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TEST REPORT

Report No. .....:	**CHTEW20030067**	Report Verification:
Project No.....:	**SHT1909084904EW**	
FCC ID.....:	**K6630673X3D**	
IC.....:	**511B-30673X3D**	
Applicant's name.....:	**YAESU MUSEN CO., LTD.**	
Address .....:	Tennozu Parkside Building 2-5-8 Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-0002 Japan	
Manufacturer.....:	VTech (Dongguan) Communications Limited	
Address.....:	Xia Ling Bei Management Zone, Liaobu,Dongguan, Guangdong, China	
Test item description .....:	**25 Watt VHF/FM Marine Transceiver**	
Trade Mark .....:	STANDARD HORIZON	
Model/Type reference .....:	GX2400GPS	
Listed Model(s).....:	-	
Standard.....:	**IEC 62238: 2003-03**	
Date of receipt of test sample.....:	Feb.18, 2020	
Date of testing.....:	Feb.18, 2020- Mar.12, 2020	
Date of issue.....:	Mar.13, 2020	
Result .....:	**PASS**	

Compiled by (position+printed name+signature) .:	File administrator Echo Wei	Echo Wei
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Approved by (position+printed name+signature) .:	RF Manager Hans Hu	Hans Hu

Testing Laboratory Name.....:	**Shenzhen Huatongwei International Inspection Co., Ltd**
Address .....:	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

Contents

1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

- IEC 62238:2003-03: Maritime navigation and radiocommunication equipment and systems –VHF radiotelephone equipment incorporating Class "D" Digital Selective Calling (DSC) – Methods of testing and required test results

1.2. Report version information

Revision No.	Date of issue	Description
N/A	2020-03-13	Original

2. TEST DESCRIPTION

Environmental Requirement				
Test item		Standards requirement (IEC62238)	Result	Test Engineer
Vibration test		Sub-clause 7.4	Pass	Gaosheng Pan
Temperature tests	Dry heat	Sub-clause 7.5	Pass	Gaosheng Pan
	Damp heat	Sub-clause 7.5	Pass	Gaosheng Pan
	Low temperature	Sub-clause 7.5	Pass	Gaosheng Pan
Transmitter Requirement				
Test item		Standards requirement (IEC62238)	Result	Test Engineer
Frequency error		Sub-clause 8.1	Pass	Gaosheng Pan
Carrier power		Sub-clause 8.2	Pass	Gaosheng Pan
Frequency deviation		Sub-clause 8.3	Pass	Gaosheng Pan
Sensitivity of the modulator, including microphone		Sub-clause 8.4	Pass	Gaosheng Pan
Audio frequency response		Sub-clause 8.5	Pass	Gaosheng Pan
Audio frequency harmonic distortion of the emission		Sub-clause 8.6	Pass	Gaosheng Pan
Adjacent channel power		Sub-clause 8.7	Pass	Gaosheng Pan
Conducted spurious emissions conveyed to the antenna		Sub-clause 8.8	Pass	Gaosheng Pan
Transient frequency behaviour of the transmitter		Sub-clause 8.9	Pass	Gaosheng Pan
Residual modulation of the transmitter		Sub-clause 8.10	Pass	Gaosheng Pan
Frequency error (DSC signal)		Sub-clause 8.11	Pass	Gaosheng Pan
Modulation index for DSC		Sub-clause 8.12	Pass	Gaosheng Pan
Modulation rate for DSC		Sub-clause 8.13	Pass	Gaosheng Pan
Testing of generated call sequences		Sub-clause 8.14	Pass	Gaosheng Pan
Receiver for Radiotelephone Requirement				
Test item		Standards requirement (IEC62238)	Result	Test Engineer
Harmonic distortion and rated audio frequency output power		Sub-clause 9.1	Pass	Gaosheng Pan
Audio frequency response		Sub-clause 9.2	Pass	Gaosheng Pan
Maximum usable sensitivity		Sub-clause 9.3	Pass	Gaosheng Pan
Co-channel rejection		Sub-clause 9.4	Pass	Gaosheng Pan
Adjacent channel selectivity		Sub-clause 9.5	Pass	Gaosheng Pan
Spurious response rejection		Sub-clause 9.6	Pass	Gaosheng Pan
Intermodulation response		Sub-clause 9.7	Pass	Gaosheng Pan
Blocking or desensitization		Sub-clause 9.8	Pass	Gaosheng Pan
Spurious emissions		Sub-clause 9.9	Pass	Gaosheng Pan
Receiver residual noise level		Sub-clause 9.10	Pass	Gaosheng Pan
Squelch operation		Sub-clause 9.11	Pass	Gaosheng Pan
Squelch hysteresis		Sub-clause 9.12	Pass	Gaosheng Pan
Multiple watch characteristic		Sub-clause 9.13	Pass	Gaosheng Pan

Receiver for DSC decoder Requirement			
Test item	Standards requirement (IEC62238)	Result	Test Engineer
Maximum usable sensitivity	Sub-clause 10.1	Pass	Gaosheng Pan
Co-channel rejection	Sub-clause 10.2	Pass	Gaosheng Pan
Adjacent channel selectivity	Sub-clause 10.3	Pass	Gaosheng Pan
Spurious response and blocking immunity	Sub-clause 10.4	Pass	Gaosheng Pan
Intermodulation response	Sub-clause 10.5	Pass	Gaosheng Pan
Dynamic range	Sub-clause 10.6	Pass	Gaosheng Pan
Spurious emissions	Sub-clause 10.7	Pass	Gaosheng Pan
Verification of correct decoding of various types of DSC calls	Sub-clause 10.8	Pass	Gaosheng Pan
Reaction to VTS and AIS channel management DSC transmissions	Sub-clause 10.9	Pass	Gaosheng Pan
Simultaneous reception	Sub-clause 10.10	Pass	Gaosheng Pan

3. SUMMARY

3.1. Client Information

Applicant:	YAESU MUSEN CO., LTD.
Address:	Tennozu Parkside Building 2-5-8 Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-0002 Japan
Manufacturer:	VTech (Dongguan) Communications Limited
Address:	Xia Ling Bei Management Zone, Liaobu,Dongguan, Guangdong, China

3.2. Product Description

Name of EUT:	25 Watt VHF/FM Marine Transceiver
Trade mark:	STANDARD HORIZON
Model/Type reference:	GX2400GPS
Listed mode(s):	-
Power supply:	DC 13.8V
Test sample No.:	9A000001
Hardware version:	9A00
Software version:	9A00

3.3. Radio Specification Description

Operation Frequency Range:	TX: 156.025MHz to 161.600MHz	
	RX: 156.050MHz to 162.025MH	
Rated Output Power:	☒ High Power: 25W (43.98dBm) ☒ Low Power 1W (30.00dBm)	
Modulation Type:	Analog Voice:	FM
	Digital Data(DSC):	FSK
Channel Separation:	Analog Voice:	25kHz
	Digital Data(DSC):	25kHz
Emission Designator:	Analog Voice:	16K0G3E
	Digital Data(DSC):	16K0G2B
Antenna Type:	External	

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Qualifications	Type	Accreditation Number
	CNAS	L1225
	A2LA	3902.01
	FCC	762235
	Canada	5377A

4. TEST CONFIGURATION

4.1. Marine VHF channel list

Channel	Frequency (MHz)		Channel	Frequency (MHz)	
	Transmit	Receive		Transmit	Receive
1	156.05	160.65	60	156.025	160.625
2	156.1	160.7	61	156.075	160.675
3	156.15	160.75	62	156.125	160.725
4	156.2	160.8	63	156.175	160.775
5	156.25	160.85	64	156.225	160.825
6	156.3	156.3	65	156.275	160.875
7	156.35	160.95	66	156.325	160.925
8	156.4	156.4	67	156.375	156.375
9	156.45	156.45	68	156.425	156.425
10	156.5	156.5	69	156.475	156.475
11	156.55	156.55	**70**	**156.525**	**156.525**
12	156.6	156.6	71	156.575	156.575
13	156.65	156.65	72	156.625	156.625
14	156.7	156.7	73	156.675	156.675
15	156.75	156.75	74	156.725	156.725
16	**156.8**	**156.8**	75	156.775	156.775
17	156.85	156.85	76	156.825	156.825
18	156.9	161.5	77	156.875	156.875
19	156.95	161.55	78	156.925	161.525
20	157	161.6	79	156.975	161.575
21	157.05	161.65	80	157.025	161.625
22	157.1	161.7	81	157.075	161.675
23	157.15	161.75	82	157.125	161.725
24	157.2	161.8	83	157.175	161.775
25	157.25	161.85	84	157.225	161.825
26	157.3	161.9	85	157.275	161.875
27	157.35	161.95	86	157.325	161.925
28	157.4	162	87	157.375	157.375
			88	157.425	157.425

4.2. Test frequency list

According to section 6.7

Channel Separation	Test Channel	Channel number	Frequency (MHz)	
			Transmit	Receive
25kHz	CH_M	CH16	156.800	156.800
	CH_L	CH60	156.025	160.625
	CH_H	CH88	157.425	157.425
DSC function	CH_{M1}	CH70	156.525	156.525

4.3. Test mode

Test mode	Transmitting	Receiving	Power level		Test channel	
			High	Low	CH16	CH70
TX-AWH	√		√		√	
TX-AWL	√			√	√	
TX-DSC	√		√			√
RX-AW		√			√	
RX-DSC		√				√

√: is operation mode.

4.4. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

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

Whether support unit is used?				
✓ No				
Item	Equipement	Trade Name	Model No.	Other specification
1				
2				

4.5. Environmental conditions

Normal Conditon	Temperature	15 °C to 35 °C	
	Relative humidity	20 % to 75 %.	
	Voltage	☐ Battery power source	Where the equipment is designed to operate from a battery, the normal test voltage shall be the nominal voltage of the battery (12 V, 24 V, etc.)
		☒ Other power sources	the normal test voltage shall be that declared by the equipment provider
Extreme Conditon	Temperature	☒ -15 °C to +55 °C	
	Voltage	☐ Battery power source	Where the equipment is designed to operate from a battery, the extreme test voltages shall be 1,3 times and 0,9 times the nominal voltage of the battery (12 V, 24 V, etc.).
		☒ Other power sources	the extreme test voltages shall be that declared by the equipment manufacturer

Normal Conditon	V_N=nominal Voltage	DC 13.80V
	T_N=normal Temperature	20 °C
Extreme Conditon	V_L=lower Voltage	DC 11.00V
	T_L=lower Temperature	-15 °C
	V_H=higher Voltage	DC 16.50V
	T_H=higher Temperature	55 °C

Note:

Unless otherwise stated the extreme tests conditions means that the Equipment Under Test (EUT) shall be tested
at the upper temperature (T_H) and at the upper limit of the supply voltage (V_H) applied simultaneously, and
at the low temperature (T_L) and the lower limit of the supply voltage (V_L) applied simultaneously.

4.6. Measurement uncertainty

Test Items	Measurement Uncertainty
RF frequency	15Hz for <1GHz 70Hz for >1GHz
RF power	0.51dB
Maximum frequency deviation: within 300 Hz to 6 kHz of modulation frequency	2.6 %
Deviation limitation	3.5 %
Adjacent channel power	0.72dB
Conducted spurious emission	0.51dB
Audio output power	0.25 dB
Amplitude characteristics of receiver limiter	1.20 dB
Sensitivity at 20 dB SINAD	2.60 dB
Two-signal measurement	2.80 dB
Three-signal measurement	2.20 dB
Radiated emission	2.66dB for <1GHz 3.44dB for >1GHz
Transmitter transient time	6.8 %
Transmitter transient frequency	75 Hz
Receiver desensitization (duplex operation)	0.25 dB

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

4.7. Equipments Used during the Test

● TS8613 Test system							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Spectrum Analyzer	Agilent	HTWE0286	N9020A	MY50510187	2019/10/26	2020/10/25
●	Signal & Spectrum Analyzer	R&S	HTWE0262	FSW26	103440	2019/10/26	2020/10/25
●	RF Communication Test Set	HP	HTWE0038	8920A	3813A10206	2019/10/26	2020/10/25
●	Digital intercom communication tester	Aeroflex	HTWE0255	3920B	1001682041	2019/10/26	2020/10/25
●	Signal Generator	R&S	HTWE0191	SML02	100507	2019/10/26	2020/10/25
●	RF Control Unit	Tonscend	HTWE0294	JS0806-2	N/A	N/A	N/A
●	Filter-VHF	Microwave	HTWE0309	N26460M1	498702	N/A	N/A
○	Filter-UHF	Microwave	HTWE0311	N25155M2	498704	N/A	N/A
●	Power Divider	Microwave	HTWE0043	OPD1040-N-4	N/A	2019/05/24	2020/05/23
●	Attenuator	JFW	HTWE0292	50FH-030-100	N/A	2019/05/18	2020/05/17
●	Attenuator	JFW	HTWE0293	50-A-MFN-20	0322	2019/05/18	2020/05/17
●	Test software	HTW	N/A	Radio ATE	N/A	N/A	N/A

● Auxiliary Equipment							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Climate chamber	ESPEC	HTWE0254	GPL-2	N/A	2019/10/23	2020/10/22
●	DC Power Supply	Gwinstek	HTWE0274	SPS-2415	GER835793	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Environmental Requirement

5.1.1. Vibration test

TEST RESULTS:

Complies

Please refer to the below test data:

Vibration Frequency (Hz)	Test channel	Operation mode	Test item	Measured data	Limit	Result
2.5~100	CH_M	TX-AWH	Frequency Error (kHz)	0.083	±1.5	Pass
			Carrier power (dBm)	43.21	37.78~43.98	Pass
		RX-AW	Maximum usable sensitivity 【SINAD (dB)】	30.74	≥20	Pass
	CH_{M1}	RX-DSC	DSC receiver (error ratio)	0.001	$\leq 10^{-2}$	Pass

5.1.2. Dry heat

TEST RESULTS:

Complies

Please refer to the below test data:

Temperature (℃)	Test channel	Operation mode	Test item	Measured data	Limit	Result
55	CH_M	TX-AWH	Frequency Error (kHz)	0.065	±1.5	Pass
			Carrier power (dBm)	43.15	37.78~43.98	Pass
		RX-AW	Maximum usable sensitivity 【SINAD (dB)】	30.15	≥20	Pass
	CH_{M1}	RX-DSC	DSC receiver (error ratio)	0.003	$\leq 10^{-2}$	Pass

5.1.3. Damp heat

TEST RESULTS:

Complies

Please refer to the below test data:

Test conditions	Test channel	Operation mode	Test item	Measured data	Limit	Result
Temperature 40℃ Humidity 93%	CH_M	TX-AWH	Frequency Error (kHz)	0.119	±1.5	Pass
			Carrier power (dBm)	43.17	37.78~43.98	Pass
		RX-AW	Maximum usable sensitivity 【SINAD (dB)】	29.85	≥20	Pass
	CH_{M1}	RX-DSC	DSC receiver (error ratio)	0.006	$\leq 10^{-2}$	Pass

5.1.4. Low temperature

TEST RESULTS:

Complies

Please refer to the below test data:

Temperature (℃)	Test channel	Operation mode	Test item	Measured data	Limit	Result
-15	CH_M	TX-AWH	Frequency Error (kHz)	0.048	±1.5	Pass
			Carrier power (dBm)	43.26	37.78~43.98	Pass
		RX-AW	Maximum usable sensitivity 【SINAD (dB)】	29.07	≥20	Pass
	CH_{M1}	RX-DSC	DSC receiver (error ratio)	0.004	$\leq 10^{-2}$	Pass

5.2. Transmitter Requirement

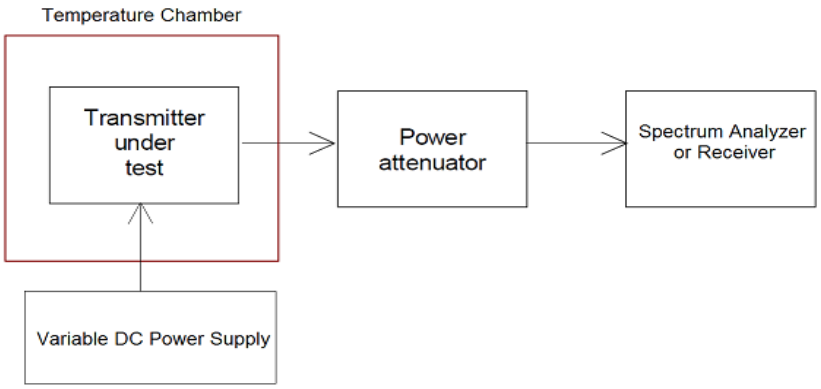
5.2.1. Frequency error

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

LIMIT

IEC 62238 Sub-clause 8.1.3
The frequency error shall be within ±1,5 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☒ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 8.1.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix A on the appendix report

5.2.2. Carrier Power (Conducted)

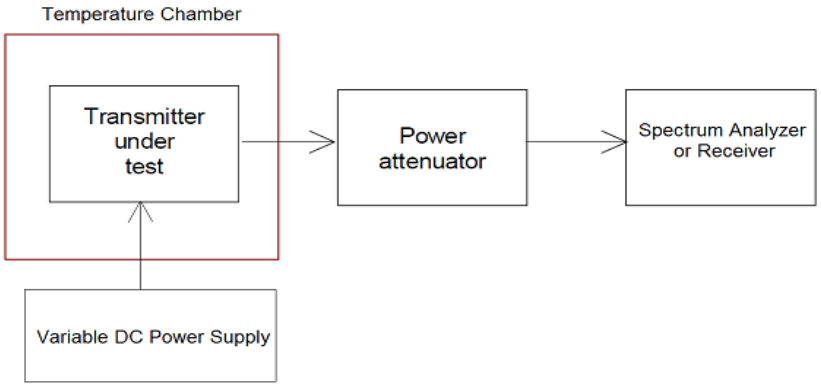
The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation. The rated output power is the carrier power declared by the manufacturer.

LIMIT

IEC 62238 Sub-clause 8.2.3
Normal test conditions:
The rated output power of the equipment shall be between 6 W and 25 W.
With the output power switch set at maximum, the carrier power shall be within ±1,5 dB of the rated output power under normal test conditions. The output power shall never however exceed 25 W.
With the output power switch set at minimum the carrier power shall remain between 0,1 W and 1 W.
The maximum continuous transmission time shall be between 5 min and 6 min.

Extreme test conditions:
With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within +2 dB, -3 dB of the rated output power under extreme conditions. The output power shall never however exceed 25 W.
With the output power switch set at minimum the carrier power shall remain between 0,1 W and 1 W.
The maximum continuous transmission time shall be between 5 min and 6 min.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☒ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 8.2.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix B on the appendix report

5.2.3. Frequency Deviation

For the purpose of the present document, the frequency deviation is the difference between the instantaneous frequency of the modulated radio frequency signal and the carrier frequency.

LIMIT

IEC 62238 Sub-clause 8.3.2
Maximum permissible frequency deviation:
The maximum frequency deviation shall be ±5 kHz.

IEC 62238 Sub-clause 8.3.3
For modulation frequencies between 3 kHz and 6 kHz the frequency deviation shall not exceed the frequency deviation with a modulation frequency of 3 kHz. For a modulation frequency of 6 kHz, the frequency deviation shall not exceed ±1,5 kHz, as shown in Figure 1.

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

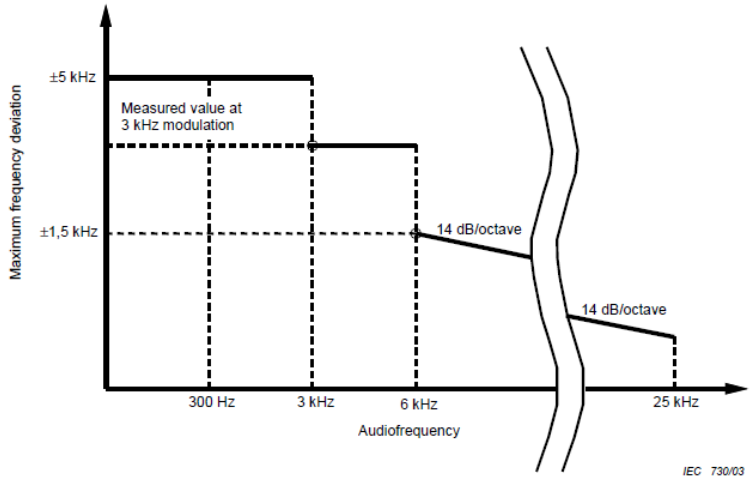
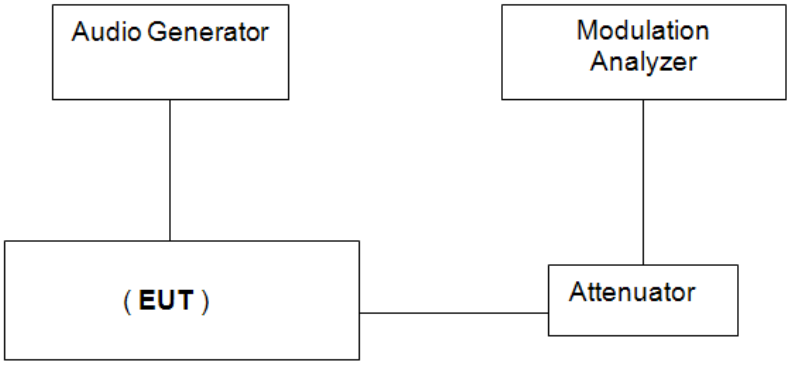


Figure 1 – Frequency deviation

TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 8.3.2,8.3.3 for the measurement method.

TEST CONFIGURATION



TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix C on the appendix report

5.2.4. Sensitivity of the modulator, including microphone

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

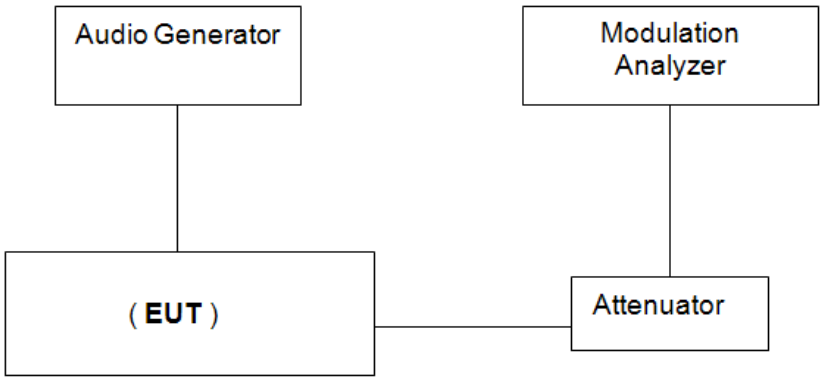
LIMIT

IEC 62238 Sub-clause 8.4.3
The resulting frequency deviation shall be between ±2,5 kHz and ±4.5 kHz.

TEST PROCEDURE

1. The test conditions.
   ☒ Normal condition ☐ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 8.4.2 for the measurement method.

TEST CONFIGURATION



TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix D on the appendix report

5.2.5. Audio frequency response

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

LIMIT

IEC 62238 Sub-clause 8.5.3
The audio frequency response shall be within +1 dB and -3 dB of a 6 dB/octave line passing through the reference point (see figure 2).

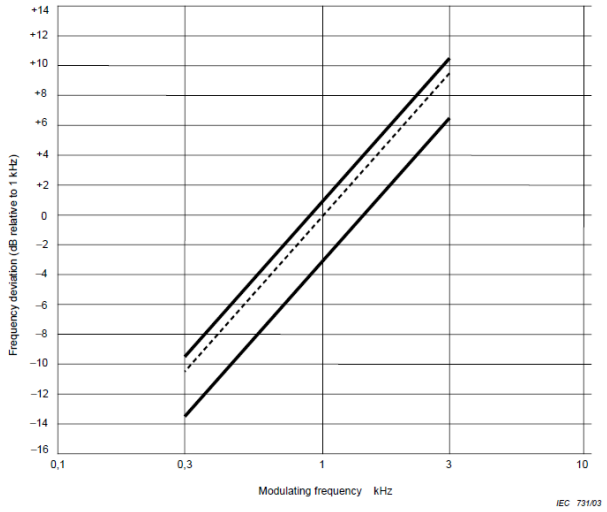
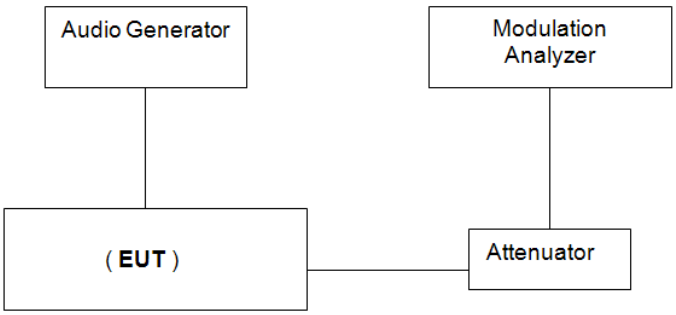


Figure 2 – Audiofrequency response

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.

☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 8.5.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix E on the appendix report

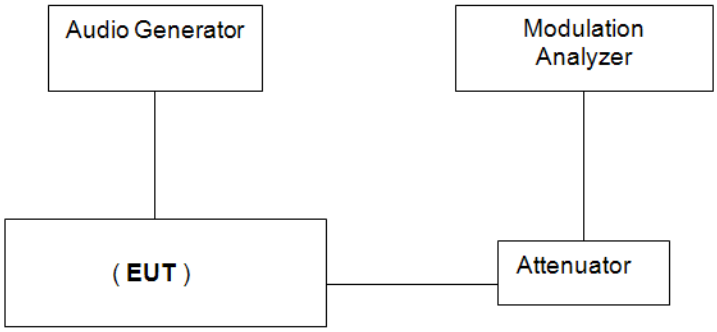
5.2.6. Audio frequency harmonic distortion of the emission

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

LIMIT

IEC 62238 Sub-clause 8.6.3
The harmonic distortion shall not exceed 10%.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions
2.Please refer to IEC 62238 Sub-clause 8.6.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix F on the appendix report

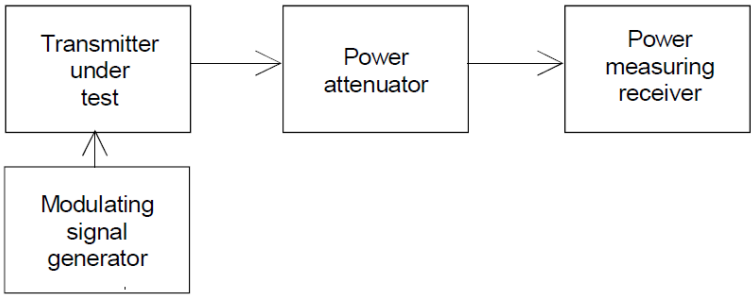
5.2.7. Adjacent Channel Power

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

LIMIT

IEC 62238 Sub-clause 8.7.3
The adjacent channel power shall not exceed a value of:
70 dB below the carrier power of the transmitter without any need to be below 0,2 μW.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions
2.Please refer to IEC 62238 Sub-clause 8.7.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix G on the appendix report

5.2.8. Conducted spurious emissions conveyed to the antenna

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

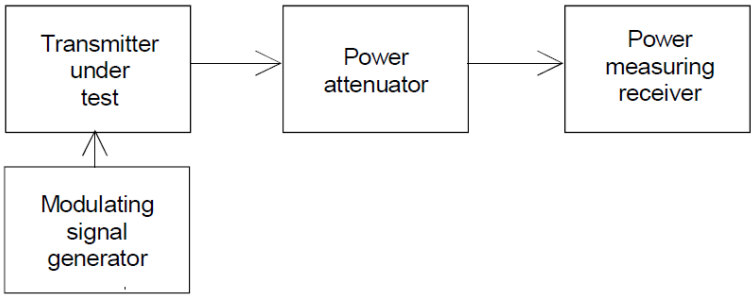
.

LIMIT

IEC 62238 Sub-clause 8.8.3

The power of any conducted spurious emission on any discrete frequency shall not exceed 0,25μW(-36dBm).

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.

☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 8.8.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix H on the appendix report

5.2.9. Transient frequency behaviour of the transmitter

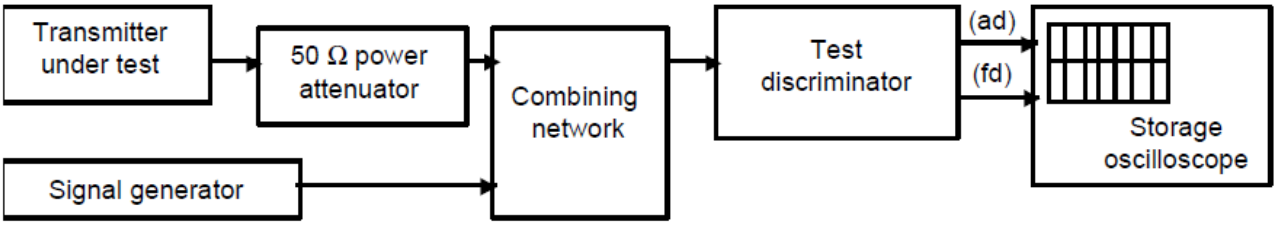
The residual modulation of the transmitter is the ratio, in decibels, of the demodulated radiofrequency signal in the absence of wanted modulation, to the modulated radiofrequency signal produced when the normal test modulation is applied.

.

LIMIT

IEC 62238 Sub-clause 8.9.3
During the periods of time t1 and t3 the frequency difference shall not exceed ±25 kHz. The frequency difference, after the end of t_2, shall be within the limit of the frequency error of ±1,5 kHz.
During the period of time t2 the frequency difference shall not exceed ±12,5 kHz. Before the start of t_3 the frequency difference shall be within the limit of the frequency error of ±1,5 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 8.9.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix I on the appendix report

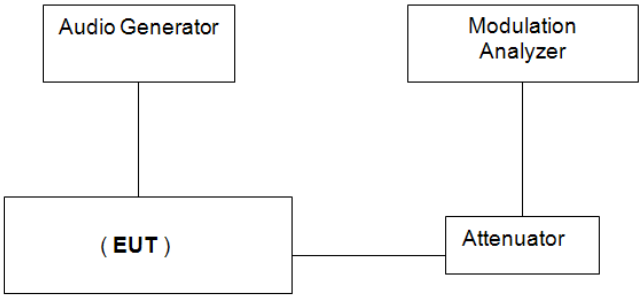
5.2.10. Residual modulation of the transmitter

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

LIMIT

IEC 62238 Sub-clause 8.10.3
The residual modulation shall not exceed –40 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 8.10.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix J on the appendix report

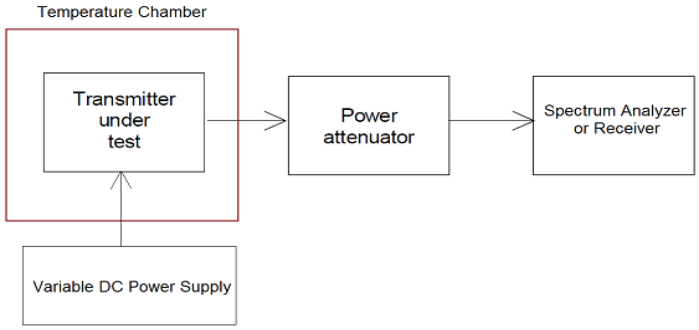
5.2.11. Frequency error (demodulated DSC signal)

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

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 ±10 Hz and for the Y-state within 1 300 Hz ± 10 Hz.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☒ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 8.11.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix K on the appendix report

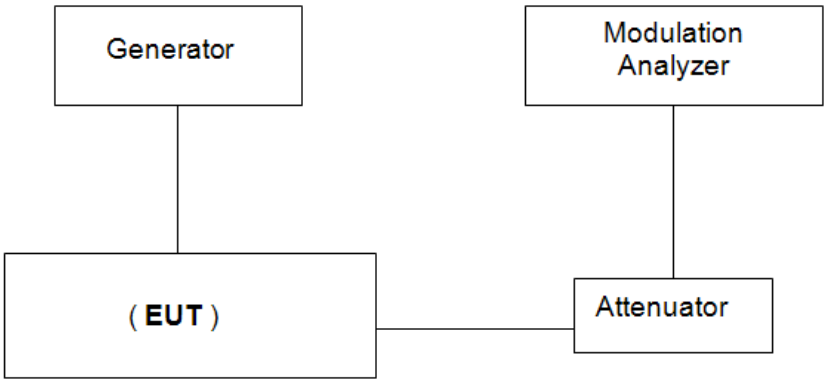
5.2.12. Modulation index for DSC

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

LIMIT

IEC 62238 Sub-clause 8.12.3
The modulation index shall be 2,0 ± 10 %.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions
2.Please refer to IEC 62238 Sub-clause 8.12.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix L on the appendix report

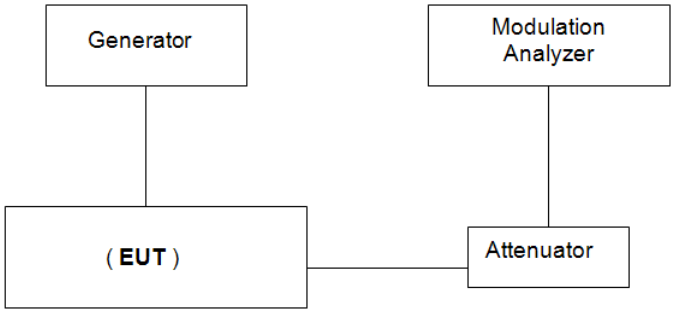
5.2.13. Modulation rate for DSC

The modulation rate is the bit stream speed measured in bit/s.

LIMIT

IEC 62238 Sub-clause 8.13.3
The frequency shall be 600 Hz ± 30 × 10^{-6} corresponding to a modulation rate of 1 200 baud.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 8.13.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix M on the appendix report

5.2.14. Testing of generated call sequences

Generated call sequences are call which comply with the requirements of ITU-R. Recommendation M.493-15.

Requirement

IEC 62238 Sub-clause 8.14.3
The requirements of ITU-R Recommendation M.493-15 regarding message composition and content shall be met.
The generated calls shall be analyzed with the calibrated apparatus for correct configuration of the signal format, including time diversity. It shall be verified that, after transmission of a DSC call, the transmitter re-tunes to the original channel. However, in the case of a distress call, the transmitter shall tune to channel 16 and automatically select the maximum power. The telecommands used and the channels tested for switching shall be stated in the test report.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix N on the appendix report

5.3. Receiver for Radiotelephone Requirement

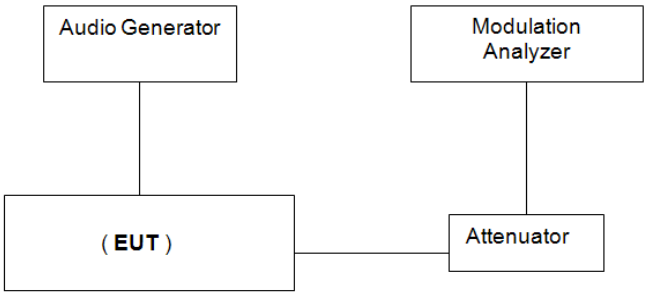
5.3.1. Harmonic distortion and rated audio frequency output power

The harmonic distortion at the receiver output is defined as the ratio, expressed as a percentage, of the total rms voltage of all the harmonic components of the modulation audio frequency to the total rms voltage of the signal delivered by the receiver.
The rated audio frequency output power is the value stated by the manufacturer to be the maximum power available at the output, for which all the requirements of the present document are met.

LIMIT

IEC 62238 Sub-clause 9.1.3
• 2 W in a loudspeaker;
• 1 mW in the handset earphone.
The harmonic distortion shall not exceed 10 %.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ normal condition ☐ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 9.1.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix O on the appendix report

5.3.2. Audio frequency response

The audio frequency response is the variation in the receiver's audio frequency output level as a function of the modulating frequency of a received radio frequency signal modulated with constant deviation.

LIMIT

IEC 62238 Sub-clause 9.2.3
The audio frequency response shall not deviate by more than +1 dB or -3 dB from a characteristic giving the output level as a function of the audio frequency, decreasing by 6 dB per octave and passing through the measured point at 1 kHz (figure 5).

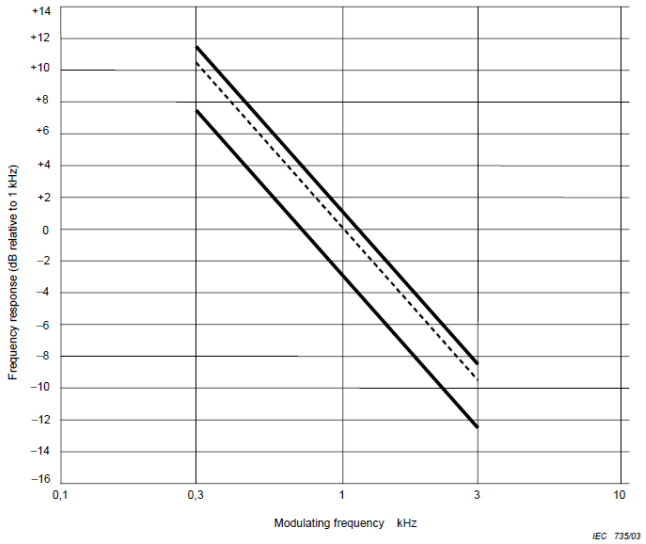
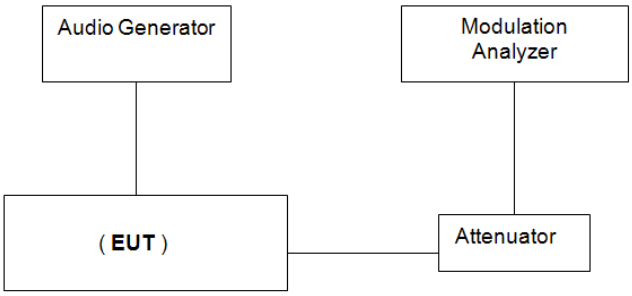


Figure 5 – Receiver audiofrequency response

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions
2.Please refer to IEC 62238 Sub-clause 9.2.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix P on the appendix report

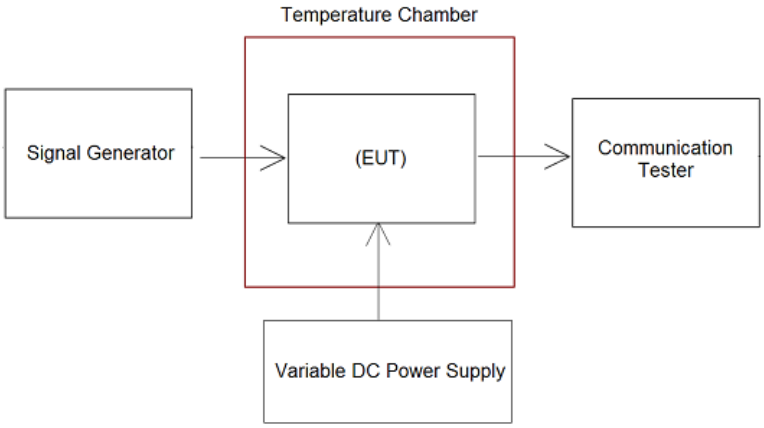
5.3.3. Maximum Usable Sensitivity

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 6.4), 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].

LIMIT

IEC 62238 Sub-clause 9.3.3
The maximum usable sensitivity for either 25 kHz or 12,5 kHz channels shall not exceed +6 dBμV (emf) under normal test conditions and +12 dBμV (emf) under extreme test conditions.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☒ Extreme conditions

2.Please refer to IEC 62238 Sub-clause 9.3.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix Q on the appendix report

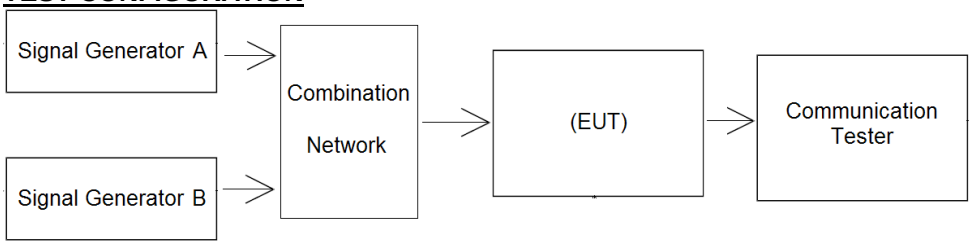
5.3.4. Co-channel rejection

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

LIMIT

IEC 62238 Sub-clause 9.4.3
The co-channel rejection ratio, at any frequency of the unwanted signal within the specified range, shall be between: -10 dB and 0 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.4.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix R on the appendix report

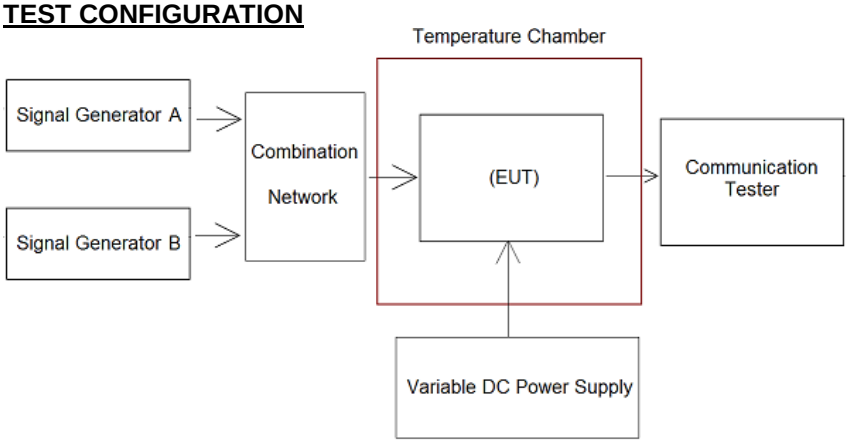
5.3.5. Adjacent channel selectivity

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.

LIMIT

IEC 62238 Sub-clause 9.5.3
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.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☒ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.5.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix S on the appendix report

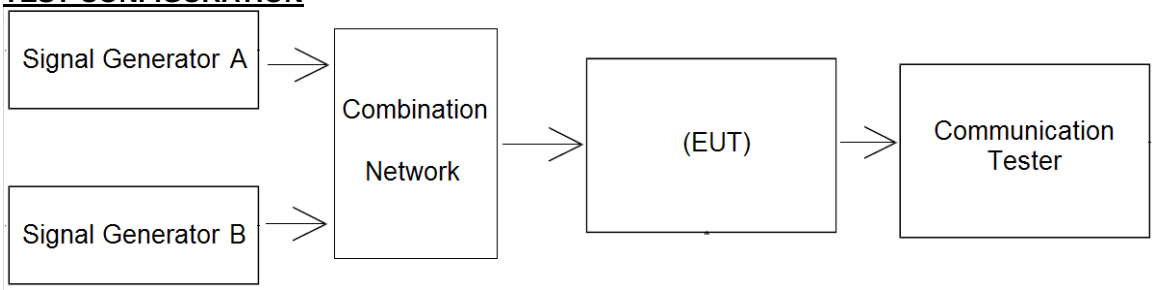
5.3.6. Spurious Response Rejection

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

LIMIT

IEC 62238 Sub-clause 9.6.3
At any frequency separated from the nominal frequency of the receiver by more than 25 kHz, the spurious response rejection ratio shall be not less than 70 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.6.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix T on the appendix report

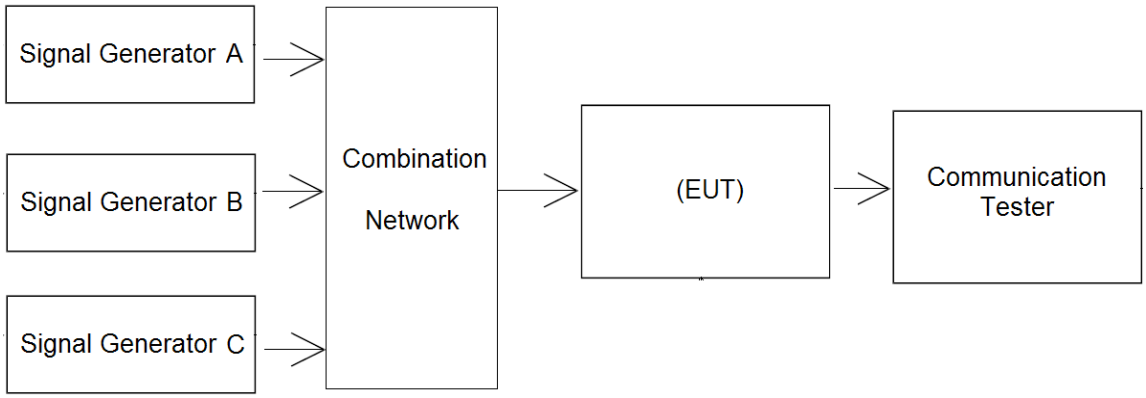
5.3.7. Intermodulation response

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

LIMIT

IEC 62238 Sub-clause 9.7.3
The intermodulation response ratio shall not be less than 68 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.7.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix U on the appendix report

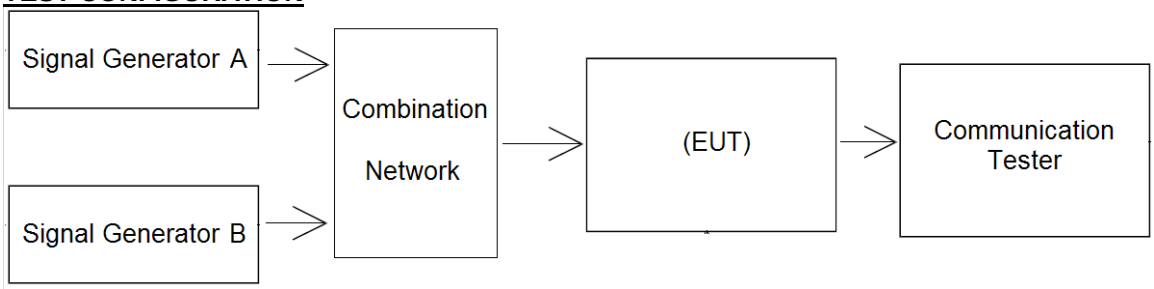
5.3.8. Blocking or Desensitization

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

LIMIT

IEC 62238 Sub-clause 9.8.3
The blocking level for any frequency within the specified ranges, shall be not less than 90 dBμV (emf), except at frequencies on which spurious responses are found.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2.Please refer to IEC 62238 Sub-clause 9.8.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix V on the appendix report

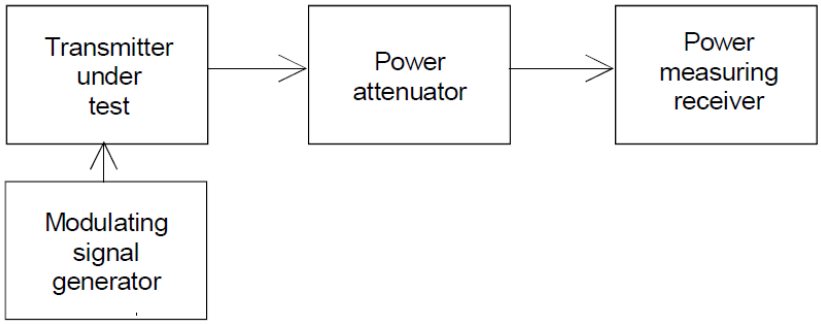
5.3.9. Conducted spurious emissions

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

LIMIT

IEC 62238 Sub-clause 9.9.3
The power of any spurious radiation shall not exceed 2 nw(-57dBm) at any frequency in the range between 9 kHz and 2 GHz.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.9.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix W on the appendix report

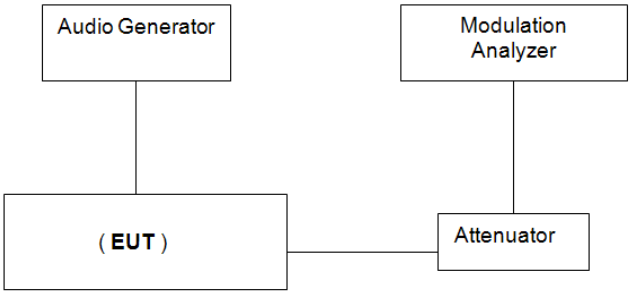
5.3.10. Receiver noise and hum level

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

LIMIT

IEC 62238 Sub-clause 9.10.3
The receiver noise and hum level shall not exceed -40 dB, relative to the modulated signal.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.10.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix X on the appendix report

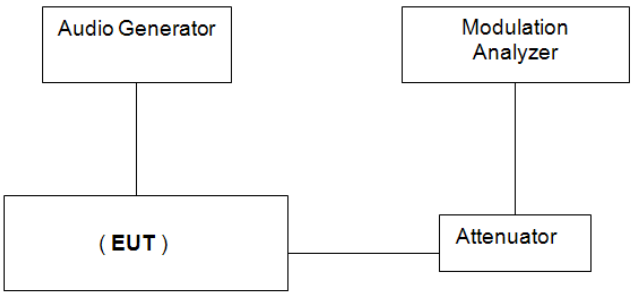
5.3.11. Squelch operation

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

LIMIT

IEC 62238 Sub-clause 9.11.3
Under the conditions specified in a) clause 9.11.2, the audio frequency output power shall not exceed -40 dB relative to the rated output power.
Under the conditions specified in b) clause 9.11.2, the input level shall not exceed +6 dBμV (emf) and the SINAD ratio shall be at least 20 dB.
Under the conditions specified in c) clause 9.11.2, the input signal shall not exceed +6 dBμV (emf) when the control is set at maximum.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
   ☒ Normal condition ☐ Extreme conditions
2. Please refer to IEC 62238 Sub-clause 9.11.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix Y on the appendix report

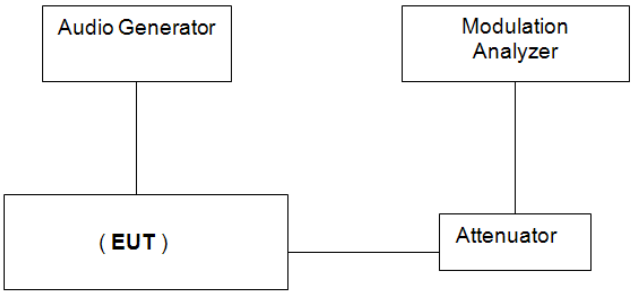
5.3.12. Squelch hysteresis

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

LIMIT

IEC 62238 Sub-clause 9.12.3
The squelch hysteresis shall be between 3 dB and 6 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.12.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix Z on the appendix report

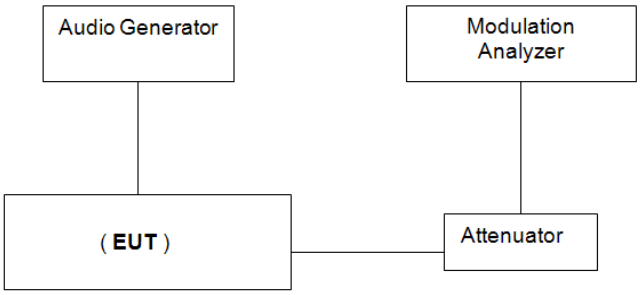
5.3.13. Multiple watch characteristic

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.

LIMIT

IEC 62238 Sub-clause 9.13.3
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. The test conditions.
☒ Normal condition ☒ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 9.13.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AA on the appendix report

5.4. Receiver for DSC decoder Requirement

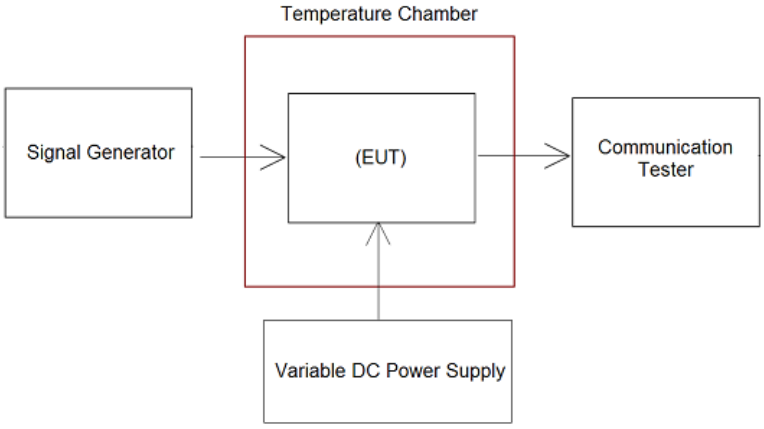
5.4.1. Maximum usable sensitivity

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

LIMIT

IEC 62238 Sub-clause 10.1.3
The bit error ratio shall be equal to or less than 10^{-2}.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☒ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 10.1.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AB on the appendix report

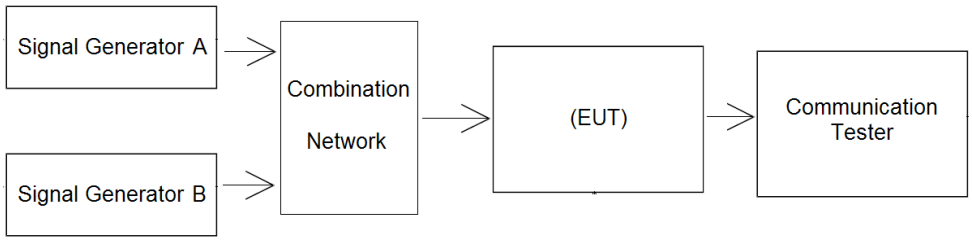
5.4.2. Co-channel rejection

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

LIMIT

IEC 62238 Sub-clause 10.2.3
The bit error ratio shall be equal to or less than 10^{-2}.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 10.2.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AC on the appendix report

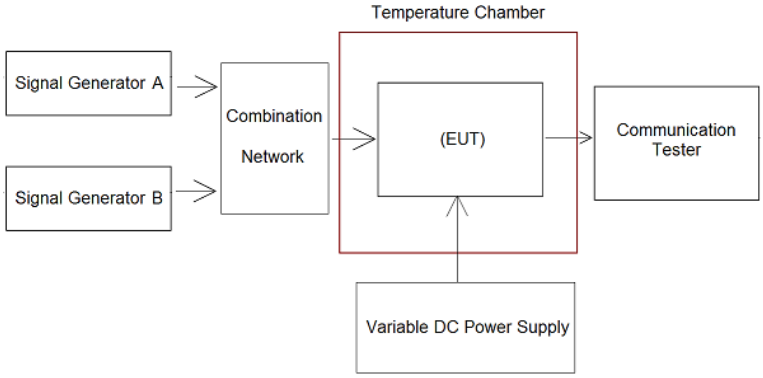
5.4.3. Adjacent channel selectivity

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

LIMIT

IEC 62238 Sub-clause 10.3.3
The bit error ratio shall be equal to or less than 10^{-2}.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☒ Extreme conditions
2. Please refer to IEC61138 Sub-clause 10.3.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AD on the appendix report

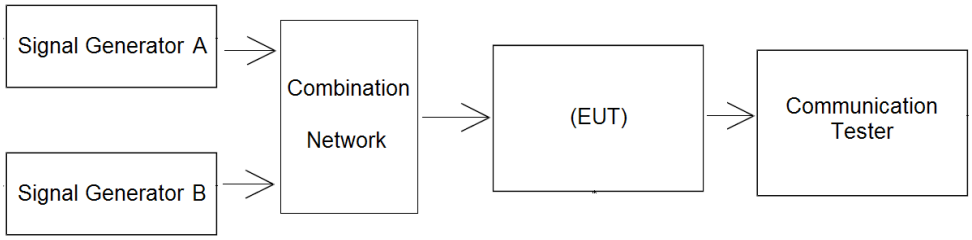
5.4.4. Spurious response and blocking immunity

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

LIMIT

IEC 62238 Sub-clause 10.4.3
The bit error ratio shall be equal to or less than 10^{-2}.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 10.4.2 for the measurement method

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AE on the appendix report

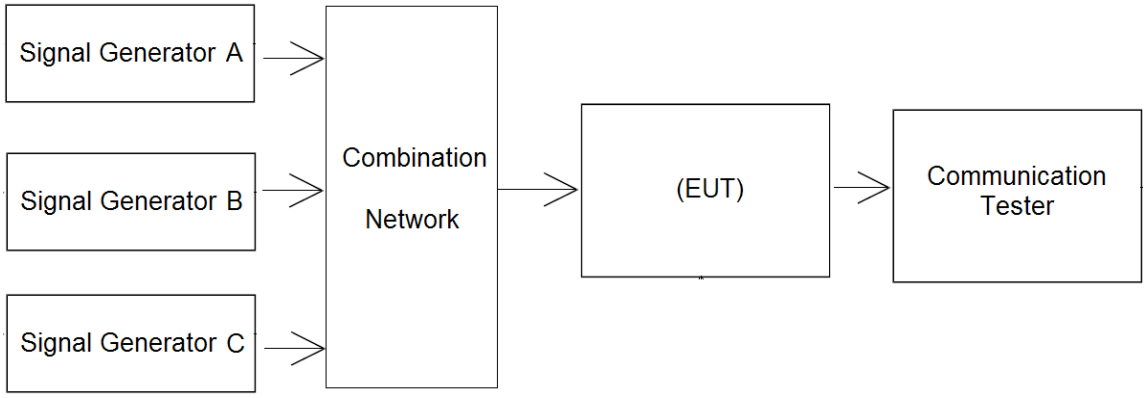
5.4.5. Intermodulation response

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

LIMIT

IEC 62238 Sub-clause 10.5.3
The bit error ratio shall be equal to or less than 10^{-2}.

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 10.5.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AF on the appendix report

5.4.6. Dynamic range

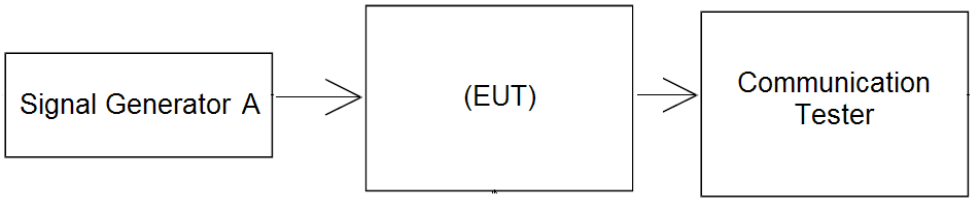
The dynamic range of the equipment is the range from the minimum to the maximum level of a radio frequency input signal at which the bit error ratio in the output of the decoder does not exceed a specified value.

Limit

IEC 62238 Sub-clause 10.6.3

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

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.

☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 10.6.2 for the measurement method

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

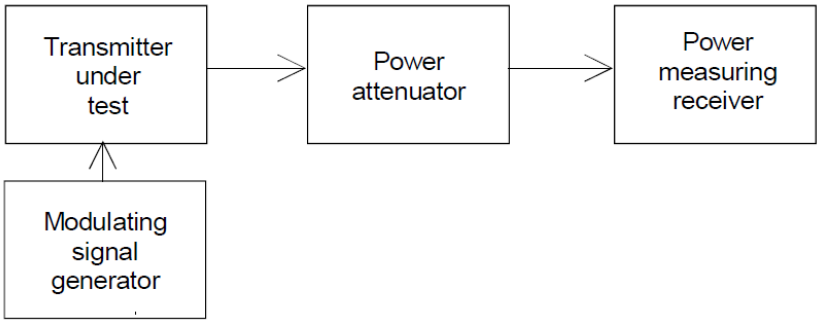
Please refer to appendix AG on the appendix report

5.4.7. Spurious emissions

Spurious emissions from the receiver are components at any frequency, present at the receiver input port.
The level of spurious emissions shall be measured as the power level at the antenna.

Limit
IEC 62238 Sub-clause 10.7.3
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. The test conditions.
☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 10.7.2 for the measurement method.

TEST MODE:
Please reference to the section 4.3

TEST RESULTS
☒ Passed ☐ Not Applicable

TEST DATA
Please refer to appendix AH on the appendix report

5.4.8. Verification of correct decoding of various types of DSC calls

DSC call sequences are calls that comply with ITU-R Recommendation M.493-14.

Requirement

The requirements of ITU-R Recommendation M.493-14 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.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AI on the appendix report

5.4.9. Reaction to VTS and AIS channel management DSC transmissions

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

Requirement

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

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AJ on the appendix report

5.4.10. Simultaneous reception

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

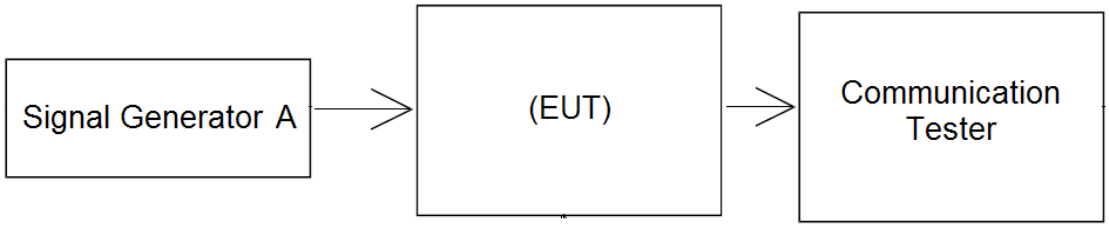
Limit

IEC 62238 Sub-clause 10.10.3

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

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

TEST CONFIGURATION



TEST PROCEDURE

1. The test conditions.

☒ Normal condition ☐ Extreme conditions

2. Please refer to IEC 62238 Sub-clause 10.10.2 for the measurement method.

TEST MODE:

Please reference to the section 4.3

TEST RESULTS

☒ Passed ☐ Not Applicable

TEST DATA

Please refer to appendix AK on the appendix report

6. APPENDIX REPORT

Appendix A: Frequency Error

Operation Mode	Test conditions		Frequency Error (kHz)	Limit (kHz)	Result
	Temperature	Voltage	CH_M		
TX-AWH	T_N	V_N	0.025	±1.5	PASS
TX-AWH	T_L	V_L	0.067	±1.5	PASS
TX-AWH	T_H	V_H	0.047	±1.5	PASS
TX-AWL	T_N	V_N	0.084	±1.5	PASS
TX-AWL	T_L	V_L	0.127	±1.5	PASS
TX-AWL	T_H	V_H	0.112	±1.5	PASS

Appendix B: Carrier power

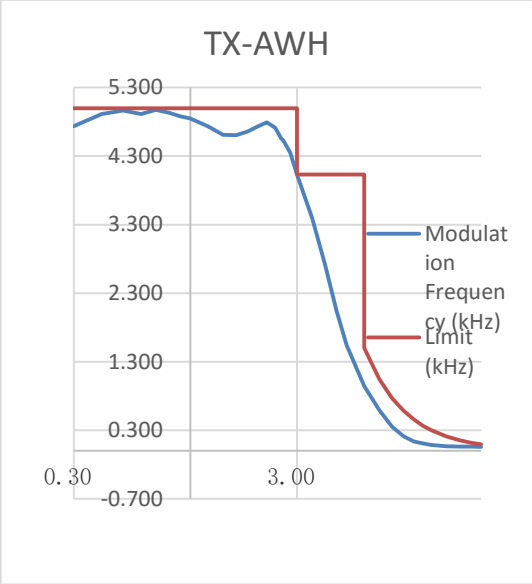
Operation Mode	Temperature	Voltage	Test Channel	Measured power (dBm)	Rated power(W)	Difference (dB)	Limit (dB)	Result
TX-AWH	T_N	V_N	CH_L	43.77	25.00	-0.21	±1.5	PASS
TX-AWH	T_N	V_N	CH_M	43.82	25.00	-0.16	±1.5	PASS
TX-AWH	T_N	V_N	CH_H	43.57	25.00	-0.41	±1.5	PASS
TX-AWH	T_L	V_L	CH_M	43.19	25.00	-0.79	-3 ~ +2	PASS
TX-AWH	T_H	V_H	CH_M	43.12	25.00	-0.86	-3 ~ +2	PASS
TX-AWL	T_N	V_N	CH_L	29.07	1.00	-0.93	±1.5	PASS
TX-AWL	T_N	V_N	CH_M	29.14	1.00	-0.86	±1.5	PASS
TX-AWL	T_N	V_N	CH_H	29.11	1.00	-0.89	±1.5	PASS
TX-AWL	T_L	V_L	CH_M	29.17	1.00	-0.83	-3 ~ +2	PASS
TX-AWL	T_H	V_H	CH_M	29.02	1.00	-0.98	-3 ~ +2	PASS

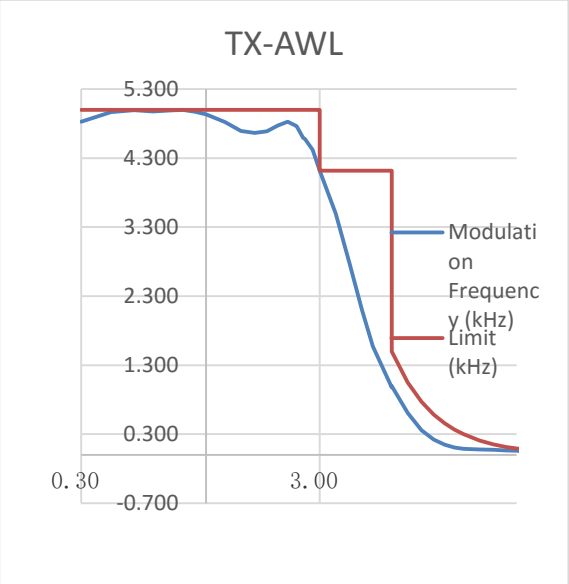
Appendix C: Frequency Deviation

Modulation Frequency (kHz)	Frequency Deviation (kHz) TX-AWH CH_M	Limit (kHz)	Result	Modulation Frequency (kHz)	Frequency Deviation (kHz) TX-AWL CH_M	Limit (kHz)	Result
0.30	4.736	5.00	PASS	0.30	4.826	5.00	PASS
0.40	4.912	5.00	PASS	0.40	4.966	5.00	PASS
0.50	4.965	5.00	PASS	0.50	4.995	5.00	PASS
0.60	4.913	5.00	PASS	0.60	4.975	5.00	PASS
0.70	4.973	5.00	PASS	0.70	4.991	5.00	PASS
0.80	4.931	5.00	PASS	0.80	4.998	5.00	PASS
0.90	4.882	5.00	PASS	0.90	4.970	5.00	PASS
1.00	4.850	5.00	PASS	1.00	4.932	5.00	PASS
1.20	4.732	5.00	PASS	1.20	4.821	5.00	PASS
1.40	4.612	5.00	PASS	1.40	4.693	5.00	PASS
1.60	4.606	5.00	PASS	1.60	4.665	5.00	PASS
1.80	4.655	5.00	PASS	1.80	4.689	5.00	PASS
2.00	4.734	5.00	PASS	2.00	4.771	5.00	PASS
2.20	4.791	5.00	PASS	2.20	4.826	5.00	PASS
2.40	4.711	5.00	PASS	2.40	4.761	5.00	PASS
2.55	4.555	5.00	PASS	2.55	4.596	5.00	PASS
2.60	4.529	5.00	PASS	2.60	4.576	5.00	PASS
2.80	4.351	5.00	PASS	2.80	4.419	5.00	PASS
3.00	4.031	5.00	PASS	3.00	4.119	5.00	PASS
3.00	4.031	4.03	PASS	3.00	4.119	4.12	PASS
3.50	3.402	4.03	PASS	3.50	3.497	4.12	PASS
4.00	2.729	4.03	PASS	4.00	2.779	4.12	PASS
4.50	2.052	4.03	PASS	4.50	2.102	4.12	PASS
5.00	1.542	4.03	PASS	5.00	1.571	4.12	PASS
6.00	0.942	4.03	PASS	6.00	0.977	4.12	PASS
6.00	0.942	1.50	PASS	6.00	0.997	1.50	PASS
7.00	0.593	1.05	PASS	7.00	0.606	1.05	PASS
8.00	0.349	0.77	PASS	8.00	0.359	0.77	PASS
9.00	0.212	0.58	PASS	9.00	0.223	0.58	PASS
10.00	0.135	0.46	PASS	10.00	0.150	0.46	PASS
11.00	0.107	0.37	PASS	11.00	0.107	0.37	PASS
12.00	0.083	0.30	PASS	12.00	0.089	0.30	PASS
14.00	0.067	0.21	PASS	14.00	0.078	0.21	PASS
16.00	0.061	0.15	PASS	16.00	0.076	0.15	PASS
18.00	0.059	0.12	PASS	18.00	0.066	0.12	PASS
20.00	0.055	0.09	PASS	20.00	0.059	0.09	PASS
22.00	0.057	0.07	PASS	22.00	0.053	0.07	PASS
24.00	0.052	0.06	PASS	24.00	0.050	0.06	PASS
25.00	0.047	0.05	PASS	25.00	0.045	0.05	PASS

Appendix C: Frequency Deviation

TEST PLOT RESULT





Appendix D: Sensitivity of the modulaotr, including microphone

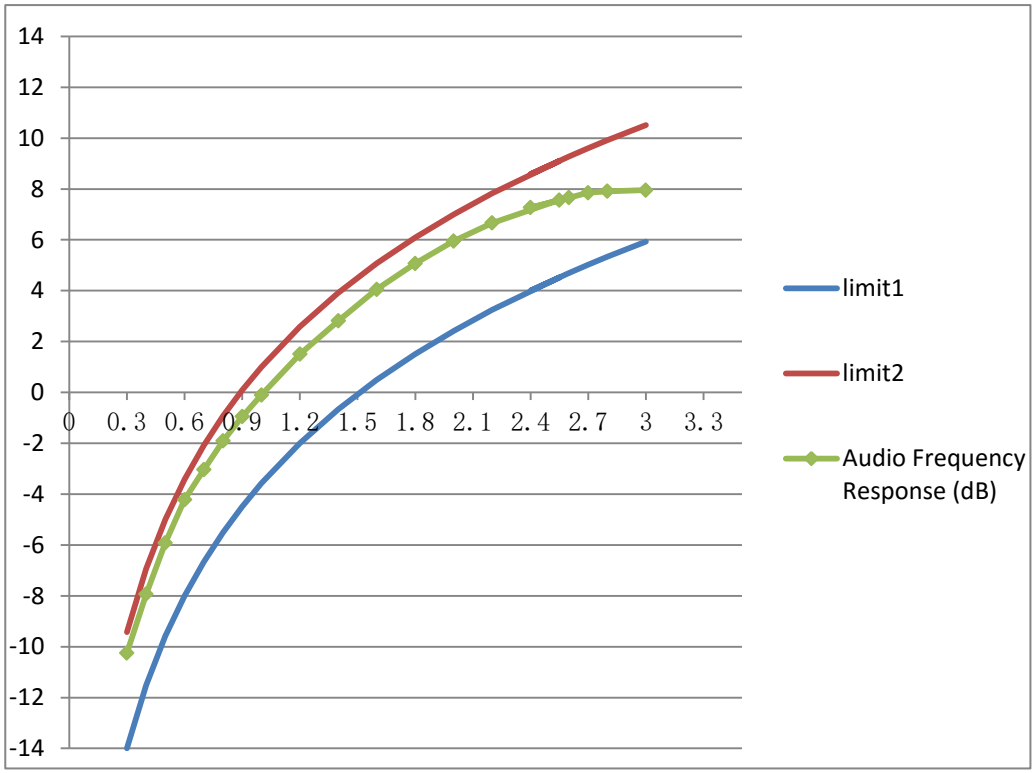
Operation Mode	Test Channel	Modulated Frequency (kHz)	Measured (kHz)	Limit(kHz)	Result
TX-AWH	CH_M	1.0	2.7	±2.5～ ±4.5	PASS
TX-AWH	CH_M	0.3	2.8	±2.5～ ±4.5	PASS
TX-AWH	CH_M	0.5	2.8	±2.5～ ±4.5	PASS

Appendix E: Audio frequency response

Frequency (KHz)	Frequency Deviation (KHz)	1KHz Reference Deviation (KHz)	Audio Frequency Response (dB)
	TX-AWH		
	CH_M		
0.3	0.31	1.00	-10.25
0.4	0.40	1.00	-7.94
0.5	0.51	1.00	-5.92
0.6	0.62	1.00	-4.22
0.7	0.70	1.00	-3.04
0.8	0.80	1.00	-1.91
0.9	0.90	1.00	-0.95
1	0.99	1.00	-0.10
1.2	1.19	1.00	1.50
1.4	1.38	1.00	2.81
1.6	1.59	1.00	4.05
1.8	1.79	1.00	5.07
2	1.98	1.00	5.95
2.2	2.15	1.00	6.66
2.55	2.39	1.00	7.56
2.4	2.31	1.00	7.27
2.6	2.42	1.00	7.66
2.7	2.47	1.00	7.85
2.8	2.49	1.00	7.91
3	2.50	1.00	7.95

Appendix E: Audio frequency response

TEST PLOT RESULT



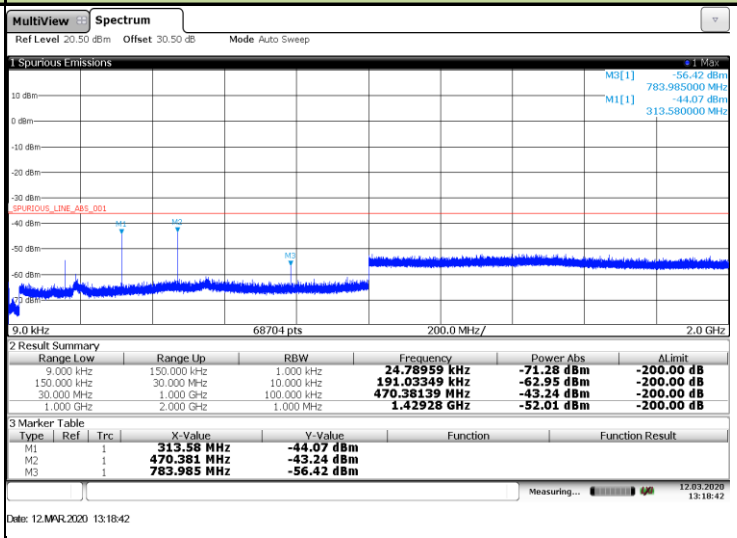
Appendix F: Audio frequency harmonic distortion of the emission

Operation Mode	Temperature (℃)	Voltage (V)	Modulated Frequency (kHz)	Test Channel	Measured (%)	Limit (%)	Result
TX-AWH	T_N	V_N	0.3	CH_M	4.7	≤10	PASS
			0.5	CH_M	2.6	≤10	PASS
			1.0	CH_M	1.3	≤10	PASS
TX-AWL	T_N	V_N	0.3	CH_M	4.6	≤10	PASS
			0.5	CH_M	2.7	≤10	PASS
			1.0	CH_M	1.4	≤10	PASS

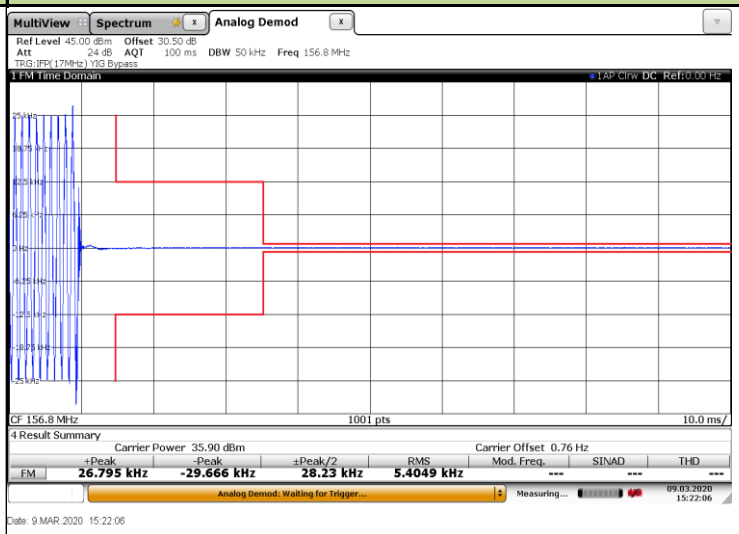
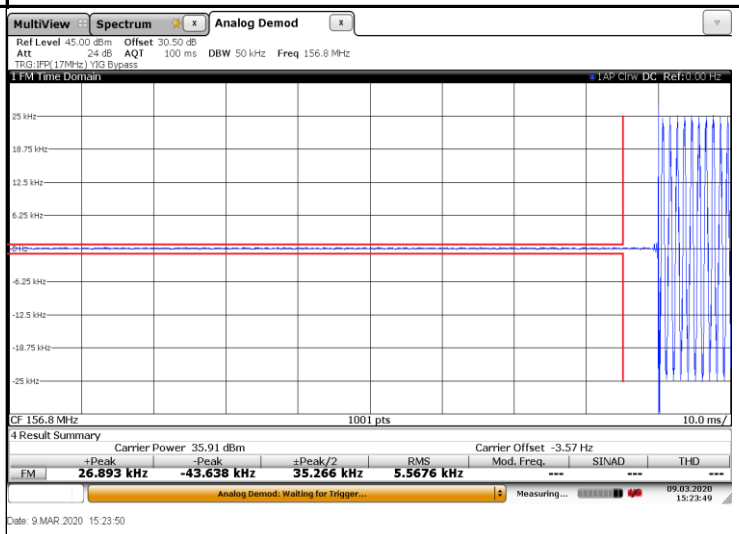
Appendix G: Adjacent Channel Power

Operation Mode	Test Channel	Test Channel	Measurement Power (dBc)	Limit (dB)	Result
TX-AWH	CH_M	Lower adjacent	-70.97	≤-70	PASS
TX-AWH	CH_M	Upper adjacent	-71.05	≤-70	PASS

Appendix H: Conducted spurious emissions conveyed to the antenna

Operation Mode	Test Channel	TEST PLOT RESULT
TX-AWH	CH_M	 9kHz~ 2GHz

Appendix I:Transient frequency behaviour of the transmitter

Operation Mode	Modulation Type	Test Channel	TEST PLOT RESULT
TX-AWH	FM	CH_M	
TX-AWH	FM	CH_M	 ON-OFF

Appendix J: Residual modulation of the transmitter

Operation Mode	Test Channel	Measured (dB)	Limit(dB)	Result
TX-AWH	CH_M	-41.02	≤-40	PASS

Appendix K: Frequency error (demodulated DSC signal)

Operation Mode	Test conditions		Frequency Error (Hz)	Limit (Hz)	Result
	Temperature	Voltage			
TX-B	T_N	V_N	2099.61	2100± 10	PASS
TX-B	T_L	V_L	2099.53	2100± 10	PASS
TX-B	T_H	V_H	2099.37	2100± 10	PASS
TX-Y	T_N	V_N	1299.71	1300± 10	PASS
TX-Y	T_L	V_L	1299.59	1300± 10	PASS
TX-Y	T_H	V_H	1299.64	1300± 10	PASS

Appendix L: Modulation index for DSC

Operation Mode	Test Channel	Modulation index	Limit	Result
TX-B	CH_{M1}	1.91	2.0± 10%	PASS
TX-Y	CH_{M1}	1.89	2.0± 10%	PASS

Appendix M: Modulation rate for DSC

Operation Mode	Test Channel	Modulation rate (Hz)	Limit	Result
TX-(B+Y)	CH_{M1}	599.999	600Hz ± 30 ppm	PASS

Appendix N: Testing of generated call sequences

Call Sent	Received without error	Telecommand 1	Telecommand 2
Distress	Yes	100	126
All Ships Urgency	Yes	100	126
All Ships Safety	Yes	100	126
Individual Routine	Yes	100	126
Group Routine	Yes	100	126

Appendix O: Harmonic distortion and rated audio frequency output power

Harmonic distortion								
Operation Mode	Temperature (℃)	Voltage (V)	Signals Llevel (dBμV)	Modulated Frequency (kHz)	Test Frequency	Measured (%)	Limit (%)	Result
RX-AW	T_N	V_N	60	0.3	CH_M	2.5	⩽10	PASS
				0.5	CH_M	1.6	⩽10	PASS
				1.0	CH_M	7.8	⩽10	PASS
			100	0.3	CH_M	2.4	⩽10	PASS
				0.5	CH_M	1.7	⩽10	PASS
				1.0	CH_M	7.6	⩽10	PASS

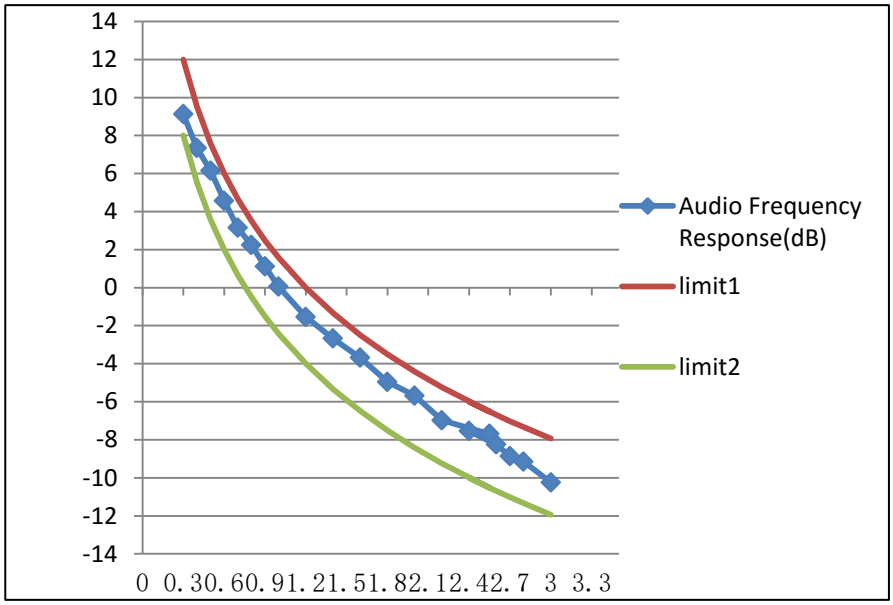
rated audio frequency output power			
TestChannel	Measured (W)	Limit (W)	Result
CH_M	2.280	≥2	PASS

Appendix P:Audio frequency response

RX-AW:CH_M			
Frequency (kHz)	Output Level(V)	Reference Level at 1kHz (V)	Audio Frequency Response(dB)
0.3	1.0927	0.3824	9.12
0.4	0.8903	0.3824	7.34
0.5	0.7763	0.3824	6.15
0.6	0.6472	0.3824	4.57
0.7	0.5496	0.3824	3.15
0.8	0.4949	0.3824	2.24
0.9	0.4350	0.3824	1.12
1	0.3846	0.3824	0.05
1.2	0.3203	0.3824	-1.54
1.4	0.2809	0.3824	-2.68
1.6	0.2500	0.3824	-3.69
1.8	0.2160	0.3824	-4.96
2	0.1988	0.3824	-5.68
2.2	0.1712	0.3824	-6.98
2.55	0.1578	0.3824	-7.69
2.4	0.1605	0.3824	-7.54
2.6	0.1479	0.3824	-8.25
2.7	0.1379	0.3824	-8.86
2.8	0.1334	0.3824	-9.15
3	0.1176	0.3824	-10.24

Appendix P:Audio frequency response

TEST PLOT RESULT



Appendix Q: Maximum Usable Sensitivity(Conducted)

Operation Mode	Temperature	Voltage	Test Channel	Measured (dBμV)	Limit (dBμV)	Result
RX-AW	T_N	V_N	CH_M	-7.4	≤+6.0	PASS
RX-AW	T_L	V_L	CH_M	-6.6	≤+12.0	PASS
RX-AW	T_H	V_H	CH_M	-7.0	≤+12.0	PASS

Appendix R: Co-Channel Rejection

Operation Mode	Test Channel	Measurement Offset (kHz)	SG B – SG A (dB)	Limit (dB)	Result
RX-AW	CH_M	-3	-7.8	-10 ~ 0	PASS
RX-AW	CH_M	0	-8.1	-10 ~ 0	PASS
RX-AW	CH_M	3	-8.0	-10 ~ 0	PASS

Appendix S: Adjacent Channel Selectivity

Operation Mode	Test Condition		Test Channel	Measurement Position	SGB–SGA (dB)	Limit (dB)	Result
	Temperature	Voltage					
RX-AW	T_N	V_N	CH_M	Lower adjacent	73.1	≥70	PASS
RX-AW	T_N	V_N	CH_M	Upper adjacent	73.4	≥70	PASS
RX-AW	T_L	V_L	CH_M	Lower adjacent	71.5	≥60	PASS
RX-AW	T_L	V_L	CH_M	Upper adjacent	71.7	≥60	PASS
RX-AW	T_H	V_H	CH_M	Lower adjacent	71.4	≥60	PASS
RX-AW	T_H	V_H	CH_M	Upper adjacent	71.5	≥60	PASS

Appendix T: Suprious Response Rejection

Operation Mode	Test Channel	Detect Frequency (MHz)	SG B – SG A (dB)	Limit (dB)	Result
RX-AW	CH_M	166.790	79.4	≥70	PASS
RX-AW	CH_M	206.750	79.9	≥70	PASS
RX-AW	CH_M	256.700	104.6	≥70	PASS
RX-AW	CH_M	266.690	104.1	≥70	PASS

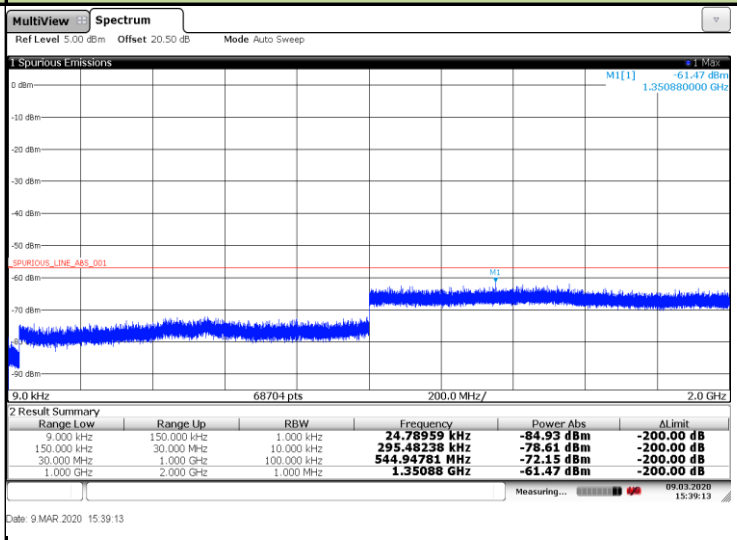
Appendix U: Intermodulation Response

Operation Mode	Test Channel	Measurement Offset (kHz)		SG B/C – SG A (dB)	Limit(dB)	Result
		SG B	SG C			
RX-AW	CH_M	-50	-100	69.9	≥68	PASS
RX-AW	CH_M	-25	-50	69.4	≥68	PASS
RX-AW	CH_M	25	50	69.3	≥68	PASS
RX-AW	CH_M	50	100	70.2	≥68	PASS

Appendix V: Blocking or Desensitization

Operation Mode	Test Channel	Measurement Offset (MHz)	SG B – SG A (dB)	Limit (dB)	Result
RX-AW	CH_M	-10	104.4	≥90	PASS
RX-AW	CH_M	-5	104.1	≥90	PASS
RX-AW	CH_M	-2	96.7	≥90	PASS
RX-AW	CH_M	-1	91.8	≥90	PASS
RX-AW	CH_M	1	91.4	≥90	PASS
RX-AW	CH_M	2	96.6	≥90	PASS
RX-AW	CH_M	5	99.0	≥90	PASS
RX-AW	CH_M	10	104.1	≥90	PASS

Appendix W: Conducted Spurious radiations

Operation Mode	Test Channel	TEST PLOT RESULT
RX-AW	CH_M	 9kHz~2GHz

Appendix X: Receiver noise and hum level

Operation Mode	Test Channel	Measured (dB)	Limit (dB)	Result
RX-AW	CH_M	-41.56	≤-40	PASS

Appendix Y:Squelch operation

Under the conditions specified in a)

RX-AW			
Test Channel	Measured (dB)	Limit (dB)	Result
CH_M	-42.40	≤-40	PASS

Under the conditions specified in b)

RX-AW			
Test Channel	Measured (dBμV)	Limit (dBμV)	Result
CH_M	4.10	≤+6.0	PASS

RX-AW			
Test Channel	Measured SINAD (dB)	Limit (dBμV)	Result
CH_M	22.50	≥20	PASS

Under the conditions specified in c)

RX-AW			
Test Channel	Measured (dBμV)	Limit (dBμV)	Result
CH_M	4.9	≤+6.0	PASS

Appendix Z:Squelch hysteresis

RX-AW			
Test Channel	Measured (dB)	Limit (dB)	Result
CH_M	4.20	3～6	PASS

Appendix AA:Multiple watch characteristic

Scanning Period:

Operation Mode	Test Condition		Test Channel	Measured(s)	Limit (s)	Result
	Temperature (℃)	Voltage (V)				
RX-AW	T_N	V_N	CH_M	1.13	≤2	PASS
	T_L	V_L	CH_M	1.14	≤2	PASS
	T_H	V_H	CH_M	1.13	≤2	PASS

Dwell Time:

Operation Mode	Test Condition		Test Channel	Measured(ms)	Limit (ms)	Result
	Temperature (℃)	Voltage (V)				
RX-AW	T_N	V_N	CH_M	100	150	PASS
	T_L	V_L	CH_M	100	150	PASS
	T_H	V_H	CH_M	100	150	PASS

Dwell time on the additional channel:

Operation Mode	Test Condition		Test Channel	Measured(s)	Limit (s)	Result
	Temperature (℃)	Voltage (V)				
RX-AW	T_N	V_N	CH_M	1.25	0.85~2	PASS
	T_L	V_L	CH_M	1.29	0.85~2	PASS
	T_H	V_H	CH_M	1.27	0.85~2	PASS

Appendix AB: Maximum Usable Sensitivity

Operation Mode	Temperature	Voltage	Test Channel	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	T_N	V_N	CH_{M1}	0.004	$\leqslant 10^{-2}$	PASS
RX-DSC	T_L	V_L	CH_{M1}	0.006	$\leqslant 10^{-2}$	PASS
RX-DSC	T_H	V_H	CH_{M1}	0.006	$\leqslant 10^{-2}$	PASS

Appendix AC: Co-Channel Rejection

Operation Mode	Test Channel	Measurement Offset (kHz)	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH_{M1}	-3	0.003	$\leqslant 10^{-2}$	PASS
RX-DSC	CH_{M1}	0	0.005	$\leqslant 10^{-2}$	PASS
RX-DSC	CH_{M1}	3	0.006	$\leqslant 10^{-2}$	PASS

Appendix AD: Adjacent channel selectivity

Operation Mode	Test Condition		Test Channel	Measurement Position	Measured (error ratio)	Limit (error ratio)	Result
	Temperature	Voltage					
RX-DSC	T_N	V_N	CH_{M1}	Lower adjacent	0.005	$\leqslant 10^{-2}$	PASS
RX-DSC	T_N	V_N	CH_{M1}	Upper adjacent	0.006	$\leqslant 10^{-2}$	PASS
RX-DSC	T_L	V_L	CH_{M1}	Lower adjacent	0.006	$\leqslant 10^{-2}$	PASS
RX-DSC	T_L	V_L	CH_{M1}	Upper adjacent	0.007	$\leqslant 10^{-2}$	PASS
RX-DSC	T_H	V_H	CH_{M1}	Lower adjacent	0.007	$\leqslant 10^{-2}$	PASS
RX-DSC	T_H	V_H	CH_{M1}	Upper adjacent	0.006	$\leqslant 10^{-2}$	PASS

Appendix AE: Spurious response and blocking immunity

Spurious response:

Operation Mode	Test Channel	Spurious Frequency (MHz)	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH_{M1}	166.515	0.004	$\leqslant 10^{-2}$	PASS
		206.475	0.006		
		256.425	0.005		
		266.415	0.006		

Blocking immunity:

Operation Mode	Test Channel	Measurement Offset (MHz)	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH_{M1}	-10	0.004	$\leqslant 10^{-2}$	PASS
		-5	0.005		
		-2	0.006		
		-1	0.006		
		1	0.007		
		2	0.006		
		5	0.005		
		10	0.003		

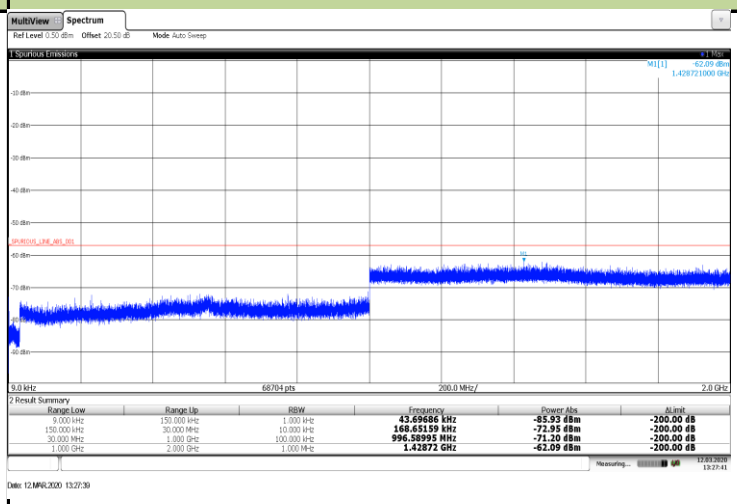
Appendix AF: Intermodulation response

Operation Mode	Test Channel	Measurement Offset (kHz)		Measured (error ratio)	Limit (error ratio)	Result
		SG B	SG C			
RX-DSC	CH_{M1}	-50	-100	0.007	$\leqslant 10^{-2}$	PASS
		50	100	0.006	$\leqslant 10^{-2}$	PASS

Appendix AG: Dynamic range

Operation Mode	Test Channel	Measured (error ratio)	Limit (error ratio)	Result
RX-DSC	CH_{M1}	0.006	$\leqslant 10^{-2}$	PASS

Appendix AH: spurious emissions

Operation Mode	Test Channel	TEST PLOT RESULT
RX-DSC	CH_{M1}	

Appendix AI: Verification of correct decoding of various types of DSC calls

Call Sent	Received (Y or N)	Telecommand 1	Telecommand 2
Distress	Y	100	126
All Ships Distress Ack	Y	110	126
All Ships Distress Relay	Y	112	126
All Ships Urgency	Y	110	126
All Ships Safety	Y	100	126
Individual Urgency	Y	100	126
Individual Safety	Y	100	126
Individual Routine	Y	100	126
Group Routine	Y	100	126

Function Check	Result
Confirm that the decoded call sequences at the output of the receiver have been examined for correct technical format, including error check characteristics.	Yes
Errors found:	No
Confirm that the checks have been made to ensure accordance between printer output and display	Yes
Errors found:	No
It has been verified that the equipment is capable of switching to a channel identified in the DSC call:	Yes

Appendix AJ: Reaction to VTS and AIS channel management DSC transmissions

Function Check	Received (Y or N)
Not sound an alarm	Y
Not display a message(An accurate informative display is permissible but not required)	Y
Not transmit a response	Y
Not suggest a transmitted response	Y
Not lock up	Y
Not require operator intervention	Y

Appendix AK: Simultaneous reception

Operation Mode	Test Channel	Measured SINAD(dB)	Limit (dB)	Result
RX-AW	CH_M	22.37	≥20	PASS

Operation Mode	Test Channel	Measured (error ratio)	Limit ((error ratio))	Result
RX-DSC	CH_{M1}	0.007	$\leqslant 10^{-2}$	PASS

----End of Report----