

FCC Test Report

FCC ID : N7NHL7688
Equipment : Wireless Module
Model No. : HL7688
Brand Name : AirPrime
Applicant : Sierra Wireless Inc.
Address : 13811 Wireless Way Richmond, BC, V6V 3A4
Canada
Standard : 47 CFR FCC Part 27
Received Date : Jul. 12, 2016
Tested Date : Aug. 03 ~ Aug. 08, 2016

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:


Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FG571601-01P27	Rev. 01	Initial issue	Aug. 18, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
2.1046 27.50(b)(10) 27.50(c)(10)	Effective Radiated Power	Power[dBm]: 22.68	Pass
2.1053 27.53(c) 27.53(g)	Radiated Emissions	Meet the requirement of limit	Pass
2.1051 27.53(c) 27.53(g)	Conducted Emissions	Meet the requirement of limit	Pass
2.1051 27.53(c) 27.53(g)	Band Edge	Meet the requirement of limit	Pass
2.1049	Occupied Bandwidth	Meet the requirement of limit	Pass
2.1055 / 27.54	Frequency Stability	Meet the requirement of limit	Pass
27.50(d)(5)	Peak to Average Ratio	Meet the requirement of limit	Pass

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

Operating Frequency	Channel Bandwidth: 5MHz: 706.5 MHz ~ 713.5 MHz Channel Bandwidth: 10MHz: 709 MHz ~ 711 MHz
Modulation Type	QPSK, 16QAM (Uplink)
Release Version	8
Duplex Mode	FDD
UE category	Cat. 1
H/W Version	1
S/W Version	RHL76xx.A.2.10.1

1.1.2 Maximum ERP and Emission Designator

Mode	Modulation	Maximum ERP (W)	Emission Designator
LTE Band 17, CB: 5MHz	QPSK	0.185	4M52G7D
LTE Band 17, CB: 5MHz	16QAM	0.152	4M50W7D
LTE Band 17, CB: 10MHz	QPSK	0.185	9M00G7D
LTE Band 17, CB: 10MHz	16QAM	0.171	8M94W7D

1.1.3 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	Dipole	2	R-SMA	---

Note: The antenna is for testing use only.

1.1.4 EUT Operational Condition

Supply Voltage	3.7 Vdc from host		
Operational Voltage	☒ Vnom (3.7 V)	☒ Vmax (4.5 V)	☒ Vmin (3.2 V)
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (55°C)	☒ Tmin (-30°C)

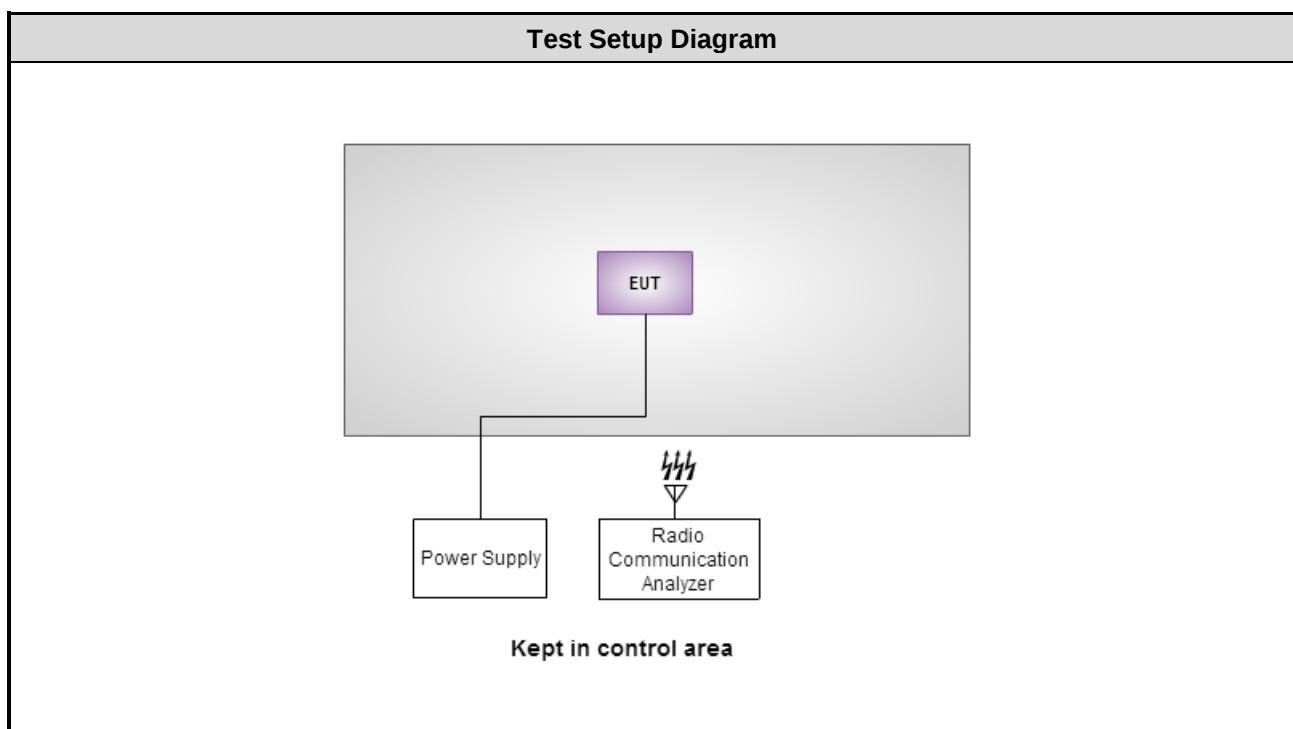
1.1.5 Operating Channel List

LTE Band 17		
Channel Bandwidth (MHz)	Channel	Frequency (MHz)
5	23755	706.5
5	23790	710.0
5	23825	713.5
10	23780	709.0
10	23790	710.0
10	23800	711.0

1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Power Supply	GWINSTEK	GPC-60300	EM884797	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	Nov. 27, 2015	Nov. 26, 2016
Power Meter	Anritsu	ML2495A	1241002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016
Radio Communication Analyzer	Anritsu	MT8820C	6201240341	Mar. 28, 2016	Mar. 27, 2017
DC POWER SOURCE	GW INSTRON	GPC-3060D	EM884797	Oct. 20, 2015	Oct. 19, 2016
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 14, 2015	Sep. 13, 2016
Receiver	Agilent	N9038A	MY53290044	Oct. 14, 2015	Oct. 13, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 26, 2016	Apr. 25, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 24, 2016	Feb. 23, 2017
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Preamplifier	EMC	EMC02325	980187	Sep. 21, 2015	Sep. 20, 2016
Preamplifier	Agilent	83017A	MY53270014	Sep. 07, 2015	Sep. 06, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 05, 2016	Feb. 04, 2017
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 05, 2016	Feb. 04, 2017
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 05, 2016	Feb. 04, 2017
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 05, 2016	Feb. 04, 2017
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 05, 2016	Feb. 04, 2017
Radio Communication Analyzer	Anritsu	MT8820C	6201240341	Mar. 28, 2016	Mar. 27, 2017
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards.

47 CFR FCC Part 27

ANSI / TIA / EIA-603-D -2010

FCC KDB 971168 D01 Power Meas License Digital Systems v02r02

FCC KDB 971168 D02 Misc OOB License Digital Systems v01

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	±34.134 Hz
Conducted power	±0.808 dB
Frequency error	±34.134 Hz
Temperature	±0.6 °C
Conducted emission	±2.670 dB
AC conducted emission	±2.90 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.37 dB

2 Test Configuration

2.1 Testing Condition and Location Information

Test Item	Test Site	Ambient Condition	Tested By
RF conducted	TH01-WS	23°C / 64%	Felix Sung
Radiated Emissions	03CH03-WS	22°C / 64%	Anderson Hung

➤ FCC site registration No.: 207696

➤ IC site registration No.: 10807C-1

2.2 The Worst Test Modes and Channel Details

Test item	Channel Bandwidth	Modulation	Test channel
E.R.P Conducted Emissions Occupied Bandwidth Peak to Average Ratio	5 MHz 10 MHz	QPSK / 16QAM QPSK / 16QAM	23755, 23790, 23825 23780, 23790, 23800
Radiated Emission ≤ 1GHz	5 MHz 10 MHz	QPSK QPSK	23825 23790
Radiated Emission > 1GHz	5 MHz 10 MHz	QPSK QPSK	23755, 23790, 23825 23780, 23790, 23800
Band Edge	5 MHz 10 MHz	QPSK / 16QAM QPSK / 16QAM	23755, 23825 23780, 23800
Frequency Stability	5 MHz 10 MHz	QPSK QPSK	23790 23790
Note:			
1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The Y-plane results were found as the worst case and were shown in this report.			

3 Test Results

3.1 Effective Radiated Power

3.1.1 Limit of Effective Radiated Power

Portable stations (hand-held devices) are limited to 3 watts ERP.

3.1.2 Test Procedures

For Conducted power measurement:

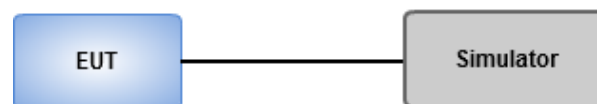
1. The EUT links up with simulator and is set to maximum output power level at low / middel / high channel.
2. Measure the output power of low / middle / high channel of the EUT.

For ERP measurement:

EPR can be calculated by below formula from KDB 412172 D01.

1. $EIRP = P_T + G_T - L_C$
 P_T = transmitter output power, in dBm.
 G_T = gain of the transmitting antenna, in dBi (EIRP).
 L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB.
2. $ERP = EIRP - 2.15 \text{ dB}$.

3.1.3 Test Setup



3.1.4 Test Result of Conducted power (dBm)

Band / Channel Bandwidth			LTE Band 17 / CB: 5MHz		
Channel			23755	23790	23825
Frequency (MHz)			706.5	710.0	713.5
Mode	RB	RB Offset	Maximum AV Power (dBm)		
QPSK	1	0	22.79	22.82	22.83
	1	12	22.71	22.78	22.75
	1	24	22.65	22.67	22.61
	12	0	21.76	21.85	21.75
	12	6	21.83	21.78	21.62
	12	11	21.80	21.70	21.58
	25	0	21.70	21.76	21.72
16QAM	1	0	21.83	21.96	21.73
	1	12	21.98	21.89	21.72
	1	24	21.87	21.76	21.57
	12	0	21.04	21.06	20.95
	12	6	20.91	21.00	20.98
	12	11	20.94	21.11	21.09
	25	0	21.01	20.90	20.88

Band / Channel Bandwidth			LTE Band 17 / CB: 10MHz		
Channel			23780	23790	23800
Frequency (MHz)			709.0	710.0	711.0
Mode	RB	RB Offset	Maximum AV Power (dBm)		
QPSK	1	0	22.78	22.82	22.71
	1	24	22.74	22.72	22.67
	1	49	22.49	22.54	22.62
	25	0	21.73	21.68	21.70
	25	12	21.73	21.71	21.78
	25	24	21.68	21.66	21.71
	50	0	21.70	21.72	21.79
16QAM	1	0	21.87	21.98	22.49
	1	24	22.13	21.96	22.09
	1	49	21.82	21.79	21.99
	25	0	20.88	20.83	20.94
	25	12	20.81	20.79	20.78
	25	24	20.74	20.86	20.87
	50	0	20.91	20.84	20.85

3.1.5 Test Result of Effective Radiated Power (dBm)

Mode	LTE Band 17, CB: 5MHz, QPSK						
Channel	Frequency (MHz)	Max. Conducted Output Power (dBm)	Max. Antenna Gain(dBi)	EIRP (dBm)	ERP (dBm)	ERP (W)	Limit (W)
23755	706.5	22.79	2	24.79	22.64	0.184	3
23790	710.0	22.82	2	24.82	22.67	0.185	3
23825	713.5	22.83	2	24.83	22.68	0.185	3

Mode	LTE Band 17, CB: 5MHz, 16QAM						
Channel	Frequency (MHz)	Max. Conducted Output Power (dBm)	Max. Antenna Gain(dBi)	EIRP (dBm)	ERP (dBm)	ERP (W)	Limit (W)
23755	706.5	21.98	2	23.98	21.83	0.152	3
23790	710.0	21.96	2	23.96	21.81	0.152	3
23825	713.5	21.73	2	23.73	21.58	0.144	3

Mode	LTE Band 17, CB: 10MHz, QPSK						
Channel	Frequency (MHz)	Max. Conducted Output Power (dBm)	Max. Antenna Gain(dBi)	EIRP (dBm)	ERP (dBm)	ERP (W)	Limit (W)
23780	709.0	22.78	2	24.78	22.63	0.183	3
23790	710.0	22.82	2	24.82	22.67	0.185	3
23800	711.0	22.71	2	24.71	22.56	0.180	3

Mode	LTE Band 17, CB: 10MHz, 16QAM						
Channel	Frequency (MHz)	Max. Conducted Output Power (dBm)	Max. Antenna Gain(dBi)	EIRP (dBm)	ERP (dBm)	ERP (W)	Limit (W)
23780	709.0	22.13	2	24.13	21.98	0.158	3
23790	710.0	21.98	2	23.98	21.83	0.152	3
23800	711.0	22.49	2	24.49	22.34	0.171	3

NOTE: ERP = S.G power value + correction factor - 2.15.

3.2 Radiated Emissions

3.2.1 Limit of Radiated Emissions

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB equal to -13dBm.

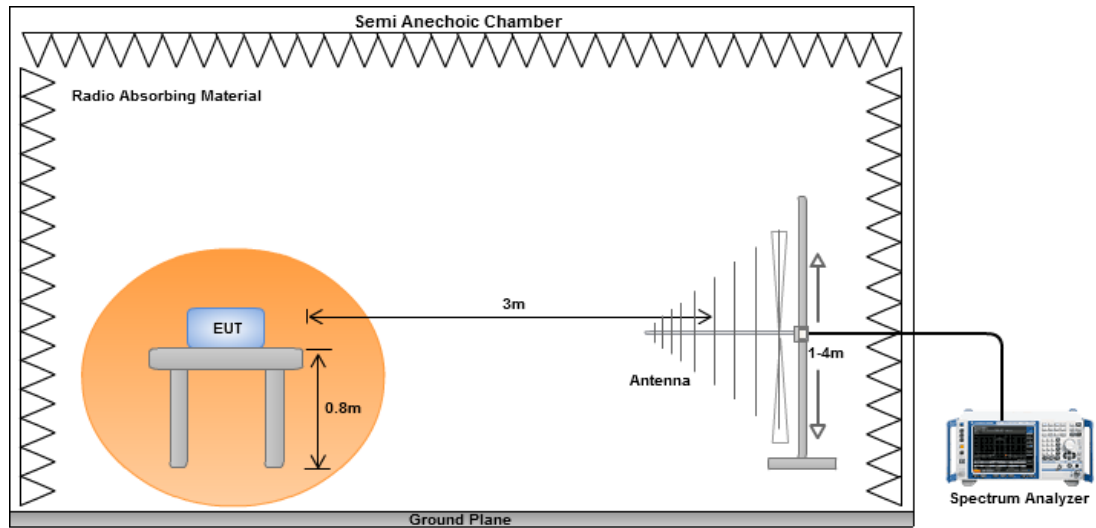
For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth.

3.2.2 Test Procedures

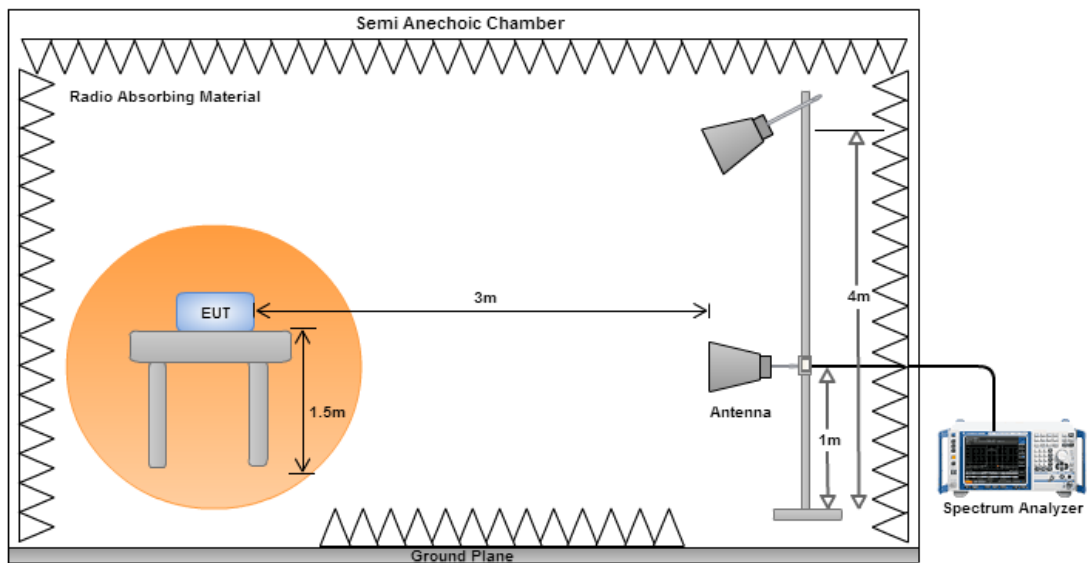
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.
4. After finding the max radiated emission, substitution method will be used for getting effective radiated power. EUT will be removed and substitution antenna will be placed at same position. Signal generator will output CW signal to substitution antenna through a RF cable. Rotate turntable and move antenna to find maximum radiated emission. Adjust output power of signal generator to let the maximum radiated emission is same as step 3. Record the output power level.
5. E.I.R.P = output power of step 4 + gain of substitution antenna – cable loss of RF cable. ERP can be calculated by below formula:
$$E.R.P = E.I.R.P - 2.15dB.$$

3.2.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.2.4 Test Result of Radiated Emissions below 1GHz

Mode	LTE Band 17, CB: 5MHz, 1RB, Offset 24, Channel : 23825						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
38.64	H	-68.56	-13.00	-55.56	-68.69	-53.76	-12.65
71.71	H	-66.73	-13.00	-53.73	-57.77	-59.93	-4.65
148.83	H	-79.43	-13.00	-66.43	-71.09	-76.16	-1.12
235.04	H	-81.23	-13.00	-68.23	-70.27	-83.52	4.44
356.19	H	-76.94	-13.00	-63.94	-71.02	-79.16	4.37
768.17	H	-68.34	-13.00	-55.34	-69.49	-69.62	3.43
37.25	V	-66.42	-13.00	-53.42	-55.87	-51.39	-12.88
70.26	V	-61.18	-13.00	-48.18	-51.27	-53.97	-5.06
150.07	V	-76.49	-13.00	-63.49	-71.10	-73.29	-1.05
237.37	V	-76.22	-13.00	-63.22	-70.59	-78.51	4.44
356.80	V	-76.06	-13.00	-63.06	-71.06	-78.28	4.37
769.08	V	-67.37	-13.00	-54.37	-69.42	-68.65	3.43

Mode	LTE Band 17, CB: 10MHz, 1RB, Offset 49, Channel : 23790						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
38.64	H	-68.21	-13.00	-55.21	-68.34	-53.41	-12.65
71.71	H	-68.66	-13.00	-55.66	-59.70	-61.86	-4.65
151.92	H	-78.78	-13.00	-65.78	-70.44	-75.68	-0.95
235.13	H	-80.35	-13.00	-67.35	-69.39	-82.64	4.44
349.13	H	-77.21	-13.00	-64.21	-71.13	-79.45	4.39
767.20	H	-67.63	-13.00	-54.63	-68.77	-68.91	3.43
38.73	V	-64.80	-13.00	-51.80	-54.58	-50.02	-12.63
69.77	V	-64.80	-13.00	-51.80	-54.89	-57.45	-5.20
149.58	V	-75.85	-13.00	-62.85	-70.51	-72.62	-1.08
235.85	V	-71.28	-13.00	-58.28	-65.59	-73.57	4.44
355.92	V	-75.91	-13.00	-62.91	-70.90	-78.13	4.37
769.14	V	-67.68	-13.00	-54.68	-69.73	-68.96	3.43

NOTE: ERP = S.G power value + correction factor - 2.15.

3.2.5 Test Result of Radiated Emissions above 1GHz

Mode	LTE Band 17, CB: 5MHz, 1RB, Offset 24, Channel : 23755						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1408.60	H	-50.20	-13.00	-37.20	-52.74	-52.55	4.50
2113.10	H	-65.97	-13.00	-52.97	-71.98	-69.93	6.11
2817.20	H	-49.35	-13.00	-36.35	-58.50	-53.55	6.35
1408.60	V	-41.38	-13.00	-28.38	-43.41	-43.73	4.50
2113.10	V	-62.83	-13.00	-49.83	-69.92	-66.79	6.11
2817.20	V	-46.27	-13.00	-33.27	-56.23	-50.47	6.35

Mode	LTE Band 17, CB: 5MHz, 1RB, Offset 24, Channel : 23790						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1415.80	H	-50.92	-13.00	-37.92	-53.48	-53.29	4.52
2123.70	H	-66.56	-13.00	-53.56	-72.60	-70.52	6.11
2831.70	H	-49.36	-13.00	-36.36	-58.59	-53.56	6.35
1415.80	V	-41.30	-13.00	-28.30	-43.35	-43.67	4.52
2123.70	V	-62.41	-13.00	-49.41	-69.70	-66.37	6.11
2831.70	V	-45.80	-13.00	-32.80	-55.72	-50.00	6.35

Mode	LTE Band 17, CB: 5MHz, 1RB, Offset 24, Channel : 23825						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1422.60	H	-50.50	-13.00	-37.50	-53.07	-52.89	4.54
2134.20	H	-65.92	-13.00	-52.92	-71.99	-69.89	6.12
2845.10	H	-49.54	-13.00	-36.54	-58.85	-53.74	6.35
1422.60	V	-42.15	-13.00	-29.15	-44.21	-44.54	4.54
2134.20	V	-62.75	-13.00	-49.75	-70.23	-66.72	6.12
2845.10	V	-45.24	-13.00	-32.24	-55.14	-49.44	6.35

NOTE: ERP = S.G power value + correction factor - 2.15.

Mode	LTE Band 17, CB: 10MHz, 1RB, Offset 49, Channel : 23780						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1409.40	H	-50.40	-13.00	-37.40	-52.95	-52.76	4.51
2114.10	H	-66.06	-13.00	-53.06	-72.07	-70.02	6.11
2818.50	H	-49.77	-13.00	-36.77	-58.92	-53.97	6.35
1409.40	V	-41.36	-13.00	-28.36	-43.40	-43.72	4.51
2114.10	V	-62.92	-13.00	-49.92	-70.03	-66.88	6.11
2818.50	V	-46.18	-13.00	-33.18	-56.13	-50.38	6.35

Mode	LTE Band 17, CB: 10MHz, 1RB, Offset 49, Channel : 23790						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1411.30	H	-51.04	-13.00	-38.04	-53.59	-53.40	4.51
2116.60	H	-66.36	-13.00	-53.36	-72.38	-70.32	6.11
2822.70	H	-49.34	-13.00	-36.34	-58.52	-53.54	6.35
1411.30	V	-41.60	-13.00	-28.60	-43.65	-43.96	4.51
2116.60	V	-63.04	-13.00	-50.04	-70.19	-67.00	6.11
2822.70	V	-45.75	-13.00	-32.75	-55.69	-49.95	6.35

Mode	LTE Band 17, CB: 10MHz, 1RB, Offset 49, Channel : 23800						
Frequency (MHz)	Antenna Polarity	E.R.P (dBm)	Limit (dBm)	Margin (dB)	S.A Reading (dBm)	S.G Power Vaule (dBm)	Correction Factor (dB)
1413.60	H	-50.36	-13.00	-37.36	-52.91	-52.73	4.52
2119.90	H	-65.82	-13.00	-52.82	-71.85	-69.78	6.11
2826.50	H	-49.60	-13.00	-36.60	-58.80	-53.80	6.35
1413.60	V	-42.36	-13.00	-29.36	-44.40	-44.73	4.52
2119.90	V	-62.39	-13.00	-49.39	-69.61	-66.35	6.11
2826.50	V	-45.26	-13.00	-32.26	-55.19	-49.46	6.35

NOTE: ERP = S.G power value + correction factor - 2.15.

3.3 Conducted Emissions

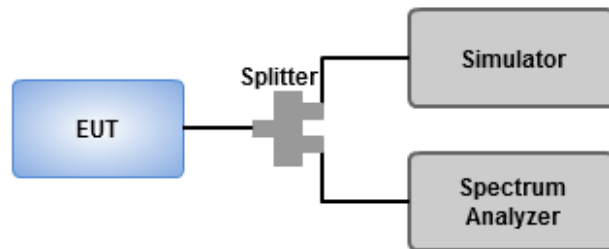
3.3.1 Limit of Conducted Emissions

On any frequency outside the the licensed band, the power of any emission shall be attenuatedoutside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB equal to -13dBm.

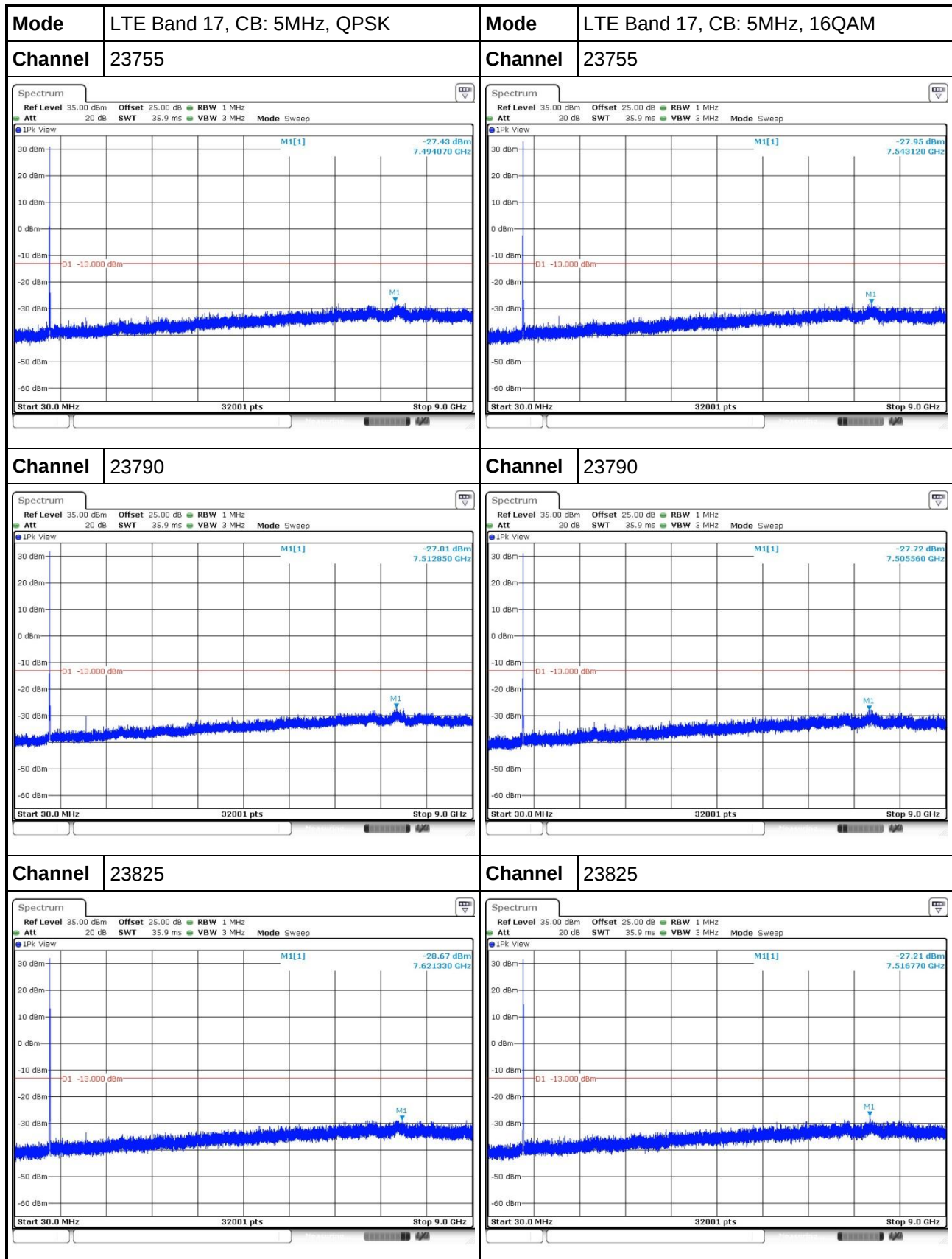
3.3.2 Test Procedures

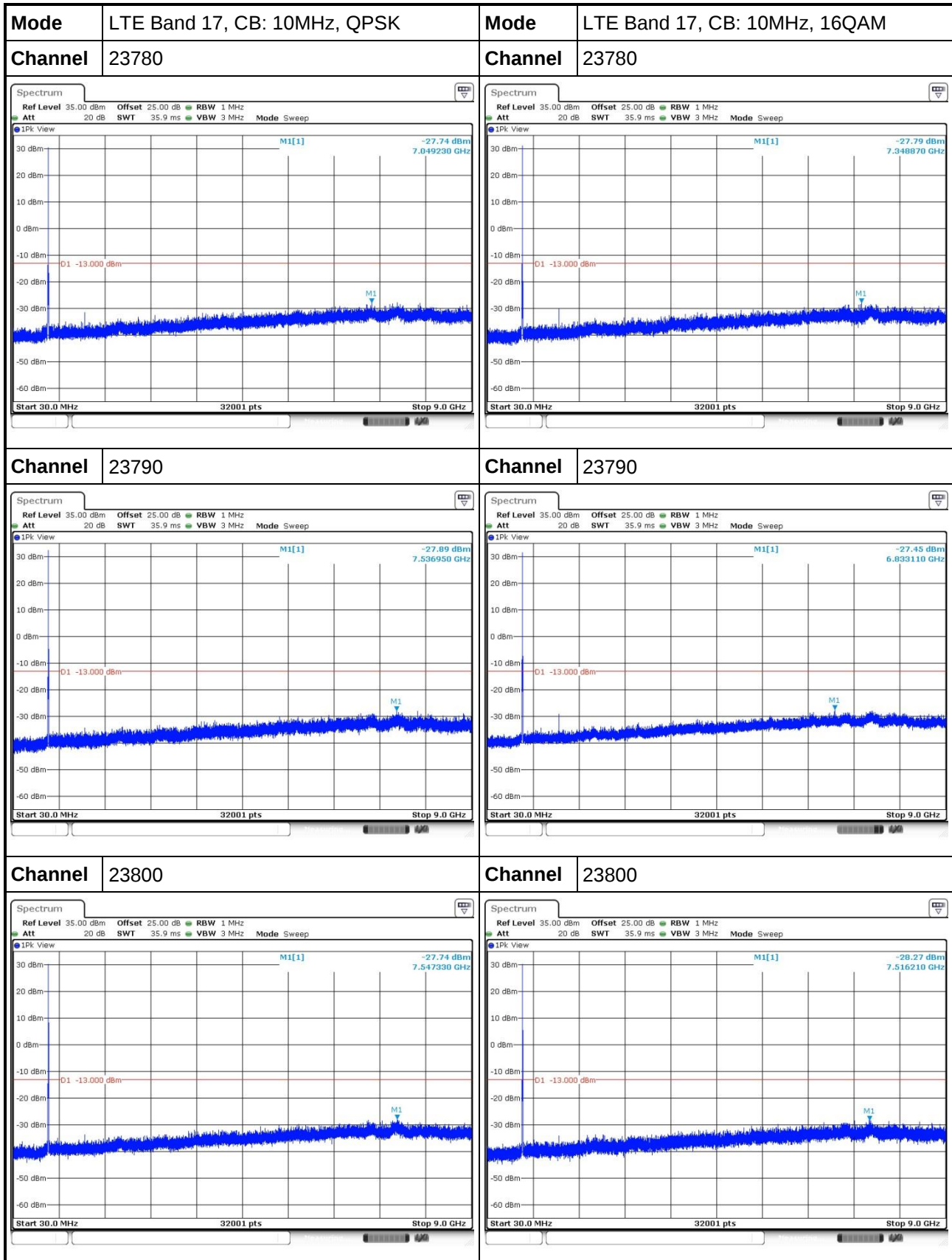
1. Lowestand highest operating channels are tested for this item.
2. Scan frequency range is from 30 MHz ~ 9 GHz.
3. Set RBW = 1MHz, VBW = 3MHz, detector = RMS, sweep time = auto.
4. Record the max trace value and capture the test plot of each sub frequency band.

3.3.3 Test Setup



3.3.4 Test Result of Conducted Emissions





3.4 Band Edge

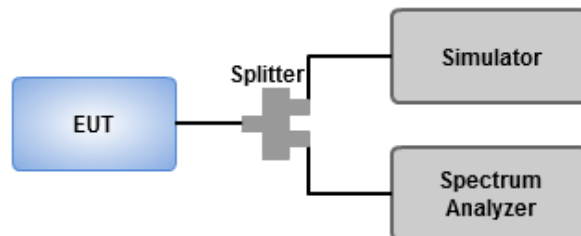
3.4.1 Limit of Band Edge

On any frequency outside the licensed band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB equal to -13dBm.

3.4.2 Test Procedures

1. Set RBW = 56kHz, VBW = 180kHz, detector = RMS, sweep time = auto for 5MHz channel bandwidth.
Set RBW = 110kHz, VBW = 330kHz, detector = RMS, sweep time = auto for 10 MHz channel bandwidth.
2. Record the max trace value and capture the test plot.
3. Set RBW = 100 kHz, VBW = 300 kHz, detector = RMS , sweep time = auto for 5MHz and use channel power measurement function of spectrum analyzer to integrate power over 1MHz.
4. Set RBW = 200 kHz, VBW = 1000 kHz, detector = RMS , sweep time = auto for 10MHz and use channel power measurement function of spectrum analyzer to integrate power over 1MHz.

3.4.3 Test Setup



3.4.4 Test Result of Band Edge















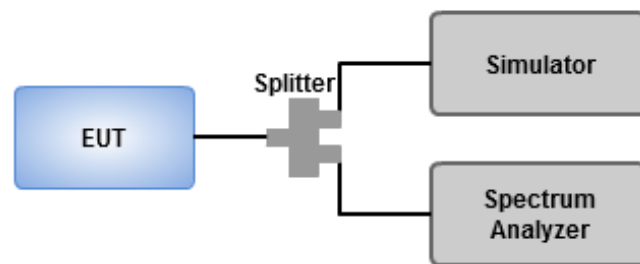


3.5 Occupied Bandwidth and 26dB Bandwidth

3.5.1 Test Procedures

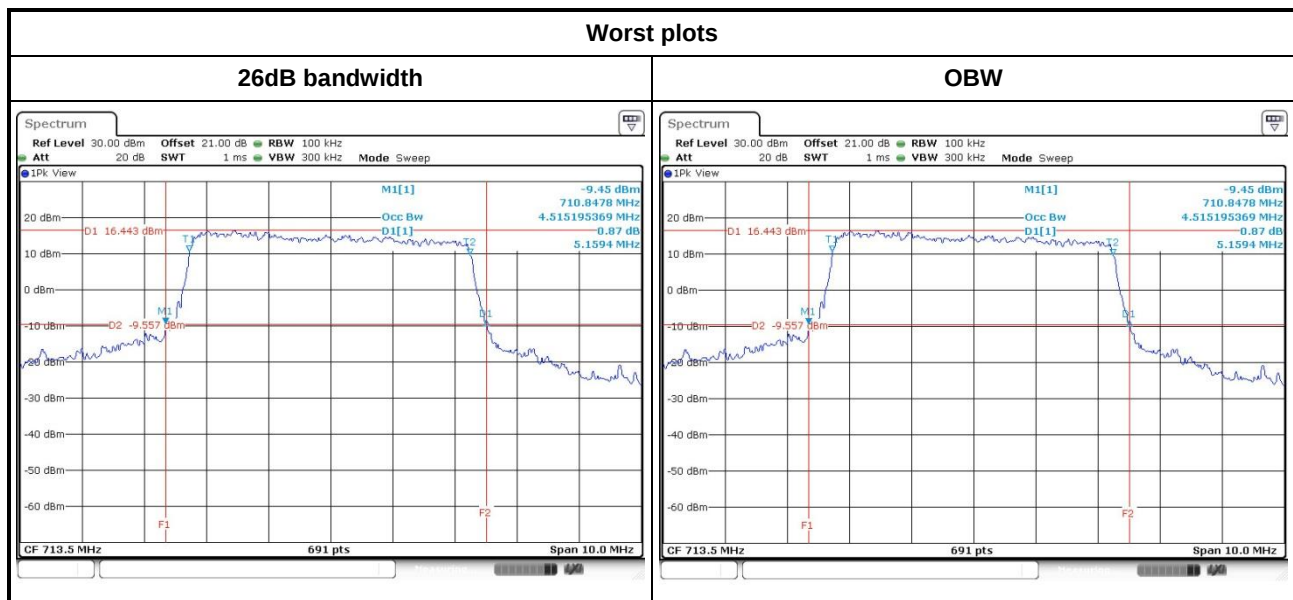
1. Set RBW = 100 kHz, VBW = 300kHz for 5 MHz channel bandwidth.
Set RBW = 200 kHz, VBW = 1MHz for 10 MHz channel bandwidth.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Using occupied bandwidth measurement function of spectrum analyzer to measure occupied bandwidth.
5. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 26dB relative to the maximum level measured in the fundamental emission.

3.5.2 Test Setup



3.5.3 Test Result of Occupied Bandwidth

Mode	CB (MHz)	Modulation	Channel	Frequency (MHz)	26dB BW (MHz)	99% OBW (MHz)
LTE Band 17	5	QPSK	23755	706.5	5.058	4.50
LTE Band 17	5	QPSK	23790	710.0	5.000	4.49
LTE Band 17	5	QPSK	23825	713.5	5.159	4.52
LTE Band 17	5	16QAM	23755	706.5	5.015	4.50
LTE Band 17	5	16QAM	23790	710.0	5.029	4.50
LTE Band 17	5	16QAM	23825	713.5	5.029	4.50



Mode	CB (MHz)	Modulation	Channel	Frequency (MHz)	26dB BW (MHz)	99% OBW (MHz)
LTE Band 17	10	QPSK	23780	709.0	10.087	9.00
LTE Band 17	10	QPSK	23790	710.0	10.116	8.97
LTE Band 17	10	QPSK	23800	711.0	10.058	8.97
LTE Band 17	10	16QAM	23780	709.0	9.855	8.94
LTE Band 17	10	16QAM	23790	710.0	9.971	8.94
LTE Band 17	10	16QAM	23800	711.0	9.971	8.94



3.6 Peak to Average Ratio

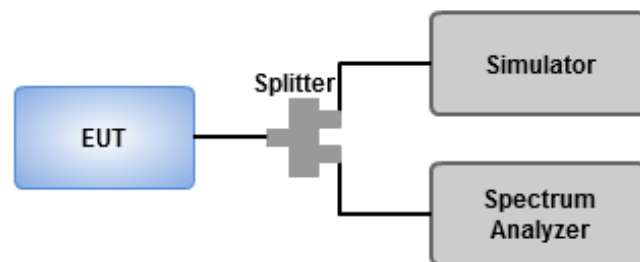
3.6.1 Limit of Peak to Average Ratio

The Peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

3.6.2 Test Procedures

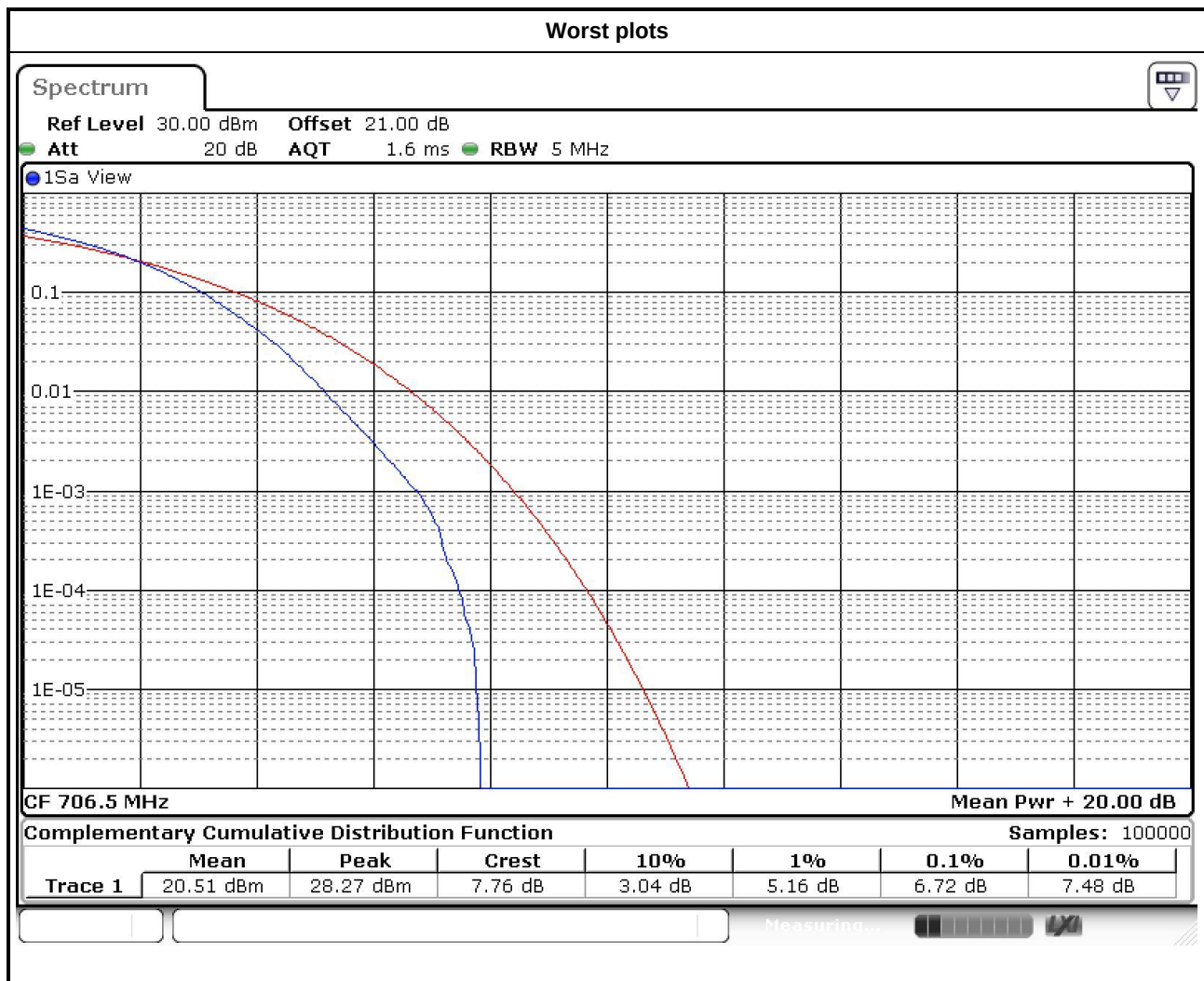
1. Set the number of counts to a value that stabilizes the measured CCDF curve.
2. Set the measurement interval to 1 ms.
3. Record the maximum PAPR level associated with a probability of 0.1%.

3.6.3 Test Setup

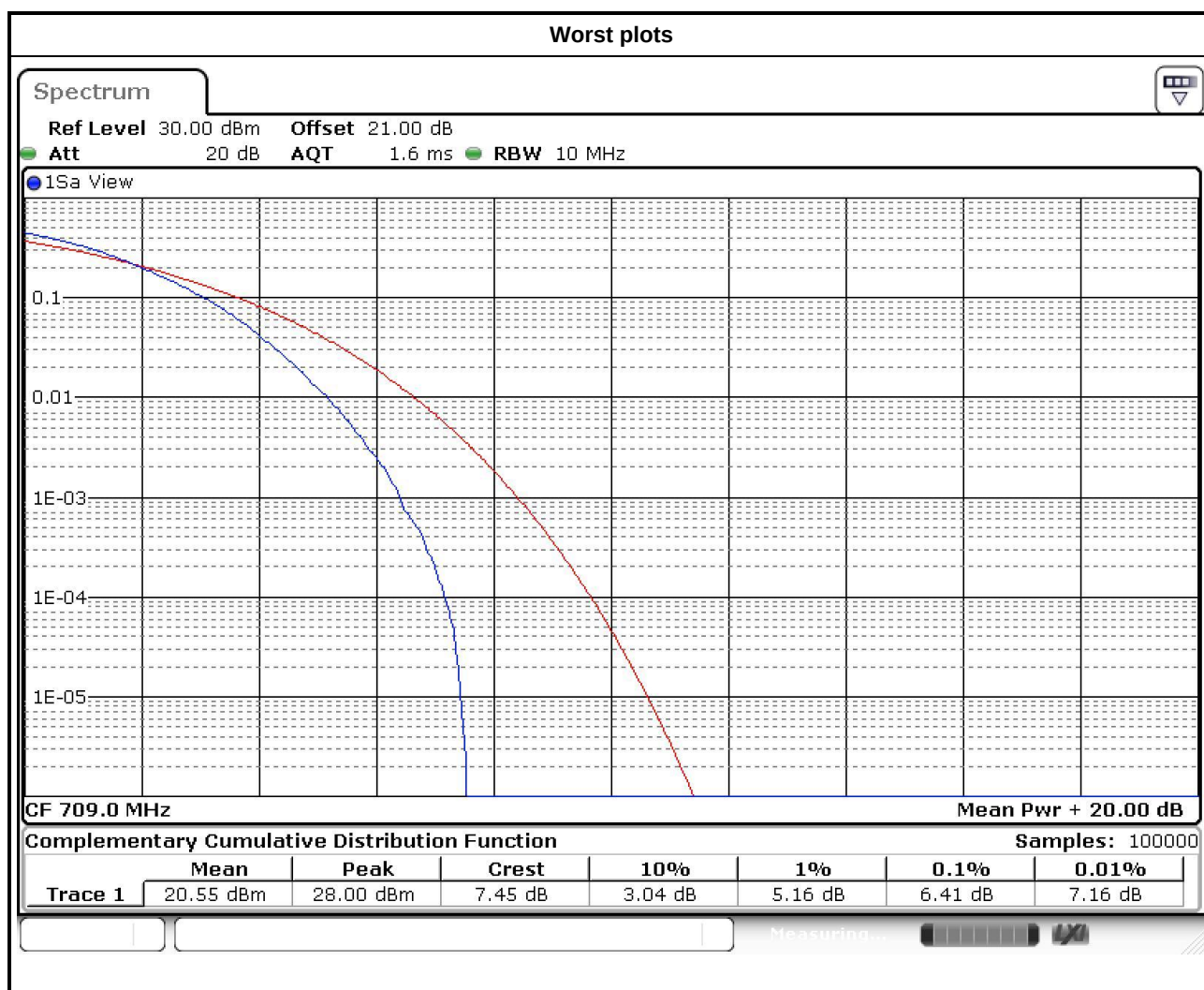


3.6.4 Test Result of Peak to Average Ratio

Mode	CB (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average ratio (dB)
LTE Band 17	5	QPSK	23755	706.5	5.74
LTE Band 17	5	QPSK	23790	710.0	5.62
LTE Band 17	5	QPSK	23825	713.5	5.65
LTE Band 17	5	16QAM	23755	706.5	6.72
LTE Band 17	5	16QAM	23790	710.0	6.70
LTE Band 17	5	16QAM	23825	713.5	6.35



Mode	CB (MHz)	Modulation	Channel	Frequency (MHz)	Peak to Average ratio (dB)
LTE Band 17	10	QPSK	23780	709.0	5.62
LTE Band 17	10	QPSK	23790	710.0	5.30
LTE Band 17	10	QPSK	23800	711.0	5.30
LTE Band 17	10	16QAM	23780	709.0	6.41
LTE Band 17	10	16QAM	23790	710.0	6.35
LTE Band 17	10	16QAM	23800	711.0	6.38



3.7 Frequency Stability

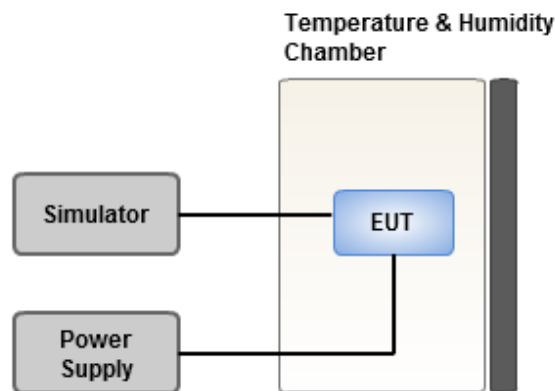
3.7.1 Limit of Frequency Stability

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

3.7.2 Test Procedures

1. EUT was placed at temperature chamber and connected to an external power supply.
2. Temperature and voltage condition shall be tested to confirm frequency stability.
3. Temperature range is from -30~55°C and voltage range is from lowest to highest working voltage.
4. Tem Link up EUT and simulator. Confirm frequency drift value of simulator and record it.

3.7.3 Test Setup



3.7.4 Test Result of Frequency Stability

LTE Band 17, CB: 5MHz			
Temperature (°C)	Voltage (dc)	Frequency Drift (ppm)	Limit (ppm)
55	3.7	0.028	2.5
50	3.7	0.030	2.5
40	3.7	0.025	2.5
30	3.7	0.032	2.5
20	3.7	0.031	2.5
10	3.7	0.028	2.5
0	3.7	0.030	2.5
-10	3.7	0.030	2.5
-20	3.7	0.031	2.5
-30	3.7	0.027	2.5
20	4.5	0.031	2.5
20	3.2	0.027	2.5

LTE Band 17, CB: 10MHz			
Temperature (°C)	Voltage (dc)	Frequency Drift (ppm)	Limit (ppm)
55	3.7	0.028	2.5
50	3.7	0.023	2.5
40	3.7	0.025	2.5
30	3.7	0.027	2.5
20	3.7	0.015	2.5
10	3.7	0.021	2.5
0	3.7	0.020	2.5
-10	3.7	0.021	2.5
-20	3.7	0.018	2.5
-30	3.7	0.018	2.5
20	4.5	0.025	2.5
20	3.2	0.024	2.5

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

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Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
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333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information.

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Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

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