A record-breaking energetic dwarf nova outburst hosting a massive white dwarf

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Some accreting white dwarf (WD) systems show dwarf nova (DN) outbursts. These are characterized by an outburst amplitude of a few magnitudes and a duration of days to weeks in optical bands, as explained in the thermal instability model. We report the detailed optical and X-ray observations of the 2021 outburst in MASTER OT J030227.28+191754.5 (hereafter J0302). The X-ray spectrum at outburst maximum showed a ~30 eV blackbody component which we interpret as emission from the boundary layer. Its luminosity suggests the WD mass as 1.15 - 1.34 solar mass, much more massive than the typical WD mass found in DNe. Moreover, the overall optical light curve exhibited an outburst amplitude of 10.2 mag and duration of ~60 d, both are the record-breaking largest and longest among DNe with a highly-evolved donor star. Our analyses suggest that the outburst energetics of J0302 are not explained solely by the effect of its massive WD but that a lower disk viscosity in quiescence provides a natural explanation for both its outburst amplitude and duration. We also discuss the possibility of J0302 leading to an accretion-induced collapse.

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