

Czech Interest in EIC SC & IP6 Tracking

Czech Technical University in Prague,
Faculty of Nuclear Physics and Physical Engineering (FNSPE CTU)
&
Nuclear Physics Institute, Czech Academy of Sciences (NPI CAS)

Experiences from STAR, PHENIX, ATLAS and ALICE collaborations.

Possible contribution:

- Development and testing of detector simulations (Jaroslav Bielcik, Jana Bielcikova)
0.5 FTE postdoc will be hired from summer 2021 EIC → **WP1**
- Participation in detector R&D and hardware preparation (Lukas Tomasek et al.)
- Radiation hardness tests (Filip Krizek) → **WP3**

capads.fjfi.cvut.cz, contact email: Lukas.Tomasek@fjfi.cvut.cz

Detector R&D – CAPADS group @FNSPE CTU

Main focus of our detector group in general is mostly **R&D of silicon based detectors and related activities** (readout hw and sw, testing...)

We have designed strip and pixel silicon sensors and readout ASICs and also Monolithic Active Pixel Sensors (MAPS) for applications in dosimetry, imaging and tracking.

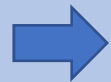
Our group collaborated for example on **CERN ATLAS Pixel** and Medipix projects.



Areas of interest of our group include these topics:

- R&D of silicon sensors, readout ASICs and Monolithic Active Pixel Sensors (MAPS) for use in high energy physics using ASIC design simulation tools and TCAD;

- Evaluation and testing of its performance in terms of detector response to high energy particles, radiation tolerance and electrical characteristics and quality assurance in general. For testing we have available an automatic probe station and at external facilities we are able to do radiation tests of developed detectors using Cobalt-60 source, reactor neutrons, 23 MeV proton and ion beams, and electrons up to 25 MeV.

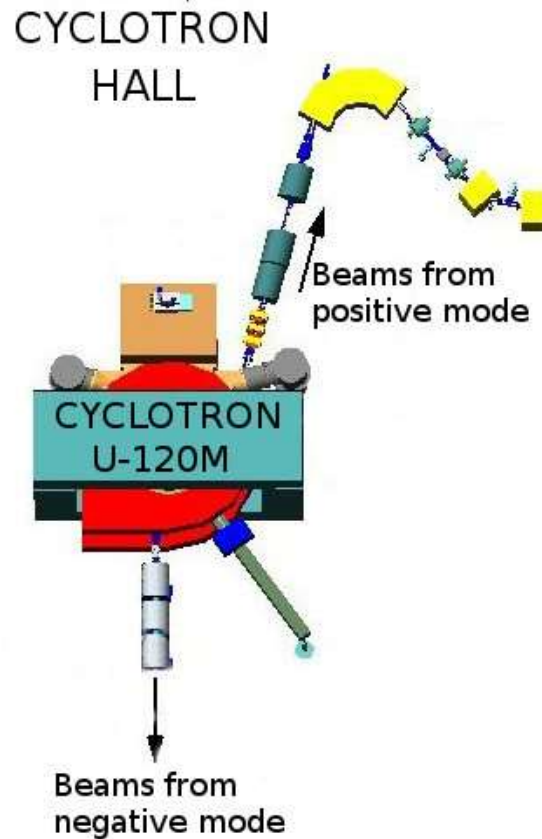


EICSC/ITS3-WP3: Pixel Chip Characterisation

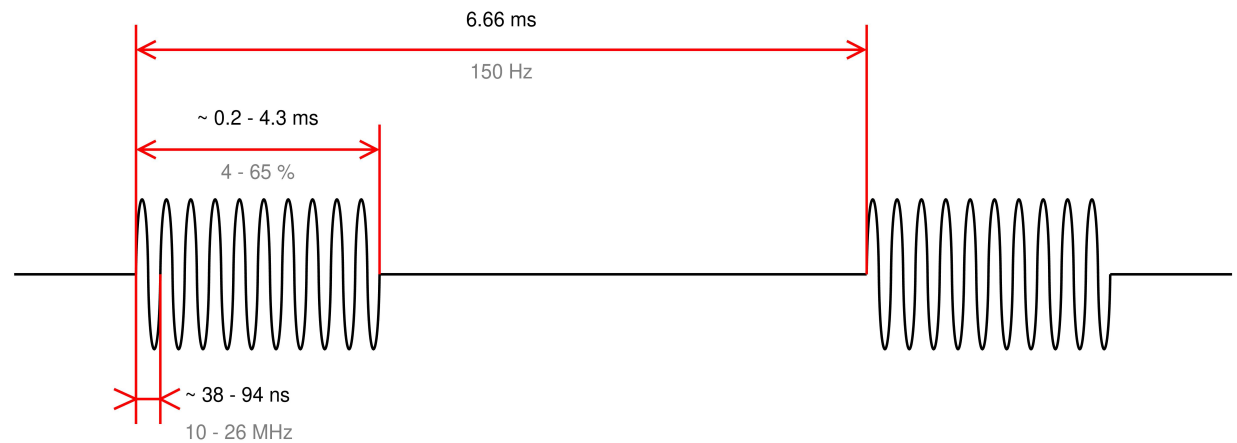
- In addition, we can work on the development of associated readout electronics, software and firmware and later to help with commissioning and operation.

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Tests of radiation hardness at the NPI cyclotron

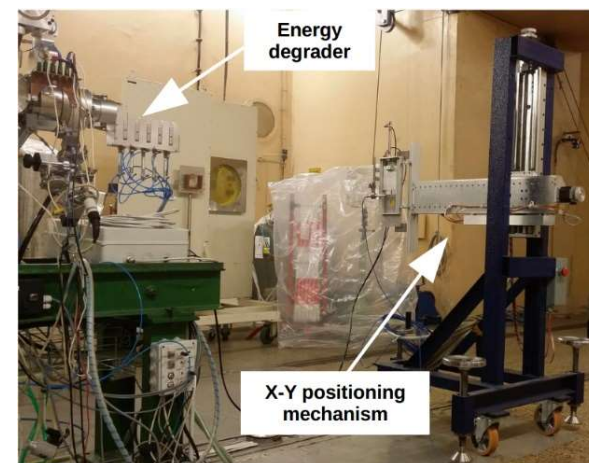
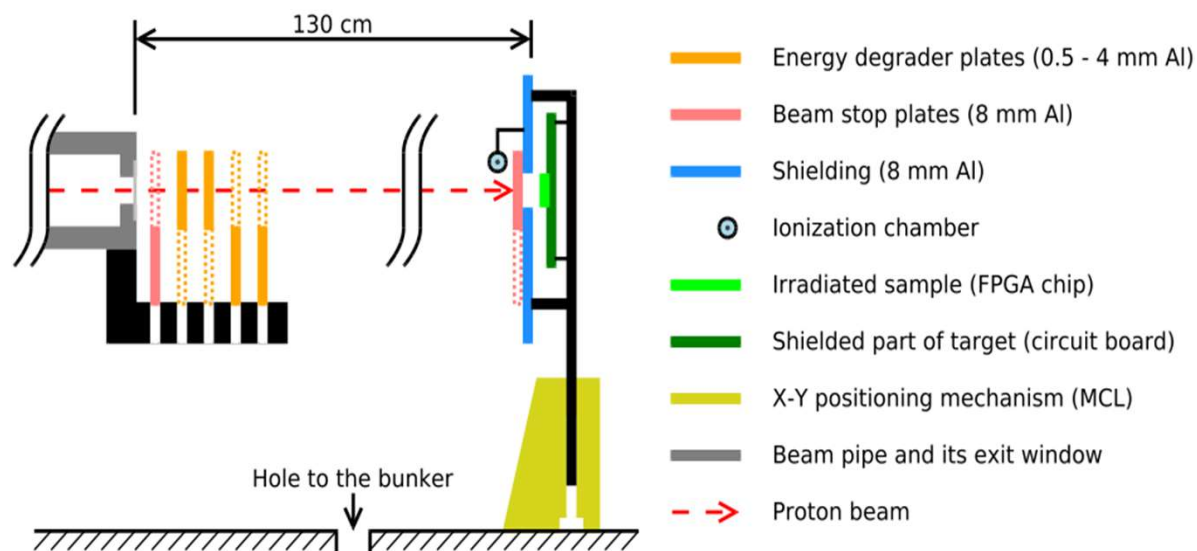


- 30 MeV protons
- Currents ~ 100 fA – 50 μ A
- Beam 2D Gaussian $\sigma_x = \sigma_y \sim 2$ cm
- Time structure 26 MHz modulated with 150 Hz macro-pulse
Duty cycle 4 - 65%



- Experimental setup is placed in the NPI's cyclotron hall

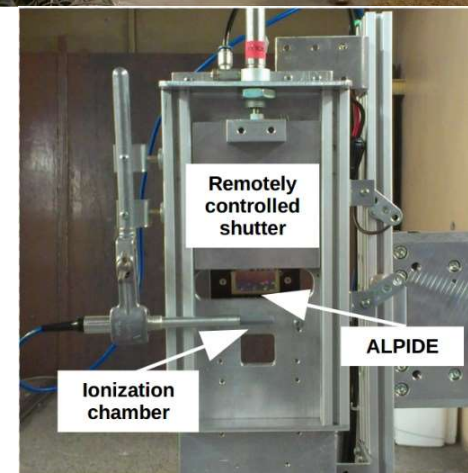
Setup for tests of radiation hardness



- Online measurement of total ionization dose (15% precision)
- Beam intensity monitored with an ionization chamber (linear up to 10^9 proton $\text{cm}^{-2} \text{s}^{-1}$)
- Remotely controlled system of beam stops and energy degrader plates (allows tuning parameters of the beam without irradiating tested sample)

F. Krizek et al., Irradiation setup at the U-120M cyclotron facility, NIM A 894 (2018) 87

Tests: [silicon sensors for ALICE@CERN](#), [FPGA](#), [electronics](#)



Summary

Our Czech group would like to participate in the EICSC activities, mainly the EICSC/ITS3-WP3 package: Pixel chip characterization. Especially laboratory, beam and radiation tests, possibly also the development of the hw and sw for the chip characterization, maybe also some simulations. We could also participate in test beams at other facilities like CERN etc. Later we can also be somehow involved in the other work packages, but WP3 seems to be the main activity of our group @EIC in the near future anyway.