RADIO TEST REPORT

Report No: STS1803275W01

Issued for

Lightcomm Technology Co.,Ltd.

RM 1808 18/F, FO TAN INDUSTRIAL CENTRE, NOS. 26-28 AU PUI WAN STREET, FO TAN SHATIN NEW TERRITORIES, HONGKONG

Product Name:	Bluetooth Speaker with Walkie Talkie
Brand Name:	INSIGNIA
Model Name:	NS-SPBTWT
Series Model:	NS-SPBTWT-XX（XX=A-Z, a-z, 0-9,or blank）XX represents different color，BTS16-E
FCC ID:	XMF-SPBTWT
Test Standard:	FCC Part 95

Shenzhen STS Test Services Co., Ltd.
1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong,China
TEL: +86-755 3688 6288 FAX: +86-755 3688 6277 E-mail:sts@stsapp.com

TEST REPORT CERTIFICATION

Applicant's name ..... :	Lightcomm Technology Co.,Ltd.
Address ..... :	RM 1808 18/F, FO TAN INDUSTRIAL CENTRE, NOS. 26-28 AU PUI WAN STREET, FO TAN SHATIN NEW TERRITORIES,
Manufacture's Name..... :	Lightcomm Technology Co.,Ltd.
Address ..... :	RM 1808 18/F, FO TAN INDUSTRIAL CENTRE, NOS. 26-28 AU PUI WAN STREET, FO TAN SHATIN NEW TERRITORIES,
Product description	
Product name ..... :	Bluetooth Speaker with Walkie Talkie
Brand name ..... :	INSIGNIA
model Name ..... :	NS-SPBTWT
Series model..... :	NS-SPBTWT -XX（XX=A-Z, a-z, 0-9,or blank）XX represents different color，BTS16-E
Test Standards ..... :	FCC Part 95
Test procedure ..... :	TIA TIA-603-D

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
This report shall not be reproduced except in full, without the written approval of STS, this document only be altered or revised by STS, personal only, and shall be noted in the revision of the document.

Date of Test.....	
Date of performance of tests	28 Mar. 2018 ~ 04 May. 2018
Date of Issue.....	04 May. 2018
Test Result	**Pass**

Testing Engineer : Chris chen
(Chris chen)

Technical Manager : Sean she
(Sean she)

Authorized Signatory : Vita Li
(Vita Li)

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	04 May. 2018	STS1803275W01	ALL	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part 95			
Standard Section	Test Item	Judgment	Remark
FCC Part 95.567	Transmitter Output Power and Effective Radiated Power (e.r.p)	PASS	--
FCC Part 95.573	Authorized Bandwidth	PASS	--
FCC Part 95.579	Emission Mask	PASS	--
FCC Part 95.579	Transmitter Radiated Spurious Emission	PASS	--
FCC Part 95.579	Spurious Emission On Antenna Port	PASS	--
FCC Part 95.565	Frequency Stability	PASS	--
FCC Part 95.575	Audio Low Pass Filter Response	PASS	--
FCC Part 95.575	Audio Frequency Response	PASS	--
FCC Part 95.575	Modulation Requirements	PASS	--

NOTE: (1)"N/A" denotes test is not applicable in this Test Report

(2) All tests are according to TIA TIA-603-D

1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.
Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
CNAS Registration No.: L7649; FCC Registration No.: 625569
IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**，where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**，providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	±2.88dB
2	Conducted Emission (150KHz-30MHz)	±2.67dB
3	RF power,conducted	±0.71dB
4	Spurious emissions,conducted	±0.63dB
5	All emissions,radiated(<1G) 30MHz-200MHz	±2.83dB
6	All emissions,radiated(<1G) 200MHz-1000MHz	±2.94dB
8	All emissions,radiated(>1G)	±3.03dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	Bluetooth Speaker with Walkie Talkie	
Brand Name	INSIGNIA	
Model Name	NS-SPBTWT	
Series Model	NS-SPBTWT -XX（XX=A-Z, a-z, 0-9,or blank）XX represents different color，BTS16-E	
Model Difference	NS-SPBTWT，NS-SPBTWT-XX，BTS16-E are the same unit, just different model number, NS-SPBTWT，NS-SPBTWT-XX is the customer Best Buy model number, BTS16-E is the manufactory Lightcomm model number	
Operation Frequency Range:	FRS	462.5500MHz~462.7250MHz
Modulation Type	FRS	FM
emission types	FRS	8K97F3E
Adapter	N/A	
Battery	Battery(rating): Rated Voltage: 3.7V Capacity :2200mAh	
Hardware version number	N/A	
Software version number	N/A	
Connecting I/O Port(s)	Please refer to the User's Manual	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2. Table for filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	INSIGNIA	NS-SPBTWT	Integral Antenna	N/A	-0.68	Antenna

3. Channel List

Channel	Frequency	Model
15	462.5500	FRS
16	462.5750	FRS
17	462.6000	FRS
18	462.6250	FRS
19	462.6500	FRS
20	462.6750	FRS
21	462.7000	FRS
22	462.7250	FRS

4. Test channel

Operation Mode	Channel Separation (kHz)	Test Channel	Test Frequency (MHz)
FRS	25	CH15	462.5500
FRS	25	CH18	462.6250
FRS	25	CH22	462.7250

2.2 DESCRIPTION OF TEST MODES

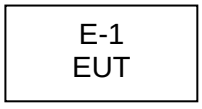
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH15 TX Mode
Mode 2	CH18 TX Mode
Mode 3	CH22 TX Mode

	For Radiated Emission
Final Test Mode	Description
Mode 1	CH15 TX Mode
Mode 2	CH18 TX Mode
Mode 3	CH22 TX Mode

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During test, Keep EUT is in continuous transmission mode, Both open button and closed button have been tested, The two keys were tested to assess and only record the worst case in the report(Open botton).



2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
N/A	N/A	N/A	N/A	N/A

Note:

(1)The support equipment was authorized by Declaration of Confirmation.

(2)For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2017.10.15	2018.10.14
Bilog Antenna	TESEQ	CBL6111D	34678	2017.10.30	2018.10.29
Horn Antenna	Schwarzbeck	BBHA 9120D(1201)	9120D-1343	2017.10.27	2018.10.26
Loop Antenna	EMCO	6502	9003-2485	N/A	N/A
Pre-mplifier (0.1M-3GHz)	EM	EM330	60538	2017.10.28	2018.10.27
PreAmplifier (1G-26.5GHz)	Agilent	8449B	60538	2017.10.15	2018.10.14
Low frequency cable	EM	R01	N/A	2018.03.11	2019.03.10
Low frequency cable	EM	R06	N/A	2018.03.11	2019.03.10
High frequency cable	SCHWARZBECK	AK9515H	SN-96286/96287	2018.03.11	2019.03.10
Semi-anechoic chamber	Changling	966	N/A	2018.03.11	2019.03.10
Signal Analyzer	Agilent	N9020A	MY49100060	2018.03.08	2019.03.07
RF COMMUNICATION TEST SET	HP	N8920A	348A05658	2017.10.15	2018.10.14

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

3. FIELD STRENGTHS AND RADIATED SPURIOUS EMISSION

3.1 RADIATED EMISSION LIMITS

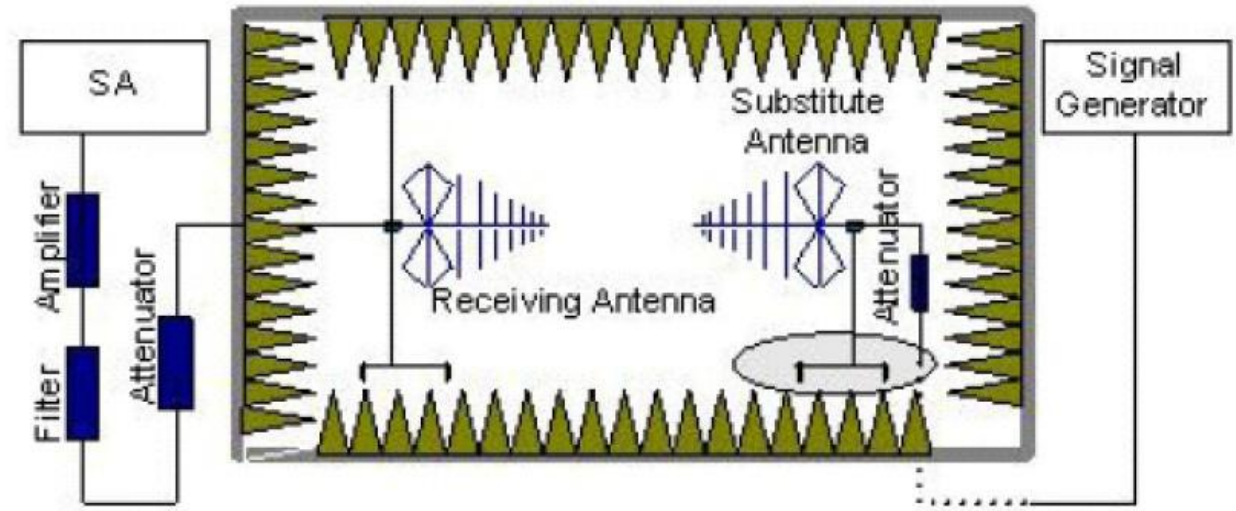
In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given below:
(a) If the equipment operates below 10 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) If the equipment operates at or above 10 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency, as well as to those frequencies removed from the carrier by multiples of the oscillator frequency.
Radiation at the frequencies of multiplier stages should also be checked.
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value need not be reported.
43 + 10 log (Pwatts)
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 P(dBm).
Limit (dBm) = P(dBm)-43-10 log (Pwatts) = -13 dBm

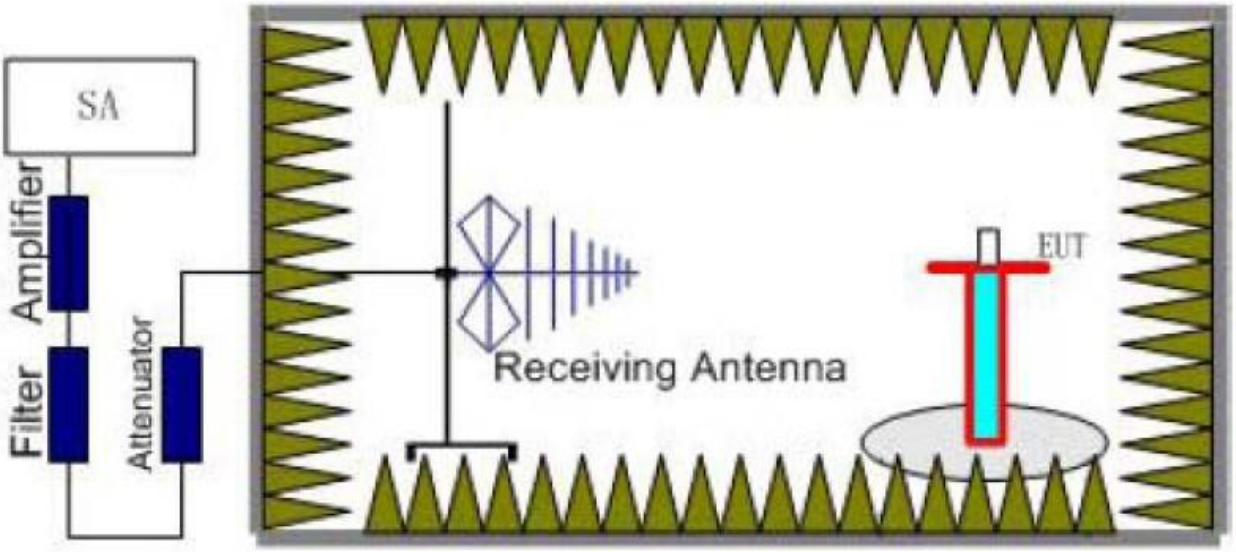
Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
Start Frequency	30 MHz
Stop Frequency	10th carrier harmonic

3.2 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 three 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 BW=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 (P_{Mea}) is applied to the input of thesubstitution 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 (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 (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test. The measurement results are obtained as described below:
   We used 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(ERP)=P_{Mea}- P_{cl} +G_a

3.3 TEST SETUP





3.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.5 TEST RESULT

462.55MHz-FRS								
Frequency	Measured Amplitude	Cable Loss	Antenna gain	Corrected Factor	Corrected Amplitude	Limit	Margin	RX Antenna Polar
(MHz)	(dBm)	（dB）	（dB）	（dB）	(dBm)	(dBm)	(dB)	(H/V)
925.10	-52.70	1.71	16.61	14.90	-37.80	-13	-24.80	H
925.10	-53.11	1.71	16.61	14.90	-38.21	-13	-25.21	V
1387.65	-58.65	2.89	18.23	15.34	-43.31	-13	-30.31	H
1387.65	-53.65	2.89	18.23	15.34	-38.31	-13	-25.31	V
1850.20	-58.09	4.12	19.56	15.44	-42.65	-13	-29.65	H
1850.20	-62.15	4.12	19.56	15.44	-40.34	-13	-27.34	V

462.625MHz- FRS								
Frequency	Measured Amplitude	Cable Loss	Antenna gain	Corrected Factor	Corrected Amplitude	Limit	Margin	RX Antenna Polar
(MHz)	(dBm)	（dB）	（dB）	（dB）	(dBm)	(dBm)	(dB)	(H/V)
925.25	-54.01	1.71	16.61	14.90	-39.11	-13	-26.11	H
925.25	-52.81	1.71	16.61	14.90	-37.91	-13	-24.91	V
1387.875	-62.72	2.89	16.61	13.72	-49.00	-13	-36.00	H
1387.875	-56.24	2.89	16.61	13.72	-42.52	-13	-29.52	V
1850.50	-57.37	4.12	16.61	12.49	-44.88	-13	-31.88	H
1850.50	-65.21	4.12	16.61	12.49	-52.72	-13	-39.72	V

462.725MHz- FRS								
Frequency	Measured Amplitude	Cable Loss	Antenna gain	Corrected Factor	Corrected Amplitude	Limit	Margin	RX Antenna Polar
(MHz)	(dBm)	（dB）	（dB）	（dB）	(dBm)	(dBm)	(dB)	(H/V)
925.45	-56.34	1.71	16.61	14.90	-41.44	-13	-28.44	H
925.45	-52.77	1.71	16.61	14.90	-37.87	-13	-24.87	V
1388.175	-61.02	2.89	16.61	13.72	-47.30	-13	-34.30	H
1388.175	-57.15	2.89	16.61	13.72	-43.43	-13	-30.43	V
1850.90	-57.84	4.12	16.61	12.49	-45.35	-13	-32.35	H
1850.90	-61.76	4.12	16.61	12.49	-49.27	-13	-36.27	V

4. SPURIOUS EMISSION ON ANTENNA PORT

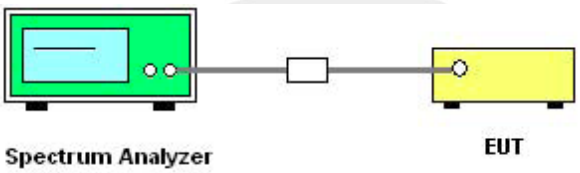
4.1 APPLIED PROCEDURES / LIMIT

43 + 10 log (Pwatts)
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 P(dBm).
Limit (dBm) = P(dBm)-43-10 log (Pwatts) = -13 dBm

4.2 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 2.5kHz and 5kHz).
2. Spectrum set as follow:
Centre frequency = fundamental frequency, span=50kHz,
RBW=100Hz, VBW=300Hz, 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.

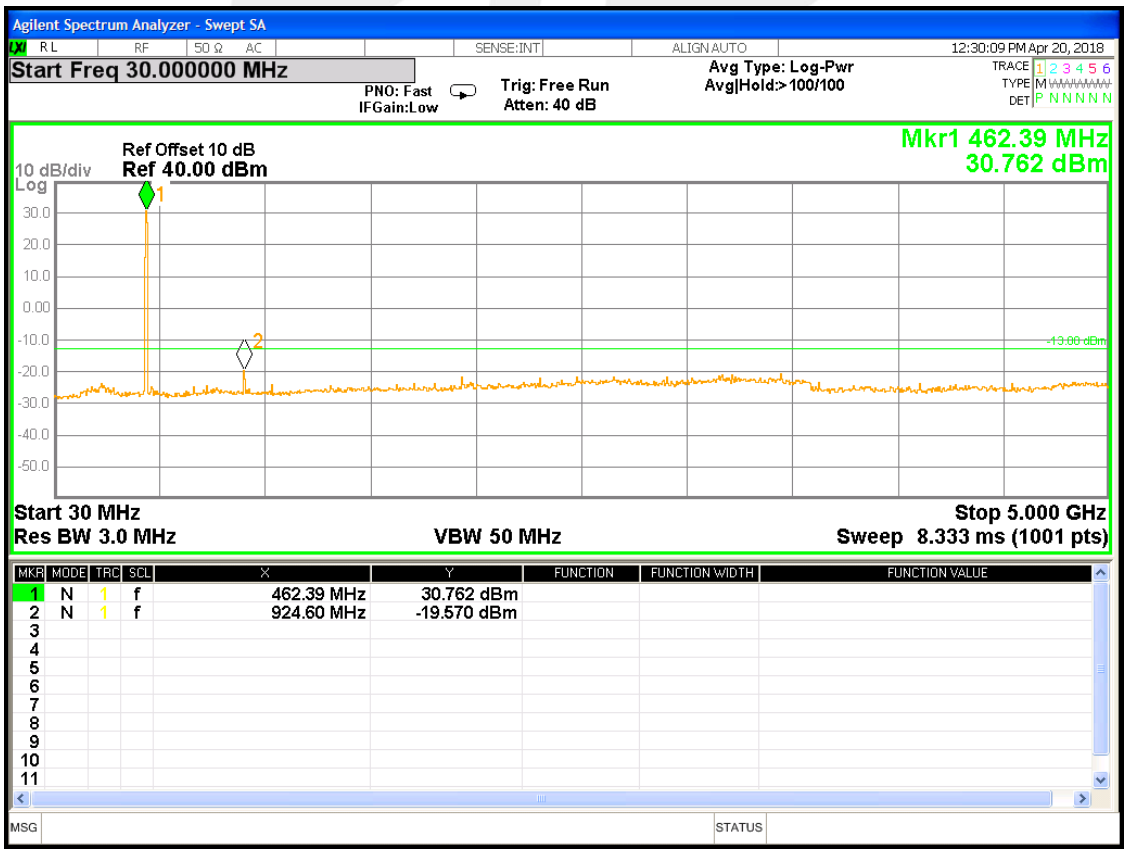
4.3 TEST SETUP



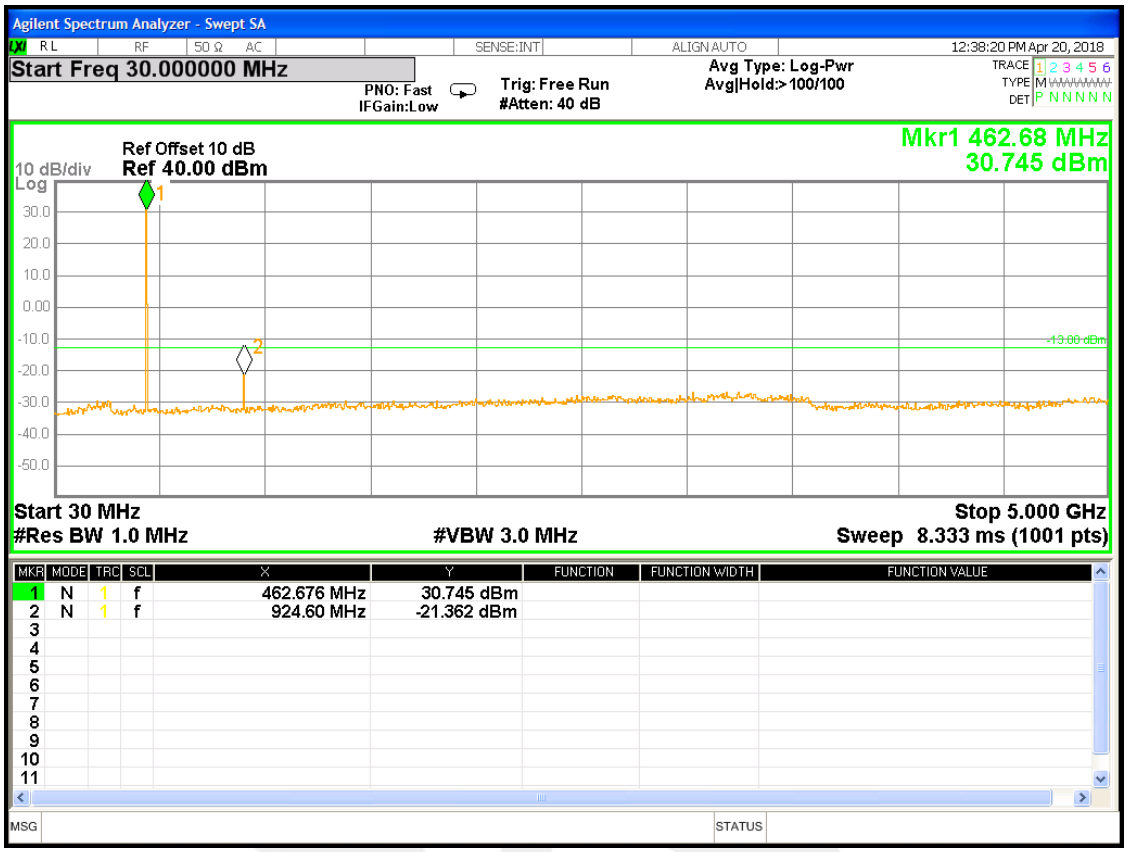
4.4 EUT OPERATION CONDITIONS

TX mode.

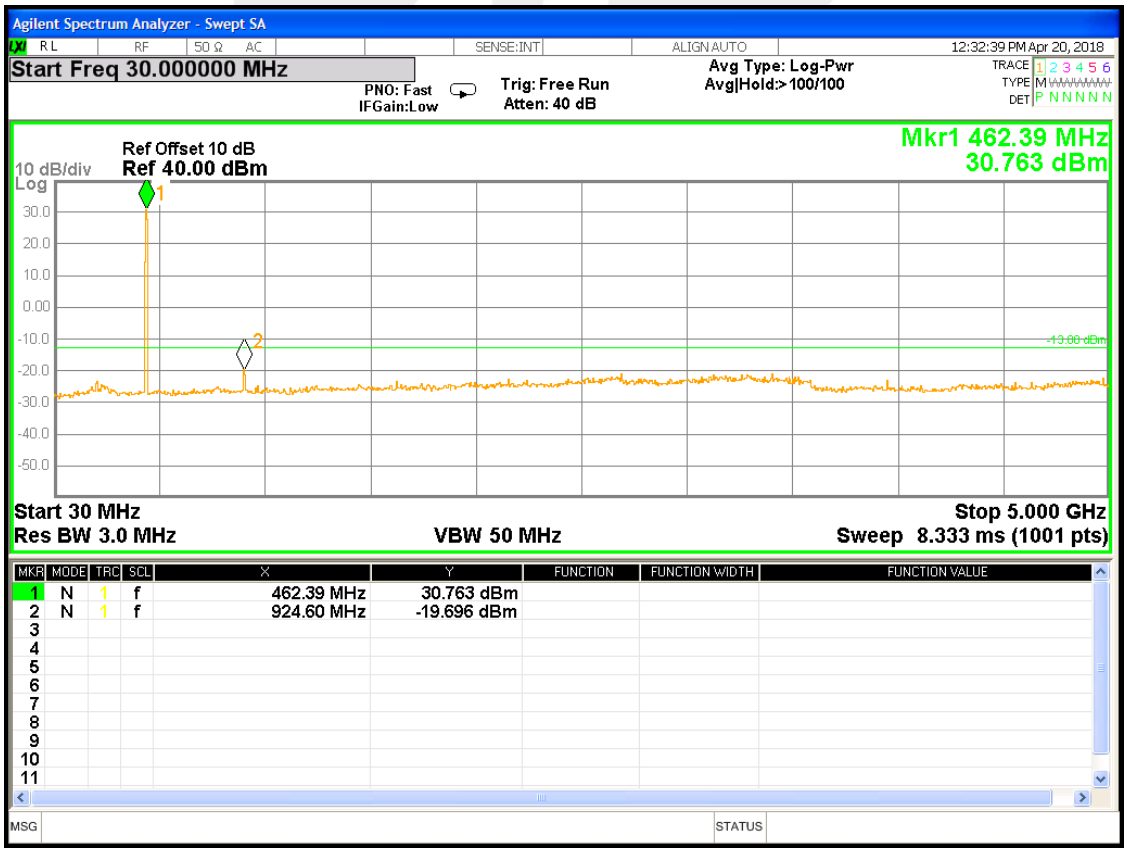
CH15



CH18


Agilent Spectrum Analyzer - Swept SA
Start Freq 30.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
12:38:20 PM Apr 20, 2018
Ref Offset 10 dB
10 dB/div
Log
Ref 40.00 dBm
Mkr1 462.68 MHz
30.745 dBm
-13.00 dBm
Start 30 MHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 5.000 GHz
Sweep 8.333 ms (1001 pts)
1 N 1 f 462.676 MHz 30.745 dBm
2 N 1 f 924.60 MHz -21.362 dBm

CH22


Agilent Spectrum Analyzer - Swept SA
Start Freq 30.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
12:32:39 PM Apr 20, 2018
Ref Offset 10 dB
10 dB/div
Log
Ref 40.00 dBm
Mkr1 462.39 MHz
30.763 dBm
-13.00 dBm
Start 30 MHz
Res BW 3.0 MHz
VBW 50 MHz
Stop 5.000 GHz
Sweep 8.333 ms (1001 pts)
1 N 1 f 462.39 MHz 30.763 dBm
2 N 1 f 924.60 MHz -19.696 dBm

5. BANDWIDTH TEST

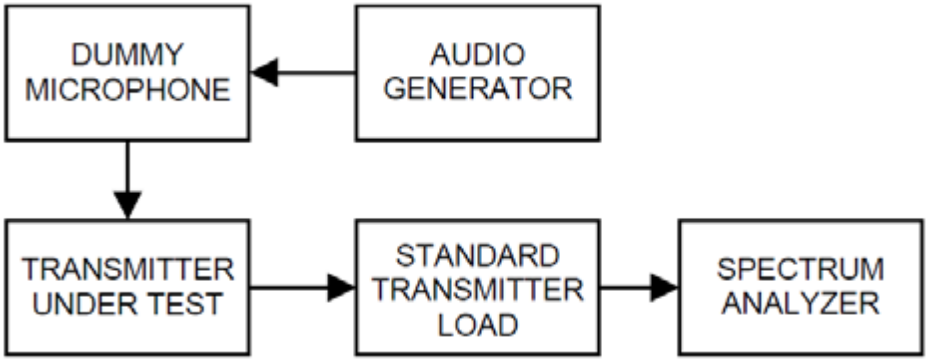
5.1 APPLIED PROCEDURES / LIMIT

FRS:
The authorized bandwidth for an FRS unit is 12.5 kHz.
FRS:
The authorized bandwidth is 8 kHz for emission types A1D, A2B, A2D, and A3E; 20 kHz for emission types F1D, F2B, F2D, F3E, and G3E

5.2 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 2.5kHz and 5kHz).
2. Spectrum set as follow:
Centre frequency = fundamental frequency, span=50kHz,
RBW=100Hz, VBW=300Hz, 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.

5.3 TEST SETUP



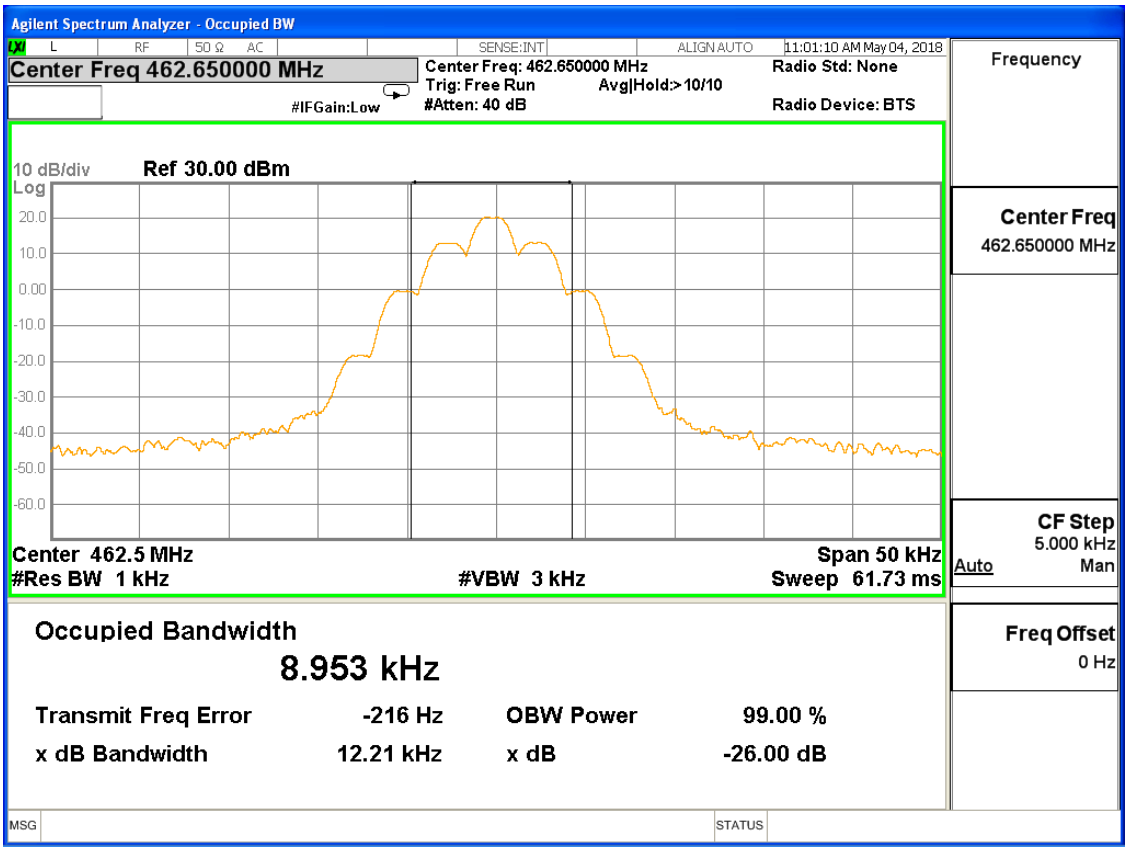
5.4 EUT OPERATION CONDITIONS

TX mode.

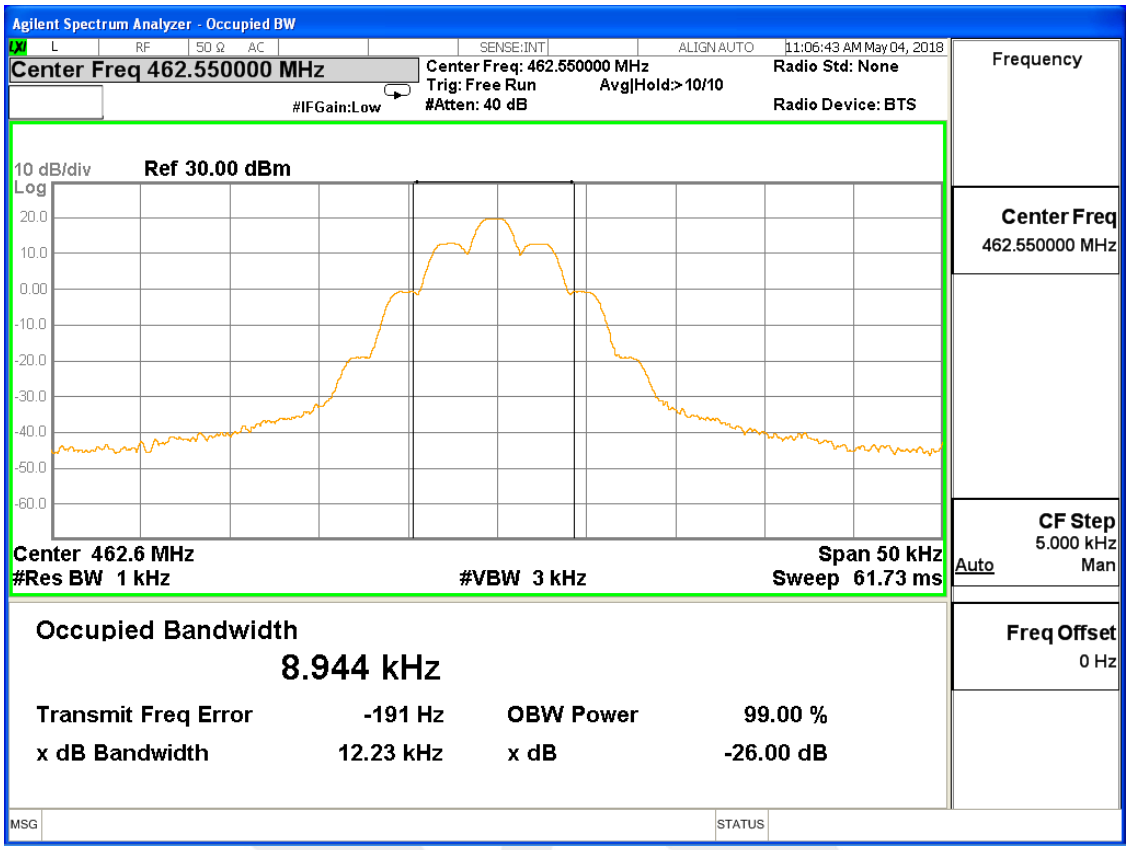
5.5 TEST RESULTS

Operation Mode	Test Channel	Occupied Bandwidth(KHz)		Limit(KHz)	Result
		99%	26dB		
FRS	CH 15	8.953	12.21	12.5	Pass
FRS	CH 18	8.944	12.23	12.5	Pass
FRS	CH 22	8.974	12.18	12.5	Pass

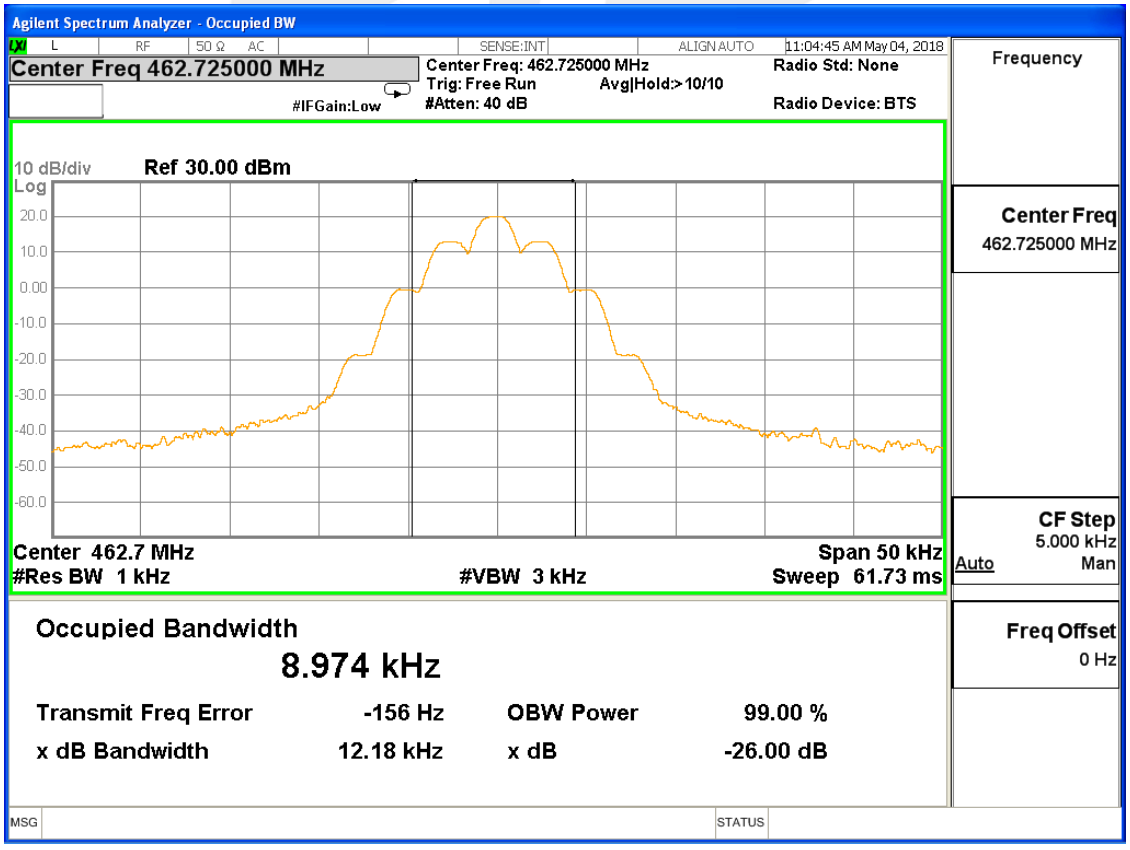
CH15



CH18


Agilent Spectrum Analyzer - Occupied BW
Center Freq 462.550000 MHz
Center Freq: 462.550000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
11:06:43 AM May 04, 2018
Frequency
10 dB/div
Ref 30.00 dBm
Log
Center Freq
462.550000 MHz
Center 462.6 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 50 kHz
Sweep 61.73 ms
CF Step
5.000 kHz
Auto
Man
Occupied Bandwidth
8.944 kHz
Transmit Freq Error -191 Hz
OBW Power 99.00 %
x dB Bandwidth 12.23 kHz
x dB -26.00 dB
Freq Offset
0 Hz
MSG
STATUS

CH22


Agilent Spectrum Analyzer - Occupied BW
Center Freq 462.725000 MHz
Center Freq: 462.725000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
11:04:45 AM May 04, 2018
Frequency
10 dB/div
Ref 30.00 dBm
Log
Center Freq
462.725000 MHz
Center 462.7 MHz
#Res BW 1 kHz
#VBW 3 kHz
Span 50 kHz
Sweep 61.73 ms
CF Step
5.000 kHz
Auto
Man
Occupied Bandwidth
8.974 kHz
Transmit Freq Error -156 Hz
OBW Power 99.00 %
x dB Bandwidth 12.18 kHz
x dB -26.00 dB
Freq Offset
0 Hz
MSG
STATUS

6. TRANSMITTER OUTPUT POWER AND EFFECTIVE RADIATED POWER (E.R.P)

6.1 APPLIED PROCEDURES / LIMIT

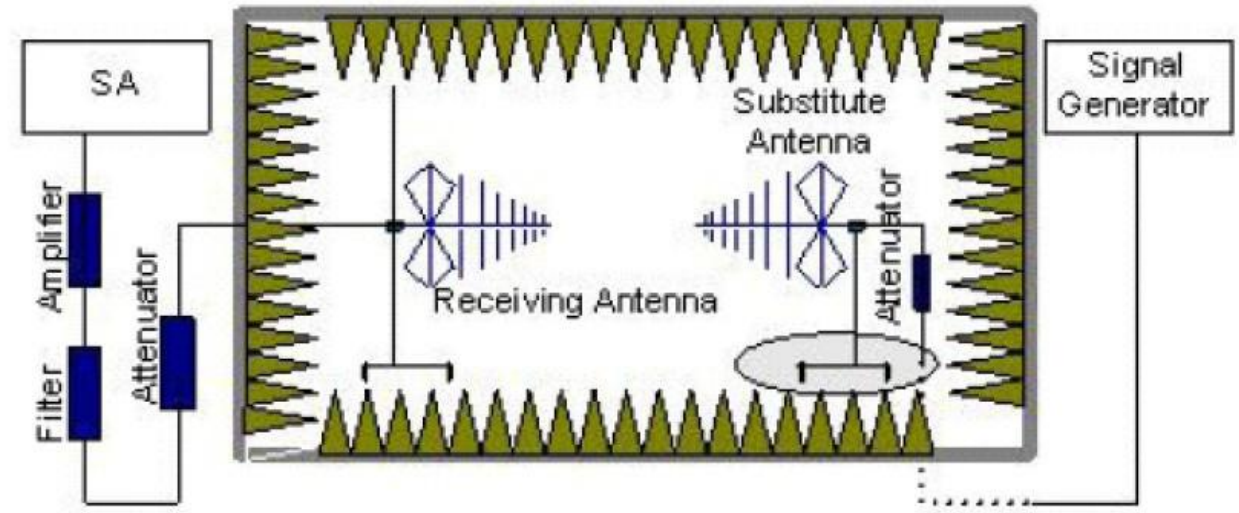
FRS:

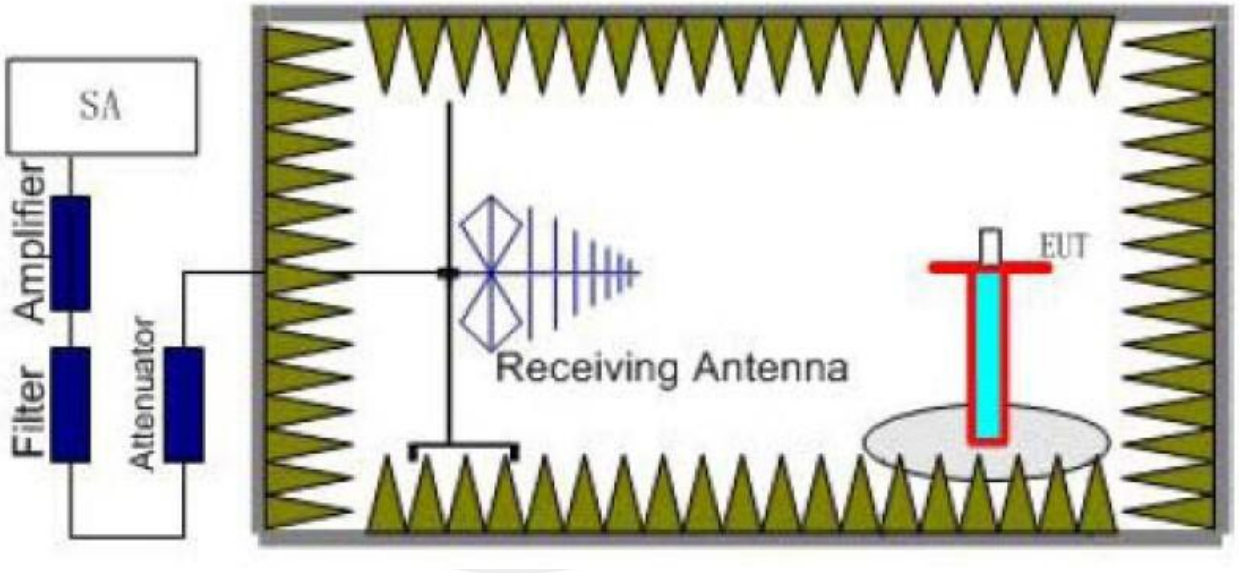
The maximum permissible transmitted ERP of the equipment under any operating conditions shall not exceed 2 W

6.2 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 three 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 BW=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 (P_{Mea}) is applied to the input of thesubstitution 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 (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 (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)=P_{Mea}- P_{Ag} - P_{cl} + G_a
   We used 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

6.3 TEST SETUP





6.4 TEST RESULTS

Operation Mode	Test Channel	Conduct Power (dBm)	Polarity	Measured ERP (dBm)	Limit (dBm)	Result
FRS	CH15	30.267	Horizontal	28.86	33	Pass
			Vertical	28.51	33	Pass
FRS	CH18	30.177	Horizontal	29.15	33	Pass
			Vertical	28.09	33	Pass
FRS	CH22	30.126	Horizontal	28.22	33	Pass
			Vertical	28.17	33	Pass

7. EMISSION MASK

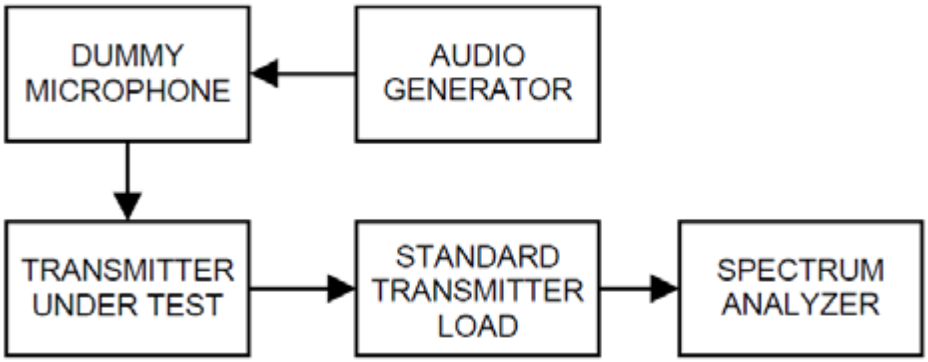
7.1 APPLIED PROCEDURES / LIMIT

FRS:
a. 25 dB, measured with a bandwidth of 300 Hz, in the band 6.25 kHz to 12.5 kHz removed from the channel centre frequency;
b. 35 dB, measured with a bandwidth of 300 Hz, in the band 12.5 kHz to 31.25 kHz removed from the channel centre frequency; and
c. 43 dB + 10 $\log_{10}$ (transmitter power in watts) dB, measured with a bandwidth of 30 kHz for frequencies beyond 31.25 kHz removed from the channel centre frequency.

7.2 TEST PROCEDURE

1. Connect the equipment as illustrated
2. Spectrum set as follow:
Centre frequency = fundamental frequency, span=125kHz 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

7.3 TEST SETUP

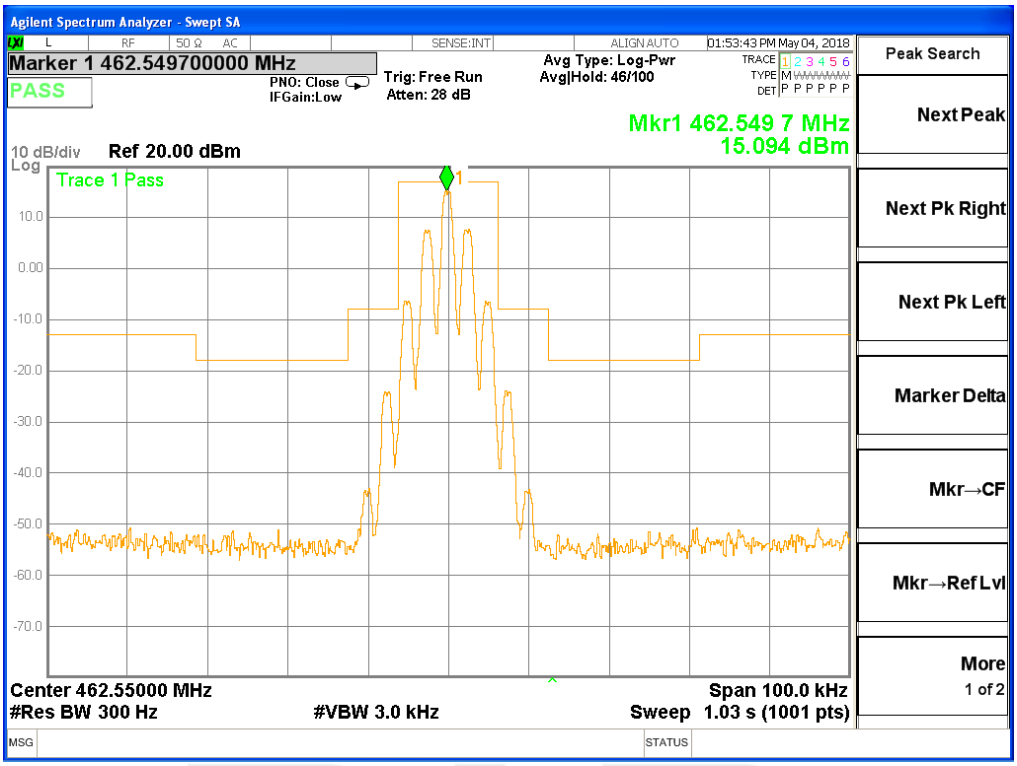


7.4 EUT OPERATION CONDITIONS

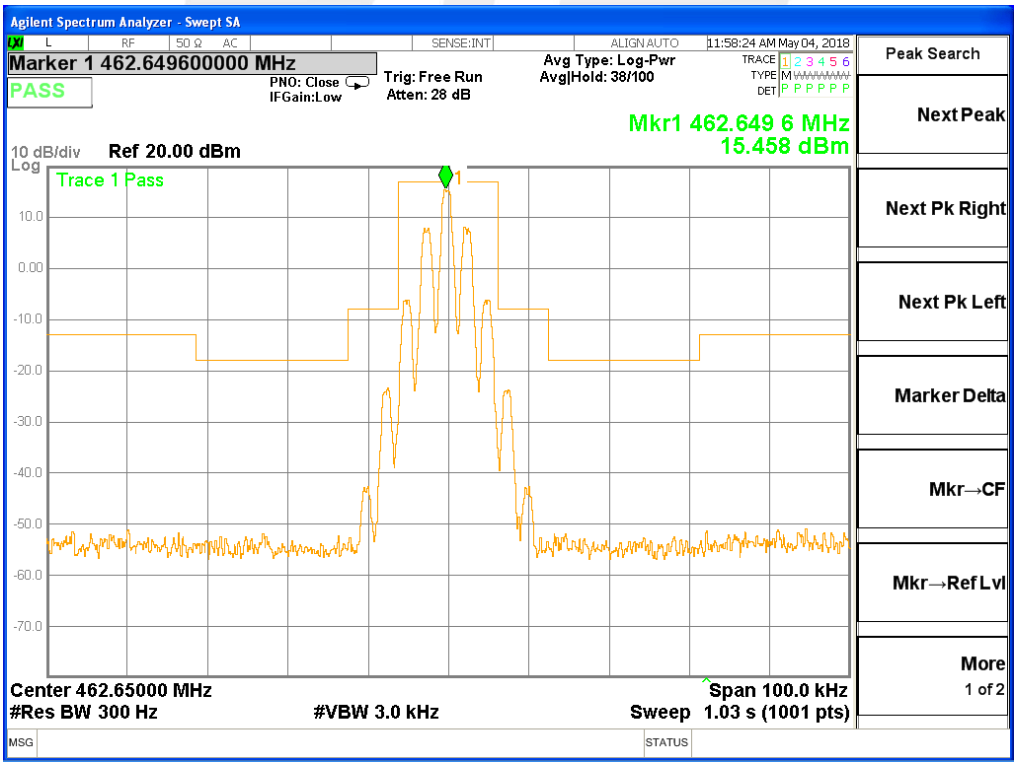
TX mode.

7.5 TEST RESULT

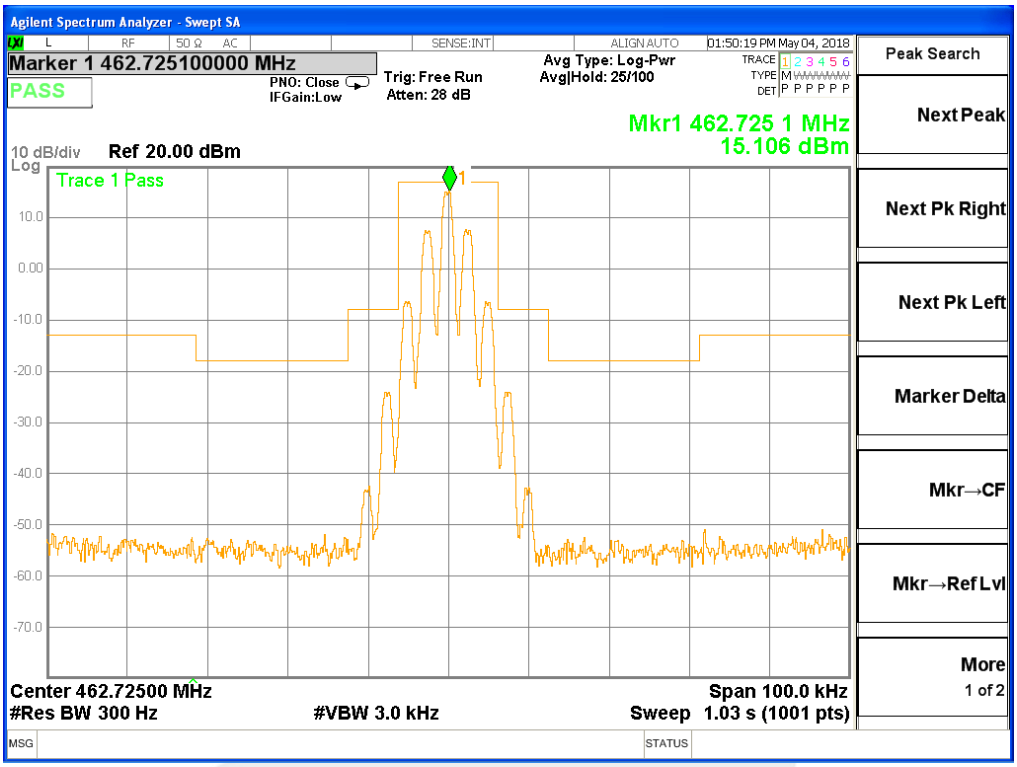
CH15



CH18



CH22


Agilent Spectrum Analyzer - Swept SA
Marker 1 462.725100000 MHz
PASS
PNO: Close
IFGain:Low
Trig: Free Run
Atten: 28 dB
Avg Type: Log-Pwr
Avg|Hold: 25/100
01:50:19 PM May 04, 2018
Mkr1 462.725 1 MHz
15.106 dBm
10 dB/div
Log
Ref 20.00 dBm
Trace 1 Pass
Center 462.72500 MHz
#Res BW 300 Hz
#VBW 3.0 kHz
Span 100.0 kHz
Sweep 1.03 s (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

8. FREQUENCY STABILITY

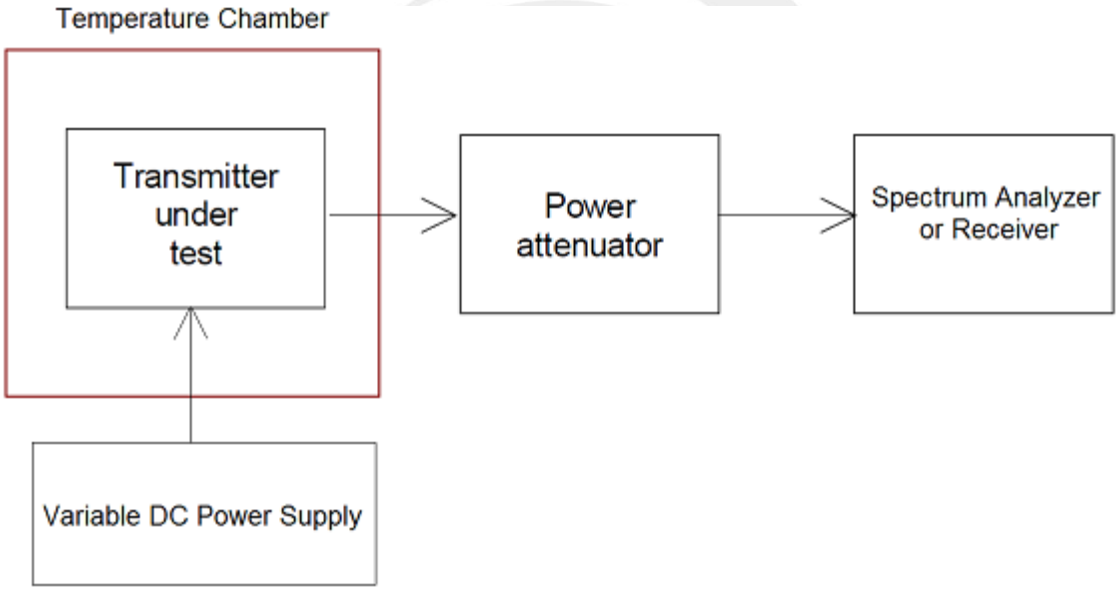
8.1 APPLIED PROCEDURES / LIMIT

The carrier frequency stability shall be better than ±2.5 ppm

8.2 TEST PROCEDURE

1. The frequency stability shall be measured with variation of ambient temperature from -30℃ to +50℃
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 3.33V to 4.07V.
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

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

TX mode.

8.5 TEST RESULT

FRS				
Test conditions		Frequency error (ppm)	Limit (ppm)	Result
Voltage(V)	Temp(℃)	CH18	±2.5	Pass
3.7V	-30	0.34		
	-20	0.26		
	-10	0.13		
	0	0.09		
	10	0.03		
	20	0.01		
	30	0.05		
	40	0.08		
	50	0.15		
3.33	20	0.19		
4.07	20	0.21		

9. MODULATION LIMIT

9.1 APPLIED PROCEDURES / LIMIT

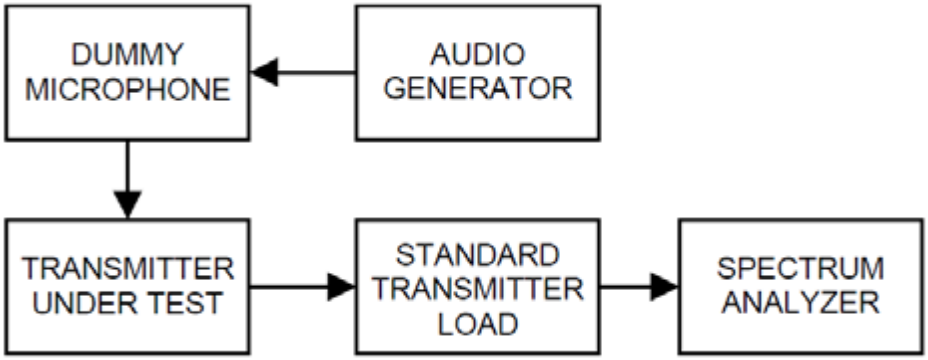
FRS:

The peak frequency deviation shall not exceed ±2.5 kHz

9.2 TEST PROCEDURE

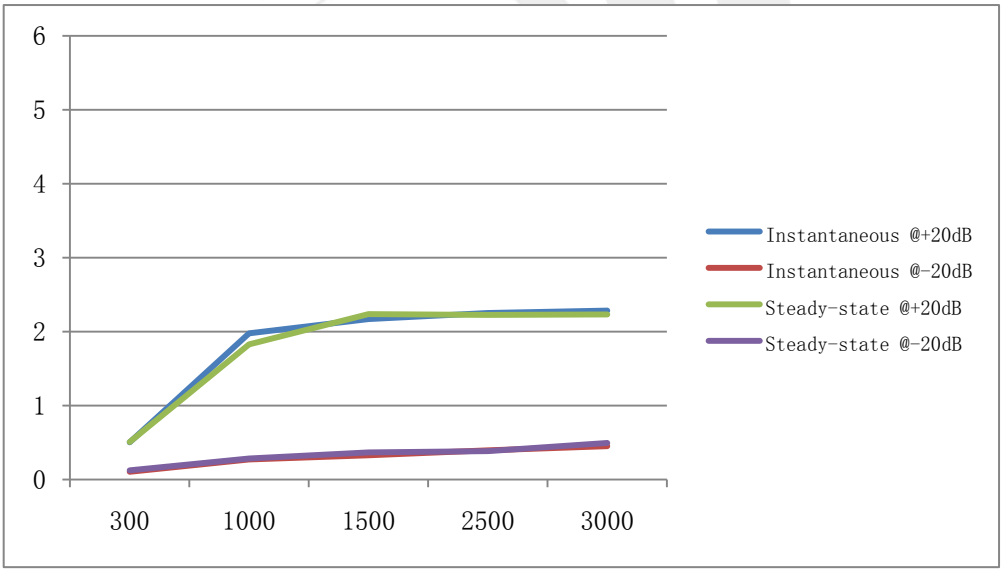
1. Connect the equipment as illustrated.
2. Adjust the transmitter per the manufacturer's procedure for full rated system deviation
3. Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz. Turn the de-emphasis function off
4. Apply a 1000 Hz modulating 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, 1000Hz, 1500Hz,2500Hz and 3000Hz in sequence.

9.3 TEST SETUP



9.4 TEST RESULT

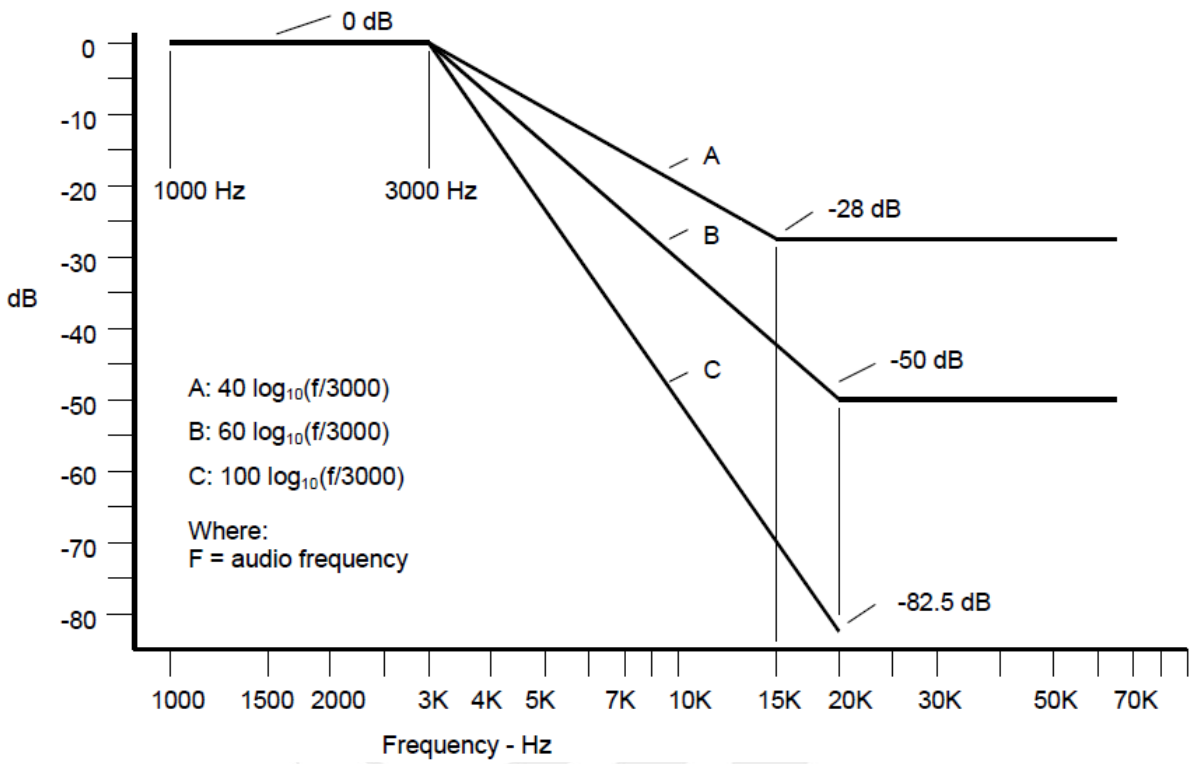
Audio Frequency (Hz)	Instantaneous		Steady-state		Limit (kHz)	Result
	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)	Deviation (@+20dB) (kHz)	Deviation (@-20dB) (kHz)		
300	0.504	0.104	0.507	0.125	±2.5	Pass
1000	1.978	0.272	1.827	0.285		
1500	2.169	0.328	2.236	0.367		
2500	2.252	0.394	2.225	0.384		
3000	2.285	0.452	2.233	0.495		



10. AUDIO LOW PASS FILTER RESPONSE

10.1 APPLIED PROCEDURES / LIMIT

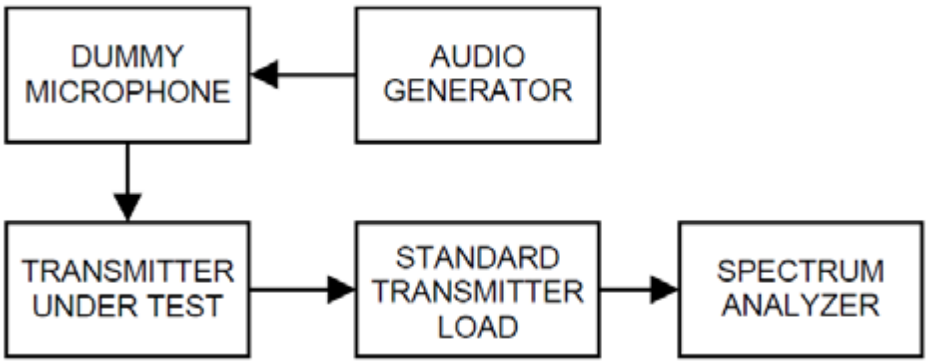
The filter must be between the modulation limiter and the modulated stage of the transmitter. At any frequency (f in kHz) between 3 and 20 kHz, the filter must have an attenuation of at least 60 log10 (f/3) dB greater than the attenuation at 1 kHz. Above 20 kHz, it must have an attenuation of at least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



10.2 TEST PROCEDURE

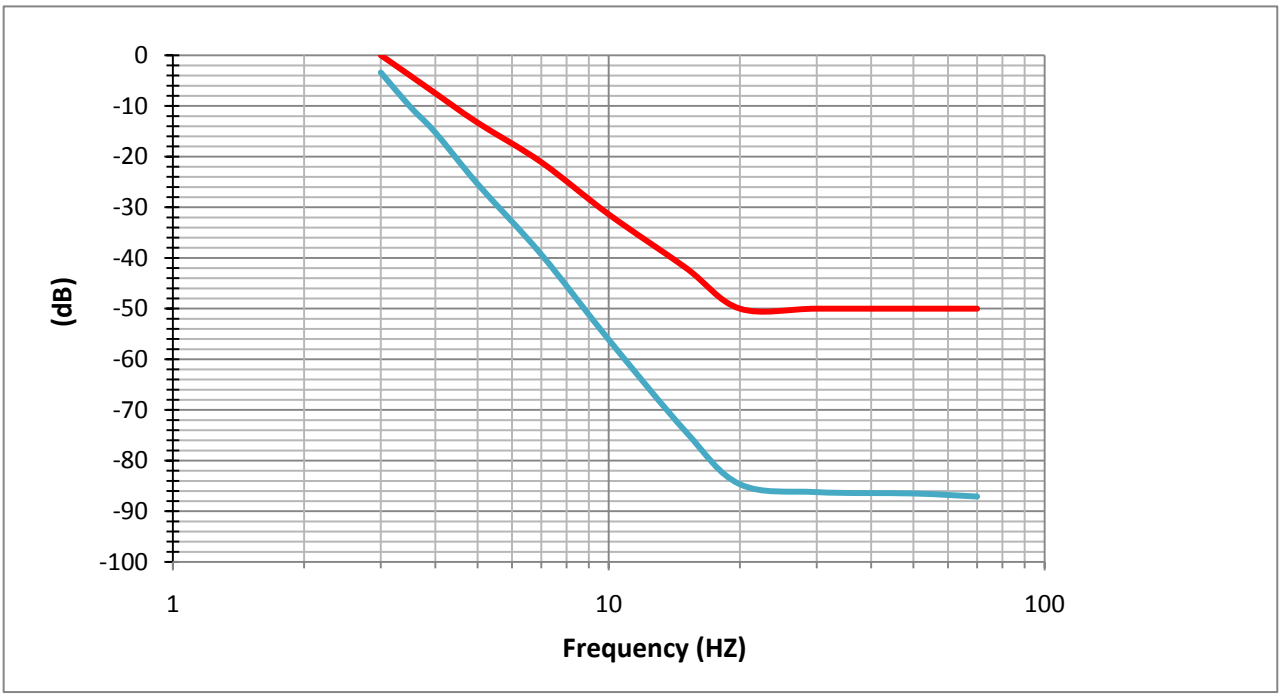
1. Configure the EUT as shown in figure
2. Apply a 1000 Hz tone from the audio signal generator and adjust the level per manufacturer's specifications. Record the dB level of the 1000 Hz tone as LEV_{REF}.
3. Set the audio signal generator to the desired test frequency between 3000 Hz and the upper low 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}

10.3 TEST SETUP



10.4 TEST RESULT

Operation Mode	Audio Frequency (KHz)	Response Attenuation (dB)	Limit	Result
FRS	3	0	-3.41	Pass
	3.5	-4	-10.13	
	4	-7.5	-15.25	
	5	-13.3	-25.40	
	7	-21.1	-39.31	
	10	-31.4	-56.15	
	15	-41.9	-74.24	
	20	-50	-84.68	
	30	-50	-86.23	
	50	-50	-86.50	
	70	-50	-87.10	



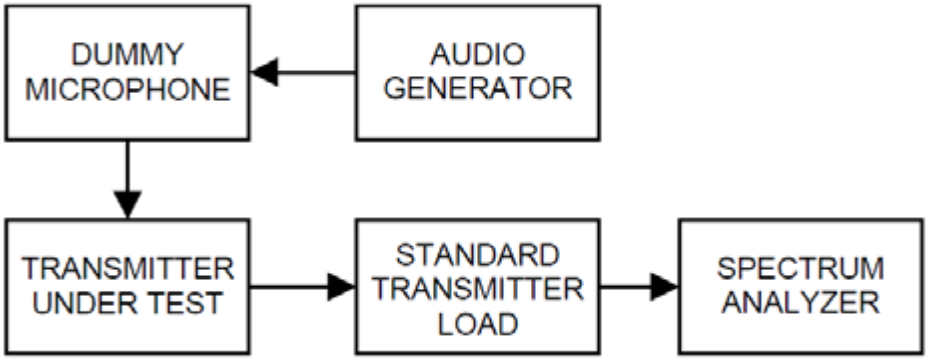
11. AUDIO FREQUENCY RESPONSE

11.1 APPLIED PROCEDURES / LIMIT

FCC Part 95.575:

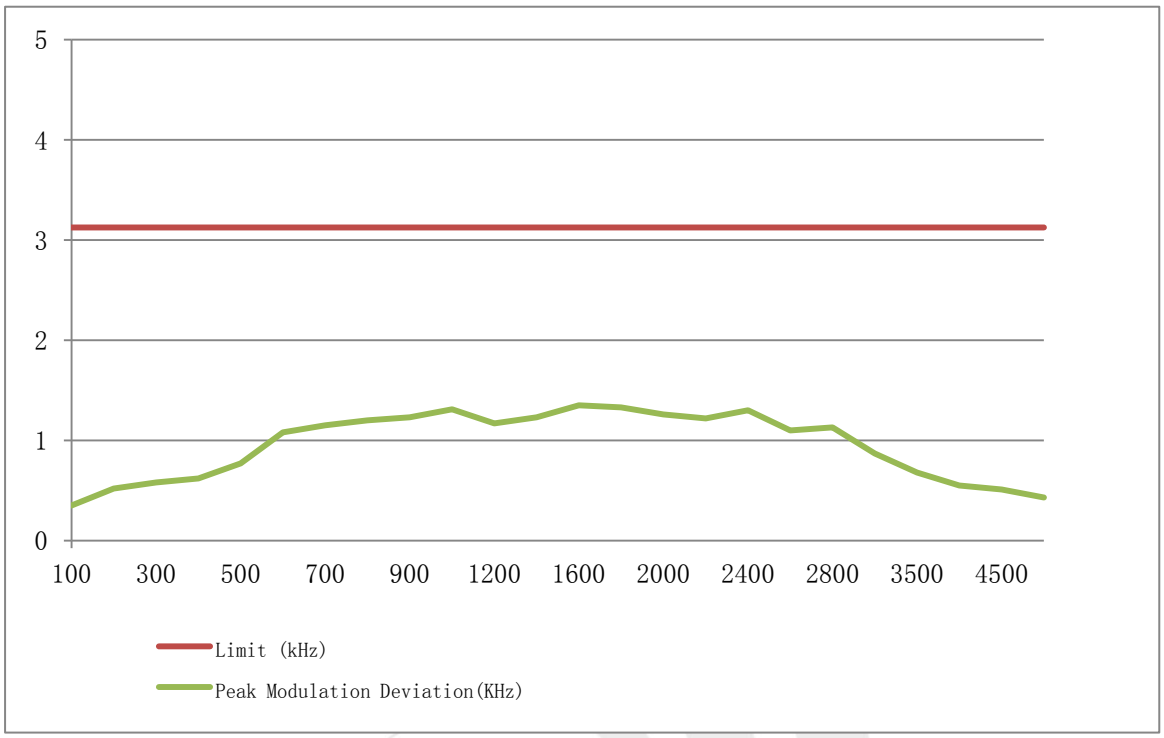
Each FRS transmitter type must be designed such that the peak frequency deviation does not exceed 2.5 kHz, and the highest audio frequency contributing substantially to modulation must not exceed 3.125 kHz.

11.2 TEST SETUP



11.3 TEST RESULT

Modulation Frequency(Hz)	Peak Modulation Deviation(KHz)	Limit (kHz)	Result
100	0.35	3.125	Pass
200	0.52		
300	0.58		
400	0.62		
500	0.77		
600	1.08		
700	1.15		
800	1.20		
900	1.23		
1000	1.31		
1200	1.17		
1400	1.23		
1600	1.35		
1800	1.33		
2000	1.26		
2200	1.22		
2400	1.30		
2600	1.10		
2800	1.13		
3000	0.87		
3500	0.68		
4000	0.55		
4500	0.51		
5000	0.43		


5
4
3
2
1
0
100
300
500
700
900
1200
1600
2000
2400
2800
3500
4500
Limit (kHz)
Peak Modulation Deviation(KHz)