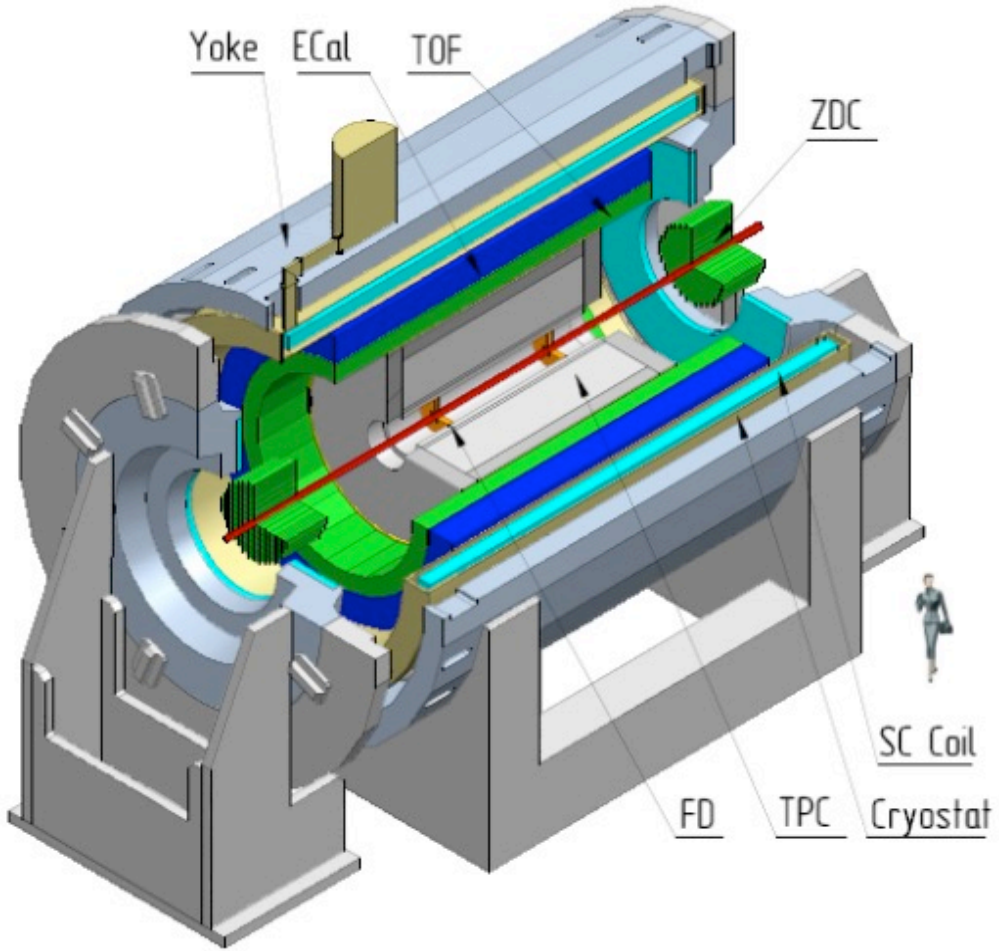
Status of MPD stage 0

V. Golovatyuk

MPD - stage I



Subsystems of Stage 1 configuration:

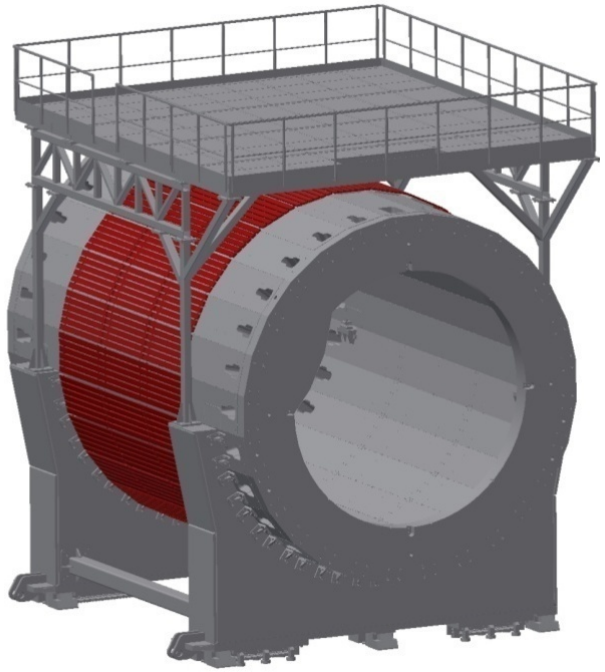
1. TPC - full configuration
2. TOF - barrel
3. FHCal - full configuration
4. FFD - full configuration
5. Ecal - barrel, 50% of all sectors
6. DAQ - barrel configuration
7. Beam pipe – aluminum prototype

Complementary:

1. MCORD – set of panels for Cosmic ray trigger
2. Mini BeBe - Trigger/Start (TOF) for p -p, p -A and small A -A- interaction

Mexican consortium proposed MiniBeBe and/or BeBe detectors

MPD Cosmic Ray Detector (MCORD)



NCBJ, Swerk - WUT, Warsaw (Poland)

18 scientists+12 engineers

As soon as we plan to start tests of MPD subsystems before Collider operation,-
the Cosmic Ray Detector will be requested for Commissioning and tests of the MPD.
The signals from MCORD will be used for TPC and TOF tests after their installation.
We'll need the elements of MCORD (as scintillation panels with readout electronics) as soon as December 2021

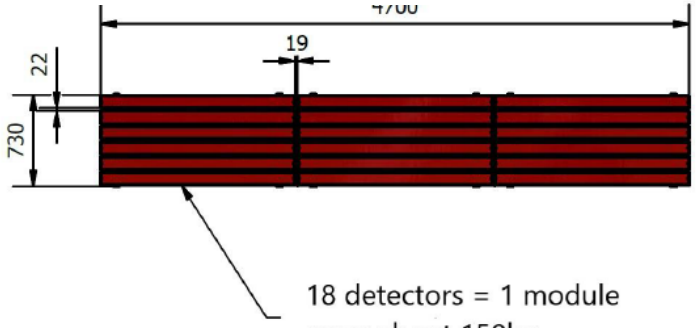
Cosmic Ray Detector consists of plastic scintillators with SiPM (Fototubes) light converters

a) Trigger (for testing or calibration)
- testing before completion of MPD
(testing of TOF, ECAL modules and TPC)
- calibration before experimental session

b) Veto (normal mode -
track and time window recognition)
Mainly for TPC and eCAL

Additionally

c) Astrophysics (muon shower and bundles)
- unique for horizontal events
Working in cooperation with TPC



5. MCORD Detector

SCINTILLATORS

Number of scintillators:	660 pcs
Dimensions of scintillators:	95x25x1500 [mm]
Dimensions of detector:	100x30x1554 [mm]
Scintillators are placed in the rectangle profile	10x30x2.5 [mm]
Weight of detector:	6.5 kg
Material of scintillators casing:	Aluminum alloy

MODULES

Number of detector in one module:	18
Number of Modules:	28
Dimensions of module:	730x90x4700 [mm]
Weight of one module:	150 kg

SiPM/MMPC

Number of SiPMs (Chanels)	1320
Number of SiPMs (with two fibers)	2640

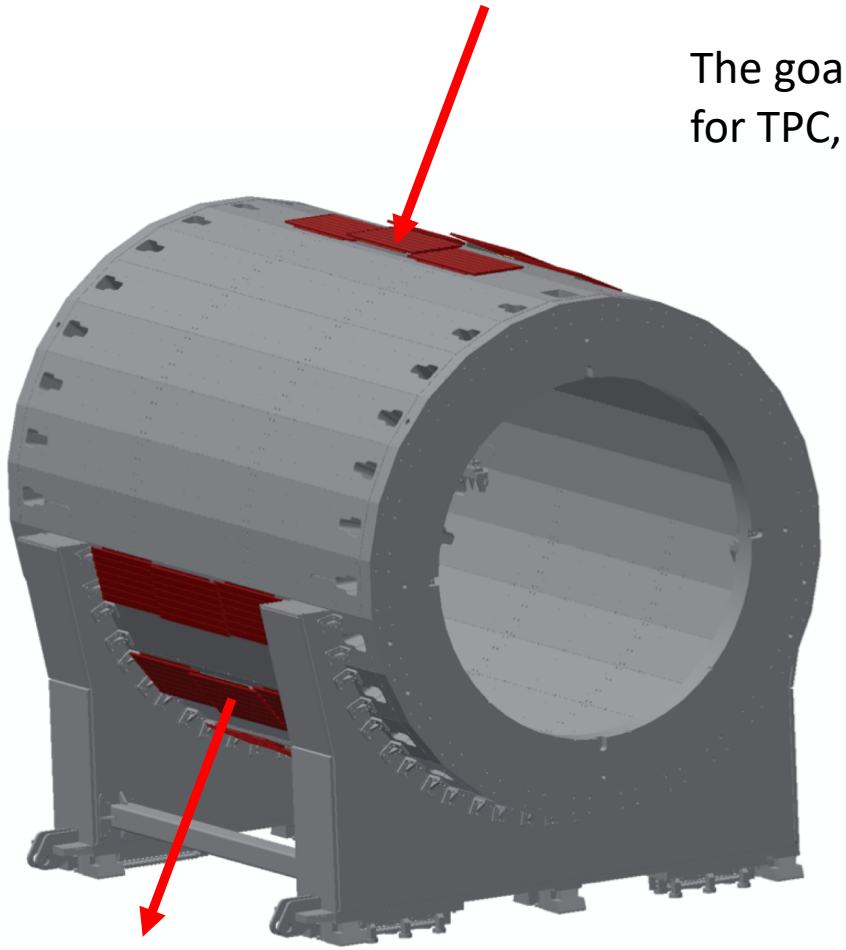
RESOLUTION

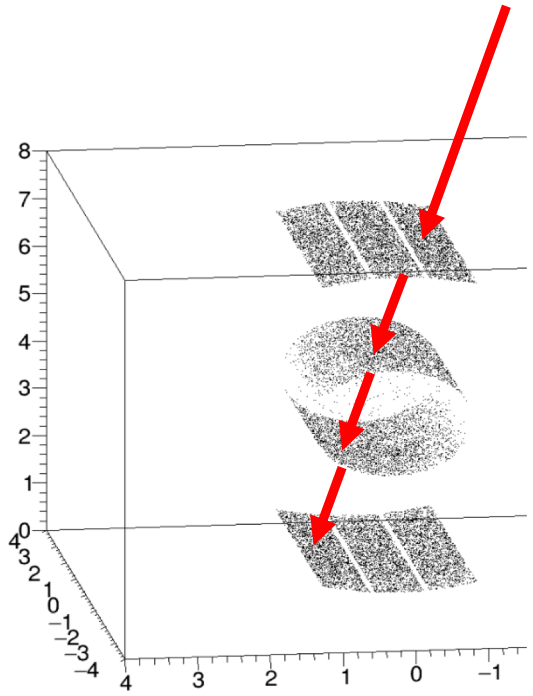
Position resolution: In X axis – up to 5 cm, In Y axis – 5-10 cm
Time Resolution – about 300-500 ps

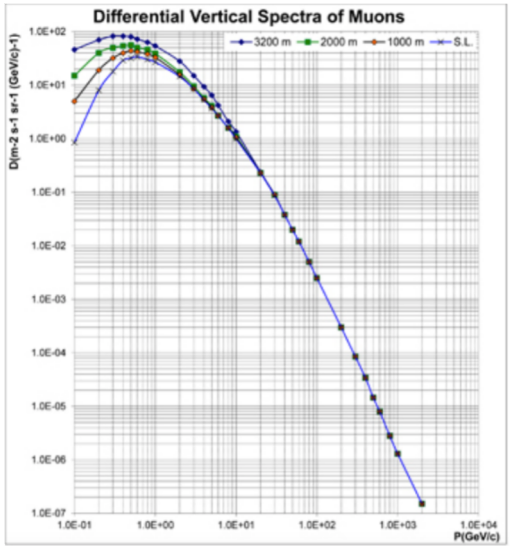
Number of events (particles):	about 100-150 per sec per m2
Calculated Coincidence factor:	about 98%

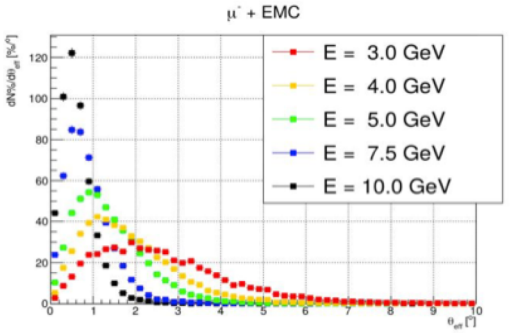
MCORD at stage 0

The goal of the detector to provide muon trigger for TPC, TOF and Ecal tests during installation









	$\langle\theta_{eff}\rangle$	
μ Energy[GeV]	with ECal	Without ECal
3	**2.68**	**2.24**
4	**1.85**	**1.65**
5	**1.41**	**1.31**
7.5	**0.91**	**0.87**
10	**0.65**	**0.63**

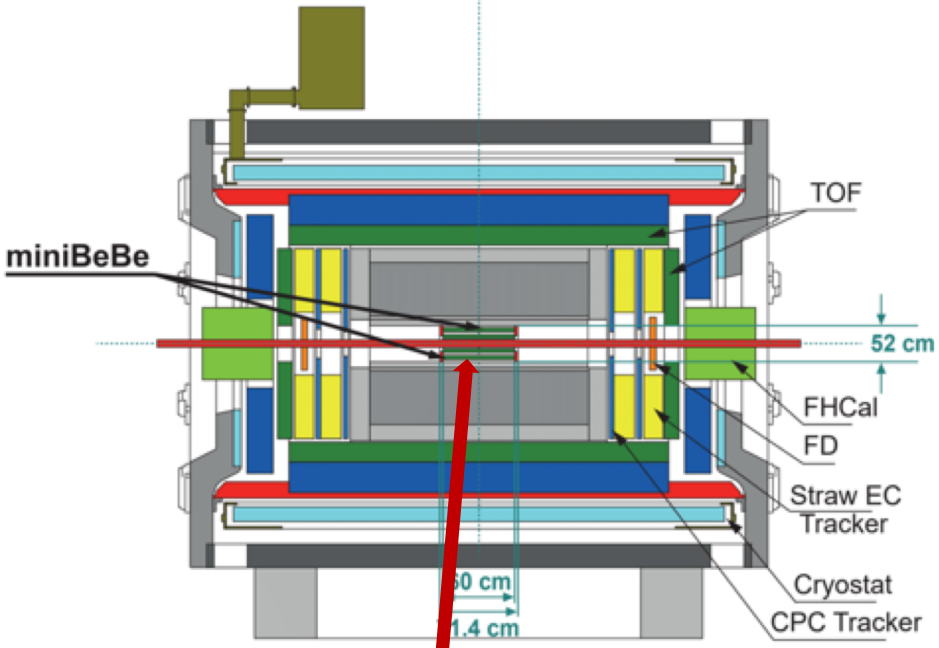
Due to multiple scattering of 10 GeV muons

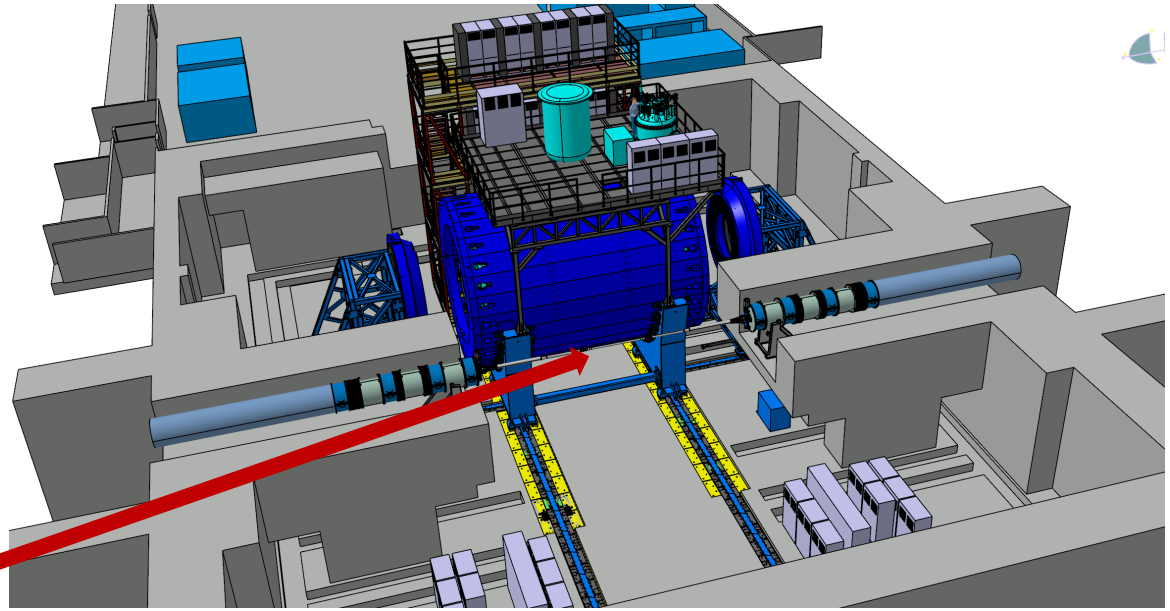
The accuracy of “tracks” in the TPC in average is 5-7 cm

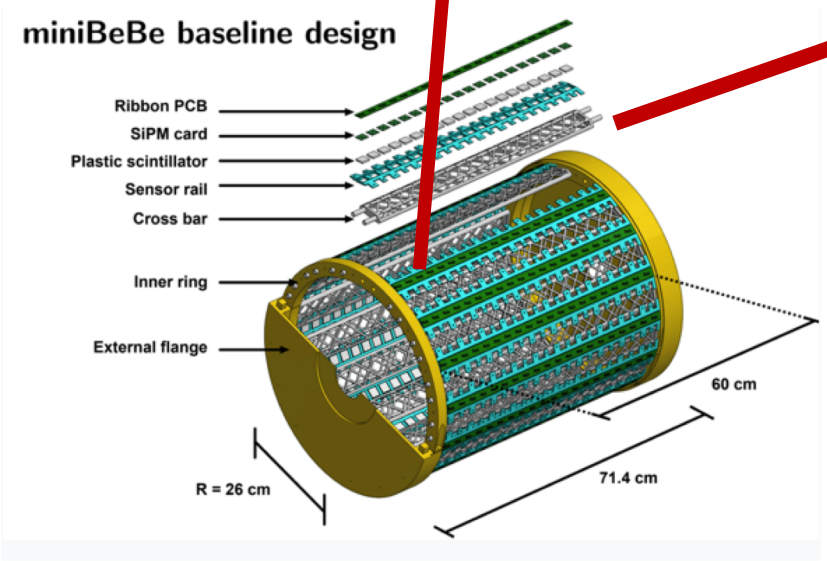
The goal of the miniBeBe detector to provide

- the trigger for low multiplicity p + p, p +A and small size A +A events and
- start signal for TOF

miniBeBe @ MPD







At the Stage 0 we need strips of detectors around beam pipe on the place of interaction region to help accelerator team to tune Collider luminosity by estimation of the number of secondaries particles as a function of beam positions.

- define the interaction region shape and size
- define the time structure of interactions

Milestones of MPD assembling in 2020-2023

Year 2020

1. July 15th - MPD Hall and pit are ready to store and unpack Yoke parts
2. August - The first 13 plates of Magnet Yoke are assembled for alignment checks
3. Sept 15ht-Oct 1st - Solenoid is ready for transportation from ASG (Italy)
4. November 10th - **Solenoid arrival**
5. Nov-Dec - Assembling of Magnet Yoke and Solenoid at JINR

Year 2021

6. Jan- April - Preparation for switching on the Solenoid (Cryogenics, Power Supply et cet.)
7. May - June - Magnetic Field measurement
8. July - Installation of Support Frame.
9. Jul- Dec - Installation of Ecal and TOF, Electronics Platform, Cabling

Year 2022

10. Jan- March - Installation of TPC, Electronics Platform, Cabling
11. March - Installation of beam pipe, FHCal, Cosmic Ray test system
12. April-Dec. - Cosmic Ray tests
13. December - Commissioning

Year 2023

14. March Run on the beam

Summary

1. To control the working parameters of installed subsystem when MPD is still open and we have chance to fix possible problems we need muon trigger system. The solution proposed by Swerk group is well fit to our requirements.
2. MiniBeBe detector and its elements allows to have control of collider luminosity, interaction region shape and time structure.

Thank you