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Simulations of bistatic Soundings during the Separation-Descent-Landing Phase for the CoNSERT Instrument aboard Spacecraft "Rosetta"

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The main objective of the "Comet Nucleus Sounding Experiment by Radiowave Transmission" (CoNSERT) is to perform a sounding of the comet 67P/Chuyurmov-Gerasimenko's nucleus. This will be achieved by launching the lander "Philae" onto the surface of the comet. For the sounding it will receive, process and retransmit a radio signal emitted by the orbiter "Rosetta". With data from the first science phase, a three-dimensional model of the comet's nucleus is to be reconstructed.

In order to increase the scientific outcome of the experiment and to collect data beneficial for the main scientific objective, the reconstruction of the comet's core, it may be considered to operate the CoNSERT instrument in other mission phases prior to the first science phase in a monostatic or bistatic radar-like mode. Suitable for this kind of investigations are e.g. the non-mission critical parts of the separation, descent and landing (SDL) phase. The data measured during this phase are echoes from comet's surface and subsurface with which we aim at the creation of an initial dielectric permittivity mapping of the comet's surface, especially around the landing site.

Under consideration of the circular polarization the instrument's antennas, the direct link between lander and orbiter as well as the backscattered echoes from the surface are simulated using a hybrid method-of-moments physical-optics approach for large dielectric bodies, where the radiation patterns for lander and orbiter antennas are computed by the method-of-moments and incorporated in the physical-optics simulation of the backscattered signal. The direct path is computed analytically an superimposed later during the processing.

The influence of the orientation and position of lander and orbiter with respect to the comet on the received signal as well as the influence of the surfaces dielectric permittivity on the backscattered signal are investigated in order to estimate the received signal and validate the possibility of operation during the SDL phase.