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## TEST REPORT

**IEC 62238**

**Report Reference No.**.....: **TRE1401013502 R/C: 72247**

**FCC ID**.....: **RIPHM360**

Compiled by

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Date of issue.....: March 04, 2013

**Testing Laboratory Name** .....: **Shenzhen Huatongwei International Inspection Co., Ltd**

Address.....: Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China

**Applicant's name**.....: **Shenzhen Jiuzhou Himunication Technology Co.,Ltd**

Address.....: B712, 7F, Jiuzhou Electric Building, Southern No.12 Road, Hi-tech Industrial Park, Nanshan District, Shenzhen, China

**Test specification** ..... :

Standard .....: **IEC 62238:2002**

TRF Originator.....: Shenzhen Huatongwei International Inspection CO., Ltd

Master TRF.....: Dated 2006-06

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**Test item description** ..... : Handheld marine radio

Trade Mark .....: /

Manufacturer .....: **Shenzhen Jiuzhou Himunication Technology Co.,Ltd**

Model/Type reference.....: HM360

List Model .....: /

Modulation .....: G3E,G2B

Channe Separation.....: 25KHz

Operation Frequency.....: From 156.05 MHz to 157.425 MHz

DSC class .....: D

Rated Power .....: 5 Watts(36.99dBm)/1 Watts(30.00dBm)

Ratings.....: DC 7.40 V

Result.....: **PASS**

**TEST REPORT**

|                                        |               |
|----------------------------------------|---------------|
| <b>Test Report No. :</b> TRE1401013502 | Mar 11, 2014  |
|                                        | Date of issue |

Equipment under Test : Handheld marine radio

Model /Type : HM360

Listed Models : /

**Applicant** : **Shenzhen Jiuzhou Himunication Technology Co.,Ltd**

Address : 3rd Floor,Block C,Huafeng Second Industry  
Park, Hangcheng Road, Gushu, Xixiang town, Baoan  
District, Shenzhen, China

**Manufacturer** : **Shenzhen Jiuzhou Himunication Technology Co.,Ltd**

Address : 3rd Floor,Block C,Huafeng Second Industry  
Park, Hangcheng Road, Gushu, Xixiang town, Baoan  
District, Shenzhen, China

|                     |             |
|---------------------|-------------|
| <b>Test Result:</b> | <b>PASS</b> |
|---------------------|-------------|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## **1. TEST STANDARDS**

The tests were performed according to following standards:

[IEC 62238:2002](#) –Maritime navigation and radiocommunication equipment and systems - VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC) -Methods of testing and required test results

[IEC 60945:2002](#) –Maritime navigation and radiocommunication equipment and systems – General requirements-Methods of testing and required test results.

## 2. SUMMARY

### 2.1. General Remarks

|                                |   |              |
|--------------------------------|---|--------------|
| Date of receipt of test sample | : | Jan 26, 2014 |
|                                |   |              |
| Testing commenced on           | : | Feb 28, 2014 |
|                                |   |              |
| Testing concluded on           | : | Mar 11, 2014 |

### 2.2. Product Description

The **Shenzhen Jiuzhou Himunication Technology Co.,Ltd**'s Model: HM360 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

|                     |                                       |                                              |
|---------------------|---------------------------------------|----------------------------------------------|
| Name of EUT         | Handheld marine radio                 |                                              |
| Model Number        | HM360                                 |                                              |
| Rated Output Power  | 5 Watts(36.99 dBm)/1 Watts(30.00 dBm) |                                              |
| DSC class           | D                                     |                                              |
| Modulation Type     | G3E,G2B                               |                                              |
| Emission Designator | Analog                                | 16K0G3E/16K0G2B for 25KHz Channel Separation |
| Channel Separation  | Analog Voice                          | 25KHz                                        |
| Antenna Type        | External                              |                                              |
| Frequency Range     | From 156.05 MHz to 157.425 MHz        |                                              |

### 2.3. Equipment Under Test

#### Power supply system utilised

|                      |   |                                                                   |                                   |
|----------------------|---|-------------------------------------------------------------------|-----------------------------------|
| Power supply voltage | : | <input type="radio"/> 230V / 50 Hz                                | <input type="radio"/> 115V / 60Hz |
|                      |   | <input type="radio"/> 12 V DC                                     | <input type="radio"/> 24 V DC     |
|                      |   | <input checked="" type="radio"/> Other (specified in blank below) |                                   |

DC 7.40 V

#### Test frequency list

| Modulation Type | Test Channel         | Test Frequency |
|-----------------|----------------------|----------------|
| Analog/FM       | Low Channel(CH1)     | 156.050 MHz    |
|                 | Middle Channel(CH16) | 156.800 MHz    |
|                 | High Channel(CH88)   | 157.425 MHz    |
|                 | DSC (CH70)           | 156.525 MHz    |

### 2.4. EUT operation mode

The EUT has been tested under typical operating condition. Using software provided by the client to control the EUT for staying in transmitting and receiving mode for testing.

### 2.5. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

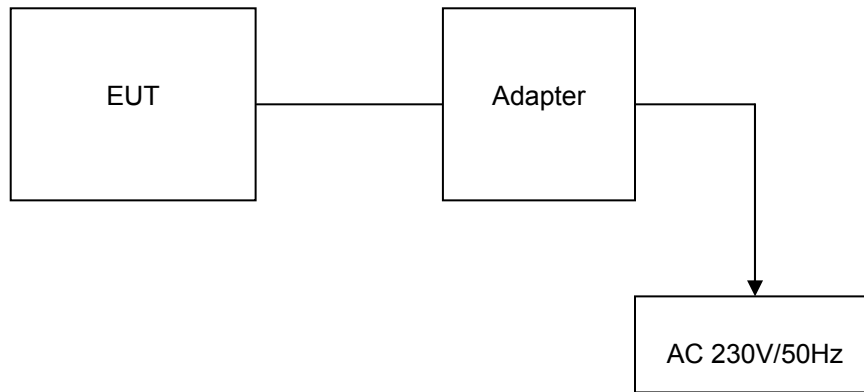


Table 2-1 Equipment Used in Tested System

**Adapter:**

Model: SW-090100

Input: 100-240V~, 50/60Hz

Output: DC 9V 1000mA

Power Cable: 100cm

◇ Shielded

◆ Unshielded

**2.6. EUT configuration**

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

|   |             |                |   |
|---|-------------|----------------|---|
| ○ | Power Cable | Length (m) :   | / |
|   |             | Shield :       | / |
|   |             | Detachable :   | / |
| ○ | Multimeter  | Manufacturer : | / |
|   |             | Model No. :    | / |

**2.7. Performance check**

The provisions of IEC62338, clause 6.3 shall apply. Where the term "performance check" is used, this shall be taken to mean a visual inspection of the equipment, a test of the transmitter output power and frequency error, and the receiver sensitivity to show that the equipment is functioning and that there is no visible damage or deterioration.

**a) For the transmitter:**

The transmitter shall be connected to the artificial antenna (see 6.4) and tuned to channel 16. The measurements shall be made in the absence of modulation with the power switch set at maximum. The output power shall be between 6 W and 25 W, and the frequency error shall be less than  $\pm 1.5$  kHz.

**b) For the radiotelephone receiver:**

A test signal (see 6.3) with a level of +12 dB $\mu$ V shall be applied to the receiver input as in 9.3.2. The SINAD ratio at the receiver output shall be equal to or greater than 20 dB.

**c) For the DSC receiver:**

A standard DSC test signal (see 6.8) with a level of +6 dB $\mu$ V shall be applied to the receiver input. The symbol error ratio in the decoder output shall be equal to or less than  $10^{-2}$ .

**2.8. NOTE**

- The EUT is a V frequency band (156.05-157.425 MHz) Handheld marine radio, The functions of the EUT listed as below:

|       | Test Standards | Reference Report |
|-------|----------------|------------------|
| Radio | FCC Part 80    | TRE1401013501    |
| Radio | IEC 62238      | TRE1401013502    |

### **3. TEST ENVIRONMENT**

#### **3.1. Address of the test laboratory**

Shenzhen Huatongwei International Inspection Co., Ltd  
Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China  
Phone: 86-755-26715686 Fax: 86-755-26748089

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

#### **3.2. Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

##### **CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: Mar. 01, 2012. Valid time is until Feb. 28, 2015.

##### **A2LA-Lab Cert. No. 2243.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until Sept. 30, 2015.

##### **FCC-Registration No.: 662850**

Shenzhen Huatongwei International Inspection Co., Ltd, EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 662850, Renewal date June 01, 2015.

##### **IC-Registration No.: 5377A**

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377 on Dec 31, 2013. Valid time is until Dec 31, 2016

##### **ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

##### **VCCI**

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: December 20, 2013. Valid time is until December 19, 2016.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: December 20, 2012. Valid time is until December 19, 2015.

##### **DNV**

Shenzhen Huatongwei International Inspection Co Ltd has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025(2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug 24, 2016.

#### **3.3. Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

|                       |              |
|-----------------------|--------------|
| Temperature:          | 15-35 ° C    |
| Humidity:             | 30-60 %      |
| Atmospheric pressure: | 950-1050mbar |

### 3.4. Test Description

| IEC62238 requirements                              |                           |      |
|----------------------------------------------------|---------------------------|------|
| Frequency deviation                                | IEC 62238 Sub-clause 8.3  | PASS |
| Sensitivity of the modulator, including microphone | IEC 62238 Sub-clause 8.4  | PASS |
| Audiofrequency response                            | IEC 62238 Sub-clause 8.5  | PASS |
| Audiofrequency harmonic distortion of the emission | IEC 62238 Sub-clause 8.6  | PASS |
| Residual modulation of the transmitter             | IEC 62238 Sub-clause 8.10 | PASS |
| Frequency error (DSC signal)                       | IEC 62238 Sub-clause 8.11 | PASS |
| Modulation index for DSC                           | IEC 62238 Sub-clause 8.12 | PASS |
| Modulation rate for DSC                            | IEC 62238 Sub-clause 8.13 | PASS |

Remark: The measurement uncertainty is not included in the test result.

### 3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 2 " and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

| Test Items                                     | Measurement Uncertainty | Notes |
|------------------------------------------------|-------------------------|-------|
| Frequency error                                | 25 Hz                   | (1)   |
| Transmitter power conducted                    | 0.57 dB                 | (1)   |
| Transmitter power Radiated                     | 2.20 dB                 | (1)   |
| Adjacent and alternate channel power Conducted | 1.20 dB                 | (1)   |
| Conducted spurious emission 9KHz-12.75 GHz     | 1.60 dB                 | (1)   |
| Radiated spurious emission 9KHz-12.75 GHz      | 2.20 dB                 | (1)   |
| Intermodulation attenuation                    | 1.00 dB                 | (1)   |
| Maximum useable receiver sensitivity           | 2.80 dB                 | (1)   |
| Co-channel rejection                           | 2.80 dB                 | (1)   |
| Adjacent channel selectivity                   | 2.80 dB                 | (1)   |
| Spurious response rejection                    | 2.80 dB                 | (1)   |
| Intermodulation response rejection             | 2.80 dB                 | (1)   |
| Blocking or desensitization                    | 2.80 dB                 | (1)   |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

### 3.6. Equipments Used during the Test

| Frequency Deviation@ Sensitivity of the modulator, including microphone@ Audiofrequency response@ Audiofrequency harmonic distortion of the emission |                             |              |           |            |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------|-----------|------------|------------|
| Item                                                                                                                                                 | Test Equipment              | Manufacturer | Model No. | Serial No. | Last Cal.  |
| 1                                                                                                                                                    | RF COMMUNICATION TEST SET   | HP           | 8920A     | 3813A10206 | 2013/10/26 |
| 2                                                                                                                                                    | Real-Time Spectrum Analyzer | Tektronix    | RSA3303B  | 3589       | 2013/10/26 |

The Cal. Interval was one year.

## 4. TEST CONDITIONS AND RESULTS

### 4.1. IEC 62338 REQUIREMENTS

#### 4.1.1. Frequency Deviation

##### LIMIT

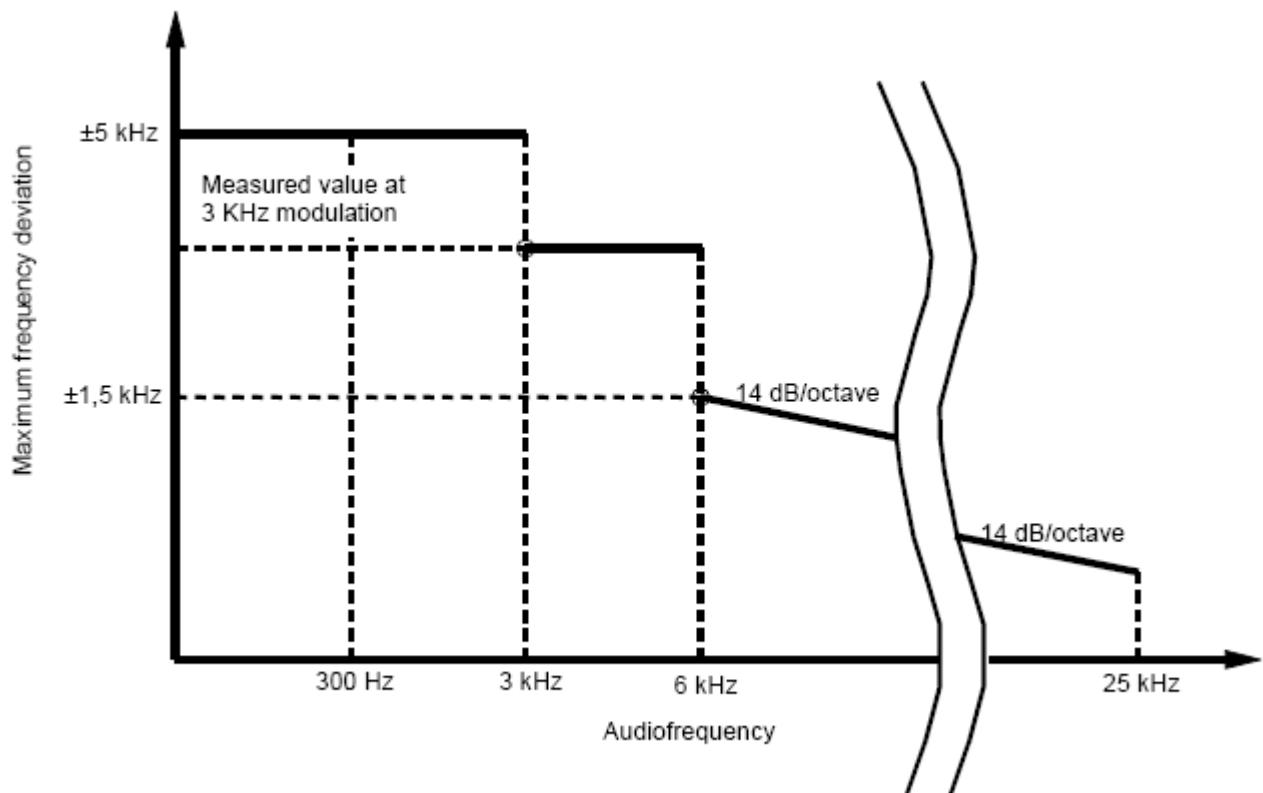
##### IEC 62238 Sub-clause 8.3.2.2 and 8.3.3.2

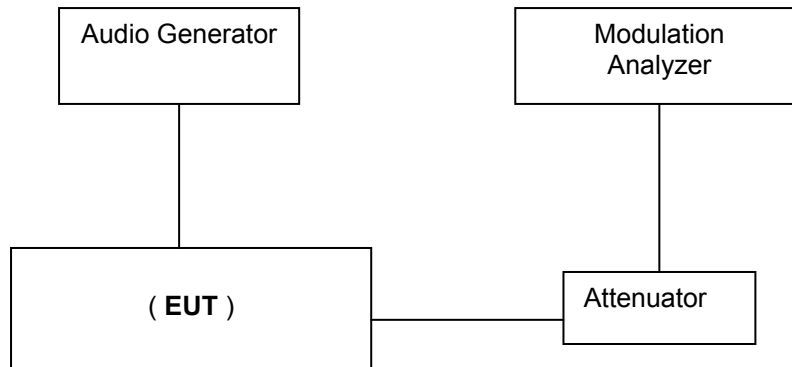
The maximum frequency deviation shall be  $\pm 5$  kHz.

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.

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  $\pm 1,5$  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  $\pm 1,5$  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.

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.

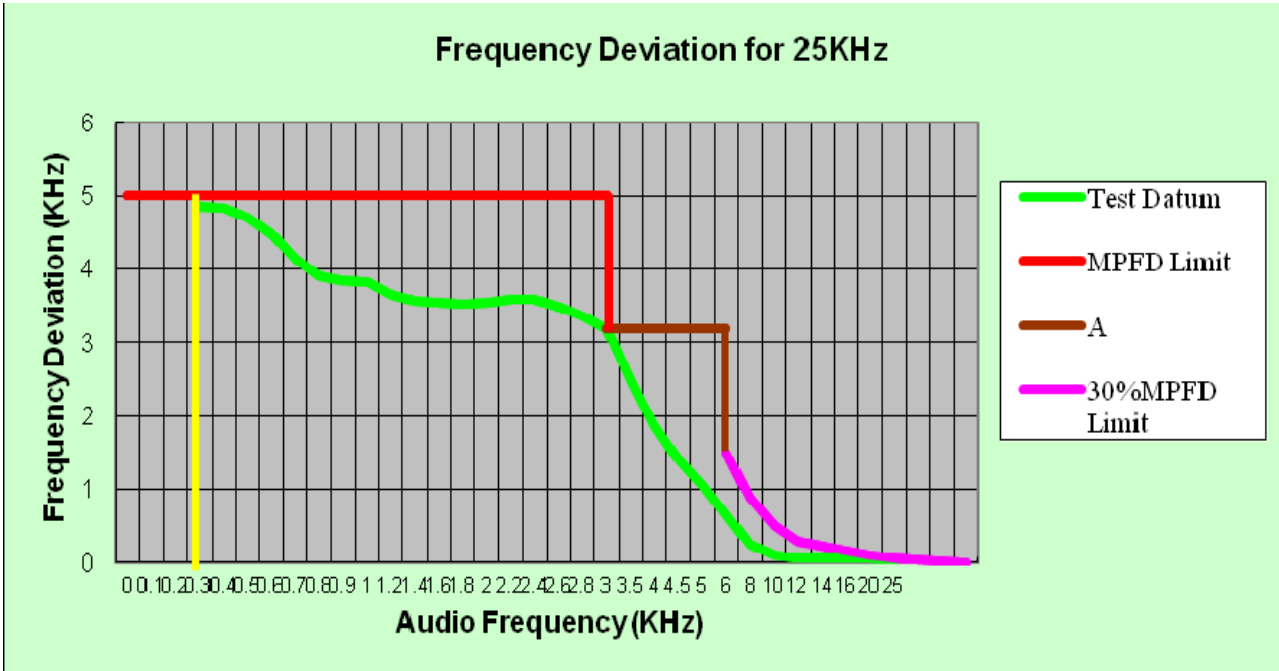


**TEST CONFIGURATION****TEST PROCEDURE**

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.3.1.2 and Sub-clause 8.3.3.1 for the measurement method.

**TEST RESULTS**

| Test Condition   |               | Modulation Frequency (KHz) | Frequency Deviation Measurement Results (KHz) |
|------------------|---------------|----------------------------|-----------------------------------------------|
| Temperature( ℃ ) | Voltage ( V ) |                            | Middle Channel                                |
| 25               | 7.40          | 0.1                        | 4.86                                          |
|                  |               | 0.2                        | 4.83                                          |
|                  |               | 0.3                        | 4.71                                          |
|                  |               | 0.4                        | 4.48                                          |
|                  |               | 0.5                        | 4.14                                          |
|                  |               | 0.6                        | 3.91                                          |
|                  |               | 0.7                        | 3.84                                          |
|                  |               | 0.8                        | 3.82                                          |
|                  |               | 0.9                        | 3.65                                          |
|                  |               | 1.0                        | 3.56                                          |
|                  |               | 1.2                        | 3.54                                          |
|                  |               | 1.4                        | 3.52                                          |
|                  |               | 1.6                        | 3.54                                          |
|                  |               | 1.8                        | 3.59                                          |
|                  |               | 2.0                        | 3.59                                          |
|                  |               | 2.2                        | 3.49                                          |
|                  |               | 2.4                        | 3.35                                          |
|                  |               | 2.6                        | 3.18                                          |
|                  |               | 2.8                        | 2.48                                          |
|                  |               | 3.0                        | 1.88                                          |
|                  |               | 3.5                        | 1.40                                          |
|                  |               | 4.0                        | 1.06                                          |
|                  |               | 4.5                        | 0.65                                          |
|                  |               | 5.0                        | 0.25                                          |
|                  |               | 6.0                        | 0.10                                          |
|                  |               | 8.0                        | 0.06                                          |
|                  |               | 10.0                       | 0.06                                          |
|                  |               | 12.0                       | 0.06                                          |
|                  |               | 14.0                       | 0.06                                          |
|                  |               | 16.0                       | 0.05                                          |
|                  |               | 20.0                       | 0.06                                          |
|                  |               | 25.0                       | 0.05                                          |
| Result           |               |                            | PASS                                          |



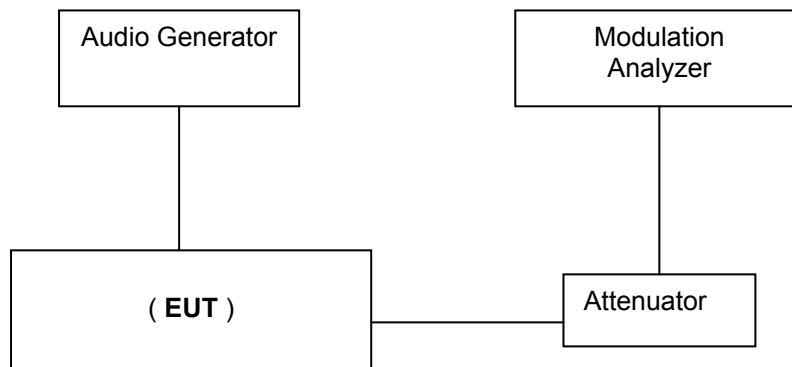
#### 4.1.2. Sensitivity of the modulator, including microphone

##### LIMIT

##### IEC 62238 Sub-clause 8.4.3

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. The resulting frequency deviation shall be between  $\pm 2.5$  kHz and  $\pm 4.5$  kHz..

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.4.2 for the measurement method.

##### TEST RESULTS

| Test Condition    |               | Modulation Frequency (KHz)                                 | Frequency Deviation Measurement Results (KHz) |
|-------------------|---------------|------------------------------------------------------------|-----------------------------------------------|
| Temperature( °C ) | Voltage ( V ) |                                                            | Middle Channel                                |
| 25                | 7.40          | 1.0                                                        | 2.96                                          |
|                   |               | 0.3                                                        | 2.85                                          |
|                   |               | 0.5                                                        | 2.72                                          |
| Limit             |               | Frequency deviation shall be between ±2.5 kHz and ±4.5 kHz |                                               |
| Result            |               | PASS                                                       |                                               |

### 4.1.3. Audio frequency response

#### LIMIT

#### IEC 62238 Sub-clause 8.5.3

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  $\pm 1$  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.

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)

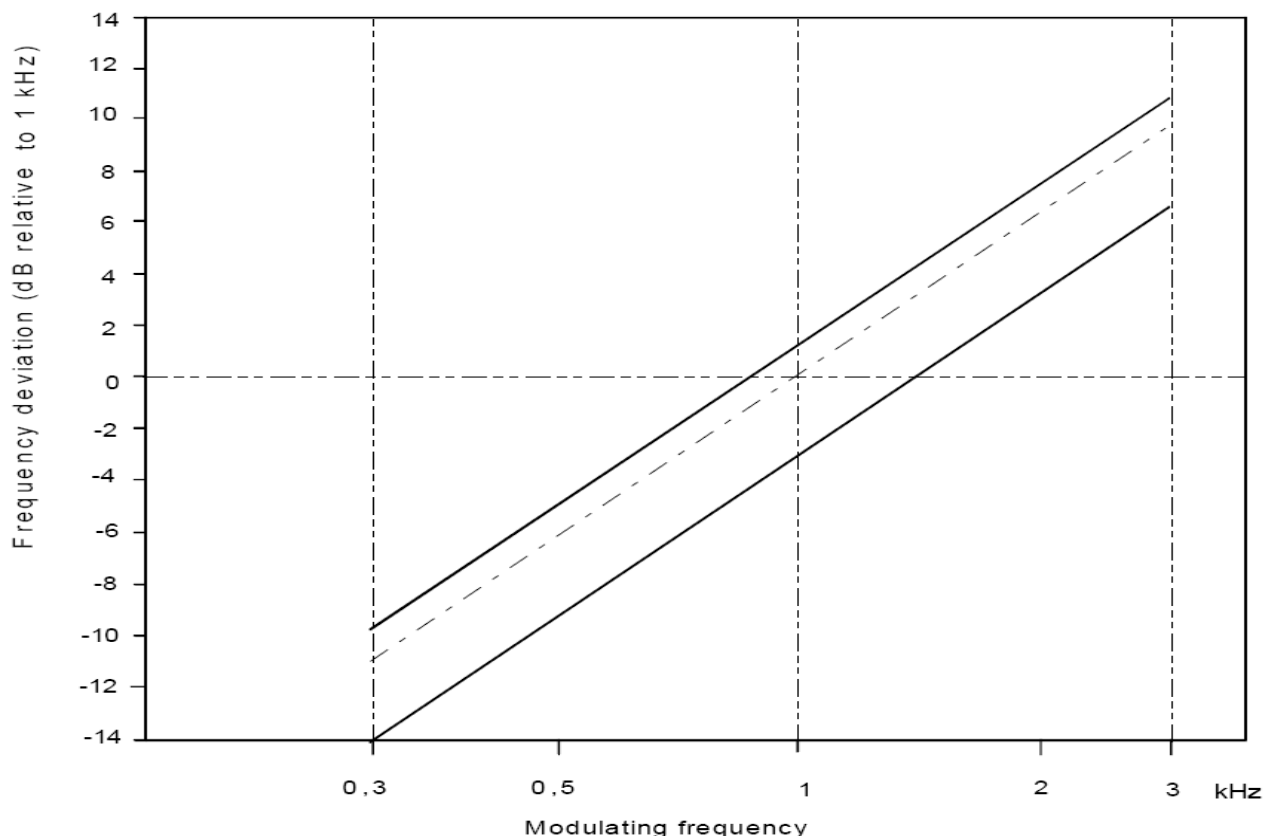
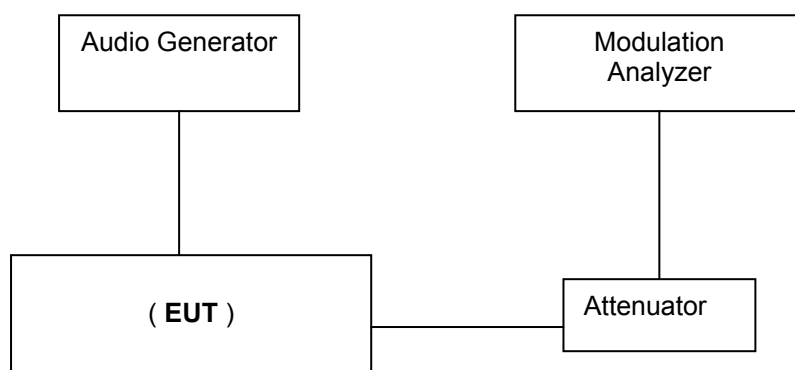


Figure 2: Audio frequency response

#### TEST CONFIGURATION



#### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.5.2 for the measurement method.

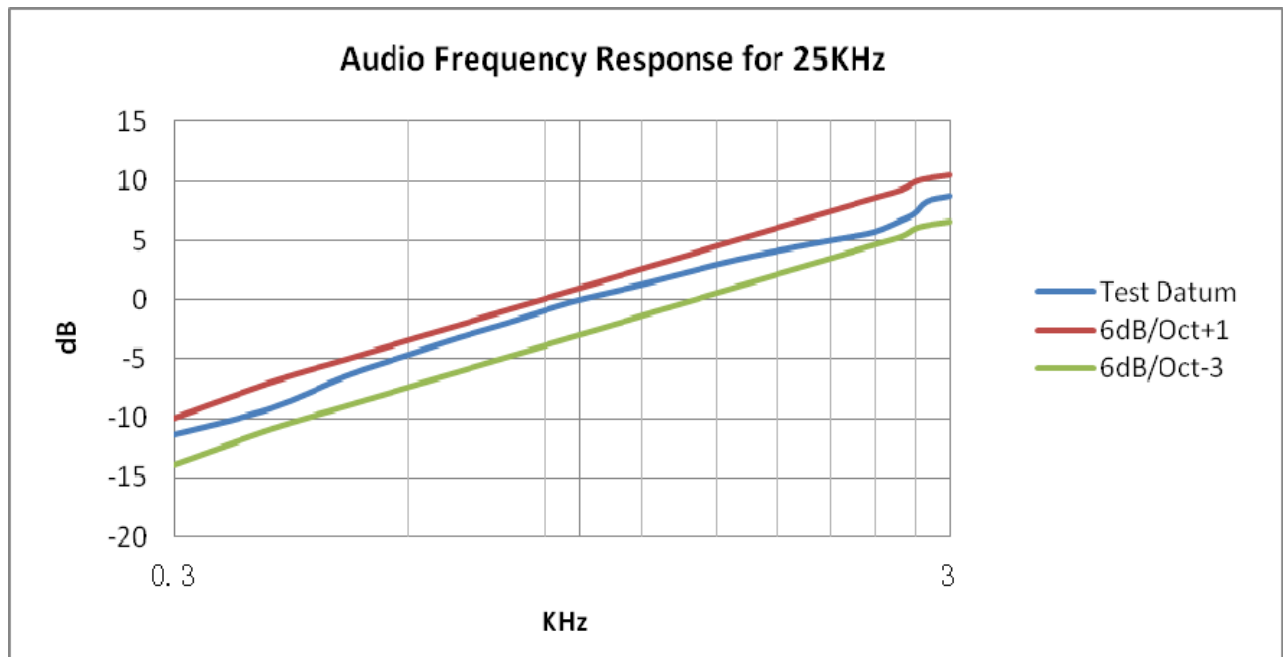
**TEST RESULTS**

The audio frequency response curve is show below.and Test Audio Level (1 KHz and 20% maximum deviation) is 2.65mv for 25 KHz channel separation.

The audio frequency response only test at middle channel.

**25 KHz Channel Separation**

| Frequency (KHz ) | Frequency Deviation (KHz) | 1KHz Refenerce Deviation (KHz) | Audio Frequency Response (dB) |
|------------------|---------------------------|--------------------------------|-------------------------------|
| 0.3              | 0.27                      | 1.01                           | -11.45                        |
| 0.4              | 0.35                      | 1.01                           | -9.20                         |
| 0.5              | 0.48                      | 1.01                           | -6.46                         |
| 0.6              | 0.59                      | 1.01                           | -4.67                         |
| 0.7              | 0.70                      | 1.01                           | -3.18                         |
| 0.8              | 0.80                      | 1.01                           | -2.02                         |
| 0.9              | 0.91                      | 1.01                           | -0.91                         |
| 1.0              | 1.01                      | 1.01                           | 0.00                          |
| 1.2              | 1.17                      | 1.01                           | 1.28                          |
| 1.4              | 1.34                      | 1.01                           | 2.46                          |
| 1.6              | 1.50                      | 1.01                           | 3.44                          |
| 1.8              | 1.63                      | 1.01                           | 4.16                          |
| 2.0              | 1.75                      | 1.01                           | 4.77                          |
| 2.2              | 1.85                      | 1.01                           | 5.26                          |
| 2.4              | 1.96                      | 1.01                           | 5.76                          |
| 2.6              | 2.20                      | 1.01                           | 6.76                          |
| 2.7              | 2.35                      | 1.01                           | 7.33                          |
| 2.8              | 2.64                      | 1.01                           | 8.35                          |
| 3.0              | 2.78                      | 1.01                           | 8.80                          |



#### 4.1.4. Audio frequency harmonic distortion of the emission

##### LIMIT

##### **IEC 62238 Sub-clause 8.6.3.**

The harmonic distortion of the emission modulated by an audio frequency signal is defined as the ratio, expressed as a percentage, of the root mean square (rms) voltage of all the harmonic components of the fundamental modulation frequency to the total rms voltage of the modulation signal after linear demodulation. 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 per octave. This test shall be carried out on a 25 kHz channel with the output power switch at both maximum and minimum.

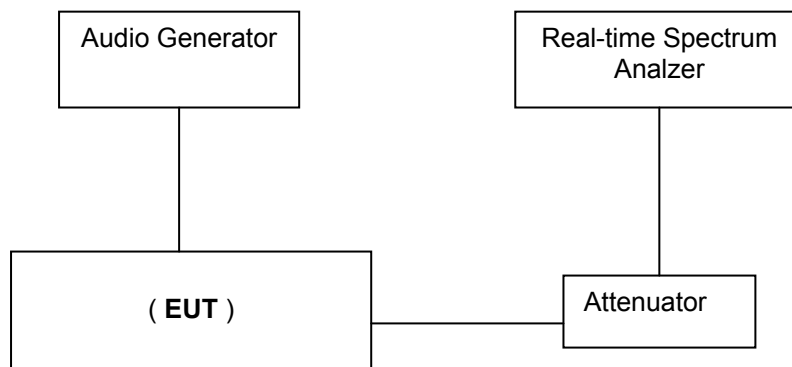
Under normal test conditions (clause 6.12) the RF signal shall be modulated successively at frequencies of 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3.

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

Under extreme test conditions (clauses 6.13.1 and 6.13.2 applied simultaneously), the measurements shall be carried out at 1 kHz with a frequency deviation of  $\pm 3$  kHz.

The harmonic distortion shall not exceed 10 %.

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 and Sub-clause 6.13 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.6.2.1 and Sub-clause 8.6.3.1 for the measurement method.

##### TEST RESULTS

Note: The harmonic distortion were tested at maximum and minimum rated power, which recorded worst case

| Test Condition    |               | Modulation<br>Frequency<br>(KHz) | Harmonic Distortion Measurement Results |
|-------------------|---------------|----------------------------------|-----------------------------------------|
| Temperature( °C ) | Voltage ( V ) |                                  | Middle Channel                          |
| T Nor ( 25°C )    | 7.40 V        | 0.3                              | 2.2%                                    |
|                   |               | 0.5                              | 3.1%                                    |
|                   |               | 1.0                              | 5.2%                                    |
| Limit             |               | Shall not exceed 10%.            |                                         |
| Result            |               | PASS                             |                                         |

#### 4.1.5. Residual modulation of the transmitter

##### LIMIT

##### IEC 62238 Sub-clause 8.10.3

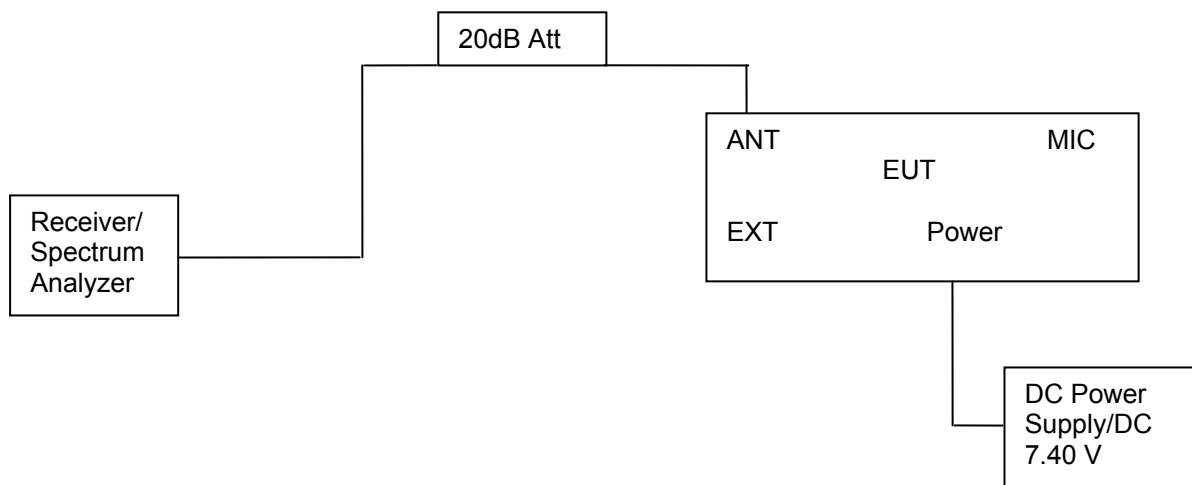
The normal test modulation defined in 6.3 shall be applied to the transmitter.

The highfrequency 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  $\mu$ s.

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 audiofrequency signal at the output shall be measured again. The residual modulation shall not exceed -40 dB.

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions
2. Please refer to IEC 62238 Sub-clause 8.11.2 for the measurement method.

##### TEST RESULTS

| Test Condition    |               | Residual Modulation Measurement Results |
|-------------------|---------------|-----------------------------------------|
| Temperature( °C ) | Voltage ( V ) | Middle Channel                          |
| T Nor ( 25°C )    | 7.40 V        | -56.2                                   |
| Limit             |               | Shall not exceed -40                    |
| Result            |               | PASS                                    |

#### 4.1.6. Modulation index for DSC

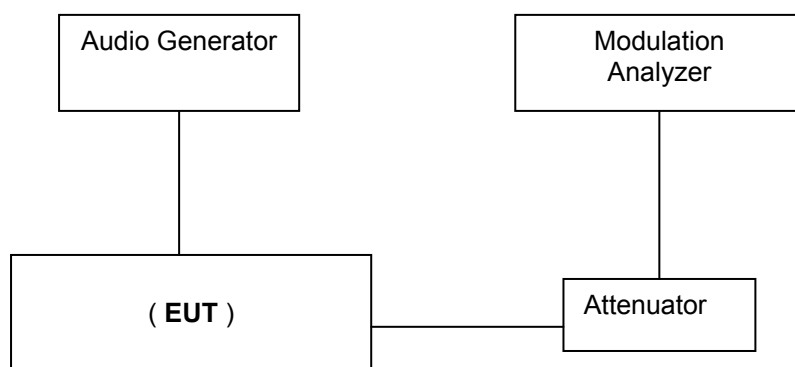
##### LIMIT

##### IEC 62238 Sub-clause 8.11.3

modulation index the ratio between the frequency deviation and the frequency of the modulation signal  
The transmitter shall be set to transmit continuous B and then Y signals. The frequency deviations shall be measured.

The modulation index shall be  $2.0 \pm 10\%$ .

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.1.2 for the measurement method.

##### TEST RESULTS

| Test Condition   |               | Modulation Frequency<br>(KHz) | Measument Results |         |
|------------------|---------------|-------------------------------|-------------------|---------|
| Temperature( ℃ ) | Voltage ( V ) |                               | B-state           | Y-state |
| 25               | 7.40          | 0.1                           | 1.88              | 1.99    |
|                  |               | 0.2                           | 1.92              | 1.91    |
|                  |               | 0.3                           | 1.86              | 2.00    |
|                  |               | 0.4                           | 1.88              | 2.05    |
|                  |               | 0.5                           | 1.85              | 1.96    |
|                  |               | 0.6                           | 1.89              | 1.92    |
|                  |               | 0.7                           | 1.82              | 2.08    |
|                  |               | 0.8                           | 1.90              | 2.02    |
|                  |               | 0.9                           | 1.95              | 2.09    |
|                  |               | 1.0                           | 2.06              | 2.03    |
|                  |               | 1.2                           | 2.00              | 2.09    |
|                  |               | 1.4                           | 1.95              | 2.04    |
|                  |               | 1.6                           | 1.93              | 2.11    |
|                  |               | 1.8                           | 2.08              | 2.08    |
|                  |               | 2.0                           | 1.96              | 2.03    |
|                  |               | 2.2                           | 1.91              | 1.95    |
|                  |               | 2.4                           | 1.95              | 1.99    |
|                  |               | 2.6                           | 1.89              | 1.91    |
|                  |               | 2.8                           | 1.85              | 1.85    |
|                  |               | 3.0                           | 1.86              | 1.82    |
| Limit            |               |                               | 2.0±10%           |         |
| Result           |               |                               | PASS              |         |

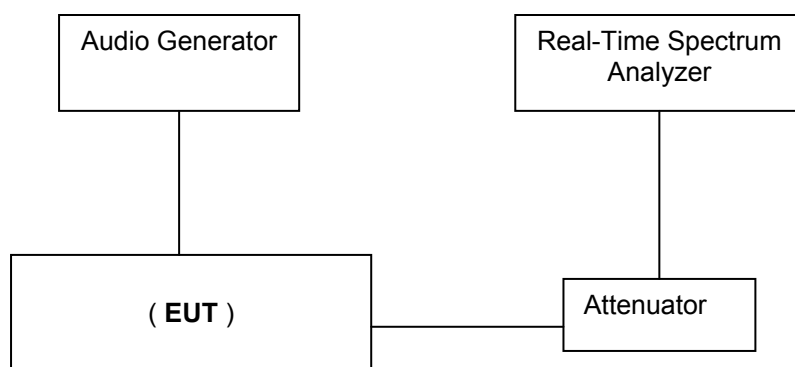
#### 4.1.7. Modulation rate for DSC

##### LIMIT

##### IEC 62238 Sub-clause 8.13.3

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 lowpass filter with a cut-off frequency of 1 kHz and a slope of 12 dB/octave. The frequency shall be  $600 \text{ Hz} \pm 30 \times 10^{-6}$  corresponding to a modulation rate of 1 200 baud.

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.1.2 for the measurement method.

##### TEST RESULTS

| Test Condition    |               | Modulation rate for DSC Measurement Results |                 |
|-------------------|---------------|---------------------------------------------|-----------------|
| Temperature( °C ) | Voltage ( V ) | Frequency (Hz)                              | Modulation rate |
| T Nor ( 25°C )    | 7.40 V        | 600                                         | 1200            |
| Limit             |               | $600 \text{ Hz} \pm 30 \times 10^{-6}$      |                 |
| Result            |               | PASS                                        |                 |

## **5. Test Set up Photos of the EUT**



## **6. External and Internal Photos of the EUT**

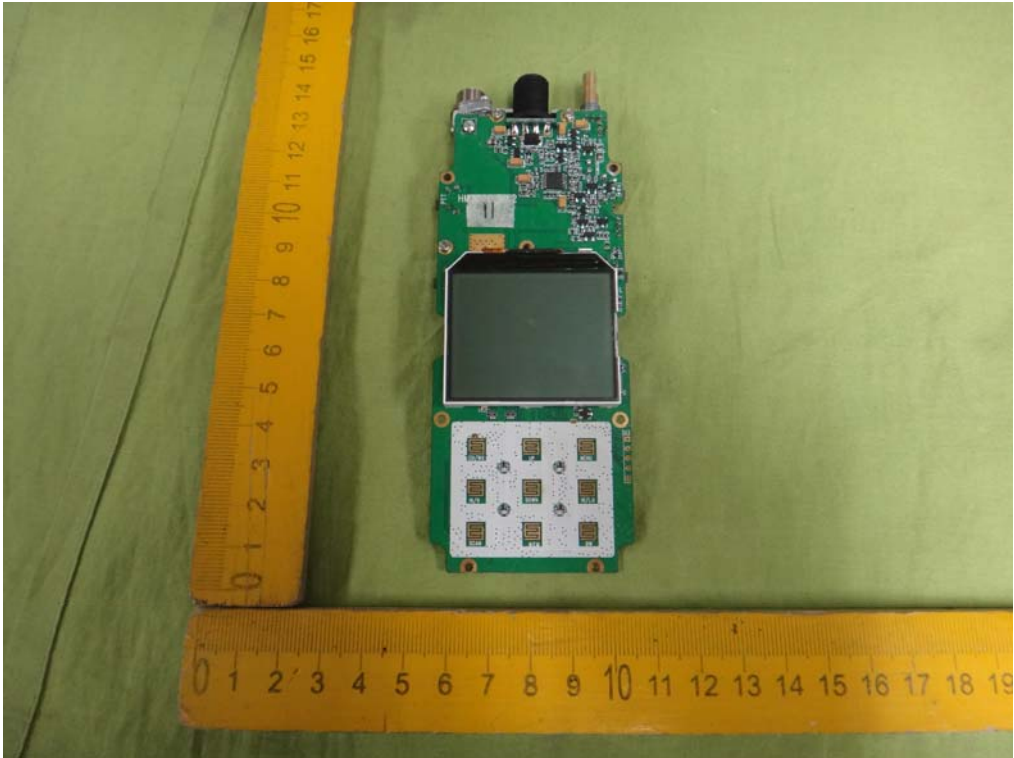
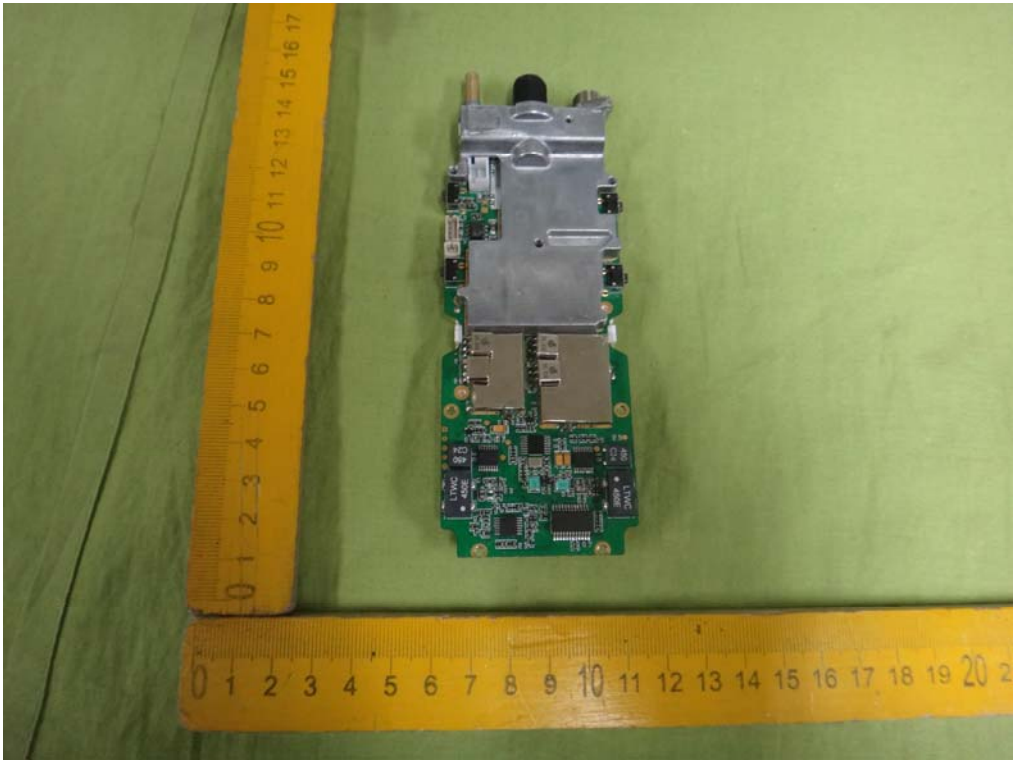
### **External photos of the EUT**

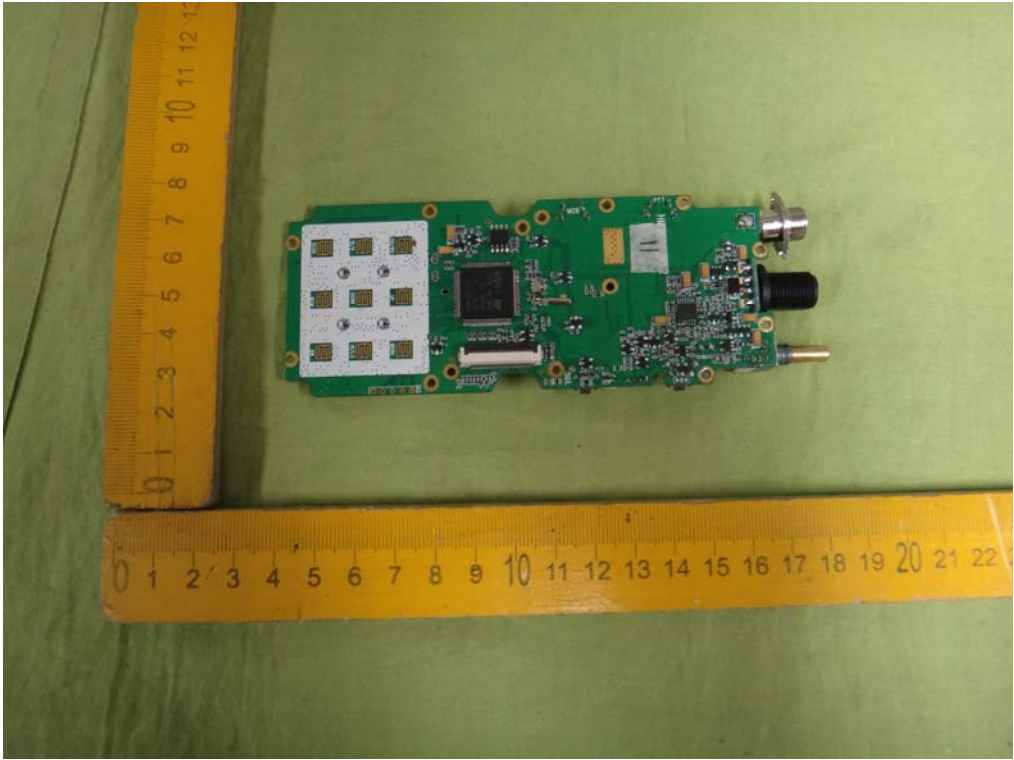
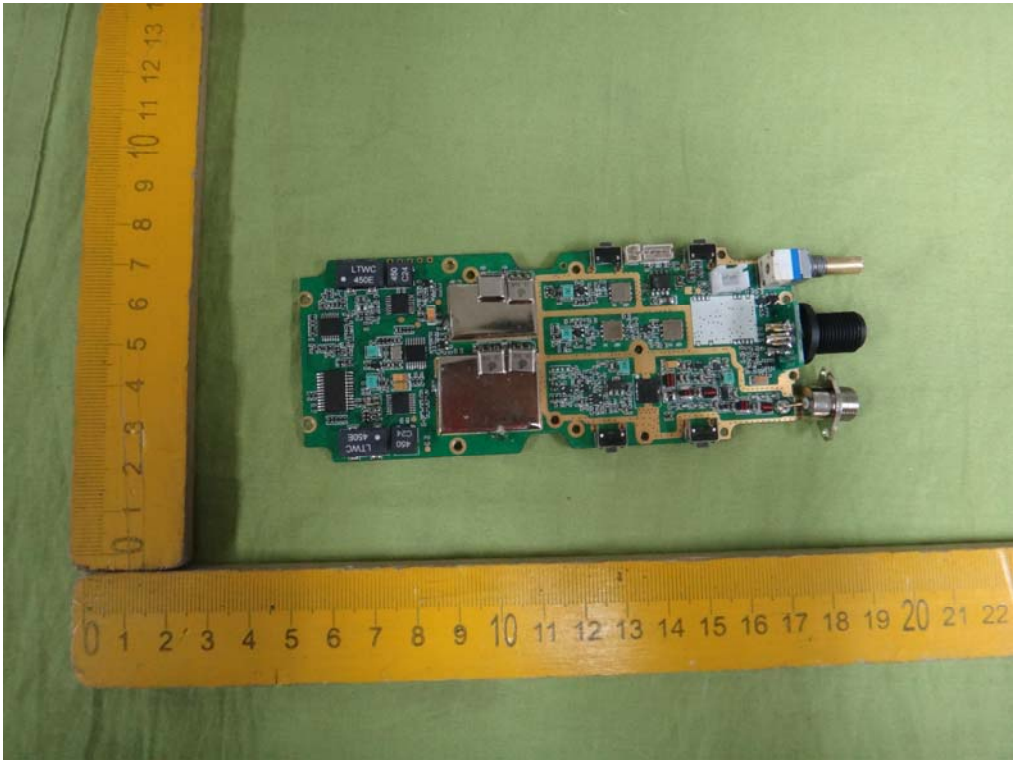




**Internal photos of the EUT**







.....End of Report.....