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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

**Primary author:** MASI, Nicolò (Istituto Nazionale di Fisica Nucleare)

**Presenter:** MASI, Nicolò (Istituto Nazionale di Fisica Nucleare)

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