

RECOMMENDATION ITU-R M.632-3*

TRANSMISSION CHARACTERISTICS OF A SATELLITE EMERGENCY POSITION-INDICATING
RADIO BEACON (SATELLITE EPIRB) SYSTEM OPERATING
THROUGH GEOSTATIONARY SATELLITES IN THE 1.6 GHz BAND

(Question ITU-R 90/8)

(1986-1990-1994-1997)

Summary

This Recommendation contains the transmission characteristics of a satellite EPIRB system operating through geostationary satellites in the 1.6 GHz band. This Recommendation is intended to facilitate the popularization of satellite EPIRB systems practically without sacrificing the system performance.

The ITU Radiocommunication Assembly,

considering

- a) that satellite EPIRBs are one of the prime alerting means in the Global Maritime Distress and Safety System (GMDSS) adopted by the International Maritime Organization (IMO);
- b) that the satellite EPIRB system operating through geostationary satellites in the 1.6 GHz band is one of two satellite-based distress alerting systems developed for use in the GMDSS;
- c) that all ships to which Chapter IV of the International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended in 1988, applies are required by Regulation IV/7.1.6 to carry a satellite EPIRB from 1 August 1993;
- d) that SOLAS Regulation IV/7.1.6 permits the carriage of a satellite EPIRB operating through the Inmarsat geostationary-satellite system, subject to the availability of appropriate receiving and processing ground facilities for each ocean region covered by Inmarsat;
- e) that pre-operational demonstrations have been satisfactorily completed;
- f) that the IMO has adopted Resolution A.661(16) – Performance standards for float-free satellite EPIRBs operating through the geostationary Inmarsat satellite system on 1.6 GHz;
- g) that ships to which the 1974 SOLAS Convention does not apply will use elements of the GMDSS, including satellite EPIRBs, some of which may not meet all of the requirements established by the IMO in Resolution A.661(16);
- h) the necessity to make available satellite EPIRB production units, and to gain operational experience within the remaining time-frame;
- j) that the frequency band for satellite EPIRBs available through the first generation Inmarsat space segment is 1 644.3-1 644.5 MHz;
- k) that the second generation Inmarsat space segment, which is planned to commence operation from 1990 onwards, will cover both the band 1 644.3-1 644.5 MHz and the band 1 645.5-1 646.5 MHz;
- l) that the number of potential users, including non-Convention ships, cannot yet be estimated;

* This Recommendation should be brought to the attention of the International Maritime Organization (IMO), the International Civil Aviation Organization (ICAO), and the International Mobile Satellite Organization (Inmarsat).

Note by the Secretariat: The current version of this Recommendation has been incorporated by reference in the Radio Regulations (RR) as revised by the World Radiocommunication Conference, 1995 (WRC-95). According to *resolves 1* of Resolution 28 (WRC-95), the next Radiocommunication Assembly shall communicate to the WRC-97 the list of the ITU-R Recommendations incorporated by reference in the RR which have been revised and approved.

m) that the amount of spectrum for the 1.6 GHz satellite EPIRB system necessary to meet the presently foreseen operational capacity requirements is probably not greater than 200 kHz,

recommends

- 1 that the transmission characteristics of all types of satellite EPIRBs operating through geostationary satellites at 1.6 GHz should be in accordance with Annex 1;
- 2 that the transmission frequencies of satellite EPIRBs be distributed uniformly across the frequency band appropriate to the space segment in use;
- 3 that the operational implementation of the 1.6 GHz satellite EPIRB system as it applies to the second and subsequent generations of the Inmarsat space segment be initiated in the spectrum between 1 645.6 and 1 645.8 MHz;
- 4 that until all satellites of the Inmarsat first generation space segment (spare and operational) are completely replaced, all types of satellite EPIRBs in the 1.6 GHz band will transmit sequentially on both 1 645.6-1 645.8 MHz and 1 644.3-1 644.5 MHz.

ANNEX 1

Transmission characteristics of a satellite emergency position-indicating radio beacon (satellite EPIRB) system operating through geostationary satellites in the 1.6 GHz band

Modulation:	non-coherent binary frequency shift keying (FSK)
Transmit frequency:*	within the bands 1 644.3-1 644.5 MHz (Inmarsat first generation space segment) and 1 645.5-1 646.5 MHz (Inmarsat second generation space segment)
Deviation:	-120 Hz (0) + 120 Hz (1) tolerance $\pm 1\%$
Accuracy of clock frequency:	$\pm 2 \times 10^{-6}$ /year (This requires a clock accuracy of $\pm 2 \times 10^{-7}$ /year in the receiver processor)
Transmit frequency:	
– long-term accuracy (for 1 year):	better than $\pm 3 \times 10^{-6}$
– short-term stability:	2×10^{-8} for 1 min
FSK switching time:	80% transmit power within 1.5 ms
Transmit power (e.i.r.p.):	0 dBW with tolerance +2 to -3 dB
Antenna:	Hemispherical in pattern
Antenna axial ratio:	≤ 5 dB for $\pm 90^\circ$ from zenith
Polarization:	right-hand circular
Frame length:	
– data:	100 bits (see Appendix 1)
– synchronization:	20 bits (see Appendix 1)
– parity bits:	40 bits (see Appendix 2)

* Until all satellites of the Inmarsat first generation space segment (spare and operational) are completely replaced, all types of satellite EPIRBs will transmit sequentially on both frequency bands of the Inmarsat first and subsequent generation space segments.

Code: NRZ-L

Modulation rate: 32 Bd

Total transmission duration: 40 min (150 min) (see § 7 of Appendix 3)

Number of transmissions: 4 (see Appendix 3)

NOTE 1 – The total transmission duration will be reduced to 20 min (75 min) (see § 7 of Appendix 3) (see also § 5 of Appendix 3) when all first generation satellites have been replaced.

APPENDIX 1

TO ANNEX 1

1 The following items, listed in the preferred priority order for entry and read-out, should be included in distress messages to the extent practicable and necessary:

TABLE 1

Content of distress message

Item	Content of distress message	Number of bits
1	Ship station identity	30
2	Position coordinates and information in the following order:	
2.1	Latitude in degrees and minutes ⁽¹⁾	14
2.2	Longitude in degrees and minutes ⁽¹⁾	15
2.3	Time of position up-date ⁽²⁾	11
3	Nature of distress	4
4	Course	9
5	Speed	6
6	Time of activation ⁽³⁾	11
7	Assistance desired and any other information which might facilitate the rescue ⁽⁴⁾	

(1) For implementation reasons the order in which items 2.1 and 2.2 are transmitted on the radio path is given in Tables 2 and 4 and Fig. 1.

(2) The time of receipt of an alert is added by the digital receiver processor.

(3) Where a GPS receiver is built in as an integral part of the EPIRB, this field may be omitted. The 11 bits thereby released may be used to enhance the accuracy of reported position as given in Table 4.

(4) Item 7 may be included with the data sent in item 3, if necessary.

2 The format of the transmitted message and string is shown in Table 2 and Fig. 1.