**CCSDS Optical Communications (OPT) Working Group**

**Invitation to Industry**

Dear XYZ

The Consultative Committee for Space Data Systems (CCSDS) is a multi-national forum for the development of communications and data systems standards for spaceflight. CCSDS participants include the world’s major space agencies, observer agencies, commercial entities, and academic institutions. The goal of the CCSDS is to enhance governmental and commercial interoperability, while also reducing risk, development time, and project costs. Consensus must be reached by the member agencies before a CCSDS standard can be published.

The CCSDS has established several working groups that focus on specific topics. The Optical Communications Working Group is developing standards for interoperable optical communication systems. Space-based optical communications systems can operate in various scenarios, e.g., via inter-satellite links or links between space vehicles and Earth. The latter must operate through Earth’s atmosphere, and can be severely impacted by weather (clouds, optical turbulence, and other atmospheric parameters); the result is that a typical spacecraft using optical communications to communicate to/from Earth must be supported by several ground stations to overcome weather-related link outages. Thus, international cross support and mutually agreed standards are both vital to facilitate space-based optical communications systems.

The working group would like to obtain technical recommendations from industry and academia for consideration. Your input could consist of a single recommendation, such as a recommendation for a particular modulation, or it could be a proposed “standard” composed of several pages of recommendations. We would like to invite you to an Optical Communications Working Group telecon on **Tuesday, February 21, 13:30h – 16:30h UTC**.

At this telecon we ask that you provide a short presentation (10 min) on how you would like to see the optical links standardized. You will also have the opportunity to pose questions to the working group to obtain clarification on the coherent optical standardization effort. **If you would like to attend the telecon on February 21, please notify Lena Braatz (**[**lena.e.braatz@nasa.gov**](mailto:lena.e.braatz@nasa.gov)**) by February 14, 2023, and provide the names, affiliations, and email addresses of all planned attendees.**

To help you develop your recommendations, Appendix A provides some background information on the Optical Communications Working Group and the standards the group has developed to date. Appendix B describes the coherent optical link scenarios that members of the working group would like to address in a new coherent optical standard.

Sincerely,

**Appendix A: CCSDS Optical Communications Working Group**

The CCSDS Optical Communications Working Group is developing standards for wavelengths, modulations, coding, interleaving, synchronization, and acquisition that are best suited for free-space optical communications systems.

To guide standards development, the working group has been considering various applications of free-space optical communications, including scenarios supporting Earth relay satellites and direct-to-Earth, lunar direct-to-Earth, and deep space direct-to-Earth communications. Just as different RF systems are required to support such very diverse scenarios, different optical communications systems will be needed as well.

To date the working group has developed the following CCSDS books:

1) [CCSDS 141.0-B-1, Optical Communications Physical Layer](https://public.ccsds.org/Pubs/141x0b1.pdf) (Blue Book)

2) [CCSDS 142.0-B-1, Optical Communications Coding and Synchronization](https://public.ccsds.org/Pubs/142x0b1.pdf) (Blue Book)

3) [CCSDS 140.1-G-1, Real-Time Weather and Atmospheric Characterization Data](https://public.ccsds.org/Pubs/140x1g1.pdf) (Green Book)

4) [CCSDS 141.11-O-1, Optical High Data Rate (HDR) Communication – 1064 nm](https://public.ccsds.org/Pubs/141x11o1e2.pdf) (Orange Book)

5) [CCSDS 141.10-O-1, Optical High Data Rate Communications – 1550nm](https://public.ccsds.org/Pubs/141x10.pdf) (Orange Book)

6) [CCSDS 141.1-M-1, Atmospheric Characterization and Forecasting for Optical Link Op.](https://public.ccsds.org/Pubs/141x1m1.pdf) (Magenta Book)

**Appendix B: Scenarios**

It is intended to cover the following link scenarios in the upcoming coherent standard:

1. Orbits: LEO/MEO/GEO  
   Destination: inter-satellite and direct-to-Earth   
   Data-rate: fixed at 100 Gbps  
   Wavelength Division Multiplexing can be used to reach N\*100Gbps
2. Orbits: LEO/MEO/GEO/CIS lunar  
   Destination: inter-satellite   
   Data rate: Dynamic and variable up to 25G  
   Wavelength Division Multiplexing can be used to reach >25G
3. Orbits: LEO/MEO/GEO/CIS lunar  
   Destination: direct-to-Earth/aircraft/HAPS   
   Data rate: Dynamic and variable up to 25G  
   Wavelength Division Multiplexing can be used to reach >25G