

## TEST REPORT

### IEC 62238

**Report Reference No.** ..... **TRE1211004802 R/C: 70799**

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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 7.4 V

Result ..... **Positive**

## TEST REPORT

Test Report No. :	TRE1211004802	March 04, 2013
		Date of issue

Equipment under Test : Handheld marine radio

Model /Type : HM360

Listed Models : /

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

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

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

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

<b>Test Result</b> according to the standards on page 4:	<b>Positive</b>
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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.

## Contents

<b><u>1. TEST STANDARDS</u></b>		<b>5</b>
<b><u>2. SUMMARY</u></b>		<b>6</b>
<b>2.1. General Remarks</b>		<b>6</b>
<b>2.2. Product Description</b>		<b>6</b>
<b>2.3. Equipment Under Test</b>		<b>6</b>
<b>2.4. EUT operation mode</b>		<b>6</b>
<b>2.5. Configuration of Tested System</b>		<b>7</b>
<b>2.6. EUT configuration</b>		<b>7</b>
<b>2.7. Performance check</b>		<b>7</b>
<b>2.8. NOTE</b>		<b>8</b>
<b><u>3. TEST ENVIRONMENT</u></b>		<b>9</b>
<b>3.1. Address of the test laboratory</b>		<b>9</b>
<b>3.2. Test Facility</b>		<b>9</b>
<b>3.3. Environmental conditions</b>		<b>10</b>
<b>3.4. Test Description</b>		<b>10</b>
<b>3.5. Statement of the measurement uncertainty</b>		<b>11</b>
<b>3.6. Equipments Used during the Test</b>		<b>11</b>
<b><u>4. TEST CONDITIONS AND RESULTS</u></b>		<b>15</b>
<b>4.1. IEC 62338 REQUIREMENTS</b>		<b>15</b>
4.1.1. Frequency Error		15
4.1.2. Carrier Power (Conducted)		16
4.1.3. Frequency Deviation		18
4.1.4. Sensitivity of the modulator, including microphone		21
4.1.5. Audio frequency response		22
4.1.6. Audio frequency harmonic distortion of the emission		24
4.1.7. Adjacent Channel Power		25
4.1.8. Conducted spurious emissions conveyed to the antenna		26
4.1.9. Cabinet radiation and conducted spurious emissions other than those conveyed to the antenna		27
4.1.10. Transmitter Frequency Behavior		30
4.1.11. Residual modulation of the transmitter		32
4.1.12. Frequency error (DSC signal)		33
4.1.13. Modulation index for DSC		35
4.1.14. Modulation rate for DSC		36
4.1.15. Testing of generated call sequences		37
4.1.16. Harmonic distortion and rated audiofrequency output power for Radiotelephone receiver	38	Radiotelephone
4.1.17. Audiofrequency response for Radiotelephone receiver		39
4.1.18. Maximum Usable Sensitivity (Conducted) for Radiotelephone receiver		41
4.1.19. Co-channel Rejection for Radiotelephone receiver		42
4.1.20. Adjacent Channel Selectivity for Radiotelephone receiver		43
4.1.21. Spurious Response Rejection for Radiotelephone receiver		44
4.1.22. InterModulation Response Rejection for Radiotelephone receiver		45
4.1.23. Blocking or Desensitization for Radiotelephone receiver		46
4.1.24. Receiver conducted spurious emissions for Radiotelephone receiver		47
4.1.25. Receiver radiated spurious emissions for Radiotelephone receiver		49
4.1.26. Receiver residual noise level for Radiotelephone receiver		51
4.1.27. Squelch operation for Radiotelephone receiver		52
4.1.28. Squelch hysteresis for Radiotelephone receiver		53
4.1.29. Multiple watch characteristic for Radiotelephone receiver		54

4.1.30.	Maximum usable sensitivity for DSC decoder	55
4.1.31.	Co-channel rejection for DSC decoder	56
4.1.32.	Adjacent channel selectivity for DSC decoder	57
4.1.33.	Spurious response and blocking immunity for DSC decoder	58
4.1.34.	Intermodulation response for DSC decoder	59
4.1.35.	Dynamic range for DSC decoder	60
4.1.36.	Spurious emissions for DSC decoder	61
4.1.37.	Verification of correct decoding of various types of DSC calls	62
4.1.38.	Reaction to VTS and AIS channel management DSC transmissions	63
4.1.39.	Simultaneous reception	64
	Simultaneous reception Measument Results	64
4.1.40.	Conducted spurious emission	65
4.1.41.	Radiated spurious emission	68
4.1.42.	Electrostatic Discharge	72
4.1.43.	Radiated disturbance	75
4.1.44.	Slow transients (Surges)	77
4.1.45.	Conducted radio frequency disturbance	79
4.1.46.	Power supply short term variations	81
4.1.47.	Power supply failure	83
4.1.48.	Fast Transients bursts	85
4.1.49.	Vibration	87
4.1.50.	Dry heat	88
4.1.51.	Damp heat	89
4.1.52.	Low temperature	90

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**5. TEST SET UP PHOTOS OF THE EUT****91**

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**6. EXTERNAL AND INTERNAL PHOTOS OF THE EUT****96**

## 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	:	Nov 20, 2012
Testing commenced on	:	Nov 20, 2012
Testing concluded on	:	March 04, 2012

### 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 7.4 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

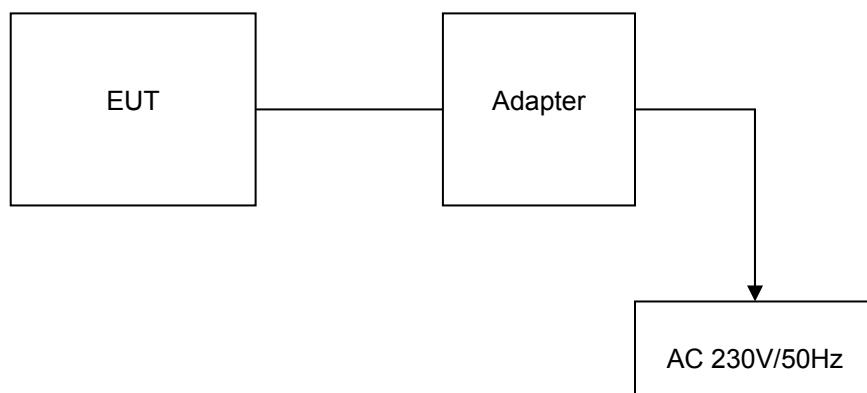


Table 2-1 Equipment Used in Tested System

## 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. :	/

### Adapter:

Model: SW-090100  
 Input: 100-240V~, 50/60Hz  
 Output: DC 9V 1000mA  
 Power Cable: 100cm  
 ◇ Shielded      ◆ Unshielded

## 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

1. 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	IEC 62238	TRE1211004802

### **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, 2013.

##### **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 Jul. 01, 2009, valid time is until Jun. 30, 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. 5377A on Jan. 25, 2011, valid time is until Jan. 24, 2014.

##### **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.

##### **NEMKO-Aut. No.: ELA125**

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10, the authorization is valid through July 07, 2013

##### **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.: G-292. Date of Registration: Dec. 24, 2010. Valid time is until Dec. 23, 2013.

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: Dec. 20, 2012. Valid time is until Dec. 19, 2015.

Telecommunication 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.: T-1837. Date of Registration: May 07, 2010. Valid time is until May 06, 2013.

## 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, 2013.

### 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 error	IEC 62238 Sub-clause 8.1	PASS
Carrier power (Conducted)	IEC 62238 Sub-clause 8.2	PASS
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
Adjacent channel power	IEC 62238 Sub-clause 8.7	PASS
Conducted spurious emissions conveyed to the antenna	IEC 62238 Sub-clause 8.8	PASS
Transient frequency behaviour of the transmitter	IEC 62238 Sub-clause 8.9	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
Testing of generated call sequences.	IEC 62238 Sub-clause 8.14	PASS
Harmonic distortion and rated audiofrequency output power for Radiotelephone receiver	IEC 62238 Sub-clause 9.1	PASS
Audiofrequency response for Radiotelephone receiver	IEC 62238 Sub-clause 9.2	PASS
Maximum usable sensitivity for Radiotelephone receiver	IEC 62238 Sub-clause 9.3	PASS
Co-channel rejection for Radiotelephone receiver	IEC 62238 Sub-clause 9.4	PASS
Adjacent channel selectivity for Radiotelephone receiver	IEC 62238 Sub-clause 9.5	PASS
Spurious response rejection for Radiotelephone receiver	IEC 62238 Sub-clause 9.6	PASS
Intermodulation response for Radiotelephone receiver	IEC 62238 Sub-clause 9.7	PASS
Blocking or desensitization for Radiotelephone receiver	IEC 62238 Sub-clause 9.8	PASS
Spurious emissions for Radiotelephone receiver	IEC 62238 Sub-clause 9.9	PASS
Receiver residual noise level for Radiotelephone receiver	IEC 62238 Sub-clause 9.10	PASS
Squelch operation for Radiotelephone receiver	IEC 62238 Sub-clause 9.11	PASS
Squelch hysteresis for Radiotelephone receiver	IEC 62238 Sub-clause 9.12	PASS
Multiple watch characteristic for Radiotelephone receiver	IEC 62238 Sub-clause 9.13	PASS
Maximum usable sensitivity for DSC decoder	IEC 62238 Sub-clause 10.1	PASS
Co-channel rejection for DSC decoder	IEC 62238 Sub-clause 10.2	PASS
Adjacent channel selectivity for DSC decoder	IEC 62238 Sub-clause 10.3	PASS
Spurious response and blocking immunity for DSC decoder	IEC 62238 Sub-clause 10.4	PASS
Intermodulation response for DSC decoder	IEC 62238 Sub-clause 10.5	PASS
Dynamic range for DSC decoder	IEC 62238 Sub-clause 10.6	PASS
Spurious emissions for DSC decoder	IEC 62238 Sub-clause 10.7	PASS
Verification of correct decoding of various types of DSC calls for DSC decoder	IEC 62238 Sub-clause 10.8	PASS

Reaction to VTS and AIS channel management DSC transmissions for DSC decoder	IEC 62238 Sub-clause 10.9	PASS
Simultaneous reception for DSC decoder	IEC 62238 Sub-clause 10.10	PASS
Conducted spurious emissions	IEC 60945 Sub-clause 9.2	PASS
Radiated spurious emissions	IEC 60945 Sub-clause 9.3	PASS
Electrostatic Discharge	IEC 60945 Sub-clause 10.9	PASS
Radiated disturbance	IEC 60945 Sub-clause 10.4	PASS
Slow transients (Surges)	IEC 60945 Sub-clause 10.6	PASS
Conducted radio frequency disturbance	IEC 60945 Sub-clause 10.3	PASS
Power supply short term variations	IEC 60945 Sub-clause 10.7	PASS
Power supply failure	IEC 60945 Sub-clause 10.8	PASS
Fast Transients bursts	IEC 60945 Sub-clause 10.5	PASS
Vibration test	IEC 60945 Sub-clause 8.7	PASS
Dry heat	IEC 60945 Sub-clause 8.2	PASS
Damp heat	IEC 60945 Sub-clause 8.3	PASS
Low temperature	IEC 60945 Sub-clause 8.4	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)
Blcking 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 Error & Carrier power (Conducted)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Receiver	Rohde&Schwarz	ESIB26	100009	2012/10/27
2	Climate Chamber	ESPEC	EL-10KA	05107008	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27

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	2012/10/27
2	Real-Time Spectrum Analyzer	Tektronix	RSA3303B	3589	2012/10/27

Spurious Emissions					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ULTRA-BROADBAND ANTENNA	Rohde&Schwarz	HL562	100015	2012/10/27
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2012/10/27
3	TURNTABLE	ETS	2088	2149	2012/10/27
4	ANTENNA MAST	ETS	2075	2346	2012/10/27
5	HORN ANTENNA	Rohde&Schwarz	HF906	100039	2012/10/27
6	EMI TEST SOFTWARE	Rohde&Schwarz	ESK1	N/A	2012/10/27
7	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
8	High-Pass Filter	Anritsu	MP526B	6220875256	2012/10/27
9	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2012/10/27
10	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2012/10/27
11	HORN ANTENNA	ShwarzBeck	9120D	1011	2012/10/27
12	HORN ANTENNA	ShwarzBeck	9120D	1012	2012/10/27
13	TURNTABLE	MATURO	TT2.0	----	2012/10/27
14	ANTENNA MAST	MATURO	TAM-4.0-P	----	2012/10/27
15	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2012/10/27

Adjacent Channel Power					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27
2	Signal Generator	Rohde&Schwarz	SMT03	100059	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27

Maximum Usable Sensitivity					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Signal Generator	Rohde&Schwarz	SMT03	100059	2012/10/27
2	Climate Chamber	ESPEC	EL-10KA	05107008	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
4	Digital Radio Test Set	AEROFLEX	3920	299001964	2012/10/27

Adjacent Channel Selectivity					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Signal Generator	Rohde&Schwarz	SMT03	100059	2012/10/27
2	Climate Chamber	ESPEC	EL-10KA	05107008	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
4	Digital Radio Test Set	AEROFLEX	3920	299001964	2012/10/27
5	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27

Electrostatic Discharge					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ESD Simulator	EM TEST	DITOC0103Z	0301-04	2012/10/27
2	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
3	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27

Co-channel rejection & Spurious Response Rejection & Inter Modulation Response Rejection & Blocking or Desensitization					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Signal Generator	Rohde&Schwarz	SMT03	100059	2012/10/27
2	Signal Generator	IFR	2023A	202304/060	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
4	Digital Radio Test Set	AEROFLEX	3920	299001964	2012/10/27
5	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27

Conducted emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	Rohde&Schwarz	ESCI	100106	2012/10/27
2	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2012/10/27
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2012/10/27
4	EMI Test Software	Rohde&Schwarz	ESK1	N/A	2012/10/27
5	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27

Transient Frequency Behavior					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Storage Oscilloscope	Tektronix	TDS3054B	B033027	2012/10/27
2	Signal Generator	Rohde&Schwarz	SMT03	100059	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27

Radiated disturbance					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Signal Generator	IFR	2032	203002/100	2012/10/27
2	AMPLIFIER	AR	150W1000	301584	2012/10/27
3	DUAL DIRECTIONAL COUPLER	AR	DC6080	301508	2012/10/27
4	POWER HEAD	AR	PH2000	301193	2012/10/27
5	POWER METER	AR	PM2002	302799	2012/10/27
6	TRANSMITTING AERIAL	AR	AT1080	28570	2012/10/27
7	POWER AMPLIFIER	AR	25S1G4A	0325511	2012/10/27
8	DUAL DIRECTIONAL COUPLER	AR	DC7144A	0325100	2012/10/27
9	TRANSMITTING AERIAL	AR	AT4002A	0324848	2012/10/27
10	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
11	Audio Analyzer	Rohde&Schwarz	UPL	SB3439	2012/10/27
12	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27

Conducted radio frequency disturbance					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Signal Generator	IFR	2023A	202304/060	2012/10/27
2	Amplifier	AR	75A250	302205	2012/10/27
3	Dual Directional Coupler	AR	DC2600	302389	2012/10/27
4	6db Attenuator	EMTEST	ATT6/75	0010230A	2012/10/27
5	EM Clamp	LÜTHI	EM101	335625	2012/10/27
6	CDN	EMTEST	CDN M3	0802-03	2012/10/27
7	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
8	Audio Analyzer	Rohde&Schwarz	UPL	SB3439	2012/10/27
9	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2012/10/27
10	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27

Fast transients (bursts), Slow transients(surges)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Ultra Compact Simulator	EM TEST	UCS500M6	0500-19	2012/10/27
2	Coupling Clamp	EM TEST	HFK	1501-14	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
4	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27

Power supply variations & Power failure					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Ultra Compact Simulator	EM TEST	UCS500M6	0500-19	2012/10/27
2	Motor Driven Voltage Transformer	EM TEST	MV2616	0301-11	2012/10/27
3	RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2012/10/27
4	Receiver	Rohde&Schwarz	ESI26	100009	2012/10/27

The Cal. Interval was one year.

## 4. TEST CONDITIONS AND RESULTS

### 4.1. IEC 62338 REQUIREMENTS

#### 4.1.1. Frequency Error

##### LIMIT

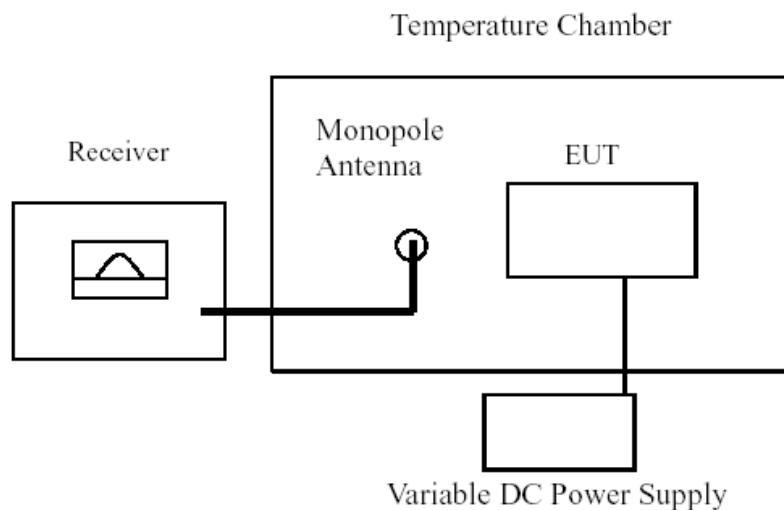
##### IEC 62238 Sub-clause 8.1.3

The frequency error shall be within  $\pm 1.5$  kHz.

The carrier frequency shall be measured in the absence of modulation, with the transmitter connected to an artificial antenna (clause 6.12). Measurements shall be made under normal test conditions (clause 6.12) and under extreme test conditions (clause 6.13).

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

#### 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 8.1.2 for the measurement method.

#### TEST RESULTS

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

The Middle Channel of 25 KHz Channel Separation

Test Condition		Frequency Measured ( MHz )	Frequency Error ( KHz )
Temperature( °C )	Voltage ( V )		
T Nor ( 25°C )	7.40 V	156.79952456	-0.47544
	8.40 V	156.79965846	-0.34154
T min ( -15°C )	6.29 V	156.79935426	-0.64574
	8.40 V	156.79956244	-0.43756
T Max ( +55°C )	6.29 V	156.79943265	-0.56735
	Limit	$\pm 1.50$ KHz @ 156.8000 MHz	
Result		PASS	

#### 4.1.2. Carrier Power (Conducted)

##### LIMIT

##### IEC 62238 Sub-clause 8.2.3

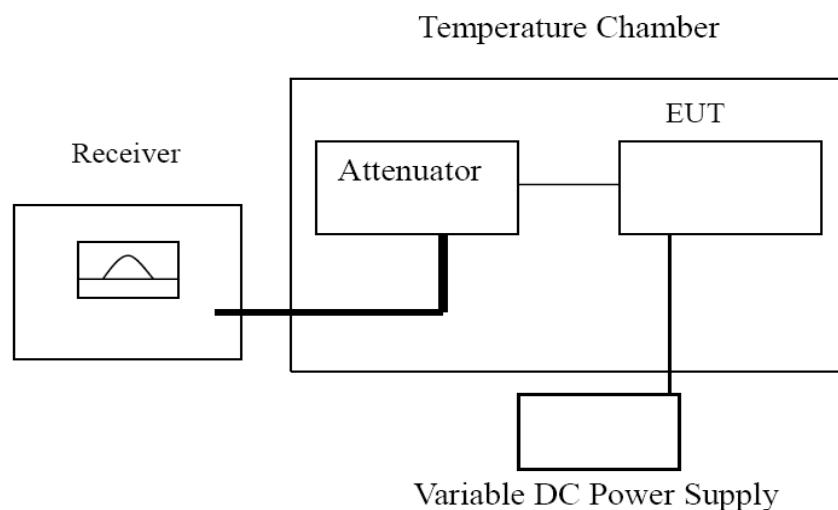
The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation.

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).

With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within  $\pm 1.5$  dB of the rated output power under normal test conditions. The output power shall never, however, exceed 25 W.

With the output power switch at minimum, the carrier power shall remain between 0.1 W and 1 W.

##### 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 8.2.2 for the measurement method.

##### TEST RESULTS

###### Operating transmitter power level: Maximum

**The High Channel of 25 KHz Channel Separation**

Test Condition		Power Measured	
Temperature( °C )	Voltage ( V )	(dBm)	(Watts)
T Nor ( 25°C )	7.40 V	36.76	4.74
T min ( -15°C )	8.40 V	36.98	4.99
	6.29 V	36.62	4.59
T Max ( +55°C )	8.40 V	36.95	4.95
	6.29 V	36.60	4.57
Limit	Shall not exceed 6 W (37.78 dBm)		
Result	PASS		

The Middle Channel of 25 KHz Channel Separation

Test Condition		Power Measured	
Temperature( °C )	Voltage ( V )	(dBm)	(Watts)
T Nor ( 25°C )	7.40 V	36.78	4.76
	8.40 V	36.99	5.00
T min ( -15°C )	6.29 V	36.72	4.70
	8.40 V	36.90	4.90
T Max ( +55°C )	6.29 V	36.62	4.59
Limit	Shall not exceed 6 W (37.78 dBm)		
Result	PASS		

The Low Channel of 25 KHz Channel Separation

Test Condition		Power Measured	
Temperature( °C )	Voltage ( V )	(dBm)	(Watts)
T Nor ( 25°C )	7.40 V	36.70	4.68
	8.40 V	36.96	4.97
T min ( -15°C )	6.29 V	36.69	4.67
	8.40 V	36.91	4.91
T Max ( +55°C )	6.29 V	36.61	4.58
Limit	Shall not exceed 6 W (37.78 dBm)		
Result	PASS		

Operating transmitter power level: Minimum

The High Channel of 25 KHz Channel Separation

Test Condition		Power Measured	
Temperature( °C )	Voltage ( V )	(dBm)	(Watts)
T Nor ( 25°C )	7.40 V	29.56	0.90
	8.40 V	29.87	0.97
T min ( -15°C )	6.29 V	29.52	0.90
	8.40 V	29.85	0.97
T Max ( +55°C )	6.29 V	29.43	0.88
Limit	Between 0.1 W and 1 W		
Result	PASS		

The Middle Channel of 25 KHz Channel Separation

Test Condition		Power Measured	
Temperature( °C )	Voltage ( V )	(dBm)	(Watts)
T Nor ( 25°C )	7.40 V	29.75	0.94
	8.40 V	29.89	0.97
T min ( -15°C )	6.29 V	29.62	0.92
	8.40 V	29.79	0.95
T Max ( +55°C )	6.29 V	29.52	0.90
Limit	Between 0.1 W and 1 W		
Result	PASS		

The Low Channel of 25 KHz Channel Separation

Test Condition		Power Measured	
Temperature( °C )	Voltage ( V )	(dBm)	(Watts)
T Nor ( 25°C )	7.40 V	29.58	0.91
	8.40 V	29.73	0.94
T min ( -15°C )	6.29 V	29.52	0.90
	8.40 V	29.68	0.93
T Max ( +55°C )	6.29 V	29.42	0.87
Limit	Between 0.1 W and 1 W		
Result	PASS		

### 4.1.3. Frequency Deviation

#### LIMIT

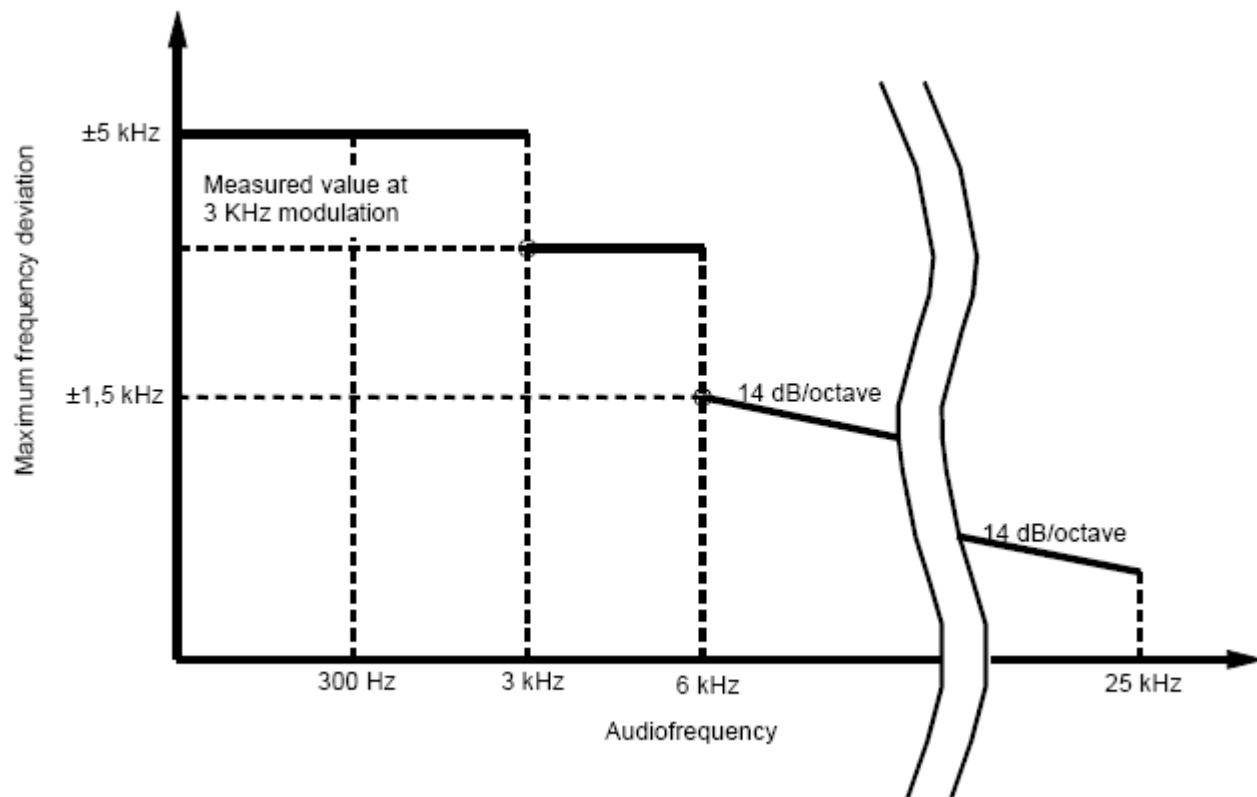
##### IEC 62238 Sub-clause 8.3.2.2 and 8.3.3.2

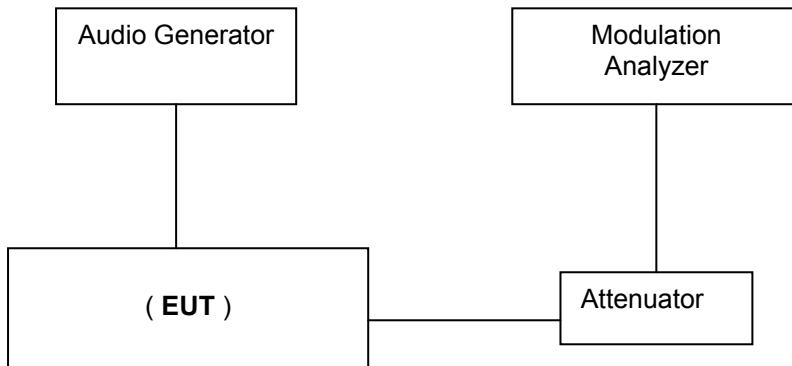
The maximum frequency deviation shall be  $\pm 5$  kHz.

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.

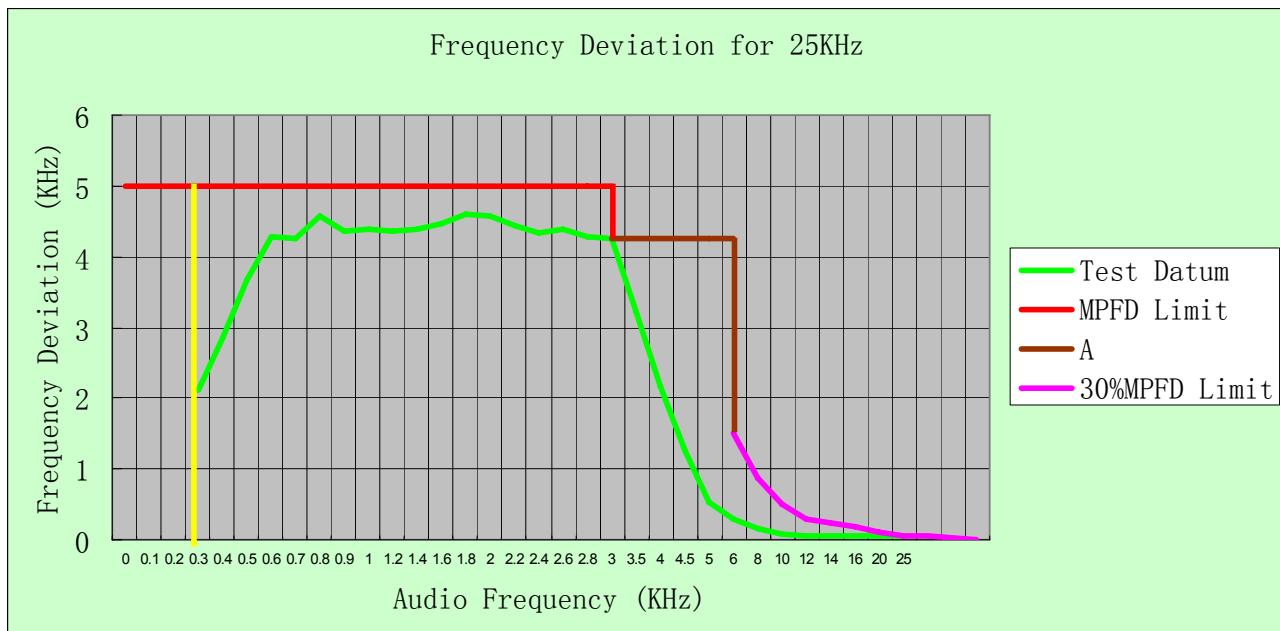


**TEST CONFIGURATION****TEST PROCEDURE**

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 Measument Results (KHz)
Temperature( °C )	Voltage ( V )		Middle Channel
25	7.40	0.1	0.95
		0.2	1.26
		0.3	2.16
		0.4	2.82
		0.5	3.61
		0.6	4.26
		0.7	4.25
		0.8	4.58
		0.9	4.32
		1.0	4.36
		1.2	4.35
		1.4	4.32
		1.6	4.49
		1.8	4.55
		2.0	4.52
		2.2	4.45
		2.4	4.36
		2.6	4.38
		2.8	4.29
		3.0	4.25
		3.5	3.22
		4.0	2.18
		4.5	1.27
		5.0	0.54
		6.0	0.28
		8.0	0.15
		10.0	0.08
		12.0	0.06
		14.0	0.06
		16.0	0.06
		20.0	0.06
		25.0	0.05
Result		PASS	



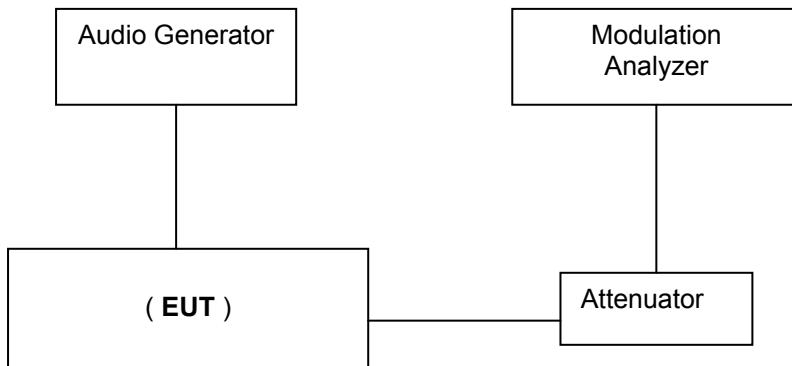
#### 4.1.4. Sensitivity of the modulator, including microphone

##### 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	3.1		
		0.3	2.8		
		0.5	2.9		
Limit		Frequency deviation shall be between $\pm 2.5$ kHz and $\pm 4.5$ kHz			
Result		PASS			

#### 4.1.5. 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 audiofrequency signal being kept constant and equal to the value specified above.

The audiofrequency response shall be within +1 dB and -3 dB of a 6 dB/octave line passing through the reference point (see figure 2)

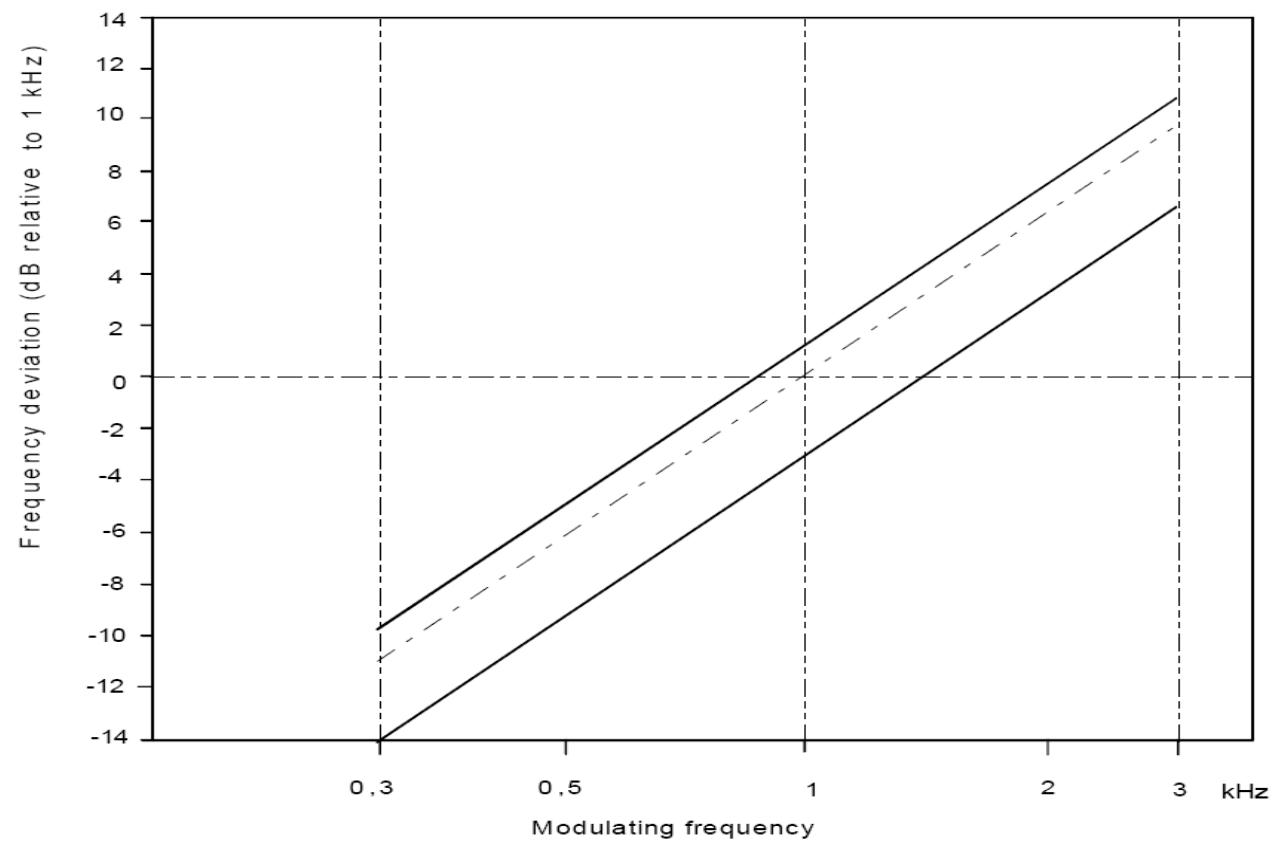
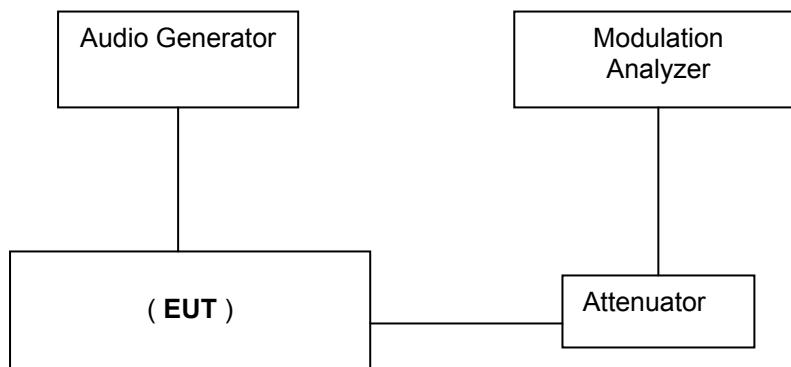


Figure 2: Audio frequency response

##### 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.

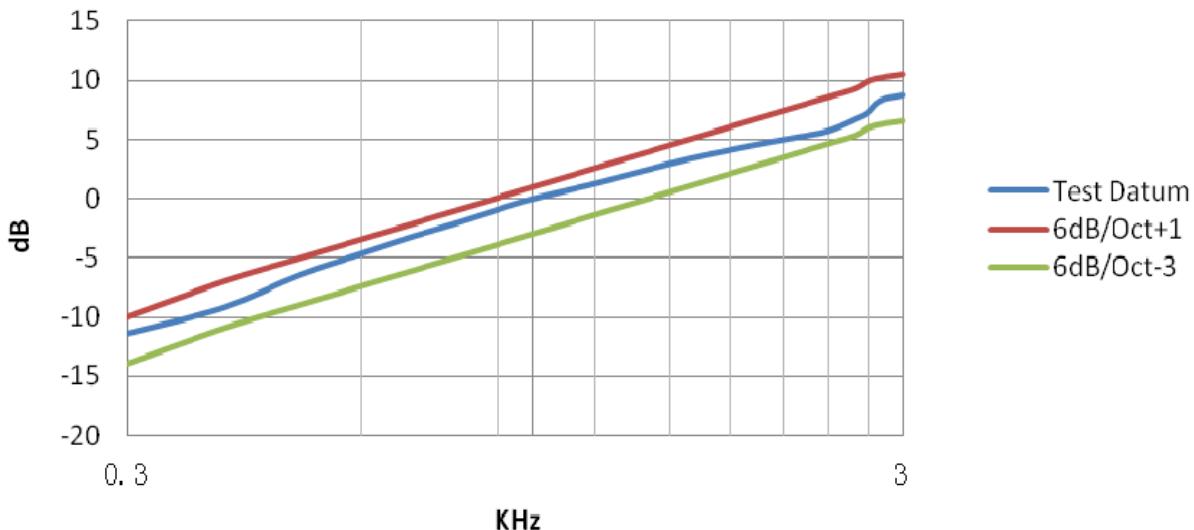
**TEST RESULTS**

The audio frequency response curve is show below and Test Audio Level (1 KHz and 20% maximum deviation) is 2.70mv for 25 KHz channel separation.

The audio frequency response only test at middle channel.

**25 KHz Channel Separation**

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference 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

**Audio Frequency Response for 25KHz**

#### 4.1.6. 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.

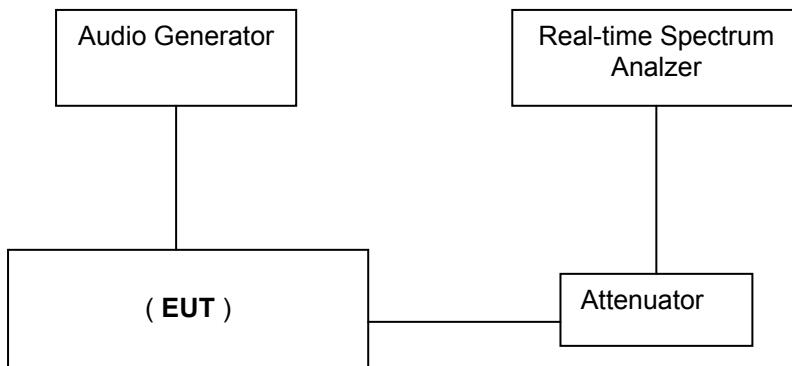
Under normal test conditions (clause 6.12) the RF signal shall be modulated successively at frequencies of 300 Hz, 500 Hz and 1 kHz with a constant modulation index of 3.

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 Frequency (KHz)	Harmonic Distortion Measument Results		
Temperature( °C )	Voltage ( V )		Middle Channel		
T Nor ( 25°C )	7.40 V	0.3	2.7%		
		0.5	3.6%		
		1.0	5.5%		
Limit		Shall not exceed 10 %.			
Result		PASS			

#### 4.1.7. Adjacent Channel Power

##### LIMIT

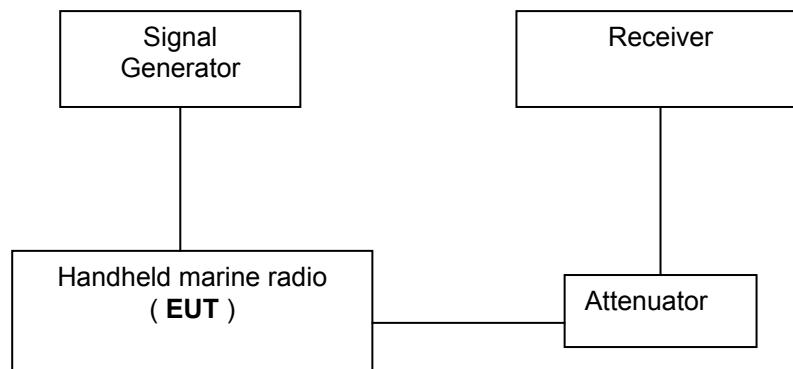
##### **IEC 62238 Sub-clause 8.7**

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.

The adjacent channel power shall not exceed a value of:

- 25 kHz channel: 70 dB below the carrier power of the transmitter without any need to be below 0,2  $\mu$ W.
- 12 kHz channel: 60 dB below the carrier power of the transmitter without any need to be below 0,2  $\mu$ W.

##### 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 8.7.2 for the measurement method.

##### TEST RESULTS

Note: The adjacent power was performed to the three channels (the high channel, the middle channel and the low channel) at Minimum and Maximum operation transmitter power level, the datum that reported below were the worst for the three channels.

##### For Adjacent Power

##### The Middle Channel of 25 KHz Channel Separation

Test Condition		Measurement Offset	Adjacent Channel Power (dBc)	
Temperature ( °C )	Voltage ( V )			
T Nor ( 25°C )	V Nor (7.40 V )	+17 KHz	-78.53	
		- 17 KHz	-77.45	
<b>Applicable Limit</b>		<b>70 dB down or 0.2 <math>\mu</math>W</b>		
<b>Result</b>		<b>PASS</b>		

#### 4.1.8. Conducted spurious emissions conveyed to the antenna

##### LIMIT

##### **IEC 62238 Sub-clause 8.8.3**

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.

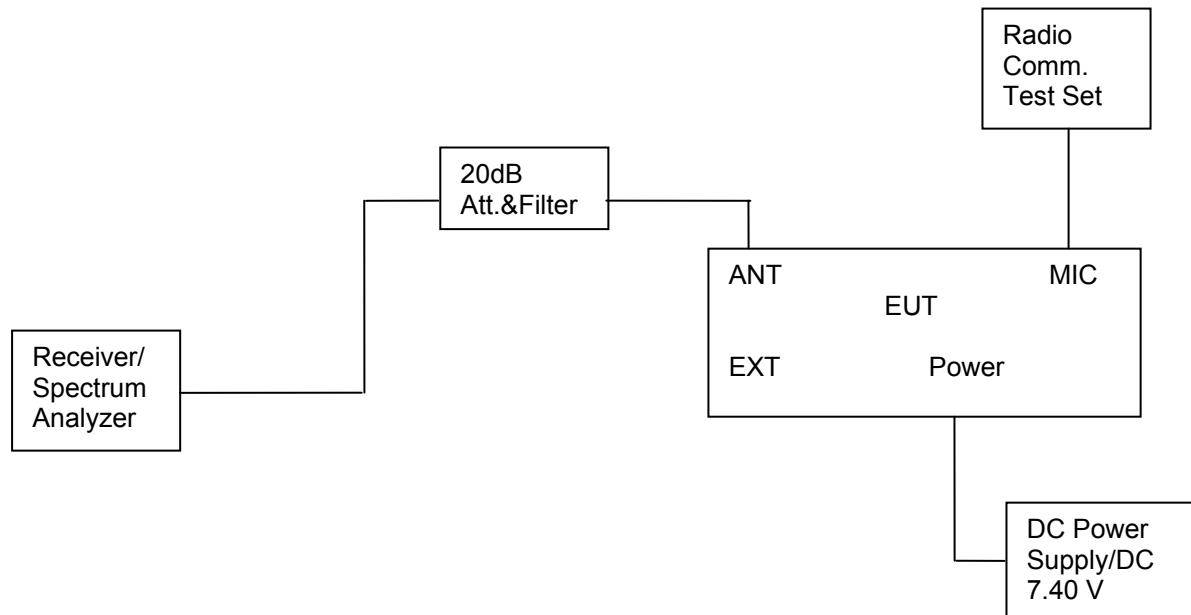
Conducted spurious emissions shall be measured with the unmodulated transmitter connected to the artificial antenna (clause 6.5).

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 analyser.

The power of any conducted spurious emission on any discrete frequency shall not exceed 0.25  $\mu$ W.

##### 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 8.8.2 for the measurement method.

##### TEST RESULTS

Note: Conducted spurious emission were performed to the three channels (the high channel, the middle channel and the low channel) at Minimum and Maximum operation transmitter power level, the datum that reported below were the worst at Maximum operation transmitter power level.

**Conducted Measurement (9 KHz to 2 GHz) -----PASS**

##### The Middle Channel for 25 KHz channel separation

Start Frequency (MHz)	Stop Frequency (MHz)	Res Bandwidth (KHz)	Maximum Emission Observed		Limit (dBm)	Margin (dB)
0.009	0.15	1	Frequency (MHz)	Datum (dBm)		
0.15	30	10	0.009	-50.89	-36	14.89
30	1000	100	0.150	-53.35	-36	17.35
1000	2000	1000	470.40	-50.70	-36	14.70
			1156.23	-48.53	-36	12.53

#### 4.1.9. Cabinet radiation and conducted spurious emissions other than those conveyed to the antenna

##### LIMIT

##### IEC 62238 Sub-clause 8.9.3

Cabinet radiation consists of emissions at frequencies, other than those of the carrier and the sideband components resulting from the wanted modulation process, which are radiated by the equipment cabinet and structures.

Conducted spurious emissions other than those conveyed to the antenna are emissions at frequencies, other than those of the carrier and the sideband components resulting from the wanted modulation process, which are produced by conduction in the wiring and accessories used with the equipment.

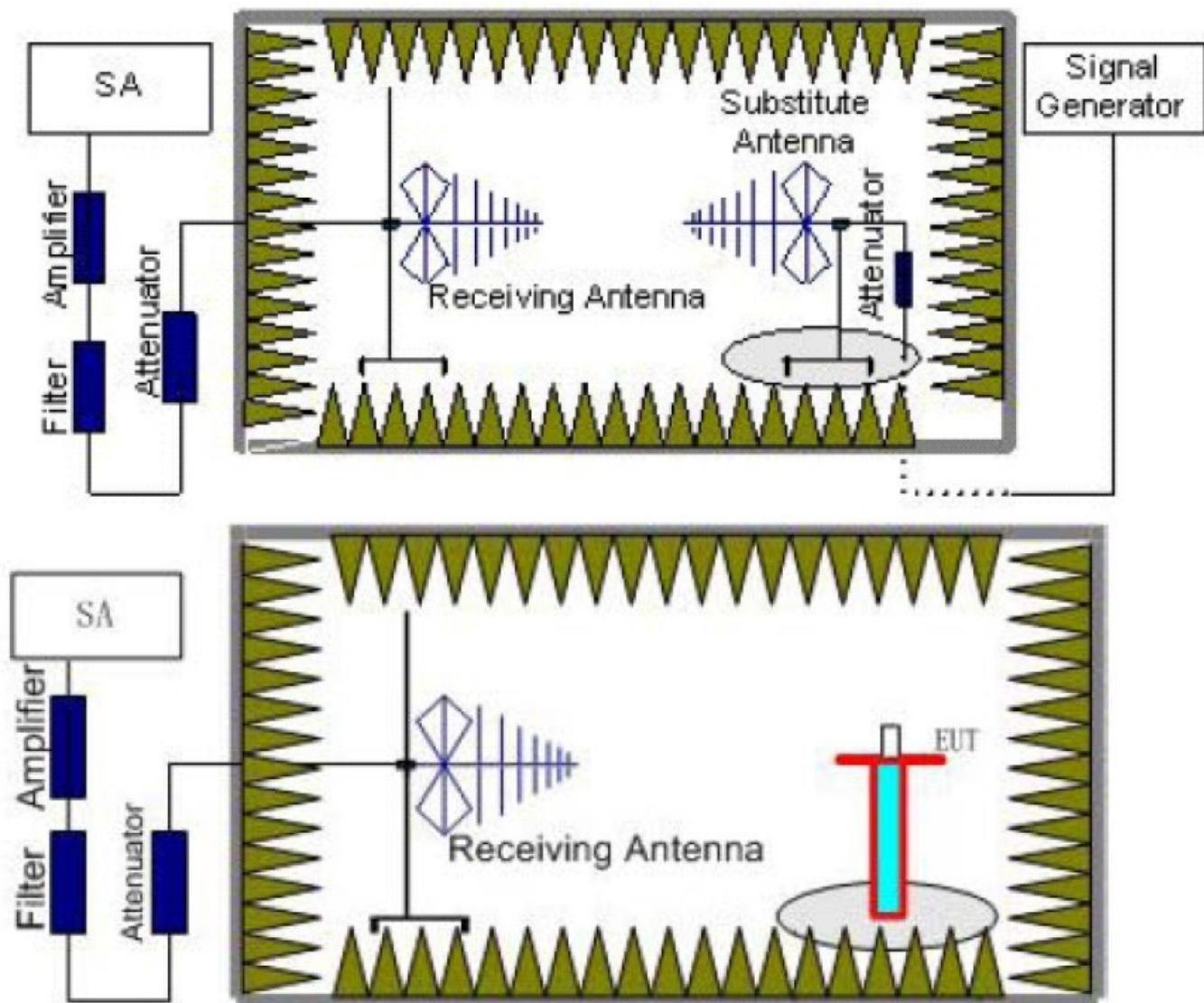
Integral antenna equipment shall be tested with the normal antenna fitted and the carrier frequency emission shall be filtered as described in the method of measurement.

With the transmitter in stand-by mode the cabinet radiation and spurious emissions shall not exceed 2 nW.

With the transmitter in operation the cabinet radiation and spurious emissions shall not exceed 0.25  $\mu$ W.

##### TEST CONFIGURATION

##### Effective Radiated Power measurement (30 MHz to 2GHz)

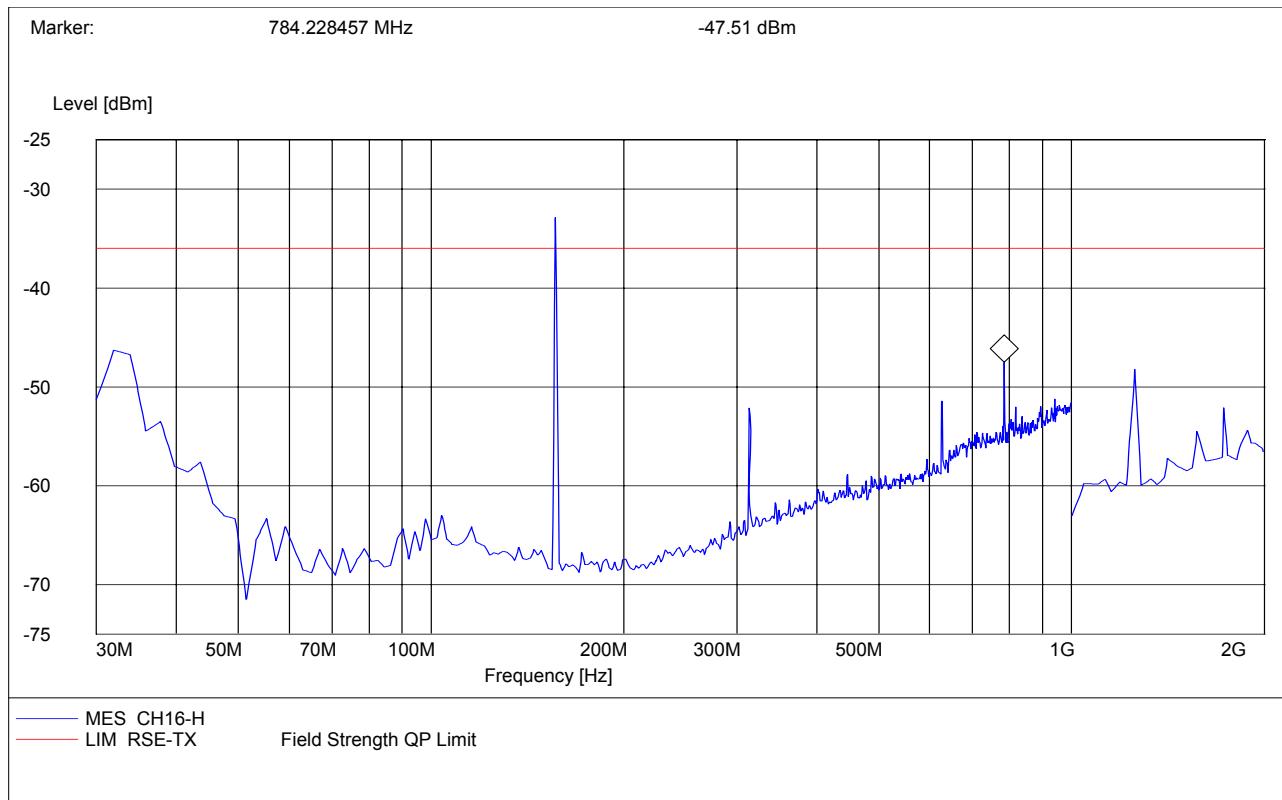
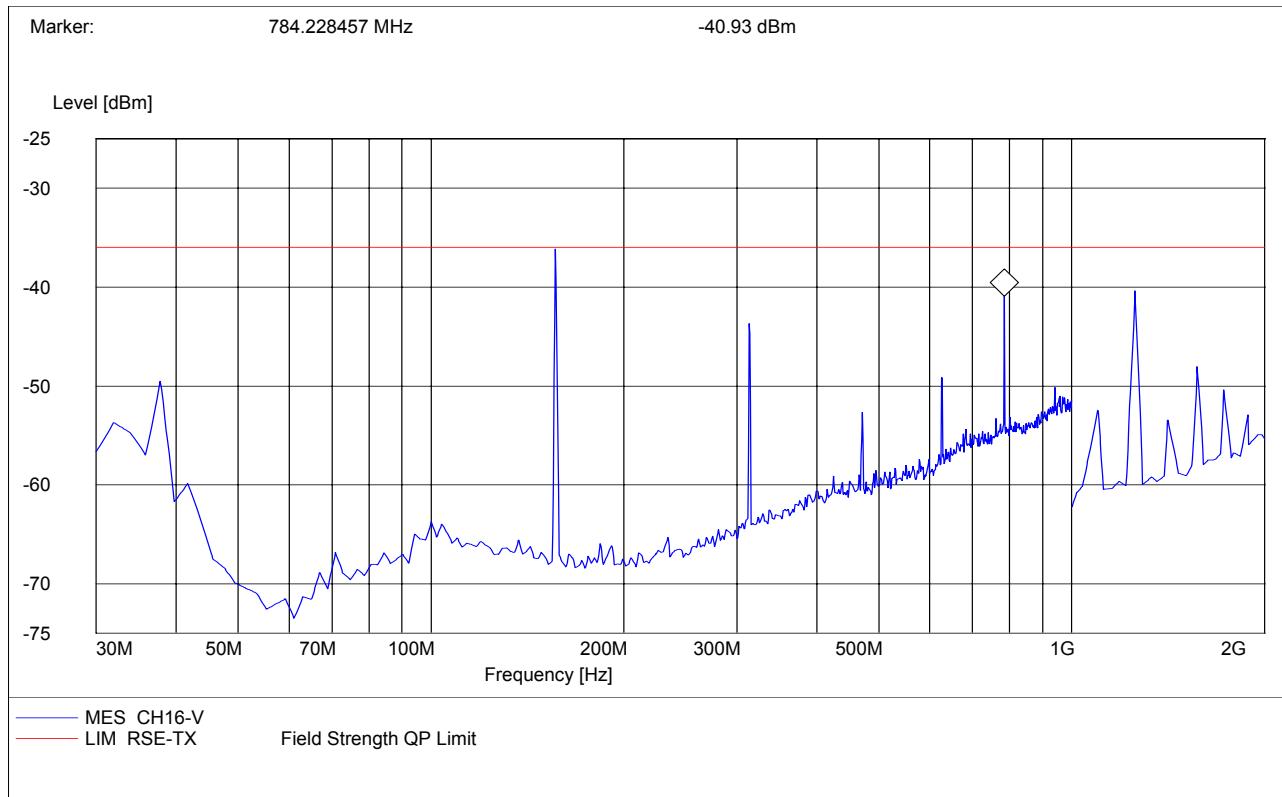


##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.9.2 for the measurement method.

**TEST RESULTS**

Note: Radiated spurious emissions were performed to the three channels (the high channel, the middle channel and the low channel) at Minimum and Maximum operation transmitter power level, the datum that reported below were the worst for the three channels at Maximum operation transmitter power level.

**Plots of Transmitter Radiated Spurious Emissions Test Results****The Middle Channel for 25 KHz Channel Separation@Horizontal****The Middle Channel for 25 KHz Channel Separation@ Vertical**

Remark:	
(1)	Corrected Power (dBm) = SG O/P-Cable + Ant Gain
(2)	Measuring frequencies from 30 MHz to the 2GHz.
(3)	Margin=Limit-Emission Level
(4)	Data of measurement within this frequency range shown “--” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

**For Standby Mode,Conducted Measurement and Radiated Measurement are performed to the three channels (the high channel, the middle channel and the low channel), the datum that reported below is the worst case of the three channels. Please see the following Section 4.1.19 test results because the standby mode is receiver mode.**

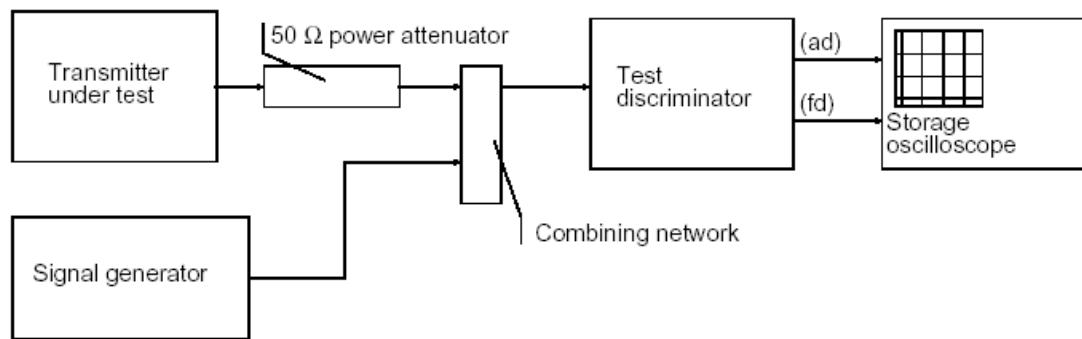
#### 4.1.10. Transmitter Frequency Behavior

##### LIMIT

###### **IEC 62238 Sub-clause 8.9.3**

During the period of time t1 the frequency difference shall not exceed the value of 25 kHz.  
During the period of time t2 the frequency difference shall not exceed the value of 12.5 kHz.  
The frequency difference, after t2, shall not exceed the value of 1.5 kHz.  
Before the start of t3 the frequency difference shall not exceed the value of 1.5 kHz.  
During the period of time t3 the frequency difference shall not exceed the value of 25 kHz.

##### TEST CONFIGURATION

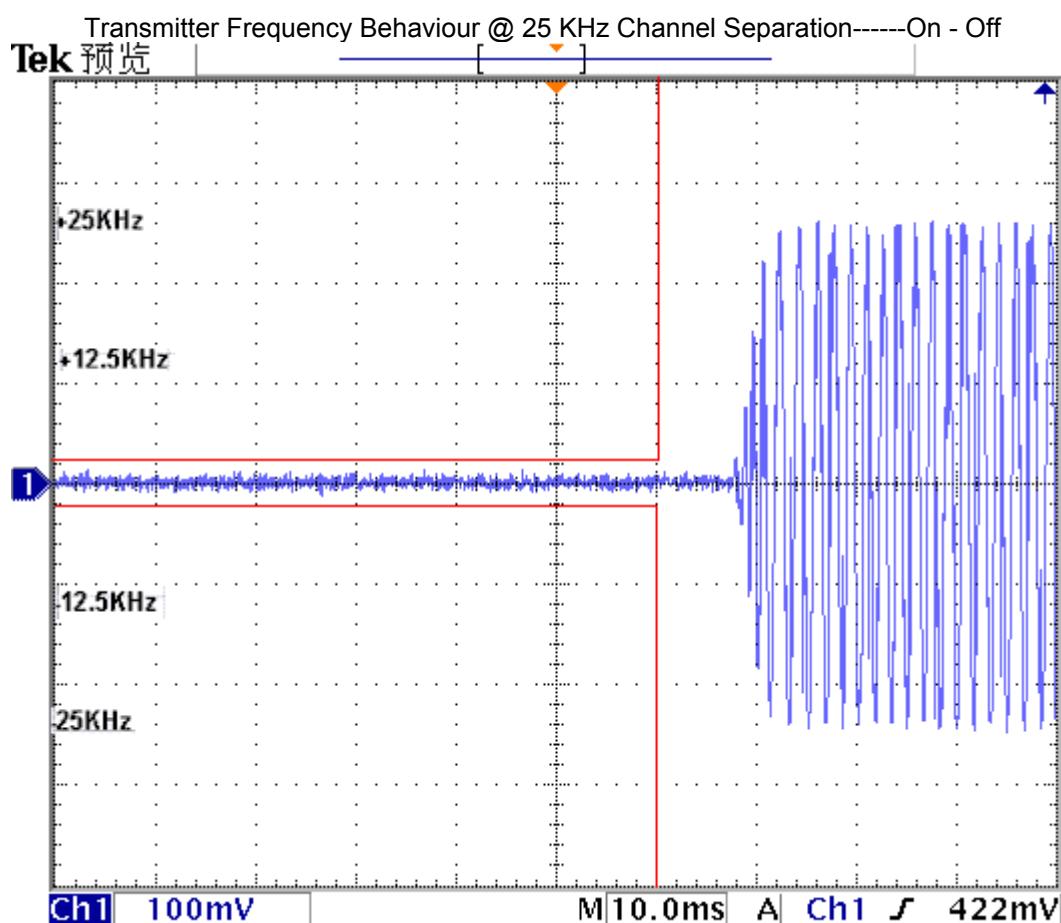
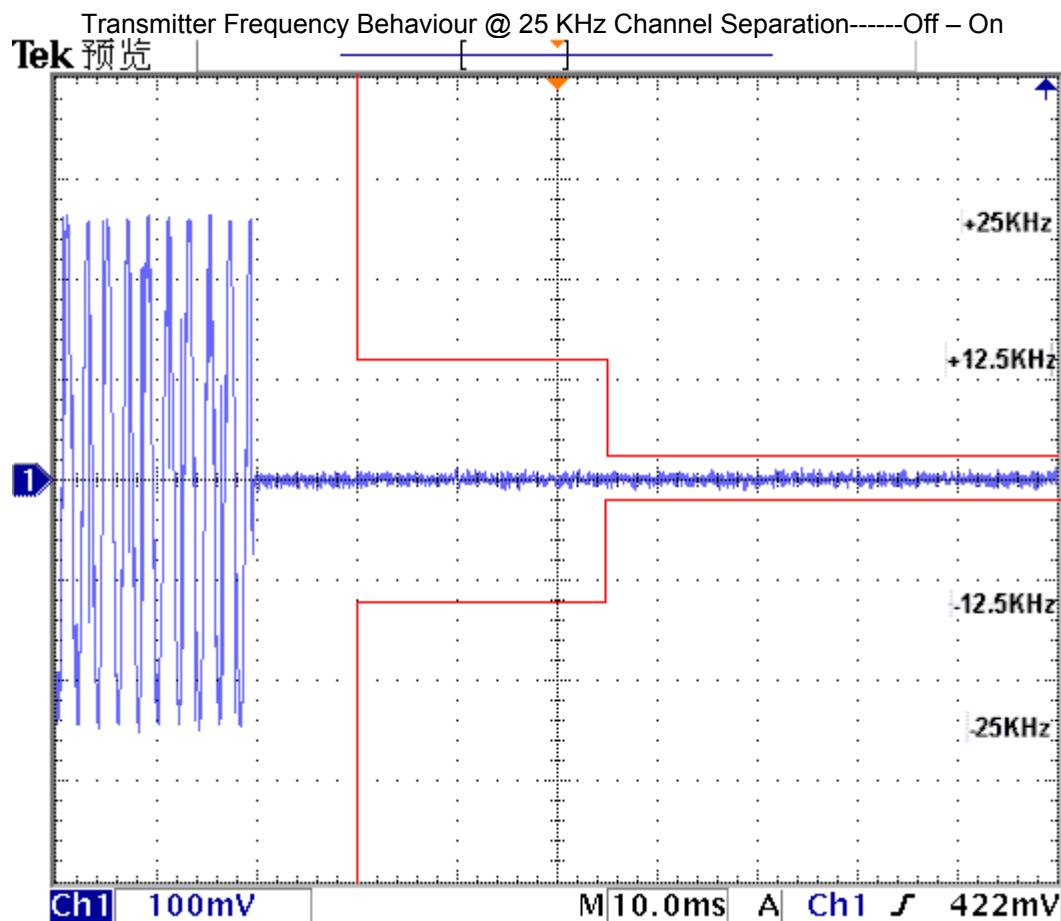


##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions
2. Please refer to IEC 62238 Sub-clause 8.9.2 for the measurement method.

##### TEST RESULTS

Please refer to the following plots.



#### 4.1.11. Residual modulation of the transmitter

##### LIMIT

##### **IEC 62238 Sub-clause 8.10.3**

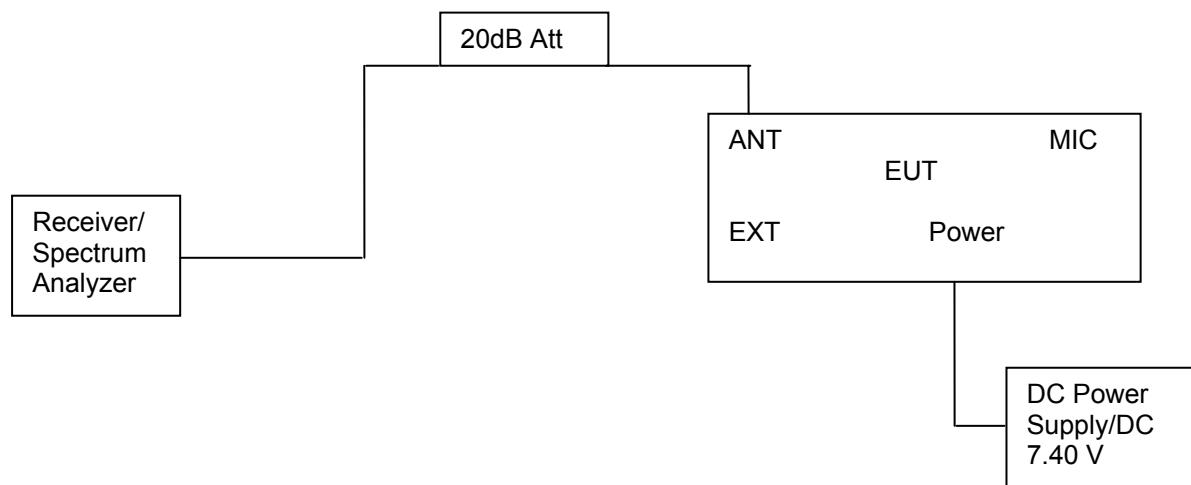
The normal test modulation defined in 6.3 shall be applied to the transmitter.

The highfrequency signal produced by the transmitter shall be applied, via an appropriate couplingdevice, to a linear demodulator with a de-emphasis network of 6 dB/octave. The time constantof this de-emphasis network shall be at least 750  $\mu$ s.

Precautions shall be taken to avoid the effects of emphasizing the low audiofrequenciesproduced 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 signalat 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	-59.0	
Limit		Shall not exceed -40	
Result		PASS	

#### 4.1.12. Frequency error (DSC signal)

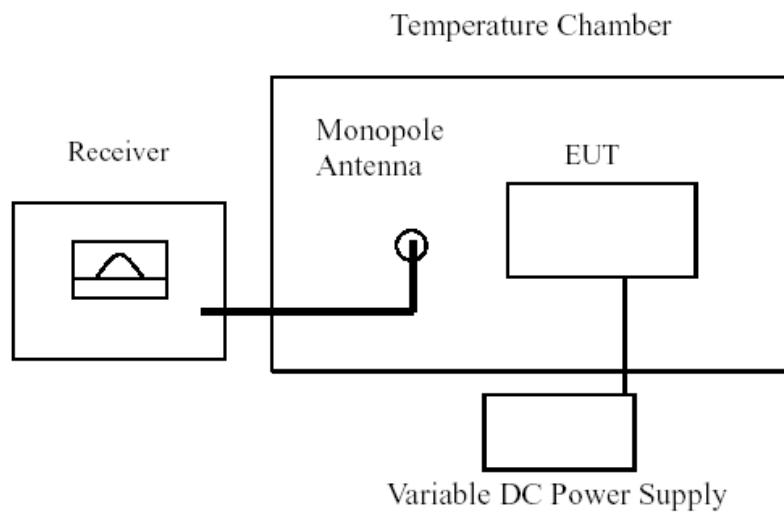
##### LIMIT

##### **IEC 62238 Sub-clause 8.11.3**

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

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 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 8.1.2 for the measurement method.

##### TEST RESULTS

**The DSC of 25 KHz Channel Separation@B-state**

Test Condition		Frequency Measured ( MHz )	Frequency Error ( KHz )
Temperature( °C )	Voltage ( V )		
T Nor ( 25°C )	7.40 V	156.52524254	0.24254
	8.40 V	156.52535414	0.35414
T min ( -15°C )	6.29 V	156.52534525	0.34525
	8.40 V	156.52555474	0.55474
T Max ( +55°C )	6.29 V	156.52545426	0.45426
Limit		$\pm 2\ 100\ Hz \pm 10\ Hz @ 156.5250\ MHz$	
Result		PASS	

The DSC of 25 KHz Channel Separation@Y-state

Test Condition		Frequency Measured ( MHz )	Frequency Error ( KHz )
Temperature( °C )	Voltage ( V )		
T Nor ( 25°C )	7.40 V	156.52512535	0.12535
T min ( -15°C )	8.40 V	156.52525452	0.25452
	6.29 V	156.52533214	0.33214
T Max ( +55°C )	8.40 V	156.52532145	0.32145
	6.29 V	156.52535465	0.35465
Limit		$\pm 1\ 300\ Hz \pm 10\ Hz @ 156.5250\ MHz$	
Result		PASS	

#### 4.1.13. Modulation index for DSC

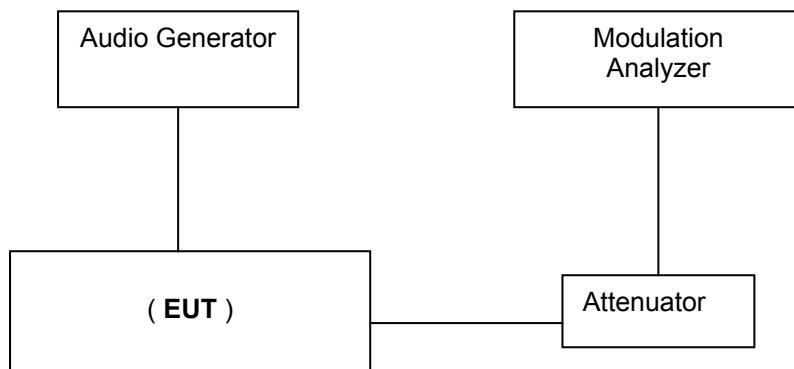
##### LIMIT

##### **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 (KHz)	Measurement Results		
Temperature( °C )	Voltage ( V )		B-state	Y-state	
25	7.40	0.1	1.85	1.95	
		0.2	1.90	1.96	
		0.3	1.85	2.06	
		0.4	1.86	2.01	
		0.5	1.82	1.93	
		0.6	1.85	1.88	
		0.7	1.85	2.01	
		0.8	1.92	2.04	
		0.9	1.92	2.07	
		1.0	2.02	1.99	
		1.2	2.02	2.02	
		1.4	1.92	2.06	
		1.6	1.92	1.99	
		1.8	2.04	2.03	
		2.0	1.95	1.98	
		2.2	1.92	1.92	
		2.4	1.92	1.96	
		2.6	1.83	1.92	
		2.8	1.83	1.89	
		3.0	1.86	1.83	
Limit		$2.0 \pm 10\%$			
Result		<b>PASS</b>			

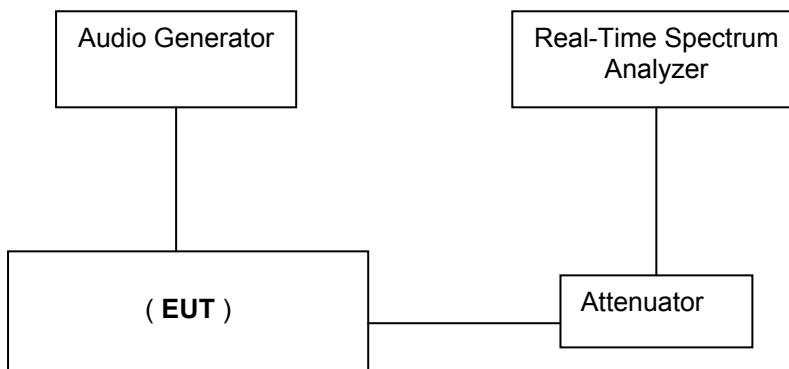
#### 4.1.14. Modulation rate for DSC

##### 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	

#### 4.1.15. Testing of generated call sequences

##### LIMIT

##### **IEC 62238 Sub-clause 8.14.3**

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

The requirements of ITU-R Recommendation M.493-10 regarding message composition andcontent shall be met.The generated calls shall be analyzed with the calibrated apparatus for correct configurationof the signal format, including time diversity.

It shall be verified that, after transmission of a DSC call, the transmitter re-tunes to theoriginal channel. However, in the case of a distress call, the transmitter shall tune tochannel 16 and automatically select the maximum power.The telecommands used and the channels tested for switching shall be stated in the test report.

##### TEST RESULTS

The equipment meets the ITU-R Recommendation M.493-10 regarding message composition andcontent.

#### 4.1.16. Harmonic distortion and rated audiofrequency output power for Radiotelephone receiver

##### LIMIT

###### IEC 62238 Sub-clause 9.1.3

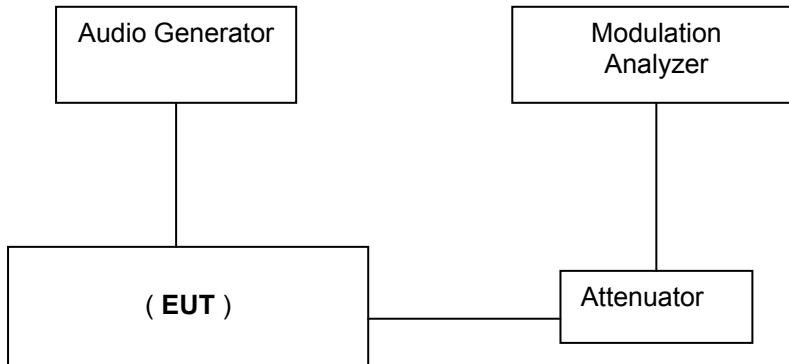
Test signals at levels of +60 dB $\mu$ V (e.m.f.) and +100 dB $\mu$ V (e.m.f.), at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation (see 6.3) shall be applied in succession to the receiver input under the conditions specified in 6.1. For each measurement, the receiver's audiofrequency volume control shall be set so as to obtain, in a resistive load which simulates the receiver's operating load, the rated audiofrequency 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 audiofrequency output power shall be measured at all the frequencies specified above.

The rated audiofrequency 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 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 8.9.2 for the measurement method.

##### TEST RESULTS

Note: Manufacturer declare that the product rated radiofrequency output power as follow:

- 2.5 W in a loudspeaker;
- 2.5 mW in the handset earphone.

Test Condition		Test signals at level (dB $\mu$ V)	Modulation Frequency(KHz)	Audiofrequency output power (W)	Audiofrequency output power (mW)	Harmonic distortion		
Temperature ( °C )	Voltage ( V )							
25	7.40	+60	0.3	2.52	2.25	5.3%		
			0.5	2.90	2.62	3.4%		
			1.0	3.25	3.08	2.0%		
		+100	0.3	2.84	2.23	5.4%		
			0.5	3.05	2.51	4.1%		
			1.0	3.31	3.00	2.6%		
Limit				≥2W	≥1mW	<10%		
Results				PASS				

#### 4.1.17. Audiofrequency response for Radiotelephone receiver

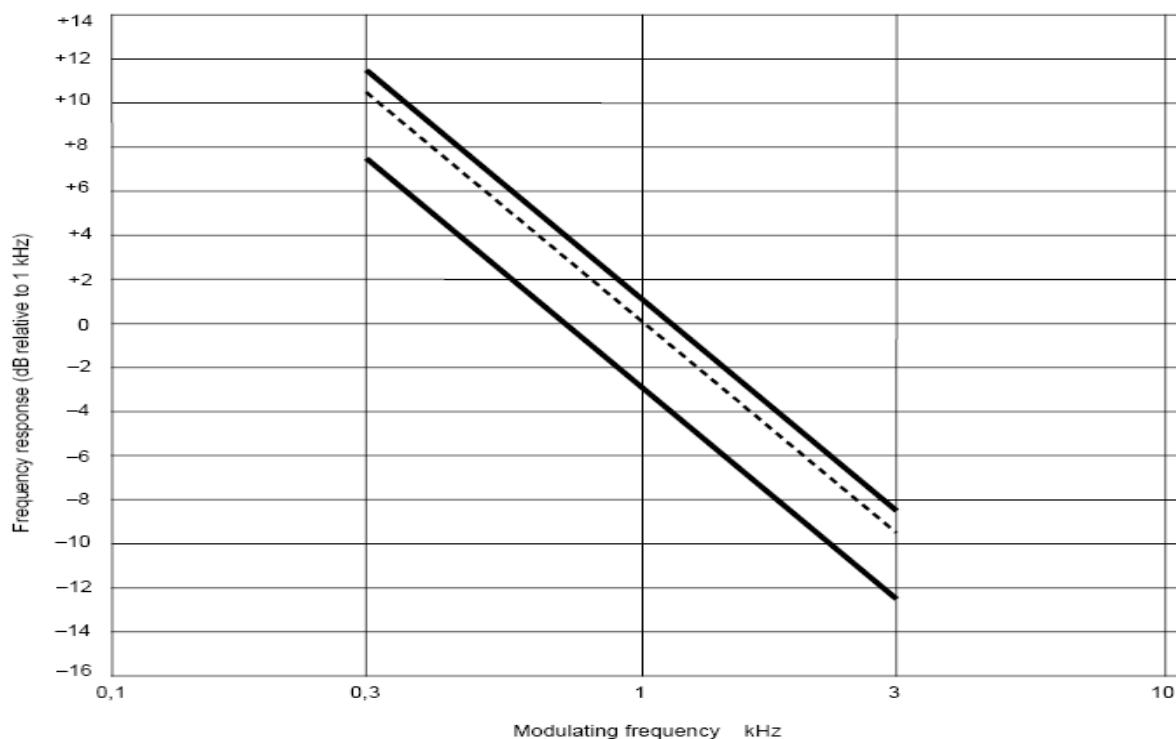
##### LIMIT

###### **IEC 62238 Sub-clause 9.2.3**

A test signal of +60 dB<sub>μ</sub>V (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  $\pm 1$  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.

The audiofrequency 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).

##### TEST CONFIGURATION



##### TEST PROCEDURE

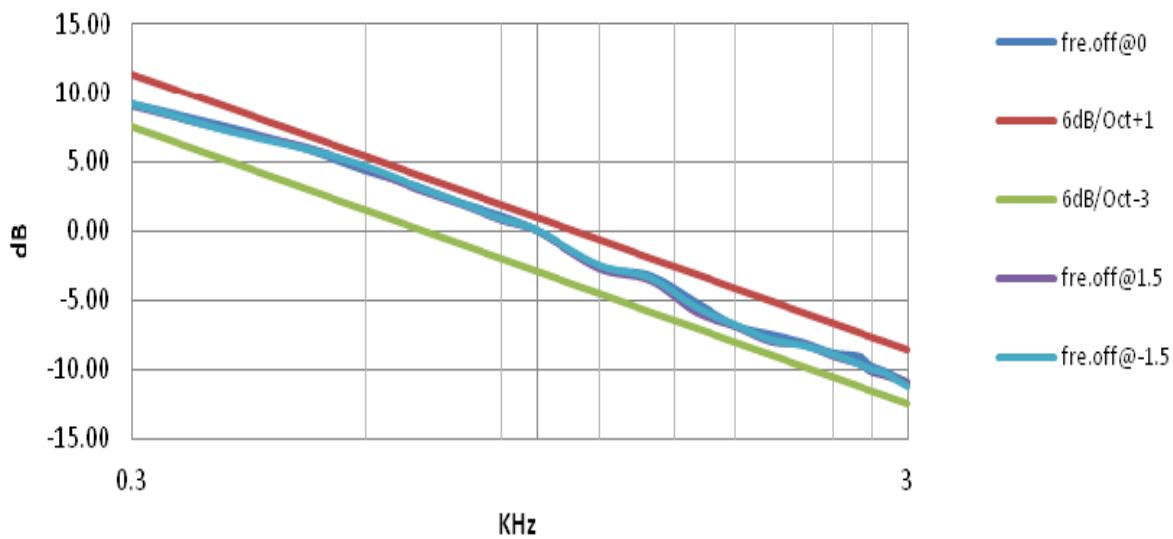
1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 8.9.2 for the measurement method.

##### TEST RESULTS

25 KHz Channel Separation

Audio Frequency (KHz)	Audio Frequency Response (dB)		
	Frequency Offset (KHz)		
	-1.5	0	1.5
0.3	9.12	9.23	9.01
0.4	7.15	7.52	7.23
0.5	5.91	6.00	6.05
0.6	4.62	4.38	4.52
0.7	3.14	3.25	3.01
0.8	1.93	2.00	1.89
0.9	0.82	1.07	0.77
1.0	0.00	0.00	0.00
1.2	-2.50	-2.58	-2.69
1.4	-3.41	-3.24	-3.55
1.6	-5.52	-5.16	-5.83
1.8	-6.80	-6.85	-6.85
2.0	-7.88	-7.52	-7.96
2.2	-8.26	-8.09	-8.14
2.4	-8.90	-8.85	-8.97
2.6	-9.63	-9.11	-9.56
2.7	-10.00	-9.80	-10.12
2.8	-10.25	-10.17	-10.36
3.0	-11.22	-11.00	-10.89

Receiver Audio Frequency Response for 25KHz



#### 4.1.18. Maximum Usable Sensitivity (Conducted) for Radiotelephone receiver

##### LIMIT

##### IEC 62238 Sub-clause 9.3.3

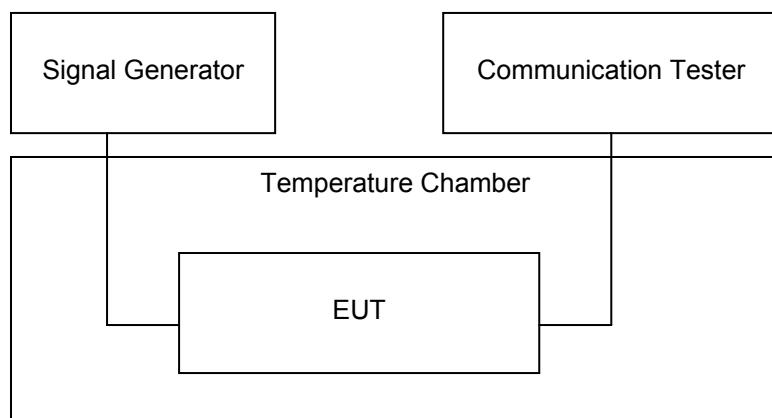
The maximum usable sensitivity of the receiver is the minimum level of the signal (emf) at the nominal frequency of the receiver which, when applied to the receiver input with normal test modulation (clause 6.12), will produce:

- in all cases, an audio frequency output power of at least 50 % of the rated output power (clause 9.1); and
- a SINAD ratio of 20 dB, measured at the receiver output through a psophometric telephone filtering network such as described in ITU-T Recommendation O.41 [6].

The test shall be performed on the lowest frequency channel, the highest frequency channel and on channel 16.

The maximum usable sensitivity for either 25 kHz or 12,5 kHz channels shall not exceed +6 dB $\mu$ V (emf) under normal test conditions and +12 dB $\mu$ V (emf) under extreme test conditions.

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 and 6.13 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 9.3.2 for the measurement method.

##### TEST RESULTS

The Middle Channel Results of 25 KHz Channel Separation

Test Condition		Result Measured (dB $\mu$ V)	SND/ND Measured (dB)	Limit (dB $\mu$ V)
Temperature ( °C )	Voltage ( V )			
T Nor ( 25°C )	7.40 V	-5.6	20	6.0
T min ( -15°C )	8.40 V	-7.5	20	12.0
	6.20 V	-7.6	20	12.0
T Max ( +55°C )	8.40 V	-7.5	20	12.0
	6.20 V	-7.8	20	12.0
Result		PASS		

#### 4.1.19. Co-channel Rejection for Radiotelephone receiver

##### LIMIT

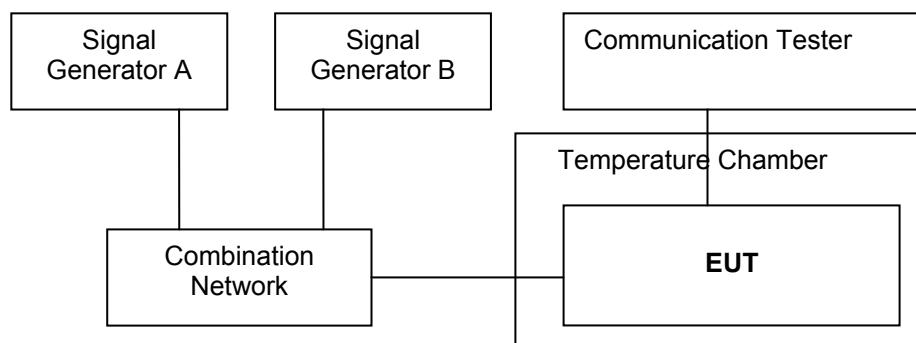
##### **IEC 62238 Sub-clause 9.4.3**

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.

The co-channel rejection of the receiver as defined as in Sub-clause 9.4, at any frequency of the unwanted signal within the specified range, shall be between:

- -10 dB and 0 dB for 25 kHz channels;
- -12 dB and 0 dB for 12.5 kHz channels.

##### 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 9.4.2 for the measurement method.

##### TEST RESULTS

**The Middle Channel Results of 25 KHz Channel Separation**

Test Condition		Measurement Offset (KHz)	Sig B SND/ND Measured (dB)	Sig Gen B-Sig Gen A (dB)	Limit
Temperature ( °C )	Voltage ( V )				
T Nor ( 25°C )	7.40 V	-3.0	14	-2.6	Between -10.0 and 0 dB
		-1.5	14	-1.5	
		0	14	-1.8	
		1.5	14	-1.9	
		3.0	14	-2.7	
Result		PASS			

#### 4.1.20. Adjacent Channel Selectivity for Radiotelephone receiver

##### LIMIT

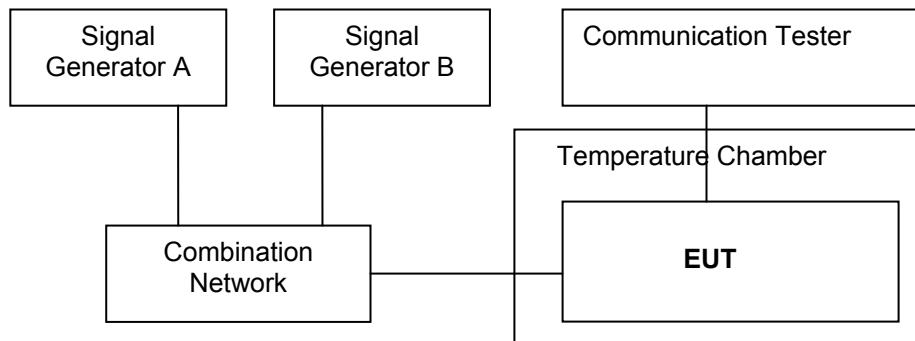
##### **IEC 62238 Sub-clause 9.5**

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 the nominal channel spacing.

25 kHz channels: 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.

12,5 kHz channels: the adjacent channel selectivity shall be not less than 60 dB under normal test conditions and not less than 50 dB under extreme test conditions.

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 and 6.13 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 9.5.2 for the measurement method.

##### TEST RESULTS

**The Middle Channel Results of 25 KHz Channel Separation**

Test Condition		Measurement Position	Sig B SND/ND Measured (dB)	Sig Gen B-Sig Gen A (dB)	Limit
Temperature ( °C )	Voltage (V)		Up Channel	14	
T Nor ( 25°C )	7.40 V	Up Channel	14	77.5	At least 70.0dB
		Low Channel	14	77.9	
	8.40 V	Up Channel	14	78.8	
		Low Channel	14	78.9	
T min ( -15°C )	6.29 V	Up Channel	14	78.7	At least 60.0dB
		Low Channel	14	78.4	
	8.40 V	Up Channel	14	79.5	
		Low Channel	14	79.8	
T Max ( +55°C )	6.29 V	Up Channel	14	79.9	
		Low Channel	14	79.5	
	PASS				

#### 4.1.21. Spurious Response Rejection for Radiotelephone receiver

##### LIMIT

##### **IEC 62238 Sub-clause 9.6.3**

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.

The spurious response rejection of the receiver as defined as in Sub-clause 9.6.3, at any frequency separated from the nominal frequency of the receiver by more than one channel, the spurious response rejection ratio shall not be less than 70.0 dB

##### TEST CONFIGURATION

The same as described in section 4.1.20

##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 9.6.2 for the measurement method.

##### TEST RESULTS

Note: The spurious response rejection was tested from 9KHz to 2GHz and recorded worst case.

**The Middle Channel Results of 25 KHz Channel Separation**

Test Condition		Sig B SND/ND Measured (dB)	Sig Gen B-Sig Gen A (dB)	Limit
Temperature ( °C )	Voltage ( V )			
T Nor ( 25°C )	7.40 V	14	78.9	At least 70.0dB
Result		PASS		

#### 4.1.22. InterModulation Response Rejection for Radiotelephone receiver

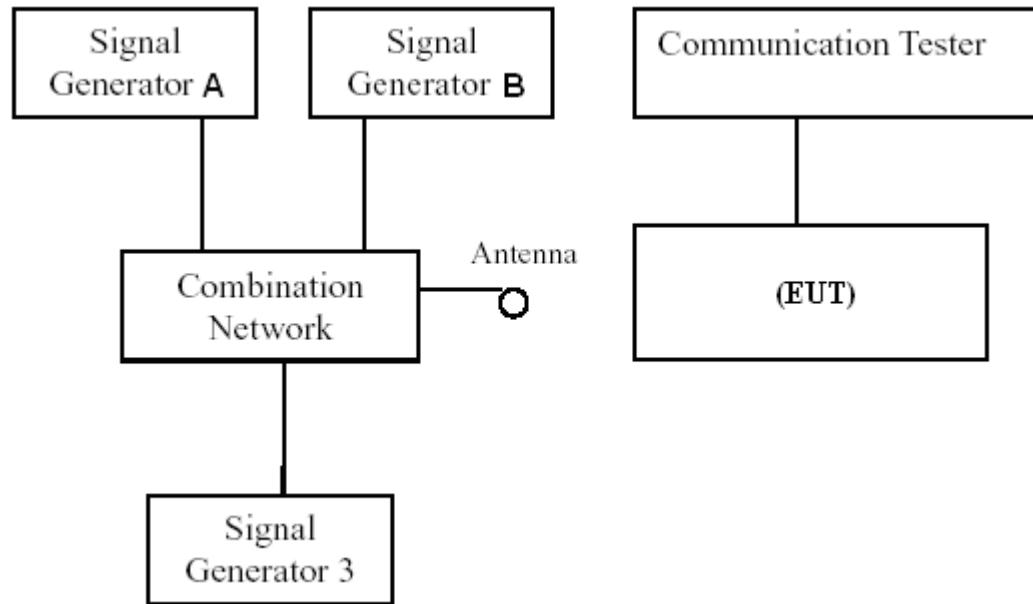
##### LIMIT

##### IEC 62238 Sub-clause 9.7.3

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.

The intermodulation response ratio shall not be less than 68 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 9.7.2 for the measurement method.

##### TEST RESULTS

The Middle Channel Results of 25 KHz Channel Separation

Test Condition		Sig Gen B	Sig Gen C	Sig B(C) SND/ND	Sig Gen B(C)-Sig Gen A (dB)	Limit
Temperature ( °C )	Voltage ( V )	Measurement Offset	Measurement Offset	Measured (dB)	Sig Gen B(C)-Sig Gen A (dB)	
T Nor ( 25°C )	7.40V	-50KHz	-100KHz	14	69.6	At least 68.0dB
		-25KHz	-50KHz	14	68.6	
		25KHz	50KHz	14	68.5	
		50KHz	100KHz	14	68.6	
Result		PASS				

#### 4.1.23. Blocking or Desensitization for Radiotelephone receiver

##### LIMIT

##### **IEC 62238Sub-clause 9.8.3**

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.

The blocking level for any frequency within the specified ranges, shall be not less than 90 dB $\mu$ V (emf), except at frequencies on which spurious responses are found (clause 9.6).

##### TEST CONFIGURATION

The same as described in section 4.1.13

##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 9.8.2 for the measurement method.

##### TEST RESULTS

**The Middle Channel Results of 25 KHz Channel Separation**

Test Condition		Measurement Offset (MHz)	Sig B SND/ND Measured (dB)	Unwanted Signal Level (dBuV)	Limit
Temperature ( °C )	Voltage ( V )				
T <sub>Nor</sub> ( 25°C )	7.40 V	-10	14	91.0	At least 90.0dB <sub>u</sub> V
		-5	14	91.3	
		-2	14	90.9	
		-1	14	90.6	
		1	14	90.6	
		2	14	90.5	
		5	14	90.8	
		10	14	90.9	
Result		PASS			

#### 4.1.24. Receiver conducted spurious emissions for Radiotelephone receiver

##### LIMIT

##### **IEC 62238 Sub-clause 9.9.3**

Conducted 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.

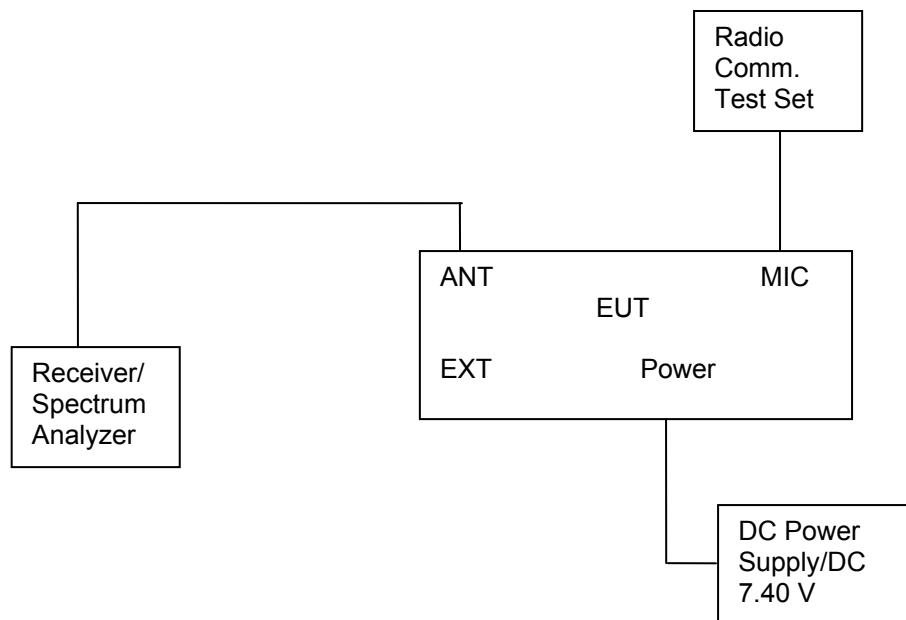
Conducted spurious radiations shall be measured as the power level of any discrete signal at the input terminals of the receiver. The receiver input terminals are connected to a spectrum analyser or selective voltmeter having an input impedance of  $50 \Omega$  and the receiver is switched on.

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.

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

##### TEST CONFIGURATION

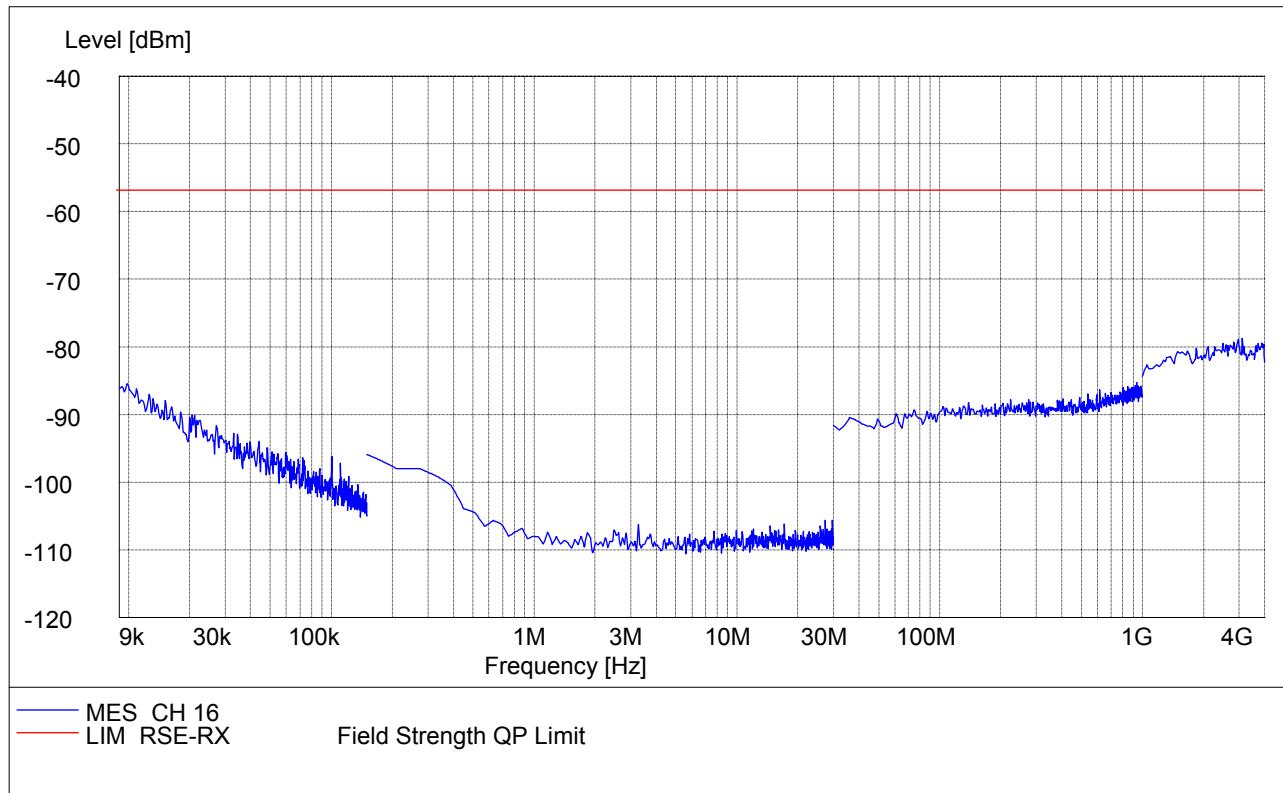


##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 9.10.2 for the measurement method.

##### TEST RESULTS

##### Plots of Receiver Conducted Spurious Emissions Test Results

The Middle Channel of 25 KHz Channel Separation

#### 4.1.25. Receiver radiated spurious emissions for Radiotelephone receiver

##### LIMIT

##### **IEC 62238 Sub-clause 9.11.3**

Radiated spurious emissions from the receiver are components at any frequency radiated by the equipment cabinet and the structure.

Integral antenna equipment shall be tested with the normal antenna fitted.

The power of any spurious radiation shall not exceed 2 nW at any frequency in the range between 30 MHz and 2 GHz.

##### TEST CONFIGURATION

The same as described in section 4.1.19.

##### TEST PROCEDURE

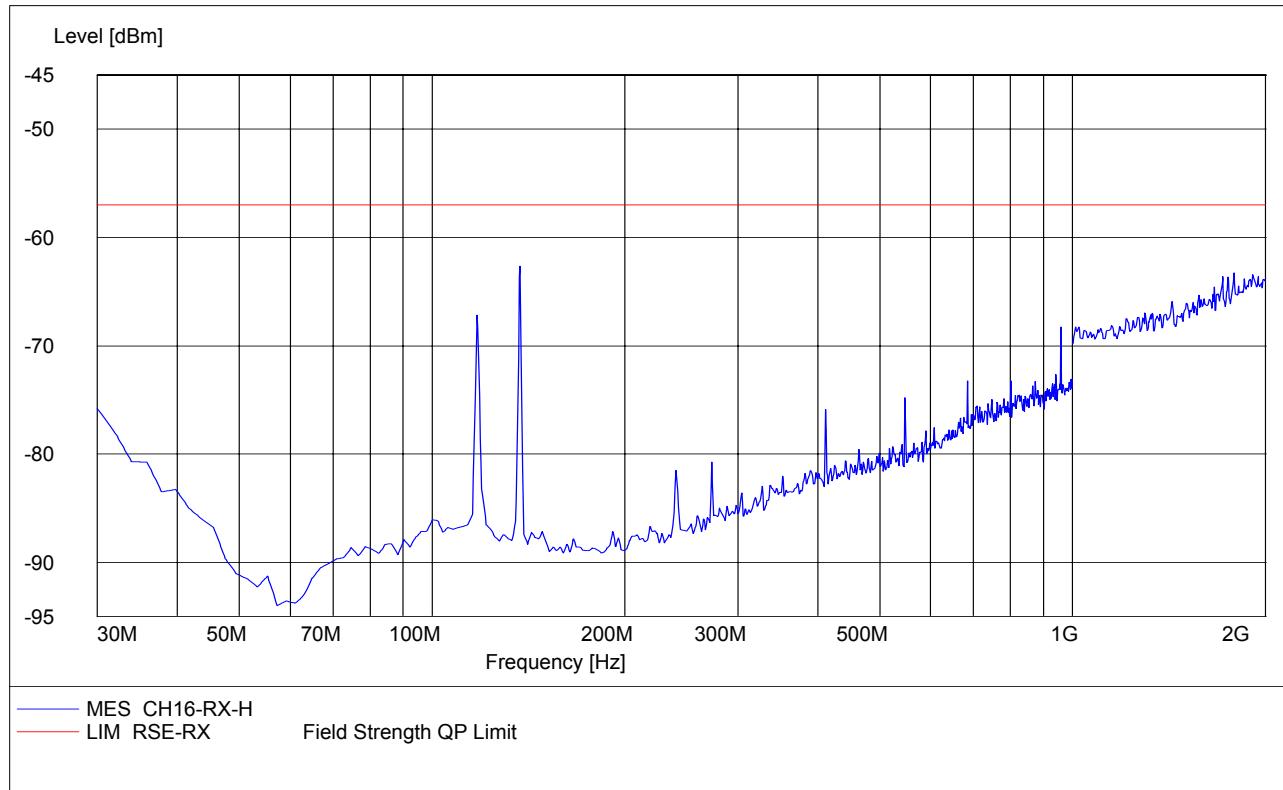
1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 9.9.2 for the measurement method.

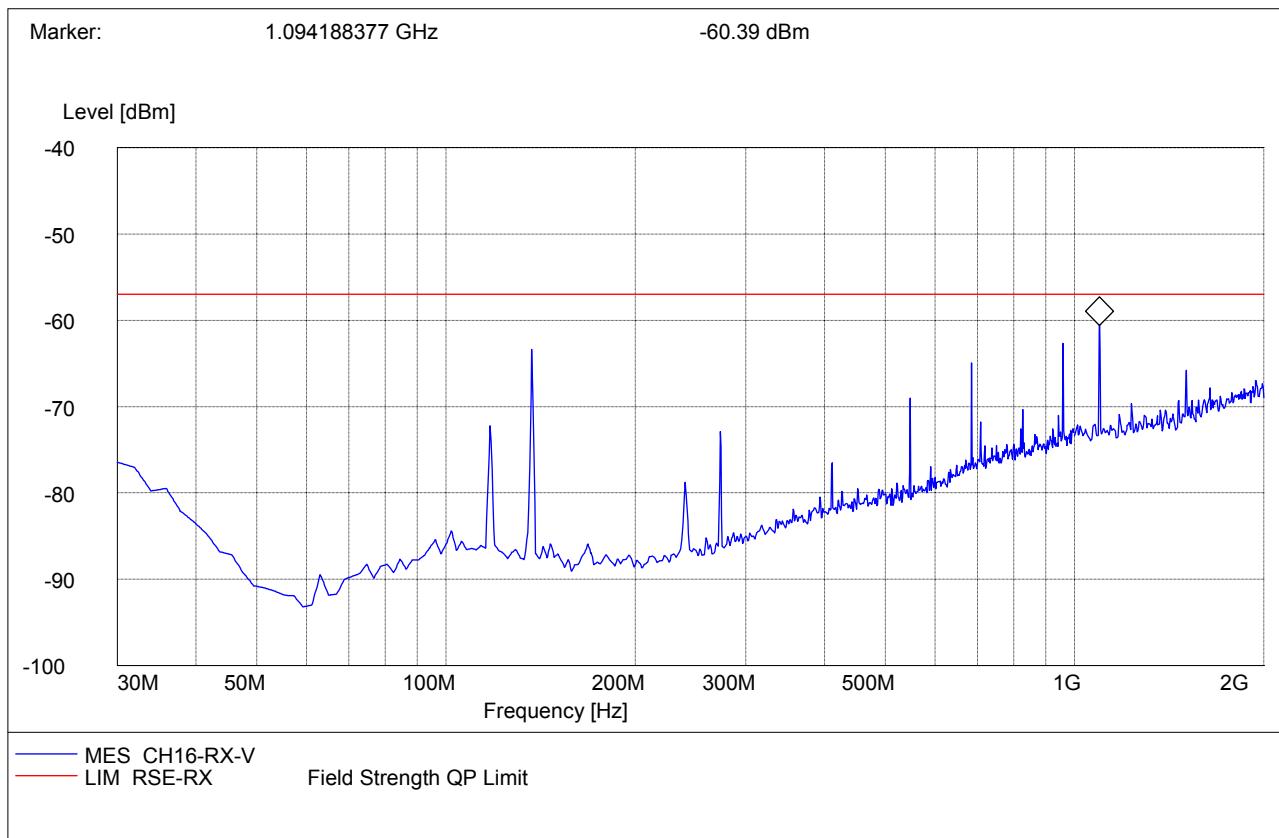
##### TEST RESULTS

Note: The Receiver radiated spurious emissions were performed to the lowest frequency channel, the highest frequency channel and the middle channel(channel 16), the datum recorded below is the worst case.

##### Plots of Receiver Radiated Spurious Emissions Test Results

##### The Middle Channel of 25 KHz Channel Separation@ Horizontal



The Middle Channel of 25 KHz Channel Separation@ Vertical

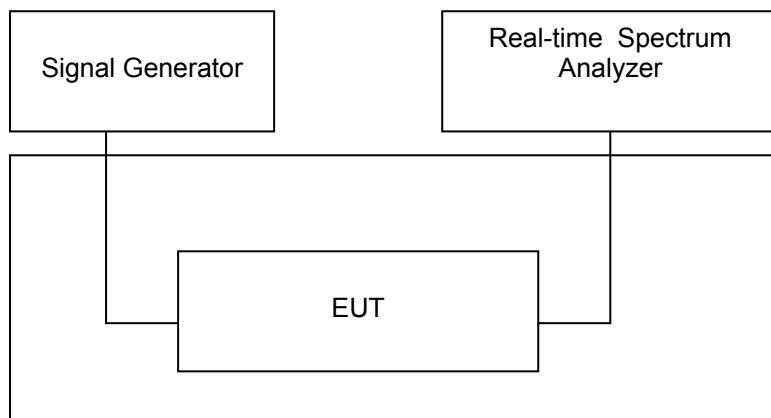
#### 4.1.26. Receiver residual noise level for Radiotelephone receiver

##### LIMIT

##### **IEC 62238 Sub-clause 9.10.3**

A test signal with a level of +30 dB<sub>μ</sub>V (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 audiofrequency load shall be connected to the output terminals of the receiver. The audiofrequency 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 audiofrequency output level measured again. The receiver residual noise level 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 9.10.2 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	-48.8	
Limit		Shall not exceed -40	
Result		PASS	

#### 4.1.27. Squelch operation for Radiotelephone receiver

##### LIMIT

###### **IEC 62238 Sub-clause 9.11.3**

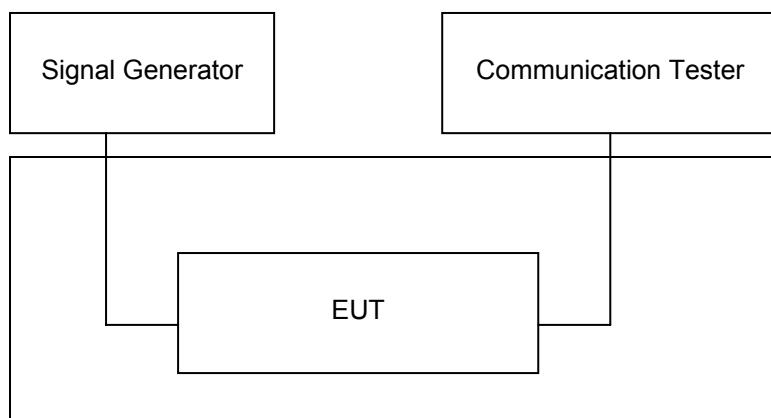
Squelch operation was defined as the purpose of the squelch facility is to mute the receiver audio output signal when the level of the signal at the receiver input is less than a given value.

Under the conditions specified in 9.11.2 a), the audiofrequency 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  $+6$  dB $\mu$ V (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  $+6$  dB $\mu$ V (e.m.f.) when the control is set at maximum.

##### 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 9.11.2 for the measurement method.

##### TEST RESULTS

Test Condition		Squelch Operation Measurement Results				
Temperature( °C )	Voltage ( V )	9.11.2 a	9.11.2 b		9.11.2 c	
25	7.4	Audiofrequency Output Power	SINAD (dB)	Input Level (dB $\mu$ V)	Input Level (dB $\mu$ V)	
		-49.25	20.00	-6.2	2.3	
Limit		$\leq -40$	$\geq 20$	$\leq 6$	$\leq 6$	
Result		PASS				

#### 4.1.28. Squelch hysteresis for Radiotelephone receiver

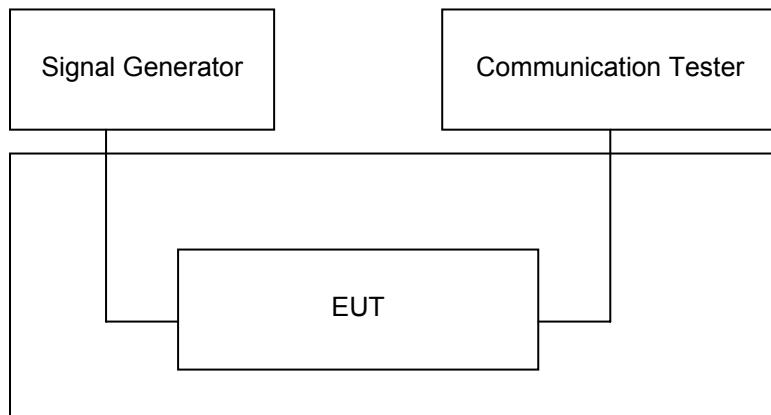
##### LIMIT

##### **IEC 62238 Sub-clause 9.12.3**

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

The squelch hysteresis shall be between 3 dB and 6 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 9.12.2 for the measurement method.

##### TEST RESULTS

Test Condition		Squelch hysteresis Measurement Results
Temperature( °C )	Voltage ( V )	Middle Channel
T Nor ( 25°C )	7.40 V	4.2
Limit		Between 3 dB and 6 dB
Result		PASS

#### 4.1.29. Multiple watch characteristic for Radiotelephone receiver

##### LIMIT

##### IEC 62238 Sub-clause 9.13.3

Multiple watch characteristic was defined as 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.

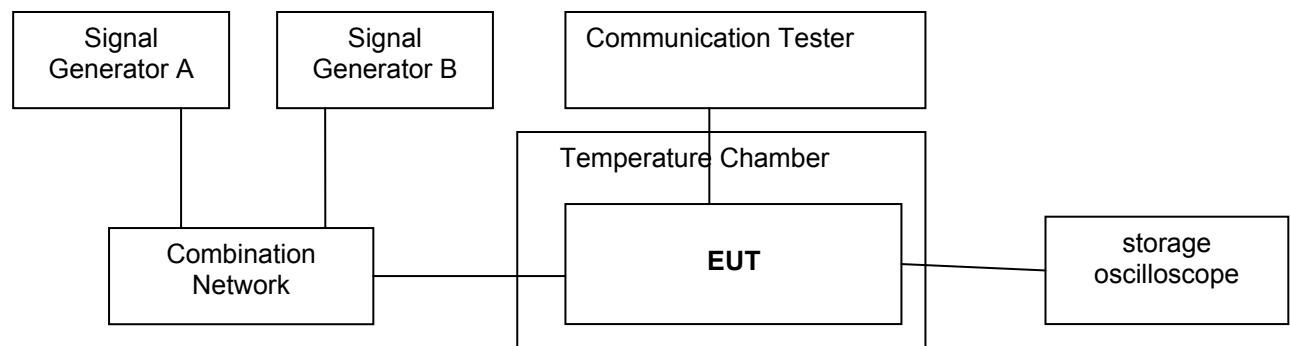
The dwell time on the priority channel is the time between the start and finish of any sample of the priority channel in the absence of a signal on that channel.

The 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.

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 and 6.13 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 9.13.2 for the measurement method.

##### TEST RESULTS

Test Condition		Multiple watch characteristic Measurement Results		
Temperature ( °C )	Voltage ( V )	Scanning Period (s)	Dwell Time For Priority Channel (ms)	Dwell Time For Additional Channel (ms)
T Nor ( 25°C )	7.40 V	1.58	120.5	1254
T min ( -15°C )	8.40 V	1.63	136.1	1332
	6.29 V	1.55	139.0	1330
T Max ( +55°C )	8.40 V	1.65	127.9	1193
	6.29 V	1.63	133.5	1300
Limit		≤2	≤150	850≤T≤2000
Result		PASS		

#### 4.1.30. Maximum usable sensitivity for DSC decoder

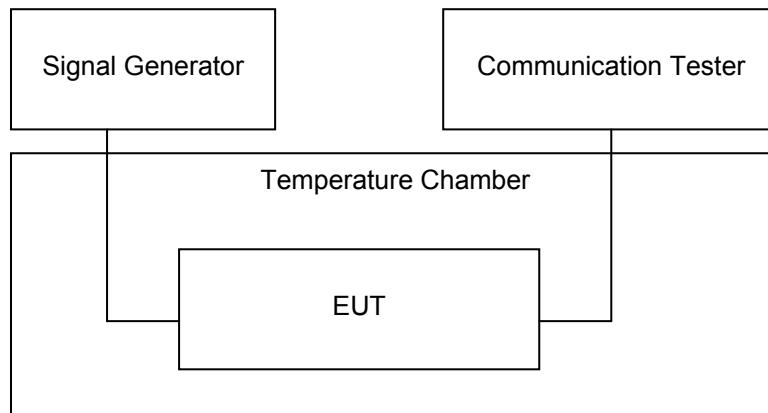
##### LIMIT

##### **IEC 62238 Sub-clause 10.1.3**

The maximum usable sensitivity of the receiver was defined as 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 testmodulation will produce a bit error ratio of  $10^{-2}$ .

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

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 and 6.13 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 10.1.2 for the measurement method.

##### TEST RESULTS

Test Condition		Maximum usable sensitivity Measument Results					
Temperature ( °C )	Voltage ( V )	Frequency Offset @ - 1.5KHz		Frequency Offset @ 0KHz		Frequency Offset @ 1.5KHz	
		Input Level (dBuV)	BER	Input Level (dBuV)	BER	Input Level (dBuV)	BER
T Nor ( 25°C )	7.40 V	0	0.003	0	0.000	0	0.003
T min ( -15°C )	8.40 V	N/A	N/A	+6		N/A	N/A
	6.29 V	N/A	N/A	+6		N/A	N/A
T Max ( +55°C )	8.40 V	N/A	N/A	+6		N/A	N/A
	6.29 V	N/A	N/A	+6		N/A	N/A
Limit		---	$\leq 10^{-2}$	---	$\leq 10^{-2}$	---	$\leq 10^{-2}$
Result		PASS					

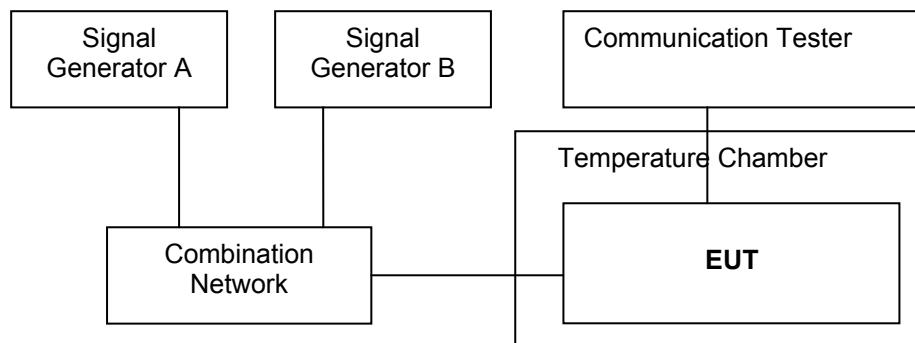
#### 4.1.31. Co-channel rejection for DSC decoder

##### LIMIT

##### **IEC 62238 Sub-clause 10.2.3**

The co-channel rejection of the receiver was defined as a measure of the capability of the receiver to receive a wantedmodulated signal without exceeding a given degradation due to the presence of an unwantedmodulated signal, both signals being at the nominal frequency of the receiver. . The bit error ratio shall be equal to or less than  $10^{-2}$ .

##### 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 10.2.2 for the measurement method.

##### TEST RESULTS

Test Condition		Co-channel rejection Measurement Results						
Temperature ( °C )	Voltage ( V )	Wanted Signal Level (dBuV)	Unwanted Signal					
			Frequency Offset @ -3KHz		Frequency Offset @ 0KHz		Frequency Offset @ 3KHz	
			Input Level (dBuV)	BER	Input Level (dBuV)	BER	Input Level (dBuV)	BER
T Nor ( 25°C )	7.40 V	3	-5	0.005	-5	0.001	-5	0.003
Limit			---	$\leq 10^{-2}$	---	$\leq 10^{-2}$	---	$\leq 10^{-2}$
Result			PASS					

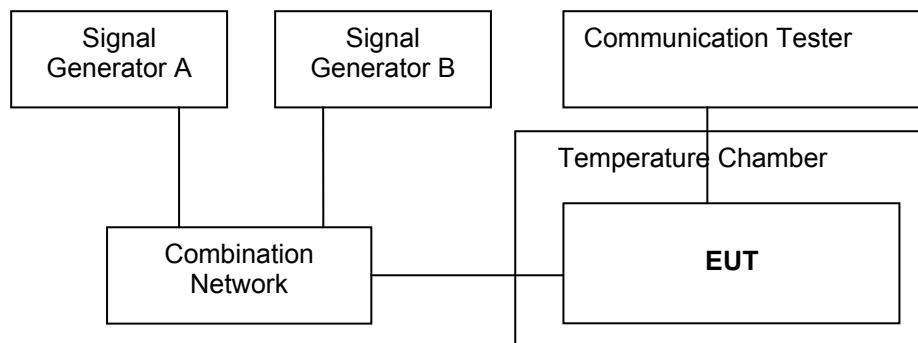
#### 4.1.32. Adjacent channel selectivity for DSC decoder

##### LIMIT

##### **IEC 62238 Sub-clause 10.3.3**

The adjacent channel selectivity of the receiver was defined as a measure of the capability of the receiver to receive 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. The bit error ratio shall be equal to or less than  $10^{-2}$ .

##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 and 6.13 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 10.3.2 for the measurement method.

##### TEST RESULTS

Test Condition		Adjacent channel selectivity Measurement Results						
Temperature ( °C )	Voltage ( V )	Wanted Signal Level (dBuV)	Unwanted Signal					
			Frequency Offset @ -25KHz		Frequency Offset @ 0KHz		Frequency Offset @ 25KHz	
			Input Level (dBuV)	BER	Input Level (dBuV)	BER	Input Level (dBuV)	BER
T Nor ( 25°C )	7.40 V	3	73	0.004	73	0.005	73	0.005
T Min ( -15°C )	8.40 V	9	63	0.004	63	0.005	63	0.004
	6.29 V	9	63	0.005	63	0.004	63	0.006
T Max ( + 55°C )	8.40 V	9	63	0.006	63	0.006	63	0.007
	6.29 V	9	63	0.003	63	0.002	63	0.004
Limit			---	$\leq 10^{-2}$	---	$\leq 10^{-2}$	---	$\leq 10^{-2}$
Result			PASS					

#### 4.1.33. Spurious response and blocking immunity for DSC decoder

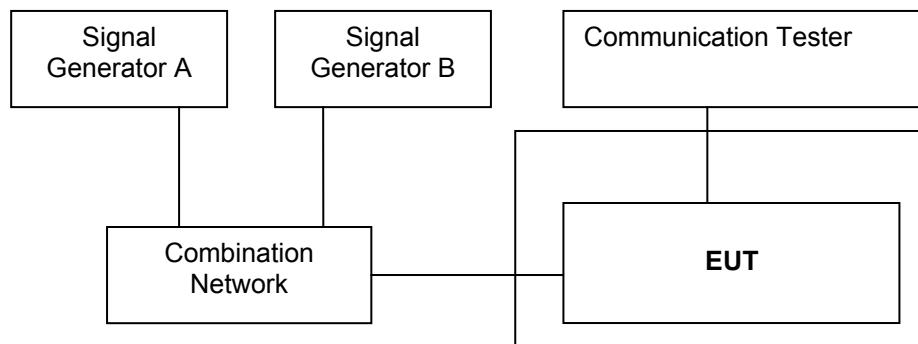
##### LIMIT

##### **IEC 62238 Sub-clause 10.4.3**

The spurious response and blocking immunity of the receiver was defined as 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.

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

##### 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 10.4.2 for the measurement method.

##### TEST RESULTS

Note: The spurious response rejection was tested from 9KHz to 2GHz and recorded worst case.

Test Condition		Spurious Response Measurement Results		
Temperature ( °C )	Voltage ( V )	Wanted Signal Level (dBuV)	Unwanted Signal	
			Input Level (dBuV)	BER
T Nor ( 25°C )	7.40 V	3	73	0.005
Limit		---		$\leq 10^{-2}$
Result		PASS		

Test Condition		Blocking Immunity Measurement Results				
Temperature ( °C )	Voltage ( V )	Wanted Signal Level (dBuV)	Unwanted Signal			Limit
			Frequency Offset (MHz)	Input Level (dBuV)	BER	
T Nor ( 25°C )	7.40 V	3	-10	93	0.005	$\leq 10^{-2}$
		3	-5	93	0.005	$\leq 10^{-2}$
		3	-2	93	0.004	$\leq 10^{-2}$
		3	-1	93	0.003	$\leq 10^{-2}$
		3	1	93	0.004	$\leq 10^{-2}$
		3	2	93	0.004	$\leq 10^{-2}$
		3	5	93	0.005	$\leq 10^{-2}$
		3	10	93	0.006	$\leq 10^{-2}$
Result		PASS				

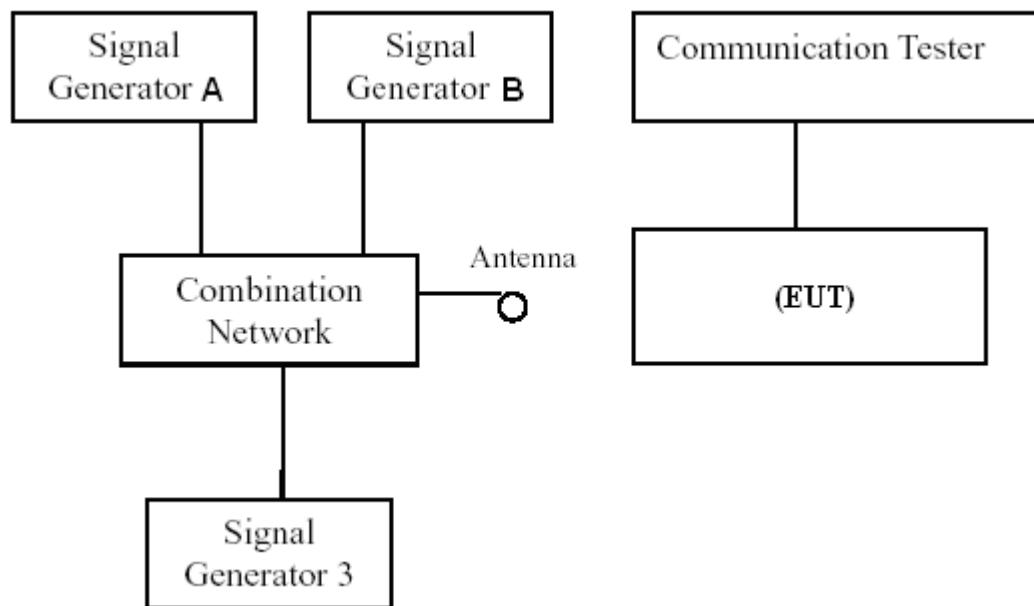
#### 4.1.34. Intermodulation response for DSC decoder

## LIMIT

IEC 62238 Sub-clause 10.5.3

The intermodulation response of the receiver was defined as a measure of the capability of the receiver to receive awanted modulated signal without exceeding a given degradation due to the presence of two ormore unwanted signals with a specific frequency relationship to the wanted signal frequency.  
The bit error ratio shall be equal to or less than  $10^{-2}$ .

## 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 10.5.2 for the measurement method.

## **TEST RESULTS**

Test Condition		Intermodulation response Measurement Results						Limit	
Temperature ( °C )	Voltage ( V )	Wanted Signal Level (dBuV)	Unwanted Signal						
			Sig Gen B		Sig Gen C				
			Frequency Offset (KHz)	Input Level (dBuV)	Frequency Offset (KHz)	Input Level (dBuV)			
T Nor ( 25°C )	7.40 V	3	-50	68	-100	68	0.005	≤10 <sup>-2</sup>	
		3	-25	68	-50	68	0.003	≤10 <sup>-2</sup>	
		3	25	68	50	68	0.003	≤10 <sup>-2</sup>	
		3	50	68	100	68	0.004	≤10 <sup>-2</sup>	
Result			PASS						

#### 4.1.35. Dynamic range for DSC decoder

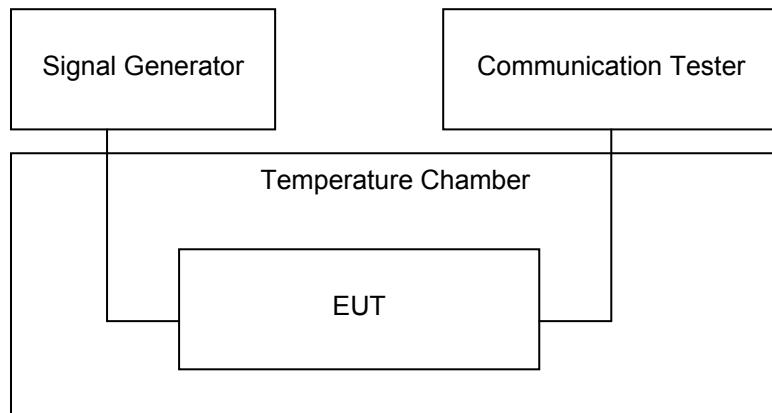
##### LIMIT

##### **IEC 62238 Sub-clause 10.6.3**

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

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

##### 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 10.6.2 for the measurement method.

##### TEST RESULTS

Test Condition		Intermodulation response Measument Results		Limit
Temperature ( °C )	Voltage ( V )	Input Level (dBuV)	BER	
T Nor ( 25°C )	7.40 V	0	0.000	$\leq 10^{-2}$
		10	0.000	$\leq 10^{-2}$
		20	0.001	$\leq 10^{-2}$
		30	0.003	$\leq 10^{-2}$
		40	0.004	$\leq 10^{-2}$
		50	0.004	$\leq 10^{-2}$
		60	0.005	$\leq 10^{-2}$
		70	0.005	$\leq 10^{-2}$
		80	0.006	$\leq 10^{-2}$
		90	0.008	$\leq 10^{-2}$
Result		PASS		

#### 4.1.36. Spurious emissions for DSC decoder

##### LIMIT

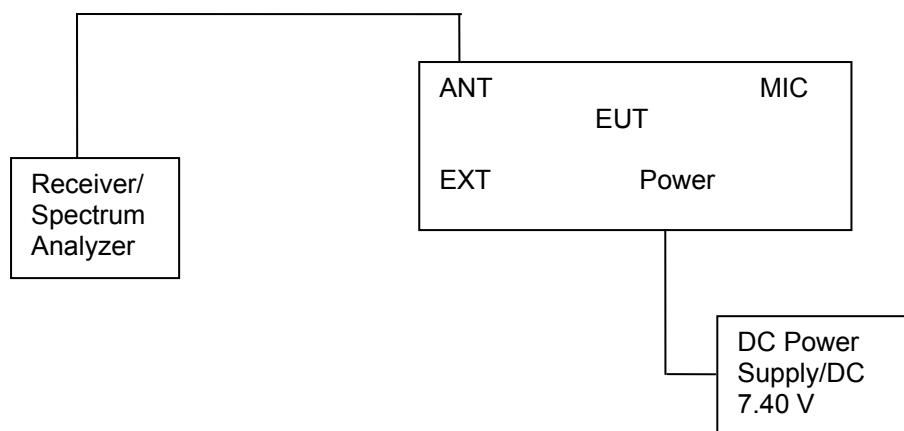
##### **IEC 62238 Sub-clause 10.7.3**

The spurious emissions of the receiver was defined as 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.

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

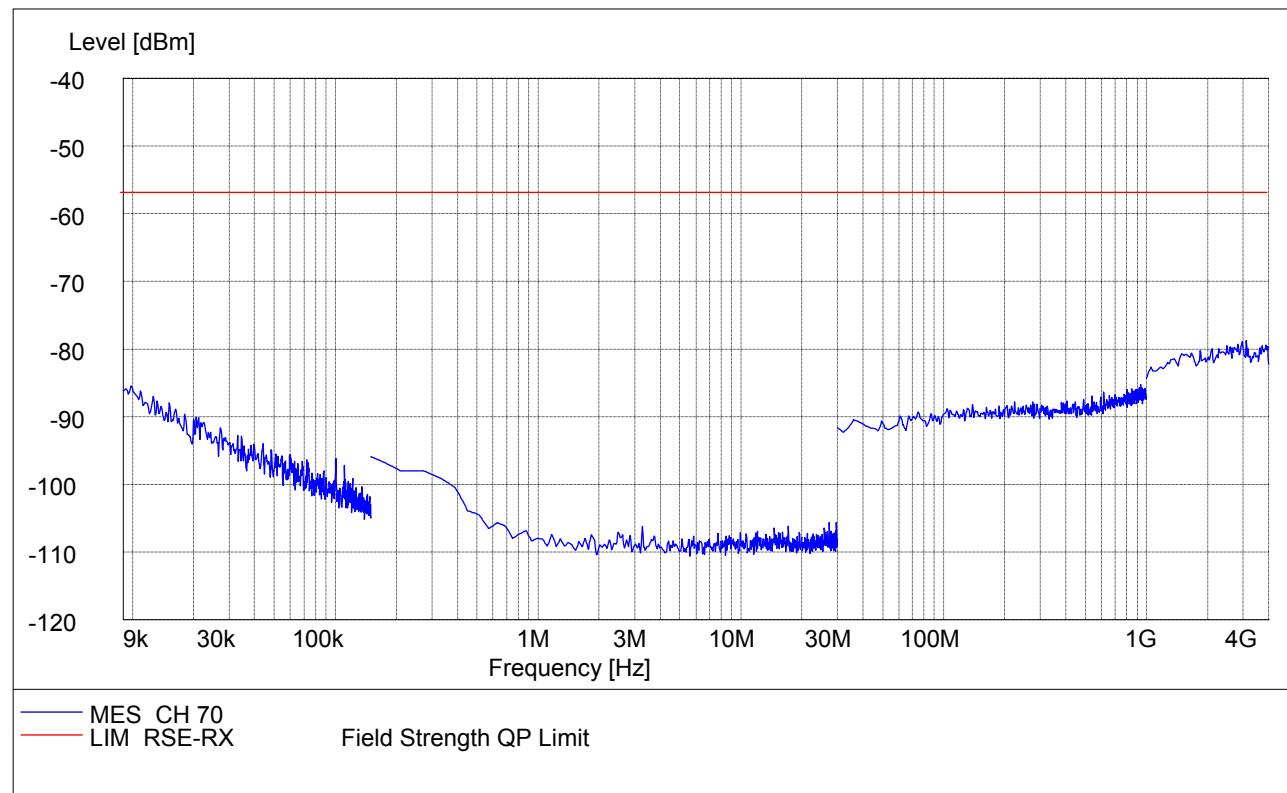
##### TEST CONFIGURATION



##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 10.7.2 for the measurement method.

##### TEST RESULTS



#### 4.1.37. Verification of correct decoding of various types of DSC calls

##### LIMIT

##### **IEC 62238 Sub-clause 10.8.3**

The DSC call sequences was defined as comply with ITU-R Recommendation M.493-10. 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.

##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 10.8.2 for the measurement method.

##### TEST RESULTS

The product meets with specified in annex A requirement.

#### 4.1.38. Reaction to VTS and AIS channel management DSC transmissions

##### LIMIT

##### **IEC 62238 Sub-clause 10.9.3**

The VTS and AIS channel management DSC transmissions was defined as are any DSC transmissions that are inaccordance with Recommendation ITU-R M.825 or M.1371.

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

##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 10.9.2 for the measurement method.

##### TEST RESULTS

The product meets with VTS and AIS channel management DSC transmissions requirement.

#### 4.1.39. Simultaneous reception

##### LIMIT

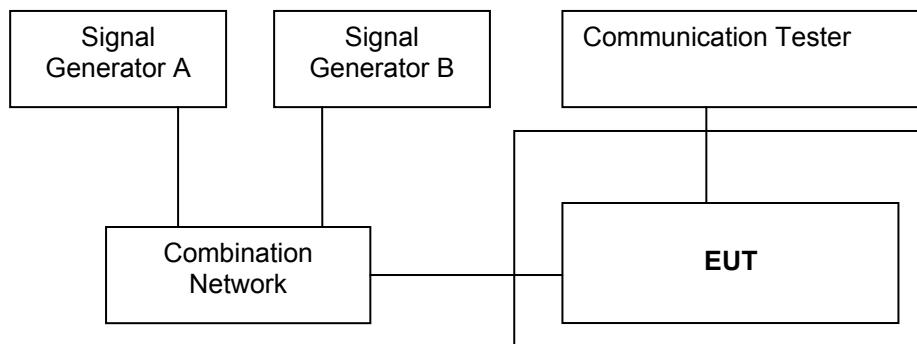
##### **IEC 62238 Sub-clause 10.10.3**

The simultaneous reception was defined as the ability of the unit to correctly receive DSC traffic and radiotelephony traffic at the same time.

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  $10^{-2}$ .

##### 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 10.10.2 for the measurement method.

##### TEST RESULTS

Test Condition		Simultaneous reception Measurement Results			
Temperature ( °C )	Voltage ( V )	Radiotelephone Test Signal		DSC Standard Test Signal	
		Input Level ( dBuV )	SINAD ( dB )	Input Level ( dBuV )	BER
T Nor ( 25°C )	7.40 V	20	24.6	0	0.003
Limit		---	≥20dB	---	≤10 <sup>-2</sup>
Result		PASS			

#### 4.1.40. Conducted spurious emission

##### LIMIT

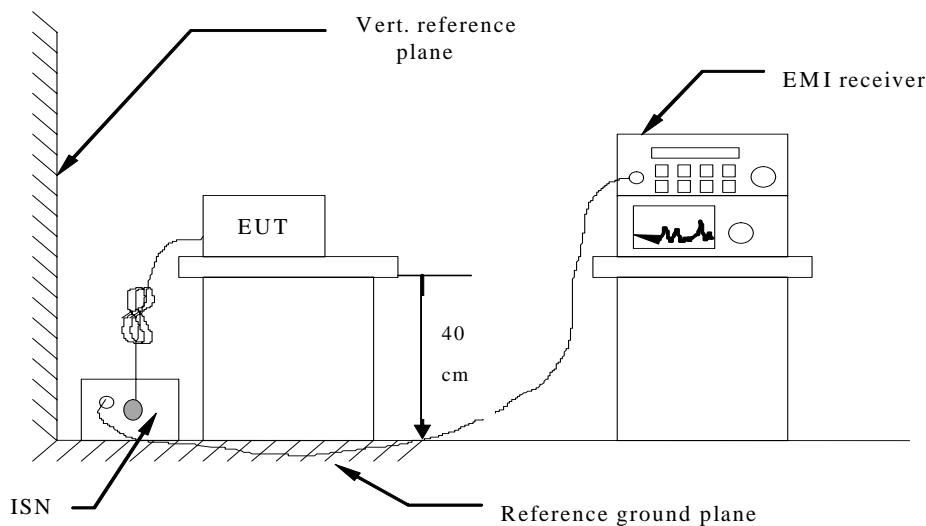
##### **IEC 62238 Sub-clause 11.1.1 and IEC 60945 Section 9.2.3**

The conducted spurious emissions was defined as specified in IEC 60945 and comply to the limits contained therein.

The conducted spurious emission should be not exceed the limit as follows:

Frequency Range	Limit (mV)	Limit (dBuV)
10KHz-150KHz	63-0.3	96-50
150KHz-350KHz	1-0.3	60-50
350KHz-30MHz	0.3	50

##### TEST CONFIGURATION

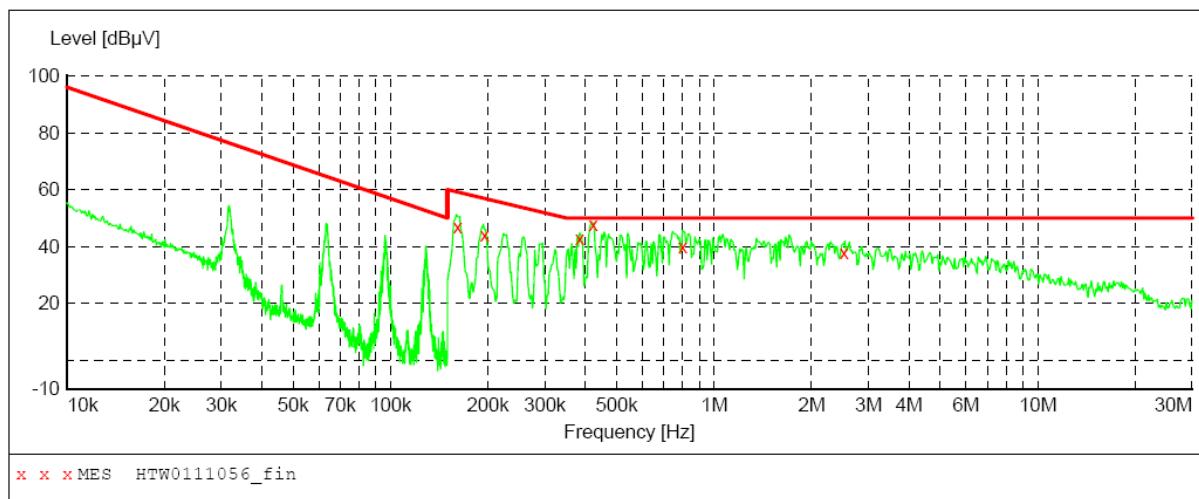


##### TEST PROCEDURE

1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 11.1.1 and IEC 60945 Section 9.2.2 for the measurement method.

##### TEST RESULTS

**SCAN TABLE: "Voltage (9K-30M) FIN"**  
 Short Description: 150K-30M Voltage

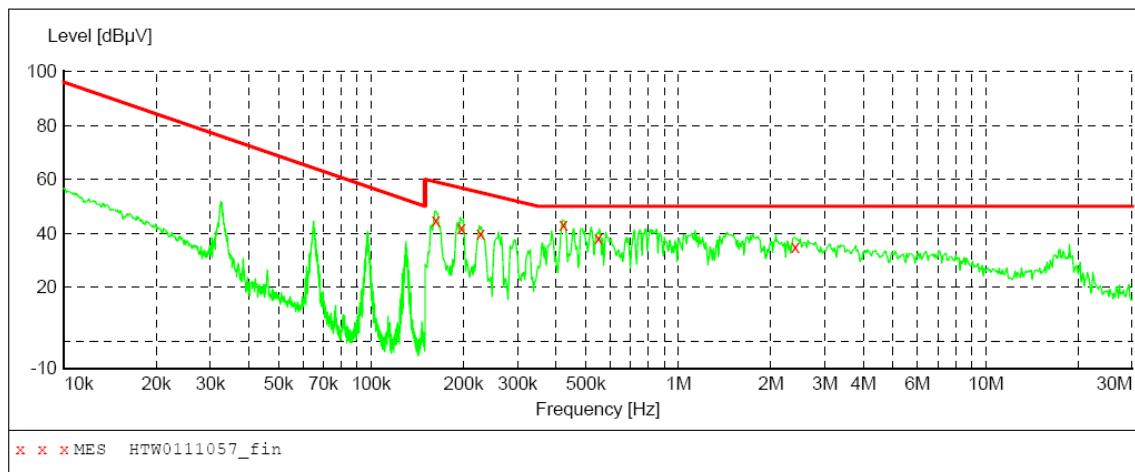


**MEASUREMENT RESULT: "HTW0111056\_fin"**

1/14/2013 9:20AM

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.161150	46.90	10.1	59	12.3	QP	N	GND
0.195105	43.90	10.1	57	13.0	QP	N	GND
0.384088	42.60	10.1	50	7.4	QP	N	GND
0.422630	47.60	10.1	50	2.4	QP	N	GND
0.799465	39.70	10.1	50	10.3	QP	N	GND
2.518370	37.80	10.2	50	12.2	QP	N	GND

**SCAN TABLE: "Voltage (9K-30M) FIN"**  
 Short Description: 150K-30M Voltage



**MEASUREMENT RESULT: "HTW0111057\_fin"**

1/14/2013 9:29AM

Frequency MHz	Level dB $\mu$ V	Transd dB	Limit dB $\mu$ V	Margin dB	Detector	Line	PE
0.162439	44.80	10.1	59	14.3	QP	L1	GND
0.196669	42.10	10.1	57	14.7	QP	L1	GND
0.226999	39.80	10.1	55	15.3	QP	L1	GND
0.422630	43.20	10.1	50	6.8	QP	L1	GND
0.549740	38.20	10.1	50	11.8	QP	L1	GND
2.400794	34.90	10.2	50	15.1	QP	L1	GND

#### 4.1.41. Radiated spurious emission

##### LIMIT

##### **IEC 62238 Sub-clause 11.1.2 and IEC 60945 Section 9.3.3**

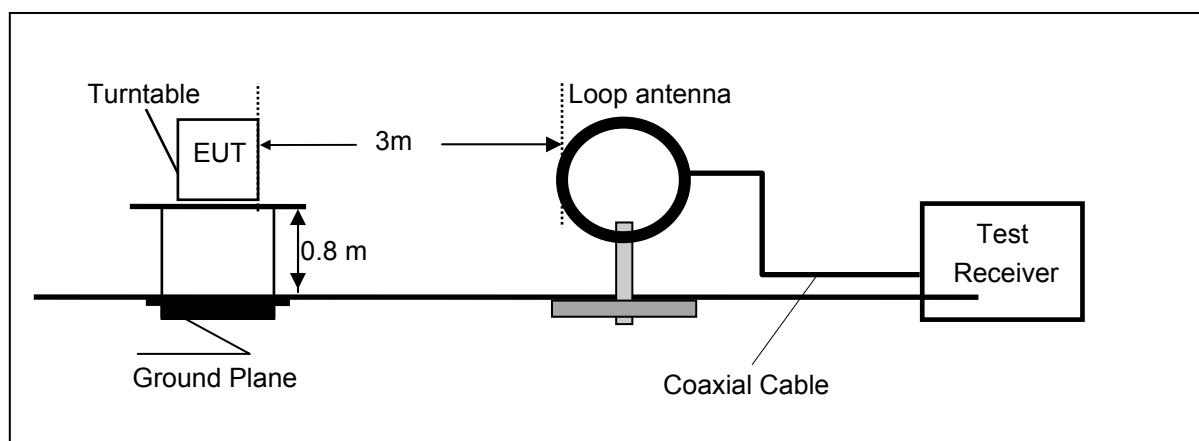
The radiated spurious emissions was defined as specified in IEC 60945 and comply to the limits contained therein.

The radiated spurious emission should be not exceed the limit as follows:

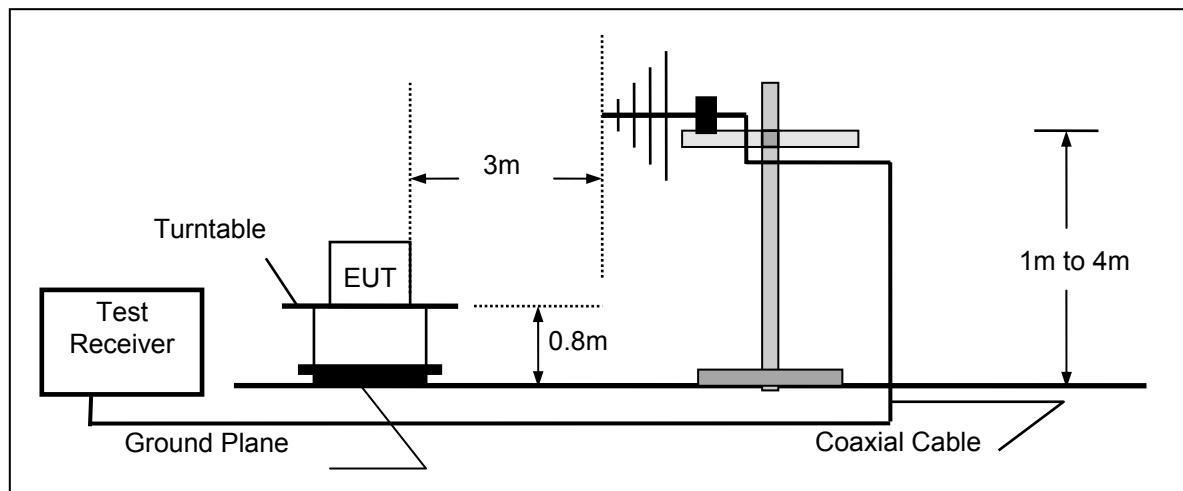
Frequency Range	Limit	Limit (dBuV/m)
10KHz-300KHz	10mV/m-316uV/m	80-52
300KHz-30MHz	316uV/m-50uV/m	52-34
30MHz-2GHz	500uV/m except for 16uV/m in quasi-peak or 32uV/m peak	54dBuV/m except for 24dBuV/m in quasi-peak or 30dBuV/m peak

##### TEST CONFIGURATION

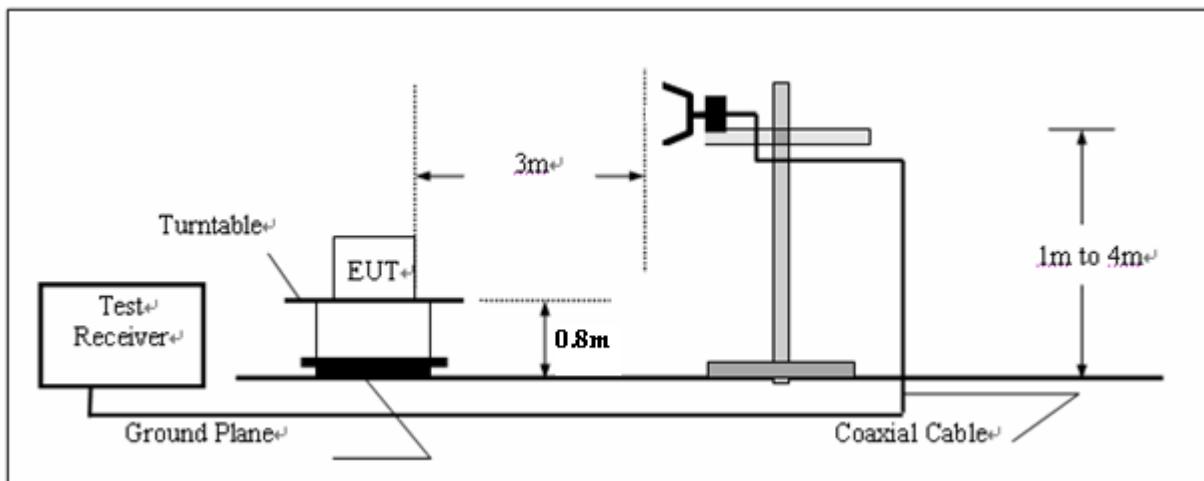
Frequency range 9KHz – 30MHz



Radiated Emission Test Set-Up, Frequency below 1000MHz



Radiated Emission Test Set-Up, Frequency above 1000MHz



## TEST PROCEDURE

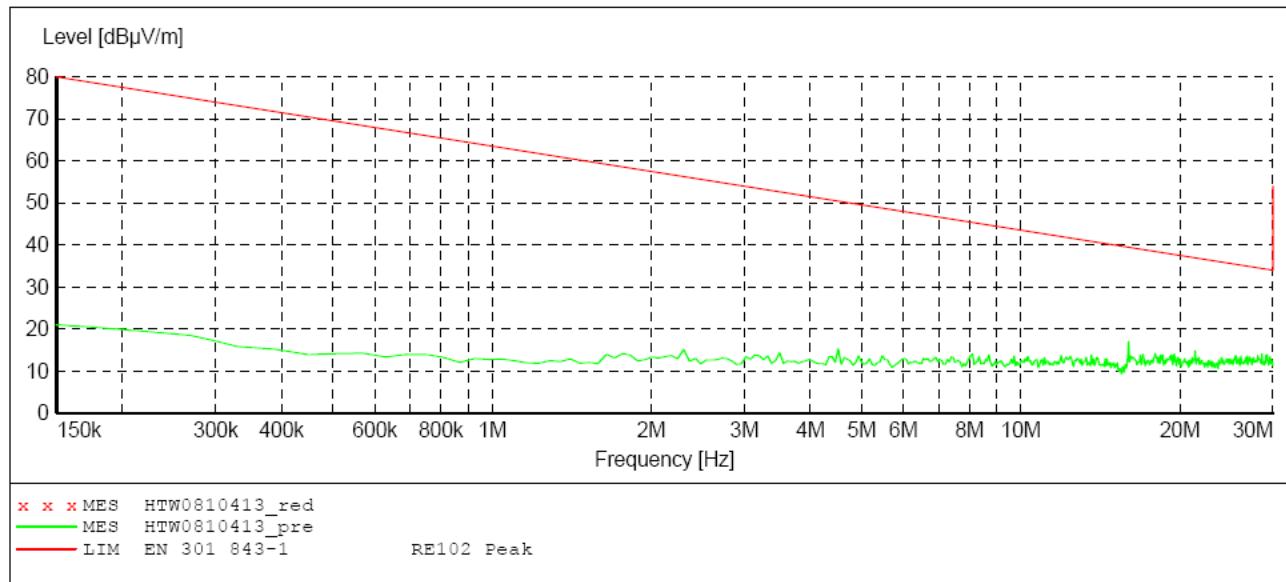
1. Please refer to IEC 62238 Sub-clause 6.12 for the test conditions.
2. Please refer to IEC 62238 Sub-clause 11.1.2 and IEC 60945 Section 9.3.2 for the measurement method.

## TEST RESULTS

### Remark:

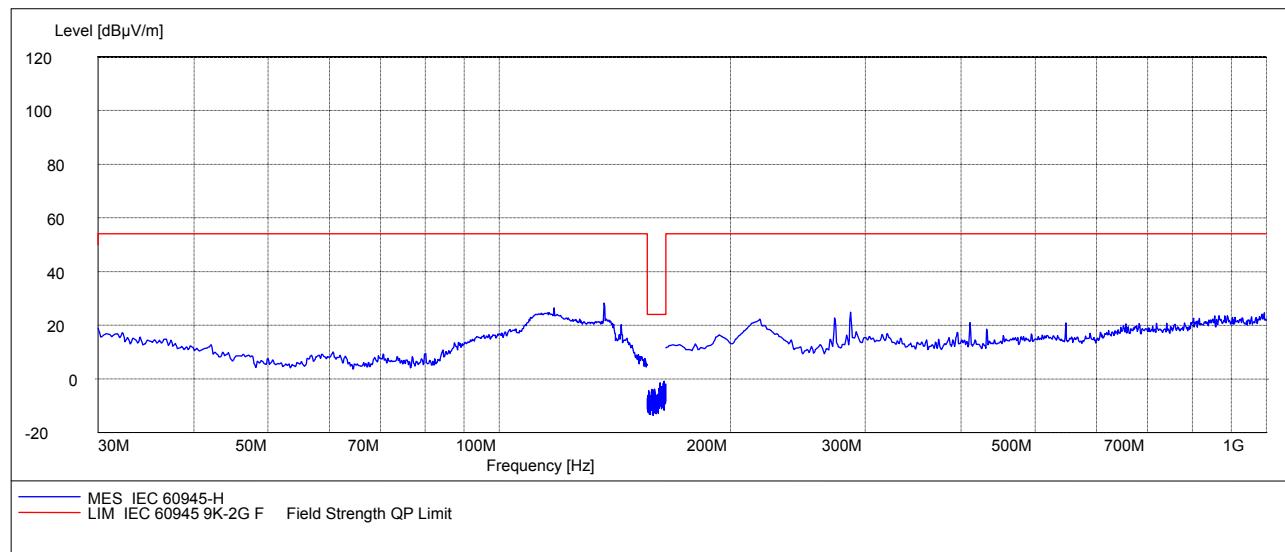
1. Emission level (dB<sub>uV</sub>/m) = Raw Value (dB<sub>uV</sub>) + Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) + Pre-amplifier (dB)
3. Margin value = Emission level – Limit value.
4. “---” means the margin at least 10dB, so not record the test values.
5. The IF bandwidth of EMI Test Receiver was 120 KHz for measuring from 30 MHz to 2 GHz and 10KHz for measuring 150KHz to 30MHz.

Frequency range: 9K-30MHz

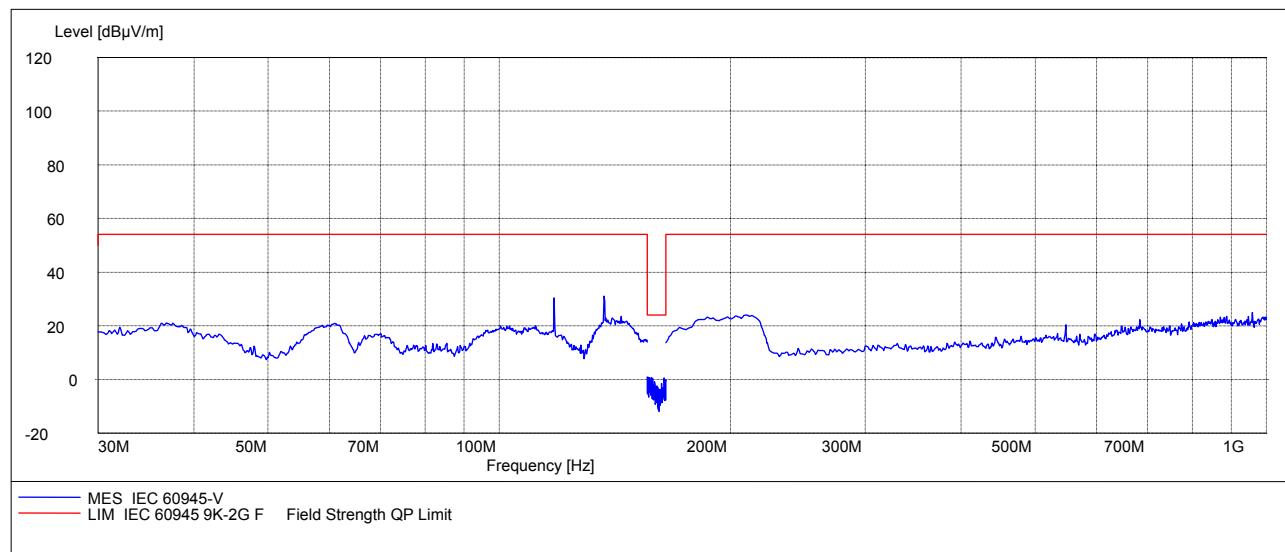


Frequency (MHz)	Emssion Level (dB <sub>uV</sub> /m)	Limit (dB <sub>uV</sub> /m)	Margin (dB)	Antenna Height (cm)	Detector	Correction Factor (dB/m)	Polari zation
---	---	---	---	---	QP	---	---
---	---	---	---	---	PK	---	---

## Frequency range:30MHz-1000MHz

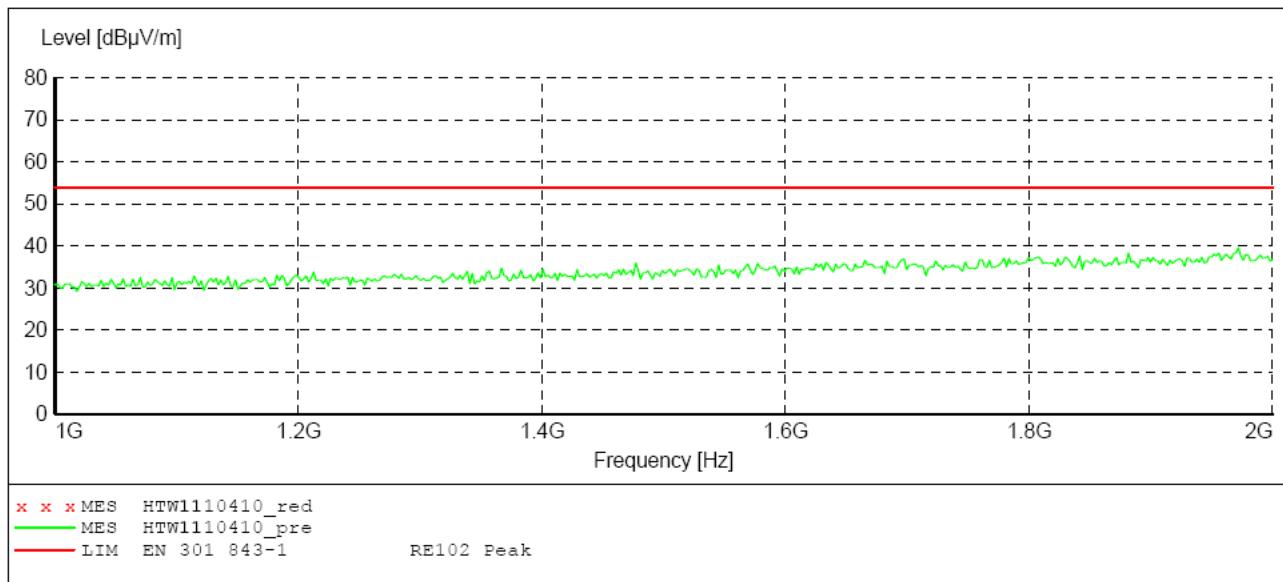


Frequency (MHz)	Emssion Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Height (cm)	Detector	Correction Factor (dB/m)	Polari zation
---	---	---	---	---	QP	---	H
---	---	---	---	---	PK	---	H

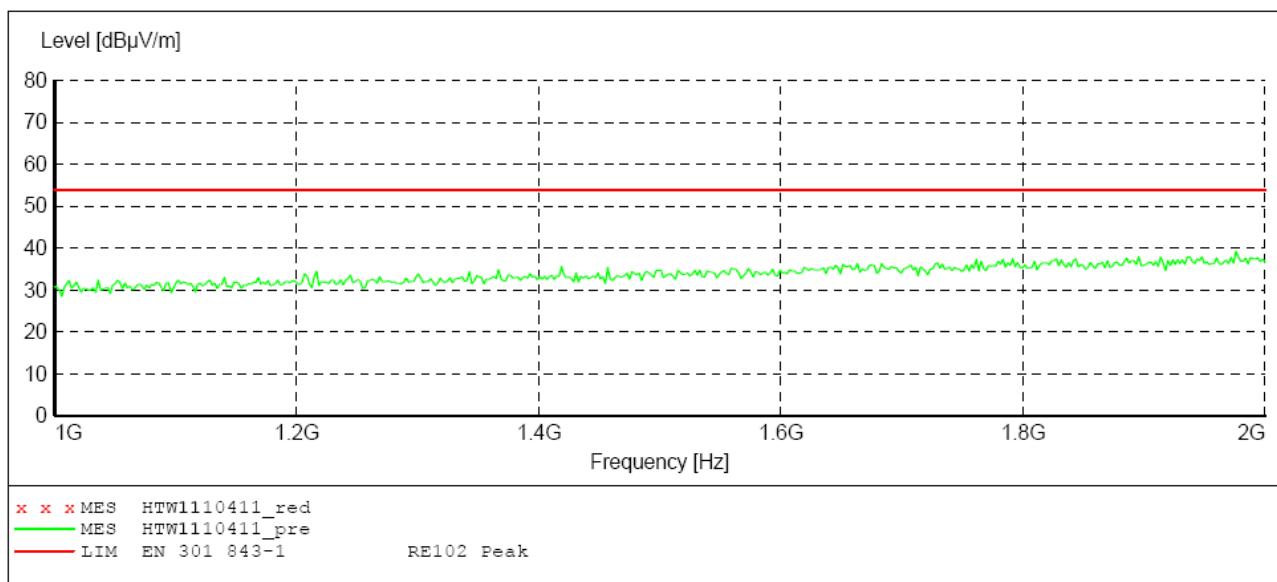


Frequency (MHz)	Emssion Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Height (cm)	Detector	Correction Factor (dB/m)	Polari zation
---	---	---	---	---	QP	---	V
---	---	---	---	---	PK	---	V

Frequency range:1000MHz-2000MHz



Frequency (MHz)	Emssion Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Height (cm)	Detector	Correction Factor (dB/m)	Polari zation
---	---	---	---	---	pk	---	V
---	---	---	---	---	AV	---	V



Frequency (MHz)	Emssion Level (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Height (cm)	Detector	Correction Factor (dB/m)	Polari zation
---	---	---	---	---	pk	---	H
---	---	---	---	---	AV	---	H

#### 4.1.42. Electrostatic Discharge

##### LIMIT

##### **IEC 62238 Sub-clause 11.1.3**

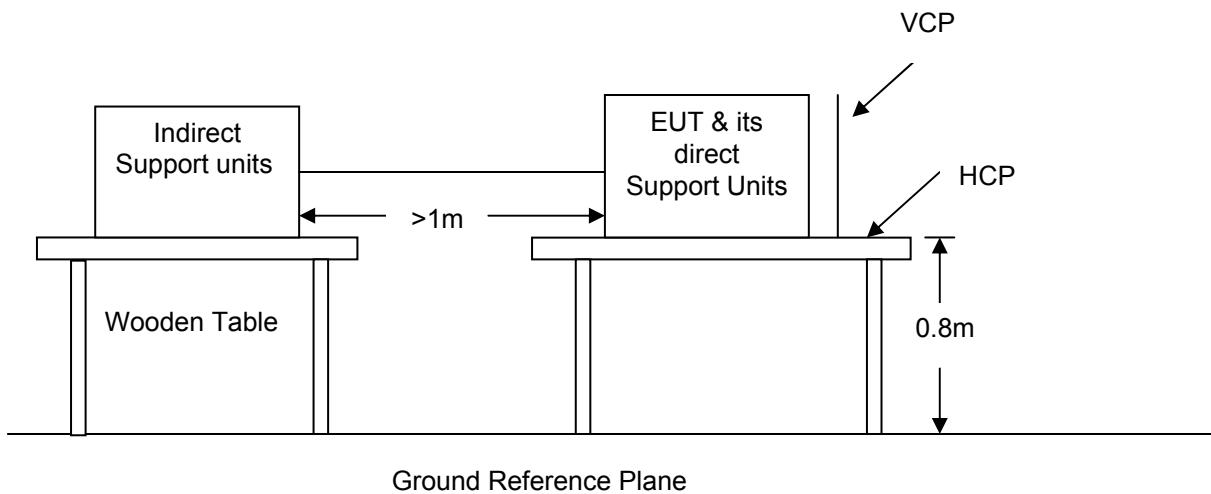
The ESD was defined as specified in IEC 60945 and comply to the limits contained therein.

##### **SEVERITY LEVELS OF ELECTROSTATIC DISCHARGE**

Test level: Contact Discharge at  $\pm 2\text{KV}, \pm 4\text{KV}, \pm 6\text{KV}$  Air Discharge at  $\pm 2\text{KV}, \pm 4\text{KV}, \pm 8\text{KV}$

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1	2	2
2	4	4
3	6	8
4	8	15
X	Special	Special

##### **TEST CONFIGURATION**



##### **TEST PROCEDURE**

Please refer to ETSI EN 301 843-1 Clause 9.3.2 and EN 61000-4-2 for the measurement methods.

##### **TEST RESULTS**

##### **Contact Discharge:**

The ESD generator is held perpendicular to the surface to which the discharge is applied and the tip of the discharge electrode touch the surface of EUT. Then turn the discharge switch. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

##### **Air Discharge:**

Air discharge is used where contact discharge can't be applied. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated at least 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

##### **Indirect discharge for horizontal coupling plane:**

At least 10 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT.

**Indirect discharge for vertical coupling plane:**

At least 10 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

**Description of the Electrostatic Discharges (ESD)**

Contact discharge voltage:	<input checked="" type="checkbox"/> 2 kV	<input type="checkbox"/> 4 kV	<input type="checkbox"/> 6 kV		
Air discharge voltage:	<input checked="" type="checkbox"/> 2 kV	<input type="checkbox"/> 4 kV	<input type="checkbox"/> 8 kV		
Number of discharges:	<input checked="" type="checkbox"/> $\geq 10$	<input type="checkbox"/> $\geq 25$			
Type of discharge:	Direct discharge		<input checked="" type="checkbox"/> Air discharge		
			<input type="checkbox"/> Contact discharge		
	Indirect discharge		<input type="checkbox"/> Contact discharge		
Polarity:	<input checked="" type="checkbox"/> Positive	<input type="checkbox"/> Negative			
Discharge location:	<input checked="" type="checkbox"/> see photo documentation of the test set-up				
	<input type="checkbox"/> all external locations accessible by hand				
	<input type="checkbox"/> horizontal plate (HCP)				
	<input type="checkbox"/> vertical coupling plate (VCP)				

**Result of Final Tests (Operating Mode & Standby (Receiving) Mode)**

Point of Discharge	Applied Voltage (KV)	Total No. of Discharge (Each Point)	Results	Performance criteria	Remark
Air Test Point	$\pm 2$	50	Pass	B	Note 1,2
	$\pm 4$	50	Pass	B	Note 1,2
	$\pm 8$	50	Pass	B	Note 1,2
Contact Discharge Test Points	$\pm 2$	50	Pass	B	Note 1,2
	$\pm 4$	50	Pass	B	Note 1,2
	$\pm 6$	50	Pass	B	Note 1,2
VCP (4 sides)	$\pm 2$	50	Pass	B	Note 1,2
	$\pm 4$	50	Pass	B	Note 1,2
	$\pm 6$	50	Pass	B	Note 1,2
HCP (4 sides)	$\pm 2$	50	Pass	B	Note 1,2
	$\pm 4$	50	Pass	B	Note 1,2
	$\pm 6$	50	Pass	B	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test,please see the test report.

Test Condition		Channel Number	Performance check for radiotelephone			
Temperature ( °C )	Voltage ( V )		Transmitter		Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	
25	7.40	16	4.89	-0.47544	26	
Limit		$\leq 6$ W	$\pm 1.50$ KHz	At least 20 dB	At least 20 dB	
Test Result		PASS				

Test Condition		Channel Number	Performance check for DSC receiver	
Temperature ( °C )	Voltage ( V )	70	DSC test signal Input Level (dBuV)	Symbol Error Ratio
25	7.40		6	0.005
<b>Limit</b>			---	$\leq 10^{-2}$
<b>Test Result</b>			<b>PASS</b>	

**Description of Discharge Point**

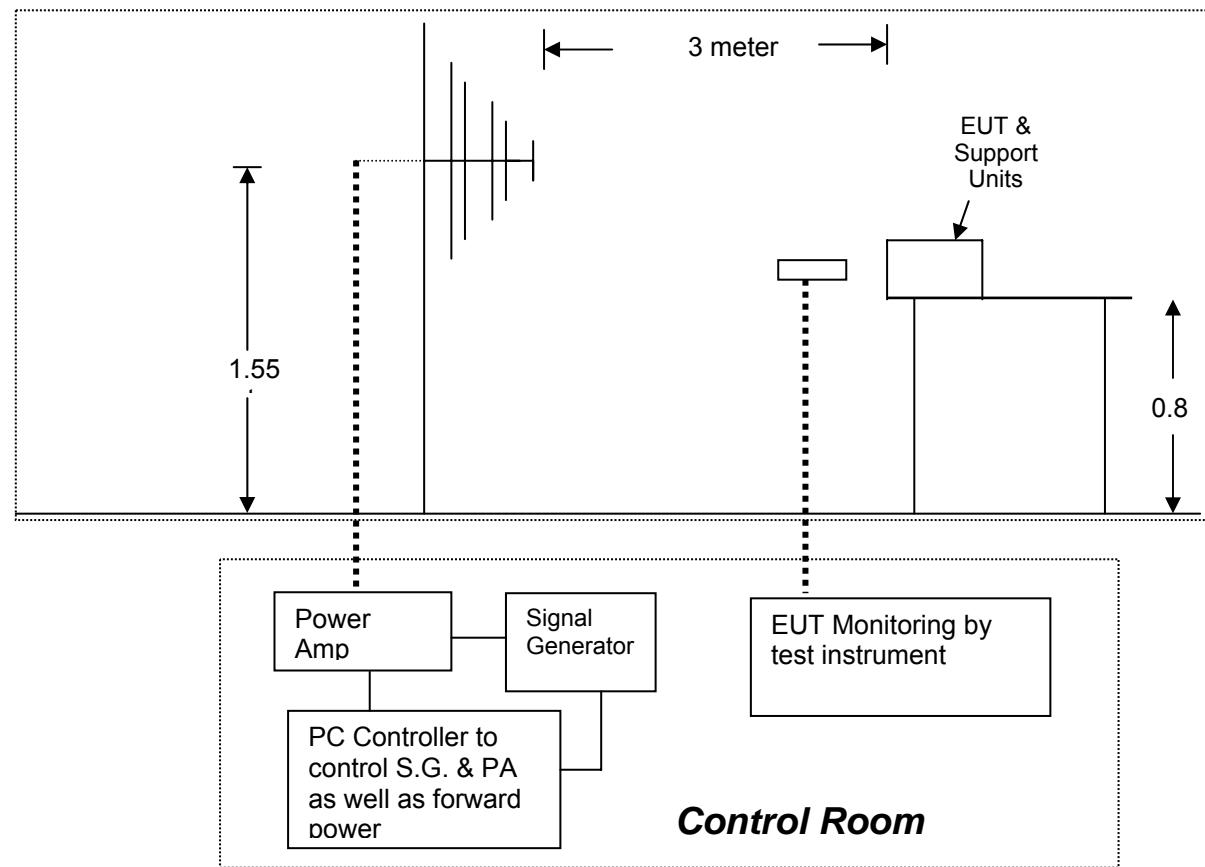
Contact Discharge 1 Test points		Air Discharge	
●	Metallic Screws	●	Plastic Screws
○	Metallic Case	●	Plastic Case(gap)
○	Metallic Connect ports	●	Plastic Connect Ports
○	Metallic Junctions	●	Plastic Junctions
○	Others (Antenna Port)	●	Others

#### 4.1.43. Radiated disturbance

##### LIMIT

Please refer to IEC 60945 Section 10.4.3

##### TEST CONFIGURATION



##### TEST PROCEDURE

Please refer to IEC60945 Clause 10.4.2 and EN 61000-4-3 for the measurement methods.

##### TEST RESULTS

**80% A.M, 400 Hz Sine wave (Field Strength: 10 V/m)**

During the assessment of CT and CR, the audio quality was monitored by a distortion analyzer located outside the test environment. An audio generator has been used to provide necessary modulation for CT test and for CR evaluation; an RF Generator has been used to provide source.

**Result of Final Tests**

Freq. Range (MHz)	Field	Modulation Depth	Polarity	Performance criteria	Mode	Remark	Result
80-1000	10V/m	80%	H	A	CT Operating	Note 1,2	PASS
1000-2000	10V/m	80%	H	A		Note 1,2	PASS
80-1000	10V/m	80%	V	A		Note 1,2	PASS
1000-2000	10V/m	80%	V	A		Note 1,2	PASS
80-1000	10V/m	80%	H	A	CR Receiving	Note 1,2	PASS
1000-2000	10V/m	80%	H	A		Note 1,2	PASS
80-1000	10V/m	80%	V	A		Note 1,2	PASS
1000-2000	10V/m	80%	V	A		Note 1,2	PASS

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test,please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.85	-0.47550	26	25	
Limit			≤6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result			PASS				

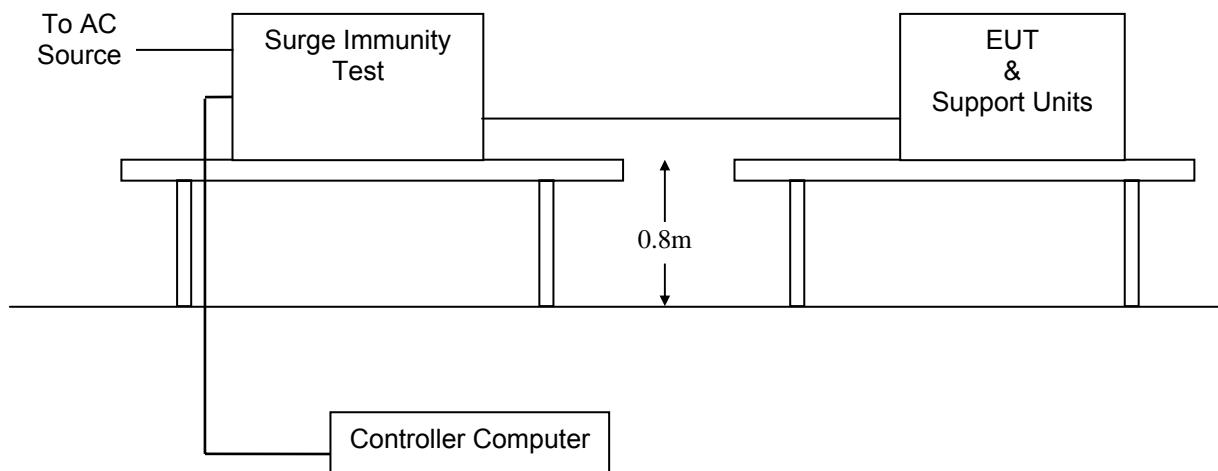
Test Condition		Channel Number 70	Performance check for DSC receiver		
Temperature ( °C )	Voltage ( V )		DSC test signal Input Level (dBuV)	Symbol Error Ratio	
			6	0.000	
Limit			---	≤10 <sup>-2</sup>	
Test Result			PASS		

#### 4.1.44. Slow transients (Surges)

##### LIMIT

Please refer to IEC 60945 Section 10.6.3.

##### TEST CONFIGURATION



##### TEST PROCEDURE

Please refer to IEC 60945 Section 10.6.2 and EN 61000-4-5 for the measurement methods.

##### TEST RESULTS

Coupling Line	Voltage (kV)	Polarity	Coupling Method	Result	Performance criteria	Remark
<input checked="" type="checkbox"/> Line + Neutral	0.5	Pos./ Neg.	Capacitive	PASS	B	Note 1,2
<input type="checkbox"/> L + PE	1	Pos./ Neg.	Capacitive	PASS	B	Note 1,2
<input type="checkbox"/> N + PE	1	Pos./ Neg.	Capacitive	PASS	B	Note 1,2
<input type="checkbox"/> T, R-Ground	0.5	Pos./ Neg.	Capacitive	PASS	B	Note 1,2
<input type="checkbox"/> RJ45 port (LAN)	1	Pos./ Neg.	Capacitive	PASS	B	Note 1,2
<input type="checkbox"/> RJ11 port (Line cable)	1	Pos./ Neg.	Capacitive	PASS	B	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test, please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.87	-0.47402	24	24	
Limit		$\leq 6 \text{ W}$		$\pm 1.50 \text{ KHz}$	At least 20 dB	At least 20 dB	
Test Result		PASS					

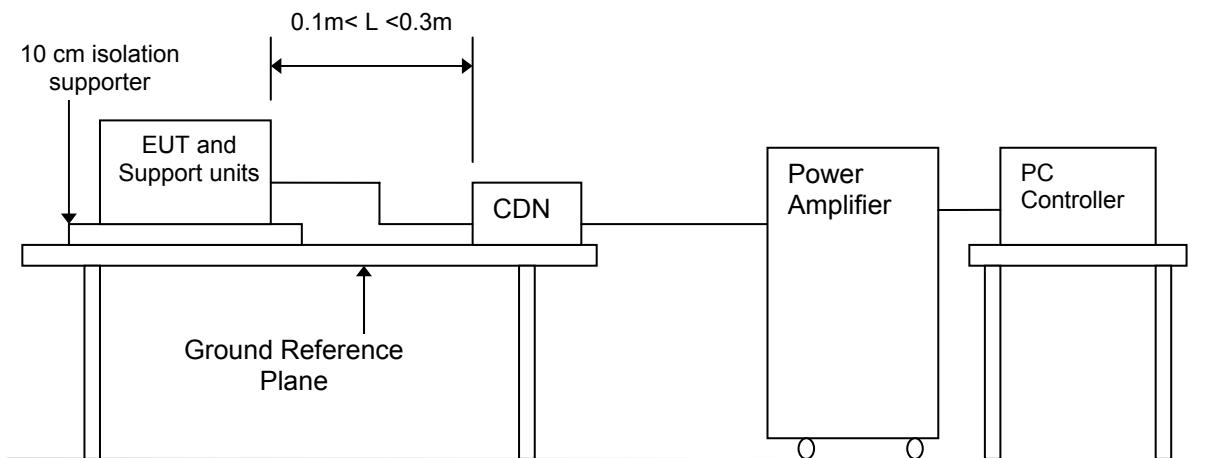
Test Condition		Channel Number	Performance check for DSC receiver	
Temperature ( °C )	Voltage ( V )	70	DSC test signal Input Level (dBuV)	Symbol Error Ratio
25	7.40		6	0.001
Limit		---	$\leq 10^{-2}$	
Test Result			PASS	

#### 4.1.45. Conducted radio frequency disturbance

##### LIMIT

Please refer to IEC 60945 Section 10.3.2.

##### TEST CONFIGURATION



##### TEST PROCEDURE

Please refer to ETSI EN 301 843-1 Clause 9.5.2, and EN 61000-4-6 for the measurement methods.

##### TEST RESULTS

Results of Final Tests  
 Frequency Range: 0.15MHz~80MHz  
 Frequency Step: 1% of fundamental  
 Dwell time: 1 Sec.

80% A.M., 400Hz Sine wave (Field Strength: 3 V/m)  
 Coupling type:  CDN /  RF Current Probe /  EM CLAMP (LÜTHI)

Freq. Range (MHz)	Field	Modulation Depth	Coupling type	Performance criteria	Mode	Remark	Result
0.15-5	3V/m	80%	CDN	A	CR Receiving	Note 1,2	PASS
5-80	3V/m	80%	CDN	A		Note 1,2	PASS
2 MHz, 3 MHz, 4 MHz, 6.2 MHz, 8.2 MHz, 12.2 MHz, 16.5 MHz, 18.8 MHz, 22 MHz and 25 MHz	10 V/m	80%	CDN	A		Note 1,2	PASS

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test, please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.85	-0.47447	26	26	
Limit			≤ 6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result			PASS				

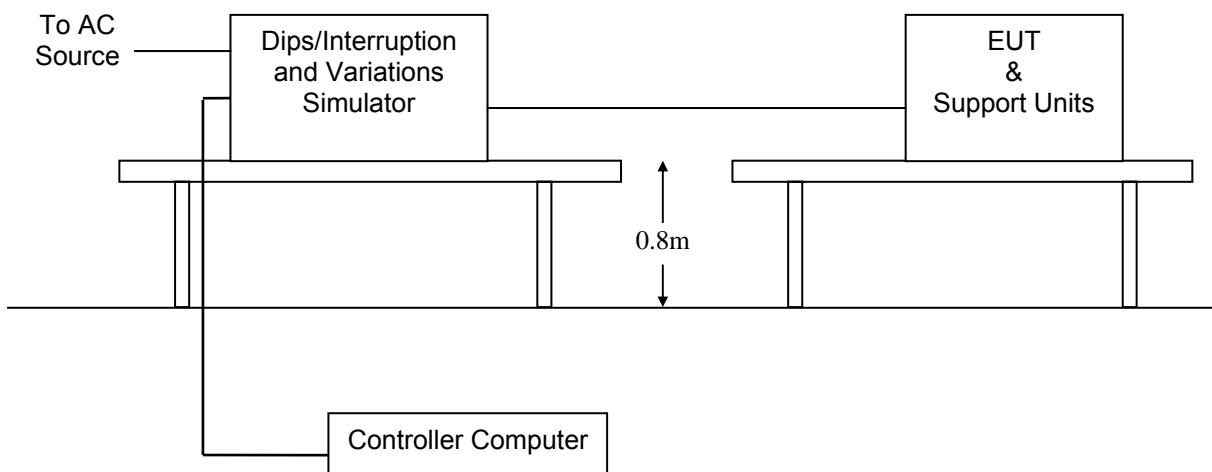
Test Condition		Channel Number 70	Performance check for DSC receiver		
Temperature ( °C )	Voltage ( V )		DSC test signal Input Level (dBuV)	Symbol Error Ratio	
			6	0.000	
Limit			---	≤10 <sup>-2</sup>	
Test Result			PASS		

#### 4.1.46. Power supply short term variations

##### LIMIT

Please refer to EN 60945 Section 10.7.3

##### TEST CONFIGURATION



##### TEST PROCEDURE

Please refer to IEC 60945 Section 10.7.2 and EN 61000-4-11 for the measurement methods

##### TEST RESULTS

Interruption at phase angles of 0, 45, 90, 135, 180, 225, 270 and 315 degree in a 60 sec-interval.

The duration with a sequence of interruptions with a minimum interval of 10 m between each test event.

##### **Power supply short term variations**

Test Level (nominal Value)	Test voltage (V)	Test Frequency (Hz)	Duration (s)	Result	Performance criteria	Remark
1.2	276	55	1.5	PASS	B	Note 1,2
1.1	253	50	0.2	PASS	B	Note 1,2
0.9	207	50	0.2	PASS	B	Note 1,2
0.8	184	45	5	PASS	B	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test,please see the test report.

Test Condition		Channel Number	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40	16	4.82	-0.47358	25	23	
Limit		$\leq 6$ W		$\pm 1.50$ KHz	At least 20 dB	At least 20 dB	
Test Result			PASS				

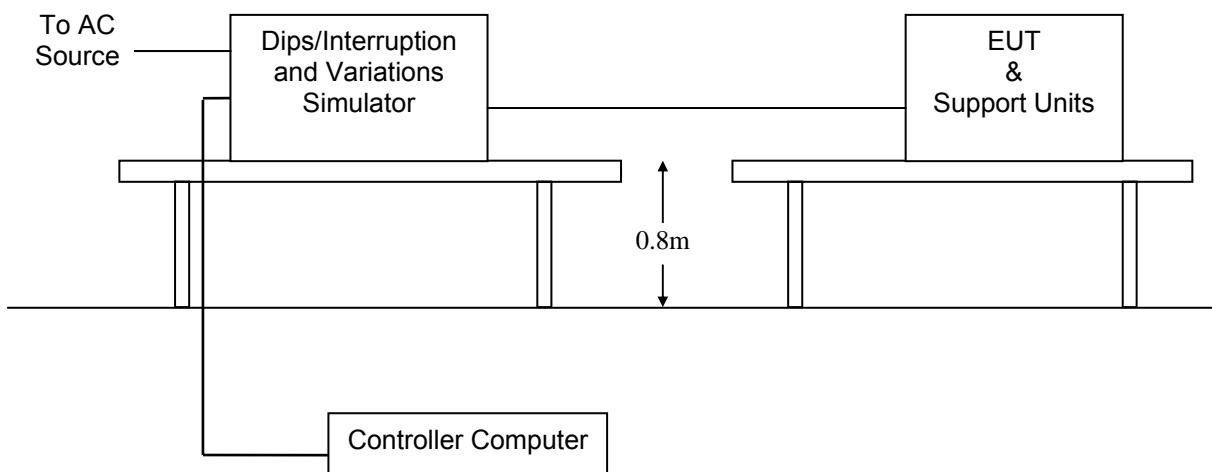
Test Condition		Channel Number	Performance check for DSC receiver	
Temperature ( °C )	Voltage ( V )	70	DSC test signal Input Level (dBuV)	Symbol Error Ratio
25	7.40		6	0.003
Limit		---	$\leq 10^{-2}$	
Test Result			PASS	

#### 4.1.47. Power supply failure

##### LIMIT

Please refer to EN 60945 Section 10.8.3

##### TEST CONFIGURATION



##### TEST PROCEDURE

Please refer to IEC 60945 Section 10.8.2 and EN 61000-4-11 for the measurement methods

##### TEST RESULTS

Interruption at phase angles of 0, 45, 90, 135, 180, 225, 270 and 315 degree in a 60 sec-interval.

The duration with a sequence of interruptions with a minimum interval of 10 m between each test event.

##### **Power supply failure**

Test Level (nominal Value)	Test voltage (V)	Test Frequency (Hz)	Duration (s)	Result	Performance criteria	Remark
1.0	230	50	60	PASS	C	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test, please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.76	-0.45049	23	25	
Limit			≤ 6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result			PASS				

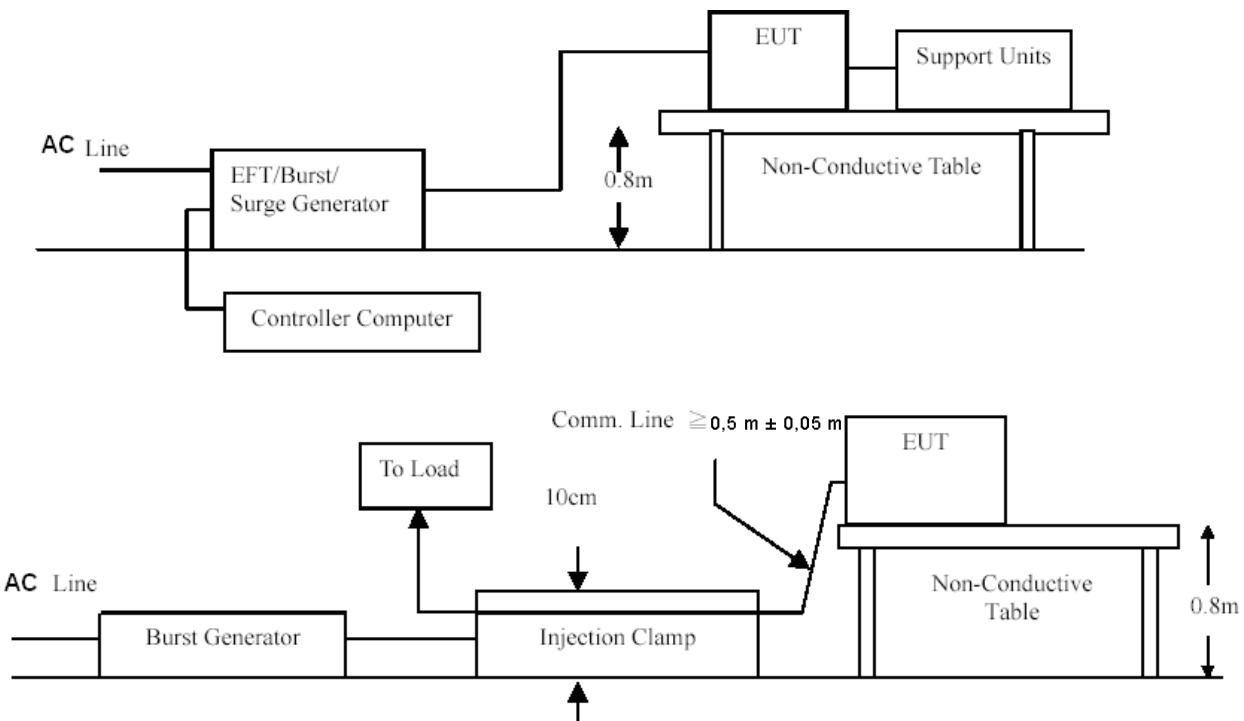
Test Condition		Channel Number	Performance check for DSC receiver	
Temperature ( °C )	Voltage ( V )	70	DSC test signal Input Level (dBuV)	Symbol Error Ratio
25	7.40		6	0.006
Limit		---	$\leq 10^{-2}$	
Test Result			PASS	

#### 4.1.48. Fast Transients bursts

##### LIMIT

Please refer to IEC 60945 Section 10.5.3

##### TEST CONFIGURATION



##### TEST PROCEDURE

Please refer to IEC 60945 Section 10.5.2 and EN 61000-4-4 for the measurement methods.

##### TEST RESULTS

###### Results of Final Tests (Receiving@Charging Mode)

Impulse Frequency: 5 kHz

Tr/Th: 5/50ns

Burst Duration: 15ms

Burst Period: 300ms

Test duration: 180s

Injection Line	Voltage (kV)	Injected Method	Result	Performance criteria	Remark
<input checked="" type="checkbox"/> Line	±2	Direct	PASS	B	Note 1,2
<input checked="" type="checkbox"/> Neutral	±2	Direct	PASS	B	Note 1,2
<input type="checkbox"/> PE	± 1	Direct	PASS	B	Note 1,2
<input checked="" type="checkbox"/> Line + Neutral	±2	Direct	PASS	B	Note 1,2
<input type="checkbox"/> L + PE	± 1	Direct	PASS	B	Note 1,2
<input type="checkbox"/> N + PE	± 1	Direct	PASS	B	Note 1,2
<input type="checkbox"/> L + N + PE	± 1	Direct	PASS	B	Note 1,2
<input type="checkbox"/> RJ45 port (LAN cable)	±1	Clamp	PASS	B	Note 1,2
<input type="checkbox"/> RJ11 port (Line cable)	±1	Clamp	PASS	B	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test, please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.82	-0.43586	25	24	
Limit			≤6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result			PASS				

Test Condition		Channel Number 70	Performance check for DSC receiver		
Temperature ( °C )	Voltage ( V )		DSC test signal Input Level (dBuV)	Symbol Error Ratio	
			6	0.000	
Limit			---	≤10 <sup>-2</sup>	
Test Result			PASS		

#### 4.1.49. Vibration

##### LIMIT

Please refer to IEC 60945 Section 8.7.3

##### TEST PROCEDURE

Please refer to IEC 60945 Section 8.7.2 for the measurement methods.

##### TEST RESULTS

Vibration Test Result		
Test Period (h)	Test Result	Remark
2	PASS	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test,please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.90	-0.52635	24	24	
Limit			≤6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result			PASS				

Test Condition		Channel Number 70	Performance check for DSC receiver		
Temperature ( °C )	Voltage ( V )		DSC test signal Input Level (dBuV)	Symbol Error Ratio	
			6	0.002	
Limit			---	≤10 <sup>-2</sup>	
Test Result			PASS		

#### 4.1.50. Dry heat

##### LIMIT

Please refer to IEC 60945 Section 8.2.2.3

##### TEST PROCEDURE

Please refer to IEC 60945 Section 8.2.2.2 for the measurement methods.

##### TEST RESULTS

Dry Heat Test Result				
Test Item	Test Temperature ( °C )	Test Period (h)	Test Result	Remark
Functional Test	+55	16	PASS	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test,please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.77	-0.66700	25	25	
Limit			≤6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result					PASS		

Test Condition		Channel Number 70	Performance check for DSC receiver		
Temperature ( °C )	Voltage ( V )		DSC test signal Input Level (dBuV)	Symbol Error Ratio	
			6	0.005	
Limit			---	≤10 <sup>-2</sup>	
Test Result			PASS		

#### 4.1.51. Damp heat

##### LIMIT

Please refer to IEC 60945 Section 8.3.1.3

##### TEST PROCEDURE

Please refer to IEC 60945 Section 8.3.1.2 for the measurement methods.

##### TEST RESULTS

Damp Heat Test Result				
Test Item	Test Temperature ( °C )	Test Humidity	Test Result	Remark
Functional Test	+40	93.5%	PASS	Note 1,2

Note 1: We choose both channel 16 and channel 70 for immunity test.

Note 2: The EUT meet performance check for transmitters and/or receivers after the test,please see the test report.

Test Condition		Channel Number 16	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40		4.80	-0.66700	23	26	
Limit			≤6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result					PASS		

Test Condition		Channel Number 70	Performance check for DSC receiver		
Temperature ( °C )	Voltage ( V )		DSC test signal Input Level (dBuV)	Symbol Error Ratio	
			6	0.002	
Limit			---	≤10 <sup>-2</sup>	
Test Result			PASS		

#### 4.1.52. Low temperature

##### LIMIT

Please refer to IEC 60945 Section 8.4.2.3

##### TEST PROCEDURE

Please refer to IEC 60945 Section 8.4.2.2 for the measurement methods.

##### TEST RESULTS

Low Temperature Test Result				
Test Item	Test Temperature ( °C )	Test Period (h)	Test Result	Remark
Functional Test	-20	16	PASS	Note 1,2

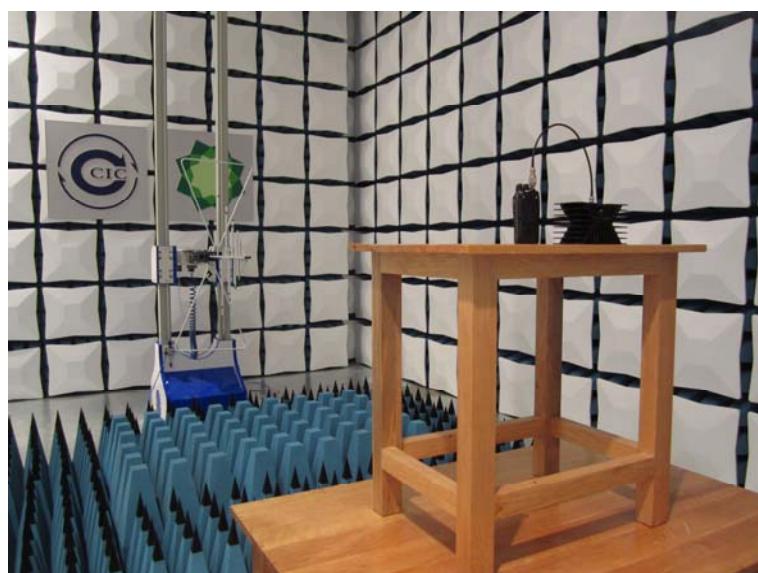
Note 1: We choose both channel 16 and channel 70 for immunity test.

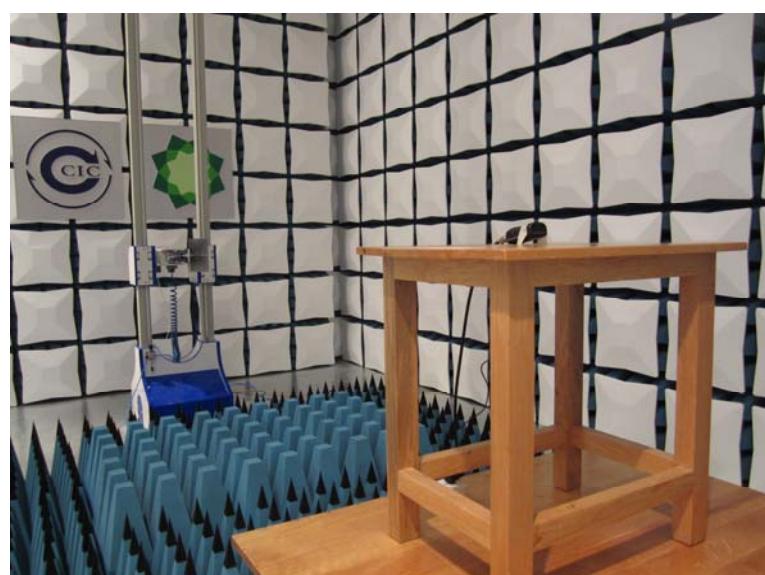
Note 2: The EUT meet performance check for transmitters and/or receivers after the test,please see the test report.

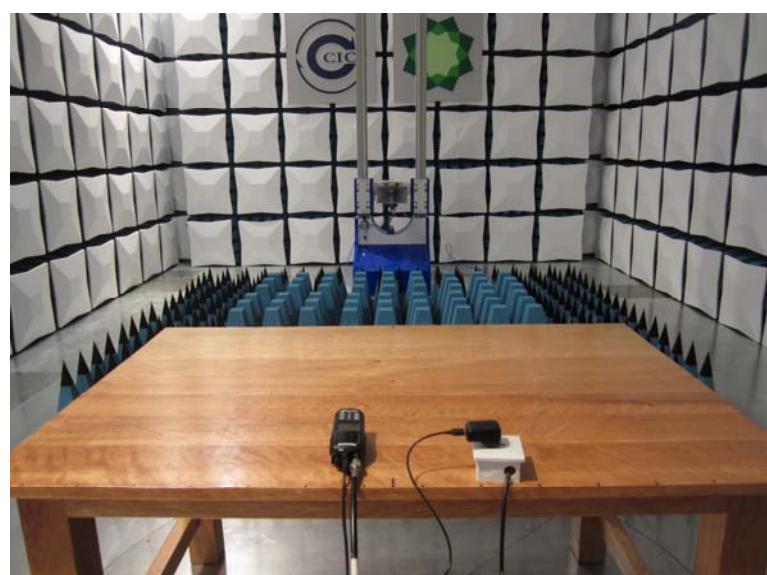
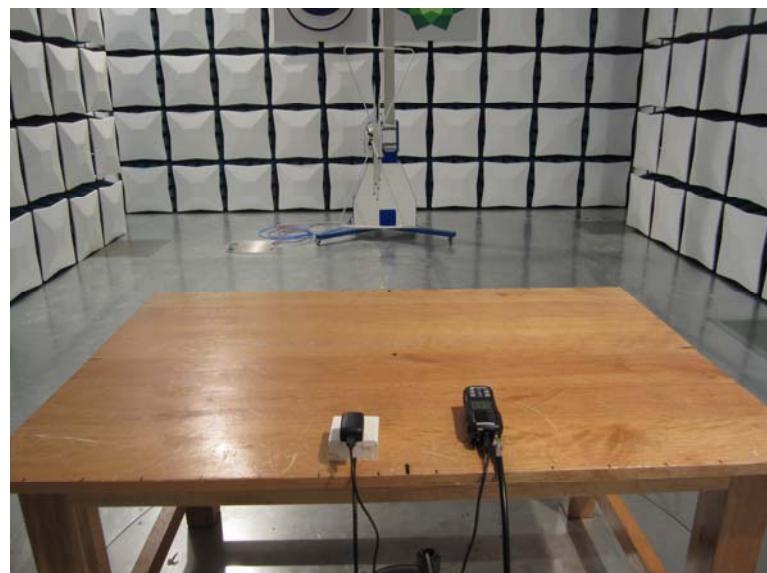
Test Condition		Channel Number	Performance check for radiotelephone				
Temperature ( °C )	Voltage ( V )		Transmitter			Receiver	
			RF output power (Watts)	frequency error (KHz)	SINAD of the demodulated output signal (dB)	receiver's SINAD (dB)	
25	7.40	16	4.89	-0.48937	26	25	
Limit			≤6 W	±1.50 KHz	At least 20 dB	At least 20 dB	
Test Result					PASS		

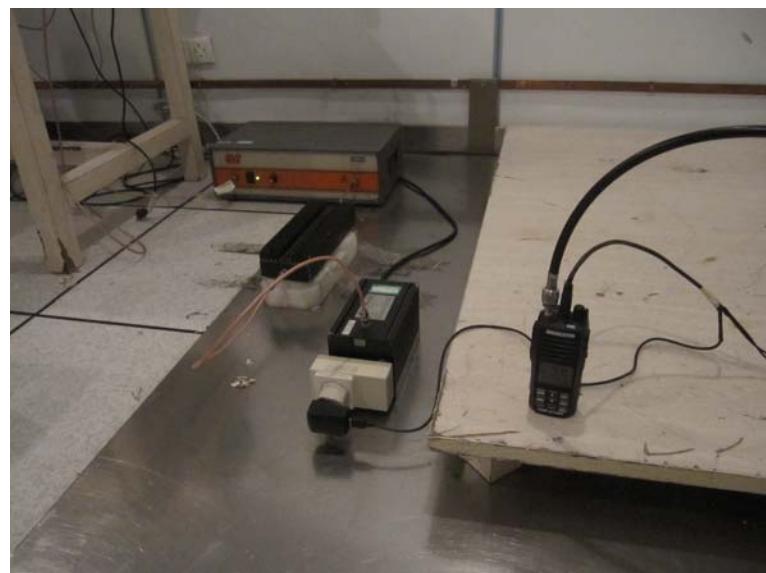
Test Condition		Channel Number	Performance check for DSC receiver		
Temperature ( °C )	Voltage ( V )		DSC test signal Input Level (dBuV)	Symbol Error Ratio	
			6	0.004	
Limit			---	≤10 <sup>-2</sup>	
Test Result			PASS		

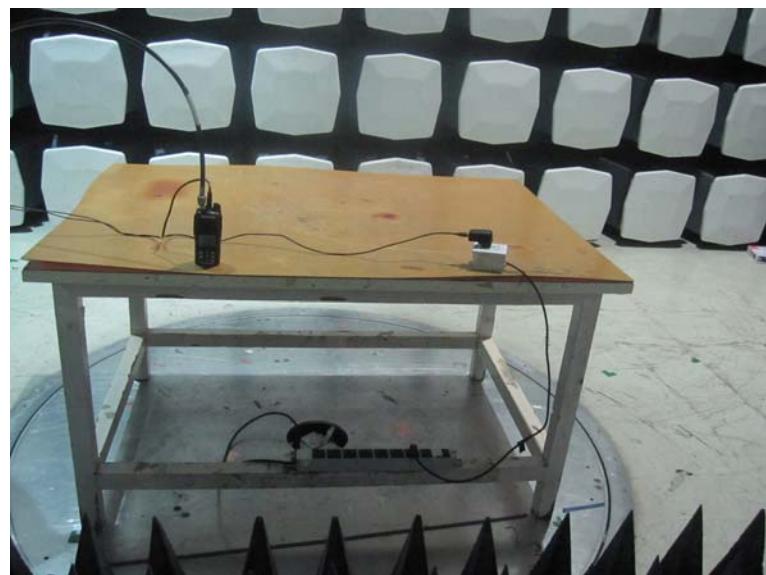
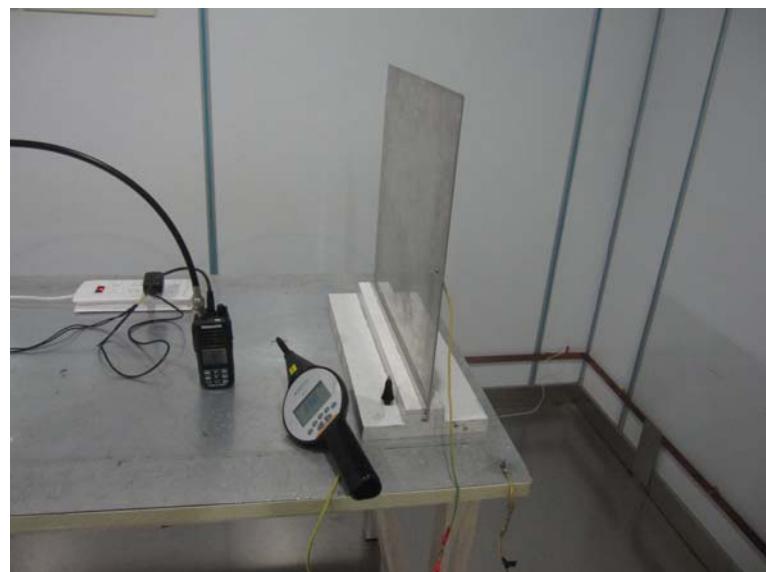
## 5. Test Set up Photos of the EUT







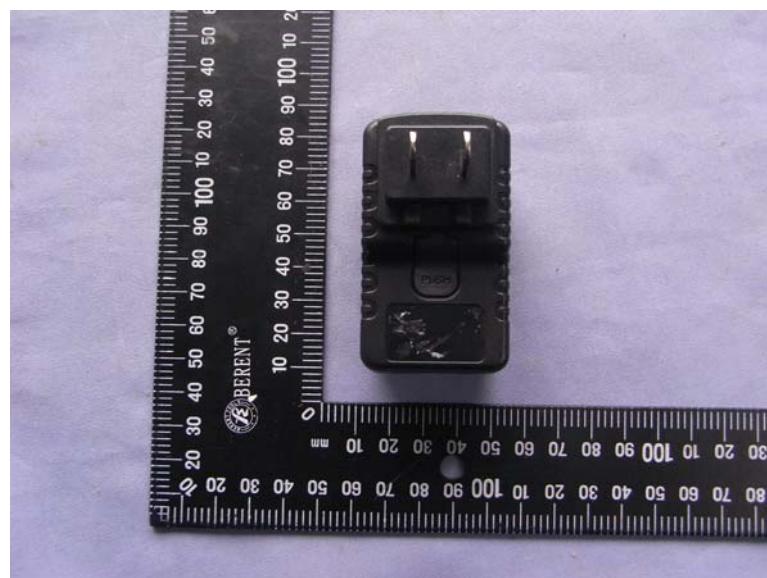


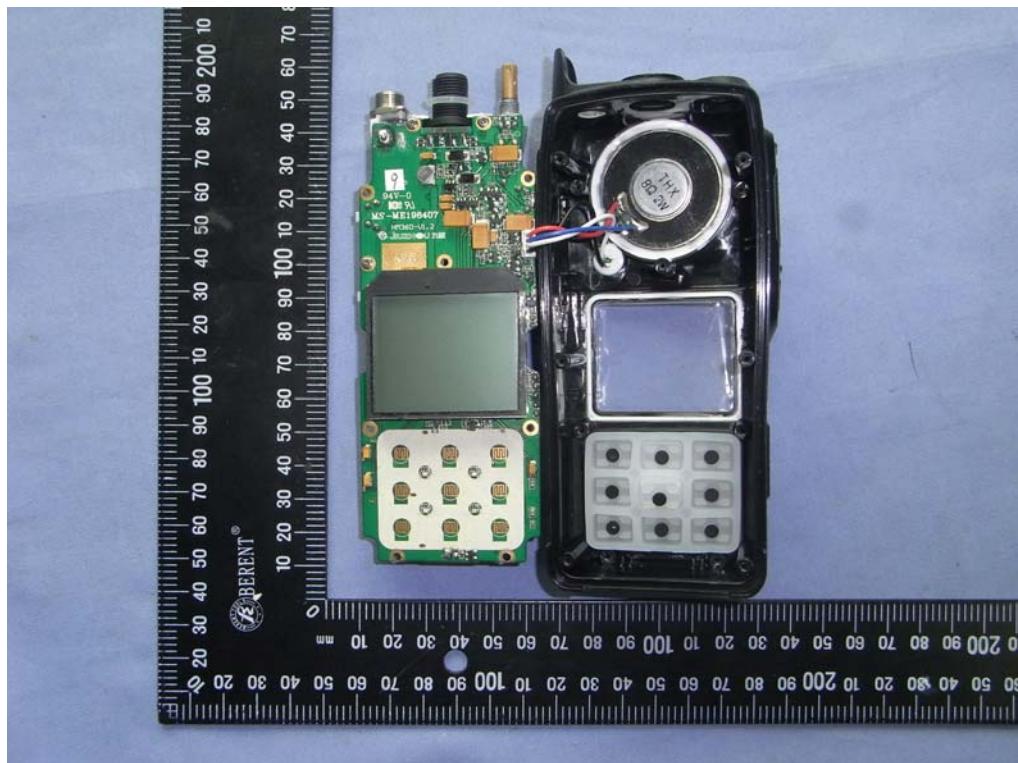
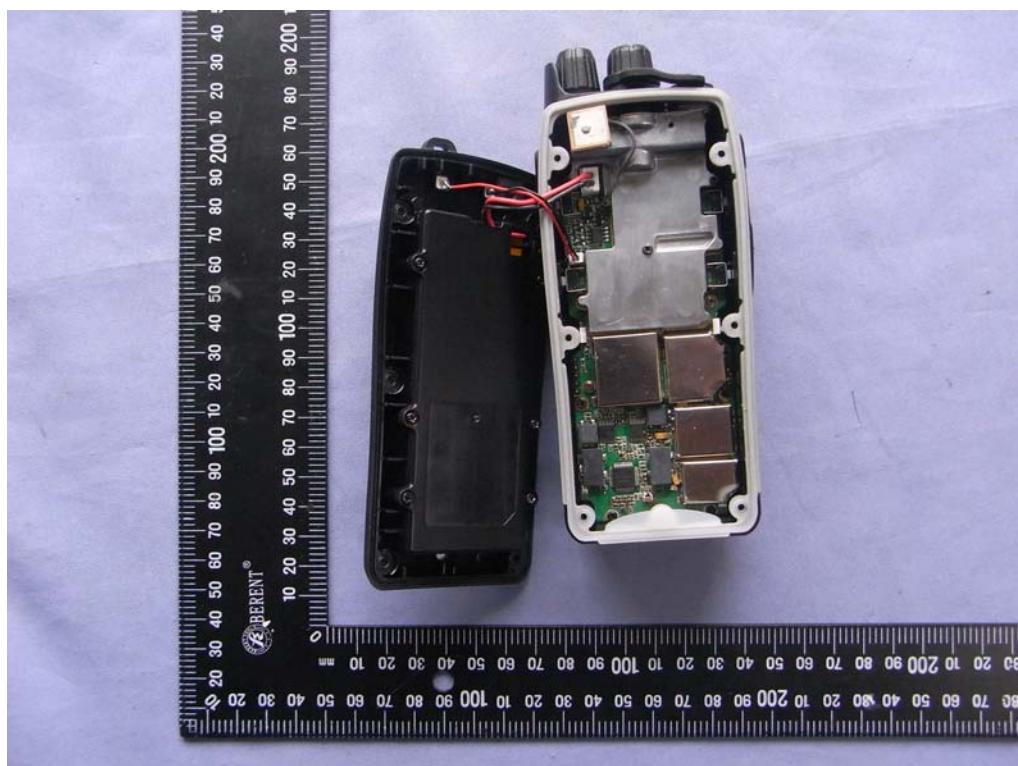


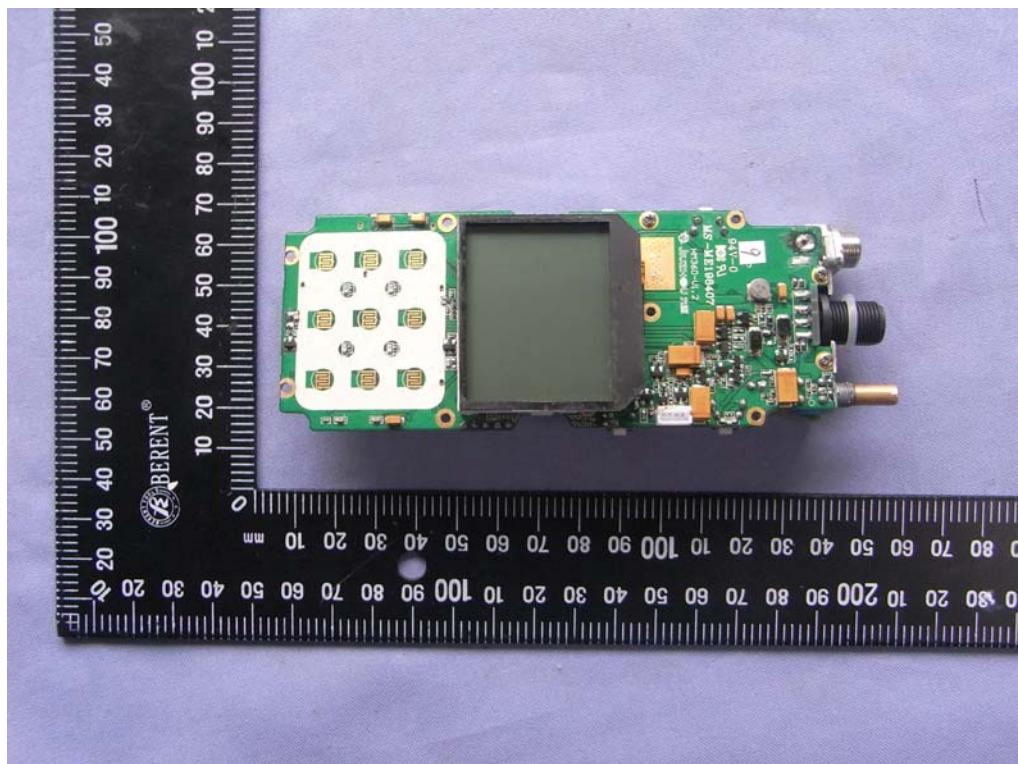
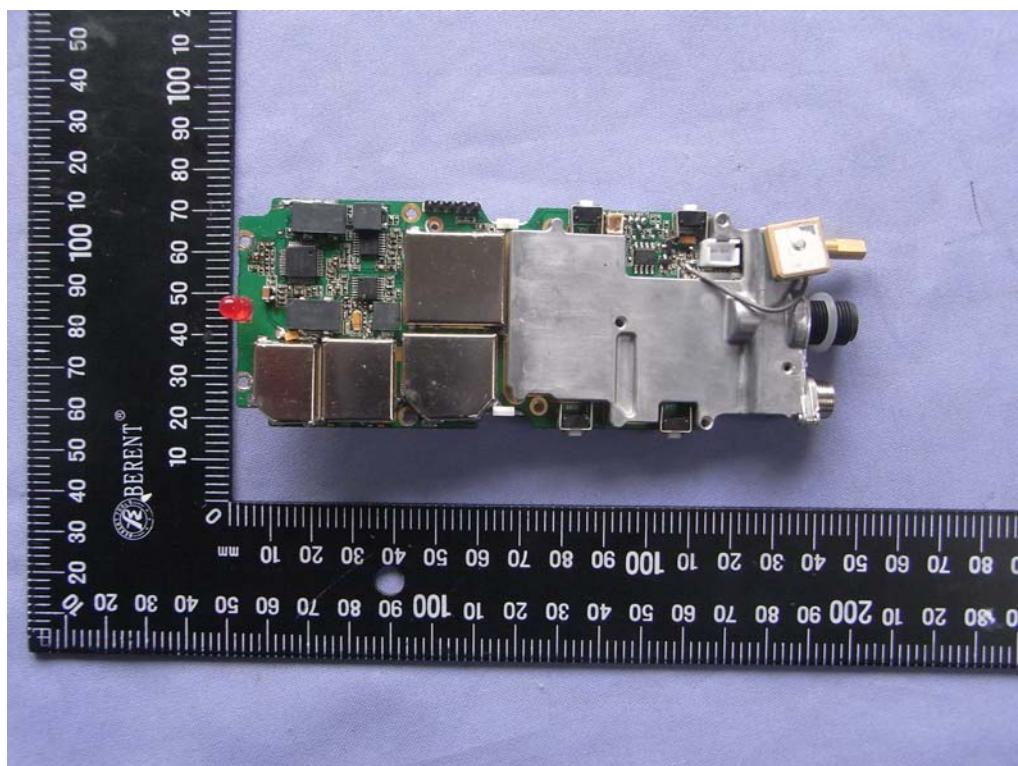
## 6. External and Internal Photos of the EUT

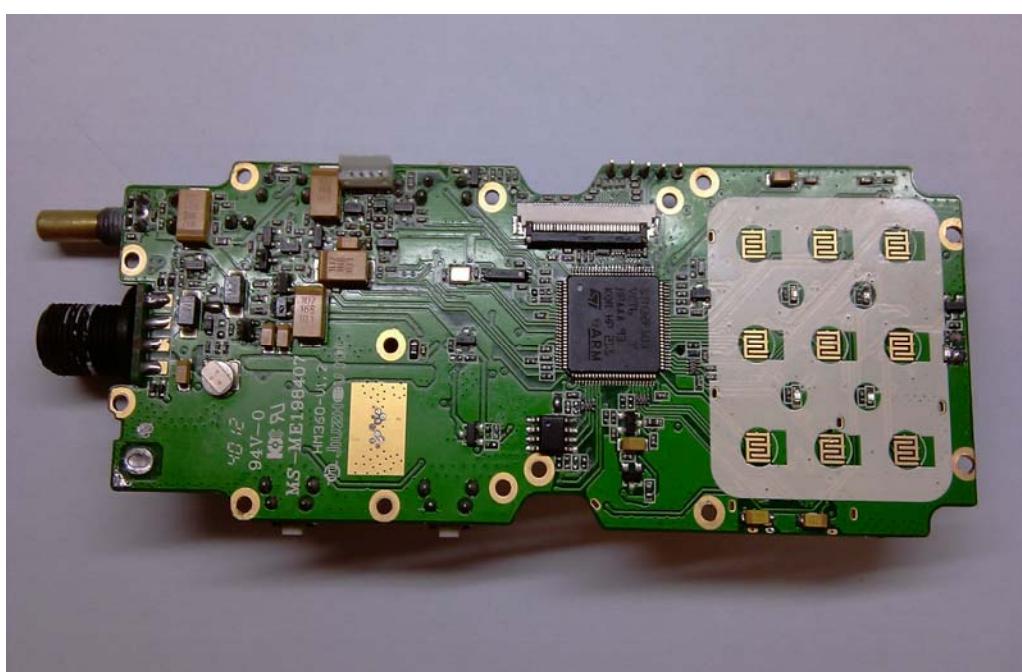
### External photos of the EUT





Internal photos of the EUT





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