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.
21F Gangnam Bldg, 1321-1 Seocho-Dong, Seocho-Gu
Seoul, Korea, (Post code : 137-070)

Dates of Issue : May 20, 2010
Test Report No. : NK-10-R-092
Test Site : Nemko Korea Co., Ltd.

FCC ID	TARCDU-685A
Brand Name	C-motech
CONTACT PERSON	C-motech Co., Ltd. 21F Gangnam Bldg, 1321-1 Seocho-Dong, Seocho-Gu, Seoul, Korea (137-070) Mr. brian Song Telephone No. : +82-2-368-9926

Applied Standard:	FCC 47 CFR Part 2, 22, 24, 27
Classification:	Licensed Potable Transmitter Next to Body(PCT)
EUT Type:	EVDO Rev. A USB Modem

The device bearing the brand name and model 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. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

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.

June 22, 2010
Tested By : Minchul Shin
Engineer

June 22, 2010
Reviewed By : Changsoo Choi
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 2 & Part 22 & 24 & 27.

Responsible Party :	C-motech Co., Ltd.
Contact Person :	Mr. Brian Song Tel No. : +82 2 368 9926
Manufacturer :	C-motech Co., Ltd. 21F Gangnam Bldg, 1321-1 Seocho-Dong, Seocho-Gu, Seoul, Korea (137-070)

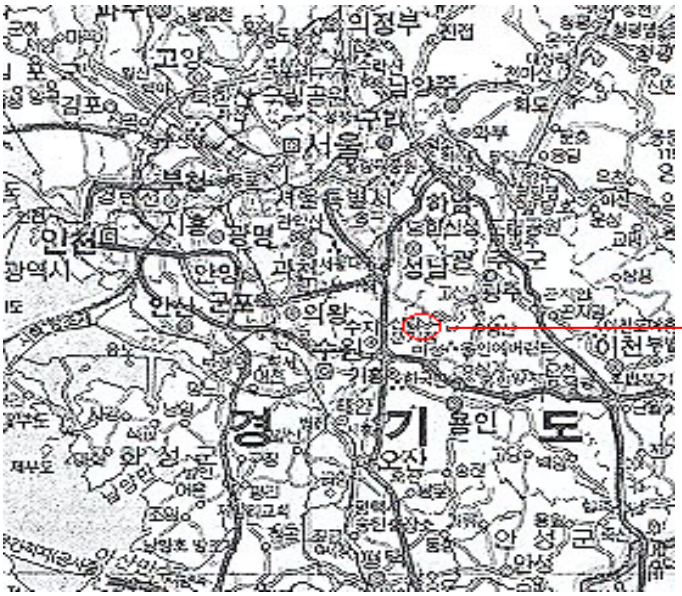
- FCC ID: TARCDU-685A
- Model: CDU-685A
- Brand Name: C-motech
- EUT Type: EVDO Rev. A USB Modem
- Classification: PCS Licensed Transmitter(PCB)
- Applied Standard: FCC 47 CFR Part & 2, 22, 24, 27
- Test Procedure(s): ANSI C63.4 (2003)
- Dates of Test: April 22, 2010 to May 17, 2010
- Place of Tests: Nemko Korea Co., Ltd.

2. Introduction (Site Description)

2.1 Test facility

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 : **TARCDU-685A**

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.

2.2 Accreditation and listing

Accreditation type		Accreditation number
FC	FCC part 15/18 Filing site	Registration No. 97992
	CAB Accreditation for DOC	Designation No. KR0026
KOLAS	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. 155
Industry Canada	Canada IC Registered site	Site No. 2040E-1
VCCI	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
IECEE CB SCHEME	EMC CBTL	-
방송통신위원회	KCC(RRL)Designated Lab.	Registration No. KR0026
	SASO registered Lab and Certification Body	Registration No. 2008-15

3. Test Conditions & EUT Information

3.1 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.

3.2 Environmental Conditions

Temperature	20℃ ~ 25℃
Relative Humidity	35% ~ 55%

3.3 Description of EUT

Frequency Band	Tx	824.70 MHz ~ 848.31 MHz 1851.25 MHz ~ 1908.75 MHz 1711.25 MHz ~ 1753.75 MHz
	Rx	869.70 MHz ~ 893.31 MHz 1931.25 MHz ~ 1988.75 MHz 2111.25 MHz ~ 2153.75 MHz
Output Power	Cellular CDMA : ERP 0.251 W(24.0 dBm) PCS CDMA : EIRP 0.562 W(27.5 dBm) AWS CDMA : EIRP 0.832 W(29.2 dBm)	
Interface	USB port	
Modulation Method	Tx : OQPSK / Rx : QPSK	
Emission Designator	1M28F9W(CDMA)/ 1M28F9W(PCS)/ 1M28F9W(AWS)	
Antenna Type	PIFA Antenna (Internal)	
Dimensions	32.1 mm(W) x 73mm(D) x 12 mm(H)	
Weight	Approx. 26 g	
Operating Conditions	-20°C ~ +55°C , 85% at 50°C	

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
ERP / EIRP Measurement	§22.913(a)(2) §24.232(c) §27.50(d)(2)	Complies
Conducted Output Power	§2.1046	Complies
Occupied Bandwidth / 26dB Emission Bandwidth	§2.1049 §22.917(a) §24.238(a) §27.53(g)1	Complies
Conducted Spurious Emission / Band Edge	§2.1051 §22.917(a) §24.238(a) §27.53(g)	Complies
Peak-Average Ratio	§24.232(d) §27.50(d)(5)	Complies
Radiated Spurious & Harmonic Emission	§2.1053 §22.917(a) §24.238(a) §27.53(g)	Complies
Frequency Stability / Temperature Variation	§2.1055 §22.355 §24.235 §27.54	Complies

6. Recommendation / Conclusion

The data collected shows that the **C-motech EVDO Rev. A USB Modem FCC ID: TARCDU-685A** is in compliance with Part 2, 22, 24 and 27 of the FCC Rules.

7. Test Equipment List

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Mar. 24 2010	1 year
2	*Test Receiver	R & S	ESCS 30	100302	Nov. 11 2009	1 year
3	*Amplifier	HP	8447F	2805A03427	Jul. 20 2009	1 year
4	*Amplifier	Sonoma Instrument	310N	291916	Jul. 22 2009	1 year
5	*Pre Amplifier	HP	8449B	3008A00107	Feb. 03 2010	1 year
6	*Pre Amplifier	HP	8447F	2805A03351	Oct. 12 2009	1 year
7	*Pre Amplifier	Agilent	83051A	3950M00201	Jun. 15 2009	1 year
8	*Spectrum Analyzer	Agilent	E4440A	MY44303257	Jul. 20 2009	1 year
9	*Wireless Communcation Test Set	Agilent	E5515C	MY48360948	Feb. 03 2010	1 year
10	*Spectrum Analyzer	R & S	FSP40	100361	Sep. 04 2009	1 year
11	*Loop Antenna	EMCO	6502	8911-2436	Jan. 11 2009	2 year
12	*Spectrum Analyzer	R & S	FSP40	100361	Sep. 04 2009	1 year
13	*Power Meter	R & S	NRVS	835360/002	Jan. 15 2010	1 year
14	Peak Power Sensor	R & S	NRV-Z32	836019/028	Nov. 11 2009	1 year
15	*Biconical Log Antenna	ARA	LPB-2520/A	1209	Dec. 08 2008	2 year
16	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-508	Dec.11 2008	2 year
17	*Horn Antenna	SCHWARZBECK	BBHA9170	9170223	Jun. 16 2008	2 year
18	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-257	Apr. 10 2010	2 year
19	*Directional Coupler	HP	778D	15550	Feb. 03 2010	1 year
20	LISN	R & S	ESH3-Z5	833874/006	Nov. 11 2009	1 year
21	LISN	R & S	ESH2-Z5	100227	Feb. 03 2010	1 year
22	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
23	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
24	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
25	*Anechoic Chamber	EM Eng.	N/A	N/A	N/A	N/A
26	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
27	*Position Controller	Seo-Young EMC	N/A	N/A	N/A	N/A
28	*Turn Table	Seo-Young EMC	N/A	N/A	N/A	N/A
29	*Antenna Mast	Seo-Young EMC	N/A	N/A	N/A	N/A
30	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
31	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A

8. Description of Tests

8.1 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.

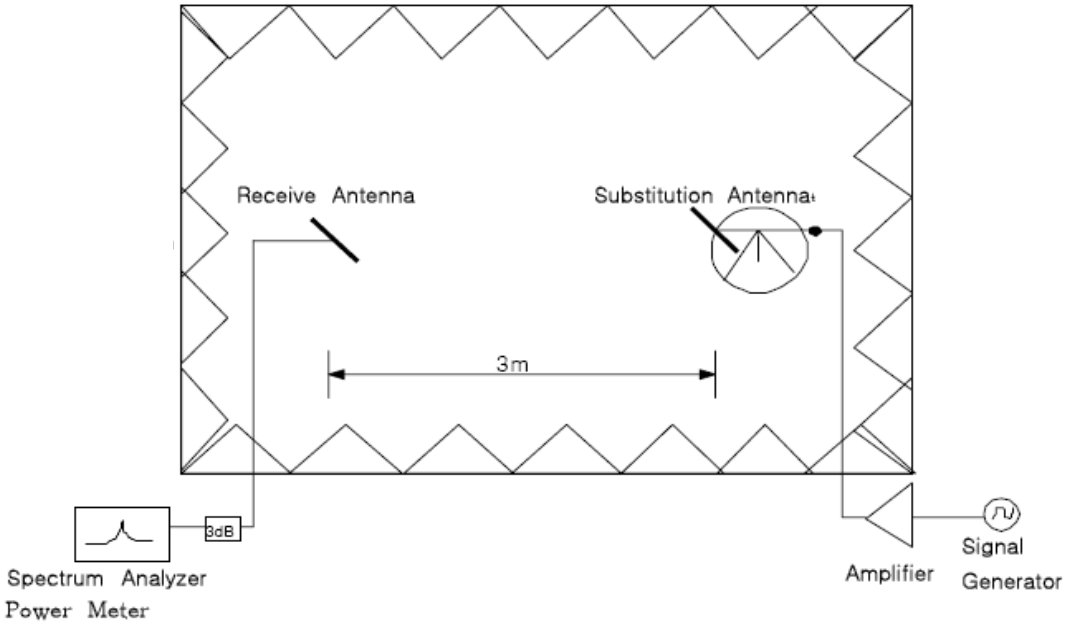


Diagram of ERP/EIRP test Set-up

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:

1. The maximum power level was searched by moving the turn table and measuring antenna and manipulating the EUT. This level (P_{EUT}) was recorded.
2. Spectrum analyzer was set to RBW 3 MHz, VBW 3 MHz for measurement.
3. The peak detection was used.
4. The EUT was replaced with a substituting antenna.
5. 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.

8.2 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.

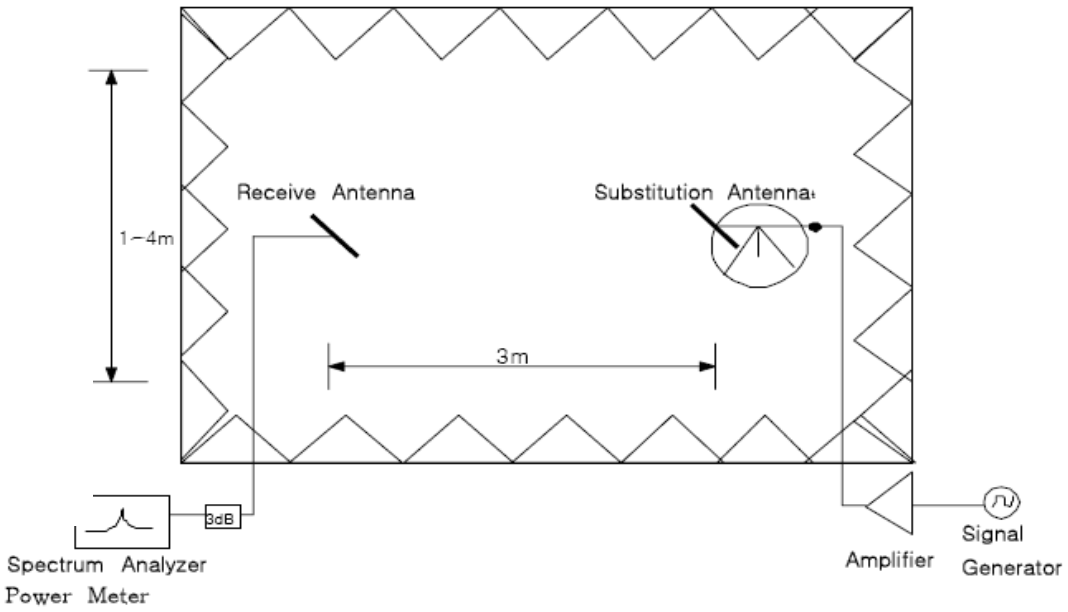


Diagram of Radiated Spurious & Harmonic test Set-up

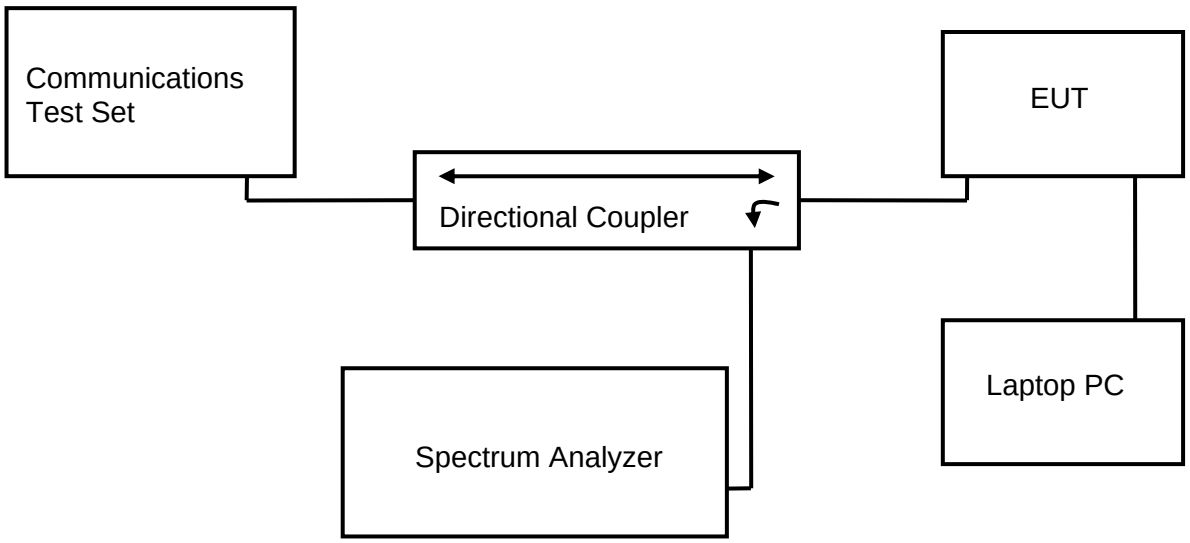
The EUT was set on a non-conductive turntable in a semi anechoic chamber.
In the corner of the chamber there was a communication antenna, which was connected to the BS simulator located outside the chamber. The radiated power from the EUT was measured with an antenna fixed to a antenna tower.
The tower 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.
The radiated spurious and harmonic emission were measured up to 10th harmonic of the fundamental frequency of operation.

Test Method:

1. The maximum power level was searched by moving the turn table and measuring antenna and manipulating the EUT. This level (P_{EUT}) was recorded.
2. For measurements the resolution bandwidth and video bandwidth were set to 100 kHz for emissions below 1GHz and 1 MHz for emissions over 1GHz.
3. The peak detection was used.
4. The EUT was replaced with a substituting antenna.
5. 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.

8.3 Occupied Bandwidth / 26dB Emission Bandwidth

Test Set-up:



Test Method:

Occupied Bandwidth

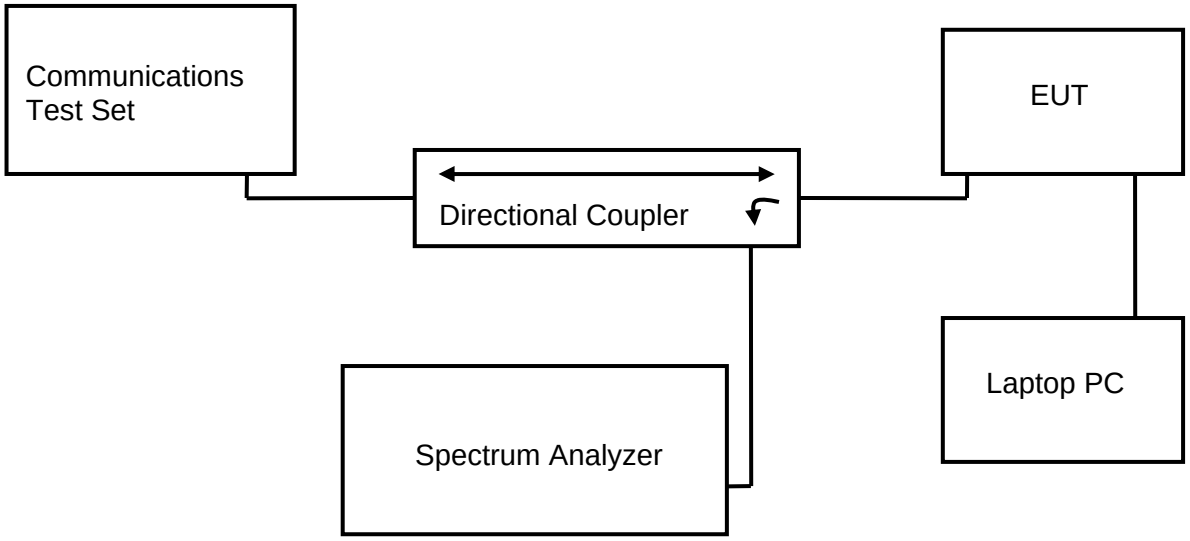
The EUT was setup to maximum output power at its lowest channel. The occupied bandwidth was measured using a spectrum analyzer. The measurements are repeated for the highest and a middle channel.
The EUT's occupied bandwidth was measured as the width of the signal between two points, one below the carrier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

26dB Emission Bandwidth

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

8.4 Conducted Spurious Emission

Test Set-up:



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 43+10log (P) dB. Limit equivalent to -13 dBm, calculation shown below.
43 + 10log (0.912 W) = 42.6 dB
29.6 dBm – 42.6 dB = -13 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 were repeated for the EUT's highest channel. For the Out-of-Band measurements a 1 MHz RBW, VBW and peak detection was used to scan from 10 MHz to 20 GHz. A display line was placed at -13 dBm to show compliance. The high, lowest and middle channels were tested for out of band measurements.

Frequency Bands:

BLOCK	Frequency Range (MHz) Transmitter (Tx)	Frequency Range (MHz) Receiver (Rx)
A* Low +A	824 ~ 835	869 ~ 880
B	835 ~ 845	880 ~ 890
A* High	845 ~ 846.5	890 ~ 891.5
B*	846.5 ~ 849	891.5 ~ 894

Cellular Service Frequency Blocks

BLOCK	Frequency Range (MHz) Transmitter (Tx)	Frequency Range (MHz) Receiver (Rx)
A	1850 ~ 1865	1930 ~ 1745
B	1870 ~ 1885	1950 ~ 1965
C	1895 ~ 1910	1975 ~ 1990
D	1865 ~ 1870	1945 ~ 1950
E	1885 ~ 1890	1965 ~ 1970
F	1890 ~ 1895	1970 ~ 1975

PCS Service Frequency Blocks

BLOCK	Frequency Range (MHz) Transmitter (Tx)	Frequency Range (MHz) Receiver (Rx)
A	1710 ~ 1720	2110 ~ 2120
B	1720 ~ 1730	2120 ~ 2130
C	1730 ~ 1735	2130 ~ 2135
D	1735 ~ 1740	2135 ~ 2140
E	1740 ~ 1745	2140 ~ 2145
F	1745 ~ 1755	2145 ~ 2155

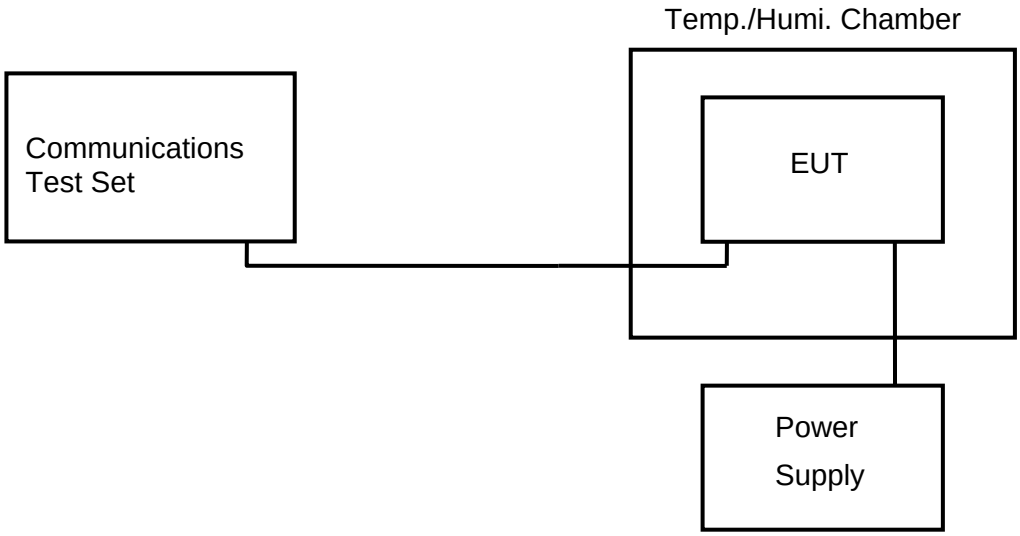
AWS Service Frequency Blocks

8.5 Peak to Average Ratio

A peak to average ratio measurement is performed at the conducted port of the EUT. For CDMA and WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) Measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak wave form spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth grater than the emission bandwidth

8.6 Frequency Stability / Temperature Variation

Test Set-up:



Specification :

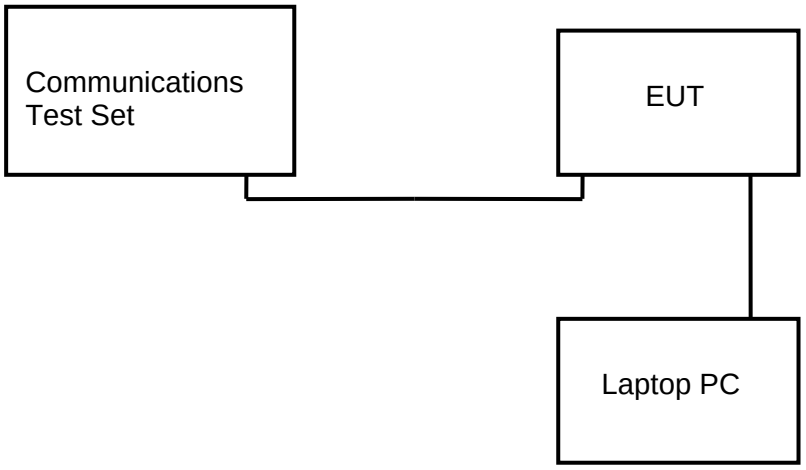
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025 % (± 2.5ppm) of the center frequency.

Test Method :

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.

8.7 Conducted Output Power

Test Set-up:



Test Method :

For conducted power measurement, connected the EUT to Communications Test Set (E5515C) directly. Set the EUT transmit the maximum power at the wanted channel by controlled E5515C. The test was performed using the average power measure under all configurations and the highest power was recorded.

9. Test Data

9.1 Conducted Output Power

1x RTT Power Measurement

Band	Channel	SO2 (dBm)	SO2 (dBm)	SO2 (dBm)	SO55 (dBm)	SO55 (dBm)	SO9 (dBm)	SO9 (dBm)	SO55 (dBm)	TDSO SO32 FCH Only (dBm)	TDSO SO32 FCH +SCH (dBm)
	F-RC	RC1	RC3	RC4	RC1	RC3	RC2	RC5	RC2	RC3	RC3
	Vocoder Rate	Full	Full	Full	Full	Full	Full	Full	Full	Full	Full
Cell.	1013	24.78	24.74	24.73	24.72	24.75	24.74	24.73	24.58	24.74	24.78
	384	24.42	24.43	24.47	24.43	24.45	24.43	24.45	24.46	24.48	24.35
	777	24.48	24.45	24.46	24.48	24.46	24.47	24.44	24.43	24.43	24.45
PCS	25	23.42	23.42	23.42	23.40	23.42	23.47	23.40	23.44	23.37	23.41
	600	23.55	23.60	23.58	23.57	23.56	23.56	23.55	23.63	23.53	23.57
	1175	23.35	23.35	23.37	23.35	23.35	23.37	23.33	23.34	23.36	23.35
AWS	25	23.95	23.82	23.82	23.97	23.84	23.90	23.80	23.97	23.84	23.81
	450	24.01	23.88	23.79	23.98	23.80	24.00	23.77	24.00	23.85	23.84
	875	24.12	24.00	24.02	24.05	23.97	23.86	23.80	23.85	24.02	24.03

EvDO Rev. 0 Power Measurement

EvDO Rev.0 (dBm) – FTAP Rate = 2Slot Version 307.2 kbps						
Band	RTAP Rate / Channel	9.6 kbps	19.2 kbps	38.4 kbps	76.8 kbps	153.6 kbps
Cell.	1013	24.59	24.51	24.50	24.50	24.54
	384	24.31	24.30	24.23	24.24	24.24
	777	24.25	24.24	24.26	24.28	24.25
PCS	25	23.32	23.33	23.29	23.33	23.30
	600	23.53	23.50	23.51	23.49	23.51
	1175	23.15	23.16	23.17	23.15	23.09
AWS	25	23.64	23.59	23.58	23.63	23.64
	450	23.82	23.79	23.72	23.72	23.71
	875	23.96	23.96	23.95	23.84	23.82

EvDO Rev. A Power Measurement

EvDO Rev.A (dBm) – FETAP Rate = 2Slot Version 307.2 kbps													
Band	RETAP Payload / Channel	128 bits	256 bits	512 bits	768 bits	1024 bits	1536 bits	2048 bits	3072 bits	4096 bits	6144 bits	8192 bits	12288 bits
Cell.	1013	24.70	24.72	24.71	24.64	24.64	24.66	24.65	24.67	24.70	24.65	24.67	24.65
	384	24.40	24.40	24.39	24.41	24.40	24.38	24.42	24.41	24.40	24.41	24.37	24.42
	777	24.45	24.42	24.36	24.39	24.41	24.40	24.41	24.36	24.41	24.42	24.39	24.43
PCS	25	23.42	23.40	23.41	23.39	23.39	23.42	23.48	23.41	23.40	23.45	23.41	23.45
	600	23.63	23.64	23.64	23.56	23.65	23.68	23.66	23.66	23.68	23.62	23.66	23.65
	1175	23.10	23.09	23.06	23.06	23.07	23.05	23.04	23.06	23.07	23.06	23.05	23.05
AWS	25	23.60	23.56	23.58	23.62	23.60	23.67	23.65	23.64	23.63	23.62	23.61	23.60
	450	23.82	23.79	23.82	23.86	23.87	23.88	23.88	23.81	23.87	23.84	23.82	23.83
	875	23.98	24.01	24.02	23.99	24.01	23.96	23.85	23.82	23.82	23.79	23.79	23.81

9.2 Effective Radiated Power (ERP)

Measurement Results : Cellular

Mode : 1x RTT

Frequency (MHz)	Ant*. Pol.	Reading (dBuV)	Correction**) Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
824.70	V	95.4	-71.9	23.5	38.45	15.0
836.52	V	95.7	-71.7	24.0	38.45	14.5
848.31	V	94.0	-71.7	22.3	38.45	16.2

Radiated Measurements at 3meters

Mode : EV-DO

Frequency (MHz)	Ant*. Pol.	Reading (dBuV)	Correction**) Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
824.70	V	95.4	-71.9	23.5	38.45	15.0
836.52	V	95.0	-71.7	23.3	38.45	15.2
848.31	V	93.8	-71.7	22.1	38.45	16.4

Radiated Measurements at 3meters

Note: This device was tested under all R.C.s and S.O.s. The worst case is reported with RC3/SO32 FCH+SCH for 1xRTT and FTAP Rate 2Slot 307.2 kbps/RETAP Rate 128 bits for EVDO Rev.A with 'All Up'power control bits.

***Correction Factor(dB) = Air loss+ Receiving Antenna factor+ Receiving Signal Pass Loss + Unit coversion factor(-107 dB)*

9.3 Equivalent Isotropic Radiated Power (EIRP)

Measurement Results: PCS

Mode : 1x RTT

Frequency (MHz)	Ant*. Pol.	Reading (dBuV)	Correction**) Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1851.25	V	91.5	-64.7	26.8	33	6.2
1880.00	V	91.6	-64.1	27.5	33	5.5
1908.75	V	89.5	-63.5	26.0	33	7.0

Radiated Measurements at 3meters

Mode : EV-DO

Frequency (MHz)	Ant*. Pol.	Reading (dBuV)	Correction**) Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1851.25	V	90.3	-64.7	25.6	33	7.4
1880.00	V	91.6	-64.1	27.5	33	5.5
1908.75	V	89.8	-63.5	26.3	33	6.7

Radiated Measurements at 3meters

Note: This device was tested under all R.C.s and S.O.s. The worst case is reported with RC3/SO32 FCH+SCH for 1xRTT and FTAP Rate 2Slot 307.2 kbps/RETAP Rate 128 bits for EVDO Rev.A with 'All Up'power control bits.

***Correction Factor(dB) = Air loss+ Receiving Antenna factor+ Receiving Signal Pass Loss + Unit coversion factor(-107 dB)*

Measurement Results: AWS

Mode : 1x RTT

Frequency (MHz)	Ant*. Pol.	Reading (dBuV)	Correction**) Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1711.25	V	93.3	-66.0	27.3	30	2.7
1732.50	V	93.9	-65.7	28.2	30	1.8
1753.75	V	94.0	-65.6	28.4	30	1.6

Radiated Measurements at 3meters

Mode : EV-DO

Frequency (MHz)	Ant*. Pol.	Reading (dBuV)	Correction**) Factor (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
1711.25	V	94.0	-66.0	28.0	30	2.0
1732.50	V	94.6	-65.7	28.9	30	1.1
1753.75	V	94.8	-65.6	29.2	30	0.8

Radiated Measurements at 3meters

Note: This device was tested under all R.C.s and S.O.s. The worst case is reported with RC3/SO32 FCH+SCH for 1xRTT and FTAP Rate 2Slot 307.2 kbps/RETAP Rate 128 bits for EVDO Rev.A with 'All Up'power control bits.

***Correction Factor(dB) = Air loss+ Receiving Antenna factor+ Receiving Signal Pass Loss + Unit coversion factor(-107 dB)*

9.4 Occupied Bandwidth / 26 dB Emission Bandwidth

Measurement Results : Cellular CDMA

Channel	Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
1013	824.70	1.2819	1.436
384	836.52	1.2829	1.441
777	848.31	1.2857	1.446

Measurement Results : PCS CDMA

Channel	Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
25	1851.25	1.2844	1.441
600	1880.00	1.2818	1.438
1175	1908.75	1.2893	1.466

Measurement Results : AWS CDMA

Channel	Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
25	1711.25	1.2877	1.452
450	1732.50	1.2826	1.446
875	1753.75	1.2861	1.439

9.5 Radiated Spurious & Harmonic Emission (Cellular)

Measurement Results:

CH 1013 (824.70 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction** Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
2307.0	V	54.5	-94.2	-39.7	-13	26.7
2475.3	V	58.2	-95.1	-36.9	-13	23.9
3297.4	V	54.9	-95.1	-40.2	-13	27.2
8250.4	H	51.7	-81.7	-30.0	-13	17.0
9074.3	V	51.8	-79.4	-27.6	-13	14.6

Radiated Measurements at 3meters

CH 384 (836.52 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction** Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
2509.5	V	59.3	-95.0	-35.7	-13	22.7
3341.23	V	56.1	-95.1	-39.0	-13	26.0
7528.9	H	51.9	-80.9	-29.0	-13	16.0
8362.5	V	56.0	-81.0	-25.0	-13	12.0
9205.9	V	52.8	-78.4	-25.6	-13	12.6

Radiated Measurements at 3meters

CH 777 (848.31 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction**) Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
1975.8	V	53.9	-97.1	-43.2	-13	30.2
2305.2	V	52.5	-94.1	-41.6	-13	28.6
2544.6	V	69.3	-95.2	-25.9	-13	12.9
3390.0	V	55.0	-94.5	-39.5	-13	26.5
8484.4	H	51.5	-80.8	-29.3	-13	16.3

Radiated Measurements at 3meters

Note: This device was tested under all R.C.s and S.O.s. The worst case is reported with FTAP Rate 2Slot 307.2 kbps/RETAP Rate 128 bits with 'All Up'power control bits.

1. **Ant Pol. H =Horizontal V=Vertical*
2. ***Correction Factor(dB) [1)] = Air loss+ Receiving Antenna factor+ Receiving Signal Pass Loss + Unit coversion factor(-107 dB)*
3. *The radiated emissions testing were made by rotating through three orthogonal axes and the worst date was recorded.*
4. *For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz with peak measurements*
5. *The spectrum is measured to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.*

9.6 Radiated Spurious & Harmonic Emission (PCS)

Measurement Results :

CH25 (1851.25 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction** Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
3702.0	V	67.4	-92.8	-25.4	-13	12.4
5549.6	H	58.5	-87.5	-29.0	-13	16.0
7402.1	V	54.1	-80.4	-26.3	-13	13.3
9259.5	H	54.9	-77.7	-22.8	-13	9.8
11107.1	V	54.4	-74.8	-20.4	-13	7.4

Radiated Measurements at 3meters

CH 600 (1880.00 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction** Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
3755.6	V	68.5	-92.4	-23.9	-13	10.9
5637.4	H	61.2	-87.3	-26.1	-13	13.1
7519.1	H	55.6	-80.9	-25.3	-13	12.3
9400.9	V	55.7	-77.1	-21.4	-13	8.4
11282.6	V	54.9	-74.5	-19.6	-13	6.6

Radiated Measurements at 3meters

CH 1175 (1908.75 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction**) Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
3814.1	V	67.8	-92.0	-24.2	-13	11.2
5725.1	H	58.8	-87.4	-28.6	-13	15.6
7636.1	V	54.0	-81.6	-27.6	-13	14.6
9547.1	V	56.8	-78.1	-21.3	-13	8.3
11453.3	V	52.8	-73.5	-20.7	-13	7.7

Radiated Measurements at 3meters

Note: This device was tested under all R.C.s and S.O.s. The worst case is reported with FTAP Rate 2Slot 307.2 kbps/RETAP Rate 128 bits with 'All Up'power control bits.

1. **Ant Pol. H =Horizontal V=Vertical*
2. ***Correction Factor(dB) [1)] = Air loss+ Receiving Antenna factor+ Receiving Signal Pass Loss + Unit coversion factor(-107 dB)*
3. *The radiated emissions testing were made by rotating through three orthogonal axes and the worst date was recorded.*
4. *For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz with peak measurements*
5. *The spectrum is measured to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.*

9.7 Radiated Spurious & Harmonic Emission (AWS)

Measurement Results :

CH25 (1711.25 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction** Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
3419.3	V	67.9	-94.1	-26.2	-13	13.2
5135.3	H	53.5	-87.6	-34.1	-13	21.1
6846.4	H	52.0	-83.8	-31.8	-13	18.8
8557.5	H	56.7	-80.1	-23.4	-13	10.4

Radiated Measurements at 3meters

CH 450 (1732.500 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction** Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
3463.1	V	66.2	-93.7	-27.5	-13	14.5
5198.6	V	57.9	-88.3	-30.4	-13	17.4
6929.3	V	53.3	-83.3	-30.0	-13	17.0
8664.8	H	58.1	-79.4	-21.3	-13	8.3

Radiated Measurements at 3meters

CH 875 (1753.75 MHz)

Frequency (MHz)	Ant.* Pol.	Reading (dBuV)	Correction**) Factor (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)
3507.0	V	72.7	-93.6	-20.9	-13	7.9
5262.0	V	57.4	-88.7	-31.3	-13	18.3
7017.0	H	53.7	-82.2	-28.5	-13	15.5
8767.1	H	53.6	-78.9	-25.3	-13	12.3

Radiated Measurements at 3meters

Note: This device was tested under all R.C.s and S.O.s. The worst case is reported with FTAP Rate 2Slot 307.2 kbps/RETAP Rate 128 bits with 'All Up'power control bits.

1. **Ant Pol. H =Horizontal V=Vertical*
2. ***Correction Factor(dB) [1)] = Air loss+ Receiving Antenna factor+ Receiving Signal Pass Loss + Unit coversion factor(-107 dB)*
3. *The radiated emissions testing were made by rotating through three orthogonal axes and the worst date was recorded.*
4. *For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz with peak measurements*
5. *The spectrum is measured to 10th harmonic and the worst-case emissions are reported. No significant emissions were found beyond the fifth harmonic for this device.*

9.8 Frequency Stability / Temperature Variation (Cellular)

Test channel : Middle channel (836.52 MHz)

Standard test voltage : 5 Vdc

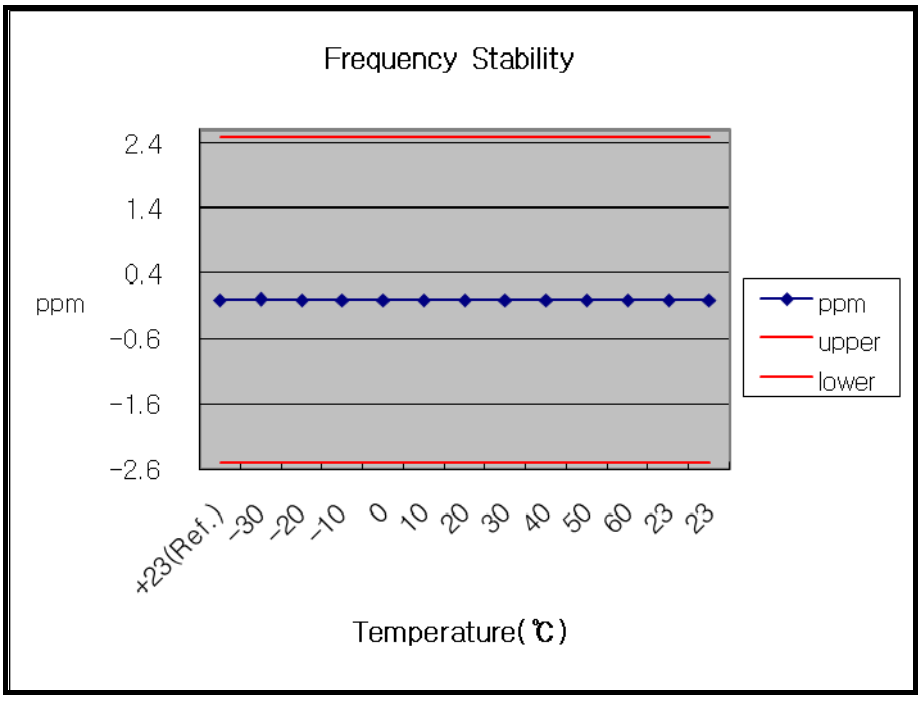
Deviation Limit : ±2.5 ppm

Measurement Result :

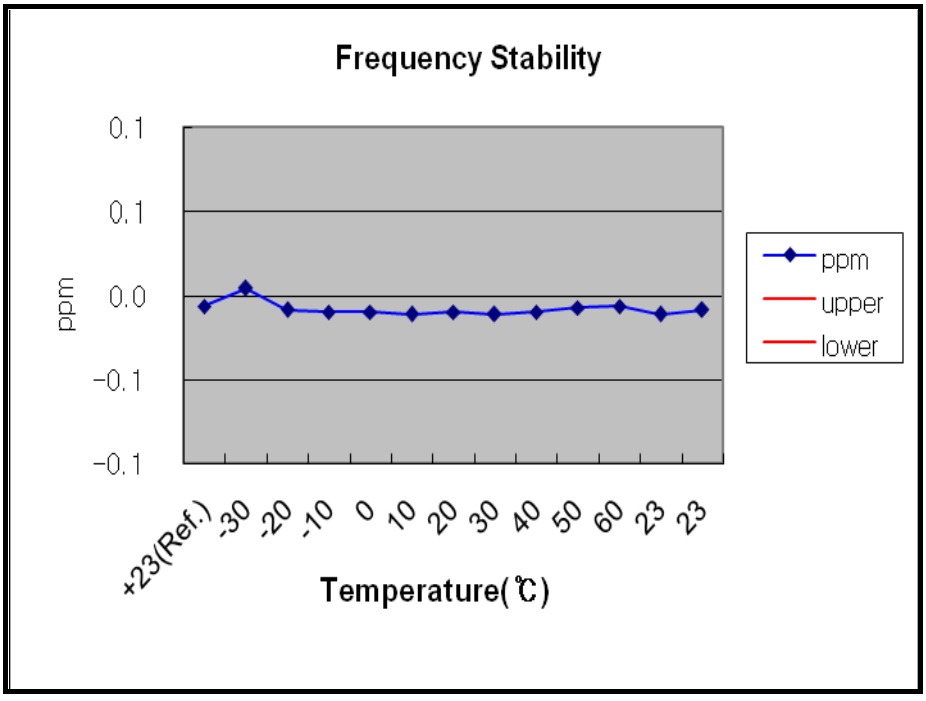
Voltage (%)	Power (Vdc)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100%	5	+23(Ref.)	836,519,998	-5	-0.0060
100%		-30	836,519,996	4	0.0048
100%		-20	836,520,003	-7	-0.0084
100%		-10	836,520,004	-8	-0.0096
100%		0	836,520,002	-8	-0.0096
100%		10	836,520,003	-9	-0.0108
100%		20	836,519,997	-8	-0.0096
100%		30	836,520,002	-9	-0.0108
100%		40	836,519,998	-8	-0.0096
100%		50	836,519,997	-6	-0.0072
100%		60	836,520,005	-5	-0.0060
85%	4.25	23	836,519,998	-9	-0.0108
115%	5.75	23	836,520,003	-7	-0.0084

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

Frequency Stability Graph (PCS)



Zoom In



9.9 Frequency Stability / Temperature Variation (PCS)

Test channel : Middle channel (1880.00 MHz)

Standard test voltage : 5 Vdc

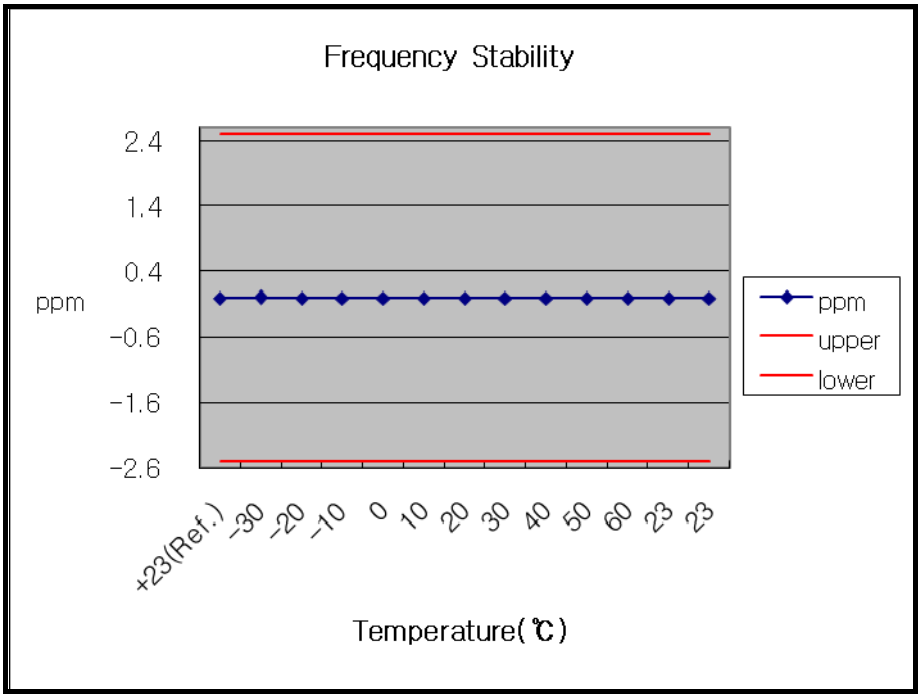
Deviation Limit : ±2.5 ppm

Measurement Result :

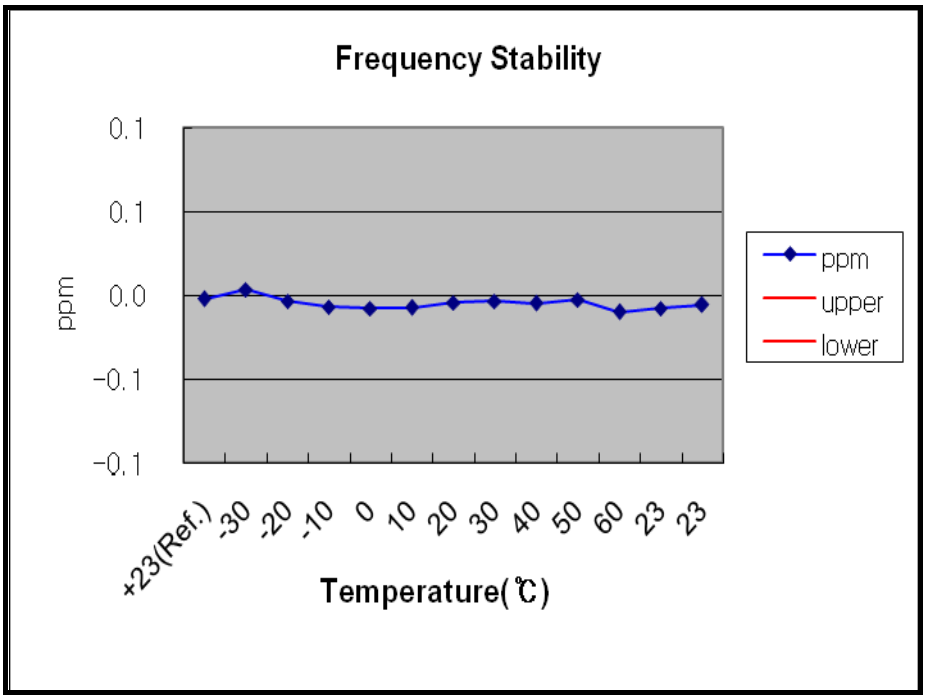
Voltage (%)	Power (Vdc)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100%	5.00	+23(Ref.)	1,879,999,996	-4	-0.0021
100%		-30	1,880,000,006	6	0.0032
100%		-20	1,879,999,993	-7	-0.0037
100%		-10	1,879,999,987	-13	-0.0069
100%		0	1,879,999,985	-15	-0.0080
100%		10	1,879,999,986	-14	-0.0074
100%		20	1,879,999,992	-8	-0.0043
100%		30	1,879,999,993	-7	-0.0037
100%		40	1,879,999,991	-9	-0.0048
100%		50	1,879,999,995	-5	-0.0027
100%		60	1,879,999,981	-19	-0.0101
85%	4.25	23	1,879,999,985	-15	-0.0080
115%	5.75	23	1,879,999,989	-11	-0.0059

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

Frequency Stability Graph (PCS)



Zoom In



9.10 Frequency Stability / Temperature Variation (AWS)

Test channel : Middle channel (1732.500 MHz)

Standard test voltage : 5 Vdc

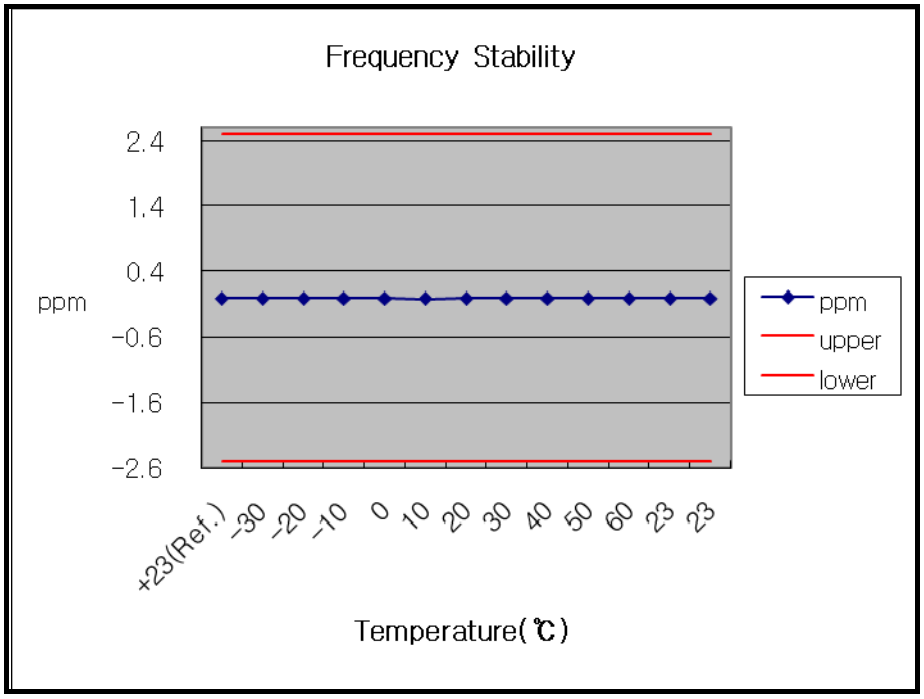
Deviation Limit : ±2.5 ppm

Measurement Result :

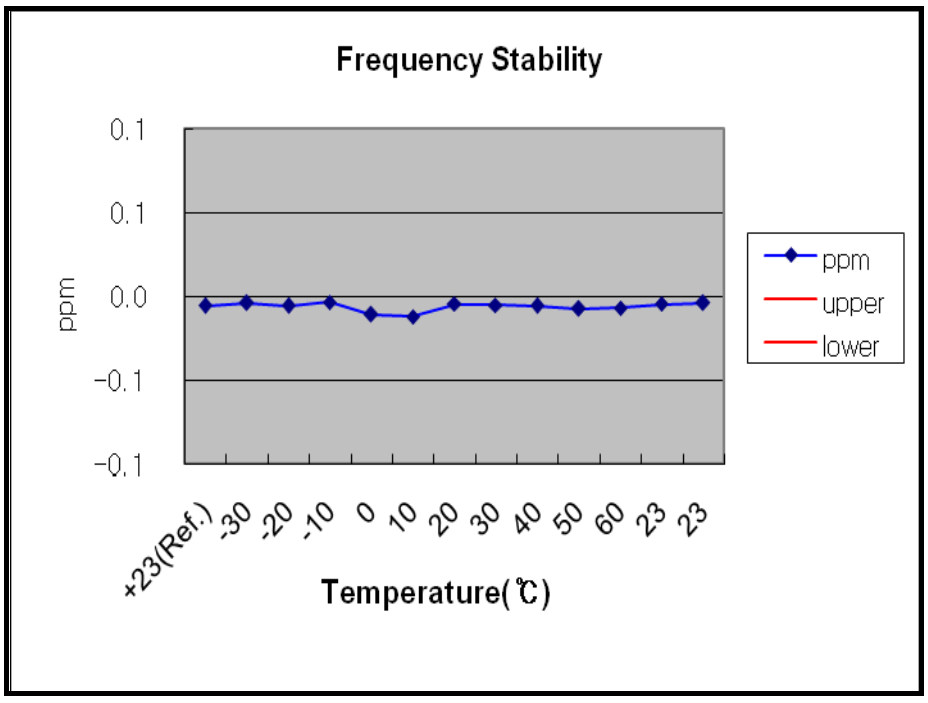
Voltage (%)	Power (Vdc)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100%	5.00	+23(Ref.)	1,732,499,990	-10	-0.0058
100%		-30	1,732,499,993	-7	-0.0041
100%		-20	1,732,499,990	-10	-0.0058
100%		-10	1,732,499,994	-6	-0.0035
100%		0	1,732,499,981	-19	-0.0110
100%		10	1,732,499,979	-21	-0.0122
100%		20	1,732,499,992	-8	-0.0046
100%		30	1,732,499,991	-9	-0.0052
100%		40	1,732,499,990	-10	-0.0058
100%		50	1,732,499,987	-13	-0.0075
100%		60	1,732,499,988	-12	-0.0070
85%	4.25	23	1,732,499,992	-8	-0.0046
115%	5.75	23	1,732,499,993	-7	-0.0041

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

Frequency Stability Graph (AWS)



Zoom In



10. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95%

1. Conducted Uncertainty Calculation

Source of Uncertainty	*Xi*	Uncertainty of *Xi*		Coverage factor *k*	*u(Xi)* (dB)	*Ci*	*Ci u(Xi)* (dB)
		Value (dB)	Probability Distribution				
Receiver reading	***RI***	± 0.1	normal 1	1.000	0.1	1	0.1
Attenuation AMN-Receiver	***LC***	± 0.08	normal 2	2.000	0.04	1	0.04
AMN Voltage division factor	***LAMN***	± 0.8	normal 2	2.000	0.4	1	0.4
Sine wave voltage	***dVSW***	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	***dVPA***	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	***dVPR***	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	***dVNF***	± 0.00	-	-	0.00	1	0.00
AMN Impedance	***dZ***	± 1.80	triangular	2.449	0.73	1	0.73
ⓐ Mismatch	***M***	+ 0.70	U-Shaped	1.414	0.49	1	0.49
ⓑ Mismatch	***M***	- 0.80	U-Shaped	1.414	- 0.56	1	- 0.56
Measurement System Repeatability	***RS***	0.05	normal 1	1.000	0.05	1	0.05
Remark	ⓐ: AMN-Receiver Mismatch : + ⓑ: AMN-Receiver Mismatch : -						
Combined Standard Uncertainty	Normal			± 1.88			
Expended Uncertainty U	Normal (k = 2)			± 3.76			

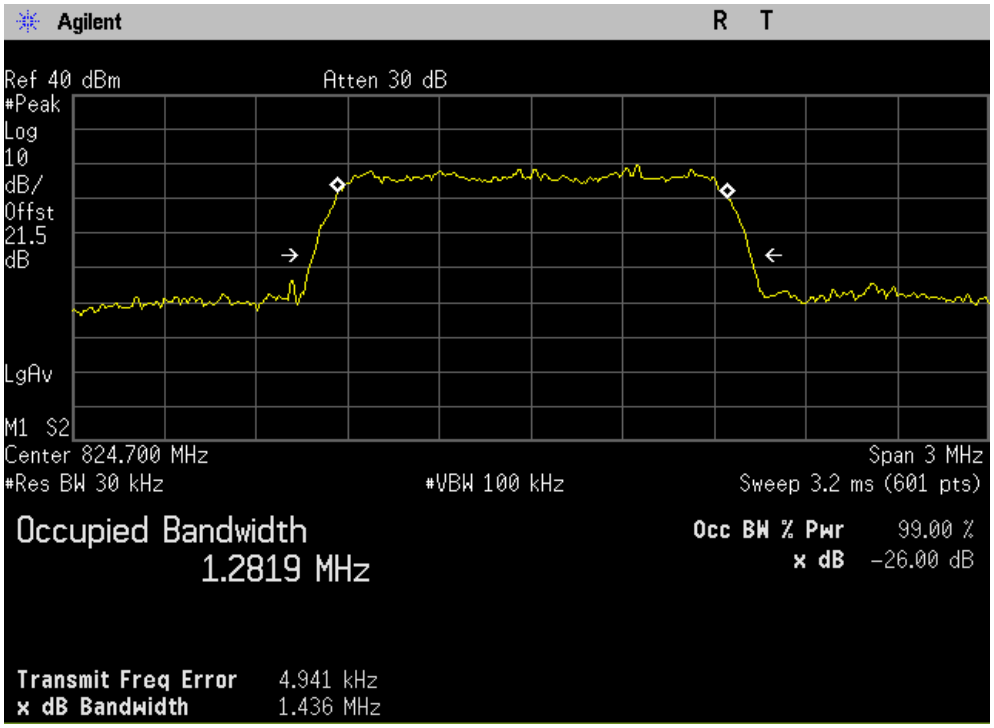
2. Radiation Uncertainty Calculation

Source of Uncertainty	*Xi*	Uncertainty of *Xi*		Coverage factor *k*	*u(Xi)* (dB)	*Ci*	*Ci u(Xi)* (dB)
		Value (dB)	Probability Distribution				
Receiver reading	***RI***	± 0.10	normal 1	1.000	0.10	1	0.10
Sine wave voltage	***dVsw***	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	***dVpa***	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	***dVpr***	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	***dVnf***	± 0.50	normal 2	2.000	0.25	1	0.25
Antenna Factor Calibration	***AF***	± 1.50	normal 2	2.000	0.75	1	0.75
Attenuation Antenna-receiver	***CL***	± 0.52	normal 2	2.000	0.26	1	0.26
Antenna Directivity	***AD***	± 1.00	rectangular	1.732	0.58	1	0.58
Antenna Factor Height Dependence	***AH***	± 0.50	rectangular	1.732	0.29	1	0.29
Antenna Phase Centre Variation	***AP***	± 0.30	rectangular	1.732	0.17	1	0.17
Antenna Factor Frequency Interpolation	***AI***	± 0.30	rectangular	1.732	0.17	1	0.17
Site Imperfections	***SI***	± 4.00	triangular	2.449	1.63	1	1.63
Measurement Distance Variation	***DV***	± 0.10	rectangular	1.732	0.06	1	0.06
Antenna Balance	***Dbal***	± 0.90	rectangular	1.732	0.52	1	0.52
Cross Polarisation	***DCross***	± 0.90	rectangular	1.732	0.52	1	0.52
ⓐ Mismatch	***M***	+ 0.25	U-Shaped	1.414	0.18	1	0.18
ⓑ Mismatch	***M***	- 0.26	U-Shaped	1.414	- 0.18	1	- 0.18
ⓒ Mismatch	***M***	+ 0.98	U-Shaped	1.414	0.69	1	0.69
ⓓ Mismatch	***M***	- 1.11	U-Shaped	1.414	- 0.79	1	- 0.79
Measurement System Repeatability	***RS***	0.09	normal 1	1.000	0.09	1	0.09
Remark	ⓐ: Biconical Antenna-receiver Mismatch : + (< 200 MHz) ⓑ: Biconical Antenna-receiver Mismatch : - (< 200 MHz) ⓒ: Log Periodic Antenna-receiver Mismatch : + (≧ 200 MHz) ⓓ: Log Periodic Antenna-receiver Mismatch : - (≧ 200 MHz)						
Combined Standard Uncertainty	Normal			± 2.63 (< 200 MHz) ± 2.74 (≧200 MHz)			
Expended Uncertainty U	Normal (*k* = 2)			± 5.26 (< 200 MHz) ± 5.48 (≧200 MHz)			

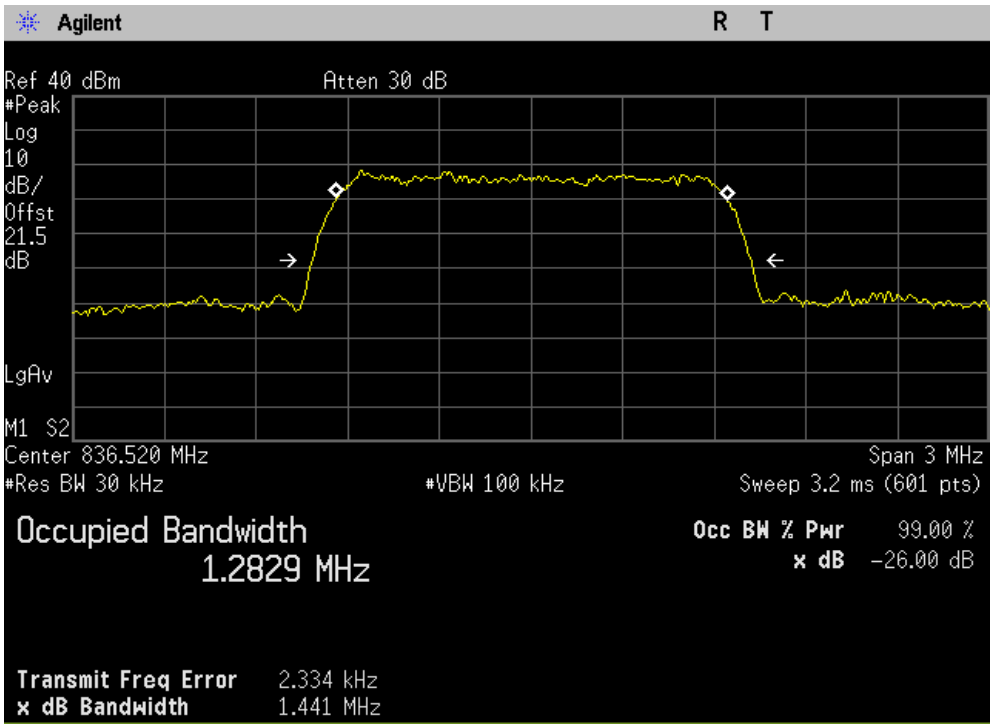
11. Test Plots (Cellular)

● Occupied Bandwidth / 26dB Bandwidth

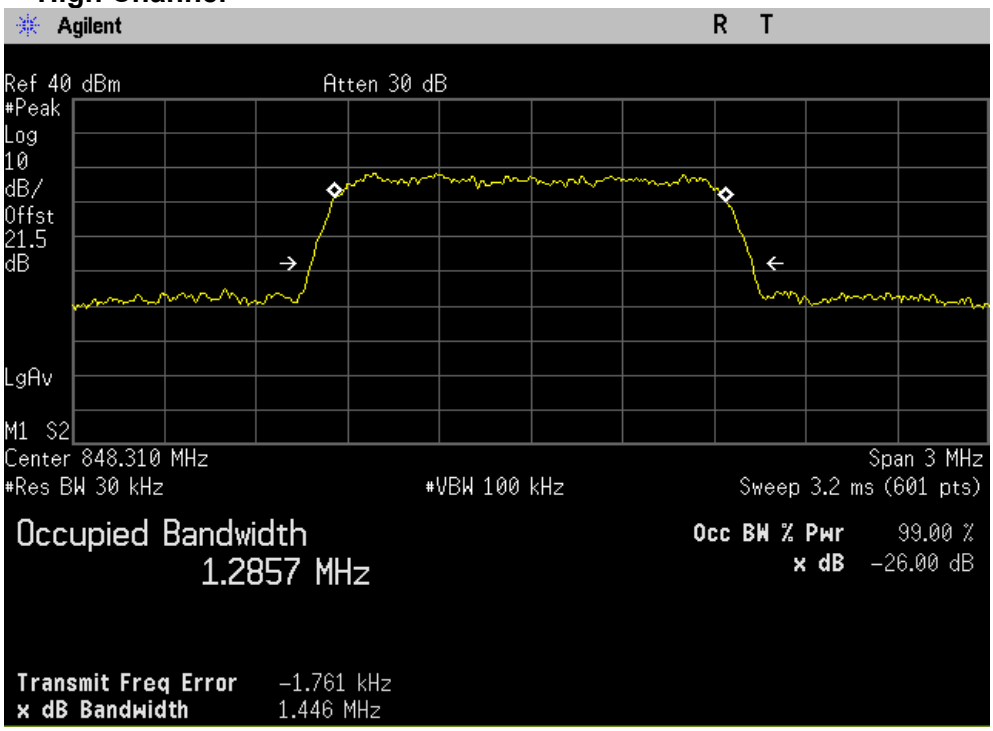
Low Channel



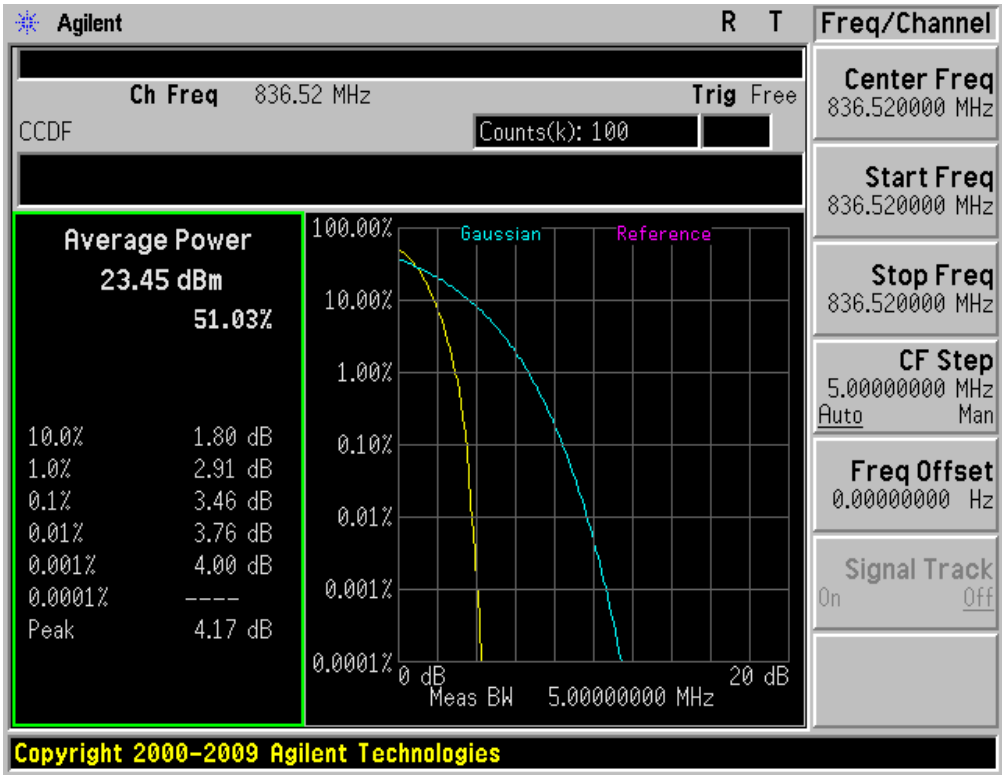
Middle Channel



High Channel

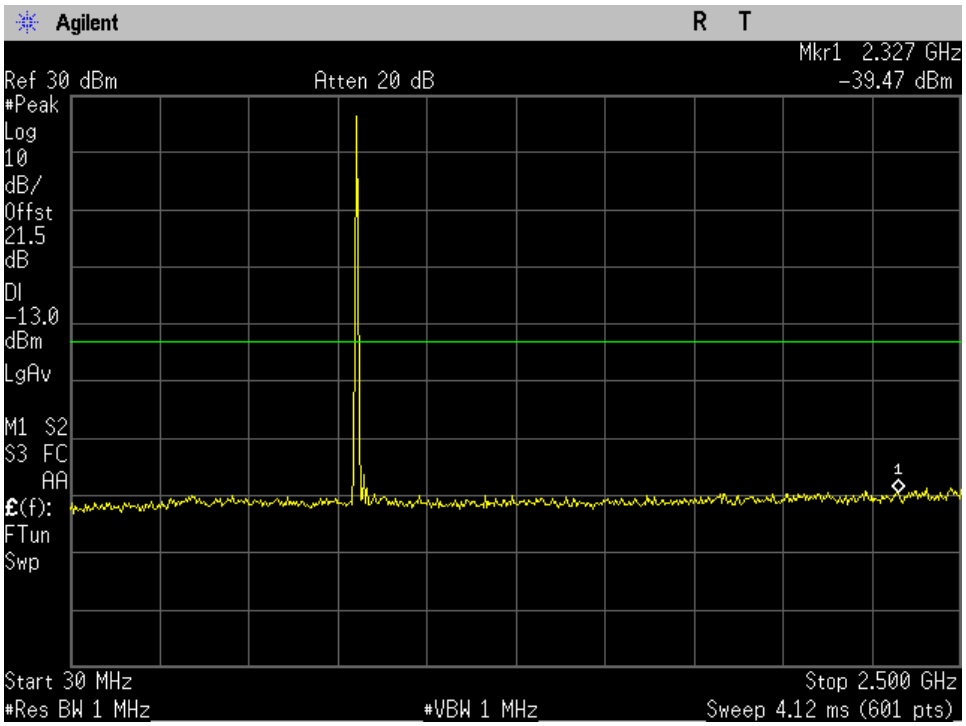


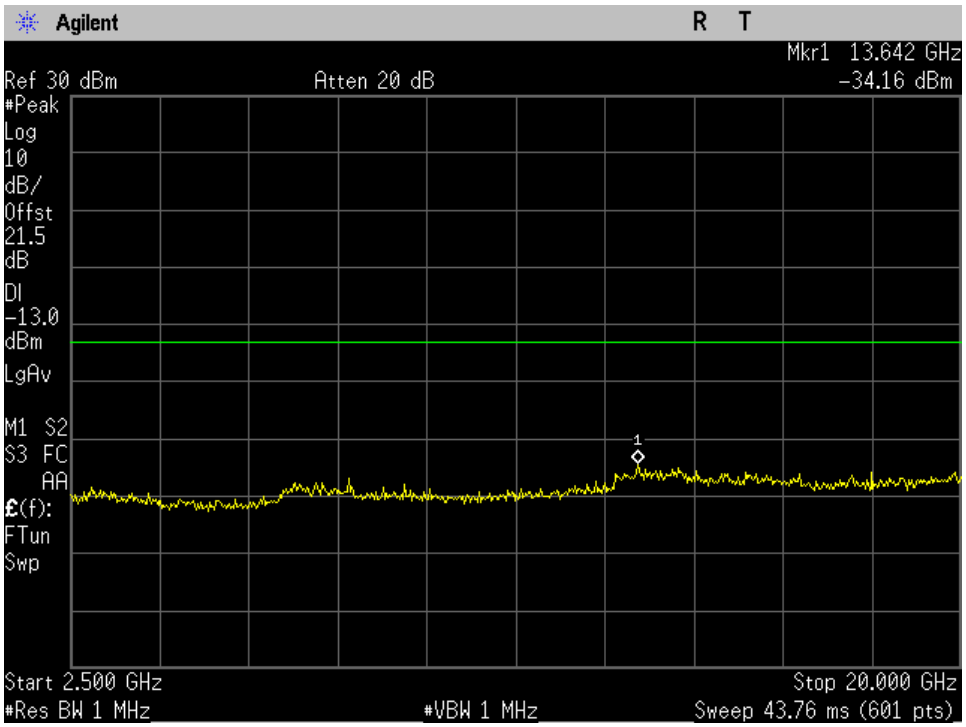
● Peak-to-Average Ratio



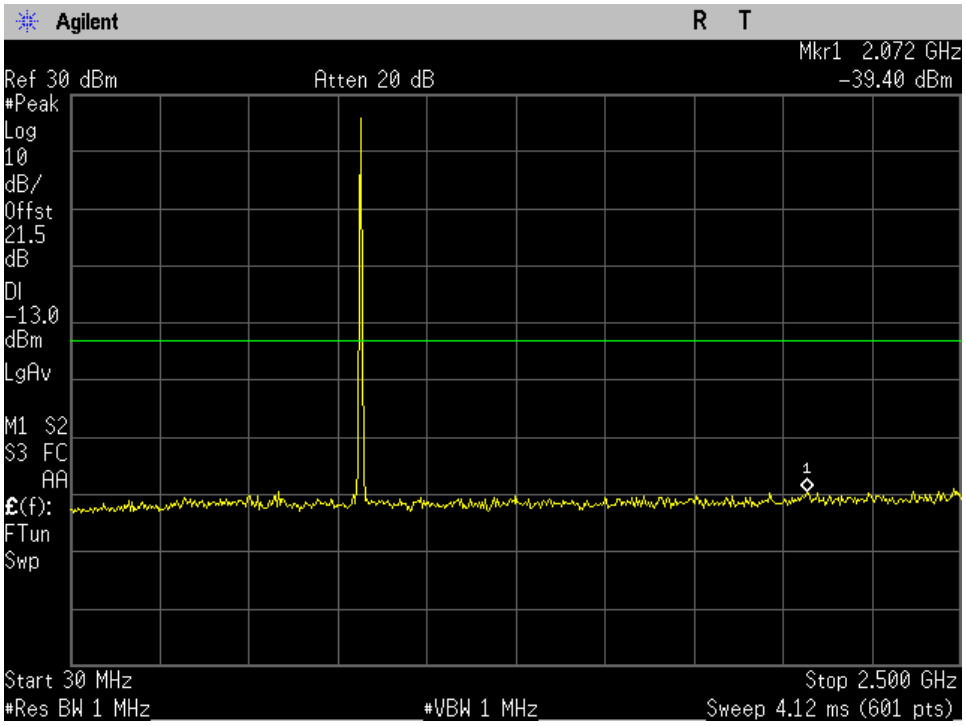
● Spurious Emission at antenna Terminals

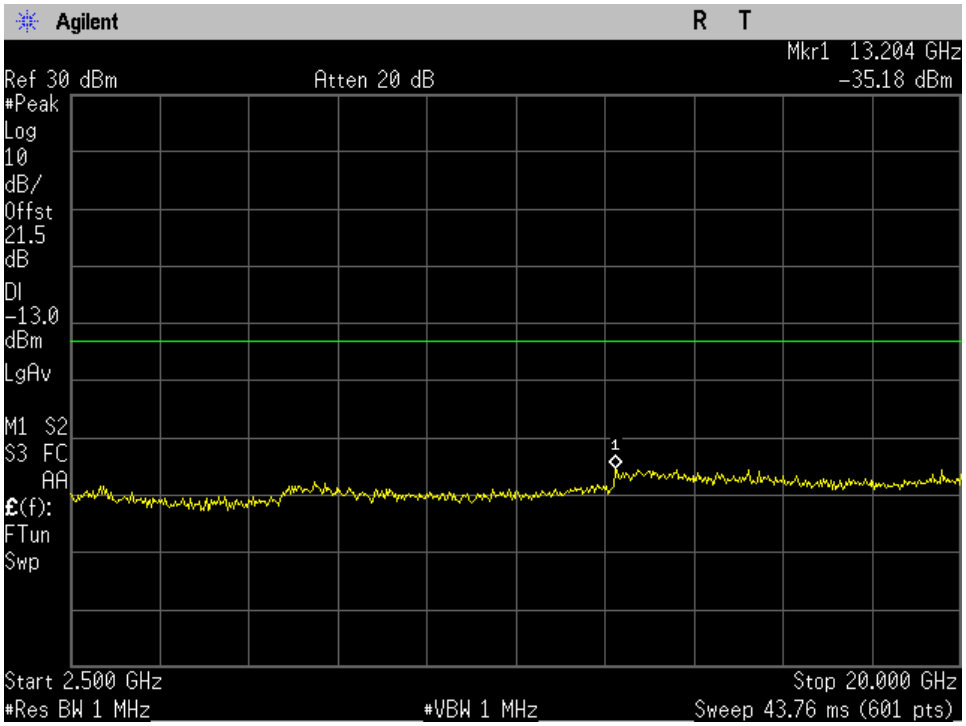
Low Channel



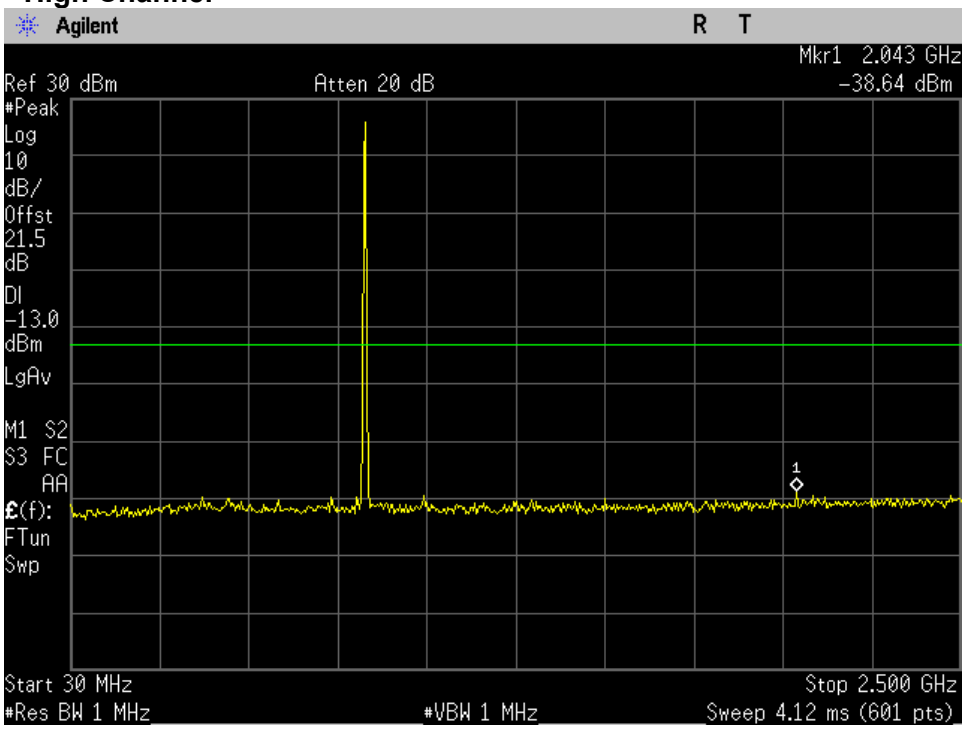


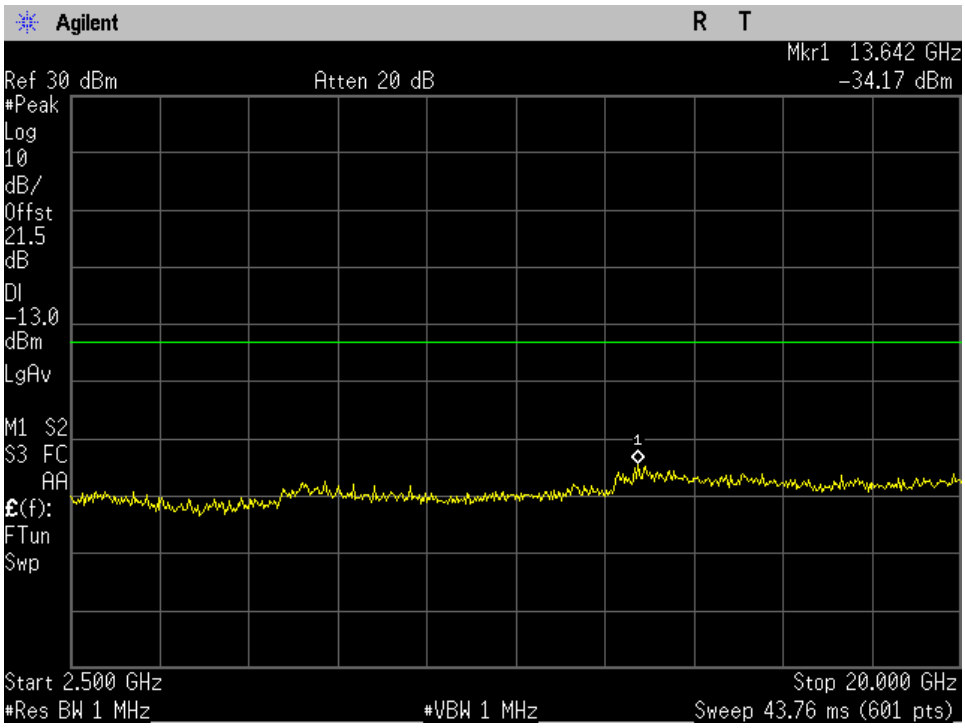
Middle Channel





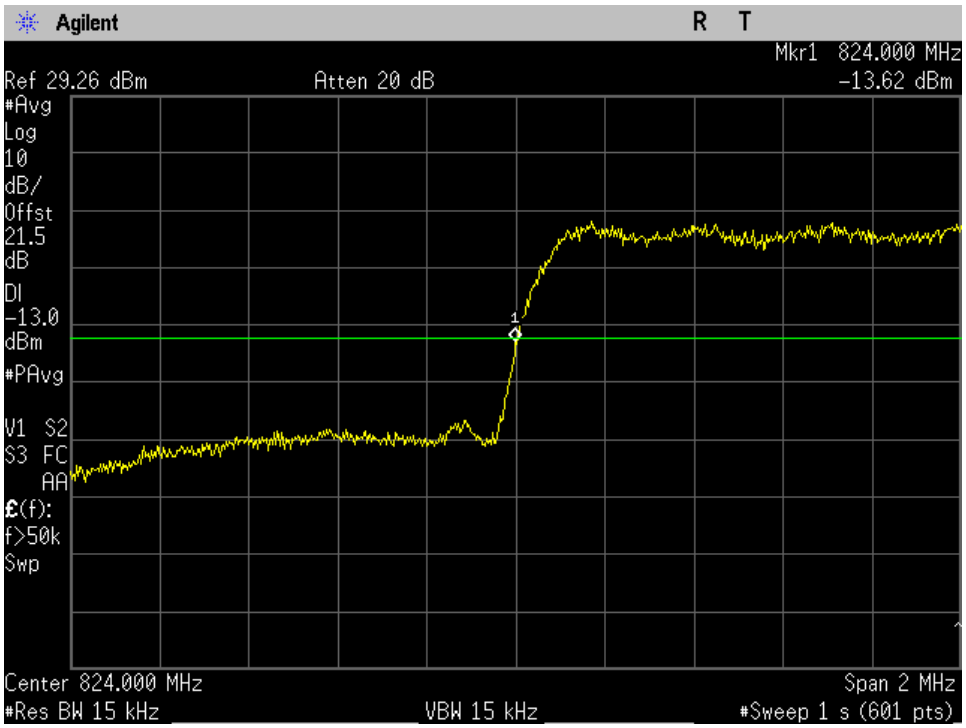
High Channel

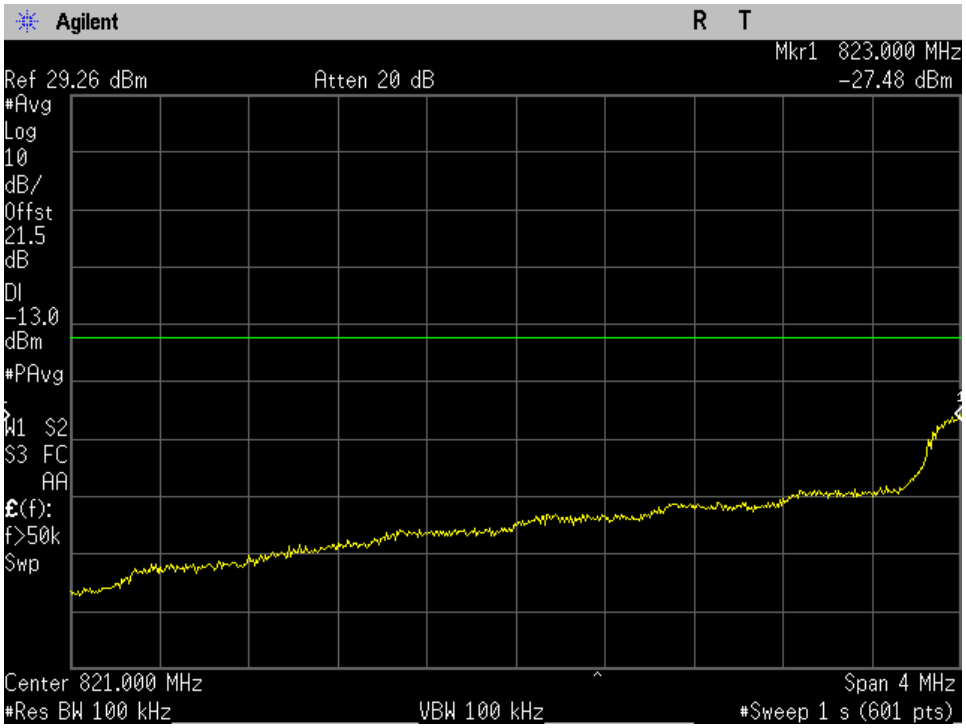




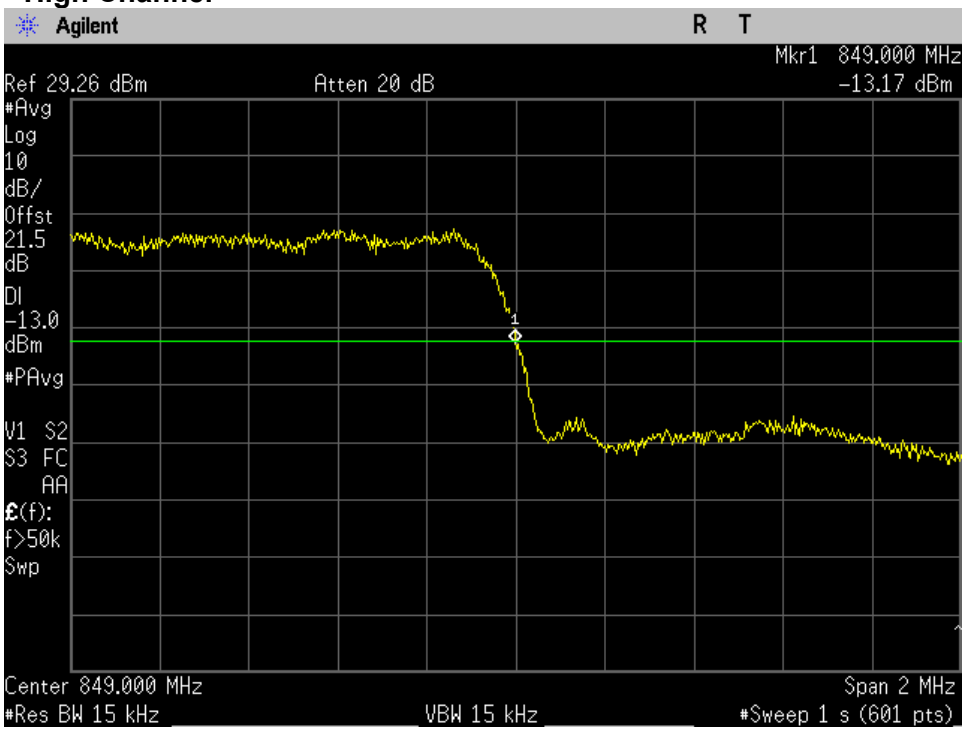
● Band Edge

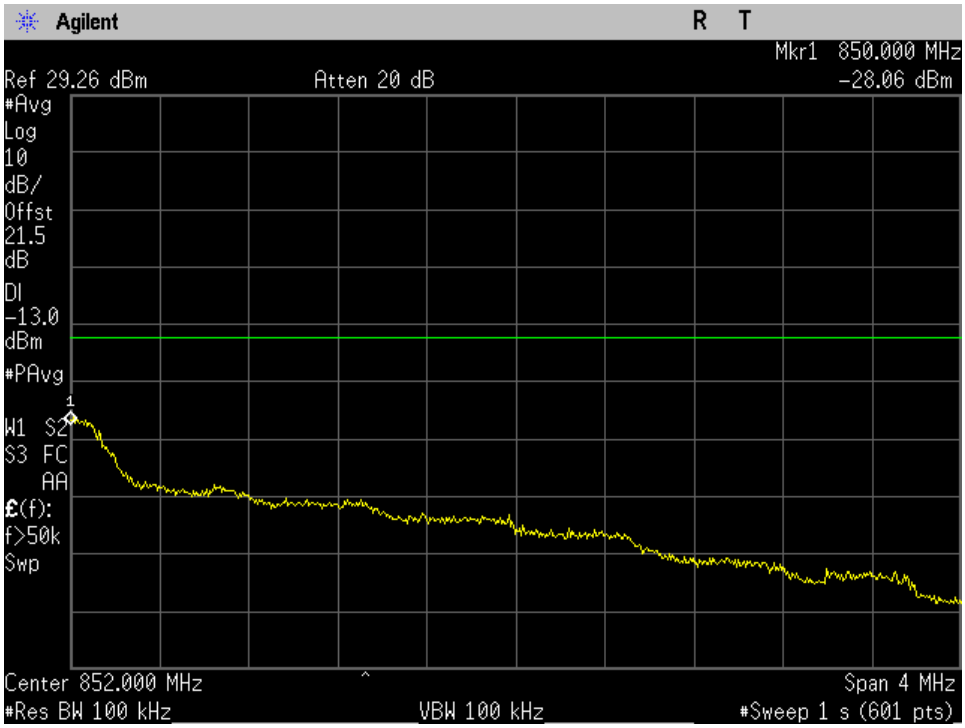
Low Channel





High Channel

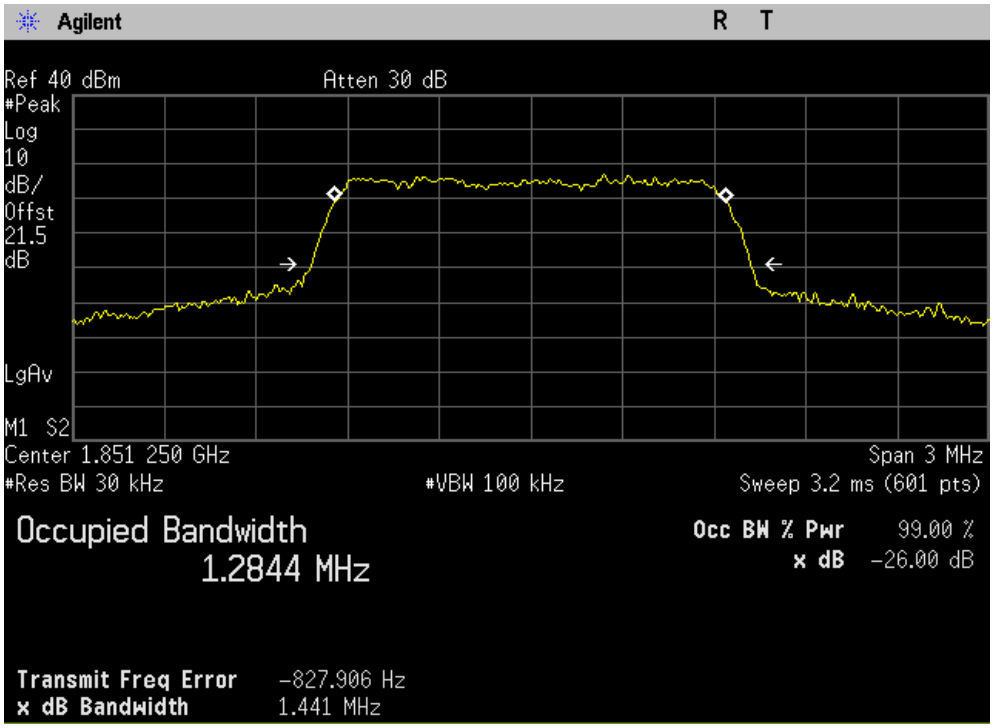




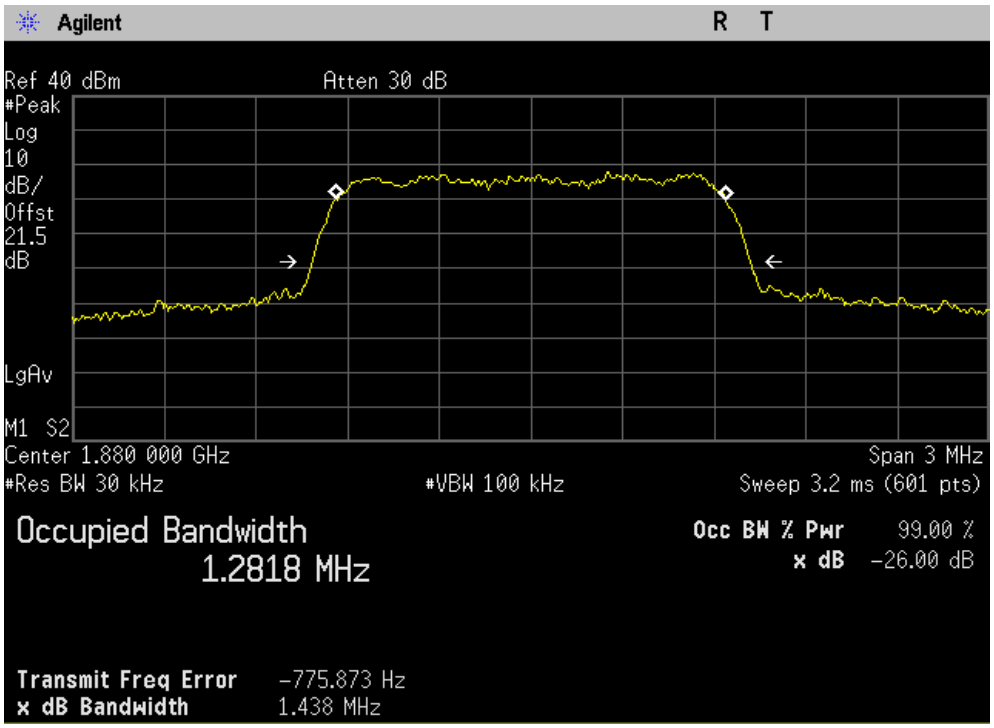
12. Test Plots (PCS)

● Occupied Bandwidth / 26dB Bandwidth

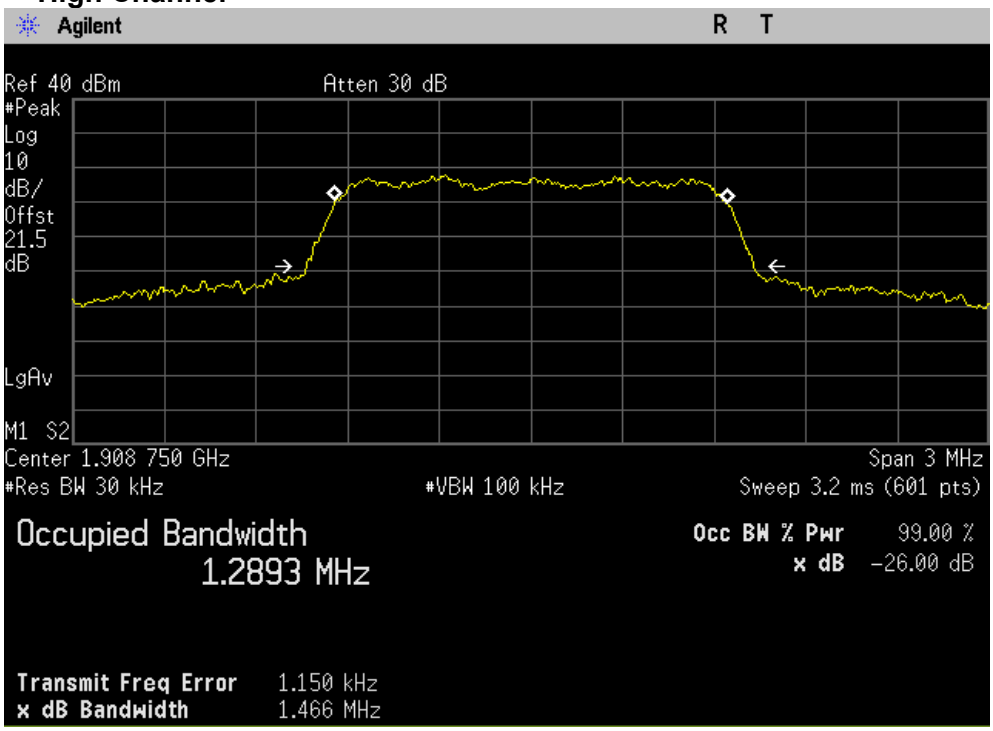
Low Channel



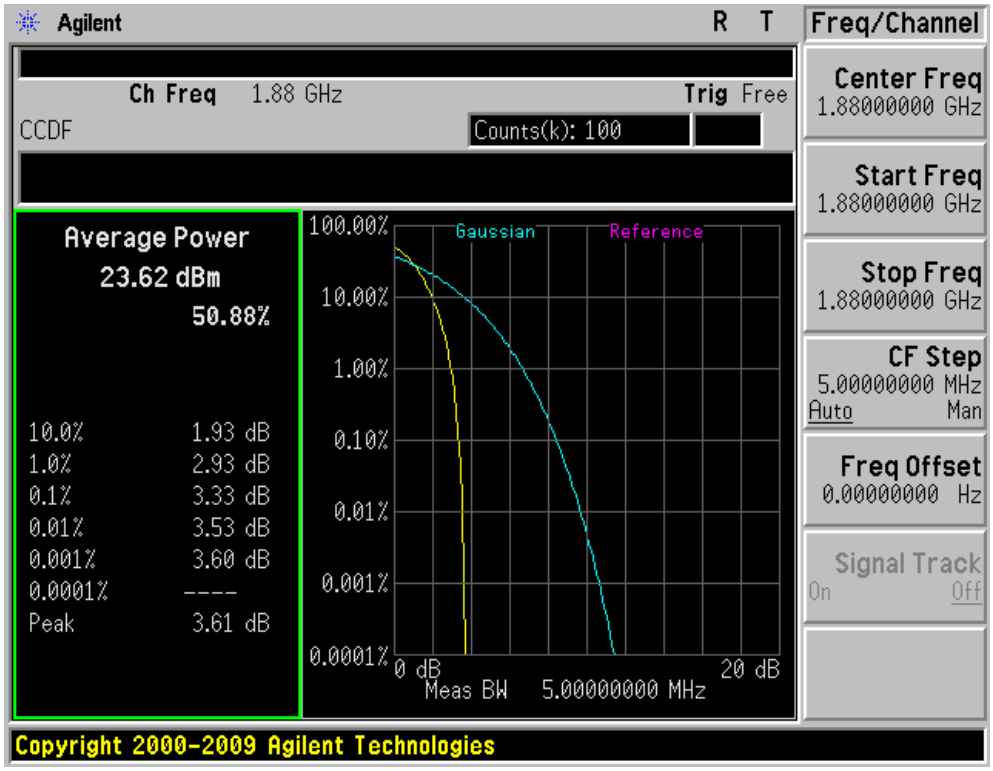
Middle Channel



High Channel

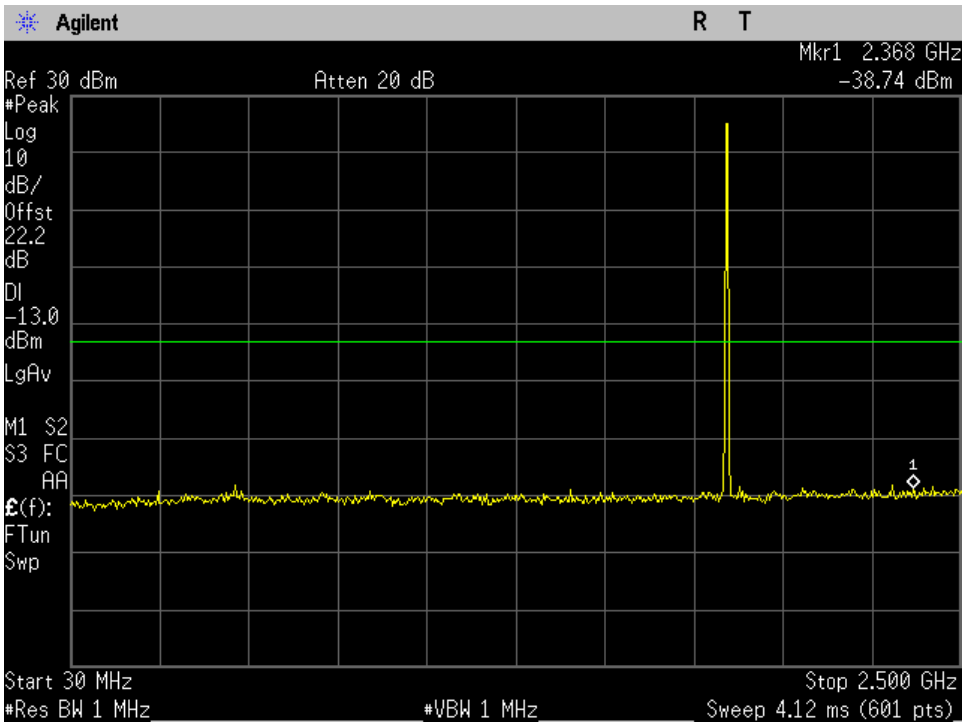


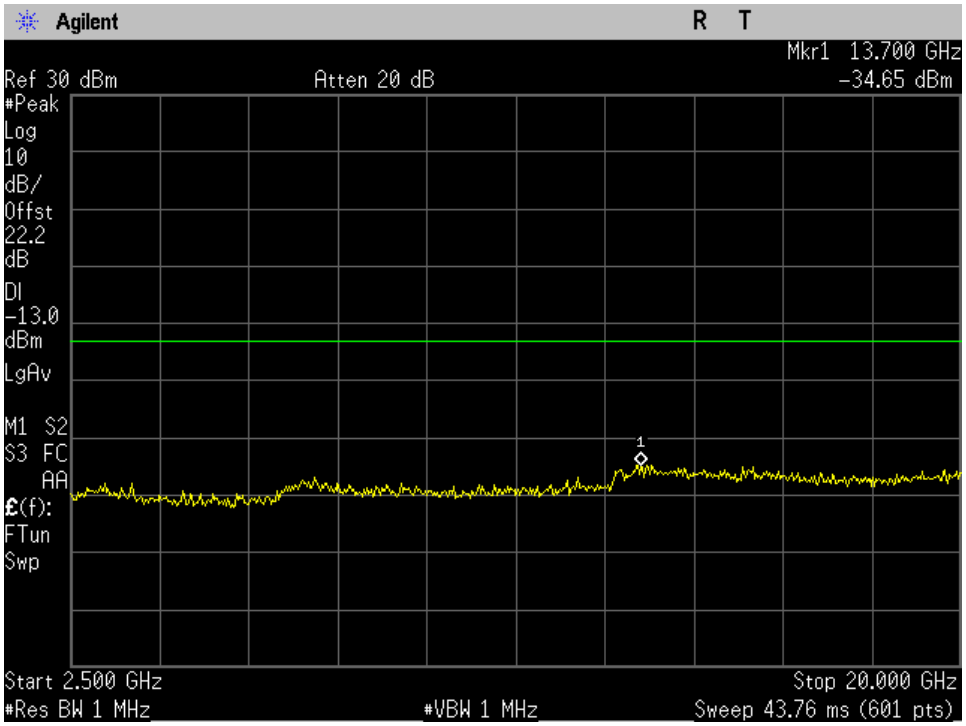
● Peak-to-Average Ratio



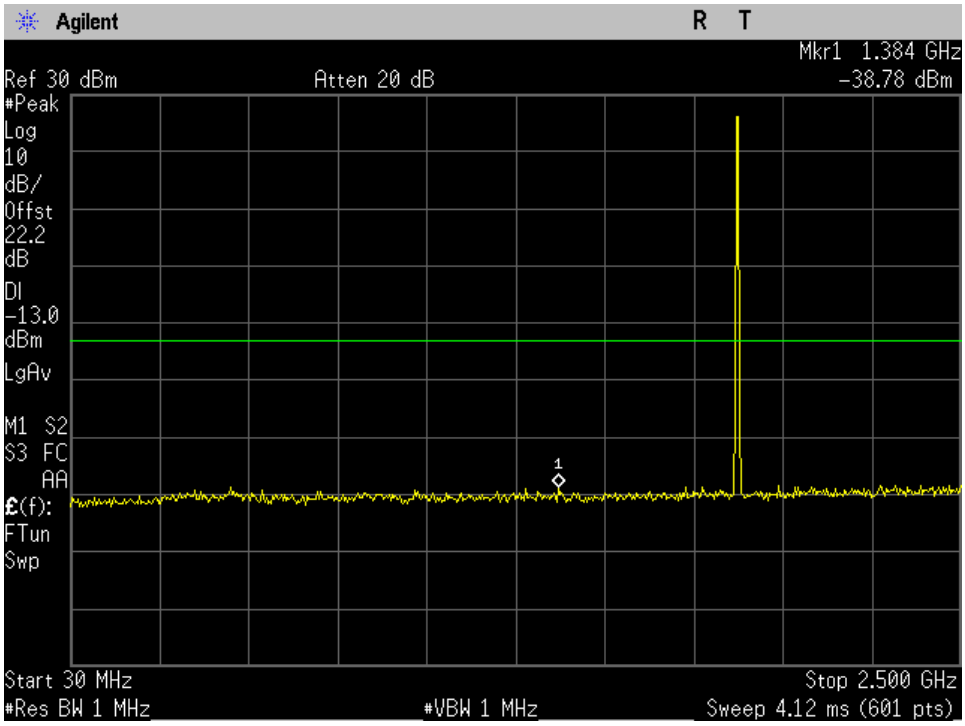
● Spurious Emission at antenna Terminals

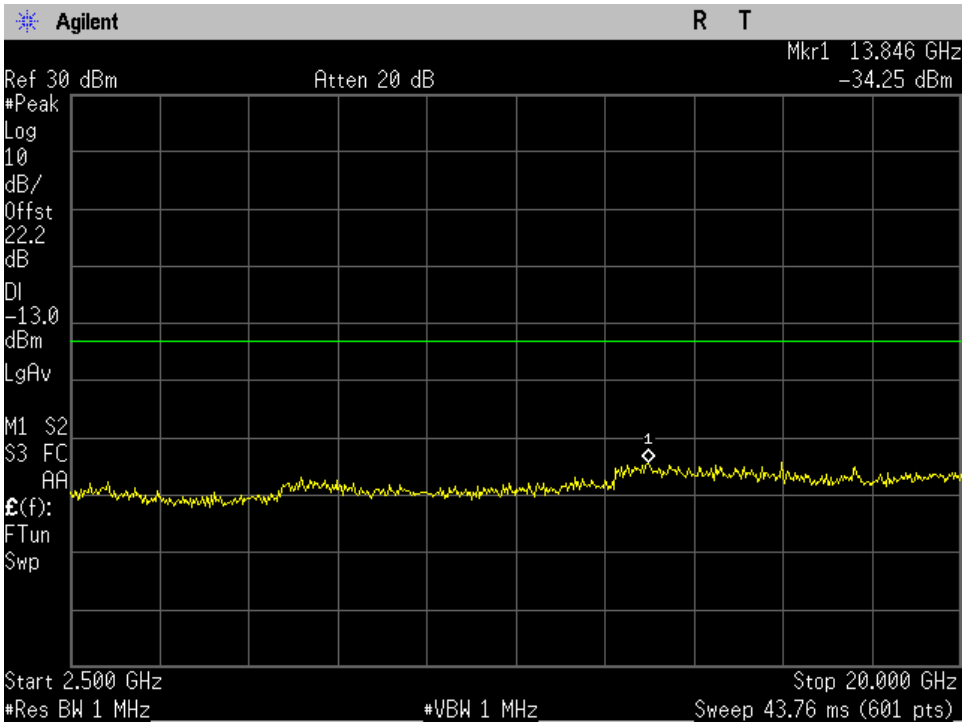
Low Channel



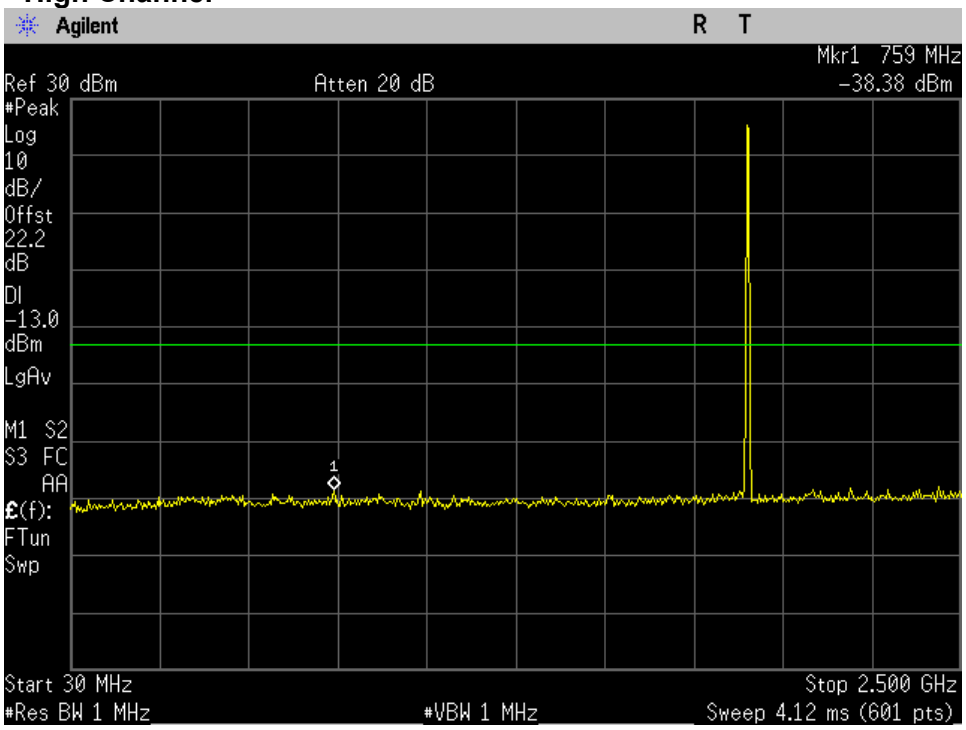


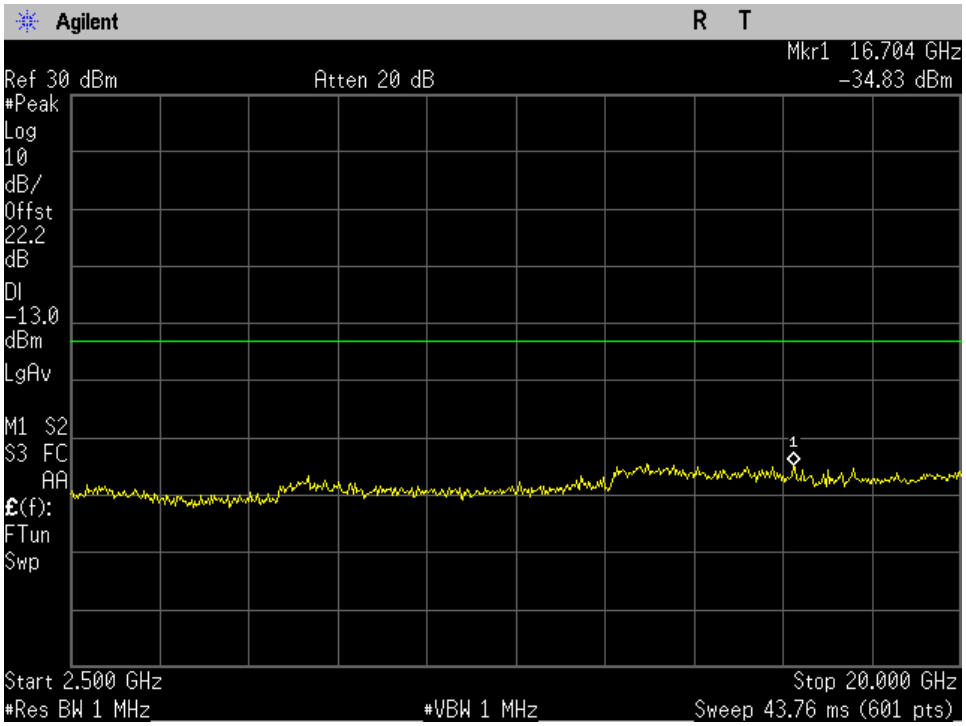
Middle Channel





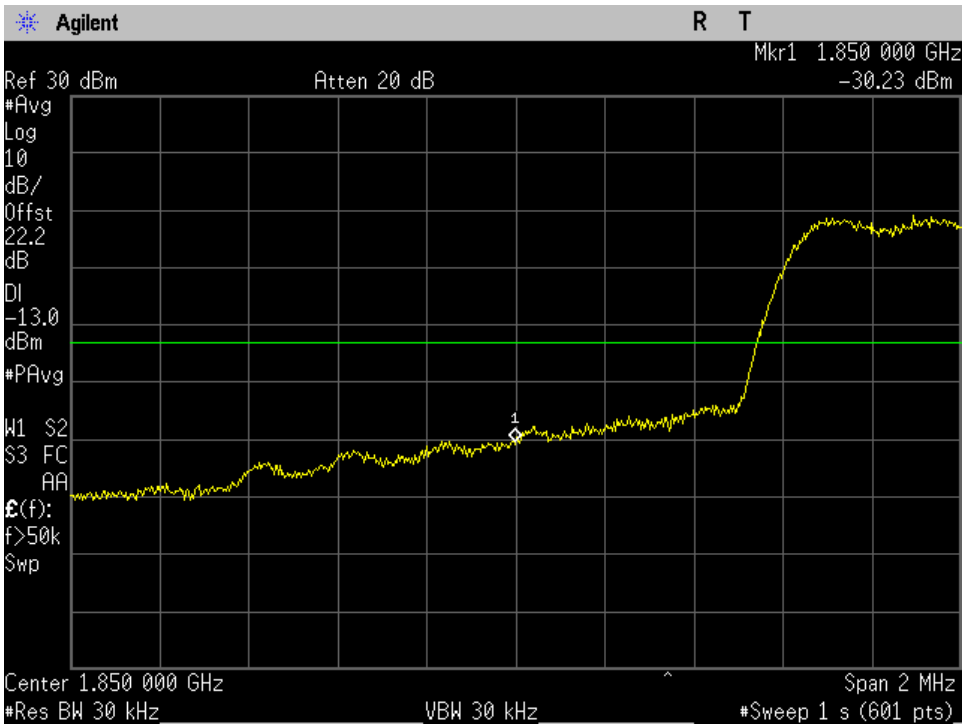
High Channel

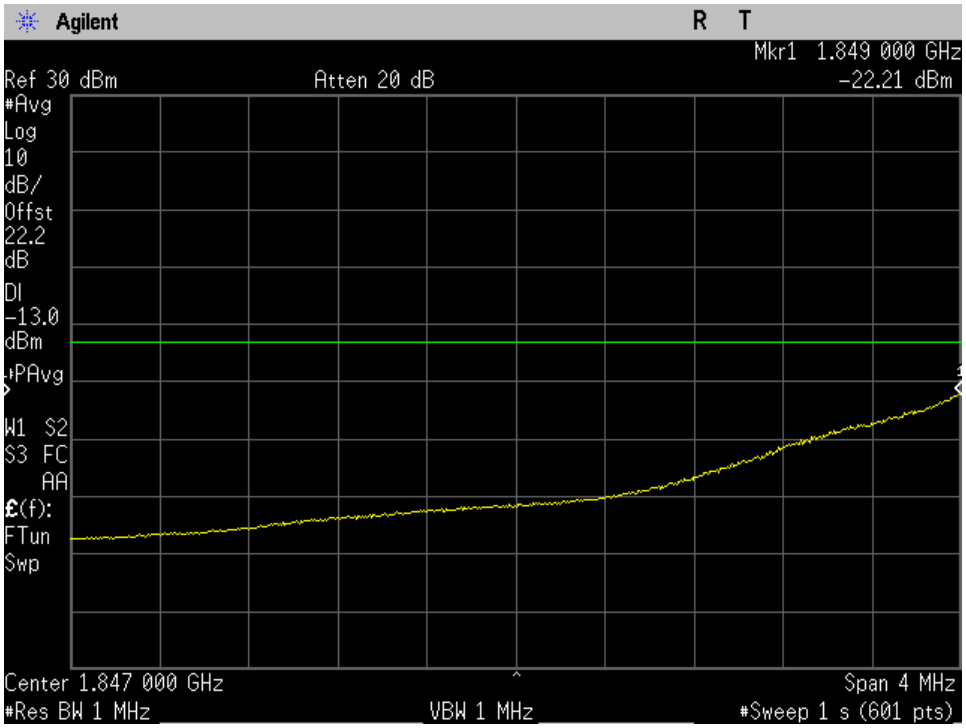




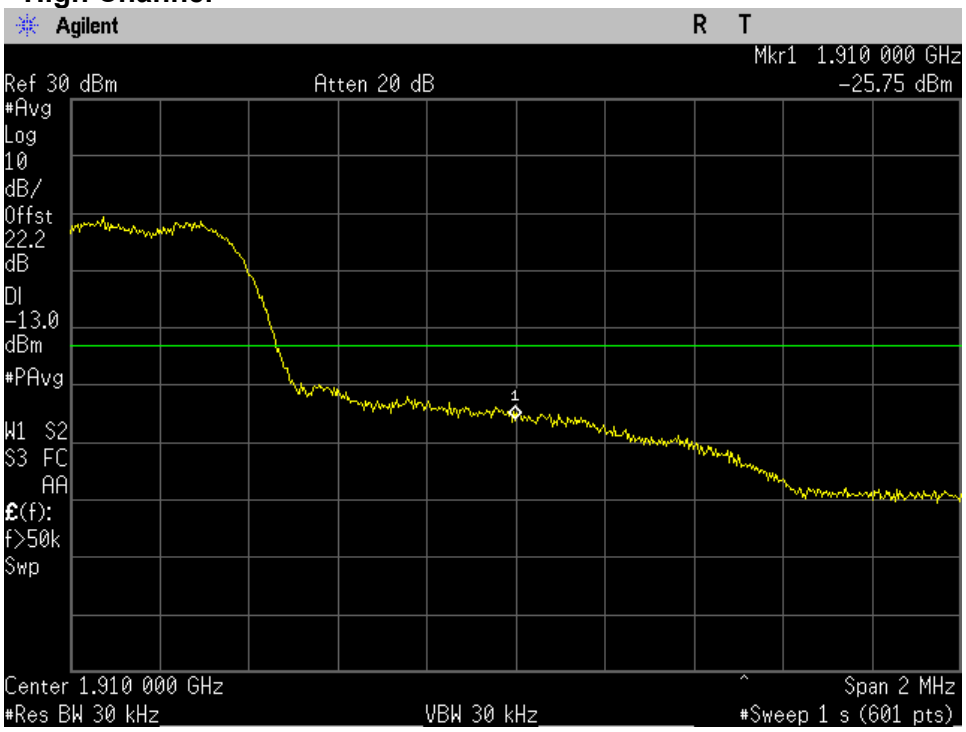
● Band Edge

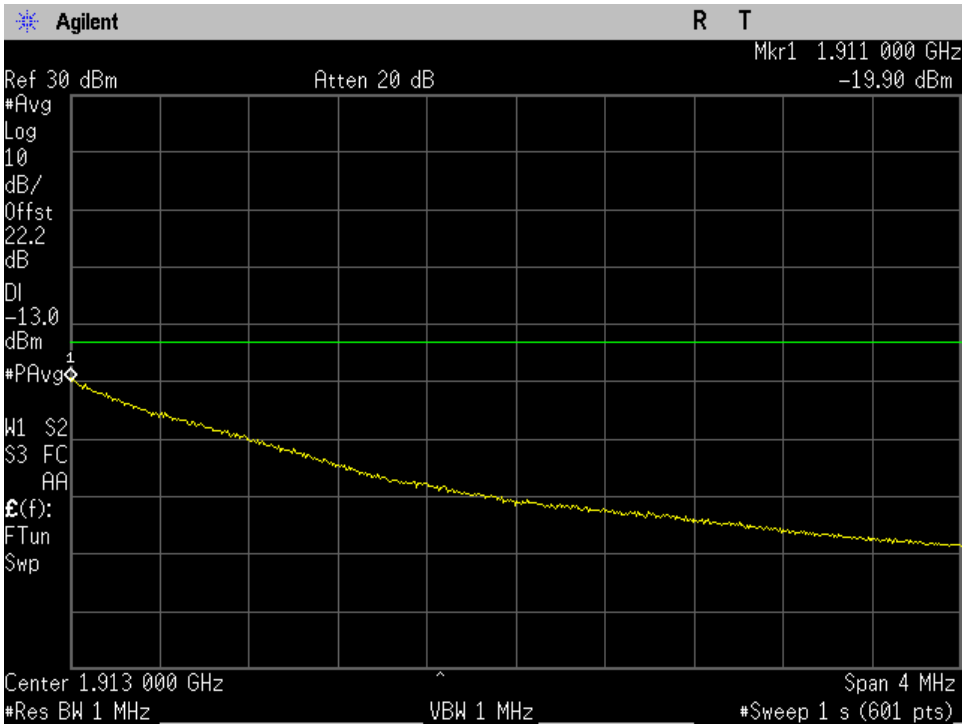
Low Channel





High Channel

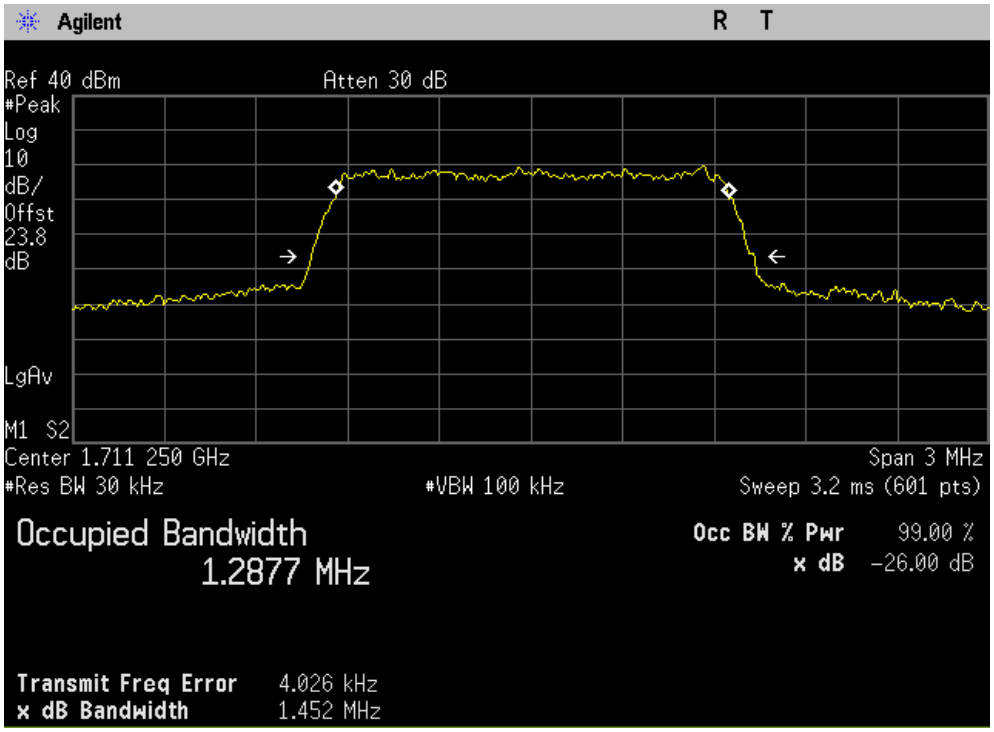




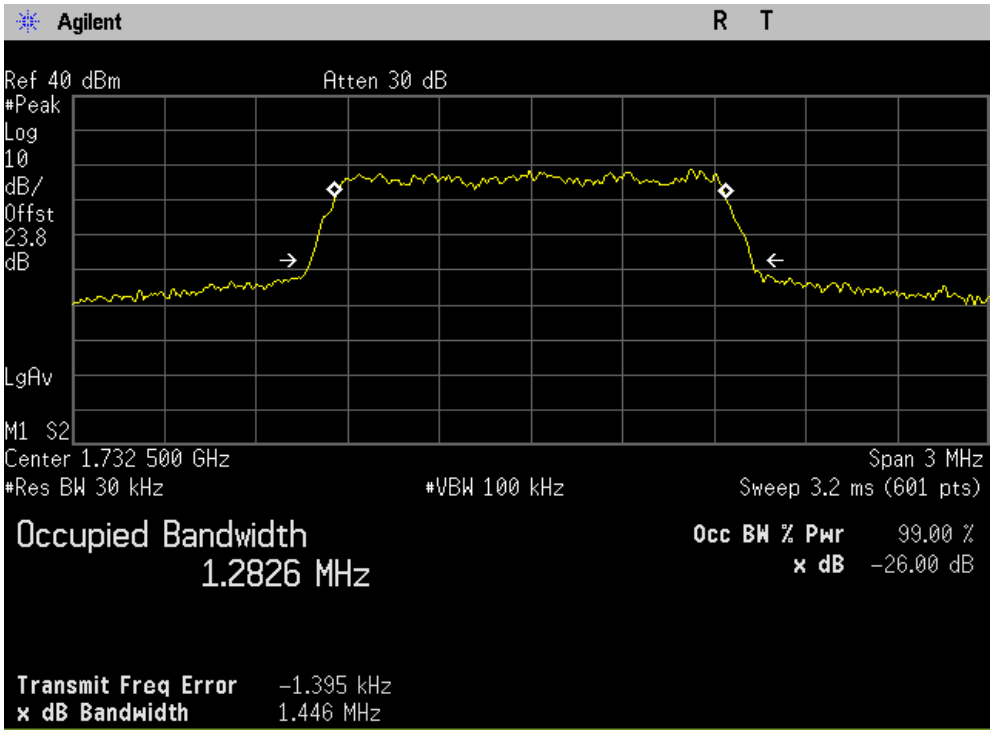
13. Test Plots (AWS)

● Occupied Bandwidth / 26dB Bandwidth

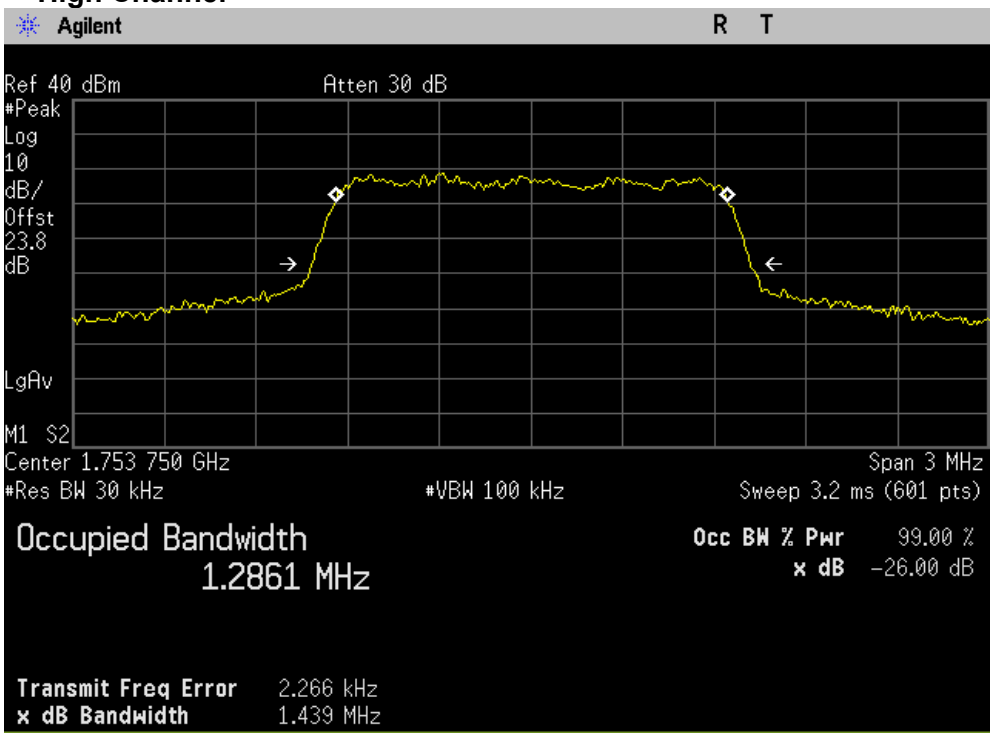
Low Channel



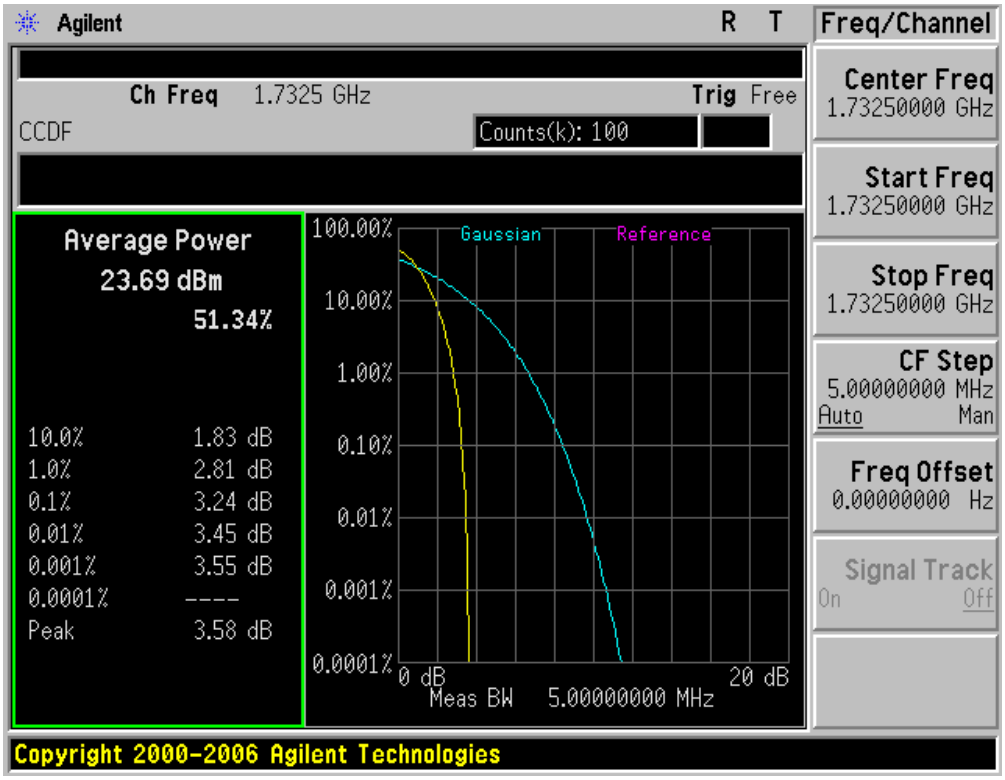
Middle Channel



High Channel

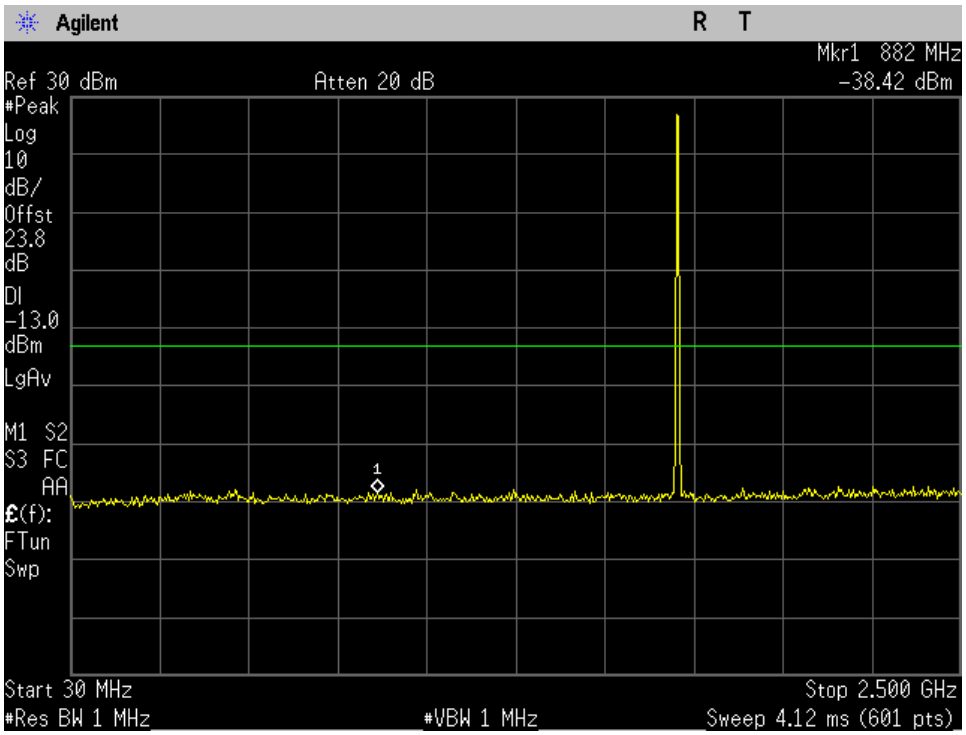


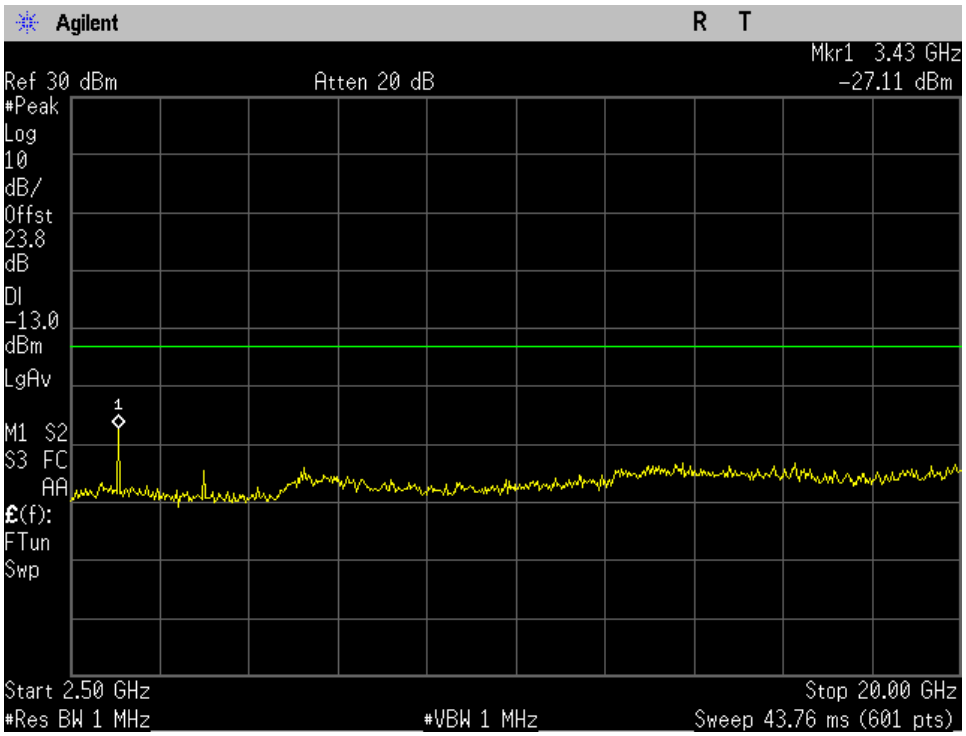
● Peak-to-Average Ratio



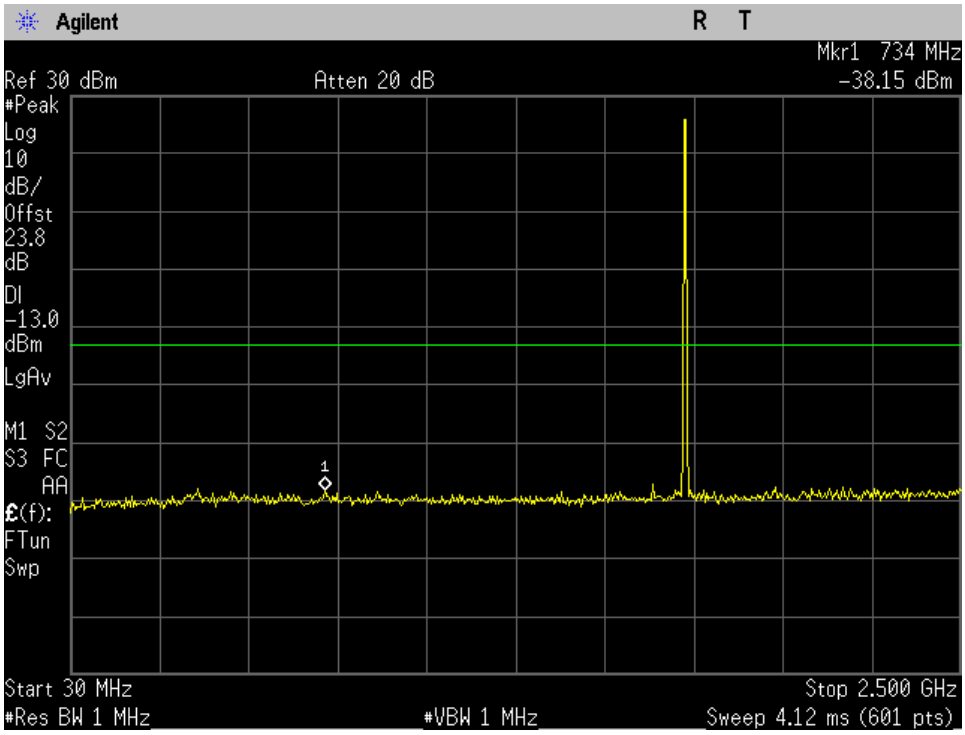
● Spurious Emission at antenna Terminals

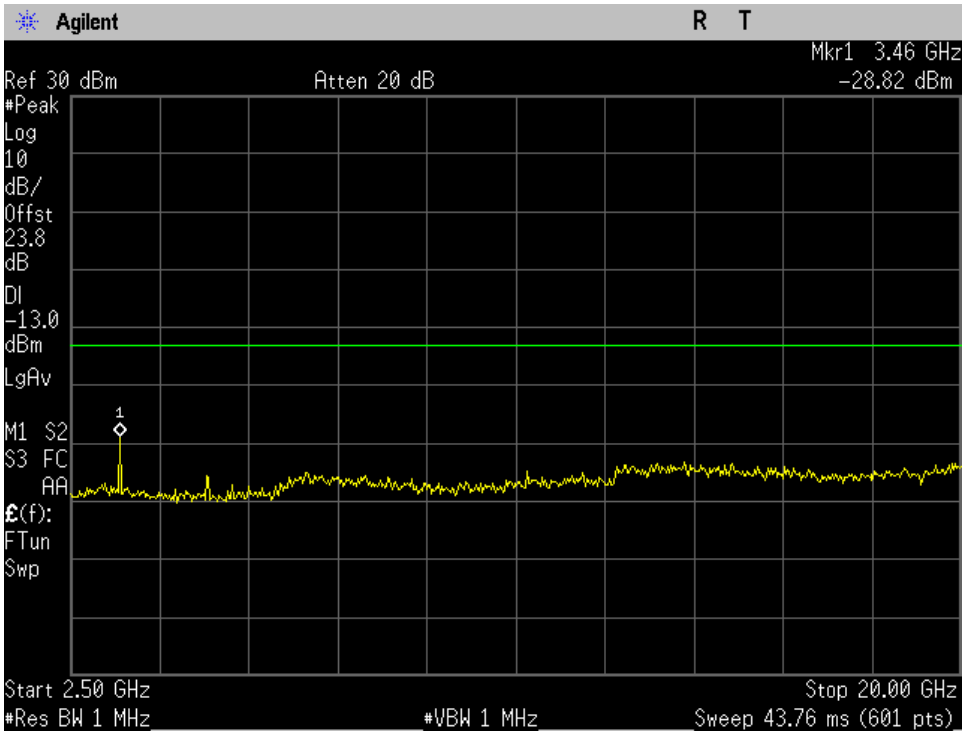
Low Channel



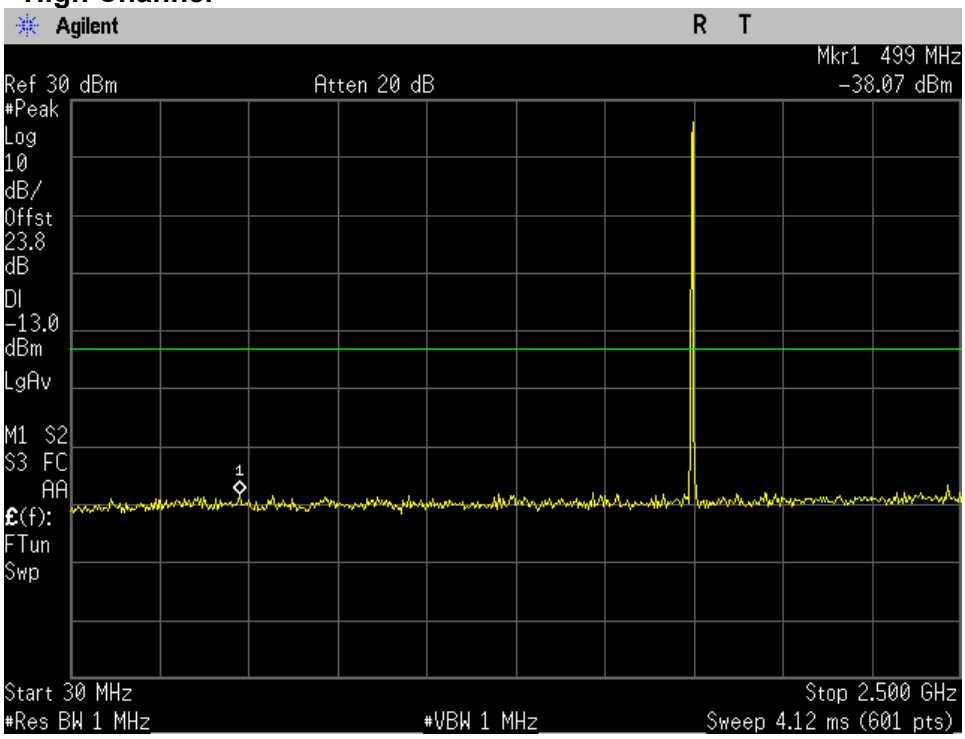


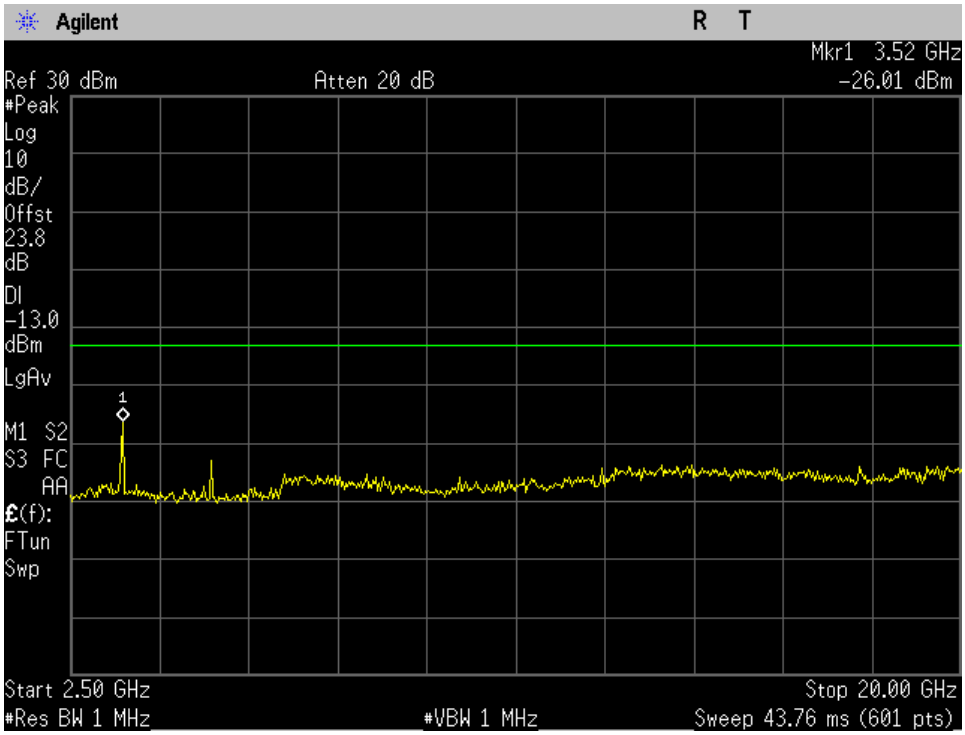
Middle Channel





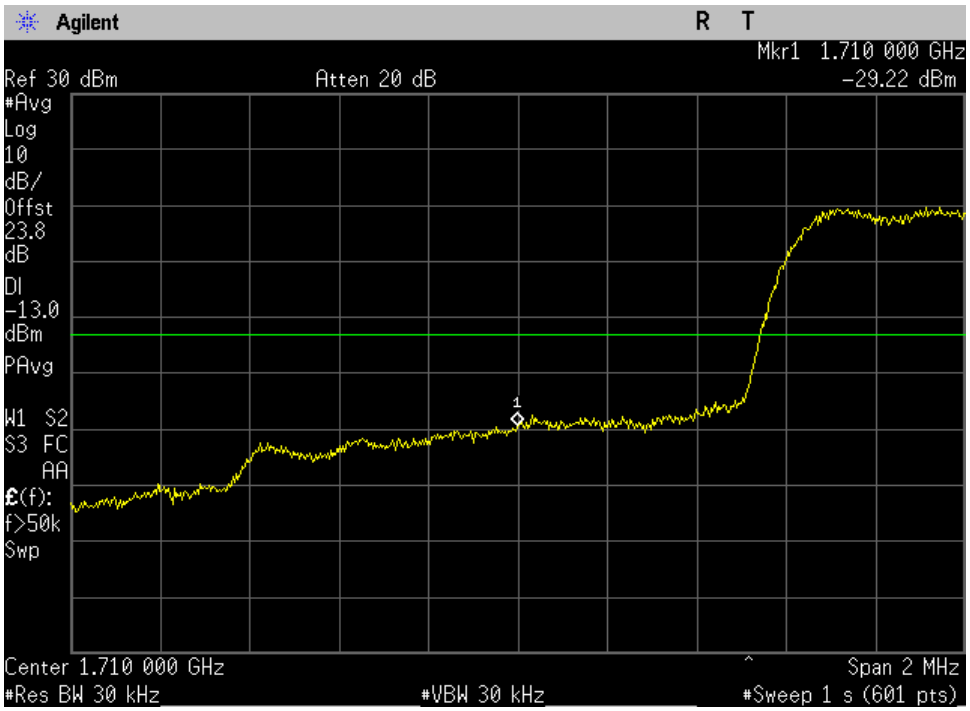
High Channel

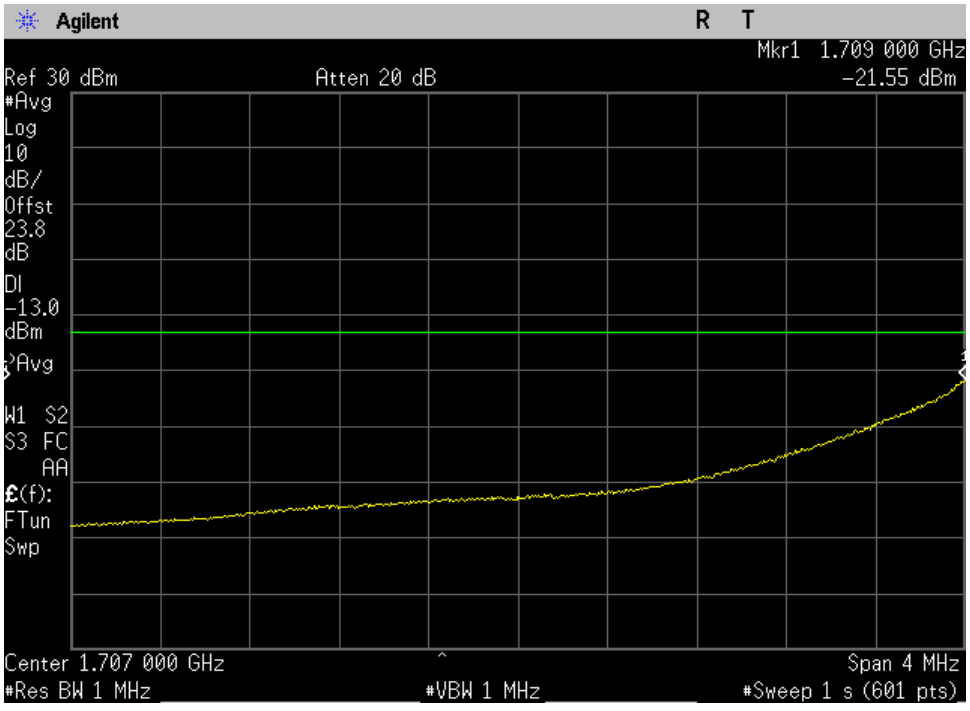




● Band Edge

Low Channel





High Channel