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Neutronics performance measurement of CSNS moderators

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The China Spallation Neutron Source (CSNS) is an accelerator based multidiscipline user facility constructed in Dongguan, Guangdong, China. The CSNS consists of a linear accelerator, a rapid cycling proton synchrotron accelerating the beam to 1.6 GeV energy, a solid tungsten target station, and three instruments in phase one for neutron scattering applications [1]. The facility operates at 25 Hz repetition rate with an initial design beam power of 100 kW and is upgradeable to 500 kW. The first neutron of CSNS was produced on 28th August 2017 after the construction of facility started on Oct. 2011 [2]. CSNS ramped the beam power to 50kW and consistently achieved an availability of more than 90%. The neutronic performance of the source (and moderators) provides evidence of strong coupling between the target and the moderators [3].

The neutron wavelength spectra ($>0.286\text{\AA}$) of three moderators, 20K Coupled Hydrogen Moderator(CHM), 20K Decoupled and Poisoned Hydrogen Moderator(DPHM) and room temperature Decoupled Water Moderator(DWM), were measured at beamline 1# 6# 9# and 20# by low efficiency He3 neutron detector and lithium glass neutron detector applying TOF method. The integral flux of cold and thermal neutron was verified by activation measurement of gold foil. The integral flux of three moderators is agree with the simulation results of engineering geometry model within 20%. The neutron pulse shape of DPHM was measured by time focusing technique and agree well with the simulation result. The detail of measurement methods and results will be introduced.

References

- [1] H. Chen, X. Wang, Nature materials 15, 689 (2016),
- [2] D. Cyranoski, Nature 551, 284 (2017).
- [3] H. Chen, Y. Chen, F. Wang, T. Liang, X. Jia, Q. Ji, C. Hu, W. He, W. Yin, K. He, B. Zhang and L. Wang, Neutron News 29, 2-2 (2018).

Poster back-up

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