TESTING
No. L2264

Part 15C

TEST REPORT

Product Name	Tablet PC
Model	R8
FCC ID	NV8-R8
Client	Estone Technology Inc

TA Technology (Shanghai) Co., Ltd.

GENERAL SUMMARY

Product Name	Tablet PC	**Model**	R8
FCC ID	NV8-R8	**Report No.**	RXC1209-0833RF01R3
Client	Estone Technology Inc		
Manufacturer	Shenzhenshi ChuangZhiCheng Technology Co., Ltd Manufacturing Center		
Reference Standard(s)	**FCC CFR47 Part 15C (2012-12)** Radio Frequency Devices **15.205** Restricted bands of operation; **15.207** Conducted limits; **15.209** Radiated emission limits; general requirements; **15.247** Operation within the bands 902-928 MHz,2400-2483.5 MHz, and 5725-5850MHz. **ANSI C63.4** Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40GHz. (2009) **DA00-705** Filing and Frequency Measurement Guidelines For Frequency Hopping Spread Spectrum System.(2000)		
Conclusion	This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 2 of this test report are below limits specified in the relevant standards. General Judgment: **Pass** (Stamp) **Date of issue: December 21st,2012**		
Comment	The test result only responds to the measured sample.		

Approved by 杨伟中 Director **Revised by** 徐凯 RF Manager **Performed by** RF Engineer

TABLE OF CONTENT

1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

If the electrical report is inconsistent with the printed one, it should be subject to the latter.

1.2. Testing laboratory

Company:	TA Technology (Shanghai) Co., Ltd.
Registration Number:	428261
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Yang Weizhong
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	yangweizhong@ta-shanghai.com

1.3. Applicant Information

Company:	Estone Technology Inc
Address:	3324 secor road #8, Toledo, OH 43606
City:	Toledo
Postal Code:	/
Country:	America

1.4. Manufacturer Information

Company:	Shenzhenshi ChuangZhiCheng Technology Co., Ltd Manufacturing Center
Address:	3F, Block A2, A3, Beida Funder Hi-tech park, Songbai Road, ShiyanStreet, Baoan District, Shenzhen
City:	Shenzhen
Postal Code:	518000
Country:	China

1.5. Information of EUT

General information

Name of EUT:	Tablet PC		
IMEI:	CZC1270024570006		
Hardware Version:	VerD		
Software Version:	R802R007		
Antenna Type:	Internal Antenna		
Device Operating Configurations:			
Mode	Basic Rate	Enhanced Data Rate(EDR)	
Modulation Type:	Frequency Hopping Spread Spectrum (FHSS)		
	GFSK	π/4 DQPSK	8DQPSK
Packet Type:(Maximum Payload)	DH5	2DH5	3DH5
Max. Conducted Power	-6.35 dBm		
Power Supply:	Battery or Adapter		
Operating Frequency Range(s)	2400 ~ 2483.5 MHz		

Auxiliary equipment details

AE2: Adapter

Model:	HKA03619021-6C
Manufacturer:	/
S/N:	A36B4211C000451

Equipment Under Test (EUT) is Tablet PC with internal antenna. The EUT supports Bluetooth.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

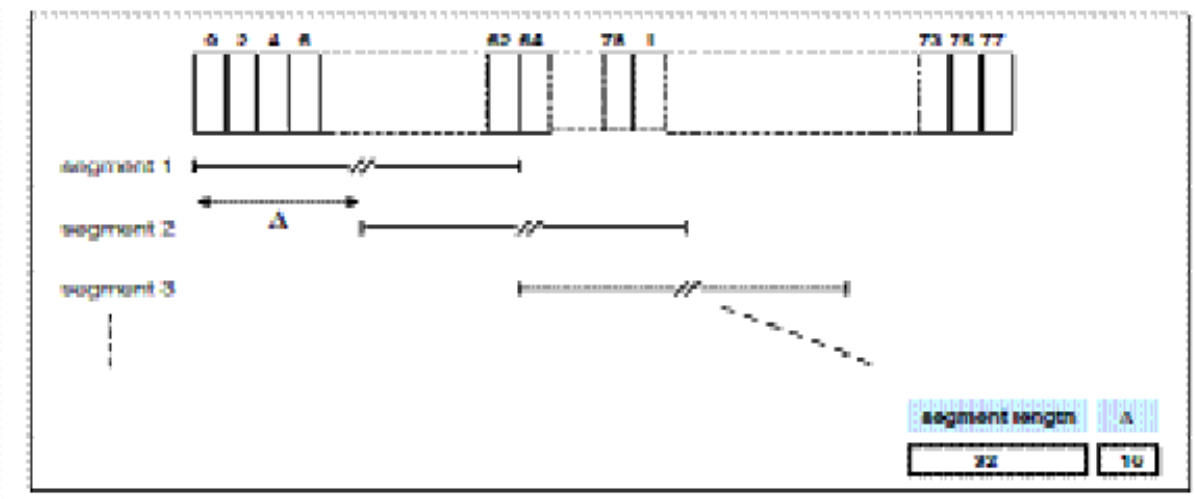
1.6. Information about the FHSS characteristics

1.6.1. Pseudorandom Frequency Hopping Sequence

Frequency Hopping Systems. A spread spectrum system in which the carrier is modulated with the coded information in a conventional manner causing a conventional spreading of the RF energy about the frequency carrier. The frequency of the carrier is not fixed but changes at fixed intervals under the direction of a coded sequence. The wide RF bandwidth needed by such a system is not required by spreading of the RF energy about the carrier but rather to accommodate the range of frequencies to which the carrier frequency can hop. The test of a frequency hopping system is that the near term distribution of hops appears random, the long term distribution appears evenly distributed over the hop set, and sequential hops are randomly distributed in both direction and magnitude of change in the hop set.

The selection scheme chooses a segment of 32 hop frequencies spanning about 64 MHz and visits these hops in a pseudo-random order. Next, a different 32-hop segment is chosen, etc. In the page, master page response, slave page response, page scan, inquiry, inquiry response and inquiry scan hopping sequences, the same 32-hop segment is used all the time (the segment is selected by the address; different devices will have different paging segments).

When the basic channel hopping sequence is selected, the output constitutes a pseudo-random sequence that slides through the 79 hops. The principle is depicted in the figure below.



Hop selection scheme in CONNECTION state.

Pseudorandom Frequency Hopping Sequence Table as below:

Channel: 08, 24, 40, 56, 40, 56, 72, 09, 01, 09, 33, 41, 33, 41, 65, 73, 53, 69, 06, 22, 04, 20, 36, 52, 38, 46, 70, 78, 68, 76, 21, 29, 10, 26, 42, 58, 44, 60, 76, 13, 03, 11, 35, 43, 37, 45, 69, 77, 55, 71, 08, 24, 08, 24, 40, 56, 40, 48, 72, 01, 72, 01, 25, 33, 12, 28, 44, 60, 42, 58, 74, 11, 05, 13, 37, 45, etc.

Each frequency used equally on the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.6.2. Equal Hopping Frequency Use

All Bluetooth units participating in the Pico net are time and hop-synchronized to the channel. Each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event.

1.6.3. System Receiver Input Bandwidth

Each channel bandwidth is 1MHz. The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.7. Test Date

The test is performed from October 26, 2012 to November 15, 2012.

2. Test Information

2.1. Summary of test results

Number	Summary of measurements of results	Clause in FCC rules	Verdict
1	Peak Power Output -Conducted	15.247(b)(1)	PASS
2	Occupied Bandwidth (20dB)	15.247(a)(1)	PASS
3	Frequency Separation	15.247(a)(1)	PASS
4	Time of Occupancy (Dwell Time)	15.247(a)(1)(iii)	PASS
5	Band Edge Compliance	15.247(d)	PASS
6	Spurious Radiated Emissions in the restricted band	15.247(d),15.205,15.209	PASS
7	Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
8	Spurious RF Conducted Emissions	15.247(d)	PASS
9	Radiates Emission	15.247(d),15.205,15.209	PASS
10	AC Power Line Conducted Emission	15.207	PASS

2.2. Peak Power Output –Conducted

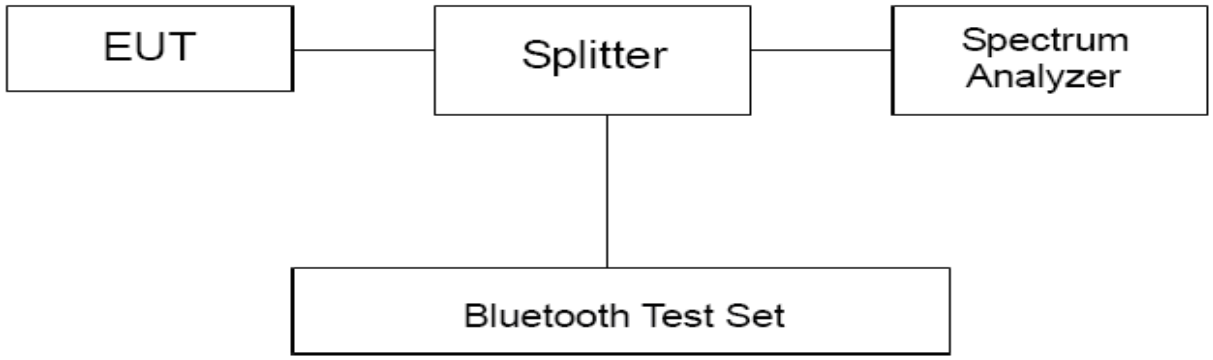
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. The EUT is controlled by the Bluetooth test set to ensure max power transmission with proper modulation. The peak detector is used.RBW is set to 1MHz,VBW is set to 3MHz.These measurements have been tested at following channels: 0, 39, and 78.

Test Setup



Limits

Rule Part 15.247 (b) (1)specifies that " For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts."

Peak Output Power	≤ 0.125W (21dBm)

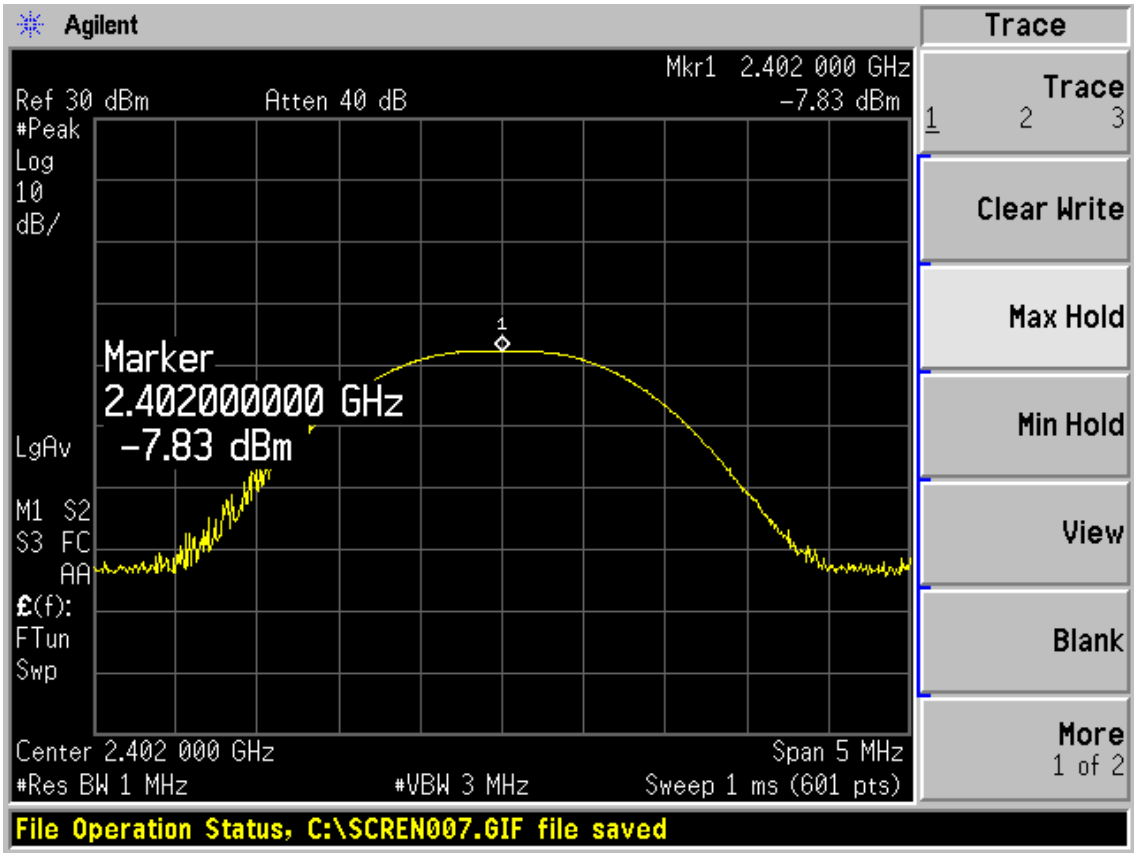
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.44 dB.

Test Results

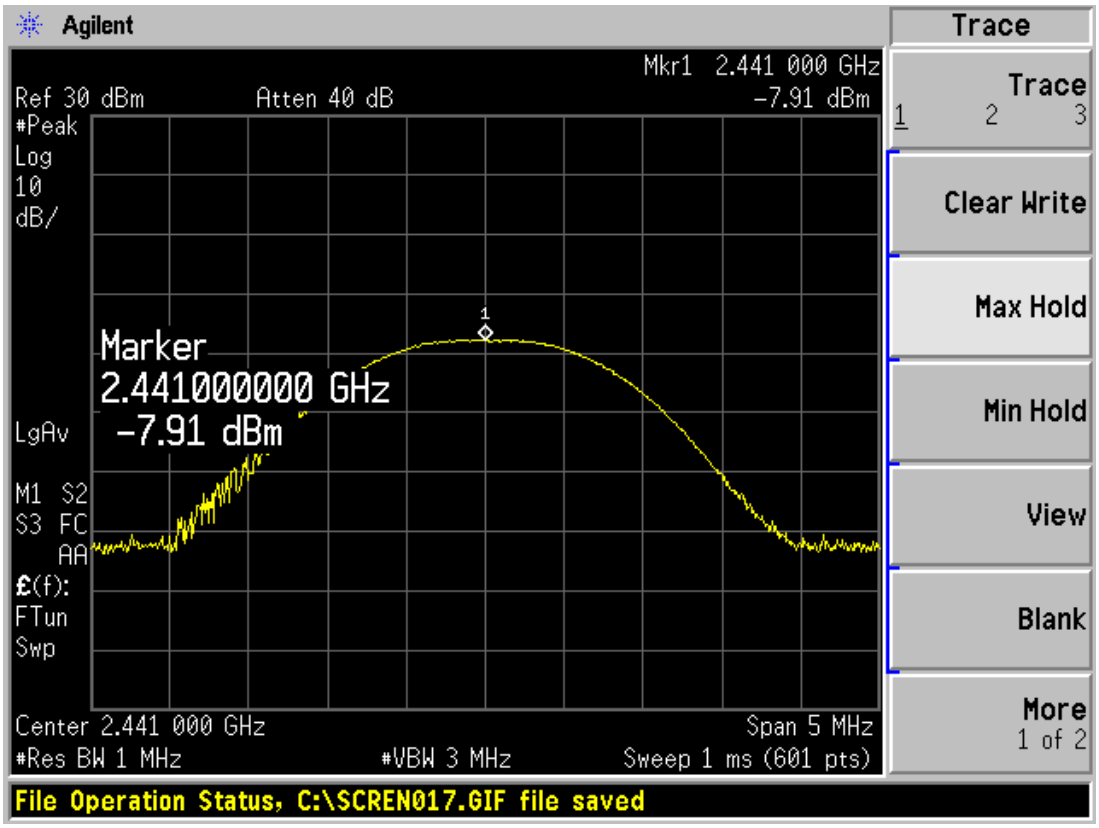
Channel	Frequency (MHz)	Peak Output Power (dBm)			Conclusion
		DH5	2DH5	3DH5	
0	2402	-7.83	-6.35	-6.43	PASS
39	2441	-7.91	-7.34	-6.67	PASS
78	2480	-8.41	-6.96	-7.05	PASS

DH5



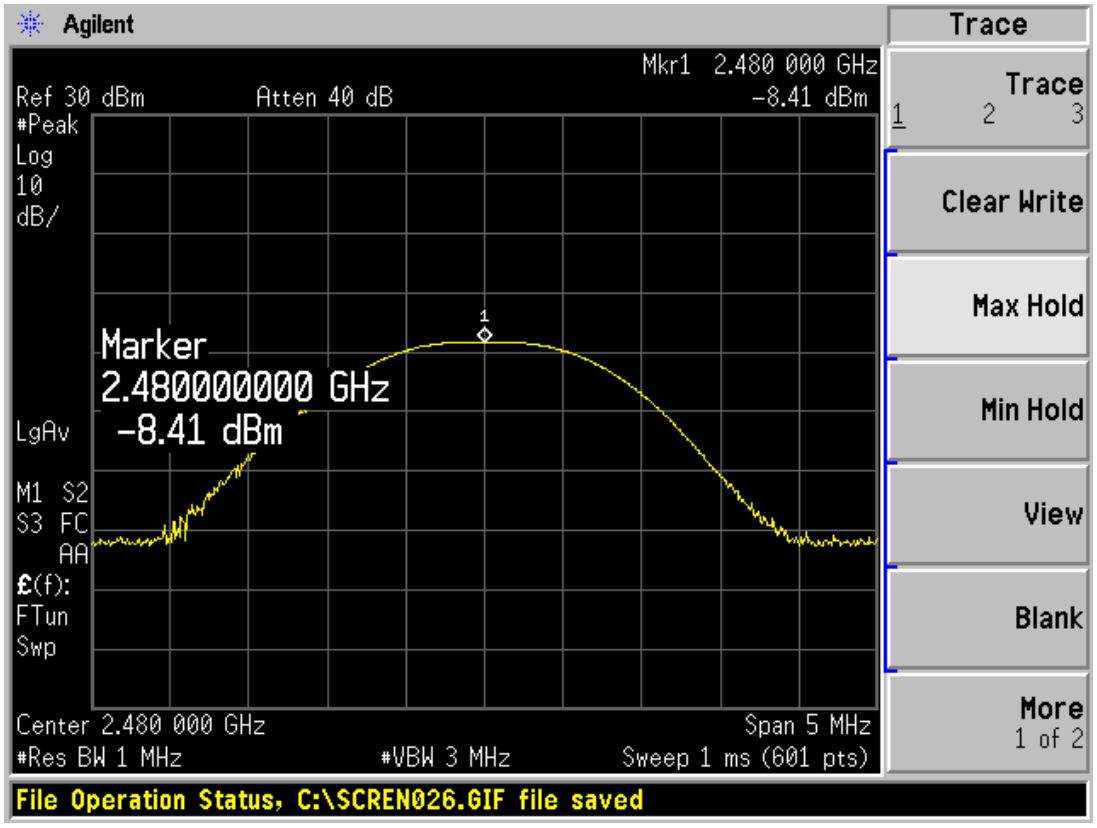
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

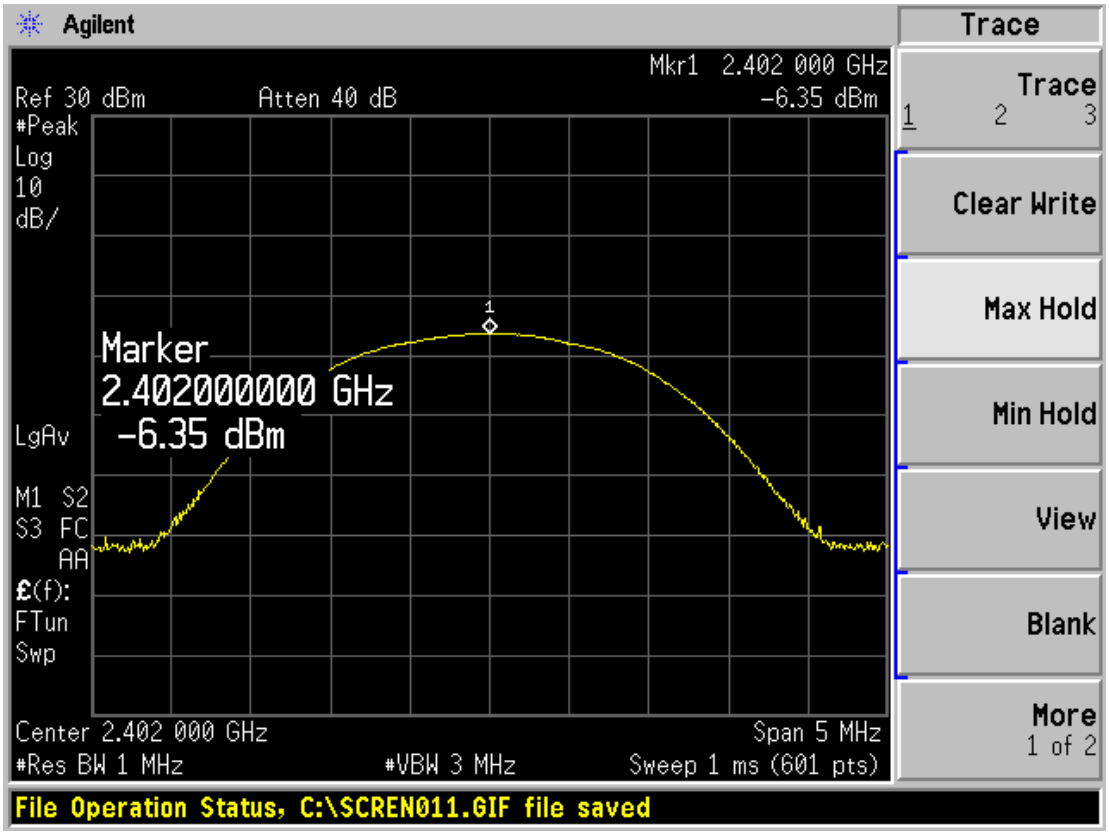
Channel No.:39



Carrier frequency (MHz): 2480

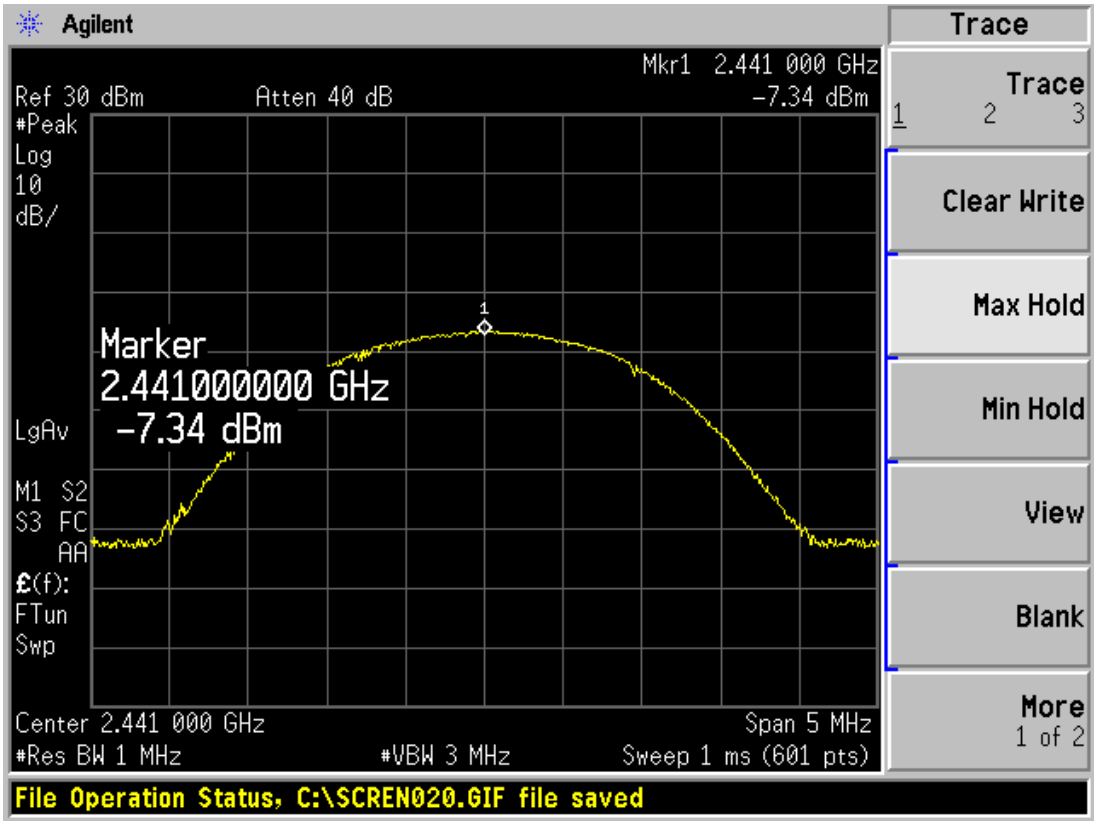
Channel No.:78

2DH5



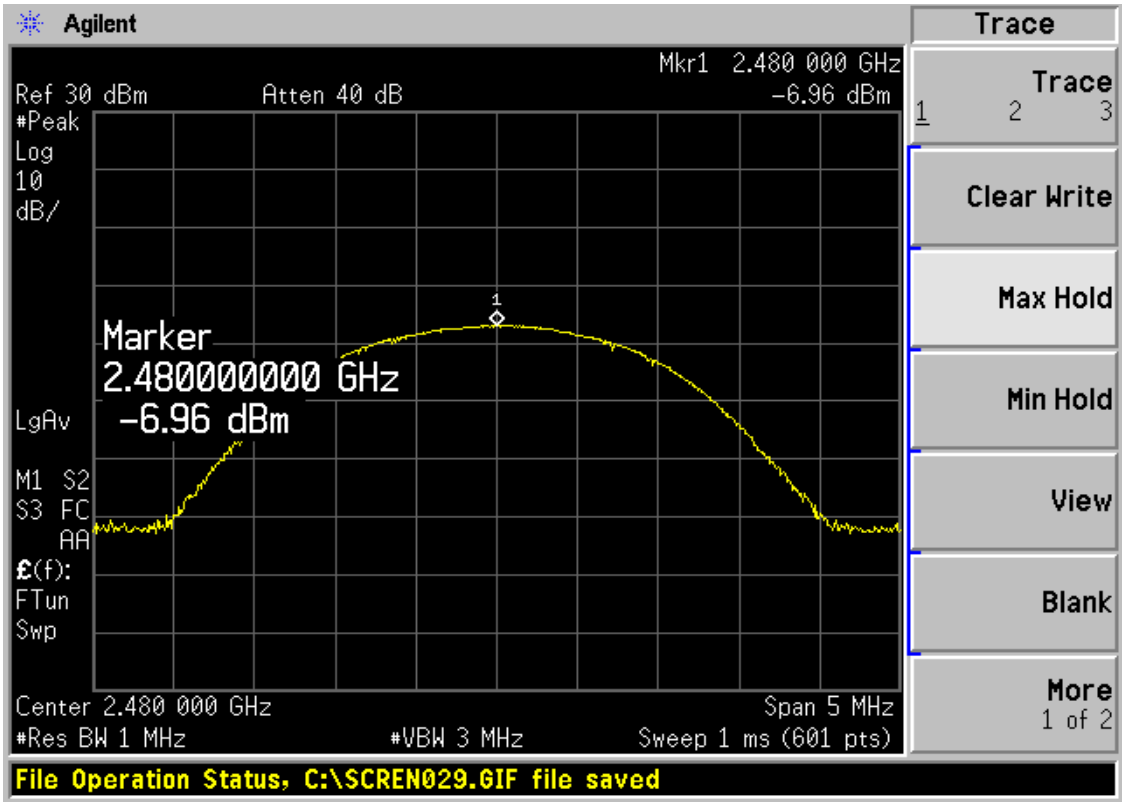
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

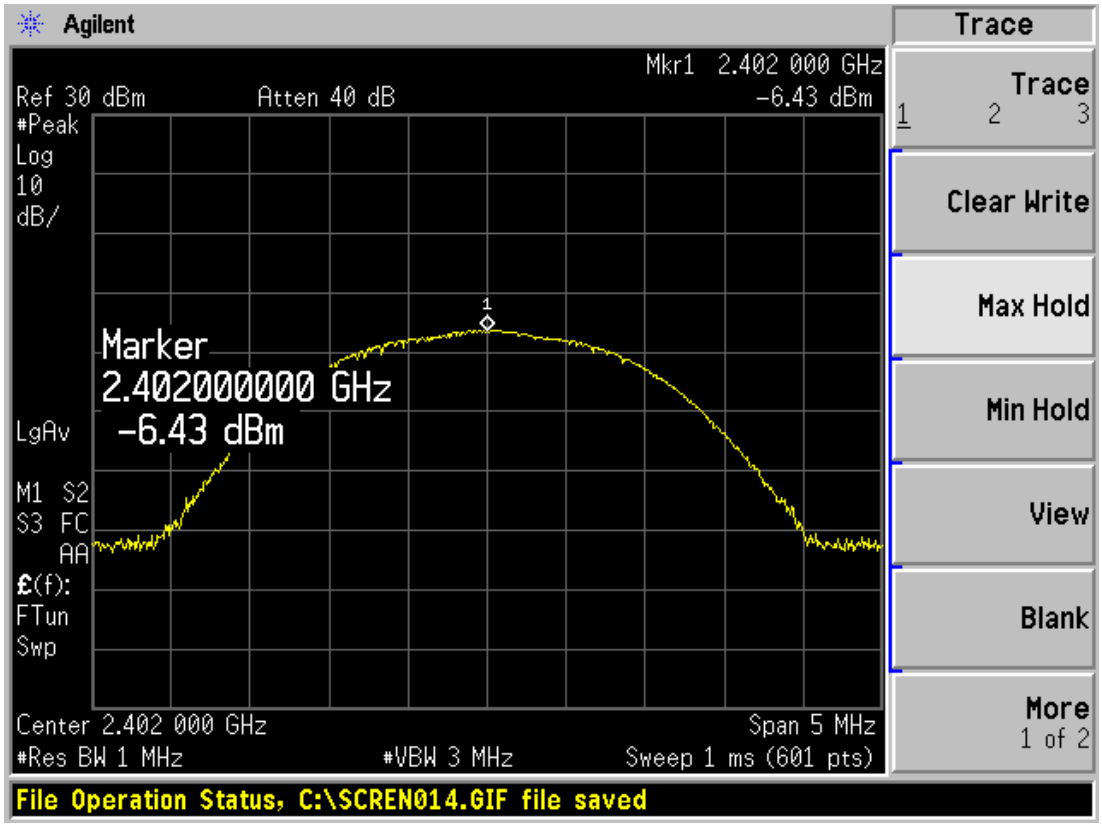
Channel No.:39



Carrier frequency (MHz): 2480

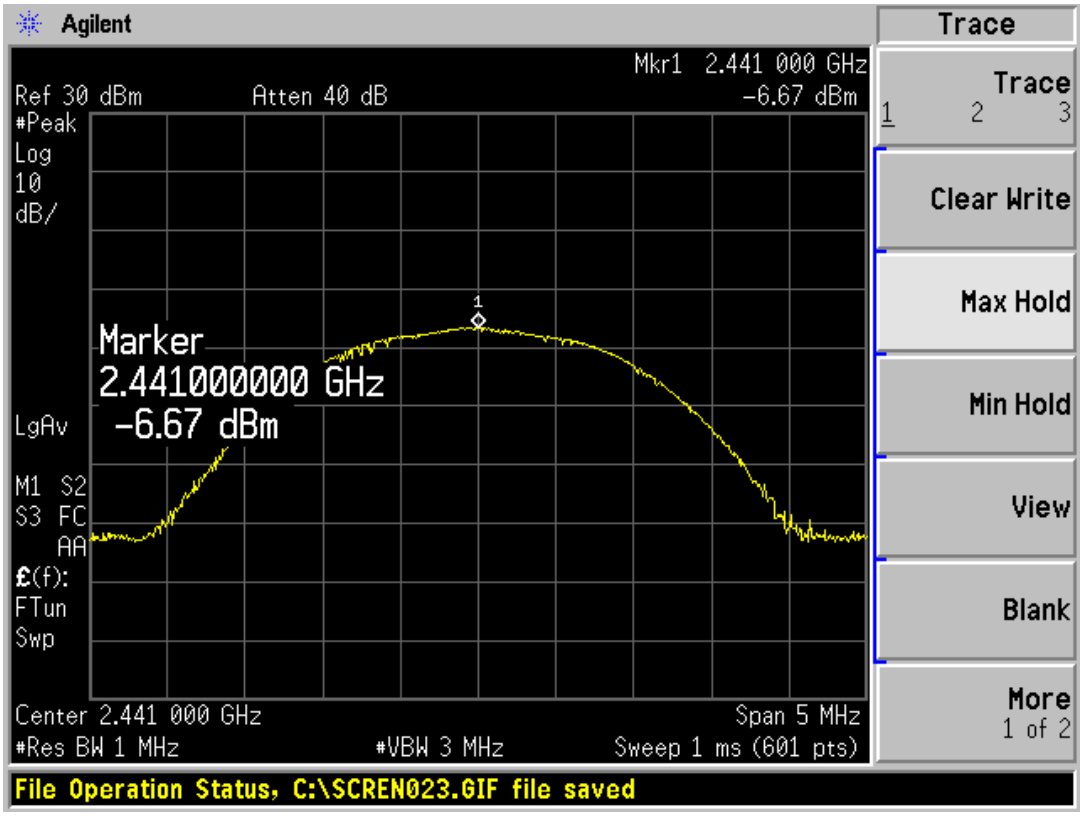
Channel No.:78

3DH5



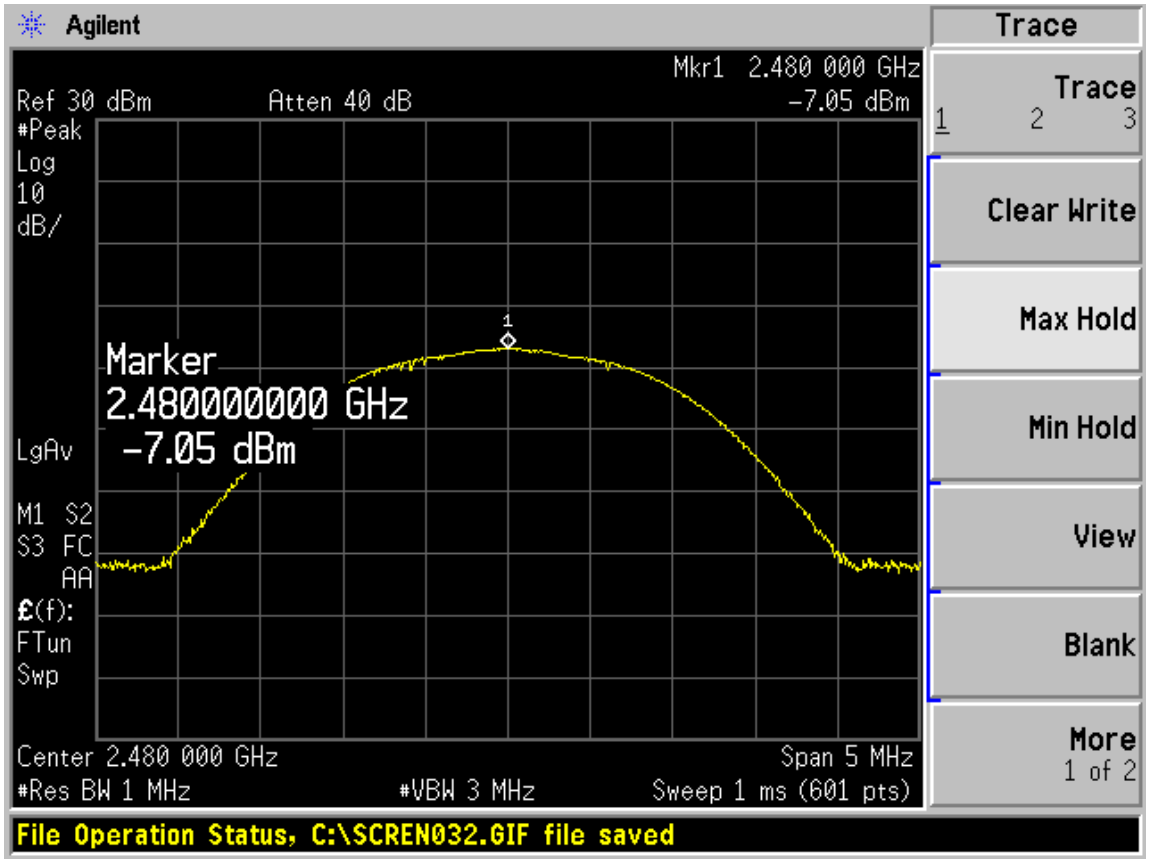
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

Channel No.:39



Carrier frequency (MHz): 2480

Channel No.:78

2.3. Occupied Bandwidth (20dB)

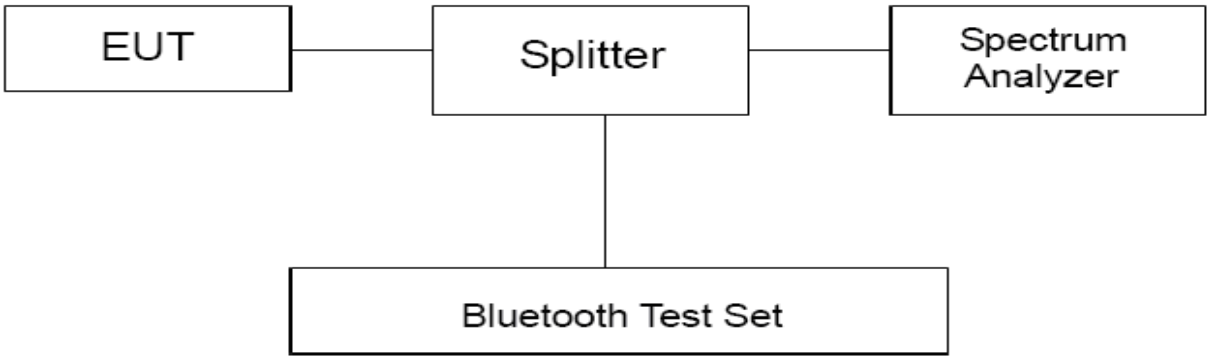
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. The occupied bandwidth is measured using spectrum analyzer. RBW is set to 10kHz and VBW is set to 30kHz on spectrum analyzer. -20dB occupied bandwidths are recorded.

Test Setup



Limits

No specific occupied bandwidth requirements in part 15.247(a) (1).

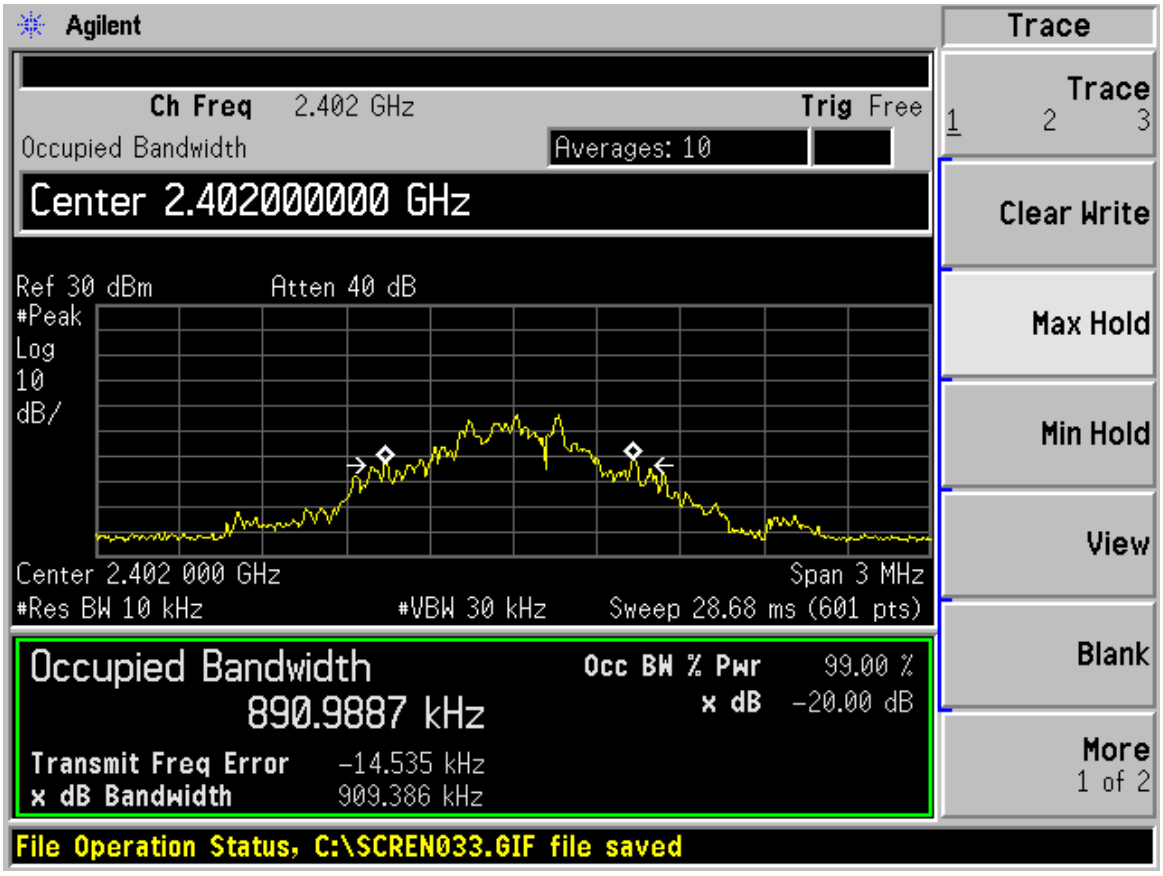
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results

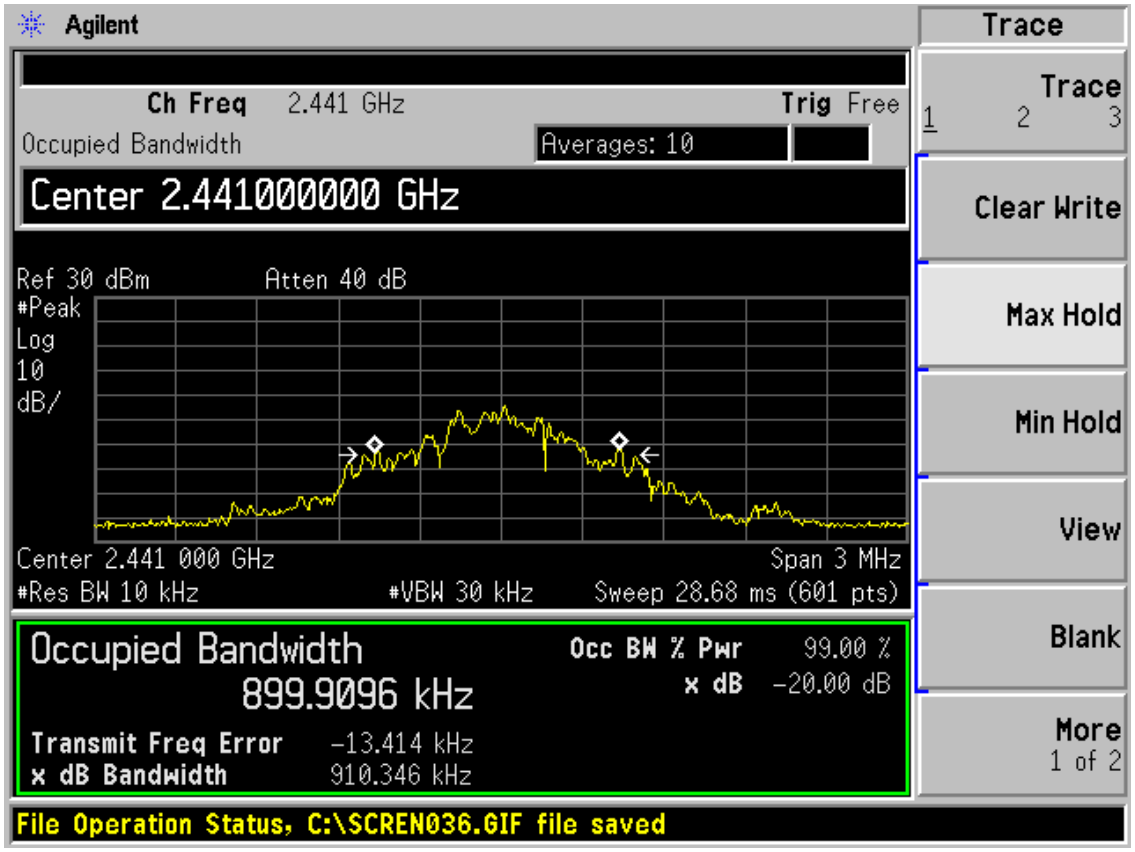
DH5

Channel	Frequency (MHz)	20dB Bandwidth (kHz)
0	2402	909.386
39	2441	910.346
78	2480	907.276



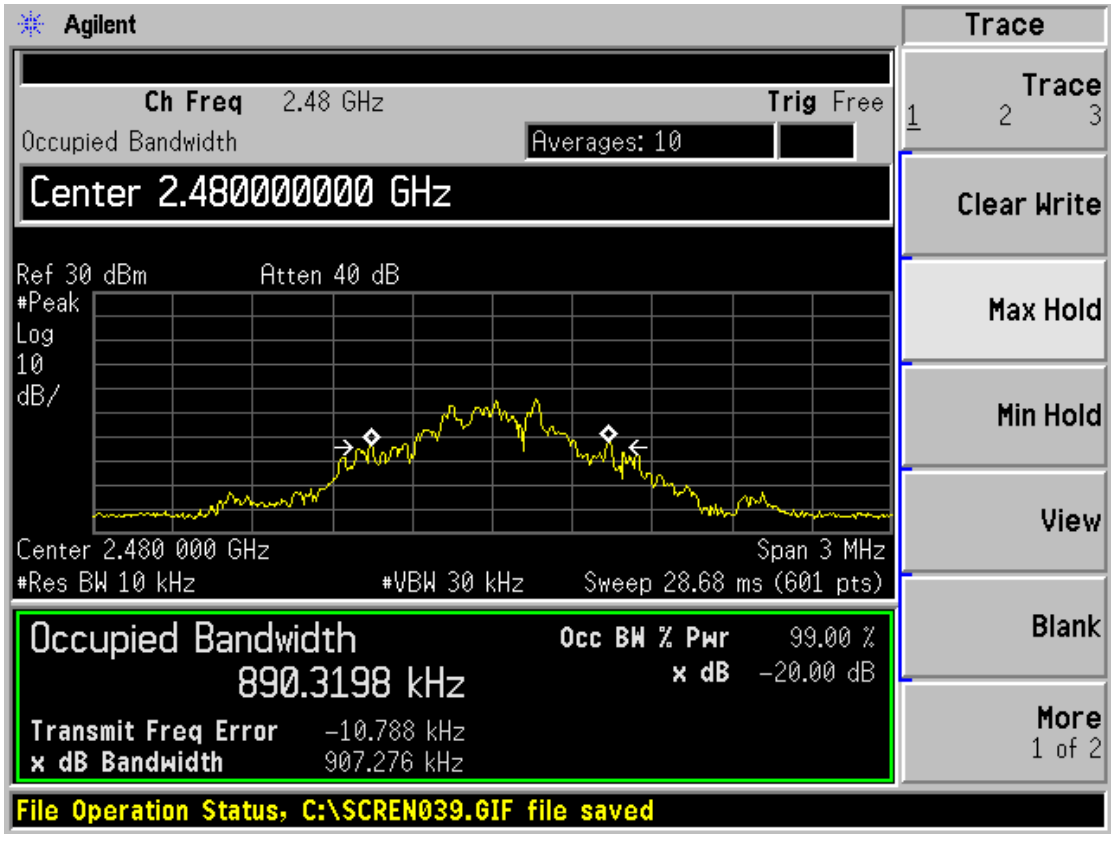
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

Channel No.:39

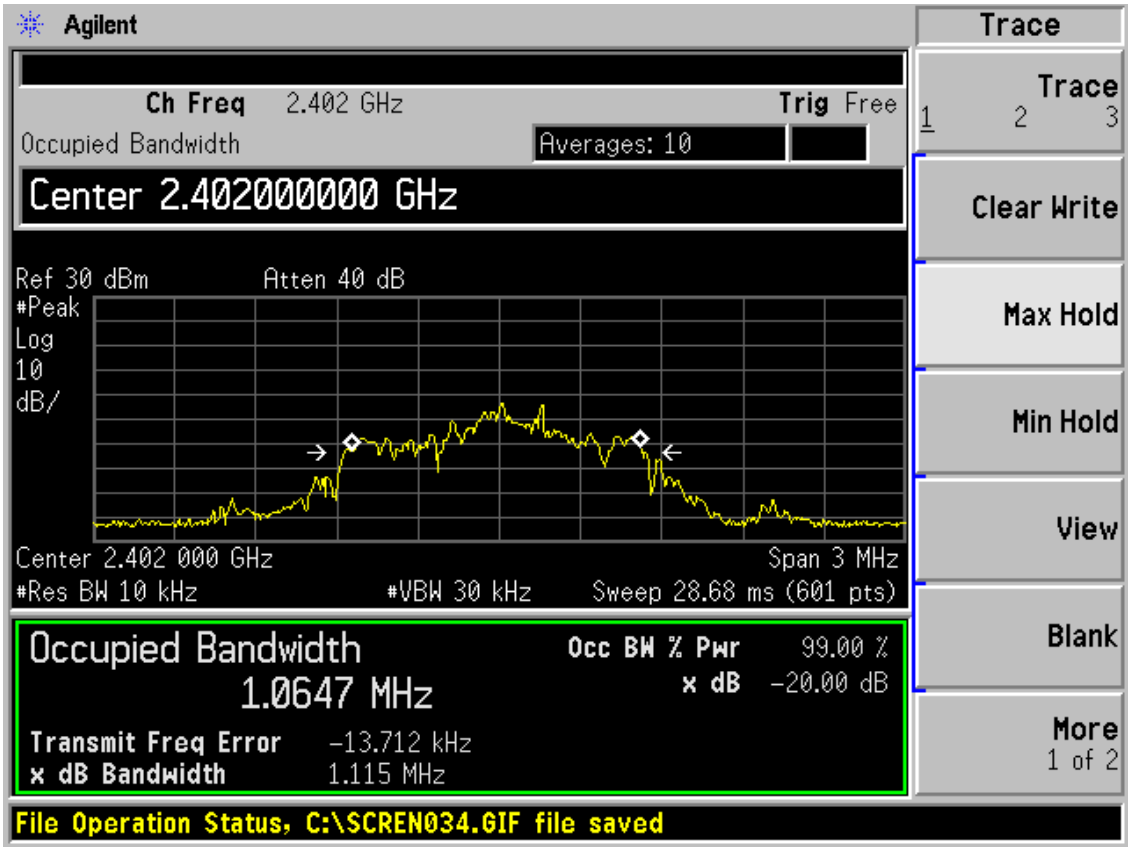


Carrier frequency (MHz): 2480

Channel No.:78

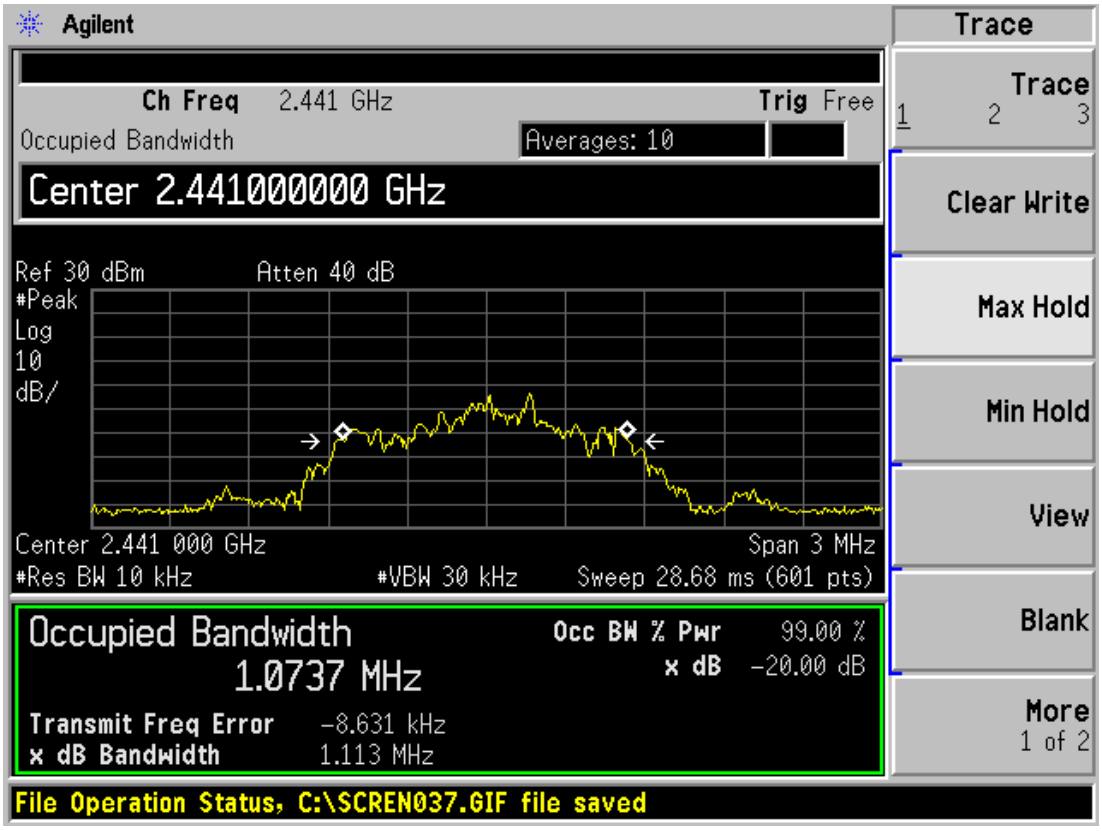
2DH5

Channel	Frequency (MHz)	20dB Bandwidth (kHz)
0	2402	1115
39	2441	1113
78	2480	1113



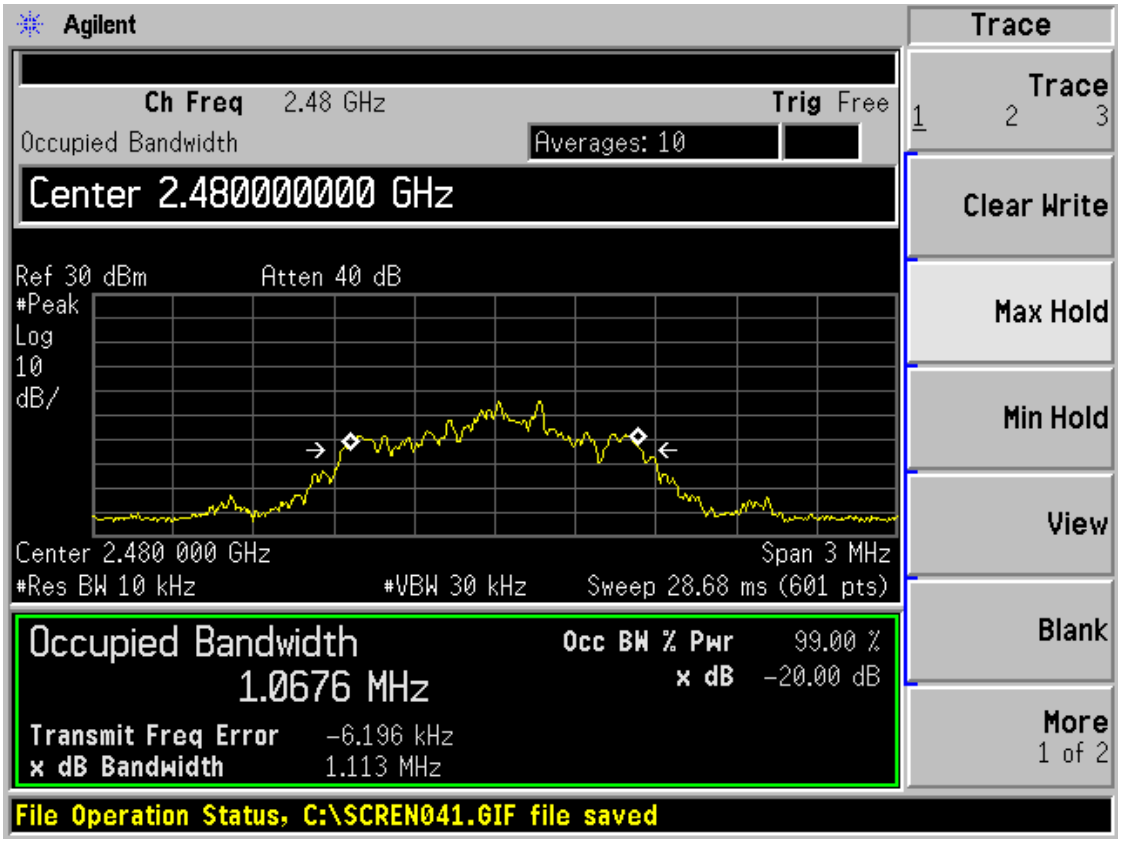
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

Channel No.:39

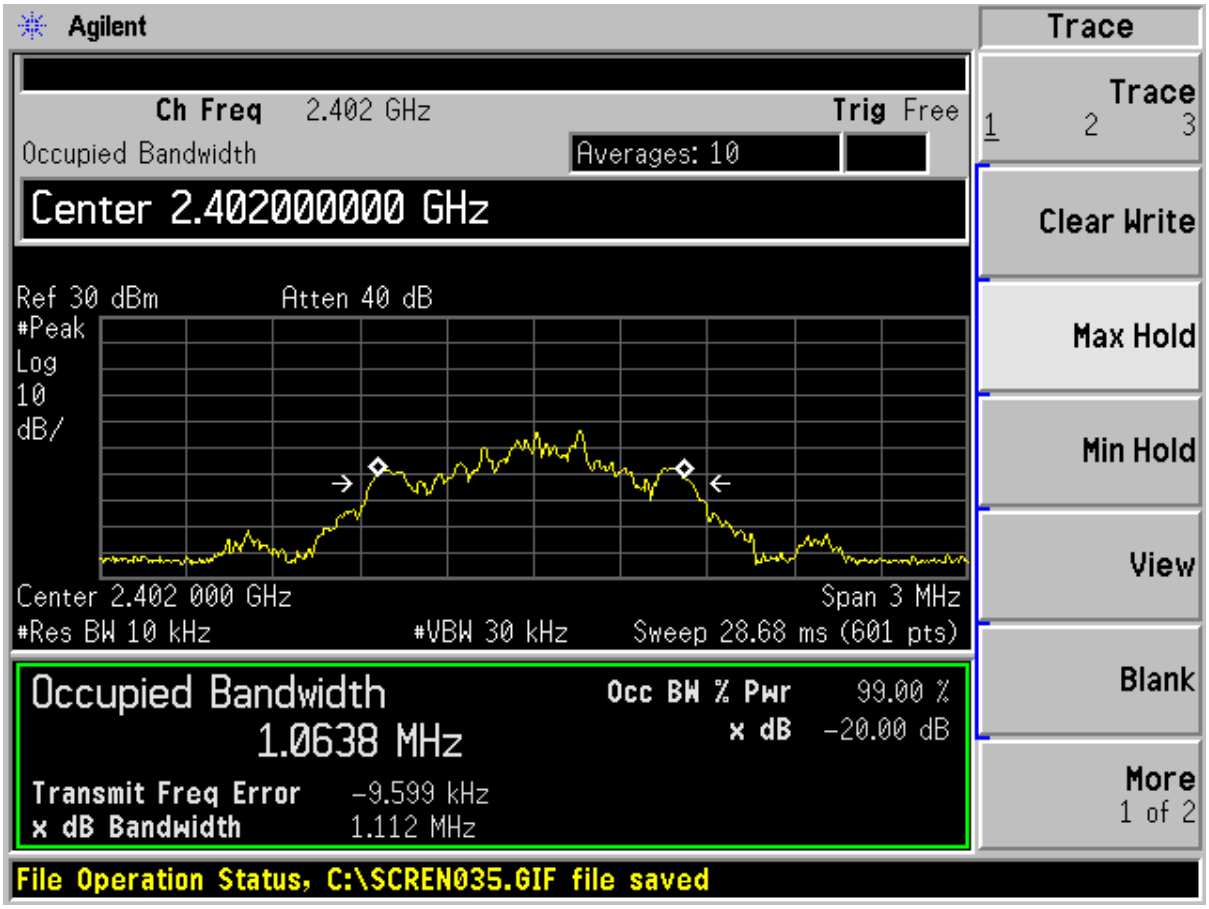


Carrier frequency (MHz): 2480

Channel No.:78

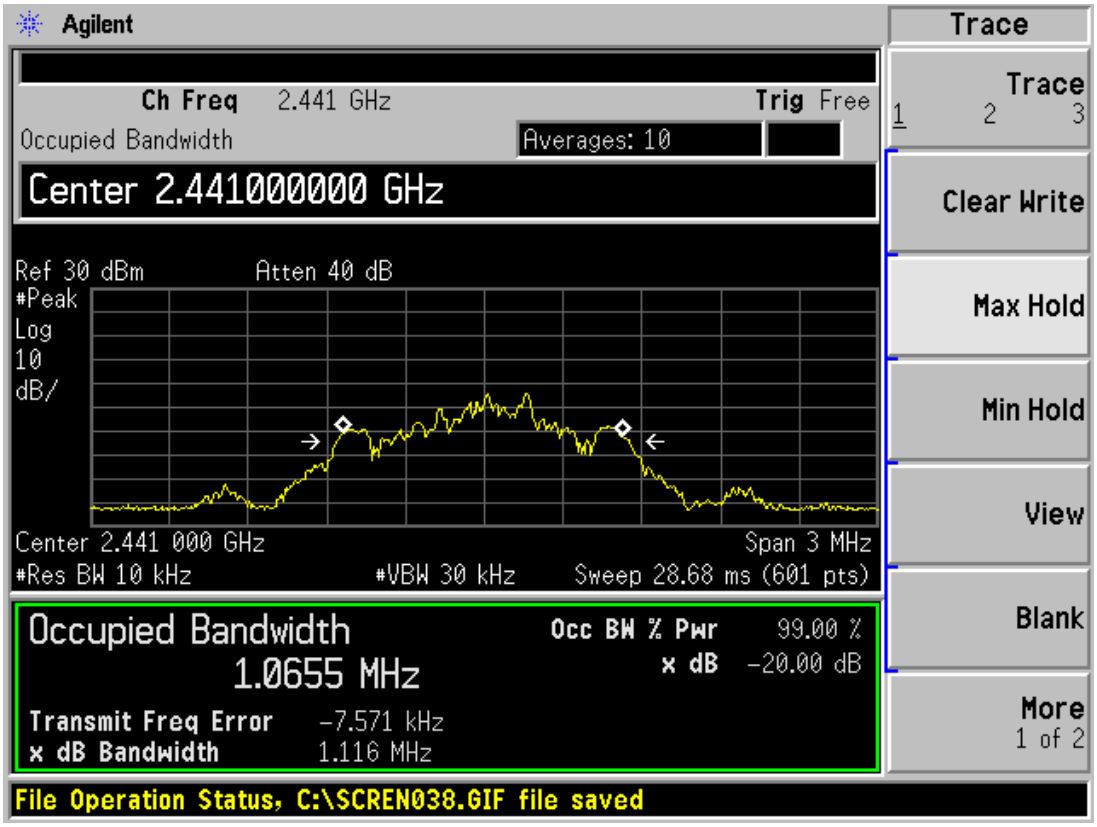
3DH5

Channel	Frequency (MHz)	20dB Bandwidth (kHz)
0	2402	1112
39	2441	1116
78	2480	1112



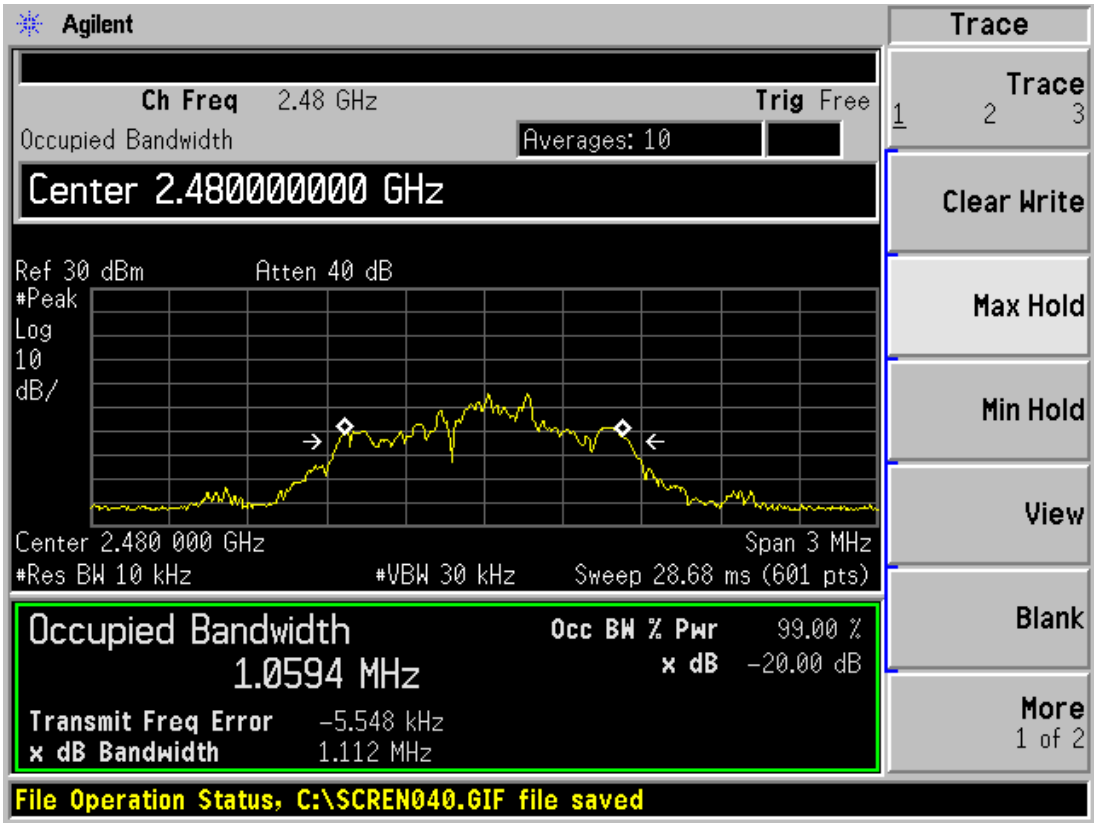
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

Channel No.:39



Carrier frequency (MHz): 2480

Channel No.:78

2.4. Frequency Separation

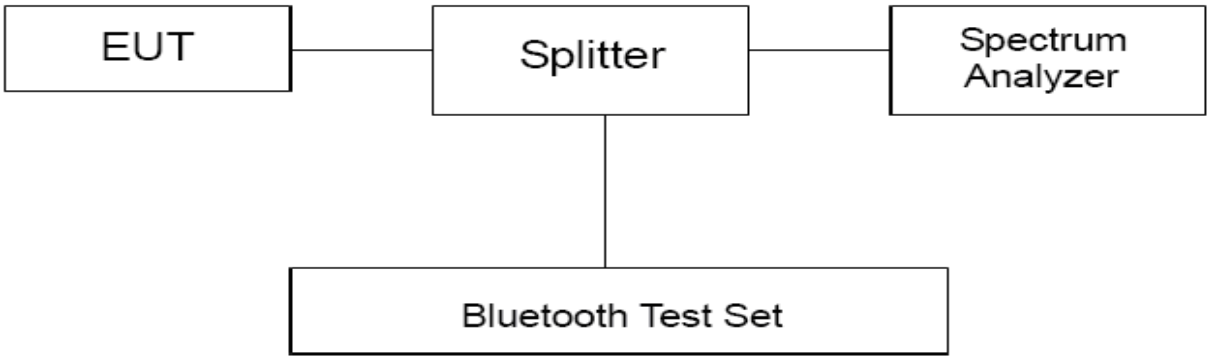
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The Equipment Under Test (EUT) was set up in a shielded room to perform the spurious emissions measurements. The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. RBW is set to 300kHz and VBW is set to 3MHz on spectrum analyzer. Set EUT on Hopping on mode.

Test setup



Limits

Rule Part 15.247(a)(1)specifies that “Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. ”

Note: The value of two-thirds of 20 dB bandwidth is always greater than 25 kHz.

Measurement Uncertainty

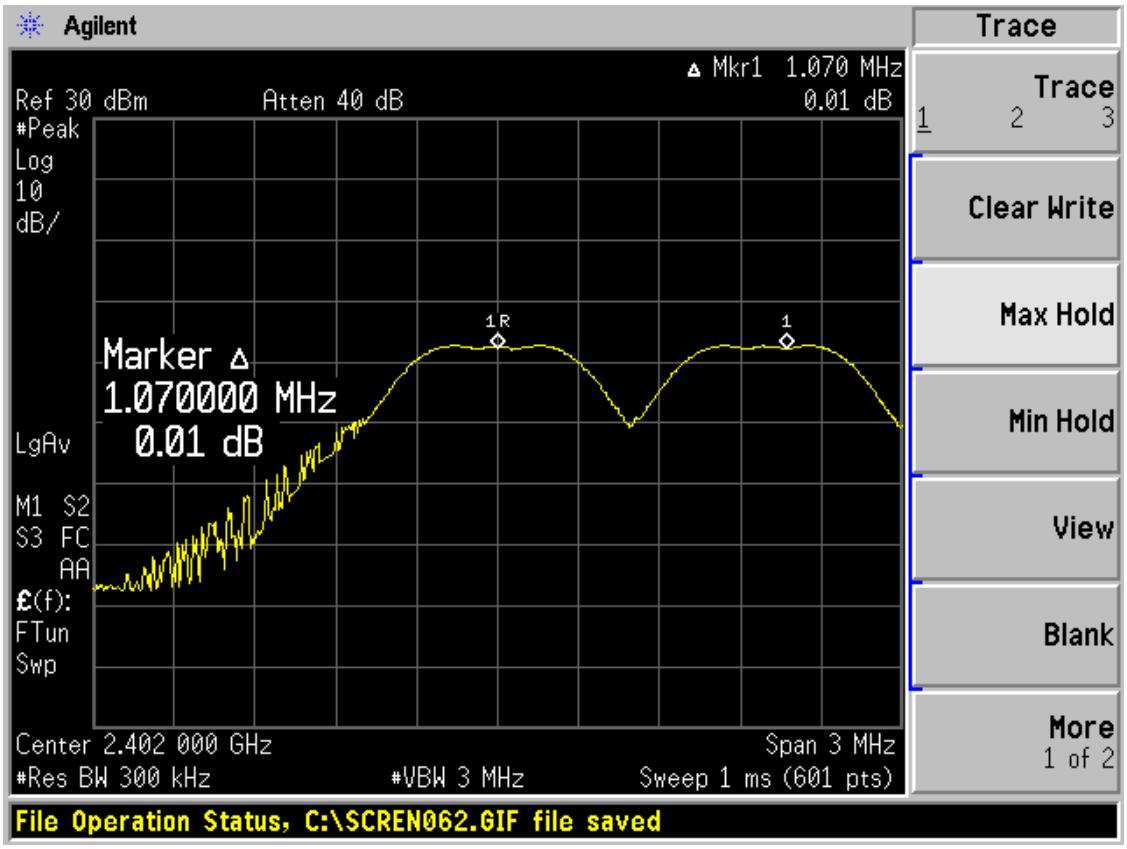
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results:

DH5

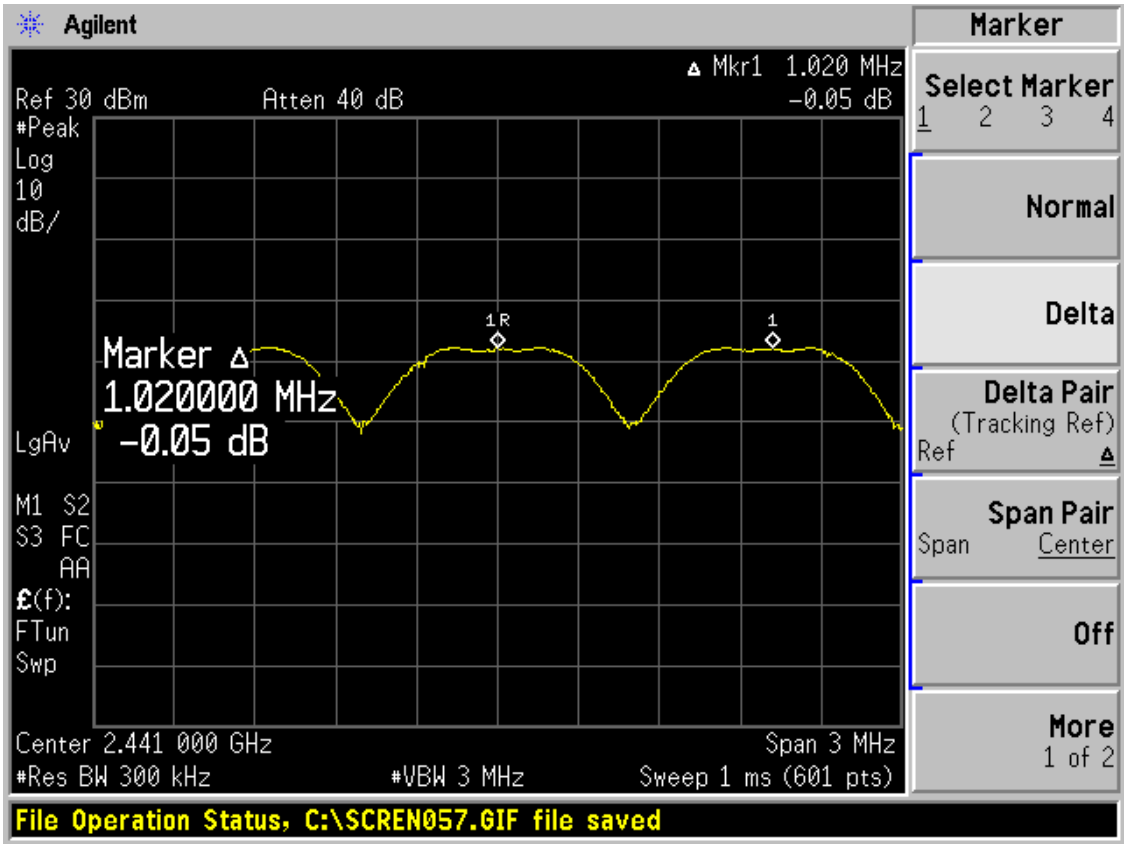
Carrier frequency (MHz)	Carrier frequency separation(kHz)	20dB Bandwidth (kHz)	Limit(kHz)	Conclusion
2402	1070	909.396	606.264	PASS
2441	1020	910.346	606.897	PASS
2480	1000	907.276	604.851	PASS

Note: The limit is two-thirds of 20 dB bandwidth.



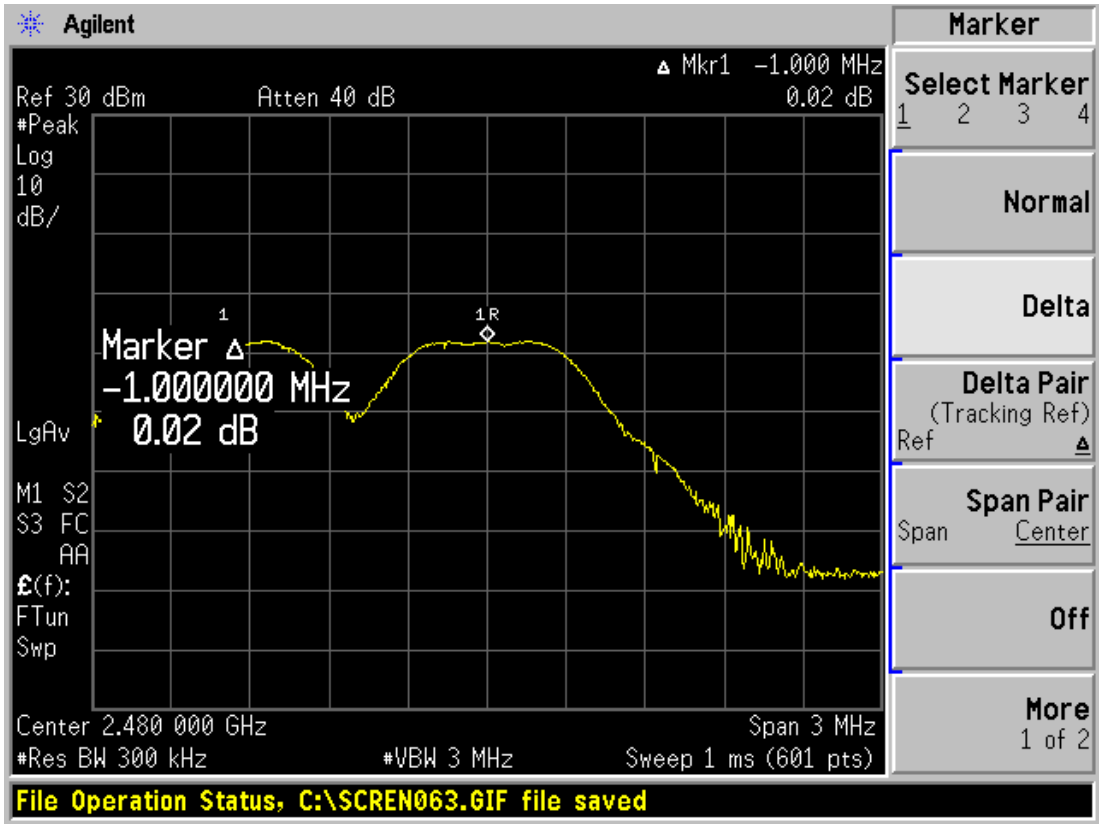
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

Channel No.:39



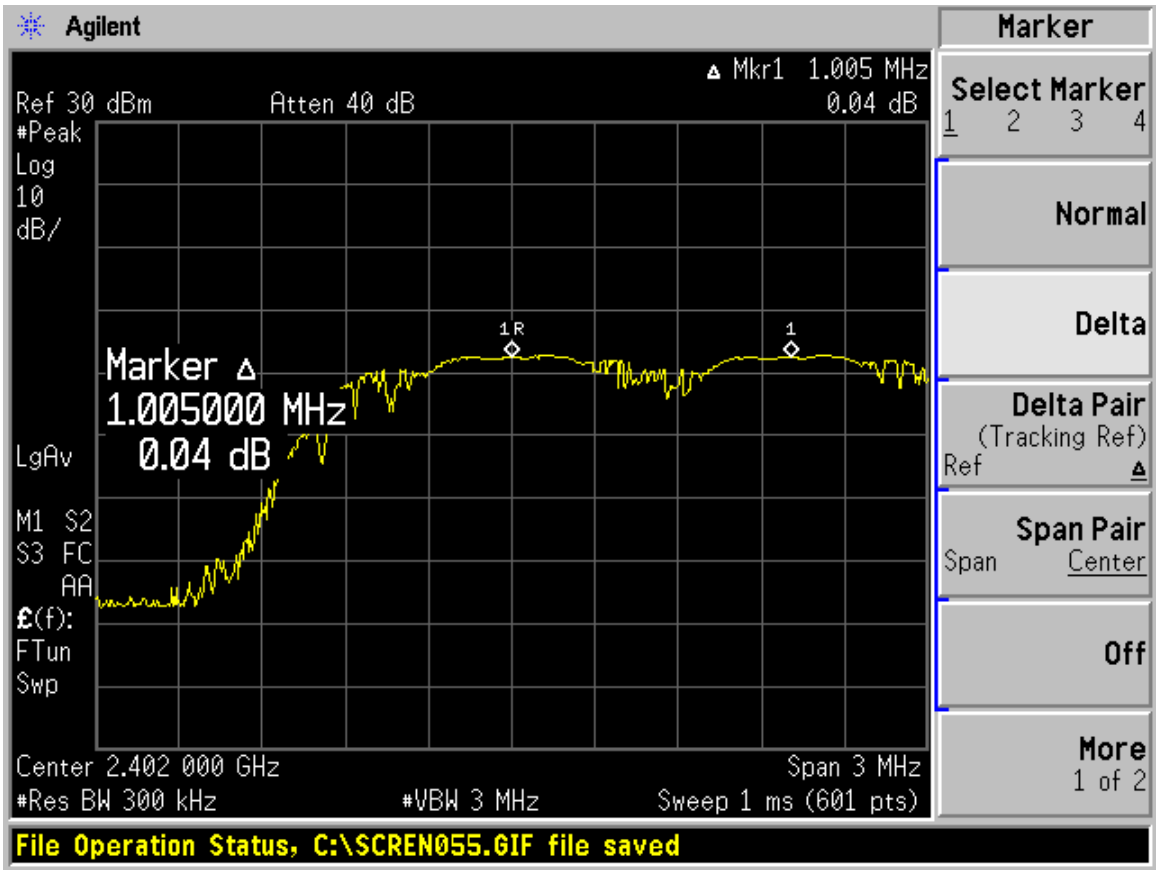
Carrier frequency (MHz): 2480

Channel No.:78

2DH5

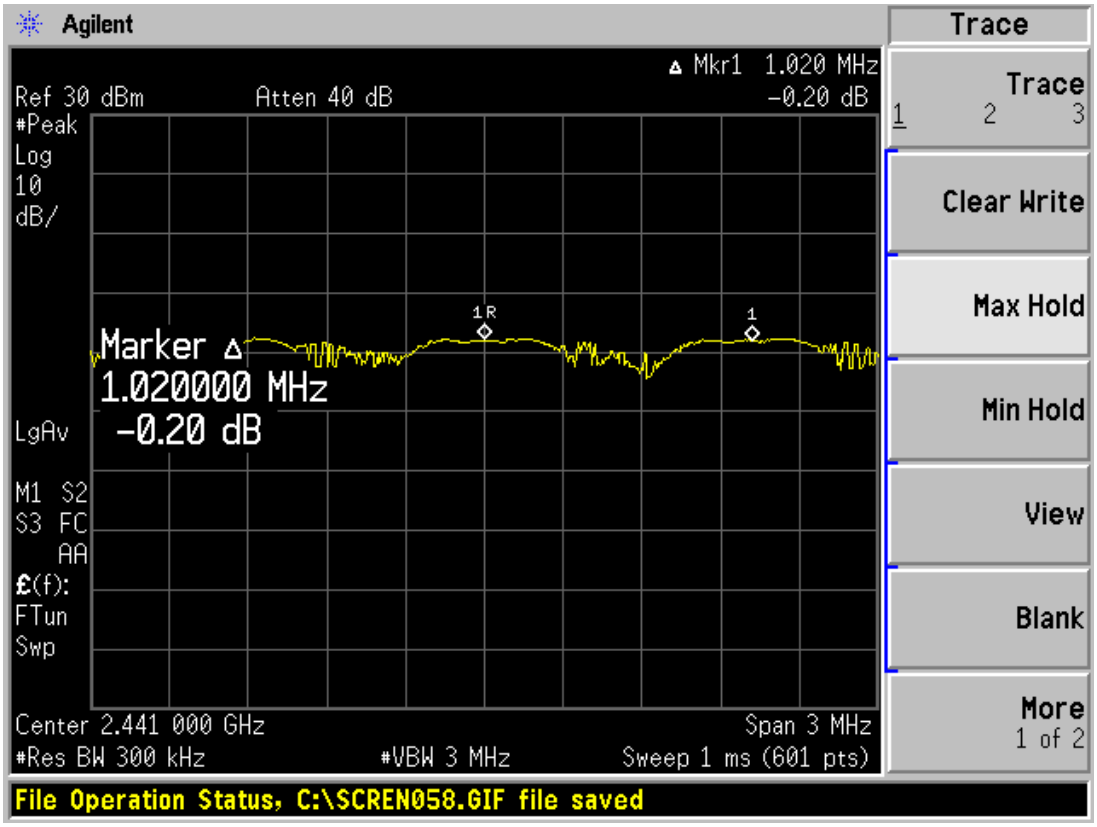
Carrier frequency (MHz)	Carrier frequency separation(kHz)	20dB Bandwidth (kHz)	Limit(kHz)	Conclusion
2402	1005	1115	743.333	PASS
2441	1020	1113	742.000	PASS
2480	1070	1113	742.000	PASS

Note: The limit is two-thirds of 20 dB bandwidth.



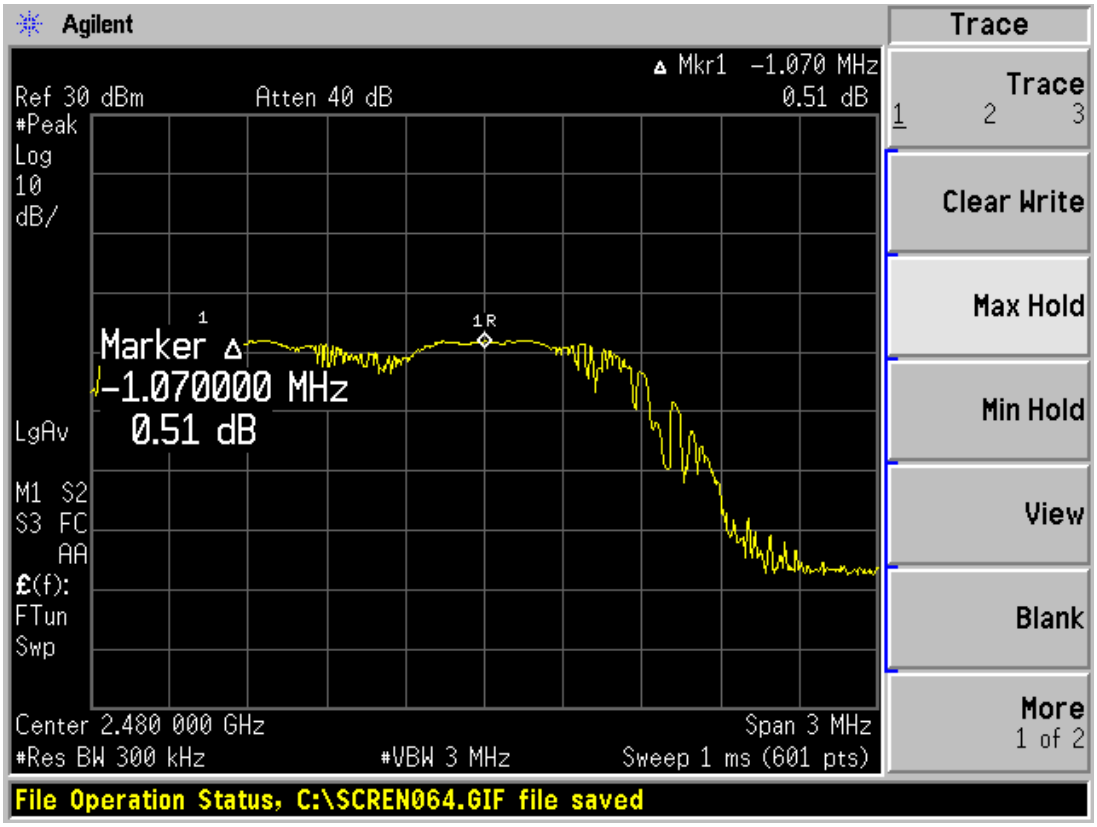
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

Channel No.:39



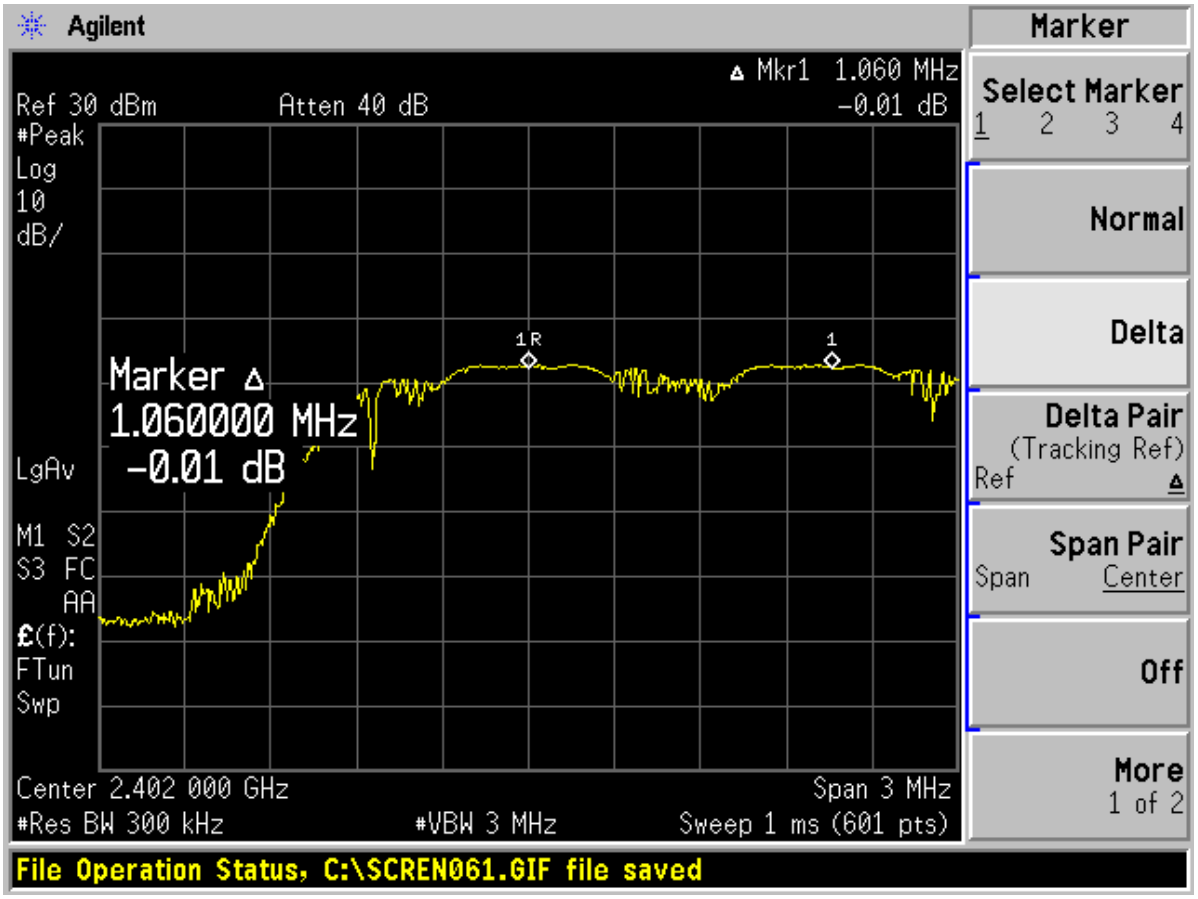
Carrier frequency (MHz): 2480

Channel No.:78

3DH5

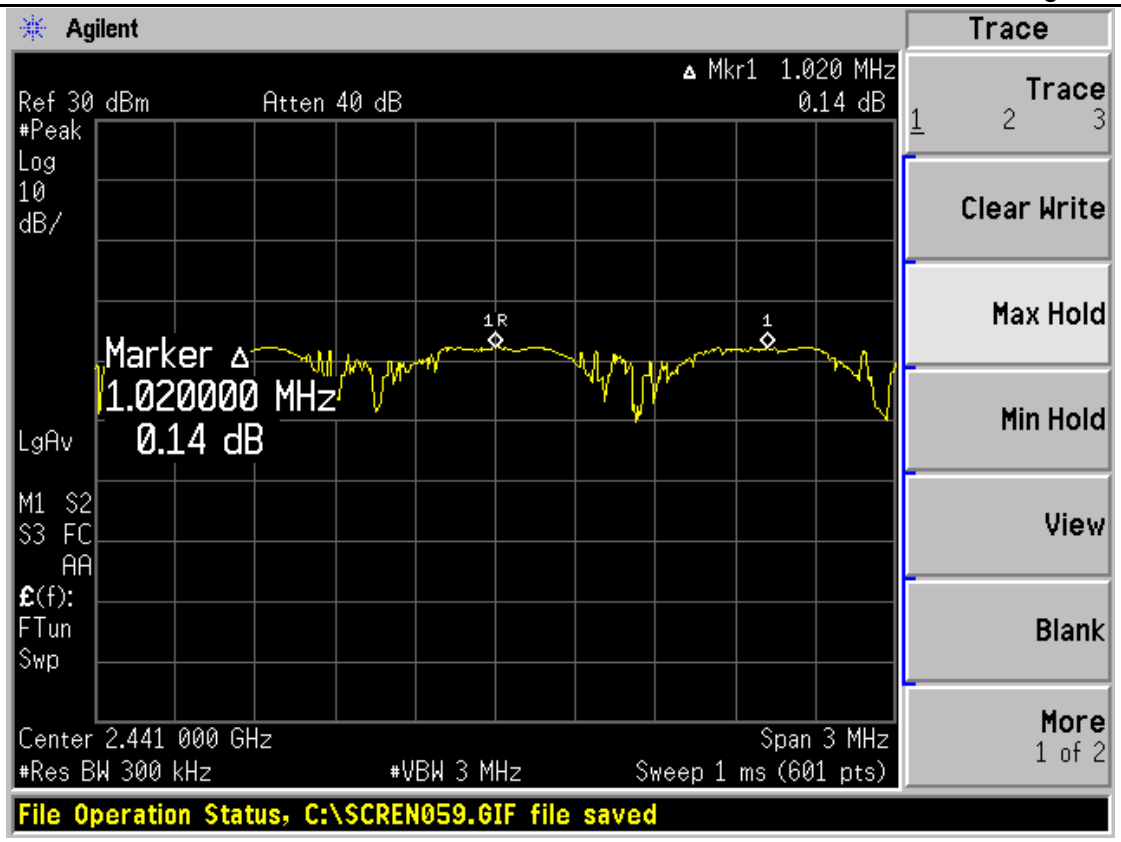
Carrier frequency (MHz)	Carrier frequency separation(kHz)	20dB Bandwidth (kHz)	Limit(kHz)	Conclusion
2402	1060	1113	741.333	PASS
2441	1020	1116	744.000	PASS
2480	1075	1112	741.333	PASS

Note: The limit is two-thirds of 20 dB bandwidth.



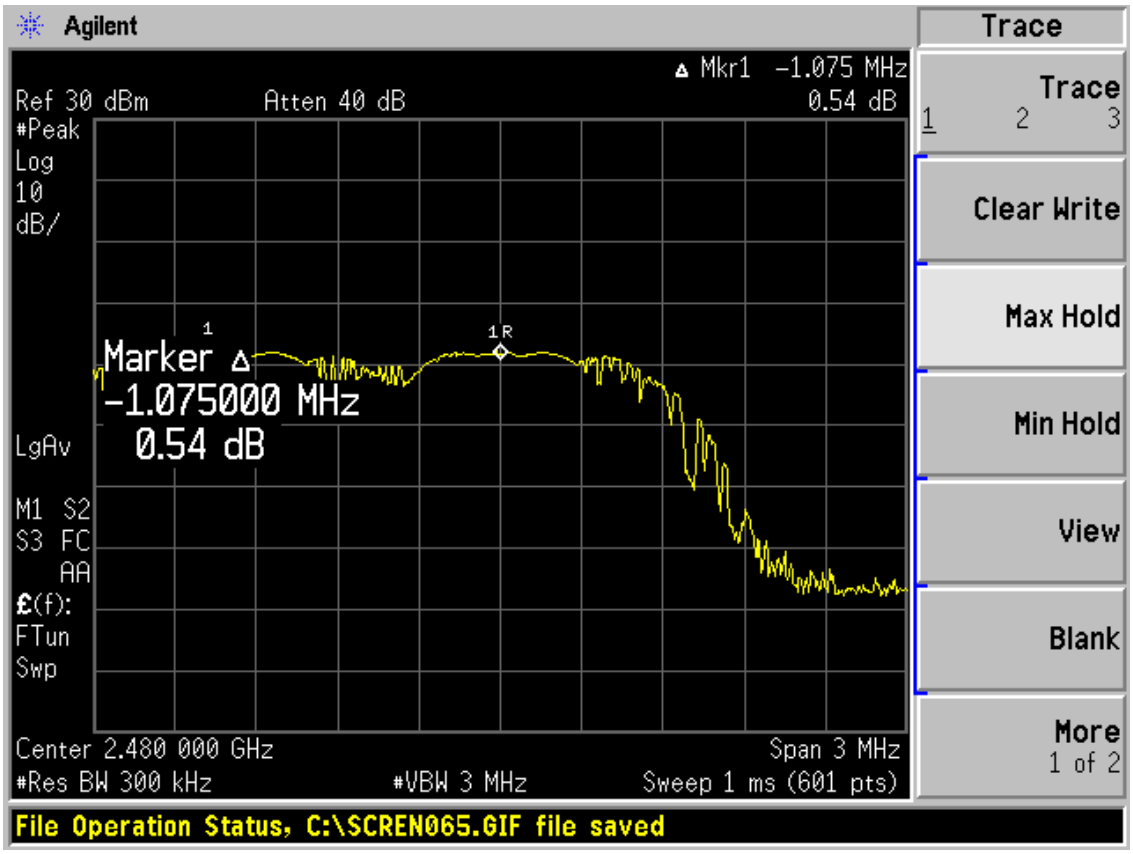
Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2441

Channel No.:39



Carrier frequency (MHz): 2480

Channel No.:78

2.5. Time of Occupancy (Dwell Time)

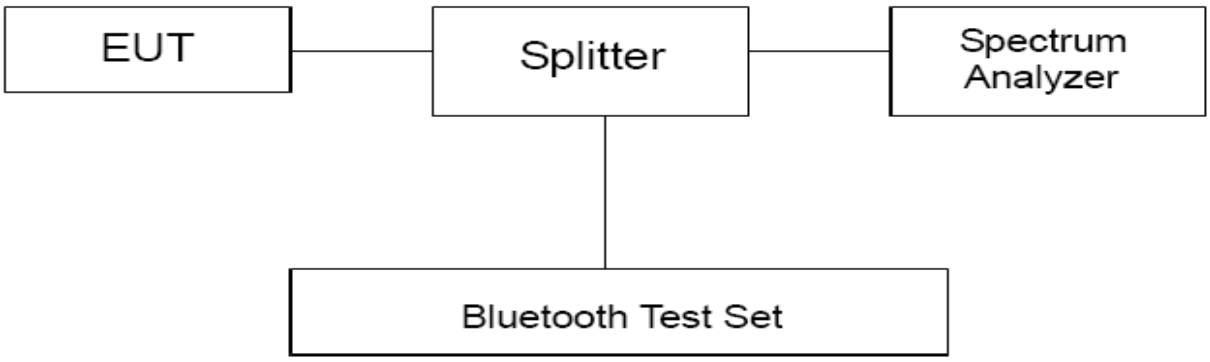
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The Equipment Under Test (EUT) was set up in a shielded room to perform the dwell time measurements. The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. RBW is set to 3MHz and VBW is set to 3MHz on spectrum analyzer .The time slot length is measured of three different packet types, which are available in the Bluetooth technology. Those are DH1, DH3 and DH5 packets. The dwell time is calculated by:
Dwell time = time slot length * hop rate * 0.4s with:
- hop rate=1600 * 1/s for DH1 packet =1600
- hop rate=1600/3 * 1/s for DH3 packet =533.33
- hop rate=1600/5 * 1/s for DH5 packet =320

Test Setup



Limits

Rule Part 22.913(a) specifies that " Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed..”

Dwell time	≤ 400ms

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 2.

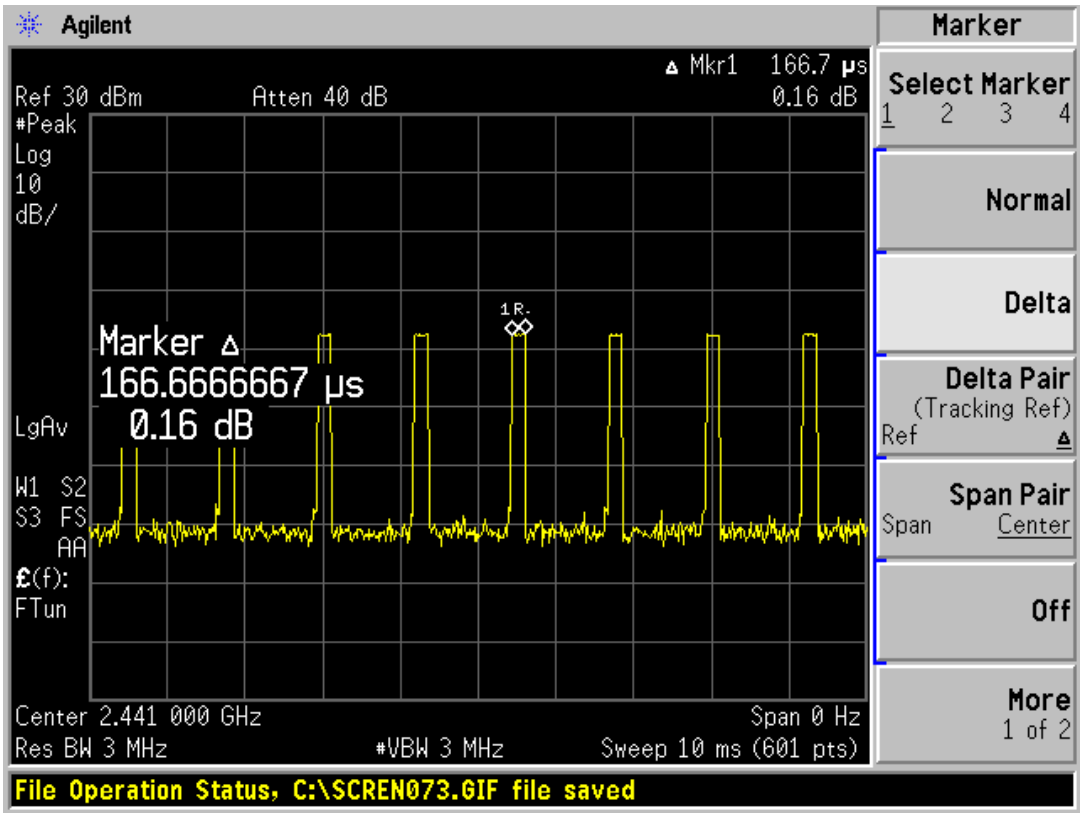
Requirements	Uncertainty	
Dwell Time	DH1	*U*= 0.64ms
	DH3	*U*= 0.80ms
	DH5	*U*= 0.70ms

Test Results:

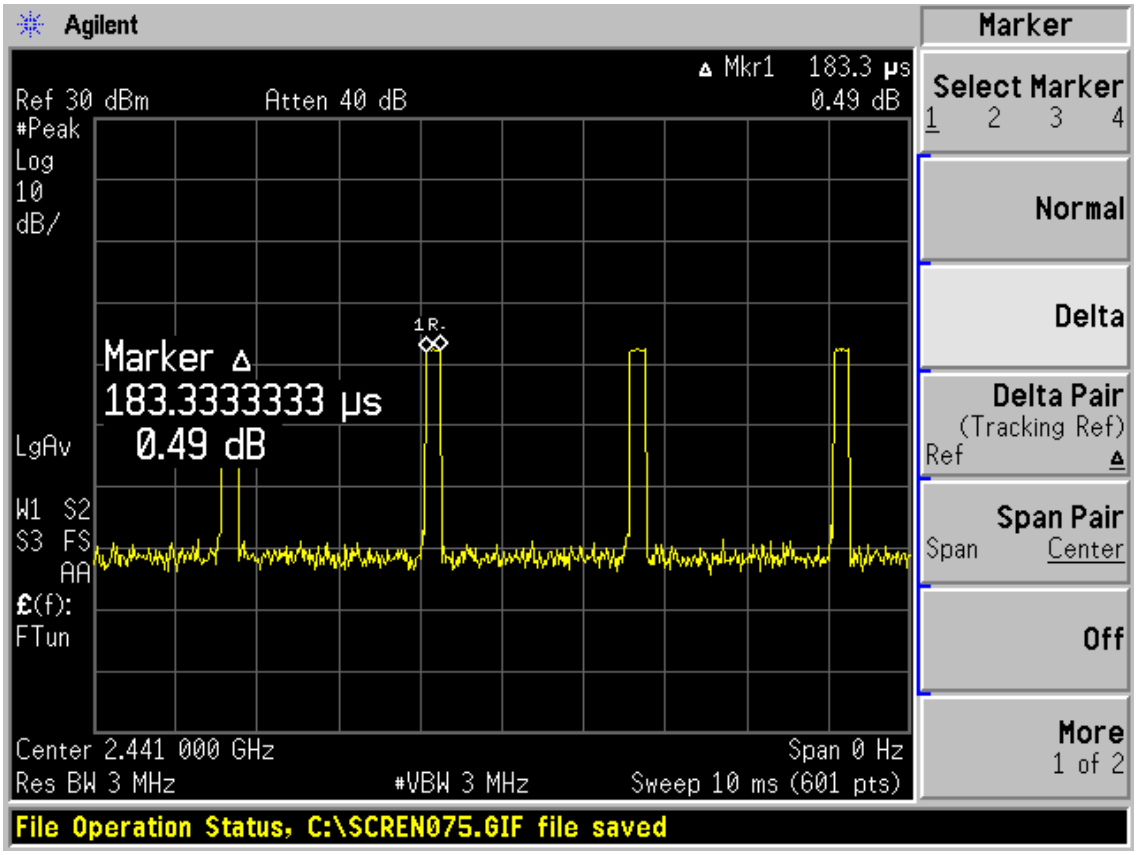
CH 39

Packet type	hop rate (1/s)	Time slot length(ms)	Dwell time (ms)	Limit (ms)	Conclusion
DH1	1600	0.1667	106.688	400	PASS
DH3	533.33	0.1833	39.104	400	PASS
DH5	320	0.1667	21.338	400	PASS
2DH1	1600	0.1667	106.688	400	PASS
2DH3	533.33	0.1667	35.562	400	PASS
2DH5	320	0.1667	21.338	400	PASS
3DH1	1600	0.1833	117.312	400	PASS
3DH3	533.33	0.1833	39.104	400	PASS
3DH5	320	0.1667	21.338	400	PASS

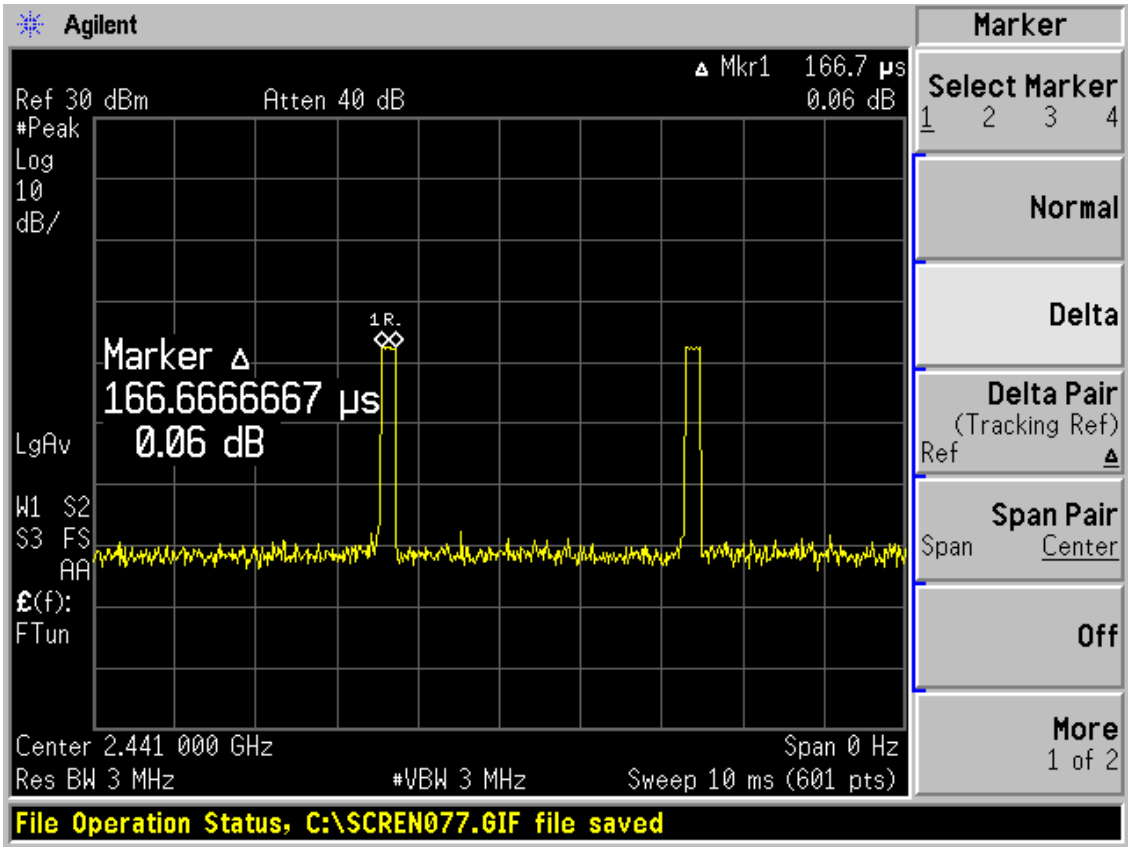
Note: Dwell time = time slot length * hop rate * 0.4s



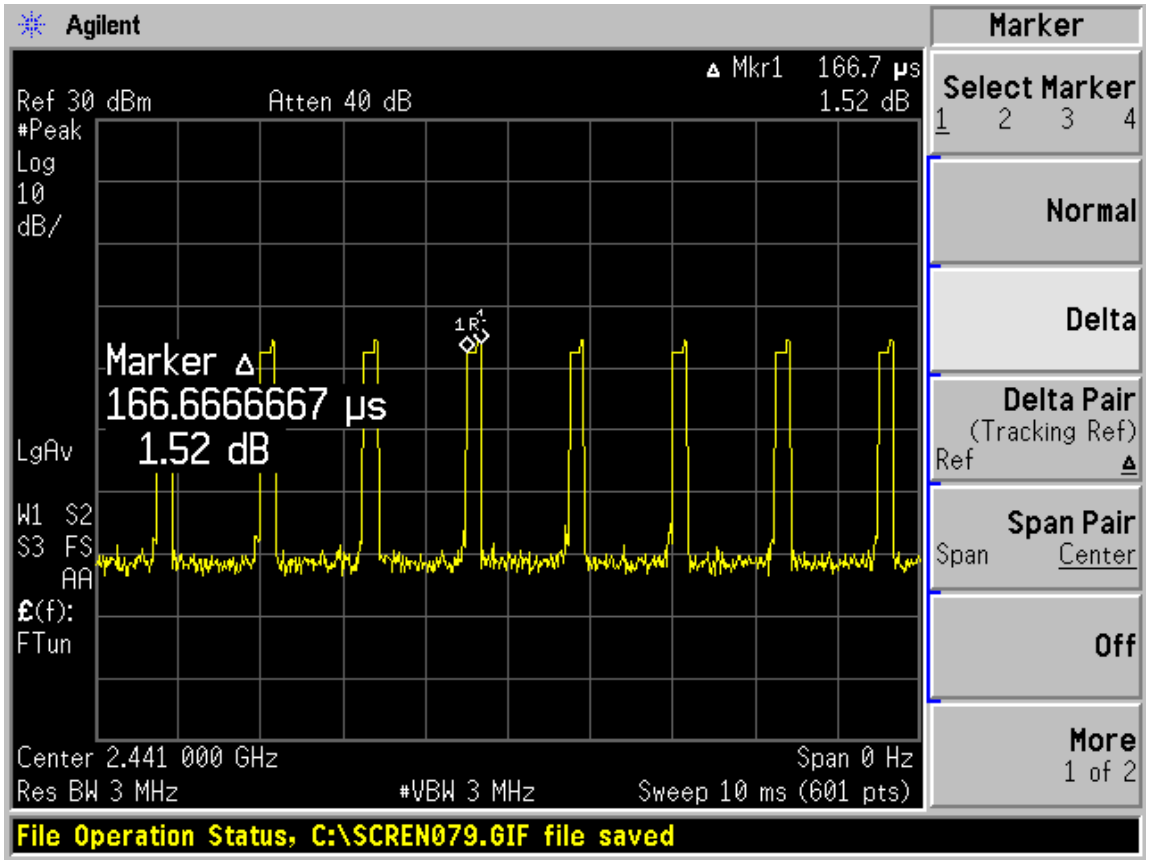
Carrier frequency (MHz): 2441,DH1



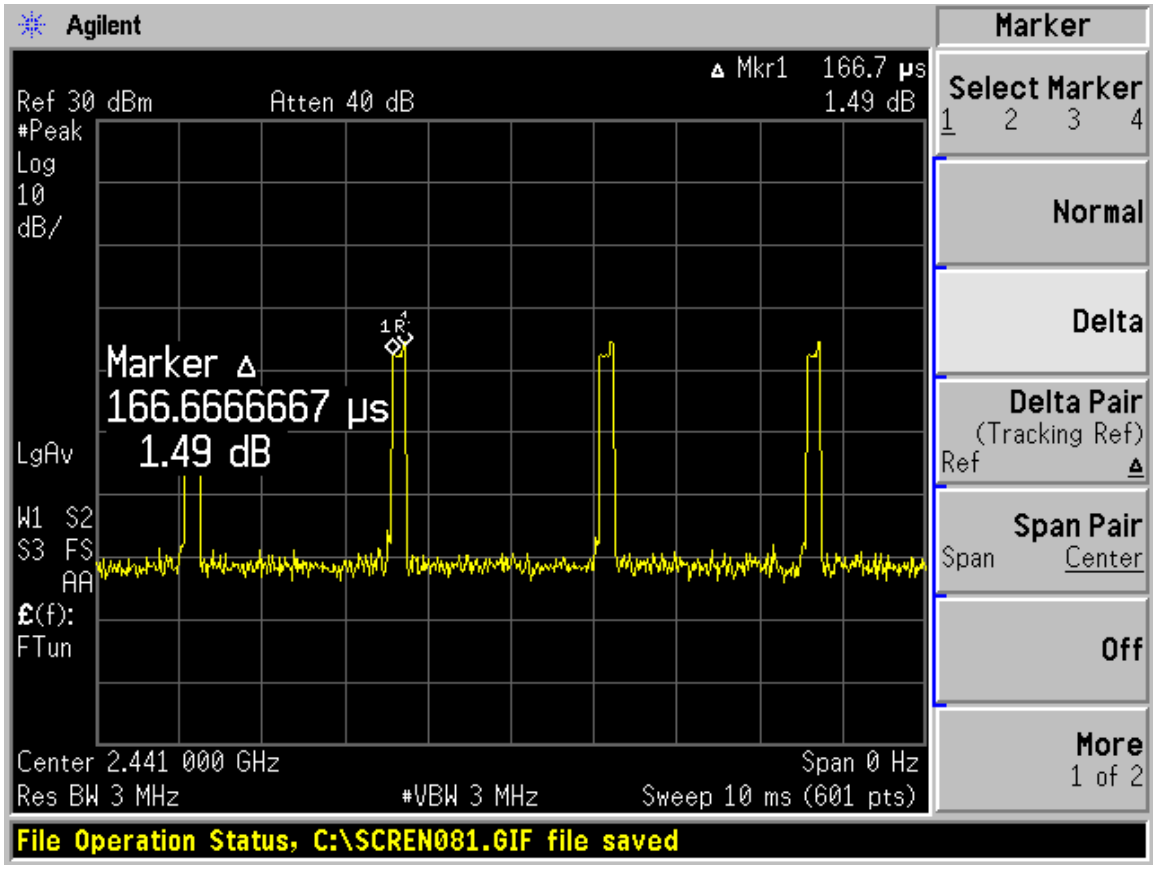
Carrier frequency (MHz): 2441,DH3



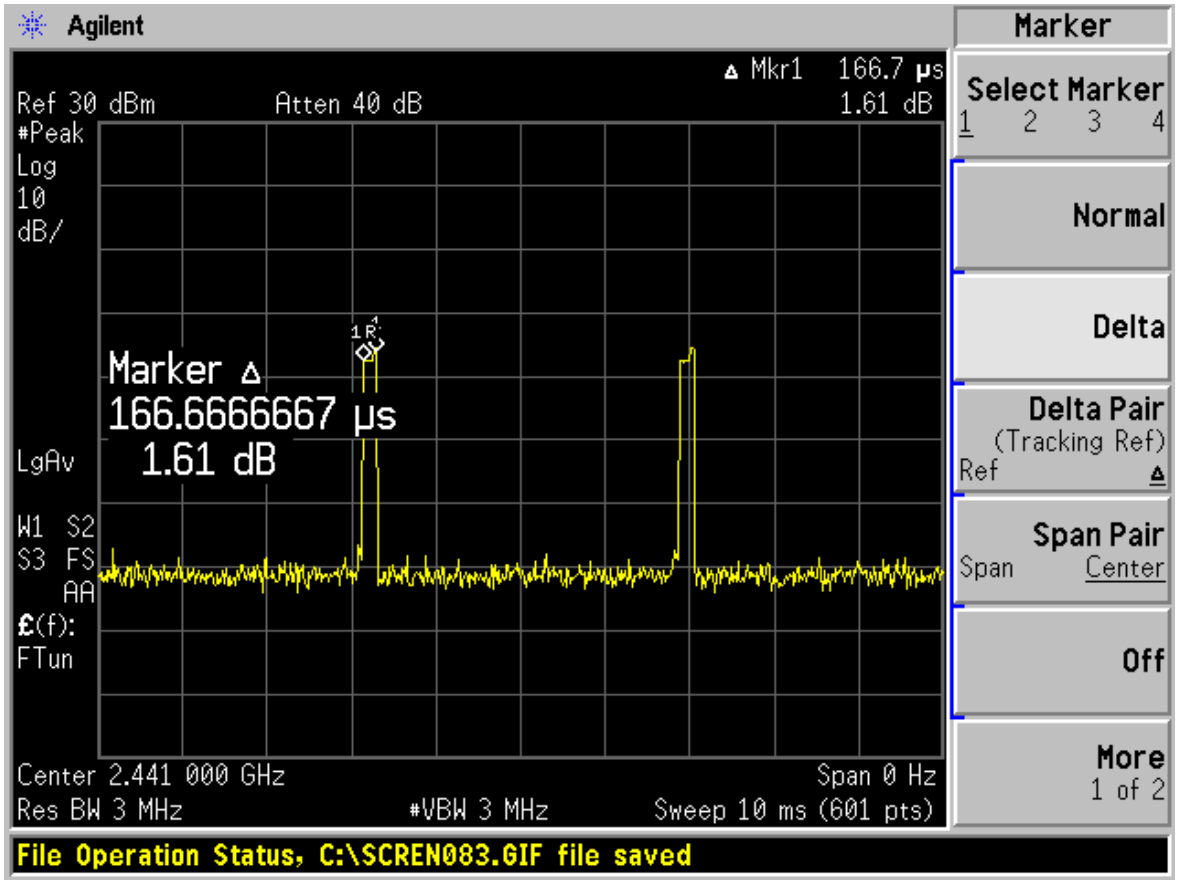
Carrier frequency (MHz): 2441,DH5



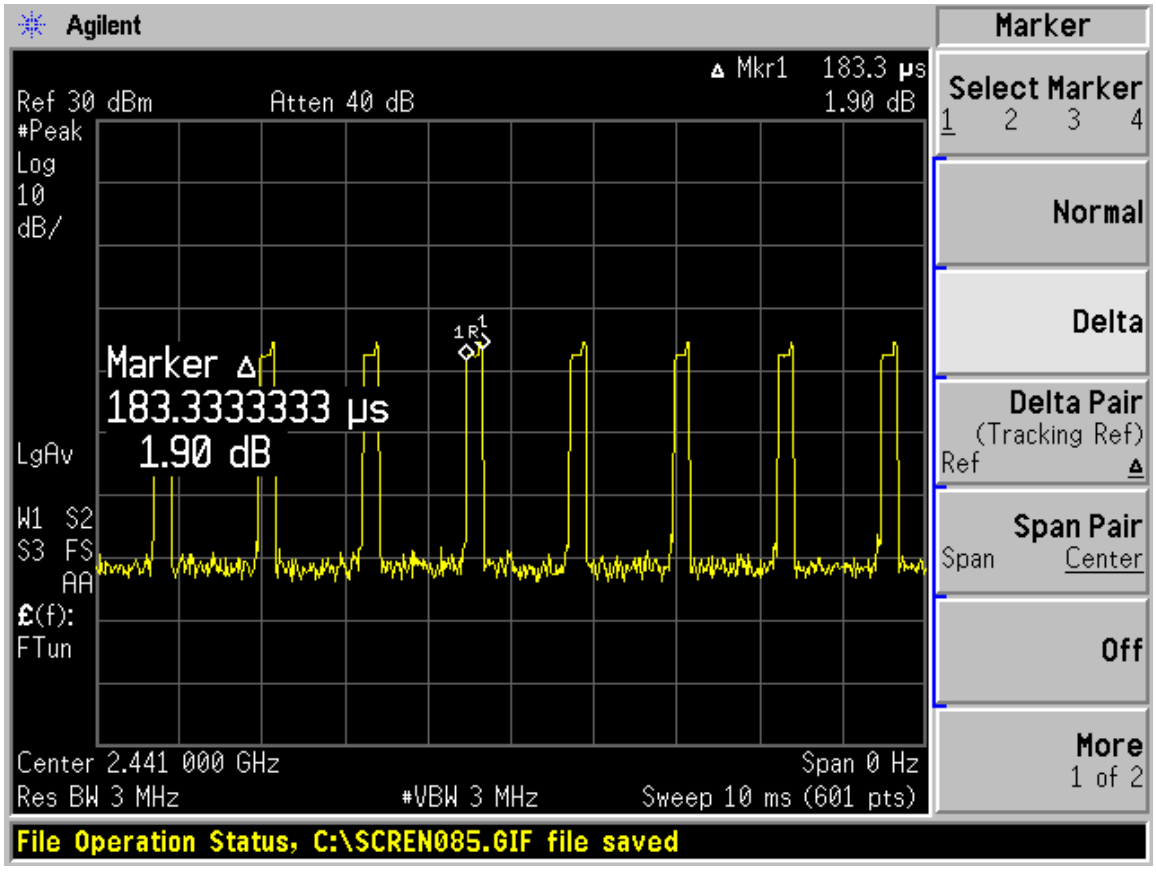
Carrier frequency (MHz): 2441,2DH1



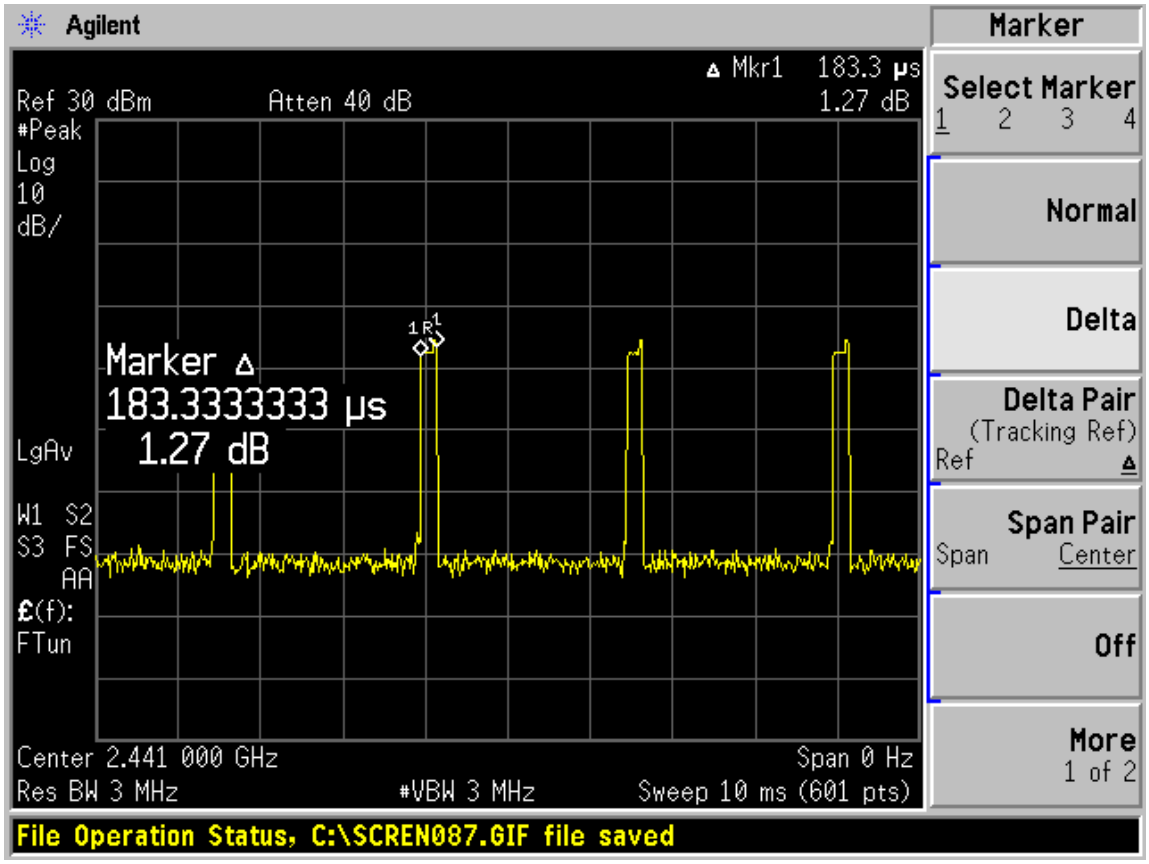
Carrier frequency (MHz): 2441,2DH3



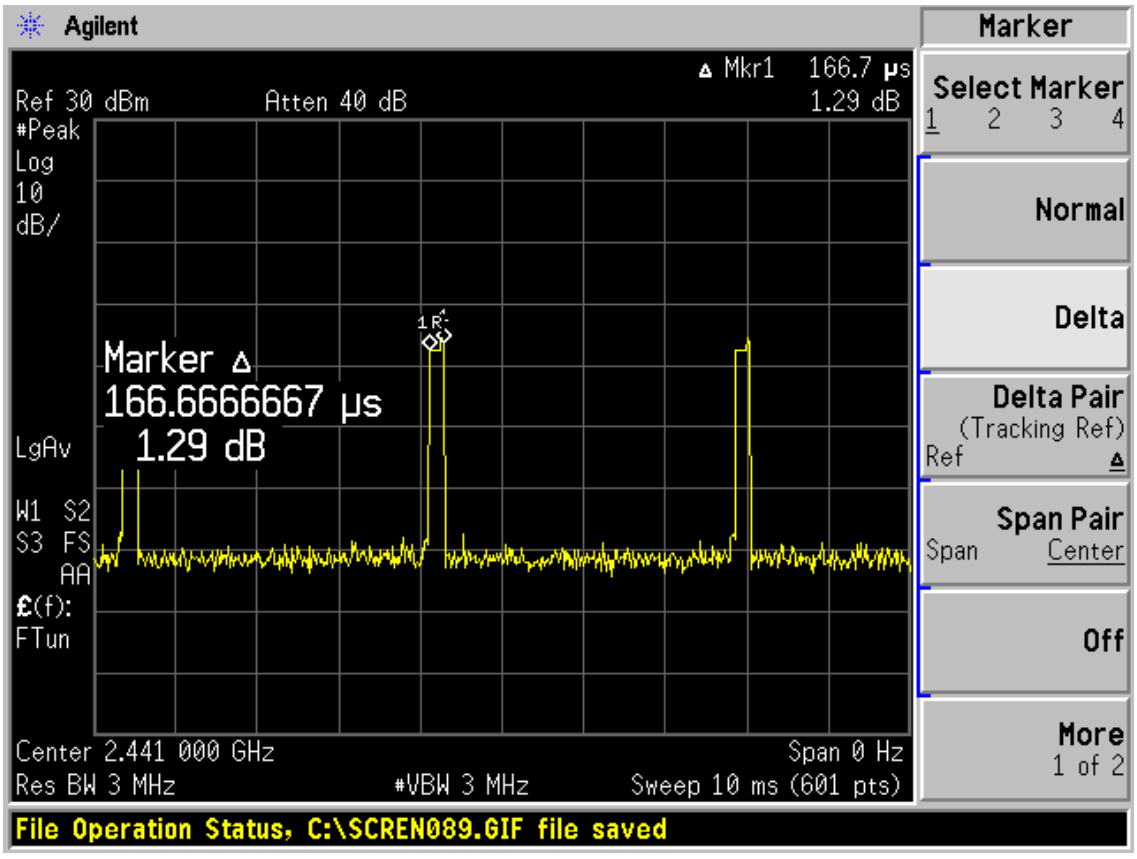
Carrier frequency (MHz): 2441,2DH5



Carrier frequency (MHz): 2441,3DH1



Carrier frequency (MHz): 2441,3DH3



Carrier frequency (MHz): 2441,3DH5

2.6. Band Edge Compliance

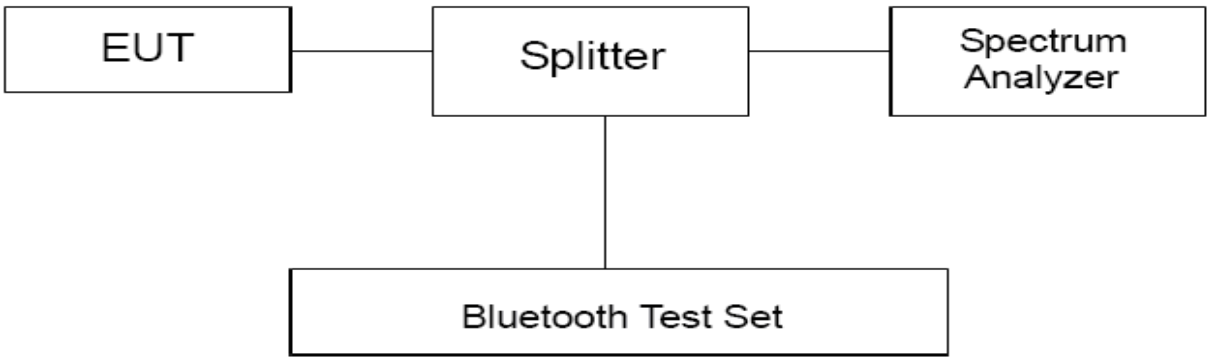
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The Equipment Under Test (EUT) was set up in a shielded room to perform the spurious emissions measurements. The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. The band edge of the lowest and highest channels were measured. The peak detector is used. RBW is set to 100KHz and VBW is set to 300KHz on spectrum analyzer.Spectrum analyzer plots are included on the following pages. EUT test for Hopping On mode and Hopping Off mode.

Test Setup



Limits

Rule Part 15.247(d) specifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.”

Limit	⩾20 dB

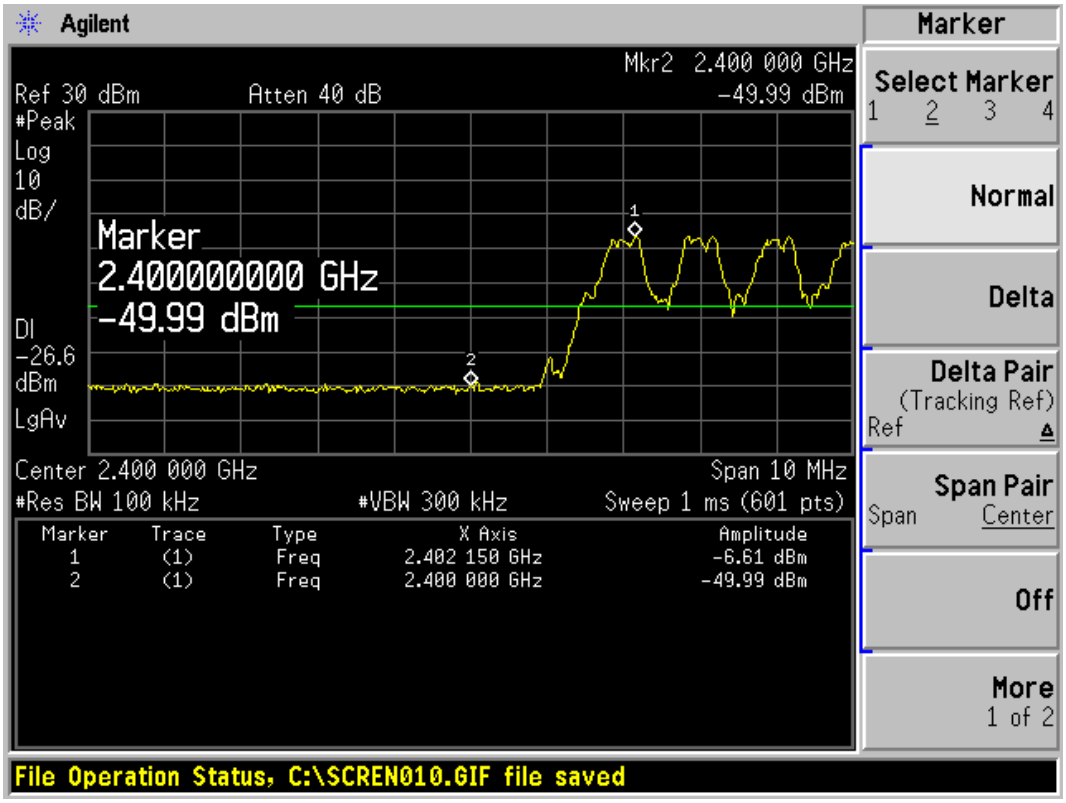
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
2GHz-3GHz	1.407 dB

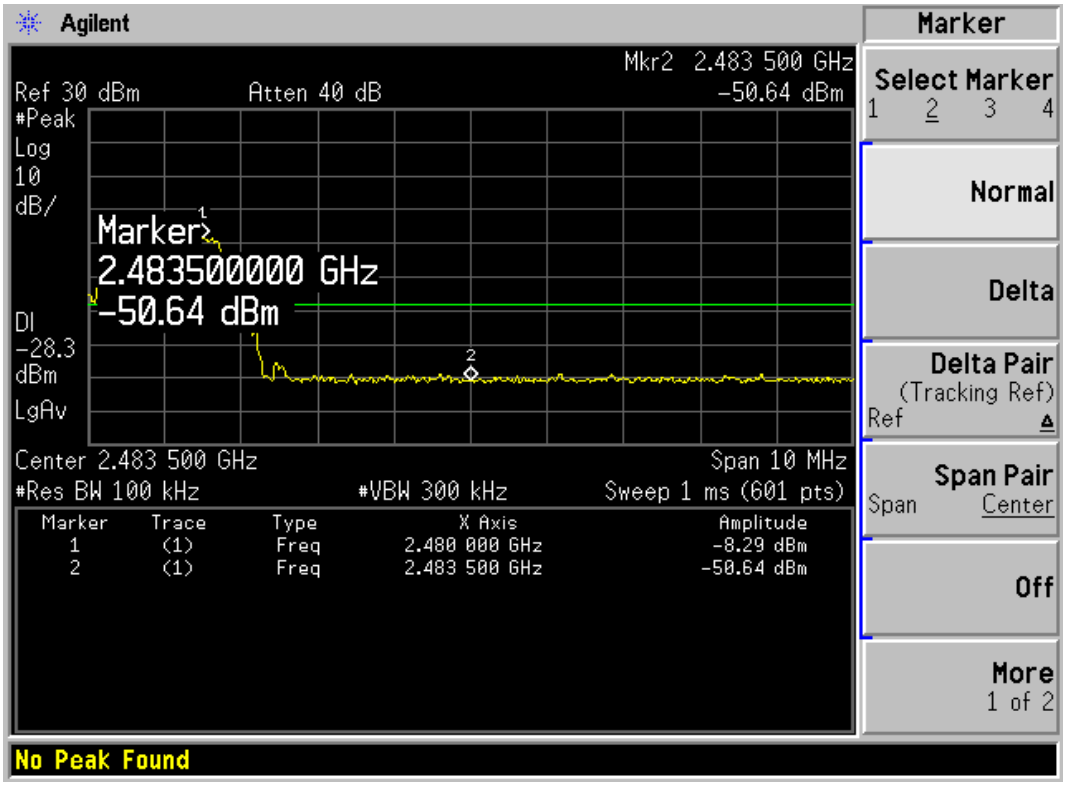
Test Results: PASS

Hopping On-DH5-



Carrier frequency (MHz): 2402

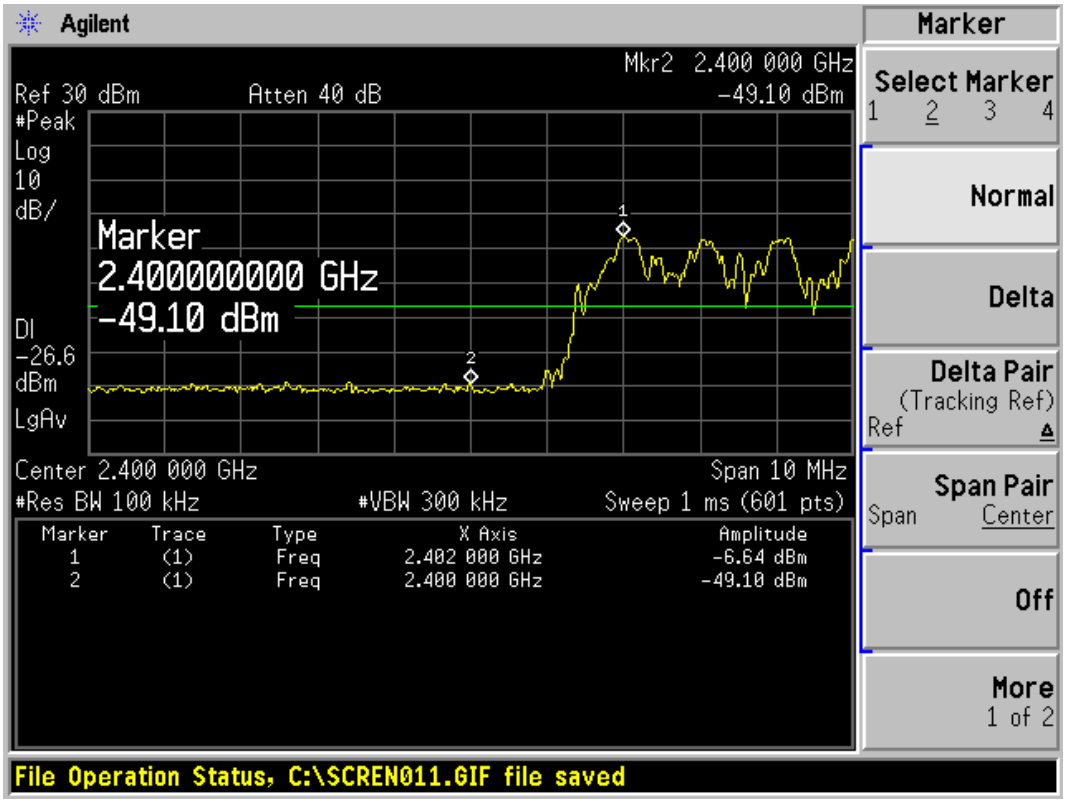
Channel No.:0



Carrier frequency (MHz): 2480

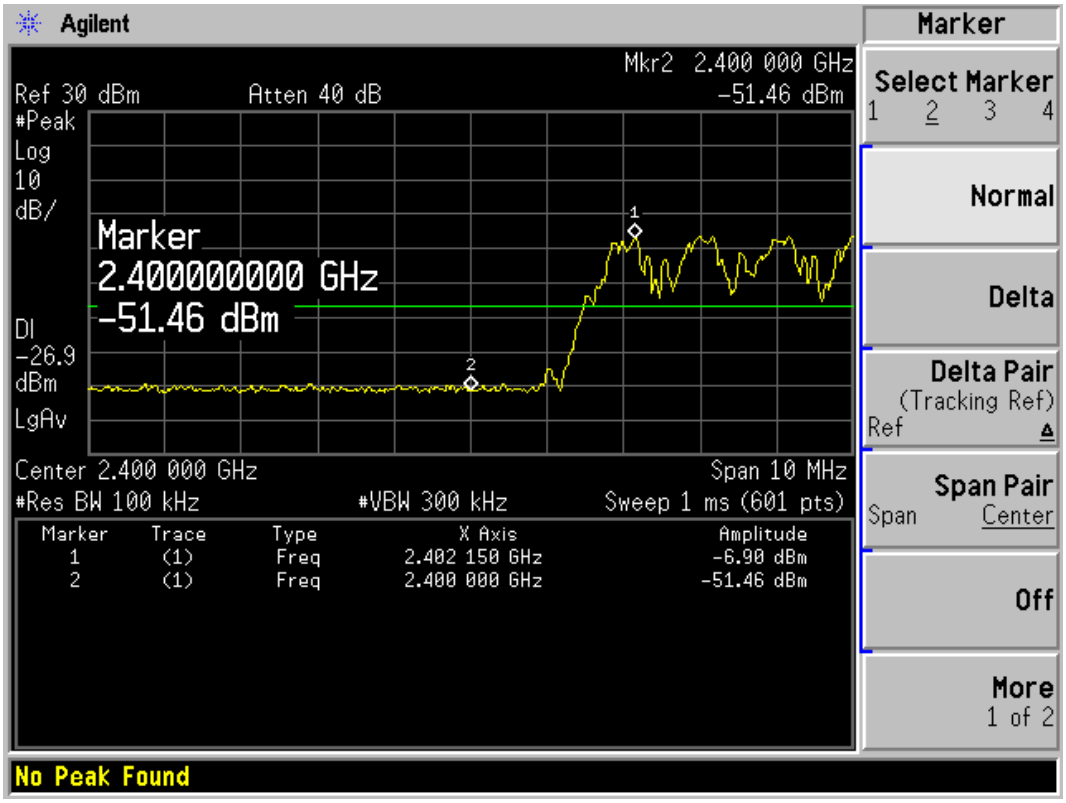
Channel No.:78

Hopping On-2DH5



Carrier frequency (MHz): 2402

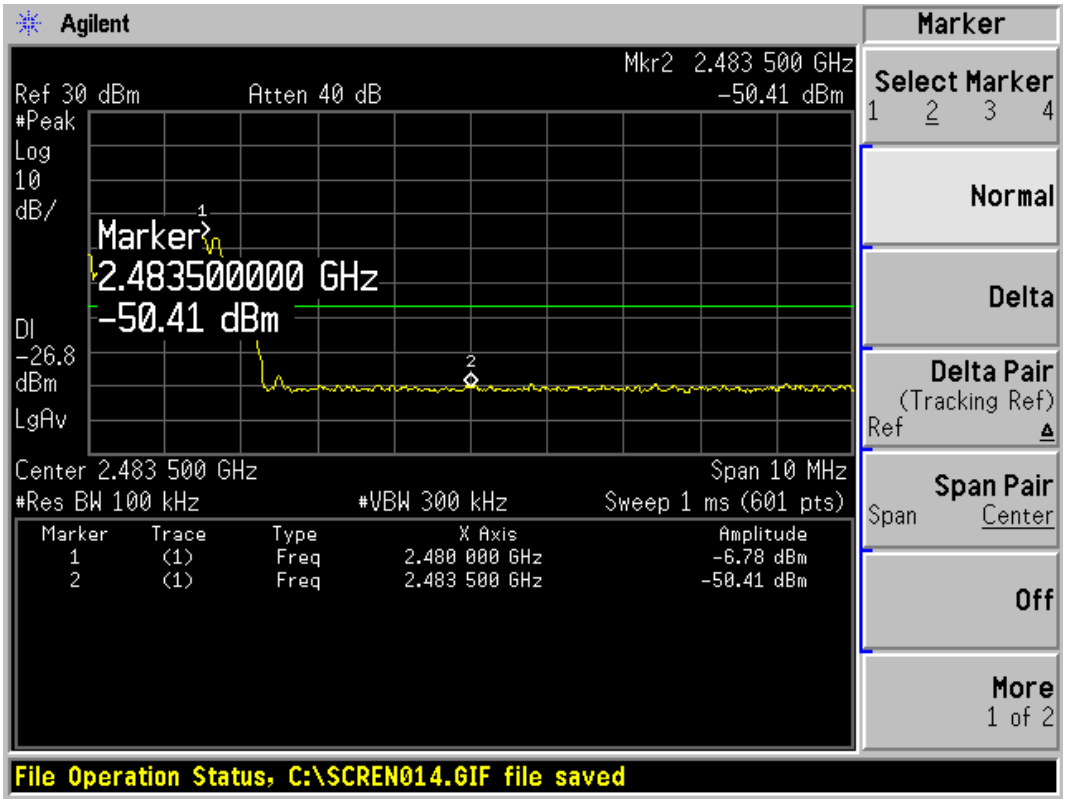
Channel No.:0



Carrier frequency (MHz): 2480

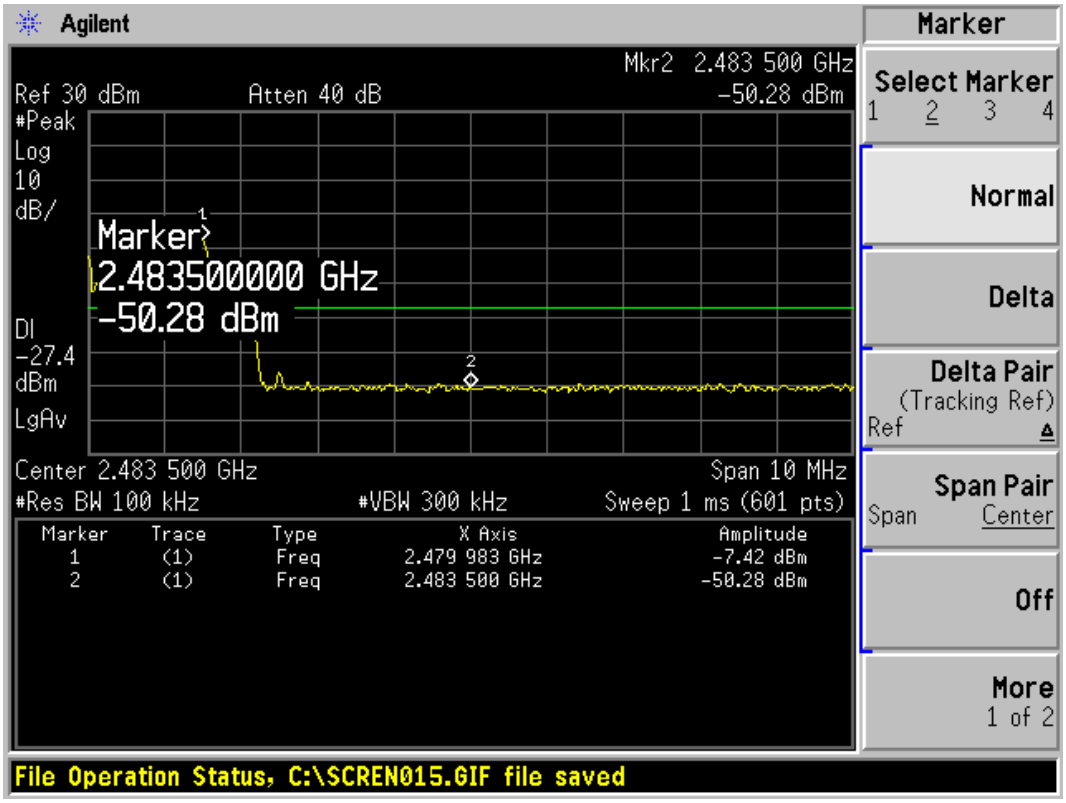
Channel No.:78

Hopping On-3DH5



Carrier frequency (MHz): 2402

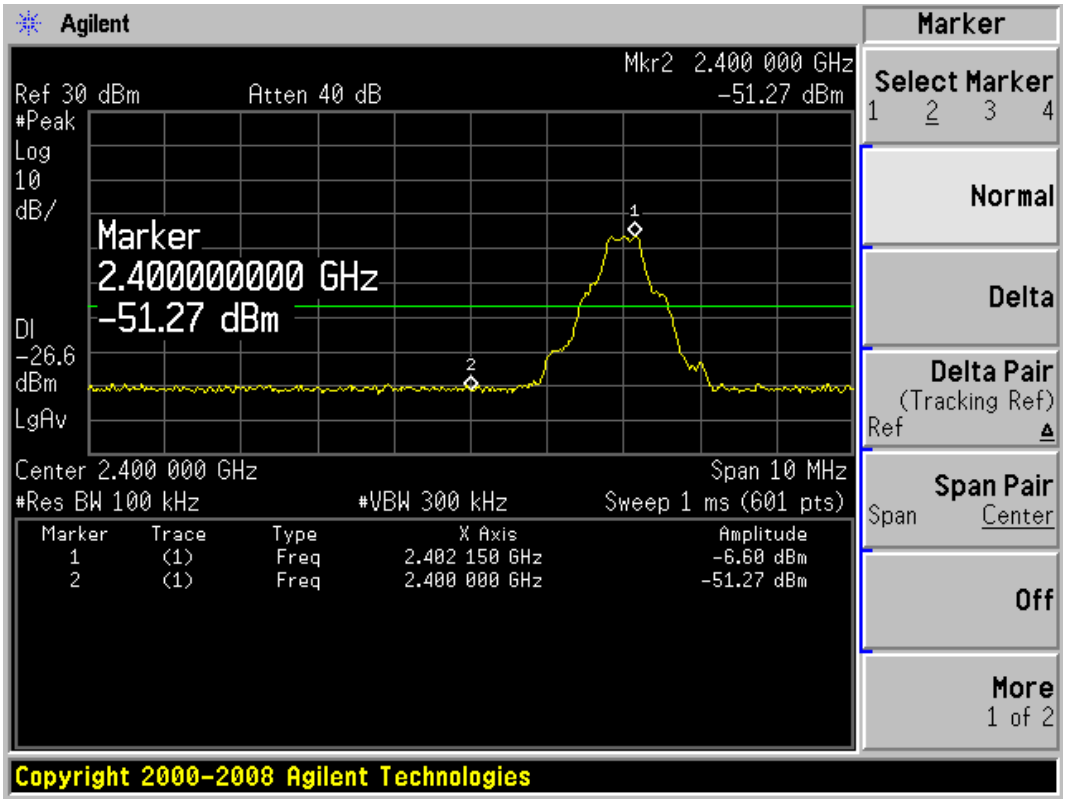
Channel No.:0



Carrier frequency (MHz): 2480

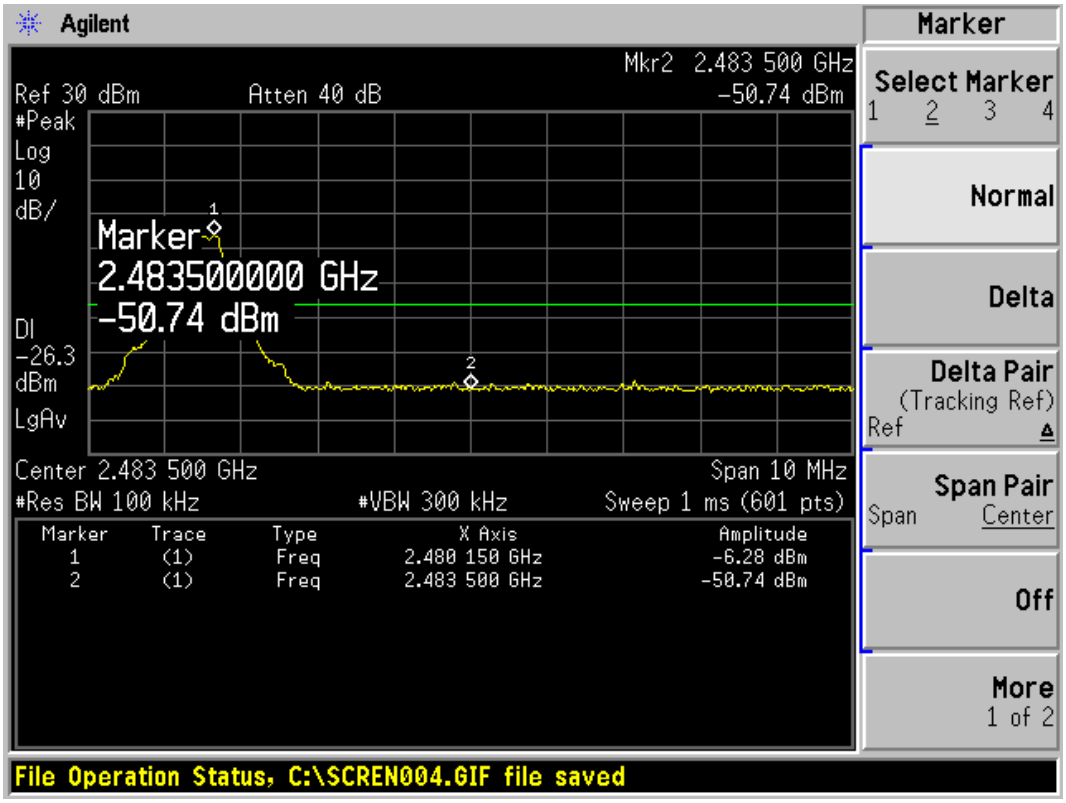
Channel No.:78

Hopping Off-DH5-



Carrier frequency (MHz): 2402

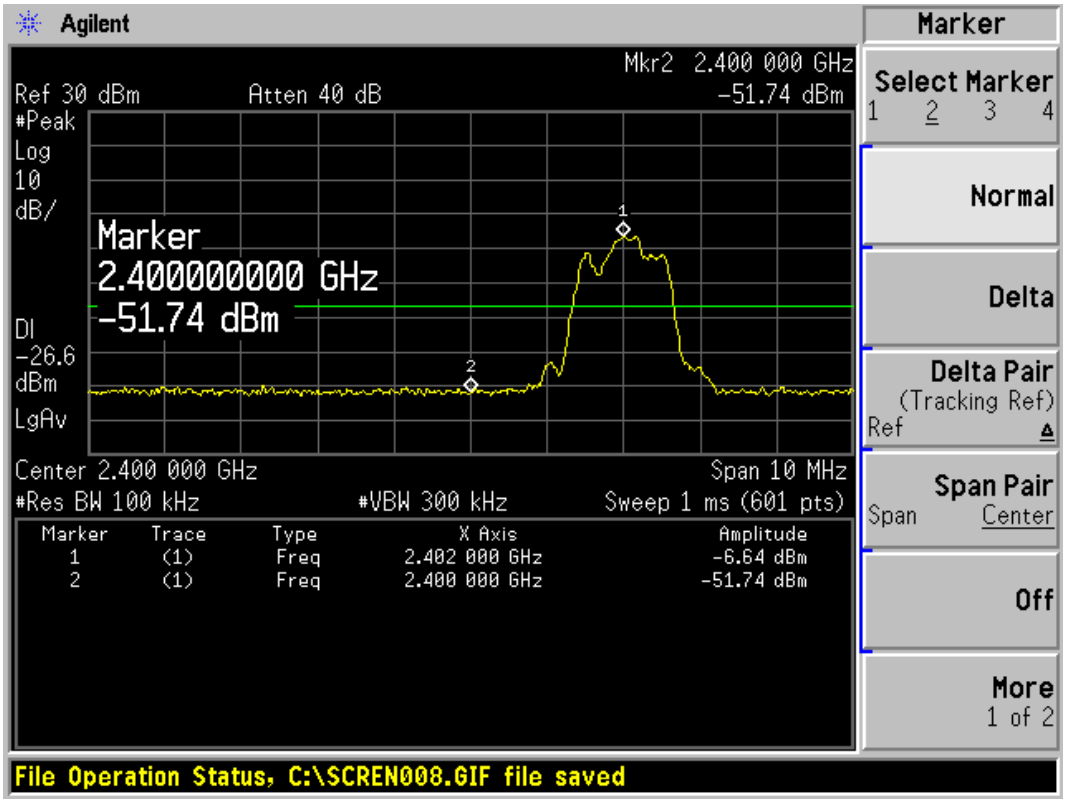
Channel No.:0



Carrier frequency (MHz): 2480

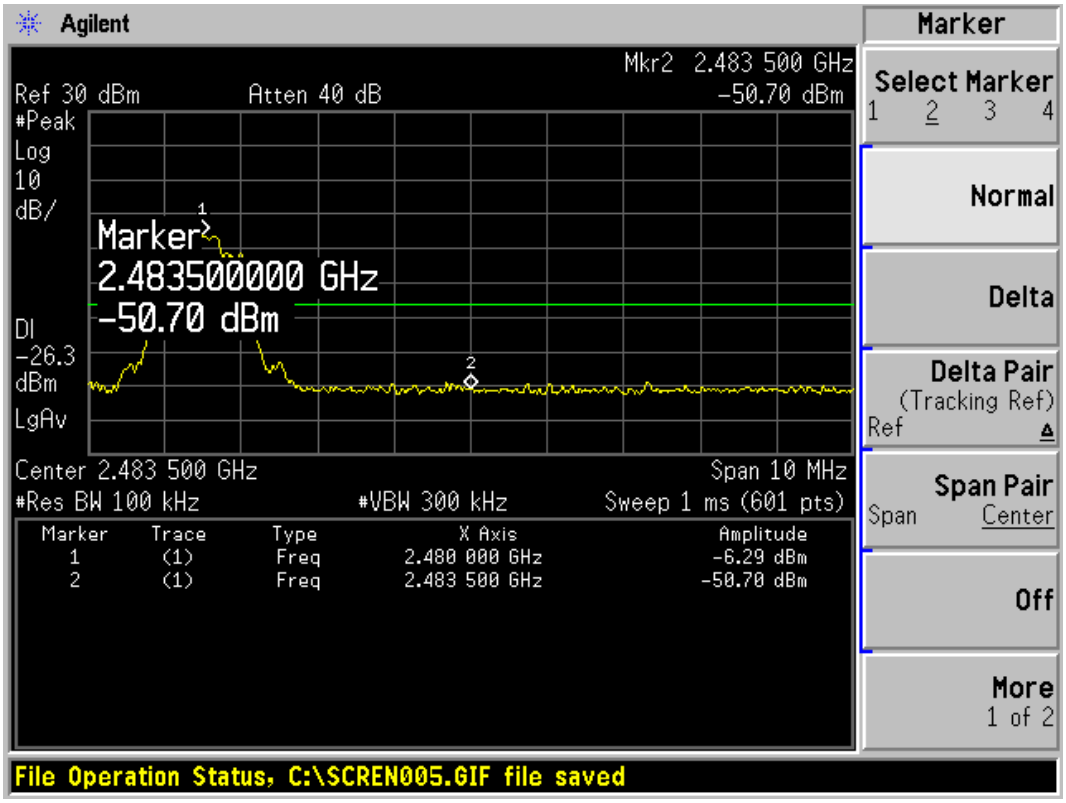
Channel No.:78

Hopping Off-2DH5



Carrier frequency (MHz): 2402

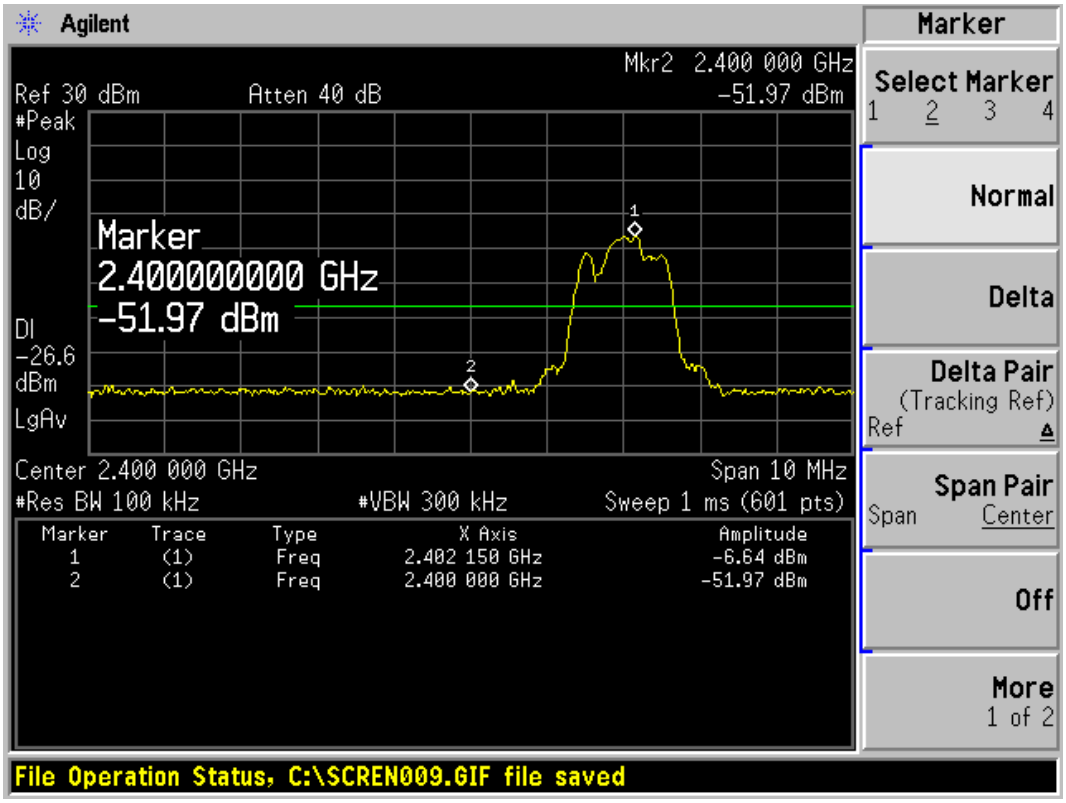
Channel No.:0



Carrier frequency (MHz): 2480

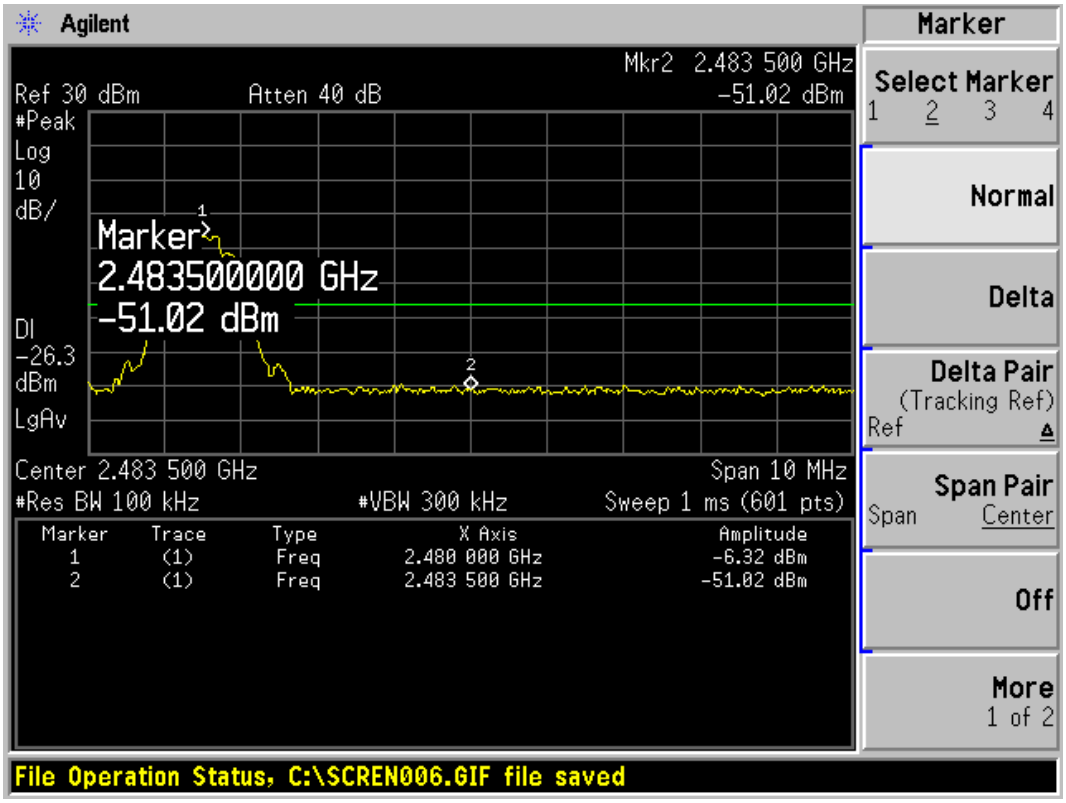
Channel No.:78

Hopping Off-3DH5



Carrier frequency (MHz): 2402

Channel No.:0



Carrier frequency (MHz): 2480

Channel No.:78

2.7. Spurious Radiated Emissions in the Restricted Band

Ambient condition

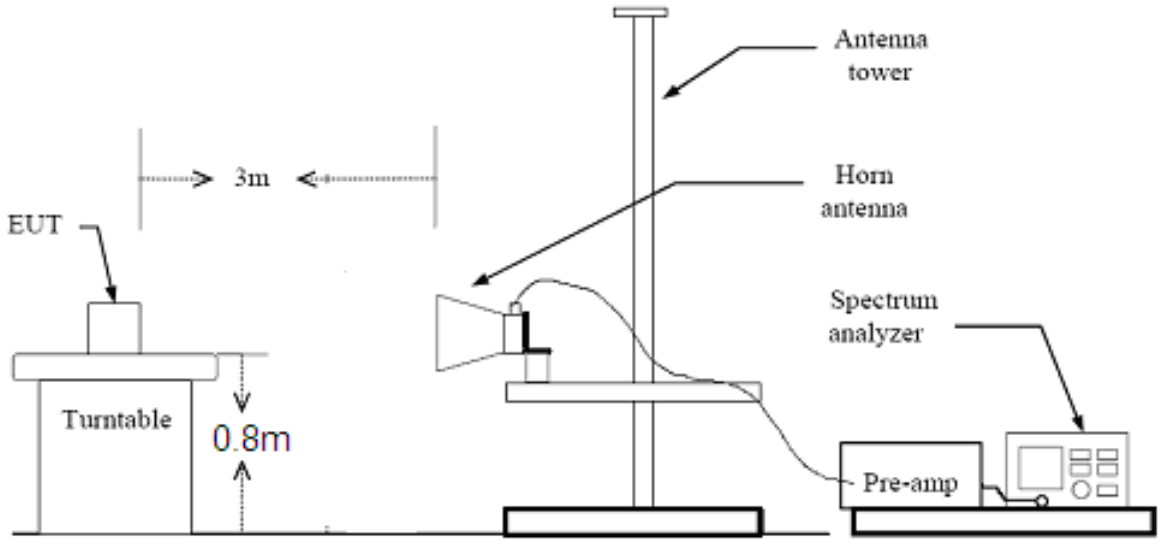
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.
Set the spectrum analyzer in the following:
(a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
This setting method can refer to **DA00-705.**

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis) and docking mode. The worst emission was found in stand-up position (Y axis) and the worst case was recorded.

The test is in transmit mode.

Test setup



Limits

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	[2]
13.36 - 13.41			

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Peak Limit=74 dBuV/m

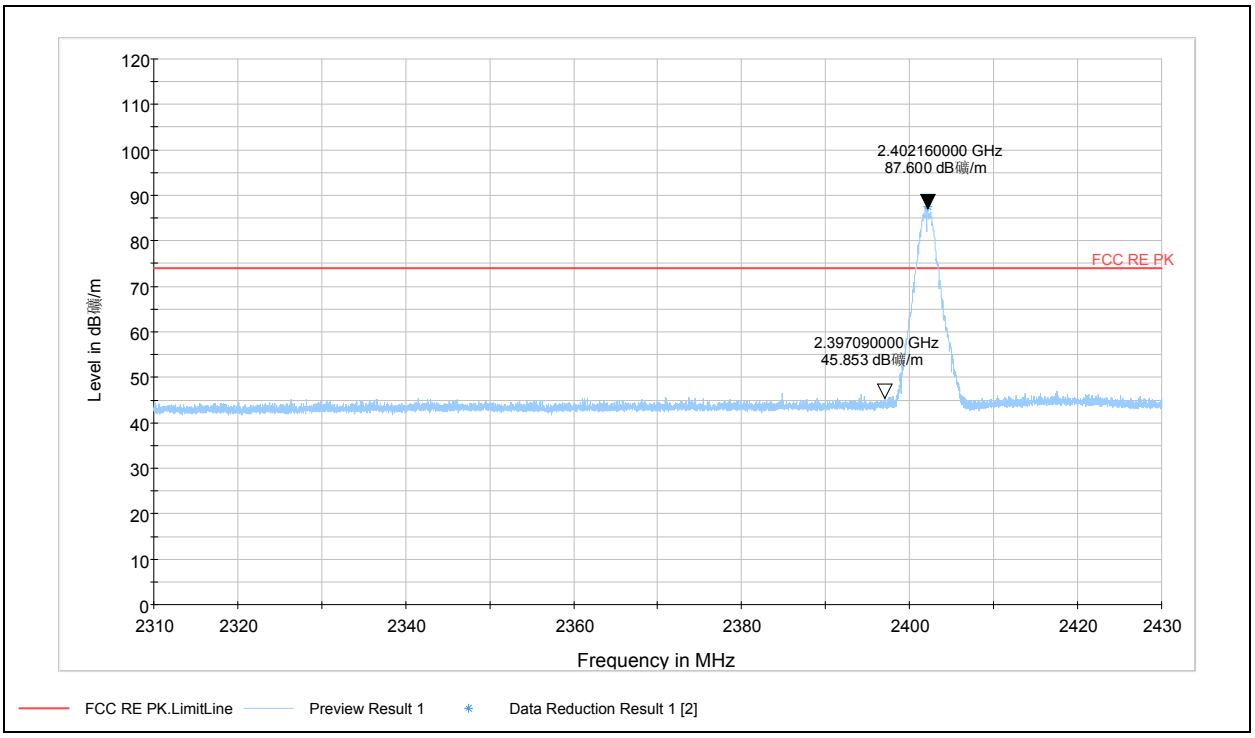
Average Limit=54 dBuV/m

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 3.55 dB.

Test Results:

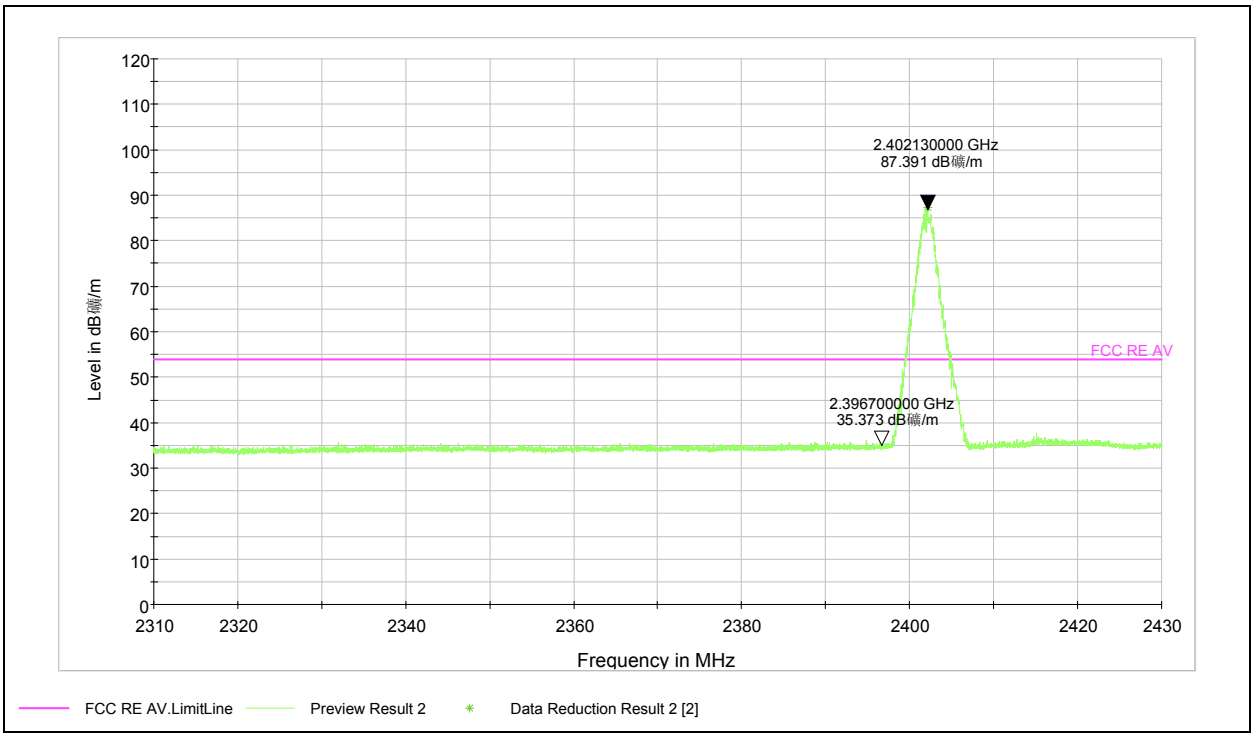
Basic Rate- Channel 0



lower band edge Peak-CH 0

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

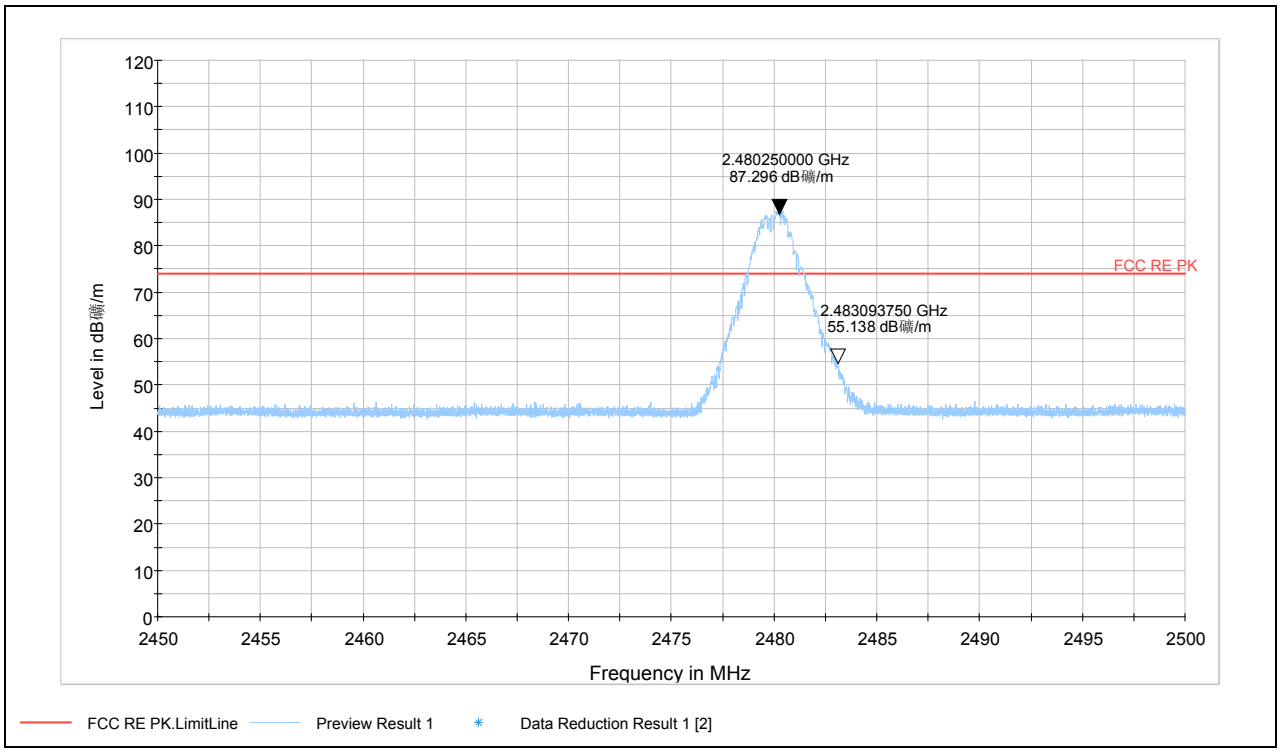


lower band edge average-CH 0

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

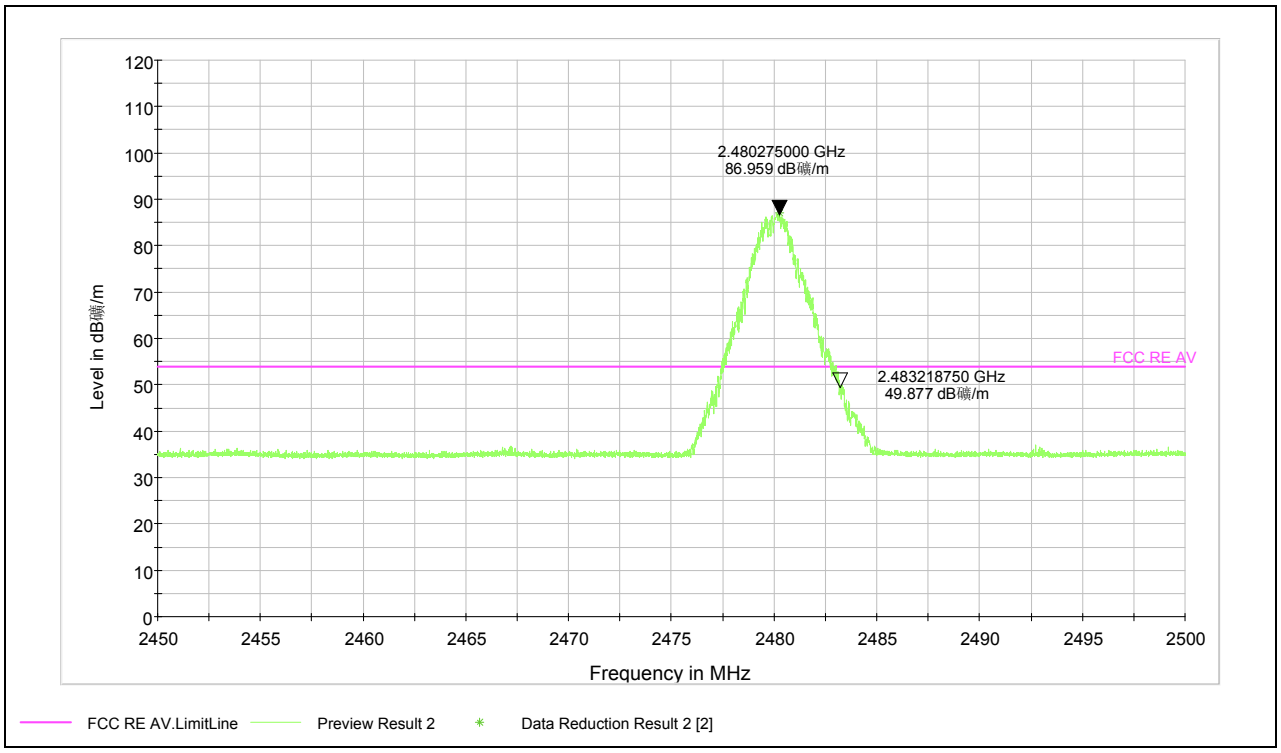
Basic Rate- Channel 78



Higher band edge Peak-CH 78

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

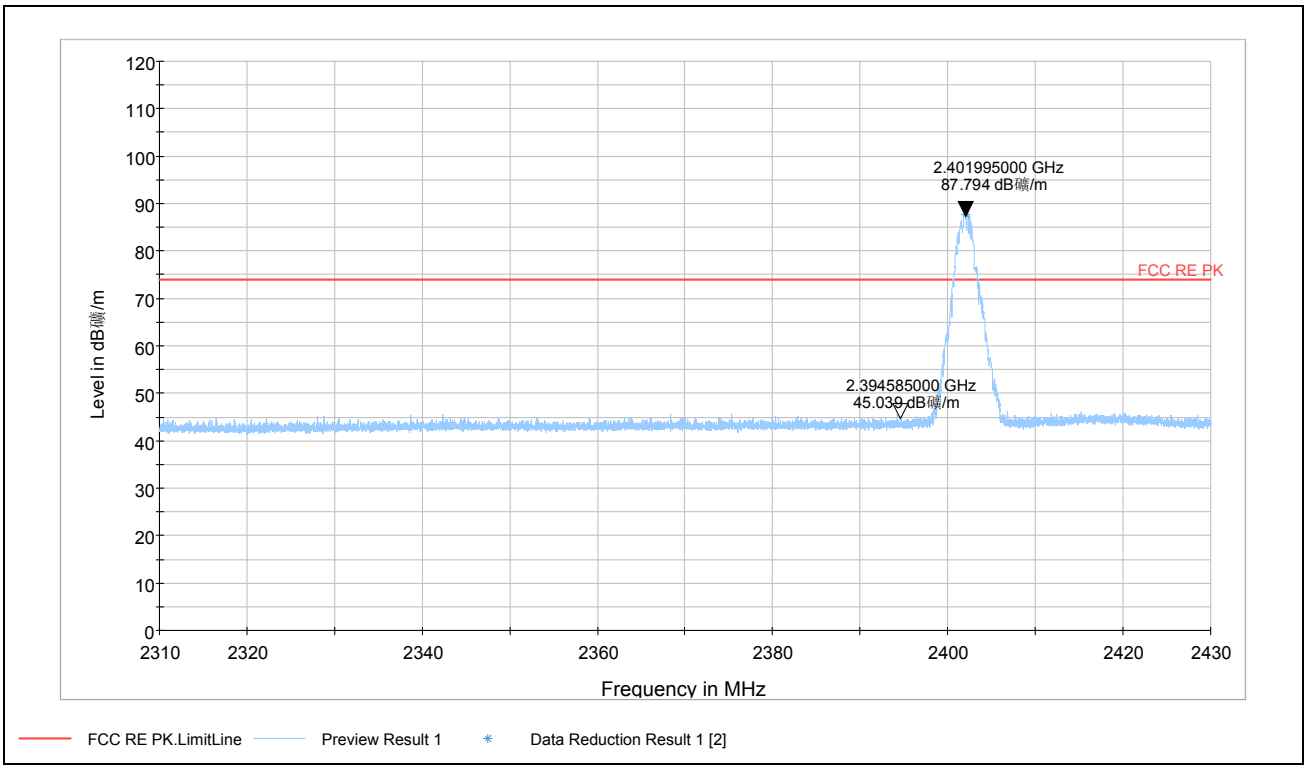


Higher band edge average-CH 78

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

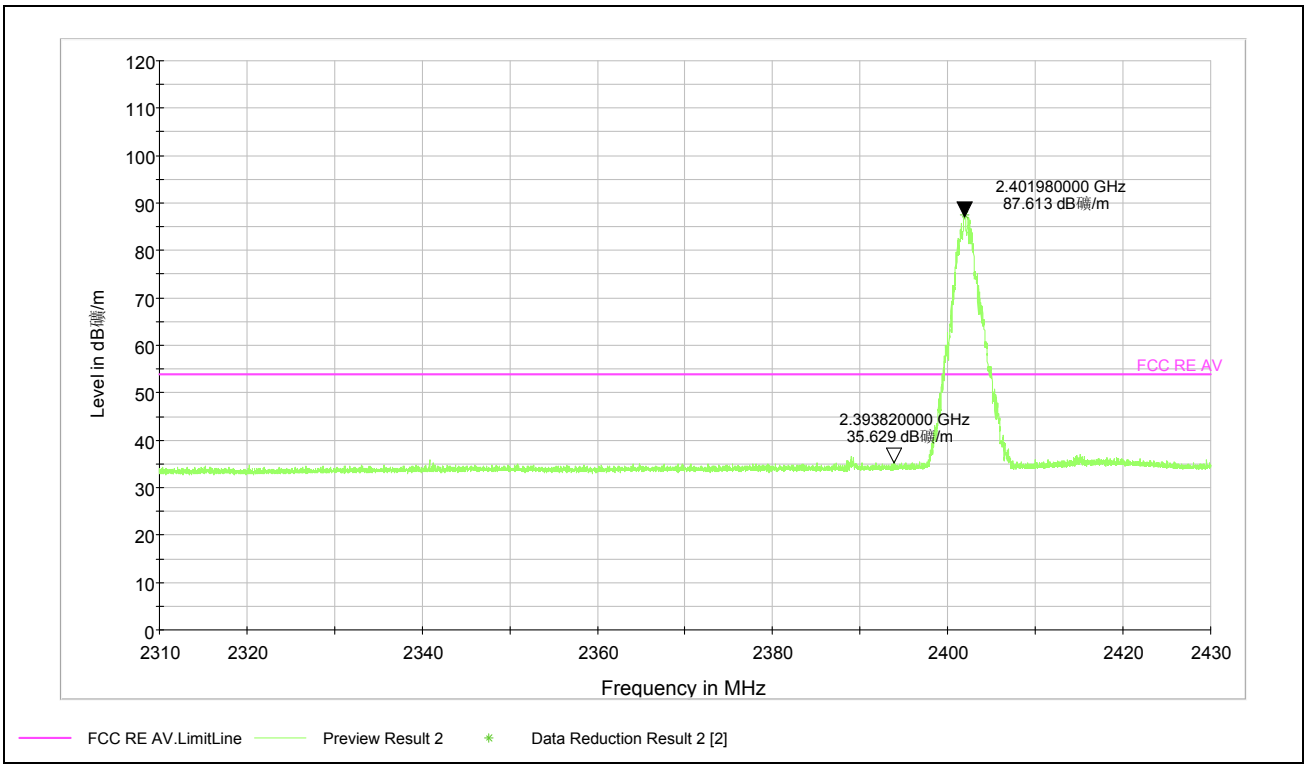
EDR- Channel 0



lower band edge Peak-CH 0

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

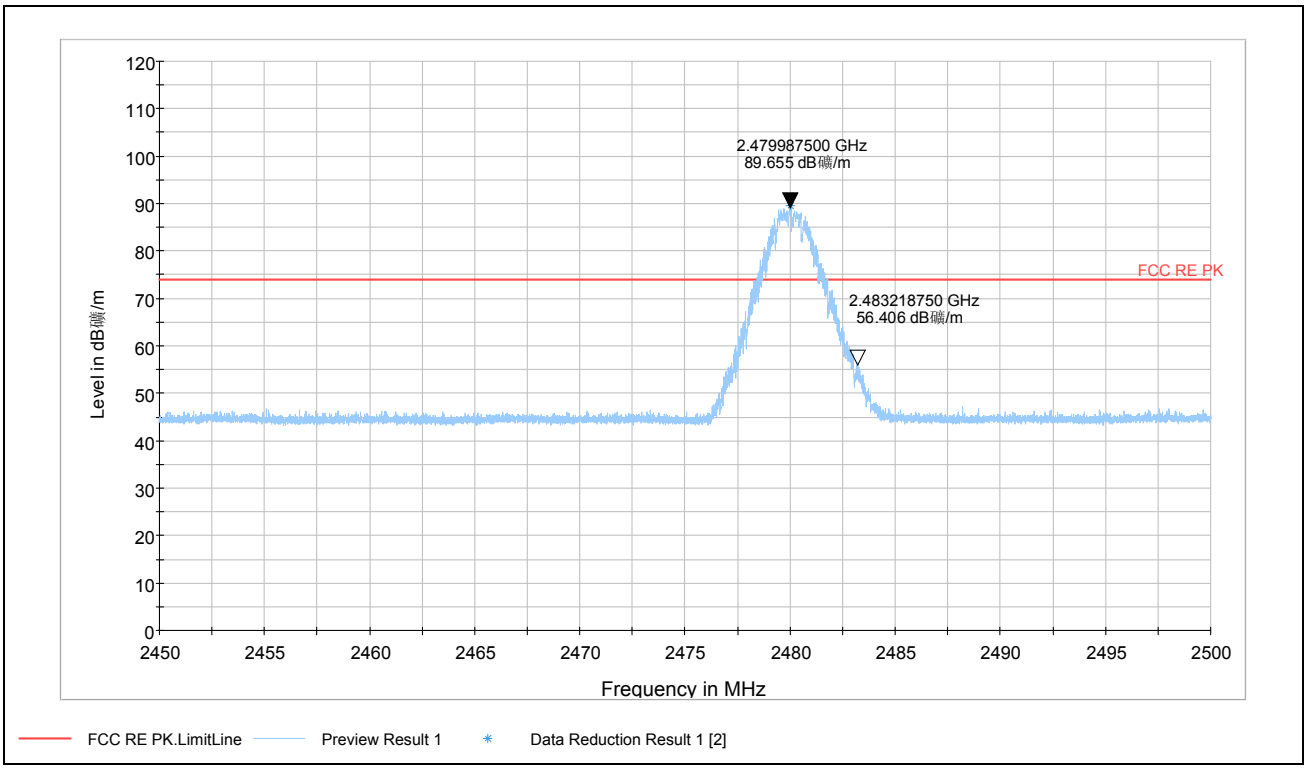


lower band edge average-CH 0

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

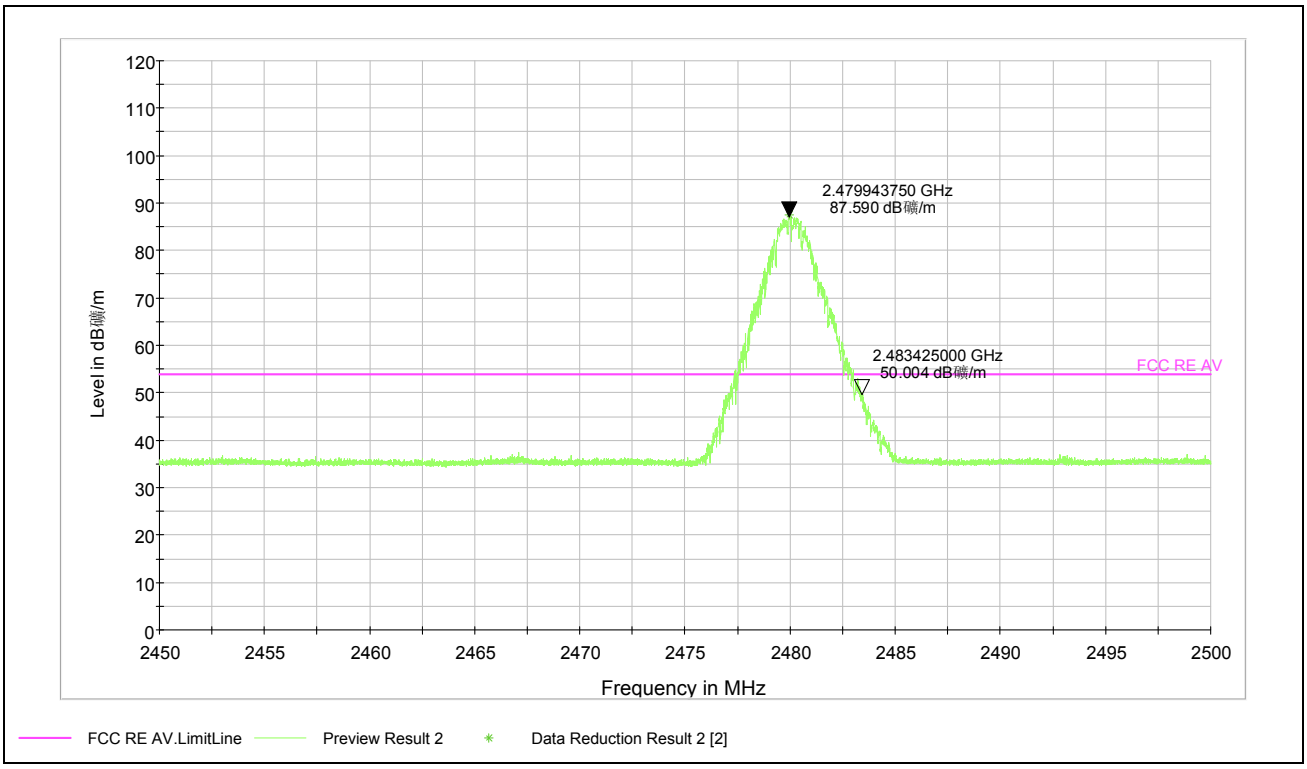
EDR- Channel 78



Higher band edge Peak-CH 78

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)



Higher band edge average-CH 78

Note: The signal beyond the limit is carrier

Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

2.8. Number of hopping Frequency

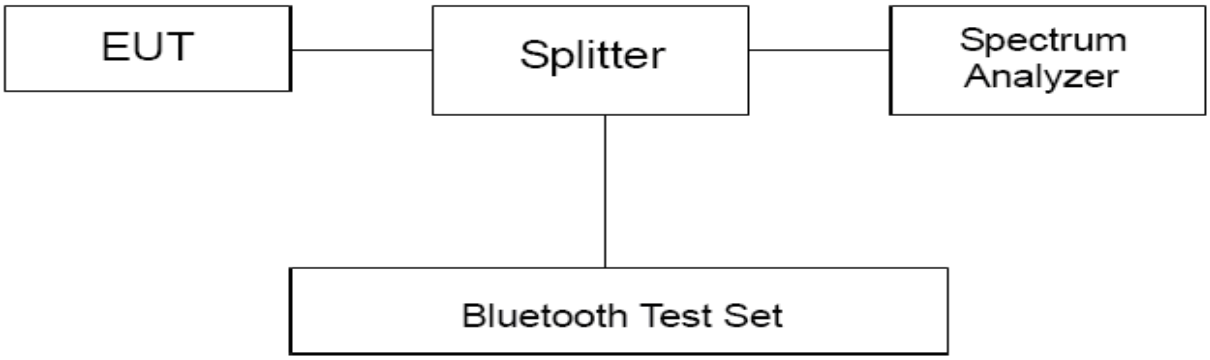
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The Equipment Under Test (EUT) was set up in a shielded room to perform the spurious emissions measurements. The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. RBW is set to 300kHz and VBW is set to 300kHz on spectrum analyzer. Set EUT on Hopping on mode.

Test setup



Limits

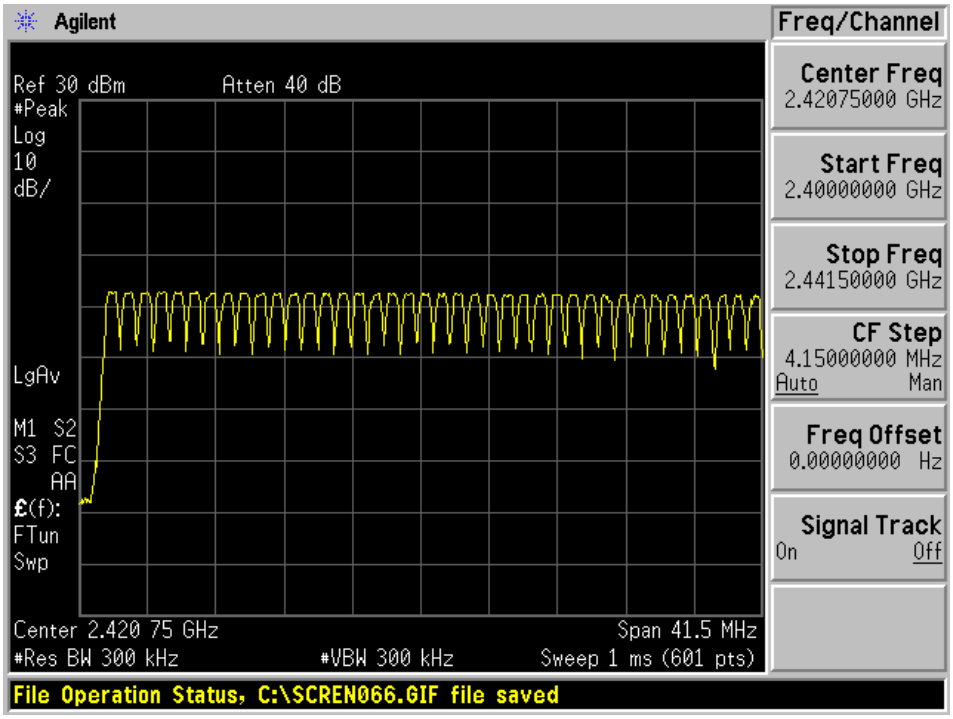
Rule Part 15.247(a) (1) (iii) specifies that" Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels..".

Limits	⩾ 15 channels

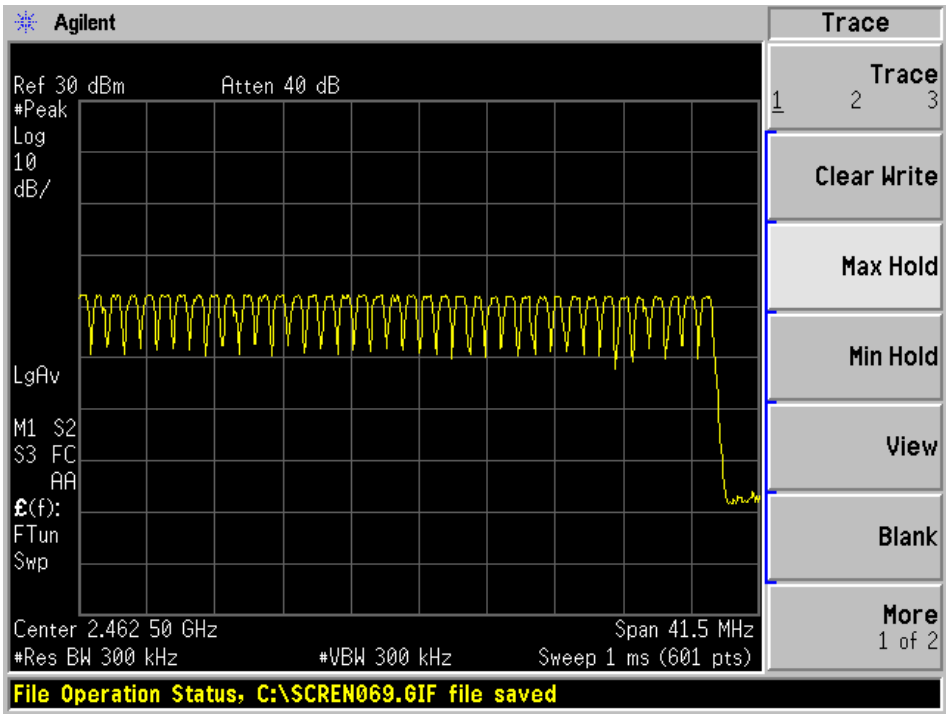
Test Results:

DH5

Number of hopping channels	conclusion
79	PASS



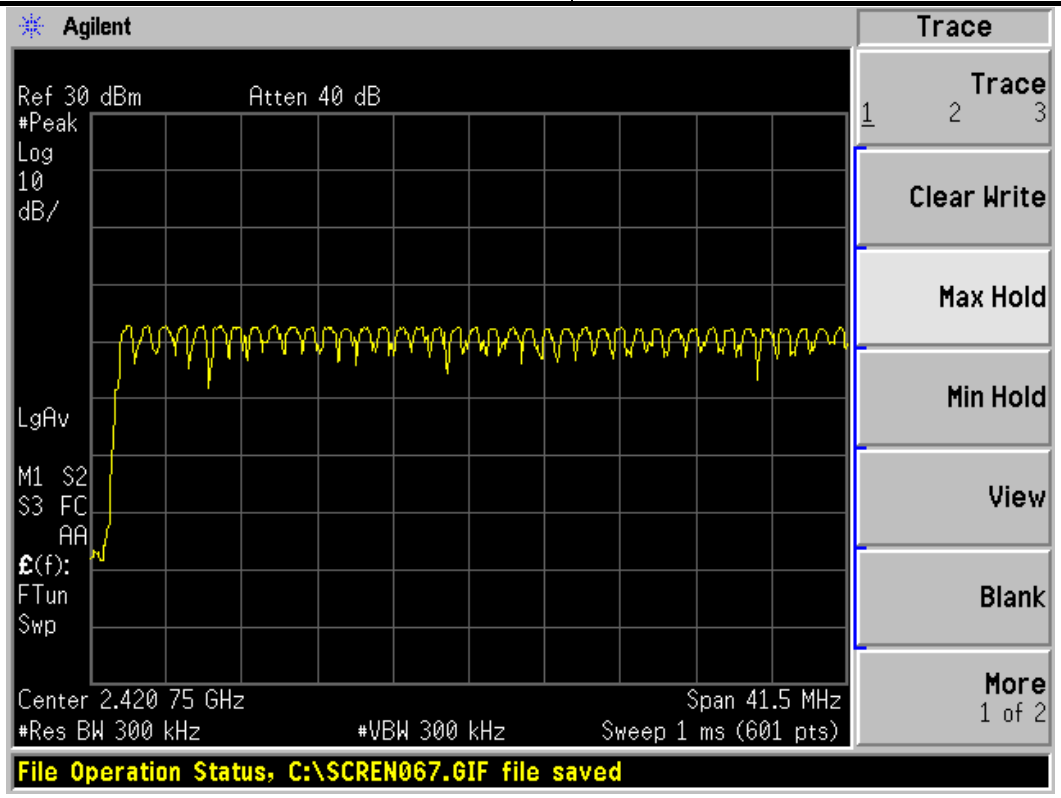
2400 MHz – 2441 MHz



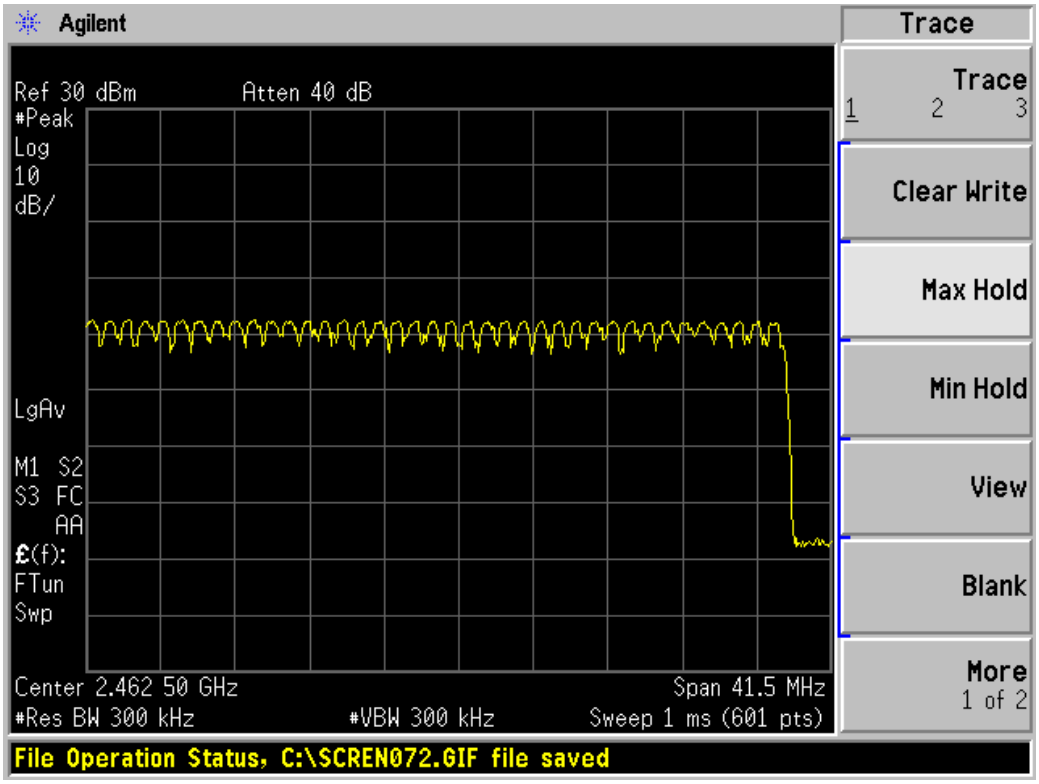
2441 MHz – 2483.5 MHz

2DH5

Number of hopping channels	conclusion
79	PASS



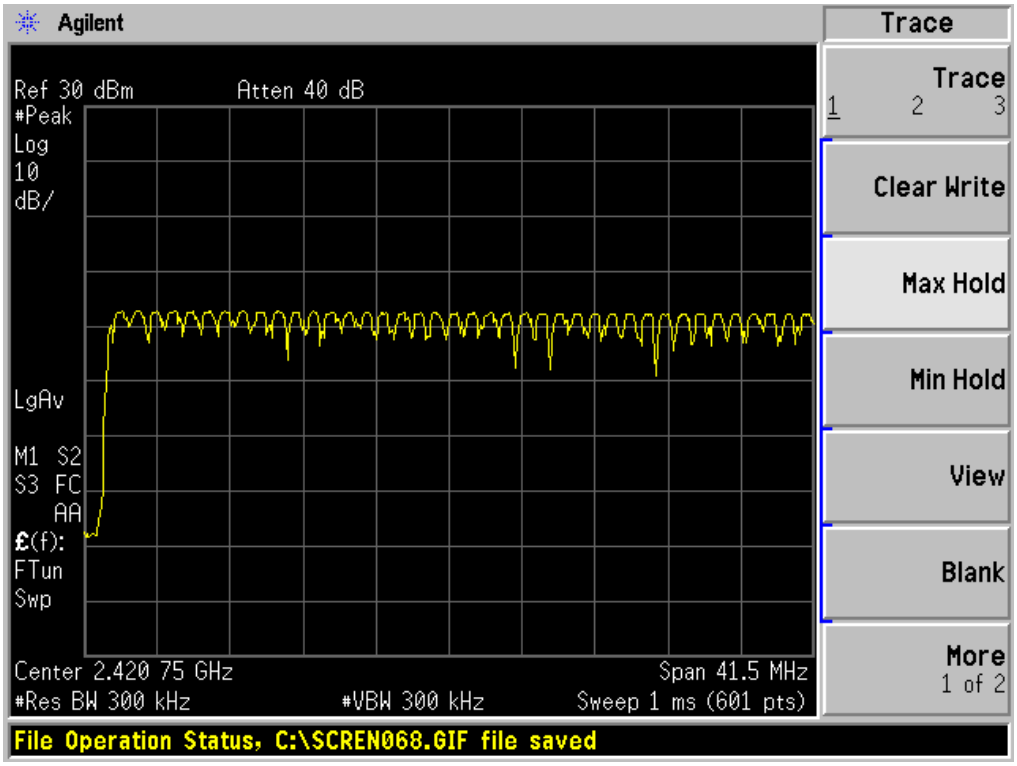
2400 MHz – 2441 MHz



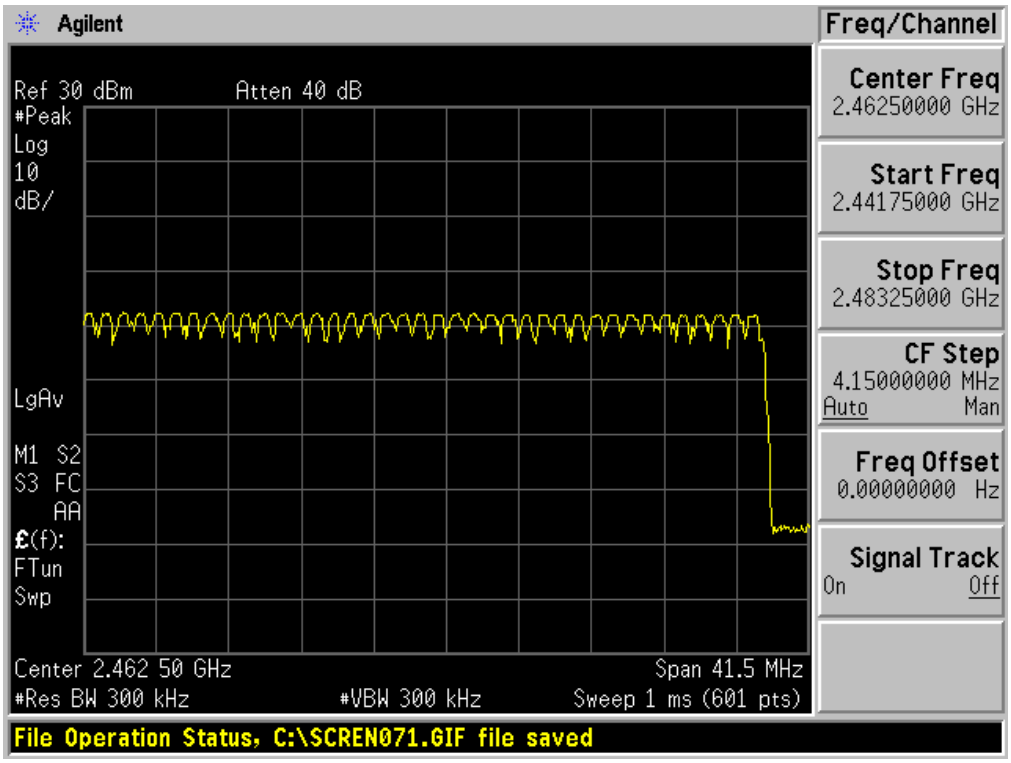
2441 MHz – 2483.5 MHz

3DH5

Number of hopping channels	conclusion
79	PASS



2400 MHz – 2441 MHz



2441 MHz – 2483.5 MHz

2.9. Spurious RF Conducted Emissions

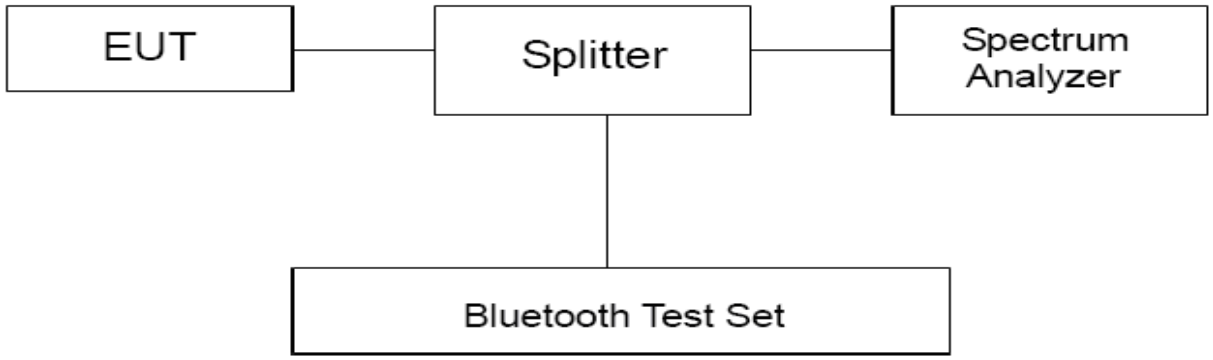
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. RBW and VBW are set to 100 kHz, Sweep is set to ATUO.
The test is in transmit mode.

Test setup



Limits

Rule Part 15.247(d) pacifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.”

Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
Basic Rate	2402	0.01	≤-19.99
	2441	-9.84	≤-29.84
	2480	-6.40	≤-26.40
EDR	2402	-2.83	≤-22.83
	2441	-11.41	≤-31.41
	2480	-12.34	≤-32.34

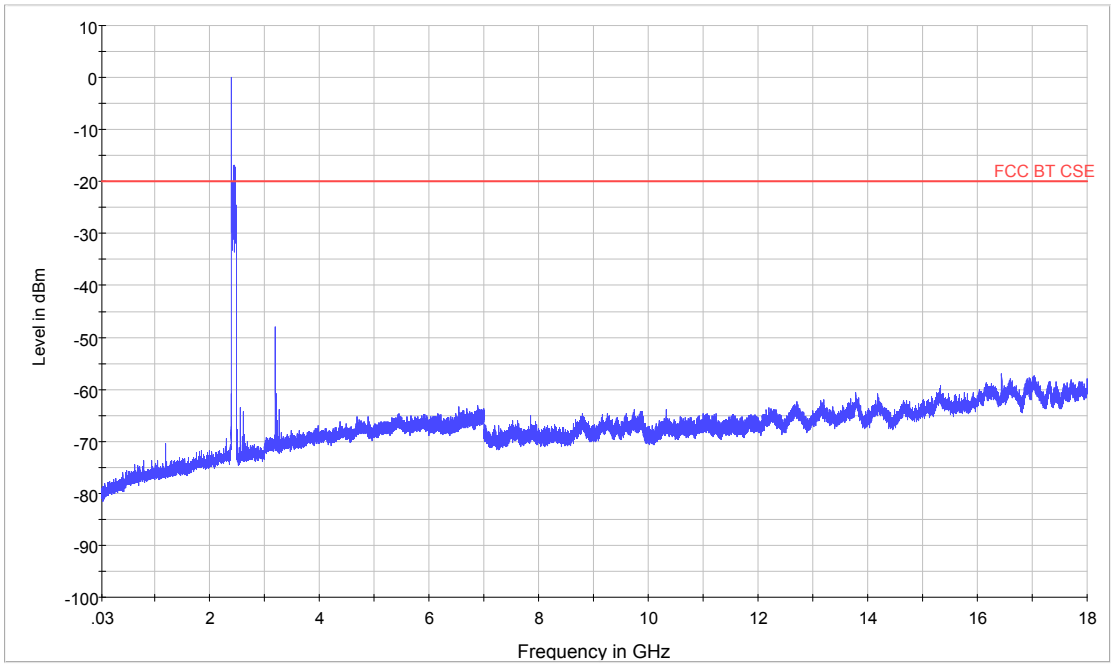
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

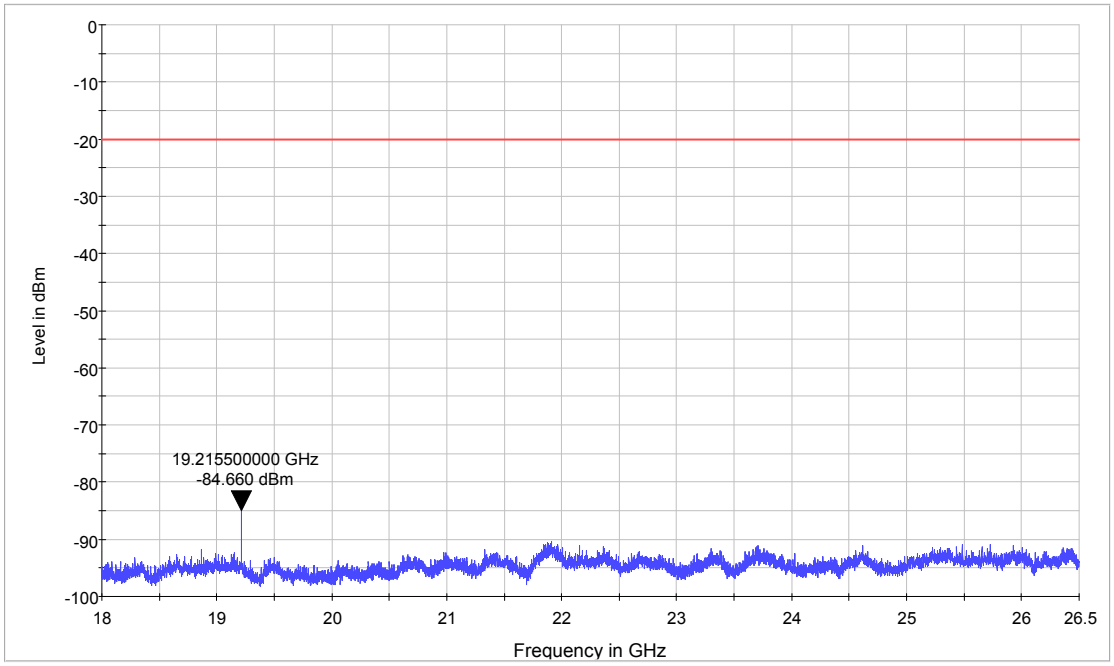
Test Results:

Basic Rate-CH0：



Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2402

Spurious RF conducted emissions from 30MHz to 18GHz

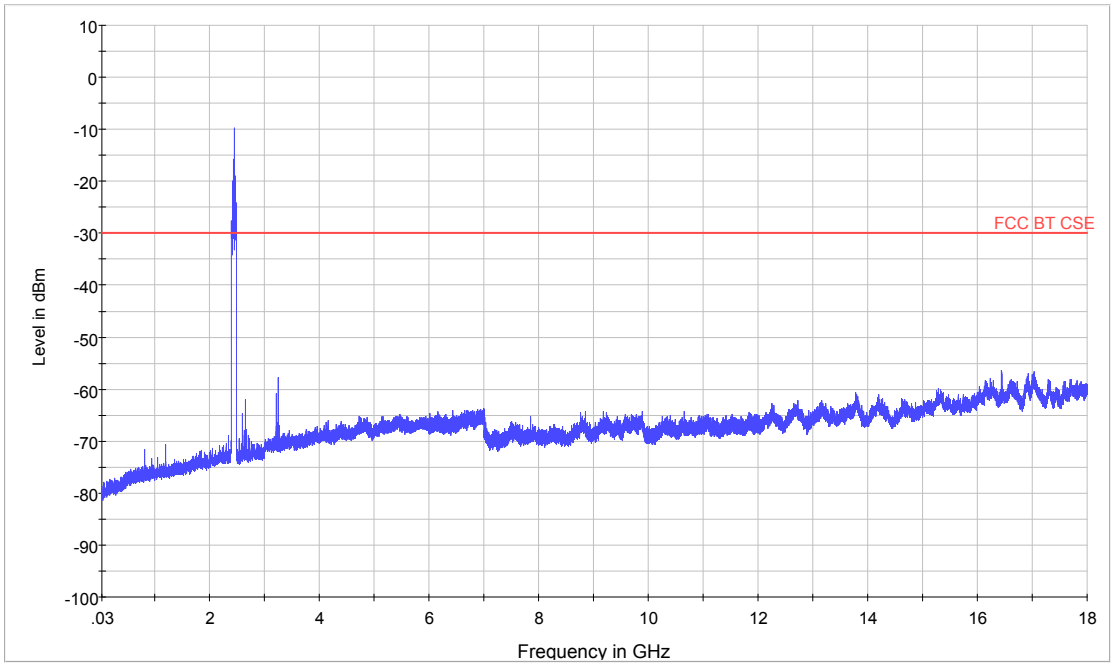


Spurious RF conducted emissions from 18GHz to 26.5GHz

Harmonic	TX ch.0 Frequency (MHz)	Level (dBm)	Limit (dBm)
2	4804	Nf	-19.99
3	7206	Nf	-19.99
4	9608	Nf	-19.99
5	12010	Nf	-19.99
6	14412	Nf	-19.99
7	16814	Nf	-19.99
8	19216	-84.66	-19.99
9	21618	Nf	-19.99
10	24020	Nf	-19.99
Nf: noise floor			

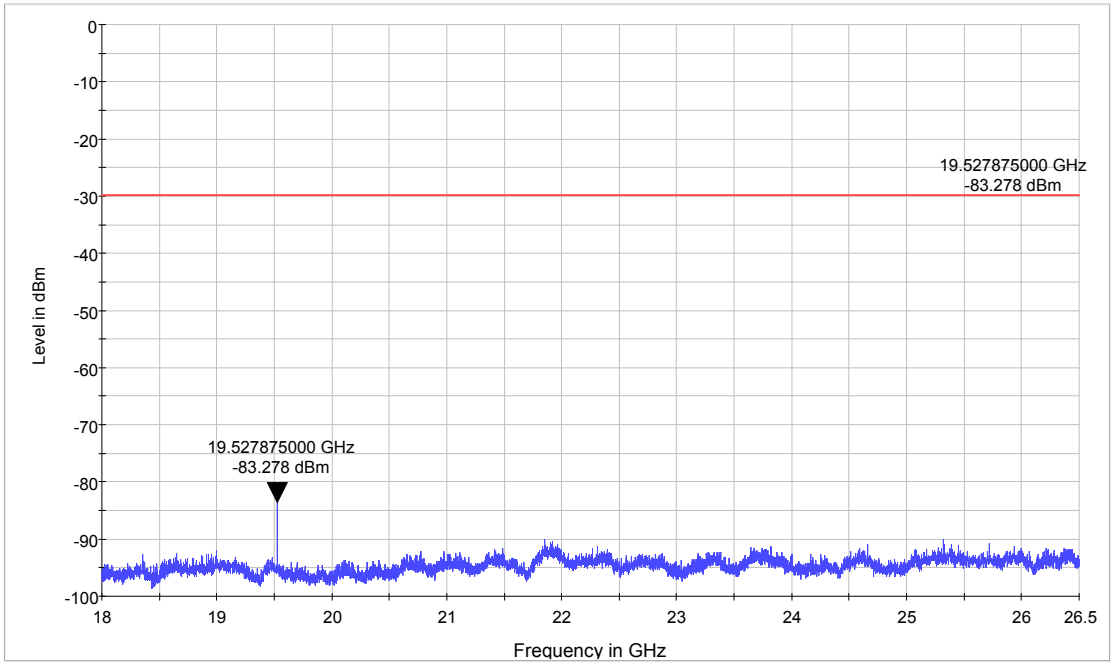
Note: The other Spurious RF conducted emissions level is no more than noise floor.

Basic Rate-CH39：



Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2441

Spurious RF conducted emissions from 30MHz to 18GHz

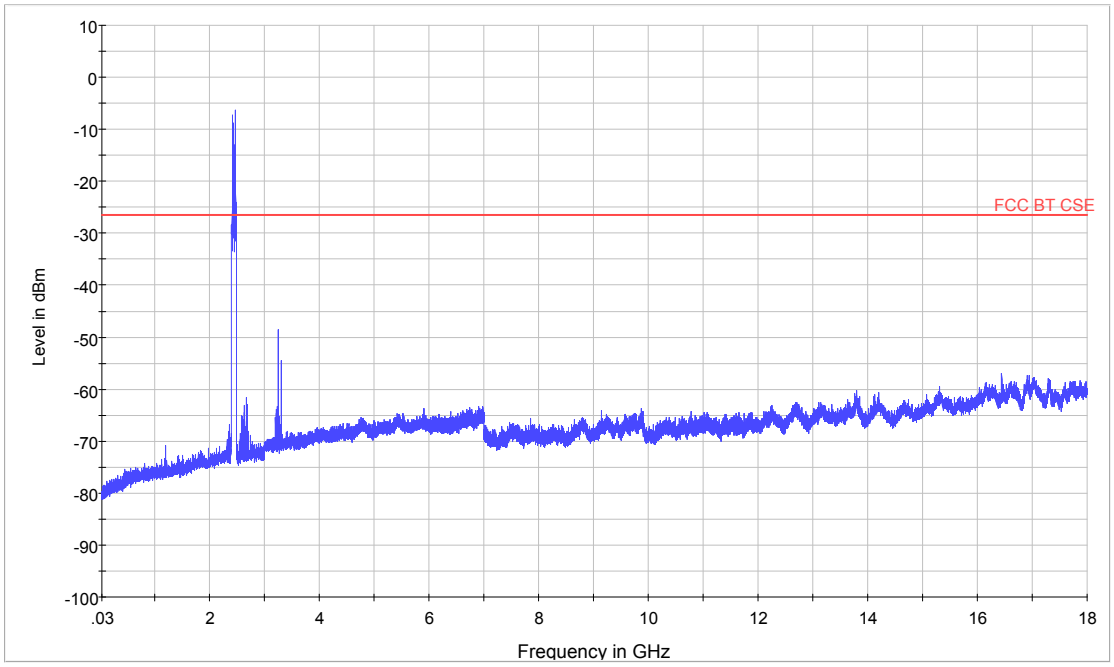


Spurious RF conducted emissions from 18GHz to 26.5GHz

Harmonic	TX ch.39 Frequency (MHz)	Level (dBm)	Limit (dBm)
2	4882	Nf	-29.84
3	7323	Nf	-29.84
4	9764	Nf	-29.84
5	12205	Nf	-29.84
6	14646	Nf	-29.84
7	17087	Nf	-29.84
8	19528	-83.28	-29.84
9	21969	Nf	-29.84
10	24410	Nf	-29.84
Nf: noise floor			

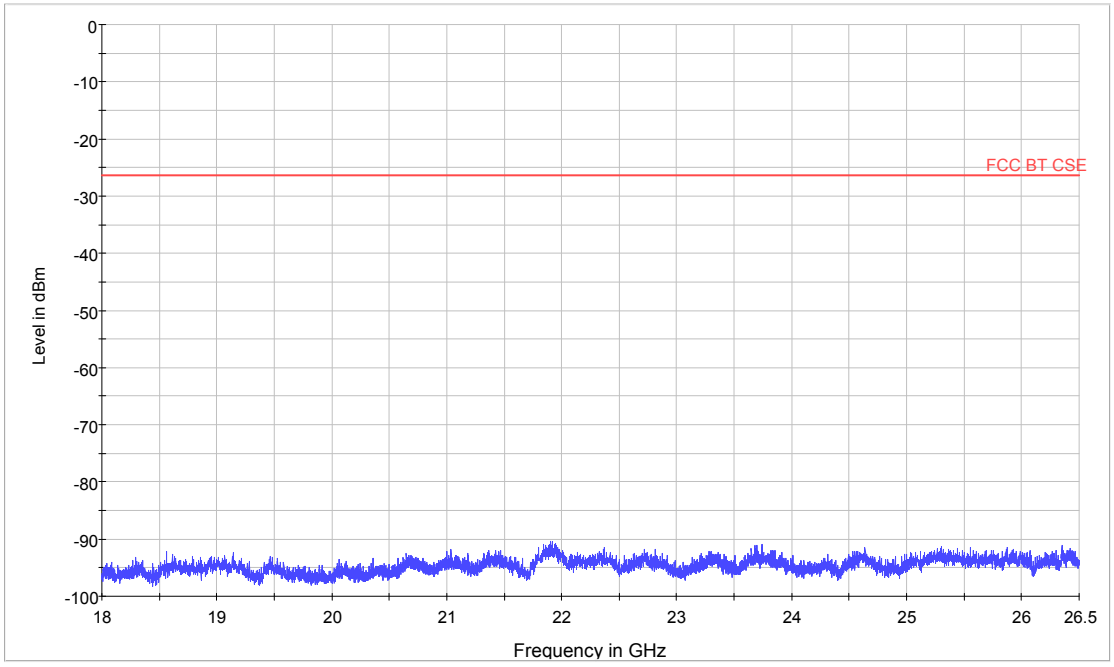
Note: The other Spurious RF conducted emissions level is no more than noise floor.

Basic Rate-CH78：



Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2480

Spurious RF conducted emissions from 30MHz to 18GHz

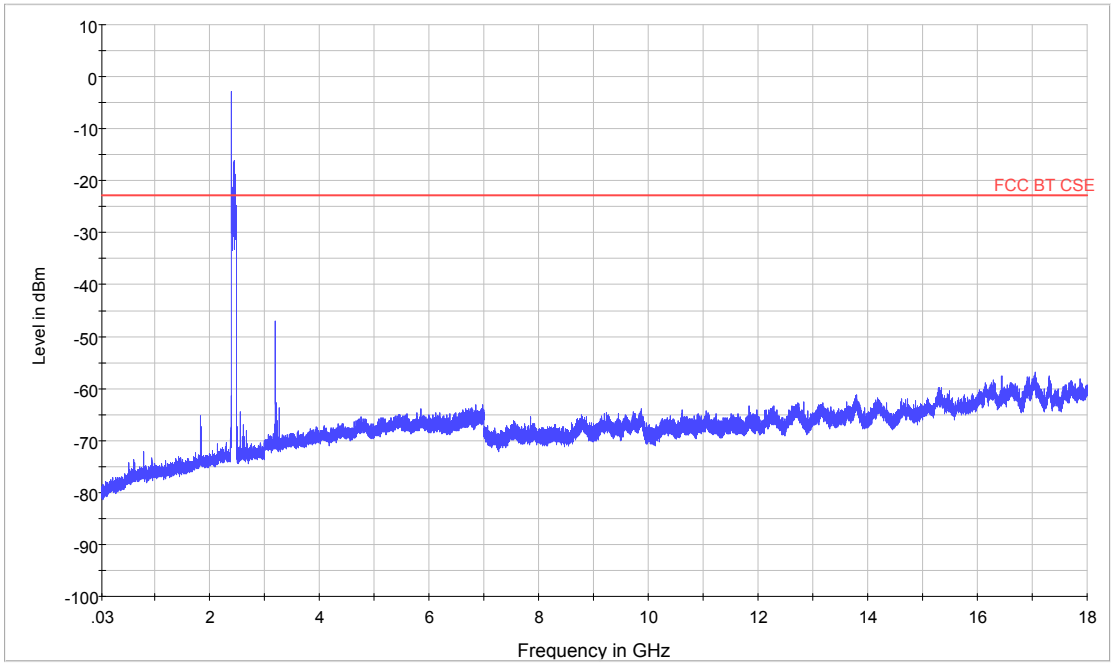


Spurious RF conducted emissions from 18GHz to 26.5GHz

Harmonic	TX ch.78 Frequency (MHz)	Level (dBm)	Limit (dBm)
2	4960	Nf	-26.40
3	7440	Nf	-26.40
4	9920	Nf	-26.40
5	12400	Nf	-26.40
6	14880	Nf	-26.40
7	17360	Nf	-26.40
8	19840	Nf	-26.40
9	22320	Nf	-26.40
10	24800	Nf	-26.40
Nf: noise floor			

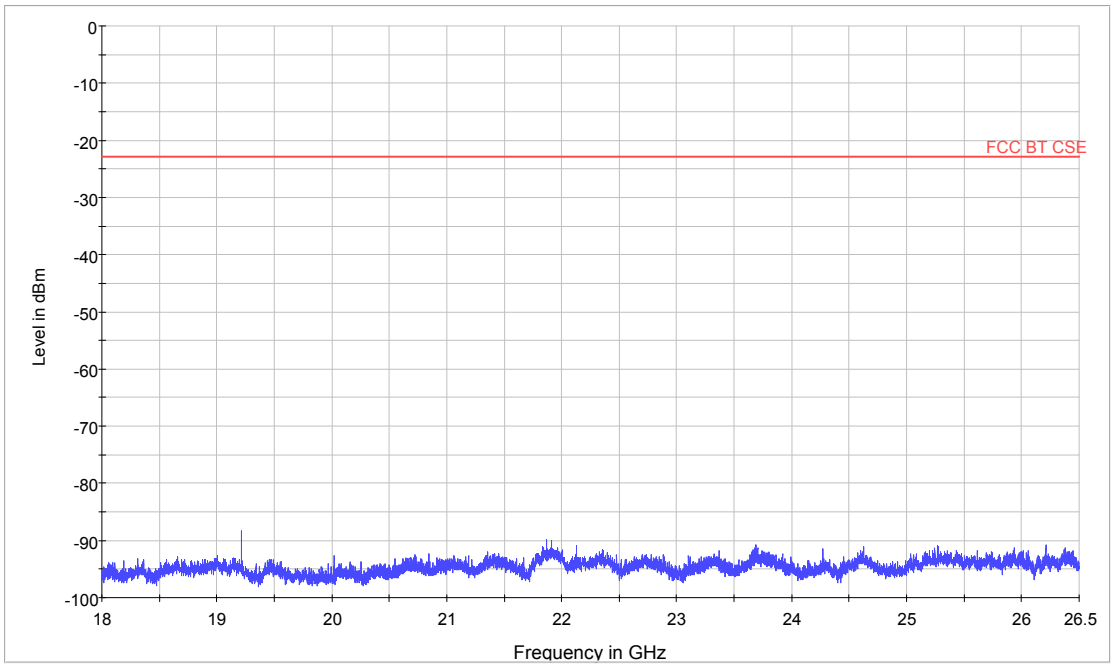
Note: The other Spurious RF conducted emissions level is no more than noise floor.

EDR-CH0：



Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2402

Spurious RF conducted emissions from 30MHz to 18GHz

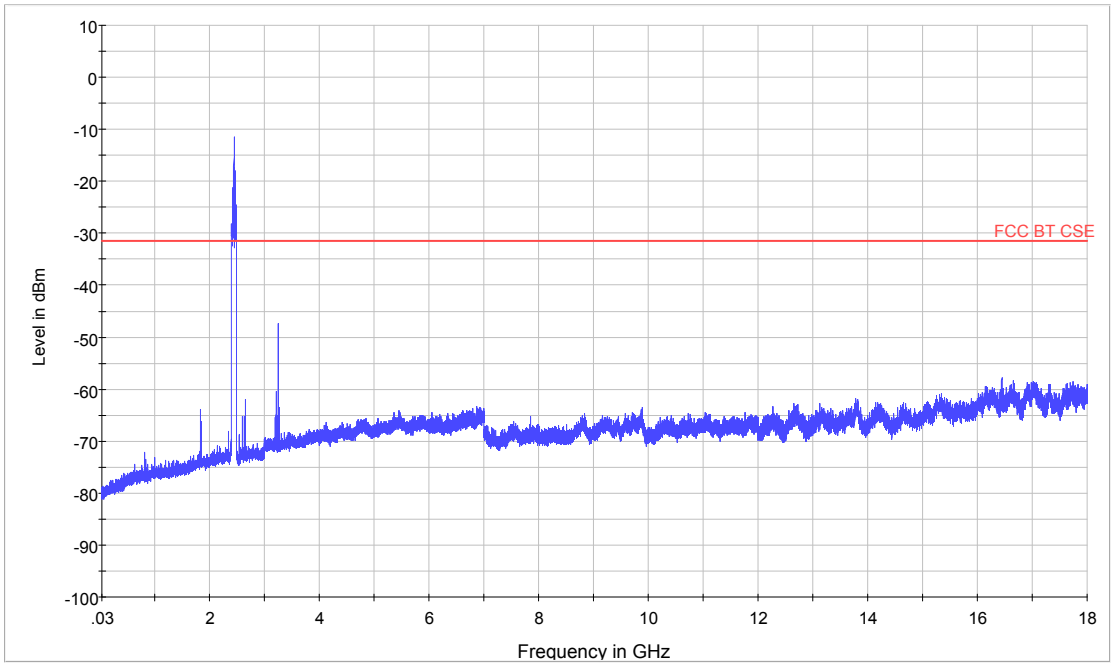


Spurious RF conducted emissions from 18GHz to 26.5GHz

Harmonic	TX ch.0 Frequency (MHz)	Level (dBm)	Limit (dBm)
2	4804	Nf	-22.83
3	7206	Nf	-22.83
4	9608	Nf	-22.83
5	12010	Nf	-22.83
6	14412	Nf	-22.83
7	16814	Nf	-22.83
8	19216	Nf	-22.83
9	21618	Nf	-22.83
10	24020	Nf	-22.83
Nf: noise floor			

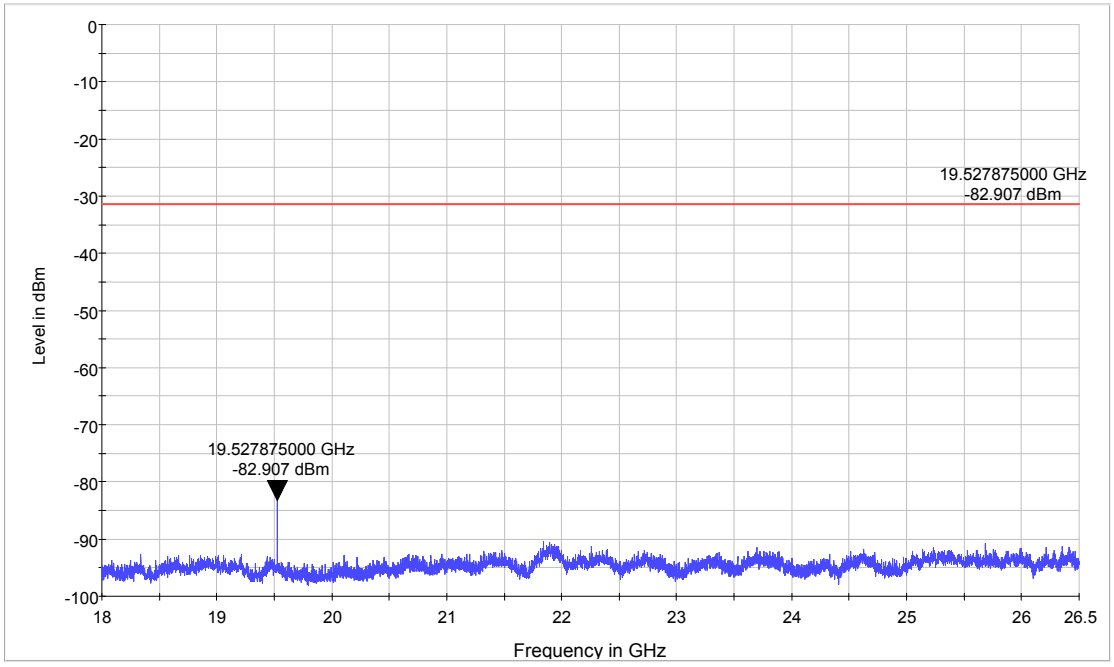
Note: The other Spurious RF conducted emissions level is no more than noise floor.

EDR -CH39：



Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2441

Spurious RF conducted emissions from 30MHz to 18GHz

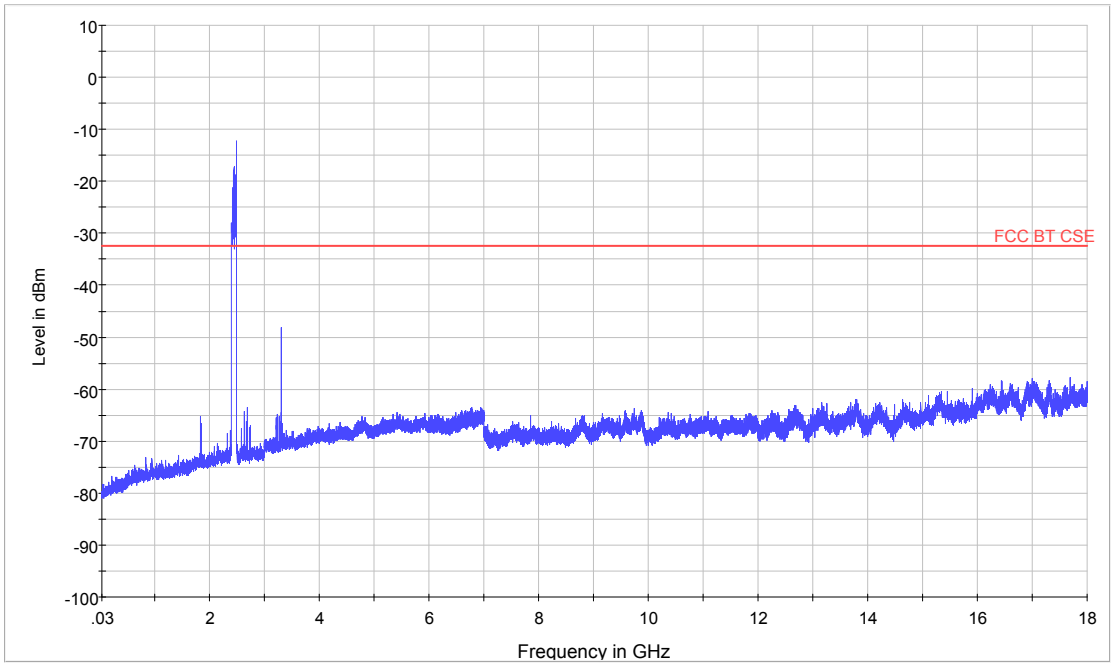


Spurious RF conducted emissions from 18GHz to 26.5GHz

Harmonic	TX ch.39 Frequency (MHz)	Level (dBm)	Limit (dBm)
2	4882	Nf	-31.41
3	7323	Nf	-31.41
4	9764	Nf	-31.41
5	12205	Nf	-31.41
6	14646	Nf	-31.41
7	17087	Nf	-31.41
8	19528	82.91	-31.41
9	21969	Nf	-31.41
10	24410	Nf	-31.41
Nf: noise floor			

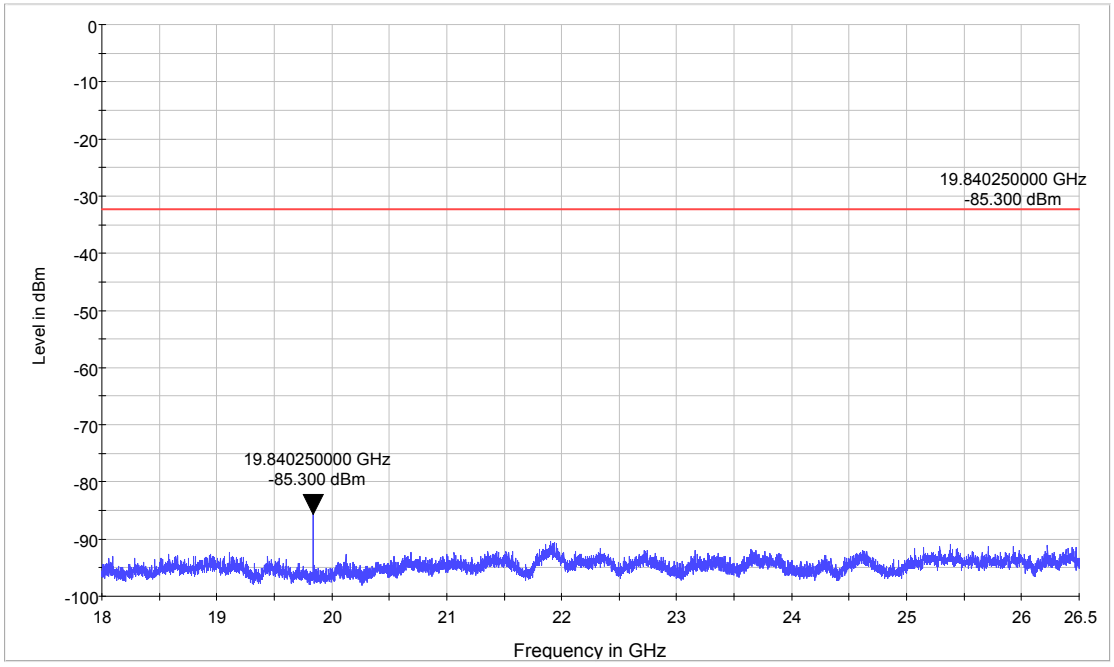
Note: The other Spurious RF conducted emissions level is no more than noise floor.

EDR -CH78：



Note: The signal beyond the limit is carrier. Carrier frequency (MHz): 2480

Spurious RF conducted emissions from 30MHz to 18GHz



Spurious RF conducted emissions from 18GHz to 26.5GHz

Harmonic	TX ch.78 Frequency (MHz)	Level (dBm)	Limit (dBm)
2	4960	Nf	-32.34
3	7440	Nf	-32.34
4	9920	Nf	-32.34
5	12400	Nf	-32.34
6	14880	Nf	-32.34
7	17360	Nf	-32.34
8	19840	-85.30	-32.34
9	22320	Nf	-32.34
10	24800	Nf	-32.34
Nf: noise floor			

Note: The other Spurious RF conducted emissions level is no more than noise floor.

2.10. Radiates Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

Method of Measurement

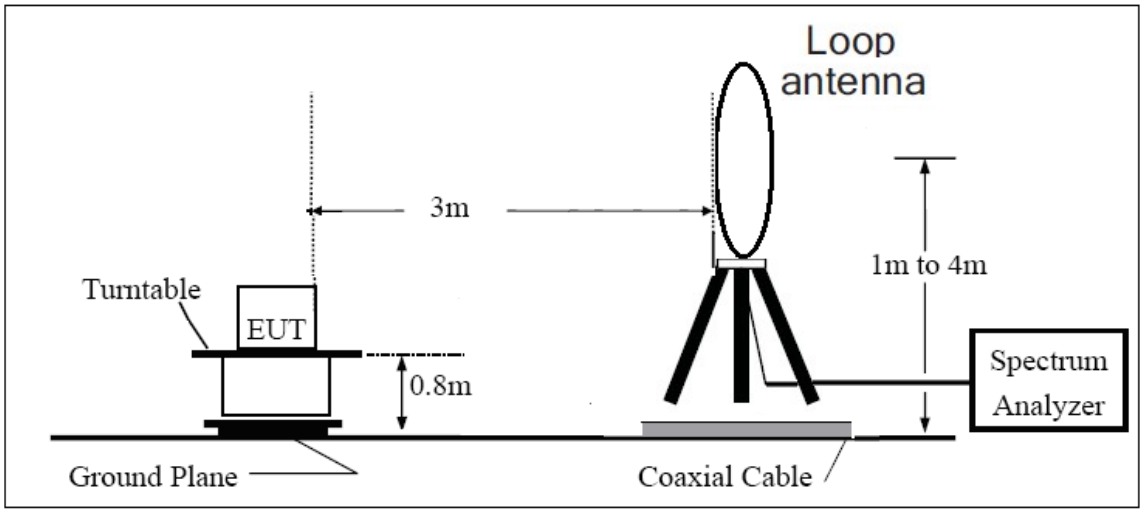
The test set-up was made in accordance to the general provisions of ANSI C63.4-2009.The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.
The height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.
Set the spectrum analyzer in the following:
Below 1GHz (detector: Peak and Quasi-Peak)
RBW=100kHz / VBW=300kHz / Sweep=AUTO
Above 1GHz(detector: Peak):
(a) PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded. Then this mode was measured in the following mode: EUT with cradle and EUT without cradle. The worst emission was found in EUT with cradle mode and the worst case was recorded.

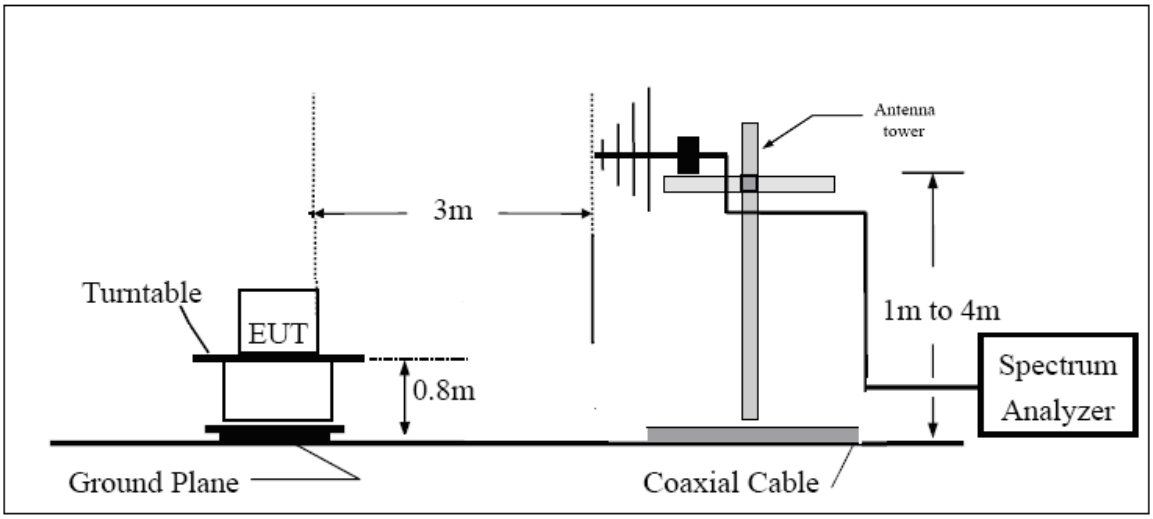
The test is in transmit mode.

Test setup

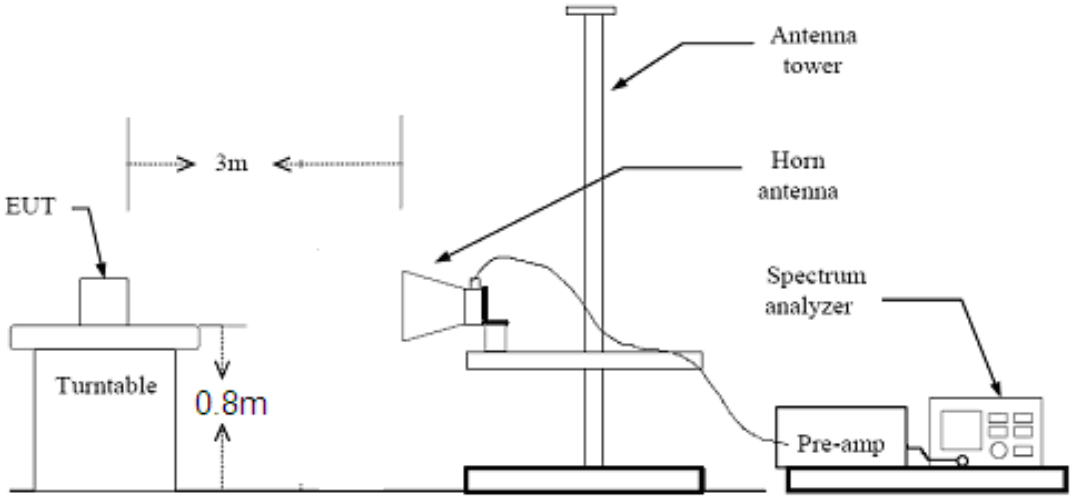
9KHz~~~ 30MHz



30MHz~~~ 1GHz



Above 1GHz



Limits

Rule Part 15.247(d) specifies that “In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).”

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009–0.490	2400/F(kHz)	/
0.490–1.705	24000/F(kHz)	/
1.705–30.0	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

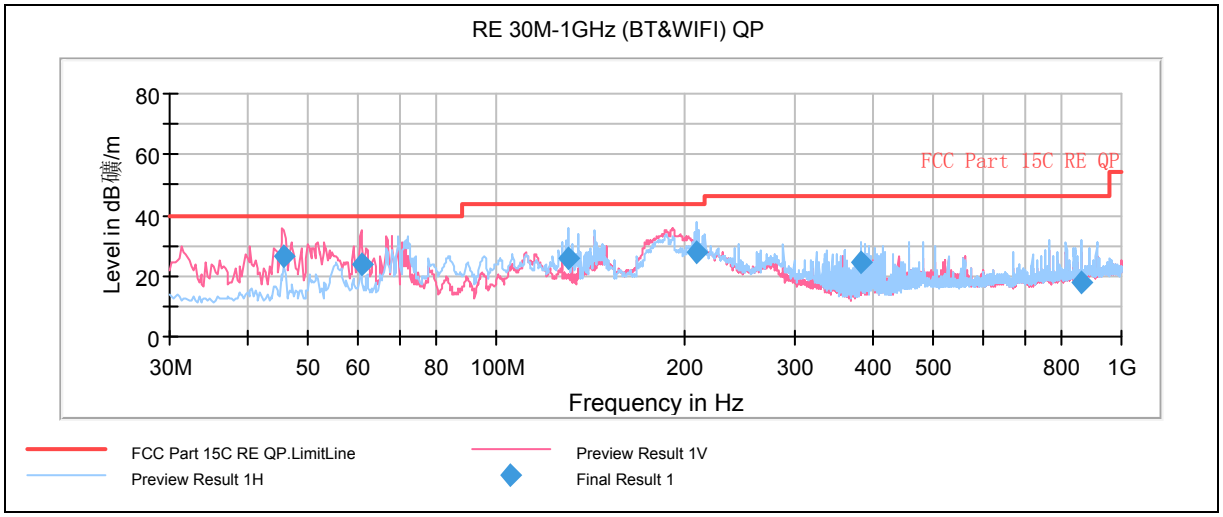
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
30MHz-200MHz	4.19 dB
200MHz-1GHz	3.63 dB
Above 1GHz	3.68 dB

Test result

Basic Rate-Channel 39



Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

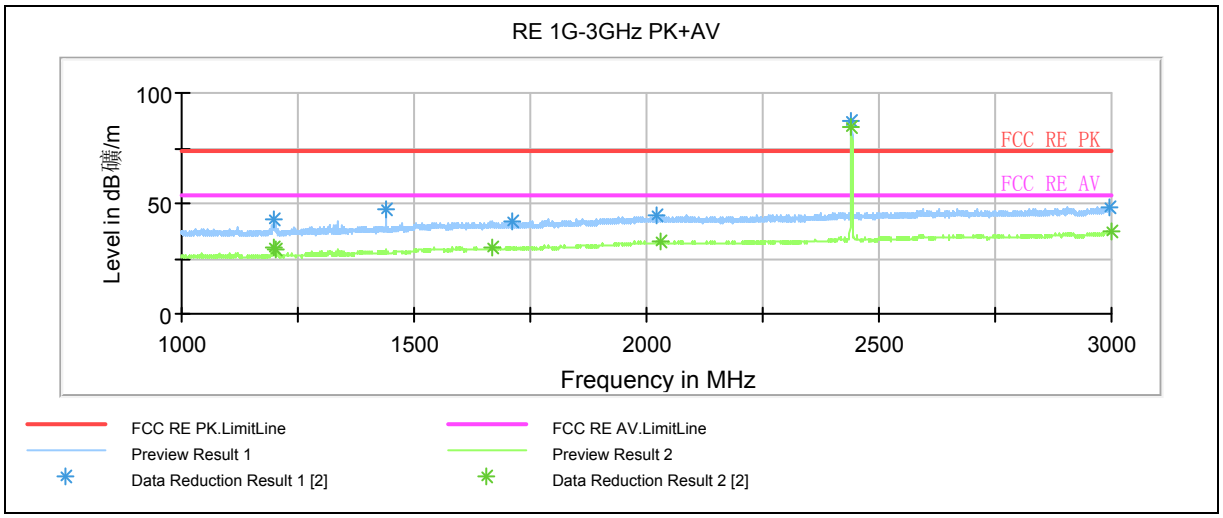
Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
45.800000	26.5	100.0	V	229.0	51.3	-24.8	13.5	40.0
60.717500	23.8	200.0	V	221.0	51.1	-27.3	16.2	40.0
130.515000	25.7	175.0	H	120.0	57.7	-32.0	17.8	43.5
209.207500	27.5	125.0	H	182.0	57.2	-29.7	16.0	43.5
384.010000	24.3	100.0	H	211.0	49.3	-25.0	21.7	46.0
864.080000	18.1	220.0	H	200.0	34.9	-16.8	27.9	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

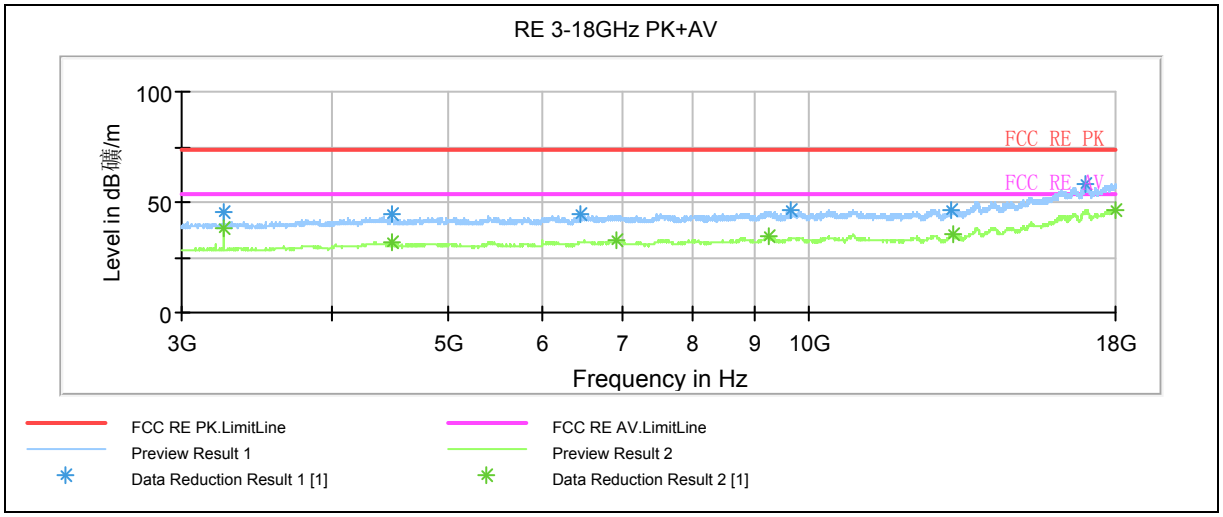
3. Margin = Limit – Quasi-Peak



Note: a font (Level in dB磍/m)in the test plot =(level in dbuv/m)

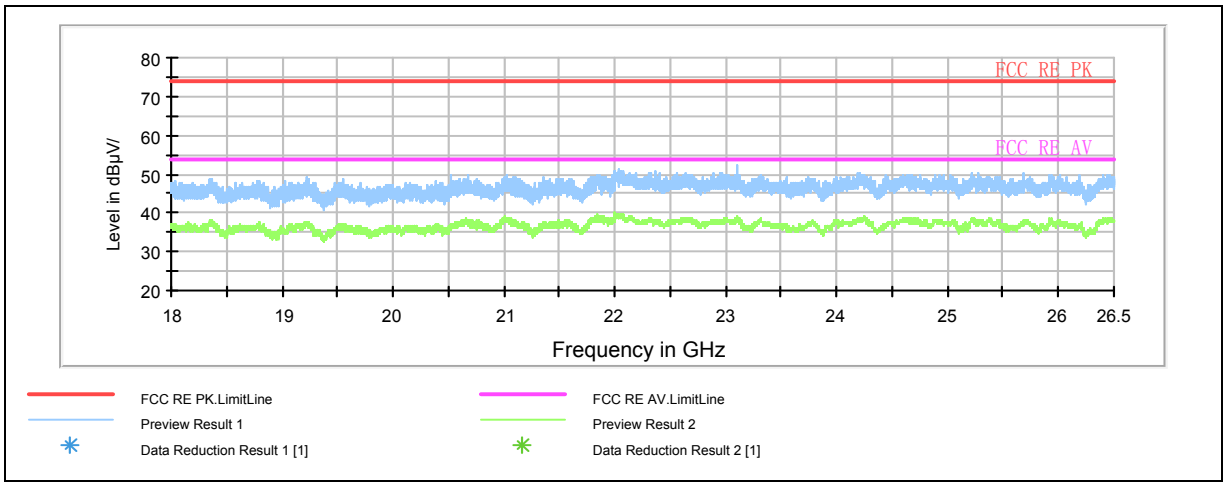
Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz



Note: a font (Level in dB磍/m)in the test plot =(level in dbuv/m)

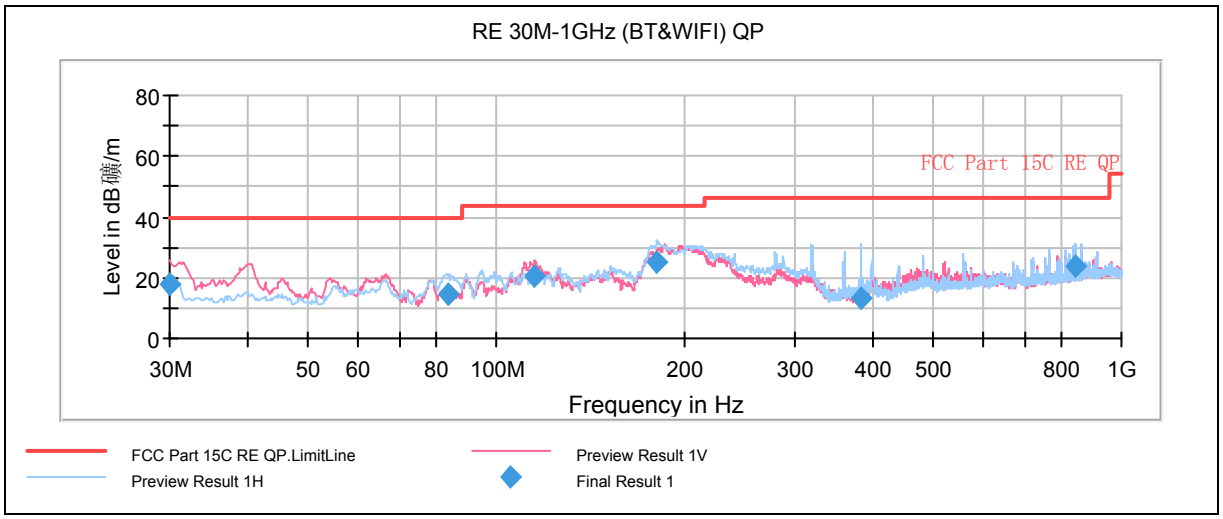
Radiates Emission from 3GHz to 18GHz



Note: a font (Level in dB磍/m)in the test plot =(level in dbuv/m)

Radiates Emission from 18GHz to 26.5GHz

EDR-Channel 39



Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

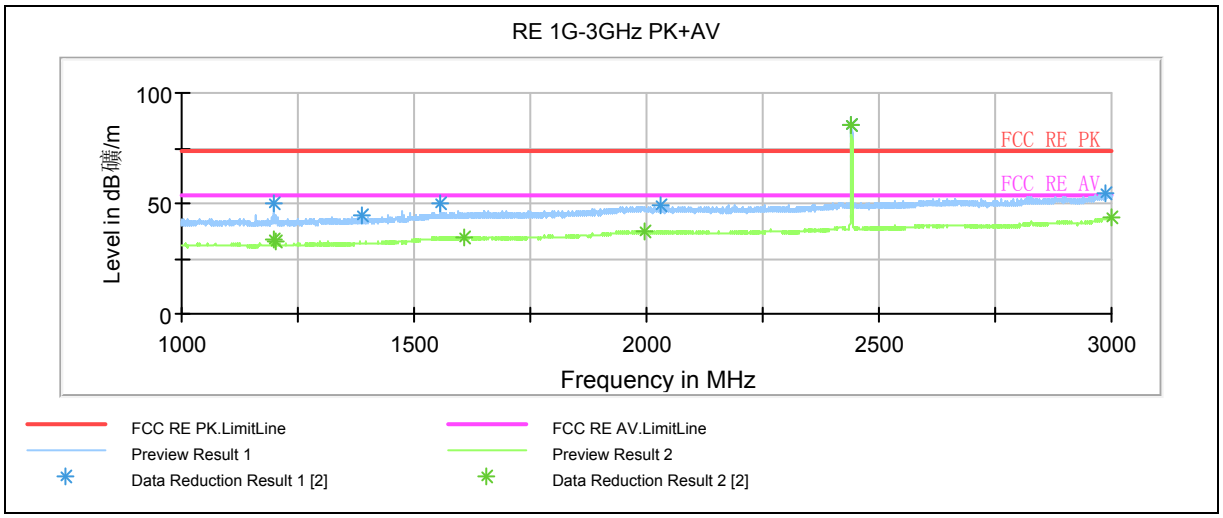
Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Reading value (dBuV/m)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
30.000000	17.7	120.0	V	45.0	41.3	-23.6	22.3	40.0
83.477500	14.9	200.0	H	65.0	45.8	-30.9	25.1	40.0
115.400000	20.6	100.0	V	131.0	50.4	-29.8	22.9	43.5
180.755000	25.0	125.0	H	0.0	56.0	-31.0	18.5	43.5
384.130000	13.2	100.0	H	0.0	38.2	-25.0	32.8	46.0
842.017500	23.5	225.0	H	193.0	40.8	-17.3	22.5	46.0

Remark: 1. Quasi-Peak = Reading value + Correction factor

2. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

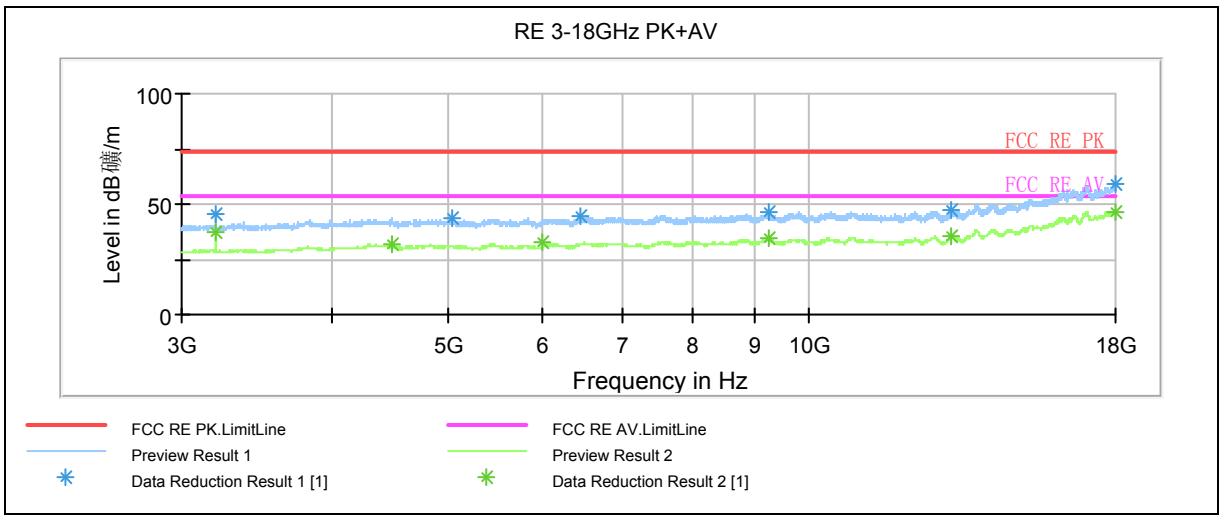
3. Margin = Limit – Quasi-Peak



Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

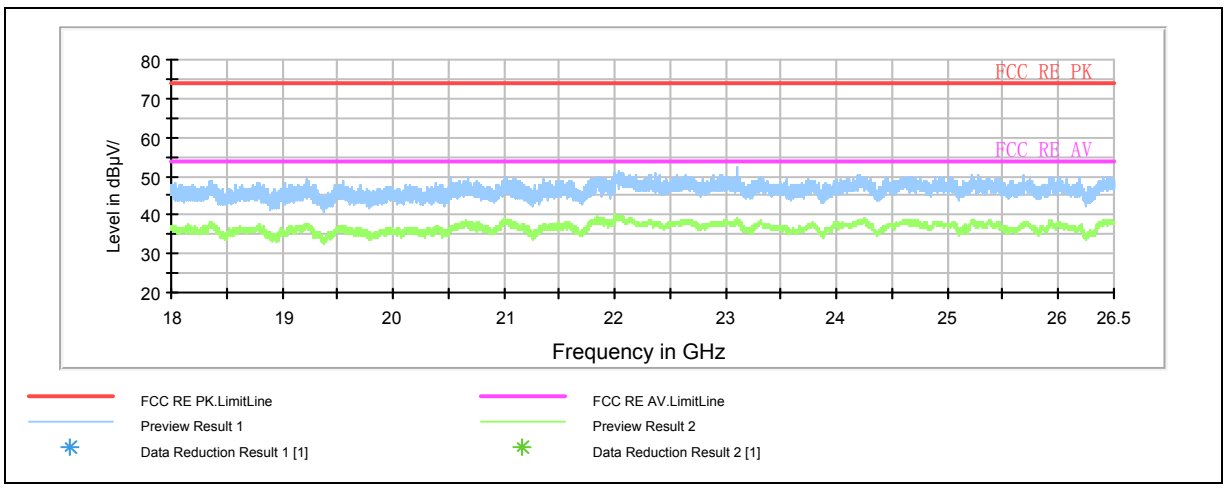
Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz



Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

Radiates Emission from 3GHz to 18GHz



Note: a font (Level in dBµV/m)in the test plot =(level in dbuv/m)

Radiates Emission from 18GHz to 26.5GHz

2.11. Conducted Emission

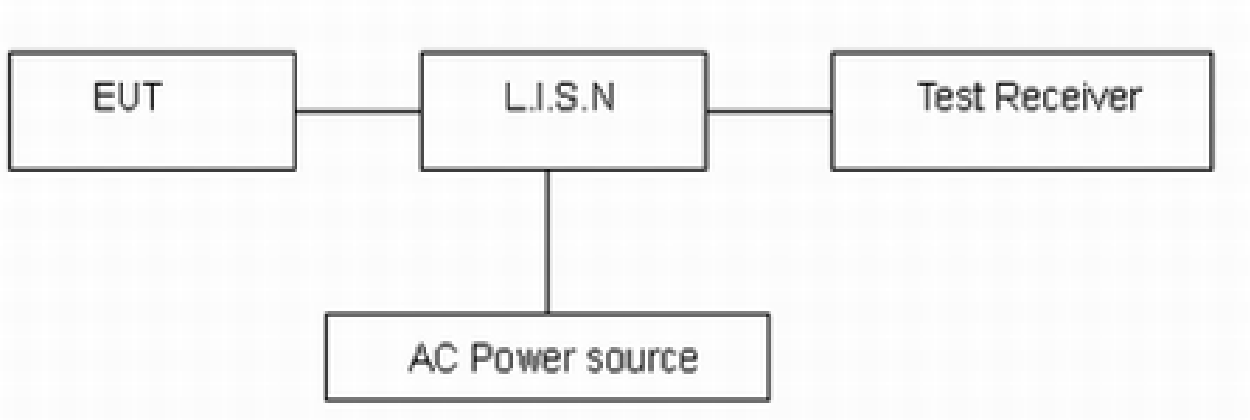
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2009. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9kHz,VBW is set to 30kHz.The measurement result should include both L line and N line. The test is in transmit mode.

Test Setup



Note: AC Power source is used to change the voltage from 220V/50Hz to 110V/60Hz.

Limits

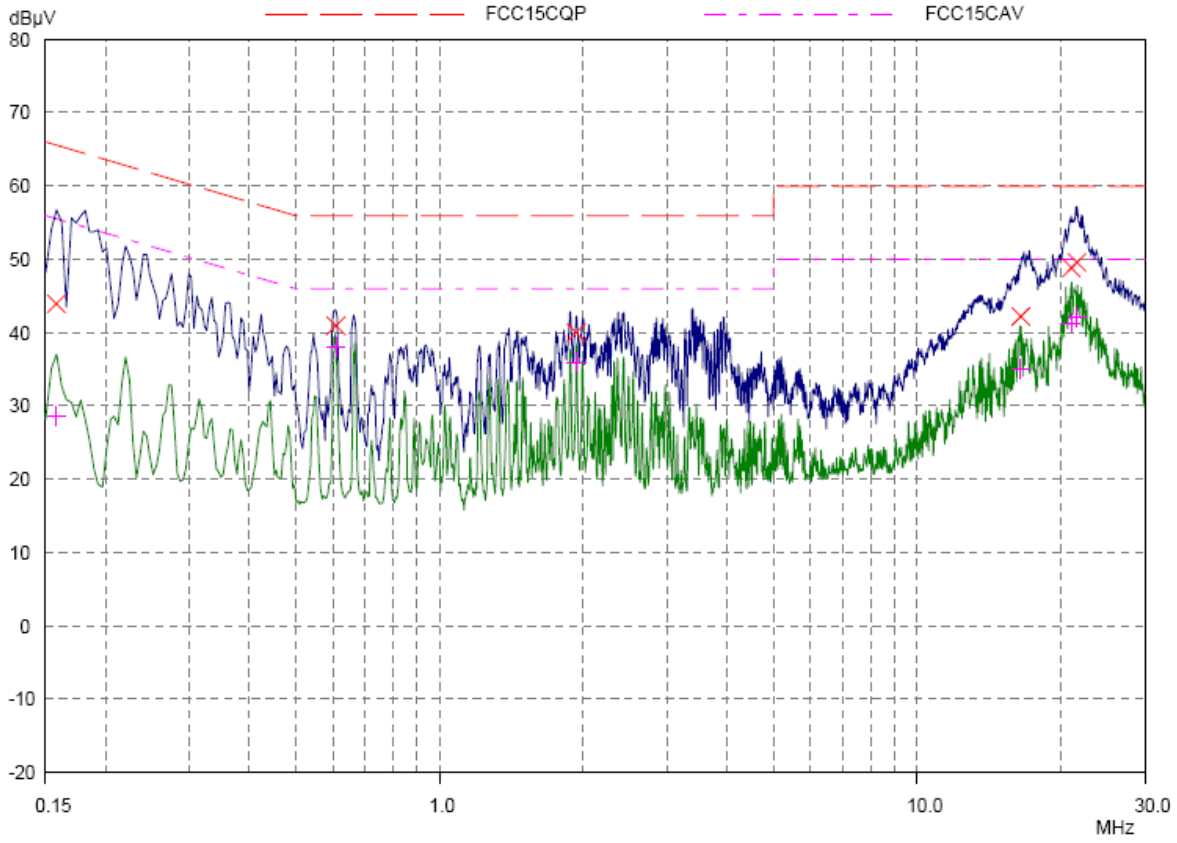
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 2.69 dB.

Test Results:

Basic Rate-CH39

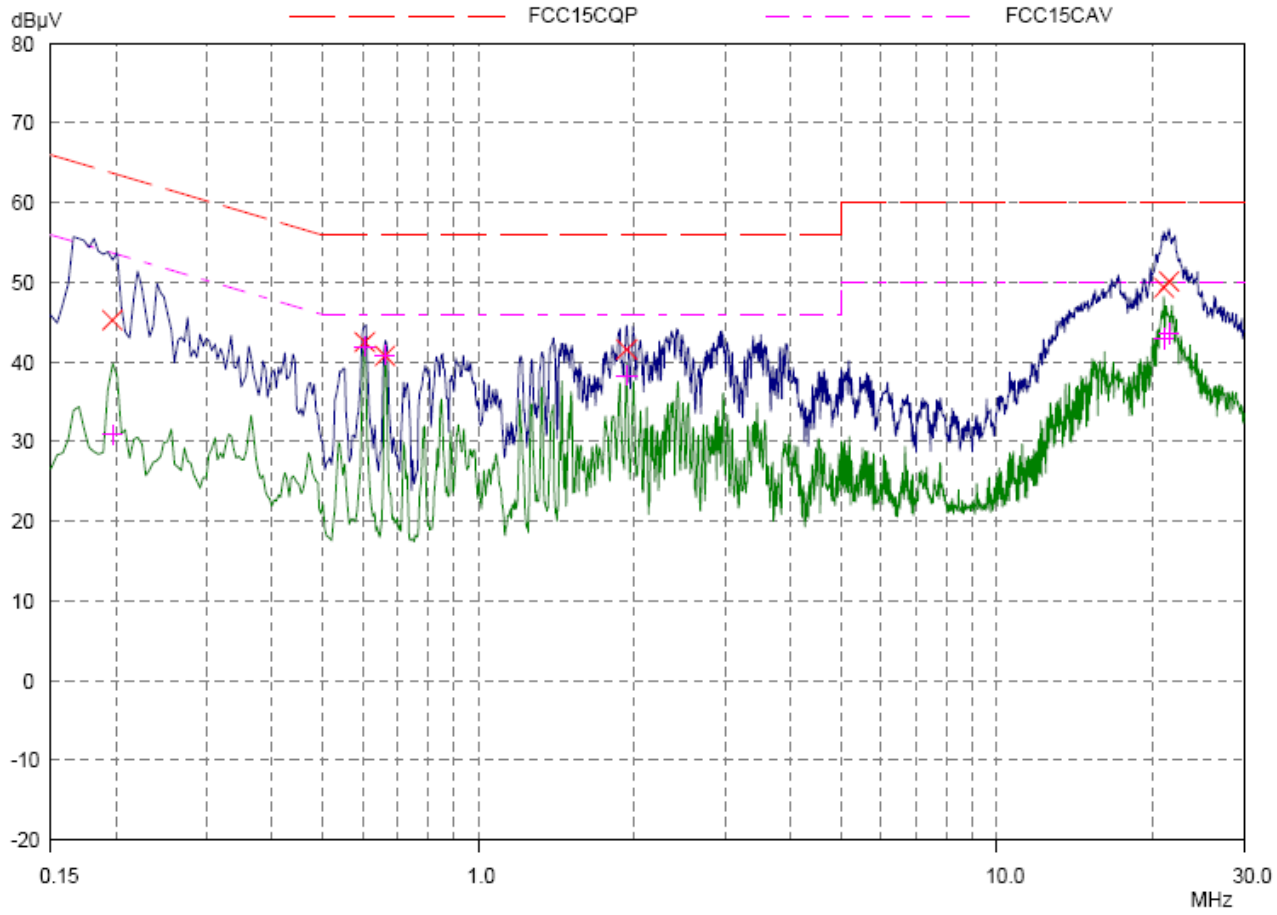


L Line

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Phase -
0.15781	43.91	65.58	21.67	L1
0.60703	40.92	56.00	15.08	L1
1.93515	40.01	56.00	15.99	L1
16.46249	42.22	60.00	17.78	L1
20.98593	48.83	60.00	11.17	L1
21.5875	49.56	60.00	10.44	L1

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB	Phase -
0.15781	28.62	55.58	26.96	L1
0.60703	38.00	46.00	8.00	L1
1.93515	35.92	46.00	10.08	L1
16.46249	35.09	50.00	14.91	L1
20.98593	41.32	50.00	8.68	L1
21.5875	42.15	50.00	7.85	L1



N Line

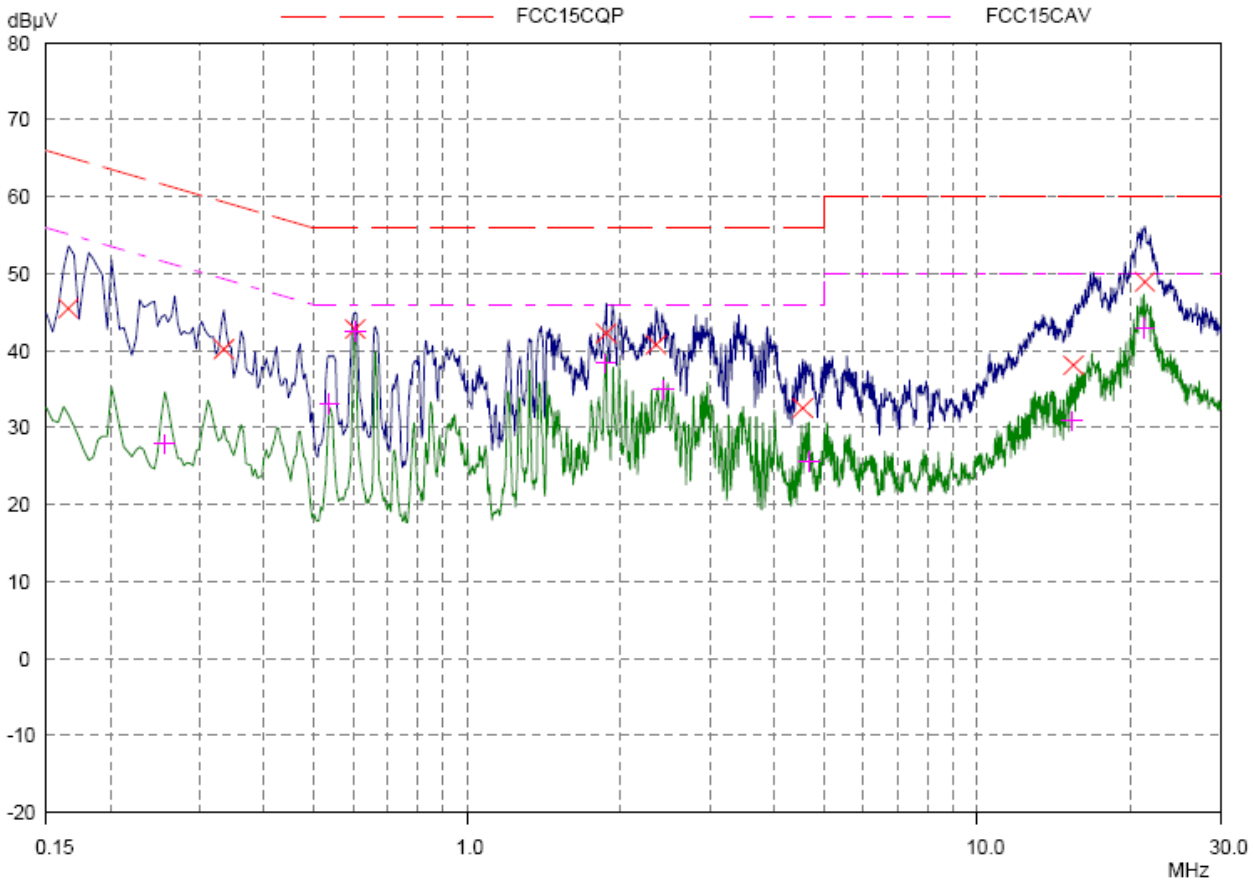
Conducted Emission from 150 KHz to 30 MHz

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Phase -
0.19687	45.28	63.74	18.46	N
0.60312	42.52	56.00	13.48	N
0.66171	40.77	56.00	15.23	N
1.93125	41.59	56.00	14.41	N
21.00546	49.33	60.00	10.67	N
21.50937	50.14	60.00	9.86	N

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB	Phase -
0.19687	30.90	53.74	22.84	N
0.60312	41.94	46.00	4.06	N
0.66171	40.89	46.00	5.11	N
1.93125	38.25	46.00	7.75	N
21.00546	42.92	50.00	7.08	N
21.50937	43.59	50.00	6.41	N

EDR-CH39

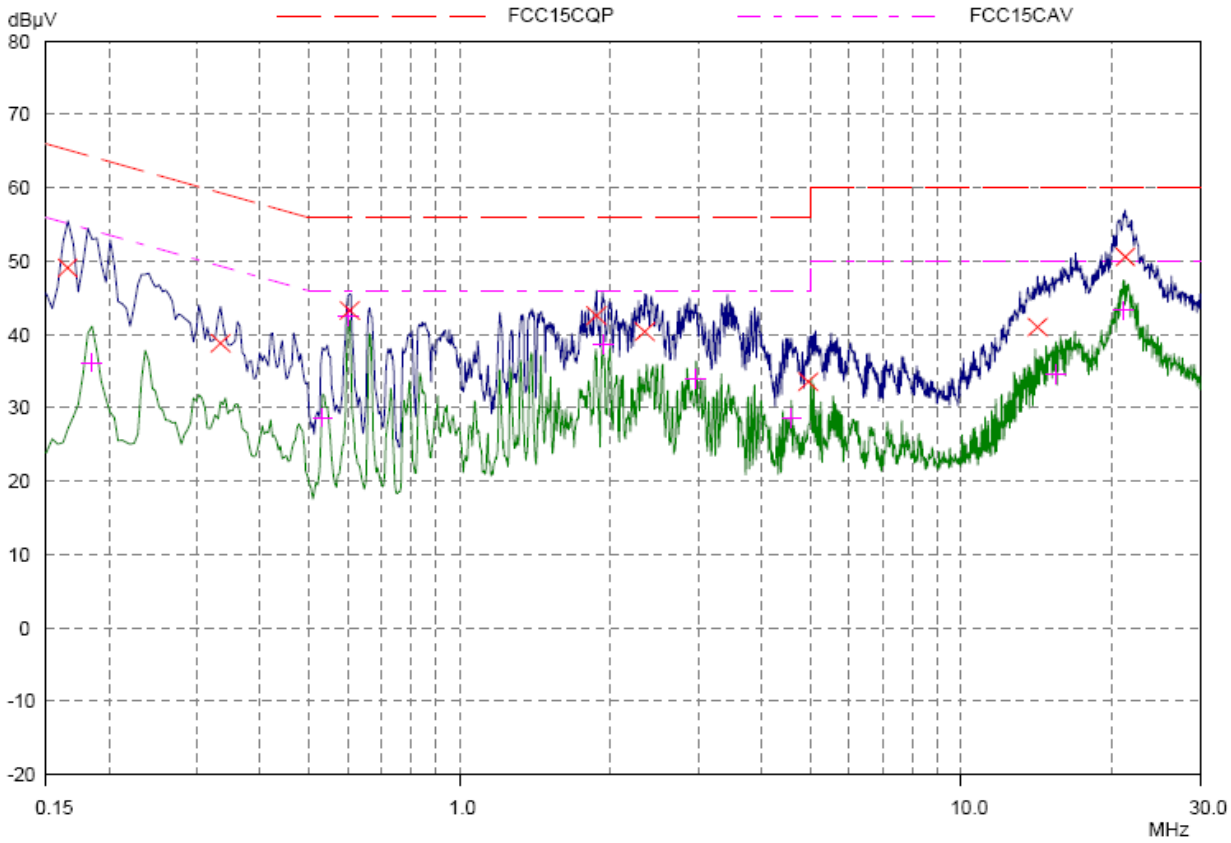


L Line

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Phase -
0.16562	45.51	65.18	19.67	L1
0.33359	40.19	59.36	19.17	L1
0.60312	42.84	56.00	13.16	L1
1.87265	42.28	56.00	13.72	L1
2.34531	40.78	56.00	15.22	L1
4.55234	32.53	56.00	23.47	L1
15.43515	38.12	60.00	21.88	L1
21.33359	48.94	60.00	11.06	L1

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB	Phase -
0.25546	27.92	51.58	23.66	L1
0.53671	33.08	46.00	12.92	L1
0.60312	42.47	46.00	3.53	L1
1.86875	38.39	46.00	7.61	L1
2.42343	34.98	46.00	11.02	L1
4.68515	25.63	46.00	20.37	L1
15.31015	30.90	50.00	19.10	L1
21.24375	42.88	50.00	7.12	L1



N Line

Conducted Emission from 150 KHz to 30 MHz

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Phase -
0.16562	49.11	65.18	16.07	N
0.33359	38.81	59.36	20.55	N
0.60312	43.28	56.00	12.72	N
1.87265	42.56	56.00	13.44	N
2.3414	40.40	56.00	15.60	N
4.95859	33.58	56.00	22.42	N
14.20859	41.00	60.00	19.00	N
21.23593	50.60	60.00	9.40	N

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB	Phase -
0.18515	36.23	54.25	18.02	N
0.53281	28.70	46.00	17.30	N
0.59921	42.43	46.00	3.57	N
1.93125	38.70	46.00	7.30	N
2.9625	34.01	46.00	11.99	N
4.5875	28.59	46.00	17.41	N
15.4664	34.54	50.00	15.46	N
21.0914	43.32	50.00	6.68	N

3. Main Test Instruments

No.	Name	Type	Manufacturer	Serial Number	Calibration Date	Valid Period
01	BT Base Station Simulator	CBT	R&S	100271	2012-06-30	One year
02	Loop Antenna	FMZB1516	SCHWARZBECK	237	2012-06-30	Two years
03	EMI Test Receiver	ESCS30	R&S	100138	2012-01-16	One year
04	LISN	ENV216	R&S	101171	2010-04-16	Three years
05	EMI Test Receiver	ESCI	R&S	100948	2012-06-30	One year
06	TRILOG Broadband Antenna	VULB 9163	Schwarzbeck	9163-201	2010-06-20	Three years
07	Double Ridged Waveguide Horn Antenna	HF907	R&S	100126	2012-07-02	Three years
08	PSG Analog Signal Generator	E8257D	Agilent	MY49281101	2012-06-30	One year
09	ESG Vector Signal Generator	E4438C	Agilent	MY49070900	2012-06-30	One year
10	Spectrum Analyzer	E4445A	Agilent	MY46181146	2012-06-30	One year
11	Power Splitter	SHX-GF2-2-13	Hua Xiang	10120101	NA	NA
12	MOB COMMS DC SUPPLY	66319D	Agilent	MY43004105	2012-06-30	One year
13	Power Sensor	E9304A	Agilent	MY50220022	2012-06-30	One year
14	Power Meter	E4418B	Agilent	MY50000623	2012-06-30	One year
15	Vibration table	ESS-050-120	dongling	D1007126	2010-08-23	Three years
16	Universal Radio Communication Tester	E5515C	Agilent	MY48367192	2012-06-30	One year

*******END OF REPORT BODY*******

ANNEX A: EUT Appearance and Test Setup

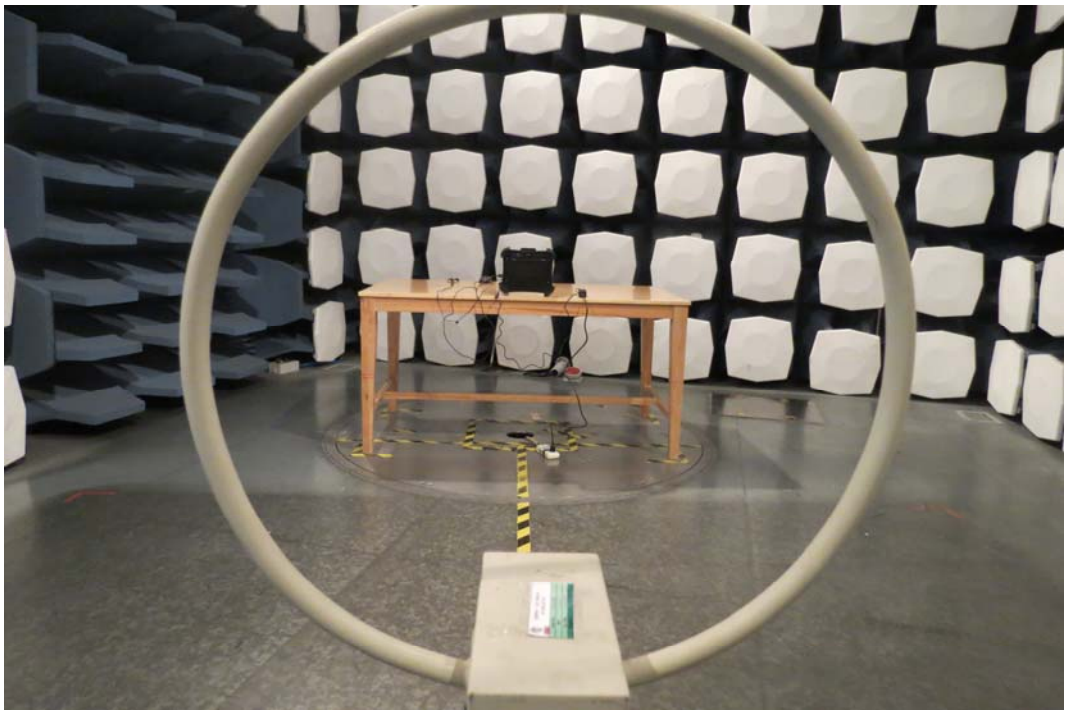
A.1 EUT Appearance

a: EUT

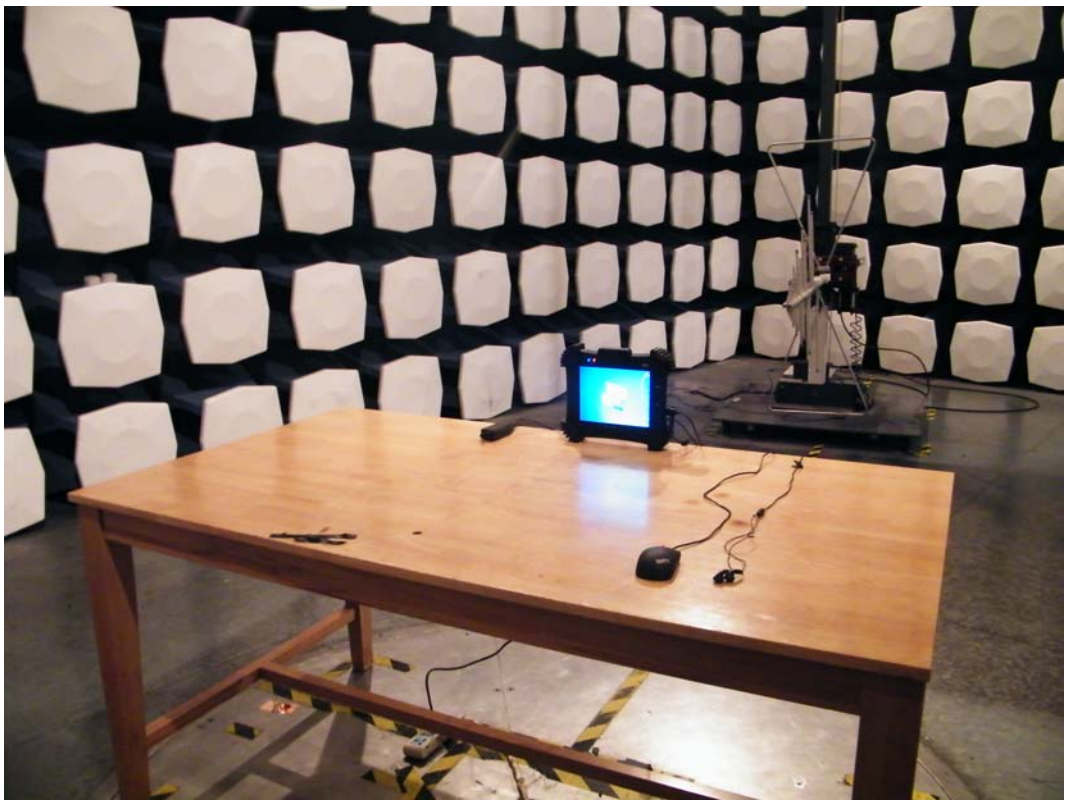
b: Adapter

Picture 1 EUT

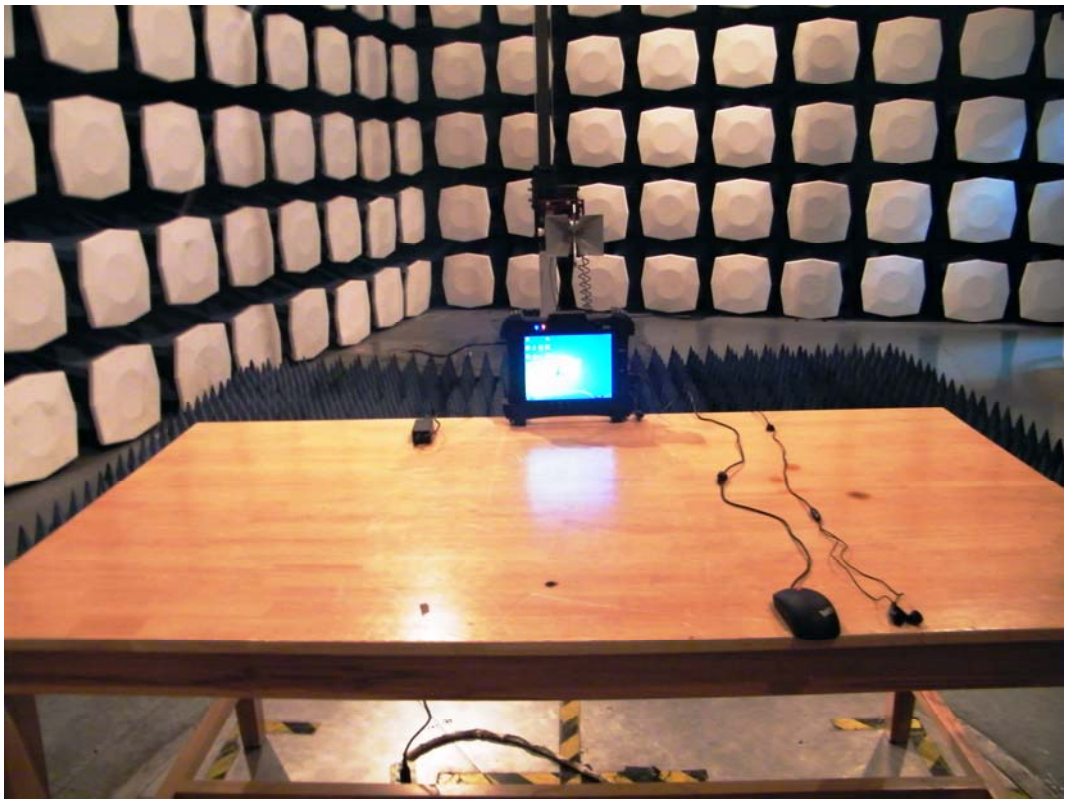
A.2 Test Setup



9KHz-30MHz

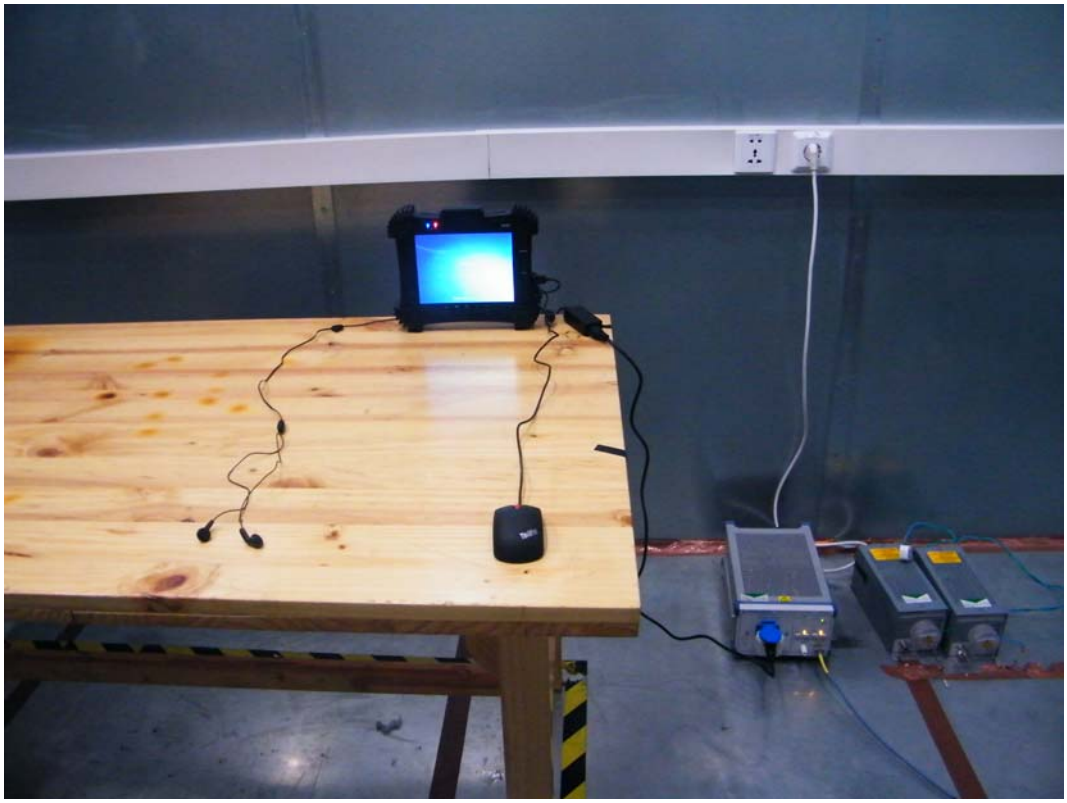


30M Hz-1GHz



Above 1GHz

Picture 2 Radiated Emission Test Setup



Picture 3 Conducted Emission Test Setup