RLI SIMULATOR: A SOFTWARE TOOL
FOR PLANNING THE RLI RADIOMETRIC EXPERIMENT

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ABSTRACT

The RLI experiment (acronym for *Radiometro Lunare Italiano*, Italian Lunar Radiometer) will be carried out by an Italian team through a sophisticated radiometer that should orbit around the Moon aboard the spacecraft TrailBlazer (the protagonist of the first private lunar mission). RLI module will have the opportunity to perform two important typologies of scientific measures, in two different fields of investigation: the first one will concern the attenuation measurement of RFIs (Radio Frequency Interferences) in SHF band caused by the lunar disk; the second one will investigate on possible lunar atmospheric phenomena in the ULF-ELF-VLF bands wavelengths (e.g. Schumann resonance. In the first order approximation, the Earth-atmosphere system can be seen, from an electromagnetic point of view, as a radial shell of three layers of conductivity. The Earth and the ionosphere in about 100 – 150 km height form a spherical shell of conductivity denoted Earth-ionosphere cavity, in which electromagnetic radiation is trapped). To perform the SHF experiment, RLI will activate its own systems of receipt, data storing and Earth information transmission everytime it will be in favorable orbital conditions. The spatial region that will be interested to this type of investigation has already been denominated "Quiet Cone" by Claudio Maccone, author of some papers on the matter. The difficulties to lead the experiment will be notable. The "Quiet Cone" will not be always aligned according to the favorable orbital positions of the spacecraft. It will need to plan the experiments very in advance through a simulation that calculates a lot of parameters in game. This will be the assignment of "RLI Simulator", simulation software written for the occasion that will provide to calculate all the temporal windows useful to the experiment. In this paper, after a brief presentation of RLI SHF radiometric experiment, we will introduce the Simulator, the various calculation tools included within, the orbital mechanics and radio astronomy matters regarding to the predicted physical phenomenon and some simulations performed through the Simulator on the possible results that this type of radiometric measure can return us.

INTRODUCTION

In early 2003 TransOrbital Inc. asked RLI Team to supply a scientific payload for the TrailBlazer commercial spacecraft, the first private mission to the Moon, in order to carry on a three months experiment along elliptical orbits.

RLI was designed as a low cost payload so its technology could be efficiently, in terms of cost, used in other further space missions (e. g.