Contribution ID: **371** Type: **Oral Presentation**

Nanoscience innovations: On the trapping of cold neutrons in nano-scaled Fabry-Perot resonating cavities & neutron lifetime considerations

Thursday, 6 July 2023 09:40 (1 hour)

Relatively to the atomic constituents' counterparts, the neutron is singular as it is sensitiveto the four fundamental interactions: strong, weak, electromagnetic, and gravitational. This multi-sensitivity makes neutron wave-matter optics a particularly versatile tool for testing quantum mechanics specifically and fundamental physics concepts in general.The lifetime of a free neutron defined via its beta-decay ⟨τn⟩ is of a pivotal importance within the standard model cosmology. Indeed, the precision on the neutron lifetime is paramount as it regulates the precision of the 1st element of the Cabibbo–Kobayashi–Maskawa matrix, central to the standard model. The two major methods used to measure ⟨τn⟩ while trapping free neutrons, namely, the beam and the bottle methods give different neutron lifetime values; ⟨τn⟩Beam ~ 888.0 ± 2.0 s , that obtained by the bottle technique is smaller; of about ⟨τn⟩Bottle ~ 879.4 ± 0.6 s. In addition of the persistent difference of ~10 s persists for years, even if the two methods have been modified to enhance the experimental accuracy. This latter was shown to be enhanced if one could trap cold neutrons in nanostructured Fabry-Perot resonators. The de Broglie wave-particle duality coupled to the Fermi total reflection phenomenon in addition to the tunneling trapping of cold neutrons in such nano-resonating cavities, allow trapping times with a precision governed by the Heisenberg uncertainty of 10 -12 s

Apply to be considered for a student ; award (Yes / No)?

N/A

Level for award;(Hons, MSc, PhD, N/A)?

N/A

Consent on use of personal information: Abstract Submission

Yes, I ACCEPT

Primary author: Prof. MAAZA, Malik

Presenter: Prof. MAAZA, Malik

Session Classification: Physics for Development, Education and Outreach

Track Classification: Track E - Physics for Development, Education and Outreach