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The Periodic Signals of Nova V1674 Herculis (2021)

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ABSTRACT

We present time-series photometry during eruption of the extremely fast nova V1674 Herculis (Nova Her 2021). The 2021 light curve showed periodic signals at 0.152921(3) d and 501.486(5) s, which we interpret as respectively the orbital and white dwarf spin-periods in the underlying binary. We also detected a sideband signal at the *difference* frequency between these two clocks. During the first 15 days of outburst, the spin-period appears to have increased by 0.014(1)%. This increase probably arose from the sudden loss of high-angular-momentum gas ("the nova explosion") from the rotating, magnetic white dwarf. Both periodic signals appeared remarkably early in the outburst, which we attribute to the extreme speed with which the nova evolved (and became transparent to radiation from the inner binary). After that very fast initial increase of ∼71 ms, the spin-period commenced a steady decrease of ∼160 ms/year — about 100x faster than usually seen in intermediate polars. This is probably due to high accretion torques from very high mass-transfer rates, which might be common when low-mass donor stars are strongly irradiated by a nova outburst.

Keywords: Cataclysmic variable stars (203) — Classical Novae (251) — Close binary stars (254) — Interacting binary stars (801) — Novae (1127) — Recurrent novae (1366) — Stellar accretion (1578) — Stellar accretion disks (1579)

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