RECOMMENDATION ITU-R M.1229

PERFORMANCE OBJECTIVES FOR THE DIGITAL AERONAUTICAL MOBILE-SATELLITE SERVICE (AMSS) CHANNELS OPERATING IN THE BANDS 1 525 TO 1 559 MHz AND 1 626.5 TO 1 660.5 MHz NOT FORMING PART OF THE ISDN

(Question ITU-R 112/8)

(1997)

Summary

In this Recommendation, the performance objectives for digital AMSS channels are recommended. The performance objectives are specified for general purpose channels including voice mode and data and signalling mode (up to 9.6 kbit/s), and for store and forward channels.

The ITU Radiocommunication Assembly,

considering

a) that performance objectives for digital mobile-satellite channels using narrow-band modulation and geostationary satellites should include an allowance for interference levels among and within systems operating in the 1-3 GHz range, as well as comply with user requirements for performance;

b) that digital AMSS channels are designed to alternatively operate in data or voice transmission modes, or in-band signalling modes using the same frequencies during the same communications sessions;

c) that reception of signals transmitted to and from mobile earth stations at most locations may be degraded by location and orientation dependant propagation impairments;

d) that the AMS(R)S provides safety communications and its performance objectives are given in Recommendation ITU-R M.1037;

e) that "store and forward" messaging digital mobile-satellite channels using geostationary satellites are generally not sensitive to delay, and therefore are able to use near perfect interleaving in mitigating channel bit error bursts, arising from multipath and light shadowing effects and thus can be operated within the performance objectives specified herein;

f) the aeronautical digital mobile-satellite channels may be used in global or spot coverage beams as part of a worldwide AMSS, in which case stringent satellite power constraints are expected, combined with a minimum elevation angle to the satellite as low as 5°,

recommends

1 that in both directions of transmission through the service and feeder links, the combined radio-link minimum performance objectives for digital channels used by geostationary satellites to serve aircraft earth stations in the AMSS are as follows:

1.1 for "general purpose" digital AMSS channel (user rates up to 9.6 kbit/s):

1.1.1 a bit error ratio (BER) after error correction better than 5×10^{-3} in the voice mode for 90% of the available time;

1.1.2 a BER after error correction better than 1×10^{-5} in the data and signalling mode for 90% of the available time;

1.2 for "store and forward", messaging digital mobile-satellite channels (up to 600 bit/s user rates):

1.2.1 a BER after error correction better than 1×10^{-5} for 80% of the available time;

1.2.2 a BER after error correction better than 4×10^{-5} for 99% of the available time;

2 that the satellite network capacity should be dimensioned such that the traffic loss due to blockage does not exceed 10% of the offered traffic in the busy hour;

3 that the additional conditions specified in the following notes are part of the performance objectives specified in § 1 and 2.

NOTE 1 – Sporadic shadowing of the signal to or from a geostationary satellite occurs with aircraft earth stations in manoeuvres, or depending on the relative position of the aircraft and satellite.

NOTE 2 – For voice communications, error control techniques may be provided as an integral part of the voice codec processing algorithm, but may also be incorporated in the modem module, or alternatively be partitioned between the modem and codec modules. Therefore, the performance objectives for voice communications should take into account the BER at the codec input.

NOTE 3 – Performance objectives for voice communications are likely to evolve with codec techniques becoming more efficient and with lower transmission rates. Therefore, voice performance objectives in future Recommendations may be stated in terms of actual voice quality (e.g. mean opinion score). Further study is needed on how to define the voice grade, and selecting an evaluation method of low rate voice codecs.

NOTE 4 – For data communication, error control techniques are generally provided as an integral part of the modem. Additional end-to-end error control measures may be implemented to enhance performance for specific user applications. However, for the purpose of this Recommendation, the effects of these user application techniques are not included in the performance objectives.

NOTE 5 – Spatial performance is defined as the cumulative link probably arising from the joint distribution of long-term random variable losses in the link. Percentage of available time reflects the fraction of time the channel is not faded by scintillation, or by multipath where the carrier-to-multipath ratio is less than 10 dB.

NOTE 6 – In the case of backup using a previous generation satellite the BER performance objectives given in § 1 might be achieved for a lower percentage of the time.

NOTE 7 – The effects of aggregate interference from other systems and services should be taken into account in meeting the overall performance objectives of the digital AMSS channel.

NOTE 8 – Further study is required for the necessity of short-term performance criteria to define the relevant BER thresholds and associated percentages of time.

NOTE 9 – For terminals at low elevation angles operating through the “general purpose” aeronautical satellite channel, the BER performance objectives given in § 1 might be achieved for a lower percentage of the time.