**Development of polarized neutron reflectometry**

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**Abstract**

Polarized neutron reflectometry is useful method for investigation of low-dimensional heterostructures. This method can give such parameters of the structure as: magnetic and nuclear profile to the depth of the structure and size of inhomogeneites in range 1 nm -100 μm. But method has some disadvantages. The project is about development of the method.

**Tasks**

1. Polarized neutron reflectometry with secondary radiation registration (calculations)

2. Polarized neutron reflectometry in oscillating magnetic field (calculations)

3. Neutron spin-echo in grazing incidence mode (calculations)

**Preliminary schedule by topics/tasks**

The duration of this project is 6 weeks.

Week 1 – introduction lecture, reading the articles

Week 2 – lecture with task explanation

Week 3, 4 - task completion

Week 5, 6 – preparing of the report

**Required skills**

1. Neutron physics: basic knowledge of polarized neutron reflectometry

2. Condensed matter physics: basic knowledge of magnetism / superconductivity

3. Computer skills: Matlab

**Acquired skills and experience**

1. Skills at polarized neutron reflectometry (PNR)

2. Understanding of possible directions of PNR development: isotope-identifying neutron reflectometry, etc.

3. Experience at data processing and fitting of data with physical model.

4. Understanding the problems of coexistence superconductivity / ferromagnetism at low-dimensional heterostructures

**Recommended literature**

1. V.D. Zhaketov et al. // arXiv:2101.09859.

2. S.V. Kozhevnikov et al. // J. Phys.: Conf. Ser. 340 012084 (2012).

3. Yu.V. Nikitenko. // J. Synch. Investig. 10, 169–176 (2016).

4. V.L. Aksenov et al. // JINR Communications D13-2004-47 (2004).

5. Yu N Khaydukov et al. // Physical Review B, Vol. 99, No. 14, pp. 140503, 2019.