Contribution ID: **99** Type: **Poster**

The superthin fixed target for the LHCb experiment in Run4

Fixed target studies at the LHC energies (SNN about 80-120 GeV) are considered as a powerful tool for exploring QCD phase diagram in a weakly known domain of densities and temperatures with variety of possible peculiarities in the EOS in entrance and exit channels in high energy heavy ions collisions. The LHCb Collaboration having implemented the SMOG2 gaseous setup with a unique feature of data taking in colliding and fixed target mode, simultaneously, plans to contribute here during Run3.
The future HL-LHC experiments in Run4 aim to take data at the essentially higher instantaneous luminosity of up to 10ˆ36 cmˆ(-2)/s. Focusing for that purpose the colliding beams in the interaction region to a spot of a few µmˆ2 implies rather strict requirements to a fixed target setup which stem out of the LHC beam intensity, stored energy and superconductive magnets quench criticality, long term integrity of radiation load on detectors, impact of vibrations on the interaction rate stability etc.
In this presentation we discuss the design of the fixed target setup based on the superthin solid targets being operated in a halo of the circulating beams. Details will be provided on the two-fold benefits of the Implementation of a fixed solid target mode.
From the physical point of view, it will extend tremendously the range of nuclei opening unexplored domain of studies on a role of ground state nuclei properties (Isospin, spin, parity, deformation, shells, neutron halo, etc.,). A-A collisions in fixed target mode generate conditions between those achieved at the SPS and those probed at RHIC. LHCb measurements in fixed target and in colliding beam mode will bridge the gap between the SPS and the LHC in a single experiment.
Another advantageous feature of a superthin fixed solid target mode stems out of its principle of construction and operation. Metal micro wire is moved in/out of the circulating beam halo to provide stable Interaction rate. The design of the experimental setup based on the 1-2 µm thick metal wires (KINR production) and MEMS (Micro Electronics Micromechanichal Systems) actuators for their movement at 3-5 sigma from the beam axis with a few nanometer step accuracy will be presented.
The results of Monte Carlo simulations are discussed for positioning of the target at the LHCb IP8 region (Z = 0 cm) as well as at the Z = - 50 cm inside the Vertex Locator (VeLo). One of the peculiarities is that instead of ˜ 30 cm long interaction region one gets really interaction point –1 µm long, only. This may lead to new ideas on how it could be explored for physics analysis (reduction of background, improvement of accuracy in vertex reconstruction, etc.). Steering of the target will be provided by the specialized system RMS-R4 operating its radiation hard metal-foil detectors for monitoring of the LHCb instantaneous luminosity.

Primary authors: CHERNYSHENKO, Serhii (National Academy of Sciences of Ukraine (UA)); PUGATCH, Valery (Institute for Nuclear Research NAS); DOBISHUK, Vasyl (National Academy of Sciences of Ukraine (UA))

Presenter: CHERNYSHENKO, Serhii (National Academy of Sciences of Ukraine (UA))

Session Classification: Poster Session