

TEST REPORT

Applicant : Sharp Corporation, Communication Systems Division
Address : 2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima,
739-0192, Japan

Products : Smart Phone
Model No. : 502SH
Serial No. : 004401/11/553731/4
004401/11/553705/8

FCC ID : APYHRO00226

Test Standard : CFR 47 FCC Rules and Regulations Part 24

Test Results : **Passed**

Date of Test : September 15 ~ 19, 2015



A handwritten signature in black ink, likely belonging to Kousei Shibata.

Kousei Shibata
Manager
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- The measurement values stated in Test Report was made with traceable to National Institute of Advanced Industrial Science and Technology (AIST) of Japan and National Institute of Information and Communications Technology (NICT) of Japan.
 - The applicable standard, testing condition and testing method which were used for the tests are based on the request of the applicant.
 - The test results presented in this report relate only to the offered test sample.
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 - VLAC does not approve, certify or warrant the product by this test report.

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DEFINITIONS FOR ABBREVIATION AND SYMBOLS USED IN THIS TEST REPORT

EUT : Equipment Under Test

AE : Associated Equipment

N/A : Not Applicable

N/T : Not Tested

EMC : Electromagnetic Compatibility

EMI : Electromagnetic Interference

EMS : Electromagnetic Susceptibility

☒ - indicates that the listed condition, standard or equipment is applicable for this report.

☐ - indicates that the listed condition, standard or equipment is not applicable for this report.

1 Description of the Equipment Under Test

1. Manufacturer : Sharp Corporation, Communication Systems Division
2-13-1, Iida Hachihonmatsu, Higashi-Hiroshima City, Hiroshima,
739-0192, Japan
2. Products : Smart Phone
3. Model No. : 502SH
4. Serial No. : 004401/11/553731/4
004401/11/553705/8
5. Product Type : Pre-production
6. Date of Manufacture : July, 2015
7. Power Rating : 4.0VDC (Lithium-ion Battery LIS1613SPPC(SY6) 3100mAh)
8. Grounding : None
9. Transmitting Frequency : 1850.7 MHz(18607CH) – 1909.3MHz(19193CH) (BW: 1.4MHz)
1851.5 MHz(18615CH) – 1908.5MHz(19185CH) (BW: 3MHz)
1852.5 MHz(18625CH) – 1907.5MHz(19175CH) (BW: 5MHz)
1855.0 MHz(18650CH) – 1905.0MHz(19150CH) (BW: 10MHz)
1857.5 MHz(18675CH) – 1902.5MHz(19125CH) (BW: 15MHz)
1860.0 MHz(18700CH) – 1900.0MHz(19100CH) (BW: 20MHz)
10. Receiving Frequency : 1930.7 MHz(607CH) – 1989.3MHz(1193CH) (BW: 1.4MHz)
1931.5 MHz(615CH) – 1988.5MHz(1185CH) (BW: 3MHz)
1932.5 MHz(625CH) – 1987.5MHz(1175CH) (BW: 5MHz)
1935.0 MHz(650CH) – 1985.0MHz(1150CH) (BW: 10MHz)
1937.5 MHz(675CH) – 1982.5MHz(1125CH) (BW: 15MHz)
1940.0 MHz(700CH) – 1980.0MHz(1100CH) (BW: 20MHz)
11. Emission Designations :

BW (MHz)	QPSK	16QAM
1.4	1M09G7D	1M08D7W
3	2M69G7D	2M68D7W
5	4M48G7D	4M47D7W
10	8M93G7D	8M94D7W
15	13M4G7D	13M4D7W
20	17M9G7D	17M9D7W

12. Max. RF Output Power :

BW (MHz)	QPSK (W EIRP)	16QAM (W EIRP)
1.4	0.155	0.132
3	0.158	0.135
5	0.162	0.135
10	0.158	0.132
15	0.155	0.132
20	0.158	0.132

13. Category : LTE FDD (Band 2)

14. EUT Authorization : Certification

15. Received Date of EUT : September 3, 2015

16. Channel Plan

The carrier spacing is 100 kHz.

The carrier frequency is designated by the absolute frequency channel number (ARFCN).

The carrier frequency is expressed in the equation shown as follows:

$$\text{Transmitting Frequency (in MHz)} = 1850.7 + 0.1 \times (n - 18607)$$

where, n : channel number ($18607 \leq n \leq 19193$)

$$\text{Receiving Frequency (in MHz)} = 1930.7 + 0.1 \times (n - 607)$$

where, n : channel number ($607 \leq n \leq 1193$)

2 Summary of Test Results

Applied Standard : CFR 47 FCC Rules and Regulations Part 24
Subpart E - Broadband PCS

The EUT described in clause 1 was tested according to the applied standard shown above.

Details of the test configuration is shown in clause 6.

The conclusion for the test items of which are required by the applied standard is indicated under the test result.

- ☒ - The test result was **passed** for the test requirements of the applied standard.
- ☐ - The test result was **failed** for the test requirements of the applied standard.
- ☐ - The test result was **not judged** the test requirements of the applied standard.

In the approval of test results,

- Determining compliance with the limits in this report was based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- No deviations were employed from the applied standard.
- No modifications were conducted by JQA to achieve compliance to the limitations.

Reviewed by:

Tested by:



Shigeru Kinoshita
Assistant Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch



Shigeru Osawa
Deputy Manager
JQA KITA-KANSAI Testing Center
SAITO EMC Branch

3 Test Procedure

Test Requirements : CFR 47 FCC Rules and Regulations Part 2
§2.1046, §2.1047, §2.1049, §2.1051, §2.1053, §2.1055 and §2.1057

Test Procedure : ANSI C63.4–2003, TIA/EIA–603-C-2004
FCC KDB 971168 D01 Power Meas License Digital Systems v02r02,
released October 17, 2014

4 Test Location

Japan Quality Assurance Organization (JQA)
KITA-KANSAI Testing Center
7-7, Ishimaru, 1-chome, Minoh-shi, Osaka, 562-0027, Japan
SAITO EMC Branch
7-3-10, Saito-asagi, Ibaraki-shi, Osaka 567-0085, Japan

5 Recognition of Test Laboratory

JQA KITA-KANSAI Testing Center SAITO EMC Branch is accredited under ISO/IEC 17025 by following accreditation bodies and the test facility is registered by the following bodies.

VLAC Accreditation No. : VLAC-001-2 (Expiry date : March 30, 2016)
VCCI Registration No. : A-0002 (Expiry date : March 30, 2016)
BSMI Registration No. : SL2-IS-E-6006, SL2-IN-E-6006, SL2-R1/R2-E-6006, SL2-A1-E-6006
(Expiry date : September 14, 2016)
IC Registration No. : 2079E-3, 2079E-4 (Expiry date : July 16, 2017)

Accredited as conformity assessment body for Japan electrical appliances and material law by METI.
(Expiry date : February 22, 2016)

6 Description of Test Setup

6.1 Test Configuration

The equipment under test (EUT) consists of :

	Item	Manufacturer	Model No.	Serial No.	FCC ID
A	Smart Phone	Sharp	502SH	004401/11/553731/4 *1) 004401/11/553705/8 *2)	APYHRO00226
B	AC Adapter	Hosiden	ZTDAC1	D7A	N/A
C	Earphone	Softbank Mobile	ZTCAA1	--	N/A
D	DTV Antenna	Sharp	--	--	N/A

*1) Used for Field Strength of Spurious Emission

*2) Used for Antenna Conducted Emission and Frequency Stability

The auxiliary equipment used for testing :

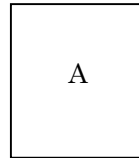
None

Type of Cable:

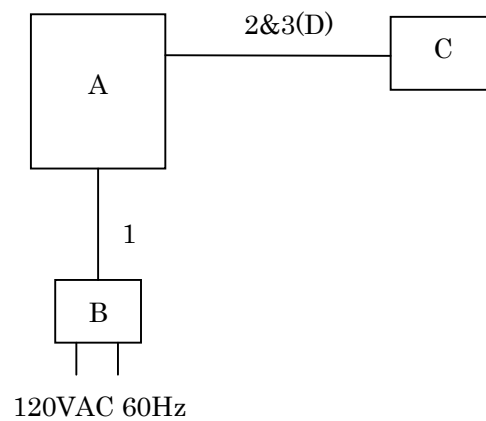
No.	Description	Identification (Manu. etc.)	Connector Shielded	Cable Shielded	Ferrite Core	Length (m)
1	USB conversion cable	--	--	NO	NO	1.5
2	Earphone Cable	--	--	NO	NO	0.5
3	DTV Antenna Cable	--	--	NO	NO	0.1

6.2 Test Arrangement (Drawings)

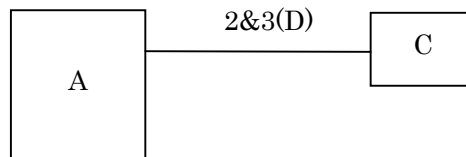
a) Single Unit



b) AC Adapter used



c) Earphone used



6.3 Operating Condition

Power Supply Voltage : 4.0 VDC (for Battery)
120 VAC, 60 Hz (For AC Adapter)

1. Bandwidth: 1.4 MHz/3 MHz/5 MHz/10 MHz/15 MHz/20 MHz
2. Modulation Type: QPSK/16QAM

The tests were carried under worst condition shown as follows:

Test Item	Bandwidth (MHz)	Modulation	RB Size
RF Power Output	1.4/3/5/10/15/20	QPSK/16QAM	1
ERP / EIRP RF Power Output	1.4/3/5/10/15/20	QPSK/16QAM	1
Occupied Bandwidth	1.4/3/5/10/15/20	QPSK/16QAM	Full
Spurious Emissions at Antenna Terminals	1.4/3/5/10/15/20	QPSK	1
Band-Edge Emission	1.4/3/5/10/15/20	QPSK/16QAM	1/Full
Field Strength of Spurious Radiation	1.4/3/5/10/15/20	QPSK	1

The Radiated Emission test were carried under 3 test configurations shown in clause 6.2.
In all tests, the fully charged battery is used for the EUT.

Other Clock Frequency
19.2MHz, 48MHz, 12MHz, 27.12MHz

The EUT was rotated through three orthogonal axis (X, Y and Z axis) in radiated measurement.
The EUT with temporary antenna port was used in conducted measurement.

RF Output Verification

The tests were conducted at the middle channel.

CH	Frequency (MHz)	BW (MHz)	Mode	RB Allocation	RB Offset	Target MPR	Conducted Average Power (dBm)
18900	1880	1.4	QPSK	1	0	0	22.97
				1	3	0	22.98
				1	5	0	22.92
				3	0	0	22.79
				3	2	0	22.85
				3	3	0	22.82
				6	0	1	21.75
			16QAM	1	0	1	21.95
				1	3	1	22.09
				1	5	1	22.02
				3	0	1	21.84
				3	2	1	21.90
				3	3	1	21.89
				6	0	2	20.78

CH	Frequency (MHz)	BW (MHz)	Mode	RB Allocation	RB Offset	Target MPR	Conducted Average Power (dBm)
18900	1880	3	QPSK	1	0	0	22.94
				1	8	0	22.95
				1	14	0	23.02
				8	0	1	21.79
				8	4	1	21.86
				8	7	1	21.80
				15	0	1	21.82
			16QAM	1	0	1	22.12
				1	8	1	22.18
				1	14	1	22.17
				8	0	2	20.80
				8	4	2	20.88
				8	7	2	20.82
				15	0	2	20.80

CH	Frequency (MHz)	BW (MHz)	Mode	RB Allocation	RB Offset	Target MPR	Conducted Average Power (dBm)
18900	1880	5	QPSK	1	0	0	22.92
				1	13	0	23.04
				1	24	0	22.99
				12	0	1	21.76
				12	7	1	21.80
				12	13	1	21.73
				25	0	1	21.75
			16QAM	1	0	1	22.21
				1	13	1	22.12
				1	24	1	22.24
				12	0	2	20.81
				12	7	2	20.83
				12	13	2	20.77
				25	0	2	20.78

CH	Frequency (MHz)	BW (MHz)	Mode	RB Allocation	RB Offset	Target MPR	Conducted Average Power (dBm)
18900	1880	10	QPSK	1	0	0	23.06
				1	25	0	23.09
				1	49	0	23.06
				25	0	1	21.75
				25	13	1	21.81
				25	25	1	21.81
				50	0	1	21.80
			16QAM	1	0	1	22.06
				1	25	1	22.12
				1	49	1	22.17
				25	0	2	20.78
				25	13	2	20.86
				25	25	2	20.87
				50	0	2	20.83

CH	Frequency (MHz)	BW (MHz)	Mode	RB Allocation	RB Offset	Target MPR	Conducted Average Power (dBm)
18900	1880	15	QPSK	1	0	0	23.11
				1	38	0	23.07
				1	74	0	23.17
				36	0	1	22.00
				36	20	1	21.95
				36	39	1	22.04
				75	0	1	21.93
			16QAM	1	0	1	22.15
				1	38	1	22.12
				1	74	1	22.22
				36	0	2	21.01
				36	20	2	20.92
				36	39	2	21.00
				75	0	2	20.96

CH	Frequency (MHz)	BW (MHz)	Mode	RB Allocation	RB Offset	Target MPR	Conducted Average Power (dBm)
18900	1880	20	QPSK	1	0	0	23.05
				1	50	0	23.08
				1	99	0	23.05
				50	0	1	21.88
				50	25	1	22.01
				50	50	1	22.05
				100	0	1	21.95
			16QAM	1	0	1	22.12
				1	50	1	22.13
				1	99	1	22.12
				50	0	2	20.94
				50	25	2	21.08
				50	50	2	21.06
				100	0	2	20.93

7 Test Requirements

7.0 Summary of the Test Results

Test Item	FCC Specification	Reference of the Test Report	Results	Remarks
RF Power Output	Section 24.232(c)	Section 7.1	Passed	-
ERP / EIRP RF Power Output	Section 24.232(c)	Section 7.2	Passed	-
Modulation Characteristics	-	-	-	-
Occupied Bandwidth	Section 24.238	Section 7.4	Passed	-
Spurious Emissions at Antenna Terminals	Section 24.238	Section 7.5	Passed	-
Band-Edge Emission	Section 24.238	Section 7.6	Passed	-
Field Strength of Spurious Radiation	Section 24.238	Section 7.7	Passed	-
Frequency Stability	Section 24.235	Section 7.8	Passed	-

7.1 RF Power Output (§2.1046)

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.1.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Transmitter Power of BW: 1.4 MHz(QPSK) is	<u>202.3</u>	mW	at	<u>1850.700</u>	MHz
Transmitter Power of BW: 1.4 MHz(16QAM) is	<u>167.5</u>	mW	at	<u>1909.300</u>	MHz
Transmitter Power of BW: 3 MHz(QPSK) is	<u>203.2</u>	mW	at	<u>1908.500</u>	MHz
Transmitter Power of BW: 3 MHz(16QAM) is	<u>171.4</u>	mW	at	<u>1908.500</u>	MHz
Transmitter Power of BW: 5 MHz(QPSK) is	<u>207.5</u>	mW	at	<u>1907.500</u>	MHz
Transmitter Power of BW: 5 MHz(16QAM) is	<u>174.2</u>	mW	at	<u>1907.500</u>	MHz
Transmitter Power of BW: 10 MHz(QPSK) is	<u>206.1</u>	mW	at	<u>1905.000</u>	MHz
Transmitter Power of BW: 10 MHz(16QAM) is	<u>166.7</u>	mW	at	<u>1855/1905</u>	MHz
Transmitter Power of BW: 15 MHz(QPSK) is	<u>208.4</u>	mW	at	<u>1857.500</u>	MHz
Transmitter Power of BW: 15 MHz(16QAM) is	<u>173.0</u>	mW	at	<u>1902.500</u>	MHz
Transmitter Power of BW: 20 MHz(QPSK) is	<u>208.0</u>	mW	at	<u>1860.000</u>	MHz
Transmitter Power of BW: 20 MHz(16QAM) is	<u>172.2</u>	mW	at	<u>1900.000</u>	MHz

Uncertainty of Measurement Results ± 0.9 dB(2σ)

Remarks : _____

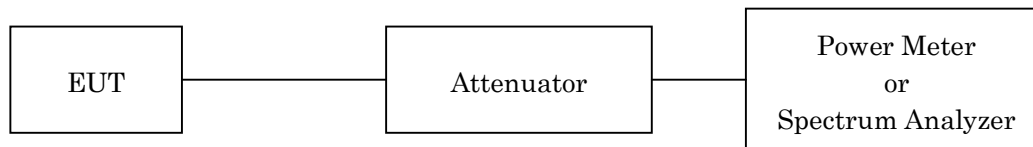
7.1.2 Test Instruments

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Power Meter	ML2495A	1423001 (B-16)	Anritsu	2016/07/16
Power Sensor	MA2411B	1339136 (B-18)	Anritsu	2016/07/16
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	43KC-20	1418003 (D-41)	Anritsu	2016/07/05
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

NOTE : The calibration interval of the above test instruments is 12 months.

7.1.3 Test Method and Test Setup (Diagrammatic illustration)

The Conducted RF Power Output and CCDF were measured with a power meter ,a spectrum analyzer, one attenuator and a short, low loss cable.



7.1.4 Test Data

1-1) BW 1.4MHz(1RB)

Mode: QPSK

(LTE 1.4MHz)QPSK

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18607	1850.700	20.32	2.74	23.06	202.3
18900	1880.000	20.32	2.66	22.98	198.6
19193	1909.300	20.32	2.73	23.05	201.8

Calculated result at 1850.700 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.74	dBm
Result	=	23.06	dBm = 202.3 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

Mode: 16QAM

(LTE 1.4MHz)16QAM

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18607	1850.700	20.32	1.83	22.15	164.1
18900	1880.000	20.32	1.77	22.09	161.8
19193	1909.300	20.32	1.92	22.24	167.5

Calculated result at 1909.300 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	1.92	dBm
Result	=	22.24	dBm = 167.5 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

1-2) BW 3MHz(1RB)

Mode: QPSK

(LTE 3MHz)QPSK

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18615	1851.500	20.32	2.72	23.04	201.4
18900	1880.000	20.32	2.70	23.02	200.4
19185	1908.500	20.32	2.76	23.08	203.2

Calculated result at 1908.500 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.76	dBm
Result	=	23.08	dBm = 203.2 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

Mode: 16QAM

(LTE 3MHz)16QAM

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18615	1851.500	20.32	1.95	22.27	168.7
18900	1880.000	20.32	1.86	22.18	165.2
19185	1908.500	20.32	2.02	22.34	171.4

Calculated result at 1908.500 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.02	dBm
Result	=	22.34	dBm = 171.4 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

1-3) BW 5MHz(1RB)

Mode: QPSK

(LTE 5MHz)QPSK

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18625	1852.500	20.32	2.82	23.14	206.1
18900	1880.000	20.32	2.72	23.04	201.4
19175	1907.500	20.32	2.85	23.17	207.5

Calculated result at 1907.500 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.85	dBm
Result	=	23.17	dBm = 207.5 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

Mode: 16QAM

(LTE 5MHz)16QAM

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18625	1852.500	20.32	2.05	22.37	172.6
18900	1880.000	20.32	1.92	22.24	167.5
19175	1907.500	20.32	2.09	22.41	174.2

Calculated result at 1907.500 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.09	dBm
Result	=	22.41	dBm = 174.2 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

1-4) BW 10MHz(1RB)

Mode: QPSK

(LTE 10MHz)QPSK

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18650	1855.000	20.32	2.80	23.12	205.1
18900	1880.000	20.32	2.77	23.09	203.7
19150	1905.000	20.32	2.82	23.14	206.1

Calculated result at 1905.000 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.82	dBm
Result	=	23.14	dBm = 206.1 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

Mode: 16QAM

(LTE 10MHz)16QAM

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18650	1855.000	20.32	1.90	22.22	166.7
18900	1880.000	20.32	1.85	22.17	164.8
19150	1905.000	20.32	1.90	22.22	166.7

Calculated result at 1855.000 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	1.90	dBm
Result	=	22.22	dBm = 166.7 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

1-5) BW 15MHz(1RB)

Mode: QPSK

(LTE 15MHz)QPSK

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18675	1857.500	20.32	2.87	23.19	208.4
18900	1880.000	20.32	2.85	23.17	207.5
19125	1902.500	20.32	2.86	23.18	208.0

Calculated result at 1857.500 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.87	dBm
Result	=	23.19	dBm = 208.4 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

Mode: 16QAM

(LTE 15MHz)16QAM

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18675	1857.500	20.32	1.94	22.26	168.3
18900	1880.000	20.32	1.90	22.22	166.7
19125	1902.500	20.32	2.06	22.38	173.0

Calculated result at 1902.500 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.06	dBm
Result	=	22.38	dBm = 173.0 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

1-6) BW 20MHz(1RB)

Mode: QPSK

(LTE 20MHz)QPSK

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18700	1860.000	20.32	2.86	23.18	208.0
18900	1880.000	20.32	2.76	23.08	203.2
19100	1900.000	20.32	2.85	23.17	207.5

Calculated result at 1860.000 MHz, as the maximum level point shown on underline:

Correction Factor	=	20.32	dB
+) Meter Reading	=	2.86	dBm
Result	=	23.18	dBm = 208.0 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

Mode: 16QAM

(LTE 20MHz)16QAM

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH	[MHz]	Correction Factor [dB]	Meter Reading (Average) [dBm]	Results (Average) [dBm]	[mW]
18700	1860.000	20.32	1.90	22.22	166.7
18900	1880.000	20.32	1.81	22.13	163.3
19100	1900.000	20.32	2.04	22.36	172.2

Calculated result at 1900.000 MHz, as the maximum level point shown on underline:

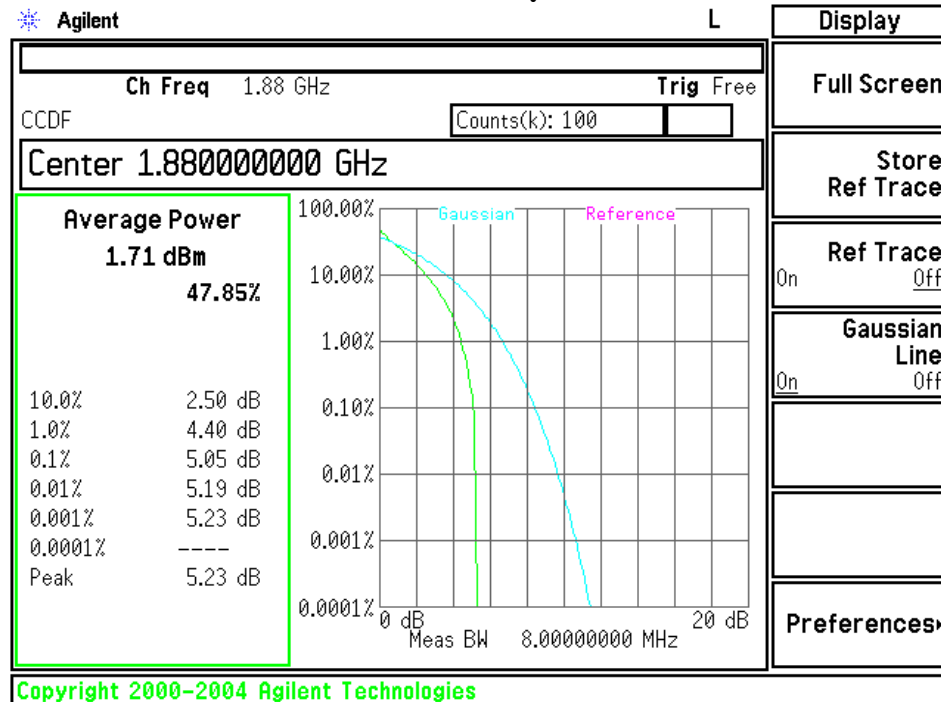
Correction Factor	=	20.32	dB
+) Meter Reading	=	2.04	dBm
Result	=	22.36	dBm = 172.2 mW

NOTE : The correction factor shows the attenuation pad loss including the short, low loss cable or adapter.

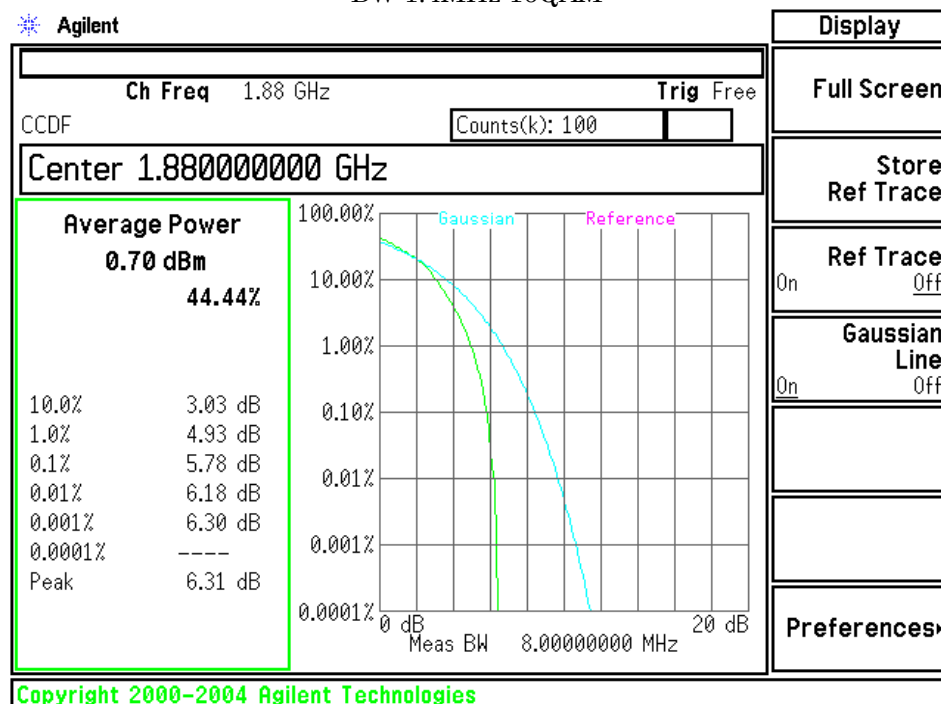
2) CCDF

Channel	Frequency (MHz)	BW (MHz)	Peak to Average Factor(CCDF 0.1%) [dB]		
			QPSK	16QAM	Limit
18900	1880.0	1.4	5.05	5.78	13
18900	1880.0	3	4.91	5.73	13
18900	1880.0	5	5.03	5.78	13
18900	1880.0	10	4.94	5.84	13
18900	1880.0	15	5.58	6.68	13
18900	1880.0	20	6.18	7.11	13

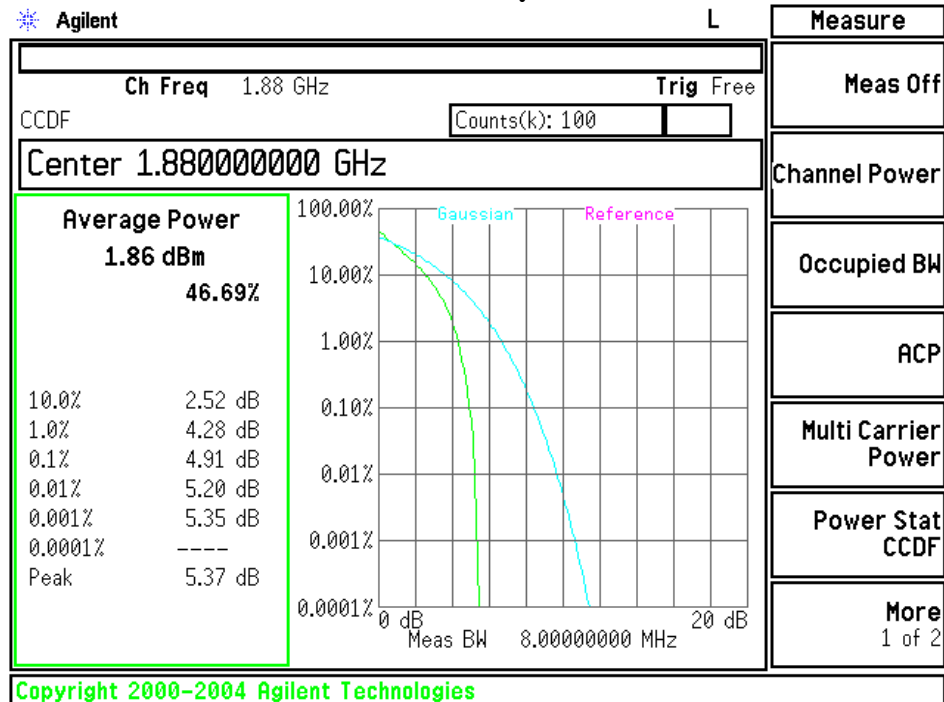
BW 1.4MHz QPSK



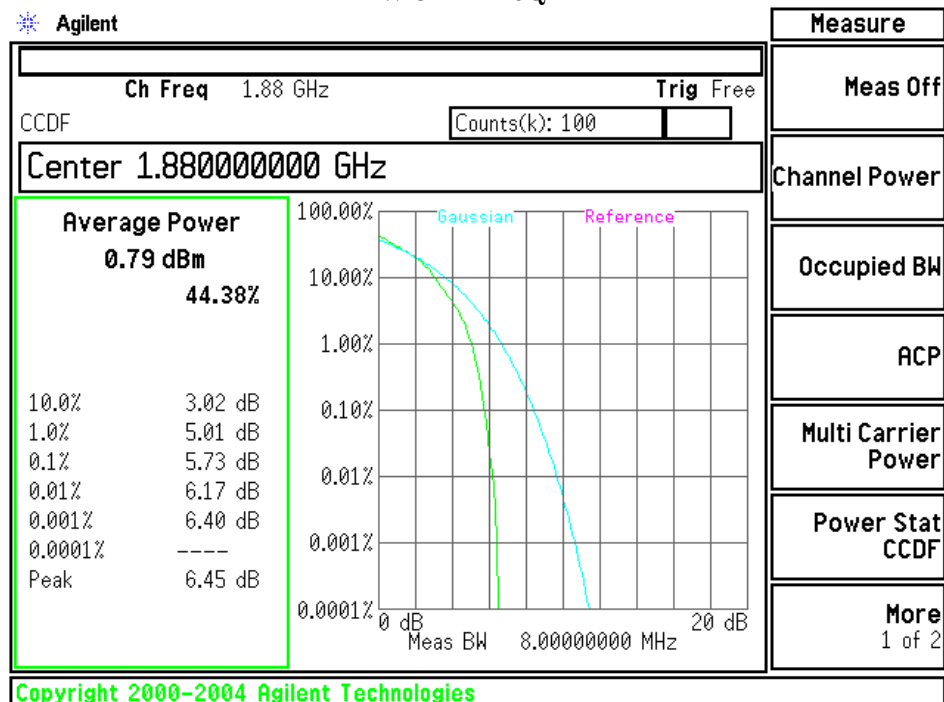
BW 1.4MHz 16QAM



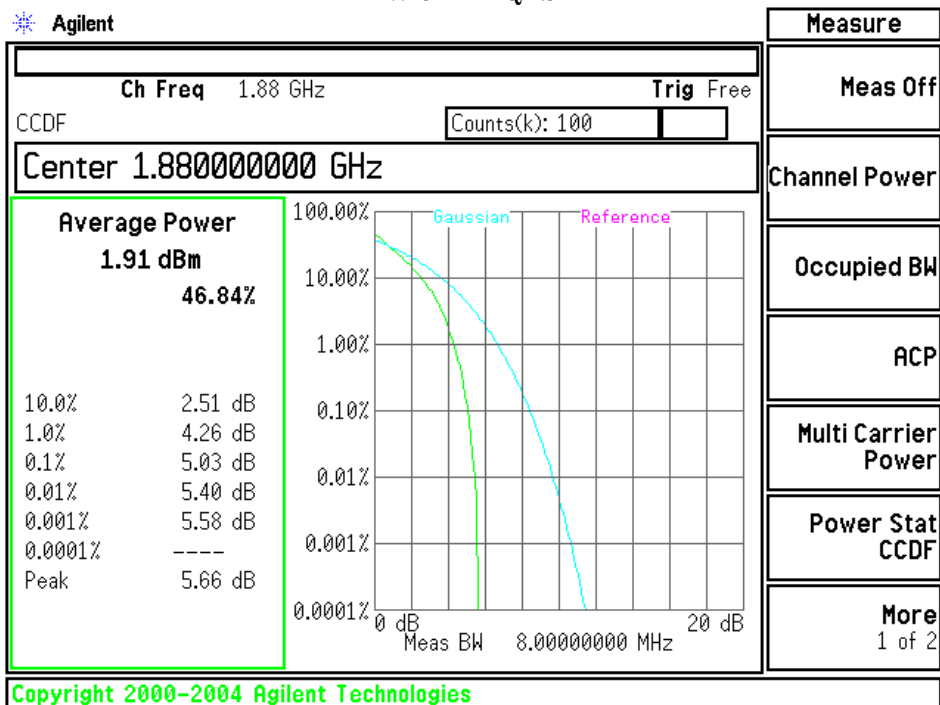
BW 3MHz QPSK



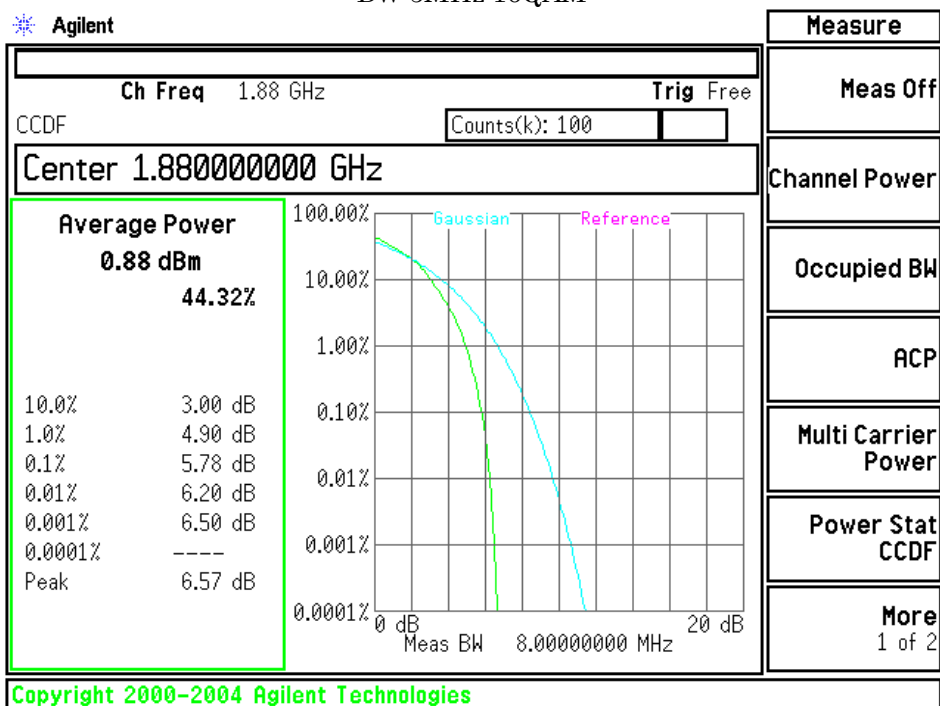
BW 3MHz 16QAM



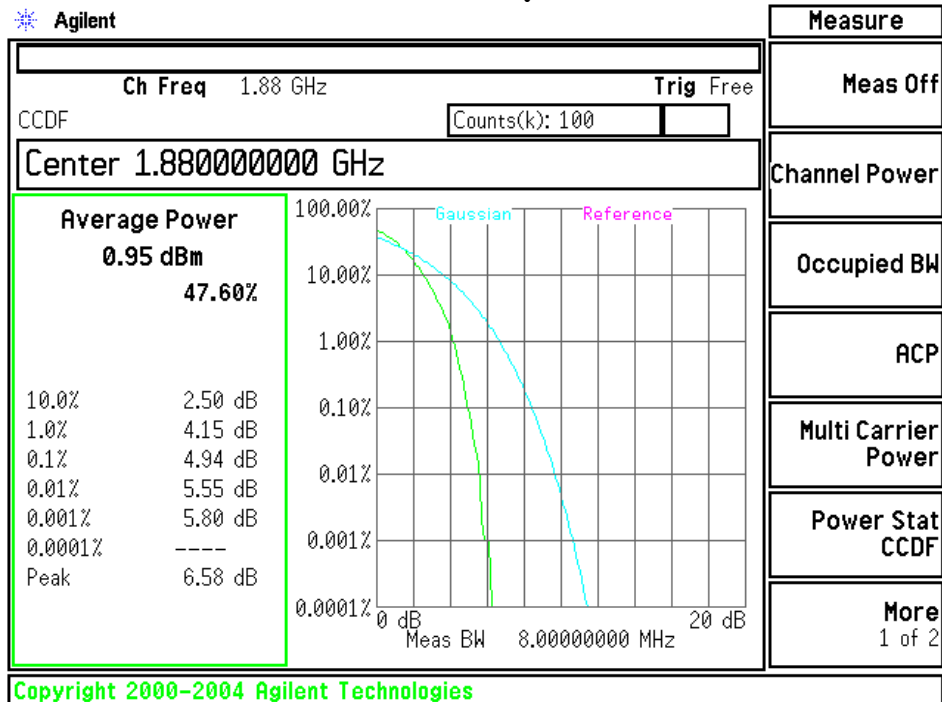
BW 5MHz QPSK



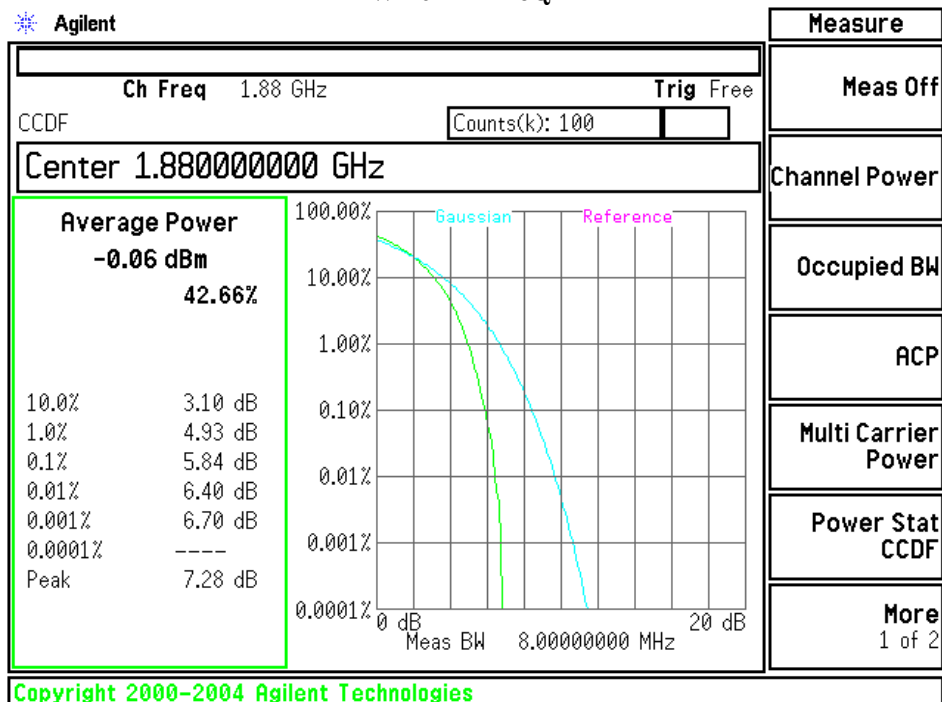
BW 5MHz 16QAM



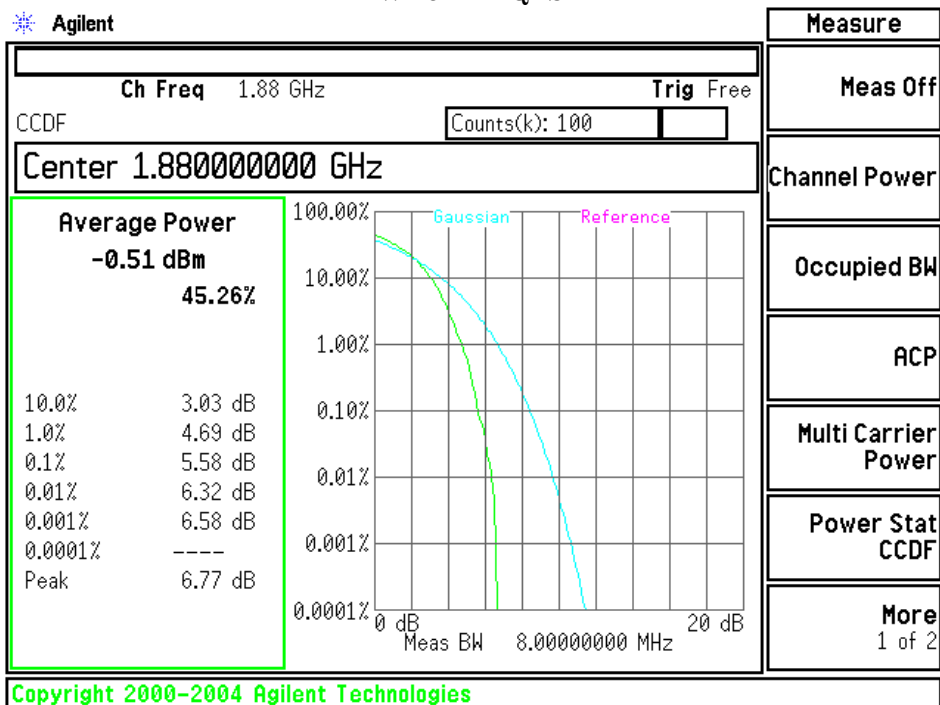
BW 10MHz QPSK



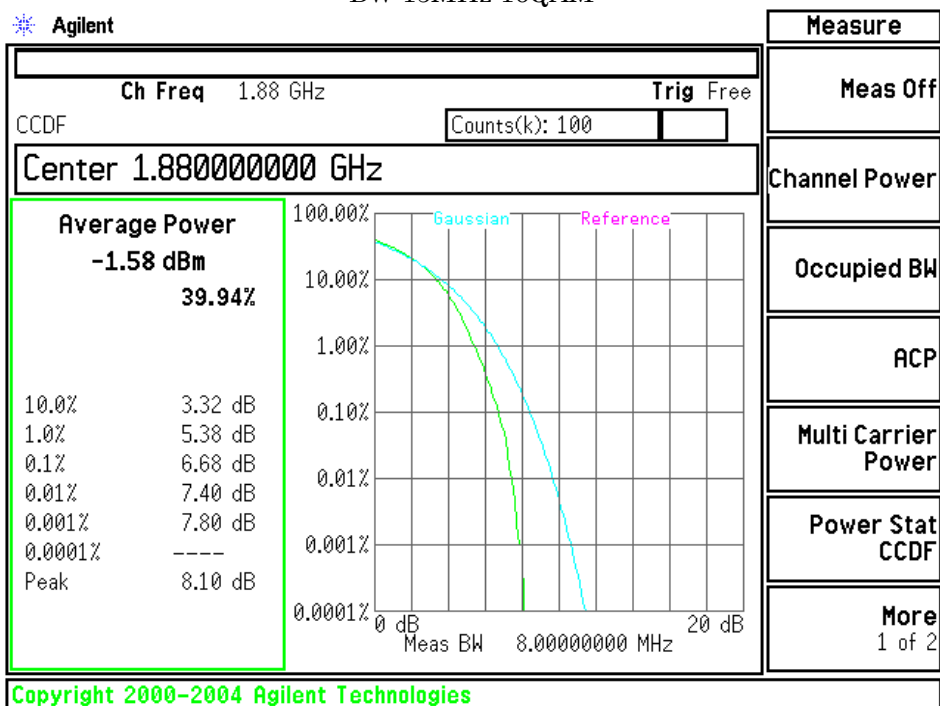
BW 10MHz 16QAM



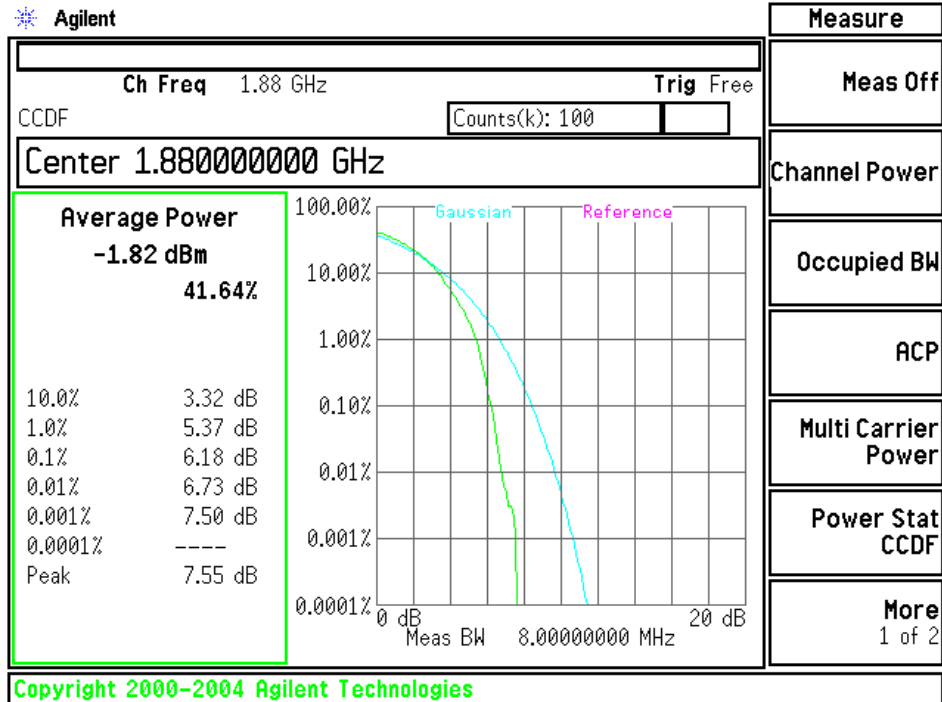
BW 15MHz QPSK



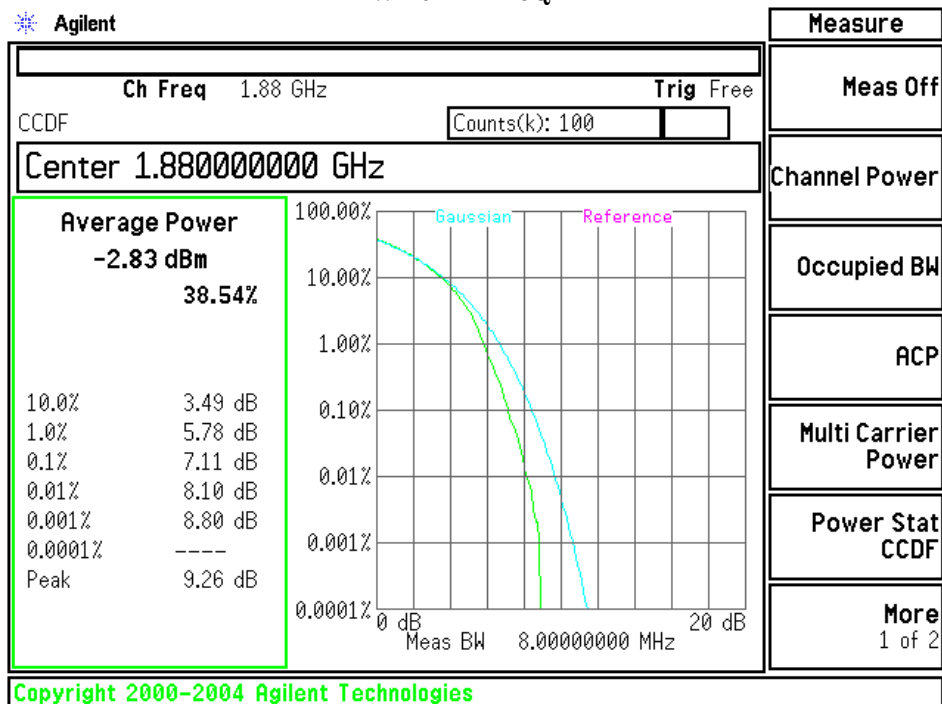
BW 15MHz 16QAM



BW 20MHz QPSK



BW 20MHz 16QAM



7.2 ERP / EIRP RF Power Output

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.2.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Min. Limit Margin 10.9 dB at 1852.500 MHz

Uncertainty of Measurement Results ± 1.8 dB(2σ)

Remarks : The maximum EIRP is 0.162 W at 1852.500 MHz (BW 5MHz, QPSK).

7.2.2 Test Instruments

Anechoic Chamber A2				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Test Receiver	ESU 26	100170 (A-6)	Rohde & Schwarz	2016/04/25
Signal Generator	E8257D	MY45140309 (B-39)	Agilent	2016/08/10
Power Meter	N1911A	GB45100291 (B-63)	Agilent	2016/07/16
Power Sensor	N1921A	US44510470 (B-64)	Agilent	2016/07/16
Horn Antenna (TX)	91888-2	560 (C-40-1)	EATON	2016/06/25
Horn Antenna (RX)	91888-2	562 (C-41-1)	EATON	2016/06/16
Attenuator (TX)	2-10	BA6214 (D-79)	Weinschel	2015/11/18
Attenuator (RX)	2-10	BF7557 (D-80)	Weinschel	2015/11/18
RF Cable (RX)	SUCOFLEX104	267479/4 (C-66)	HUBER+SUHNER	2016/01/19
RF Cable (TX)	SUCOFLEX102E	6683/2E (C-70)	HUBER+SUHNER	2015/11/18

NOTE : The calibration interval of the above test instruments is 12 months.

7.2.3 Test Method and Test Setup (Diagrammatic illustration)

Step 1:

In order to obtain the maximum emission, the EUT was placed at the height 1.5 m on the non-conducted support and was varying at three orthogonal axes, at the distance 3 m from the receiving antenna and rotated around 360 degrees.

The receiving antenna height was varied from 1 m to 4 m.

The EUT on the table was placed to be maximum emission against at the receiving antenna polarized (vertical and horizontal).

Then the meter reading of the spectrum analyzer at the maximum emission was A dB(μV).

Step 2:

The EUT was replaced to substitution antenna at the same polarized under the same condition as step 1.

The RF power was fed to the transmitting antenna through the RF amplifier from the signal generator.

In order to obtain the maximum emission level, the height of the receiving antenna was varied from 1 m to 4 m.

The level of maximum emission was A dB(μV), same as the recorded level in the step 1.

Then the RF power into the substitution horn antenna was P (dBm).

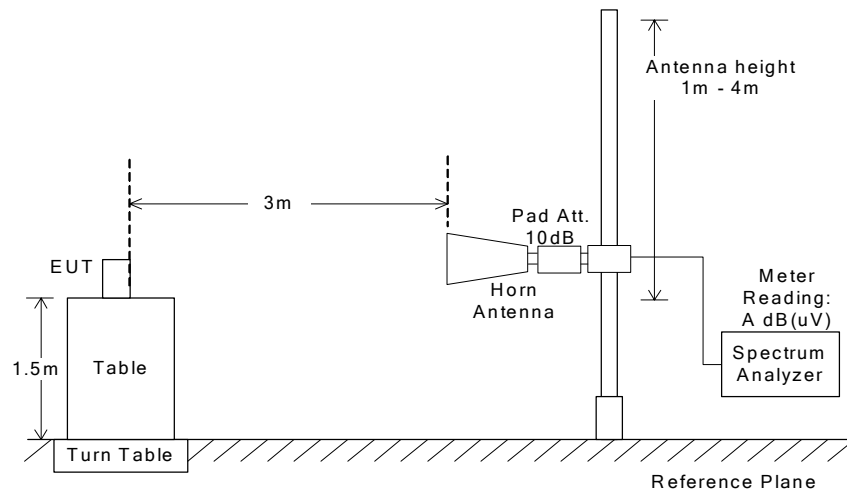
The ERP/EIRP output power was calculated in the following equation.

$$\text{ERP (dBm)} = \text{P (dBm)} - \text{Balun loss of the tuned dipole antenna (dB)} + \text{Cable loss (dB)}$$

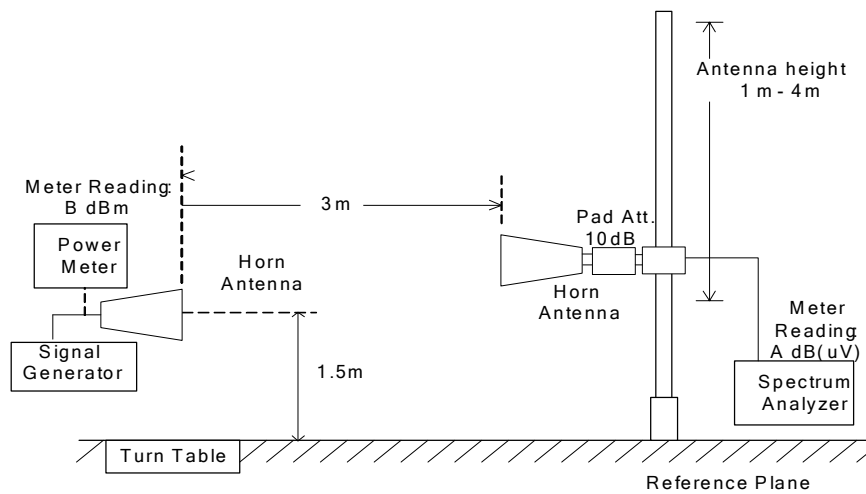
$$\text{EIRP (dBm)} = \text{P (dBm)} + \text{Gh (dBi)}$$

where, Gh (dBi) : Gain of the substitution horn antenna.

– Side View –



(a)EUT



(b) Substitution Horn Antenna

7.2.4 Test Data

1-1) BW 1.4MHz(1RB)

Mode: QPSK

(LTE 1.4MHz)QPSK

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

Transmitting Frequency		Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
CH	[MHz]	Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18607	1850.700	84.1	85.1	72.2	72.3	- 5.0	14.1
18900	1880.000	84.9	84.8	72.6	72.7	- 5.0	14.3
19193	1909.300	84.3	84.2	72.7	72.6	- 5.0	14.4

2. Calculation Results

Transmitting Frequency		Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
CH	[MHz]	Hori. (EIRPh)	Vert. (EIRPv)			
18607	1850.700	21.0	21.9	0.155	33.0	+11.1
18900	1880.000	21.6	21.4	0.145	33.0	+11.4
19193	1909.300	21.0	21.0	0.126	33.0	+12.0

Calculated result at 1850.700 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	85.1 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	21.9 dBm = 0.155 W

Minimum Margin: 33.0 - 21.9 = 11.1 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

1-2) BW 1.4MHz(1RB)

Mode: 16QAM

(LTE 1.4MHz)16QAM

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18607	1850.700	83.4	84.4	72.2	72.3	- 5.0	14.1
18900	1880.000	84.0	84.0	72.6	72.7	- 5.0	14.3
19193	1909.300	83.5	83.4	72.7	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18607	1850.700	20.3	21.2	0.132	33.0	+11.8
18900	1880.000	20.7	20.6	0.117	33.0	+12.3
19193	1909.300	20.2	20.2	0.105	33.0	+12.8

Calculated result at 1850.700 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	84.4 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	21.2 dBm = 0.132 W

Minimum Margin: 33.0 - 21.2 = 11.8 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

2-1) BW 3MHz(1RB)

Mode: QPSK

(LTE 3MHz)QPSK

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18615	1851.500	84.6	85.2	72.2	72.3	- 5.0	14.1
18900	1880.000	84.7	84.9	72.6	72.7	- 5.0	14.3
19185	1908.500	84.6	84.3	72.7	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18615	1851.500	21.5	22.0	0.158	33.0	+11.0
18900	1880.000	21.4	21.5	0.141	33.0	+11.5
19185	1908.500	21.3	21.1	0.135	33.0	+11.7

Calculated result at 1851.500 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	85.2 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	22.0 dBm = 0.158 W

Minimum Margin: 33.0 - 22.0 = 11.0 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

2-2) BW 3MHz(1RB)

Mode: 16QAM

(LTE 3MHz)16QAM

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18615	1851.500	83.8	84.5	72.2	72.3	- 5.0	14.1
18900	1880.000	84.0	84.2	72.6	72.7	- 5.0	14.3
19185	1908.500	84.0	83.7	72.7	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18615	1851.500	20.7	21.3	0.135	33.0	+11.7
18900	1880.000	20.7	20.8	0.120	33.0	+12.2
19185	1908.500	20.7	20.5	0.117	33.0	+12.3

Calculated result at 1851.500 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	84.5 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	21.3 dBm = 0.135 W

Minimum Margin: 33.0 - 21.3 = 11.7 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

3-1) BW 5MHz(1RB)

Mode: QPSK

(LTE 5MHz)QPSK

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18625	1852.500	84.7	85.3	72.2	72.3	- 5.0	14.1
18900	1880.000	84.8	85.0	72.6	72.7	- 5.0	14.3
19175	1907.500	84.9	84.6	72.7	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18625	1852.500	21.6	22.1	0.162	33.0	+10.9
18900	1880.000	21.5	21.6	0.145	33.0	+11.4
19175	1907.500	21.6	21.4	0.145	33.0	+11.4

Calculated result at 1852.500 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	85.3 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	22.1 dBm = 0.162 W

Minimum Margin: 33.0 - 22.1 = 10.9 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

3-2) BW 5MHz(1RB)

Mode: 16QAM

(LTE 5MHz)16QAM

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18625	1852.500	83.9	84.5	72.2	72.3	- 5.0	14.1
18900	1880.000	84.0	84.2	72.6	72.7	- 5.0	14.3
19175	1907.500	84.1	83.9	72.7	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18625	1852.500	20.8	21.3	0.135	33.0	+11.7
18900	1880.000	20.7	20.8	0.120	33.0	+12.2
19175	1907.500	20.8	20.7	0.120	33.0	+12.2

Calculated result at 1852.500 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	84.5 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	21.3 dBm = 0.135 W

Minimum Margin: 33.0 - 21.3 = 11.7 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

4-1) BW 10MHz(1RB)

Mode: QPSK

(LTE 10MHz)QPSK

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18650	1855.000	84.6	85.2	72.2	72.3	- 5.0	14.1
18900	1880.000	85.0	85.1	72.6	72.7	- 5.0	14.3
19150	1905.000	85.1	84.8	72.6	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18650	1855.000	21.5	22.0	0.158	33.0	+11.0
18900	1880.000	21.7	21.7	0.148	33.0	+11.3
19150	1905.000	21.9	21.6	0.155	33.0	+11.1

Calculated result at 1855.000 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	85.2 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	22.0 dBm = 0.158 W

Minimum Margin: 33.0 - 22.0 = 11.0 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

4-2) BW 10MHz(1RB)

Mode: 16QAM

(LTE 10MHz) 16QAM

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18650	1855.000	83.8	84.4	72.2	72.3	- 5.0	14.1
18900	1880.000	84.1	84.2	72.6	72.7	- 5.0	14.3
19150	1905.000	84.3	84.0	72.6	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18650	1855.000	20.7	21.2	0.132	33.0	+11.8
18900	1880.000	20.8	20.8	0.120	33.0	+12.2
19150	1905.000	21.1	20.8	0.129	33.0	+11.9

Calculated result at 1855.000 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	84.4 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	21.2 dBm = 0.132 W

Minimum Margin: 33.0 - 21.2 = 11.8 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

5-1) BW 15MHz(1RB)

Mode: QPSK

(LTE 15MHz)QPSK

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18675	1857.500	84.4	85.1	72.2	72.3	- 5.0	14.1
18900	1880.000	84.6	84.9	72.6	72.7	- 5.0	14.3
19125	1902.500	85.0	84.8	72.6	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18675	1857.500	21.3	21.9	0.155	33.0	+11.1
18900	1880.000	21.3	21.5	0.141	33.0	+11.5
19125	1902.500	21.8	21.6	0.151	33.0	+11.2

Calculated result at 1857.500 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	85.1 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	21.9 dBm = 0.155 W

Minimum Margin: 33.0 - 21.9 = 11.1 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

5-2) BW 15MHz(1RB)

Mode: 16QAM

(LTE 15MHz) 16QAM

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18675	1857.500	83.7	84.4	72.2	72.3	- 5.0	14.1
18900	1880.000	83.7	84.0	72.6	72.7	- 5.0	14.3
19125	1902.500	84.2	84.0	72.6	72.6	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18675	1857.500	20.6	21.2	0.132	33.0	+11.8
18900	1880.000	20.4	20.6	0.115	33.0	+12.4
19125	1902.500	21.0	20.8	0.126	33.0	+12.0

Calculated result at 1857.500 MHz, as the worst point shown on underline:

Emission Measurement (Mv)	=	84.4 dB(uV)
Substitution Measurement (Msv)	=	-72.3 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.1 dB
Result (EIRPv)	=	21.2 dBm = 0.132 W

Minimum Margin: 33.0 - 21.2 = 11.8 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

6-1) BW 20MHz(1RB)

Mode: QPSK

(LTE 20MHz)QPSK

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18700	1860.000	84.5	85.0	72.3	72.4	- 5.0	14.1
18900	1880.000	84.7	84.8	72.6	72.7	- 5.0	14.3
19100	1900.000	85.2	85.0	72.6	72.7	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18700	1860.000	21.3	21.7	0.148	33.0	+11.3
18900	1880.000	21.4	21.4	0.138	33.0	+11.6
19100	1900.000	22.0	21.7	0.158	33.0	+11.0

Calculated result at 1900.000 MHz, as the worst point shown on underline:

Emission Measurement (Mh)	=	85.2 dB(uV)
Substitution Measurement (Msh)	=	-72.6 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.4 dB
Result (EIRPh)	=	22.0 dBm = 0.158 W

Minimum Margin: 33.0 - 22.0 = 11.0 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

6-2) BW 20MHz(1RB)

Mode: 16QAM

(LTE 20MHz) 16QAM

Test Date: September 17, 2015
Temp.: 22 °C, Humi: 73 %

1. Measurement Results

CH	Transmitting Frequency [MHz]	Emission Measurement [dB(uV)]		Substitution Measurement [dB(uV)]		Supplied Power to Substitution Antenna [dBm]	Gain of Substitution Antenna [dBi]
		Hori. (Mh)	Vert. (Mv)	Hori. (Msh)	Vert. (Msv)		
18700	1860.000	83.8	84.3	72.3	72.4	- 5.0	14.1
18900	1880.000	83.8	84.0	72.6	72.7	- 5.0	14.3
19100	1900.000	84.4	84.2	72.6	72.7	- 5.0	14.4

2. Calculation Results

CH	Transmitting Frequency [MHz]	Average EIRP [dBm]		Maximum Average EIRP [W]	Limits [dBm]	Margin [dB]
		Hori. (EIRPh)	Vert. (EIRPv)			
18700	1860.000	20.6	21.0	0.126	33.0	+12.0
18900	1880.000	20.5	20.6	0.115	33.0	+12.4
19100	1900.000	21.2	20.9	0.132	33.0	+11.8

Calculated result at 1900.000 MHz, as the worst point shown on underline:

Emission Measurement (Mh)	=	84.4 dB(uV)
Substitution Measurement (Msh)	=	-72.6 dB(uV)
Supplied Power to Substitution Antenna	=	-5.0 dBm
+) Gain of Substitution Antenna	=	14.4 dB
Result (EIRPh)	=	21.2 dBm = 0.132 W

Minimum Margin: 33.0 - 21.2 = 11.8 (dB)

NOTE : Setting of measuring instrument(s) :

Detector Function
RMS

7.3 Modulation Characteristics (§2.1047)

For the requirements, ☐ - Applicable [☐ - Tested. ☐ - Not tested by applicant request.]
☒ - Not Applicable

7.4 Occupied Bandwidth (§2.1049)

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.4.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

The 99% Bandwidth of BW: 1.4 MHz(QPSK) is	<u>1.09</u>	MHz	at	<u>1880/1909.3</u> MHz
The 99% Bandwidth of BW: 1.4 MHz(16QAM) is	<u>1.08</u>	MHz	at	<u>1850.7/1880/1909.3</u> MHz
The 99% Bandwidth of BW: 3 MHz(QPSK) is	<u>2.69</u>	MHz	at	<u>1851.5/1880/1908.5</u> MHz
The 99% Bandwidth of BW: 3 MHz(16QAM) is	<u>2.68</u>	MHz	at	<u>1851.5/1880/1908.5</u> MHz
The 99% Bandwidth of BW: 5 MHz(QPSK) is	<u>4.48</u>	MHz	at	<u>1852.5/1880</u> MHz
The 99% Bandwidth of BW: 5 MHz(16QAM) is	<u>4.47</u>	MHz	at	<u>1852.5/1880/1907.5</u> MHz
The 99% Bandwidth of BW: 10 MHz(QPSK) is	<u>8.93</u>	MHz	at	<u>1855</u> MHz
The 99% Bandwidth of BW: 10 MHz(16QAM) is	<u>8.94</u>	MHz	at	<u>1855/1905</u> MHz
The 99% Bandwidth of BW: 15 MHz(QPSK) is	<u>13.4</u>	MHz	at	<u>1857.5/1880/1902.5</u> MHz
The 99% Bandwidth of BW: 15 MHz(16QAM) is	<u>13.4</u>	MHz	at	<u>1857.5/1880/1902.5</u> MHz
The 99% Bandwidth of BW: 20 MHz(QPSK) is	<u>17.9</u>	MHz	at	<u>1860/1880/1900</u> MHz
The 99% Bandwidth of BW: 20 MHz(16QAM) is	<u>17.9</u>	MHz	at	<u>1880/1900</u> MHz

The 26dB Bandwidth of BW: 1.4 MHz(QPSK) is	<u>1.23</u>	MHz	at	<u>1850.7</u> MHz
The 26dB Bandwidth of BW: 1.4 MHz(16QAM) is	<u>1.23</u>	MHz	at	<u>1880</u> MHz
The 26dB Bandwidth of BW: 3 MHz(QPSK) is	<u>2.97</u>	MHz	at	<u>1851.5/1880</u> MHz
The 26dB Bandwidth of BW: 3 MHz(16QAM) is	<u>2.93</u>	MHz	at	<u>1908.5</u> MHz
The 26dB Bandwidth of BW: 5 MHz(QPSK) is	<u>4.90</u>	MHz	at	<u>1852.5</u> MHz
The 26dB Bandwidth of BW: 5 MHz(16QAM) is	<u>4.85</u>	MHz	at	<u>1852.5</u> MHz
The 26dB Bandwidth of BW: 10 MHz(QPSK) is	<u>9.69</u>	MHz	at	<u>1905</u> MHz
The 26dB Bandwidth of BW: 10 MHz(16QAM) is	<u>9.71</u>	MHz	at	<u>1880/1905</u> MHz
The 26dB Bandwidth of BW: 15 MHz(QPSK) is	<u>14.5</u>	MHz	at	<u>1880</u> MHz
The 26dB Bandwidth of BW: 15 MHz(16QAM) is	<u>14.4</u>	MHz	at	<u>1880/1902.5</u> MHz
The 26dB Bandwidth of BW: 20 MHz(QPSK) is	<u>19.3</u>	MHz	at	<u>1860</u> MHz
The 26dB Bandwidth of BW: 20 MHz(16QAM) is	<u>19.1</u>	MHz	at	<u>1860/1880/1900</u> MHz

Uncertainty of Measurement Results ± 0.9 %(2σ)

Remarks : _____

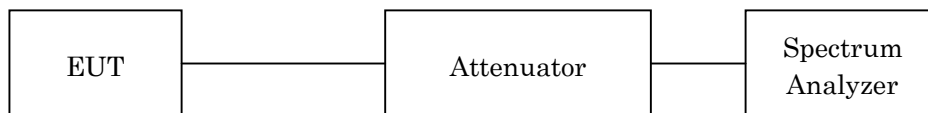
7.4.2 Test Instruments

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	43KC-20	1418003 (D-41)	Anritsu	2016/07/05
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

NOTE : The calibration interval of the above test instruments is 12 months.

7.4.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

LTE Bandwidth	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Res. Bandwidth	20 kHz	30 kHz	51 kHz	100 kHz	150 kHz	200 kHz
Video Bandwidth	62 kHz	100 kHz	160 kHz	300 kHz	470 kHz	620 kHz
Span	3 MHz	6 MHz	10 MHz	20 MHz	30 MHz	40 MHz
Sweep Time	AUTO	AUTO	AUTO	AUTO	AUTO	AUTO
Trace	Maxhold	Maxhold	Maxhold	Maxhold	Maxhold	Maxhold

7.4.4 Test Data

The resolution bandwidth was set to about 1 – 5 % of emission bandwidth, -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

Test Date :September 15 2015

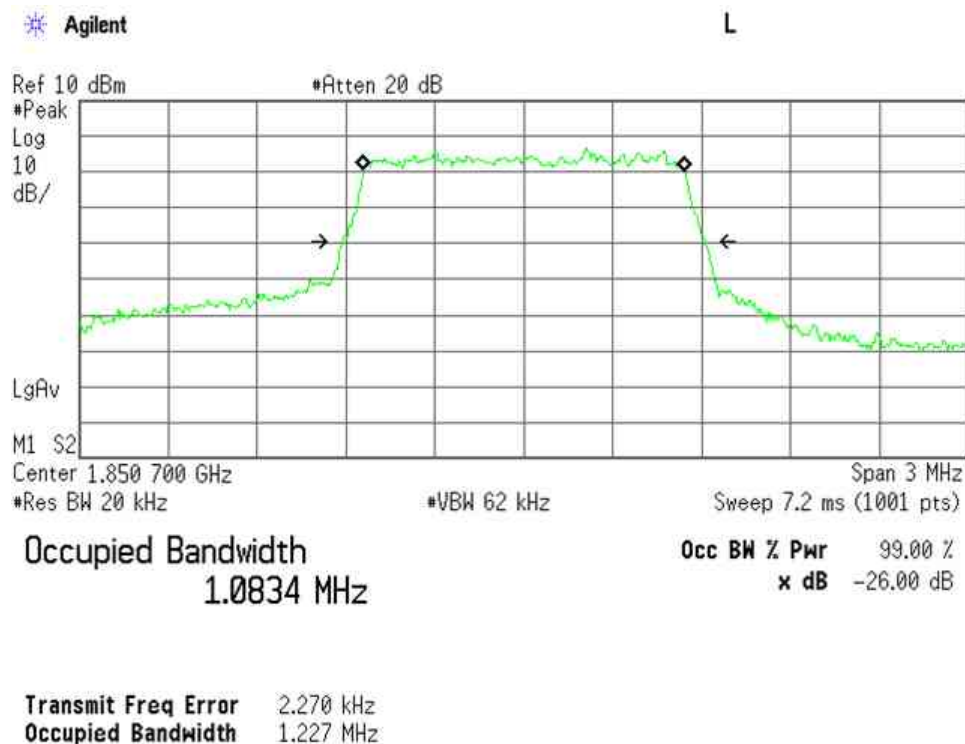
Temp.:26°C, Humi:58%

1-1) BW 1.4MHz(Full RB)

Mode: QPSK

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18607	1850.70	1.08	1.23
18900	1880.00	1.09	1.21
19193	1909.30	1.09	1.22

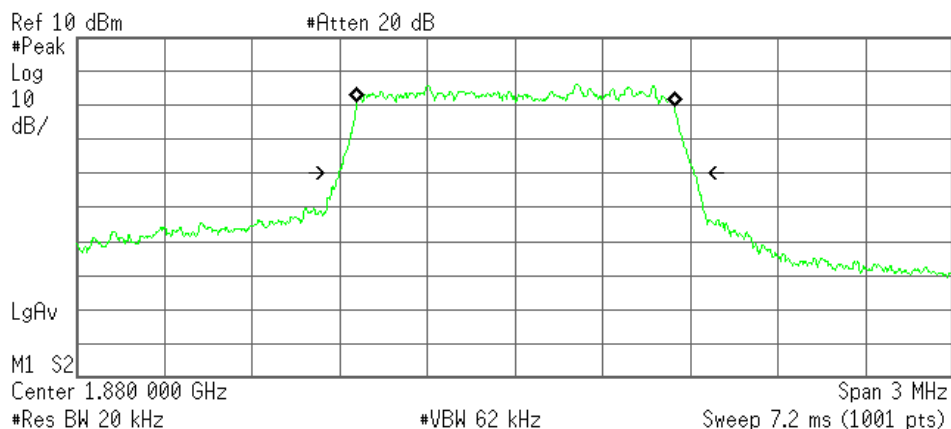
Low Channel



Middle Channel

Agilent

L



Occupied Bandwidth
1.0852 MHz

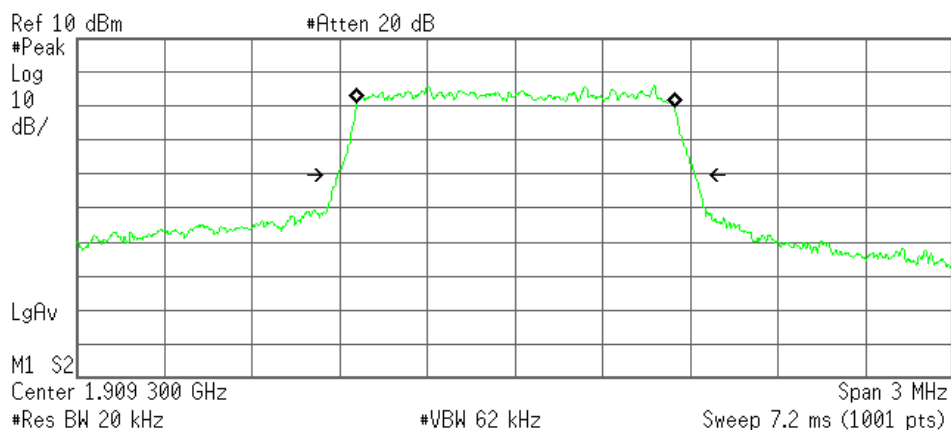
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 2.359 kHz
Occupied Bandwidth 1.213 MHz

High Channel

Agilent

L



Occupied Bandwidth
1.0856 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

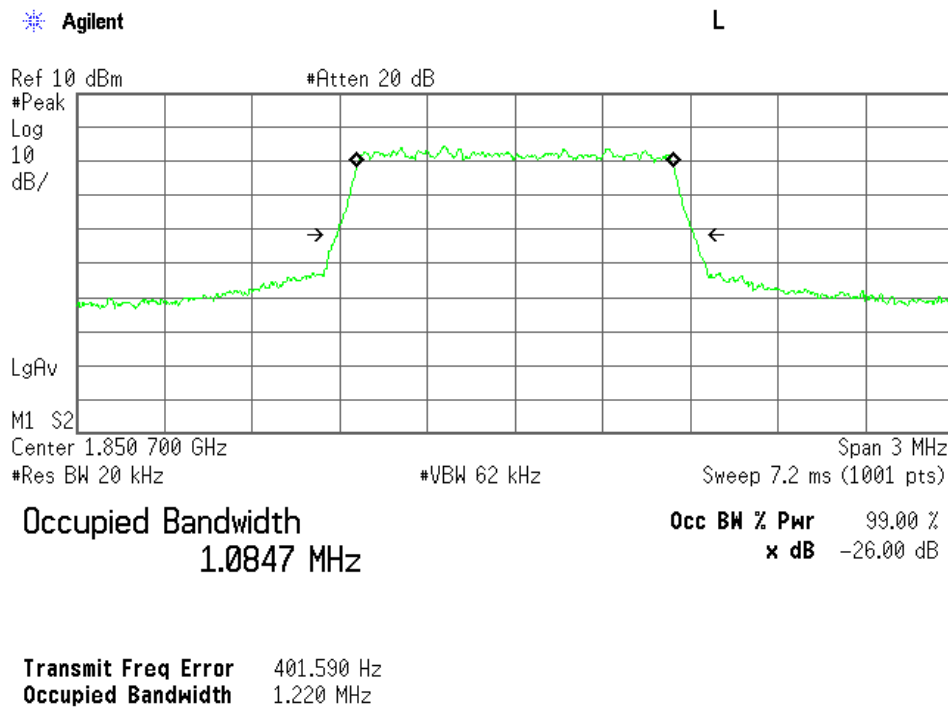
Transmit Freq Error 2.490 kHz
Occupied Bandwidth 1.223 MHz

1-2) BW 1.4MHz(Full RB)

Mode: 16QAM

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18607	1850.70	1.08	1.22
18900	1880.00	1.08	1.23
19193	1909.30	1.08	1.22

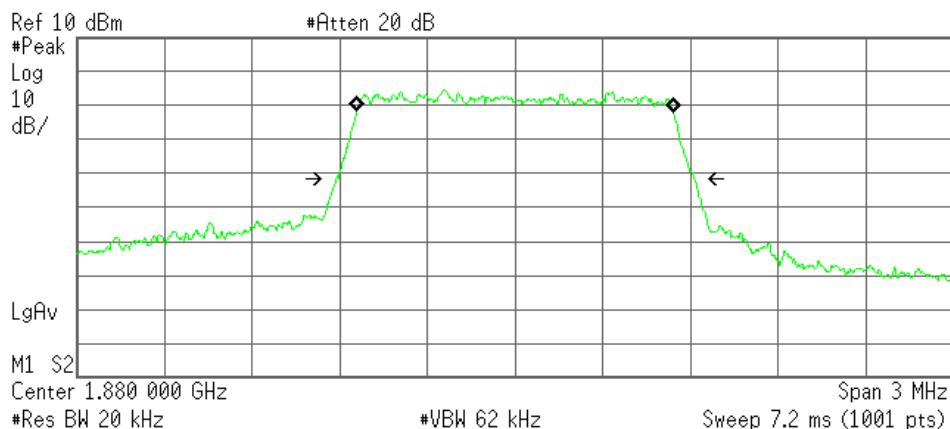
Low Channel



Middle Channel

Agilent

L



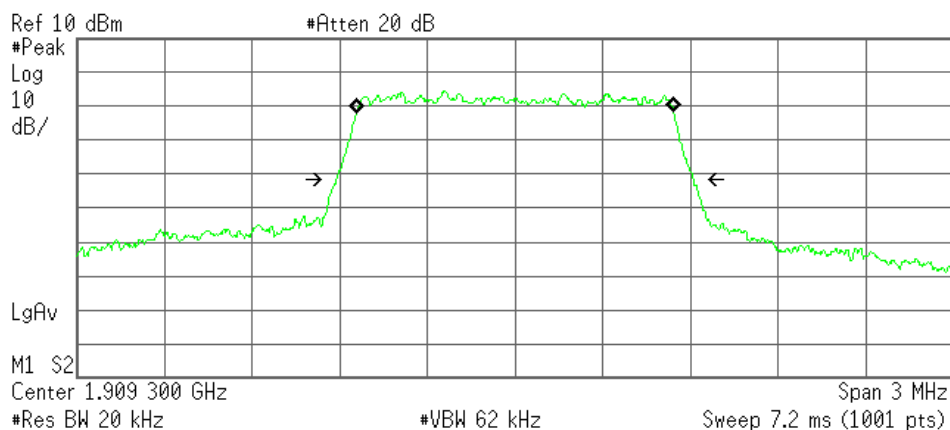
Occupied Bandwidth
1.0842 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -75.582 Hz
Occupied Bandwidth 1.225 MHz

High Channel

Agilent



Occupied Bandwidth
1.0846 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

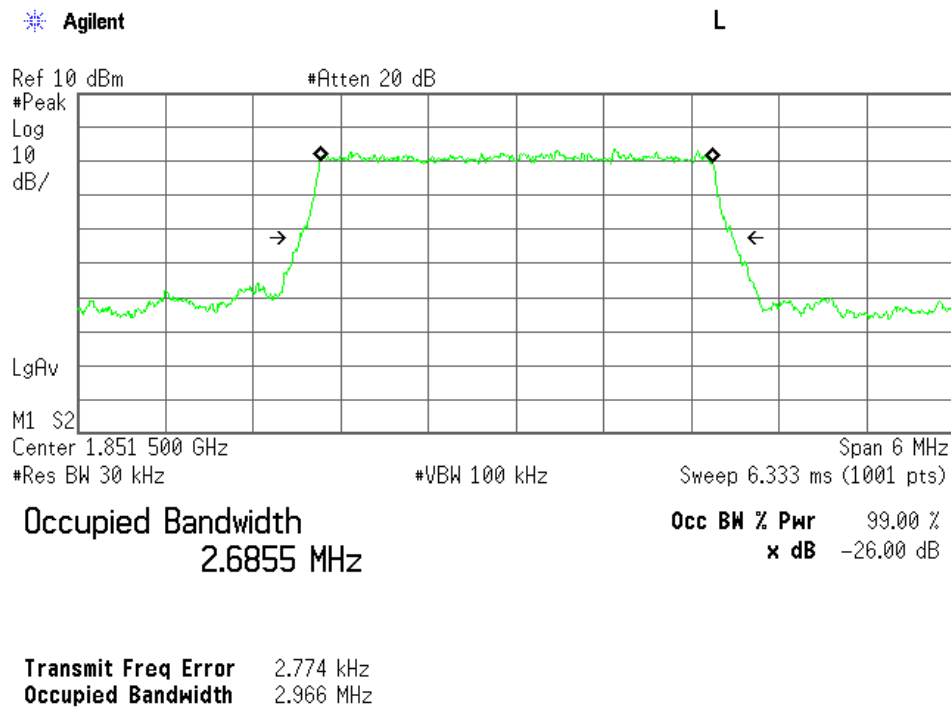
Transmit Freq Error -239.929 Hz
Occupied Bandwidth 1.223 MHz

2-1) BW 3MHz(Full RB)

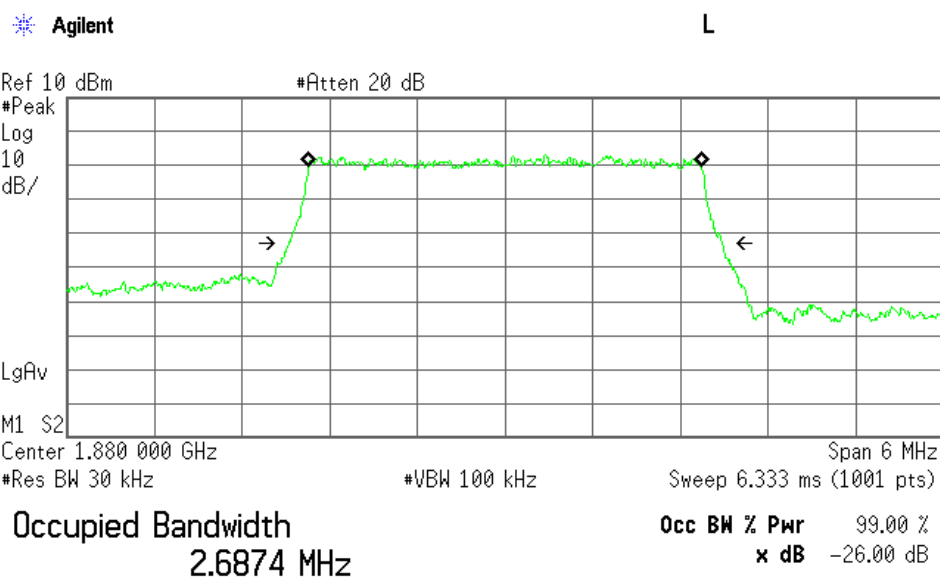
Mode: QPSK

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18615	1851.50	2.69	2.97
18900	1880.00	2.69	2.97
19185	1908.50	2.69	2.96

Low Channel

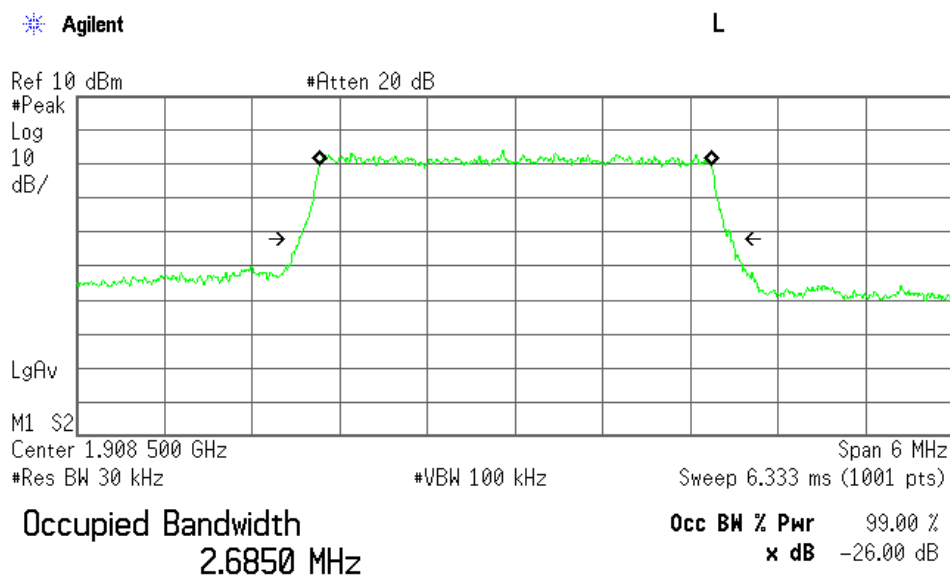


Middle Channel



Transmit Freq Error 2.358 kHz
Occupied Bandwidth 2.972 MHz

High Channel



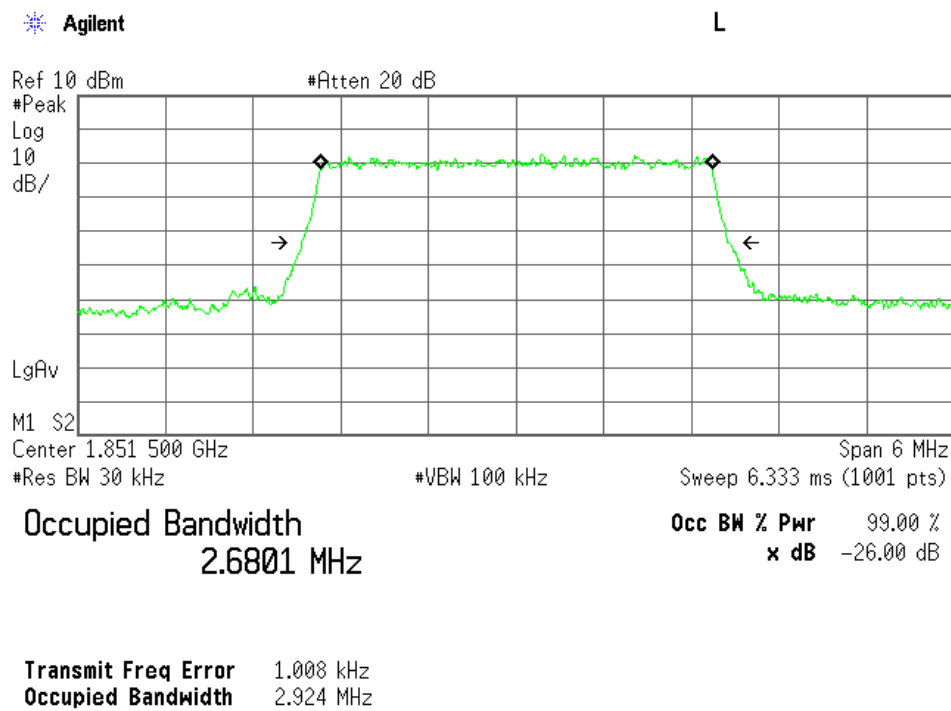
Transmit Freq Error 2.585 kHz
Occupied Bandwidth 2.960 MHz

2-2) BW 3MHz(Full RB)

Mode: 16QAM

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18615	1851.50	2.68	2.92
18900	1880.00	2.68	2.92
19185	1908.50	2.68	2.93

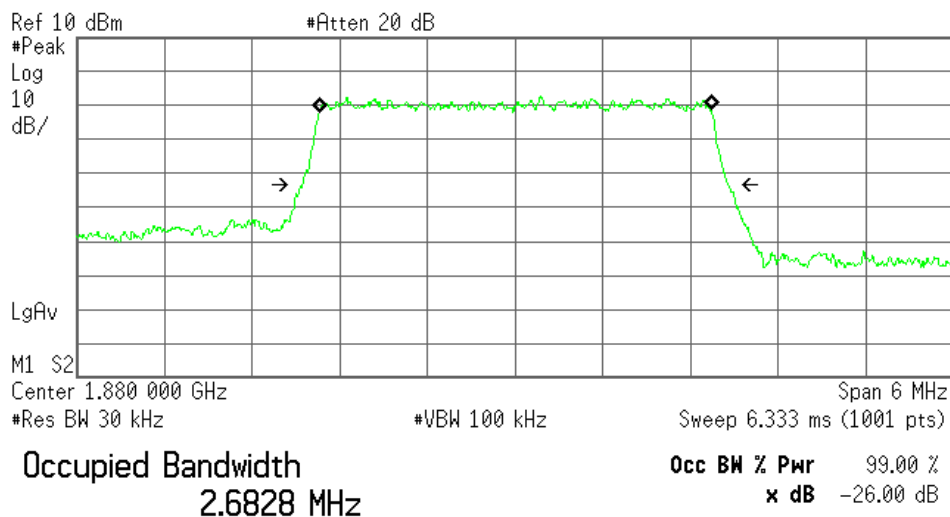
Low Channel



Middle Channel

Agilent

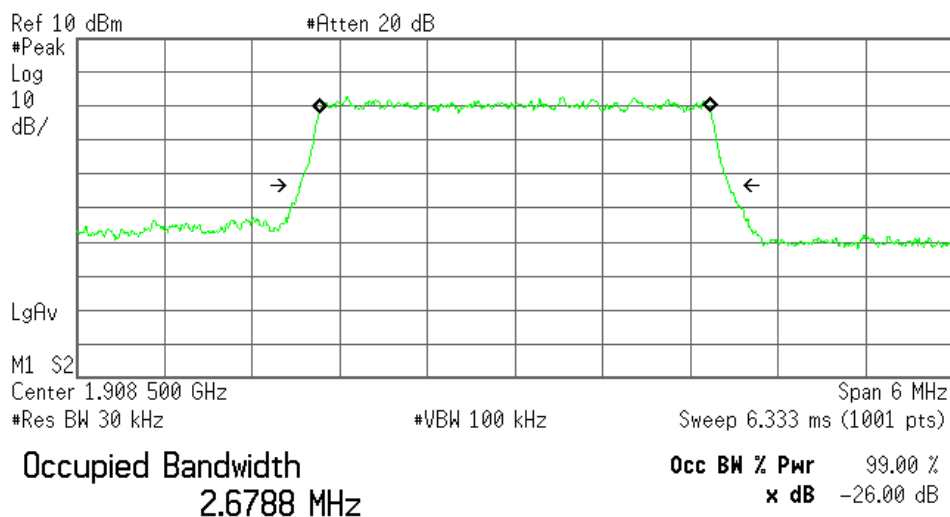
L



Transmit Freq Error 2.669 kHz
Occupied Bandwidth 2.916 MHz

High Channel

Agilent



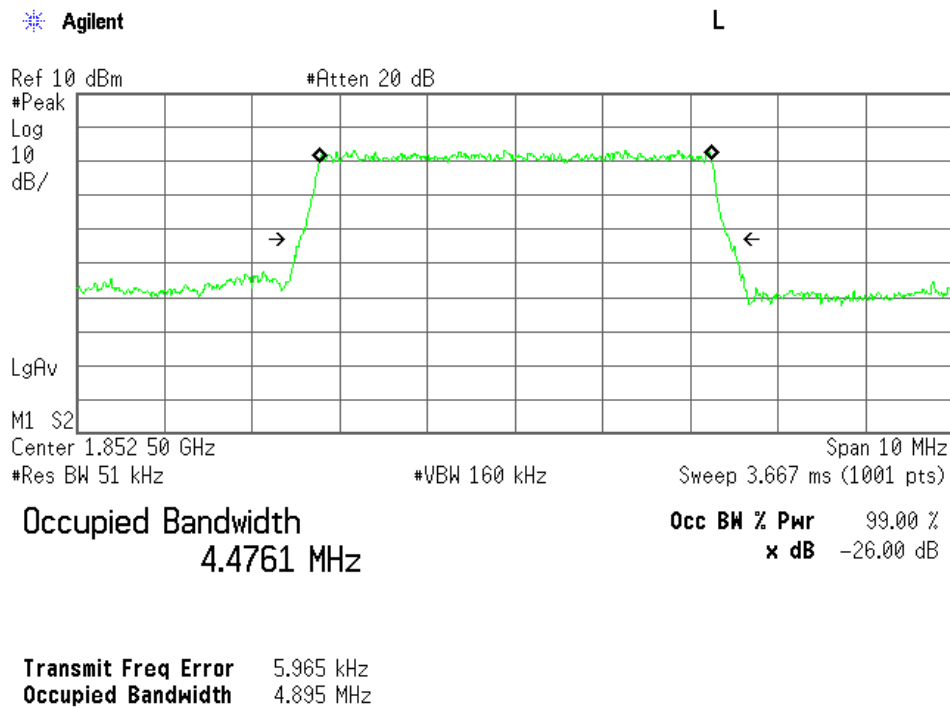
Transmit Freq Error 19.750 Hz
Occupied Bandwidth 2.931 MHz

3-1) BW 5MHz(Full RB)

Mode: QPSK

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18625	1852.50	4.48	4.90
18900	1880.00	4.48	4.86
19175	1907.50	4.47	4.88

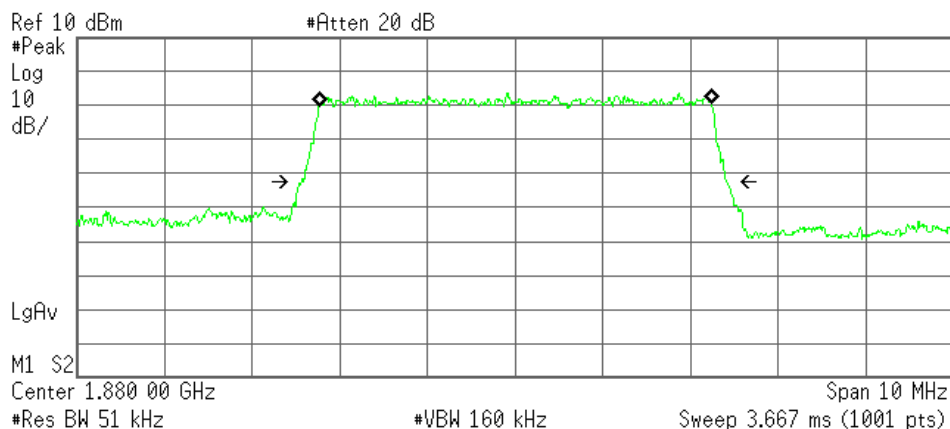
Low Channel



Middle Channel

Agilent

L



Occupied Bandwidth
4.4782 MHz

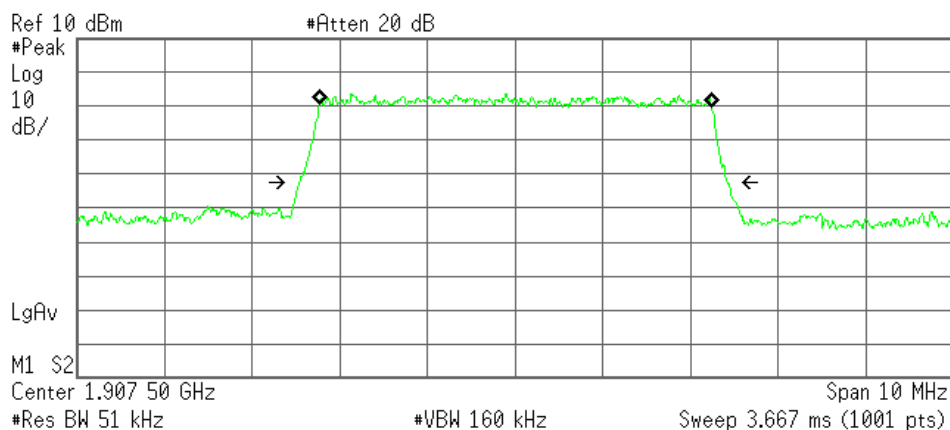
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 5.618 kHz
Occupied Bandwidth 4.859 MHz

High Channel

Agilent

L



Occupied Bandwidth
4.4724 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

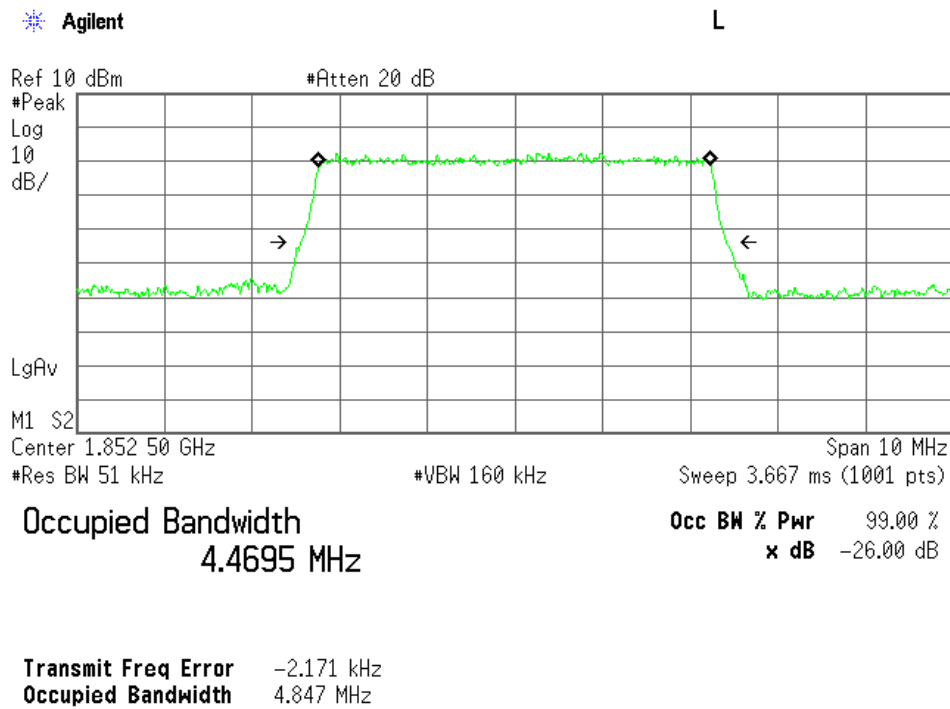
Transmit Freq Error 2.734 kHz
Occupied Bandwidth 4.884 MHz

3-2) BW 5MHz(Full RB)

Mode: 16QAM

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18625	1852.50	4.47	4.85
18900	1880.00	4.47	4.83
19175	1907.50	4.47	4.84

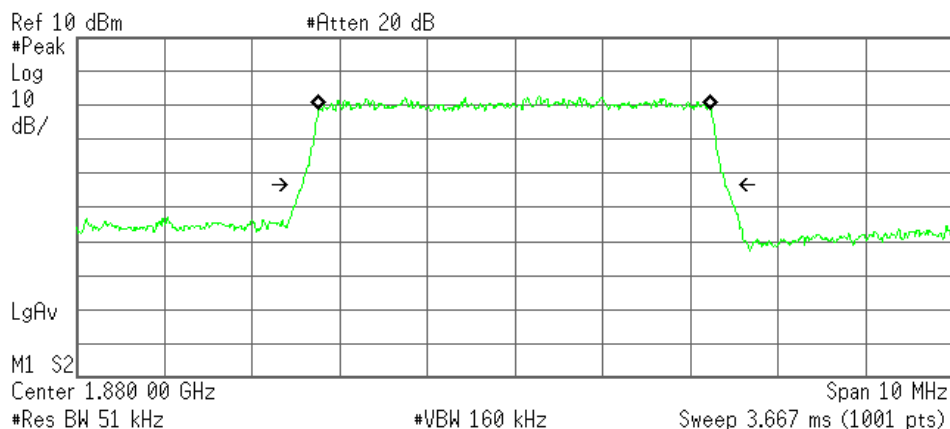
Low Channel



Middle Channel

Agilent

L



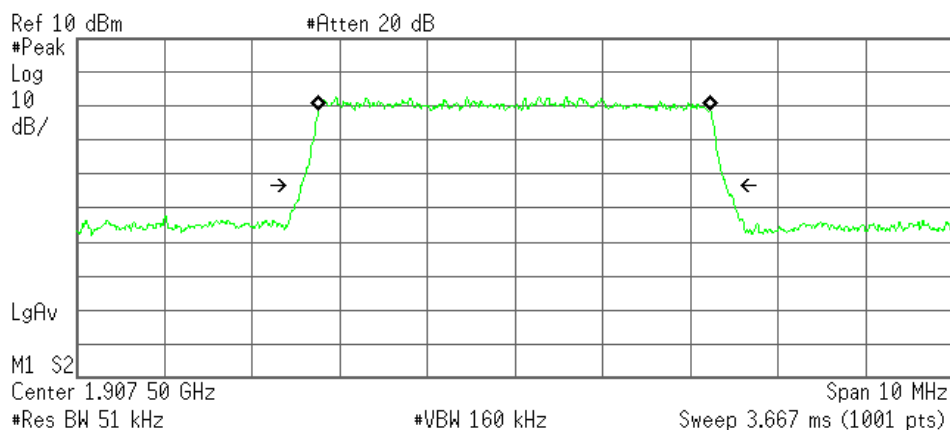
Occupied Bandwidth
4.4686 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -2.014 kHz
Occupied Bandwidth 4.827 MHz

High Channel

Agilent



Occupied Bandwidth
4.4661 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

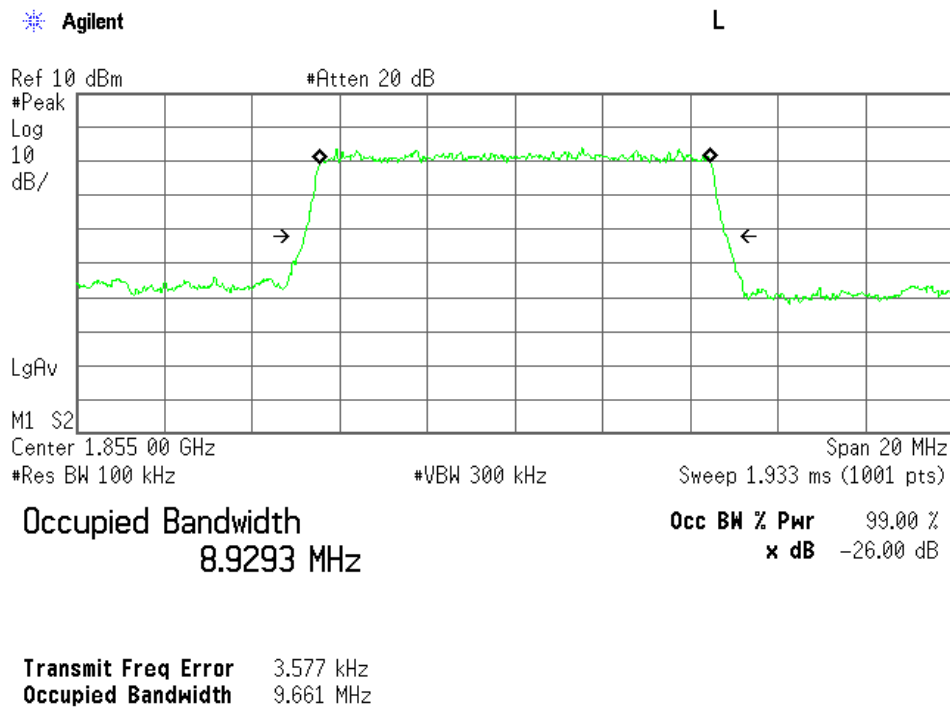
Transmit Freq Error -3.683 kHz
Occupied Bandwidth 4.843 MHz

4-1) BW 10MHz(Full RB)

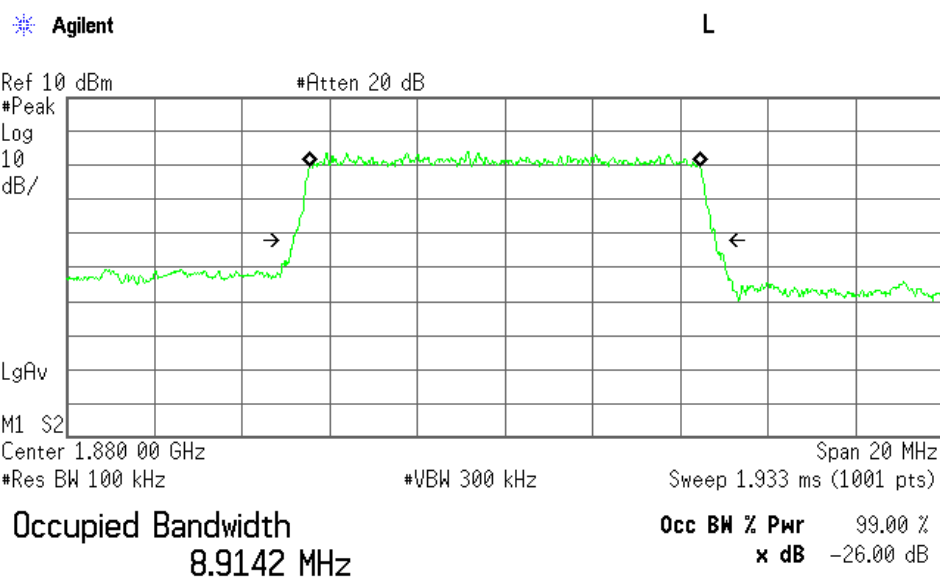
Mode: QPSK

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18650	1855.00	8.93	9.66
18900	1880.00	8.91	9.65
19150	1905.00	8.92	9.69

Low Channel

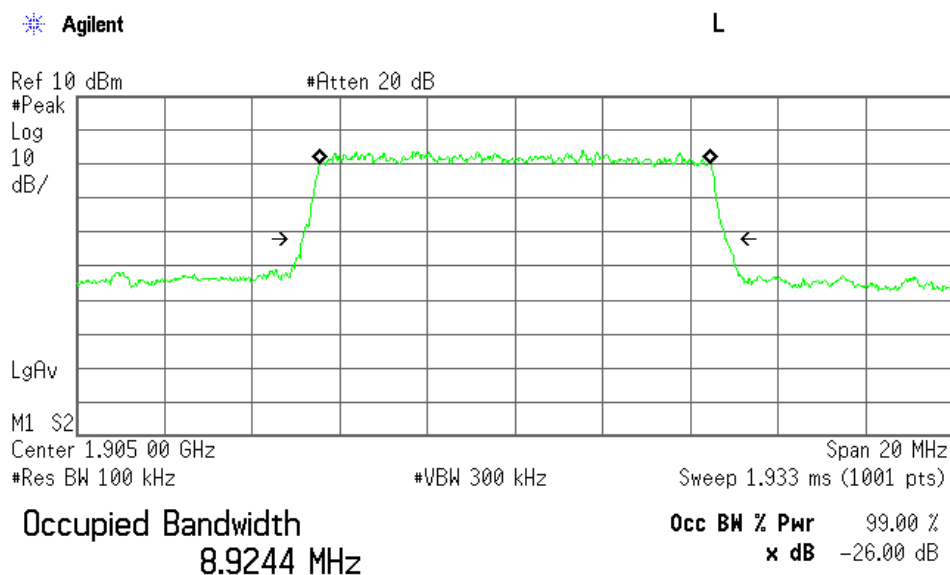


Middle Channel



Transmit Freq Error -1.498 kHz
Occupied Bandwidth 9.651 MHz

High Channel



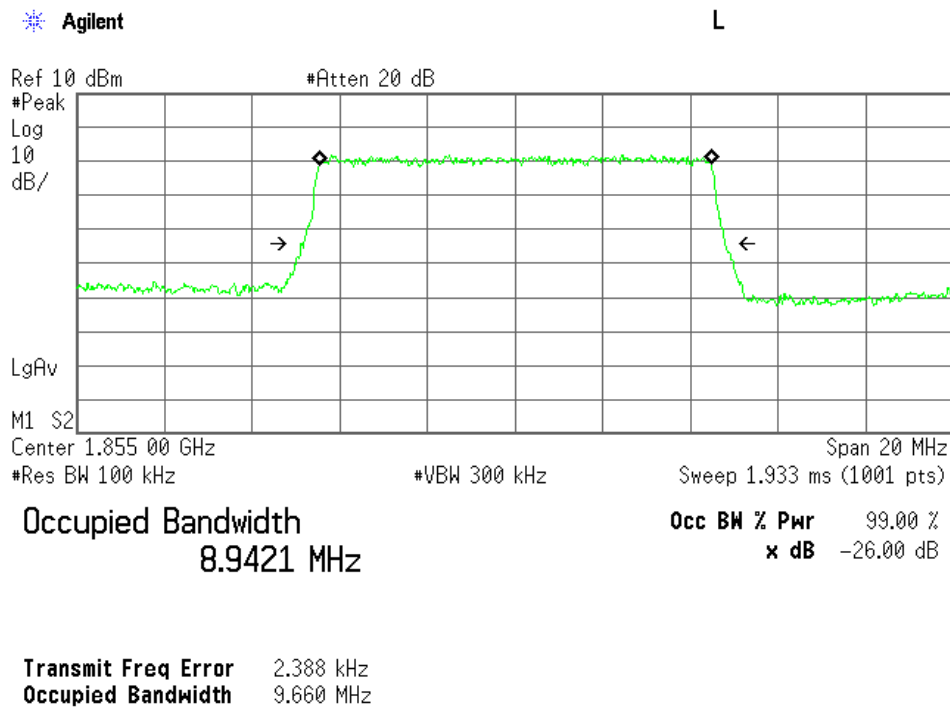
Transmit Freq Error 1.193 kHz
Occupied Bandwidth 9.685 MHz

4-2) BW 10MHz(Full RB)

Mode: 16QAM

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18650	1855.00	8.94	9.66
18900	1880.00	8.93	9.71
19150	1905.00	8.94	9.71

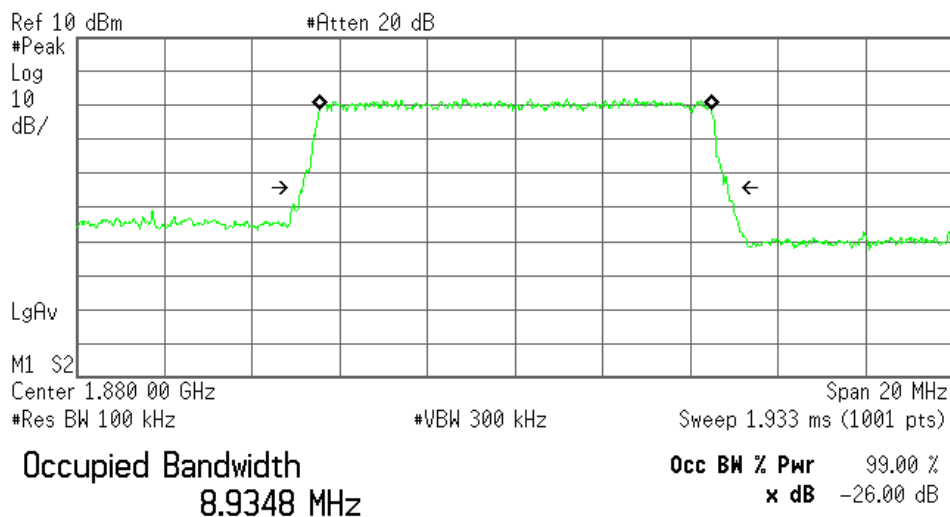
Low Channel



Middle Channel

Agilent

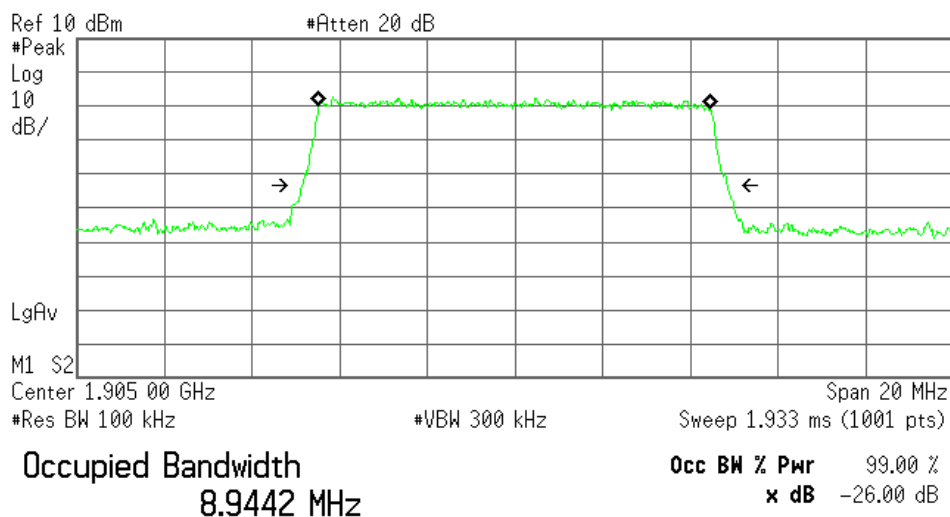
L



Transmit Freq Error 4.570 kHz
Occupied Bandwidth 9.711 MHz

High Channel

Agilent



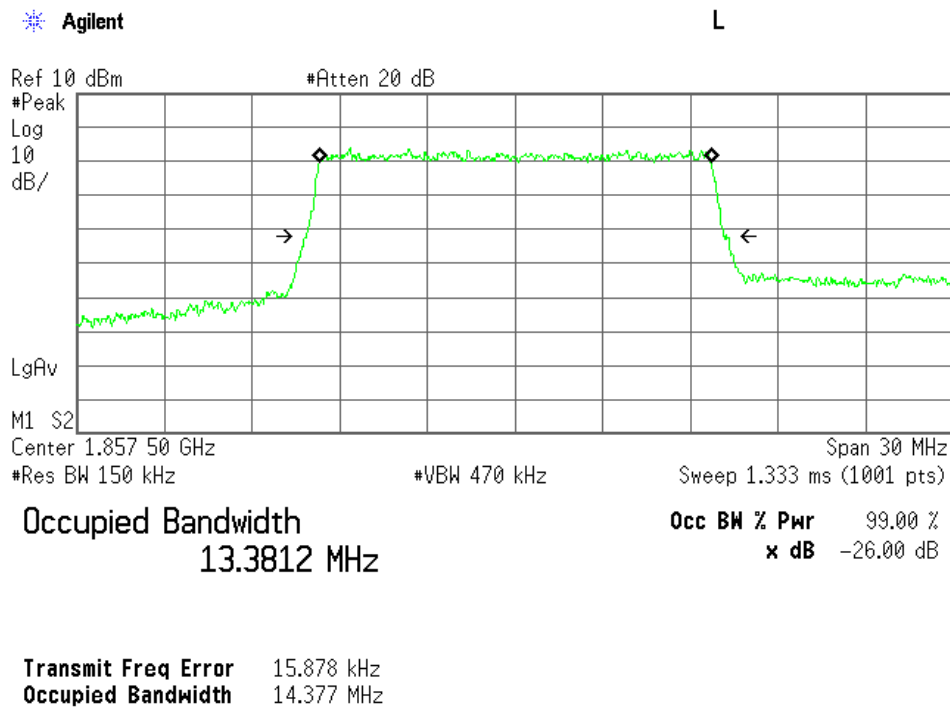
Transmit Freq Error -5.464 kHz
Occupied Bandwidth 9.711 MHz

5-1) BW 15MHz(Full RB)

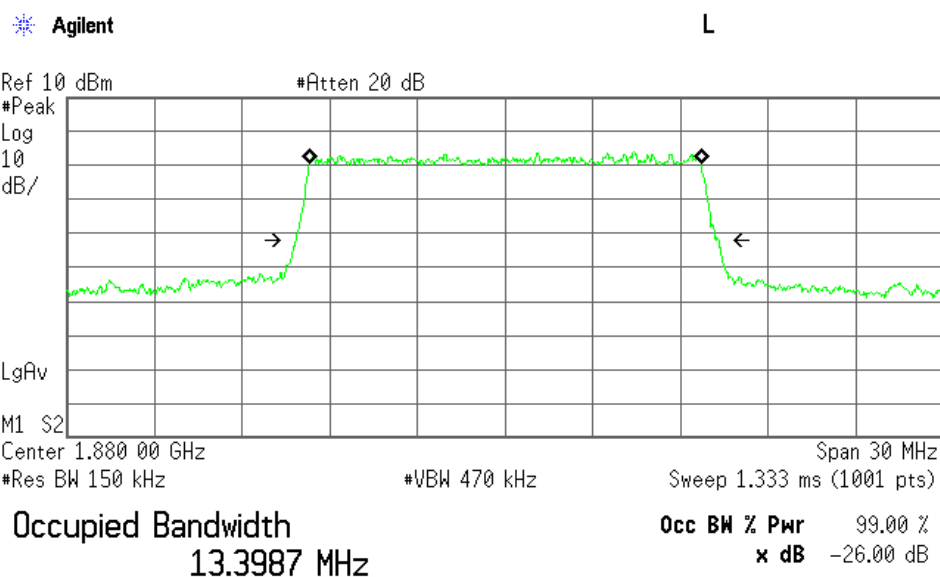
Mode: QPSK

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18675	1857.50	13.4	14.4
18900	1880.00	13.4	14.5
19125	1902.50	13.4	14.3

Low Channel

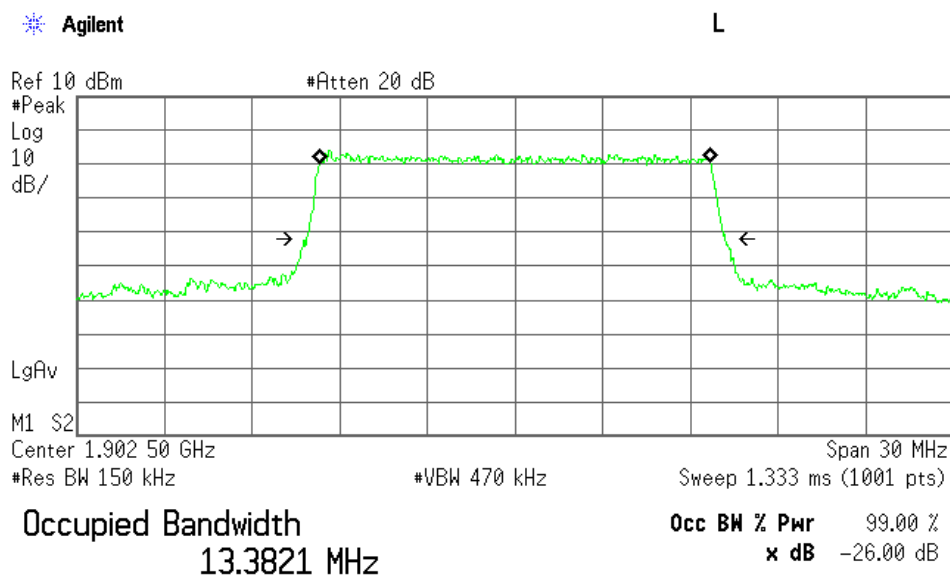


Middle Channel



Transmit Freq Error 15.024 kHz
Occupied Bandwidth 14.471 MHz

High Channel

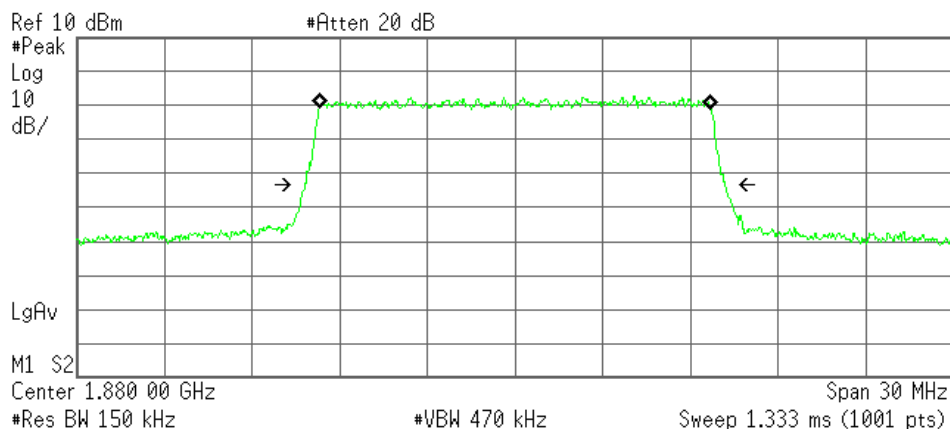


Transmit Freq Error 4.211 kHz
Occupied Bandwidth 14.324 MHz

Middle Channel

Agilent

L



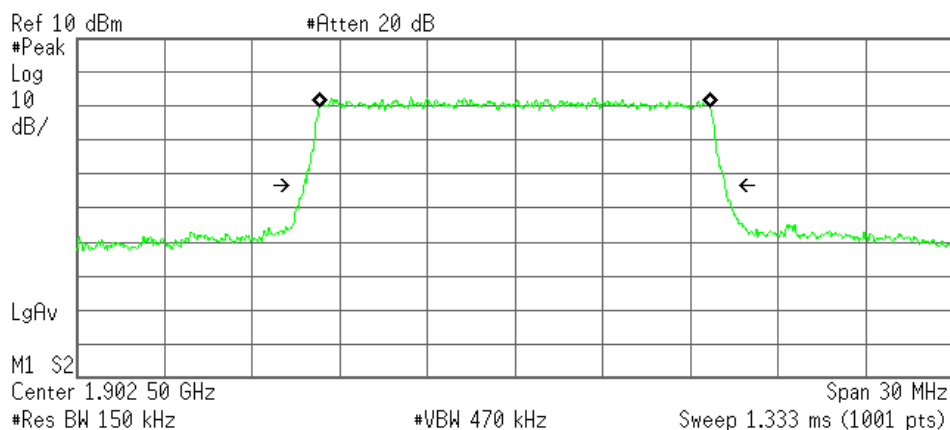
Occupied Bandwidth
13.3917 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 5.937 kHz
Occupied Bandwidth 14.381 MHz

High Channel

Agilent



Occupied Bandwidth
13.3849 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

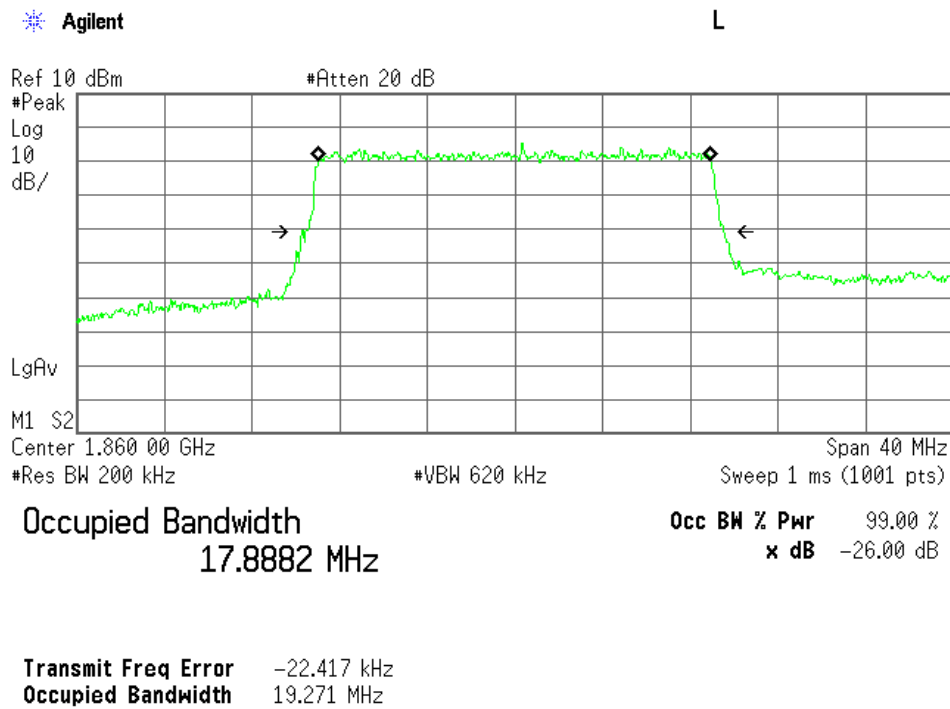
Transmit Freq Error -4.523 kHz
Occupied Bandwidth 14.419 MHz

6-1) BW 20MHz(Full RB)

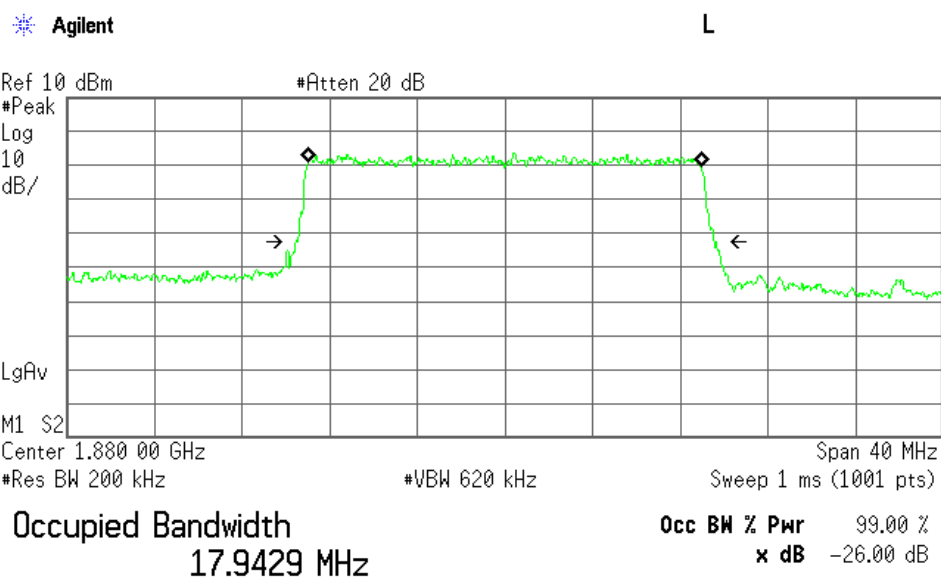
Mode: QPSK

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18700	1860.00	17.9	19.3
18900	1880.00	17.9	19.2
19100	1900.00	17.9	19.1

Low Channel

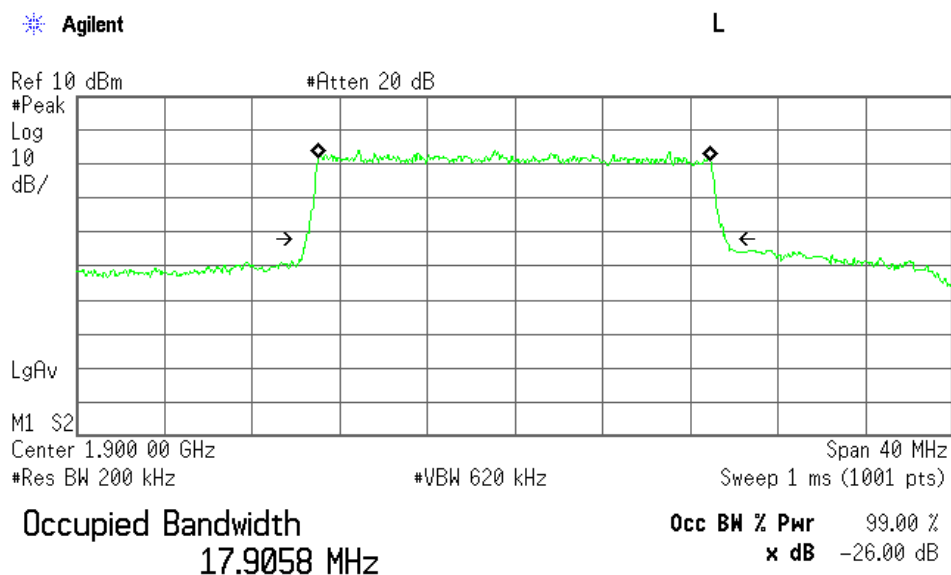


Middle Channel



Transmit Freq Error -30.308 kHz
Occupied Bandwidth 19.180 MHz

High Channel



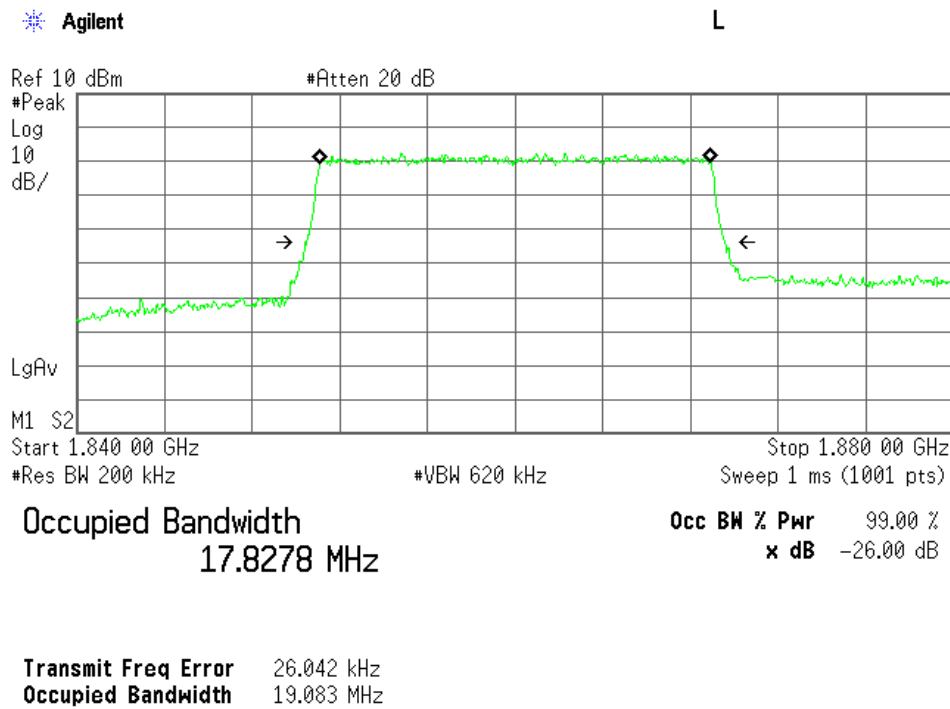
Transmit Freq Error -20.298 kHz
Occupied Bandwidth 19.146 MHz

6-2) BW 20MHz(Full RB)

Mode: 16QAM

Channel	Frequency (MHz)	99% Bandwidth (MHz)	-26dBc Bandwidth (MHz)
18700	1860.00	17.8	19.1
18900	1880.00	17.9	19.1
19100	1900.00	17.9	19.1

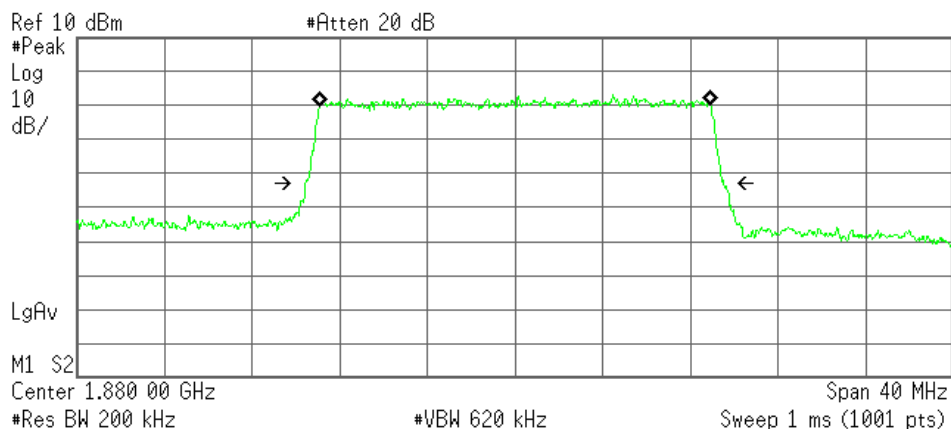
Low Channel



Middle Channel

Agilent

L



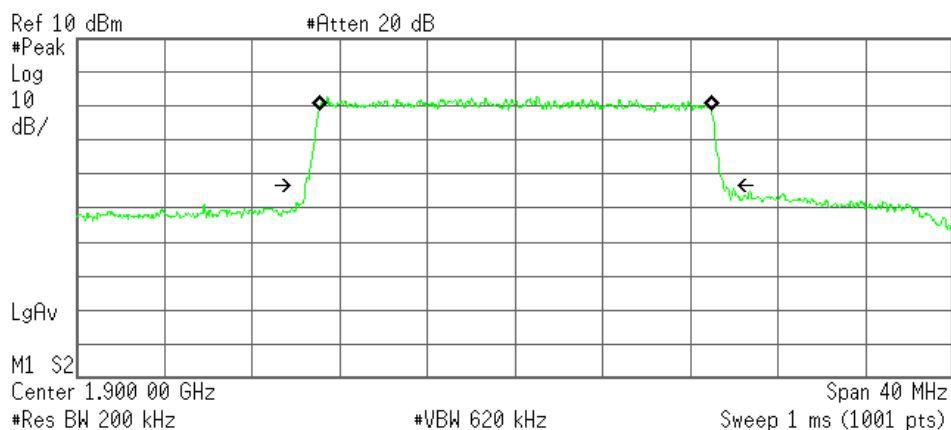
Occupied Bandwidth
17.8543 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 9.164 kHz
Occupied Bandwidth 19.068 MHz

High Channel

Agilent



Occupied Bandwidth
17.8630 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 9.712 kHz
Occupied Bandwidth 19.069 MHz

7.5 Spurious Emissions at Antenna Terminals (§2.1051)

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.5.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Min. Limit Margin 27.7 dB at 3818.600 MHz

Uncertainty of Measurement Results
9 kHz – 1 GHz ± 1.4 dB(2σ)
1 GHz – 18 GHz ± 1.7 dB(2σ)
18 GHz – 40 GHz ± 2.3 dB(2σ)

Remarks : BW 1.4 MHz

7.5.2 Test Instruments

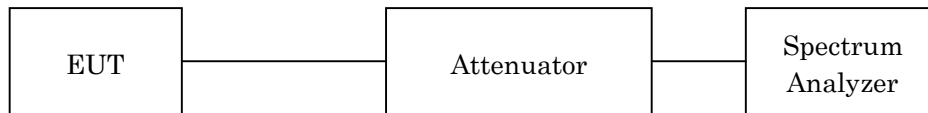
Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	43KC-20	1418003 (D-41)	Anritsu	2016/07/05
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16
High Pass Filter	HPM13899	001 (D-96)	MICRO-TRONICS	2016/02/08

NOTE : The calibration interval of the above test instruments is 12 months.

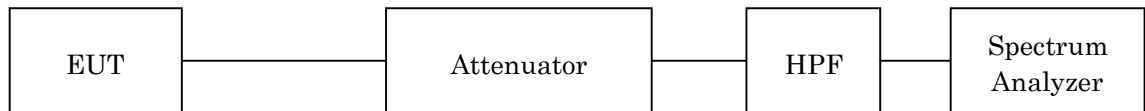
7.5.3 Test Method and Test Setup (Diagrammatic illustration)

The Antenna Conducted Emission was measured with a spectrum analyzer. The test system is shown as follows:

- a) Frequency Range: 9 kHz – 2 GHz



- b) Frequency Range: 2 GHz – 20 GHz



The setting of the spectrum analyzer are shown as follows:

Frequency Range	9 kHz - 150 kHz	150 kHz - 30 MHz	30 MHz - 20 GHz
Res. Bandwidth	200 Hz	10 kHz	1 MHz
Video Bandwidth	1 kHz	30 kHz	3 MHz
Sweep Time	AUTO	AUTO	AUTO
Trace	Maxhold	Maxhold	Maxhold

7.5.4 Test Data

1) BW 1.4MHz(1RB)

(LTE 1.4MHz)

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

CH	Transmitting Frequency [MHz]	Measured Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dBm]	Limits [dBm]	Results [dBm]	Margin [dB]	Remarks
18607	1850.700	3701.400	21.0	-62.5	-13.0	-41.5	+28.5	C
		5552.100	21.2	-69.3	-13.0	-48.1	+35.1	C
		7402.800	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9253.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11104.200	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		12954.900	22.2	-67.1	-13.0	-44.9	+31.9	C
		14805.600	22.5	< -70.0	-13.0	< -47.5	> +34.5	C
		16656.300	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18507.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
18900	1880.000	3760.000	21.0	-64.0	-13.0	-43.0	+30.0	C
		5640.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7520.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9400.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11280.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13160.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15040.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		16920.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18800.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
19193	1909.300	3818.600	21.0	-61.7	-13.0	-40.7	+27.7	C
		5727.900	21.2	-70.0	-13.0	-48.8	+35.8	C
		7637.200	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9546.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11455.800	22.0	< -70.0	-13.0	< -48.0	> +35.0	C
		13365.100	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15274.400	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		17183.700	22.9	< -70.0	-13.0	< -47.1	> +34.1	C
		19093.000	23.2	< -70.0	-13.0	< -46.8	> +33.8	C

Calculated result at 3818.6 MHz, as the worst point shown on underline:

Corr. Factor	=	21.0 dB
+) <u>Meter Reading</u>	=	<u>-61.7 dBm</u>
Result	=	-40.7 dBm

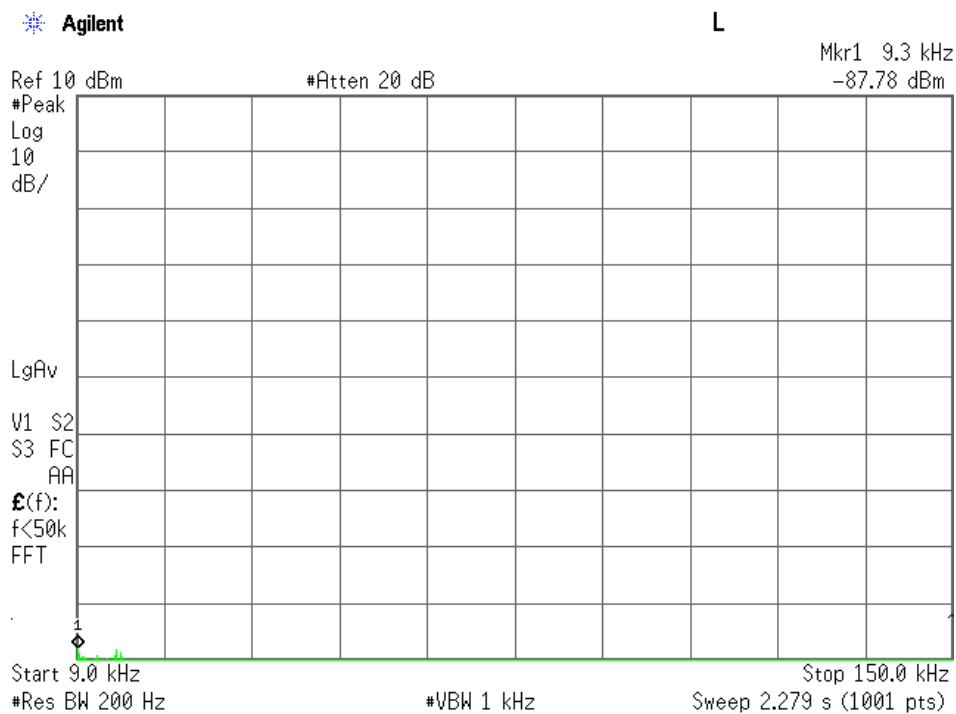
Minimum Margin: -13.0 - (-40.7) = 27.7 (dB)

NOTES

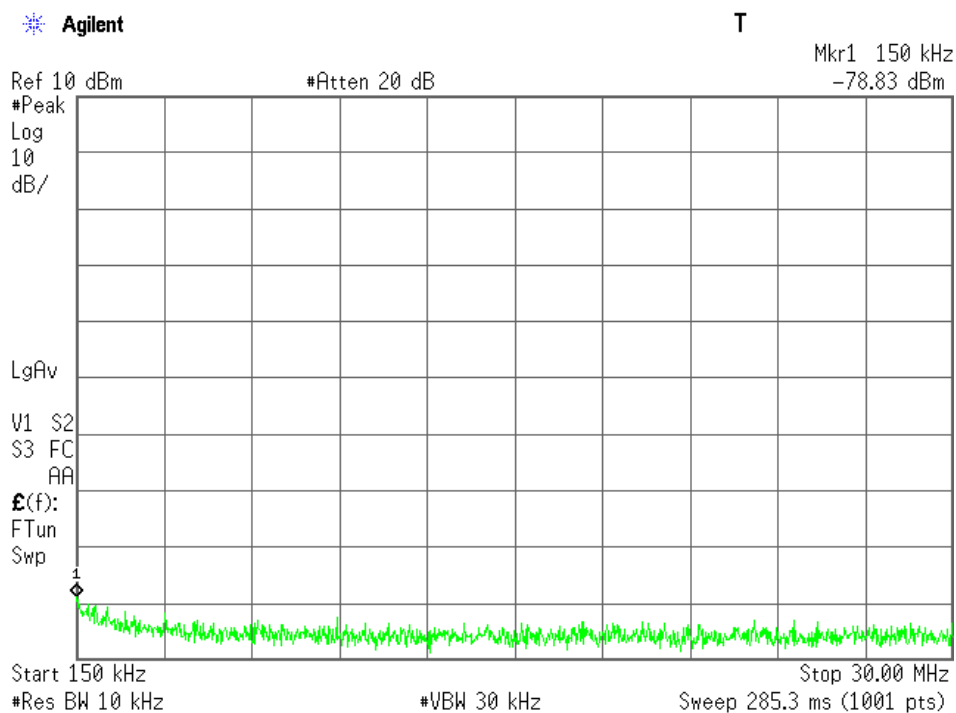
- The spectrum was checked from 9 kHz to 20 GHz.
- Applied limits : $-13.0 \text{ [dBm]} = 10\log(\text{TP[mW]}) - (43 + 10\log(\text{tp[W]})) = 10\log(\text{TP[mW]}) - (43 + (10 \log(\text{TP[mW]}) - 30))$
where, $\text{tp[W]} = \text{TP[mW]} / 1000$: Transmitter power at antenna terminal
- The correction factor is shown as follows:
Corr. Factor [dB] = Cable Loss + Pad Att. [dB] (9 kHz - 2 GHz)
Corr. Factor [dB] = Cable Loss + Pad Att. + High Pass Filter Loss [dB] (over 2 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	200 Hz	1 kHz	AUTO
B	Peak	10 kHz	30 kHz	AUTO
C	Peak	1 MHz	3 MHz	AUTO

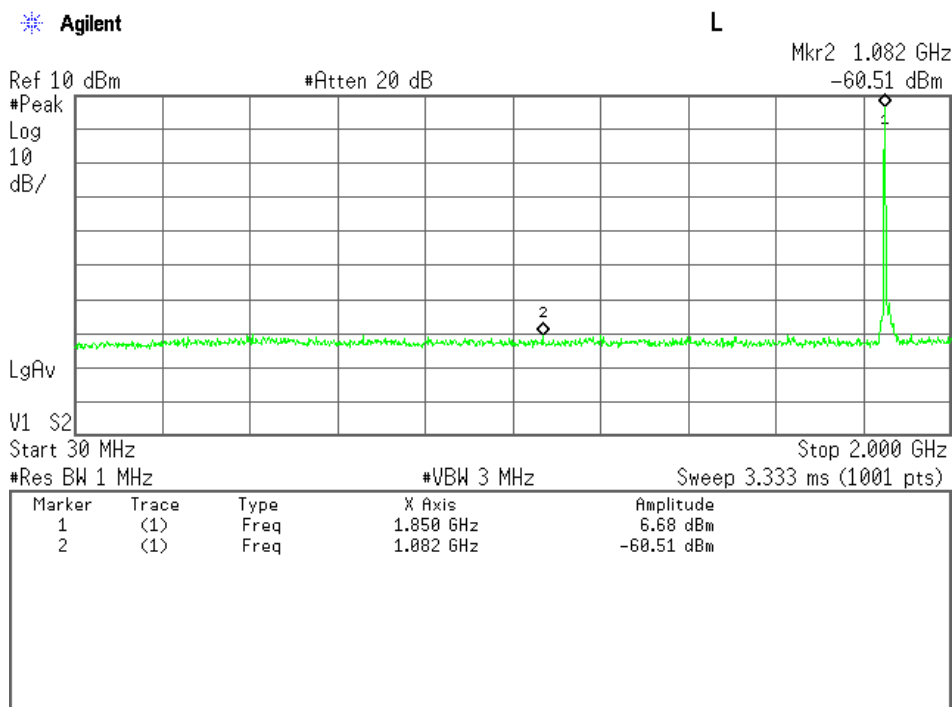
Low Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



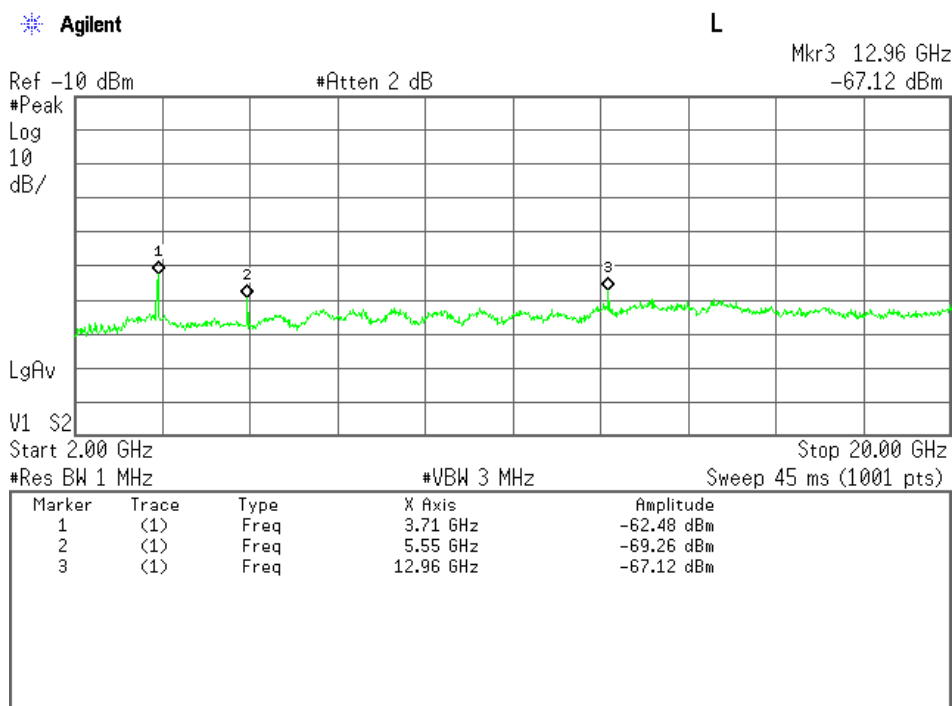
Low Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



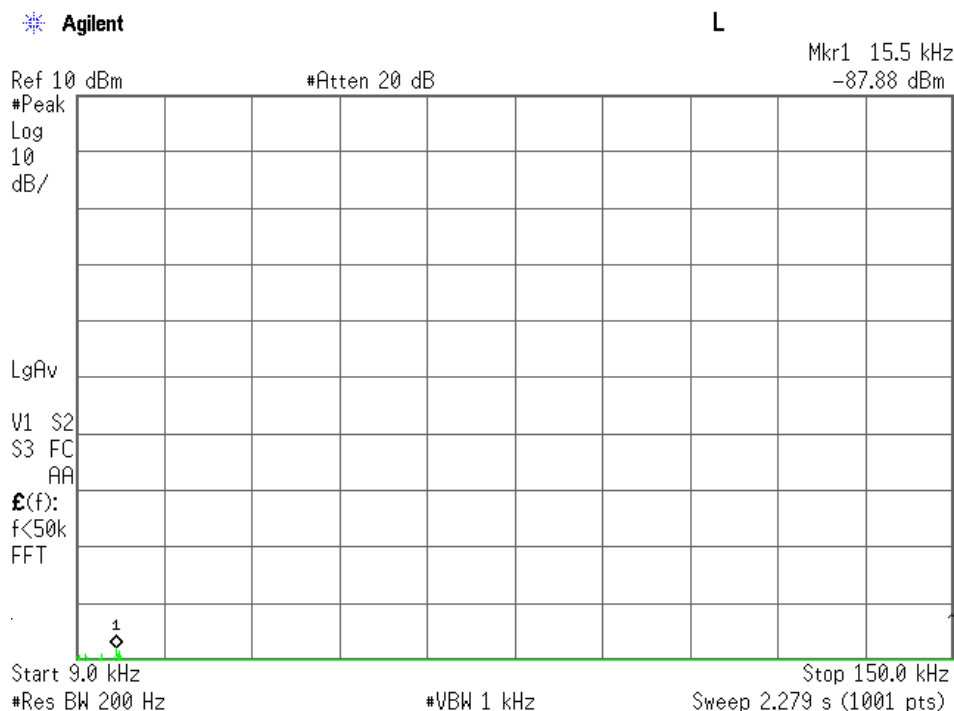
Low Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



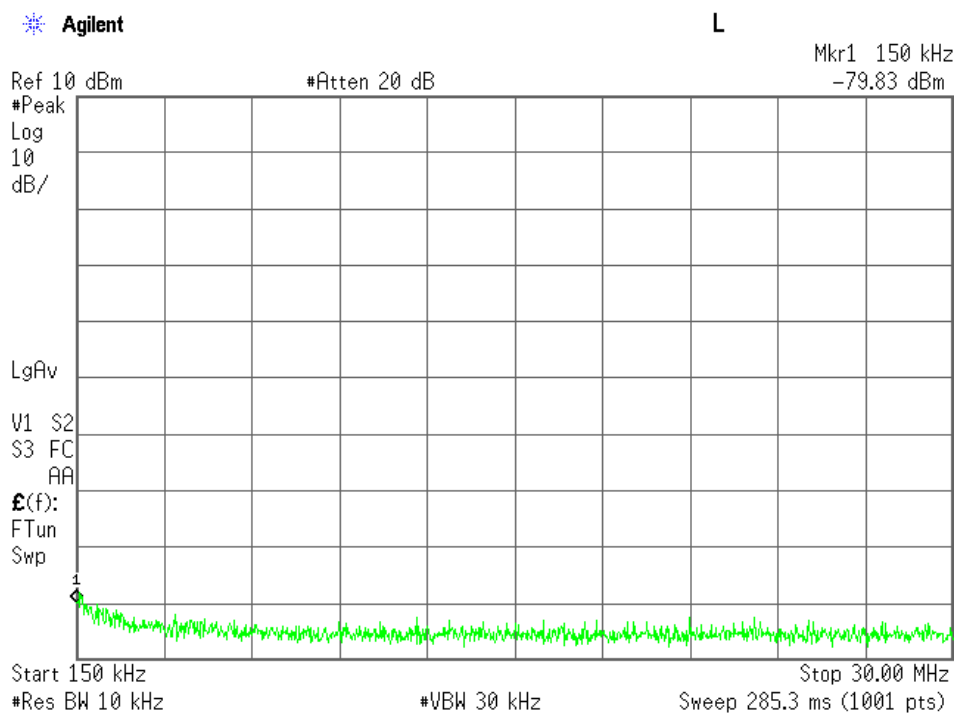
Low Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



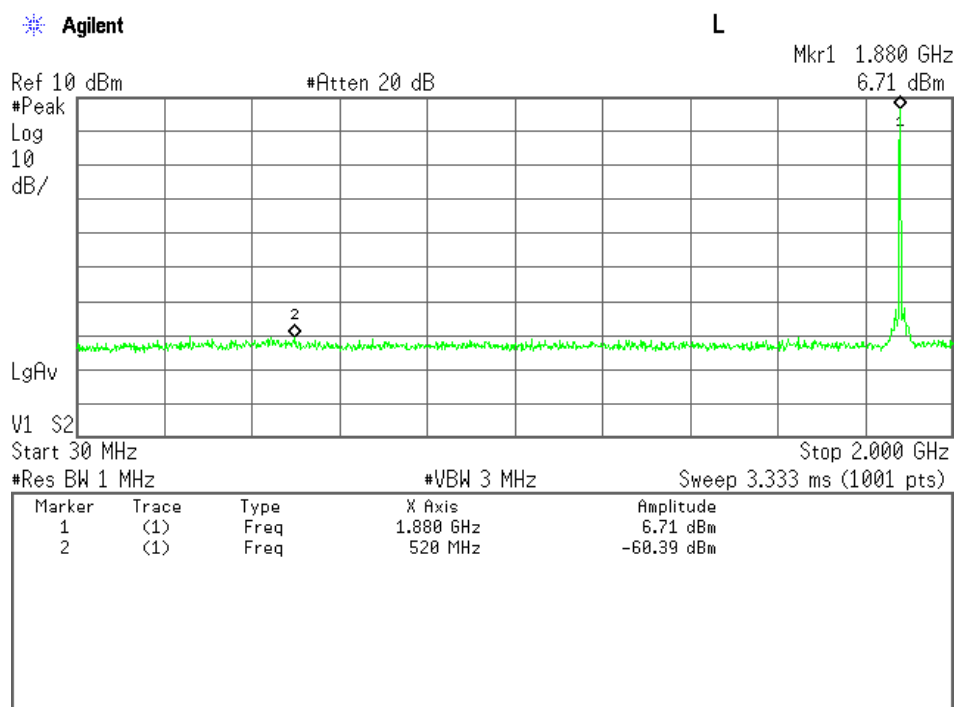
Middle Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



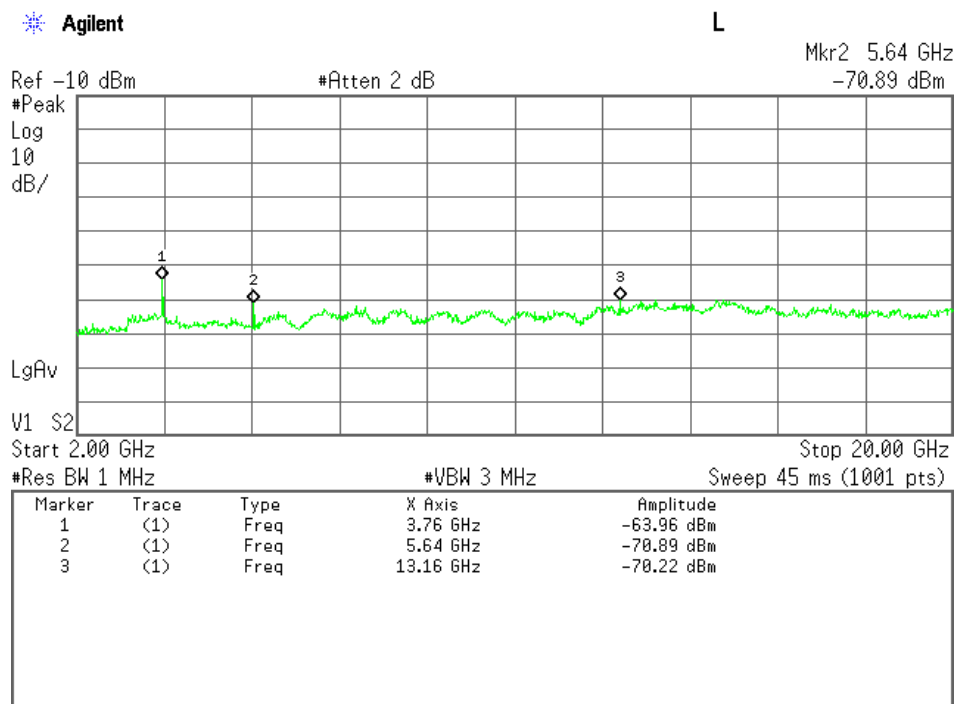
Middle Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



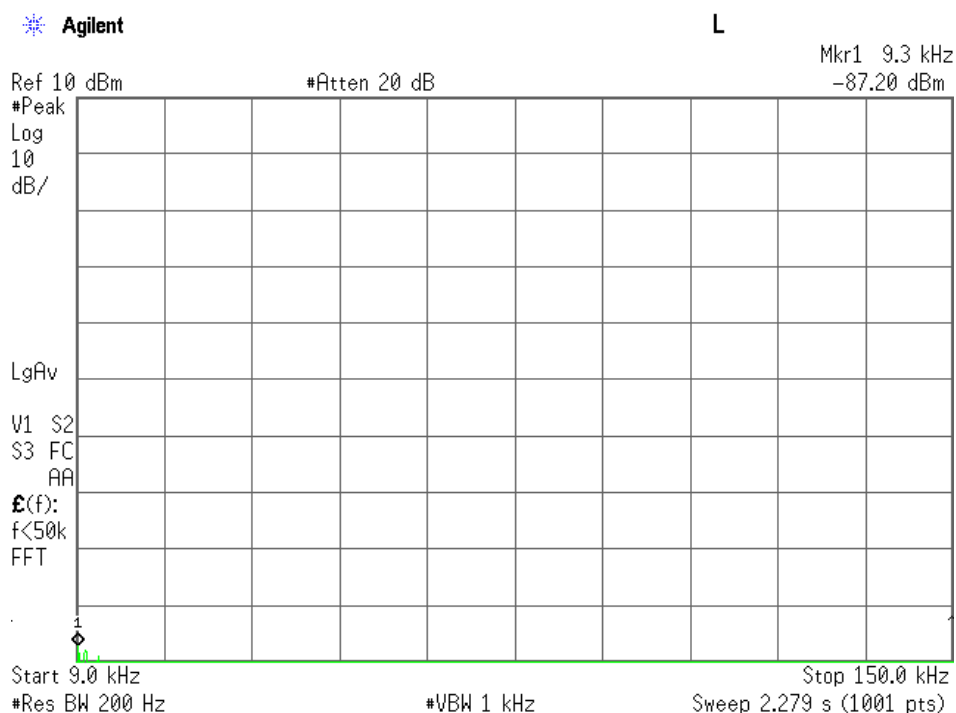
Middle Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



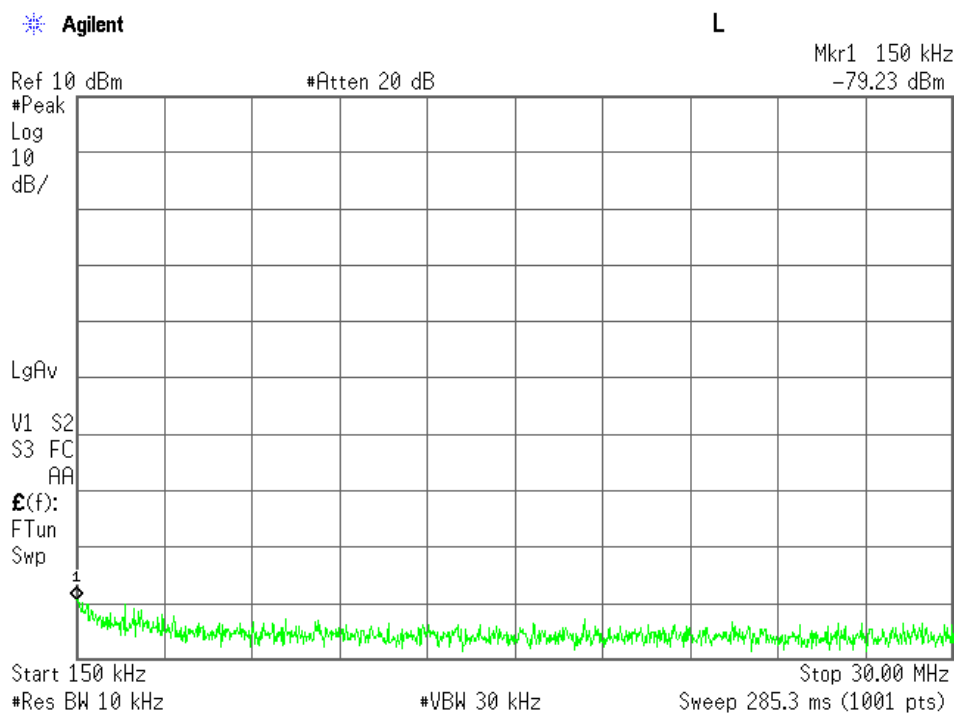
Middle Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



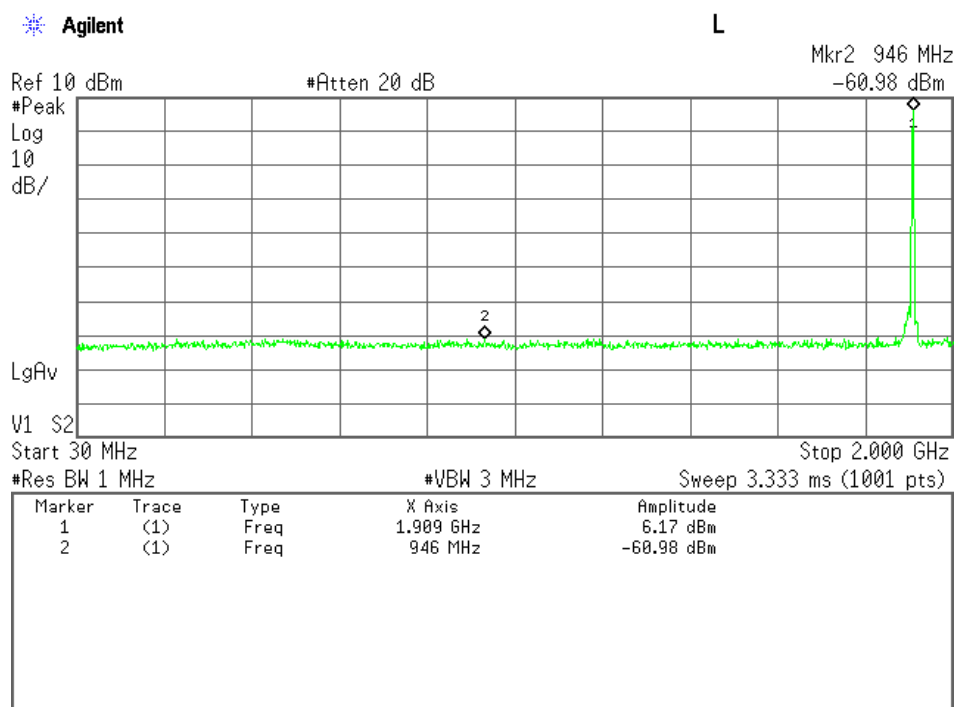
High Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



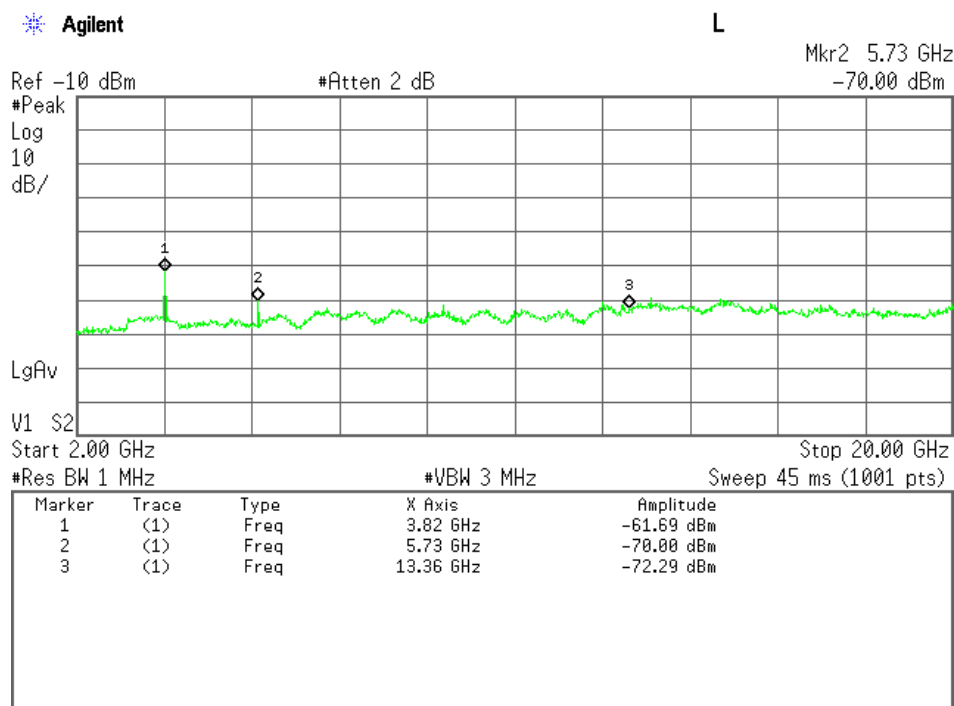
High Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



High Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



High Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



2) BW 3MHz(1RB)

(LTE 3MHz)

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH		Measured Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dBm]	Limits [dBm]	Results [dBm]	Margin [dB]	Remarks
18615	1851.500	3703.000	21.0	-62.7	-13.0	-41.7	+28.7	C
		5554.500	21.2	-69.7	-13.0	-48.5	+35.5	C
		7406.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9257.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11109.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		12960.500	22.2	-67.6	-13.0	-45.4	+32.4	C
		14812.000	22.5	< -70.0	-13.0	< -47.5	> +34.5	C
		16663.500	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18515.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
18900	1880.000	3760.000	21.0	-64.1	-13.0	-43.1	+30.1	C
		5640.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7520.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9400.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11280.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13160.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15040.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		16920.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18800.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
19185	1908.500	3817.000	21.0	-62.0	-13.0	-41.0	+28.0	C
		5725.500	21.2	-69.2	-13.0	-48.0	+35.0	C
		7634.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9542.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11451.000	22.0	< -70.0	-13.0	< -48.0	> +35.0	C
		13359.500	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15268.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		17176.500	22.9	< -70.0	-13.0	< -47.1	> +34.1	C
		19085.000	23.2	< -70.0	-13.0	< -46.8	> +33.8	C

Calculated result at 3817.0 MHz, as the worst point shown on underline:

Corr. Factor	=	21.0 dB
+) <u>Meter Reading</u>	=	<u>-62.0 dBm</u>
Result	=	-41.0 dBm

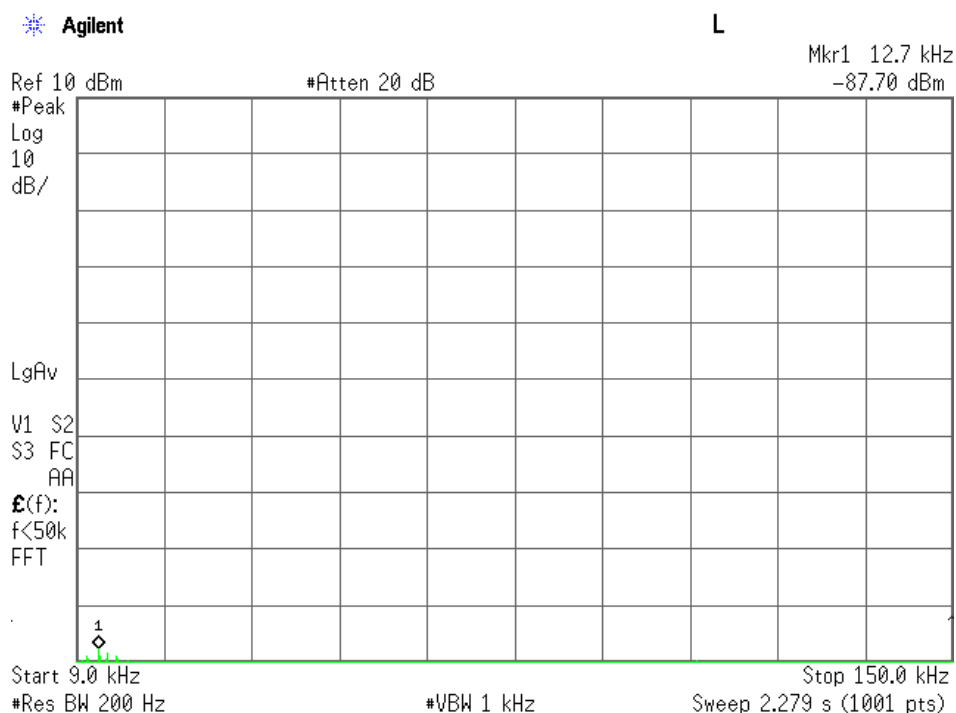
Minimum Margin: -13.0 - (-41.0) = 28.0 (dB)

NOTES

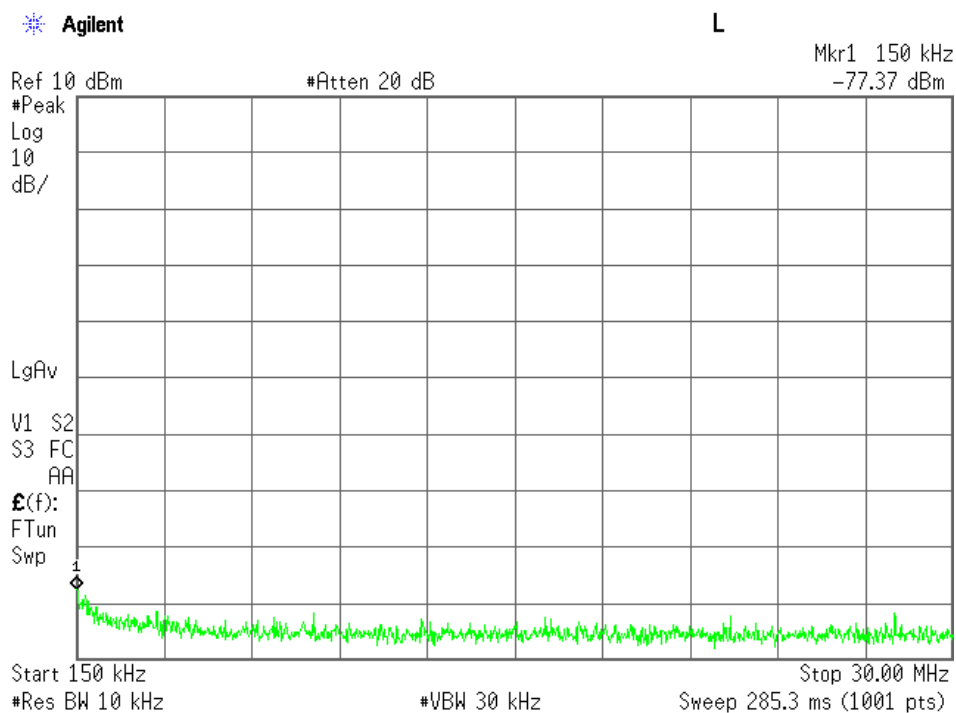
- The spectrum was checked from 9 kHz to 20 GHz.
- Applied limits : $-13.0 \text{ [dBm]} = 10\log(\text{TP[mW]}) - (43 + 10\log(\text{tp[W]})) = 10\log(\text{TP[mW]}) - (43 + (10 \log(\text{TP[mW]}) - 30))$
where, $\text{tp[W]} = \text{TP[mW]} / 1000$: Transmitter power at antenna terminal
- The correction factor is shown as follows:
Corr. Factor [dB] = Cable Loss + Pad Att. [dB] (9 kHz - 2 GHz)
Corr. Factor [dB] = Cable Loss + Pad Att. + High Pass Filter Loss [dB] (over 2 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	200 Hz	1 kHz	AUTO
B	Peak	10 kHz	30 kHz	AUTO
C	Peak	1 MHz	3 MHz	AUTO

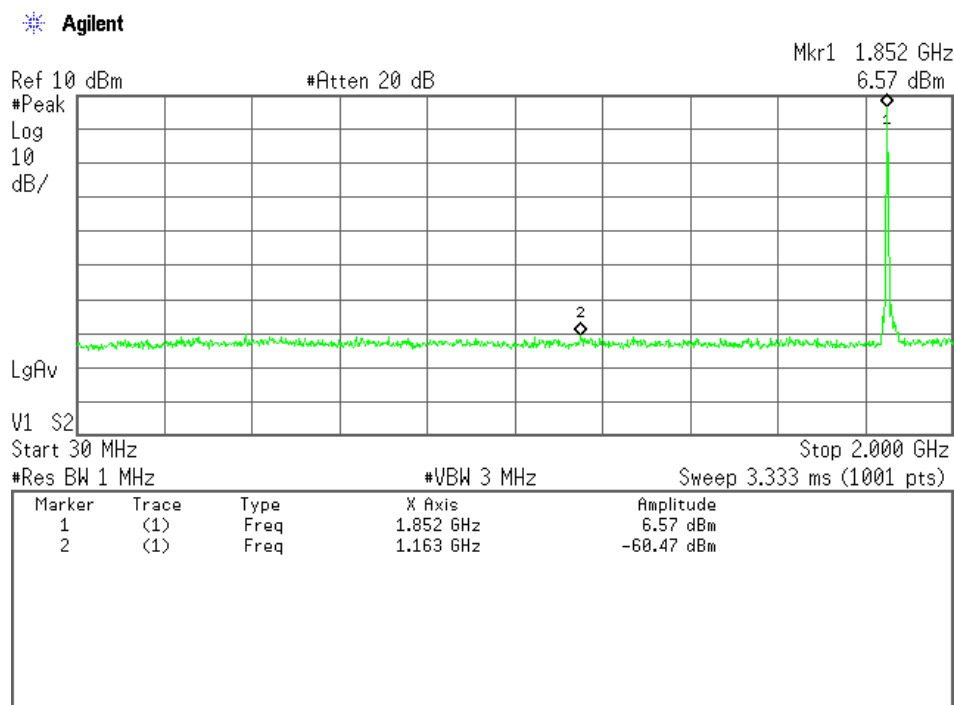
Low Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



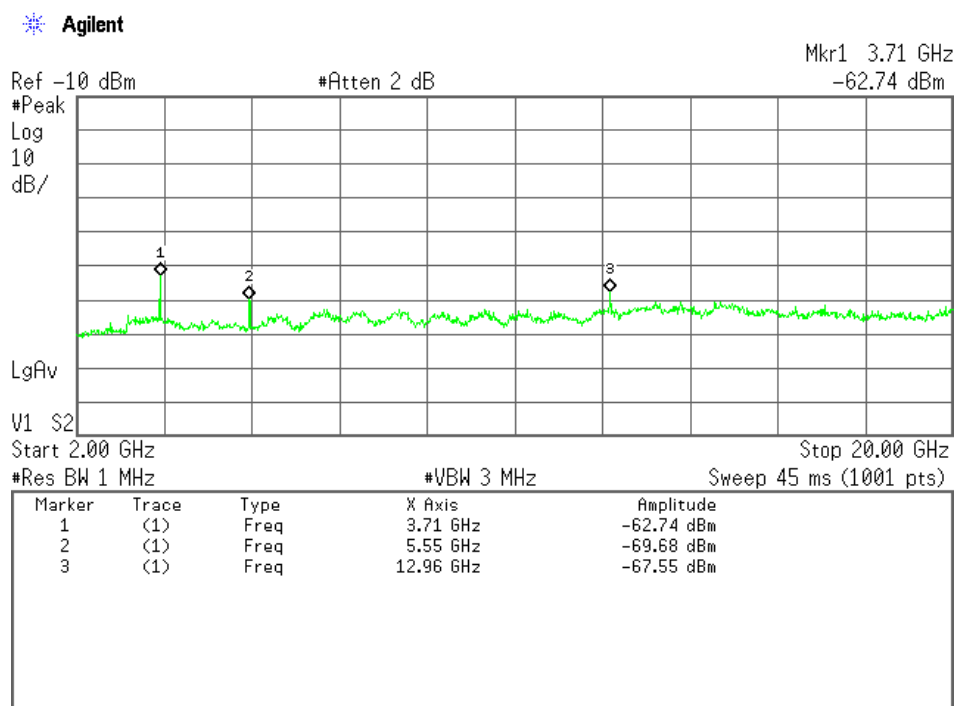
Low Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



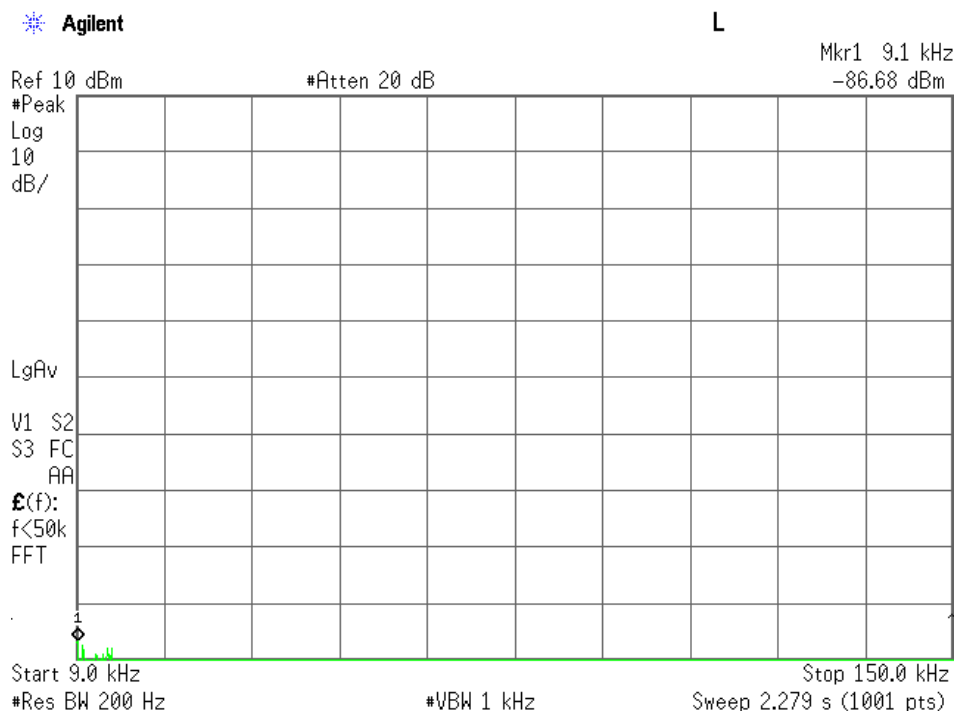
Low Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



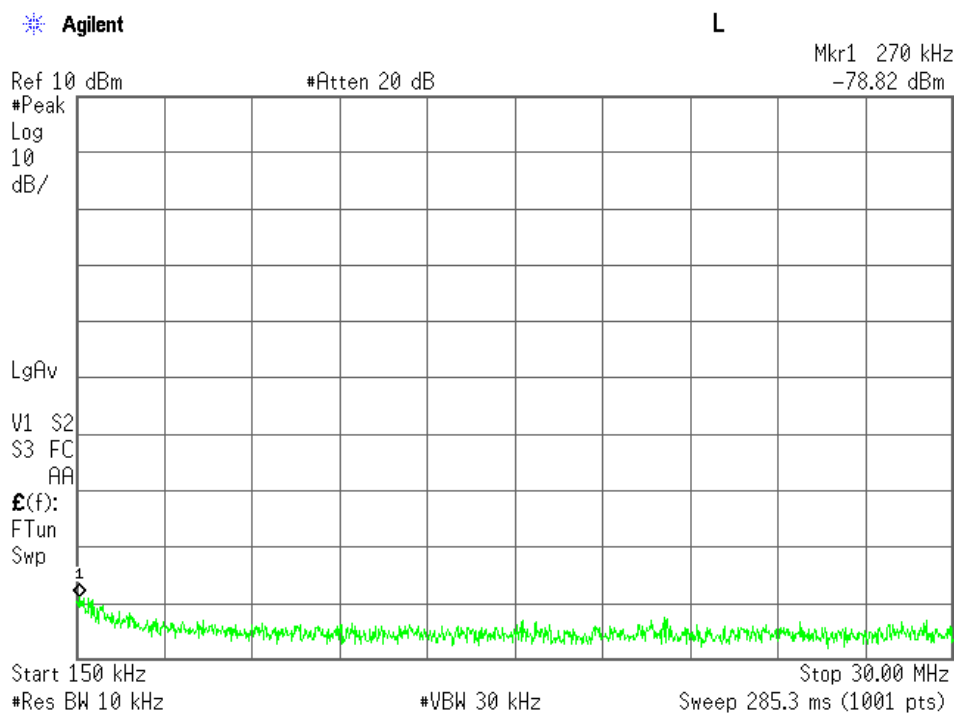
Low Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



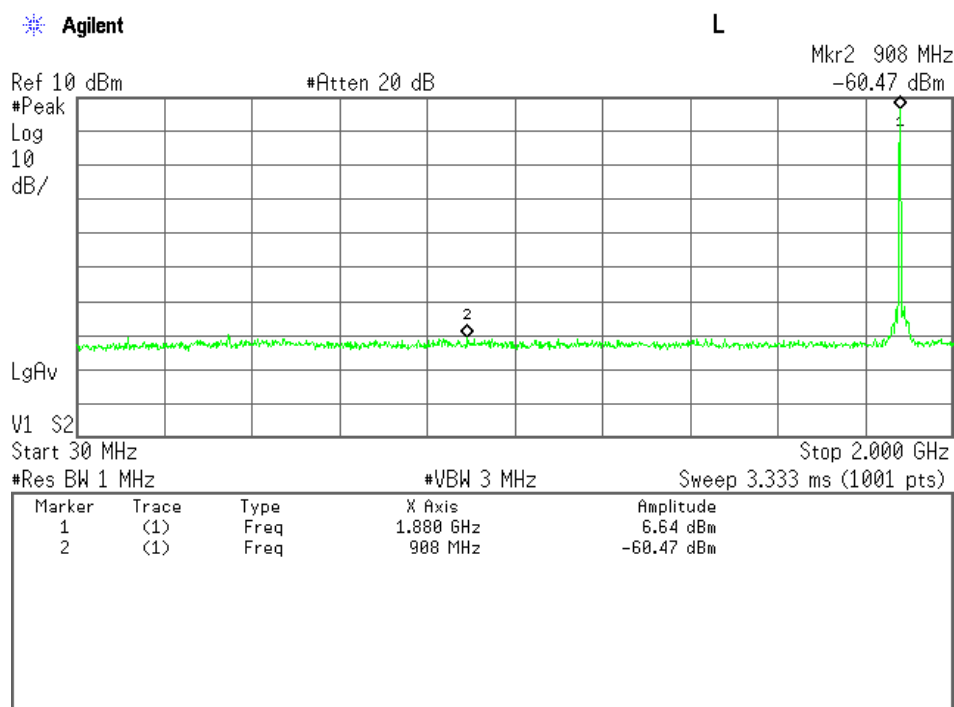
Middle Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



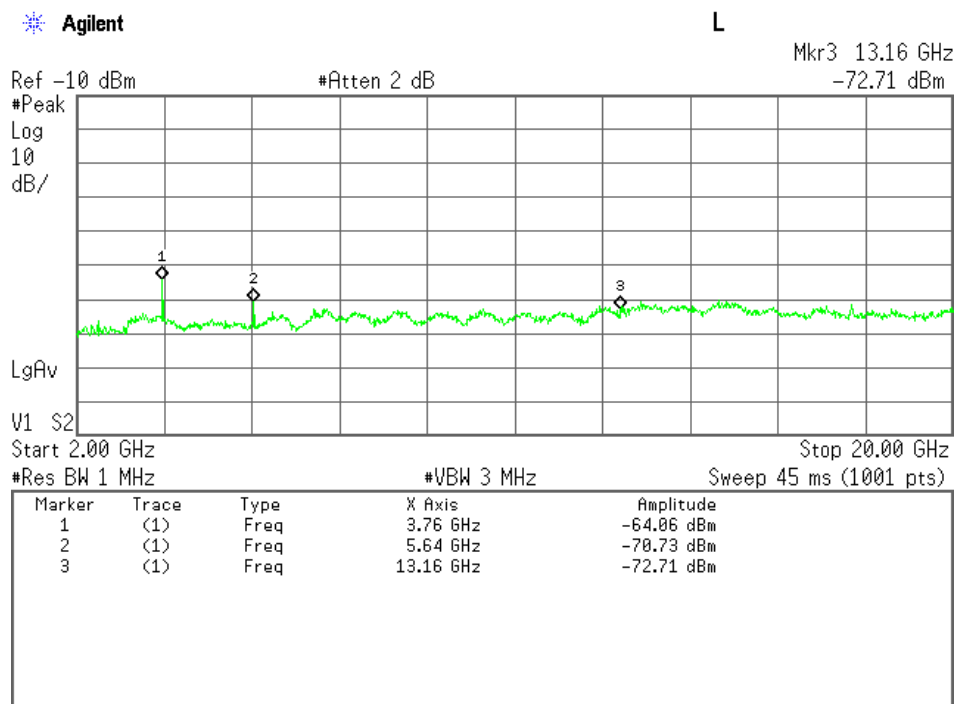
Middle Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



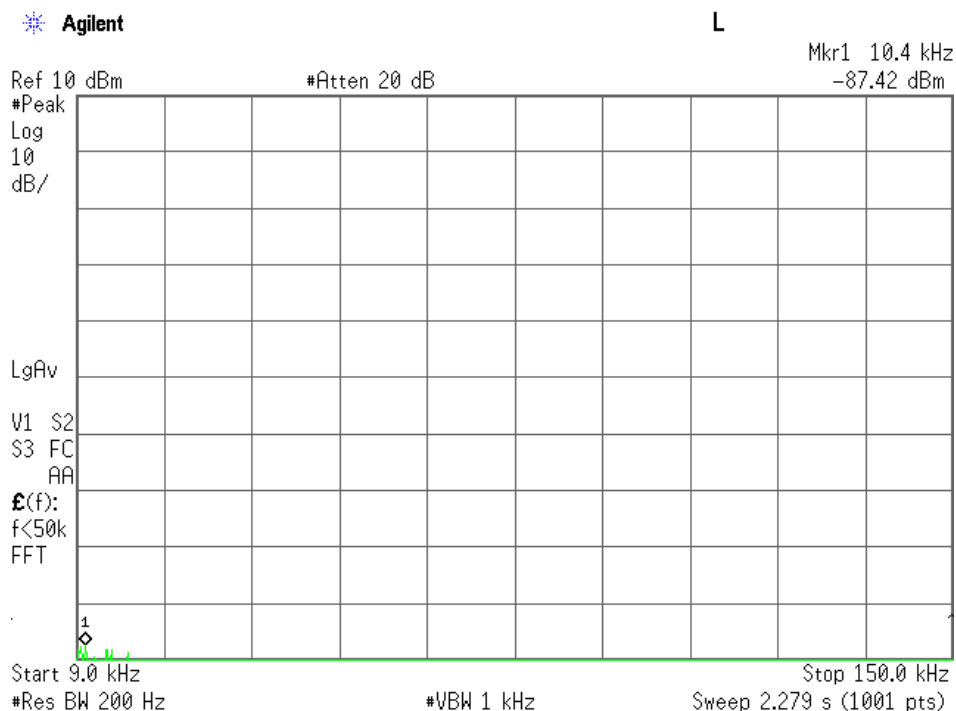
Middle Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



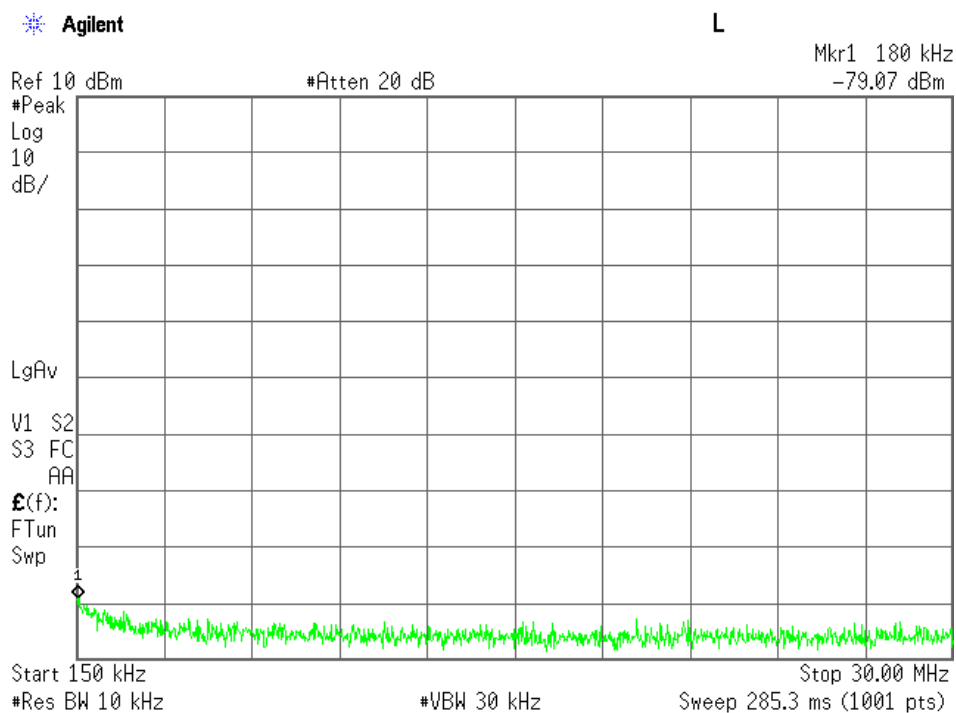
Middle Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



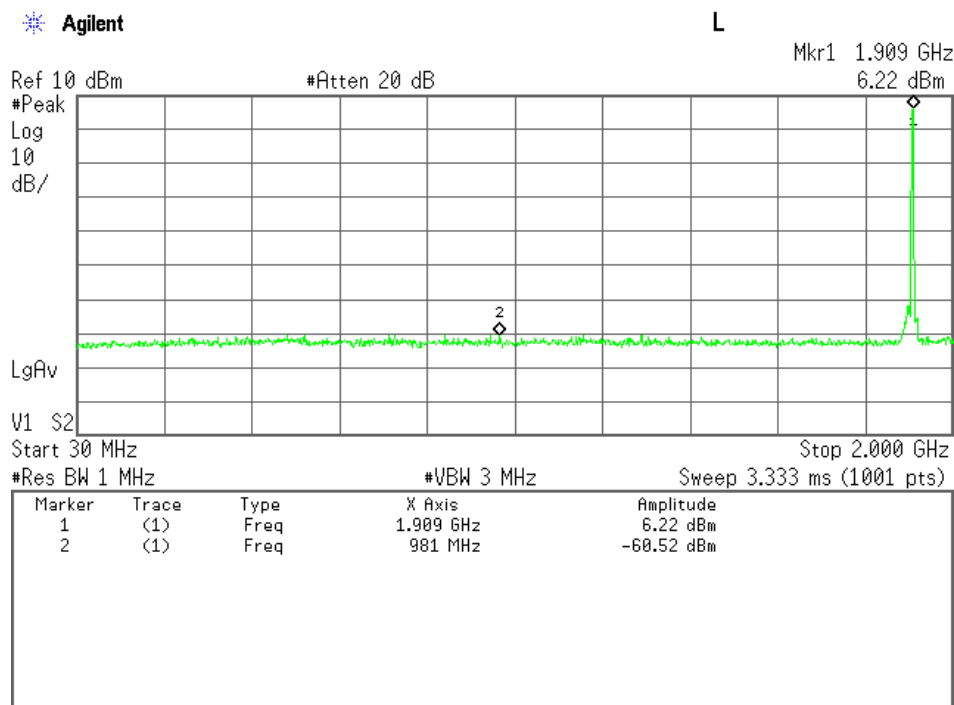
High Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



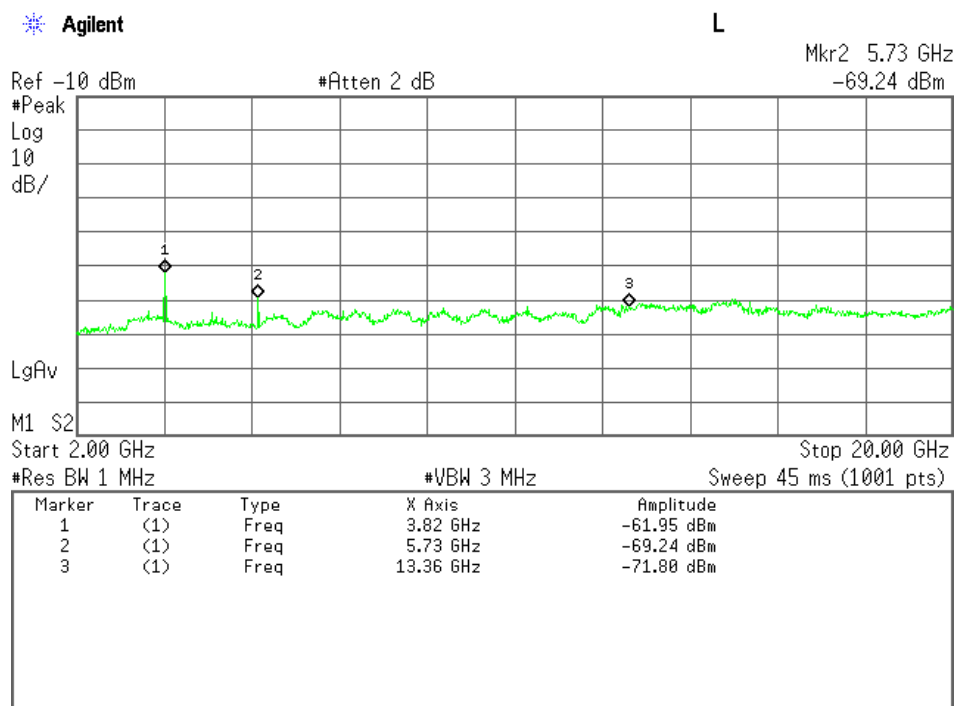
High Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



High Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



High Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



3) BW 5MHz(1RB)

(LTE 5MHz)

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH [MHz]		Measured Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dBm]	Limits [dBm]	Results [dBm]	Margin [dB]	Remarks
18625	1852.500	3705.000	21.0	-62.6	-13.0	-41.6	+28.6	C
		5557.500	21.2	-68.1	-13.0	-46.9	+33.9	C
		7410.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9262.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11115.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		12967.500	22.2	-68.3	-13.0	-46.1	+33.1	C
		14820.000	22.5	< -70.0	-13.0	< -47.5	> +34.5	C
		16672.500	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18525.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
18900	1880.000	3760.000	21.0	-64.1	-13.0	-43.1	+30.1	C
		5640.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7520.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9400.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11280.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13160.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15040.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		16920.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18800.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
19175	1907.500	3815.000	21.0	-62.7	-13.0	-41.7	+28.7	C
		5722.500	21.2	-69.3	-13.0	-48.1	+35.1	C
		7630.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9537.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11445.000	22.0	< -70.0	-13.0	< -48.0	> +35.0	C
		13352.500	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15260.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		17167.500	22.9	< -70.0	-13.0	< -47.1	> +34.1	C
		19075.000	23.2	< -70.0	-13.0	< -46.8	> +33.8	C

Calculated result at 3705.0 MHz, as the worst point shown on underline:

Corr. Factor	=	21.0 dB
+) <u>Meter Reading</u>	=	<u>-62.6 dBm</u>
Result	=	-41.6 dBm

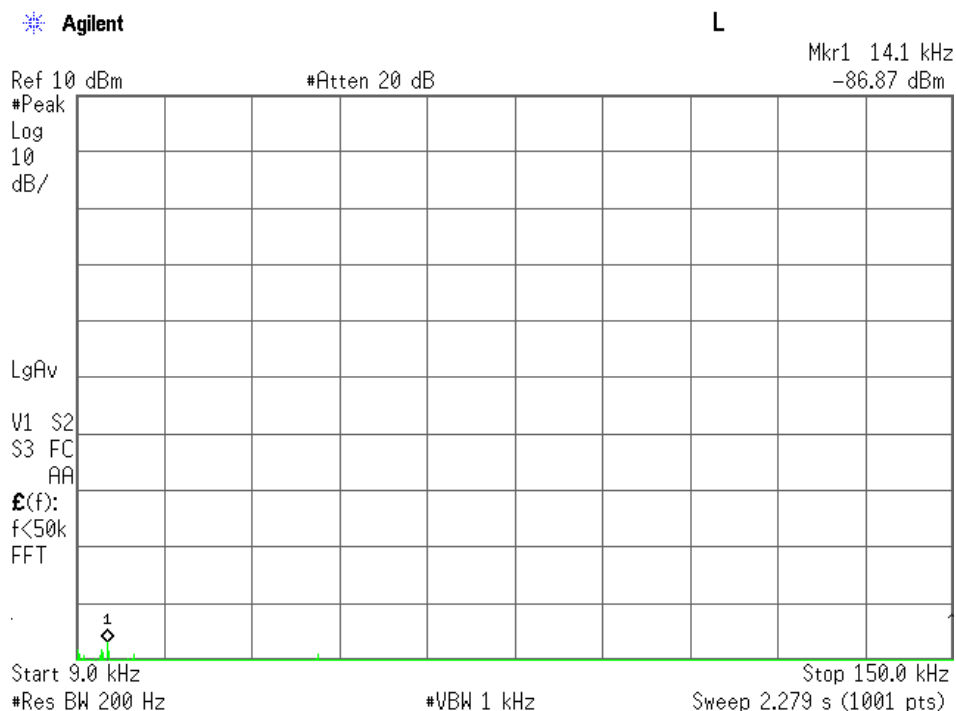
Minimum Margin: -13.0 - (-41.6) = 28.6 (dB)

NOTES

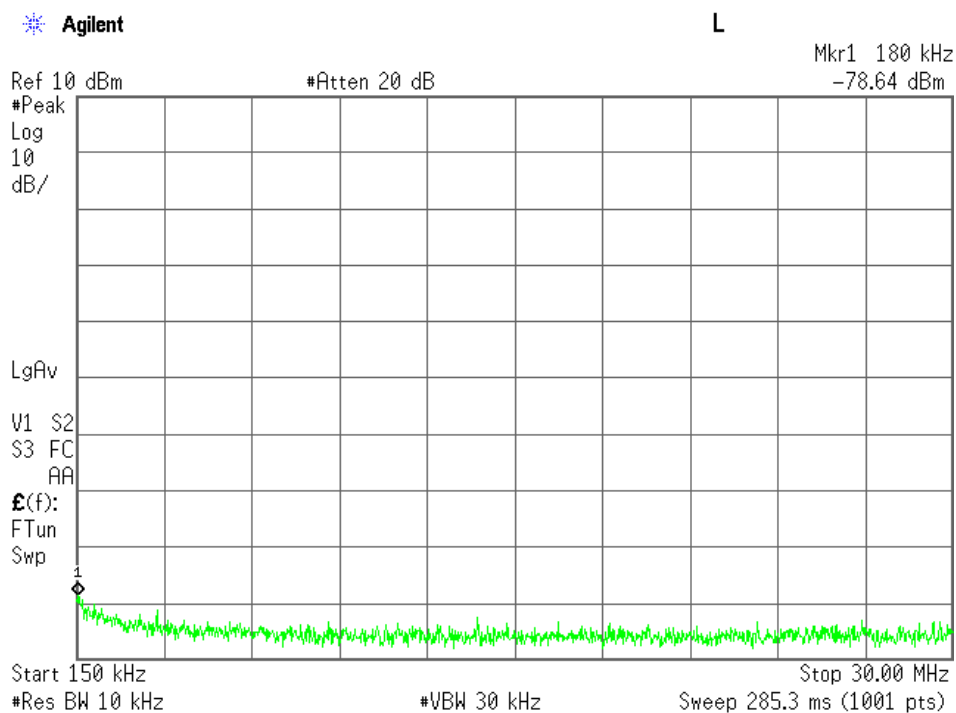
- The spectrum was checked from 9 kHz to 20 GHz.
- Applied limits : $-13.0 \text{ [dBm]} = 10\log(\text{TP[mW]}) - (43 + 10\log(\text{tp[W]})) = 10\log(\text{TP[mW]}) - (43 + (10 \log(\text{TP[mW]}) - 30))$
where, $\text{tp[W]} = \text{TP[mW]} / 1000$: Transmitter power at antenna terminal
- The correction factor is shown as follows:
Corr. Factor [dB] = Cable Loss + Pad Att. [dB] (9 kHz - 2 GHz)
Corr. Factor [dB] = Cable Loss + Pad Att. + High Pass Filter Loss [dB] (over 2 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	200 Hz	1 kHz	AUTO
B	Peak	10 kHz	30 kHz	AUTO
C	Peak	1 MHz	3 MHz	AUTO

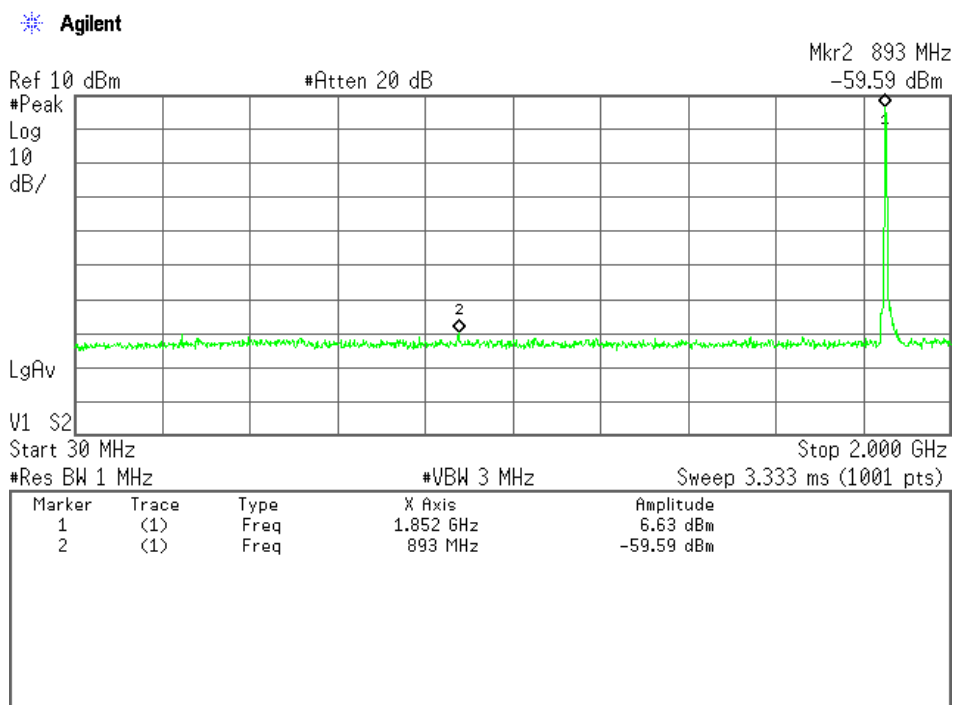
Low Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



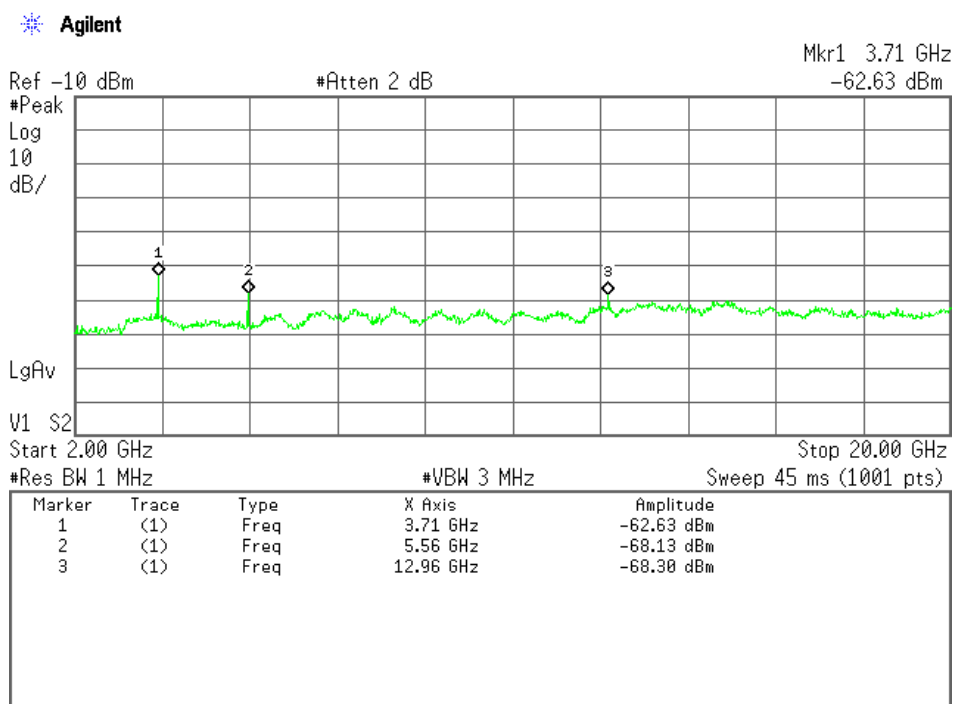
Low Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



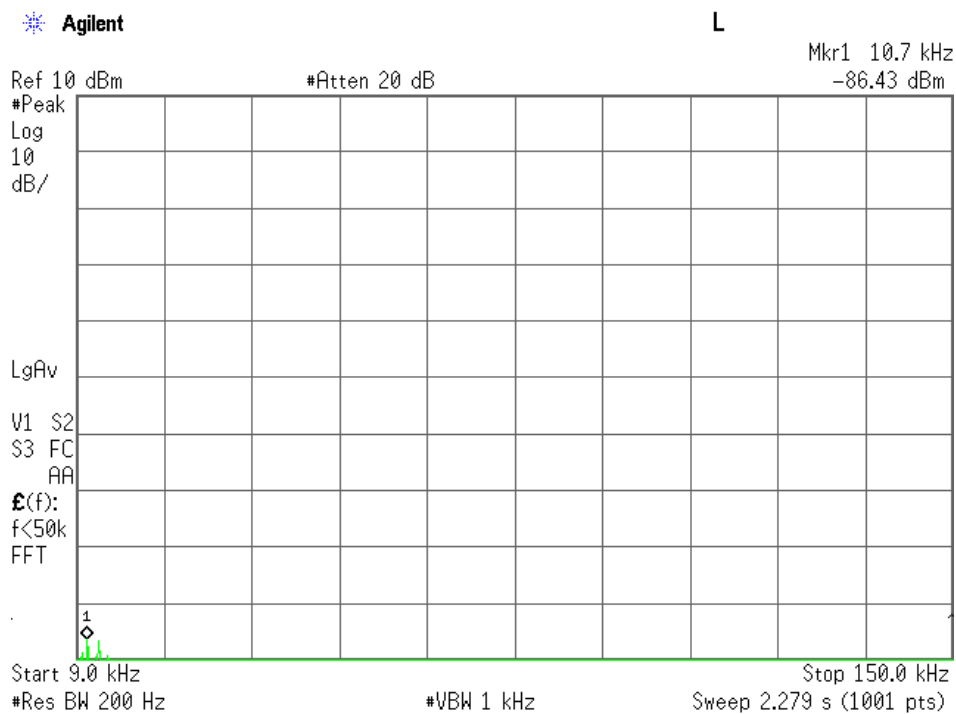
Low Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



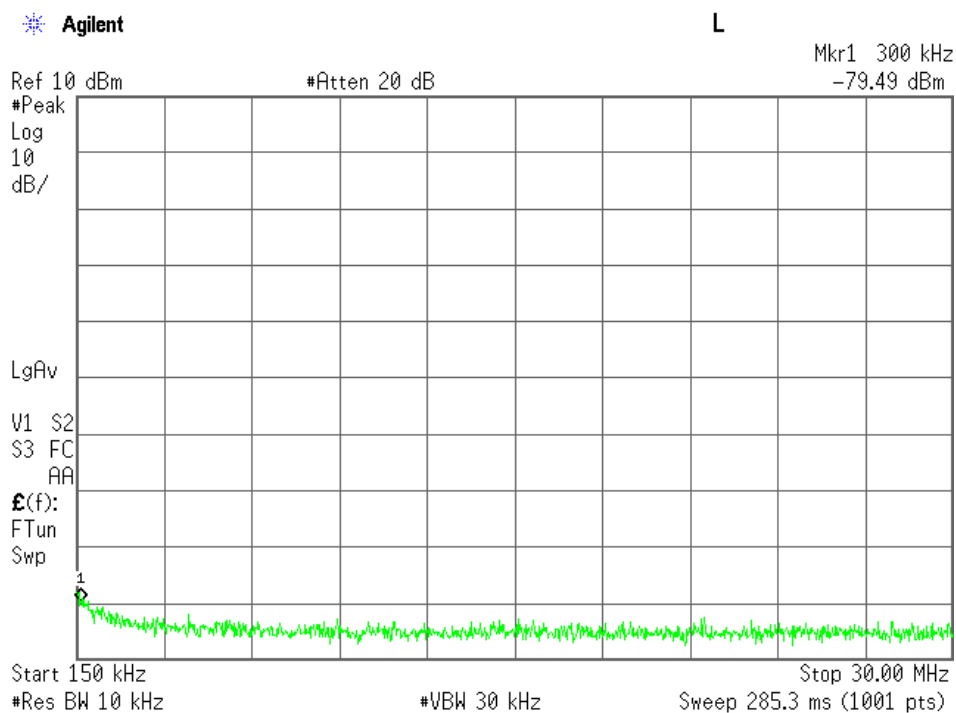
Low Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



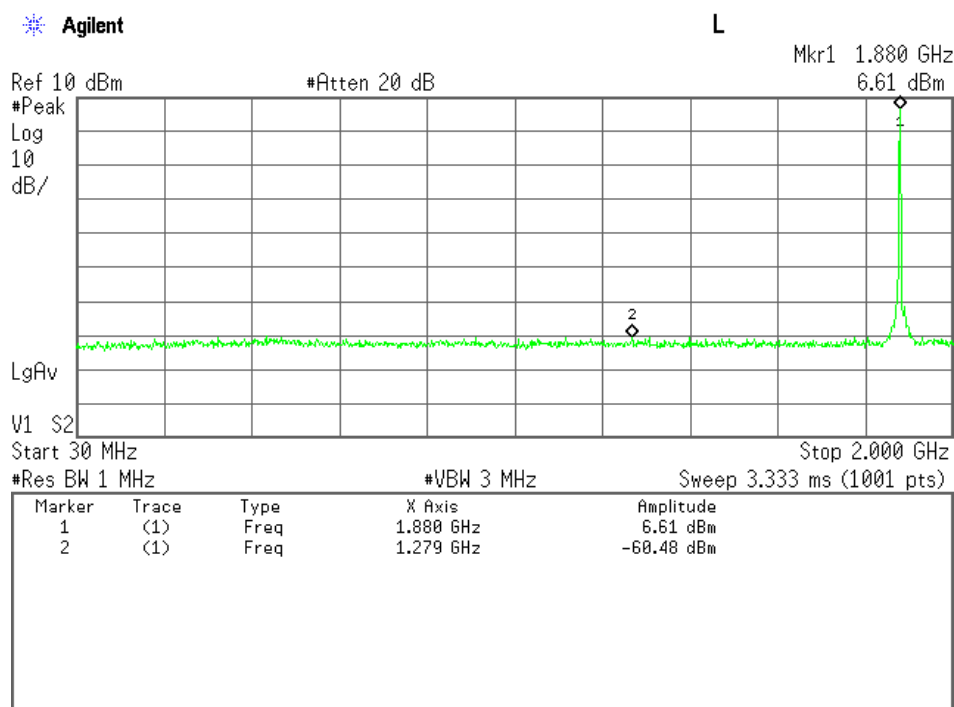
Middle Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



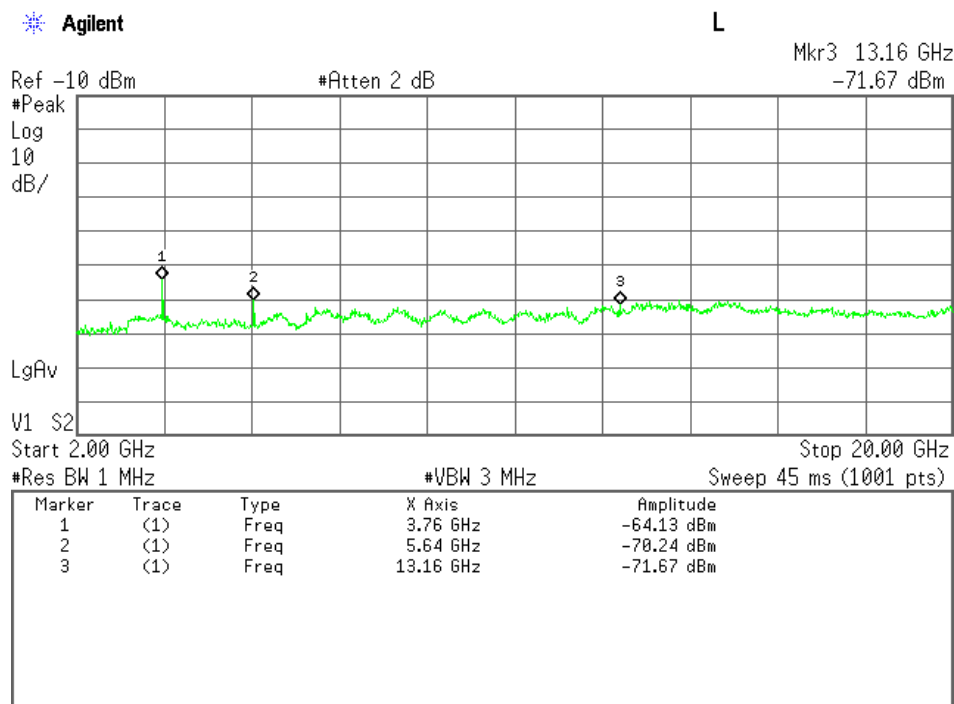
Middle Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



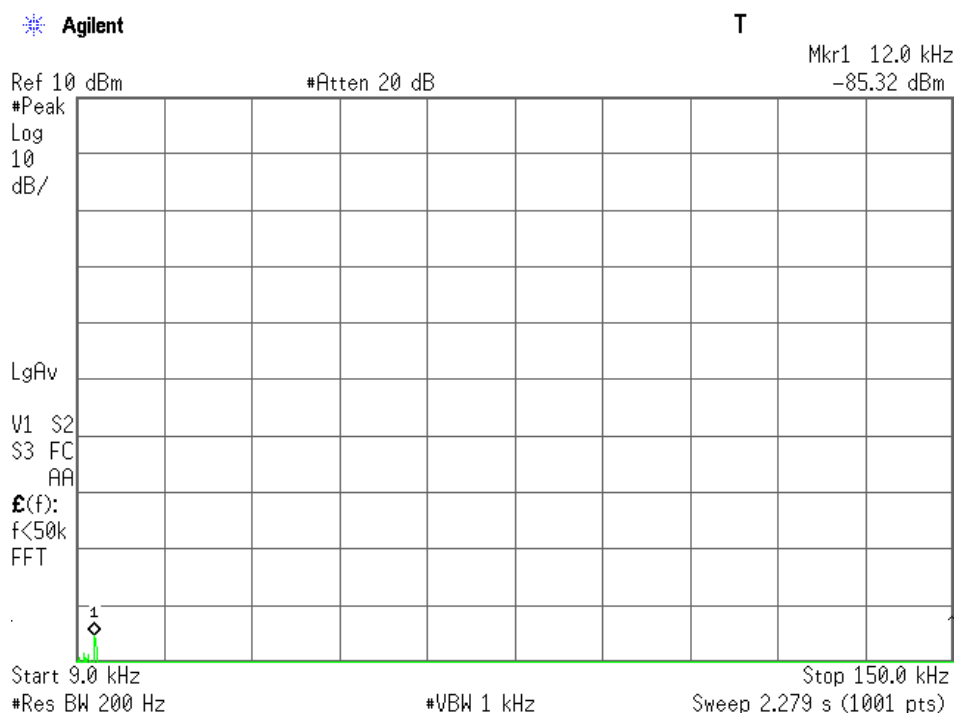
Middle Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



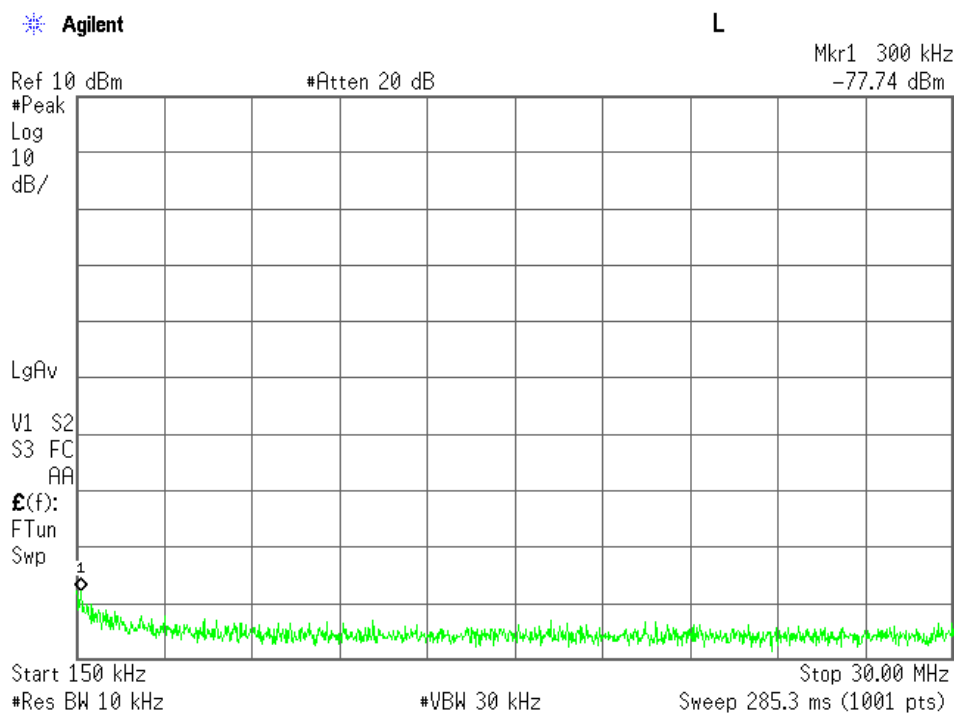
Middle Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



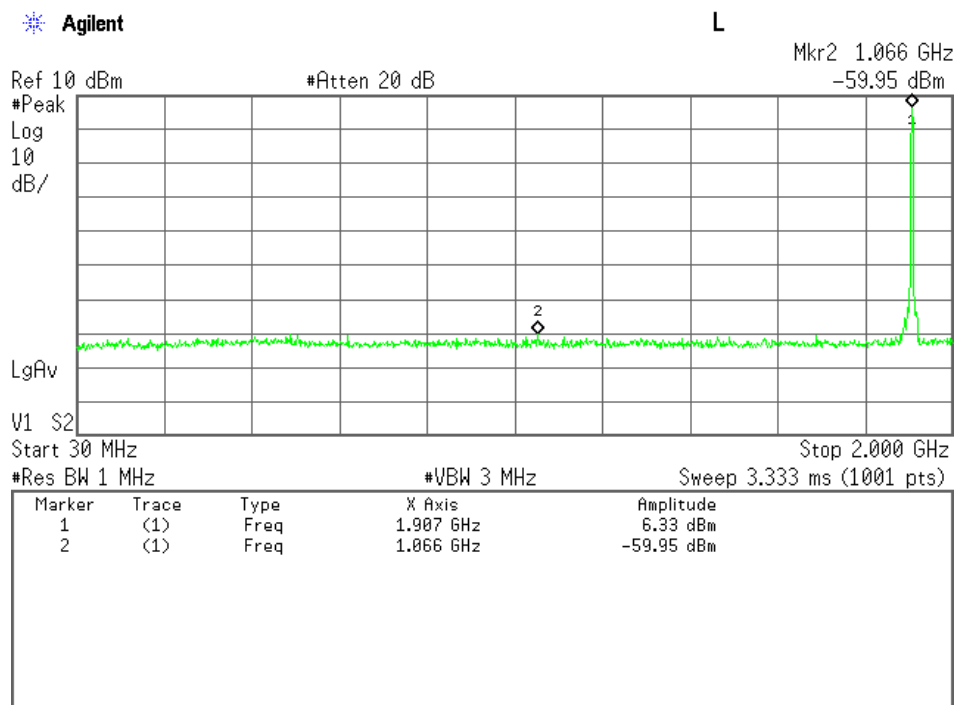
High Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



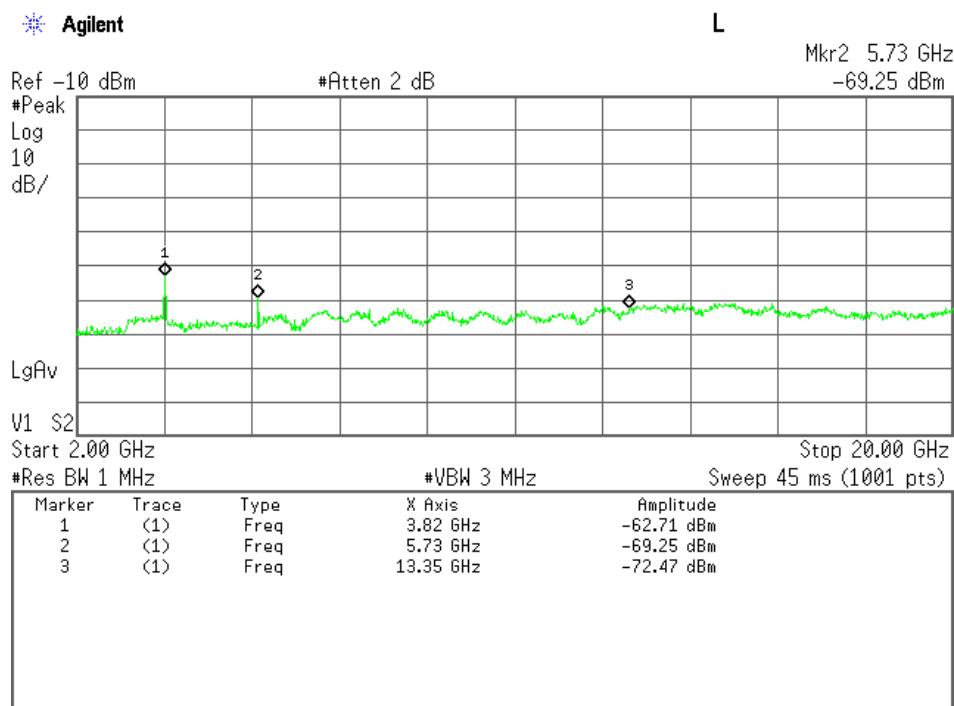
High Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



High Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



High Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



4) BW 10MHz(1RB)

(LTE 10MHz)

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH [MHz]		Measured Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dBm]	Limits [dBm]	Results [dBm]	Margin [dB]	Remarks
18650	1855.000	3710.000	21.0	-62.5	-13.0	-41.5	+28.5	C
		5565.000	21.2	-68.8	-13.0	-47.6	+34.6	C
		7420.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9275.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11130.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		12985.000	22.2	-68.0	-13.0	-45.8	+32.8	C
		14840.000	22.5	< -70.0	-13.0	< -47.5	> +34.5	C
		16695.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18550.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
18900	1880.000	3760.000	21.0	-63.8	-13.0	-42.8	+29.8	C
		5640.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7520.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9400.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11280.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13160.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15040.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		16920.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18800.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
19150	1905.000	3810.000	21.0	-64.9	-13.0	-43.9	+30.9	C
		5715.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7620.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9525.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11430.000	22.0	< -70.0	-13.0	< -48.0	> +35.0	C
		13335.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15240.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		17145.000	22.9	< -70.0	-13.0	< -47.1	> +34.1	C
		19050.000	23.2	< -70.0	-13.0	< -46.8	> +33.8	C

Calculated result at 3710.0 MHz, as the worst point shown on underline:

Corr. Factor	=	21.0 dB
+) <u>Meter Reading</u>	=	<u>-62.5 dBm</u>
Result	=	-41.5 dBm

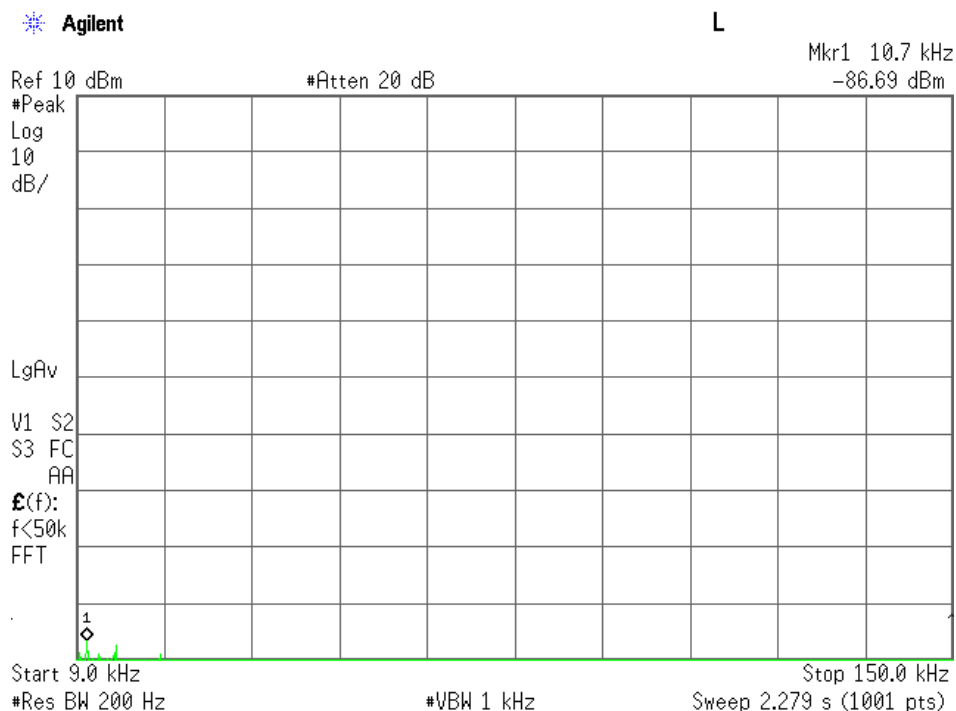
Minimum Margin: -13.0 - (-41.5) = 28.5 (dB)

NOTES

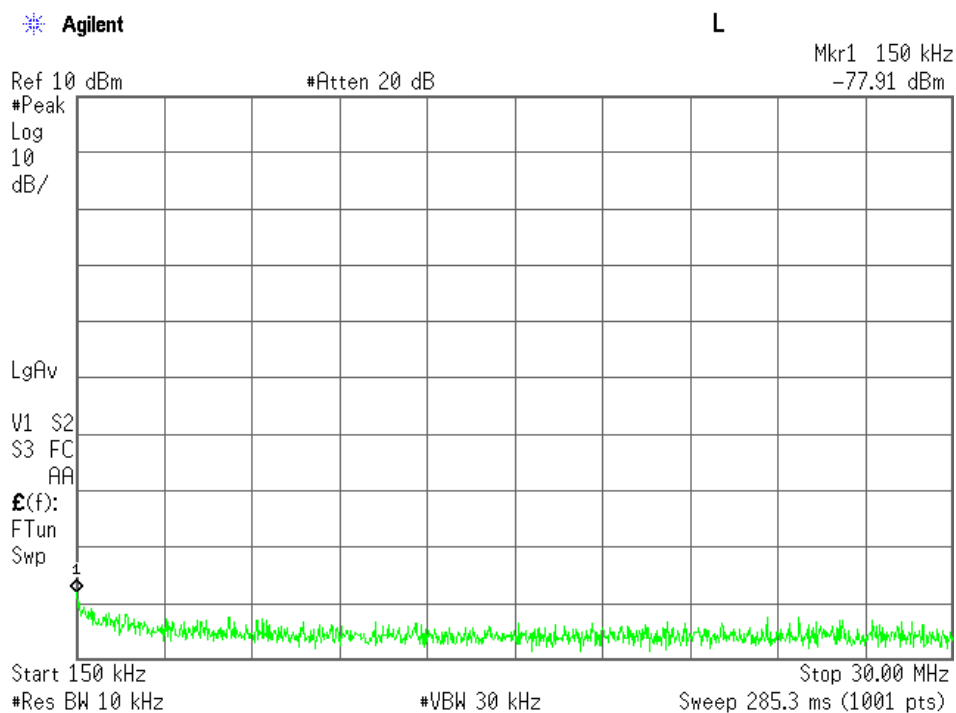
- The spectrum was checked from 9 kHz to 20 GHz.
- Applied limits : $-13.0 \text{ [dBm]} = 10\log(\text{TP[mW]}) - (43 + 10\log(\text{tp[W]})) = 10\log(\text{TP[mW]}) - (43 + (10 \log(\text{TP[mW]}) - 30))$
where, $\text{tp[W]} = \text{TP[mW]} / 1000$: Transmitter power at antenna terminal
- The correction factor is shown as follows:
Corr. Factor [dB] = Cable Loss + Pad Att. [dB] (9 kHz - 2 GHz)
Corr. Factor [dB] = Cable Loss + Pad Att. + High Pass Filter Loss [dB] (over 2 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	200 Hz	1 kHz	AUTO
B	Peak	10 kHz	30 kHz	AUTO
C	Peak	1 MHz	3 MHz	AUTO

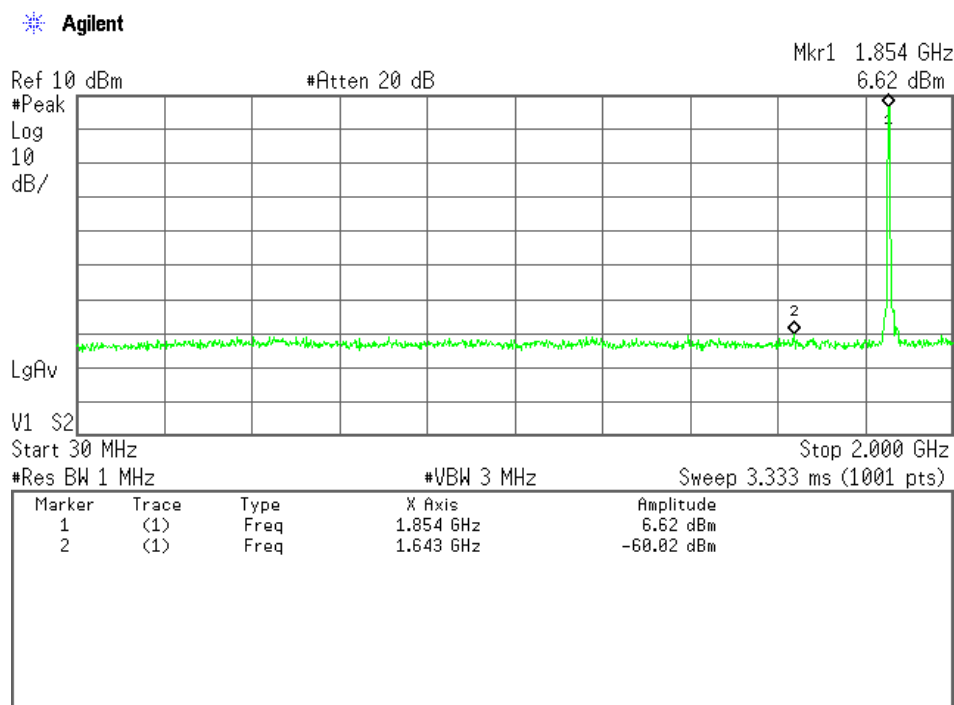
Low Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



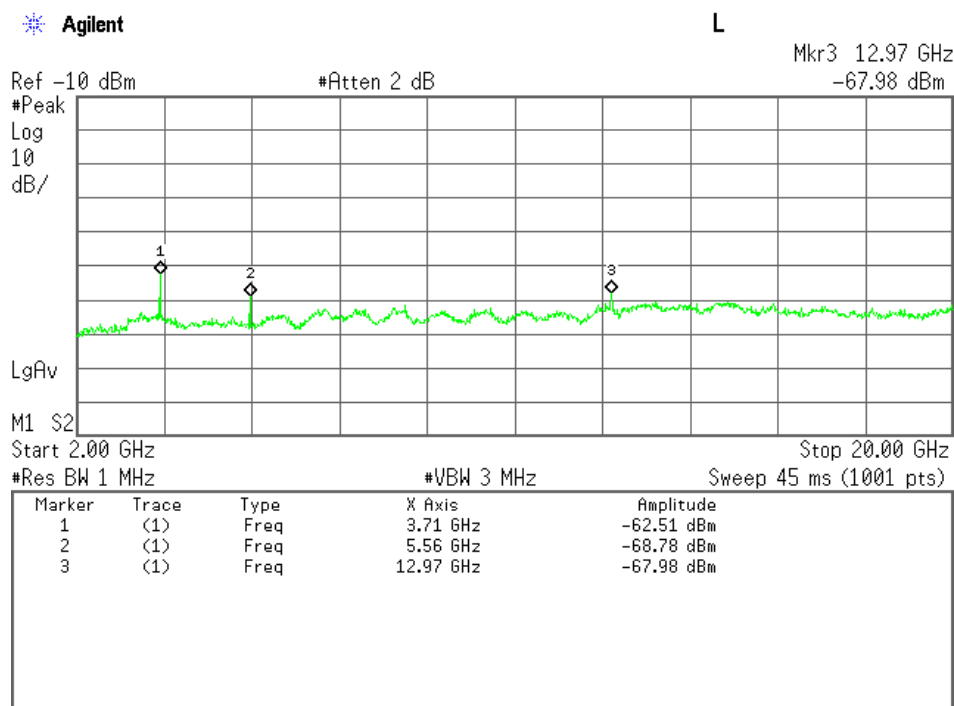
Low Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



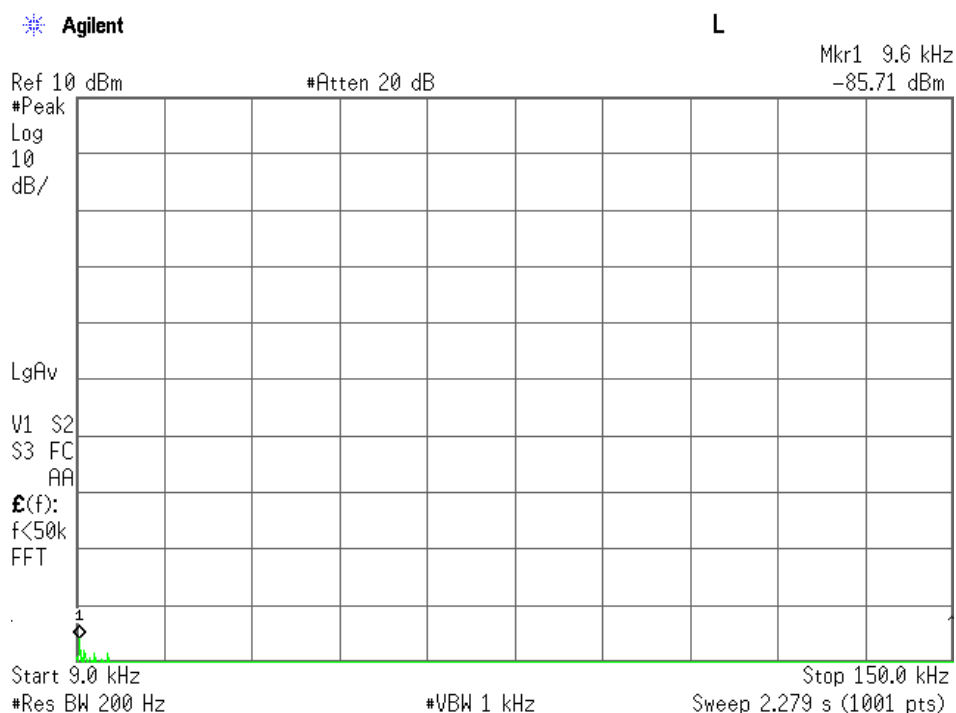
Low Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



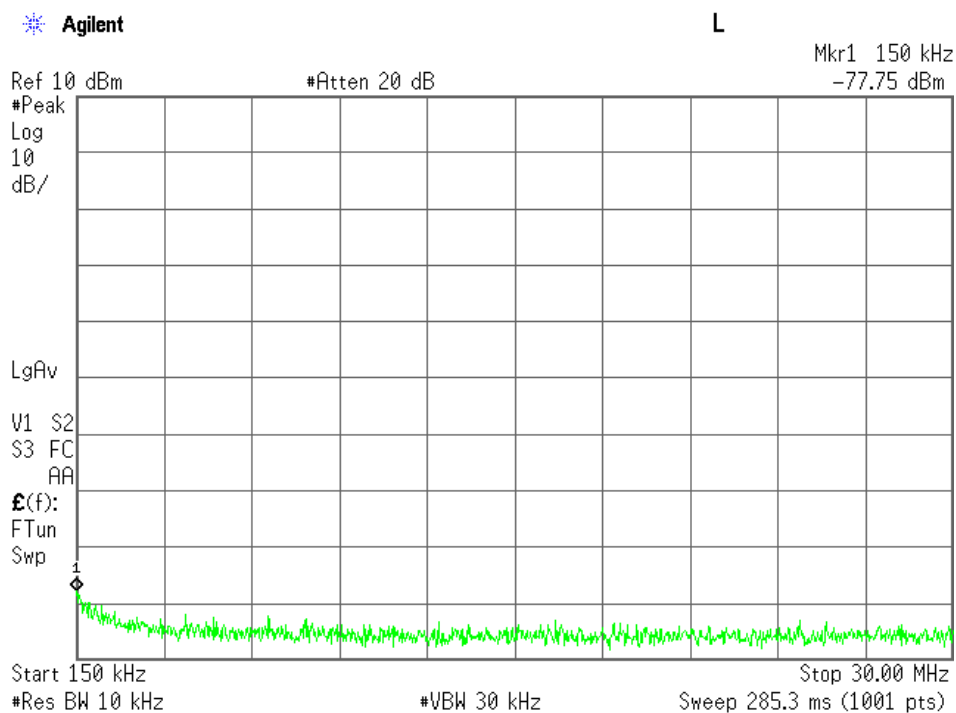
Low Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



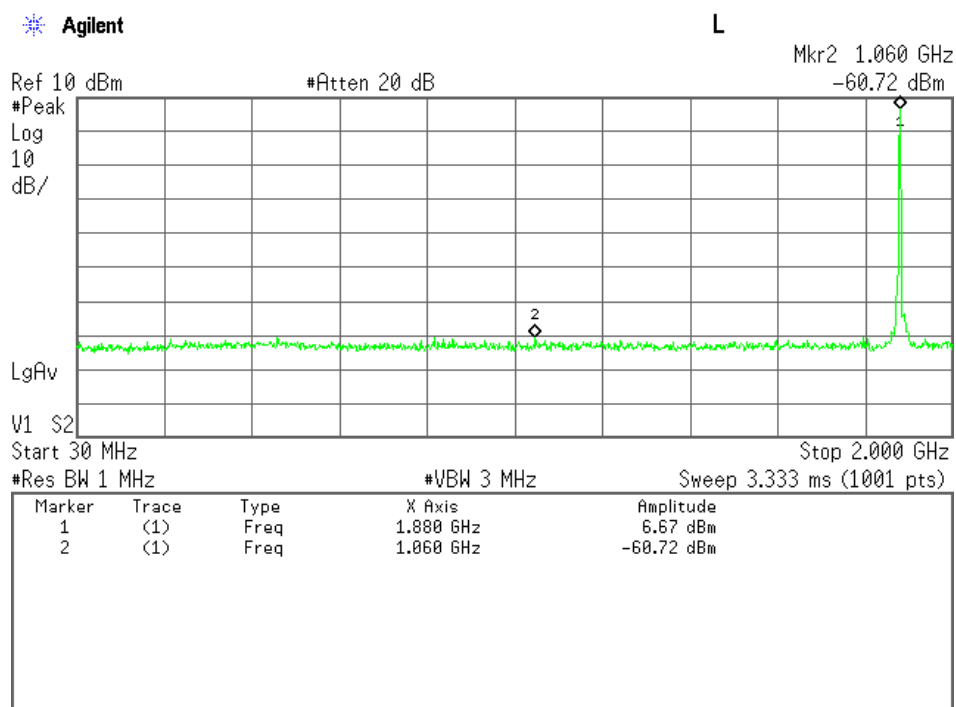
Middle Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



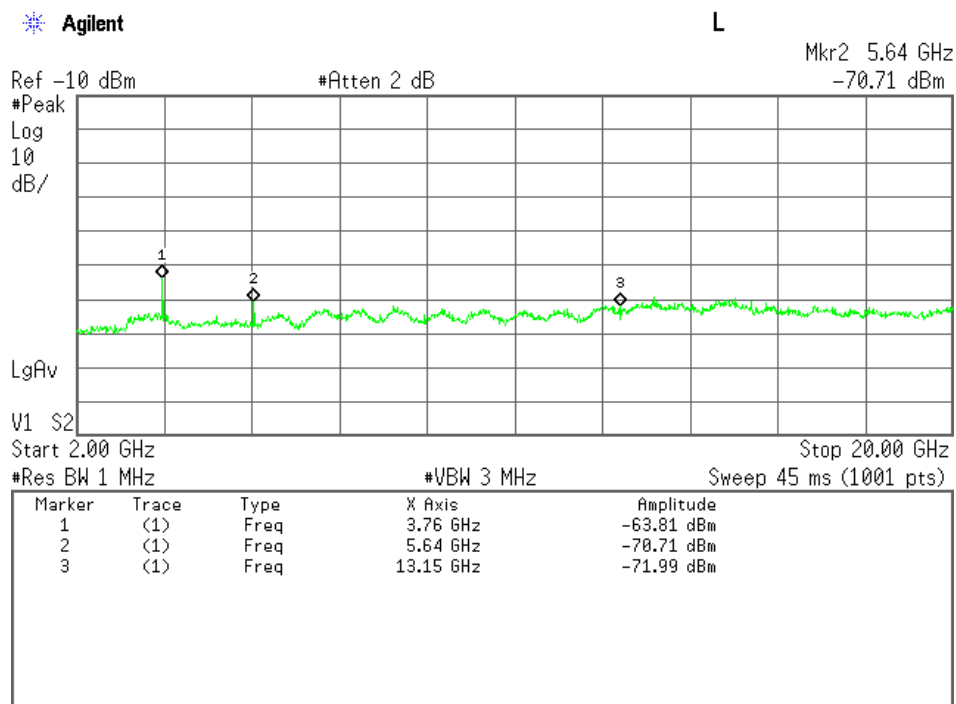
Middle Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



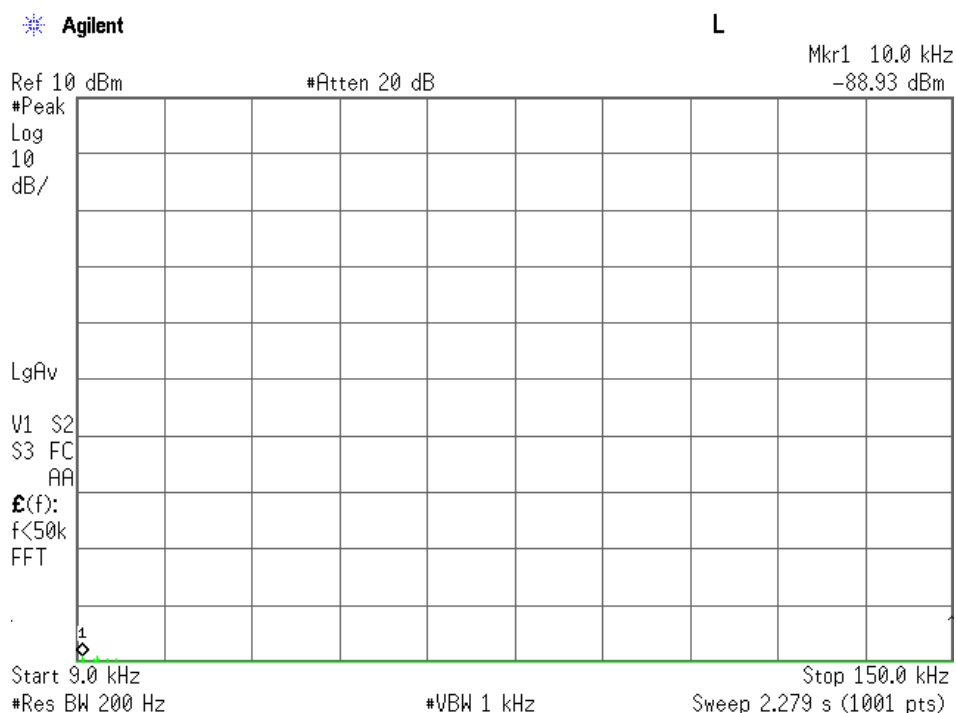
Middle Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



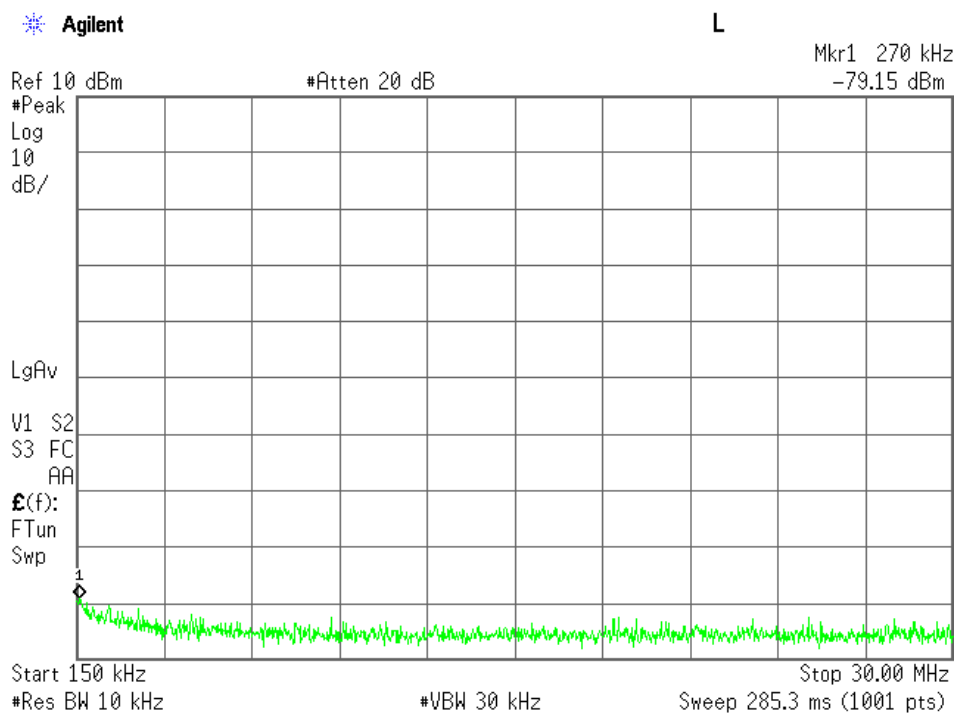
Middle Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



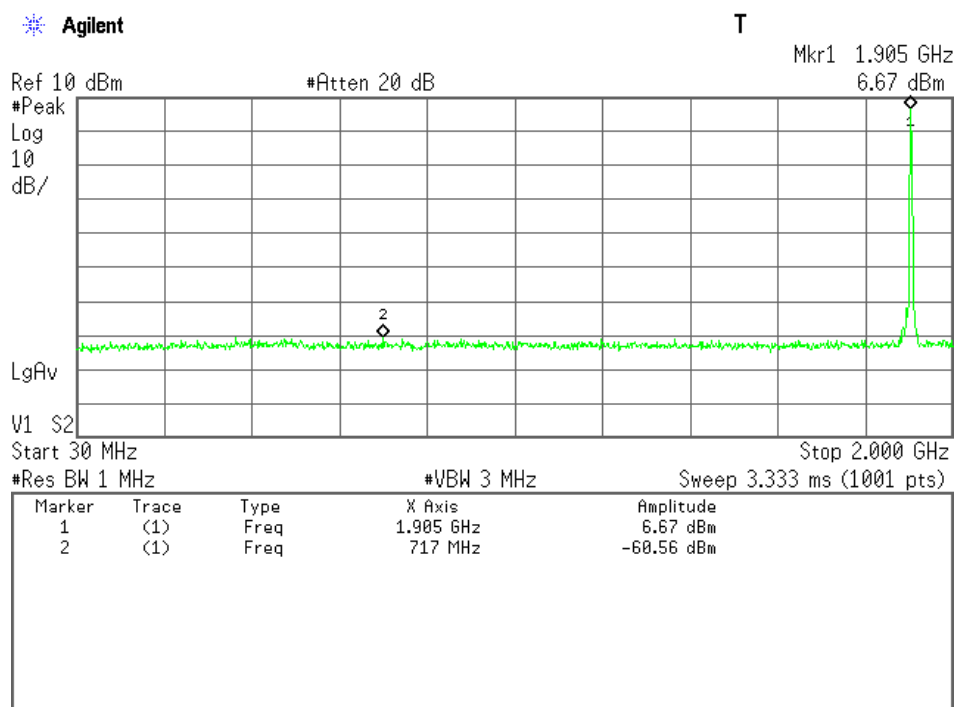
High Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



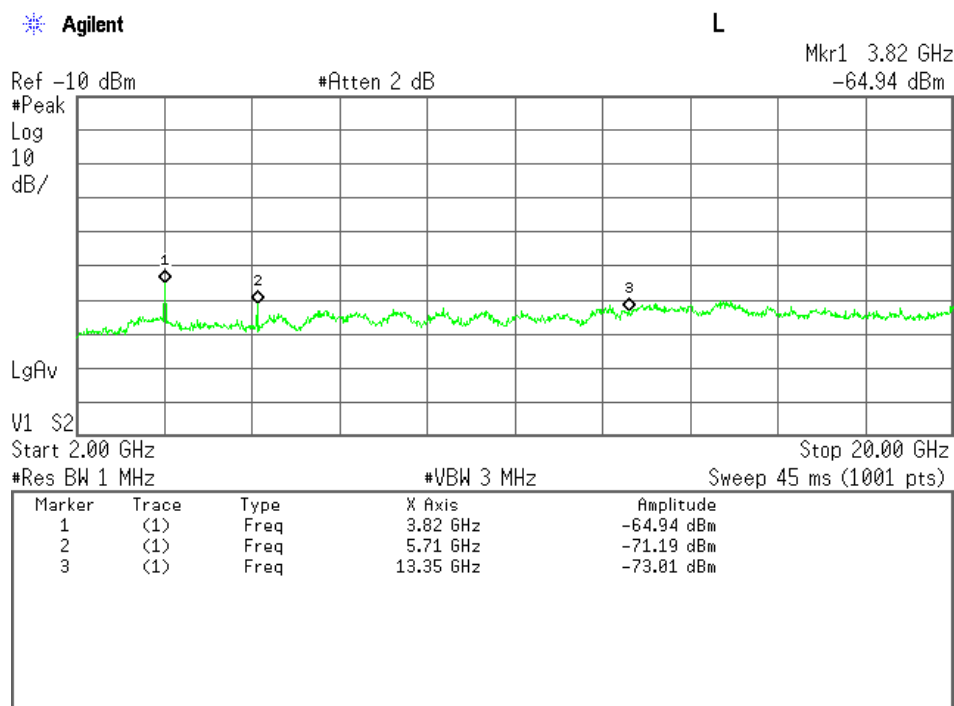
High Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



High Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



High Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



5) BW 15MHz(1RB)

(LTE 15MHz)

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH [MHz]		Measured Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dBm]	Limits [dBm]	Results [dBm]	Margin [dB]	Remarks
18675	1857.500	3715.000	21.0	-62.5	-13.0	-41.5	+28.5	C
		5572.500	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7430.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9287.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11145.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13002.500	22.2	-68.4	-13.0	-46.2	+33.2	C
		14860.000	22.5	< -70.0	-13.0	< -47.5	> +34.5	C
		16717.500	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18575.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
18900	1880.000	3760.000	21.0	-63.5	-13.0	-42.5	+29.5	C
		5640.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7520.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9400.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11280.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13160.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15040.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		16920.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18800.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
19125	1902.500	3805.000	21.0	-65.8	-13.0	-44.8	+31.8	C
		5707.500	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7610.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9512.500	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11415.000	22.0	< -70.0	-13.0	< -48.0	> +35.0	C
		13317.500	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15220.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		17122.500	22.9	< -70.0	-13.0	< -47.1	> +34.1	C
		19025.000	23.2	< -70.0	-13.0	< -46.8	> +33.8	C

Calculated result at 3715.0 MHz, as the worst point shown on underline:

Corr. Factor	=	21.0 dB
+) <u>Meter Reading</u>	=	<u>-62.5 dBm</u>
Result	=	-41.5 dBm

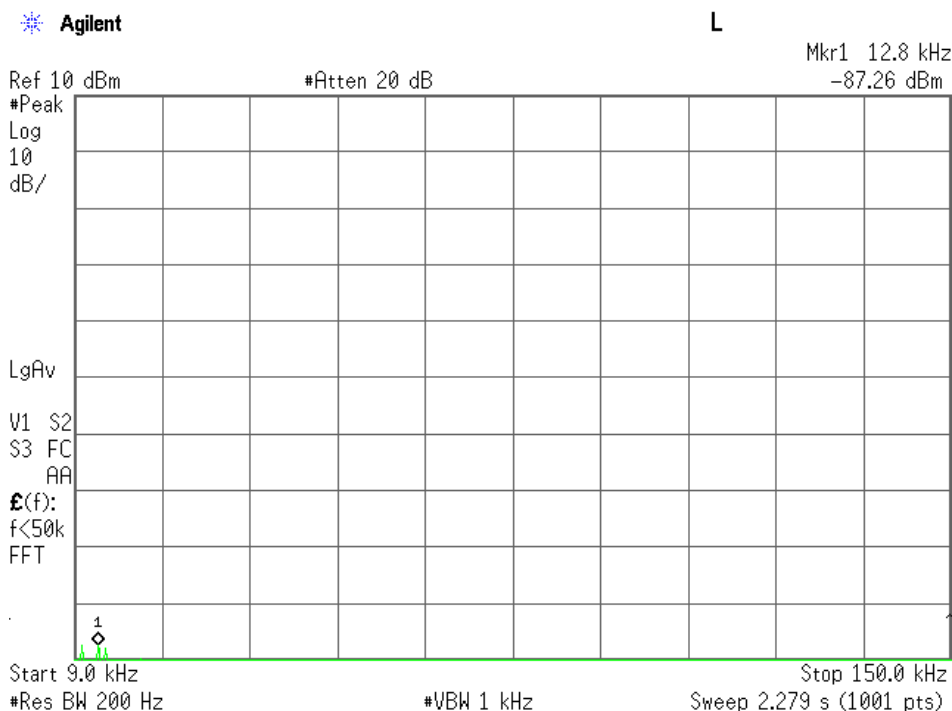
Minimum Margin: -13.0 - (-41.5) = 28.5 (dB)

NOTES

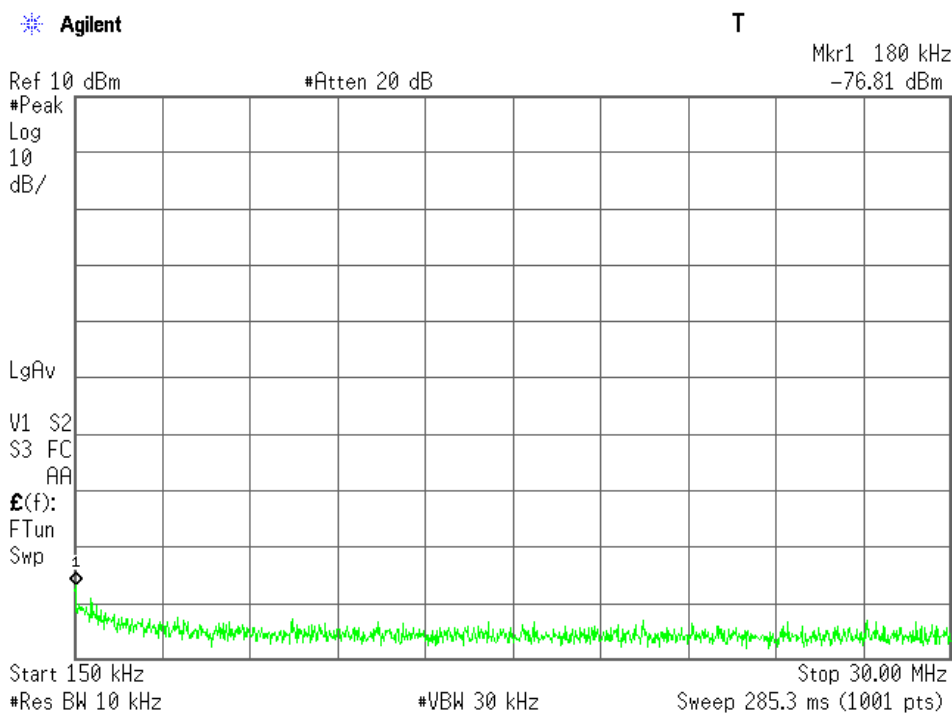
- The spectrum was checked from 9 kHz to 20 GHz.
- Applied limits : $-13.0 \text{ [dBm]} = 10\log(\text{TP[mW]}) - (43 + 10\log(\text{tp[W]})) = 10\log(\text{TP[mW]}) - (43 + (10 \log(\text{TP[mW]}) - 30))$
where, $\text{tp[W]} = \text{TP[mW]} / 1000$: Transmitter power at antenna terminal
- The correction factor is shown as follows:
Corr. Factor [dB] = Cable Loss + Pad Att. [dB] (9 kHz - 2 GHz)
Corr. Factor [dB] = Cable Loss + Pad Att. + High Pass Filter Loss [dB] (over 2 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	200 Hz	1 kHz	AUTO
B	Peak	10 kHz	30 kHz	AUTO
C	Peak	1 MHz	3 MHz	AUTO

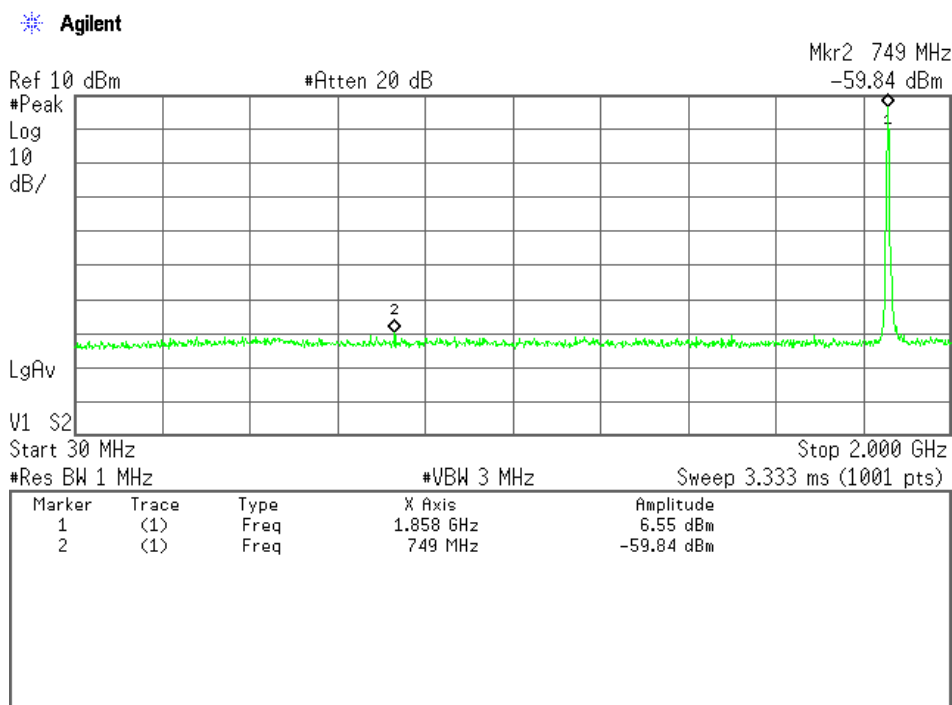
Low Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



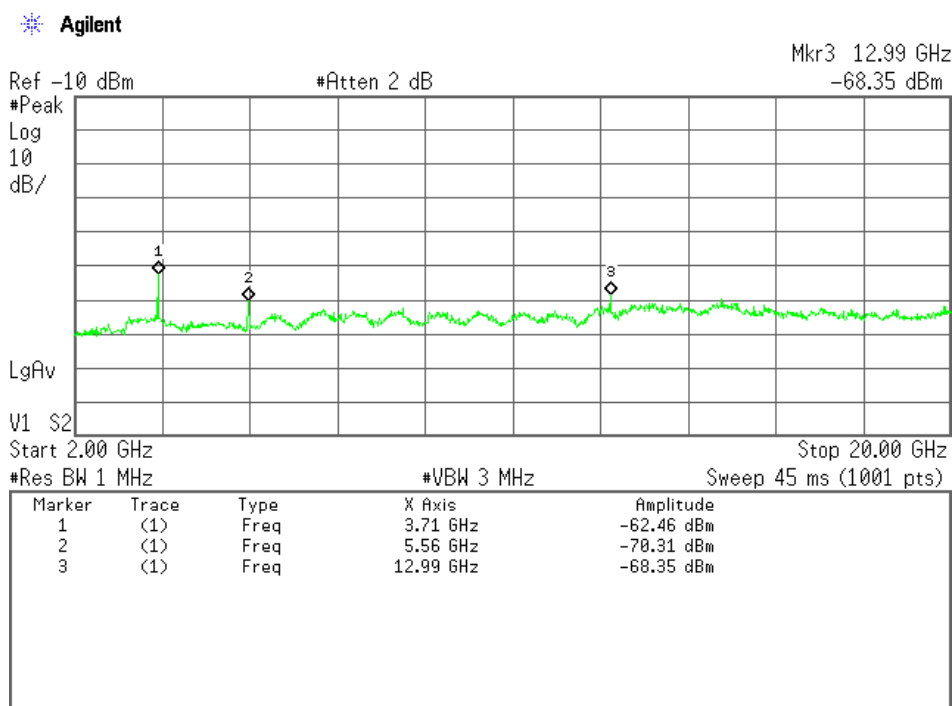
Low Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



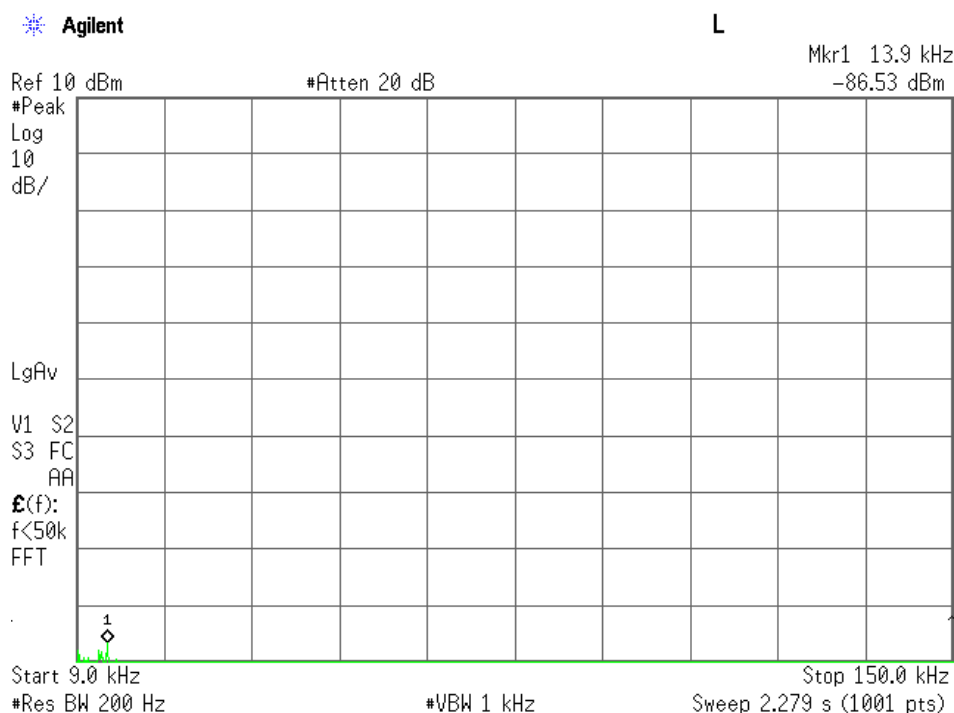
Low Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



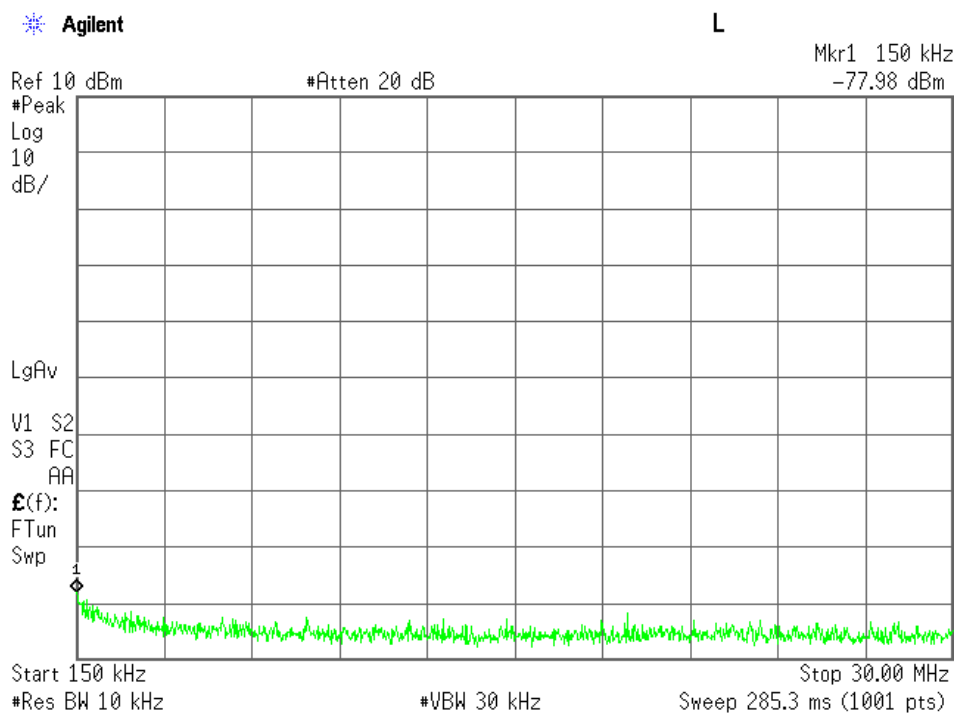
Low Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



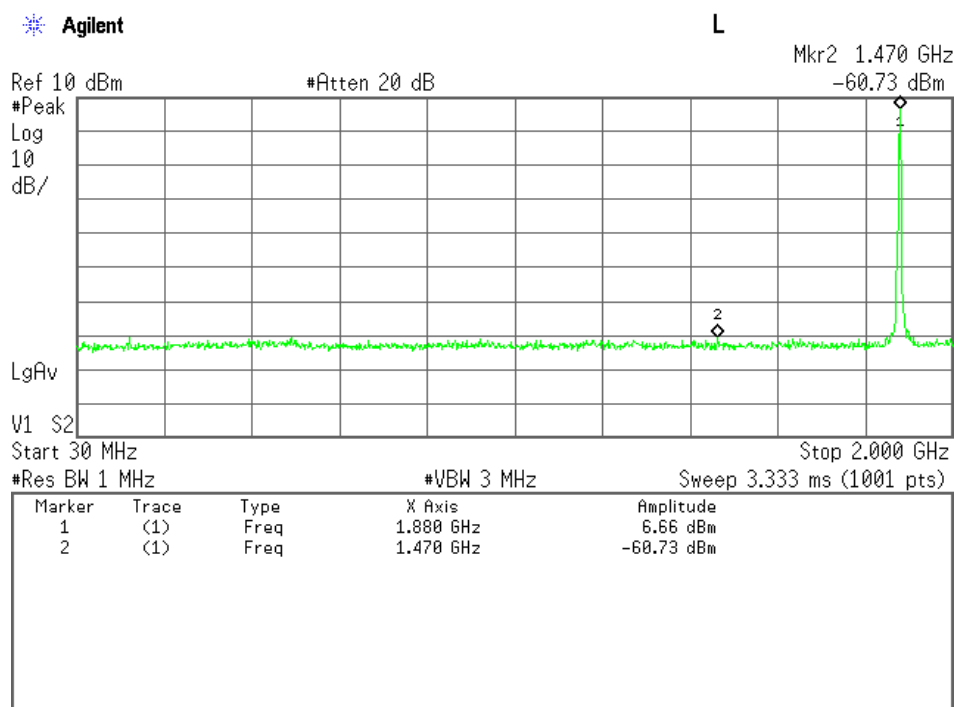
Middle Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



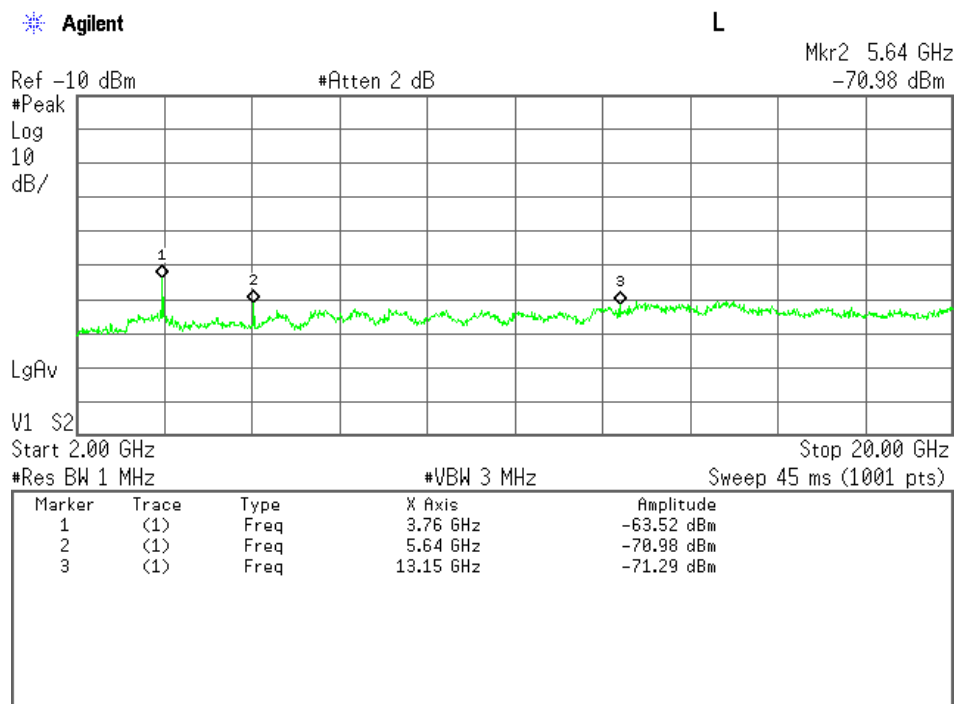
Middle Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



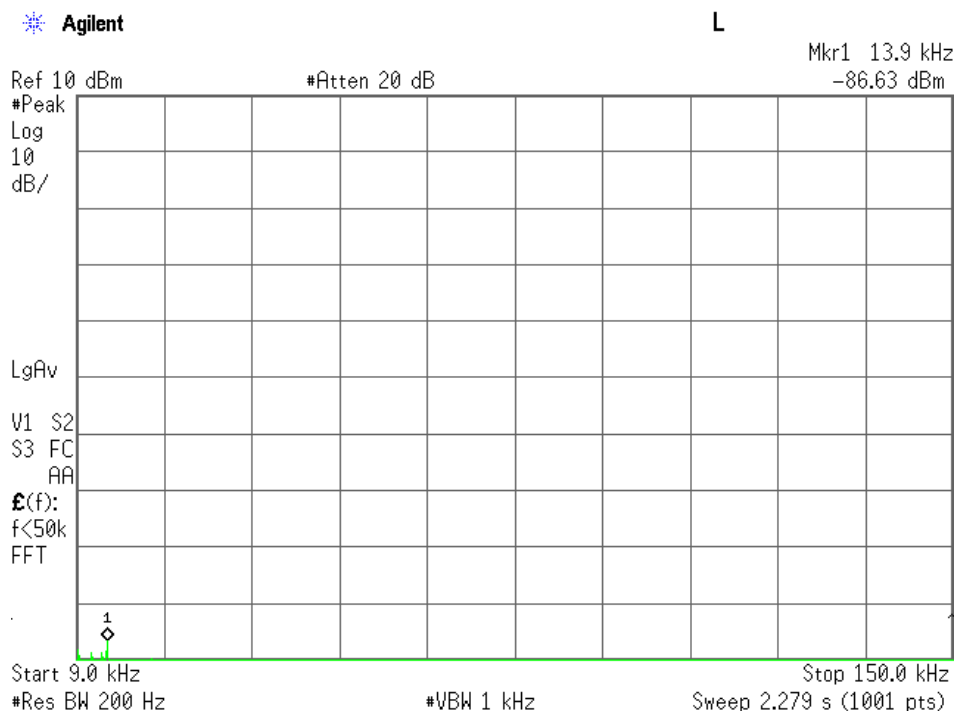
Middle Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



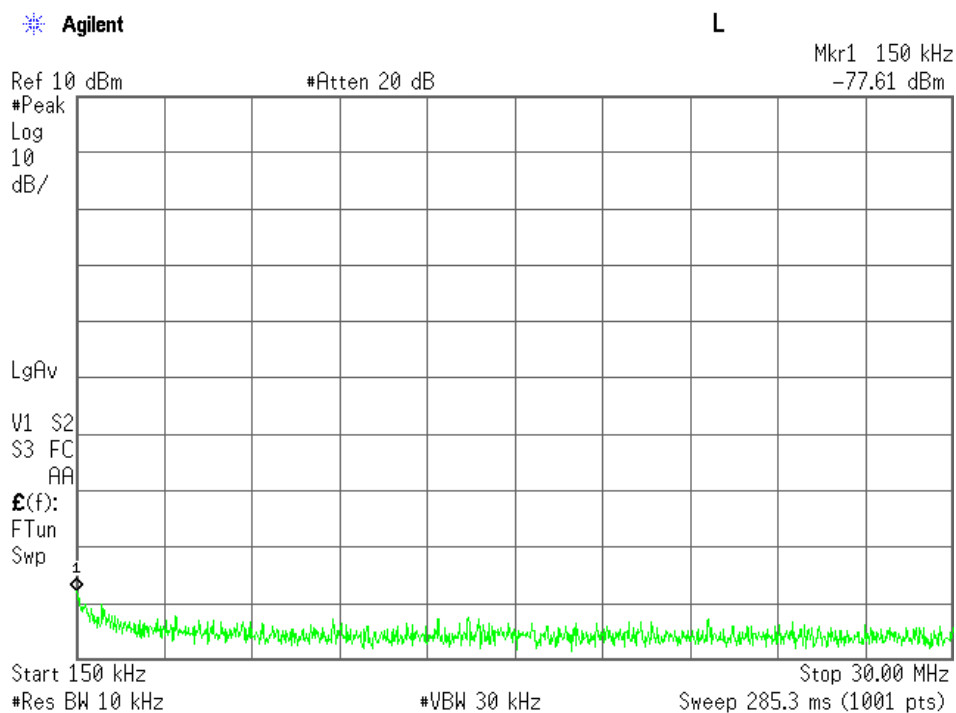
Middle Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



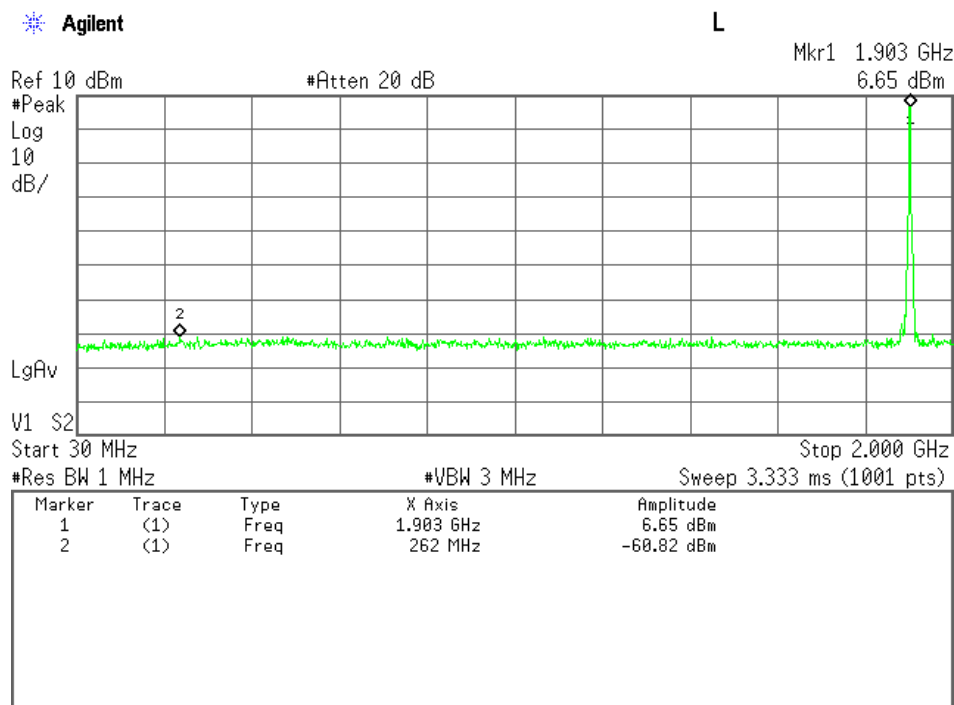
High Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



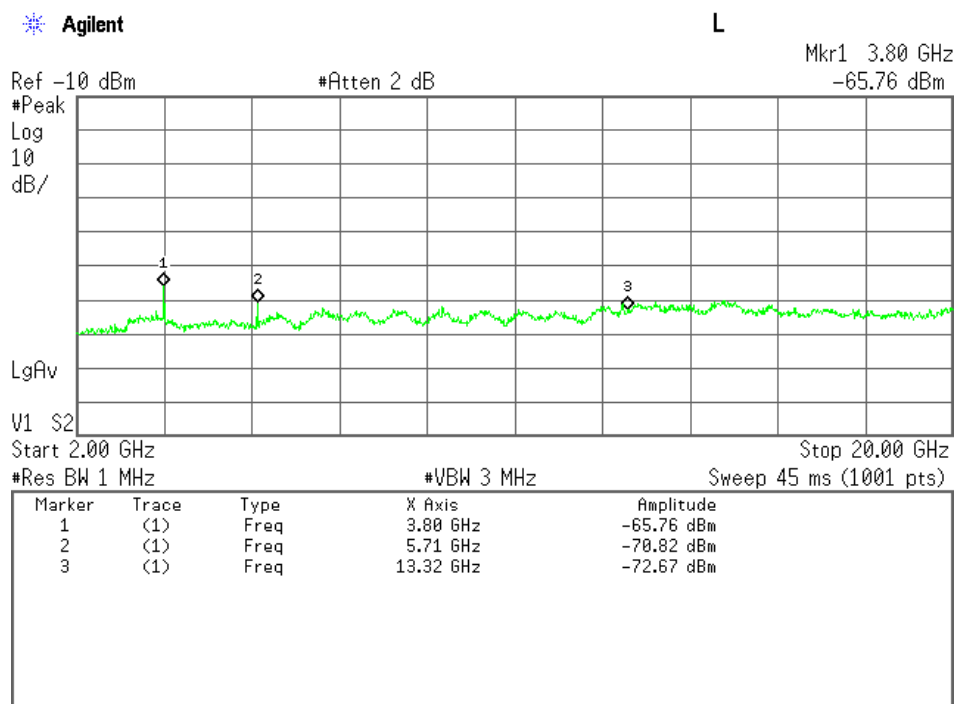
High Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



High Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



High Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



6) BW 20MHz(1RB)

(LTE 20MHz)

Test Date: September 15, 2015

Temp.: 26 °C, Humi: 58 %

Transmitting Frequency CH [MHz]		Measured Frequency [MHz]	Corr. Factor [dB]	Meter Readings [dBm]	Limits [dBm]	Results [dBm]	Margin [dB]	Remarks
18700	1860.000	3720.000	21.0	-61.9	-13.0	-40.9	+27.9	C
		5580.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7440.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9300.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11160.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13020.000	22.2	-69.9	-13.0	-47.7	+34.7	C
		14880.000	22.5	< -70.0	-13.0	< -47.5	> +34.5	C
		16740.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18600.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
18900	1880.000	3760.000	21.0	-63.7	-13.0	-42.7	+29.7	C
		5640.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7520.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9400.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11280.000	21.9	< -70.0	-13.0	< -48.1	> +35.1	C
		13160.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15040.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		16920.000	22.8	< -70.0	-13.0	< -47.2	> +34.2	C
		18800.000	23.1	< -70.0	-13.0	< -46.9	> +33.9	C
19100	1900.000	3800.000	21.0	-64.6	-13.0	-43.6	+30.6	C
		5700.000	21.2	< -70.0	-13.0	< -48.8	> +35.8	C
		7600.000	21.4	< -70.0	-13.0	< -48.6	> +35.6	C
		9500.000	21.7	< -70.0	-13.0	< -48.3	> +35.3	C
		11400.000	22.0	< -70.0	-13.0	< -48.0	> +35.0	C
		13300.000	22.2	< -70.0	-13.0	< -47.8	> +34.8	C
		15200.000	22.6	< -70.0	-13.0	< -47.4	> +34.4	C
		17100.000	22.9	< -70.0	-13.0	< -47.1	> +34.1	C
		19000.000	23.2	< -70.0	-13.0	< -46.8	> +33.8	C

Calculated result at 3720.0 MHz, as the worst point shown on underline:

Corr. Factor	=	21.0 dB
+) <u>Meter Reading</u>	=	<u>-61.9 dBm</u>
Result	=	-40.9 dBm

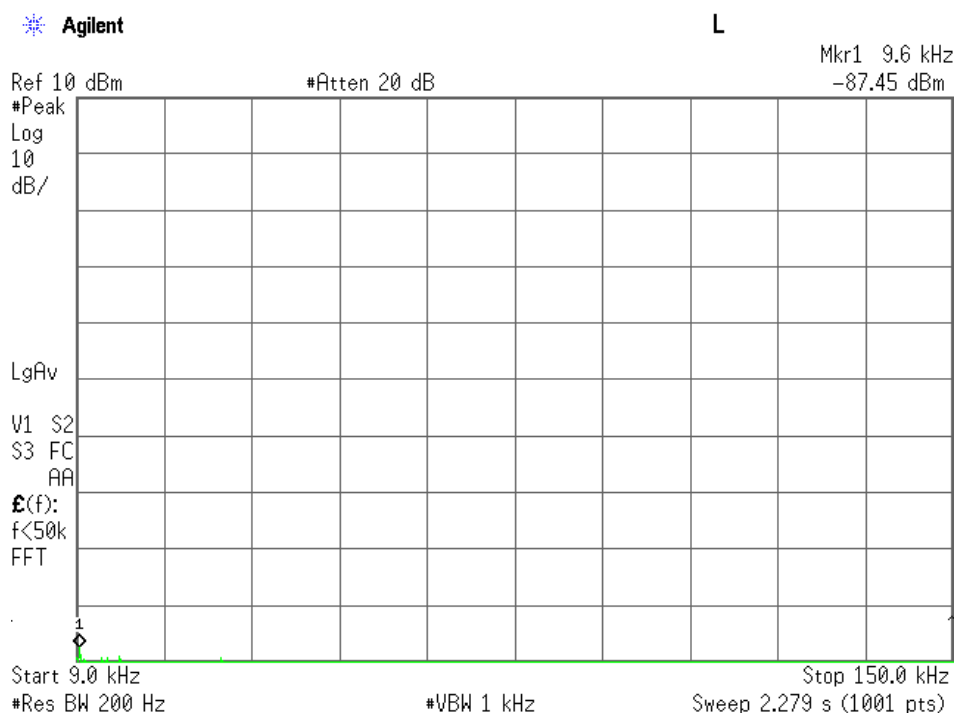
Minimum Margin: -13.0 - (-40.9) = 27.9 (dB)

NOTES

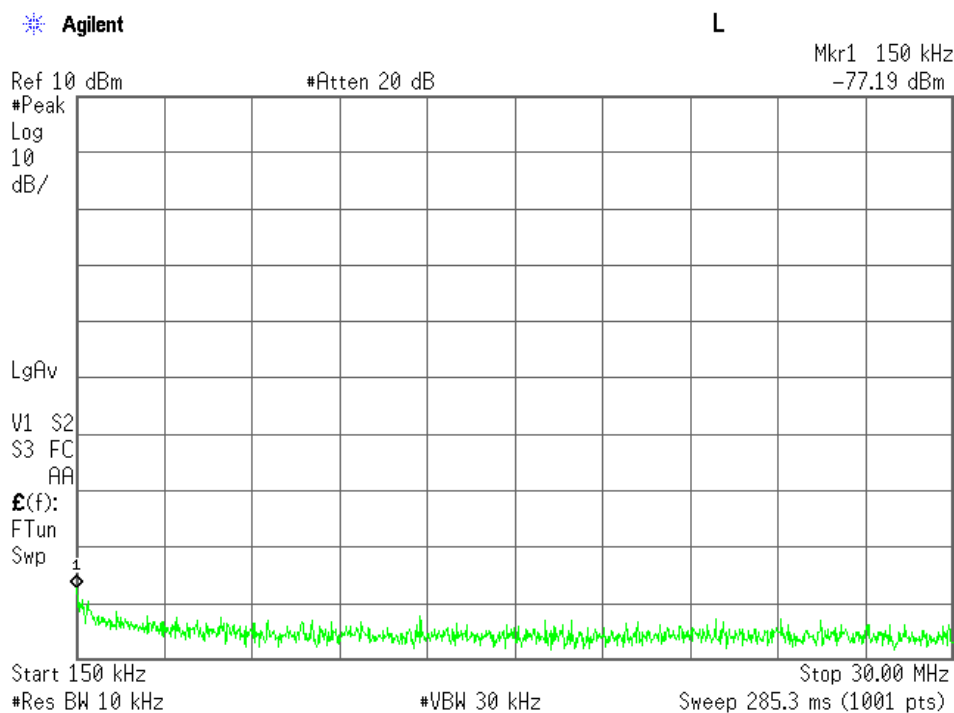
- The spectrum was checked from 9 kHz to 20 GHz.
- Applied limits : $-13.0 \text{ [dBm]} = 10\log(\text{TP[mW]}) - (43 + 10\log(\text{tp[W]})) = 10\log(\text{TP[mW]}) - (43 + (10 \log(\text{TP[mW]}) - 30))$
where, $\text{tp[W]} = \text{TP[mW]} / 1000$: Transmitter power at antenna terminal
- The correction factor is shown as follows:
Corr. Factor [dB] = Cable Loss + Pad Att. [dB] (9 kHz - 2 GHz)
Corr. Factor [dB] = Cable Loss + Pad Att. + High Pass Filter Loss [dB] (over 2 GHz)
- The symbol of "<" means "or less".
- The symbol of ">" means "more than".
- Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	200 Hz	1 kHz	AUTO
B	Peak	10 kHz	30 kHz	AUTO
C	Peak	1 MHz	3 MHz	AUTO

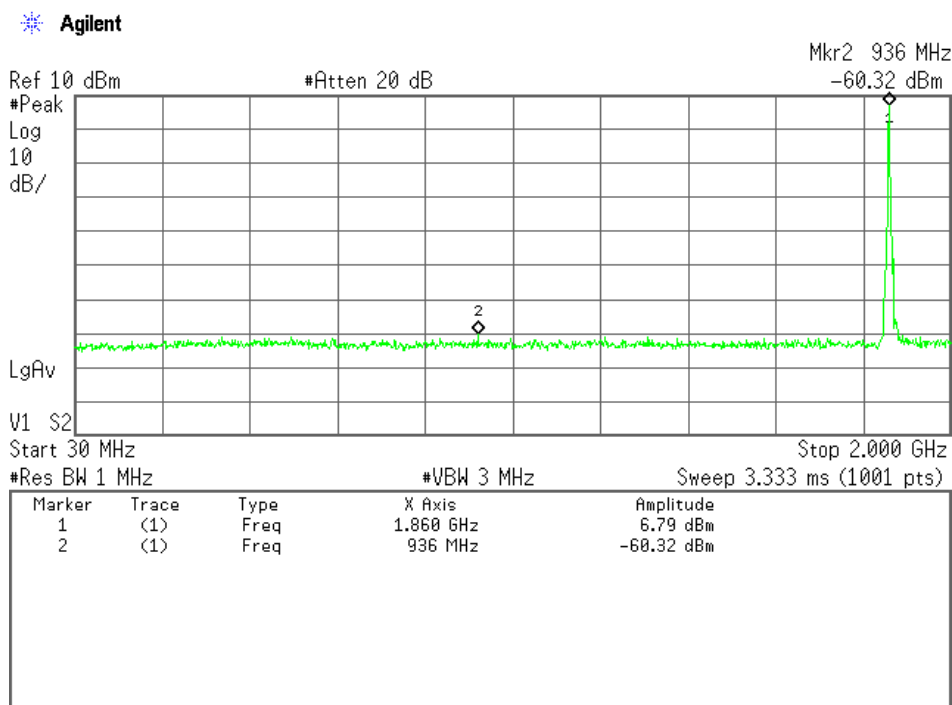
Low Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



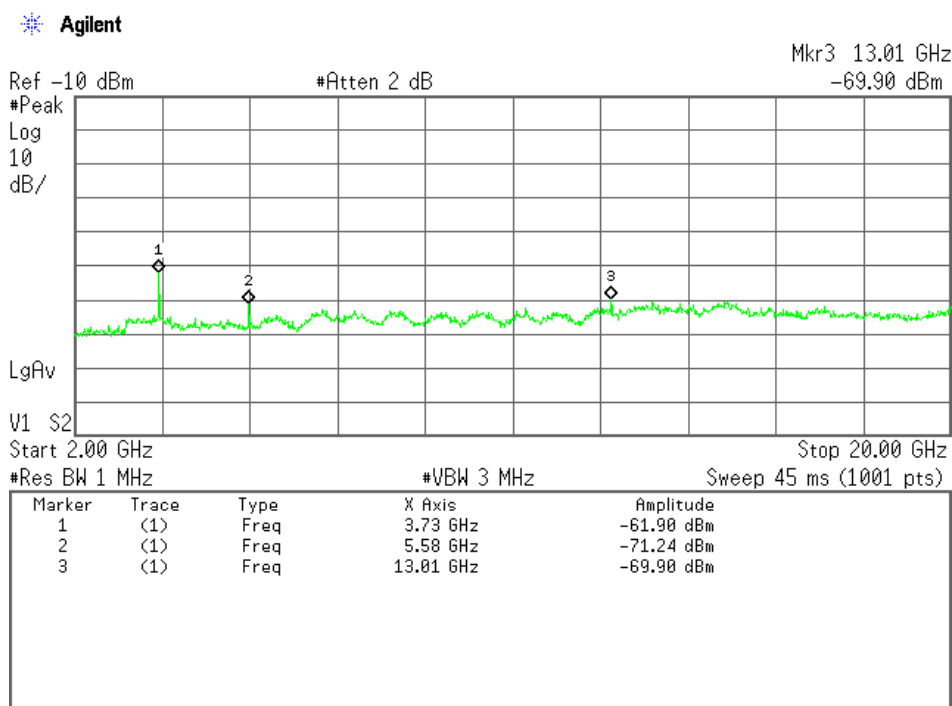
Low Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



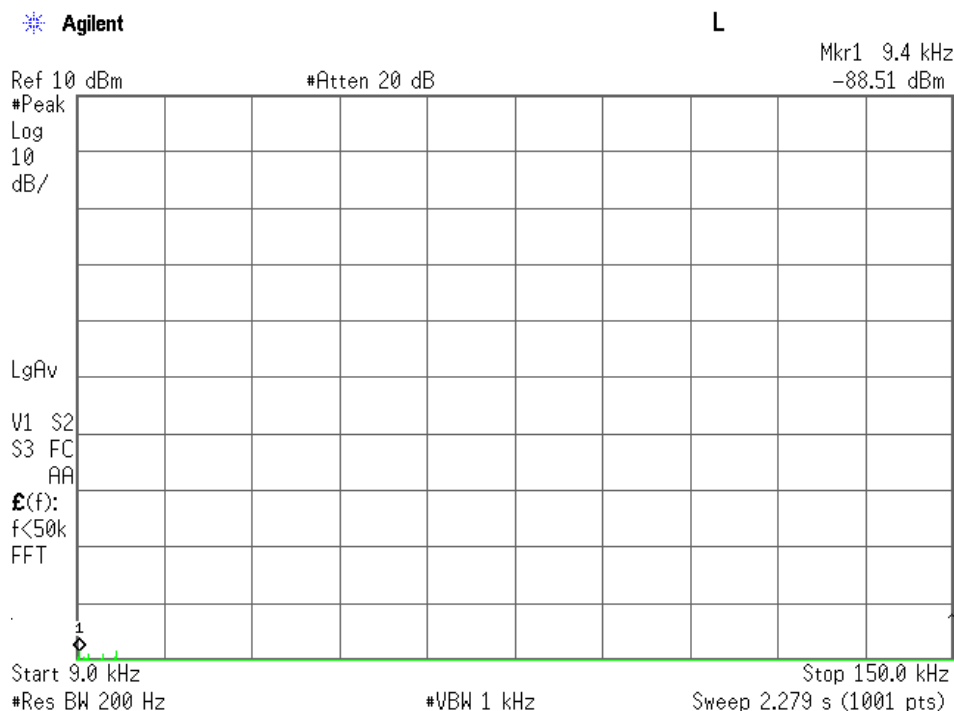
Low Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



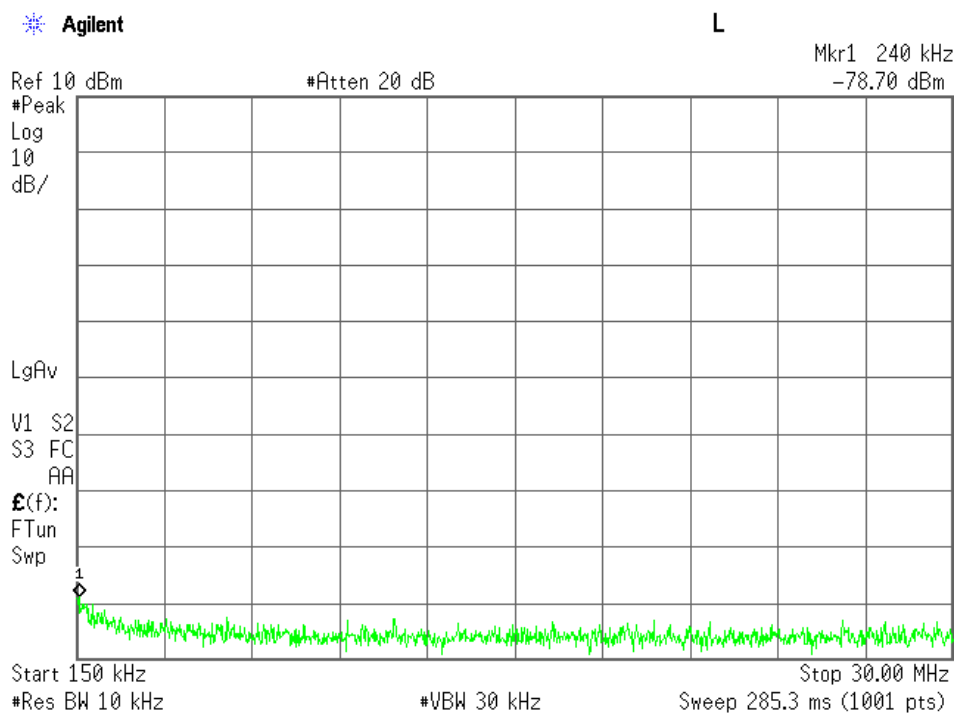
Low Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



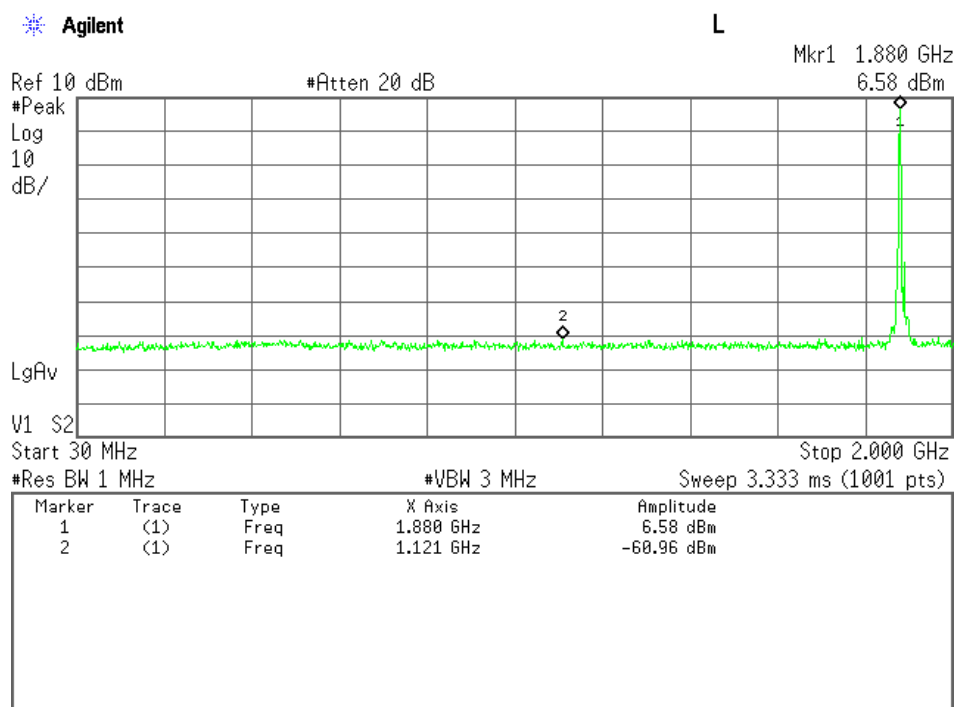
Middle Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



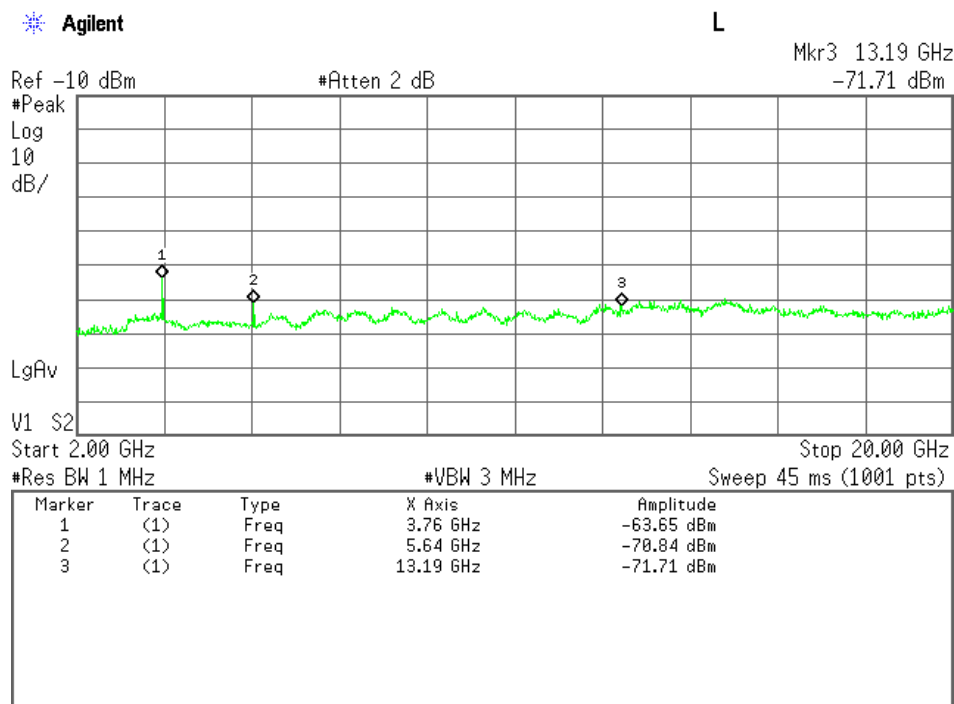
Middle Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



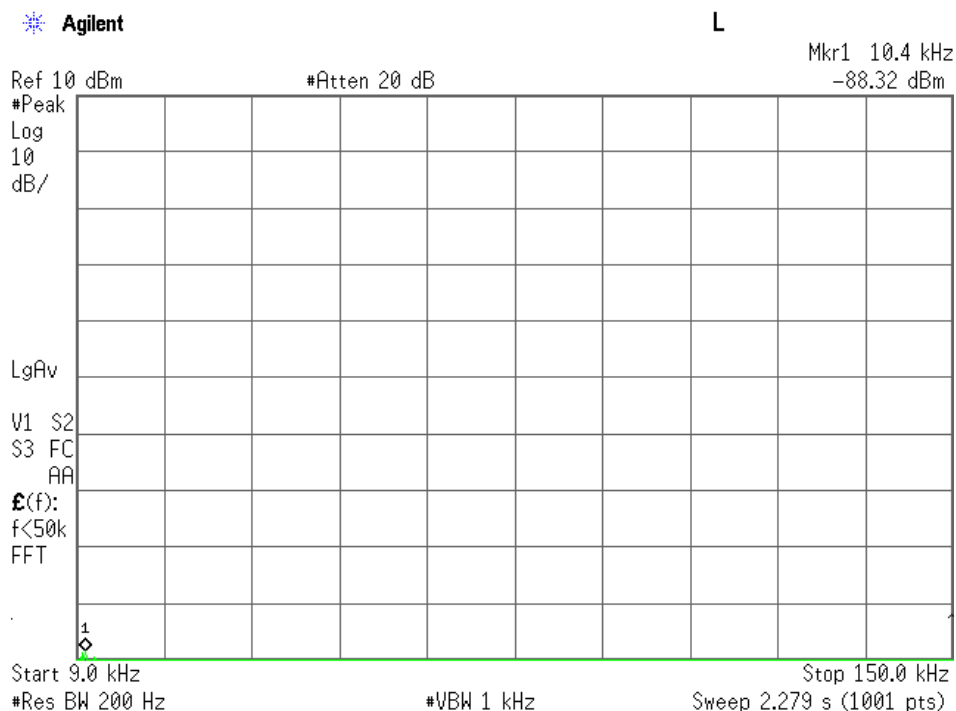
Middle Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



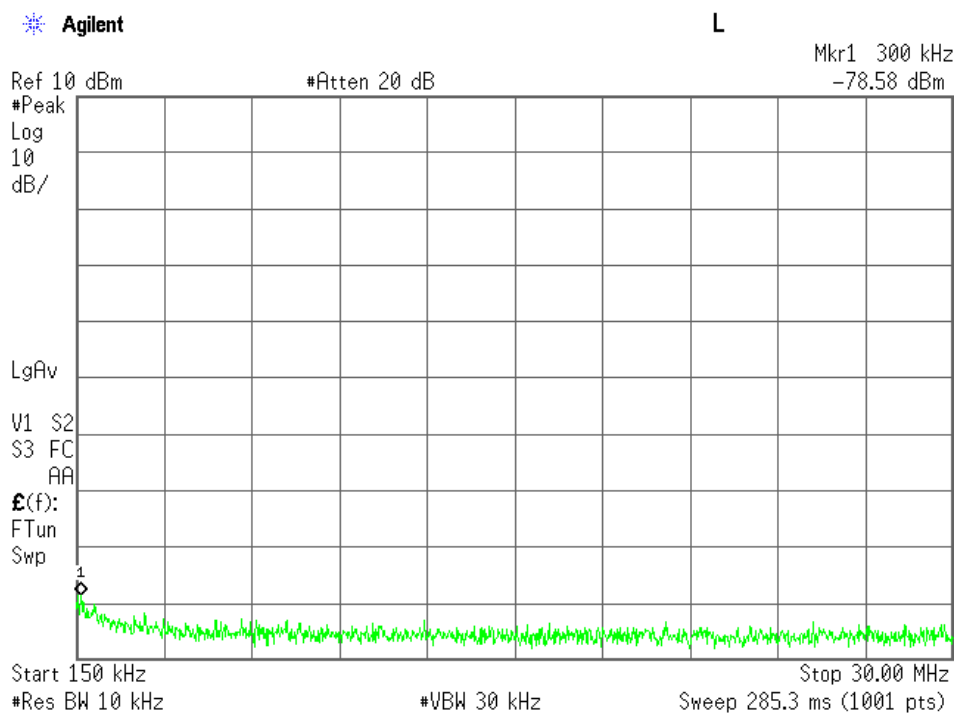
Middle Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



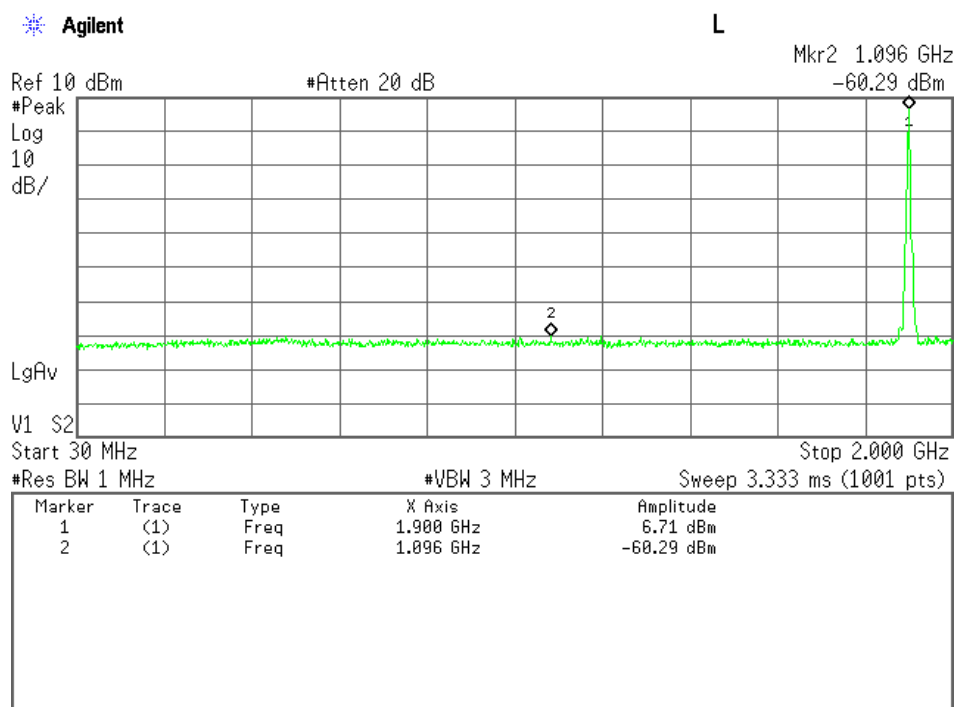
High Channel, Out-Of-Band Emissions (9 kHz – 150 kHz)



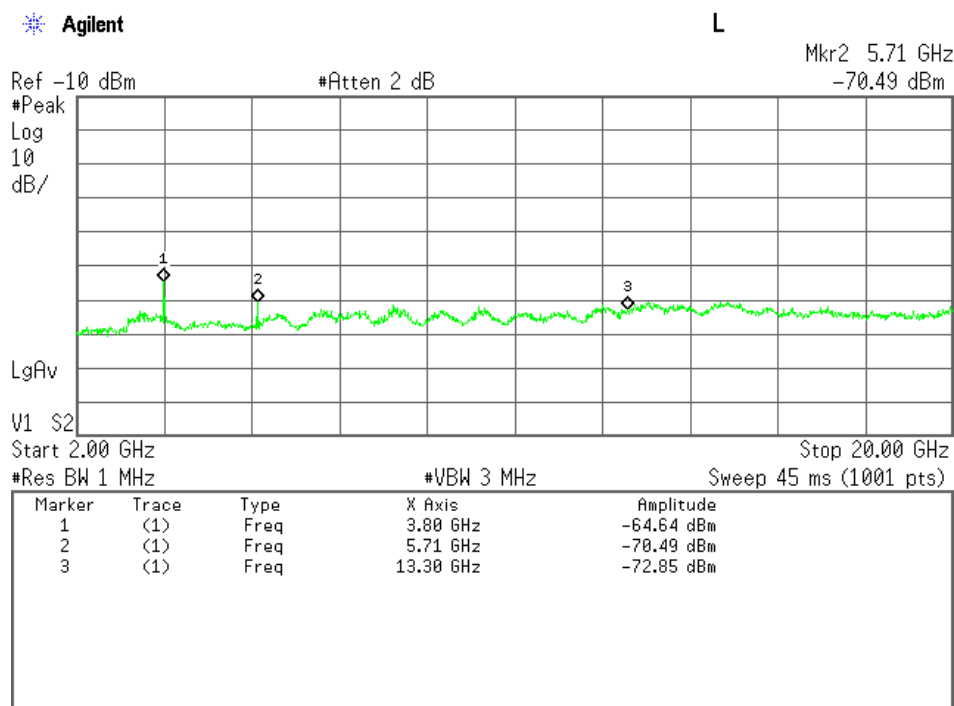
High Channel, Out-Of-Band Emissions (150 kHz – 30 MHz)



High Channel, Out-Of-Band Emissions (30 MHz – 2 GHz)



High Channel, Out-Of-Band Emissions (2 GHz – 20 GHz)



7.6 Band-Edge Emission (§2.1051)

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.6.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Min. Limit Margin 5.9 dB at 1850/1910 MHz

The Band-Edge level is -18.9 dBm at 1850/1910 MHz

Uncertainty of Measurement Results ± 1.7 dB(2 σ)

Remarks : BW 3MHz QPSK

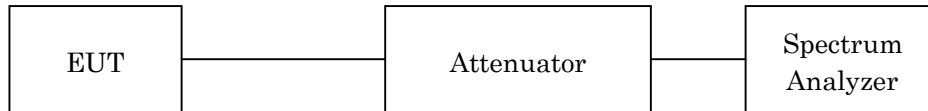
7.6.2 Test Instruments

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Spectrum Analyzer	E4446A	US44300388 (A-39)	Agilent	2016/08/11
Attenuator	43KC-20	1418003 (D-41)	Anritsu	2016/07/05
RF Cable	SUCOFLEX102	14253/2 (C-52)	HUBER+SUHNER	2016/08/16

NOTE : The calibration interval of the above test instruments is 12 months.

7.6.3 Test Method and Test Setup (Diagrammatic illustration)

The test system is shown as follows:



The setting of the spectrum analyzer are shown as follows:

LTE Bandwidth	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Band-Edge Frequency	1850 MHz / 1910 MHz					
Res. Bandwidth	20 kHz	30 kHz	51 kHz	100 kHz	150 kHz	200 kHz
Video Bandwidth	62 kHz	100 kHz	160 kHz	300 kHz	470 kHz	620 kHz
Span	5 MHz	10 MHz	20 MHz	20 MHz	30 MHz	40 MHz
Sweep Time	100 ms					
Detector	Power Average(RMS)					
Trace	Average					

7.6.4 Test Data

Test Date : September 15, 2015

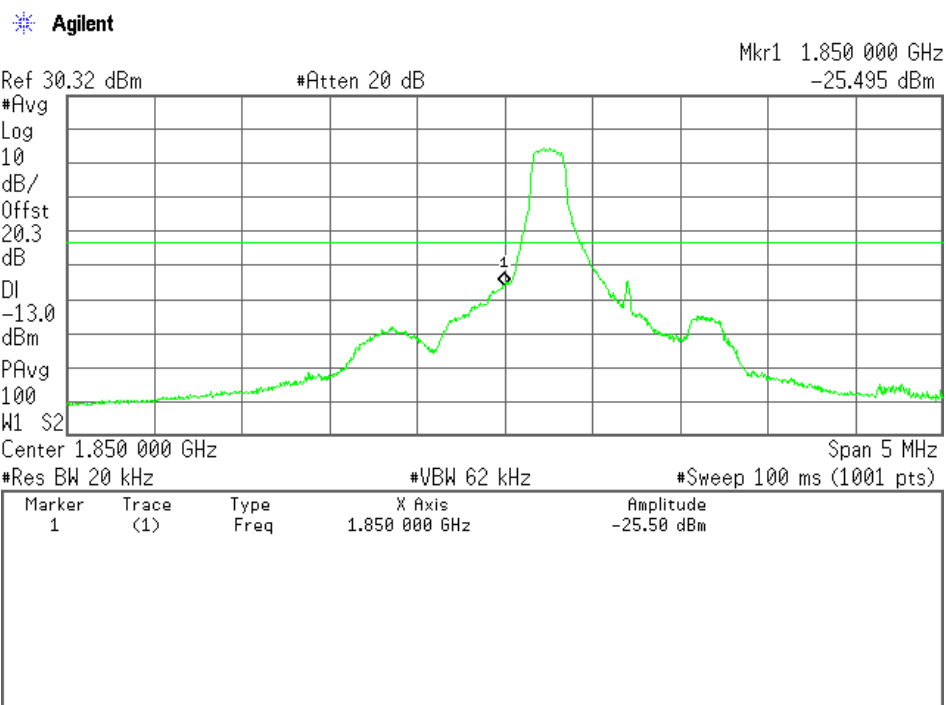
Temp.:26°C, Humi:58%

1-1) BW 1.4MHz

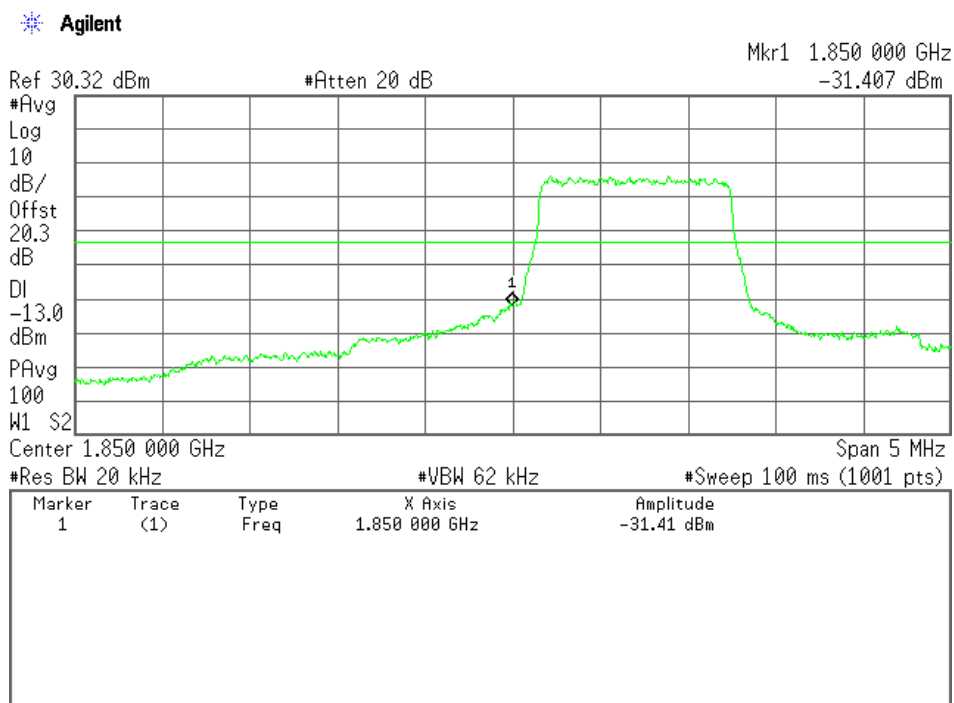
Mode: QPSK

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18607	1850.70	1850.0	-25.5 (at 1850.0 MHz)	-13.0	+12.5
19193	1909.30	1910.0	-25.5 (at 1910.0 MHz)	-13.0	+12.5

Low Channel(1RB Offset 0), Band-Edge Emission

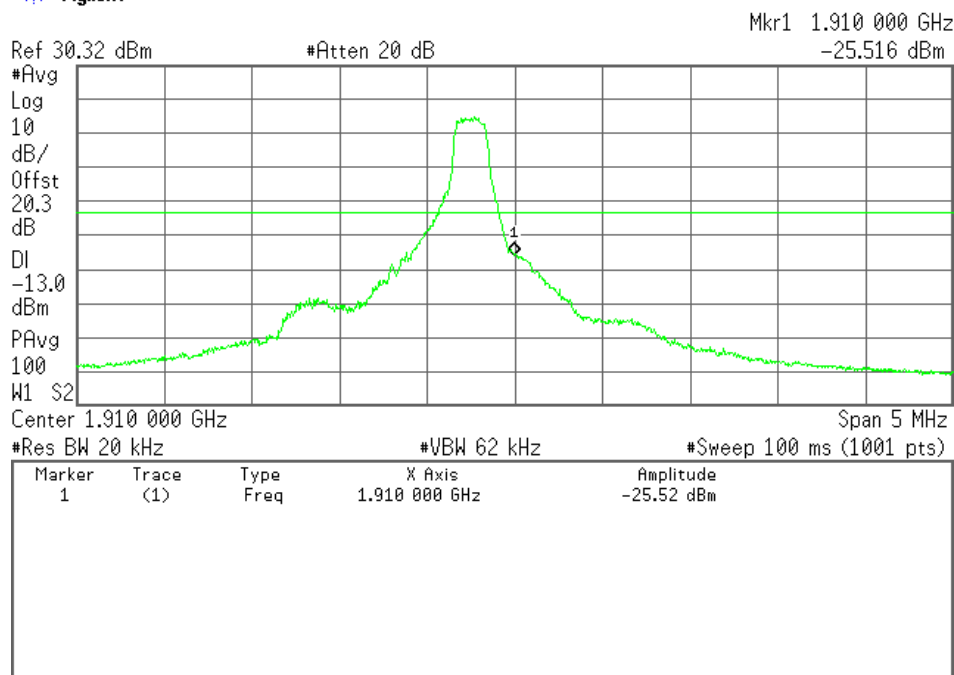


Low Channel(Full RB), Band-Edge Emission



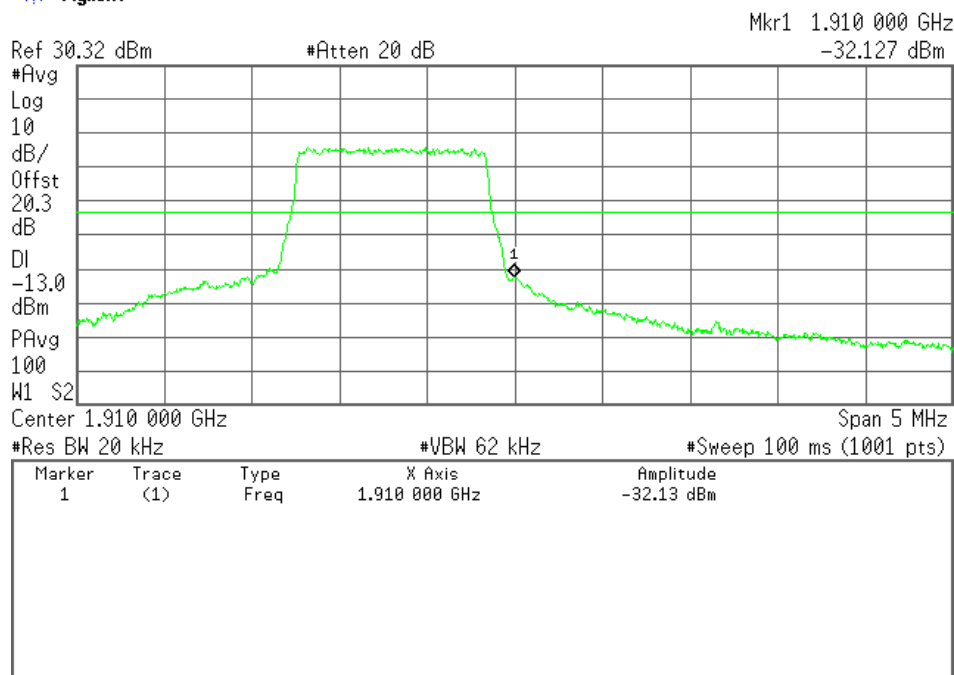
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

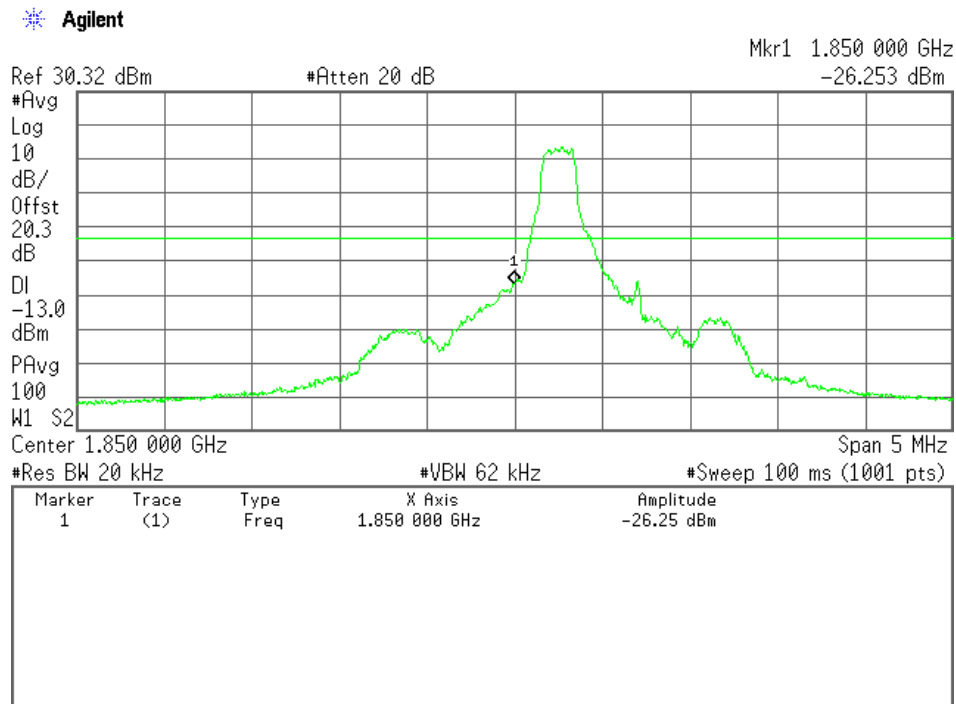


1-2) BW 1.4MHz

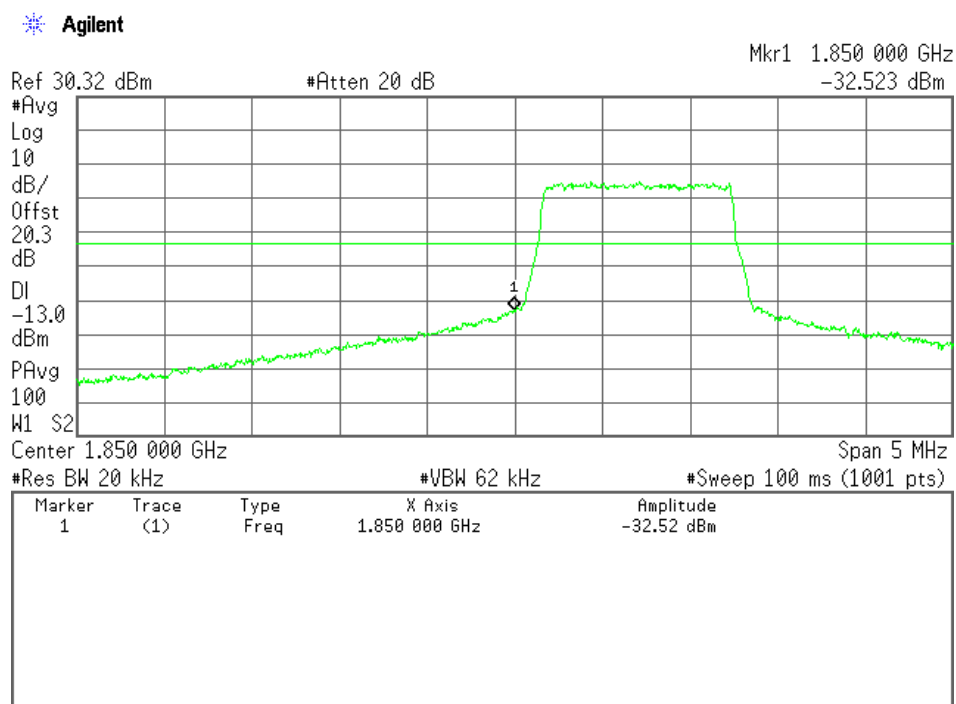
Mode:16 QAM

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18607	1850.70	1850.0	-26.3 (at 1850.0 MHz)	-13.0	+13.3
19193	1909.30	1910.0	-25.9 (at 1910.0 MHz)	-13.0	+12.9

Low Channel(1RB Offset 0), Band-Edge Emission

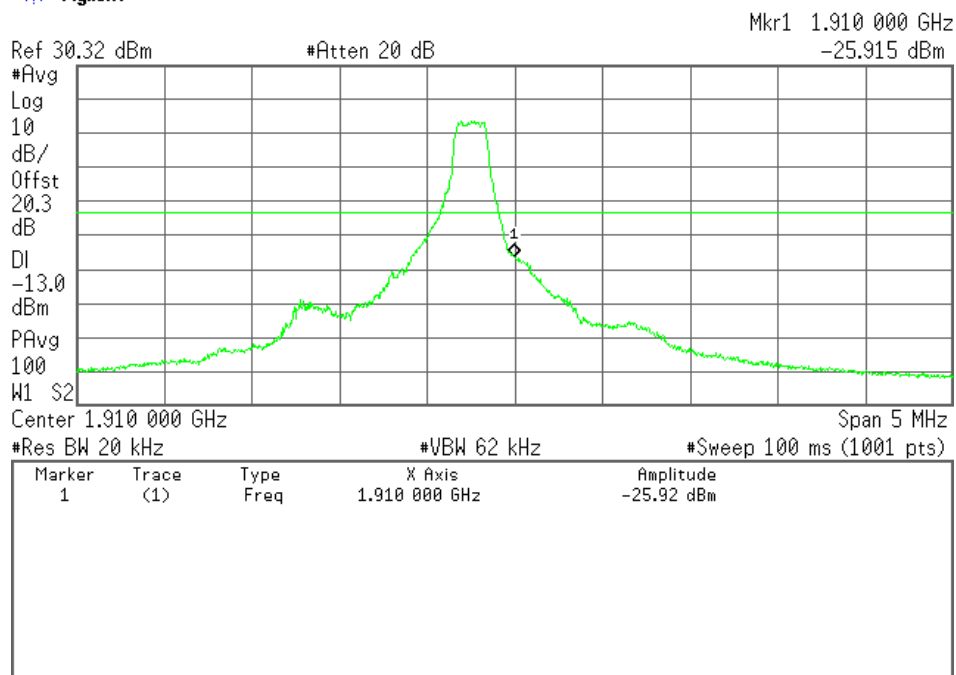


Low Channel(Full RB), Band-Edge Emission



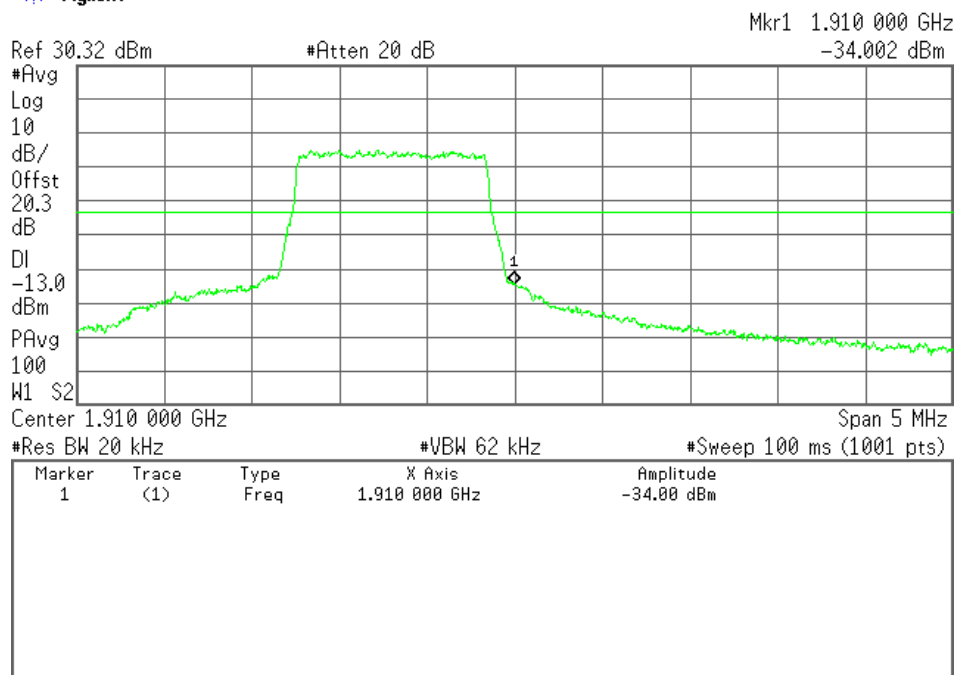
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

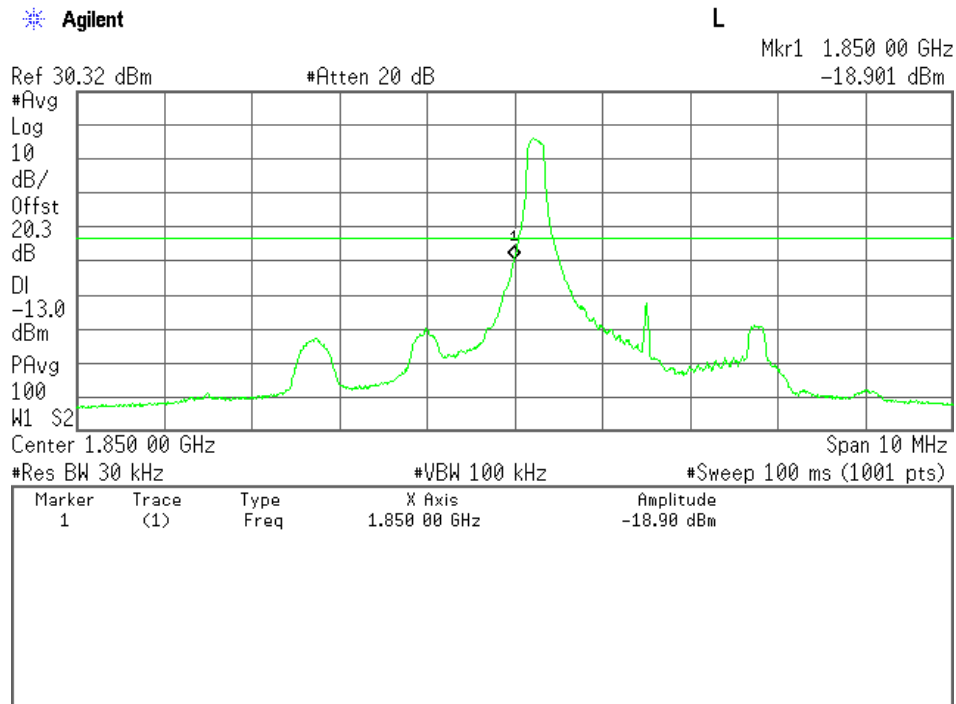


2-1) BW 3MHz

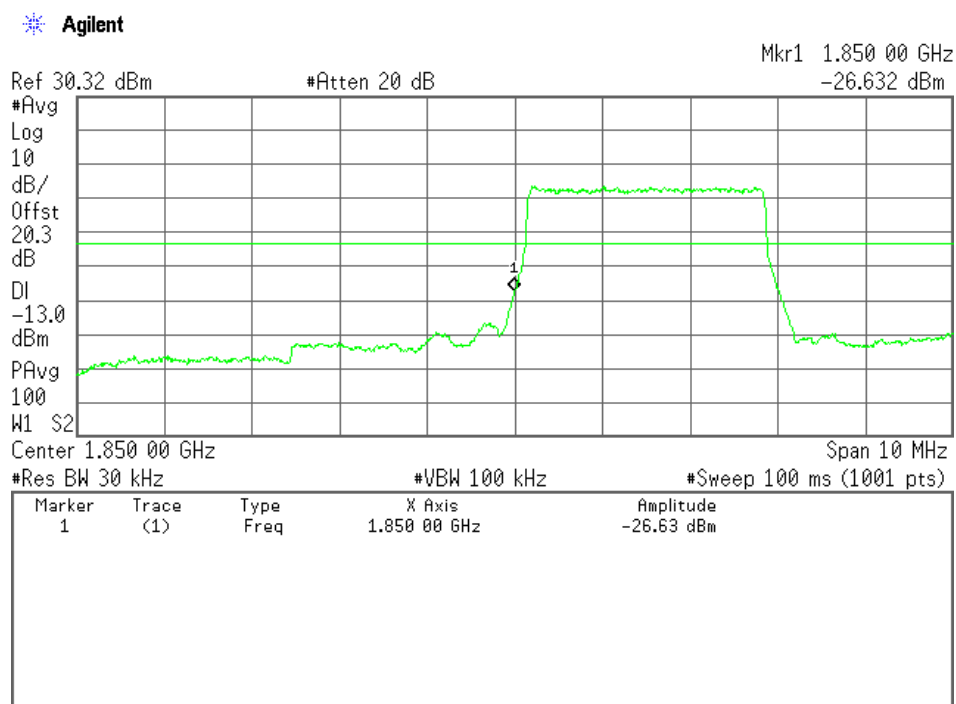
Mode: QPSK

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18615	1851.50	1850.0	-18.9 (at 1850.0 MHz)	-13.0	+5.9
19185	1908.50	1910.0	-18.9 (at 1910.0 MHz)	-13.0	+5.9

Low Channel(1RB Offset 0), Band-Edge Emission

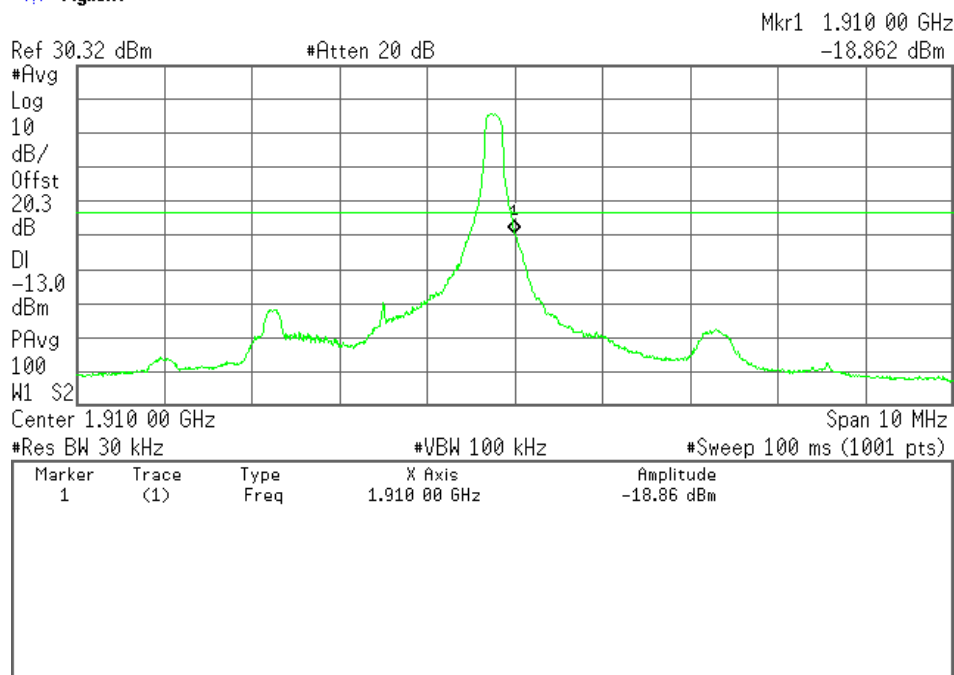


Low Channel(Full RB), Band-Edge Emission



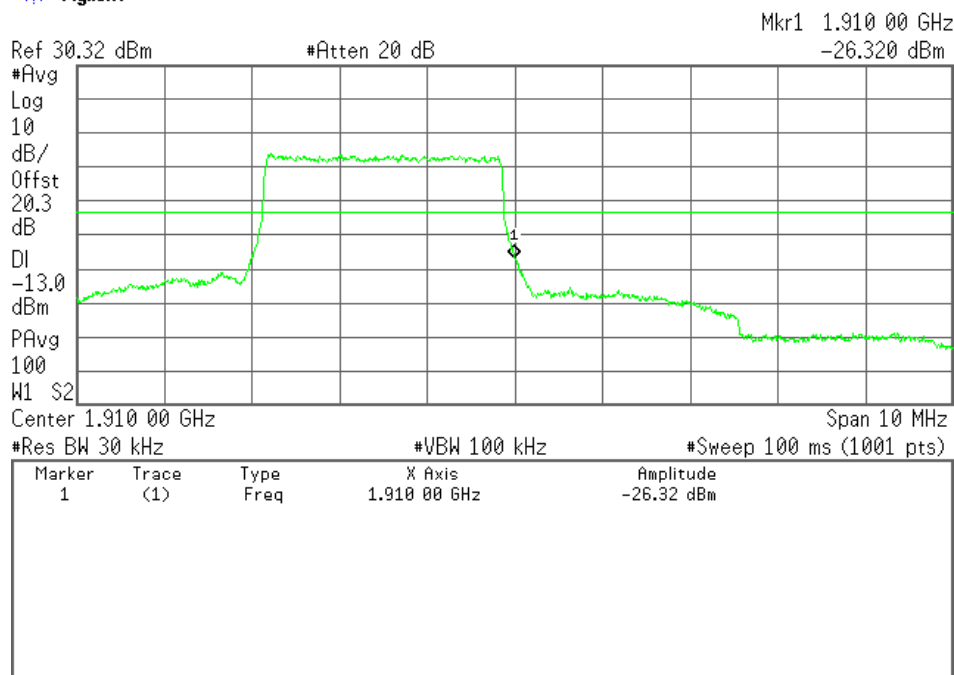
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

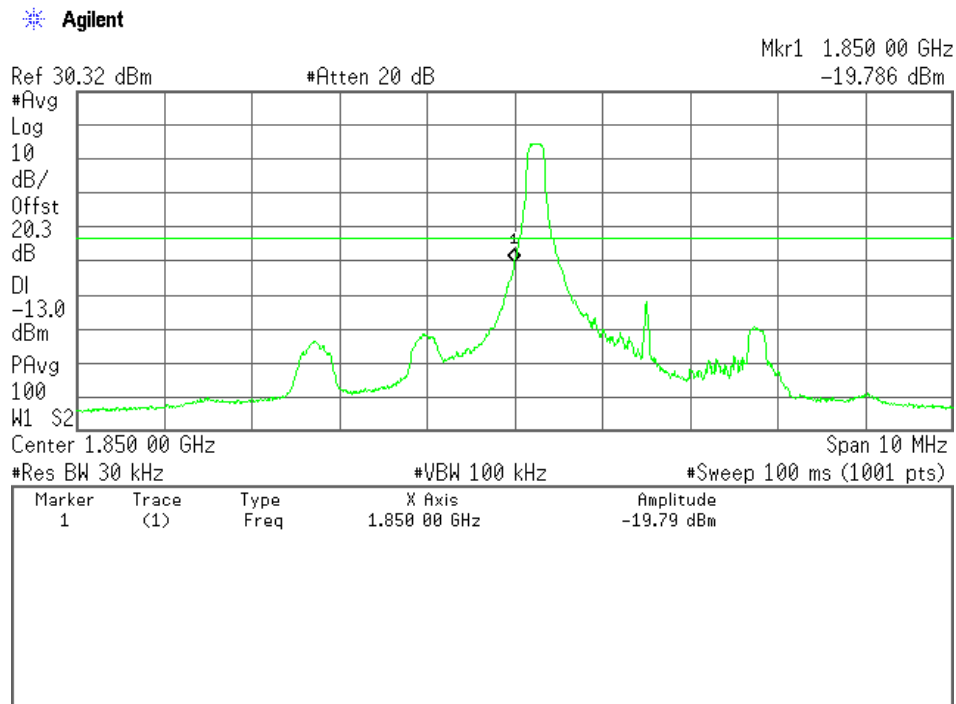


2-2) BW 3MHz

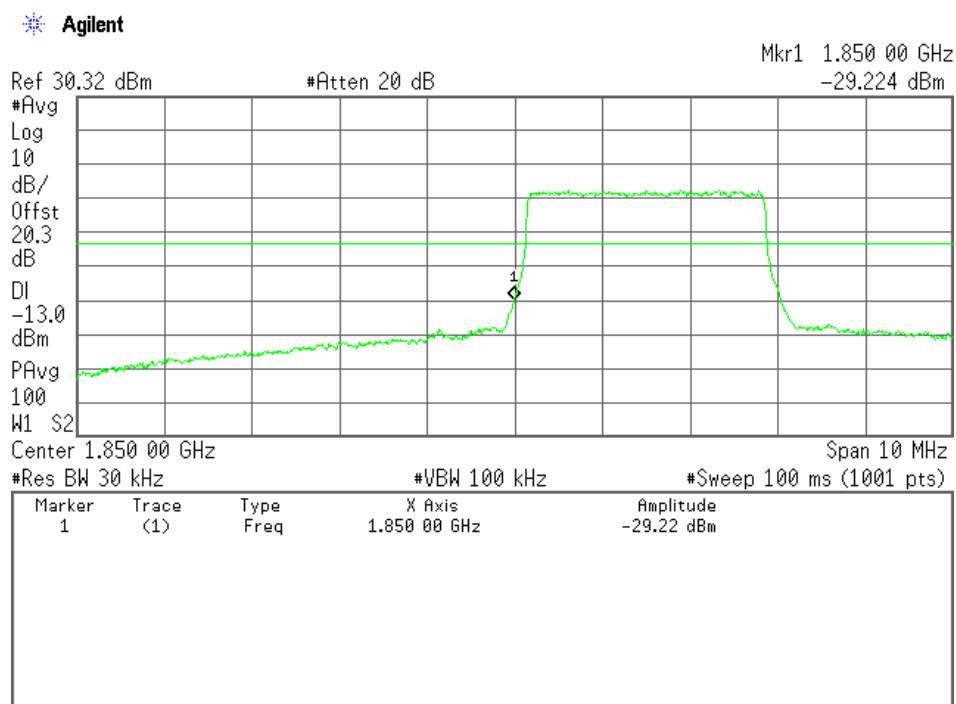
Mode:16 QAM

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18615	1851.50	1850.0	-19.8 (at 1850.0 MHz)	-13.0	+6.8
19185	1908.50	1910.0	-20.1 (at 1910.0 MHz)	-13.0	+7.1

Low Channel(1RB Offset 0), Band-Edge Emission

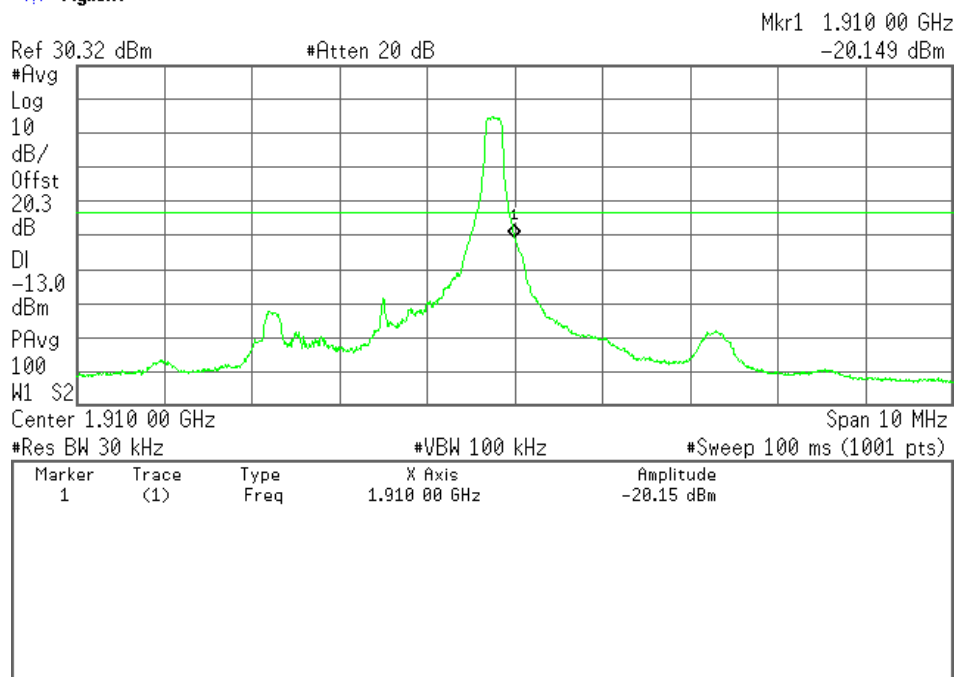


Low Channel(Full RB), Band-Edge Emission



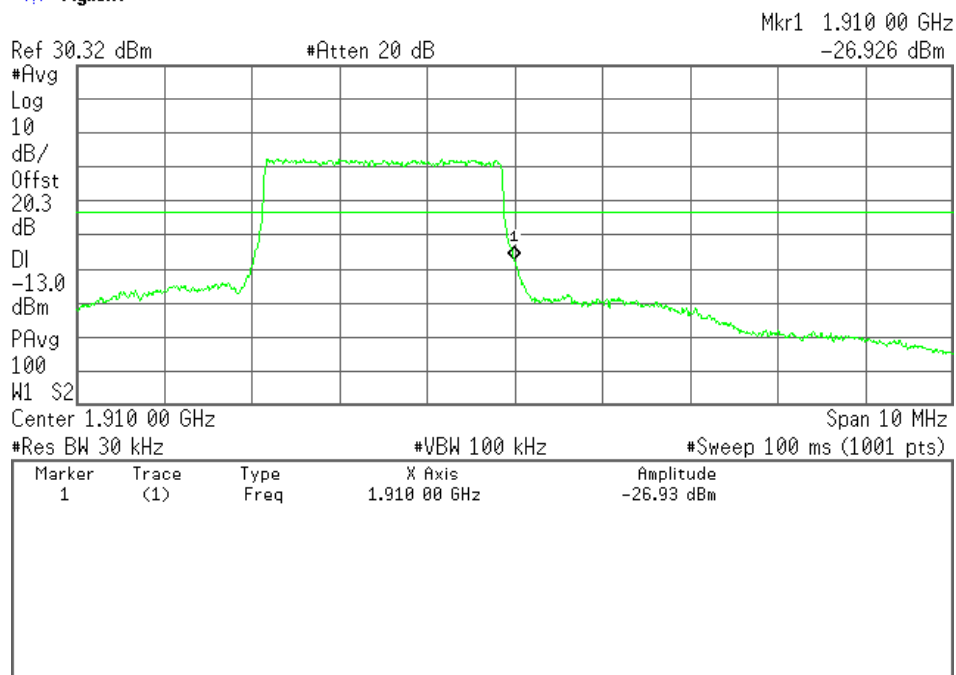
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

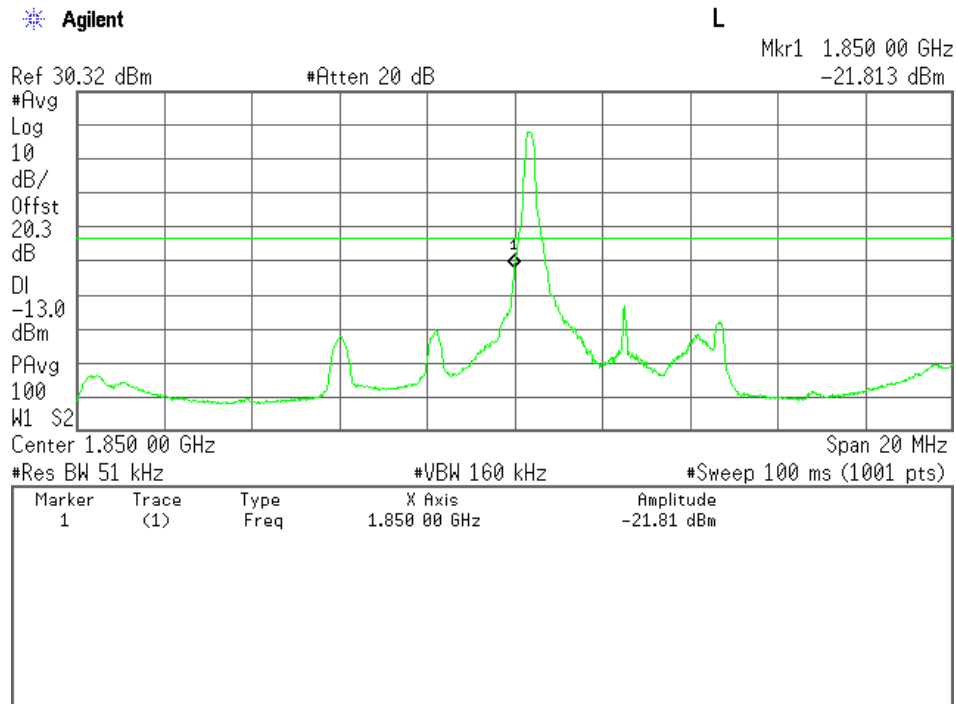


3-1) BW 5MHz

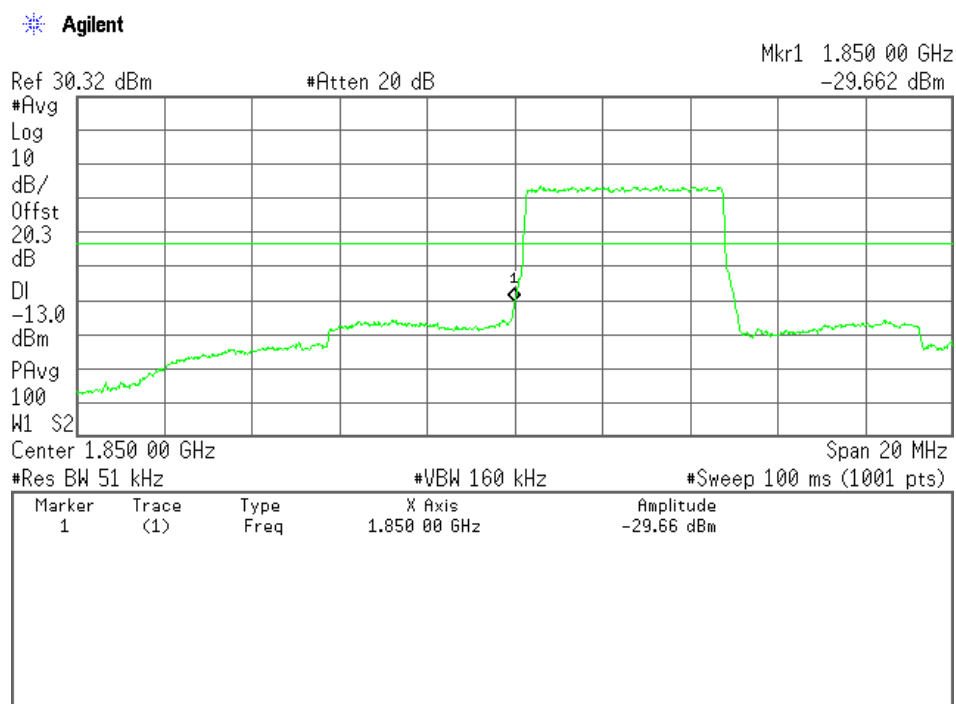
Mode: QPSK

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18625	1852.50	1850.0	-21.8 (at 1850.0 MHz)	-13.0	+8.8
19175	1907.50	1910.0	-21.7 (at 1910.0 MHz)	-13.0	+8.7

Low Channel(1RB Offset 0), Band-Edge Emission

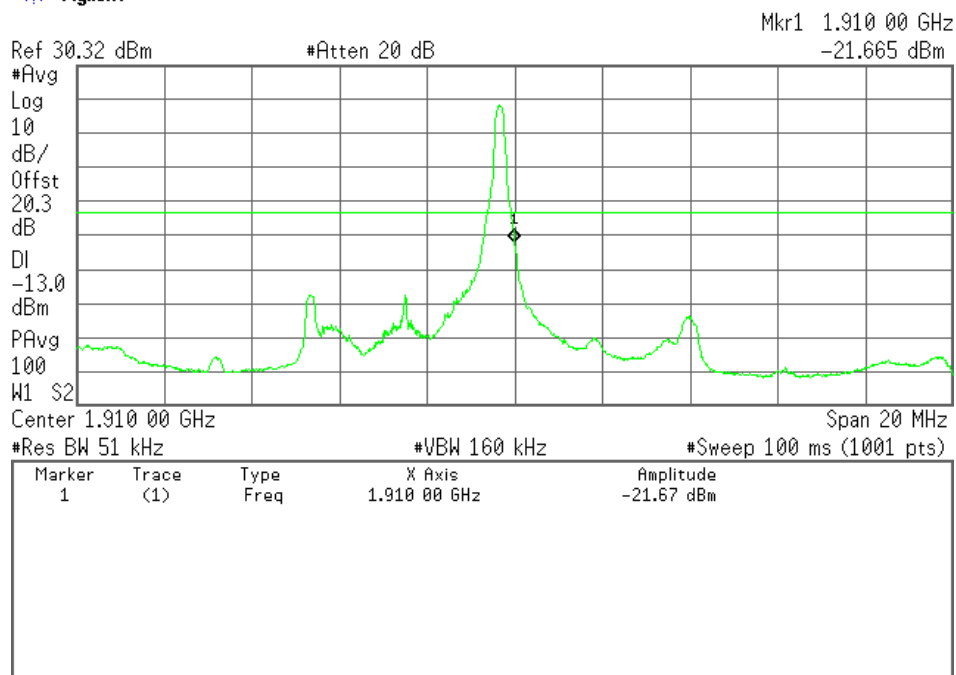


Low Channel(Full RB), Band-Edge Emission



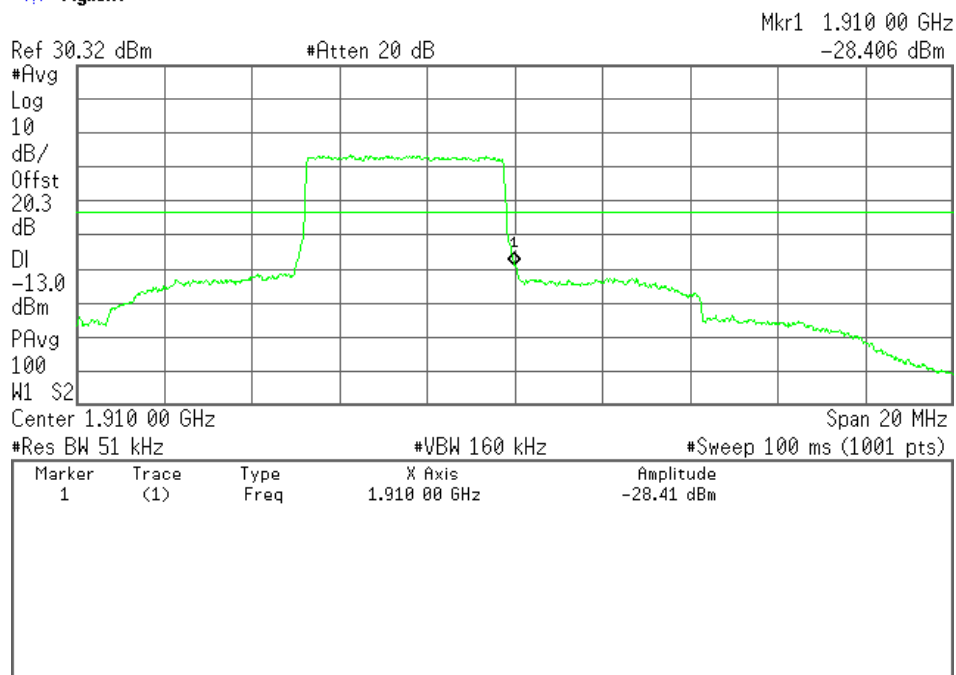
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

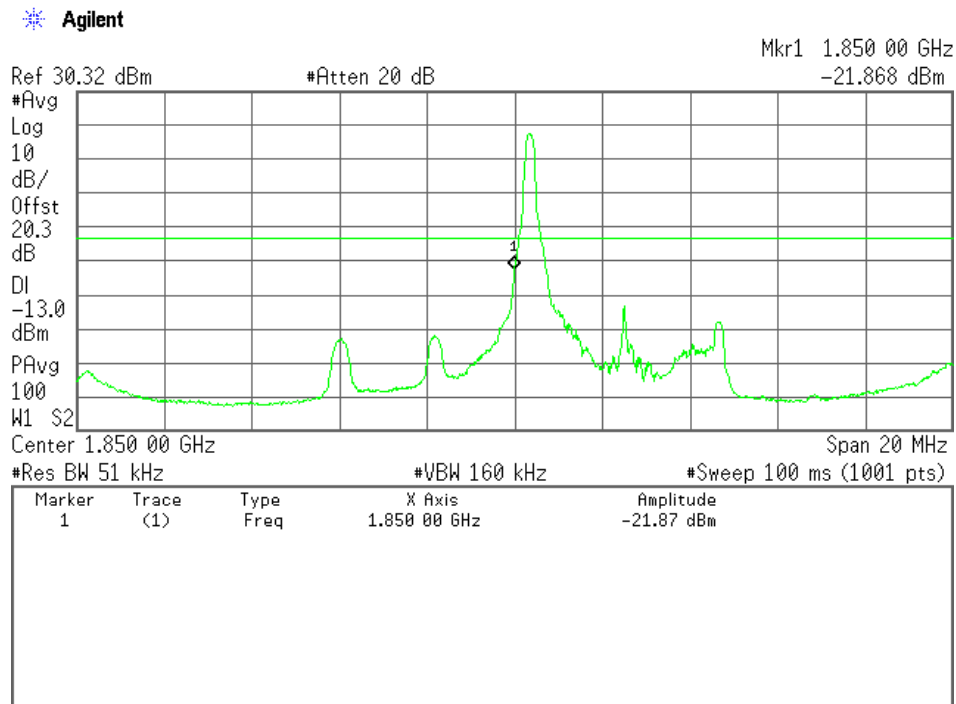


3-2) BW 5MHz

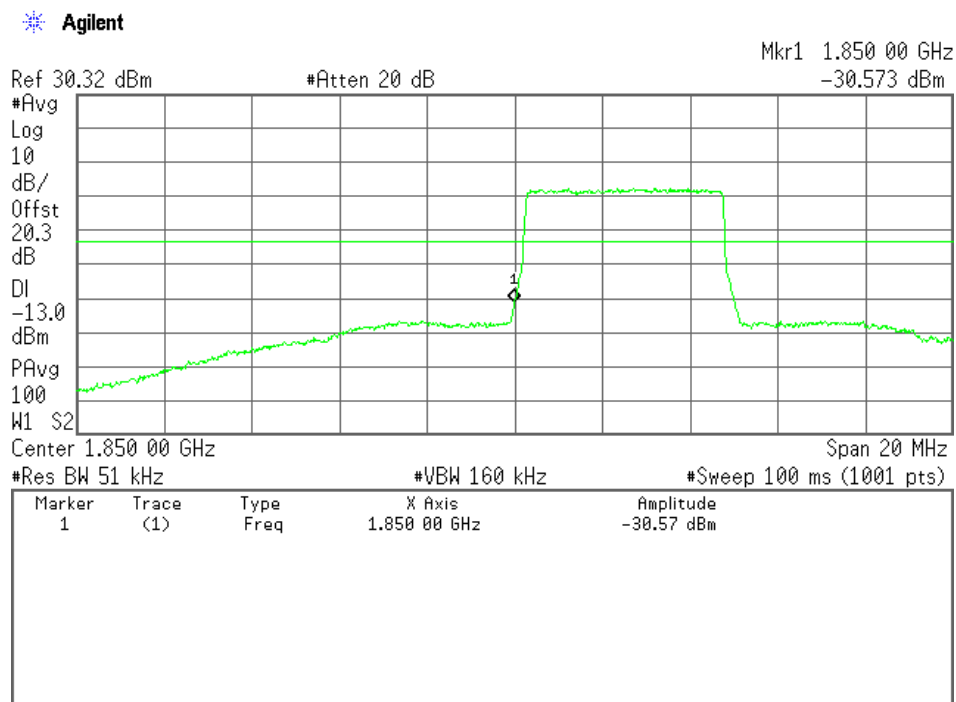
Mode:16 QAM

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18625	1852.50	1850.0	-21.9 (at 1850.0 MHz)	-13.0	+8.9
19175	1907.50	1910.0	-22.7 (at 1910.0 MHz)	-13.0	+9.7

Low Channel(1RB Offset 0), Band-Edge Emission

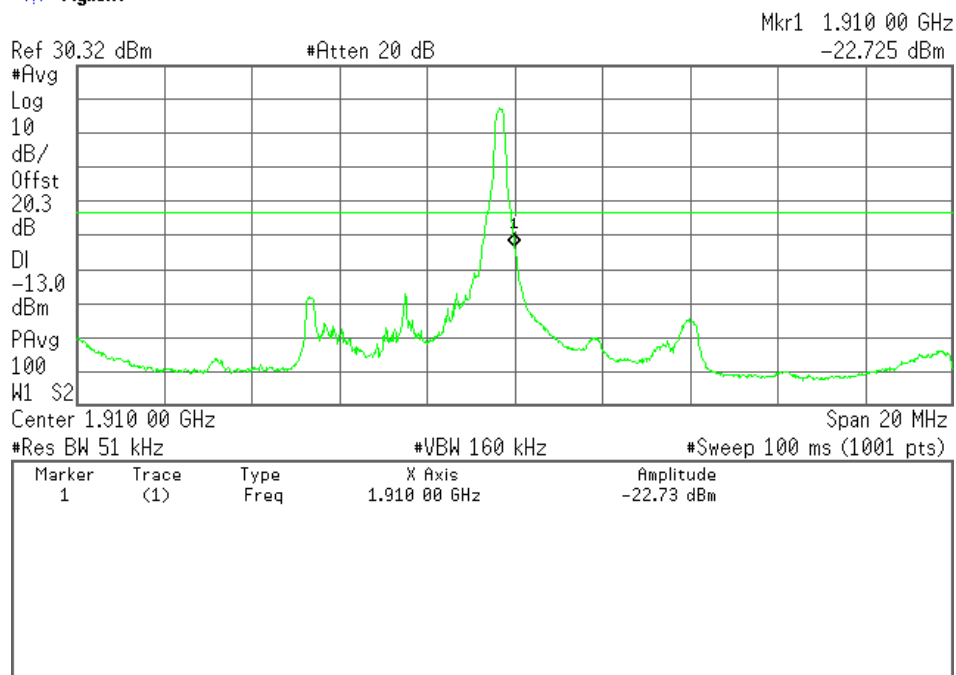


Low Channel(Full RB), Band-Edge Emission



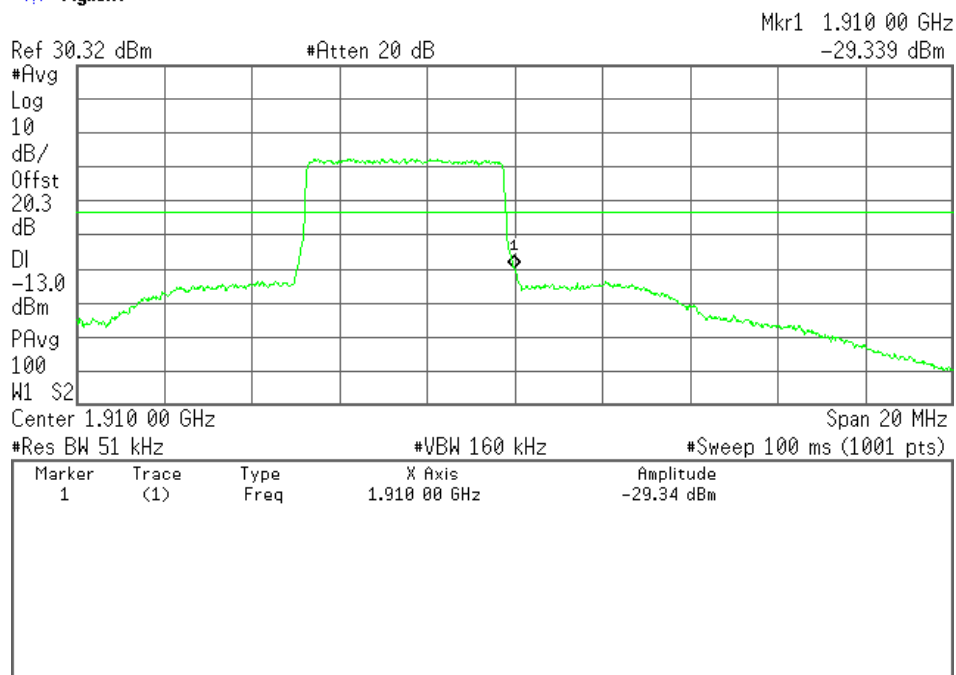
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

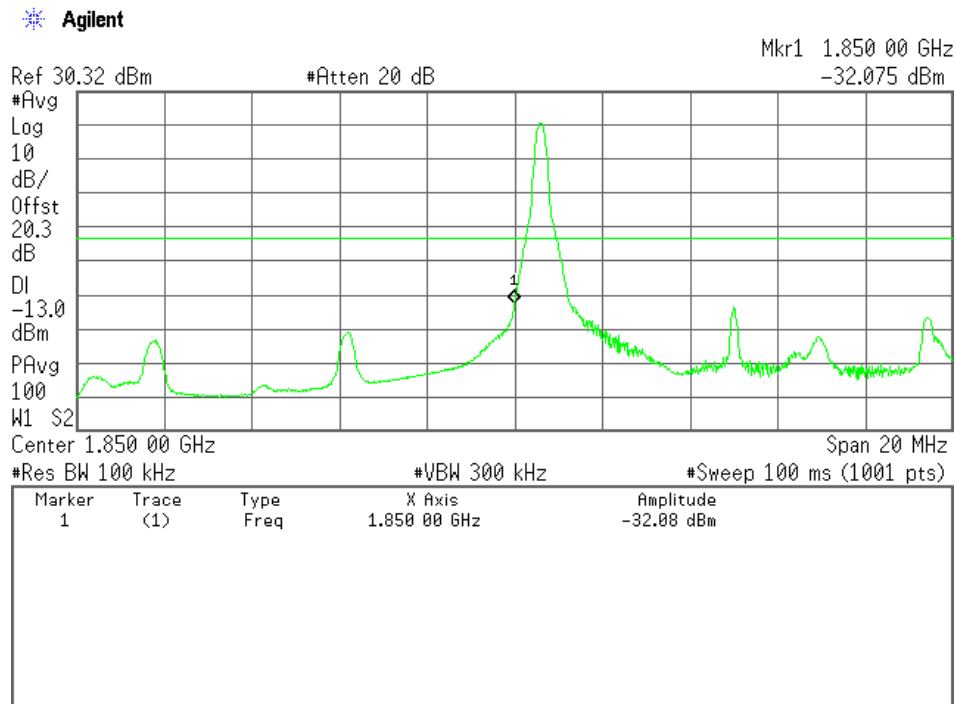


4-1) BW 10MHz

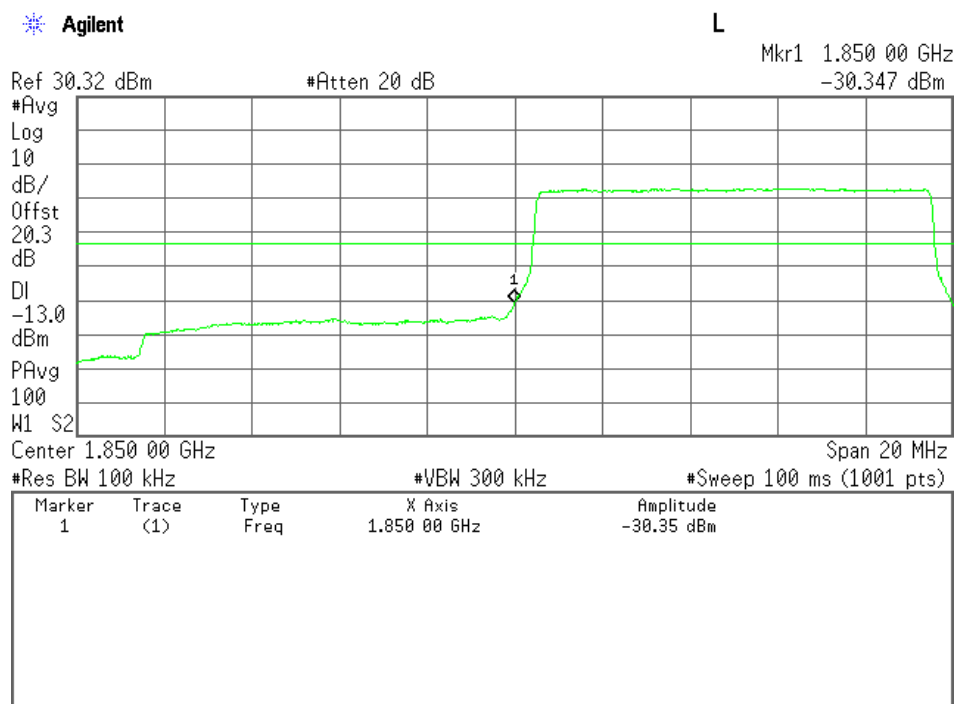
Mode: QPSK

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18650	1855.00	1850.0	-30.3 (at 1850.0 MHz)	-13.0	+17.3
19150	1905.00	1910.0	-29.5 (at 1910.0 MHz)	-13.0	+16.5

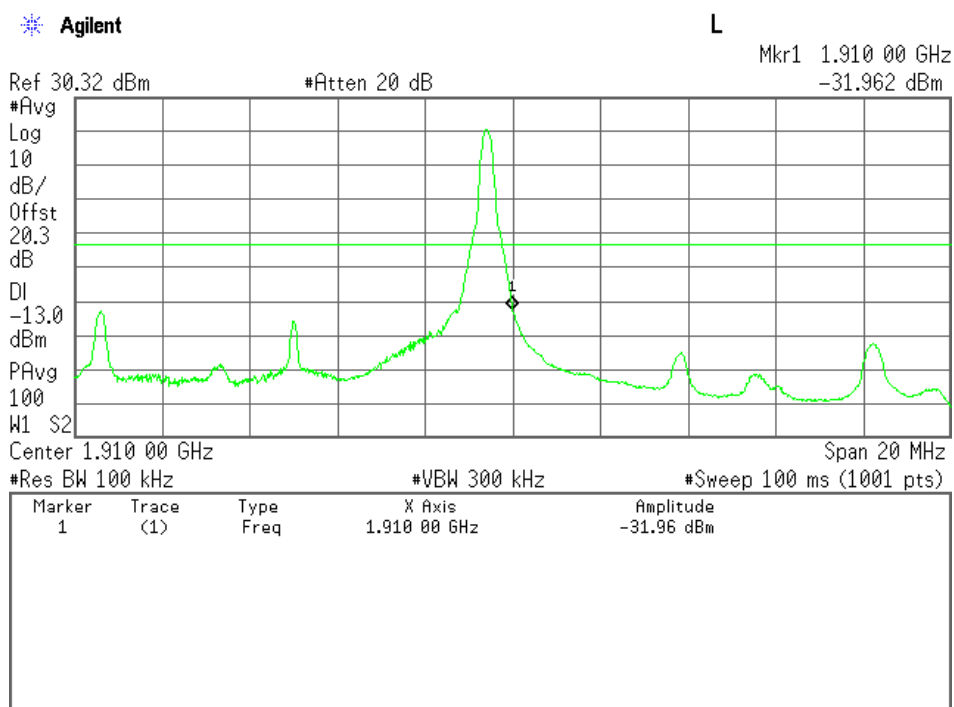
Low Channel(1RB Offset 0), Band-Edge Emission



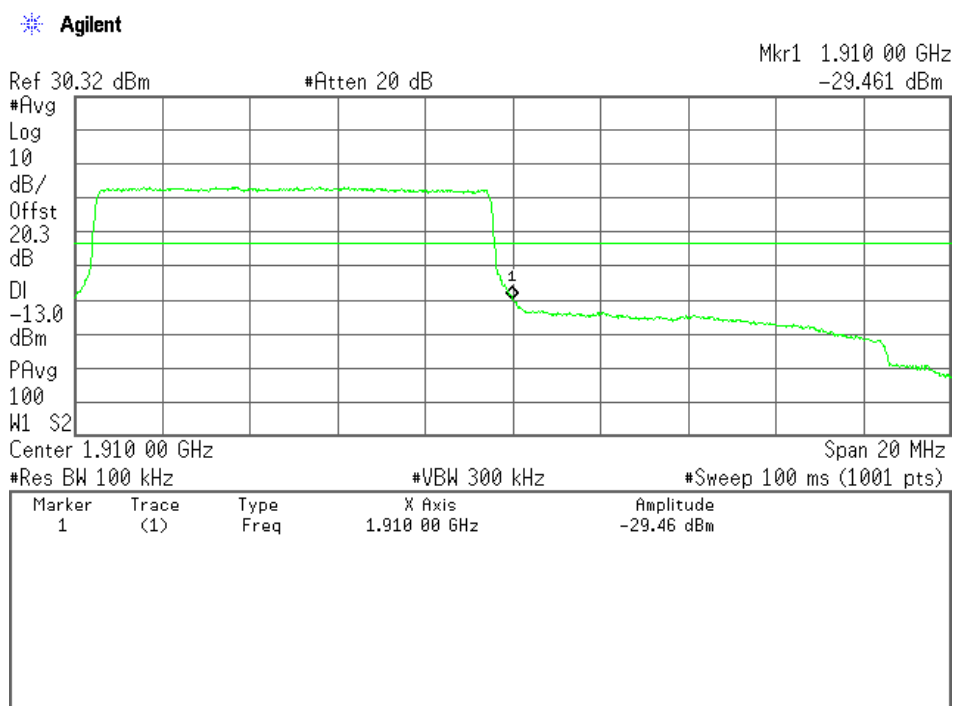
Low Channel(Full RB), Band-Edge Emission



High Channel(1RB Offset Max), Band-Edge Emission



High Channel(Full RB), Band-Edge Emission

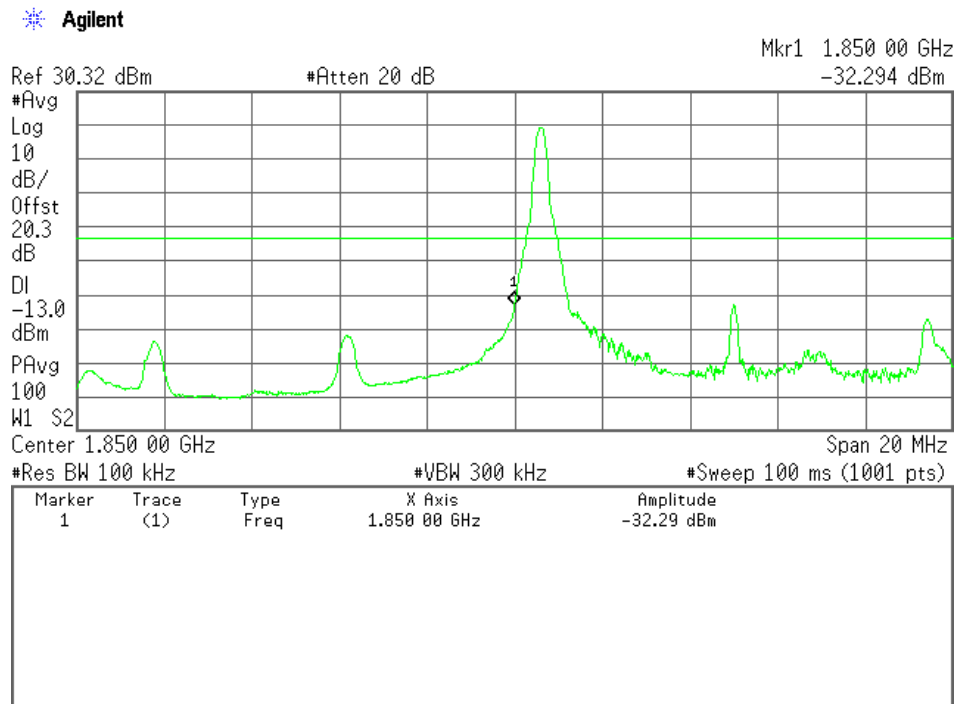


4-2) BW 10MHz

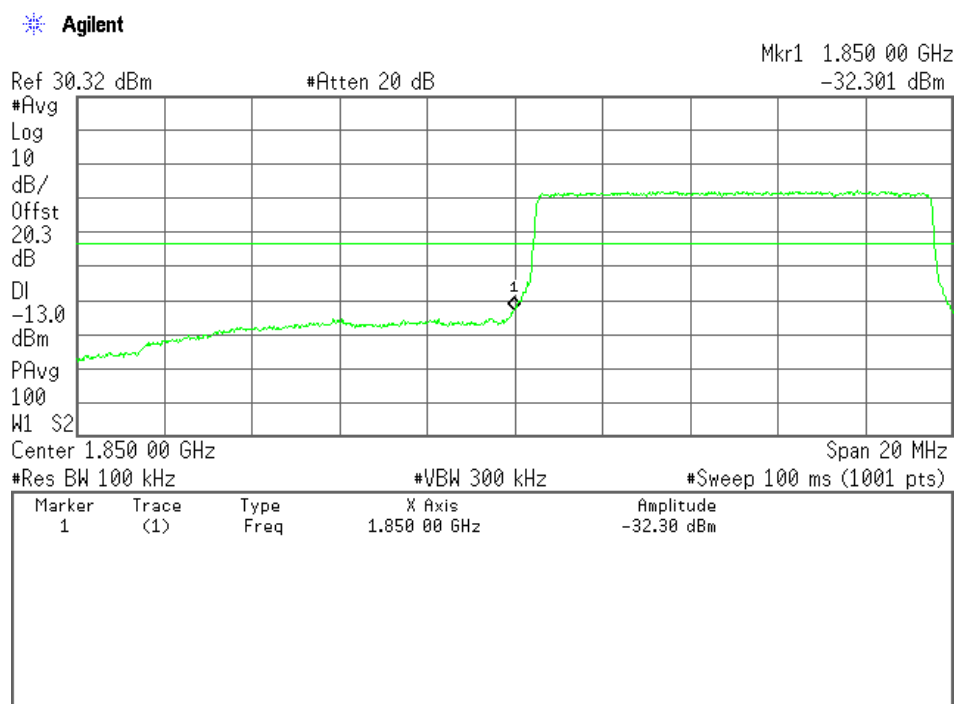
Mode:16 QAM

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18650	1855.00	1850.0	-32.3 (at 1850.0 MHz)	-13.0	+19.3
19150	1905.00	1910.0	-31.3 (at 1910.0 MHz)	-13.0	+18.3

Low Channel(1RB Offset 0), Band-Edge Emission

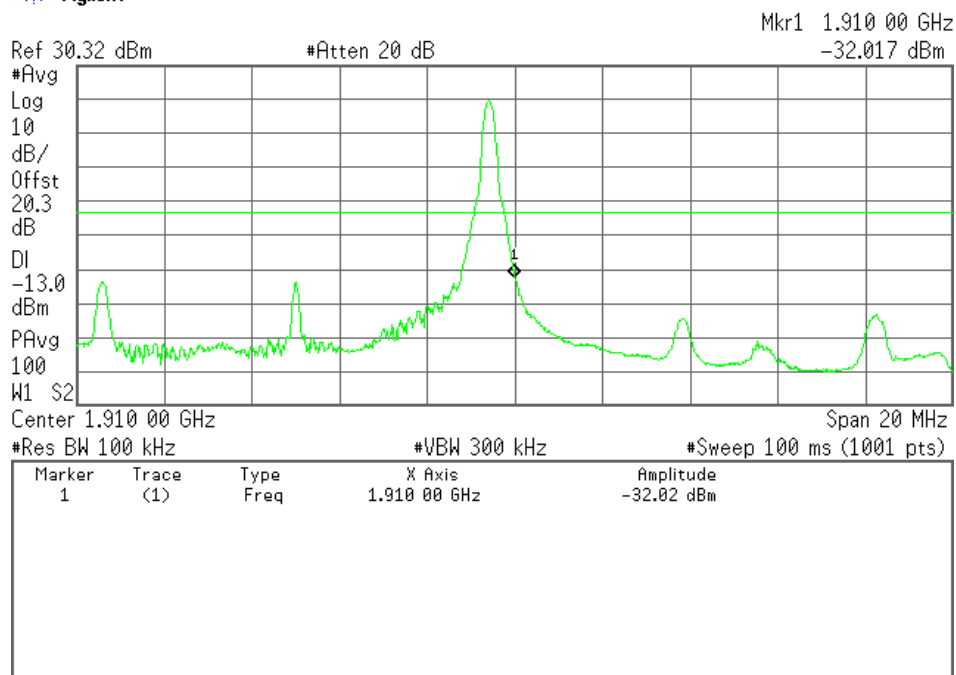


Low Channel(Full RB), Band-Edge Emission



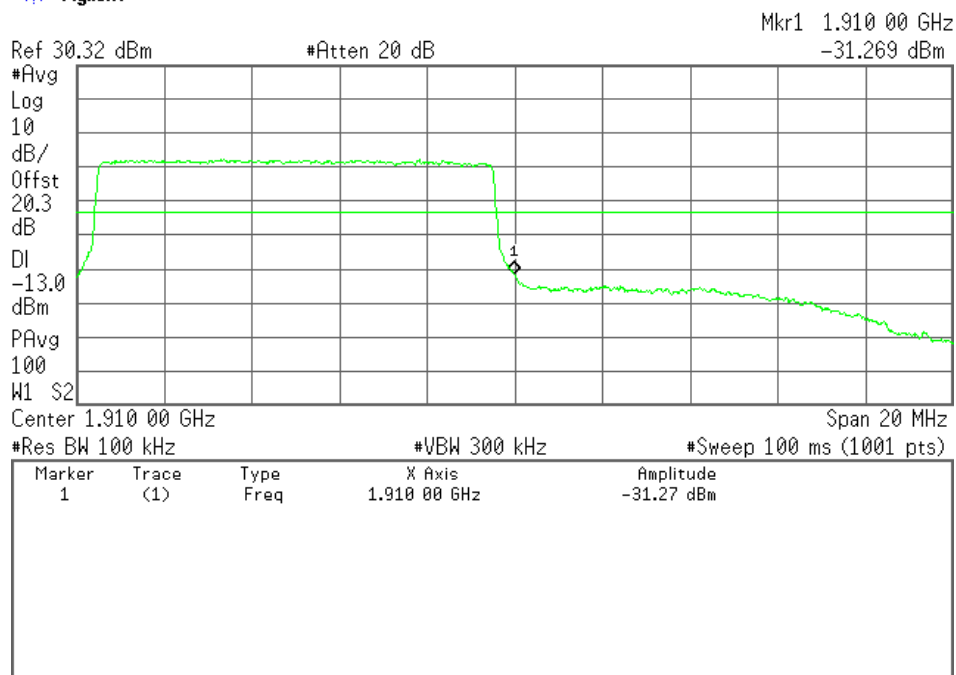
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

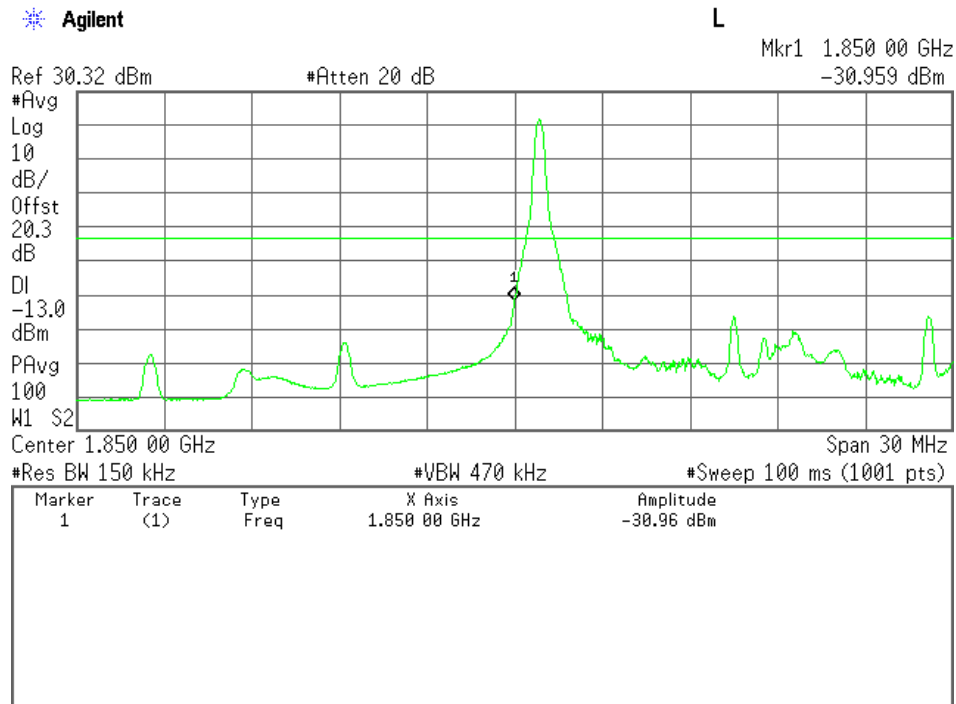


5-1) BW 15MHz

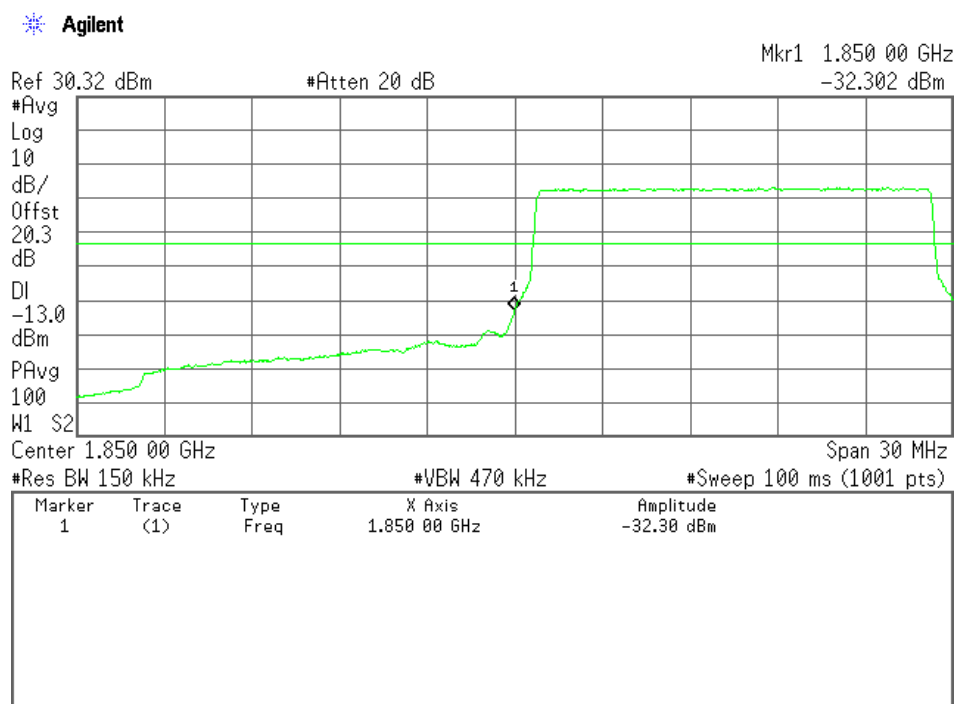
Mode: QPSK

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18675	1857.50	1850.0	-31.0 (at 1850.0 MHz)	-13.0	+18.0
19125	1902.50	1910.0	-30.0 (at 1910.0 MHz)	-13.0	+17.0

Low Channel(1RB Offset 0), Band-Edge Emission

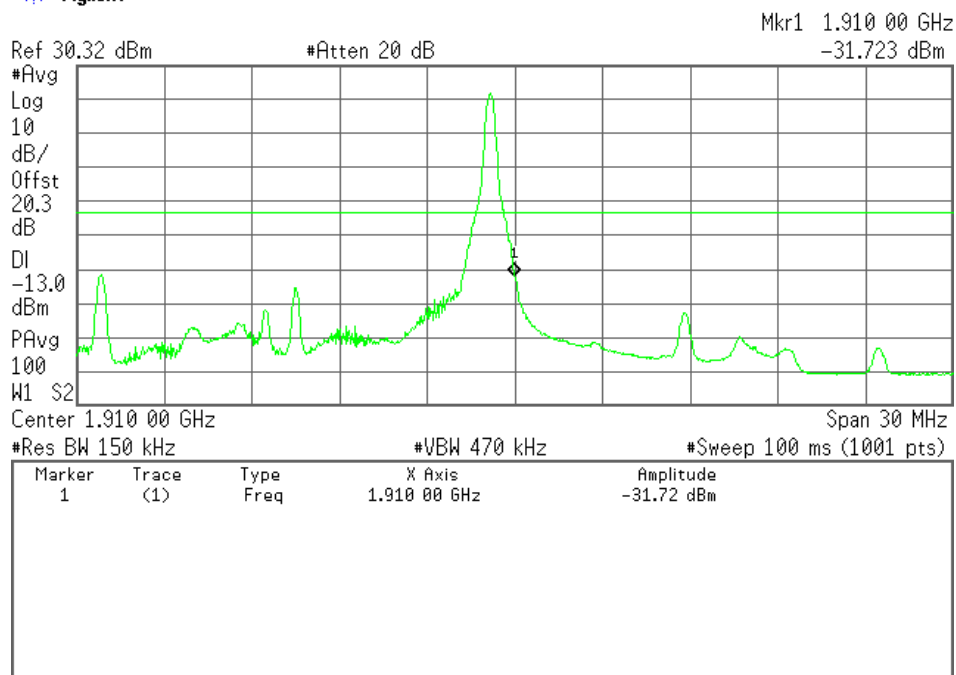


Low Channel(Full RB), Band-Edge Emission



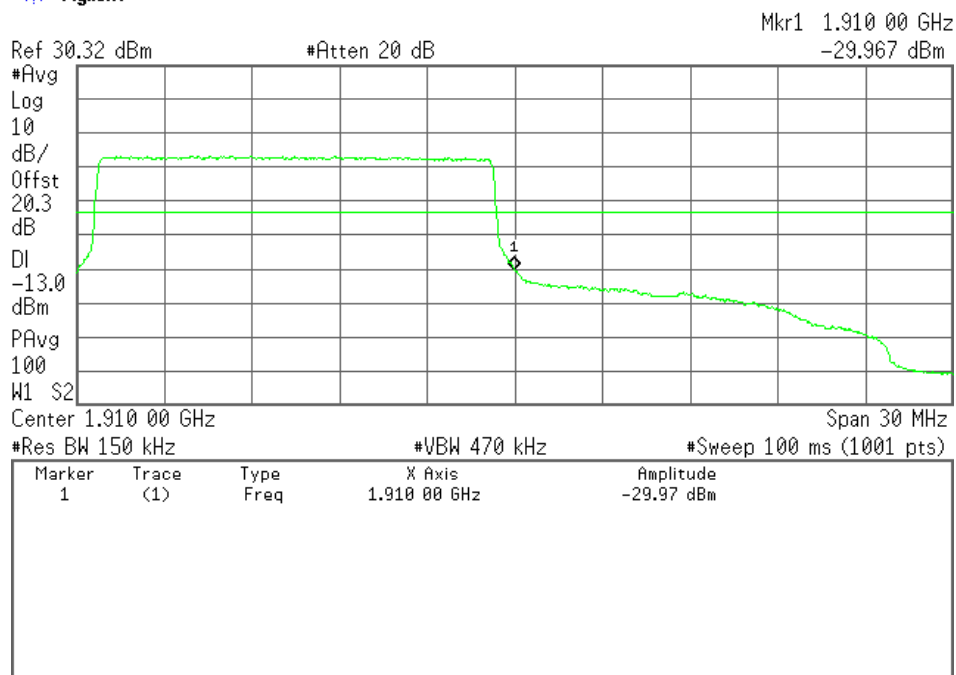
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

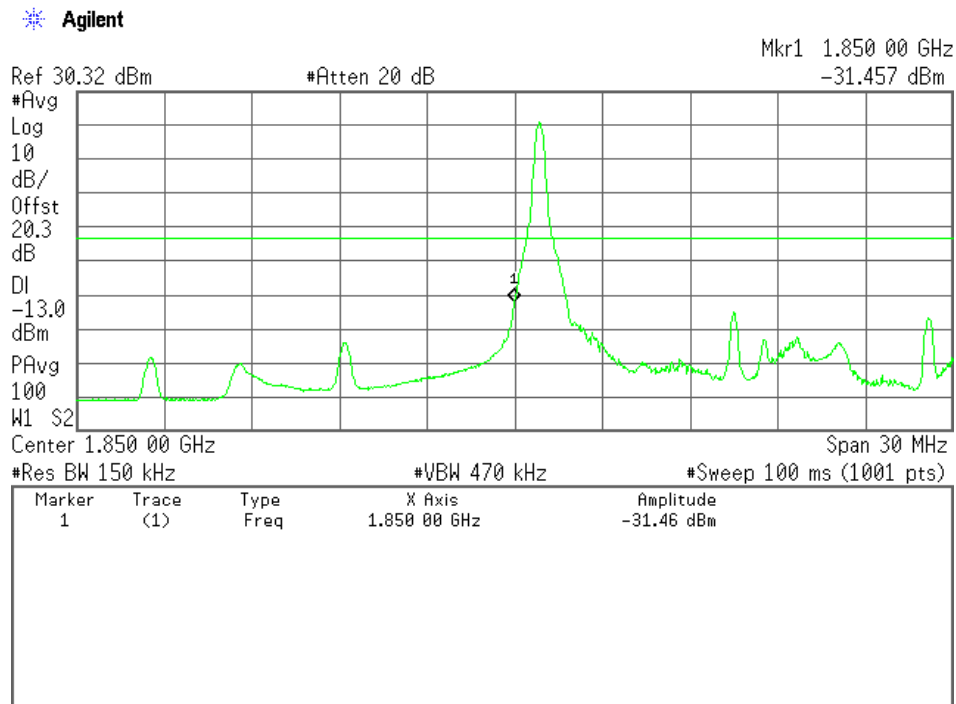


5-2) BW 15MHz

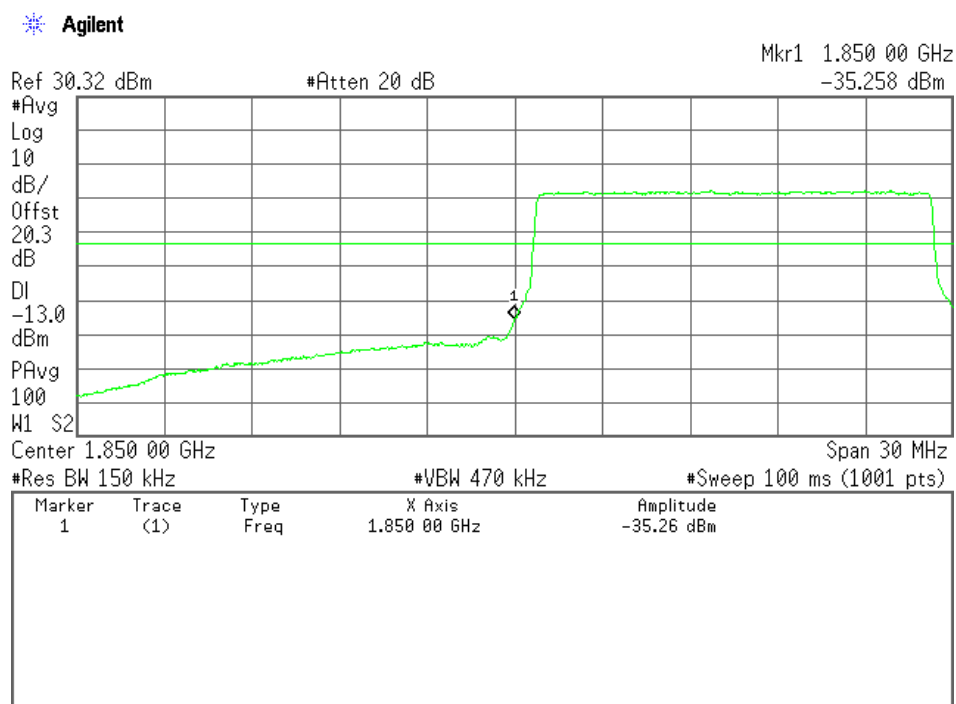
Mode:16 QAM

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18675	1857.50	1850.0	-31.5 (at 1850.0 MHz)	-13.0	+18.5
19125	1902.50	1910.0	-31.4 (at 1910.0 MHz)	-13.0	+18.4

Low Channel(1RB Offset 0), Band-Edge Emission

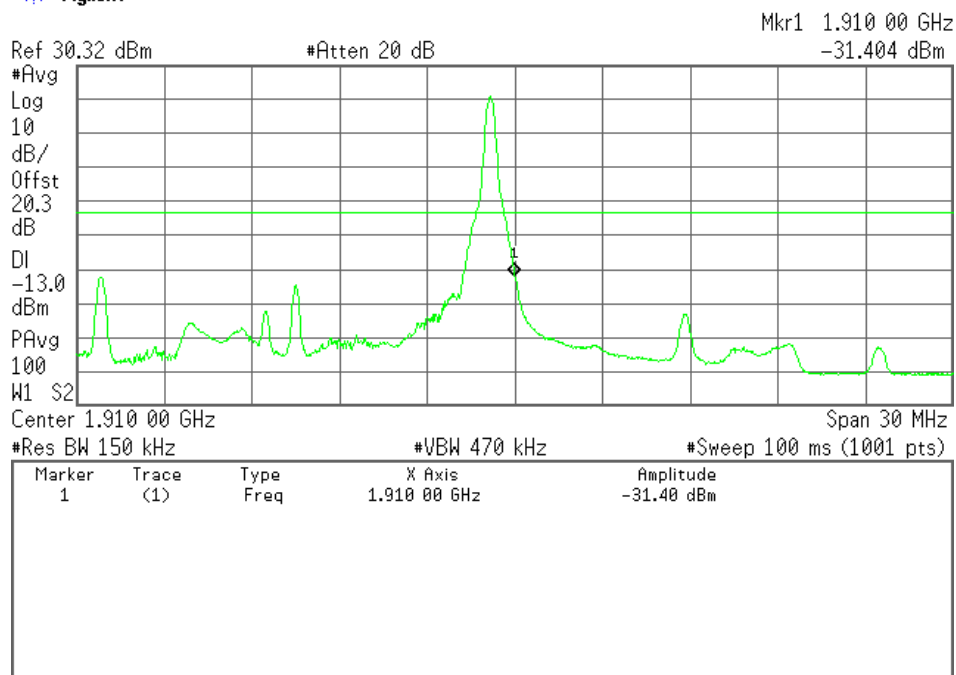


Low Channel(Full RB), Band-Edge Emission



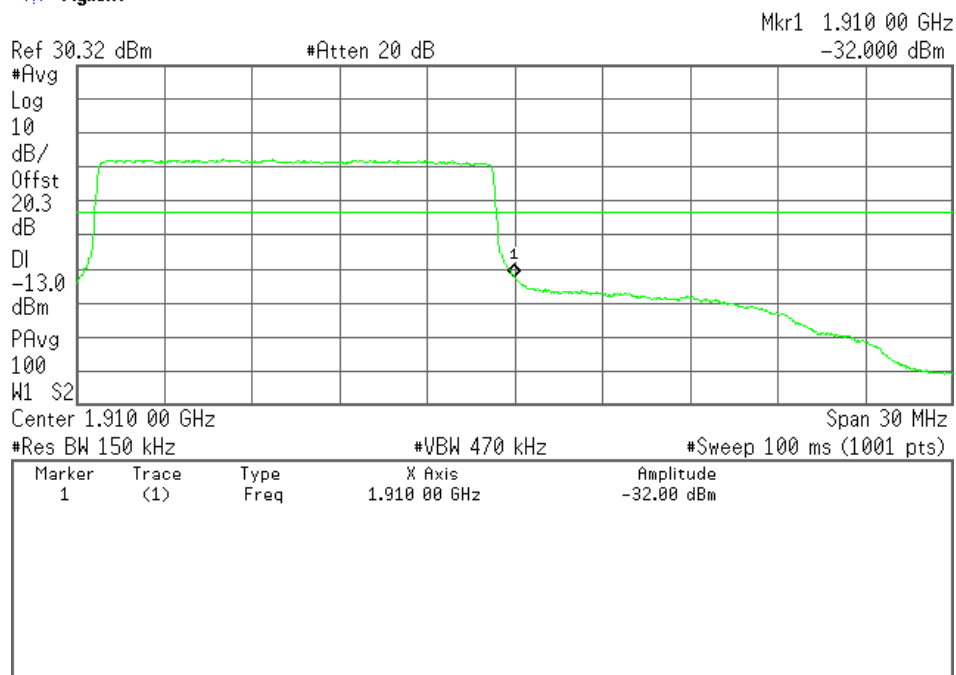
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

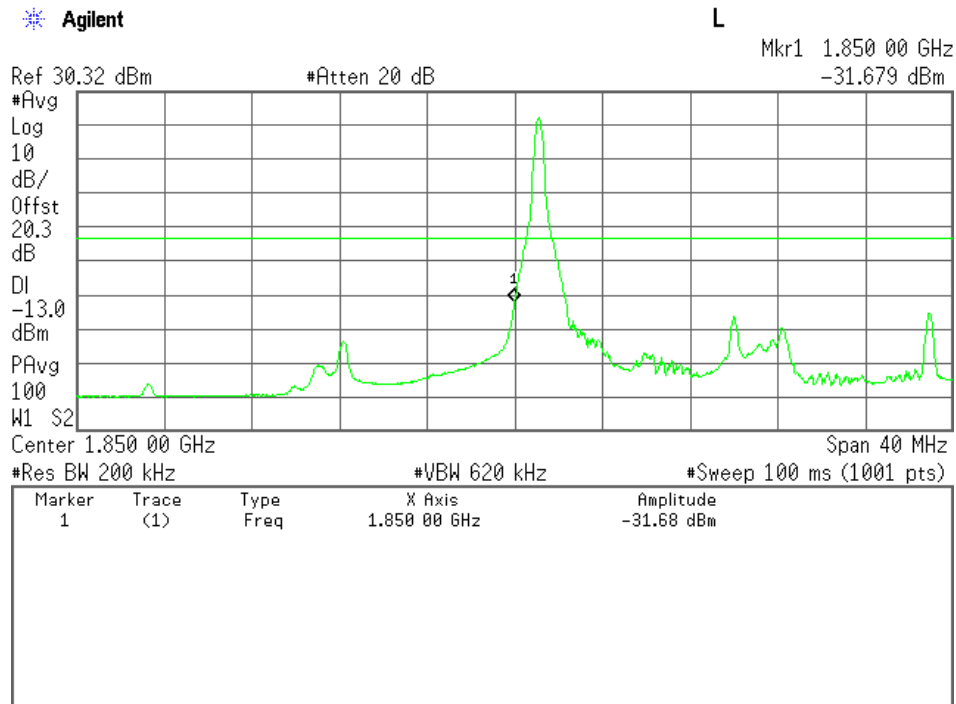


6-1) BW 20MHz

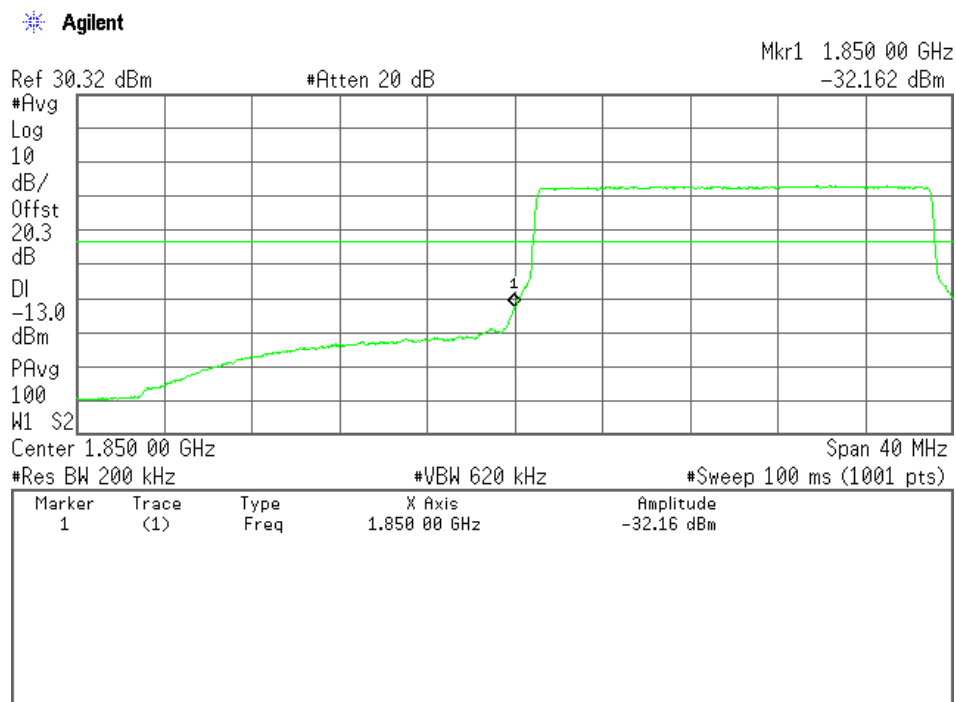
Mode: QPSK

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18700	1860.00	1850.0	-31.7 (at 1850.0 MHz)	-13.0	+18.7
19100	1900.00	1910.0	-24.0 (at 1910.0 MHz)	-13.0	+11.0

Low Channel(1RB Offset 0), Band-Edge Emission

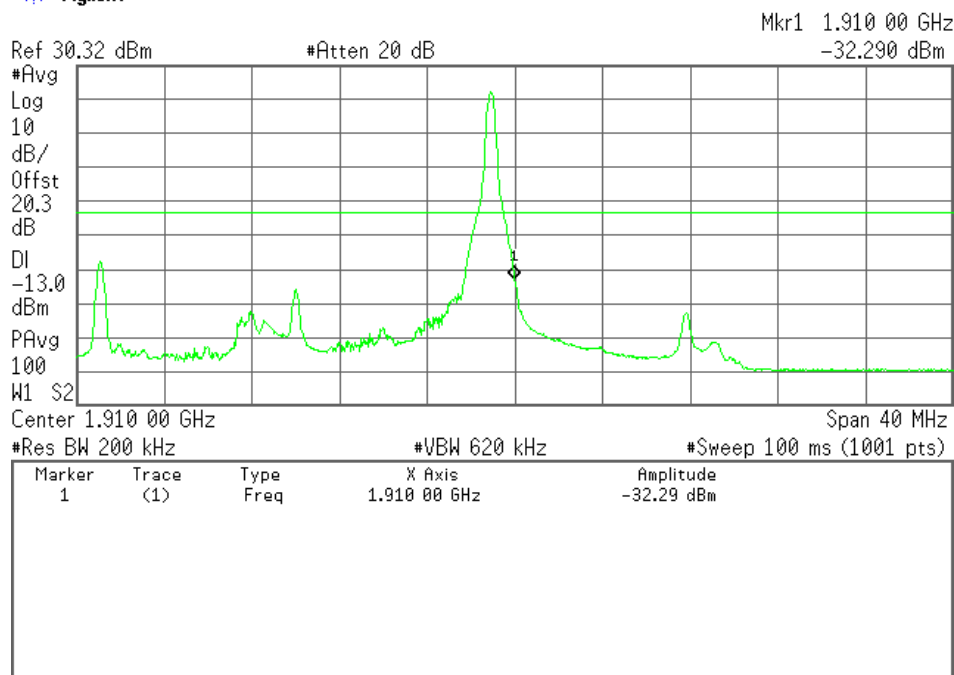


Low Channel(Full RB), Band-Edge Emission



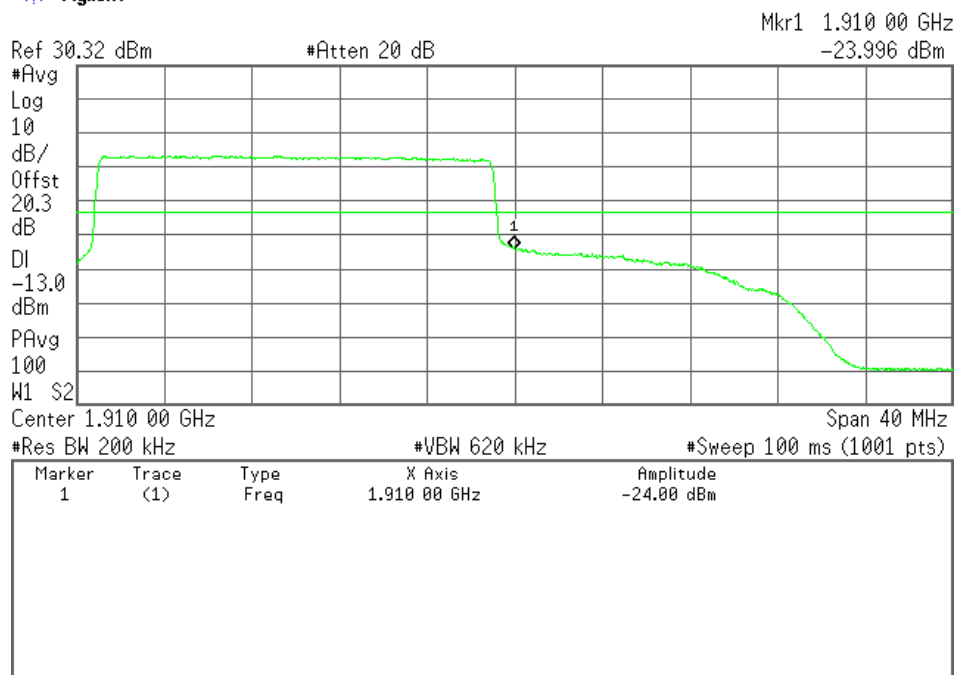
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent

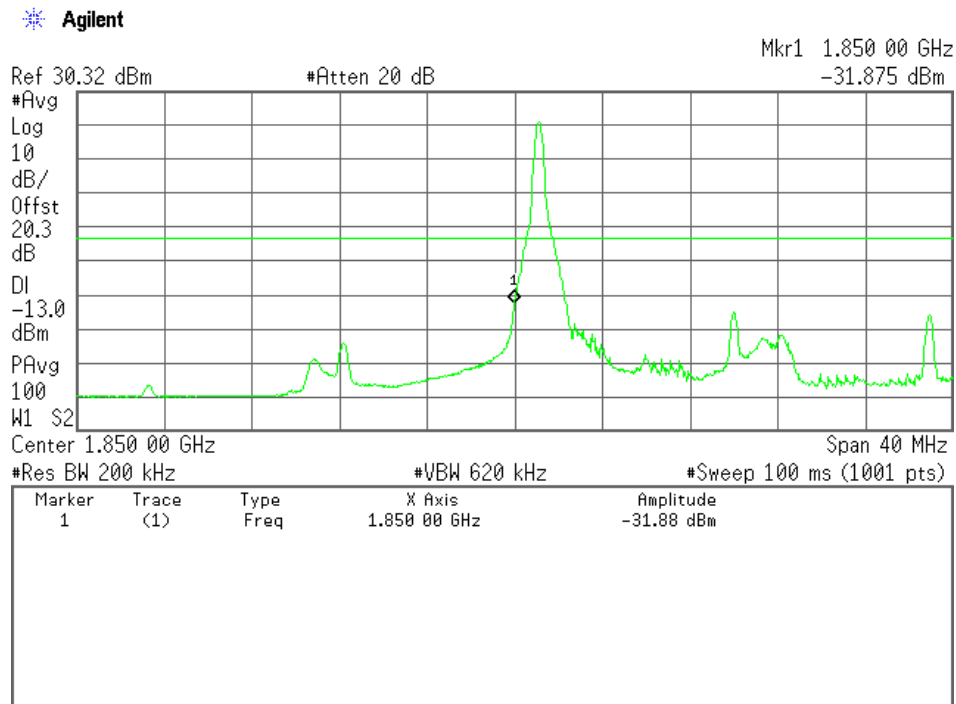


6-2) BW 20MHz

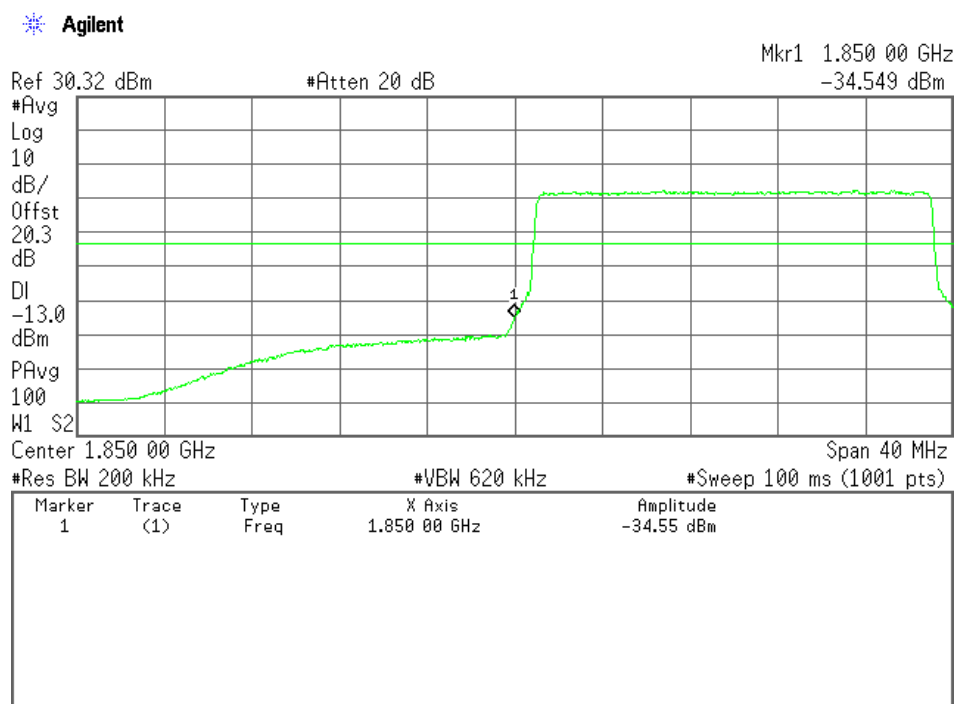
Mode:16 QAM

Channel	Frequency (MHz)	Band-Edge Frequency (MHz)	Level (dBm)	Limits (dBm)	Margin (dB)
18700	1860.00	1850.0	-31.9 (at 1850.0 MHz)	-13.0	+18.9
19100	1900.00	1910.0	-25.2 (at 1910.0 MHz)	-13.0	+12.2

Low Channel(1RB Offset 0), Band-Edge Emission

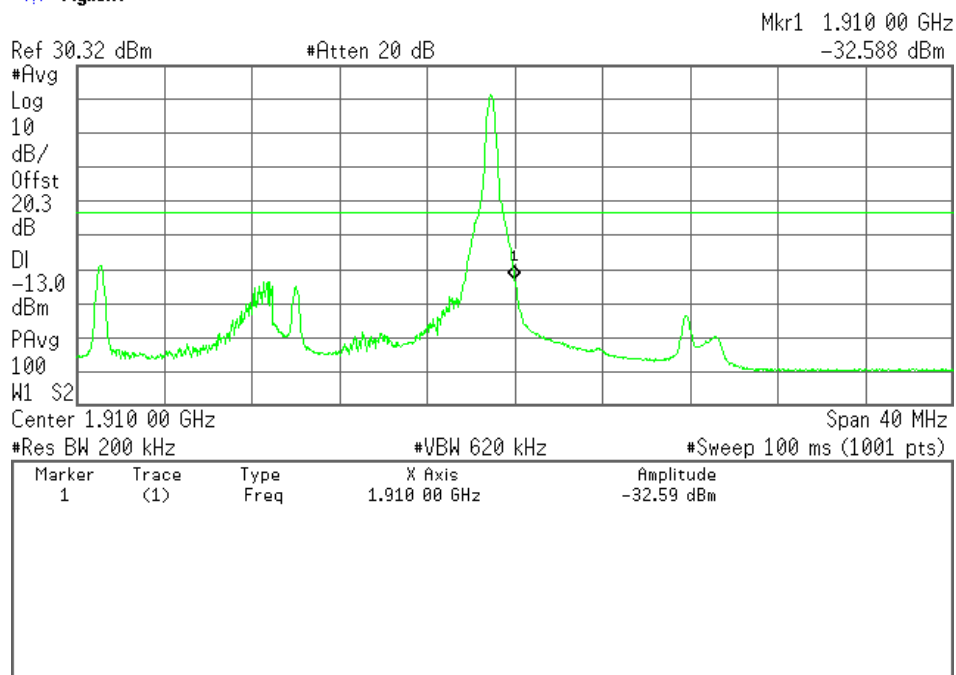


Low Channel(Full RB), Band-Edge Emission



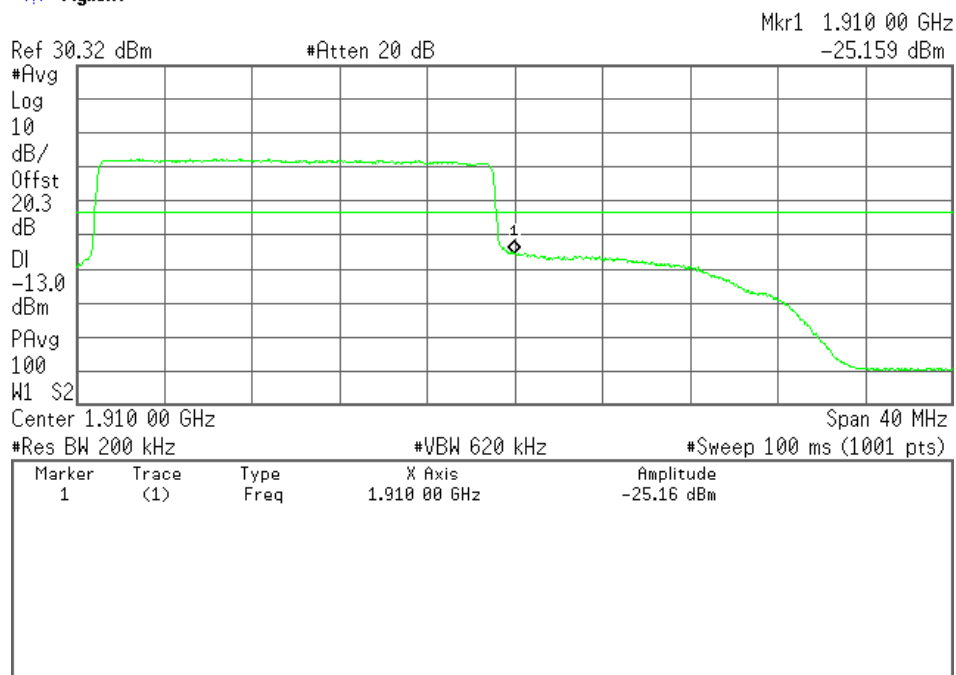
High Channel(1RB Offset Max), Band-Edge Emission

Agilent



High Channel(Full RB), Band-Edge Emission

Agilent



7.7 Field Strength of Spurious Radiation (§2.1053)

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.7.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

Min. Limit Margin >20.8 dB at 17183.7/17176.5 MHz
at 17167.5 MHz

Uncertainty of Measurement Results
30 MHz – 1000 MHz ± 1.6 dB(2σ)
1 GHz – 18 GHz ± 1.8 dB(2σ)
18 GHz – 40 GHz ± 2.7 dB(2σ)

Remarks : _____

7.7.2 Test Instruments

Anechoic Chamber A2				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Test Receiver	ESU 26	100170 (A-6)	Rohde & Schwarz	2016/04/25
Signal Generator	E8257D	MY45140309 (B-39)	Agilent	2016/08/10
Power Meter	N1911A	GB45100291 (B-63)	Agilent	2016/07/16
Power Sensor	N1921A	US44510470 (B-64)	Agilent	2016/07/16
Biconical Antenna	VHA9103/BBA9106	2355 (C-30)	Schwarzbeck	2016/05/24
Log-periodic Antenna	UHALP9108-A1	0694 (C-31)	Schwarzbeck	2016/05/24
Dipole Antenna (TX)	KBA-511A	0-273-2 (C-17)	Kyoritsu	2016/05/20
Dipole Antenna (TX)	KBA-611	0-248-2 (C-20)	Kyoritsu	2016/05/20
RF Cable	S 10162 B-11 etc.	--- (H-4)	HUBER+SUHNER	2016/04/15
Pre-Amplifier	TPA0118-36	1010 (A-37)	TOYO	2016/05/11
Horn Antenna	91888-2	562 (C-41-1)	EATON	2016/06/16
Horn Antenna	91889-2	568 (C-41-2)	EATON	2016/06/16
Horn Antenna	3160-04	9903-1053 (C-55)	EMCO	2016/06/29
Horn Antenna	3160-05	9902-1061 (C-56)	EMCO	2016/06/29
Horn Antenna	3160-06	9712-1045 (C-57)	EMCO	2016/06/29
Horn Antenna	3160-07	9902-1113 (C-58)	EMCO	2016/06/29
Horn Antenna	3160-08	9904-1099 (C-59)	EMCO	2016/06/29
Horn Antenna	3160-09	9808-1117 (C-48)	EMCO	2016/06/28
Attenuator	2-10	AW7937 (D-40)	Weinschel	2015/10/26
Attenuator	54A-10	W5713 (D-29)	Weinschel	2016/08/16
Attenuator	2-10	BA6214 (D-79)	Weinschel	2015/11/18
RF Cable	SUCOFLEX102E	6683/2E (C-70)	HUBER+SUHNER	2015/11/18
RF Cable	SUCOFLEX104	267479/4 (C-66)	HUBER+SUHNER	2016/01/19
RF Cable	SUCOFLEX104	267414/4 (C-67)	HUBER+SUHNER	2016/01/19
RF Cable	SUCOFLEX102EA	3041/2EA (C-69)	HUBER+SUHNER	2016/01/19
High Pass Filter	HPM13899	001 (D-96)	MICRO-TRONICS	2016/02/08

NOTE : The calibration interval of the above test instruments is 12 months.

7.7.3 Test Method and Test Setup (Diagrammatic illustration)

Step 1) The spurious radiation for transmitter were measured at the distance 3 m away from the EUT which was placed on a non-conducted support 0.8 m in height and was varying at three orthogonal axes. The receiving antenna was oriented for vertical polarization and varied from 1 m to 4 m until the maximum emission level was detected on the measuring instrument. The EUT was rotated 360 degrees until the maximum emission was received. The measurement was also repeated with the receiving antenna in the horizontal polarization.

This test was carried out using the half-wave dipole antenna for up to 1GHz and using the horn antenna for above 1 GHz.

Step 2)

A) Up to 1 GHz

The ERP measurement was carried out with according to Step 2 in Clause 7.2.3. Then the RF power in the substitution antenna half-wave dipole antenna for up to 1 GHz and the substitution horn antenna for above 1 GHz.

The ERP is calculated in the following equation.

$$\text{ERP(dBm)} = P(\text{dBm}) - (\text{Balun Loss of the half-wave dipole Ant. (dB)}) + \text{Cable Loss(dB)}$$

B) Above 1 GHz

The ERP is calculated from the maximum emission level by the following formula.

$$\frac{e^2}{120\pi} = \frac{\text{eirp}}{4\pi d^2} \quad \text{---(Eq.1)}$$

$$\text{erp} = \text{eirp} - Gd \quad \text{---(Eq.2)}$$

Where, $e[V/m]$: Field Strength at measuring distance($d=3m$)

$\text{eirp}[W]$: Equivalent Isotropic Radiated Power

$\text{erp}[W]$: Effective Radiated Power

$Gd(dBi)$: Gain of the substitution half-wave dipole antenna(2.15dBi)

$$\text{eirp} = \frac{(de)^2}{30} = \frac{3}{10} e^2$$

$$\therefore 10 \log(\text{eirp}) = 20 \log(e) + 10 \log(3/10) = 20 \log(e) - 5.23$$

$$10 \log(\text{eirp}) = \text{EIRP[dBm]} - 30$$

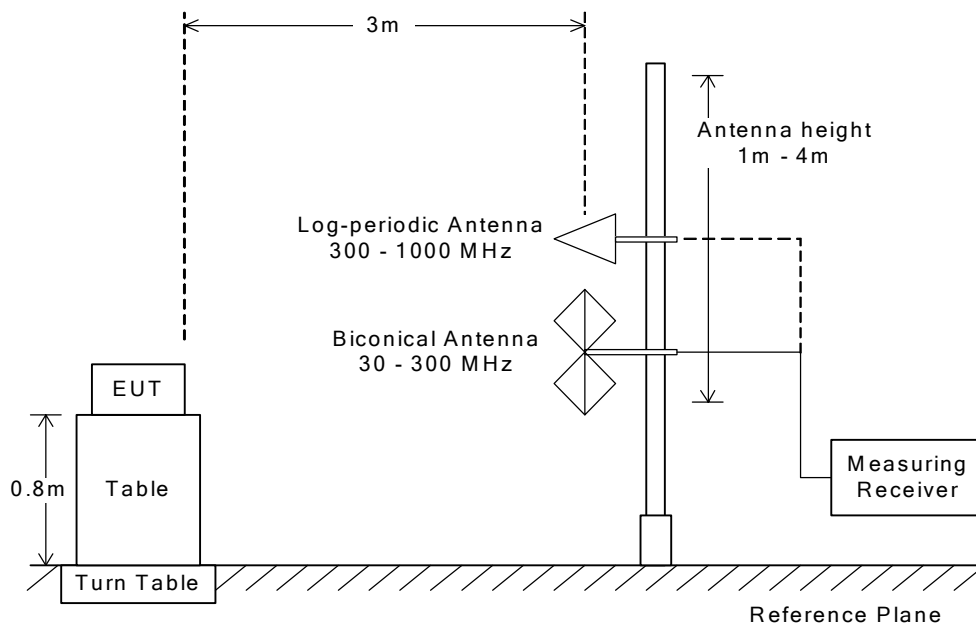
$$20 \log(e) = E[dB(\mu V/m)] - 120$$

$$\therefore \text{EIRP} = E - 120 + 30 - 5.23 = E - 95.23$$

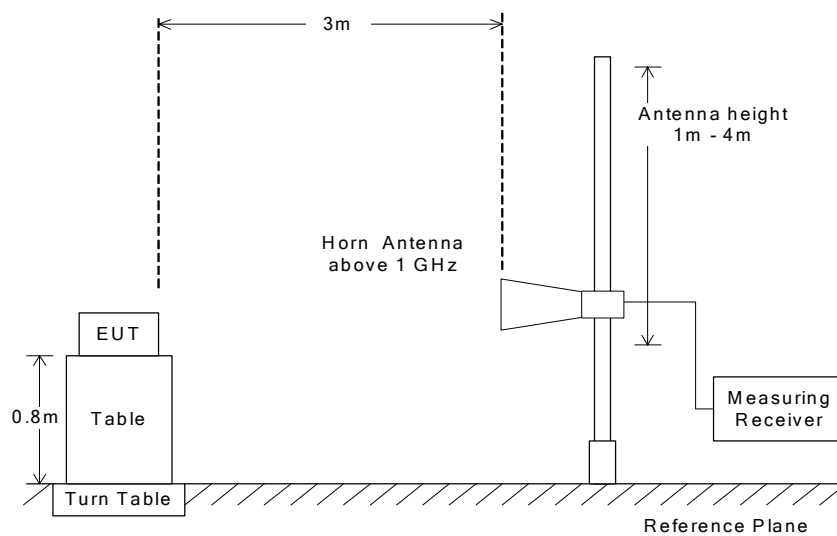
$$\therefore \text{ERP[dBm]} = \text{EIRP} - 2.15 = E - 97.38$$

The respective calculated ERP of the spurious and harmonics were compared with the ERP of fundamental frequency by specified attenuation limits, $43+10\log_{10}(TP \text{ in watt})[dB]$. Where, TP = Transmitter power at the ANT OUT under test configuration as the hands free unit used.

Radiated Emission 30 MHz to 1000 MHz



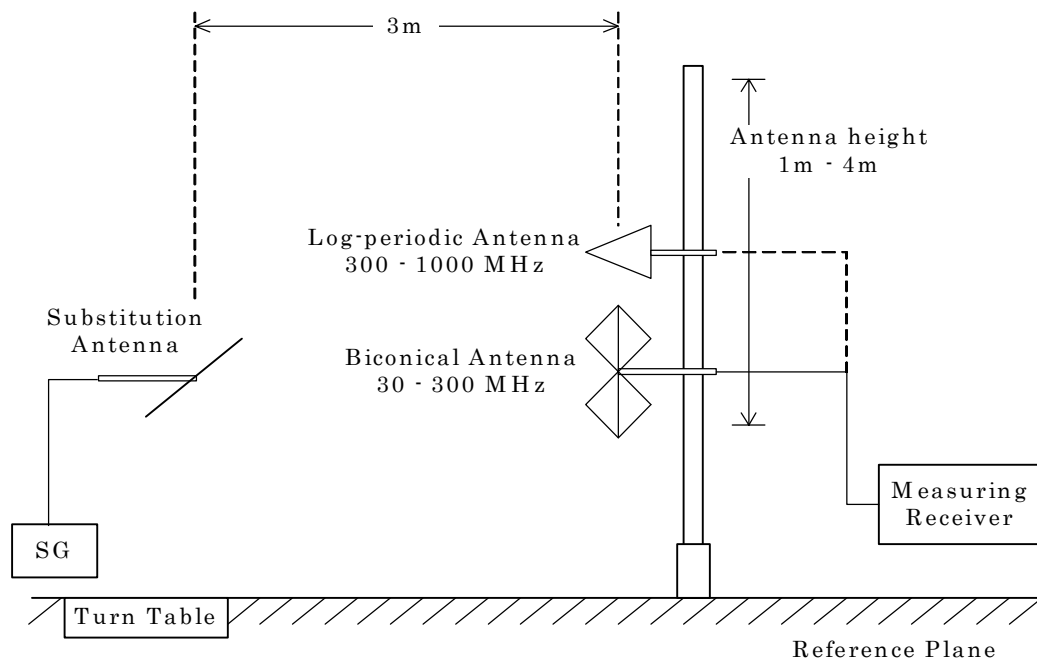
Radiated Emission above 1 GHz



NOTE

The antenna height is scanned depending on the EUT's size and mounting height.

Radiated Emission 30 to 1000 MHz – Substitution Method



7.7.4 Test Data

1) BW 1.4MHz(1RB)

(LTE 1.4MHz)

Test Configuration : Single Unit

Test Date: September 18, 2015

Temp.: 24 °C, Humi: 70 %

CH	Transmitting	Measured	ERP		Limits	Margin	Remarks
	Frequency [MHz]	Frequency [MHz]	Hori.	Vert.	[dBm]	[dB]	
18607	1850.700	3701.400	-51.6	-51.8	-13.0	+38.6	C
		5552.100	< -47.2	< -47.2	-13.0	> +34.2	C
		7402.800	< -45.7	< -45.7	-13.0	> +32.7	C
		9253.500	< -42.1	< -42.1	-13.0	> +29.1	C
		11104.200	< -40.5	< -40.5	-13.0	> +27.5	C
		12954.900	< -38.9	< -38.9	-13.0	> +25.9	C
		14805.600	< -37.8	< -37.8	-13.0	> +24.8	C
		16656.300	< -36.2	< -36.2	-13.0	> +23.2	C
		18507.000	< -39.9	< -39.9	-13.0	> +26.9	C
18900	1880.000	3760.000	< -52.1	< -52.1	-13.0	> +39.1	C
		5640.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7520.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9400.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11280.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13160.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15040.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16920.000	< -34.9	< -34.9	-13.0	> +21.9	C
		18800.000	< -39.8	< -39.8	-13.0	> +26.8	C
19193	1909.300	3818.600	< -52.0	< -52.0	-13.0	> +39.0	C
		5727.900	< -47.2	< -47.2	-13.0	> +34.2	C
		7637.200	< -45.7	< -45.7	-13.0	> +32.7	C
		9546.500	< -41.8	< -41.8	-13.0	> +28.8	C
		11455.800	< -40.5	< -40.5	-13.0	> +27.5	C
		13365.100	< -38.9	< -38.9	-13.0	> +25.9	C
		15274.400	< -37.9	< -37.9	-13.0	> +24.9	C
		17183.700	< -33.8	< -33.8	-13.0	> +20.8	C
			19093.000	< -39.6	< -39.6	-13.0	> +26.6

Calculated result at 17183.7 MHz, as the worst point shown on underline:

Minimum Margin: $-13.0 - (<-33.8) = >20.8$ (dB)

NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 20 GHz.
3. All emissions not reported were more than 20 dB below the applied limits.
4. Applied limits : -13.0 [dBm] = $10\log(TP[mW]) - (43 + 10\log(tp[W])) = 10\log(TP[mW]) - (43 + (10\log(TP[mW]) - 30))$
where, $tp[W] = TP[mW] / 1000$: Transmitter power at antenna terminal
5. The symbol of "<" means "or less".
6. The symbol of ">" means "more than".
7. Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	10 kHz	30 kHz	20 msec.
B	Peak	100 kHz	300 kHz	20 msec.
C	Peak	1 MHz	3 MHz	20 msec.

2) BW 3MHz(1RB)

(LTE 3MHz)

Test Configuration : Single Unit

Test Date: September 18, 2015

Temp.: 24 °C, Humi: 70 %

CH	Transmitting Frequency [MHz]	Measured Frequency [MHz]	ERP [dBm]		Limits [dBm]	Margin [dB]	Remarks
			Hori.	Vert.			
18615	1851.500	3703.000	< -52.4	< -52.4	-13.0	> +39.4	C
		5554.500	< -47.2	< -47.2	-13.0	> +34.2	C
		7406.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9257.500	< -42.0	< -42.0	-13.0	> +29.0	C
		11109.000	< -40.5	< -40.5	-13.0	> +27.5	C
		12960.500	< -38.9	< -38.9	-13.0	> +25.9	C
		14812.000	< -37.8	< -37.8	-13.0	> +24.8	C
		16663.500	< -36.2	< -36.2	-13.0	> +23.2	C
		18515.000	< -39.8	< -39.8	-13.0	> +26.8	C
18900	1880.000	3760.000	< -52.1	< -52.1	-13.0	> +39.1	C
		5640.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7520.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9400.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11280.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13160.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15040.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16920.000	< -34.9	< -34.9	-13.0	> +21.9	C
		18800.000	< -39.8	< -39.8	-13.0	> +26.8	C
19185	1908.500	3817.000	< -52.0	< -52.0	-13.0	> +39.0	C
		5725.500	< -47.2	< -47.2	-13.0	> +34.2	C
		7634.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9542.500	< -41.8	< -41.8	-13.0	> +28.8	C
		11451.000	< -40.5	< -40.5	-13.0	> +27.5	C
		13359.500	< -38.9	< -38.9	-13.0	> +25.9	C
		15268.000	< -37.9	< -37.9	-13.0	> +24.9	C
		17176.500	< -33.8	< -33.8	-13.0	> +20.8	C
		19085.000	< -39.6	< -39.6	-13.0	> +26.6	C

Calculated result at 17176.5 MHz, as the worst point shown on underline:

Minimum Margin: $-13.0 - (<-33.8) = >20.8$ (dB)

NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 20 GHz.
3. All emissions not reported were more than 20 dB below the applied limits.
4. Applied limits : -13.0 [dBm] = $10\log(TP[mW]) - (43 + 10\log(tp[W])) = 10\log(TP[mW]) - (43 + (10\log(TP[mW]) - 30))$
where, $tp[W] = TP[mW] / 1000$: Transmitter power at antenna terminal
5. The symbol of "<" means "or less".
6. The symbol of ">" means "more than".
7. Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	10 kHz	30 kHz	20 msec.
B	Peak	100 kHz	300 kHz	20 msec.
C	Peak	1 MHz	3 MHz	20 msec.

3) BW 5MHz(1RB)

(LTE 5MHz)

Test Configuration : Single Unit

Test Date: September 18, 2015

Temp.: 24 °C, Humi: 70 %

CH	Transmitting Frequency [MHz]	Measured Frequency [MHz]	ERP [dBm]		Limits [dBm]	Margin [dB]	Remarks
			Hori.	Vert.			
18625	1852.500	3705.000	-51.9	-52.2	-13.0	+38.9	C
		5557.500	< -47.2	< -47.2	-13.0	> +34.2	C
		7410.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9262.500	< -42.0	< -42.0	-13.0	> +29.0	C
		11115.000	< -40.5	< -40.5	-13.0	> +27.5	C
		12967.500	< -38.9	< -38.9	-13.0	> +25.9	C
		14820.000	< -37.8	< -37.8	-13.0	> +24.8	C
		16672.500	< -36.1	< -36.1	-13.0	> +23.1	C
		18525.000	< -39.8	< -39.8	-13.0	> +26.8	C
18900	1880.000	3760.000	< -52.1	< -52.1	-13.0	> +39.1	C
		5640.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7520.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9400.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11280.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13160.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15040.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16920.000	< -34.9	< -34.9	-13.0	> +21.9	C
		18800.000	< -39.8	< -39.8	-13.0	> +26.8	C
19175	1907.500	3815.000	< -52.0	< -52.0	-13.0	> +39.0	C
		5722.500	< -47.2	< -47.2	-13.0	> +34.2	C
		7630.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9537.500	< -41.8	< -41.8	-13.0	> +28.8	C
		11445.000	< -40.5	< -40.5	-13.0	> +27.5	C
		13352.500	< -38.9	< -38.9	-13.0	> +25.9	C
		15260.000	< -37.9	< -37.9	-13.0	> +24.9	C
		17167.500	< -33.8	< -33.8	-13.0	> +20.8	C
		19075.000	< -39.6	< -39.6	-13.0	> +26.6	C

Calculated result at 17167.5 MHz, as the worst point shown on underline:

Minimum Margin: $-13.0 - (<-33.8) = >20.8$ (dB)

NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 20 GHz.
3. All emissions not reported were more than 20 dB below the applied limits.
4. Applied limits : -13.0 [dBm] = $10\log(TP[mW]) - (43 + 10\log(tp[W])) = 10\log(TP[mW]) - (43 + (10\log(TP[mW]) - 30))$
where, $tp[W] = TP[mW] / 1000$: Transmitter power at antenna terminal
5. The symbol of "<" means "or less".
6. The symbol of ">" means "more than".
7. Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	10 kHz	30 kHz	20 msec.
B	Peak	100 kHz	300 kHz	20 msec.
C	Peak	1 MHz	3 MHz	20 msec.

4) BW 10MHz(1RB)

(LTE 10MHz)

Test Configuration : Single Unit

Test Date: September 18, 2015

Temp.: 24 °C, Humi: 70 %

CH	Transmitting Frequency [MHz]	Measured Frequency [MHz]	ERP [dBm]		Limits [dBm]	Margin [dB]	Remarks
			Hori.	Vert.			
18650	1855.000	3710.000	-51.7	-52.1	-13.0	+38.7	C
		5565.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7420.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9275.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11130.000	< -40.4	< -40.4	-13.0	> +27.4	C
		12985.000	< -38.9	< -38.9	-13.0	> +25.9	C
		14840.000	< -37.8	< -37.8	-13.0	> +24.8	C
		16695.000	< -36.0	< -36.0	-13.0	> +23.0	C
		18550.000	< -39.9	< -39.9	-13.0	> +26.9	C
18900	1880.000	3760.000	< -52.1	< -52.1	-13.0	> +39.1	C
		5640.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7520.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9400.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11280.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13160.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15040.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16920.000	< -34.9	< -34.9	-13.0	> +21.9	C
		18800.000	< -39.8	< -39.8	-13.0	> +26.8	C
19150	1905.000	3810.000	< -52.0	< -52.0	-13.0	> +39.0	C
		5715.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7620.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9525.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11430.000	< -40.5	< -40.5	-13.0	> +27.5	C
		13335.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15240.000	< -37.9	< -37.9	-13.0	> +24.9	C
		17145.000	< -34.0	< -34.0	-13.0	> +21.0	C
		19050.000	< -39.6	< -39.6	-13.0	> +26.6	C

Calculated result at 17145.0 MHz, as the worst point shown on underline:

Minimum Margin: $-13.0 - (<-34.0) = >21.0$ (dB)

NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 20 GHz.
3. All emissions not reported were more than 20 dB below the applied limits.
4. Applied limits : -13.0 [dBm] = $10\log(TP[mW]) - (43 + 10\log(tp[W])) = 10\log(TP[mW]) - (43 + (10\log(TP[mW]) - 30))$
where, $tp[W] = TP[mW] / 1000$: Transmitter power at antenna terminal
5. The symbol of "<" means "or less".
6. The symbol of ">" means "more than".
7. Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	10 kHz	30 kHz	20 msec.
B	Peak	100 kHz	300 kHz	20 msec.
C	Peak	1 MHz	3 MHz	20 msec.

5) BW 15MHz(1RB)

(LTE 15MHz)

Test Date: September 18, 2015

Temp.: 24 °C, Humi: 70 %

Test Configuration : Single Unit

CH	Transmitting Frequency [MHz]	Measured Frequency [MHz]	ERP [dBm]		Limits [dBm]	Margin [dB]	Remarks
			Hori.	Vert.			
18675	1857.500	3715.000	< -52.2	< -52.2	-13.0	> +39.2	C
		5572.500	< -47.2	< -47.2	-13.0	> +34.2	C
		7430.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9287.500	< -41.9	< -41.9	-13.0	> +28.9	C
		11145.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13002.500	< -38.9	< -38.9	-13.0	> +25.9	C
		14860.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16717.500	< -35.9	< -35.9	-13.0	> +22.9	C
		18575.000	< -39.9	< -39.9	-13.0	> +26.9	C
18900	1880.000	3760.000	< -52.1	< -52.1	-13.0	> +39.1	C
		5640.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7520.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9400.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11280.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13160.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15040.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16920.000	< -34.9	< -34.9	-13.0	> +21.9	C
		18800.000	< -39.8	< -39.8	-13.0	> +26.8	C
19125	1902.500	3805.000	< -52.0	< -52.0	-13.0	> +39.0	C
		5707.500	< -47.2	< -47.2	-13.0	> +34.2	C
		7610.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9512.500	< -41.9	< -41.9	-13.0	> +28.9	C
		11415.000	< -40.5	< -40.5	-13.0	> +27.5	C
		13317.500	< -38.9	< -38.9	-13.0	> +25.9	C
		15220.000	< -37.9	< -37.9	-13.0	> +24.9	C
		17122.500	< -34.1	< -34.1	-13.0	> +21.1	C
		19025.000	< -39.6	< -39.6	-13.0	> +26.6	C

Calculated result at 17122.5 MHz, as the worst point shown on underline:

Minimum Margin: $-13.0 - (<-34.1) = >21.1$ (dB)

NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 20 GHz.
3. All emissions not reported were more than 20 dB below the applied limits.
4. Applied limits : -13.0 [dBm] = $10\log(TP[mW]) - (43 + 10\log(tp[W])) = 10\log(TP[mW]) - (43 + (10\log(TP[mW]) - 30))$
where, $tp[W] = TP[mW] / 1000$: Transmitter power at antenna terminal
5. The symbol of "<" means "or less".
6. The symbol of ">" means "more than".
7. Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	10 kHz	30 kHz	20 msec.
B	Peak	100 kHz	300 kHz	20 msec.
C	Peak	1 MHz	3 MHz	20 msec.

6) BW 20MHz(1RB)

(LTE 20MHz)

Test Configuration : Single Unit

Test Date: September 18, 2015

Temp.: 24 °C, Humi: 70 %

CH	Transmitting Frequency [MHz]	Measured Frequency [MHz]	ERP [dBm]		Limits [dBm]	Margin [dB]	Remarks
			Hori.	Vert.			
18700	1860.000	3720.000	-51.9	< -52.2	-13.0	+38.9	C
		5580.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7440.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9300.000	< -41.8	< -41.8	-13.0	> +28.8	C
		11160.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13020.000	< -38.9	< -38.9	-13.0	> +25.9	C
		14880.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16740.000	< -35.8	< -35.8	-13.0	> +22.8	C
		18600.000	< -40.0	< -40.0	-13.0	> +27.0	C
18900	1880.000	3760.000	< -52.1	< -52.1	-13.0	> +39.1	C
		5640.000	< -47.2	< -47.2	-13.0	> +34.2	C
		7520.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9400.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11280.000	< -40.4	< -40.4	-13.0	> +27.4	C
		13160.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15040.000	< -37.9	< -37.9	-13.0	> +24.9	C
		16920.000	< -34.9	< -34.9	-13.0	> +21.9	C
		18800.000	< -39.8	< -39.8	-13.0	> +26.8	C
19100	1900.000	3800.000	< -52.0	< -52.0	-13.0	> +39.0	C
		5700.000	< -47.3	< -47.3	-13.0	> +34.3	C
		7600.000	< -45.7	< -45.7	-13.0	> +32.7	C
		9500.000	< -41.9	< -41.9	-13.0	> +28.9	C
		11400.000	< -40.5	< -40.5	-13.0	> +27.5	C
		13300.000	< -38.9	< -38.9	-13.0	> +25.9	C
		15200.000	< -37.8	< -37.8	-13.0	> +24.8	C
		17100.000	< -34.1	< -34.1	-13.0	> +21.1	C
		19000.000	< -39.6	< -39.6	-13.0	> +26.6	C

Calculated result at 17100.0 MHz, as the worst point shown on underline:

Minimum Margin: $-13.0 - (<-34.1) = >21.1$ (dB)

NOTES

1. Test Distance : 3 m
2. The spectrum was checked from 30 MHz to 20 GHz.
3. All emissions not reported were more than 20 dB below the applied limits.
4. Applied limits : -13.0 [dBm] = $10\log(TP[mW]) - (43 + 10\log(tp[W])) = 10\log(TP[mW]) - (43 + (10\log(TP[mW]) - 30))$
where, $tp[W] = TP[mW] / 1000$: Transmitter power at antenna terminal
5. The symbol of "<" means "or less".
6. The symbol of ">" means "more than".
7. Setting of measuring instrument(s) :

	Detector Function	RES B.W.	V.B.W.	Sweep Time
A	Peak	10 kHz	30 kHz	20 msec.
B	Peak	100 kHz	300 kHz	20 msec.
C	Peak	1 MHz	3 MHz	20 msec.

7.8 Frequency Stability (§2.1055)

For the requirements, ☒ - Applicable [☒ - Tested. ☐ - Not tested by applicant request.]
☐ - Not Applicable

7.8.1 Test Results

For the standard, ☒ - Passed ☐ - Failed ☐ - Not judged

The Frequency Stability level is -0.01 ppm at 1880.000 MHz

Uncertainty of Measurement Results ± 0.03 ppm(2σ)

Remarks : _____

7.8.2 Test Instruments

Shielded Room S4				
Type	Model	Serial No. (ID)	Manufacturer	Cal. Due
Base Station Simulator	MT8820C	6200918329 (B-5)	Anritsu	2016/03/02
Environmental Chamber	SH-641	92010990 (F-32)	ESPEC	2016/07/06
DC Voltage Meter	2011	02247S (B-33)	YOKOGAWA	2016/04/07
DC Power Supply	NL035-10	35883293 (F-4)	TAKASAGO	N/A

NOTE : The calibration interval of the above test instruments is 12 months.

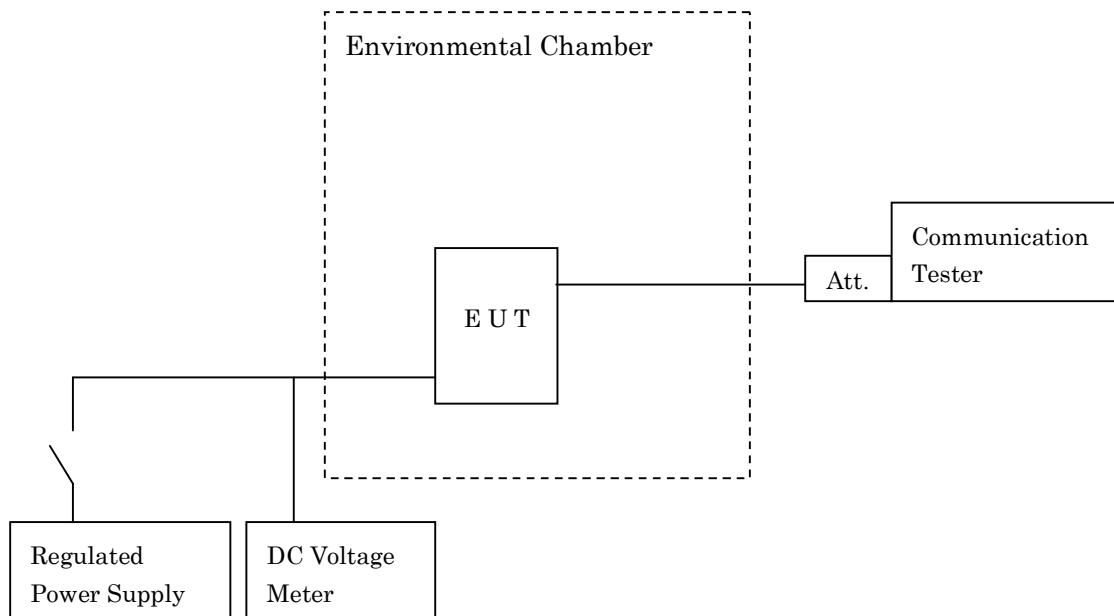
7.8.3 Test Method and Test Setup (Diagrammatic illustration)

Frequency Stability versus Temperature

The EUT was placed in an environmental chamber and was tested in the range from –30 to +50 degrees Celsius. The EUT was stabilized at each temperature. The power (4.0VDC) supplied was applied to the transmitter and allowed to stabilize for 10 minutes. The transmitting frequency was measured at startup and 2 minutes, 5 minutes and 10 minutes after startup. This procedure was repeated from –30 to +50 degrees Celsius at the interval of 10 degrees.

Frequency Stability versus Power Supply Voltage

The EUT was placed in an environmental chamber and was tested at the temperature of +20 degrees Celsius. The EUT was stabilized at the temperature. The power (4.0VDC) and the power (3.7VDC, the ending voltage) was applied to the EUT allowed to stabilize for 10 minutes. The transmitting frequency was measured at startup and 2 minutes, 5 minutes and 10 minutes after startup.



7.8.4 Test Data

(LTE)

Test Date: September 18, 2015
- September 19, 2015

1. Frequency Stability Measurement versus Temperature

Transmitting Frequency : 1880.000 MHz (18900 ch)
DC Supply Voltage : 4.0 VDC

Ambient Temperature [°C]	Startup	Deviation [ppm]			Limits [ppm]	Margin [ppm]
		2 minutes	5 minutes	10 minutes		
-30	+ 0.00	+ 0.00	+ 0.00	+ 0.00	N/A	N/A
-20	+ 0.00	+ 0.00	+ 0.00	+ 0.00	N/A	N/A
-10	<u>+ 0.01</u>	+ 0.00	+ 0.00	+ 0.00	N/A	N/A
0	+ 0.00	<u>- 0.01</u>	+ 0.00	+ 0.00	N/A	N/A
10	+ 0.00	<u>- 0.01</u>	+ 0.00	+ 0.00	N/A	N/A
20	<u>- 0.01</u>	<u>- 0.01</u>	<u>- 0.01</u>	<u>- 0.01</u>	N/A	N/A
30	+ 0.00	<u>- 0.01</u>	+ 0.00	<u>- 0.01</u>	N/A	N/A
40	<u>- 0.01</u>	<u>- 0.01</u>	<u>- 0.01</u>	<u>- 0.01</u>	N/A	N/A
50	<u>- 0.01</u>	+ 0.00	+ 0.00	+ 0.00	N/A	N/A

2. Frequency Stability Measurement versus Power Supply Voltage

Transmitting Frequency : 1880.000 MHz (18900 ch)
Ambient Temperature: : 20 °C

DC Supply Voltage [V]	Startup	Deviation [ppm]			Limits [ppm]	Margin [ppm]
		2 minutes	5 minutes	10 minutes		
4.0	<u>- 0.01</u>	<u>- 0.01</u>	<u>- 0.01</u>	<u>- 0.01</u>	N/A	N/A
3.7(Ending)	+ 0.00	<u>- 0.01</u>	<u>- 0.01</u>	<u>- 0.01</u>	N/A	N/A

Test condition example as the maximum deviation point shown on underline:

Ambient Temperature : -10 °C / Startup

DC Supply Voltage : 4 VDC

NOTE : The measurement were made after all of components of the oscillator sufficiently stabilized at each temperature.