



FCC TEST REPORT (PART 27)

REPORT NO.: RF981223H11

MODEL NO.: CPEo 25450

RECEIVED: Dec. 24, 2009

TESTED: Jan. 04 to 15, 2010

ISSUED: Feb. 02, 2010

APPLICANT: Motorola Home & Networks Mobility · Broadband
Access Solutions

ADDRESS: 1475 W. Shure Drive · MD: 340 · Arlington Heights, IL
60004-7810

ISSUED BY : Bureau Veritas Consumer Products Services (H.K.)
Ltd., Taoyuan Branch

LAB LOCATION : No. 81-1, Lu Liao Keng, 9th Ling,Wu Lung Tsuen,
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan

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1 CERTIFICATION

PRODUCT: WiMAX 2.5G Outdoor CPE

BRAND NAME: Motorola

MODEL NO.: CPEo 25450

APPLICANT: Motorola Home & Networks Mobility · Broadband Access Solutions

TESTED: Jan. 04 to 15, 2010

TEST SAMPLE: ENGINEERING SAMPLE

TEST STANDARDS: FCC 47 CFR Part 2

FCC 47 CFR Part 27, Subpart C & M

ANSI/TIA/EIA-603-C-2004

The above equipment (Model No.: CPEo 25450) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : Sunny Wen , **DATE:** Feb. 02, 2010
(Sunny Wen, Specialist)

TECHNICAL ACCEPTANCE : Hank Chung , **DATE:** Feb. 02, 2010
(Hank Chung, Deputy Manager)

APPROVED BY : May Chen , **DATE:** Feb. 02, 2010
(May Chen, Deputy Manager)

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 27 & Part 2			
STANDARD SECTION	TEST TYPE AND LIMIT	RESULT	REMARK
2.1046 27.50(h)(2)	Maximum Peak Output Power Limit: max. 2 watts conducted peak power	PASS	Meet the requirement of limit.
2.1055 27.54	Frequency Stability Stay with the authorized bands of operation	PASS	Meet the requirement of limit.
2.1049 27.53(m)(6)	Emission Bandwidth	PASS	Meet the requirement of limit.
2.1051 27.53(m)(4)(6)	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 27.53(m)(4)(6)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 27.53(m)(4)(6)	Radiated Spurious Emissions	PASS	Meet the requirement of limit.



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2.1 MEASUREMENT UNCERTAINTY

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

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

Measurement	Value
Radiated emissions (30MHz-1GHz)	3.94 dB
Radiated emissions (1GHz -18GHz)	2.49 dB
Radiated emissions (18GHz -40GHz)	2.70 dB



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3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	WiMAX 2.5G Outdoor CPE
MODEL NO.	CPEo 25450
FCC ID	VYO-CPE25450
POWER SUPPLY	DC 56V from power adapter
MODULATION TECHNOLOGY	OFDMA
MODULATION	BPSK-1/2, QPSK-1/2, -3/4, 16QAM-1/2, 3/4, 64QAM-1/2, -2/3, -3/4 (64QAM for Rx only)
OPERATING FREQUENCY	5MHz: 2498.5MHz ~ 2687.5MHz 10MHz: 2501MHz ~ 2685MHz
CHANNEL BANDWIDTH	5MHz & 10MHz
MAX. CONDUCTED POWER	5MHz: 26.2dBm 10MHz: 26.2dBm
ANTENNA TYPE	Directional antenna with MCX connector (Antenna Gain: 12.5dBi)
DATA CABLE	NA
I/O PORTS	RJ45 port x 1, RJ14 port x 1
ASSOCIATED DEVICES	Adapter + POE x 1

NOTE:

1. The EUT must be supplied with the a power adapter as below table:

Brand:	PHIHONG
Model No.:	PSM25R-560
Input power :	100-240V, 50-60Hz, 0.5A
Output power :	56V, 0.45A DC output cable (unshielded, 1.95m with one core)



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2. For the EUT Modulation type and coding rate. After pre-testing items of output power and spurious emissions, QPSK-1/2 was found to be 5MHz worst case, 16QAM-3/4 was found to be 10MHz worst case, and was selected for the final test configuration.

Up Link		Down Link	
Modulation	Coding rate	Modulation	Coding rate
BPSK	1/2	BPSK	1/2
QPSK	1/2	QPSK	1/2
	3/4		3/4
16QAM	1/2	16QAM	1/2
	3/4		3/4
		64QAM	1/2
			2/3
			3/4

3. The EUT embedded a firmware for testing that needs to control from Notebook computer to let EUT with different DL/UL ration.
4. The device has different DL/UL ration in normal operation. It was tested with (DL:UL= 29:18) duty cycle mode for 5MHz and 10MHz, which is the worse mode, and controlled by software. (The detail duty cycle refer to appendix A).
5. The above EUT information was declared by manufacturer and for more detailed feature descriptions, please refers to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Three channels have been tested and presented.

CHANNEL BANDWIDTH: 5MHz

Low channel (L): 2498.5MHz.

Middle channel (M): 2600MHz.

High channel (H): 2687.5MHz.

CHANNEL BANDWIDTH: 10MHz

Low channel (L): 2501MHz.

Middle channel (M): 2600MHz.

High channel (H): 2685MHz.



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3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO							DESCRIPTION
	OP	FS	EB	CE	CSE	RE<1G	RE ³ 1G	
MODE 1	√	√	√	√	√	√	√	Channel Bandwidth: 5MHz
MODE 2	√	√	√	√	√	√	√	Channel Bandwidth: 10MHz

Where **OP**: Output power **FS**: Frequency stability
EB: Emission bandwidth **CE**: Channel edge
CSE: Conducted spurious emissions **RE<1G**: Radiated emission below 1GHz
RE³1G: Radiated emission above 1GHz

OUTPUT POWER MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

TESTED MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
MODE 1	L, M, H	OFDMA	QPSK
MODE 2	L, M, H	OFDMA	16QAM

FREQUENCY STABILITY MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
M	OFDMA	Unmodulation

EMISSION BANDWIDTH MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

TESTED MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
MODE 1	L, M, H	OFDMA	QPSK
MODE 2	L, M, H	OFDMA	16QAM

CHANNEL EDGE MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

TESTED MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
MODE 1	L, M, H	OFDMA	QPSK
MODE 2	L, M, H	OFDMA	16QAM

CONDUCTED SPURIOUS EMISSIONS MEASUREMENT:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

TESTED MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
MODE 1	L, M, H	OFDMA	QPSK
MODE 2	L, M, H	OFDMA	16QAM

RADIATED EMISSION MEASUREMENT (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

TESTED MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
MODE 1	M	OFDMA	QPSK
MODE 2	M	OFDMA	16QAM

RADIATED EMISSION MEASUREMENT (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

TESTED MODE	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE
MODE 1	L, M, H	OFDMA	QPSK
MODE 2	L, M, H	OFDMA	16QAM

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC 47 CFR Part 2

FCC 47 CFR Part 27, Subpart C & M

ANSI/TIA/EIA-603-C-2004

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

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.



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3.4 DESCRIPTION OF SUPPORT UNITS

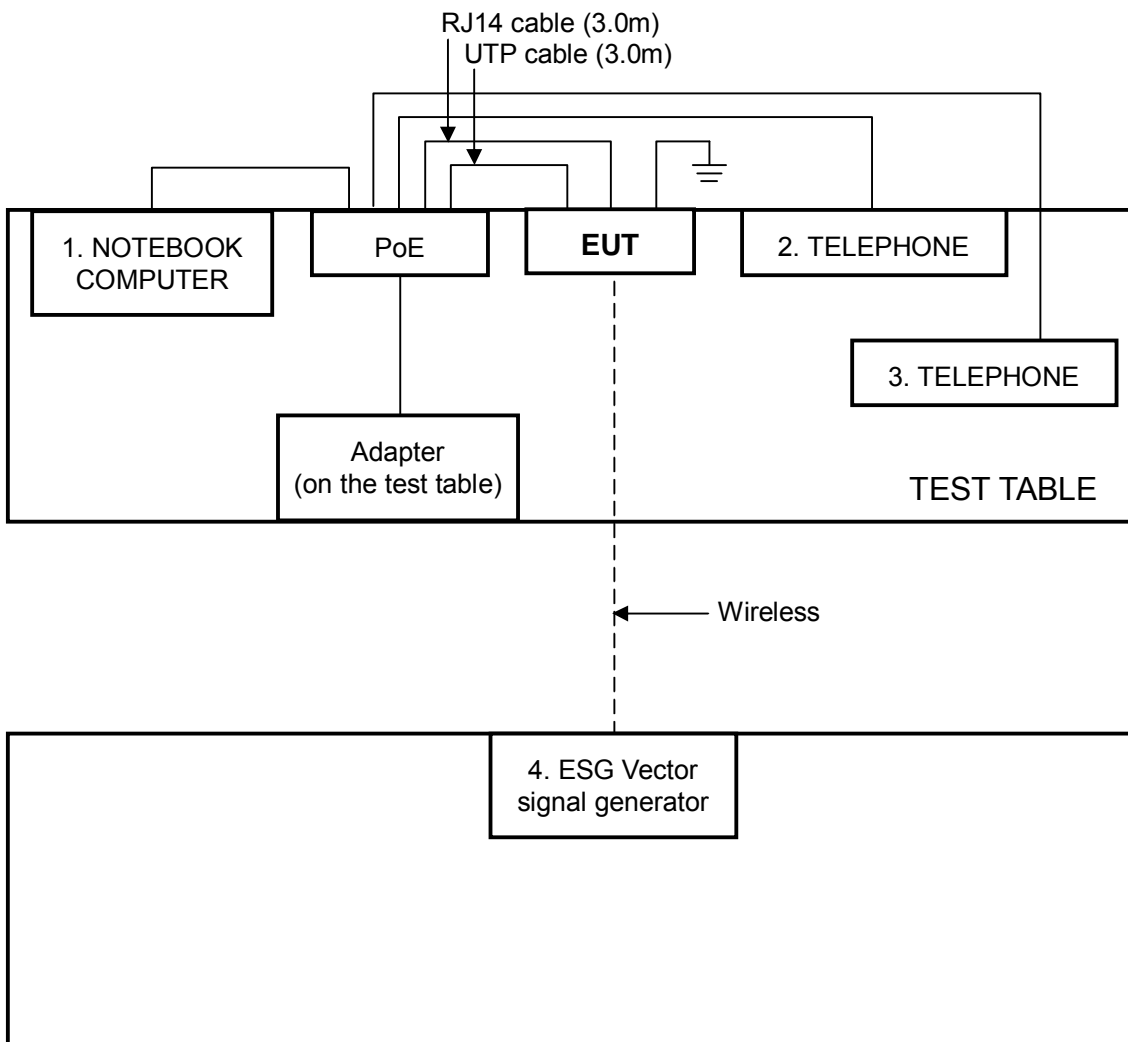
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	ASUS	M2400N	4ANP088103	FCC DoC
2	TELEPHONE	DAISHO	DS-03	NA	NA
3	TELEPHONE	ROMEO	TE-812	97285638	NA
4	ESG Vector signal generator	Agilent	E4438C	MY45094468/005 506 602 UK6 UNJ	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	3.0 m UTP cable.
2	3.0 m non shielded cable, RJ11 connector, w/o core.
3	3.0 m non shielded cable, RJ11 connector, w/o core.
4	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

3.4.1 CONFIGURATION OF SYSTEM UNDER TEST



4 TEST TYPES AND RESULTS

4.1 OUTPUT POWER MEASUREMENT

4.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

The radiated peak output power shall be according to the specific rule Part 27.50(h)(2) that “Other User stations are limited to 2 watts and 27.50(i) specific that “Peak transmit power must be measure over any interval of continuous transmission using instrumentation calibration in terms of rms-equivalent voltage.”

4.1.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
Anritsu Power meter	ML2495A	0824006	April 24, 2010
JFW 10dB attenuation	50HF-010-SMA	N/A	NA

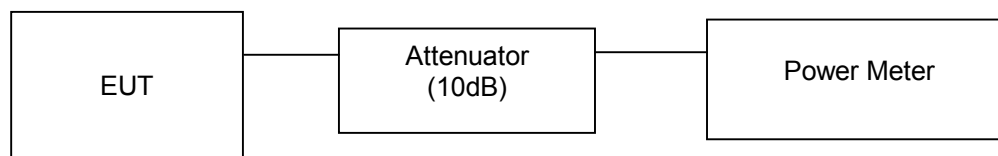
NOTE:

The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1.3 TEST PROCEDURES

The transmitter output was connected to power meter through an attenuator. The test result was measured and recorded.

4.1.4 TEST SETUP



4.1.5 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which placed on a testing table.
2. The communication partner run test program “BCS200 Control Panel 3.3.0” to enable EUT under transmission/receiving condition continuously at specific channel frequency.



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4.1.6 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

INPUT POWER (SYSTEM)	120Vac, 60Hz		
ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa	TESTED BY	Phoenix Huang

CONDUCTED POWER			
CHANNEL	FREQUENCY (MHz)	POWER OUTPUT(mW)	POWER OUTPUT(dBm)
Low	2498.5	416.9	26.2
Middle	2600	416.9	26.2
High	2687.5	407.4	26.1



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CHANNEL BANDWIDTH: 10MHz

INPUT POWER (SYSTEM)	120Vac, 60Hz		
ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa	TESTED BY	Phoenix Huang

CONDUCTED POWER			
CHANNEL	FREQUENCY (MHz)	POWER OUTPUT(mW)	POWER OUTPUT(dBm)
Low	2501	407.4	26.1
Middle	2600	416.9	26.2
High	2685	416.9	26.2



4.2 FREQUENCY STABILITY MEASUREMENT

4.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that "The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT $-30^{\circ}\text{C} \sim 50^{\circ}\text{C}$.

4.2.2 TEST INSTRUMENTS

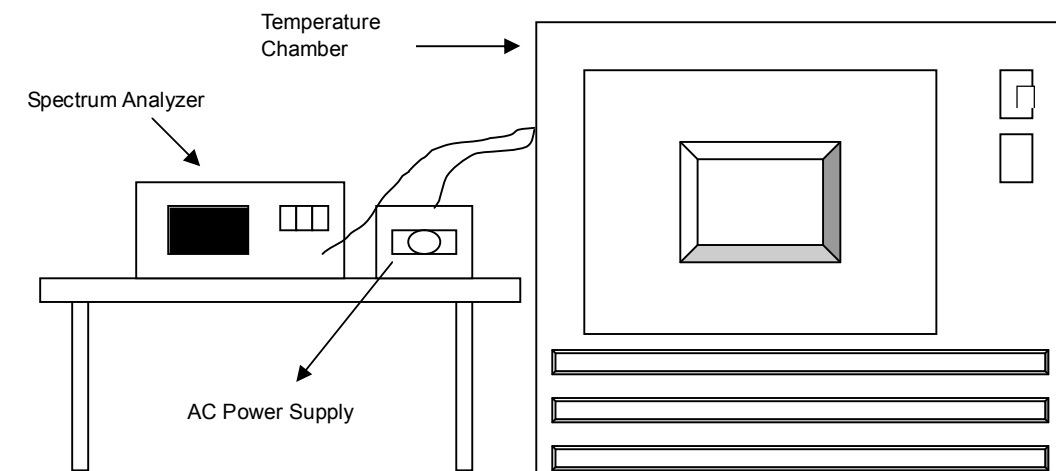
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 03, 2009	Aug. 02, 2010
OVEN	MHU-225AU	911033	Dec. 17, 2009	Dec. 16, 2010
HUBER+SUHNER	SUCOFLEX104	222684/4	Aug. 15, 2009	Aug. 14, 2010
AC POWER SOURCE	6205	1140503	NA	NA

NOTE: 1. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

4.2.3 TEST PROCEDURE

- a. Power must be removed when changing from one temperature to another or one voltage to another voltage. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- b. EUT is connected the external power supply to control the AC input power. The various Volts from the minimum 102 Volts to 138 Volts. Each step shall be record the frequency error rate.
- c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the $\pm 0.5^{\circ}\text{C}$ during the measurement testing.
- d. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

4.2.4 TEST SETUP





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4.2.5 TEST RESULTS

MODE	Middle channel (2600MHz)	INPUT POWER (SYSTEM)	120Vac, 60Hz
ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa	TESTED BY	Phoenix Huang

AFC FREQUENCY ERROR VS. VOLTAGE						
VOLTAGE (Volts)	2Minutes		5Minutes		10Minutes	
	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)
138	2599.9982	0.000069	2599.9986	0.000054	2599.9988	0.000046
120	2599.9985	0.000058	2599.9987	0.000050	2599.9983	0.000065
102	2599.9986	0.000054	2599.9984	0.000062	2599.9981	0.000073

AFC FREQUENCY ERROR VS. TEMP						
TEMP (°C)	2Minutes		5Minutes		10Minutes	
	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)
50	2599.9984	0.000062	2599.9982	0.000069	2599.9985	0.000058
40	2599.9986	0.000054	2599.9988	0.000046	2599.9984	0.000062
30	2599.9986	0.000054	2599.9987	0.000050	2599.9983	0.000065
20	2599.9985	0.000058	2599.9987	0.000050	2599.9983	0.000065
10	2599.9988	0.000046	2599.9986	0.000054	2599.9987	0.000050
0	2599.9989	0.000042	2599.9985	0.000058	2599.9983	0.000065
-10	2599.999	0.000038	2599.9986	0.000054	2599.9987	0.000050
-20	2599.9986	0.000054	2599.9981	0.000073	2599.9988	0.000046
-30	2599.9982	0.000069	2599.9987	0.000050	2599.9985	0.000058



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4.3 EMISSION BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF EMISSION BANDWIDTH MEASUREMENT

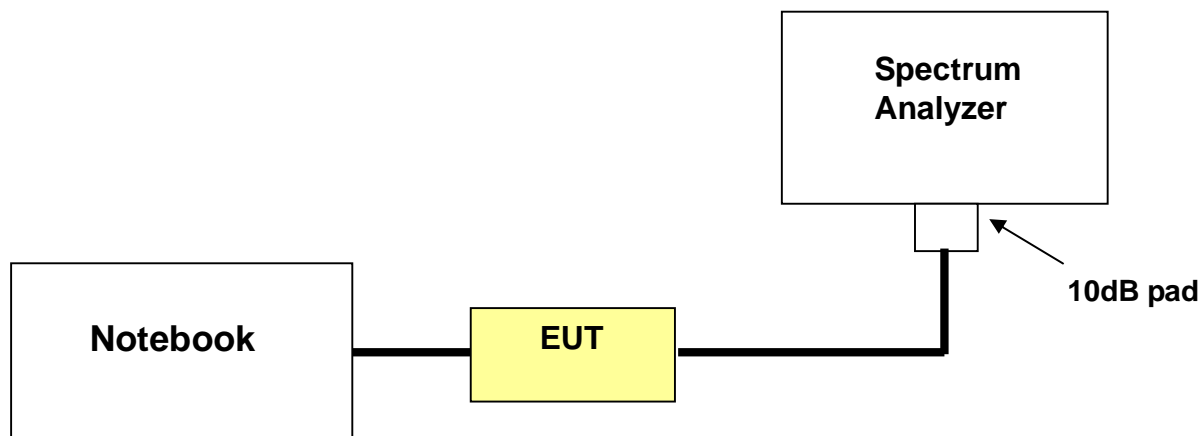
According to FCC 27.53(m)(6) specified that emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

4.3.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HUBER+SUHNER	SUCOFLEX104	222684/4	Aug. 15, 2009	Aug. 14, 2010
JFW 10dB attenuation	50HF-010-SMA	N/A	N/A	N/A

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST SETUP



4.3.4 TEST PROCEDURES

- a. The Notebook controlled EUT to export rated output power under transmission mode and specific channel frequency. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300kHz VBW. The 26dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 26dB.



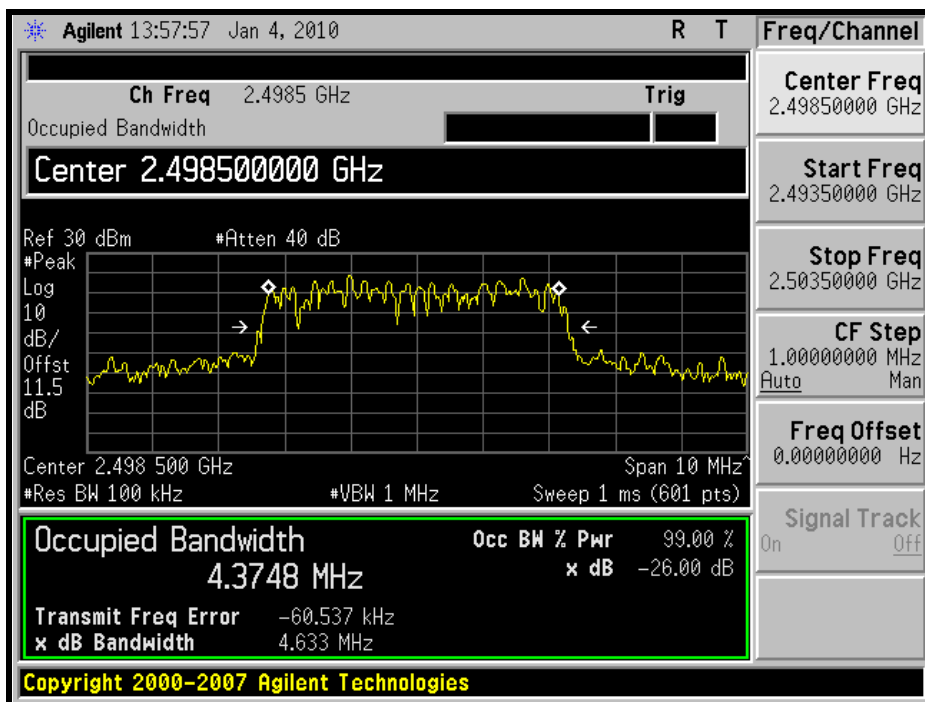
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4.3.5 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

FREQUENCY (MHz)	-26 dBc BANDWIDTH (MHz)
2498.5	4.63
2600	4.67
2687.5	4.63

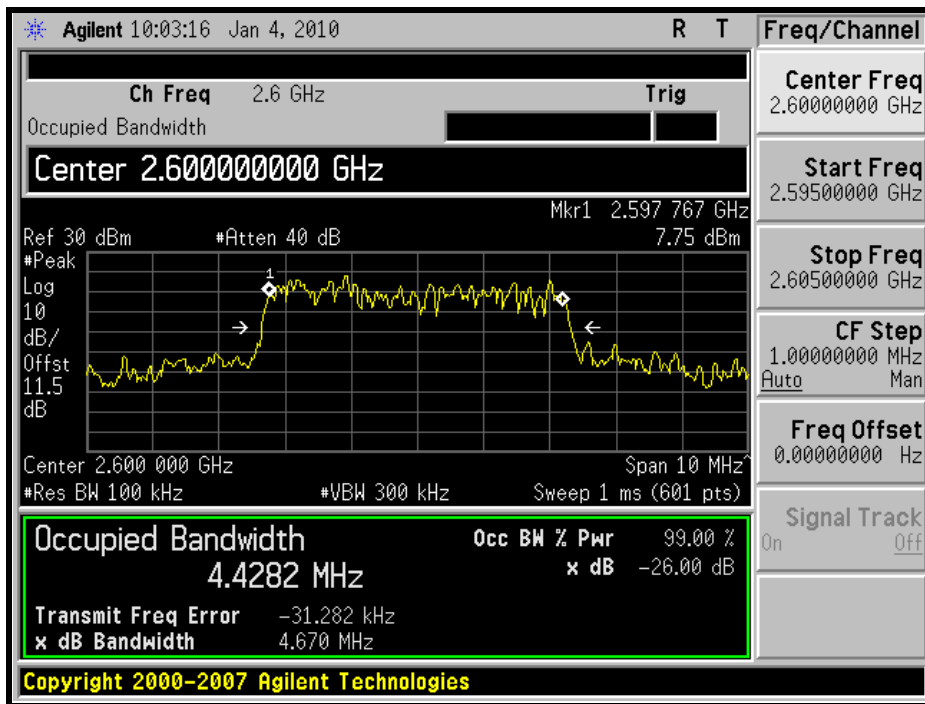
LOW CHANNEL



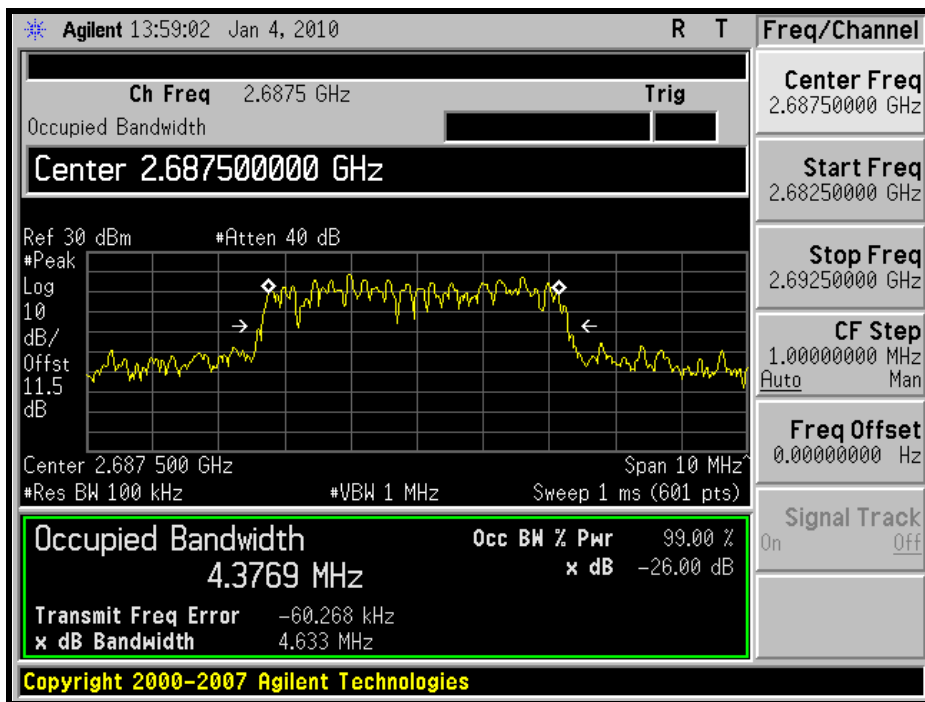


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MIDDLE CHANNEL



HIGH CHANNEL



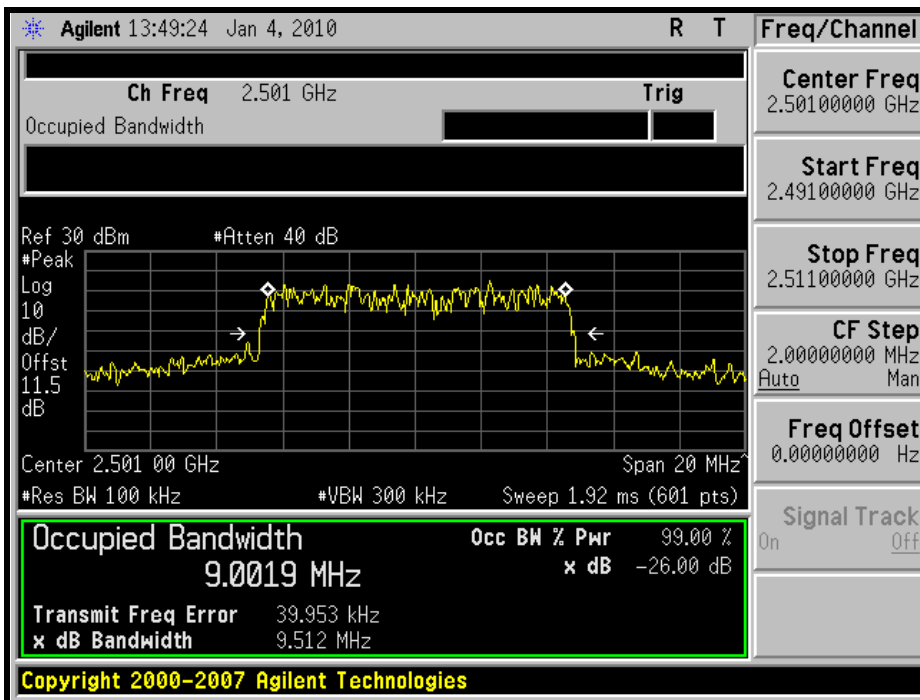


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CHANNEL BANDWIDTH: 10MHz

FREQUENCY (MHz)	-26 dBc BANDWIDTH (MHz)
2501	9.51
2600	9.41
2685	9.52

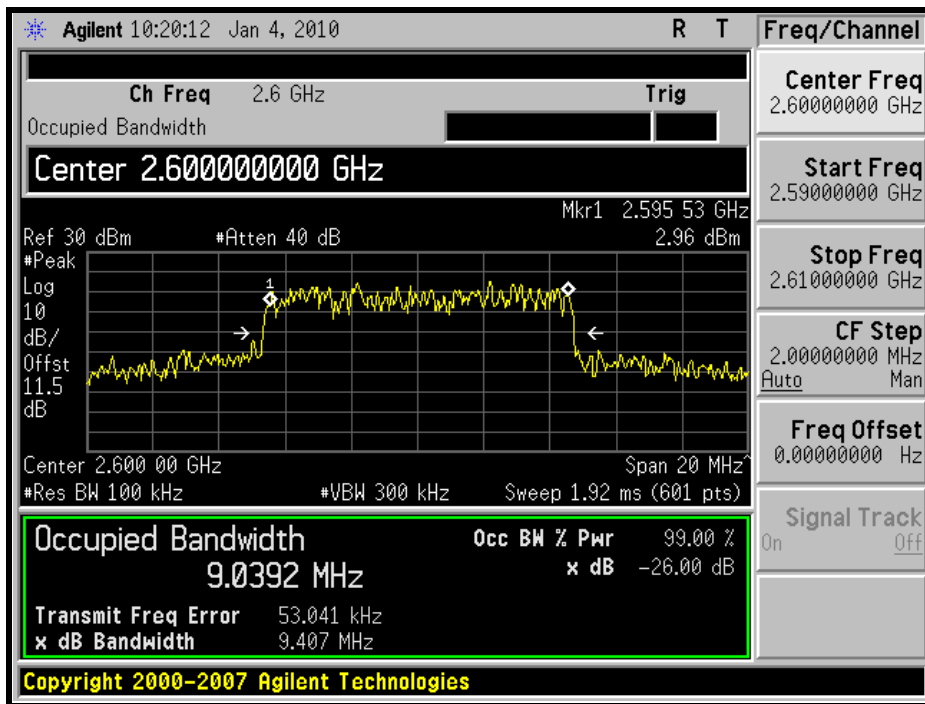
LOW CHANNEL



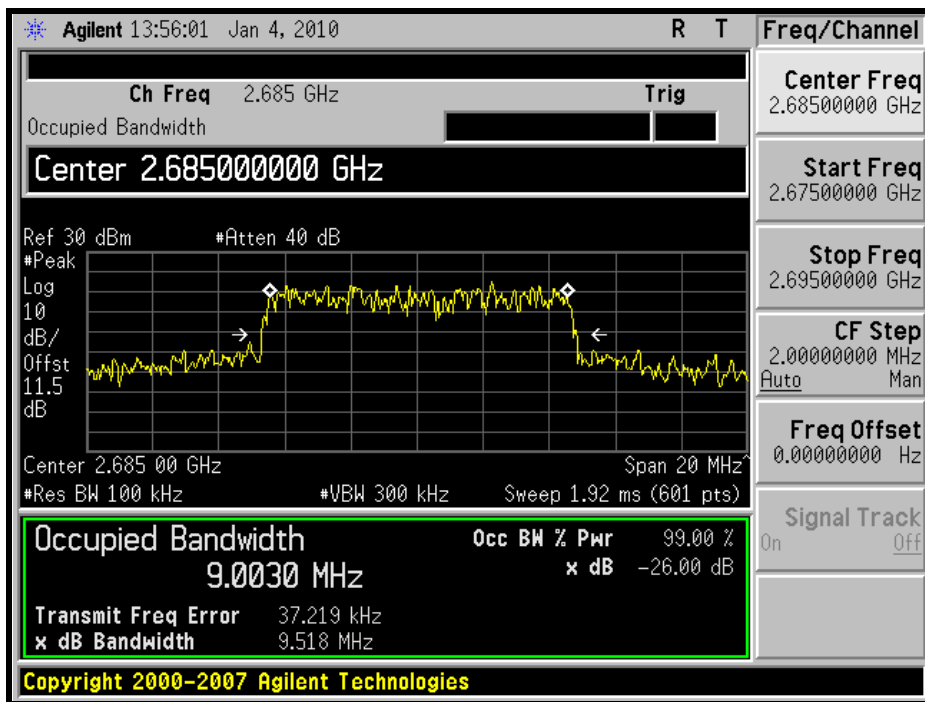


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MIDDLE CHANNEL



HIGH CHANNEL



4.4 CHANNEL EDGE MEASUREMENT

4.4.1 LIMITS OF CHANNEL EDGE MEASUREMENT

According to FCC 27.53(m)(2) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HUBER+SUHNER	SUCOFLEX104	222684/4	Aug. 15, 2009	Aug. 14, 2010
JFW 10dB attenuation	50HF-010-SMA	NA	NA	NA

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.4.3 TEST SETUP

Same as Item 4.3.3

4.4.4 TEST PROCEDURES

- a. The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels: low, middle and high operational frequency range.
- b. For Channel bandwidth: 5 MHz:
The center frequency of spectrum is the band edge frequency and span is 20MHz. RBW of the spectrum is 51kHz and VB W of the spectrum is 150kHz.
- c. For Channel bandwidth: 10 MHz:
The center frequency of spectrum is the band edge frequency and span is 30MHz. RB W of the spectrum is 100kHz and VB W of the spectrum is 300kHz.
- d. Record the max trace plot into the test report.

4.4.5 EUT OPERATING CONDITION

Same as item 4.1.5

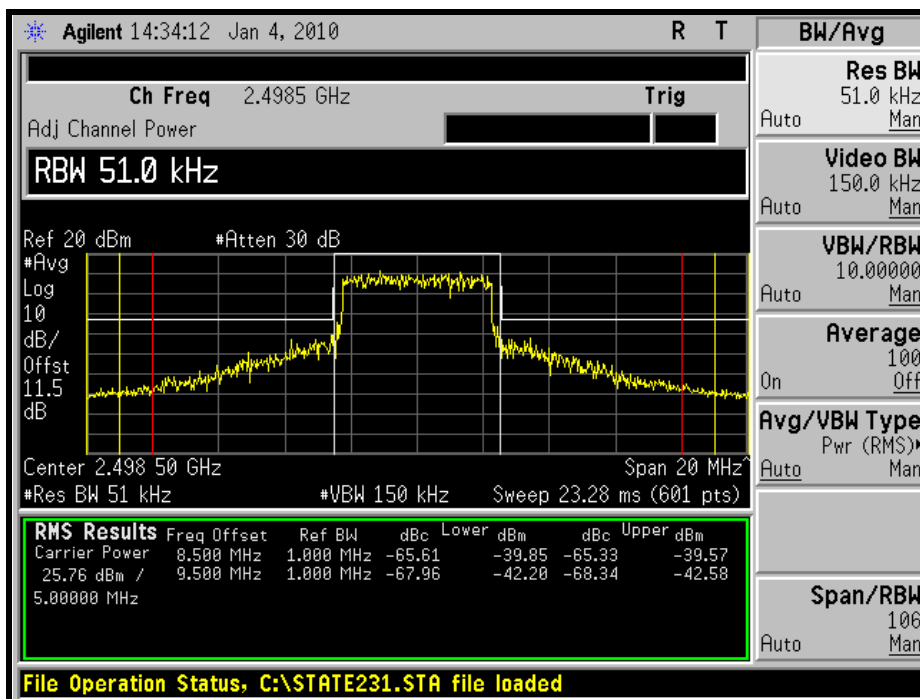
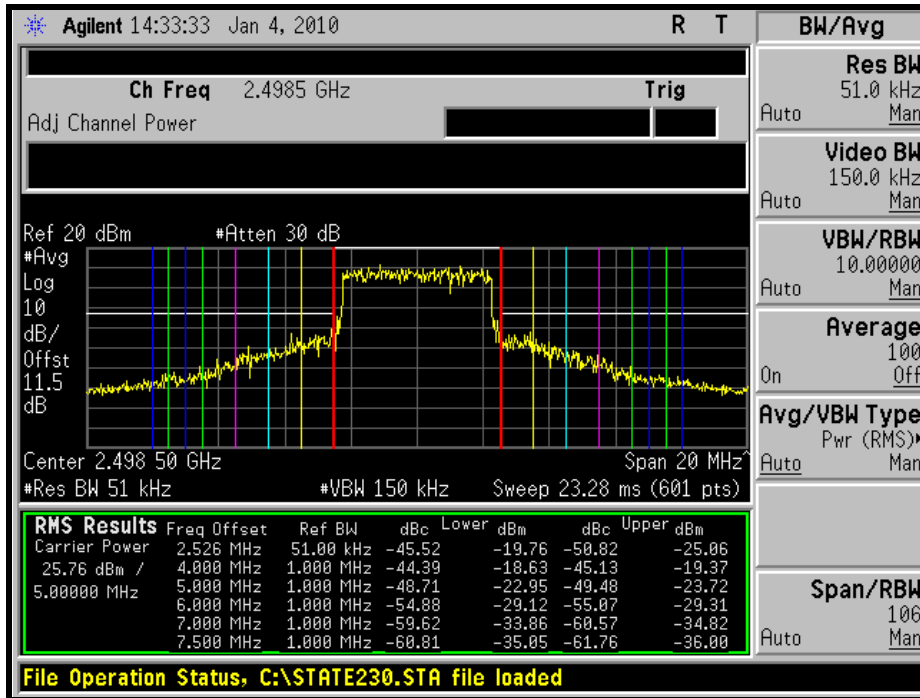


A D T

4.4.6 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

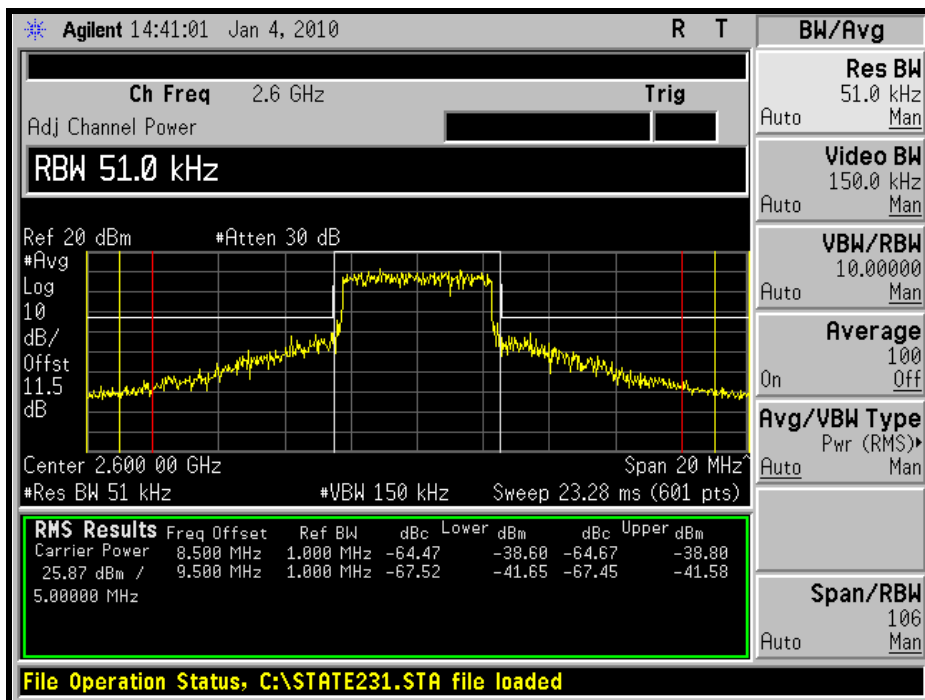
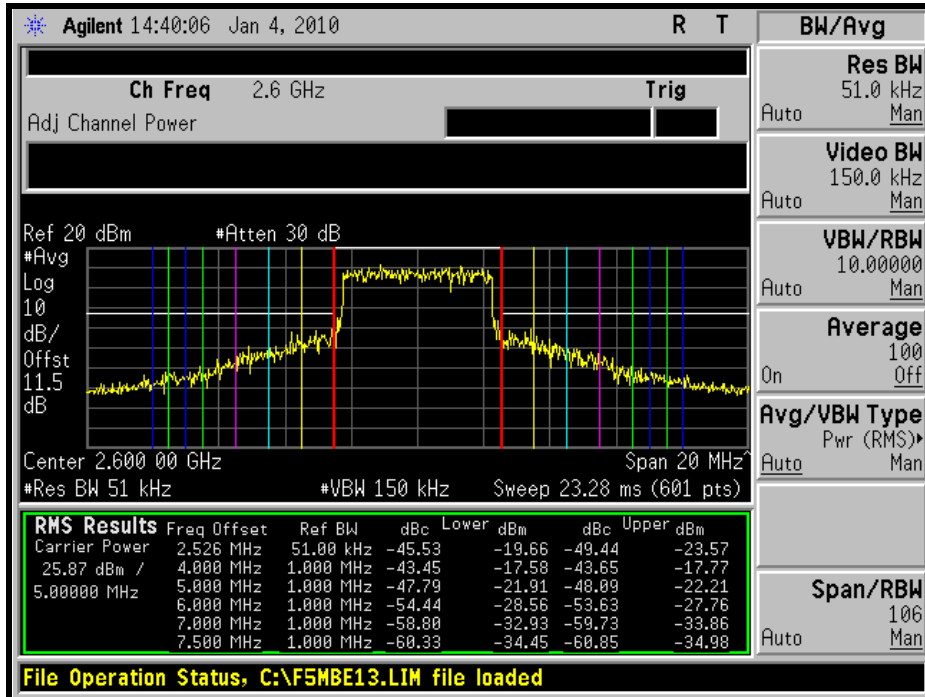
LOW CHANNEL





A D T

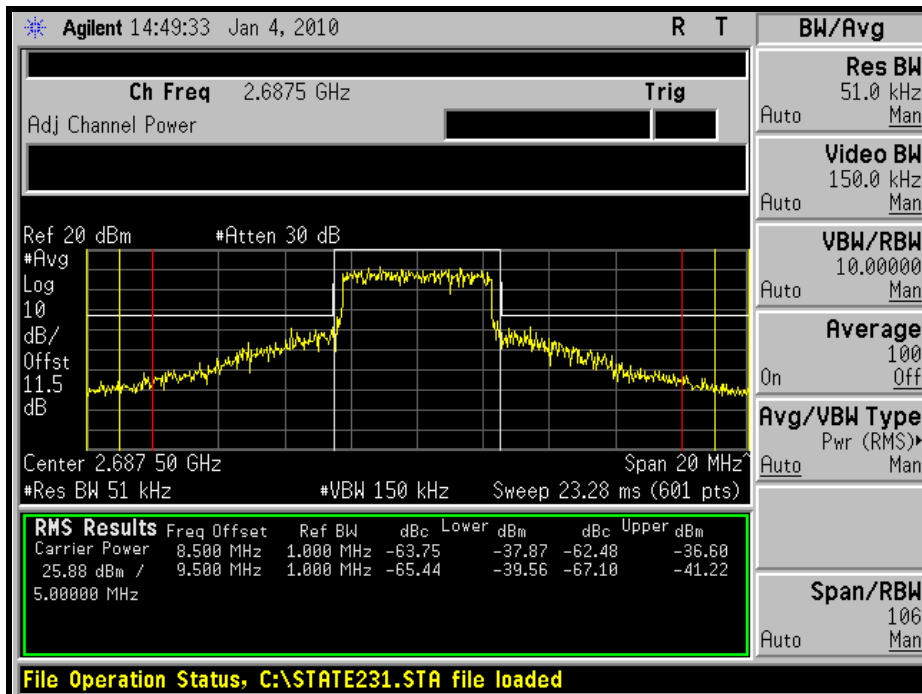
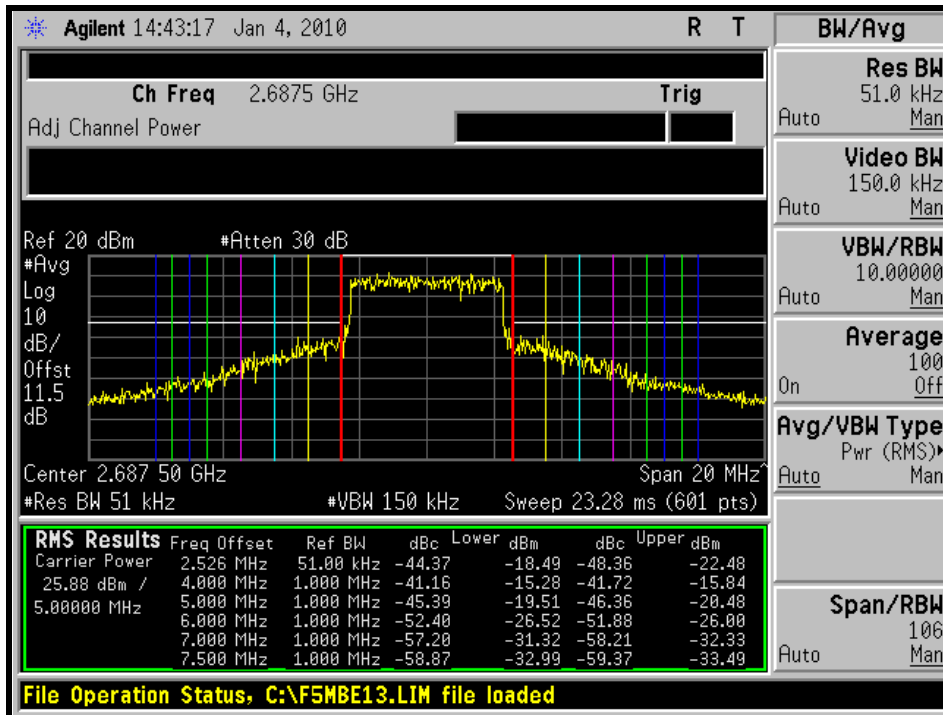
MIDDLE CHANNEL





A D T

HIGH CHANNEL

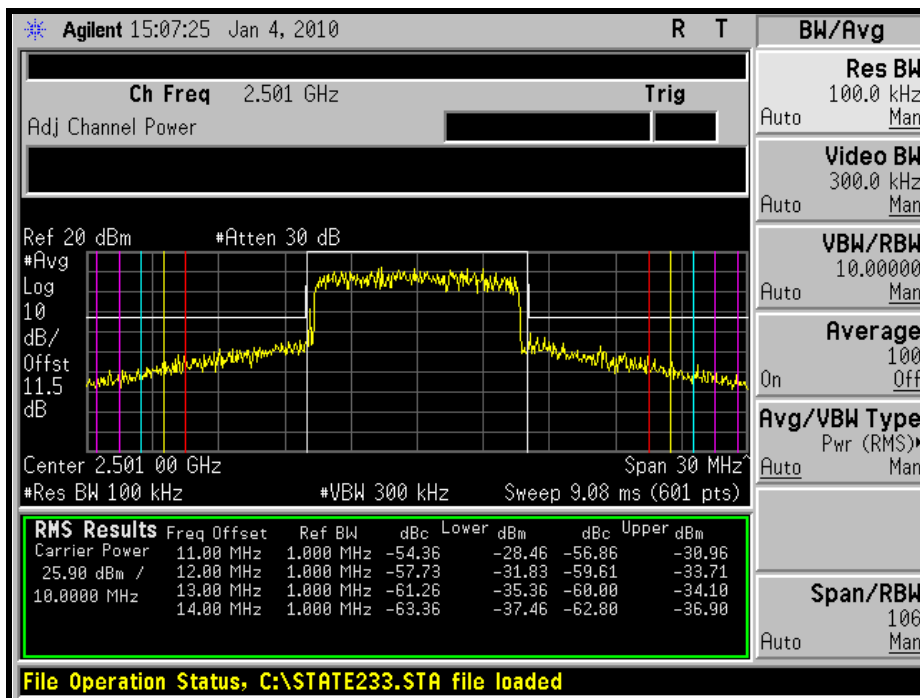
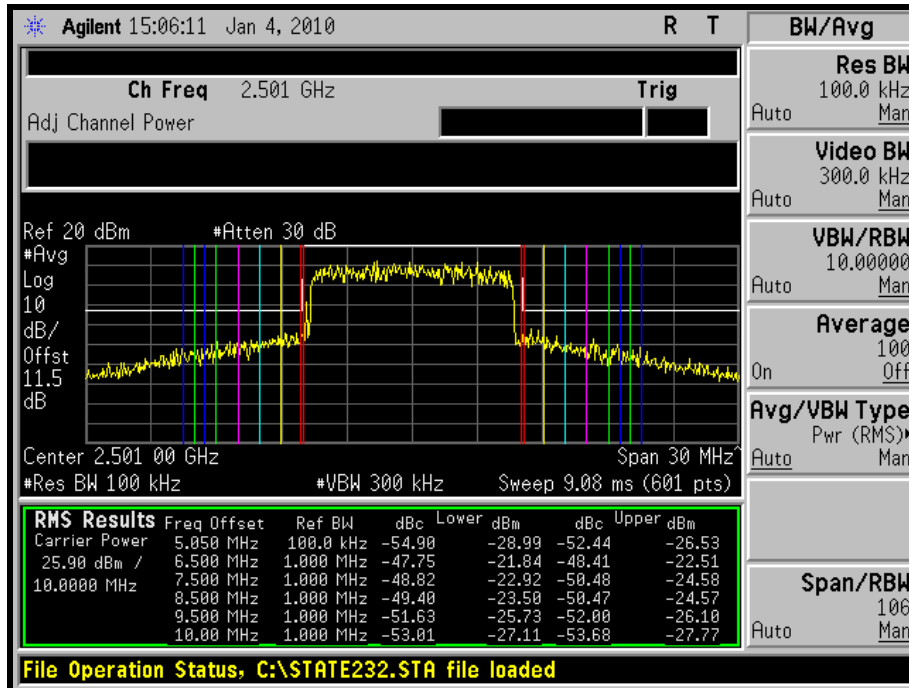




A D T

CHANNEL BANDWIDTH: 10MHz

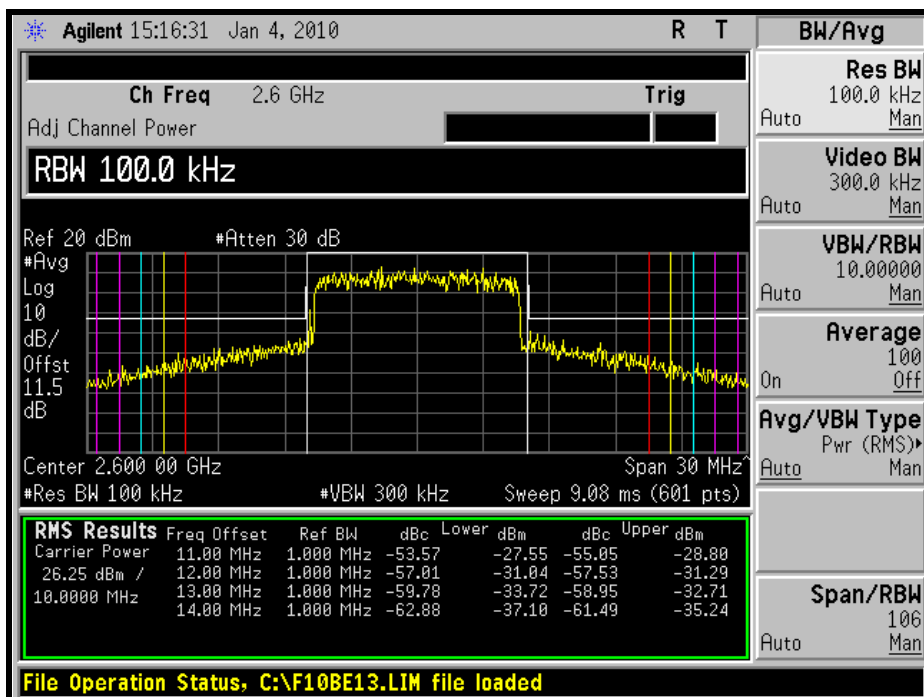
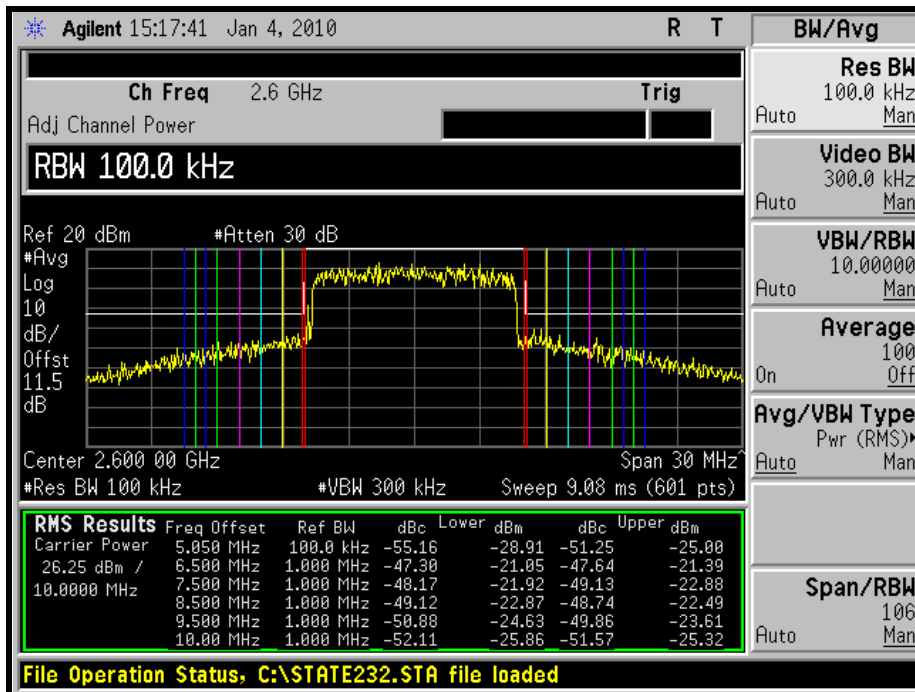
LOW CHANNEL





A D T

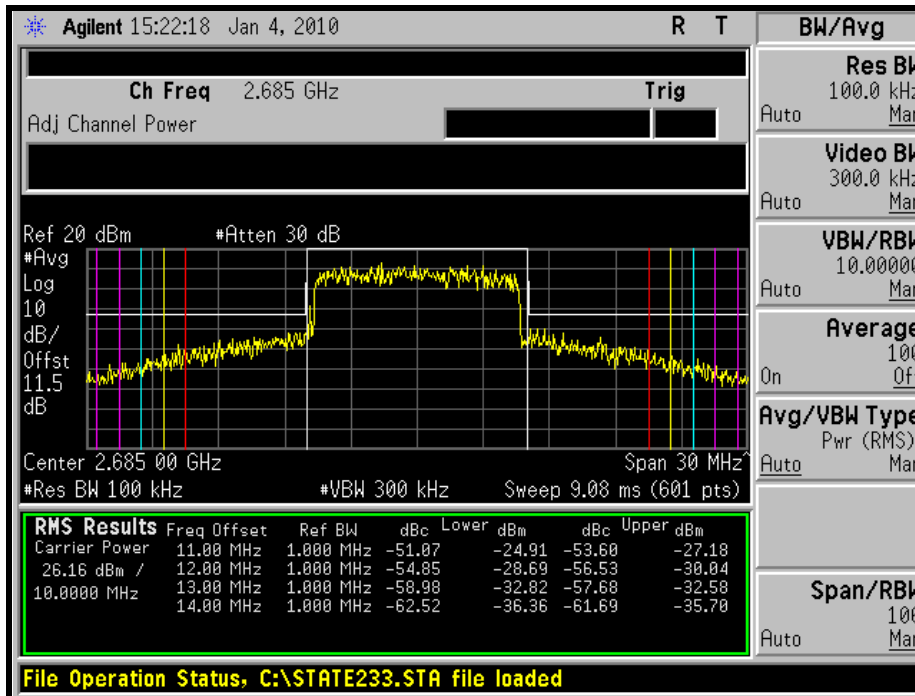
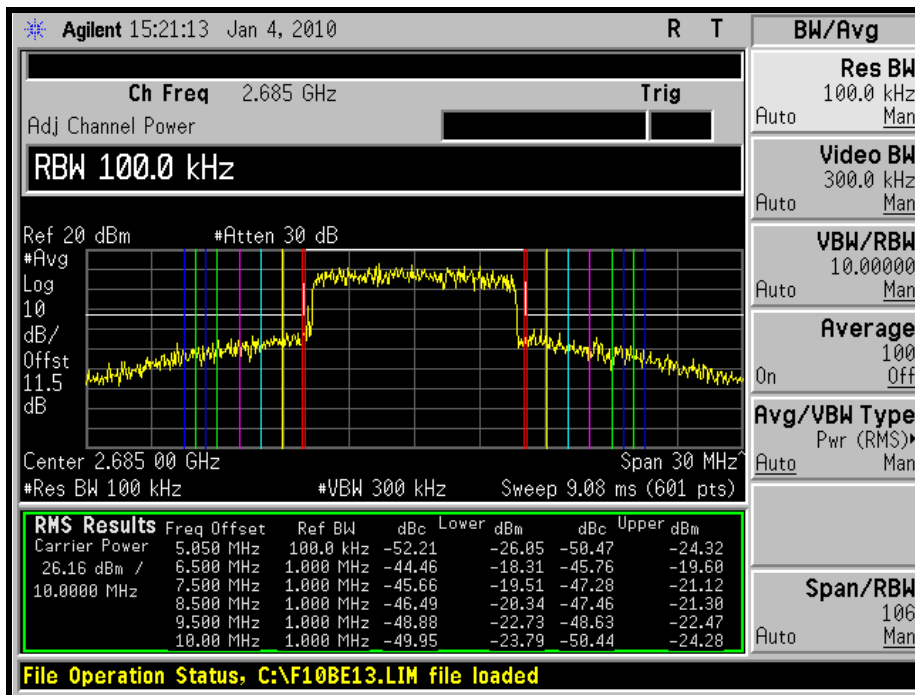
MIDDLE CHANNEL





A D T

HIGH CHANNEL





4.5 CONDUCTED SPURIOUS EMISSIONS

4.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

In the FCC 27.53(m)(2), On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB from the channel edges.

4.5.2 TEST INSTRUMENTS

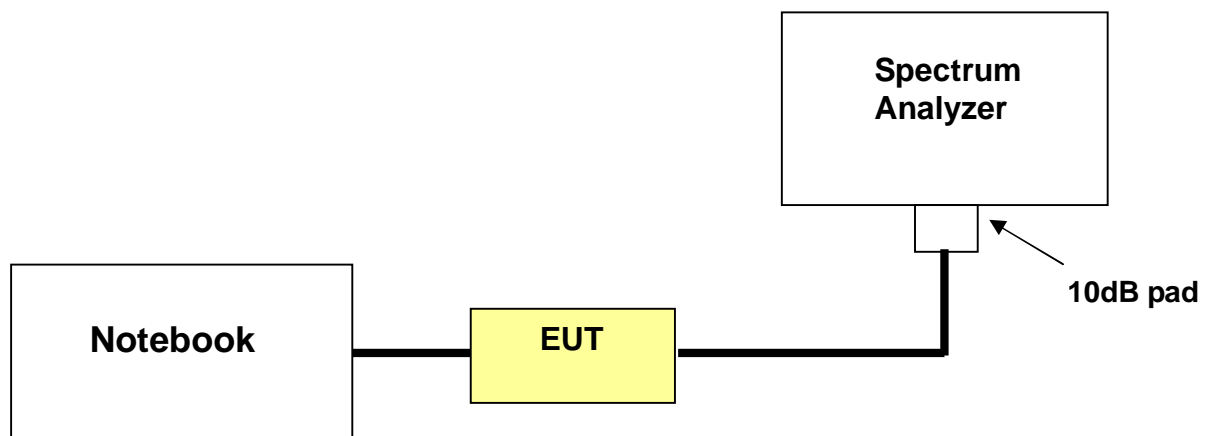
Description & Manufacturer	Model No.	Serial No.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23, 2010
HUBER+SUHNER	SUCOFLEX104	22238114	July 31, 2009	July 30, 2010
JFW 10dB attenuation	50HF-010-SMA	N/A	N/A	N/A
Wainwright Instruments High Pass Filter	WHK3.1/18G-1 0SS	ZZ-010091	N/A	N/A

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.5.3 TEST PROCEDURE

- a. The EUT was set up for the rated peak power. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels: low, middle and high operational frequency range.
- b. When the spectrum scanned from 30MHz to 3GHz, it shall be connected to the 10dB pad attenuated the carried frequency. The spectrum set RB = 1MHz, VB = 3MHz.
- c. When the spectrum scanned from 3GHz to 26.5GHz, it shall be connected to the high pass filter attenuated the carried frequency. The spectrum set RB = 1MHz, VB = 3MHz.

4.5.4 TEST SETUP



4.5.5 EUT OPERATING CONDITIONS

Same as item 4.1.5

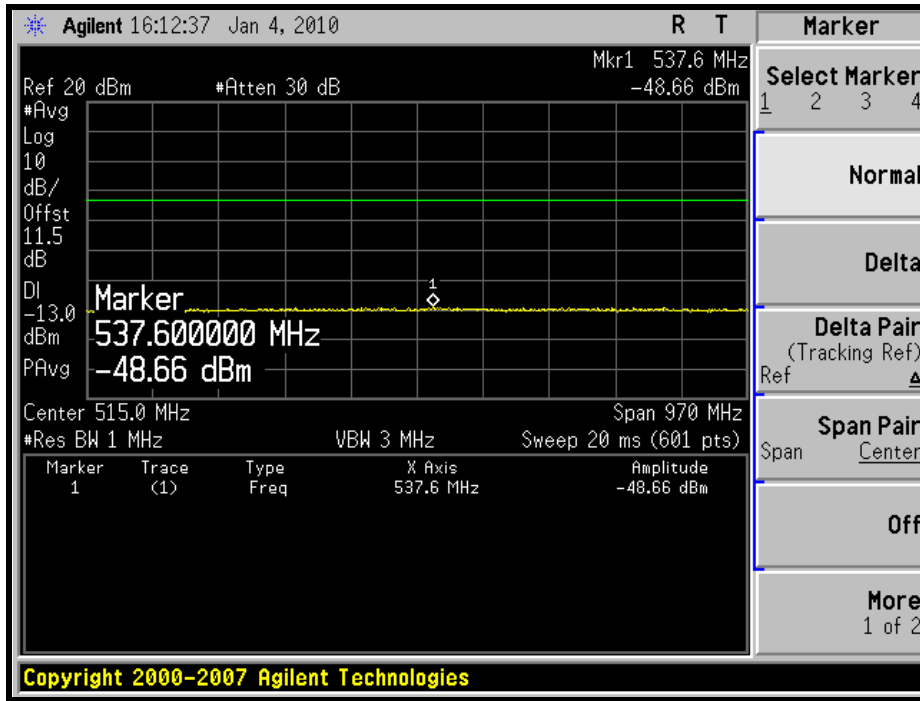


A D T

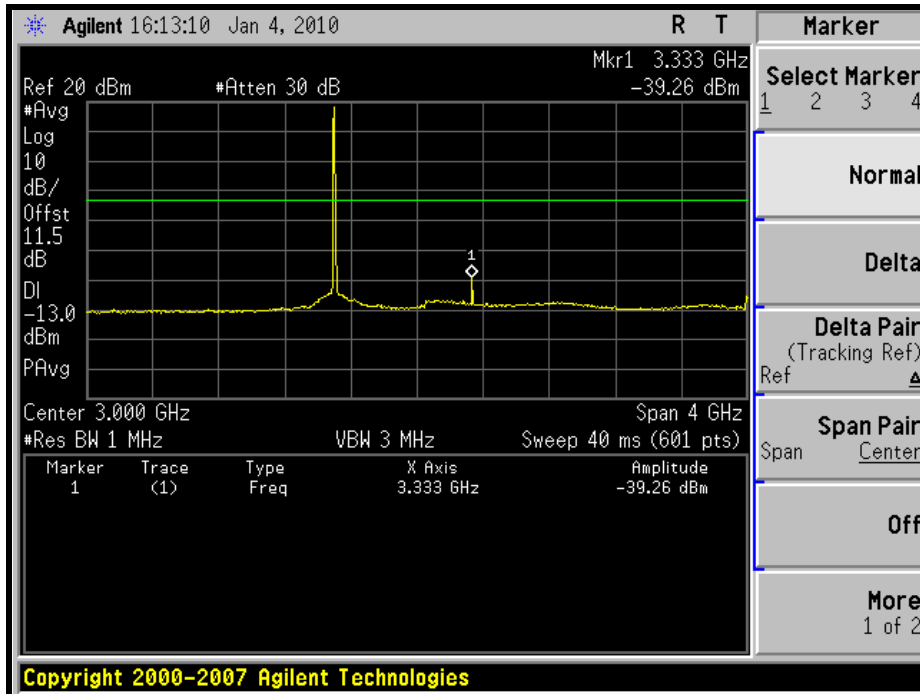
4.5.6 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

LOW CHANNEL: 30MHz ~ 1GHz:



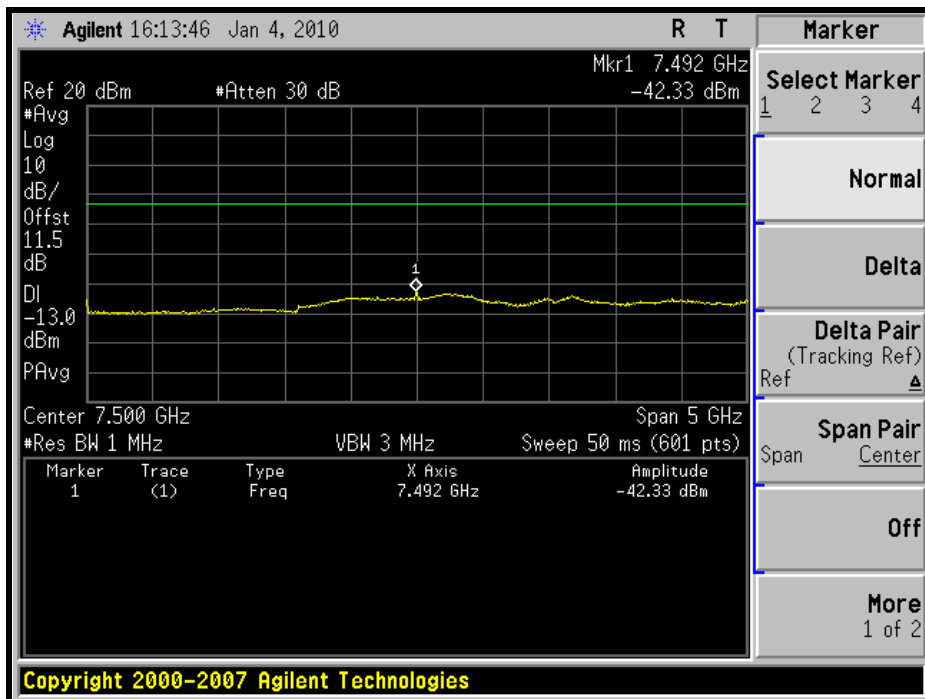
1GHz ~ 5GHz:



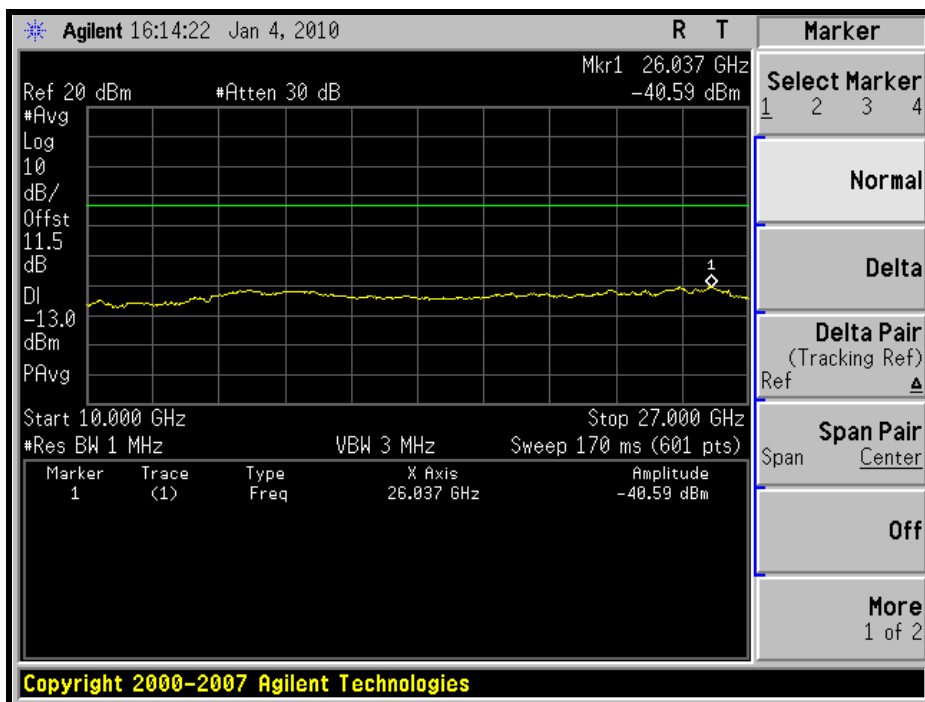


A D T

5GHz ~ 10GHz:



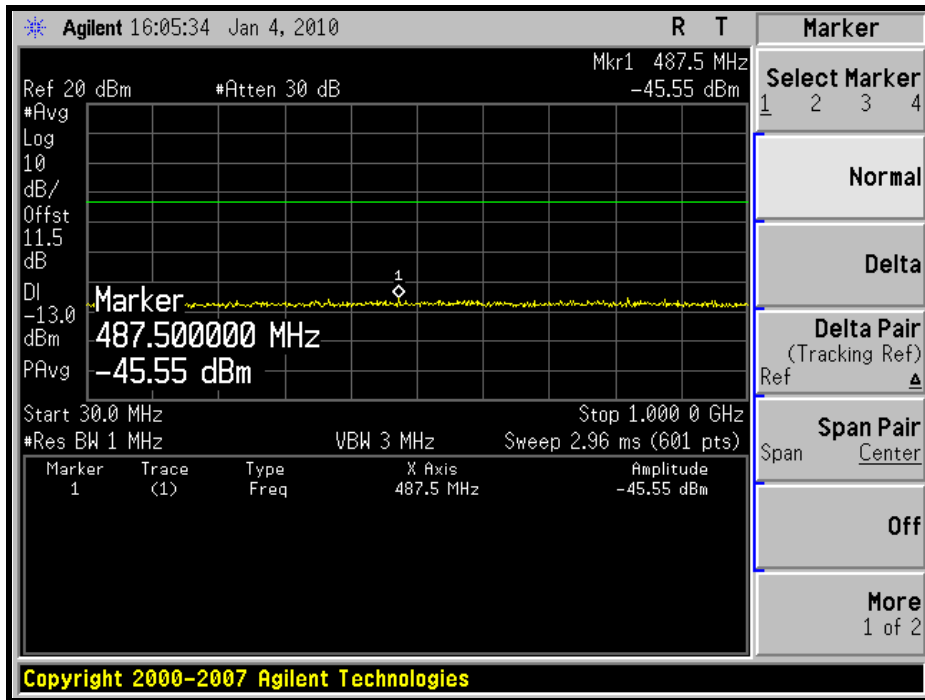
10GHz ~ 27GHz:



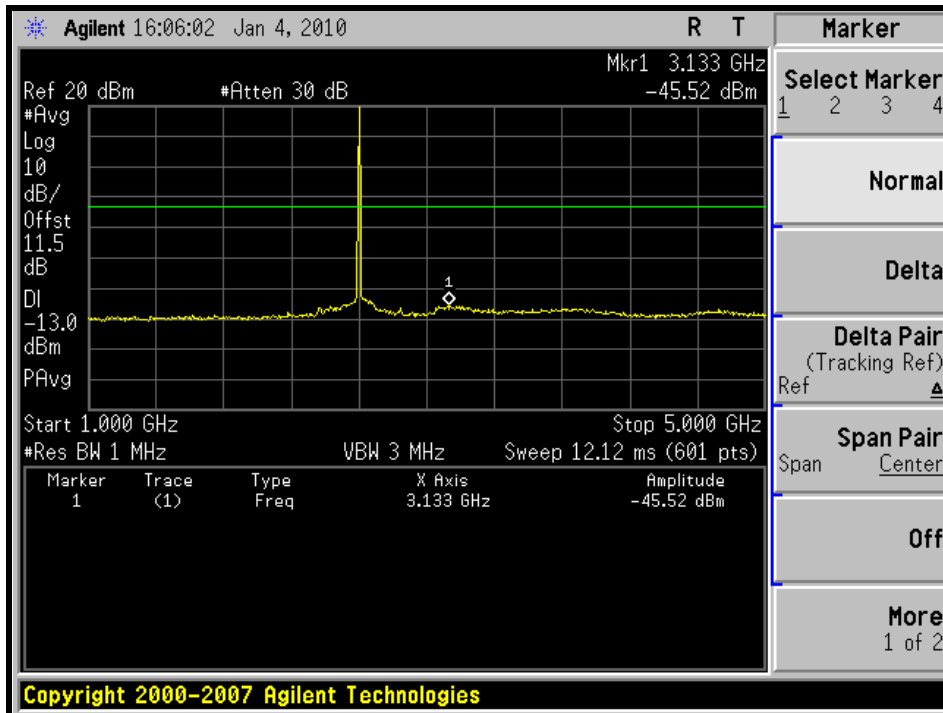


A D T

MIDDLE CHANNEL: 30MHz ~ 1GHz:



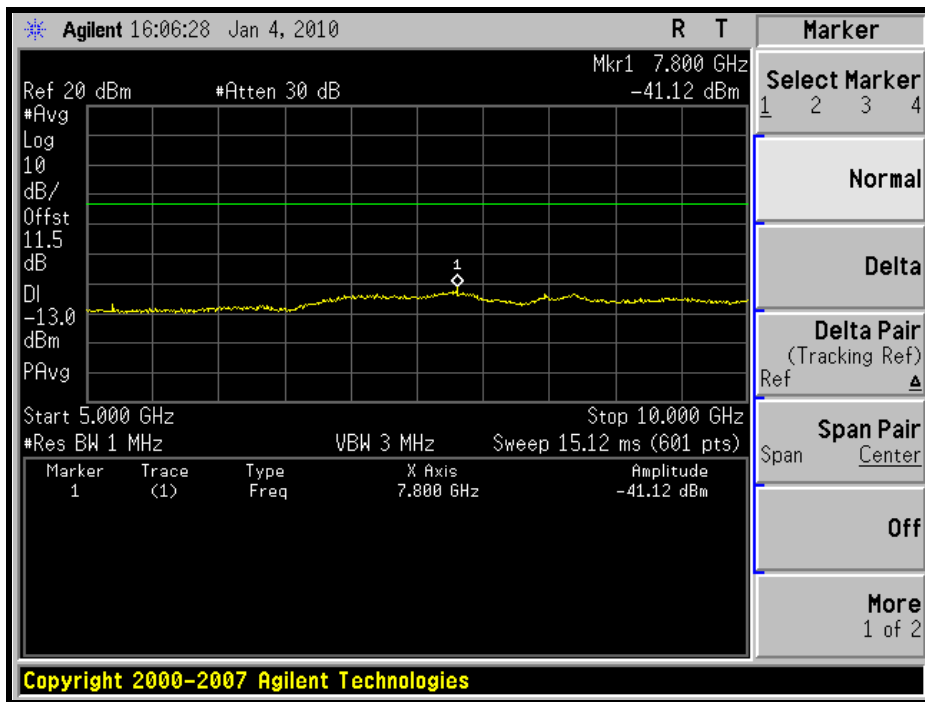
1GHz ~ 5GHz:



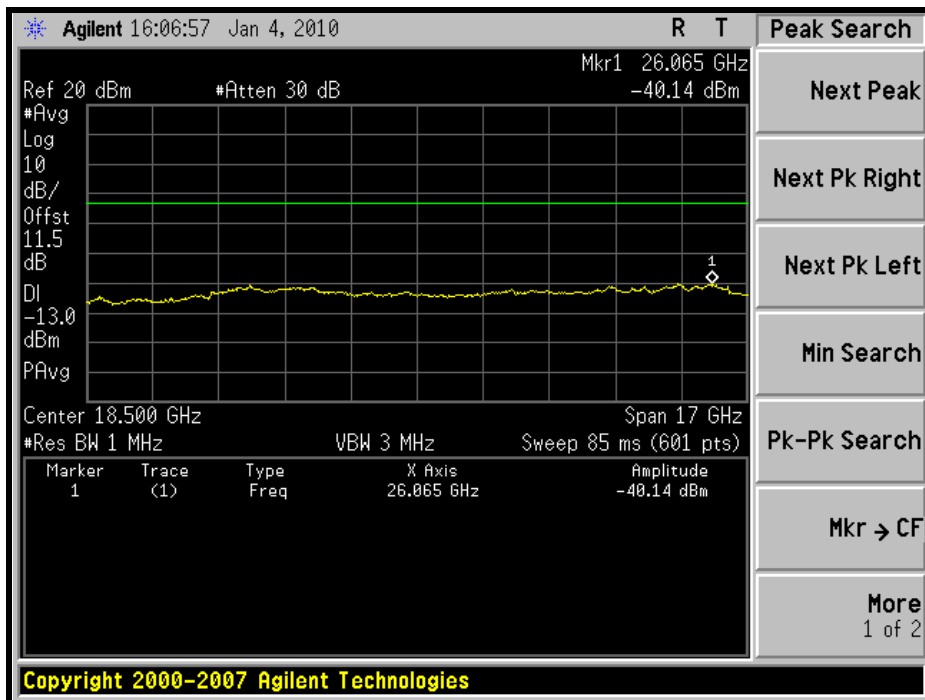


A D T

5GHz ~ 10GHz:



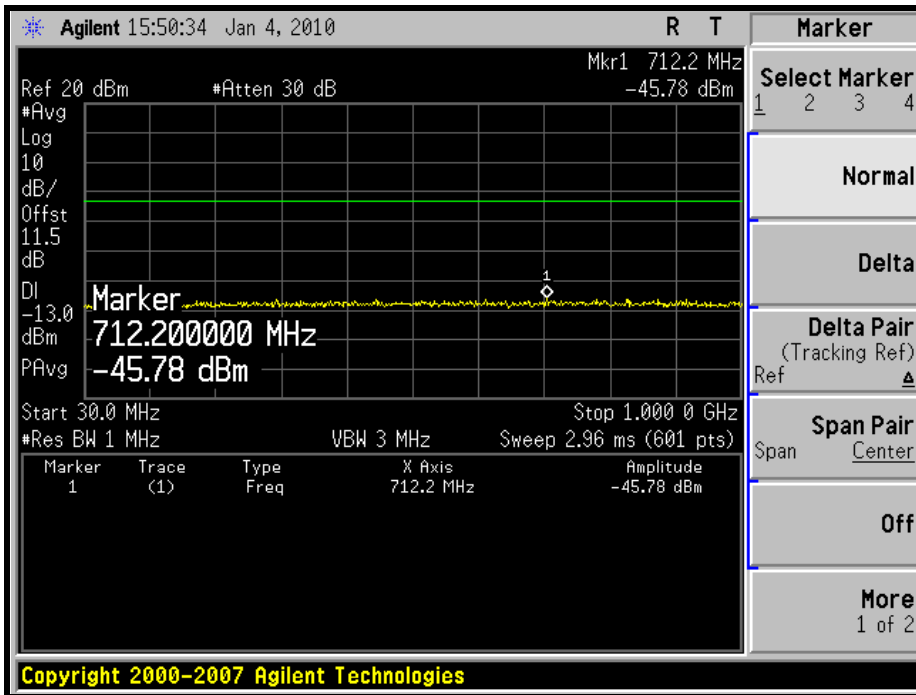
10GHz ~ 27GHz:



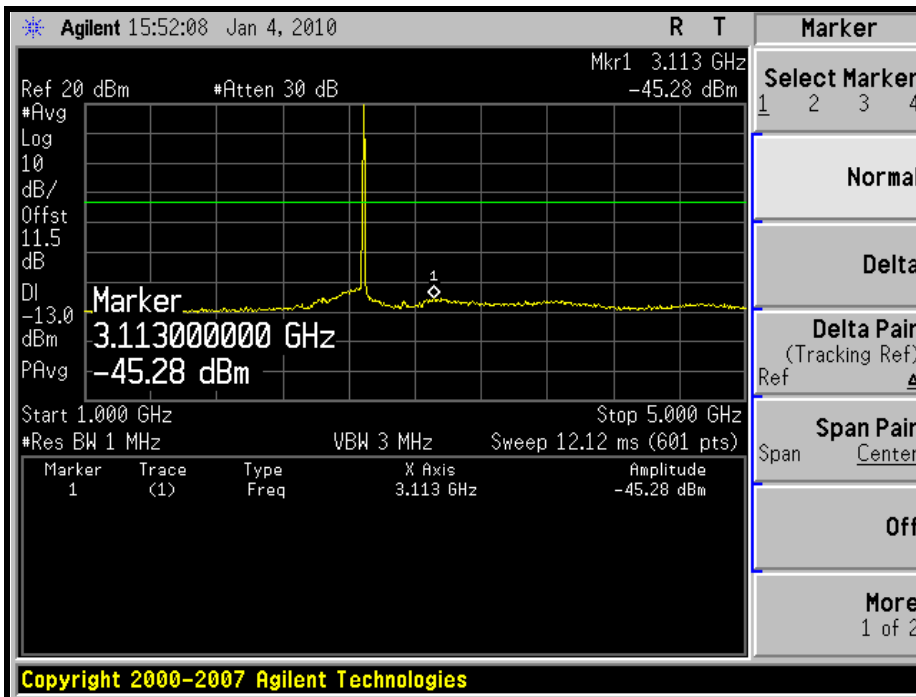


A D T

HIGH CHANNEL: 30MHz ~ 1GHz:



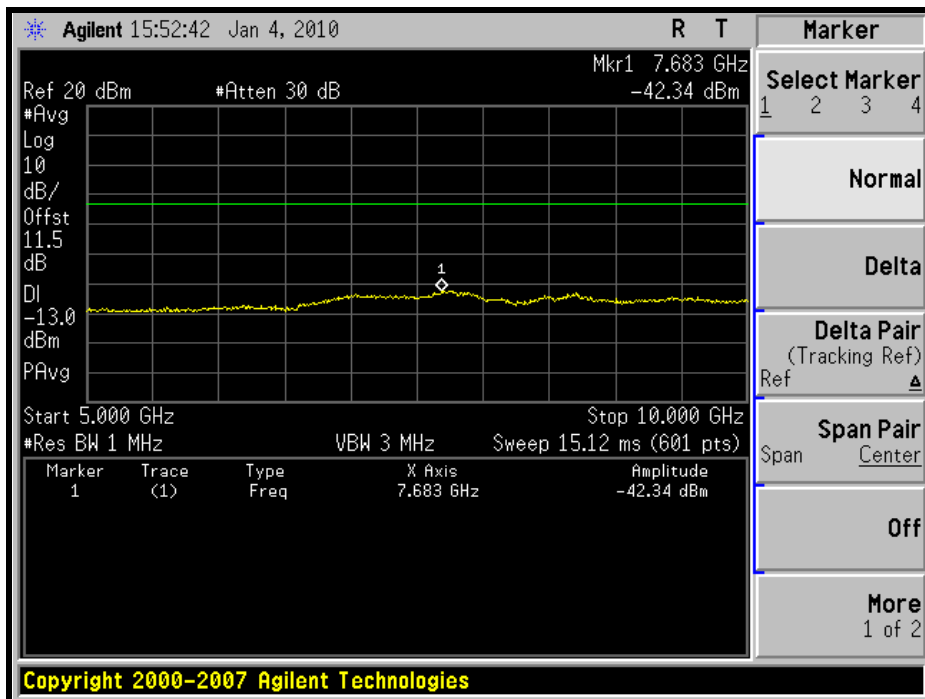
1GHz ~ 5GHz:



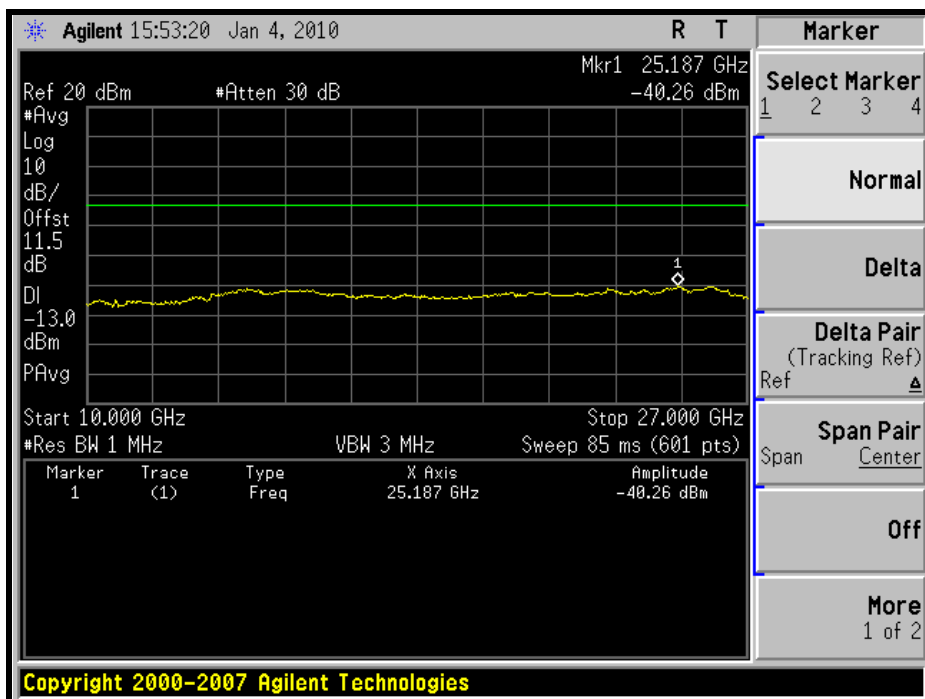


A D T

5GHz ~ 10GHz:



10GHz ~ 27GHz:

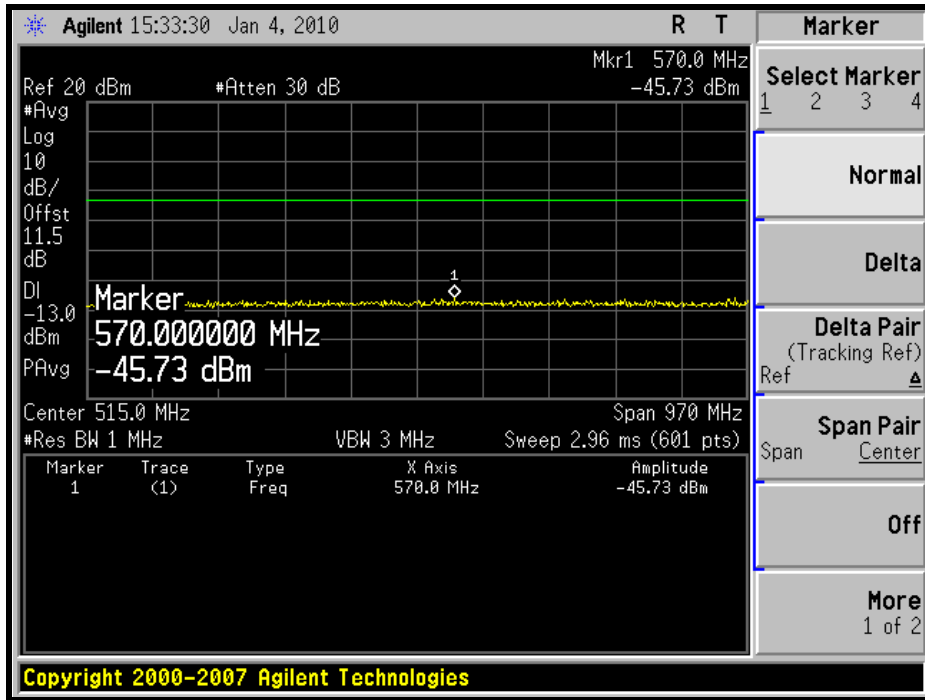




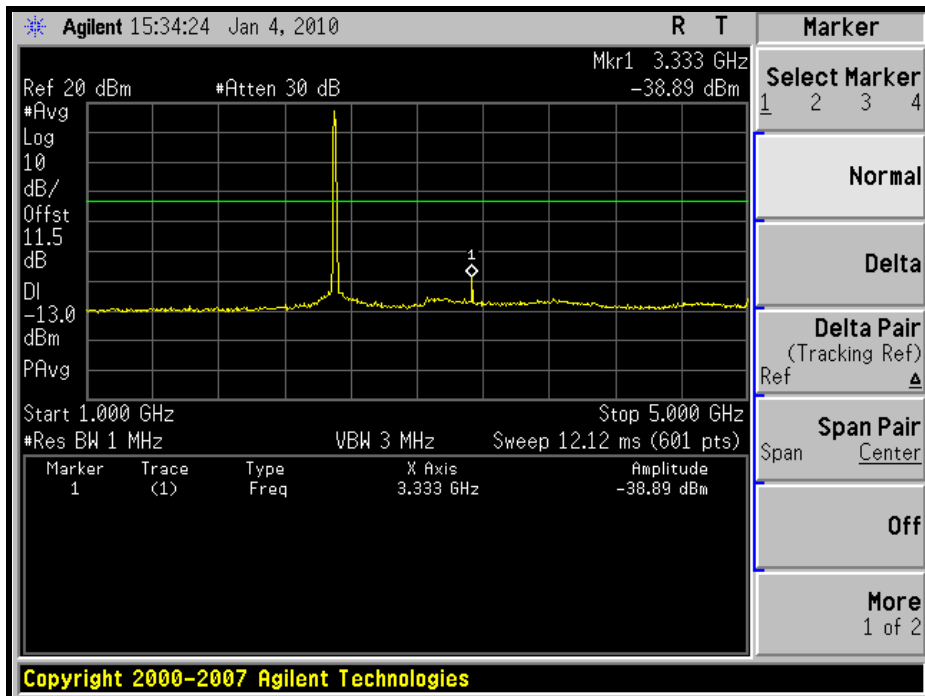
A D T

CHANNEL BANDWIDTH: 10MHz

LOW CHANNEL: 30MHz ~ 1GHz:



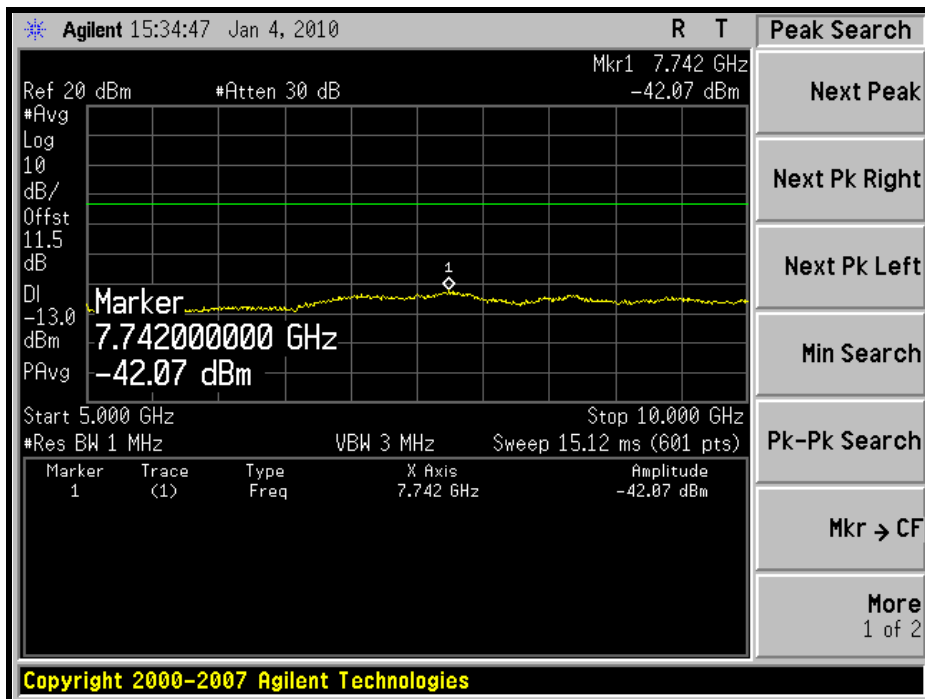
1GHz ~ 5GHz:



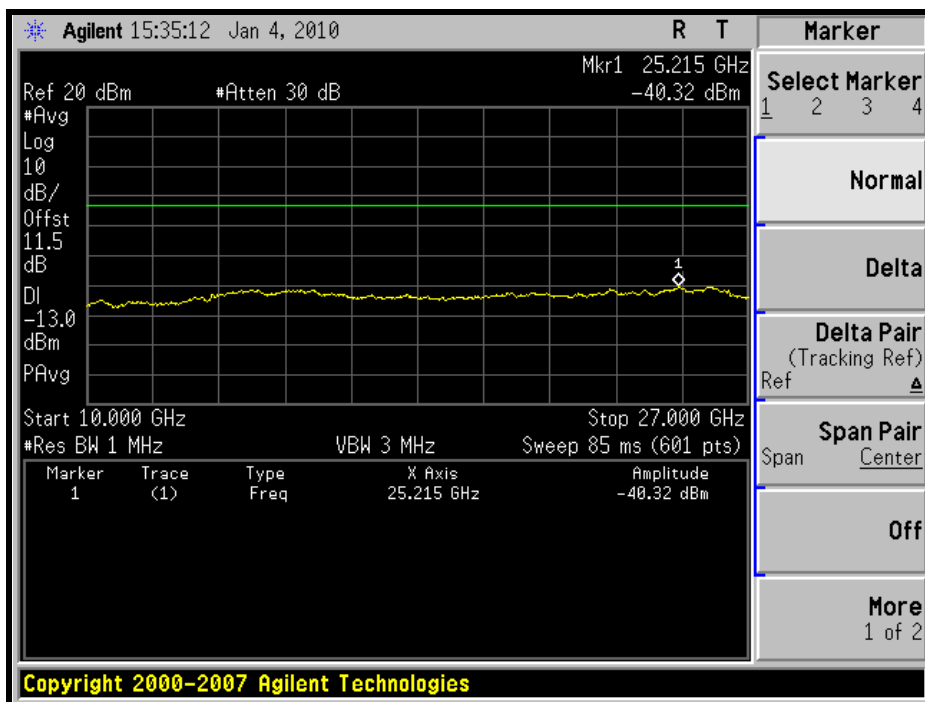


A D T

5GHz ~ 10GHz:



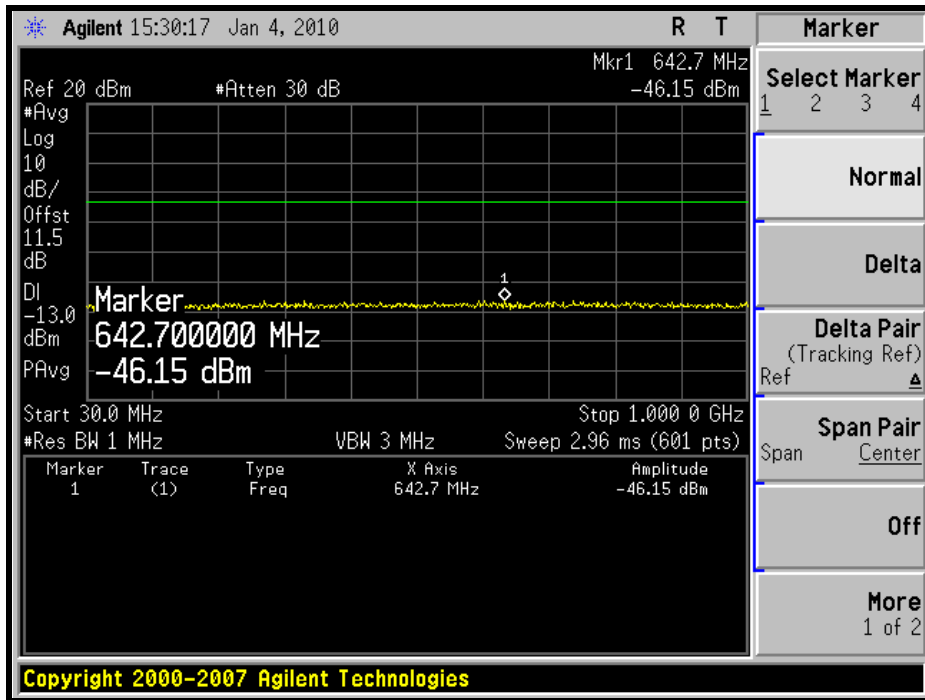
10GHz ~ 27GHz:



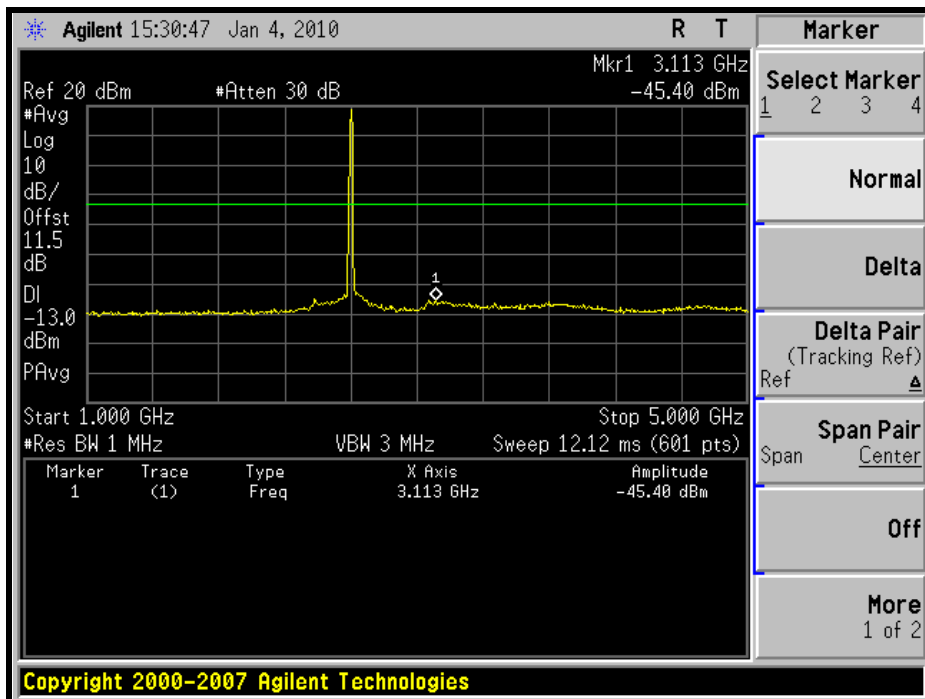


A D T

MIDDLE CHANNEL: 30MHz ~ 1GHz:



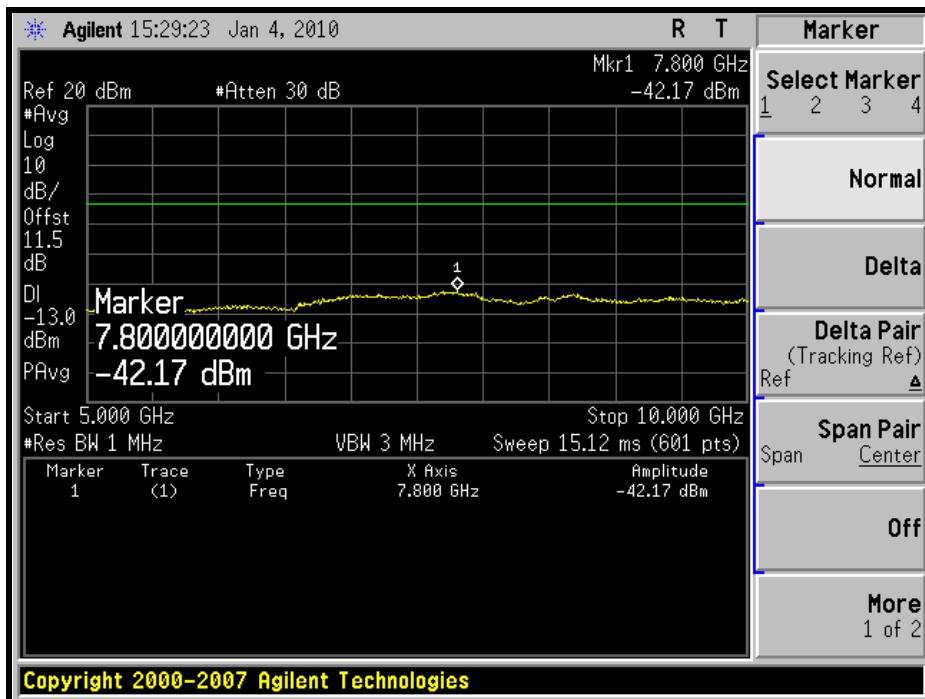
1GHz ~ 5GHz:



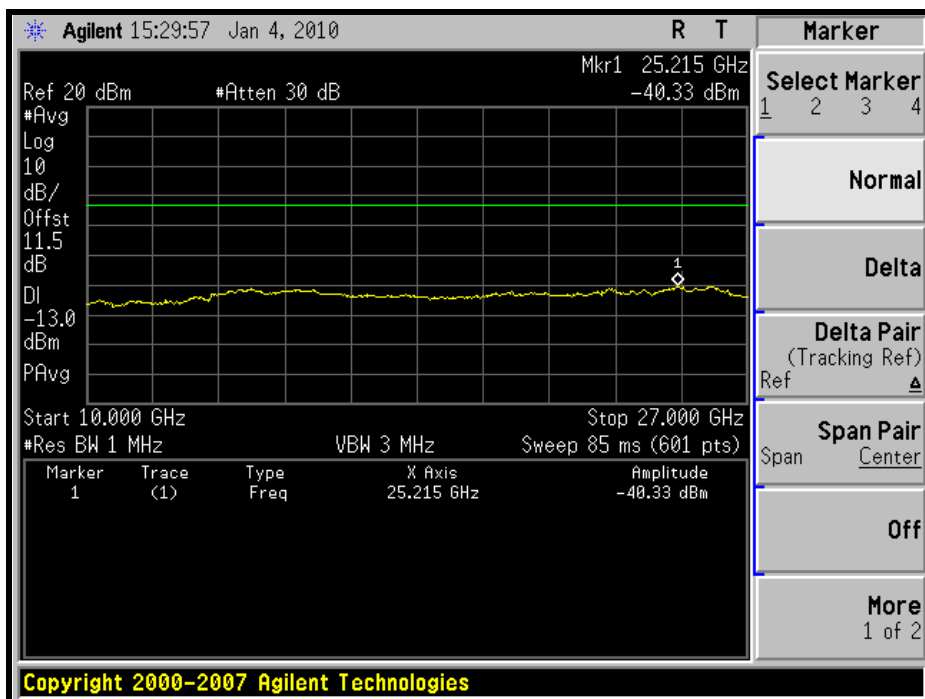


A D T

5GHz ~ 10GHz:



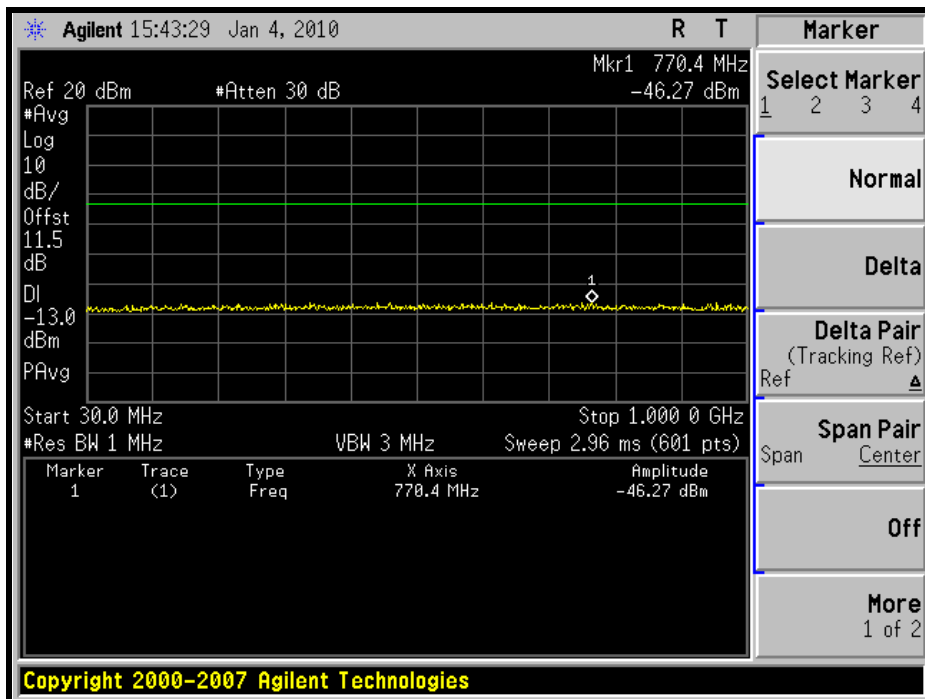
10GHz ~ 27GHz:



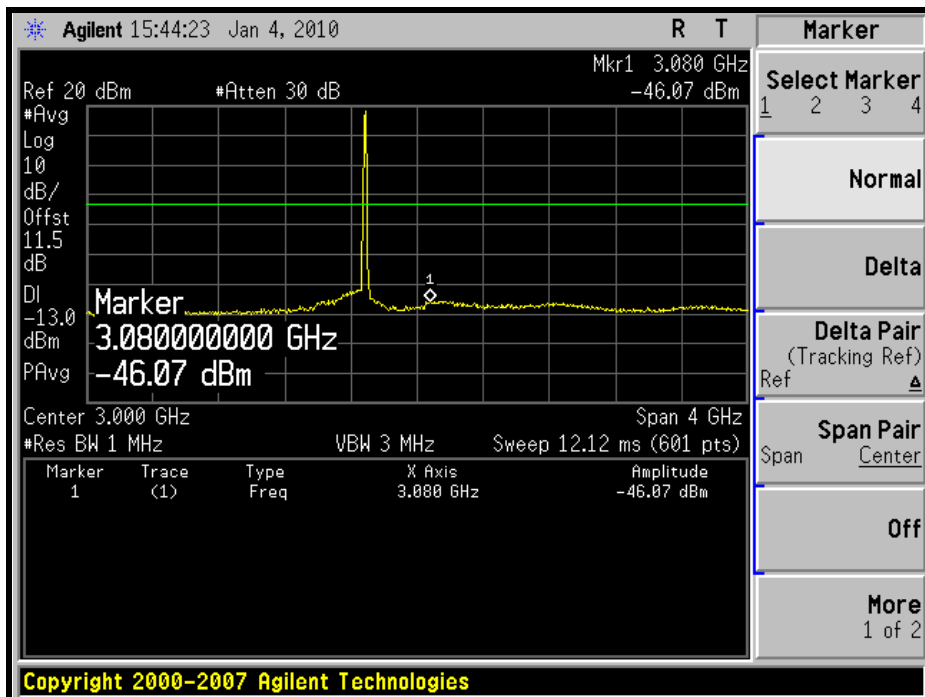


A D T

HIGH CHANNEL: 30MHz ~ 1GHz:



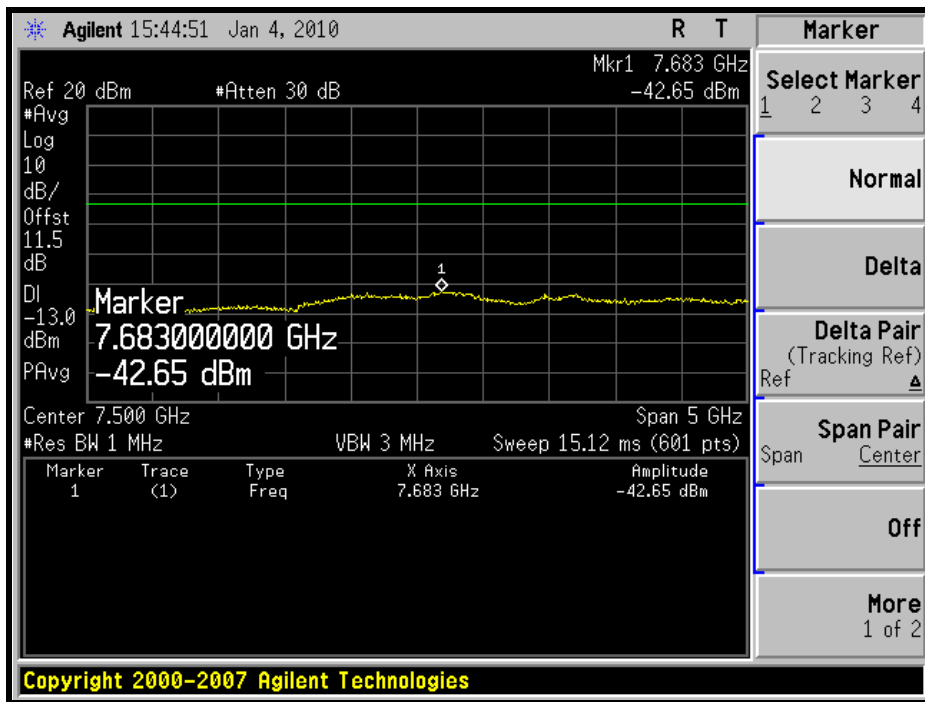
1GHz ~ 5GHz:



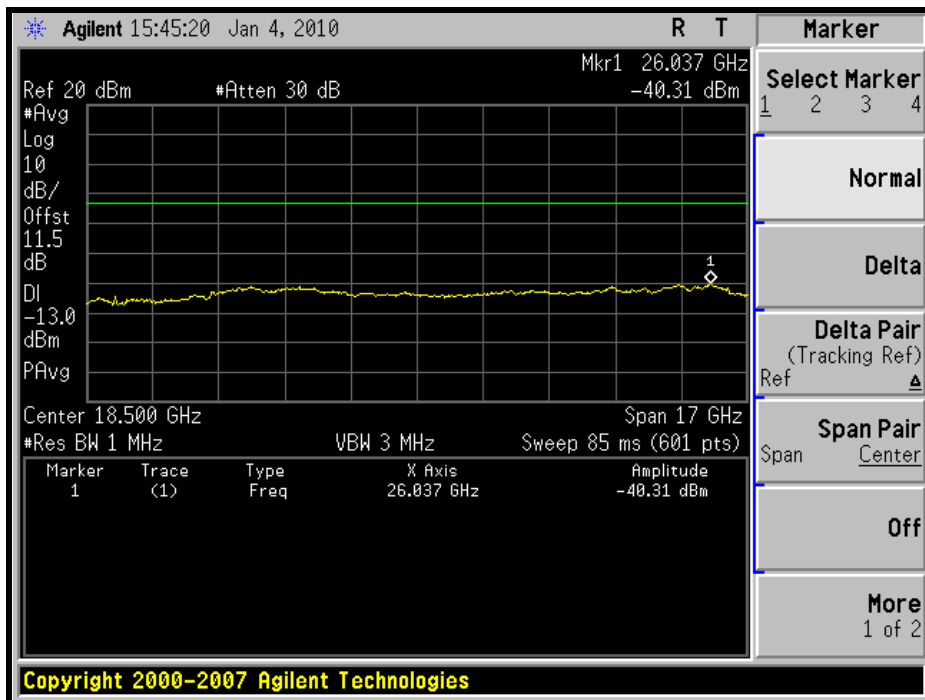


A D T

5GHz ~ 10GHz:



10GHz ~ 27GHz:



4.6 RADIATED EMISSION MEASUREMENT (BELOW 1GHz)

4.6.1 LIMITS OF RADIATED EMISSION MEASUREMENT

In the FCC 27.53(m) (2), On any frequency outside a licensee's frequency block the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB from the channel edges.

4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 18, 2009	Dec. 17, 2010
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HP Pre_Amplifier	8449B	300801923	Nov. 02, 2009	Nov. 01, 2010
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Aug. 28, 2009	Aug. 27, 2010
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 29, 2009	April 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 18, 2009	Dec. 17, 2010
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
RF Switches	EMH-011	1001	NA	NA
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 14, 2009	Aug. 13, 2010
RF Cable	8DFB	STCCAB-30M-1GHz	NA	NA
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.

3. The test was performed in Open Site No. C.

4. The FCC Site Registration No. is 656396.

5. The VCCI Site Registration No. is R-1626.

6. The CANADA Site Registration No. is IC 7450G-3.

4.6.3 TEST PROCEDURES

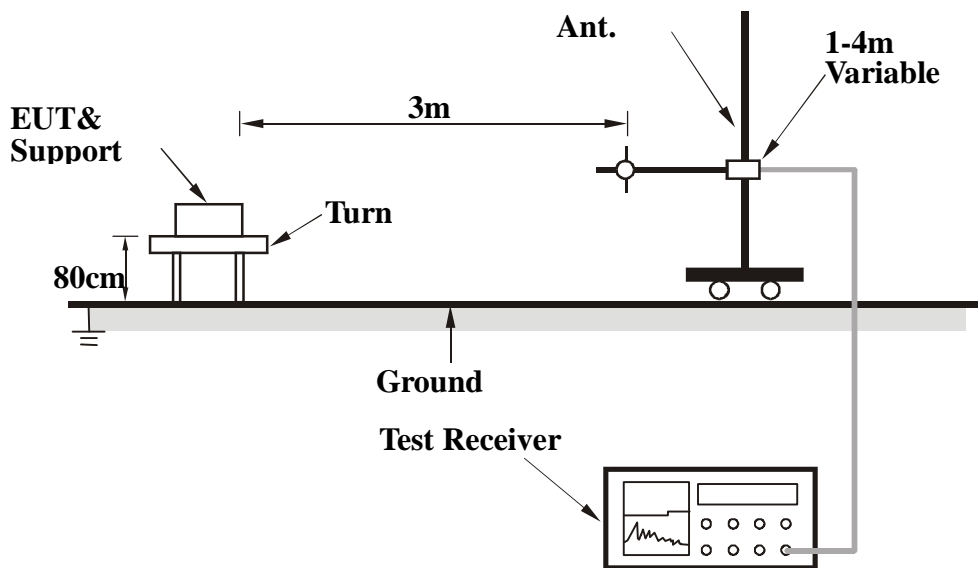
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
- c. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
- d. The EUT is replaced by a horn antenna connected to a signal generator tuned to the frequency of emission.
- e. The signal generator level has to be adjusted to have the same emission nature.
- f. The radiated power can be calculated via the factor and antenna gain.
- g. Repeat step a ~ f for horizontal polarization.

NOTE: The resolution bandwidth of spectrum analyzer is 1MHz and the video bandwidth is 3MHz.

4.6.4 DEVIATION FROM TEST STANDARD

No deviation

4.6.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.6.6 EUT OPERATING CONDITIONS

Same as item 4.1.5



A D T

4.6.7 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

MODE	Middle channel	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Timmy Hu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	125	31.55	-13	-59.13	-1.21	-60.35
2	250	34.66	-13	-60.30	3.89	-56.41
3	375	35.75	-13	-62.10	3.46	-58.64
4	500	33.41	-13	-62.11	2.89	-59.22
5	625	36.38	-13	-58.43	1.77	-56.66
6	749.99	33.14	-13	-63.23	0.82	-62.42
7	875.01	34.83	-13	-61.86	0.76	-61.10
8	1000	42.71	-13	-53.76	0.59	-53.17

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	120	33.44	-13	-56.16	-1.18	-57.34
2	250	31.93	-13	-63.03	3.89	-59.14
3	312.5	34.75	-13	-61.55	3.68	-57.87
4	500	37.98	-13	-57.54	2.89	-54.65
5	550	39.19	-13	-55.74	2.52	-53.22
6	625	41.75	-13	-53.06	1.77	-51.29
7	749.99	41.79	-13	-54.58	0.82	-53.77
8	875	33.97	-13	-62.72	0.76	-61.96
9	1000	43.74	-13	-52.73	0.59	-52.14

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



A D T

CHANNEL BANDWIDTH: 10MHz

MODE	Middle channel	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Timmy Hu		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	125	31.64	-13	-59.04	-1.21	-60.26
2	250	34.85	-13	-60.11	3.89	-56.22
3	375	35.94	-13	-61.91	3.46	-58.45
4	500	33.61	-13	-61.91	2.89	-59.02
5	625	36.52	-13	-58.29	1.77	-56.52
6	749.99	33.25	-13	-63.12	0.82	-62.31
7	875.01	34.75	-13	-61.94	0.76	-61.18
8	1000	42.89	-13	-53.58	0.59	-52.99

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	120	33.65	-13	-55.95	-1.18	-57.13
2	250	31.98	-13	-62.98	3.89	-59.09
3	312.5	34.68	-13	-61.62	3.68	-57.94
4	500	37.85	-13	-57.67	2.89	-54.78
5	550	39.25	-13	-55.68	2.52	-53.16
6	625	41.68	-13	-53.13	1.77	-51.36
7	749.99	41.54	-13	-54.83	0.82	-54.02
8	875	33.85	-13	-62.84	0.76	-62.08
9	1000	43.69	-13	-52.78	0.59	-52.19

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



4.7 RADIATED EMISSION MEASUREMENT (ABOVE 1GHz)

4.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

In the FCC 27.53(m) (2), On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB from the channel edges.

4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
ROHDE & SCHWARZ Spectrum Analyzer	FSP40	100036	Dec. 18, 2009	Dec. 17, 2010
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	Apr. 24 , 2009	Apr. 23 , 2010
HP Pre_Amplifier	8449B	300801923	Nov. 02, 2009	Nov. 01, 2010
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Aug. 28, 2009	Aug. 27, 2010
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	April 29, 2009	April 28, 2010
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 18, 2009	Dec. 17, 2010
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 22, 2009	Jan. 21, 2010
RF Switches	EMH-011	1001	NA	NA
RF CABLE (Chaintek)	Sucoflex 106	28077	Aug. 14, 2009	Aug. 13, 2010
RF Cable	8DFB	STCCAB-30M-1GHz	NA	NA
Software	ADT_Radiated_V7.6.15.9.2	NA	NA	NA
CT Antenna Tower & Turn Table	NA	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The horn antenna, HP preamplifier (model: 8449B) and Spectrum Analyzer (model: FSP40) are used only for the measurement of emission frequency above 1GHz if tested.

3. The test was performed in Open Site No. C.

4. The FCC Site Registration No. is 656396.

5. The VCCI Site Registration No. is R-1626.

6. The CANADA Site Registration No. is IC 7450G-3.

4.7.3 TEST PROCEDURES

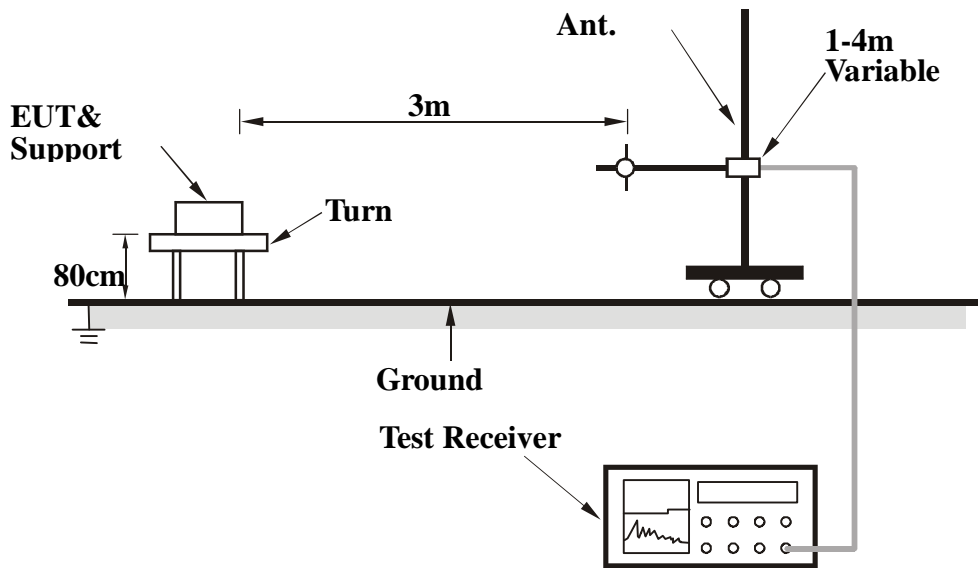
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the receiving antenna, which was mounted on antenna tower and its position at 0.8 m above the ground.
- c. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading and recorded the value.
- d. The EUT is replaced by a horn antenna connected to a signal generator tuned to the frequency of emission.
- e. The signal generator level has to be adjusted to have the same emission nature.
- f. The radiated power can be calculated via the factor and antenna gain.
- g. Repeat step a ~ f for horizontal polarization.

NOTE: The resolution bandwidth of spectrum analyzer is 1MHz and the video bandwidth is 3MHz.

4.7.4 DEVIATION FROM TEST STANDARD

No deviation

4.7.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.7.6 EUT OPERATING CONDITIONS

Same as item 4.1.5



A D T

4.7.7 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

MODE	Low channel	FREQUENCY RANGE	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Duke Tseng		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	3331.3	65.8	-13	-37.19	7.61	-29.59
2	4997	68.35	-13	-35.88	7.01	-28.87
3	7495.5	82.04	-13	-20.57	4.55	-16.02
4	9994	63.55	-13	-38.01	4.04	-33.97
5	12492.5	57.81	-13	-43.79	4.34	-39.45
6	14991	61.88	-13	-35.48	3.69	-31.79

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	3331.3	63.43	-13	-39.56	7.61	-31.96
2	4997	73.11	-13	-31.12	7.01	-24.11
3	7495.5	79.34	-13	-23.27	4.55	-18.72
4	9994	63.82	-13	-37.74	4.04	-33.70
5	12492.5	58.65	-13	-42.95	4.34	-38.61
6	14991	67.99	-13	-29.37	3.69	-25.68

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



A D T

MODE	Middle channel	FREQUENCY RANGE	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Duke Tseng		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5200	52	-13	-52.53	7.05	-45.48
2	7800	83.66	-13	-18.96	4.29	-14.67
3	10400	57.1	-13	-44.91	3.66	-41.24
4	15600	51.8	-13	-49.44	3.85	-45.59

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5200	57.9	-13	-46.63	7.05	-39.58
2	7800	80.69	-13	-21.93	4.29	-17.64
3	10400	74.22	-13	-27.79	3.66	-24.12
4	15600	53.4	-13	-47.84	3.85	-43.99

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



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MODE	High channel	FREQUENCY RANGE	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Duke Tseng		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5375	51.96	-13	-52.83	7.09	-45.74
2	8062.5	77.24	-13	-25.38	4.13	-21.25
3	10750	66.62	-13	-35.22	3.33	-31.88
4	13437.5	52.9	-13	-47.32	3.40	-43.92

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5375	57.22	-13	-47.57	7.09	-40.48
2	8062.5	81.84	-13	-20.78	4.13	-16.65
3	10750	69.38	-13	-32.46	3.33	-29.12
4	13437.5	54.06	-13	-46.16	3.40	-42.76

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



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CHANNEL BANDWIDTH: 10MHz

MODE	Low channel	FREQUENCY RANGE	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Duke Tseng		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5002	59.4	-13	-44.83	7.01	-37.82
2	7503	80.4	-13	-22.22	4.54	-17.68
3	10004	56.78	-13	-44.78	4.03	-40.75
4	12505	51.28	-13	-50.31	4.34	-45.97
5	15006	58.25	-13	-39.14	3.71	-35.43

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5002	64.71	-13	-39.52	7.01	-32.51
2	7503	69.66	-13	-32.96	4.54	-28.42
3	10004	63.43	-13	-38.13	4.03	-34.10
4	12505	50.16	-13	-51.43	4.34	-47.09
5	15006	53.4	-13	-43.99	3.71	-40.28

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



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MODE	Middle channel	FREQUENCY RANGE	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Duke Tseng		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5200	57.4	-13	-47.13	7.05	-40.08
2	7800	81.17	-13	-21.45	4.29	-17.16
3	10400	51.7	-13	-50.31	3.66	-46.64
4	15600	53.4	-13	-47.84	3.85	-43.99

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M						
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5200	62.6	-13	-41.93	7.05	-34.88
2	7800	74.22	-13	-28.40	4.29	-24.11
3	10400	61	-13	-41.01	3.66	-37.34
4	15600	57.4	-13	-43.84	3.85	-39.99

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



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MODE	High channel	FREQUENCY RANGE	Above 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1023hPa
TESTED BY	Duke Tseng		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5370	52.11	-13	-52.68	7.09	-45.58
2	8055	78.4	-13	-24.22	4.13	-20.09
3	10740	64.96	-13	-36.89	3.34	-33.55
4	13425	52	-13	-48.24	3.43	-44.80
5	16110	49.3	-13	-55.25	3.98	-51.28

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBm)	S.G level (dBm)	C.F. (dB)	Power level (dBm)
1	5370	60.4	-13	-44.39	7.09	-37.29
2	8055	69.27	-13	-33.35	4.13	-29.22
3	10740	70.08	-13	-31.77	3.34	-28.43
4	13425	51.78	-13	-48.46	3.43	-45.02
5	16110	49.9	-13	-54.65	3.98	-50.68

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



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5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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





6 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025:

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5/phtml.
If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26052943

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Email: service@adt.com.tw

Web Site: www.adt.com.tw

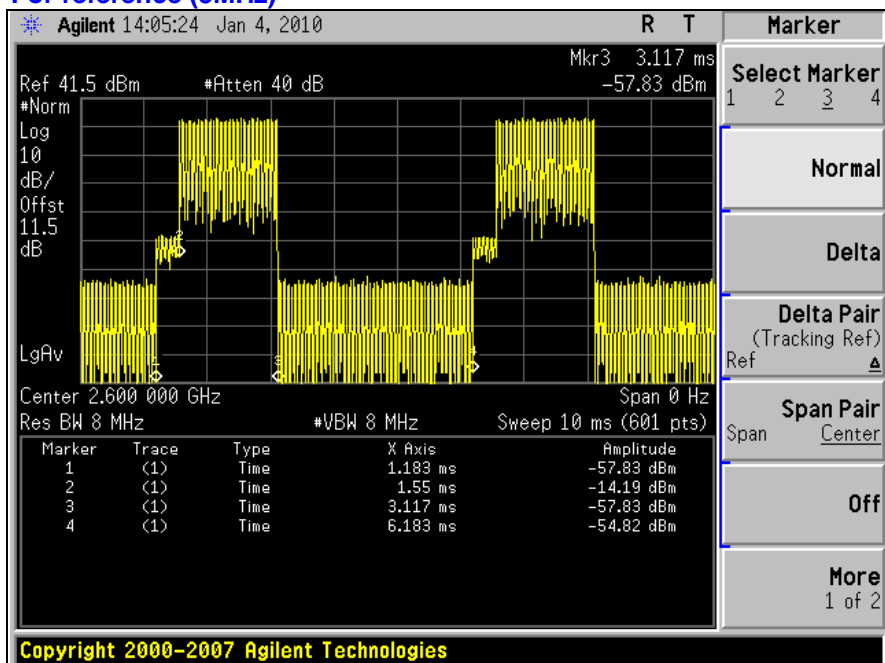
The address and road map of all our labs can be found in our web site also.



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7 APPENDIX - A DL/UL RATION FOR TEST

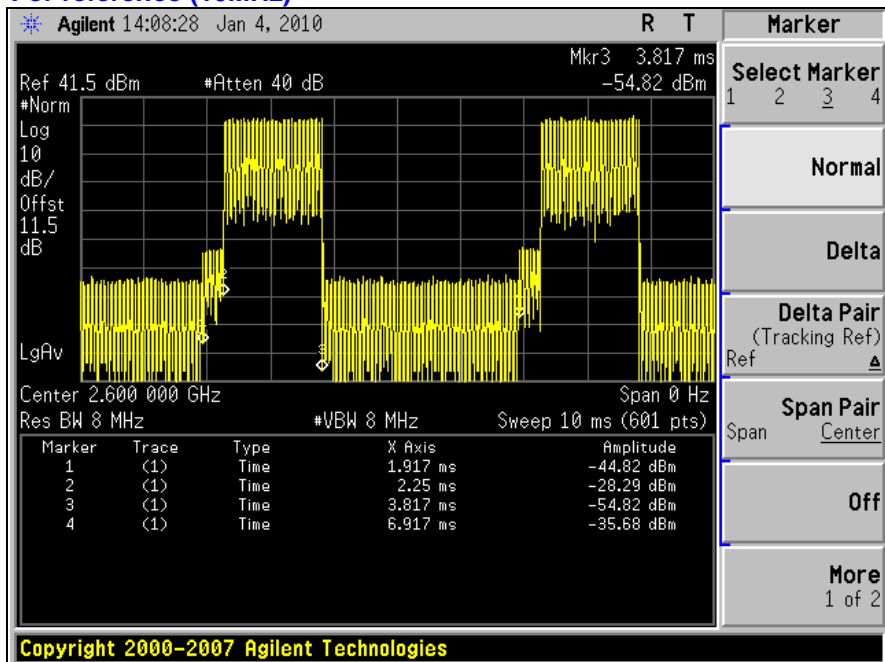
For reference (5MHz)



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$$\text{Ratio} = [(3.117-1.55) / (6.183-1.183)] * \% = 31.34\%$$

For reference (10MHz)



Copyright 2000-2007 Agilent Technologies

$$\text{Ratio} = [(3.817-2.25) / (6.917-1.917)] * \% = 31.34\%$$

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