Report on the concluding project “Isotope- identifying neutron reflectometry at the IBR-2 facility”

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Aim of project is development of neutron reflectometry. The project was directed on creating of equipment which allows to conduct the measurements of spatial profiles of isotopes, magnetic elements and inhomogeneouts. Correspondently to these possibilities additionally to channel of mirror neutron reflection at spectrometer REMUR were created the channels of registration of scattered neutrons, spin flipped neutrons, charge particles and gamma-quantum.

I. Next equipment is manufactured:

1. Channels of registration of scattered and spin flipped neutrons (channels 2 and 3) which include:

1) Position-sensitive detector 22cm×22cm

2) Analyzer of neutron polarization 20cm×20cm

3) Electromagnet with rotation device

2. Channel of registration of charge particles (channel 4), which includes

1) big ionization chamber

2) small ionization chamber for magnetic measurements

3) crate with apparature of amplifying and formation of signal

3. Channel №5 of registration of gamma-quants which includes:

1) Germanium neutron detector with correspondent electronics

2) protection from radiation and tables for equipment

3) neutron collimator

II. Testing of channels have been fulfilled on neutron beam

1. Developed and manufactured the test structures with 5 nm thickness layers of ^{6}LiF, FeCo and Gd.

2. In charge particle channel:

1) sensitivity 1 nm is achieved in definition of spatial position of 5 nm layer, in which atom nuclei have interaction cross-section σ_{min}= 1 barn

2) spatial resolution δz=5 nm is achieved

3) is showed that in future can be achieved σ_{min}=0.07 barn(tens isotopes for investigations) and δz=0.5 nm

3. The gamma-quant channel will be tested at autumn 2018.

So the project is performed practically. Further task consists in implementation of method for decision of physical tasks. Suitable task for example is investigation of proximity phenomena in ferromagnet-superconducting layered structures.