

## **PhD project in ASTROPHYSICS (One page)**

**Title of the Project:** Development of techniques and tools for the image processing of radar signals for the observation of planetary bodies: from the subsurface of Mars to asteroids

**DIFA tutor:** Prof. Daniele Dallacasa

**Supervisor:** Roberto Orosei, Istituto Nazionale di Astrofisica, Istituto di Radioastronomia

**Scientific Case:** Radar experiments have been used successfully in the exploration of the Solar System both from orbiting probes and from the ground. The elaboration of the acquired signal allows reconstructing images useful for the characterization and the geological study of the surfaces and the subsoil of solar system bodies. The problems to be addressed concern the correction of distortion effects caused by the ionosphere, the calibration of the data, range and azimuth processing algorithms, and the extraction of quantitative information from the images thus obtained.

**Outline of the Project:** The candidate will learn the basics of these techniques to develop and specialize them according to two projects active at IRA, namely the observation of the subsurface of Mars using the MARSIS radar on board the European Mars Express probe in orbit around Mars, and the feasibility study for the observation of potentially dangerous asteroids for the Earth (Near Earth Objects - NEO) using ground-based radars. This last project will end in the summer of 2021 but will be the premise for a subsequent development phase still to be planned. The candidate should be interested in the study and modeling of electromagnetic propagation, in the implementation of numerical simulations and methods for radio signal analysis, and should have at least basic skills in numerical programming languages (Matlab , IDL, etc.)

**Contacts:** roberto.oroisei@inaf.it