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TEST REPORT

Report Reference No. ..... :	**TRE1611014202**	**R/C……: 93883**
FCC ID ..... :	**Y9ZMT4D1050**	
Applicant's name ..... :	**3M Company**	
Address..... :	Personal Safety Division, 3M Center, Building 235-2NW-70, St. Paul, Minnesota, United States	
Manufacturer.....:	3M SVENSKA AB	
Address.....:	Malmstensgatan 19, SE331 02 Varnamo, Sweden	
Test item description ..... :	3M™ PELTOR™ WS™ LiteCom PRO III	
Trade Mark .....:	3M PELTOR	
Model/Type reference.....:	MT73H7A4D10EU	
Listed Model(s) .....:	See annex	
Standard ..... :	**FCC Part 95/ FCC Part 15B/FCC Part 2**	
Date of receipt of test sample……..:	Nov. 25, 2016	
Date of testing……:	Nov. 28, 2016 – Jan. 16, 2017	
Date of issue……...:	Jan. 16, 2017	
Result..... ……..:	**PASS**	

Compiled by (position+printed name+signature)..:	File administrators Shayne Zhu	Shayne Zhu
Supervised by (position+printed name+signature)..:	Project Engineer Cary Luo	Cary Luo
Approved by (position+printed name+signature)..:	RF Manager Hans Hu	Hans Hu

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

Contents

1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:
FCC Rules Part 95: 2016 PERSONAL RADIO SERVICES
FCC Part 15 Subpart B: 2016 Unintentional Radiators
TIA/EIA 603 D: June 2010 Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.
FCC Part 2: 2016 Frequency allocations and radio treaty matters, general rules and regulations.

1.2. Report version

Version No.	Date of issue	Description
00	Jan. 16, 2017	Original

Annex:
MT73H7P3E4D10EU,MT73H7B4D10EU,MT73H7F4D10EU-50,,MT73H7P3E4D10EU-50,
MT73H7B4D10EU-50,MT73H7A4D10NA, MT73H7P3E4D10NA, MT73H7B4D10NA,
MT73H7F4D10NA-50, MT73H7P3E4D10NA-50,MT73H7B4D10NA-50

2. Test Description

Transmitter Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Maximum Transmitter Power	FCC Part 95.639(a)& (d)	☒	
Modulation Limit	FCC Part 95.637(a)	☒	
Audio Frequency Response	FCC Part 95.637(a)	☒	
Audio Low Pass Filter Response	FCC Part 95.637(b)		☒
Emission Bandwidth	FCC Part 95.633(a)&(c)	☒	
Emission Mask	FCC Part 95.635(b)(1)(3)(7)	☒	
Transmitter Radiated Spurious Emission	FCC Part 95.635(b) (7)	☒	
Spurious Emission On Antenna Port	FCC Part 95.635(b) (7)		☒
Frequency Stability	FCC Part 95.626(b)	☒	
Receiver Requirement			
Test item	Standards requirement	Result	
		Pass	N/A
Conducted Emission	FCC Part 15.107	☒	
Radiated Emission	FCC Part 15.109	☒	

Note:
The test measurements were made in accordance with the above-mentioned departmental standard(s), and the equipment identified in this application has been subject to all the applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

3. SUMMARY

3.1. Client Information

Applicant:	3M Company
Address:	Personal Safety Division, 3M Center, Building 235-2NW-70, St. Paul, Minnesota, United States
Manufacturer:	3M SVENSKA AB
Address:	Malmstensgatan 19, SE331 02 Varnamo, Sweden

3.2. Product Description

Name of EUT:	3M™ PELTOR™ WS™ LiteCom PRO III	
Trade mark:	3M PELTOR	
Model/Type reference:	MT73H7A4D10EU	
Listed model(s):	See annex	
Power supply:	3M™ PELTOR™ WS™ LiteCom PRO III	
Battery information 1:	Model:ACK08 3.7Vd.c.,1350mAh,5Wh	
Battery information 2:	Model:ACK082 3.7Vd.c.,1350mAh,5Wh	
Battery information 3:	Model:ACK081 3.7Vd.c.,1800mAh,6.7Wh	
Charger information:	-	
Adapter information:	Model:EMSA050100 Input:100-240Va.c.,50-60Hz,0.2A Output:5Vd.c.,1.0A	
Operation Frequency Range:	FRS:	462.5625MHz~467.7125MHz
Rated Output Power:	FRS:	High Power: 200mW (23.00dBm)/Low Power: 10mW (10.00dBm)
Modulation Type:	FRS:	FM
Channel Separation:	FRS:	12.5kHz
Emission Designator:	FRS:	5K86F3E
Maximum Transmitter Power (ERP):	FRS:	197.7mW
Antenna Type:	Integral	

Note:

1. The device only supports voice communication.
2. The device has no gain and vertically polarized antenna.

Remark:
We tested all models, but recorded the worst case at Type 3.
The charging cable has two models: AL2AI and AL2AH. 3 batteries with 3 models: ACK081, ACK08 and ACK 082. The cable matched with 3 batteries as following when testing:
a. EUT+ACK081+AL2AI
b. EUT+ACK08/ ACK082+AL2AH
The only difference between ACK08 and ACK 082 is the model name, other data are the same.
We recorded the worst case at EUT+ACK08+AL2AH.

3.3. Test frequency list

Mode	Modulation	Operation Frequency Range (MHz)	Test Frequency (MHz)
FRS	FM	462.5625MHz~467.7125MHz	462.5625
			467.5625
			467.7125

3.4. EUT operation mode

Test mode	Transmitting	Receiving	Power level		FRS /FM
			High	Low	12.5kHz
TX1	√		√		√
TX2	√			√	√
RX1		√			√

√: is operation mode.

3.5. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

○	Power Cable	Length (m) :	-
		Shield :	Unshielded
		Detachable :	Undetachable
○	Multimeter	Manufacturer :	-
		Model No. :	-

4. TEST ENVIRONMENT

4.1. Address of the test laboratory

Laboratory:Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

4.2. Test Facility

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

CNAS-Lab Code: L1225
Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories
(identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

A2LA-Lab Cert. No. 3902.01
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until December 31, 2016.

FCC-Registration No.: 317478
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

IC-Registration No.: 5377A&5377B
The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Dec. 31, 2013, valid time is until Dec. 31, 2016.
Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

ACA
Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Environmental conditions

Normal Conditon	
Relative humidity:	20 % to 75 %.
Air Pressure:	950~1050mba
Voltage:	DC 3.7V

4.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to 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 Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency stability	25 Hz	(1)
Transmitter power Radiated	2.20 dB	(1)
Radiated Emission 30~1000MHz	4.65 dB	(1)
Occupied Bandwidth	35 Hz	(1)
FM deviation	25 Hz	(1)
Audio level	0.62 dB	(1)
Low Pass Filter Response	0.76 dB	(1)
Modulation Limiting	0.42 %	(1)

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

4.5. Equipments Used during the Test

Modulation Characteristic				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13

Frequency Stability				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
Signal Generator	Rohde&Schwarz	SMT03	100059	2016/11/13
Climate Chamber	ESPEC	EL-10KA	05107008	2016/11/13

Maximum Transmitter Power & Transmitter Radiated Spurious Emission				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
Ultra-Broadband Antenna	Rohde&Schwarz	HL562	100015	2016/11/13
EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
HORN ANTENNA	Rohde&Schwarz	HF906	100039	2016/11/13
Turntable	ETS	2088	2149	N/A
Antenna Mast	ETS	2075	2346	N/A
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2016/11/13
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	2016/11/13
HORN ANTENNA	ShwarzBeck	9120D	1012	2016/11/13
HORN ANTENNA	ShwarzBeck	9120D	1011	2016/11/13
TURNTABLE	MATURO	TT2.0	----	N/A
ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A
Attenuator	Chengdu E-Microwave	EMCAXX-10RNZ-3	----	2016/11/13
RF Cable	Chengdu E-Microwave	----	----	2016/11/13
Combiner	Chengdu E-Microwave	EMPD-T-2-180-10-600	----	2016/11/13

Emission Bandwidth & Emission Mask				
Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
Receiver	Rohde&Schwarz	ESI 26	100009	2016/11/13
Attenuator	R&S	ESH3-22	100449	2016/11/13
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	2016/11/13
Spectrum Analzyer	Rohde&Schwarz	FSP40	1164.4391.40	2016/11/13

The calibration interval was one year.

5. TEST CONDITIONS AND RESULTS

5.1. Maximum Transmitter Power (Effective Radiated Power)

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation.

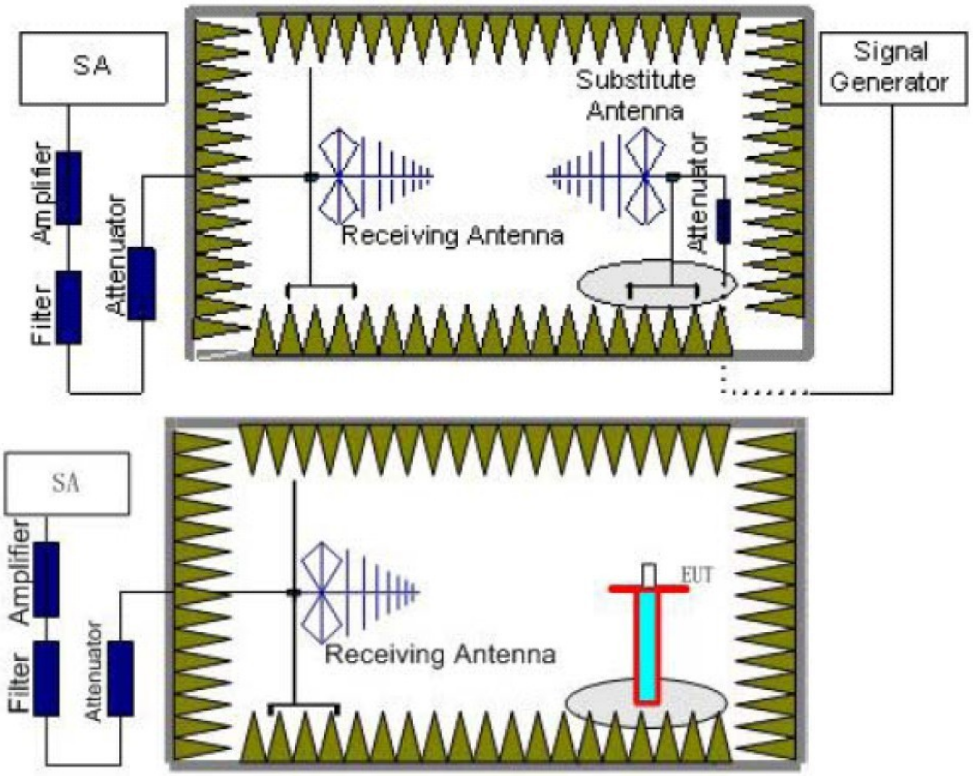
LIMIT

FCC Part 95.639(d):
FRS: The maximum permissible transmitter output power under any operating conditions is 0.5 W effective radiated power (e.r.p.). The radio shall be equipped with an integral antenna.

TEST PROCEDURE

1. EUT was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1. 0 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (Pr).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=PMea- PAg - Pcl - Ga
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=PMea- Pcl - Ga
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST CONFIGURATION



TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Operation Mode	Test Frequency (MHz)	ERP (dBm)	Difference (dB)	Limit (dBm)	Result
TX1	462.5625	22.96	-4.04	27.00	Pass
	467.5625	22.93	-4.07	27.00	
	467.7125	22.95	-4.05	27.00	
TX2	462.5625	9.93	-17.07	27.00	Pass
	467.5625	9.95	-17.05	27.00	
	467.7125	9.91	-17.09	27.00	

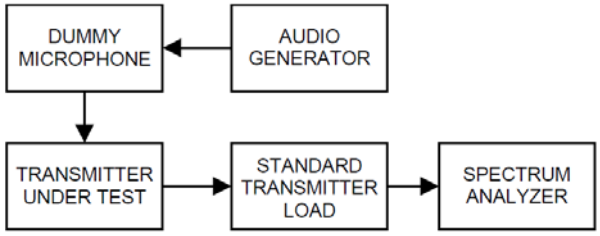
5.2. Emission Bandwidth

The Emission bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits.

LIMIT

FCC Part 95.633(c):
FRS:
The authorized bandwidth for an FRS unit is 12.5 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1 The EUT was modulated by 2.5kHz sine wave audio signal; the level of the audio signal employed is 16dB greater than that necessary to produce 50% of rated system deviation.
Rated system deviation is 2.5 kHz for 12.5kHz channel spacing).
2 Spectrum set as follow:
Centre frequency = fundamental frequency, span=30kHz for 12.5kHz channel spacing,
RBW=300Hz, VBW=1000Hz, Sweep = auto,
Detector function = peak, Trace = max hold
3 Set 99% Occupied Bandwidth and 26dB Occupied Bandwidth
4 Measure and record the results in the test report.

TEST MODE:

Please reference to the section 3.4

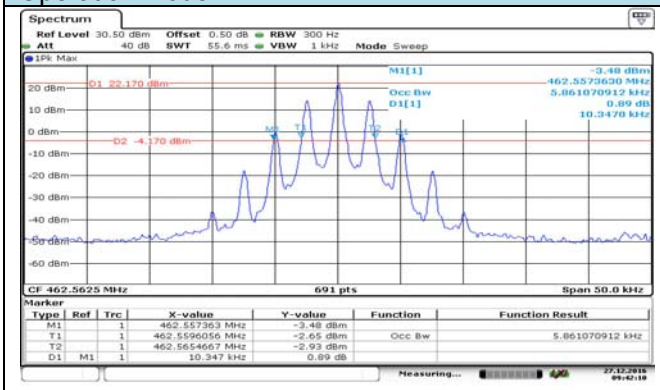
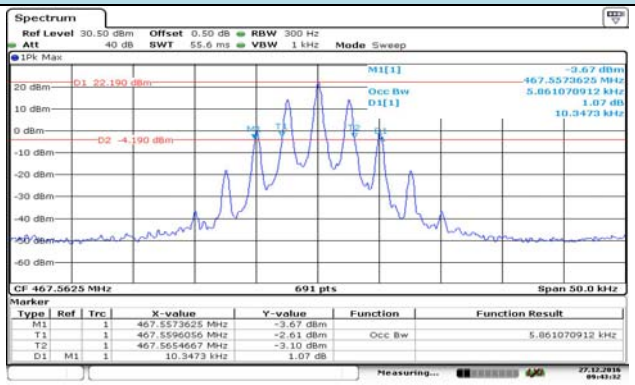
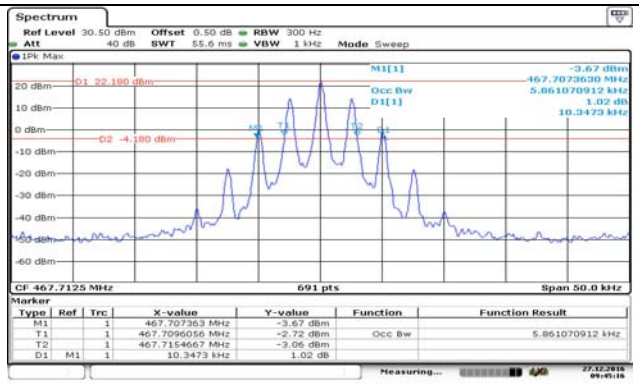
TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: have pre-tested TX1 to TX2 mode, record the worst case mode TX1 on the report.

Operation Mode	Test Frequency (MHz)	Occupied Bandwidth		Limit (kHz)	Result
		99%	26dB		
TX1	462.5625	5.85	10.35	≤12.5	Pass
	467.5625	5.86	10.35	≤12.5	
	467.7125	5.86	10.35	≤12.5	

Test plot as follows:

Operation Mode	TX1
	
462.5625MHz	467.5625MHz
	No Plot
467.7125MHz	-

5.3. Emission Mask

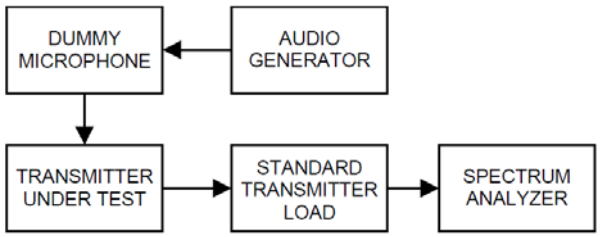
Transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section.

LIMIT

FCC Part 95.635 (b)(1)(3)(7):
FRS:
Unwanted emissions shall be attenuated below the unmodulated carrier power in accordance with the following:

(1) At least 25 dB (decibels) on any frequency removed from the center of the authorized bandwidth by more than 50% up to and including 100% of the authorized bandwidth.
(3) At least 35 dB on any frequency removed from the center of the authorized bandwidth by more than 100% up to and including 250% of the authorized bandwidth.
(7) At least 43 + 10 $\log_{10}$ (T) dB on any frequency removed from the center of the authorized bandwidth by more than 250%.

TEST CONFIGURATION



TEST PROCEDURE

1 Connect the equipment as illustrated.
2 Spectrum set as follow:
Centre frequency = fundamental frequency, span=30kHz for 12.5kHz channel spacing,
RBW=300Hz, VBW=1000Hz, Sweep = auto,
Detector function = peak, Trace = max hold
3 Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0dB reference for the measurement.
4 Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation(Rated system deviation is 2.5 kHz for 12.5kHz channel spacing). The input level shall be established at the frequency of maximum response of the audio modulating circuit. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer
5 Measure and record the results in the test report.

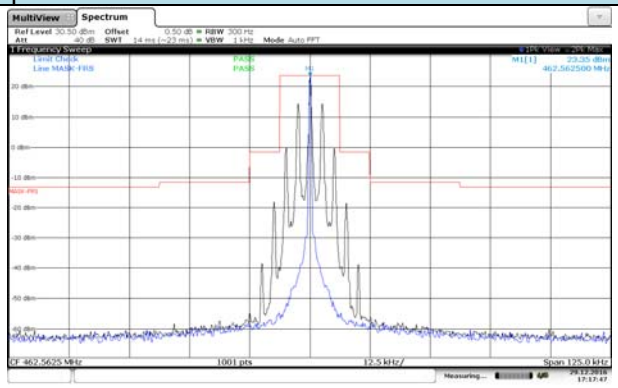
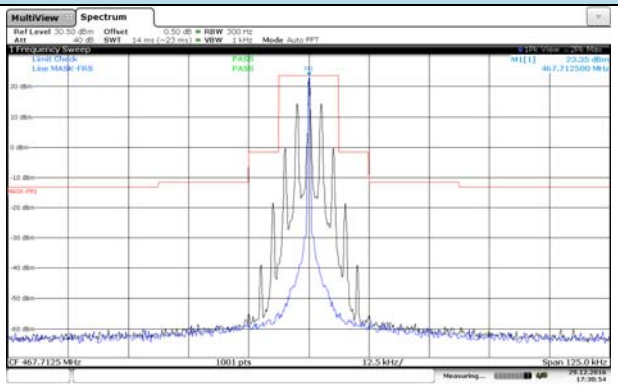
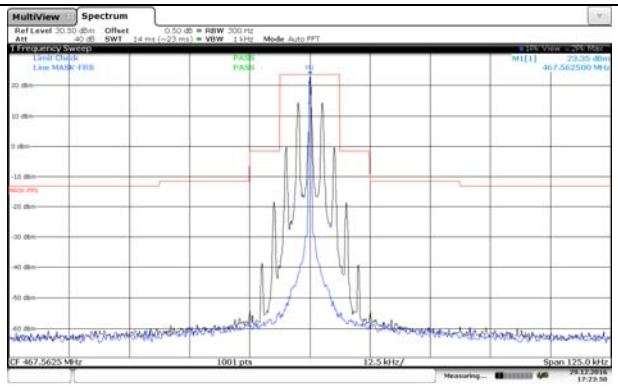
TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: have pre-tested TX1 to TX2 mode, record the worst case mode TX1 on the report.

Operation Mode	TX1
	
462.5625MHz	467.5625MHz
	No Plot
467.7125MHz	-

5.4. Transmitter Radiated Spurious Emission

Radiated spurious emissions are emissions from the equipment when transmitting into a nonradiating load on a frequency or frequencies that are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

LIMIT

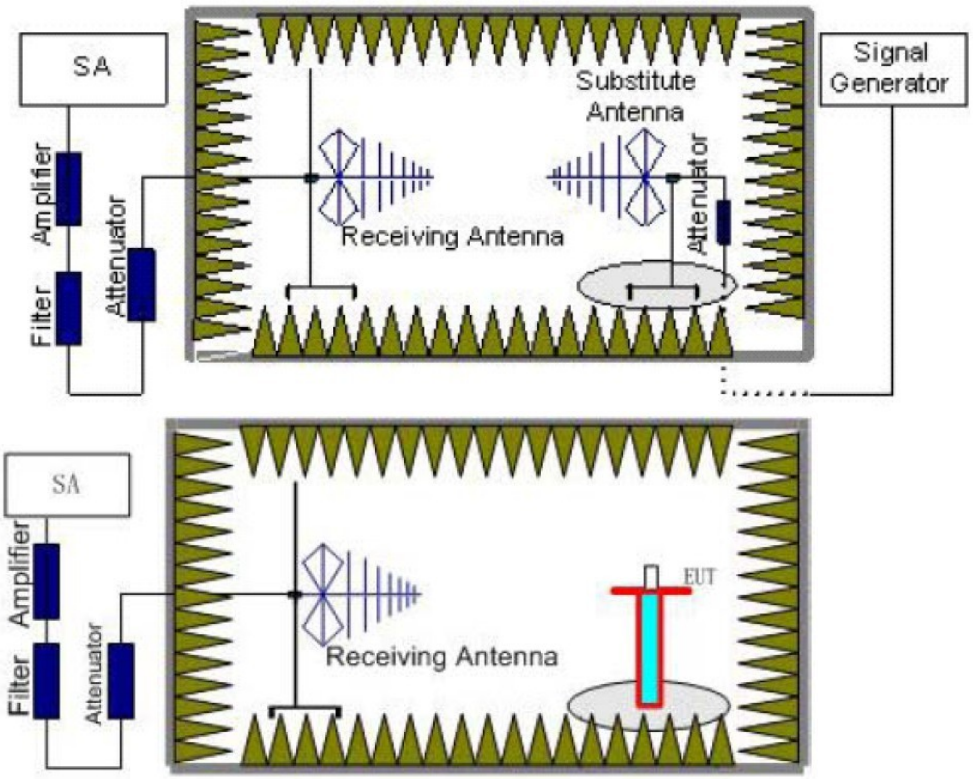
FCC Part 95.635(b) (7) (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:
43 + 10 log (Pwatts) = 43 + 10 log (0.2)

Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 23 dBm.
Limit (dBm) =23-43-10log$_{10}$ (0.2) = -13dBm

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1. 0 m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in six channels were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz for above 1GHz and RBW=100kHz,VBW=300kHz for 30MHz to 1GHz, And the maximum value of the receiver should be recorded as (P_r).

4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}) ,the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test.
   The measurement results are obtained as described below:
   Power(EIRP)=P_{Mea}- P_{Ag} - P_{cl} - G_a
   We used SMF100A micowave signal generator which signal level can up to 33dBm,so we not used power Amplifier for substituation test; The measurement results are amend as described below:
   Power(EIRP)=P_{Mea}- P_{cl} - G_a
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:
1. In general, the worse case attenuation requirement shown above was applied.
2. The measurement frequency range from 30 MHz to 5 GHz.
3. Absolute Level=SG Level-Cable loss+Antenna Gain, Margin=Limit-Absulute Level
4. Note: have pre-tested TX1 to TX2 mode, record the worst case mode TX1 on the report.

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G.Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
TX1:462.5625 MHz								
925.125	H	66.45	-31.21	0	3.62	-34.83	-13	21.83
925.125	V	68.54	-28.33	0	3.62	-31.95	-13	18.95
1387.6875	H	59.42	-38.95	9.8	4.47	-33.62	-13	20.62
1387.6875	V	55.12	-44.62	9.8	4.47	-39.29	-13	26.29
1850.25	H	52.34	-49.28	12.3	5.78	-42.76	-13	29.76
1850.25	V	50.05	-52.09	12.3	5.78	-45.57	-13	32.57
TX1:467.5625MHz								
935.125	H	66.42	-29.99	0	3.64	-33.63	-13	20.63
935.125	V	68.36	-29.46	0	3.64	-33.1	-13	20.1
1402.6875	H	59.24	-41.38	9.9	4.51	-35.99	-13	22.99
1402.6875	V	55.47	-46.19	9.9	4.51	-40.8	-13	27.8
1870.25	H	52.52	-48.95	12.4	5.82	-42.37	-13	29.37
1870.25	V	50.11	-51.88	12.4	5.82	-45.3	-13	32.3
TX1:467.7125 MHz								
935.425	H	66.12	-30.73	0	3.65	-34.38	-13	21.38
935.425	V	68.23	-30.29	0	3.65	-33.94	-13	20.94
1403.1375	H	59.23	-42.13	9.9	4.52	-36.75	-13	23.75
1403.1375	V	55.03	-45.83	9.9	4.52	-40.45	-13	27.45
1870.85	H	52.15	-49.54	12.4	5.83	-42.97	-13	29.97
1870.85	V	49.81	-52.88	12.4	5.83	-46.31	-13	33.31

5.5. Spurious Emission on Antenna Port

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies that are outside a band sufficient to ensure transmission of information of required quality for the class of communication desired

LIMIT

FCC Part 95.635(b) (7) (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz at least:
43 + 10 log (Pwatts) = 43 + 10 log (10^{-3})

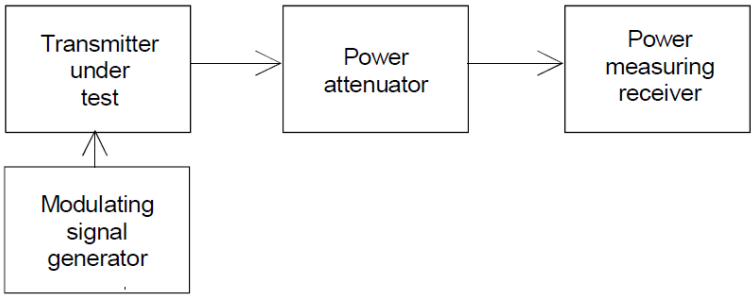
Note: In general, the worse case attenuation requirement shown above was applied.
Calculation: Limit (dBm) =EL-43-10log10 (TP)

Notes: EL is the emission level of the Output Power expressed in dBm,
In this application, the EL is 0 dBm.
Limit (dBm) =0-43-10log$_{10}$ (10^{-3}) = -13dBm

TEST PROCEDURE

1. The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation.
2. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower and the highest frequency range. Set RBW 100 kHz, VBW 300 kHz in the frequency band 30MHz to 1GHz,while set RBW=1MHz.VBW=3MHz from the 1GHz to 10th Harmonic.
3. The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for each channel separation.

TEST CONFIGURATION



TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☐ **Passed** ☒ **Not Applicable**

This equipment is integral antenna.

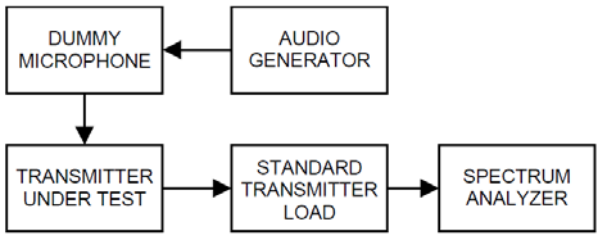
5.6. Modulation Limit

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of a rated system deviation.

LIMIT

FCC Part 95.637(a), FCC Part 2.1047(b)
2.5 KHz for 12.5 KHz Channel Spacing System

TEST CONFIGURATION



TEST PROCEDURE

1) Connect the equipment as illustrated.
2) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.
3) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz. Turn the de-emphasis function off.
4) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation, this level is as a reference (0dB) and vary the input level from –20 to +20dB.
5) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level
6) Repeat step 4-5 with input frequency changing to 300Hz, 1004Hz, 1500Hz and 2500Hz in sequence.

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**
Note: have pre-tested TX1 to TX2 mode, record the worst case mode TX1 on the report.

TX1: 462.5625MHz						
Modulation Level (dB)	Peak frequency deviation (kHz)				Limit (kHz)	Result
	300Hz	1004Hz	1500Hz	2500 Hz		
-20	0.2	0.23	0.3	0.19	2.5	Pass
-15	0.34	0.36	0.46	0.43		
-10	0.46	0.52	0.8	1.16		
-5	0.79	0.6	1.57	1.44		
0	0.99	1.65	2.13	2.07		
5	1.44	2	2.16	2.18		
10	1.84	2.13	2.22	2.24		
15	2	2.18	2.19	2.28		
20	2.16	2.34	2.32	2.32		

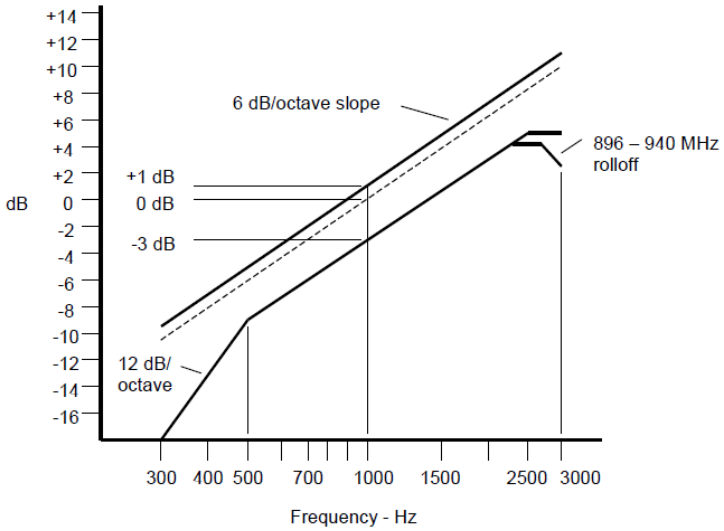
Test plot as follows:

5.7. Audio Frequency Response

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

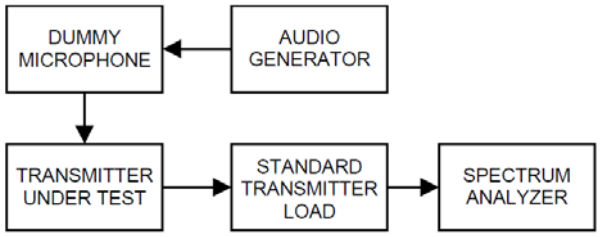
LIMIT

2.1047(a): Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.



An additional 6 dB per octave attenuation is allowed from 2500 Hz to 3000 Hz in equipment operating in the 25 MHz to 869 MHz range.

TEST CONFIGURATION



TEST PROCEDURE

1) Configure the EUT as shown in figure .
2) Adjust the audio input for 20% of rated system deviation at 1kHz using this level as a reference.
3) Vary the Audio frequency from 300Hz to 3 kHz and record the frequency deviation.
4) Audio Frequency Response =$20\log_{10}$ (V_{FREQ}/V_{REF}).

TEST MODE:

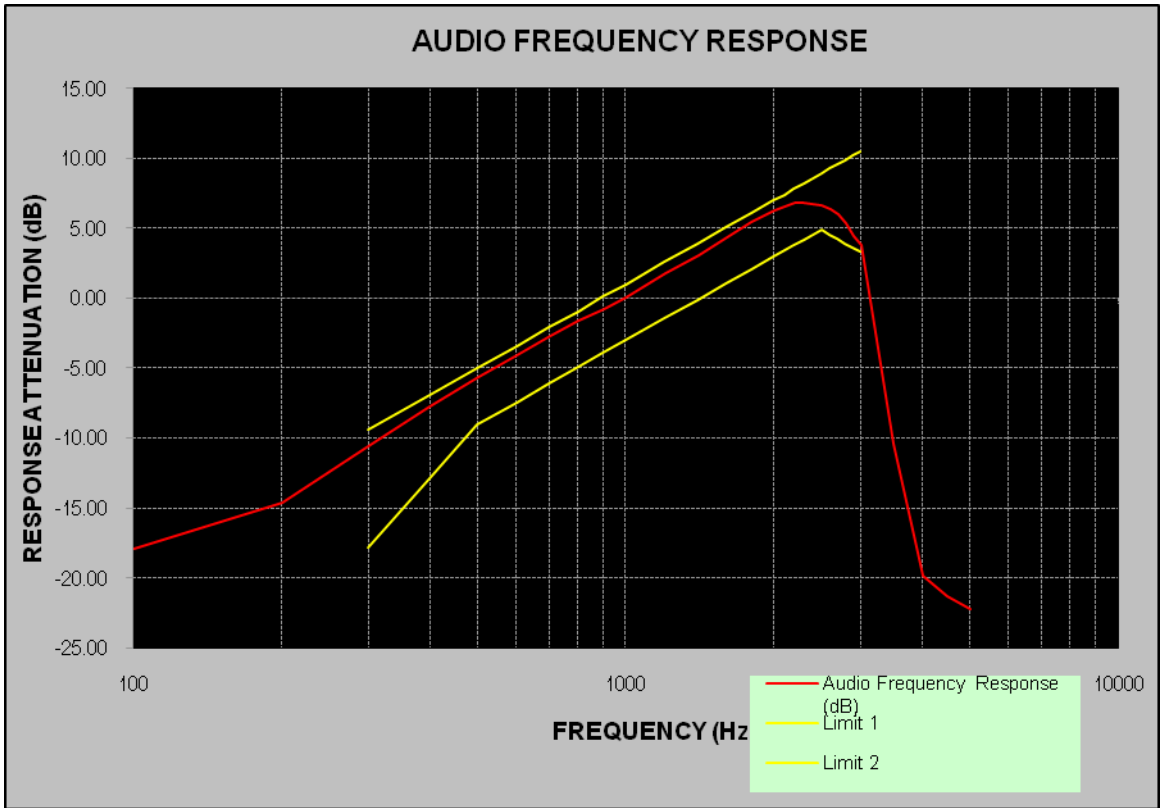
Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: have pre-tested TX1 to TX2 mode, record the worst case mode TX1 on the report.

TX1: 443.05MHz			
Audio Frequency (Hz)	Audio Frequency Response (dB)	Audio Frequency (Hz)	Audio Frequency Response (dB)
100	-17.86	2100	6.54
200	-14.61	2200	6.75
300	-10.56	2300	6.78
400	-7.73	2400	6.68
500	-5.66	2500	6.59
600	-4.10	2600	6.28
700	-2.75	2700	5.97
800	-1.64	2800	5.28
900	-0.79	2900	4.38
1000	0.00	3000	3.73
1200	1.72	3500	-10.39
1400	3.05	4000	-19.85
1600	4.33	4500	-21.32
1800	5.45	5000	-22.19
2000	6.19	-	-

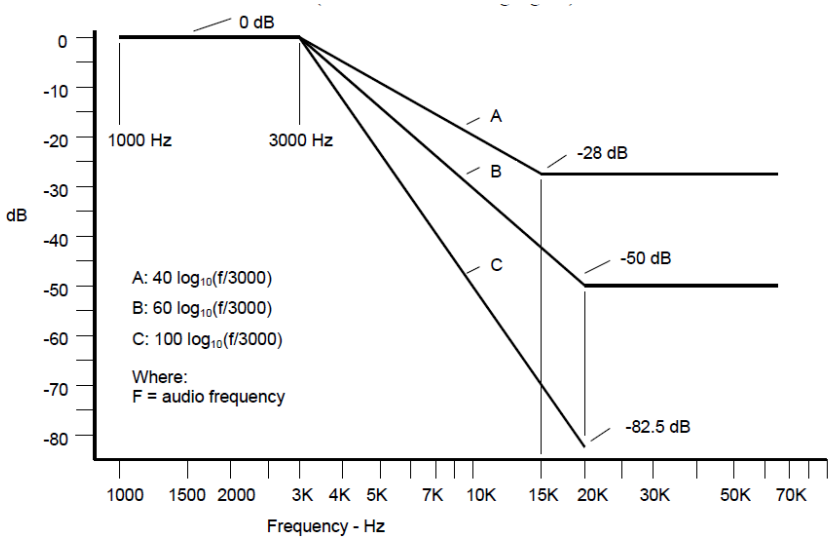


5.8. Audio Low Pass Filter Response

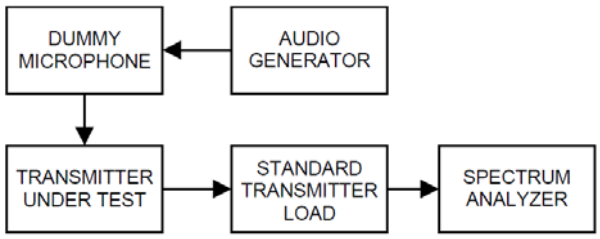
The audio low pass filter response is the frequency response of the post limiter low pass filter circuit above 3000 Hz.

LIMIT

FCC Part 95.637(b):
The filter must be between the modulation limiter and the modulated stage of the transmitter. At any frequency (f in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least 60 log10 (f/3) dB greater than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least 50 dB greater than the attenuation at 1 kHz.



TEST CONFIGURATION



TEST PROCEDURE

1) Configure the EUT as shown in figure .
2) Apply a 1000 Hz tone from the audio signal generator and adjust the level per manufacturer's specifications. Record the dB level of the 1000 Hz tone as LEV_{REF}.
3) Set the audio signal generator to the desired test frequency between 3000 Hz and the upper low pass filter limit. Record the dB level at the test frequency as $LEV_{FREQ.}$
4) Calculate the audio frequency response at the test frequency as:
low pass filter response = LEV_{FREQ} - LEV_{REF}

TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☐ **Passed** ☒ **Not Applicable**

Note:
This equipment does not support GMRS function.

5.9. Frequency Stability

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

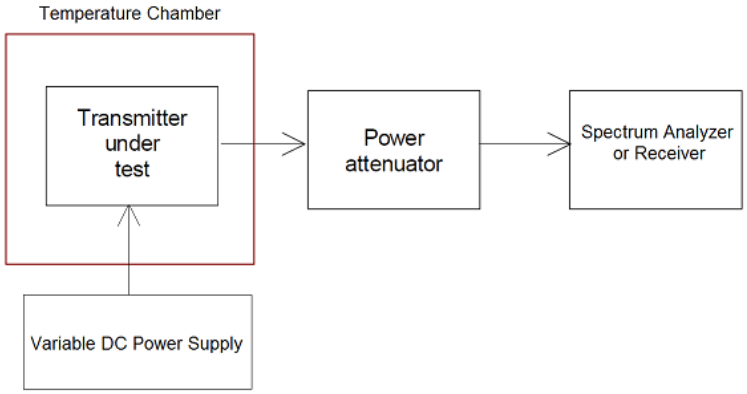
LIMIT

FCC Part 95.626(b):
FRS:
The carrier frequency tolerance shall be better than ±2.5 ppm.

TEST PROCEDURE

1. According to FCC Part 2 Section 2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30℃ to +50℃ centigrade.
2. According to FCC Part 2 Section 2.1055 (d) (2), for battery powered equipment, the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. Vary primary supply voltage from 3.6V to 4.2V.
4. The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply and the voltage was adjusted in the required ranges. The result was recorded.

TEST CONFIGURATION



TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note: have pre-tested TX1 to TX2 mode, record the worst case mode TX1 on the report.

Please refer to the below test data:

Test conditions		Frequency error (ppm)			Limit (ppm)	Result
Voltage(V)	Temp(℃)	462.5625MHz (TX1)	467.5625 (TX1)	467.7125MHz (TX1)		
3.7	-30	0.43	0.65	0.57	±2.5	Pass
	-20	0.40	0.68	0.54		
	-10	0.40	0.65	0.55		
	0	0.40	0.63	0.56		
	10	0.42	0.66	0.55		
	20	0.43	0.68	0.57		
	30	0.43	0.70	0.58		
	40	0.44	0.72	0.58		
	50	0.46	0.76	0.62		
3.6	20	0.42	0.62	0.53		
4.2	20	0.45	0.68	0.58		

5.10. Conducted Emissions

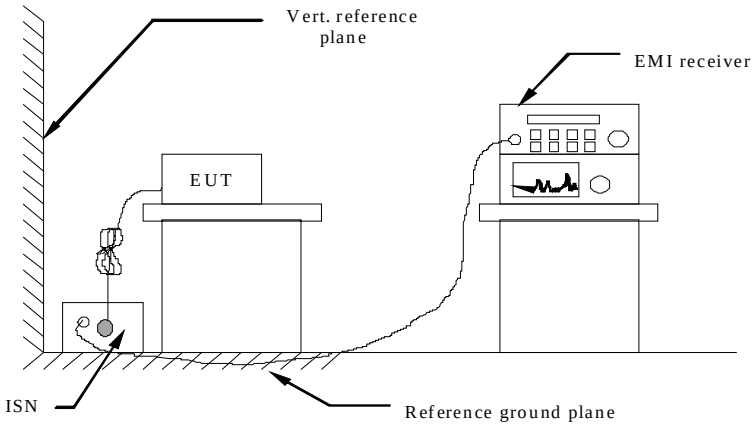
The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 u Henry as specified by section 5.1 of ANSI C63.4 - 2014. Cables and peripherals were moved to find the maximum emission levels for each frequency.

Limit

FCC part 15.107(a)

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2014.
2 Support equipment, if needed, was placed as per ANSI C63.4-2014.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2014.
4 If a EUT received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

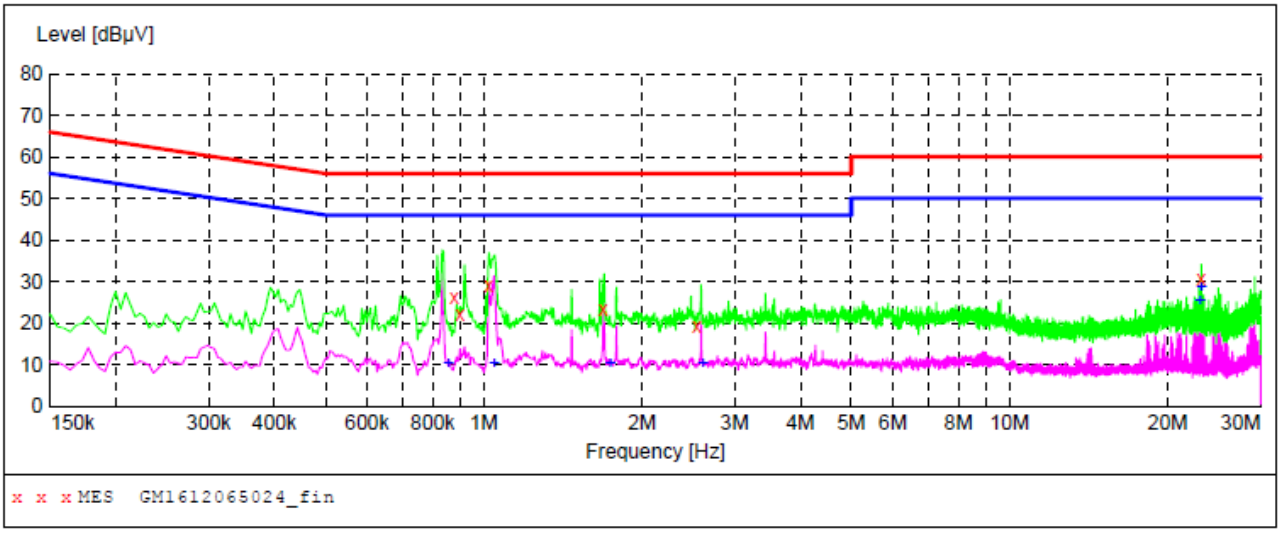
TEST MODE:

Please reference to the section 3.4

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

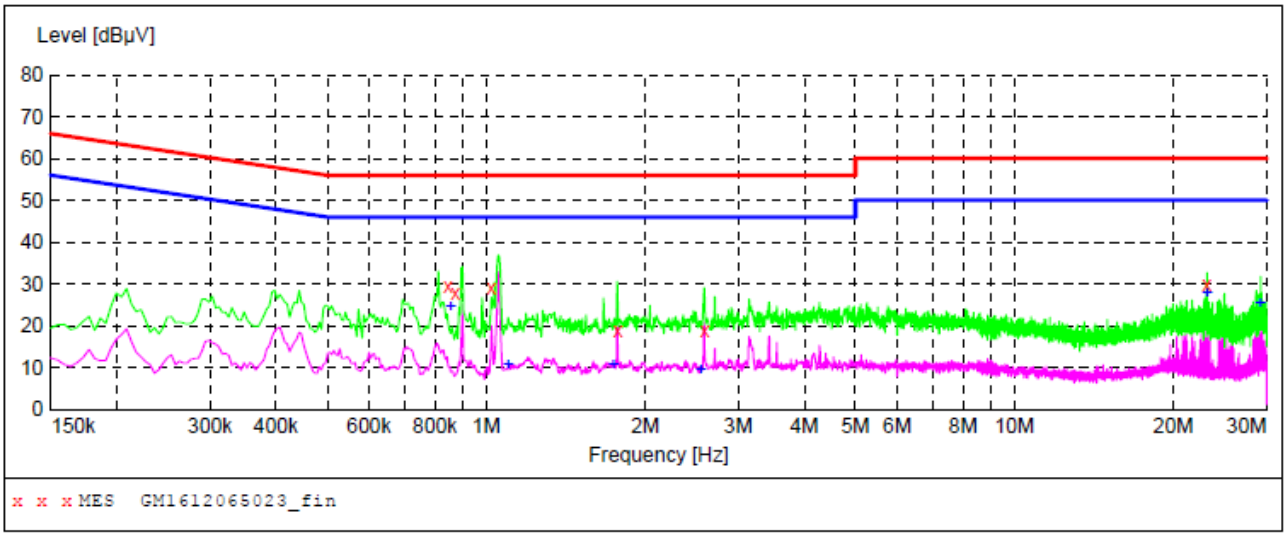
Test mode:	RX1	Polarization	L1



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.879000	26.30	10.1	56	29.7	QP	L1	GND
0.901500	22.00	10.1	56	34.0	QP	L1	GND
1.023000	28.90	10.2	56	27.1	QP	L1	GND
1.689000	23.30	10.2	56	32.7	QP	L1	GND
2.544000	19.10	10.2	56	36.9	QP	L1	GND
23.131500	30.70	10.7	60	29.3	QP	L1	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.856500	10.30	10.1	46	35.7	AV	L1	GND
1.045500	10.40	10.2	46	35.6	AV	L1	GND
1.738500	10.40	10.2	46	35.6	AV	L1	GND
2.607000	10.40	10.2	46	35.6	AV	L1	GND
23.068500	25.20	10.7	50	24.8	AV	L1	GND
23.131500	28.60	10.7	50	21.4	AV	L1	GND

Test mode:	RX1	Polarization	N



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.847500	29.60	10.1	56	26.4	QP	N	GND
0.874500	28.00	10.1	56	28.0	QP	N	GND
1.023000	29.20	10.2	56	26.8	QP	N	GND
1.774500	18.80	10.2	56	37.2	QP	N	GND
2.593500	18.80	10.2	56	37.2	QP	N	GND
23.131500	29.70	10.7	60	30.3	QP	N	GND

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.856500	24.60	10.1	46	21.4	AV	N	GND
1.099500	10.50	10.2	46	35.5	AV	N	GND
1.738500	10.70	10.2	46	35.3	AV	N	GND
2.548500	9.60	10.2	46	36.4	AV	N	GND
23.131500	27.80	10.7	50	22.2	AV	N	GND
29.238000	25.30	10.8	50	24.7	AV	N	GND

5.11. Radiated Emission

LIMIT

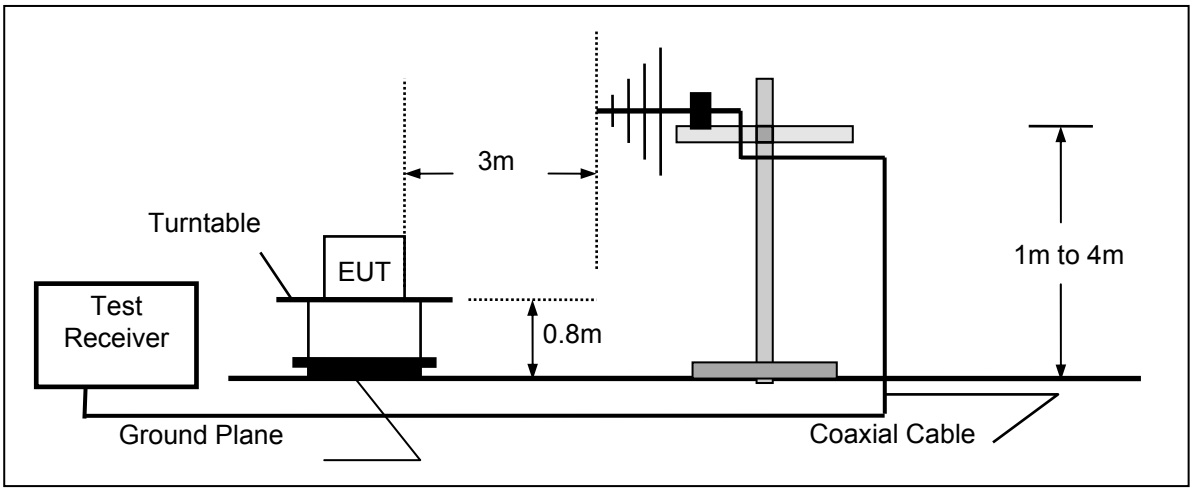
For unintentional device, according to § 15.109(a) except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

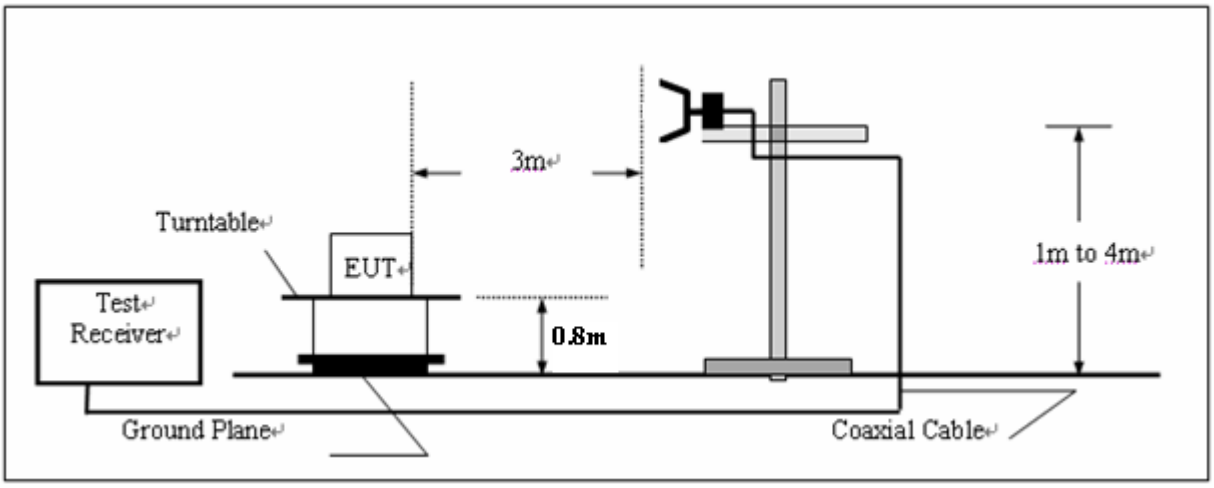
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

TEST CONFIGURATION

(A) Radiated Emission Test Set-Up, Frequency below 1000MHz



(B) Radiated Emission Test Set-Up, Frequency above 1000MHz



TEST PROCEDURE

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4 Repeat above procedures until all frequency measurements have been completed.

TEST MODE:

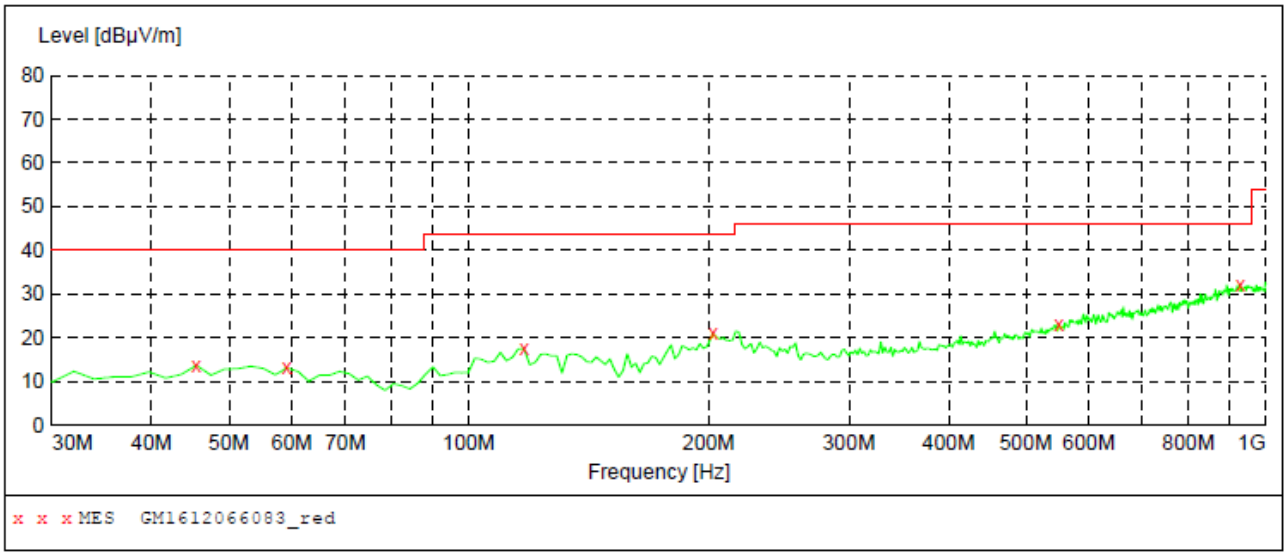
Please reference to the section 3.4

TEST RESULTS

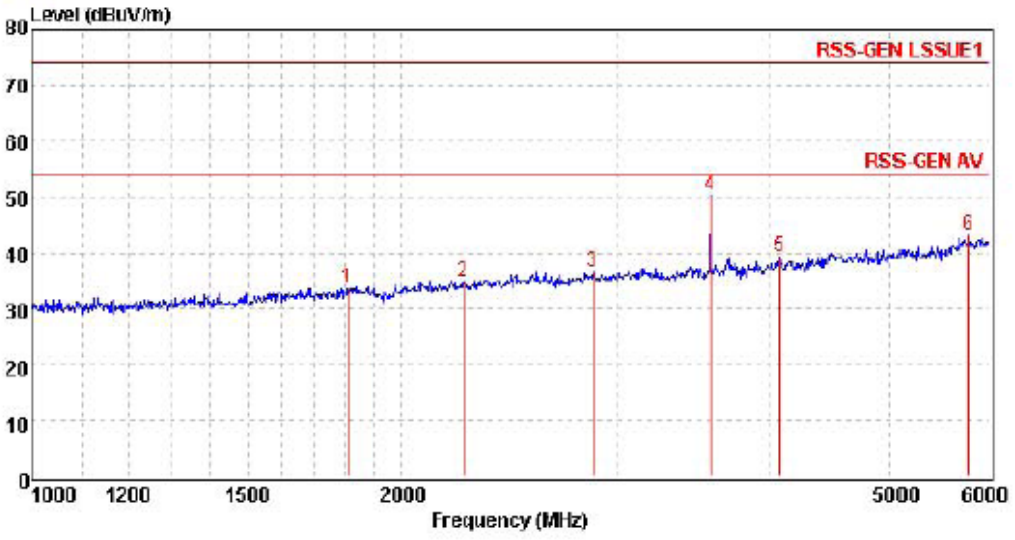
☒ **Passed** ☐ **Not Applicable**

Note:
1. The EUT shall be scanned from 30 MHz to the 5th harmonic of the highest oscillator frequency in the digital devices or 1 GHz whichever is higher.

Test Mode:	RX1	Polarity:	*Horizontal*

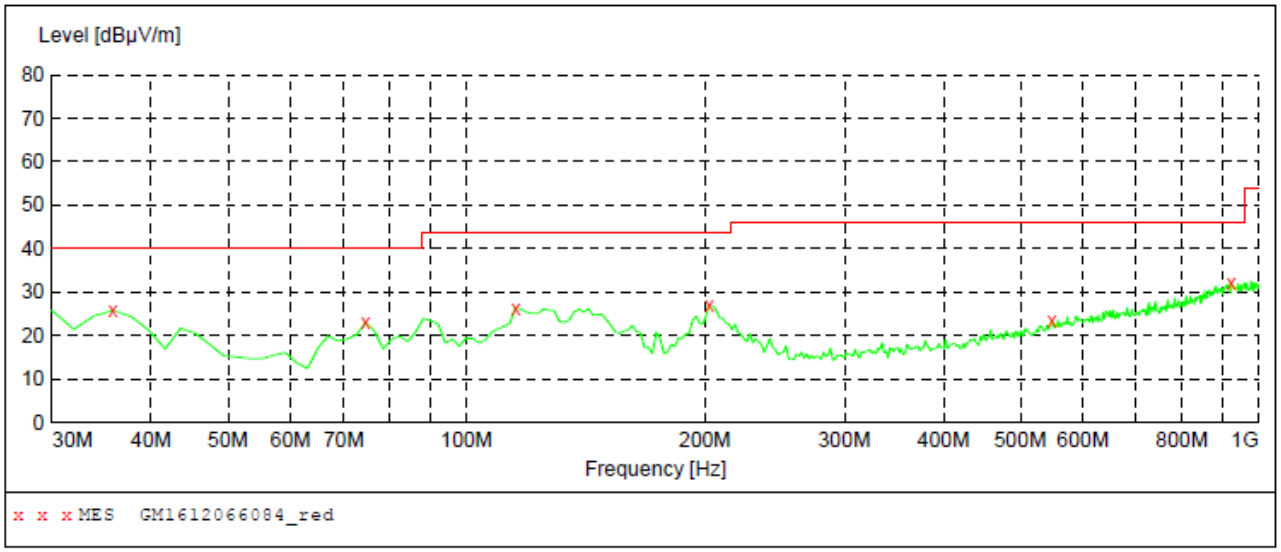


Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.520000	13.60	-16.5	40.0	26.4	QP	300.0	344.00	HORIZONTAL
59.100000	13.00	-17.1	40.0	27.0	QP	100.0	281.00	HORIZONTAL
117.300000	17.50	-18.2	43.5	26.0	QP	300.0	3.00	HORIZONTAL
202.660000	21.00	-15.9	43.5	22.5	QP	100.0	231.00	HORIZONTAL
549.920000	23.00	-6.2	46.0	23.0	QP	100.0	102.00	HORIZONTAL
928.220000	32.20	1.4	46.0	13.8	QP	100.0	152.00	HORIZONTAL

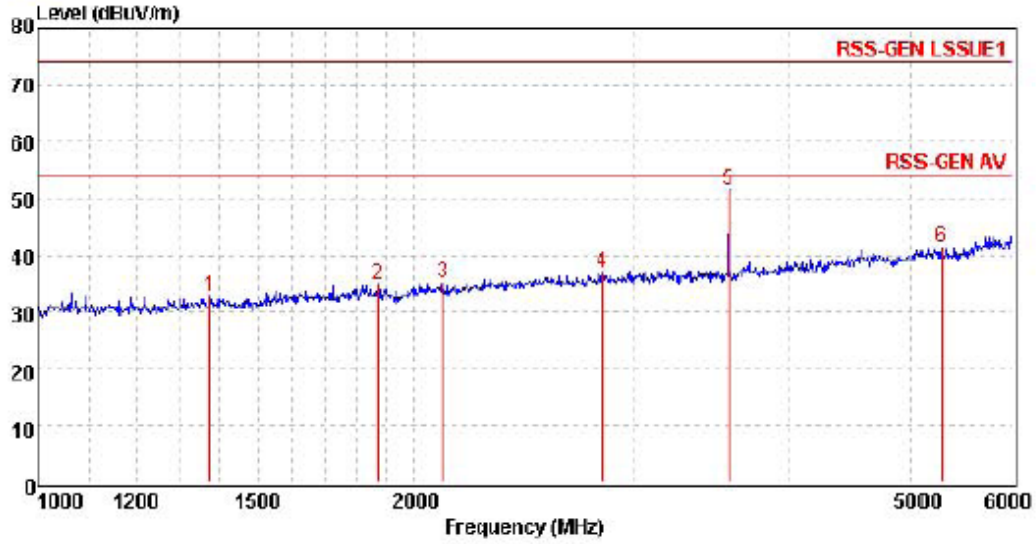


Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1809.54	39.21	25.61	5.97	37.15	33.64	74.00	-40.36	Peak
2	2247.63	38.85	27.04	6.52	37.47	34.94	74.00	-39.06	Peak
3	2862.69	39.26	28.35	7.40	38.32	36.69	74.00	-37.31	Peak
4	3568.51	51.55	28.82	8.22	38.31	50.28	74.00	-23.72	Peak
5	4059.89	38.72	29.67	8.83	37.97	39.25	74.00	-34.75	Peak
6	5768.09	35.16	32.83	10.54	35.41	43.12	74.00	-30.88	Peak

Test Mode:	RX1	Polarity:	Vertical



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
35.820000	25.70	-17.6	40.0	14.3	QP	100.0	250.00	VERTICAL
74.620000	23.00	-20.0	40.0	17.0	QP	100.0	198.00	VERTICAL
115.360000	26.40	-18.1	43.5	17.1	QP	100.0	198.00	VERTICAL
202.660000	26.90	-15.9	43.5	16.6	QP	100.0	214.00	VERTICAL
547.980000	23.30	-6.3	46.0	22.7	QP	100.0	0.00	VERTICAL
922.400000	32.20	1.4	46.0	13.8	QP	100.0	63.00	VERTICAL



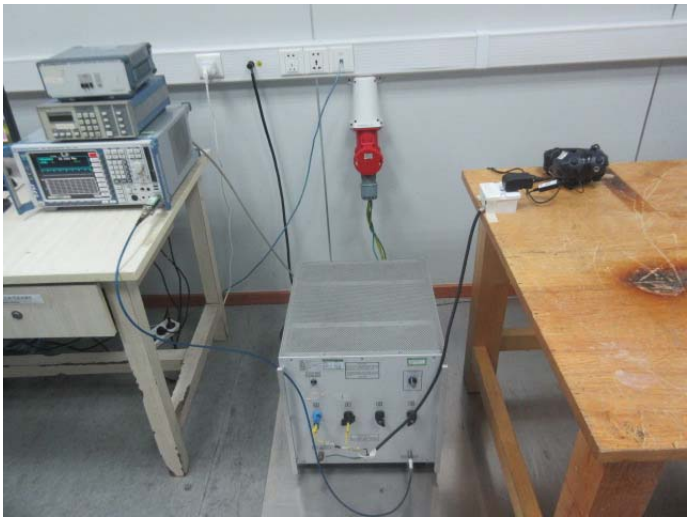
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1373.20	39.64	24.59	4.95	36.47	32.71	74.00	-41.29	Peak
2	1872.20	40.24	25.78	6.07	37.20	34.89	74.00	-39.11	Peak
3	2107.23	39.48	26.52	6.36	37.32	35.04	74.00	-38.96	Peak
4	2827.01	39.43	28.31	7.38	38.34	36.78	74.00	-37.22	Peak
5	3568.51	52.67	28.82	8.22	38.31	51.40	74.00	-22.60	Peak
6	5264.37	35.88	31.85	9.93	36.39	41.27	74.00	-32.73	Peak

6. Test Setup Photos of the EUT

Transmitter Radiated Spurious Emission:

Radiated Emission:

Conducted Emission:



7. External and Internal Photos of the EUT

Please reference to the test report No.:TRE1611014201.

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