



Part 80 Emergency Position Indicating Radiobeacons (EPIRBs) and Part 87 Emergency Locator Transmitters (ELTs)

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**Federal Communications Commission
Office of Engineering and Technology
Laboratory Division**



Scope B3 – Maritime Services EPIRB - New Rulemaking Review

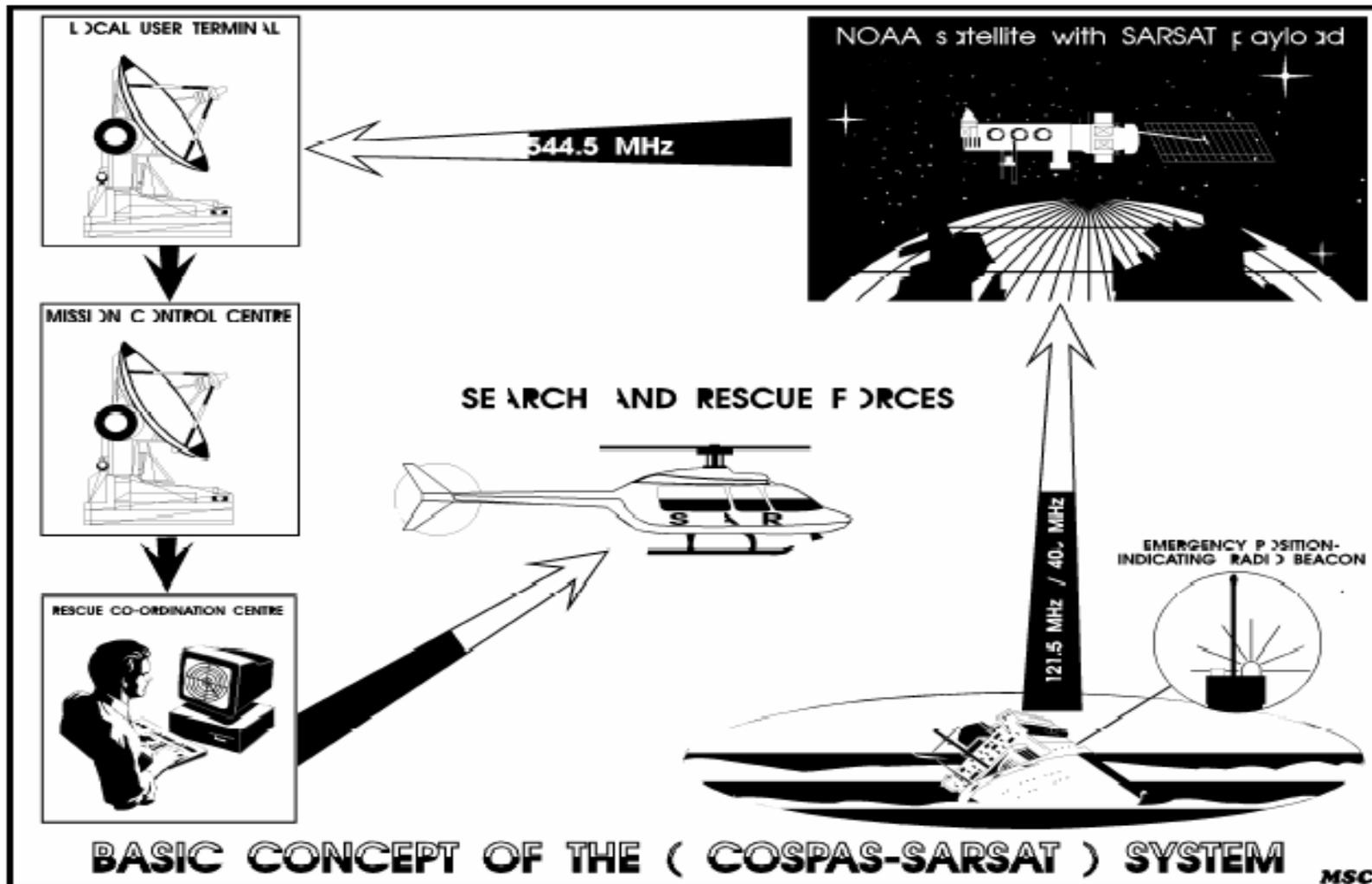
- Second R&O, Sixth R&O, and Second FNPRM (FCC 04-3)
 - authorize domestic use of INMARSAT-E emergency position indicating radiobeacons (EPIRBs) and establish standards for such devices

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-3A1.pdf
- Inmarsat E-EPIRB (1.4 GHz) to discontinue operation after December 1, 2004
 - After 8 years of service only 100 L-Band EPIRBs fitted to GMDSS ships and less than 1300 L-Band EPIRBs fitted worldwide
 - Inmarsat L-Band maintenance contracts expire
 - Other Inmarsat service not affected
- **TCBs can now approve these devices**



Scope B3 – Maritime Services

EPIRB – COPAS-SARSAT





Scope B3 – Maritime Services EPIRB – 406 MHz Frequencies

- 406 to 406.1 MHz Band dedicated to Search and Rescue (SAR) - Earth to Space, Rules now allow equipment authorization anywhere within this band
- 406 to 406.1 MHz is an FCC protected band (Reference FCC 04-75)

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-75A1.pdf



Scope B3 – Maritime Services

EPIRB Types

- Class A - Section 80.1053
 - 121.5/243 MHZ. Float-free, automatically-activating, detectable by aircraft and satellite. Coverage is limited. An alert from this device to a rescue coordination center may be delayed 4 - 6 or more hours. No longer recommended or Granted.
- Class B – Section 80.1055
 - 121.5/243 MHZ. Manually activated version of Class A. No longer recommended or Granted
- **Class C – Section 80.1057**
 - **VHF ch15/16. Manually activated, operates on maritime channels only. Not detectable by satellite. These devices have been phased out by the FCC and are no longer recognized. Grants can still be issued.**
- Class S – Section 80.1059
 - 121.5/243 MHZ. Similar to Class B, except it floats, or is an integral part of a survival craft. No longer recommended or Granted

Note: Subpart 2N - Test Procedure for Class A, B, and S EPIRBs is obsolete since they no longer can be Granted



Scope B3 – Maritime Services EPIRB Categories

- **Category II**
 - 406/121.5 MHZ. Similar to Category I, except is manually activated. Some models are also water activated.
- **Category I**
 - 406/121.5 MHZ. Float-free, automatically activated EPIRB. Detectable by satellite anywhere in the world. Recognized by GMDSS.
- **Include Bracket information for Category I/II in Grant condition**



Scope B3 – Maritime Services EPIRBs – Cospas-Sarsat Satellite

- 121.5 MHz – civilian use
- 243 MHz – military use
- 406-406.1 MHz – vessel/aircraft info. and registration info. from database
- Beginning in 2009, only 406 MHz beacons will be detected by the Cospas-Sarsat satellite system. <http://www.sarsat.noaa.gov/121phaseout.pdf>



Scope B3 – Maritime Services

EPIRBs – System Comparison

	406 MHz Beacon	121.5 MHz Beacon
Signal	Digital: unique identification, registration data provides information on the owner/vessel or aircraft	Analog: no data encoded, higher false alert rate
Signal Power	5 Watts pulse	0.1 Watts continuous
Coverage	Global	Regional
Position Accuracy	Within 5 km (Doppler), 100m if GNSS (GPS) position is encoded in message	Within 20 km (Doppler only)
Alert Time	GEO alert within 5 minutes	Waiting time for LEO satellite pass 45 minutes average
Doppler Position Ambiguity	Resolved at first satellite pass	Two passes required to resolve position ambiguity



Scope B3 – Maritime Services

EPIRBs – International Standards

- **SPECIFICATION FOR COSPAS-SARSAT 406 MHz DISTRESS BEACONS C/S T.001 Issue 3 - Revision 6**
October 2004

<http://www.cospas-sarsat.org/DocumentsTSeries/T1Oct04.pdf>

- **RTCM Recommended Standards for 406 MHz Satellite Emergency Position-Indicating Radiobeacons (EPIRBs), Version 2.1 - purchase paper copy (electronic version not available)**

<https://ssl29.pair.com/dmarkle/puborder.php?show=7>



Scope B3 – Maritime Services EPIRBs – Equip. Authorization

- **TCBs can now approve these devices**
- All standards data required, even if not applicable for equipment authorization. Legal requirement.
- Approved Test Laboratories
 - Indoor tests – no TX to satellite
 - Outdoor tests – functional test w/ TX to satellite
 - Important to check application for approved test lab for 406 MHz devices. List available:

<http://www.cospas-sarsat.org/Beacons/beaconTypeApprovalLabs.htm>



Scope B3 – Maritime Services EPIRBs – Equip. Authorization

- Equipment Class – GEP 406 MHz EPIRB
- Note Code – “GM” for GMDSS compliance
- Use 80.1101(c)(5) on 121.5 and 406 MHz line items
- Section 80.1101(c)(5) *406.0–406.1 MHz EPIRBs*:
 - (i) IMO Resolution A.810(19), “Performance Standards for Float-free Satellite Emergency Position-indicating Radio Beacons (EPIRBs) Operating on 406 MHz,” with Annex, adopted 23 November 1995, and IMO Resolution A.812(19), “Performance Standards for Float-free Satellite Emergency Position-indicating Radio Beacons Operating Through the Geostationary INMARSAT Satellite System on 1.6 GHz,” with Annex, adopted 23 November 1995.



Scope B3 – Maritime Services EPIRBs – Equip. Authorization

- (iii) ITU-R Recommendation M.633-1, “Transmission Characteristics of a Satellite Emergency Position-indicating Radiobeacon (Satellite EPIRB) System Operating Through a Low Polar-orbiting Satellite System in the 406 MHz Band,” 1990.
 - (iv) The 406.0-406.1 MHz EPIRBs must also comply with 80.1061.
- No RF Exposure Exhibit required – low duty factor



Scope B3 – Maritime Services

EPIRBs – Approval Letter Exhibits

- All EPIRBs require US Coast Guard approval letter
- COSPAS – SARSAT Certificate



Scope B3 – Maritime Services EPIRBs – Example certificate



COSPAS-SARSAT TYPE APPROVAL CERTIFICATE

For a 406 Megahertz Distress Beacon
for use with the Cospas-Sarsat Satellite System

WHEREAS, *Jotron Electronics a.s.*, of *Tjodalyng, Norway*, the manufacturer of a 406 Megahertz Distress Beacon packaged as an *EPIRB*, and identified as Model: *TRON 40 GPS* has submitted test data and had said beacon tested in *October 2000* at a facility accepted by Cospas-Sarsat at *Intespace, Toulouse, France*, to demonstrate that said beacon meets the applicable technical requirements for use with the Cospas-Sarsat Satellite System, as defined in documents C/S T.001*, Issue 3 - Rev. 3, October 1999, and C/S T.007 "Cospas-Sarsat 406 MHz Distress Beacon Type Approval Standard", Issue 3 - Rev. 6 October 1999,** for frequency channel *406.025 MHz*;

WHEREAS, the Cospas-Sarsat Council has determined, following a review of the test results, that the said beacon meets the Cospas-Sarsat Class 2 requirements and is rated for operating over the temperature range of *-20 °C to +55 °C*,** with battery:

Soft
Lithium Thionyl Chloride (LiSOCl₂, 4 D-cells LSH20) and

WHEREAS, said manufacturer has certified that all other units of the same type will meet said technical requirements in a similar manner to the unit subjected to test, which incorporated the following features:

- *121.5 MHz Auxiliary radio locating device (20 dBm ± 3dB, continuous)*
- *Internal navigation device (GPS): manufacturer: Connexant
model: Jupiter LP*
- *Automatic activation*
- *Strobe light (0.85 cd, 21 flashes/min)*
- *Self-test mode (one burst: 520 ms, format flag bit = "1", long message;
440 ms, format flag bit = "0", short message)*

* *beacon is approved for use with standard location protocol, short standard location protocol and user-location protocol*

** *specified operating lifetime 48 hours*

NOW, THEREFORE, in reliance upon the following, the Cospas-Sarsat Council does hereby certify that the 406 MHz Distress Beacon Model identified herein is compatible with the Cospas-Sarsat System as of the date of this Certificate.

Certificate No: *122*

Date: *8 November 2000*

Signed by:

D. Levesque
Head of Cospas-Sarsat Secretariat

NOTE, HOWEVER:

1. This certificate does not authorize the operation or sale of any 406 MHz distress beacon. Such authorization may require type acceptance by national administrations in countries where the beacon will be distributed, and may also be subject to national licensing requirements.

2. This certificate is intended only as a formal notification to the above identified manufacturer that the Cospas-Sarsat Council has determined, on the basis of test data of a beacon submitted by the manufacturer, that 406 MHz distress beacons of the type identified herein meet the standards for use with the Cospas-Sarsat System. This certificate is not a warranty and Cospas-Sarsat hereby expressly disclaims any and all liability arising out of or in connection with the issuance, use, or misuse of this certificate.

3. This certificate is subject to revocation by the Cospas-Sarsat Council should the beacon type for which it is issued cease to meet the Cospas-Sarsat specification. A new certificate may be issued after satisfactory corrective action has been taken and correct performance demonstrated in accordance with to the Cospas-Sarsat Type Approval Standard.



Scope B3 – Maritime Services EPIRB – 406 MHz Frequencies

- The frequency change from 406.025 MHz to 406.028 MHz was allowed as an option of the manufacturer, but will be mandatory for new beacon models presented for certification and approved by COSPAS/SARSAT after January 1, 2002. New Grants must list the new frequency.
- 406.028 MHz required to prevent saturation of satellites at the old frequency (406.025 MHz). Reference FCC 02-102.

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-02-102A1.pdf



Scope B3 – Maritime Services EPIRBs – 406 MHz Characteristics

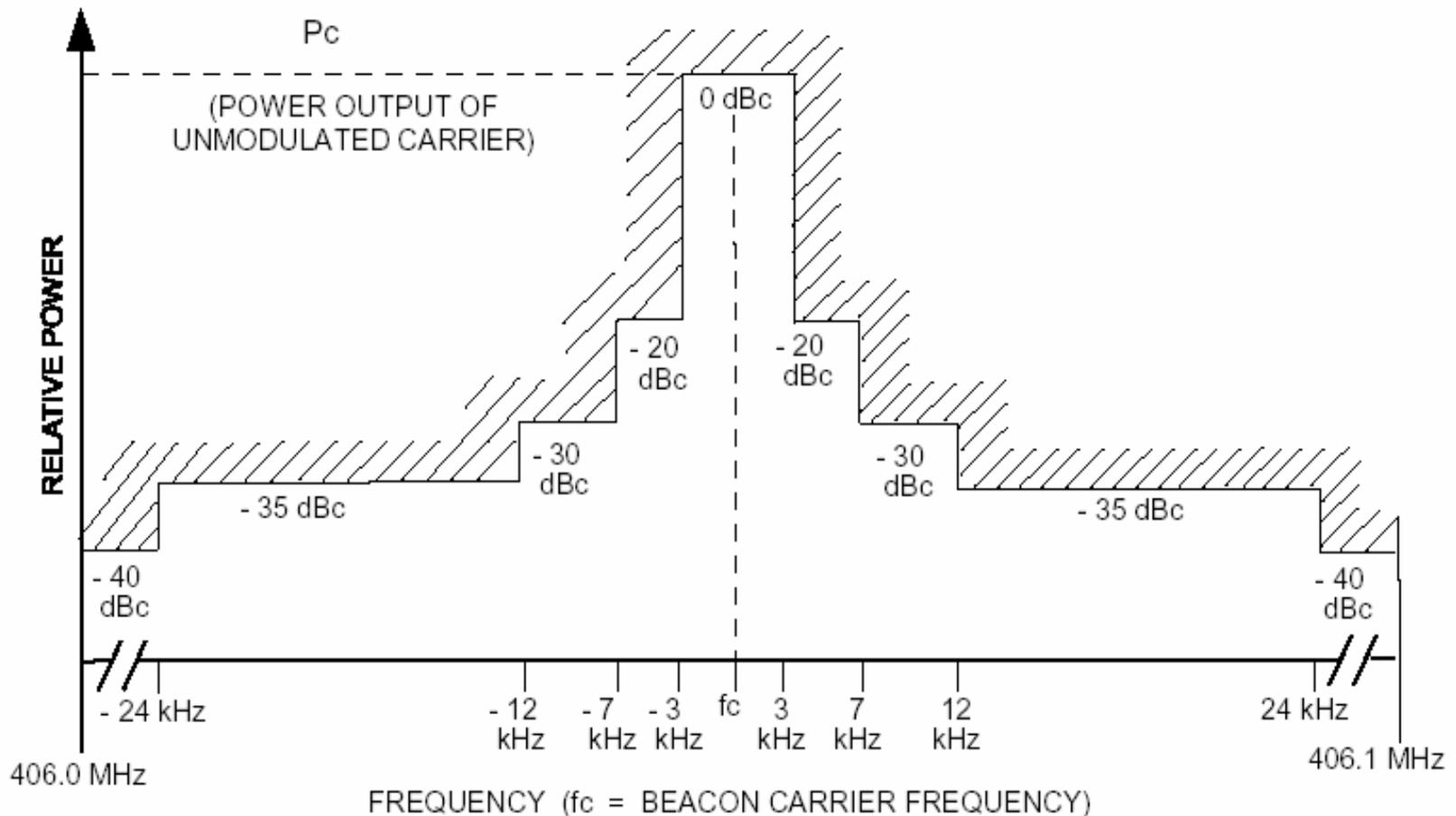
- **Frequency Tolerance:** short-term variations 2 ppm in 100 ms. Long-term variations +2 kHz /-5 kHz from 406.028 MHz in 5 years.
- **Power Output:** 5 W + 2 dB (35 to 39 dBm)
- **Maximum Continuous Transmission:** maximum of 45 seconds
- **Emissions Designator – 16K0G1D**



Scope B3 – Maritime Services

EPIRBs – 406 MHz Mask

The in-band spurious emissions shall not exceed the levels specified by the signal mask in Figure 2.3, when measured in a 100 Hz resolution bandwidth.





Scope B3 – Maritime Services

EPIRB – 121.5 MHz Characteristics

● RF Signal Transmitted

- power : 50 - 100 mW PERP*
- Transmission life : 48 hours
- Frequency : 121.5 MHz +/- 6 kHz
- Polarization : Linear

● Modulation

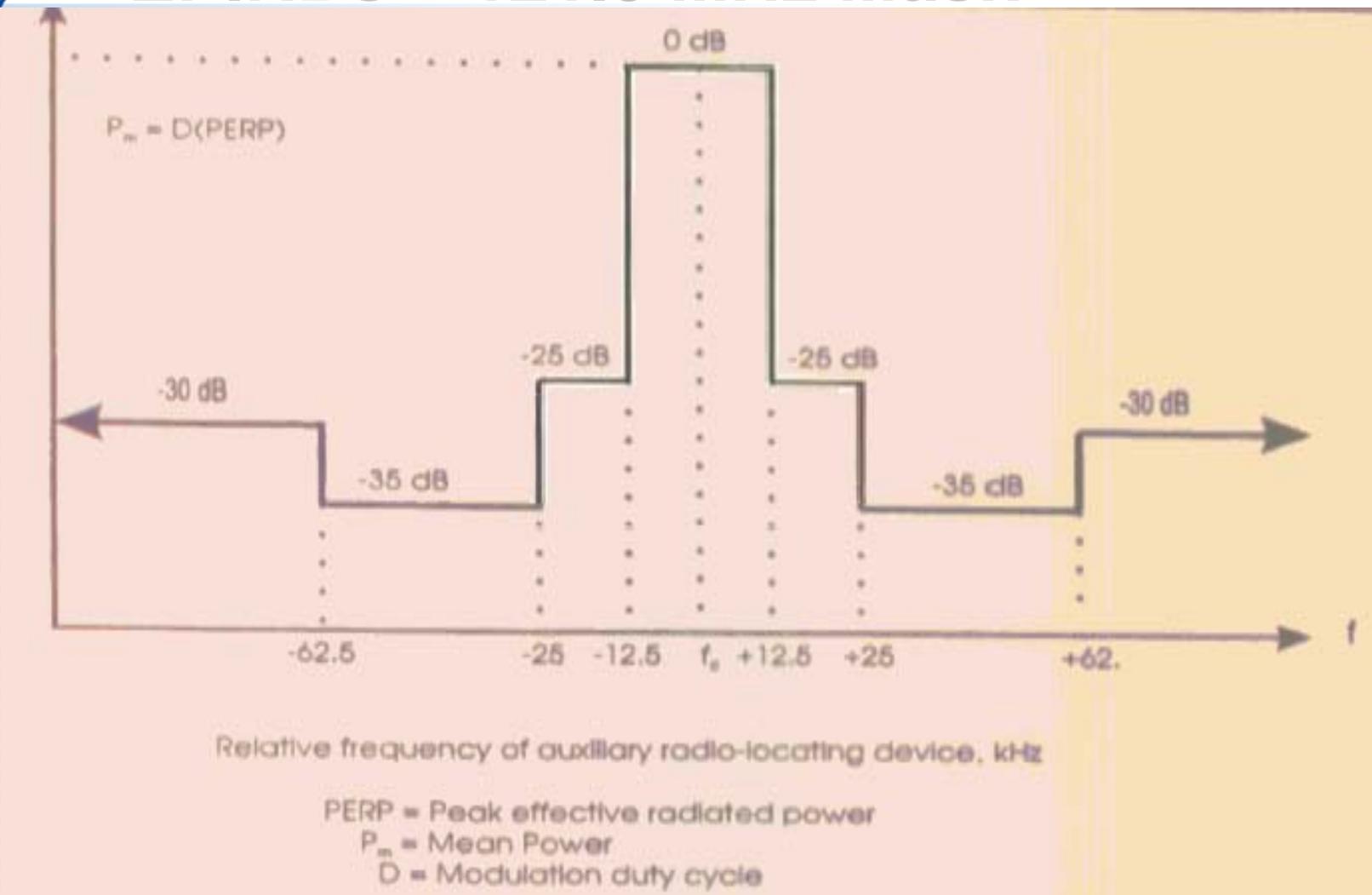
- Sweep rate : 2 - 4 Hz
- Range : 300-1600 Hz (swept at least 700 Hz)
- Modulation type : AM
- Modulation depth : > 85%
- Duty Cycle : 40%

● Emissions Designator – 3K20A3X

* Peak Effective Radiated Power relative to a 1/4 wavelength monopole mounted on a ground plane



Scope B3 – Maritime Services EPIRBs – 121.5 MHz Mask





Scope B3 – Maritime Services

EPIRBs – Labeling Requirements

- FCC ID and Section 80.1103(e)
 - “The owner of this 406.0–406.1 MHz EPIRB must register the NOAA identification code contained on this label with the National Oceanic and Atmospheric Administration (NOAA) whose address is: NOAA, NOAA/SARSAT Beacon Registration, E/SP3, Federal Building 4, Room 3320, 5200 Auth Road, Suitland, MD 20746–4304.” Vessel owners shall advise NOAA in writing upon change of vessel or EPIRB ownership, transfer of EPIRB to another vessel, or any other change in registration information. NOAA will provide registrants with proof of registration and change of registration postcards.”
- RTCM Label
 - “USE ONLY DURING SITUATIONS OF GRAVE AND IMMINENT DANGER”



Scope B3 – Maritime Services

EPIRBs – Grant Example

Equipment Class : 406 MHz EPIRB

Notes: EPIRB Class A FLOAT FREE

<u>Grant Notes</u>	<u>FCC Rule Parts</u>	<u>Frequency Range (MHZ)</u>	<u>Output Watts</u>	<u>Frequency Tolerance</u>	<u>Emission Designator</u>
GM	80.1101(c)(5)	406.025	5	2 PPM	16K0G1D
GM	80.1101(c)(5)	121.5	0.1	10 PPM	3K20A3X

Approved for RTCM Category 1 (Float Free) when used with bracket FB4 or FBH4.

Approved for RTCM Category 2 (Manual) when used with bracket MB4.

GM: This unit meets requirements for GMDSS use as contained in Subpart W of Part 80.



Scope B3 – Maritime Services Ship Security Alert Systems (SSAS)

- Homeland Security directive
- 406 MHz COSPAS-SARSAT system without 121.5 MHz homing beacon so messages are covert. Transmitter is essentially a modified 406 MHz EPIRB.

<http://www.cospas-sarsat.org/FirstPage/ssas.htm>

- **TCBs can now approve these devices**



Scope B3 – Maritime Services

SSAS – Equipment Authorization

- Currently no applicable Rules so applications are processed under the requirements specified in DA 04-4052

http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-04-4052A1.pdf

- Equipment Class – SSA (Ship Security Alert Systems)
- No RF Exposure required – low duty factor
- Grant condition – This device complies with the Ship Security Alert Systems (SSAS) provisions of DA 04-4052.
- Requires US Coast Guard Approval Letter



Scope B3 – Maritime Services SSAS – International Standards

- Interim COSPAS-SARSAT Type Acceptance Procedures for SSAS

<http://www.cospas-sarsat.org/DocumentsTSeries/095-enclosure.pdf>

- Final COSPAS-SARSAT Standards approved June 4, 2004
 - RTCM Paper 110-2004/SC110-STD
 - Currently not available on the Internet – contact COSPAS-SARSAT for a copy



Scope B3 – Aviation Services Emergency Location Transmitter (ELTs)

- 121.5/406 MHz beacons carried aboard aircraft can usually be activated both manually and automatically by shock (using a crash sensor or G switch). False alerts w/G switch.
- Section 87.197 – ELT Test Procedures
- Section 87.199 – Special Requirements
- COSPAS/SARSAT approved test facility required
- **TCBs can now approve these devices**



Scope B3 – Aviation Services ELTs - Standards

- FAA Standard TSO – C91A
[http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgTSO.nsf/0/e2b1e589c98200f886256dc900695b8c/\\$FILE/C91a.pdf](http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgTSO.nsf/0/e2b1e589c98200f886256dc900695b8c/$FILE/C91a.pdf)
- Radio Technical Commission for Aeronautics document titled “Minimum Operational Performance Standards 406 MHz Emergency Locator Transmitters (ELT)” Document No. RTCA/DO–204 dated September 29, 1989.



Scope B3 – Aviation Services ELTs – Approval Letter Exhibits

- FAA Approval
 - Section 87.149(d)(2) for 121.5 MHz
 - Section 87.149(e) for 406 MHz
- COSPAS – SARSAT Certificate



Scope B3 – Aviation Services ELTs

- Equipment Class – “GET” 406 MHz ELT
- Must have 121.5 MHz capability
- Section 87.139 – Emissions Mask for all bands
- No RF Exposure Exhibit Required



Scope B3 – Maritime Services

Part 80 - AIS Update

- Previously Automatic Identification Equipment (AIS) required a US Coast Guard approval letter
- U.S. / European Community Mutual Recognition Agreement on Marine Equipment - July 1st, 2004
<http://www.uscg.mil/hq/g-m/mse4/mra.htm>
- AIS requires EC Accrediting Body Certificate – needs “Wheelmark” and a USCG Approval Number (Issued by EC Notification Body) on the Label Exhibits





Scope B3 – Maritime Services VHF/GMDSS Update

- VHF Radios with Global Maritime Distress & Safety System (GMDSS) – Equipment Class GVH (Part 80 VHF Transmitter (GMDSS))
<http://www.navcen.uscg.gov/marcomms/gmdss/>
- Part 80 VHF transmitters without GMDSS now use Equipment Class TNB (Licensed non-broadcast station transmitter)



Scope B3 – Maritime/Aviation Services Summary

- TCBs can now approve the following:
 - Part 80 121.5/406 MHz Class C EPIRBs
 - Section 80.1101(c)(5)
 - Equipment Class – GEP (406 MHz EPIRB)
 - Requires US Coast Guard Approval Letter
 - Part 80 Ship Security Alert Systems (SSAS)
 - Authorized under DA 04-4052
 - Equipment Class SSA (Ship Security Alert Systems)
 - Requires US Coast Guard Approval Letter
 - Part 87 Emergency Location Transmitters (ELTs)
 - Equipment Class GEP (406 MHz ELT)
 - Requires FAA Approval Letter
- Automatic Identification Equipment (AIS) no longer requires US Coast Guard approval letter under MRA
 - Now requires label exhibit with “wheelmark” and US Coast Guard approval number



Questions and Answers

Thanks!