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Quark-less Baryonium Dark Matter States as Progenitors for Hadron Generations

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Abstract. Quark-less baryonium diagram appeared in the old paper on baryonium physics (L. Montanet, G.C. Rossi, G.Veneziano, 1980). If two gluon lines in this diagram are cut, we have tetraquark with two quarks and two anti-quarks. This idea can be expanded to multi baryon-antibaryon states of Baryonium Dark Matter (BDM), see (Piskounova, 2023). Baryonium Dark Matter consists of the net of baryon and antibaryon String Junctions (SJ) completely connected via gluons on the surface of torus. BDM states have no quarks and zero baryon charge because of equal numbers SJs and anti-SJs. The progression of BDM mass was assumed exponential that is natural for QCD physics, see (O. Piskounova, 2016). The low mass baryonium states are studied in order to show how they correspond to the BDM mass sequence. Previously-observed heavy baryonium states (1835 MeV, 1851 MeV and 1859 MeV are very close to the third order mass in BDM progression, 1855 ± 15 MeV, see (Piskounova , 2019). Since BDMs particles are quark-less and rather compressed, they have hidden mass and can be deconstructed into charmed baryonium resonance, or into charmed tetraquarks, pentaquarks, hexaquarks etc. Each product may be accompanied at the deconstruction of BDM with dozens of pions and photons. In such a way, the states of BDM have to be considered as the progenitors of particles in hadron generations. Next state of BDM is expected of mass near the beauty family of hadrons, 5042 ± 40 MeV. The important advantages of Baryonium Dark Matter for astrophysics of Universe have been discussed.

Primary author(s) : Dr. PISKOUNOVA, Olga (FIAN)

Presenter(s) : Dr. PISKOUNOVA, Olga (FIAN)

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