Search for a Neutron Dark Decay in 6He

Doctorant·e
LE JOUBIOUX Marius

Direction de thèse
SAVAJOLS HERVÉ (Directeur·trice de thèse)

Date de la soutenance
22/10/2024 à 14:00
Lieu de la soutenance
GANIL

Rapporteurs de la thèse
PFÜTZNER MAREK Université de VARSOVIE
ROCCIA STÉPHANIE Maître de conférences Universite Grenoble Alpes

Membres du jurys
BLANK BERTRAM, , UNIVERSITE BORDEAUX 1 SCIENCES ET TECHNOLOGIE
GULMINELLI Francesca, , Université de Caen Normandie (UCN)
MCKEEN DAVID, Chercheur, TRIUMF, MOB 231
PFÜTZNER MAREK, , Université de VARSOVIE
ROCCIA STÉPHANIE, Maître de conférences, Universite Grenoble Alpes
SAVAJOLS HERVÉ, , 14 GANIL de CAEN

Abstract
Neutron dark decays have been suggested as a solution to the discrepancy between bottle and beam experiments, providing a dark matter candidate that can be searched for in halo nuclei. The free neutron in the final state following the decay of 6He into 4He□n□ provides an exceptionally clean detection signature when combined with a high-efficiency neutron detector. Using a high-intensity 6He□ beam at the Grand Accélérateur National d'Ions Lourds (GANIL), a search for a coincident neutron signal resulted in an upper limit on a dark decay branching ratio of Br ¤ 4:0 □ 10□10 with a 95% confidence level. Using the dark neutron decay model proposed originally by Fornal and Grinstein, we translate this into an upper bound on a dark neutron branching ratio of Op10□5q, improving over global constraints by one to several orders of magnitude depending on m.