

Consultative Committee for Space Data Systems

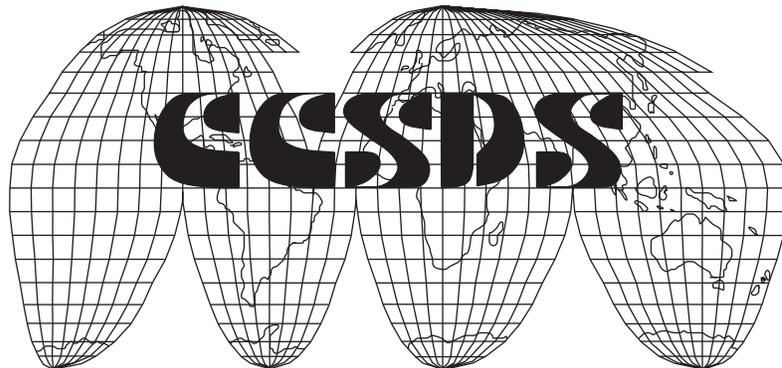
DRAFT RECOMMENDATION FOR SPACE
DATA SYSTEM STANDARDS

PROXIMITY-1 SPACE LINK PROTOCOL— PHYSICAL LAYER

CCSDS 211.1-BP-2.1

BLUE BOOKPINK SHEETS

May 2004December 2004



3.4.4 KA-BAND FREQUENCIES

Ka-Band frequencies are intentionally left unspecified until a user need for them is identified.

NOTE – If such a need arises, users are requested to contact the CCSDS Secretariat at: ccsds@lists.hq.nasa.gov.

3.4.5 POLARIZATION

Both forward and return links shall operate with RHCP.

3.4.6 MODULATION

3.4.6.1 The PCM data shall be Bi-Phase-L encoded and modulated directly onto the carrier.

3.4.6.2 Residual carrier shall be provided with modulation index of $60^\circ \pm 5\%$.

3.4.6.3 The symmetry of PCM Bi-Phase-L waveforms shall be such that the mark-to-space ratio is between 0.98 and 1.02.

3.4.6.4 A positive-going signal shall result in an advance of the phase of the radio frequency carrier. For directly modulated Bi-phase-L waveform,

- a) a symbol '1' shall result in an advance of the phase of the radio frequency carrier at the beginning of the symbol interval;
- b) a symbol '0' shall result in a delay.

3.4.7 DATA RATES

3.4.7.1 Forward and Return Data Rates

The Proximity-1 link shall support one or more of the following 12 discrete forward and return data rates, shown in bits per second: 1000, 2000, 4000, 8000, 16000, 32000, 64000, 128000, 256000, 512000, 1024000, 2048000.

3.4.7.2 Short Term Data Rate Stability

3.4.7.2.1 The short term data rate stability as measured at the output of the Proximity-1 transmitter shall meet the requirements in table 3-3 and paragraph 3.4.7.2.2.

Table 3-3: Short Term Stability Requirements

Symbol Rate (1/T _s)	Short Term Stability Requirement
< 16 Ksps	$ T_{avg} - T_s / T_s < 0.001$ where T _{avg} is the average symbol period over 10 symbols
≥ 16 Ksps	$ T_{avg} - T_s / T_s < 0.001$ where T _{avg} is the average symbol period over 100 symbols

3.4.7.2.2 Generated data symbol rates shall not deviate by more than (plus or minus) 10% from the defined proximity-1 rates as measured at the output of the transceiver and as measured on a symbol-to-symbol basis. Maximum deviation of any given symbol shall be limited to (plus or minus) 10% of the average symbol rate.

3.4.7.3 Data Rate Offset

Generated data symbol rate, measured over an interval greater than 10000 symbol periods, shall differ less than 0.1% from the defined Proximity-1 rates as measured at the output of the transmitter.

3.5 PERFORMANCE REQUIREMENTS

3.5.1 DELIVERED BIT STREAM ERROR RATE

Link margins shall be designed to provide a Bit Error Rate (BER) less than or equal to 1×10^{-6} for asynchronous links.

3.5.2 CARRIER FREQUENCY STABILITY REQUIREMENTS

3.5.2.1 The long term oscillator stability (over the life of the mission) including all effects and over all operating conditions shall be 10 ppm.

3.5.2.2 The short term oscillator stability over 1 minute shall be 1 ppm.

3.5.3 RESIDUAL AMPLITUDE MODULATION

Residual amplitude modulation of the phase modulated RF signal shall be less than 2% RMS.