TEST REPORT

Product Name:	Wireless speaker
Trade Mark:	PHILIPS
Model No.:	TAS4405-MIC
Add. Model No.:	N/A
Report Number:	191104004RFC-1
Test Standards:	FCC 47 CFR Part 74 Subpart H RSS-210 Issue 9 RSS-Gen Issue 5
FCC ID:	2AR2STAS4405M
IC:	24589-TAS4405M
Test Result:	PASS
Date of Issue:	January 2, 2020

Prepared for:

MMD Hong Kong Holding Limited
Units 1006-1007, 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by: _____ Reviewed by: _____

Eric Yu
Team Leader

Kevin Liang
Assistant Manager

Approved by: _____ Date: January 2, 2020

Billy Li
Technical Director

Version

Version No.	Date	Description
V1.0	January 2, 2020	Original

CONTENTS

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	MMD Hong Kong Holding Limited
Address of Applicant:	Units 1006-1007, 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong
Manufacturer:	MMD Hong Kong Holding Limited
Address of Manufacturer:	Units 1006-1007, 10th Floor, C-Bons International Center, 108 Wai Yip Street, Kwun Tong, Kowloon, Hong Kong

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Wireless speaker	
Model No.:	TAS4405-MIC	
Add. Model No.:	N/A	
Trade Mark:	PHILIPS	
DUT Stage:	Production Unit	
EUT Supports Function:	Wireless microphones:	174 - 216 MHz (VHF)
Power Supply:	The transmitter unit is supplied by 2×1.5V⎓AA batteries.	
Sample Received Date:	November 15, 2019	
Sample Tested Date:	November 26, 2019 to December 4, 2019	

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band :	174 - 216 MHz (VHF)
Frequency Range:	214.216 MHz
Type of Modulation:	☐Analog: FM
	☒Digital: 4FSK
Number of Channels:	1
Channel Separation:	1 MHz
Antenna Type:	Integral Antenna
Antenna Gain:	0 dBi
Max. RF Output Power:	12.65 dBm
Normal Test Voltage:	3.0 V (2 × 1.5V⎓AA batteries)
Extreme Test Voltage:	2.7 to 3.3Vdc
Extreme Test Temperature:	-10 °C to +50 °C

1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.15 Meter	UnionTrust

1.5 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.6 TEST FACILITY

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

CNAS-Lab Code: L9069
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories
CAB identifier: CN0032

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

1.7 DEVIATION FROM STANDARDS

None.

1.8 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.10 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	RF output power, conducted	±0.52 dB
2	Radio frequency	±6.3 x 10^{-8}
3	Occupied Channel Bandwidth	±2.3 %
4	Radiated Spurious emissions 30MHz-1GHz	±4.5 dB
5	Radiated Spurious emissions 1GHz-18GHz	±4.4 dB

2. TEST SUMMARY

FCC 47 CFR Part 74 Subpart H Test Cases			
Test Item	**Test Requirement**	**Test Method**	**Result**
RF output power	FCC 47 CFR Part 74.861(e)(1)(ii), (iii) FCC 47 CFR Part 2.1046(a) RSS-210 Issue 9 G.3.1	ANSI C63.26-2015	PASS
Emission mask	FCC 47 CFR Part 74.861(e)(7)	ETSI EN 300 422-1 V1.4.2, section 8.3.2.1	PASS
Radiated Spurious emissions	FCC 47 CFR Part 74.861(e)(6)(iii) RSS-210 Issue 9 G.3.4	ANSI C63.26-2015	PASS
Occupied Bandwidth	FCC 47 CFR Part 74.861(e) (5) RSS-210 Issue 9 G.3.2	ANSI C63.26-2015	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 74.861(e) (4) RSS-210 Issue 9 G.3.3	ANSI C63.26-2015	PASS

3. EQUIPMENT LIST

RF Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	Receiver	R&S	ESR7	1316.3003K07 -101181-K3	Nov. 24, 2019	Nov. 24, 2020
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 24, 2019	Nov. 24, 2020
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	Nov. 24, 2019	Nov. 24, 2020
☒	Audio Test System	Audio Precision	ATS-1	ATS1-41075	May 14, 2019	May 14, 2020
☒	DC Source	KIKUSUI	PWR400L	LK003024	Sep. 09, 2019	Sep. 08, 2020
☒	Temp & Humidity chamber	Votisch	VT4002	58566133290 020	Jun. 05, 2018	Jun. 05, 2020

Radiated Emission Test Equipment List						
Used	**Equipment**	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm dd, yyyy)**	**Cal. Due date (mm dd, yyyy)**
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 24, 2019	Nov. 24, 2020
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 24, 2019	Nov. 24, 2020
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 24, 2019	Nov. 24, 2020
☒	Preamplifier	HP	8447F	2805A02960	Nov. 24, 2019	Nov. 24, 2020
☒	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	May 18, 2019	May 18, 2020
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Test Environment	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	3.0	20 to 75
TL/VL	-10	2.7	20 to 75
TH/VL	+50	2.7	20 to 75
TL/VH	-10	3.3	20 to 75
TH/VH	+50	3.3	20 to 75

Remark:

1) The EUT just work in such extreme temperature of -10 °C to +50 °C and the extreme voltage of 2.7 V to 3.3 V, so here the EUT is tested in the temperature of -10 °C to +50 °C and the voltage of 2.7 V to 3.3 V.
2) VN: Normal Voltage; TN: Normal Temperature;
TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Tested by
RF output power	25.6	52.0	100.2	Asia Yan
Emission mask	24.0	56.0	100.3	Hank Wu
Radiated Spurious emissions	25.6	52.0	100.2	Asia Yan
Occupied Bandwidth	24.0	56.0	100.3	Hank Wu
Frequency stability	24.0	56.0	100.3	Hank Wu

4.2 TEST CHANNELS

Frequency Range	Test RF Channel Lists
214.216 MHz	214.216 MHz

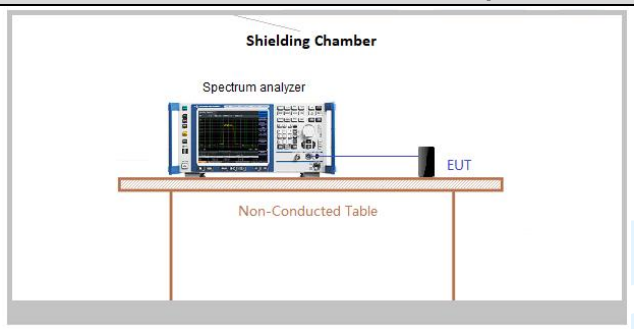
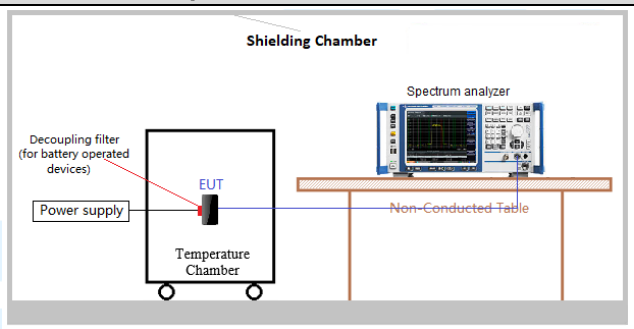
4.3 EUT TEST STATUS

Description
1. Keep the EUT in continuously transmitting with modulation test mode. 2. Keep the EUT in continuously transmitting with Un-modulation test mode.

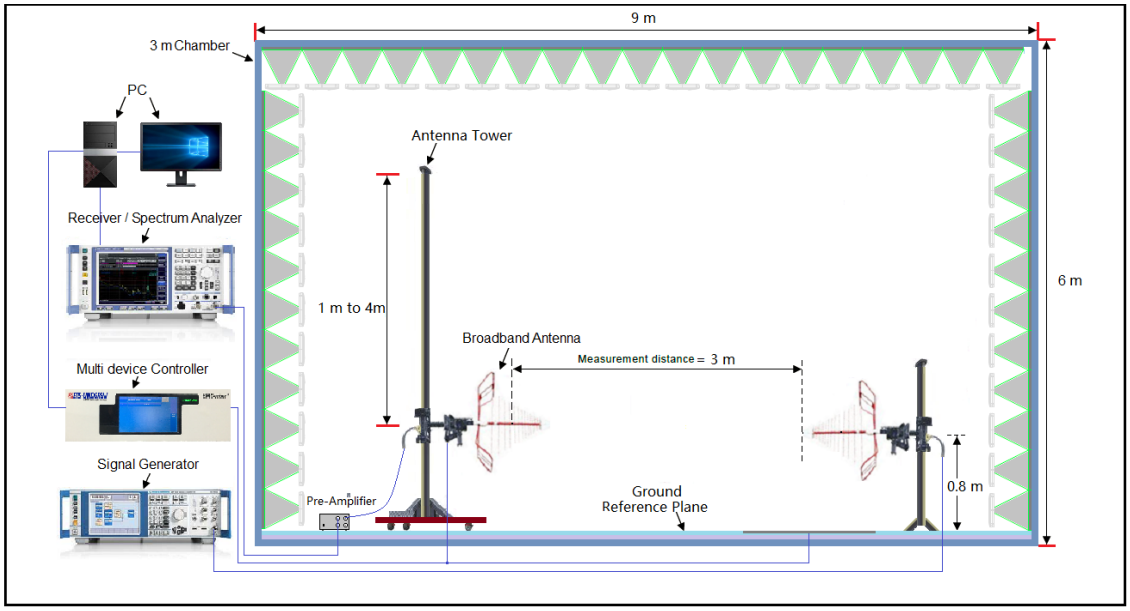
Power Setting
Power Setting: not applicable, test used software default power level.

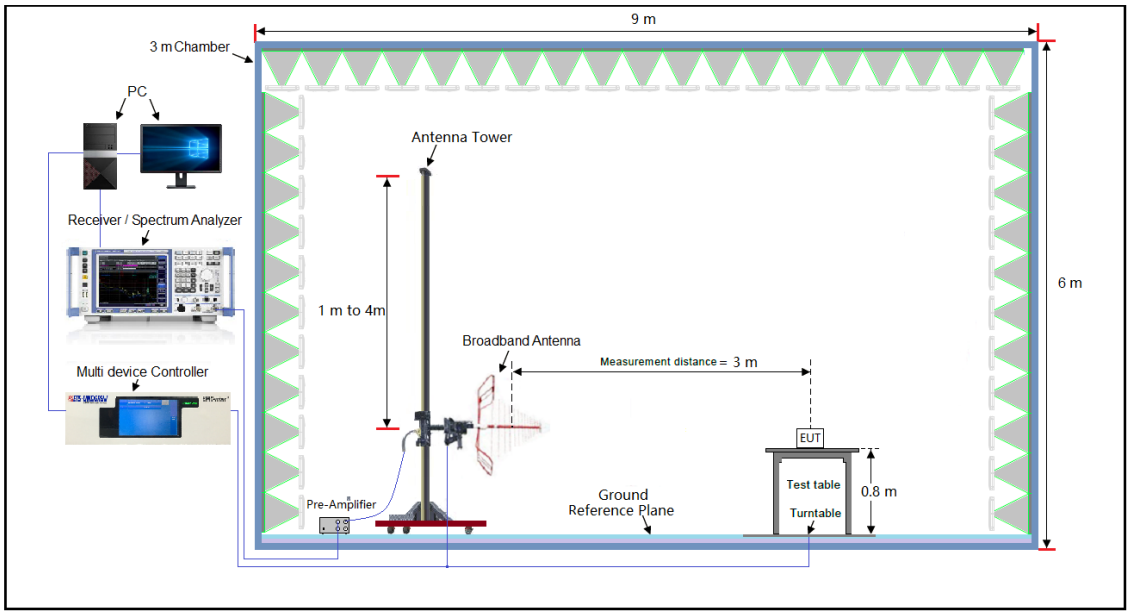
Test Software
Test software name: N/A;

4.4 TEST SETUP

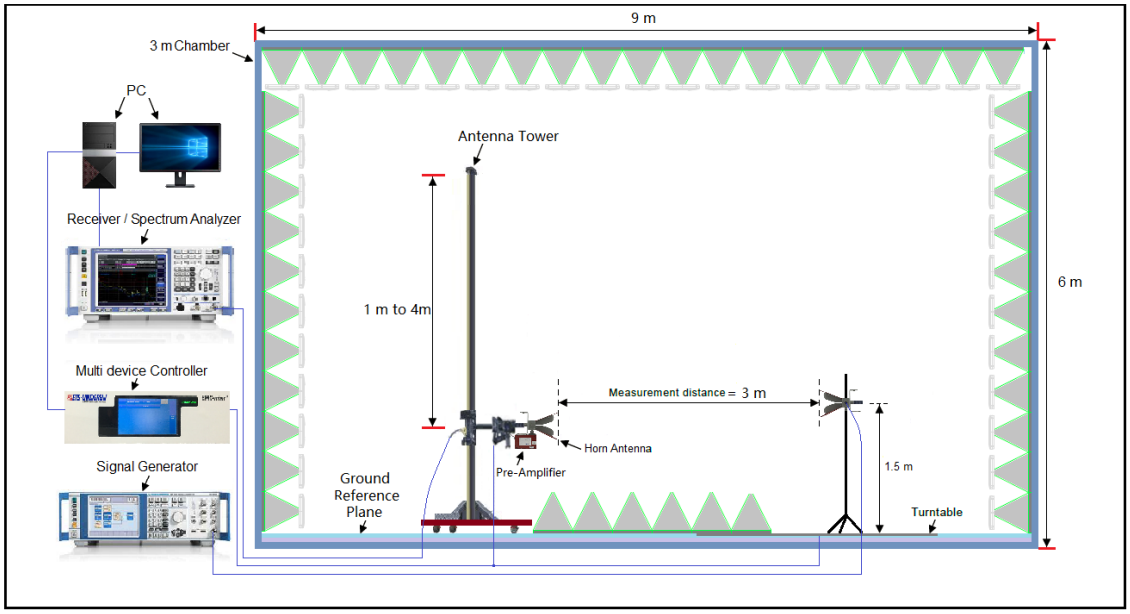
Setup -1_RF Conducted test setup	
	
Normal Test	Extreme Test

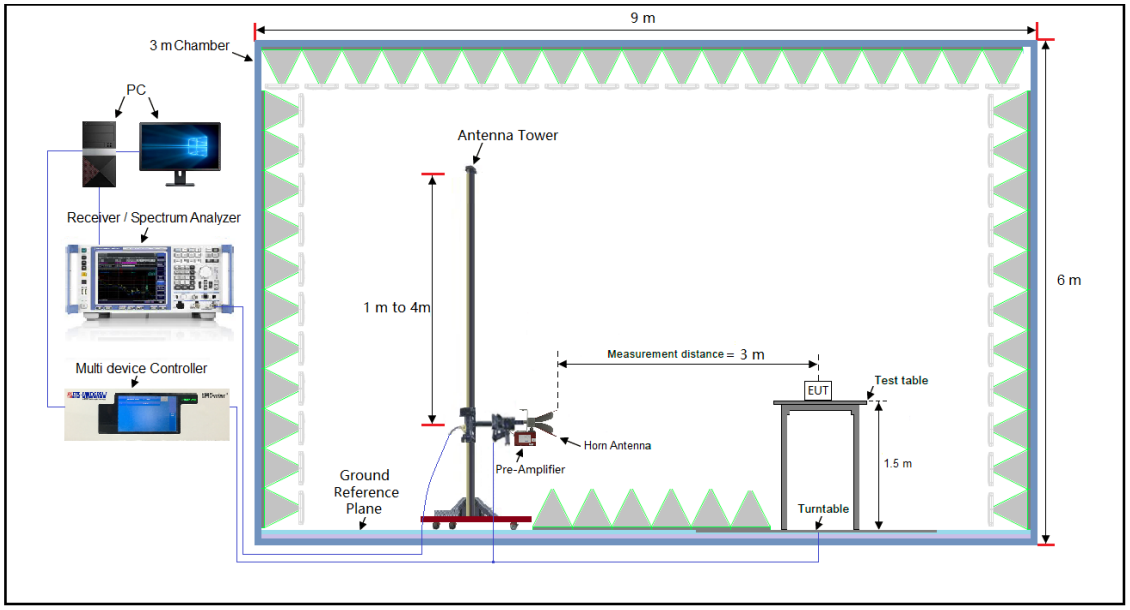
Setup - 2_ERP Test setup





Setup - 3_EIRP Test setup





5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 74 Subpart H	Low Power Auxiliary Stations
2	FCC 47 CFR Part 2 Subpart J	Frequency allocations and radio treaty matters; general rules and regulations
3	RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus
4	RSS-210 Issue 9	Licence-Exempt Radio Apparatus: Category I Equipment
5	ETSI EN 300 422-1 V1.4.2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement
6	KDB 206256 D01 Wireless Microphone Certification v02	Basic certification requirements for Wireless microphones
7	ANSI C63.26-2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

5.2 RF OUTPUT POWER

Test Requirement: FCC 47 CFR Part 74.861(e)(1)(ii), (iii)
FCC 47 CFR Part 2.1046(a)
RSS-210 Issue 9 G.3.1

Test Method: ANSI C63.26-2015

Limits:

(e) For low power auxiliary stations operating in the 600 MHz duplex gap and the bands allocated for TV broadcasting, the following technical requirements apply:
(1) The power may not exceed the following values.
(ii) 174-216: 50 mW conducted power
(iii) 600 MHz duplex gap: 20 mW EIRP

Test Setup: Refer to section 4.4 for details.

Test Procedures:

1. The output of the EUT was connected to a spectrum analyzer through 20dB of attenuation. The EUT was set to transmit on the lowest/ middle/ highest frequency.
2. Measure out each test modes' average output power, record the power level.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Test Frequency (MHz)	EIRP (dBm)	EIRP (mW)	Limit (mW)	Margin (mW)
214.216	12.65	18.4077	50.00	31.5923

5.3 EMISSION MASK

Test Requirement: FCC 47 CFR Part 74.861(e)(7)

Test Method: ETSI EN 300 422-1 V1.4.2, section 8.3.2.1

Limits:

For Analogue Systems:

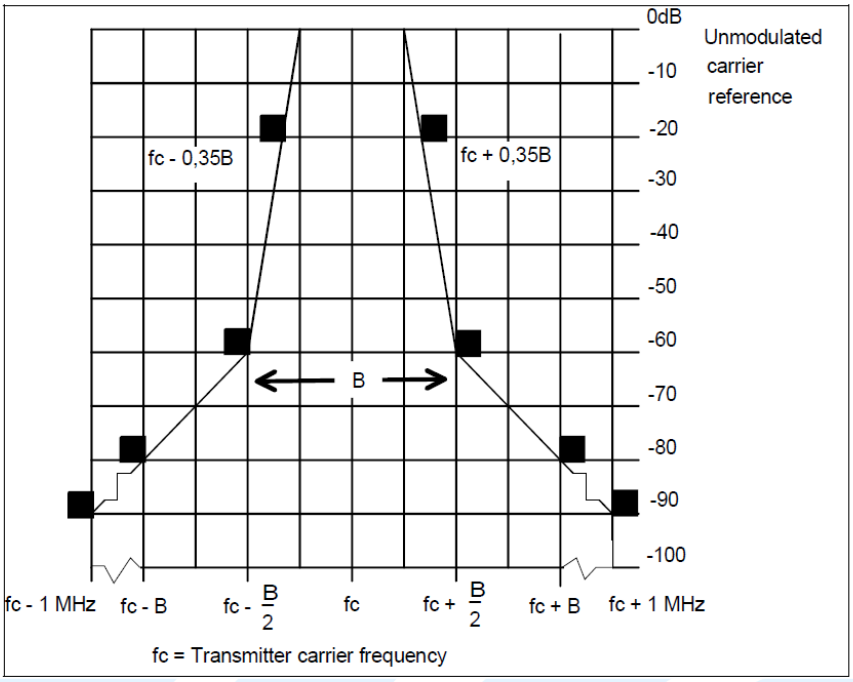


Figure 3: Spectrum mask for analogue systems in all bands

Figure 3 shows the spectrum mask for all analogue systems in the band. The -90 dBc point shall be ±1 MHz from fc measured with an average detector. To comply, a measured value must fall below the mask limit as shown in figure 3.

For Digital Systems:

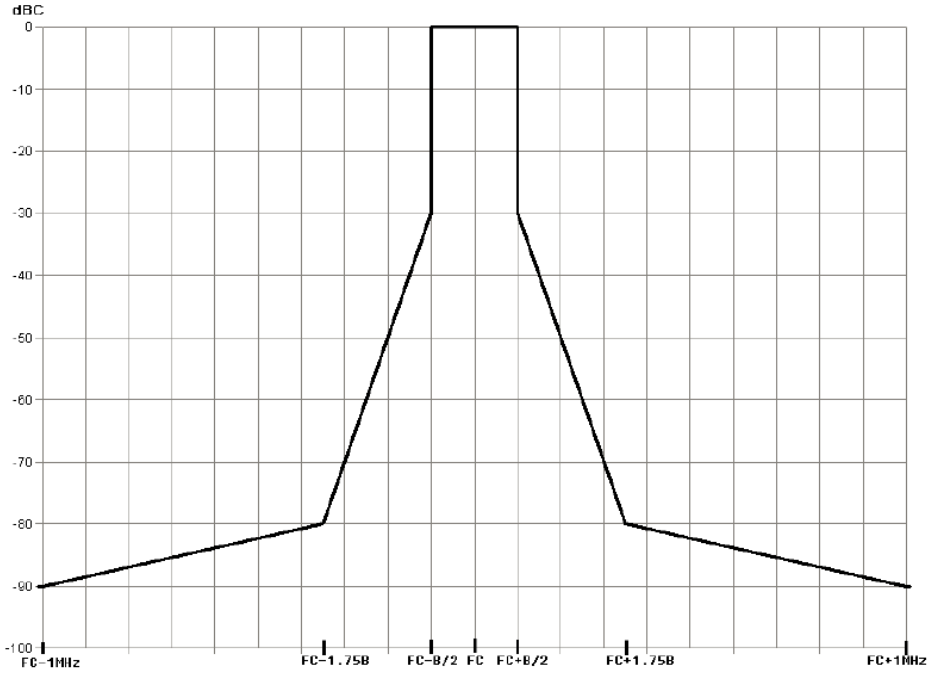


Figure 4: Spectrum mask for digital systems below 1 GHz

For the measurement uncertainty, see clause 10. The -90 dBc point shall be ±1 MHz from fc measured with an average detector.

Test Setup: Refer to section 4.4 for details.

Test Procedures:

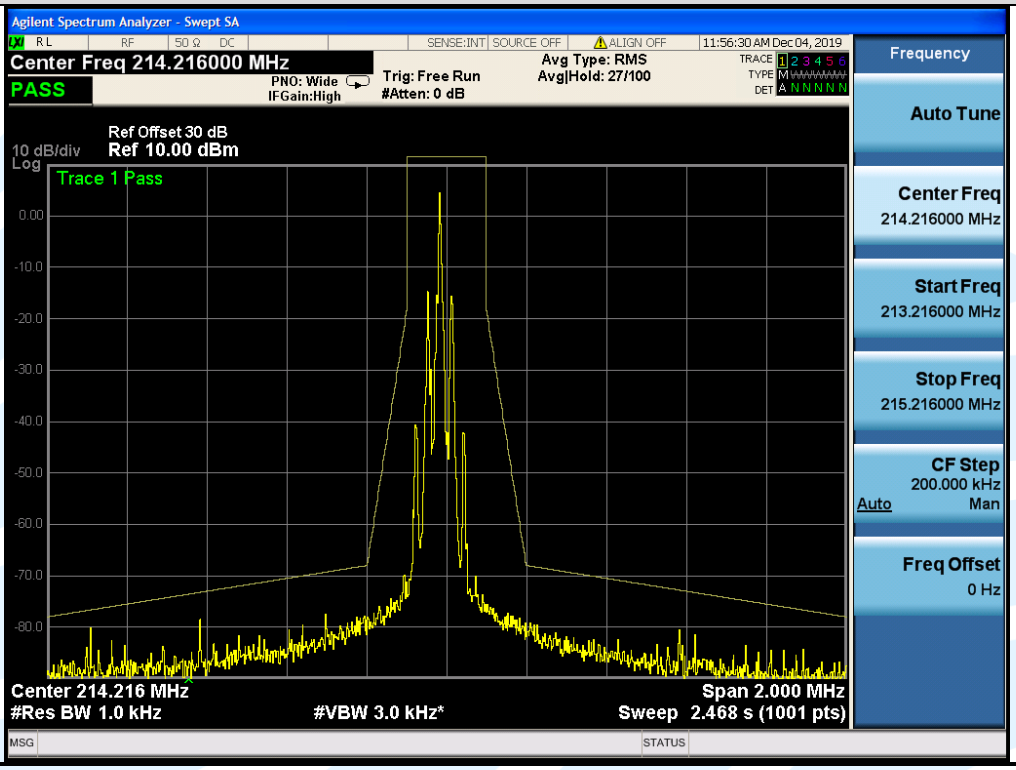
Refer to ETSI EN 300 422-1 V1.4.2, section 8.3.2.1

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

For 214.216 MHz



5.4 RADIATED SPURIOUS EMISSIONS

Test Requirement: FCC 47 CFR Part 15.236(g)
RSS-210 Issue 9 G.3.4

Test Method: ANSI C63.26-2015

Limits:

On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43 + 10log$_{10}$ (mean output power in watts) dB.

Test Setup: Refer to section 4.4 for details.

Test Procedures:

ANSI/TIA-603-E-2016

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

For 214.216 MHz

No.	Frequency (MHz)	Reading (dBm)	Correction factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)	Detector	Antenna Polaxis
1	952.000	-103.25	41.61	-57.37	-13.00	-44.37	Peak	Horizontal
2	1070.000	-40.10	-0.07	-40.17	-13.00	-27.17	Peak	Horizontal
3	1284.000	-42.43	0.57	-41.86	-13.00	-28.86	Peak	Horizontal
4	646.822	-96.97	41.61	-58.25	-31.36	-26.89	Peak	Vertical
5	1070.000	-40.32	0.68	-39.64	-13.00	-26.64	Peak	Vertical
6	1284.000	-43.00	1.50	-41.50	-13.00	-28.50	Peak	Vertical

Standby mode test result:

Not any spurious emissions has been observed.

5.5 OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 74.861(e) (5)
RSS-210 Issue 9 Annex G.3.2

Test Method: ANSI C63.26-2015

Limits:

The operating bandwidth shall not exceed 200 kHz.

Test Setup: Refer to section 4.4 for details.

Test Procedures:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Use the following spectrum analyzer settings:
a) Set RBW = 1 % to 5 % of the anticipated OBW.
b) Set VBW ≥ 3 x RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

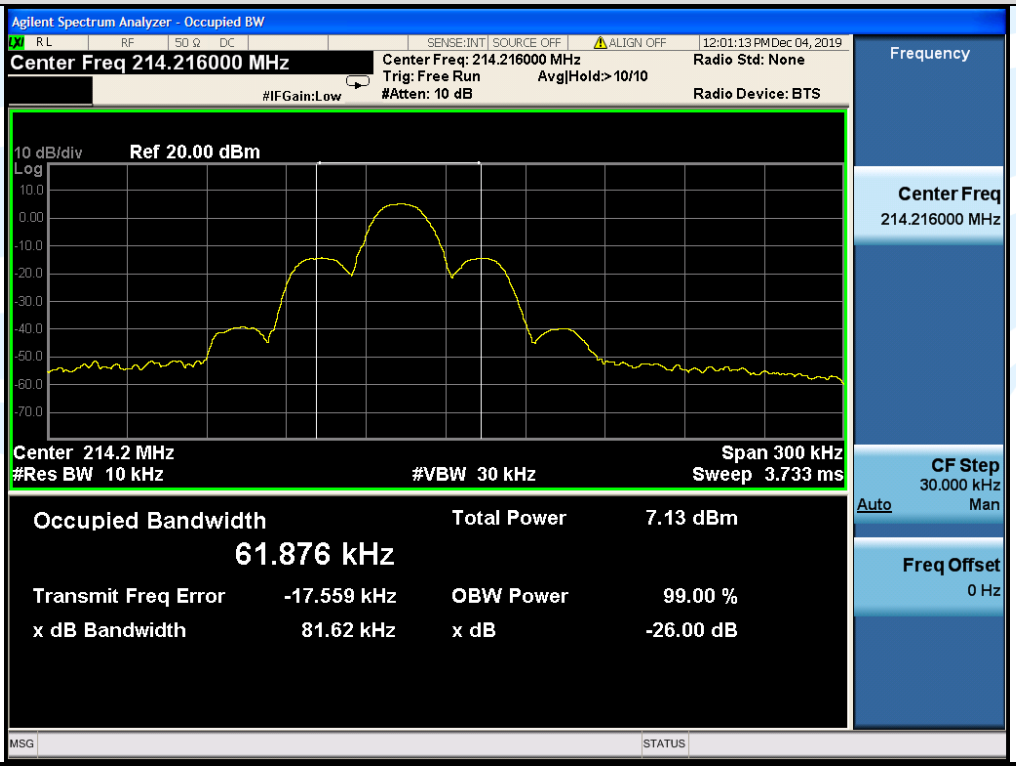
Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Channel	Occupied Bandwidth (kHz)	Limit (kHz)
Lowest	61.876	200

For 214.216 MHz



5.6 FREQUENCY STABILITY

Test Requirement: FCC 47 CFR Part 74.861(e) (4)
RSS-210 Issue 9 Annex G.3.3

Test Method: ANSI/TIA-603-E-2016

Limits:

The frequency tolerance of the transmitter shall be 0.005 percent (50ppm)

Test Setup: Refer to section 4.4 for details.

Test Procedures:

1) Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage.
2) The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up. Frequency stability is tested:
   a) at 10°C intervals of temperatures between -30°C and +50°C at the manufacturer's rated supply voltage, and
   b) at +20 °C temperature and ± 15 % supply voltage variations. If a product is specified to operate over a range of input voltage then the -15 % variation is applied to the lowermost voltage and the + 15 % is applied to the uppermost voltage.
3) During the test all necessary settings, adjustments and control of the EUT have to be performed without disturbing the test environment, i.e., without opening the environmental chamber. The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range. For handheld equipment that is only capable of operating from internal batteries and the supply voltage cannot be varied, the frequency stability tests shall be performed at the nominal battery voltage and the battery end point voltage specified by the manufacturer. An external supply voltage can be used and set at the internal 2483 battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

Channel	Frequency	Voltage	Temperature	Measured value	Deviation	Limit	Pass/ Fail
	(MHz)	(Vdc)	(℃)	(MHz)	(ppm)	(ppm)	
1	214.216	VL	TN	214.218	9.3364	± 50	Pass
		VN		214.219	11.6705	± 50	Pass
		VH		214.220	18.6727	± 50	Pass
		VN	50	214.220	16.3386	± 50	Pass
			40	214.219	14.0046	± 50	Pass
			30	214.218	7.0023	± 50	Pass
			20	214.220	16.3386	± 50	Pass
			10	214.218	9.3364	± 50	Pass
			0	214.219	11.6705	± 50	Pass
			-10	214.218	9.3364	± 50	Pass
			-20	214.218	9.3364	± 50	Pass
			-30	214.218	9.3364	± 50	Pass

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***