



Recommendation SFCG 27-1R1

**EFFICIENT SPECTRUM UTILIZATION FOR SPACE RESEARCH
SERVICE, DEEP SPACE (CATEGORY B), FOR SPACE-TO-EARTH
LINKS IN THE 31.8-32.3 GHZ BAND**

The SFCG,

CONSIDERING

- a) that spectrum allocated to space research service (SRS), deep space, space-to-Earth, is limited to 10 MHz in the 2 GHz band (2290-2300 MHz), 50 MHz in the 8.4 GHz band (8400-8450 MHz), and 500 MHz in the 32 GHz band (31.8-32.3 GHz);
- b) that the 32 GHz band will be the primary Category B space-to-Earth link band for high data rate missions;
- c) that the technology and ground support infrastructure for the 32 GHz allocation are available in more than one space agency;
- d) that the technology and ground support infrastructure for high-rate efficient modulations offering similar performance as more conventional modulations are available in more than one space agency;
- e) that future missions being planned are considering symbol rates up to 100 Msps in the near-term and even higher in the long-term;
- f) that on-board advanced power generating technologies and larger ground antennas could enable downlink rates much higher than those which are common today;
- g) that radioscience experiments, such as occultation and gravity mapping, require a spectrally clean residual carrier;
- h) that residual carrier modulations, while spectrally less efficient, have the carrier spectral purity needed to meet radioscience requirements;

- i) that use of residual carrier modulations should be restricted to low symbol rates;
- j) that a 60 MHz bandwidth limitation for links with low symbol rates will allow for accommodation of the number of high and low data rate links in the 31.8-32.3 GHz band expected by SFCG member agencies;

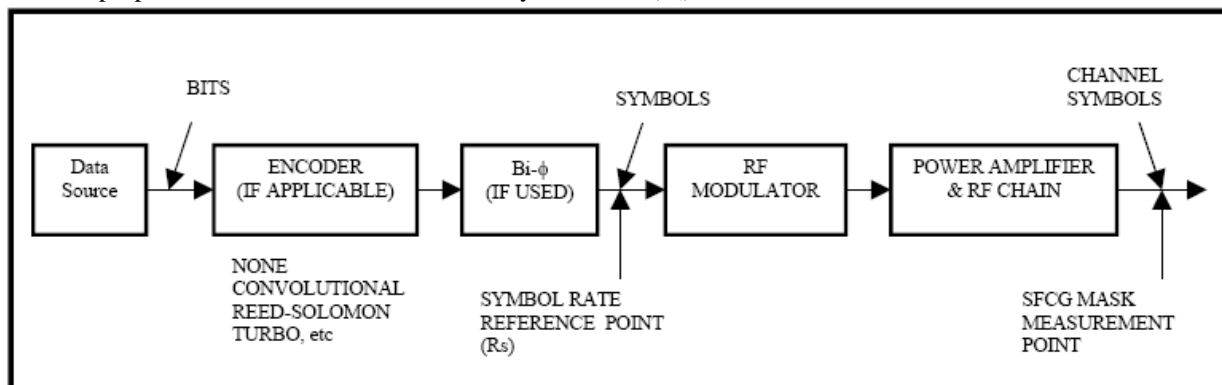
NOTING

- a) that, CCSDS Rec. 2.4.20B recommends efficient modulations for the 32 GHz band;
- b) that, based on current plans, it is not expected that the 32 GHz band will be congested until after 2015;

RECOMMENDS

- 1) that, in the 31.8-32.3 GHz band, links with telemetry symbol rates of 20 Msps or more use bandwidth efficient modulation with spectral efficiency similar to GMSK ($BT_s=0.5$ where $T_s=1/R_s$) for missions planned to be launched after 2015¹;
- 2) that the 20-dB bandwidth² for links with telemetry symbol rates less than 20 Msps not exceed 60 MHz.

¹ For the purpose of this Recommendation, the Symbol Rate (R_s) is defined as:



² The 20-dB bandwidth is the bandwidth of the transmitted telemetry signal beyond which the power spectral density (PSD) remains always below the modulation peak PSD (excluding the residual carrier) by 20 dB.