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Consert during the Philae Descent

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The CONSERT experiment on board Rosetta and Philae is to perform the tomography of the 67P/CG comet nucleus measuring radio waves transmission from the Rosetta S/C to the Philae Lander and using the 67P nucleus rotation to cover different geometries.

CONSERT will operate during the Philae descent. This geometry strongly differs from the "nominal" bistatic tomography where the orbiter is on the opposite side of the nucleus by regard to the lander. During the descent, CONSERT will measure direct wave propagating from orbiter to lander and waves reflected / scattered by the 67P surface and subsurface. This signal will provide information of the greatest interest for both scientific investigations of 67P and technical operations of Philae.

The landing site position is known a priori with a large ellipse of dispersion due to uncertainties on the Rosetta velocity and Rosetta/Philae separation strength. This dispersion is increased by the difference between nominal and emergency separation strength. An accurate estimation of the landing position as soon as possible after landing is of the greatest interest to optimize Philae operation during FSS. So propagation delay of the direct and reflected waves measured by CONSERT will help to reconstruct the descent geometry in order to more precisely estimate the landing position.

The reflected signal is determined by the surface properties: its dielectric permittivity, its roughness and layering. The signal power inversion will allow to map surface properties especially in the vicinity of the landing site.

This paper details the measurement configuration. It presents the data retrieval based on Monte-Carlo simulation using Metropolis-Hastings algorithm and expected performances for both science and operations.