Status of
Fast Forward Detector
(FFD)

Vladimir Yurevich

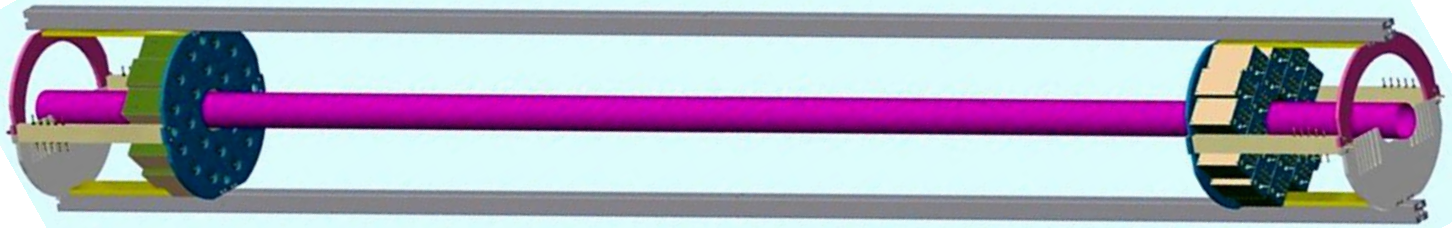
LHEP / JINR

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



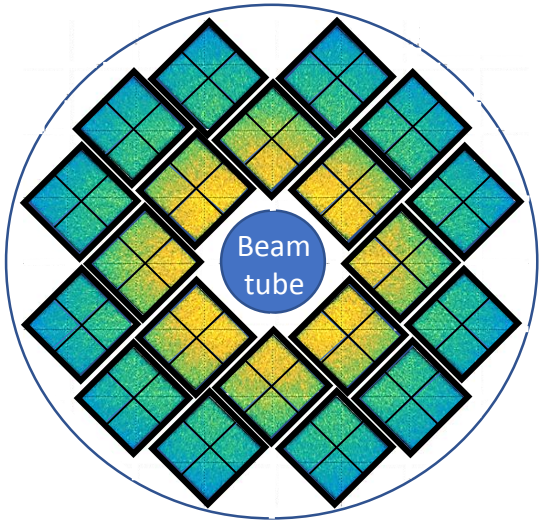
FFD_E FFD_W

The main aims of FFD

Fast and effective triggering of nucleus – nucleus collisions

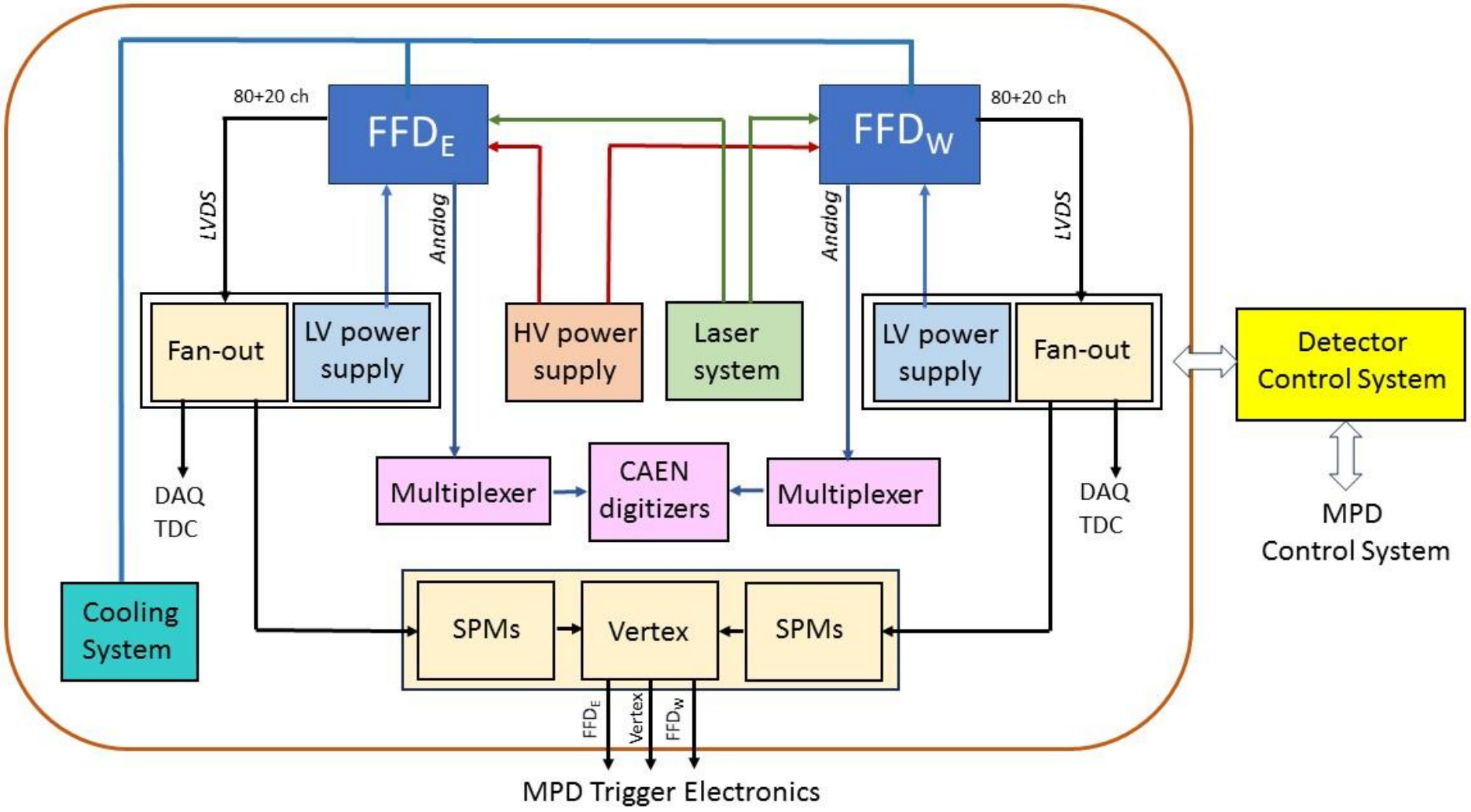
Generation of the start pulse T0 for the TOF detector

FFD detects relativistic charged particles and high-energy photons

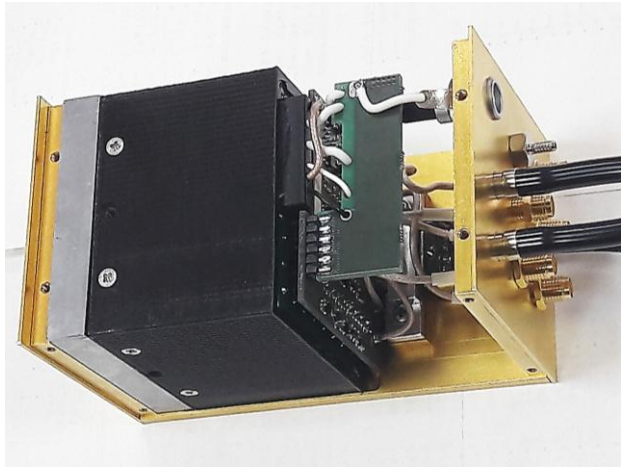


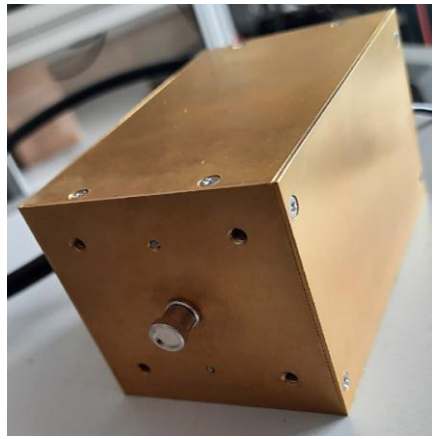
Distribution of incoming particles on the front of FFD modules

FFD Sub-Systems

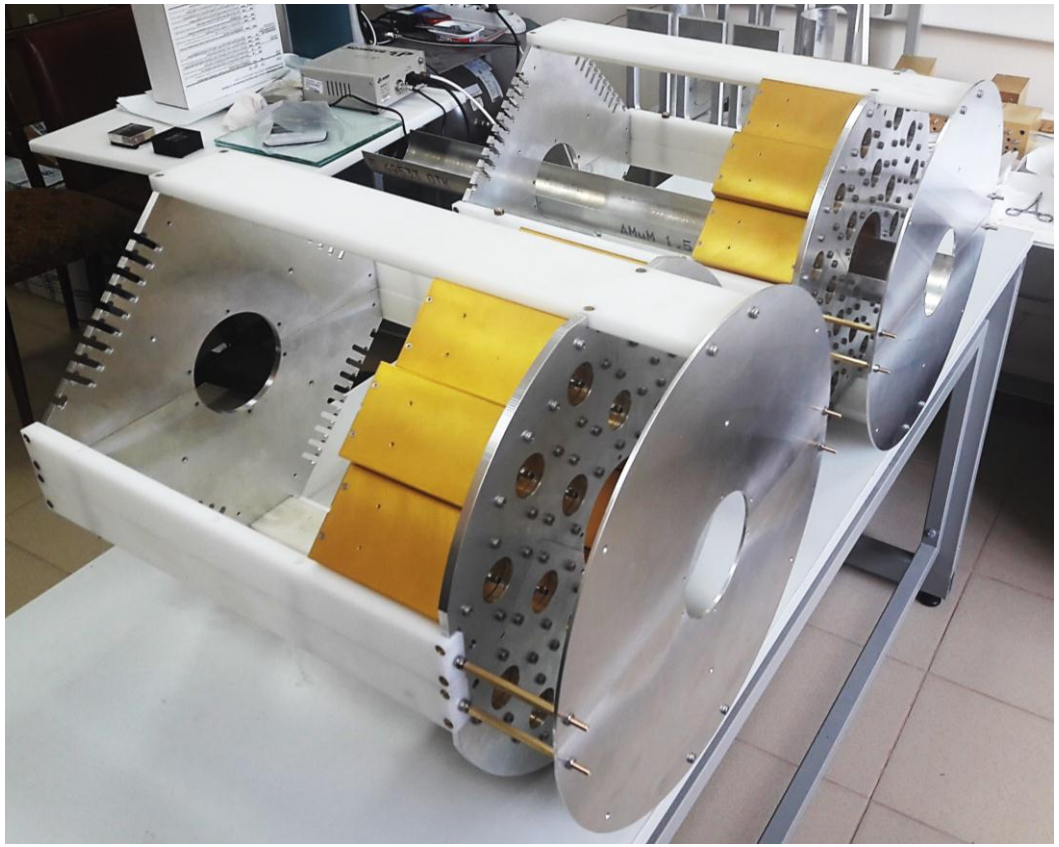


FFD modules and sub-detector mechanics





FFD modules



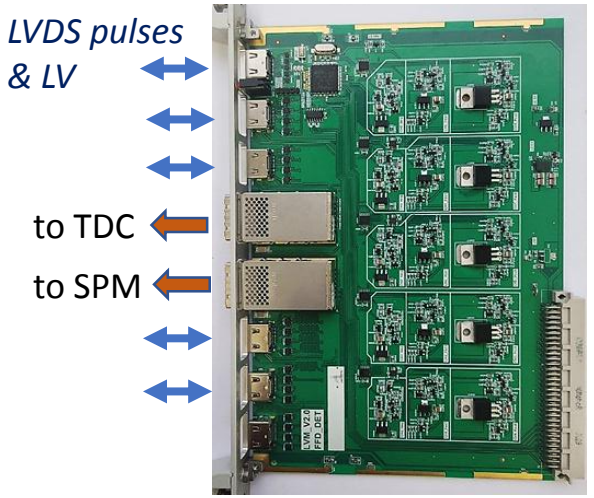
FFD sub-detector mechanics

Readiness 100%

Electronics for LVDS pulses & LV

Readiness 100%

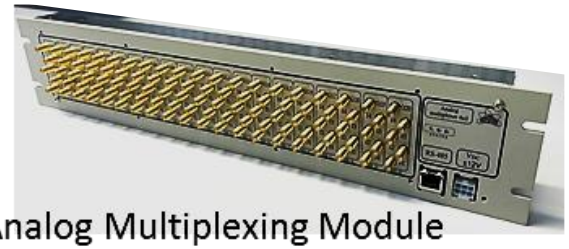
Crates with Fan-out & LV modules



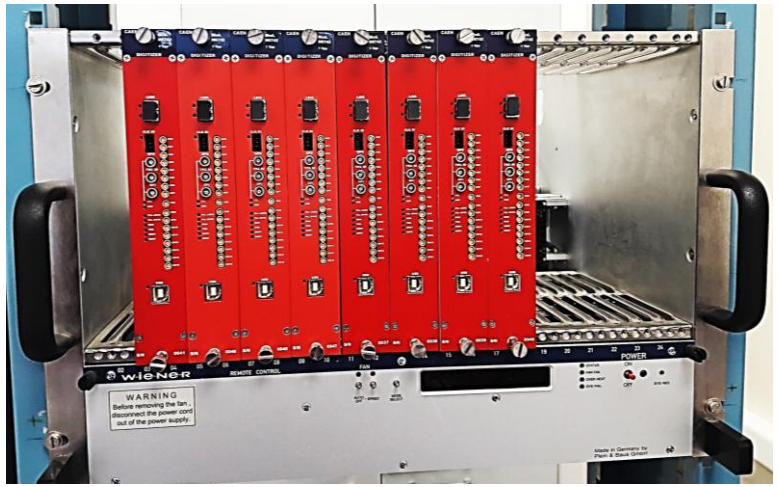
Fan-out & L V Module

Electronics for analog pulses

Readiness 100%

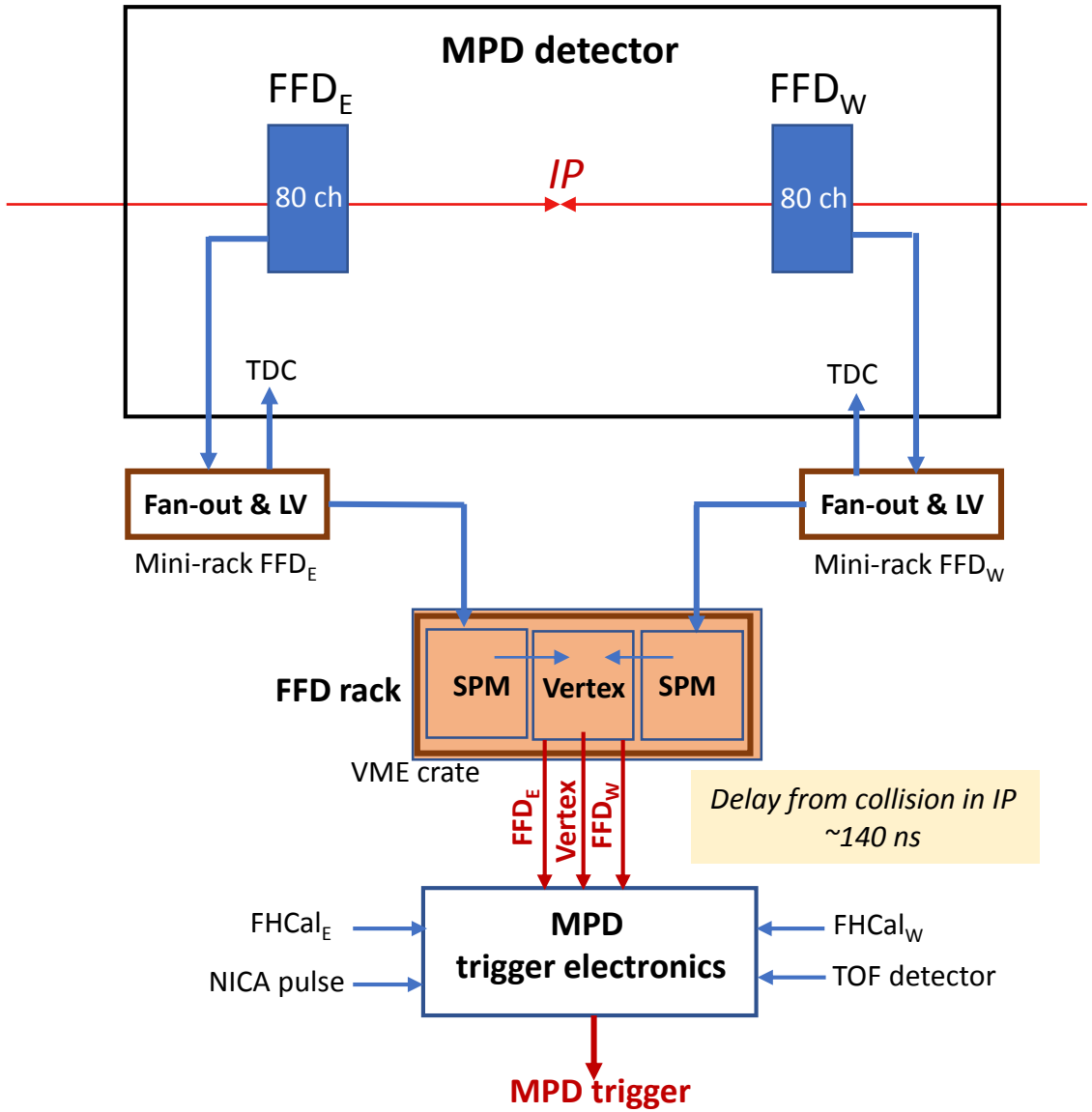


Analog Multiplexing Module
2 units

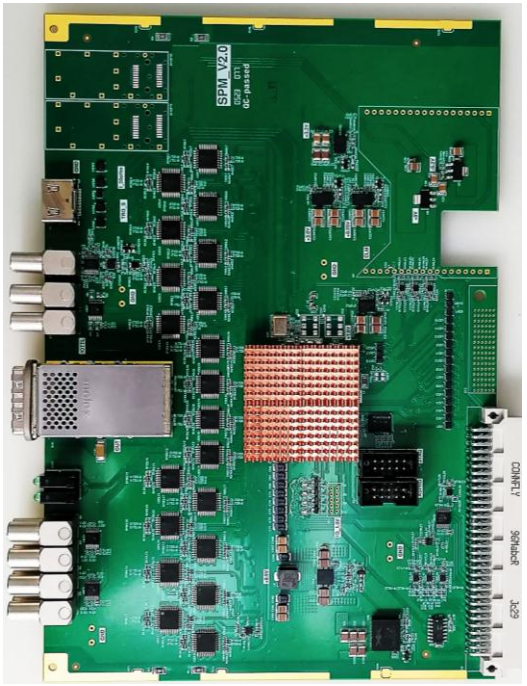


NIM crate with CAEN digitizers

FFD in MPD Trigger



Electronics for FFD trigger pulses



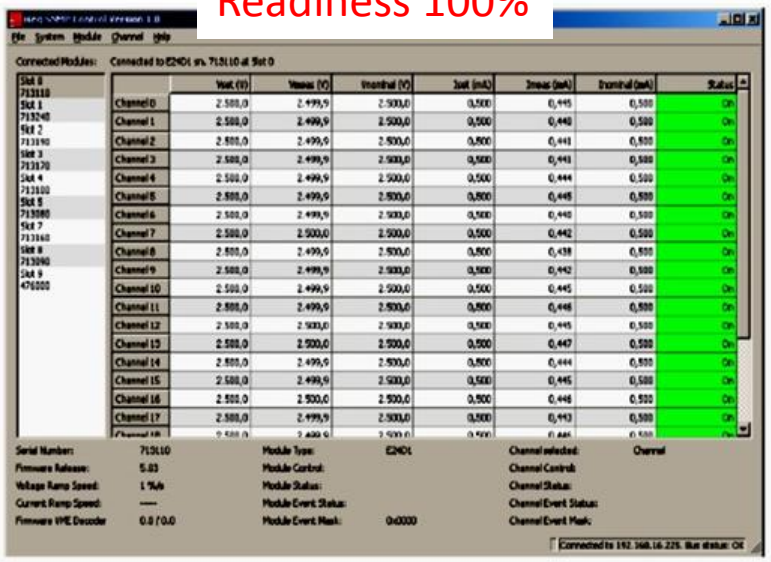
SPM module

2 units are ready
6 units will be produced with delay of ~ a few months

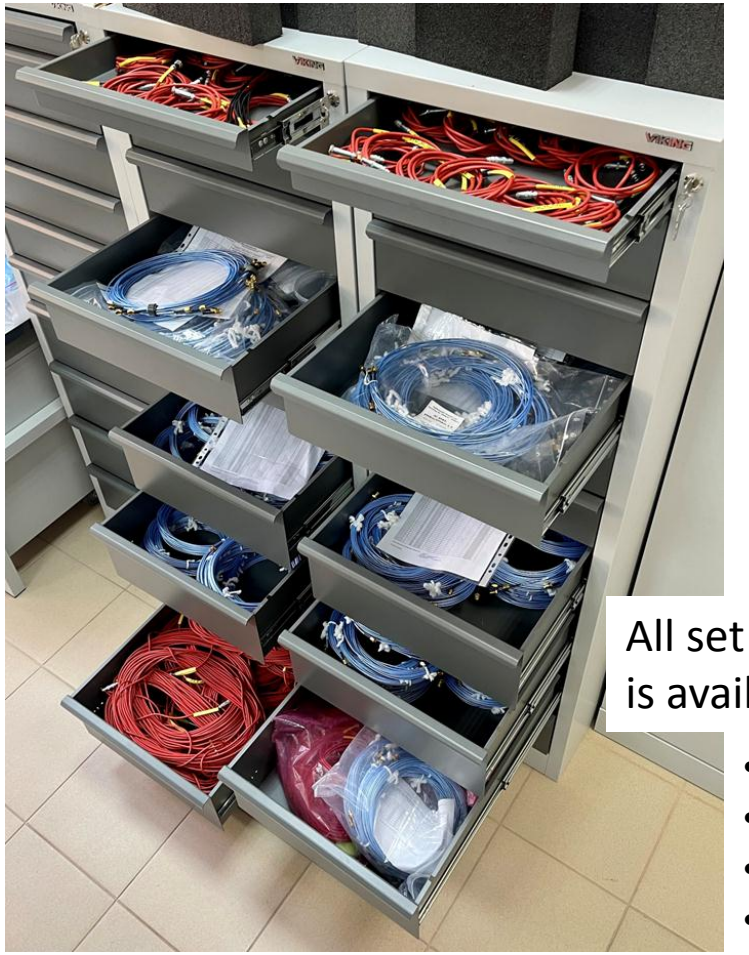
Vertex module is under development (Dec. 2024)

High Voltage System

Readiness 100%



Cable System



All set of FFD cables
is available and it was tested

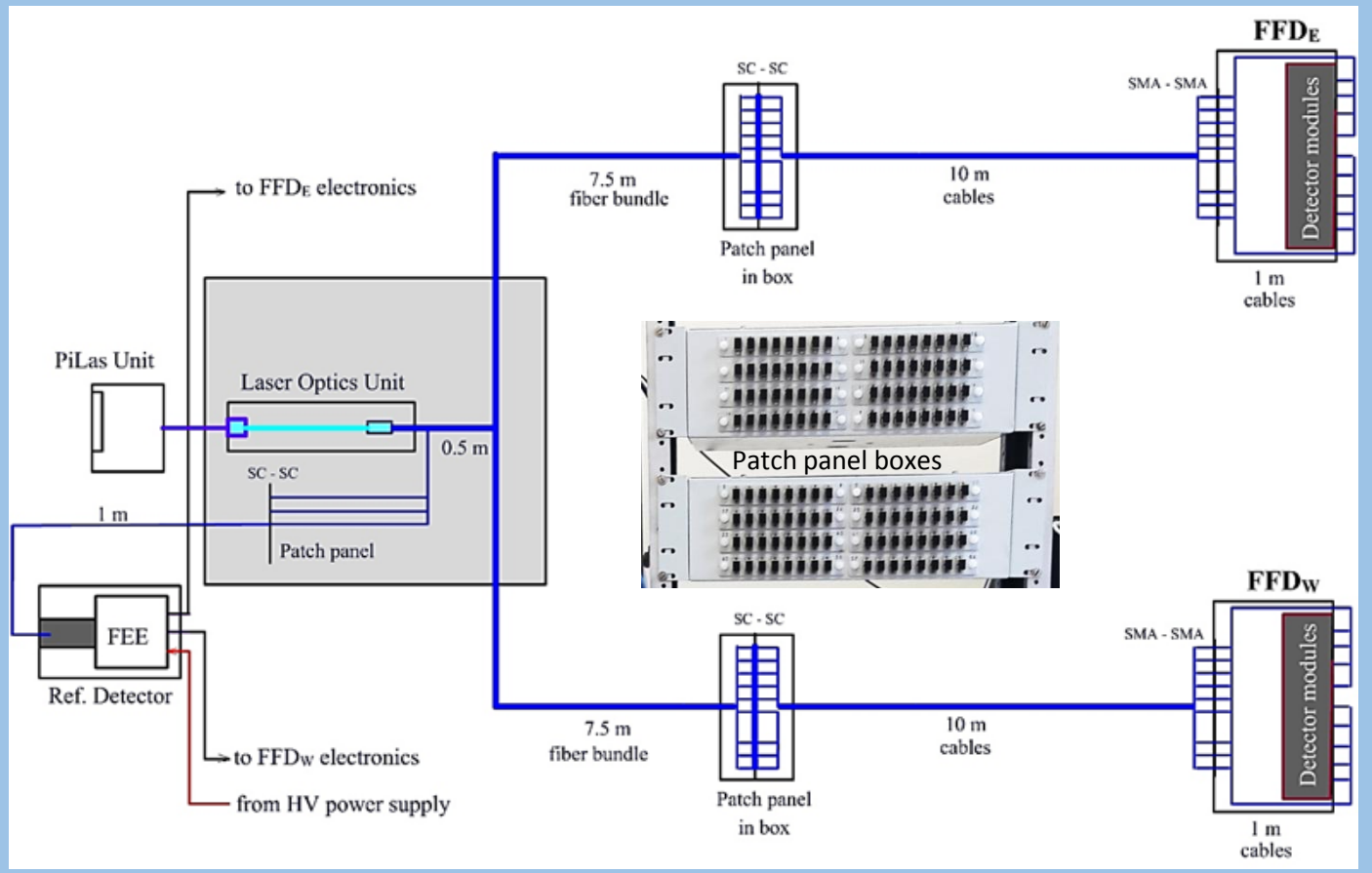
- HV cables
- HDMI cables
- Molex cables
- Coaxial cables
- Optical cables

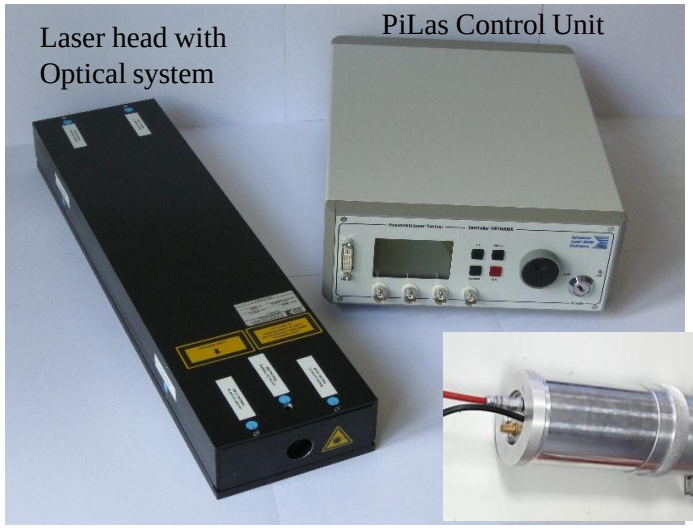
Readiness 100%

Laser System

Laser system components

- PiLas laser
- Laser Optics Unit
- Reference Detector
  with <30 ps 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.)

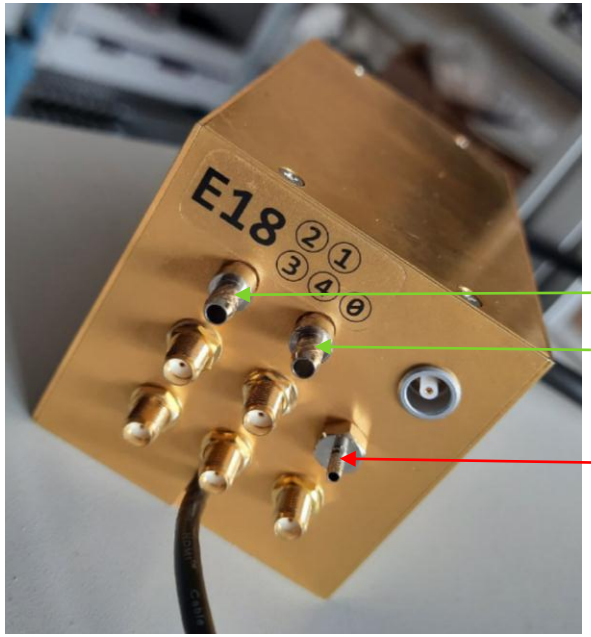




Reference detector
With MCP-PMT

Readiness 100%

Cooling and temperature control system



Power consumption per module is 1 W
or 20 W per FFD sub-detector

Air flow through the modules
removes ~1/2 thermal energy

Requirement for FFD cooling:

Flow of cool and dry air or nitrogen

with 100 L/min per subdetector

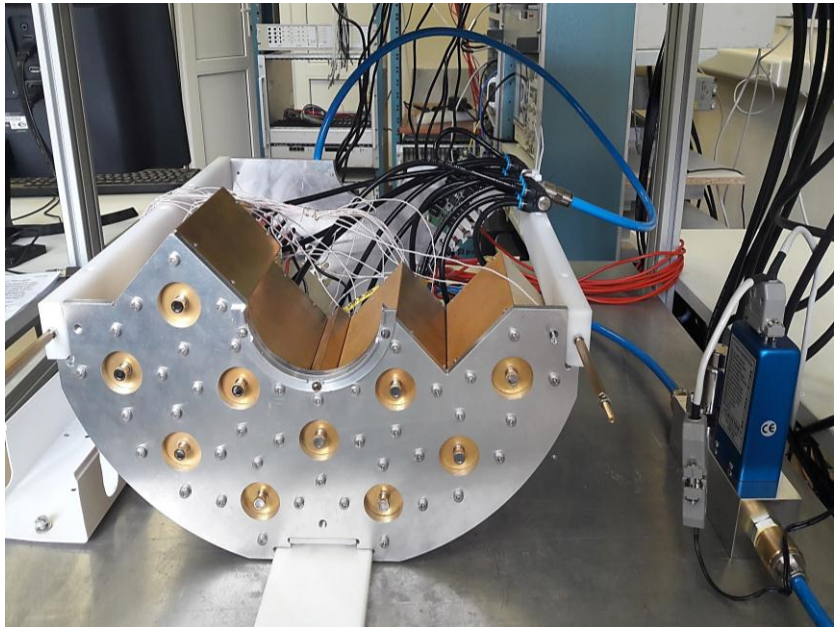
Cables and distributors of
air flow to FFD modules

Temperature
Monitoring Module
(2 per Sub-Detector)

Current status:

All components are available

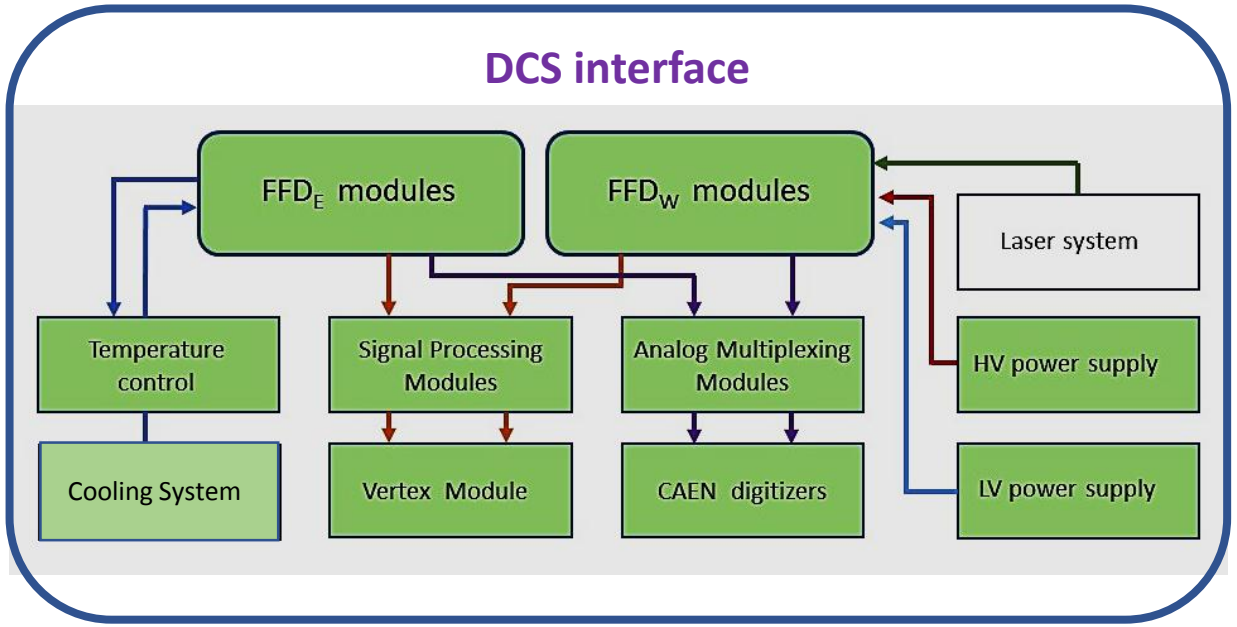
Readiness 100%



Test of cooling system with air flow

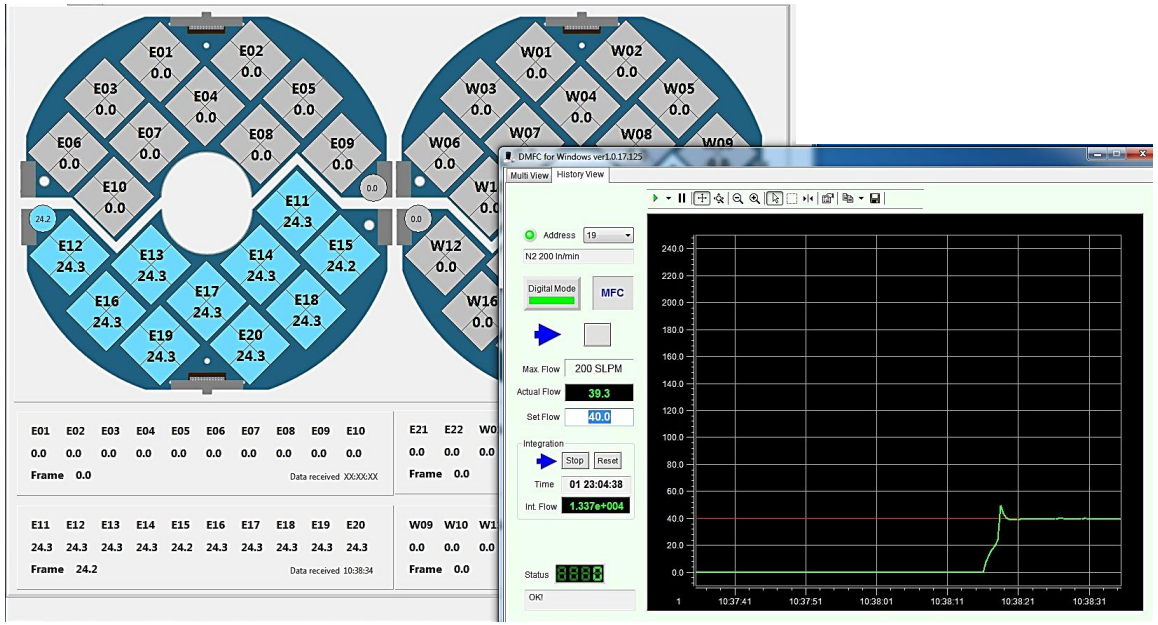
Detector Control System

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



Example

Interface of temperature monitoring



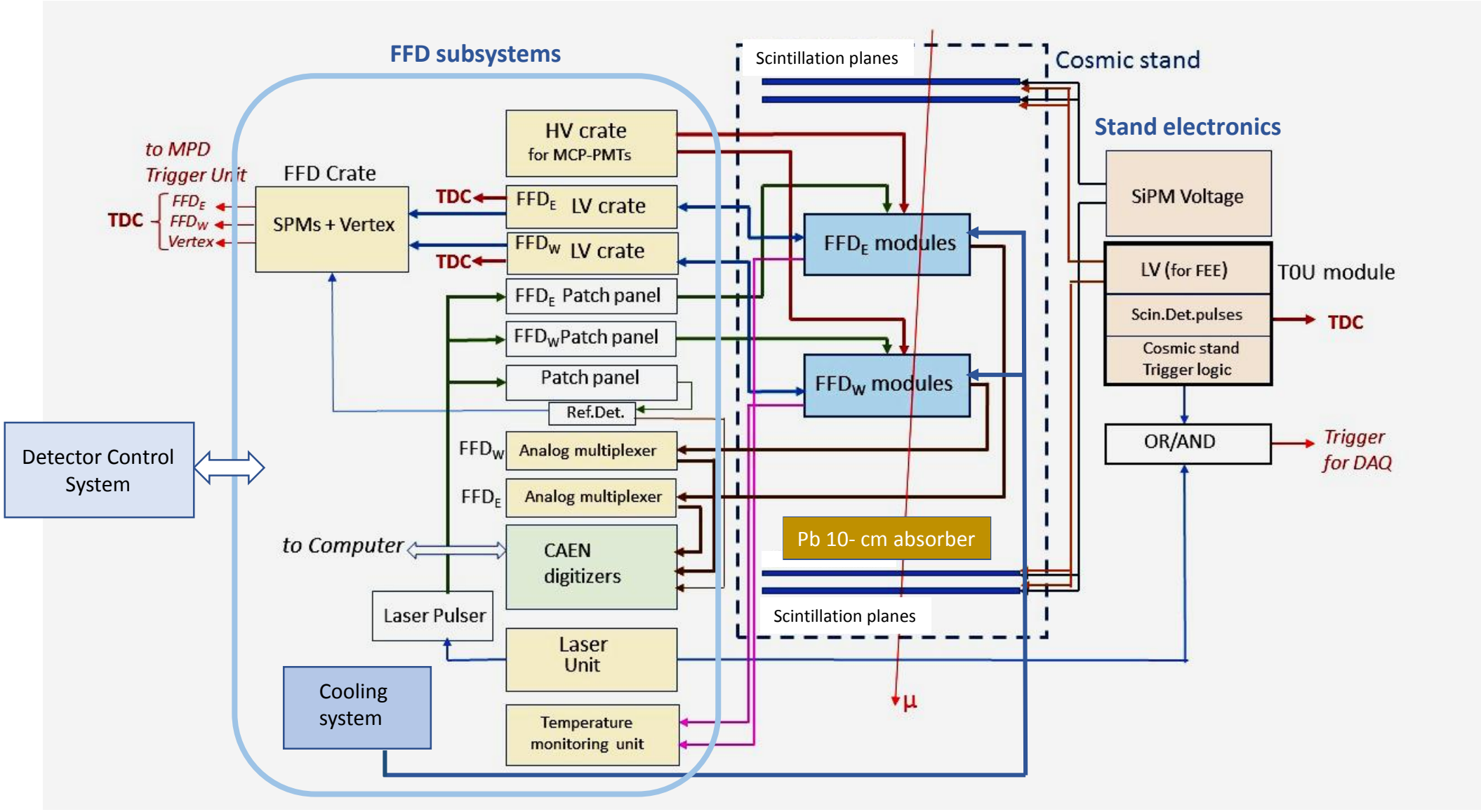
States of equipment:

- "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%	–	
Laser system	100%	–	
Cooling system	100%*	–	
DCS & Interface	80%	In progress	~6 months
Cable system	100%	–	
Long term test with cosmic rays & laser	In beginning	In progress	Tests till Dec. 2024

** A source of compressed air flow is required*

Thank You for Your Attention!