

SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Design and Technology for Small Satellites - Part 1 (6A)

Author: Mr. Ahmed Maghawry

National Authority for Remote Sensing and Space Sciences (NARSS), Egypt, amaghawry@narss.sci.eg

SPACE AND GROUND SEGMENTS LINK PERFORMANCE VERIFICATION FOR SMALL
SATELLITE TT&C TRANSPONDERS

Abstract

Verification of low earth orbit (LEO) satellite communication links is required for evaluation and acceptance purposes. Telemetry and telecommand transponder's bit error rate (BER), which is the main communication link parameter to be evaluated, is required to be verified by measurement rather than by analysis. This paper introduces an algorithm for measuring the BER of both space and ground segments. BER could be determined only if a received pattern is compared with a locally generated one. This feature exists for those transponders that utilize direct sequence spread spectrum (DS-SS) technique for purposes of range and range rate measurements, spreading the spectrum, or for security. In this work the space and ground segments' BER verification by measurement is achieved by exploiting the inherent locally generated pseudo random sequences (PRS). The application of this algorithm for measuring the BER of the space segment necessitates sending the information as telemetry parameter just before the end of the communication session. This algorithm requires measuring BER over a large sample of the received chips due to the randomness of the errors. The high chip rate of the employed PRS (around 0.5MHz) and the period of the communication session (7-10 minutes in average) satisfy this condition. This algorithm is applied for measuring the BER for a digitally implemented coherent MSK DS-SS modem and the results for measuring the BER against E_b/N_0 are presented.