12. OCCUPIED BANDWIDTH

12.1 Operating environment

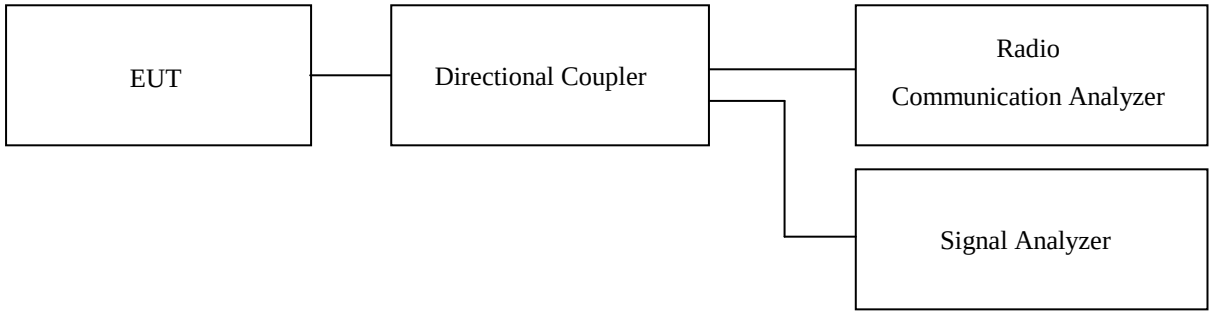
Temperature : 23 ℃

Relative humidity : 47 % R.H.

12.2 Test set-up

The emission bandwidth (×dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated × dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3× the resolution bandwidth. When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3×RBW.



12.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jul. 24, 2019 (1Y)
■ -	AAMCS-UDC	AA-MCS	Directional Coupler	400	Jul. 25, 2019 (1Y)
■ -	MT8821C	ANRITSU	Radio Communication Analyzer	6261849029	Jul. 26, 2019 (1Y)
☐ -	GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 10, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

12.4 Test data

12.4.1 Test data for LTE Band 4

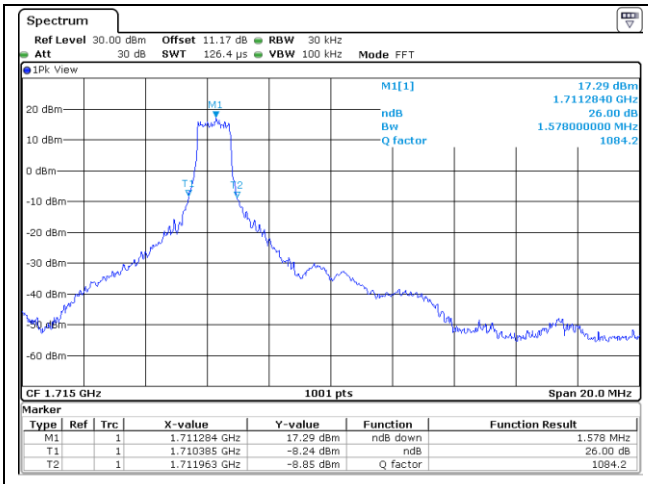
-. Test Date : September 23, 2019 ~ Ocotber 04, 2019

-. Test Result : Pass

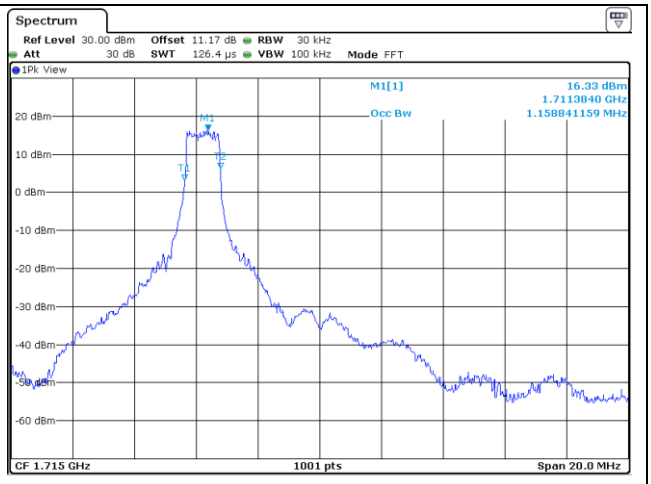
Test Mode	Channel	26 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Result
QPSK	Low	1.578	1.159	PASS
	Middle	1.538	1.139	PASS
	High	1.598	1.139	PASS

Test Mode	Channel	26 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Result
16QAM	Low	1.578	1.159	PASS
	Middle	1.638	1.159	PASS
	High	1.598	1.139	PASS

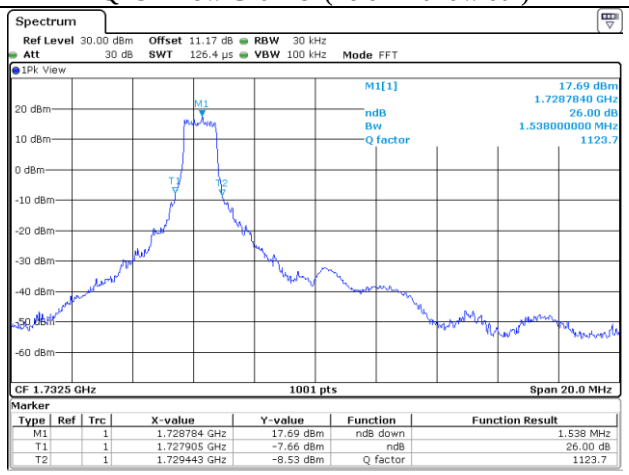
Tested by: Ju Yun Park / Assistant Manager



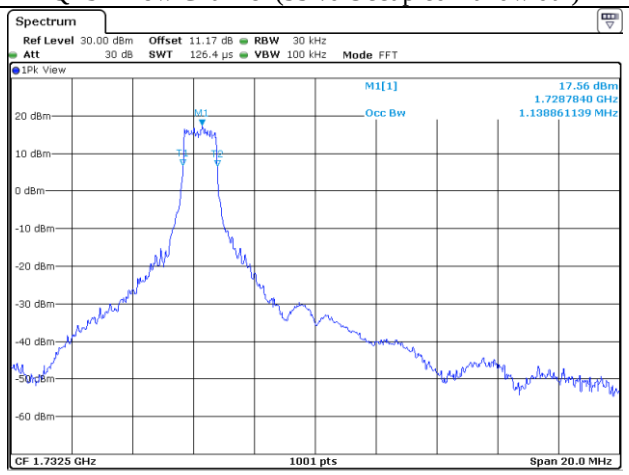
QPSK Low Channel (26 dB Bandwidth)



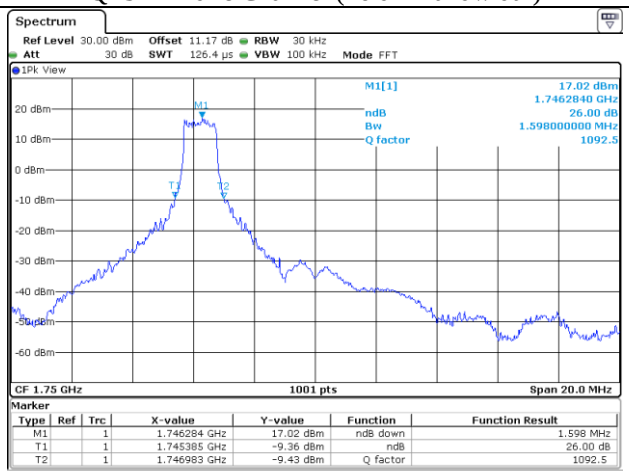
QPSK Low Channel (99 % Occupied Bandwidth)



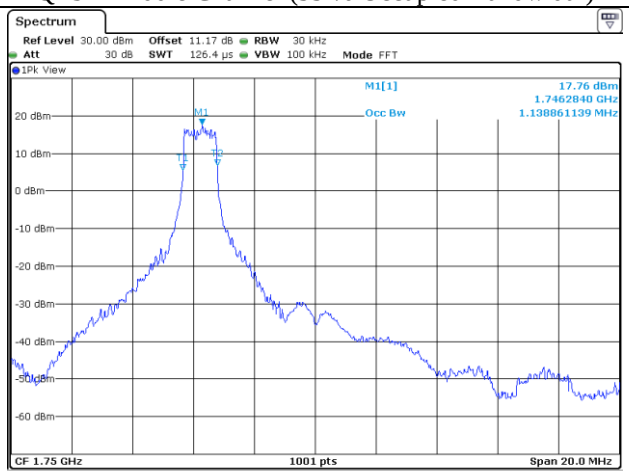
QPSK Midlle Channel (26 dB Bandwidth)



QPSK Middle Channel (99 % Occupied Bandwidth)

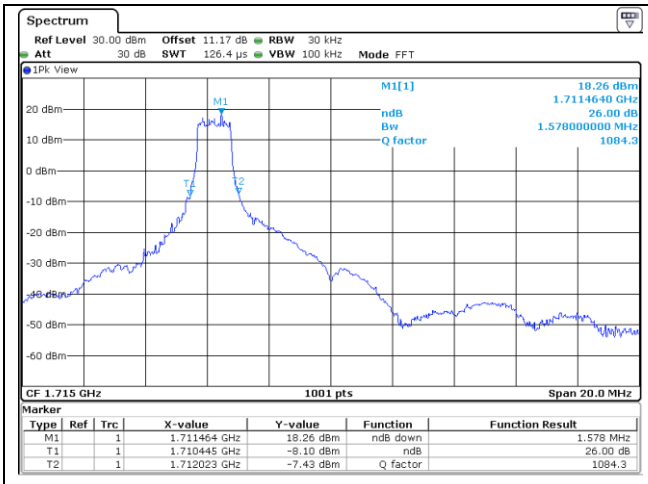


QPSK High Channel (26 dB Bandwidth)

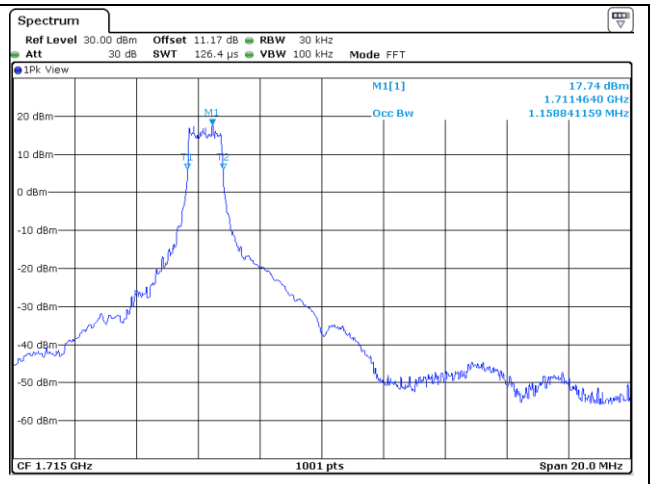


QPSK High Channel (99 % Occupied Bandwidth)

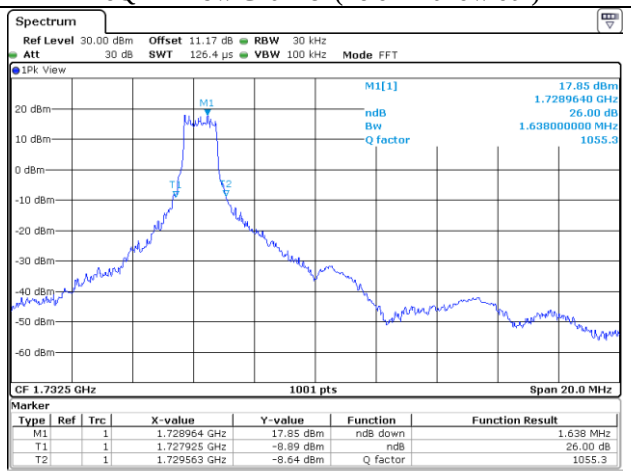
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



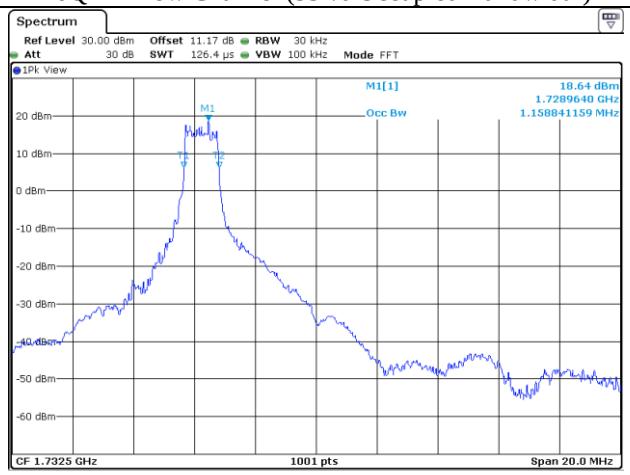
16QAM Low Channel (26 dB Bandwidth)



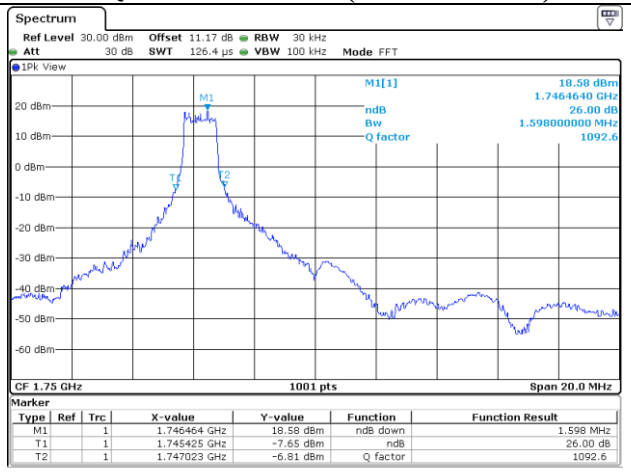
16QAM Low Channel (99 % Occupied Bandwidth)



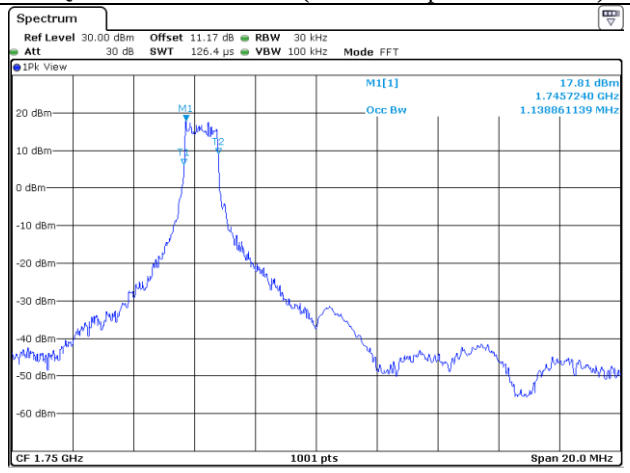
16QAM Midlle Channel (26 dB Bandwidth)



16QAM Middle Channel (99 % Occupied Bandwidth)



16QAM High Channel (26 dB Bandwidth)



16QAM High Channel (99 % Occupied Bandwidth)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

12.4.2 Test data for LTE Band 12

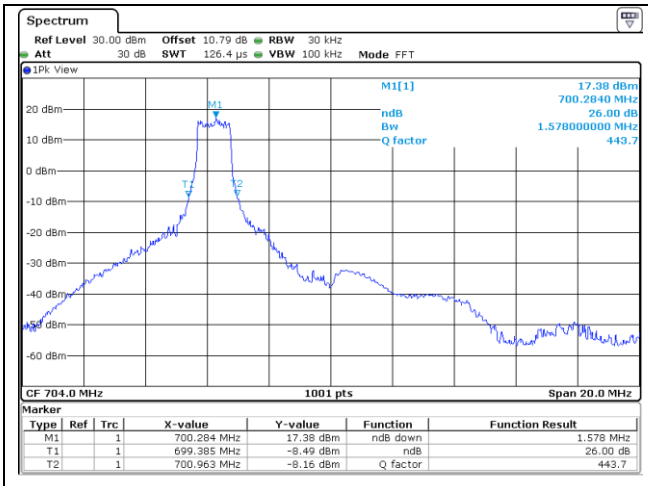
-. Test Date : September 23, 2019 ~ Ocotber 04, 2019

-. Test Result : Pass

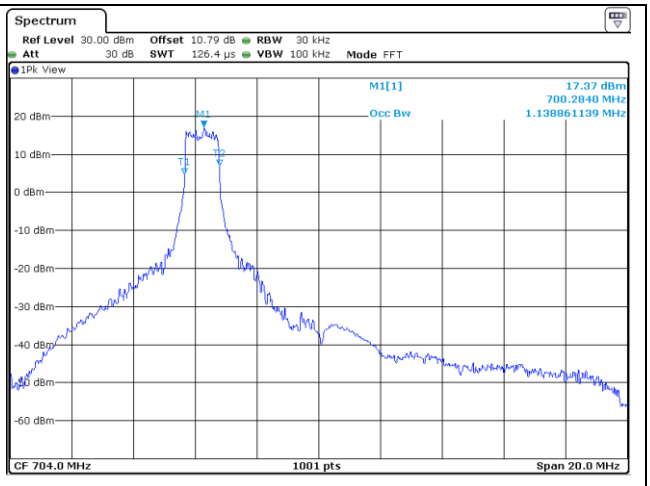
Test Mode	Channel	26 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Result
QPSK	Low	1.578	1.139	PASS
	Middle	1.578	1.159	PASS
	High	1.638	1.139	PASS

Test Mode	Channel	26 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Result
16QAM	Low	1.598	1.139	PASS
	Middle	1.598	1.139	PASS
	High	1.598	1.139	PASS

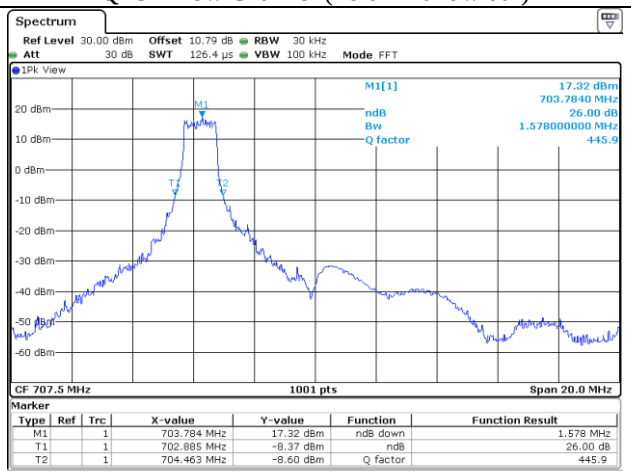
Tested by: Ju Yun Park / Assistant Manager



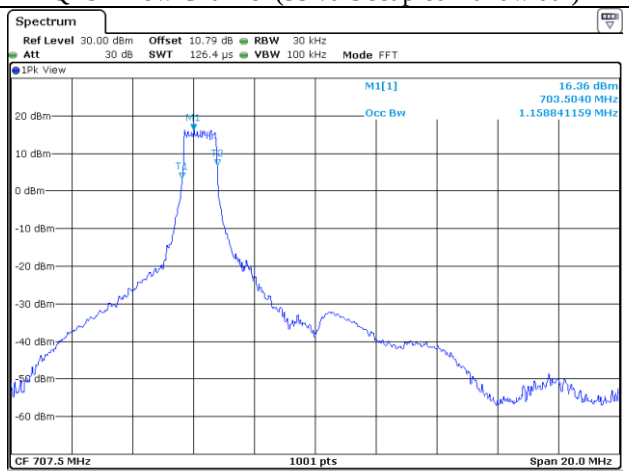
QPSK Low Channel (26 dB Bandwidth)



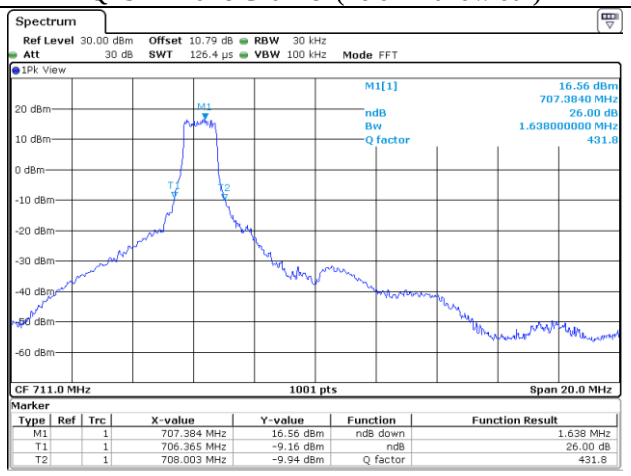
QPSK Low Channel (99 % Occupied Bandwidth)



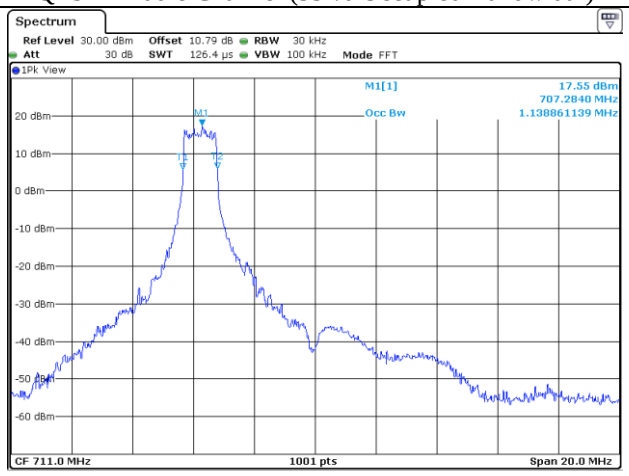
QPSK Midlle Channel (26 dB Bandwidth)



QPSK Middle Channel (99 % Occupied Bandwidth)

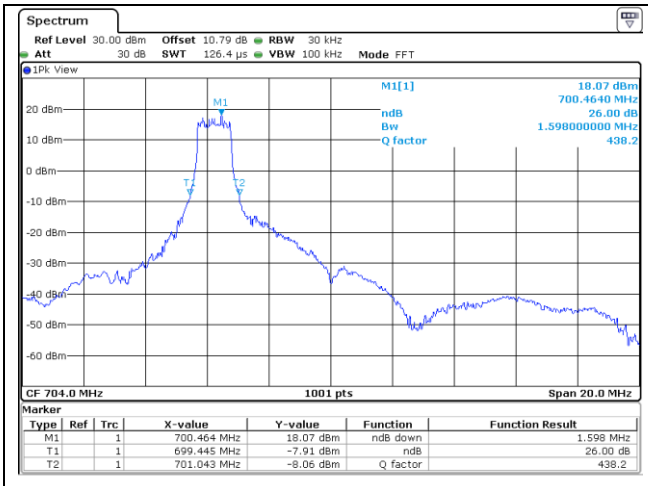


QPSK High Channel (26 dB Bandwidth)

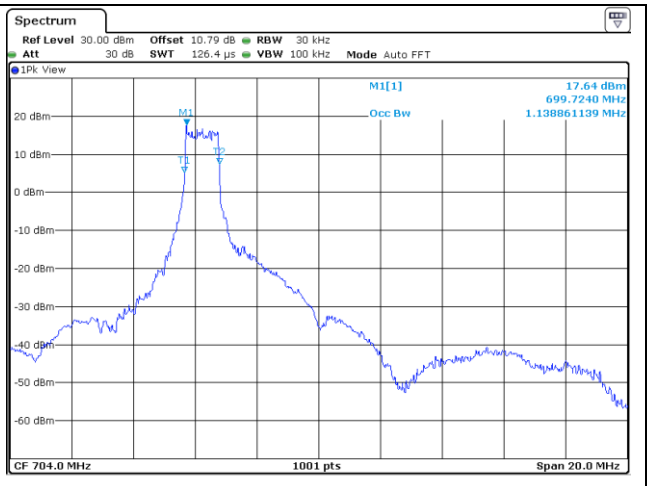


QPSK High Channel (99 % Occupied Bandwidth)

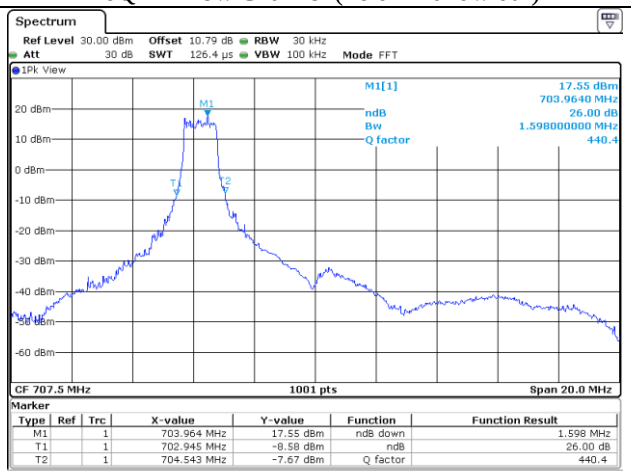
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



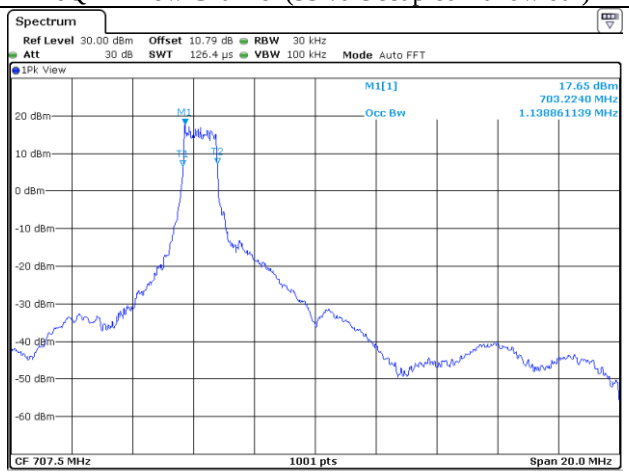
16QAM Low Channel (26 dB Bandwidth)



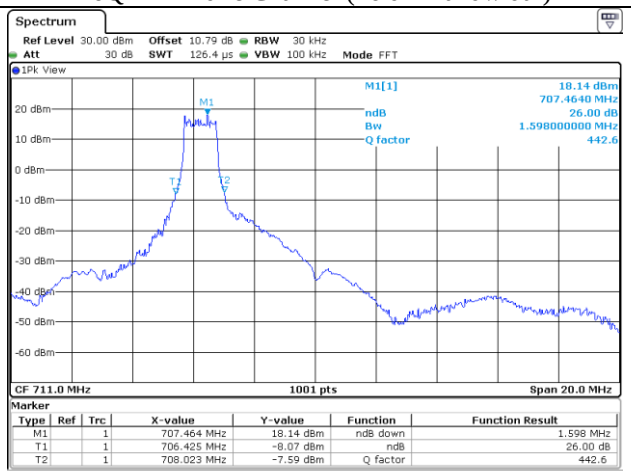
16QAM Low Channel (99 % Occupied Bandwidth)



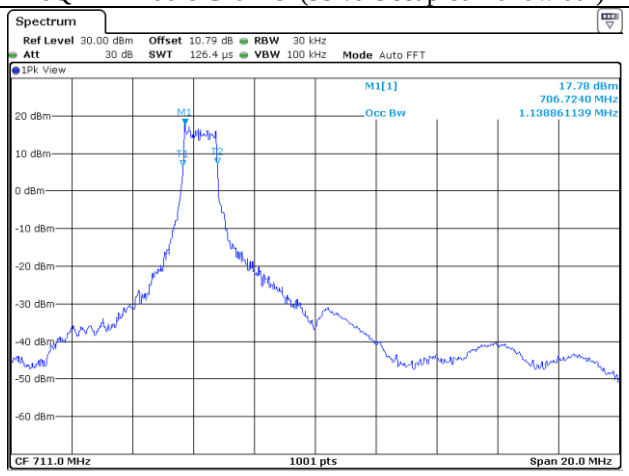
16QAM Midlle Channel (26 dB Bandwidth)



16QAM Middle Channel (99 % Occupied Bandwidth)



16QAM High Channel (26 dB Bandwidth)



16QAM High Channel (99 % Occupied Bandwidth)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

12.4.3 Test data for LTE Band 13

-. Test Date : September 23, 2019 ~ Ocotber 04, 2019

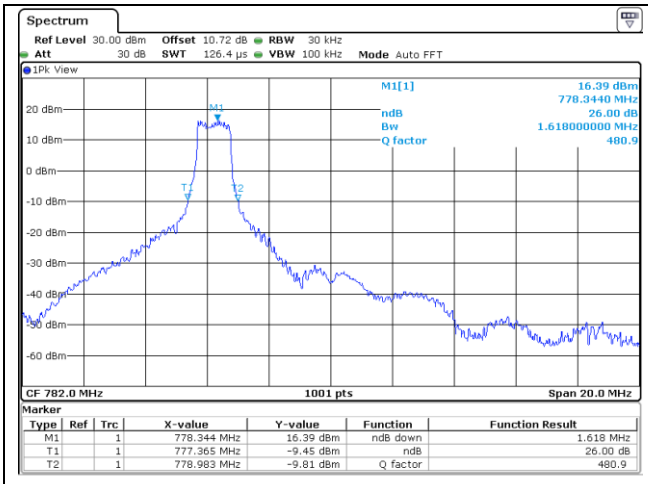
-. Test Result : Pass

Test Mode	Channel	26 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Result
QPSK	Low	1.618	1.119	PASS

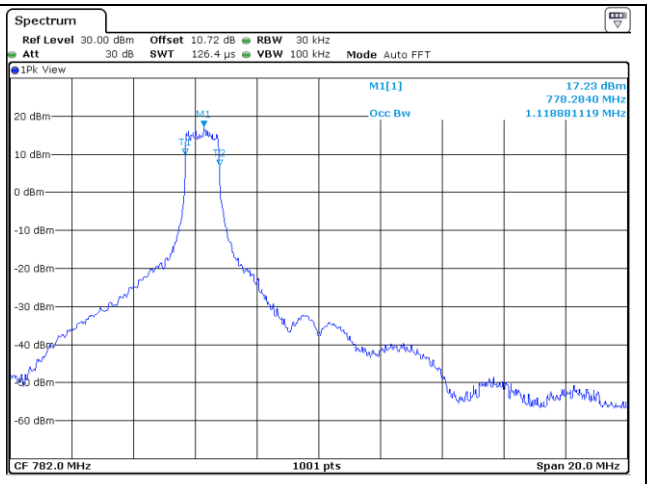
Test Mode	Channel	26 dB Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Result
16QAM	Low	1.618	1.139	PASS

Tested by: Ju Yun Park / Assistant Manager

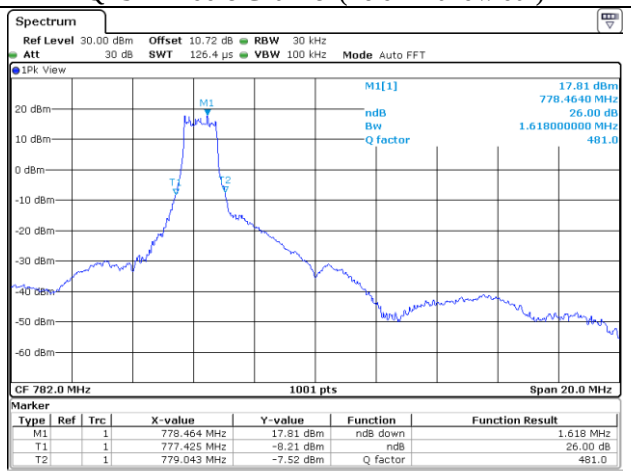
ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



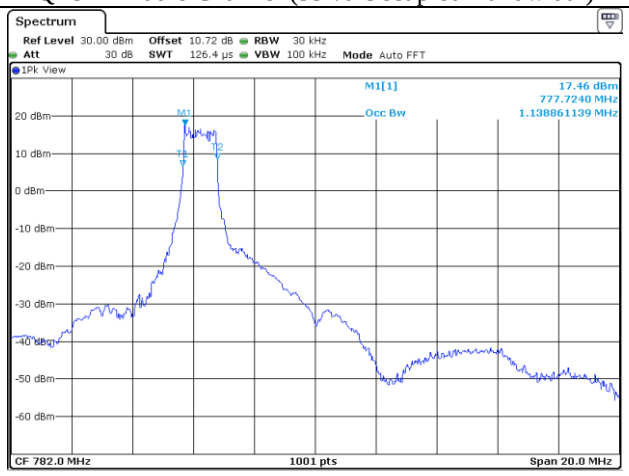
QPSK Middle Channel (26 dB Bandwidth)



QPSK Middle Channel (99 % Occupied Bandwidth)



16QAM Midlle Channel (26 dB Bandwidth)



16QAM Middle Channel (99 % Occupied Bandwidth)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

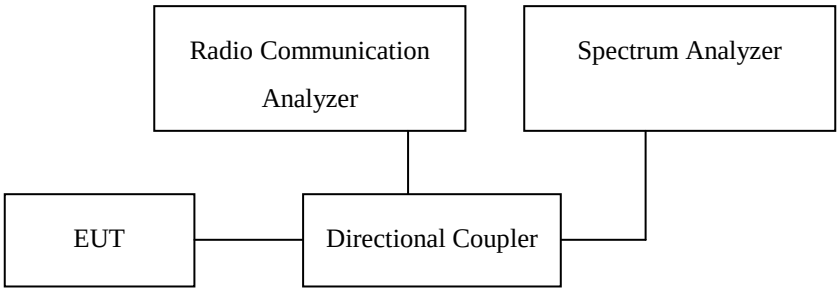
13. Conducted Band Edge

13.1 Operating environment

Temperature : 23 ℃

Relative humidity : 47 % R.H.

13.2 Test set-up



(Configuration of conducted Emission measurement)

Conducted Spurious Emissions is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v04, April 9, 2018, Section 6.

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels(low, middle and high operational range.)

The Conducted Spurious Emissions used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

13.3 Methods of Measurement

1. All measurements were done at low and high operational frequency range.
2. Set spectrum analyzer with RMS detector.
3. The center frequency of spectrum is the band edge frequency and set RBW of the spectrum is 20 kHz and VBW of the spectrum is 50 kHz

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

13.4 Limits

LTE -4 Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.”

LTE -12 Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 +10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

LTE -13 Rule Part 27.53(f)For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

LTE Band 4 / 12 Limit

Limit	-13 dBm

LTE Band 13 Limit

Limit out of the band 1559-1610 MHz	-13 dBm
Limit in the band 1559-1610 MHz	-40 dBm

13.5 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jul. 24, 2019 (1Y)
■ -	AAMCS-UDC	AA-MCS	Directional Coupler	400	Jul. 25, 2019 (1Y)
■ -	MT8821C	ANRITSU	Radio Communication Analyzer	6261849029	Jul. 26, 2019 (1Y)
☐ -	GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 10, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

13.6 Test data

13.6.1 Test data for LTE Band 4

-. Test Date : September 23, 2019 ~ Ocotber 04, 2019

-. Test Result : Pass

LTE Band 4 QPSK

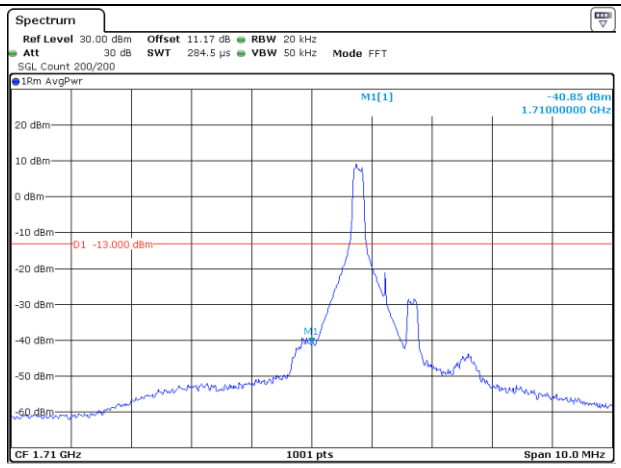
Test Mode	Channel	Edge Frequency (MHz)	MEASURED VLAUE (dBm)	Limit (dBm)	Result
1 RB	Low	1 710.000 0	-40.85	-13.00	PASS
	High	1 755.000 0	-35.10	-13.00	PASS
6 RB	Low	1 710.000 0	-37.66	-13.00	PASS
	High	1 755.000 0	-36.14	-13.00	PASS

LTE Band 4 16QAM

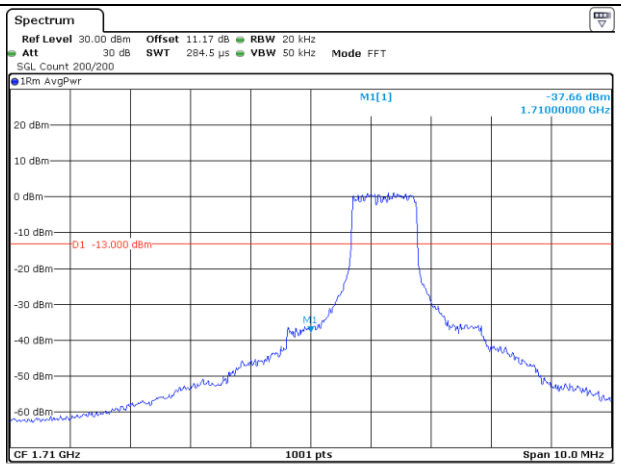
Test Mode	Channel	Edge Frequency (MHz)	MEASURED VLAUE (dBm)	Limit (dBm)	Result
1 RB	Low	1 710.000 0	-35.97	-13.00	PASS
	High	1 755.000 0	-38.29	-13.00	PASS
6 RB	Low	1 710.000 0	-33.57	-13.00	PASS
	High	1 755.000 0	-34.11	-13.00	PASS

Tested by: Ju Yun Park / Assistant Manager

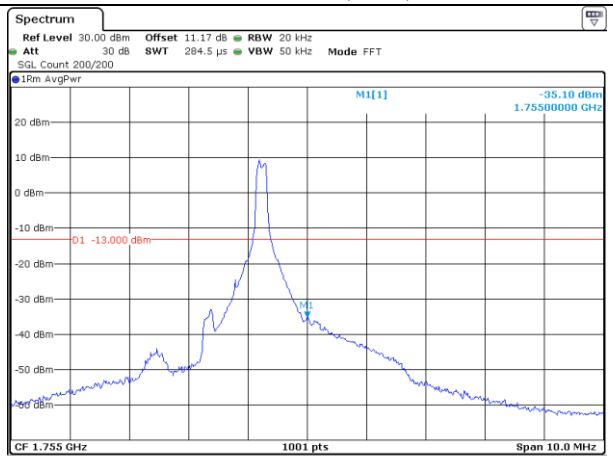
13.6.2 Test data for LTE Band 4 QPSK



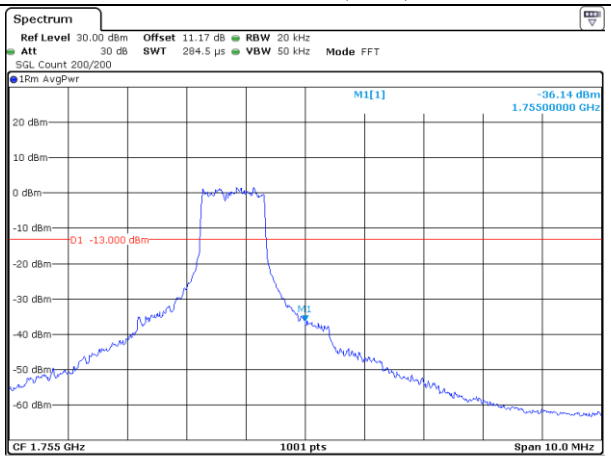
Low Channel(1 RB)



Low Channel(6 RB)



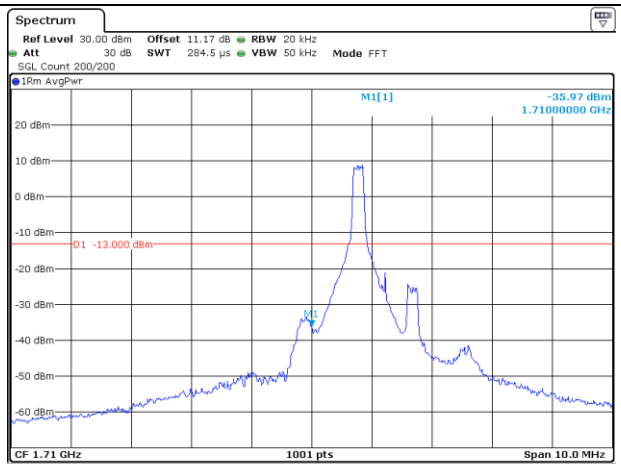
High Channel(1 RB)



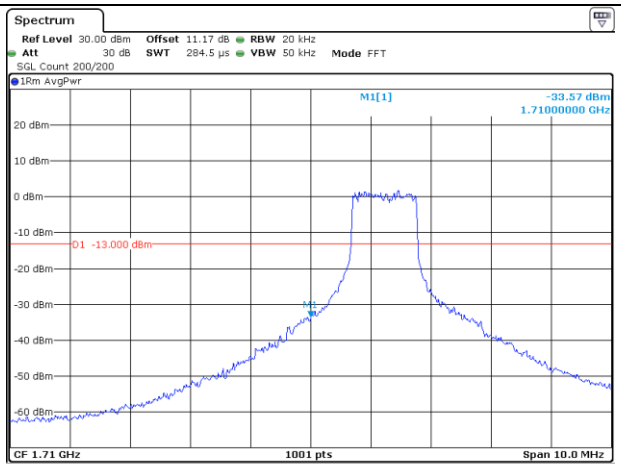
High Channel(6 RB)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

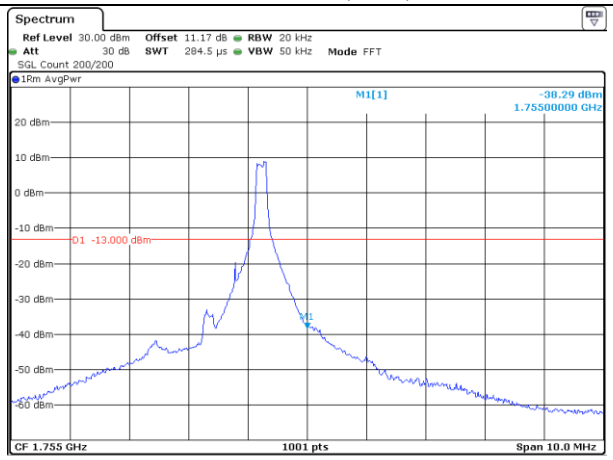
13.6.3 Test data for LTE Band 4 16QAM



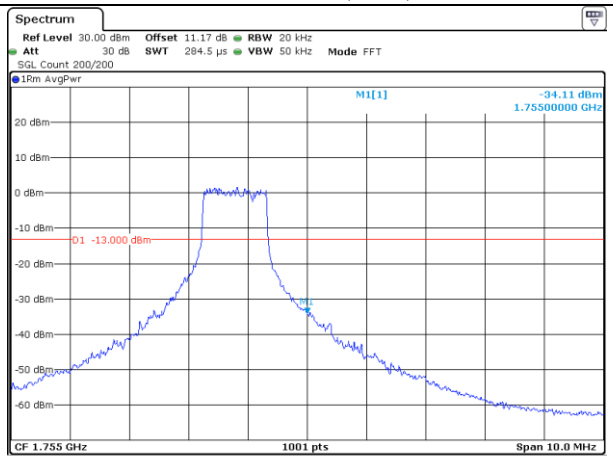
Low Channel(1 RB)



Low Channel(6 RB)



High Channel(1 RB)



High Channel(6 RB)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

13.6.4 Test data for LTE Band 12

-. Test Date : September 23, 2019 ~ Ocotber 04, 2019

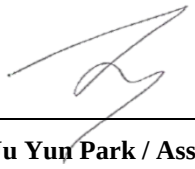
-. Test Result : Pass

LTE Band 12 QPSK

Test Mode	Channel	Edge Frequency (MHz)	MEASURED VLAUE (dBm)	Limit (dBm)	Result
1 RB	Low	699.000 0	-44.05	-13.00	PASS
	High	716.000 0	-46.45	-13.00	PASS
6 RB	Low	699.000 0	-37.12	-13.00	PASS
	High	716.000 0	-35.64	-13.00	PASS

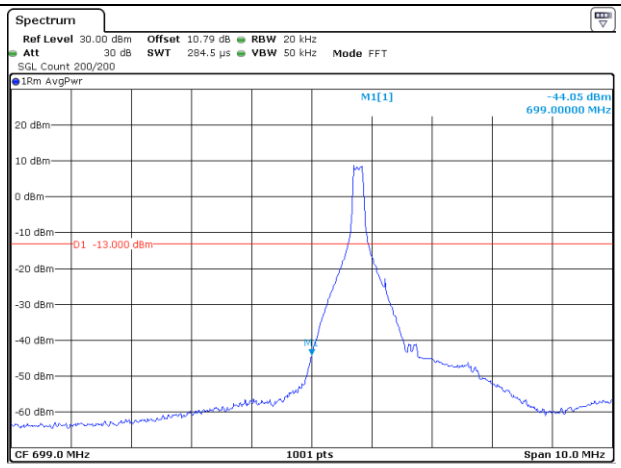
LTE Band 12 16QAM

Test Mode	Channel	Edge Frequency (MHz)	MEASURED VLAUE (dBm)	Limit (dBm)	Result
1 RB	Low	699.000 0	-41.21	-13.00	PASS
	High	716.000 0	-44.11	-13.00	PASS
6 RB	Low	699.000 0	-34.74	-13.00	PASS
	High	716.000 0	-34.68	-13.00	PASS

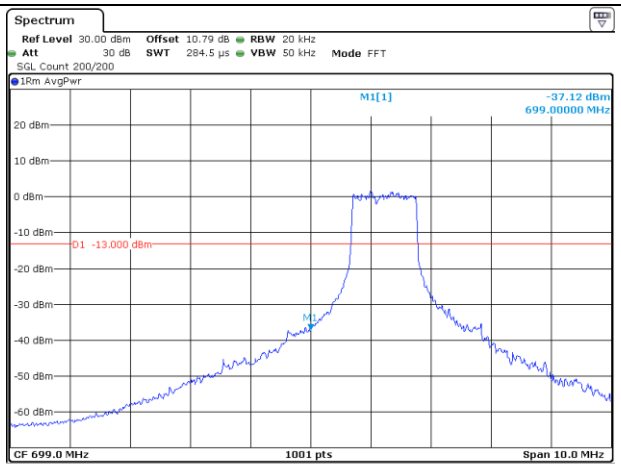


Tested by: Ju Yun Park / Assistant Manager

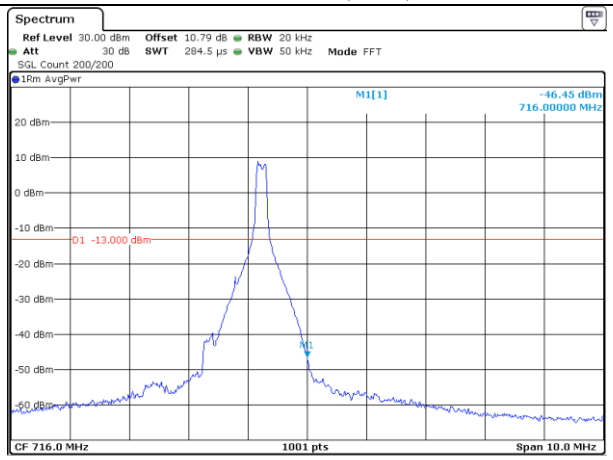
13.6.5 Test data for LTE Band 12 QPSK



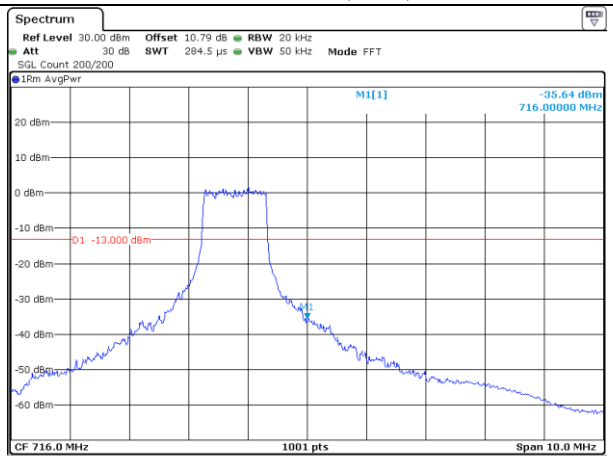
Low Channel(1 RB)



Low Channel(6 RB)



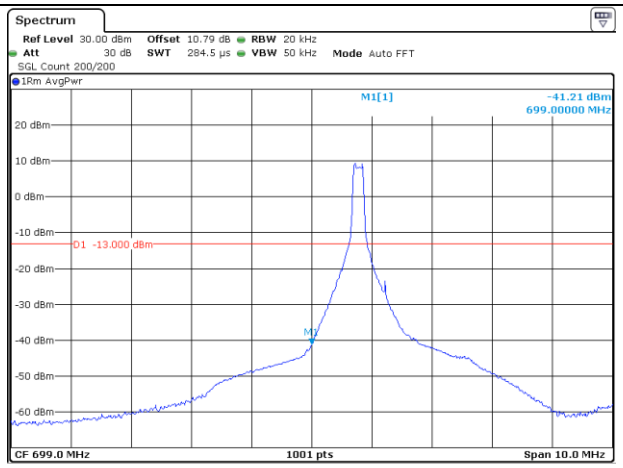
High Channel(1 RB)



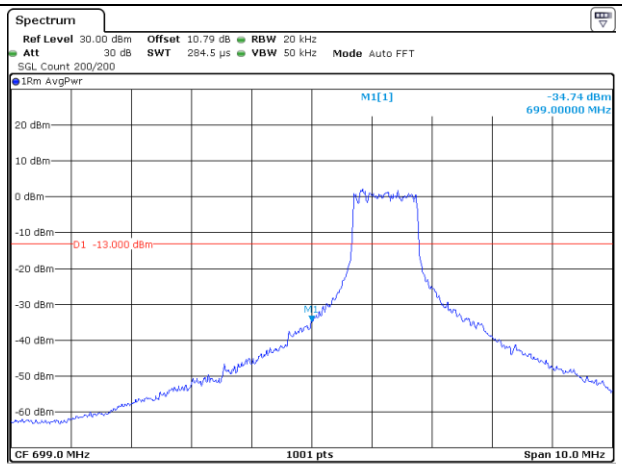
High Channel(6 RB)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

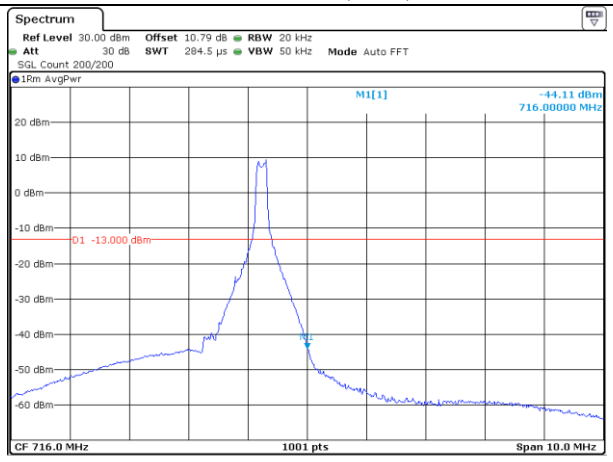
13.6.6 Test data for LTE Band 12 16QAM



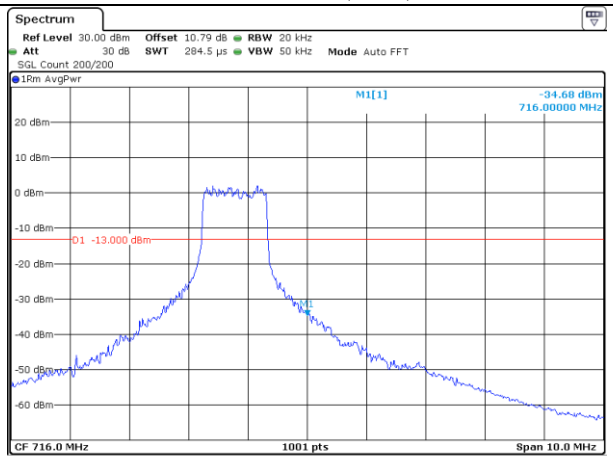
Low Channel(1 RB)



Low Channel(6 RB)



High Channel(1 RB)



High Channel(6 RB)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

13.6.7 Test data for LTE Band 13

-. Test Date : September 23, 2019 ~ Ocotber 04, 2019

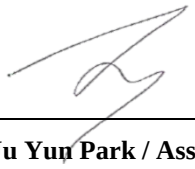
-. Test Result : Pass

LTE Band 13 QPSK

Test Mode	Channel	Edge Frequency (MHz)	MEASURED VLAUE (dBm)	Limit (dBm)	Result
1 RB	Low	777.000 0	-44.81	-13.00	PASS
	High	787.000 0	-46.53	-13.00	PASS
6 RB	Low	777.000 0	-38.45	-13.00	PASS
	High	787.000 0	-37.88	-13.00	PASS

LTE Band 13 16QAM

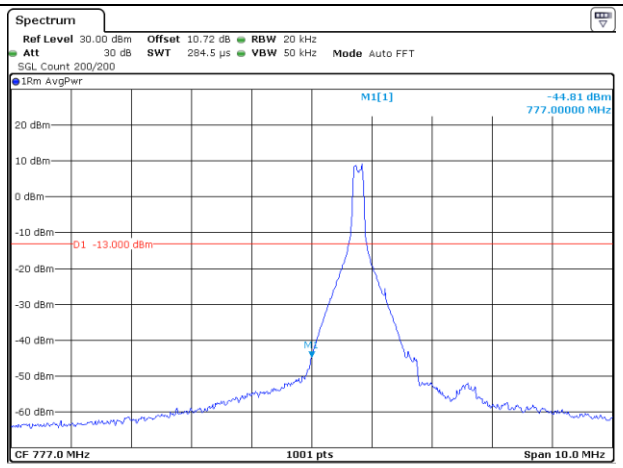
Test Mode	Channel	Edge Frequency (MHz)	MEASURED VLAUE (dBm)	Limit (dBm)	Result
1 RB	Low	777.000 0	-44.97	-13.00	PASS
	High	787.000 0	-42.78	-13.00	PASS
6 RB	Low	777.000 0	-36.31	-13.00	PASS
	High	787.000 0	-36.91	-13.00	PASS



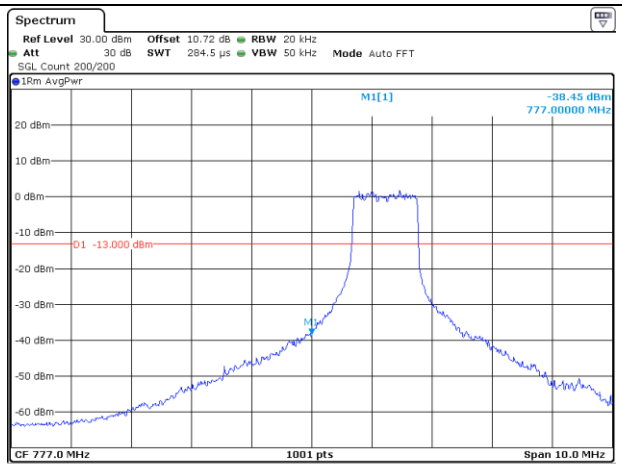
Tested by: Ju Yun Park / Assistant Manager

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

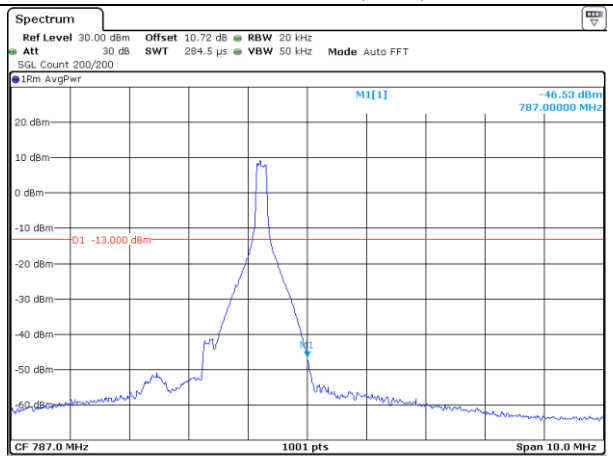
13.6.8 Test data for LTE Band 13 QPSK



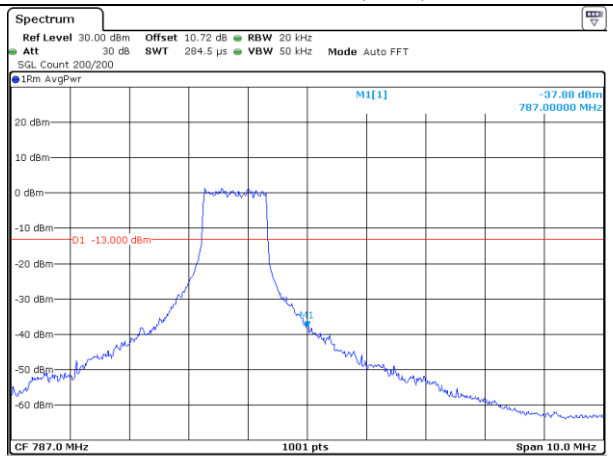
Middle Channel(1 RB)



Middle Channel(6 RB)



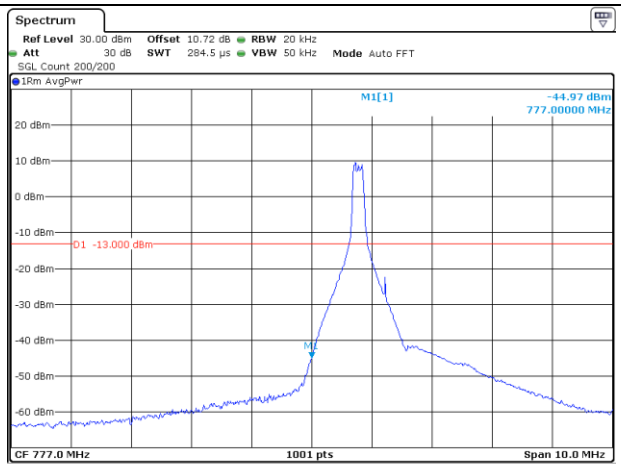
Middle Channel(1 RB)



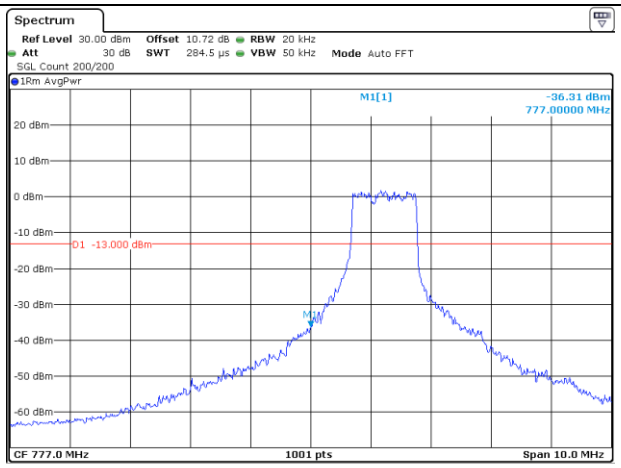
Middle Channel(6 RB)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

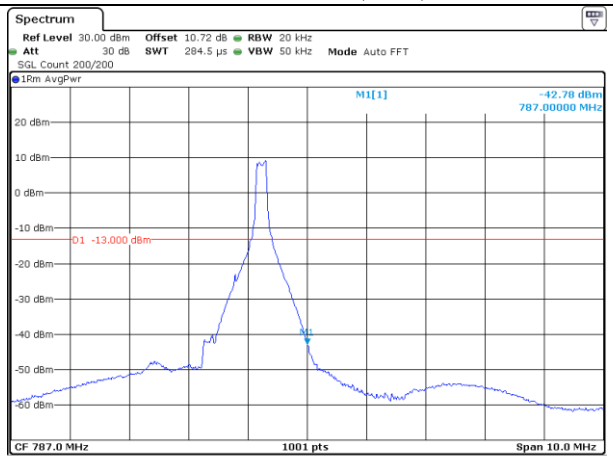
13.6.9 Test data for LTE Band 13 16QAM



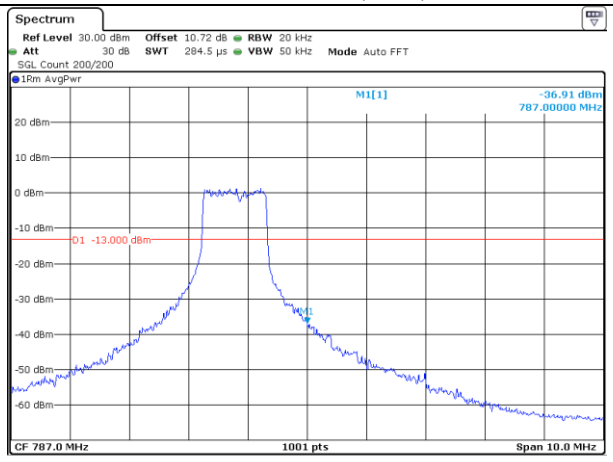
Middle Channel(1 RB)



Middle Channel(6 RB)



Middle Channel(1 RB)



Middle Channel(6 RB)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

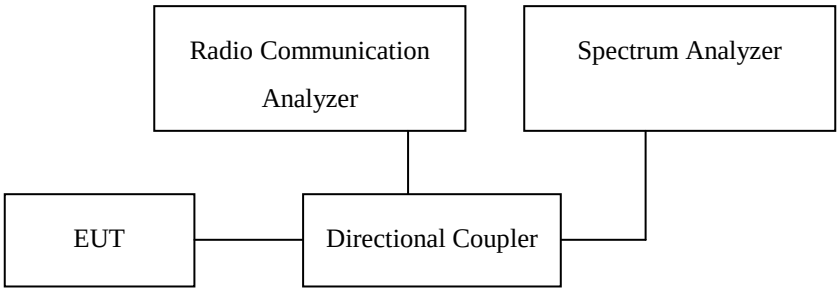
14. Conducted Spurious and Harmonic Emissions at Antenna Termianl

14.1 Operating environment

Temperature : 23 ℃

Relative humidity : 47 % R.H.

14.2 Test set-up



(Configuration of conducted Emission measurement)

Conducted Spurious Emissions is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v04, April 9, 2018, Section 6.

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels(low, middle and high operational range.)

The Conducted Spurious Emissions used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

Conducded spurious emissions

The EUT was setup to maximum output power. The 100 kHz RBW and 300 kHz VBW was used to scan from 30 MHz to 1 GHz. Also, the 1 MHz RBW and 3 MHz VBW was used to scan from 1 GHz to 20 GHz. The high, low and a middle channel were tested for out of band measurements.

14.3 Limits

LTE -4 Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.”

LTE -12 Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 +10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

LTE -13 Rule Part 27.53(f)For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

LTE Band 4 / 12 Limit

Limit	-13 dBm

LTE Band 13 Limit

Limit out of the band 1559-1610 MHz	-13 dBm
Limit in the band 1559-1610 MHz	-40 dBm

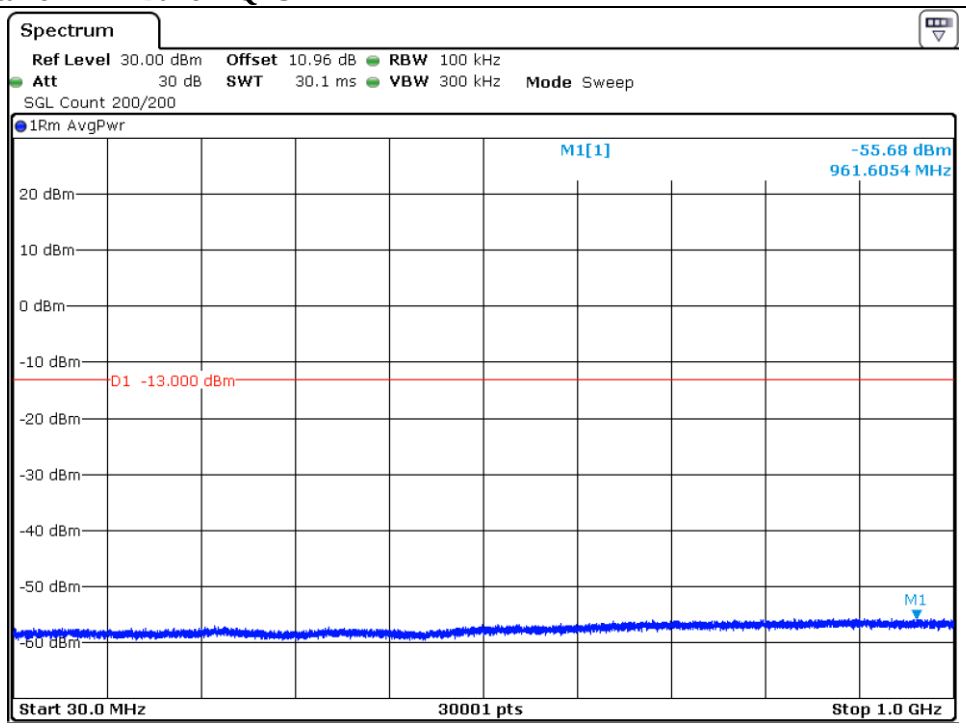
14.4 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jul. 24, 2019 (1Y)
■ -	AAMCS-UDC	AA-MCS	Directional Coupler	400	Jul. 25, 2019 (1Y)
■ -	MT8821C	ANRITSU	Radio Communication Analyzer	6261849029	Jul. 26, 2019 (1Y)
☐ -	GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 10, 2019 (1Y)

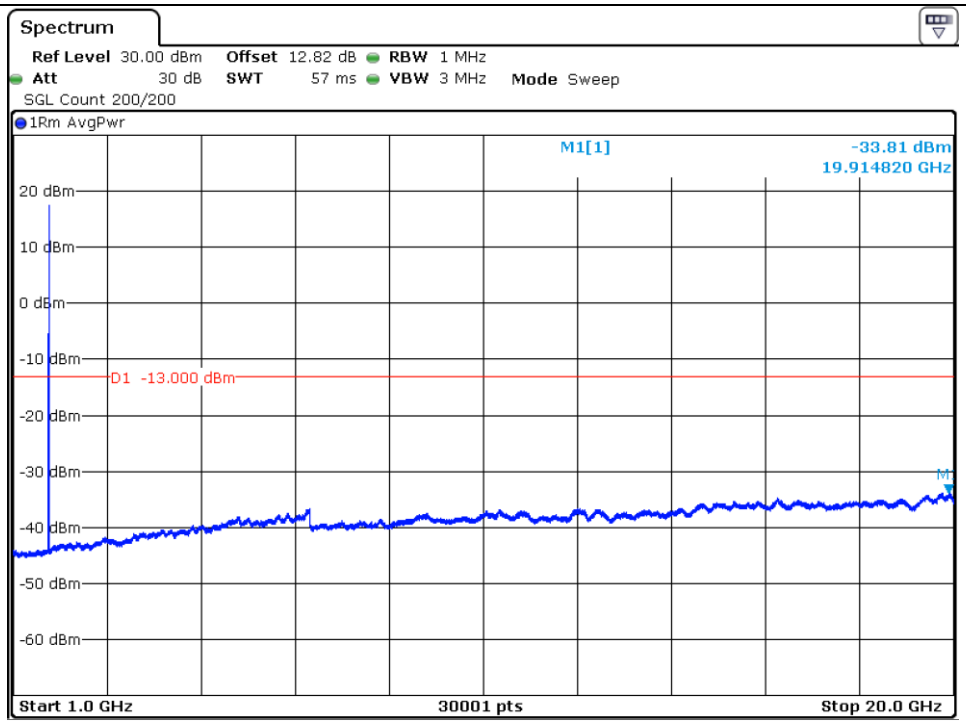
All test equipment used is calibrated on a regular basis.

14.5 Test data

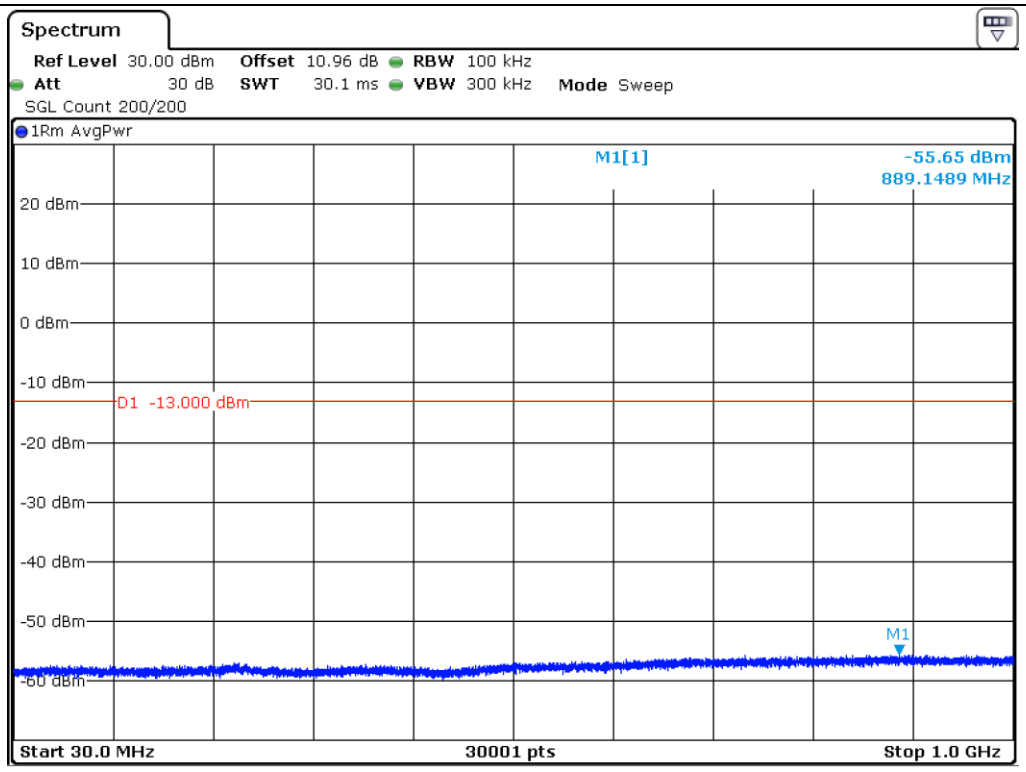
14.5.1 Test data for LTE Band 4 QPSK



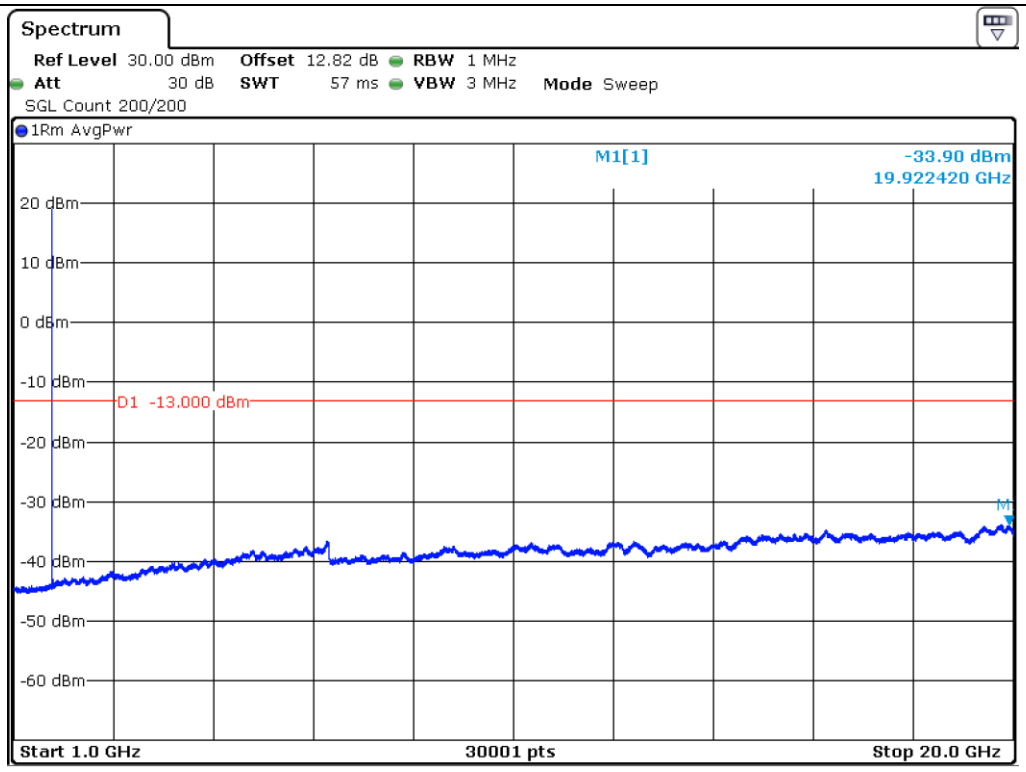
Low Channel



Low Channel

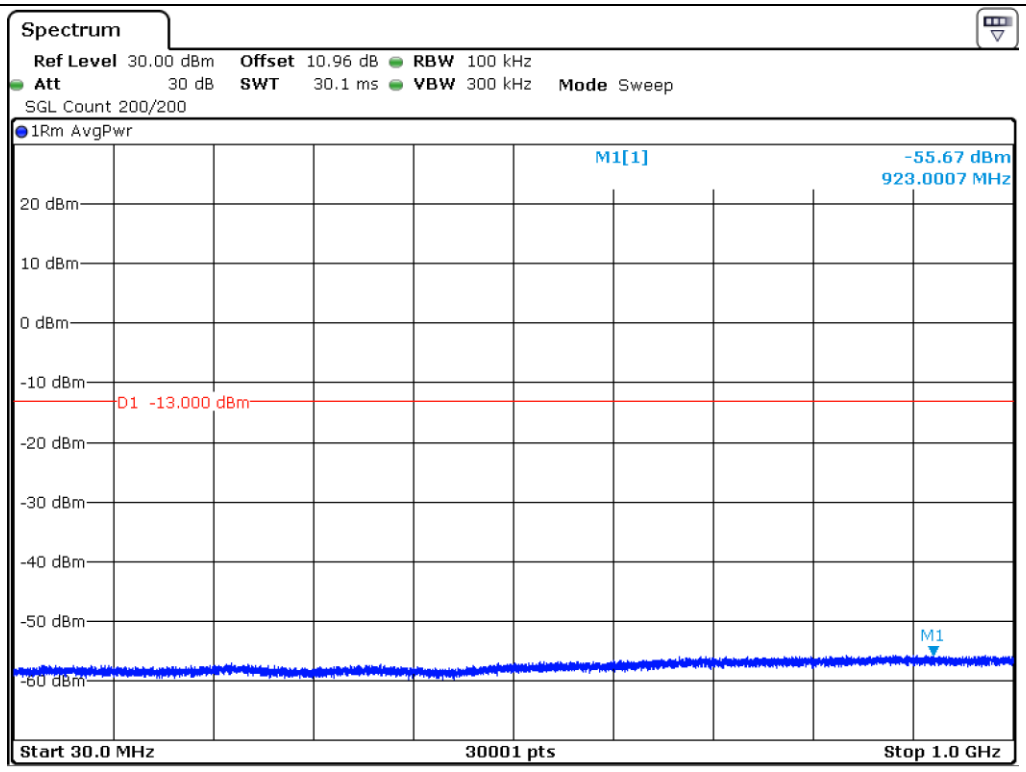


Midle Channel

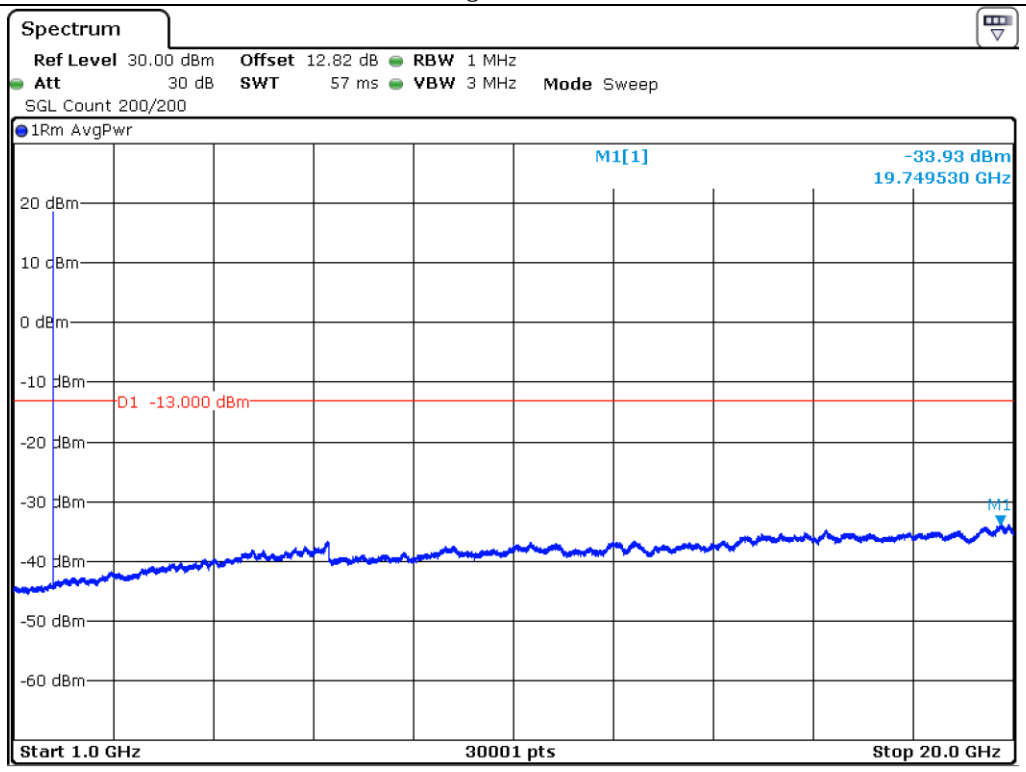


Midle Channel

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



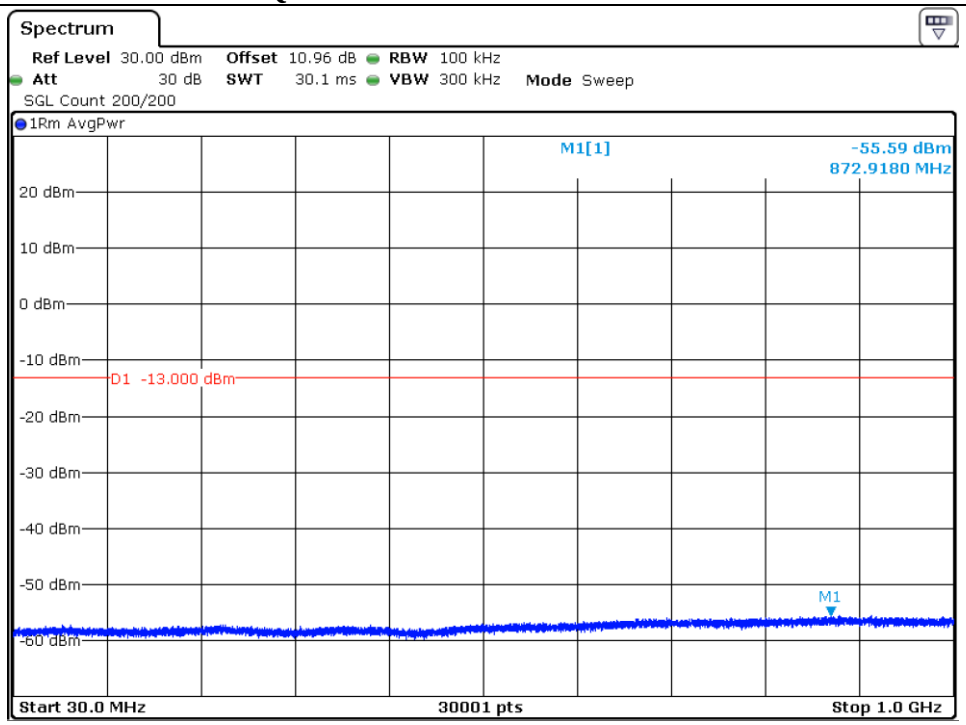
High Channel



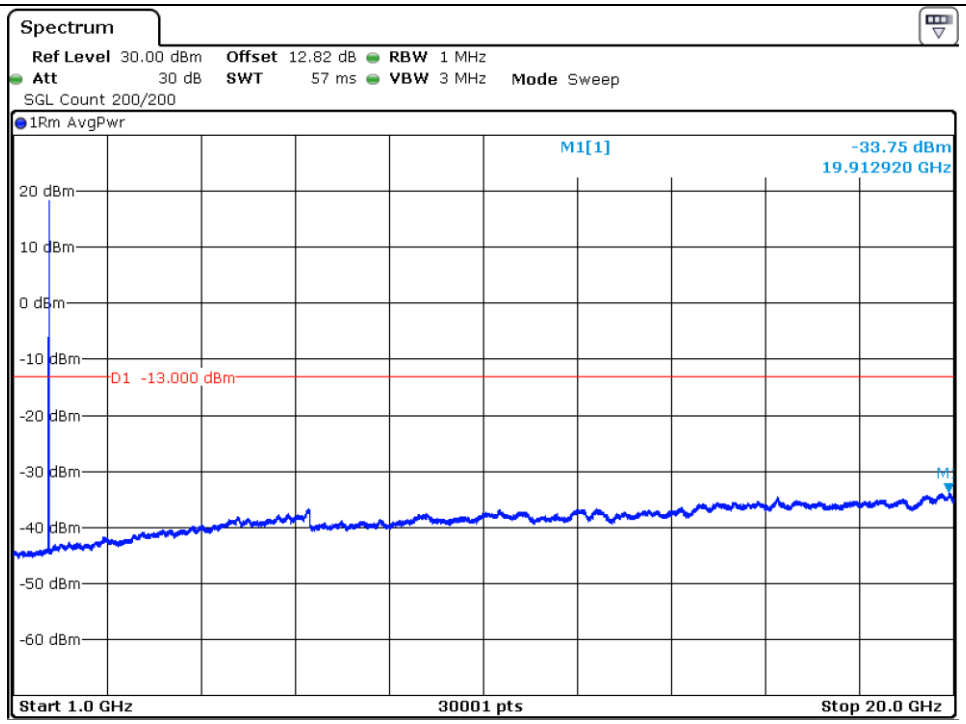
High Channel

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

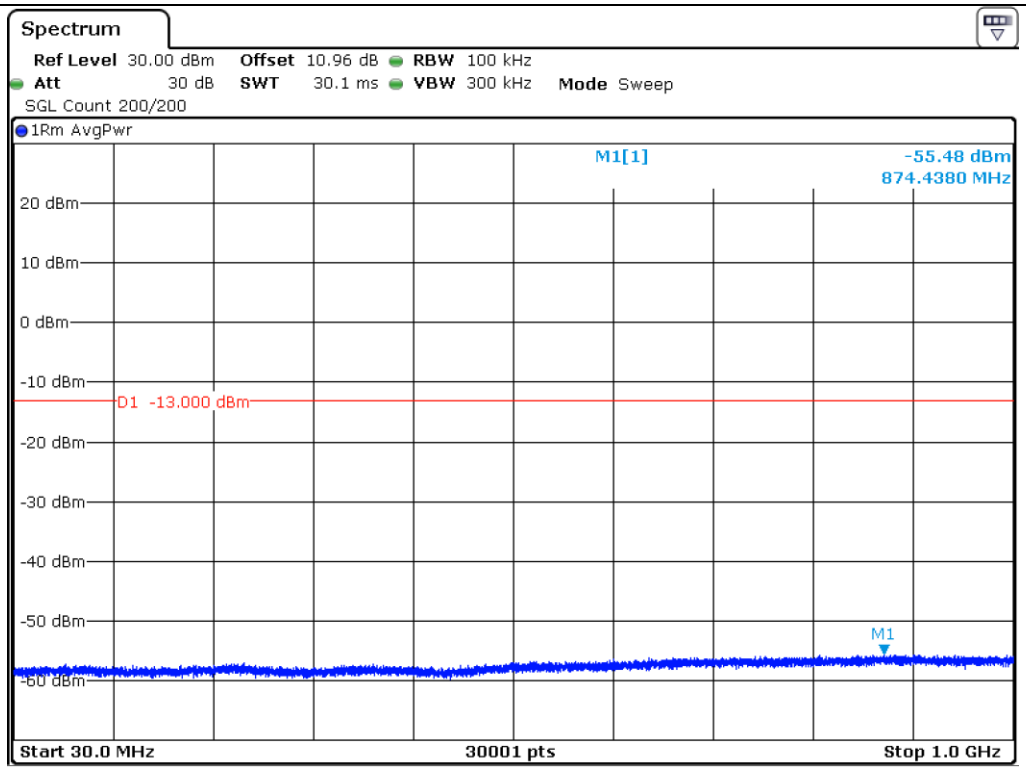
14.5.2 Test data for LTE Band 4 16QAM



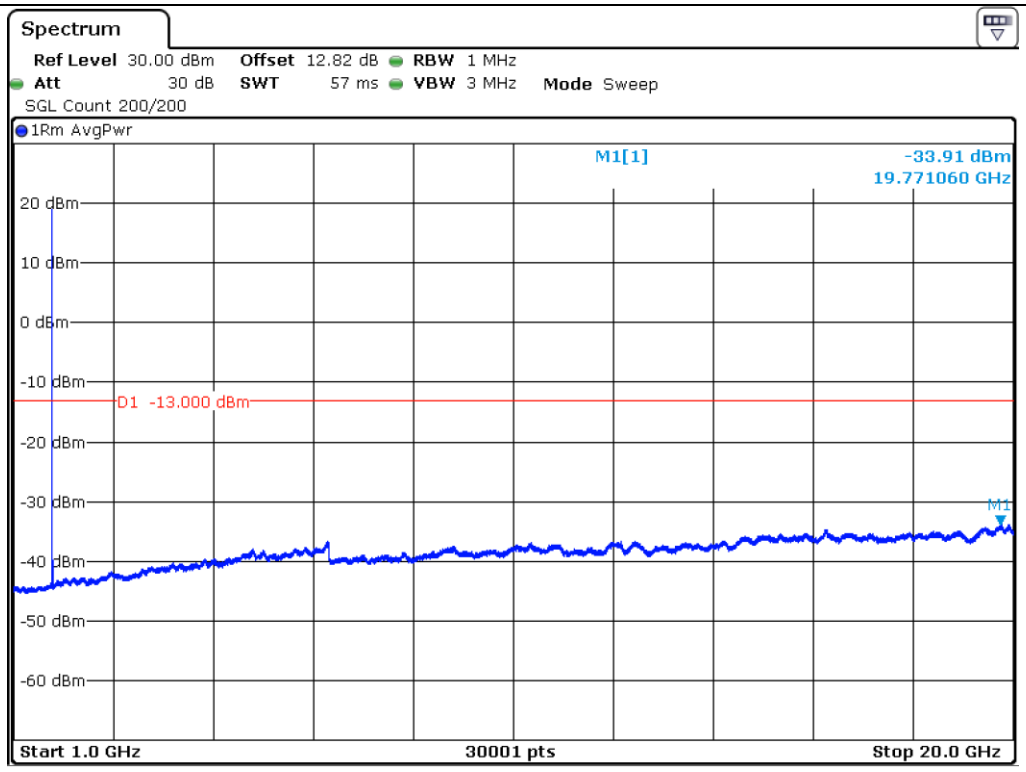
Low Channel



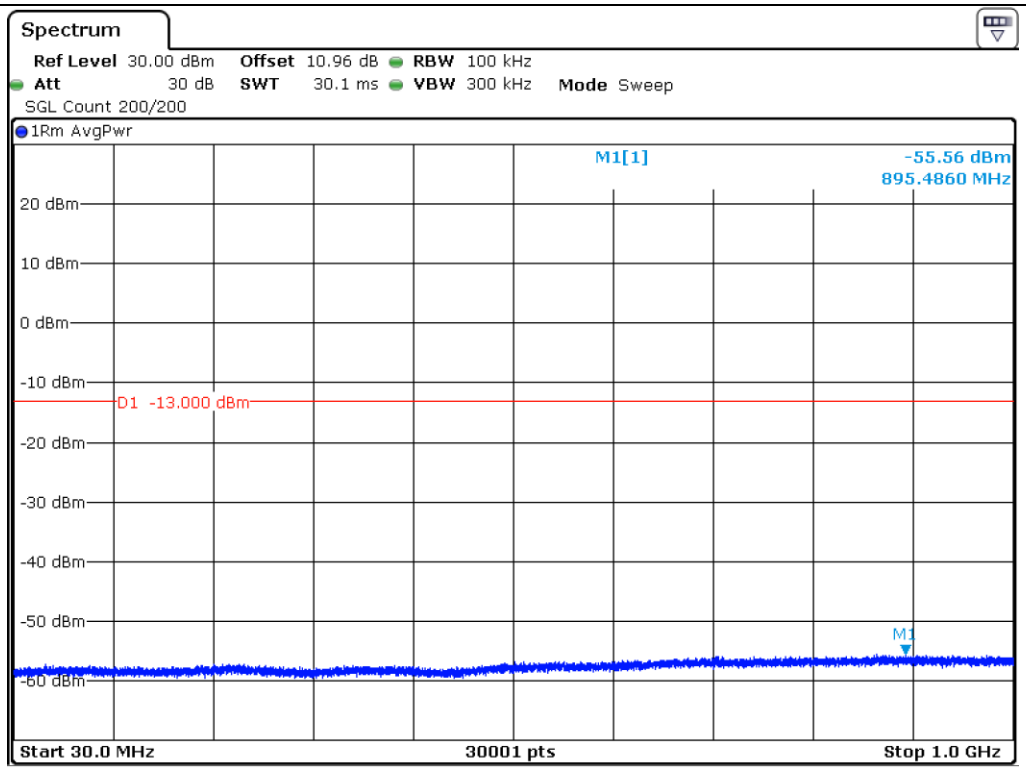
Low Channel



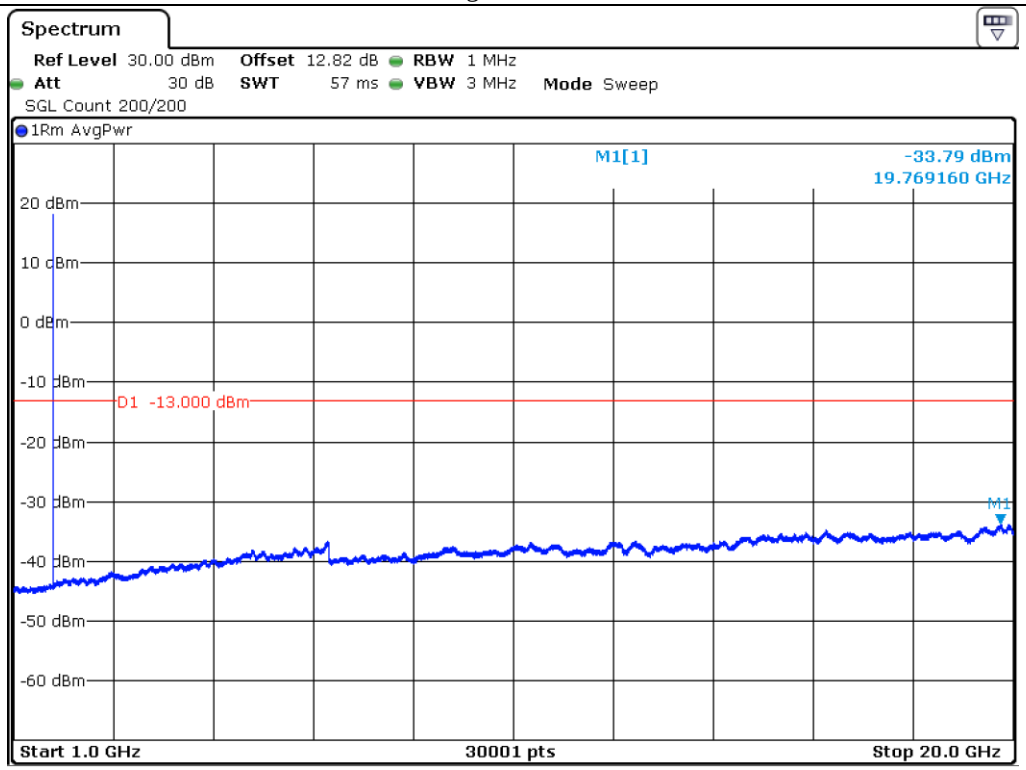
Midle Channel



Midle Channel



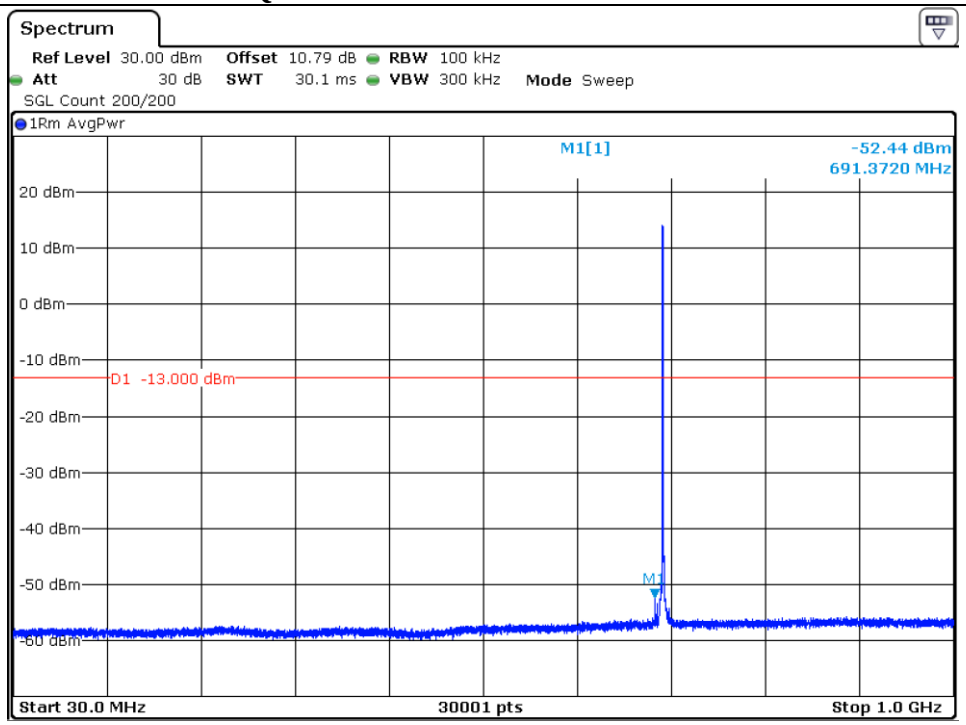
High Channel



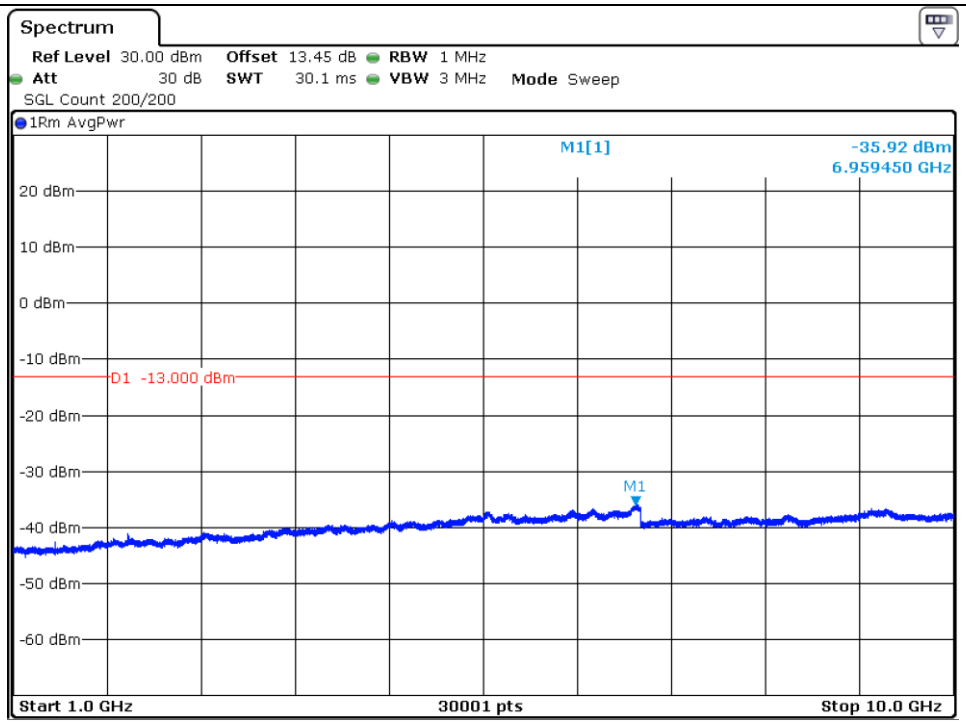
High Channel

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

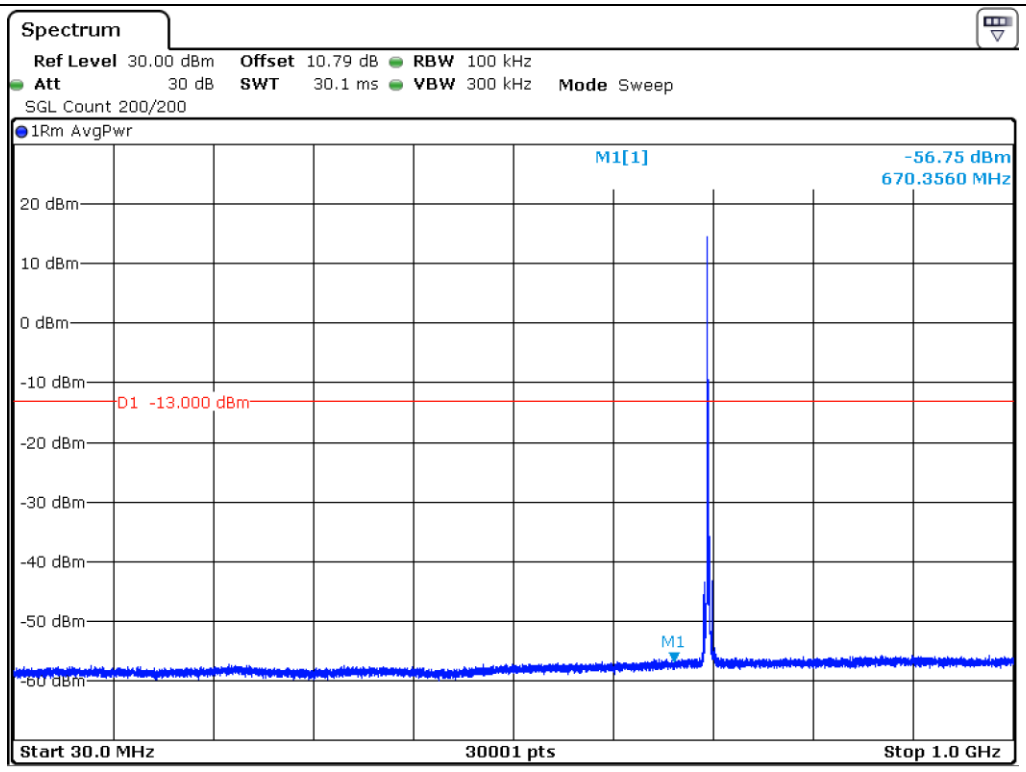
14.5.3 Test data for LTE Band 12 QPSK



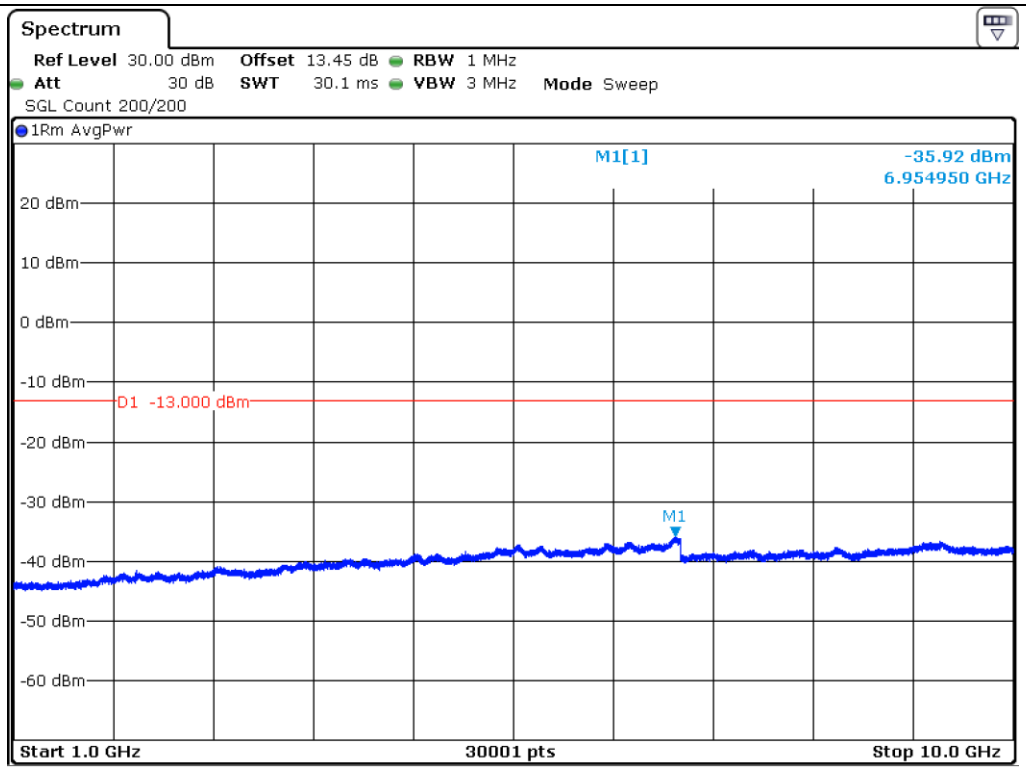
Low Channel



Low Channel

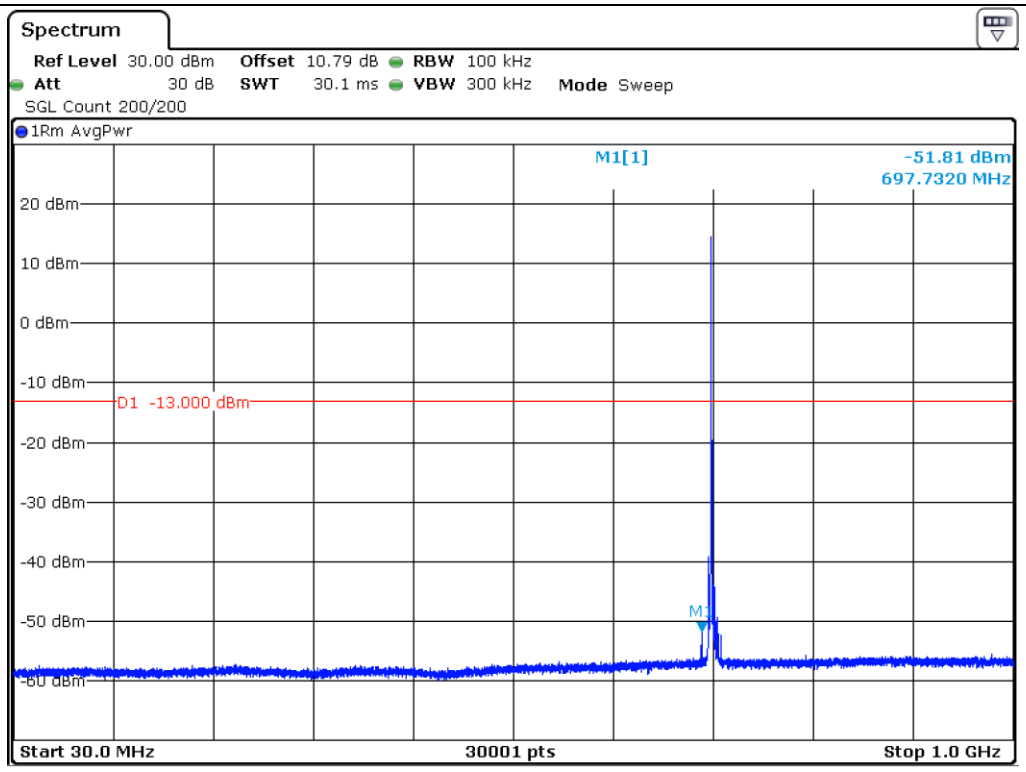


Midle Channel

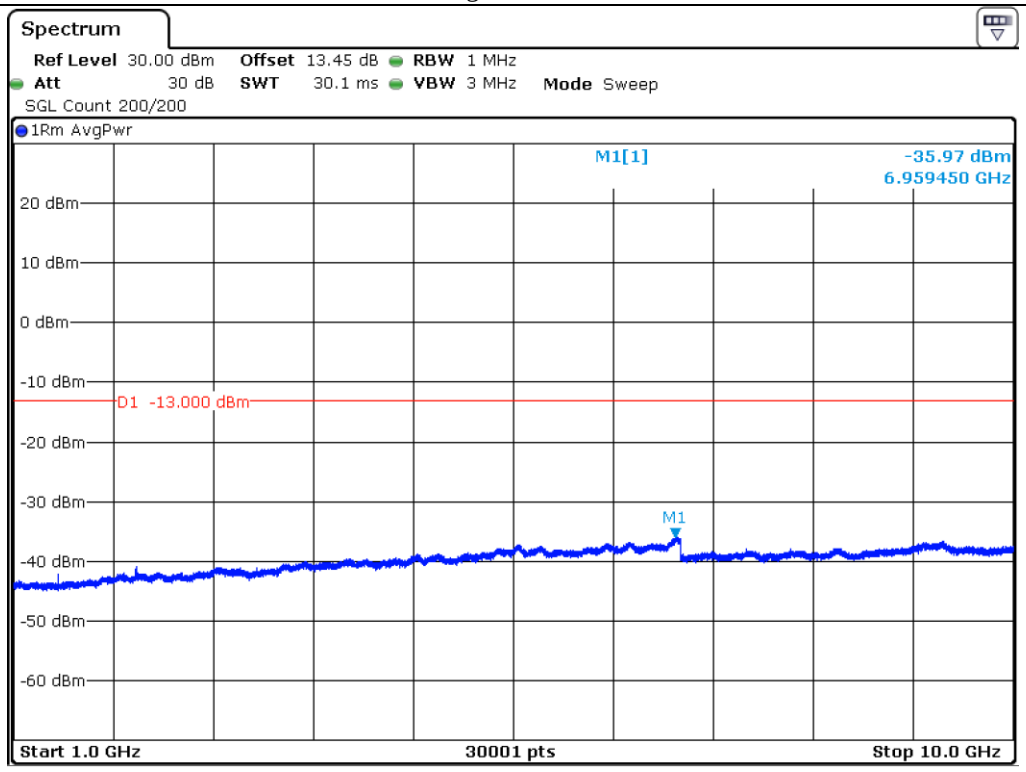


Midle Channel

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



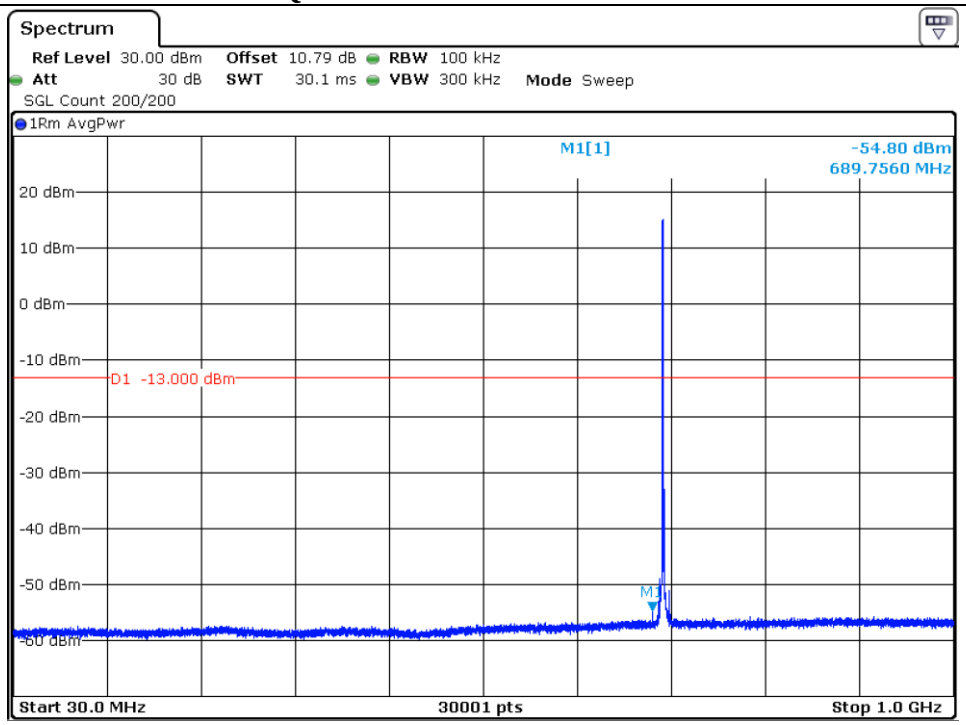
High Channel



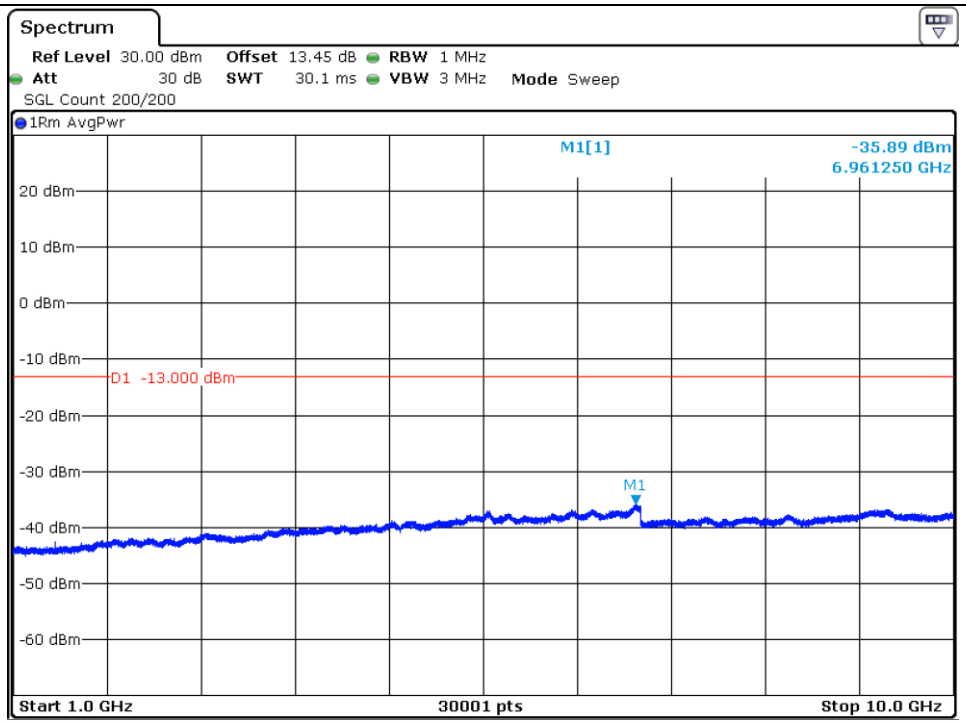
High Channel

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

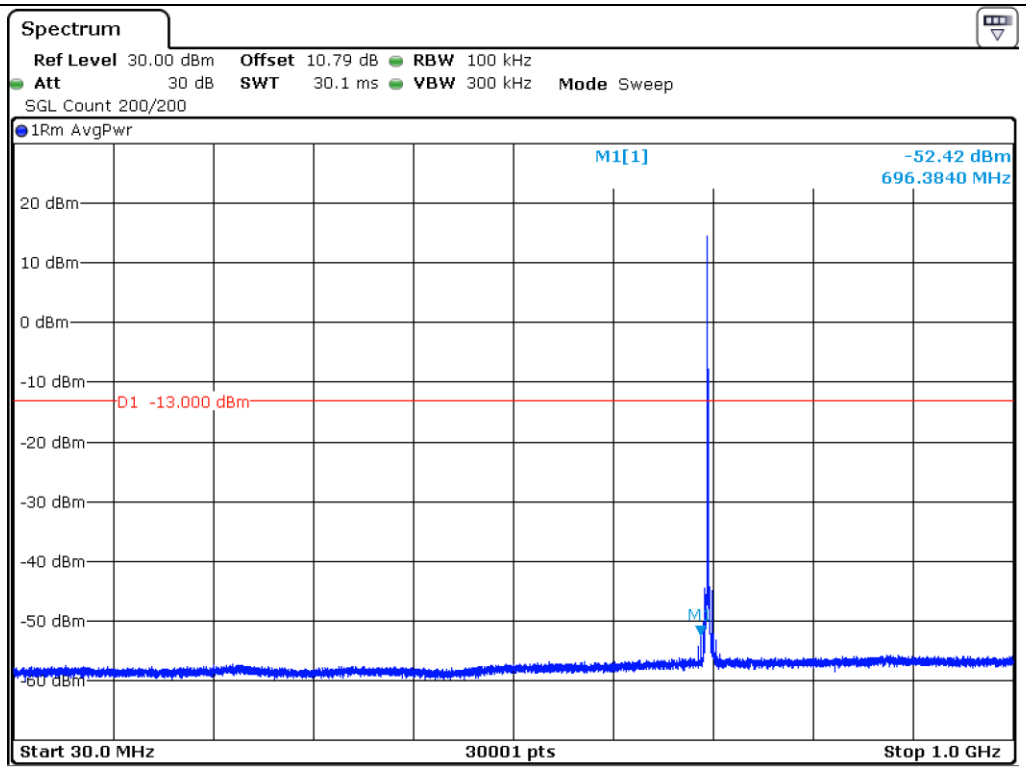
14.5.4 Test data for LTE Band 12 16QAM



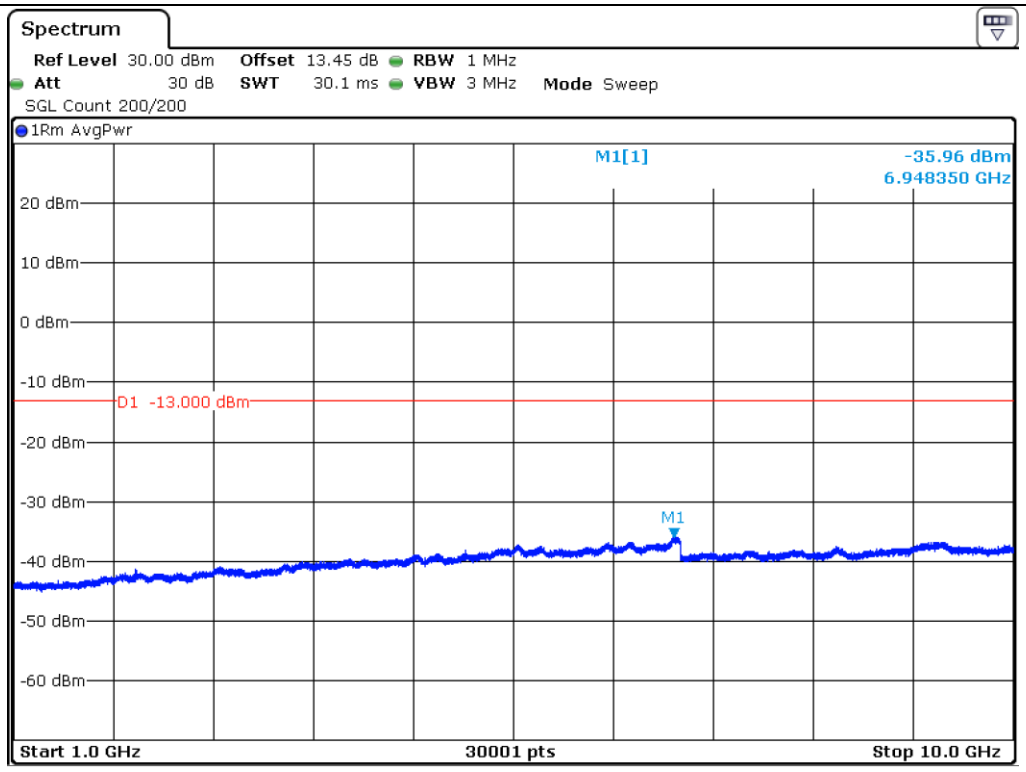
Low Channel



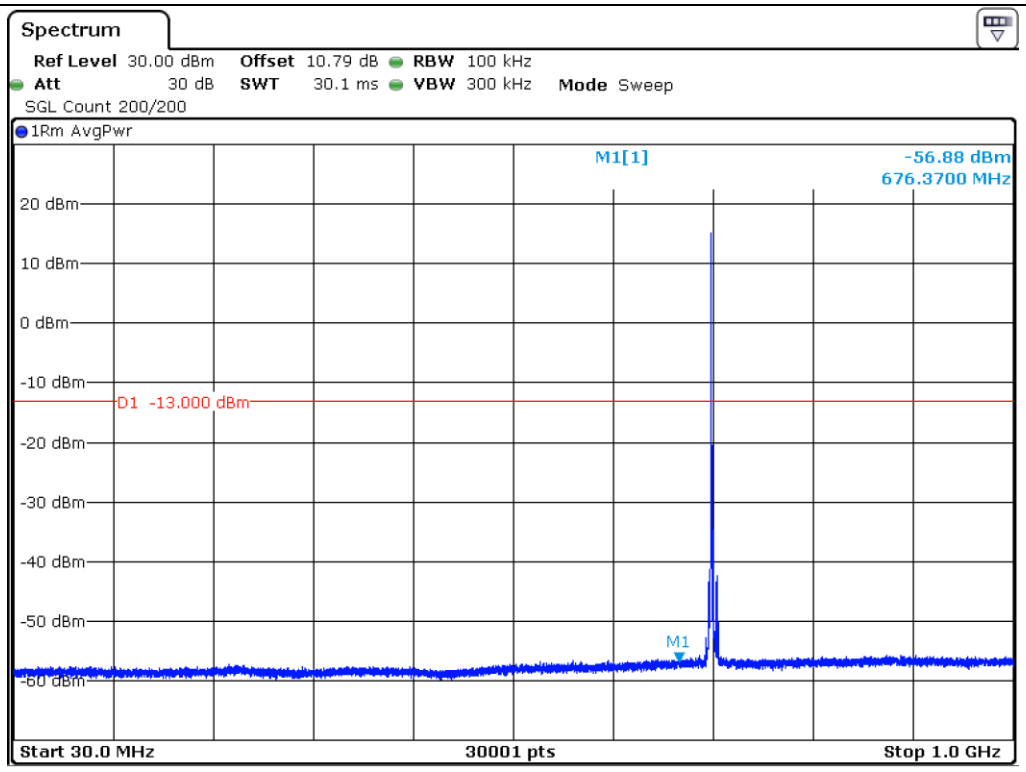
Low Channel



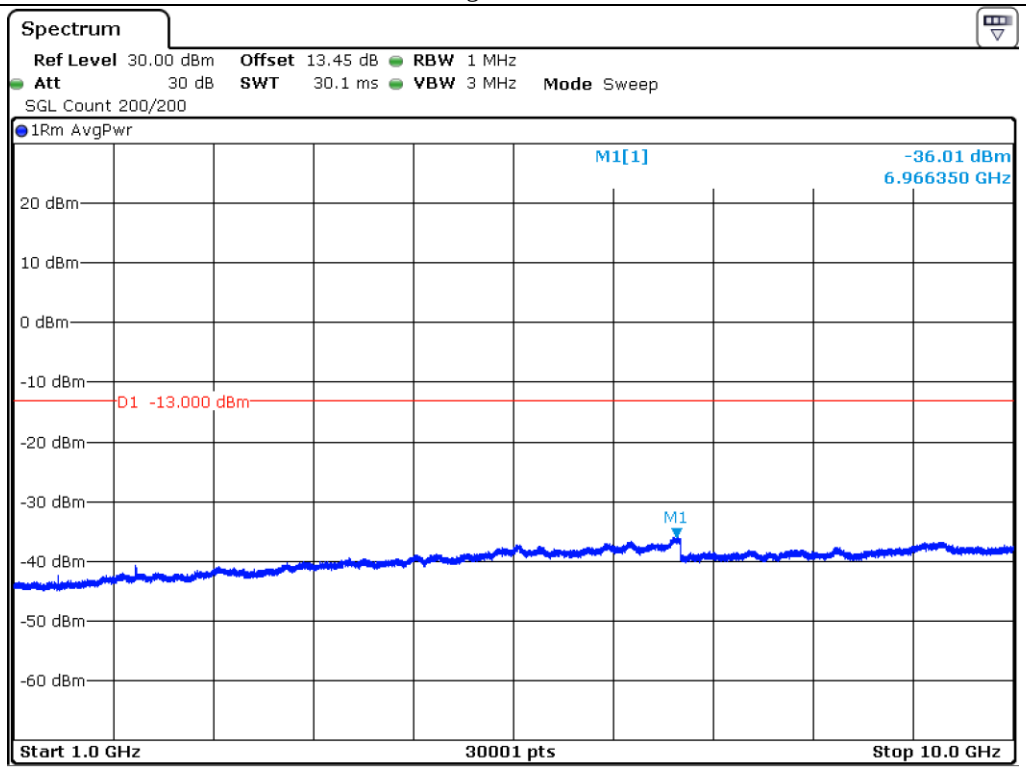
Midle Channel



Midle Channel



High Channel



High Channel

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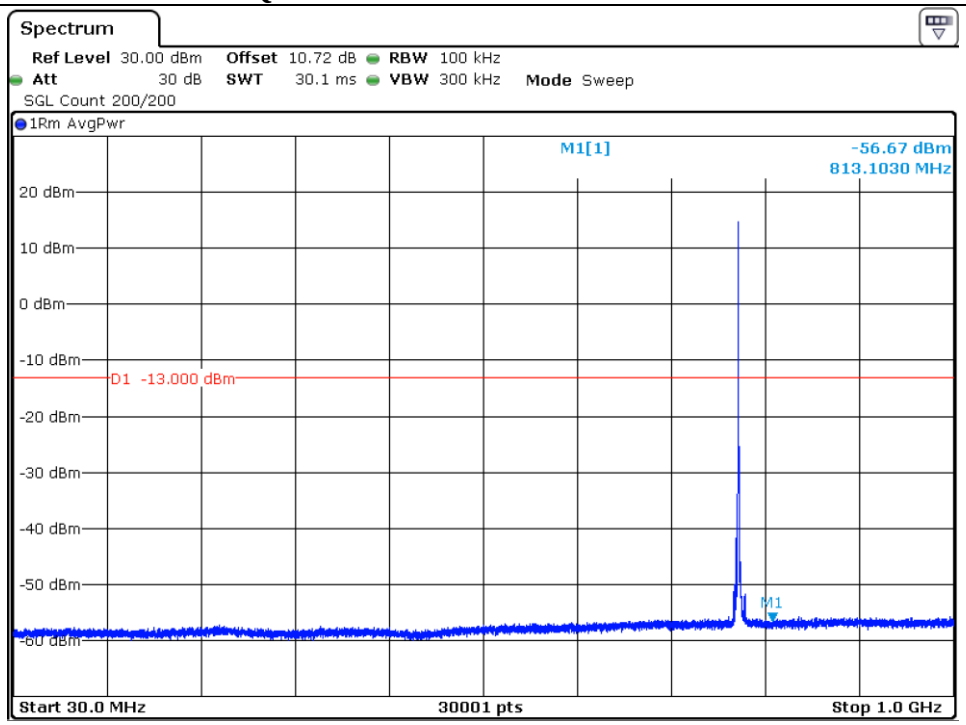
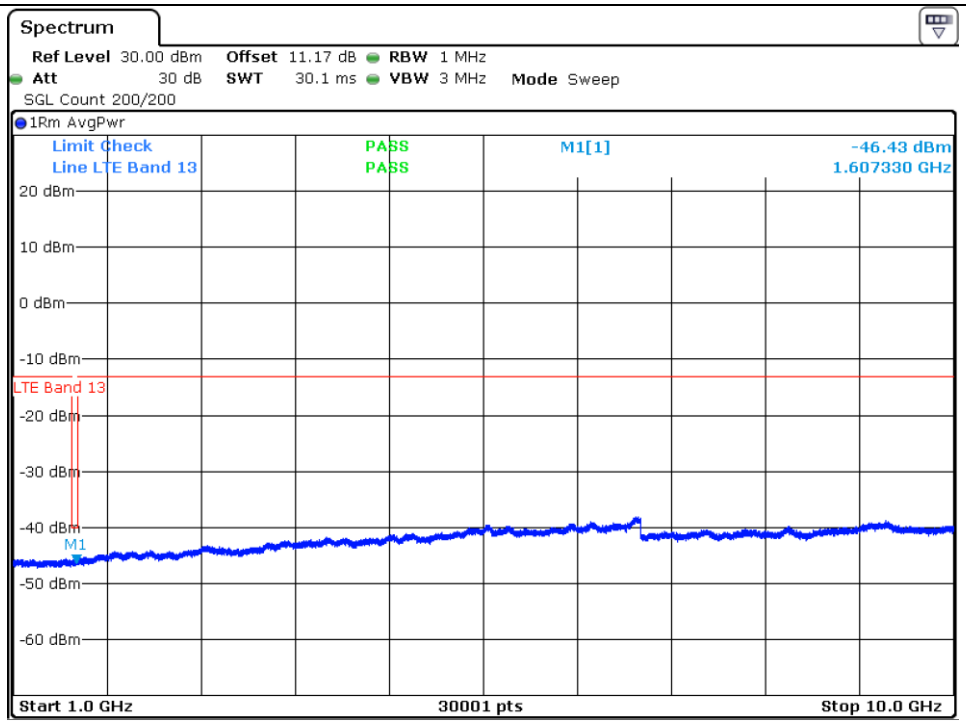
14.5.5 Test data for LTE Band 13 QPSK

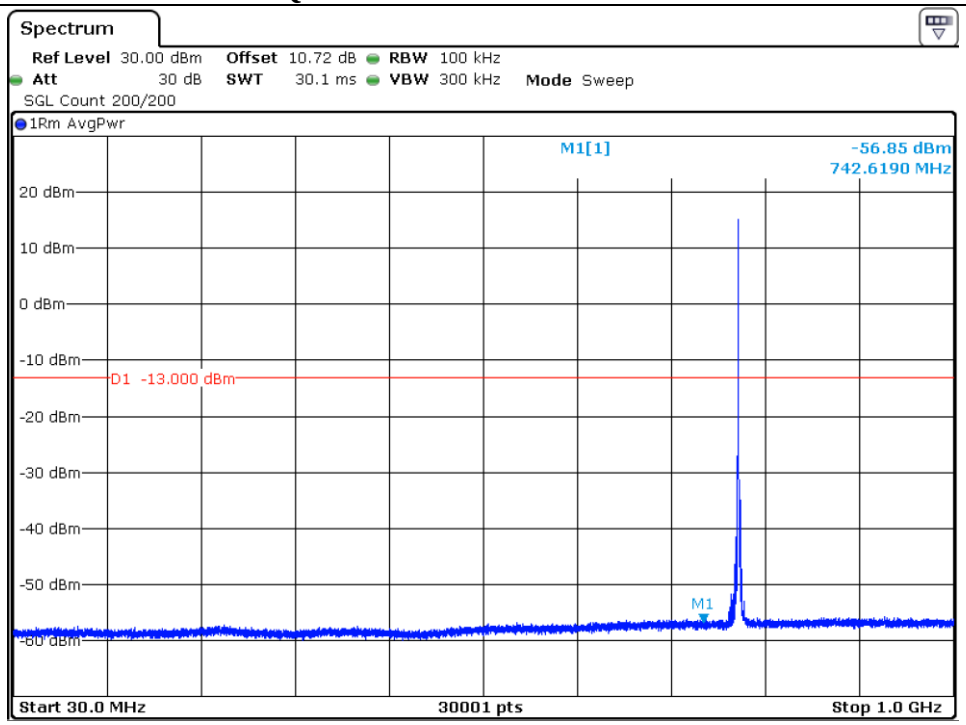


Low Channel

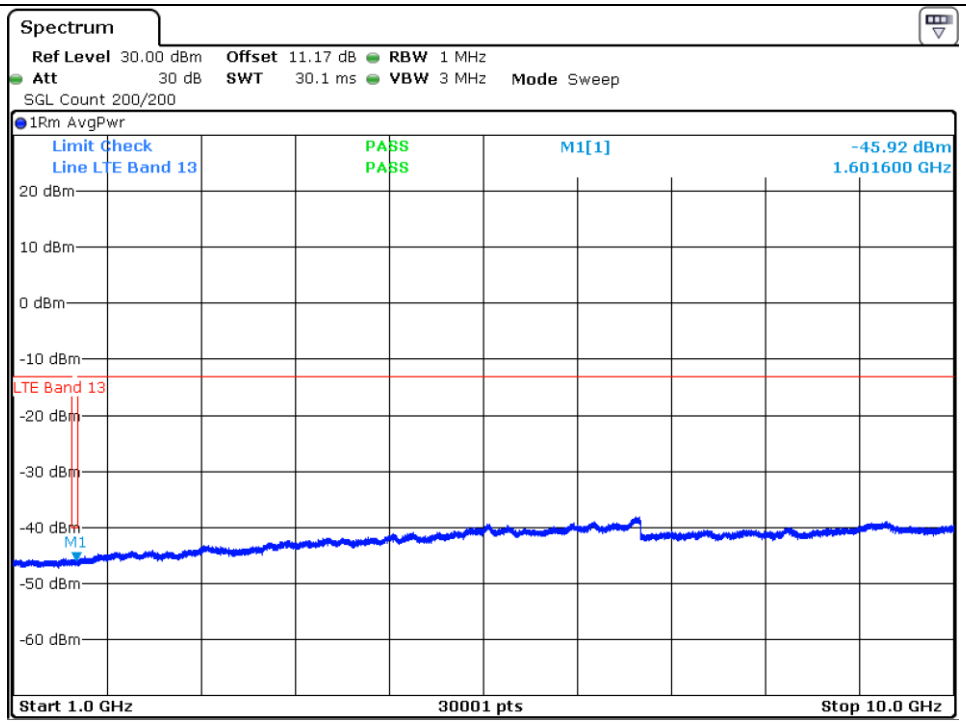


Low Channel

14.5.6 Test data for LTE Band 13 16QAM



Middle Channel



Middle Channel

15. FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

15.1 Operating environment

Temperature : 23 ℃

Relative humidity : 47 % R.H.

15.2 Test set-up

1. Frequency Stability (Voltage Variation)

+20 ℃ temperature and ±15% supply voltage variations. If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15% is applied to the uppermost voltage.

(1) Vary primary supply voltage from ±15% of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

2. Frequency Stability (Temperature Variation)

Turn EUT off and set chamber temperature to -30 ℃ and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 ℃ step from -30 ℃ to +50 ℃. Repeat above method for frequency measurements every 10 ℃ step and then record all measured frequencies on each temperature step.

15.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal.
■ -	FSV30	Rohde & Schwarz	Signal Analyzer	101372	Jul. 24, 2019 (1Y)
■ -	AAMCS-UDC	AA-MCS	Directional Coupler	400	Jul. 25, 2019 (1Y)
■ -	MT8821C	ANRITSU	Radio Communication Analyzer	6261849029	Jul. 26, 2019 (1Y)
■ -	PSL-2KP	ESPEC	Environmental Test Chamber	14009407	Feb. 22, 2019 (1Y)
■ -	GP-4303D	LG Precision Co.,Ltd	DC Power Supply	5071069	Jan. 10, 2019 (1Y)

All test equipment used is calibrated on a regular basis.

15.4 Test data

15.4.1 Test data for Voltage(V)_LTE Band 4

Temperature(˚C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
20	3.60	1 732 500 000	1 732 500 013	0.007 5
	3.06		1 732 500 009	0.005 2
	4.14		1 732 500 011	0.006 3

15.4.2 Test data for Temperature(˚C) _LTE Band 4

Temperature(˚C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
-30	3.60	1 732 500 000	1 732 499 987	-0.007 5
-20			1 732 499 992	-0.004 6
-10			1 732 499 995	-0.002 9
0			1 732 500 004	0.002 3
10			1 732 500 008	0.004 6
20			1 732 500 013	0.007 5
30			1 732 500 011	0.006 3
40			1 732 500 014	0.008 1
50			1 732 500 012	0.006 9

Tested by: Ju Yun Park / Assistant Manager

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

15.4.3 Test data for Voltage(V)_LTE Band 12

Temperature(˚C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
20	3.60	707 500 000	707 500 008	0.011 3
	3.06		707 500 004	0.005 7
	4.14		707 499 997	-0.004 2

15.4.4 Test data for Temperature(˚C) _LTE Band 12

Temperature(˚C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
-30	3.60	707 500 000	707 499 997	-0.004 2
-20			707 499 999	-0.001 4
-10			707 500 002	0.002 8
0			707 500 007	0.009 9
10			707 500 004	0.005 7
20			707 500 008	0.011 3
30			707 500 011	0.015 5
40			707 500 007	0.009 9
50			707 500 009	0.012 7

Tested by: Ju Yun Park / Assistant Manager

15.4.5 Test data for Voltage(V)_LTE Band 13

Temperature(˚ C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
20	3.60	782 000 000	781 999 997	-0.003 8
	3.06		781 999 991	-0.011 5
	4.14		781 999 994	-0.007 7

15.4.6 Test data for Temperature(˚ C) _LTE Band 13

Temperature(˚ C)	Power(VDC)	Center Freq.	Measured Freq.	PPM
-30	3.60	782 000 000	781 999 985	-0.019 2
-20			781 999 987	-0.016 6
-10			781 999 987	-0.016 6
0			781 999 994	-0.007 7
10			781 999 999	-0.001 3
20			781 999 997	-0.003 8
30			782 000 004	0.005 1
40			782 000 007	0.009 0
50			782 000 002	0.002 6

Tested by: Ju Yun Park / Assistant Manager

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)