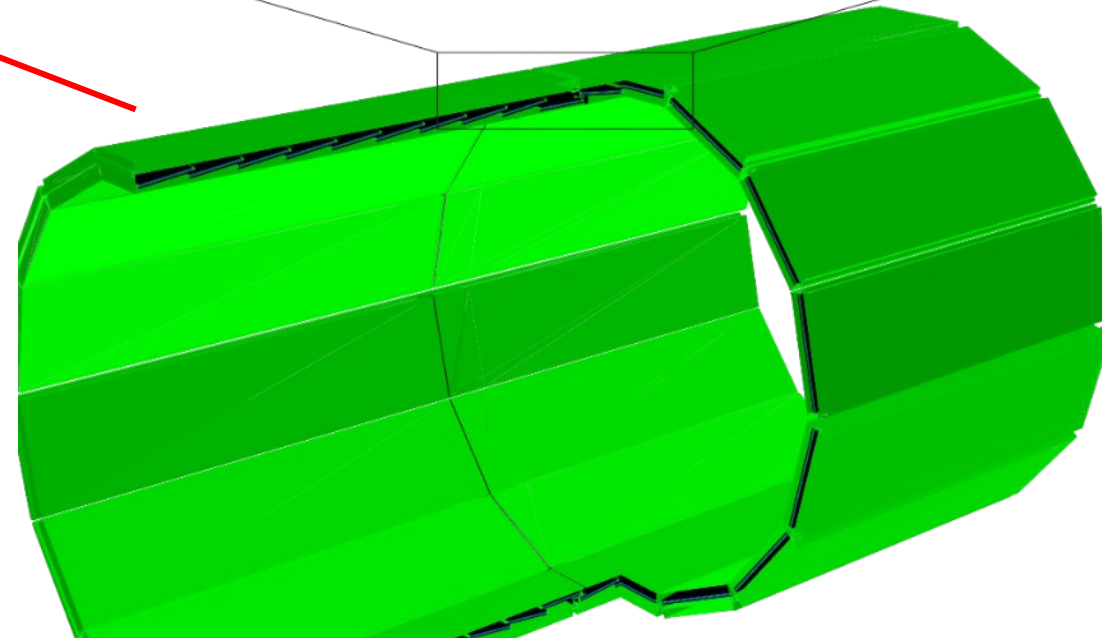
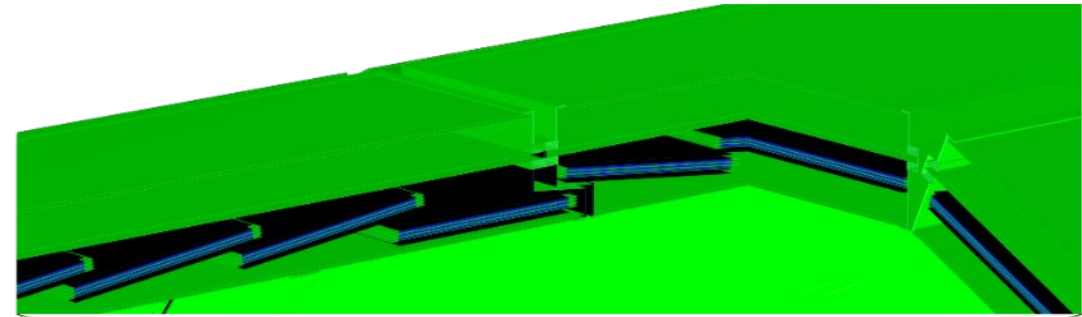
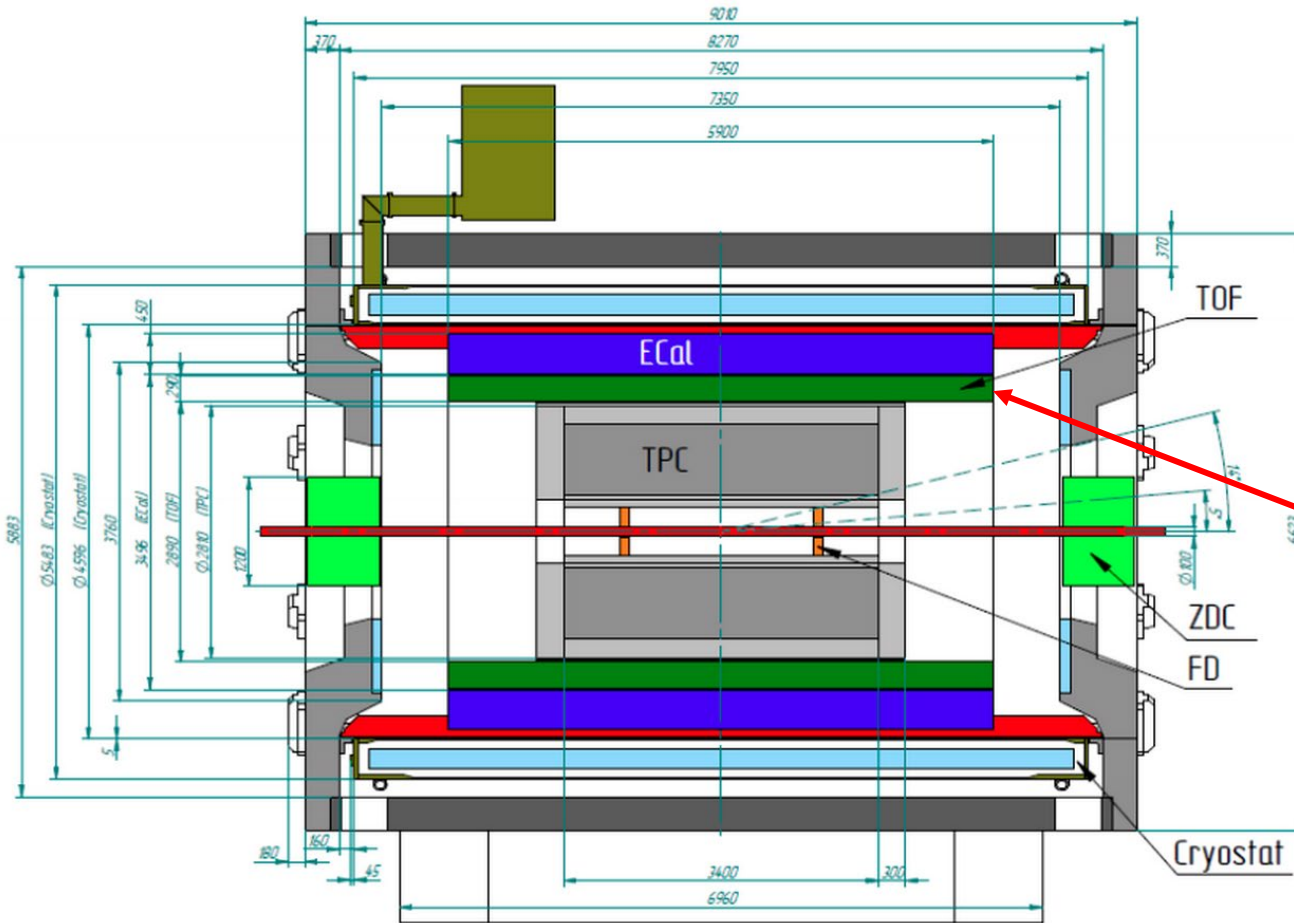


Status of the MPD Time-of-Flight Identification System

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

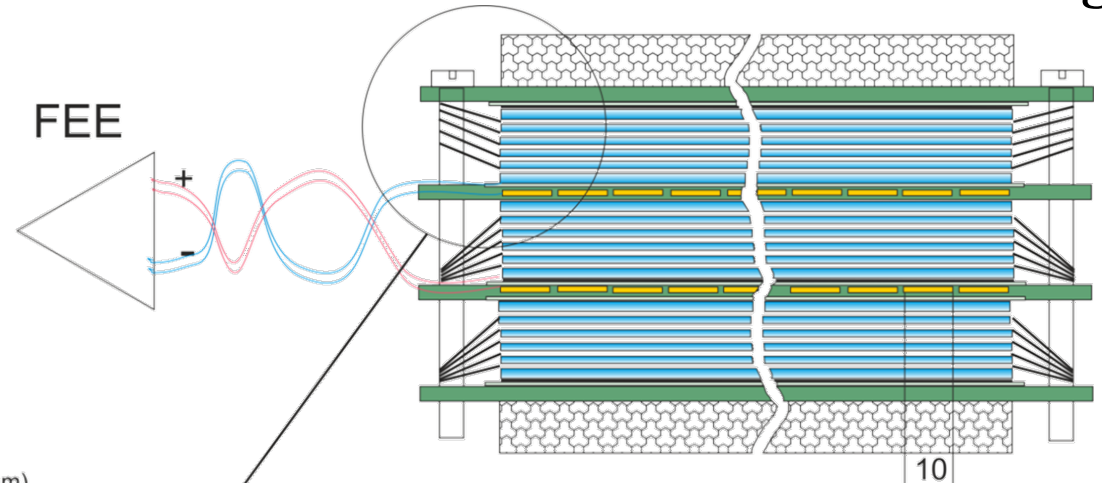
$L \approx 6 \text{ m}$, $d \approx 3 \text{ m}$, $|\eta| < 1.44$



TOF Barrel (MPDRoot geometry)

	Number of detectors	Number of readout strips	Sensitive area, m ²	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

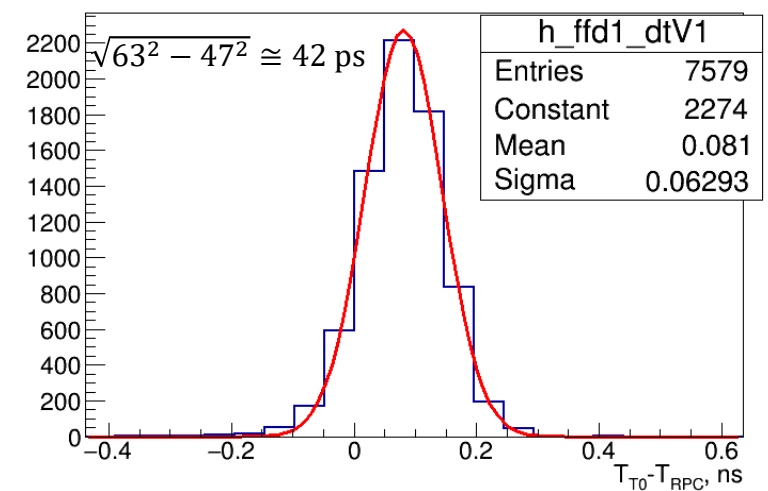
MPD TOF MRPC design



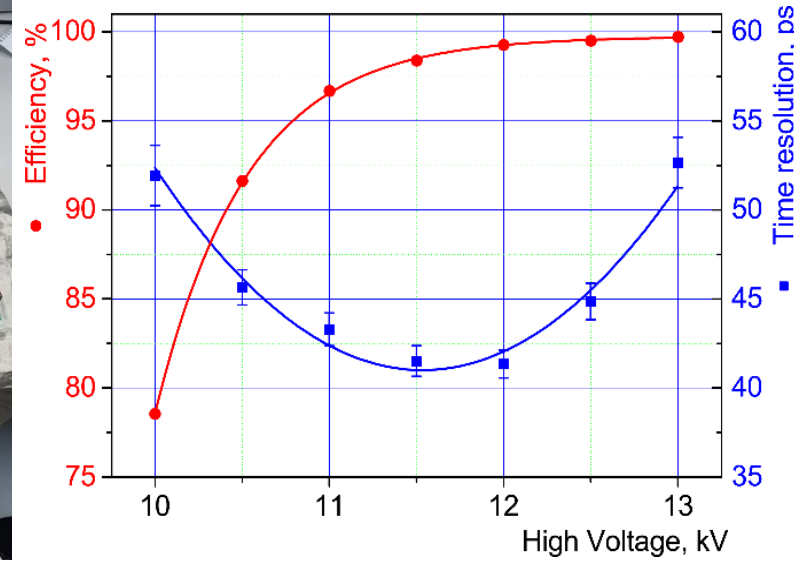
- Honeycomb (5 mm)
- PET Screw
- Outer PCB (1.5 mm)
- Mylar (100mkm)
- Outer HV glass (400 mkm)
- Inner glass (270 mkm)
- Spaser (fishing line 200 mkm)
- PCB with "strips" (1.5 mm)

3-stack 15-gaps MRPC

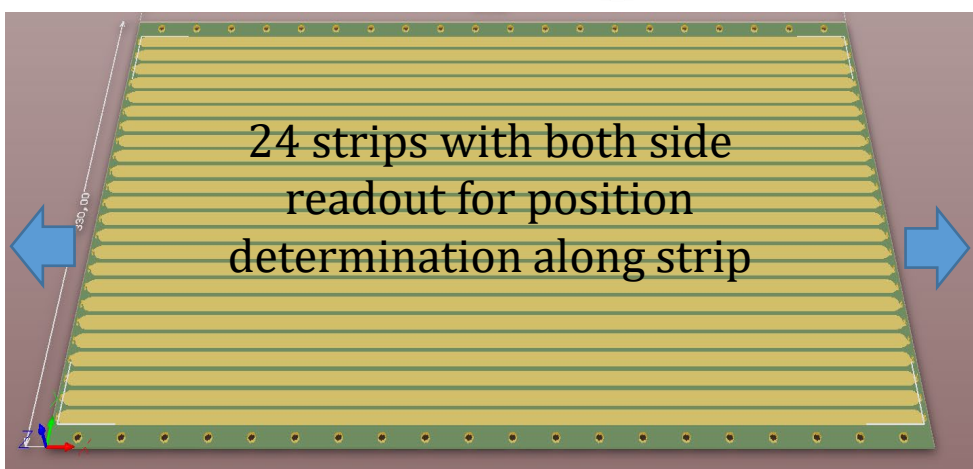
Gas mixture: $C_2H_2F_4/SF_6/iC_4H_{10}$ (90/5/5)



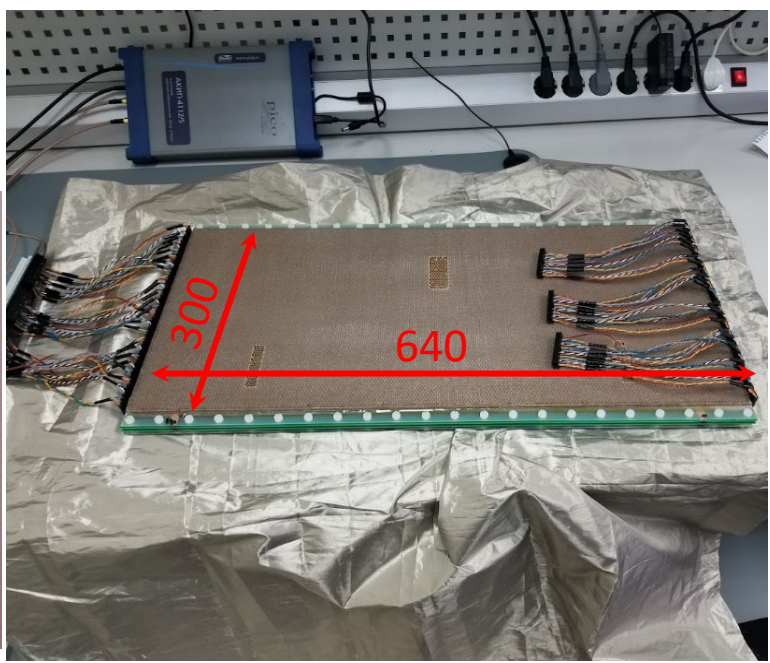
The best measured time resolution



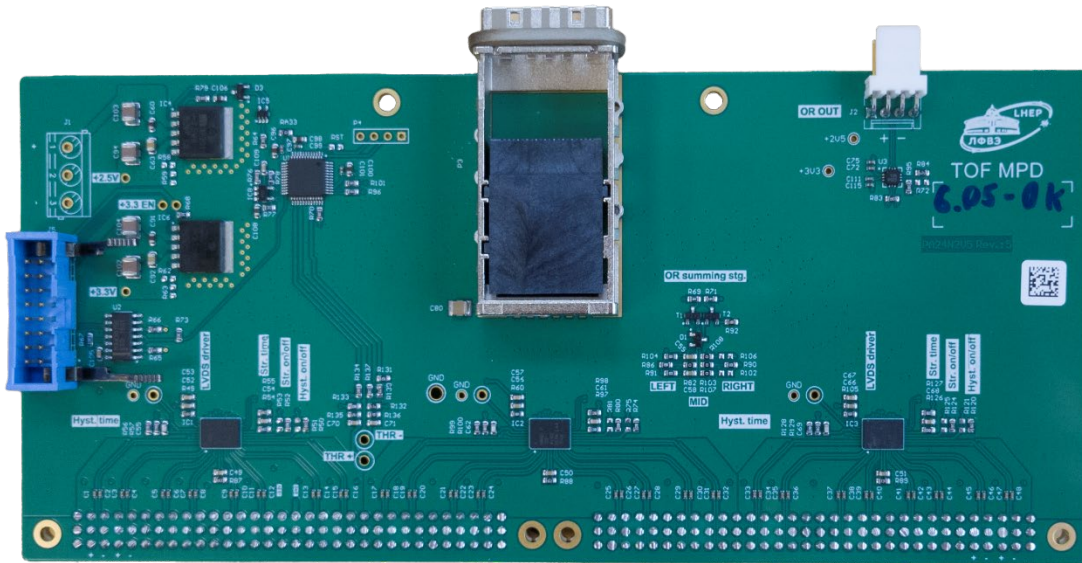
Efficiency vs applied HV



MRPC readout strips



Readout electronics of the MPD TOF system



MPD TOF amplifier-discriminator PA2402V(4)5

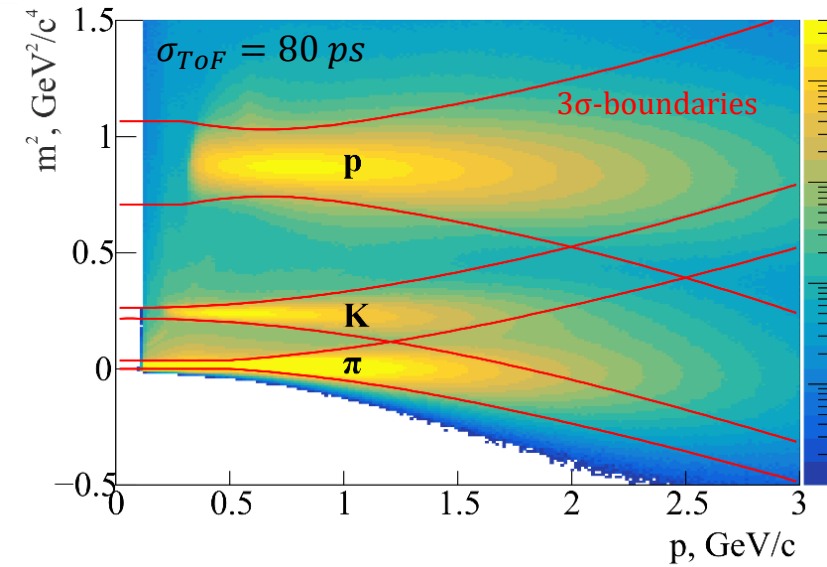
- Time jitter (RMS) for one channel ≈ 7 ps;
- Stabilization of **NINO** and MC voltages (+2.5V/+3.3V)
- Differential inputs ($Z_{diff} = 55$ Ohm)
- Inputs overload protection by 1 MOhm resistors
- Capacitors on the inputs for double-end strip readout
- CXP (InfiniBand) 100 Ω output connector
- The possibility to use for triggering (series “or” output)
- “On board” slow control:
 - supply voltage control
 - preamplifier thresholds (0-500 mV) control
 - board and gas volume temperature monitoring ± 0.5 °C



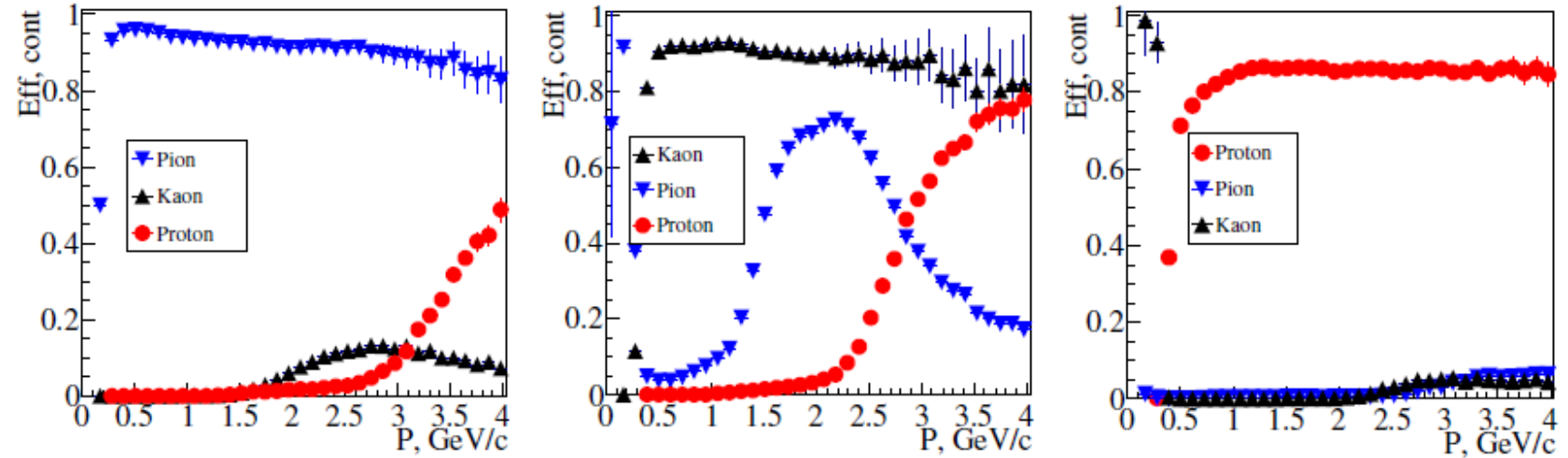
72-channels time-to-digital converter TDC72VHL-V4(VXS)

- VME64x interface with VXS
- TDC type: timestamping **HPTDC** chip
- Input: differential 100 Ω (LVDS)
- Channel resolution: 24 ps bin size ($\sigma_t \approx 20$ ps – average measured)
- Power consumption: +5V/0.13A; +3.3V/5.6A;
- Standalone mode
- Ethernet or VXS data transfer
- Time synchronization by the White Rabbit

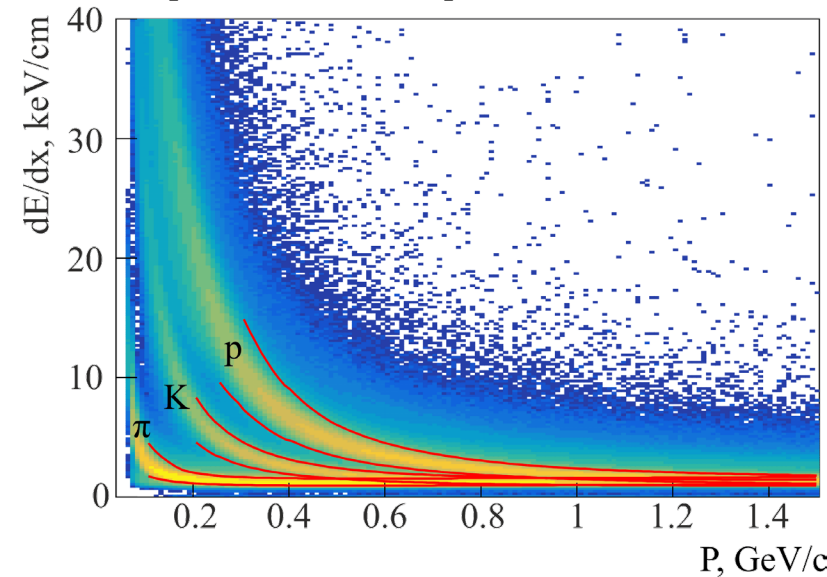
Charged particles identification in MPD



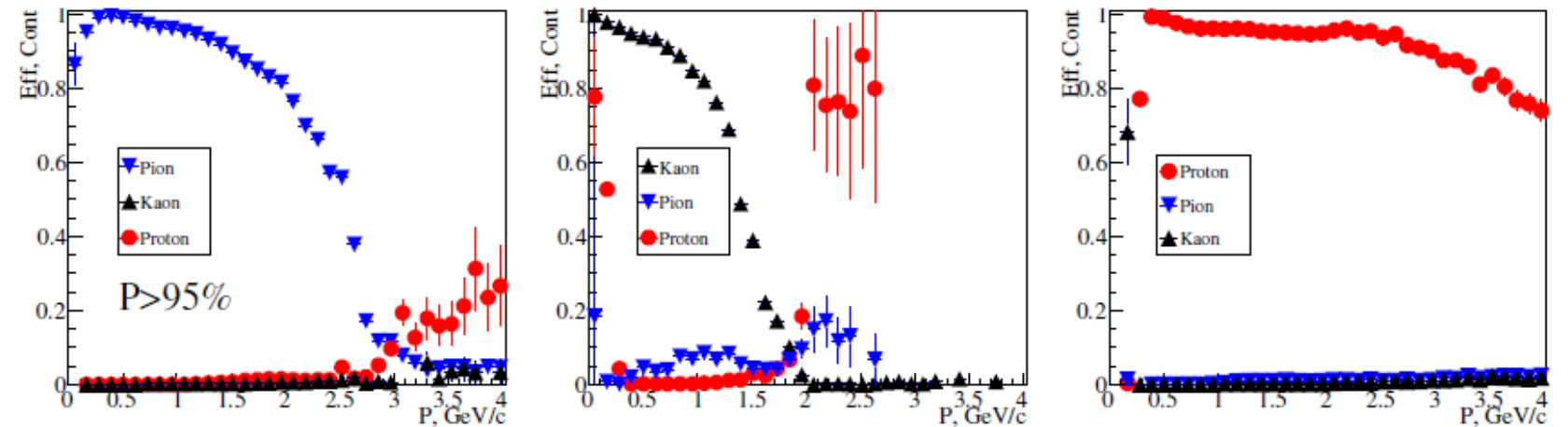
Efficiency and contamination of “3 σ -method” PID



Squared mass of particles from TOF



Bayesian approach for particles identification



Energy deposition of particles in TPC

Cosmic rays test of TOF modules

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



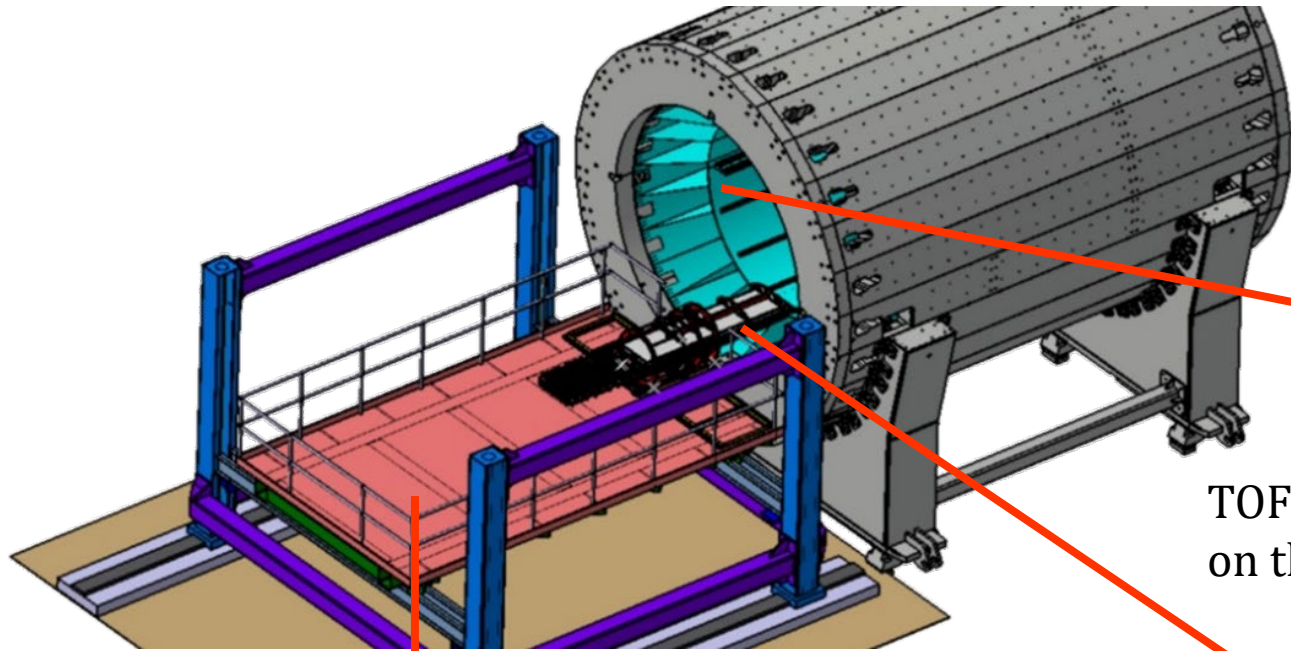
Progress of the TOF detectors and modules assembling

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 are ready for TOF installation into the MPD power frame

TOF installation



TOF module
on the rails

MPD Power Frame



Lifting platform



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

Vadim Babkin, MPD TOF status,
XIV Collaboration Meeting of the MPD Experiment at NICA

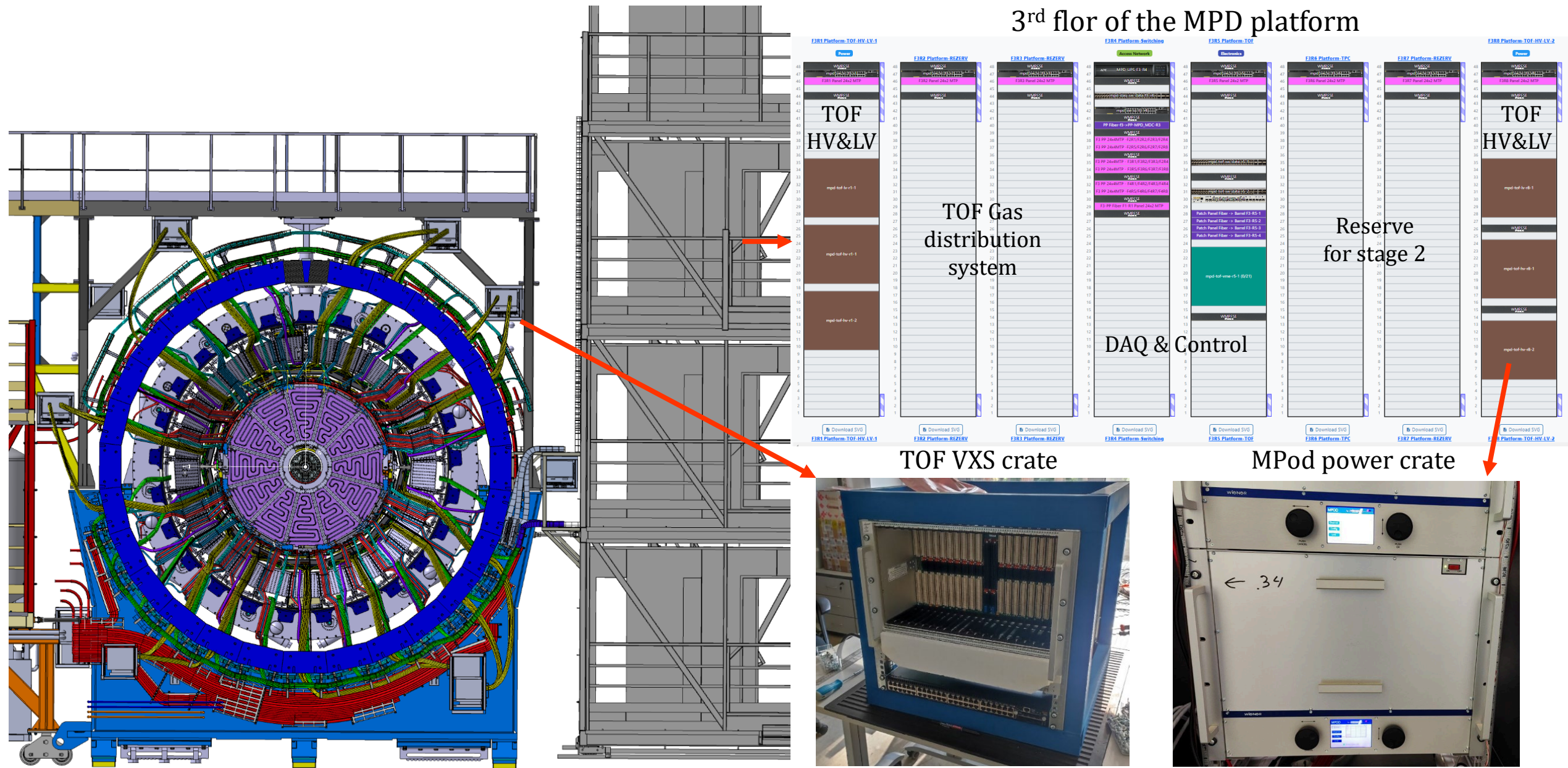


TOF installation



TOF readout and power crates

3rd floor of the MPD platform

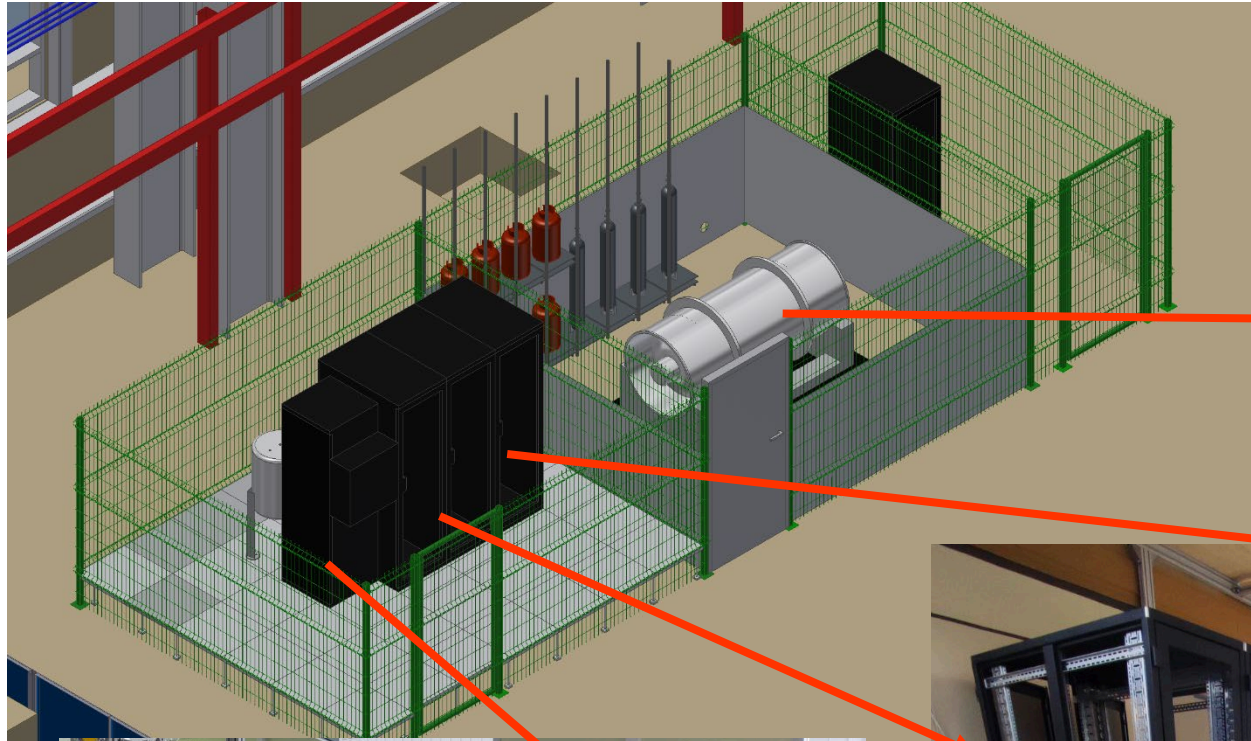


14.10.2024

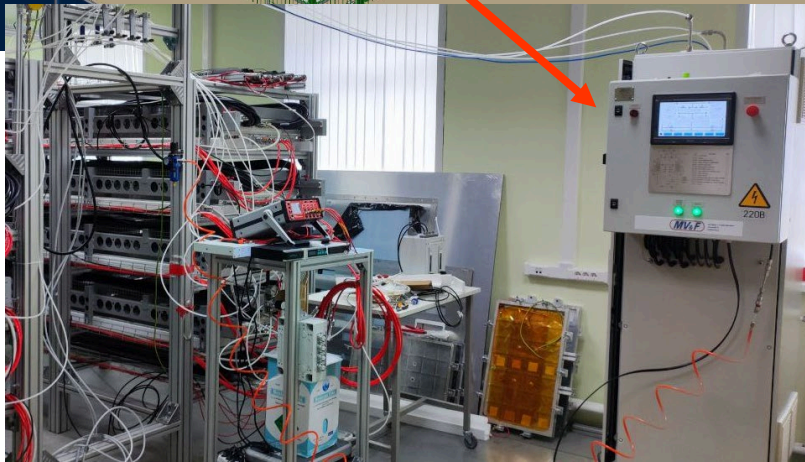
Vadim Babkin, MPD TOF status,
XIV Collaboration Meeting of the MPD Experiment at NICA

10/14

Gas system for the TOF in the MPD hall



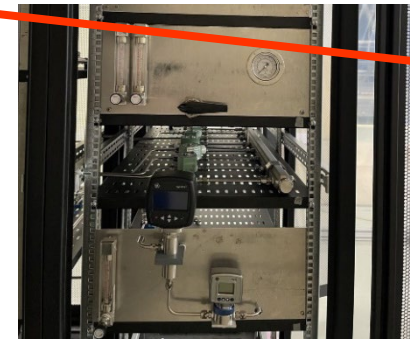
Freon cylinder (1000 kg)



Gas mixture purifier (rack #4)



Mixer and analyzer (racks #2, 3)



Automatic and control (rack #1)

Gas system for the TOF in the MPD hall

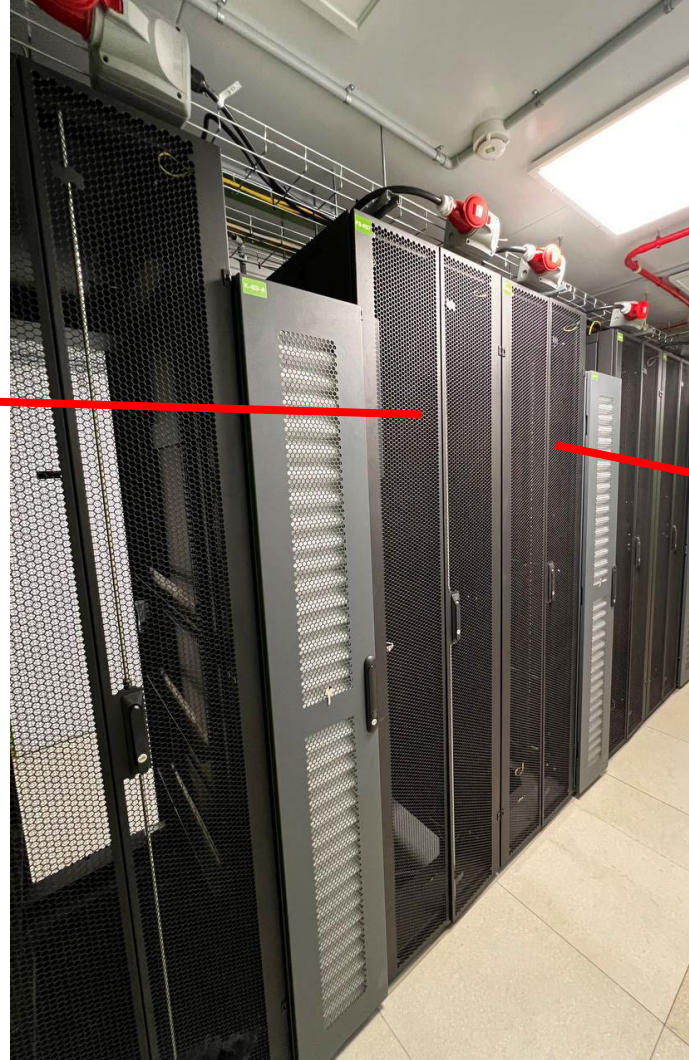


Gas distribution system for the TOF in the MPD Electronics Platform

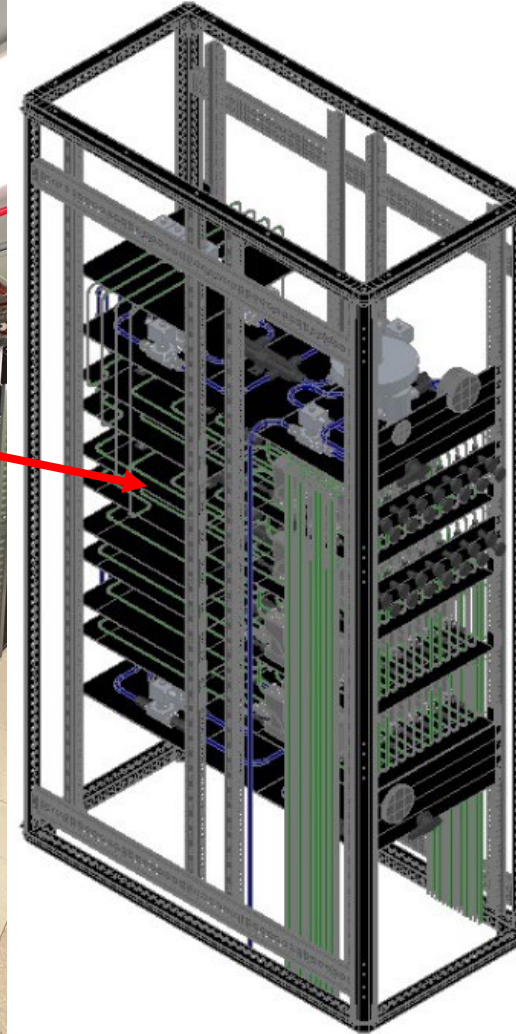
Distribution control rack



3-rd floor (rack #2, 3)



Gas distribution rack



TOF integration schedule

- 1) Mass production of MRPCs – 300 of 280 are ready (~107%)
- 2) Mass production of TOF modules – 28 of 28 are ready (~100%)
- 3) Integration equipment – completed
- 4) VME crates, cables, and HV distributors on the MPD yoke – in development
- 5) Gas supply and storage for the gas system in building 17 – in the assembly

TOF plans in accordance of the MPD assembling milestones

June-Sept 2024 – upgrade of existed TOF modules (remove gas leaks, update FEE, etc.) - ready

Sept-Nov 2024 – building of TOF gas system area in the MPD hall

Nov-Dec 2024 – assembling of the TOF gas system in the MPD hall and on the electronics platform

Jan-Febr 2024 – commissioning of the TOF gas system

Mar-Apr 2025 – organizing of the TOF modules installation area and assembling of equipment

June 2025 – TOF modules installation into the MPD power frame

Thank you for the attention!