Search for high-mass resonances decaying into dilepton final state at 13 TeV with CMS

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A search for new high-mass resonances decaying into electron or muon pairs is performed using the full dataset obtained from proton-proton collisions at 13 TeV. The search exploits data collected by the CMS experiment in 2016, corresponding to an integrated luminosity of 36 fb$^{-1}$. No significant deviations are observed from the standard model expectation. Upper limits on the product of a new resonance production cross section and branching fraction to dileptons are calculated in a model-independent manner. A lower mass limit is set at 95% confidence level for new spin-1 resonance arising in the sequential standard model and grand unified theory models, and spin-2 Kaluza-Klein graviton arising in the Randall-Sundrum model of extra dimensions.
1. Introduction, event selection, and results

Neutral resonances decaying to lepton pairs are predicted in a variety of theoretical models beyond the standard model (SM). Commonly considered models are the sequential standard model and the grand unified theory models containing the spin-1 $Z'_{SSM}$ and $Z'_\psi$ boson respectively, and Randall-Sundrum model of extra dimensions containing the spin-2 $G_{KK}$.

Electron (muon) candidates are required to have a transverse momentum $p_T > 35$ (53) GeV, be within geometrical acceptance, pass high-energy (momentum) identification, and pass isolation requirements. Figure 1 shows the comparison of dilepton invariant mass spectra between data and SM background prediction after the selection for the two channels.

**Figure 1:** The invariant mass spectra of dielectron (left) and dimuon (right) events.

No significant deviations are observed. The limits are set on the ratio of the cross section for $Z'$ boson to cross section for the SM $Z$ boson. The expected and observed limits for spin-1 and spin-2 resonances are shown in Figure 2. We obtain 95% CL lower mass limits of 4.50 and 3.90 TeV for $Z'_{SSM}$ and $Z'_\psi$, respectively; and 2.10, 3.65, and 4.25 TeV for $G_{KK}$ with coupling parameter $k/M_{Pl}$ of 0.01, 0.05, and 0.10, respectively. All the results are based on [1].

**Figure 2:** The upper limits at 95% CL on the product of production cross section and branching fraction for a spin-1 (left) and spin-2 resonance (right).

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References