

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Near-Earth and Interplanetary Communications (5)

Author: Dr. Morio Toyoshima

National Institute of Information and Communications Technology (NICT), Japan, morio@nict.go.jp

Mr. Hideki Takenaka

National Institute of Information and Communications Technology (NICT), Japan, take@nict.go.jp

Dr. Yozo Shoji

National Institute of Information and Communications Technology (NICT), Japan, shoji@nict.go.jp

Dr. Yoshihisa Takayama

National Institute of Information and Communications Technology (NICT), Japan, takayama@nict.go.jp

Mr. Yoshisada Koyama

National Institute of Information and Communications Technology (NICT), Japan,

koyama.yoshisada@nict.go.jp

Dr. Maki Akioka

National Institute of Information and Communications Technology (NICT), Japan, akioka@nict.go.jp

LINK BUDGET ANALYSIS FOR SMALL OPTICAL TRANSPONDER ONBOARD SMALL
SATELLITES

Abstract

Satellite communications are important to various space-based activities, such as data reception from earth-observation satellites, communication links with manned space stations, and in-orbit operations of space planes. In particular, optical communication systems have various advantages over other types of communications. They have smaller and lighter equipment, higher data rates, larger communication capacities, limited risk of interference with other optical communication systems, and no licensing requirements or tariffs. Recently, the activities on the development of small satellites are very active; however, the small satellite community still uses 9.6-kbps communication links by employing ham radio communications because of resource constraints in the nano-class satellites. The compact terminal can be used in nano-class satellites that have a mass of the order of a few tens of kilograms. In addition, there is a significant advantage with regard to the frequency-licensing problems faced by satellites, and the optical frequency carrier will be very useful to the small satellite community. Therefore, the National Institute of Information and Communications Technology (NICT) has begun to develop a Small Optical TrAnsponder (SOTA) onboard a small satellite, which project is called the Space Optical Communications Research Advanced Technology Satellite (SOCRATES). The link budget analyses between a low earth orbit (LEO) satellite and an optical ground station (OGS), a geostationary earth orbit (GEO) satellite and the OGS, and the LEO and the GEO are performed by assuming the SOTA onboard small satellites. In this paper, the results of the link budget analyses for the SOTA are presented and its application to small satellites is proposed.