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New INS spectrometer at FLNP JINR

The state of research of the condensed matter dynamics using the inelastic neutron scattering (INS) technique at FLNP was a matter of concern for both the user community and laboratory management, and was the subject of intensive discussions on the further development of this research area at FLNP. As a result of the discussions, it became clear that the current INS spectrometer NERA, which once competed with similar instruments in European neutron centres, has become significantly outdated and no longer meets the requirements of the user community in the Eastern European region. Therefore, it is extremely important to significantly upgrade the suit of INS instruments and support the preservation of the world-leading scientific position of FLNP JINR in the field of INS spectroscopy.

In order to regain competitiveness in the field of neutron spectroscopy, it is necessary to create new INS spectrometers that will use modern neutron optics and new design solutions to obtain high resolution in combination with a good signal-to-background ratio over a wide range of energy transfer that permits using small samples (˜a few mg). The first planned instrument will be a universal spectrometer in inverse geometry - the BJN spectrometer (Bajorek-Janik-Natkaniec). The high luminosity of the IBR-2 source, in combination with modern focusing neutron optics, and a very large surface area (˜3.3 m2) of energy analysers will ensure the maximum possible luminosity of the spectrometer under development. Monte Carlo simulations have been performed using the MacStas software package in order to optimize the geometry of spectrometer and especially the geometry of energy analyser system (cooled beryllium filters + HOPG).

INS is a technique that is ideally suited to study hydrogen-containing materials due to the high cross section of hydrogen. The instrument promises the applicability to a wide manifold of scientific research activities: functional materials, energy storage materials, hydrogen bonds in molecular matter (vibrational analysis), dynamics studies of pharmaceutics and new biologically active compounds or photonic materials of industrial applications.

In summary a broad project overview with conceptual engineering design and development highlights will be presented.

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