MEASUREMENT REPORT

EN 300 296 V2.1.1 Walkie Talkie

Applicant:	CPS Telecom Limited
Address:	Office B, 15/F, King Palace Plaza, 55 King Yip Street, Kwun Tong, Kowloon, Hong Kong
Product:	Walkie Talkie
Model No.:	CP225
Serial Model:	Ultra micro, Ultra mini
Brand Name:	CPS, Zodiac
Standards:	EN 300 296 V2.1.1 (2016-03)
Result:	Complies
Test Date:	June 25 ~ July 30, 2019

Reviewed By: Sunny Sun
(Sunny Sun)

Approved By: Robin Wu
(Robin Wu)

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

Revision History

Report No.	Version	Description	Issue Date	Note
1906RSU006-E1	Rev. 01	Initial Report	08-06-2019	Valid

CONTENTS

1. General Information

1.1. Applicant

CPS Telecom Limited

Office B, 15/F, King Palace Plaza, 55 King Yip Street, Kwun Tong, Kowloon, Hong Kong

1.2. Manufacturer

Contrad (HuiZhou) Ltd.

No.8, He Chuang East 5 Road, HuiTai Industrial Park, ZhongKai New And High-Tech Zone, HuiZhou City, Guangdong Province, China

1.3. Testing Facility

Test Site

MRT Technology (Suzhou) Co., Ltd

Test Site Location

D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- **MRT facility is a FCC registered (MRT Reg. No. 893164) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.**
- **MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.**
- **MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.**
- **MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications, Radio and SAR testing.**

1.4. Feature of Product

Product Name	Walkie Talkie
Model No.	CP225
Serial Model	Ultra micro, Ultra mini
Brand Name:	CPS, Zodiac
Frequency Range	446.00625 - 446.09375MHz
Channel Number	8
Channel Spacing	12.5kHz
Modulation	FM
Adapter	Model: K-T50501000E1 Input: 100-240V ~ 50-60Hz, 0.15A Max Output: 5VDC, 1000mA
Li-ion Battery Pack	Model: 3.7V, 1100mAh, 4.07Wh

Note: The difference between models is only for marketing different client, the others were the same.

1.5. Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	446.00625	02	446.01875	03	446.03125
04	446.04375	05	446.05625	06	446.06875
07	446.08125	08	446.09375	---	---

1.6. Test Condition

Test Temperature

The equipment shall fulfill all the requirements in the full temperature range as above. Most tests in the present document are performed in normal temperature condition.

The manufacturer defined the temperature as below table.

Low extreme temperature	Normal temperature	Higher extreme temperature
-20℃	25℃	55℃

Test Power-Supply Voltage

The lower extreme test voltages for equipment with power sources using batteries shall be as follows:

- for the nickel metal-hydride, leclanché or lithium type: 0,85 times the nominal battery voltage;
- for the mercury or nickel-cadmium type: 0,9 times the nominal battery voltage.

No upper extreme test voltages apply.

In the case where no upper extreme test voltage the nominal voltage is applicable, the corresponding four extreme test conditions are:

- V_{min}/T_{min}, V_{min}/T_{max};
- (V_{max} = nominal)/T_{min}, (V_{max} = nominal)/T_{max}.

V_{min}	V_{nom}	V_{max}
DC 3.15V	DC 3.70V	DC 3.70V

1.7. Standards Applicable for Testing

The EUT complies with the requirements of EN 300 296 V2.1.1.

2. Test Configuration of Equipment Under Test

2.1. Test Mode

Test Mode
Mode 1: Transmit
Mode 2: Receive

2.2. Test Software

Turn on the power of all equipment, and set the test mode and channel, then press the PTT button continuously to start continue transmit or receive.

3. Test Summary

Clause (EN 300296)	Test Parameter	Result (Pass/Fail)	Remark
Transmitter Requirement			
7.1	Frequency Error	Pass	---
7.2	Effective Radiated Power	Pass	---
7.3	Frequency Deviation	Pass	---
7.4	Adjacent and Alternate Channel Power	Pass	---
7.5	Radiated unwanted emissions in the spurious domain	Pass	---
7.6	Voice Operated Transmitter	N/A	---
7.7	Maximum transmission time	Pass	---
Receiver Requirement			
8.1	Average Usable Sensitivity	Pass	---
8.2	Spurious Radiations	Pass	---
8.3	Co-channel Rejection	Pass	---
8.4	Receiver Adjacent Channel Selectivity	Pass	---
8.5	Receiver Spurious Response Rejection	Pass	---
8.6	Inter-modulation Response Rejection	Pass	---
8.7	Blocking or Desensitization	Pass	---

Note:

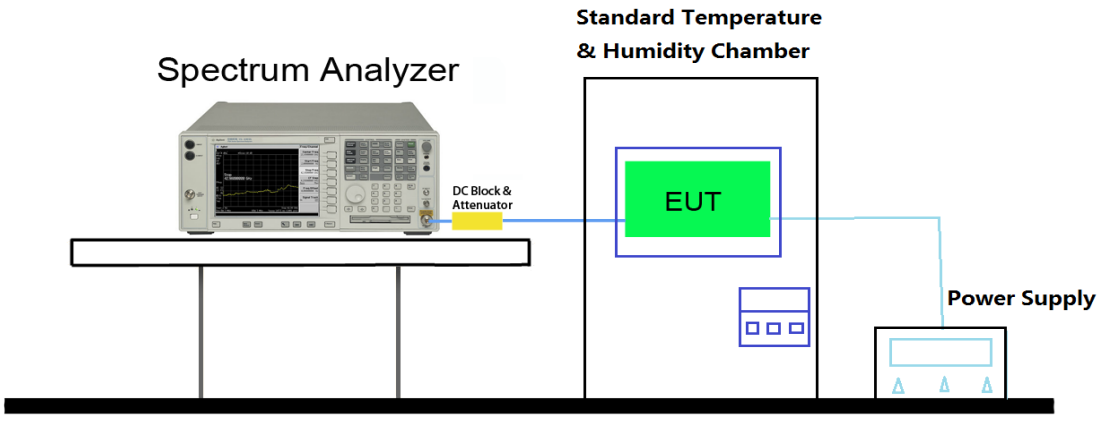
1. For radiated spurious emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
2. “N/A” means that the test item is not applicable, and the detailed information refers to relevant section.

4. Frequency Error

4.1. Limit

Channel separation (kHz)	Frequency Error limit (kHz)				
	≤47 MHz	47 MHz ~ 137MHz	137MHz ~ 300MHz	300 MHz ~ 500MHz	500 MHz ~ 1000 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.					

4.2. Test Setup



4.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 7.1.2

4.4. Test Result

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Channel	Channel 1 (446.00625MHz)	Test Site	TR3

Test conditions		Frequency Error(kHz)
T_{NOM} (25°C)	V_{NOM} (3.70V)	446,006.32
T_{MIN} (-20°C)	V_{MIN} (3.15V)	446,006.13
	V_{MAX} (3.70V)	446,006.18
T_{MAX} (+55°C)	V_{MIN} (3.15V)	446,006.25
	V_{MAX} (3.70V)	446,006.21
Max Frequency Error (kHz)		-0.12
Limit (kHz)		-1.5 ~ +1.5

5. Effective Radiated Power

5.1. Limit

The maximum effective radiated power under normal test conditions shall be within d_f from the rated maximum effective radiated power.

The average effective radiated power under normal test conditions shall also be within d_f from the rated average effective radiated power.

The allowance for the characteristics of the equipment (±1,5 dB) shall be combined with the actual measurement uncertainty in order to provide d_f, as follows:

$$d_f^2 = d_m^2 + d_e^2 = [3.98]^2 + [1.41]^2$$

$$d_f = 4.22 \text{ in linear terms, or } 6.25\text{dB}$$

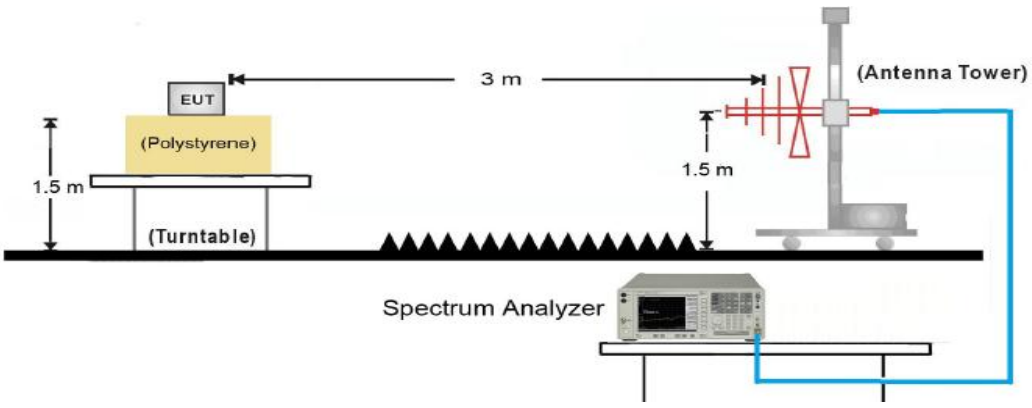
where uncertainty:

- d_m is the actual measurement uncertainty (±6 dB, 3.98 in linear terms);
- d_e is the allowance for the equipment (±1,5 dB, 1.41 in linear terms);
- d_f is the final difference;
- all values shall be expressed in linear terms

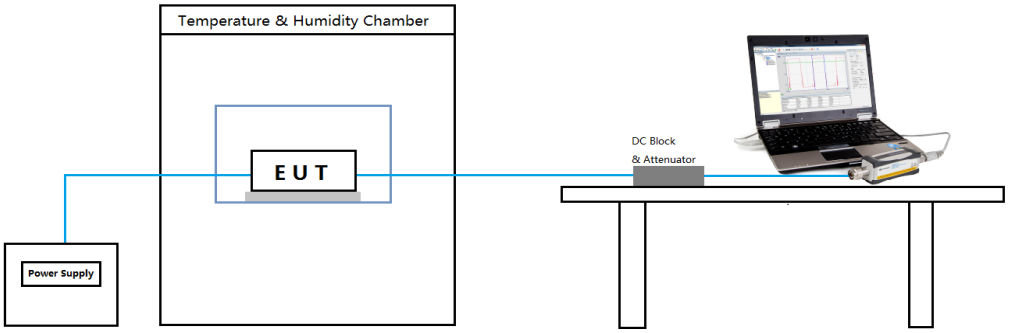
The variation of power due to the change of temperature and voltage for the measurements under extreme test conditions shall not exceed +2 dB or -3 dB.

5.2. Test Setup

For Radiated Measurement



For Extreme Measurement



5.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 7.2.2

5.4. Test Result

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Channel	Channel 1 (446.00625 MHz)	Test Site	AC2

For Maximum Effective Radiated Power

Test Conditions		Max. ERP (dBm)	Declared Max. ERP (dBm)	Variation (dB)	Limit (dB)	Result
T_{NOM} (25°C)	V_{NOM} (3.70V)	2.5	3	-0.5	±6.25	Pass
T_{MIN} (-20°C)	V_{MIN} (3.15V)	2.8	3	0.6	±6.25	Pass
	V_{MAX} (3.70V)	2.7	3	0.8	±6.25	Pass
T_{MAX} (+55°C)	V_{MIN} (3.15V)	2.4	3	-0.6	±6.25	Pass
	V_{MAX} (3.70V)	2.6	3	-0.1	±6.25	Pass

Note: Variation (dB) = Max. ERP (dBm) – Declared Max. ERP (dBm)

For Average Effective Radiated Power

Test Conditions		ERP (dBm) at eight positions								Average Value (dBm)
		P_1 (0°)	P_2 (45°)	P_3 (90°)	P_4 (135°)	P_5 (180°)	P_6 (225°)	P_7 (270°)	P_8 (315°)	
T_{NOM} (25°C)	V_{NOM} (3.70V)	2.71	2.25	2.60	2.47	2.30	2.16	2.91	2.32	2.47
T_{MIN} (-20°C)	V_{MIN} (3.15V)	2.85	2.62	2.94	2.80	2.50	2.52	3.09	2.57	2.74
	V_{MAX} (3.70V)	2.81	2.64	2.92	2.72	2.47	2.54	3.02	2.52	2.71
T_{MAX} (+55°C)	V_{MIN} (3.15V)	2.62	2.09	2.46	2.32	2.14	1.99	2.64	2.18	2.31
	V_{MAX} (3.70V)	2.60	2.00	2.39	2.19	2.01	1.92	2.76	2.14	2.25
Declared Max. ERP (dBm)		3dBm								
Max. Variation (dB)		-0.75								
Limit (dB)		±6.25								
Result		Pass								

Note:

1. Average Value (dBm) = (P_1 + P_2 + P_3 + P_4 + P_5 + P_6 + P_7 + P_8) / 8 (dBm)
2. Max. Variation (dB) = Max. Average Value (dBm) – Declared Max. ERP (dBm)

6. Maximum Permissible Frequency Deviation

6.1. Limit

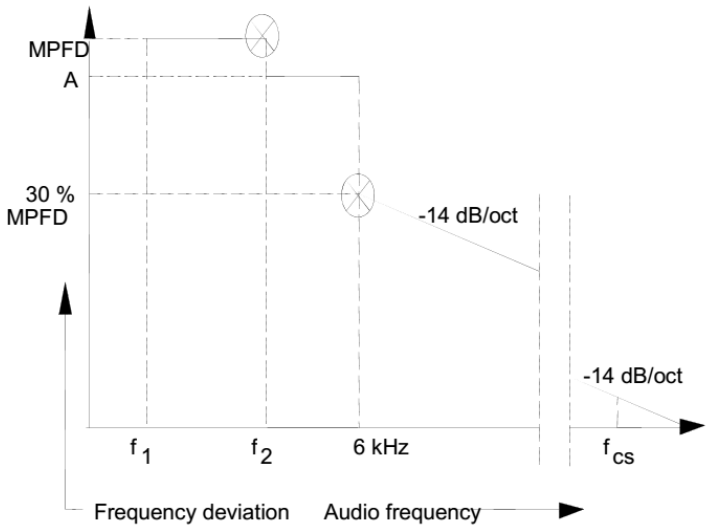
Maximum permissible frequency deviation

Channel separation in kHz	Maximum Permissible Frequency Deviation (MPFD) in kHz
12.5	±2.5
20	±4.0
25	±5.0

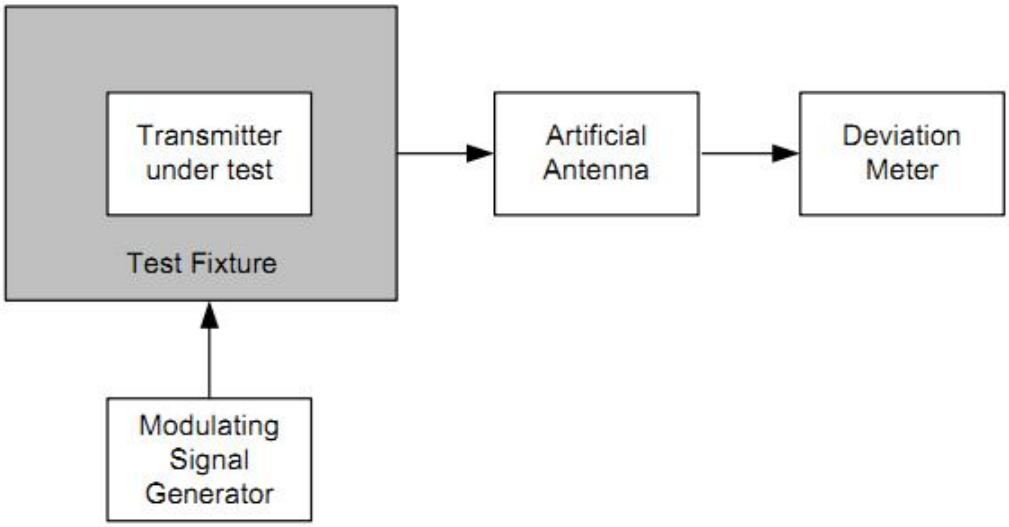
Response of the transmitter to modulation frequencies above 3 kHz

The frequency deviation at modulation frequencies between 3,0 kHz (for equipment operating with 20 kHz or 25 kHz channel separations) and 2,55 kHz (for equipment operating with 12,5 kHz channel separation) and 6,0 kHz shall not exceed the frequency deviation at a modulation frequency of 3,0 kHz/2,55 kHz. At 6,0 kHz the deviation shall be not more than 30,0 % of the maximum permissible frequency deviation.

The frequency deviation at modulation frequencies between 6,0 kHz and a frequency equal to the channel separation for which the equipment is intended shall not exceed that given by a linear representation of the frequency deviation (dB) relative to the modulation frequency, starting at the 6,0 kHz limit and having a slope of -14,0 dB per octave. These limits are illustrated in below figure.



6.2. Test Setup



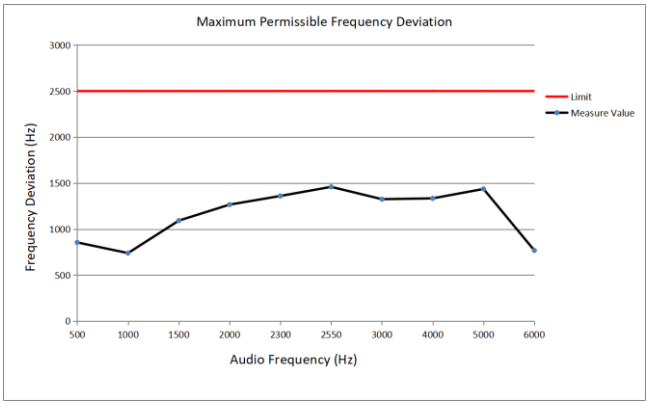
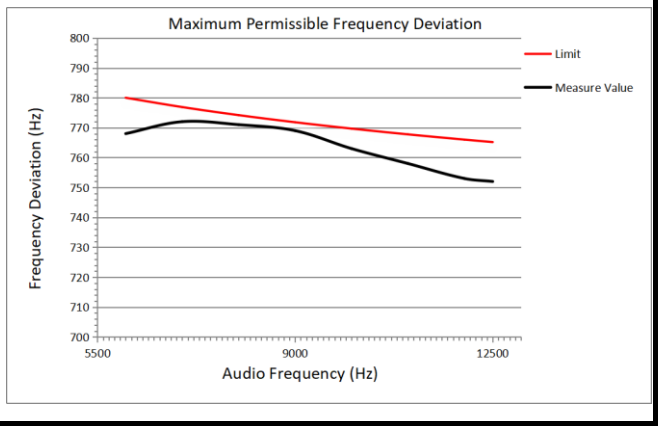
6.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 7.3.2

6.4. Test Result

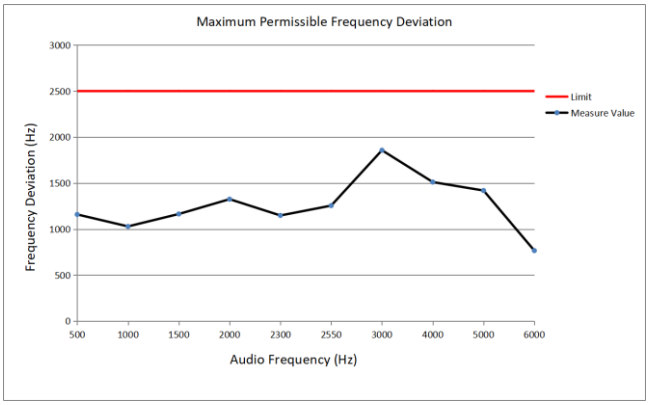
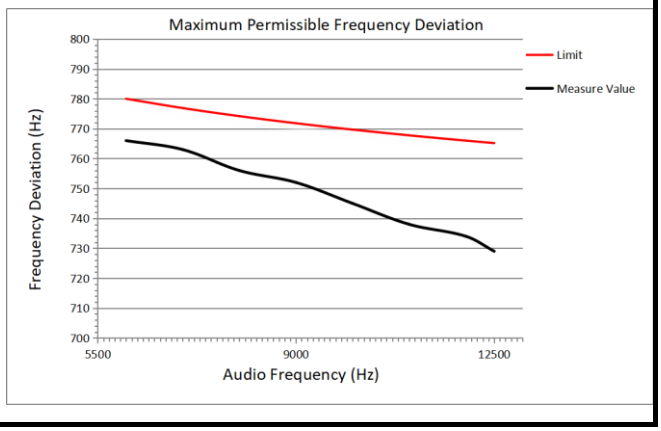
Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 1 (446.00625MHz)	Test Site	TR3

Maximum Permissible Frequency Deviation - CTCSS			
Audio Frequency (Hz)	Frequency Deviation (Hz)	Limit (Hz)	Result
500	855	2500	Pass
1000	739	2500	Pass
1500	1092	2500	Pass
2000	1266	2500	Pass
2300	1360	2500	Pass
2550	1459	2500	Pass
3000	1325	2500	Pass
4000	1334	2500	Pass
5000	1436	2500	Pass
6000	768	780	Pass
7000	772	777	Pass
8000	771	774	Pass
9000	769	772	Pass
10000	763	770	Pass
11000	758	768	Pass
12000	753	766	Pass
12500	752	765	Pass

Maximum Permissible Frequency Deviation - CTCSS	
Modulation Frequencies below 6 kHz	Modulation Frequencies above 6 kHz
	

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 1 (446.00625MHz)	Test Site	TR3

Maximum Permissible Frequency Deviation - DCS			
Audio Frequency (Hz)	Frequency Deviation (Hz)	Limit (Hz)	Result
500	1159	2500	Pass
1000	1029	2500	Pass
1500	1164	2500	Pass
2000	1325	2500	Pass
2300	1148	2500	Pass
2550	1255	2500	Pass
3000	1857	2500	Pass
4000	1511	2500	Pass
5000	1419	2500	Pass
6000	766	780	Pass
7000	763	777	Pass
8000	756	774	Pass
9000	752	772	Pass
10000	745	770	Pass
11000	738	768	Pass
12000	734	766	Pass
12500	729	765	Pass

Maximum Permissible Frequency Deviation - DCS	
Modulation Frequencies below 6 kHz	Modulation Frequencies above 6 kHz
	

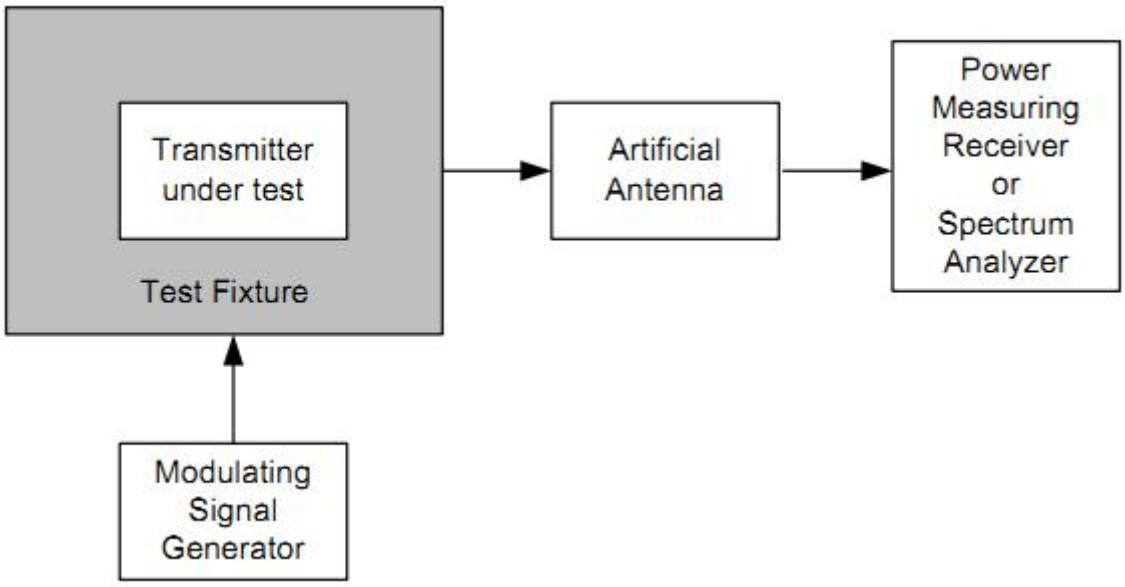
7. Adjacent and Alternate Channel Power

7.1. Limit

The adjacent channel power shall not exceed a value of 60dB below the transmitter carrier power without the need to be below 0.2uW.

The alternate channel power shall not exceed a value of 70dB below the carrier power of the transmitter without the need to be below 0.2uW.

7.2. Test Setup



7.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 7.4.2

7.4. Test Result

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 1 (446.00625MHz)	Test Site	TR3

Continuous Signalling Systems	Channel Frequency (MHz)	Channel Separation (kHz)	Adjacent/Alternate Channel	Ratio (dB)	Limit (dB)
CTCSS	446.00625	12.5	Upper Adjacent	-69.32	≤ -60
			Lower Adjacent	-67.51	≤ -60
			Upper Alternate	-77.39	≤ -70
			Lower Alternate	-77.24	≤ -70
DCS	446.00625	12.5	Upper Adjacent	-70.15	≤ -60
			Lower Adjacent	-70.36	≤ -60
			Upper Alternate	-80.42	≤ -70
			Lower Alternate	-80.55	≤ -70

8. Radiated Unwanted Emissions in the Spurious Domain

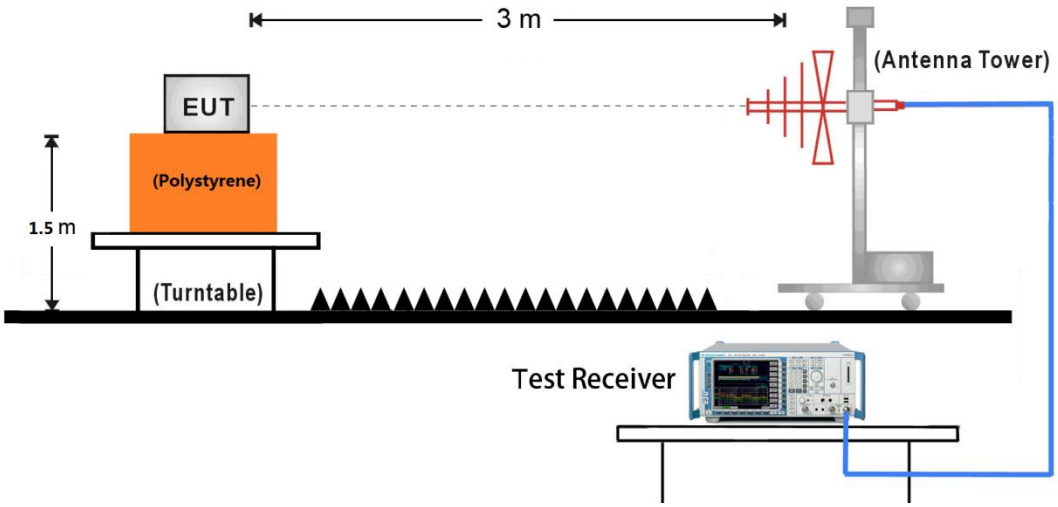
8.1. Limit

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

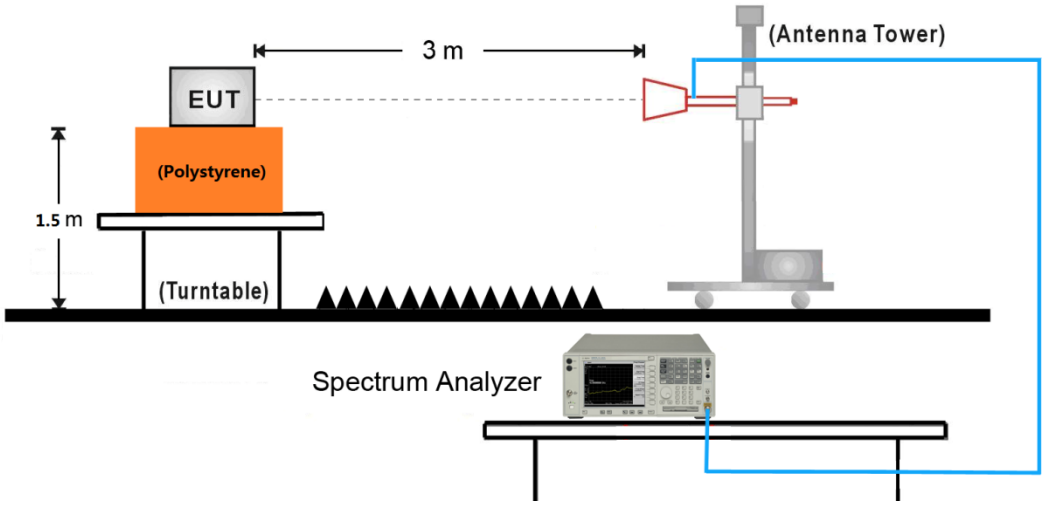
Frequency range	Tx operating	Tx standby
30 MHz ~ 1 GHz	0.25 μW (-36 dBm)	2.0 nW (-57 dBm)
1 GHz ~ 4 GHz, or 1 GHz ~ 12.75 GHz	1.00 μW (-30 dBm)	20 nW (-47 dBm)

8.2. Test Setup

30MHz ~ 1GHz Test Setup:



1GHz ~ 12.75GHz Test Setup:



8.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 7.5.2.

8.4. Test Result

Product	Walkie Talkie	Temperature	26°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC2	Test Date	2019/06/25

Channel	Frequency (MHz)	Reading Level (dBm)	Substitution Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
1	891.8	-97.0	34.5	-62.5	-36.0	-26.5	Peak	Horizontal
	1339.0	-58.5	9.4	-49.1	-30.0	-19.1	Peak	Horizontal
	1784.5	-64.4	9.3	-55.1	-30.0	-25.1	Peak	Horizontal
	2230.0	-63.7	12.0	-51.7	-30.0	-21.7	Peak	Horizontal
	2677.0	-47.0	11.3	-35.7	-30.0	-5.7	Peak	Horizontal
	3122.5	-55.3	11.7	-43.6	-30.0	-13.6	Peak	Horizontal
	3568.0	-45.4	13.7	-31.7	-30.0	-1.7	Peak	Horizontal
	891.8	-88.0	34.2	-53.8	-36.0	-17.8	Peak	Vertical
	1339.0	-57.5	9.6	-47.9	-30.0	-17.9	Peak	Vertical
	1784.5	-61.7	9.3	-52.4	-30.0	-22.4	Peak	Vertical
	2230.0	-62.5	11.8	-50.7	-30.0	-20.7	Peak	Vertical
	2677.0	-51.0	11.5	-39.5	-30.0	-9.5	Peak	Vertical
	3122.5	-49.4	11.6	-37.8	-30.0	-7.8	Peak	Vertical
	3569.5	-45.6	13.8	-31.8	-30.0	-1.8	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB)

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

Product	Walkie Talkie	Temperature	26°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC2	Test Date	2019/06/25

Channel	Frequency (MHz)	Reading Level (dBm)	Substitution Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
8	892.3	-97.3	34.5	-62.8	-36.0	-26.8	Peak	Horizontal
	1339.0	-58.5	9.4	-49.1	-30.0	-19.1	Peak	Horizontal
	1784.5	-64.3	9.3	-55.0	-30.0	-25.0	Peak	Horizontal
	2231.5	-63.6	11.9	-51.7	-30.0	-21.7	Peak	Horizontal
	2677.0	-47.1	11.3	-35.8	-30.0	-5.8	Peak	Horizontal
	3122.5	-55.6	11.7	-43.9	-30.0	-13.9	Peak	Horizontal
	3569.5	-45.7	13.7	-32.0	-30.0	-2.0	Peak	Horizontal
	892.3	-87.9	34.2	-53.7	-36.0	-17.7	Peak	Vertical
	1339.0	-56.3	9.6	-46.7	-30.0	-16.7	Peak	Vertical
	1784.5	-63.1	9.3	-53.8	-30.0	-23.8	Peak	Vertical
	2231.5	-61.4	11.8	-49.6	-30.0	-19.6	Peak	Vertical
	2677.0	-51.3	11.5	-39.8	-30.0	-9.8	Peak	Vertical
	3122.5	-49.1	11.6	-37.5	-30.0	-7.5	Peak	Vertical
	3569.5	-46.4	13.8	-32.6	-30.0	-2.6	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB)

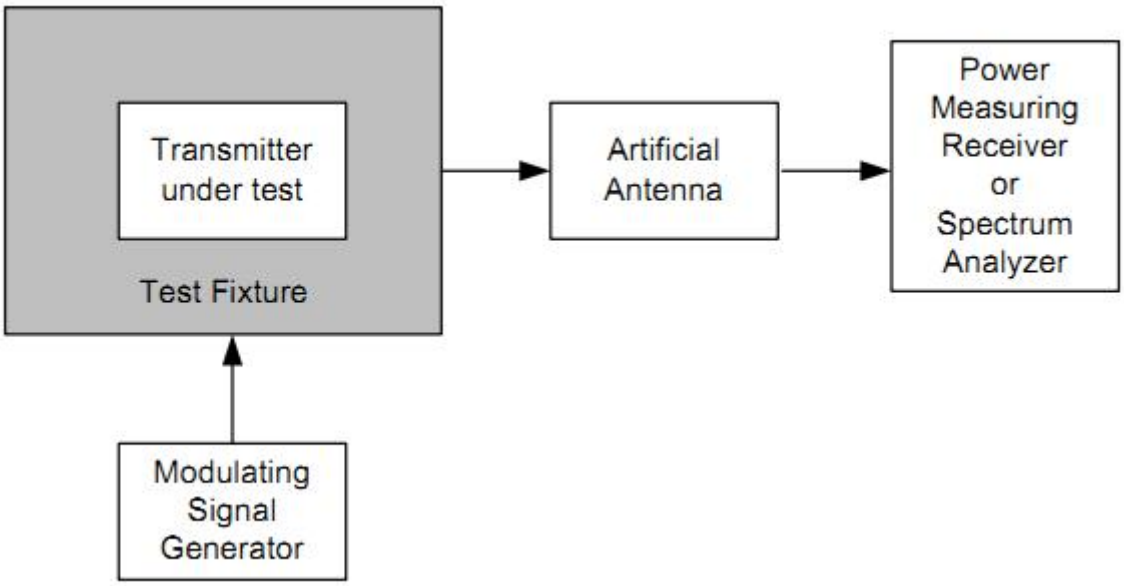
Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

9. Voice Operated Transmitter

9.1. Limit

The VOX power ratio shall not exceed -70 dB.

9.2. Test Setup



9.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 7.6.2.

9.4. Test Result

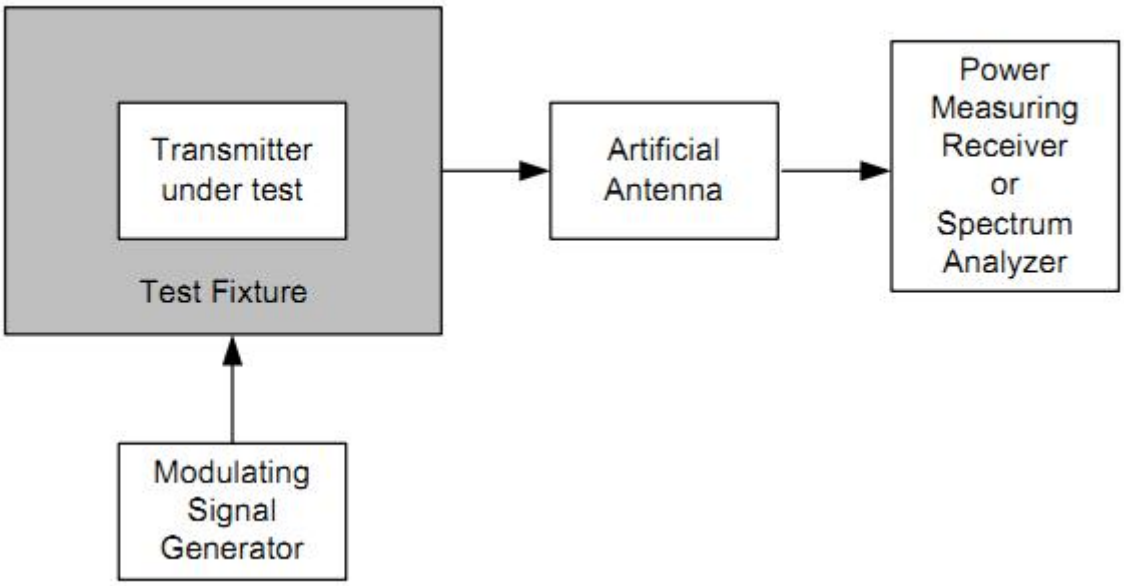
This device has PTT operation, and this requirement shall only apply to PMR446 equipment not having PTT operation.

10. Maximum Transmission Time

10.1. Limit

The maximum transmission time shall be less than 180 seconds.

10.2. Test Setup



10.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 7.7.2.

10.4. Test Result

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 5 (446.00625MHz)	Test Site	TR3

Functionality	transmission time (s)	Limit (s)	Result
PTT	72.1	≤ 180	Pass

11. Average Usable Sensitivity

11.1. 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 1: 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 1000	33.0

Table 2: 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 1000	31.0

Category C:

At frequencies greater than 375 MHz the limits shall be as specified in table 2.

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 5b.

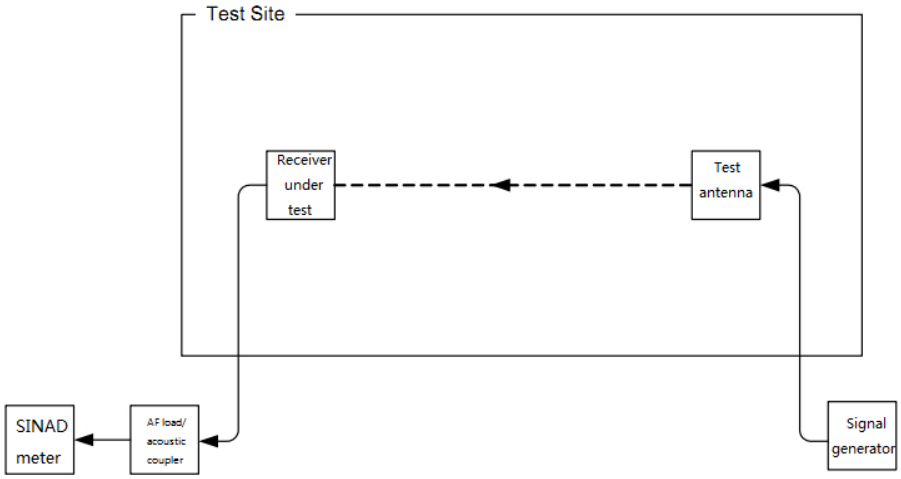
- K = 20 log10 [(l + 20)/ 40];
- where l is the external part of the antenna in cm.

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

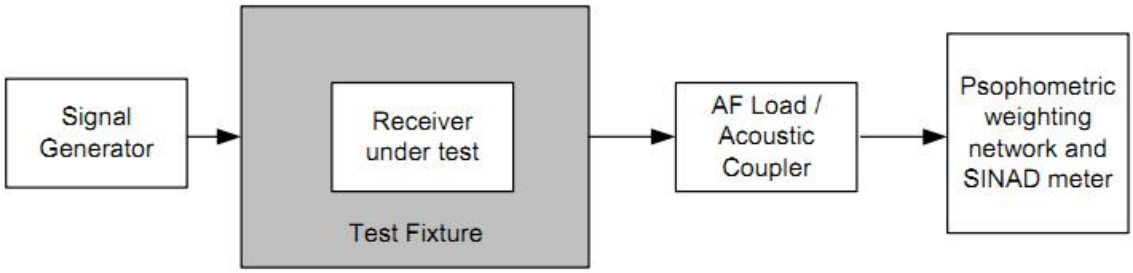
For all categories of equipment, add 6 dB to the limit under normal test conditions to obtain the limit under extreme test conditions.

11.2. Test Setup

For Normal Conditions:



For Extreme Conditions:



11.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 8.1.2

11.4. Test Result

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 1 (446.00625MHz)	Test Site	TR3

Test Conditions		Average Usable Sensitivity (dBμV/m)										Result
		X_1 (0°)	X_2 45°	X_3 90°	X_4 135°	X_5 180°	X_6 225°	X_7 270°	X_8 315°	Average Value	Limit	
T_{NOM} (25°C)	V_{NOM} (3.70V)	7.2	7.9	8.3	9.6	8.6	6.8	5.7	5.9	7.5	26.5	Pass

Note:

1. Average Value (dBuV/m) = (X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8) / 8 (dBuV/m)
2. The device is applicable for category B of limit.

Test Conditions		Average Usable Sensitivity (dBμV/m)	Limit (dBμV/m)	Result
T_{MIN} (-20°C)	V_{MIN} (3.15V)	7.4	26.5	Pass
	V_{MAX} (3.70V)	7.2	26.5	Pass
T_{MAX} (+55°C)	V_{MIN} (3.15V)	8.5	26.5	Pass
	V_{MAX} (3.70V)	8.9	26.5	Pass

Note: The device is applicable for category B of limit.

12. Receiver Spurious Radiation

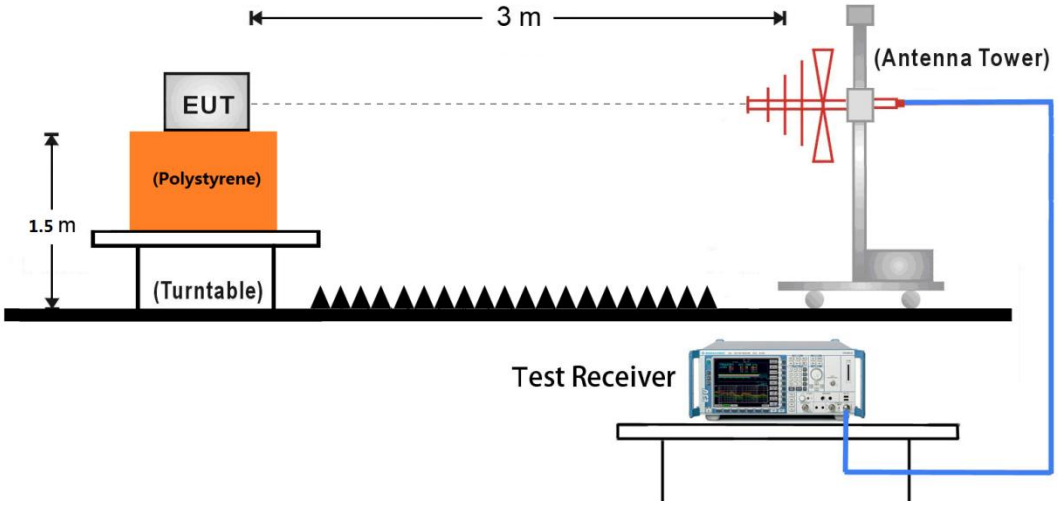
12.1. Limit

The power of any spurious radiation shall not exceed the values given in below table.

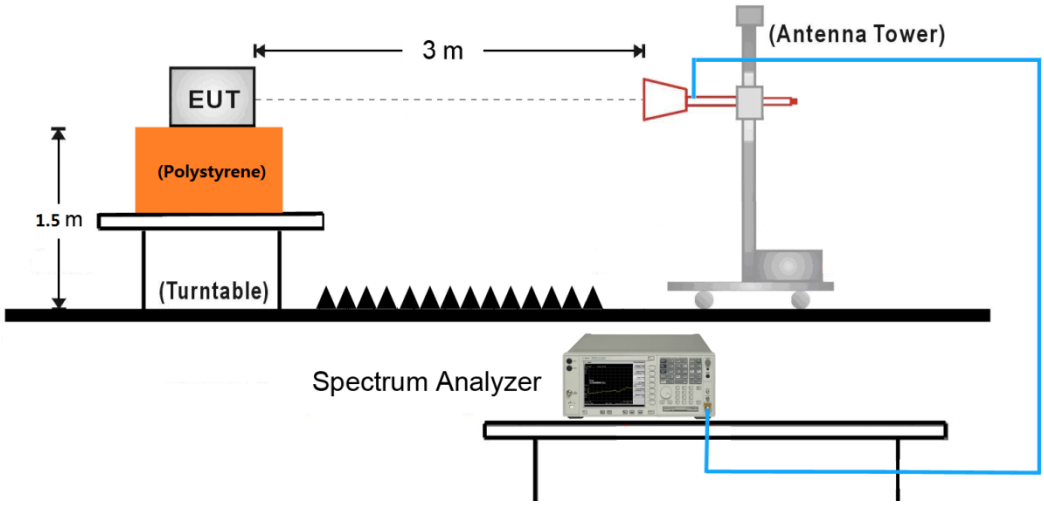
30 MHz to 1 GHz	above 1 GHz to 12.75 GHz
2.0 nW (-57.0 dBm)	20.0 nW (-47.0 dBm)

12.2. Test Setup

30MHz ~ 1GHz Test Setup:



1GHz ~ 12.75GHz Test Setup:



12.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 8.2.2

12.4. Test Result

Product	Walkie Talkie	Temperature	26°C
Test Engineer	Bacon Dong	Relative Humidity	54%
Test Site	AC2	Test Date	2019/07/10

Channel	Frequency (MHz)	Reading Level (dBm)	Substitution Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
1	33.9	-101.3	27.3	-74.0	-57.0	-17.0	Peak	Horizontal
	963.6	-102.9	35.8	-67.1	-57.0	-10.1	Peak	Horizontal
	89.7	-103.5	28.0	-75.5	-57.0	-18.5	Peak	Vertical
	939.4	-103.2	35.7	-67.5	-57.0	-10.5	Peak	Vertical
	2824.0	-67.5	14.2	-53.3	-47.0	-6.3	Peak	Horizontal
	3698.5	-66.1	16.3	-49.8	-47.0	-2.8	Peak	Horizontal
	2177.5	-66.6	11.9	-54.7	-47.0	-7.7	Peak	Vertical
	3566.5	-65.0	15.7	-49.3	-47.0	-2.3	Peak	Vertical
8	34.4	-101.3	27.4	-73.9	-57.0	-16.9	Peak	Horizontal
	918.5	-104.1	36.3	-67.8	-57.0	-10.8	Peak	Horizontal
	87.7	-103.6	28.5	-75.1	-57.0	-18.1	Peak	Vertical
	988.8	-103.1	36.6	-66.5	-57.0	-9.5	Peak	Vertical
	2821.0	-68.4	14.2	-54.2	-47.0	-7.2	Peak	Horizontal
	3511.0	-65.5	15.7	-49.8	-47.0	-2.8	Peak	Horizontal
	3107.5	-68.0	15.6	-52.4	-47.0	-5.4	Peak	Vertical
	3803.5	-68.4	16.3	-52.1	-47.0	-5.1	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB)

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

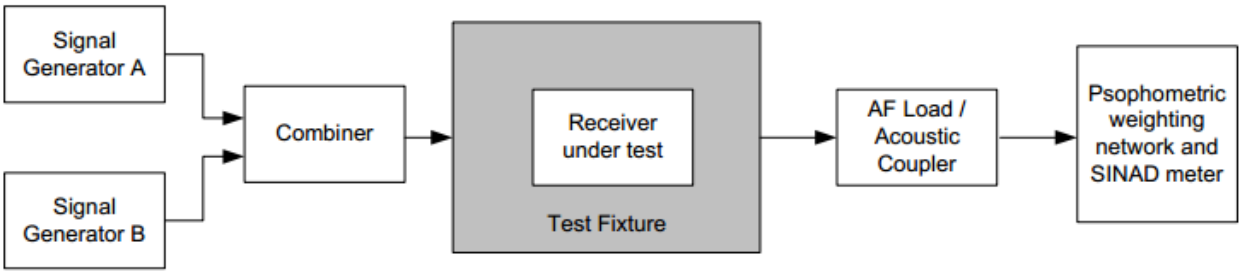
13. Co-channel Rejection

13.1. Limit

The value of the co-channel rejection ratio, expressed in dB, at any frequency of the unwanted signal within the specified range, shall be between:

- -8,0 dB and 0 dB for channel separations of 20 kHz and 25 kHz;
- -12,0 dB and 0 dB for a channel separation of 12.5 kHz.

13.2. Test Setup



13.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 8.3.2

13.4. Test Result

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 5 (446.05625MHz)	Test Site	AC2

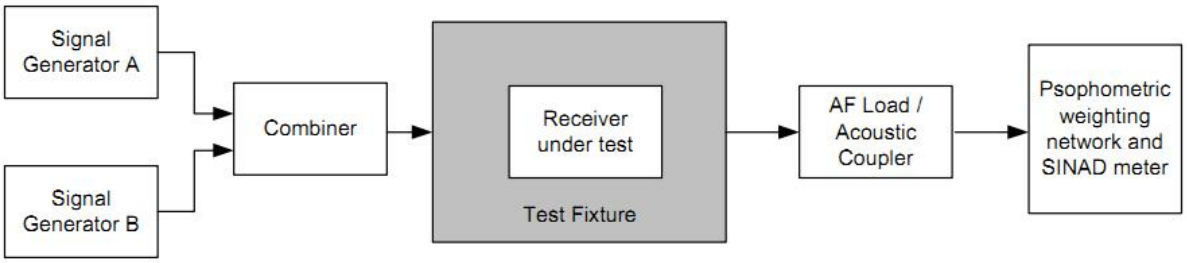
Test Conditions		co-channel rejection ratio (dB)	Limit(dB)	Result
T_{NOM} (25°C)	V_{NOM} (3.70V)	-5.1	-12 ~ 0	Pass
T_{MIN} (-20°C)	V_{MIN} (3.15V)	-6.3	-12 ~ 0	Pass
	V_{MAX} (3.70V)	-4.6	-12 ~ 0	Pass
T_{MAX} (+55°C)	V_{MIN} (3.15V)	-7.2	-12 ~ 0	Pass
	V_{MAX} (3.70V)	-5.3	-12 ~ 0	Pass

14. Adjacent Channel Selectivity

14.1. Limit

Channel Separation (kHz)	Adjacent Channel Selectivity limit (dBμV/m)			
	Unwanted frequencies ≤ 68 MHz		Unwanted frequencies > 68 MHz	
	Normal conditions	Extreme conditions	Normal conditions	Extreme 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.				

14.2. Test Setup



14.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 8.4.2

14.4. Test Result

Product	Walkie Talkie	Temperature	-20°C ~ 55°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 5 (446.05625MHz)	Test Site	AC2

Test Conditions		Adjacent Channel Selectivity (dBμV/m)	Limit (dBμV/m)	Result
T_{NOM} (25°C)	V_{NOM} (3.70V)	83.1	≥ 81.3	Pass
T_{MIN} (-20°C)	V_{MIN} (3.15V)	84.2	≥ 71.3	Pass
	V_{MAX} (3.70V)	86.7	≥ 71.3	Pass
T_{MAX} (+55°C)	V_{MIN} (3.15V)	81.5	≥ 71.3	Pass
	V_{MAX} (3.70V)	80.9	≥ 71.3	Pass

Note:

1. For Normal Conditions:
   Limit = (20 $\log_{10}$ (f) + 28.3) dBμV/m = (20 $\log_{10}$ (446.05625) + 28.3) dBμV/m = 81.3 dBμV/m.
   For Extreme Conditions:
   Limit = (20 $\log_{10}$ (f) + 28.3) dBμV/m = (20 $\log_{10}$ (446.05625) + 18.3) dBμV/m = 71.3 dBμV/m.
2. For the upper and lower channels nearest to the receiving channel, the lower Adjacent Channel Selectivity value should show in the report.

15. Spurious Response Rejection

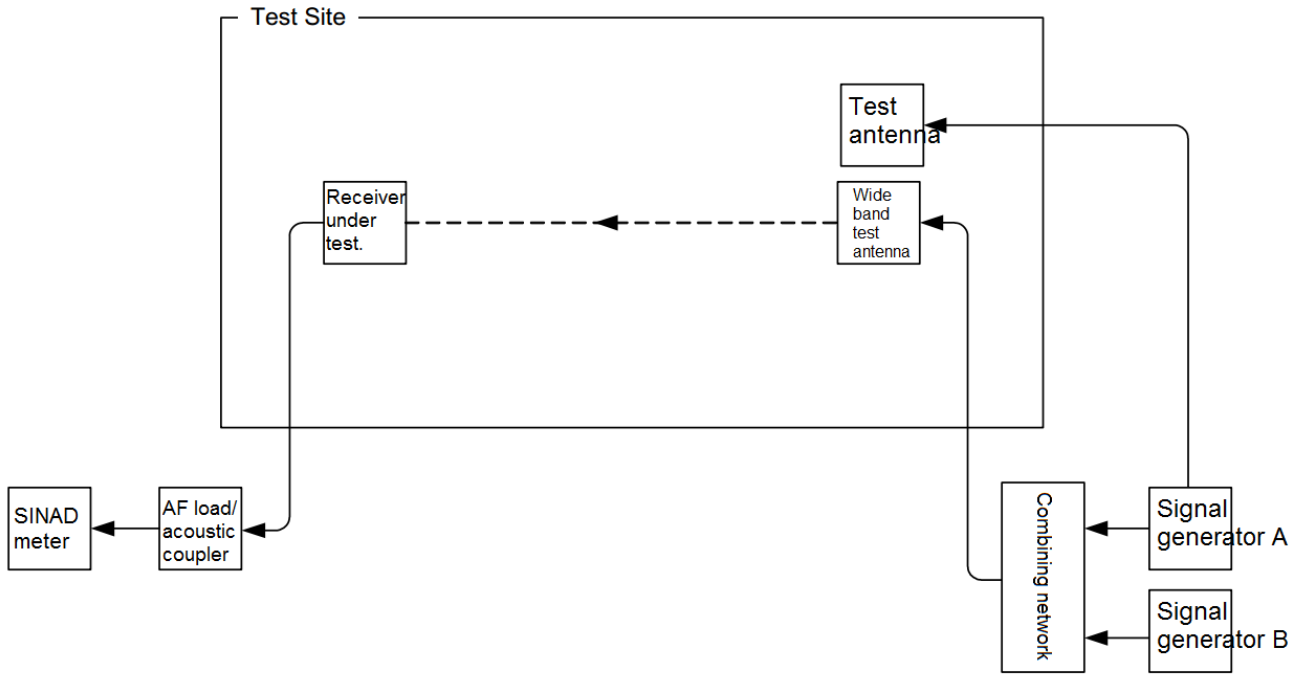
15.1. Limit

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 $\log_{10}$(f) + 38.3) dBµV/m for unwanted signal frequencies > 68 MHz;

where f is the frequency in MHz.

15.2. Test Setup



15.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 8.5.2

15.4. Test Result

Product	Walkie Talkie	Temperature	25°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	1 / 4 / 8	Test Site	AC2

Channel No.	Frequency (MHz)	Test result (dBμV/m)	Limit (dBμV/m)	Result
1	446.00625	95.3	≥ 91.3	Pass
4	446.04325	94.2	≥ 91.3	Pass
8	446.09325	96.1	≥ 91.3	Pass

Note: Limit = (20 $\log_{10}$ (f) + 38.3) dBμV/m = (20 $\log_{10}$ (446.05625) + 38.3) dBμV/m = 91.3 dBμV/m.

16. Intermodulation Response Rejection

16.1. Limit

For low power equipment

The inter modulation response rejection of low power 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:

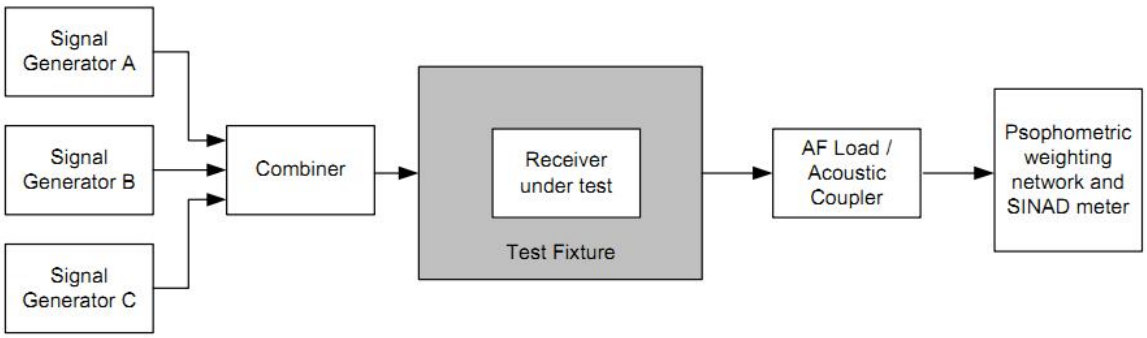
- 60 dBμV/m for unwanted signal frequencies ≤ 68 MHz;
- (20 $\log_{10}$ (f) + 23.6) dBμV/m for unwanted signal frequencies > 68 MHz;
  where f is the frequency in MHz.

For other equipment

The inter modulation response rejection of equipment that is not low power 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:

- 70 dBμV/m for unwanted signal frequencies ≤ 68 MHz;
- (20 $\log_{10}$ (f) + 33.3) dBμV/m for unwanted signal frequencies > 68 MHz;
  where f is the frequency in MHz.

16.2. Test Setup



16.3. Test Procedure

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 8.6.2

16.4. Test Result

Product	Walkie Talkie	Temperature	25°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 5 (446.05625MHz)	Test Site	AC2

The wanted signal (MHz)	Frequency offset (kHz)	Test result (dBμV/m)	Limit (dBμV/m)	Result
446.05625	+50/+100	95.5	≥ 76.6	Pass

Note:

1. The device belongs to low power equipment.
2. Limit = (20 $\log_{10}$ (f) + 23.6) dBμV/m = (20 $\log_{10}$ (446.05625) + 23.6) dBμV/m = 76.6 dBμV/m.
3. For the frequency offset +50/+100 kHz or -50/-100 kHz to the wanted signal, the lower Inter-Modulation Response Rejection value should show in the report.

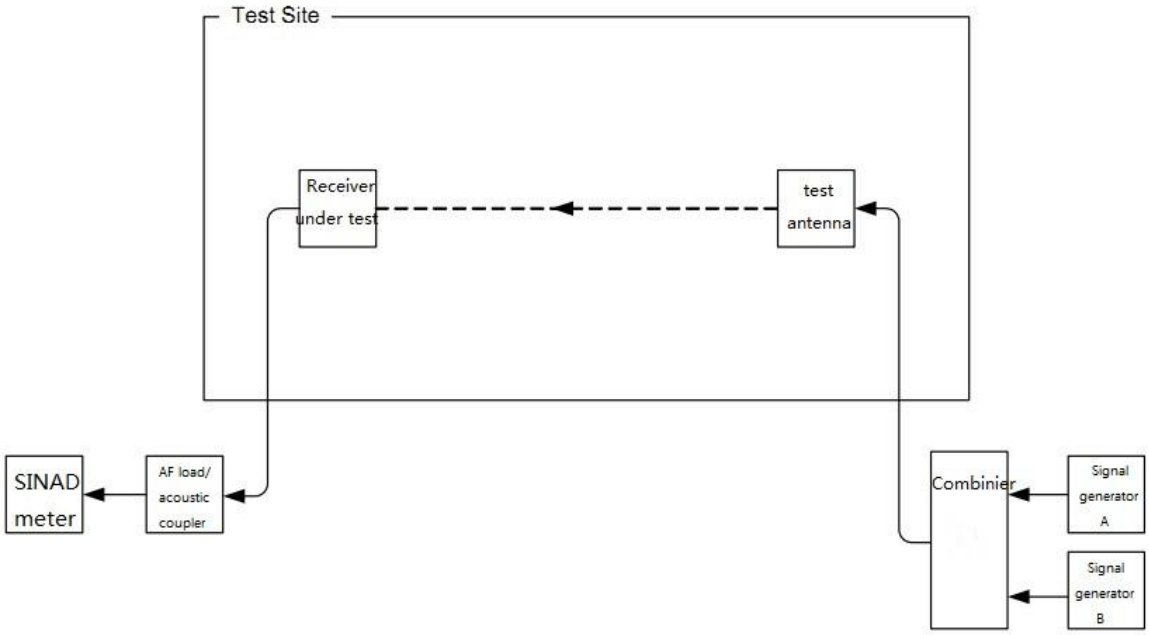
17. Blocking or Desensitization

17.1. Limit

The blocking level, for any frequency within the specified ranges, shall be:

- ≥ 89 dBµV/m for unwanted signal frequencies ≤ 68 MHz;
- ≥ (20 $\log_{10}$ (f) + 52.3) dBµV/m for unwanted signal frequencies > 68 MHz;
  where f is the frequency in MHz.

17.2. Test Setup



17.3. Test Procedur

Refer to ETSI EN 300 296 V2.1.1 (2016-03) Clause 8.7.2

17.4. Test Result

Product	Walkie Talkie	Temperature	25°C
Test Engineer	Andy Zhu	Relative Humidity	54%
Test Channel	Channel 5 (446.05625MHz)	Test Site	AC2

The wanted signal (MHz)	Frequency offset (MHz)	Test result (dBμV/m)	Limit (dBμV/m)	Result
446.05625	-1	107.9	≥ 105.3	Pass
	+1	107.7	≥ 105.3	Pass
	-2	107.6	≥ 105.3	Pass
	+2	107.3	≥ 105.3	Pass
	-5	114.8	≥ 105.3	Pass
	+5	116.1	≥ 105.3	Pass
	-10	119.9	≥ 105.3	Pass
	+10	120.7	≥ 105.3	Pass

Note: Limit = (20 log10 (f) + 52.3) dBμV/m = (20 log10 (446.05625) + 52.3) dBμV/m = 105.3 dBμV/m.

18. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	±1 x 10^{-7}
Conducted RF power variation using a test fixture	±0.75 dB
Radiated RF power	±6 dB
Maximum frequency deviation: - within 300 Hz to 6 kHz of audio frequency - within 6 kHz to 25 kHz of audio frequency	 ±5 % ±3 dB
Deviation limitation	±5 %
Adjacent and Alternate Channel Power	±5 dB
Sensitivity at 20 dB SINAD	±3 dB
Two-signal measurement, valid up to 4 GHz (using a test fixture)	±4 dB
Two-signal measurement, valid up to 4 GHz (using radiated fields)	±6 dB
Three-signal measurement (using a test fixture)	±3 dB
Radiated emission of the transmitter, valid up to 12.75 GHz	±6 dB
Radiated emission of receiver, valid up to 12.75 GHz	±6 dB
Temperature	±1 °C
Humidity	±10 %

19. List of Measuring Instrument

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2020/04/15
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2020/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2020/04/15
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2019/11/16
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2020/06/30
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2020/06/30
Programmable Temperature & Humidity Chamber	BAOYT	BYH-1500L	MRTSUE06051	1 year	2019/11/16
Thermohygrometer	Testo	608-H1	MRTSUE06401	1 year	2019/08/14

Transmitter Spurious Emissions and Receiver Spurious Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Due Date
PXA Signal Analyzer	Keysight	N9030B	MRTSUE06395	1 year	2019/09/25
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2019/11/16
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2020/03/31
Broad Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2019/10/19
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2019/08/14
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2020/04/30

Transmitter Spurious Emissions and Receiver Spurious Emissions - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2019/08/13
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2019/11/09
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2019/10/19
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2019/11/09
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2019/11/16
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2019/12/13
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2020/04/30

Software	**Version**	**Function**
EMI Software	V3	EMI Test Software

The End

Appendix A - Test Setup Photograph

Refer to “1906RSU006-ET” file.

Appendix B - EUT Photograph

Refer to “1906RSU006-EE” file.