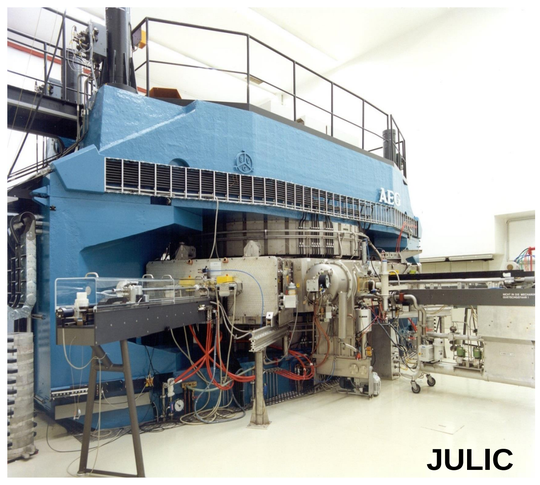
Recent Extensions of JULIC for HBS investigations

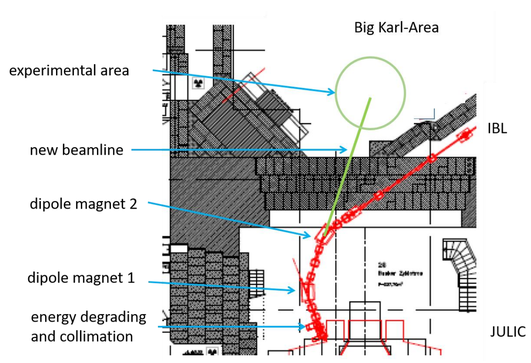
IKP at Forschungszentrum Jülich

At the Forschungszentrum Jülich (FZJ) the energy variable cyclotron JULIC is used as injector of the Cooler Synchrotron (COSY) and for irradiations of different types. Recently a new target station inside Big Karl Experimental area close to the cyclotron bunker was build. It offers space for complex detector and component setups for nuclear and neutron related experiments. It is mainly used for tests of new target materials, neutron target development and neutron yield investigations.

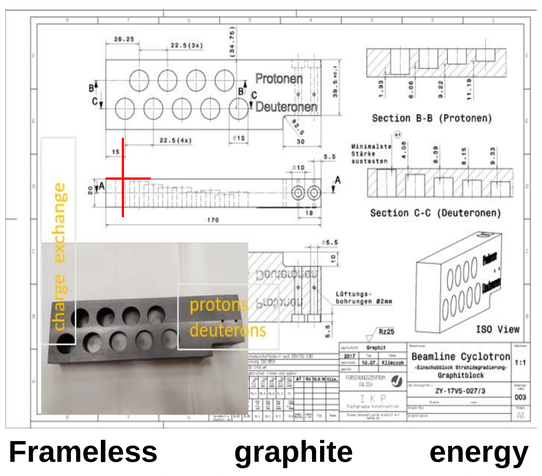


Routinely 45 MeV H^- and 75 MeV D^-

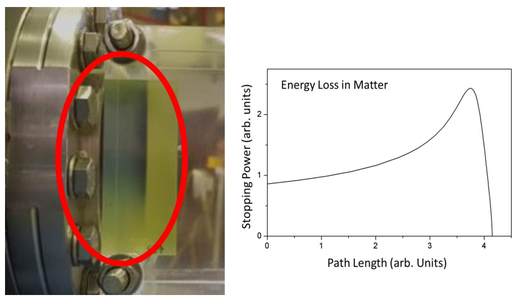
- Pole diameter 3.3 m / 700 t iron
- 20 – 30 MHz (h=3)
- 22.5 – 45 MeV/A
- $<B>_{max}$ = 1.35 T, B_{hill} = 1.97 T
- 2 – 4.5 keV/A injection
- 3 ion sources
  - 2 multicusp
  - pol CBS
- Pre-accelerator of COSY



Position of energy degrader and dipole magnet to obtain optimal experimental conditions in Big Karl area with reduced neutron background.

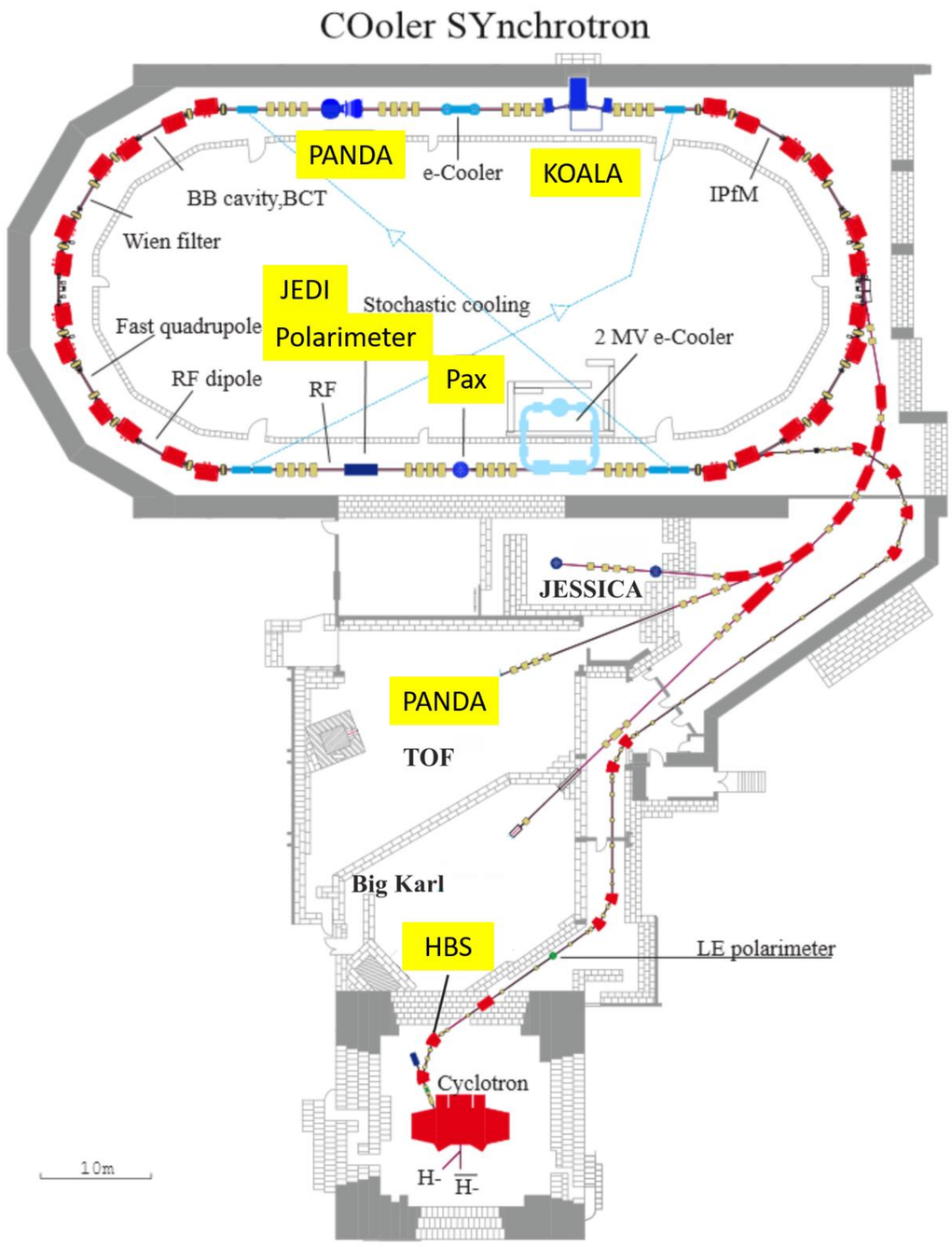


Frameless graphite energy degrader for fixed energies of 10, 20, 30 and 40 MeV for protons and deuterons.

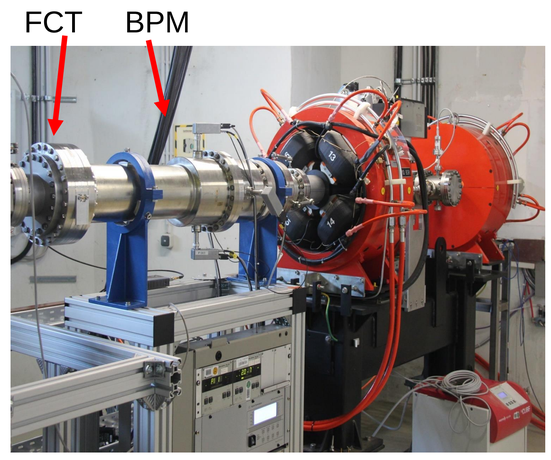


Measurement of the penetrating depth into PMMA using gaf-chromic® films and comparison with SRIM-calculation to validate the proton energy.

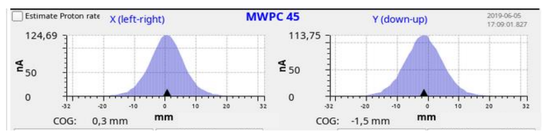
COSY facility



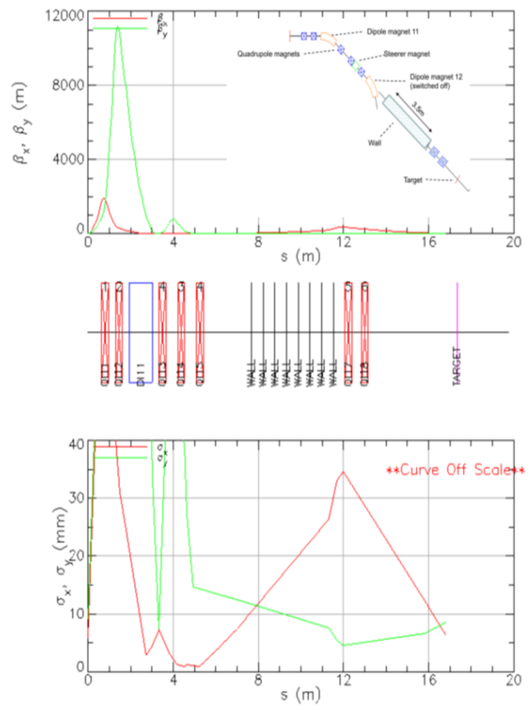
- COoler SYnchrotron, 3.7 GeV/c
- Polarized protons and deuterons
- Beam cooling
  - electron cooling
  - stochastic cooling
- Development and Test of FAIR related components
  - accelerator components (BB Cavity, BCT, IPfM…)
  - detectors and modules (PANDA, KOALA, CBM…)



Beamline with Quadrupoles, Beam Position Monitoring System (BPM) and Fast Current Transformer (FCT) in Big Karl area.

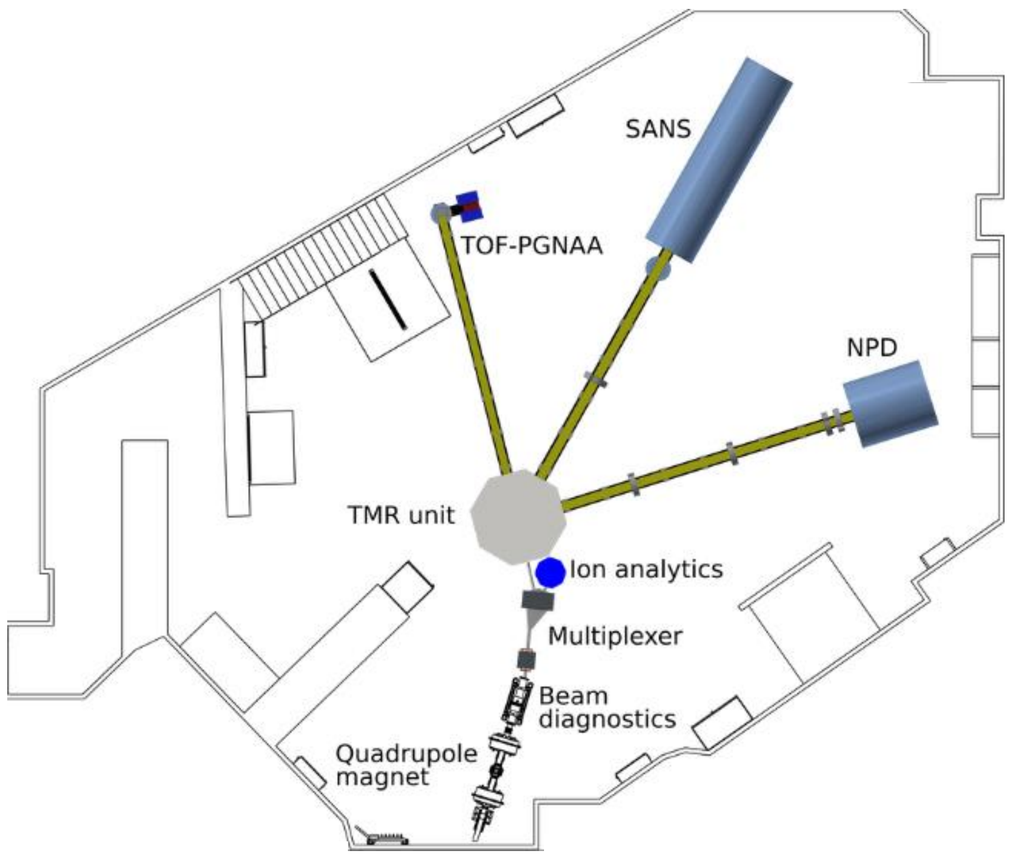


Beam profile taken with MWPC. The beam size regarding the experimental needs is ~15 mm FWHM.

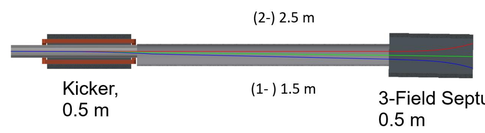


Beam Transport calculation results for optimized ß-functions and beam size.

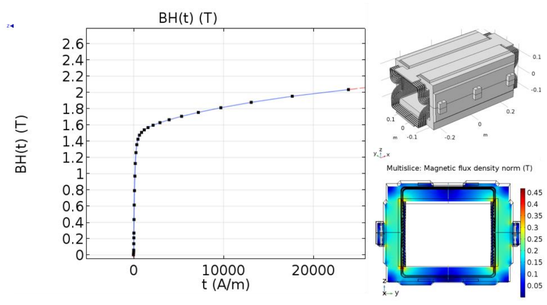
Outlook - HBS JULIC Neutron Platform



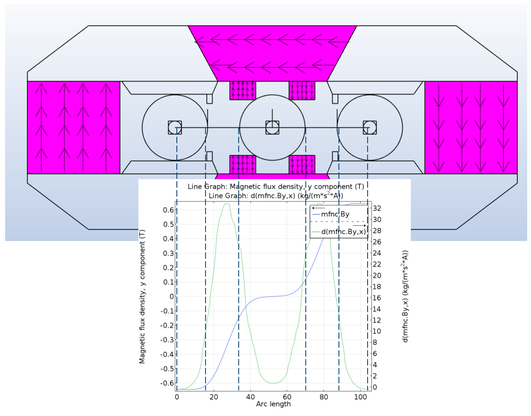
- Development, testing and operation of components of pulsed accelerator based neutron sources
  - targetry and neutron provision,
  - moderator development and optimization of the TMR unit.
- Test of Proton beam transport devices
  - beam control and dynamics,
  - beam multiplexing or beam dump systems
- Design, construction and operation of versatile neutron instruments
  - for neutron scattering purposes,
  - neutron analytics



Multiplexer System



Kicker



Septa Magnet

Multiplexer system with fast kicker deflecting the beam up to 40° into a dedicated septa magnet to separate the beam to three target stations .

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