Low Frequency Radar (LFR) on the JUVENTAS CubeSat for HERA / ESA mission

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The Low Frequency Radar (LFR) on the JUVENTAS CubeSat for HERA / ESA mission to Didymos Binary Asteroid is a unique opportunity to perform direct measurements of its internal structure and regolith. LFR has been developed to fathom asteroid from a small platform. This instrument is inherited from CONSERT/Rosetta and has been redesigned in the frame of the AIDA and HERA ESA mission.

Onboard JUVENTAS, LFR is operating in monostatic mode to probe down to the first hundreds of meters into the subsurface and to achieve a full tomography of the Didymos' moonlet. Direct observations of the internal structure of asteroids can solve still open basic questions like: Is the body a monolithic piece of rock or a rubble-pile? How high is the porosity? What is the typical size of the constituent blocks? Are these blocks homogeneous or heterogeneous? How is the regolith covering its surface constituted?

The low frequency aboard the Juventas CubeSat will contribute to the solution of these open and for planetary defense crucial questions.
- The first LRF objective is the characterization of the moonlet interior, to identify internal structure and to analyze the size distribution and heterogeneity of constitutive blocks from sub metric to global.
- The second objective is the estimation of average permittivity and mapping of its spatial variation especially in the crater area.
- The same characterization applied to the main of the binary system is among secondary objectives.
- Supporting shape modeling and determination of the dynamical state by radar ranging is a further secondary objective.

This paper will present the instrument concept and measurement strategy, its performances and the expected science return.