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 Msp s 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 2015\(^1\);

2) that the 20-dB bandwidth\(^2\) for links with telemetry symbol rates less than 20 Msp s not exceed 60 MHz.

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

\[ R_s = \frac{N_{	ext{bits}}}{T_{	ext{symbol}}} \]

\(^2\) 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.