

# Cremlin+: WP 5, Task 6 (BINP)

Tasks, plans and status

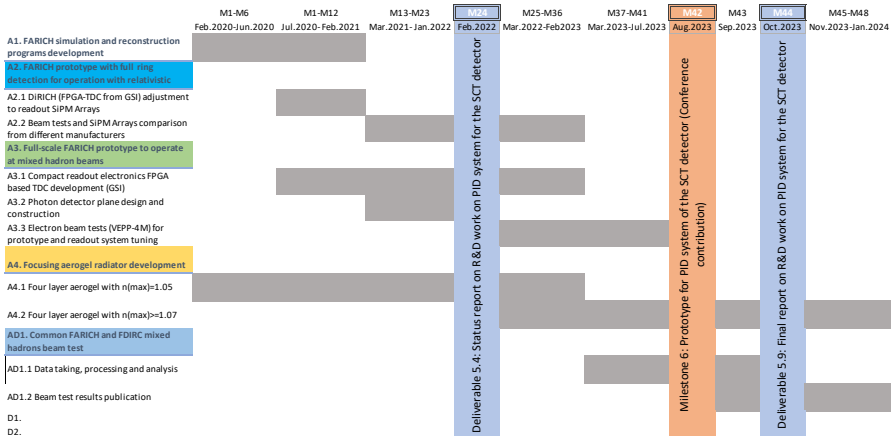
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Budker Institute of Nuclear Physics , Novosibirsk 2020

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# Task & Plans

The experience of several research groups will be combined to come up with proposals for the optimum PID system for the SCT project with respect to performance and cost. Detector prototypes are going to be constructed and tested to verify the performance of these novel detector concepts and their readout systems.



A1-4 - FARICH tasks and activities  
D1-... - FDIRC tasks and activities  
AD1-... - Joint FARICH and FDIRC activities

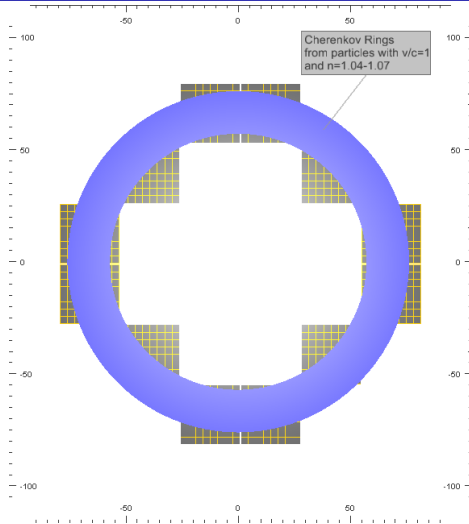
# A1. FARICH simulation and reconstruction programs

- FARICH simulation program is developed in GEANT4 framework. Photon detector based on SiPM arrays is described. The intrinsic noises of SiPMs are simulated.
- Simulation results are in good agreement with FARICH beam tests with relativistic electrons while small part of the ring is detected ( $10 \div 25\%$  one Cherenkov photon per particle in average).
- Several approaches for PID parameters reconstruction are developed and tested with simulated data (only for perpendicular penetrating particles). More detailed comparison of the approaches are foreseen soon.

## Plans:

- After comparison of several approaches we need to integrate this simulated data and reconstruction soft to AURORA framework.
- Validation of simulation with FARICH prototype beam test results.

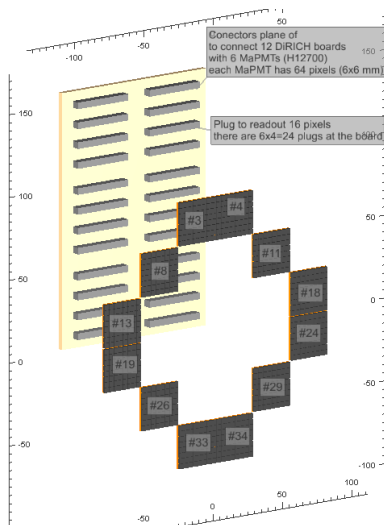
## A2. FARICH prototype for full ring detection with electron beams



- 12 SiPM arrays ( $28 \times 28$  mm) are enough to detect 80% of the ring (768 pixels  $3 \times 3$  mm).
- We have 10 SiPM arrays  $8 \times 8$  pixels with  $3 \times 3$  mm (4 from Hamamatsu and 6 from SensL) + 4 from KETEK are expected until the end of the year.

12 SiPM arrays ( $28 \times 28$  mm) and Cherenkov ring

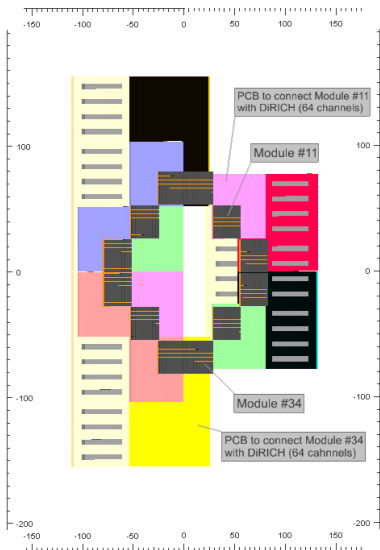
# A2.1 Readout electronics based on DiRICH



12 modules + DiRICH board

- We have 3 DiRICH boards to readout  $6 \times 64 \times 3 = 1152$  pixels.
- It is easy to connect H12700 and XP85012 PMTs with  $6 \times 6$  mm  $8 \times 8$  pixels.
- To readout SiPM arrays with  $3 \times 3$  mm  $8 \times 8$  pixels especial PCB-connectors are needed.

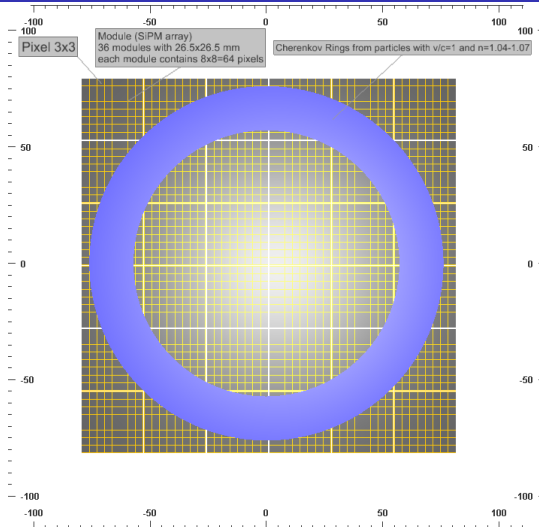
## A2.1 Readout electronics based on DiRICH #2



- Each DiRICH board readouts 4 SiPM arrays. It is easy to change some arrays to H12700 MaPMTs.
- Development and production of special PCBs to connect SiPM arrays with DiRICH are planned until the end of the year.
- Development of the cooling system for FARICH prototype based on LAUDA is in progress.

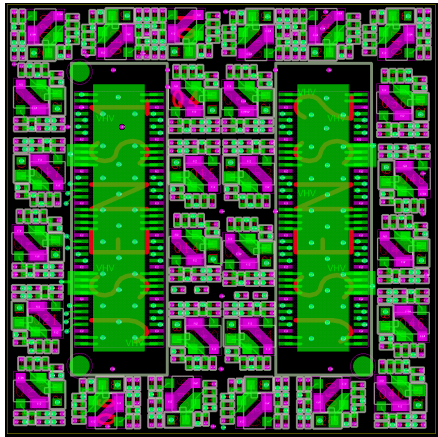
12 arrays + 3 DiRICH boards with PCB-connectors

# A3. Full-scale FARICH prototype

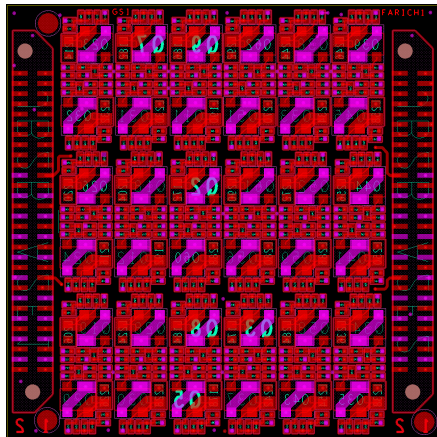


6x6 SiPM arrays, 2304 pixels 3x3 mm in total, readout electronics in 4 times compact than DiRICH boards (RICH-CBM, RICH-HADES and FRICH-PANDA) are required

## A3.1 Compact readout electronics FPGA-TDC



Top view (sensor side) of 14-layer amplifier circuitry for KETEK-SiPM 28x28 mm



Bottom view (FPGA-TDC side) of 14-layer amplifier circuitry for KETEK-SiPM 28x28 mm

Designed by M. TRaxler and H. Kayan (GSI)