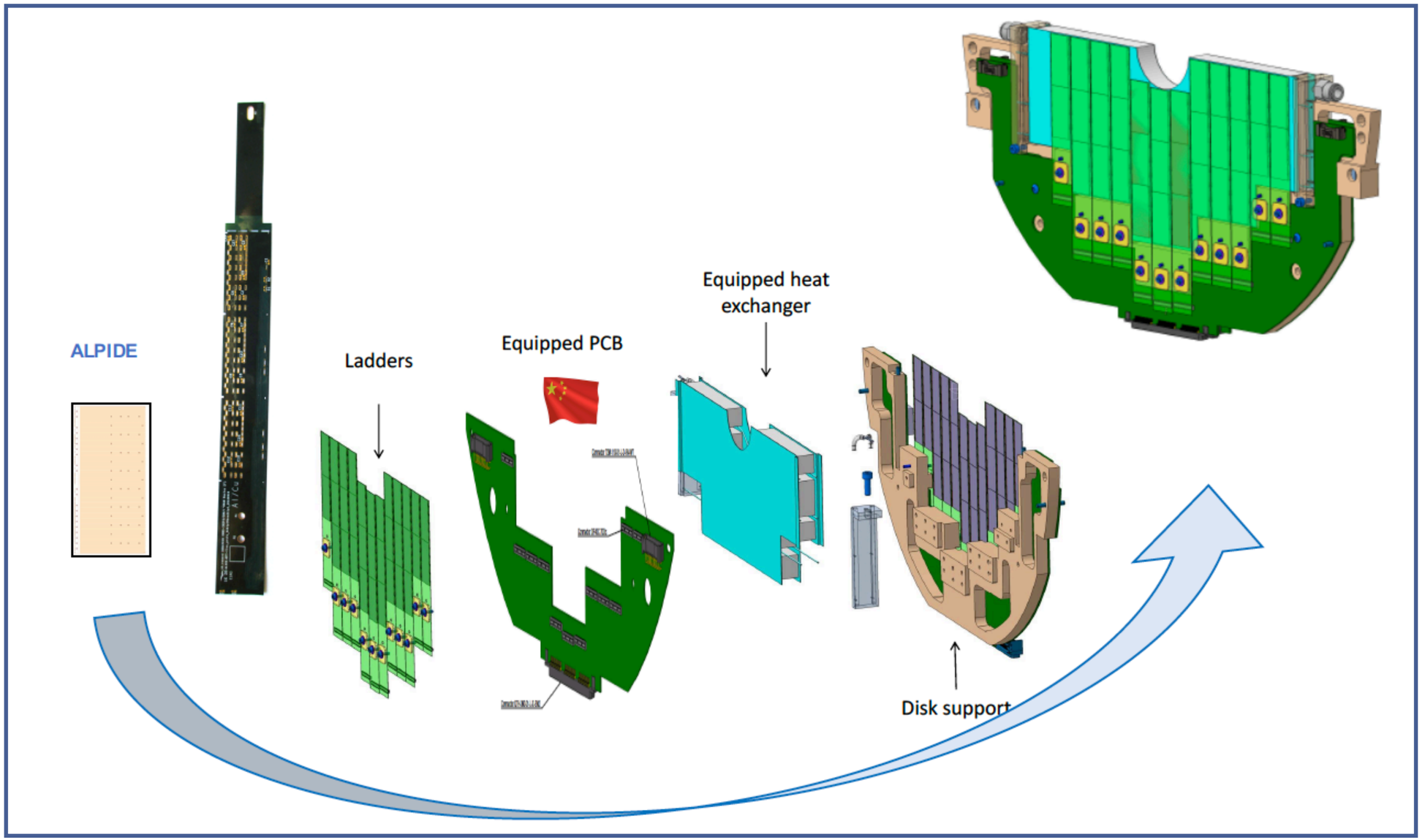


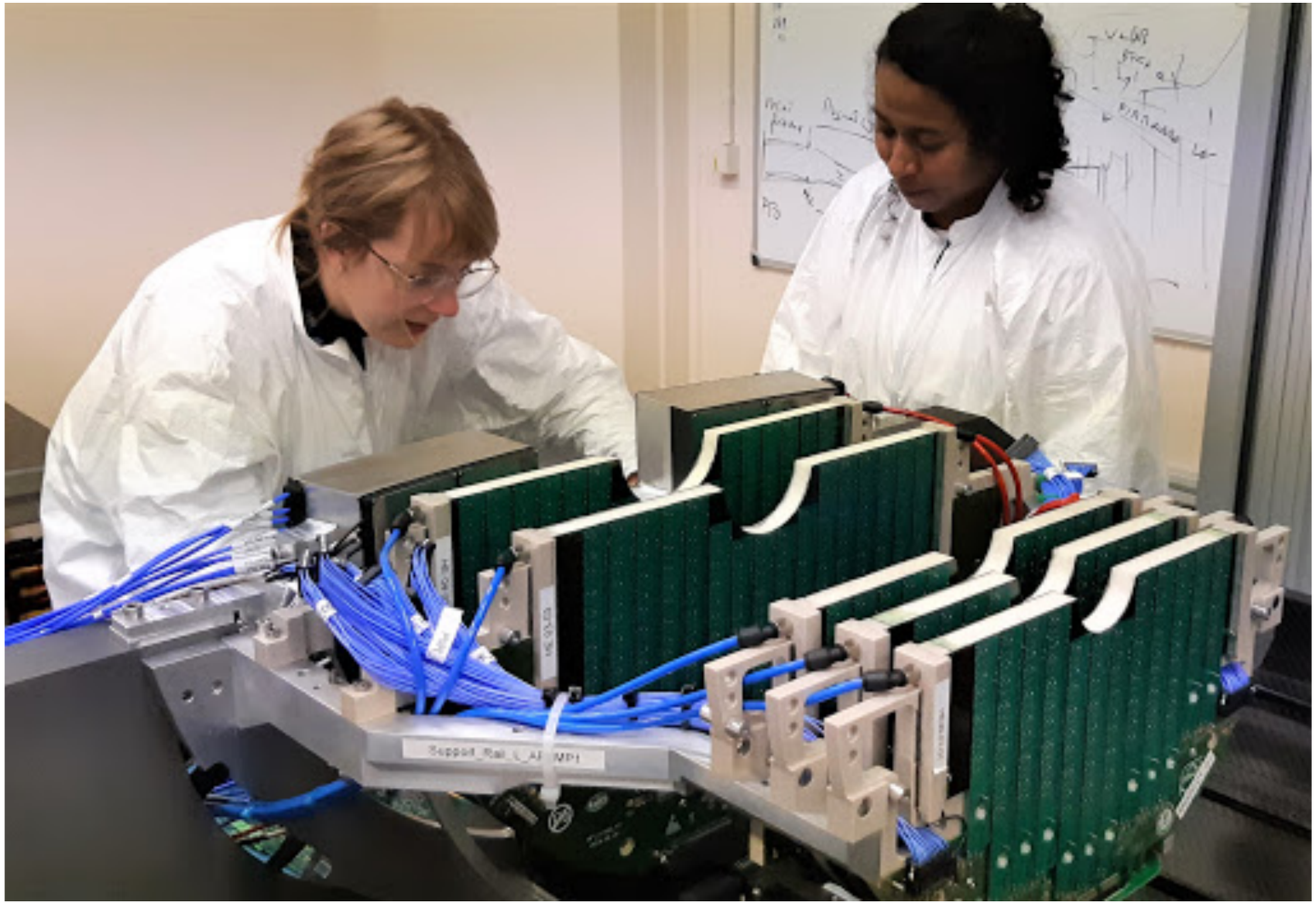


Construction status

- Detector assembled
- Being tested @ CERN (on the surface, bldg. 581)

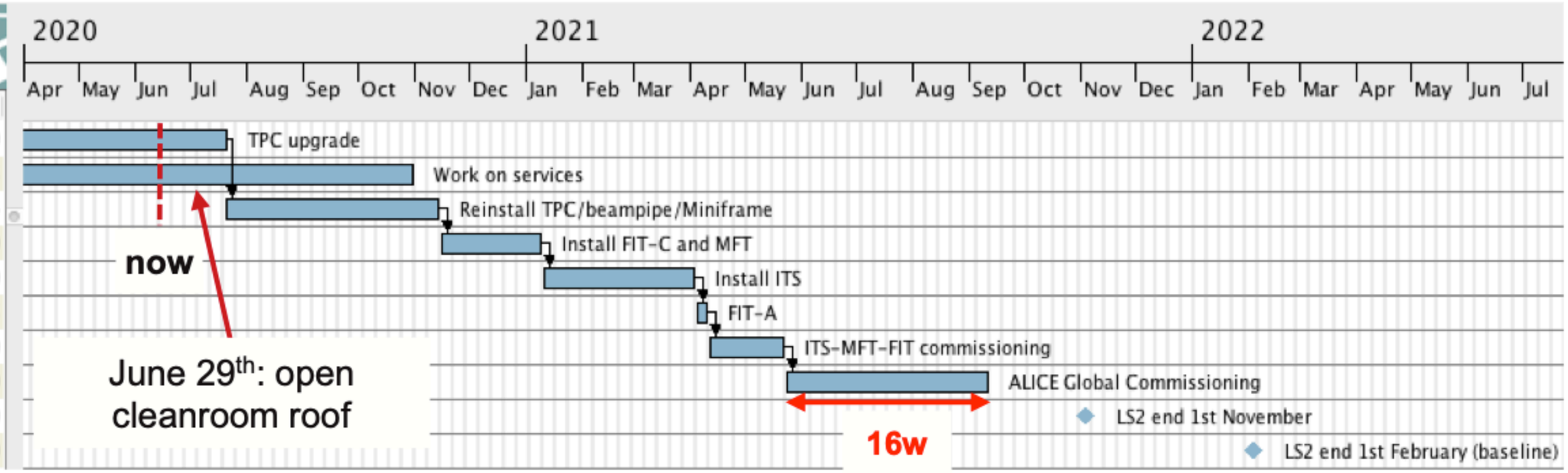
Involvement of our group

See presentation by Diana Krupova @ 11:20



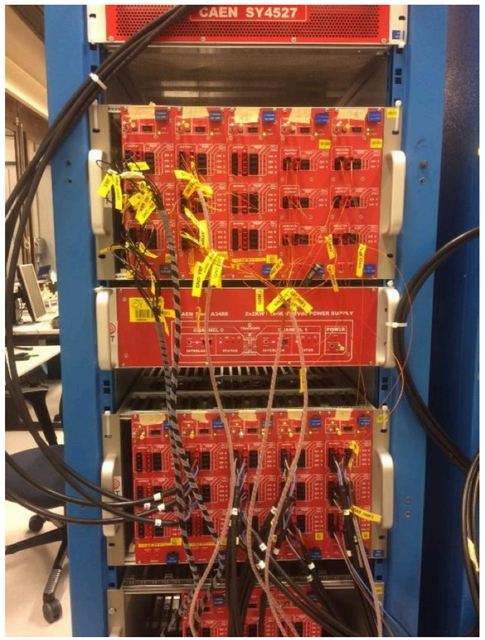
MFT in the cavern

Begin date	End date	Dur...
6/3/19	20/7/20	359
7/1/19	30/10/20	475
21/7/20	13/11/20	84
16/11/20	8/1/21	40
11/1/21	2/4/21	60
5/4/21	9/4/21	5
12/4/21	21/5/21	30
24/5/21	10/9/21	80
1/11/21	1/11/21	0
1/2/22	1/2/22	0



Other non-hardware components

- **Detector Control System (DCS)**
  - Power supplies, voltage control
  - Monitoring of voltage and temperature
- **Readout**
  - “Lot’s of cables” and software to get data from the detector and
- **Quality Control**
  - Monitoring of data coming from the detector



Involvement of our group
See presentation by Tomas Herman @ 11:40