David Gault – 22 Booker Road, Hawkesbury Heights, N.S.W. Australia

Kuriwa Observatory MPC E28

longitude 150d 38m 27.9s east, latitude 33d 39m 51.9s south, altitude 286m

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Peter Nosworthy – 55 Red Gum Ave, Hazelbrook, N.S.W., Australia

Hazelbrook Observatory

longitude 150d 27m06.5s east, latitude 33d 42m 26.6s south, altitude 648m

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affiliations;

Trans-Tasman Occultation Alliance and Western Sydney Amateur Astronomy Group

(4337) ARECIBO

David Gault and Peter Nosworthy report possible detection of a 9-km diameter satellite of the minor planet (4337) Arecibo, from its occultation of the star UCAC4 323-126197 = Gaia EDR3 4064355353554962304 on 2021 May 19, 17:58 UT.

The observers (Gault and Nosworthy) had a cross-path separation of 0.7km and along path separation of 18km. The observations were obtained using 30cm and 28cm reflectors, Watec 910BD video cameras (which have a response similar to the visual band) and GPS Video Time Inserters used to time stamp the video stream prior to recording to PC hard drives.

Both of their light curves show two occultation events, with all transitions being instantaneous. The light level during all four occultation events was reduced to zero. Their observations are summarised as:

Observer Location (Australia) Chord Lengths

Main body Satellite

Gault Hawkesbury Heights 18.7km 5.6km

Nosworthy Hazelbrook 19.7km 2.6km

The sky-plane separation of the satellite from the main body at 2021 May 19, 17:58 UT was 23.8 mas (35 km), in position angle 91 deg.

The lengths of the main body chords are consistent with the three NEOWISE measurements of the diameter of this asteroid (19.686, 17.840 and 17.704 km). A fit of a circle to the two chords for the satellite indicates a diameter of about 9 km. However the diameter measurement is poorly constrained, with it being within the range of 5 to 15 km.

No other known asteroid or comet was within a radius of 5 arc minutes of (4337) Arecibo at the time of the observation.

The possibility that the observation could be explained by the occultation of two components of a double star is excluded by reason of the complete disappearance of the star during both occultations. If the star was a double star, it would require that one component be brighter than mag 14.4. The limiting magnitude of the two recordings was 15.4 (Gault) and 15.5 (Nosworthy) determined by comparison with four nearby comparison stars in the range of Gaia EDR3 G-band mag 14.90 to 15.47. The asteroid magnitude was 17.0, well below the limiting magnitude of the recording. The complete disappearance of the star during all occultation events indicates the absence of any stellar component brighter than G-band magnitude 14.7, thereby excluding the possibility of the star being a double star.

For a single body to have caused all occultations, it would need to be 48km long, which is inconsistent with the NEOWISE data.