

406-406.1 MHz

1. Band Introduction

In the 406-406.1 MHz band, the National Oceanic and Atmospheric Administration (NOAA) operates polar orbiting and geostationary satellites that carry Search and Rescue Satellite (SARSAT) payloads providing distress alert and location information to appropriate public safety rescue authorities for maritime, aviation, and land users in distress. The satellites receive distress alert and location information from low-power Emergency Position-Indicating Radio Beacon (EPIRB), Emergency Locator Transmitter (ELT), and Personal Locator Beacons (PLBs) transmitters.¹ These satellites then transmit the location information to earth station receivers where the information alerts appropriate public safety rescue authorities.

2. Allocations

2a. Allocation Table

The frequency allocation table shown below is extracted from the Manual of Regulations and Procedures for Federal Radio Frequency Management, Chapter 4 – Allocations, Allotments and Plans.

Table of Frequency Allocations

United States Table

Federal Table	Non-Federal Table	FCC Rule Part(s)
406-406.1 MOBILE-SATELLITE (Earth-to-space)		Maritime (80) Aviation (87) Personal Radio (95)
5.266 5.267		

2b. Additional Allocation Table Information

5.266 The use of the band 406-406.1 MHz by the mobile-satellite service is limited to low power satellite emergency position-indicating radio beacons (see also Article 31 and Appendix 13).

5.267 Any emission capable of causing harmful interference to the authorized uses of the band 406-406.1 MHz is prohibited.

¹ EPIRBS support maritime use, ELTs support aviation use, and PLBs support land-based applications.

3. Federal Agency Use

3a. Federal Agency Frequency Assignments Table

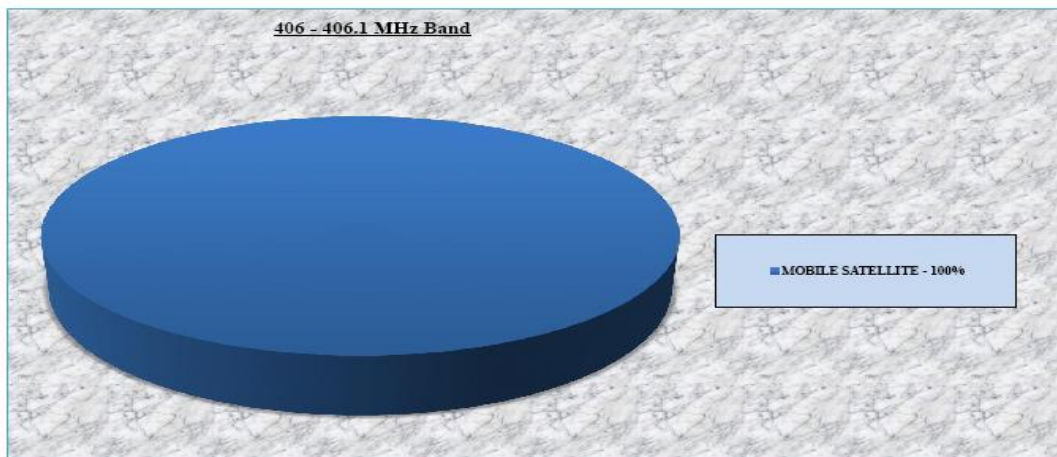
The following table identifies the frequency band, type(s) of allocation(s), types of application, and the number of frequency assignments by agency.

Federal Frequency Assignment Table

406 – 406.1 MHz Band					
SHARED BAND					
AGENCY	MOBILE-SATELLITE (Earth-to-Space)				
	TYPE OF APPLICATION				
	MOBILE SATELLITE				TOTAL
AF	1				1
DOC	2				2
NASA	4				4
TOTAL	7				7
<p>The number of actual systems, or number of equipment, may exceed and sometimes far exceed, the number of frequency assignments in a band. Also, a frequency assignment may represent, a local, state, regional or nationwide authorization. Therefore, care must be taken in evaluating bands strictly on the basis of assignment counts or percentages of assignments.</p>					

3b. Percentage of Frequency Assignments Chart

The following chart displays the percentage of frequency assignments for the systems operating in the frequency band 406-406.1 MHz.



4. Frequency Band Analysis By Application

Mobile-Satellite

In the mobile-satellite service, polar orbiting and geostationary weather satellites of the Department of Commerce's NOAA operate SARSAT systems to detect radio distress signals. Various types of fixed and mobile earth stations equipped with emergency beacons transmit distress signals to the satellites during emergency. Upon receiving the signal, the satellites then transmit using the frequency 1544.5 MHz and provide location information within 2-5 kilometers resolution.

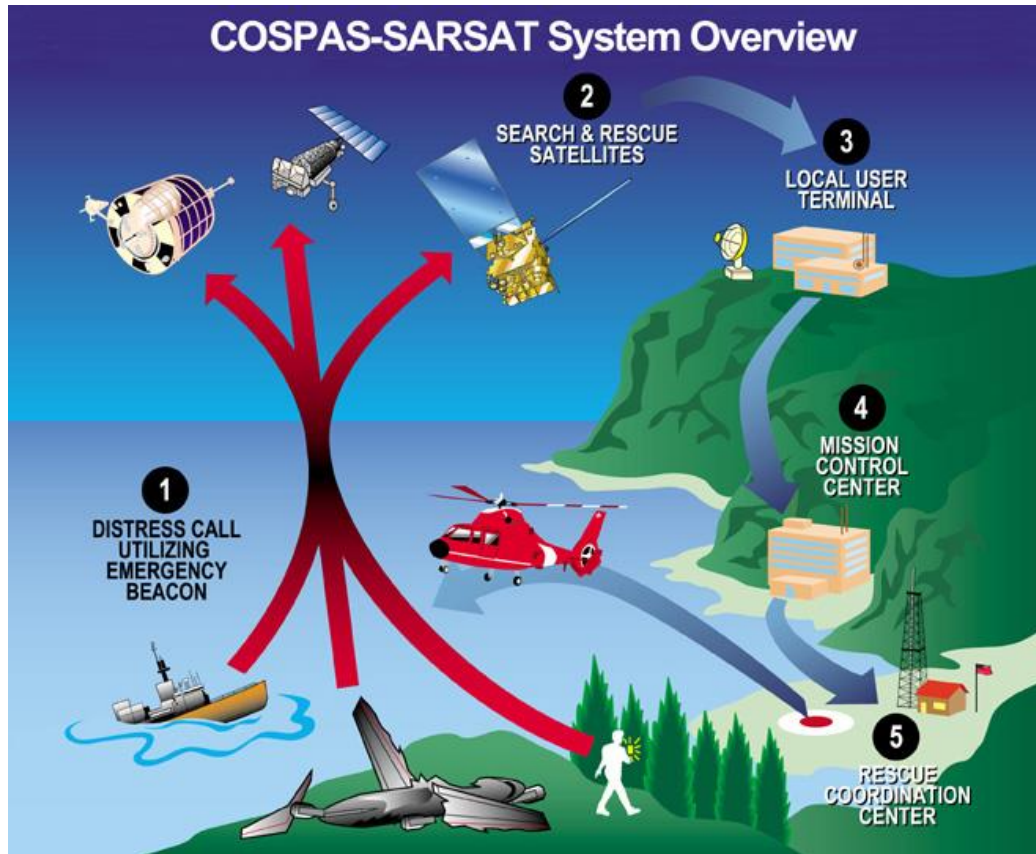


Figure 1. Global Satellite System for Search and Rescue

Figure 1 depicts overview of the SARSAT system. The COSPAS-SARSAT² is an international program operated by the United States, Canada, France, and the Russian Federation. The system precisely locates vessels, airplanes, or people in distress. It operates satellites that receive beacon signals from the vessel or person, and transmit the signal to ground receiving stations, referred to as Local Users Terminals (LUTs). Mission Control Centers (MCCs) receive alerts produced by LUTs process the data, then transmit it to Rescue Coordination Centers (RCCs), Search and Rescue Points Of Contacts (SPOCs) or other MCCs.

The system currently consists of a both a Low-Earth Orbiting (LEO) segment and a Geostationary-Satellite-Orbit (GSO) Segment. The LEO segment consists of the U.S. SARSAT operated by NOAA, and the Russian COSPAS satellites. The geostationary constellation includes the United States GOES series of satellites; Indian National Satellite System (INSAT) series of satellites; and the European Organization for the Exploration of Meteorological-Satellites (EUMETSAT) satellite series. The COSPAS-SARSAT system operated with beacons operating internationally at the frequencies 121.5 MHz, 243 MHz, or 406 MHz called emergency positioning radiobeacons (EPIRBs).

² Cosmicheskaya Sistyema Poiska Avariynich Sudov (Russian) - Search And Rescue Satellite Aided Tracking

All mariners, aviators, and individuals using EPIRBs on those frequencies will need to switch to the newer, more reliable, digital systems operating on 406.025 MHz in order for satellites to detect the signal. The decision to stop processing of the 121.5 MHz and 243 MHz satellite signals resulted from problems with beacons on these frequencies, inundating search and rescue authorities with numerous false alerts providing inaccurate data, and adversely affecting the capability of lifesaving services.

The U.S. Coast Guard (USCG) conducts maritime search and rescue operations. The USCG uses the 121.5 and 406.025 MHz frequencies for localized position determinations. NOAA operates the satellite system, routing maritime alerts to the responsible Coast Guard Rescue Coordination Centers. The National Aeronautics and Space Administration (NASA) uses the 406-406.1 MHz band for verification and calibration of EPIRBs and ELT systems. The Department of Energy (DOE) uses the EPIRB signal during emergencies to track vehicles.

The Radio Regulations designate the 406.025 MHz emergency frequency worldwide for distress use only and. The international COSPAS-SARSAT Program terminated satellite processing of distress signals from 121.5 MHz and 243 MHz EPIRBs and ELTs as of February 1, 2009. Therefore, users of EPIRBs and ELTs that send distress alerts on 121.5 MHz and 243 MHz should begin using EPIRBs and ELTs operating on 406.025 MHz if the alerts are to be detected and relayed via satellites. Mariners, aviators, and other persons will have to switch to EPIRBs and ELTs that operate on 406.025 MHz frequency. The COSPAS-SARSAT 406 MHz frequency management plan includes frequencies ranging from 406.025 MHz to 406.076 MHz. In addition to 406.025 MHz, 406.028 MHz is already in use, and 406.037 MHz will soon be available.³ Furthermore, the International Telecommunications Union (ITU) has established recommendations regarding the interference protection criteria for COSPAS-SARSAT search and rescue instruments operating in the band 406-406.1 MHz.⁴ Figure 2 shows examples of EPIRB and ELT transmitters.

³ The COSPAS-SARSAT frequency management plan is available at: www.cospas-sarsat.org/download/T12-Nov0402withoutAnnexCandD.pdf; www.cospas-sarsat.org/download/T12-Nov0402AnnexC.pdf; www.cospas-sarsat.org/download/T12-Nov0402AnnexD.pdf.

⁴ ITU-R M. 1478-1, protection criteria for COSPAS-SARSAT search and rescue instruments in the band 406-406.1 MHz.



Figure 2 Emergency Beacon Transmitters

5. Planned Use

In September of 1997, a Canadian study revealed that a constellation of Mid-Earth Orbiting (MEO) satellites could augment the existing COSPAS-SARSAT system by providing improved space-based distress alerting and locating capability. The National Aeronautics and Space Administration (NASA) in coordination with the Global Positioning System (GPS) Program Office, and Sandia National Laboratories, has determined that the GPS constellation would be the best and most cost-effective MEO satellite constellation to host the search and rescue (SAR) instruments. NASA calls this project the Distress Alerting Satellite System (DASS).⁵ The purpose of DASS is to enhance the international COSPAS-SARSAT satellite-aided search and rescue (SAR) system by installing 406 MHz SAR instruments on the GPS MEO navigational satellites and by introducing new ground segment tracking stations and processing algorithms. DASS is expected to enhance current COSPAS-SARSAT operations significantly by providing near-instantaneous detection and location of current and future 406 MHz emergency beacons.

The spectrum requirements for EPIRBs, ELTs, and PLBs operating in the 406-406.1 MHz band used in conjunction with the COSPAS-SARSAT systems will continue for the foreseeable future.

⁵ NASA Goddard Space Flight Center, Space and Rescue Mission Office, Distress Alerting Satellite System (DASS). Available at: <http://searchandrescue.gsfc.nasa.gov/dass/index.html>