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OPTICAL COMMUNICATIONS FEASIBILITY STUDY FOR SCIENCE MISSIONS LOCATED AT  
SUN-EARTH LAGRANGIAN POINT L2**Abstract**

NASA's Exploration and Space Communications projects division recently completed an investigative study, researching the feasibility of integrating optical communications capabilities onto a science-based mission orbiting at Lagrange Point 2 (L2). Optical communications has been demonstrated and integrated into many low-Earth-orbiting missions, however, using the technology as far as L2 needed to be thoroughly researched and proven similarly as efficient as the mission's planned radio frequency system. The investigation team was charged with assessing the feasibility of including optical communications on the mission without interfering with its primary science objectives. As science and detection technologies become more advanced, data rates and communications requirements continue to evolve. Missions with complex science instruments have a need for more optimized communications capabilities. Optical communications technologies provide NASA and industry missions with increased data rates and quicker response times, allowing scientists to access more data than ever before. Missions utilizing optical communications will have a lighter and more efficient method of transmitting data to users on Earth. The team investigating this opportunity discovered that including an optical communications payload onboard the mission to provide a bi-directional link between the spacecraft and Earth-based ground stations is feasible and reaches data rates that are comparable to, and even exceed, the mission's RF system. In the course of their investigation, the team also discovered significant navigation and ranging benefits provided by the optical communications payload.