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 : September, 10, 2009
Test Report No. : NK09R134
Test Site : Nemko Korea Co., Ltd.

FCC ID *TARCMU-301*

CONTACT PERSON

C-motech Co., Ltd.
8,9F Yongsan Bldg, Yoido-dong,
Youngdungpo-gu, Seoul Korea (150-871)
Mr. brian Song
Telephone No. : +82 2 368-9863

Applied Standard: FCC 47 CFR Part 27 & 2
Equipment Class: Public Mobile Services
EUT Type: DBDM(CDMA&WiMAX) 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 2 & Part 27.

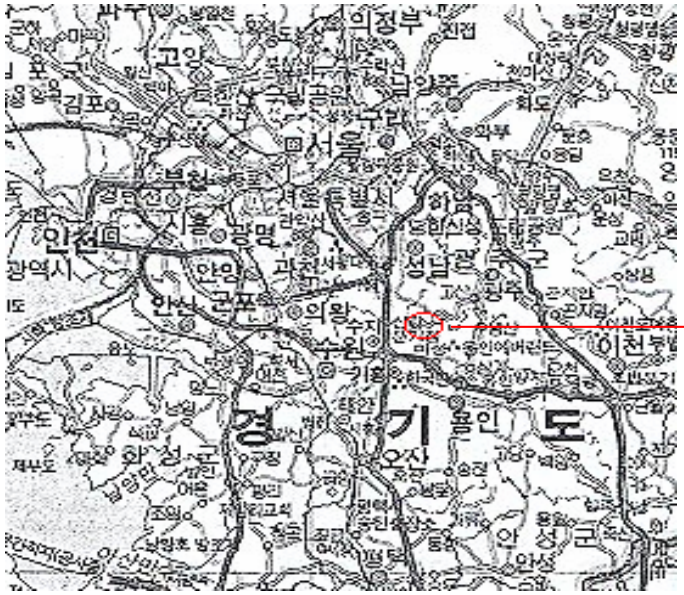
Responsible Party :	C-motech Co., Ltd.
Contact Person :	Mr. Brian Song Tel No. : +82 2 368 9863
Manufacturer :	C-motech Co., Ltd. 8,9F Yongsan Bldg., Yoido-dong, Youngdungpo-gu, Seoul Korea (150-871)

- FCC ID: TARCMU-301
- Model: U301, CMU-301, CMU-301S
- EUT Type: DBDM(CDMA&WiMAX) USB MODEM
- Electric Rating: +5 Vdc from USB port
- Equipment Class: Public Mobile Service
- Applied Standard: FCC 47 CFR Part 2
FCC 47 CFR Part 27
- Test Procedure(s): ANSI C63.4 (2003), DA 02-2138(2002)
- Dates of Test: August 24, 2009 to September 09, 2009
- 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-301***

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	22℃ ~ 25℃
Relative Humidity	35% ~ 55%

Description of EUT

Frequency Band	Tx	2498.5 MHz ~ 2687.5 MHz
	Rx	2498.5 MHz ~ 2687.5 MHz
Output Power	10MHz BW QPSK : EIRP 0.489 W(26.89 dBm) 5MHz BW QPSK : EIRP 0.665 W(28.23 dBm)	
Access / Duplex	OFDMA / TDD	
Interface	USB port	
Modulation	QPSK,16QAM	
Demodulation	QPSK,16QAM,64QAM	
Channel Bandwidth	5MHz / 10 MHz	
Data Throughput	Downlink : 30 Mbps, Uplink : 6 Mbps	
Antenna Type	PCB Pattern Antenna (Internal)	
Dimensions	32.2mm * 89mm * 24mm	
Weight	Approx. 35.6 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
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 and Equivalent Isotropic Radiated Power	§2.1051 §27.50(h)(2)	Complies
Radiated Spurious Emissions	§2.1053 §27.53(l)(4)	Complies
Frequency Stability / Temperature Variation	§2.1055 §27.54	Complies

6. Recommendation / Conclusion

The data collected shows that the **C-motech Co., Ltd.**
FCC ID : ***TARCMU-301, DBDM(CDMA&WiMAX) USB MODEM***
The highest emission observed was at 8062.5 MHz for radiated emissions with a margin of 4.37 dB.

7. Sample Calculation

7.1 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	Mar.28.2009	1year
2	Test Receiver	R & S	ESCS 30	100302	Dec. 04.2008	1year
3	Amplifier	HP	8447F	2805A03427	Jul. 20 2009	1year
4	Amplifier	HP	8447F	2805A03351	Oct. 23 2008	1year
5	Amplifier	HP	8449B	3008A00107	Feb. 12 2009	1year
6	Spectrum Analyzer	Advantest	R3265A	45060401	Nov.12 2008	1year
7	Spectrum Analyzer	Agilent	E4440A	MY44303257	Jul. 20 2009	1year
8	Biconical Log Antenna	ARA	LBP-2520/A	1209	Dec. 08 2008	2year
9	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-474	Jun. 13 2008	2year
10	Biconical Log Anten	ARA	LPB-2520/A	1180	Apr. 21 2008	2year
11	Radio Communication tester	R & S	CMU200	106332	Jan. 22 2009	1year
12	LISN	R & S	ESH3-Z5	833874/006	Nov. 11 2008	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. 18 2008	2year
23	Communications Test Set	Agilent	E5515C	GB43193659	May. 19 2009	1year
24	Spectrum Analyzer	Agilent	E4440A	MY44022567	Sep. 04 2009	1year
25	Signal Generator	Agilent	E4438C	MY45092564	Feb.12 2009	1year
26	Signal Generator	R & S	SMP02	833286/003	Jul.20 2009	1year

9. Description of Tests

9.1 Equivalent Isotropic Radiated Power

Test Set-up

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

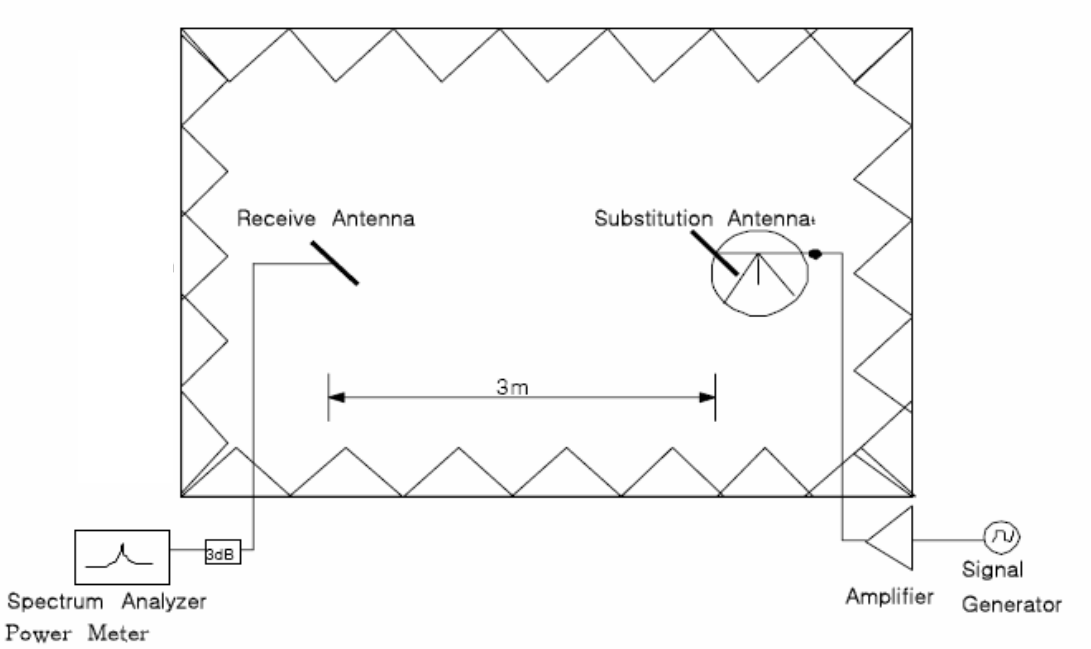


Diagram of ERP/EIRP test Set-up

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

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) Spectrum analyzer was set to RBW 1 MHz, VBW 1 MHz for measurement.
c) The peak detection was used.
d) The EUT was replaced with a substituting antenna.
e) 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.

9.2 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.

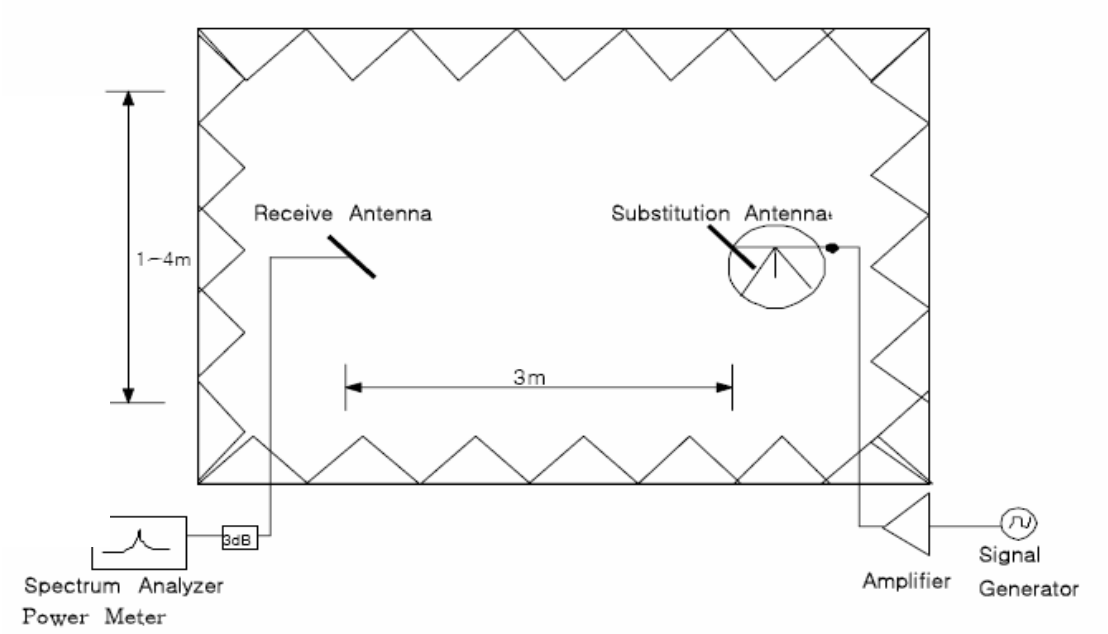


Diagram of Radiated Spurious & Harmonic test Set-up

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 10^{th} harmonic of the fundamental frequency of operation. 30 MHz~10 GHz for cell and 30 MHz~ 20 GHz for PCS were searched.

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) For measurements the resolution bandwidth and video bandwidth were set to 100 kHz for emissions below 1GHz and 1 MHz for emissions over 1GHz.
c) The peak detection was used.
d) The EUT was replaced with a substituting antenna.
e) 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.

9.3 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.

9.4 Spurious and Harmonic Emissions at Antenna Terminal

9.4.1 Occupied Bandwidth Emission Limits

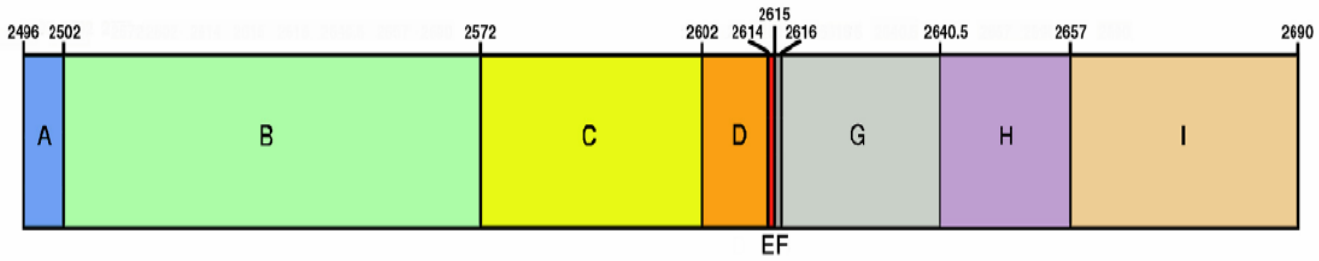
(a) On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 55 + 10 log (P) dB.

(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.

9.4.2 EBS/BRS – 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)

9.4.3 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 (0.310 W) = 49.92 dB
24.92 dBm – 49.92 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.

9.5 Frequency Stability / Temperature Variation

The frequency stability of the transmitter is measured by:

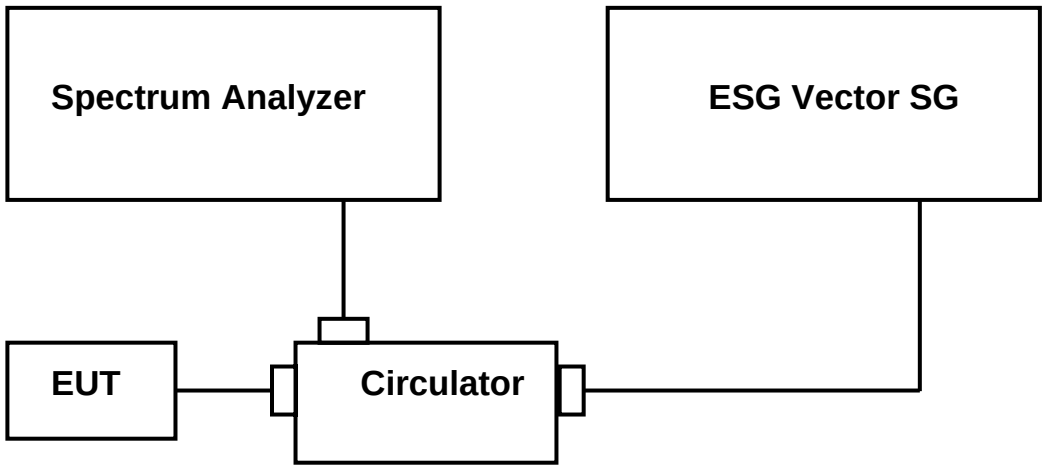
a.) Temperature: The temperature is carried from -30 °C to + 60 °C using an environmental chamber.
b.) Primary Supply Voltage: The primary supply voltage is varied from 85 % to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

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.

9.6 Conducted Output Power

Test Set-up:



Test Procedure:

Setup the EUT like test Set-up diagram.

a. Load the QPSK 1/2 test signal to the ESG Signal Generator.
b. Set the gate parameter according to the specific test vector.
c. Set the ESG, EUT software (Beceem diagnostic control panel version 3.3.0), Spectrum analyzer's frequency to Low, Middle, High.
d. Set the EUT's output power to the maximum allowed output power.
e. For measurements the resolution bandwidth was set to 100 kHz and video bandwidth was set to 100 kHz.
f. The RMS detection was used.
g. Measure the channel power in the 5 MHz/10 MHz channel bandwidth.

10. Test Data

10.1 Transmitter Conducted Output Power

Measurement Results: 10MHz Bandwidth

Frequency (MHz)	QPSK		16QAM	
	Coding Rate 1/2 (dBm)	Coding Rate 3/4 (dBm)	Coding Rate 1/2 (dBm)	Coding Rate 3/4 (dBm)
2501.0	23.50	23.45	23.60	23.49
2593.0	23.07	22.95	22.94	22.92
2685.0	22.61	22.54	22.67	22.47

Measurement Results: 5MHz Bandwidth

Frequency (MHz)	QPSK		16QAM	
	Coding Rate 1/2 (dBm)	Coding Rate 3/4 (dBm)	Coding Rate 1/2 (dBm)	Coding Rate 3/4 (dBm)
2498.5	23.85	23.72	23.83	23.80
2593.0	22.98	22.68	23.40	23.25
2687.5	22.68	22.61	22.77	22.63

10.2 Occupied Bandwidth / 26dB Emission Bandwidth

10.2.1 Bandwidth 10 MHz

Measurement Results : QPSK

Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
2501	9.3632	9.978
2593	9.3663	9.978
2685	9.3646	9.978

Measurement Results : 16QAM

Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
2501	9.3742	10.335
2593	9.3697	10.233
2685	9.3576	10.166

10.2.2 Bandwidth 5 MHz

Measurement Results : QPSK

Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
2498.5	4.7140	5.203
2593.0	4.7204	5.229
2687.5	4.7224	5.230

Measurement Results : 16QAM

Frequency (MHz)	Occupied BW (MHz)	26dB Emission BW (MHz)
2498.5	4.7047	5.191
2593.0	4.7060	5.257
2687.5	4.7141	5.325

10.3 Equivalent Isotropic Radiated Power

10.3.1 Bandwidth 10 MHz

Measurement Results : QPSK

Frequency (MHz)	*EUT Pol.	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dBm)	EIRP (dBm)	Limit (dBm)
2501	H	H	-21.96	0.00	-35.05	10.55	2.81	20.83	33
		V	-19.57	0.00	-34.88	10.55	2.81	23.05	
	E1	H	-22.97	0.00	-35.05	10.55	2.81	19.82	
		V	-21.83	0.00	-34.88	10.55	2.81	20.79	
	E2	H	-25.04	0.00	-35.05	10.55	2.81	17.75	
		V	-16.62	0.00	-34.88	10.55	2.81	26.00	
2593	H	H	-23.52	0.00	-35.41	10.75	2.85	19.79	33
		V	-20.15	0.00	-35.08	10.75	2.85	22.83	
	E1	H	-24.02	0.00	-35.41	10.75	2.85	19.29	
		V	-22.17	0.00	-35.08	10.75	2.85	20.81	
	E2	H	-26.32	0.00	-35.41	10.75	2.85	16.99	
		V	-16.33	0.00	-35.08	10.75	2.85	**26.89**	
2685	H	H	-25.83	0.00	-35.85	11.06	2.87	18.21	33
		V	-23.16	0.00	-35.53	11.06	2.87	20.56	
	E1	H	-25.36	0.00	-35.85	11.06	2.87	18.68	
		V	-24.05	0.00	-35.53	11.06	2.87	19.67	
	E2	H	-26.84	0.00	-35.85	11.06	2.87	17.20	
		V	-19.33	0.00	-35.53	11.06	2.87	24.39	

Measurement Results : 16QAM

Frequency (MHz)	*EUT Pol.	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dBm)	EIRP (dBm)	Limit (dBm)
2501	H	H	-22.03	0.00	-35.05	10.55	2.81	20.76	33
		V	-19.22	0.00	-34.88	10.55	2.81	23.40	
	E1	H	-22.88	0.00	-35.05	10.55	2.81	19.91	
		V	-21.63	0.00	-34.88	10.55	2.81	20.99	
	E2	H	-24.45	0.00	-35.05	10.55	2.81	18.34	
		V	-16.01	0.00	-34.88	10.55	2.81	26.61	
2593	H	H	-23.25	0.00	-35.41	10.75	2.85	20.06	33
		V	-20.13	0.00	-35.08	10.75	2.85	22.85	
	E1	H	-23.25	0.00	-35.41	10.75	2.85	20.06	
		V	-21.14	0.00	-35.08	10.75	2.85	21.84	
	E2	H	-25.13	0.00	-35.41	10.75	2.85	18.18	
		V	-16.89	0.00	-35.08	10.75	2.85	26.09	
2685	H	H	-26.15	0.00	-35.85	11.06	2.87	17.89	33
		V	-23.19	0.00	-35.53	11.06	2.87	20.53	
	E1	H	-25.40	0.00	-35.85	11.06	2.87	18.64	
		V	-23.36	0.00	-35.53	11.06	2.87	20.36	
	E2	H	-26.53	0.00	-35.85	11.06	2.87	17.51	
		V	-18.89	0.00	-35.53	11.06	2.87	24.83	

10.3.2 Bandwidth 5 MHz

Measurement Results : QPSK

Frequency (MHz)	*EUT Pol.	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dBm)	EIRP (dBm)	Limit (dBm)
2498.5	H	H	-20.21	0.00	-35.04	10.55	2.81	22.57	33
		V	-19.67	0.00	-34.87	10.55	2.81	22.94	
	E1	H	-20.02	0.00	-35.04	10.55	2.81	22.76	
		V	-19.56	0.00	-34.87	10.55	2.81	23.05	
	E2	H	-23.48	0.00	-35.04	10.55	2.81	19.30	
		V	-16.75	0.00	-34.87	10.55	2.81	25.86	
2593.0	H	H	-20.98	0.00	-35.41	10.75	3.05	22.13	33
		V	-20.75	0.00	-35.08	10.75	3.05	22.03	
	E1	H	-21.56	0.00	-35.41	10.75	3.05	21.55	
		V	-21.41	0.00	-35.08	10.75	3.05	21.37	
	E2	H	-22.55	0.00	-35.41	10.75	3.05	20.56	
		V	-14.55	0.00	-35.08	10.75	3.05	**28.23**	
2687.5	H	H	-23.75	0.00	-35.86	11.07	2.87	20.31	33
		V	-19.24	0.00	-35.54	11.07	2.87	24.50	
	E1	H	-23.12	0.00	-35.86	11.07	2.87	20.94	
		V	-22.22	0.00	-35.54	11.07	2.87	21.52	
	E2	H	-25.24	0.00	-35.86	11.07	2.87	18.82	
		V	-17.52	0.00	-35.54	11.07	2.87	26.22	

Radiated Measurements at 3meters

Measurement Results : 16QAM

Frequency (MHz)	*EUT Pol.	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dBm)	EIRP (dBm)	Limit (dBm)
2498.5	H	H	-19.98	0.00	-35.04	10.55	2.81	22.80	33
		V	-20.19	0.00	-34.87	10.55	2.81	22.42	
	E1	H	-19.64	0.00	-35.04	10.55	2.81	23.14	
		V	-20.16	0.00	-34.87	10.55	2.81	22.45	
	E2	H	-23.12	0.00	-35.04	10.55	2.81	19.66	
		V	-16.73	0.00	-34.87	10.55	2.81	25.88	
2593.0	H	H	-21.11	0.00	-35.41	10.75	3.05	22.00	33
		V	-19.02	0.00	-35.08	10.75	3.05	23.76	
	E1	H	-20.62	0.00	-35.41	10.75	3.05	22.49	
		V	-18.66	0.00	-35.08	10.75	3.05	24.12	
	E2	H	-22.22	0.00	-35.41	10.75	3.05	20.89	
		V	-14.56	0.00	-35.08	10.75	3.05	28.22	
2687.5	H	H	-23.32	0.00	-35.86	11.07	2.87	20.74	33
		V	-23.15	0.00	-35.54	11.07	2.87	20.59	
	E1	H	-22.24	0.00	-35.86	11.07	2.87	21.82	
		V	-22.51	0.00	-35.54	11.07	2.87	21.23	
	E2	H	-24.24	0.00	-35.86	11.07	2.87	19.82	
		V	-17.14	0.00	-35.54	11.07	2.87	26.60	

Note : The test data show the emission level from the three-azimuth.

10.4 Radiated Spurious & Harmonic Emission

Low Channel (2498.5 MHz)

Freq. (MHz)	EUT Pol	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
4997.00	E1	H	-64.14	0.00	-10.04	12.65	4.47	-45.92	-25	20.92
	E2	V	-61.21	0.00	-9.34	12.65	4.47	-43.69		18.69
7495.50	E1	H	-56.37	0.00	-17.74	11.23	5.52	-32.92	-25	7.92
	E1	V	-59.10	0.00	-17.43	11.23	5.52	-35.96		10.96
9994.00	E1	H	-57.84	0.00	-19.96	12.08	6.15	-31.95	-25	6.95
	H	V	-63.92	0.00	-20.32	12.08	6.15	-37.67		12.67

Middle Channel (2593 .0MHz)

Freq. (MHz)	EUT Pol	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5186.0	E1	H	-61.92	0.00	-9.55	12.85	4.38	-43.90	-25	18.90
	E2	V	-60.04	0.00	-9.02	12.85	4.38	-42.55		17.55
7779.0	E1	H	-56.85	0.00	-17.84	11.44	5.56	-33.13	-25	8.13
	E2	V	-57.87	0.00	-17.49	11.44	5.56	-34.50		9.50
10372.0	E1	H	-60.92	0.00	-22.79	11.77	5.97	-32.33	-25	7.33
	H	V	-63.13	0.00	-22.94	11.77	5.97	-34.39		9.39
12965.0	E2	H	-63.92	0.00	-23.45	13.62	7.04	-33.89	-25	8.89
	H	V	-64.38	0.00	-23.45	13.62	7.04	-34.35		9.35

High Channel (2687.5 MHz)

Freq. (MHz)	EUT Pol	Ant. Pol.	P_{EUT} (dBm)	P_{TX} (dBm)	P_{RX} (dBm)	$G_{antenna}$ (dBi)	L_{Cable} (dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)
5375.0	E1	H	-54.73	0.00	-9.59	13.10	4.73	-36.77	-25	11.77
	E1	V	-59.00	0.00	-9.01	13.10	4.73	-41.62		16.62
8062.5	E1	H	-55.95	0.00	-18.63	11.44	5.85	-31.73	-25	6.73
	E1	V	-53.62	0.00	-18.66	11.44	5.85	-29.37		4.37
10750.0	E1	H	-61.20	0.00	-23.86	11.59	6.70	-32.45	-25	7.45
	E1	V	-63.13	0.00	-24.17	11.59	6.70	-34.07		9.07
13437.5	E1	H	-65.81	0.00	-27.16	12.85	7.40	-33.20	-25	8.20
	E1	V	-63.29	0.00	-26.94	12.85	7.40	-30.90		5.90

Note: The test data show the worst emission level from the three-azimuth.
The QPSK modulation with 5 MHz bandwidth was the worst case.

10.6 Frequency Stability / Temperature Variation

Test Mode : Set to Middle channel (2593 MHz)

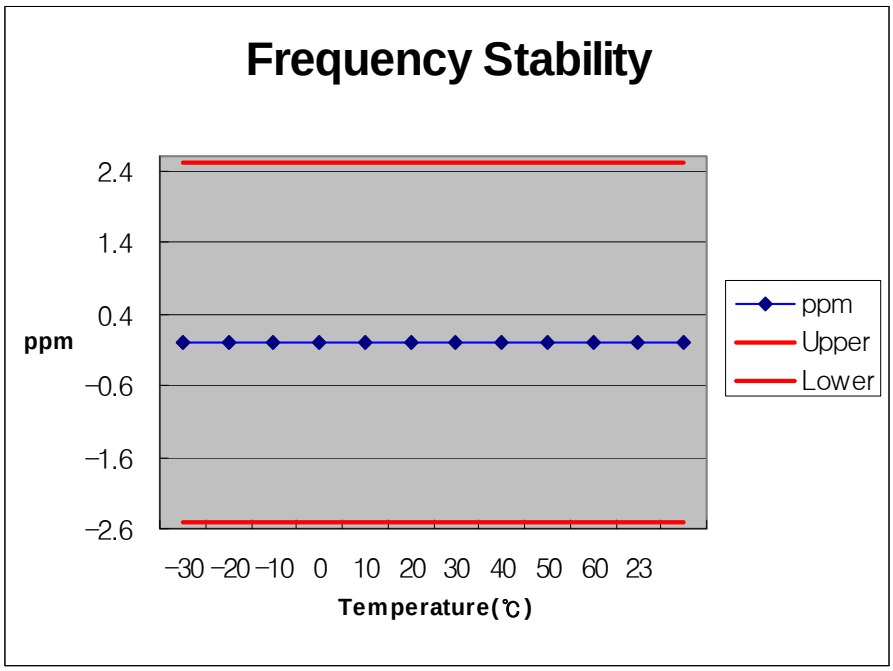
Deviation Limit : ±2.5ppm

Measurement Result :

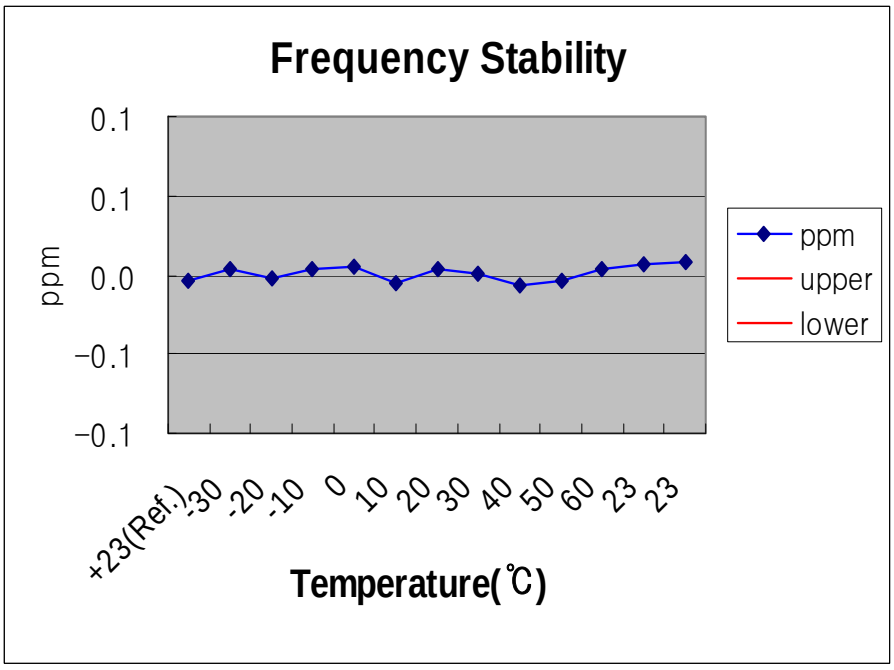
Voltage (%)	Power (Vdc)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	ppm
100%	5.0	+23(Ref.)	2,592,999,989	-11	-0.0042
100%		-30	2,593,000,008	8	0.0031
100%		-20	2,592,999,993	-7	-0.0027
100%		-10	2,593,000,010	10	0.0039
100%		0	2,593,000,013	13	0.0050
100%		10	2,592,999,985	-15	-0.0058
100%		20	2,593,000,010	10	0.0039
100%		30	2,593,000,003	3	0.0012
100%		40	2,592,999,983	-17	-0.0066
100%		50	2,592,999,991	-9	-0.0035
100%		60	2,593,000,008	8	0.0031
85%	4.25	23	2,593,000,017	17	0.0066
115%	5.75	23	2,593,000,023	23	0.0089

***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

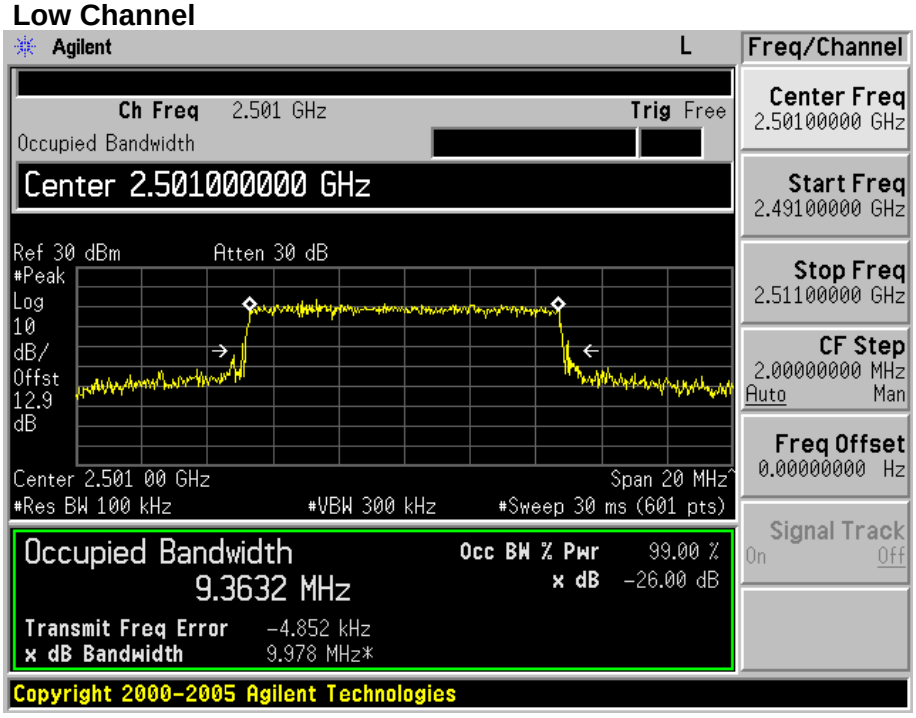
Contribution	*Probability Distribution*	*Uncertainty(+/-dB)*
Receiver Specification	Normal (k=2)	± 2.0
LISN coupling spec.	Normal (k=2)	± 0.4
Cable and input attenuator cal.	Rectangular	± 0.4
Mismatch:Receiver VRC ri=0.3 LISN vrc rg=0.1 Uncertainty Limits 20Log(1+/-ri rR)	U-Shaped	± 0.26
System Repeatibilty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

12. Test Plots

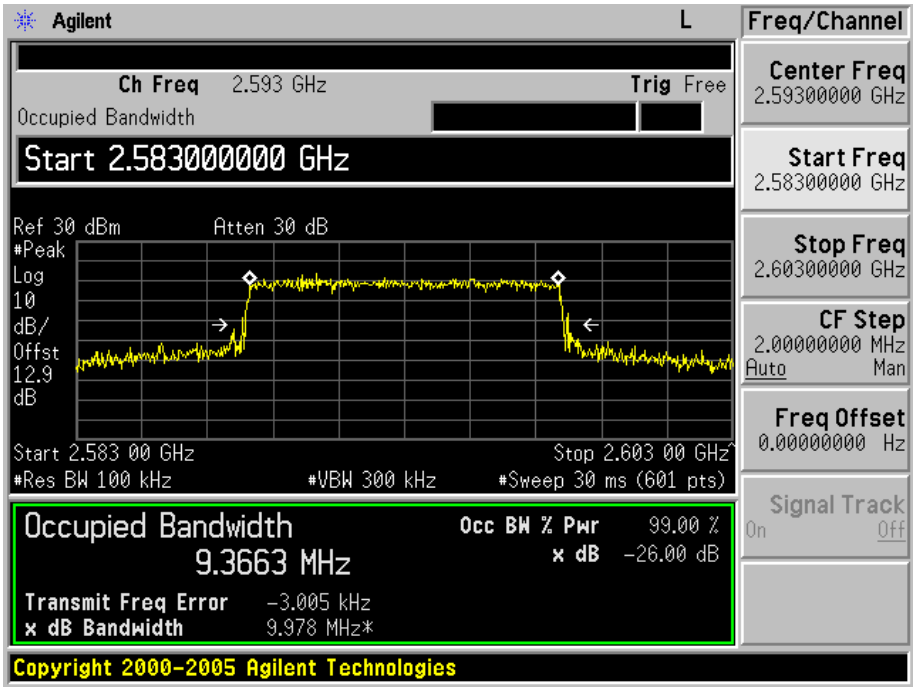
● **Occupied Bandwidth / 26dB Bandwidth**

10MHz Bandwidth QPSK mode

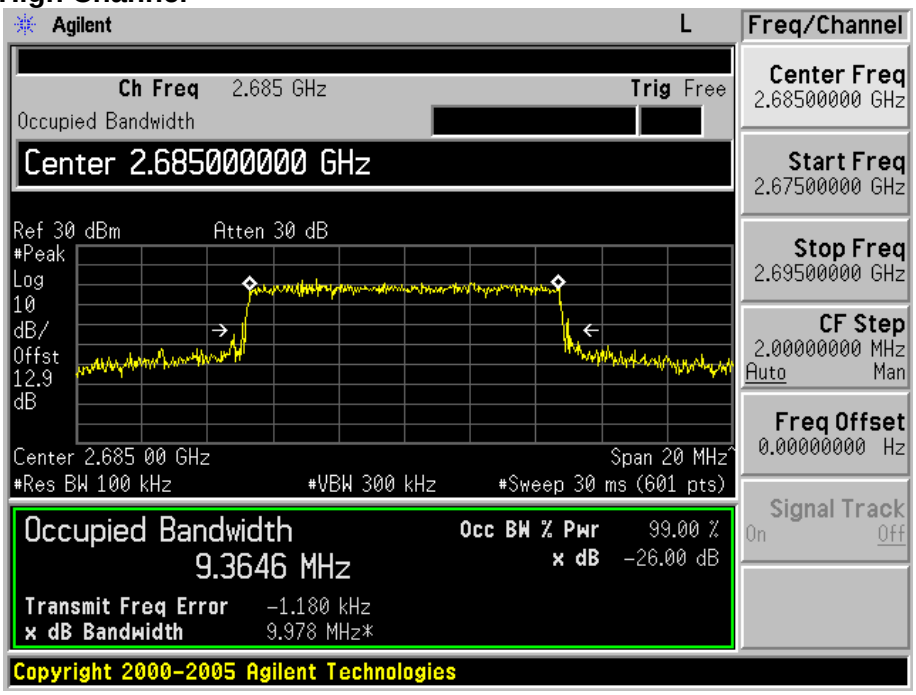
Low Channel



Middle Channel

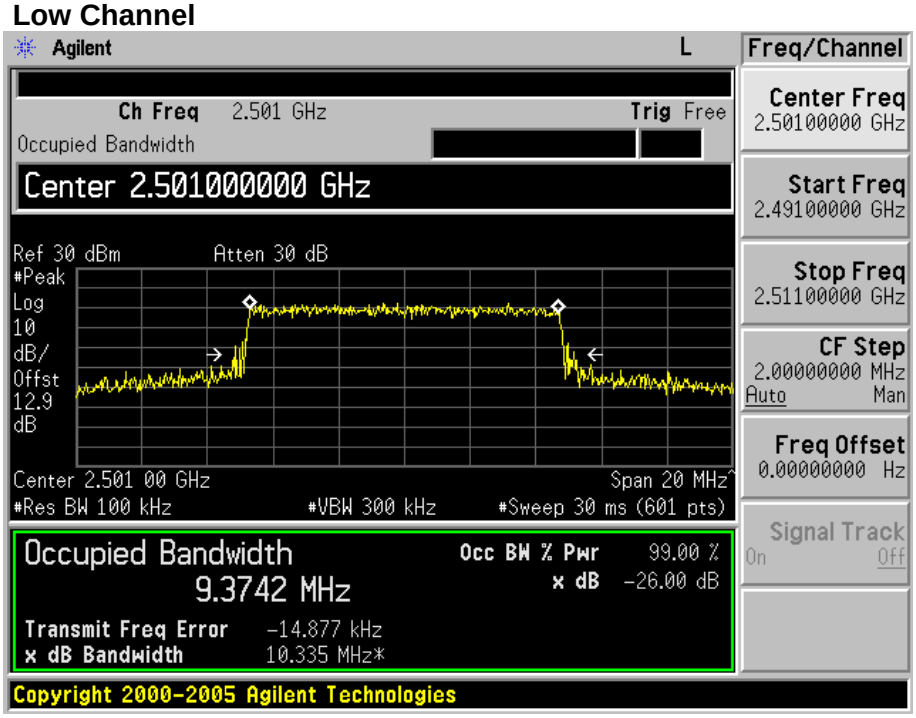


High Channel

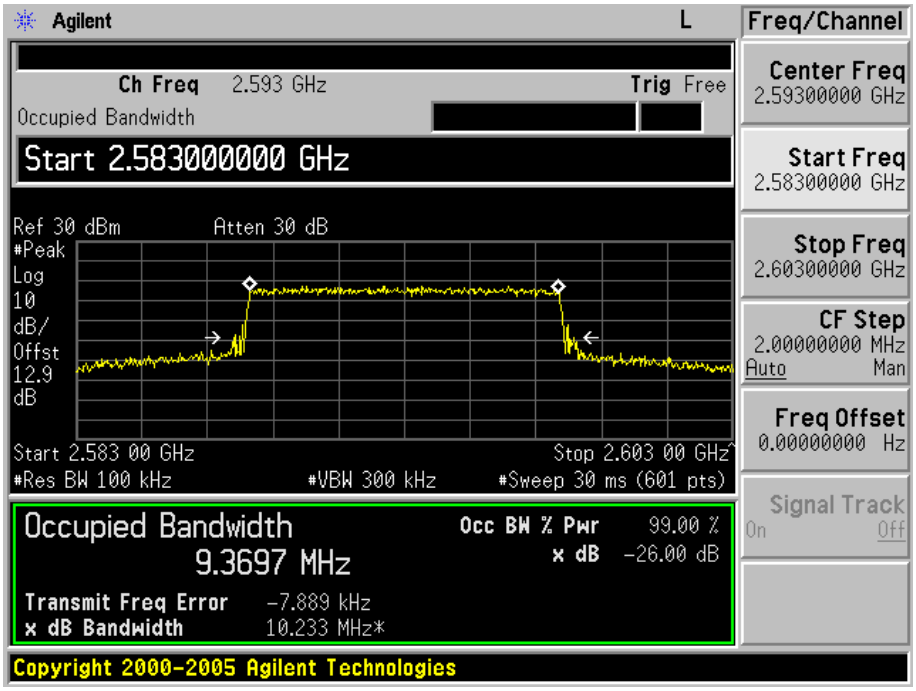


10MHz Bandwidth 16QAM mode

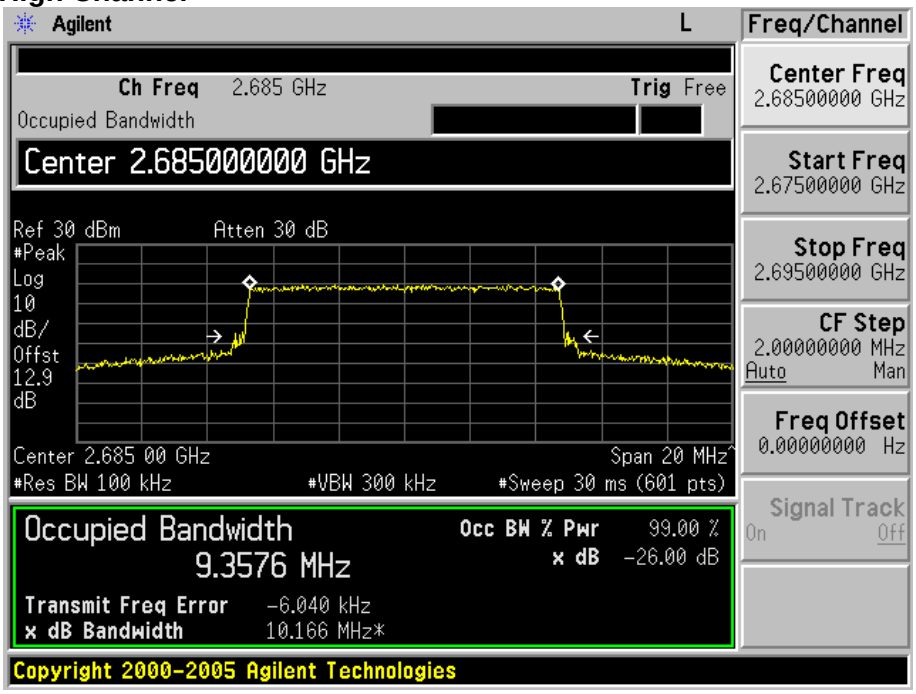
Low Channel



Middle Channel

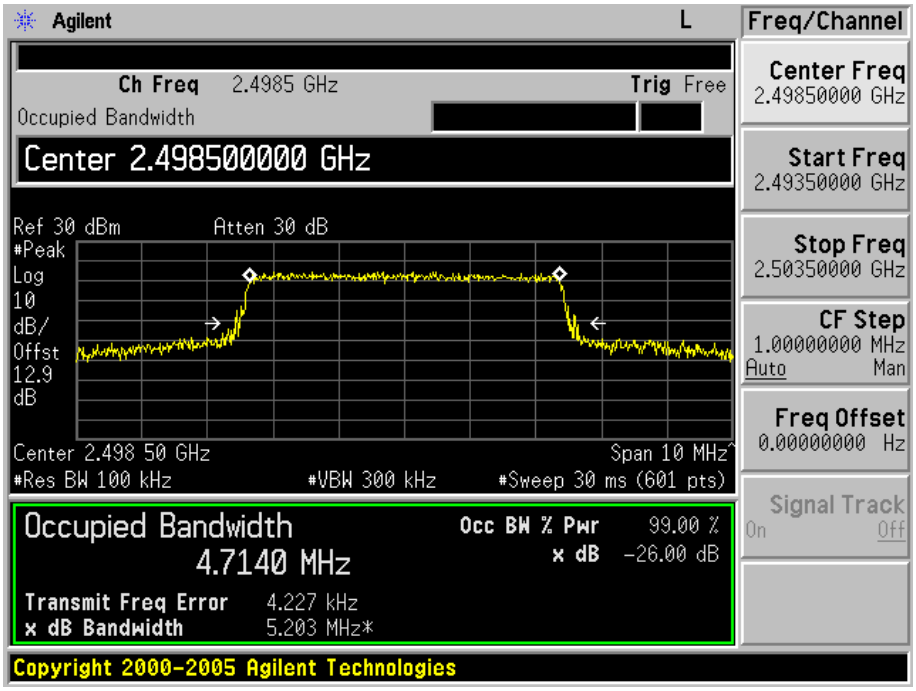


High Channel

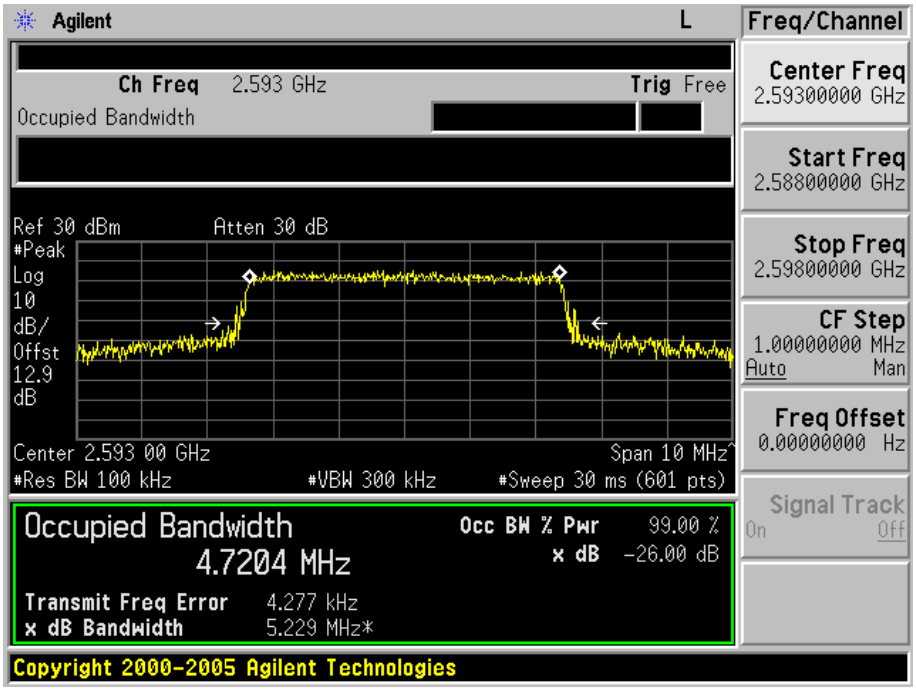


5MHz Bandwidth QPSK mode

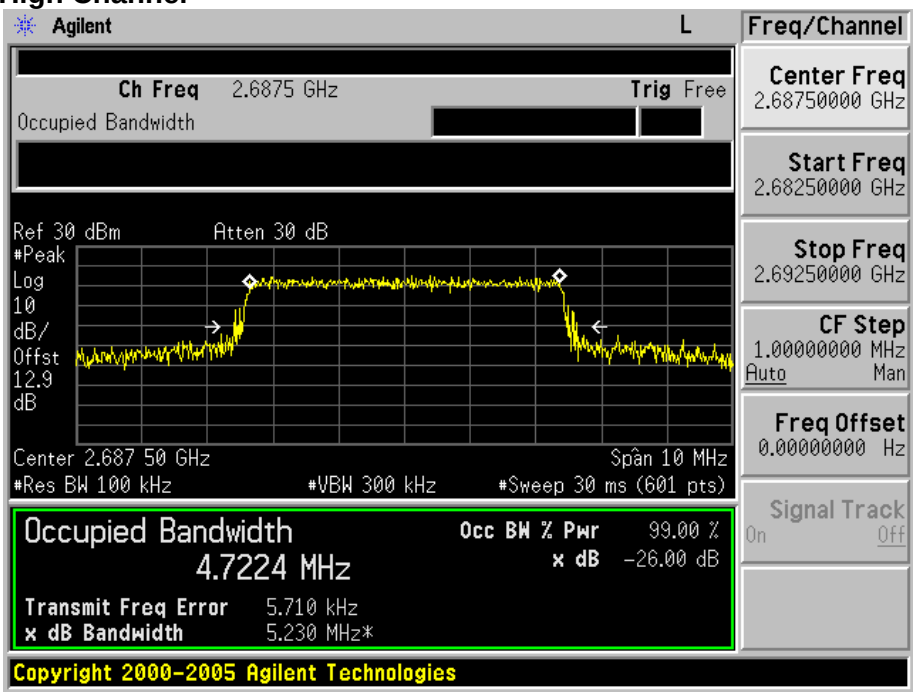
Low Channel



Middle Channel

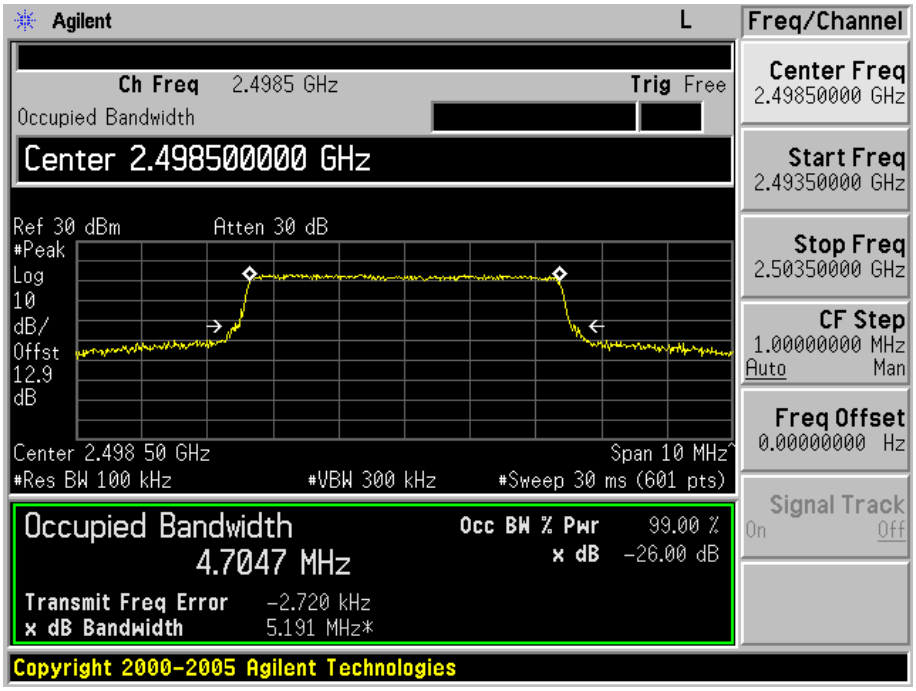


High Channel

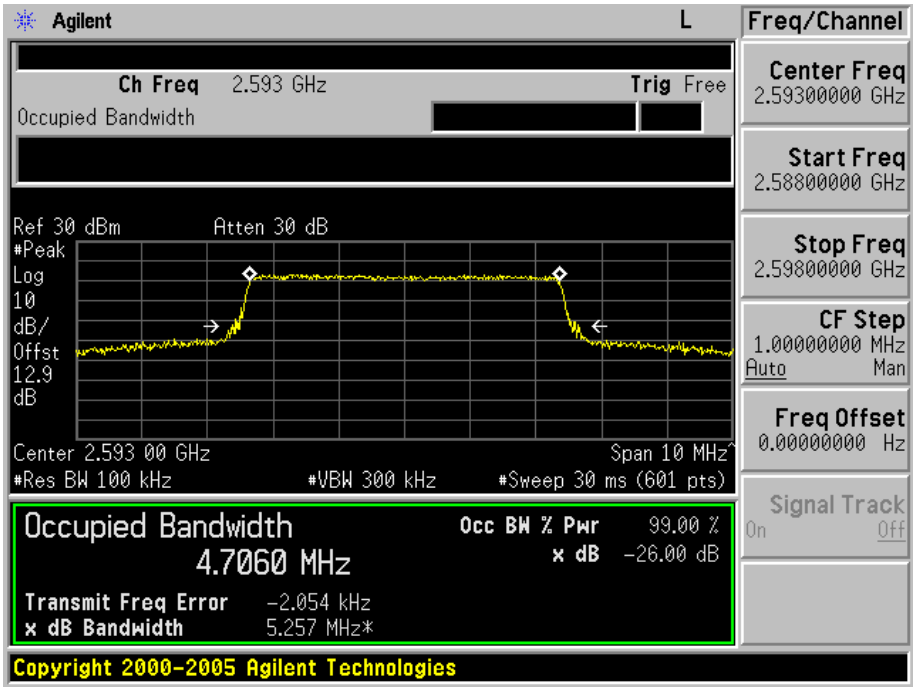


5MHz Bandwidth 16QAM mode

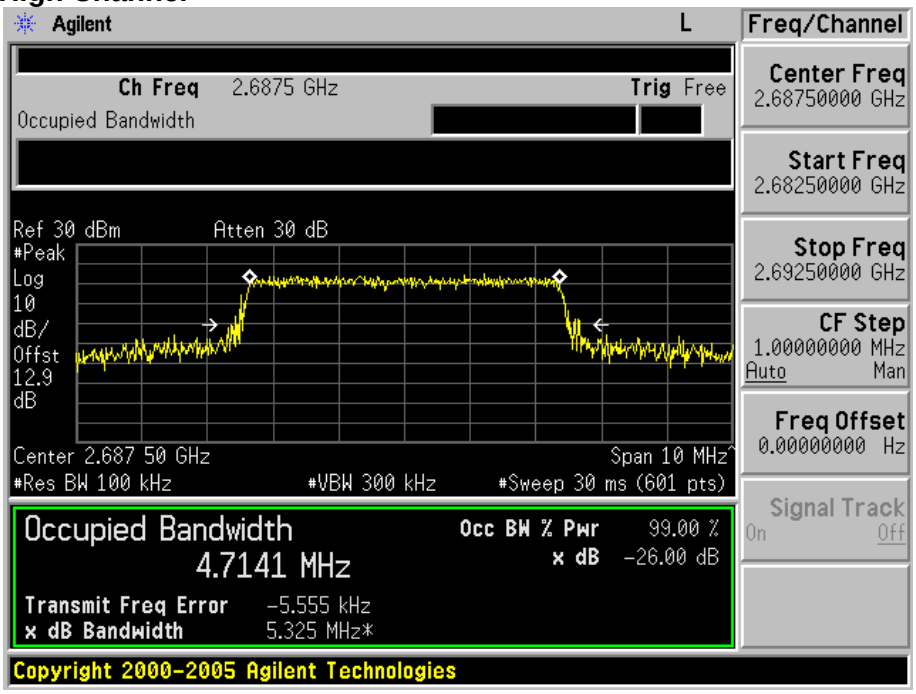
Low Channel



Middle Channel



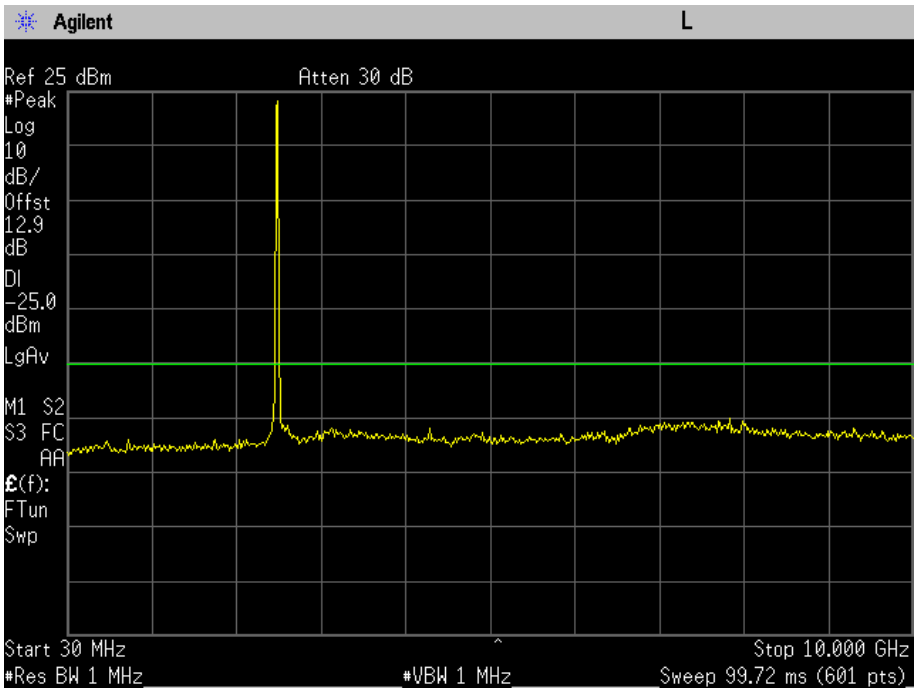
High Channel

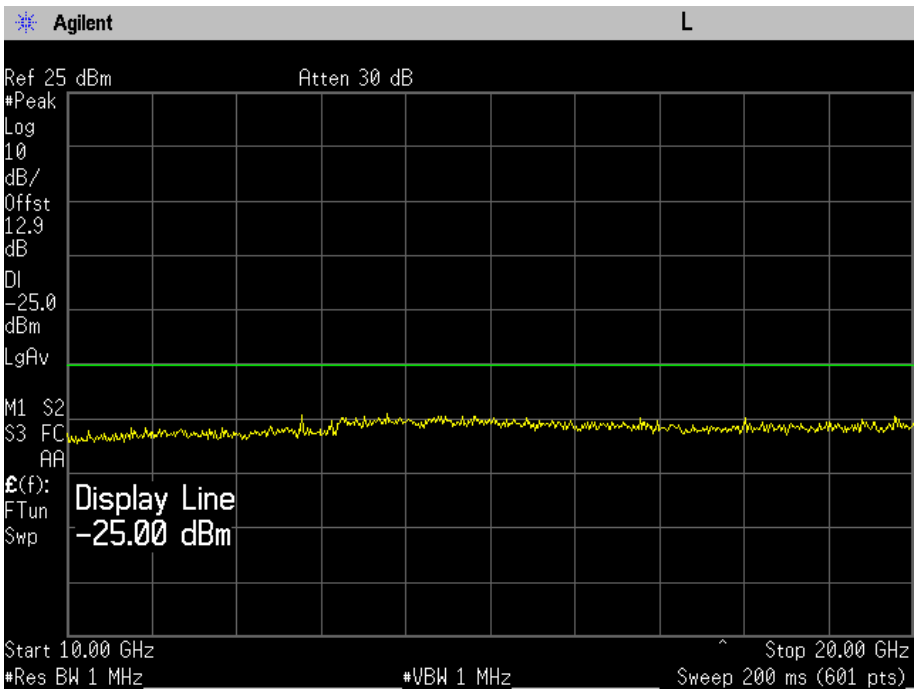


● **Spurious Emission at antenna Terminals**

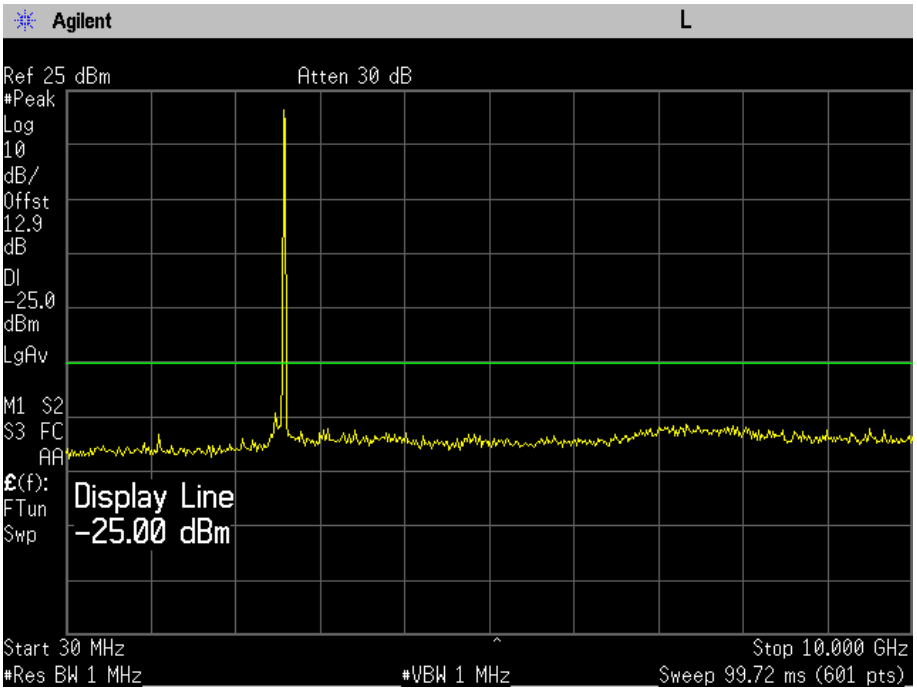
10MHz Bandwidth QPSK mode

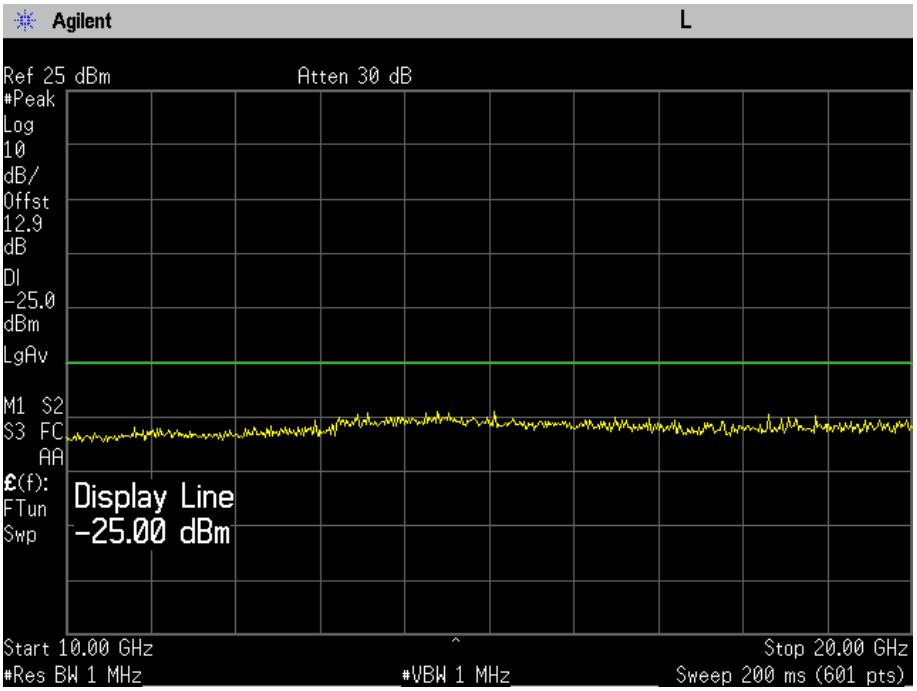
Low Channel



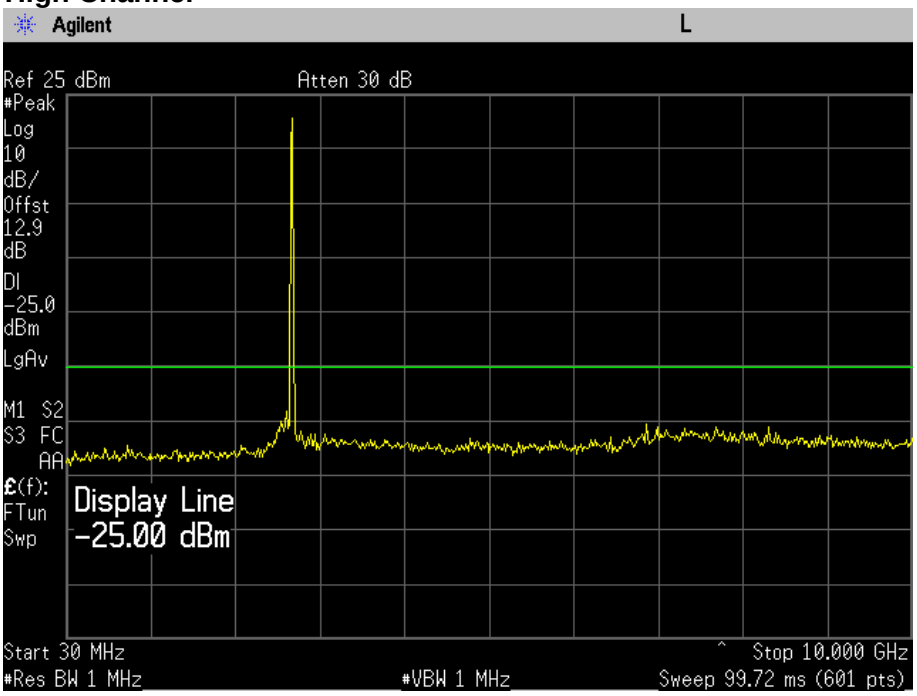


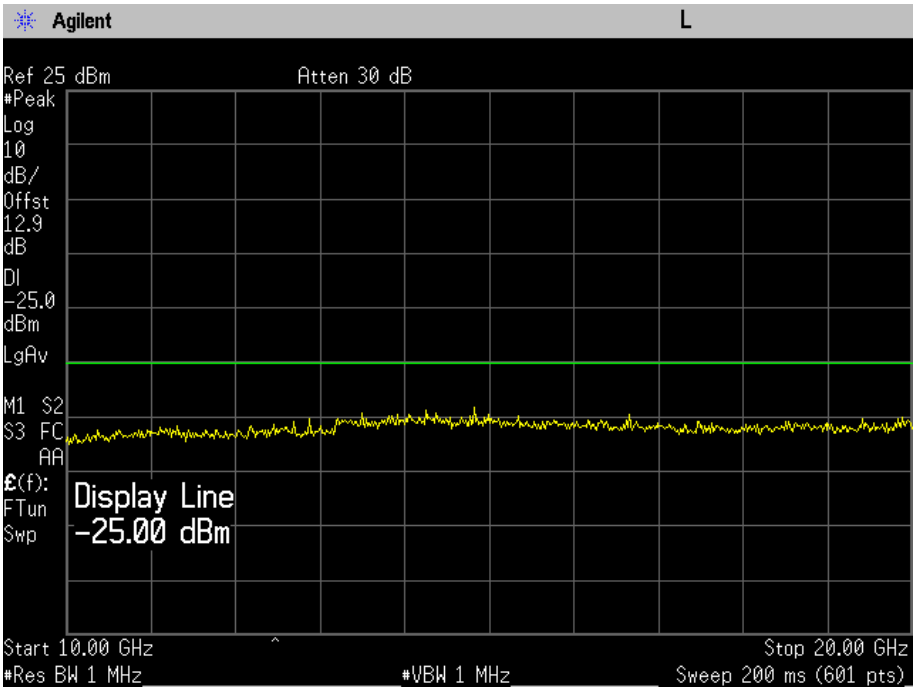
Middle Channel





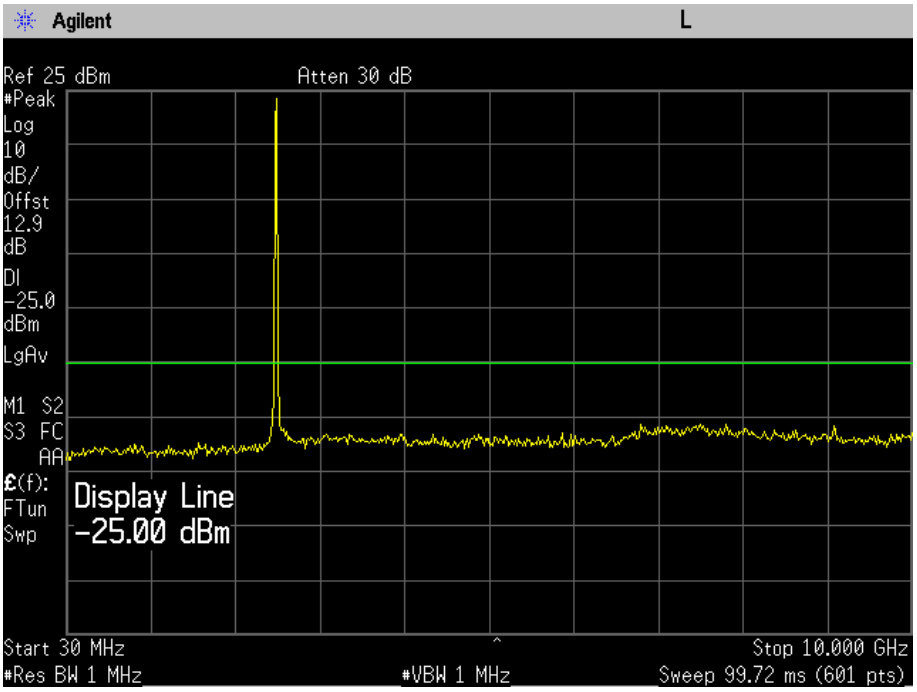
High Channel

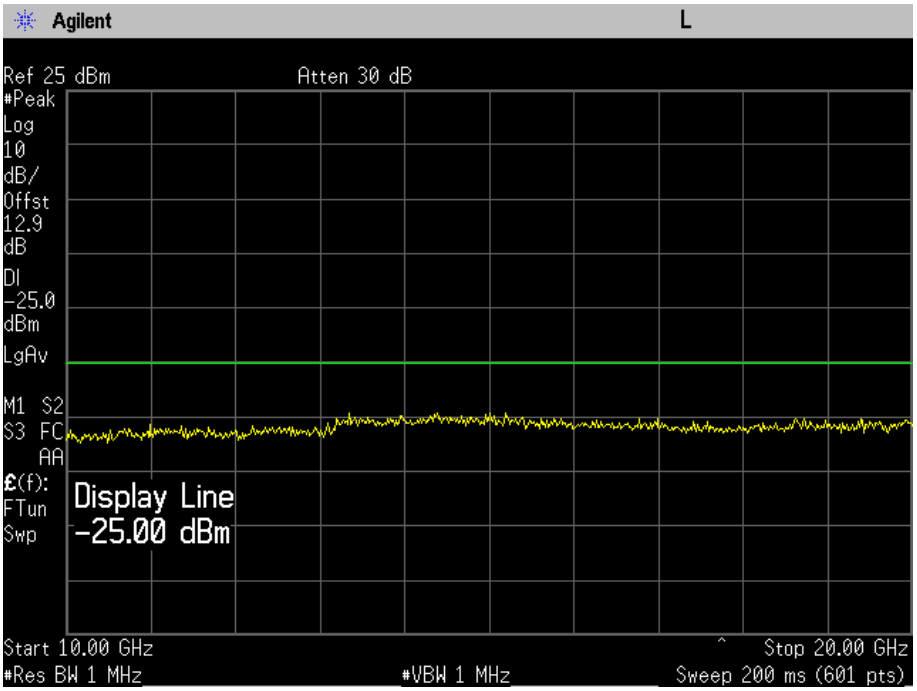




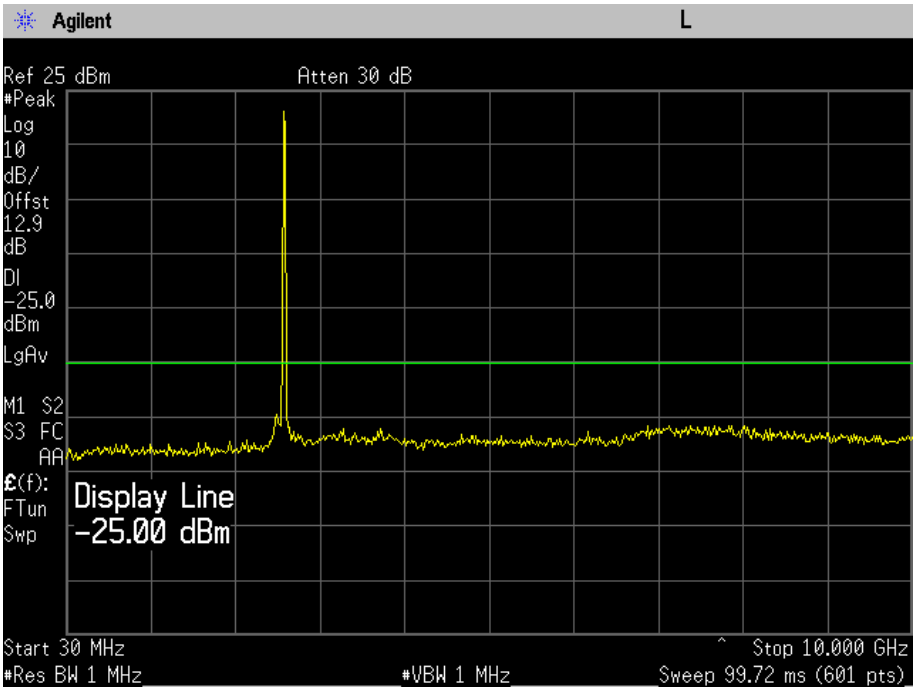
10MHz Bandwidth 16QAM mode

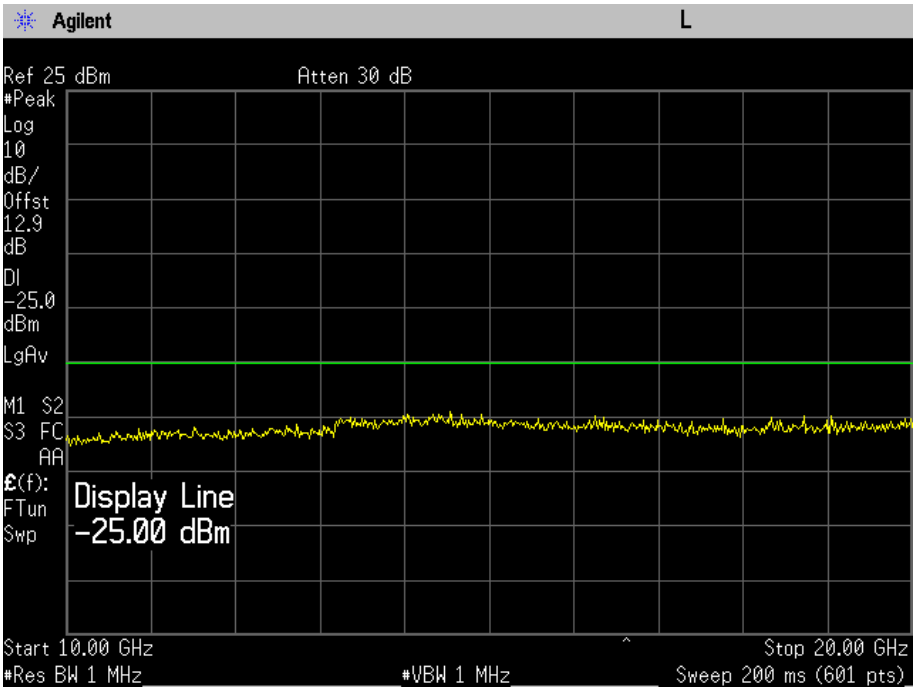
Low Channel



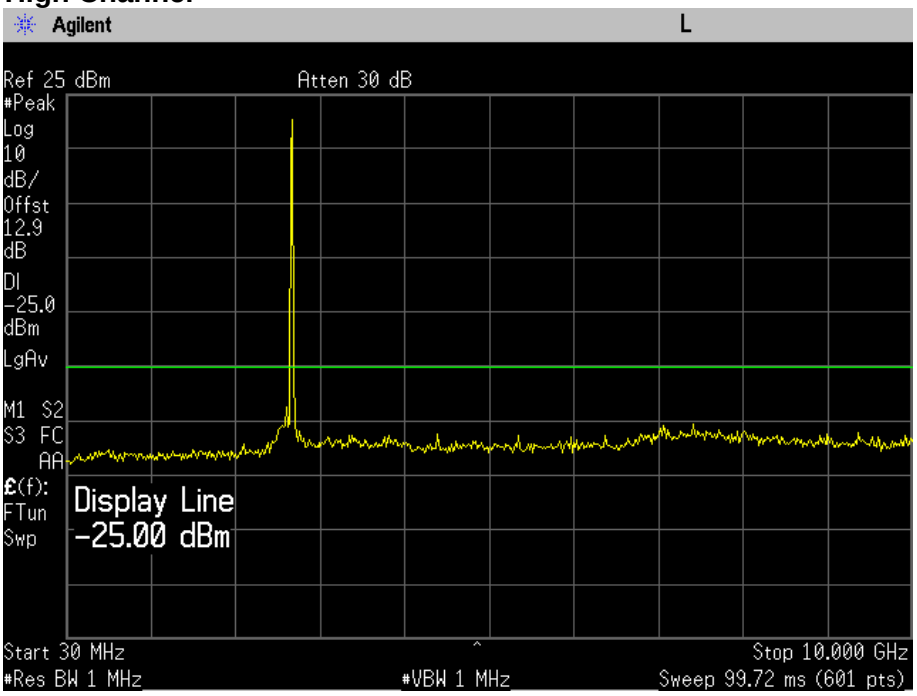


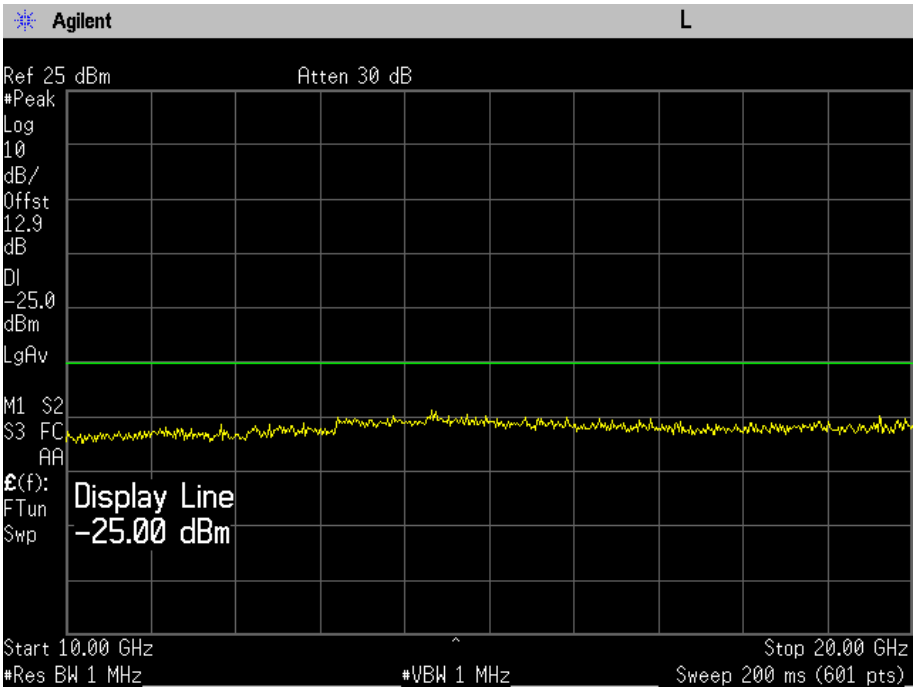
Middle Channel





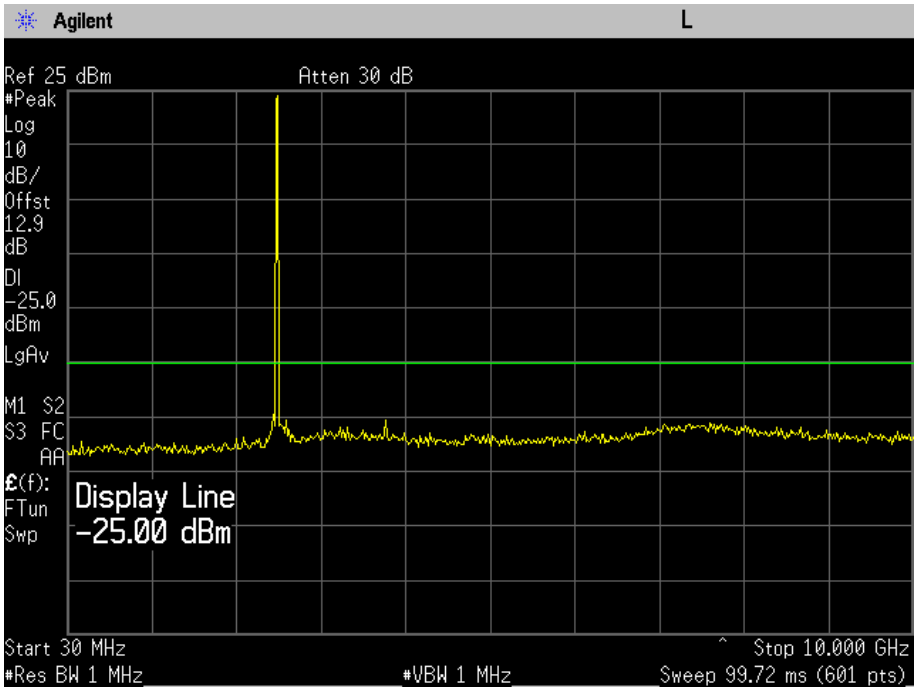
High Channel

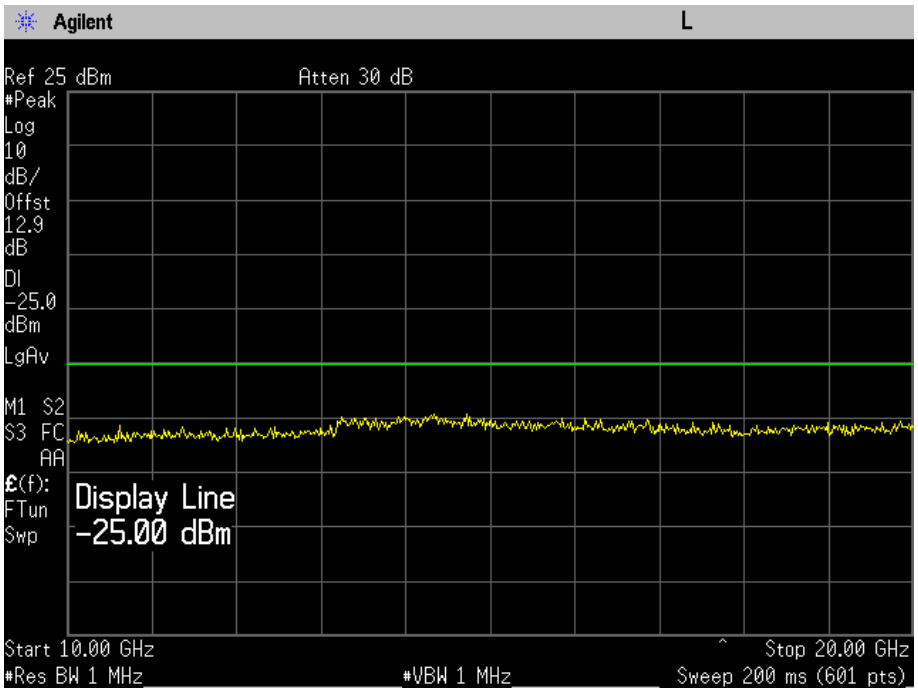




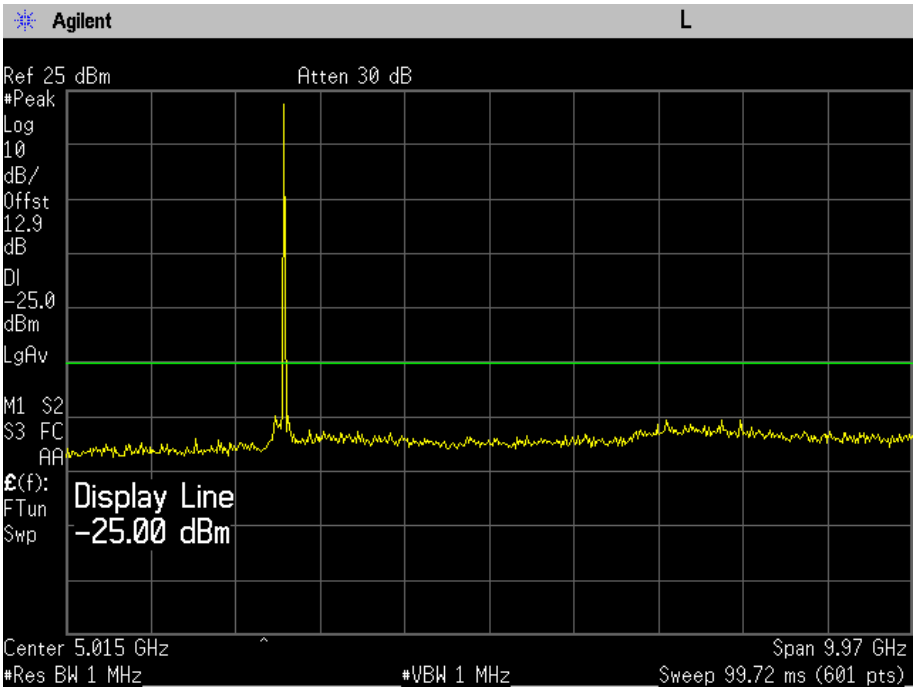
5MHz Bandwidth QPSK mode

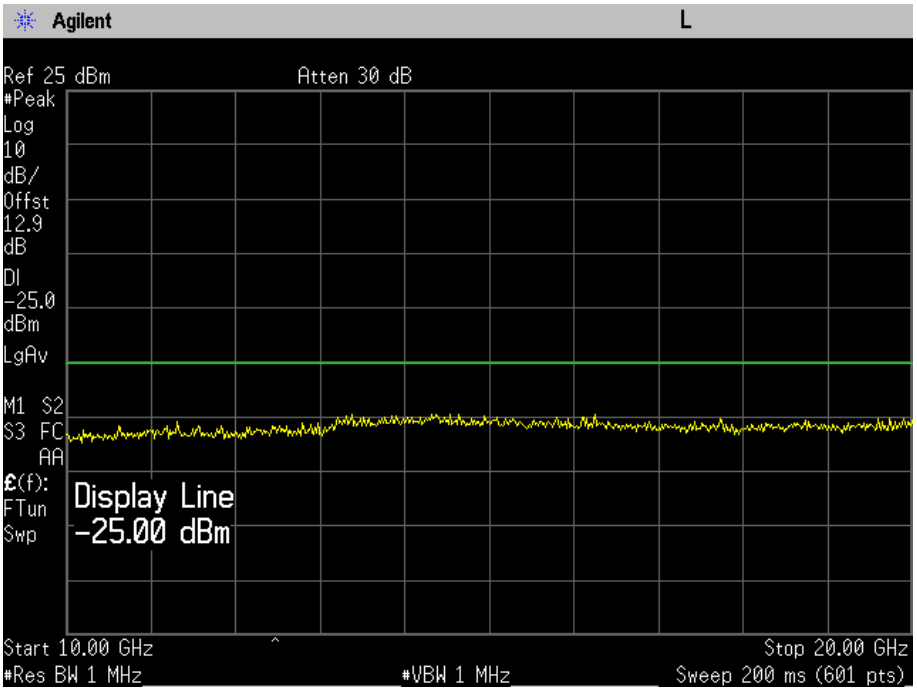
Low Channel



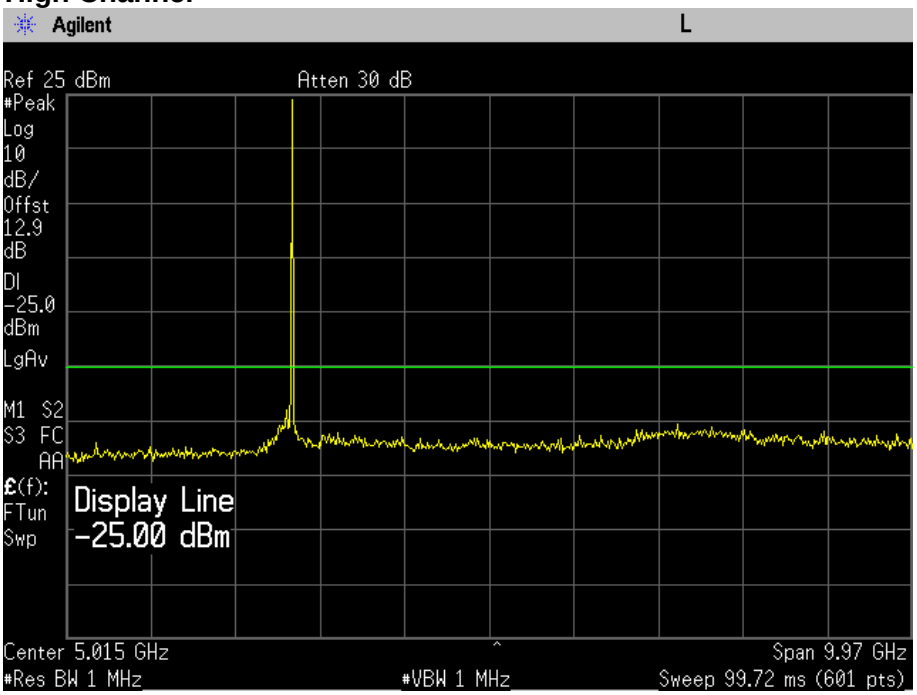


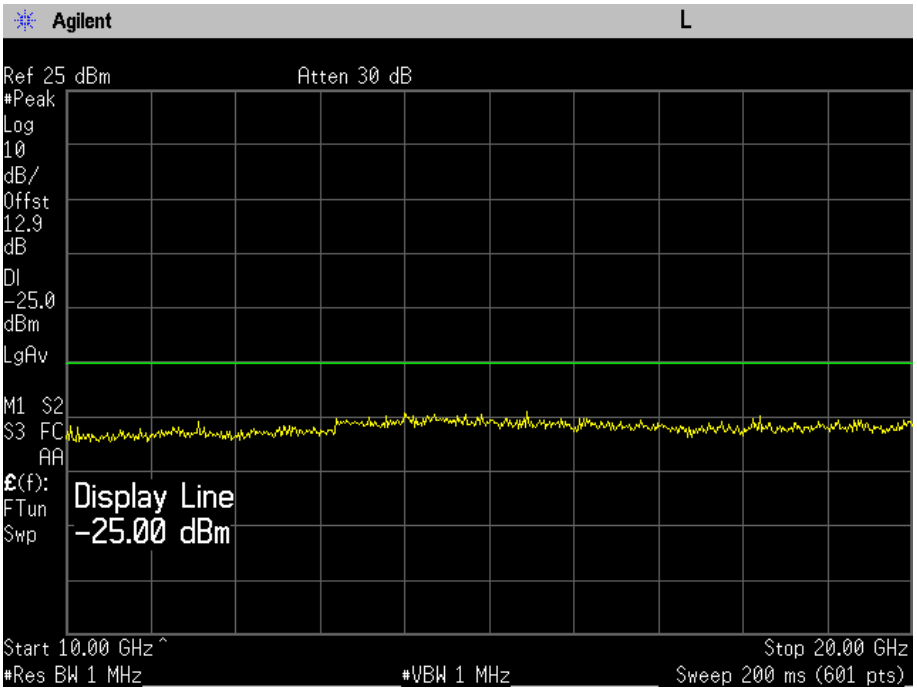
Middle Channel





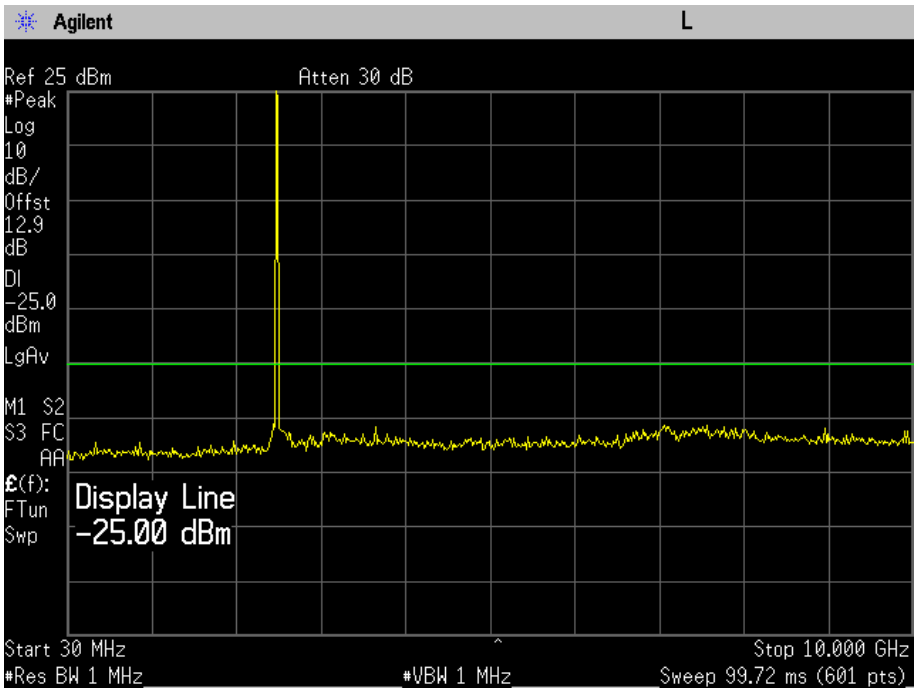
High Channel

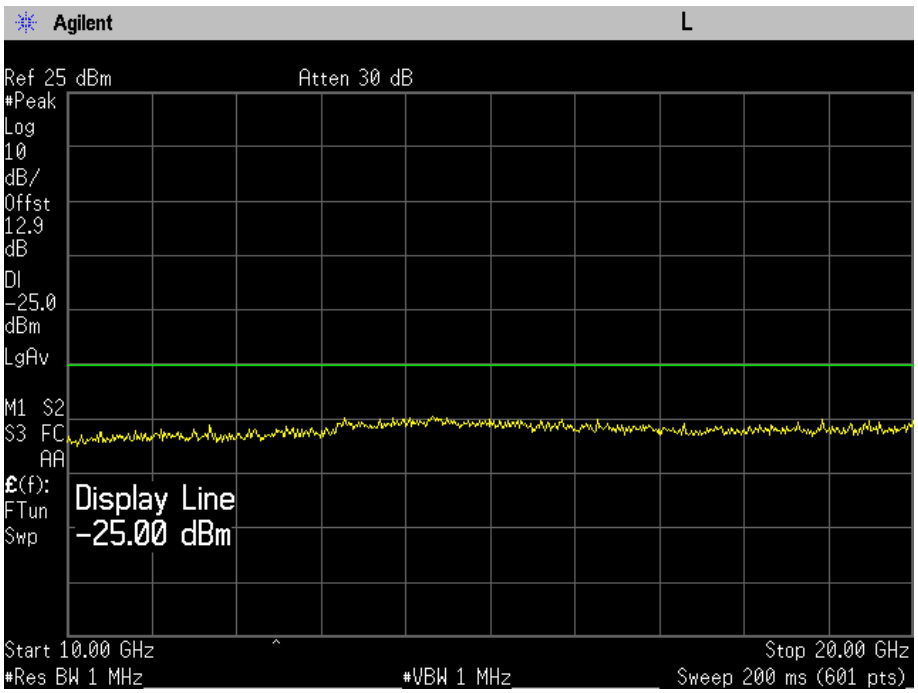




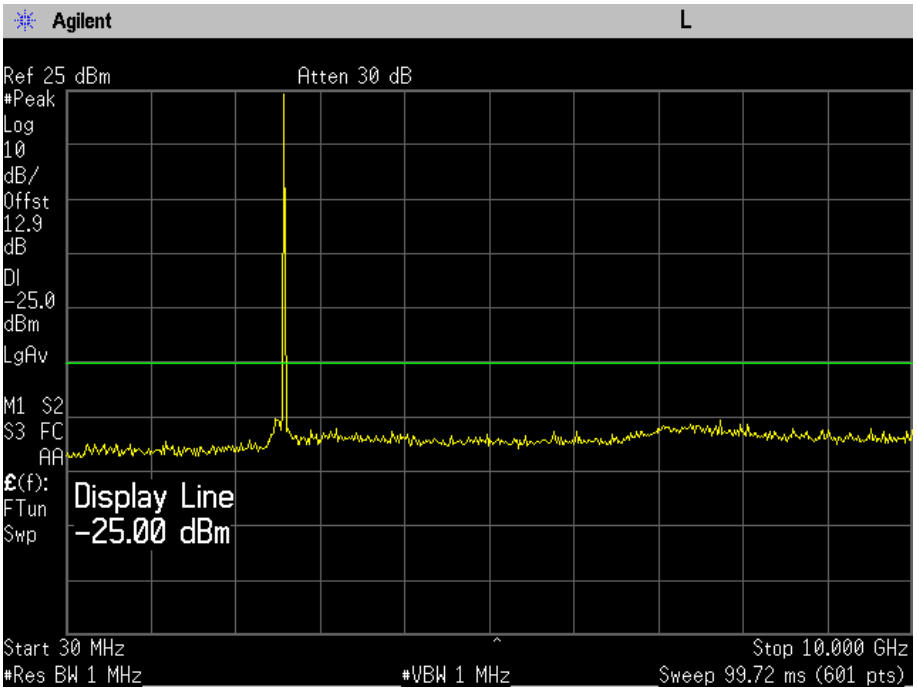
5MHz Bandwidth 16QAM mode

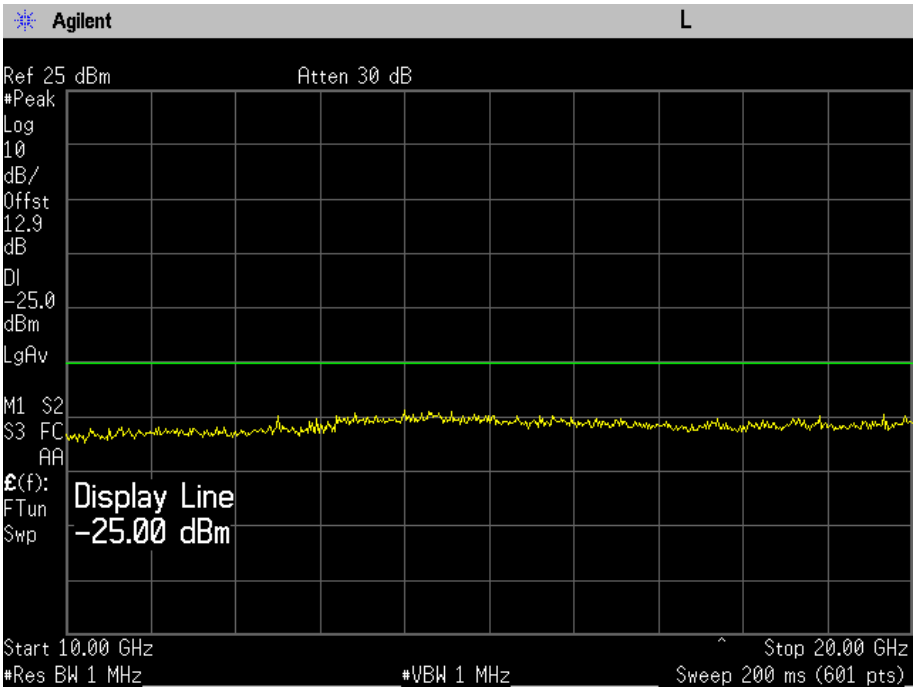
Low Channel



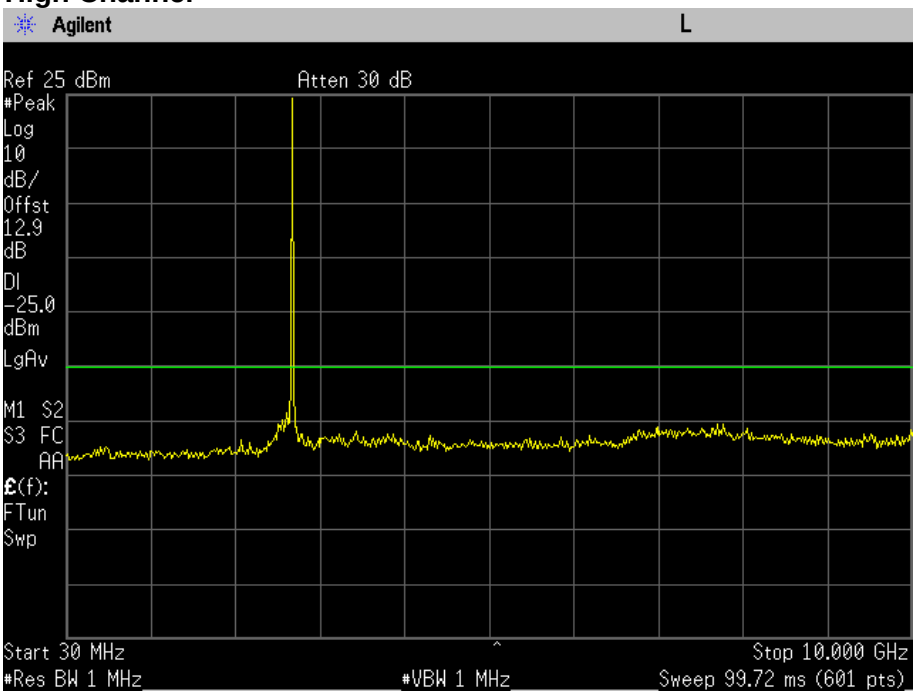


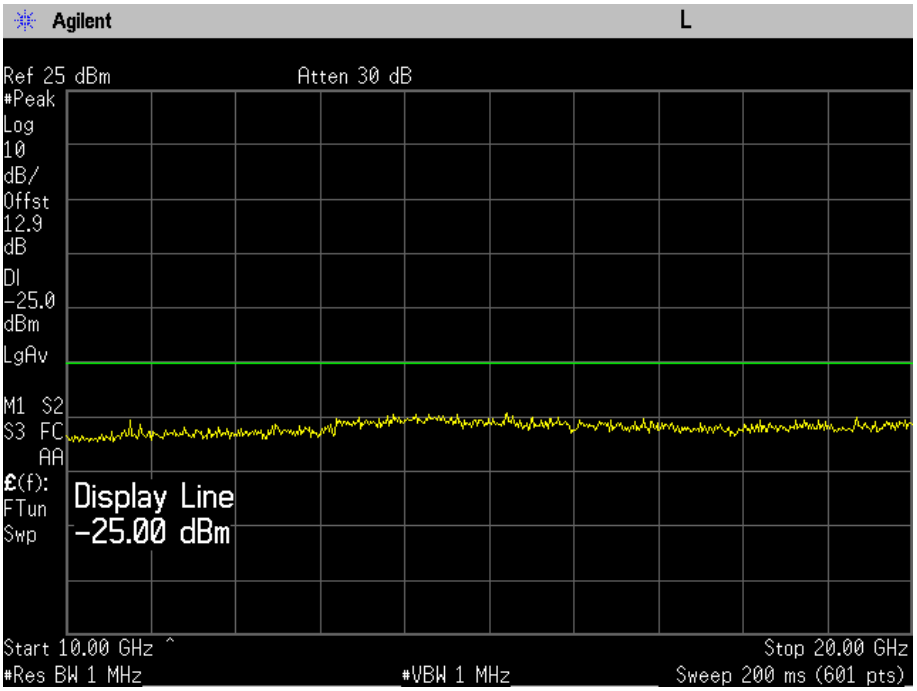
Middle Channel





High Channel

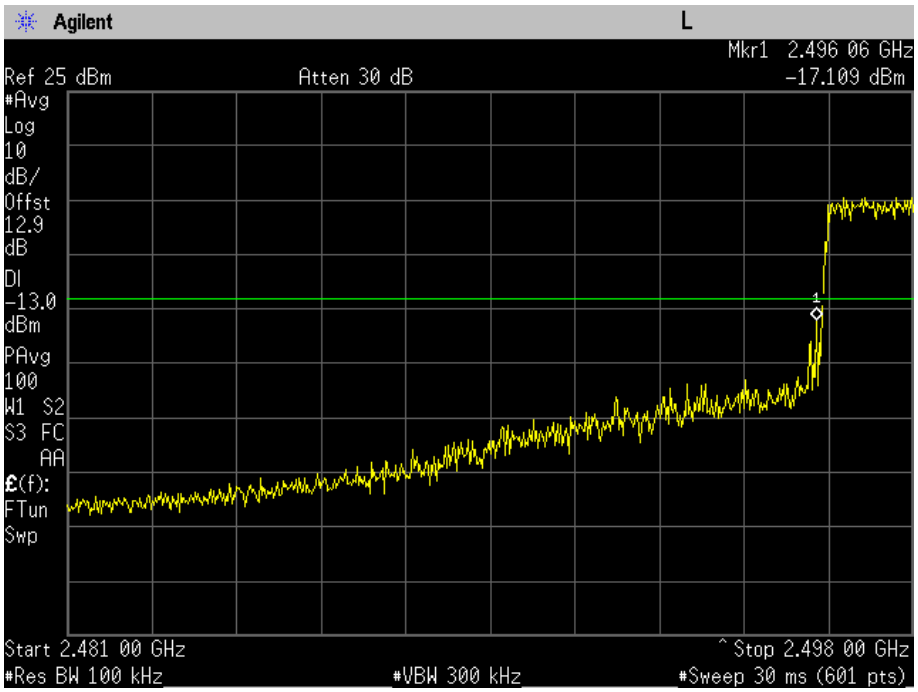




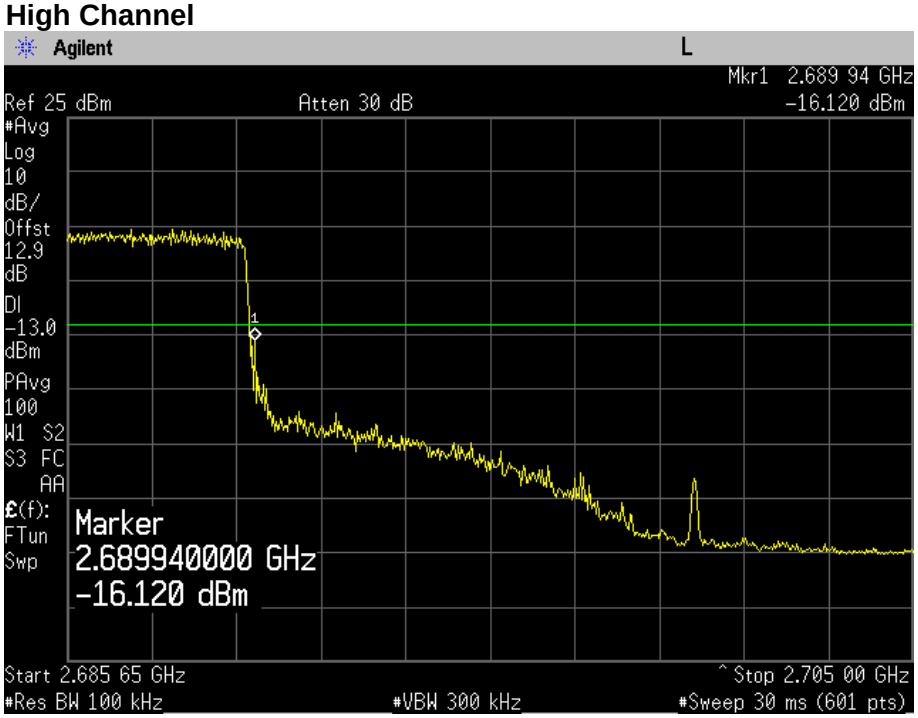
● **Band Edge**

10MHz Bandwidth QPSK mode

Low Channel

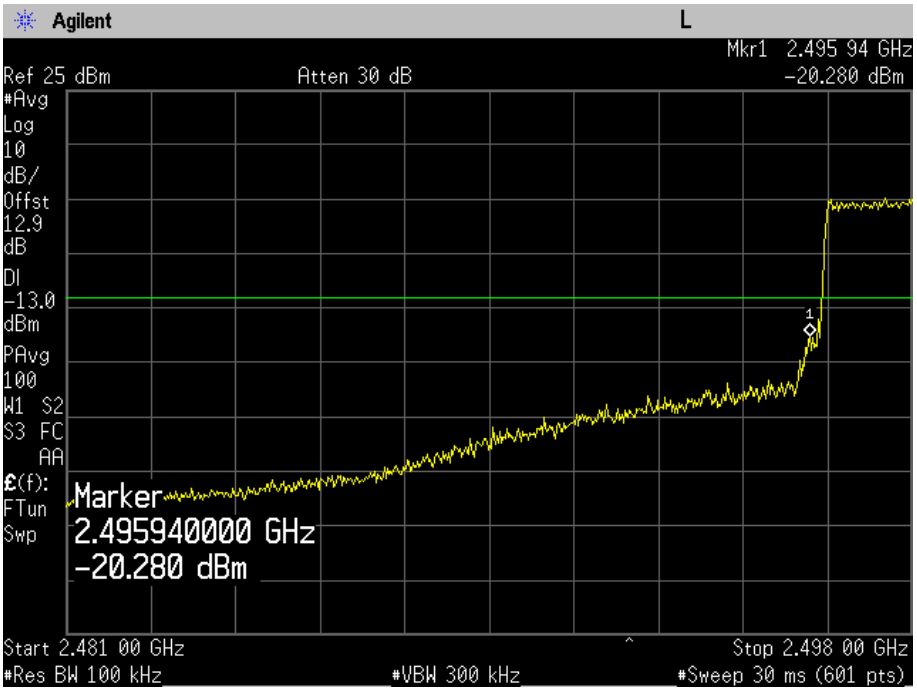


High Channel

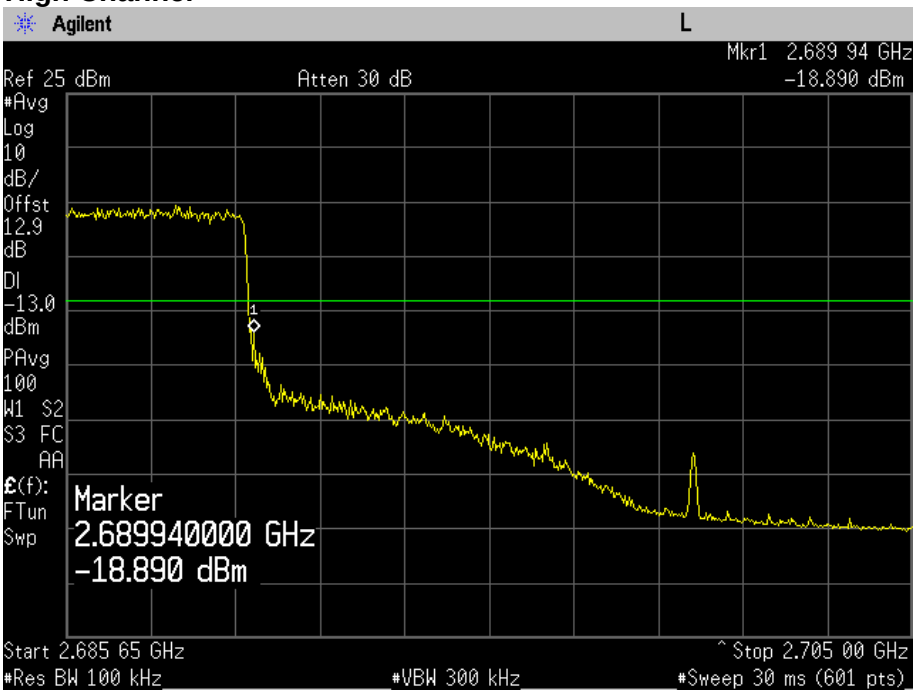


10MHz Bandwidth 16QAM mode

Low Channel

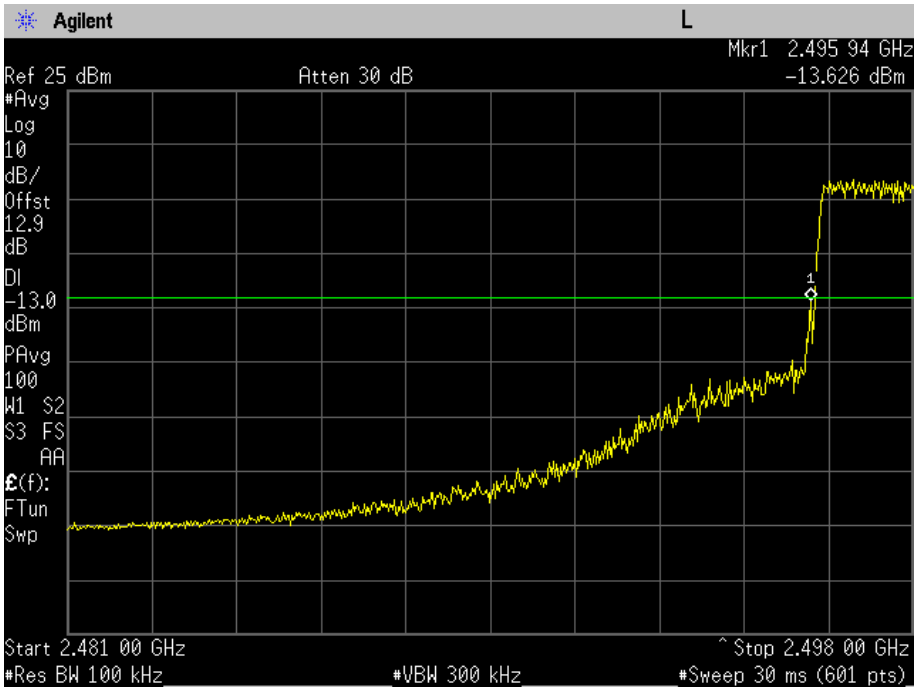


High Channel

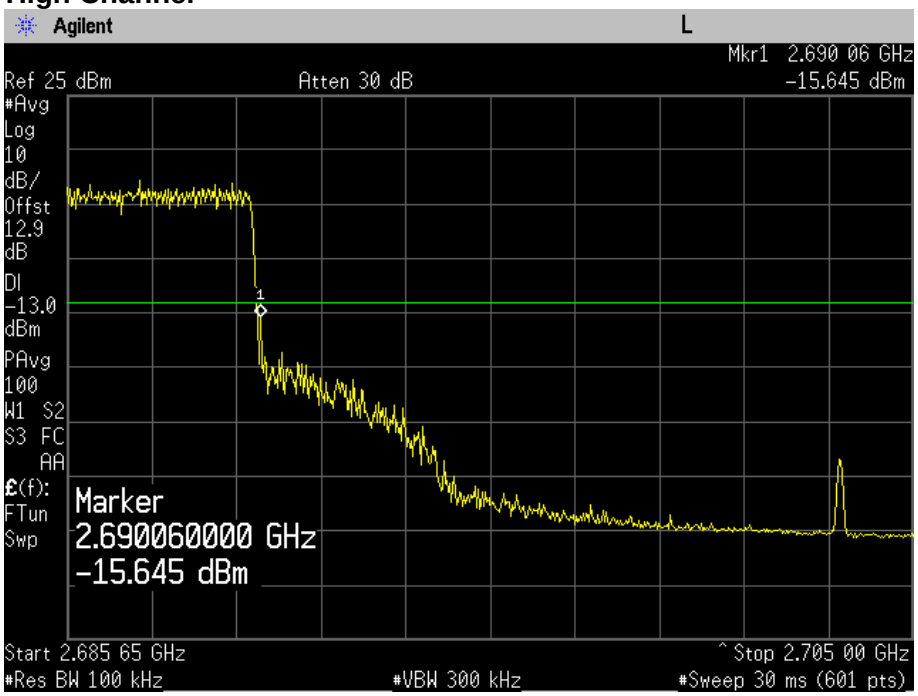


5MHz Bandwidth QPSK mode

Low Channel

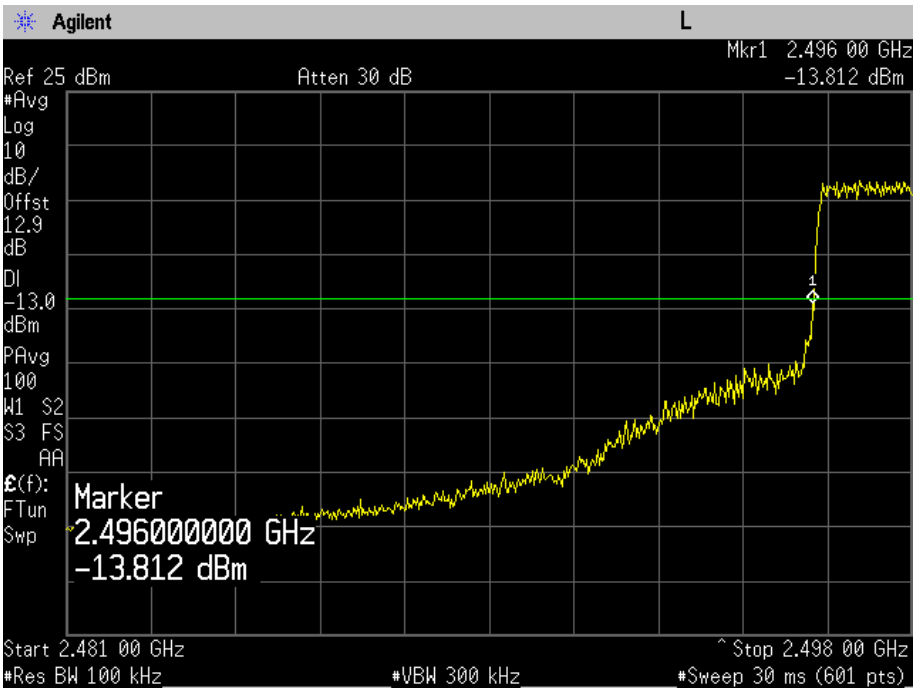


High Channel



5MHz Bandwidth 16QAM mode

Low Channel



High Channel