ACTIVITIES FOR ISOTOPE SAMPLE PRODUCTION AND RADIATION EFFECT TESTS AT JULIC/COSY JÜLICH

JÜLICH FORSCHUNGSZENTRUM

IKP at Forschungszentrum Jülich

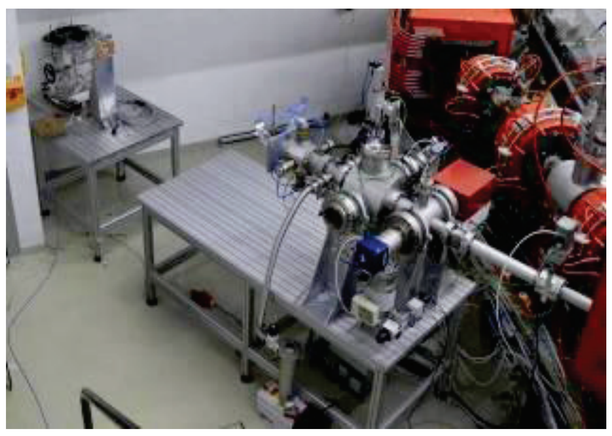
At the Forschungszentrum Jülich (FZJ) the intermediate energy cyclotron JULIC, used as injector of the Cooler Synchrotron (COSY), and COSY itself, over the last years, have been enabled to perform low to medium current irradiations.

Main task is to support the FZJ radionuclide research programme of INM-5, by developing, adapting and optimizing the irradiation facilities. The INM-5 target holders were implemented via an adapter section to the external target station of JULIC to obtain reliable irradiations with 45 MeV protons and 76 MeV deuterons, both for nuclear reaction cross section measurements and medical radionuclide production.

For testing of radiation effects, single event effects (SEE) and displacement damage (DD) with energetic protons for electronics used in space or accelerators the beam can be extracted to a dedicated test stand, e.g. used by Fraunhofer INT.

To provide these possibilities at higher energies up to 2.5 GeV as well one external beamline of the cooler synchrotron COSY is going to be equipped with a new irradiation vacuum chamber to separate the irradiation zone from the COSY-vacuum system and adaption for the dosimetry systems are done. Different dosimetry systems (PTW® Farmer ionization chambers, PTW® Bragg Peak chambers, Gafchromic® Dose sensitive foils) are available to monitor and control the ongoing irradiation.

Test setup for Radiation effects tests and the “irradiation chamber” (INM-5) in the Big Karl area .



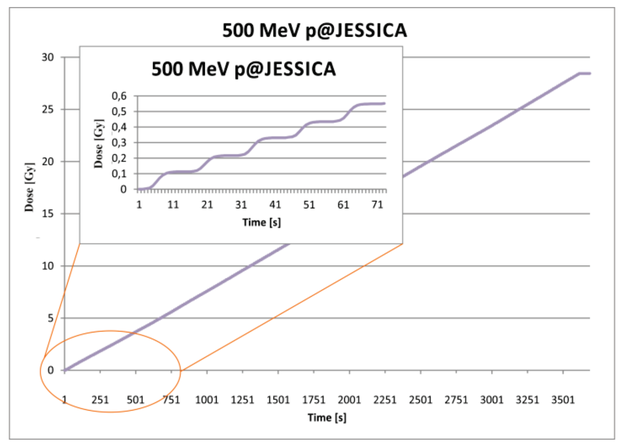
Dedicated Radiation effects test facility at an external beam line of the JULIC

Fraunhofer

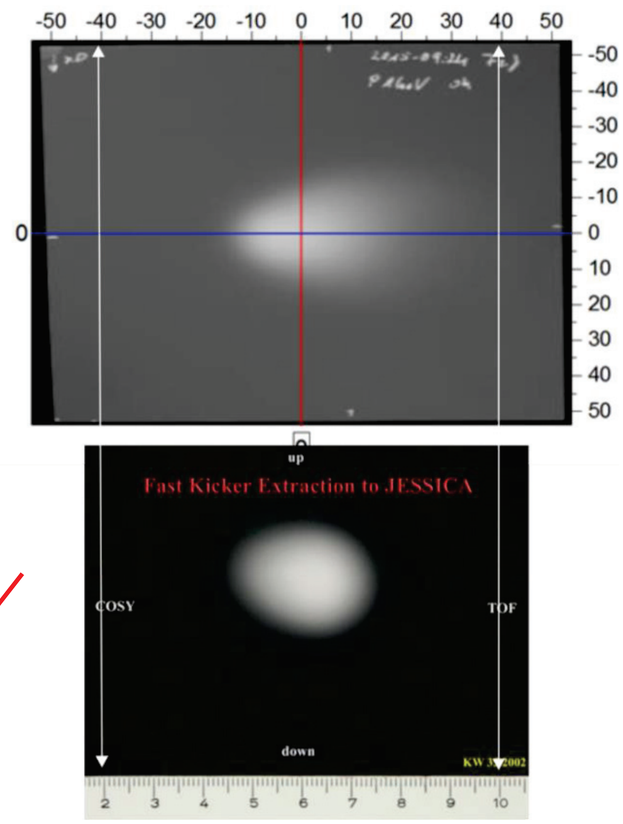
COSY facility with internal and external experiments

COSY facility

- COoler SYnchrotron, 3.7 GeV/c
- usage as a test facility for accelerator research and detector development for realisation of the Facility for Antiproton and Ion Research (FAIR)
- irradiation and nuclide production for fundamental research purposes
- testing of radiation effects, displacement damage (DD) and single event effects (SEE), with energetic protons and deuterons for electronics used in space and accelerators
- experiments on the road map of the Helmholtz Association and international collaborations

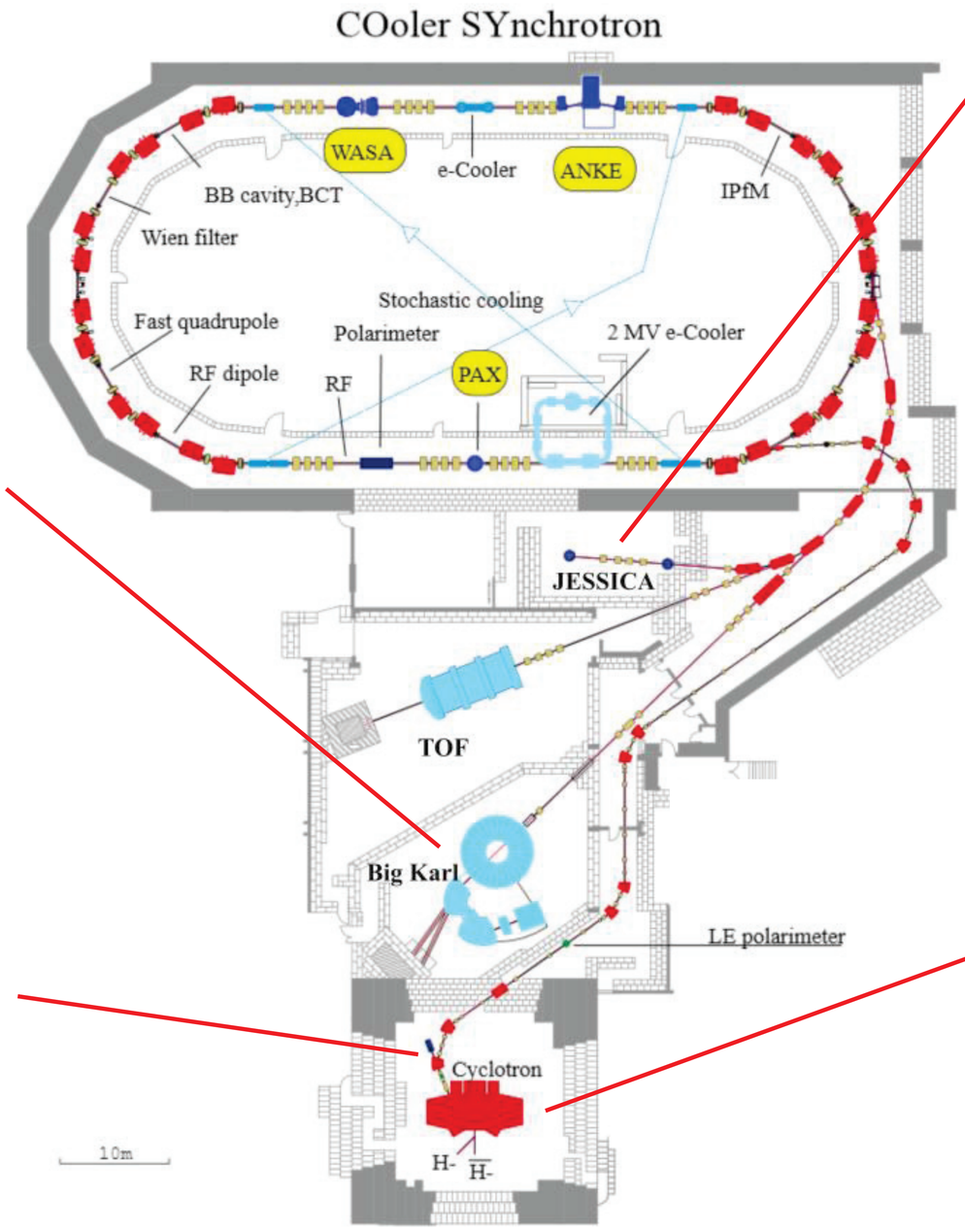


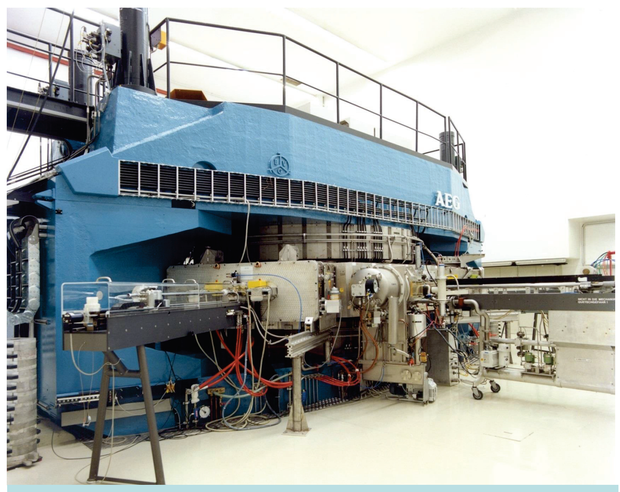
COSY operation - very reproducible and reliable with ~7000 h/year



BEAM spots at JESSICA target place;
Two different extraction schemes:

- Slow Extraction with variable beam currents of 10^{10} p/s down to 10^{4} p/s (2015)
- Fast Kicker Extraction 10^{9}p within 200 ns (2002)

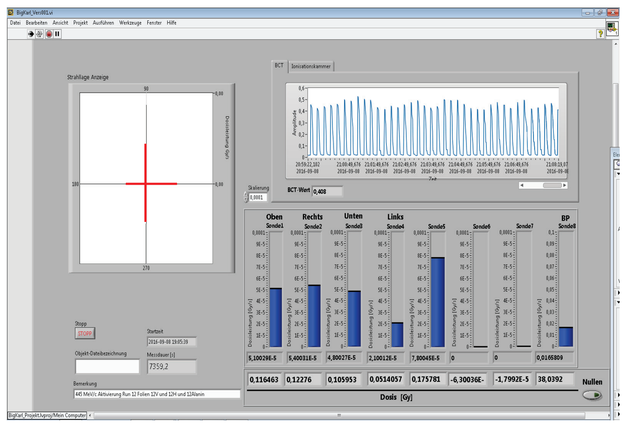




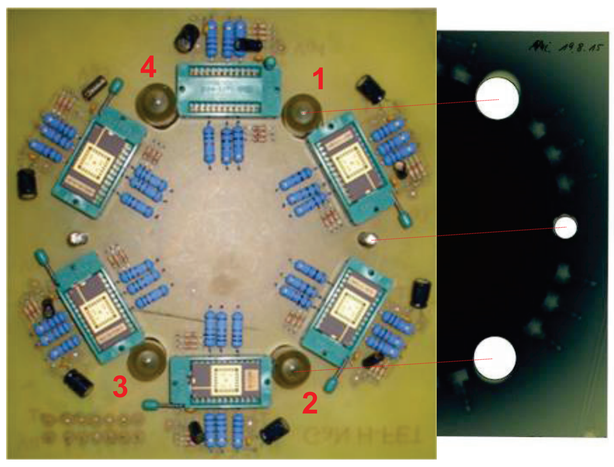
Cyclotron JULIC

routinely 45 MeV H^- and 75 MeV D^- for COSY

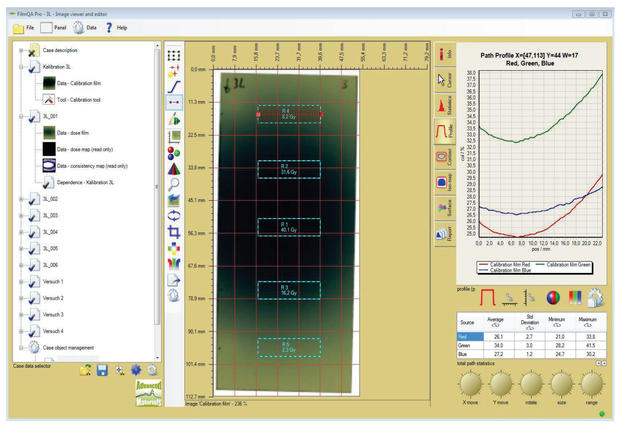
- pre-accelerator of COSY
- irradiation and nuclide production
- [H.-P. May, THP04, this conference]



Beam preparation and control GUI



Irradiation station with el. dosimeters and background film dosimeter



Film Analysis GUI

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