FCC RADIO TEST REPORT

FCC ID:Y4O-DX24

Product：	Envoi Wireless Transmitter
Trade Name：	DENON PROFESSIONAL
Model Name：	Envoi HL Transmitter
Serial Model：	DX24
Report No.：	NTEK-2016NT05165756F

Prepared for

INMUSIC BRANDS INC.

200 Scenic View Drive, Suite 201 Cumberland, Rhode Island02864, United States

Prepared by

Shenzhen NTEK Testing Technology Co., Ltd.

1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street
Bao'an District, Shenzhen P.R. China
Tel.: +86-0755-61156588 Fax.: +86-0755-61156599
Website:www.ntek.org.cn

TEST RESULT CERTIFICATION

Applicant's name ..... INMUSIC BRANDS INC.

Address ..... 200 Scenic View Drive, Suite 201 Cumberland, Rhode Island02864, United States

Manufacture's Name... Ningbo Tonwel Audio Co.,LTD.

Address ..... No.500 Qihang Road Zhanqi Town Yingzhou Ningbo China

Product description

Product name ..... Envoi Wireless Transmitter

Model and/or type reference ..... Envoi HL Transmitter

Serial Model DX24

Standards ..... FCC CFR47 Part 74

Test procedure TIA/EIA-603C

This device described above has been tested by NTEK, and 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 NTEK, this document may be altered or revised by NTEK, personnel only, and shall be noted in the revision of the document.

Date of Test .....:

Date (s) of performance of tests .....: 16 May 2016~30 May 2016

Date of Issue.....: 30 May 2016

Test Result.....: **Pass**

Testing Engineer : Susan

(Susan Su)

Technical Manager : Jason chen

(Jason Chen)

Authorized Signatory : Sam . Chen

(Sam Chen)

Table of Contents

Page

Table of Contents

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC CFR47 Part 74			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	
74.861(e)(1)(ii)	RF Output Power	PASS	
2.1047(a)	Modulation Characteristics	PASS	
2.1049(c)(1)	Occupied Bandwidth	PASS	
2.1053 & 74.861(e)(6)	Radiated Emissions	PASS	
2.1051	Spurious emissions at antenna terminals	PASS	
2.1055(a)(1)	Frequencies Stability	PASS	

NOTE:

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

Requirement for Radio Equipment on Certification:

1. RF output Power
   For transmitters, the power output shall be measured at the RF output terminals.

2. Modulation Characteristics
   For Voice Modulated Communication Equipment, a curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000Hz shall be submitted.

3. Occupied Bandwidth
   For radiotelephone transmitter, other than single sideband or indenpent sideband transmitter, where modulated by a 2.5KHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

4. Spurious Emission at Antenna Terminals
   The radio frequency voltage or power generated within the equipment and appearing on a spurious Frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

5. Field Strength of Spurious Emission
   Measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate ciruit elements under normal condition of installation and operation.

6. Frequencies Tolerance
   The frequency stability shall be measured with variation of ambient temperature.
   The frequency stability shall be measured with variation of primary supply voltage.

1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd
Add.:1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.
FCC Registration No.:238937; IC Registration No.:9270A-1
CNAS Registration No.:L5516

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 Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>Envoi Wireless Transmitter</td></tr>
<tr><td>Trade Name</td><td>DENON PROFESSIONAL</td></tr>
<tr><td>Model Name</td><td>Envoi HL Transmitter</td></tr>
<tr><td>Serial Model</td><td>DX24</td></tr>
<tr><td>Model Difference</td><td>All the model are the same circuit and RF module,
except the model No..</td></tr>
<tr><td>Product Description</td><td>The EUT is a Envoi Wireless Transmitter

<table><tr><td>Operation Frequency:</td><td>584.40-606.75 MHz</td></tr><tr><td>Modulation Type:</td><td>FM</td></tr><tr><td>Number Of Channel</td><td>16CH(Please see Note 2.)</td></tr><tr><td>Antenna Designation:</td><td>Please see Note 3.</td></tr><tr><td>Antenna Gain (dBi)</td><td>1.0dBi</td></tr></table></td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Ratings</td><td>DC 3.0V</td></tr>
<tr><td>Adapter</td><td>N/A</td></tr>
<tr><td>Battery</td><td>DC 1.5V*2 cell ”AA” alkaline battery</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
</table>

Note:

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

2.

Channel	Frequency (MHz)
01	584.400MHz
02	587.500MHz
03	589.575MHz
04	591.050MHz
05	593.425MHz
06	595.200MHz
07	598.450MHz
08	599.650MHz
09	601.275MHz
10	603.775MHz
11	605.500MHz
12	606.750MHz
13	586.025MHz
14	590.525MHz
15	594.150MHz
16	602.450MHz

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
A	N/A	N/A	External antenna	N/A	1.0	Antenna

2.2 DESCRIPTION OF TEST MODES

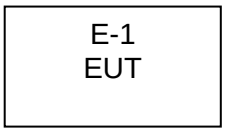
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration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

Pretest Mode	Description
Mode 1	TX(CH01/ CH15/ CH12)
Mode 2	
Mode 3	

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX(CH01/ CH15/ CH12)
Mode 2	
Mode 3	

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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	Brand	Model/Type No.	Series No.	Note
E-1	Envoi Wireless Transmitter	DENON PROFESSIONAL	Envoi HL Transmitter	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

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

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2015.07.06	2016.07.05	1 year
2	Test Receiver	R&S	ESPI	101318	2015.06.07	2016.06.06	1 year
3	Bilog Antenna (30MHz-1GHz)	TESEQ	CBL6111D	31216	2015.07.06	2016.07.05	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2015.06.07	2016.06.06	1 year
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	2015.06.07	2016.06.06	1 year
6	Horn Antenna (1-18GHz)	EM	EM-AH-10180	2011071402	2015.07.06	2016.07.05	1 year
7	Horn Ant (1-18GHz)	Schwarzbeck	BBHA 9170	9170-181	2015.07.06	2016.07.05	1 year
8	Amplifier	EM	EM-30180	060538	2015.12.22	2016.12.21	1 year
9	Loop Antenna (9KHz-30MHz)	ARA	PLA-1030/B	1029	2015.06.08	2016.06.07	1 year
10	Power Meter	R&S	NRVS	100696	2015.07.06	2016.07.05	1 year
11	Power Sensor	R&S	URV5-Z4	0395.1619.05	2015.07.06	2016.07.05	1 year
12	Modulation Analyzer	HP	8920B	-	2015.07.06	2016.07.05	1 year
13	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2015.11.19	2016.11.18	1 year
14	Substitution Antenna (30MHz-1GHz)	Schwarzbeck	VULB 9160	9160-3309	2015.07.06	2016.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2015.06.06	2016.06.05	1 year
2	LISN	R&S	ENV216	101313	2015.08.24	2016.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2015.08.24	2016.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2015.06.07	2016.06.06	1 year
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2015.06.07	2016.06.06	1 year
6	Absorbing clamp	R&S	MOS-21	100423	2015.06.08	2016.06.07	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

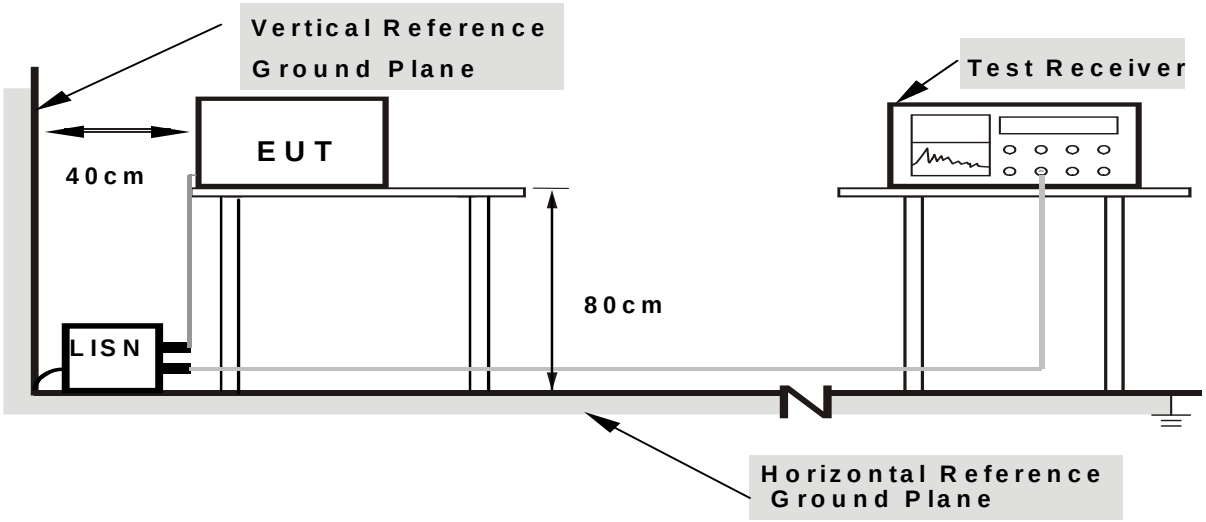
3.1.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

EUT：	Envoi Wireless Transmitter	Model Name. ：	Envoi HL Transmitter
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase：	N/A
Test Voltage ：	N/A	Test Mode：	N/A
Note: No applicable, Since the EUT's Power supplied from DC 3V battery.			

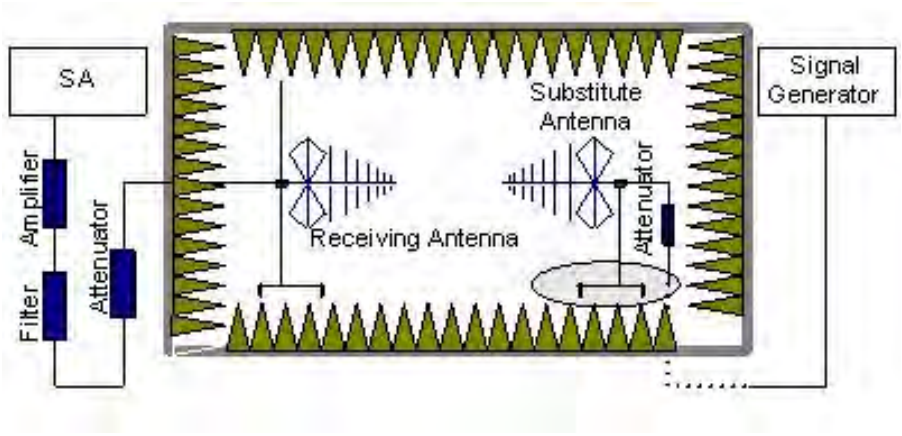
3.2 RADIATED EMISSION MEASUREMENT

3.2.1 MEASUREMENT METHOD

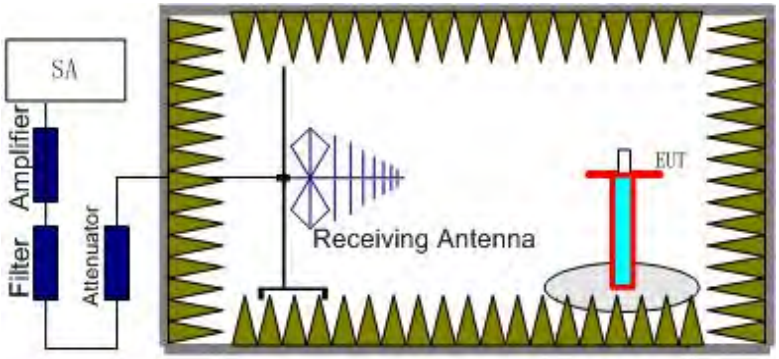
The measurements procedures specified in TIA-603D-2004 were used for testing. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment. The resolution bandwidth is set 1MHz as outlined in Part 2.1053 ; 74.861 (e)
The measurements were performed on all modes at 3 typical channels(the Top Channel, the Middle Channel and the Bottom Channel) for each band.Only shown the worst data.

The procedure of radiated spurious emissions is as follows:

a) Pre-calibration With pre-calibration method, the Radiated Spurious Emissions(RSE) is calculated as, RSE=Rx（dBuV）+CL（dB）+SA（dB）+Gain（dBi）-107（dBuV to dBm）The SA is calibrated using following setup.



b) 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 test item for emission measurements. The height of receiving antenna is 0.8m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the test item and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1MHz bandwidth.



The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established and the ARpl is the attenuation of “reference path loss”, and including the gain of receive antenna, the gain of the preamplifier, the cable loss and the air loss.The measurement results are obtained as described below:
Power=PMea+ARpl

3.2.2 PROVISIONS APPLICABLE

(a) On any frequency outside a licensee’s frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

3.2.3 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.

3.2.4 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

EUT：	Envoi Wireless Transmitter	Model Name. ：	Envoi HL Transmitter
Temperature：	20 ℃	Relative Humidtity：	48%
Pressure：	1010 hPa	Test Voltage ：	N/A
Test Mode ：	N/A	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	N/A
--	--	--	--	N/A

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.5 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

EUT：	Envoi Wireless Transmitter	Model Name ：	Envoi HL Transmitter
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 3.0V
Test Mode ：	TX		

Polar (H/V)	Frequency (MHz)	Power (dBm)	Cable loss (dB)	Antenna Factor (dB)	Absolute Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	56.4235	-70.15	0.24	28.67	-41.24	-13	-28.24	peak
V	132.399	-65.68	0.34	22.42	-42.92	-13	-29.92	peak
V	195.953	-65.78	0.37	24.47	-40.94	-13	-27.94	peak
V	260.419	-66.62	0.42	22.52	-43.68	-13	-30.68	peak
V	407.983	-77.54	0.46	29.29	-47.79	-13	-34.79	peak
V	720.925	-82.15	0.48	34.58	-47.09	-13	-34.09	peak
H	68.3728	-80.12	0.26	26.55	-53.31	-13	-40.31	peak
H	129.924	-76.56	0.32	18.8	-57.44	-13	-44.44	peak
H	218.935	-71.24	0.35	24.5	-46.39	-13	-33.39	peak
H	272.795	-65.93	0.44	23.15	-42.34	-13	-29.34	peak
H	391.533	-74.46	0.45	27.86	-46.15	-13	-33.15	peak
H	542.264	-82.23	0.46	30.79	-50.98	-13	-37.98	peak

Remark:
Absolute Level= Power + Cable Loss+ Antenna Factor
Margin= Absolute Level - Limit

3.2.6 TEST RESULTS (ABOVE 1000 MHZ)

EUT：	Envoi Wireless Transmitter	Model Name ：	Envoi HL Transmitter
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 3.0V
Test Mode ：	TX		

Polar (H/V)	Frequency (MHz)	Power (dBm)	Cable loss (dB)	Antenna Factor (dB)	Absolute Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
CH 01								
V	1168.82	-32.16	1.24	-14.29	-45.21	-13	-32.21	peak
V	1753.25	-39.38	1.45	-12.58	-50.51	-13	-37.51	peak
H	1168.84	-32.28	1.24	-14.29	-45.33	-13	-32.33	peak
H	1753.25	-35.34	1.45	-12.58	-46.47	-13	-33.47	peak
CH 15								
V	1188.34	-25.06	1.25	-14.66	-38.47	-13	-25.47	peak
V	1782.45	-31.07	1.46	-13.65	-43.26	-13	-30.26	peak
H	1188.35	-38.15	1.25	-14.66	-51.56	-13	-38.56	peak
H	1782.45	-40.27	1.46	-13.65	-52.46	-13	-39.46	peak
CH 12								
V	1213.51	-31.37	1.27	-14.93	-45.03	-13	-32.03	peak
V	1820.26	-30.17	1.49	-11.2	-39.88	-13	-26.88	peak
H	1213.52	-25.26	1.27	-14.93	-38.92	-13	-25.92	peak
H	1820.26	-27.08	1.49	-11.2	-36.79	-13	-23.79	peak

Remark:
Absolute Level= Power + Cable Loss+ Antenna Factor
Margin= Absolute Level - Limit

4. RF OUTPUT POWER

4.1 Conducted Output Power

4.0.1.1 APPLIED PROCEDURES / LIMIT

Test requirement: FCC CFR47 Part 74 Section 74.861(e)(1)(ii)

Test method: Based on TIA/EIA-603-C-2004

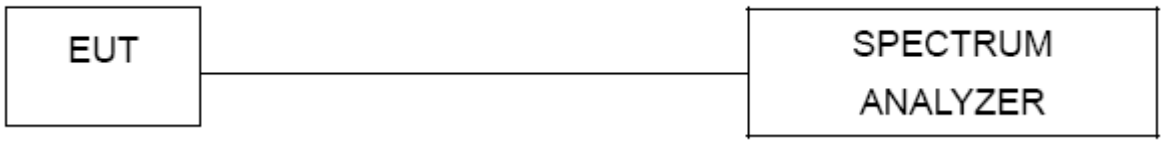
Limit: According to Part 74.861(e)(1)(ii), the output power shall not exceed 250mW (23.98 dBm).

4.1.2 TEST PROCEDURE

The maximum peak output power was measured with a spectrum analyzer connected to the antenna terminal (conducted measurement) while EUT was operating in normal situation.

Detector:	Peak (worst case) / Average (RMS)
Sweep time:	Auto /
Resolution bandwidth:	> emission bandwidth
Video bandwidth:	> resolution bandwidth
Span:	> 2 times emissions bandwidth
Trace mode:	Max. hold
EUT configuration:	Peak: Unmodulated carrier RMS: Modulate the transmitter with a 2.5 kHz tone at a level 16 dB higher than that required to produce a frequency deviation of ± 75 kHz, or to produce 50% of the manufacturer's rated deviation, whichever is less.

4.1.3 TEST SETUP



4.1.4 EUT OPERATION CONDITIONS

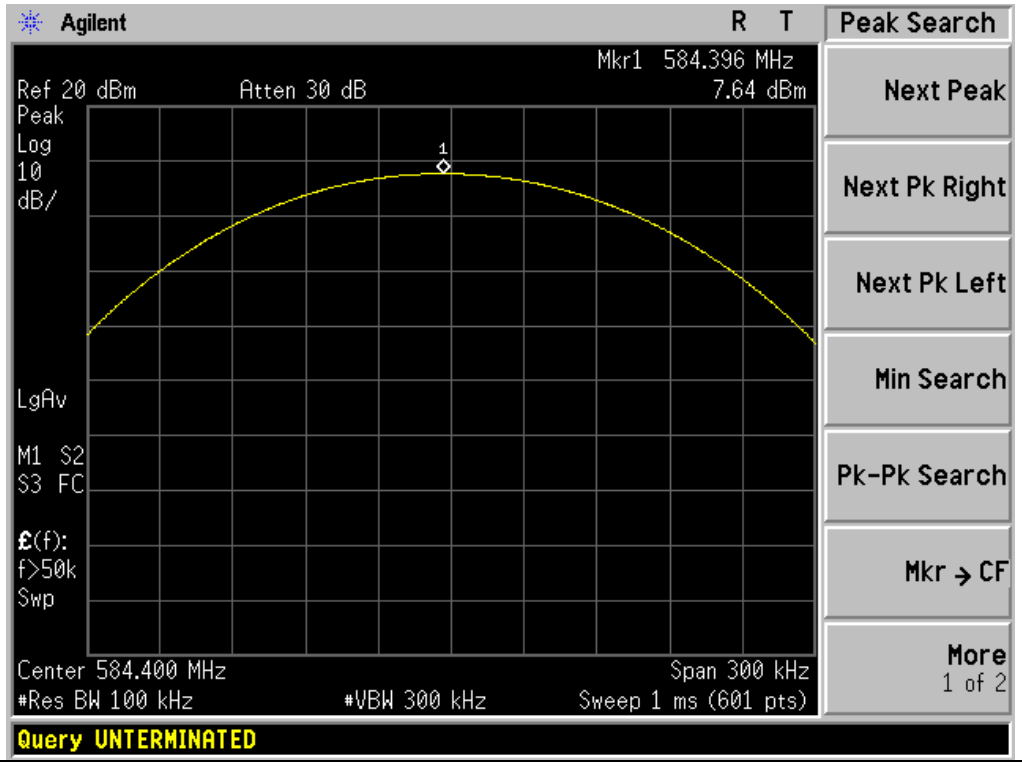
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

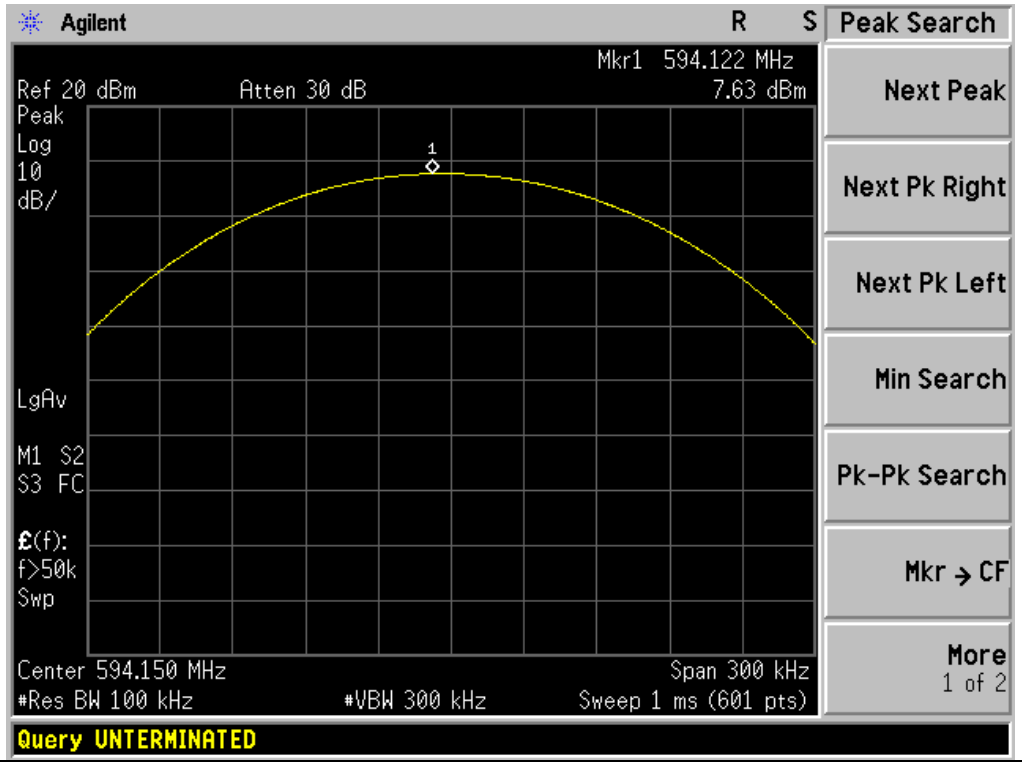
EUT：	Envoi Wireless Transmitter	Model Name ：	Envoi HL Transmitter
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1015 hPa	Test Voltage ：	DC 3.0V
Test Mode ：	TX		

Test Channel	Frequency	Cable loss	Conducted Output Power (PK)	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	(dBm)	(dBm)	dBm
CH 01	584.4	0.52	7.64	8.16	23.98
CH 15	594.15	0.54	7.63	8.17	23.98
CH 12	606.75	0.56	7.65	8.21	23.98

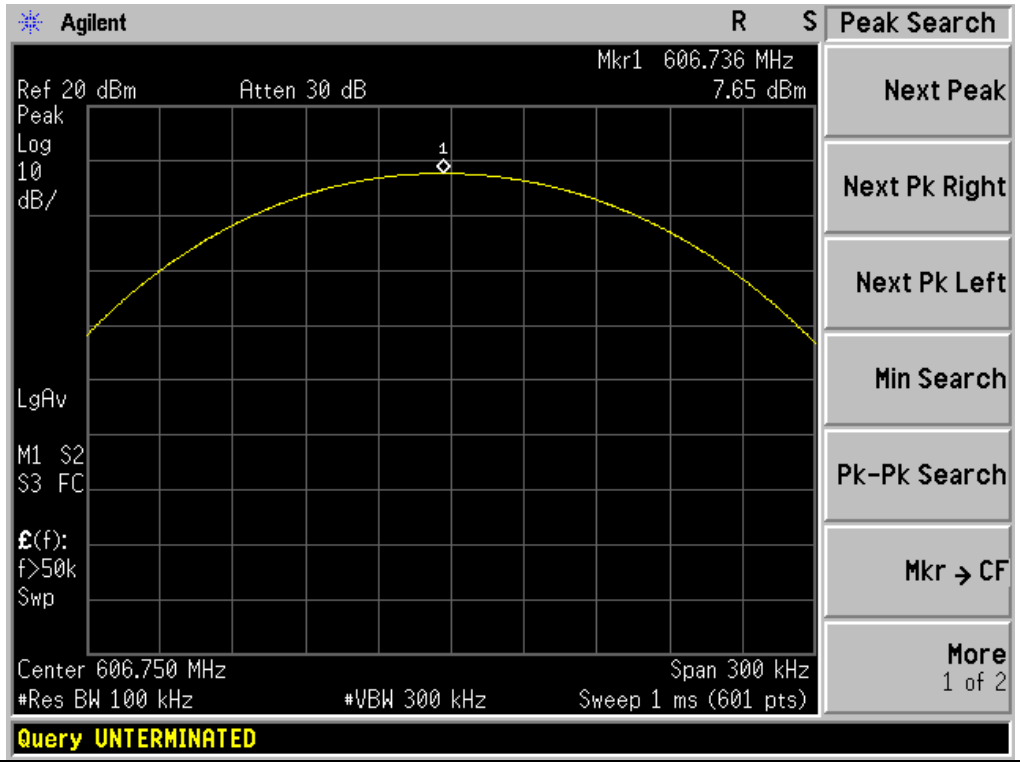
TX CH01


Agilent
R T
Peak Search
Mkr1 584.396 MHz
Ref 20 dBm
Atten 30 dB
7.64 dBm
Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 584.400 MHz
Span 300 kHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
Query UNTERMINATED

CH 02


Agilent
R S
Peak Search
Mkr1 594.122 MHz
Ref 20 dBm
Atten 30 dB
7.63 dBm
Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Center 594.150 MHz
Span 300 kHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
Query UNTERMINATED

TX CH03


Agilent
R
S
Peak Search
Mkr1 606.736 MHz
Ref 20 dBm
Atten 30 dB
7.65 dBm
Peak
Log
10
dB/
1
Next Peak
Next Pk Right
Next Pk Left
Min Search
LgAv
M1 S2
S3 FC
Pk-Pk Search
£(f):
f>50k
Swp
Mkr → CF
More
1 of 2
Center 606.750 MHz
Span 300 kHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
Query UNTERMINATED

4.2. Radiated Output Power

4.2.1measurement method

The measurements procedures specified in TIA-603D-2004 were applied.

1. In an anechoic antenna test chamber, a half-wave dipole antenna for the frequency band of interest is placed at the reference centre of the chamber. An RF Signal source for the frequency band of interest is connected to the dipole with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A known (measured) power (Pin) is applied to the input of the dipole, and the power received (Pr) at the chamber's probe antenna is recorded.

2.The substitution method is used. Substitution values at each frequency are measured before and saved to the test software. A "reference path loss" is established as ARpl=Pin + 2.15 - Pr. The ARpl is he attenuation of “reference path loss”, and including the gain of receive antenna, the cable loss and the air loss. The measurement results are obtained as described below: Power=PMea+ARpl

3. The EUT is substituted for the dipole at the reference centre of the chamber and a scan is performed to obtain the radiation pattern

4. From the radiation pattern, the co-ordinates where the maximum antenna gain occurs are identified.

5.The EUT is then put into continuously transmitting mode at its maximum power level.

6.Power mode measurements are performed with the receiving antenna placed at the coordinates determined in Step 3 to determine the output power as defined in Rule Part 74.861(e)(1)(ii),

The "reference path loss" from Step1 is added to this result.

7.This value is EIRP since the measurement is calibrated using a half-wave dipole antenna of known gain (2.15 dBi) and known input power (Pin).

8. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP -2.15dBi.

9. Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

4.2.2 PROVISIONS APPLICABLE

N/A

4.2.3 Measurement Result

Radiated Power (ERP)							
Frequency	Result					Limit (dBm)	Conclusion
	Reading Level (dBm)	Cable loss (dB)	Antenna Factor (dBm)	Max. Peak ERP (dBm)	Polarization Of Max. ERP		
584.400MHz	-17.34	3.01	19.50	5.167	Horizontal	23.98	Pass
584.400MHz	-16.28	3.01	19.50	6.235	Vertical	23.98	Pass
594.150MHz	-18.84	3.30	20.01	4.474	Horizontal	23.98	Pass
594.150MHz	-17.68	3.30	20.01	5.627	Vertical	23.98	Pass
606.750MHz	-18.62	3.31	20.06	4.746	Horizontal	23.98	Pass
606.750MHz	-17.48	3.31	20.06	5.889	Vertical	23.98	Pass

Note:
Max. Peak ERP = Reading Level+Antenna Factor + Cable Loss.

5. MODULATION CHARACTERISTICS

5.1 APPLIED PROCEDURES / LIMIT

Test requirement: FCC CFR47 Part 2 Section 2.1047(a)
Test method: Based on TIA/EIA-603-C-2004
Requirement: According to Part 2.1047(a), for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100Hz to 5000Hz shall be measured.

5.1.1 TEST PROCEDURE

(a) Test Configuration
(b) Audio Frequency Response:
1) Apply a 1000 Hz tone and adjust the audio frequency generator to produce 20% of the rated system deviation.
2) Set the test receiver to measure rms deviation and record the deviation reading as DEVREF .
3) Set the audio frequency generator to the desired test frequency between 100 Hz and 5000 Hz.
4) Record the test receiver deviation reading as DEVFREQ .
5) Calculate the audio frequency response at the present frequency as:
audio frequency response =20lg(DEVFREQ/ DEVREF)
6) Repeat steps 4) through5) for all the desired test frequencies.
(c) Modulation Limiting:
1) 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.
2) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.
3) With the level from the audio frequency generator held constant at the level.
obtained in step e), slowly vary the audio frequency from 300 Hz to 3000Hz and observe the steady-state deviation. Record the maximum deviation.
4) Set the test receiver to measure peak negative deviation and repeat steps 1) through 3).
5) The values recorded in steps 3) and 4) are the modulation limiting.

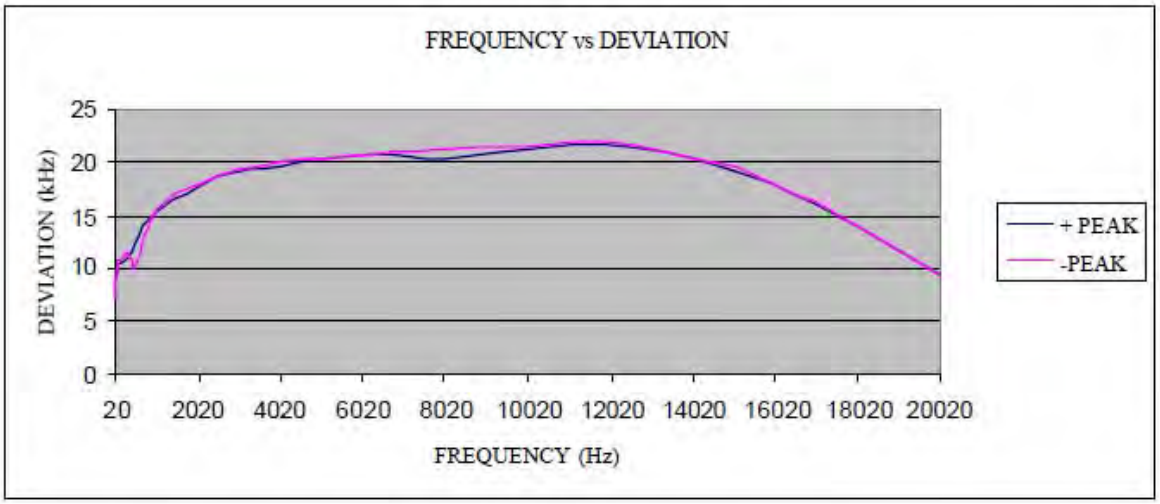
TEST SETUP

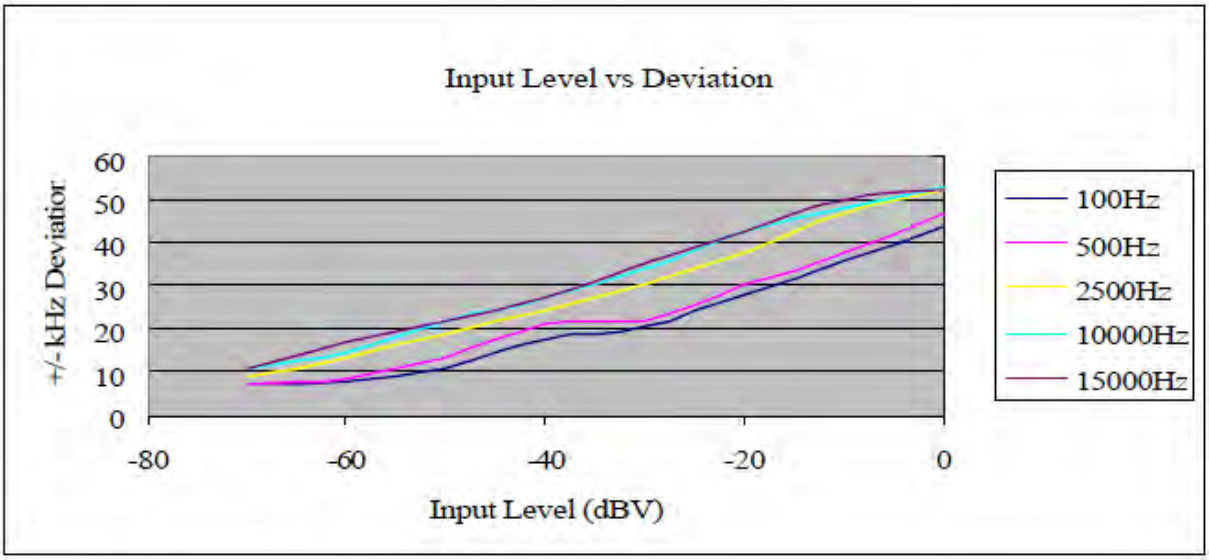
5.1.2 EUT OPERATION CONDITIONS

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.

5.1.3 TEST RESULTS

EUT：	Envoi Wireless Transmitter	Model Name ：	Envoi HL Transmitter
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 3.0V
Test Mode ：	TX		





6. OCCUPIED BANDWIDTH OF EMISSION

6.1 APPLIED PROCEDURES / LIMIT

Test requirement: FCC CFR47 Part 2 Section 2.1049©(1)
Test method: Based on TIA/EIA-603-C-2004
Limit: According to FCC 74.861 (e)(5), the frequency emission bandwidth shall not exceed 200 kHz.

Occupied bandwidth 99%. Other than single sideband or independent sideband transmitters - when modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

The input level shall be established at the frequency of maximum response of the audio modulating circuit.

6.1.1 TEST PROCEDURE

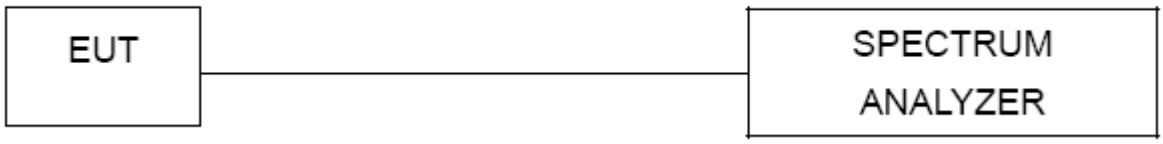
1. Check the calibration of the measuring instrument using either an internal calibrator or a knownsignal from an external generator.
2. Turn on the EUT and set it to any one convenient frequency within its operating range.

Detector:	Peak
Sweep time:	Auto /
Resolution bandwidth:	1 % to 5 % of the occupied bandwidth
Video bandwidth:	3 x resolution bandwidth
Span:	> 2 times emissions bandwidth
Analyzer function:	99% power occupied bandwidth function
Trace mode:	Max. hold
EUT configuration:	Modulated signal with max. frequency deviation

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

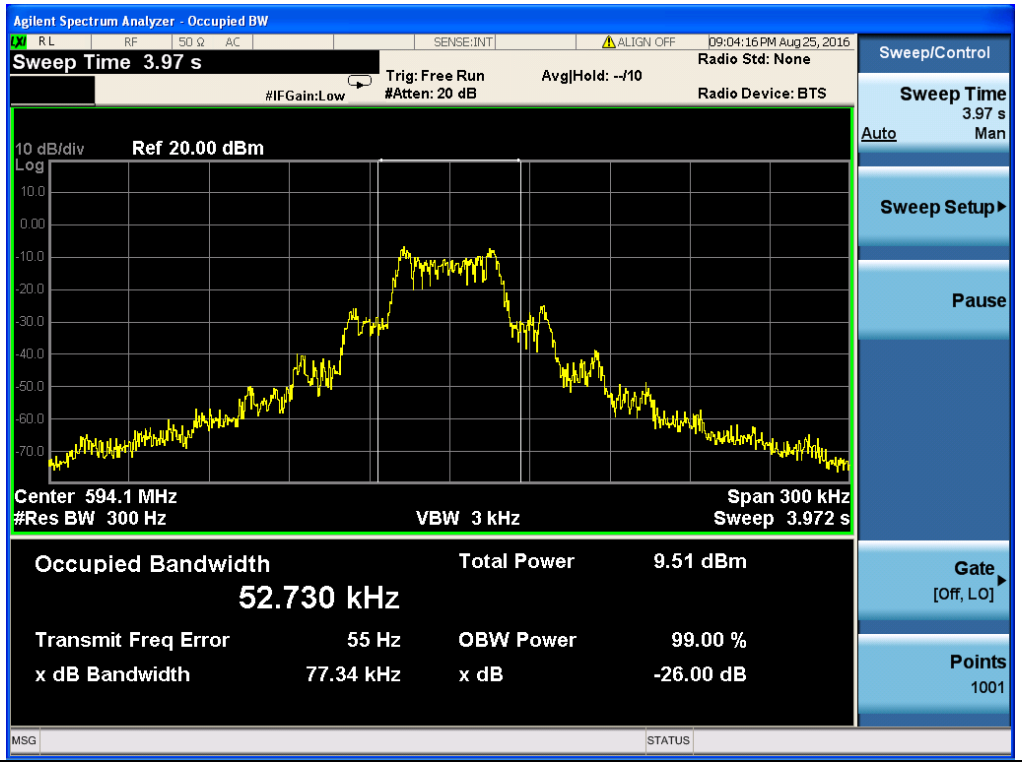
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

EUT：	Envoi Wireless Transmitter	Model Name ：	Envoi HL Transmitter
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 3.0V
Test Mode ：	TX		

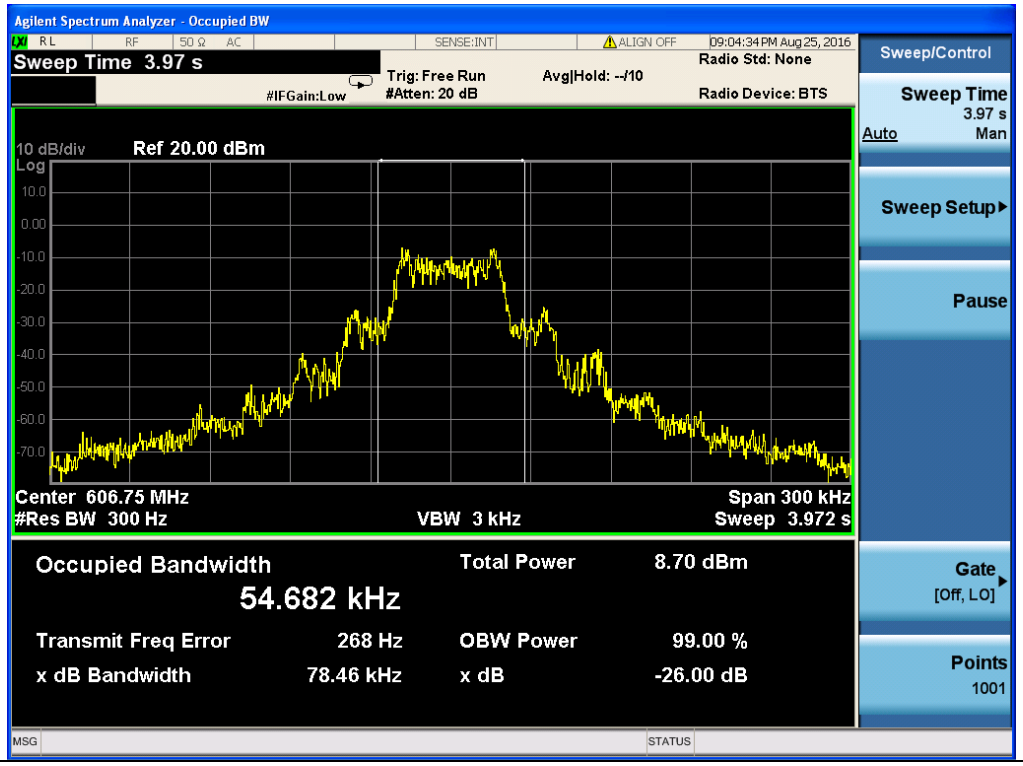
Frequency	99% Bandwidth (1kHz tone)	99% Bandwidth (2.5kHz tone)	Limit (kHz)	Result
584.40 MHz	52.353	58.037	200	PASS
594.15 MHz	52.730	56.635	200	PASS
606.75 MHz	54.682	58.471	200	PASS

TX CH01-1 kHz tone

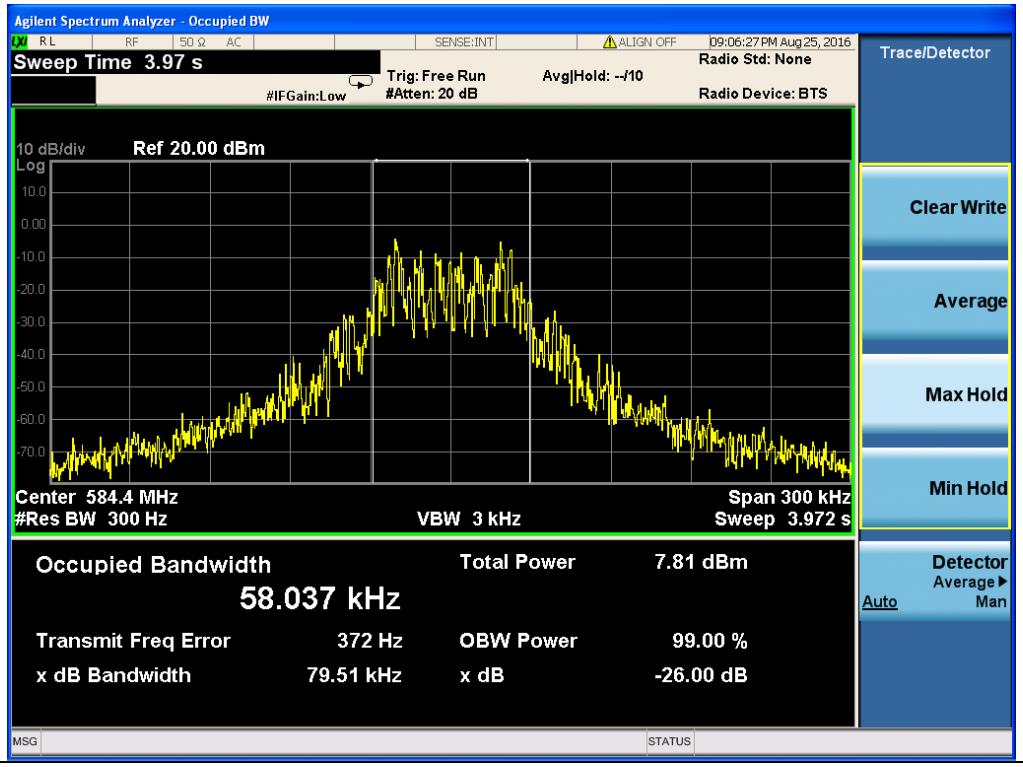
CH 02-1 kHz tone



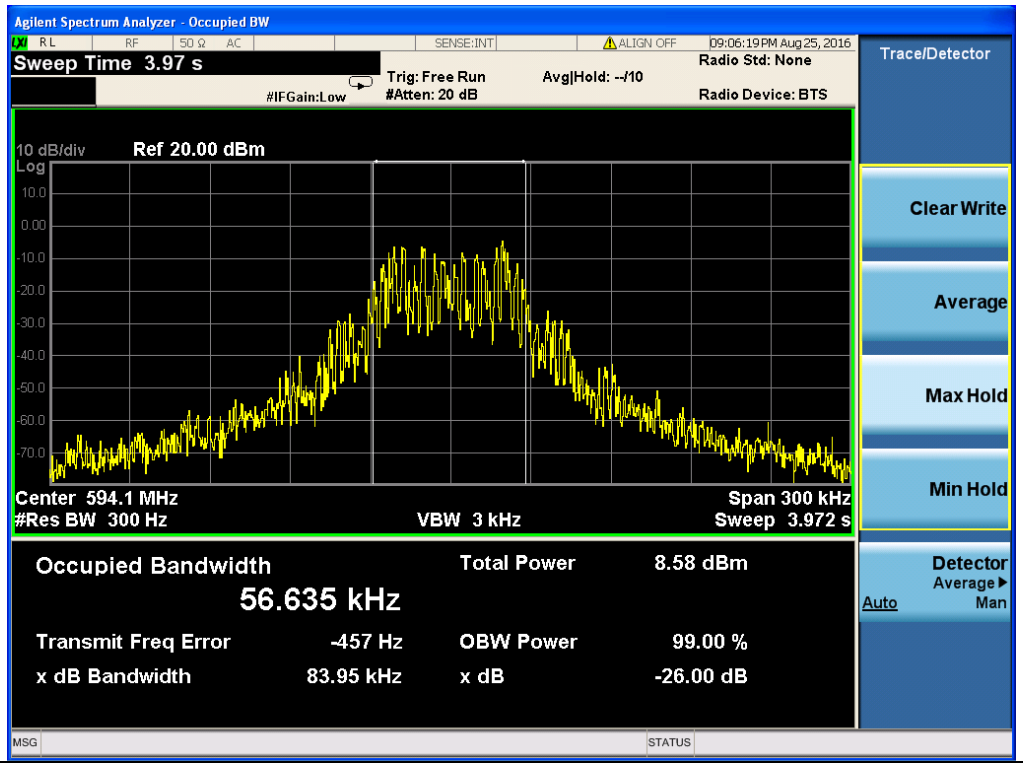
TX CH03-1 kHz tone



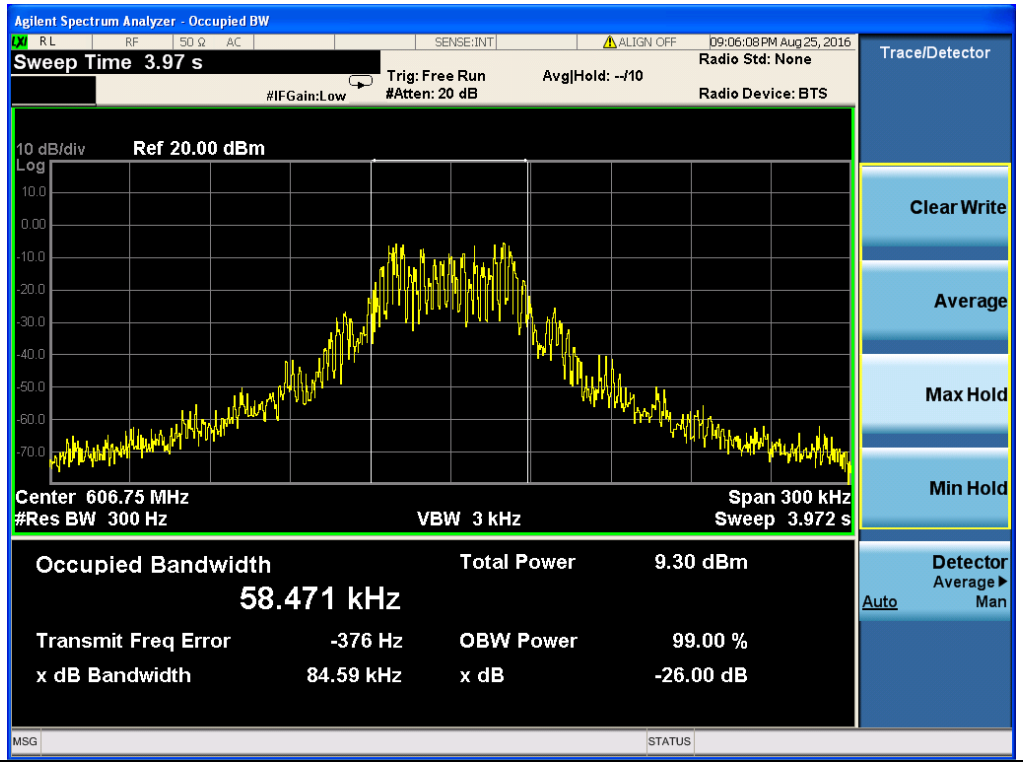
CH 01-2.5 kHz tone



TX CH02-2.5 kHz tone



CH 03-2.5 kHz tone



7. SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Test requirement: FCC CFR47 Part 2 Section 2.1053

Test method: Based on TIA/EIA-603-C-2004

Limit: According to Part 74.861 (e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(i) on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.

(ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.

(iii) on any frequency removed from the operating frequency by more than 250 percent up to and the authorized bandwidth shall be attenuated below the un-modulated carrier by at least 43 + 10 Log (output power in watts)dB.

7.1 TEST PROCEDURE

1. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable.Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
2. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
3. Set the SA on View mode and then plot the result on SA screen.
4. Repeat above procedures until all frequencies measured were complete.

Detector:	Peak	
Sweep time:	Auto /	
Resolution bandwidth:	25 dBc and 35 dB-ccriteria:	1% of the authorized bandwidth
	$55+10\log_{10}(P_{MEAN}$ inWatts) dB - criteria	30 kHz
	$43+10\log_{10}(P_{MEAN}$ inWatts) dB - criteria	120 kHz /1 MHz
Video bandwidth:	3 x resolution bandwidth	
Span:	> 2 times emissions bandwidth	
Trace mode:	Max. hold	
EUT configuration:	Modulated signal with max. frequency deviation	

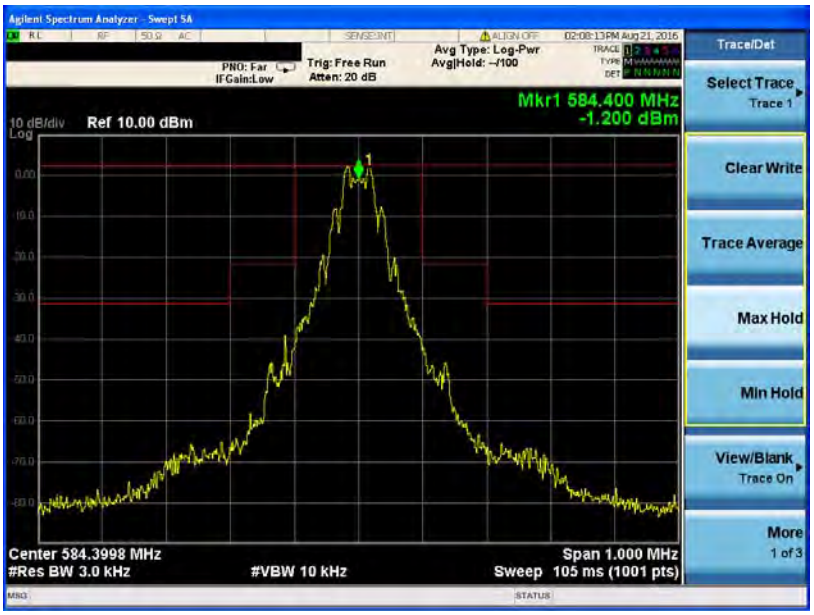
7.2 EUT OPERATION CONDITIONS

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.

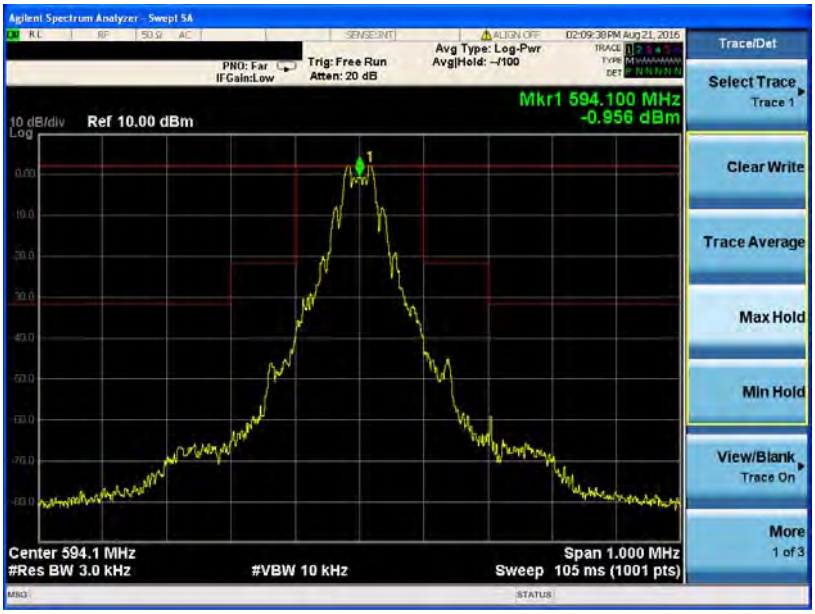
7.3 TEST RESULTS

EUT：	Envoi Wireless Transmitter	Model Name ：	Envoi HL Transmitter
Temperature：	25 ℃	Relative Humidity：	56%
Pressure：	1012 hPa	Test Voltage ：	DC 3.0V
Test Mode ：	TX		

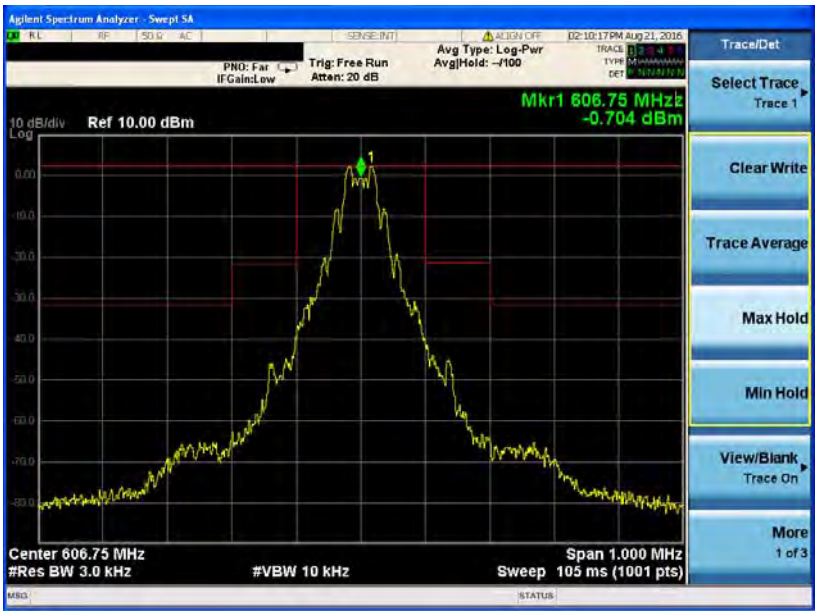
Emission Mask: 584.40MHz



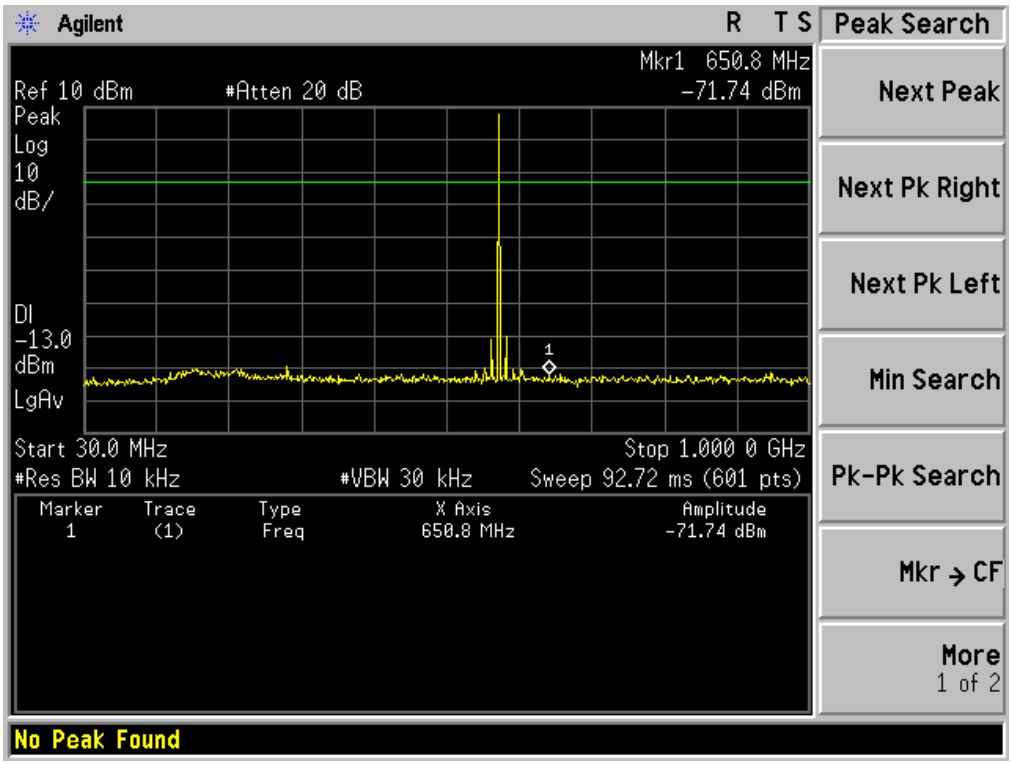
Emission Mask: 594.15MHz



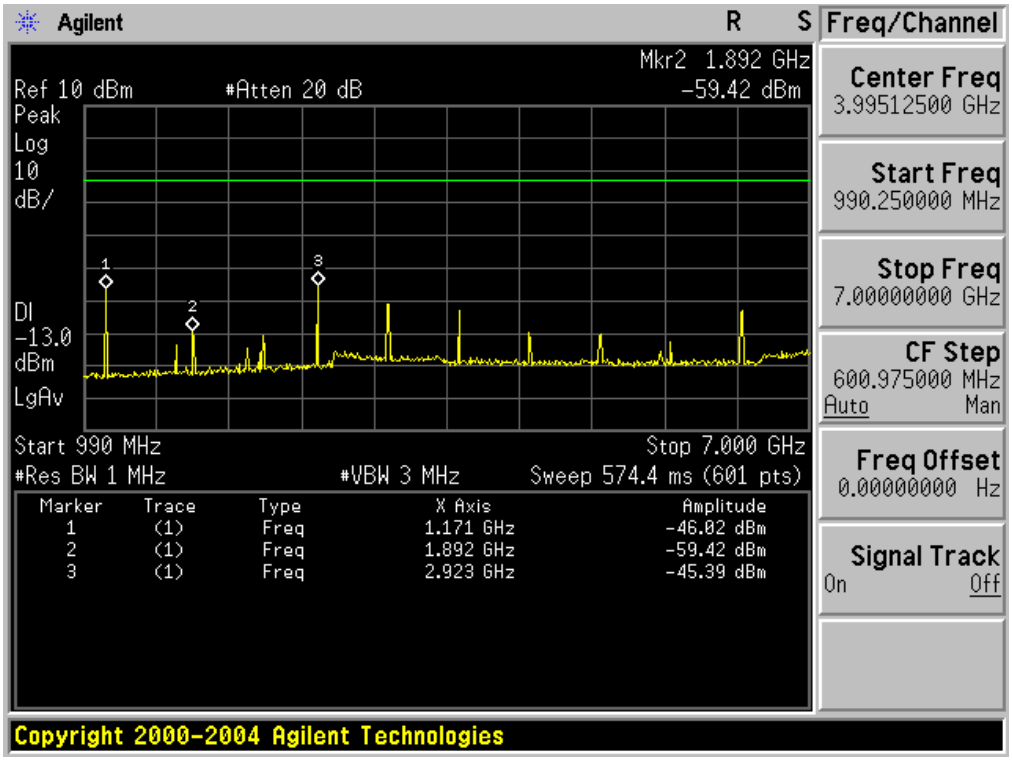
Emission Mask: 606.75MHz



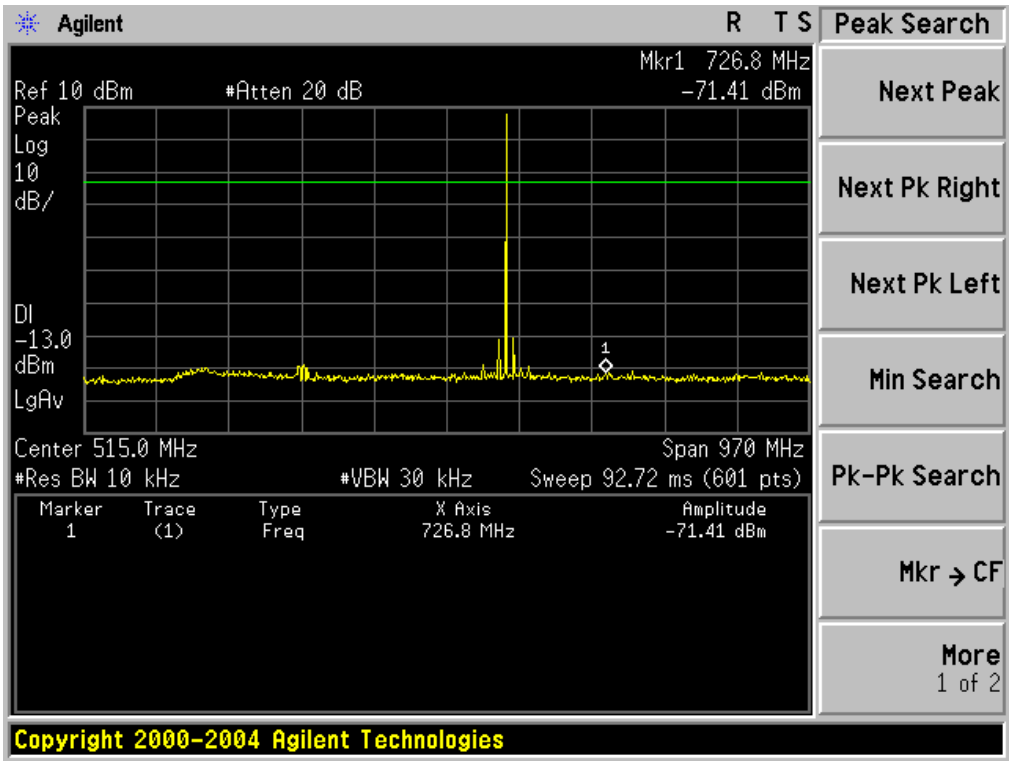
Conducted Spurious Emissions
584.40MHz
30-1G



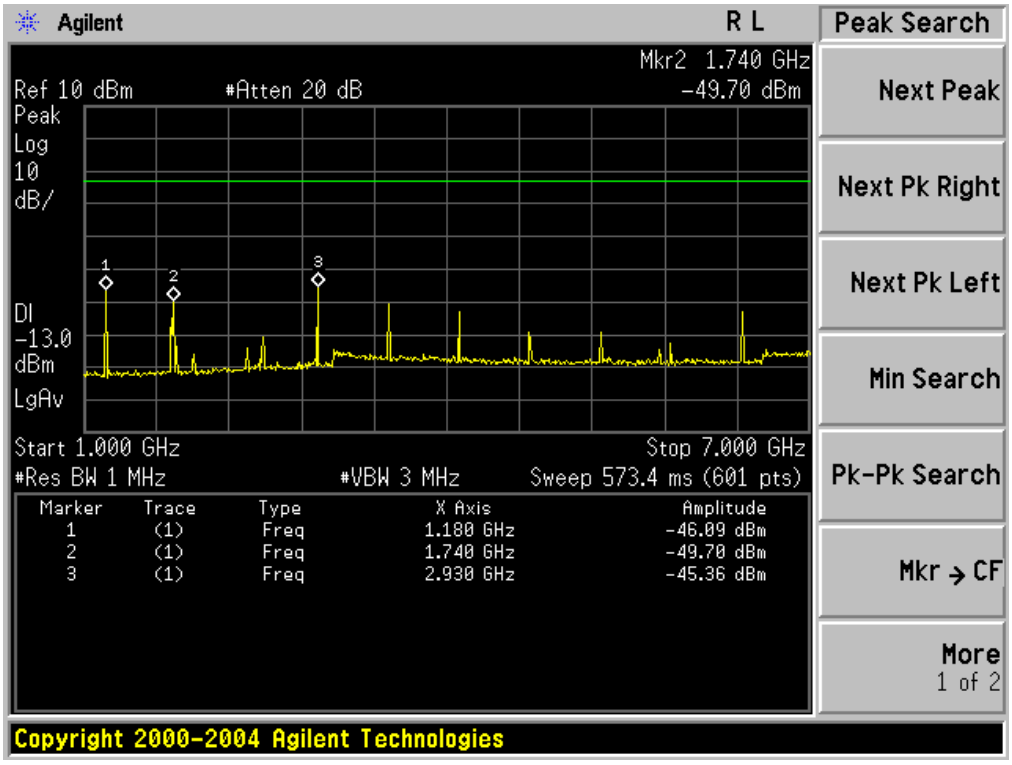
1-7G



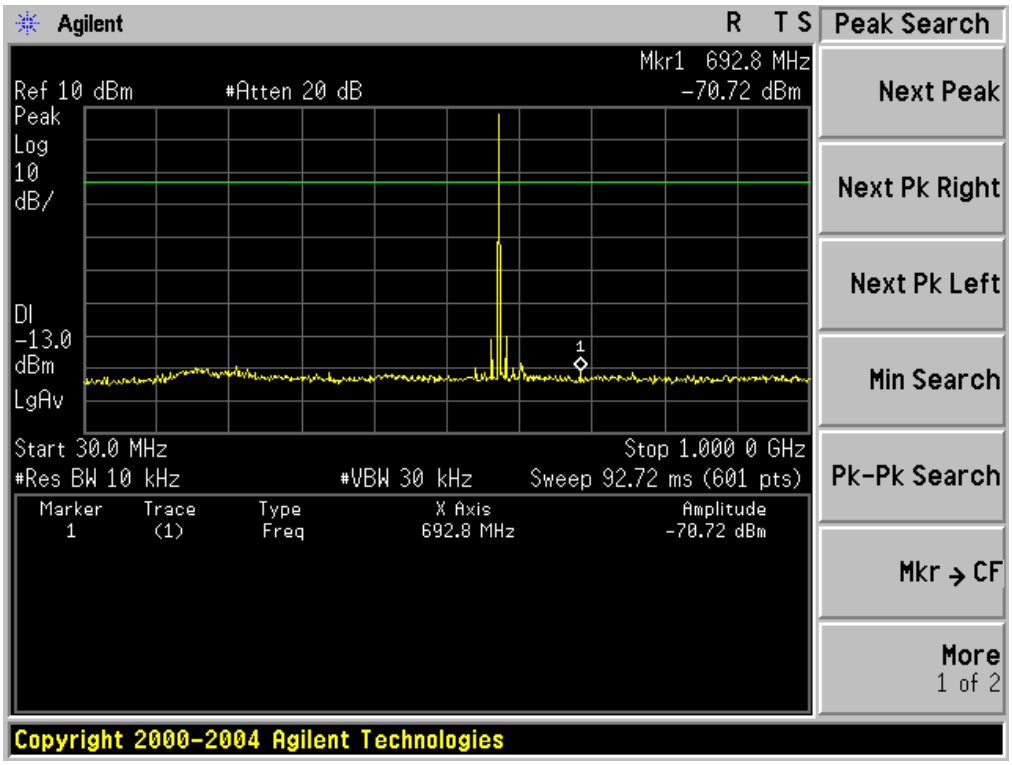
594.15MHz
30-1G



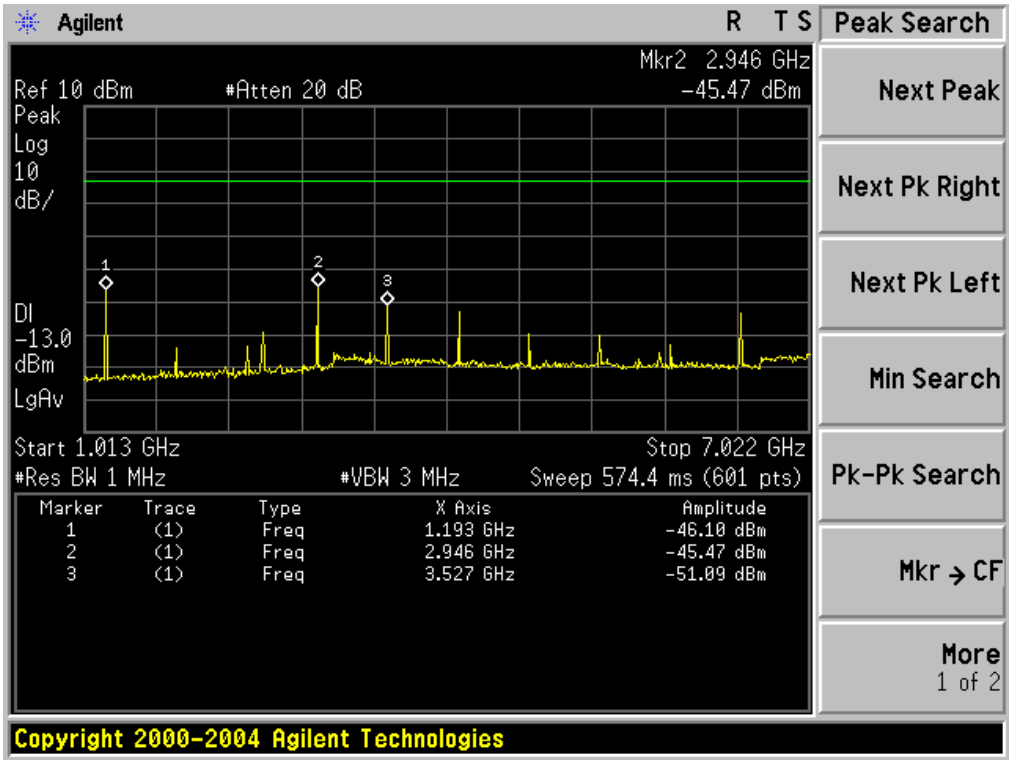
1-7G



606.75MHz
30-1G



1-7G

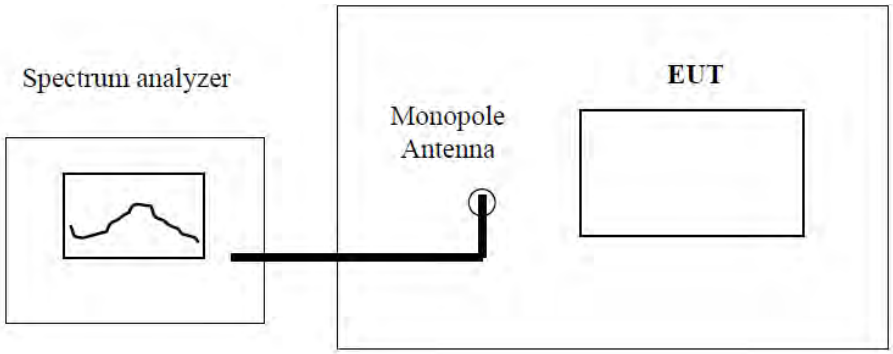


8. FREQUENCY STABILITY

8.1 STANDARD REQUIREMENT

Test requirement: FCC CFR47 Part 2 Section 2.1055(a)(a)
Test method: Based on TIA/EIA-603-C-2004
Limit: According to FCC 74.86(e)(4), the frequency tolerance of the transmitter shall be 0.005 percent.

8.2 TEST CONFIGURATION



8.3 TEST PROCEDURE

A) Frequency stability versus input voltage

1 .An external variable DC power supply was connected to the battery terminals of the equipment under test.
2.For hand carried , battery powered equipment primary supply voltage was reduced to the battery operating end point as specified by the manufacturer. The output frequency was recorded for each battery voltage.

Detector:	Peak
Sweep time:	Auto /
Resolution bandwidth:	1 Hz / 10 Hz / 100 Hz
Video bandwidth:	3 x resolution bandwidth
Span:	wide enough to follow the frequency drift
Trace mode:	clear/write/view
EUT configuration:	CW signal or MC with measurement method description

B) Frequency stability versus environmental temperature

1. Setup the configuration per figure 1 for frequencies measured at an environmental chamber, Install new batteries in the EUT.
2. Turn on EUT and set SA center frequency to the EUT operation frequency, then set SA RBW to 30kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. Set the temperature of chamber to 50ºC. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10ºC decreased per stage until the lowest temperature -30ºC is measured, record all measurement frequencies.

8.4 TEST RESULT

a) Frequency stability versus input voltage

Power Supply	Reference Frequency (MHz)	Environment Temperature (ºC)	Frequency Measured	Frequency Tolerance (%)
DC 2.55V	584.400	20	584.417	0.0029
DC 3.45V	584.400	20	584.414	0.0024
DC 2.55V	594.150	20	594.153	0.0005
DC 3.45V	594.150	20	594.158	0.0013
DC 2.55V	606.750	20	606.756	0.0010
DC 3.45V	606.750	20	606.752	0.0003

b) Frequency stability versus environmental temperature

584.400MHz

Environment Temperature(ºC)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	DC 3.0V	584.402	0.0003
40	DC 3.0V	584.405	0.0009
30	DC 3.0V	584.417	0.0029
20	DC 3.0V	584.463	0.0108
10	DC 3.0V	584.404	0.0007
0	DC 3.0V	584.405	0.0009
-10	DC 3.0V	584.407	0.0012
-20	DC 3.0V	584.403	0.0005
-30	DC 3.0V	584.404	0.0007

594.150MHz

Environment Temperature(ºC)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	DC 3.0V	594.153	0.0005
40	DC 3.0V	594.155	0.0008
30	DC 3.0V	594.157	0.0012
20	DC 3.0V	594.153	0.0005
10	DC 3.0V	594.151	0.0002
0	DC 3.0V	594.158	0.0013
-10	DC 3.0V	594.154	0.0007
-20	DC 3.0V	594.152	0.0003
-30	DC 3.0V	594.159	0.0015

606.750MHz

Environment Temperature(ºC)	Power Supply	Frequency Deviation measured with time Elapse(30 minutes)	
		MHz	%
50	DC 3.0V	606.758	0.0013
40	DC 3.0V	606.752	0.0003
30	DC 3.0V	606.756	0.0010
20	DC 3.0V	606.751	0.0002
10	DC 3.0V	606.752	0.0003
0	DC 3.0V	606.757	0.0012
-10	DC 3.0V	606.755	0.0008
-20	DC 3.0V	606.752	0.0003
-30	DC 3.0V	606.758	0.0013

9. EUT TEST PHOTO