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NEO Characterization

NEO RADAR OBSERVATIONS IN EUROPE

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ABSTRACT

We present preliminary results of NEO radar observations carried out by European radio telescopes in the wake of the ESA project “NEO observation concepts for radar systems”, in which INAF, SpaceDyS, and the University of Helsinki were involved. The project was aimed to derive the functional requirements of a radar system, evaluate the available European assets to perform NEO radar observations and carry out some test radar campaigns, with successful experiments performed on asteroids such as 2021 AF8, 2016 AJ193 and 4660 Nereus - all in collaboration with JPL (DSS-14, Goldstone).

After the completion of this pilot project, further observations were planned in order to test a fully Europe-based system. The Madrid MDSCC station was involved, in particular the DSS-63 antenna was employed as the transmitting element (at 7167 MHz). Due to the limited power available at this facility (20 kW), only a small number of targets could be selected for the experiments. On the other hand, the possibility to exploit the large Effelsberg radio telescope on the receiving side, together with the Medicina 32-m antenna, provided the opportunity to achieve higher signal-to-noise ratio and accuracy in the measurements.

Here we focus on the experiment carried out on November 23, 2022 on 2005LW3, a binary asteroid roughly 150 m in size, observed at a distance of about 1.2×10^6 km (3.1 Lunar Distance). Both the Medicina and the Effelsberg dishes detected the radar

echo, well resolving it in the frequency domain. This kind of measurement permits us to derive some important physical properties of the target, such as the rotation period and the near-surface roughness at wavelength scale, and to obtain very accurate range-rate estimation, which is essential to improve the orbit knowledge.

Comments:

(Presenting Author: R. Orosei)