FCC Part 15C (Bluetooth Portion)

Measurement and Test Report

For

Matsunichi Digital Development (Shenzhen) Co., Ltd

F/22, Matsunichi Building, No.9996, Shennan Boulevard, Nanshan District, Shenzhen, China

FCC ID: ZDRMP436

Report Concerns: Original Report	**Equipment Type:** WCDMA Smart Phone
Model:	MP436
Report No.:	STR12038238I-3
Test Date:	2012-03-29 to 2012-04-23
Issue Date:	2012-04-24
Tested By:	Silin Chen / Engineer Silin chen
Reviewed By:	Lahm Peng / EMC Manager Lahm peng
Approved & Authorized By:	Jandy so / PSQ Manager Jandyso

Prepared By:

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Matsunichi Digital Development (Shenzhen) Co., Ltd
Address of applicant: F/22, Matsunichi Building, No.9996, Shennan Boulevard, Nanshan District, Shenzhen, China

Manufacturer 1: Matsunichi Digital Development (Shenzhen) Co., Ltd
Address of manufacturer: No.5, KeJi Road, PingShan Industrial Estate, PinShan New District, Shenzhen, China

Manufacturer 2: Guangzhou Singulargold Electronics Co., Ltd
Address of manufacturer: No.6, Lianhua yan Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, China

General Description of E.U.T

Items	**Description**
EUT Description:	WCDMA Smart Phone
Trade Name:	Matsunichi / Le Pan
Model No.:	MP436
Power Supply:	Input 100-240V/50/60Hz Output 5V DC Adaptor DC 3.7V Battery
Adaptor Model:	KSAS0060500120VUU
Rated Voltage:	DC 3.7V
Battery Capacity:	1530mAh（5.66Wh）
Hardware Version:	R004
Software Version:	4833
RF Output Power	Max. 3.384dBm (Conducted)
Antenna Gain:	4.8dBi
Frequency range:	2402-2480MHz
Number of channels:	79
Channel Separation:	1MHz
Type of Antenna:	Integral Antenna

Note: The test data is gathered from a production sample, provided by the manufacture.

1.2 Test Standards

The following report is prepared on behalf of the Matsunichi Digital Development (Shenzhen) Co., Ltd in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted with Low Channel, Middle Channel and High Channel, accordingly in reference to the Operating Instructions.

1.4 Test Facility

- **FCC – Registration No.: 994117**
  SEM.Test Compliance Services Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 994117.

- **Industry Canada (IC) Registration No.: 7673A**
  The 3m Semi-anechoic chamber of SEM.Test Compliance Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 7673A.

- **CNAS Registration No.: L4062**
  Shenzhen SEM.Test Electronics Service Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 3/F, Jinbao Commerce Building, Xin’an Fanshen Road, Bao’an District, Shenzhen, P.R.C (518101)

1.5 EUT Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements, all testing shall be perform at the low, middle, high channel.

Modulation Configure

Modulation	Packet	Packet Type	Packet Size
GFSK	DH1	4	27
	DH3	11	183
	DH5	15	339
Pi/4 QDPSK	2DH1	20	54
	2DH3	26	367
	2DH5	30	379
8DPSK	3DH1	24	83
	3DH3	27	552
	3DH5	31	1021

Normal mode: the Bluetooth has been tested on the modulation of GFSK.
EDR mode: the Bluetooth has been tested on the modulation of (Pi/4)QDPSK and 8DPSK, compliance test and record the worst case on 8DPSK.

1.6 Accessories Equipment List and Details

Description	Manufacturer	Model	Serial Number
N/A	N/A	N/A	N/A

1.7 EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
USB Cable	1.0	Shielded	With Core
Earphone Cable	1.4	Unshielded	Without Core

2. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§ 15.247(a)(1)(iii)	Quantity of Hopping Channel	Compliant
§ 15.247(a)(1)	Channel Separation	Compliant
§ 15.247(a)(1)(iii)	Time of Occupancy (Dwell time)	Compliant
§ 15.247(a)	20dB Bandwidth	Compliant
§ 15.247(b)(1)	Power Output	Compliant
§ 15.209(a)(f)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(a)(1)	Frequency Hopping Sequence	Compliant
§ 15.247(g), (h)	Frequency Hopping System	Compliant

3. §15.203 - ANTENNA REQUIREMENT

3.1 Standard Applicable

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Evaluation Information

This product has a permanent antenna, fulfill the requirement of this section.

4. Frequency Hopping System Requirements

4.1 Standard Applicable

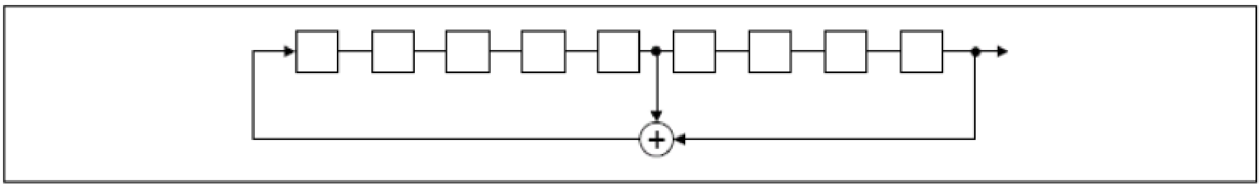
According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

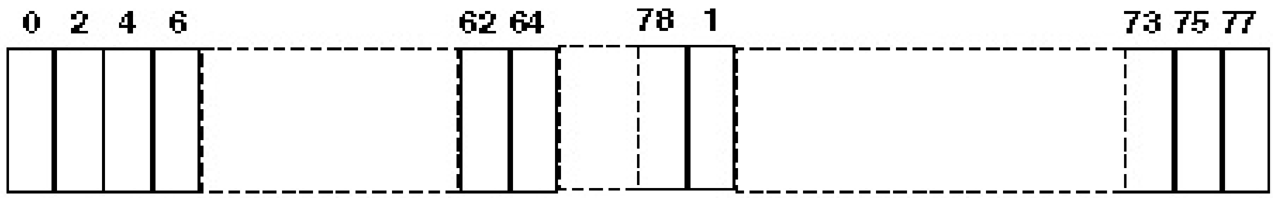
(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

4.2 EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.
Number of shift register stages: 9
Length of pseudo-random sequence: 29-1 = 511 bits
Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence



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.

4.3 Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule.

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2402 to 2480 MHz) in the range 2,400-2,483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

5. NUMBER OF HOPPING CHANNELS AND CHANNEL SPACING

5.1 Standard Applicable

According to FCC 15.247(a)(1), 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, and frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

5.3 Test Procedure

According to the DA 00-705, the number of hopping frequencies test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Set span = the frequency band of operation (2400MHz to 2483.5MHz)
RBW = 100kHz, VBW = 100kHz
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize, observed the band of 2400MHz to 2483.5MHz, than count it out the number of channels for comparing with the FCC rules.

The channel spacing test method as follows:

Set span = wide enough to capture the peaks of two adjacent channels
Other setting as above
Allow the trace to stabilize, Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

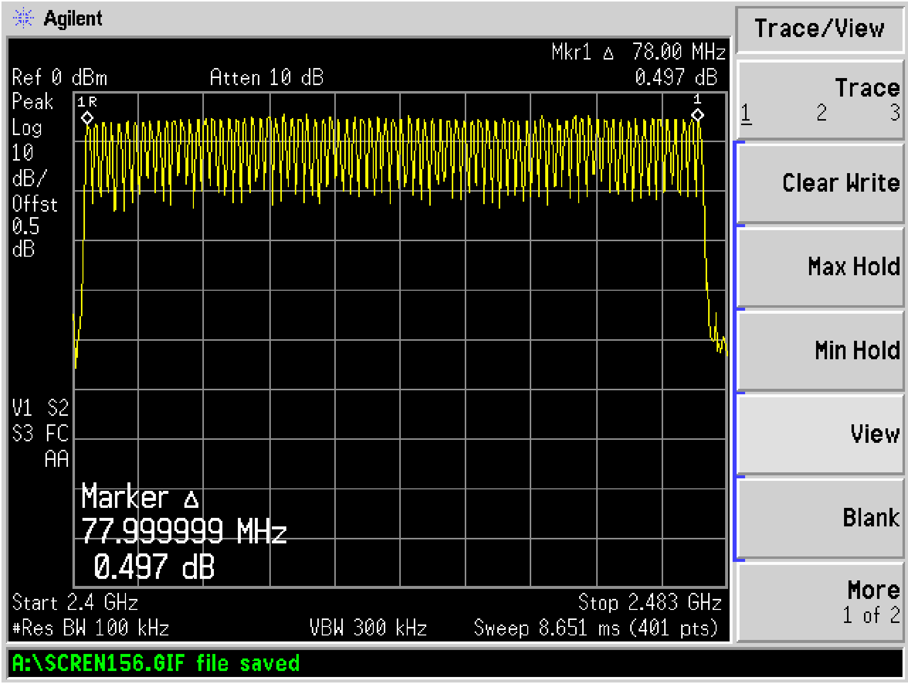
5.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

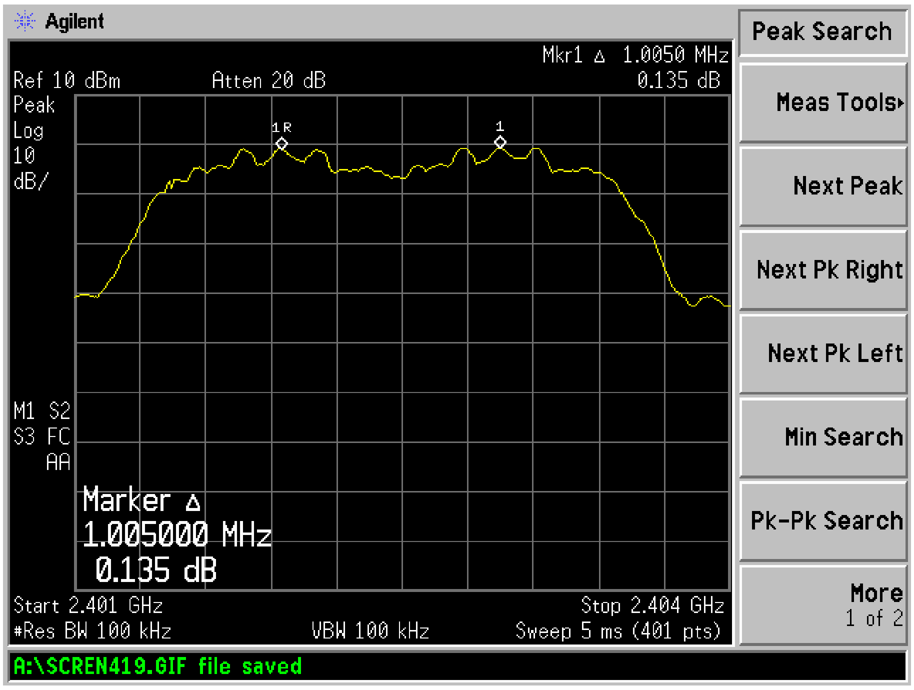
5.5 Summary of Test Results/Plots

Test mode: 8DPSK 3DH5

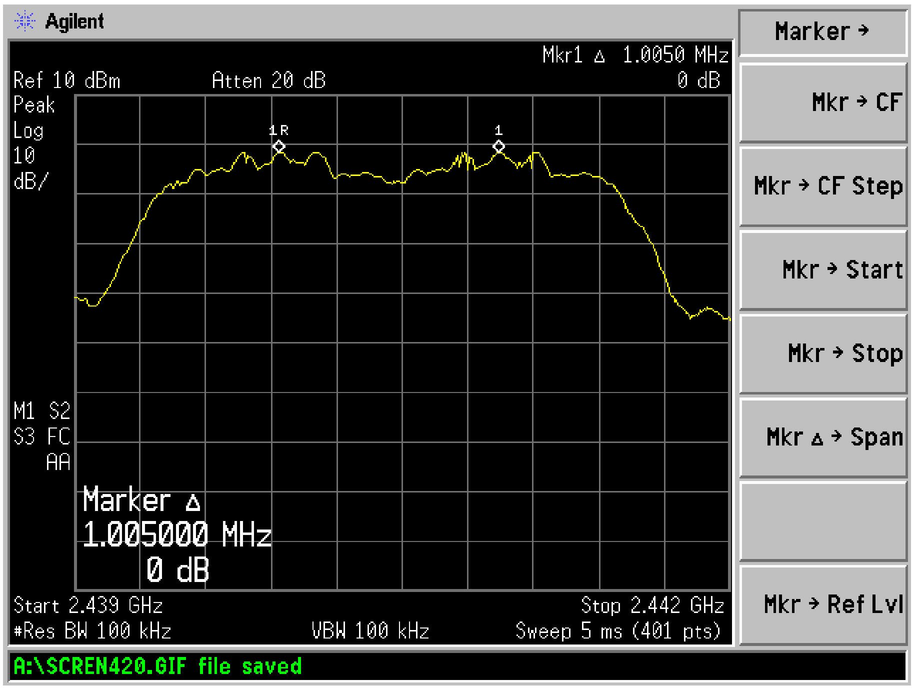
No. of Channel = 79



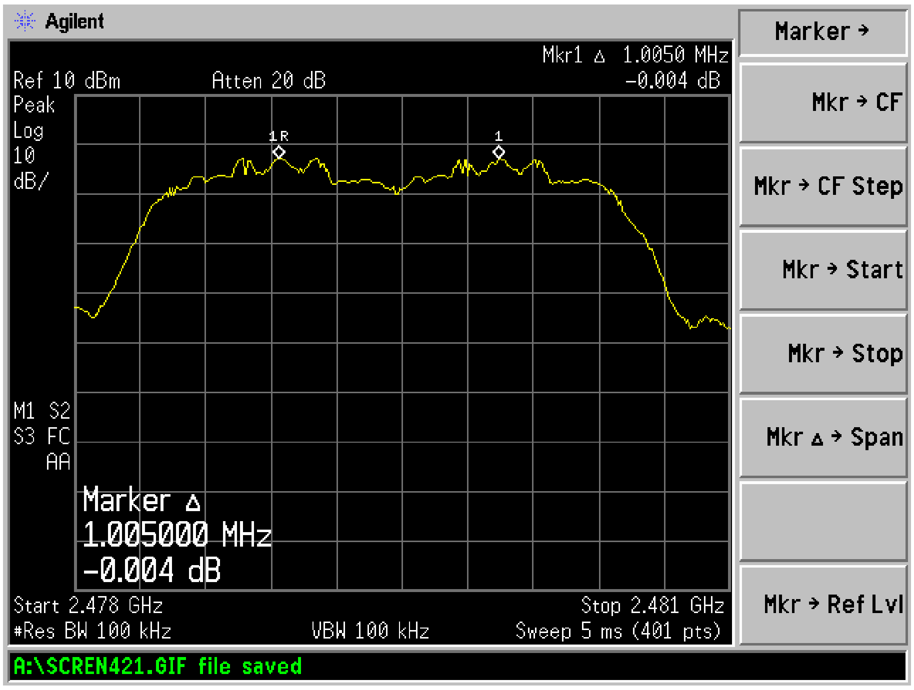
Channel Spacing (Low CH=1MHz)



Channel Spacing (Middle CH=1MHz)



Channel Spacing (High CH=1MHz)



6. DWELL TIME OF A HOPPING CHANNEL

6.1 Standard Applicable

According to 15.247(a)(1)(iii), 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.

6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

6.3 Test Procedure

According to the DA 00-705, the dwell time of a hopping channel test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Set span = zero span, centered on a hopping channel
RBW = 1MHz, VBW = 1MHz
Sweep = auto
Detector function = peak
Trace = max hold
Use the marker-delta function to determine the dwell time

6.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

6.5 Summary of Test Results/Plots

The dwell time within a period in data mode is independent from the packet type (packet length).
Test data is corrected with the worse case, which the packet length is DH1, DH3, DH5, 3DH1, 3DH3, 3DH5.

The test period: T = 0.4 Second X 79 Channel = 31.6 s
Dwell time = time slot length X (Hopping rate / Number of hopping channels) X Period

Low Channel-2402MHz:
DH1 dwell time = 0.416 (ms) * (1600/(2*79)) * 31.6 = 166 ms
DH3 dwell time = 1.680 (ms) * (1600/(4*79)) * 31.6 = 288 ms
DH5 dwell time = 2.930 (ms) * (1600/(6*79)) * 31.6 = 325 ms

Middle Channel-2441MHz:
DH1 dwell time = 0.420 (ms) * (1600/(2*79)) * 31.6 = 163 ms
DH3 dwell time = 1.680 (ms) * (1600/(4*79)) * 31.6 = 288 ms
DH5 dwell time = 2.930 (ms) * (1600/(6*79)) * 31.6 = 331 ms

High Channel-2480MHz:
DH1 dwell time = 0.420 (ms) * (1600/(2*79)) * 31.6 = 163 ms
DH3 dwell time = 1.670 (ms) * (1600/(4*79)) * 31.6 = 294 ms
DH5 dwell time = 2.940 (ms) * (1600/(6*79)) * 31.6 = 325 ms

Low Channel-2402MHz:
3DH1 dwell time = 0.420 (ms) * (1600/(2*79)) * 31.6 = 166 ms
3DH3 dwell time = 1.670 (ms) * (1600/(4*79)) * 31.6 = 276 ms
3DH5 dwell time = 2.930 (ms) * (1600/(6*79)) * 31.6 = 325 ms

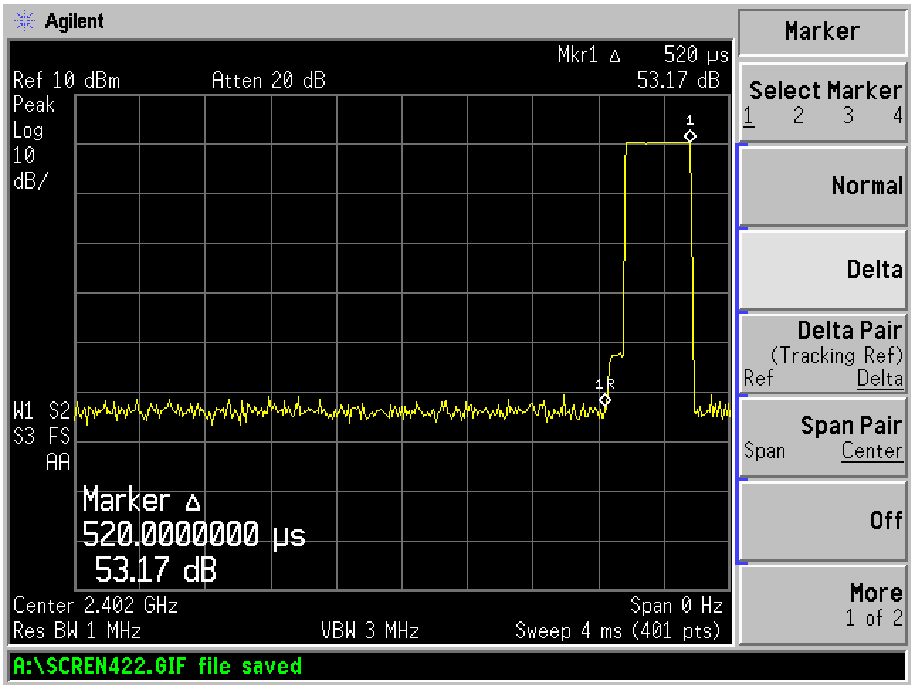
Middle Channel-2441MHz:
3DH1 dwell time = 0.420 (ms) * (1600/(2*79)) * 31.6 = 166 ms
3DH3 dwell time = 1.670 (ms) * (1600/(4*79)) * 31.6 = 281 ms
3DH5 dwell time = 2.920 (ms) * (1600/(6*79)) * 31.6 = 320 ms

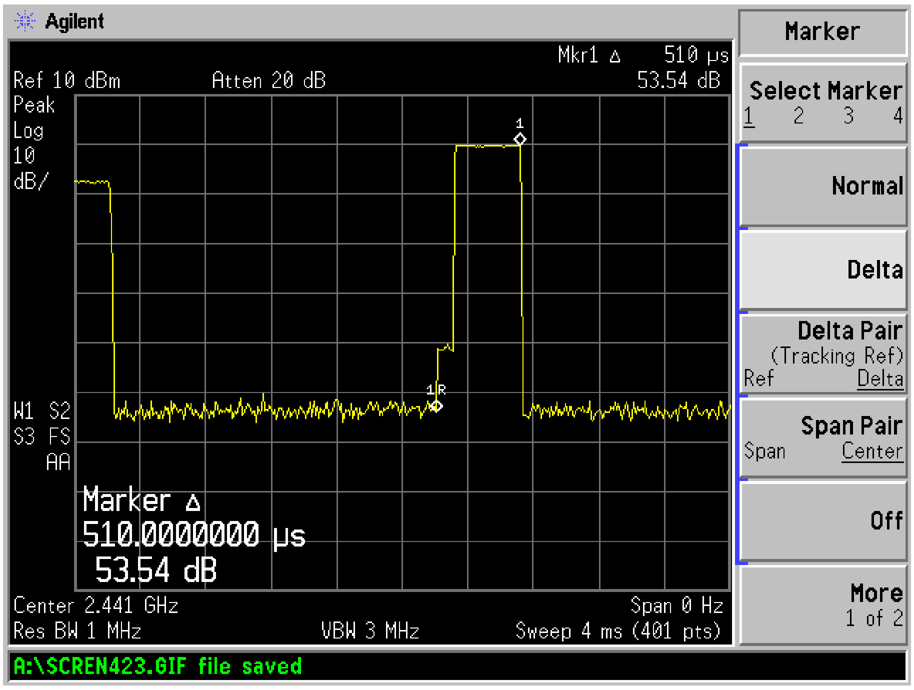
High Channel-2480MHz:
3DH1 dwell time = 0.420 (ms) * (1600/(2*79)) * 31.6 = 166 ms
3DH3 dwell time = 1.680 (ms) * (1600/(4*79)) * 31.6 = 294 ms
3DH5 dwell time = 2.910 (ms) * (1600/(6*79)) * 31.6 = 325 ms

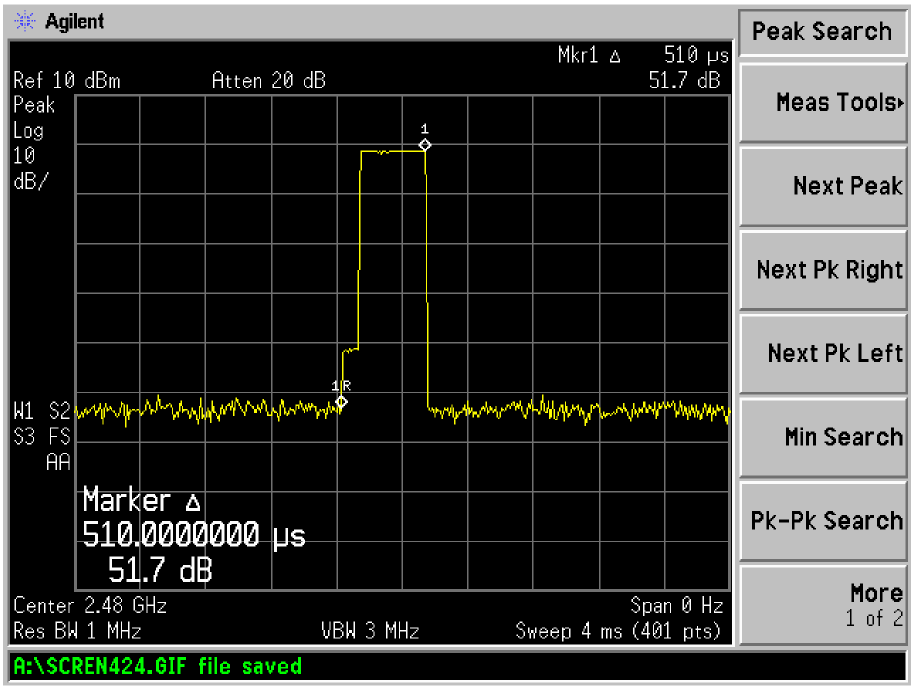
The test results are not greater than 0.4 seconds.

Please see the test plots as below:

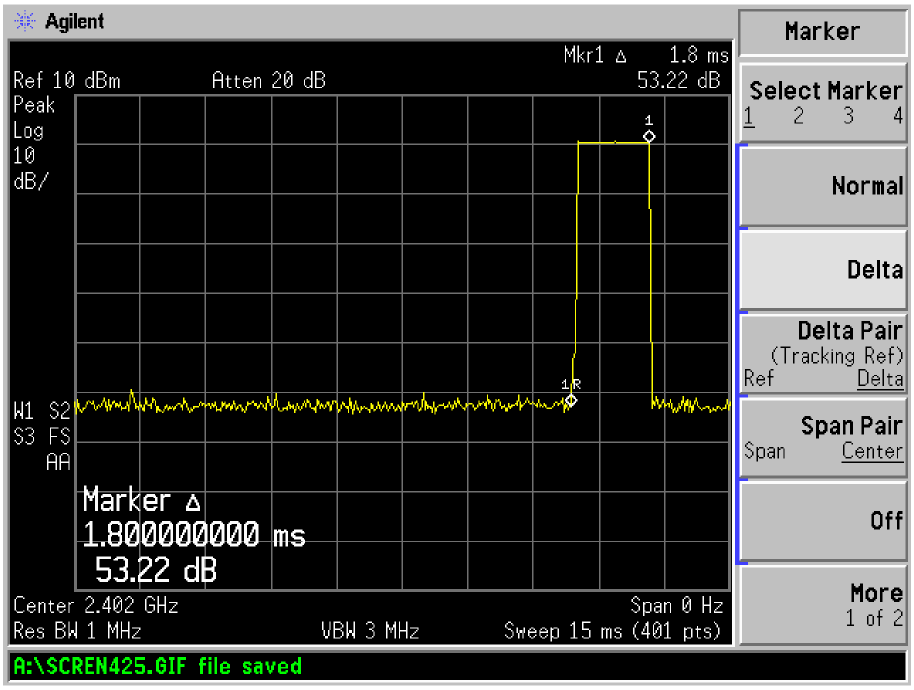
DH1 time slot

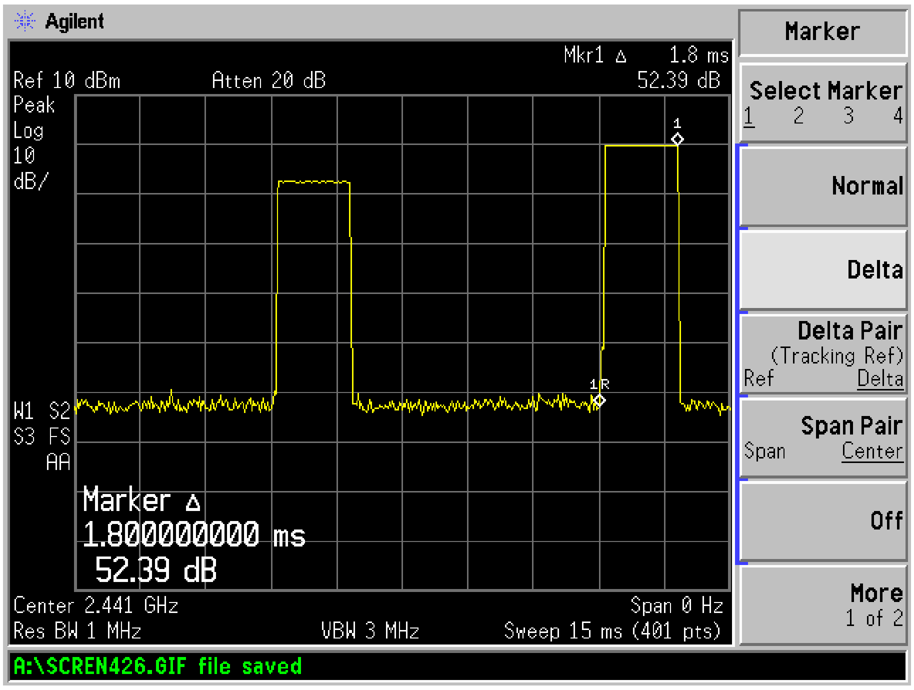


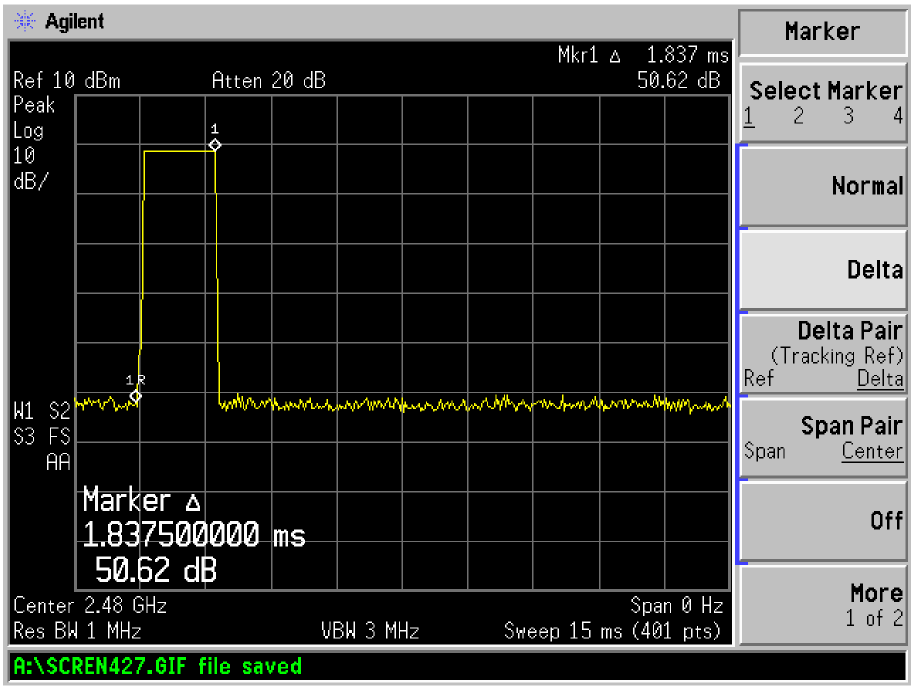




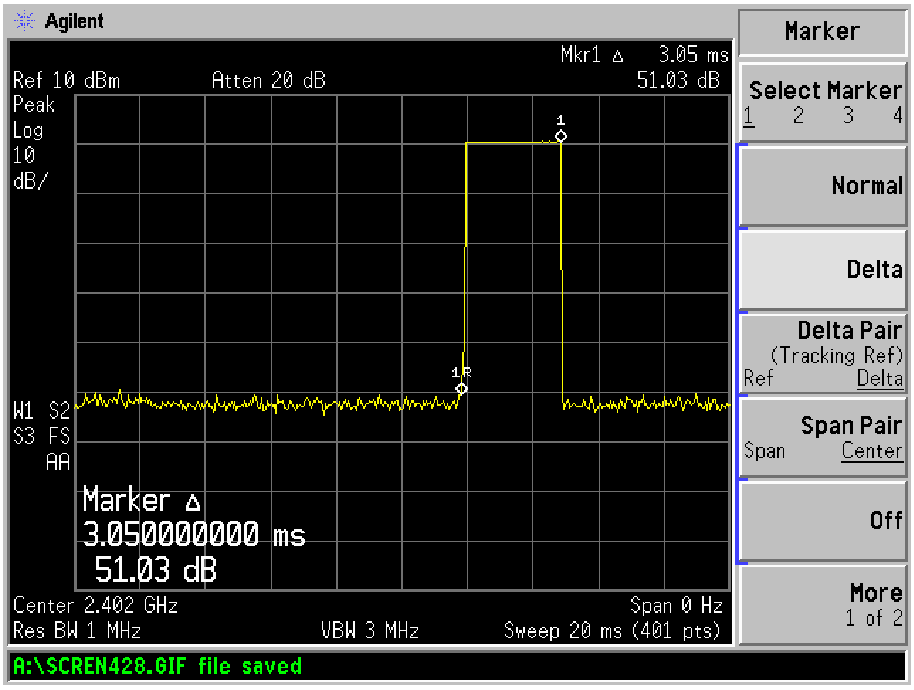
DH3 time slot

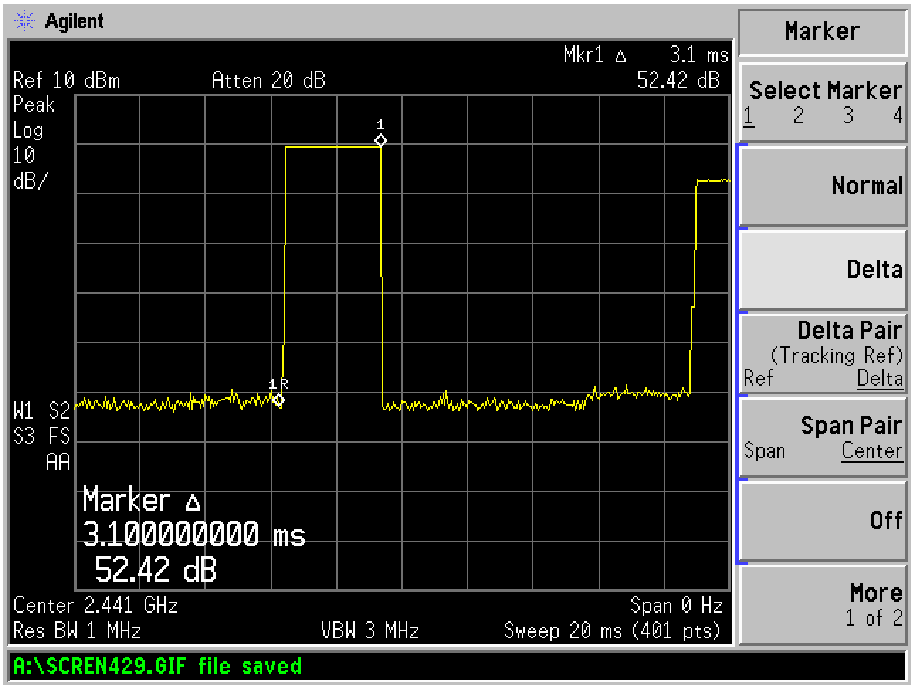


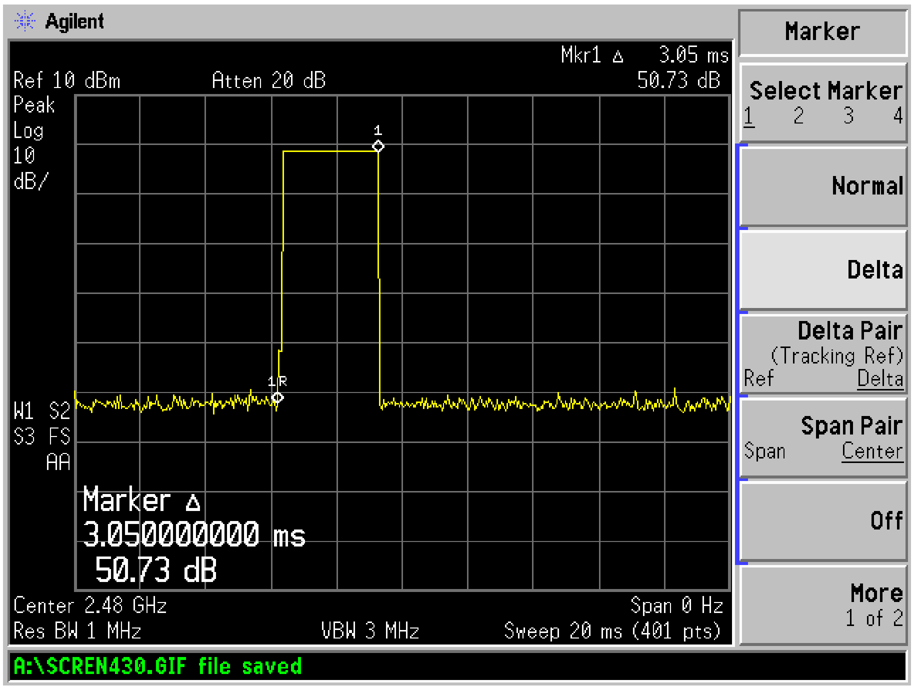

Agilent
Mkr1 Δ 1.8 ms
Ref 10 dBm Atten 20 dB 52.39 dB
Peak
Log
10
dB/
W1 S2
S3 FS
AA
Marker Δ
1.800000000 ms
52.39 dB
Center 2.441 GHz Span 0 Hz
Res BW 1 MHz VBW 3 MHz Sweep 15 ms (401 pts)
A:\SCREN426.GIF file saved
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
Mkr1 Δ 1.837 ms
Ref 10 dBm Atten 20 dB 50.62 dB
Peak
Log
10
dB/
W1 S2
S3 FS
AA
Marker Δ
1.837500000 ms
50.62 dB
Center 2.48 GHz Span 0 Hz
Res BW 1 MHz VBW 3 MHz Sweep 15 ms (401 pts)
A:\SCREN427.GIF file saved
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

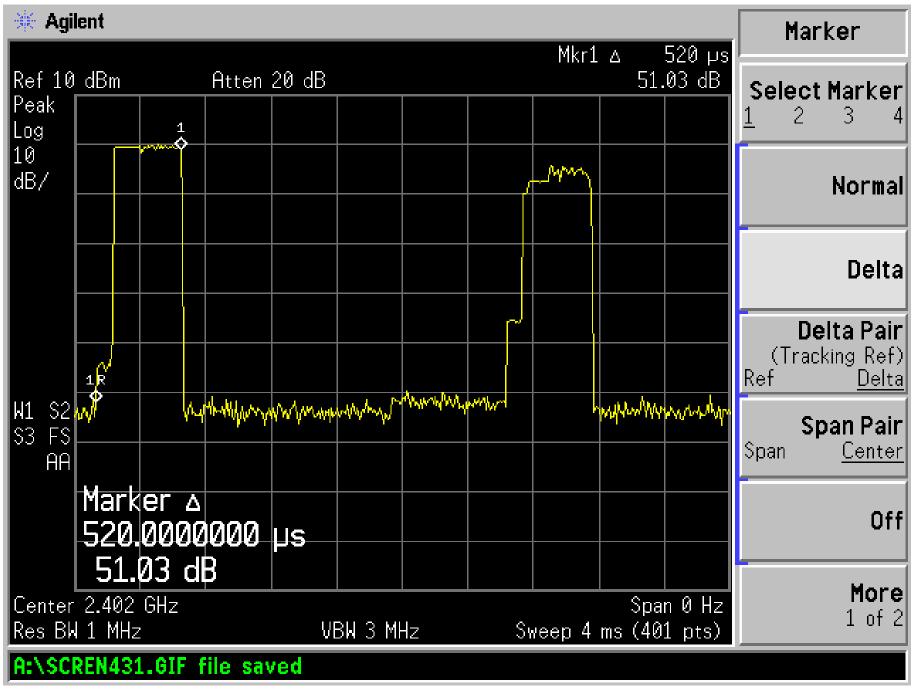
DH5 time slot

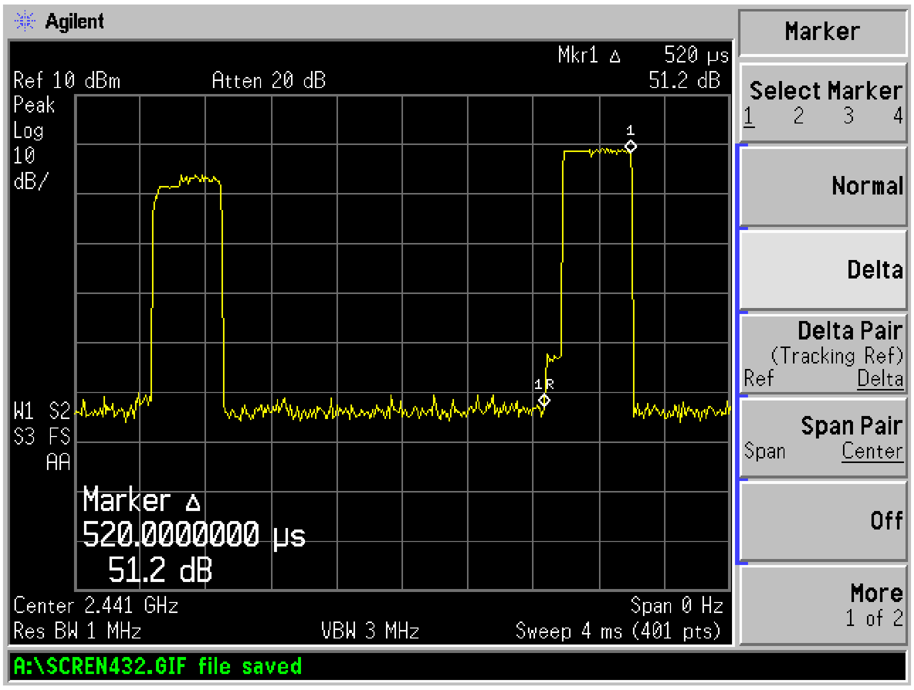


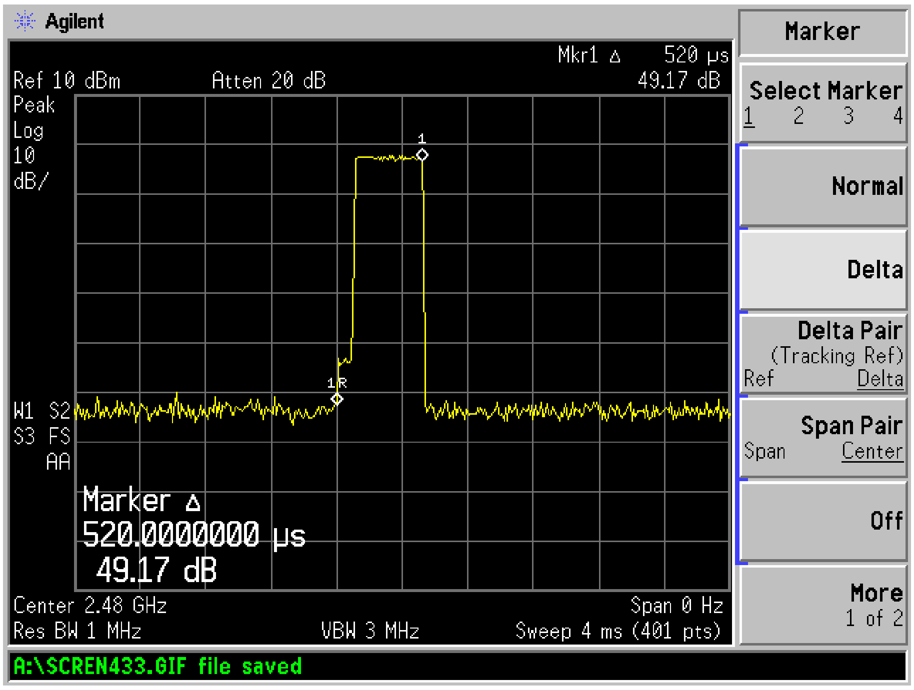




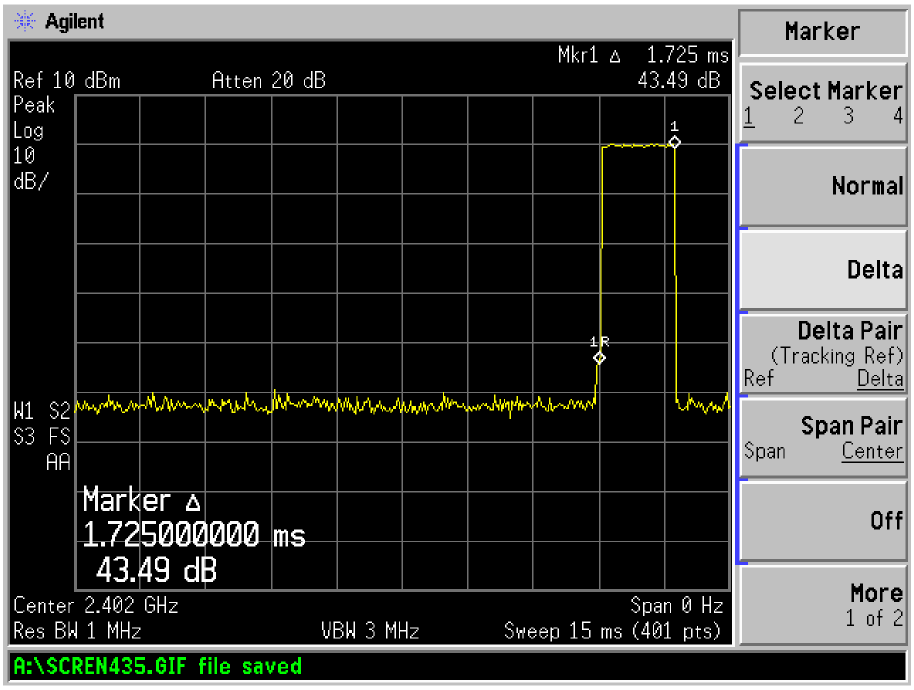
3DH1 time slot

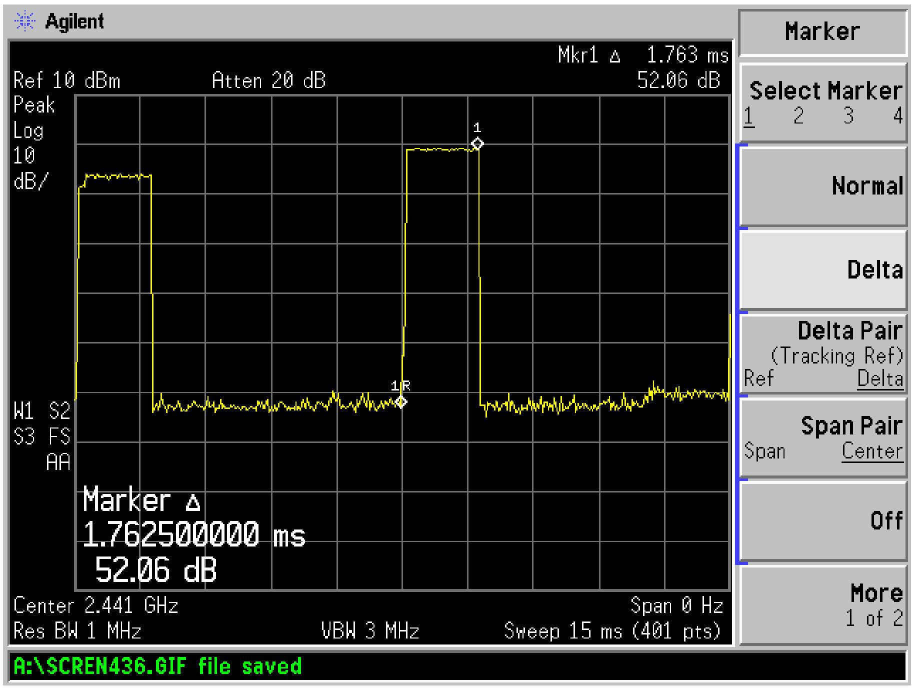


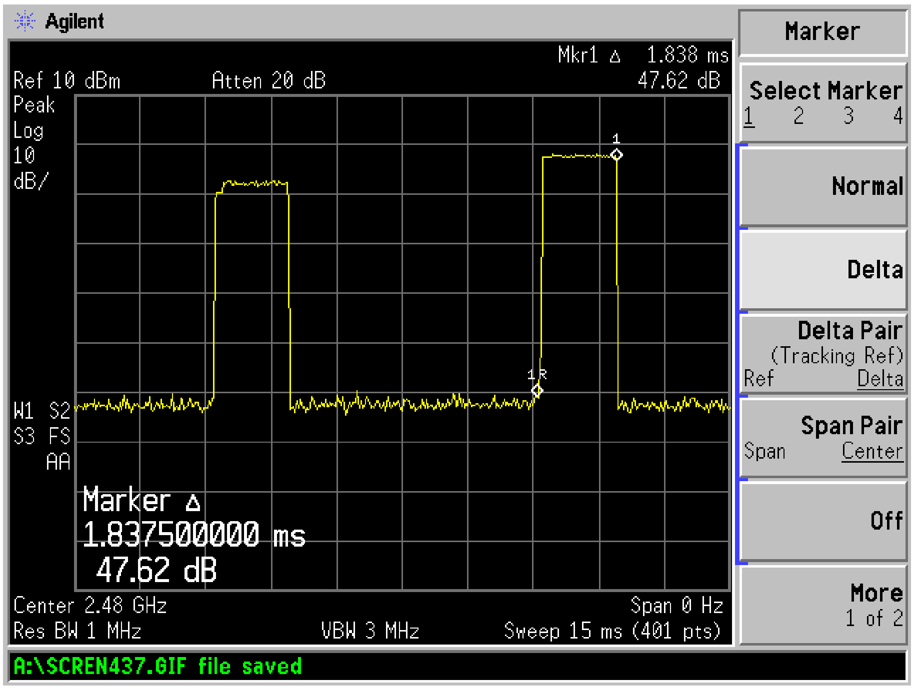

Agilent
Mkr1 Δ 520 µs
Ref 10 dBm Atten 20 dB 51.2 dB
Peak
Log
10
dB/
W1 S2
S3 FS
AA
Marker Δ
520.0000000 µs
51.2 dB
Center 2.441 GHz Span 0 Hz
Res BW 1 MHz VBW 3 MHz Sweep 4 ms (401 pts)
A:\SCREN432.GIF file saved
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
Mkr1 Δ 520 µs
Ref 10 dBm Atten 20 dB 49.17 dB
Peak
Log
10
dB/
W1 S2
S3 FS
AA
Marker Δ
520.0000000 µs
49.17 dB
Center 2.48 GHz Span 0 Hz
Res BW 1 MHz VBW 3 MHz Sweep 4 ms (401 pts)
A:\SCREN433.GIF file saved
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

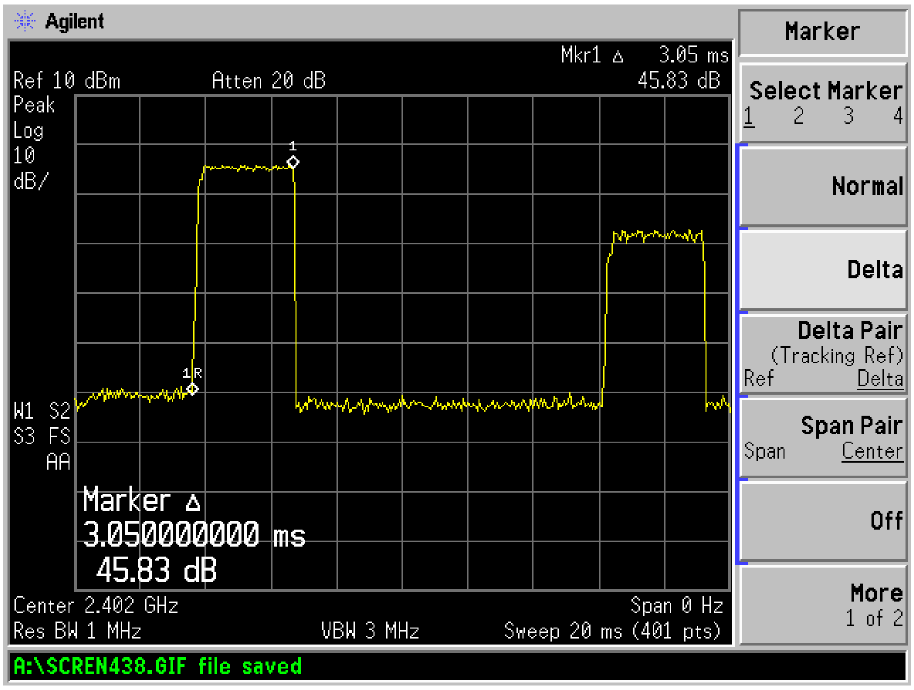
3DH3 time slot

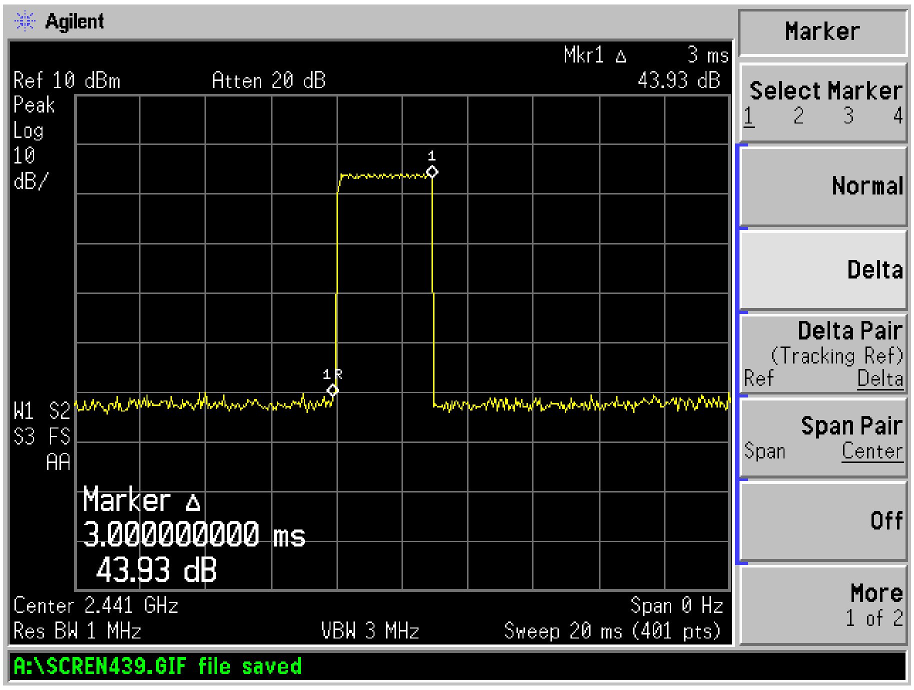


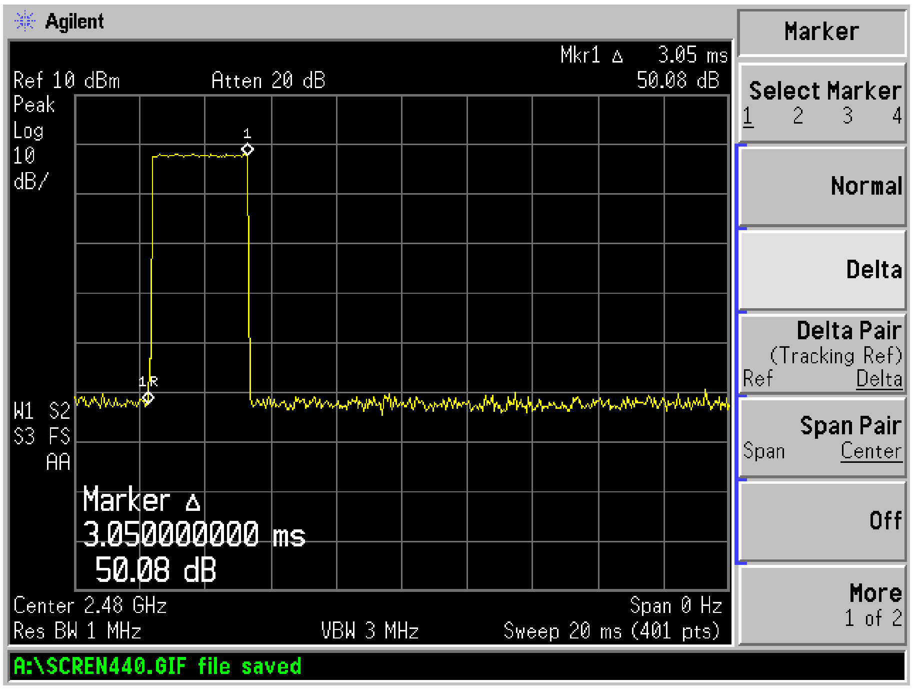




3DH5 time slot




Agilent
Mkr1 Δ 3 ms
Ref 10 dBm Atten 20 dB 43.93 dB
Peak
Log
10
dB/
W1 S2
S3 FS
AA
Marker Δ
3.000000000 ms
43.93 dB
Center 2.441 GHz Span 0 Hz
Res BW 1 MHz VBW 3 MHz Sweep 20 ms (401 pts)
A:\SCREN439.GIF file saved
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
Mkr1 Δ 3.05 ms
Ref 10 dBm Atten 20 dB 50.08 dB
Peak
Log
10
dB/
W1 S2
S3 FS
AA
Marker Δ
3.050000000 ms
50.08 dB
Center 2.48 GHz Span 0 Hz
Res BW 1 MHz VBW 3 MHz Sweep 20 ms (401 pts)
A:\SCREN440.GIF file saved
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

7. 20-dB BANDWIDTH

7.1 Standard Applicable

According to 15.247(a)(1)(iii). For frequency hopping systems operating in the 2400MHz-2483.5 MHz no limit for 20dB bandwidth.

7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

7.3 Test Procedure

According to the DA 00-705, the 20dB bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Set span = 2MHz, centered on a hopping channel
RBW ≥1% 20dB Bandwidth, VBW ≥RBW
Sweep = auto
Detector function = peak
Trace = max hold
All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

7.4 Environmental Conditions

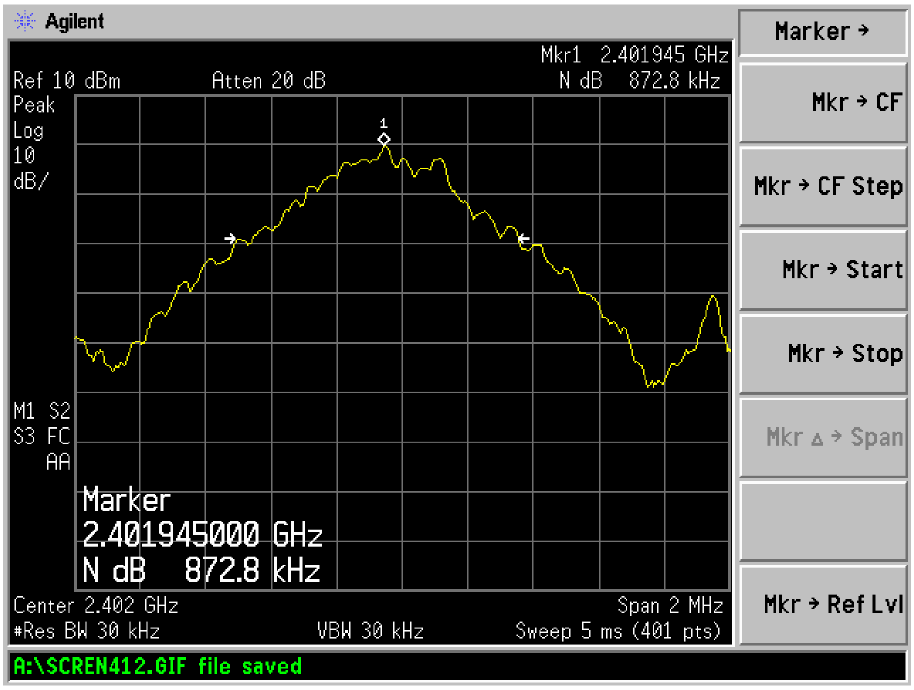
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

7.5 Summary of Test Results/Plots

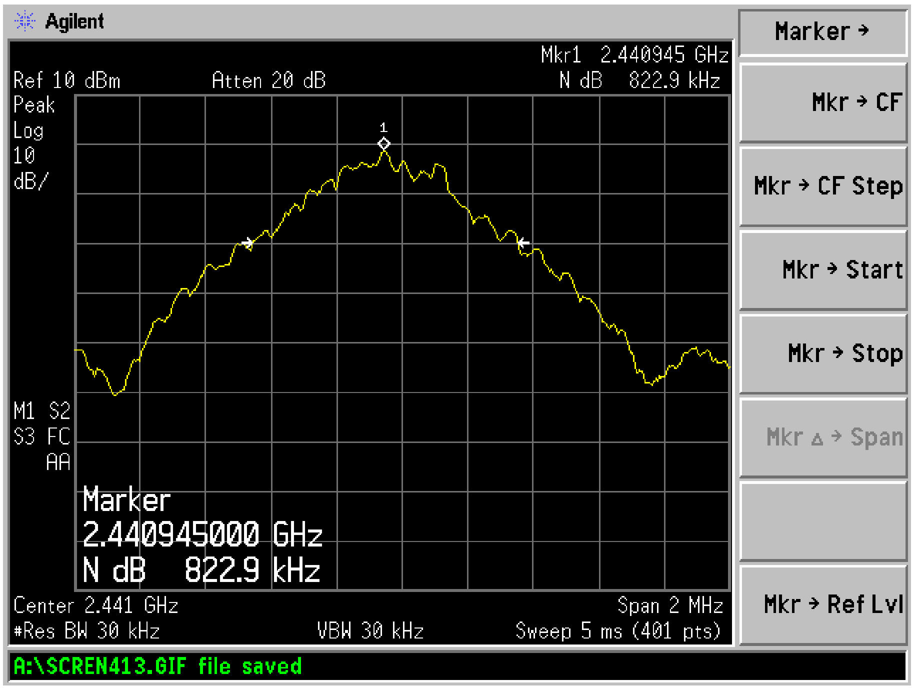
Frequency MHz	20 dB Bandwidth DH5 kHz	20 dB Bandwidth 3DH5 kHz	Limit dB
2402	873	1307	/
2441	823	1287	/
2480	828	1287	/

DH5 Mode

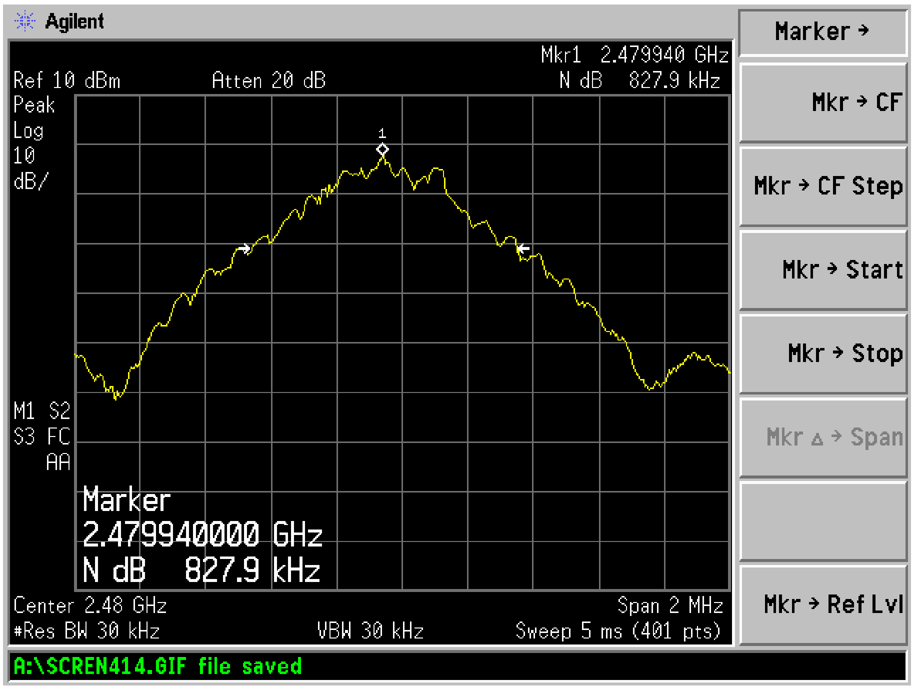
CH Low:



CH Mid:

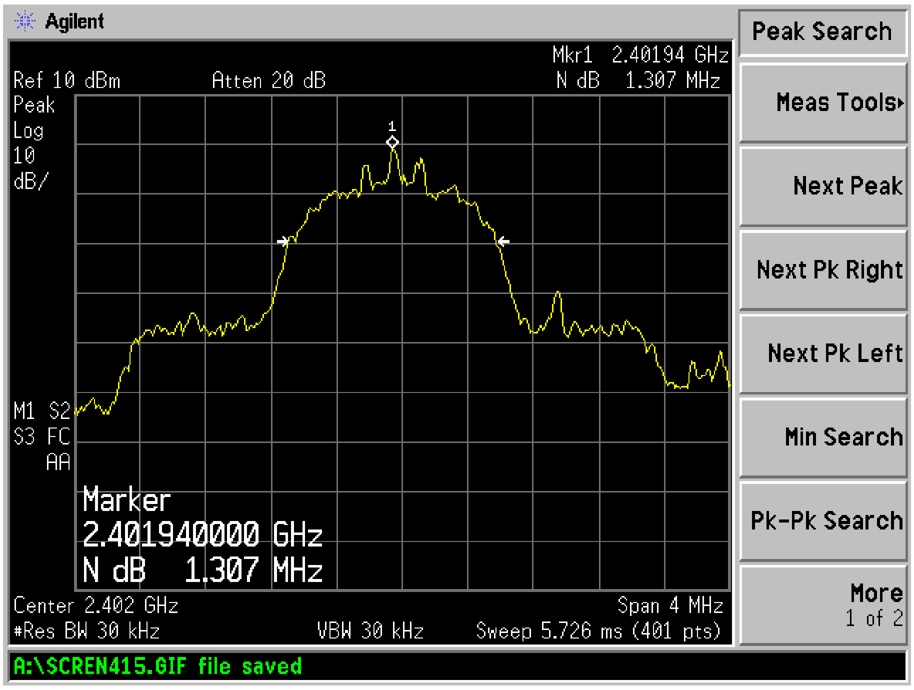


CH High:

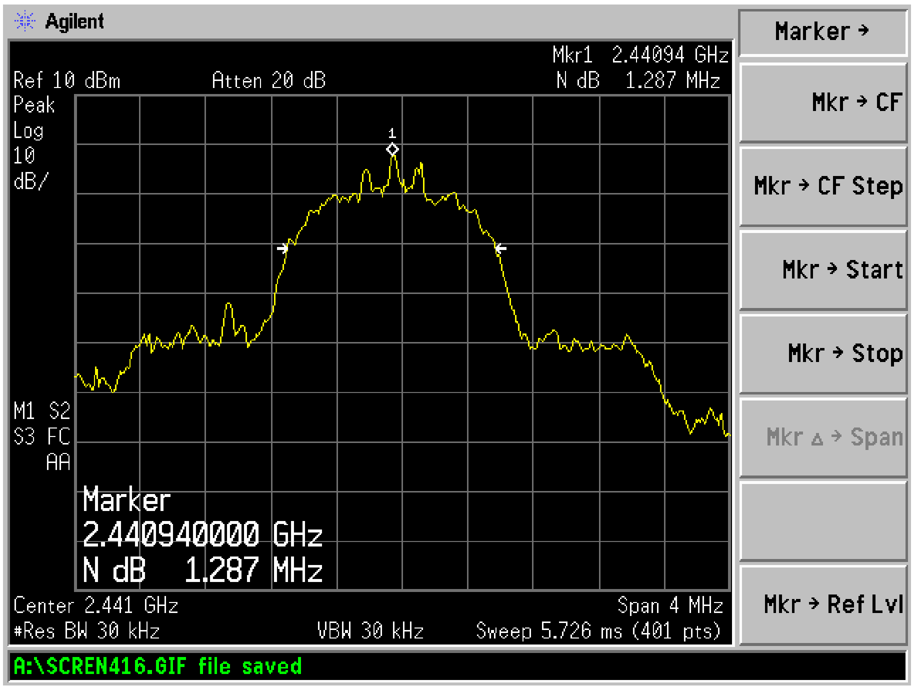


3DH5 Mode

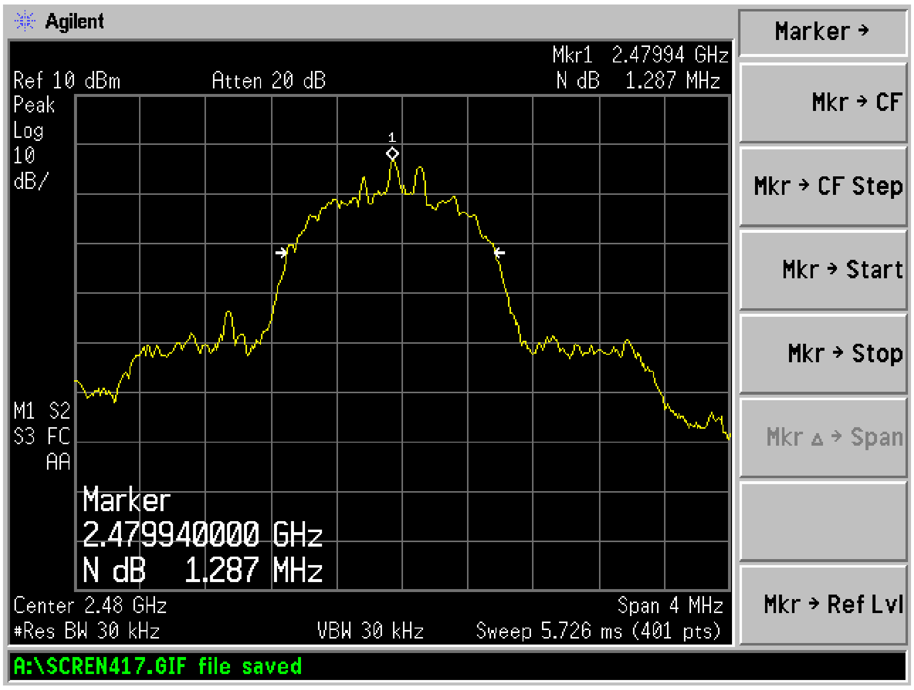
CH Low:



CH Mid:



CH High:



8. POWER OUTPUT

8.1 Standard Applicable

According to 15.247(b)(1). 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.

8.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

8.3 Test Procedure

According to the DA 00-705, the peak output power test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
Set span = 5MHz, centered on a hopping channel
RBW = 1MHz, VBW = 1MHz
Sweep = auto
Detector function = peak
Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, the indicated level is the peak output power (the external attenuation and cable loss shall be considered).

8.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	55%
ATM Pressure:	1011 mbar

8.5 Summary of Test Results/Plots

Conducted Power: DH5

Channel	Frequency MHz	Measured Value dBm	Output Power mW	Limit mW
Low Channel	2402	3.384	2.1797	1000
Middle Channel	2441	3.716	2.3529	1000
High Channel	2480	2.495	1.7762	1000

Conducted Power: 3DH5

Channel	Frequency MHz	Measured Value dBm	Output Power mW	Limit mW
Low Channel	2402	1.950	1.5668	1000
Middle Channel	2441	3.091	2.0375	1000
High Channel	2480	2.879	1.9404	1000

Note: the antenna gain of 4.8dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.

9. FIELD STRENGTH OF SPURIOUS EMISSIONS

9.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is $\pm$5.10 dB.

9.2 Standard Applicable

According to §15.247(d), 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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).

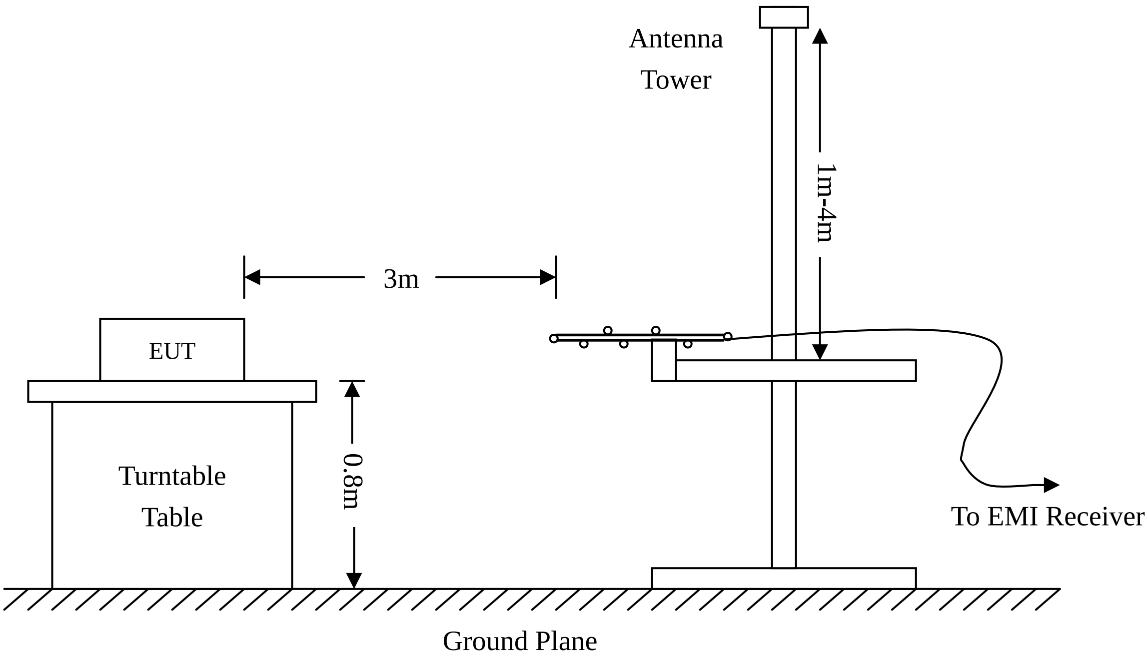
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

9.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24
Horn Antenna	ETS	3116B	00088203	2012-02-25	2013-02-24
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2012-02-25	2013-02-24

9.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
The spacing between the peripherals was 10 cm.



9.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Ant. Factor + Cable Loss – Ampl. Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15 Limit

9.6 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

9.7 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst margin of:

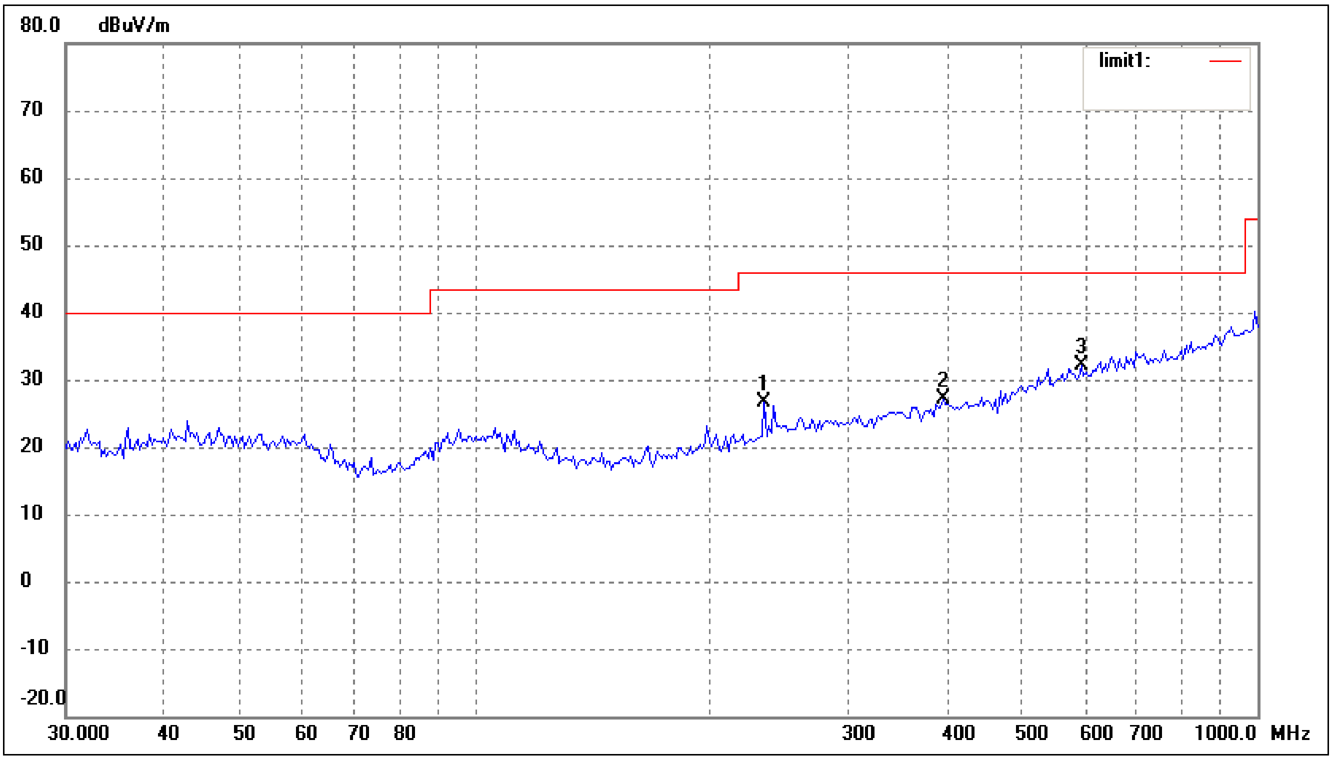
-11.20 dBμV at **4882.0 MHz** in the H**orizontal** polarization for **Middle Channel**, **9 kHz to 25 GHz, 3 Meters**

Note: *this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

From 30 MHz to 1 GHz

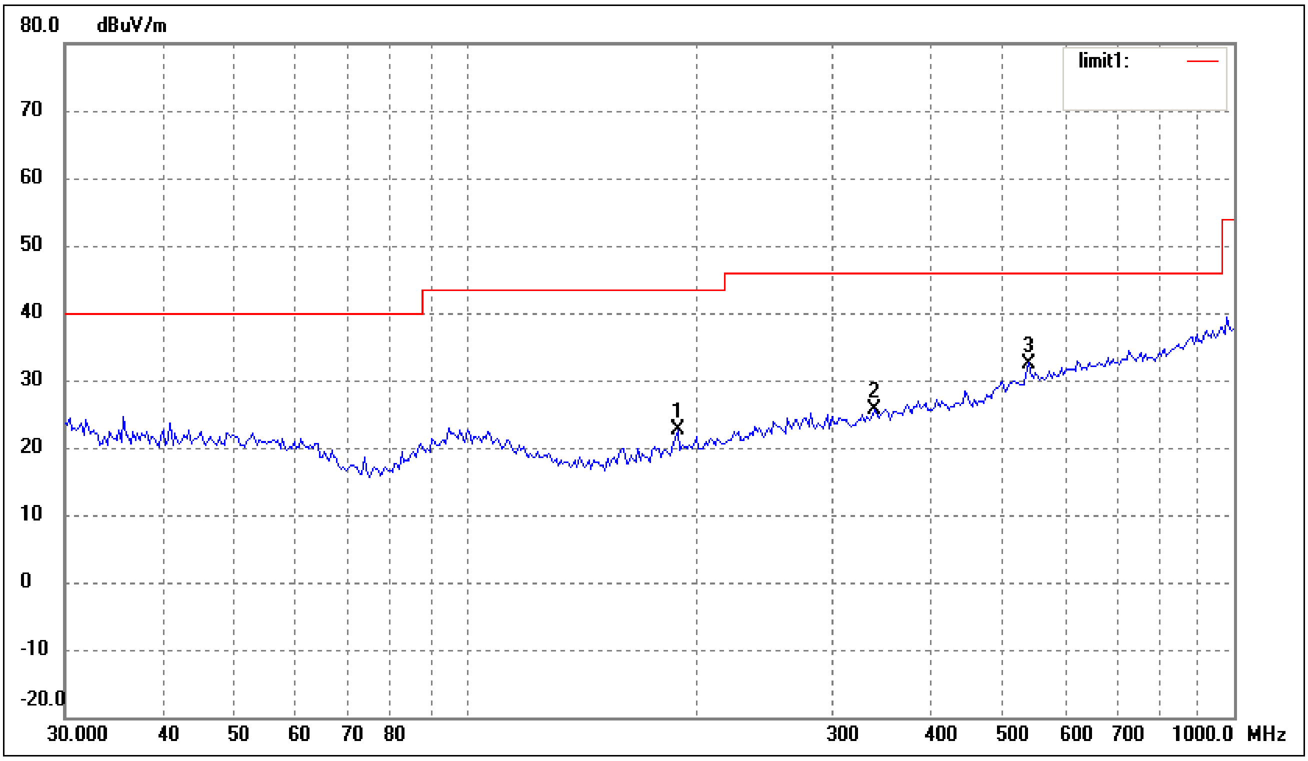
Test Mode: Transmitting-Low channel (2402MHz)

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	234.1684	18.59	8.10	26.69	46.00	-19.31	360	100	peak
2	396.2415	15.86	11.37	27.23	46.00	-18.77	360	100	peak
3	595.1329	15.47	16.55	32.02	46.00	-13.98	360	100	peak

Vertical

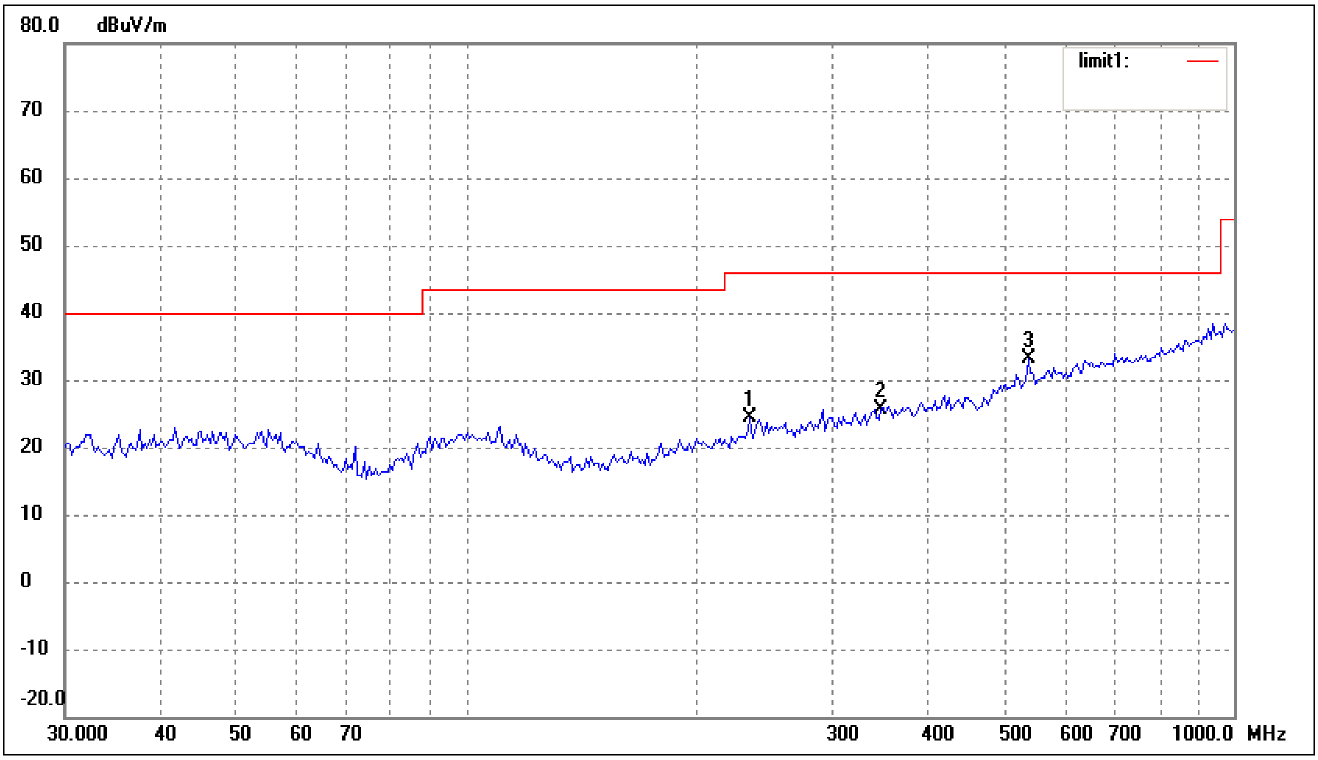


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	188.4125	16.25	6.40	22.65	43.50	-20.85	360	100	peak
2	339.5888	15.11	10.42	25.53	46.00	-20.47	360	100	peak
3	539.4775	17.20	15.30	32.50	46.00	-13.50	360	100	peak

From 30 MHz to 1 GHz

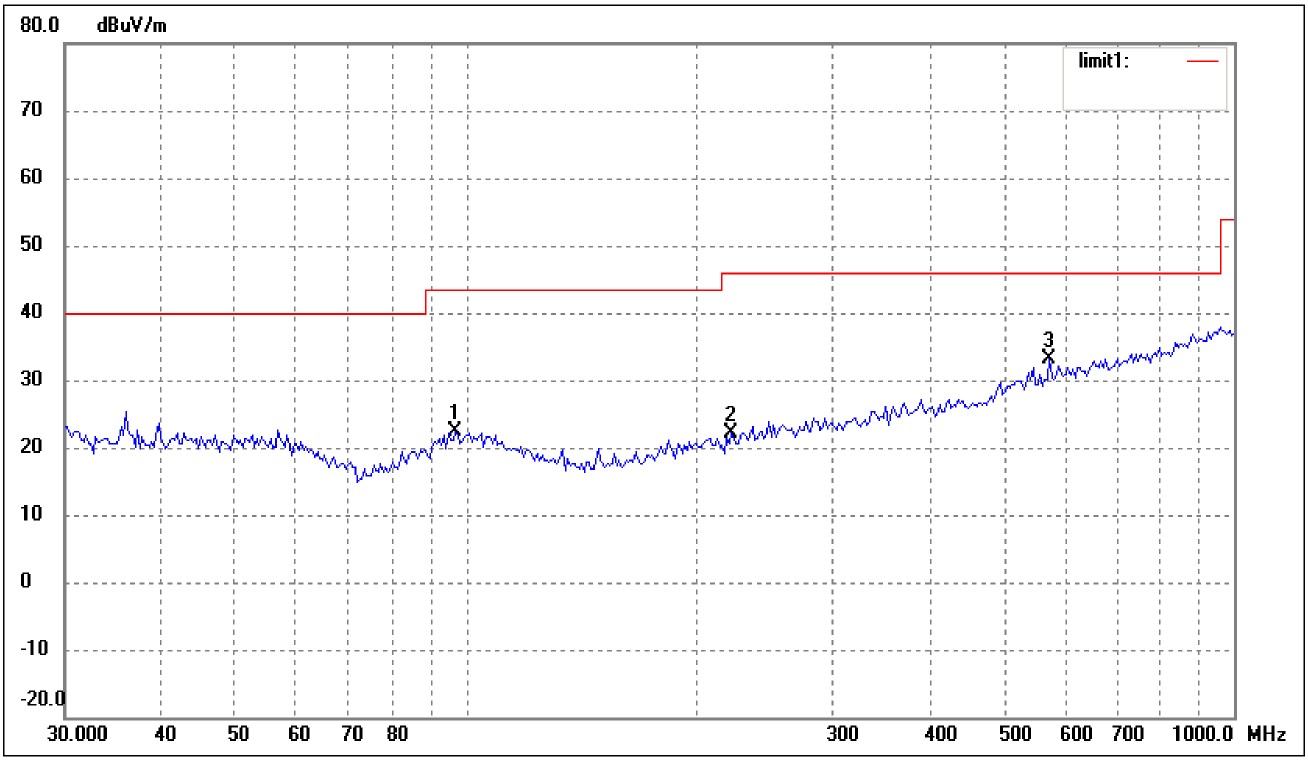
Test Mode: Transmitting-Middle channel (2441MHz)

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	234.1684	16.30	8.10	24.40	46.00	-21.60	360	100	peak
2	346.8092	15.00	10.58	25.58	46.00	-20.42	360	100	peak
3	539.4775	17.77	15.30	33.07	46.00	-12.93	360	100	peak

Vertical

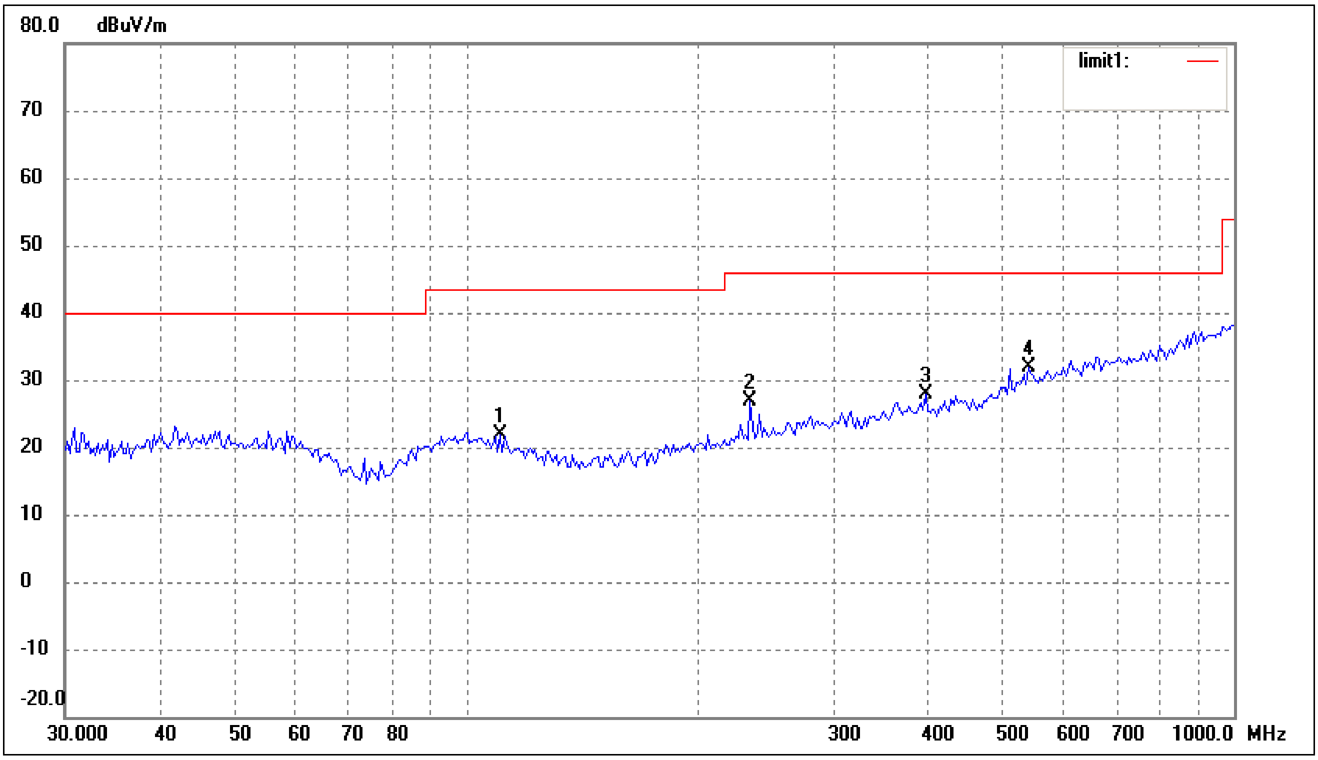


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	96.7749	14.07	8.19	22.26	43.50	-21.24	360	100	peak
2	221.3921	14.88	7.36	22.24	46.00	-23.76	360	100	peak
3	574.6258	16.97	16.10	33.07	46.00	-12.93	360	100	peak

From 30 MHz to 1 GHz

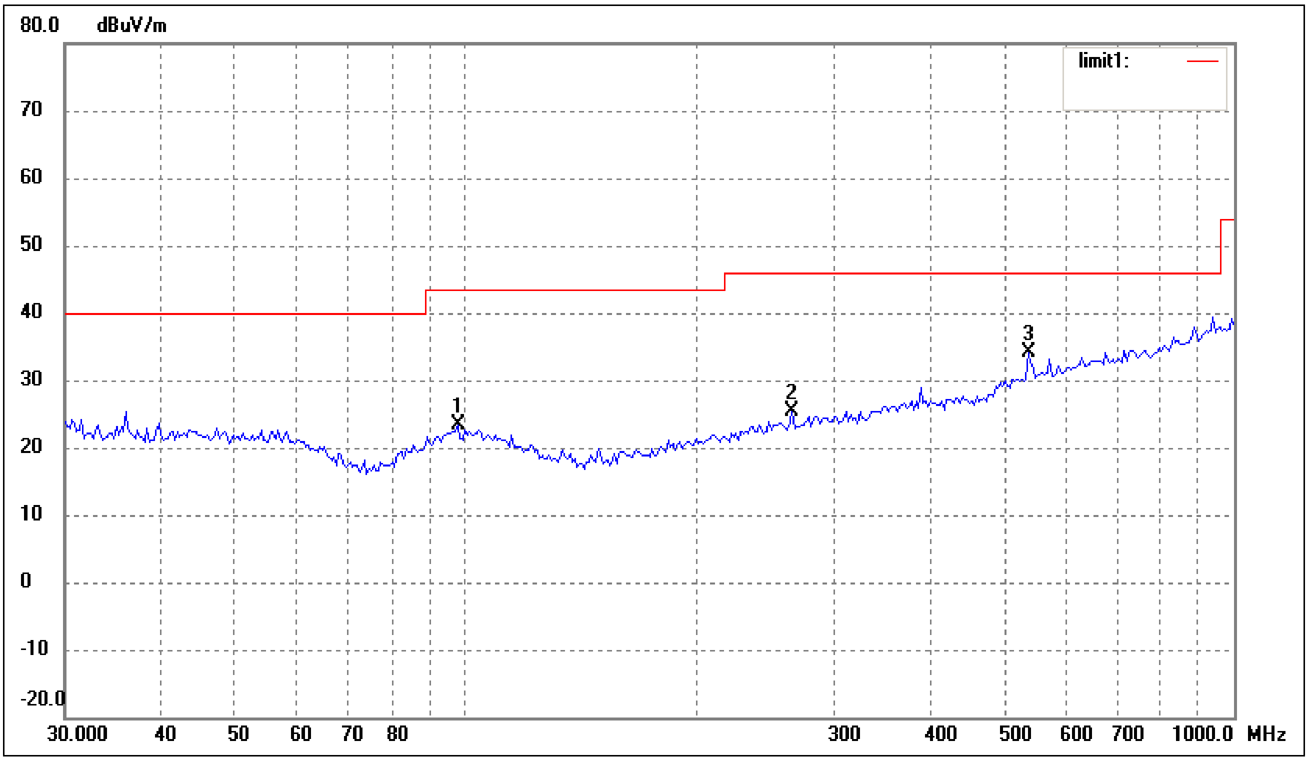
Test Mode: Transmitting-High channel (2480MHz)

Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	110.5687	14.31	7.50	21.81	43.50	-21.69	360	100	peak
2	234.1684	18.73	8.10	26.83	46.00	-19.17	360	100	peak
3	396.2415	16.52	11.37	27.89	46.00	-18.11	360	100	peak
4	539.4775	16.54	15.30	31.84	46.00	-14.16	360	100	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	97.4560	15.25	8.23	23.48	43.50	-20.02	360	100	peak
2	265.6757	16.16	9.11	25.27	46.00	-20.73	360	100	peak
3	539.4775	18.72	15.30	34.02	46.00	-11.98	360	100	peak

Spurious Emission Above 1GHz

Frequency MHz	Detector	Meter Reading dBuV	Direction Degree	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Correction Amplitude dBuV/m	Limit dBuV/m	Margin dB
Low Channel (2402MHz)										
4804.0	AV	35.91	51	H	34.1	5.2	33.0	42.21	54	-11.79
4804.0	AV	34.92	314	V	34.1	5.2	33.0	41.22	54	-12.78
7206.0	AV	29.20	60	H	37.4	6.1	33.5	39.20	54	-14.80
7206.0	AV	30.69	122	V	37.4	6.1	33.5	40.69	54	-13.31
4804.0	PK	37.90	65	H	34.1	5.2	33.0	44.20	74	-29.80
4804.0	PK	36.70	98	V	34.1	5.2	33.0	43.00	74	-31.00
7206.0	PK	30.12	256	H	37.4	6.1	33.5	40.12	74	-33.88
7206.0	PK	30.01	185	V	37.4	6.1	33.5	40.01	74	-33.99
Middle Channel (2441MHz)										
4882.0	AV	36.50	21	H	34.1	5.2	33.0	42.80	54	-11.20
4882.0	AV	36.11	34	V	34.1	5.2	33.0	42.41	54	-11.59
7323.0	AV	30.21	342	H	37.4	6.1	33.5	40.21	54	-13.79
7323.0	AV	30.07	30	V	37.4	6.1	33.5	40.07	54	-13.93
4882.0	PK	37.60	23	H	34.1	5.2	33.0	43.90	74	-30.10
4882.0	PK	37.91	34	V	34.1	5.2	33.0	44.21	74	-29.79
7323.0	PK	31.24	264	H	37.4	6.1	33.5	41.24	74	-32.76
7323.0	PK	30.67	112	V	37.4	6.1	33.5	40.67	74	-33.33
High Channel (2480MHz)										
4960.0	AV	35.98	17	H	34.1	5.2	33.0	42.28	54	-11.72
4960.0	AV	36.06	13	V	34.1	5.2	33.0	42.36	54	-11.64
7440.0	AV	29.29	25	H	37.4	6.1	33.5	39.29	54	-14.71
7440.0	AV	30.14	66	V	37.4	6.1	33.5	40.14	54	-13.86
4960.0	PK	35.29	23	H	34.1	5.2	33.0	41.59	74	-32.41
4960.0	PK	37.83	59	V	34.1	5.2	33.0	44.13	74	-29.87
7440.0	PK	30.34	129	H	37.4	6.1	33.5	40.34	74	-33.66
7440.0	PK	29.37	64	V	37.4	6.1	33.5	39.37	74	-34.63

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
The measurements greater than 20dB below the limit from 9kHz to 30MHz..

10. OUT OF BAND EMISSIONS

10.1 Standard Applicable

According to §15.247 (d) 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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).

10.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2012-03-28	2013-03-27
EMI Test Receiver	R&S	ESVB	825471/005	2012-03-28	2013-03-27
Pre-amplifier	Agilent	8447F	3113A06717	2012-03-28	2013-03-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2012-03-28	2013-03-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2012-02-25	2013-02-24
Horn Antenna	ETS	3117	00086197	2012-02-25	2013-02-24
Spectrum Analyzer	Agilent	E4402B	US41192821	2012-03-28	2013-03-27
Attenuator	ATTEN	ATS100-4-20	/	2012-03-28	2013-03-27

Statement of Traceability: All calibrations have been performed per the NVLAP requirements traceable to the NIST.

10.3 Test Procedure

According to the DA 00-705, the band-edge radiated test method as follows.

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2410MHz for low bandedge, 2470MHz to 2500MHz for the high bandedge)
RBW = 1MHz, VBW = 1MHz for peak value measured
RBW = 1MHz, VBW = 10Hz for average value measured
Sweep = auto; Detector function = peak; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation porduct outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205.

According to the DA 00-705, the band-edge conducted test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2380MHz to 2410MHz for low bandedge, 2470MHz to 2500MHz for the high bandedge)
RBW = 100kHz, VBW = 300kHz
Sweep = auto; Detector function = peak; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation porduct outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the limit specified in this section (at least 20dB attenuation).

10.4 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

10.5 Summary of Test Results/Plots

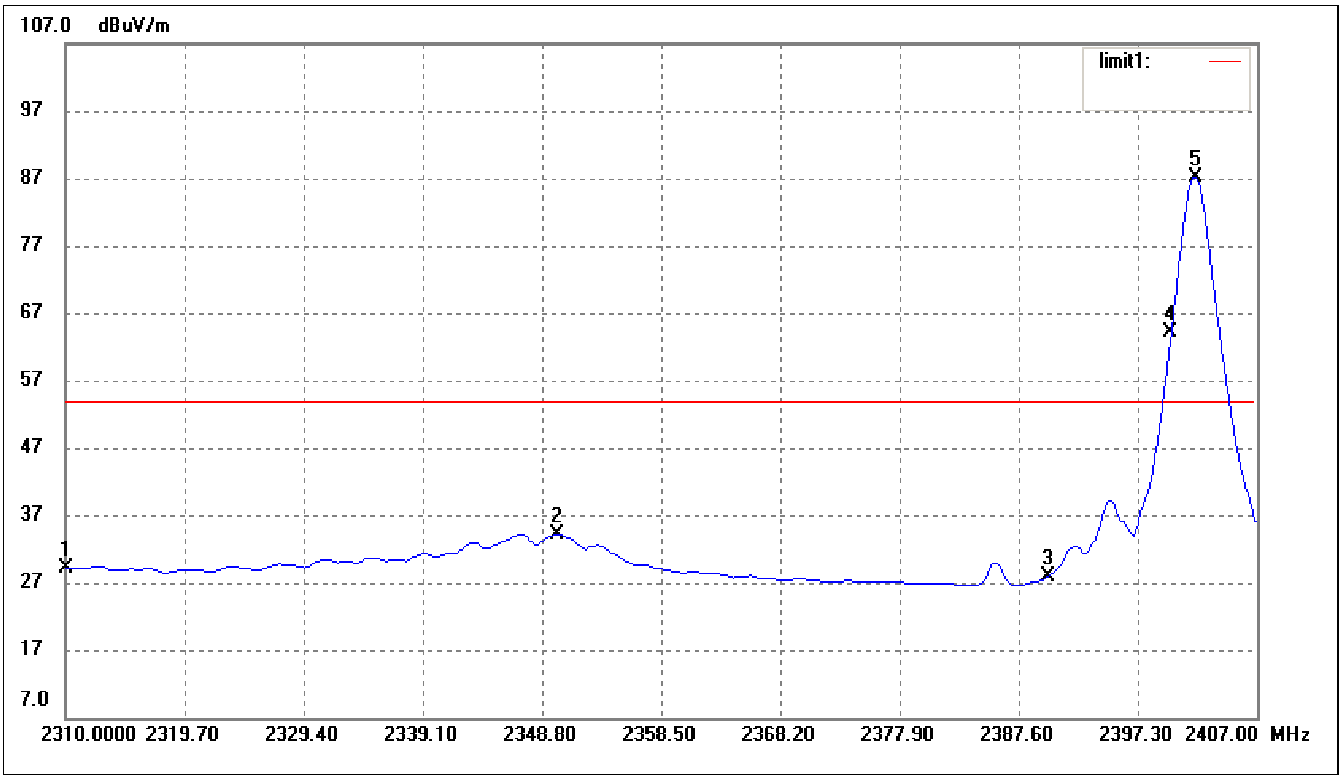
Test mode	Frequency MHz	Limit dBuV /dB	Result
Lowest	2350.06	<54dBuv	Pass
	2390.00	<54dBuv	Pass
	2400.00	>20dB ATT	Pass
Highest	2483.50	<54dBuv	Pass
	2500.00	<54dBuv	Pass

The edge emissions are below the FCC 15.209 Limits or complies with the 15.247(d) requirements.

Please refer to the test plots as below.

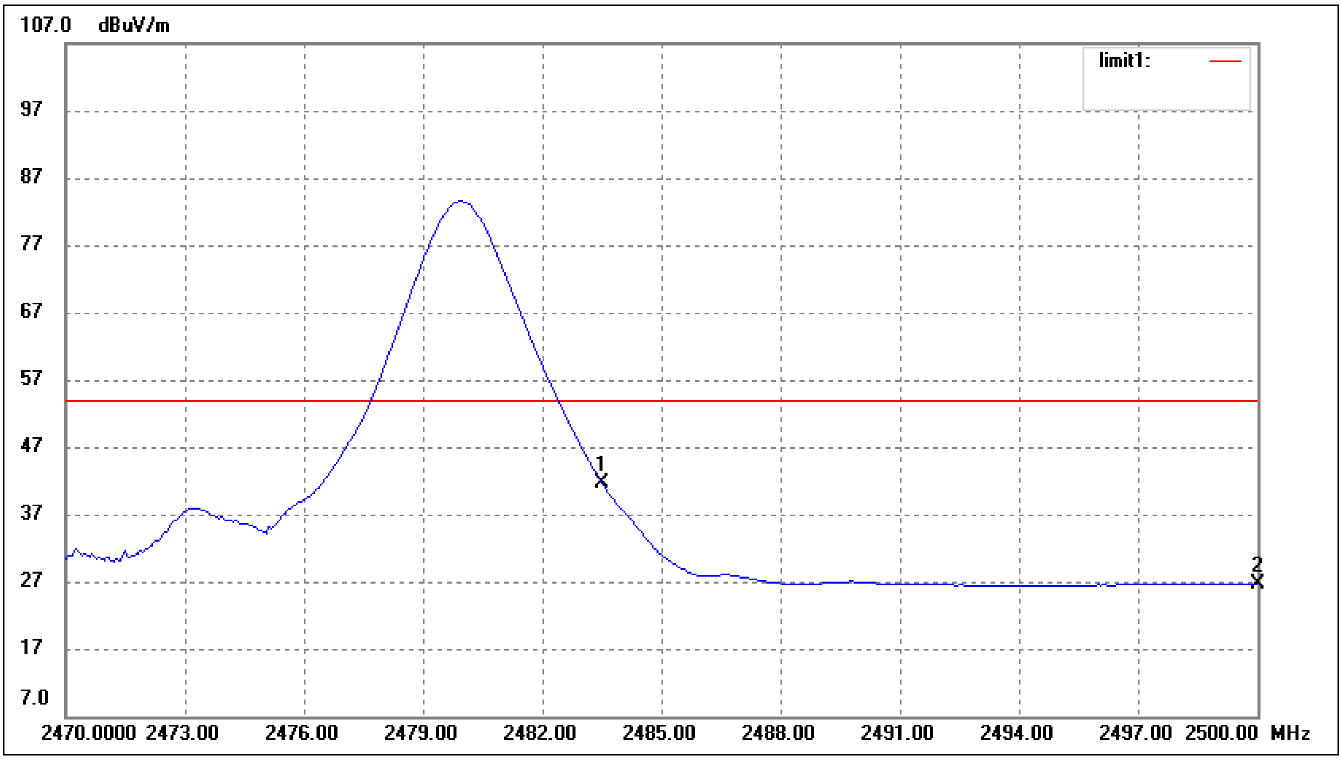
Bandedge (Radiated)

Lowest Bandedge



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	36.64	-7.51	29.13	54.00	-24.87	Average Detector
	2310.000	38.77	-7.51	31.26	74.00	-42.74	Peak Detector
2	2350.061	41.57	-7.42	34.15	54.00	-19.85	Average Detector
	2350.061	44.02	-7.42	36.60	74.00	-37.40	Peak Detector
3	2390.000	35.10	-7.34	27.76	54.00	-26.24	Average Detector
	2390.000	36.70	-7.34	29.36	74.00	-44.64	Peak Detector
4	2400.000	71.55	-7.31	64.24	/	/	Average Detector
5	2402.055	94.46	-7.31	87.15	/	/	Average Detector

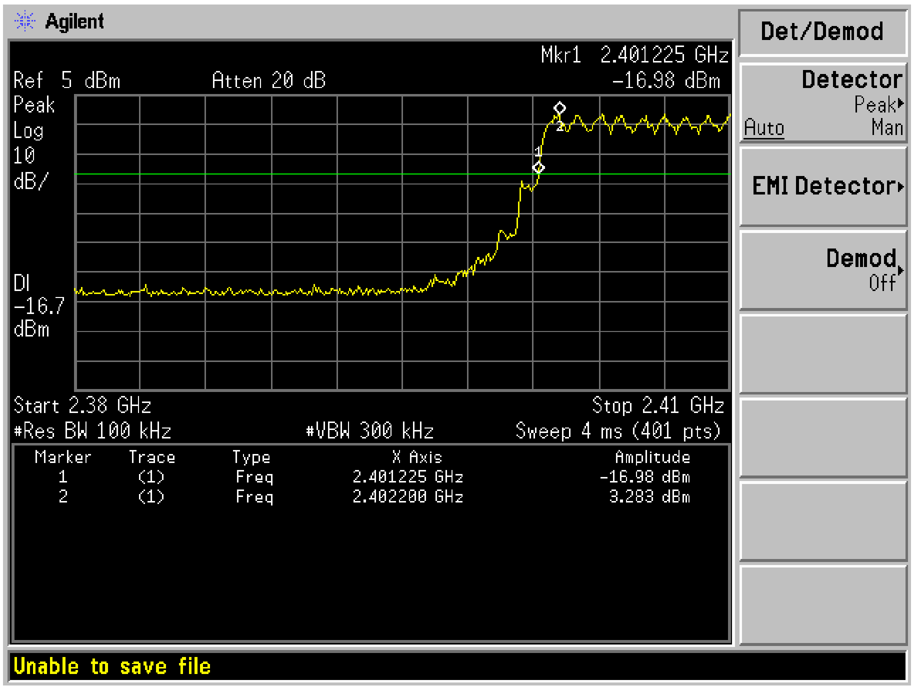
Highest Bandedge



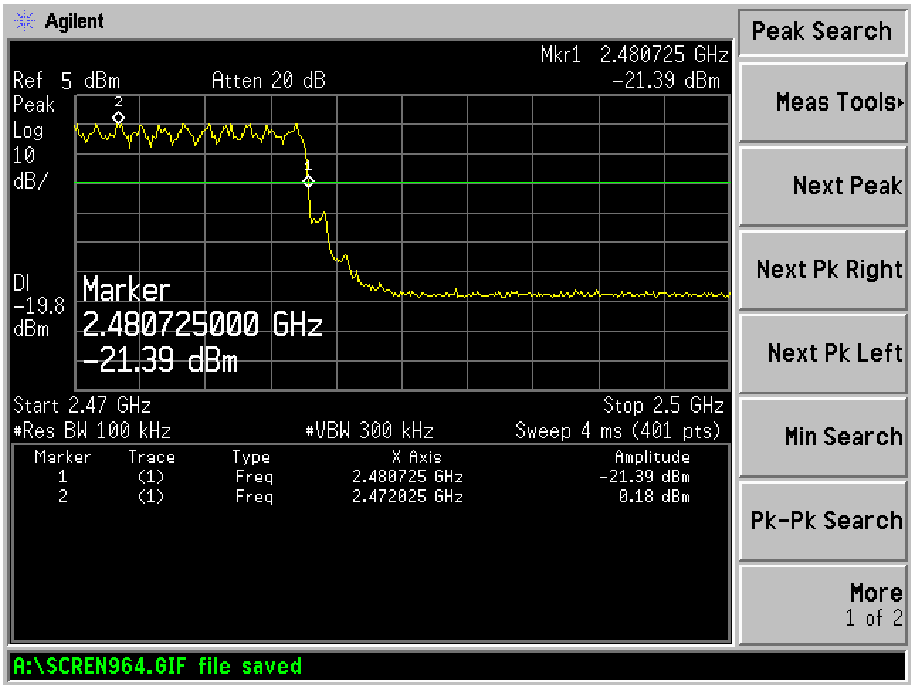
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2483.500	48.72	-7.13	41.59	54.00	-12.41	Average Detector
	2483.500	50.41	-7.13	43.28	74.00	-30.72	Peak Detector
2	2500.000	33.63	-7.08	26.55	54.00	-27.45	Average Detector
	2500.000	35.77	-7.08	28.69	74.00	-45.31	Peak Detector

Bandedge (Conducted)

Lowest Bandedge



Highest Bandedge



11. CONDUCTED EMISSIONS

11.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is $\pm$ 2.88 dB.

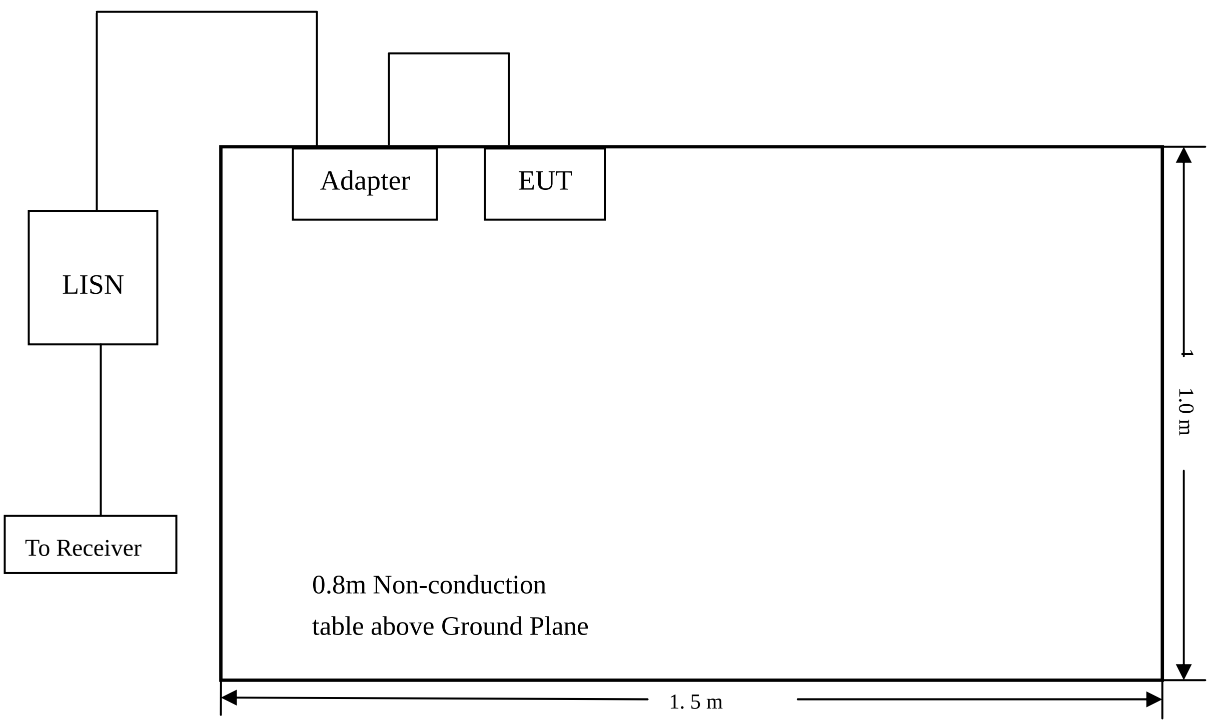
11.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2012-03-28	2013-03-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2012-03-28	2013-03-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2012-03-28	2013-03-27

11.3 Test Procedure

Test is conducting under the description of ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

11.4 Basic Test Setup Block Diagram



11.5 Environmental Conditions

Temperature:	20° C
Relative Humidity:	52%
ATM Pressure:	1011 mbar

11.6 Summary of Test Results/Plots

According to the data in section 10.7, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

-10.91 dBμV at **0.318 MHz** in the **Line, Average** Detector, 0.15-30MHz

11.7 Conducted Emissions Test Data

Plot of Conducted Emissions Test Data

Conducted Disturbance

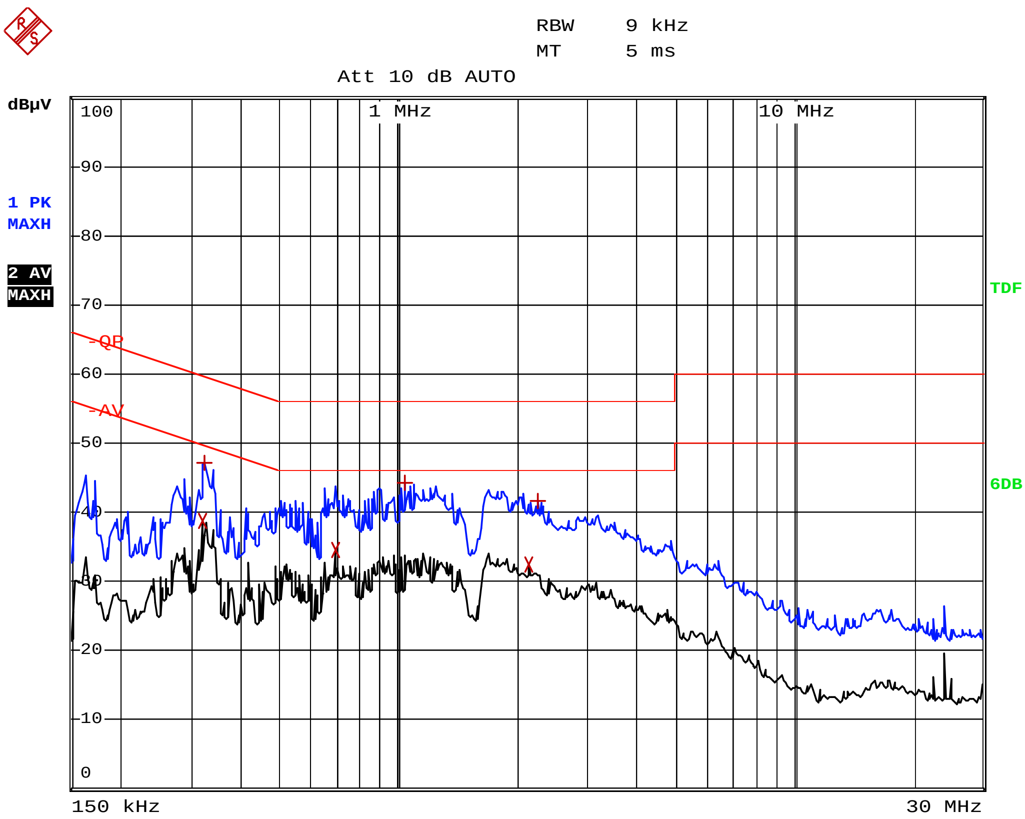
EUT: WCDMA Smart Phone

M/N: MP436

Operating Condition: Bluetooth Transmitting

Test Specification: Line

Comment: AC 120V/60Hz/Adapter DC 5V



EDIT PEAK LIST (Prescan Results)

Trace1:	-QP
Trace2:	-AV
Trace3:	---

TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
2	Average	318 kHz	38.84	-10.91
1	Max Peak	322 kHz	47.16	-12.49
2	Average	694 kHz	34.46	-11.53
1	Max Peak	1.034 MHz	44.25	-11.74
2	Average	2.146 MHz	32.36	-13.63
1	Max Peak	2.262 MHz	41.66	-14.34

Plot of Conducted Emissions Test Data

Conducted Disturbance

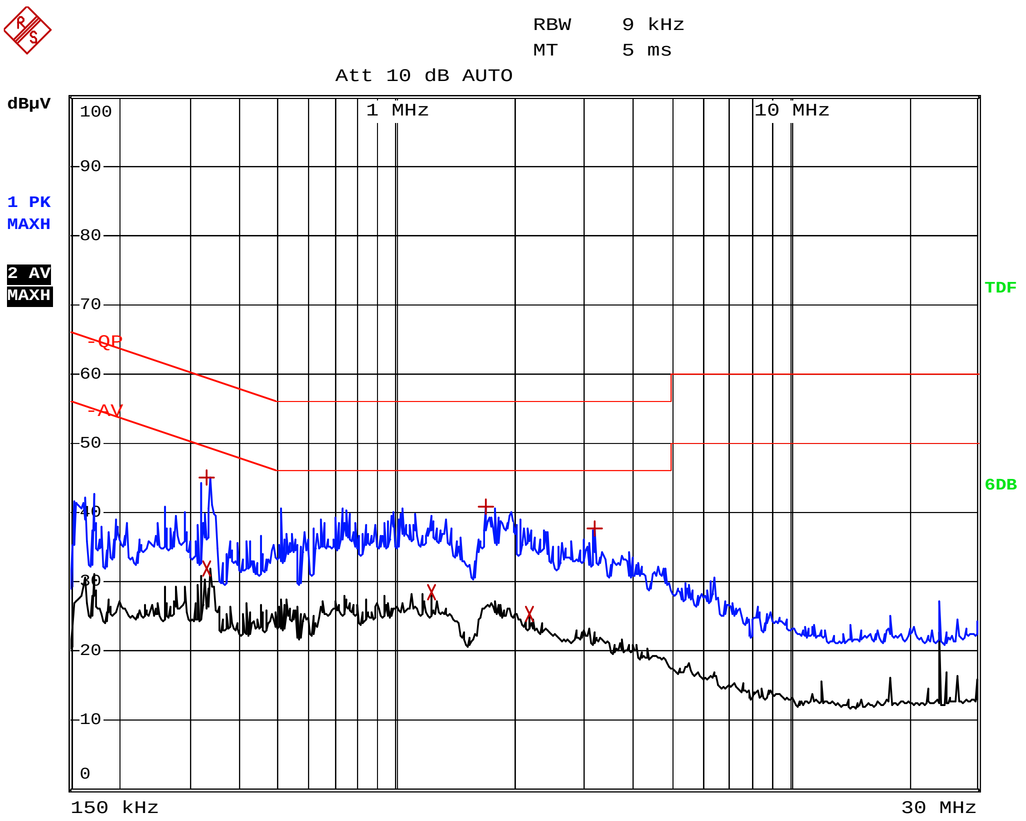
EUT: WCDMA Smart Phone

M/N: MP436

Operating Condition: Bluetooth Transmitting

Test Specification: Neutral

Comment: AC 120V/60Hz/Adapter DC 5V



EDIT PEAK LIST (Prescan Results)			
Trace1:	-QP		
Trace2:	-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1 Max Peak	334 kHz	45.10	-14.25
2 Average	334 kHz	32.01	-17.33
2 Average	1.226 MHz	28.43	-17.56
1 Max Peak	1.702 MHz	40.72	-15.27
2 Average	2.19 MHz	25.28	-20.71
1 Max Peak	3.194 MHz	37.62	-18.37

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