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Processing of altimetric data of CASSINI mission

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Topography is a key characteristic of planetary surfaces and its quantitative topographic evaluation is essential to understand flow such as occurs in volcanic and fluvial processes. Topography is also essential for geophysical probing of the interior of planets.

Cassini mission, that is a joint NASA/ESA/ASI effort, has recently offered the unique possibility of exploring Titan, the largest moon of Saturn. In fact, the smoggy haze, mostly composed of nitrogen, aerosols and a variety of hydrocarbons, that completely envelops the satellite, has made the surface below very difficult to be observed from the Earth with optical images, up to date.

Funded by ASI, CORISTA and Alcatel Alenia Space Italia designed and realized an HW and SW system devoted to process altimetric data for the nominal 4-years mission lifetime (i.e. 45 envisaged flybys of Titan).

This facility offers all the specific instruments needed to process, manage, visualize, archive and disseminate the scientific products containing all the retrieved information about the Titan surface topography, starting from the raw data as delivered by JPL/NASA.

The height retrieval functionality, core of the altimetry processing, is performed by using algorithms, based on *ad hoc* developed mathematical techniques, that are necessary to simulate analytically the average return power waveform, as obtained from the received signal, in order to cope with the particular operating conditions and with the expected occurrence of off-nadir measurements.

This paper provides an overview of the processing chain architecture, in terms of implemented functionalities, component applications and system design. The used algorithm is based on a Maximum Likelihood Estimator (MLE) that allows the fit of the received echoes with theoretical model describing the Radar Impulse Response.

In addition, retrieved topography of the fly-bys performed up to now are shown and commented from a geophysical point of view. The accuracy of achieved results are also given.