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An exceptional G(2) extension of the Standard Model from an algebraic conjecture: implications for the strong sector and dark matter

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A new criterion to extend the Standard Model (SM) of particle physics is proposed: the symmetries of physical microscopic forces originate from the automorphism groups of main Cayley–Dickson algebras, from complex numbers to octonions and sedenions. This correspondence leads to a natural and minimal enlargement of the color sector, from a SU(3) gauge group to an exceptional Higgs-broken G(2) group. In this picture, an additional ensemble of massive G(2)-gluons emerges, which is separated from the particle dynamics of the SM and might play the role of dark matter (DM). A fully Lagrangian approach is provided, along with the description of the breaking mechanism, the G(2) particle spectrum, the possible composite DM states and their stability examination. Moreover, G(2) gauge theory could guarantee peculiar manifestations in astrophysical compact objects, which can be observed in the future studying gravitational waves.

In-person participation

Yes

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