



Experimental measurement of neutronic performance at neutron beam line in CSNS

Songlin WANG, Bin ZHOU, TianCheng YI, Fei SHEN,
TianJiao LIANG

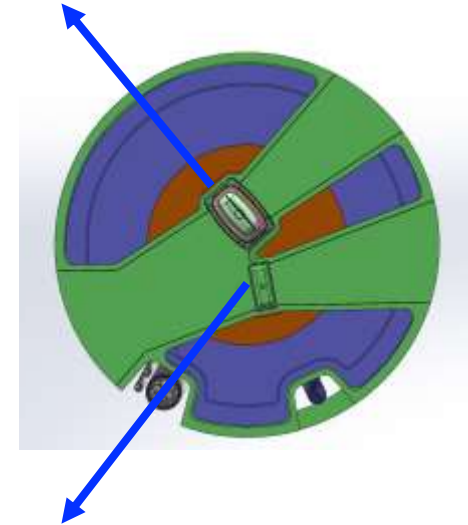
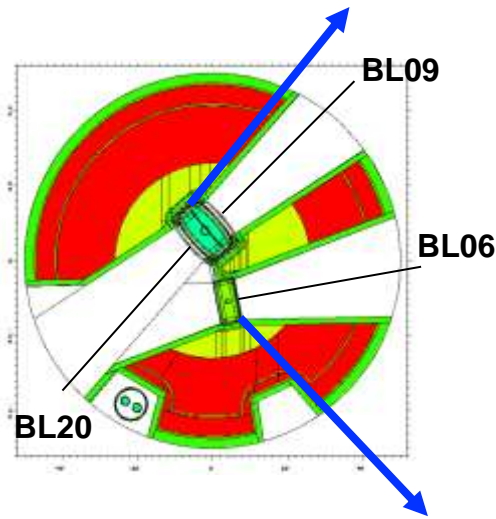
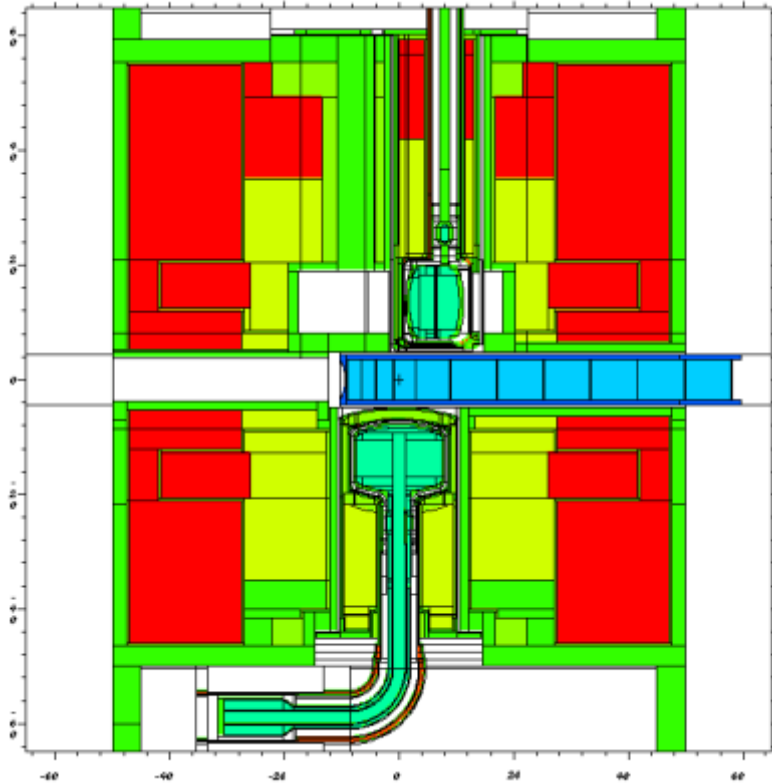
*China Spallation Neutron Source,
Institute of High Energy Physics, CAS*

Outline

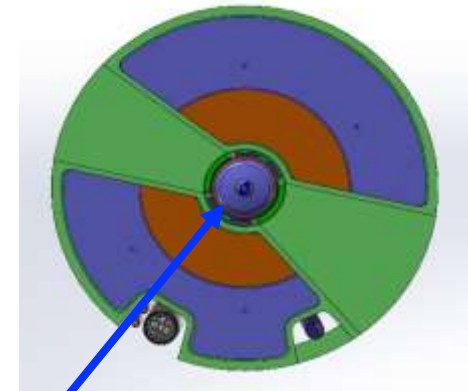
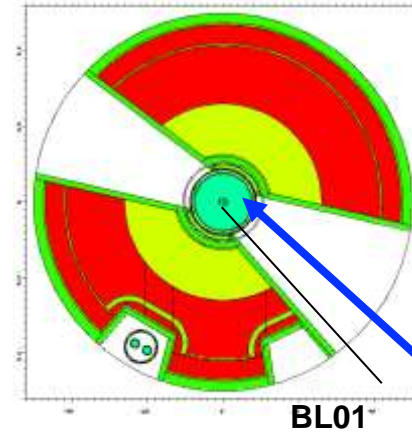
- 1 Neutronic performance simulation**
- 2 Measurement methods
- 3 Neutron Spectra
- 4 Neutron pulse shape
- 5 Summary

TMR engineering geometry

DPHM (Decoupled & Poisoned Hydrogen Moderator)

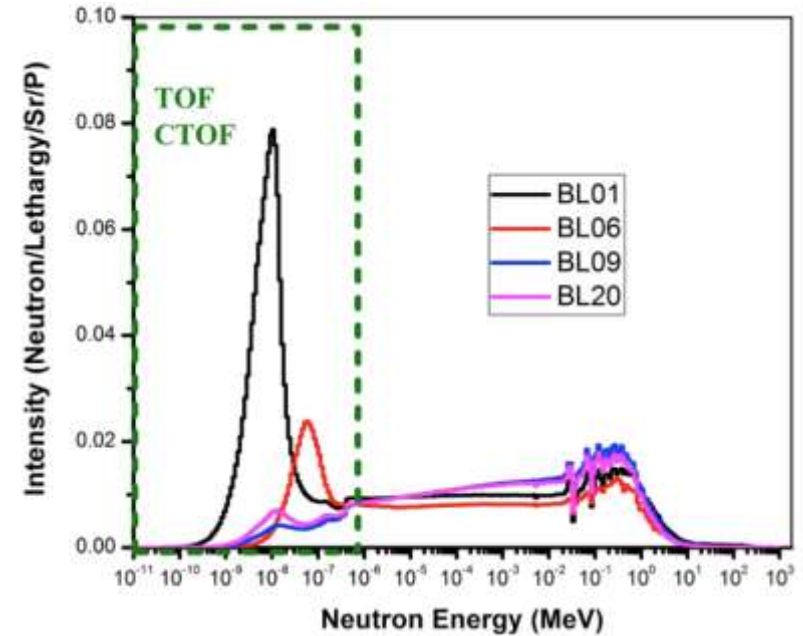
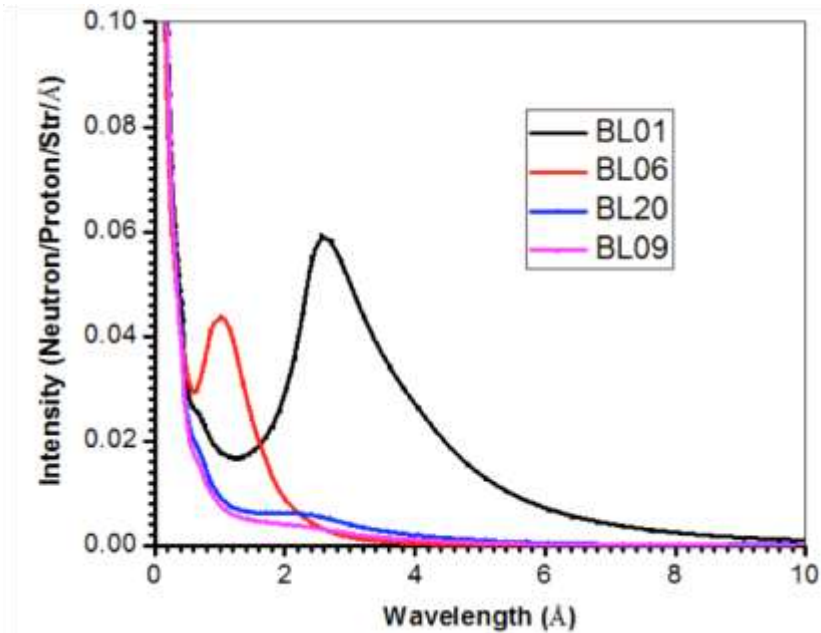


DWM (Decoupled Water moderator)



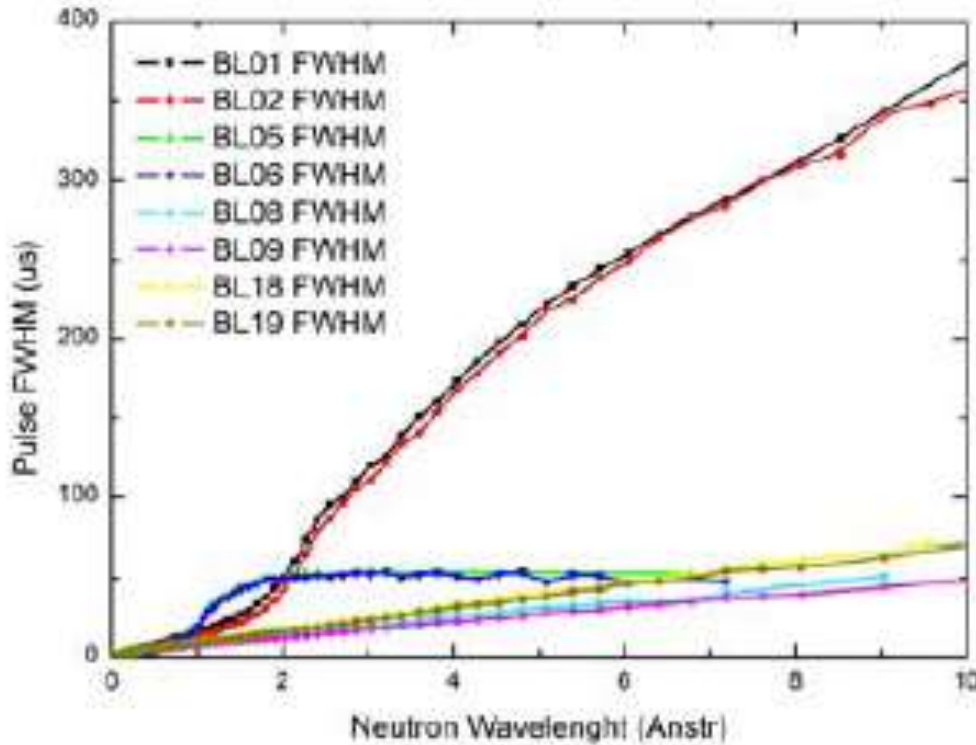
CHM (Coupled Hydrogen Moderator)

Wavelength spectra of mechanical model

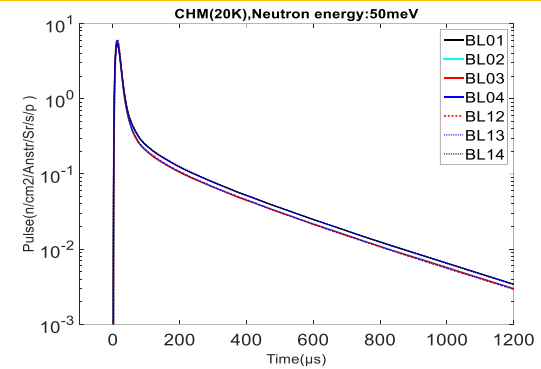


Neutronic performance – Wavelength spectra

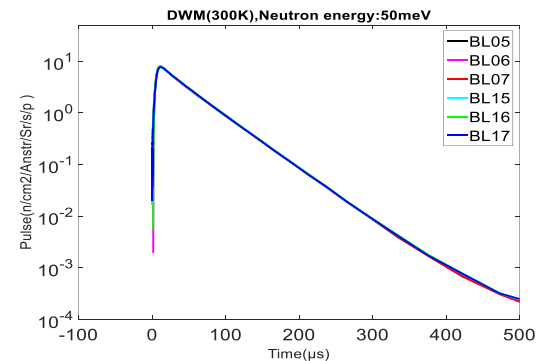
Neutron pulse shape of mechanical model



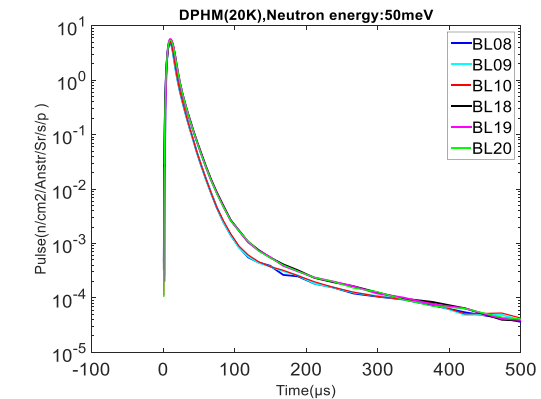
Pulse FWHM



CHM



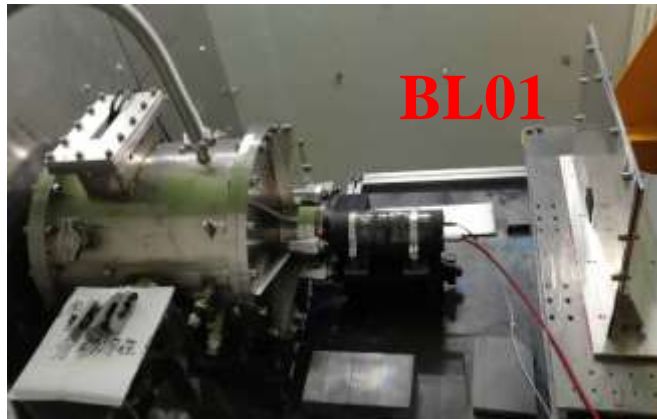
DWM



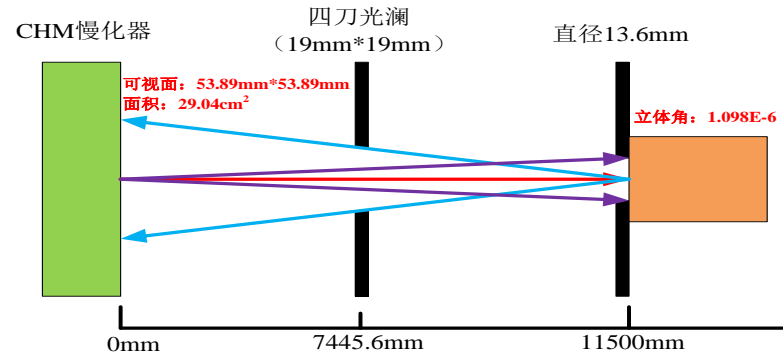
DPHM

Pulse shape of 1.28 Å neutron

Neutronic performance measurement position



BL01

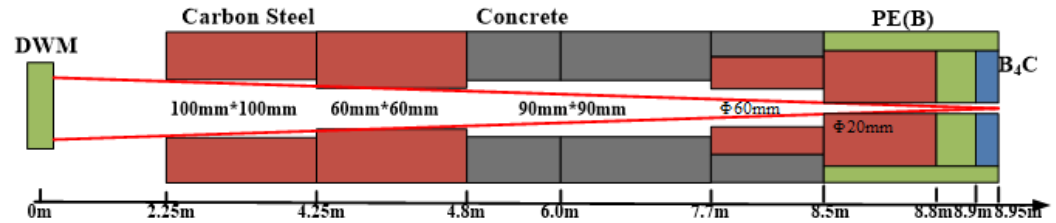


BL01

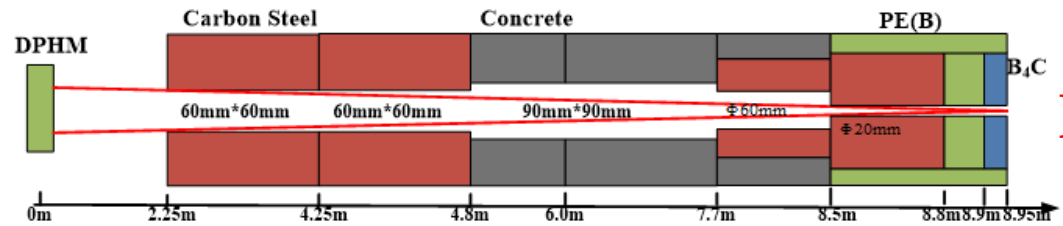


BL06

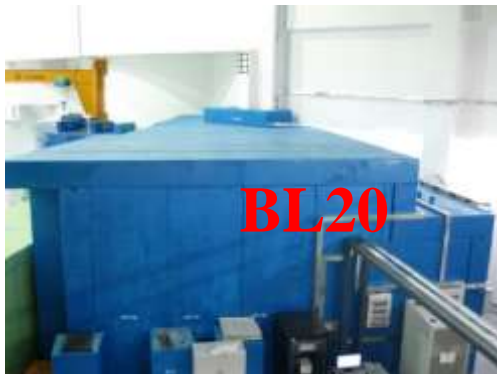
BL09



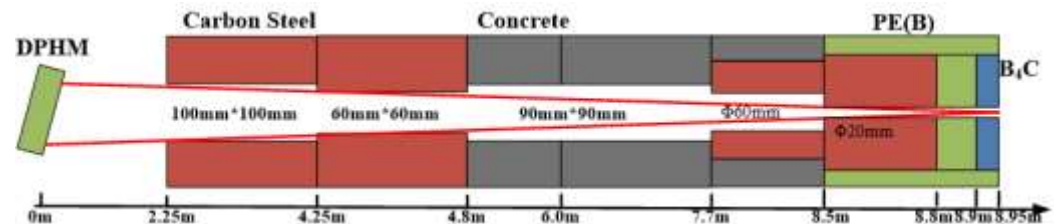
BL06



BL09



BL20



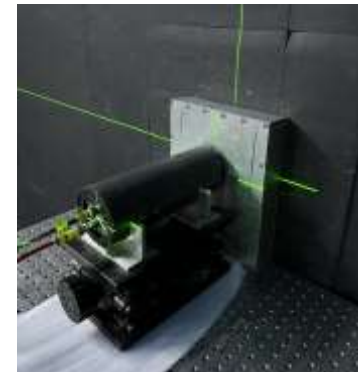
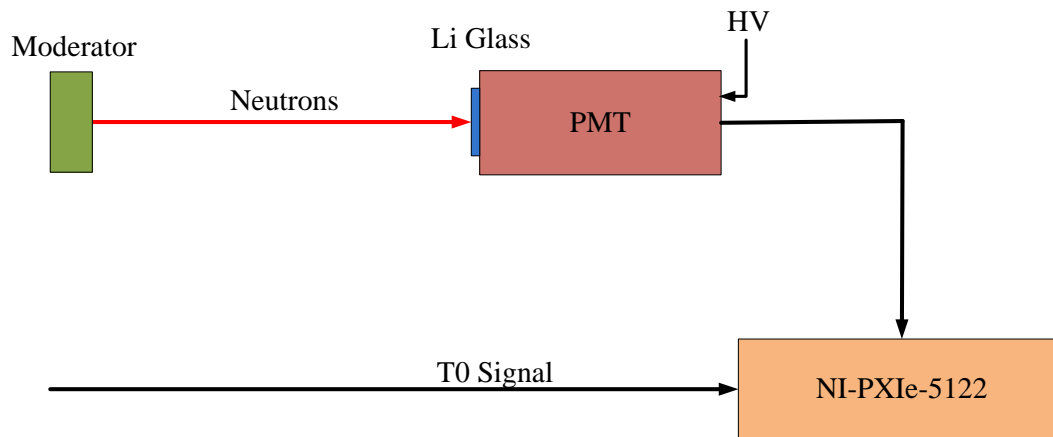
BL20

Outline

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Wavelength spectra measurement method-CTOF

- Lithium-glass scintillation detector worked at current mode
- Detector anode current signal is recorded by high resolution digitizer
- TOF spectra is expected to measure for single proton pulse



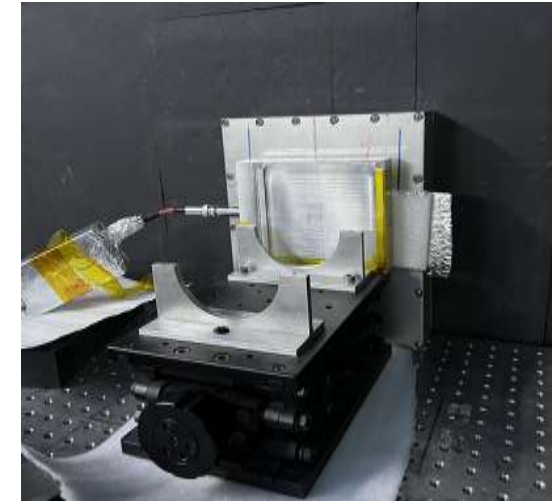
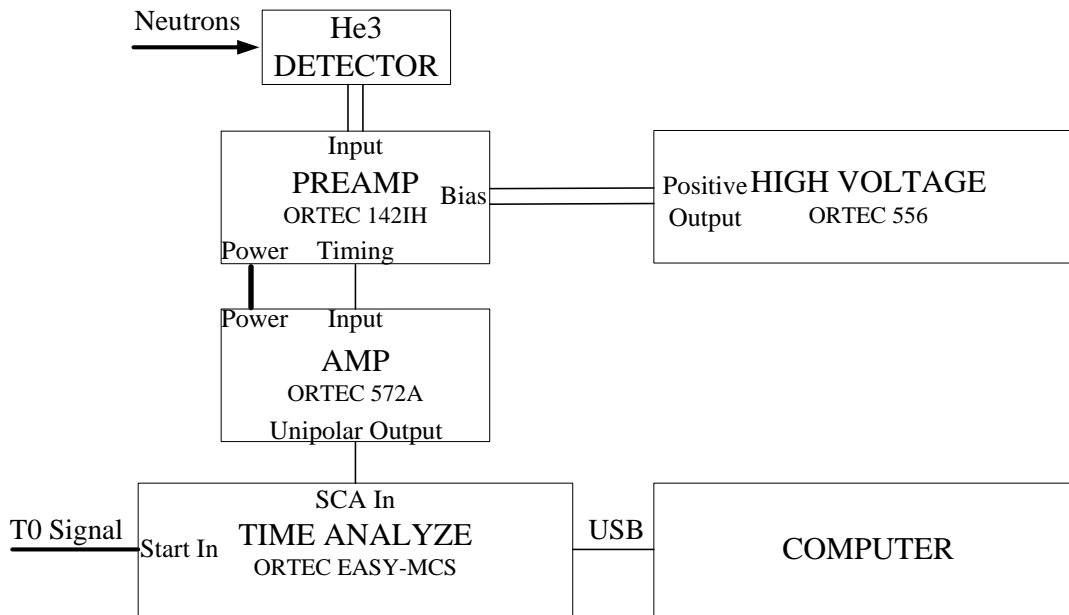
Li glass detector



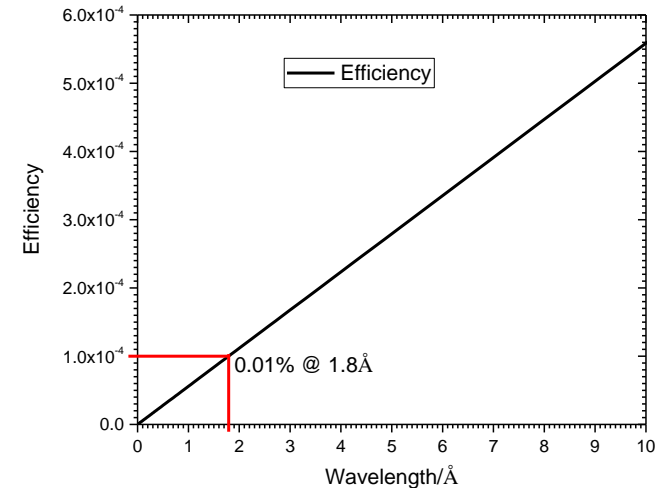
Digitizer

Wavelength spectra measurement method-TOF

- The low efficiency neutron detector to avoid overlap



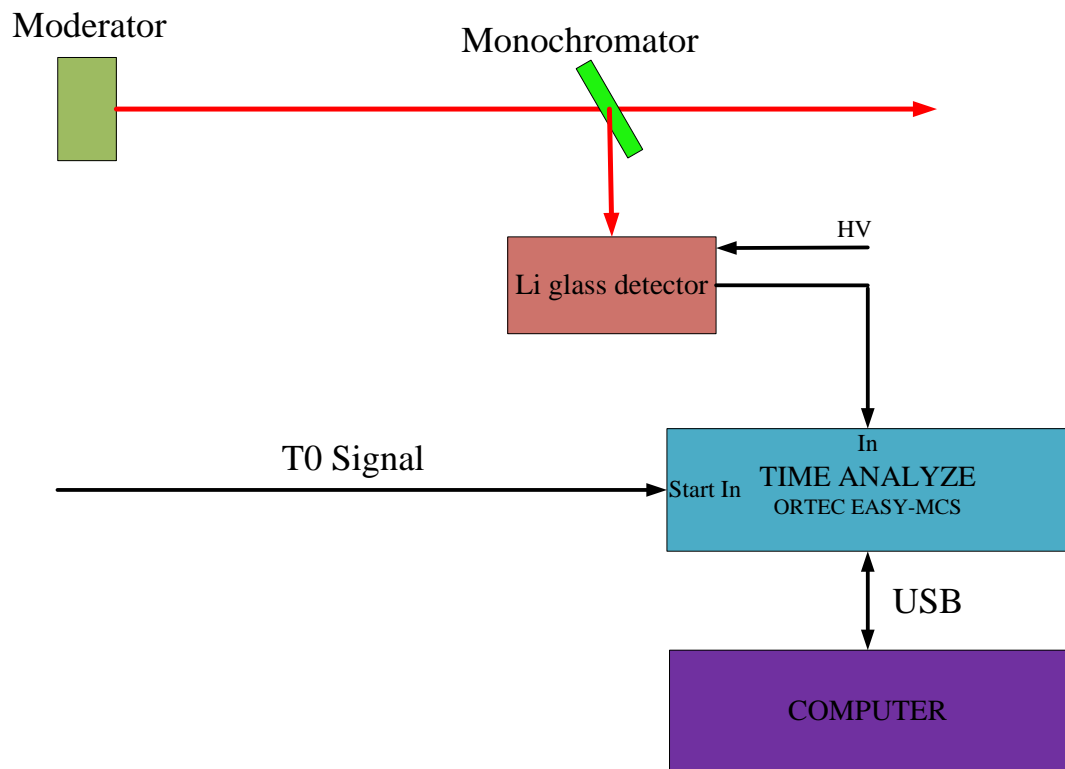
Low efficiency neutron detector



The efficiency line of detector

Pulse shape measurement method

- Bragg diffraction select single wavelength neutron



Mica monochromator

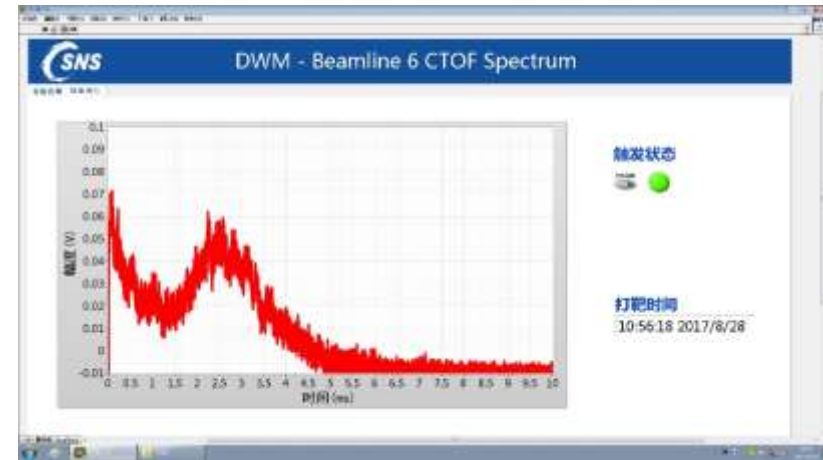


Germanium monochromator

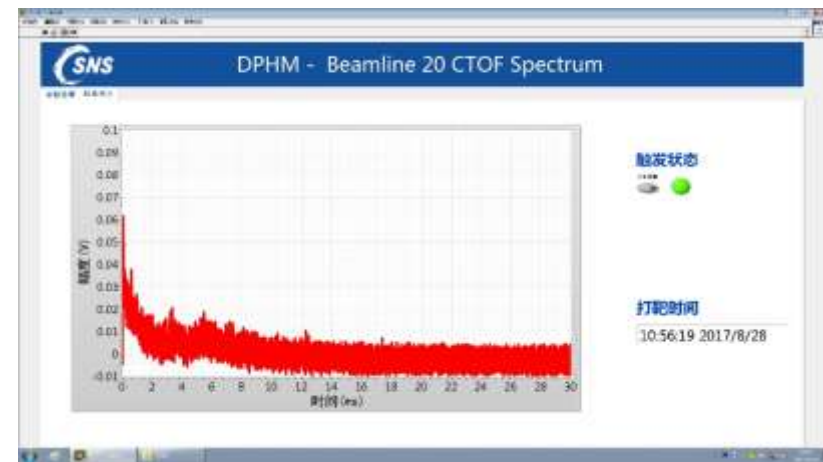
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First Neutron (CTOF technique)

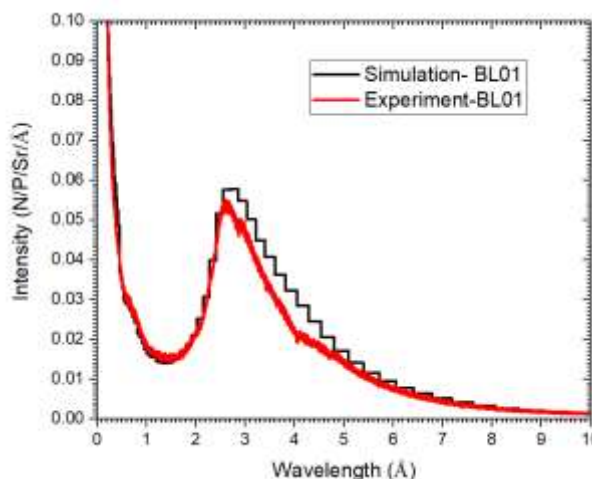
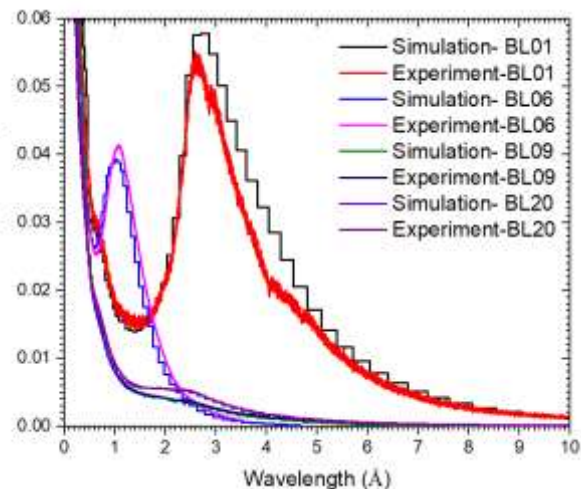


First neutron CTOF spectrum of BL06

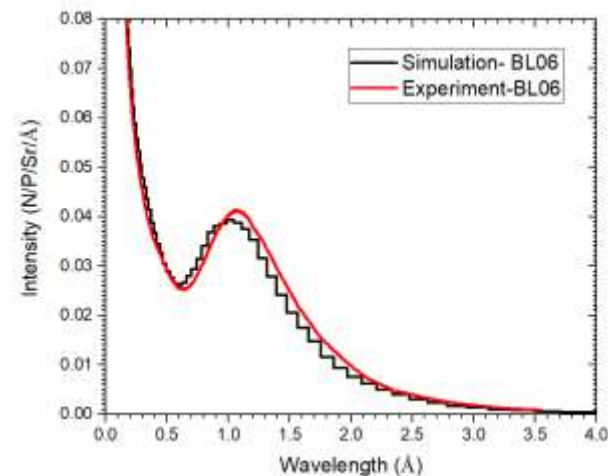


First neutron CTOF spectrum of BL20

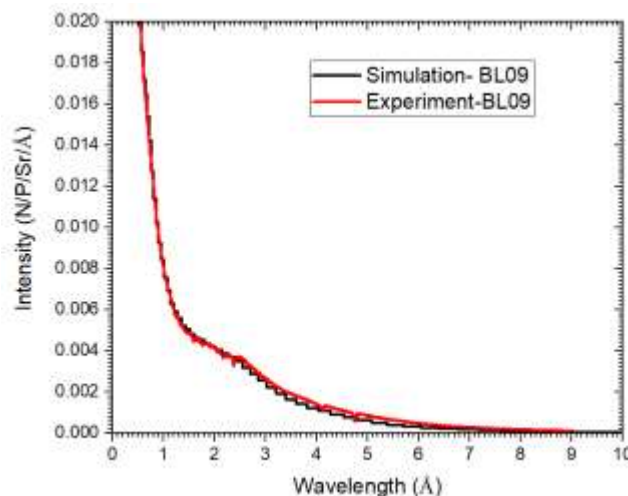
Neutron wavelength spectra result -CTOF



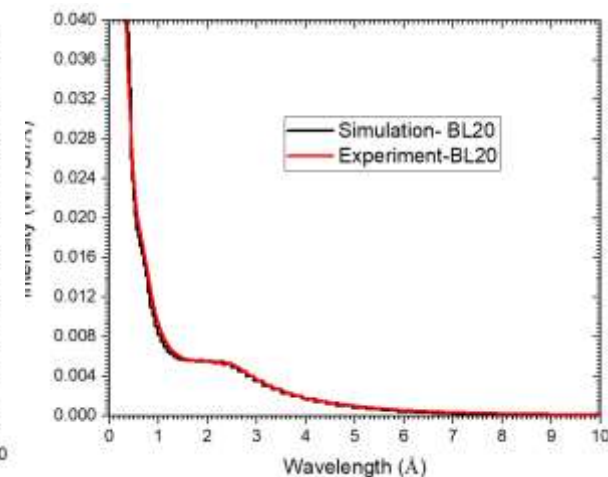
BL01 @ CHM



BL06 @ DWM



BL09 @ DPHM



BL20 @ DPHM

Flux comparison (CTOF and Au activation)



Position: SANS

Length: 11.5m

Wavelength band: 0.64Å~10.36Å

Neutron detector: Li glass detector / Au

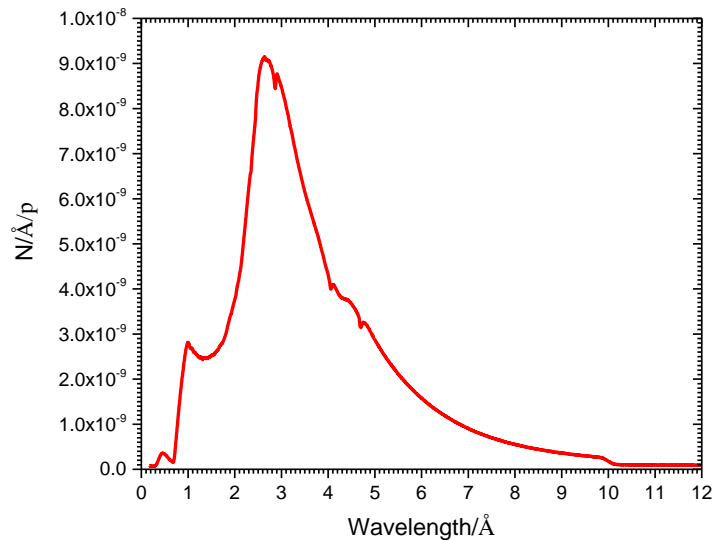
Method: CTOF/Activation



CTOF



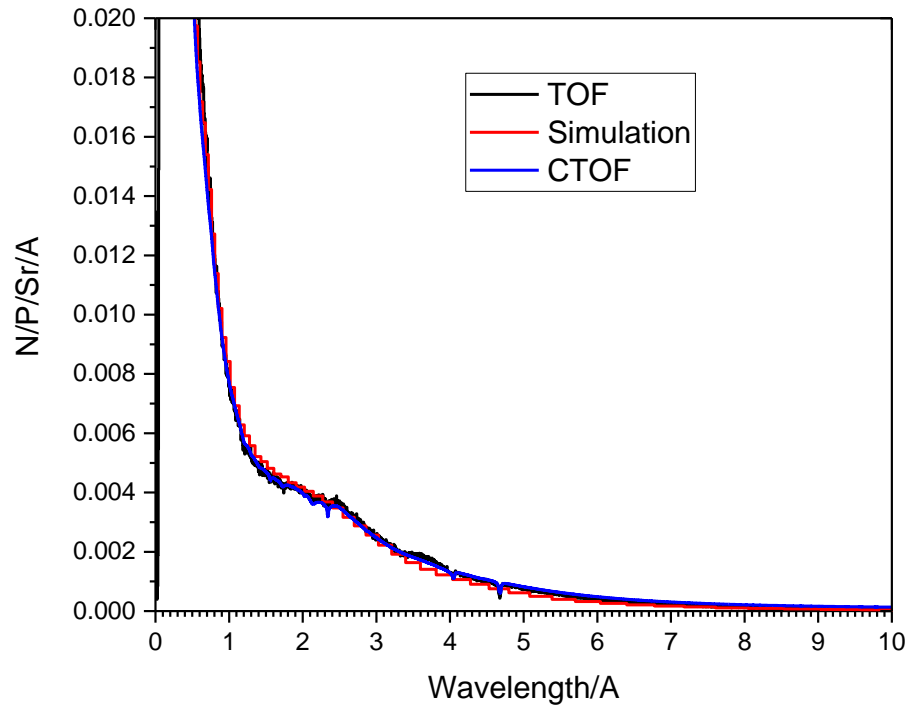
Au activation



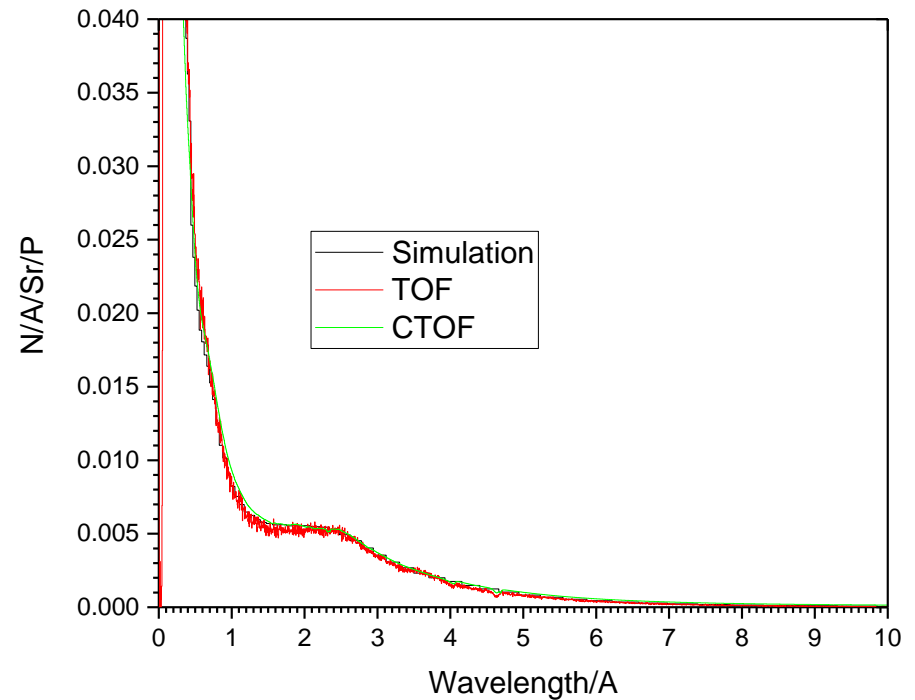
The wavelength spectra

	n/p/cm ²
CTOF	1.74×10^{-8}
Activation	1.70×10^{-8}

- The wavelength spectra of TOF measurement and CTOF measurement agree well with the simulation.



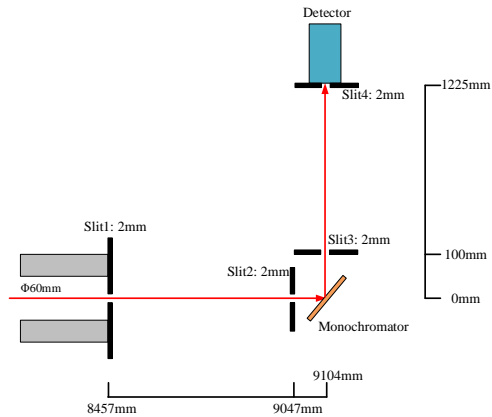
BL09 @ DPHM



BL20 @ DPHM

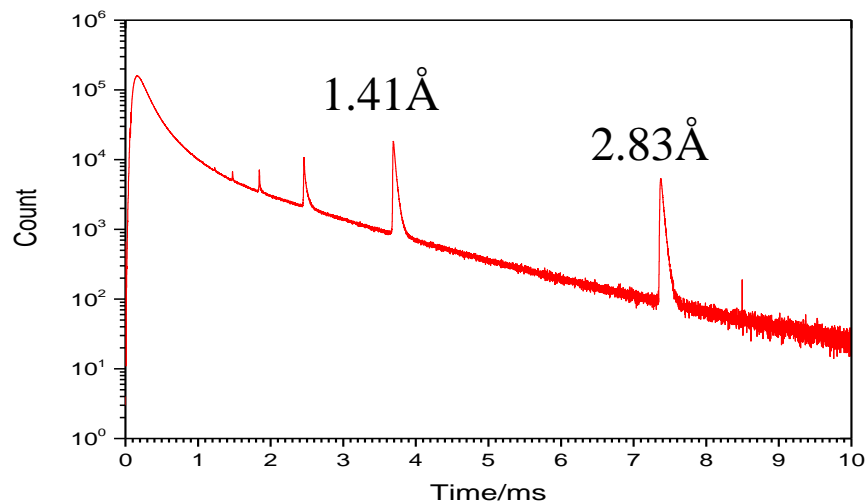
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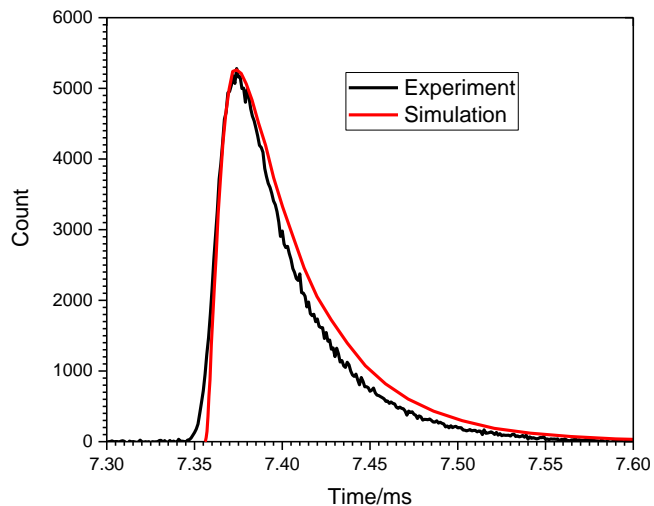


Experiment setup

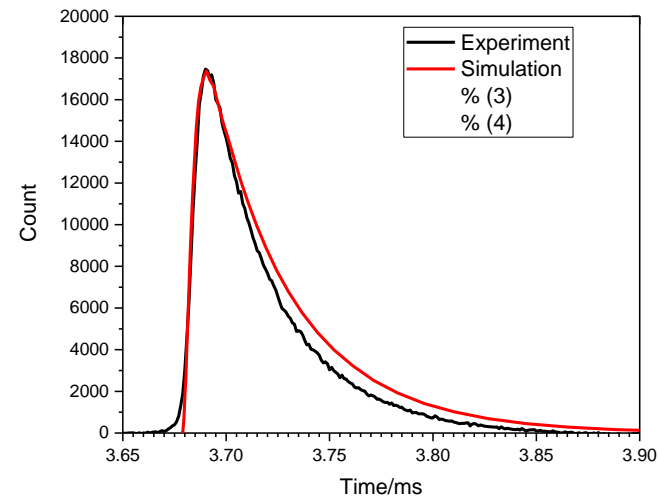
Beamline	BL06
Moderator	DWM
Diffraction plane	Ge[2 2 0]
Bragg angle	45degree
Wavelength of diffraction neutron	2.83Å/1.41Å
Neutron detector	Li glass detector



The TOF spectrum

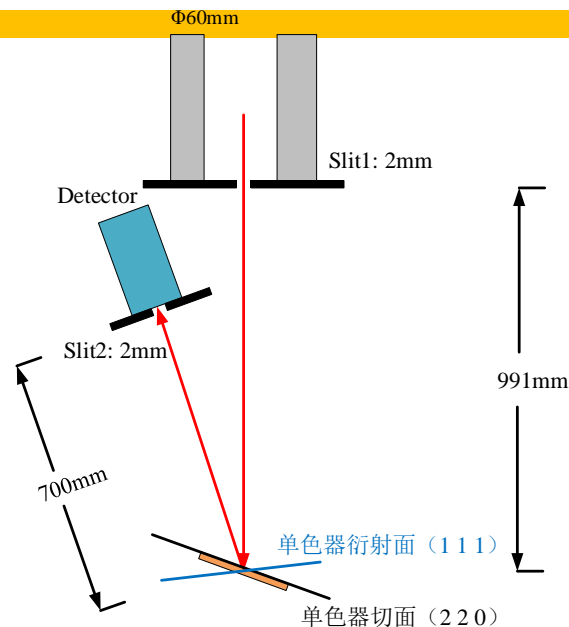
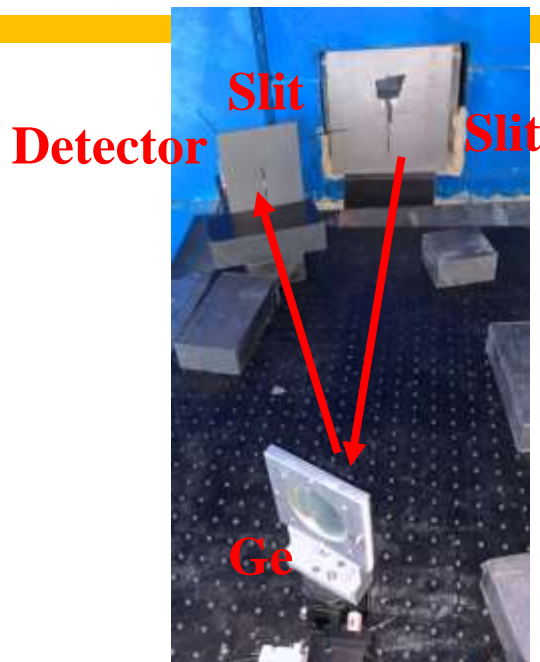


The pulse shape 2.83Å



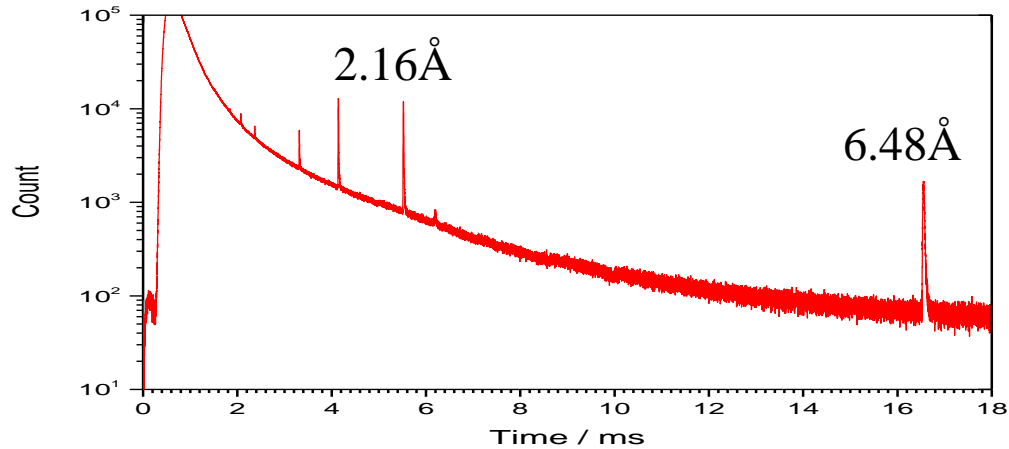
The pulse shape 1.41Å

Pulse shape measurement result – BL09

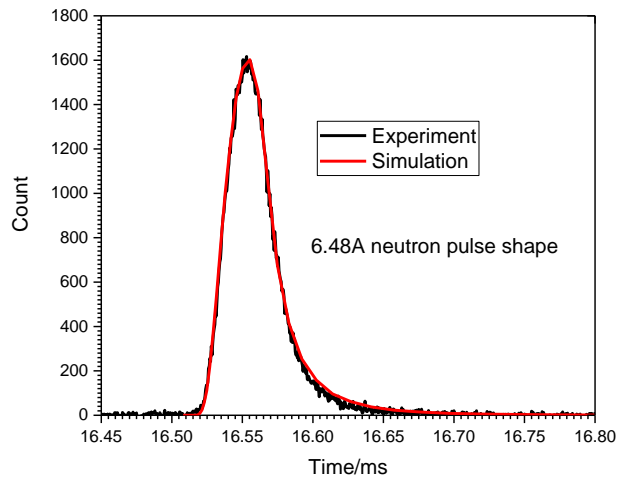


Experiment setup

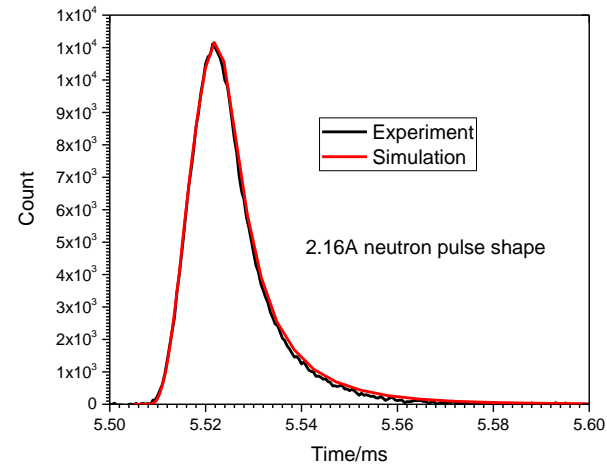
Beamline	BL09
Moderator	DPHM
Diffraction plane	Ge[1 1 1]
Cut plane	Ge[2 2 0]
Bragg angle	82.6degree
Wavelength of diffraction neutron	6.48Å、2.16Å
Neutron detector	Li glass detector



The TOF spectrum



The pulse shape 6.48\AA



The pulse shape 2.16\AA

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- The neutron spectra of three moderators were measured and agree well with the simulation.
- The integral flux was verified by activation measurement of gold foil.
- The pulse shape of DPHM and DWM were measured and agree well with the simulation.



Thank you !