

Minutes of meeting on 5.11 NEOtoolkit TOOLBOX FOR A CHARACTERISATION PAYLOAD

This meeting took place on January 31st 2018, on the side of the 10th SMPAG meeting at UN-City in Vienna.

List of Participants (not complete): Pierre Bousquet (CNES), Ozgur Karatekin (ROB), Patrick Michel (Obs. Nice), Ian Carnelli (ESA), Detlef Koschny (ESA), Camilla Colombo (Politecnico de Milano), Daniel Mazanek (NASA)

PB presented the current status

The documentation is based on CNES Apophis study, but also on the Neoshield1, Neoshield2, AIM and HERA studies. The outcomes of a study dedicated to Apophis was already shown in the previous meeting.

Identification of some short notice mission scenarios and specifications. The objectives of the associated characterization mission are discussed.

Main physical parameters needed for each mitigation method is presented by PB. The requirement of some physical parameters such as spin is debated (Question by IC). The importance of chemistry and thermal surface properties for blast was mentioned by Massimiliano Vasile. The need of a clear precision of what is needed and what influence the outcome is underlined.

The modification of ranking of mitigation methods needing smaller to larger number of parameters is proposed by PM. PM mentioned the difficulties to characterize the near subsurface in micro gravity environment for anchoring techniques.

For potential mission scenario, the possibilities of fly-by vs Rendez-vous (RV) is presented. Whether the mitigation method can be fully decided before the characterization mission is argued. Based on initial ground based observations (preliminary info on mass) the possible mitigation methods could be reduced and the final method could be determined following the characterization. The toolbox output shall give the options almost like shopping cards to find the optimal configuration easily without the need to determine the final mitigation method.

Work from Massimiliano Vasile shows that very few targets accessible with $\Delta V < 4$ km/s for RDV missions. Further studies taking into account other parameters such as the gravity assist maneuvers, mission duration and the range of parameters (ΔV) is suggested to provide a more detailed statistical analysis to assess the risk not to access the targets.

Instruments associated to mission scenario are presented by PB. OK proposed to have a more generic name instead of seismic study to include other geophysical investigation such as impacts (Accelerometers), gravity, etc... PB proposes to present the chart in a simpler form composed of two main rows (Fly-by & RV) with possible sub-sets. The feasibility and requirements of Bi-static LF& radar is discussed. **The issue will be addressed to Alain Herique by**

OK. The capabilities of Radio science to detect the mass using fly-bys using simple or multiple spacecraft with/without inter satellite link is mentioned. Detlef suggested to look closer to Rosetta flyby of Lutetia using radio science.

<https://www.sciencedirect.com/science/journal/00320633/66>

The radio science investigation need to be further studied to give precisions under different mission scenarii (OK, IC and JPL will look in more details). The added value of multiple spacecraft fly-by needs to be assessed. If relevant, the requirements of multiple spacecraft fly-by will be provided to CC for mission trajectory analysis.