

# MURMUR: a new low-noise experiment for the search of neutron-hidden neutron transitions in the context of braneworld scenarios

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MURMUR is a new passing-through-wall neutron experiment installed near the BR2 nuclear reactor at the Belgian Nuclear Research Center (SCK.CEN, Mol, Belgium) and designed to search neutron interbrane transitions in the context of braneworld scenarios. In such scenarios, our Universe could be a 3-brane embedded in a multidimensional Universe, called the bulk, which could contain many other invisible adjacent 3-branes. Theoretical works have shown that the existence of hidden braneworlds can be experimentally tested thanks to neutron exchanges between braneworlds which must occur. A neutron  $n$  in our visible brane can be converted into a hidden neutron  $n'$  propagating in a hidden braneworld when scattered by a nucleus with a cross section  $\sigma(n \rightarrow n') \propto \sigma_E(n \rightarrow n) \times p$ , where  $\sigma_E$  is the usual elastic cross-section and  $p$  the neutron swapping probability. Hidden neutrons could thus be generated in the moderator of the BR2 nuclear reactor where a high neutron flux undergoes many elastic scatterings. This hidden neutron flux could be free to travel out of the biological shielding of the reactor up to a matrix made of lead, acting as an antenna, which makes possible to regenerate hidden neutrons into visible ones thanks to reverse swapping. These regenerated neutrons can be detected thanks to a neutron detector placed inside the lead block. The experimental setup of MURMUR is described, as well as the different improvements which have been included in comparison with the first experiment of this kind carried out at the ILL (Grenoble, France) in 2015. Then, the first results of MURMUR are presented and discussed. Finally, some upcoming modifications of the experimental setup of MURMUR are introduced.

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## Secondary track (number)

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