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Radar Shape Modeling of Binary Near-Earth Asteroid (385186) 1994 AW1

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(385186) 1994 AW1 is a potentially hazardous asteroid and the first near-Earth asteroid suspected to be a binary [1,2]. It made a close approach to Earth in July 2015 getting as close as 25 lunar distances on the 15th. This flyby was a great opportunity for observations in photometry [3] and radar.

Continuous-wave (CW) and Delay-Doppler imaging modes were used, first at Goldstone for the 14-19 July period (0.066-0.700 au), and then by Arecibo for 20-30 July (0.075-0.126 au). A range resolution of 150 m was achieved at Goldstone in bistatic configuration with Green Bank Telescope, while monostatic observations in S-band (2380 MHz, 12.6 cm) at Arecibo were obtained at resolutions of 30 m and 75 m. The rotation period of the primary (2.52 h) and orbital period of the secondary (22 h) derived from optical light curves were confirmed by these observations. The primary is about 600 m in diameter and the secondary is about half of the primary's size. A more recent but relatively distant approach (July 8, 2022; 0.11 au) allowed CW spectra to be obtained at Goldstone [4].

We also obtained new light curves on 2023 January 13-24 while it was at $V \sim 16-17$ mag. We used the TRAPPIST-South (I40, Chile) and -North (Z53, Morocco) [5] to gather 10 light curves in total. For four of them, brightness drops indicate mutual events between 1994 AW1 and its satellite.

We then used our radar and optical datasets with SHAPE [6] to perform shape modeling of the primary component. We will present our preliminary 3D shape model, pole coordinates and system density.

References:

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