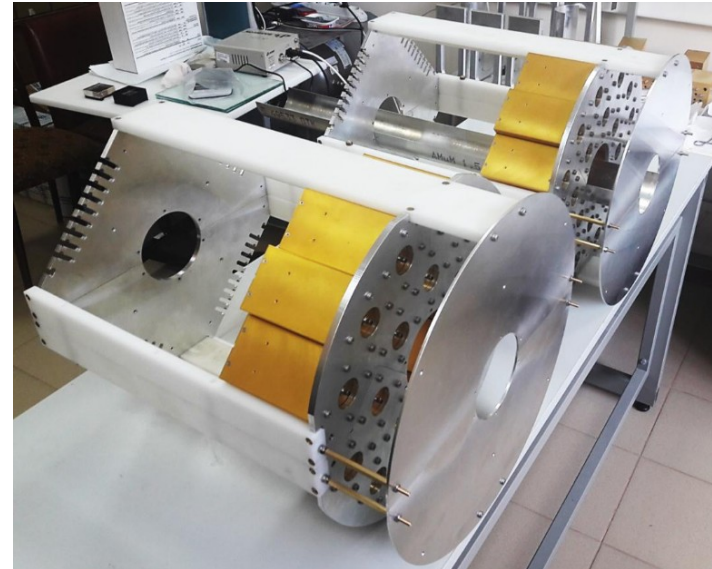
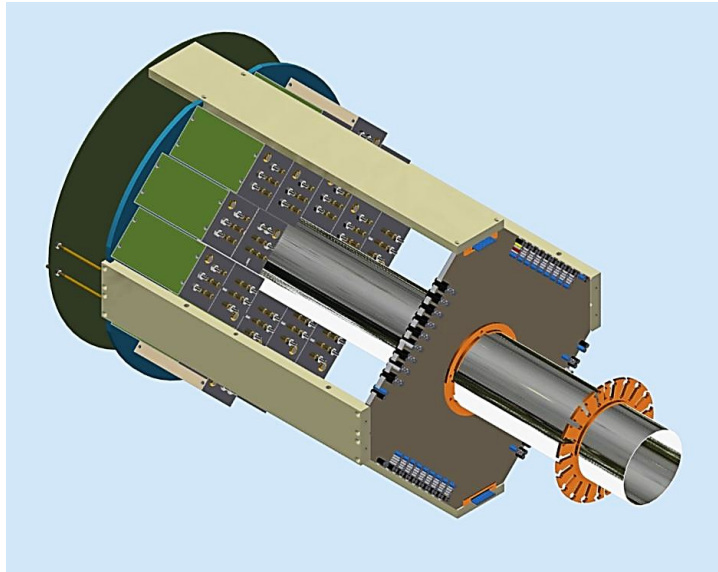


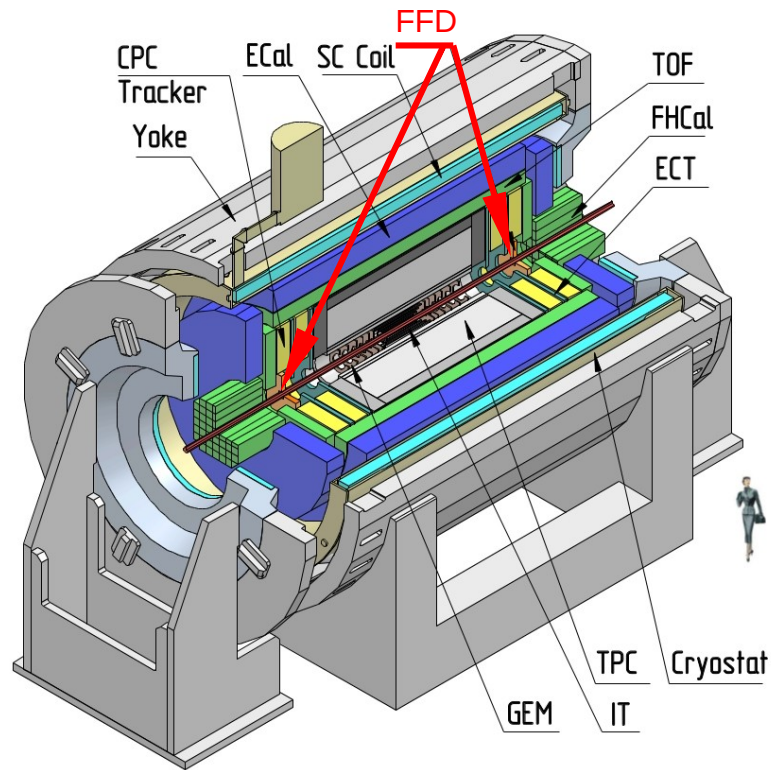
Status of the Fast Forward Detector

Sergey Sedykh for the FFD group
LHEP / JINR



XV-th MPD Collaboration Meeting
April 16, 2025

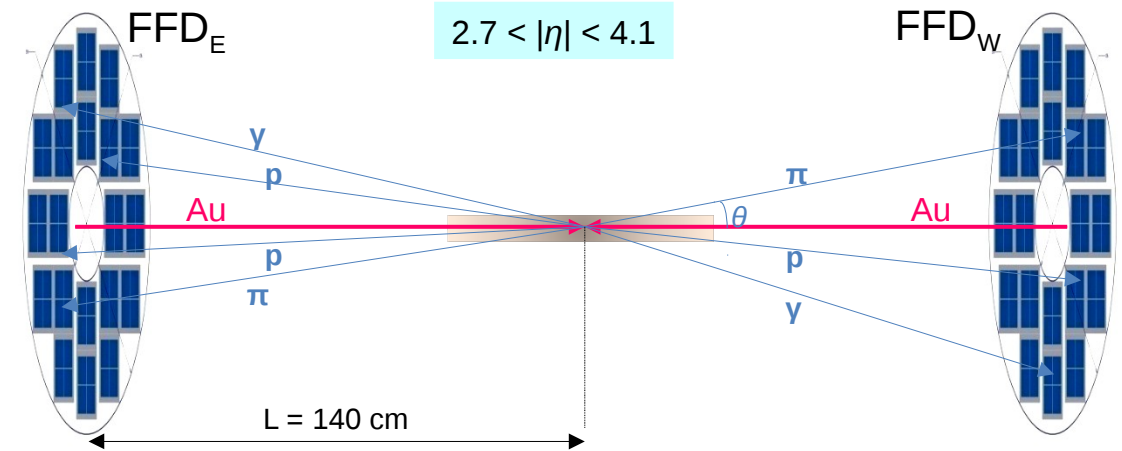
FFD concept and requirements



FFD is one of the trigger subsystems.

FHCAL is also expected to be integrated in the trigger (slower but with larger acceptance).

TOF can also be considered.



Fast interaction trigger & T0 detector for TOF

Trigger is based on coincidence of signals in two sub-detectors

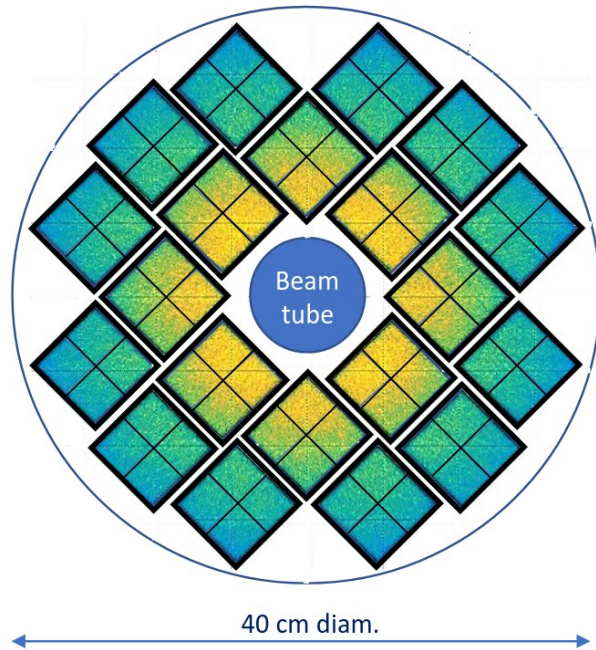
$$t_E - t_W \Rightarrow \text{localization of interaction point } \Delta Z < 3 \text{ cm}$$

Condition on multiplicity of hits in each arm (80 cells in each arm)

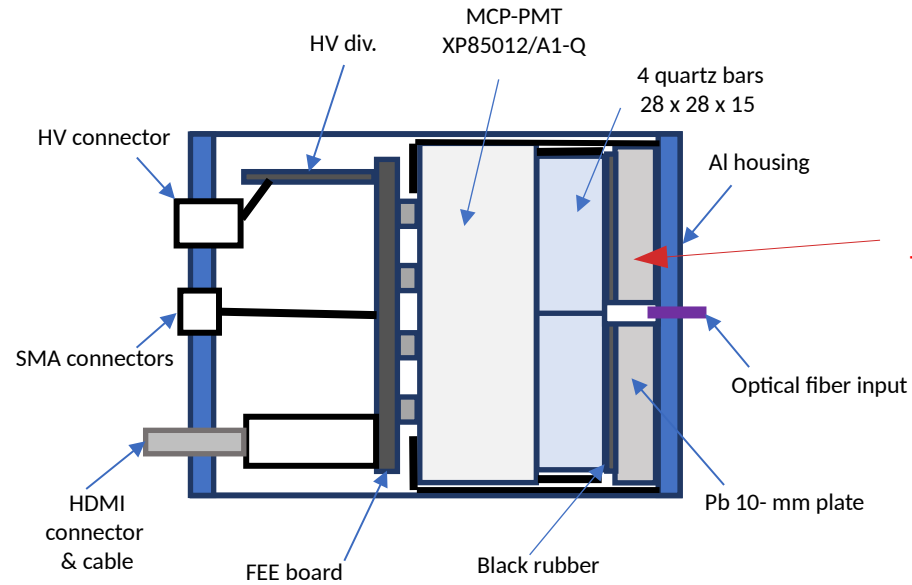
Offline t_0 time for TOF better than 50 ps

FFD Modules

Viktor Rogov
Vladimir Yurevich



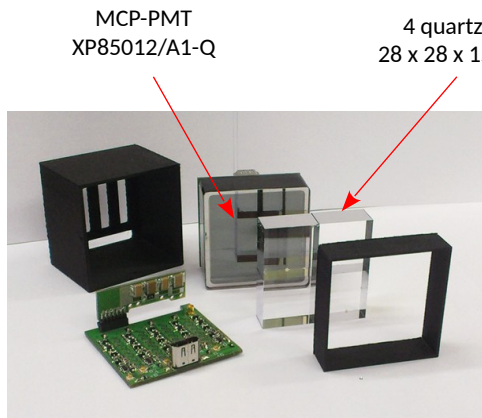
Each FFD side is segmented into 80 cells in 20 FFD modules



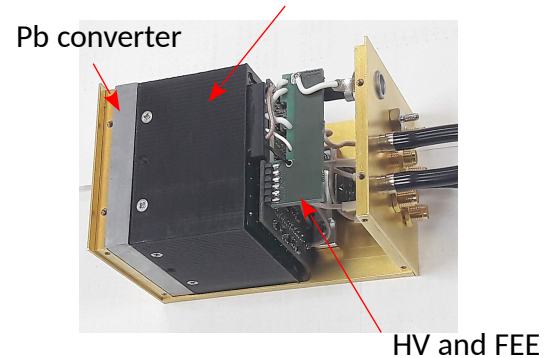
Quartz	56 x 56 mm ²
Module	64 x 64 mm ²
Occupancy	76.6%

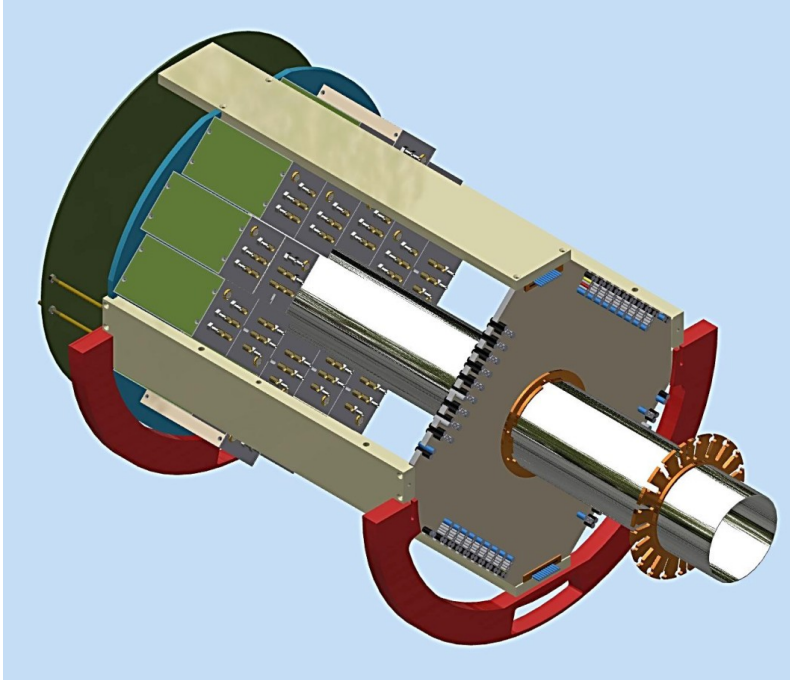
Status:

all 2 x 20 FFD modules are produced;
all channels are tested with the laser system;
prepared for tests of time synchronization in FFD-E and FFD-W planes using laser system and cosmic stand



Box with quartz radiator & MCP-PMT





Design of FFD sub-detector



FFD mechanical support and tools for FFD installation

Status:

Sub-detector mechanical parts are ready.

Integration tools for installation of FFD in the MPD setup are ready.

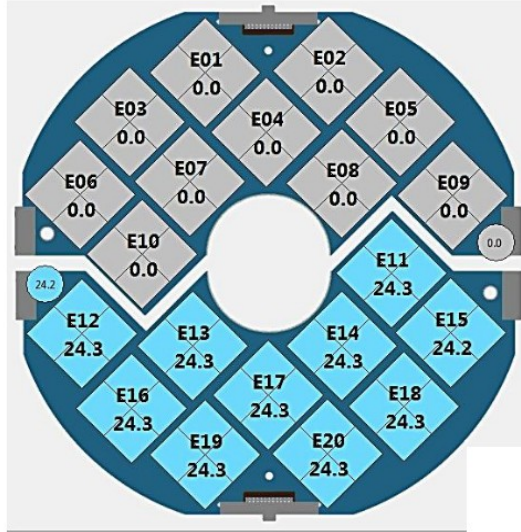
Actual mechanics is currently been used for preparation of the integration. FFD modules weight is represented by dummies.

Mechanical parts are not needed for the ongoing and planned tests of other FFD systems.

When to replace the dummies with actual FFD modules will be coordinated with the integration team in the Fall of 2025.

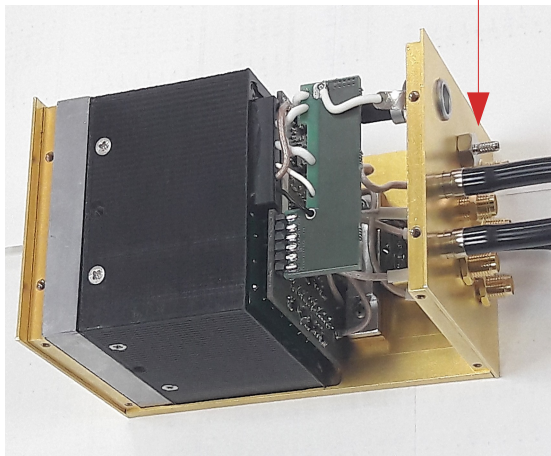
FFD cooling system

Vladimir Tikhomirov
Sergey Sergeev

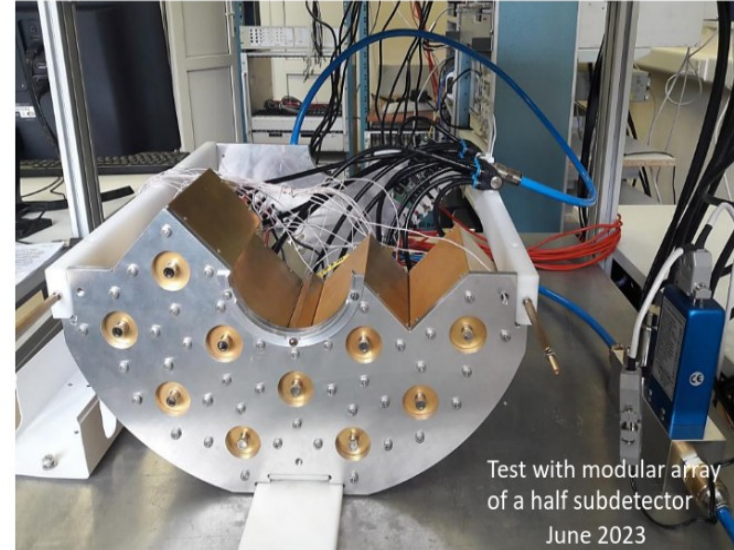


Interface for temperature monitoring

feedthrough for
temperature sensor



← feedthrough
← for gas flow



Temperature inside modules

No air flow	Air flow 40 l/min
+8° C	+4° C

Air of room temperature was used in the tests

Setup for cooling system test
with a set of 10 modules

Status:

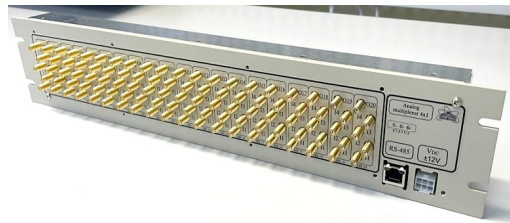
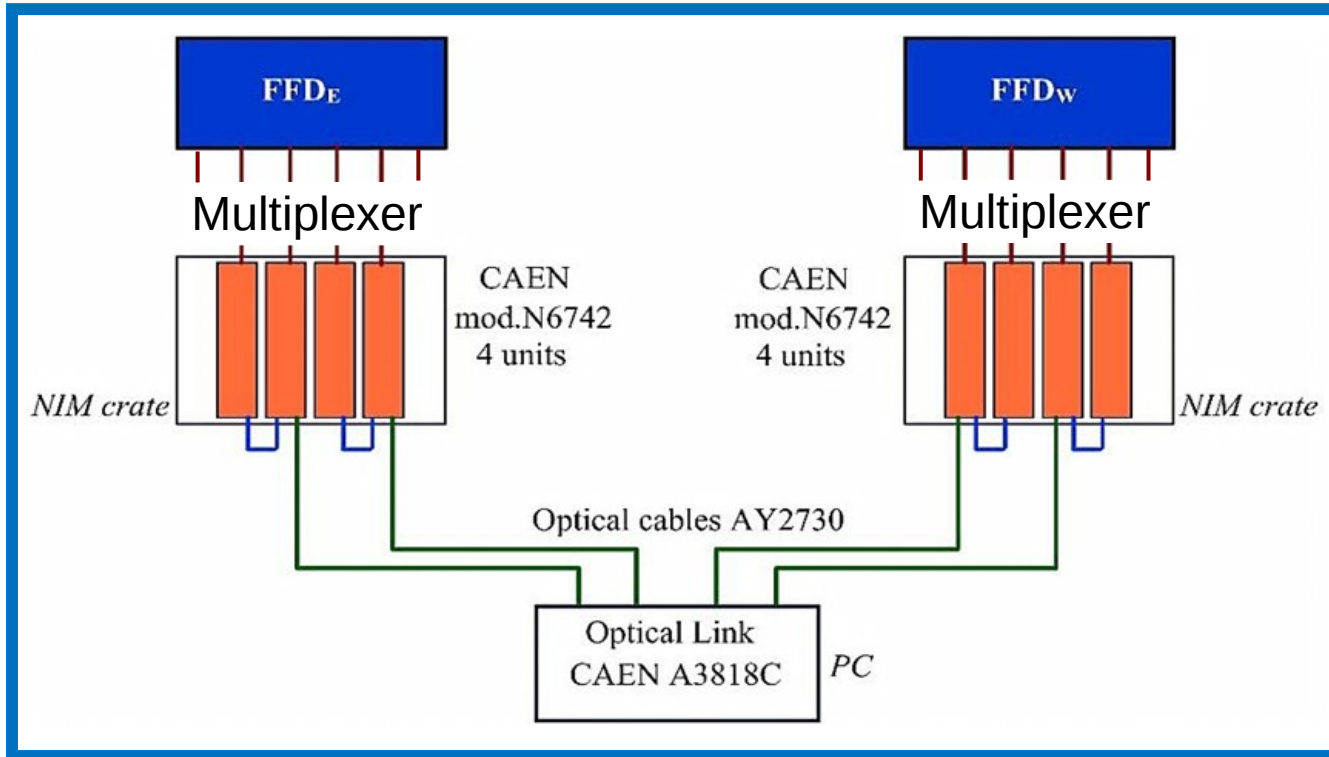
All components of the cooling system are available.

All FFD modules are equipped with a temperature sensor.

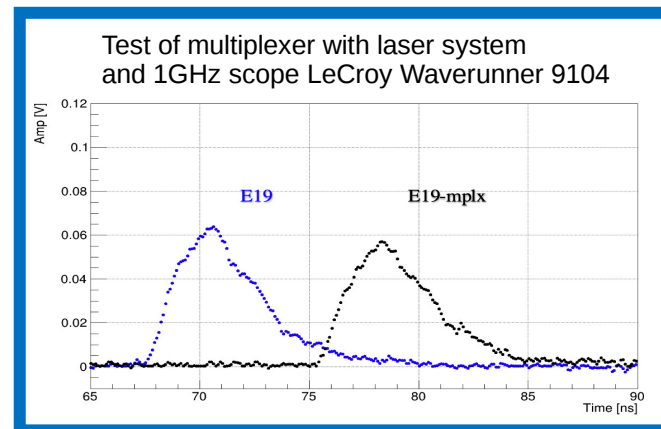
Temperature monitoring system with GUI is developed and tested.

Planned tests in Summer 2025:

Cooling of full sets of FFD-E and FFD-W modules.



Analog 4 → 1 multiplexers



Status:

all parts are available
2 multiplexers 4 → 1 ready and tested
readout of single CAEN N6742 was used so far

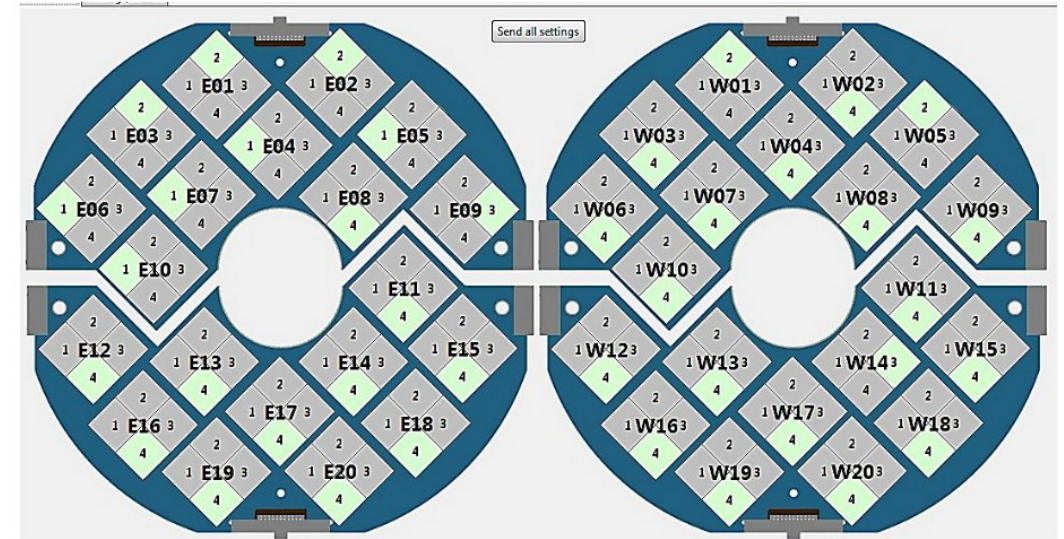
To be done:

- chain readout of several CAEN N6742
- customized interface
- Linux version of readout and interface

High Voltage system and Low Voltage for FEE

Sergey Sergeev
Victor Rogov

Wiener MpodC 48 ch.



High voltage interface

using SNMP Control Version 1.0

File System Module Channel Help

Connected Modules: Connected to E2ND1 sn. 713110 at Slot 0

Slot	Channel	Vset (V)	Vmax (V)	Vmin (V)	Iset (mA)	Imax (mA)	Imin (mA)	Status
Slot 0	Channel 0	2.500,0	2.499,9	2.500,0	0,500	0,445	0,500	On
Slot 1	Channel 1	2.500,0	2.499,9	2.500,0	0,500	0,440	0,500	On
Slot 2	Channel 2	2.500,0	2.499,9	2.500,0	0,500	0,441	0,500	On
Slot 3	Channel 3	2.500,0	2.499,9	2.500,0	0,500	0,441	0,500	On
Slot 4	Channel 4	2.500,0	2.499,9	2.500,0	0,500	0,444	0,500	On
Slot 5	Channel 5	2.500,0	2.499,9	2.500,0	0,500	0,445	0,500	On
Slot 6	Channel 6	2.500,0	2.499,9	2.500,0	0,500	0,440	0,500	On
Slot 7	Channel 7	2.500,0	2.500,0	2.500,0	0,500	0,442	0,500	On
Slot 8	Channel 8	2.500,0	2.499,9	2.500,0	0,500	0,438	0,500	On
Slot 9	Channel 9	2.500,0	2.499,9	2.500,0	0,500	0,442	0,500	On
Slot 10	Channel 10	2.500,0	2.499,9	2.500,0	0,500	0,445	0,500	On
Slot 11	Channel 11	2.500,0	2.499,9	2.500,0	0,500	0,446	0,500	On
Slot 12	Channel 12	2.500,0	2.500,0	2.500,0	0,500	0,445	0,500	On
Slot 13	Channel 13	2.500,0	2.500,0	2.500,0	0,500	0,447	0,500	On
Slot 14	Channel 14	2.500,0	2.499,9	2.500,0	0,500	0,444	0,500	On
Slot 15	Channel 15	2.500,0	2.499,9	2.500,0	0,500	0,445	0,500	On
Slot 16	Channel 16	2.500,0	2.500,0	2.500,0	0,500	0,446	0,500	On
Slot 17	Channel 17	2.500,0	2.499,9	2.500,0	0,500	0,443	0,500	On
Slot 18	Channel 18	2.500,0	2.499,9	2.500,0	0,500	0,446	0,500	On

Serial Number: 713110 Module Type: E2ND1 Channel selected: Channel

Firmware Release: 5.03 Module Control: Channel Control:

Voltage Ramp Speed: 1 %/s Module Status: Channel Status:

Current Ramp Speed: Module Event Status: Channel Event Status:

Firmware VME Decoder: 0.0 / 0.0 Module Event Mask: 0x0000 Channel Event Mask:

Connected to 192.168.16.225. Bus status: OK

Status:

All components are available.

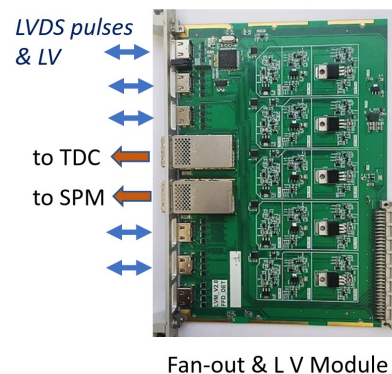
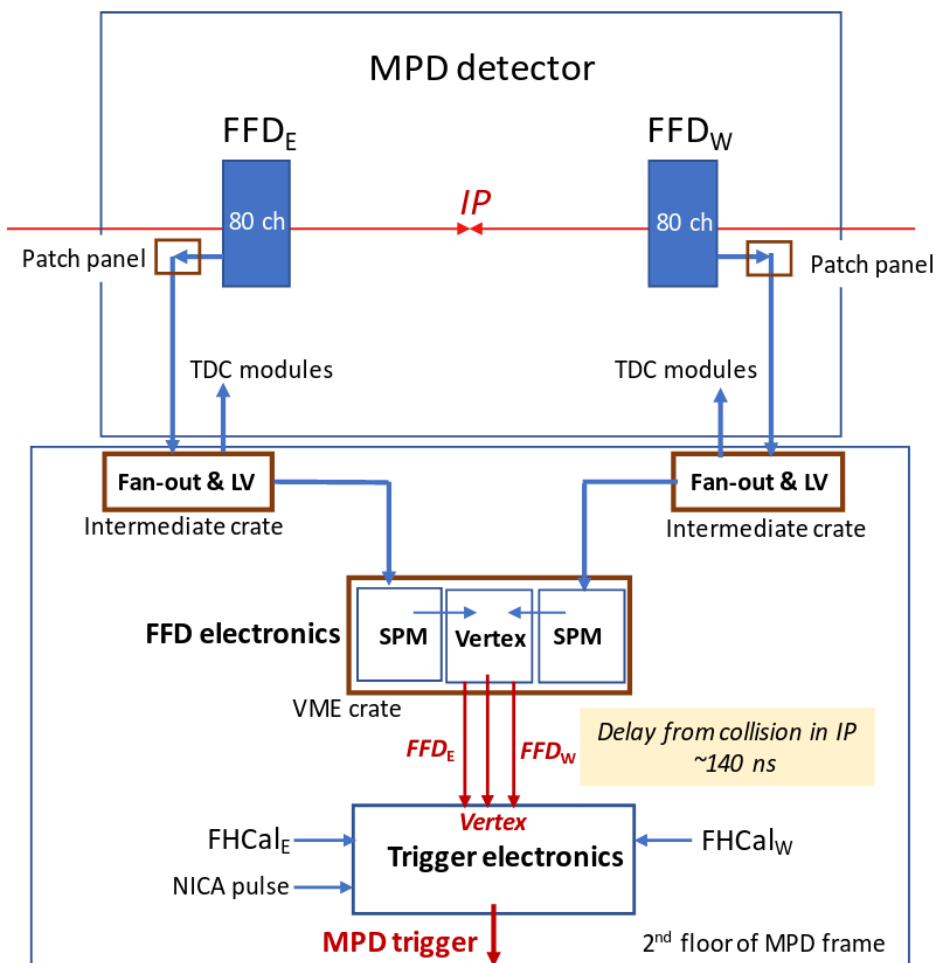
High Voltage GUI is ready and tested.

FEE Low Voltage in previous tests was taken from prototype electronics, now this part is prepared and ready for testing.

To be done: HV auto switch-off in the alarm state.

Read-out and trigger electronics

Sergey Sergeev
Victor Rogov
Pavel Grigoriev



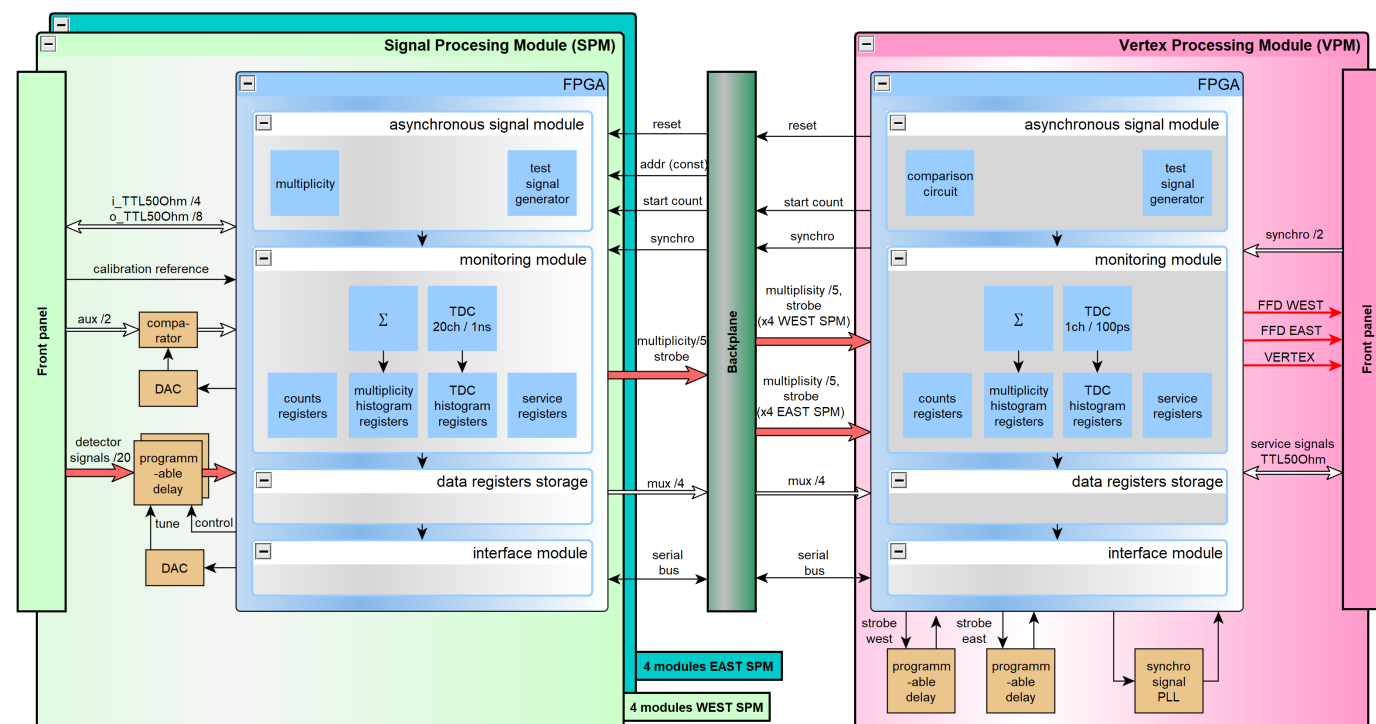
Current status:

TDC: 10 modules TDC72VHL, ready (DAQ group)

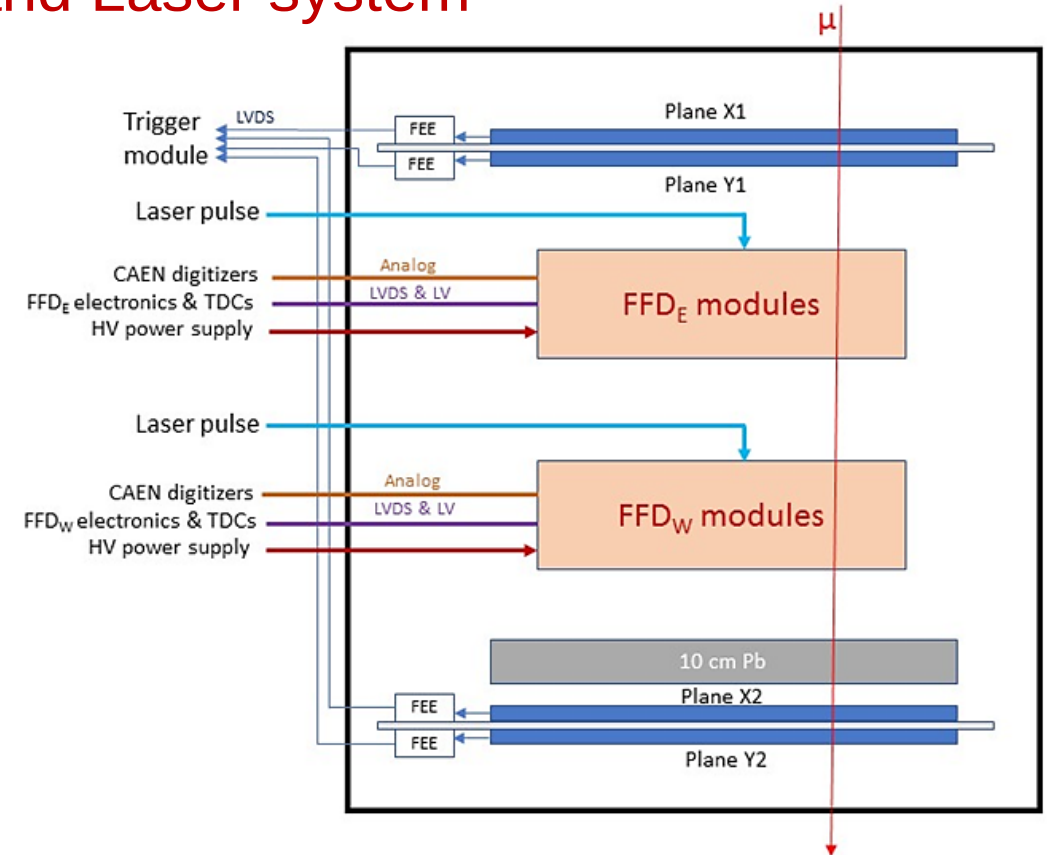
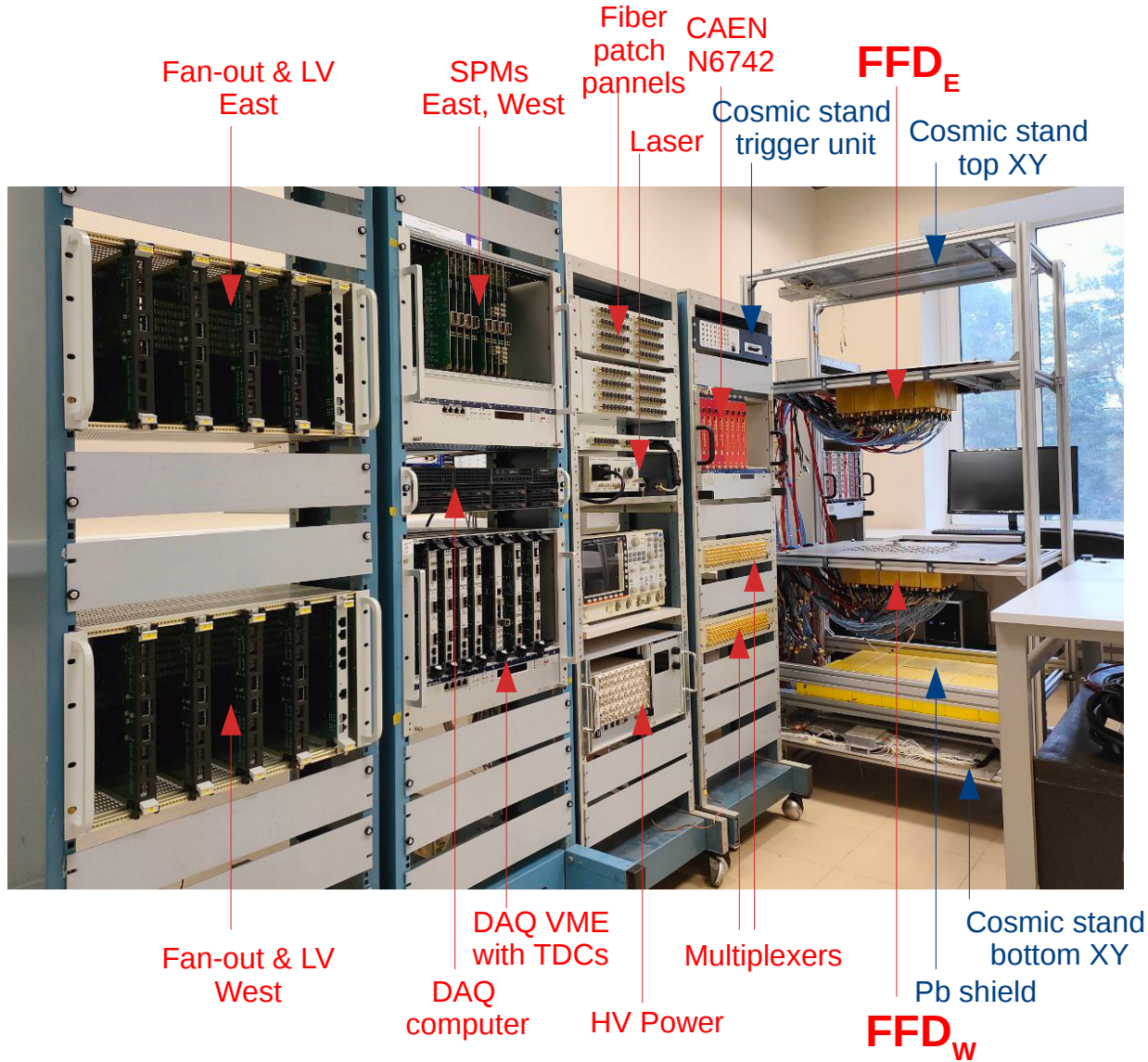
Fan-out & LV: ready

SPM (Signal Processing Module): ready for testing

VPM (Vertex Processing Module): design in progress, all parts available



Tests with Cosmic Stand and Laser system



Main goals of the tests (May-Aug, 2025):

- integrated long-term test of all the systems: power supply, cooling, monitoring, TDC readout, trigger logic
- test of all the components before installation in MPD: detectors, cables, electronics
- time synchronization of modules in FFD-E, FFD-W planes

Work schedule for the upcoming period

Lab tests of subsystems: May – Aug. 2025;
(*Nikita Lashmanov, Sergey Sedykh and others*)

Development of a software for timing adjustment and multiplicity counts in SPM: May – Aug. 2025;
(*Pavel Grigoriev, Sergey Sergeev*)

Move long cables to MPD (HV, Molex for TDC readout, analog monitoring): Aug. 2025
(*Victor Rogov* in coordination with other MPD groups)

Assembly of detectors with short cables in the FFD-E and FFD-W frames: Sept. 2025
(*Vladimir Tikhomirov*, time will be coordinated with the team of *Yury Murin*)

Main GUI software for FFD trigger settings, which will also include as sub-panels already developed interfaces for HV system, cooling system, laser control, etc.: May – Dec. 2025
(*Sergey Sergeev*)

FFD Detector Control System and its connection to the MPD CDCS: ongoing
(*Sergey Sergeev*)

Preparation of the Vertex Processing Module: ongoing
(*Victor Rogov, Sergey Sergeev, Pavel Grigoriev*)

All the preparation steps, setting priorities, etc. are being discussed and coordinated with *Vladimir Yurevich* who makes important contribution as advisor.