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Observation of $WW\gamma$ production and search for $H\gamma$ production in proton-proton collisions at $\sqrt{s} = 13$ TeV

The observation of $WW\gamma$ production in proton-proton collisions at a center-of-mass energy of 13 TeV with an integrated luminosity of 138 fb^{-1} is presented. The observed (expected) significance is 5.6 (4.7) standard deviations. Events are selected by requiring exactly two leptons (one electron and one muon) of opposite charge, moderate missing transverse momentum, and a photon. The measured fiducial cross section for $WW\gamma$ is $6.0 \pm 0.8 \text{ (stat)} \pm 0.7 \text{ (syst)} \pm 0.6 \text{ (modeling)} \text{ fb}$, in agreement with the next-to-leading order quantum chromodynamics prediction. The analysis is extended with a search for the associated production of the Higgs boson and a photon, which is generated by a coupling of the Higgs boson to light quarks. The result is used to constrain the Higgs boson couplings to light quarks.

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