REPORT ITU-R M.2127

Example of maritime wideband VHF data system

(2008)

Introduction

This Report describes a wideband VHF data system operated in Norway for the exchange of data and electronic mail in the maritime mobile service. The system is currently in use, covering all 2 400 km of Norwegian coastline.

The main maritime VHF data system in Norway is narrowband (see Recommendation ITU-R M.1842, Annex 2), but this wideband system is an option that is offering higher data speed transfer for users with more demanding requirements. A modification of this system is under development to meet the requirements of Recommendation ITU-R M.1842.

The system is operating on frequencies specified by footnote o) in Radio Regulations Appendix 18.

1 General characteristics of the wideband VHF data system

1.1 The system is operating duplex on nine combined 25 kHz channels, resulting in a 225 kHz band. Actual bandwidth usage is dependent upon the data exchange transmission speed required.

1.2 The modulation is 2-level GMSK. Transmit bit rate is 133 bit/s.

1.3 The class of emission is 150KF1DAN.

1.4 The access method is time division multiple access (TDMA).

1.5 The following area coverage techniques are used:

– Cellular channel reuse

– Time sharing transmission.

1.6 The following handover techniques are utilized:

– Uninterrupted handover (channel and base station)

– Uninterrupted file transfer.

1.7 Emissions are vertically polarized at the source.

1.8 Switching between reception and transmission should not take more than 5 ms.

1.9 The serial communication channels (SCC) on a single radio modem should be:

– Ethernet

– RS232 (NMEA)

– IEC 61162.

1.10 The radio equipment meets the following norms:

– Radio parameters: ETSI EN 300 113-1, ETSI EN 300 908-9

– EMC: ETSI EN 301 489-5, IEC 60945.

2 Transmitters

2.1 The frequency tolerance for coast station transmitters should not exceed five parts in 10^6, and that for ship station transmitters should not exceed ten parts in 10^6.

2.2 The carrier power for coast station transmitters should not exceed 50 W.

2.3 The carrier power for ship station transmitters should not exceed 25 W.

2.4 The cabinet radiated power should not exceed 25 µW.

3 Receivers

3.1 The receiver sensitivity for bit-error rate (BER) 10^{-3} should be better than –105 dBm.

3.2 The adjacent channel selectivity should be at least 70 dB.

3.3 The spurious response rejection ratio should be at least 70 dB.

3.4 The radio frequency intermodulation rejection ratio should be at least 70 dB.

3.5 The power of any conducted spurious emission at the antenna terminals should not exceed 2.0 nW.

4 Possibilities and advantages

4.1 Coverage and stability

The VHF band has very good qualities regarding range and stability. Typical range from a land-based station is up to 70 NM (130 km).

4.2 IP – Ethernet

The common used Ethernet protocol makes connection to local data networks and other data services easy.

4.3 Fixed IP address at the radio on board the ship

This makes it possible to send data to the ship without any need to activate the link. The ship may also have 10 local IP addresses.

4.4 Always connected

There is no connection time. This makes the system very effective for real time applications, e.g. banking terminals.

4.5 Several services in parallel form one radio on the ship

The system is based on packets all the way. From one radio onboard the ship one may carry out several different services at the same time. The system is therefore frequency efficient.

4.6 Automatic reconnection after disruption

The system will reconnect automatically and continue the tasks again at the right point. This happens both after short breaks as well as after long breaks, e.g. when returning into radio coverage area.

4.7 Integrated data router

The radio is fitted with an integrated router. It means that tasks may be programmed directly into the radio and may be carried out without the use of a PC. For example, a fishing boat positioning and movement report system may be programmed into the radio/router. In addition, the router has a very large capacity to carry out several tasks, e.g. compression and decompression of electronic mail, web applications and weather maps.

4.8 Several inputs to the radio

Ethernet cable may be plugged directly into the radio or the router, enabling easy establishment of a local net on board the ship. Other digital or analogue inputs may be used for GNSS, measuring instruments, etc.

4.9 Connection to local WLAN

The system may be combined with local wireless networks on board the ship.

4.10 External communication carriers

The system may be delivered with possibilities for seamless connection to external networks, e.g. wireless LANs in harbour areas or to satellite communications.

5 Applications

Some current and possible future applications of VHF Data are listed below:

– Safe SeaNet reporting (ISPS)
– Fishery catch reporting
– Fishing boat position and movement reporting
– Weather maps
– General electronic mail
– Messages to the ship’s agent, the pilot or harbour authorities
– Safety related information
– Telemetry information
– Updating of electronic maps.

6 System interoperability

6.1 Ship-to-shore

In the ship-to-shore direction interoperability is maintained by the internet service provider (ISP) at internet protocol (IP) level. Typically, a ship will feed an electronic mail, with or without attachments, into the electronic mail system and then click on the “send” button.

6.2 Shore-to-ship

In this system, there are no interoperability concerns on the part of the shore-side user. The shore-based sender of an electronic mail to a ship can merely:

a) click the “reply” button, or

b) address the message to Shipname@xxx.com or Callsign@xxx.com.

6.3 Delivery of messages

The electronic mail will be delivered via whatever system the ship is using. If there is a system failure, there will be an automatic re-route via an alternate system. These automated decisions are based upon the contents of an extensive database. Consequently, the electronic mail may be delivered via HF or a satellite-based system. If there is an overall system failure, addressing problem, or non-delivery for any reason, the system support operators will be alerted and take corrective action. This ensures that shore-based users need not be concerned about what system or network the ship is using; they need only address the electronic mail and click the “send” button.

7 Technical management of the wideband VHF data system

7.1 The wideband VHF data system is always used in combination with the narrowband VHF data system (VHF channel 63). The wideband radio on board the ship is kept in listening mode until the existence of wideband net is detected through the narrowband net. In this way the channel loading is limited considerably.