



Status of Fast Forward Detector (FFD)

Vladimir Yurevich

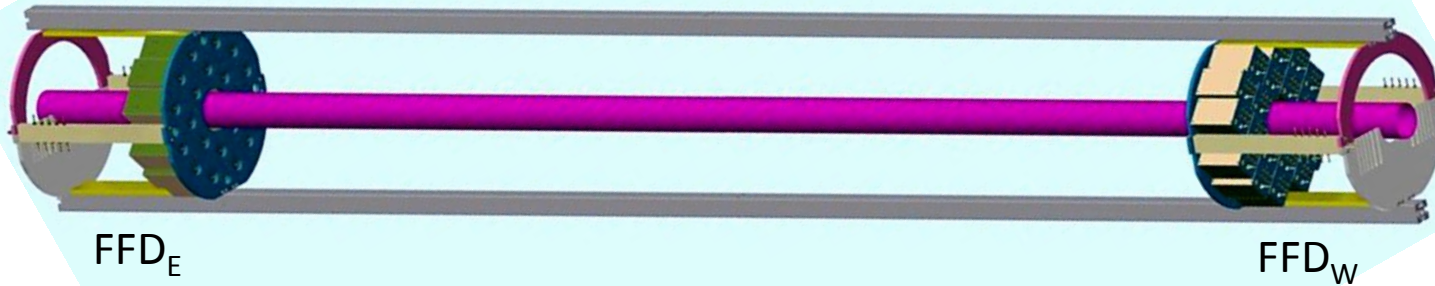
LHEP / JINR

Fast Forward Detector Design

Two Cherenkov sub-detectors FFD_E and FFD_W

Each sub-detector has 20 modules & 80 cells and produces 80 + 20 pulses (LVDS & analog)

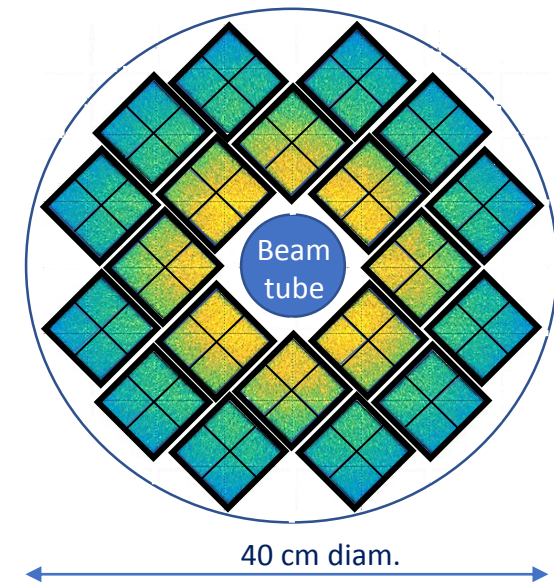
Sub-detector location: $L = 140$ cm from MPD center



The main aims of FFD

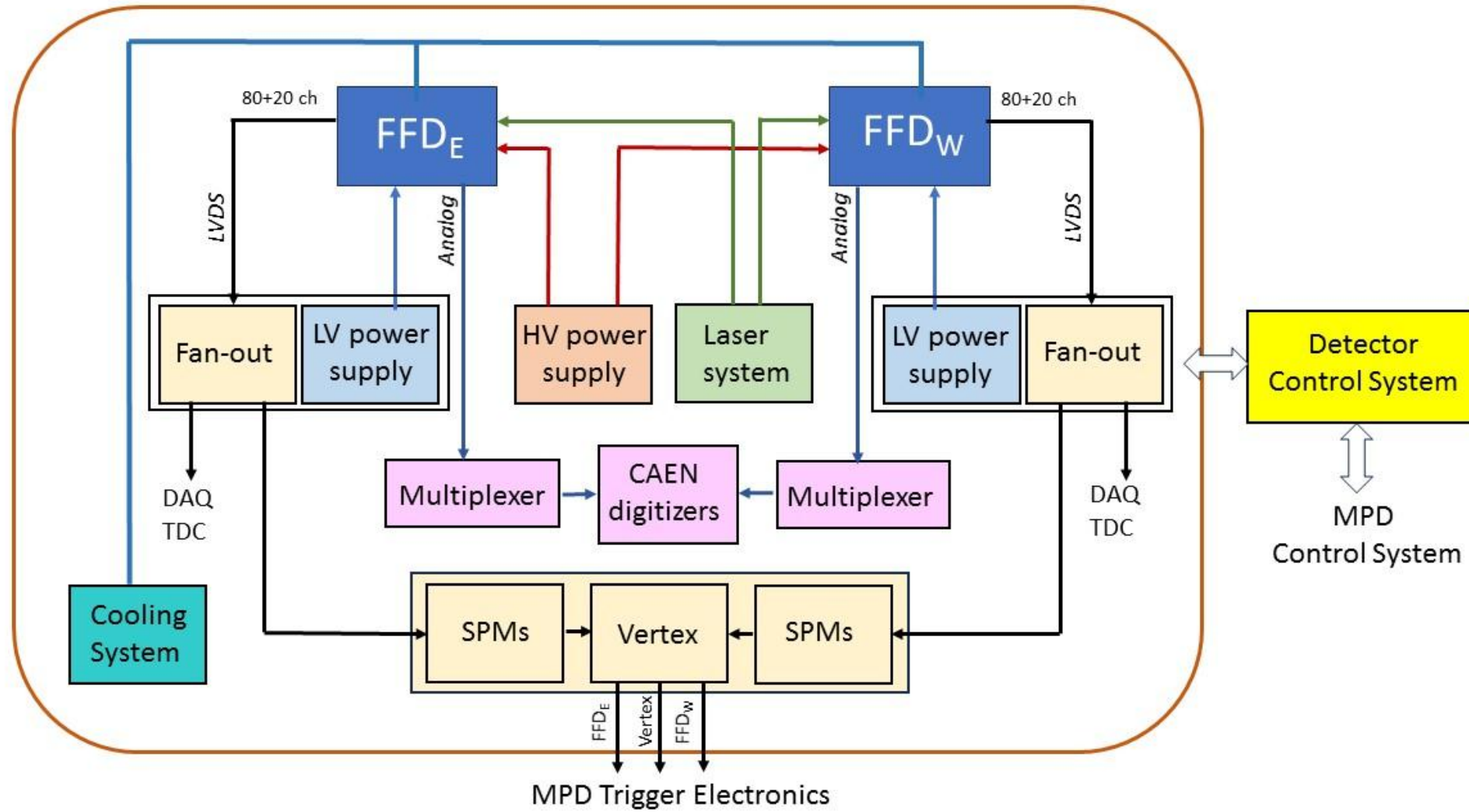
Fast and effective triggering of nucleus – nucleus collisions
Generation of the start pulse T_0 for the TOF detector

FFD detects relativistic charged particles and high-energy photons

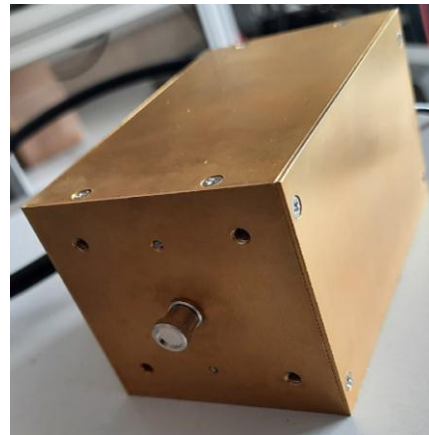
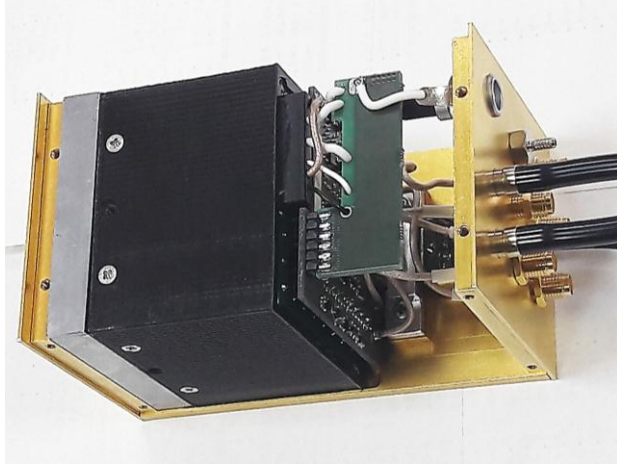


Distribution of incoming particles on the front of FFD modules

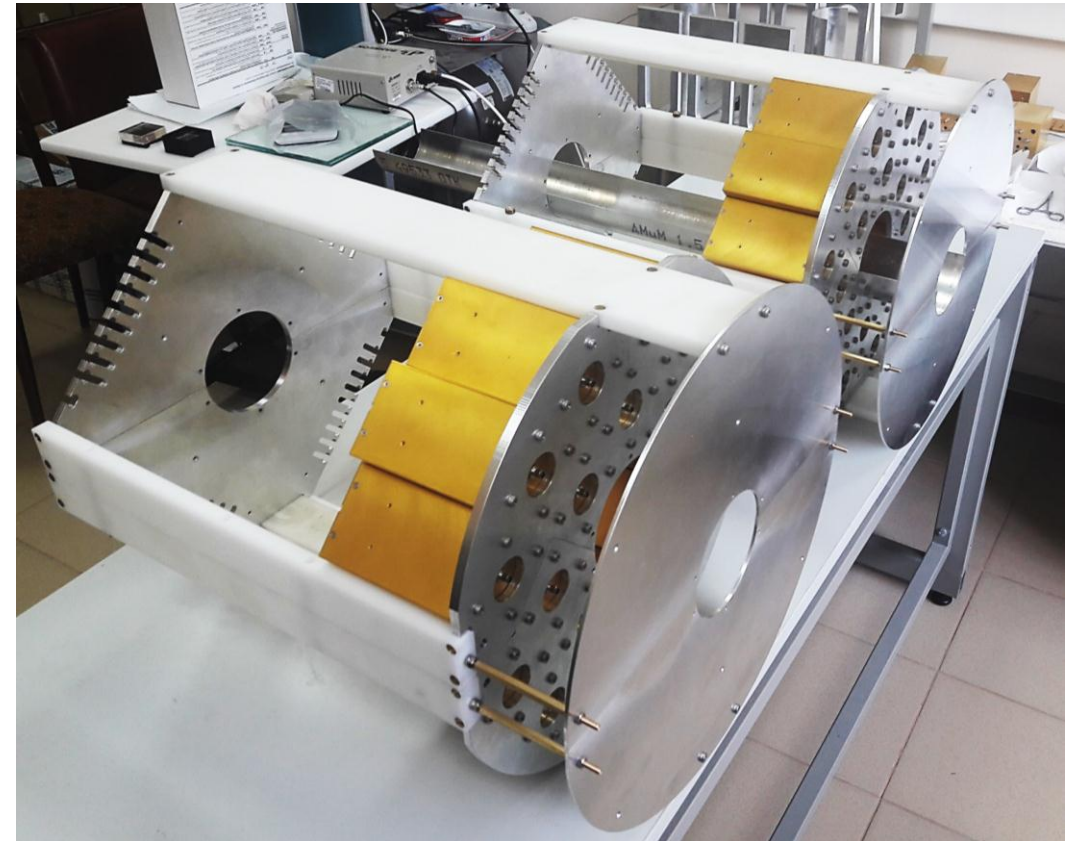
FFD Sub-Systems



FFD modules and sub-detector mechanics



FFD modules



FFD sub-detector mechanics

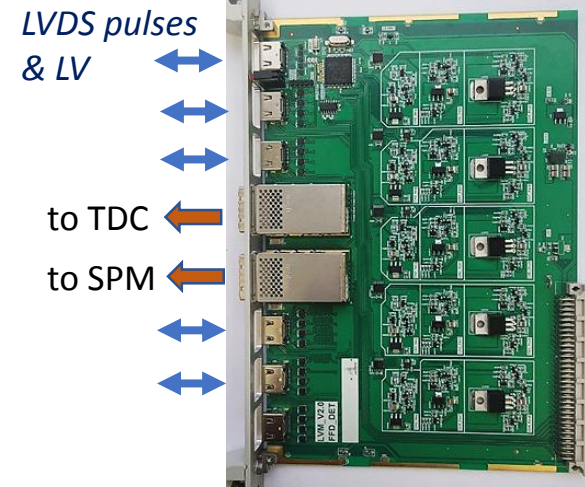
Readiness 100%

Electronics for LVDS pulses & LV

Readiness 100%



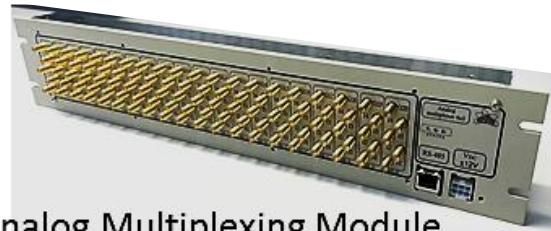
Crates with Fan-out & LV modules



Fan-out & L V Module

Electronics for analog pulses

Readiness 100%

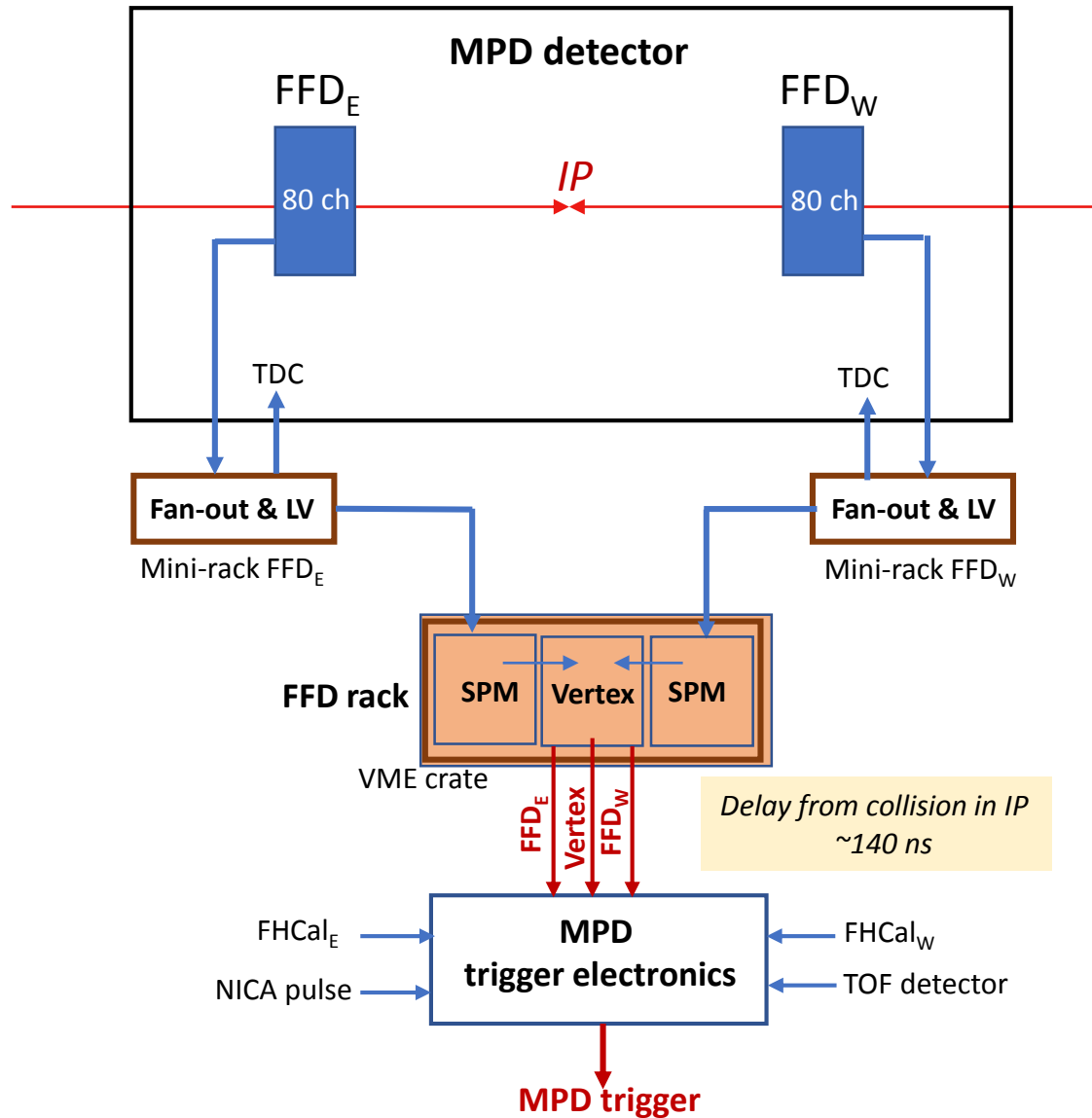


Analog Multiplexing Module
2 units

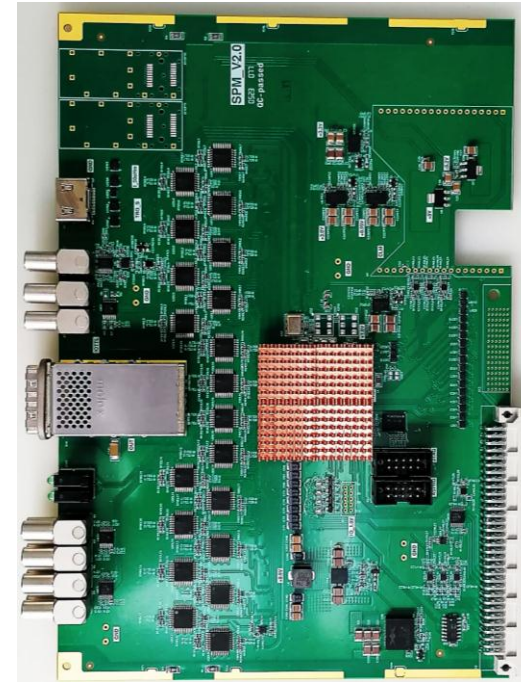


NIM crate with CAEN digitizers

FFD in MPD Trigger



Electronics for FFD trigger pulses



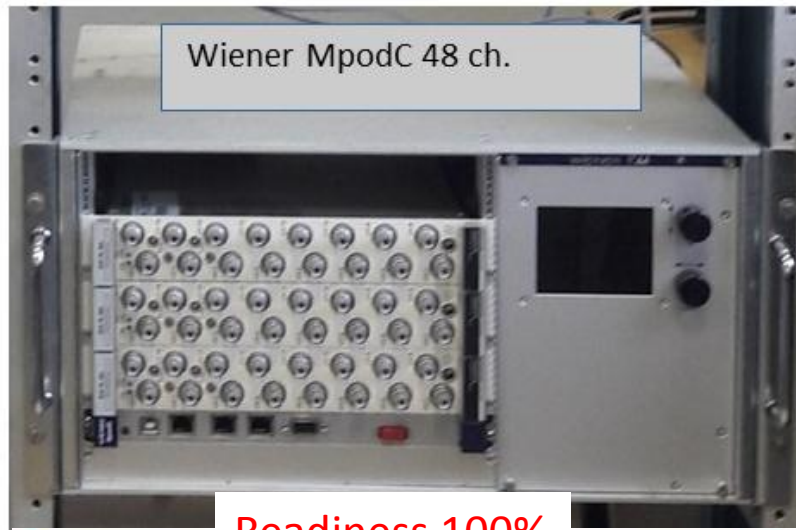
SPM module

2 units are ready

6 units will be produced with **delay of \sim a few months**

Vertex module is under development (**Dec. 2024**)

High Voltage System



Wiener MpodC 48 ch.

Readiness 100%

Slot #	Channel	Volt (V)	Vmax (V)	Integral (V)	Inst (mA)	Imax (mA)	Integral (mA)	Status
Slot 0	Channel 0	2.500,0	2.499,9	2.500,0	0,500	0,445	0,500	OK
Slot 1	Channel 1	2.500,0	2.499,9	2.500,0	0,500	0,440	0,500	OK
Slot 2	Channel 2	2.500,0	2.499,9	2.500,0	0,500	0,441	0,500	OK
Slot 3	Channel 3	2.500,0	2.499,9	2.500,0	0,500	0,441	0,500	OK
Slot 4	Channel 4	2.500,0	2.499,9	2.500,0	0,500	0,444	0,500	OK
Slot 5	Channel 5	2.500,0	2.499,9	2.500,0	0,500	0,448	0,500	OK
Slot 6	Channel 6	2.500,0	2.499,9	2.500,0	0,500	0,440	0,500	OK
Slot 7	Channel 7	2.500,0	2.500,0	2.500,0	0,500	0,442	0,500	OK
Slot 8	Channel 8	2.500,0	2.499,9	2.500,0	0,500	0,439	0,500	OK
Slot 9	Channel 9	2.500,0	2.499,9	2.500,0	0,500	0,442	0,500	OK
Slot 10	Channel 10	2.500,0	2.499,9	2.500,0	0,500	0,445	0,500	OK
Slot 11	Channel 11	2.500,0	2.499,9	2.500,0	0,500	0,448	0,500	OK
Slot 12	Channel 12	2.500,0	2.500,0	2.500,0	0,500	0,445	0,500	OK
Slot 13	Channel 13	2.500,0	2.500,0	2.500,0	0,500	0,447	0,500	OK
Slot 14	Channel 14	2.500,0	2.499,9	2.500,0	0,500	0,444	0,500	OK
Slot 15	Channel 15	2.500,0	2.499,9	2.500,0	0,500	0,445	0,500	OK
Slot 16	Channel 16	2.500,0	2.500,0	2.500,0	0,500	0,448	0,500	OK
Slot 17	Channel 17	2.500,0	2.499,9	2.500,0	0,500	0,443	0,500	OK
Slot 18	Channel 18	2.500,0	2.499,9	2.500,0	0,500	0,444	0,500	OK

Serial Number: 713110 Module Type: E2DC1 Channel selected: Channel

Firmware Release: 5.83 Module Control: Channel Control: Channel Status: Channel Event Status: Channel Event Mask:

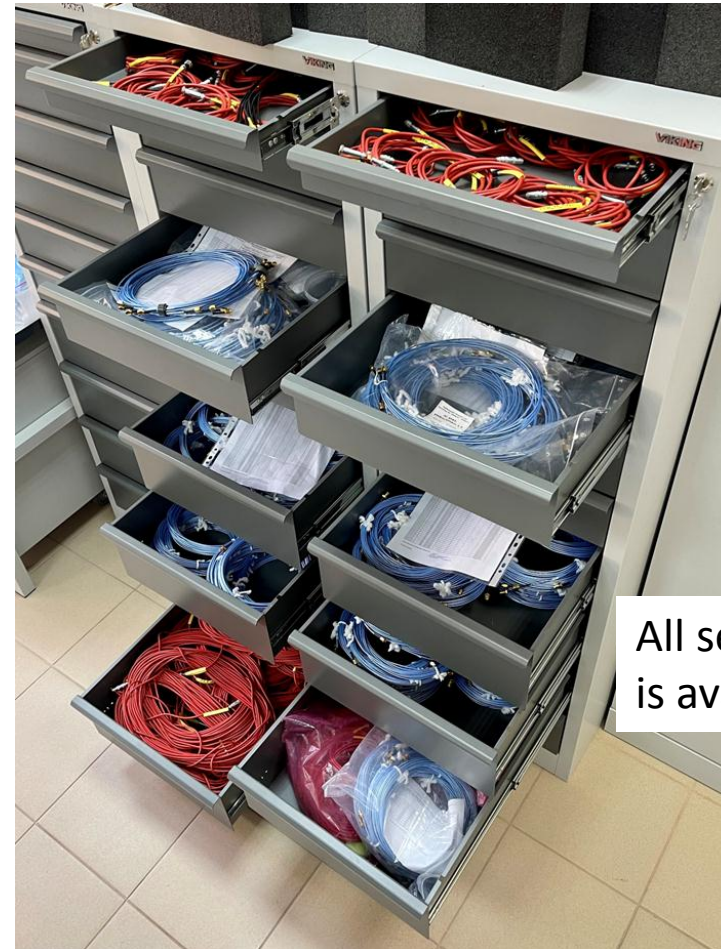
Voltage Ramp Speed: 1 %/s Module Status: Channel Status: Channel Event Status: Channel Event Mask:

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

Firmware VPE Decoder: 0.8 / 0.0 Module Event Mask: 0x0000 Channel Event Mask:

Connected to 192.168.16.225. Bus # status: OK

Cable System



All set of FFD cables is available and it was tested

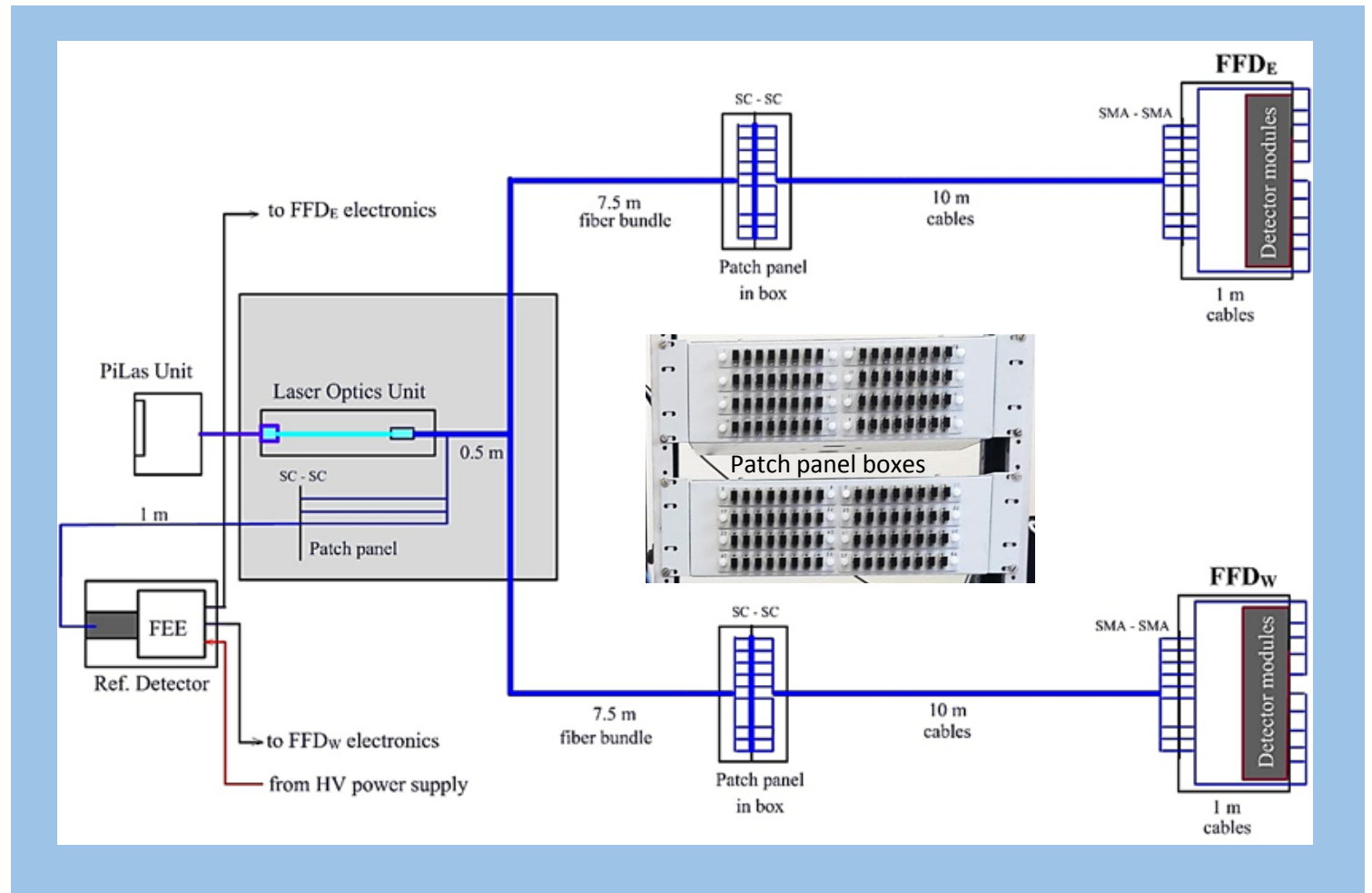
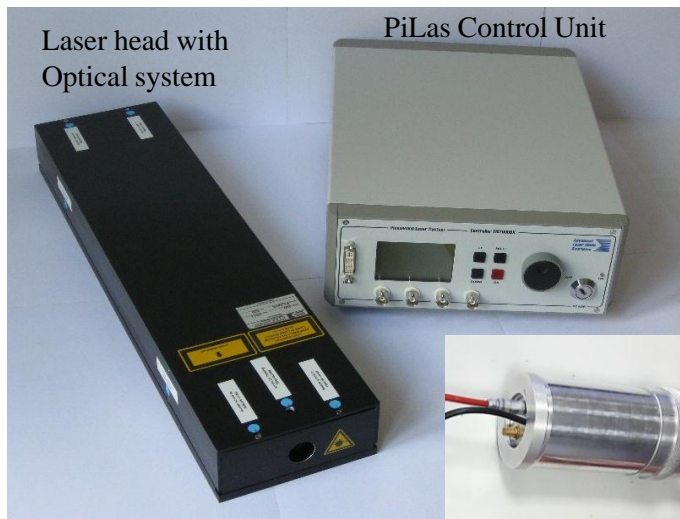
- HV cables
- HDMI cables
- Molex cables
- Coaxial cables
- Optical cables

Readiness 100%

Laser System

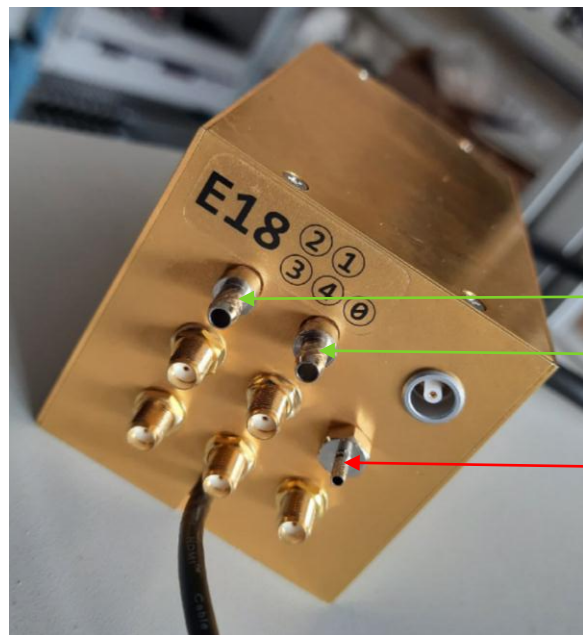
Laser system components

- PiLas laser
- Laser Optics Unit
- Reference Detector with <math><30\text{ ps}</math> time resolution
- Fiber bundles
 - 7.5 m (2 x 60 fibers)
- Patch panels
- Set of optical cables
 - 10 m (2 x 20 pcs.)
 - 1.5 m (2 x 20 pcs.)



Readiness 100%

Cooling and temperature control system

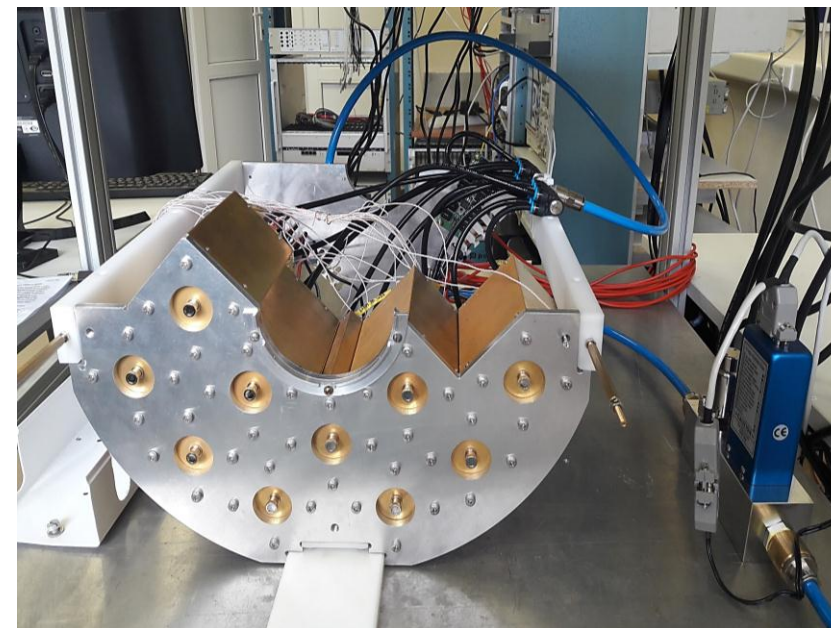


air flow
feedthrough

Sensor
connector

Power consumption per module is 1 W
or 20 W per FFD sub-detector
Air flow through the modules
removes $\sim 1/2$ thermal energy

Requirement for FFD cooling:
Flow of cool and dry air or nitrogen
with 100 L/min per subdetector



Test of cooling system with air flow



Cables and distributors of
air flow to FFD modules



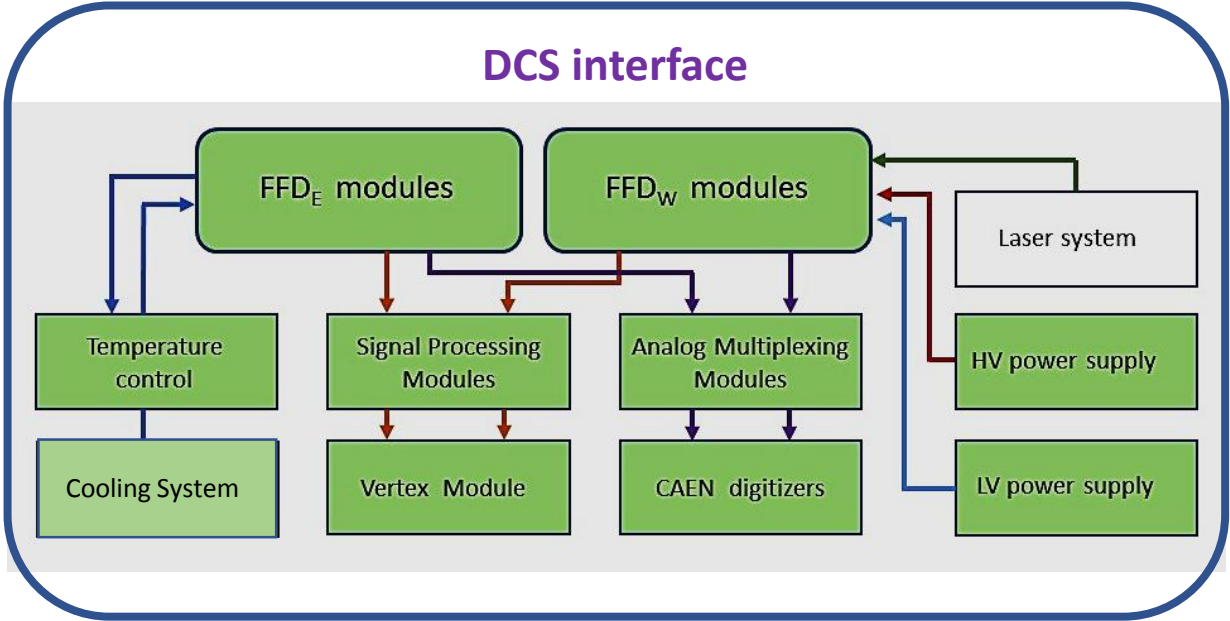
Temperature
Monitoring Module
(2 per Sub-Detector)

Current status:
All components are available

Readiness 100%

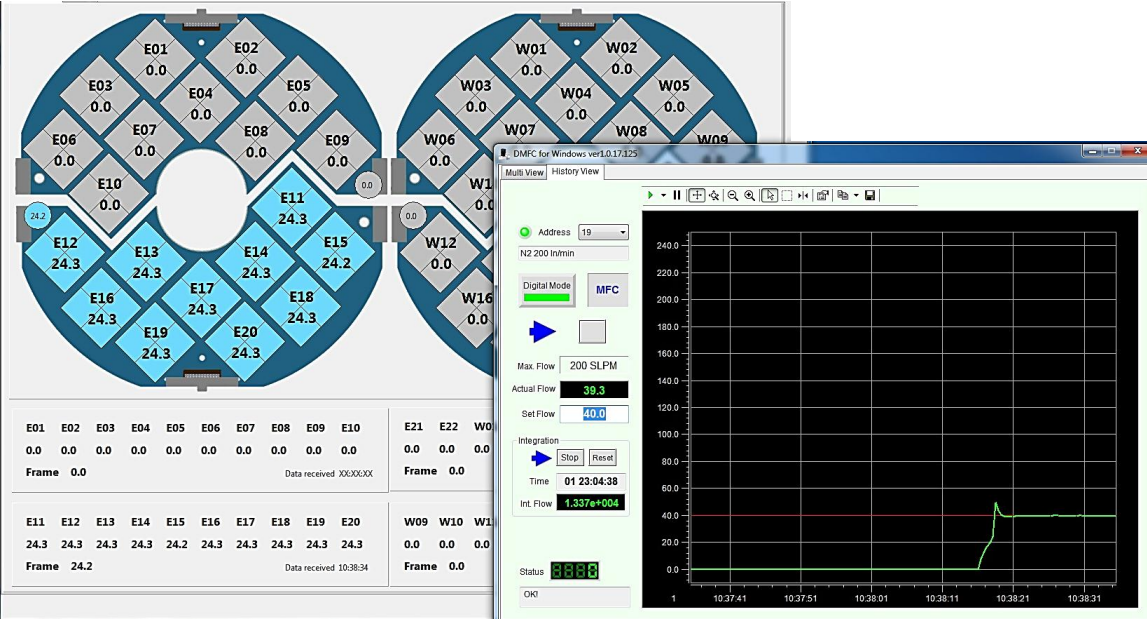
Detector Control System

The system is built using client-server architecture and it includes control and monitoring of all FFD subsystems



Example

Interface of temperature monitoring



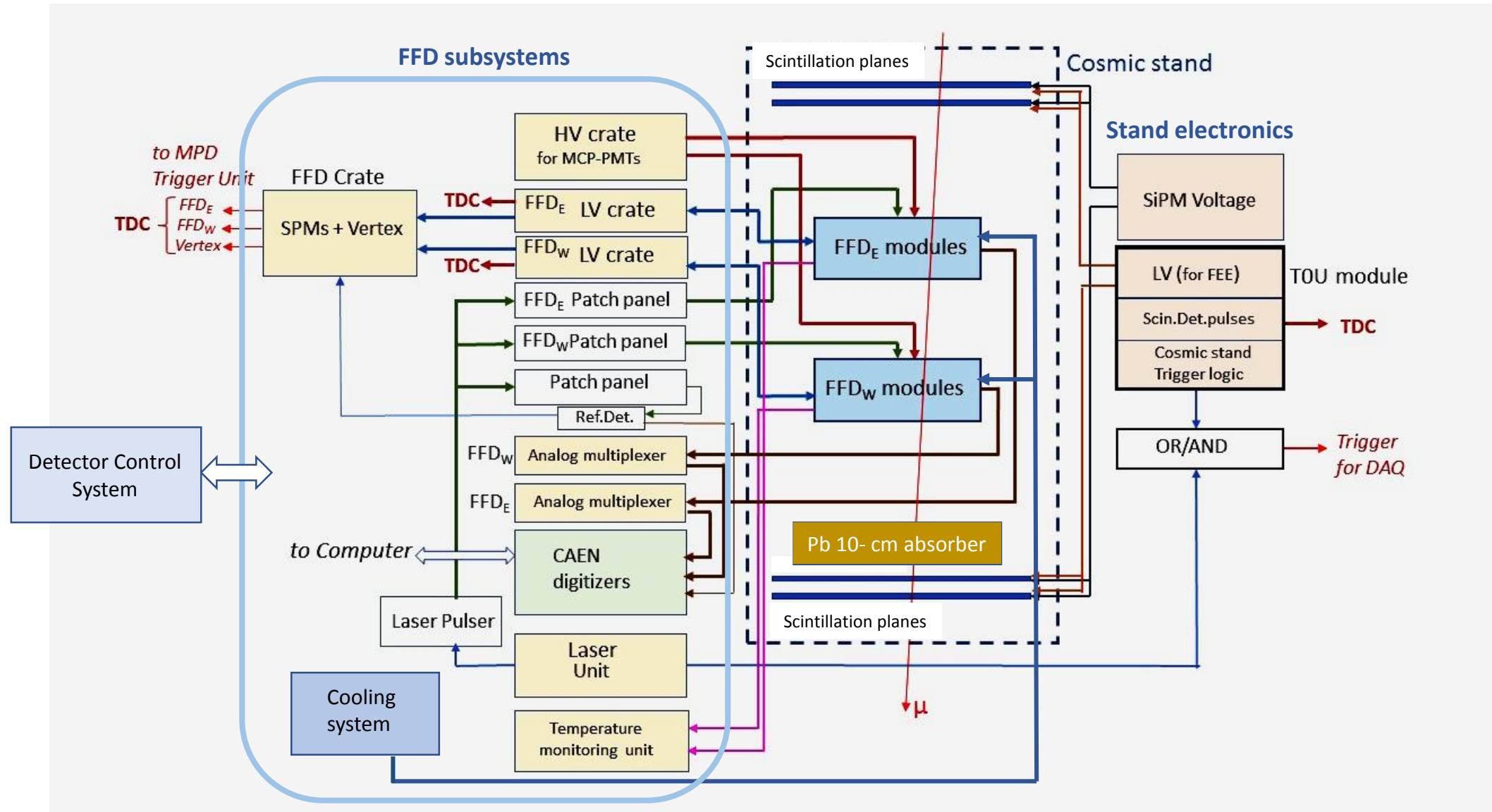
States of equipment:

- "OFF" – not in operation (switched off)
- "StdBy" – in Stand-by mode
- "Ready" – in operation (on)
- "Wrng" – warning - something is out of operation range
- "ALRM" – alarm - dangerous regime (must be switched off and repaired)

Monitoring and control of the cooling system with air flow

Readiness 80%

A scheme of the Stand for Test Measurements with Cosmic Muons & Laser

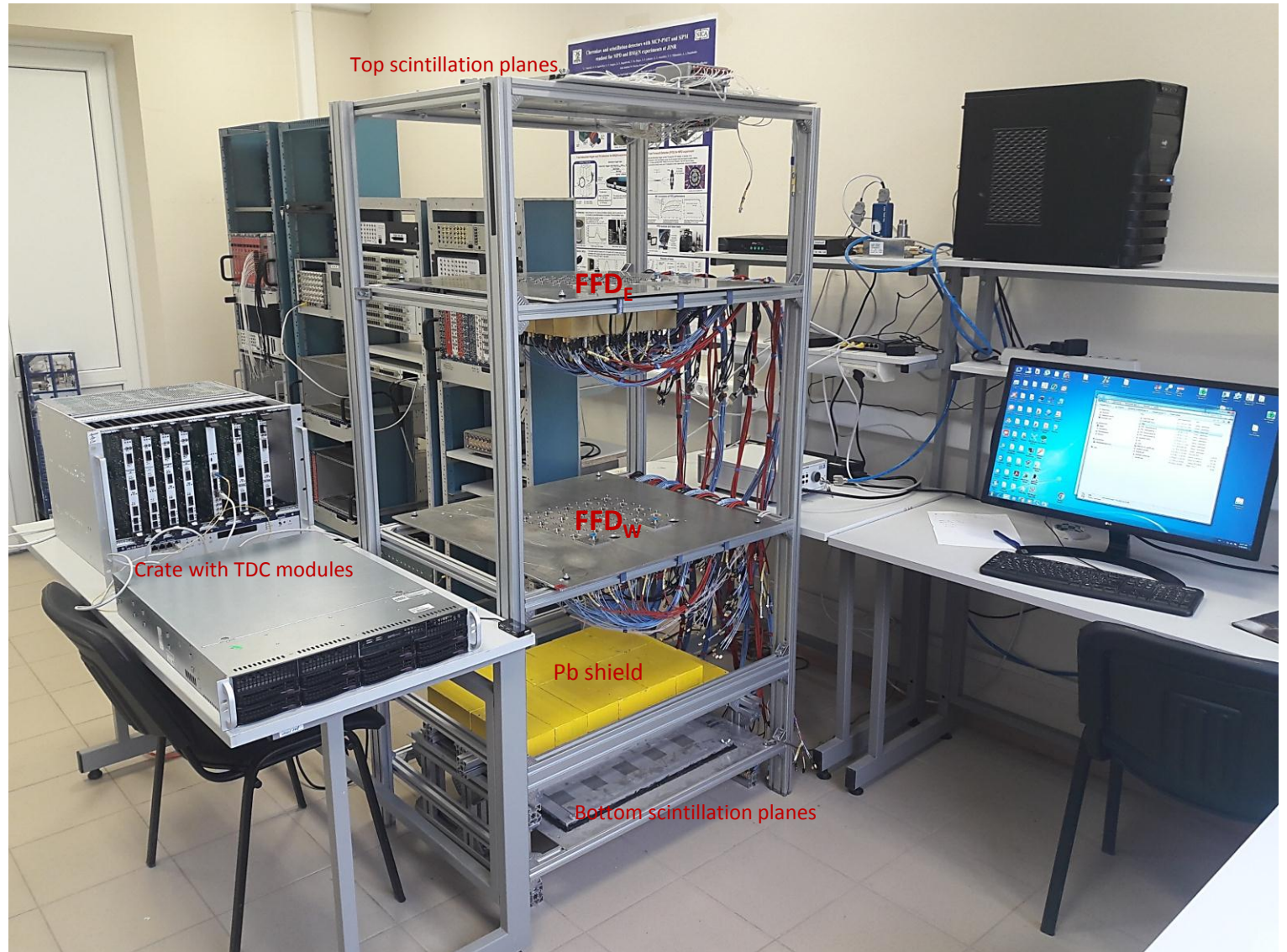


The stand for study of FFD operation with cosmic rays and laser

Preparation to a final global test reproducing as much as possible FFD operation in MPD.

The aim - to get proper and stable work of all FFD subsystems.

Period of the tests: June – Dec. 2024



Summary

Subsystem	Readiness	Comment	Expected delay
Sub-detectors	100%	—	~a few months
Electronics	75%	Delay with production of SPM & Vertex modules	
HV & LV systems	100%	—	~6 months
Laser system	100%	—	
Cooling system	100%*	—	
DCS & Interface	80%	In progress	
Cable system	100%	—	Tests till Dec. 2024
Long term test with cosmic rays & laser	In beginning	In progress	

** A source of compressed air flow is required*

Thank You for Your Attention!