RADIO TEST REPORT

ETSI EN 300 296 V2.1.1 (2016-03)

Report Reference No.	:	**POCE210325026MRE-R1**
Applicant's Name	:	Shenzhen Sunjet Electronic Co., Ltd
Address of Applicant	:	West, 3rd floor, Building 1, Xinkecheng Industry Park, No. 51, Dabao Road, District 28, Xinan Street, Baoan District, Shenzhen City, Guangdong province, China
Test Firm	:	Shenzhen POCE Technology Co., Ltd.
Address of Test Firm	:	H Building, Hongfa Science And Technology Park, Tangtou, Shiyan, Bao'An District, Shenzhen, China
Test Specification Standard	:	**ETSI EN 300 296 V2.1.1 (2016-03)**
Product Name	:	walkie talkie
Model/Type Reference	:	T388
Listed Models	:	N/A
Date of Receipt	:	Apr. 06, 2021
Date of Test	:	Apr. 06, 2021 -- Apr. 08, 2021
Data of Issue	:	Apr. 08, 2021
Result	:	PASS

Compiled by:	Supervised by:	Approved by:
Amy Zhu/ File administrators	Stone Yin/ Technique principal	Bill Yuan/ Manager

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1 SUMMARY OF TEST RESULTS

Test standard

ETSI EN 300 296 V2.1.1 (2016-03) –Land Mobile Service; Radio equipment using integral antennas intended primarily for analogue speech; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU

ETSI TR 100 028 (V1.4.1) (12-2001) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

ETSI TR 100 028-2 (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

Test Description

Test Item	Sub-clause	Result	Note
Transmitter frequency error	7.1	PASS	LT
Transmitter effective radiated power	7.2	PASS	LT
Transmitter frequency deviation	7.3	PASS	/
Transmitter adjacent and alternate channel power	7.4	PASS	/
Transmitter unwanted emissions in the spurious domain	7.5	PASS	LT
Transmitter voice operated transmit	7.6	N/A	/
Transmitter maximum transmit time	7.7	N/A	/
Receiver maximum useable sensitivity	8.1	PASS	LT
Receiver spurious radiations	8.2	PASS	/
Receiver co-channel rejection	8.3	PASS	/
Receiver adjacent channel selectivity	8.4	PASS	LT
Receiver spurious response rejection	8.5	PASS	/
Receiver inter-modulation response rejection	8.6	PASS	/
Receiver blocking or desensitization	8.7	PASS	/

Note: LT means limited tests item according to EN 300 793 V1.1.1 (1998-02) Annex B.2

Not applicable: This item only for equipment without a PTT.

2 GENERAL INFORMATION

2.1 Client Information

Applicant	:	Shenzhen Sunjet Electronic Co., Ltd
Address	:	West, 3rd floor, Building 1, Xinkecheng Industry Park, No. 51, Dabao Road, District 28, Xinan Street, Baoan District, Shenzhen City, Guangdong province, China
Manufacturer	:	Shenzhen Sunjet Electronic Co., Ltd
Address	:	West, 3rd floor, Building 1, Xinkecheng Industry Park, No. 51, Dabao Road, District 28, Xinan Street, Baoan District, Shenzhen City, Guangdong province, China

2.2 Test Environmental conditions

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

Temperature	Normal Temperature:	25°C
	High Temperature:	55°C
	Low Temperature:	-20°C
Voltage	Normal Voltage	DC 6.0V
Other	Relative Humidity	55 %
	Air Pressure	101 kPa

2.3 Description of EUT

Product Name:	walkie talkie
Model/Type reference:	T388
Serial models:	/
Trade Name	/
Power supply:	DC 6.0V battery (AAA*4)
HW/SW:	V01 / V1.0
SRD	
Frequency Range:	446.00625 –446.09375MHz
Modulation:	FM-F3E
Operation frequency:	12.5/25 KHz
Channel number:	Spring antenna
Operating frequency:	0dBi

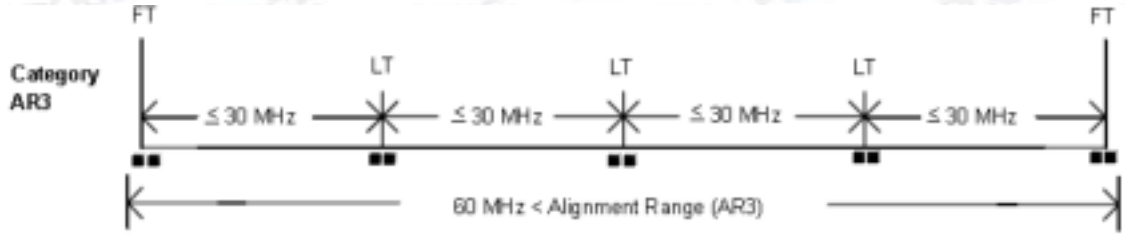
2.4 Test Frequency and Description of Test Modes

The EUT has been tested under typical operating condition. As, test modes selected as below by the technical parameters of the EUT:

Operation Mode No.	Modulation	Channel Separation	Condition	
	FM	12.5KHz/25KHz	TX	RX
1	☒	☒	☒	
2	☒	☒		☒

Test frequency list

According to EN 300 793 V1.1.1 (1998-02) clause 4.3 the alignment Rang of this device is belong to Category AR3, Full tests shall be carried out on two channels, one within 50 kHz of the highest, and one within 50 kHz of the lowest frequency of the alignment range. Limited tests shall be carried out on intermediate test channels, equally spaced (±50 kHz) over the alignment range and chosen such that the gaps between the test channels do not exceed 30 MHz



NOTE:

FT	Full tests.
LT	Limited tests.
■■	50 kHz range in which tests are carried out.

Frequency selected to perform test as below:

Modulation Type	Channel	Test Frequency (MHz)	Power
GMRS	CH01	462.5625	0.5W
	CH02	462.5875	
	CH03	462.6125	
	CH04	462.6375	
	CH05	462.6625	
	CH06	462.6875	
	CH07	462.7125	
FRS	CH08	467.5625	0.5W
	CH09	467.5875	
	CH10	467.6125	
	CH11	467.6375	
	CH12	467.6625	
	CH13	467.6875	
	CH14	467.7125	
GMRS	CH15	462.5500	0.5W
	CH16	462.5750	
	CH17	462.6000	
	CH18	462.6250	
	CH19	462.6500	
	CH20	462.6750	
	CH21	462.7000	
	CH22	462.7250	

frequency selected for test

Modulation Type	Channel	Test Frequency (MHz)	Power
GMRS	CH01	462.5625	0.5W
GMRS	CH04	462.6375	0.5W
FRS	CH11	467.6375	0.5W
GMRS	CH15	462.5500	0.5W

The tests for frequencies 462.5625MHz and 462.5875MHz are manufacturer's requirements.
Note3: This device uses 467MHz band FRS channels and 462MHz band GMRS channels.

2.5 Test Facility

CNAS Registration Number is L8229

Shenzhen POCE Technology 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: Jan. 06, 2016.

VCCI Membership No.: 3941

The 3m Semi-anechoic chamber of Shenzhen POCE Technology Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.:R-3941.
Date of Registration: Oct. 22, 2018.

2.6 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 CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen POCETechnology 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 POCE. is reported

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

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.7 Measurement Instruments List

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	E4408B	CFG006	Dec. 09, 2021
2	Test Receiver	R&S	ESPI	102109	Dec. 09, 2021
3	Test Receiver	R&S	ESCI	101431	Dec. 09, 2021
4	Bilog Antenna	Model JB6	CBL6111D	A090414	Dec. 09, 2021
5	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	Dec. 09, 2021
6	Spectrum Analyzer	ADVANTEST	R3132	150900201	Dec. 09, 2021
7	Horn Ant	Schwarzbeck	Model DRH-118	A091114	Dec. 09, 2021
8	Low Fre.Amplifier	Schwarzbeck	BBV9743	9743-151	Dec. 09, 2021
9	High Fre. AMP	Schwarzbeck	BBV9718	9718-282	Dec. 09, 2021
10	Loop Antenna	ARA	PLA-2030/B	1029	Dec. 09, 2021
11	Power Meter	R&S	NRVS	100696	Dec. 09, 2021
12	Signal Generator	R&S	SMT 06	832080/007	Dec. 09, 2021
13	Temperature & Humitidy Chamber	GIANT FORCE	GTH-056P	GF-94454-1	Dec. 09, 2021
14	Power Sensor (AV)	R&S	URV5-Z4	0395.1619.05	Dec. 09, 2021
15	Noise Generaror	Ningbo Zhongce	DF1681	EMC0009	Dec. 09, 2021
16	BT test set	Anritsu	MT8852B	6K00005966	Dec. 09, 2021
17	Wireless communication	Agilent	E5515C	GB44300243	Dec. 09, 2021

3 TEST ITEM AND RESULTS

3.1 Transmitter

3.1.1. Frequency Error

LIMIT

The frequency error shall not exceed the values given in table 2 under normal or extreme conditions.

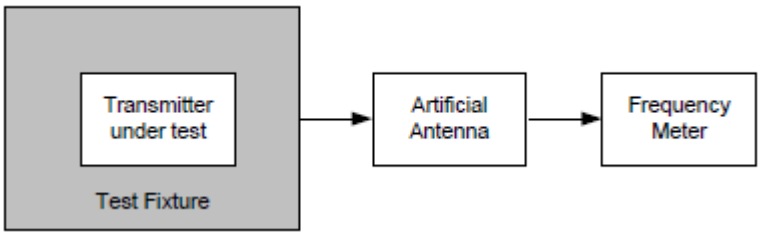
Table 2: Frequency error

Channel separation (kHz)	Frequency error limit (kHz)				
	below 47 MHz	47 MHz to 137 MHz	above 137 MHz to 300 MHz	above 300 MHz to 500 MHz	above 500 MHz to 1 000 MHz
20 and 25	±0,60	±1,35	±2,00	±2,00	±2,50 (see note)
12,5	±0,60	±1,00	±1,50	±1,50 (see note)	±2,50 (see note)

NOTE: For handportable stations having integral power supplies, the figures given in the table only apply to the limited temperature range 0 °C to +40 °C. However for the full extreme temperature conditions (clause 5.4.1) exceeding the limited temperature range above, the following frequency error limits apply:
- ±2,50 kHz between 300 MHz and 500 MHz;
- ±3,00 kHz between 500 MHz and 1 000 MHz.

Test Configuration

The equipment shall operate in continuous transmission mode during the time necessary to perform the measurement of the frequency.



The equipment shall be connected to the artificial antenna.
The measurement arrangement in figure 2 shall be used.
The carrier frequency shall be measured in the absence of modulation. The measurement shall be made under normal test conditions (see clause 5.3) and extreme test conditions (see clause 5.4).

TEST RESULTS

Test Condition	Frequency (MHz)	Carrier frequency (MHz)	Tolerance (kHz)	Limit (kHz)	Result
6.0V/25°C	462.5625	462.5626	0.14	±1.5	PASS
	462.6375	462.6378	0.34		
	467.6375	467.6378	0.27		
	462.5500	462.5508	0.78		

3.1.2. Transmitter power conducted & radiated

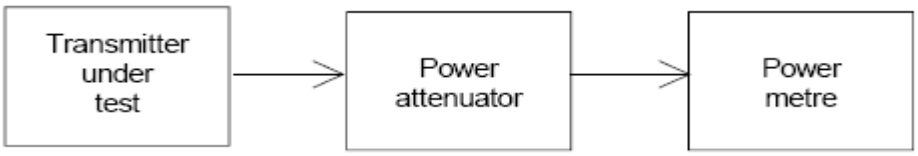
LIMIT

The transmitter power (conducted) under the specified conditions of measurement (see clause 7.2.2) and at normal test conditions (see clause 5.3), shall be within ±1,5 dB of the rated carrier power (conducted).

The transmitter power (conducted) under extreme test conditions (see clause 5.4) shall be within +2,0 dB and -3,0 dB of the rated output power.

NOTE: It is assumed that the appropriate National Administration will state the maximum permitted transmitter output power.

Test Configuration



For practical reasons, measurements shall be performed only at the lowest and highest power level at which the transmitter is intended to operate.

The measurement arrangement in figure 3 shall be used.

The measurement shall be performed in the absence of modulation.

The transmitter shall be set in continuous transmission mode.

The transmitter shall be connected to a power attenuator and the mean power delivered to this artificial antenna shall be measured.

The measurement shall be made under normal test conditions (see clause 5.3) and extreme test conditions (see clause 5.4).

TEST RESULTS

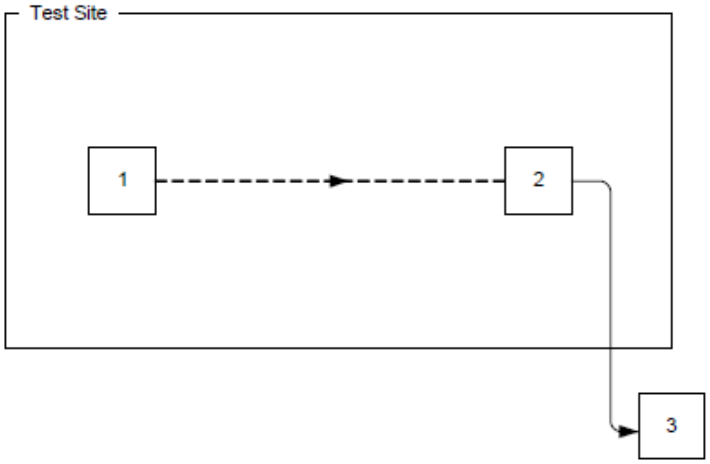
Test Condition	Channel Separation	Frequency/ Channel (MHz)	Transmitter power	Theoretical power	Limit	Result
6.0V/+25°C	12.5KHz	462.5625	26.56	27dBm	±1.5dBm	**PASS**
		462.6375	26.69			
		467.6375	26.81			
		462.5500	26.93			

NOTE: Manufacturer declares the maximum transmit power of this device is 0.5W(36.02dBm) and the minimum transmit power is 1W(27dBm)

Effective radiated power

Method of measurement

Maximum effective radiated power under normal test conditions



1: Transmitter under test.

2: Test antenna.

3: Spectrum analyser or selective voltmeter (test receiver).

Measurement arrangement

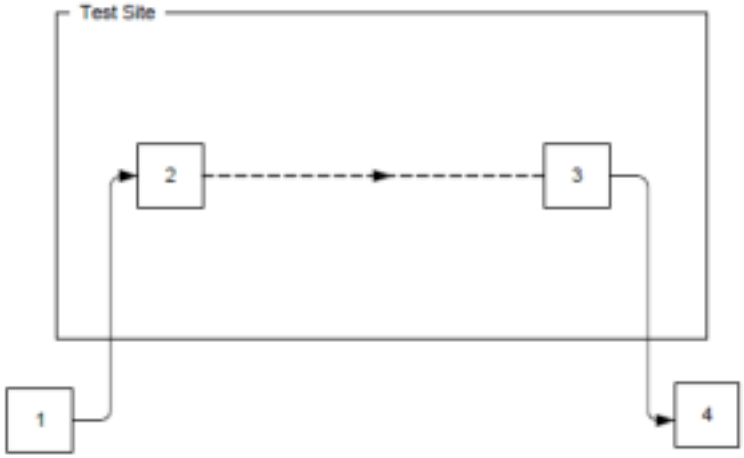
a) A test site, selected from annex A, which fulfils the requirements of the specified frequency range of this measurement shall be used. The measurement arrangement of figure 3 shall be used. The test antenna shall be oriented initially for vertical polarization unless otherwise stated.
The equipment and its antenna shall be mounted in a normal installation in its normal operating position and switched on without modulation.

b) The spectrum analyser or selective voltmeter shall be tuned to the transmitter carrier frequency. The test antenna shall be raised or lowered through the specified height range until the maximum signal level is detected on the spectrum analyser or selective voltmeter.

c) The transmitter shall be rotated through 360° around a vertical axis in order to find the direction of the maximum signal.

d) The test antenna shall be raised or lowered again through the specified height range until a new maximum is obtained. This level shall be recorded. (This maximum may be a lower value than the value obtainable at heights outside the specified limits.)

The test antenna may not need to be raised or lowered if the measurement is carried out on a test site according
to clause A.1.1.



1: Signal generator.

2: Substitution antenna.

3: Test antenna.

4: Spectrum analyser or selective voltmeter (test receiver).

Measurement arrangement

e) Using the measurement arrangement of figure 4 the substitution antenna, shall replace the transmitter antenna

in the same position and in vertical polarization. The frequency of the signal generator shall be adjusted to the transmitter carrier frequency. The test antenna shall be raised or lowered as necessary to ensure that the maximum signal is still received.

The test antenna need not be raised or lowered if the measurement is carried out on a test site according to clause A.1.1.

The input signal to the substitution antenna shall be adjusted in level until an equal or a known related level to that detected from the transmitter is obtained in the test receiver.

The maximum carrier radiated power is equal to the power supplied by the signal generator, increased by the known relationship if necessary and after corrections due to the gain of the substitution antenna and the cable loss between the signal generator and the substitution antenna.

f) Steps b) to e) above shall be repeated with the test antenna and the substitution antenna oriented in horizontal polarization.

TEST RESULTS

Frequency (MHz)	PMea (dBm)	Pcl (dB)	Ga Antenna Gain (dBi)	Correction (dB)	PAg (dB)	ERP (dBm)	ERP (W)	Polarization
462.5625	-11.56	2.08	7.69	2.15	34.59	26.49	0.4457	V
462.5625	-11.63	2.08	7.69	2.15	34.59	26.42	0.4385	H
462.6375	-11.46	2.08	7.69	2.15	34.59	26.59	0.4560	V
462.6375	-11.36	2.08	7.69	2.15	34.59	26.69	0.4667	H
467.6375	-11.54	2.08	7.69	2.15	34.59	26.51	0.4477	V
467.6375	-11.39	2.08	7.69	2.15	34.59	26.66	0.4634	H
462.6500	-11.12	2.08	7.69	2.15	34.59	26.93	0.4932	V
462.6500	-11.34	2.08	7.69	2.15	34.59	26.71	0.4688	H

NOTE: 1. EIRP=PMea(dBm) +PAg(dB) -Pcl(dB) +Ga(dBi)

2. ERP = EIRP – 2.15dBi as EIRP by subtracting the gain of the dipole.

3.1.3. Frequency deviation

LIMIT

Maximum permissible frequency deviation

The maximum permissible frequency deviation for modulation frequencies from the lowest frequency transmitted (f1) by the equipment (as declared by the manufacturer) up to (f2) shall be as given in table 3.

Channel separation (kHz)	Maximum permissible frequency deviation (kHz)
12,5	±2,5
20	±4,0
25	±5,0

TEST PROCEDURE

The maximum permissible frequency deviation (positive or negative) shall be measured at the output of the transmitter connected to a 50 Ω power attenuator, by means of a deviation metre capable of measuring the maximum permissible frequency deviation, including that due to any harmonics and intermodulation products which may be generated in the transmitter.

The modulation frequency shall be varied between the lowest frequency considered to be appropriate, and 3 kHz(see note).

NOTE: 2,55 kHz for transmitters intended for 12,5 kHz channel separation.

The level of this test signal shall be 20 dB above the level of the normal test modulation, clause 6.1.

The transmitter shall be operated under normal test conditions, see clause 5.3.

TEST RESULTS

Test Condition	Channel Separation	Instantaneous frequency (MHz)	Carrier frequency (MHz)	Tolerance (KHz)	Limit	Result
6.0V/+25°C	12.5KHz	462.5625	462.5642	1.73	±5KHz	**PASS**
		462.6375	462.6388	1.26		
		467.6375	467.6384	0.93		
		462.5500	462.5511	1.09		

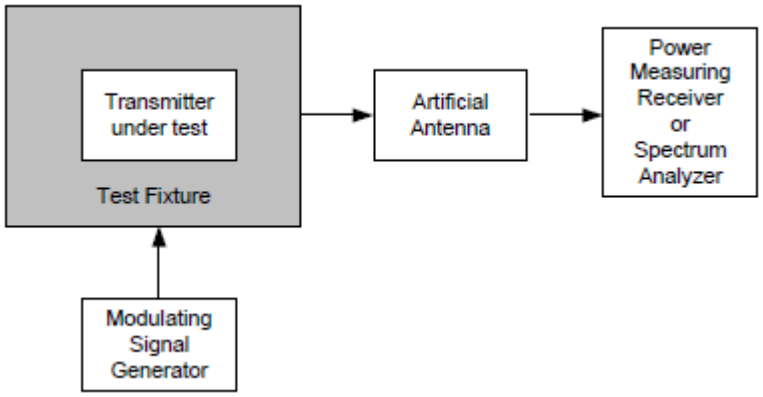
3.1.4. Adjacent and alternate channel power

Limit

The adjacent channel power shall not exceed a value of 60,0 dB below the transmitter carrier power without the need to be below 0,20 µW.

The alternate channel power shall not exceed a value of 70,0 dB below the carrier power of the transmitter without the need to be below 0,20 µW.

TEST PROCEDURE



During the test, the transmitter shall be set in continuous transmission mode. If this is not possible, the measurements shall be carried out in a period shorter than the duration of the transmission. Averaging measurements with 100 samples are possible.

The measurement arrangement in figure 7 shall be used.

The adjacent channel power may be measured, as follows, with a power measuring receiver which conforms to annex B (referred to in this clause as the "receiver"):

a) the transmitter shall be operated at the transmitter power determined in clause 7.2 under normal test conditions (see clause 5.3). The output of the transmitter shall be linked to the input of the "receiver" by a connecting device such that the impedance presented to the transmitter is 50 Ω and the level at the "receiver input" is appropriate;

b) with the transmitter unmodulated, the tuning of the "receiver" shall be adjusted so that a maximum response is obtained. This is the 0 dB response point. The "receiver" attenuator setting and the reading of the metre shall be recorded;

c) the frequency of the "receiver" shall be adjusted above the carrier so that the "receiver" -6 dB response nearest to the transmitter carrier frequency is located at a displacement from the nominal carrier frequency as given in table 4a;

Table 4a: Frequency displacement

Channel separation (kHz)	Specified necessary bandwidth (kHz)	Displacement of the -6 dB point from the nominal carrier frequency (kHz)
12,5	8,5	8,25
20	14	13
25	16	17

d) the transmitter shall be modulated by a test signal of 1 250 Hz at a level which is 20 dB higher than that required to produce 60 % of the maximum permissible deviation, clause 7.4.3.1;

e) the "receiver" variable attenuator shall be adjusted to obtain the same metre reading as in step b), or a known relation to it;

f) the ratio of the adjacent channel power to the carrier power is the difference between the attenuator settings in steps b) and e), corrected for any differences in the reading of the metre.

For each adjacent channel, the adjacent channel power shall be recorded:
- the measurement shall be repeated with the frequency of the "receiver" adjusted below the carrier so that the "receiver" -6 dB response nearest to the transmitter carrier frequency is located at a displacement from the nominal carrier frequency as given in table 4a;
- the adjacent channel power of the equipment under test shall be expressed as the higher of the two values recorded in step f) for the upper and lower channels nearest to the channel considered.

Steps c) to f) shall be repeated for the alternate channels with the values in table 4b.

Table 4b: Frequency displacement

Channel separation (kHz)	Specified necessary bandwidth (kHz)	Displacement of the -6 dB point from the nominal carrier frequency (kHz)
12,5	8,5	20,75
20	14	33
25	16	42

For each alternate channel, the alternate channel power shall be recorded:
- the measurement shall be repeated with the frequency of the "receiver" adjusted below the carrier so that the "receiver" -6 dB response nearest to the transmitter carrier frequency is located at a displacement from the nominal carrier frequency as given in table 4b;
- the alternate channel power of the equipment under test shall be expressed as the higher of the two values recorded in step f) for the upper and lower channels nearest to the channel considered.

TEST RESULTS

Test Condition		Test Channel	Adjacent or Alternate Channel	Channel Power (dBc)	Limit (dBc)	Result
Temperature (℃)	Voltage (V)					
25	6.0V	462.5625	Lower Adjacent	-62.93	-60	PASS
			Upper Adjacent	-63.32		
		462.6375	Lower Adjacent	-63.89	-60	
			Upper Adjacent	-63.69		
		467.6375	Lower Adjacent	-63.25	-60	
			Upper Adjacent	-63.88		
		462.5500	Lower Adjacent	-62.21	-60	
			Upper Adjacent	-62.88		

3.1.5. Unwanted emissions in the spurious

LIMIT

The power of any spurious emission shall not exceed the values given in table 6a.

Table 6a: Radiated emissions

Frequency range	Tx operating	Tx standby
30 MHz to 1 GHz	0,25 µW (-36 dBm)	2,0 nW (-57 dBm)
Above 1 GHz to 4 GHz, or above 1 GHz to 12,75 GHz (see clause 7.5.2)	1,00 µW (-30 dBm)	20 nW (-47 dBm)

The reference bandwidths used shall be as stated in tables 6b and 6c.

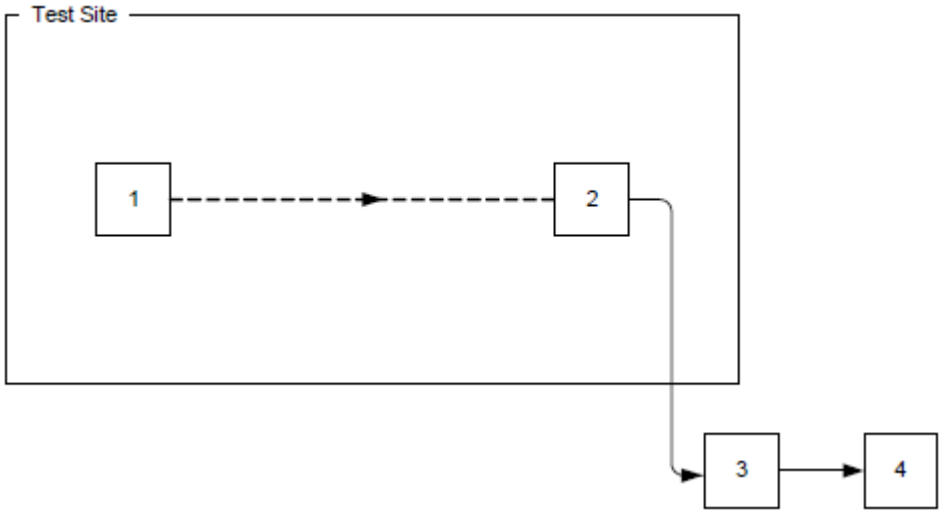
Table 6b: Reference bandwidths to be used for the measurement of spurious emission

Frequency range	RBW
30 MHz to 1 GHz	100 kHz
1 GHz to 12,75 GHz	1 MHz

Table 6c: Reference bandwidths to be used close to the wanted emission (for equipment operating below 1 GHz)

Frequency offset from carrier	RBW
250 % of the CSP to 100 kHz	1 kHz
100 kHz to 500 kHz	10 kHz

TEST PROCEDURE



NOTE 1: Transmitter under test.
NOTE 2: Test antenna.
NOTE 3: High "Q" (notch) or high pass filter.
NOTE 4: Spectrum analyser or selective voltmeter (test receiver).

The measurement arrangement in figure 9 shall be used.

The measurement procedure shall be as follows:

a) On a test site, fulfilling the requirements of annex A, the sample shall be placed at the specified height on the support.

b) The transmitter shall be operated at the transmitter power as specified under clause 7.2, delivered to the integral antenna.

c) If possible, the measurement shall be made with the transmitter unmodulated. If this is not possible, the transmitter shall be modulated by the normal test signal as appropriate (see clause 6.1).

The transmitter shall be set in continuous transmission mode. If this is not possible, this fact shall be stated in the test report and precautions shall be taken to ensure that all spurious emissions are correctly detected and measured.

The resolution bandwidth of the measuring instrument shall be the smallest bandwidth available which is greater than the spectral width of the spurious component being measured. This shall be considered to be achieved when the next highest bandwidth causes less than 1 dB increase in amplitude.

As a general rule, the resolution bandwidth of the measuring receiver should be equal to the reference bandwidth.
The conditions used in the relevant measurements shall be reported in the test report.

d) The radiation of any spurious components shall be detected by the test antenna and receiver, over the frequency range 30 MHz to 4 GHz, For equipment operating on frequencies above 470 MHz the measurements shall also be performed over the frequency range 4 GHz to 12,75 GHz if emissions are detected within 10 dB of the of the specified limit between 1,5 GHz and 4 GHz.

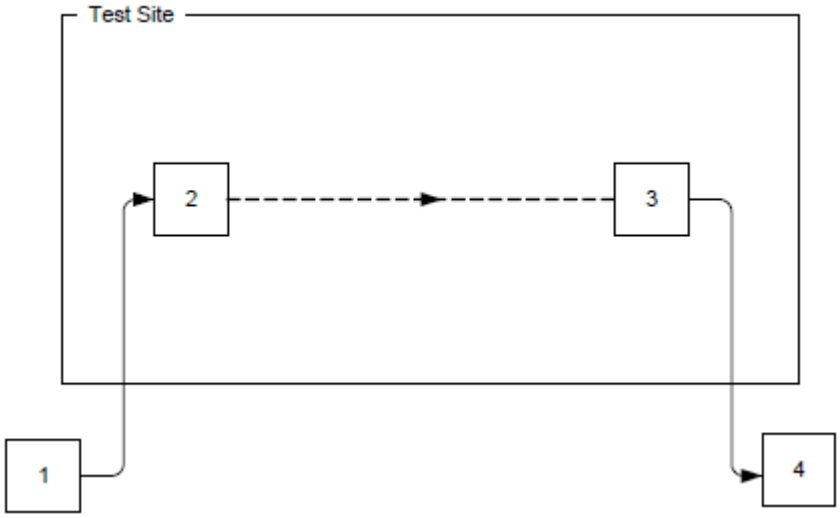
The measurements are performed excluding the five contiguous channels centred on the channel on which the transmitter is intended to operate.

e) At each frequency at which a component is detected, the sample shall be rotated to obtain maximum response and the effective radiated power of that component determined by a substitution measurement, using the measurement arrangement of figure 10.

f) The value of the effective radiated power of that component shall be recorded.

g) The measurements shall be repeated with the test antenna in the orthogonal polarization plane.

h) The measurements shall be repeated with the transmitter in the "stand-by" position.



NOTE 1: Signal generator.

NOTE 2: Substitution antenna.

NOTE 3: Test antenna.

NOTE 4: Spectrum analyser or selective voltmeter (test receiver).

TEST RESULTS

We tested the low/mid/high channel, but just recorded the worst channel

Frequency (MHz)	ANT polarization	Result (dBm)	Limit (dBm)	Margin (dB)	Result
892.01	V	-40.71	-36	4.71	PASS
1338.02	V	-50.22	-36	14.22	PASS
1784.03	V	-46.04	-30	16.04	PASS
--	--	--	--	--	--
892.01	H	-42.75	-36	6.75	PASS
1338.02	H	-52.54	-36	16.54	PASS
1784.03	H	-40.59	-30	10.59	PASS

3.1.6. Transmitter maximum transmit time

Limit

The maximum transmission time shall be less than 180 seconds.
This requirement only applies to PMR446 equipment [i.7] having Push-To-Talk (PTT) functionality capable of being latched 'on' or no PTT functionality.

TEST PROCEDURE

The measurement arrangement in figure 8 shall be used.
The measurement procedure shall be as follows:
a) the transmitter under test shall be activated;
b) the output power shall be monitored;
c) the time between the start of transmission and the end of the transmission, shall be noted.

NOTE 1: The start of transmission is taken as the time when the measured power has increased from a value at least 70 dB below the value measured in clause 7.2 to not less than 3 dB below the value measured in clause 7.2.

NOTE 2: The end of transmission is taken as the time when the measured power has reduced by at least 70 Db below the value measured in clause 7.2.

TEST RESULTS

N/A

NOTE: PMR446 [i.7] equipment only

3.2 Receiver

3.2.1 Average useable sensitivity

LIMIT

For the average usable sensitivity limits, four categories of equipment are defined as follows:
Category A: equipment having an integral antenna fully within the case.
Category B: equipment having an extractable or fixed integral antenna, with an antenna length not exceeding 20 cm external to the case.
Category C: equipment having an extractable or fixed integral antenna, with an antenna length exceeding 20 cm external to the case.
Category D: equipment not covered by category A, B or C.

Under normal test conditions, the average usable sensitivity shall not exceed the following field strength values.

Table 7a: Sensitivity limits for Categories A and D

Frequency band (MHz)	Average usable sensitivity in dB relative to 1μV/m
30 to 400	30,0
> 400 to 750	31,5
> 750 to 1 000	33,0

Table 7b: Sensitivity limits for Category B

Frequency band (MHz)	Average usable sensitivity in dB relative to 1μV/m
30 to 130	21,0
> 130 to 300	22,5
> 300 to 440	24,5
> 440 to 600	26,5
> 600 to 800	28,5
> 800 to 1 000	31,0

Category C
At frequencies greater than 375 MHz the limits shall be as specified in table 7b.
In the case of frequencies less than or equal to 375 MHz a correction factor K shall be subtracted from the specified field strengths in table 7b.
• K = 20 log10 [(l + 20)/40];
• where l is the external part of the antenna in cm.

This correction only applies if the antenna length external to the case is less than (15 000/fo - 20) in cm, where fo is the frequency in MHz.

For all categories of equipment, add 6 dB to the limit under normal test conditions to obtain the limit under extreme test conditions.

TEST PROCEDURE

The test signal, at the nominal frequency of the receiver, with normal test modulation, at an emf. of 6 dBμV, value ofthe limit for the maximum usable sensitivity, shall be applied to the receiver input connector.

An audio frequency output load, a SINAD Meter and a psophometric telephone weighting network shall be connected to the receiver output terminals.

Where possible, the receiver volume control shall be adjusted to give at least 50 % of the rated output power, in the caseof stepped volume controls, to the first step that provides an output power of at least

50 % of the rated output power.

The test signal input level shall be reduced until a SND/ND ratio of 20 dB is obtained.
The test signal input level under these conditions is the value of the maximum usable sensitivity.
The measurement shall be made under normal test conditions and repeated under extreme test conditions.

Under extreme test conditions, the receiver audio output power shall be within ±3,0 dB of the value obtained undernormal test condition.

TEST RESULTS

We tested low, medium and high channels, but only recorded the worst low channels

Test Conditions		MAX Measured Sensitivity (dBμV/m)	Limit (dBμV/m)	Results
Frequency (MHz)	Position			
462.5625	0/180/270	22	26.5	PASS
462.6375	0/180/270	25		
467.6375	0/180/270	24		
462.5500	0/180/270	23		

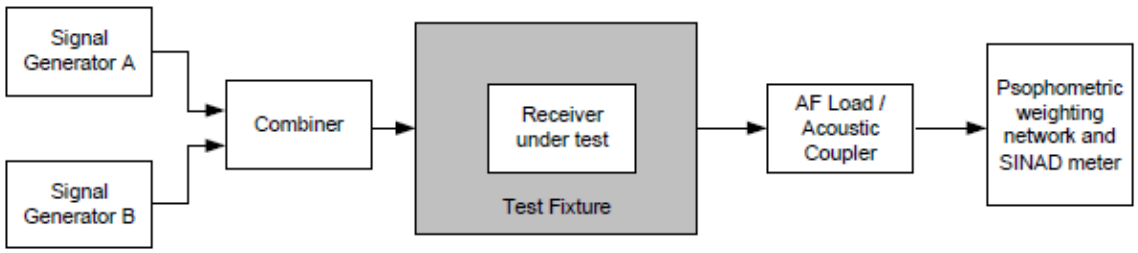
3.2.2 Co-channel rejection

Limit

The value of the co-channel rejection ratio, expressed in dB, at the signal displacements given in the method ofmeasurement, shall be:

- between -8,0 dB and 0 dB, for channel separations of 20 kHz and 25 kHz;
- between -12,0 dB and 0 dB, for channel separations of 12,5 kHz.

Test Procedure



a) The receiver shall be placed in the test fixture (clause A.4).
Two signal generators A and B shall be connected to the test fixture via a combining network.
The wanted signal, provided by signal generator A, shall be at the nominal frequency of the receiver and shall have normal test modulation A-M1 (see clause 6.1).
The unwanted signal, provided by signal generator B, shall be modulated with signal A-M3 (see clause 6.1).
Both input signals shall be at the nominal frequency of the receiver under test.

b) Initially, signal generator B (unwanted signal) shall be switched off (maintaining its output impedance).

The level of the wanted signal from generator A shall be adjusted to a level which is equivalent to the level of the limit of the average usable sensitivity, for the category of equipment used, expressed as a field strength (clauses 8.1.3 and 6.7).

Where possible, the receiver volume control shall be adjusted to give at least 50 % of the rated output power, clause 6.6, or, in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated output power.

c) The unwanted signal from generator B shall then be switched on.

d) The level of signal generator B shall be adjusted so that the unwanted signal causes:

- a reduction of 3 dB in the output level of the wanted signal; or
- a reduction to 14 dB of the SINAD ratio at the receiver output (with a psophometric filter), whether or not measured acoustically; whichever occurs first.

e) The level of the unwanted signal shall be noted.
f) For each frequency of the unwanted signal, the co-channel rejection ratio shall be expressed as the ratio, in dB, of the level of the unwanted signal to the level of the wanted signal.
This ratio shall be recorded.
g) The measurement shall be repeated for displacements of the unwanted signal of ±6 % and ±12 % of the channel separation.

h) The co-channel rejection of the equipment under test shall be expressed as the lowest of the five values expressed in dB, recorded in step f).
The value of the co-channel rejection ratio, expressed in dB, is generally negative (therefore, for example, -12 dB is lower than -8 dB).

Test Results

Test Condition		Test Channel	Measurement Offset (KHz)	Sig B SND/ND Measured (dB)	Sig Gen B-Sig Gen A (dB)	Limit
Temperature (℃)	Voltage (V)					
T_{Nor} (25℃)	6.0V	CH01	-3.0	14	-8.2	Between -12dB and 0 dB
			-1.5	14	-8.3	
			0	14	-7.9	
			1.5	14	-8.4	
			3.0	14	-7.5	
Result			PASS			

3.2.3 Adjacent channel selectivity

Limit

The adjacent channel selectivity of the equipment shall be such that under the specified test conditions, the given degradation shall not be exceeded for levels of the unwanted signal up to those given in table 9.

Table 9: Adjacent channel selectivity

Channel Separation (kHz)	Adjacent channel selectivity limit (dBμV/m)			
	Unwanted frequencies ≤ 68 MHz		Unwanted frequencies > 68 MHz	
	Normal test conditions	Extreme test conditions	Normal test conditions	Extreme test conditions
20 and 25	75	65	$20 \log_{10}(f) + 38,3$	$20 \log_{10}(f) + 28,3$
12,5	65	55	$20 \log_{10}(f) + 28,3$	$20 \log_{10}(f) + 18,3$
NOTE: f is the carrier frequency in MHz.				

TEST PROCEDURE

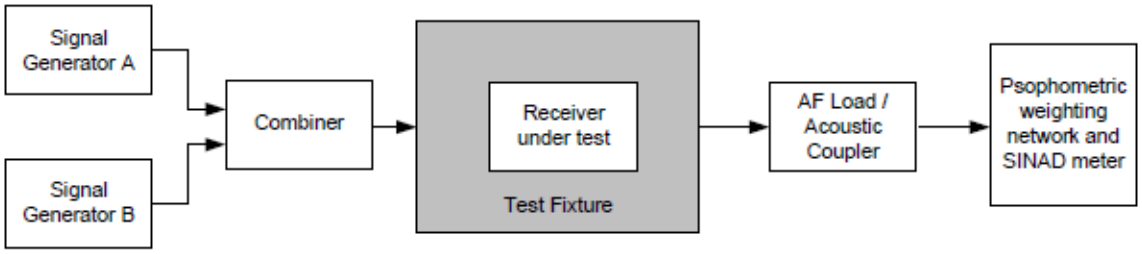


Figure 16: Measurement arrangement

The measurement procedure shall be as follows (see figure 16):
a) The receiver shall be placed in the test fixture (clause A.4).
Two signal generators A and B shall be connected to the test fixture via a combining network.

The wanted signal, provided by signal generator A, shall be at the nominal frequency of the receiver and shall have normal test modulation A-M1 (see clause 6.1).

The unwanted signal, provided by signal generator B, shall be modulated with signal A-M3 (see clause 6.1) and shall be at the frequency of the channel immediately above that of the wanted signal.

b) Initially, signal generator B (unwanted signal) shall be switched off (maintaining the output impedance).
The level of the wanted signal from generator A shall be adjusted to the level which is equivalent to the level of the limit of the average usable sensitivity, for the category of equipment used, expressed as a field strength (clauses 8.1.3 and 6.7).

Where possible, the receiver volume control shall be adjusted to give at least 50 % of the rated output power, clause 6.6, or, in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated output power.

c) The unwanted signal from signal generator B shall then be switched on.

d) The level of signal generator B shall be adjusted so that the unwanted signal causes:
- a reduction of 3 dB in the output level of the wanted signal; or
- a reduction to 14 dB of the SINAD ratio at the receiver output (with a psophometric filter), whether or not measured acoustically;

whichever occurs first.

e) The level of the unwanted signal shall be noted.

f) For each adjacent channel, the selectivity shall be expressed as the ratio in dB of level of the unwanted signal to the level of the wanted signal.
It shall then be converted back into field strengths of the unwanted signals at the receiver location and expressed in dBμV/m.
This value shall be recorded.

g) The measurement shall be repeated with the unwanted signal at the frequency of the channel below that of the wanted signal.

h) The adjacent channel selectivity of the equipment under test shall be expressed as the lower of the two values calculated in step f) for the upper and lower channels nearest to the receiving channel.

i) The measurement shall be repeated under extreme test conditions (clauses 5.4.1 and 5.4.2 applied simultaneously), with the level of the wanted signal adjusted to a level which is equivalent to the level of the limit of the average usable sensitivity (under extreme test conditions), for the category of equipment used, expressed as a field strength (see clauses 8.1.3 and 6.7).

TEST RESULTS

Test Channel	Test Condition		Measurement Position	Sig B SND/ND Measured (dB)	Sig Gen B-Sig Gen A (dB)	Limit (dBμV/m)
	Temperature (℃)	Voltage (V)				
CH01	T_{Nor} (25℃)	6.0V	Up Channel	14	65.4	81.290
			Low Channel	14	66.2	
Result			PASS			

3.2.4 Spurious response rejection

Limits

The spurious response rejection of the equipment shall be such that under the specified test conditions, the given degradation shall not be exceeded for levels of the unwanted signal up to:

- 75 dBμV/m for unwanted signal frequencies ≤ 68 MHz;
- (20 log10 (f) + 38,3) dBμV/m for unwanted signal frequencies > 68 MHz;
  where f is the frequency in MHz.

Method of measurement

Spurious responses may occur at all frequencies throughout the frequency spectrum and the requirements of the present document shall be met for all frequencies. However, for practical reasons the measurements shall be performed as specified in the present document. More specifically, this method of measurement is not intended to capture all spurious responses but selects those that have a high probability of being present. However, in a limited frequency range close to the nominal frequency of the receiver, it has been considered impossible to determine the probability of a spurious response and therefore a search shall be performed over this limited frequency range. This method provides a high degree of confidence that the equipment also meets the requirements at frequencies not being measured.

To determine the frequencies at which spurious responses can occur the following calculations shall be made:

a) calculation of the "limited frequency range":

- the limited frequency range is defined as the frequency of the local oscillator signal (fLO) applied to the first mixer of the receiver plus or minus the sum of the intermediate frequencies (fI1,...fIn) and a half the switching range (sr) of the receiver;
- hence, the frequency fl of the limited frequency range is:

$$f_{LO} - \sum_{j=1}^{j=n} f_{Ij} - \frac{sr}{2} \leq f_l \leq f_{LO} + \sum_{j=1}^{j=n} f_{Ij} + \frac{sr}{2}$$

b) calculation of frequencies outside the limited frequency range:

- a calculation of the frequencies at which spurious responses can occur outside the range determined in a) is made for the remainder of the frequency range of interest, as appropriate;
- the frequencies outside the limited frequency range are equal to the harmonics of the frequency of the local oscillator signal (fLO) applied to the first mixer of the receiver plus or minus the first intermediate frequency (fI1) of the receiver;
- hence, the frequencies of these spurious responses are:

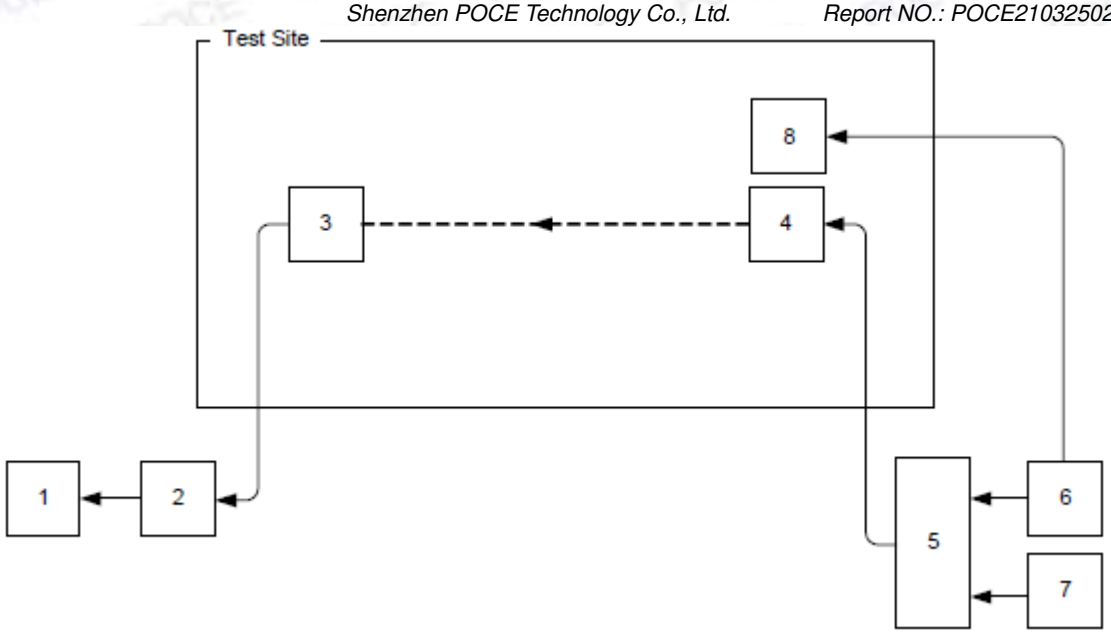
$$nf_{LO} \pm f_{I1}$$

where n is an integer greater than or equal to 2;

the measurement of the first image response of the receiver shall initially be made to verify the calculation of spurious response frequencies.

For the calculations a) and b) above, the manufacturer shall state the frequency of the receiver, the frequency of the local oscillator signal (f_{LO}) applied to the 1st mixer of the receiver, the intermediate frequencies (f_{I1}, f_{I2}, etc.) and the switching range (sr) of the receiver.

Measurement arrangement



1: Psophometric weighting network and SINAD meter.

2: AF load/acoustic coupler.

3: Receiver under test.

4: Wide band test antenna.

5: Combining network (used only when one antenna is used).

6: Signal generator A.

7: Signal generator B.

8: Test antenna for the wanted signal (see clause 8.5.2.2 e)).

The measurement arrangements shall be as follows (see figure 17):

a) A test site corresponding to that for the measurement of the average usable sensitivity shall be used (see clause 8.1).

b) The equipment under test shall be placed on the support at a suitable height and in the reference direction as indicated in clauses 8.1.2.1 and 6.7.

TEST RESULTS

Test Condition		Test Channel	Sig B SND/ND Measured (dB)	Sig Gen B-Sig Gen A (dB)	Limit dBμV/m
Temperature (℃)	Voltage (V)				
T_{Nor} (25℃)	6.0V	CH01	14	74.68	91.29
Result		PASS			

3.2.5 Intermodulation response rejection

Limit

The intermodulation response 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 two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

Method of measurement

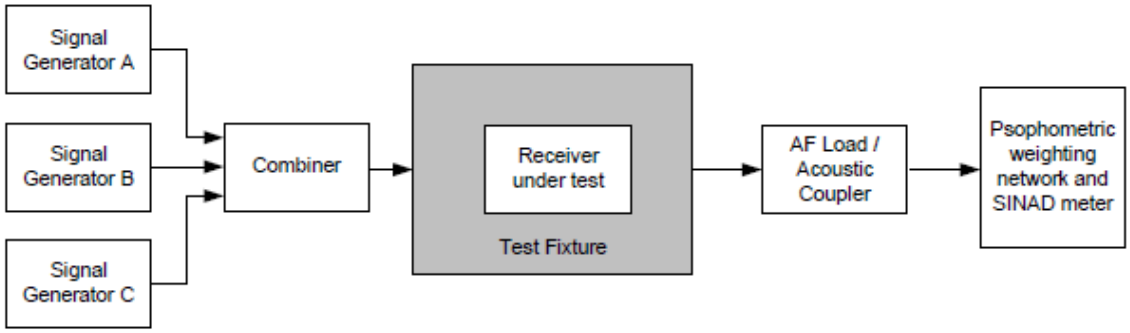


Figure 18: Measurement arrangement

The measurement procedure shall be as follows (see figure 18):
a) The receiver shall be placed in a test fixture (clause A.4).
Three signal generators, A, B and C shall be connected to the test fixture via a combining network. The wanted signal, provided by signal generator A, shall be at the nominal frequency of the receiver and shall have normal test modulation A-M1 (see clause 6.1).

The first unwanted signal, provided by signal generator B, shall be unmodulated and adjusted to the frequency 50 kHz above the nominal frequency of the receiver.

The second unwanted signal, provided by signal generator C, shall be modulated with signal A-M3 (see clause 6.1) and adjusted to a frequency 100 kHz above the nominal frequency of the receiver.

b) Initially, signal generators B and C (unwanted signals) shall be switched off (maintaining the output impedances).

The level of the wanted signal from generator A shall be adjusted to a level which is equivalent to the level of the limit of the average usable sensitivity, for the category of equipment used, expressed as a field strength (clauses 8.1.3 and 6.7).

Where possible, the receiver volume control shall be adjusted to give at least 50 % of the rated output power,clause 6.6, or, in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated output power.

c) The two unwanted signals from signal generators B and C shall then be switched on.

d) Their levels shall be maintained equal and shall be adjusted so that the unwanted signal causes:
- a reduction of 3 dB in the output level of the wanted signal; or
- a reduction to 14 dB of the SINAD ratio at the receiver output (with a psophometric filter) whether or not measured acoustically;

whichever occurs first.

e) The level of the unwanted signals shall be noted.
f) For each configuration of the unwanted signals, the intermodulation response rejection shall be expressed as the ratio in dB of the level of the unwanted signals to the level of the wanted signal. It shall then be converted back into field strength of the unwanted signals at the receiver location and expressed in dBμV/m.

This value shall be recorded.

g) The measurement shall be repeated with the unwanted signal generator B at the frequency 50 kHz below that of the wanted signal and the frequency of the unwanted signal generator C at the frequency 100 kHz below that of the wanted signal.

h) The intermodulation response rejection of the equipment under test shall be expressed as the lower of the two values recorded in step f).

Test result

Test Condition		Test Channel	Sig Gen B	Sig Gen C	Sig B(C) SND/ND Measured (dB)	Sig Gen B(C)-Sig Gen A (dB)	Limit dBμV/m
Temperature (℃)	Voltage (V)		Measurement Offset	Measurement Offset			
T_{Nor} (25℃)	6.0 V	CH01	-50KHz	-100KHz	14	66.9	76.59
			-25KHz	-50KHz	14	66.3	
			25KHz	50KHz	14	66.5	
			50KHz	100KHz	14	66.7	
Result			PASS				

3.2.6 Blocking or desensitization

LIMIT

The blocking ratio for any frequency within the specified ranges shall not be less than 84,0 dB, except at frequencies on which spurious responses are found.

Method of measurement

The two input signals shall be connected to the receiver via a combining network.

The wanted test signal, at the nominal frequency of the receiver, with normal test modulation, at an emf of 6 dBμV, value of the limit for the maximum usable sensitivity, shall be applied to the receiver input connector via one input of the combining network.

Where possible, the receiver volume control shall be adjusted to give at least 50 % of the rated output power or, in the case of stepped volume controls, to the first step that provides an output power of at least 50 % of the rated output power.

The obtained audio output level shall be noted.

The unwanted test signal, at a frequency from 1 MHz to 10 MHz offset from the nominal frequency of the receiver, without modulation, shall be applied to the receiver input connector via the second input of the combining network.

For practical reasons the measurements will be carried out at frequencies of the unwanted signal at approximately ±1 MHz, ±2 MHz, ±5 MHz and ±10 MHz.

The amplitude of the unwanted test signal shall be adjusted until:

• a reduction of 3 dB in the audio output level of the wanted signal; or
• the SND/ND ratio, psophometrically weighted, at the output of the receiver is reduced to 14 dB; whichever occurs first. This level shall be noted.

The measure of the blocking or desensitization is the ratio in dB of the level of the unwanted test signal to the level of the wanted test signal at the receiver input for which the specified reduction in audio output level or in the SND/ND ratio occurs.

This ratio shall be recorded for each of the eight noted levels as the blocking or desensitization.

TEST RESULTS

Test Condition		Test Channel	Measurement Offset (MHz)	Sig B SND/ND Measured (dB)	Sig Gen B-Sig Gen A (dB)	Limit
Temperature (℃)	Voltage (V)					
T_{Nor} (25℃)	6.0V	CH01	-10	14	86.8	At least 84.0dB
			-5	14	86.7	
			-2	14	86.5	
			-1	14	87.2	
			1	14	87.6	
			2	14	87.1	
			5	14	86.8	
			10	14	85.9	
Result			PASS			

3.2.7 Spurious radiations

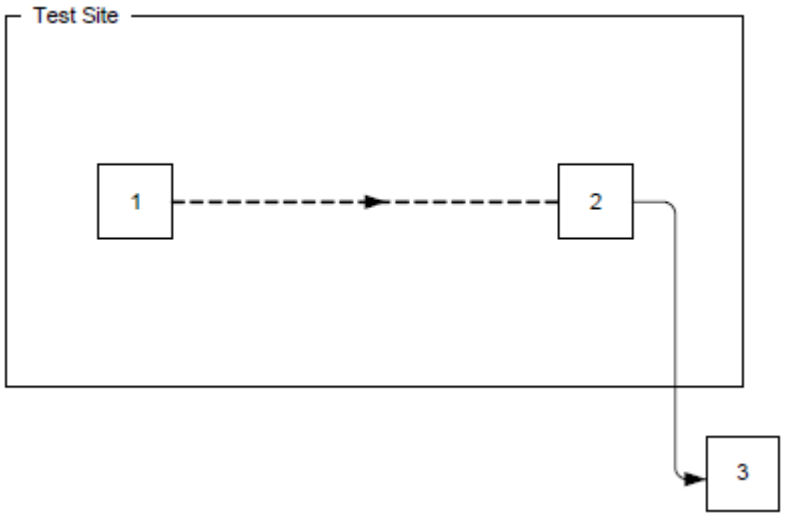
Limit

The power of any spurious radiation shall not exceed the values given in tables 8a and 8b.

Frequency range	30 MHz to 1 GHz	above 1 GHz to 12,75 GHz
Limit	2,0 nW (-57,0 dBm)	20,0 nW (-47,0 dBm)

Method of measurement

Unwanted emissions from the receiver are components at any frequency radiated by the equipment and its antenna.



1: Receiver under test.
2: Test antenna.
3: Spectrum analyser or selective voltmeter (test receiver).

The measurement procedure shall be as follows (see figure 13):
a) A test site, which fulfils the requirements of the specified frequency range of this measurement selected from annex A, shall be used.

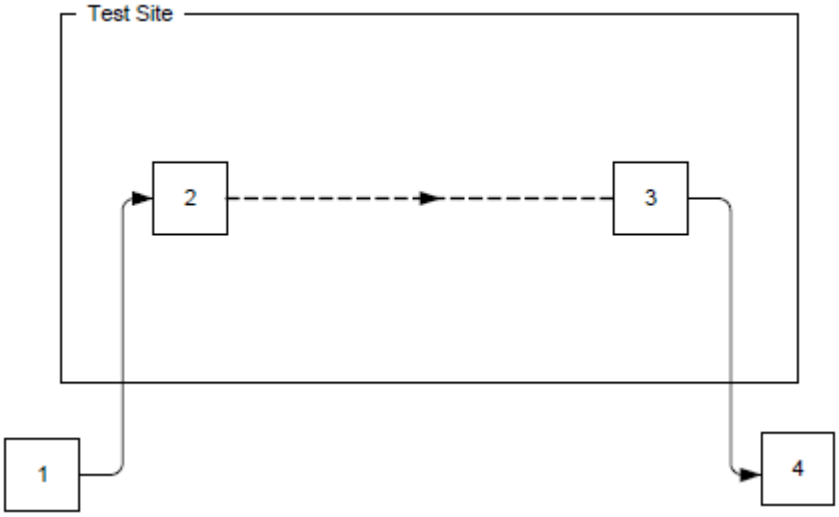
The test antenna shall be oriented for vertical polarization and connected to a spectrum analyser or a selective voltmeter with reference bandwidth as stated in table 8b.

b) The receiver under test shall be placed on the support at a suitable height. The radiation of any spurious component shall be detected by the test antenna and spectrum analyser or selective voltmeter over the frequency range 30 MHz to 4 GHz. In addition, for equipment operating on frequencies above 470 MHz, measurements shall be repeated over the frequency range 4 GHz to 12,75 GHz. The frequency of each spurious component shall be recorded.

c) At each frequency at which a component has been detected, the spectrum analyser or selective voltmeter shall be tuned and the test antenna shall be raised or lowered through the specified height range until the maximum signal level is detected on the spectrum analyser or selective voltmeter.

d) The receiver shall be rotated through 360° around a vertical axis, until higher maximum signal is received.

e) The test antenna shall be raised or lowered again through the specified height range until a maximum is obtained. This level shall be recorded.



1: Signal generator.
2: Substitution antenna.
3: Test antenna.
4: Spectrum analyser or selective voltmeter (test receiver).

f) Using the measurement arrangement in figure 14, the substitution antenna shall replace the receiver antenna in the same position and in vertical polarization. It shall be connected to the signal generator.

g) For each frequency at which a component has been detected, the signal generator and spectrum analyser or selective voltmeter shall be tuned and the test antenna shall be raised or lowered through the specified height range until the maximum signal level is detected on the spectrum analyser or selective voltmeter.

The test antenna may not need to be raised or lowered if the measurement is carried out on a test site according to clause A.1.1.

The level of the signal generator giving the same signal level on the spectrum analyser or selective voltmeter as in step e) shall be recorded. This value, after correction due to the gain of the substitution antenna and the cable loss between the signal generator and the substitution antenna, is the radiated spurious component at this frequency.

h) Measurements of steps b) to g) shall be repeated with the test antenna oriented in horizontal polarization.

TEST RESULTS

We tested the low/mid/high channel, but just recorded the worst channel

CH01					
Frequency (MHz)	**ANT polarization**	**Result (dBm)**	**Limit (dBm)**	**Margin (dB)**	**Result**
164.33	H	-69.76	-57	12.76	PASS
559.83	H	-69.93	-57	12.93	PASS
2157.29	H	-58.32	-47	11.32	PASS
--	--	--	--	--	--
164.33	V	-70.14	-57	13.14	PASS
559.83	V	-71.60	-57	14.60	PASS
2157.29	V	-59.73	-47	12.73	PASS

4 PHOTOGRAPHS OF EUT

Please refer to the report NO.: POCE210325025KRE-R1

**********End of Report**********