



Contribution ID: 361

Type: **Talk**

Upgrade Project of TOF spectrometer NEAT at Helmholtz Zentrum Berlin –new power for new science

Tuesday, 18 September 2018 14:15 (15 minutes)

Neutron TOF spectrometer NEAT has a successful history of applications to the study of dynamics in the large time and length scale domains 0.01 –100 ps and 0.05 - 5 nm, respectively, since the start of user operation in 1995. To address user community needs in more powerful instrumental capabilities, a concept of the full instrument upgrade has been developed and proposed. The upgrade started in 2010 as a HGF large scale project and the new instrument renew its user operation in January 2017. Thanks to the advanced design the upgrade resulted in 300 fold higher count rate compare to NEAT'1995 and in the instrument performance similar to the world leader IN5 at ILL, France despite an order of magnitude difference in the cold neutron flux. The features of the new instrument include novel integrated guide-chopper system, which delivers neutrons with flexible beam properties: either highly homogeneous beam with low divergence for single crystals studies or “hot-spot” neutrons suitable for small samples. Substantial increase of the detector angle coverage was achieved by using 416 ³He position sensitive detectors placed at 3 m from the sample and equipped by modern electronics using event recording data collection. The accessible wavelength range has been broadened into the thermal wavelength domain making NEAT a bispectral spectrometer and providing better conditions for low temperature studies. Non-magnetic instrument environment allows for studies with high magnetic fields up to 14 T and polarization applications. High count rate enables to reduce the mass of the sample from gm to mg. The upgrade makes NEAT'2016 one of the most advanced instrument worldwide and provides an outstanding experimental tool for broad range of research areas at BER II.

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Session Classification: Parallel session 1

Track Classification: P1 Instrumentation and methods