

# Feasibility study on fast neutron rejection capability of the JSNS<sup>2</sup> detector

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## BEAM REQUEST A:

Running Time	1 day
Beam Line	ENN or WS
Type of Particle	proton
Beam Energy	300 MeV
Beam Intensity	as low as possible
Energy Resolution	$\leq 1 \%$
Others	The sooner, the better.

## BEAM REQUEST B:

Running Time	3 days
Beam Line	N0
Type of Particle	neutron
Beam Energy	80 MeV
Beam Intensity	5 nA
Energy Resolution	$\leq 1 \text{ MeV}$
Others	Need some time to prepare apparatus.

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# Proposal for an experiment at the RCNP Cyclotron Facility

Submitted to RCNP for the BPAC evaluation in March 2016

## Feasibility study on fast neutron rejection capability of the JSNS<sup>2</sup> detector

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### Summary of the proposal

The purpose of this proposed measurement is to investigate a capability of the fast neutron rejection in the JSNS<sup>2</sup> (J-PARC Sterile Neutrino Search at J-PARC Spallation Neutron Source) experiment (J-PARC E56) [1].

The JSNS<sup>2</sup> experiment is an experiment to search for a sterile neutrino at J-PARC Material and Life science Facility (MLF).

One of the dominant backgrounds of the experiment is due to fast neutrons induced by cosmic rays. In the proposal of the experiment [1], we assume the rejection capability for the background, factor of 100, using Cherenkov and/or Pulse Shape Discrimination techniques. We have to show the capability using not only MC simulation but also the test-beam data.

To show the feasibility, we consider two measurements using RCNP beams. The first step (Experiment A) is to use the existing cylindrical test-bench and a proton beam to study the basic response of the liquid scintillator to protons. The shorter time scale and the known direction of proton is suitable to observe the basic response.

The second step (Experiment B) is to prepare a 300kg-LAB box and use a neutron beam to demonstrate the feasibility with a realistic setup.

### References

- [1] M.Harada *et al.*, arXiv:1310.1437 [physics.ins-det]