

# Nuclear Lunch Questions from **Probing neutron-hidden neutron transitions with the MURMUR experiment**, presented November 4, 2020

For discussion on November 18, 2020

## Theory

1. Neutrinos are also neutral particles with mass; can neutrinos undergo this same transition and become “hidden”? (**Holly**)
2. The paper mentions the braneworld and mirror-matter models in BSM theory. Without giving us a course on string theory, can you please explain some more about these theories? (**Joseph**)
3. What would the properties of hidden neutrons be? In what respect are they “hidden”? (**Robert**)
4. What causes the swapping of neutrons to hidden neutrons and vice versa? The paper says that “a collision with a visible nucleus acts as a quantum measurement”. What does that mean? (**Ibrahim**)

## Experimental Setup/Variables

1. Why did they use Pb as the regenerator? (**Yenuel**)
2. While running neutron detection experiments, what fraction of the background neutrons we detect would we expect to have come from hidden neutrons produced in the reactor? (**Justin B.**)
3. Please explain Eq. (14). Why does the bound not depend on the amount of time the experiment runs for? (**Utsav**)

## Applications

1. Could hidden neutrons play any role in nucleosynthesis studies of neutron dense environments (perhaps in the r-process)? Has anyone used this idea to set bounds on the oscillation probability? (**Shiv**)