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Search for narrow and broad dijet resonances in proton-proton collisions at root s=13 TeV and constraints on dark matter mediators and other new particles

By: [Sirunyan, AM](#) (Sirunyan, A. M.)^[1]; [Tumasyan, A](#) (Tumasyan, A.)^[1]; [Adam, W](#) (Adam, W.)^[2]; [Ambrogi, F](#) (Ambrogi, F.)^[2]; [Asilar, E](#) (Asilar, E.)^[2]; [Bergauer, T](#) (Bergauer, T.)^[2]; [Brandstetter, J](#) (Brandstetter, J.)^[2]; [Brondolin, E](#) (Brondolin, E.)^[2]; [Dragicevic, M](#) (Dragicevic, M.)^[2]; [Ero, J](#) (Ero, J.)^[2] ...[More](#)

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Abstract

Searches for resonances decaying into pairs of jets are performed using proton-proton collision data collected at root s = 13 TeV corresponding to an integrated luminosity of up to 36 fb⁻¹. A low-mass search, for resonances with masses between 0.6 and 1.6 TeV, is performed based on events with dijets reconstructed at the trigger level from calorimeter information. A high-mass search, for resonances with masses above 1.6 TeV, is performed using dijets reconstructed offline with a particle-flow algorithm. The dijet mass spectrum is well described by a smooth parameterization and no evidence for the production of new particles is observed. Upper limits at 95% confidence level are reported on the production cross section for narrow resonances with masses above 0.6 TeV. In the context of specific models, the limits exclude string resonances with masses below 7.7 TeV, scalar diquarks below 7.2 TeV, axigluons and colorons below 6.1 TeV, excited quarks below 6.0 TeV, color-octet scalars below 3.4 TeV, W' bosons below 3.3 TeV, Z' bosons below 2.7 TeV, Randall-Sundrum gravitons below 1.8 TeV and in the range 1.9 to 2.5 TeV, and dark matter mediators below 2.6 TeV. The limits on both vector and axial-vector mediators, in a simplified model of interactions between quarks and dark matter particles, are presented as functions of dark matter particle mass and coupling to quarks. Searches are also presented for broad resonances, including for the first time spin-1 resonances with intrinsic widths as large as 30% of the resonance mass. The broad resonance search improves and extends the exclusions of a dark matter mediator to larger values of its mass and coupling to quarks.

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Author Information

Reprint Address: Sirunyan, AM (reprint author)

+ [Yerevan Phys Inst, Yerevan, Armenia.](#)

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- + [2] [Inst Hochenergiephys, Vienna, Austria](#)
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