FCC TEST REPORT (PART 27)

REPORT NO.: RF110317E04
MODEL NO.: MAX208M
FCC ID: I88MAX208M
RECEIVED: Mar. 17, 2011
TESTED: Mar. 24 to 30, 2011
ISSUED: June 22, 2011

APPLICANT: ZyXEL Communications Corporation

ADDRESS: No. 6, Innovation Road II, Science-Park, Hsin-Chu, 300, Taiwan

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

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

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	NA	June 22, 2011

1 CERTIFICATION

PRODUCT:	WiMAX Indoor Gateway
BRAND NAME:	ZyXEL
MODEL NO.:	MAX208M
APPLICANT:	ZyXEL Communications Corporation
TESTED:	Mar. 24 to 30, 2011
TEST SAMPLE:	MASS-PRODUCTION
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.: MAX208M) 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 : _____ , **DATE:** *June 22, 2011*
(Claire Kuan, Specialist)

APPROVED BY : _____ , **DATE:** *June 22, 2011*
(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.

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

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	WiMAX Indoor Gateway
MODEL NO.	MAX208M
FCC ID	I88MAX208M
POWER SUPPLY	DC 12V from adapter
MODULATION TECHNOLOGY	OFDMA
MODULATION	Up Link :QPSK-1/2, -3/4, 16QAM-1/2, 3/4, 64QAM-5/6
	Down Link: QPSK-1/2, -3/4, 16QAM-1/2, 3/4, 64QAM-1/2, -2/3, -3/4, -5/6
OPERATING FREQUENCY	5MHz: 2498.5MHz ~ 2687.5MHz 10MHz: 2501MHz ~ 2685MHz
CHANNEL BANDWIDTH	5MHz & 10MHz
MAX. CONDUCTED POWER	5MHz: 25.8dBm 10MHz: 25.7dBm
ANTENNA TYPE	Please see note 1
DATA CABLE	NA
I/O PORTS	Ethernet port x 1(10/100Mbps)
ASSOCIATED DEVICES	Adapter x 1

NOTE:

1. There are two antennas provided to this EUT, please refer to the following table:

Transmitter Circuit	Antenna Type	Antenna Connector	Gain (dBi) (peak, Included cable loss)	Diversity Function
Chain(0)	Dipole	R-SMA	6	Yes
Chain(1)	Dipole	R-SMA	6	Yes

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

Brand:	DVE
Model No.:	DSA-12G-12 FUS 120120
Input power :	100-240V, 50/60Hz, 0.3A
Output power :	12V, 1A DC output cable (unshielded, 1.5m)

3. 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, 64QAM-5/6 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
QPSK	1/2	QPSK	1/2
	3/4		3/4
16QAM	1/2	16QAM	1/2
	3/4		3/4
64QAM	5/6	64QAM	1/2
			2/3
			3/4
			5/6

4. The EUT is 1 * 2 spatial SIMO (1Tx & 2Rx) without beam forming function.

5. The EUT embedded a firmware for testing that needs to control from Notebook computer to let EUT with different DL/UL ration.

6. 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).

7. 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.

3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO							DESCRIPTION
	OP	FS	EB	CE	CSE	RE<1G	RE≥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
RE≥1G: 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-1/2
MODE 2	L, M, H	OFDMA	64QAM-5/6

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-1/2
MODE 2	L, M, H	OFDMA	64QAM-5/6

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-1/2
MODE 2	L, M, H	OFDMA	64QAM-5/6

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-1/2
MODE 2	L, M, H	OFDMA	64QAM-5/6

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-1/2
MODE 2	L	OFDMA	64QAM-5/6

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-1/2
MODE 2	L, M, H	OFDMA	64QAM-5/6

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.

3.4 DESCRIPTION OF SUPPORT UNITS

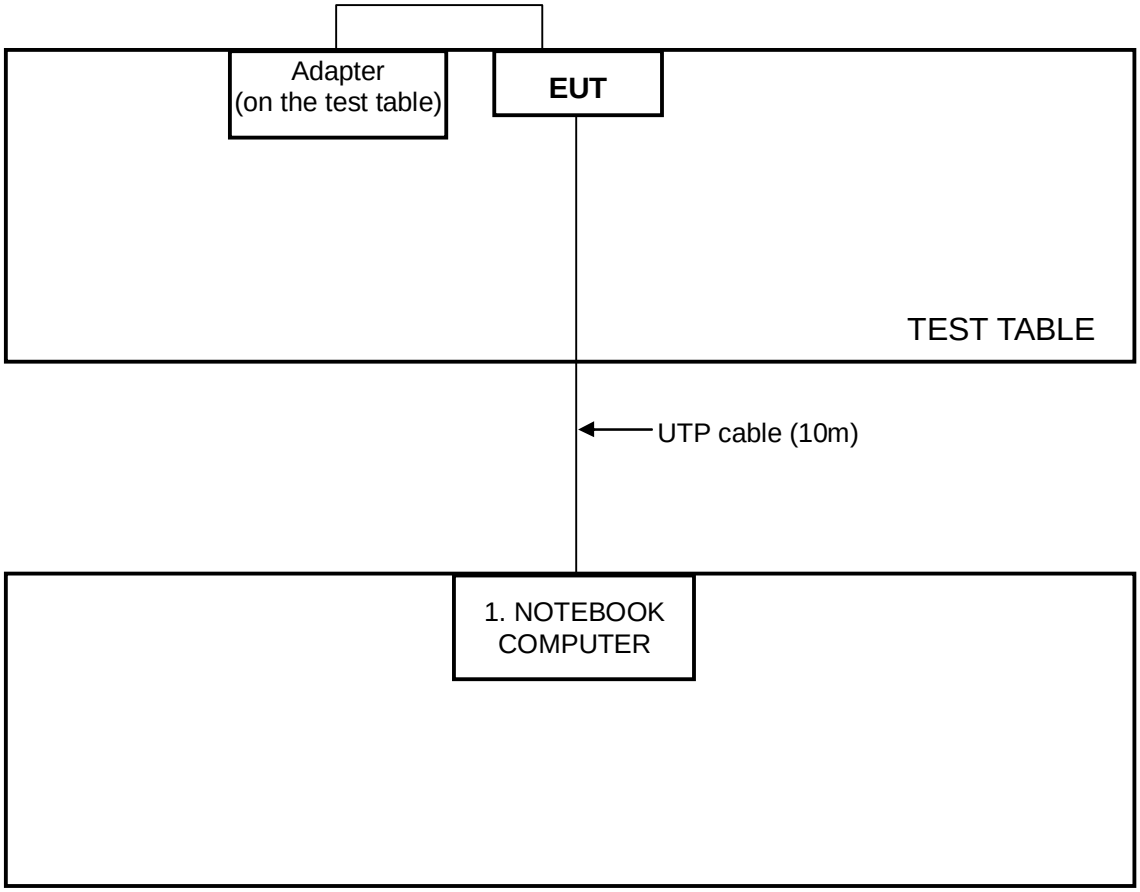
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	DSLB32S	FCC DoC

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	UTP cable (10m)

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

4.1.2 TEST INSTRUMENTS

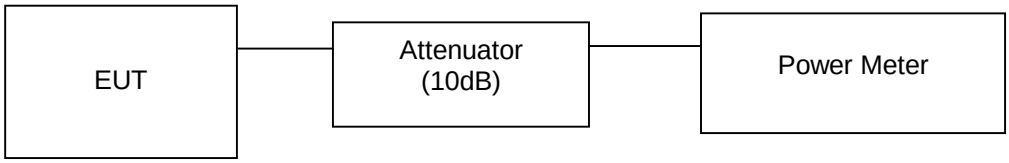
DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Anritsu Power meter	ML2495A	0824006	April 25, 2010	April 24, 2011
JFW 10dB attenuation	50HF-010-SMA	N/A	NA	NA

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

4.1.3 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. The EUT connects the support unit 1(Notebook computer) via one UTP cable.
2. Support unit 1(Notebook computer) ran the test program “MTK RFCAL Toolv1.5.1 b553” which was used to set the frequency and force the EUT into continuous transmit mode.

4.1.6 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

INPUT POWER	120Vac, 60Hz		
ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1025hPa	**TESTED BY**	Rex Huang

CONDUCTED POWER			
CHANNEL	**FREQUENCY (MHz)**	**POWER OUTPUT(mW)**	**POWER OUTPUT(dBm)**
Low	2498.5	353.997	25.5
Middle	2600	378.443	25.8
High	2687.5	370.681	25.7

CHANNEL BANDWIDTH: 10MHz

INPUT POWER	120Vac, 60Hz		
ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1025hPa	**TESTED BY**	Rex Huang

CONDUCTED POWER			
CHANNEL	**FREQUENCY (MHz)**	**POWER OUTPUT(mW)**	**POWER OUTPUT(dBm)**
Low	2501	371.535	25.7
Middle	2600	361.410	25.6
High	2685	354.813	25.5

4.2 FREQUENCY STABILITY MEASUREMENT

4.2.1 LIMITS OF FREQUENCY STABILIITY MEASUREMENT

According to the FCC part 2.1055 and 27.54 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℃ ~ 50℃.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100037	Aug. 02, 2010	Aug. 01, 2011
OVEN	MHU-225AU	911033	Dec. 16, 2010	Dec. 15, 2011
HUBER+SUHNER	SUCOFLEX104	222684/4	Aug. 14, 2010	Aug. 13, 2011
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

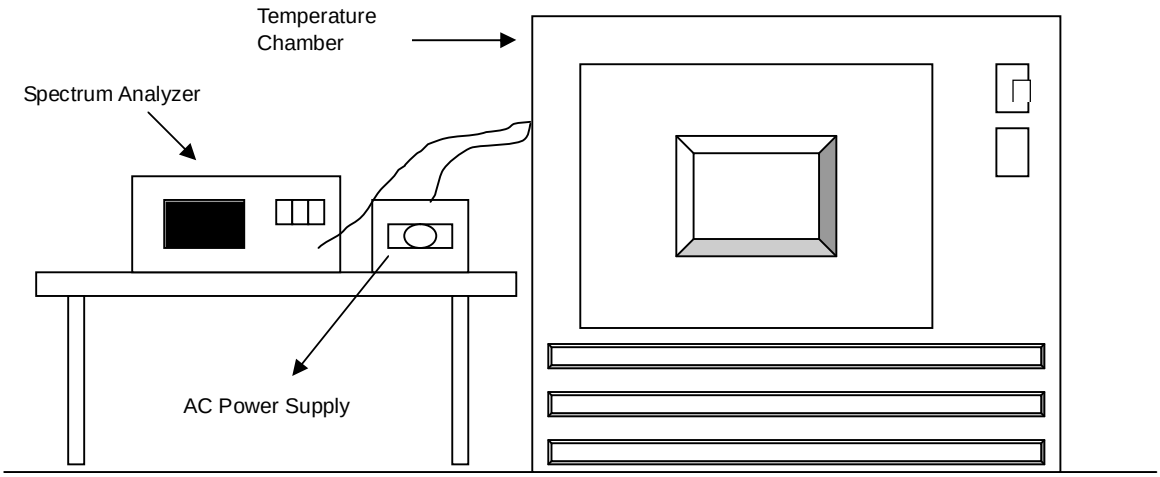
a. Power must be removed when changing from one temperature to another or one voltage to another voltage. Power warm up is at least 15 min and power applied should perform before recording frequency error.

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 ±0.5℃ 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



4.2.5 TEST RESULTS

MODE	Middle channel (2600MHz)	INPUT POWER	120Vac, 60Hz
ENVIRONMENTAL CONDITIONS	20deg°C, 60%RH 1025hPa	TESTED BY	Rex Huang

AFC FREQUENCY ERROR VS. VOLTAGE								
VOLTAGE (Volts)	0Minutes		2Minutes		5Minutes		10Minutes	
	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)
138	2600.00709	0.000273	2600.00012	0.000005	2600.0044	0.000169	2599.9953	0.000181
120	2600.00684	0.000263	2600.00599	0.000231	2599.9906	0.000360	2599.9904	0.000370
102	2600.00679	0.000261	2599.99128	0.000335	2599.9920	0.000309	2599.9979	0.000082

AFC FREQUENCY ERROR VS. TEMP								
TEMP (℃)	0Minutes		2Minutes		5Minutes		10Minutes	
	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)	FREQUENCY (MHz)	PPM (%)
50	2600.00488	0.000188	2599.99751	0.000096	2600.00489	0.000188	2599.9904	0.000369
40	2600.00693	0.000266	2600.00411	0.000158	2600.00926	0.000356	2600.0097	0.000373
30	2599.99245	0.000290	2600.00894	0.000344	2600.00972	0.000374	2600.0058	0.000222
20	2600.00684	0.000263	2600.00599	0.000231	2599.9906	0.000360	2599.9904	0.000370
10	2600.0078	0.000300	2599.99939	0.000023	2600.0055	0.000212	2600.0050	0.000191
0	2599.99589	0.000158	2599.99933	0.000026	2600.0084	0.000323	2600.0079	0.000303
-10	2599.9965	0.000135	2600.00344	0.000132	2600.0000	0.000000	2599.9964	0.000140
-20	2600.00037	0.000014	2599.99017	0.000378	2599.9926	0.000283	2599.9943	0.000218
-30	2599.9961	0.000152	2600.0088	0.000337	2599.9939	0.000235	2599.9955	0.000173

4.3 EMISSION BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF EMISSION BANDWIDTH MEASUREMENT

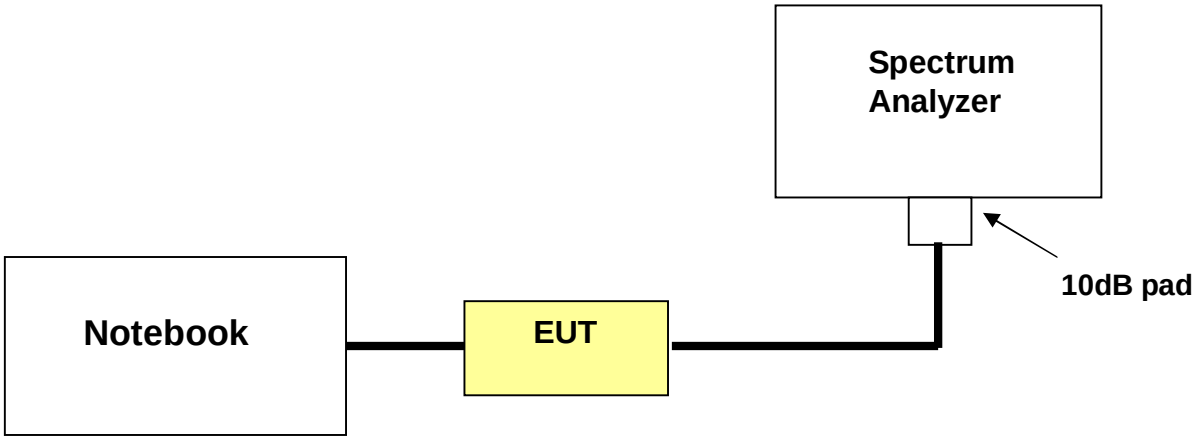
According to FCC 27.53(m)(6) specified that emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY46180622	May 12, 2010	May 11, 2011
HUBER+SUHNER	SUCOFLEX104	222684/4	Aug. 14, 2010	Aug. 13, 2011
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

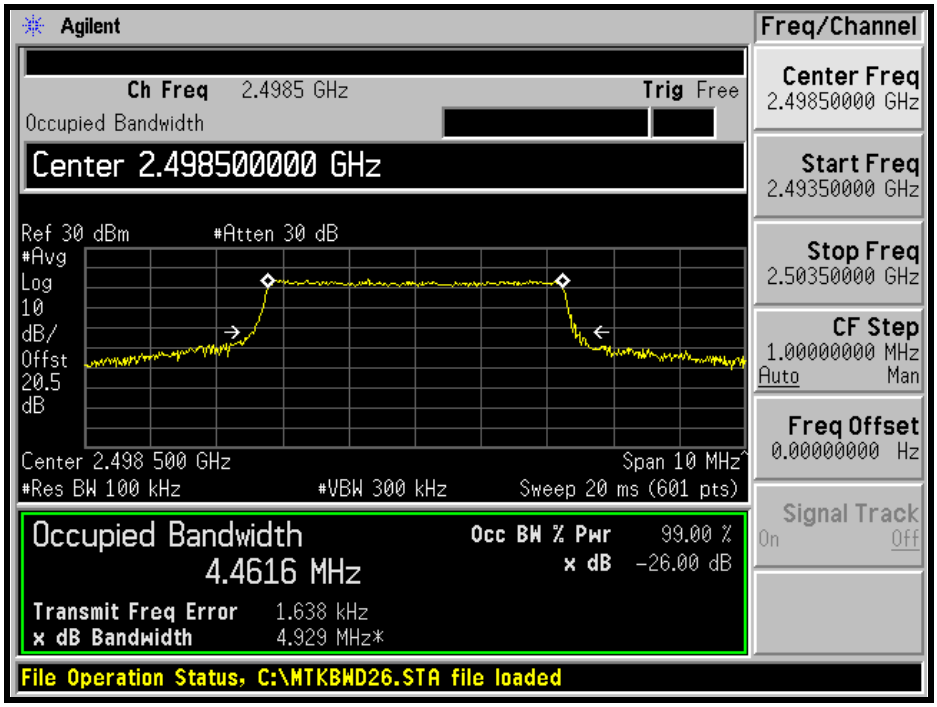
a. The Notebook controlled EUT to export rated output power under transmission mode and specific channel frequency. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 300kHz VBW. Measure the bandwidth at the -26dBc levels with respect to the reference level.

4.3.5 TEST RESULTS

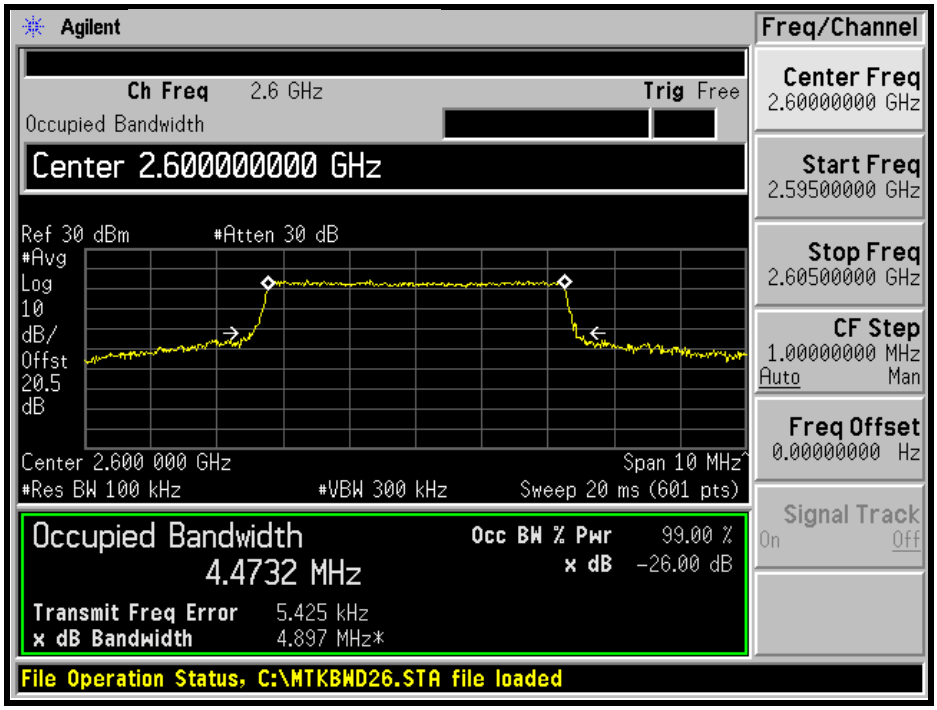
CHANNEL BANDWIDTH: 5MHz

FREQUENCY (MHz)	-26 dBc BANDWIDTH (MHz)
2498.5	4.92
2600	4.89
2687.5	4.84

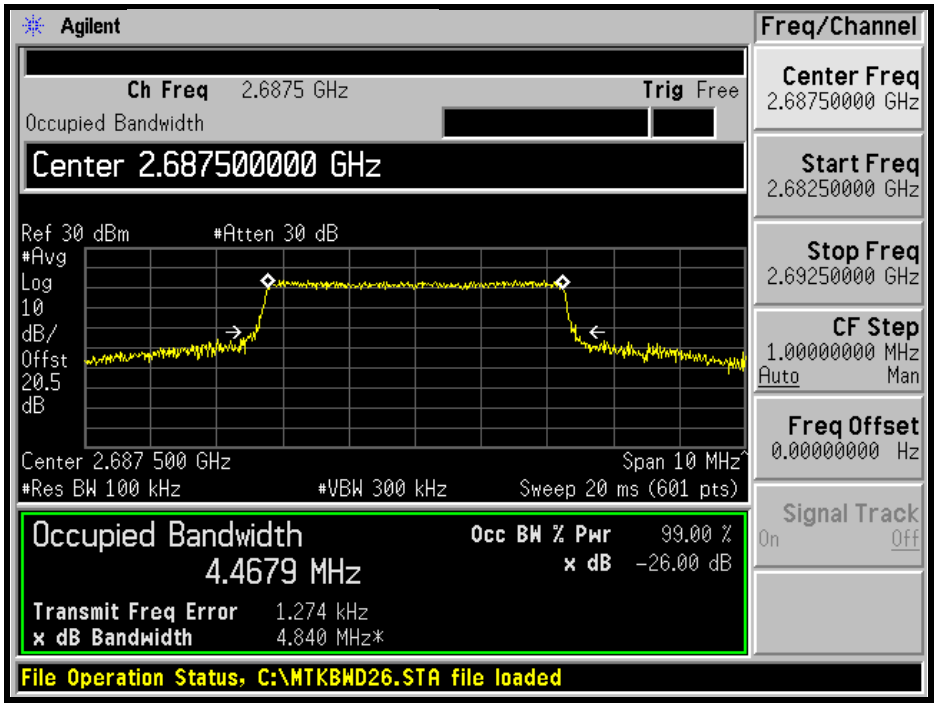
LOW CHANNEL



MIDDLE CHANNEL



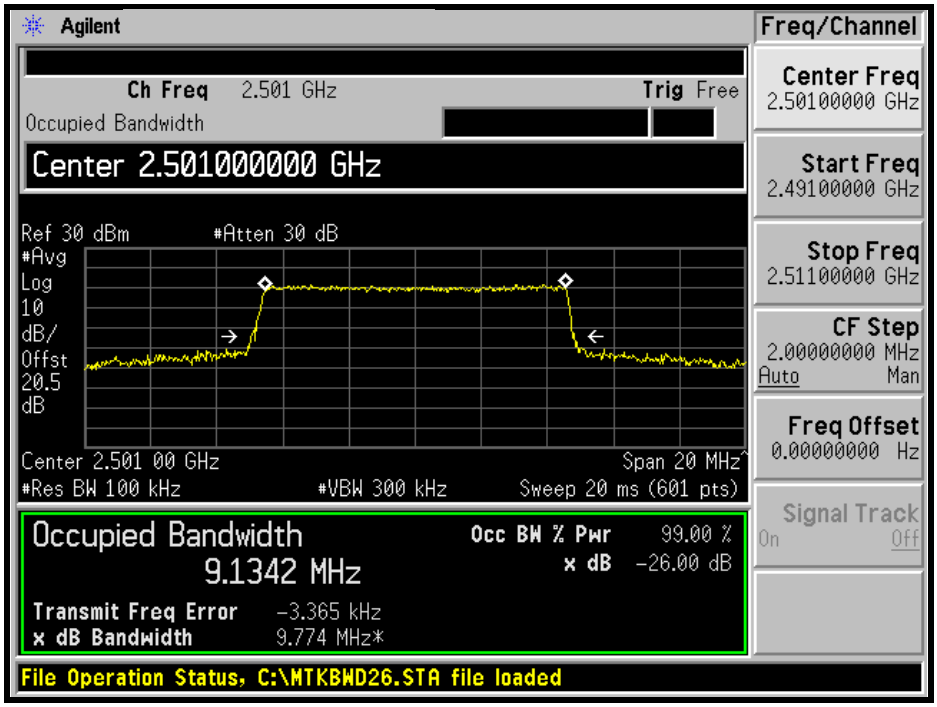
HIGH CHANNEL



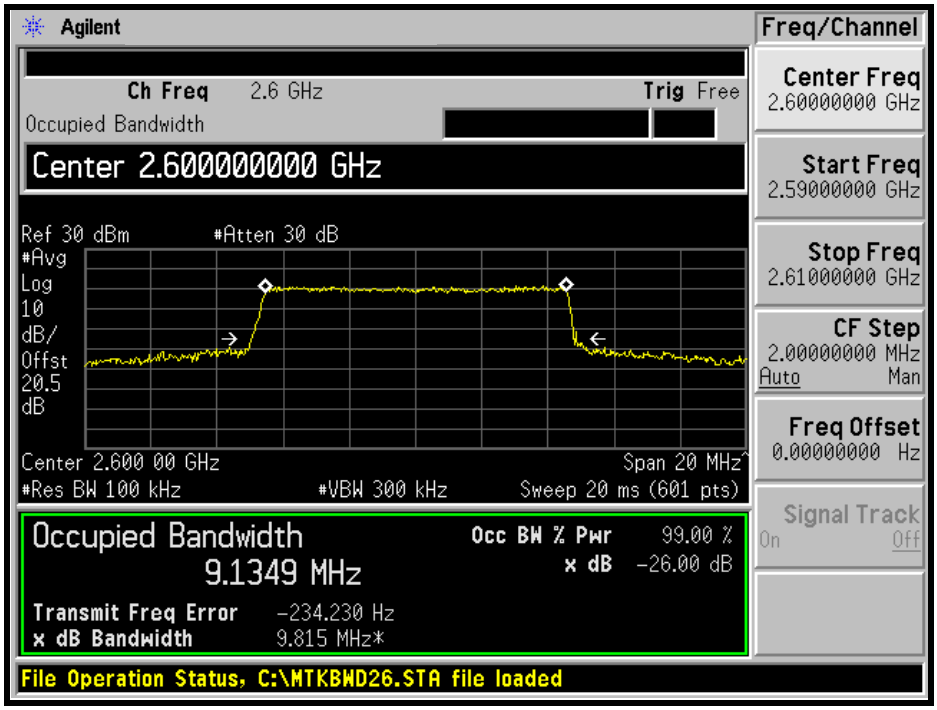
CHANNEL BANDWIDTH: 10MHz

FREQUENCY (MHz)	-26 dBc BANDWIDTH (MHz)
2501	9.77
2600	9.81
2685	9.68

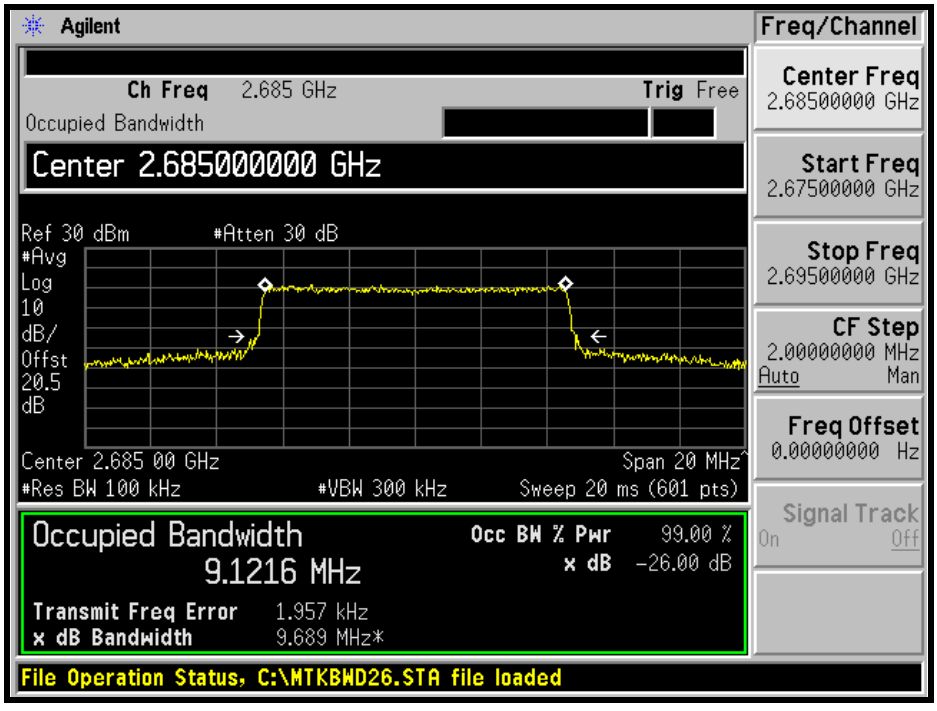
LOW CHANNEL



MIDDLE CHANNEL



HIGH CHANNEL



4.4 CHANNEL EDGE MEASUREMENT

4.4.1 LIMITS OF CHANNEL EDGE MEASUREMENT

According to FCC 27.53(m)(4) 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 and 55 + 10 log (P) dB at 5.5 MHz from the channel edges. 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	May 12, 2010	May 11, 2011
HUBER+SUHNER	SUCOFLEX104	222684/4	Aug. 14, 2010	Aug. 13, 2011
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 160kHz.

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.

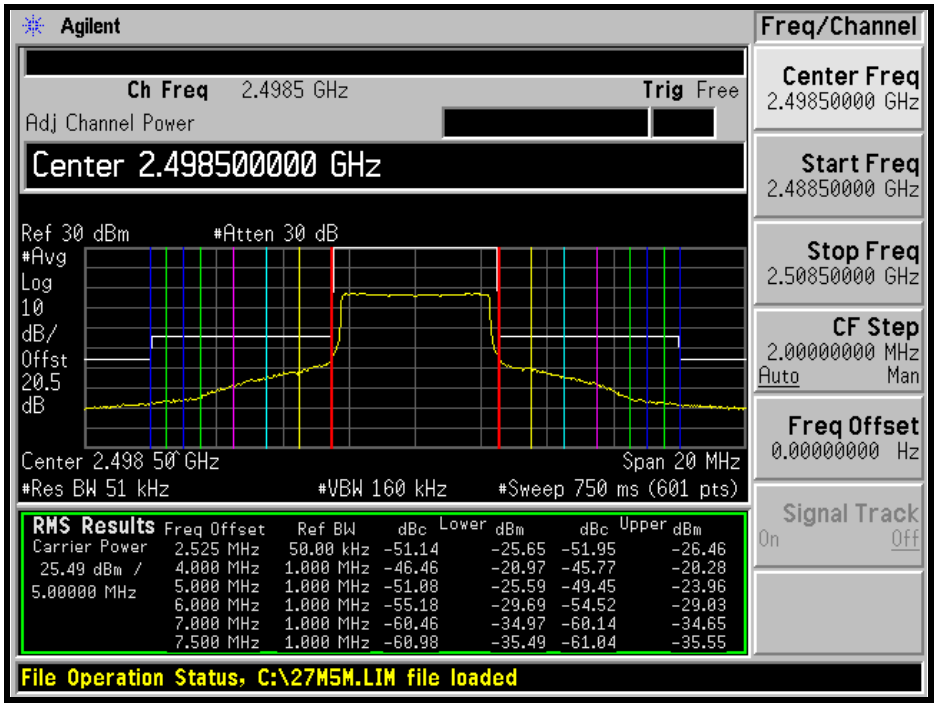
4.4.5 EUT OPERATING CONDITION

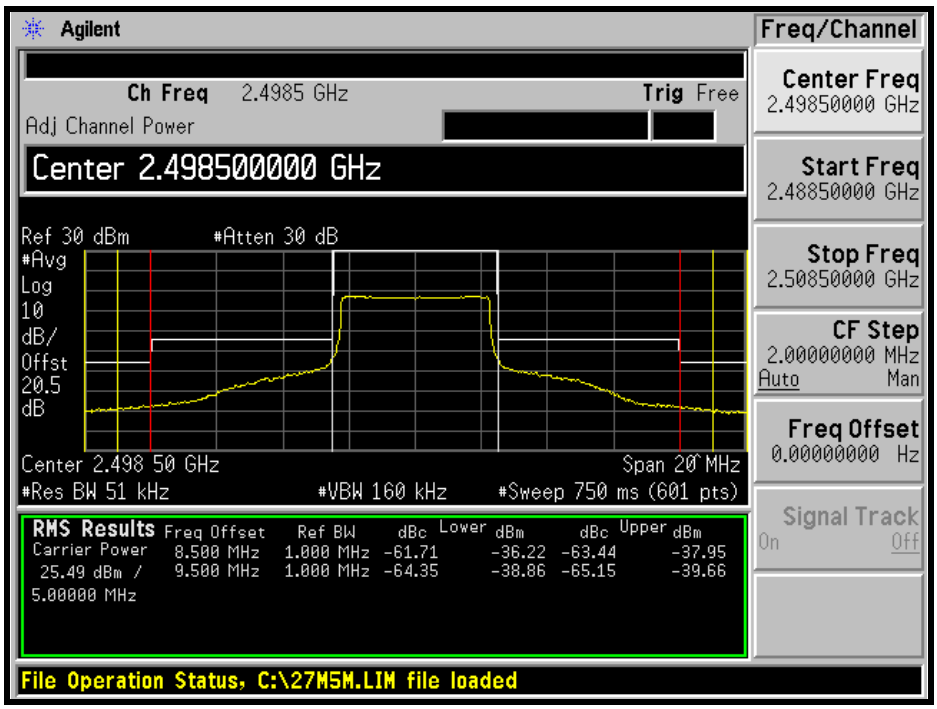
Same as item 4.1.5

4.4.6 TEST RESULTS

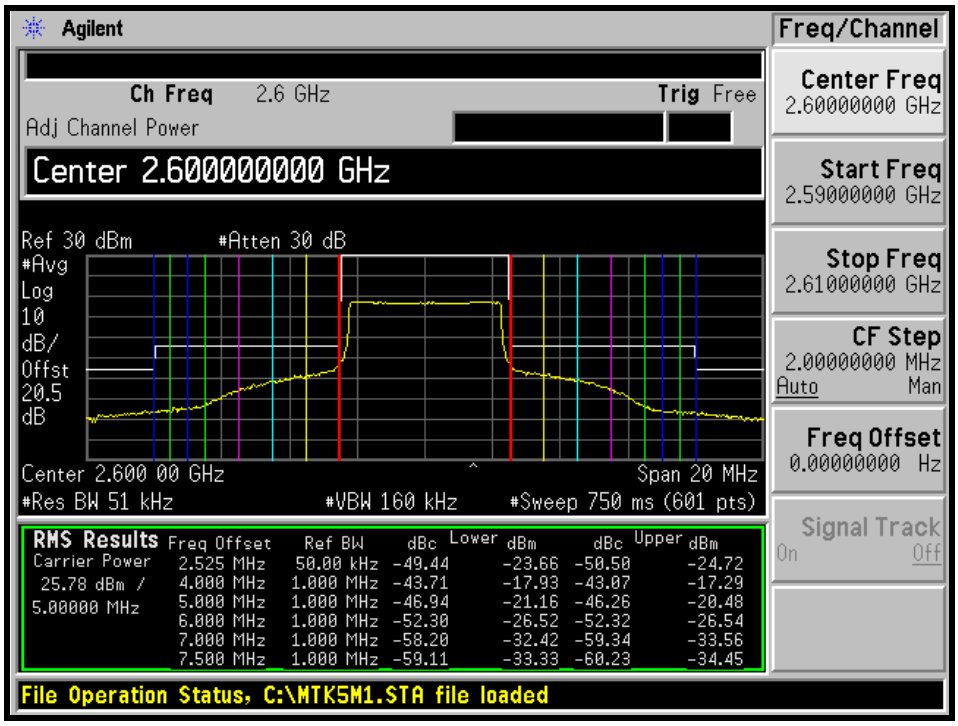
CHANNEL BANDWIDTH: 5MHz

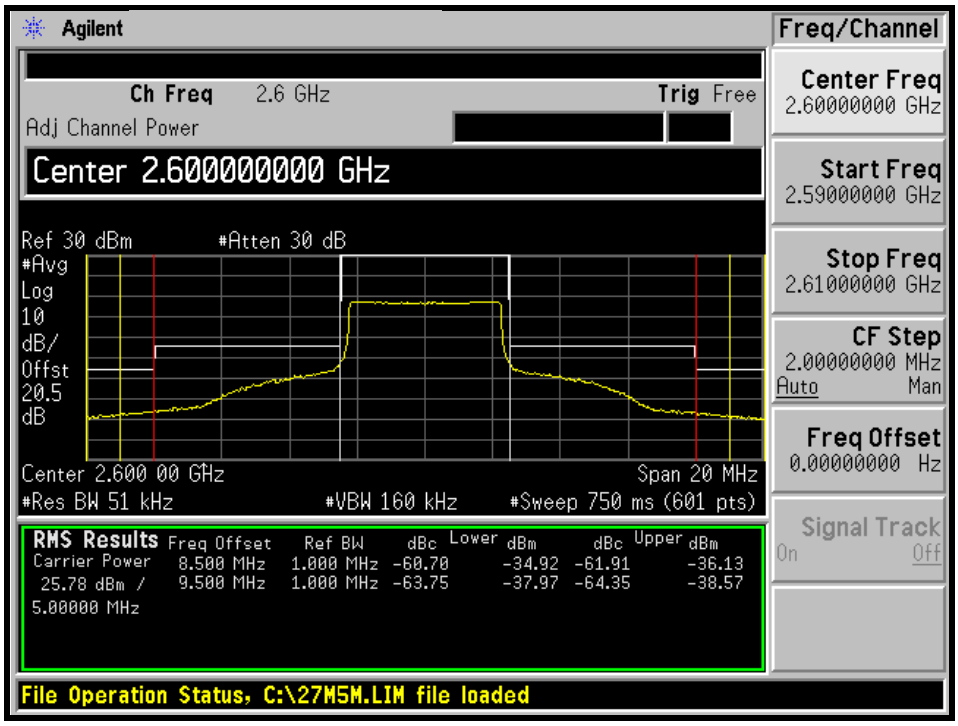
LOW CHANNEL



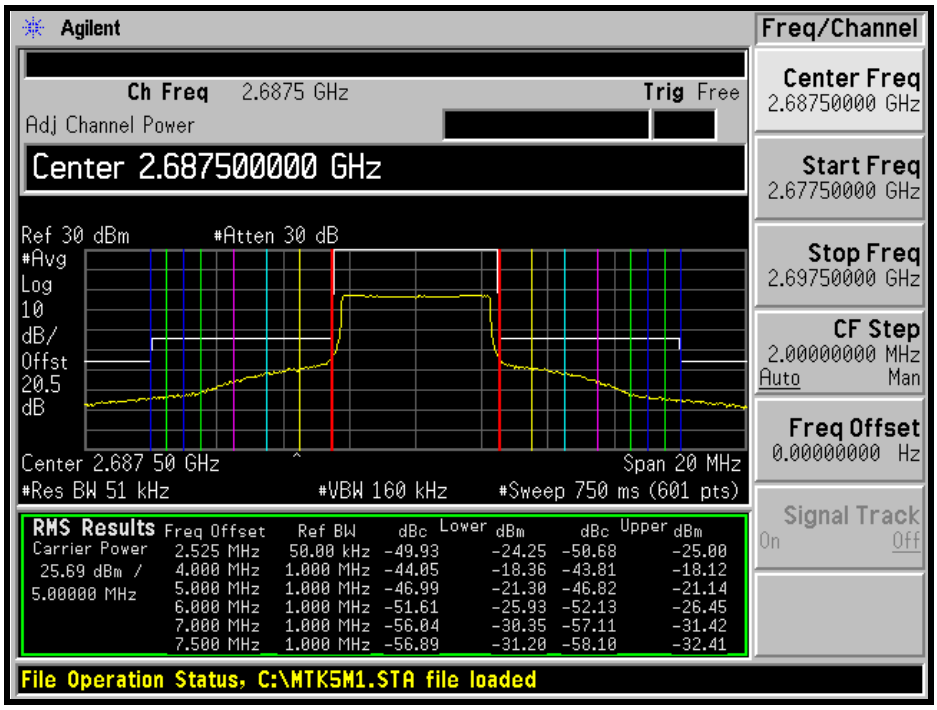


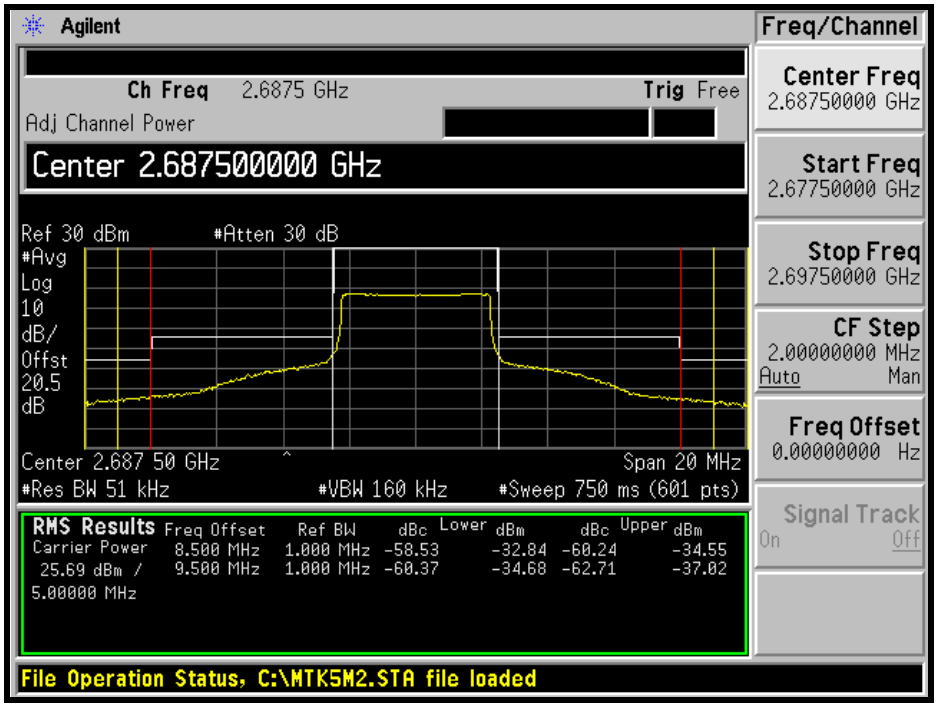
MIDDLE CHANNEL





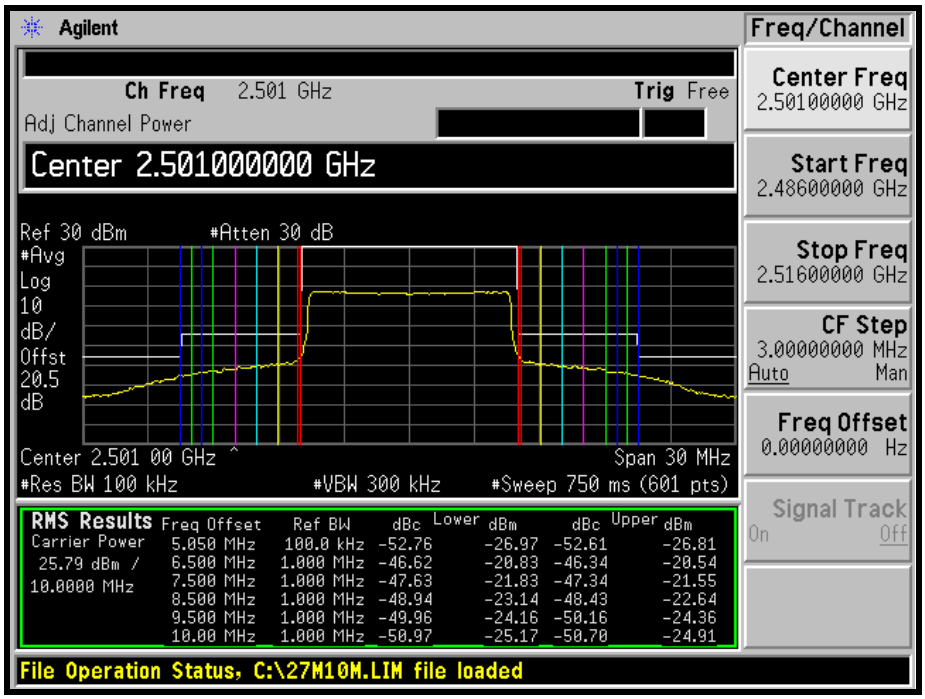
HIGH CHANNEL

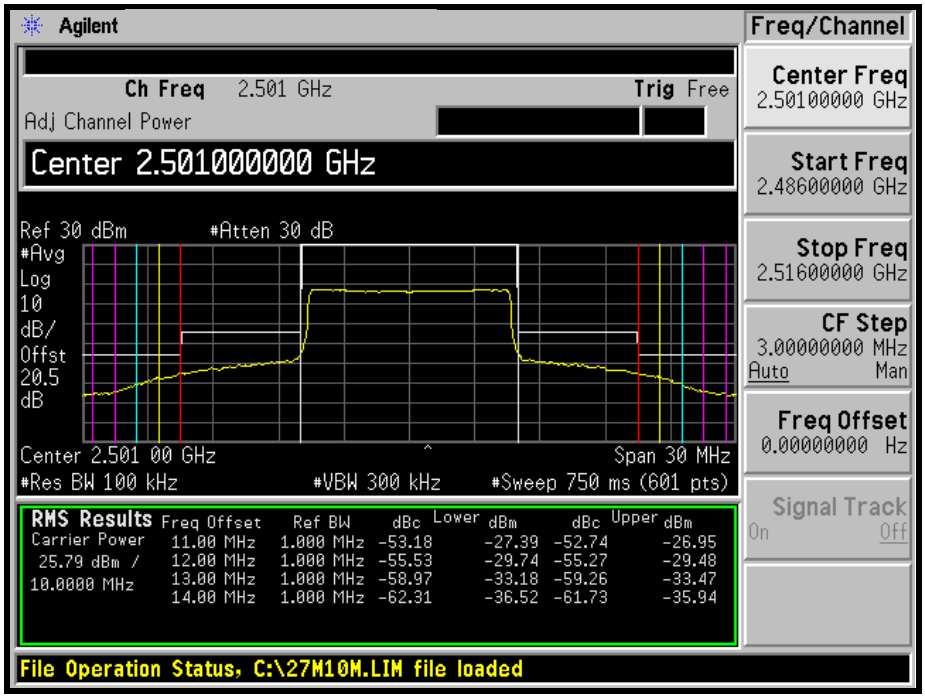




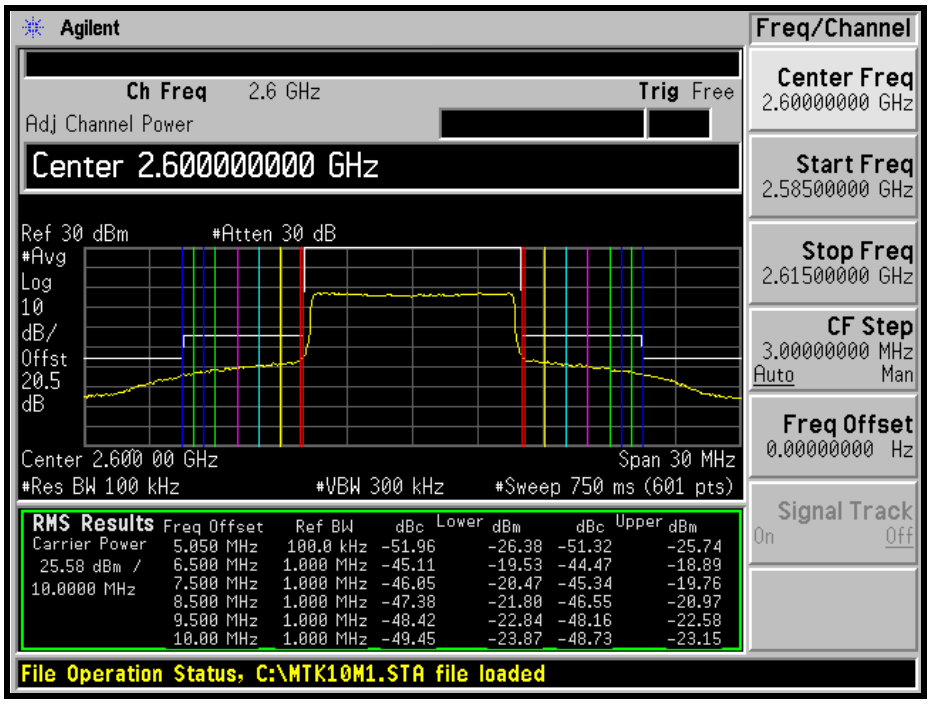
CHANNEL BANDWIDTH: 10MHz

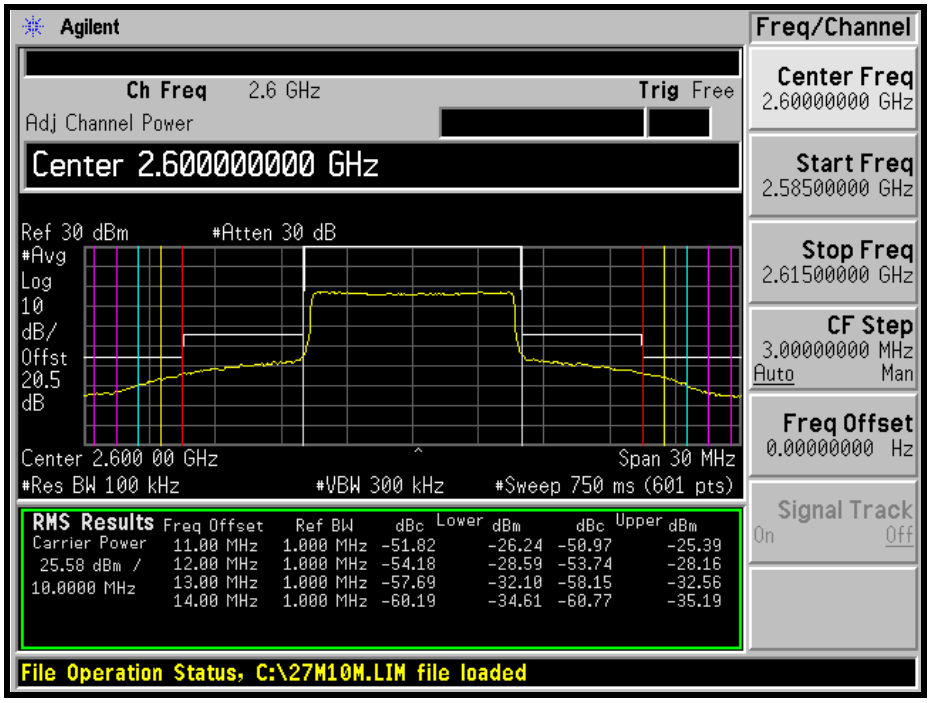
LOW CHANNEL



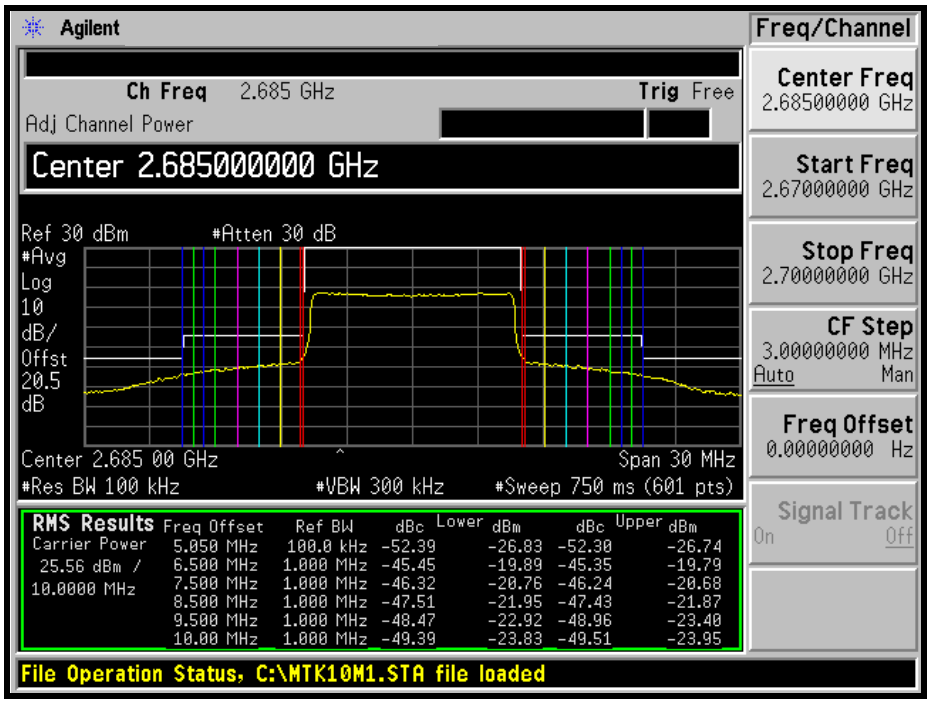


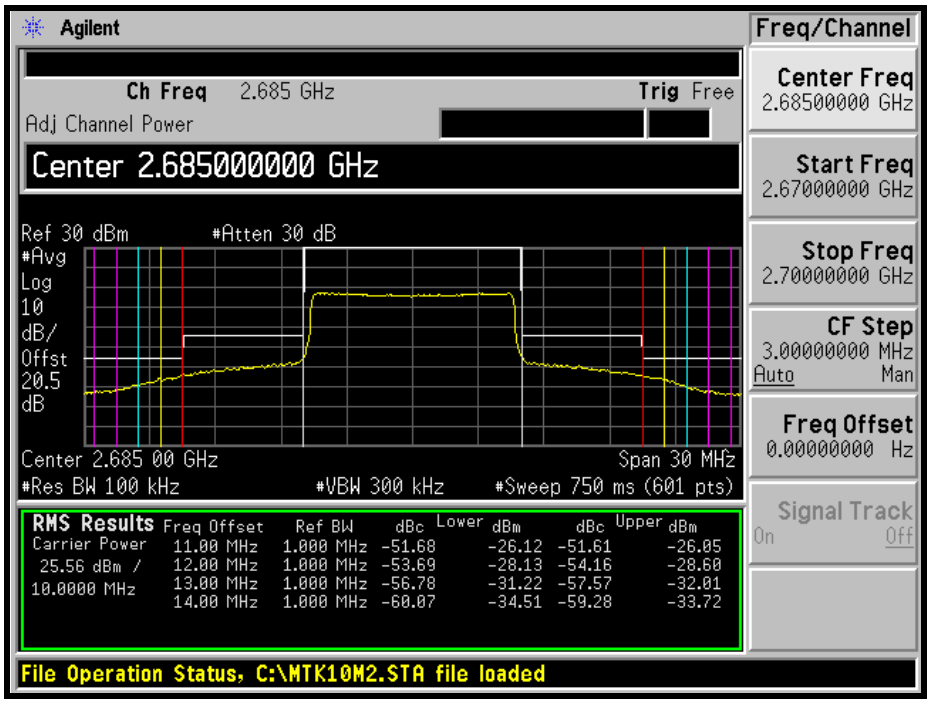
MIDDLE CHANNEL





HIGH CHANNEL





4.5 CONDUCTED SPURIOUS EMISSIONS

4.5.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

In the FCC 27.53(m)(4), 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 and 55 + 10 log (P) dB at 5.5 MHz from the channel edges.

4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Agilent Spectrum Analyzer	E4446A	MY46180622	May. 12, 2010	May. 11, 2011
HUBER+SUHNER	SUCOFLEX104	22238114	July 30, 2010	July 29, 2011
JFW 10dB attenuation	50HF-010-SMA	N/A	N/A	N/A

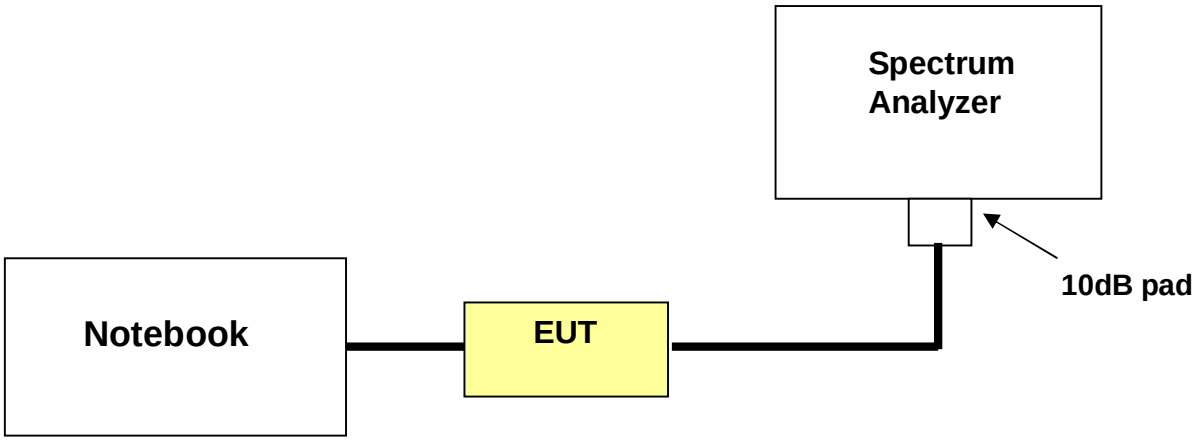
NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.5.3 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 27GHz, it shall be connected to the 10dB pad attenuated the carried frequency. The spectrum set RB = 1MHz, VB = 3MHz.

4.5.4 TEST SETUP



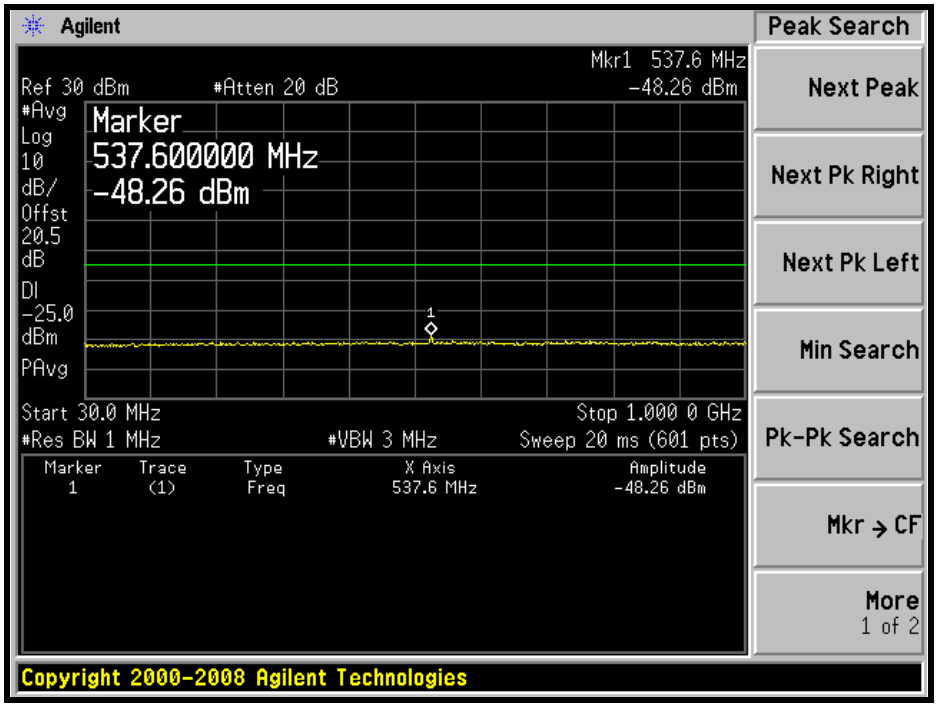
4.5.5 EUT OPERATING CONDITIONS

Same as item 4.1.5

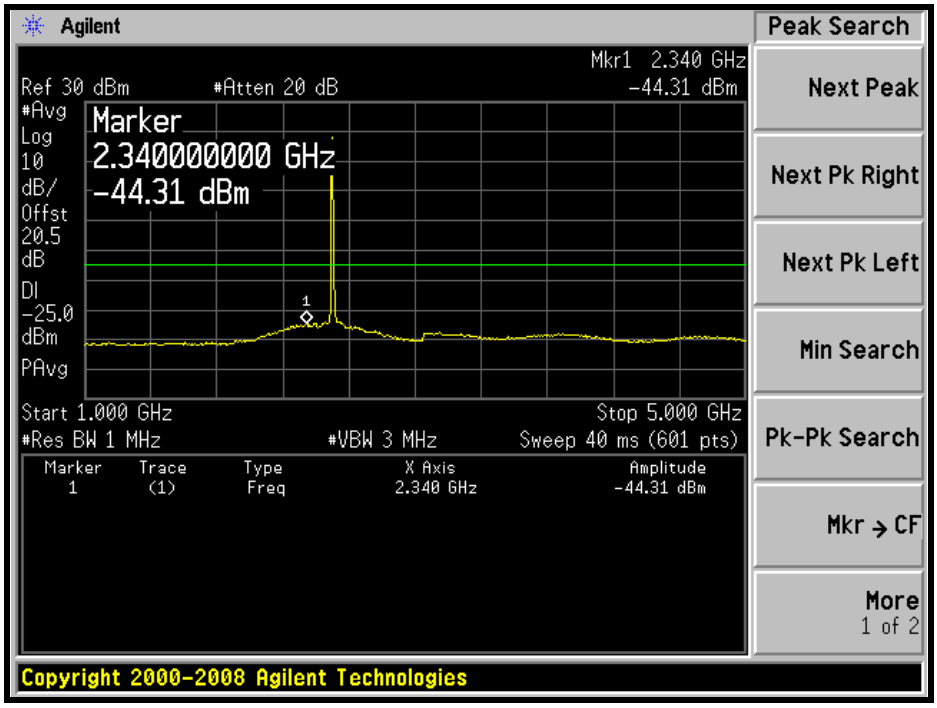
4.5.6 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

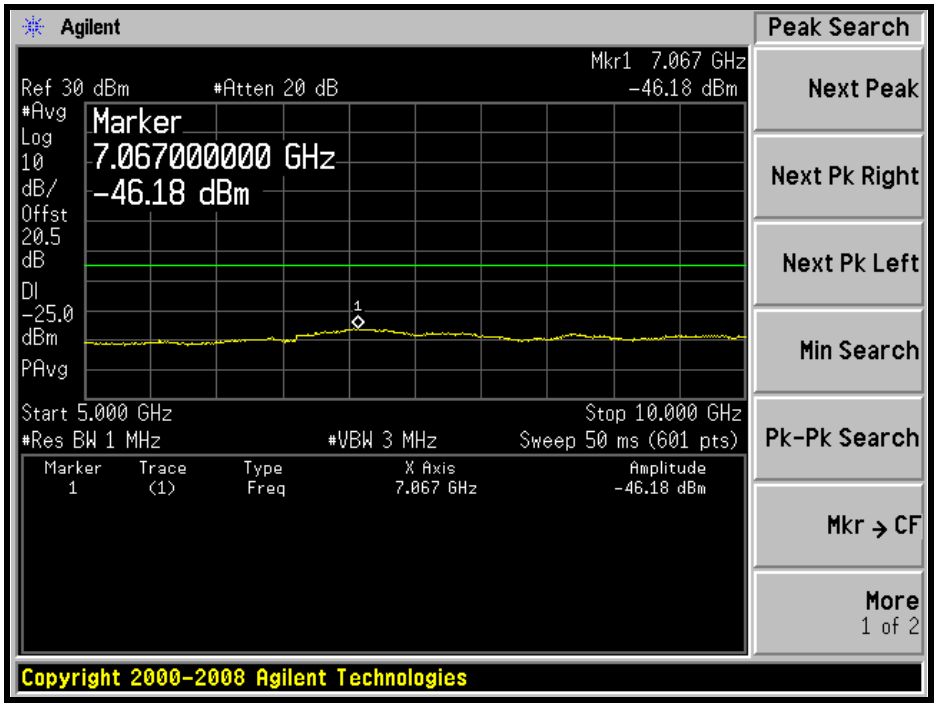
LOW CHANNEL: 30MHz ~ 1GHz:



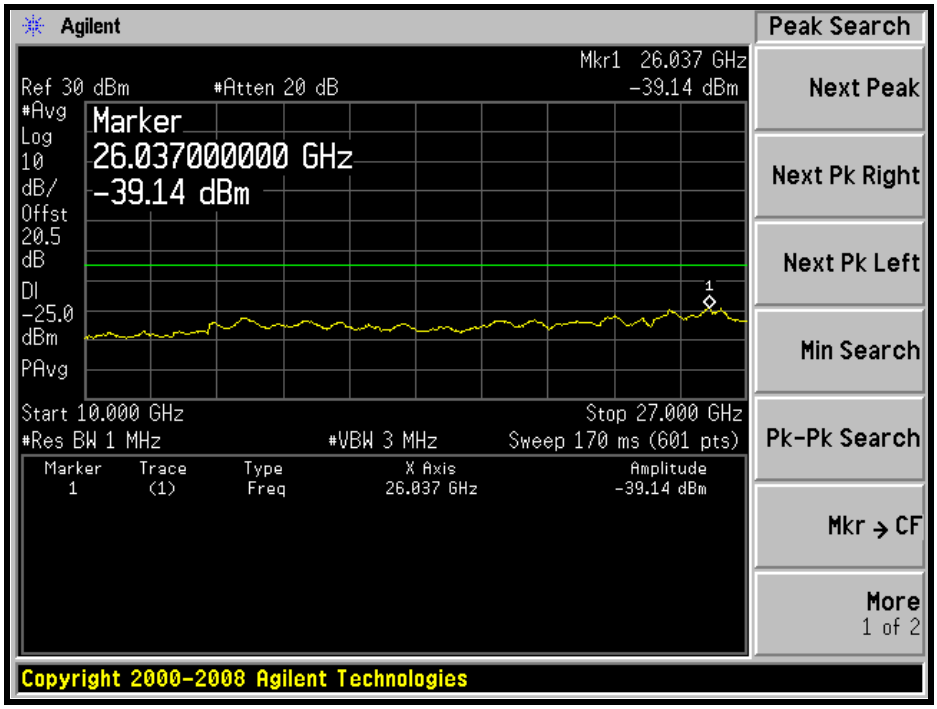
1GHz ~ 5GHz:



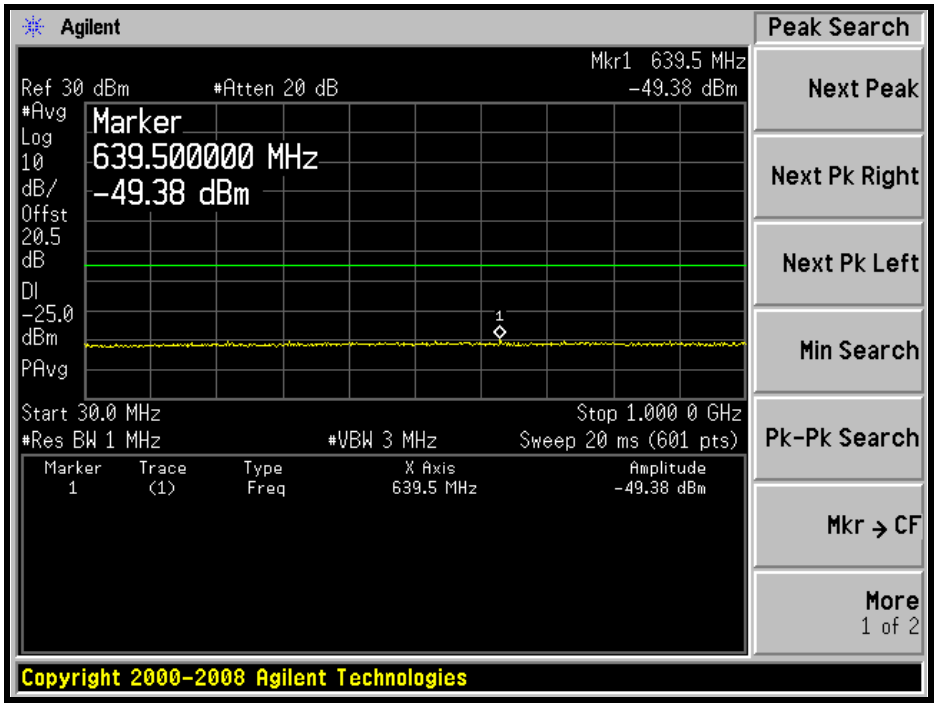
5GHz ~ 10GHz:



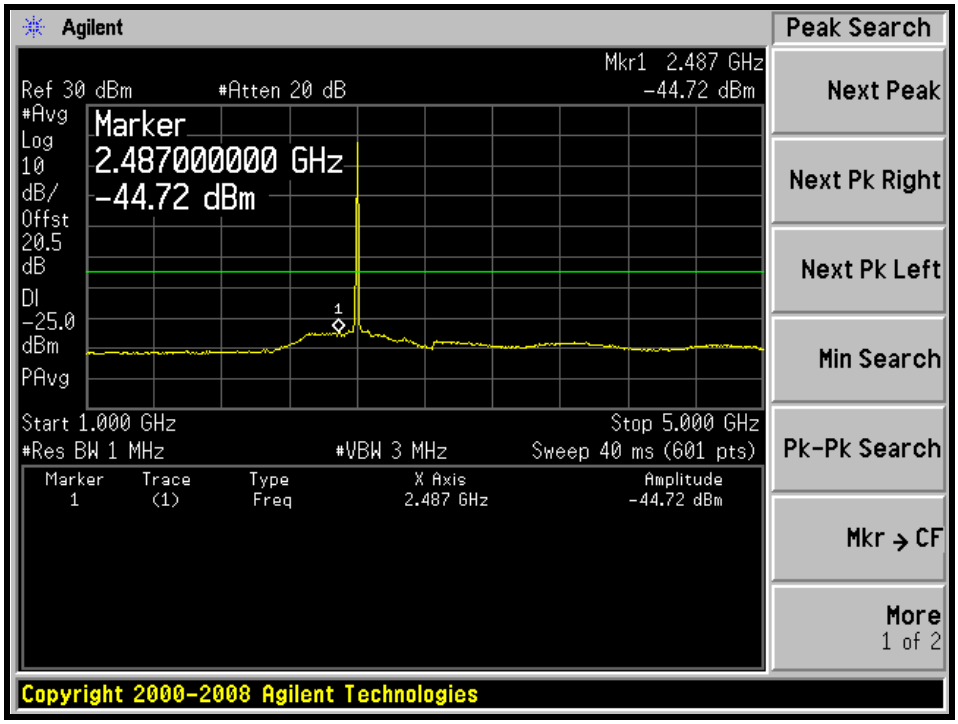
10GHz ~ 27GHz:



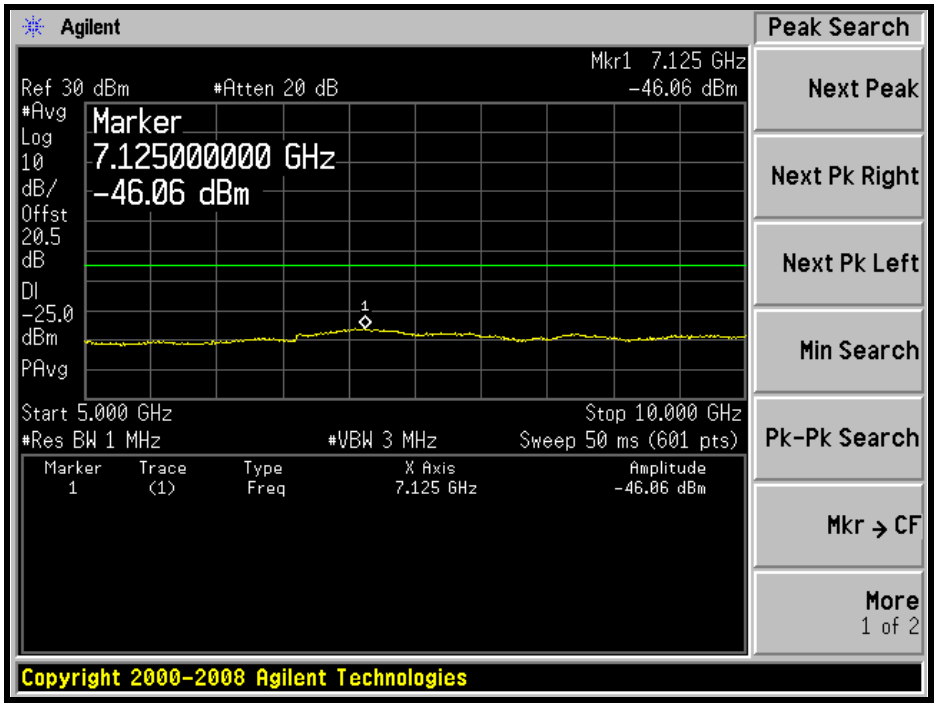
MIDDLE CHANNEL: 30MHz ~ 1GHz:



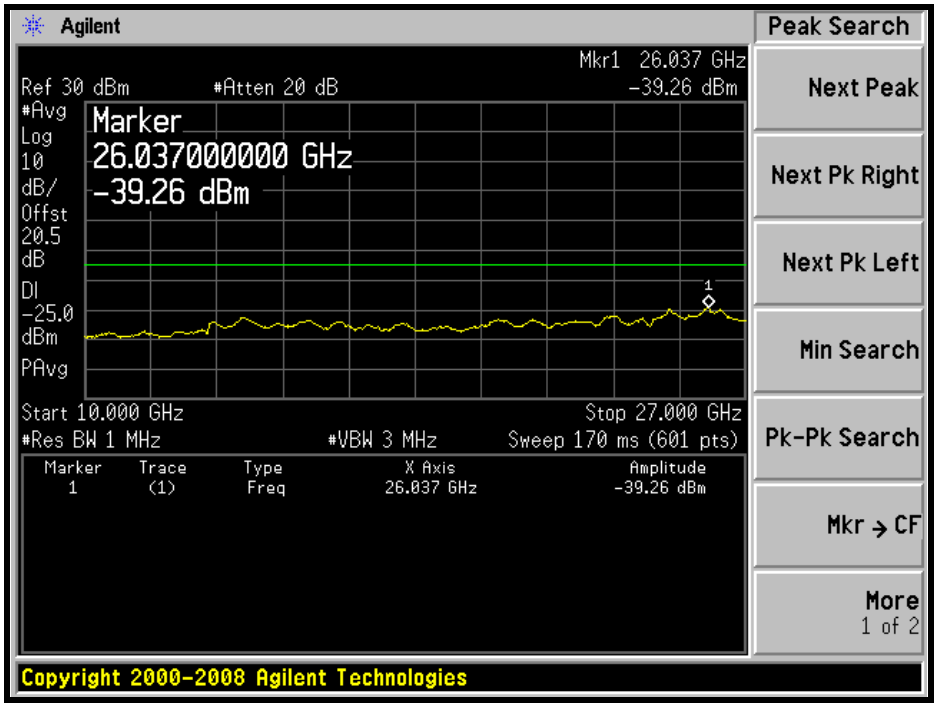
1GHz ~ 5GHz:



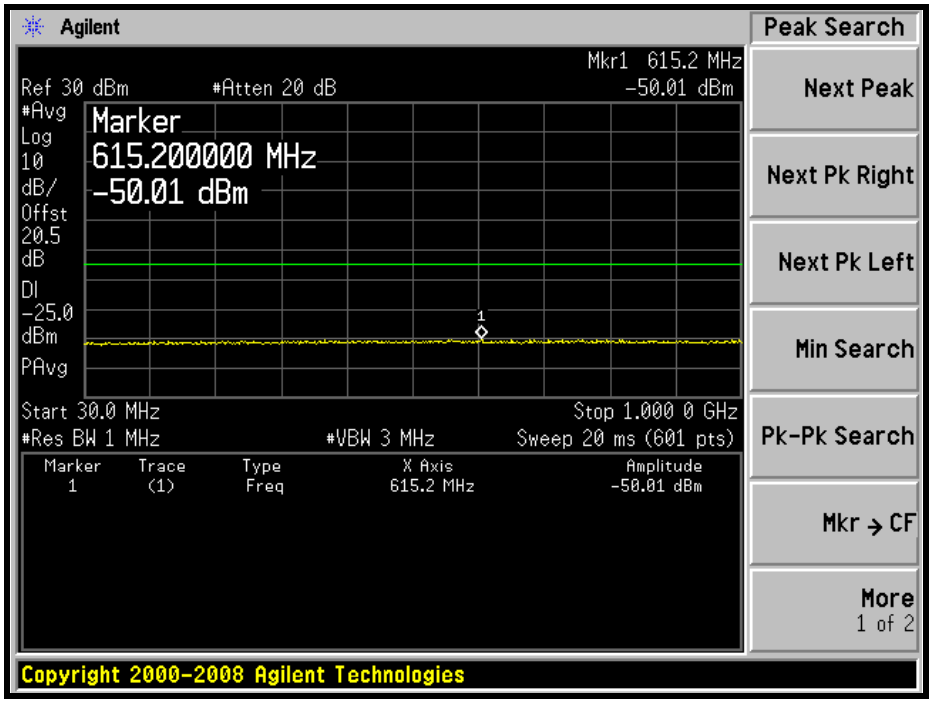
5GHz ~ 10GHz:



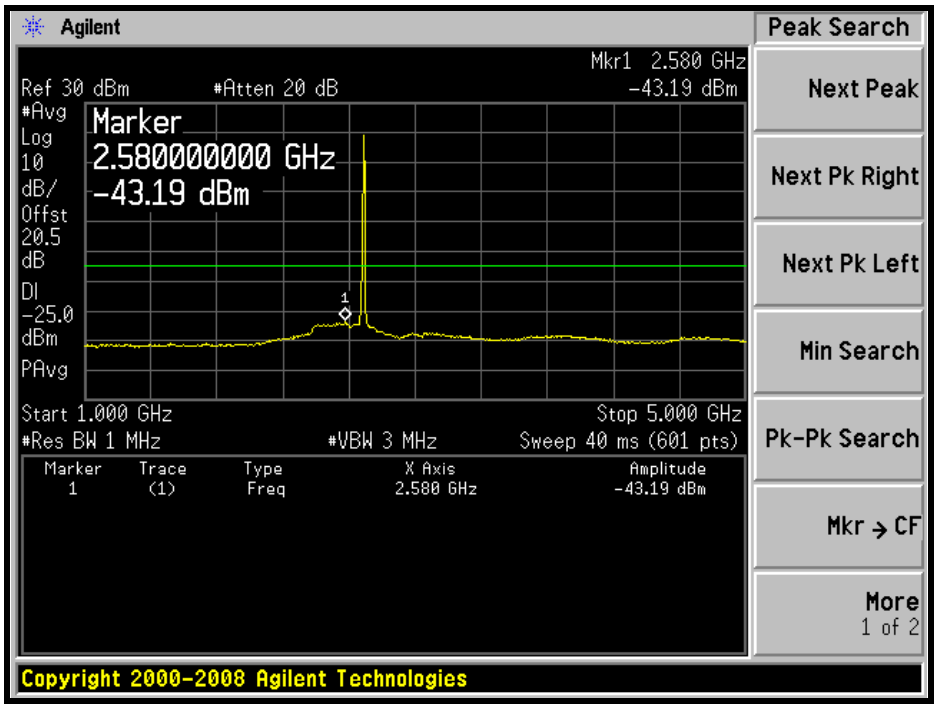
10GHz ~ 27GHz:



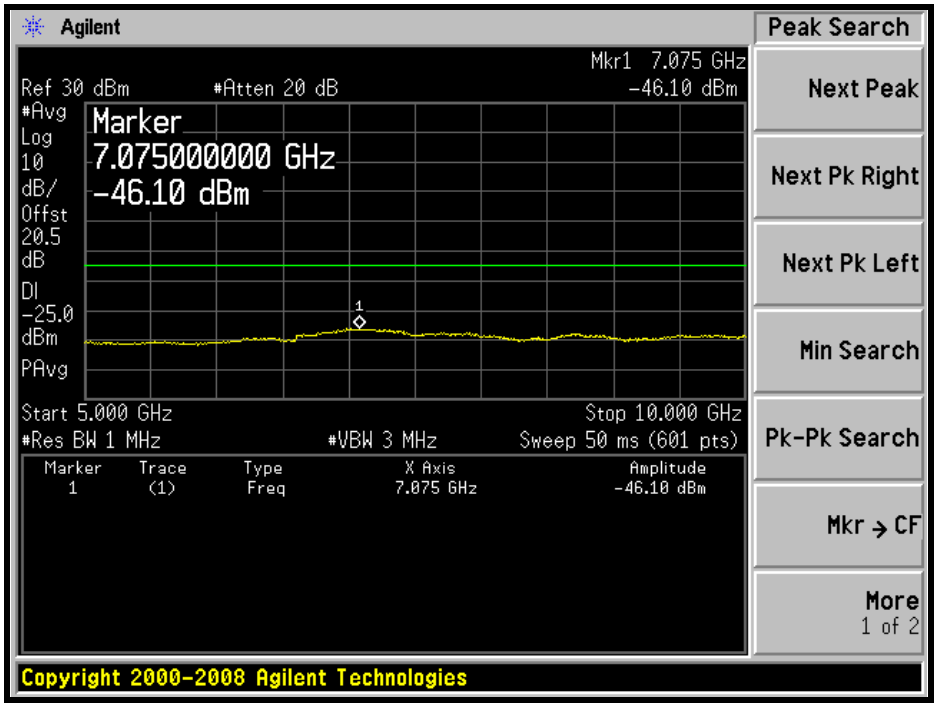
HIGH CHANNEL: 30MHz ~ 1GHz:



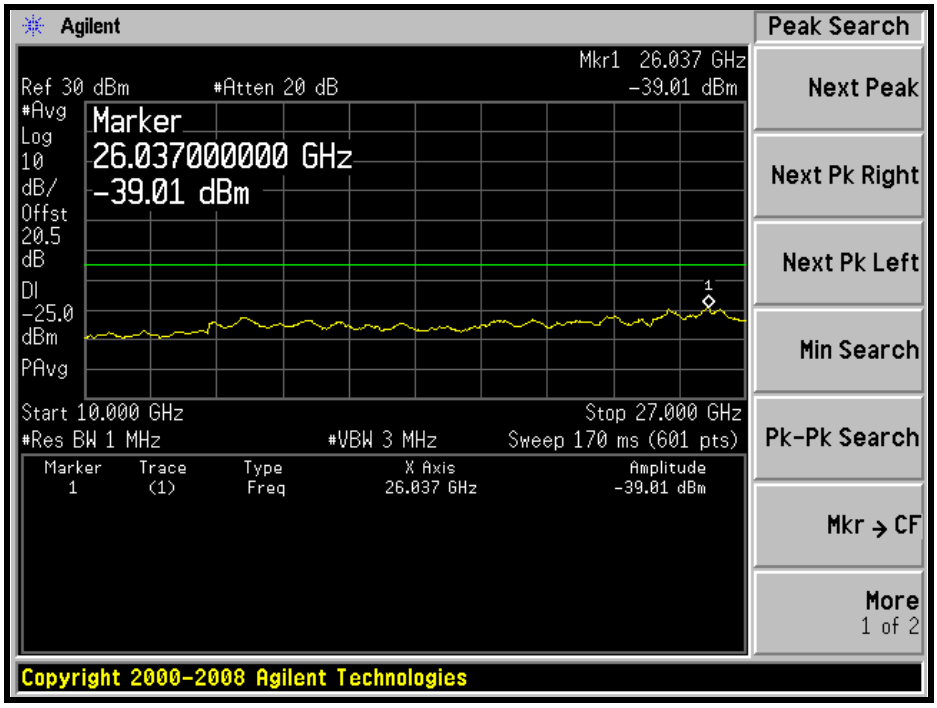
1GHz ~ 5GHz:



5GHz ~ 10GHz:

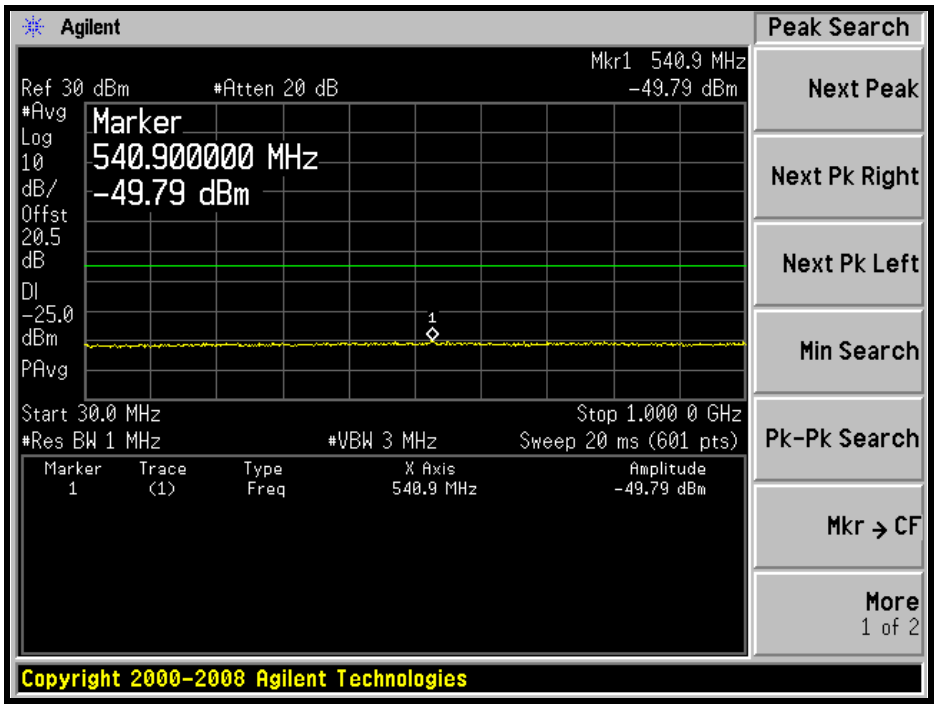


10GHz ~ 27GHz:

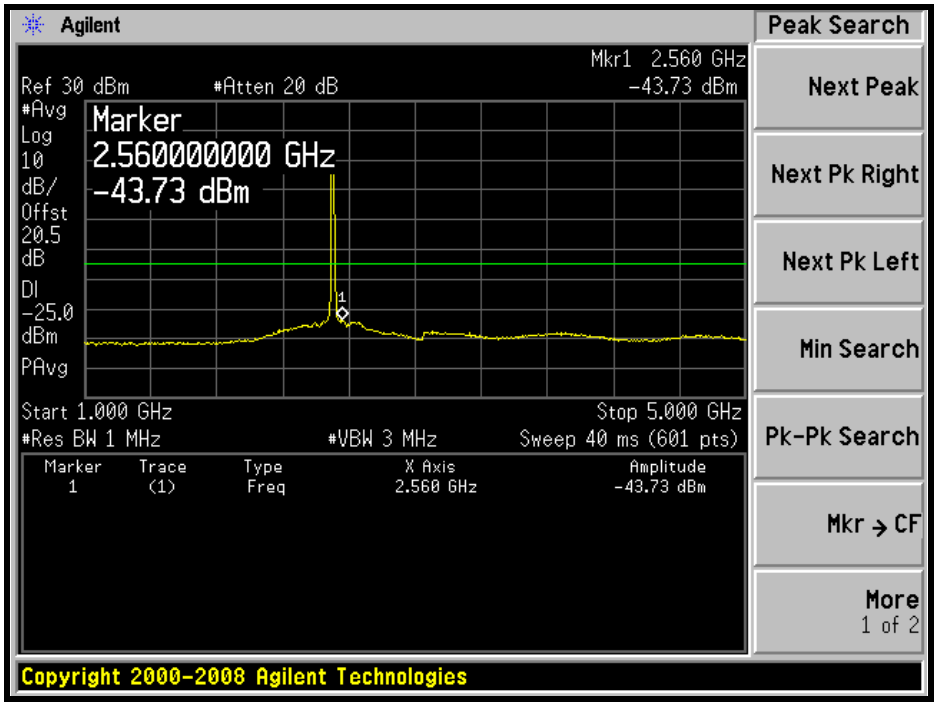


CHANNEL BANDWIDTH: 10MHz

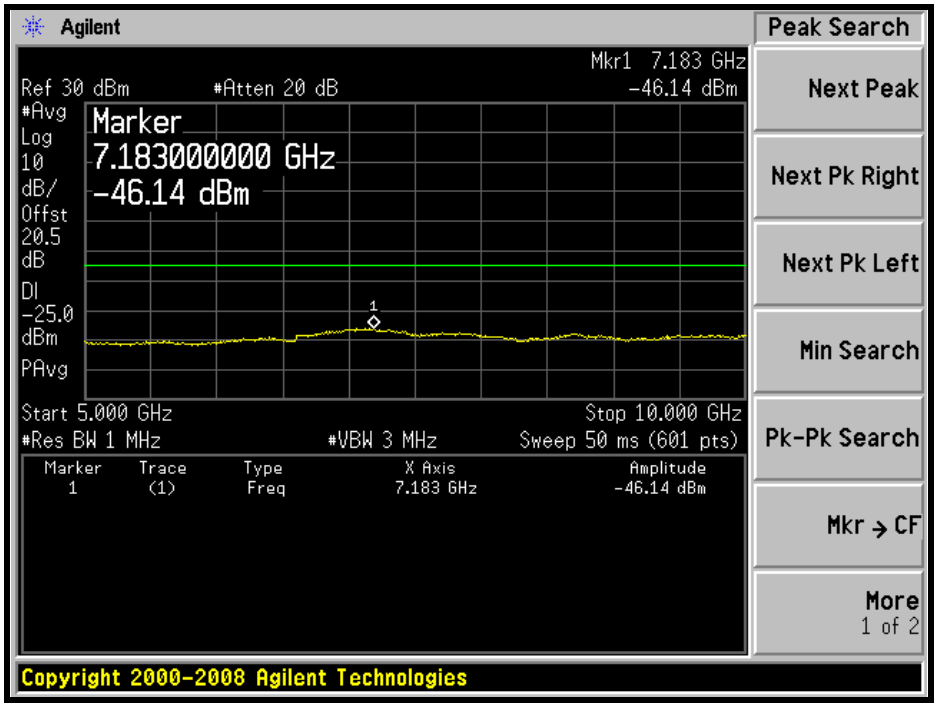
LOW CHANNEL: 30MHz ~ 1GHz:



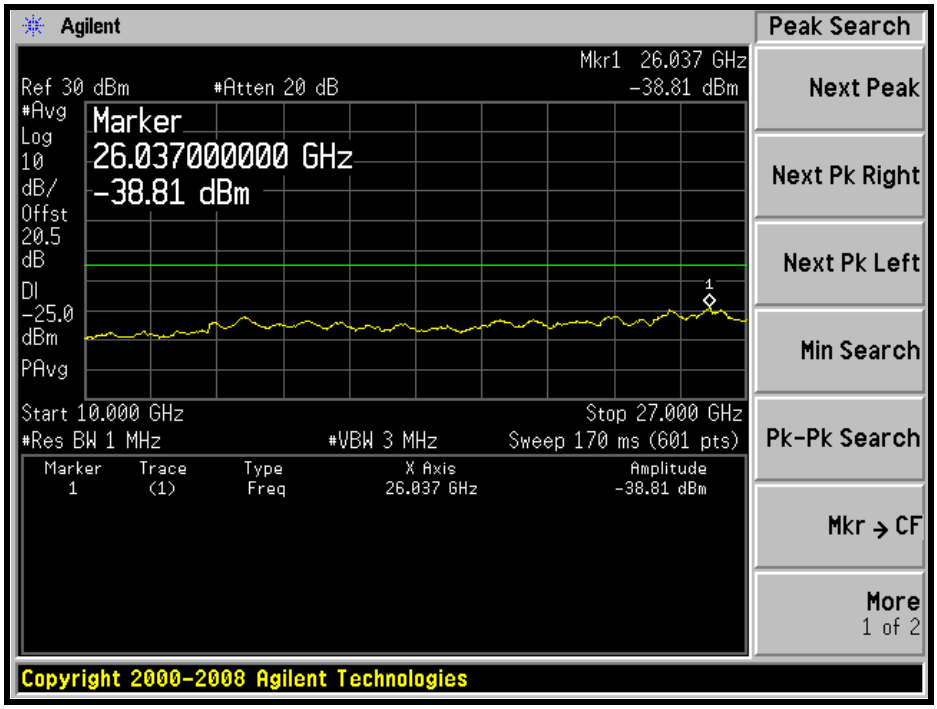
1GHz ~ 5GHz:



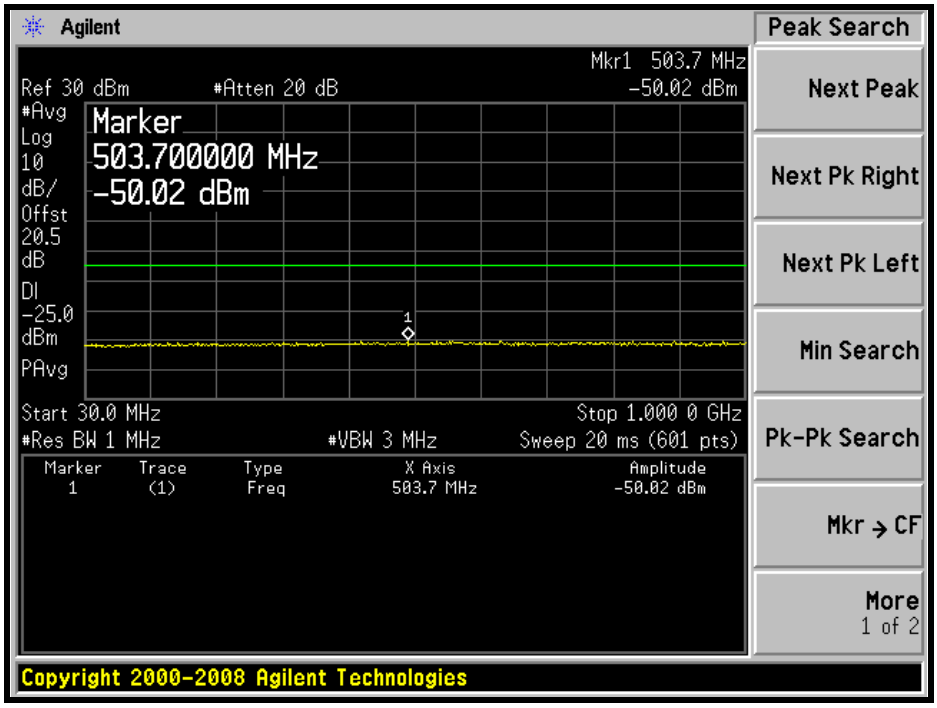
5GHz ~ 10GHz:



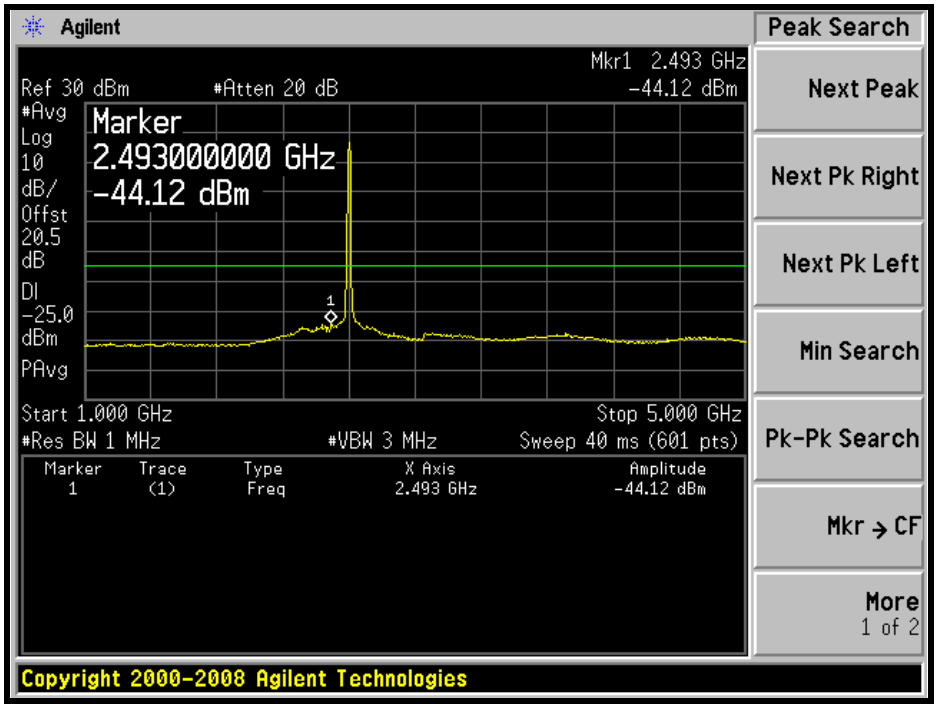
10GHz ~ 27GHz:



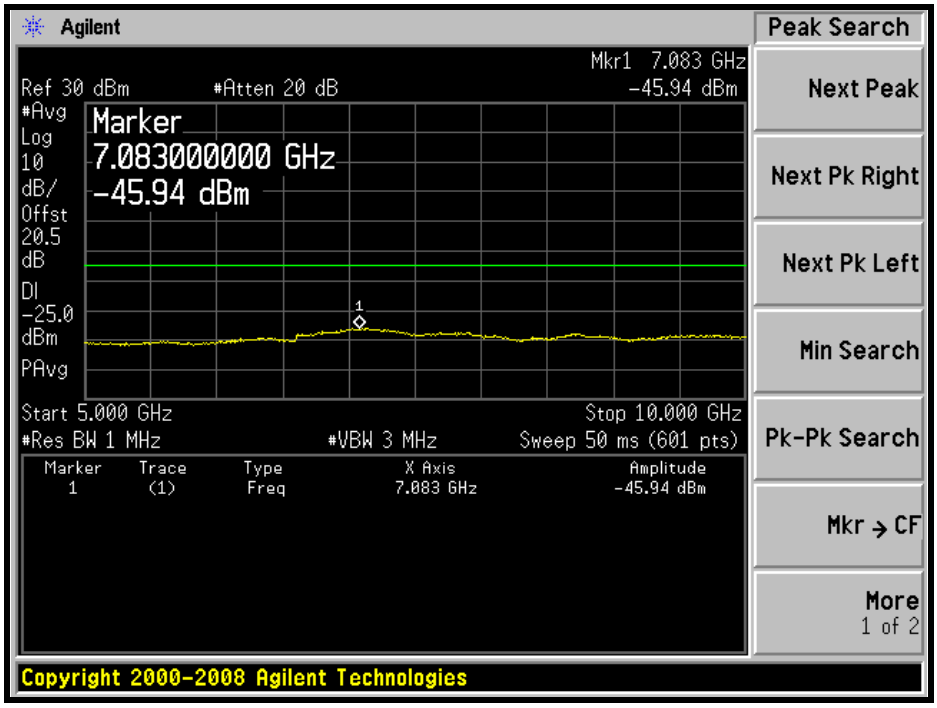
MIDDLE CHANNEL: 30MHz ~ 1GHz:



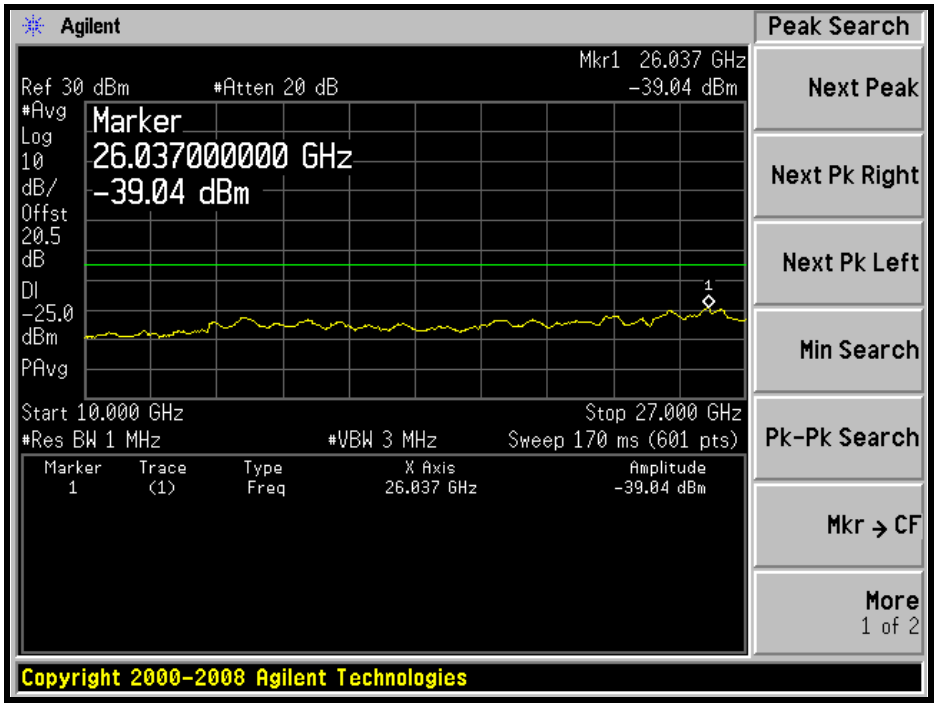
1GHz ~ 5GHz:



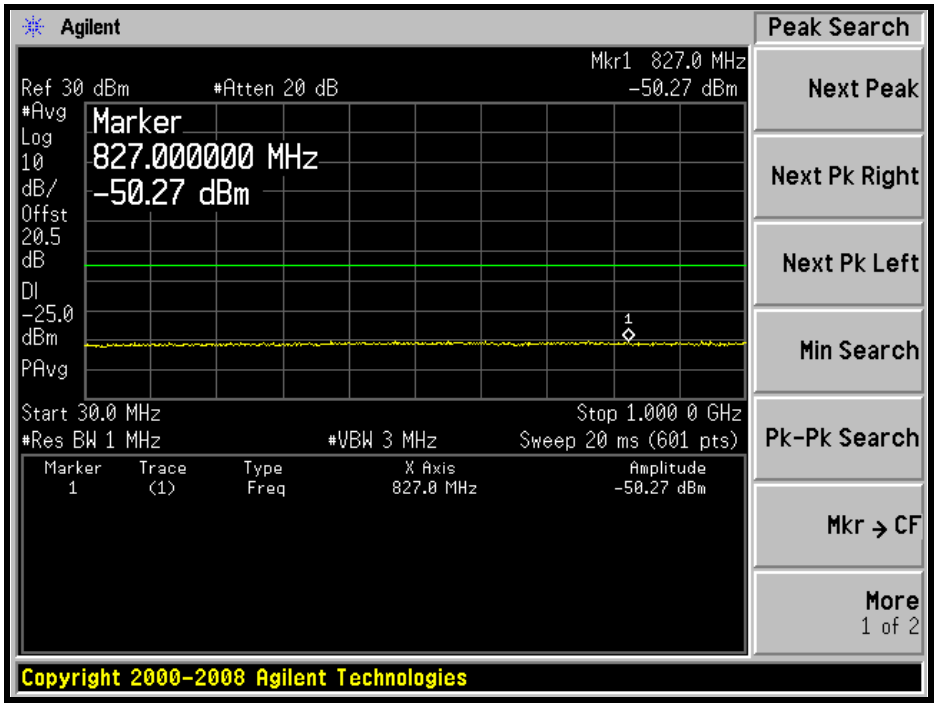
5GHz ~ 10GHz:



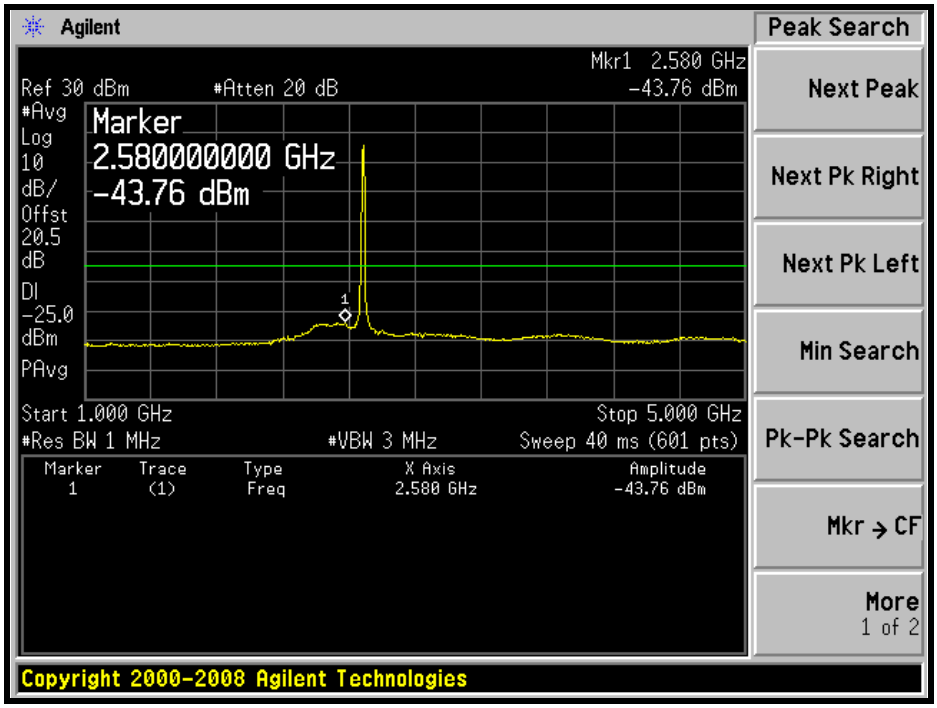
10GHz ~ 27GHz:



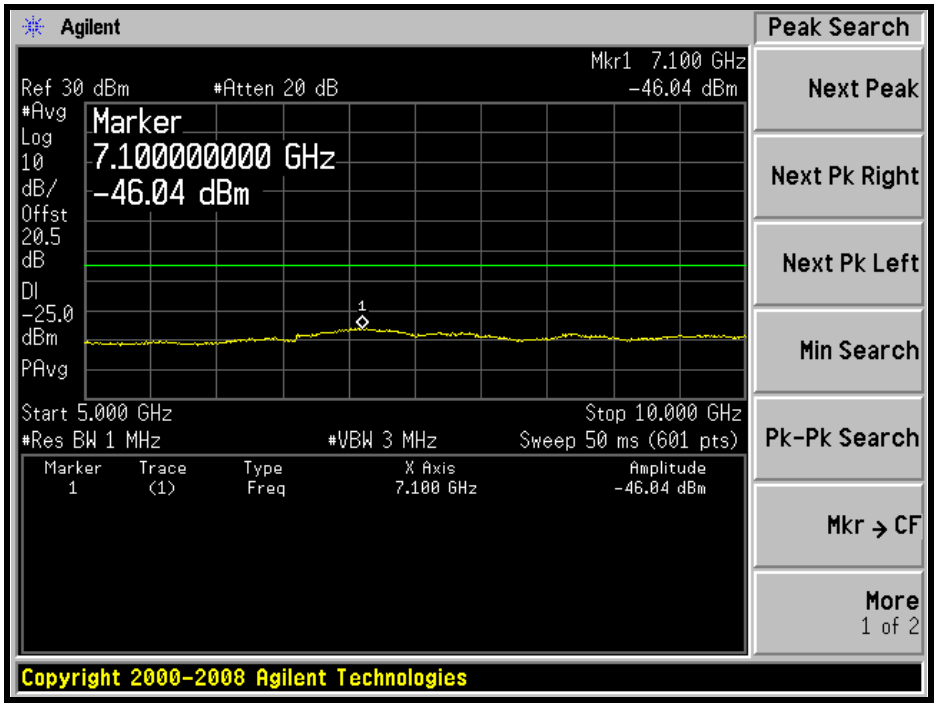
HIGH CHANNEL: 30MHz ~ 1GHz:



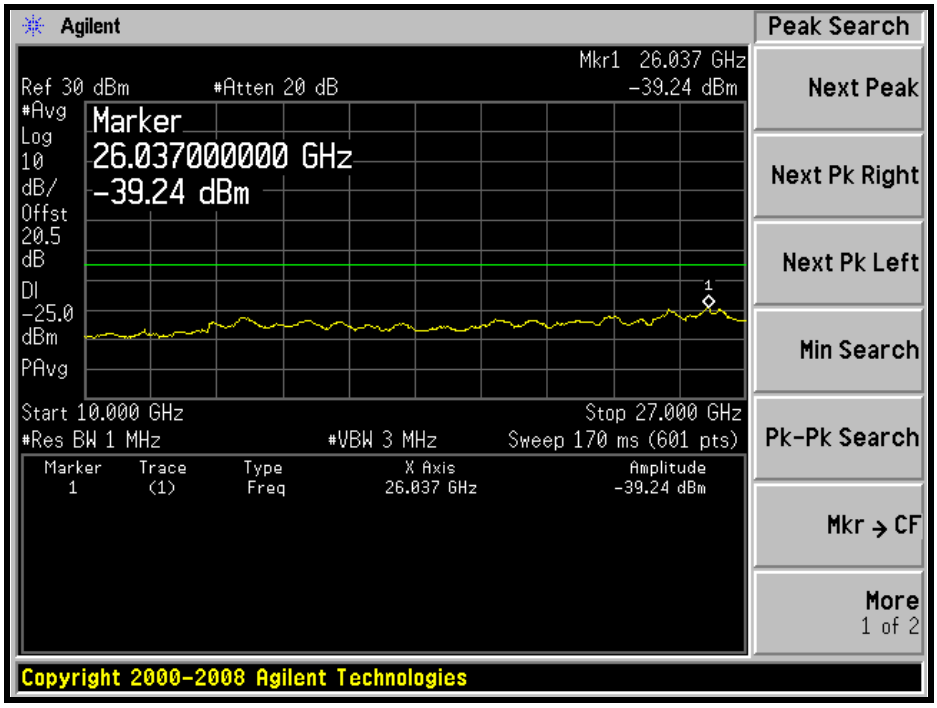
1GHz ~ 5GHz:



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) (4), 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 and 55 + 10 log (P) dB at 5.5 MHz 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. 08, 2010	Dec. 07, 2011
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	May 12 , 2010	May 11 , 2011
HP Pre_Amplifier	8449B	300801923	Nov. 01, 2010	Oct. 31, 2011
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Sep. 03, 2010	Sep. 02, 2011
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	Apr. 28, 2010	Apr. 27, 2011
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 17, 2010	Dec. 16, 2011
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 17, 2011	Jan. 16, 2012
R&S Loop Antenna	HFH2-Z2	100070	Feb. 03, 2010	Feb. 02, 2012
RF Switches	EMH-011	1001	NA	NA
RF CABLE (Chaintek)	Sucoflex 104+ Sucoflex 106	RF104-101+R F106-101	Aug. 24, 2010	Aug. 23, 2011
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, 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

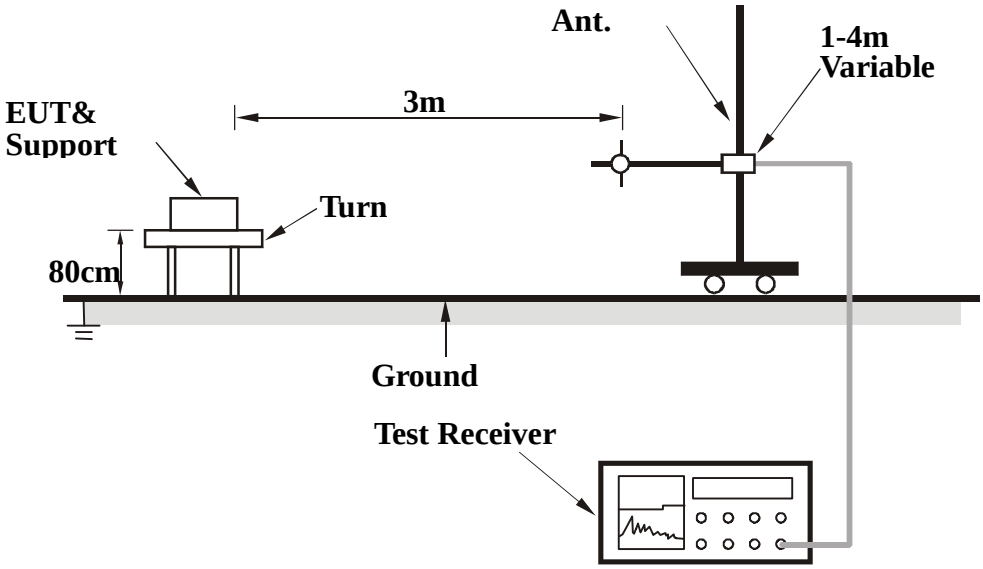
1. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high channel of operational frequency range.)
2. Substitution method is used for E.I.R.P measurement. In the open area test site, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
3. The substitution antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step b. Record the power level of S.G
4. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution antenna.

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

4.6.7 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

MODE	Middle channel	**FREQUENCY RANGE**	Below 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	63	37.50	-25	-46.42	-6.71	-53.13
2	101.9	31.30	-25	-59.27	-0.68	-59.95
3	229.8	29.20	-25	-63.06	0.82	-62.24
4	375	33.30	-25	-62.70	1.61	-61.09
5	500	31.40	-25	-64.12	2.89	-61.23
6	750	33.80	-25	-65.71	3.95	-61.76

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	50.5	39.20	-25	-39.48	-9.90	-49.38
2	62.1	40.40	-25	-42.98	-6.97	-49.95
3	101.9	39.10	-25	-51.47	-0.68	-52.15
4	151.5	28.40	-25	-62.24	-0.96	-63.20
5	229.8	28.30	-25	-63.96	0.82	-63.14
6	500	29.20	-25	-66.32	2.89	-63.43
7	750	31.70	-25	-67.81	3.95	-63.86

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

CHANNEL BANDWIDTH: 10MHz

MODE	Low channel	**FREQUENCY RANGE**	Below 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	63	38.49	-25	-45.43	-6.71	-52.14
2	101.9	32.42	-25	-58.15	-0.68	-58.83
3	229.8	29.86	-25	-62.40	0.82	-61.58
4	375	33.03	-25	-62.97	1.61	-61.36
5	500	31.24	-25	-64.28	2.89	-61.39
6	750	34.43	-25	-65.08	3.95	-61.13

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	50.5	38.62	-25	-40.06	-9.90	-49.96
2	62.1	39.52	-25	-43.86	-6.97	-50.83
3	101.9	39.27	-25	-51.30	-0.68	-51.98
4	151.5	27.83	-25	-62.81	-0.96	-63.77
5	229.8	27.97	-25	-64.29	0.82	-63.47
6	500	30.25	-25	-65.27	2.89	-62.38
7	750	32.07	-25	-67.44	3.95	-63.49

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) (4), 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 and 55 + 10 log (P) dB at 5.5 MHz 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. 08, 2010	Dec. 07, 2011
Agilent PSA Spectrum Analyzer	E4446A	MY46180622	May 12 , 2010	May 11 , 2011
HP Pre_Amplifier	8449B	300801923	Nov. 01, 2010	Oct. 31, 2011
ROHDE & SCHWARZ Test Receiver	ESCS30	847124/029	Sep. 03, 2010	Sep. 02, 2011
SCHWARZBECK TRILOG Broadband Antenna	VULB 9168	138	Apr. 28, 2010	Apr. 27, 2011
Schwarzbeck Horn_Antenna	BBHA9120	D124	Dec. 17, 2010	Dec. 16, 2011
Schwarzbeck Horn_Antenna	BBHA 9170	BBHA9170153	Jan. 17, 2011	Jan. 16, 2012
R&S Loop Antenna	HFH2-Z2	100070	Feb. 03, 2010	Feb. 02, 2012
RF Switches	EMH-011	1001	NA	NA
RF CABLE (Chaintek)	Sucoflex 104+ Sucoflex 106	RF104-101+RF106-101	Aug. 24, 2010	Aug. 23, 2011
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, 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

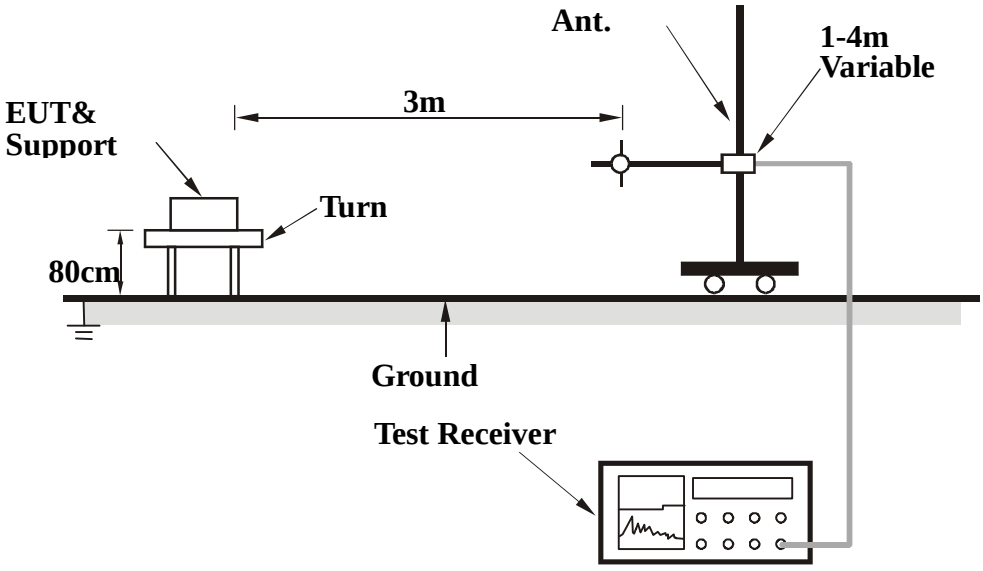
1. The power was measured with Spectrum Analyzer. All measurements were done at 3 channels (low, middle and high channel of operational frequency range.)
2. Substitution method is used for E.I.R.P measurement. In the open area test site, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
3. The substitution antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value “ of step b. Record the power level of S.G
4. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution antenna.

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

4.7.4 DEVIATION FROM TEST STANDARD

No deviation

4.7.5 TEST SETUP



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

4.7.6 EUT OPERATING CONDITIONS

Same as item 4.1.5

4.7.7 TEST RESULTS

CHANNEL BANDWIDTH: 5MHz

MODE	Low channel	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	4997	48.30	-25	-55.93	7.01	-48.92
2	7495.5	50.90	-25	-51.71	4.55	-47.16
3	9994	51.20	-25	-50.36	4.04	-46.32
4	12492.5	54.20	-25	-47.40	4.34	-43.06

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	4997	47.80	-25	-56.43	7.01	-49.42
2	7495.5	52.70	-25	-49.91	4.55	-45.36
3	9994	52.40	-25	-49.16	4.04	-45.12
4	12492.5	52.20	-25	-49.40	4.34	-45.06

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

MODE	Middle channel	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	50.40	-25	-54.13	7.05	-47.08
2	7800	51.80	-25	-50.82	4.29	-46.53
3	10400	51.60	-25	-50.41	3.66	-46.74
4	13000	54.50	-25	-46.33	4.45	-41.88

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	49.70	-25	-54.83	7.05	-47.78
2	7800	54.40	-25	-48.22	4.29	-43.93
3	10400	53.40	-25	-48.61	3.66	-44.94
4	13000	53.00	-25	-47.83	4.45	-43.38

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

MODE	High channel	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	50.70	-25	-54.09	7.09	-47.00
2	8062.5	53.90	-25	-48.72	4.13	-44.59
3	10750	52.50	-25	-49.34	3.33	-46.00
4	13437.5	56.50	-25	-43.72	3.41	-40.31

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	51.40	-25	-53.39	7.09	-46.30
2	8062.5	56.10	-25	-46.52	4.13	-42.39
3	10750	54.10	-25	-47.74	3.33	-44.40
4	13437.5	53.60	-25	-46.62	3.41	-43.21

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

CHANNEL BANDWIDTH: 10MHz

MODE	Low channel	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	46.20	-25	-58.03	7.01	-51.03
2	7503	49.20	-25	-53.42	4.54	-48.88
3	10004	53.30	-25	-48.26	4.03	-44.23
4	12505	52.50	-25	-49.10	4.34	-44.76

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	43.90	-25	-60.33	7.01	-53.33
2	7503	50.10	-25	-52.52	4.54	-47.98
3	10004	51.10	-25	-50.46	4.03	-46.43
4	12505	52.10	-25	-49.50	4.34	-45.16

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

MODE	Middle channel	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	46.30	-25	-58.23	7.05	-51.18
2	7800	49.10	-25	-53.52	4.29	-49.23
3	10400	54.30	-25	-47.71	3.66	-44.04
4	13000	54.30	-25	-46.53	4.45	-42.08

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	43.80	-25	-60.73	7.05	-53.68
2	7800	50.70	-25	-51.92	4.29	-47.63
3	10400	51.00	-25	-51.01	3.66	-47.34
4	13000	53.00	-25	-47.83	4.45	-43.38

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

MODE	High channel	**FREQUENCY RANGE**	Above 1000MHz
INPUT POWER	120Vac, 60Hz	**ENVIRONMENTAL CONDITIONS**	20deg°C, 60%RH 1025hPa
TESTED BY	Kent Liu		

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	48.30	-25	-56.48	7.09	-49.39
2	8055	50.40	-25	-52.22	4.13	-48.09
3	10740	55.00	-25	-46.85	3.34	-43.51
4	13425	54.60	-25	-45.64	3.44	-42.20

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	44.60	-25	-60.18	7.09	-53.09
2	8055	50.30	-25	-52.32	4.13	-48.19
3	10740	52.50	-25	-49.35	3.34	-46.01
4	13425	53.20	-25	-47.04	3.44	-43.60

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

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

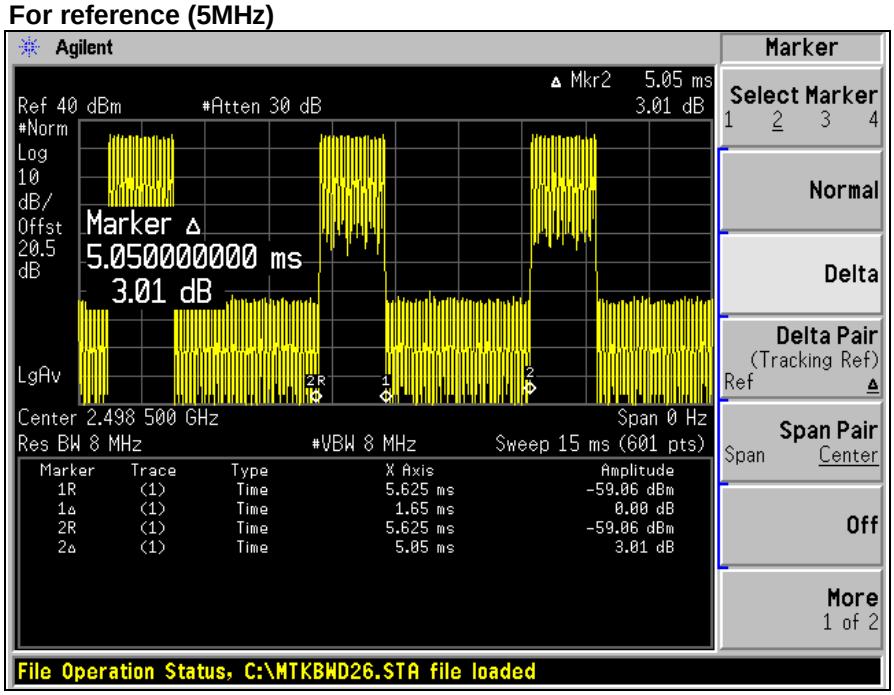
Hwa Ya EMC/RF/Safety/Telecom Lab:
Tel: 886-3-3183232
Fax: 886-3-3185050

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.

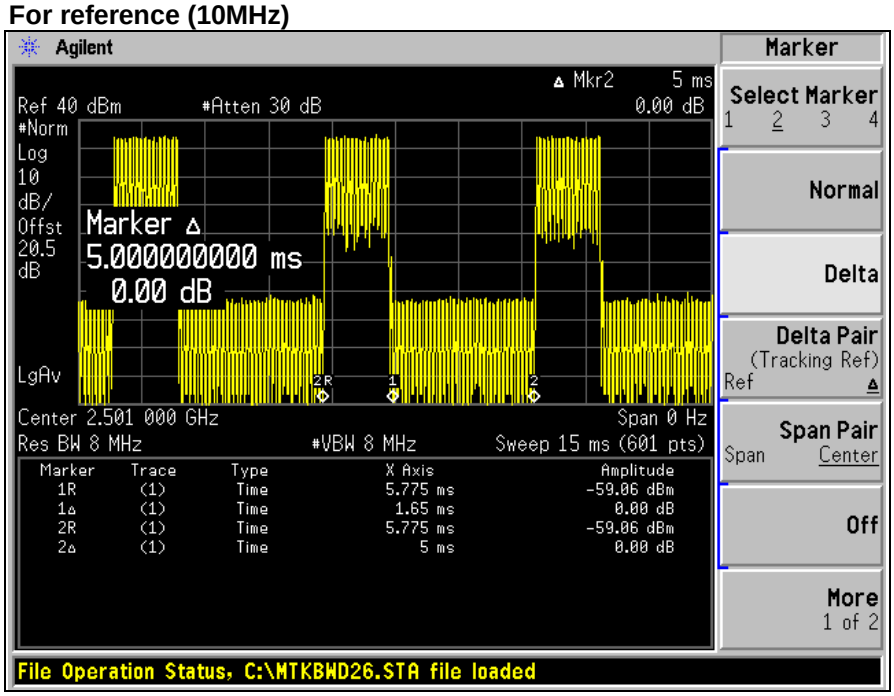
7 APPENDIX - A DL/UL RATION FOR TEST

For reference (5MHz)



Ratio = (1.65 / 5.05) *% = 32.67%

For reference (10MHz)



Ratio = (1.65 / 5) *% = 33%

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