Prüfbericht-Nr.: *Test Report No.*:	**16802784 001**	**Auftrags-Nr.:** *Order No.*:	**1140010193**	Seite 1 von 68 *Page 1 of 68*
Kunden-Referenz-Nr.: *Client Reference No.*:	**N/A**	**Auftragsdatum:** *Order date*:	**2013-10-17**	

Auftraggeber: *Client*:	**Module Audio Technology Co., Ltd.** *2F. No.4, ALLEY 23, LANE 91, SEC. 1, NEI HU RD., TAIPEI 114 TAIWAN*
Prüfgegenstand: *Test item*:	**minibar**
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	**B1239**
Auftrags-Inhalt: *Order content*:	**FCC**
Prüfgrundlage: *Test specification*:	**FCC Part 15 Subpart C Section 15.207** **FCC Part 15 Subpart C Section 15.209** **FCC Part 15 Subpart C Section 15.247**
Wareneingangsdatum: *Date of receipt*:	**2013-10-17**
Prüfmuster-Nr.: *Test sample No.*:	Engineering sample
Prüfzeitraum: *Testing period*:	**2013-10-30 to 2014-01-06**
Ort der Prüfung: *Place of testing*:	**Refer to section 1.1**
Prüflaboratorium: *Testing laboratory*:	**Refer to section 1.1**
Prüfergebnis*: *Test result**:	**Passed**

geprüft von / *tested by*:

2014-01-12	Yang, Kai/PE	Yang Kai
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by*:

2014-01-12	Sun, Lixun /Reviewer	Sun Lixun
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery*:	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST SUMMARY

4.1.1 ANTENNA REQUIREMENT
RESULT: Passed

4.1.2 PEAK OUTPUT POWER
RESULT: Passed

4.1.3 20DB BANDWIDTH
RESULT: Passed

4.1.4 CONDUCTED SPURIOUS EMISSIONS IN 100KHZ BANDWIDTH
RESULT: Passed

4.1.5 RADIATED EMISSION
RESULT: Passed

4.1.6 FREQUENCY SEPARATION
RESULT: Passed

4.1.7 NUMBER OF HOPPING FREQUENCY
RESULT: Passed

4.1.8 TIME OF OCCUPANCY
RESULT: Passed

4.1.9 CONDUTED EMISSION
RESULT: Passed

4.2.1 ELECTROMAGNETIC FIELDS
RESULT: Passed

Contents

1. Test Sites

1.1 Test Facilities

Laboratory 1: AUDIX Technology (Shenzhen) Co., Ltd. (FCC Registration Number: 794232)

Address: No. 6,Ke Feng Road,Block 52,Shenzhen Science & Industry Park, Nantou, Shenzhen, Guangdong P.R. China

Laboratory 2: China Household Electrical Appliance Research Institute(FCC Registration Number: 161284)

Address: No.29 Xiaxie Str. XuanWu District, Beijing 100053, P.R. China

The used test equipment is in accordance with CISPR 16-1 for measurement of radio interference.

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Lab 1: (Peak Output Power, 20dB Bandwidth,Conducted Spurious Emissions in 100kHz Bandwidth, Frequency Separation, Number of hopping frequency, Time of Occupancy, Radiated Emission above 1GHz)

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
Bi-log Antenna	Schaffner	CBL6111C	2598	2014-04-25
Amplifier	HP	8557D	2648A04738	2014-05-07
Amplifier	Agilent	8449B	3008A00863	2014-05-07
Spectrum Analyzer	Agilent	E4407B	MY41440292	2014-05-07
Spectrum Analyzer	E4446A	US44300459	Agilent	2014-05-07

Lab 2: (Conduted Emission, Radiated Emission below 1GHz)

Kind of Equipment	Type	S/N	Manufacturer	Calibrated until
EMI Test Receiver	ESCS30	0311031	R&S	2014-02-20
LISN	ESH2-Z5	0311031-03	R&S	2014-02-19
Bi-log Antenna	HL562	0304826-06	R&S	2014-11-15
EMI Receiver	ESCI7	0304826-03	R&S	2014-11-11

1.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institude of Metrology P.R. China) or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

1.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

1.5 Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO/IEC 17025 are:

Table 2: Measurement Uncertainty

Items	Extended Uncertainty
RE (30-1000MHz)	4.2 dB, distance:3m,k=2, σ=95%
RE (1-25GHz)	3.7 dB, distance:3m,k=2, σ=95%
CE	3.2 dB, k=2, σ=95%
Uncertainty for Radiated Spurious Emission test in RF chamber	3.57 dB, k=2, σ=95%
Uncertainty for Conduction Spurious emission test	2.00 dB, k=2, σ=95%
Uncertainty for Output power test	0.73 dB, k=2, σ=95%
Uncertainty for Power density test	2.00 dB, k=2, σ=95%
Uncertainty for Frequency range test	$7x10^{-8}$, k=2, σ=95%
Uncertainty for Bandwidth test	83 kHz, k=2, σ=95%

2. General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is a minibar with bluetooth technology. For the further information refer to the User Manual and Circuit Diagram.

2.2 Ratings and System Details

Table 3: Rating of EUT

Kind of Equipment:	minibar
Type Designation:	B1239
FCC ID	2ABP9B1239
Rated Input Voltage	DC 12V
Rated Input Current	2A
Accessory Information	
Kind of Accessory	Switching adapter
Model	PS301BCAK2000U
Input Voltage and Current	AC 100-240V,50/60Hz,0.8A
Output Voltage and Current	DC 12V, 2A
Manufatoury	Shenzhen Flypower Technlogy Co., Ltd.

Table 4: Technical Specification

Item	**Description**
Operating Frequency band	2402-2480MHz
Channel Number	79
Channel Separation	1MHz
Modulation	GFSK, DQPSK
Antenna	Integrated Antenna, Non-User Replaceable
Bluetooth spec	2.0+EDR
Antenna Gain (dBi)	2 dBi(max.)
RF output power level	Fix

2.3 Independent Operation Modes

The basic operation modes are:

A. On, with adapter, transmitting,basic data rate(BDR)
   1. Low channel
   2. Middle channel
   3. High channel

B. On, with adapter, transmitting,enhance data rate(EDR)
   1. Low channel
   2. Middle channel
   3. High channel

C. On, without adapter, transmitting,basic data rate(BDR)
   1. Low channel
   2. Middle channel
   3. High channel

D. On, without adapter, transmitting,enhance data rate(EDR)
   1. Low channel
   2. Middle channel
   3. High channel

E. Off.

As the operation modes A and B can be considered as the typical modes of EUT, except additional indicating, all the tests are performed on these modes

2.4 Submitted Documents

- Bill of Material
- Circuit Diagram
- PCB Layout
- Instruction Manual
- Photo Document
- Rating Label

3. Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use. And prior to the measurements, the test object operated about 5 minutes (warm-up) in order to stabilize its operating conditions and to ensure reliable measurement values.

3.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.10: 2009.

3.3 Special Accessories and Auxiliary Equipment

Refer to section 2.2.

3.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

3.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

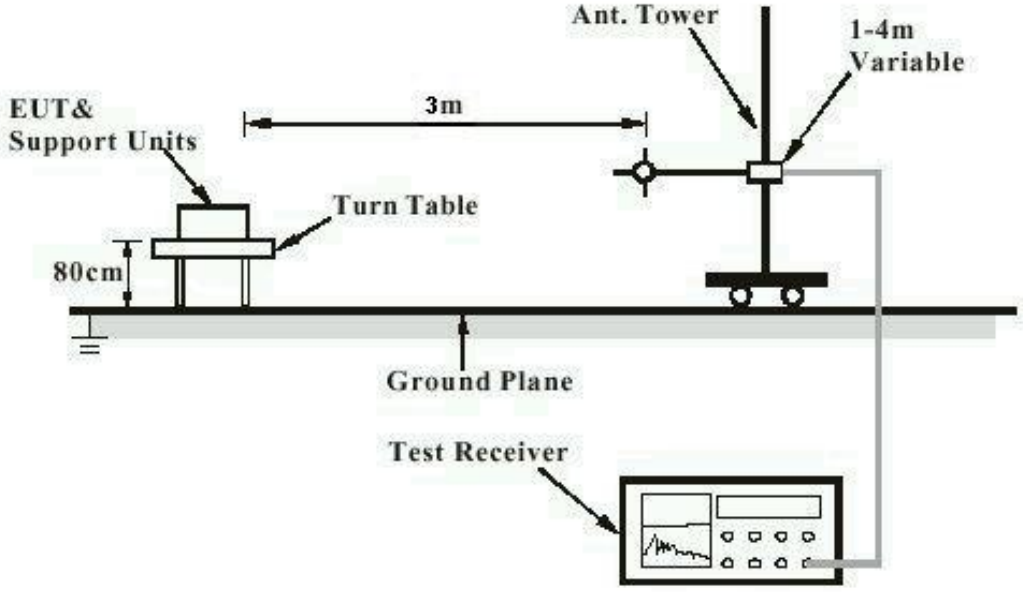


Diagram of Measurement Equipment Configuration for Conduction Measurement

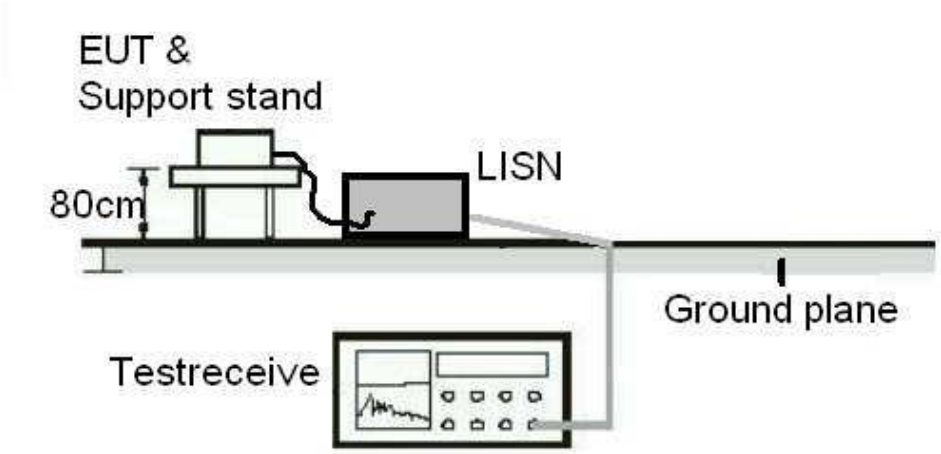
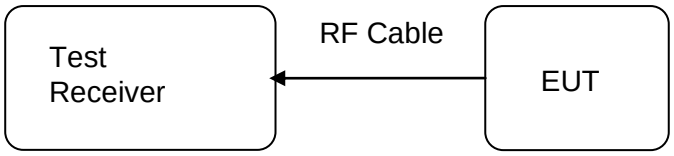


Diagram of Measurement Equipment Configuration for Transmitter Measurement



4. Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT: **Passed**

Test date	:	2013-12-23
Test standard	:	FCC Part 15.247(b)(4) and Part 15.203
Limit	:	the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has an internal antenna, the directional gain of antenna is 1 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

4.1.2 Peak Output Power

RESULT: **Passed**

Test date	:	2013-12-23
Test standard	:	FCC Part 15.247(b)(1)
Limit	:	0.125 Watt
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A and B
Ambient temperature	:	21℃
Relative humidity	:	44%
Atmospheric pressure	:	101 kPa

Table 5: Test result of Peak Output Power, basic data rate

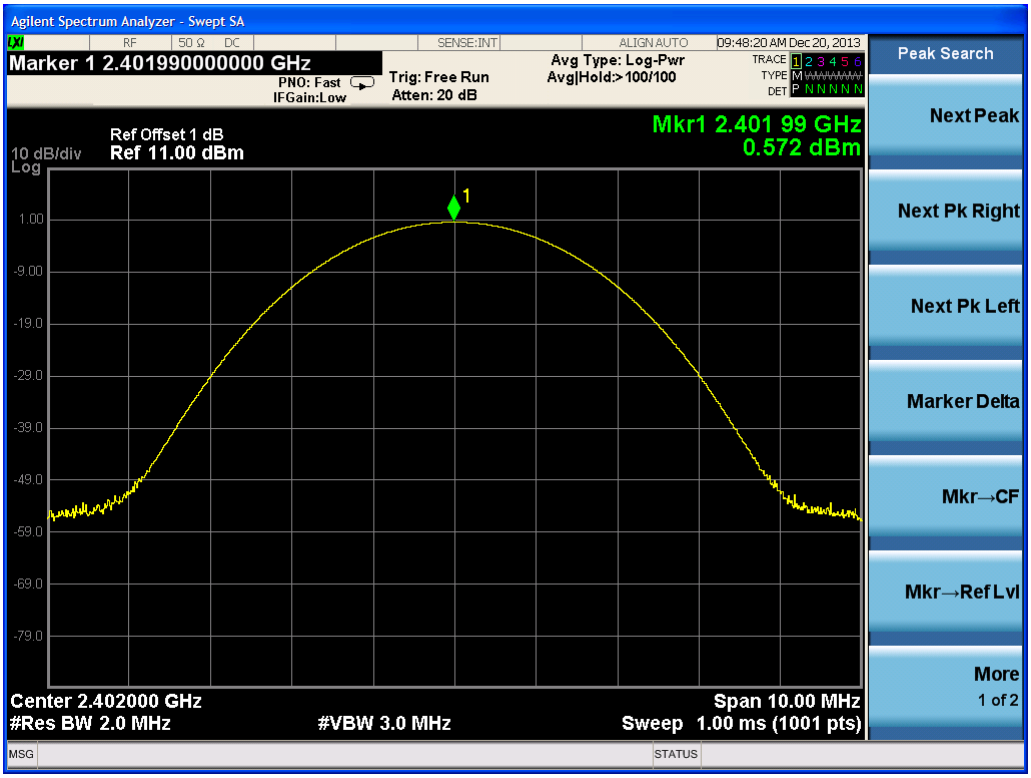
Channel	Channel Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(mW)	(mW)
Low Channel	2402	0.572	1.14	125
Middle Channel	2441	1.413	1.38	125
High Channel	2480	1.439	1.39	125

Table 6: Test result of Peak Output Power, enhance data rate

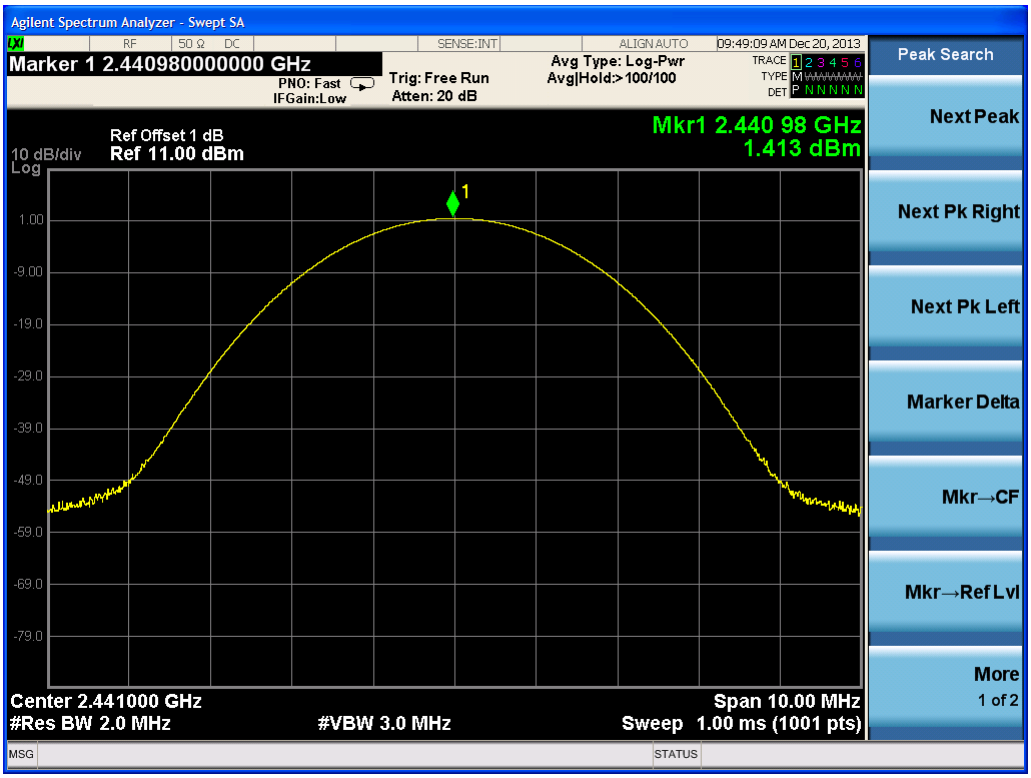
Channel	Channel Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(mW)	(mW)
Low Channel	2402	1.275	1.34	125
Middle Channel	2441	1.675	1.47	125
High Channel	2480	1.641	1.46	125

Test Graph of Peak Output Power, Basic Data Rate

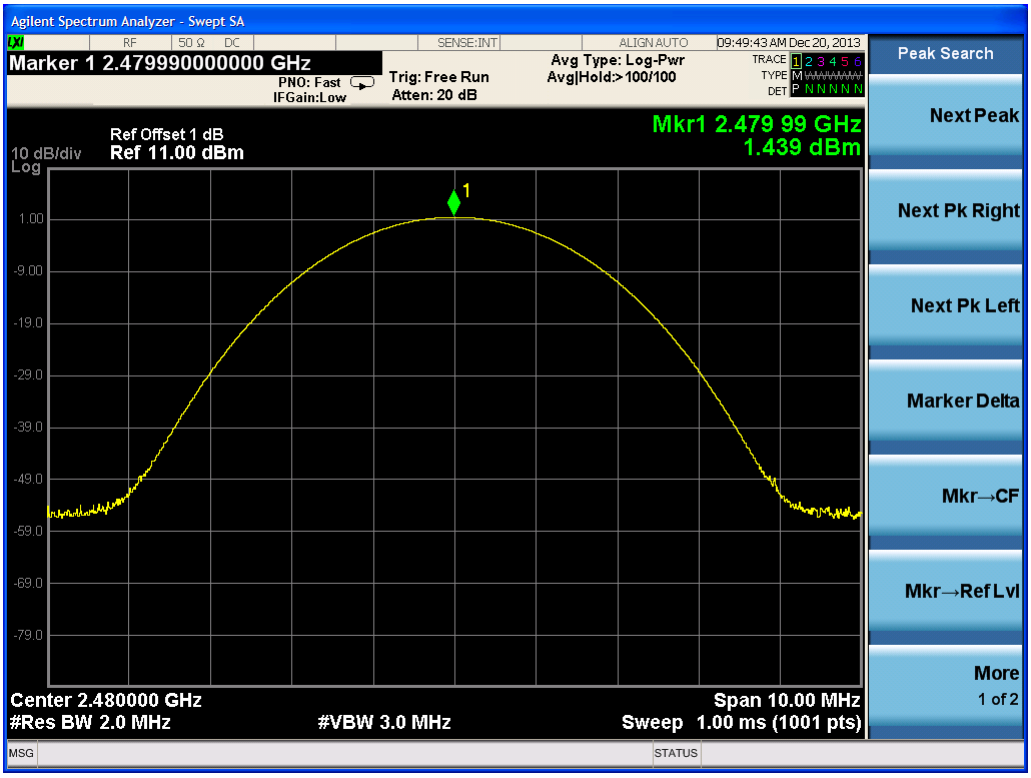
Low Channel



Middle Channel

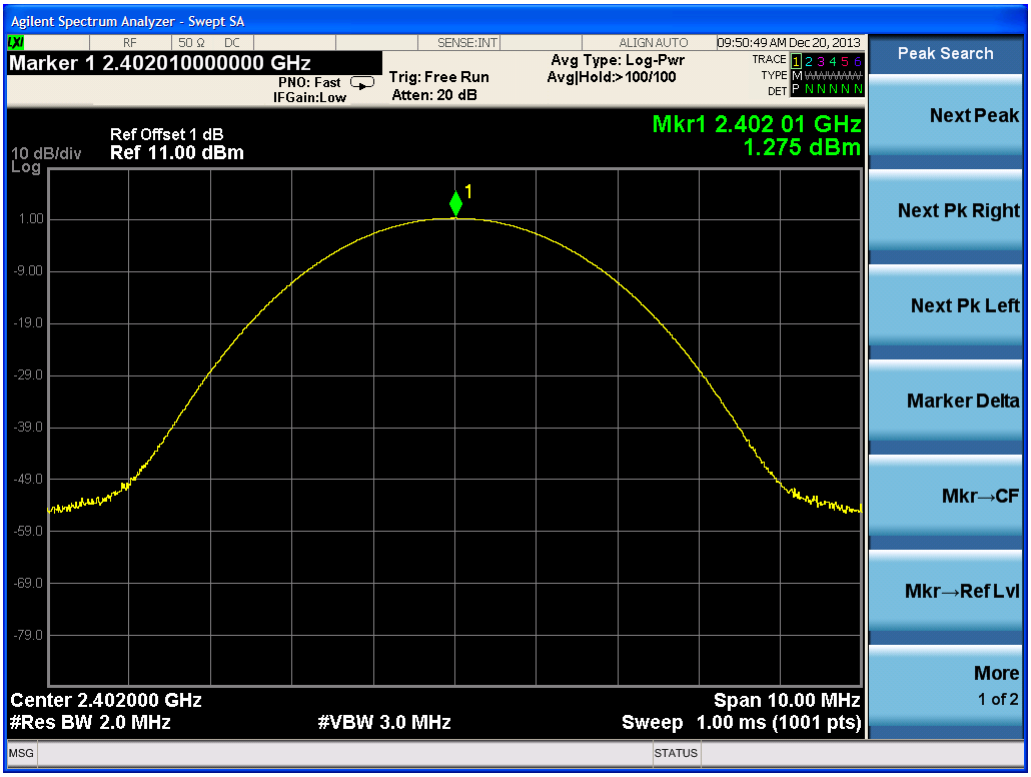


High Channel

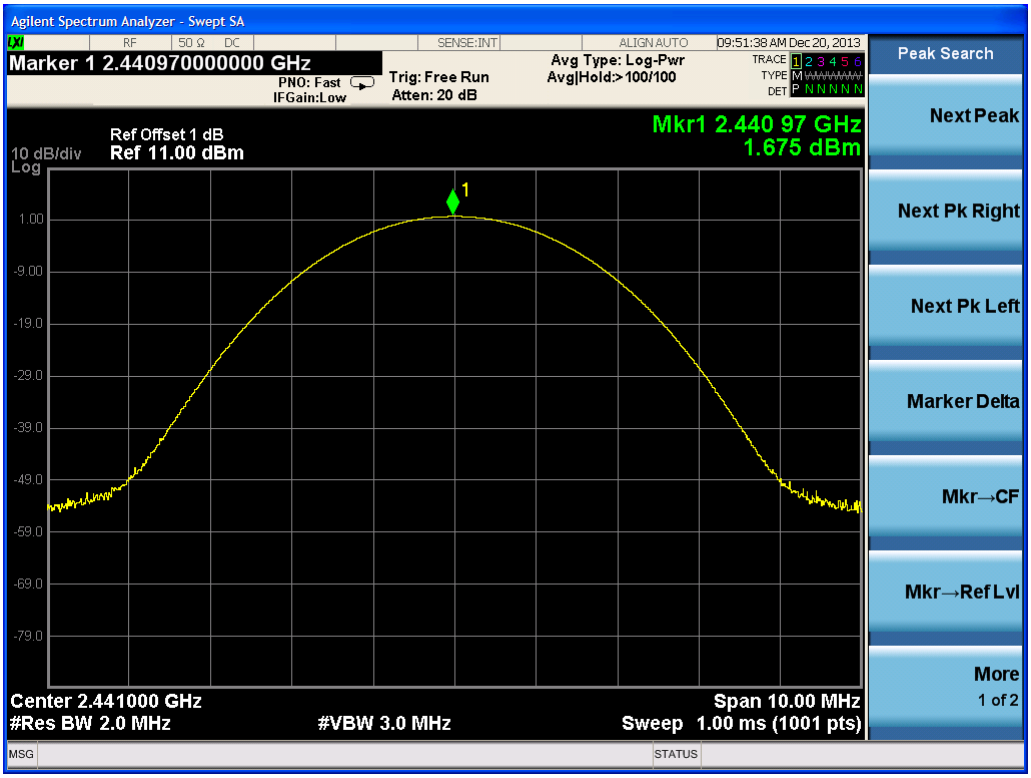


Test Graph of Peak Output Power, Enhance Data Rate

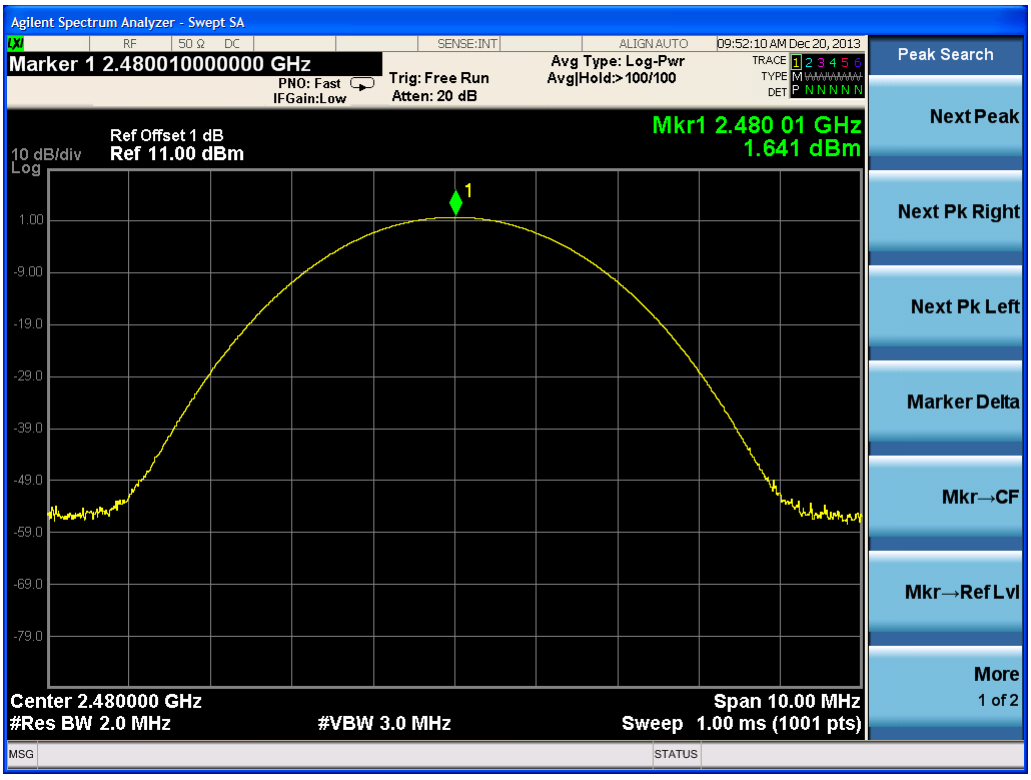
Low Channel



Middle Channel



High Channel



4.1.3 20dB Bandwidth

RESULT: **Passed**

Date of testing	:	2013-12-23
Test standard	:	FCC Part 15.247(a)(1)
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A and B
Ambient temperature	:	21℃
Relative humidity	:	44%
Atmospheric pressure	:	101 kPa

Table 7: Test result of 20dB Bandwidth, basic data rate

Channel	Channel Frequency (MHz)	Occupied Bandwidth (kHz)	Result
Low Channel	2402	830.81	Passed
Mid Channel	2441	834.51	Passed
High Channel	2480	838.11	Passed

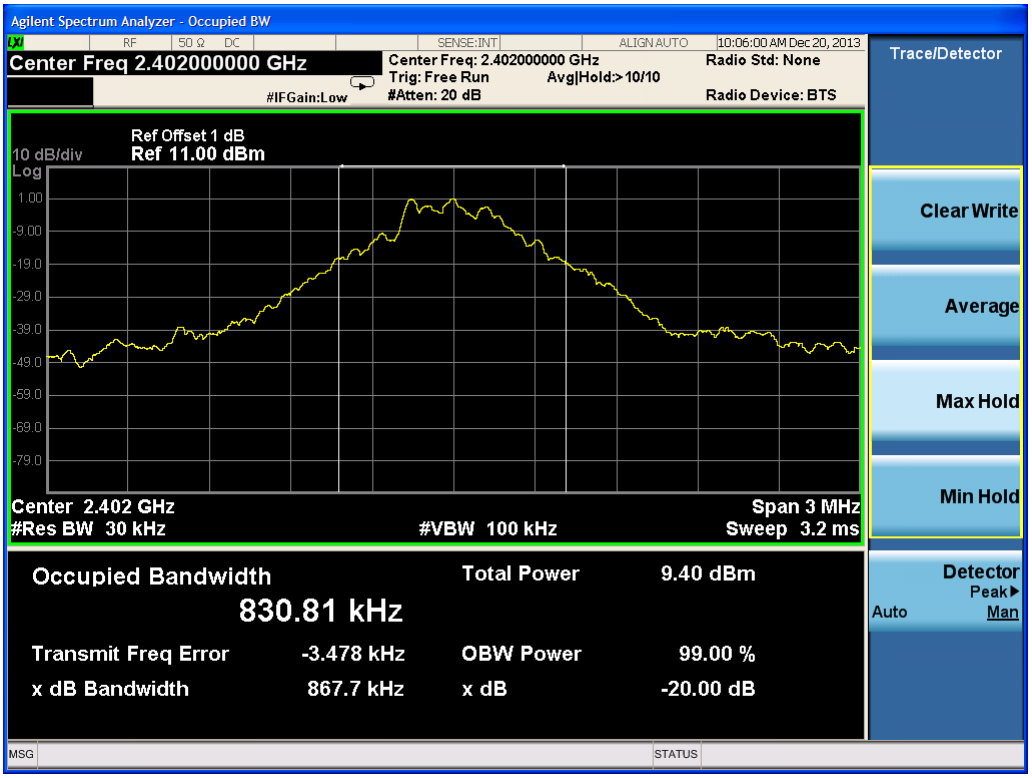
Table 8: Test result of 20dB Bandwidth, enhance data rate

Channel	Channel Frequency (MHz)	Occupied Bandwidth (kHz)	Result
Low Channel	2402	1133.8	Passed
Mid Channel	2441	1135.2	Passed
High Channel	2480	1133.4	Passed

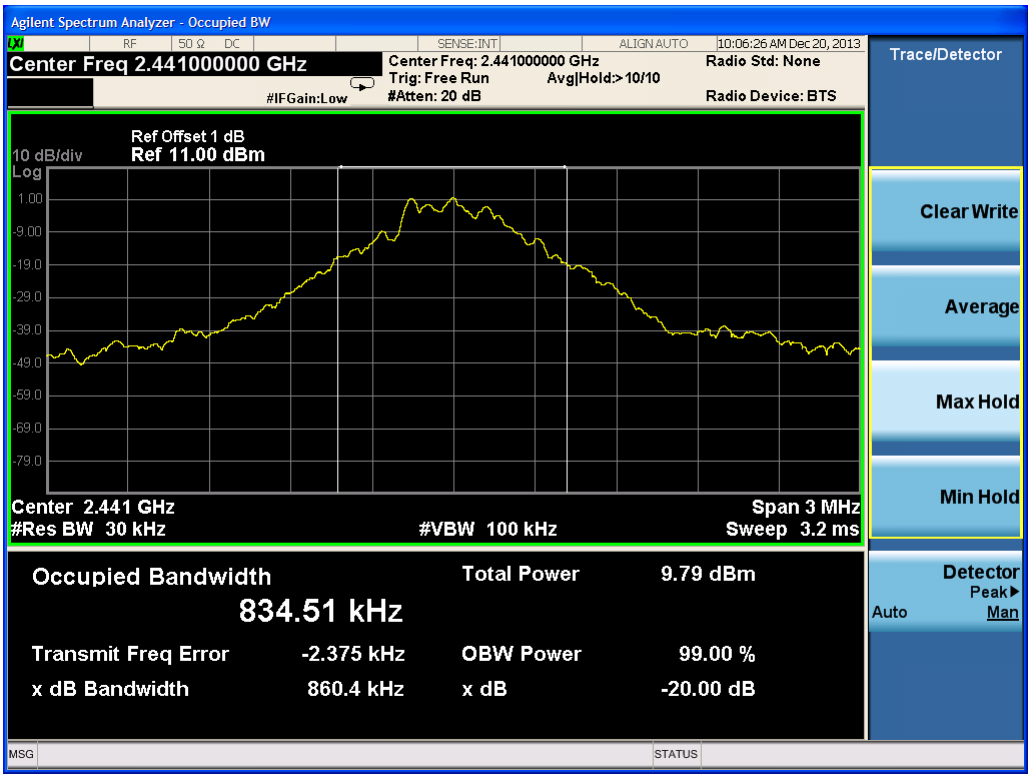
Notes: No specific occupied bandwitdth requirement in part 15.247(a) (1).

Test Graph of 20dB Bandwidth, Basic Data Rate

Low Channel



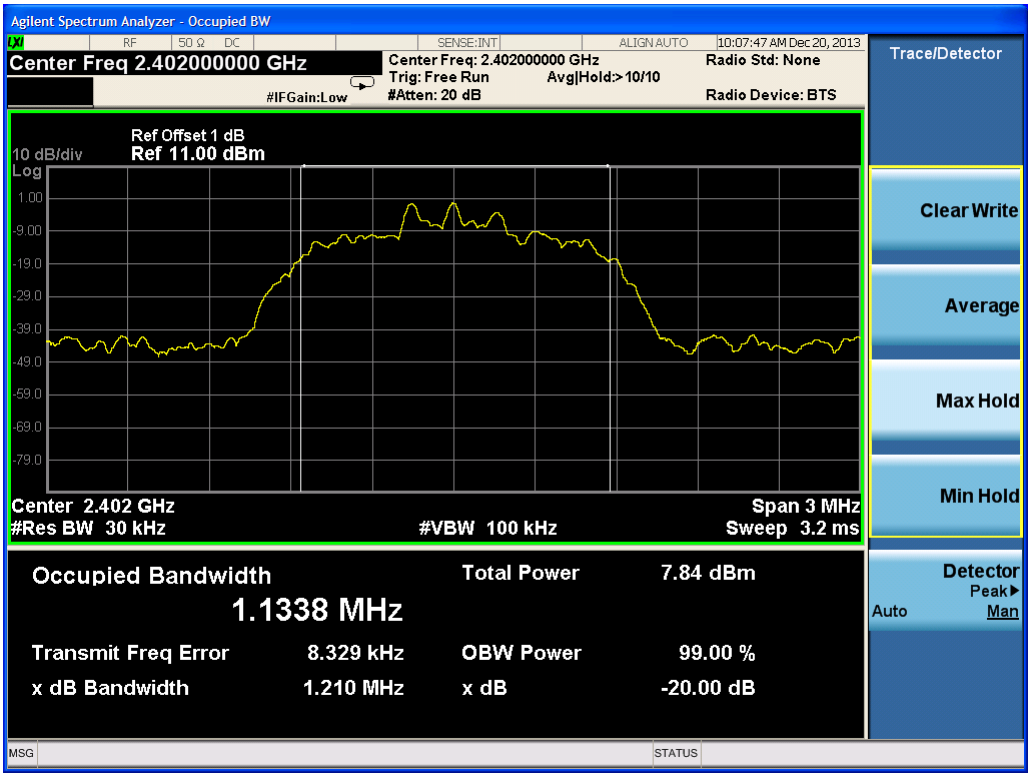
Middle Channel



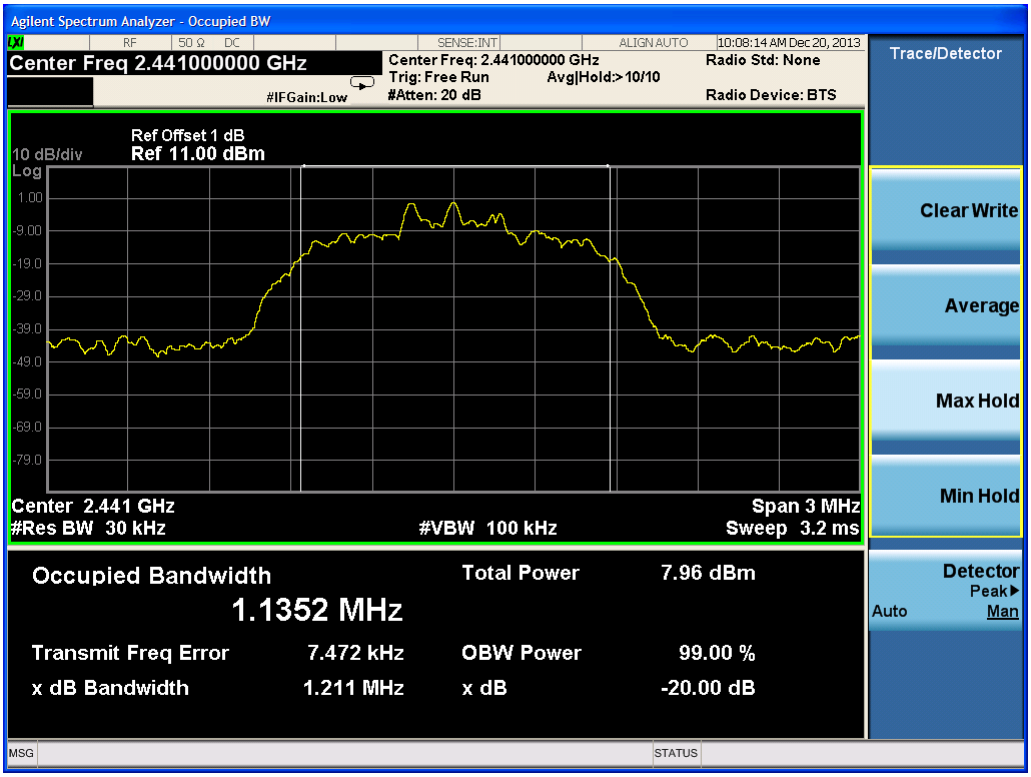
High Channel

Test Graph of 20dB Bandwidth, Enhance Data Rate

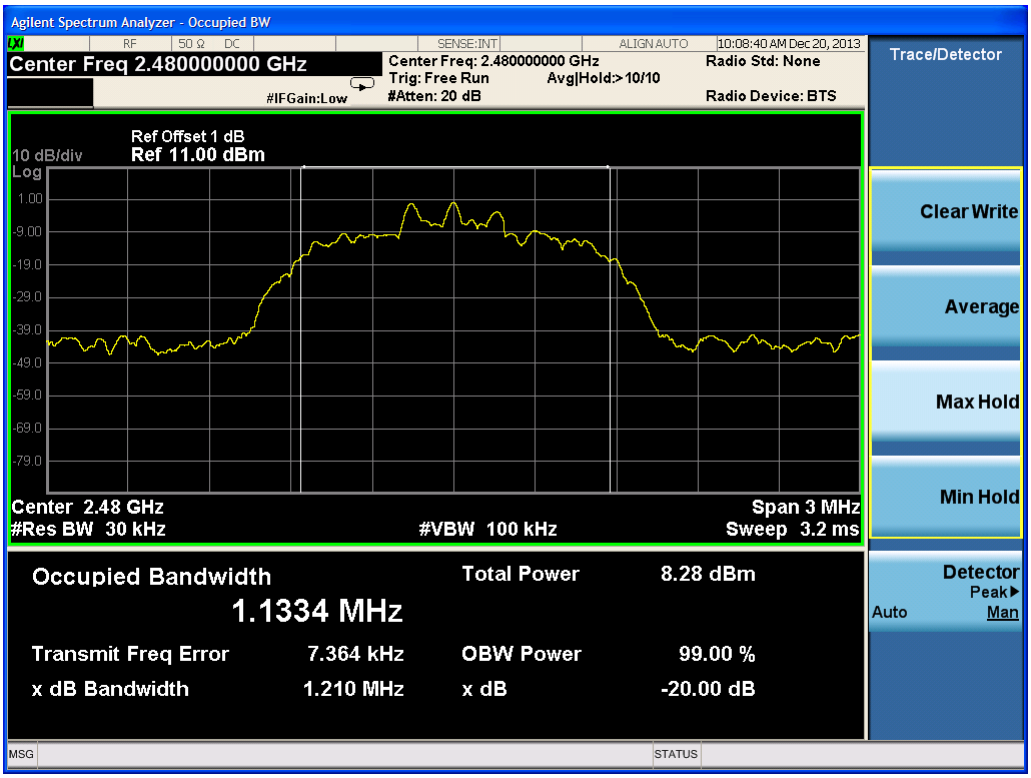
Low Channel



Middle Channel



High Channel



4.1.4 Conducted Spurious Emissions in 100kHz Bandwidth

RESULT: **Passed**

Date of testing	:	2013-12-23
Test standard	:	FCC part 15.247(d)
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	:	Shield room

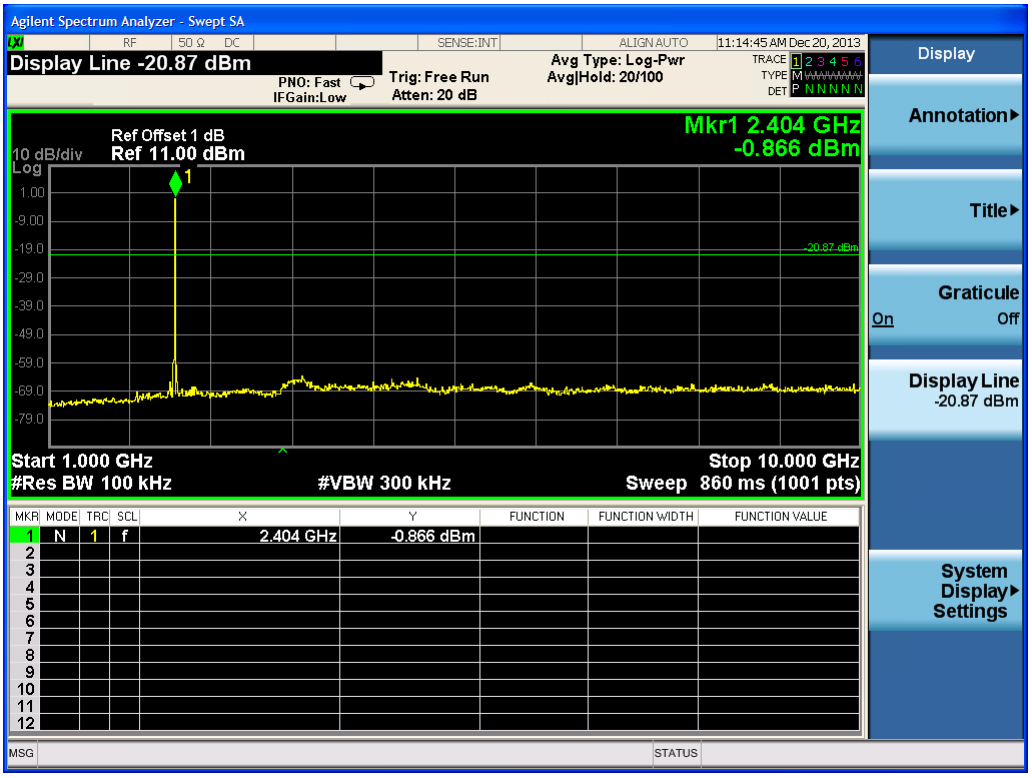
Test setup

Test Channel	:	Low/ High
Operation mode	:	A and B
Ambient temperature	:	23℃
Relative humidity	:	54%
Atmospheric pressure	:	101 kPa

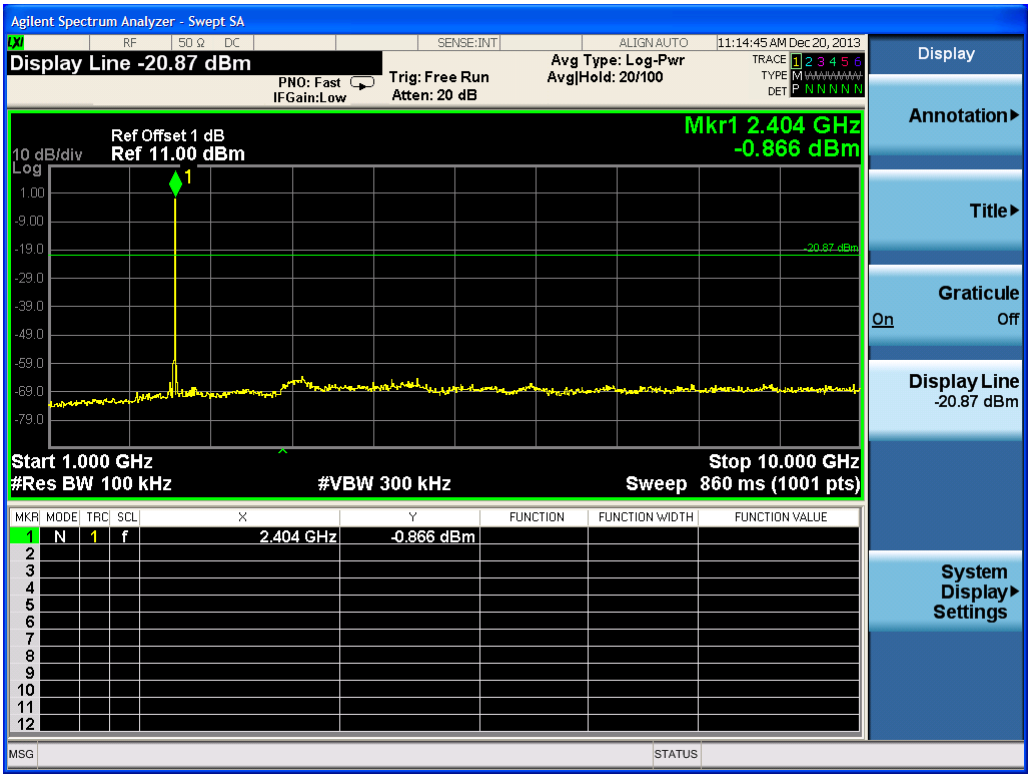
All emissions are more than 20dB below fundamental, details refer to following test Graph, and compliance is achived as well.

Test Graph of Conducted Spurious Emissions measured in 100kHz Bandwidth, Enhance Data Rate

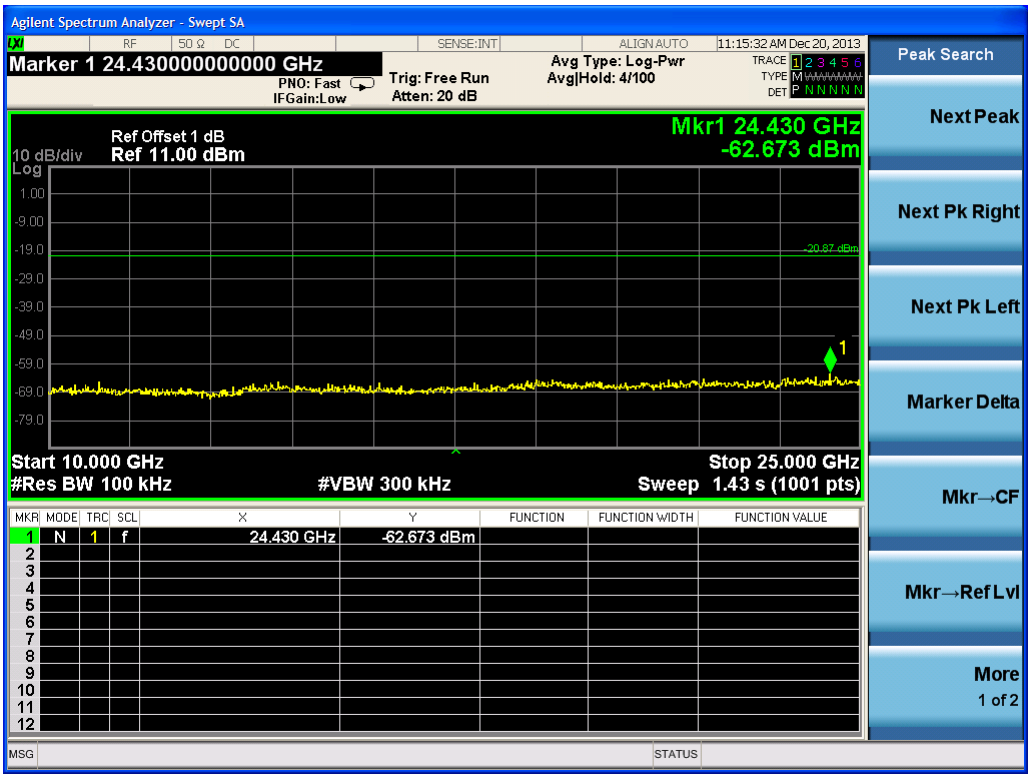
Low Channel



30MHz-1GHz

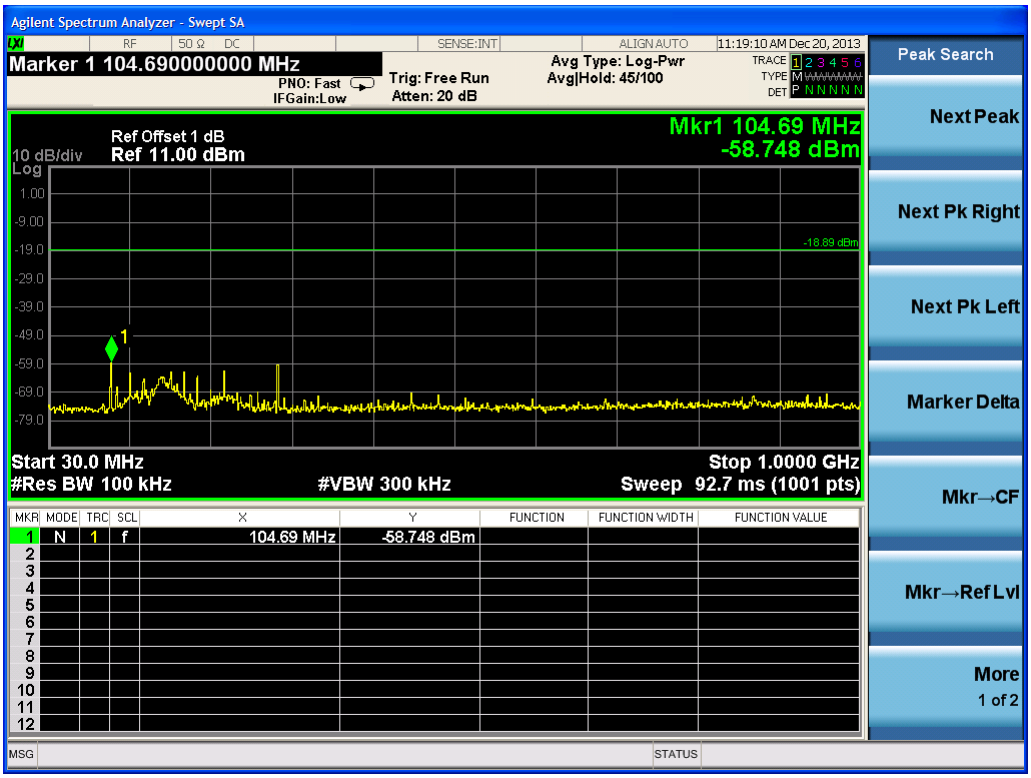


1GHz-10GHz

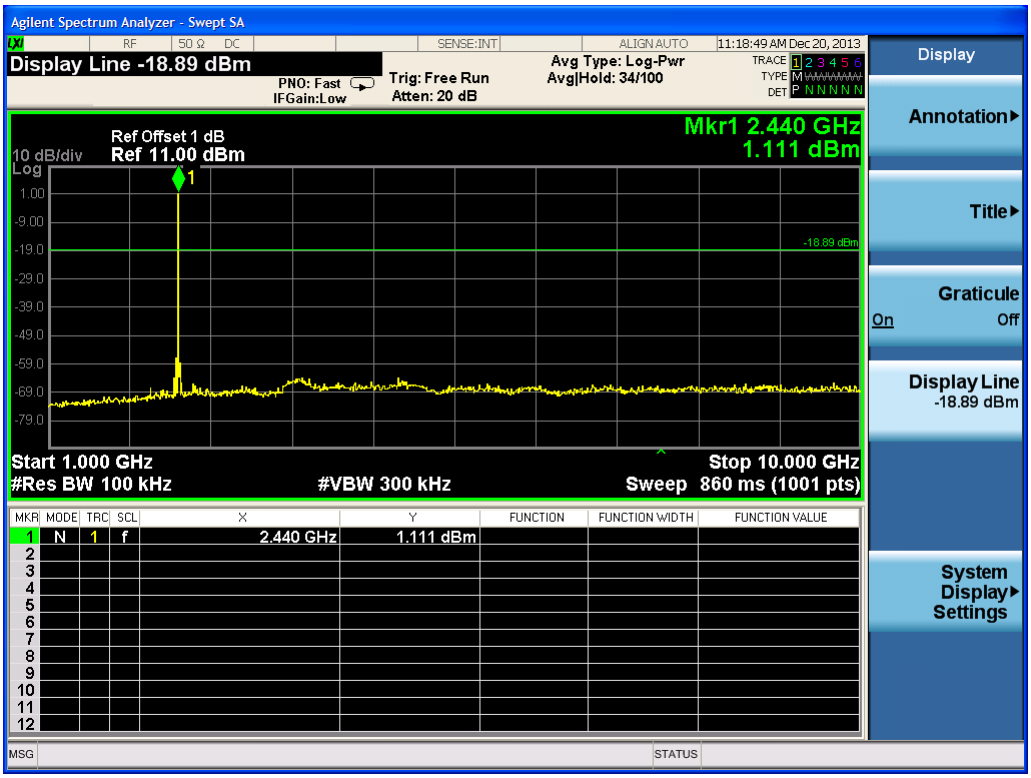


10GHz-25GHz

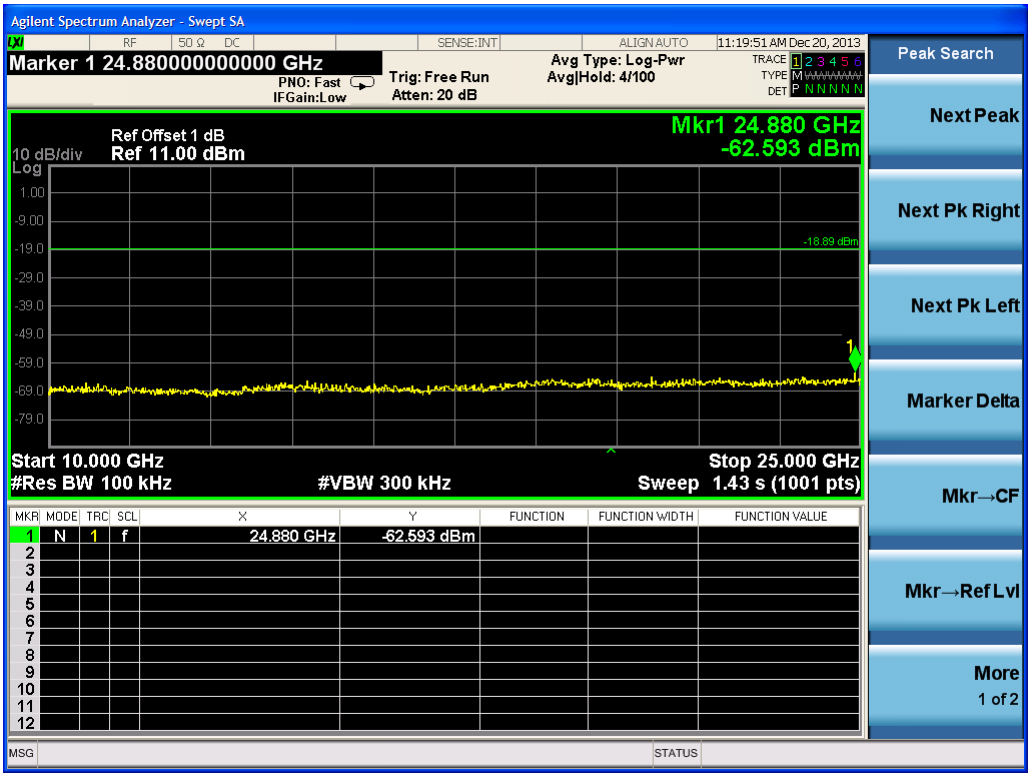
Middle Channel



30MHz-1GHz

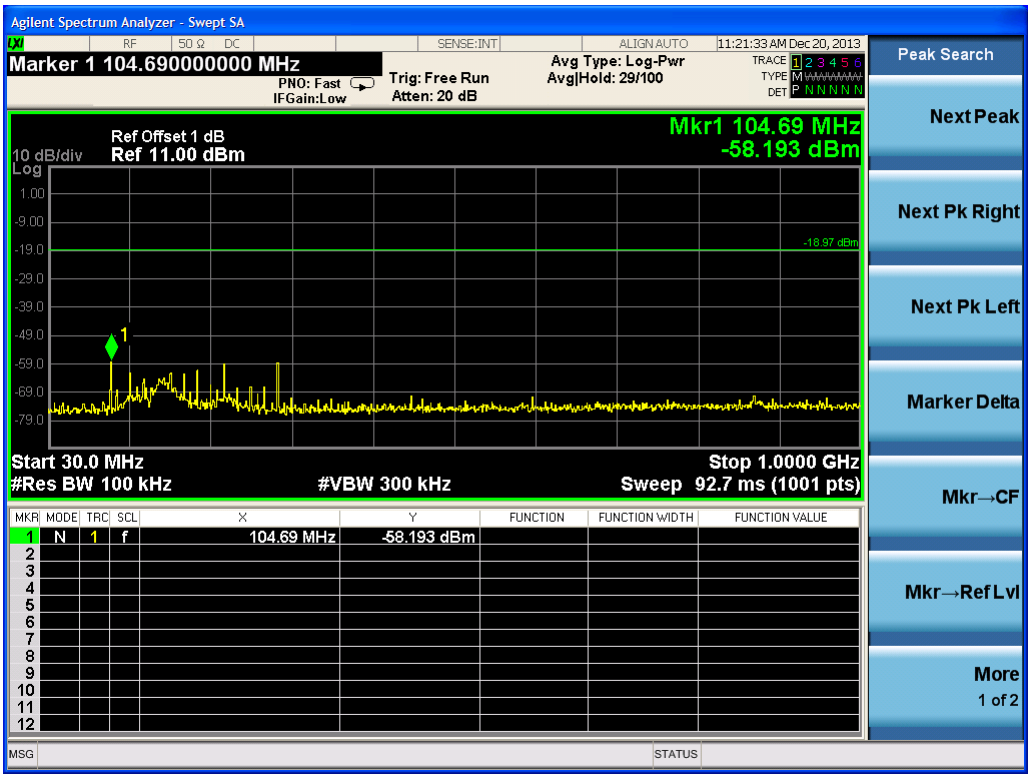


1GHz-10GHz

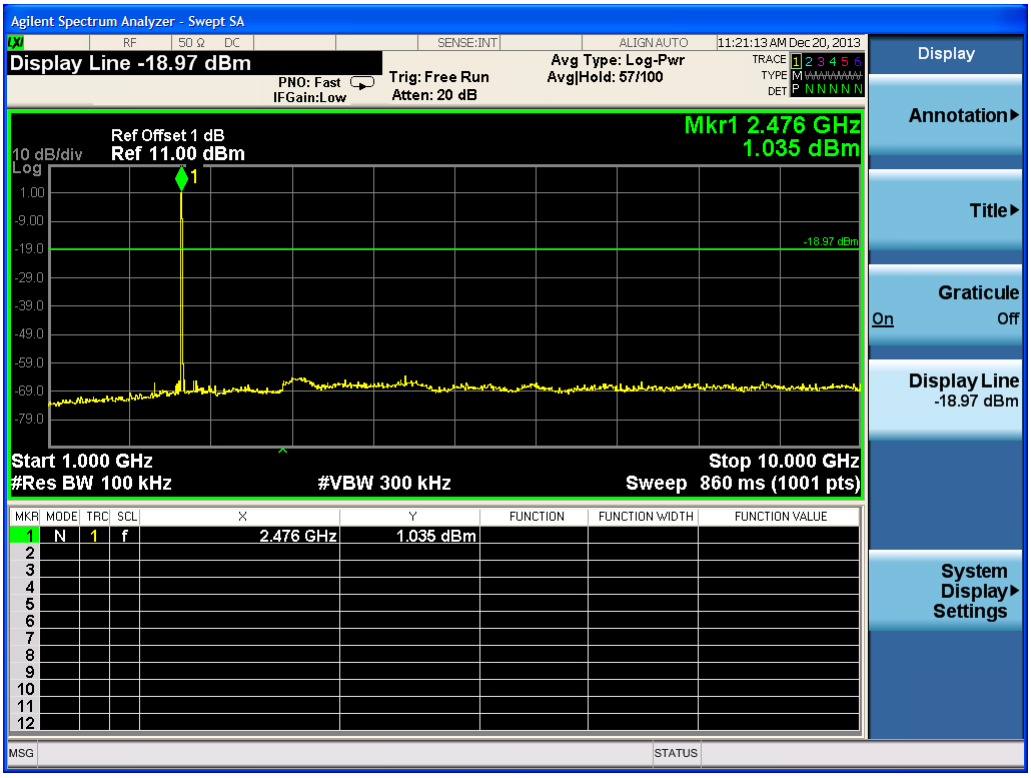


10GHz-25GHz

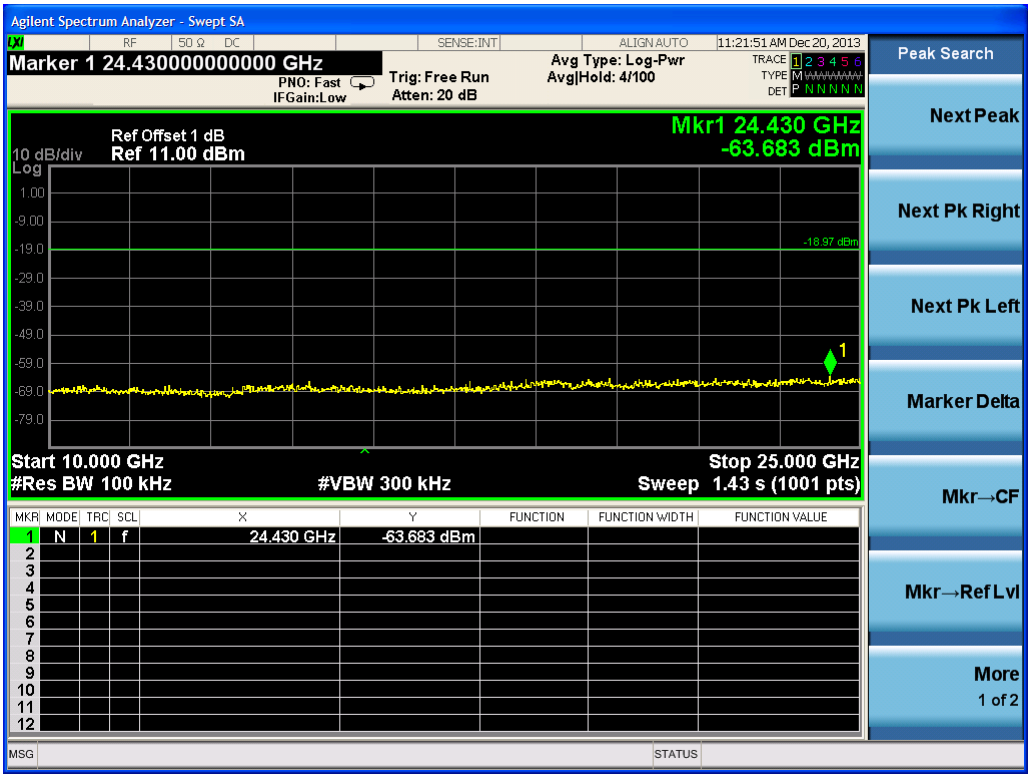
High Channel



30MHz-1GHz



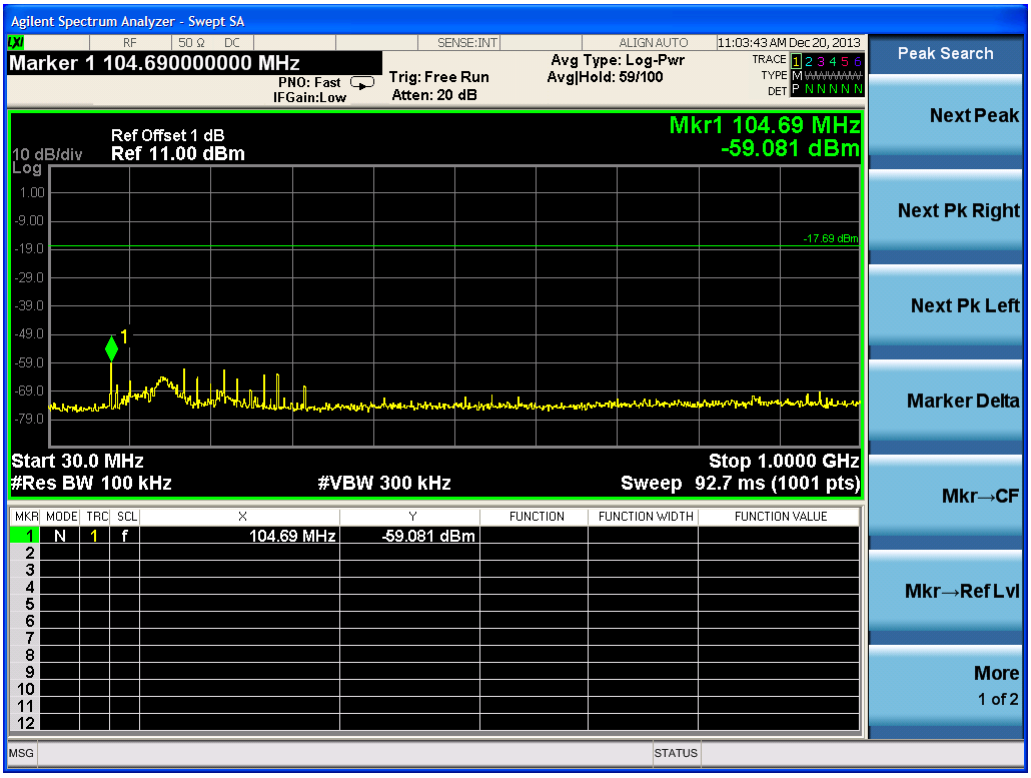
1GHz-10GHz


Agilent Spectrum Analyzer - Swept SA
Marker 1 24.430000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 4/100
11:21:51 AM Dec 20, 2013
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 24.430 GHz
-63.683 dBm
-18.97 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 1.43 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 24.430 GHz -63.683 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

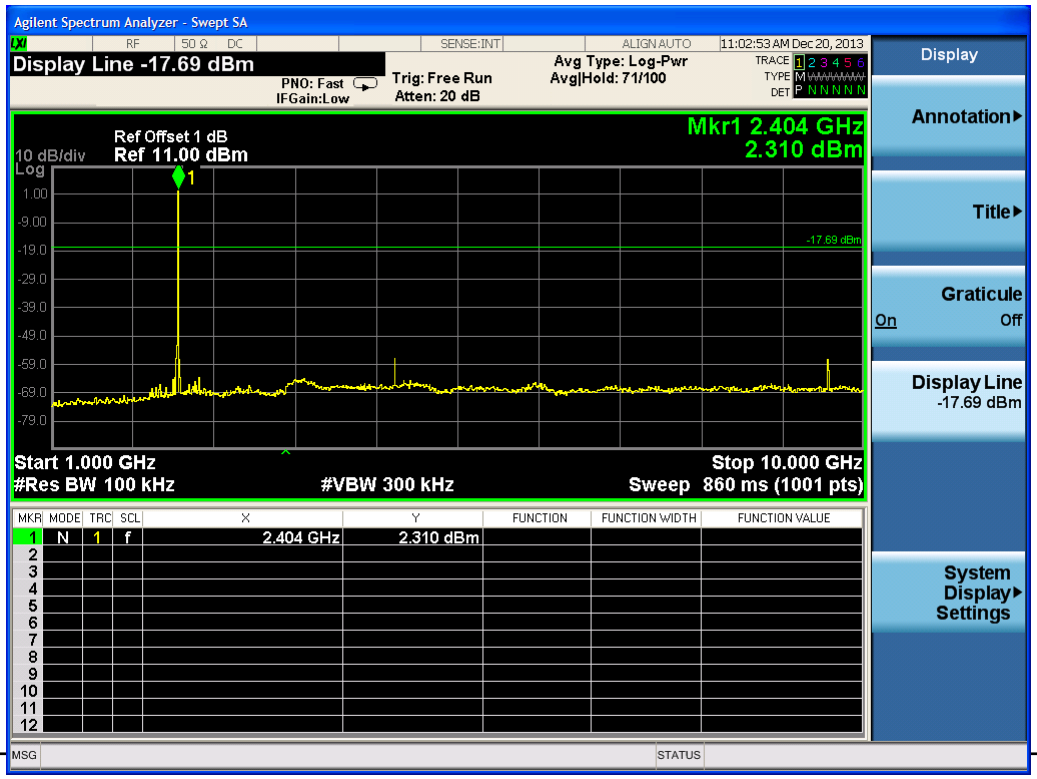
10GHz-25GHz

Test Graph of Conducted Spurious Emissions measured in 100kHz Bandwidth, Basic Data Rate

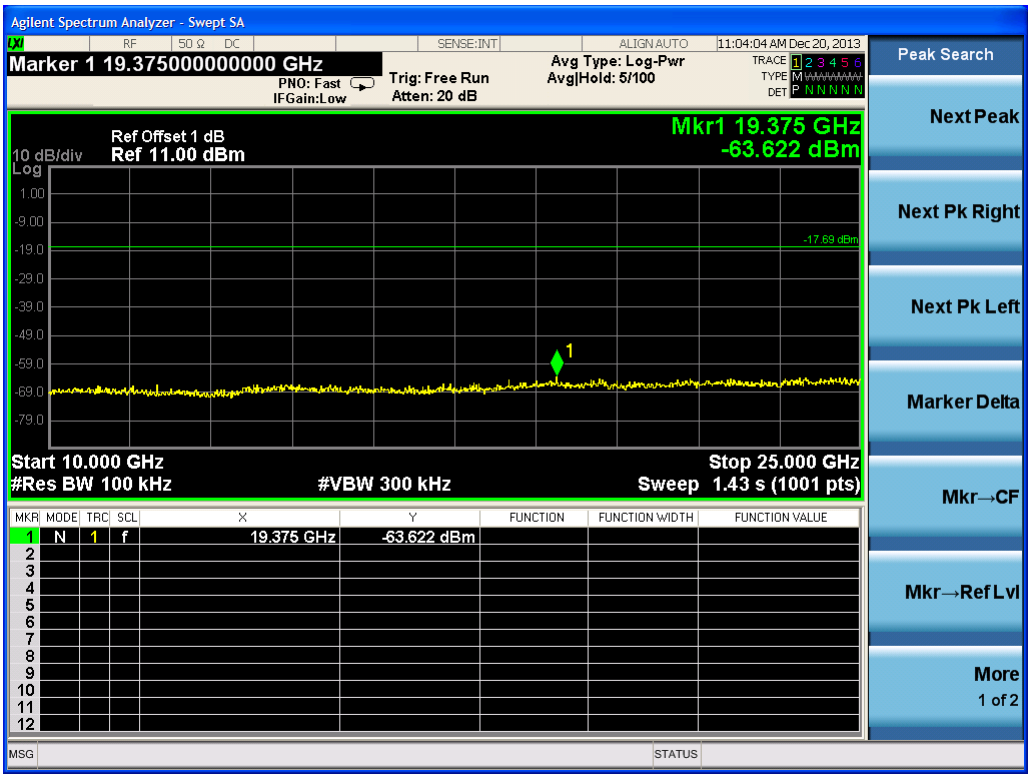
Low Channel



30MHz-1GHz

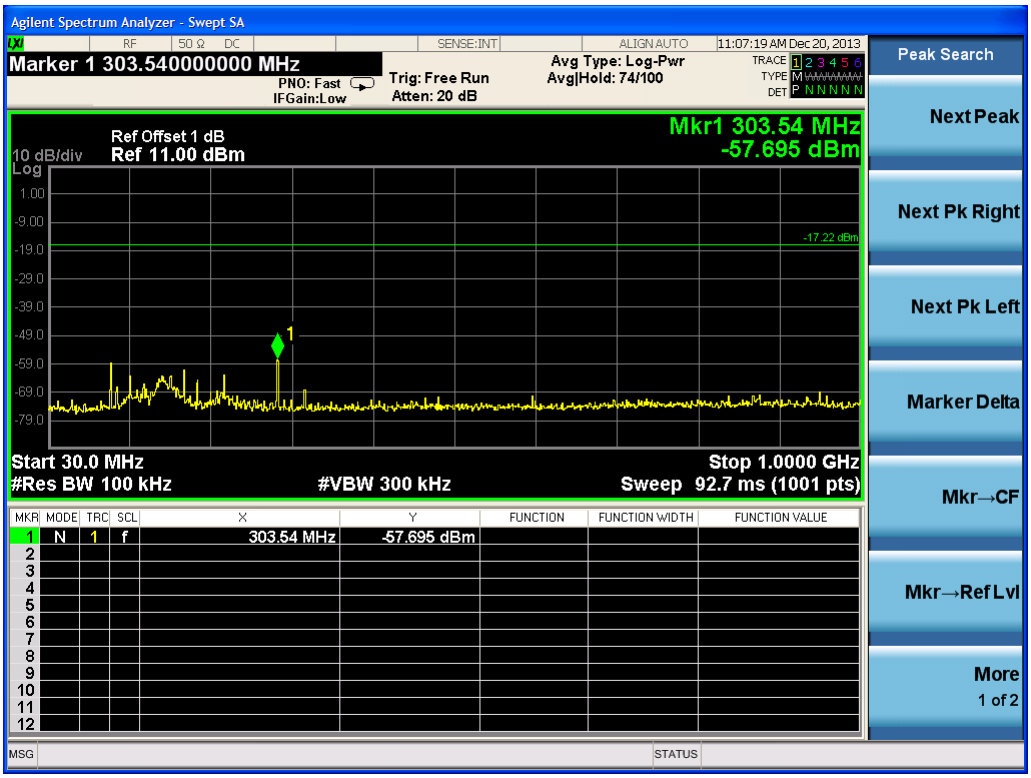


1GHz-10GHz

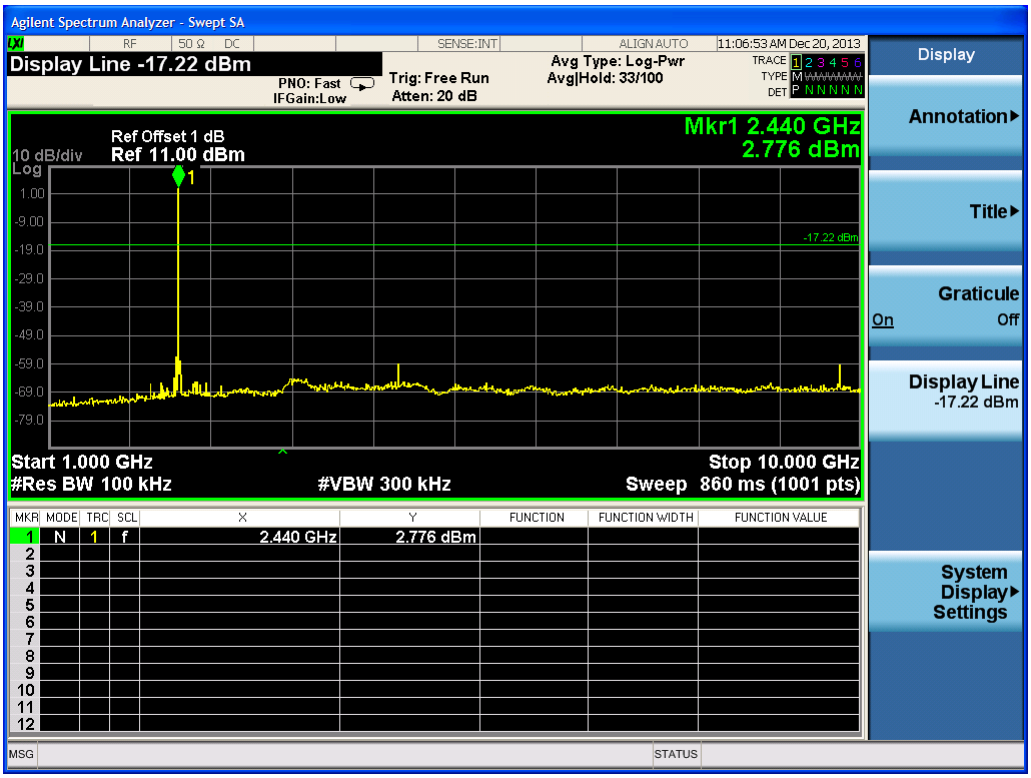


10GHz-25GHz

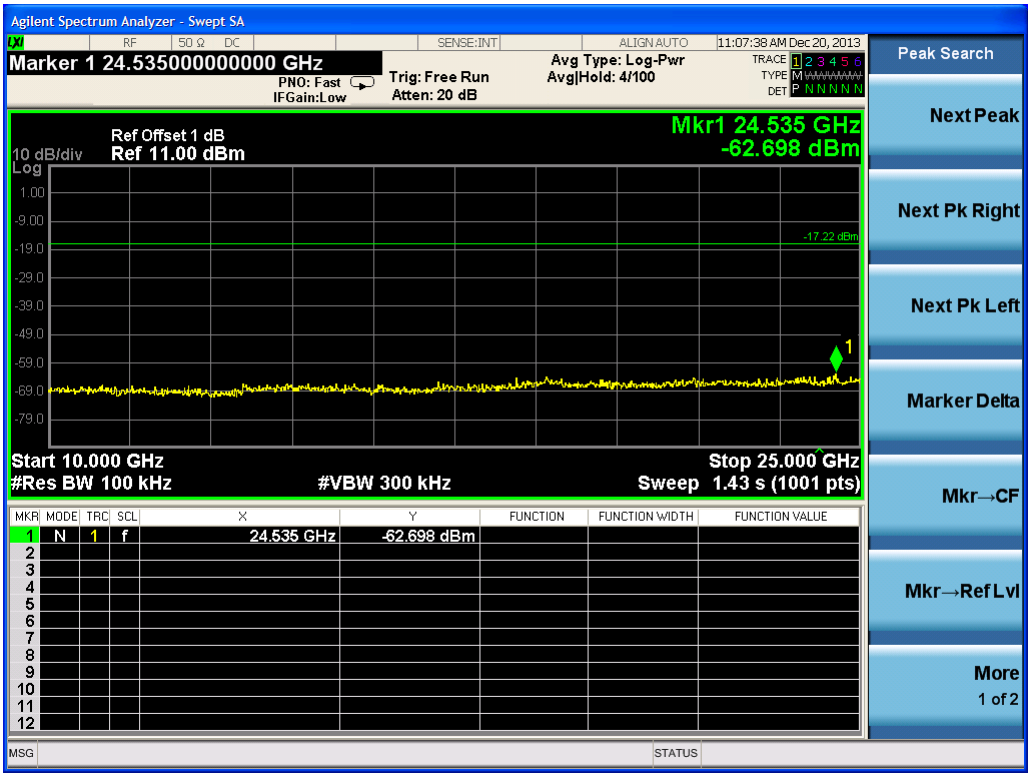
Middle Channel



30MHz-1GHz

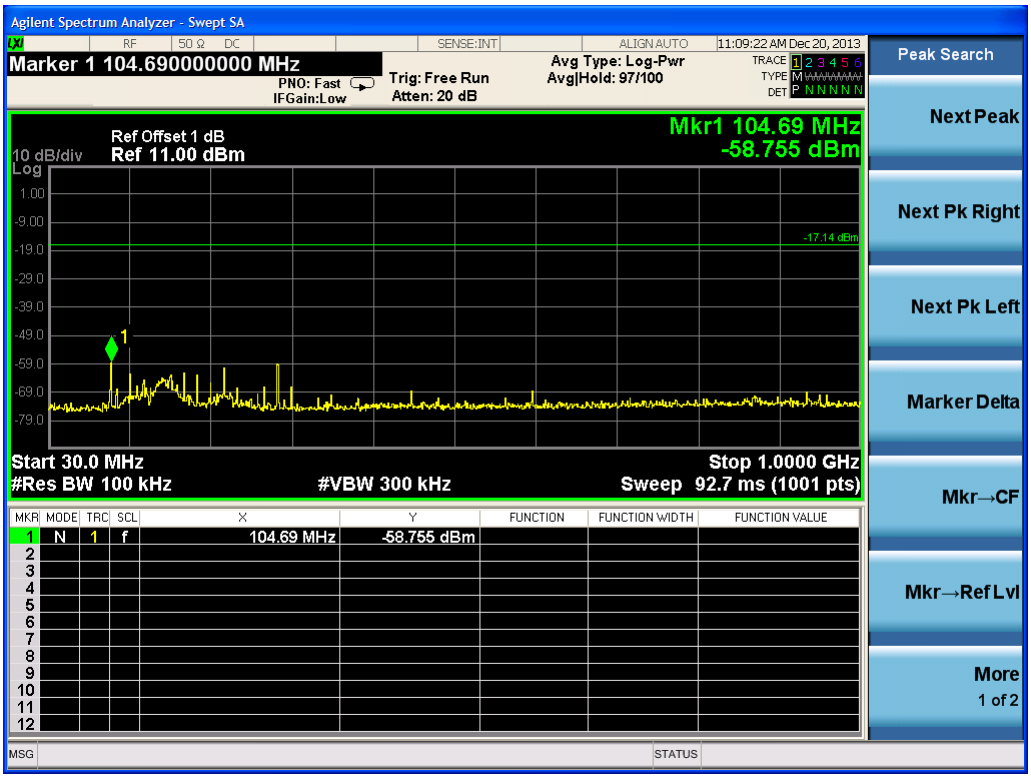


1GHz-10GHz

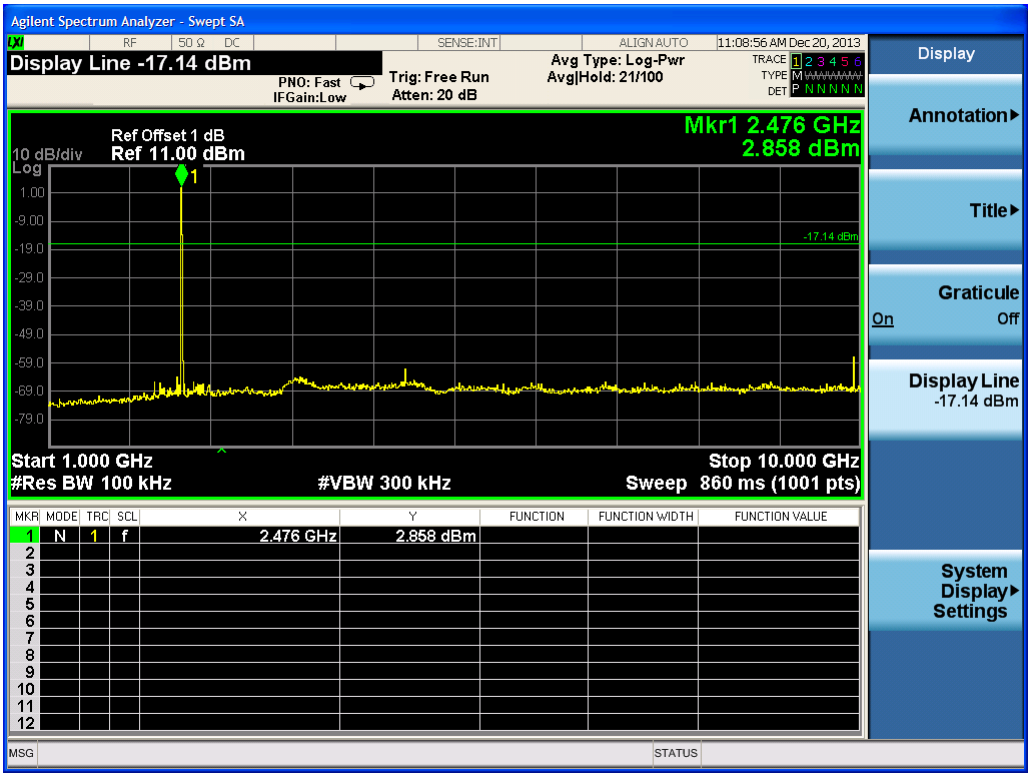


10GHz-26GHz

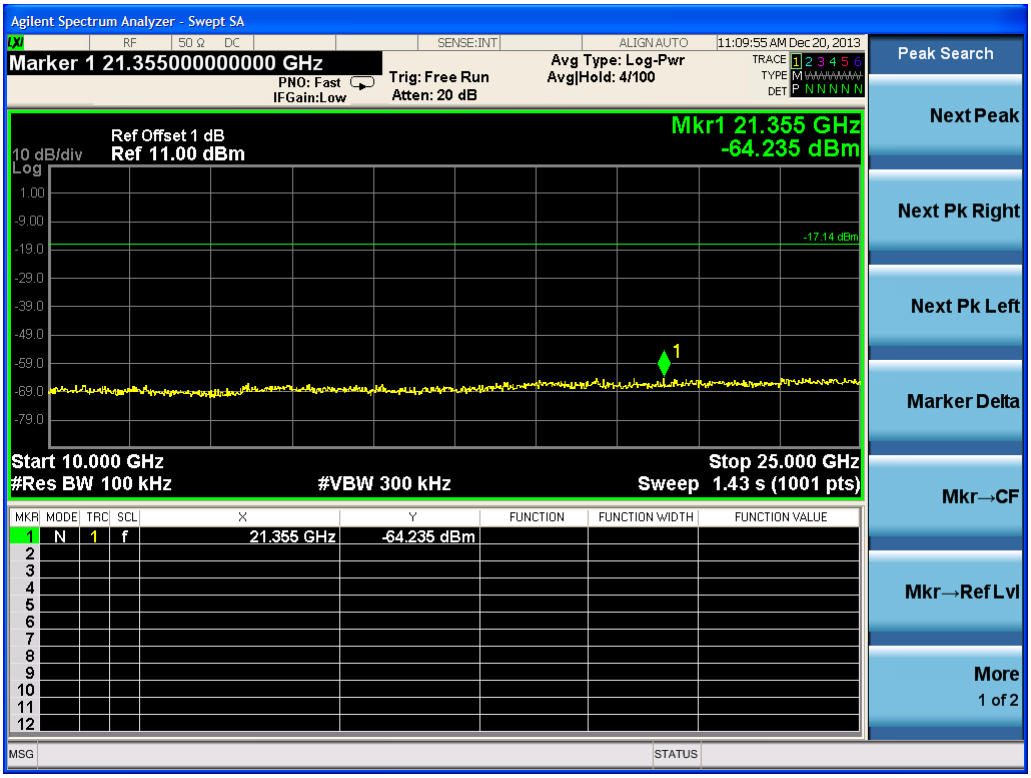
High Channel



30MHz-1GHz



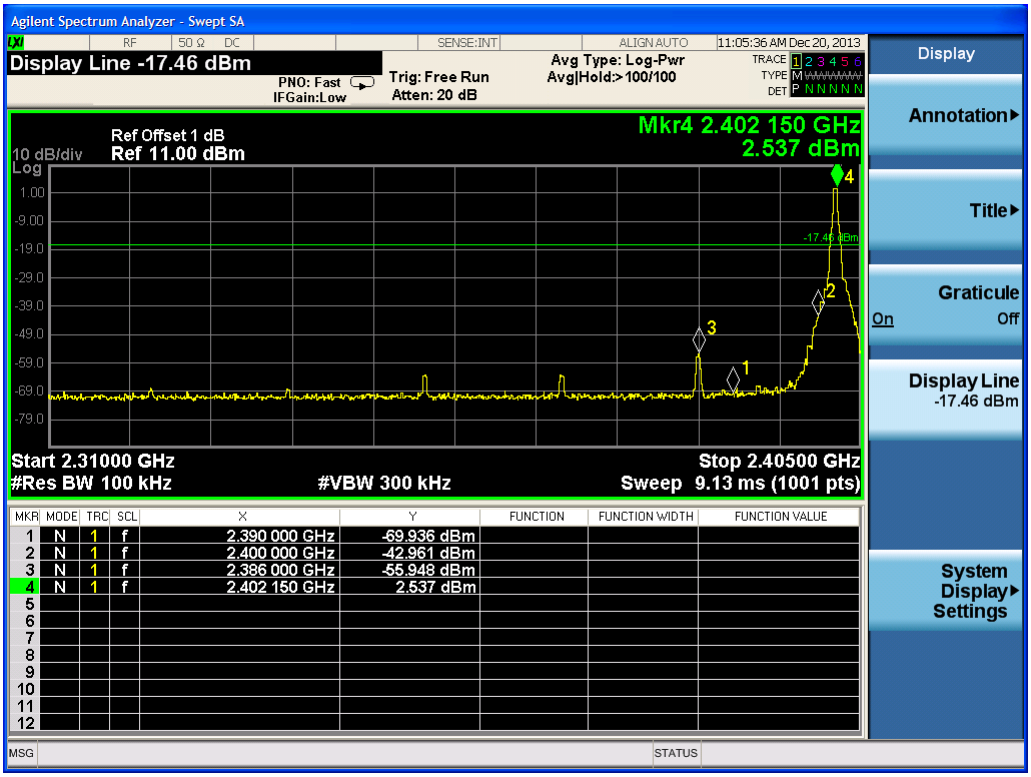
1GHz-10GHz


Agilent Spectrum Analyzer - Swept SA
Marker 1 21.355000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold: 4/100
11:09:55 AM Dec 20, 2013
Ref Offset 1 dB
10 dB/div
Log
Ref 11.00 dBm
Mkr1 21.355 GHz
-64.235 dBm
-17.14 dBm
Start 10.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 GHz
Sweep 1.43 s (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 21.355 GHz -64.235 dBm
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2
MSG
STATUS

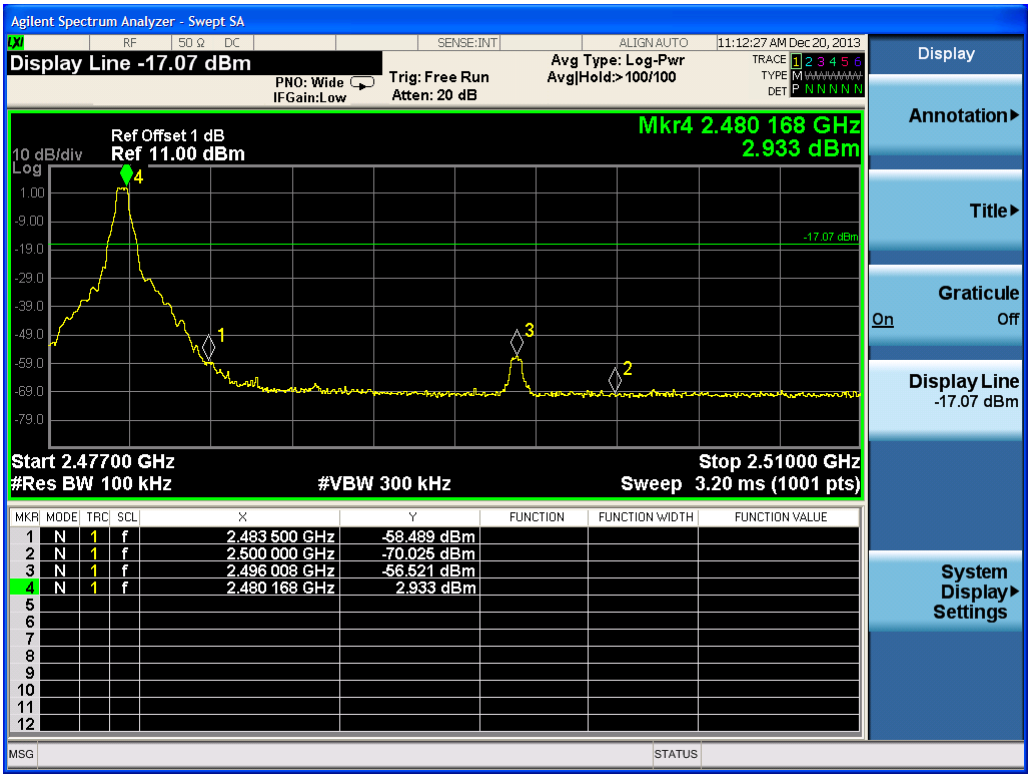
10GHz-25GHz

Test Graph of Band Edge measured in 100kHz Bandwidth, Basic Data Rate

Low Channel

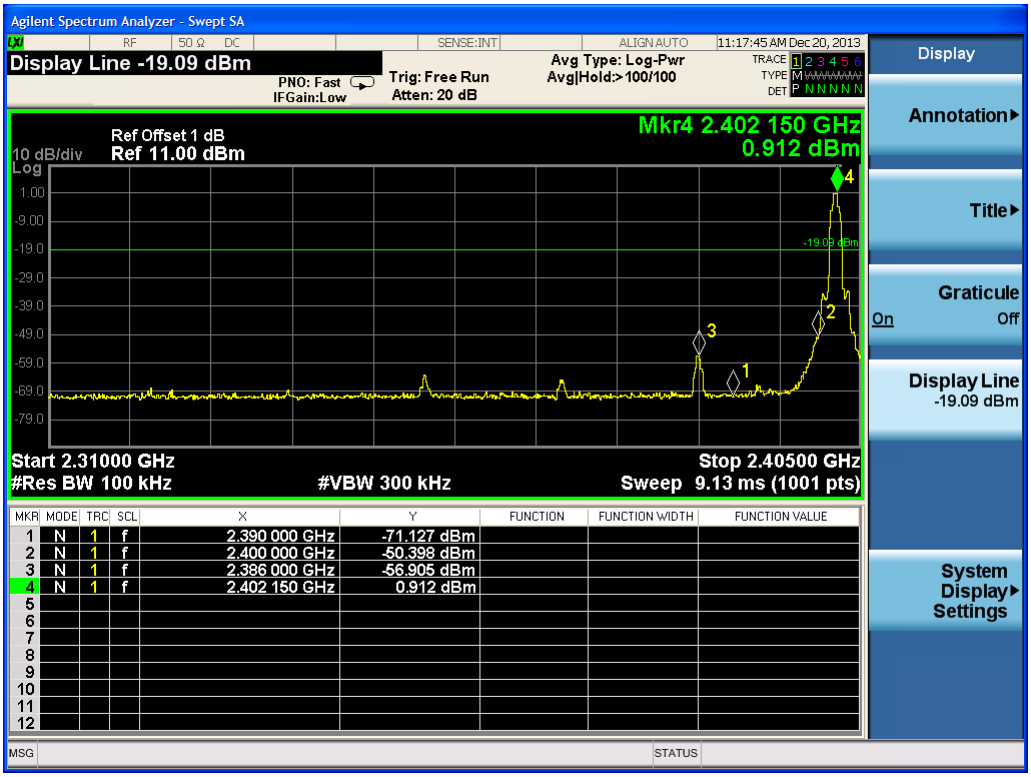


High Channel

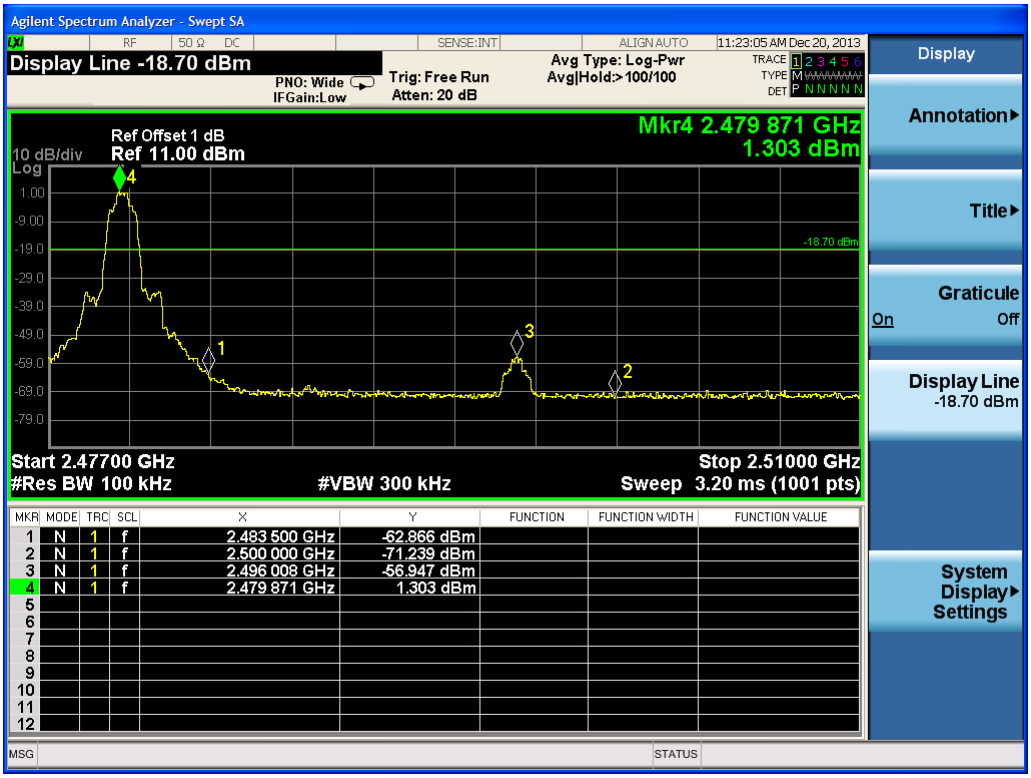


Test Graph of Band Edge measured in 100kHz Bandwidth, Enhance Data Rate

Low Channel



High Channel



4.1.5 Radiated Emission

RESULT: **Passed**

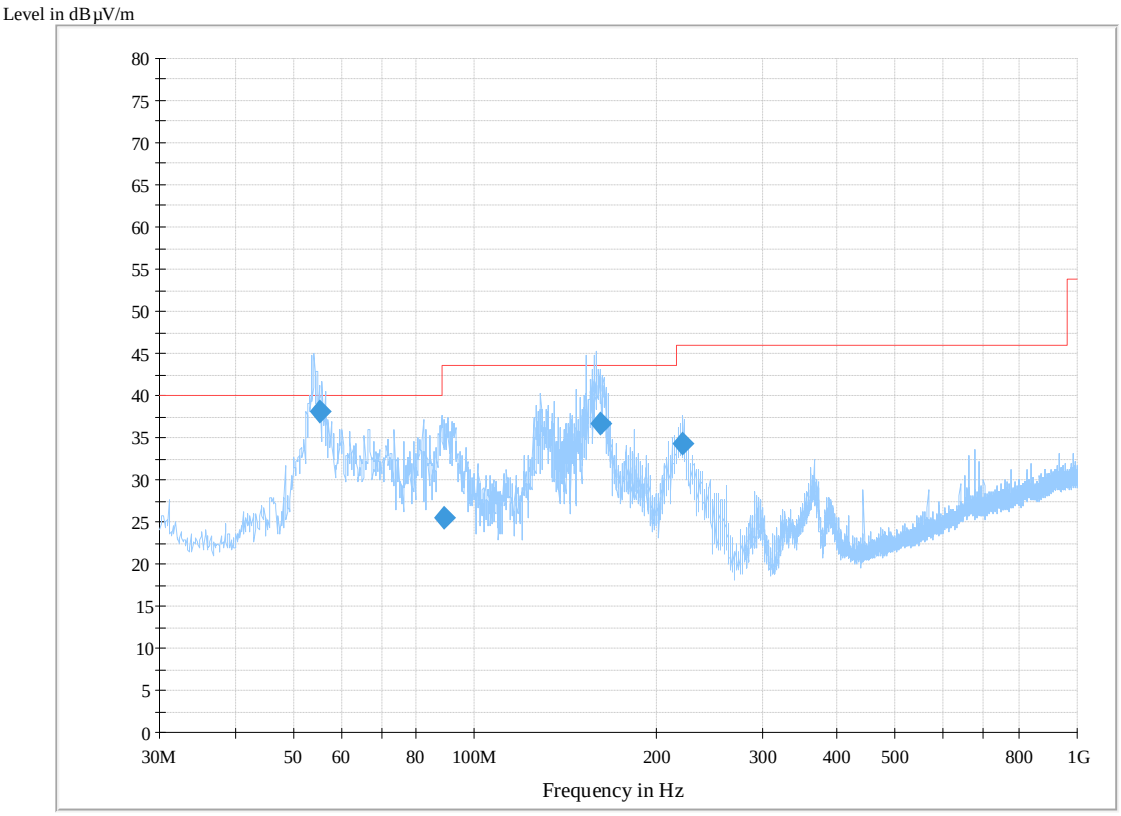
Date of testing	:	2013-12-11
Test standard	:	FCC part 15.247(d)
Limits	:	Refer to 15.209(a)
Frequency range	:	30MHz-25GHz
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A and B
Ambient temperature	:	23℃
Relative humidity	:	54%
Atmospheric pressure	:	100 kPa

During the test, the wooden table was rotated 360° around and the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.
For radiated emission below 1GHz, a pre-test was performed in the basic data rate and the enhance data rate, low, middile and high channel, only the worst result was showed in the report.
The following figures and tables were those measured by an automatic measurement system. Plots of the band edge are also shown.
The emission found on the operating band should be igored.

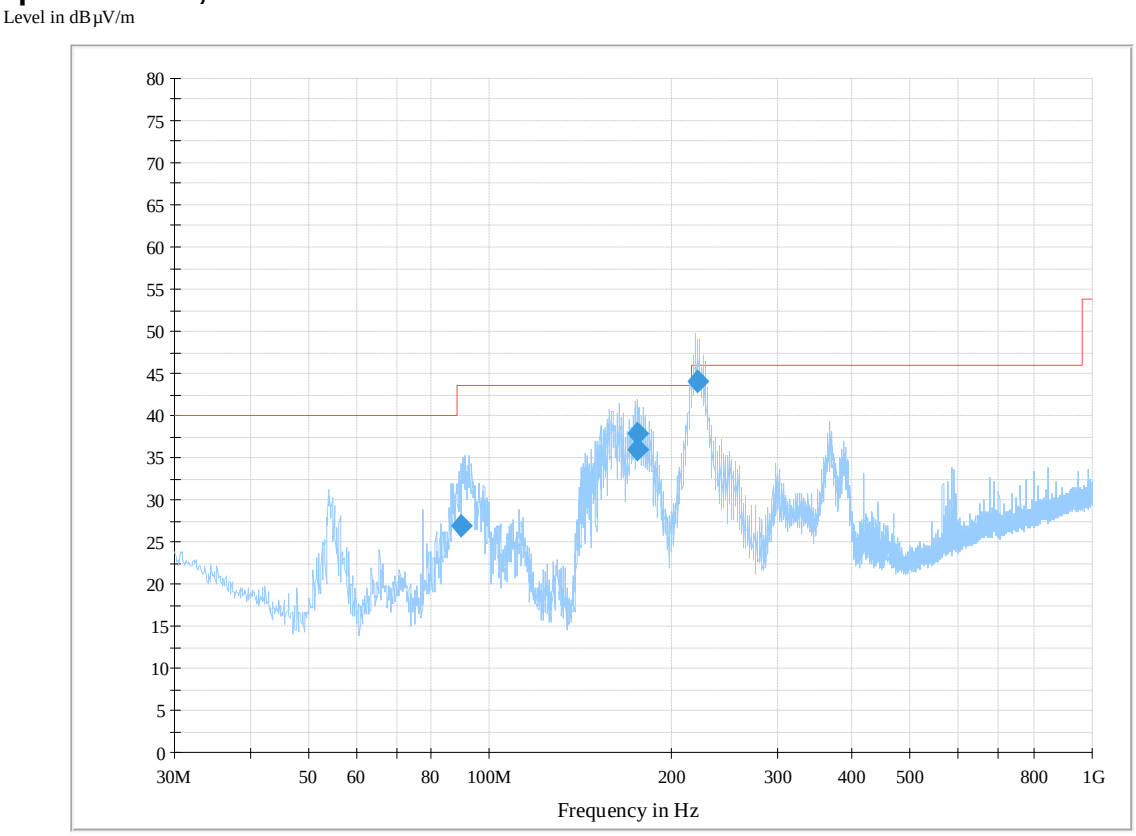
Figure 1: Spurious emission measurement results, 30MHz-1GHz, vertical polarization, worst case



Final measurement result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
55.305250	38.0	175.0	V	239.0	5.1	2.0	40.0
88.987750	25.4	99.9	V	23.0	9.7	18.1	43.5
162.165750	36.7	116.0	V	94.0	8.8	6.8	43.5
220.575000	34.2	99.9	V	90.0	10.0	11.8	46.0

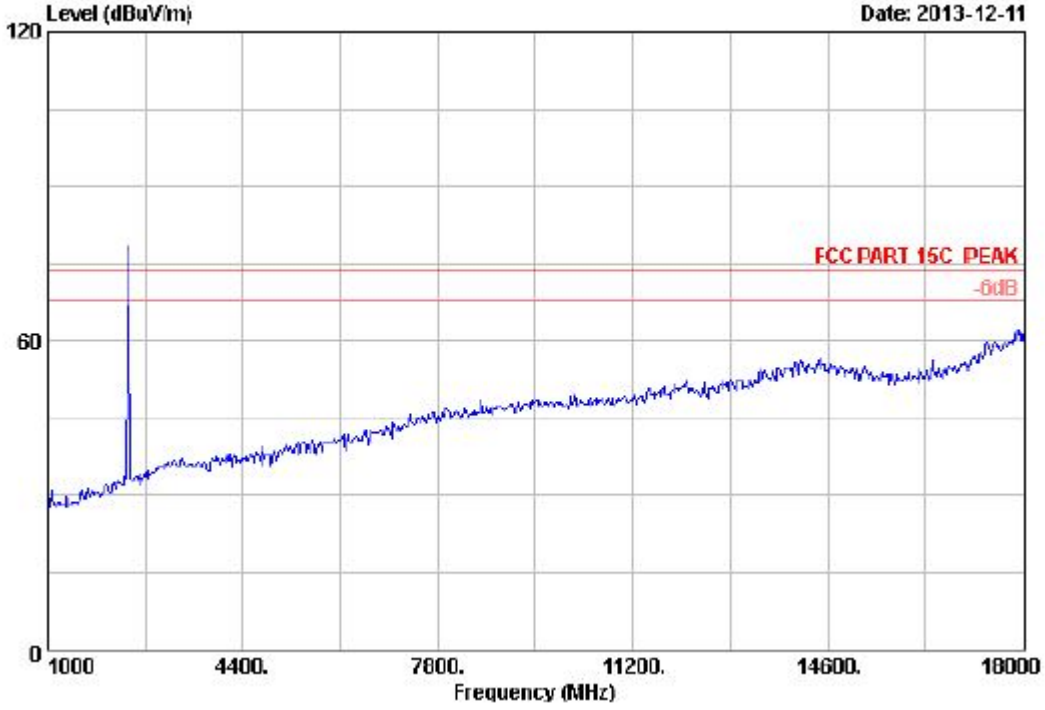
Figure 2: Spurious emission measurement results, 30MHz-1GHz, horizontal polarization, worst case



Final measurement result:

Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
89.710250	26.9	275.0	H	222.0	9.7	16.6	43.5
175.997250	37.8	175.0	H	131.0	10.1	5.7	43.5
175.997250	35.9	193.0	H	131.0	10.1	7.6	43.5
221.739500	44.1	175.0	H	144.0	10.1	1.9	46.0

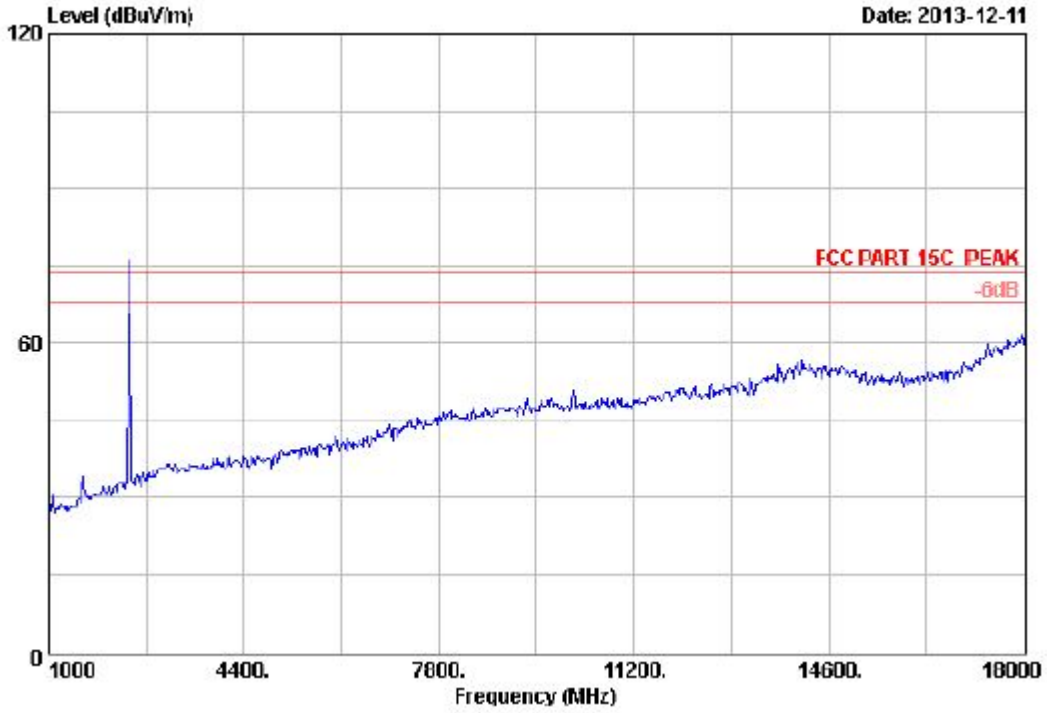
Figure 3: Spurious emission measurement results, low channel, 1GHz -18GHz, horizontal polarization, BDR



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.000	28.18	5.80	35.70	85.03	83.31	74.00	-9.31	Peak
2	4804.000	32.85	6.56	35.70	44.79	50.50	74.00	23.50	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Figure 4: Spurious emission measurement results, low channel, 1GHz-18GHz, vertical polarization, BDR

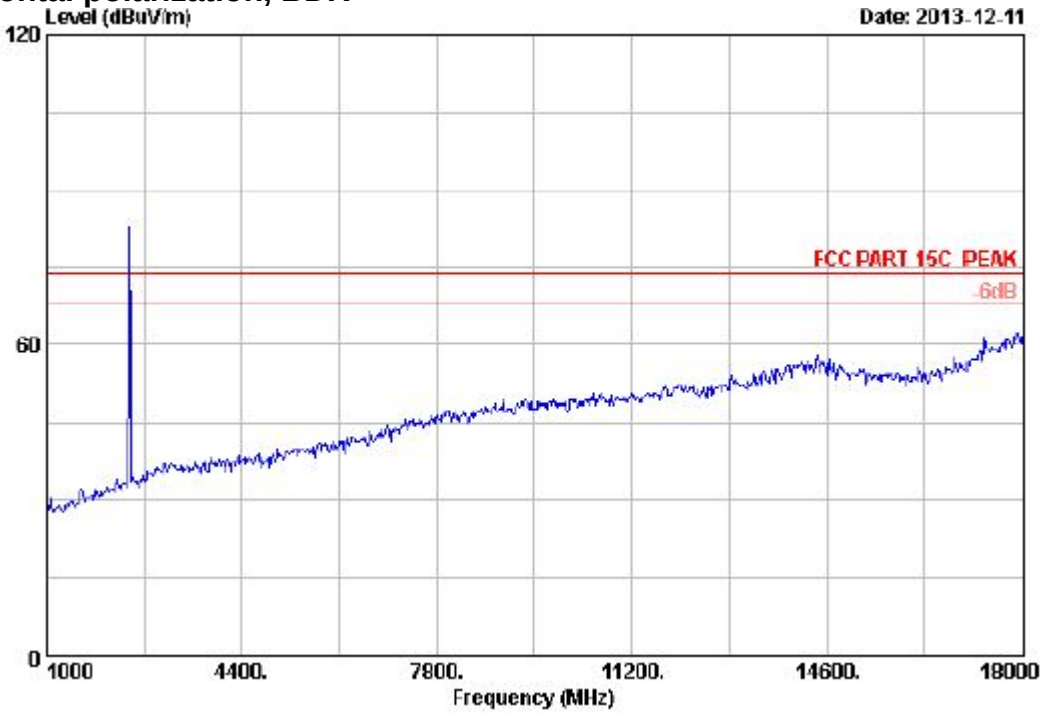


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.000	28.18	5.80	35.70	84.78	83.06	74.00	-9.06	Peak
2	4804.000	32.85	6.56	35.70	45.36	51.07	74.00	22.93	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 5: Spurious emission measurement results, mid channel, 1GHz-18GHz, horizontal polarization, BDR

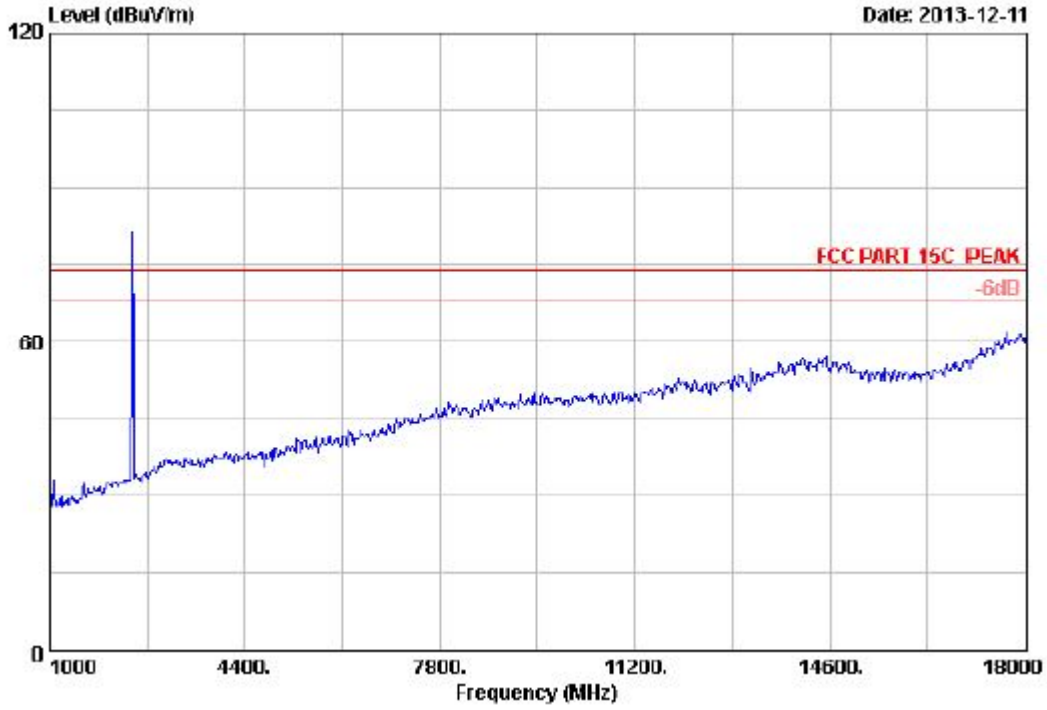


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.000	28.27	5.86	35.70	86.22	84.65	74.00	-10.65	Peak
2	4882.000	32.99	8.64	35.70	44.96	50.89	74.00	23.11	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 6: Spurious emission measurement results, mid channel, 1GHz-18GHz, vertical polarization, BDR

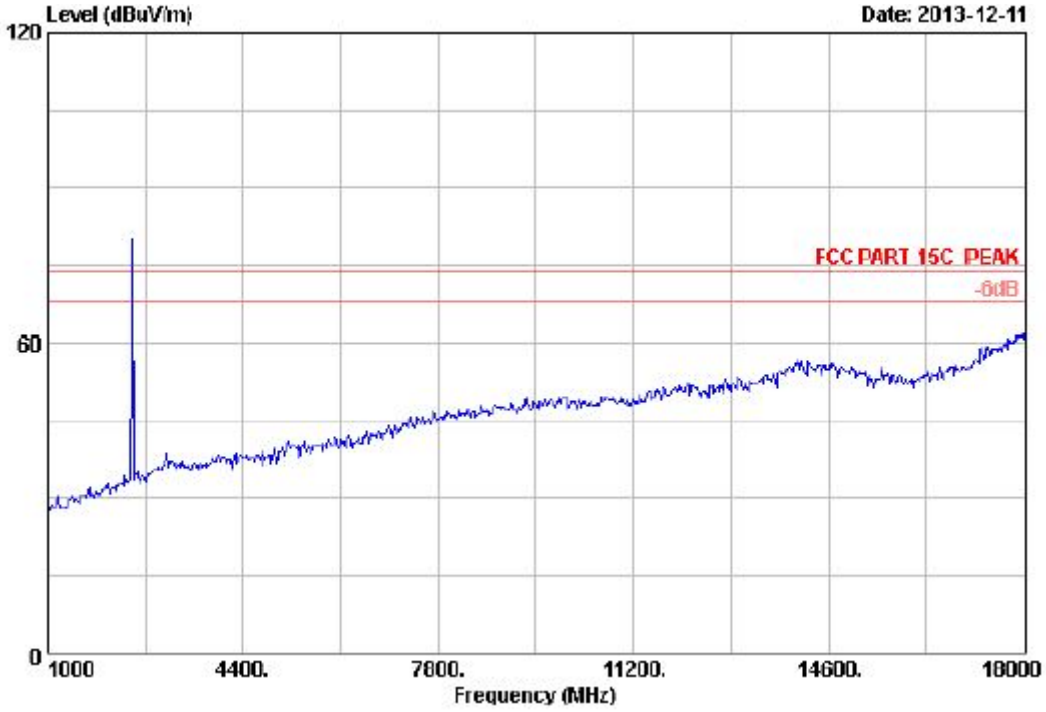


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.000	28.27	5.86	35.70	85.31	83.74	74.00	-9.74	Peak
2	4882.000	32.99	8.64	35.70	45.66	51.59	74.00	22.41	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 7: Spurious emission measurement results, high channel, 1GHz-18GHz, horizontal polarization, BDR

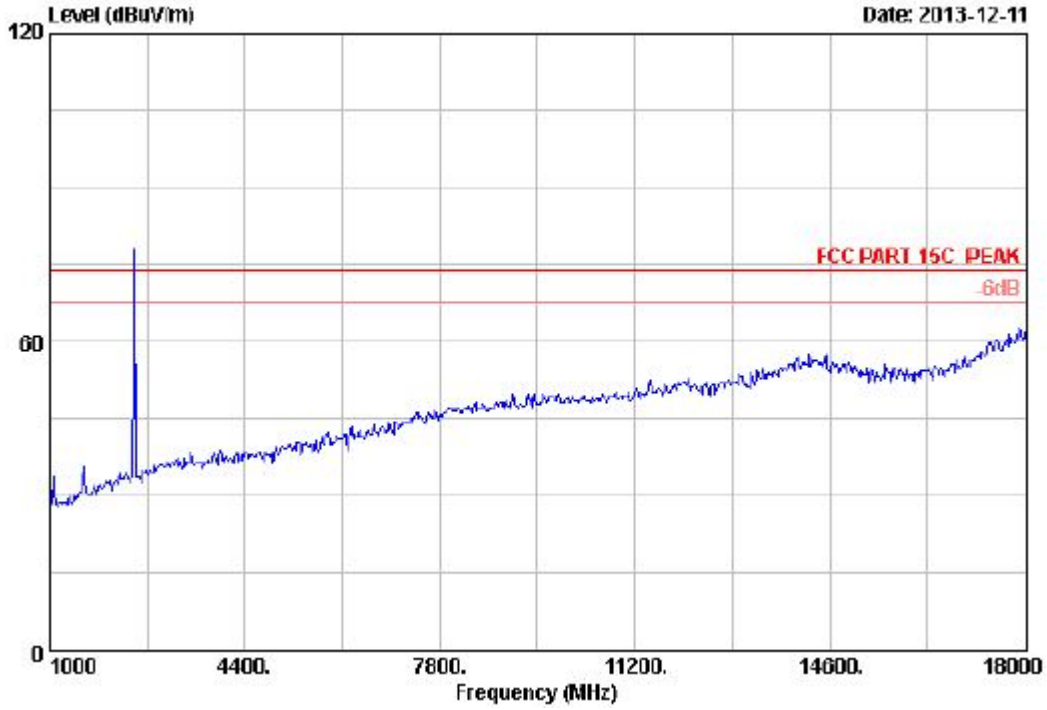


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.000	28.36	5.91	35.70	83.88	82.45	74.00	-8.45	Peak
2	4960.000	33.13	8.72	35.70	44.62	50.77	74.00	23.23	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 8: Spurious emission measurement results, high channel, 1GHz-18GHz, vertical polarization

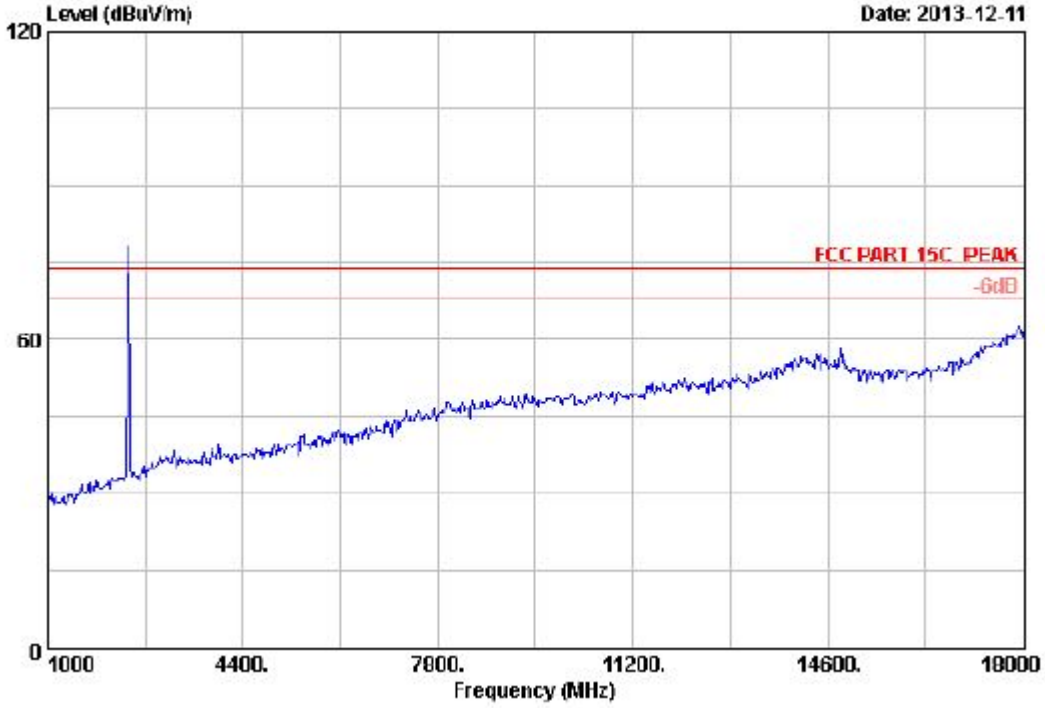


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.000	28.36	5.91	35.70	81.19	79.76	74.00	-5.76	Peak
2	2480.000	28.36	5.91	35.70	45.26	43.83	74.00	30.17	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 9: Spurious emission measurement results, low channel, 1GHz-18GHz, horizontal polarization, EDR

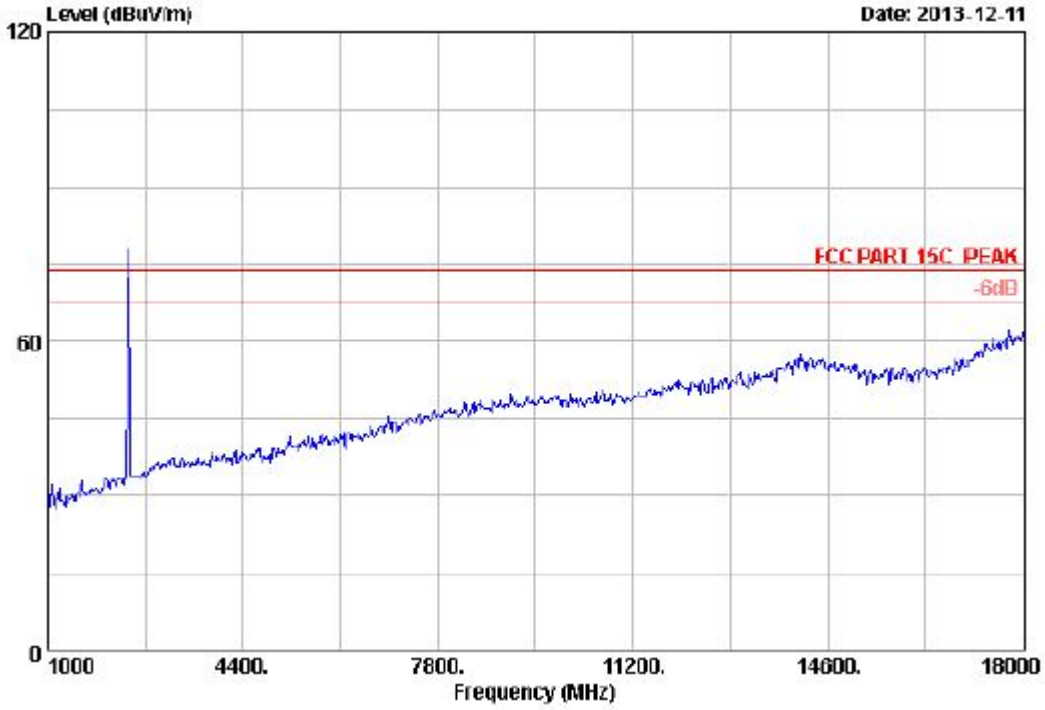


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.000	28.18	5.80	35.70	80.33	78.61	74.00	-4.61	Peak
2	4804.000	32.85	8.56	35.70	45.29	51.00	74.00	23.00	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 10: Spurious emission measurement results, high channel, 1GHz-18GHz, vertical polarization, EDR

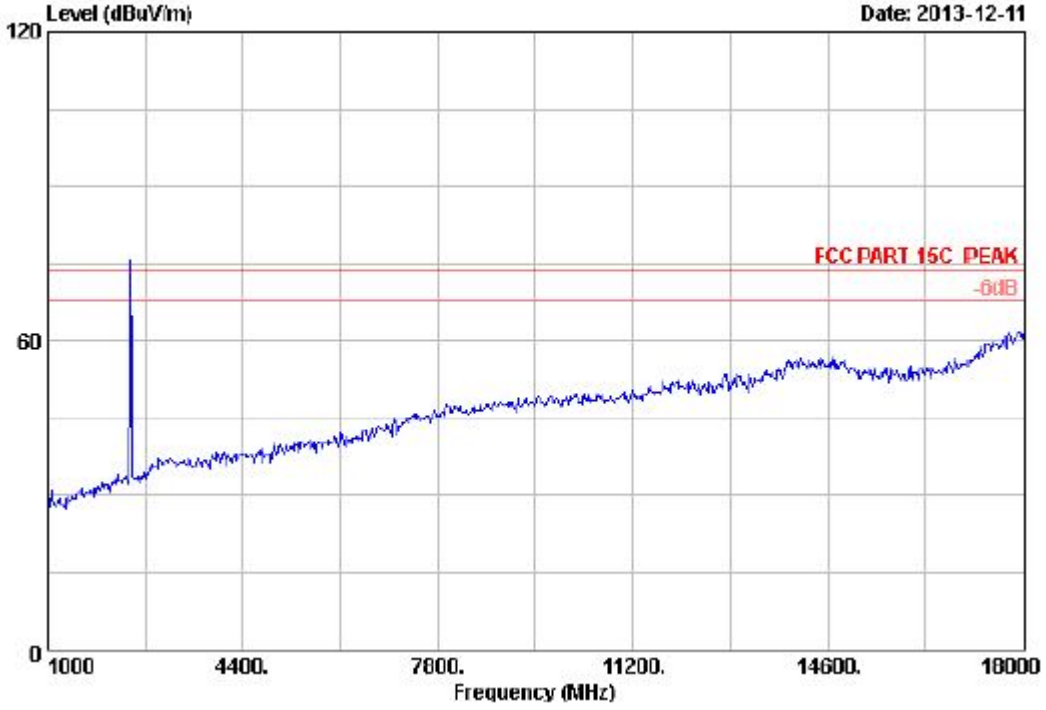


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2402.000	28.18	5.80	35.70	81.74	80.02	74.00	-6.02	Peak
2	4804.000	32.85	8.56	35.70	44.67	50.38	74.00	23.62	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 11: Spurious emission measurement results, mid channel, 1GHz-18GHz, horizontal polarization, EDR

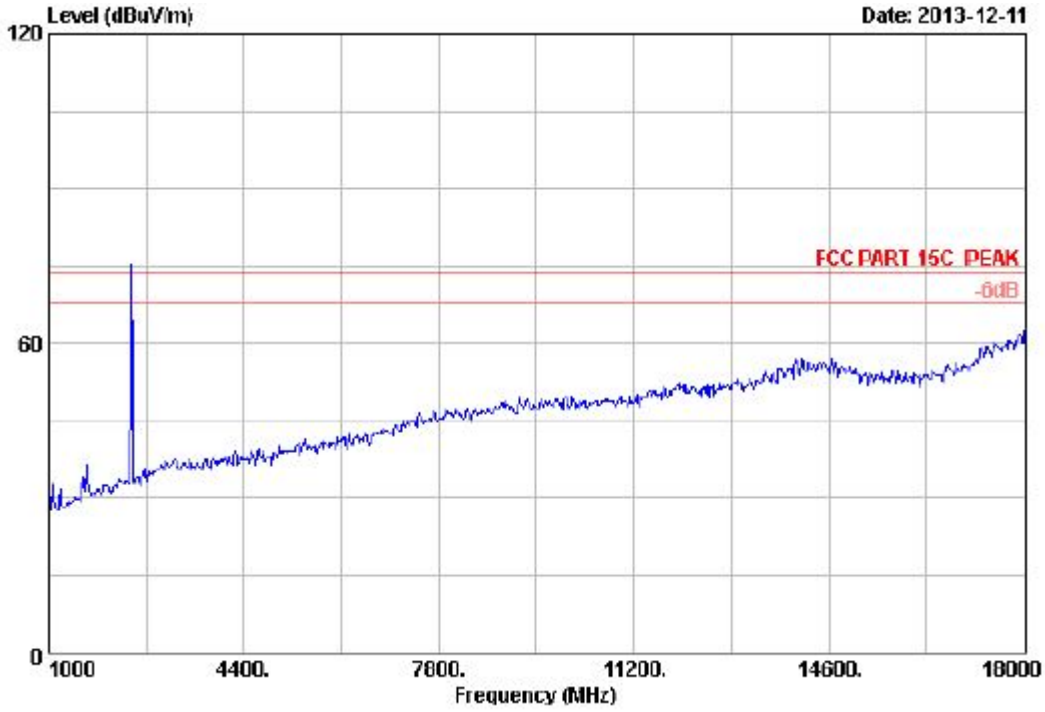


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.000	28.27	5.86	35.70	80.37	78.80	74.00	-4.80	Peak
2	4882.000	32.99	8.64	35.70	45.03	50.96	74.00	23.04	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 12: Spurious emission measurement results, mid channel, 1GHz-18GHz, vertical polarization, EDR

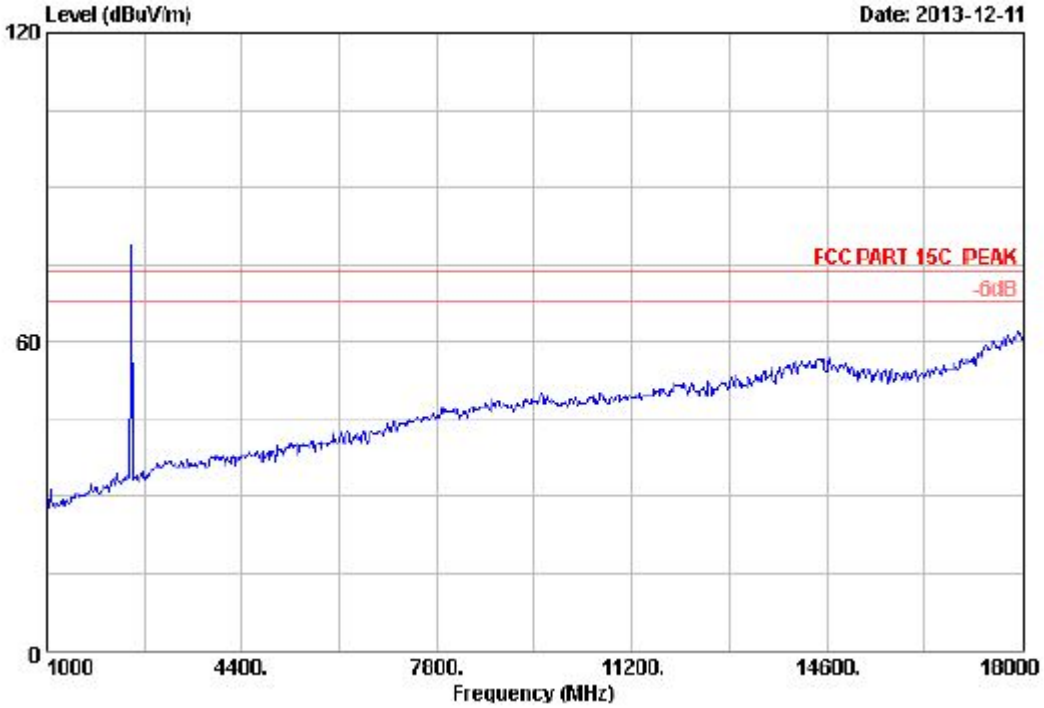


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2441.000	28.27	5.86	35.70	80.38	78.81	74.00	-4.81	Peak
2	4882.000	32.99	6.64	35.70	44.97	50.90	74.00	23.10	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 13: Spurious emission measurement results, high channel, 1GHz-18GHz, horizontal polarization, EDR

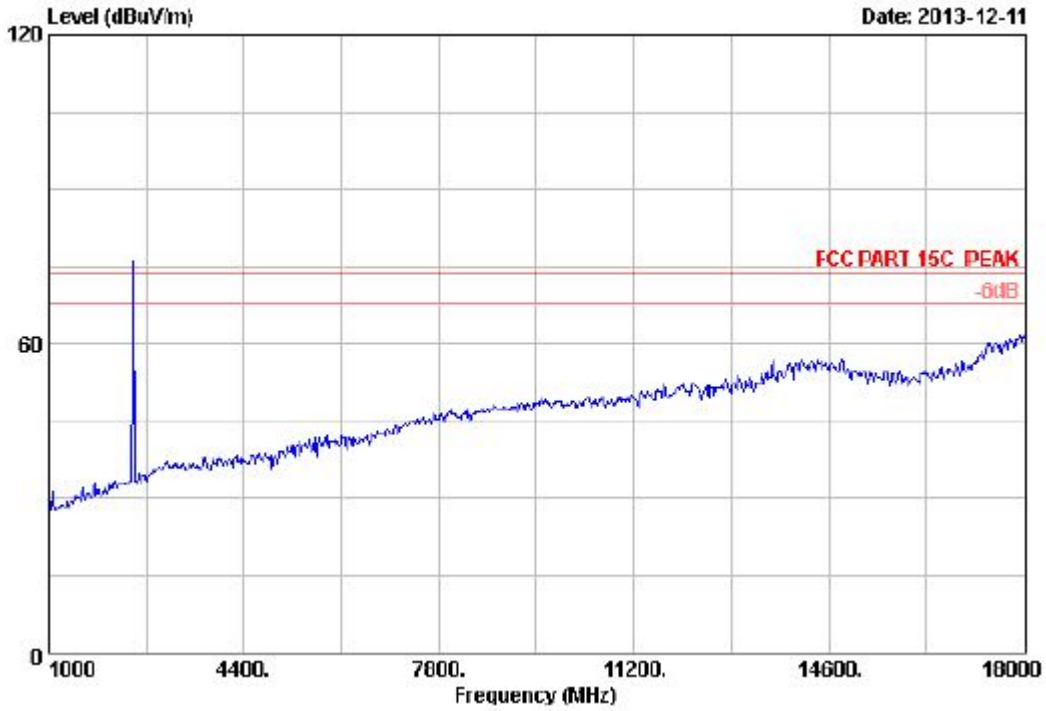


	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.000	28.36	5.91	35.70	80.42	78.99	74.00	-4.99	Peak
2	4960.000	33.13	8.72	35.70	44.73	50.86	74.00	23.12	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 14: Spurious emission measurement results, high channel, 1GHz-18GHz, vertical polarization, EDR



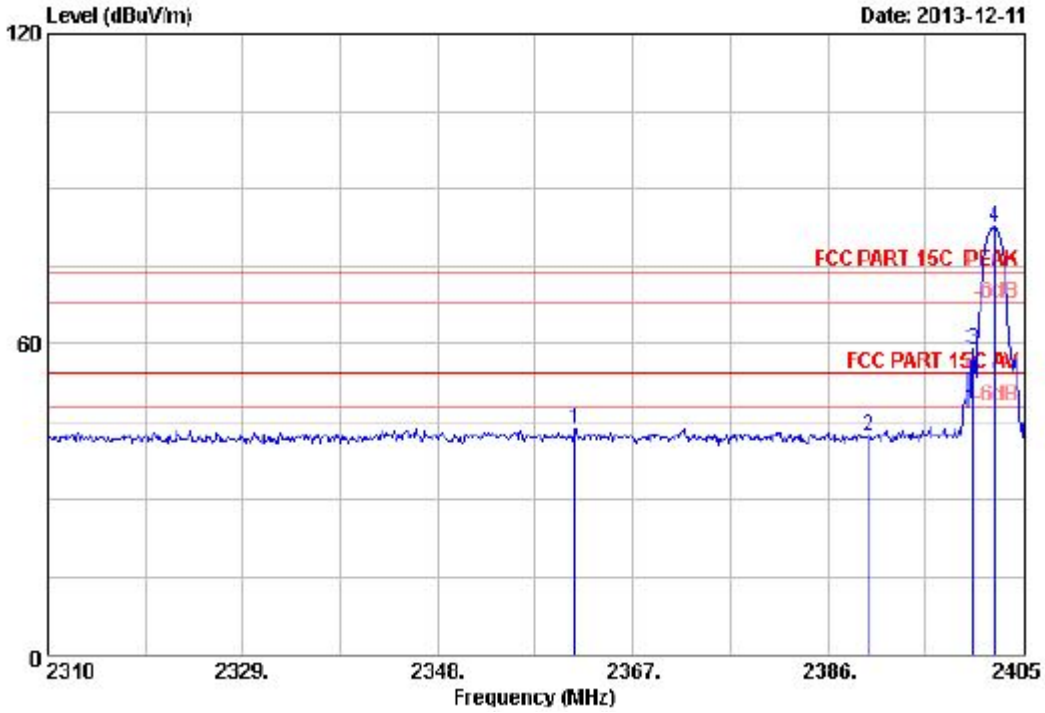
	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.000	28.36	5.91	35.70	79.96	78.53	74.00	-4.53	Peak
2	4960.000	33.13	8.72	35.70	45.13	51.28	74.00	22.72	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

Note: At the frequency from 18GHz-26GHz, no emission was found above the background noise.

Figure 15: Band Edge measurement results

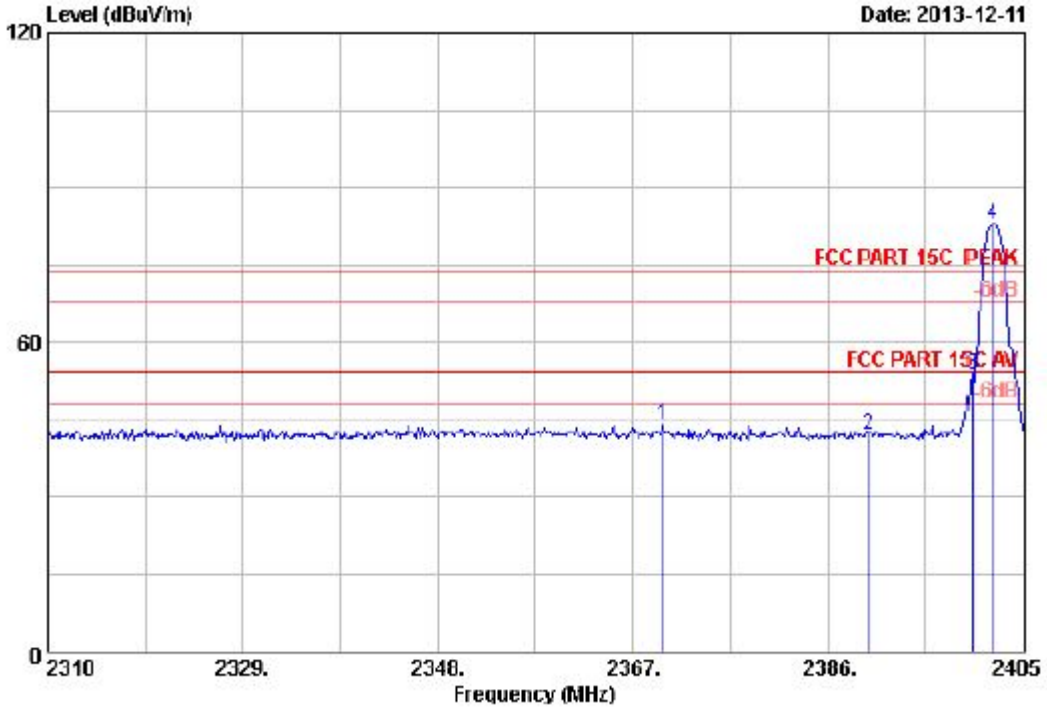
Low Channel，BDR, vertical polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2361.300	28.09	5.74	35.70	45.74	43.87	74.00	30.13	Peak
2	2390.000	28.16	5.76	35.70	44.29	42.53	74.00	31.47	Peak
3	2400.000	28.18	5.80	35.70	60.44	58.72	74.00	15.28	Peak
4	2402.150	28.18	5.80	35.70	84.15	82.43	74.00	-8.43	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

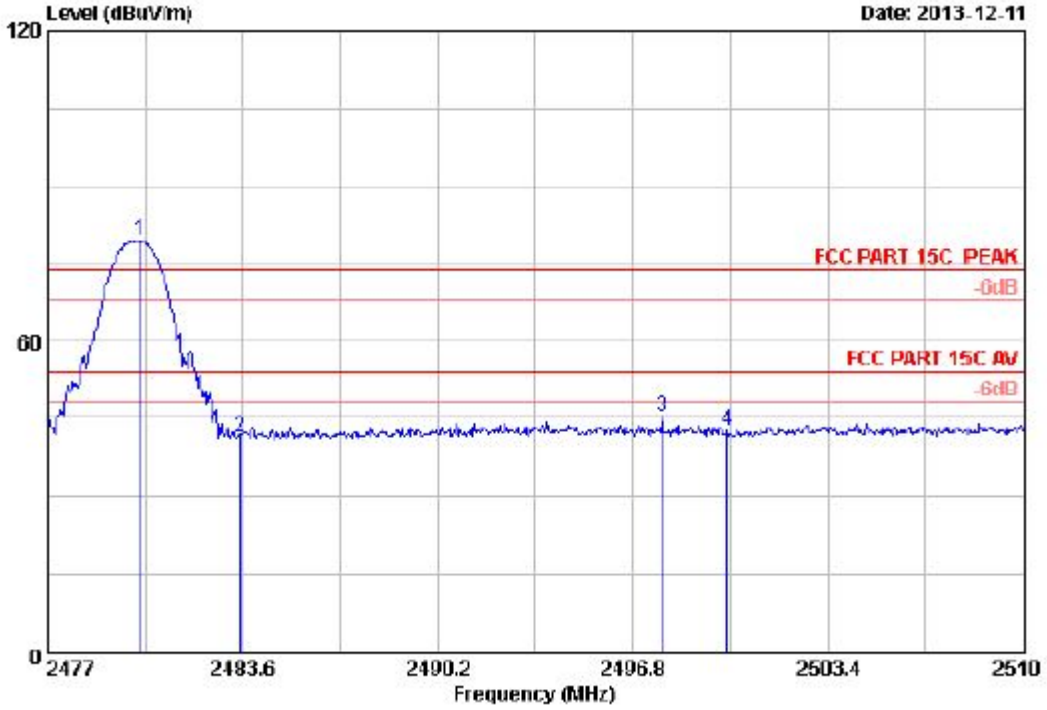
Low Channel，BDR, horizontal polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2369.850	28.11	5.75	35.70	45.83	43.99	74.00	30.01	Peak
2	2390.000	28.16	5.76	35.70	44.01	42.25	74.00	31.75	Peak
3	2400.000	28.18	5.80	35.70	55.48	53.76	74.00	20.24	Peak
4	2401.865	28.18	5.80	35.70	84.63	82.91	74.00	-8.91	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

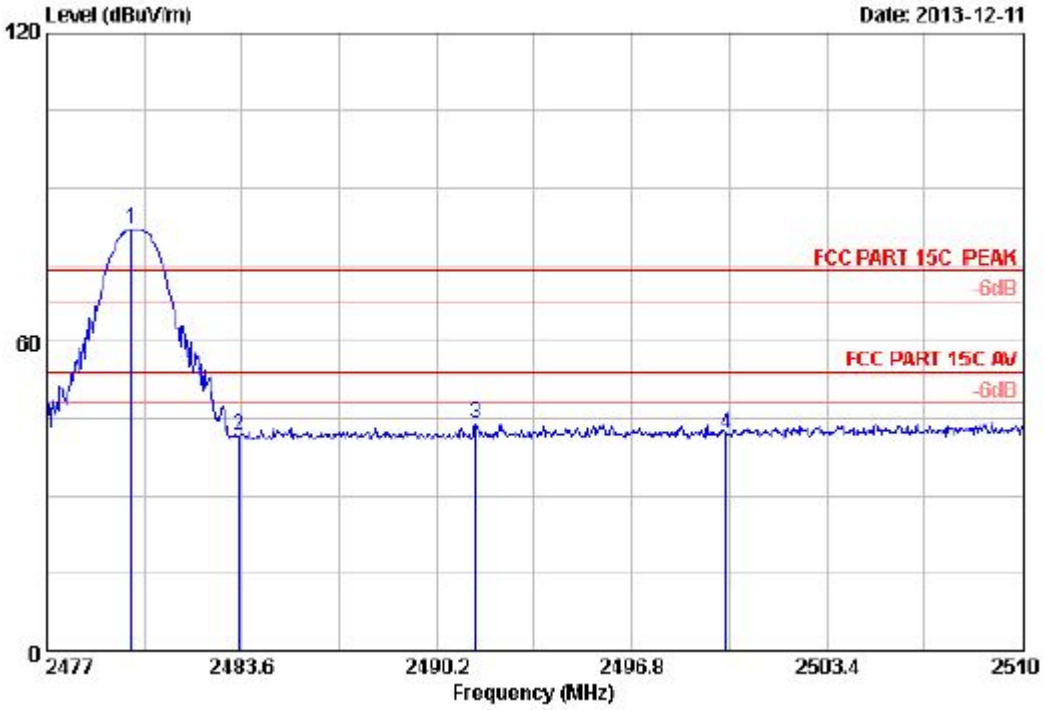
High Channel，BDR, vertical polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.135	28.36	5.91	35.70	80.88	79.45	74.00	-5.45	Peak
2	2483.500	28.36	5.92	35.70	42.58	41.16	74.00	32.84	Peak
3	2497.790	28.40	5.94	35.70	46.44	45.08	74.00	28.92	Peak
4	2500.000	28.40	5.94	35.70	43.64	42.28	74.00	31.72	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

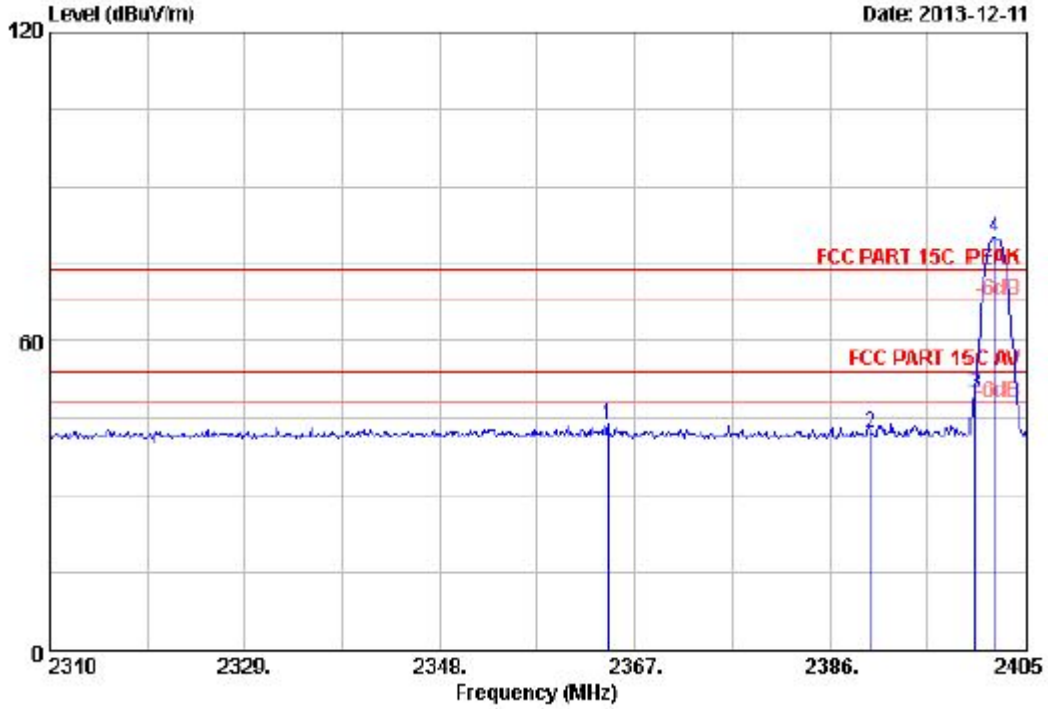
High Channel，BDR, horizontal polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.871	28.36	5.91	35.70	83.35	81.92	74.00	-7.92	Peak
2	2483.500	28.36	5.92	35.70	43.18	41.76	74.00	32.24	Peak
3	2491.520	28.38	5.93	35.70	45.54	44.15	74.00	29.85	Peak
4	2500.000	28.40	5.94	35.70	43.45	42.09	74.00	31.91	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

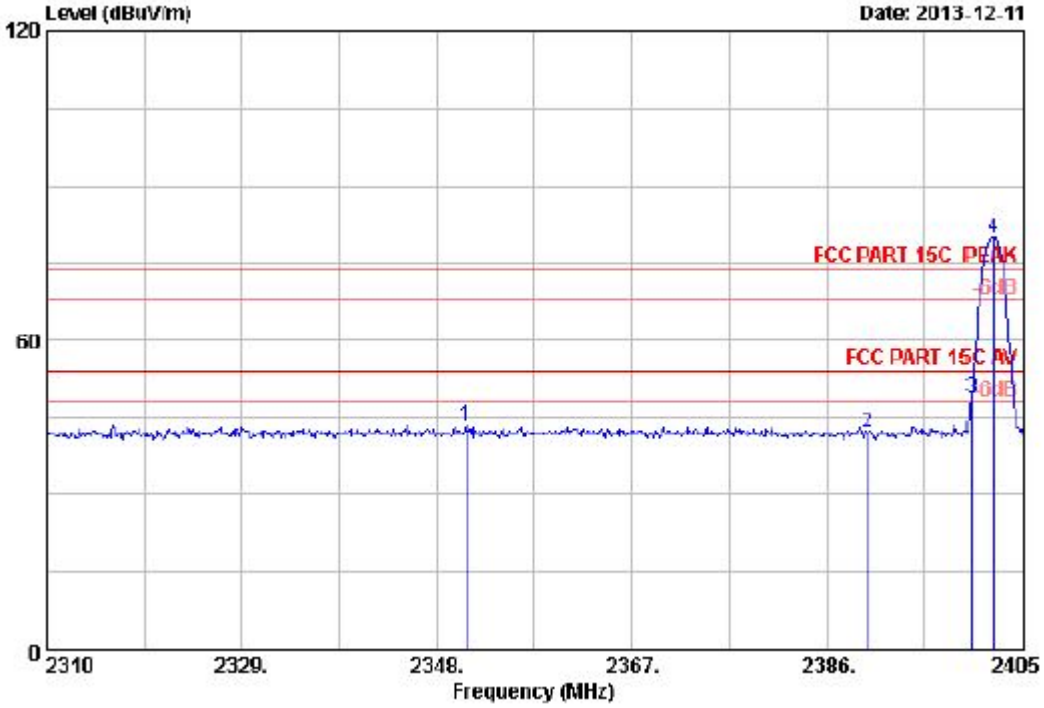
Low Channel，EDR, vertical polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2364.435	28.10	5.75	35.70	45.66	43.81	74.00	30.19	Peak
2	2390.000	28.16	5.78	35.70	43.73	41.97	74.00	32.03	Peak
3	2400.000	28.18	5.80	35.70	51.53	49.81	74.00	24.19	Peak
4	2401.865	28.18	5.80	35.70	82.10	80.38	74.00	-6.38	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

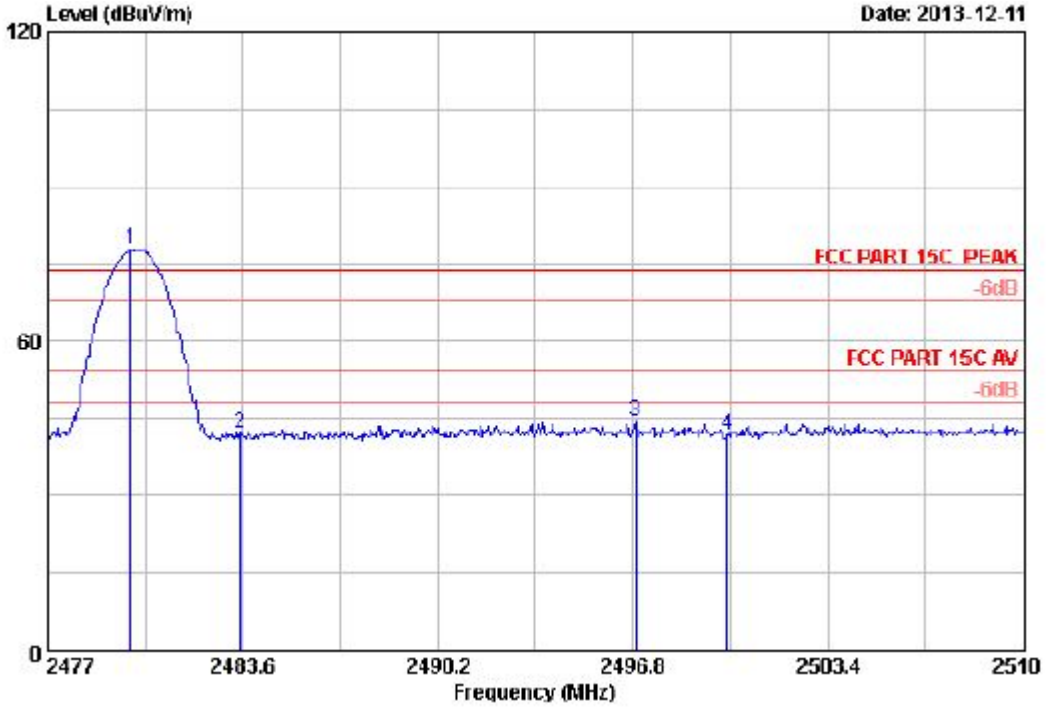
Low Channel，EDR, horizontal polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2350.850	28.07	5.73	35.70	45.42	43.52	74.00	30.48	Peak
2	2390.000	28.16	5.78	35.70	44.00	42.24	74.00	31.76	Peak
3	2400.000	28.18	5.80	35.70	50.56	48.84	74.00	25.16	Peak
4	2402.150	28.18	5.80	35.70	81.75	80.03	74.00	-6.03	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

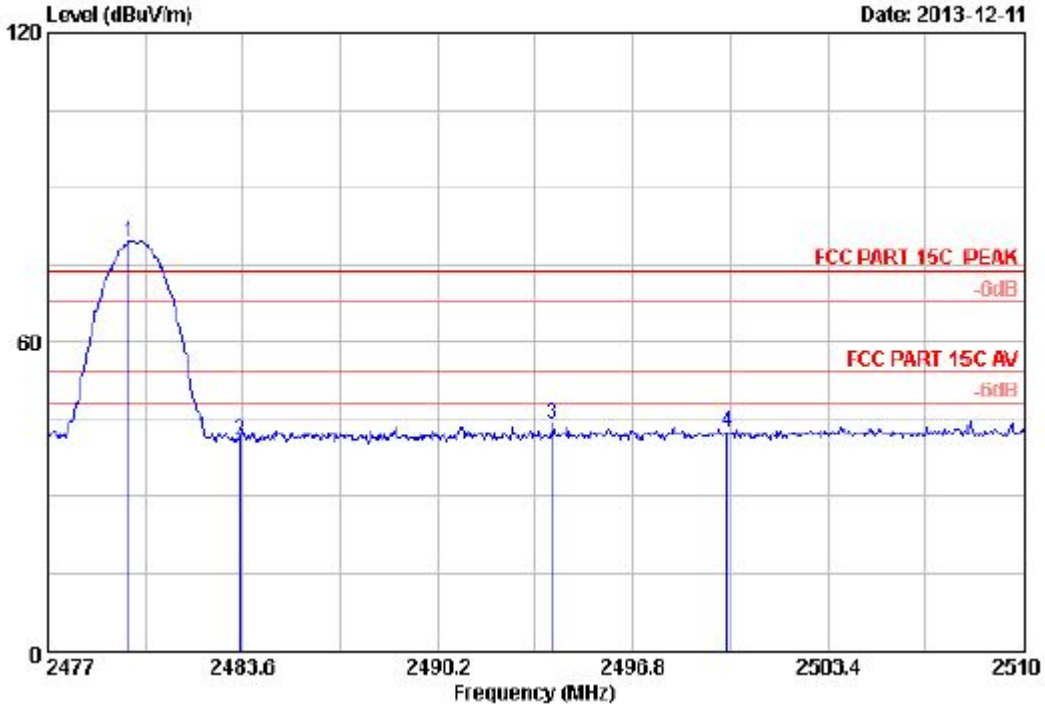
High Channel，EDR, vertical polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.805	28.36	5.91	35.70	79.17	77.74	74.00	-3.74	Peak
2	2483.500	28.36	5.92	35.70	43.61	42.19	74.00	31.81	Peak
3	2496.899	28.39	5.94	35.70	45.96	44.59	74.00	29.41	Peak
4	2500.000	28.40	5.94	35.70	43.27	41.91	74.00	32.09	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

High Channel，EDR, horizontal polarization



	Freq. (MHz)	Ant. Factor (dB/m)	Cable loss (dB)	Amp. Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.739	28.36	5.91	35.70	60.96	79.53	74.00	-5.53	Peak
2	2483.500	28.36	5.92	35.70	42.36	40.94	74.00	33.06	Peak
3	2494.061	28.39	5.93	35.70	45.59	44.21	74.00	29.79	Peak
4	2500.000	28.40	5.94	35.70	43.94	42.58	74.00	31.42	Peak

Remarks:
1. Emission Level= Antenna Factor + Cable Loss -Amp Factor + Reading.
2. The emission levels that are 20dB below the official limit are not reported.

4.1.6 Frequency Separation

RESULT: **Passed**

Date of testing	:	2013-12-23
Test standard	:	FCC part 15.247(a)(1)
Limit	:	≥ 25kHz or 2/3 of 20dB bandwidth, whichever is greater

Test setup

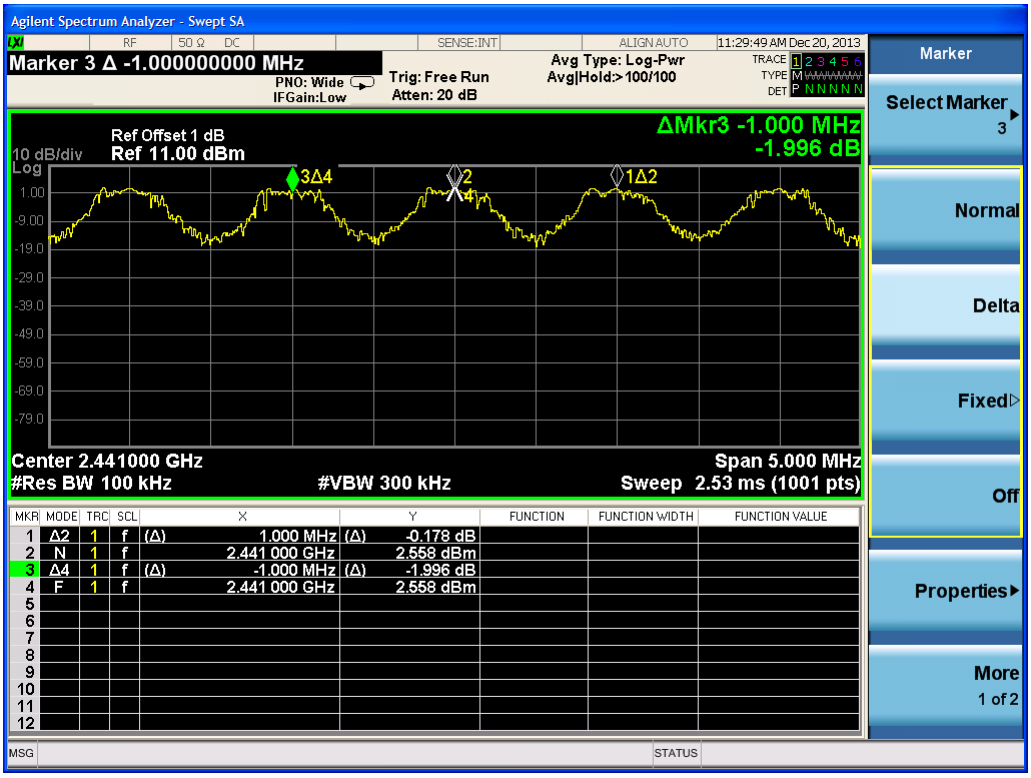
Test Channel	:	Low/ Middle/ High
Operation Mode	:	A and B
Ambient temperature	:	23℃
Relative humidity	:	54%
Atmospheric pressure	:	101 kPa

Table 9: Test result of Frequency Separation

Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Mid Channel	2441	1	≥ 25kHz or 2/3 of 20dB bandwidth	Passed
Adjacency Channel	2442			
Adjacency Channel	2440			

The frequency separation value that was found at the lowest and highest frequency is the same as the middle channel.
The frequency separation value in enhance data rate is the same as in basic data rate.

Test Plot of Frequency Separation



4.1.7 Number of hopping frequency

RESULT: **Passed**

Date of testing	:	2013-12-23
Test standard	:	FCC part 15.247(a)(1)(iii)
Limits	:	≥ 15 non-overlapping channels
Kind of test site	:	Shield room

Test setup

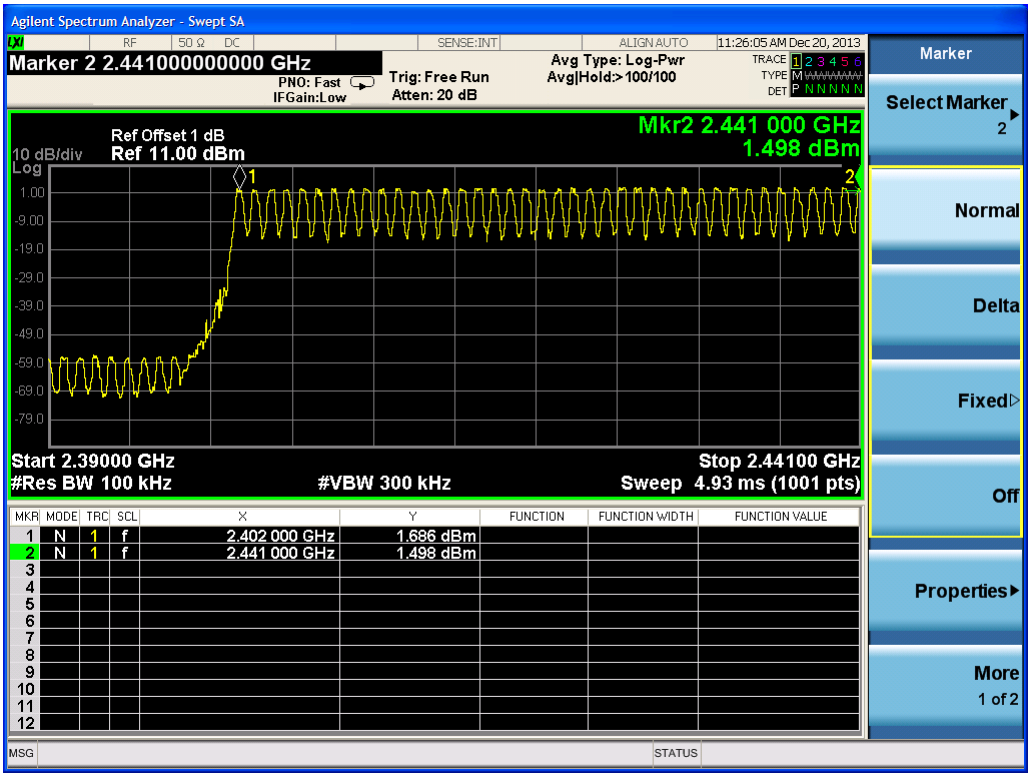
Test Channel	:	Low/ Middle/ High
Operation Mode	:	A and B
Ambient temperature	:	23℃
Relative humidity	:	54%
Atmospheric pressure	:	101 kPa

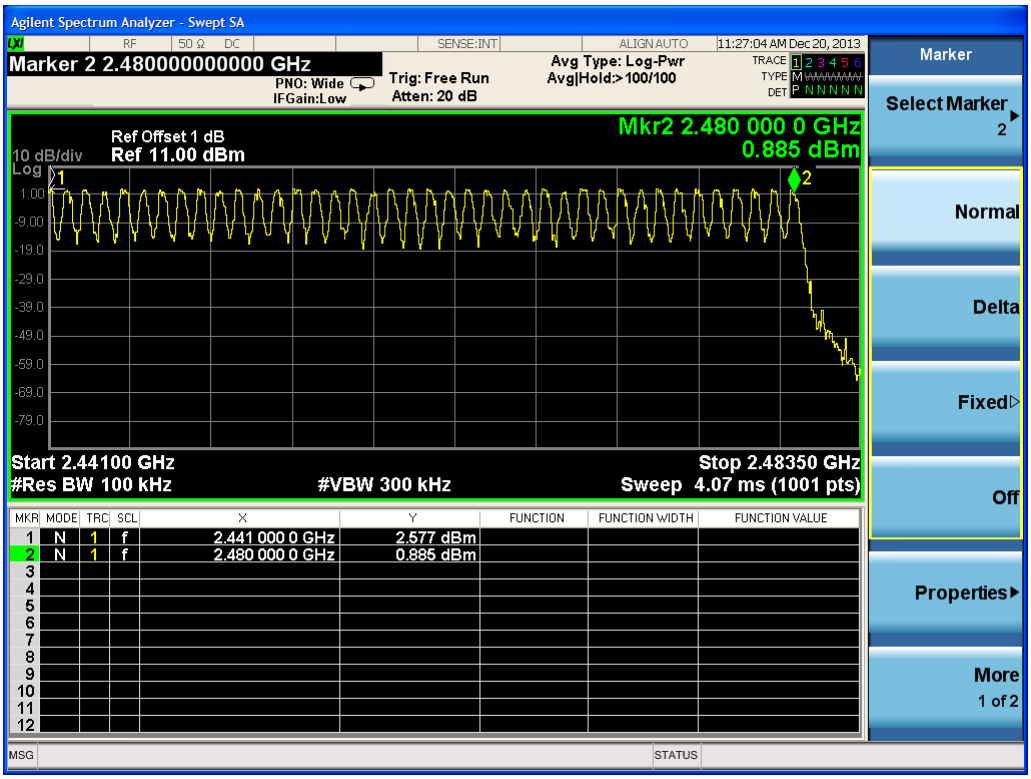
Table 10: Test result of Number of hopping frequency

Frequency Range	Measured Quantity of Hopping Channel	Limit	Result
2400 to 2483.5 MHz	79	≥15	Passed

The number of hopping frequency in enhance data rate is the same as in basic data rate.

Test Plot of Number of hopping frequencies





4.1.8 Time of Occupancy

RESULT: **Passed**

Date of testing	:	2013-12-23
Test standard	:	FCC part 15.247(a)(1)(iii)
Limits	:	0.4s
Kind of test site	:	Shield room

Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A and B
Ambient temperature	:	22℃
Relative humidity	:	52%
Atmospheric pressure	:	101 kPa

Table 11: Test result of Time of Occupancy

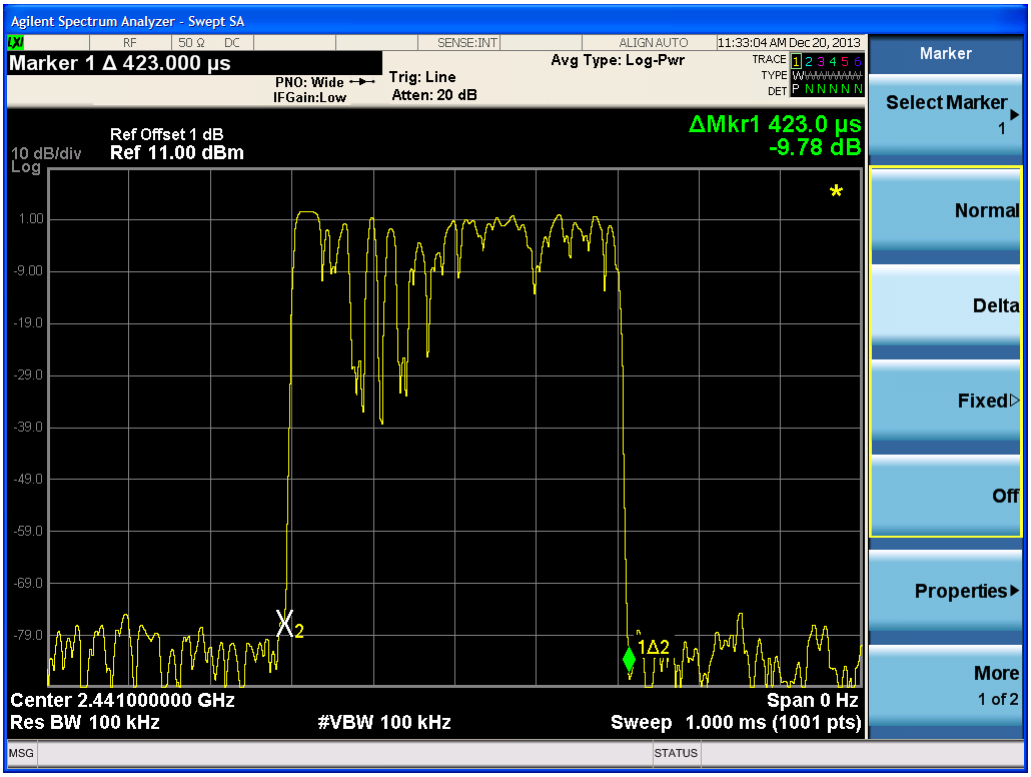
Data Mode	Pulse width (ms)	Formula of Dwell time	Measured Dwell time (s)	Limit (s)	Result
DH1	0.423	Pulse width*1600*31.6/2/79	0.135	<0.4	Passed
DH3	1.686	Pulse width*1600*31.6/4/79	0.269	<0.4	Passed
DH5	2.935	Pulse width*1600*31.6/6/79	0.313	<0.4	Passed

Note:

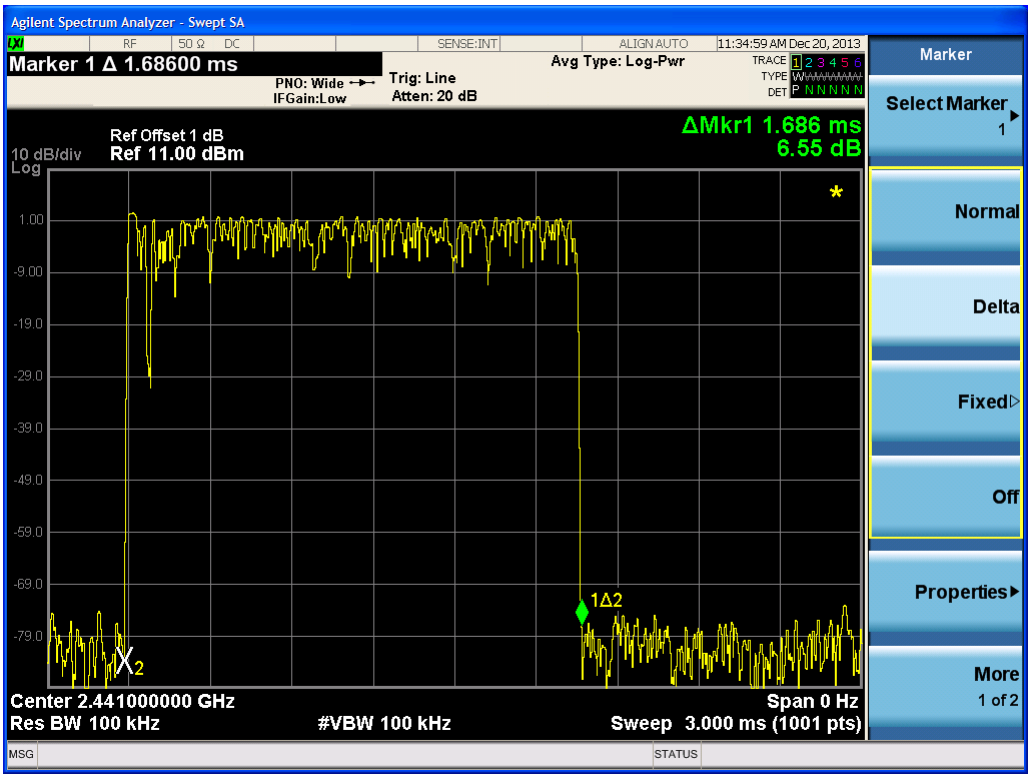
1. The dwell time value that was found at the lowest and highest frequency is the same as the middle channel.
2. Dwell time=Pulse width*(Hopping rate/Number of Channel)*Period

Test Plot of Time of Occupancy

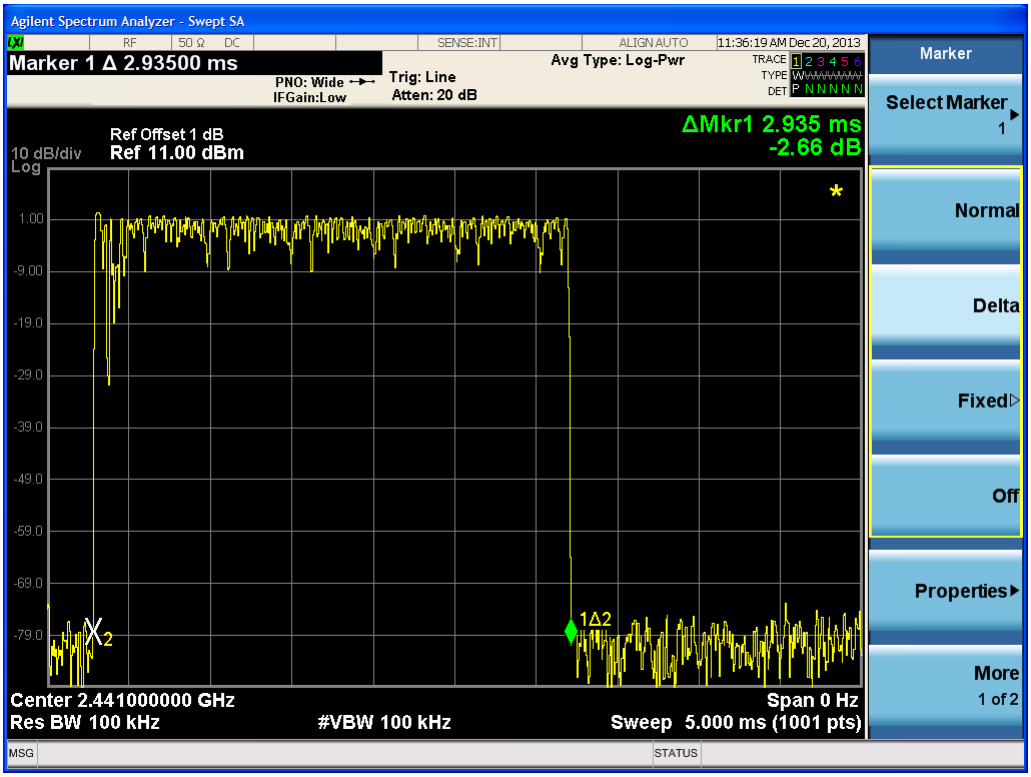
Middle Channel- DH1



Middle Channel- DH3



Middle Channel- DH5



4.1.9 Conduted Emission

RESULT: **Passed**

Date of testing	:	2013-11-25
Test procedure	:	FCC Part 15 Subpart C Section 15.207
Limits	:	0.15-0.5MHz, Quasi-peak: 66-56dBµV, Average: 56-46dBµV; 0.5-5MHz, Quasi-peak: 56dBµV, Average:46dBµV; 5-30MHz, Quasi-peak: 60dBµV, Average: 50dBµV
Kind of test site	:	Shielded room

Test Setup

Input voltage	:	AC 100V-120V; 60Hz
Operational mode	:	On
Earthing	:	Earthed through power cord. (as class II equipment)

The measurement setup was made according to ANSI C63.10:2009 in a shielded room.

The measurement equipment like test receivers, quasi-peak detector, average detector and LISN are in compliance with CISPR 16-1 series standards and ANSI C63.10:2009. The tested object was operated under its rated voltage and its rated frequency. Prior to the measurements the test object operated about 5 minutes (warm-up) in order to stabilize its operating conditions and to ensure reliable measurement values.

Furthermore an internal calibration with the test receiver was conducted prior to each measurement.

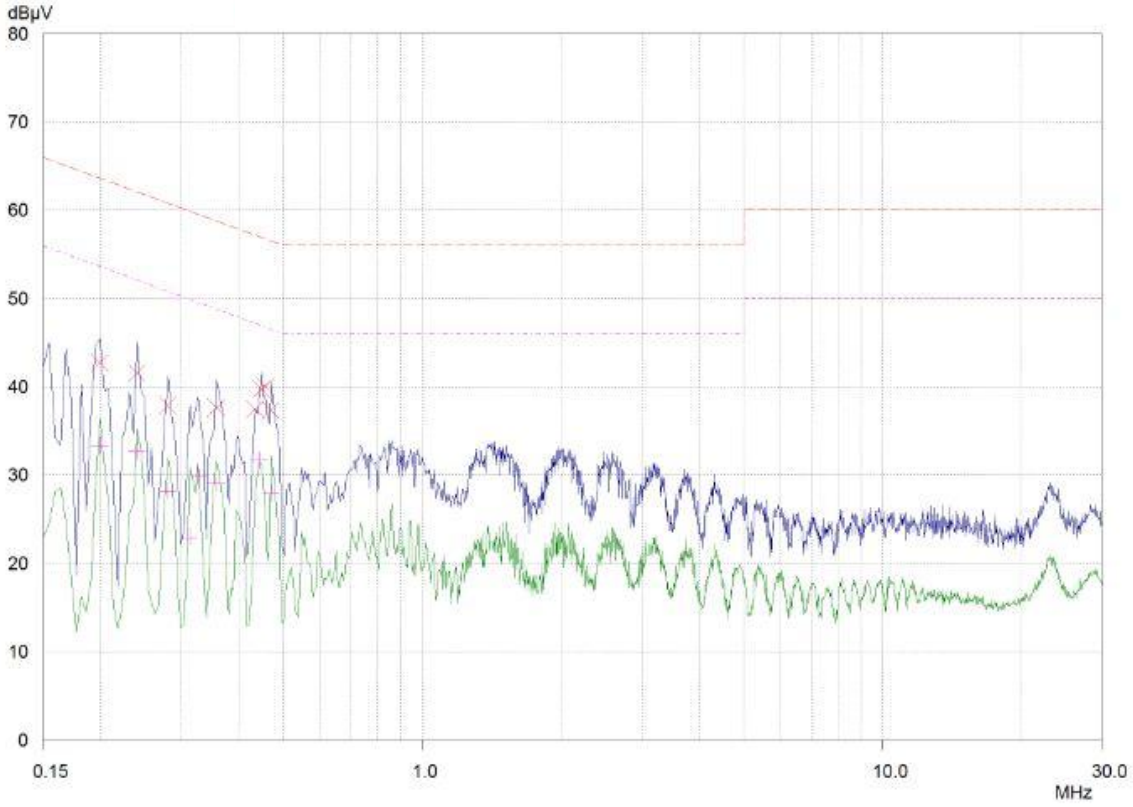
The EUT was set 0.8m away from the LISN. The cord longer than necessary to be connected to the LISN was folded forth and back parallel so as to form a bundle with a length between 0.3m and 0.4m.

The interference voltage was determined according to FCC Part 15 Subpart C Section 15.207 while measuring the line conductor by turns.

The test was carried out from 100V to 120V for the max. measurement results.

The following figures and tables were those measured by an automatic measuring system. A preview test was first made with peak detector. Final test with quasi-peak detector and average detector was only performed at these critical frequencies found via preview test.

Figure 16: Spectral diagrams and measurement results



Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Phase -	PE -
0.1995	42.70	63.63	20.93	L1	fl
0.24	41.51	62.10	20.59	L1	fl
0.2805	37.87	60.80	22.93	L1	fl
0.357	37.65	58.80	21.15	L1	fl
0.4335	37.47	57.19	19.72	N	fl
0.447	39.79	56.93	17.14	L1	fl
0.456	39.96	56.77	16.81	L1	fl
0.4695	37.35	56.52	19.17	L1	fl

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB	Phase -	PE -
0.1995	33.34	53.63	20.29	L1	fl
0.24	32.68	52.10	19.42	L1	fl
0.2805	28.23	50.80	22.57	L1	fl
0.312	22.96	49.92	26.96	L1	fl
0.3255	29.87	49.57	19.70	L1	fl
0.357	29.06	48.80	19.74	L1	fl
0.4425	31.70	47.01	15.31	L1	fl
0.4695	27.89	46.52	18.63	L1	fl

4.2 Radio Frequency Exprosure Compliance

4.2.1 Electromagnetic Fields

RESULT: **Passed**

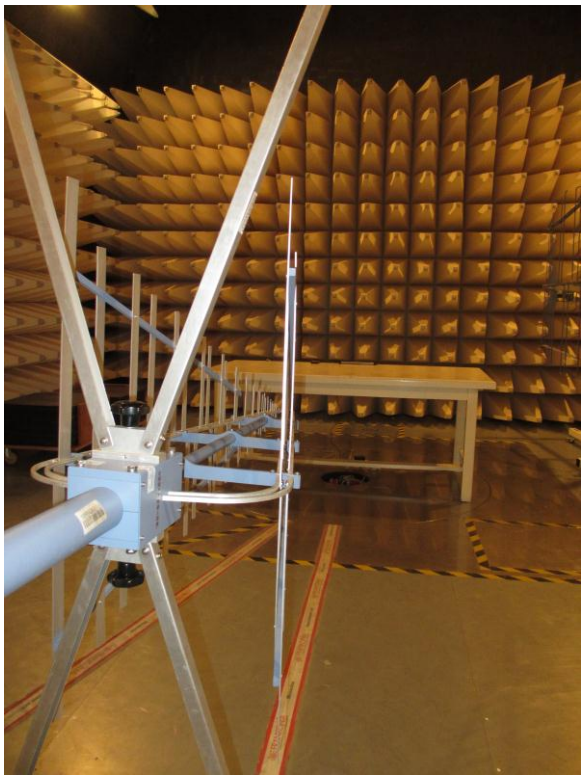
Date of testing	:	2013-12-23
Test standard	:	FCC KDB publication 447498

Test setup

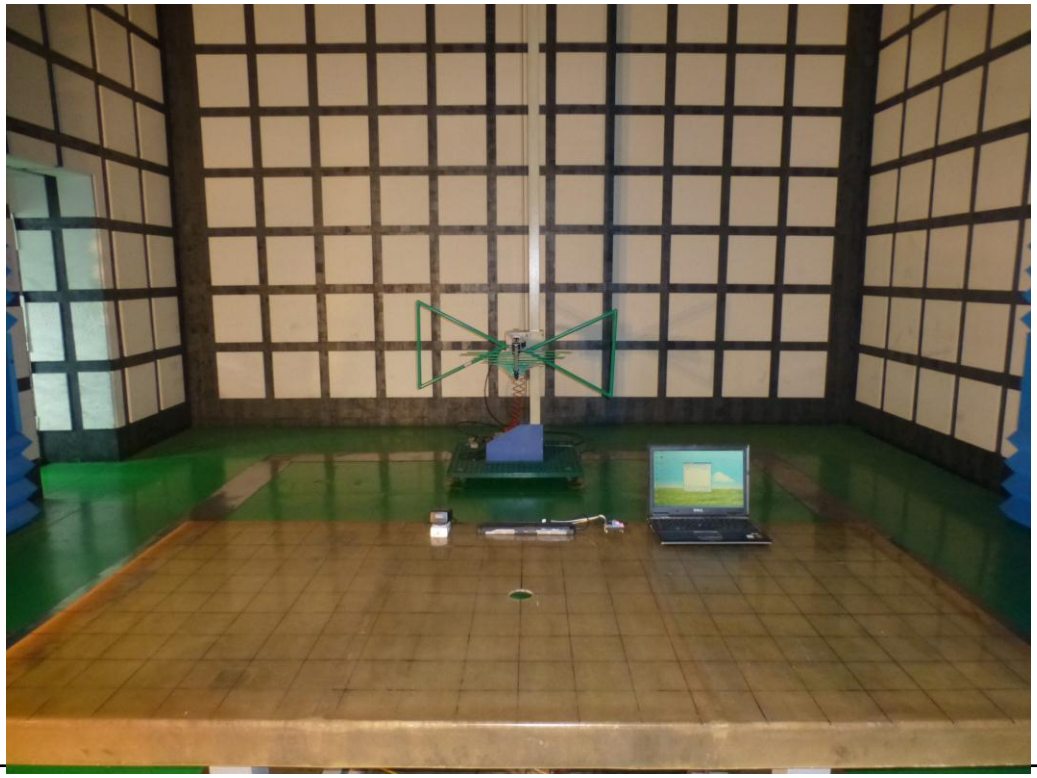
Since maximum peak output power of the transmitter is <60/f (GHz) mW, i.e. 1.47mW<25(=60/2.4) mW, hence the EUT is exclueded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

5. Photographs of the Test Set-Up

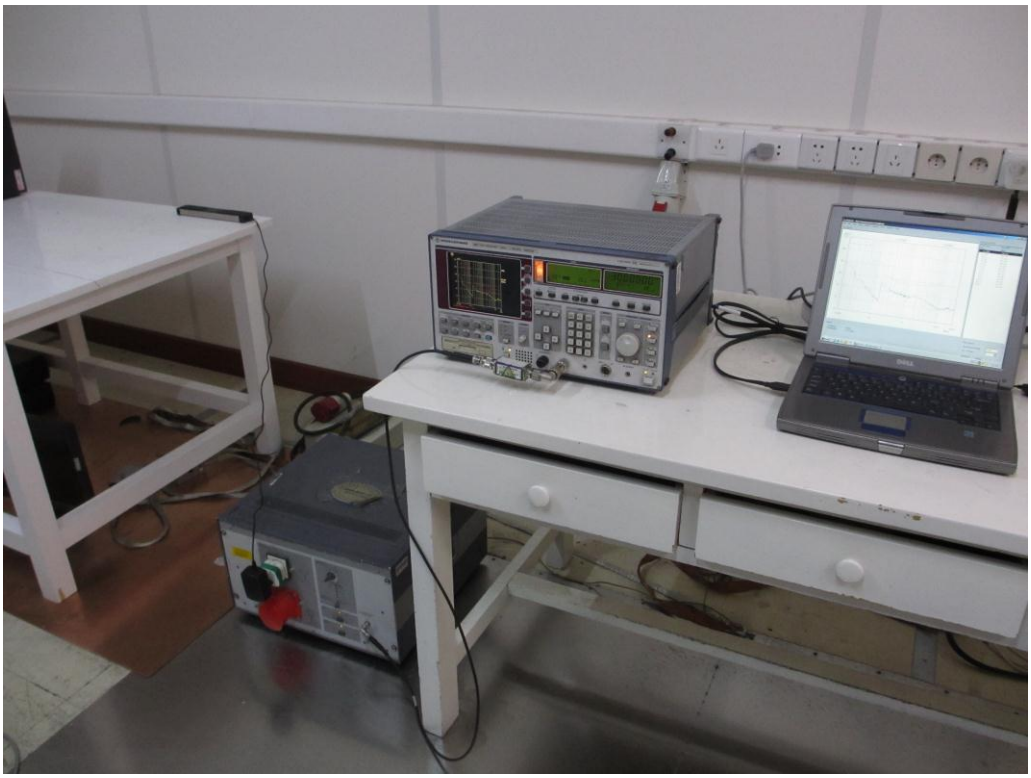
Photograph 1: Set-up for Spurious Emissions 30MHz – 1GHz



Photograph 2: Set-up for Spurious Emissions 1GHz – 18GHz



Photograph 3: Set-up for Conducted Emissions



Photograph 4: Set-up for RF test

6. List of Tables

7. List of Figures

8. List of Photographs