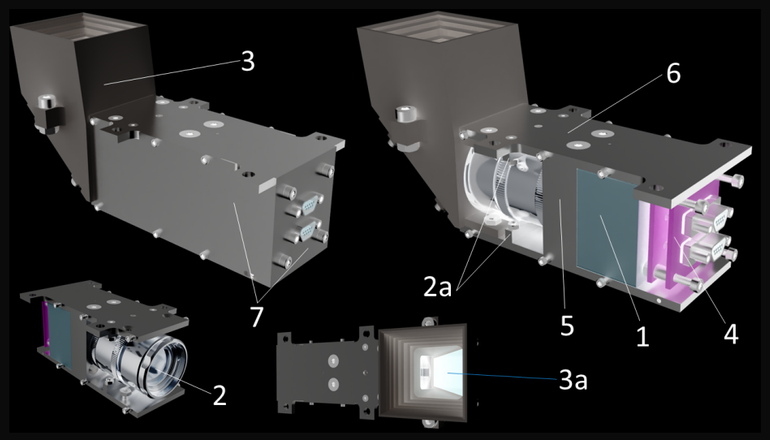
Optical Periscopic Imager for Comets (OPIC) Instrument for the Planned Comet Interceptor Mission

I. Iakubivskyi[1]*, M. Pajusalu[1], J. Kivastik[1], H. Teras[1], A. Nikolajev[1], A. S. Paul[1], U. A. Bhat[1], A. Slavinskis[1]

[1]Tartu Observatory, University of Tartu, Observatooriumi 1, Tõravere, 61602 Estonia; *iaroslav.iakubivskyi@ut.ee

This poster presents an update on the development of the Optical Periscopic Imager for Comets (OPIC) instrument [1], which will be hosted on one of three spacecraft making up the Comet Interceptor ESA–JAXA mission [2]. OPIC is a compact (<0.5 kg) monochromic camera for taking images of the nucleus and coma of either a long-period or dynamically new comet, or an interstellar object for mapping, reconstruction and localisation purposes. The camera will operate in a harsh environment with continuous dust impacts throughout its multi-day operation; therefore, the instrument is equipped with a periscope, which protects optics from high-velocity impacts. The probe is spin-stabilised at 4–15 RPM and will be parked in Lagrange point L2 (launched with ARIEL telescope) and depart at a suitable time to intercept a target at velocity 10–70 km/s. The closest approach is approximately 400 km.

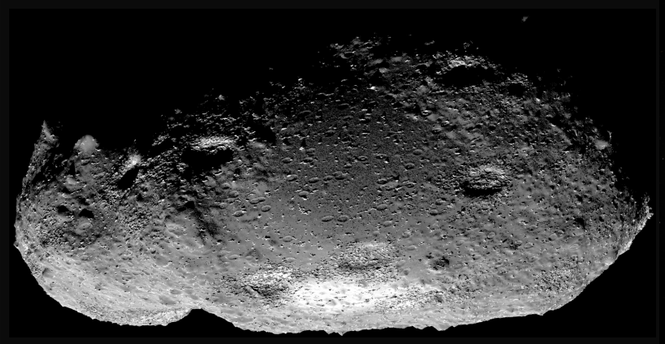
OPIC



1 – Camera head (3DCM734-1 from 3D plus with CMV4000 2048×2048 pixels);
2 – Optical assembly (Kowa LM35JCM-V);
2a – Optical supports;
3 – Periscope assembly;
3a – Mirror;
4 – Data and power interfaces;
5 – C-mount adapter
6 – Interface plane with the probe
7 – Enclosure

SISPO

Space Imaging Simulator for Proximity Operations (SISPO) is a newly developed physically-based space imaging simulator developed by us [3]. It is based on open-source Blender software and its Cycles rendering engine. SISPO is applicable for terrestrial-body mission-oriented operations, such as the design of advanced deep-space missions, the simulation of large sets of configurable scenarios, and the development and validation of algorithms for (semi-)autonomous operations, vision-based navigation, localisation and image processing.



Procedural texture generaion with SISPO on example of Itokawa

Example of OPIC coma image on the spinning probe (mention blur) using SISPO

[1] Pajusalu, M., J. Kivastik, Iakubivskyi, I., and A. Slavinskis (2020). “Developingautonomous image capturing systems for maximum science yield for high fly-by velocity small solar system body exploration”https://dl.iafastro.directory/event/IAC-2020/paper/61048/

[2] Snodgrass, Colin and Geraint H Jones (2019). “The European Space Agency’sComet Interceptor lies in wait”. In:Nature communications10.1, pp. 1–4 https://doi.org/10.1038/s41467-019-13470-1

[3] Pajusalu, M.,Iakubivskyi, I., G. J. Schwarzkopf, T. Väisänen, M. Bührer, O.Knuuttila, M. F. Palos, J. Praks, and A. Slavinskis (2021). “SISPO: SpaceImaging Simulator for Proximity Operations” http://arxiv.org/abs/2105.06771