VIII SPD Collaboration Meeting, November 4-8, JINR

Zero Degree Calorimeter (ZDC) for SPD *(Progress report)*

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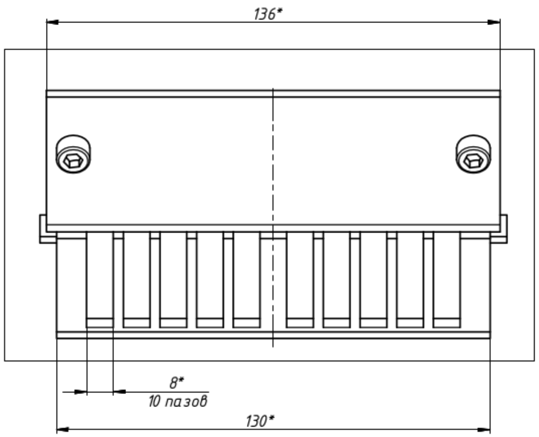
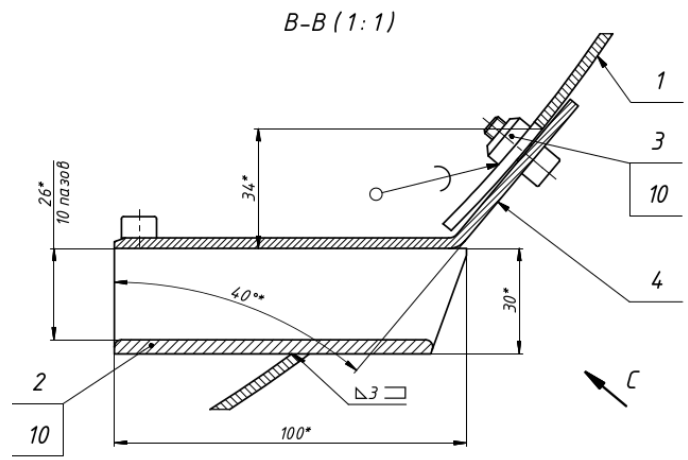
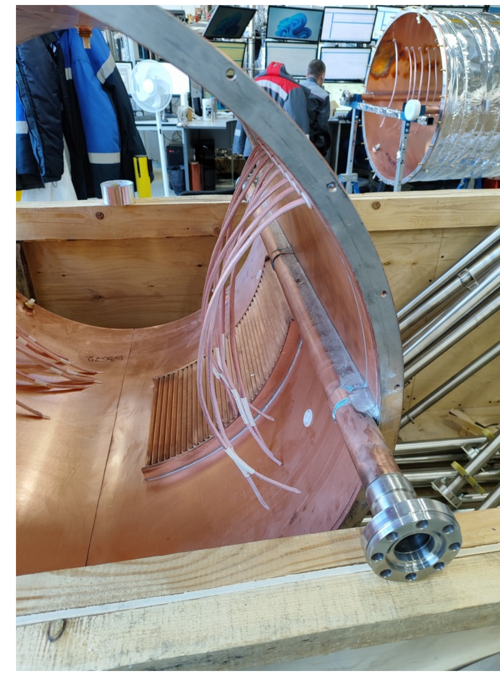
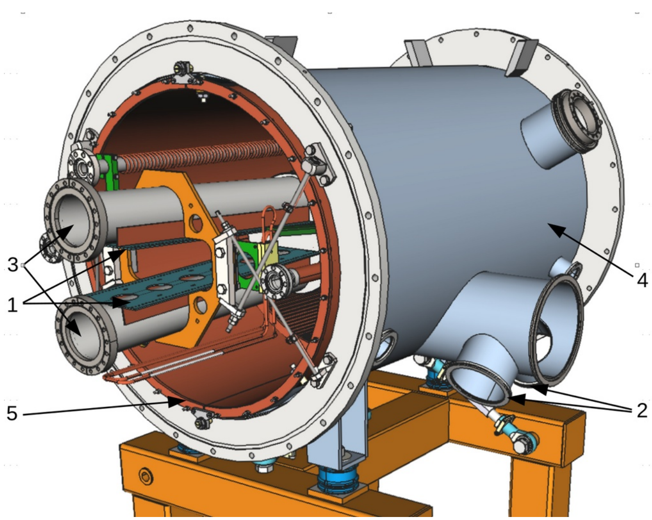
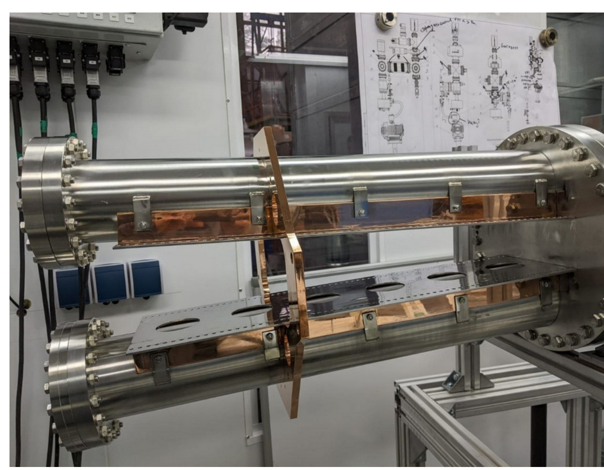
Pass through LqN screen developed and cryostat sections are already modified.
Cables go on one side of the screen only.
Space for wires ~ 20 cm^2.

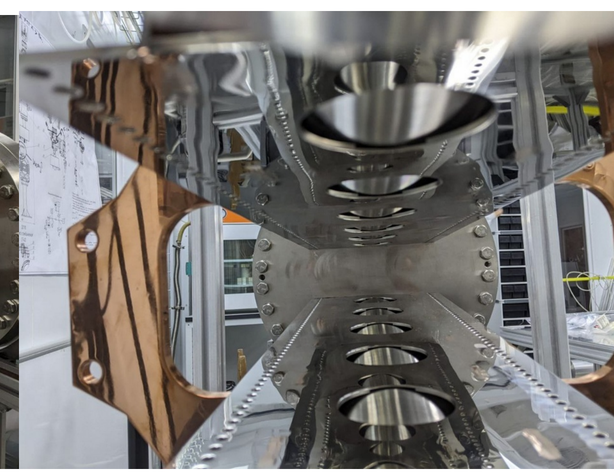




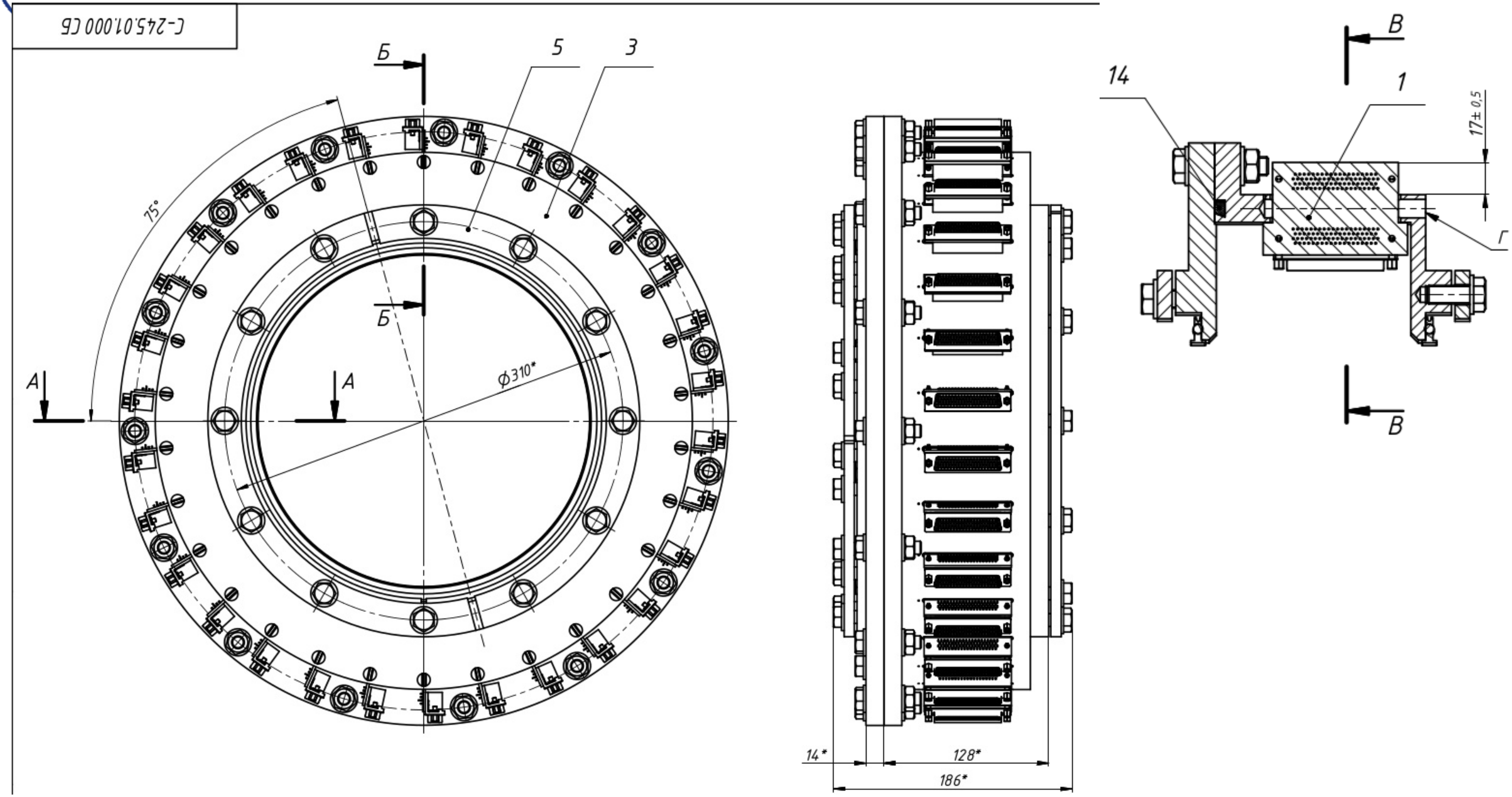




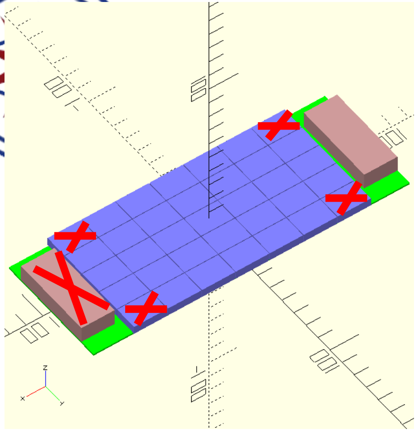




Pass from vacuum

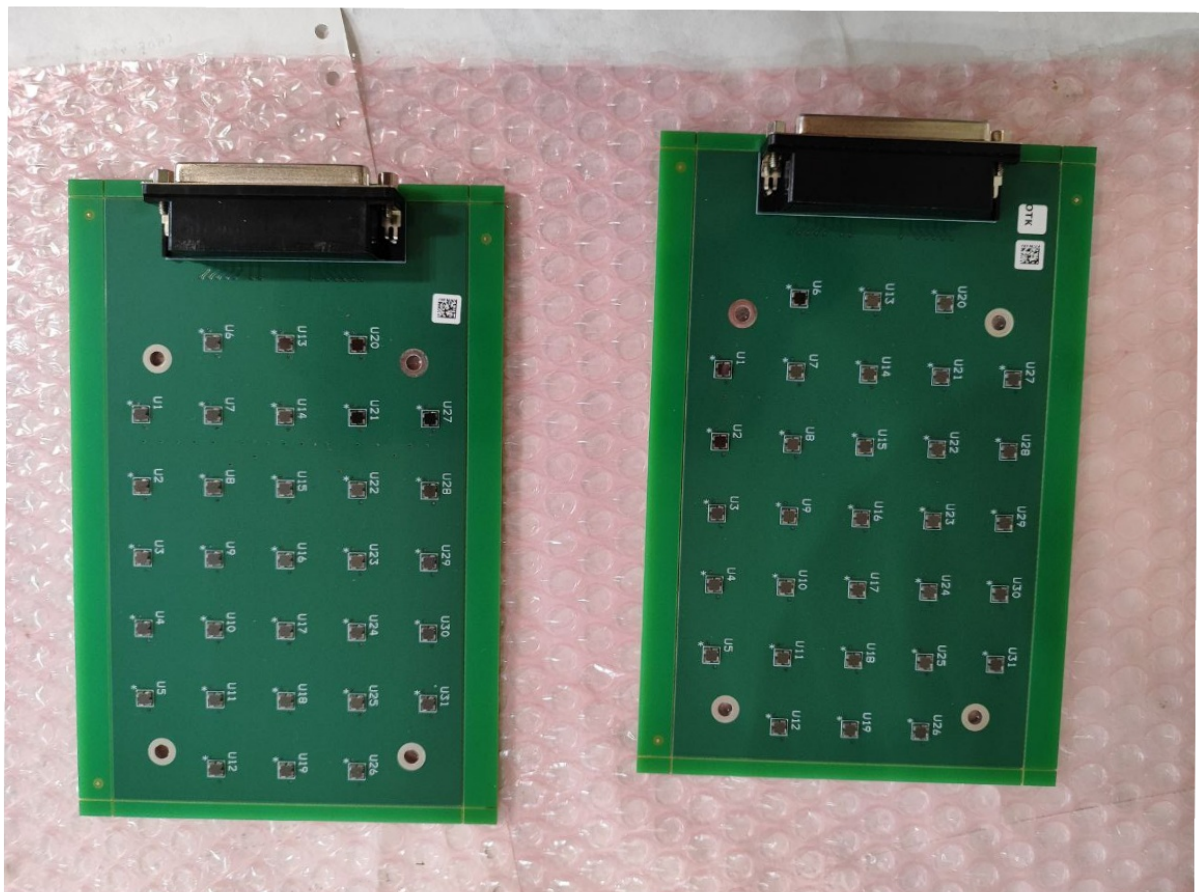


A barrel with 30 pcb boards with 78-pin connectors DHR-78F (DS1038-78F) will be installed on one side of the cryostat at large side flanges. The boards are already manufactured by REZONIT and received in JINR. Two barrels are ordered and expected to be received in JINR 28.12.2024.



Test SiPM boards

2 test SiPM boards with 31 SiPM each manufactured.
2 sets of square 20x20 mm² scintillator tiles with 3 and 5 mm thicknesses produced and connected to boards. The tiles are wrapped in high reflecting film and have polished pit in the place where SiPM is attached. Sensitive area 140x100 mm² correspond to some middle part of ZDC.



Tunnel installation around December - March?

Original plan for the first stage of ZDC was – 6 planes with trapezoid geometry and 320 mm thick copper radiator. It was supposed to be prepared for installation by summer 2025.

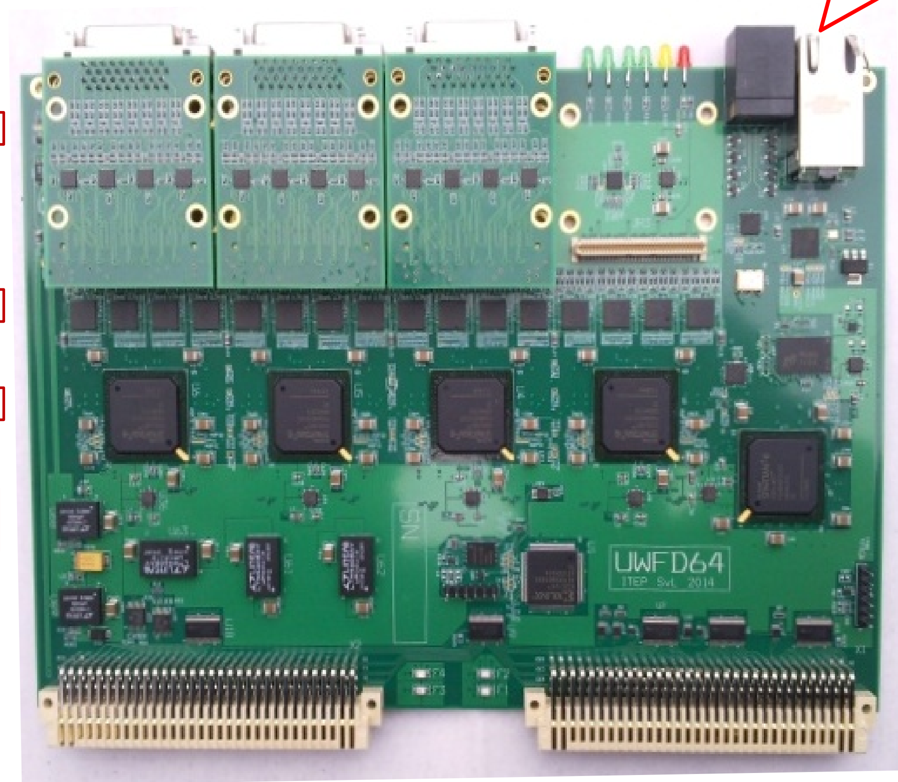
What could be done by December-March:

A compact version with the same as in test SiPM boards. 3 layers with a copper or stainless steel radiator about 9 cm total thickness (close to shower maximum for a few GeV).

What we need to do before the cryostat will be closed:

1. Manufacture and install vacuum feed through barrels - **ordered**.
2. Solder and install MGTF twisted pair cables with DHS-78M (DS1035-78M) on both sides. We need at least 3 cables at each side of IP.
3. Manufacture 6 more SiPM boards of the same size and design - **ordered**.
4. Produce 186 SiPM tiles 20x20x5 mm^3 - **done**.
5. Make radiator planes – **prepairing the drawings**.
6. Design an installation into the rails – **prepairing the drawings**.
7. Assemble and install the modules.
8. A simple test with multimeter before we lose an access inside the cryostat.

DAQ and front-end



Raw price estimate

(stage I detector, **6** signal planes on each side of IP):
8 UWFD modules ~ 5 M rouble
15 front-end boards ~ 0.5 M rouble
15 power boards ~ 0.5 M rouble

DAQ:

- 64 channels
- 12 bits
- 125 MSPS
- 512 Mbyte DDR3 RAM
- Capable 64 bits DDR VME block transfer

Front-end:

- 32-channel
- ADA4940-2 based
- Need to be designed

SiPM power:

- 32-channel
- AD5674 based
- Is developed now for DANSS upgrade

After cryostat will be closed

- Prepare infrastructure: AC power, ethernet, VME64X crates.
- Prepare front-end electronics – make simple boards based on ADA4940-2ACPZ (amplifiers) and AD5674RBCPZ-1 (DAC for individual BIAS adjustment) and cables.
- Manufacture 5(10?) more UWFD64 modules for digitization.

Plans for the first collisions

- We will have a limited setup with ~ 6 L_{rad} thikness on both sides of IP.
- We will need AC power, ethernet and to place VME64 crate with digitization and front-end electronics close to each Y-section of the collider.
- Measurements:
  - Test detector in the operating conditions of isolation vacuum and LqN temperature.
  - Calibrate SiPM at low temperature. No noise! May be we shell think about LED system.
  - Get statistics of beam collisions. We will not have good sensitivity to neutrons, but should measure gammas. Compare with MC.
  - Try to get some luminosity measurement.

Thank you for your attention