# TEST REPORT

| | |
|---|---|
| Applicant/Manufacturer: | Cobra Electronics Corporation |
| Address: | 1701 Golf Road, Suite 3-900 Rolling Meadows Illinois United States 60008 |
| Report Number: | 2401Y98811E-RFB |

**Test Standard (s)**

IEC 62238:2003

**Sample Description**

| | |
|---|---|
| Product Type: | Marine Radio |
| Model No.: | BlueBound1350B |
| Multiple Model(s) No.: | BlueBound1350W |
| Trade Mark: | Cobra |
| Date Received: | 2025/07/18 |
| Issue Date: | 2025/10/22 |

| | |
|---|---|
| Test Result: | Pass▲ |

▲In the configuration tested, the EUT complied with the standards above.

**Prepared and Checked By:**

Bruce Lin

Bruce Lin
RF Engineer

**Approved By:**

Jimmy Xiao

Jimmy Xiao
EMC Manager

Note: The information marked# is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

# TABLE OF CONTENTS

# DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | 2401Y98811E-RFB | Original Report | 2025/10/22 |

# GENERAL INFORMATION

## Product Description for Equipment under Test (EUT)

| | |
|---|---|
| Product | Marine Radio |
| Tested Model | BlueBound1350B |
| Multiple Model(s) | BlueBound1350W |
| Frequency Range | FM: 156.050-157.425MHz<br>DSC: 156.525 MHz |
| Rated Transmit Power | 25Watts(High), 1Watt(Low) |
| Channel separation | 25kHz |
| Modulation Technique | FM: FM<br>DSC: FSK |
| Voltage Range | DC 10.8-15.6 V |
| Sample serial number | 2SPL-2 (Assigned by BACL, Shenzhen) |
| Normal/Extreme Condition# | L.V.: Low Voltage 10.8$V_{DC}$; L.T.: Low Temperature -10℃<br>N.V.: Normal Voltage 13.8$V_{DC}$; N.T.: Normal Temperature +25℃<br>H.V.: High Voltage 15.6$V_{DC}$; H.T.: High Temperature +55℃<br>Note: the extreme test condition was declared by manufacturer. |
| Sample/EUT Status | Good condition |
| Adapter Information | N/A |
| Note: The Multiple models are electrically identical with the test model except for model number and color. Please refer to the declaration letter# for more detail, which was provided by manufacturer. | |

## Objective

This report is prepared in accordance with IEC 62238:2003 Maritime navigation and radio communication equipment and systems - VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC) - Methods of testing and required test results.

The objective is to determine the compliance of the EUT with IEC 62238:2003.

## Measurement uncertainty

| Parameter | Uncertainty |
|---|---|
| Radio Frequency | $\pm 1\times 10^{-7}$ |
| RF Conducted Power | 0.86dB(k=2, 95% level of confidence) |
| Adjacent channel power | 1.32dB(k=2, 95% level of confidence) |
| Conducted spurious emission of transmitter | 1.60dB(k=2, 95% level of confidence) |
| Two-signal measurement | ±2.5 dB |
| Three-signal measurement | ±2.5 dB |
| Transmitter transient frequency | ±200 Hz |
| Temperature | ±1℃ |
| Humidity | ±1% |

*Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.*

## Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 5F(B-West), 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

Each test item follows test standards and with no deviation.

# SYSTEM TEST CONFIGURATION

## Description of Test Configuration

The system was configured for testing in an engineering mode, which is provided by manufacturer.

## EUT Exercise Software

No exercise software was used.

## Special Accessories

No special accessory was used.

## Equipment Modifications

No modification was made to the EUT tested.

## Support Equipment List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| / | / | / | / |

## External I/O Cable

| Cable Description | Length (m) | From Port | To |
|---|---|---|---|
| / | / | / | / |

# SUMMARY OF TEST RESULTS

| IEC 62238:2003 | Description of Test | Test Result |
|---|---|---|
| §4 | General and operational requirements | Compliant* |
| §5 | General technical requirements | Compliant* |
| §7.4 | Vibration Test | Compliant |
| §7.5 | Temperature Tests | Compliant |
| §8.1 | Transmitter frequency error | Compliant |
| §8.2 | Transmitter carrier power | Compliant |
| §8.3 | Transmitter frequency deviation | Compliant |
| §8.4 | Sensitivity of the modulator, including microphone | Compliant |
| §8.5 | Audio frequency response | Compliant |
| §8.6 | Audio frequency harmonic distortion of the emission | Compliant |
| §8.7 | Transmitter adjacent channel power | Compliant |
| §8.8 | Transmitter conducted spurious emissions conveyed to the antenna | Compliant |
| §8.9 | Transient frequency behaviour of the transmitter | Compliant |
| §8.10 | Residual modulation of the transmitter | Compliant |
| §8.11 | Frequency error (demodulated DSC signal) | Compliant |
| §8.12 | Modulation index for DSC | Compliant |
| §8.13 | Modulation rate for DSC | Compliant |
| §8.14 | Test of Gennerated Call Sequences | Compliant |
| §9.1 | Harmonic distortion and rated audio-frequency output power | Compliant |
| §9.2 | Receiver audio frequency response | Compliant |
| §9.3 | Receiver maximum useable sensitivity | Compliant |
| §9.4 | Receiver co-channel rejection | Compliant |
| §9.5 | Receiver adjacent channel selectivity | Compliant |
| §9.6 | Receiver spurious response rejection | Compliant |
| §9.7 | Receiver inter-modulation response | Compliant |
| §9.8 | Receiver blocking or desensitization | Compliant |
| §9.9 & 10.7 | Receiver spurious emissions at the antenna;<br>DSC receiver spurious emissions; | Compliant |
| §9.10 | Receiver residual noise level | Compliant |
| §9.11 | Squelch operation | Compliant |
| §9.12 | Squelch hysteresis | Compliant |
| §9.13 | Multiple watch characteristic | Compliant |
| §10.1 | DSC receiver maximum useable sensitivity | Compliant |
| §10.2 | DSC receiver co-channel rejection | Compliant |
| §10.3 | DSC receiver Adjacent channel selectivity | Compliant |
| §10.4 | DSC receiver spurious response and blocking immunity | Compliant |
| §10.5 | DSC receiver Inter-modulation response | Compliant |
| §10.6 | DSC receiver Dynamic range | Compliant |
| §10.8 | Verification of Correct Decoding of Various Types of DSC Calls | Compliant |
| §10.9 | Reaction to VTS and AIS Channel Management DSC Transmissions | Compliant |
| §10.10 | DSC receiver simultaneous reception | Compliant |
| §11 | Electromagnetic compatibility | Compliant** |
| Annex D | Recommended standards for equipment operating in high level electromagnetic environments | Compliant |

Compliance*: Please refer to the declaration letter which is provided by the manufacturer.
Compliance**: Please refer to the report: 2401Y98811E-EM-01

# TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|
| **RF Conducted Test** | | | | | |
| Rohde & Schwarz | Spectrum Analyzer | FSU26 | 200982 | 2025/08/12 | 2026/08/11 |
| BACL | Temperature & Humidity Chamber | BTH-150-40 | 30144 | 2024/12/06 | 2025/12/05 |
| HP | RF Communication test set | 8920B | US36141849 | 2024/12/04 | 2025/12/03 |
| instek | DC Power Supply | GPS-3030DD | EM832096 | NCR | NCR |
| Fluke | Digital Multimeter | 287 | 19000011 | 2025/04/29 | 2026/04/28 |
| JFW | 30dB Attenuator | 50FH-030-100 RF | F-03-EM032 | 2025/06/26 | 2026/06/25 |
| Micro-Tronics | RF Cable | 8082135 | W1113 | 2025/06/26 | 2026/06/25 |
| Keysight | MXG Vector Signal Generator | N5182B | MY53051503 | 2024/12/04 | 2025/12/03 |
| Agilent | Signal Generator | N5183A | MY50140588 | 2025/08/12 | 2026/08/11 |
| Unknown | Power Splitter | PD2 | 2000-600 | 2025/06/26 | 2026/06/25 |
| LONGDATE | Vibration Tester | LD-F | 200581801 | 2024/09/20 | 2025/12/20 |
| Rohde & Schwarz | Signal Analyzer | FSIQ26 | 837405/023 | 2024/12/04 | 2025/12/03 |

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

# IEC 62238 §7.4 VIBRATION TEST

## Applicable Standard

According to IEC 62238 §7.4

## Method of Measurement

According to IEC 62238 §7.4

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Test Level | Test Voltage($V_{DC}$) | Performance Check |
|---|---|---|
| 2 Hz to 5 Hz and up to 13,2 Hz with an excursion of ±1 mm ± 10 % | 13.8 | Compliance |
| (7 m/s2 maximum acceleration at 13,2 Hz) | | |
| above 13,2 Hz and up to 100 Hz with a constant maximum acceleration of 7 m/s2. | 13.8 | Compliance |
| Note: Endurance Test for 2 hour sat each resonant frequency or frequency with a g level ≥5 times the drive g level. If no resonant frequencies or frequency with a g level ≥5 times the drive g level are found endurance test shall be performed at 30Hz. | | |

# IEC 62238 §7.5 TEMPERATURE TESTS

## Applicable Standard

According to IEC 62238 §7.5

## Method of Measurement

According to IEC 62238 §7.5

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| | | | | |
|---|---|---|---|---|
| **Storage Test** | **Temperature Condition** | | **Period (Hour)** | **Performance Check** |
| | Dry Heat | 70℃±3℃ | 12 | Compliance |
| | Low Temperature | -10℃±3℃ | 12 | Compliance |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Functional Test** | **Environment condition** | | **Relative Humidity** | **Period (Hour)** | **Test Voltage($V_{DC}$)** | **Performance Check** |
| | Dry Heat | 55℃±3℃ | / | 12 | 10.8 | Compliance |
| | | | | 12 | 13.8 | Compliance |
| | | | | 12 | 15.6 | Compliance |
| | Damp Heat | 40℃±2℃ | 93 % ± 1 % | 12 | 10.8 | Compliance |
| | | | | 12 | 13.8 | Compliance |
| | | | | 12 | 15.6 | Compliance |

# IEC 62238 §8.1 TRANSMITTER FREQUENCY ERROR

## Applicable Standard

The frequency error is the difference between the measured carrier frequency and its nominal value.

## Limit

The frequency error shall be within ±1,5 kHz.

## Method of Measurement

The carrier frequency shall be measured in the absence of modulation, with the transmitter connected to an artificial antenna (see 6.4) and tuned to channel 16.

Measurements shall be made under normal test conditions (see 6.12) and under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

This test shall be carried out with the output power switch being set at both maximum and minimum.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Frequency(MHz) | Power level | Test Condition | Reading(MHz) | Frequency Error(kHz) | Limit(khz) |
|---|---|---|---|---|---|
| 156.8 | Maximum | NTNV | 156.8007 | 0.7 | ±1.5 |
| | | LTLV | 156.8003 | 0.3 | |
| | | LTHV | 156.8003 | 0.3 | |
| | | HTLV | 156.8005 | 0.5 | |
| | | HTHV | 156.8004 | 0.4 | |
| | Minimum | NTNV | 156.8001 | 0.1 | |
| | | LTLV | 156.8008 | 0.8 | |
| | | LTHV | 156.8007 | 0.7 | |
| | | HTLV | 156.8002 | 0.2 | |
| | | HTHV | 156.8004 | 0.4 | |

# IEC 62238 §8.2 TRANSMITTER CARRIER POWER

## Applicable Standard

The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation.

The rated output power is the carrier power declared by the manufacturer.

## Limit

### Normal test conditions

With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within ±1,5 dB of the rated output power under normal test conditions. The output power shall never, however, exceed 25 W.

With the output power switch set at minimum, the carrier power shall remain between 0,1 W and 1 W.

### Extreme test conditions

With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within +2 dB, –3 dB of the rated output power under extreme conditions.
The output power shall never however exceed 25 W.

With the output power switch set at minimum, the carrier power shall remain between 0,1 W and 1 W.

## Method of Measurement

The transmitter shall be connected to an artificial antenna (see 6.4) and the power delivered to this artificial antenna shall be measured. The measurements shall be made on channel 16, the highest frequency channel and the lowest frequency channel under normal test conditions (see 6.12) and channel 16 under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

During the test on channel 16, a check should be made that the power output falls to zero after 5 min and before 6 min of continuous transmission.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Carrier Frequency (MHz) | TEST CONDITION | Maximum continuous transmission time(s) | Limit(s) | Maximum power level | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Reading (dBm) | Limit 1 (dBm) | Limit2 (dBm) | Reading (dBm) | Limit3 (dBm) |
| 156.8 | NTNV | 310 | 300-360 | 43.73 | 43.98±1.5 | 37.78-43.98 | 29.11 | 20-30 |
| | LTLV | | | 43.66 | 43.98＋2/－3 | | 29.14 | |
| | LTHV | | | 43.84 | | | 29.56 | |
| | HTLV | | | 43.75 | | | 29.37 | |
| | HTHV | | | 43.61 | | | 29.85 | |
| 156.05 | NTNV | / | | 43.93 | 43.98±1.5 | | 29.79 | |
| 157.425 | NTNV | / | | 43.75 | 43.98±1.5 | | 29.13 | |

# IEC 62238 §8.3 TRANSMITTER FREQUENCY DEVIATION

## Applicable Standard

For the purposes of this standard, the frequency deviation is the difference between the instantaneous frequency of the modulated radio frequency signal and the carrier frequency.

## Limit

**Maximum permissible frequency deviation:**

The maximum frequency deviation shall be ±5 kHz.

**Reduction of frequency deviation at modulation frequencies above 3 kHz:**

For modulation frequencies between 3 kHz and 6 kHz the frequency deviation shall not exceed the frequency deviation with a modulation frequency of 3 kHz. For a modulation frequency of 6 kHz, the frequency deviation shall not exceed ±1,5 kHz, as shown in Figure 1.

For modulation frequencies between 6 kHz and 25 kHz, the frequency deviation shall not exceed that given by a linear response of frequency deviation (in dB) against modulation frequency, starting at the point where the modulation frequency is 6 kHz and the frequency deviation is ±1,5 kHz and inclined at 14 dB/octave, with the frequency deviation diminishing as the modulation frequency increases, as shown in Figure 1 as far as practicable.

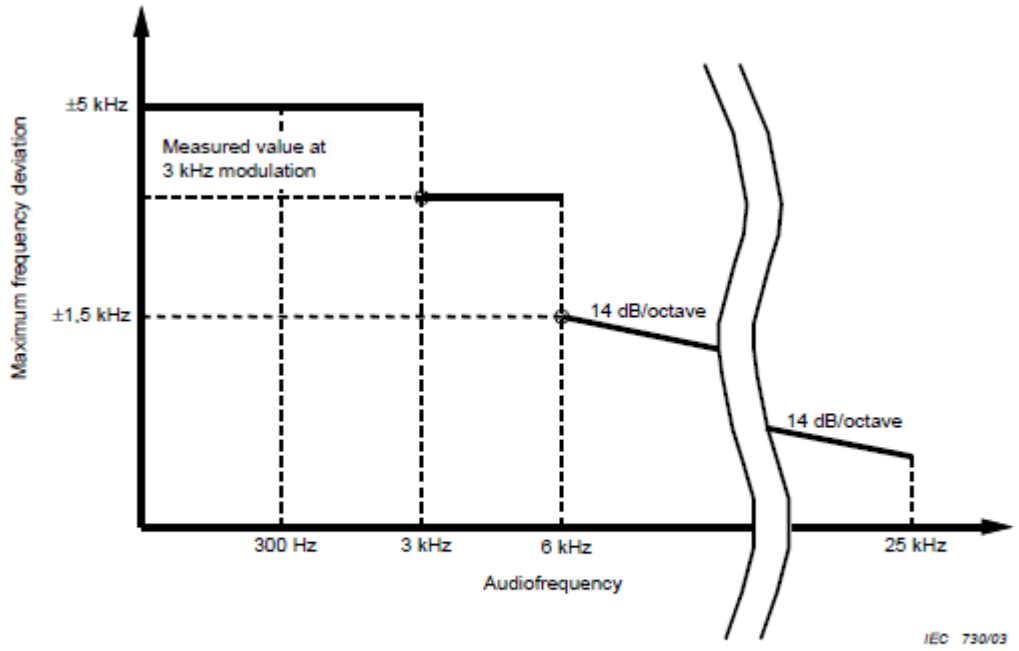



**Figure 1 – Frequency deviation**

## Method of Measurement

**Maximum permissible frequency deviation:**

The frequency deviation shall be measured at the output with the transmitter connected to an artificial antenna (see 6.4) and tuned to channel 16, by means of a deviation meter capable of measuring the maximum deviation, including that due to any harmonics and intermodulation products which may be generated in the transmitter.

The modulation frequency shall be varied between 100 Hz and 3 kHz. The level of this test signal shall be 20 dB above the level which produces normal test modulation (see 6.3). This test shall be carried out with the output power switch set at both maximum and minimum.

**Reduction of frequency deviation at modulation frequencies above 3 kHz:**

The transmitter shall operate under normal test conditions (see 6.12) connected to a load as specified in 6.4.

The transmitter shall be modulated by the normal test modulation (see 6.3) and tuned to channel 16. With the input level of the modulation signal being kept constant, the modulation frequency shall be varied between 3 kHz and 25 kHz and the frequency deviation shall be measured.

## Test Data

**Environmental Conditions**

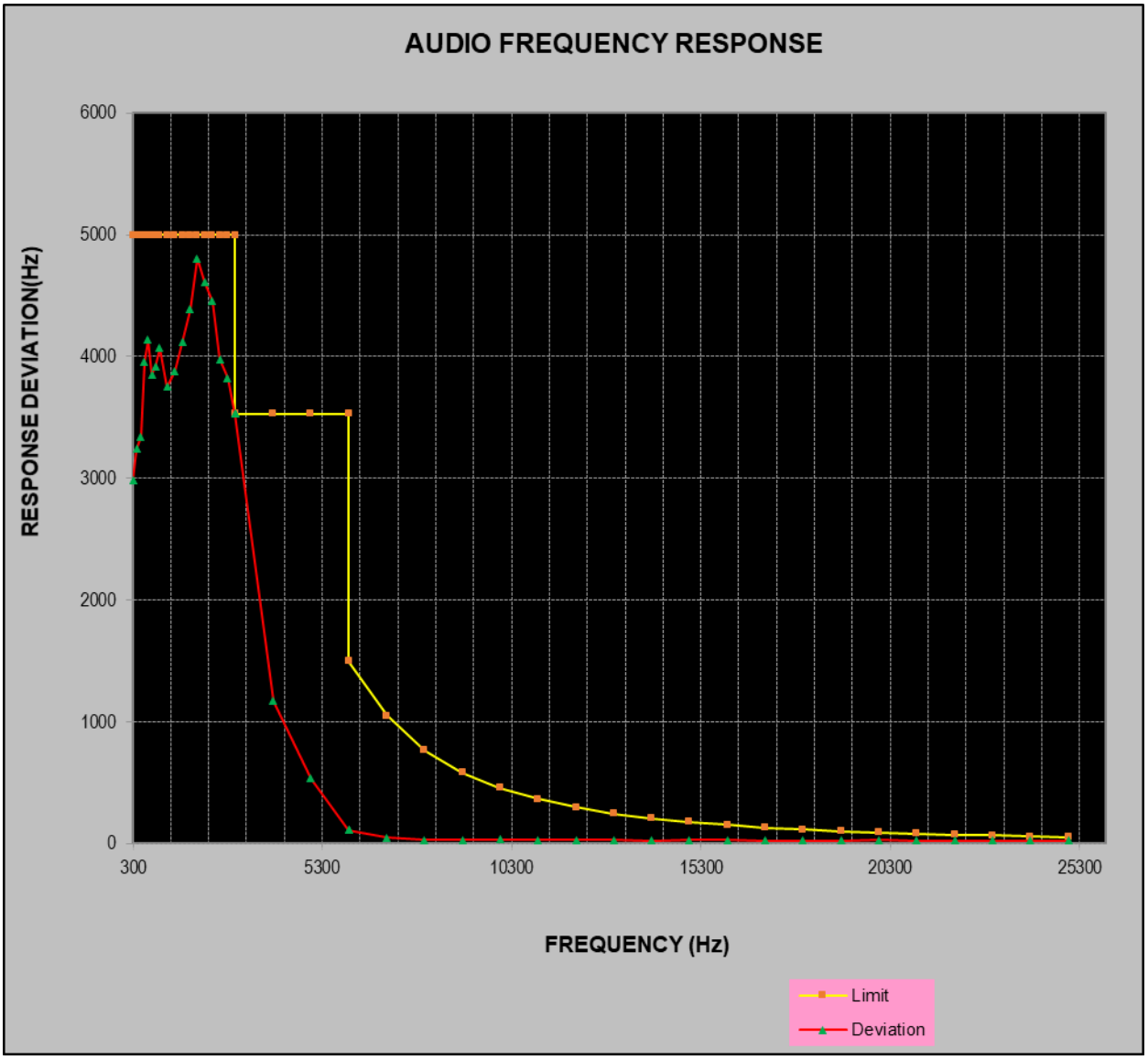
| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

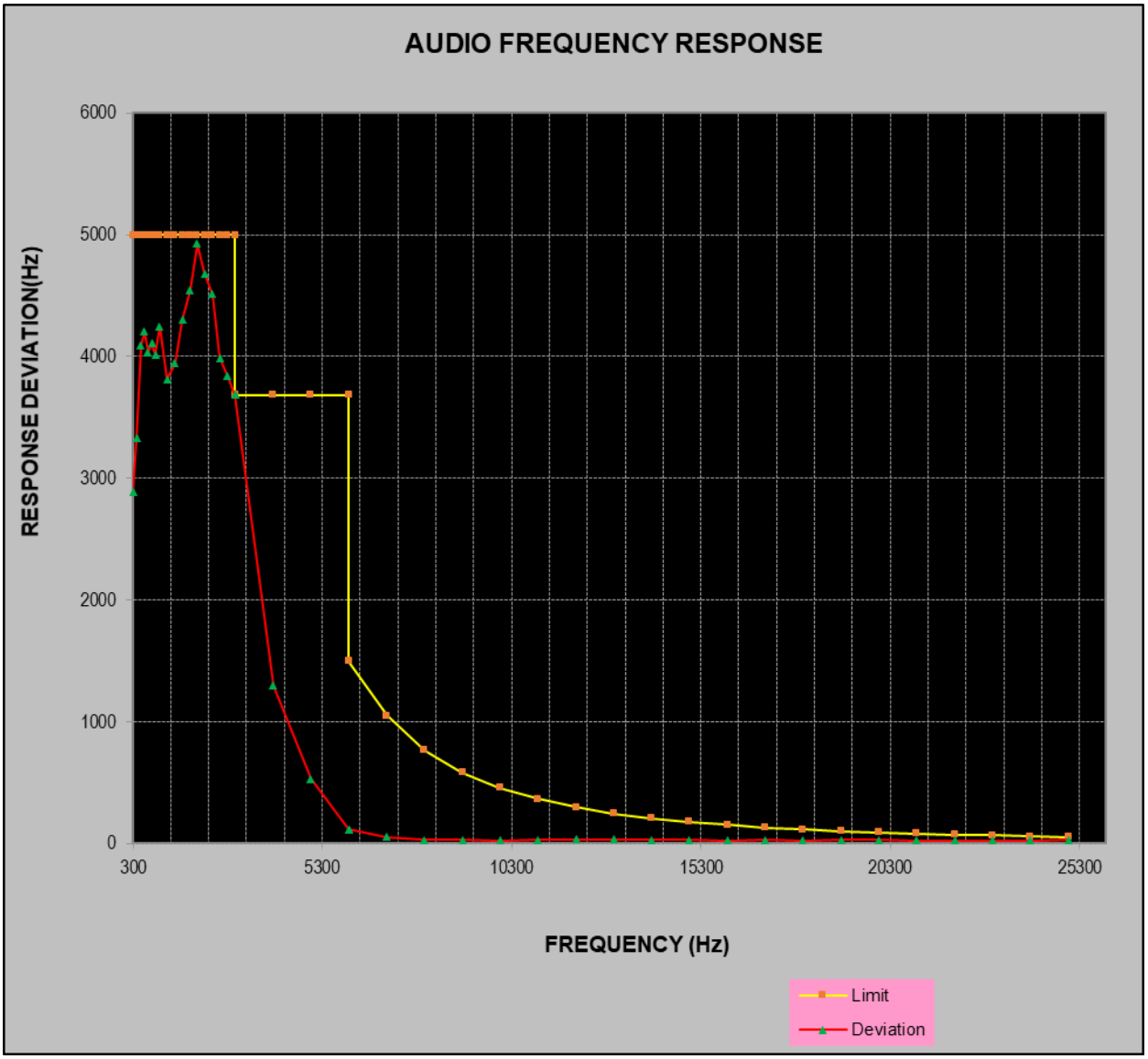
**Frequency: 156.8MHz, High Power**

| Modulation Frequency (Hz) | Maximum Deviation (Hz) | Limit (Hz) |
|---|---|---|
| 300 | 2987 | 5000 |
| 400 | 3241 | 5000 |
| 500 | 3342 | 5000 |
| 600 | 3959 | 5000 |
| 700 | 4135 | 5000 |
| 800 | 3851 | 5000 |
| 900 | 3917 | 5000 |
| 1000 | 4069 | 5000 |
| 1200 | 3753 | 5000 |
| 1400 | 3881 | 5000 |
| 1600 | 4120 | 5000 |
| 1800 | 4386 | 5000 |
| 2000 | 4804 | 5000 |
| 2200 | 4615 | 5000 |
| 2400 | 4456 | 5000 |
| 2600 | 3976 | 5000 |
| 2800 | 3824 | 5000 |
| 3000 | 3531 | 5000 |
| 3000 | 3531 | 3531 |
| 4000 | 1169 | 3531 |
| 5000 | 534 | 3531 |
| 6000 | 112 | 3531 |
| 6000 | 112 | 1500 |
| 7000 | 51 | 1048 |
| 8000 | 31 | 768 |
| 9000 | 32 | 584 |
| 10000 | 36 | 457 |
| 11000 | 30 | 366 |
| 12000 | 31 | 299 |
| 13000 | 29 | 248 |
| 14000 | 26 | 209 |
| 15000 | 28 | 178 |
| 16000 | 29 | 153 |
| 17000 | 24 | 133 |
| 18000 | 26 | 117 |
| 19000 | 27 | 103 |
| 20000 | 31 | 91 |
| 21000 | 25 | 81 |
| 22000 | 23 | 73 |
| 23000 | 26 | 66 |
| 24000 | 24 | 60 |
| 25000 | 26 | 54 |


AUDIO FREQUENCY RESPONSE
RESPONSE DEVIATION(Hz)
6000
5000
4000
3000
2000
1000
0
300
5300
10300
15300
20300
25300
FREQUENCY (Hz)
Limit
Deviation

**Frequency: 156.8MHz, Low Power**

| Modulation Frequency (Hz) | Maximum Deviation (Hz) | Limit (Hz) |
|---|---|---|
| 300 | 2889 | 5000 |
| 400 | 3328 | 5000 |
| 500 | 4096 | 5000 |
| 600 | 4206 | 5000 |
| 700 | 4037 | 5000 |
| 800 | 4109 | 5000 |
| 900 | 4018 | 5000 |
| 1000 | 4246 | 5000 |
| 1200 | 3813 | 5000 |
| 1400 | 3944 | 5000 |
| 1600 | 4299 | 5000 |
| 1800 | 4547 | 5000 |
| 2000 | 4926 | 5000 |
| 2200 | 4679 | 5000 |
| 2400 | 4512 | 5000 |
| 2600 | 3986 | 5000 |
| 2800 | 3839 | 5000 |
| 3000 | 3683 | 5000 |
| 3000 | 3683 | 3683 |
| 4000 | 1295 | 3683 |
| 5000 | 531 | 3683 |
| 6000 | 117 | 3683 |
| 6000 | 117 | 1500 |
| 7000 | 52 | 1048 |
| 8000 | 31 | 768 |
| 9000 | 29 | 584 |
| 10000 | 27 | 457 |
| 11000 | 32 | 366 |
| 12000 | 35 | 299 |
| 13000 | 33 | 248 |
| 14000 | 30 | 209 |
| 15000 | 29 | 178 |
| 16000 | 27 | 153 |
| 17000 | 32 | 133 |
| 18000 | 26 | 117 |
| 19000 | 28 | 103 |
| 20000 | 30 | 91 |
| 21000 | 24 | 81 |
| 22000 | 26 | 73 |
| 23000 | 27 | 66 |
| 24000 | 26 | 60 |
| 25000 | 29 | 54 |


AUDIO FREQUENCY RESPONSE
RESPONSE DEVIATION(Hz)
6000
5000
4000
3000
2000
1000
0
300
5300
10300
15300
20300
25300
FREQUENCY (Hz)
Limit
Deviation

# IEC 62238 §8.4 TRANSMITTER SENSITIVITY OF THE MODULATOR, INCLUDING MICROPHONE

## Applicable Standard

This characteristic expresses the capability of the transmitter to produce sufficient modulation when an audio frequency signal corresponding to the normal mean speech level is applied to the microphone.

## Limit

The resulting frequency deviation shall be between ±2,5 kHz and ±4,5 kHz.

## Method of Measurement

An acoustic signal with a frequency of 1 kHz and a sound level of 94 dB(A) shall be applied to the microphone. The resulting deviation shall be measured. This test shall be repeated at frequencies of 300 Hz and 500 Hz.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Carrier Frequency(MHz) | Acoustic signal | Audio signal Frequency(kHz) | Frequency deviation(kHz) | Limit(KHz) |
|---|---|---|---|---|
| 156.8 | 1kHz/94db(A) | 0.3 | 4.1 | ±2.5-±4.5 |
| | | 0.5 | 4.1 | |
| | | 1 | 4.2 | |

# IEC 62238 §8.5 TRANSMITTER AUDIO FREQUENCY RESPONSE

## Applicable Standard

The audio frequency response is the frequency deviation of the transmitter as a function of the modulating frequency.

## Limit

The audio frequency response shall be within +1 dB and –3 dB of a 6 dB/octave line passing through the reference point (see Figure 2).

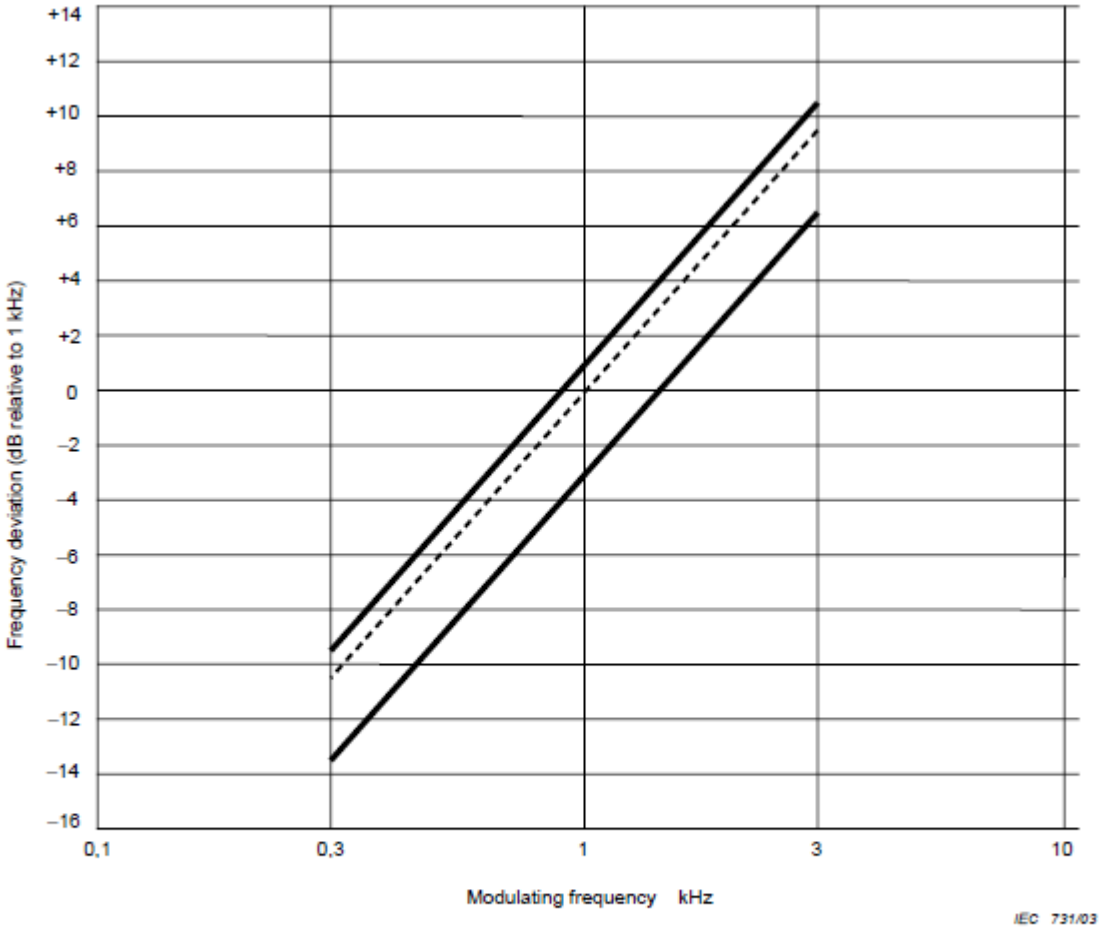



**Figure 2 – Audiofrequency response**

## Method of Measurement

A modulating signal at a frequency of 1 kHz shall be applied to the transmitter and the deviation shall be measured at the output. The audio input level shall be adjusted so that the frequency deviation is ±1 kHz. This is the reference point in Figure 2 (1 kHz corresponds to 0 dB).

The modulation frequency shall then be varied between 300 Hz and 3 kHz, with the level of the audio frequency signal being kept constant and equal to the value specified above.

## Test Data

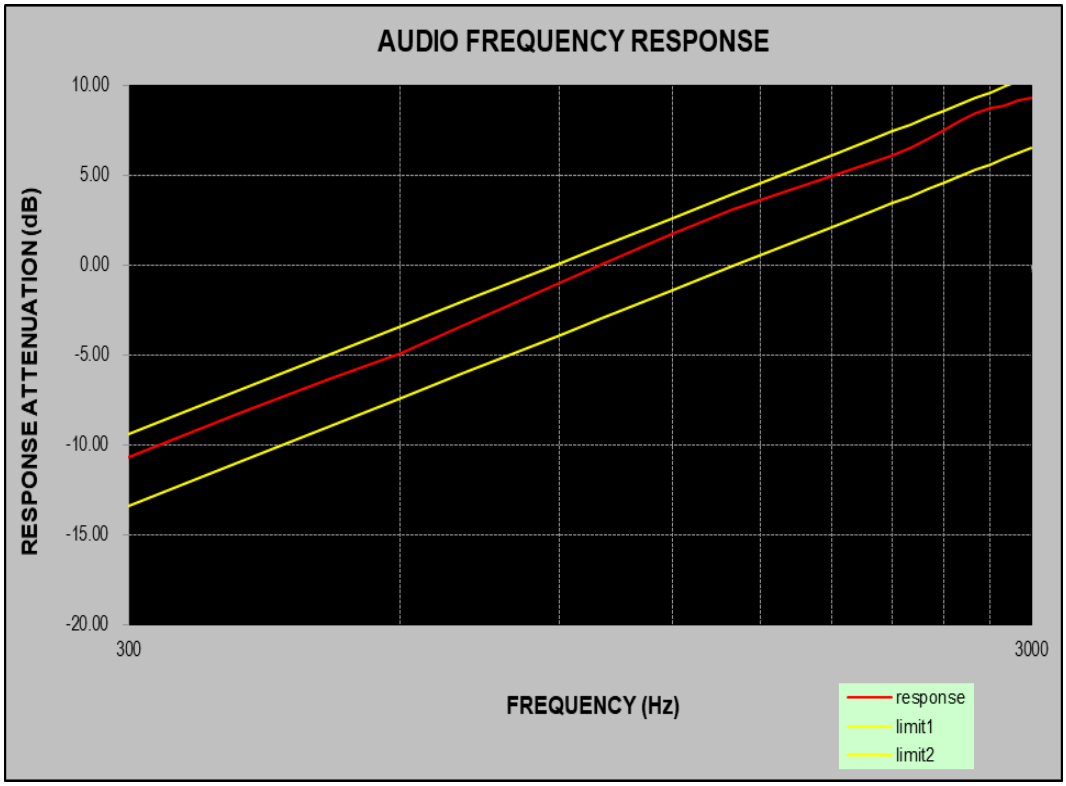
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*
*Test Mode: Transmitter*

| **Channel Spacing: FM 25kHz** | **Carrier Frequency: 156.8 MHz** |
|---|---|

| Modulation Frequency (Hz) | Response Data (dB) |
|---|---|
| 300 | -10.69 |
| 400 | -8.22 |
| 500 | -6.34 |
| 600 | -4.88 |
| 700 | -3.40 |
| 800 | -2.11 |
| 900 | -0.96 |
| 1000 | 0.00 |
| 1200 | 1.75 |
| 1400 | 3.10 |
| 1600 | 4.10 |
| 1800 | 4.95 |
| 2000 | 5.71 |
| 2100 | 6.07 |
| 2200 | 6.52 |
| 2300 | 6.99 |
| 2400 | 7.51 |
| 2500 | 8.03 |
| 2600 | 8.45 |
| 2700 | 8.73 |
| 2800 | 8.90 |
| 2900 | 9.17 |
| 3000 | 9.29 |



# IEC 62238 §8.6 TRANSMITTER AUDIO FREQUENCY HARMONIC DISTORTION OF THE EMISSION

## Applicable Standard

The harmonic distortion of the emission modulated by any audio frequency signal is defined as the ratio, expressed as a percentage, of the root mean square (r.m.s.) voltage of all the harmonic components of the fundamental frequency to the total r.m.s. voltage of the signal after linear demodulation.

## Limit

The harmonic distortion shall not exceed 10 %.

## Method of Measurement

### General

The RF signal produced by the transmitter shall be applied via an appropriate coupling device to a linear demodulator with a de-emphasis network of 6 dB/octave. This test shall be carried out with the output power switch at both maximum and minimum.

### Normal test conditions

Under normal test conditions (see 6.12), the RF signal shall be modulated successively at frequencies of 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3.

The distortion of the audio frequency signal shall be measured at all the frequencies specified above.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Carrier Frequency(MHz) | Power level | Test condition | Audio signal Frequency(MHz) | Frequency Deviation(MHz) | Distortion(%) | Limit(%) |
|---|---|---|---|---|---|---|
| 156.8 | Maximum | NTNV | 0.3 | 0.9 | 2.6 | ≤10 |
| | | | 0.5 | 1.5 | 4.7 | |
| | | | 1 | 3 | 4.7 | |
| | Minimum | NTNV | 0.3 | 0.9 | 2.6 | |
| | | | 0.5 | 1.5 | 4.7 | |
| | | | 1 | 3 | 4.7 | |

# IEC 62238 §8.7 TRANSMITTER ADJACENT CHANNEL POWER

## Applicable Standard

The adjacent channel power is that part of the total power output of a transmitter under defined conditions of modulation which falls within a specified passband centred on the nominal frequency of either of the adjacent channels. This power is the sum of the mean power produced by the modulation hum and noise of the transmitter.

## Limit

The adjacent channel power shall not exceed a value of 70 dB below the carrier power of the transmitter without any need to be below 0,2 μW.

## Method of Measurement

Please refer to IEC 62238 §8.7.2 for the measurement method.

## Test Data

### Environmental Conditions

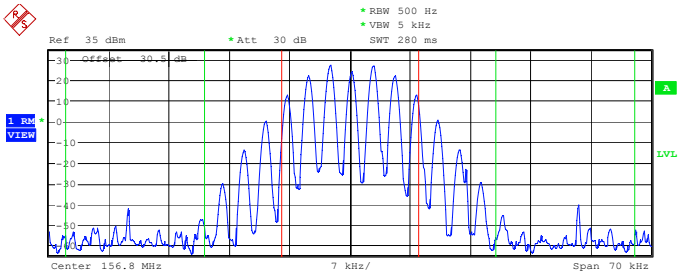
| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Channel Frequency (MHz) | Channel Separation (kHz) | Adjacent Channel (kHz) | Adjacent Channel Ratio (dB) | IEC 62238 Limit (dB) |
|---|---|---|---|---|
| **Low Power Level** | | | | |
| 156.8 | 25 | -25 | -72.26 | -70.0 |
| | | +25 | -71.68 | -70.0 |
| **High Power Level** | | | | |
| 156.8 | 25 | -25 | -73.59 | -70.0 |
| | | +25 | -71.13 | -70.0 |

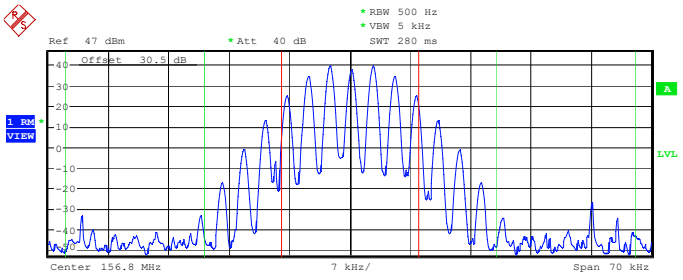
## Low Power Level




| | | | |
|---|---|---|---|
| **Tx Channel** | | | |
| Bandwidth | 16 kHz | Power | 32.16 dBm |
| **Adjacent Channel** | | | |
| Bandwidth | 16 kHz | Lower | -72.26 dB |
| Spacing | 25 kHz | Upper | -71.68 dB |

ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang
Date: 29.SEP.2025 16:22:17

## High Power Level




| | | | |
|---|---|---|---|
| **Tx Channel** | | | |
| Bandwidth | 16 kHz | Power | 44.59 dBm |
| **Adjacent Channel** | | | |
| Bandwidth | 16 kHz | Lower | -73.59 dB |
| Spacing | 25 kHz | Upper | -71.13 dB |

ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang
Date: 29.SEP.2025 16:21:09

# IEC 62238 §8.8 TRANSMITTER CONDUCTED SPURIOUS EMISSIONS CONVEYED TO THE ANTENNA

## Applicable Standard

Conducted spurious emissions are emissions on a frequency or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions.

## Limit

The power of any conducted spurious emission on any discrete frequency shall not exceed 0,25 μW.

## Method of Measurement

Conducted spurious emissions shall be measured with the unmodulated transmitter connected to the artificial antenna (see 6.4).

The measurements shall be made over a range from 9 kHz to 2 GHz, excluding the channel on which the transmitter is operating and its adjacent channels.

The measurements for each spurious emission shall be made using a tuned radio measuring instrument or a spectrum analyzer.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

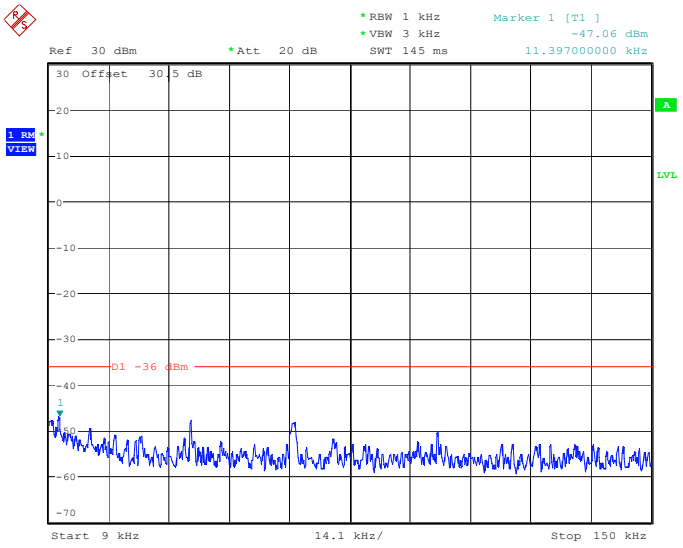
*The testing was performed by Cheeb Huang on 2025-09-29 & 2025-10-20.*

*Test Mode: Transmitter (worst case)*

Note 1: Only the high power level channel was tested.

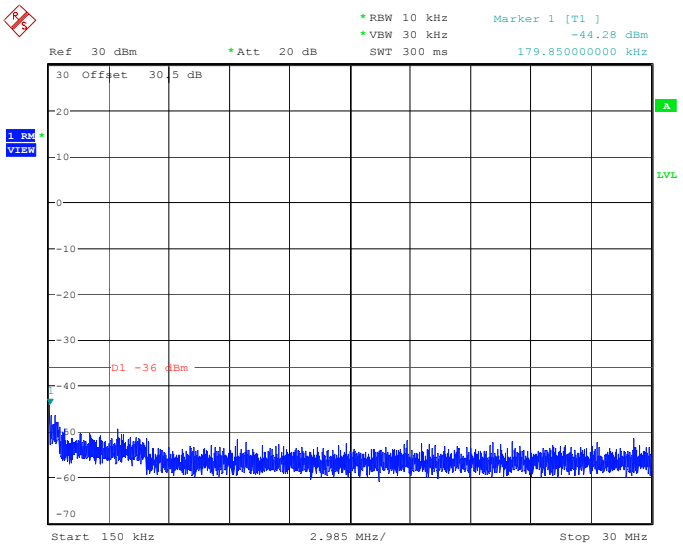
Note 2: The worst path loss (cable loss and Attenuator) among the test frequency range was added into plots.

**156.800MHz:**



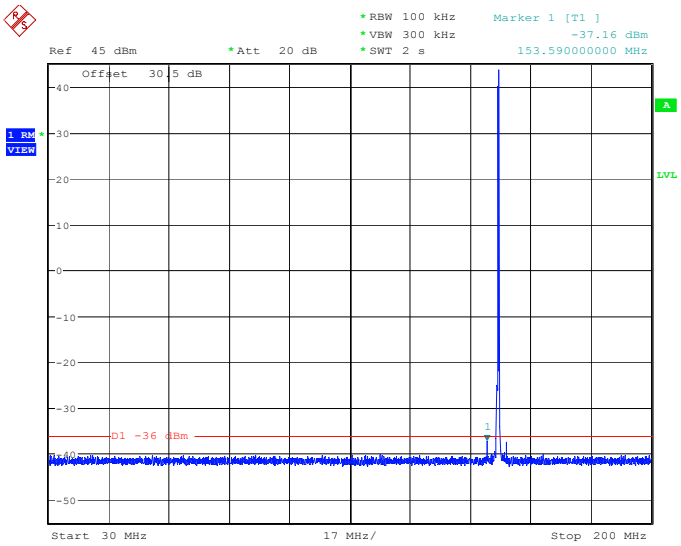

ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang

Date: 29.SEP.2025 16:44:26



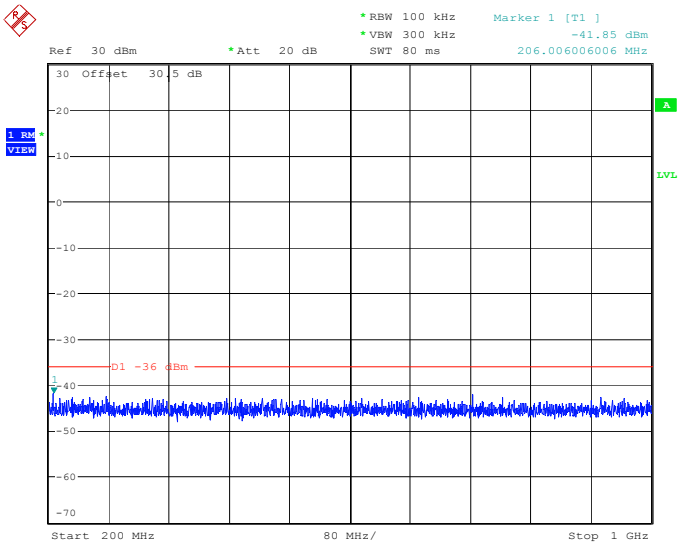

ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang

Date: 29.SEP.2025 16:43:40



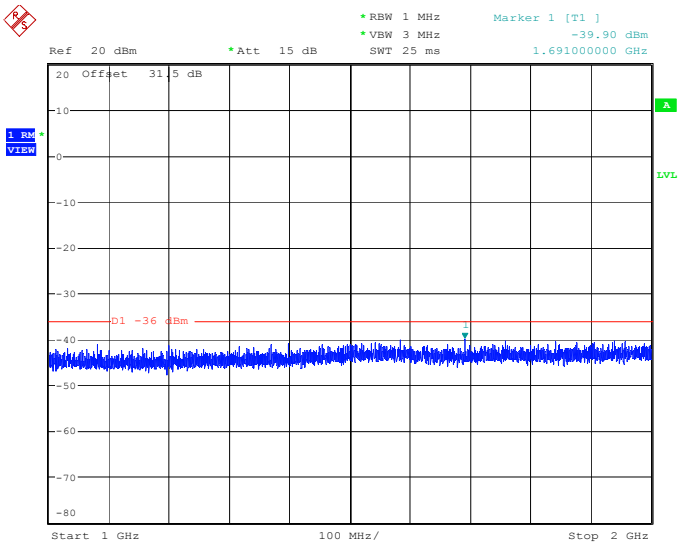

ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang

Date: 29.SEP.2025 16:31:46




ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang

Date: 29.SEP.2025 16:33:38




ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang
Date: 20.OCT.2025 19:19:43

# IEC 62238 §8.9 TRANSIENT FREQUENCY BEHAVIOUR OF THE TRANSMITTER

## Applicable Standard

The transient frequency behaviour of the transmitter is the variation in time of the transmitter frequency difference from the nominal frequency of the transmitter when the RF output power is switched on and off.

$t_{on}$ according to the method of measurement described in 8.10.2 the switch-on instant $t_{on}$ of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the nominal power;

$t_1$ period of time starting at $t_{on}$ and finishing according to Table 2;

$t_2$ period of time starting at the end of $t_1$ and finishing according to Table 2;

$t_{off}$ switch-off instant defined by the condition when the nominal power falls below 0,1 % of the nominal power;

$t_3$ period of time that finishing at $t_{off}$ and starting according to Table 2.

**Table 2 – Transmitter transient timing (ms)**

| | |
|---|---|
| $t_1$ | 5,0 |
| $t_2$ | 20,0 |
| $t_3$ | 5,0 |

NOTE 1 During the periods $t_1$ and $t_3$ the frequency difference should not exceed the value of 1 channel separation.
NOTE 2 During the period $t_2$ the frequency difference should not exceed the value of half a channel separation.

## Limit

The power of any conducted spurious emission on any discrete frequency shall not exceed 0,25 μW.

## Method of Measurement

During the periods of time t1 and t3 the frequency difference shall not exceed ±25 kHz.

The frequency difference after the end of t2 shall be within the limit of the frequency error given in 8.1.

During the period of time t2 the frequency difference shall not exceed ±12,5 kHz.

Before the start of t3 the frequency difference shall be within the limit of the frequency error given in 8.1.

## Test Data

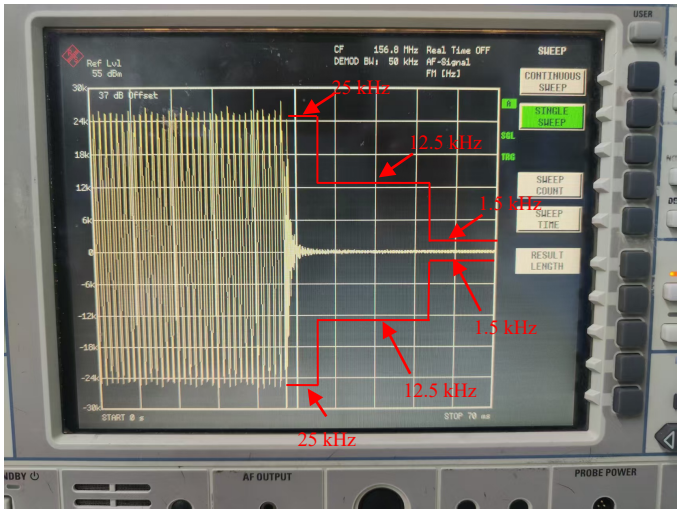
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

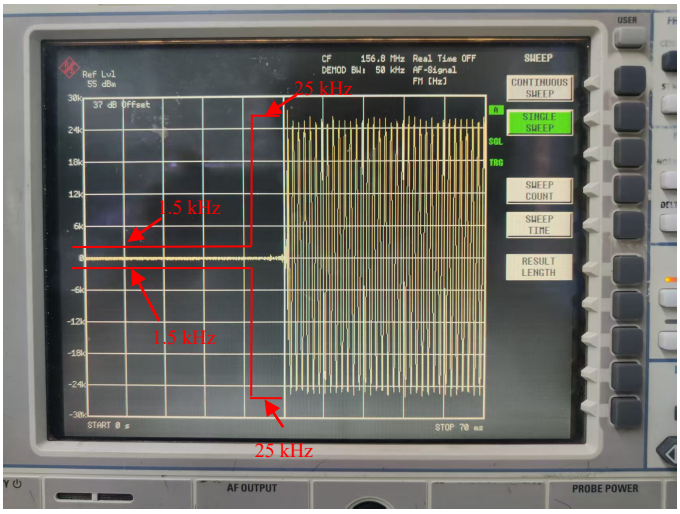
*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

ON




OFF



# IEC 62238 §8.10 RESIDUAL MODULATION OF THE TRANSMITTER

## Applicable Standard

The residual modulation of the transmitter is the ratio, in dB, of the demodulated RF signal in the absence of wanted modulation, to the demodulated RF signal produced when the normal test modulation is applied.

## Limit

The residual modulation shall not exceed –40 dB.

## Method of Measurement

The normal test modulation defined in 6.3 shall be applied to the transmitter. The high frequency signal produced by the transmitter shall be applied, via an appropriate coupling device, to a linear demodulator with a de-emphasis network of 6 dB/octave. The time constant of this de-emphasis network shall be at least 750 μs.

Precautions shall be taken to avoid the effects of emphasizing the low audio frequencies produced by internal noise.

The signal shall be measured at the demodulator output using an r.m.s. voltmeter.

The modulation shall then be switched off and the level of the residual audio frequency signal at the output shall be measured again.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Carrier Frequency (MHz) | Result (dB) | Limit (dB) |
|---|---|---|
| 156.8 | -41.0 | ≤-40 |

**Test Result:** Compliant.

# IEC 62238 §8.11 TRANSMITTER FREQUENCY ERROR (DSC SIGNAL)

## Applicable Standard

The frequency error for the B-state and the Y-state is the difference between the measured frequency from the demodulator and the nominal values.

## Limit

The measured frequency from the demodulator at any time for the B-state shall be within 2 100 Hz ± 10 Hz and for the Y-state within 1 300 Hz ± 10 Hz.

## Method of Measurement

The transmitter shall be connected to the artificial antenna as specified in 6.4 and a suitable FM demodulator. The transmitter shall be set to channel 70.

The transmitter shall be set to transmit a continuous B-state or Y-state.

The measurement shall be performed by measuring the demodulated output, for both the continuous B-state and Y-state.

The measurements shall be carried out under normal test conditions (see 6.12) and extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Carrier Frequency (MHz) | Mode | Test Condition | Frequency deviation Reading (Hz) | Limit (Hz) |
|---|---|---|---|---|
| 156.525 | B-state | NTNV | 2105 | 2100±10 |
| | | LTLV | 2106 | |
| | | LTHV | 2107 | |
| | | HTLV | 2107 | |
| | | HTHV | 2106 | |
| | Y-state | NTNV | 1306 | 1300±10 |
| | | LTLV | 1306 | |
| | | LTHV | 1305 | |
| | | HTLV | 1305 | |
| | | HTHV | 1306 | |

**Test Result:** Compliant.

# IEC 62238 §8.12 TRANSMITTER MODULATION INDEX FOR DSC

## Applicable Standard

This test measures the modulation index in the B and Y states.

## Limit

The modulation index shall be 2,0 ± 10 %.

## Method of Measurement

The transmitter shall be set to transmit continuous B and then Y signals. The frequency deviations shall be measured.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Carrier Frequency (MHz) | Mode | Modulation index | Limit |
|---|---|---|---|
| 156.525 | B-state | 2.00 | 2 ± 0.1 |
| | Y-state | 2.00 | 2 ± 0.1 |

**Test Result:** Compliant.

# IEC 62238 §8.13 TRANSMITTER MODULATION RATE FOR DSC

## Applicable Standard

The modulation rate is the bit stream speed measured in bits per second.

## Limit

The frequency shall be 600 Hz ± 30 × 10−6 corresponding to a modulation rate of 1 200 band.

## Method of Measurement

The transmitter shall be set to transmit continuous dot pattern.

The RF output terminal of the transmitter, via a suitable attenuator, shall be connected to a linear FM demodulator. The output of the demodulator shall be limited in bandwidth by a low pass filter with a cut-off frequency of 1 kHz and a slope of 12 dB/octave.

The frequency of the output shall be measured.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Carrier Frequency (MHz) | Mode | Frequency (ppm) | Limit (ppm) |
|---|---|---|---|
| 156.525 | B-state | 10 | ± 30 |
| | Y-state | 10 | ± 30 |

**Test Result:** Compliant.

# IEC 62238 §8.14 TRANSMITTER TESTING OF GENNERATED CALL SEQUENCES

## Applicable Standard

Generated call sequences are calls which comply with the requirements of ITU-R Recommendation M.493-10.

## Limit

The requirements of ITU-R Recommendation M.493-10 regarding message composition and content shall be met.

The generated calls shall be analyzed with the calibrated apparatus for correct configuration of the signal format, including time diversity.

It shall be verified that, after transmission of a DSC call, the transmitter re-tunes to the original channel. However, in the case of a distress call, the transmitter shall tune to channel 16 and automatically select the maximum power.

The telecommands used and the channels tested for switching shall be stated in the test report.

## Method of Measurement

The output of the transmitter shall be suitably connected to an apparatus for decoding and printing out the information content of the call sequences generated by the equipment.

The transmitter shall be set to transmit DSC calls as specified in annex A.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Transmitter*

| Format Specifier | Category | 1st telecommand (symbol No.) | 2st telecommand (symbol No.) |
|---|---|---|---|
| Distress | / | 100 | 126 |
| All Ships | Urgency | 100 | 126 |
| All Ships | Safety | 100 | 126 |
| Individual | Urgency | 100 | 126 |
| Individual | Safety | 100 | 126 |
| Individual | Routine | 100 | 126 |
| Group | Routine | 100 | 126 |

**Test Result:** Compliant.

# IEC 62238 §9.1 RECEIVER HARMONIC DISTORTION AND RATED AUDIO-FREQUENCY OUTPUT POWER

## Applicable Standard

The harmonic distortion at the receiver output is defined as the ratio, expressed as a percentage, of the total r.m.s. voltage of all the harmonic components of the modulation audio frequency to the total r.m.s. voltage of the signal delivered by the receiver.

The rated audio frequency output power is the value stated by the manufacturer to be the maximum power available at the output, for which all the requirements of this standard are met.

## Limit

The rated audio frequency output power shall be at least:

- 2 W in a loudspeaker;
- 1 mW in the handset earphone.

The harmonic distortion shall not exceed 10 %.

## Test Procedure

Test signals at levels of +60 dBμV (e.m.f.) and +100 dBμV (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation (see 6.3) shall be applied in succession to the receiver input under the conditions specified in 6.1.

For each measurement, the receiver's audio frequency volume control shall be set so as to obtain, in a resistive load which simulates the receiver's operating load, the rated audio frequency output power (see 9.1.1). The value of this load shall be stated by the manufacturer.

Under normal test conditions (see 6.12) the test signal shall be modulated successively at 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3 (ratio between the frequency deviation and the modulation frequency). The harmonic distortion and audio frequency output power shall be measured at all the frequencies specified above.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test Condition | Signals at levels (dBu/V) | Modulation Frequency (Hz) | Loudspeaker | | | |
|---|---|---|---|---|---|---|---|
| | | | | Audio Frequency output power (W) | Limit (W) | Harmonic Distortion (%) | Limit (%) |
| 156.8 | NTNV | 60 | 300 | 3.36 | ≥2 | 0.60 | ≤10 |
| | | | 500 | 3.40 | | 0.50 | |
| | | | 1000 | 3.32 | | 1.30 | |
| | | 100 | 300 | 3.37 | | 0.50 | |
| | | | 500 | 3.40 | | 0.50 | |
| | | | 1000 | 3.32 | | 1.10 | |

**Test Result:** Compliant.

# IEC 62238 §9.2 RECEIVER AUDIO FREQUENCY RESPONSE

## Applicable Standard

The audio frequency response is defined as the variation in the receiver's audio frequency output level as a function of the modulation frequency of the radio frequency signal with constant deviation applied to its input.

## Limit

The audio frequency response shall not deviate by more than +1 dB or –3 dB from a characteristic giving the output level as a function of the audio frequency, decreasing by 6 dB/octave and passing through the measured point at 1 kHz (see Figure 5).

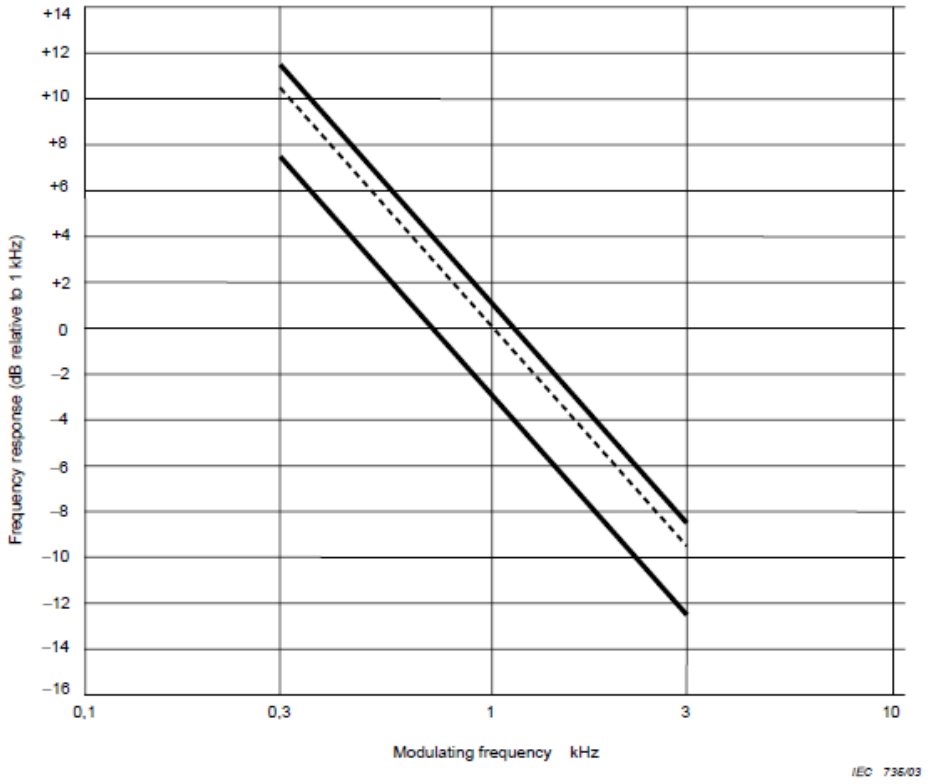



**Figure 5 – Receiver audiofrequency response**

## Method of Measurement

A test signal of +60 dBμV (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated with normal test modulation (see 6.3) shall be applied to the receiver antenna port under the conditions specified in 6.1.

The receiver's audio frequency power control shall be set so as to produce a power level equal to 50 % of the rated output power (see 9.1). This setting shall remain unchanged during the test.

The frequency deviation shall then be reduced to ±1 kHz and the audio output is the reference point in Figure 5 (1 kHz corresponds to 0 dB).

The frequency deviation shall remain constant while the modulation frequency is varied between 300 Hz and 3 kHz and the output level shall then be measured.

The measurement shall be repeated with a test signal at frequencies 1,5 kHz above and below the nominal frequency of the receiver.

## Test Data

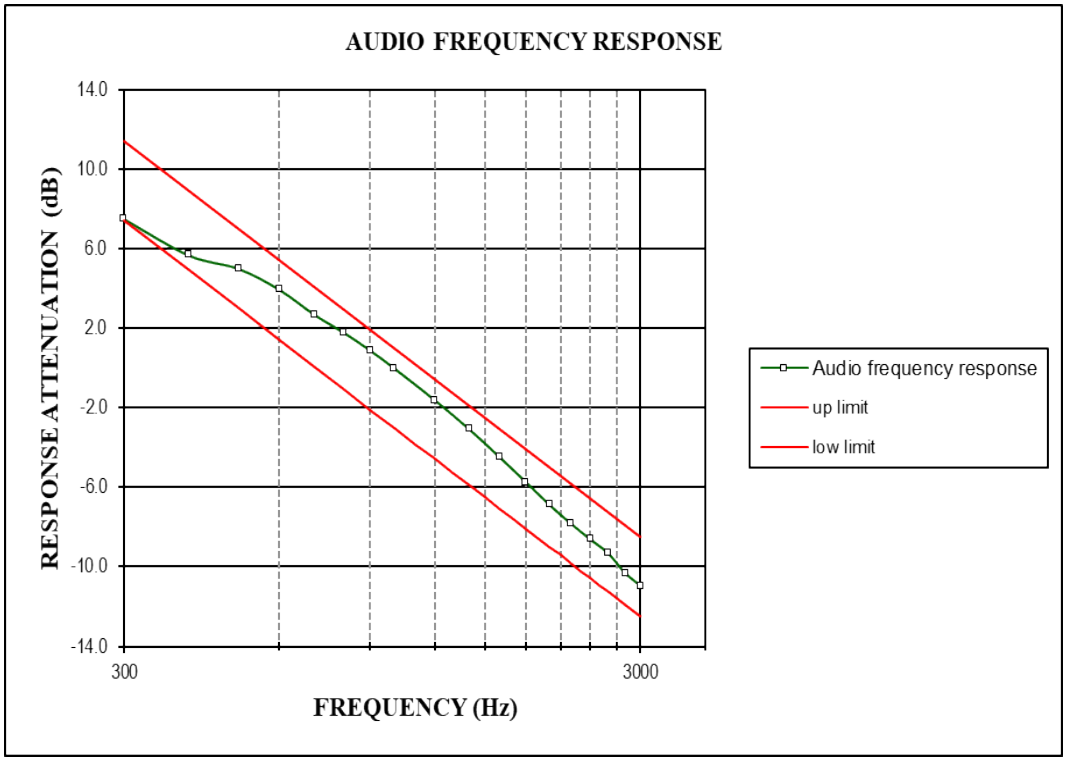
### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

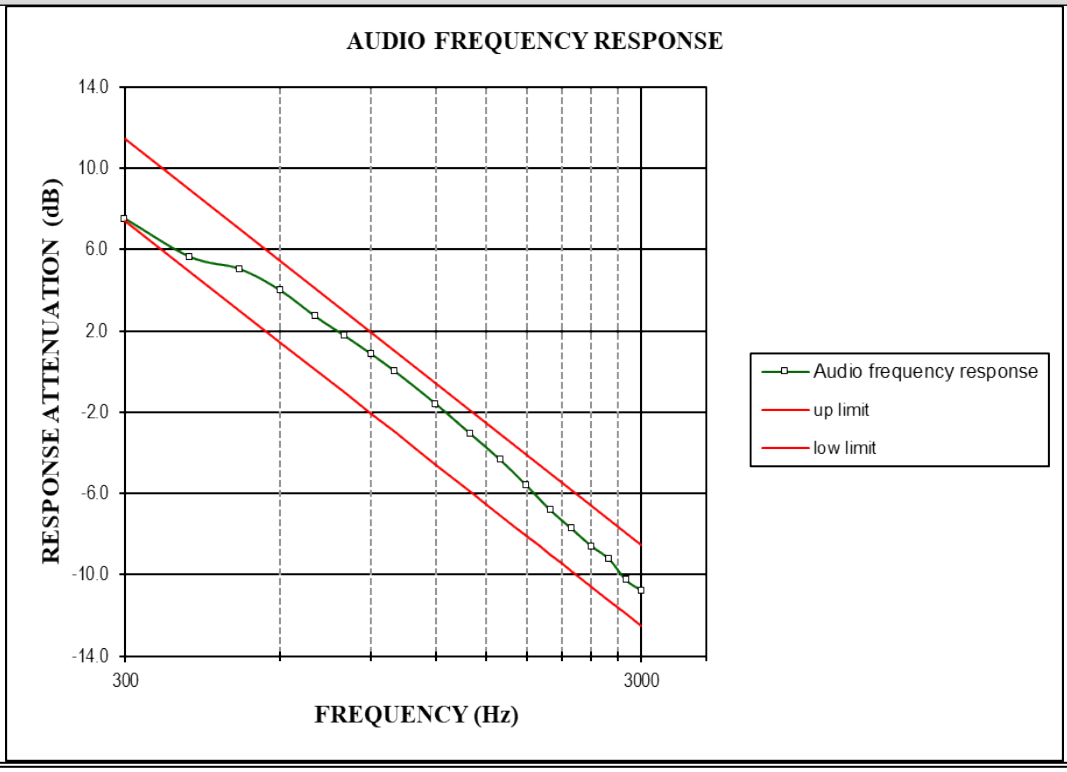
*Test Mode: Receiver*

| **Channel Spacing: FM 25kHz** | | **Nominal Frequency: 156.8 MHz, Test Signal Frequency Offset: None** |
|---|---|---|
| **Modulation Frequency (Hz)** | **Response Data (dB)** | |
| 300 | 7.50 | |
| 400 | 5.68 | |
| 500 | 5.00 | |
| 600 | 3.94 | |
| 700 | 2.70 | |
| 800 | 1.78 | |
| 900 | 0.88 | |
| 1000 | 0.00 | |
| 1200 | -1.62 | |
| 1400 | -3.08 | |
| 1600 | -4.47 | |
| 1800 | -5.73 | |
| 2000 | -6.88 | |
| 2200 | -7.82 | |
| 2400 | -8.62 | |
| 2600 | -9.32 | |
| 2800 | -10.30 | |
| 3000 | -10.95 | |



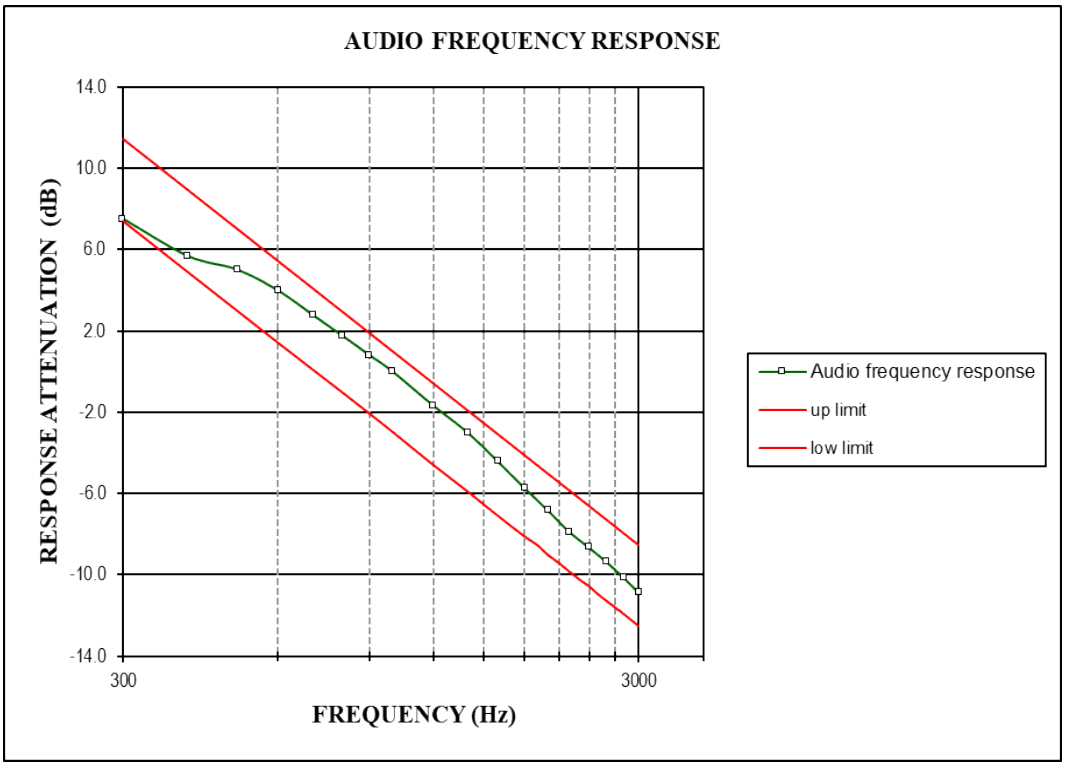
| Channel Spacing: FM 25kHz | |
|---|---|
| **Modulation Frequency (Hz)** | **Response Data (dB)** |
| 300 | 7.51 |
| 400 | 5.64 |
| 500 | 5.04 |
| 600 | 3.98 |
| 700 | 2.71 |
| 800 | 1.74 |
| 900 | 0.85 |
| 1000 | 0.00 |
| 1200 | -1.60 |
| 1400 | -3.07 |
| 1600 | -4.35 |
| 1800 | -5.62 |
| 2000 | -6.82 |
| 2200 | -7.74 |
| 2400 | -8.59 |
| 2600 | -9.23 |
| 2800 | -10.26 |
| 3000 | -10.77 |

**Nominal Frequency: 156.8 MHz, Test Signal Frequency Offset: +1.5kHz**




| Channel Spacing: FM 25kHz | |
|---|---|
| **Modulation Frequency (Hz)** | **Response Data (dB)** |
| 300 | 7.50 |
| 400 | 5.68 |
| 500 | 5.00 |
| 600 | 3.97 |
| 700 | 2.78 |
| 800 | 1.75 |
| 900 | 0.82 |
| 1000 | 0.00 |
| 1200 | -1.68 |
| 1400 | -3.01 |
| 1600 | -4.42 |
| 1800 | -5.71 |
| 2000 | -6.82 |
| 2200 | -7.87 |
| 2400 | -8.64 |
| 2600 | -9.36 |
| 2800 | -10.10 |
| 3000 | -10.87 |

**Nominal Frequency: 156.8 MHz, Test Signal Frequency Offset: -1.5kHz**



# IEC 62238 §9.3 RECEIVER MAXIMUM USEABLE SENSITIVITY

## Applicable Standard

The maximum usable sensitivity of the receiver is the minimum level of the signal (e.m.f.) at the nominal frequency of the receiver which, when applied to the receiver input with normal test modulation (see 6.3), will produce:

– in all cases, an audio frequency output power equal to 50 % of the rated output power (see 9.1); and
– a Signal + Noise + Distortion to Noise + Distortion (SINAD) ratio of 20 dB, measured at the receiver output through a psophometric telephone filtering network such as described in ITU-T Recommendation P.53.

## Limit

The maximum usable sensitivity shall not exceed +6 dBμV (e.m.f.) under normal test conditions and +12 dBμV (e.m.f.) under extreme test conditions.

## Method of Measurement

A test signal at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation (see 6.3) shall be applied to the receiver input. An audio frequency load and a measuring instrument for measuring SINAD ratio (through a psophometric network as specified in 9.3.1) shall be connected to the receiver output terminals.

The level of the test signal shall be adjusted until a SINAD ratio of 20 dB is obtained, using the psophometric network and with the receiver's audio frequency power control adjusted to produce 50 % of the rated output power. Under these conditions, the level of the test signal at the input is the value of the maximum usable sensitivity.

The measurements shall be made under normal test conditions (see 6.12) and under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

A receiver output power variation of ±3 dB relative to 50 % of the rated output power may be allowed for sensitivity measurements under extreme test conditions.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test Condition | Result dBµV (e.m.f) | Limit dBµV (e.m.f) |
|---|---|---|---|
| 156.8 | NTNV | -11.0 | ≤6 |
| | LTLV | -11.0 | ≤12 |
| | LTHV | -11.0 | |
| | HTLV | -11.0 | |
| | HTHV | -11.0 | |

**Test Result:** Compliant.

# IEC 62238 §9.4 RECEIVER CO-CHANNEL REJECTION

## Applicable Standard

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

## Limit

The co-channel rejection ratio shall be between –10 dB and 0 dB.

## Method of Measurement

The two input signals shall be connected to the receiver via a combining network (see 6.1).
The wanted signal shall have normal test modulation (see 6.3). The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz. Both input signals shall be at the nominal frequency of the receiver under test and the measurement repeated for displacements of the unwanted signal of ±3 kHz.

The wanted input signal shall be set to the value corresponding to the measured maximum usable sensitivity (see 9.3).

The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio (psophometrically weighted) at the output of the receiver is reduced to 14 dB.

The co-channel rejection ratio shall be expressed as the ratio in dB of the level of the unwanted signal to the level of the wanted signal at the receiver input for which the specified reduction in SINAD ratio occurs.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Measurement Offset (kHz) | Measured Value (dB) | Limit (dB) |
|---|---|---|---|
| 156.8 | -3.0 | -8.0 | -10≤Limit≤0 |
| | 0.0 | -6.0 | |
| | 3.0 | -4.0 | |

**Test Result:** Compliant.

# IEC 62238 §9.5 RECEIVER ADJACENT CHANNEL SELECTIVITY

## Applicable Standard

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted signal by 25 kHz.

## Limit

The adjacent channel selectivity shall be not less than 70 dB under normal test conditions and not less than 60 dB under extreme test conditions.

## Method of Measurement

The two input signals shall be applied to the receiver input via a combining network (see 6.1).

The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see 6.3). The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz, and shall be at the frequency of the channel immediately above that of the wanted signal.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity. The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio at the receiver output, psophometrically weighted, is reduced to 14 dB. The measurement shall be repeated with an unwanted signal at the frequency of the channel below that of the wanted signal.

The adjacent channel selectivity shall be expressed as the lower value of the ratios in dB for the upper and lower adjacent channels of the level of the unwanted signal to the level of the wanted signal.

The measurements shall then be repeated under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously) with the wanted signal set to the value corresponding to the maximum usable sensitivity under these conditions.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test Condition | Measured Channel | Measured Value (dB) | Limit (dB) |
|---|---|---|---|---|
| 156.8 | NTNV | Upper | 71.0 | ≥70 |
| | | Lower | 71.0 | |
| | LTLV | Upper | 71.0 | ≥60 |
| | | Lower | 71.0 | |
| | LTHV | Upper | 71.0 | |
| | | Lower | 71.0 | |
| | HTLV | Upper | 71.0 | |
| | | Lower | 72.0 | |
| | HTHV | Upper | 72.0 | |
| | | Lower | 71.0 | |

**Test Result:** Compliant.

# IEC 62238 §9.6 RECEIVER SPURIOUS RESPONSE REJECTION

## Applicable Standard

The spurious response rejection is a measure of the capability of the receiver to discriminate between the wanted modulated signal at the nominal frequency and an unwanted signal at any other frequency at which a response is obtained.

## Limit

At any frequency separated from the nominal frequency of the receiver by more than 25 kHz, the spurious response rejection ratio shall be not less than 70 dB.

## Method of Measurement

Two input signals shall be applied to the receiver input via a combining network (see 6.1). The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see 6.3).

The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity. The amplitude of the unwanted input signal shall be adjusted to an e.m.f. of +86 dBμV. The frequency shall then be swept over the frequency range from 100 kHz to 2 000 MHz.

At any frequency at which a response is obtained, the input level shall be adjusted until the SINAD ratio psophometrically weighted, is reduced to 14 dB.

The spurious response rejection ratio shall be expressed as the ratio in dB between the unwanted signal and the wanted signal at the receiver input when the specified reduction in the SINAD ratio is obtained.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Measured Result (dB) (worst case) | Limit (dB) |
|---|---|---|
| 156.8 | 72.0 | ≥70 |

**Test Result:** Compliant.

# IEC 62238 §9.7 RECEIVER INTER-MODULATION RESPONSE

## Applicable Standard

The intermodulation response is a measure of the capability of a receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

## Limit

The intermodulation response ratio shall be greater than 68 dB.

## Method of Measurement

Three signal generators, A, B and C shall be connected to the receiver via a combining network (see 6.1). The wanted signal, represented by signal generator A shall be at the nominal frequency of the receiver and shall have normal test modulation (see 6.3). The unwanted signal from signal generator B shall be unmodulated and adjusted to the frequency 50 kHz above (or below) the nominal frequency of the receiver. The second unwanted signal from signal generator C shall be modulated by 400 Hz with a deviation of ±3 kHz, and adjusted to a frequency 100 kHz above (or below) the nominal frequency of the receiver.

The wanted input signal shall be set to a value corresponding to the maximum usable sensitivity. The amplitude of the two unwanted signals shall be maintained equal and shall be adjusted until the SINAD ratio at the receiver output, psophometrically weighted, is reduced to 14 dB. The frequency of signal generator B shall be adjusted slightly to produce the maximum degradation of the SINAD ratio. The level of the two unwanted test signals shall be readjusted to restore the SINAD ratio of 14 dB. The intermodulation response ratio shall be expressed as the ratio in dB between the two unwanted signals and the wanted signal at the receiver input, when the specified reduction in the SINAD ratio is obtained.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Measured Result (dB) | Limit (dB) |
|---|---|---|
| 156.8 | 70.0 | >68 |

**Test Result:** Compliant.

# IEC 62238 §9.8 RECEIVER BLOCKING OR DESENSITIZATION

## Applicable Standard

Blocking is a change (generally a reduction) in the wanted output power of the receiver or a reduction of the SINAD ratio due to an unwanted signal on another frequency.

## Limit

The blocking level for any frequency within the specified ranges, shall be not less than 90 dBμV (e.m.f.), except at frequencies on which spurious responses are found.

## Method of Measurement

Two input signals shall be applied to the receiver via a combining network (see 6.1). The modulated wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation (see 6.3). Initially, the unwanted signal shall be switched off and the wanted signal set to the value corresponding to the maximum usable sensitivity.

The output power of the wanted signal shall be adjusted, where possible, to 50 % of the rated output power and in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated output power. The unwanted signal shall be unmodulated and the frequency shall be swept between +1 MHz and +10 MHz, and also between –1 MHz and –10 MHz, relative to the nominal frequency of the receiver. The input level of the unwanted signal, at all frequencies in the specified ranges, shall be so adjusted that the unwanted signal causes:

a) a reduction of 3 dB in the output level of the wanted signal; or
b) a reduction to 14 dB of the SINAD ratio at the receiver output using a psophometric telephone filtering network such as described in ITU-T Recommendation P.53 whichever occurs first. This level shall be noted.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Measurement Offset (MHz) | Measured Result (dBµV) | Limit (dBµV) |
|---|---|---|---|
| 156.8 | -10.0 | 92.0 | ≥90 |
| | -5.0 | 92.0 | |
| | -2.0 | 92.0 | |
| | -1.0 | 92.0 | |
| | 1.0 | 92.0 | |
| | 2.0 | 92.0 | |
| | 5.0 | 92.0 | |
| | 10.0 | 92.0 | |

**Test Result:** Compliant.

# IEC 62238 §9.9&§10.7 RECEIVER SPURIOUS EMISSIONS

## Applicable Standard

Spurious emissions from the receiver are components at any frequency, present at the receiver input port.

The level of spurious emissions shall be measured as the power level at the antenna.

## Limit

The power of any spurious emission shall not exceed 2 nW at any frequency in the range between 9 kHz and 2 GHz.

## Method of Measurement

Spurious emissions shall be measured as the power level of any discrete signal at the input terminals of the receiver. The receiver input terminals are connected to a spectrum analyzer or selective voltmeter having an input impedance of 50 Ω and the receiver is switched on.

If the detecting device is not calibrated in terms of power input, the level of any detected components shall be determined by a substitution method using a signal generator.

The measurements shall extend over the frequency range of 9 kHz to 2 GHz.

## Test Data

### Environmental Conditions

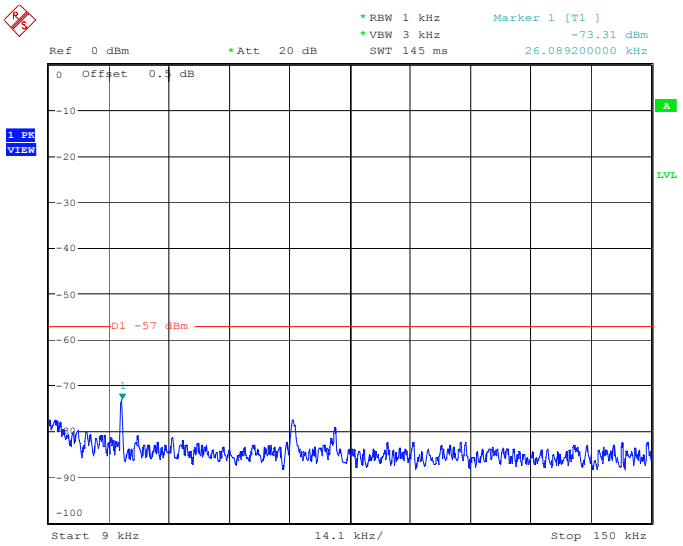
| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29 & 2025-10-20.*

*Test Mode: Receiver (worst case)*

*Note: The worst path loss (cable loss and Attenuator) among the test frequency range was added into plots.*

**156.800MHz:**

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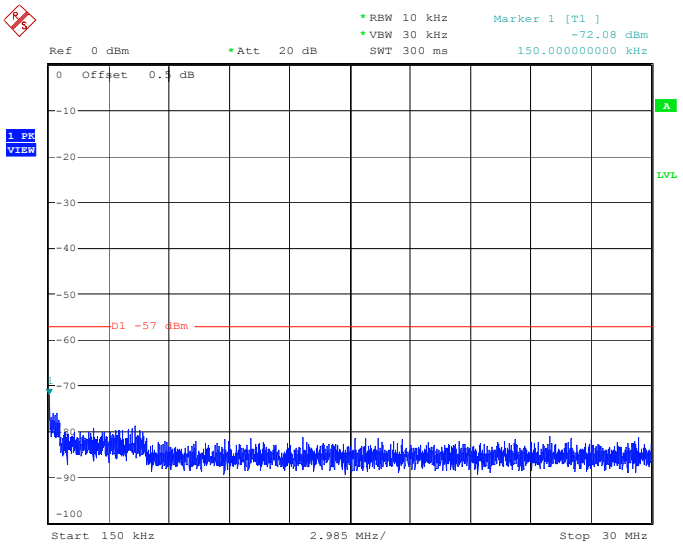
Date: 29.SEP.2025 16:47:49

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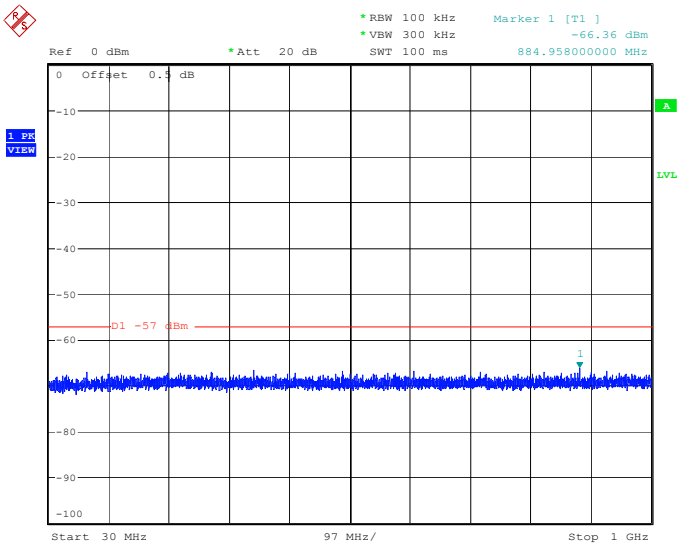


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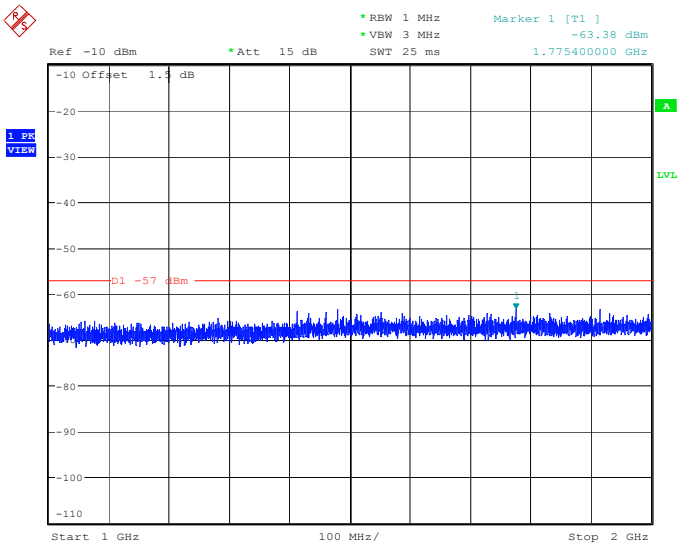


ProjectNo.:2401Y98811E-RF Tester:Cheeb Huang
Date: 20.OCT.2025 19:21:59

# IEC 62238 §9.10 RECEIVER RESIDUAL NOISE LEVEL

## Applicable Standard

The receiver residual noise level is defined as the ratio, in dB, of the audio frequency power of the noise and hum resulting from spurious effects of the power supply system or from other causes, to the audio frequency power produced by a high-frequency signal of average level, modulated by the normal test modulation and applied to the receiver input.

## Limit

The receiver residual noise level shall not exceed -40 dB.

## Method of Measurement

A test signal with a level of +30 dBμV (e.m.f.) at a carrier frequency equal to the nominal frequency of the receiver, and modulated by the normal test modulation specified in 6.3, shall be applied to the receiver input. An audio frequency load shall be connected to the output terminals of the receiver. The audio frequency power control shall be set so as to produce the rated output power level conforming to 9.1.

The output signal shall be measured by an r.m.s. voltmeter having a –6 dB bandwidth of at least 20 kHz. The modulation shall then be switched off and the audio frequency output level measured again.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Residual noise level (dB) (worst case) | Limit (dB) |
|---|---|---|
| 156.8 | -58 | ≤-40 |

**Test Result:** Compliant.

# IEC 62238 §9.11 RECEIVER SQUELCH OPERATION

## Applicable Standard

The purpose of the squelch facility is to mute the receiver audio output signal when the level of the signal at the receiver input is less than a given value.

## Limit

Under the conditions specified in 9.11.2 a), the audio frequency output power shall not exceed –40 dB relative to the rated output power.

Under the conditions specified in 9.11.2 b), the input level shall not exceed +6 dBμV (e.m.f.) and the SINAD ratio shall be at least 20 dB.

Under the conditions specified in 9.11.2 c), the input signal shall not exceed +6 dBμV (e.m.f.) when the control is set at maximum.

## Method of Measurement

a) With the squelch facility switched off, a test signal of +30 dBμV (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation specified in 6.3, shall be applied to the input terminals of the receiver. An audio frequency load and a psophometric filtering network shall be connected to the output terminals of the receiver. The receiver's audio frequency power control shall be set so as to produce the rated output power defined in 9.1.
The output signal shall be measured with the aid of an r.m.s. voltmeter.
The input signal shall then be suppressed, the squelch facility switched on and the audio frequency output level measured again.

b) With the squelch facility switched off again, a test signal modulated by the normal test modulation shall be applied to the receiver input at a level of +6 dBμV (e.m.f.) and the receiver shall be set to produce 50 % of the rated output power.
The level of the input signal shall then be reduced and the squelch facility shall be switched on.
The input signal shall then be increased until the above-mentioned output power is reached.
The SINAD ratio and the input level shall then be measured.

c) (Applicable only to equipment with continuously adjustable squelch control.) With the squelch facility switched off, a test signal with normal test modulation shall be applied to the receiver input at a level of +6 dBμV (e.m.f.), and the receiver shall be adjusted to give 50 % of the rated audio output power.
The level of the input signal shall then be reduced and the squelch facility shall be switched on at its maximum position and the level of the input signal increased until the output power again is 50 % of the rated audio output power.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test Condition | Result | Limit |
|---|---|---|---|
| 156.8 | Condition a | -44.1dB | ≤-40dB (relative tothe rated output power) |
| | Condition b | 26dB | SINAD ≥20dB |
| | Condition c | 3 dBuV (e.m.f.) | Input Signal ≤6dBuV (e.m.f.) |

**Test Result:** Compliant.

# IEC 62238 §9.12 RECEIVER SQUELCH HYSTERESIS

## Applicable Standard

Squelch hysteresis is the difference in dB between the receiver input signal levels at which the squelch opens and closes.

## Limit

The squelch hysteresis shall be between 3 dB and 6 dB.

## Method of Measurement

If there is any squelch control on the exterior of the equipment it shall be placed in its maximum muted position. With the squelch facility switched on, an unmodulated input signal at a carrier frequency equal to the nominal frequency of the receiver shall be applied to the input of the receiver at a level sufficiently low to avoid opening the squelch. The input signal shall be increased at the level just opening the squelch. This input level shall be recorded. With the squelch still open, the level of the input signal shall be slowly decreased until the squelch mutes the receiver audio output again.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test squelch Hysteresis | | | Limit (dB) |
|---|---|---|---|---|
| | Open (dB) | Close (dB) | Difference (dB) | |
| 156.8 | -121.4 | -124.9 | 3.5 | 3~6 |

**Test Result:** Compliant.

# IEC 62238 §9.13 RECEIVER MULTIPLE WATCH CHARACTERISTIC

## Applicable Standard

The scanning period is the time between the start of two successive samples of the priority channel in the absence of a signal on that channel.

The dwell time on the priority channel is the time between the start and finish of any sample of the priority channel in the absence of a signal on that channel.

The dwell time on the additional channel is the time between the start and finish of any sample of the additional channel.

## Limit

The scanning period shall not exceed 2 s.
The dwell time on the priority channel shall not exceed 150 ms.
The dwell time on the additional channel shall be between 850 ms and 2 s as indicated by the time of the gap between two output bursts.

## Method of Measurement

The equipment shall be adjusted to scan the priority channel and one additional channel.

The squelch shall be operational and so adjusted that the receiver just mutes on both the channels.

A test signal at the carrier frequency equal to the nominal frequency of the additional channel of the receiver, modulated by the normal test modulation (see 6.3) shall be connected to the receiver via a combining network (see 6.1). A second test signal with a frequency equal to the nominal frequency of the priority channel having no modulation shall be connected to the receiver via the other input of the combining network. The level of the two test signals shall be +12 dBµV (e.m.f.) at the receiver input.

A storage oscilloscope shall be connected to the audio output. Initially, the output of the test signal on the priority channel shall be switched off. The scanning process is started and the output observed on the oscilloscope. The gap between and the duration of the audio bursts shall be measured. Now the test signal on the priority channel shall be switched on and the scanning shall stop on the priority channel after the last burst and within the dwell time on the priority channel. The measurement shall be carried out where the additional channel is a simplex channel and repeated where it is a duplex channel.

The measurements shall be made under normal and under extreme test conditions.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test Condition | Scanning period (s) | Limit (s) | Dwell time on the priority channel (ms) | Limit (ms) | Dwell time on the additional channel (s) | Limit (s) |
|---|---|---|---|---|---|---|---|
| 156.8 | NTNV | 1 | ≤2 | 90 | ≤150 | 1.4 | 0.85~2 |
| | LTLV | 1 | | 90 | | 1.4 | |
| | LTHV | 1 | | 90 | | 1.4 | |
| | HTLV | 1 | | 90 | | 1.4 | |
| | HTHV | 1 | | 90 | | 1.4 | |

**Test Result:** Compliant.

# IEC 62238 §10.1 DSC RECEIVER MAXIMUM USEABLE SENSITIVITY

## Applicable Standard

The maximum usable sensitivity of the receiver is the minimum level of the signal (e.m.f.) at the nominal frequency of the receiver which when applied to the receiver input with a test modulation will produce a bit error ratio of $10^{-2}$.

## Limit

The bit error ratio shall be equal to or less than $10^{-2}$.

## Method of Measurement

DSC standard test signal (see 6.8) containing DSC calls shall be applied to the receiver input.
The input level shall be 0 dBµV under normal test conditions (see 6.12) and +6 dBµV under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

The measurement shall be repeated under normal test conditions at the nominal carrier frequency ±1,5 kHz.

The bit error ratio in the decoder output shall be determined as described in 6.9.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test Condition | Carrier frequency offset (kHz) | Input level dBµV(e.m.f) | Bit Error Ratio (%) | Limit (%) |
|---|---|---|---|---|---|
| 156.525 | NTNV | 0 | 0 | 0.20 | ≤1 |
| | | -1.5 | | 0.40 | |
| | | 1.5 | | 0.50 | |
| | LTLV | 0 | 6 | 0.50 | |
| | LTHV | 0 | | 0.50 | |
| | HTLV | 0 | | 0.45 | |
| | HTHV | 0 | | 0.50 | |

**Test Result:** Compliant.

# IEC 62238 §10.2 DSC RECEIVER CO-CHANNEL REJECTION

## Applicable Standard

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

## Limit

The bit error ratio shall be equal to or less than $10^{-2}$

## Method of Measurement

The two input signals shall be connected to the receiver input terminal via a combining network (see 6.1). The wanted signal shall be the DSC standard test signal (see 6.8) containing DSC calls. The level of the wanted signal shall be +3 dBμV. The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz. Both input signals shall be at the nominal frequency of the receiver under test and the measurement shall be repeated for displacements of the unwanted signal of up to ±3 kHz.

The input level of the unwanted signal shall be –5 dBμV.

The bit error ratio in the decoder output shall be determined as described in 6.9.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Carrier frequency offset (kHz) | Bit Error Ratio (%) | Limit (%) |
|---|---|---|---|
| 156.525 | 0 | 0.3 | ≤1 |
| | -3 | 0.5 | |
| | 3 | 0.6 | |

**Test Result:** Compliant.

# IEC 62238 §10.3 DSC RECEIVER ADJACENT CHANNELSELECTIVITY

## Applicable Standard

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted signal by 25 kHz.

## Limit

The bit error ratio shall be equal to or less than $10^{-2}$

## Method of Measurement

The two input signals shall be connected to the receiver input terminal via a combining network (see 6.1).

The wanted signal shall be the DSC standard test signal (see 6.8) containing DSC calls. The level of the wanted signal shall be +3 dBμV under normal test conditions and +9 dBμV under extreme test conditions.

The unwanted signal shall be modulated to 400 Hz with a deviation of ±3 kHz. The unwanted signal shall be tuned to the centre frequency of the upper adjacent channel. The input level of the unwanted signal shall be 73 dBμV under normal test conditions and 63 dBμV under extreme test conditions.

The bit error ratio in the decoder output shall be determined as described in 6.9.

The measurement shall be repeated with the unwanted signal tuned to the centre frequency of the lower adjacent channel.

The measurement shall be carried out under normal test conditions (see 6.12) and under extreme test conditions (see 6.13.1 and 6.13.2 applied simultaneously).

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Test Condition | Carrier frequency offset (kHz) | Bit Error Ratio (%) | Limit (%) |
|---|---|---|---|---|
| 156.525 | NTNV | -25 | 0.60 | ≤1 |
| | | 25 | 0.50 | |
| | LTHV | -25 | 0.60 | |
| | | 25 | 0.60 | |
| | LTLV | -25 | 0.60 | |
| | | 25 | 0.56 | |
| | HTLV | -25 | 0.56 | |
| | | 25 | 0.60 | |
| | HTHV | -25 | 0.60 | |
| | | 25 | 0.60 | |

**Test Result:** Compliant.

# IEC 62238 §10.4 DSC RECEIVER SPURIOUS RESPONSE AND BLOCKING IMMUNITY

## Applicable Standard

The spurious response and blocking immunity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal with frequencies outside the pass band of the receiver.

## Limit

The bit error ratio shall be equal to or less than $10^{-2}$

## Method of Measurement

The two input signals shall be connected to the receiver input terminal via a combining network (see 6.1).

The wanted signal shall be the DSC standard test signal (see 6.8) containing DSC calls. The level of the wanted signal shall be +3 dBμV.

For the spurious response test, the unwanted signal shall be unmodulated. The frequency shall be varied over the range 9 kHz to 2 GHz with the exception of the channel of the wanted signal and its adjacent channels. The unwanted signal level shall be 73 dBμV. Where spurious response occurs, the bit error ratio shall be determined.
For the blocking test, the unwanted signal shall be unmodulated. The frequency shall be varied between –10 MHz and –1 MHz and also between +1 MHz and +10 MHz relative to the nominal frequency of the wanted signal. The unwanted signal shall be at a level of 93 dBμV. Where blocking occurs, the bit error ratio shall be determined.

The bit error ratio in the decoder output shall be determined as described in 6.9.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | Carrier Frequency Offset (MHz) | Bit Error Ratio (%) | Limit (%) |
|---|---|---|---|
| 156.525 | -10 | 0.70 | ≤1 |
| | -1 | 0.60 | |
| | 1 | 0.66 | |
| | 10 | 0.80 | |
| | 9 kHz~2 GHz | 0.80 | |

**Test Result:** Compliant.

# IEC 62238 §10.5 DSC RECEIVER INTER-MODULATION RESPONSE

## Applicable Standard

The intermodulation response is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

## Limit

The bit error ratio shall be equal to or less than $10^{-2}$.

## Method of Measurement

The three input signals shall be connected to the receiver input terminal via a combining network (see 6.1).

The wanted signal represented by signal generator A shall be at the nominal frequency of the receiver and shall be the DSC standard test signal (see 6.8) containing DSC calls. The level of the wanted signal shall be +3 dBμV.

The unwanted signals shall be applied, both at the same level. The unwanted signal from signal generator B shall be unmodulated and adjusted to a frequency 50 kHz above (or below) the nominal frequency of the receiver. The second unwanted signal from signal generator C shall be modulated by 400 Hz with a deviation of ±3 kHz and adjusted to a frequency 100 kHz above (or below) the nominal frequency of the receiver.

The input level of the unwanted signals shall be 68 dBμV.

The bit error ratio in the decoder output shall be determined as described in 6.9.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | BER (%) (worst case) | Limit (%) |
|---|---|---|
| 156.525 | 0.8 | ≤1 |

**Test Result:** Compliant.

# IEC 62238 §10.6 DSC RECEIVER DYNAMIC RANGE

## Applicable Standard

The dynamic range of the equipment is the range from the minimum to the maximum level of a radio frequency input signal at which the bit error ratio in the output of the decoder does not exceed a specified value.

## Limit

The bit error ratio shall be equal to or less than $10^{-2}$.

## Method of Measurement

A test signal in accordance with the DSC standard test signal (see 6.8) containing consecutive DSC calls, shall be applied to the receiver input. The level of the test signal shall alternate between 100 dBµV and 0 dBµV.

The bit error ratio in the decoder output shall be determined as described in 6.9.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency (MHz) | BER (%) | Limit (%) |
|---|---|---|
| 156.525 | 0.8 | ≤1 |

**Test Result:** Compliant.

# IEC 62238 §10.8 VERIFICATION OF CORRECT DECODING OF VARIOUS TYPES OF DSC CALLS

## Applicable Standard

DSC call sequences are calls that comply with ITU-R Recommendation M.493-10.

## Limit

The requirements of ITU-R Recommendation M.493-10 regarding message composition and content shall be met.

The decoded call sequences at the output of the receiver shall be examined for correct technical format, including error-check characters.

When receiver measurements are made by use of a printer or a computer, a check shall be made to ensure accordance between printer output and display indication.

It shall be verified that the equipment is capable of switching to a channel identified in the DSC call.

The telecommands used and channels tested for switching shall be stated in the test report.

## Method of Measurement

The input terminal of the receiver shall be suitably connected to a calibrated apparatus for generation of digital selective call signals.

DSC calls as specified in annex A shall be applied to the receiver.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode:*

| Format Specifier | Category | 1st telecommand (symbol No.) | 2st telecommand (symbol No.) |
|---|---|---|---|
| Distress | / | 100 | 126 |
| All Ships | Urgency | 100 | 126 |
| All Ships | Safety | 100 | 126 |
| Individual | Urgency | 100 | 126 |
| Individual | Safety | 100 | 126 |
| Individual | Routine | 100 | 126 |
| Group | Routine | 100 | 126 |

**Test Result:** Compliant.

# IEC 62238 §10.9 REACTION TO VTS AND AIS CHANNEL MANAGEMENT DSC TRANSMISSIONS

## Applicable Standard

VTS and AIS channel management DSC transmissions are any DSC transmissions that are in accordance with Recommendation ITU-R M.825 or M.1371.

## Limit

The equipment shall not sound an alarm, display a message (an accurate, informative display is permissible but not required), transmit a response or suggest a transmitted response, lock up, or require operator intervention.

## Method of Measurement

The input terminal of the receiver shall be connected as per 10.8.2. DSC polling and regional channel management in accordance with Annex 3 of ITU-R M.1371-1 shall be applied to the receiver. A DSC transmission of format specifier symbol 112 and then with 116, category symbol 103, and otherwise similar to a distress call described in Table 4 of ITU-R M.493-10 shall also be made.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 °C |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode:*

| Items | Confirm(Y or N) |
|---|---|
| Not sound an alarm | Y |
| Not display a message(an accurate informative display is permissible but not required) | Y |
| Not transmit a response | Y |
| Not suggest a transmitted response | Y |
| Not lock up | Y |
| Not require operator intervention | Y |

**Test Result:** Compliant.

# IEC 62238 §10.10 DSC RECEIVER SIMULTANEOUS RECEPTION

## Applicable Standard

Simultaneous reception is the ability of the unit to correctly receive DSC traffic and radiotelephony traffic at the same time.

## Limit

For radiotelephony operation the SINAD ratio shall be no less than 20 dB in the presence of the DSC test signal.

The DSC bit error ratio shall be equal to or less than $10^{-2}$.

## Method of Measurement

The radiotelephone shall be set for operation on channel 16.

Two input signals shall be connected to the receiver input terminal via combining network (see 6.1).

The radiotelephone test signal shall be at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation (see 6.3) shall be applied to the receiver input.

An audio frequency load and a measuring instrument for measuring SINAD ratio (through a psophometric network as specified in 9.3.1) shall be connected to the receiver output terminals.

The radiotelephone test signal level shall be set for 20 dBμV.

The SINAD shall be measured with and without the presence of the DSC test signal.

The DSC standard test signal input level shall be 0 dBμV (see 6.8) containing DSC calls.

The bit error ratio in the decoder output shall be determined as described in 6.9.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

*Test Mode: Receiver*

| Carrier Frequency(MHz) | SINAD limit db | | Bit error rate measured value(%) | Bit error rate limit(%) |
|---|---|---|---|---|
| | Measure Value(db) | Limit(db) | | |
| 156.8 | 25 | ≥20 | 0.45 | ≤1 |

**Test Result:** Compliant.

# IEC 62238 RECOMMENDED STANDARDS FOR EQUIPMENT OPERATING IN HIGH LEVEL ELECTROMAGNETIC ENVIRONMENTS

## Applicable Standard

In some areas of the world, high power transmitters are located in close proximity to navigable waterways which can produce large power levels ranging from typically –40 dBm to –10 dBm. This has been observed, for instance, in the New Orleans/Baton Rouge waterway areas in the USA. Such power levels generate in-band nonlinear reactions, such as desensitization or intermodulation in the receiver input of greater severity than those anticipated by the blocking and intermodulation tests of this standard.

Equipment intended for use in such areas is recommended to meet the requirements of the test below. Receivers meeting the requirements below should be capable of useful reception in such environments better than 95 % of the time.

Optional circuitry accessible by operator, for example a switched RF attenuator, may be used to meet the limits required by the test.

## Limit

The SINAD ratio of the radio receiver tuned to the wanted frequency of 156,650 MHz. at the receiver audio frequency output, psophometrically weighted, shall indicate a level no less than 14 dB, averaged over a 1 min measurement interval.

## Method of Measurement

Please refer to IEC 62238 §D.2 for the measurement method.

## Test Data

### Environmental Conditions

| | |
|---|---|
| **Temperature:** | 25 ℃ |
| **Relative Humidity:** | 50 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Cheeb Huang on 2025-09-29.*

| Frequency(MHZ) | SINAD Ratio result (db) | Limit(db) |
|---|---|---|
| 156.65 | 22 | ≥14db |

**Test Result:** Compliant.

# EXHIBIT A - EUT PHOTOGRAPHS

Please refer to the attachment 2401Y98811E-RF-EXP External photo and 2401Y98811E-RF-INP Internal photo.

*******END OF REPORT*******