Nemko Korea CO., Ltd.

300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-City, Gyeonggi-Do, KOREA
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FCC EVALUATION REPORT FOR CERTIFICATION

Applicant :
C-motech Co., Ltd.
8,9F Yongsan Bldg. Yoido-dong, Youngdungpo-Gu
Seoul, Korea, (Post code : 150-871)

Dates of Issue : February, 22, 2008
Test Report No. : NK08R031-1
Test Site : Nemko Korea Co., Ltd.

FCC ID	*TARCMU-300*
Brand Name	**C-motech**
CONTACT PERSON	**C-motech Co., Ltd.** **8,9F Yongsan Bldg, Yoido-dong,** **Youngdungpo-gu, Seoul Korea (150-871)** **Mr. Gil-Sung Bahn** **Telephone No. : +82 2 368-9863**

Applied Standard:	FCC 47 CFR Part 15 & 2
	FCC 47 CFR Part 27
Classification:	FCC Class B Device
Equipment Class:	Public Mobile Services
EUT Type:	DBDM(CDMA & Wi-max) USB MODEM

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003.
I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested By : Minchul Shin
Engineer

Reviewed By : H.H. Kim
Manager & Chief Engineer

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1. Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC Part 15 & Part 27.

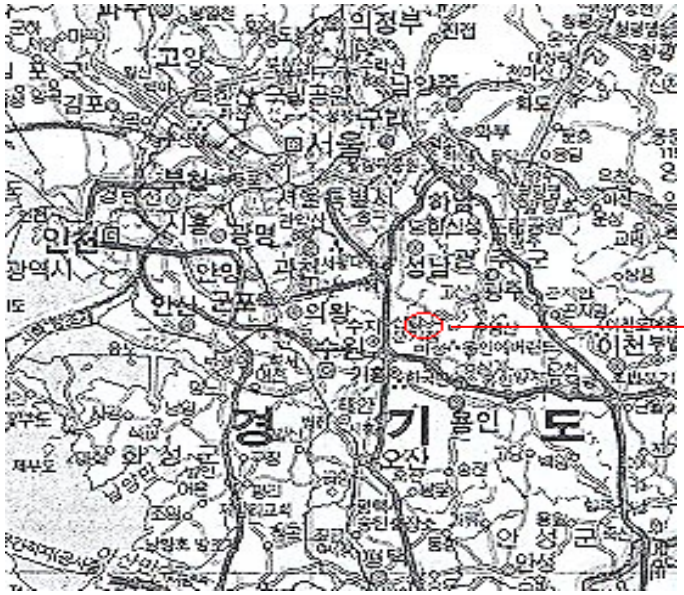
Responsible Party :	C-motech Co., Ltd.
Contact Person :	Mr. Gil-sung Bahn Tel No. : +82 2 368 9863
Manufacturer :	C-motech Co., Ltd. 8,9F Yongsan Bldg., Yoido-dog, Youngdungpo-gu, Seoul Korea (150-871)

- FCC ID: TARCMU-300
- Model: CMU-300
- Brand Name: C-motech
- EUT Type: DBDM(CDMA&Wi-max) USB MODEM
- Electric Rating: +5 Vdc from USB port
- Equipment Class: Public Mobile Service
- Classification: FCC Class B
- Applied Standard: FCC 47 CFR Part 15 & 2
FCC 47 CFR Part 27
- Test Procedure(s): ANSI C63.4 (2003), DA 02-2138(2002)
- Dates of Test: January 29, 2008 to February 20, 2008
- Place of Tests: Nemko Korea Co., Ltd.

2. Introduction (Site Description)

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **C-motech Co., Ltd.**
FCC ID : **TARCMU-300**

These measurement tests were conducted at ***Nemko Korea Co., Ltd.***
The site address is 300-2, Osan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, KOREA
The area of Nemko Korea Corporation Ltd. Test site is located in a mountain area at 80 kilometers (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 kilometers (18miles) south-southeast from central Seoul.
It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.
The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 2003.



Nemko Korea Co., Ltd.
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Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. and Incheon Airport.

3. Test Conditions & EUT Information

Operating During Test

The EUT was tested at the lowest channel, middle channel and the highest channel with maximum RF power and all data were recorded in the report.

Environmental Conditions

Temperature	20℃ ~ 25℃
Relative Humidity	30% ~ 55%

Description of EUT

Frequency Band	Tx	2507.5 ~ 2684.5 MHz
	Rx	2507.5 ~ 2684.5 MHz
Output Power	QPSK : EIRP 0.318 W(25.02 dBm) QAM : EIRP 0.277 W(24.43 dBm)	
Interface	USB port	
Modulation Method	Tx: QPSK, QAM / Rx: QPSK, QAM	
Antenna Type	Internal monopole antenna	
Antenna Gain	Wi-max : -3.2 dBi	
Dimensions	33 mm x 93mm x 12.5 mm	
Weight	Approx. 43.8 g	
Operating Conditions	-20°C ~ +55°C , 85% at 50°C	
Antenna Length (LXWXH)	26.85 mm x 12.95 mm x 7.8 mm	

Support Equipment

DBDM(CDMA&Wi-max) USB Modem	C-motech Co. Ltd. Model: CMU-300	S/N: N/A
Notebook Computer	Samsung Electronics Co., Ltd. Model : NT-X11B 0.5 m shielded USB cable, 0.65 m shielded USB cable Adaptor : Lishin Model : AD-6019 1.2m unshielded AC cable, 1.8m unshielded DC cable	S/N: N/A S/N: N/A
Monitor	Tianjin Samsung Electronics Display Model : BR20BS 1.5 m shielded D-sub cable, 1.5 m unshielded AC power cable	S/N: N667HVZLC00912Z
Wireless Communications Test Set	Agilent Technologies Model : E5515C	S/N: GB43193659
Mobile Wi-max Test Set	Agilent Technologies Model : E6651A	S/N: KR47220125

4. Measuring Instrument Calibration

All measurements were made with instruments calibrated according to the recommendation by manufacturer. Measurement of radiated emissions and conducted emissions were made with instruments conforming to American National Standards Institute, ANSI C63.4-2003.
The calibration of measuring instrument, including any accessories that may affect test results, were performed according to the recommendation by manufacturer.

- End of page -

5. Summary of Test Results

The EUT has been tested according to the following specification:

Description of Test	FCC Rule	Result
Occupied Bandwidth	§2.1049 §27.53(l)(6)	Complies
Band Edge	§2.1051 §27.53(l)(4)(6)	Complies
Conducted Spurious Emissions	§2.1051 §27.53(l)(4)(6)	Complies
Conducted Output Power	§2.1051	Complies
Equivalent Isotropic Radiated Power	§27.50(h)(2)	Complies
Radiated Spurious Emissions	§2.1053 §27.53(l)(4)	Complies
Frequency Stability / Temperature Variation	§2.1055 §27.54	Complies
AC Power Line Conducted Emission	§15.107	Complies

6. Recommendation / Conclusion

The data collected shows that the **C-motech Co., Ltd.**
FCC ID : **TARCMU-300, DBDM(CDMA&WI-MAX) USB MODEM.**
The highest emission observed was at 0.19 MHz for conducted emissions with a Ave. margin of **12.7 dB,** at 12.995 GHz for radiated emissions with a margin of **3.09 dB.**

7. Sample Calculation

7.1 Radiation for Part 15

$$dB\,\mu N = 20 \log_{10}(\mu N/m)$$

$$\mu N = 10^{(dB\,\mu N/20)}$$

EX. 1.

@165.0 MHz Class B limit = 30.0 dB μN/m

Reading = 38.2 dB μN(calibrated level)
Antenna factor + Cable Loss + Amplifier Gain = -12.9 dB
Total = 25.30 dB μN/m
Margin = 30.0 – 25.30 = 4.70
4.70 dB below the limit

7.2 Radiation for Part 27

The formula below was used to calculate the ERP/EIRP of the EUT. $P_{subst\_TX[dBm]}$, $P_{subst\_RX[dBm]}$, $L_{Cable[dB]}$ and $G_{substitute\_antenna[dBd]/[dBi]}$ factors are combined in one correction factor.

$$P_{ERP[W]} = \frac{10^{(P_{sust\_Tx[dBm]}+P_{EUT[dBm]}-P_{subst\_Rx[dBm]})+G_{subst\_antenna[dBi]}-L_{cable[dB]})/10}}{1000}$$

Where the variables are as follows:

$P_{EUT\ [dBm]}$	Measured power level from the EUT
$P_{Subst\_TX\ [dBm]}$	Power fed to the substituting antenna
$P_{Subst\_RX\ [dBm]}$	Power received with the spectrum analyzer
$G_{Substitute\_antenna\ [dBi]}$	Gain of the substitutive antenna over dipole (dBi)
$L_{Cable\ [dB]}$	Loss of the cable between signal generator and the substituting antenna

8. Test Equipment List

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Apr. 02.2007	1year
2	*Test Receiver	R & S	ESCS 30	100302	Dec. 03.2007	1year
3	*Amplifier	HP	8447F	2805A03427	Aug. 07 2007	1year
4	*Amplifier	HP	8447F	2805A03351	Oct. 23 2007	1year
5	*Amplifier	HP	8449B	3008A00107	Mar. 12 2007	1year
6	Spectrum Analyzer	Advantest	R3265A	45060401	Dec. 04 2007	1year
7	*Spectrum Analyzer	Agilent	E4440A	MY44303257	Sep. 12 2007	1year
8	Biconical Log Antenna	ARA	LBP-2520/A	1209	Dec. 31 2007	1year
9	*Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-474	Jul. 24 2007	1year
10	*Biconical Log Antenn	ARA	LPB-2520/A	1180	Feb. 28 2007	1year
11	Mobile Wimax Teste	Agilent	E6651A	KR47220125	Jul. 13 2007	1year
12	*LISN	R & S	ESH3-Z5	833874/006	Oct. 23 2007	1year
13	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
14	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
15	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
16	*Anechoic Chamber	EM Eng.	N/A	N/A	N/A	N/A
17	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
18	*Position Controller	Inn-co	CO2000	N/A	N/A	N/A
19	*Turn Table	Inn-co	DS1200S	N/A	N/A	N/A
20	*Antenna Mast	Inn-co	AS2000P	N/A	N/A	N/A
21	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
22	*Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-508	Dec. 27 2007	1year
23	*Communications Test Set	Agilent	E5515C	GB43193659	Jun. 18 2007	1year
24	*Spectrum Analyzer	Agilent	E4440A	MY44022567	Dec. 04 2007	1year

***) Test equipment used during the test**

9. Description of Tests

9.1 Conducted Emissions

The Line conducted emission test facility is located inside a 4 X 7 X 2.5 meter shielded enclosure.
It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.
A 1 m X 1.5 m wooden table 0.8 m height is placed 0.4 m away from the vertical wall and 1.5 m away from the side of wall of the shielded room Rohde & Schwarz (ESH3-Z5) and Kyoritsu (KNW-407) of the 50 ohm/50 uH Line Impedance Stabilization Network(LISN) are bonded to the shielded room.
The EUT is powered from the Rohde & Schwarz LISN and the support equipment is powered from the Kyoritsu LISN. Power to the LISNs are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1/2".
If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs.
All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.
Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.
The spectrum was scanned from 150 kHz to 30 MHz with 20 msec sweep time.
The frequency producing the maximum level was re-examined using the EMI test receiver.
(Rohde & Schwarz ESCS30).
The detector functions were set to CISPR quasi-peak mode & average mode.
The bandwidth of receiver was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.
Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.
Each EME reported was calibrated using the R&S signal generator.

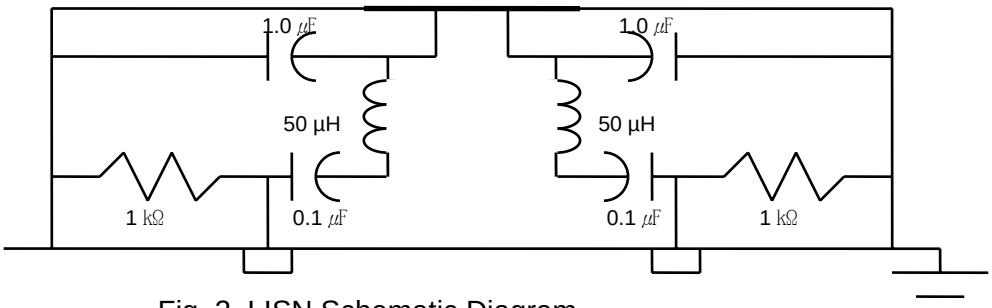


Fig. 2. LISN Schematic Diagram

9.2 Radiated Emissions

Preliminary measurements were made indoors at 3 meter using broad band antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found. The spectrum was scanned from 30 to 1000MHz using Biconical log Antenna (ARA, LPB-2520/A).
Final Measurements were made outdoors at 3 or 10m test range using Logbicon Super Antenna (Schwarzbeck, VULB 9166).
The test equipment was placed on a wooden table.
Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
Each frequency found during pre-scan measurements was reexamined and investigated using EMI test receiver (ESCS30).
The detector functions were set to CISPR quasi-peak and peak mode and the bandwidth of the receiver were set to 120 kHz and 1 MHz depending on the frequency or type of signal.
The half wave dipole antenna was tuned to the frequency found during preliminary radiated measurements.
The EUT support equipment and interconnecting cables were reconfigured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8m high non- metallic 1.0X 1.5 meter table.
The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission.
The turn table containing the Technology was rotated; the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by : switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; which ever determined the worst case emission.
Each EME reported was calibrated using the R/S signal generator.

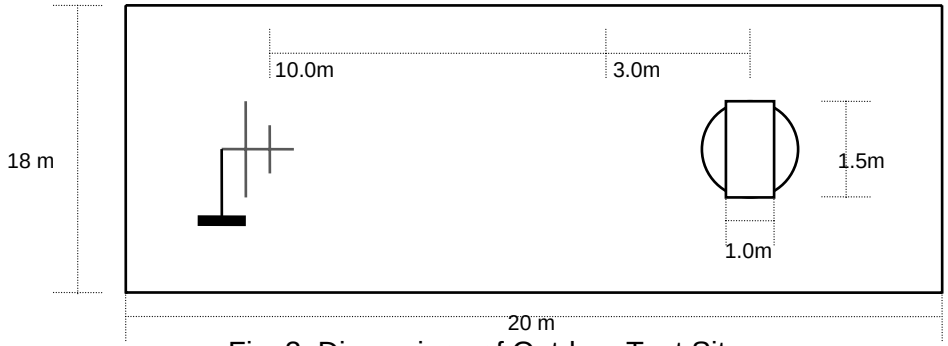


Fig. 3. Dimensions of Outdoor Test Site

9.3 Effective Radiated Power / Equivalent Isotropic Radiated Power

Test Set-up

Effective Radiated Power Output and Equivalent Isotropic Radiated Power output Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2003.

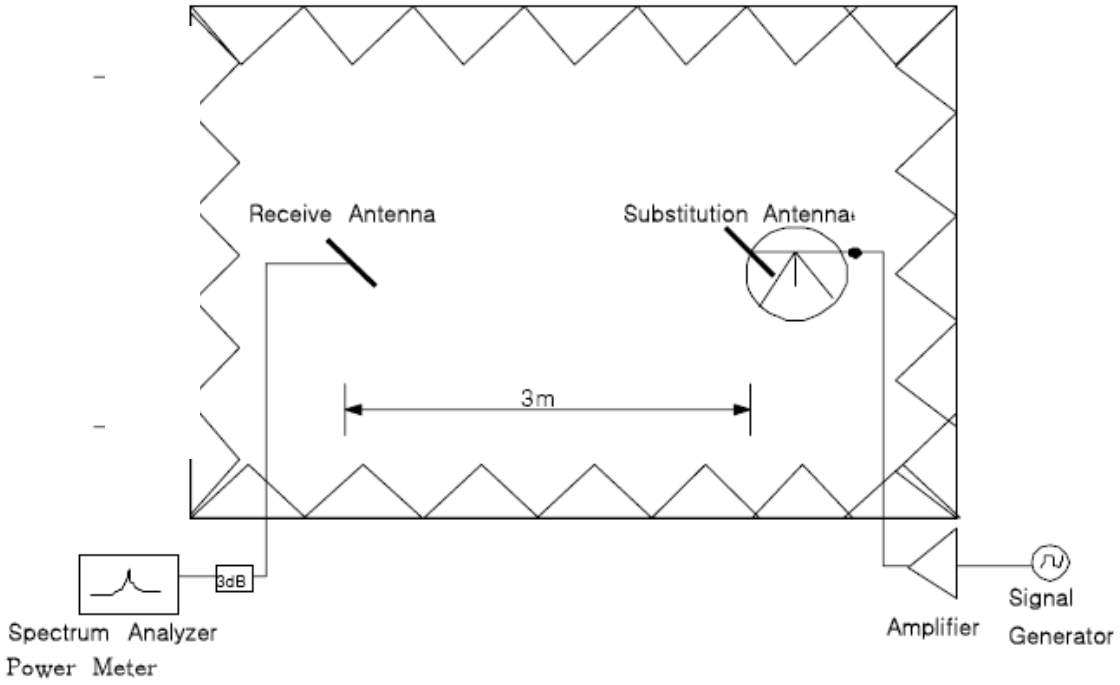


Figure 4. Diagram of ERP/EIRP test Set-up

The EUT was set on a non-conductive turntable in a semi anechoic chamber.
In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the chamber. The radiated power from the EUT was measured with an antenna fixed to a antenna tower.
The tower and turn table were remotely controlled to turn the EUT and change the antenna polarization. The measured signal was routed from the measuring antenna to the spectrum analyzer. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

Test Method

a) The maximum power level was searched by moving the turn table and measuring antenna and manipulating the EUT. This level (P_{EUT}) was recorded.
b) The EUT was replaced with a substituting antenna.
c) The substituting antenna was fed with the power (P_{Subst_TX}) giving a convenient reading on the spectrum analyzer. That reading (P_{Subst_RX}) on spectrum analyzer was recorded.

9.4 Radiated Spurious & Harmonic Emission

Test Set-up

Effective Radiated Power Output and Equivalent Isotropic Radiated Power output Measurements by Substitution Method according to ANSI/TIA/EIA-603-A-2003.

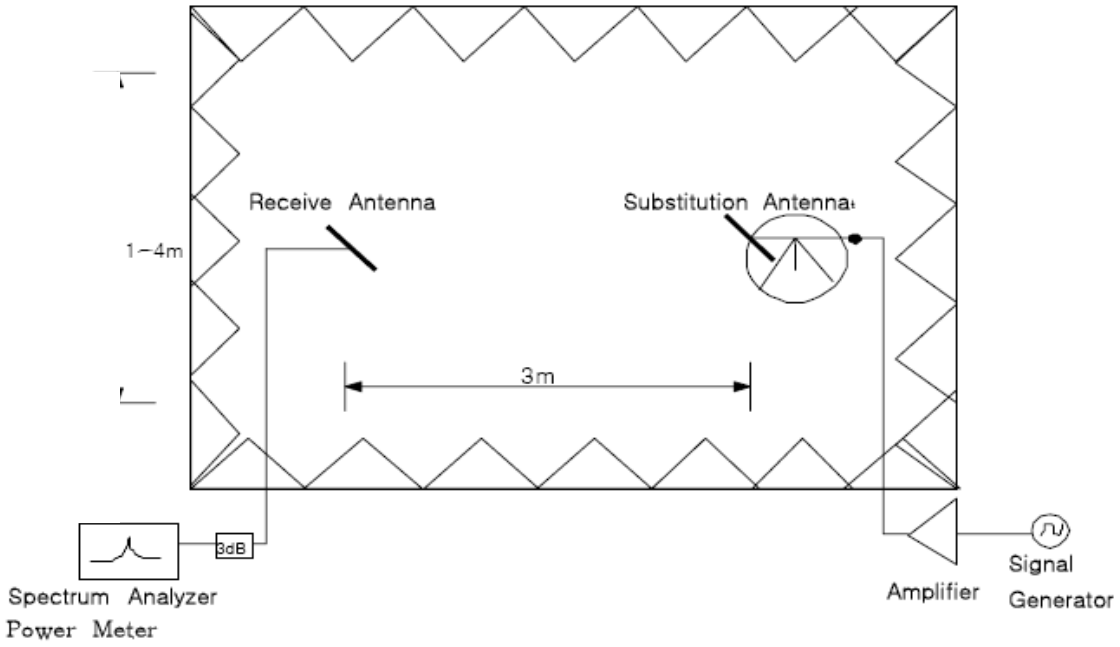


Figure 5. Diagram of Radiated Spurious & Harmonic test Set-up

The EUT was set on a non-conductive turntable in a semi anechoic chamber. In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the chamber. The radiated power from the EUT was measured with an antenna fixed to a antenna tower.
The tower and turn table were remotely controlled to turn the EUT and change the antenna polarization. The measured signal was routed from the measuring antenna to the spectrum analyzer. The BS simulator was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

Test Method

a) The maximum power level was searched by moving the turn table and measuring antenna and manipulating the EUT. This level (P_{EUT}) was recorded.
b) The EUT was replaced with a substituting antenna.
c) The substituting antenna was fed with the power (P_{Subst_TX}) giving a convenient reading on the spectrum analyzer. That reading (P_{Subst_RX}) on spectrum analyzer was recorded.

9.5 Occupied Bandwidth / 26dB Emission Bandwidth

Occupied Bandwidth

The EUT was setup to maximum output power at its lowest channel. The occupied bandwidth was measured using a spectrum analyzer. The measurements are repeated for the highest and a middle channel.
The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
Plots of the EUT's occupied bandwidth are shown herein.

26dB Emission Bandwidth

The transmitter output is connected to the spectrum analyzer.
The RBW of spectrum analyzer is set to approximately 1% of the emission bandwidth And peak detection is used. The emission bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 26 dB.

9.6 Spurious and Harmonic Emissions at Antenna Terminal

9.6.1 Occupied Bandwidth Emission Limits

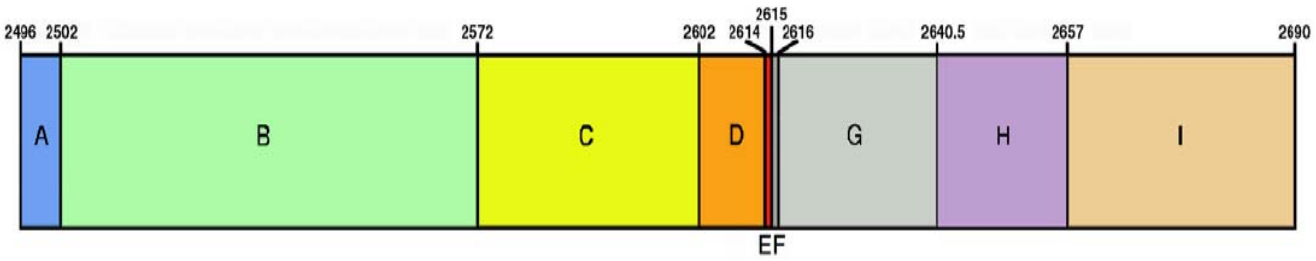
(a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 55 + 10 log (P) dB.

(b) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.
However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1 % of the emission bandwidth of the fundamental emission of the transmitter may be employed.
The 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 emission are attenuated at least 26 dB below the transmitter power.

(c) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

(d) The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

9.6.2 EBS/RRS – Frequency Band Blocks



BLOCK A: 2496MHz – 2502MHz (BRS)	BLOCK B: 2502MHz – 2572MHz (EBS)	BLOCK C: 2572MHz – 2602MHz (EBS)
BLOCK D: 2602MHz – 2614MHz (BRS)	BLOCK E: 2614MHz – 2615MHz (BRS)	BLOCK F: 2615MHz – 2616MHz (EBS)
BLOCK G: 2616MHz – 2640.5MHz (BRS)	BLOCK H: 2640.5MHz – 2657MHz (EBS)	BLOCK A: 2657MHz – 2690MHz (BRS)

9.6.2 Conducted Spurious Emission

Minimum standard:

On any frequency outside a license frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 55+10log (P) dB.
Limit equivalent to -25 dBm, calculation shown below.
55 + 10log (0.318 W) = 50.02 dB
25.02 dBm – 50.02 dB = -25 dBm

Compliance with the out-of-band emissions requirement is based on test being performed with an analyzer resolution bandwidth of 1 MHz. However in the 1 MHz band immediately outside and adjacent to the frequency block a resolution bandwidth of at least 1 % of the fundamental emissions bandwidth may be employed.

Test Procedure:

The EUT was setup to maximum output power at its lowest channel.
The Resolution BW of the analyzer is set to 1 % of the emission bandwidth to show compliance with the -13 dBm limit, in the 1 MHz bands immediately outside and adjacent to the edge of the frequency block.
The measurements are repeated for the EUT's highest channel. For the Out-of-Band measurements a 1 MHz RBW was used to scan from 10 MHz to 26.5 GHz.
A display line was placed at -25 dBm to show compliance. The high, lowest and middle channels were tested for out of band measurements.
Plots are shown.

9.7 Frequency Stability / Temperature Variation

The frequency stability of the transmitter is measured by:

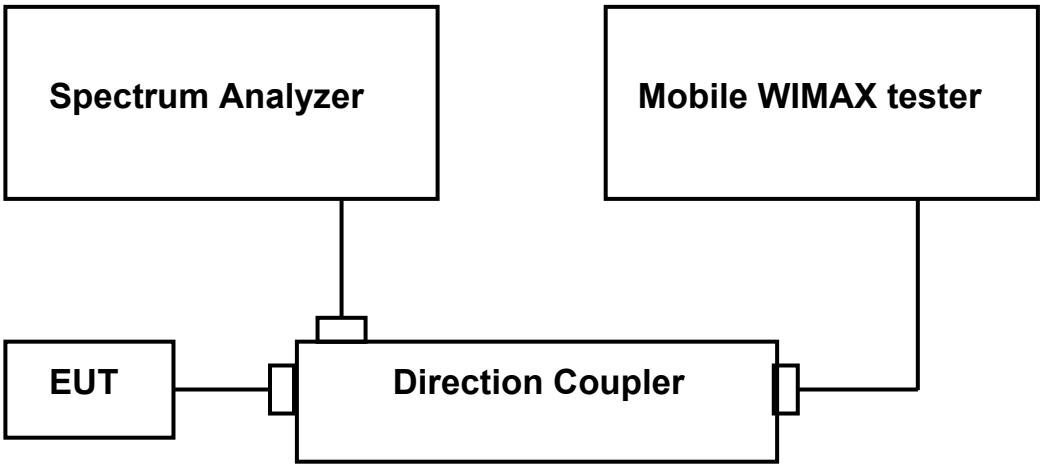
a.) Temperature: The temperature is carried from -30 °C to + 60 °C using an environmental chamber.
b.) Primary Supply Voltage: The primary supply voltage is varied from 85 % to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025 % (± 2.5ppm) of the center frequency.

Time Period and Procedure:
1. The carrier frequency of the transmitter and the individual oscillators is measured at room temperature(20 °C to 25 °C to provide a reference).
2. The equipment is subjected to an overnight “soak” at -30 °C without any power applied.
3. After the overnight “soak” at -30 °C (Usually 14 ~ 16 hours), the equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter and the individual oscillators is made within a three minute interval after applying power to the transmitter.
4. Frequency measurements are made at 10 °C interval up to room temperature. At least a period of one and one half-hour is provided to allow stabilization of the equipment at each temperature level.
5. Again the transmitter carrier frequency and the individual oscillators is measured at room temperature to begin measurement of the upper temperature levels.
6. Frequency measurements are at 10 intervals starting at – 30 °C up to + 60 °C allowing at least two hours at each temperature for stabilization. In all measurements the frequency is measured within three minutes after re-applying power to the transmitter.
7. The artificial load is mounted external to the temperature chamber.

9.8 Transmitter Conducted Output Power

Test Set-up:



Test Procedure:

Setup the EUT like test Set-up diagram.
Set the EUT to send the test channel with Max power using the Mobile Wimax tester.
Measure the Max Conducted power with 10 MHz channel power function with Spectrum Analyzer.

10. Test Data

10.1 AC Power Line Conducted Emissions

FCC ID : TARCMU-300

▶ **Wi-max TCH mode**

Frequency	Level(dBμV)		Line	Limit(dBμV)		Margin(dB)	
(MHz)	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.15	44.8	26.5	L	66.0	56.0	21.2	29.5
0.19	51.3	41.3	N	64.0	54.0	12.7	12.7
0.25	44.8	34.6	N	61.8	51.8	17.0	17.2
0.31	42.1	30.2	N	60.0	50.0	17.9	19.8
0.57	43.1	30.8	N	56.0	46.0	12.9	15.2
1.01	36.4	25.8	L	56.0	46.0	19.6	20.2

Line Conducted Emissions Tabulated Data

NOTES:

1. Measurements using CISPR quasi-peak mode & average mode.

2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.

3. LINE : L =Line , N = Neutral

4. The limit is on the FCC Part section 15.107(a).

PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Wi-max TCH mode, Line)***

NEMKO KOREA 14 Feb 2008 14:41

Conducted Emissions

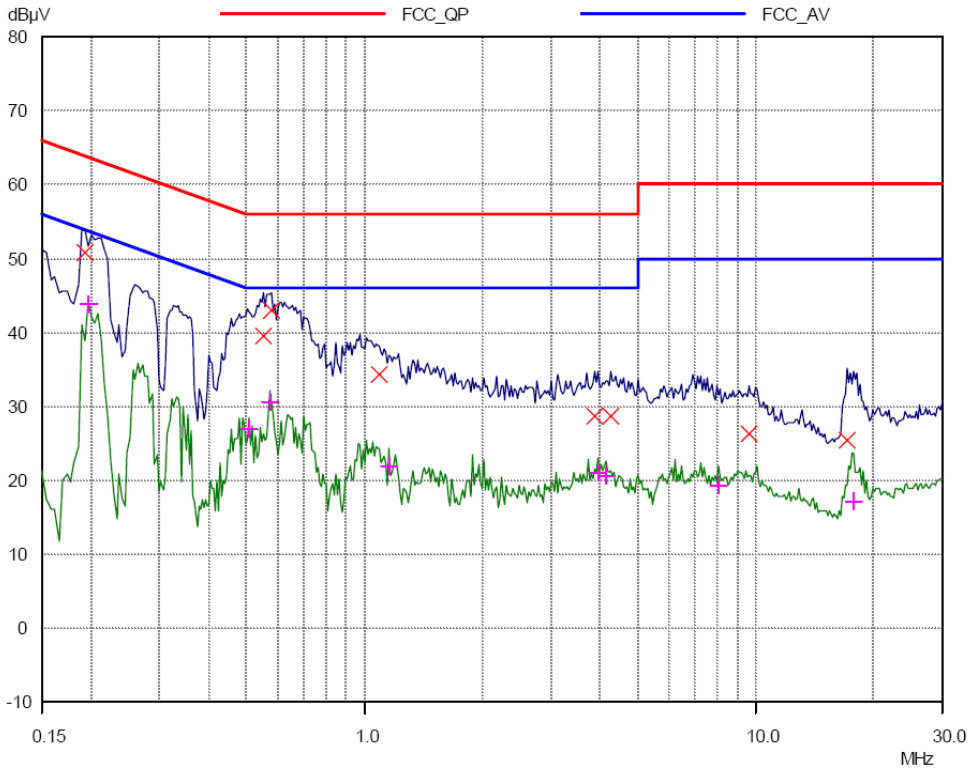
EUT:	CDMA835/1900, WIMAX
Manuf:	C-motech co. ltd.
Op Cond:	a. c. 120 V / 60 Hz
Operator:	S. Lee
Test Spec:	FCC Part 15
Comment:	MODEL : CMU-300(WIMAX TCH Mode)
	LINE : LINE-PE
Result File:	127WI-L.dat : FCC Part 15.107

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	CE_LINE

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 8
Acc Margin: 60 dB



PLOTS OF EMISSIONS

- ***Conducted Emission at the Mains port (Wi-max TCH mode, Neutral)***

NEMKO KOREA 14 Feb 2008 14:57

Conducted Emissions

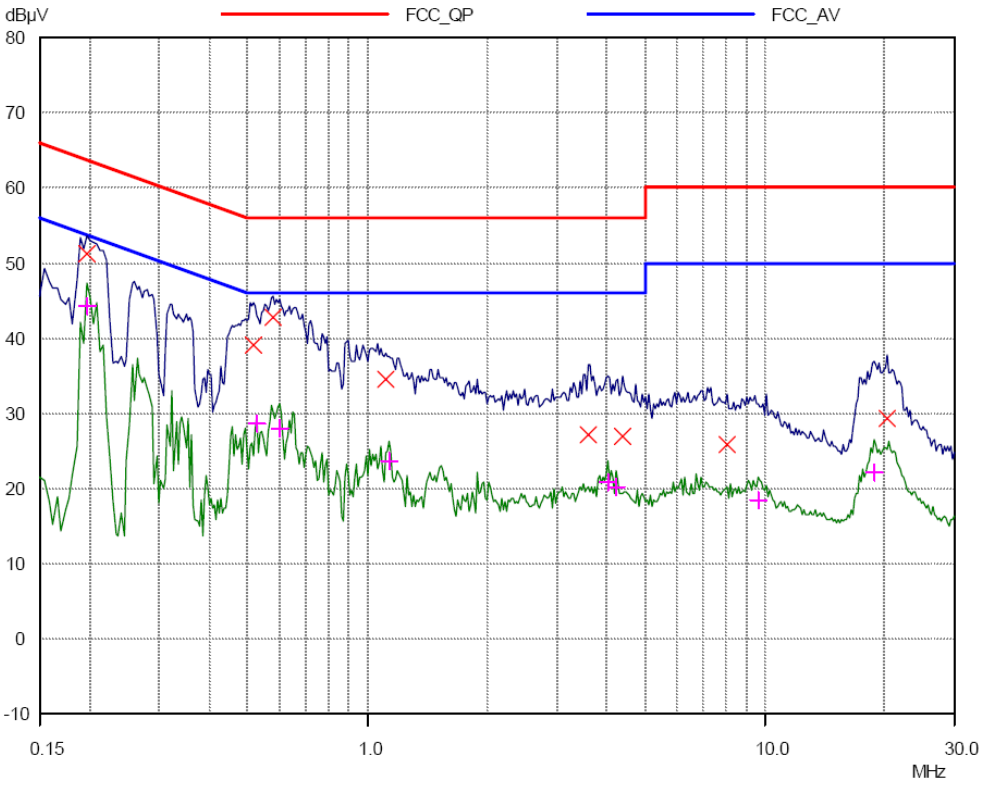
EUT:	CDMA835/1900, WIMAX
Manuf:	C-motech co. ltd.
Op Cond:	a. c. 120 V / 60 Hz
Operator:	S. Lee
Test Spec:	FCC Part 15
Comment:	MODEL : CMU-300(WIMAX TCH Mode)
	LINE : NEUTRAL-PE
Result File:	127wi-n.dat : FCC Part 15.107

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	20msec	20 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	1	150kHz	30MHz	CE_NEUT

Final Measurement:		
	Detectors:	X QP / + AV
	Meas Time:	1sec
	Subranges:	8
	Acc Margin:	60 dB



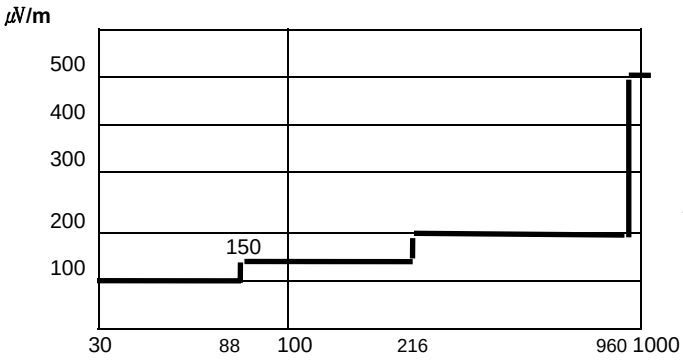
10.2 Field Strength of Radiated Emissions (30MHz ~ 1GHz)

FCC ID : TARCMU-300

▶ **WIMAX TCH mode**

Frequency (MHz)	Reading (dBμV/m)	Pol* (H/V)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
60.00	39.3	V	-17.9	21.4	40.0	18.6
120.00	39.1	V	-13.2	25.9	43.5	17.6
240.00	48.9	H	-11.6	37.3	46.0	8.7
323.99	38.7	H	-9.4	29.3	46.0	16.7
336.00	36.9	H	-9.5	27.4	46.0	18.6
383.99	37.0	H	-8.3	28.7	46.0	17.3

Radiated Measurements at 3 meters



NOTES:

1. All modes were measured and the worst-case emission was reported.

2 The radiated limits are shown on Figure 4. Above 1GHz the limit is 500 μV/m.

Limits at 3 meters

NOTES:

1. *Pol. H =Horizontal V=Vertical

2. **AF+CL+Amp. = Antenna Factor + Cable Loss + Amplifier.

3. Measurements using CISPR quasi-peak mode.

4. The limit is on the FCC Part section 15.109(a).

10.3 Transmitter Conducted Output Power

Measurement Results:

Band	Frequency (MHz)	QPSK		QAM	
		1/2 (dBm)	3/4 (dBm)	1/2 (dBm)	3/4 (dBm)
EBS/ BRS	2507.5	23.42	23.40	23.34	23.20
	2599.0	23.38	23.31	23.33	23.16
	2684.5	23.61	23.57	23.44	23.40

10.4 Equivalent Isotropic Radiated Power

Measurement Results :QPSK mode

Frequency (MHz)	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dBm)	EIRP (dBm)	Limit (dBm)
2507.5	H	-28.15	0.00	-35.08	10.57	2.81	14.69	33
	V	-20.43	0.00	-34.89	10.57	2.81	22.22	
2599.0	H	-25.24	0.00	-37.13	10.77	3.05	19.61	33
	V	-19.83	0.00	-37.13	10.77	3.05	25.02	
2684.5	H	-28.08	0.00	-35.85	11.06	2.87	15.96	33
	V	-21.99	0.00	-35.52	11.06	2.87	21.72	

Measurement Results :QAM mode

Frequency (MHz)	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dBm)	EIRP (dBm)	Limit (dBm)
2507.5	H	-27.41	0.00	-35.08	10.57	2.81	15.43	33
	V	-20.81	0.00	-34.89	10.57	2.81	21.84	
2599.0	H	-25.30	0.00	-37.13	10.77	3.05	19.55	33
	V	-20.42	0.00	-37.13	10.77	3.05	24.43	
2684.5	H	-27.61	0.00	-35.85	11.06	2.87	16.43	33
	V	-21.97	0.00	-35.52	11.06	2.87	21.74	

Radiated Measurements at 3meters

10.5 Occupied Bandwidth / 26dB Emission Bandwidth

Measurement Results : QPSK

Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
2507.5	9.1340	9.679
2599.0	9.1153	9.653
2684.5	9.1673	9.782

Measurement Results :QAM

Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
2507.5	9.0375	9.986.
2599.0	9.1011	9.994
2684.5	9.0081	9.497

10.6 Radiated Spurious & Harmonic Emission

Measurement Results:

(2507.5 MHz)

Freq. (MHz)	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5015.00	V	-61.58	0.00	-9.31	12.67	4.46	-44.06	-25	19.06
7522.50	H	-61.04	0.00	-17.77	11.29	5.55	-37.53	-25	12.53
10030.00	H	-60.23	0.00	-20.17	12.06	6.17	-34.17	-25	9.17
12537.50	H	-59.54	0.00	-21.70	13.78	6.70	-30.76	-25	5.76
15045.00	H	-65.85	0.00	-25.57	13.78	7.76	-34.26	-25	9.26

(2599.0 MHz)

Freq. (MHz)	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBI)	L_{Cable} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5198.00	V	-63.33	0.00	-9.00	12.86	4.37	-45.84	-25	20.84
7797.00	H	-55.87	0.00	-17.84	11.44	5.55	-32.14	-25	7.14
10396.00	V	-62.22	0.00	-23.13	11.75	5.93	-33.27	-25	8.27
12995.00	H	-58.17	0.00	-23.44	13.60	6.96	-28.09	-25	3.09
15594.00	H	-66.34	0.00	-21.23	16.35	8.16	-36.92	-25	11.92

(2684.5 MHz)

Freq. (MHz)	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBI)	L_{Cable} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5369.00	V	-63.55	0.00	-9.01	13.09	4.72	-46.17	-25	21.17
8053.50	H	-52.91	0.00	-18.70	11.41	5.85	-28.65	-25	3.65
10738.00	H	-59.31	0.00	-23.83	11.60	6.70	-30.58	-25	5.58
13422.50	H	-60.94	0.00	-27.06	12.88	7.40	-28.40	-25	3.40

Note: All modes of operation were investigated and the worst-case emissions are reported.

10.7 Frequency Stability / Temperature Variation

Test Mode : Set to Middle channel (2559 MHz)

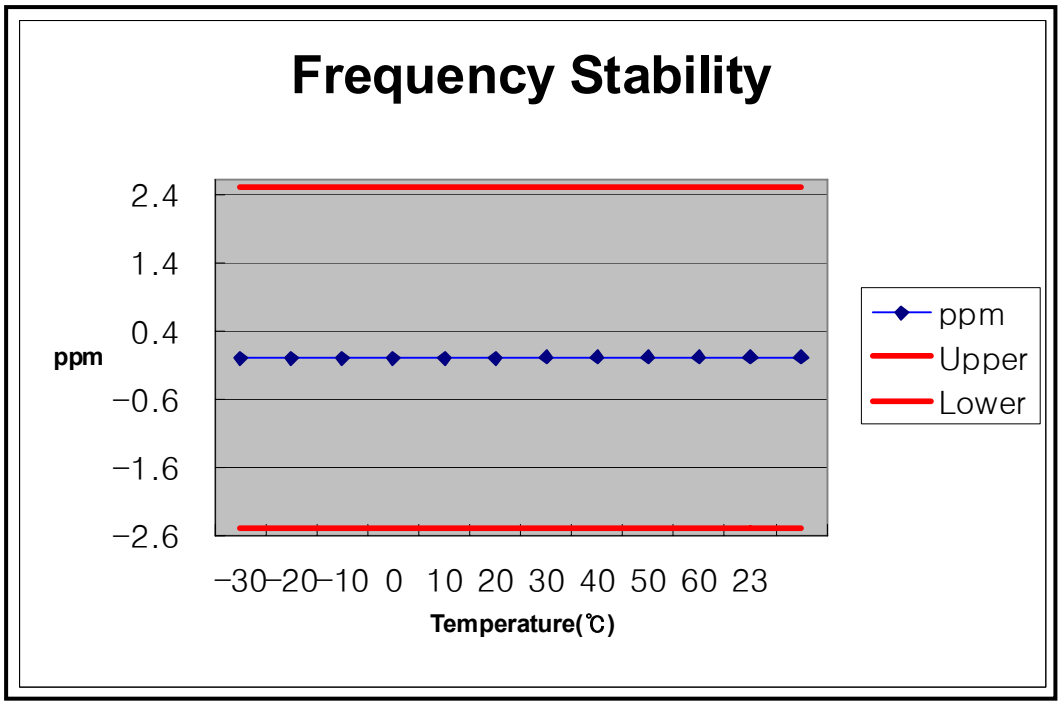
Deviation Limit : ±2.5ppm

Measurement Result :

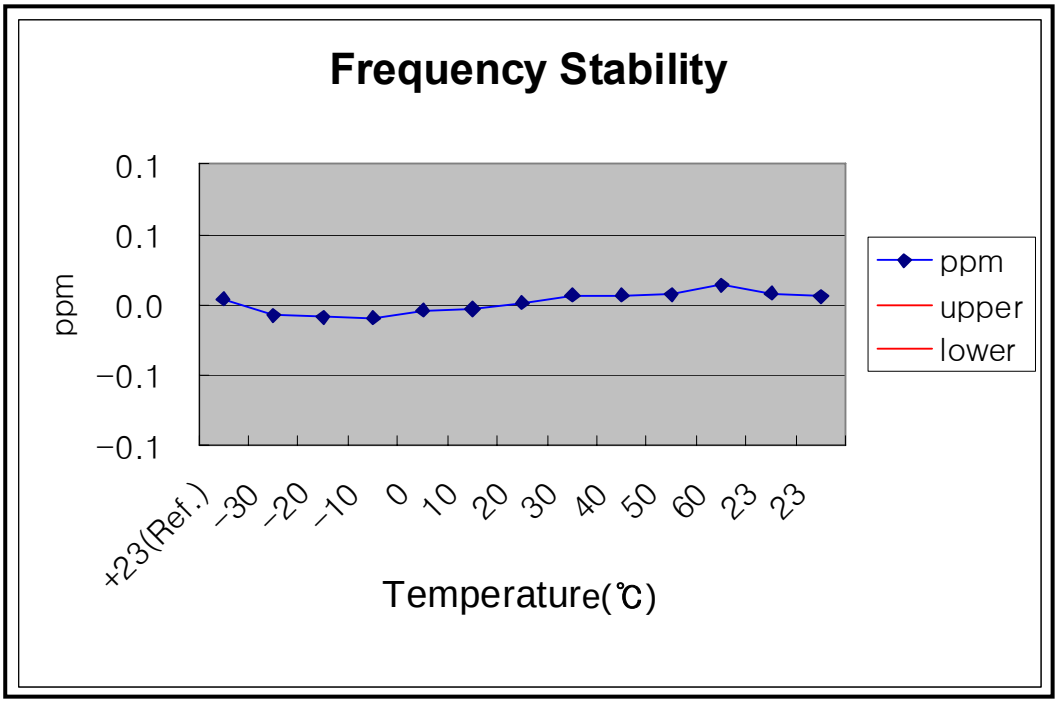
Voltage (%)	Power (Vdc)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100%	5.00	+23(Ref.)	2,559,000,011	11	0.0043
100%		-30	2,558,999,981	-19	-0.0074
100%		-20	2,558,999,978	-22	-0.0086
100%		-10	2,558,999,976	-24	-0.0094
100%		0	2,558,999,991	-9	-0.0035
100%		10	2,558,999,993	-7	-0.0027
100%		20	2,559,000,004	4	0.0016
100%		30	2,559,000,018	18	0.0070
100%		40	2,559,000,017	17	0.0066
100%		50	2,559,000,020	20	0.0078
100%		60	2,559,000,037	37	0.0145
85%	4.25	23	2,559,000,021	21	0.0082
115%	5.75	23	2,559,000,016	16	0.0063

***The temperature is varied from -30°C to +60°C using an environmental chamber.**

Frequency Stability Graph



Zoom In



11. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 with the confidence level of 95%

1. Radiation Uncertainty Calculation

Contribution	*Probability Distribution*	*Uncertainty(+/-dB)*
Antenna Factor	Normal (k=2)	± 0.5
Cable Loss	Normal (k=2)	± 0.04
Receiver Specification	Rectangular	± 2.0
Antenna directivity	Rectangular	± 1.0
Antenna Factor variation with Height		
Antenna Phase Center Variation		
Antenna Factor Frequency Interpolation		
Measurement Distance Variation		
Site Inperfections	Rectangular	± 2.0
Mismatch:Receiver VRC ri=0.3 Antenna VRC rR=0.1(Bi)0.4(Lp) Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	+ 0.25 / - 0.26
System Repeatibilty	Std.deviation	± 0.05
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.77
Expended Uncertainty U	Normal (k=2)	± 3.5

2. Conducted Uncertainty Calculation

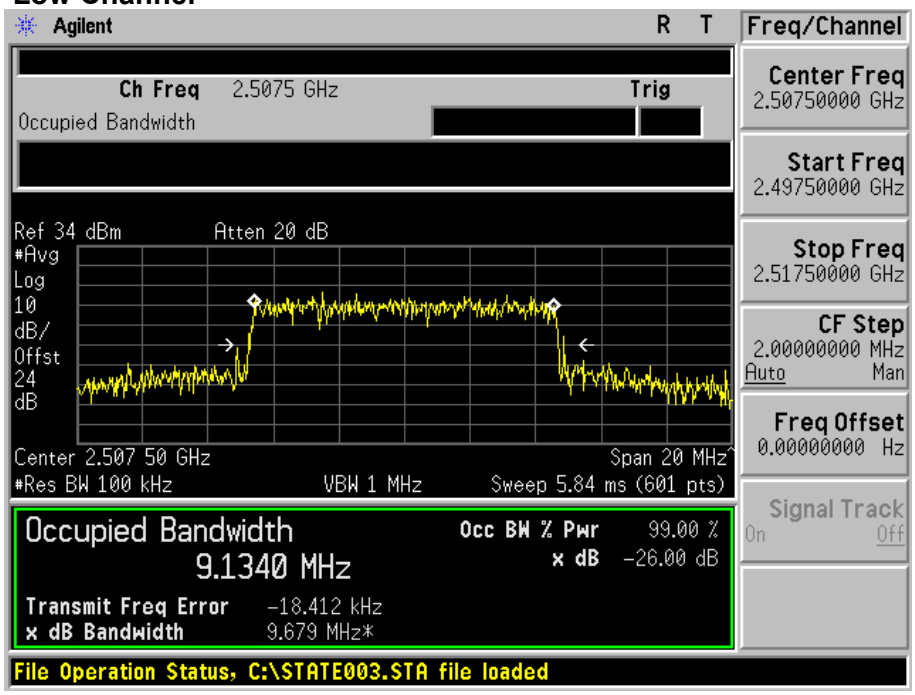
Contribution	*Probability Distribution*	*Uncertainty(+/-dB)*
Receiver Specification	Normal (k=2)	± 2.0
LISN coupling spec.	Normal (k=2)	± 0.4
Cable and input attenuator cal.	Rectangular	± 0.4
Mismatch:Receiver VRC ri=0.3 LISN vrc rg=0.1 Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	± 0.26
System Repeatibilty	Std.deviation	± 0.68
Repeatability of EUT	-	-
Combined Standard Uncertainty	Normal	± 1.18
Expended Uncertainty U	Normal (k=2)	± 2.4

12. Test Plots

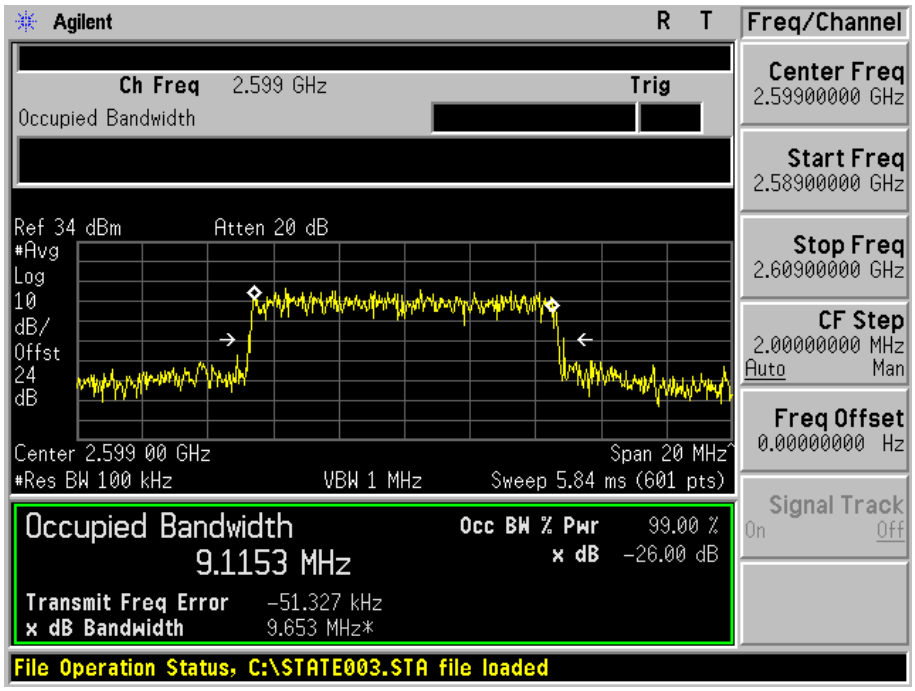
● **Occupied Bandwidth / 26dB Bandwidth**

QPSK mode

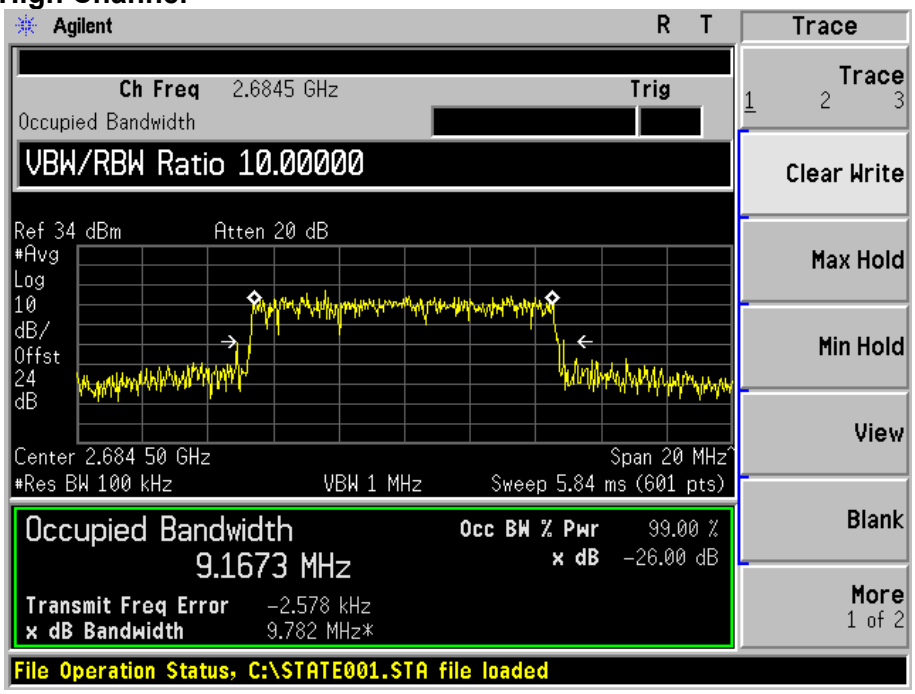
Low Channel



Middle Channel

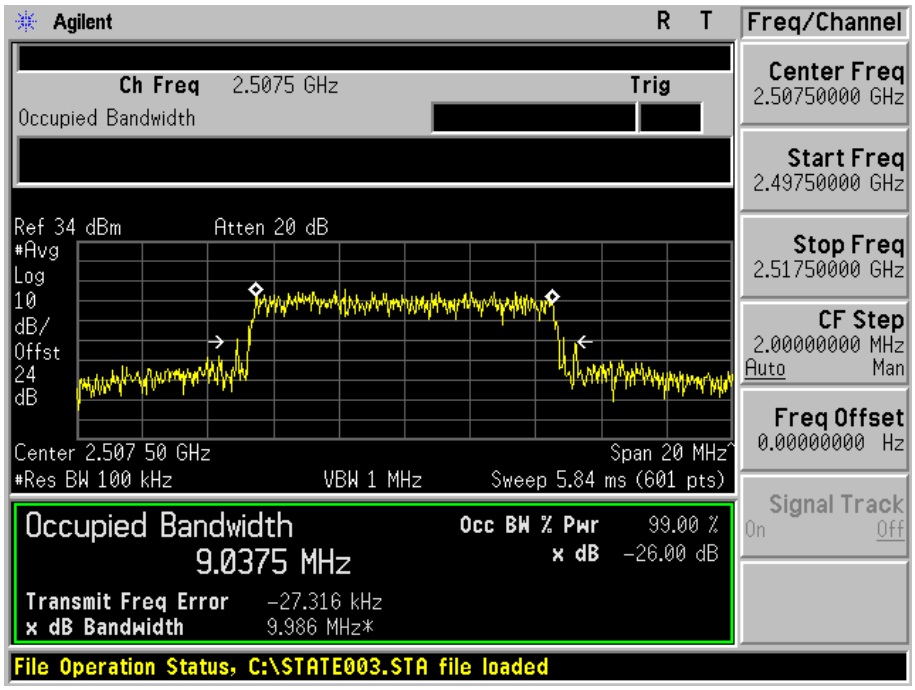


High Channel

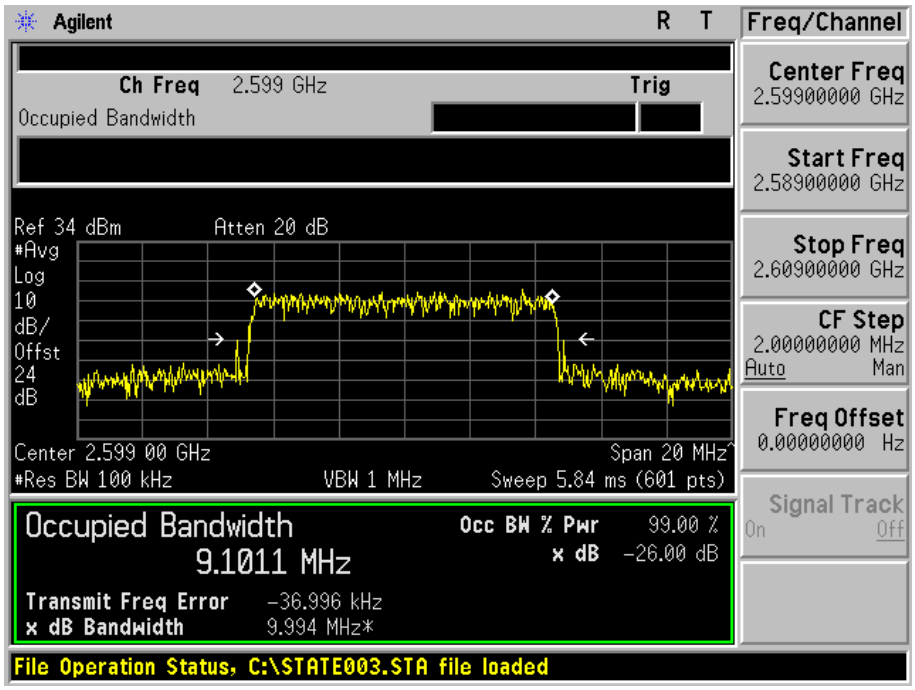


QAM mode

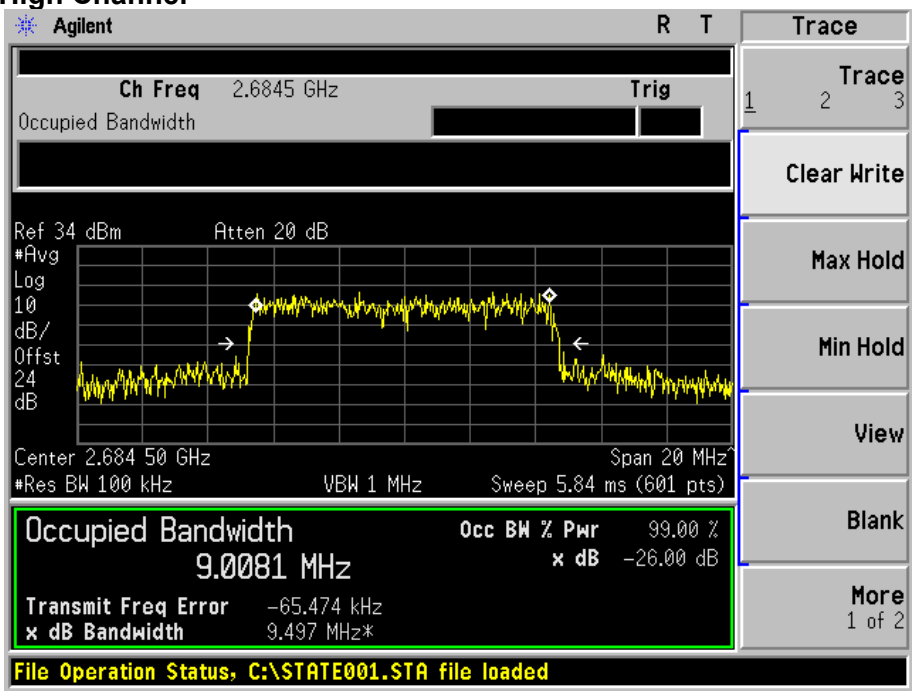
Low Channel



Middle Channel

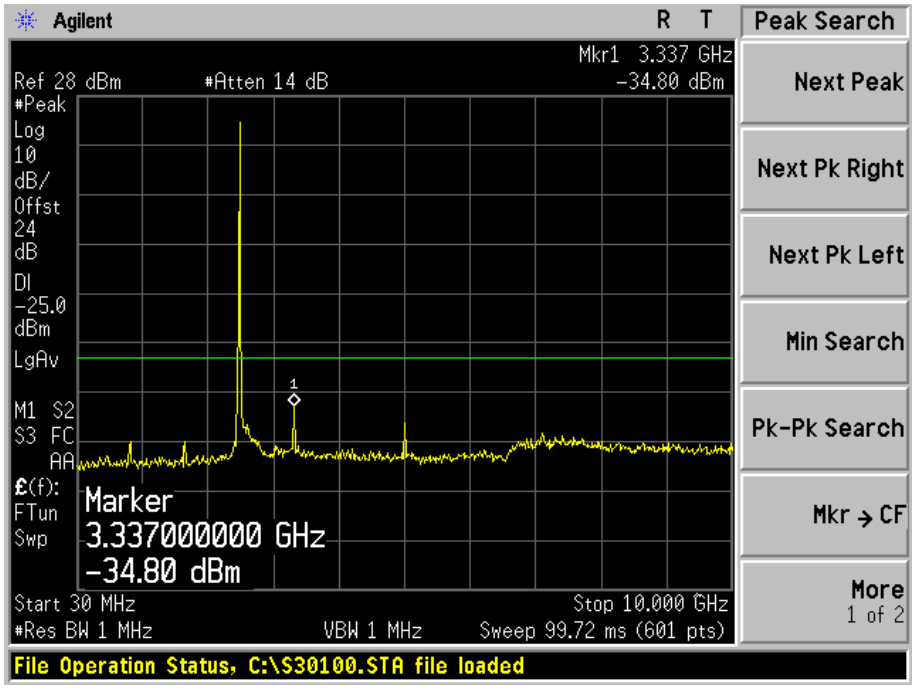


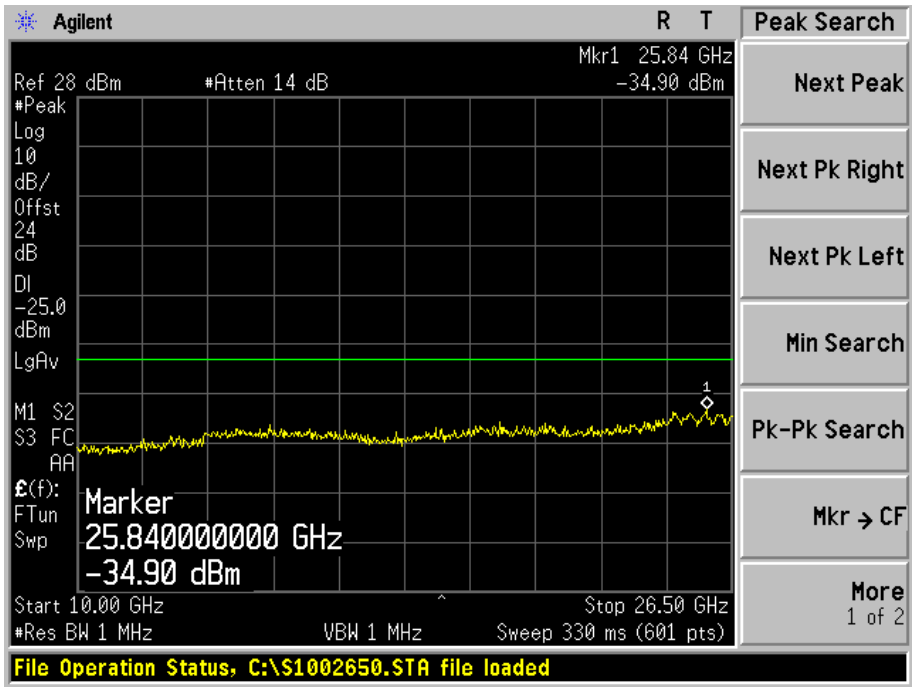
High Channel



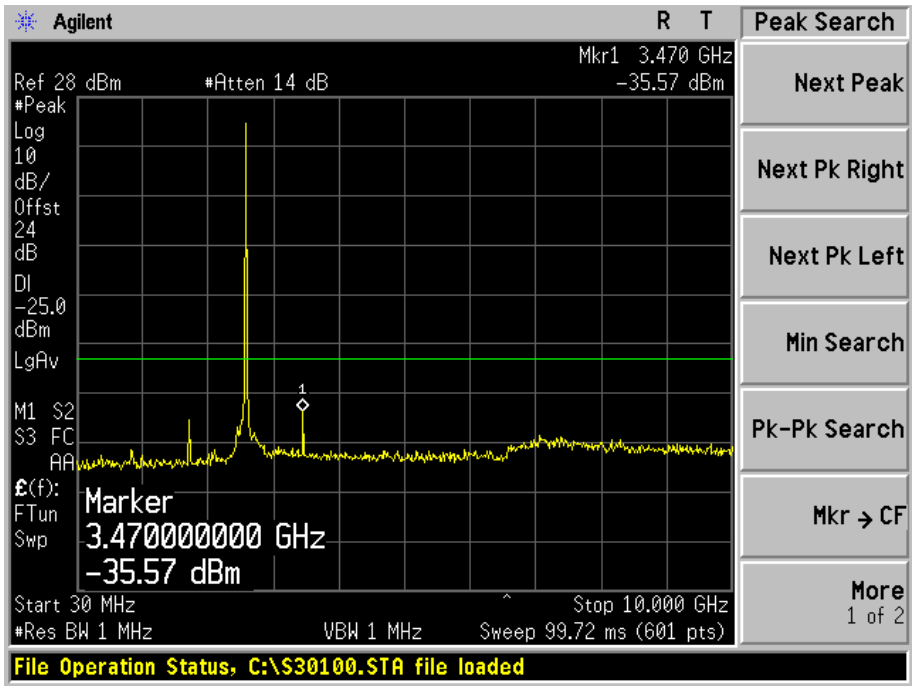
● **Spurious Emission at antenna Terminals**

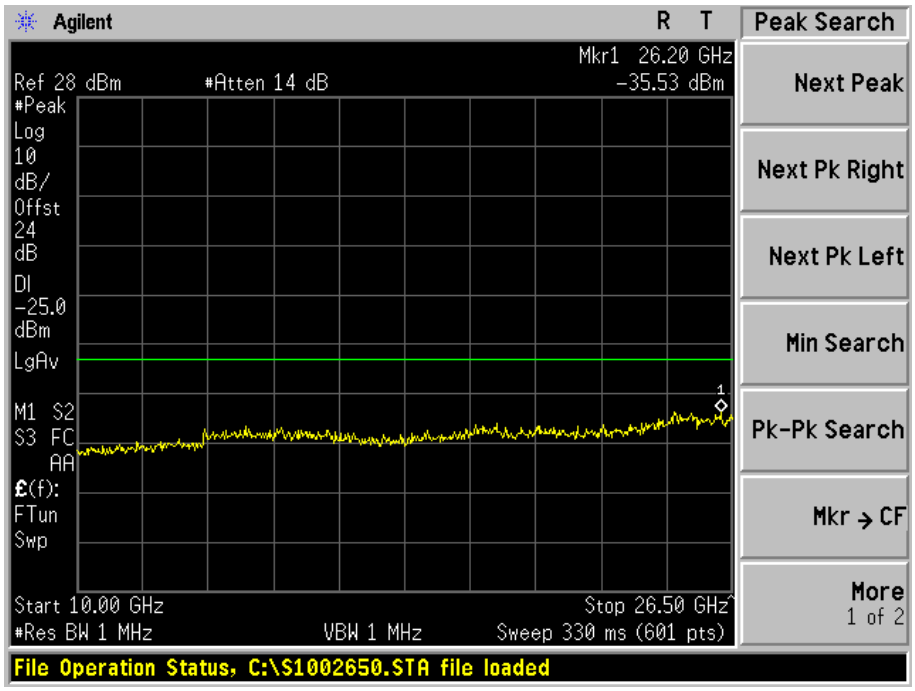
Low Channel



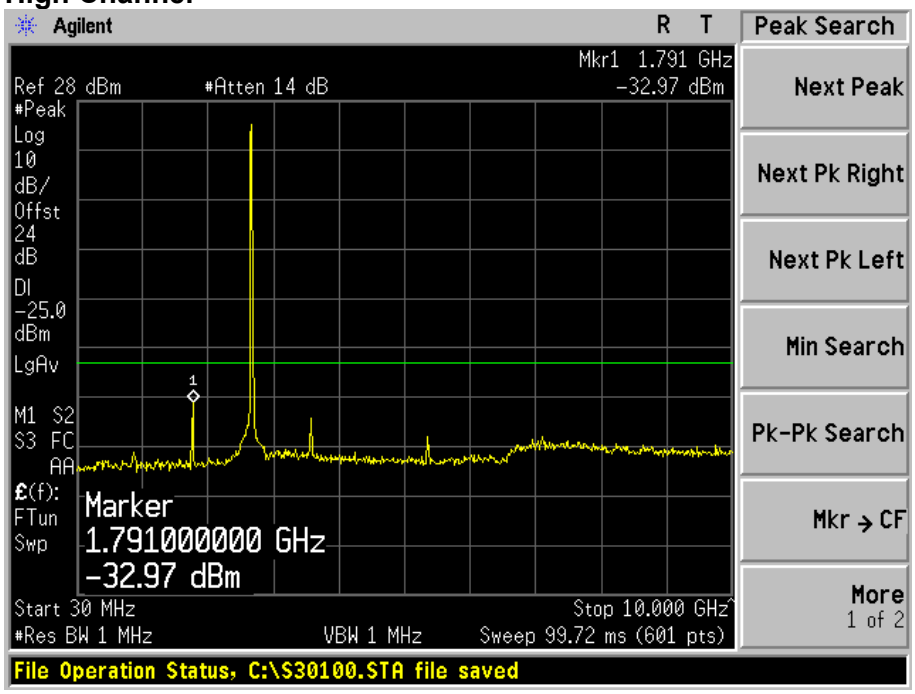


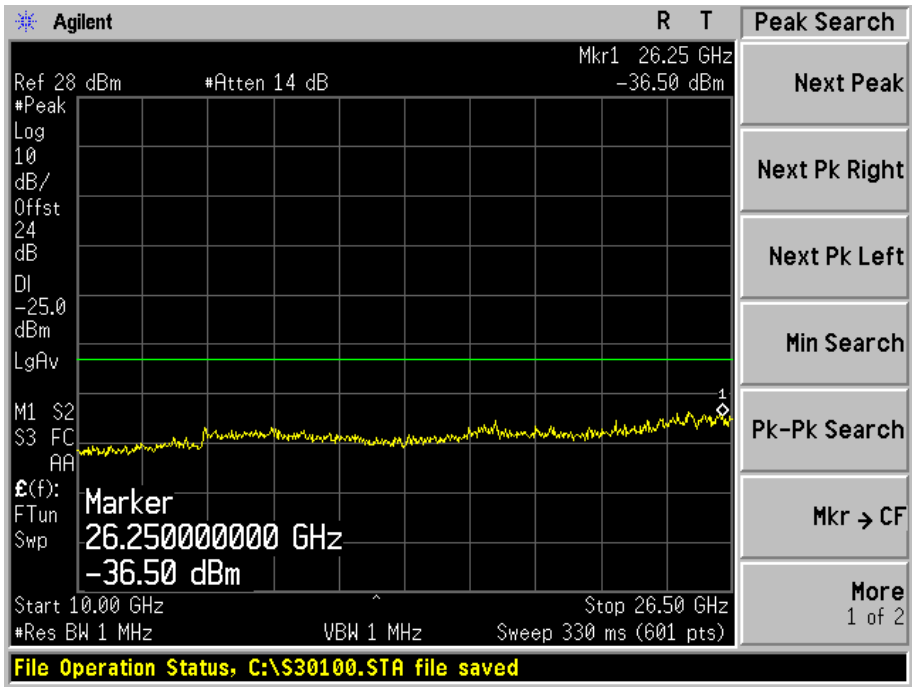
Middle Channel





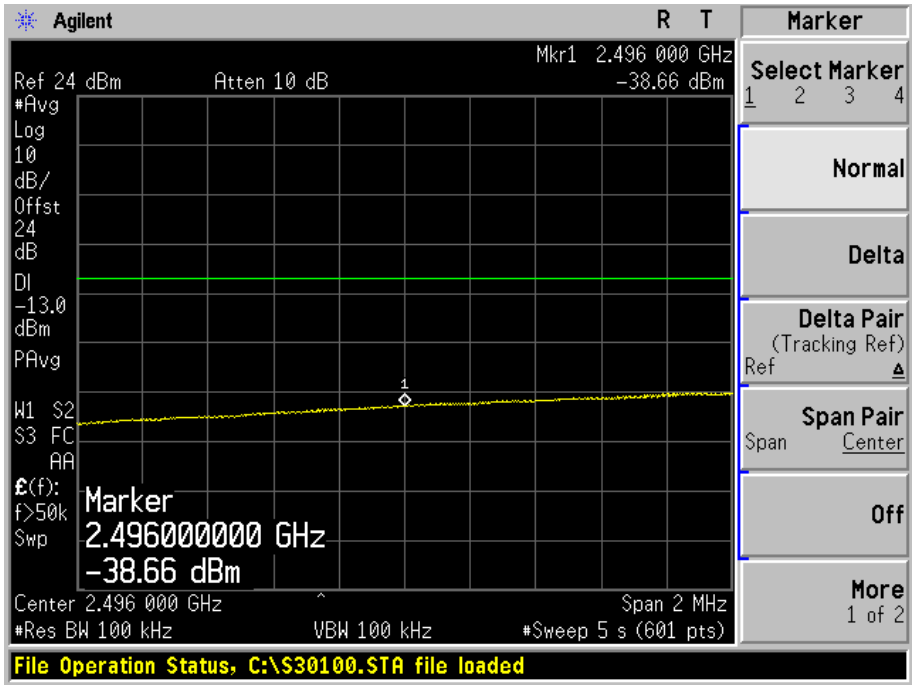
High Channel

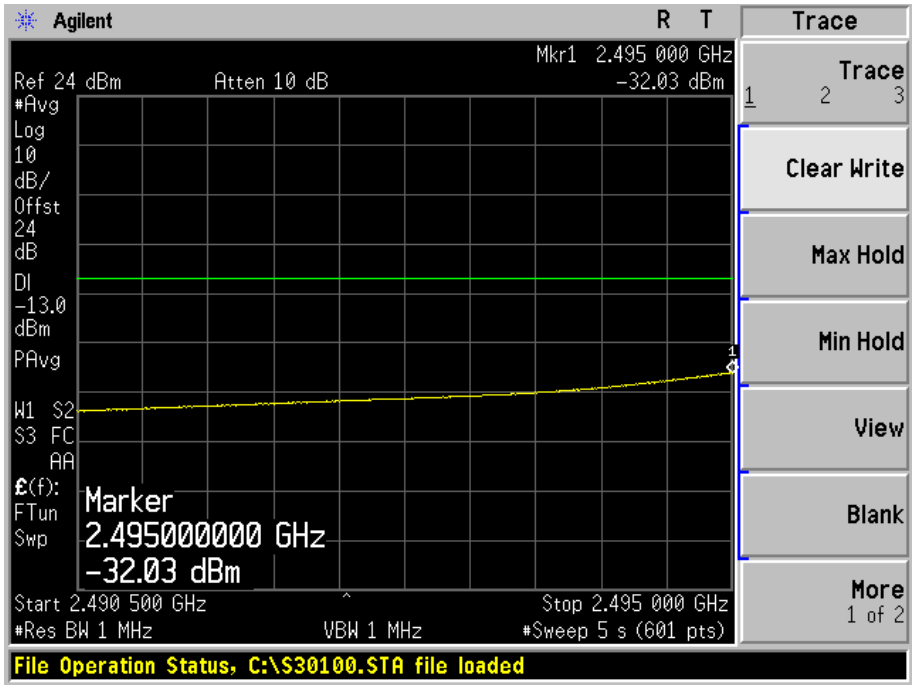




● **Band Edge**

Low Channel





High Channel