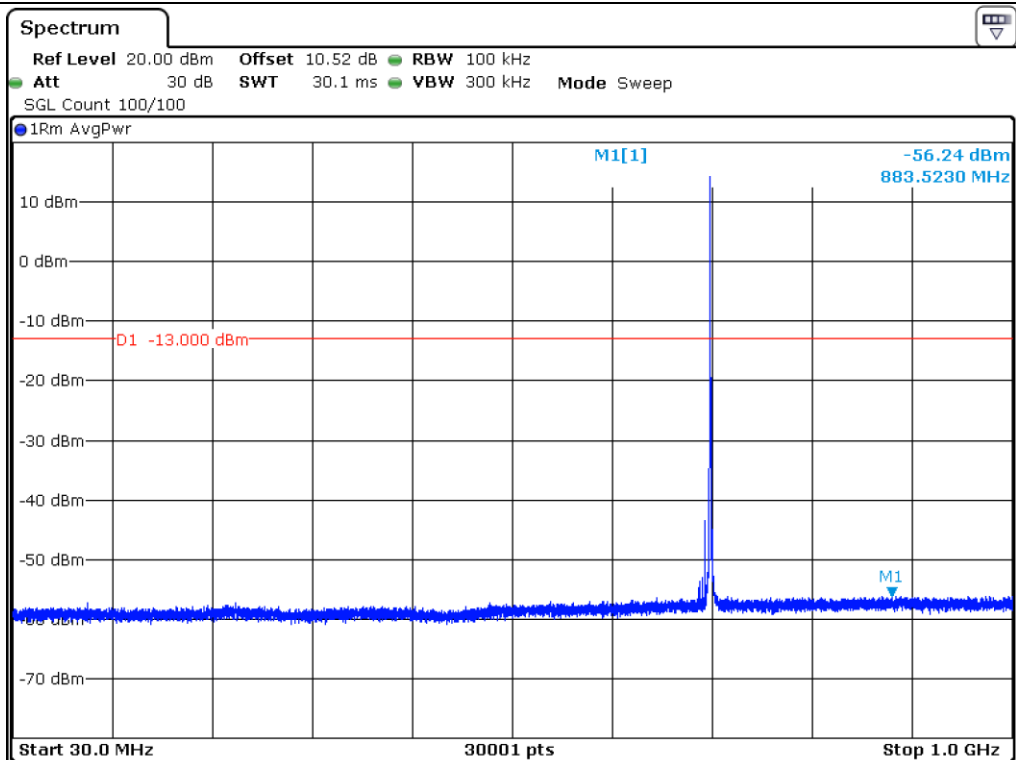
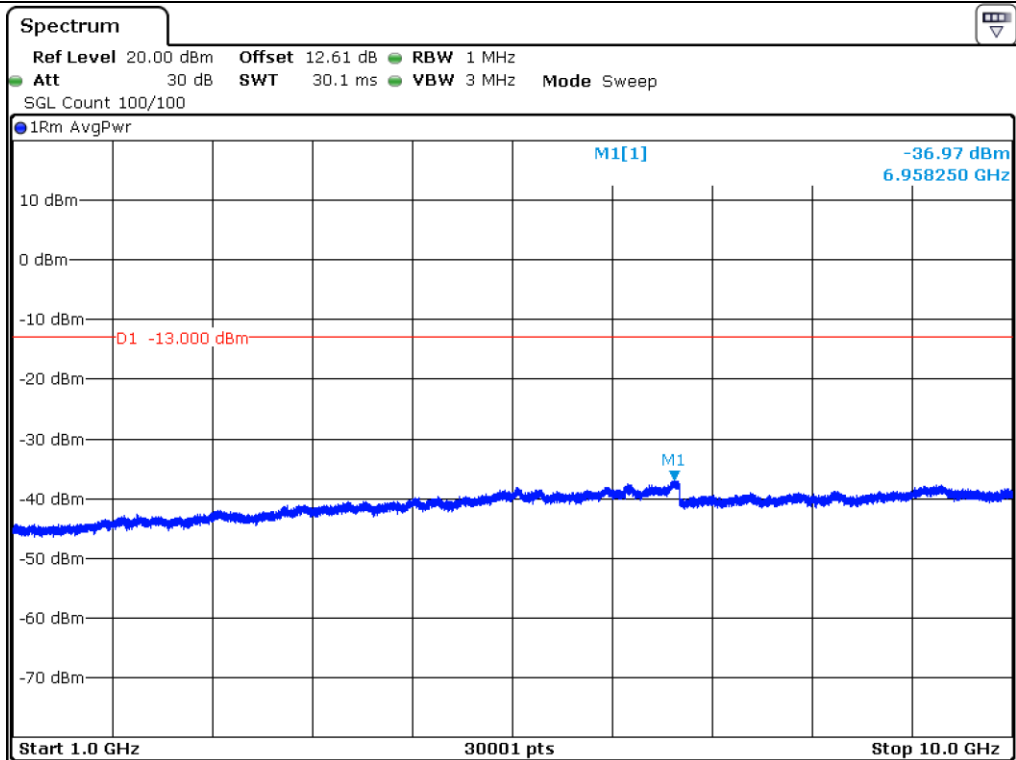


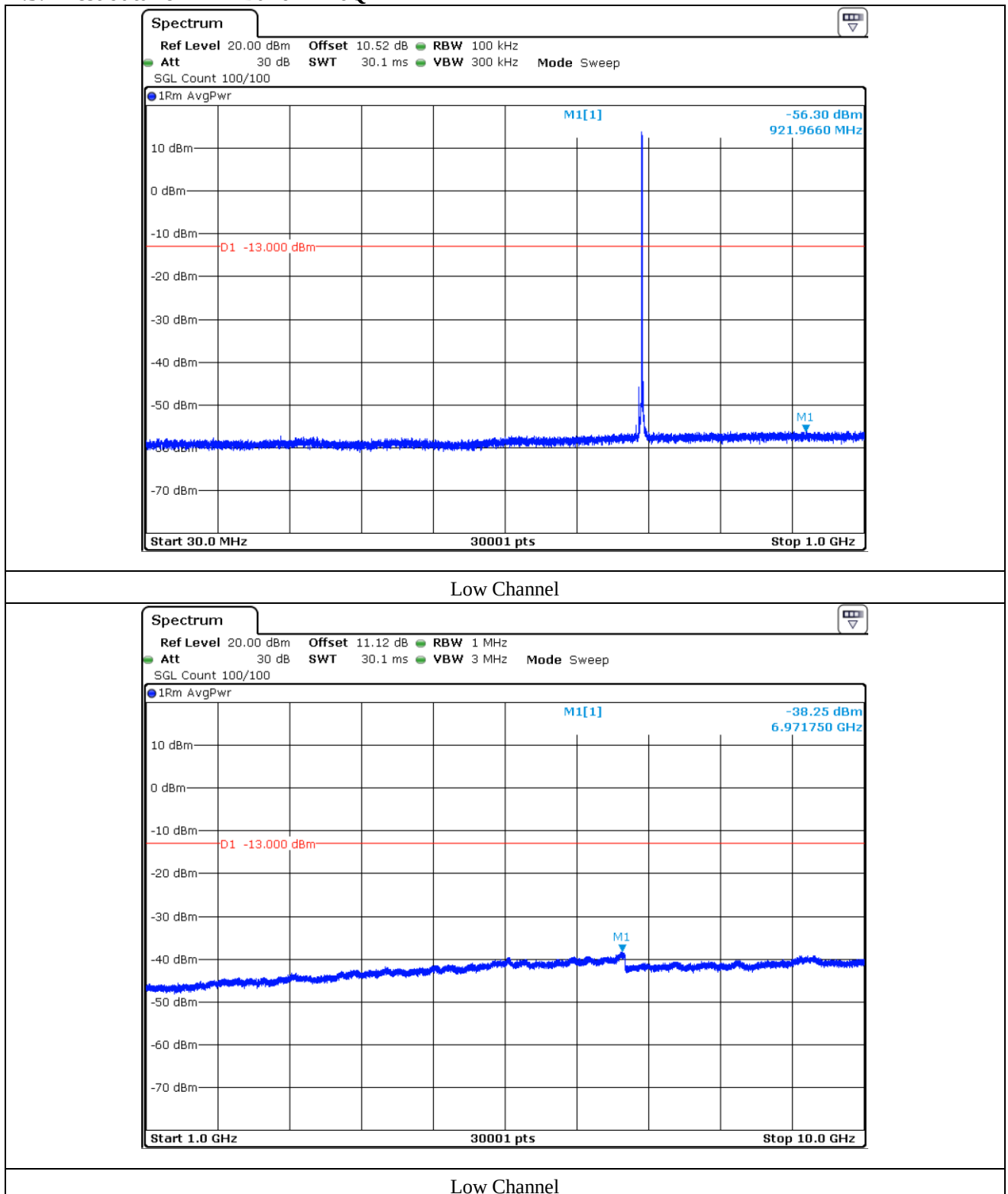


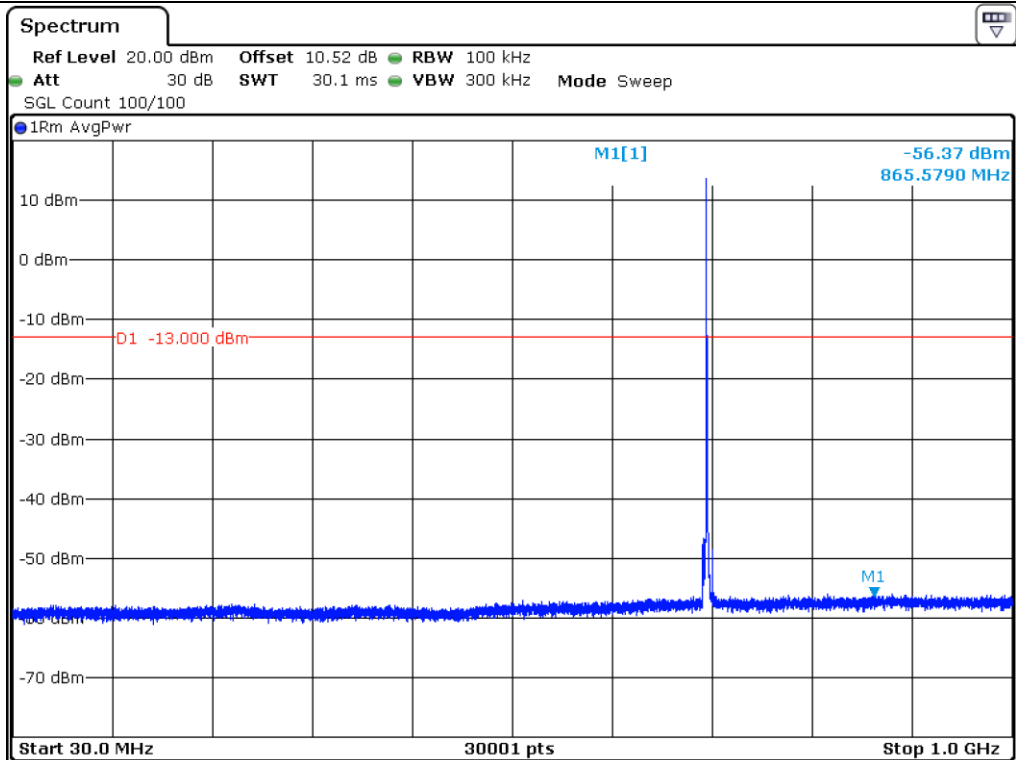
High Channel



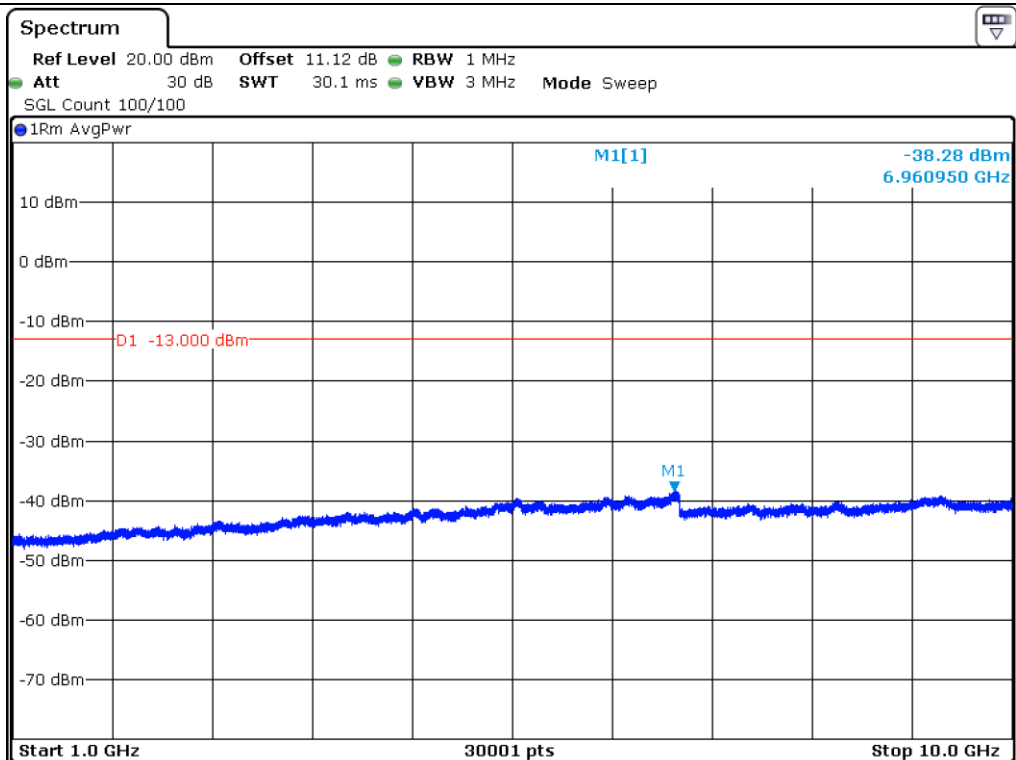
High Channel

14.5.4 Test data for LTE Band 12 16QAM

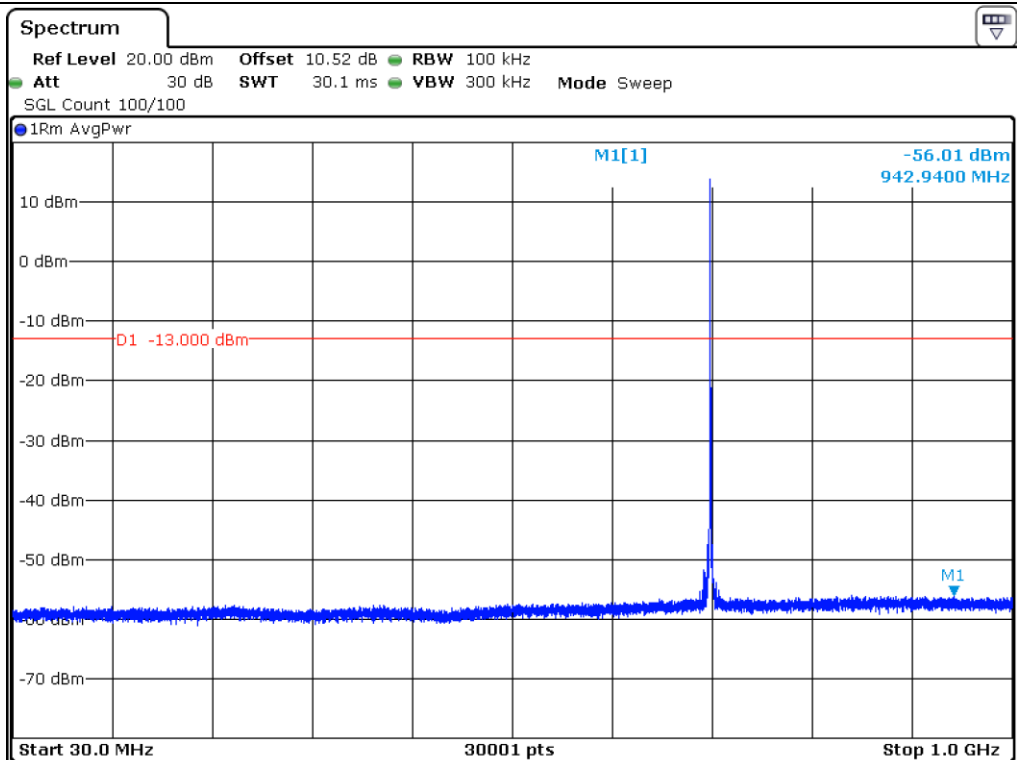




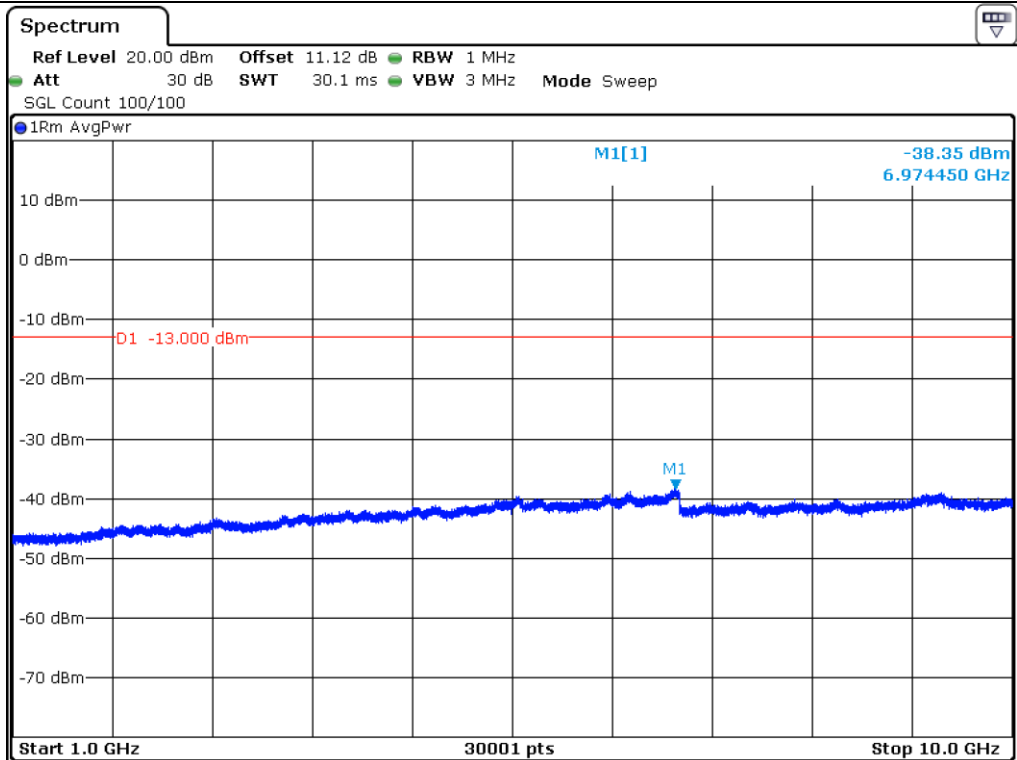
Midle Channel



Midle Channel

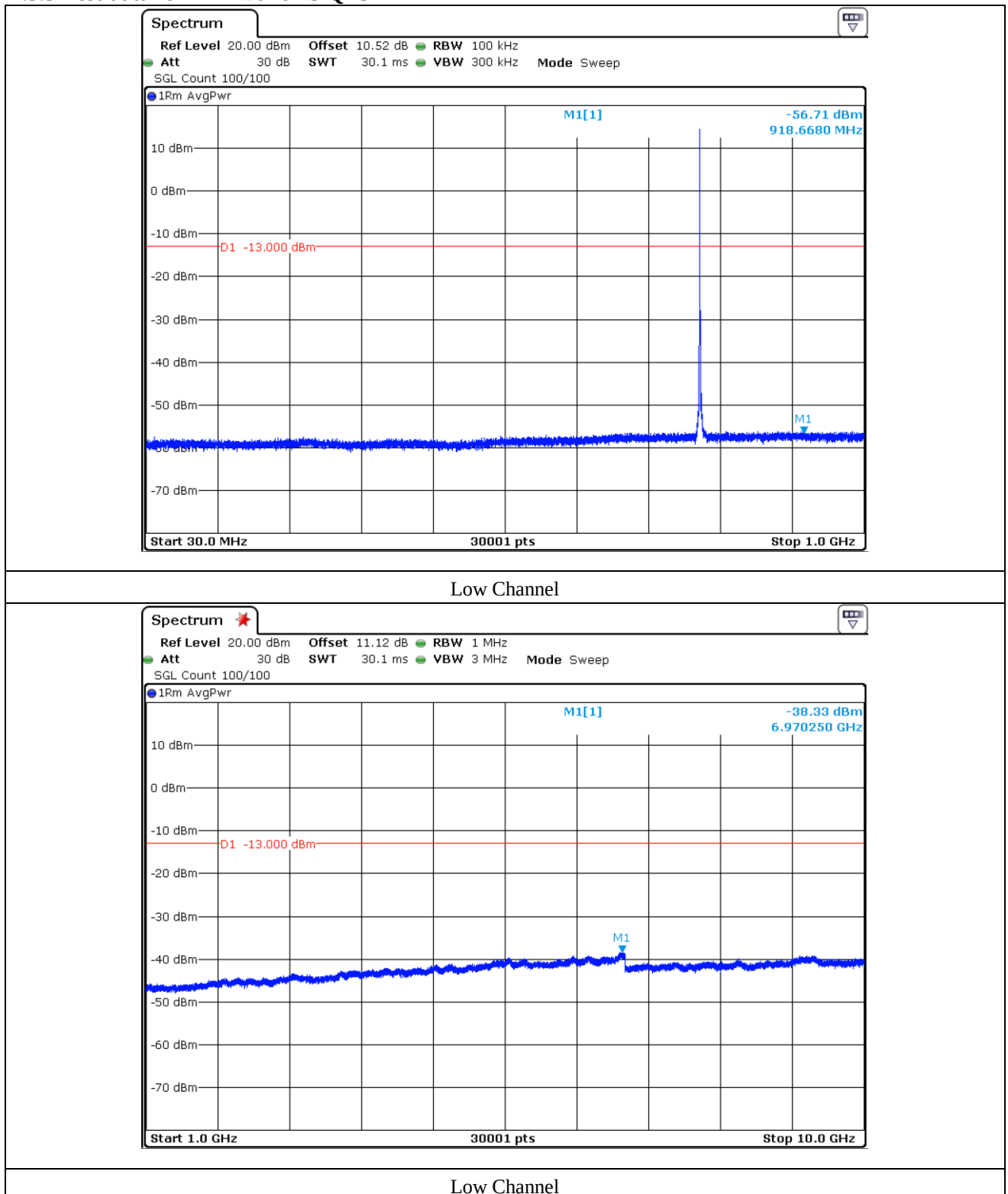


High Channel

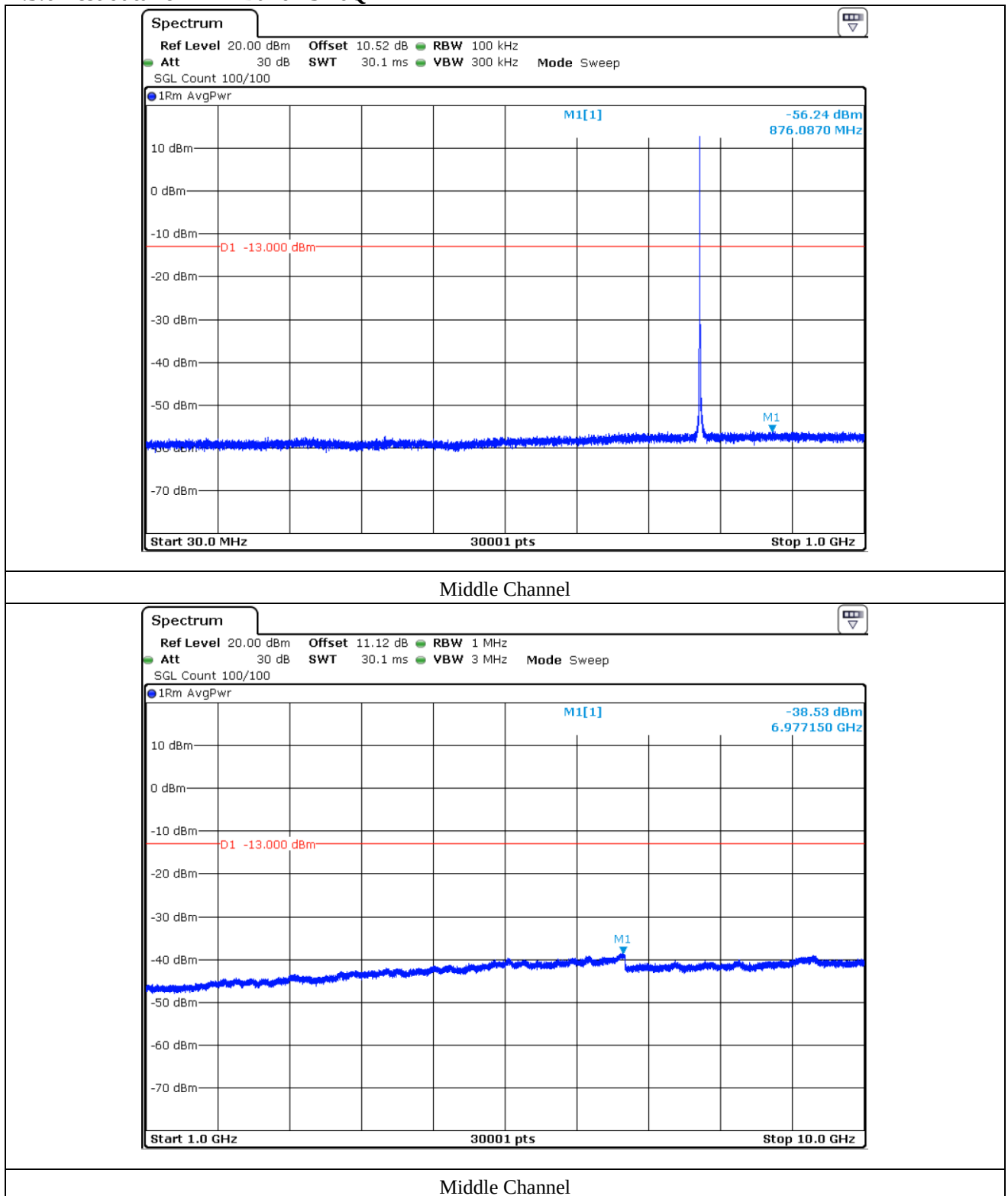


High Channel

14.5.5 Test data for LTE Band 13 QPSK



14.5.6 Test data for LTE Band 13 16QAM



15. FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

15.1 Operating environment

Temperature : 23 °C
Relative humidity : 47 % R.H.

15.2 Test set-up

1. Frequency Stability (Voltage Variation)

+20 °C temperature and $\pm 15\%$ 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 $\pm 15\%$ 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 $-30\text{ }^{\circ}\text{C}$ 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 $10\text{ }^{\circ}\text{C}$ step from $-30\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$. Repeat above method for frequency measurements every $10\text{ }^{\circ}\text{C}$ 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	Aug. 23, 2018 (1Y)
■ -	AAMCS-UDC	AA-MCS	Directional Coupler	400	Aug. 23, 2018 (1Y)
■ -	MT8821C	ANRITSU	Radio Communication Analyzer	6261849029	Aug. 22, 2018 (1Y)
■ -	PSL-2KP	ESPEC	Environmental Test Chamber	14009407	Feb. 22, 2019 (1Y)
■ -	PWS-3003D	Protek	DC Power Supply	4020409	Aug. 24, 2018 (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	1 732 500 006	0.003 5
	2.70		1 732 500 013	0.007 5
	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	1 732 499 992	-0.004 6
-20			1 732 499 994	-0.003 5
-10			1 732 499 999	-0.000 6
0			1 732 500 001	0.000 6
10			1 732 500 004	0.002 3
20			1 732 500 006	0.003 5
30			1 732 500 008	0.004 6
40			1 732 500 009	0.005 2
50			1 732 500 012	0.006 9



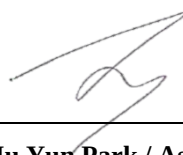
Tested by: Ju Yun Park / Assistant Manager

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
	2.70		707 500 011	0.015 5
	4.14		707 499 998	-0.002 8

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	707 500 011	0.015 5
-20			707 500 014	0.019 8
-10			707 500 009	0.012 7
0			707 499 998	-0.002 8
10			707 500 002	0.002 8
20			707 500 008	0.011 3
30			707 500 013	0.018 4
40			707 499 992	-0.011 3
50			707 499 996	-0.005 7



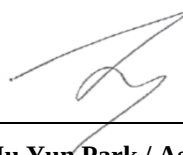
Tested by: Ju Yun Park / Assistant Manager

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	781 999 991	-0.011 5
	2.70		781 999 988	-0.015 3
	4.14		781 999 992	-0.010 2

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			781 999 992	-0.010 2
-10			781 999 994	-0.007 7
0			781 999 989	-0.014 1
10			781 999 995	-0.006 4
20			781 999 991	-0.011 5
30			781 999 997	-0.003 8
40			782 000 004	0.005 1
50			782 000 006	0.007 7



Tested by: Ju Yun Park / Assistant Manager

16. CONDUCTED EMISSION TEST

16.1 Operating environment

Temperature : 24 °C
Relative humidity : 48 % R.H.

16.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

16.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ -	ESCI	Rohde & Schwarz	EMI Test Receiver	101012	Oct. 22, 2018 (1Y)
□ -	ESHS10	Rohde & Schwarz	EMI Test Receiver	834467/007	Mar. 29, 2018 (1Y)
■ -	NSLK8128	Schwarzbeck	AMN	8128-216	Mar. 28, 2018 (1Y)
□ -	NSLK8126	Schwarzbeck	AMN	8126-404	Apr. 04, 2018 (1Y)
□ -	NSLK8126	Schwarzbeck	AMN	8126-479	Oct. 22, 2018 (1Y)
■ -	3825/2	EMCO	LISN	9109-1869	Apr. 11, 2018 (1Y)

All test equipment used is calibrated on a regular basis.

16.4 Test data

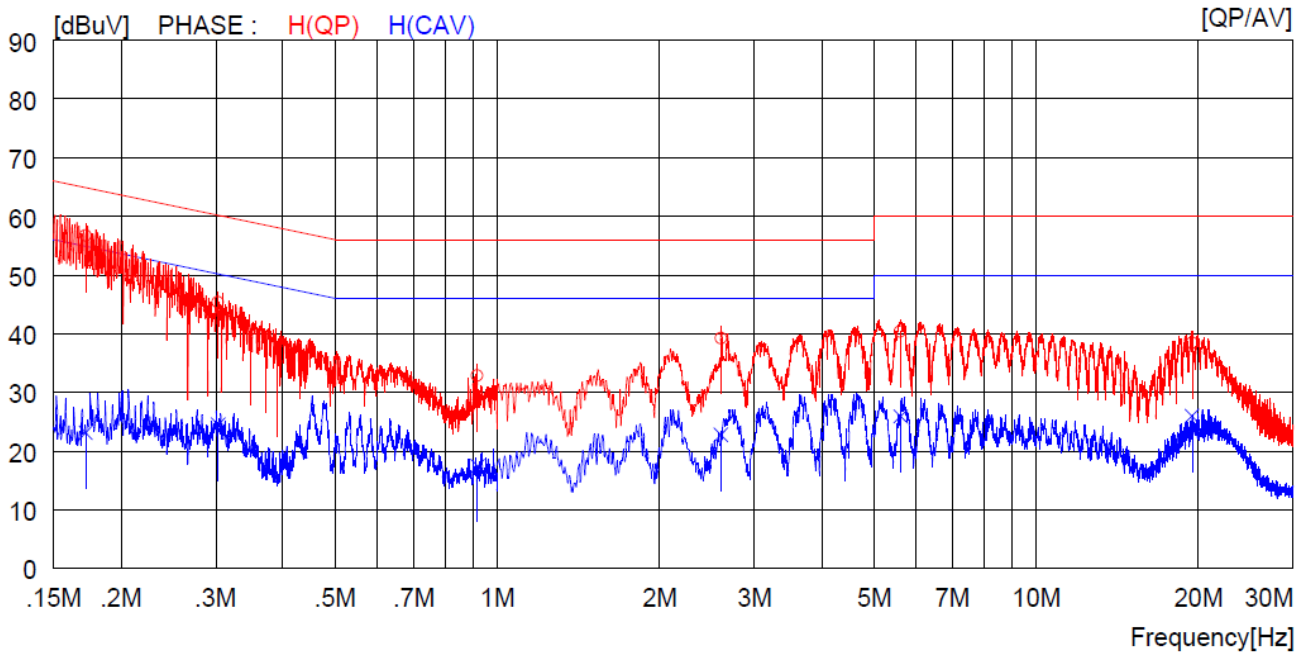
16.4.1 Test data for LTE Band 4

-. Test Date : February 13, 2019 ~ March 05, 2019

-. Resolution bandwidth : 9 kHz

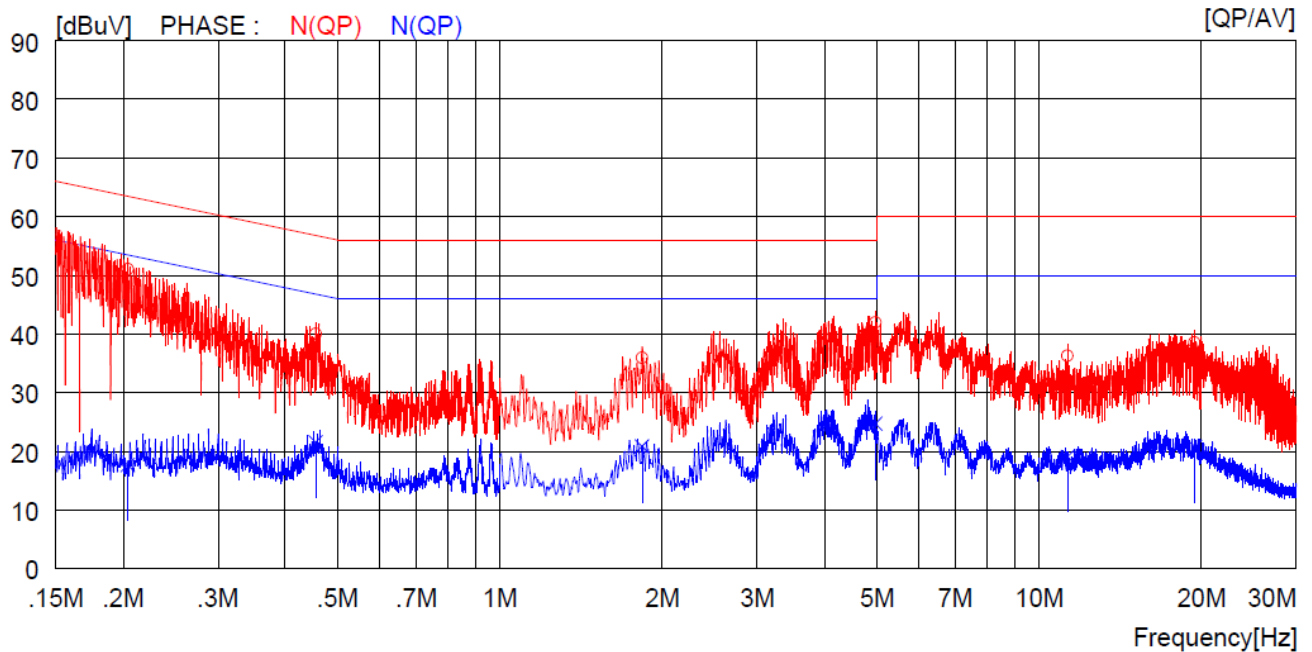
-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.17200	46.8	----	9.9	56.7	----	64.9	----	8.2	----	H (QP)
2	0.30300	35.4	----	9.9	45.3	----	60.2	----	14.9	----	H (QP)
3	0.91800	22.8	----	10.0	32.8	----	56.0	----	23.2	----	H (QP)
4	2.60000	29.2	----	10.0	39.2	----	56.0	----	16.8	----	H (QP)
5	5.59500	30.2	----	10.1	40.3	----	60.0	----	19.7	----	H (QP)
6	19.46000	28.1	----	10.3	38.4	----	60.0	----	21.6	----	H (QP)
7	0.17200	----	13.2	9.9	----	23.1	----	54.9	----	31.8	H (CAV)
8	0.30300	----	14.6	9.9	----	24.5	----	50.2	----	25.7	H (CAV)
9	0.91800	----	7.4	10.0	----	17.4	----	46.0	----	28.6	H (CAV)
10	2.60000	----	12.8	10.0	----	22.8	----	46.0	----	23.2	H (CAV)
11	5.59500	----	15.8	10.1	----	25.9	----	50.0	----	24.1	H (CAV)
12	19.46000	----	15.7	10.3	----	26.0	----	50.0	----	24.0	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.20400	41.1	----	9.9	51.0	----	63.4	----	12.4	----	N(QP)
2	0.45500	30.1	----	9.9	40.0	----	56.8	----	16.8	----	N(QP)
3	1.83600	25.9	----	10.0	35.9	----	56.0	----	20.1	----	N(QP)
4	4.97600	31.8	----	10.1	41.9	----	56.0	----	14.1	----	N(QP)
5	11.29000	26.1	----	10.2	36.3	----	60.0	----	23.7	----	N(QP)
6	19.44000	28.2	----	10.3	38.5	----	60.0	----	21.5	----	N(QP)
7	0.20400	----	7.8	9.9	----	17.7	----	53.4	----	35.7	N(CAV)
8	0.45500	----	11.6	9.9	----	21.5	----	46.8	----	25.3	N(CAV)
9	1.83600	----	10.9	10.0	----	20.9	----	46.0	----	25.1	N(CAV)
10	4.97600	----	14.6	10.1	----	24.7	----	46.0	----	21.3	N(CAV)
11	11.29000	----	8.9	10.2	----	19.1	----	50.0	----	30.9	N(CAV)
12	19.44000	----	10.4	10.3	----	20.7	----	50.0	----	29.3	N(CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Ju Yun Park / Assistant Manager

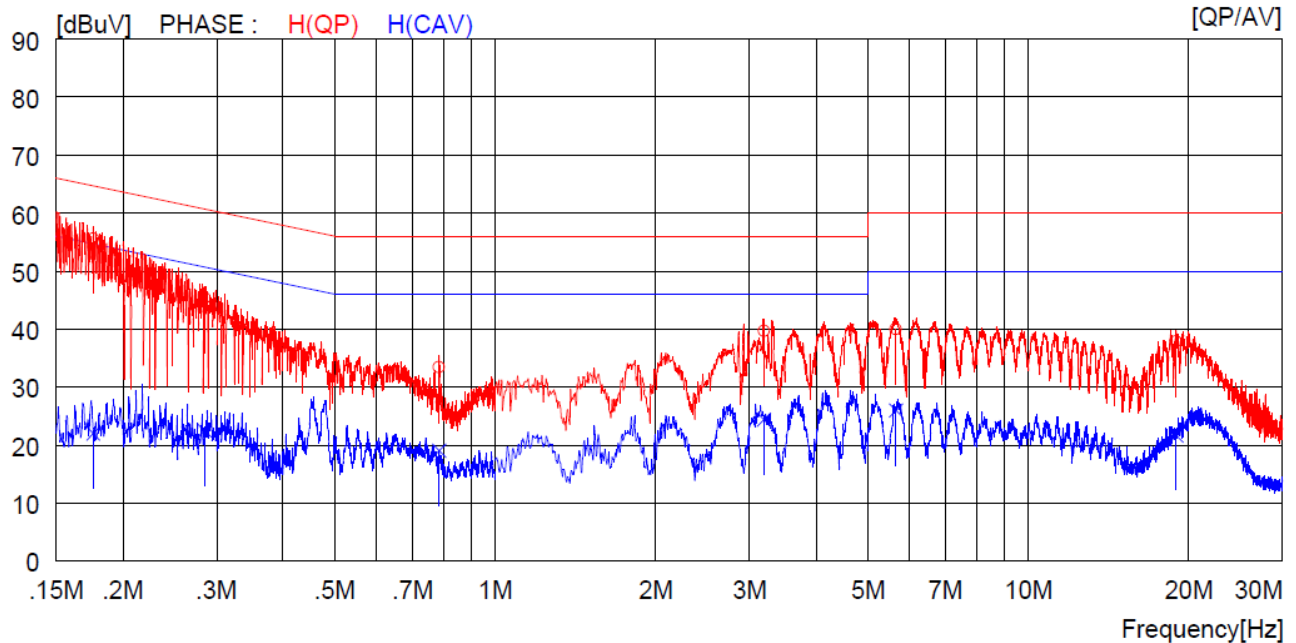
16.4.1 Test data for LTE Band 12

-. Test Date : February 13, 2019 ~ March 05, 2019

-. Resolution bandwidth : 9 kHz

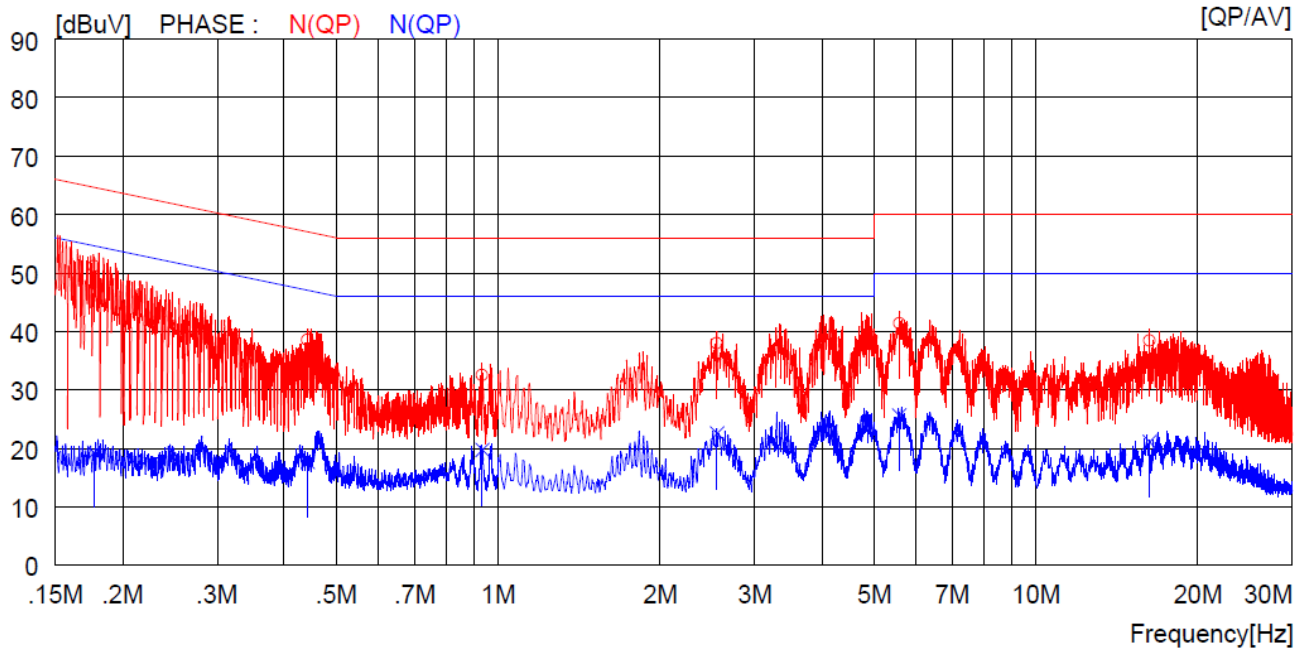
-. Frequency range : 0.15 MHz ~ 30 MHz

-. Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.17600	45.7	----	9.9	55.6	----	64.7	----	9.1	----	H (QP)
2	0.28500	35.5	----	9.9	45.4	----	60.7	----	15.3	----	H (QP)
3	0.78500	23.5	----	9.9	33.4	----	56.0	----	22.6	----	H (QP)
4	3.19200	29.7	----	10.0	39.7	----	56.0	----	16.3	----	H (QP)
5	5.64500	29.9	----	10.1	40.0	----	60.0	----	20.0	----	H (QP)
6	18.96000	27.5	----	10.3	37.8	----	60.0	----	22.2	----	H (QP)
7	0.17600	----	12.1	9.9	----	22.0	----	54.7	----	32.7	H (CAV)
8	0.28500	----	12.6	9.9	----	22.5	----	50.7	----	28.2	H (CAV)
9	0.78500	----	9.1	9.9	----	19.0	----	46.0	----	27.0	H (CAV)
10	3.19200	----	14.4	10.0	----	24.4	----	46.0	----	21.6	H (CAV)
11	5.64500	----	15.9	10.1	----	26.0	----	50.0	----	24.0	H (CAV)
12	18.96000	----	11.4	10.3	----	21.7	----	50.0	----	28.3	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.17700	41.3	----	9.9	51.2	----	64.6	----	13.4	----	N(QP)
2	0.44200	28.5	----	10.0	38.5	----	57.0	----	18.5	----	N(QP)
3	0.93400	22.5	----	10.0	32.5	----	56.0	----	23.5	----	N(QP)
4	2.55200	28.0	----	10.0	38.0	----	56.0	----	18.0	----	N(QP)
5	5.57500	31.3	----	10.1	41.4	----	60.0	----	18.6	----	N(QP)
6	16.28000	28.2	----	10.2	38.4	----	60.0	----	21.6	----	N(QP)
7	0.17700	----	9.4	9.9	----	19.3	----	54.6	----	35.3	N(CAV)
8	0.44200	----	7.7	10.0	----	17.7	----	47.0	----	29.3	N(CAV)
9	0.93400	----	9.7	10.0	----	19.7	----	46.0	----	26.3	N(CAV)
10	2.55200	----	12.6	10.0	----	22.6	----	46.0	----	23.4	N(CAV)
11	5.57500	----	15.5	10.1	----	25.6	----	50.0	----	24.4	N(CAV)
12	16.28000	----	10.9	10.2	----	21.1	----	50.0	----	28.9	N(CAV)

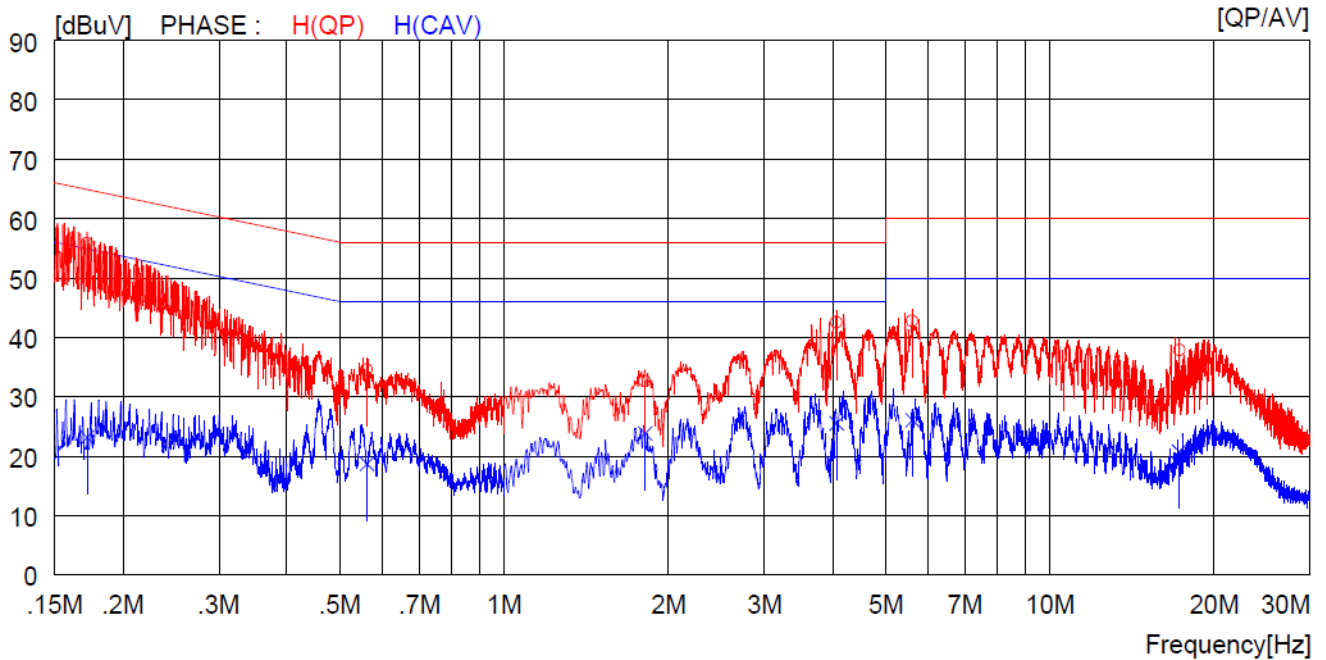
Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Ju Yun Park / Assistant Manager

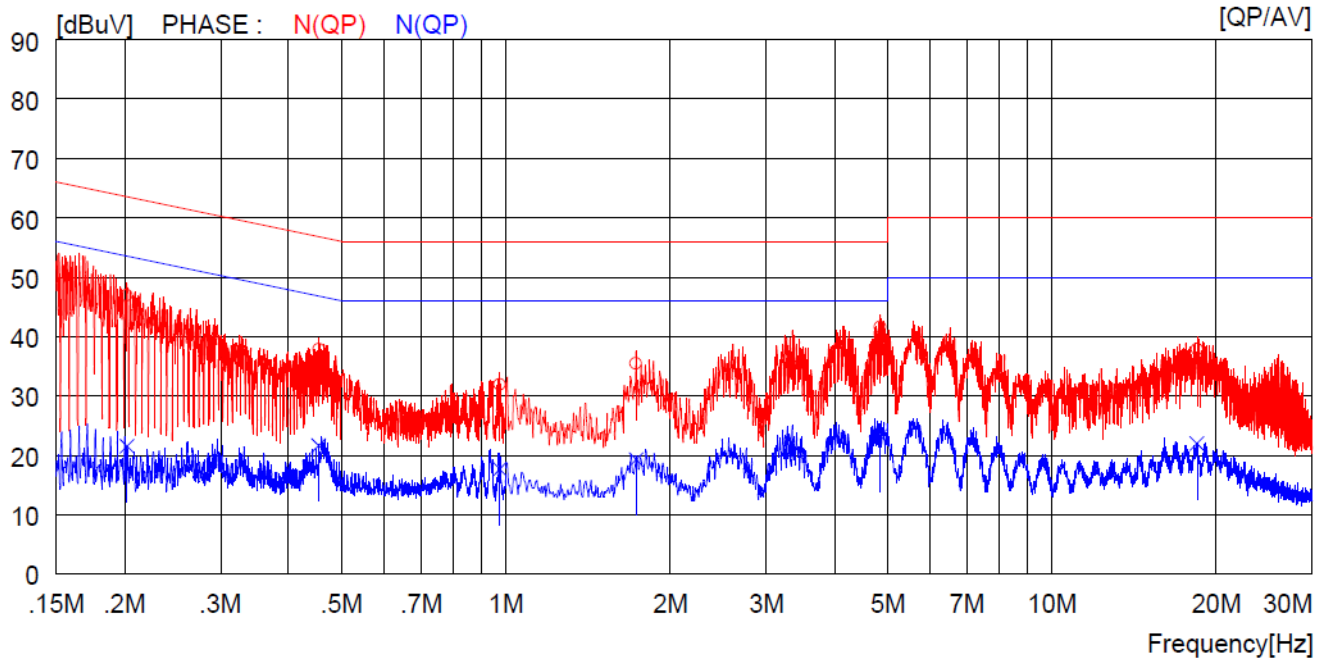
16.4.1 Test data for LTE Band 13

- Test Date : February 13, 2019 ~ March 05, 2019
- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.17200	45.9	----	9.9	55.8	----	64.9	----	9.1	----	H (QP)
2	0.56000	24.7	----	9.9	34.6	----	56.0	----	21.4	----	H (QP)
3	1.81200	22.6	----	10.0	32.6	----	56.0	----	23.4	----	H (QP)
4	4.06800	32.4	----	10.1	42.5	----	56.0	----	13.5	----	H (QP)
5	5.60000	32.6	----	10.1	42.7	----	60.0	----	17.3	----	H (QP)
6	17.28000	27.5	----	10.3	37.8	----	60.0	----	22.2	----	H (QP)
7	0.17200	----	13.2	9.9	----	23.1	----	54.9	----	31.8	H (CAV)
8	0.56000	----	8.8	9.9	----	18.7	----	46.0	----	27.3	H (CAV)
9	1.81200	----	13.8	10.0	----	23.8	----	46.0	----	22.2	H (CAV)
10	4.06800	----	15.4	10.1	----	25.5	----	46.0	----	20.5	H (CAV)
11	5.60000	----	16.0	10.1	----	26.1	----	50.0	----	23.9	H (CAV)
12	17.28000	----	10.4	10.3	----	20.7	----	50.0	----	29.3	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.20200	37.1	----	9.9	47.0	----	63.5	----	16.5	----	N (QP)
2	0.45400	27.9	----	9.9	37.8	----	56.8	----	19.0	----	N (QP)
3	0.97400	21.9	----	10.0	31.9	----	56.0	----	24.1	----	N (QP)
4	1.73200	25.5	----	10.0	35.5	----	56.0	----	20.5	----	N (QP)
5	4.84400	31.5	----	10.1	41.6	----	56.0	----	14.4	----	N (QP)
6	18.45000	27.5	----	10.3	37.8	----	60.0	----	22.2	----	N (QP)
7	0.20200	----	11.6	9.9	----	21.5	----	53.5	----	32.0	N (CAV)
8	0.45400	----	11.8	9.9	----	21.7	----	46.8	----	25.1	N (CAV)
9	0.97400	----	7.7	10.0	----	17.7	----	46.0	----	28.3	N (CAV)
10	1.73200	----	9.3	10.0	----	19.3	----	46.0	----	26.7	N (CAV)
11	4.84400	----	13.2	10.1	----	23.3	----	46.0	----	22.7	N (CAV)
12	18.45000	----	11.7	10.3	----	22.0	----	50.0	----	28.0	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

Tested by: Ju Yun Park / Assistant Manager