Contribution ID: **454** Type: **Poster**

A Dark Matter WIMP That Can Be Detected and Definitively Identified with Currently Planned Experiments

Friday, 8 July 2022 20:10 (20 minutes)

We propose and describe a dark matter particle which is consistent with current experiment and observation, and which should be detectable within the next 1-5 years [1,2]. This particle is unique in that it has (i) precisely defined couplings and (ii) a well-defined mass of about 72 GeV. It has not yet been detected because it has no interactions other than second-order gauge couplings, to W and Z bosons. However, these weak couplings are still sufficient to enable observation by direct detection experiments which should be fully functional within the next few years, including XENONnT, LZ, and PandaX. The cross-section for collider detection at LHC energies is small (roughly 1 fb) but observation may ultimately be achievable at the high-luminosity LHC, and should certainly be within reach of the even more powerful colliders now being planned. It is possible that the present dark matter candidate has already been observed via indirect detection: Several analyses of gamma rays from the Galactic center, observed by Fermi-LAT, and of antiprotons, observed by AMS-02, have shown consistency with the interpretation that these result from annihilation of dark matter particles having roughly the same mass and annihilation cross-section as the present candidate. Finally, there is consistency with the observations of Planck, which have ruled out many possible candidates with larger masses. The most promising signature for collider detection appears to be missing transverse energy of > 145 GeV accompanied by two jets, following creation through vector boson fusion. The most promising mechanism for direct detection appears to be a one-loop process involving exchange of two vector bosons. The present dark matter particle and the lightest susy neutralino (as well as an axion-like particle) can stably coexist in a multicomponent dark matter scenario, which results from a fundamental picture which predicts both an extended Higgs sector and supersymmetry [3].
[1] Reagan Thornberry, Maxwell Throm, Gabriel Frohaug, John Killough, Dylan Blend, Michael Erickson, Brian Sun, Brett Bays, and Roland E. Allen. "Experimental signatures of a new dark matter WIMP", EPL (Europhysics Letters) 134, 49001 (2021).
[2] Caden LaFontaine, Bailey Tallman, Spencer Ellis, Trevor Croteau, Brandon Torres, Sabrina Hernandez, Diego Cristancho Guerrero, Jessica Jaksik, Drue Lubanski, and Roland E. Allen, "A Dark Matter WIMP That Can Be Detected and Definitively Identified with Currently Planned Experiments", Universe 7, 270 (2021).
[3] Roland E. Allen, "Predictions of a fundamental statistical picture", arXiv:1101.0586 [hep-th].

In-person participation

Yes

Primary author: ALLEN, Roland (Texas a&M University)

Presenter: ALLEN, Roland (Texas a&M University)

Session Classification: Poster Session

Track Classification: Dark Matter