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FEASIBILITY ASSESSMENT OF OPTICAL TECHNOLOGIES FOR RELIABLE HIGH CAPACITY FEEDER LINKS

Abstract

Space telecomm scenarios like data relay satellite and broadband/ broadcast service providers require reliable feeder links with high bandwidth/ data rate for the communication between ground station and satellite. Free space optical communication (FSOC) appears as an attractive alternative to microwave links, improving performance by offering abundant bandwidth at small apertures of the optical terminals. At the same time Near-Earth communication by FSOC avoids interference with other services and is free of regulatory issues. The drawbacks however are the impairments by the laser propagation through the atmosphere at optical wavelengths. Also to be considered are questions of eye safety for ground personnel and aviation.

In this paper we assess the user requirements for typical space telecomm scenarios and compare these requirements with solutions using optical data links through the atmosphere. We suggest a site diversity scheme with a number of ground stations and a switching scheme using two optical terminals on board the satellite. Considering the technology trade-offs between three different optical wavelengths we recommend the future use of 1.5 μm laser technology and calculate a link budget for an atmospheric condition of light haze on the optical path. By comparing link budgets we show an outlook to the future potential use of 10 μm laser technology.