

ASSERT: a CONCERT for Asteroid - Radar Tomography for the Mascot Lander

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Abstract

ASSERT (ASteroid Sounding Experiment by Radiowave Transmission) is a radar to instrument the Mascot lander, which is proposed in the frame of future Near Earth Asteroid missions. This low frequency radar is based on the CONCERT (Comet Nucleus Sounding Experiment by Radiowave Transmission) experiment onboard the Rosetta probe. It is a unique opportunity to sound the internal structure of the target. Its objective is to achieve the tomography of the asteroid, both in transmission and in reflection, in order to determine its fracturing, stratigraphy and heterogeneity at different scales, for a better understanding of accretion and evolution phenomena.

This talk reviews all the aspects of the proposed experiment. The problematics of the NEA is reviewed in order to demonstrate the interest of low-frequency radar sounding. A CONCERT-like bistatic experiment solution is proposed to fulfil the low mass budget constraints. The concept of this tomography between the lander and the orbiter is detailed, including its different operation modes, the measurements, the inversions and the addressed NEA issues.

In the second part, we present the preliminary design of our instrument. This review starts from the existing Consert instrument on board the Rosetta and Philae probes. The main instrument trade offs are presented from the mission characteristics and the proposed target. The electronics are revisited and the

budgets updated, and some antenna designs are proposed for both lander and orbiter spacecrafsts. Finally, a preliminary experiment budget is shown.