## Radar detection of binary asteroids

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Radar observations of NEAs have revealed many binary systems, and confirmed others discovered by lightcurve observations. The inherent biases are different and in many ways complementary to photometric observing, making the combination powerful indeed. Radar observations will reveal a binary system nearly independent of viewing geometry. Except during total eclipse of the secondary, the objects will be separated by either range, Doppler frequency or both. Usually, the secondary is rotating synchronously with the orbital period, and usually the orbital velocity and primary rotation velocity are very different. This leads to a very different bandwidth for each object. However, processing at a variety of resolutions can separate the objects very clearly. Down to a size comparable to the resolution (7.5-15m) the secondary can be detected, except when it happens to fall at the same range as the primary, and the images may be superposed. Images from the next day will generally separate the two objects again. We look up to several tens of radii from the primary for secondary objects. The detection limit is not otherwise dependent upon separation distance, but may be biased against possible fast rotating secondaries. Radar observations would not detect a binary system if viewed with the orbit plane face-on, but with sky motion of tens of degrees, this situation would change enough in a day (2.5 hours at Arecibo) or by the following day to allow detection. In the case of Hermes, where two similar-sized objects are in synchronous mutual orbits, the radar observations clearly showed the separation of the objects. Most of the radar observations have been made at Arecibo, but when the object is beyond the declination limit, and high enough signal-to-noise ratio, the Goldstone radar system can follow objects for a longer time per day which helps determine the orbital period with fewer aliasing problems. Implications of the radar detection biases on the discovery rate of near-Earth binary systems will be discussed.