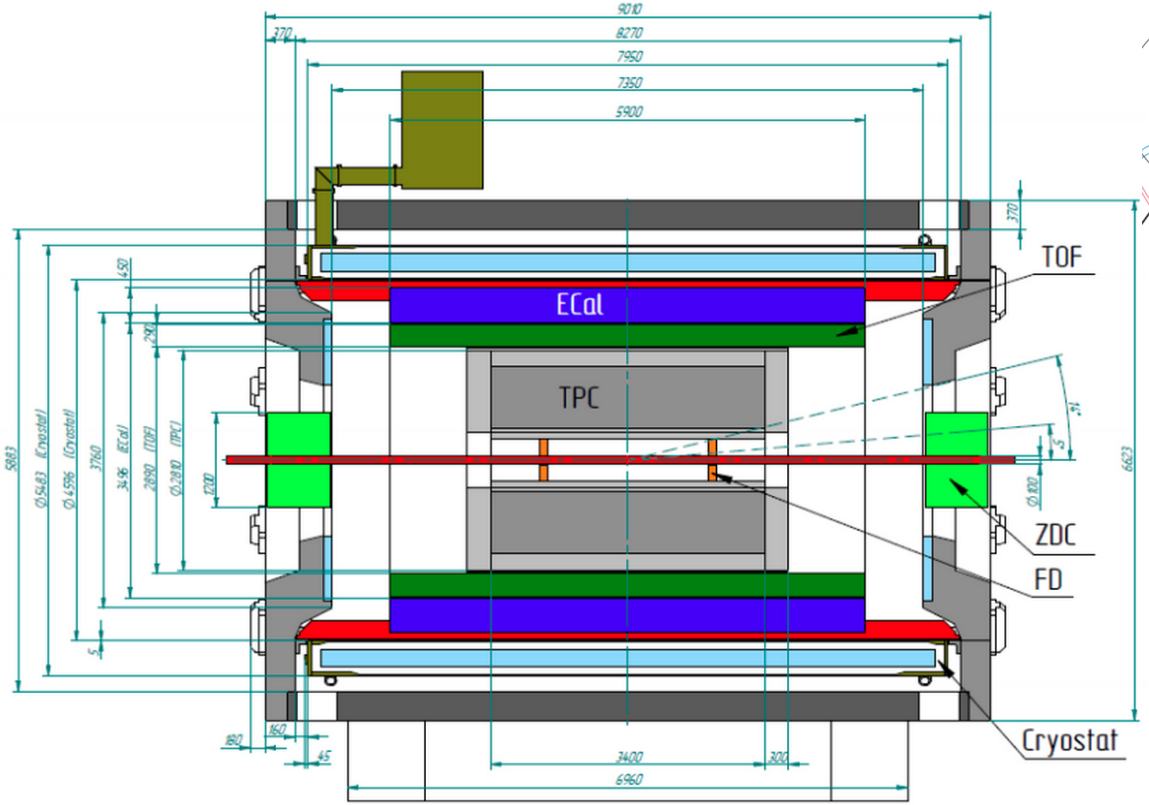
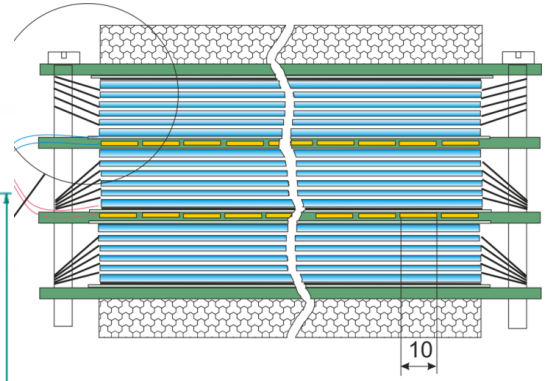
Status of the MPD TOF System

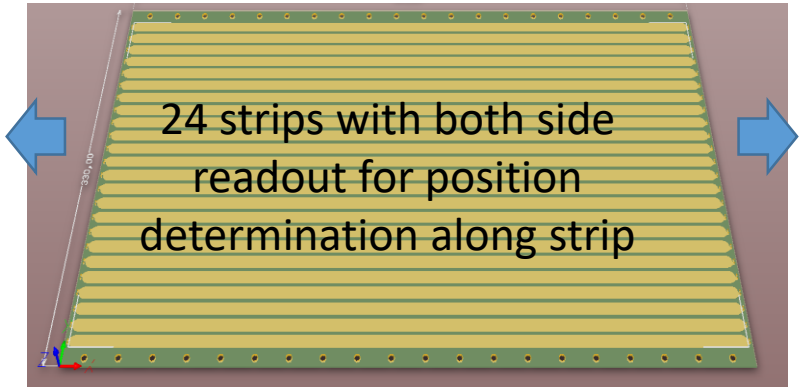
Contents

Time-of-Flight system in the basic configuration of MPD



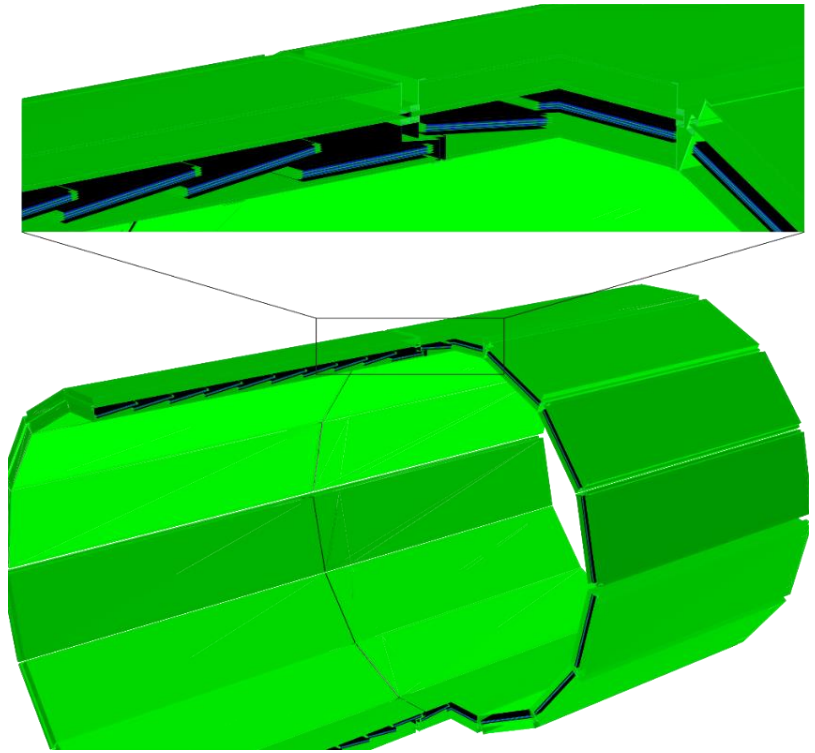


3-stack 15-gaps MRPC



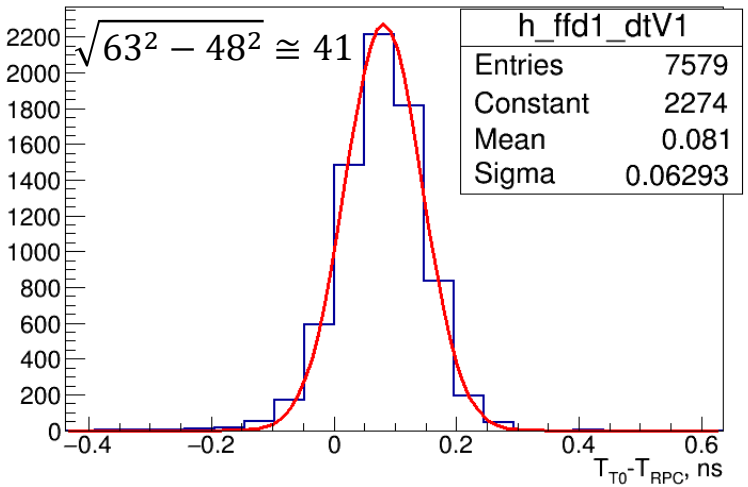
MRPC readout strips

	Number of detectors	Number of readout strips	Sensitive area, m²	Number of FEE cards	Number of FEE channels
MRPC	1	24	0.192	2	48
Module	10	240	1.848	20	480
Barrel (**28 modules**)	**280**	6720	**51.8**	560	**13440**

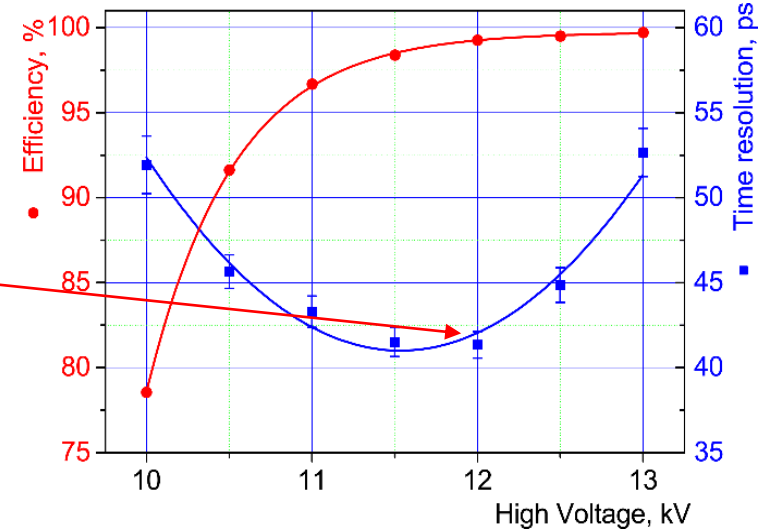


TOF Barrel

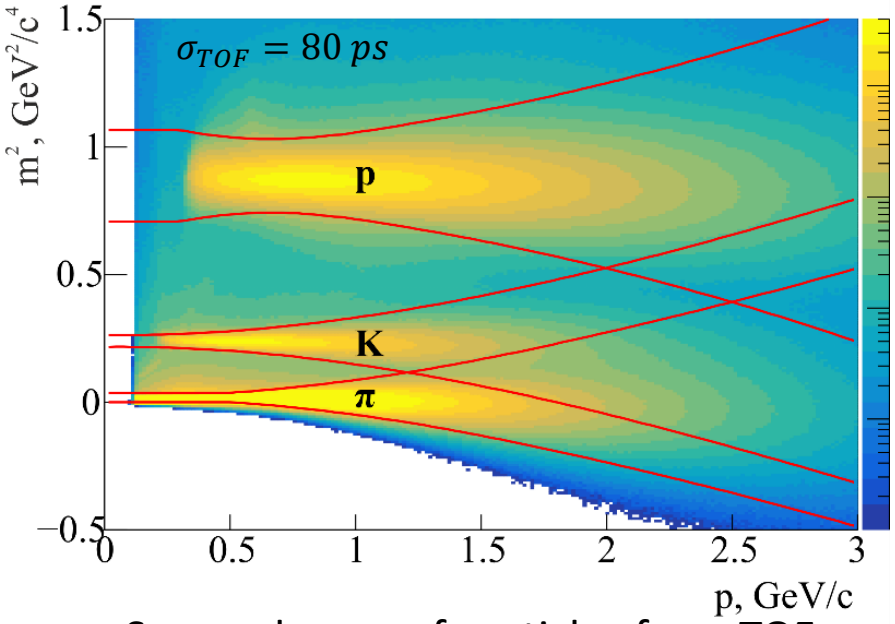
Particles identification by the time-of-flight in MPD



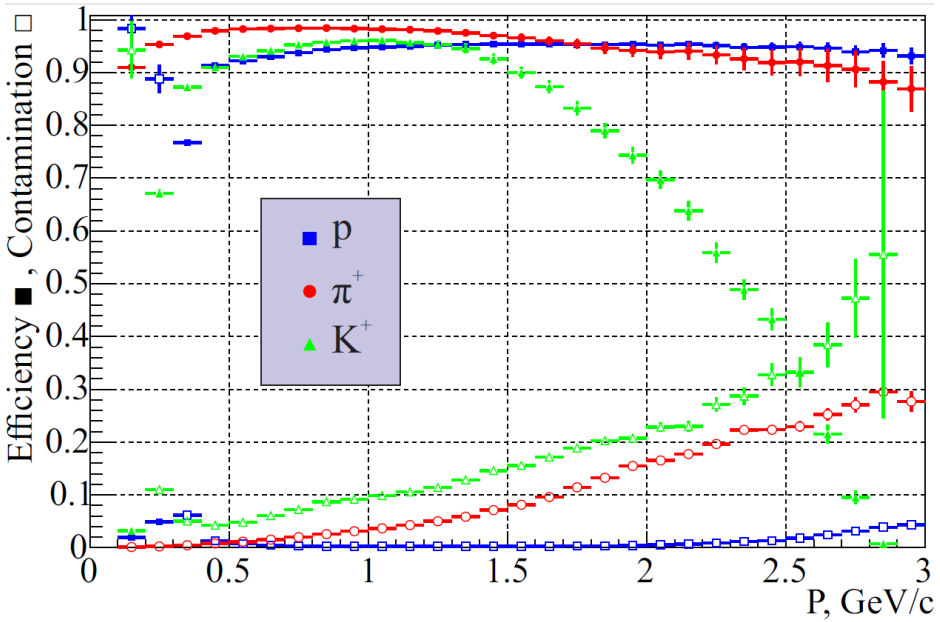
The best measured MRPC time resolution



Efficiency vs applied HV



Squared mass of particles from TOF



TOF PID efficiency

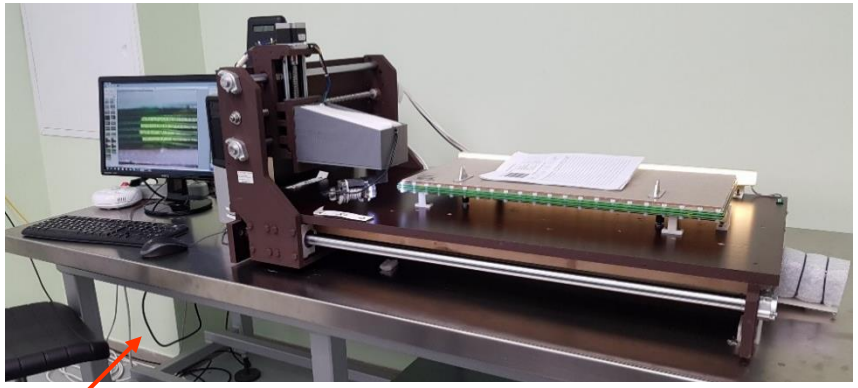
Mass production and quality control

Mass production staff: 4 physicists, 4 technicians, 2 electronics engineers

All procedure of detector assembling and optical control is performed in a clean rooms ISO class 6-7.

Glass cleaning with ultrasonic wave & deionized water

Automatic painting the conductive layer on glass

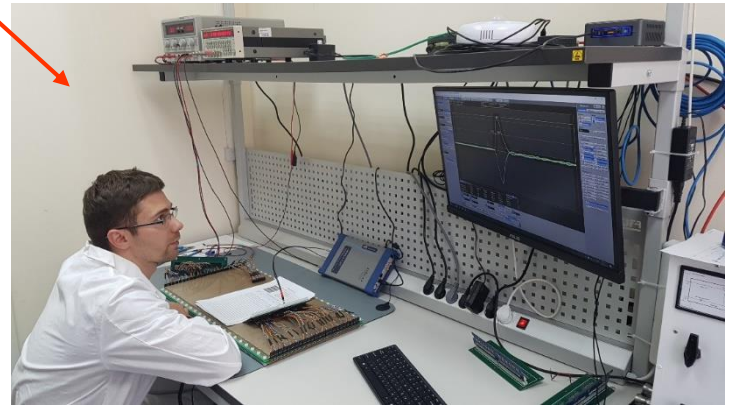


Check list

1) Optical control (gap uniformity, cracks in glass)
2) Primary HV testing (without gas) - up to 6 kV
3) Readout pins and cables break, short-circuit and reversed polarity control
4) Full HV testing (after fast pumping and filling with working gas mixture) – up to 12 kV
5) Transmission line impedance (reflection) control

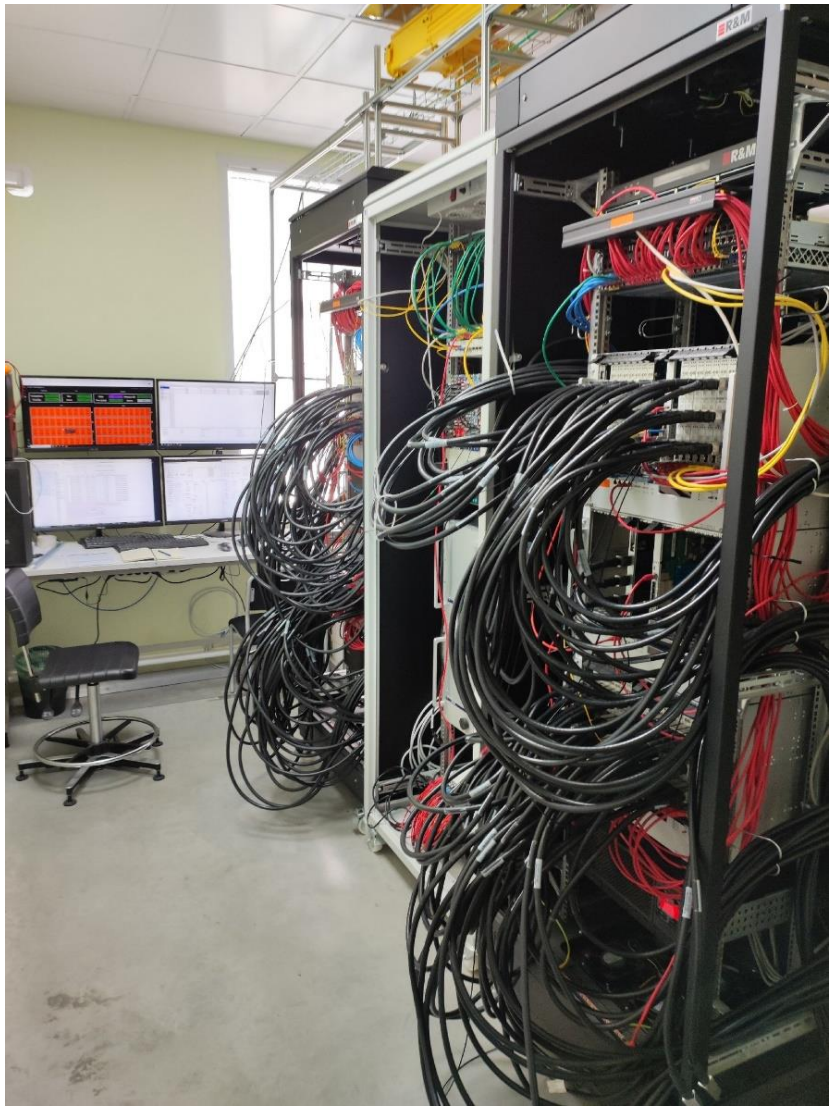
MRPC assembling

TOF modules assembling



Cosmic rays test of TOF modules

Laboratory stand for testing TOF modules on cosmic rays operate since beginning of August 2021

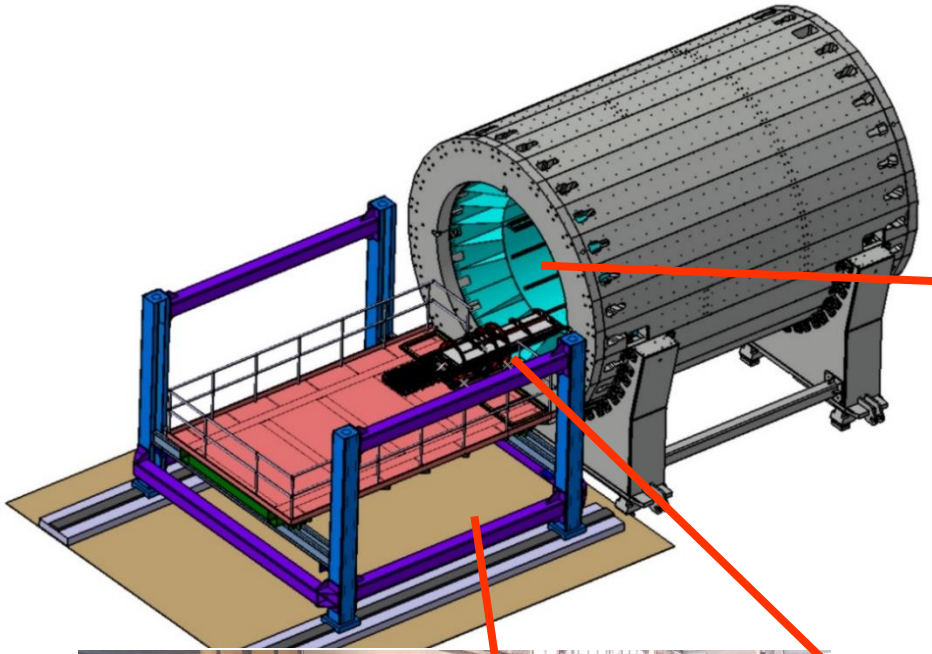


Progress of the TOF detectors and modules assembling

The production of MRPC detectors has been completed. Totally, to date, 300 (107%) MRPC detectors were produced. All 28 (100%) TOF MPD modules are already assembled, tested and stored. We have time to recheck and upgrade previously assembled modules. We are currently planning to make several additional spare modules.

We are ready for TOF installation into the MPD power frame

Equipment for TOF installation



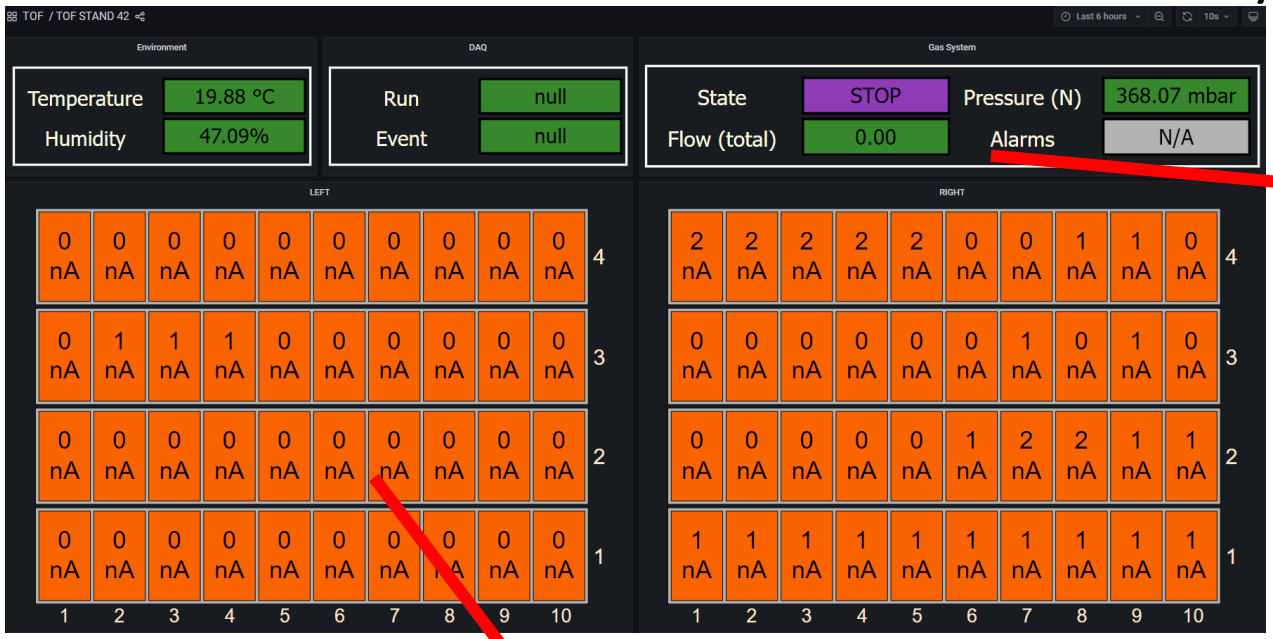
TOF module

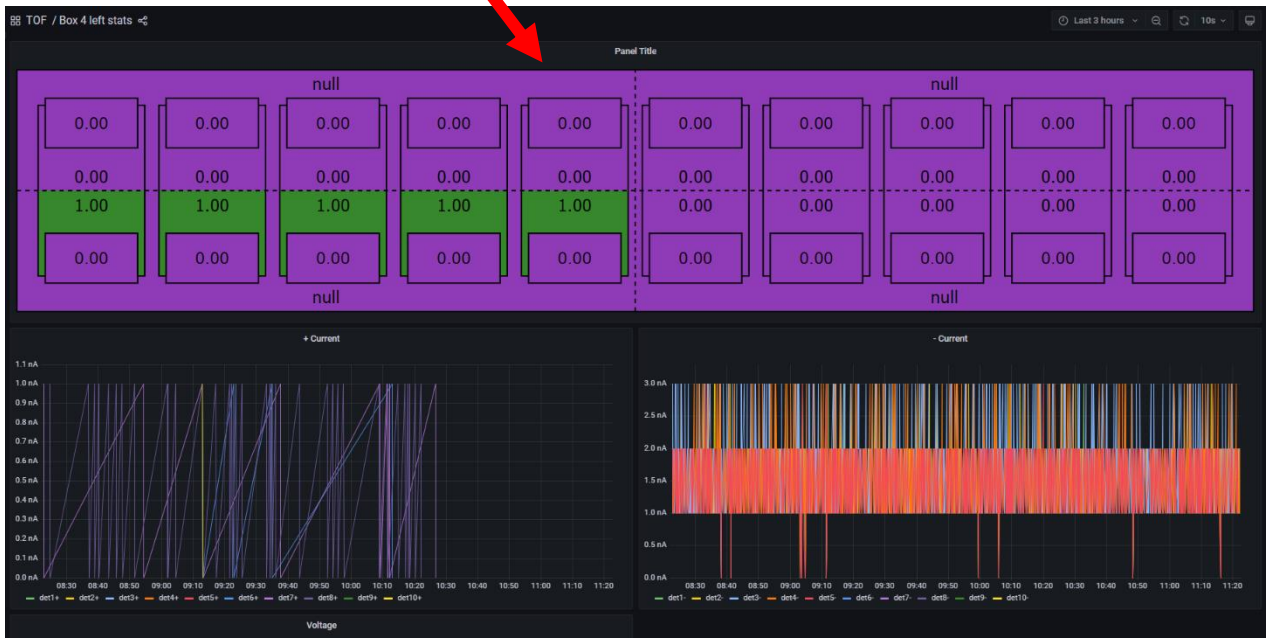
Aluminum rails for TOF are installed on the MPD Power Frame

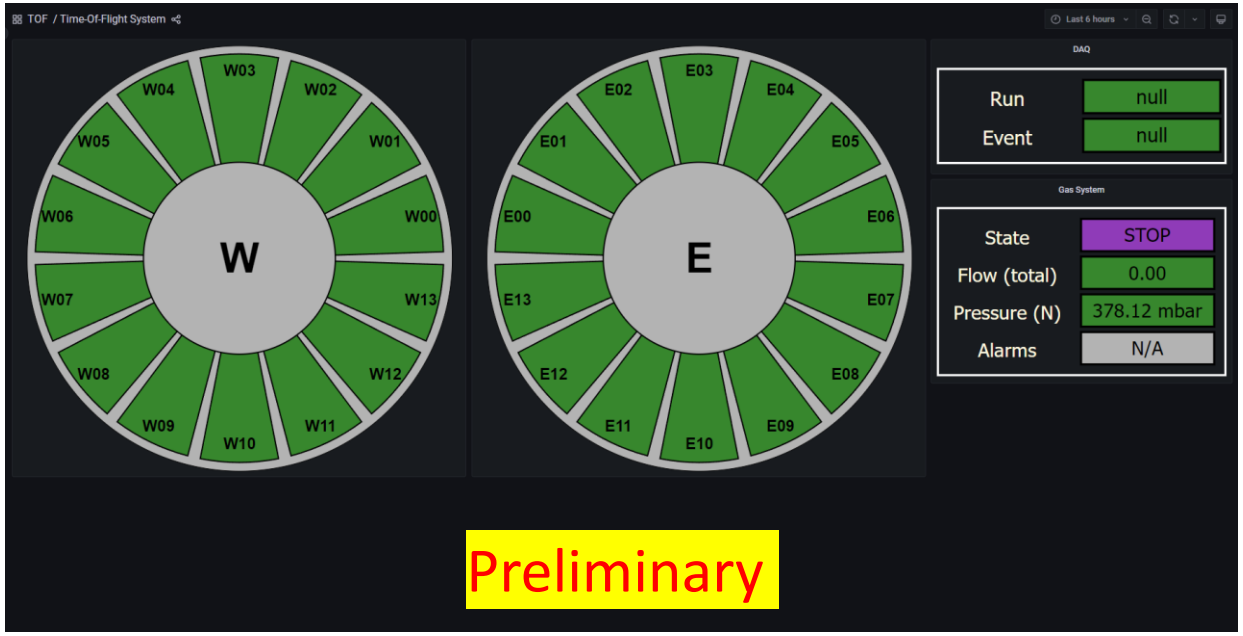
Lifting platform

The TOF installation bench is fully assembled and stored in the VBLHEP

Slow control system for TOF MPD

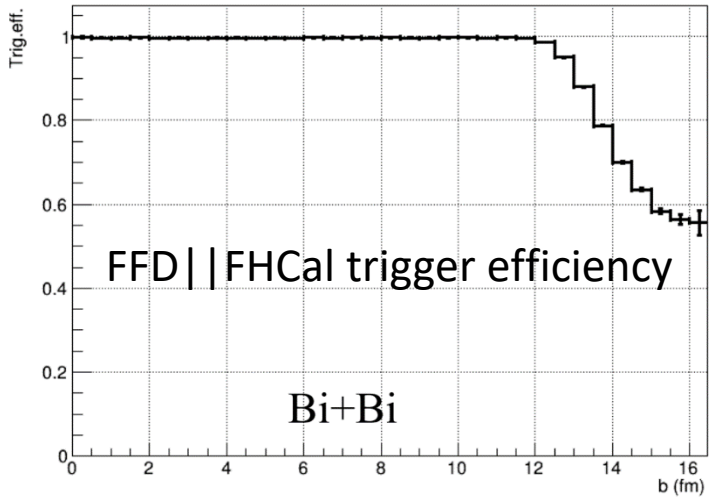




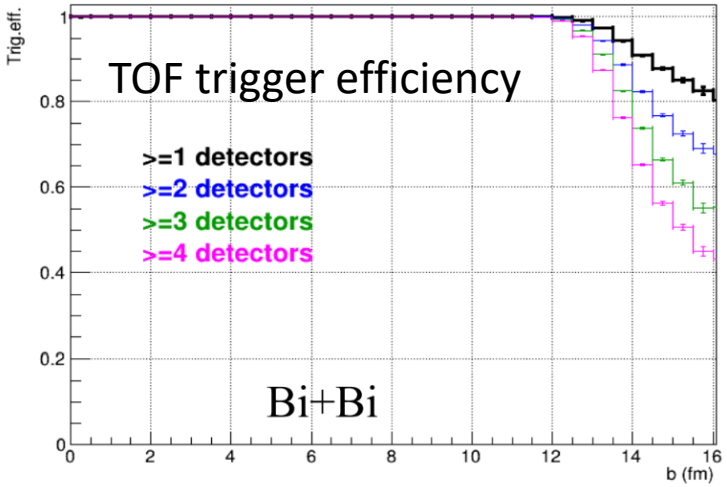


TOF based trigger system

DCM-QGSM-SMM Bi+Bi $\sqrt{S_{NN}} = 11$ GeV

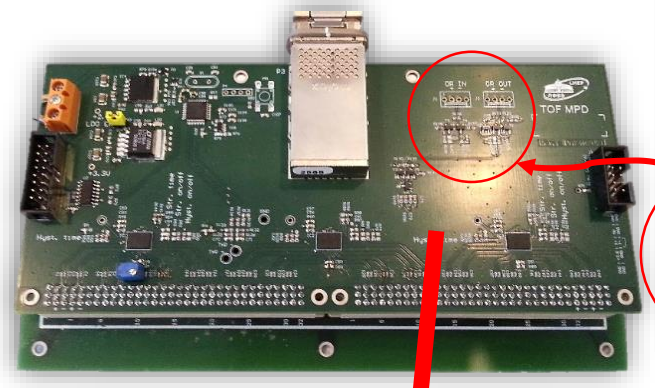


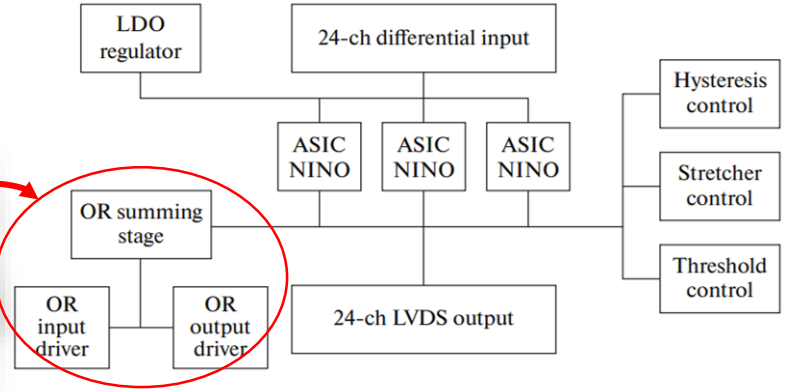
100% from 0 to 12 fm



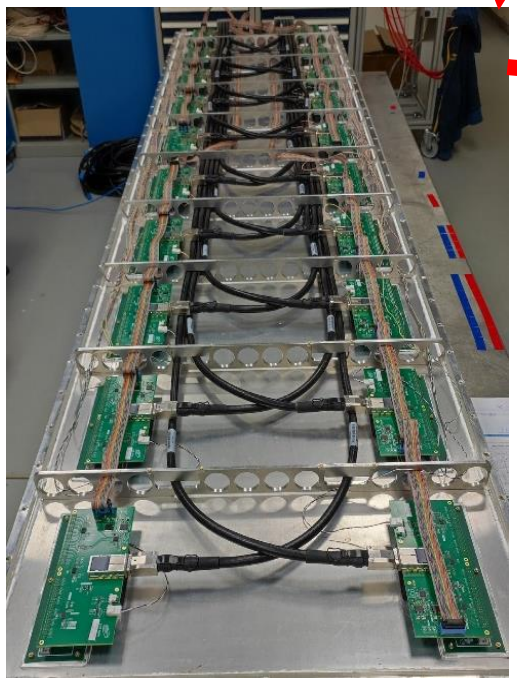
100% from 0 to 12 fm

NINO "OR" output



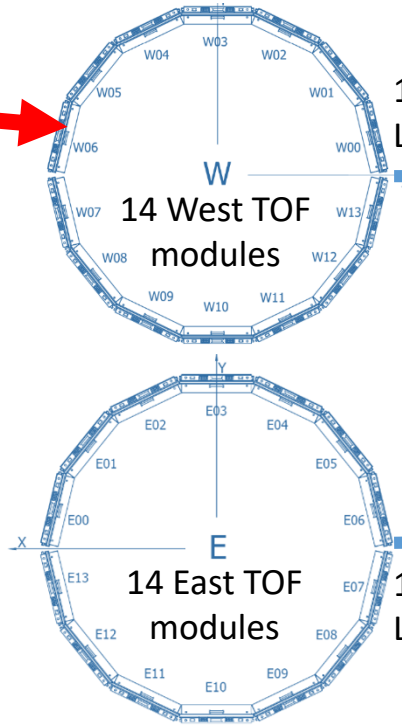


TOF module = 10 MRPCs



10 "left" "OR" NINO signals

10 "right" "OR" NINO signals



140 signals after L && R logic

140 signals after L && R logic

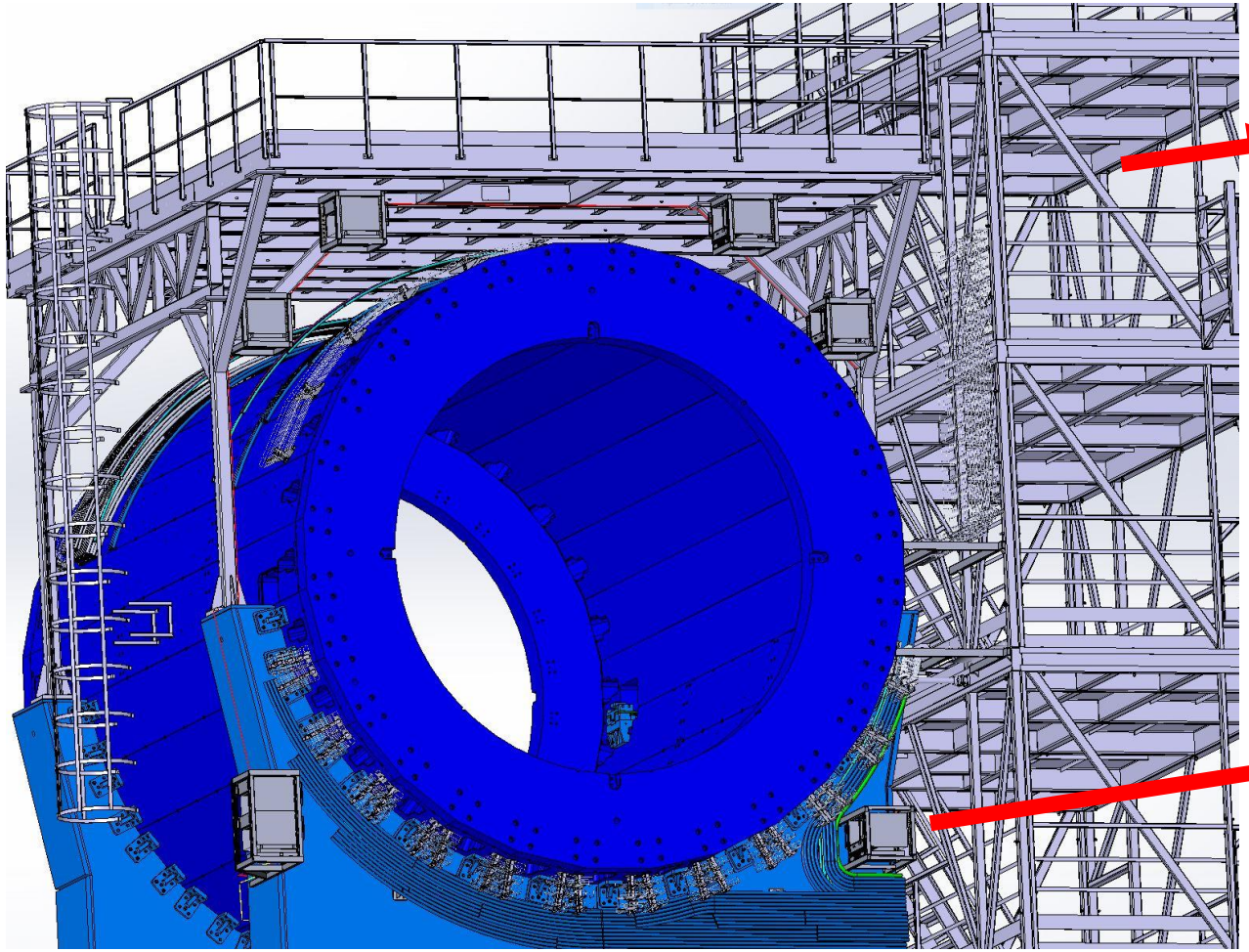
280 inputs counter

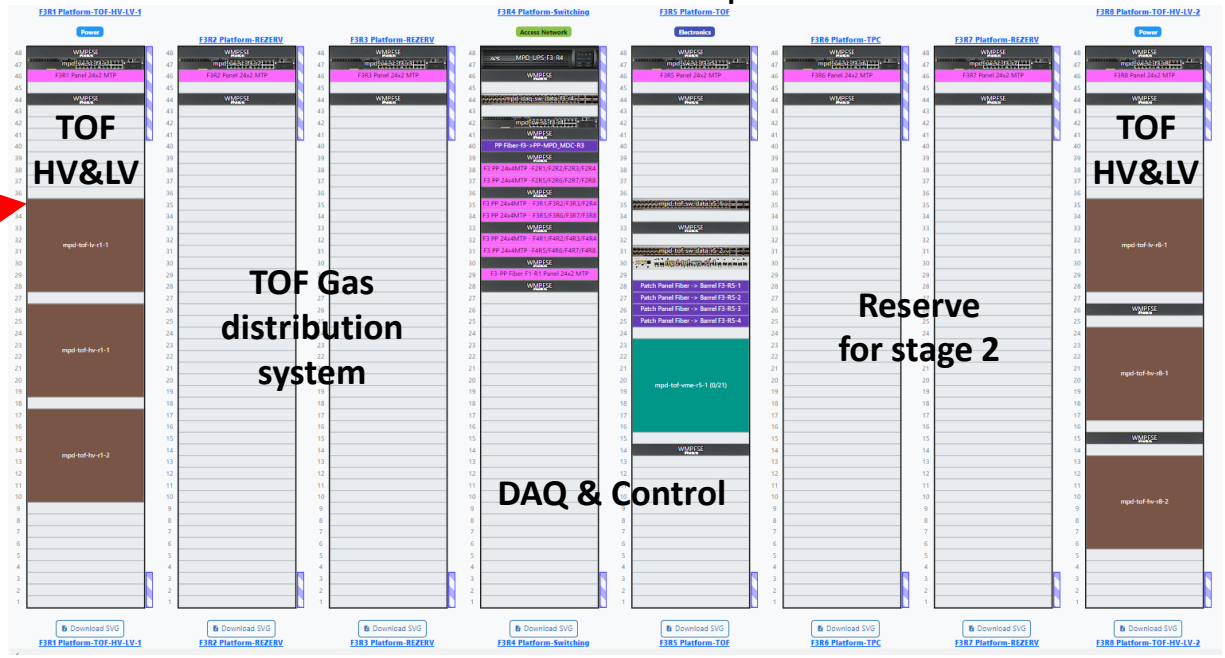
Number of "hited" detectors

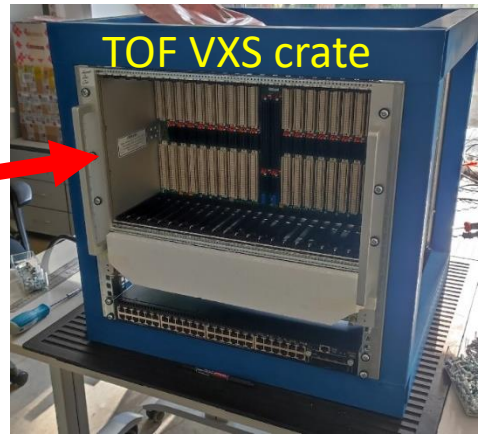
To central trigger system at the MPD platform

TOF readout and power crates at the MPD

3rd flor of the MPD platform



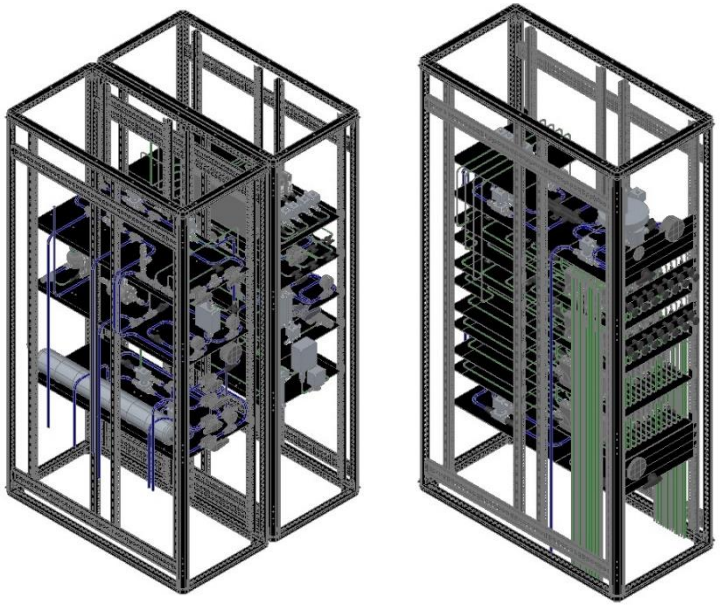




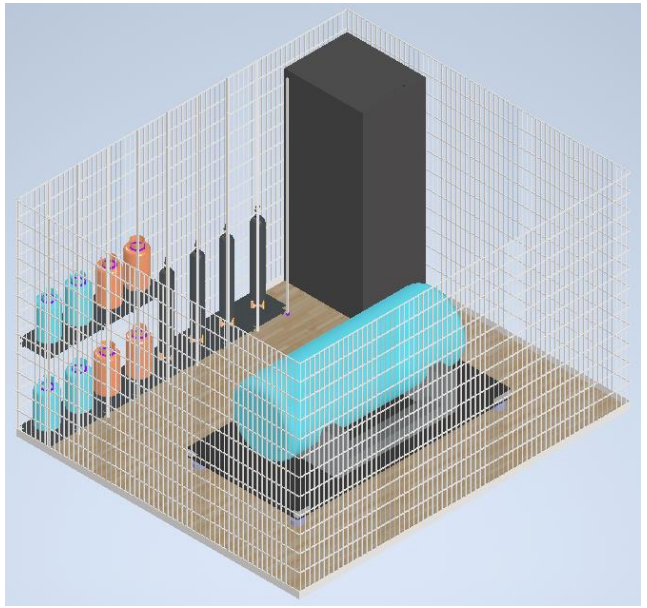
Details about MPD Electronics Platform in the presentation of A. Fedyunin (today 17:40)

Gas system for the TOF in the MPD hall

Scheme of gas systems position in the MPD hall



Model of mixer (left) and distributor (right) of TOF gas systems



Gas supply area in the MPD hall

"Tent" for assembling gas system in the MPD hall

Conclusions

- Mass production of MRPCs – 300 of 280 are ready (~107%))
- Mass production of TOF modules – 28 of 28 are ready (~100%)
- Integration equipment – completed
- TOF slow control – in development
- TOF trigger system – in development and production
- VME crates, cables, and HV distributors on the MPD yoke – in development and assembling
- Gas supply and storage for the gas system in building 17 – in the assembly (commissioning in April 2024)

The installation of TOF modules inside the MPD solenoid is scheduled for September 2024

We invite you to cooperate in the field of hardware and software development!

Thank you for the attention!