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On the optical transient of double white dwarf mergers

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Double white-dwarf (DWD) mergers are relevant astrophysical sources expected to produce massive, highly-magnetized WDs, supernovae (SNe) Ia, and neutron stars (NSs). There are expected to be numerous sources in the sky, but none have been yet detected, evading the most advanced transient surveys (e.g., The Zwicky Transient Facility - ZTF). We characterize the optical transient from DWD mergers, leaving as a central remnant a stable (sub-Chandrasekhar) WD. The expansion and cooling of the merger's dynamical ejecta emits an optical transient peaking at 1-10 d post-merger, with luminosities of 1040-1041 erg s−1. We present light-curves, spectra, and color evolution of the transient. These properties, with the estimated rate of DWD mergers, are consistent with the absence of detection, e.g., by ZTF. More importantly, we show that the Legacy Survey of Space and Time (LSST) of the Vera C. Rubin Observatory will likely detect a few/several hundred per year.

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