

RECOMMENDATION ITU-R M.1038*

**Efficient use of the geostationary-satellite orbit and spectrum in the
1-3 GHz frequency range by mobile-satellite systems**

(Question ITU-R 83/8)

(1994)

The ITU Radiocommunication Assembly,

considering

- a) that the frequency spectrum allocated to the mobile-satellite services (MSS) in the 1-3 GHz range should be used efficiently;
- b) that MSS communications requirements and the number of systems that will fulfil those requirements are expected to grow substantially;
- c) that the spectrum resource used by an MSS system can be characterized in terms of power, bandwidth, space, and time parameters;
- d) that the efficiency with which the spectrum resources are used by an MSS system depends on the degree to which other MSS systems are denied access to the spectrum resource as well as the capacity per unit of spectrum used and area served;
- e) that improvements in the efficiency of established MSS networks can be made only over a long period of time associated with replacement of satellites, mobile earth stations, and operating control systems (see Note 1);
- f) that new or replacement network elements normally employ technologies yielding the highest practical levels of efficiency (see Note 1);
- g) that use of technologies for achieving efficient use of the spectrum and orbit can facilitate coordination of frequency assignments among MSS systems using the same bands,

recommends

1 that, consistent with service requirements, the antennas of geostationary satellites for MSS systems operating at 1-3 GHz be designed in accordance with the following principles:

1.1 the coverage area(s) associated with the mainbeam(s) of an MSS satellite antenna should be confined to the intended service area as far as practicable;

1.2 the gain towards points outside the intended service area should be at the minimum practical levels;

1.3 satellite antennas generating multiple, abutting spot beams should be used where practicable to cover the service area, and the smallest practical beamwidth should be used for the spot beams (see Note 2);

1.4 in cases where adherence with § 1.3 is not practicable, particular emphasis is to be placed on all other provisions of this Recommendation, particularly § 2.1;

* Radiocommunication Study Group 8 made editorial amendments to this Recommendation in 2004 in accordance with Resolution ITU-R 44.

2 that the antennas of mobile earth stations for use with 1-3 GHz geostationary satellites be designed in accordance with the following principles:

2.1 where practical and consistent with particular service requirements, directional antennas should be used with mechanical or electrical steering of the mainbeam and relatively low gain outside the intended pointing direction of the mainbeam;

2.2 in networks where non-directional antennas are used, special emphasis is to be placed on conformance with other provisions of this Recommendation, and in particular, § 1;

3 that modulation techniques for 1-3 GHz MSS systems be selected in accordance with the following principles:

3.1 the data rates produced by source coding and error correction coding should be at the minimum practical levels in systems using digital modulation, consistent with the desire to minimize the transmitter power requirements for mobile earth stations and the extent to which error correction capabilities may enable frequency re-use or sharing;

3.2 in cases where analogue modulation is employed, the minimum emission bandwidth should be used consistent with the extent to which use of wider than the minimum bandwidth may enable frequency reuse or sharing;

3.3 in the space-to-Earth transmission direction, noting spectrum is a scarce resource, the principles of § 3.1 and 3.2 should be observed even in the case where it is desirable to increase satellite transmission capacity where capacity is limited by the available transponder power;

4 that multiple access provisions be designed to yield the maximum practical channel loading (see Note 3);

5 that transmission systems for 1-3 GHz MSS networks be designed with power levels that are sufficiently high to provide margins for fading and the level of interference that may occur with the necessary frequency sharing;

6 that the following Notes be considered part of this Recommendation.

NOTE 1 – This Recommendation provides guidelines for the design and operation of all mobile satellite systems using geostationary satellites in the 1-3 GHz range. Although practical considerations may limit the extent to which the *recommends* can be observed in existing systems, more efficient design and operating provisions should be implemented in these systems at the earliest possible time.

NOTE 2 – Systems providing service to most of the area visible from the selected orbital location may require use of Earth-coverage antennas. In such cases, it is helpful to also employ spot beams for service to areas of high telecommunications traffic and to minimize the amount of spectrum used via the Earth-coverage antenna.

NOTE 3 – The minimum possible channel spacing should be used in networks using frequency division multiple access (FDMA) unless greater spacing in conjunction with channel interleaving improves internal frequency re-use efficiency or the efficiency of sharing with another network.
