

Triple near-Earth asteroid 2001 SN₂₆₃: Physical models of the primary asteroid and its two satellites

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Radar observations made by the Arecibo observatory on February 12, 2008 revealed two small satellites orbiting the near-Earth asteroid (153591) 2001 SN₂₆₃, making it the first known triple near-Earth asteroid system. Using the delay-Doppler data obtained at Arecibo from February 12 – February 26, 2008 and optical lightcurve data observed from eight different observatories spanning January 12 through March 31, 2008, we have developed physical models of the three components of 2001 SN₂₆₃.

We find that the primary asteroid is spheroidal with an equivalent diameter of 2.50 ± 0.30 km and displays an equatorial bulge. Its sidereal rotation period is 3.4256 ± 0.0002 hours and its pole direction has an ecliptic latitude and longitude of $(-80, 309) \pm 15$ degrees. The larger satellite is elongated and has an equivalent diameter of 0.77 ± 0.12 km. Its sidereal rotation period is 13.439 hours, which is considerably shorter than its orbital period of approximately 6 days. The smaller satellite, which is in a closer orbit around the primary, has an equivalent diameter of 0.43 ± 0.14 km and is likely to be tidally locked to the primary. We find the densities of the primary asteroid, the larger satellite and the smaller satellite to be 1.13 ± 0.15 g/cm³, 1.01 ± 0.41 g/cm³ and 2.27 ± 1.27 g/cm³, respectively. We present shape models and physical properties of each component of the triple near-Earth asteroid 2001 SN₂₆₃.