Test Lab
Cert 2951.01

TEST REPORT

Applicant	SOUTH NAVIGATION LIMITED
Address	2/F，No.52-54 Jian Zhong Rd，Ke Yun Rd Software Park Guangzhou，China 510665（HQ）

Manufacturer or Supplier	SOUTH NAVIGATION LIMITED
Address	2/F，No.52-54 Jian Zhong Rd，Ke Yun Rd Software Park Guangzhou，China 510665（HQ）
Product	GPS RTK
Brand Name	SOUTH
Model	S86
Additional Model & Model Difference	S86T, S86C, See Section 3.1
Date of tests	Oct. 28, 2012 ~May 07, 2013

the tests have been carried out according to the requirements of the following standards:

☒ **FCC Part 90**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Prepared by Kent Liu Project Engineer / EMC Department	Approved by Sam Tung Manager / EMC Department
	 Date: May 07, 2013

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF121022N025	Original release	May 07, 2013

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 90			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
§90.205	RF output power	PASS	Compliant
§90.209	20 dB bandwidth limitation and 99 % bandwidth	PASS	Compliant
§90.210(d)	Emission mask	PASS	Compliant
§90.213	Frequency stability	PASS	Compliant
§90.214	Transient frequency behavior	PASS	Compliant
§90.210(d)	Radiated spurious emissions	PASS	Compliant

2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44dB
Radiated emissions	30MHz ~ 200MHz	3.19dB
	200MHz ~1000MHz	3.21dB
	1GHz ~ 18GHz	2.26dB
	18GHz ~ 40GHz	1.94dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	GPS RTK
MODEL NO.	S86
FCC ID	QXV-SOUTHGNSS-86
NOMINAL VOLTAGE	DC 7.4V by battery or DC 8.4V by adapter
MODULATION TYPE	FM
OPERATING FREQUENCY	463.125MHz ~ 466.625MHz
RATE POWER	22dBm
ANTENNA TYPE	External Antenna with 4.0dBi Gain
I/O PORTS	Refer to user's manual
DATA CABLE SUPPLIED	Refer to user's manual

NOTE:.

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

2 For the test results, the EUT had been tested with all conditions. But only the worst case was showed in test report.

3 The EUT was powered by the following adapters:

ADAPTER	
BRAND:	SOUTH
MODEL:	HYLC-0818
INPUT:	AC 100 - 240V, 50/60Hz
OUTPUT:	DC 8.4V, 1.8A
DC LINE:	Unshielded, Undetachable 1.5m

4 Additional model S86T and S86C is identical with the test model S86 except the font and font color of the trademark on the exterior panel

3.2 DESCRIPTION OF TEST MODES

8 channels are provided :

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	463.125 MHz	5	465.125 MHz
2	463.625 MHz	6	465.625 MHz
3	464.125 MHz	7	466.125 MHz
4	464.625 MHz	8	466.625 MHz

The EUT was tested under following condition.

Condition	Configuration
1	**Charging with adapter mode**
2	Battery mode

Following channel(s) was (were) selected for the test as listed below.

TESTED CHANNEL	MODULATION TYPE
1, 5, 8	FM

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 90

All test items have been performed and recorded as per the above standards.

NOTE: It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Verification). The test report has been issued separately.

3.4 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.

◆ FOR CONDUCTED EMISSION MEASUREMENT

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Notebook	DELL	5P2PM2X	12400120329	N/A

NO.	DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	AC Line :Unshielded, Detachable 1.5m;DC Line: Unshielded, Undetachable 1.8m

4. TEST TYPES AND RESULTS

4.1 RF OUTPUT POWER

4.1.1 LIMITS OF RF OUTPUT POWER

According to FCC 90.205(h) 450 ~ 470 MHz. (1) The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. Applicants requesting an ERP in excess of that listed in table 2 must submit an engineering analysis based upon generally accepted engineering practices and standards that includes coverage contours to demonstrate that the requested station parameters will not produce coverage in excess of that which the applicant requires.

Table 2. 450 ~ 470 MHz - Maximum ERP/Reference HAAT for a Specific Service Area Radius

TABLE 2—450–470 MHz—MAXIMUM ERP/REFERENCE HAAT FOR A SPECIFIC SERVICE AREA RADIUS—Continued

	Service area radius (km)									
	3	8	13	16	24	32	40[4]	48[4]	64[4]	80[4]
Maximum ERP (w)[1]	2	100	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500
Up to reference HAAT (m)[3]	15	15	15	27	63	125	250	410	950	2700

[1] Maximum ERP indicated provides for a 39 dBu signal strength at the edge of the service area per FCC Report R–6602, Fig. 29 (See § 73.699, Fig. 10 b).
[2] Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 39 dBu.
[3] When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation: $ERP_{allow} = ERP_{max} \times (HAAT_{ref} / HAAT_{actual})^2$.
[4] Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 39 dBu.

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer (9KHz–40GHz)	Agilent	E4446A	MY46180622	May 02,12	May 01,13
Spectrum Analyzer (9KHz-25GHz)	Agilent	E7405A	MY45118807	May 15,12	May 14,13
Power Meter	Anritsu	ML2495A	1139001	Nov. 04,12	Nov. 03,13
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13

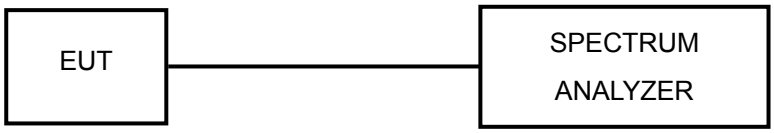
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA

4.1.3 TEST PROCEDURES

a. The transmitter output was connected to the spectrum analyzer through an attenuator

b. The Use the following spectrum analyzer setting
Span = 2 MHz
RBW = 100 kHz
VBW = 100 kHz (≥ RBW)
Sweep = auto
Detector function = peak
Trace = max hold

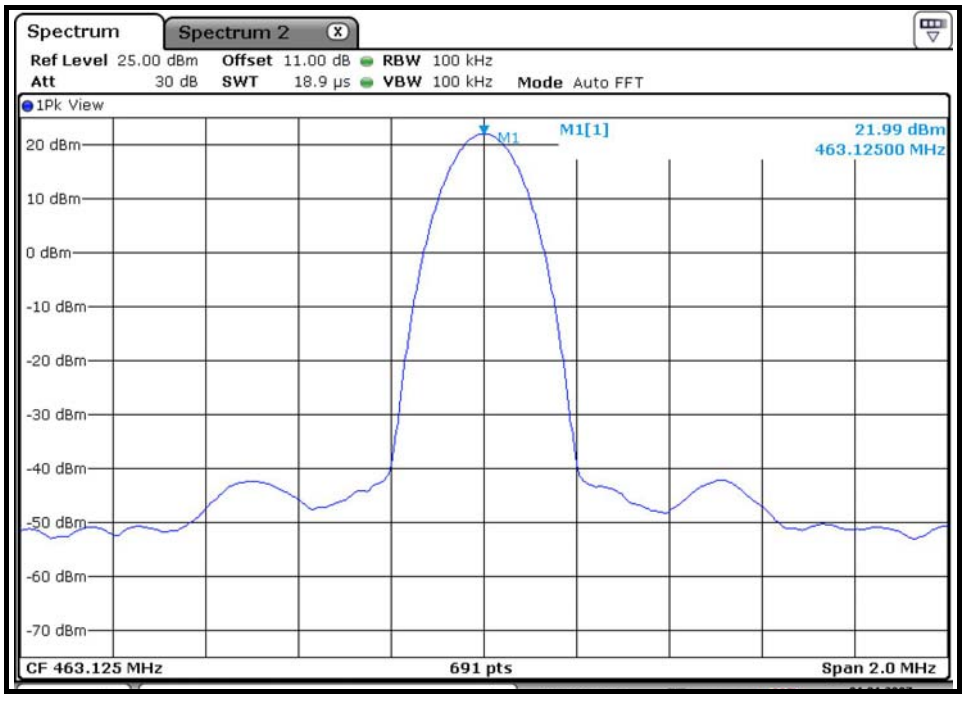
4.1.4 TEST SETUP



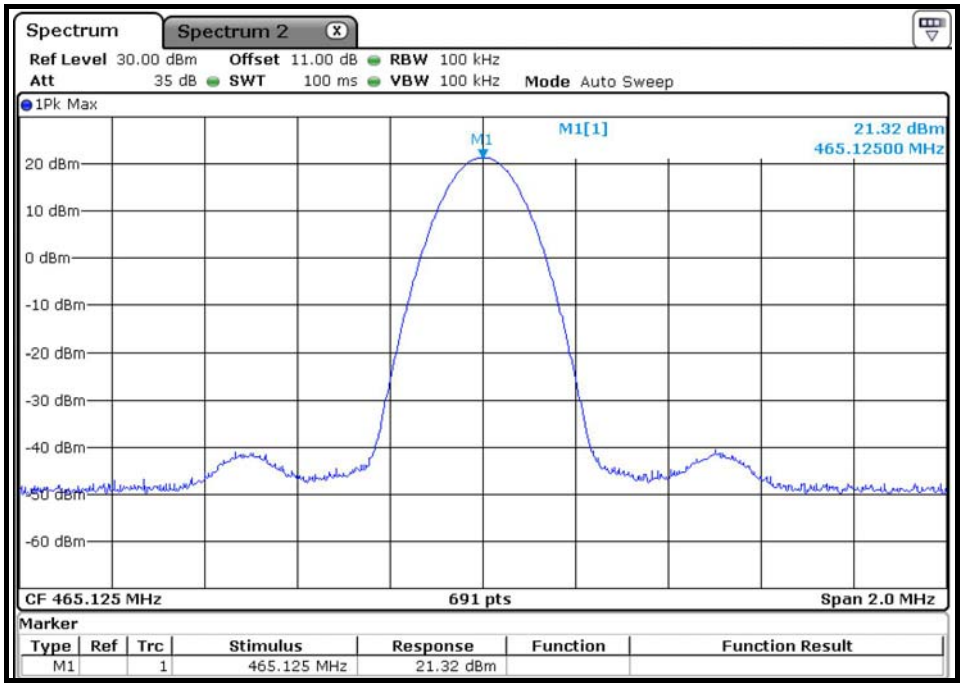
4.1.5 TEST RESULTS

Frequency (MHz)	Output power (dBm)	Output power (W)	Rate power (dBm)
463.125	21.99	0.16	22.00
465.125	21.32	0.14	
466.625	19.38	0.09	

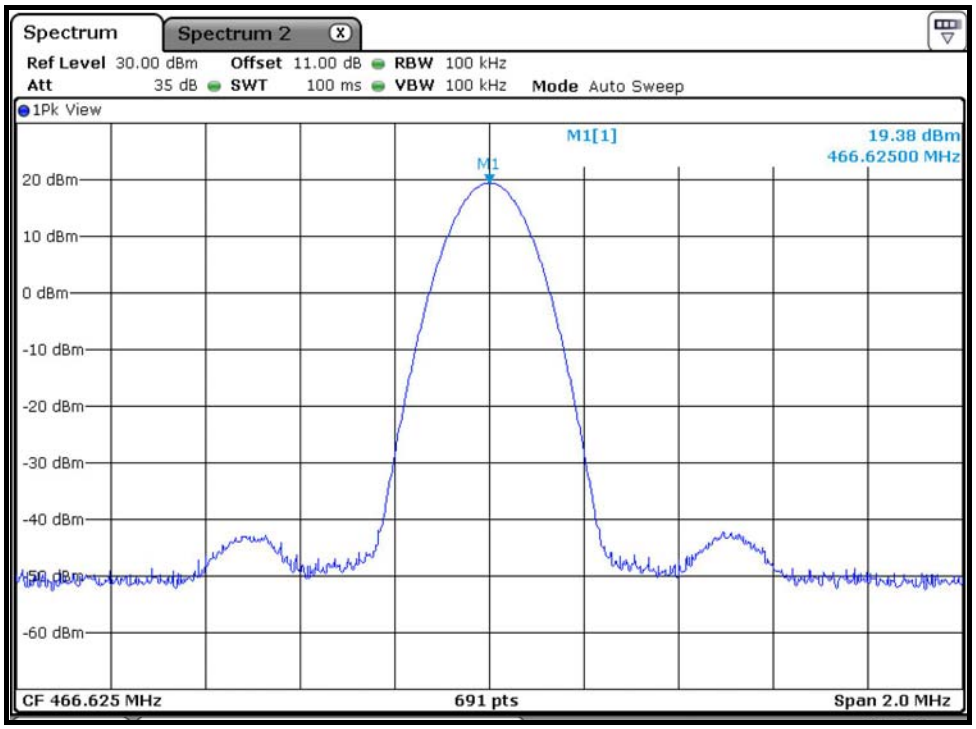
463.125MHz



465.125MHz



466.625MHz



4.2 20dB BANDWITCH & 99% BANDWIDTH

4.2.1 LIMITS OF 20dB BANDWITCH & 99% BANDWIDTH

According to FCC 90.209, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	May 02,12	May 01,13
EMI Test Receiver	Rohde&Schwarz	ESVD	847398/003	May 15,12	May 14,13
Bilog Antenna (25MHz-2GHz)	Teseq	CBL 6111D	27089	Jul. 16,12	Jul. 15,13
Horn Antenna (1GHz -18GHz)	EMCO	3117	00062558	Oct.18,12	Oct.17,13
Pre-Amplifier (20MHz-3GHz)	EMCI	EMC 330	980095	Nov. 02,12	Nov.01,13
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 31,12	May 30,13
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,13	Mar. 23,14
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 04,11	Jan. 03,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,12	Nov. 03,13
Test Software	ADT	ADT_Radiated_V7.6.15	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.

2. The test was performed in Dongguan Chamber 10m.

4.2.1 TEST PROCEDURES

The EUT was placed on a turn table which was 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on a antenna tower. At the frequency band of 30MHz to 1GHz, The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 to 4 m for horizontal and vertical polarizations.

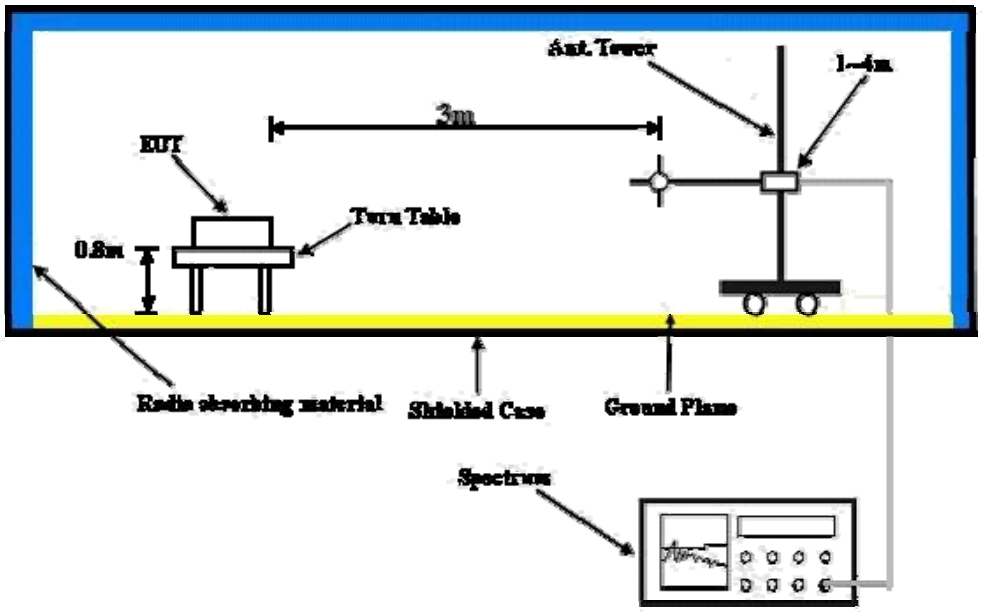
The spectrum analyzer was receiving the maximum emission level. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

The spectrum analyzer was receiving the maximum emission level. The 99% bandwidth is defined as the spectrum 99% occupied bandwidth of which is the resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

4.2.2 DEVIATION FROM TEST STANDARD

No deviation

4.2.3 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.4 EUT OPERATING CONDITIONS

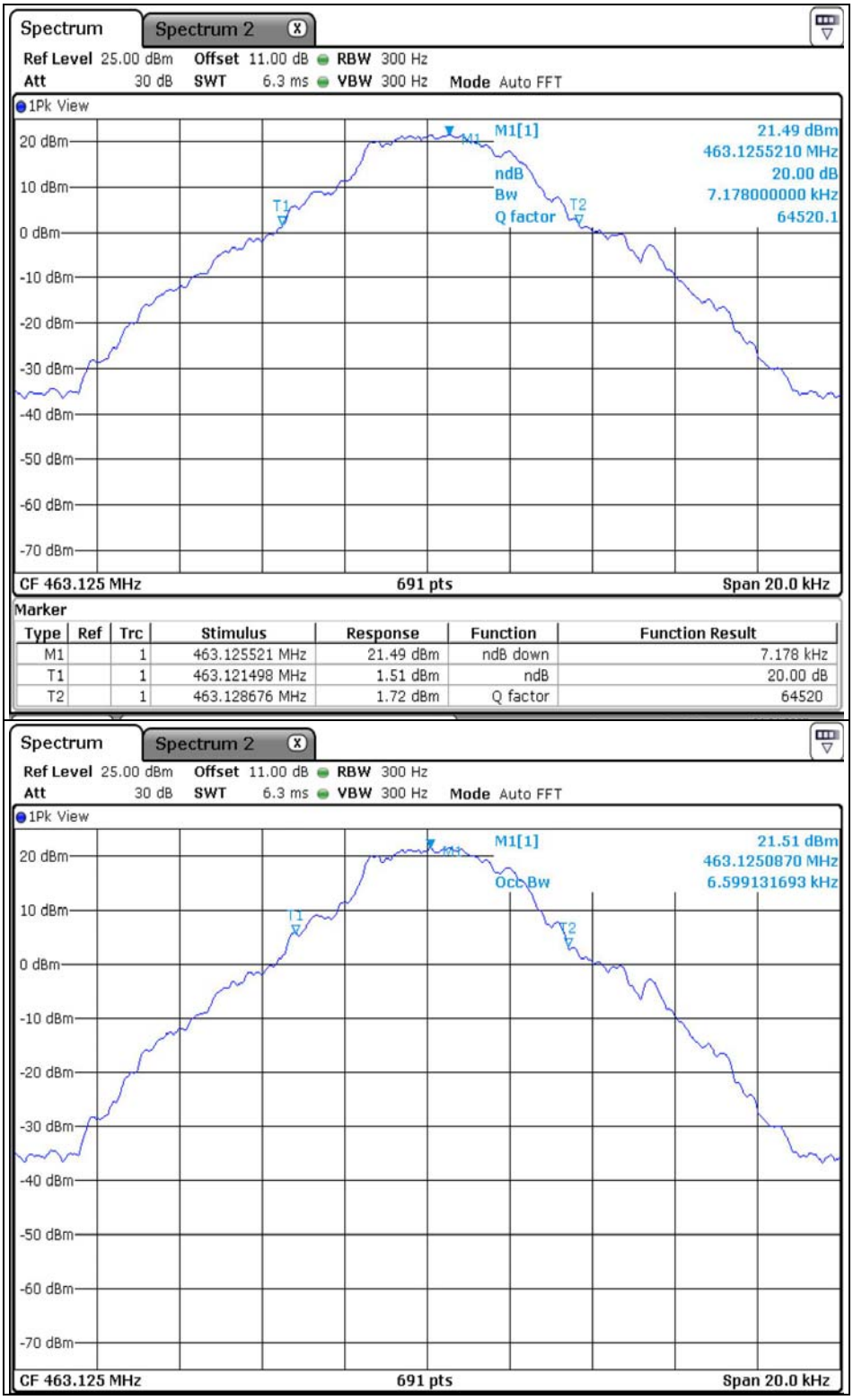
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.2.5 TEST RESULTS

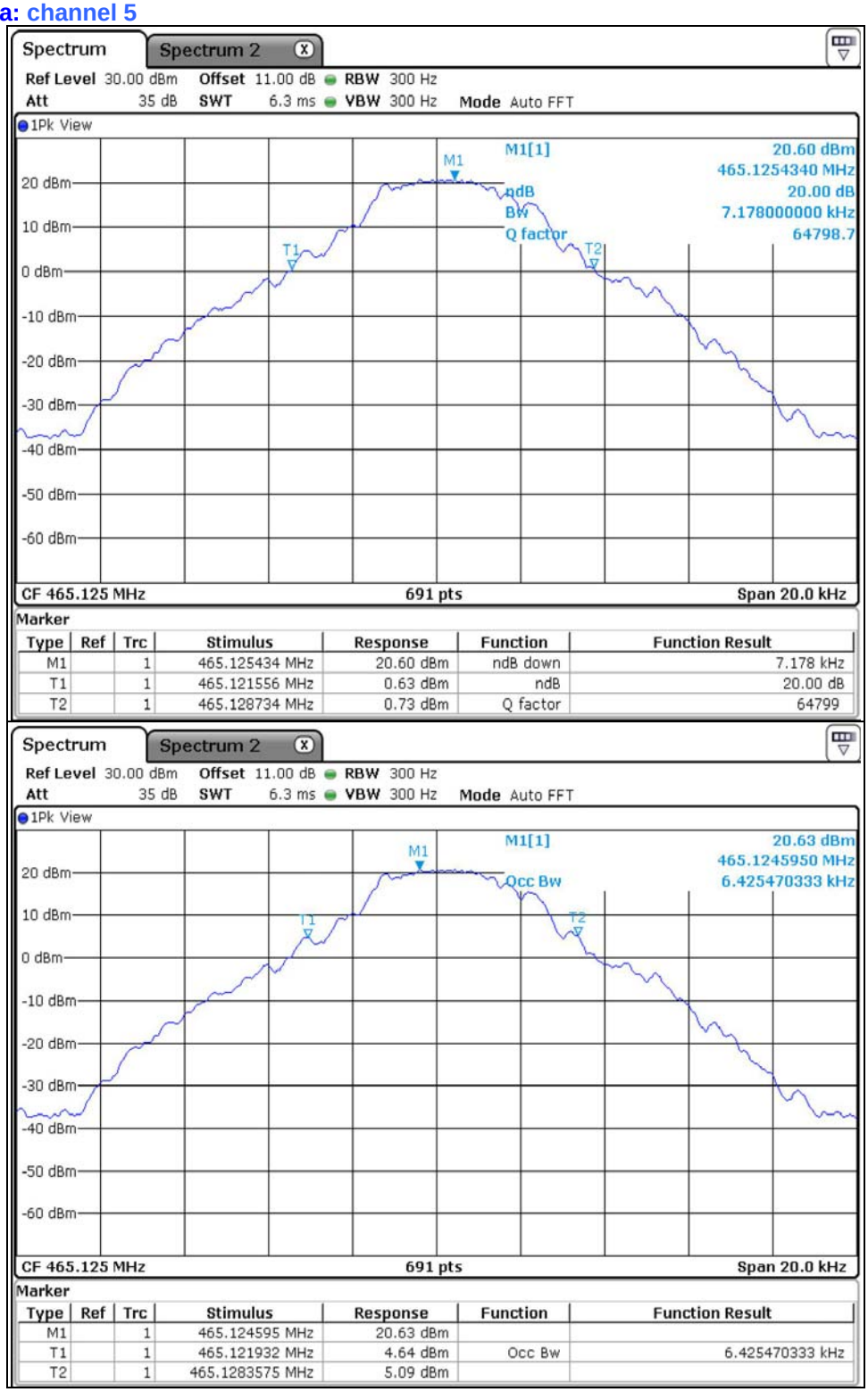
20dB Bandwidth & 99% Bandwidth

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (KHz)	99% BANDWIDTH (KHz)
1	463.125	7.17	6.59
5	465.125	7.17	6.42
8	466.625	7.20	6.54

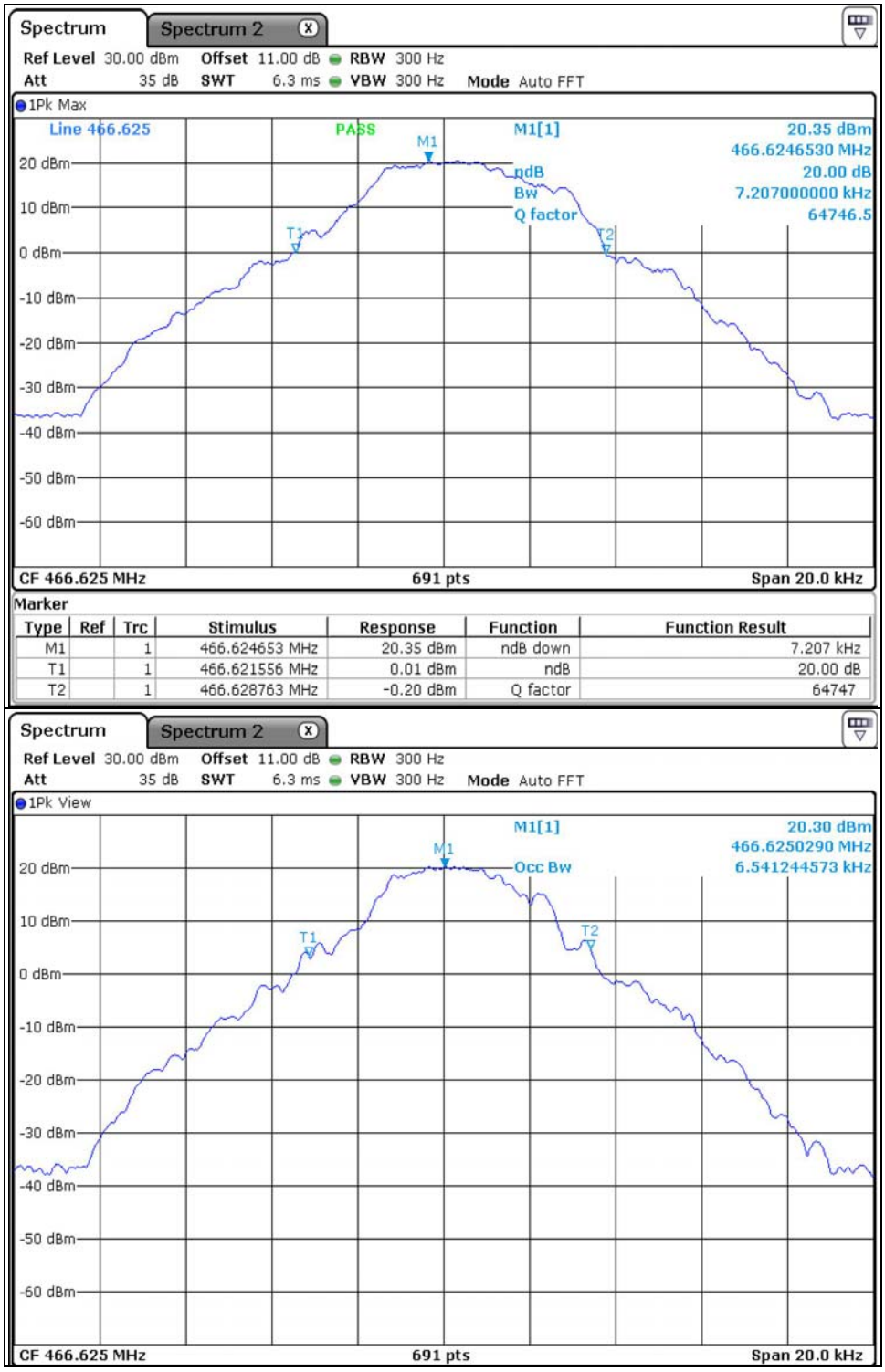
Test Data: channel 1



Test Data: channel 5



Test Data: channel 8



4.3 EMISSION MASK

4.3.1 LIMITS OF EMISSION MASK

According to FCC part 90.210(d) Emission Mask D – 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power(P) of the highest emission contained within the authorized bandwidth as follows:

(1) On any frequency from the center of the authorized bandwidth f 0 to 5.625 kHz removed from f 0 : Zero dB.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz, but no more than 12.5 kHz: At least 7.27 ((f_d -2.88 kHz) dB.

(3) 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 50 + 10log(P) dB or 70 dB, whichever is the lesser attenuation.

4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer (9KHz–40GHz)	Agilent	E4446A	MY46180622	May 02,12	May 01,13
Spectrum Analyzer (9KHz-25GHz)	Agilent	E7405A	MY45118807	May 15,12	May 14,13
Power Meter	Anritsu	ML2495A	1139001	Nov. 04,12	Nov. 03,13
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA

4.3.3 TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator
2. Use the following spectrum analyzer setting

   Span = 120 kHz

   RBW = 100 kHz

   VBW = 300 kHz (≥ RBW)

   Sweep = auto

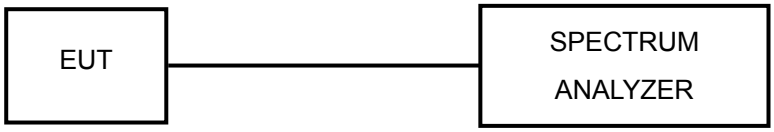
   Detector function = peak

   Trace = max hold
3. Mark the peak frequency with maximum peak power as the center of the display of the spectrum analyzer.
4. Record the power spectrum analyzer and compare to the mask..

4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

4.3.5 TEST SETUP

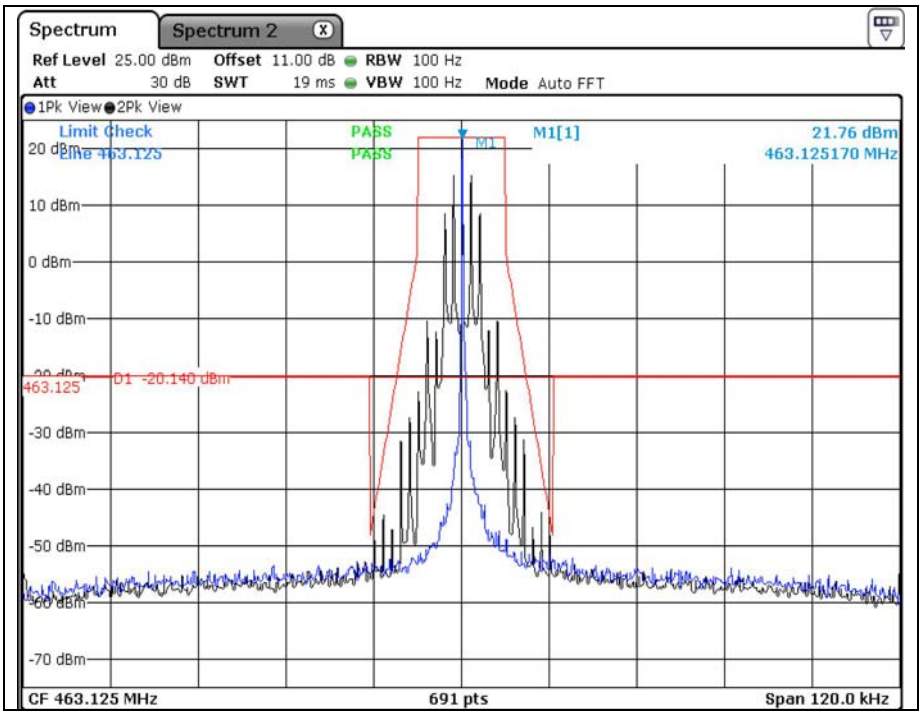


4.3.6 EUT OPERATING CONDITIONS

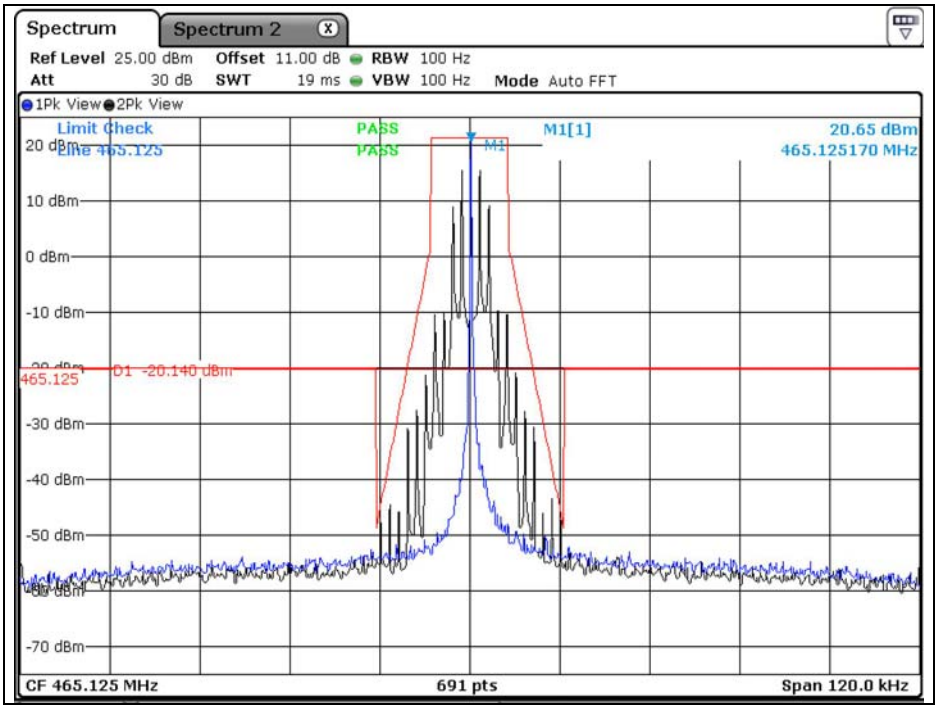
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 TEST RESULTS

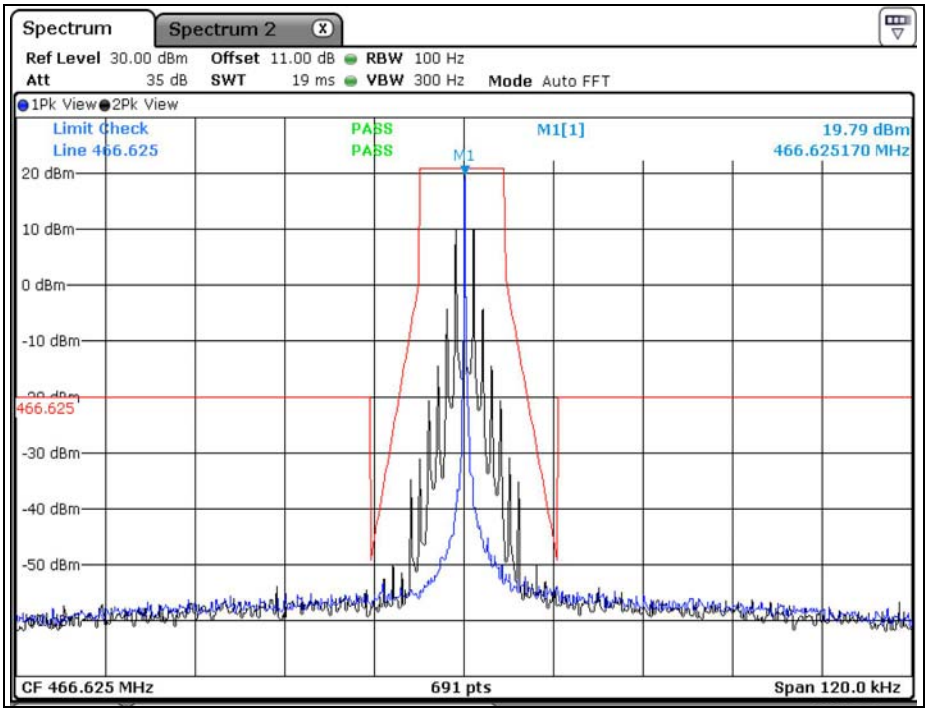
Test Data: channel 1



Test Data: channel 5



Test Data: channel 8



4.4 CONDUCTED SPURIOUS EMISSION

4.4.1 LIMITS OF CONDUCTED SPURIOUS EMISSION

According to FCC part 90.210(d) Emission Mask D – 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power(P) of the highest emission contained within the authorized bandwidth as follows:

(3) 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 50 + 10log(P) dB or 70 dB, whichever is the lesser attenuation.

4.4.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer (9KHz–40GHz)	Agilent	E4446A	MY46180622	May 02,12	May 01,13
Spectrum Analyzer (9KHz-25GHz)	Agilent	E7405A	MY45118807	May 15,12	May 14,13
Power Meter	Anritsu	ML2495A	1139001	Nov. 04,12	Nov. 03,13
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA

4.4.3 TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator
2. Use the following spectrum analyzer setting

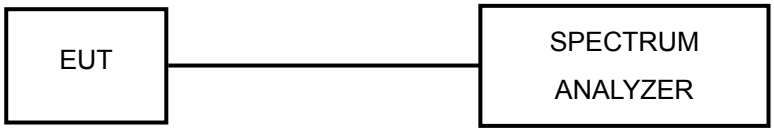
Span = 30MHz to 1GHz
RBW = 100 kHz
VBW = 300 kHz (≥ RBW)
Sweep = auto
Detector function = peak
Trace = max hold

Span = 1GHz to 5GHz
RBW = 1MHz
VBW = 3MHz (≥ RBW)
Sweep = auto
Detector function = peak
Trace = max hold

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 TEST SETUP

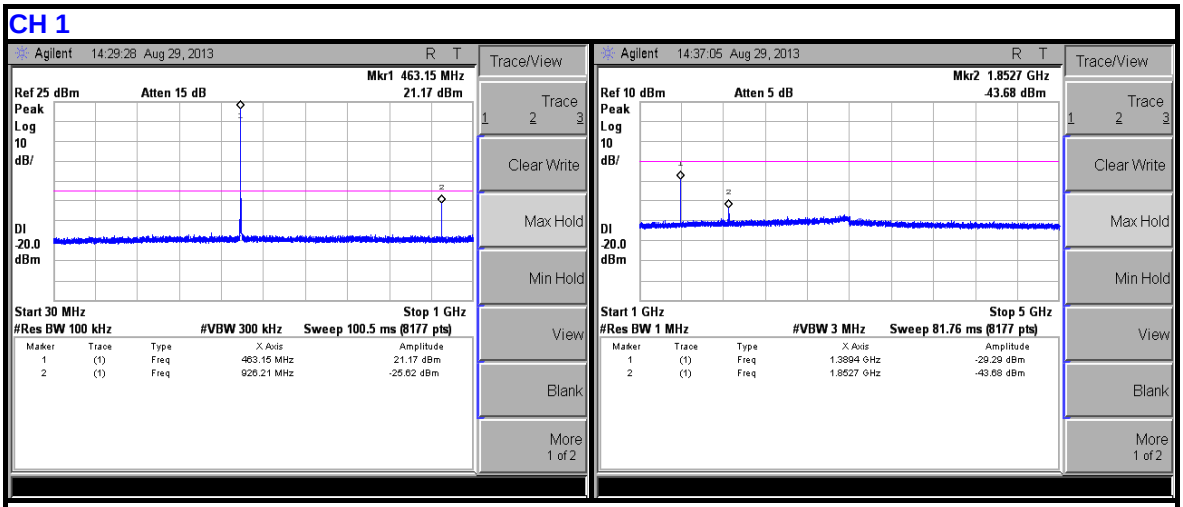


4.4.6 EUT OPERATING CONDITIONS

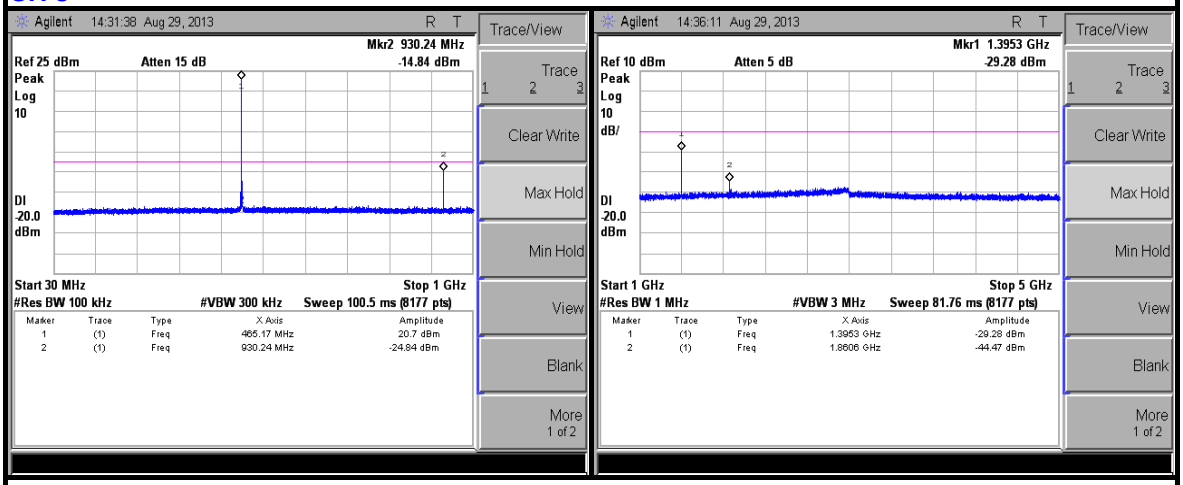
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.4.7 TEST RESULTS

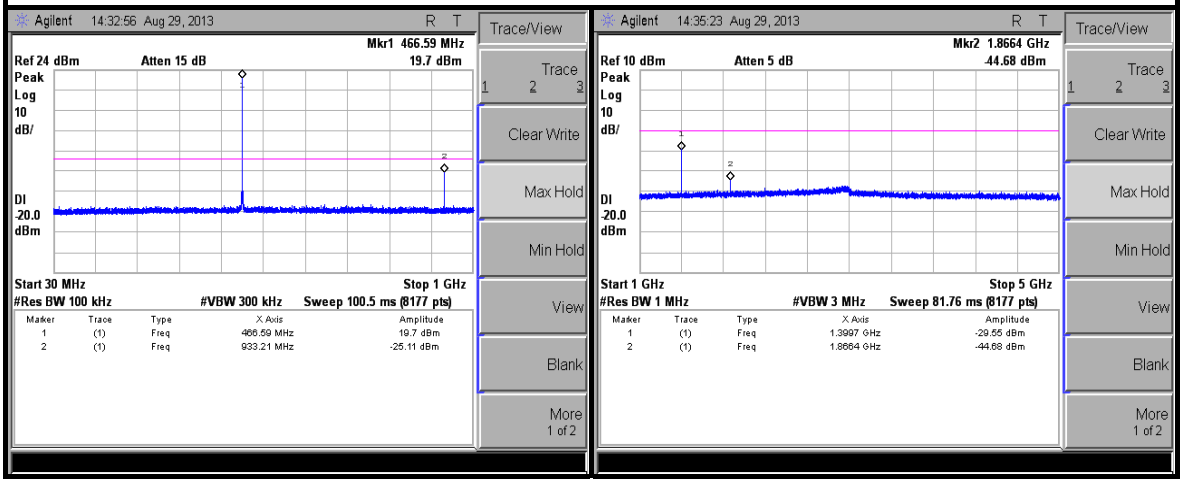
CH 1



CH 5



CH 8



4.5 FREQUENCY STABILITY

4.1.1 LIMITS OF FREQUENCY STABILITY

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 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. According to FCC part 90 section 90.213, (a) Unless noted elsewhere, transmitters used in the services overned by this part must have a minimum frequency stability as specified in the following table.

Minimum Frequency Stability [Parts per million (ppm)]

Frequency range (MHz)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1,2,3] 100	100	200
25–50	20	20	50
72–76	5	.....	50
150–174	[5,11] 5	[6] 5	[4,6] 50
220–222 [12]	0.1	1.5	1.5
421–512	[7,11,14] 2.5	[8] 5	[8] 5
806–821	[14] 1.5	2.5	2.5
821–824	[14] 1.0	1.5	1.5
851–866	1.5	2.5	2.5
866–869	1.0	1.5	1.5
896–901	[14] 0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928 [13]	2.5	2.5	2.5
929–930	1.5	.....	.....
935–940	0.1	1.5	1.5
1427–1435	[9] 300	300	300
Above 2450 [10]	.....	.....	.....

4.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer (9KHz–40GHz)	Agilent	E4446A	MY46180622	May 02,12	May 01,13
Spectrum Analyzer (9KHz-25GHz)	Agilent	E7405A	MY45118807	May 15,12	May 14,13
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep. 17,12	Sep. 16,13
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

2. The test was performed in Oven room

4.1.3 TEST PROCEDURES

1 The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.

2 Turn the EUT on and couple its output to a spectrum analyzer.

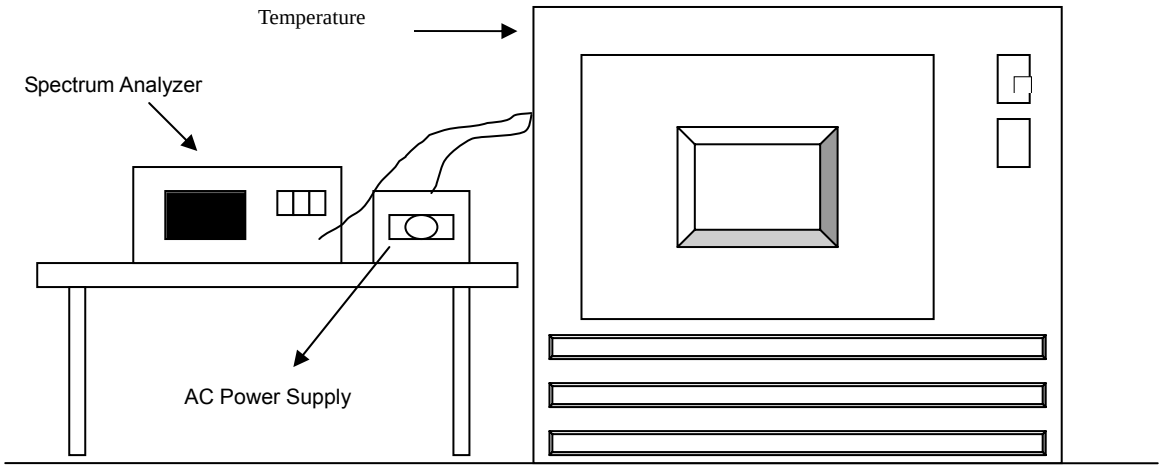
3 Turn the EUT off and set the chamber to the highest temperature specified.

4 Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.

5 Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.

6 The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

4.1.4 TEST SETUP



4.1.5 TEST RESULTS

Assigned frequency (MHz):465.125

Test voltage (%)	Test voltage (V)	Temperature (℃)	Measure frequency (MHz)	Frequency Deviation (Hz)	Frequency Deviation (ppm)	Limit (ppm)
100%	7.4	-30	465.12462	380	0.817	1.5
100%		-20	465.12475	250	0.537	
100%		-10	465.12489	110	0.236	
100%		0	465.12503	30	0.064	
100%		10	465.12513	130	0.279	
100%		20	465.12514	140	0.301	
100%		30	465.12515	150	0.322	
100%		40	465.12515	150	0.322	
100%		50	465.12515	150	0.322	
115%	8.51	20	465.12513	130	0.279	
85%	6.29	20	465.12519	190	0.408	

4.6 TRANSIENT FREQUENCY BEHAVIOR OF THE TRANSMITTER

4.6.1 LIMITS OF TRANSIENT FREQUENCY BEHAVIOR OF THE TRANSMITTER

According to FCC 90.214, Transmitters designed to operate in the 150 ~ 174 MHz and 421 ~ 512 MHz frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1, 2]	Maximum frequency difference [3]	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels			
t_1 [4]	± 25.0 kHz	5.0 ms	10.0 ms
t_2	± 12.5 kHz	20.0 ms	25.0 ms
t_3 [4]	± 25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels			
t_1 [4]	± 12.5 kHz	5.0 ms	10.0 ms
t_2	± 6.25 kHz	20.0 ms	25.0 ms
t_3 [4]	± 12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels			
t_1 [4]	± 6.25 kHz	5.0 ms	10.0 ms
t_2	± 3.125 kHz	20.0 ms	25.0 ms
t_3 [4]	± 6.25 kHz	5.0 ms	10.0 ms

[1] t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t_1 is the time period immediately following t_{on}.
t_2 is the time period immediately following t_1.
t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
t_{off} is the instant when the 1 kHz test signal starts to rise.
[2] During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in § 90.213.
[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.
[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

4.6.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	April 24,13	April 23,14
Audio Test System	BOSCH	ATS-1	0000300054270000	Nov. 07, 11	Nov. 07, 12
Digital oscilloscope	Agilent	DSO9254A	MY51260160	Nov. 01,12	Oct. 01,13

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.
2. The test was performed in Dongguan Chamber 10m.

4.6.3 TEST PROCEDURE

1. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ±12.5kHz deviation and set its output level to -100 dBm.
2. Key the transmitter.
3. Supply sufficient attenuation via the RF attenuator to provide an input level to the test receiver that is 40dB below the test receiver maximum allowed input power when the transmitter is operating at its rated power level.
4. Unkey the transmitter.
5. Adjust the RF level of the signal generator to provide RF power into the RF power meter equal to the level this signal generator RF level shall be maintained throughout the rest of the measurement.
6. Connect the output of the RF combiner network to the input of the Modulation analyzer.
7. Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjust the display to continuously view the 1000Hz tone. Adjust the vertical amplitude control of the oscilloscope to display the 1000Hz at ±4 divisions vertically centered on the display.
8. Key the transmitter and observe the stored display. Once the modulation Analyzer demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the 1 kHz test signal is completely suppressed (including any capture time due to phasing) is considered to be t_{on}. The trace should be maintained within the allowed divisions during the period t_1 and t_2. See the figure in the appropriate standards section.
9. During the time from the end of t_2 to the beginning of t_3 the frequency difference should not exceed the limits set by the FCC in 47 CFR 90.214 and outlined in 3.2.2. The allowed limit is equal to the transmitter frequency times its FCC frequency tolerance times ±4 display divisions divided by 12.5 kHz.
10. Key the transmitter and observe the stored display. The trace should be maintained within the allowed divisions after the end of t_2 and remain within it until the end of the trace. See the figure in the appropriate standards sections.
11. To test the transient frequency behavior during the period t_3 the transmitter shall be keyed
12. Adjust the oscilloscope trigger controls so it will trigger on a decreasing magnitude from the Modulation analyzer, at 1 division from the right side of the display, when the transmitter is turned off. Set the controls to store the display. The moment when the 1 kHz test signal starts to rise is considered to provide to t off.

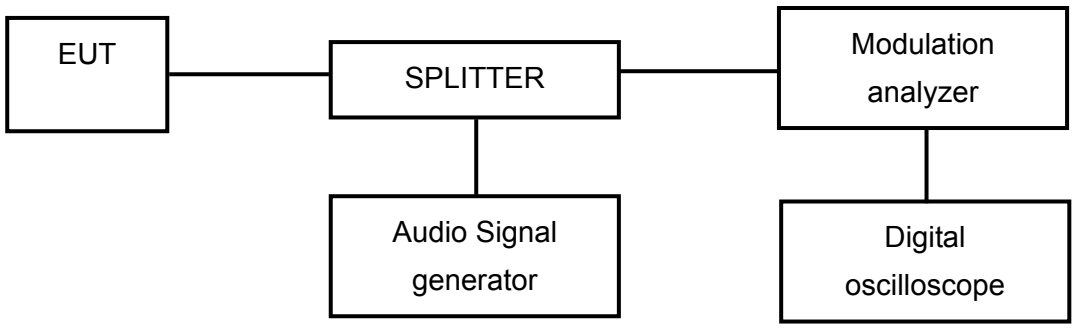
13. The transmitter shall be unkeyed.

14. Observe the display. The trace should remain within the allowed divisions during period t3. See the figures in the appropriate standards section.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

4.6.5 TEST SETUP

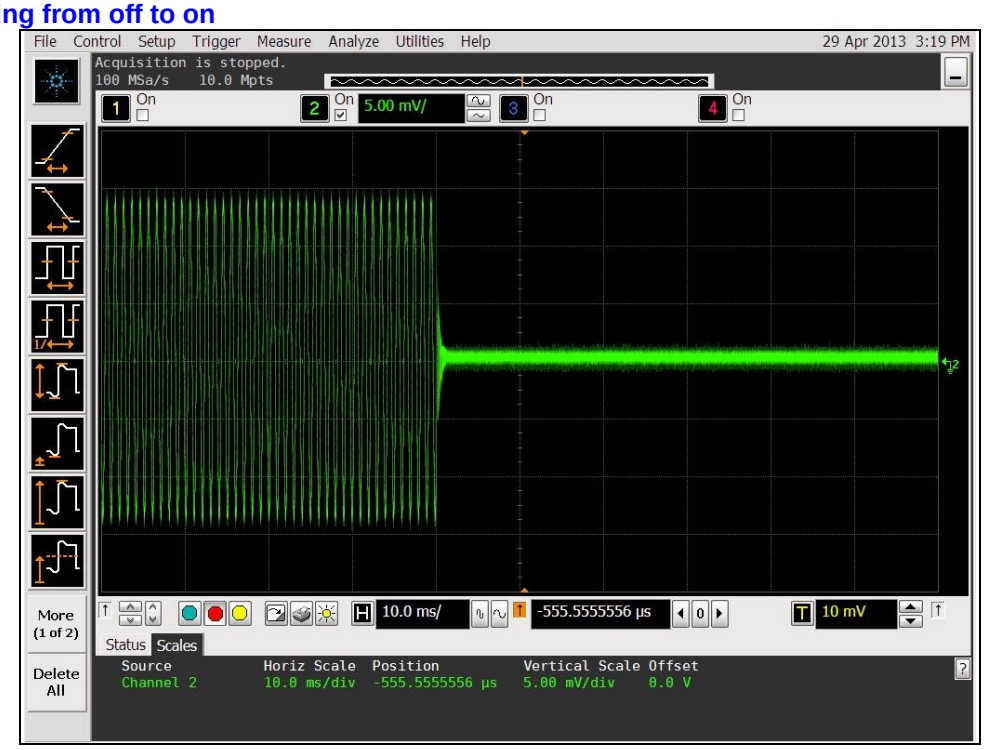


4.6.6 EUT OPERATING CONDITIONS

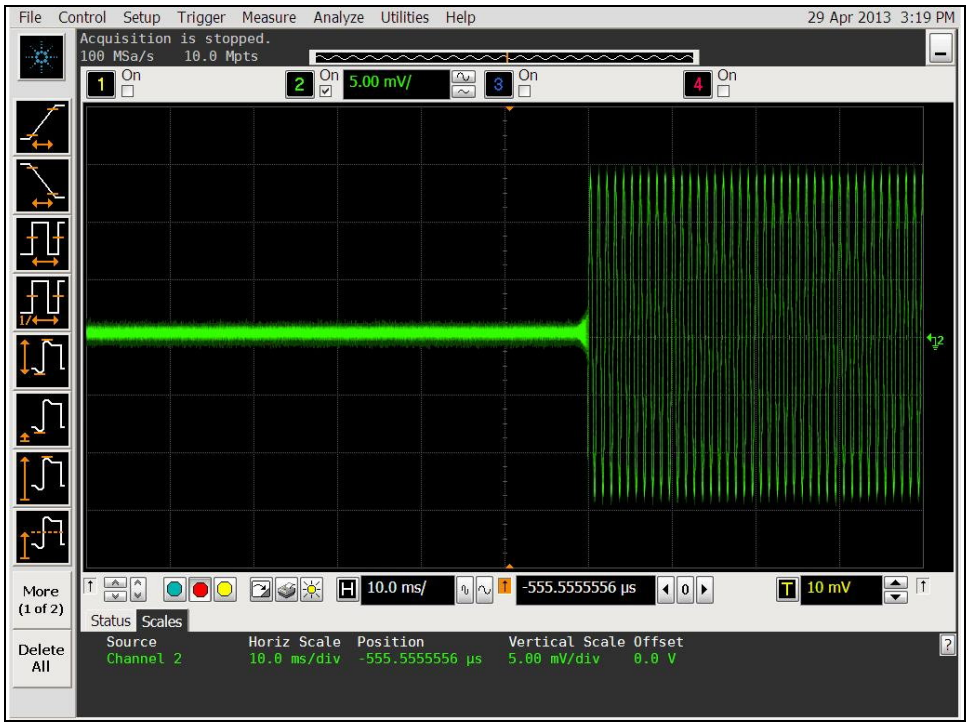
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.6.7 TEST RESULTS

Switching from off to on



Switching from on to off



4.7 RADIATED EMISSION MEASUREMENT

4.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

According to §90.210(d), Spurious attenuated in dB = 50 + 10log(Power output in watts)

4.7.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	May 02,12	May 01,13
EMI Test Receiver	Rohde&Schwarz	ESVD	847398/003	May 15,12	May 14,13
Bilog Antenna (25MHz-2GHz)	Teseq	CBL 6111D	27089	Jul. 16,12	Jul. 15,13
Horn Antenna (1GHz -18GHz)	EMCO	3117	00062558	Oct.18,12	Oct.17,13
Pre-Amplifier (20MHz-3GHz)	EMCI	EMC 330	980095	Nov. 02,12	Nov.01,13
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 31,12	May 30,13
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,13	Mar. 23,14
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 04,11	Jan. 03,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,12	Nov. 03,13
Test Software	ADT	ADT_Radiated_V7.6.15	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.

2. The test was performed in Dongguan Chamber 10m.

4.7.3 TEST PROCEDURES

1 Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.

2 The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step a. Record the power level of S.G

3 EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

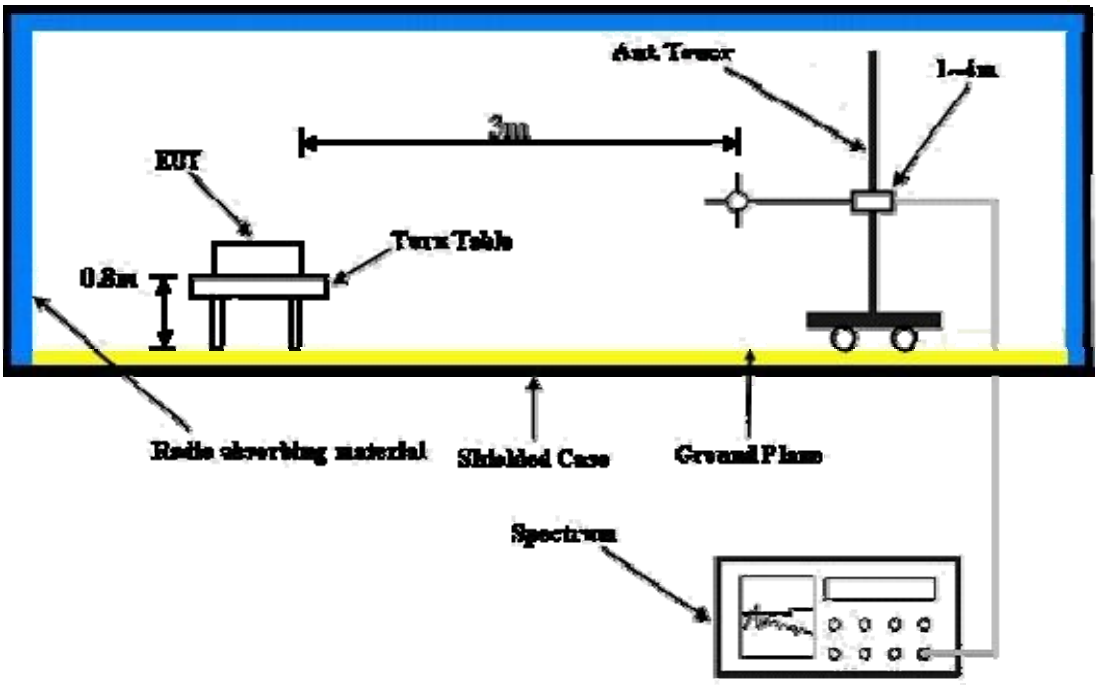
4 E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

NOTE: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz/3MHz.

4.7.4 DEVIATION FROM TEST STANDARD

No deviation

4.7.5 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.7.6 EUT OPERATING CONDITIONS

a. Turned on the power and connected of all equipment.
b. Set the transmitter part of EUT under transmission condition continuously at specific channel frequency.
c. EUT was operated according to the type used was description in manufacturer's specifications or the User's Manual.

4.7.7 TEST RESULTS

Below 1GHz

FREQUENCY RANGE	Below 1000MHz	INPUT POWER	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	21deg. C, 65%RH	TESTED BY	Venless Long

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	42.93	36.10	-20	-44.9	-14.23	-59.13
2	109.22	43.95	-20	-45.6	-5.68	-51.28
3	157.72	33.19	-20	-50.47	-11.57	-62.04
4	311.3	34.76	-20	-54.7	-5.77	-60.47
5	429.32	39.74	-20	-51.02	-4.47	-55.49
6	925.6	68.19	-20	-32.24	5.15	-27.09
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	157.72	32.41	-20	-48.22	-14.6	-62.82
2	240.17	33.07	-20	-52.36	-9.8	-62.16
3	275.73	38.79	-20	-47.92	-8.52	-56.44
4	367.88	36.92	-20	-52.38	-5.93	-58.31
5	384.05	33.55	-20	-56.2	-5.48	-61.68
6	925.6	59.98	-20	-40.21	4.96	-35.25

REMARKS:

1. Power Value (dBm) = S.G Value (dBm) + Correction Factor (dB).

2. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).

Above 1GHz

Channel 1: 463.125MHz

FREQUENCY RANGE	1GHz---5GHz	**INPUT POWER**	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH	**TESTED BY**	Venless Long

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	**Freq. (MHz)**	**Emission Level (dBuV)**	**Limit (dBm)**	**S.G Power Value (dBm)**	**Correction Factor (dB)**	**Power Value (dBm)**
1	1389.36	54.74	-20	-50.31	9.82	-40.49
2	1852.52	45.98	-20	-61.36	12.11	-49.25
3	2315.64	45.81	-20	-62.18	12.76	-49.42
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	**Freq. (MHz)**	**Emission Level (dBuV)**	**Limit (dBm)**	**S.G Power Value (dBm)**	**Correction Factor (dB)**	**Power Value (dBm)**
1	1389.37	52.75	-20	-52.79	10.31	-42.48
2	1852.48	47.46	-20	-58.89	11.12	-47.77
3	2315.62	45.85	-20	-61.86	12.48	-49.38

REMARKS:

1. Power Value (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

2. Correction Factor = gain of substitution antenna + cable loss

Channel 5: 465.125MHz

FREQUENCY RANGE	1GHz---5GHz	INPUT POWER	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH	TESTED BY	Venless Long

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1395.38	53.07	-20	-52.48	10.32	-42.16
2	1860.52	47.13	-20	-59.23	11.13	-48.1
3	2325.64	46.53	-20	-61.21	12.51	-48.7
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1395.38	54.48	-20	-50.59	9.84	-40.75
2	1860.5	45.73	-20	-61.65	12.15	-49.5
3	2325.64	45.64	-20	-62.35	12.76	-49.59

REMARKS:

1. Power Value (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

2. Correction Factor = gain of substitution antenna + cable loss

Channel 8: 466.625MHz

FREQUENCY RANGE	1GHz---5GHz	INPUT POWER	120Vac, 60 Hz
ENVIRONMENTAL CONDITIONS	26deg. C, 65%RH	TESTED BY	Venless Long

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1399.87	54.6	-20	-50.49	9.86	-40.63
2	1866.48	46.26	-20	-61.16	12.19	-48.97
3	2333.16	45.64	-20	-62.34	12.75	-49.59
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	Power Value (dBm)
1	1399.87	53.68	-20	-51.88	10.33	-41.55
2	1866.48	47.16	-20	-59.21	11.14	-48.07
3	2333.11	47.31	-20	-60.46	12.54	-47.92

REMARKS:

1. Power Value (dBm) = S.G Power Value (dBm) + Correction Factor (dB).

2. Correction Factor = gain of substitution antenna + cable loss

5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---