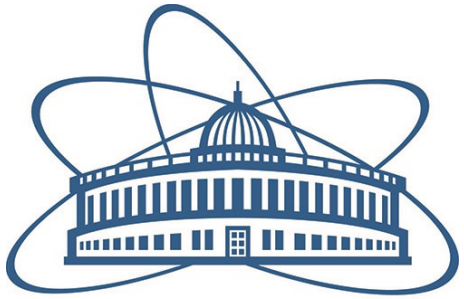
Russian Particle Accelerators Conference RuPAC'23

ByPass NICA for QFS



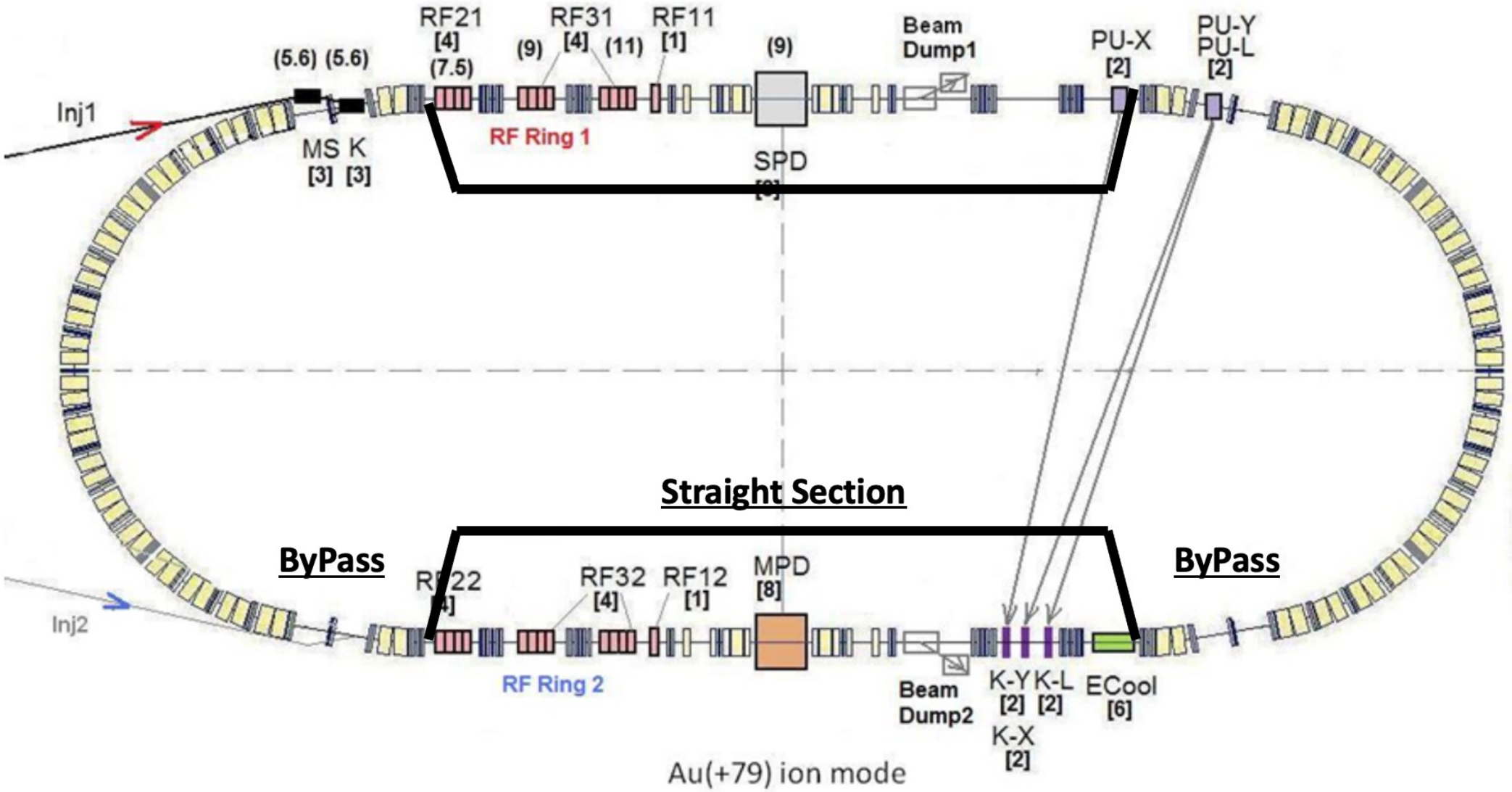
Reasons of modernization

There are two main reasons for magneto-optical structure modernization.

Firstly, space lack for Wien Filters in already existing straight sections. Secondly, the available magneto-optics assumes NICA ring in the collider mode. But EDM search experiments involve long-term retention and preservation of polarized coherent beam at a time about $T_{SC} \sim 1000$ sec.

Therefore, proposed the modernization by introduction of ByPass channels to create an alternative straight section, parallel to the original one. Thus, NICA can be used as a Storage Ring. Such rings can carry out EDM search experiments with polarized deuterons at QFS regime.

General NICA ByPass Concept



Particle & Energy

Energy defined by polarimetry needs:

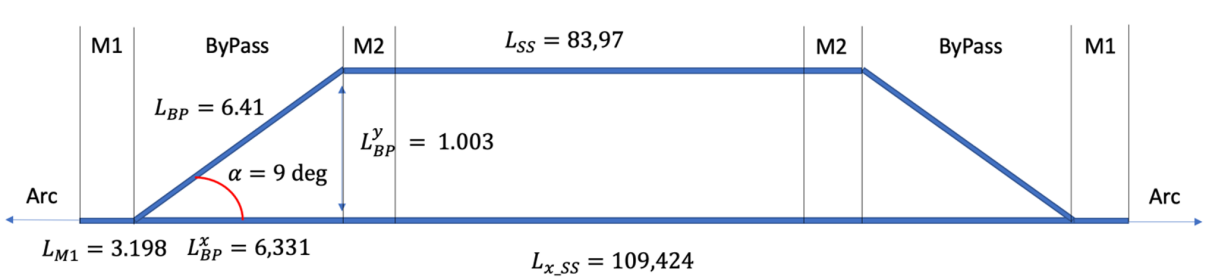
The largest scattering cross-section on carbon target polarimeter at 270 MeV.

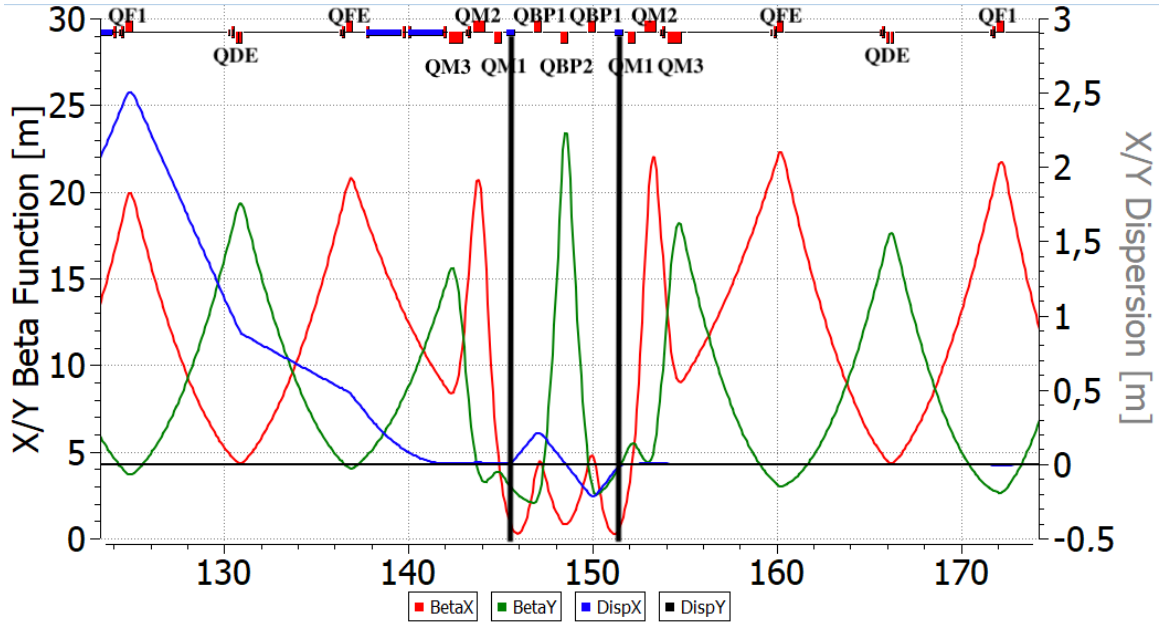
Particle defined:

At QFS method spin oscillates in the magnetic arc around the direction of the pulse within $\pi \cdot \gamma G/2$.
For a deuteron magnetic moment anomaly G_d = -0.1429, for the proton G_p = 1.7928.
For deuterons takes a value of the order $\pi \cdot \gamma G_d/2 \sim 0.25$.
For protons is too large $\pi \cdot \gamma G_d/2 > 1$.

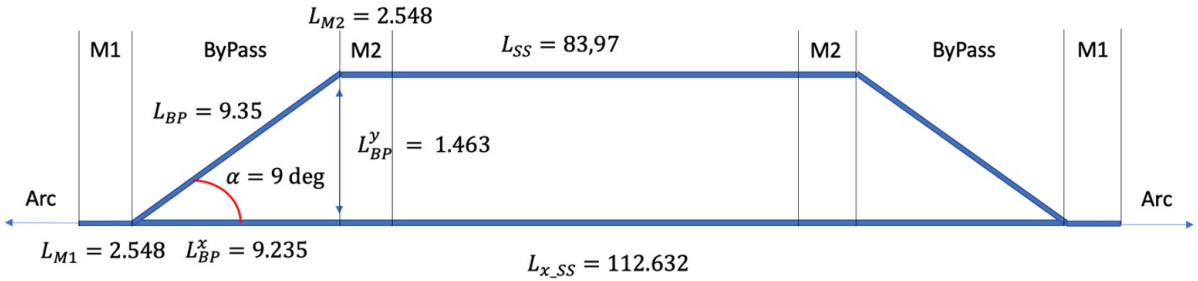
Possible ByPass Optics

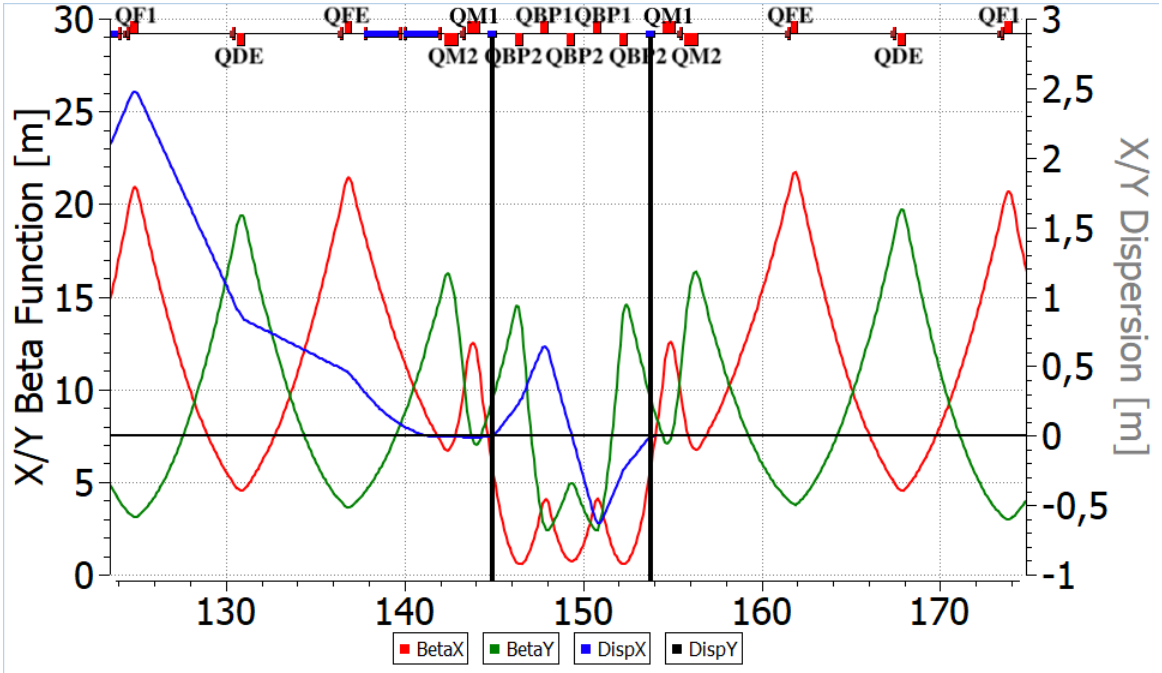
3 Quadrupoles





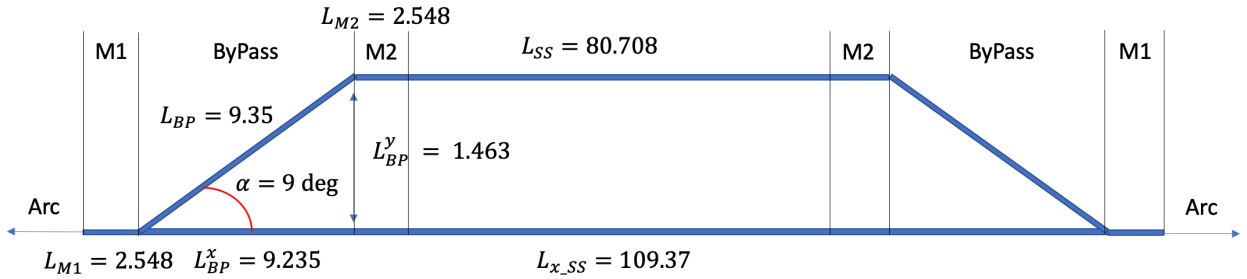
5 Quadrupoles

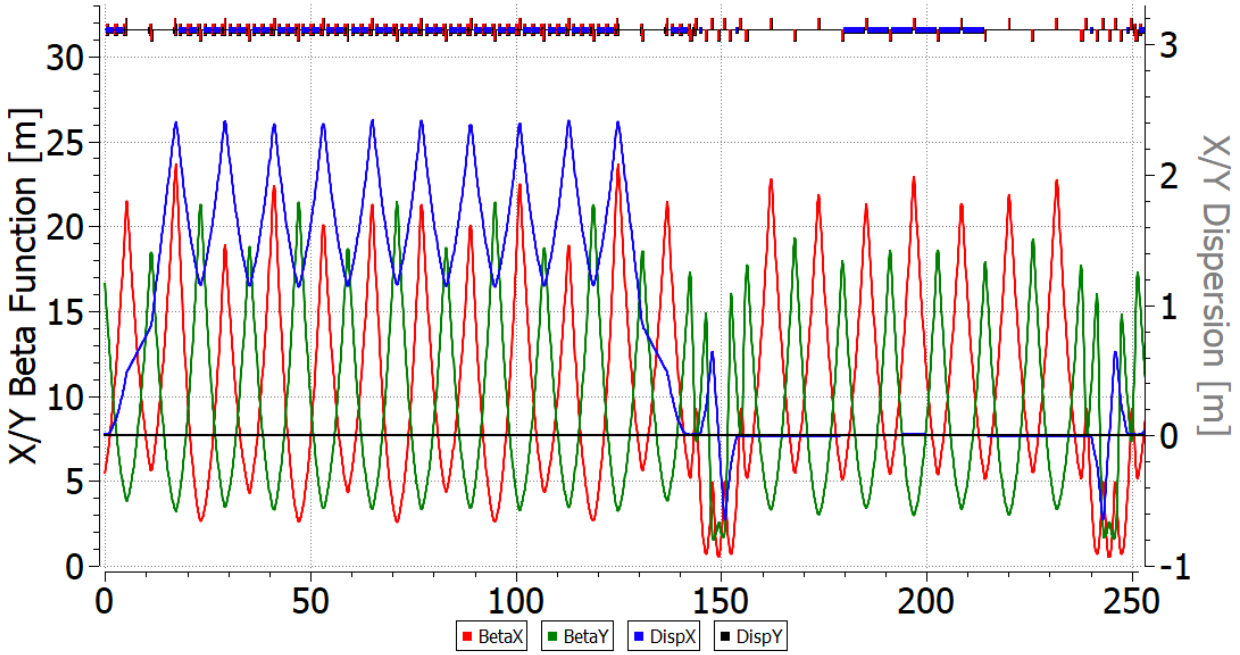




Fully adopted Twiss-functions with Wien Filters

Straight Section is Fully Regular





Straight Section Wien Filters restore spin rotation in Arc