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# KEY CHALLENGES IN ESTABLISHING LASER SPACE COMMUNICATION STANDARDS AND RECOMMENDATIONS OF THE SGC SPACE TECHNOLOGIES WORKING GROUP

**Abstract**

Free-space optical communication is promising great potential as a future communication and data link technology for different scenarios such as space-to-space and ground-to-space communication. These scenarios all exhibit different technological challenges given by the diverse environments of the communication paths. Although laser space communication systems have been demonstrated successfully and independently by both the National Aeronautics and Space Administration and the European Space Agency, both agencies have developed their own technologies without establishing common international standards for the interoperability of such communication systems. In order to allow access to this technology to as many stakeholders as possible, standards need to be put in place to facilitate global collaborations amongst the stakeholders on all levels.

During the 16th Space Generation Congress (SGC) of the Space Generation Advisory Council (SGAC) held in Adelaide, Australia in September 2017, the Space Technologies Working Group addressed the topic of interoperable laser communication systems. The working group discussed the application scenarios for optical communication, investigated the hurdles faced in creating common standards and provided recommendations to help overcome these challenges. In this paper, we present the outcomes of these discussions. In terms of the scope of standards, the working group identified that the optimum way forward is to develop systems with compatible infrastructure, so that flexible platforms can operate across multiple standards. The development costs, technical complexity and complexity of negotiations are the key challenges in achieving common standards. To overcome these challenges the working group recommends that the costs should be distributed among all stakeholders, through the creation of joint

programmes, and that the standards should be formulated broadly and with a certain degree of flexibility. The working group also focussed on the mediation between all stakeholders involved in the process of developing the standards. Challenges here include: encouraging industry support, accounting for cultural differences and dealing with the diversity in technological maturity within the industry. As possible solutions, the working group recommends to promote the benefits of standardisation, to hold regular 'in-person' meetings, to establish a dedicated liaison between stakeholders and to use the location of such meetings as a tool to encourage participation.

The recommendations provided in this paper mirror the opinion of the next generation of individuals and experts on the progress of technology for enabling future space exploration, which requires both significant consideration and immediate action so that the technology can be easily developed and quickly matured.