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Physical Review Letters

Volume 121, Issue 14, 4 October 2018, Article number 141801

## Observation of the $Z \rightarrow \psi + -$ Decay in $pp$ Collisions at $s = 13$ TeV

(Article) ([Open Access](#))Sirunyan, A.M.<sup>a</sup>, Tumasyan, A.<sup>a</sup>, Adam, W.<sup>b</sup>, Ambrogi, F.<sup>b</sup>, Asilar, E.<sup>b</sup>, Bergauer, T.<sup>b</sup>, Brandstetter, J.<sup>b</sup>, Brondolin, E.<sup>b</sup>, Dragicevic, M.<sup>b</sup>, Erö, J.<sup>b</sup>, Escalante Del Valle, A.<sup>b</sup>, Flechl, M.<sup>b</sup>, Frühwirth, R.<sup>b,gv</sup>, Ghete, V.M.<sup>b</sup>, Hrubec, J.<sup>b</sup>, Jeitler, M.<sup>b,gv</sup>, Krammer, N.<sup>b</sup>, Krätschmer, I.<sup>b</sup>, Liko, D.<sup>b</sup>, Madlener, T.<sup>b</sup>, Mikulec, I.<sup>b</sup>, Rad, N.<sup>b</sup>,View additional authors [v](#)<sup>a</sup>Yerevan Physics Institute, Yerevan, Armenia<sup>b</sup>Institut für Hochenergiephysik, Wien, Austria<sup>c</sup>Institute for Nuclear Problems, Minsk, BelarusView additional affiliations [v](#)

### Abstract

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This Letter presents the observation of the rare  $Z$  boson decay  $Z \rightarrow \psi + -$ . Here,  $\psi$  represents contributions from direct  $J/\psi$  and  $\psi(2S) \rightarrow J/\psi X$ ,  $+ -$  is a pair of electrons or muons, and the  $J/\psi$  meson is detected via its decay to  $\mu + \mu -$ . The sample of proton-proton collision data, collected by the CMS experiment at the LHC at a center-of-mass energy of  $13$  TeV, corresponds to an integrated luminosity of  $35.9 \text{ fb}^{-1}$ . The signal is observed with a significance in excess of 5 standard deviations. After subtraction of the  $\psi(2S) \rightarrow J/\psi X$  contribution, the ratio of the branching fraction of the exclusive decay  $Z \rightarrow J/\psi + -$  to the decay  $Z \rightarrow \mu + \mu - \mu + \mu -$  within a fiducial phase space is measured to be  $B(Z \rightarrow J/\psi + -)/B(Z \rightarrow \mu + \mu - \mu + \mu -) = 0.67 \pm 0.18(\text{stat}) \pm 0.05(\text{syst})$ . © 2018 CERN, for the CMS Collaboration.

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