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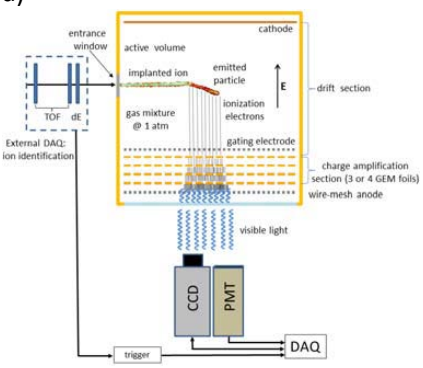
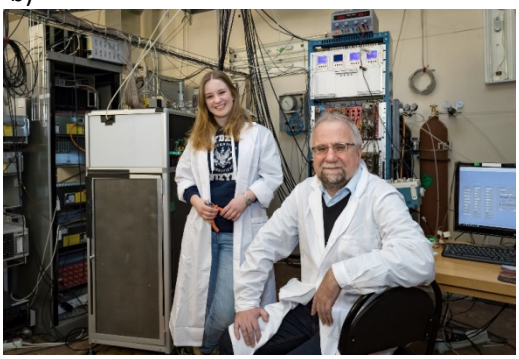
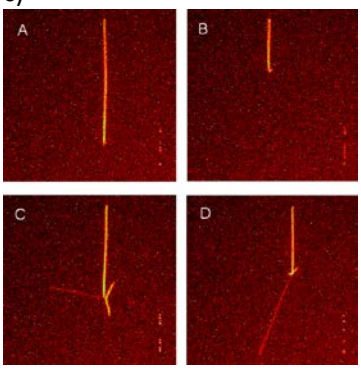
Topical plan for JINR research and international cooperation, Nuclear Physics (03), Theme (03-5-1130-2017/2021): Synthesis and Properties of Nuclei at the Stability Limits.
Project: β-delayed charged particle spectroscopy by the OTPC technique and practical training with gas systems for gaseous detectors. Project is addressed to 2 students.

Project description:
1. Introduction of the principle of operation and the design of the in-flight separators: ACCULINNA and ACCULINNA-2 separator. Getting familiar with detectors and introduction to the techniques used in experimental nuclear physics at ACCULINNA.
2. Introduction of the principle of operation of charged particle detection technique – to the OTPC (Optical Time Projection Chamber) and the 'mini OTPC' detector system for studies of light emission from gas mixtures used in the OTPC.
3. Practical work with vacuum systems, gas mixing systems and with residual gas analyzer (RGA) for gaseous mixture contents analysis.

The main goal of the practice is to get familiar with novel technique of charged particle detection – the principle of operation of the OTPC spectrometer. In the period of summer training students will get introduction to the main studies at the FLNR and to the main area of studies at the ACCULINNA separator, with principle of operation of the separator. The new ACCULINNA-2 separator will be introduced. Students will get basic knowledge about novel technique of charged particle detection and principle of operation of the OTPC spectrometer.
Students will work with the 'mini OTPC' detector system designed for studies of the light emission from gas mixtures used in the OTPC spectrometer. Construction of vacuum systems, work with gas mixing and mas flow control devices is planned. Moreover students will learn basic principle of operation of gas contents analysis device - Residual Gas Analyzer (RGA) and will perform measurement of gaseous mixture contents.
Additionally during the summer training a series of excursions to the main experimental facilities at FLNR will be organized (microtron MT-25, cyclotron IC-100 and U400M).

a)


b)


c)


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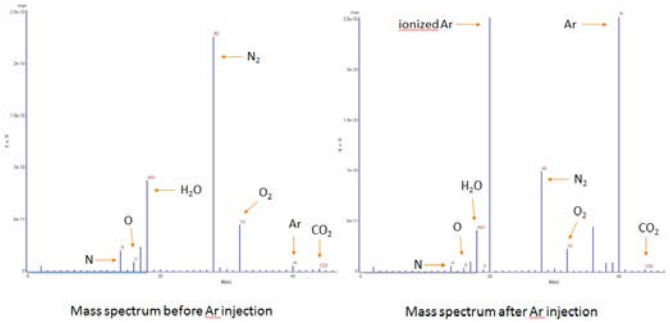

a) The scheme of the OTPC operation b) The OTPC installed at the ACCULINNA beam line c) example picture of decay of ^{9}C [A. Giska, Bachelor thesis, UW, 2018] d) students at work – construction of a vacuum stand e) preparation of RGA system for gas mixture contents analysis f) example spectra of the gas mixture contents measured with RGA.

Requirements:
The projects is related to students and PhD students interested in nuclear physics, experimental physics and particle detection techniques. Basics knowledge in nuclear physics.

Useful links:
http://fls2.jinr.ru/flnr/index.html
http://aculina.jinr.ru/
http://lise.nscl.msu.edu/lise.html
http://indico.cern.ch/event/3062/contribution/135/material/poster/0.pdf
http://www.fuw.edu.pl/~pfutzner/Research/2pDecay/Talks/MPF_ISOLDE_L1.pdf