

Experimental measurement of neutronic performance at neutron beam line in CSNS

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1. Introduction of CSNS and three beam lines

China Spallation Neutron Source (CSNS) passed the national acceptance on August 23, 2018, and was officially open to worldwide users in various disciplines. The neutronic performance measurements are crucial for commission and operation to demonstrate that target station are working properly to produce neutron at a satisfactory level, it's also be helpful to validate the MC simulation. Three neutron beam lines of target station, BL06, BL09 and BL20, have been constructed in the spectrometers room at CSNS. A primal mission of three beam lines is to study neutronic performance of CSNS.

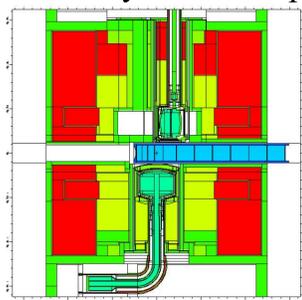


Fig.1 Target-Moderator-Reflector

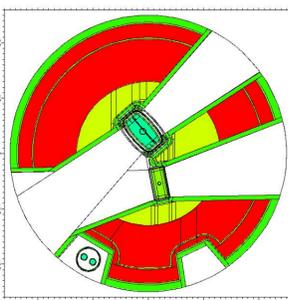


Fig.2 DPHM and DWM

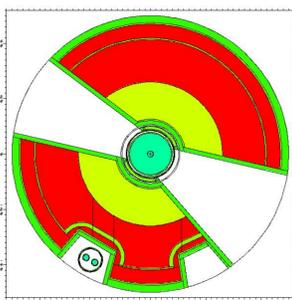


Fig.3 CHM



Fig.4 The neutron beam line BL06 and BL09

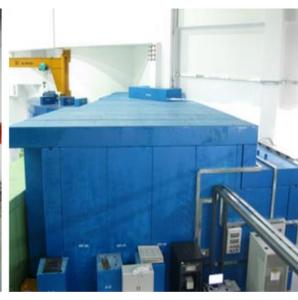


Fig.5 The neutron beam line BL20

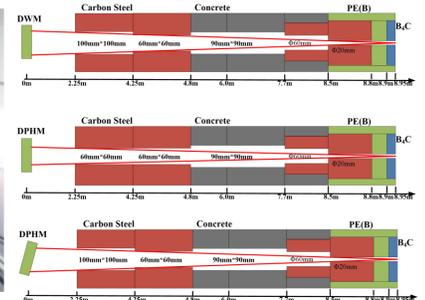


Fig.6 The neutron optical path diagram of three neutron beam lines

2. The neutron wavelength spectrum

The Current mode Time Of Flight (CTOF) is chosen to measure the neutron wavelength spectrum during commission, this can be helpful to reduce the activity of target station components during commission due to the high detection efficiency. The experimental measurements agree well with the simulation results.

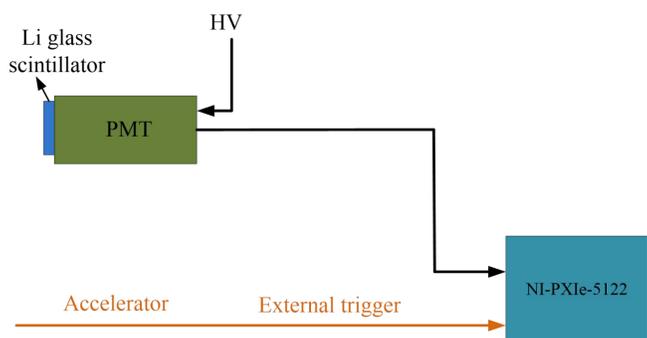


Fig.7 Current mode Time Of Flight

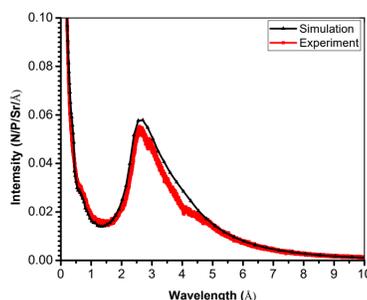


Fig.8 The wavelength spectrum of BL01

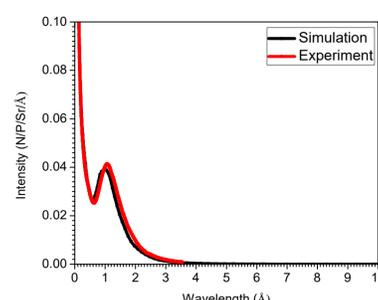


Fig.9 The wavelength spectrum of BL06

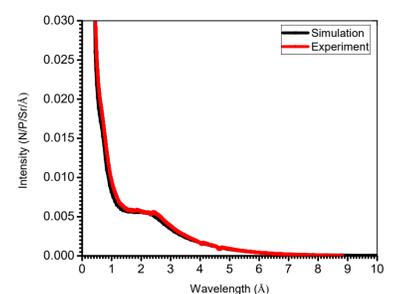


Fig.10 The wavelength spectrum of BL20

3. The neutron pulse shape

The temporal characteristics of neutron pulse emitted from moderators of CSNS target station are important neutronics parameters and critical factor related to the resolution of neutron instruments, which employed the time of flight (TOF) technique. A crystal monochromator and detector arrangement as show in figure 11 is chosen to measure the pulse shape of serials neutrons which energy fulfill the Bragg law.

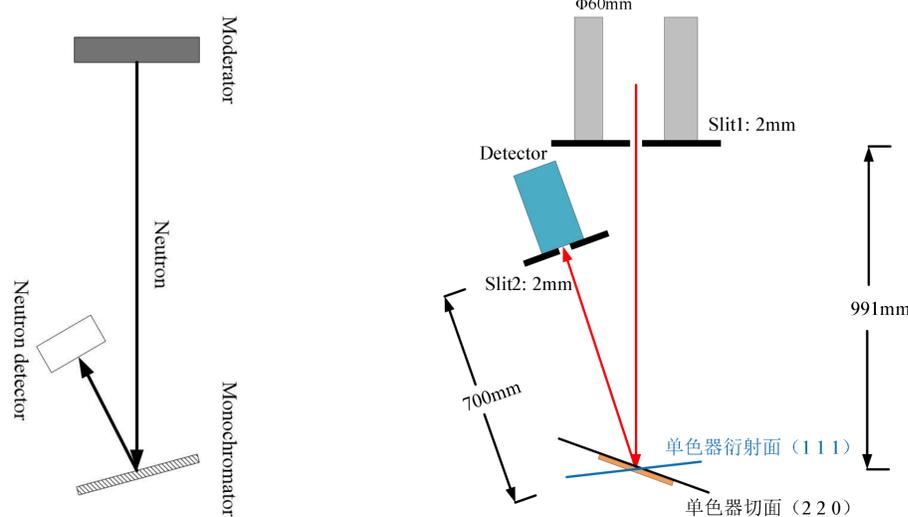


Fig.11 The schematic view of experimental arrangement for pulse shape measurement

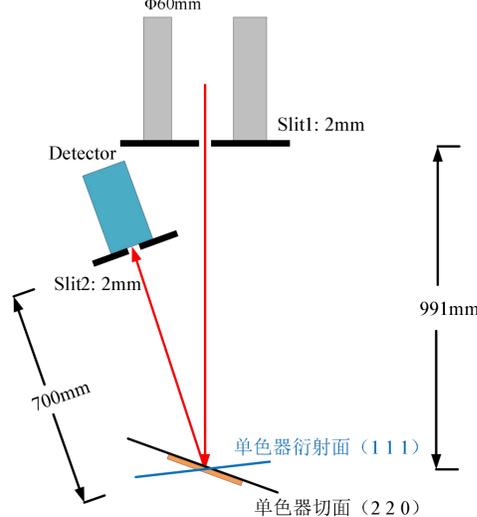


Fig.12 The experimental arrangement of BL09 for pulse shape measurement

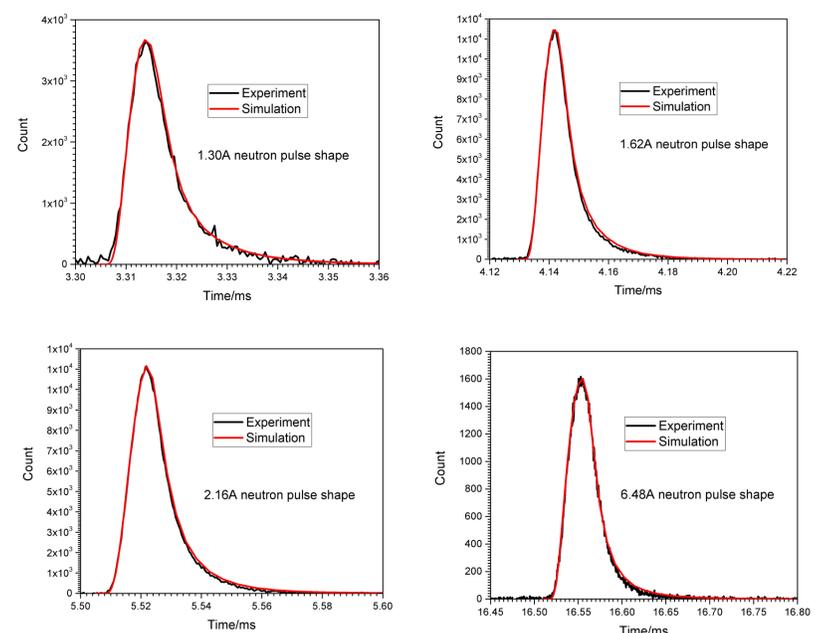


Fig.13 The comparison of experimental results and simulation results of BL09