

## Executive Summary

The Coast Guard funded the National Telecommunications and Information Administration (NTIA) to perform electromagnetic compatibility (EMC) tests between an ITU-R M. 825-3 (*Characteristics Of a Transponder System Using Digital Selective Calling Techniques for Use with Vessel Traffic Services and Ship-to-Ship Identification*) based Automatic Identification System (AIS) operating on 12.5 kHz channels and Public Correspondence (PC) Systems operating on 25 kHz channels. The tests were performed between January 17-28, 2000 in and around an AIS base station communications tower located at Point Ala Hache, La. by NTIA, SETA Corporation, and Coast Guard personnel.

AIS is a shipborne transponder-based navigation safety system that serves as the foundation for the Vessel Traffic Service (VTS) being established in New Orleans and elsewhere by the Coast Guard under the Ports And Waterway Safety System (PAWSS) project. AIS is based on technical standards established by the International Telecommunication Union (ITU). The current implementation in New Orleans is based on ITU-R Recommendation M.825-3. This will be updated in the future to the standard for Universal Shipborne AIS, ITU-R M. 1371 (*Technical Characteristics for a Universal Shipborne Identification System Using Time Division Multiple Access In the VHF Maritime Mobile Band*). Transponders that are fully compliant with ITU-R M. 1371 are not currently available. AIS facilitates the efficient exchange of data between ships and between shore stations and ships. AIS responds to the mariners' need for timely, relevant and accurate information (including data on ships position, speed, etc) delivered in an unobtrusive manner. AIS requires dedicated frequencies in order to operate safely and reliably.

AIS requires duplex channels for ship-to-shore and shore-to-ship digital data transmissions and simplex channels for ship-to-ship operations. Frequencies selected for AIS must come from Appendix 18 of the International Radio Regulations (between 156.025-157.425 MHz and 160.625-162.025 MHz).

Of the 35 duplex channels listed in Appendix 18 of the ITU Radio Regulations, only nine remain for consideration for potential AIS operations in the United States due to past U.S. regulatory decisions. These nine 25 kHz duplex channels are currently utilized within the VHF marine Public Correspondence (PC) Band, and designated as channels 24, 84, 25, 85, 26, 86, 27, 87, and 28. To obtain additional AIS frequencies, the U.S. must utilize techniques outlined in ITU-R M. 1084-3 (*Interim Solutions for Improved Efficiency In The Use of the Band 156-174 MHz by Stations In the Maritime Mobile Service*) regarding the use of 12.5 kHz interstitial channels that are interleaved between existing 25 kHz wideband channels.

AIS and Public Correspondence systems both use duplex channels in the maritime mobile VHF band for communications between a mobile unit and a base station, which results in five interference scenarios occurring between the two systems. The four interference scenarios tested were: 1) an AIS base station causing interference to a PC mobile radio receiver; 2) a PC base station causing interference in a AIS transponder receiver; 3) an AIS transponder causing interference in a PC base station receiver; and 4) a PC mobile radio causing interference to an AIS base station receiver. At a minimum, 12.5 kHz of frequency separation was used in all tests scenarios between the interfering transmitter and victim receiver. In addition, 25 kHz, 37.5 kHz, 50

kHz and 62.5 kHz frequency separations were also tested. Tests at 25 kHz and 50 kHz frequency separations are not applicable since they would require that wideband Public Correspondence to operate on interstitial channels. These tests were performed to obtain additional results to establish data trends. A fifth test scenario would be required to determine compatibility between ship-to-ship AIS and PC operations, and this was not tested due to the unavailability of suitable equipment. This fifth scenario represents a co-site concern with both AIS and PC systems operating on the same ship. The inability to test the fifth scenario does not alter the conclusions or recommendations given in this report.

Analyses of the results of the four test scenarios offer general guidelines for determining compatibility between AIS operations on interstitial 12.5 kHz channels and Public Correspondence operations on wideband 25 kHz channels.

Analyses of the test results show that, since AIS and PC systems both offer service to mariners on ships and would employ base stations with transmission towers located in the same geographic environment, operating these systems is not practical with 12.5 kHz of frequency separation (i.e., geographical separation distances on the order of 15 to 25 miles are required). Operating the systems in the same geographic environment with a frequency separation of 25 kHz may be possible if the PC system (base stations and mobile radios) were designed for 12.5 kHz channel operations. This would require testing of suitable equipment to verify this specific case. There are no current plans to modify the PC system for 12.5 kHz operation. The PC and AIS systems should be able to operate within the same geographic environment provided that a minimum of 37.5 kHz of frequency separation is provided between the two systems.

NTIA recommends that the Coast Guard consider: 1) Developing an AIS frequency coordination plan for the lower Mississippi River for the PC and AIS systems that will ensure mutually compatible and satisfactory operations. 2) Performing additional EMC testing between ship-to-ship AIS and PC operations. 3) Performing EMC tests between PC systems and ITU-R. M 1371 compliant AIS equipment when such equipment becomes available, 4) Pursuing necessary regulatory changes to improve AIS and PC operations in the same geographical area (e.g., including a 12.5 kHz channelization plan for both AIS and PC operations and developing appropriate receiver standards).