Light Detection and Ranging (LIDAR) Laser Altimeter for the Martian Moons Exploration (MMX) Spacecraft

Hiroki Senshu (✉ hsenshu@gmail.com)

Planetary Exploration Research Center, Chiba Institute of Technology <https://orcid.org/0000-0001-8381-666X>

Takahide Mizuno

institute of space and astronautical science, japan aerospace exploration agency

Kazuhiro Umetani

Tohoku University: Tohoku Daigaku

Toru Nakura

Fukuoka Daigaku

Akihiro Konishi

Okayama Daigaku

Akihiko Ogawa

IHI Aero Space Company Limited

Hirokazu Ikeda

Japan Aerospace Exploration Agency

Koji Matsumoto

National Astronomical Observatory of Japan: Subaru Telescope

Hiroto Noda

National Observatory of Japan

Yoshiaki Ishihara

Japan Aerospace Exploration Agency

Sho Sasaki

Osaka University

Naoki Tateno

Japan Space Forum

Yasuyuki Ikuse

NEC Corporation

Katsunori Mayuzumi

NEC Corporation

Teiji Kase

NEC Corporation

Hisayoshi Kashine

NEC Corporation

Technical report

Keywords: LIDAR, MMX, Phobos

Posted Date: January 20th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-150346/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published at Earth, Planets and Space on December 1st, 2021. See the published version at <https://doi.org/10.1186/s40623-021-01537-7>.

Abstract

An altimeter is a critical instrument in planetary missions, for both safe operations and science activities. We present required specifications and link budget calculations for light detection and ranging (LIDAR) onboard the Martian Moons Exploration (MMX) spacecraft. During the mission phase, this LIDAR will continuously measure the distance between the spacecraft and its target. The time-series distance provides important diagnostic information for safe spacecraft operations and important information for geomorphological studies. Because MMX is a sample return mission, its LIDAR must accommodate physical disturbances on the Martian satellite surface. This resulted in changes to the optical system design.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the latest manuscript can be downloaded and [accessed as a PDF](#).

Tables

Due to technical limitations, table 1 is only available as a download in the Supplemental Files section.

Figures

Figure 1

Schematic view of the LIDAR receiver and transmitter geometry.

Figure 2

Positional relation between LIDAR main mirror and dust source and the required hood height (h) to protect the mirror.

Figure 3

LIDAR appearance. The hood in front of LIDAR covers the receiver (a Cassegrain-type telescope) and the transmitter. The flat panel on the side of LIDAR is the radiator.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SenshuEtalEPS2021table.xlsx](#)
- [MMXLIDAREMGraphicalAbstract.jpg](#)