Contribution ID: **876** Type: **not specified**

Experimental Demonstration of Fast Neutron Absorption Spectroscopy Driven by Repetitive Laser Neutron Source

Thursday, 29 May 2025 09:50 (15 minutes)

Hao Xu1, *Jie Feng1,2, Mingyang Zhu1, Bingzhan Shi1, Guoqiang Zhang3, Jinguang Wang4, Yifei Li4, Xin Lu4,5,6, Wenchao Yan1,2, Liming Chen1,2*
*1State Key Laboratory of Dark Matter Physics, Key Laboratory for Laser Plasmas (MoE), School of Physics and Astronomy, Shanghai Jiao Tong University, Shanghai 200240, China,*haoxu001@sjtu.edu.cn.
2 Collaborative Innovation Center of IFSA, Shanghai Jiao Tong University, Shanghai 200240, China.
3Shanghai Advanced Research Institute, Chinese Academy of Sciences, Shanghai 201210, China.
4Beijing National Laboratory of Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China.
5School of Physical Sciences, University of Chinese Academy of Sciences, Beijing 100049, China.
6Songshan Lake Materials Laboratory, Dongguan 523808, China.

Fast neutron absorption spectroscopy enables isotope-specific material analysis with deep penetration and high nuclear sensitivity. However, achieving high-resolution, table-top fast neutron absorption spectroscopy remains challenging, primarily due to constraints in neutron time duration and diagnostic capability. Here, we report the first experimental demonstration of fast neutron absorption spectroscopy using a repetitive laser driven neutron source. With single-neutron counting and pulse shape discrimination techniques, we achieved high-precision, high-resolution (0.02 MeV at 0.5 MeV) neutron spectrum measurements. Magnesium resonance absorption features at 0.268 MeV and 0.432 MeV were clearly resolved. Local Pearson correlation analysis confirmed good agreement of experimental result and theoretical model. This work combines the ultrashort, table-top laser driven neutron source with advanced detection technique, opening a new avenue for non-destructive testing application and fundamental nuclear science.

Primary author: XU, Hao (Shanghai Jiao Tong University)

Presenter: XU, Hao (Shanghai Jiao Tong University)

Session Classification: Parallel Session 4: Nuclear and related analytical techniques in environmental and materials science

Track Classification: Parallel session: Parallel session 1