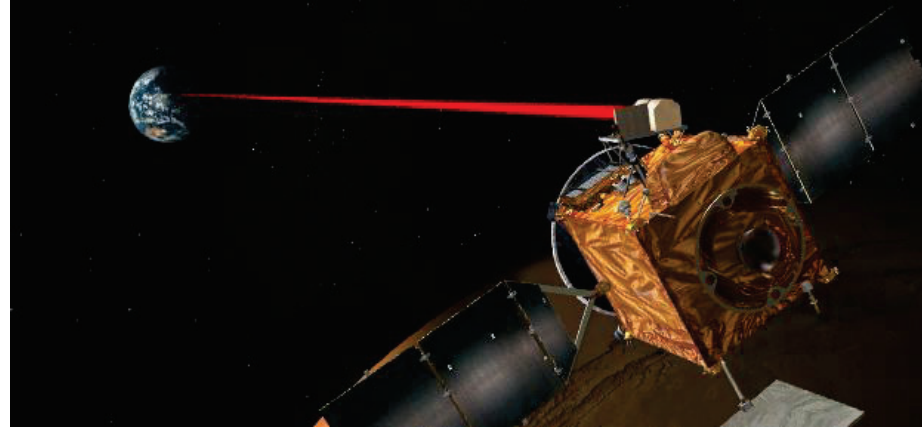


Goal / Objective

- In the vast expanse of space, communication between planets is essential for space exploration and scientific discovery. However, current methods of planet-to-planet communication using radio frequency have limitations, including a limited data rate, high power consumption, and interference from various sources. To overcome these challenges, Team 2 has proposed a new project to develop a space-based, laser communication technology. This project aims to revolutionize space communication by enabling high-speed / high-bandwidth data transfer with low power usage within deep space, and by overcoming the limitations of traditional radio frequency communication. The development of this laser-based communication technology will address a need for reliable and efficient communication systems in space, and facilitate improved space exploration and scientific discovery.
- NASA NTR qualification: YES
- Development of a proof-of-concept prototype, the prototype would be designed to demonstrate the potential of the laser-based communication low power consumption, and high-speed / high-bandwidth data transfer.



Leopold, G. (2017, February 21). *NASA preps for space-based laser communications*. <https://gcn.com/2017/02/nasa-preps-for-space-based-laser-communications/304663/>

Team Overview

- SME: Scott Snider: Lead Space Lasers Engineer at SpaceX - Pending
- SME: Robert Havens: Infrastructure Specialist at SpaceX - Pending
- Gavin Yam: CPP, Aerospace Engineering, Propulsion & Controls
- Luke Lawson: CSULB, Aerospace Engineering, Propulsion
- Brian Tong: Citrus College, Chemical Engineering
- Justin Glass: CSUS, Mechanical Engineering
- Alexa Quinones: Kean University, Chemistry
- Andres Ortiz: UCSD, Electrical Engineering, Photonics
- Abby Caraway: UCF, Aerospace Engineering
- Matthew Heusmann: ASU, Electrical Engineering
- Rishabh Bhandari: UIUC, Aerospace Engineering
- Ramya Sree Javvaji: UMBC, Information Systems
- Kamayani Richhariya: UCSD, Physics
- Tahmid Abdullah: LAVC, Physics
- TX05.1.3 Lasers

Metrics and Key Performance Parameters

SOA RF Communications (TRL 9) (NASA's Deep Space Net)

| Data Rate: | Power Consumption: |
|---|--|
| $\leq 100\text{-}300\text{ Mb/s}$ (Near Earth) $\leq 1\text{-}50\text{ kb/s}$ (Interplanetary) | $\leq 1\text{ kW/h}$ (High Speed link) $\leq 1\text{-}200\text{ W/h}$ (Low Speed) |

Proposed Laser Optical Communications (TRL 1)

| Data Rate: (est.) | Power Consumption: (est.) |
|---|---|
| $\leq 50\text{ Gb/s}$ (Near Earth) $\leq 1\text{ Gb/s}$ (Interplanetary) | $\leq 100\text{ W/h}$ (High Speed link) |

Near Earth and High Speed Link
Data Rate: 250x faster Power Usage: 10x less