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Dark Matter interpretation of neutron multiplicity anomalies

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Subterrestrial neutron spectra show weak but consistent anomalies at multiplicities ˜100 and above [1-3]. The data of the available measurements are of low statistical significance [4] but indicate an excess of events not correlated with the muon flux. The origin of the anomalies remains ambiguous, but it could be a signature of WIMP annihilation-like interaction with a Pb target. In the presentation, we'll outline a model consistent with this hypothesis. We use an extended Standard Model approach called the Radiation Gauge Model (RGM). The RGM identifies the scalar neutrino-antineutrino wave function component of WIMP DM responsible for the weak interaction leading to annihilation with ordinary matter. The model assigns neutrino-(target)nucleon CC (charged current) transitions to the observed anomalies. For example, an 8 GeV WIMP particle annihilating Pb nucleus requires 3.25 GeV excitation to destroy or fragment the Pb into neutrons and protons, which further undergo (n, xn) and (p, xn) reactions in the massive Pb target. The outgoing weak interaction leptons (e, mu, tau, and neutrinos) take the remainder of the energy (4.75 GeV). If the existence of the anomalies is confirmed and the model interpretation is positively verified, this will be the first terrestrial Indirect Detection of Dark Matter.

[1] https://doi.org/10.22323/1.395.0514
[2] http://doi.org/10.1088/1742-6596/2156/1/012029
[3] https://doi.org/10.1016/j.nima.2022.167223
[4] TAUP abstract #166

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Authors: Dr WARD, Thomas (US Department of Energy; Techsource Incorporated); Prof. TRZASKA, Wladyslaw (Department Physics, University of Jyvaskyla, Finland; Helsinki Institute of Physics (HIP), University of Helsinki)

Presenters: Dr WARD, Thomas (US Department of Energy; Techsource Incorporated); Prof. TRZASKA, Wladyslaw (Department Physics, University of Jyvaskyla, Finland; Helsinki Institute of Physics (HIP), University of Helsinki)

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