RF TEST REPORT

Applicant	Quectel Wireless Solutions Co., Ltd
FCC ID	XMR201805EC21AU
Product	LTE Module
Brand	Quectel
Model	EC21-AU, EC21- AU MINIPCIE
Report No.	R1804A0155-R2V1
Issue Date	May 10, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2017)/ FCC CFR 47 Part 24E (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Jiangpeng Lan

Performed by: Jiangpeng Lan

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Summary of measurement results

No.	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	24.232(c)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	2.1051 /24.238(a)	PASS
5	Peak-to-Average Power Ratio	24.232/KDB 971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 24.235	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 / 24.238(a)	PASS
8	Radiates Spurious Emission	2.1053 / 24.238(a)	PASS
Date of Testing: April 12, 2018~ April 18, 2018			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard.			

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1. Test Laboratory

1.1. Notes of the test report

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1.2. Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

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1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
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2. General Description of Equipment under Test

Client Information

Applicant	Quectel Wireless Solutions Co., Ltd
Applicant address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

General information

EUT Description			
Model	EC21-AU, EC21-AU MINIPCIE		
IMEI	861108035997005		
Hardware Version	R1.0		
Software Version	EC21AUFAR02A04M4G		
Power Supply	External supply power		
Antenna Type	The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Dipole Antenna)		
Test Mode(s)	GSM1900; WCDMA Band II; LTE Band 2;		
Test Modulation	(GSM)GMSK,8PSK; (WCDMA)QPSK; (LTE)QPSK,16QAM		
GPRS Multislot Class	33		
EGPRS Multislot Class	33		
HSDPA UE Category	24		
HSUPA UE Category	6		
DC-HSDPA UE Category	24		
HSPA+ Uplink UE Category	6		
LTE Category	4		
Maximum E.I.R.P	GSM 1900:	28.91dBm	
	WCDMA Band II:	23.84dBm	
	LTE Band 2:	23.58dBm	
Rated Power Supply Voltage	3.8 V		
Extreme Voltage	Minimum: 3.3 V Maximum: 4.3V		
Extreme Temperature	Lowest: -40°C Highest: +85°C		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM1900	1850 ~ 1910	1930 ~ 1990
	WCDMA Band II	1850 ~ 1910	1930 ~ 1990
	LTE Band 2	1850 ~ 1910	1930 ~ 1990
Note: The information of the EUT is declared by the manufacturer.			

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The series model number is: EC21-AU MINIPCIE. The difference of these models are have different marketing requirement.

Accessory equipment	
Evaluation Board	RF Cable
RS232-to-USB Cable	Antenna: Dipole Antenna
Headset	DC 5V Adaptor

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3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC CFR47 Part 2 (2017)

FCC CFR 47 Part 24E (2017)

ANSI/TIA-603-E (2016)

KDB 971168 D01 Power Meas License Digital Systems v03

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4. Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, vertical polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.
Subsequently, only the worst case emissions are reported.
The following testing in GSM/WCDMA/LTE is set based on the maximum RF Output Power.

Test modes are chosen to be reported as the worst case configuration below:

	Test items	**Modes/Modulation**	
		GSM 1900	WCDMA Band II
Conducted Test cases	RF power output	GSM GPRS EGPRS	RMC/ HSDPA/ HSUPA/ DC-HSDPA
	Occupied Bandwidth	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Band Edge Compliance	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Peak-to-Average Power Ratio	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Frequency Stability	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Spurious Emissions at Antenna Terminals	GSM	RMC
Radiated Test cases	Effective Isotropic Radiated power	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
	Radiates Spurious Emission	GSM	RMC

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Test modes are chosen to be reported as the worst case configuration below for LTE Band 2:

Test items	Bandwidth (MHz)						Modulation		RB			Test Channel		
	1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	O	O	O	O	O	O	O	O	-	-	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	O	O	-	-	O	O	O	O
Band Edge Compliance	O	O	O	O	O	O	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	O	O	O	O	O	O	O	O	-	-	O	O	O	O
Frequency Stability	O	O	O	O	O	O	O	O	-	-	O	-	O	-
Conducted Spurious Emissions	O	O	O	O	O	O	O	-	O	-	-	O	O	O
Radiates Spurious Emission	O	O	O	O	O	O	O	-	O	-	-	O	O	O
Note	1. The mark “O” means that this configuration is chosen for testing. 2. The mark “-” means that this configuration is not testing.													

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5. Test Case Results

5.1. RF Power Output

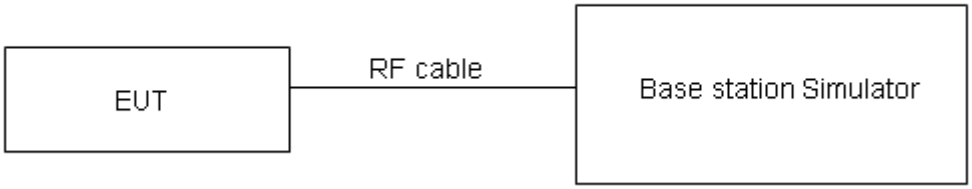
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.4 dB.

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Test Results

GSM 1900		Conducted Power(dBm)		
		Channel 512	Channel 661	Channel 810
		1850.2(MHz)	1880(MHz)	1909.8(MHz)
GSM	Results	29.69	29.81	29.72
GPRS (GMSK)	1TXslot	29.63	29.76	29.98
	2TXslots	29.53	29.70	29.91
	3TXslots	29.42	29.61	29.87
	4TXslots	29.32	29.46	29.75
EGPRS (8PSK)	1TXslot	29.68	29.79	29.70
	2TXslots	29.58	29.72	29.65
	3TXslots	29.49	29.58	29.59
	4TXslots	29.43	29.58	29.45

WCDMA Band II		Conducted Power(dBm)		
		Channel 9262	Channel 9400	Channel 9538
		1852.4(MHz)	1880(MHz)	1907.6(MHz)
RMC		23.71	23.64	23.40
HSDPA	Sub - Test 1	23.54	23.47	23.23
	Sub - Test 2	23.62	23.55	23.31
	Sub - Test 3	23.11	23.04	22.80
	Sub - Test 4	23.10	23.03	22.79
HSUPA	Sub - Test 1	23.59	23.52	23.28
	Sub - Test 2	21.78	21.71	21.47
	Sub - Test 3	22.51	22.44	22.36
	Sub - Test 4	21.73	21.66	21.45
	Sub - Test 5	23.65	23.58	23.34
DC-HSDPA	Sub - Test 1	23.64	23.53	23.29
	Sub - Test 2	23.63	23.52	23.28
	Sub - Test 3	23.12	23.01	22.77
	Sub - Test 4	23.11	23.10	22.75

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LTE Band 2				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18607/1850.7	18900/1880	19193/1909.3
1.4MHz	QPSK	1	0	23.52	23.49	23.53
		1	2	23.57	23.66	23.60
		1	5	23.61	23.26	23.71
		3	0	23.48	23.57	23.42
		3	2	23.51	23.47	23.50
		3	3	23.42	23.45	23.24
		6	0	22.53	22.51	22.42
	16QAM	1	0	22.59	23.16	22.68
		1	2	22.44	23.13	22.48
		1	5	22.60	22.92	22.24
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18615/1851.5	18900/1880	19185/1908.5
3MHz	QPSK	1	0	23.45	23.45	23.43
		1	7	23.41	23.62	23.34
		1	14	23.39	23.42	23.72
		8	0	22.42	22.36	22.44
		8	4	22.38	22.39	22.34
		8	7	22.47	22.41	22.54
		15	0	22.52	22.50	22.51
	16QAM	1	0	22.79	22.41	22.57
		1	7	22.58	22.51	22.64
		1	14	22.40	22.74	22.47
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18625/1852.5	18900/1880	19175/1907.5
5MHz	QPSK	1	0	23.42	23.43	23.39
		1	13	23.39	23.58	23.31
		1	24	23.36	23.37	23.68
		12	0	22.39	22.31	22.40
		12	6	22.36	22.35	22.29
		12	13	22.45	22.39	22.50
		25	0	22.50	22.49	22.49
	16QAM	1	0	22.76	22.37	22.54
		1	13	22.55	22.49	22.61
		1	24	22.37	22.72	22.43
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18650/1855	18900/1880	19150/1905

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10MHz	QPSK	1	0	23.44	23.44	23.42
		1	25	23.42	23.63	23.35
		1	49	23.38	23.41	23.71
		25	0	22.42	22.36	22.44
		25	13	22.39	22.40	22.33
		25	25	22.47	22.43	22.55
		50	0	22.58	22.51	22.53
	16QAM	1	0	22.78	22.40	22.56
		1	25	22.58	22.53	22.64
		1	49	22.40	22.74	22.46
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18675/1857.5	18900/1880	19125/1902.5
15MHz	QPSK	1	0	23.43	23.40	23.40
		1	38	23.40	23.62	23.32
		1	74	23.35	23.36	23.67
		36	0	22.40	22.32	22.41
		36	18	22.36	22.35	22.29
		36	39	22.44	22.40	22.51
		75	0	22.56	22.47	22.48
	16QAM	1	0	22.73	22.38	22.54
		1	38	22.56	22.50	22.62
		1	74	22.37	22.70	22.43
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				18700/1860	18900/1880	19100/1900
20MHz	QPSK	1	0	23.40	23.36	23.37
		1	50	23.39	23.58	23.30
		1	99	23.33	23.35	23.64
		50	0	22.37	22.27	22.37
		50	25	22.34	22.31	22.26
		50	50	22.41	22.35	22.47
		100	0	22.53	22.42	22.44
	16QAM	1	0	22.71	22.34	22.49
		1	50	22.52	22.48	22.58
		1	99	22.35	22.67	22.41

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5.2. Effective Isotropic Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The testing follows FCC KDB 971168 v03 Section 5.8 and ANSI/TIA-603-E (2016).

a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)
e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:ERP (dBm) = LVL (dBm) + LOSS (dB)
f) The maximum ERP is the maximum value determined in the preceding step.
g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g.transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:
ERP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBd)
where:dBd refers to gain relative to an ideal dipole.
EIRP (dBm) = ERP (dBm) + 2.15 (dB.)

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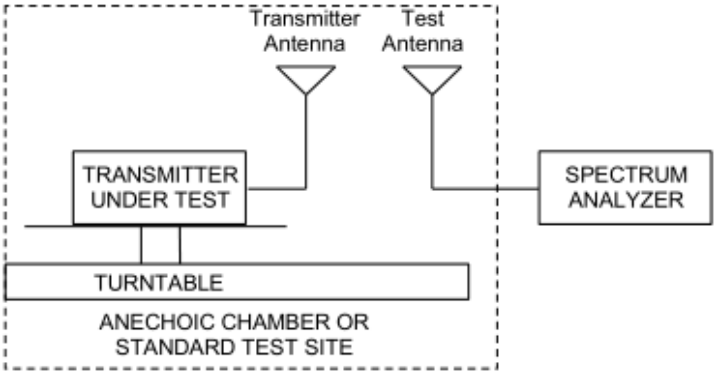
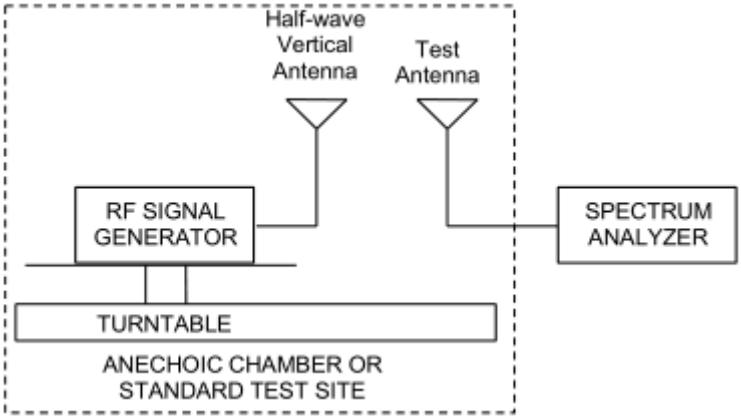
Test setup





Limits

Rule Part 24.232(c) Mobile and portable stations are limited to 2 watts EIRP.
Rule Part 24.232(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Limit	⩽ 2 W (33 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 1.19 dB

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Test Results:

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

Mode	Channel	Frequency (MHz)	Polarization	EIRP (dBm)	Limit (dBm)	Conclusion
GSM 1900	Low	1850.2	Horizontal	28.01	33	Pass
	Mid	1880	Horizontal	28.91	33	Pass
	High	1909.8	Horizontal	28.41	33	Pass
GPRS 1900	Low	1850.2	Horizontal	27.94	33	Pass
	Mid	1880	Horizontal	28.88	33	Pass
	High	1909.8	Horizontal	28.23	33	Pass
EGPRS 1900	Low	1850.2	Horizontal	21.94	33	Pass
	Mid	1880	Horizontal	22.88	33	Pass
	High	1909.8	Horizontal	22.23	33	Pass
WCDMA Band II	Low	1852.4	Horizontal	23.84	33	Pass
	Mid	1880	Horizontal	23.74	33	Pass
	High	1907.6	Horizontal	23.61	33	Pass

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LTE Band 2						
bandwidth	Channel	Frequency (MHz)	Polarization	EIRP (dBm)	Limit (dBm)	Conclusion
1.4 MHz (QPSK)	Low	1850.7	Horizontal	22.51	33	Pass
	Mid	1880	Horizontal	22.34	33	Pass
	High	1909.3	Horizontal	22.19	33	Pass
3 MHz (QPSK)	Low	1851.5	Horizontal	22.86	33	Pass
	Mid	1880	Horizontal	22.92	33	Pass
	High	1908.5	Horizontal	22.96	33	Pass
5 MHz (QPSK)	Low	1852.5	Horizontal	22.54	33	Pass
	Mid	1880	Horizontal	22.69	33	Pass
	High	1907.5	Horizontal	22.89	33	Pass
10 MHz (QPSK)	Low	1855	Horizontal	23.51	33	Pass
	Mid	1880	Horizontal	23.44	33	Pass
	High	1905	Horizontal	23.14	33	Pass
15 MHz (QPSK)	Low	1857.5	Horizontal	23.58	33	Pass
	Mid	1880	Horizontal	23.45	33	Pass
	High	1902.5	Horizontal	23.47	33	Pass
20 MHz (QPSK)	Low	1860	Horizontal	23.49	33	Pass
	Mid	1880	Horizontal	23.12	33	Pass
	High	1900	Horizontal	23.23	33	Pass
1.4 MHz (16QAM)	Low	1850.7	Horizontal	22.39	33	Pass
	Mid	1880	Horizontal	22.22	33	Pass
	High	1909.3	Horizontal	22.07	33	Pass
3 MHz (16QAM)	Low	1851.5	Horizontal	22.74	33	Pass
	Mid	1880	Horizontal	22.80	33	Pass
	High	1908.5	Horizontal	22.84	33	Pass
5 MHz (16QAM)	Low	1852.5	Horizontal	22.42	33	Pass
	Mid	1880	Horizontal	22.57	33	Pass
	High	1907.5	Horizontal	22.77	33	Pass
10 MHz (16QAM)	Low	1855	Horizontal	23.39	33	Pass
	Mid	1880	Horizontal	23.32	33	Pass
	High	1905	Horizontal	23.02	33	Pass
15 MHz (16QAM)	Low	1857.5	Horizontal	23.46	33	Pass
	Mid	1880	Horizontal	23.33	33	Pass
	High	1902.5	Horizontal	23.35	33	Pass
20 MHz (16QAM)	Low	1860	Horizontal	23.37	33	Pass
	Mid	1880	Horizontal	23.00	33	Pass
	High	1900	Horizontal	23.11	33	Pass

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5.3. Occupied Bandwidth

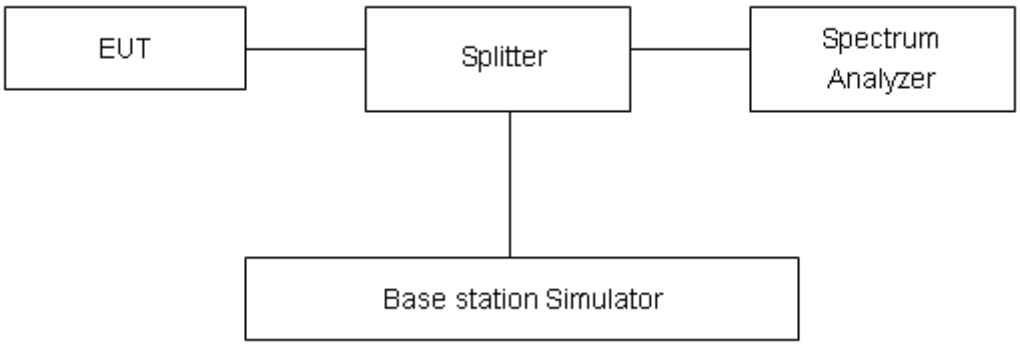
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.
RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900,
RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band II,
RBW is set to 51kHz, VBW is set to 160kHz for LTE Band 2 (1.4MHz),
RBW is set to 100kHz,VBW is set to 300kHz for LTE Band 2 (3MHz/5MHz),
RBW is set to 300kHz,VBW is set to 1MHz for LTE Band 2 (10MHz/15MHz/20MHz).
99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 624Hz.

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Test Result

Mode	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
GSM 1900 (GSM)	512	1850.2	0.24879	0.2989
	661	1880.0	0.24256	0.2997
	810	1909.8	0.24740	0.2974
GPRS 1900 (GMSK)	512	1850.2	0.24640	0.3129
	661	1880.0	0.24719	0.3164
	810	1909.8	0.24779	0.3119
EGPRS 1900 (8-PSK)	512	1850.2	0.24309	0.3113
	661	1880.0	0.24398	0.3094
	810	1909.8	0.24504	0.3089
WCDMA Band II (RMC)	9262	1852.4	4.1233	4.670
	9400	1880	4.1253	4.686
	9538	1907.6	4.1161	4.650

LTE Band 2					
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
QPSK	1.4	18607	1850.7	1.1256	1.371
		18900	1880.0	1.1259	1.384
		19193	1909.3	1.1397	1.348
	3	18615	1851.5	2.7426	3.070
		18900	1880	2.7485	3.061
		19185	1908.5	2.7446	3.065
	5	18625	1852.5	4.5338	5.017
		18900	1880	4.5161	5.047
		19175	1907.5	4.5128	5.050
	10	18650	1855	9.0436	10.160
		18900	1880	9.0125	10.060
		19150	1905	9.0271	10.020
	15	18675	1857.5	13.4950	14.760

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		18900	1880	13.4120	14.690
		19125	1902.5	13.4400	14.770
	20	18700	1860	17.9180	19.250
		18900	1880	17.8340	19.250
		19100	1900	17.8700	19.540
16QAM	1.4	18607	1850.7	1.1266	1.338
		18900	1880.0	1.1202	1.337
		19193	1909.3	1.1233	1.375
	3	18615	1851.5	2.7349	3.078
		18900	1880	2.7630	3.088
		19185	1908.5	2.7370	3.052
	5	18625	1852.5	4.5173	5.024
		18900	1880	4.5391	5.043
		19175	1907.5	4.5312	5.052
	10	18650	1855	9.0501	10.070
		18900	1880	9.0213	9.971
		19150	1905	9.0066	10.030
	15	18675	1857.5	13.4840	14.750
		18900	1880	13.4740	14.740
		19125	1902.5	13.4370	14.810
	20	18700	1860	17.9370	19.440
		18900	1880	17.8390	19.300
		19100	1900	17.8820	19.310

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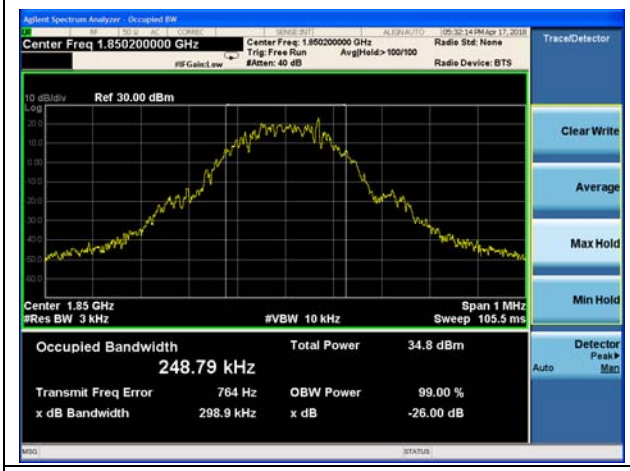
GSM1900 GSM CH-Low

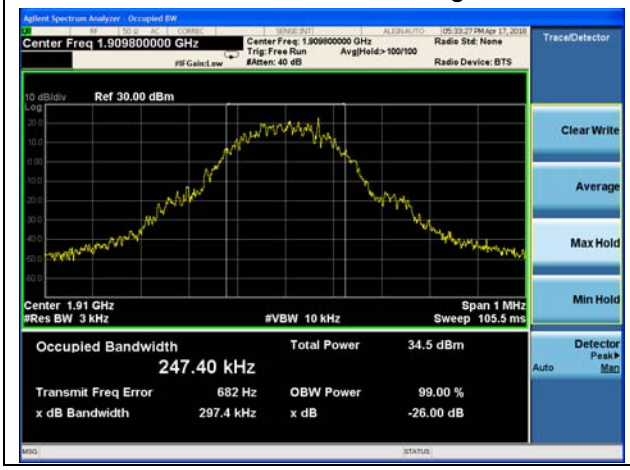


GSM1900 GPRS CH-Low

GSM 1900 GSM CH-Middle

GSM 1900 GPRS CH-Middle

GSM 1900 GSM CH-High



GSM 1900 GPRS CH-High

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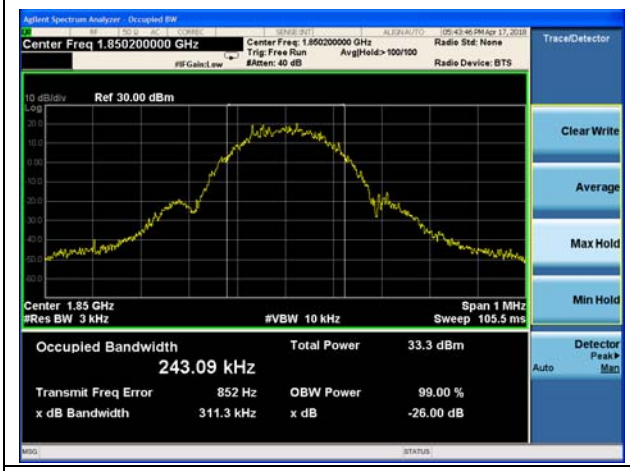
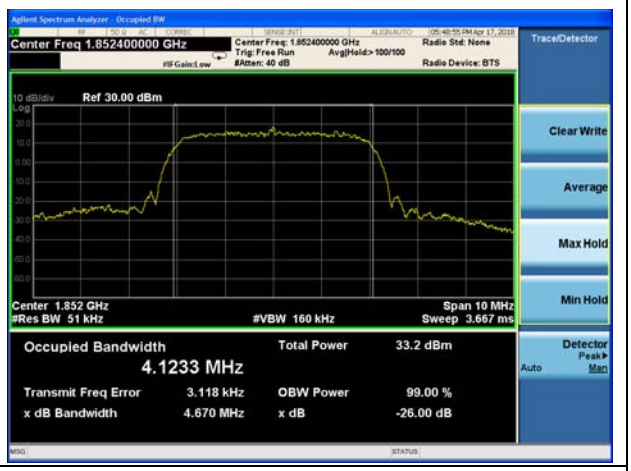
GSM1900 EGPRS CH-Low



WCDMA Band II RMC CH-LOW



GSM 1900 EGPRS CH-Middle

WCDMA Band II RMC CH-Middle

GSM 1900 EGPRS CH-High

WCDMA Band II RMC CH-High

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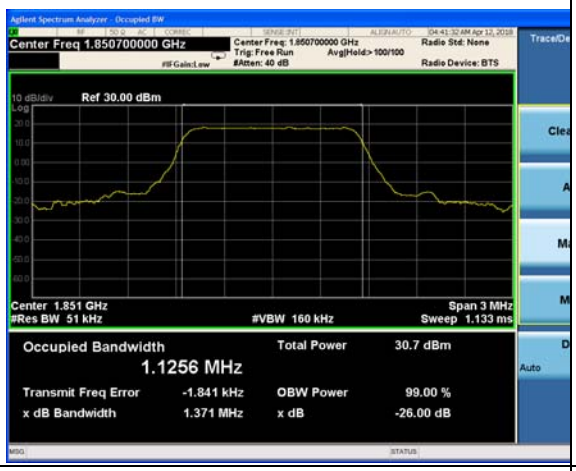
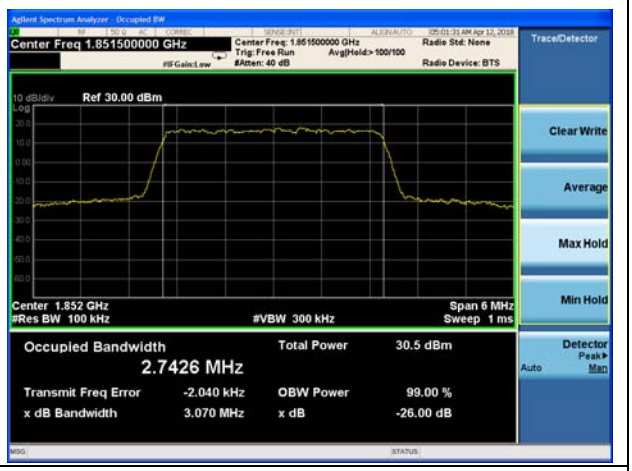
LTE Band 2 1.4MHz QPSK CH-Low



LTE Band 2 3MHz QPSK CH-Low



LTE Band 2 1.4MHz QPSK CH-Middle

LTE Band 2 3MHz QPSK CH-Middle

LTE Band 2 1.4MHz QPSK CH-High

LTE Band 2 3MHz QPSK CH-High

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LTE Band 2 5MHz QPSK CH-Low

LTE Band 2 10MHz QPSK CH-Low

LTE Band 2 5MHz QPSK CH-Middle

LTE Band 2 10MHz QPSK CH-Middle

LTE Band 2 5MHz QPSK CH-High

LTE Band 2 10MHz QPSK CH-High

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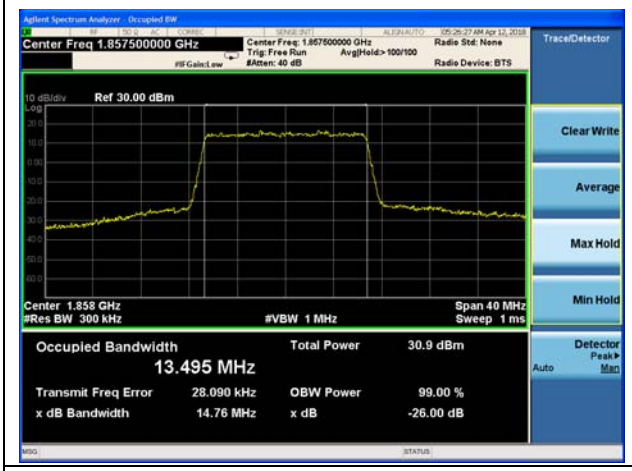
LTE Band 2 15MHz QPSK CH-Low



LTE Band 2 20MHz QPSK CH-Low

LTE Band 2 15MHz QPSK CH-Middle

LTE Band 2 20MHz QPSK CH-Middle

LTE Band 2 15MHz QPSK CH-High

LTE Band 2 20MHz QPSK CH-High

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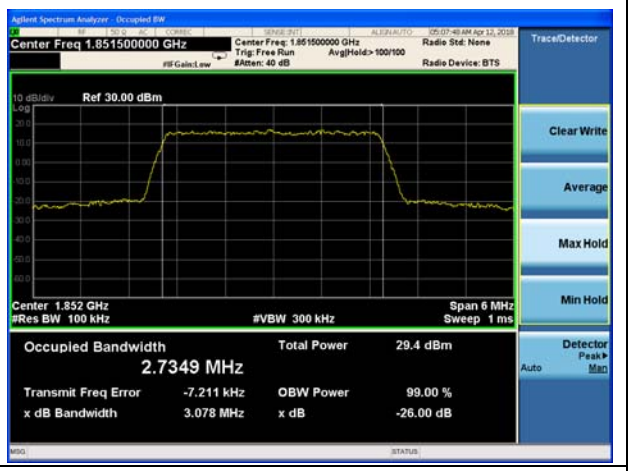
LTE Band 2 1.4MHz 16QAM CH-Low

LTE Band 2 3MHz 16QAM CH-Low

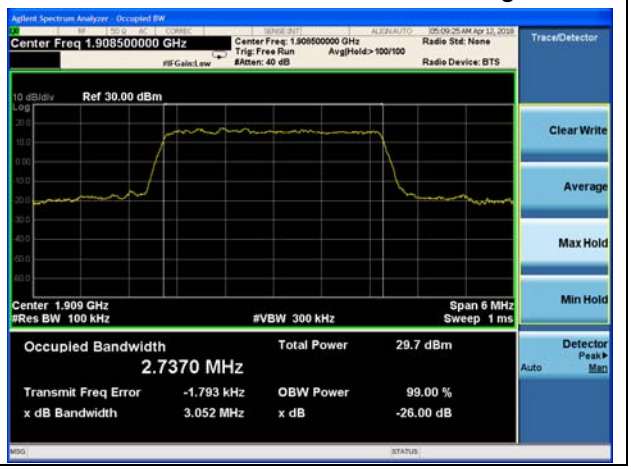


LTE Band 2 1.4MHz 16QAM CH-Middle

LTE Band 2 3MHz 16QAM CH-Middle

LTE Band 2 1.4MHz 16QAM CH-High

LTE Band 2 3MHz 16QAM CH-High



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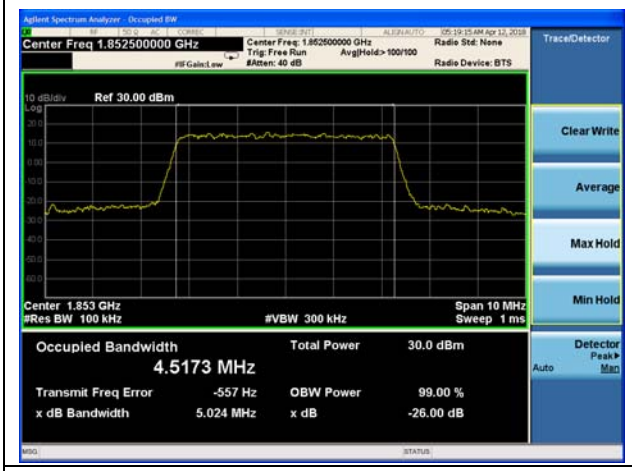
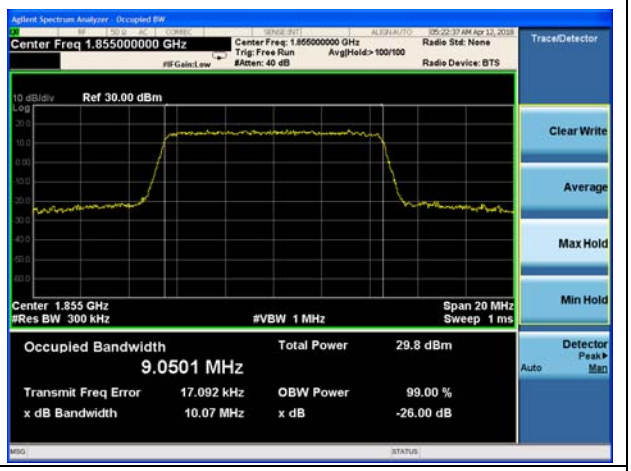
LTE Band 2 5MHz 16QAM CH-Low

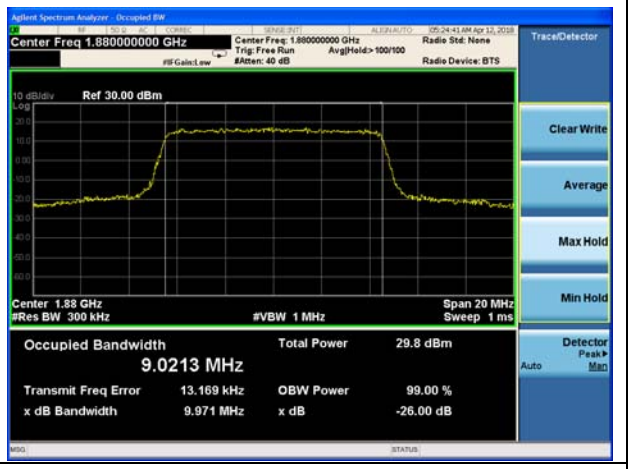


LTE Band 2 10MHz 16QAM CH-Low



LTE Band 2 5MHz 16QAM CH-Middle

LTE Band 2 10MHz 16QAM CH-Middle



LTE Band 2 5MHz 16QAM CH-High

LTE Band 2 10MHz 16QAM CH-High

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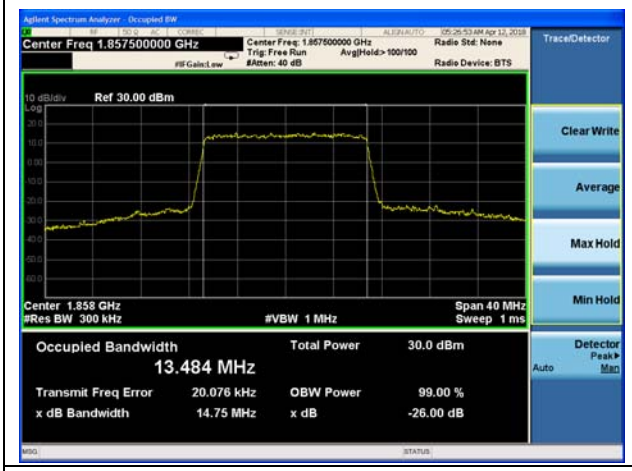
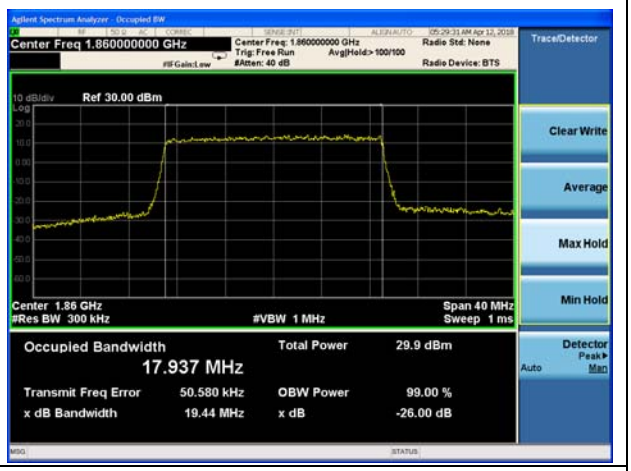
LTE Band 2 15MHz 16QAM CH-Low



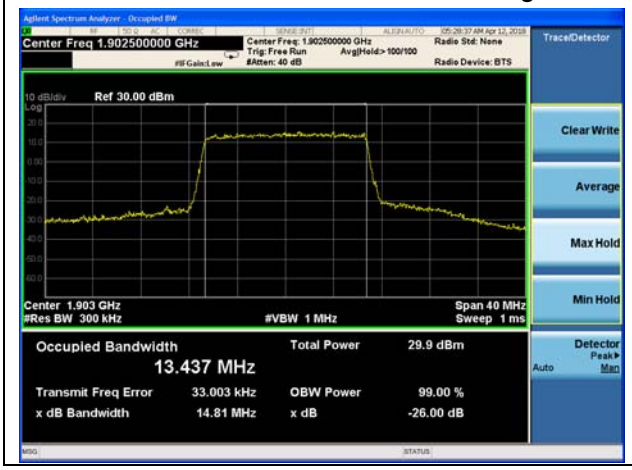
LTE Band 2 20MHz 16QAM CH-Low



LTE Band 2 15MHz 16QAM CH-Middle

LTE Band 2 20MHz 16QAM CH-Middle

LTE Band 2 15MHz 16QAM CH-High



LTE Band 2 20MHz 16QAM CH-High

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5.4. Band Edge Compliance

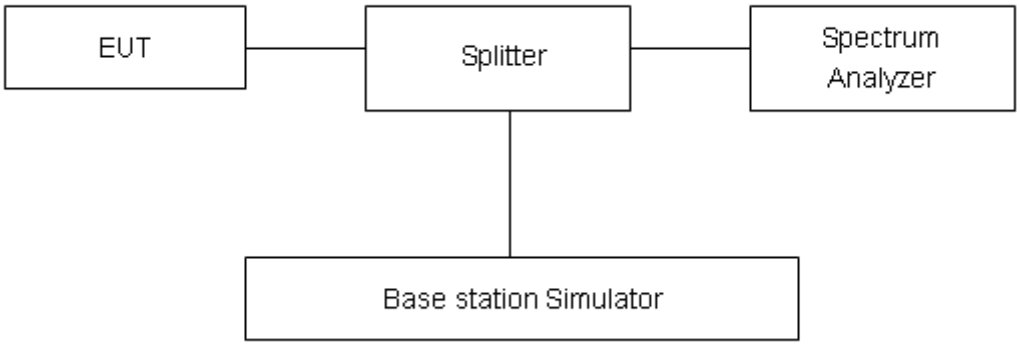
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The Average detector is used and
RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900,
RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band II,
RBW is set to 15kHz, VBW is set to 51kHz for LTE Band 2 (1.4MHz),
RBW is set to 30kHz,VBW is set to 100kHz for LTE Band 2 (3MHz),
RBW is set to 51kHz,VBW is set to 160kHz for LTE Band 2 (5MHz),
RBW is set to 100kHz,VBW is set to 300kHz for LTE Band 2 (10MHz),
RBW is set to 150kHz,VBW is set to 510kHz for LTE Band 2 (15MHz),
RBW is set to 200kHz,VBW is set to 620kHz for LTE Band 2 (20MHz).
Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.”

Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U=0.684dB.

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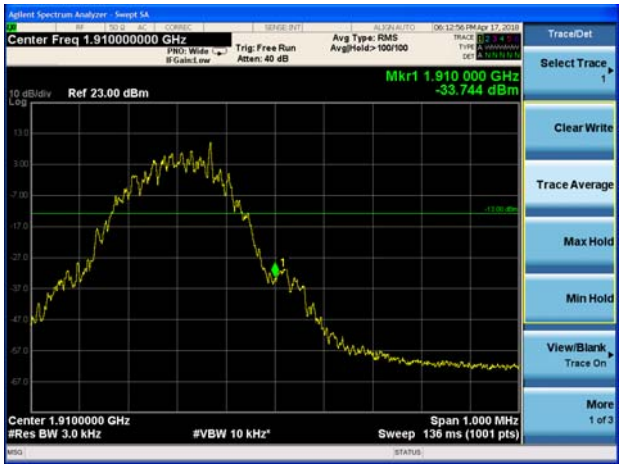
Test Result:

GSM1900 GSM CH-Low

GSM 1900 GSM CH-High



GSM1900 GPRS CH-Low

GSM 1900 GPRS CH-High

GSM1900 EGPRS CH-Low

GSM 1900 EGPRS CH-High

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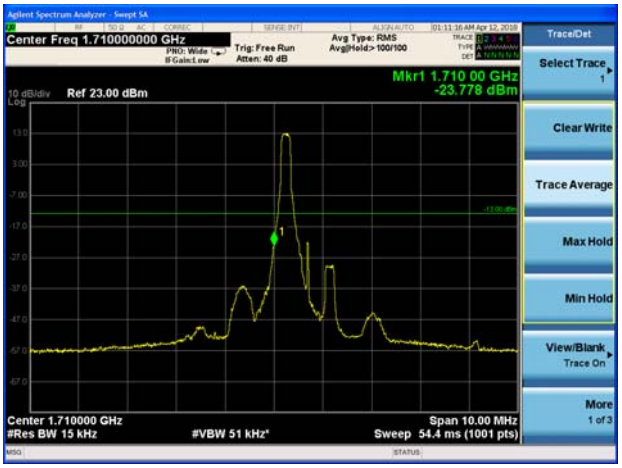
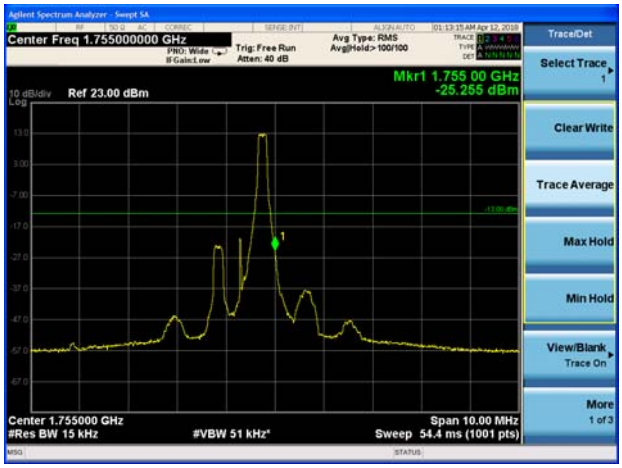
WCDMA Band II RMC CH-Low

WCDMA Band II RMC CH-High

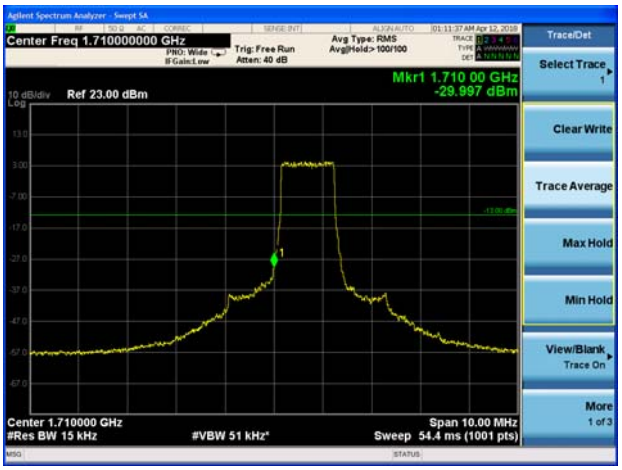
LTE Band 2 1.4MHz QPSK 1RB CH-Low



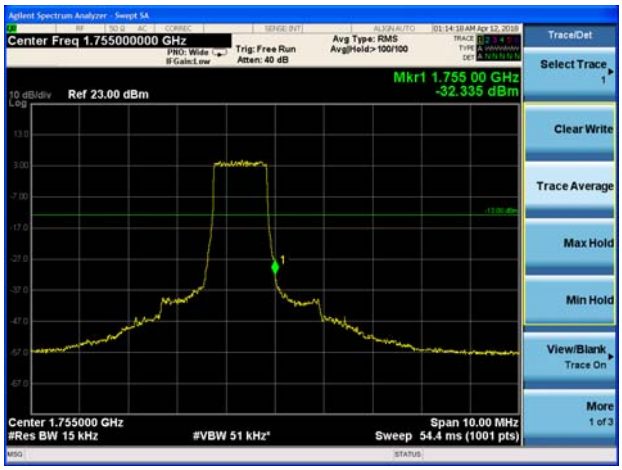
LTE Band 2 1.4MHz QPSK 1RB CH-High



LTE Band 2 1.4MHz QPSK 100%RB CH-Low



LTE Band 2 1.4MHz QPSK 100%RB CH-High



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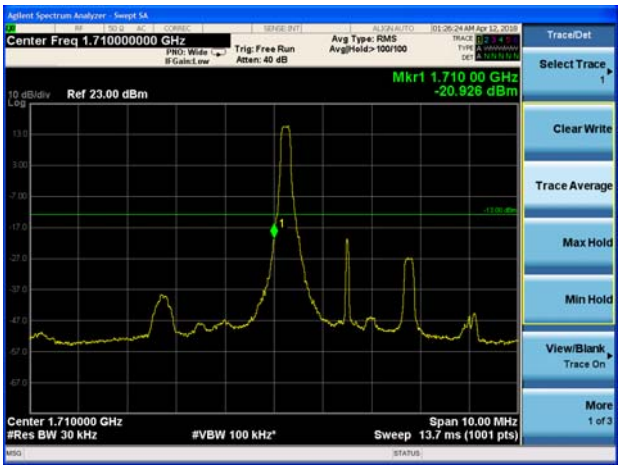
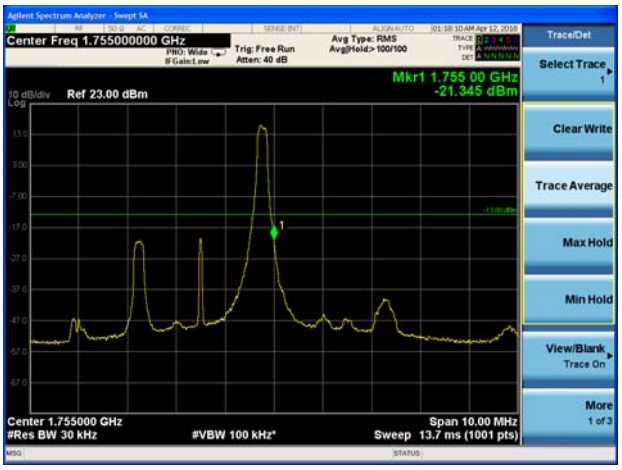
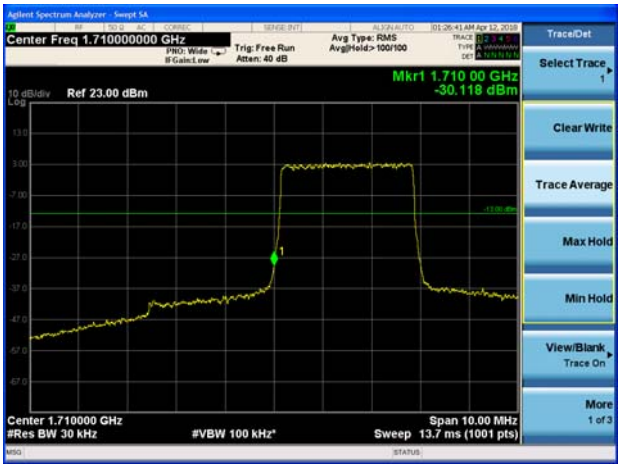
LTE Band 2 3MHz QPSK 1RB CH-Low



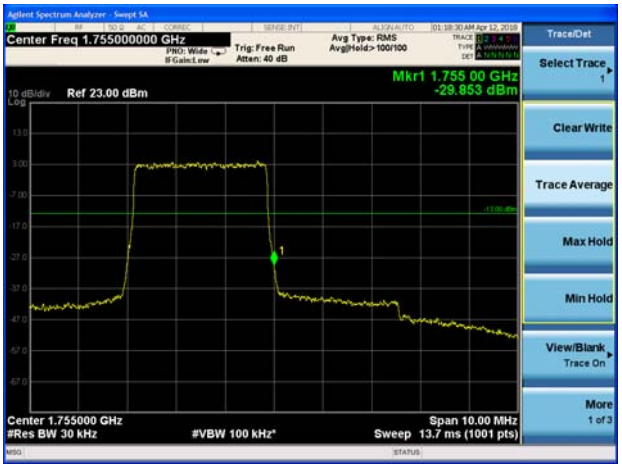
LTE Band 2 3MHz QPSK 1RB CH-High



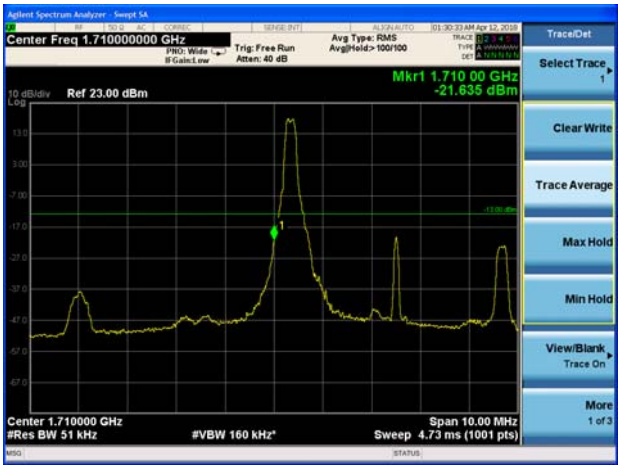
LTE Band 2 3MHz QPSK 100%RB CH-Low



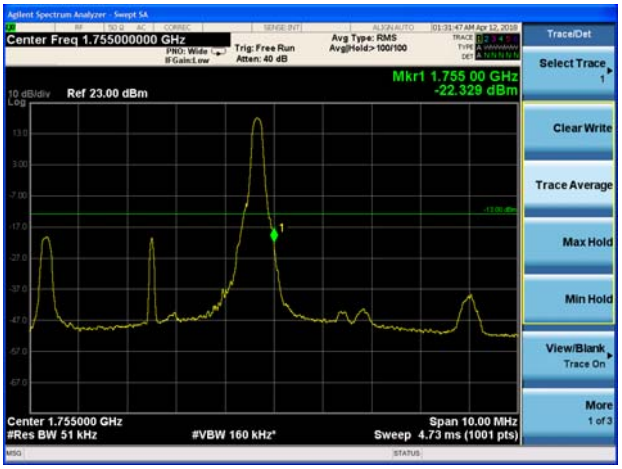
LTE Band 2 3MHz QPSK 100%RB CH-High



LTE Band 2 5MHz QPSK 1RB CH-Low



LTE Band 2 5MHz QPSK 1RB CH-High



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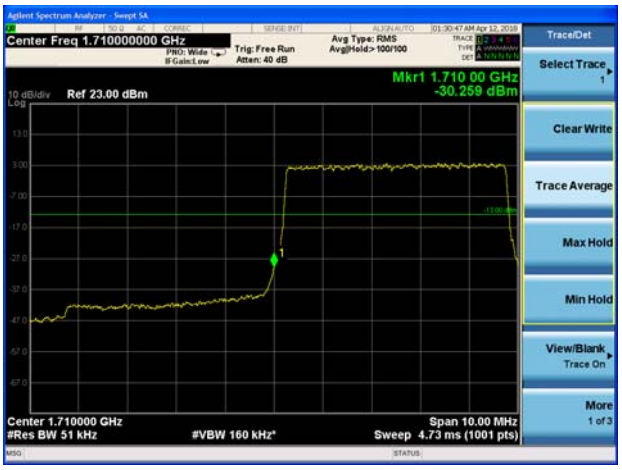
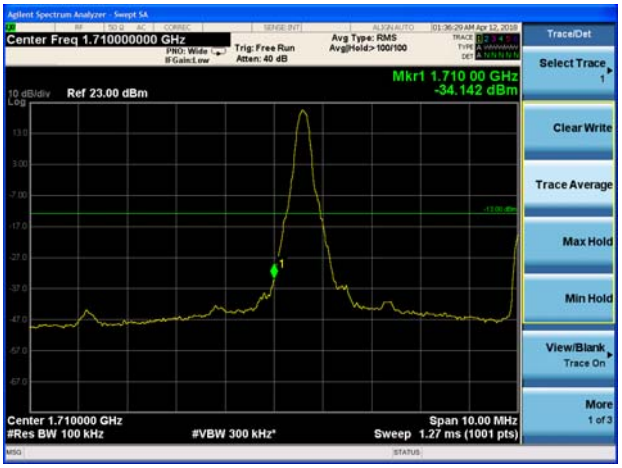
LTE Band 2 5MHz QPSK 100%RB CH-Low

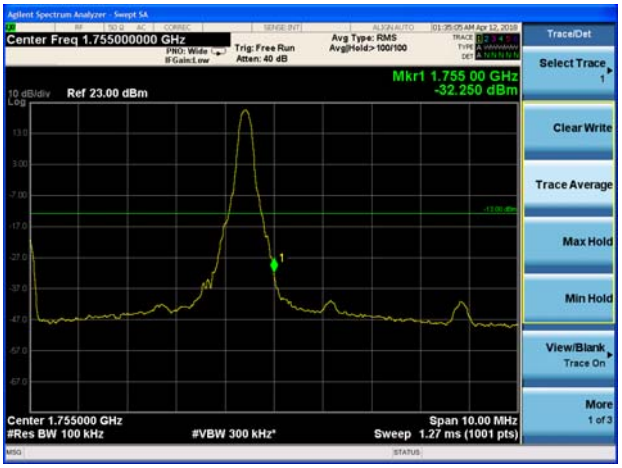


LTE Band 2 5MHz QPSK 100%RB CH-High

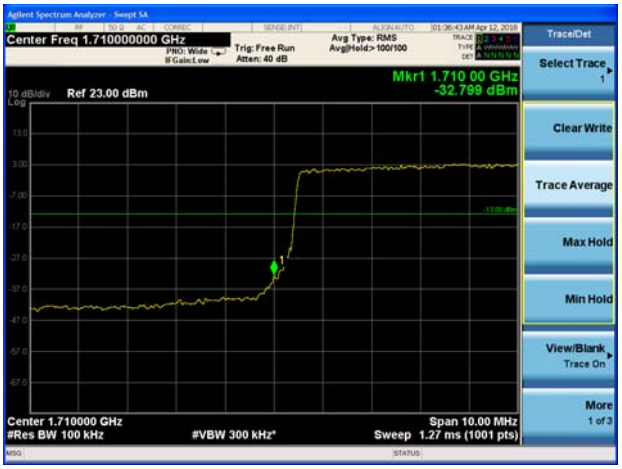
LTE Band 2 10MHz QPSK 1RB CH-Low



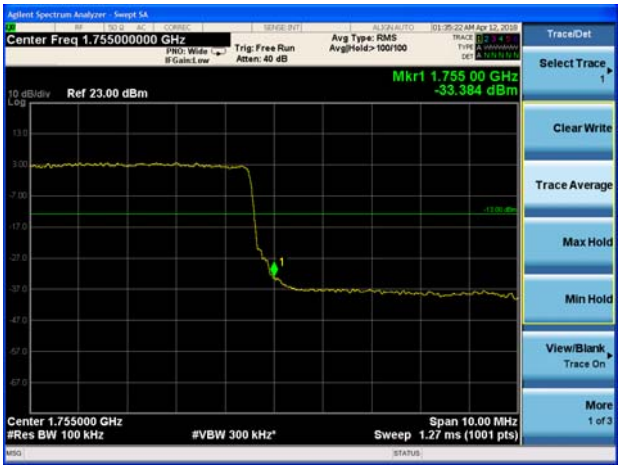
LTE Band 2 10MHz QPSK 1RB CH-High



LTE Band 2 10MHz QPSK 100%RB CH-Low



LTE Band 2 10MHz QPSK 100%RB CH-High



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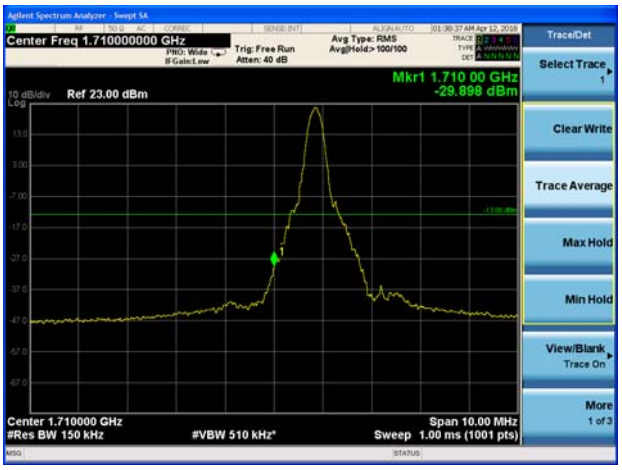
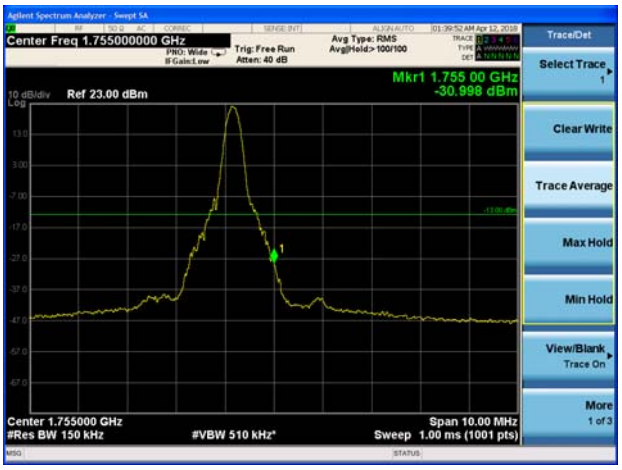
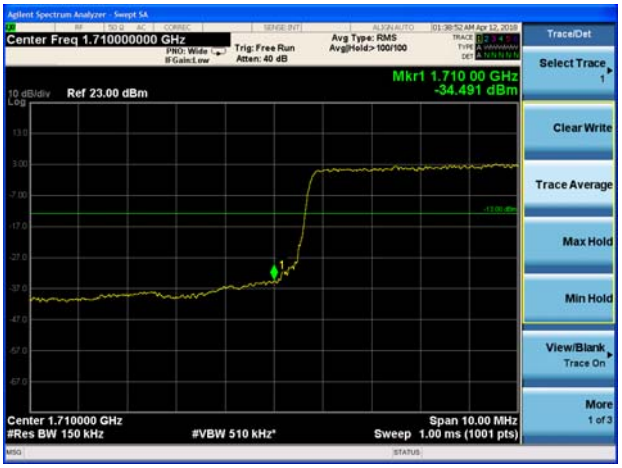
LTE Band 2 15MHz QPSK 1RB CH-Low



LTE Band 2 15MHz QPSK 1RB CH-High

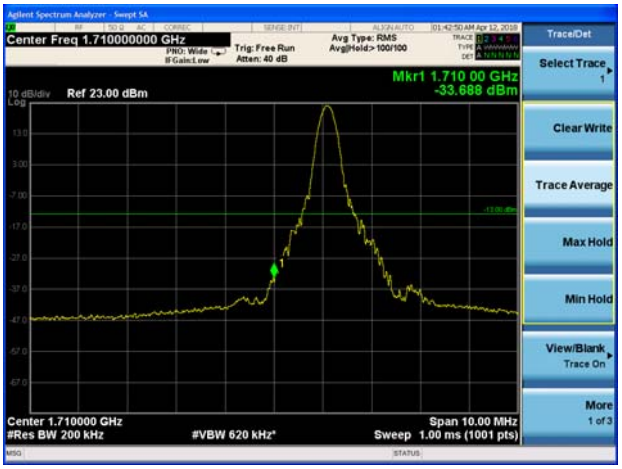


LTE Band 2 15MHz QPSK 100%RB CH-Low

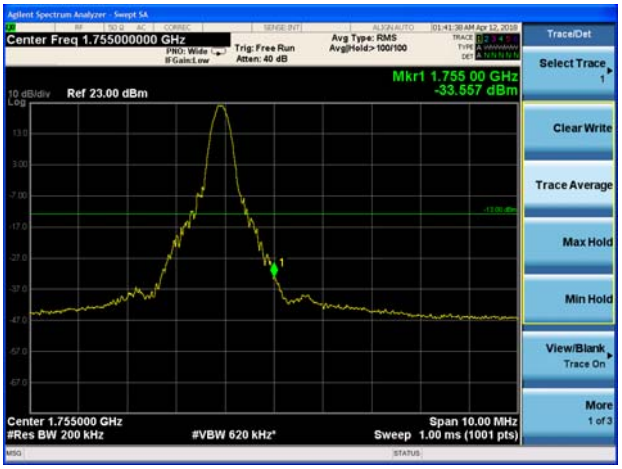


LTE Band 2 15MHz QPSK 100%RB CH-High

LTE Band 2 20MHz QPSK 1RB CH-Low



LTE Band 2 20MHz QPSK 1RB CH-High



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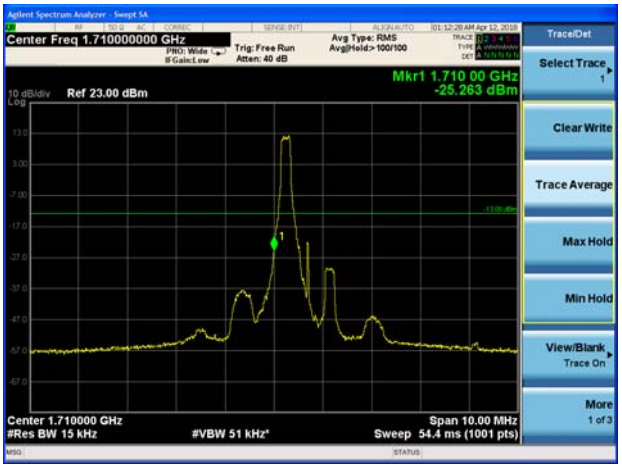
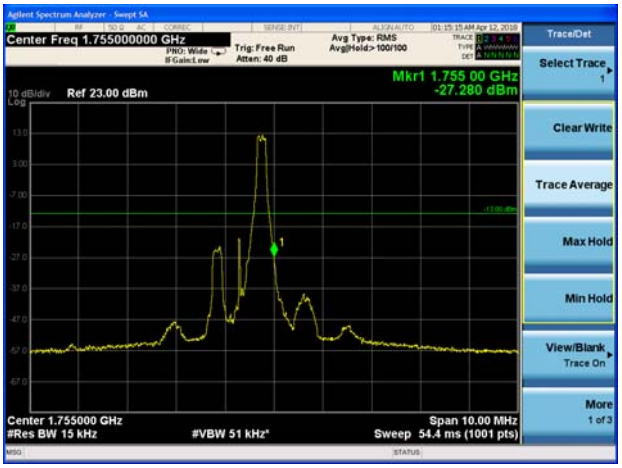
LTE Band 2 20MHz QPSK 100%RB CH-Low

LTE Band 2 20MHz QPSK 100%RB CH-High

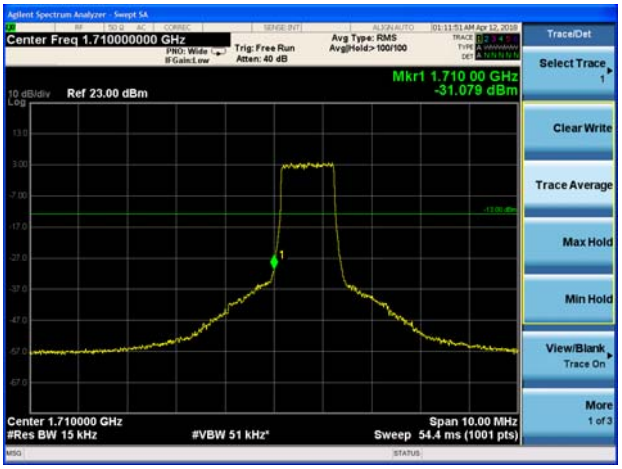
LTE Band 2 1.4MHz 16QAM 1RB CH-Low



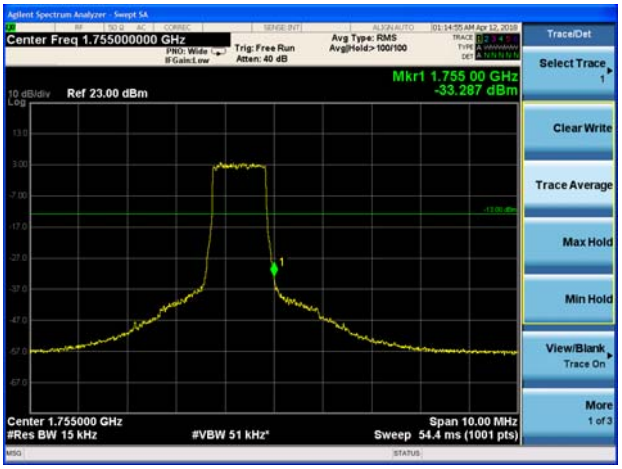
LTE Band 2 1.4MHz 16QAM 1RB CH-High



LTE Band 2 1.4MHz 16QAM 100%RB CH-Low



LTE Band 2 1.4MHz 16QAM 100%RB CH-High



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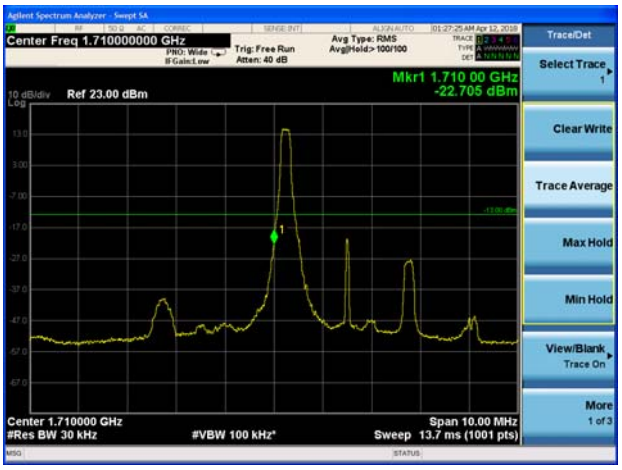
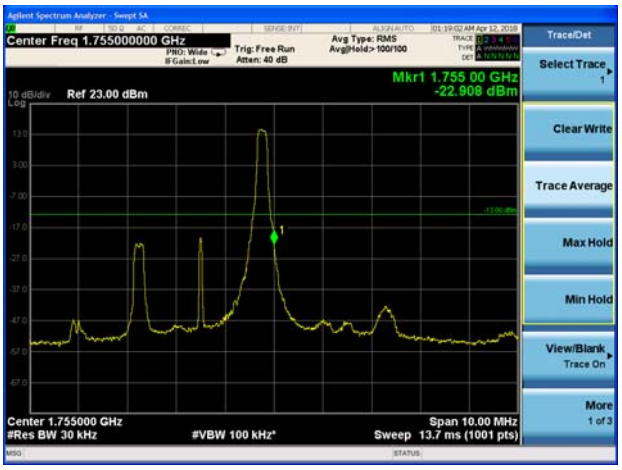
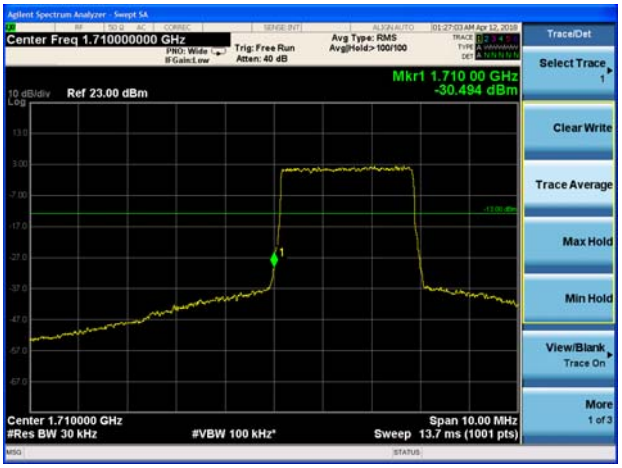
LTE Band 2 3MHz 16QAM 1RB CH-Low



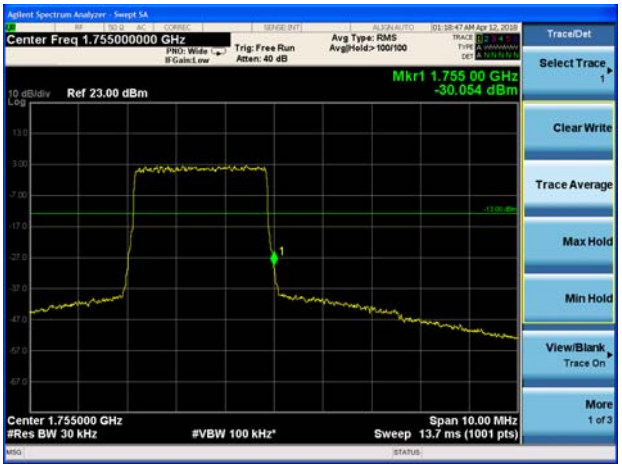
LTE Band 2 3MHz 16QAM 1RB CH-High



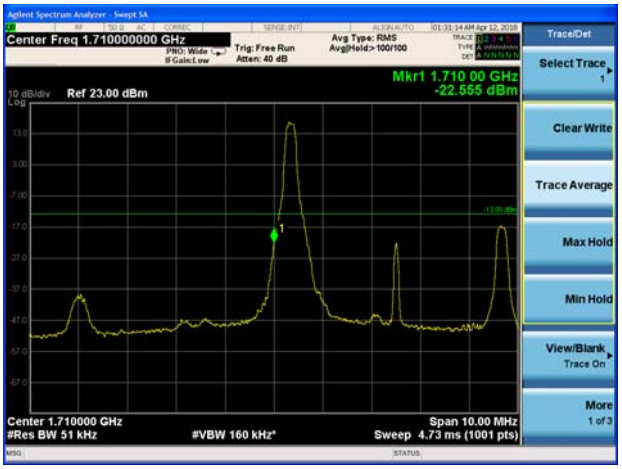
LTE Band 2 3MHz 16QAM 100%RB CH-Low



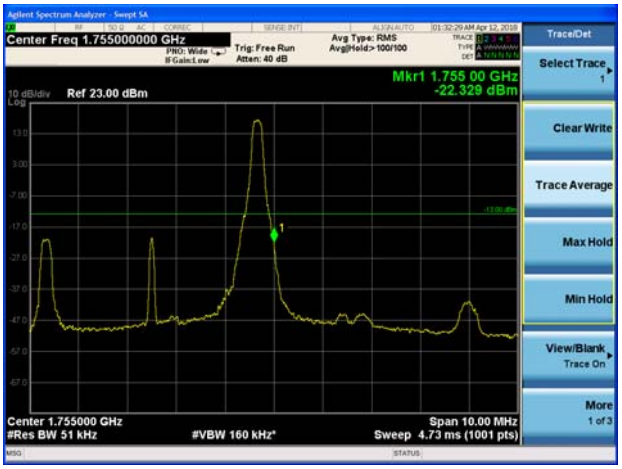
LTE Band 2 3MHz 16QAM 100%RB CH-High



LTE Band 2 5MHz 16QAM 1RB CH-Low



LTE Band 2 5MHz 16QAM 1RB CH-High



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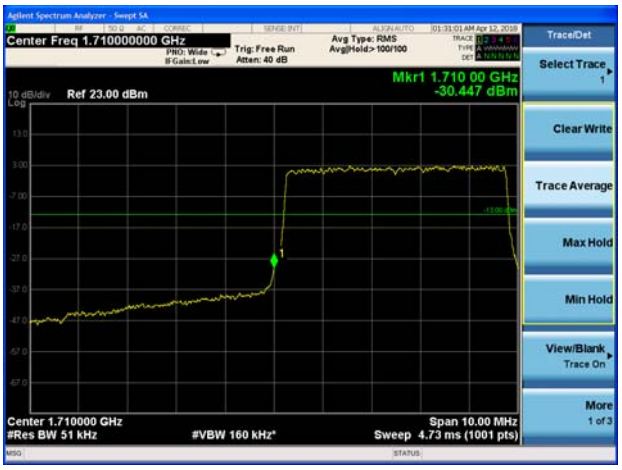
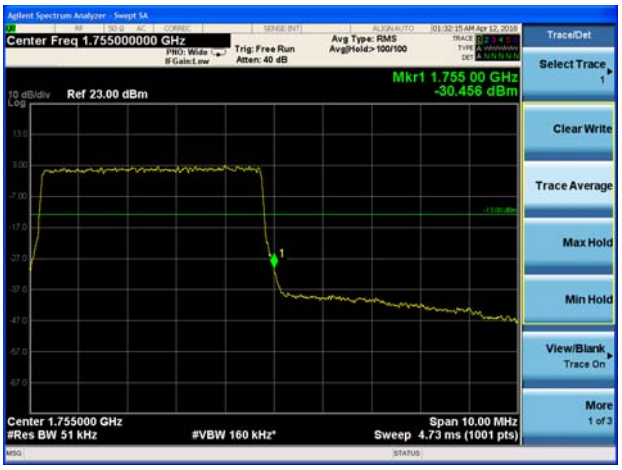
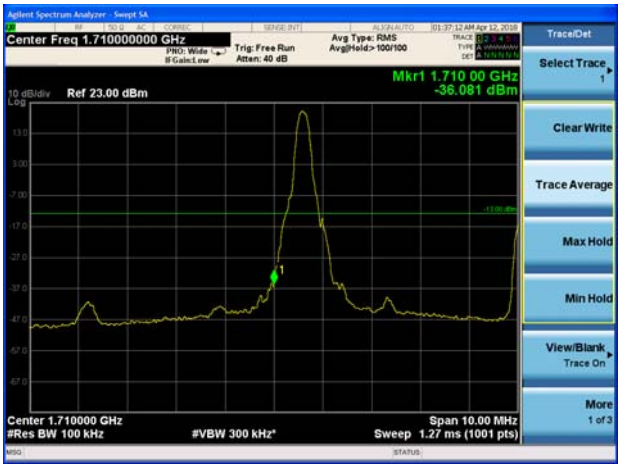
LTE Band 2 5MHz 16QAM 100%RB CH-Low



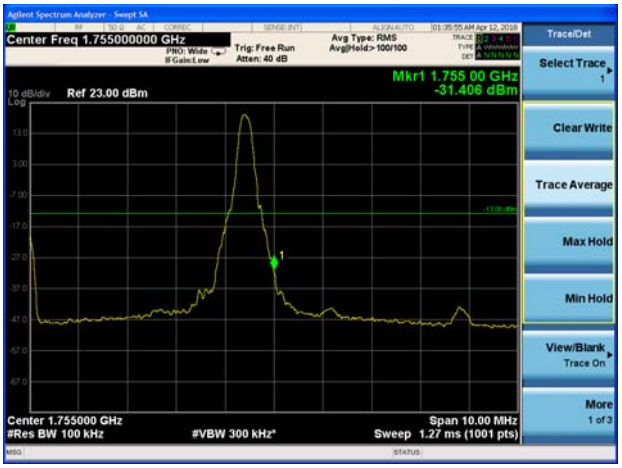
LTE Band 2 5MHz 16QAM 100%RB CH-High



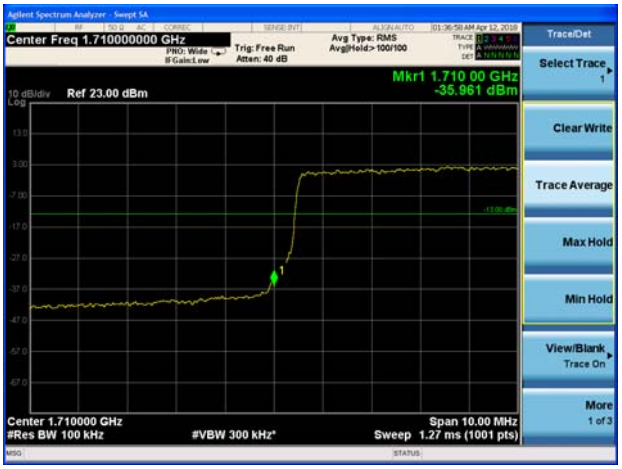
LTE Band 2 10MHz 16QAM 1RB CH-Low



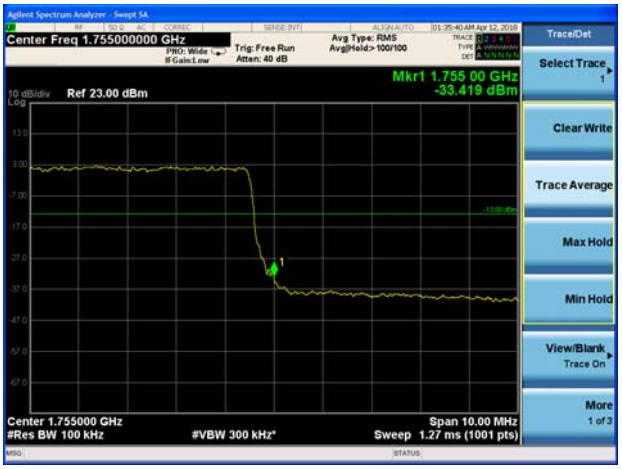
LTE Band 2 10MHz 16QAM 1RB CH-High



LTE Band 2 10MHz 16QAM 100%RB CH-Low



LTE Band 2 10MHz 16QAM 100%RB CH-High



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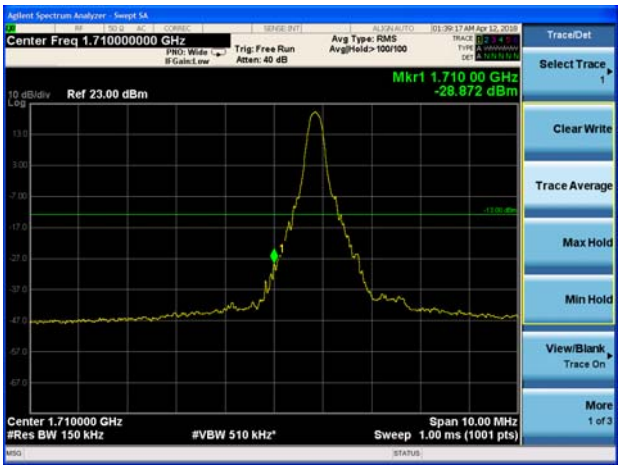
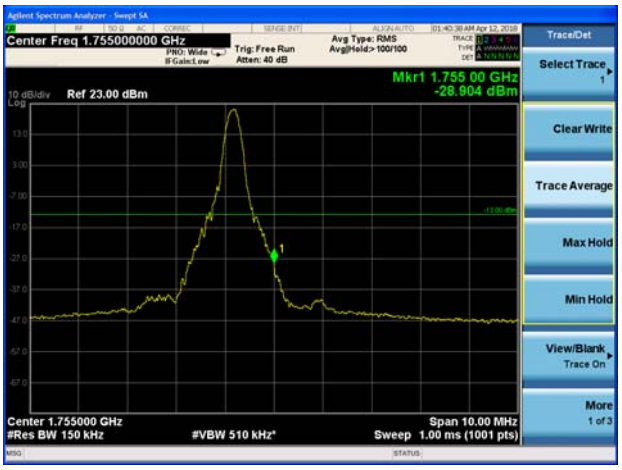
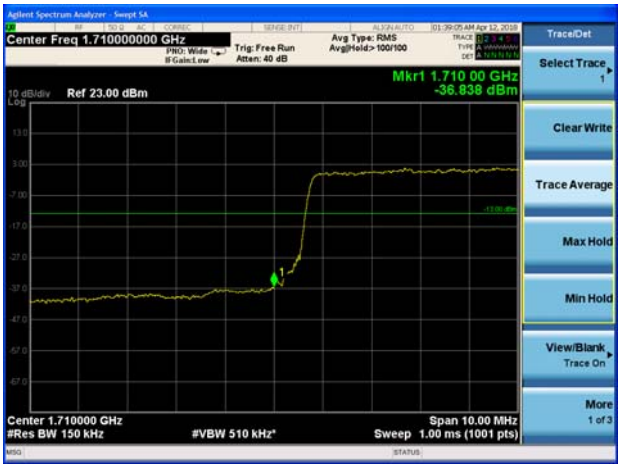
LTE Band 2 15MHz 16QAM 1RB CH-Low



LTE Band 2 15MHz 16QAM 1RB CH-High

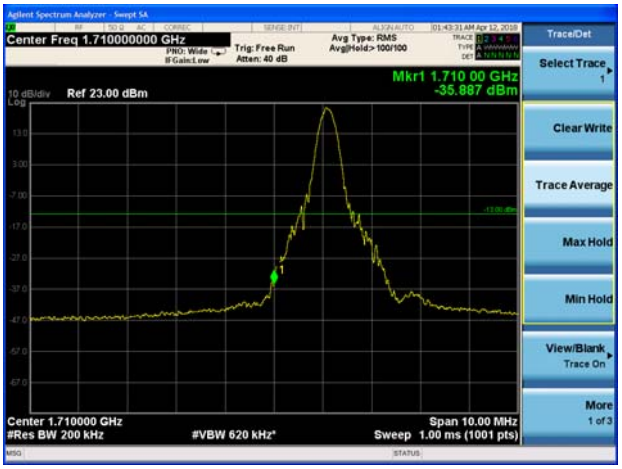


LTE Band 2 15MHz 16QAM 100%RB CH-Low

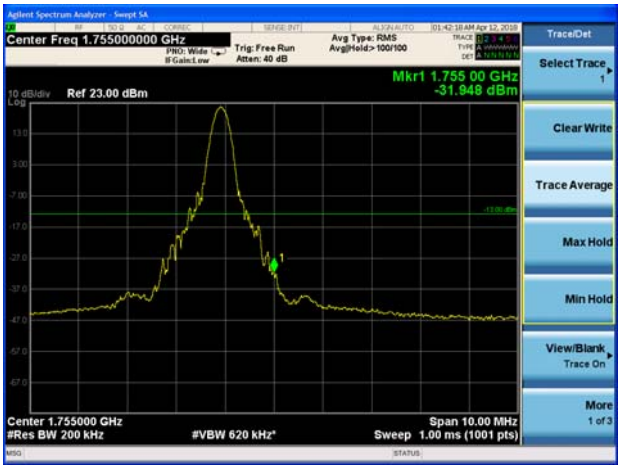


LTE Band 2 15MHz 16QAM 100%RB CH-High

LTE Band 2 20MHz 16QAM 1RB CH-Low



LTE Band 2 20MHz 16QAM 1RB CH-High



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LTE Band 2 20MHz 16QAM 100%RB CH-Low	LTE Band 2 20MHz 16QAM 100%RB CH-High

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5.5. Peak-to-Average Power Ratio (PAPR)

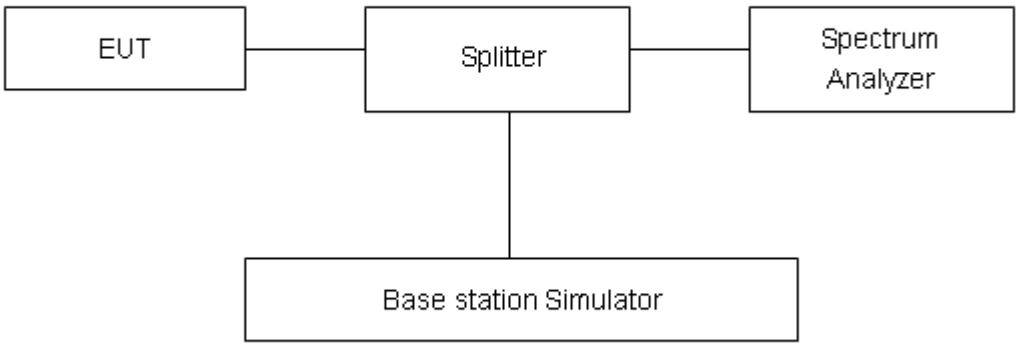
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (*e.g.*, dBm). Determine the PAPR from:
PAPR (dB) = PPk (dBm) - PAvg (dBm).

Test Setup



Limits

In measuring transmissions in this band using an average power technique, the peakto-average ratio (PAR) of the transmission may not exceed 13 dB in 24.232(d).

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the

normal distribution is with the coverage factor k = 2, U= 0.4 dB.

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Test Results

Mode	Channel	Frequency (MHz)	Peak(dBm)	Avg(dBm)	PAPR(dB)	Limit(dB)	Conclusion
GSM 1900 (GSM)	512	1850.2	30.68	29.80	0.88	≤13	PASS
	661	1880	30.75	29.86	0.89	≤13	PASS
	810	1909.8	30.75	29.91	0.84	≤13	PASS
GPRS 1900 (GMSK)	512	1850.2	30.51	29.57	0.94	≤13	PASS
	661	1880	30.58	29.61	0.97	≤13	PASS
	810	1909.8	30.62	29.71	0.91	≤13	PASS
EGPRS 1900 (8-PSK)	512	1850.2	30.54	29.51	1.03	≤13	PASS
	661	1880	30.73	29.64	1.09	≤13	PASS
	810	1909.8	30.83	29.68	1.15	≤13	PASS
WCDMA Band II (RMC)	9262	1852.4	26.82	23.78	3.04	≤13	PASS
	9400	1880	26.84	23.78	3.06	≤13	PASS
	9538	1907.6	26.68	23.57	3.11	≤13	PASS

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LTE Band 2								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	1.4	18607	1850.7	27.40	22.41	4.99	≤13	PASS
		18900	1880.0	27.48	22.65	4.83	≤13	PASS
		19193	1909.3	27.11	22.27	4.84	≤13	PASS
	3	18615	1851.5	27.57	22.44	5.13	≤13	PASS
		18900	1880	27.56	22.62	4.94	≤13	PASS
		19185	1908.5	27.33	22.30	5.03	≤13	PASS
	5	18625	1852.5	27.50	22.42	5.08	≤13	PASS
		18900	1880	27.52	22.61	4.91	≤13	PASS
		19175	1907.5	27.30	22.28	5.02	≤13	PASS
	10	18650	1855	27.61	22.50	5.11	≤13	PASS
		18900	1880	27.58	22.63	4.95	≤13	PASS
		19150	1905	27.44	22.32	5.12	≤13	PASS
	15	18675	1857.5	27.71	22.48	5.23	≤13	PASS
		18900	1880	27.54	22.59	4.95	≤13	PASS
		19125	1902.5	27.53	22.27	5.26	≤13	PASS
	20	18700	1860	27.66	22.45	5.21	≤13	PASS
		18900	1880	27.55	22.54	5.01	≤13	PASS
		19100	1900	27.47	22.23	5.24	≤13	PASS
16QAM	1.4	18607	1850.7	27.19	21.39	5.80	≤13	PASS
		18900	1880.0	27.19	21.57	5.62	≤13	PASS
		19193	1909.3	27.21	21.59	5.62	≤13	PASS
	3	18615	1851.5	27.33	21.42	5.91	≤13	PASS
		18900	1880	27.24	21.50	5.74	≤13	PASS
		19185	1908.5	27.47	21.62	5.85	≤13	PASS
	5	18625	1852.5	27.24	21.40	5.84	≤13	PASS
		18900	1880	27.12	21.46	5.66	≤13	PASS
		19175	1907.5	27.35	21.57	5.78	≤13	PASS
	10	18650	1855	27.28	21.43	5.85	≤13	PASS
		18900	1880	27.21	21.51	5.70	≤13	PASS
		19150	1905	27.55	21.61	5.94	≤13	PASS
	15	18675	1857.5	27.33	21.40	5.93	≤13	PASS
		18900	1880	27.13	21.46	5.67	≤13	PASS
		19125	1902.5	27.58	21.57	6.01	≤13	PASS
	20	18700	1860	27.34	21.38	5.96	≤13	PASS
		18900	1880	27.17	21.42	5.75	≤13	PASS
		19100	1900	27.59	21.54	6.05	≤13	PASS

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5.6. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -40°C to +85°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -40°C to +85°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

Frequency Stability (Voltage Variation)

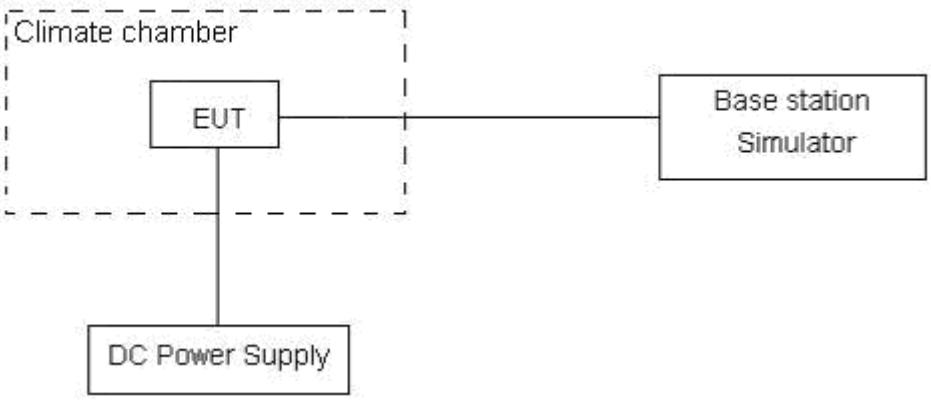
The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent 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.

This transceiver is specified to operate with an input voltage of between 3.3 V and 4.3 V, with a nominal voltage of 3.8V.

Test setup



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Limits

No specific frequency stability requirements in part 24.235

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 3, U= 0.01ppm.

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Test Result

GSM 1900					
Condition		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	1850.0649	1909.9487	-2.93	-0.00156
Extreme（85°C）		1850.0649	1909.9487	-3.68	-0.00196
Extreme（80°C）		1850.0649	1909.9487	-0.64	-0.00034
Extreme（70°C）		1850.0649	1909.9487	-4.14	-0.00220
Extreme（60°C）		1850.0649	1909.9487	-5.31	-0.00282
Extreme（50°C）		1850.0649	1909.9487	-3.50	-0.00186
Extreme（40°C）		1850.0649	1909.9487	-2.64	-0.00140
Extreme（30°C）		1850.0649	1909.9487	-0.25	-0.00013
Extreme（20°C）		1850.0649	1909.9487	1.29	0.00069
Extreme（10C）		1850.0649	1909.9487	-3.63	-0.00193
Extreme（0°C）		1850.0649	1909.9487	-2.75	-0.00146
Extreme（-10°C）		1850.0649	1909.9487	-4.86	-0.00259
Extreme（-20°C）		1850.0649	1909.9487	-4.36	-0.00232
Extreme（-30°C）		1850.0649	1909.9487	-0.75	-0.00040
Extreme（-40°C）		1850.0649	1909.9487	-3.74	-0.00199
25°C	LV	1850.0649	1909.9487	-2.02	-0.00107
	HV	1850.0649	1909.9487	-1.37	-0.00073

GPRS 1900					
Condition		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	1850.0589	1909.9421	-5.27	-0.00280
Extreme（85°C）		1850.0589	1909.9421	-3.17	-0.00169
Extreme（80°C）		1850.0589	1909.9421	-2.02	-0.00107
Extreme（70°C）		1850.0589	1909.9421	-7.62	-0.00405
Extreme（60°C）		1850.0589	1909.9421	-3.60	-0.00191
Extreme（50°C）		1850.0589	1909.9421	-5.50	-0.00293
Extreme（40°C）		1850.0589	1909.9421	-2.94	-0.00156
Extreme（30°C）		1850.0589	1909.9421	-2.00	-0.00106
Extreme（20°C）		1850.0589	1909.9421	-0.91	-0.00048
Extreme（10C）		1850.0589	1909.9421	-4.48	-0.00238
Extreme（0°C）		1850.0589	1909.9421	-2.62	-0.00139
Extreme（-10°C）		1850.0589	1909.9421	-4.00	-0.00213
Extreme（-20°C）		1850.0589	1909.9421	1.51	0.00080

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Extreme（-30°C）		1850.0589	1909.9421	0.79	0.00042
Extreme（-40°C）		1850.0589	1909.9421	0.47	0.00025
25°C	LV	1850.0589	1909.9421	-1.19	-0.00063
	HV	1850.0589	1909.9421	-4.88	-0.00260
EGPRS 1900					
Condition		1850	1910	Delta (Hz)	Frequency Stability (ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	1850.0637	1909.9283	-0.56	-0.00030
Extreme（85°C）		1850.0637	1909.9283	1.39	0.00074
Extreme（80°C）		1850.0637	1909.9283	2.35	0.00125
Extreme（70°C）		1850.0637	1909.9283	3.43	0.00182
Extreme（60°C）		1850.0637	1909.9283	-1.26	-0.00067
Extreme（50°C）		1850.0637	1909.9283	0.13	0.00007
Extreme（40°C）		1850.0637	1909.9283	3.26	0.00173
Extreme（30°C）		1850.0637	1909.9283	-1.29	-0.00069
Extreme（20°C）		1850.0637	1909.9283	-1.52	-0.00081
Extreme（10C）		1850.0637	1909.9283	1.44	0.00077
Extreme（0°C）		1850.0637	1909.9283	0.86	0.00046
Extreme（-10°C）		1850.0637	1909.9283	-2.69	-0.00143
Extreme（-20°C）		1850.0637	1909.9283	-1.82	-0.00097
Extreme（-30°C）		1850.0637	1909.9283	2.10	0.00112
Extreme（-40°C）		1850.0637	1909.9283	0.86	0.00046
25°C	LV	1850.0637	1909.9283	0.35	0.00019
	HV	1850.0637	1909.9283	-0.40	-0.00021

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WCDMA Band II					
Condition		1850	1910	Delta(Hz)	Frequency Stability(ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	1850.0249	1909.9531	-3.63	-0.00193
Extreme（85°C）		1850.0249	1909.9532	-0.77	-0.00041
Extreme（80°C）		1850.0249	1909.9532	-2.98	-0.00159
Extreme（70°C）		1850.0249	1909.9532	-4.68	-0.00249
Extreme（60°C）		1850.0249	1909.9532	-4.04	-0.00215
Extreme（50°C）		1850.0249	1909.9532	-5.46	-0.00290
Extreme（40°C）		1850.0249	1909.9532	-3.80	-0.00202
Extreme（30°C）		1850.0249	1909.9532	-4.70	-0.00250
Extreme（20°C）		1850.0249	1909.9532	-0.39	-0.00021
Extreme（10C）		1850.0249	1909.9532	-0.22	-0.00012
Extreme（0°C）		1850.0249	1909.9532	-0.25	-0.00013
Extreme（-10°C）		1850.0249	1909.9532	-2.81	-0.00149
Extreme（-20°C）		1850.0249	1909.9532	-4.48	-0.00238
Extreme（-30°C）		1850.0249	1909.9532	-1.29	-0.00069
Extreme（-40°C）		1850.0249	1909.9532	-4.96	-0.00264
25C	LV	1850.0249	1909.9532	-3.14	-0.00167
	HV	1850.0249	1909.9532	-5.15	-0.00274

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LTE Band 2					
(QPSK, 20MHz BANDWIDTH)					
Condition		1850	1910	Delta(Hz)	Frequency Stability(ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	1850.6419	1909.4872	0.59	0.00031
Extreme（85°C）		1850.6419	1909.4872	0.03	0.00002
Extreme（80°C）		1850.6419	1909.4872	4.60	0.00245
Extreme（70°C）		1850.6419	1909.4872	-2.62	-0.00139
Extreme（60°C）		1850.6419	1909.4872	1.34	0.00071
Extreme（50°C）		1850.6419	1909.4872	-0.65	-0.00035
Extreme（40°C）		1850.6419	1909.4872	2.41	0.00128
Extreme（30°C）		1850.6419	1909.4872	3.82	0.00203
Extreme（20°C）		1850.6419	1909.4872	1.64	0.00087
Extreme（10C）		1850.6419	1909.4872	4.80	0.00255
Extreme（0°C）		1850.6419	1909.4872	3.94	0.00210
Extreme（-10°C）		1850.6419	1909.4872	-0.45	-0.00024
Extreme（-20°C）		1850.6419	1909.4872	3.85	0.00205
Extreme（-30°C）		1850.6419	1909.4872	1.31	0.00070
Extreme（-40°C）		1850.6419	1909.4872	-5.45	-0.00290
25°C	LV	1850.6419	1909.4872	-1.98	-0.00105
	HV	1850.6419	1909.4872	-2.26	-0.00120
(16QAM, 20MHz BANDWIDTH)					
Condition		1850	1910	Delta(Hz)	Frequency Stability(ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	1850.5784	1909.4513	-0.60	-0.00032
Extreme（85°C）		1850.5784	1909.4513	-6.99	-0.00372
Extreme（80°C）		1850.5784	1909.4513	3.06	0.00163
Extreme（70°C）		1850.5784	1909.4513	-3.56	-0.00189
Extreme（60°C）		1850.5784	1909.4513	-5.22	-0.00278
Extreme（50°C）		1850.5784	1909.4513	-3.92	-0.00209
Extreme（40°C）		1850.5784	1909.4513	-2.16	-0.00115
Extreme（30°C）		1850.5784	1909.4513	-2.64	-0.00140
Extreme（20°C）		1850.5784	1909.4513	0.55	0.00029
Extreme（10C）		1850.5784	1909.4513	0.33	0.00018
Extreme（0°C）		1850.5784	1909.4513	-2.00	-0.00106
Extreme（-10°C）		1850.5784	1909.4513	0.06	0.00003
Extreme（-20°C）		1850.5784	1909.4513	4.07	0.00216
Extreme（-30°C）		1850.5784	1909.4513	-0.53	-0.00028
Extreme（-40°C）		1850.5784	1909.4513	0.76	0.00040
25°C	LV	1850.5784	1909.4513	-0.98	-0.00052
	HV	1850.5784	1909.4513	2.99	0.00159

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5.7. Spurious Emissions at Antenna Terminals

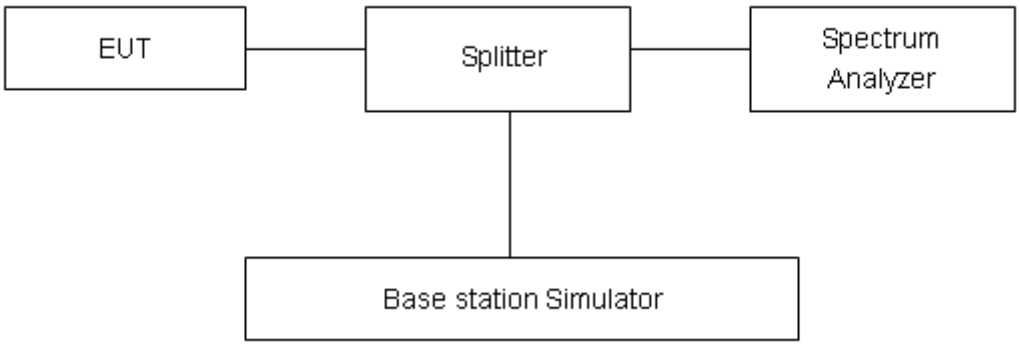
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier. The peak detector is used.set RBW 1MHz and VBW is 3MHz, Sweep is set to ATUO.

Test setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.”

Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-20GHz	1.407 dB

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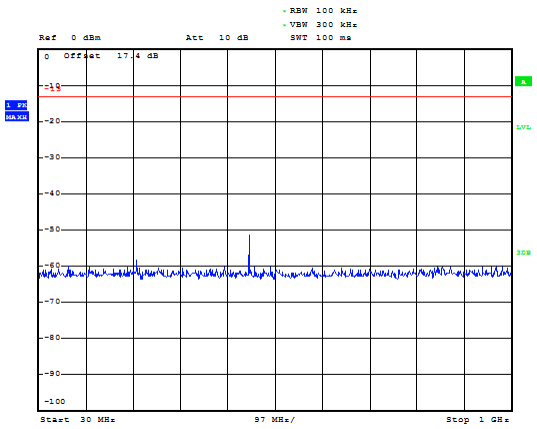
Test Result

Sweep from 9 kHz to 30MHz, and the emissions more than 20 dB below the permissible value are not reported.

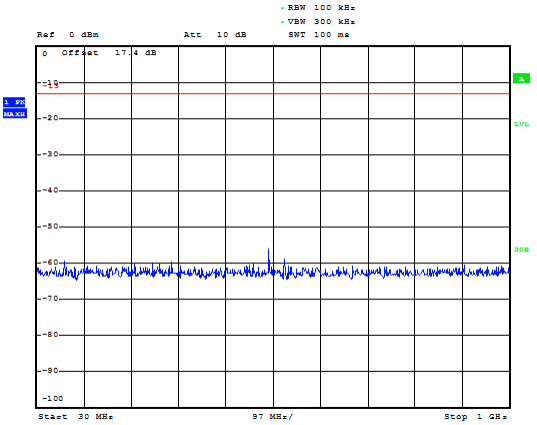
If disturbances were found more than 20dB below limit line, the mark is not required for the EUT.

The signal beyond the limit is carrier.

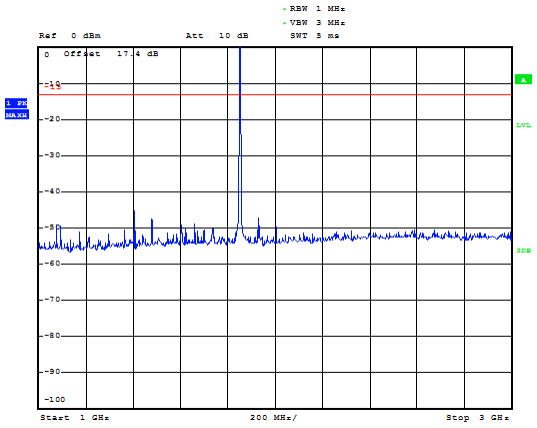
GSM 1900 CH-Low 30MHz~1GHz



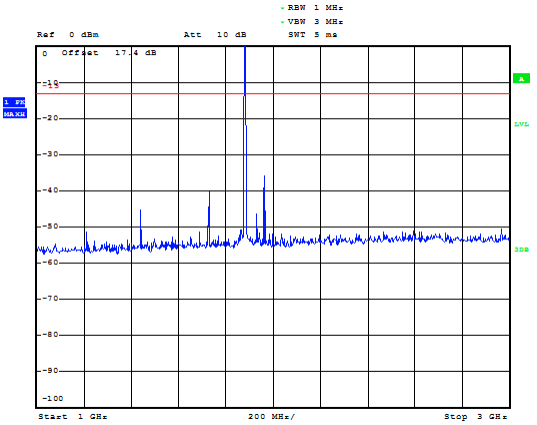
GSM 1900 CH-Middle 30MHz~1GHz



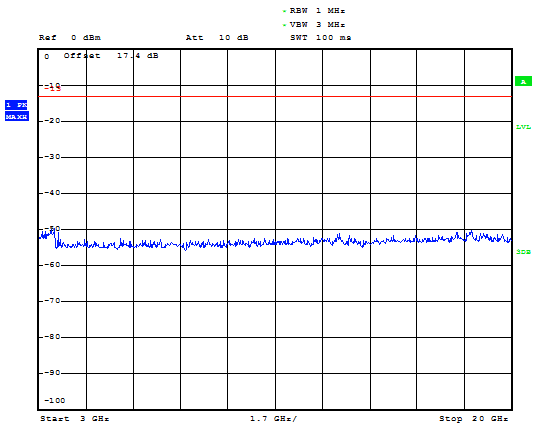
GSM 1900 CH-Low 1GHz~3GHz



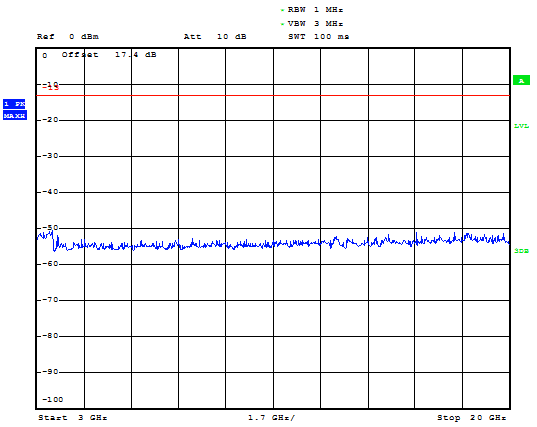
GSM 1900 CH-Middle 1GHz~3GHz



GSM 1900 CH-Low 3GHz~20GHz



GSM 1900 CH-Middle 3GHz~20GHz



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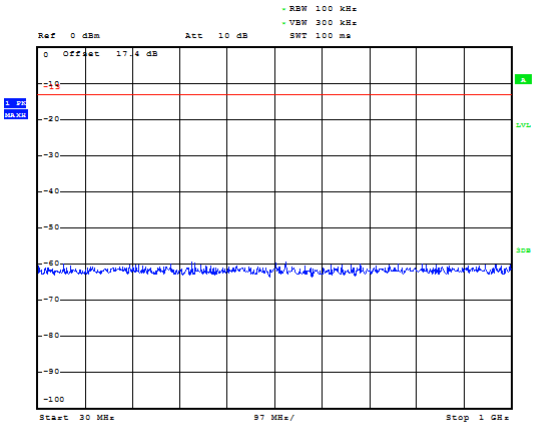
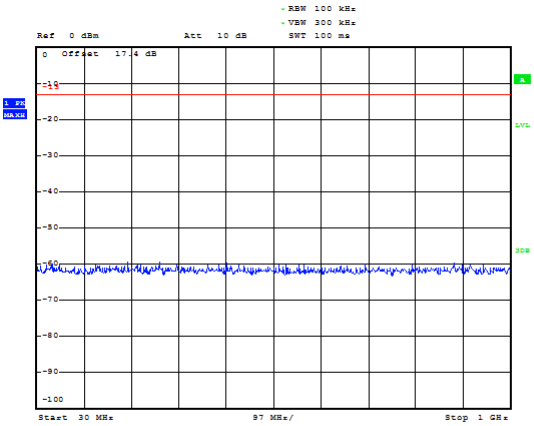
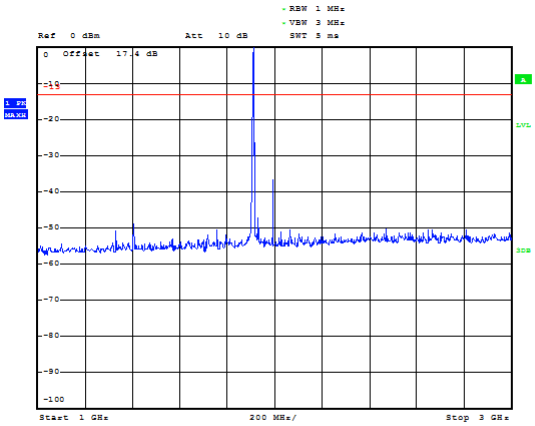
GSM 1900 CH-High 30MHz~1GHz



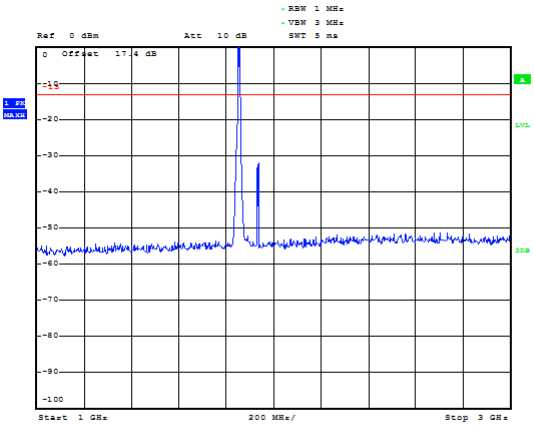
WCDMA Band II CH-Low 30MHz~1GHz



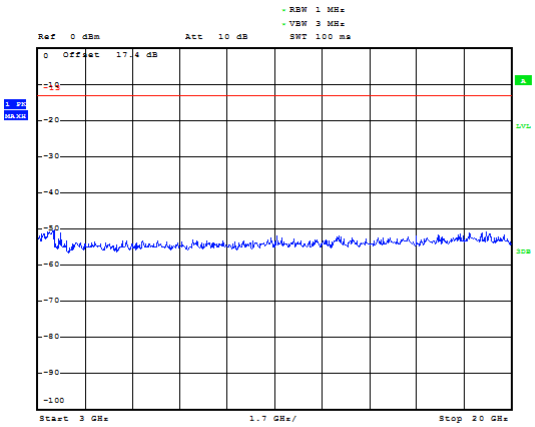
GSM 1900 CH-High 1GHz~3GHz



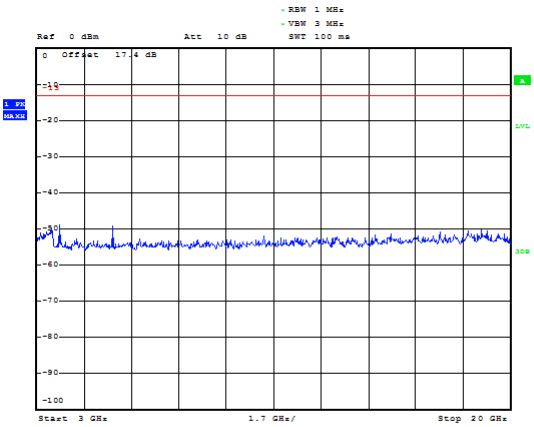
WCDMA BAND II CH-Low 1GHz~3GHz



GSM 1900 CH-High 3GHz~20GHz



WCDMA BAND II CH-Low 3GHz~20GHz



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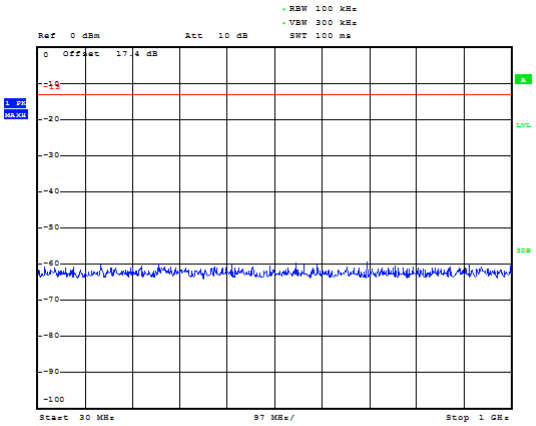
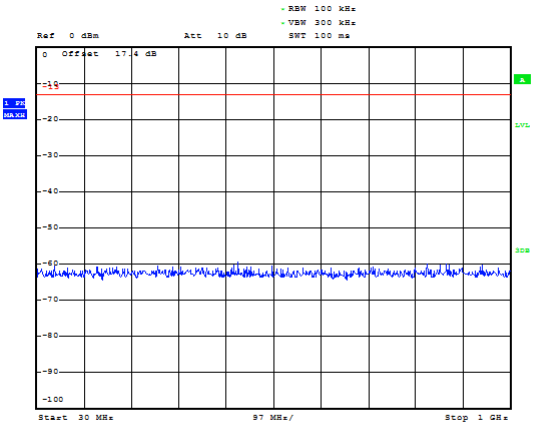
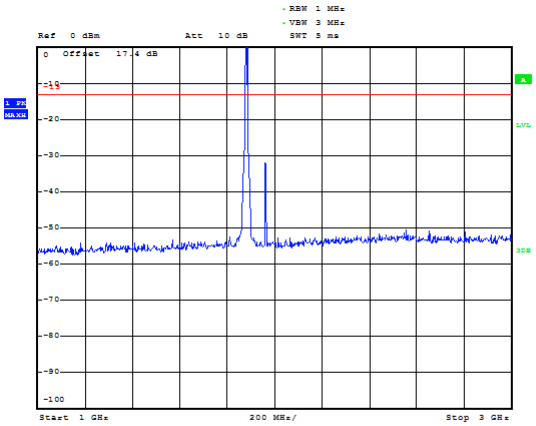
WCDMA Band II CH- Middle 30MHz~1GHz



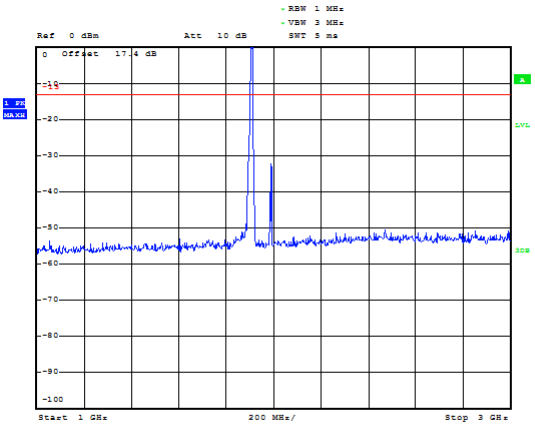
WCDMA Band II CH- High 30MHz~1GHz



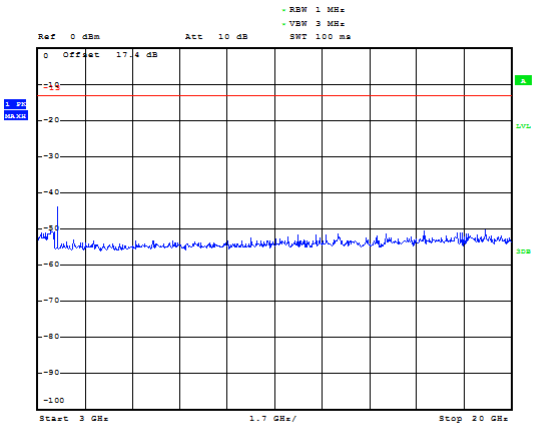
WCDMA BAND II CH-Middle 1GHz~3GHz



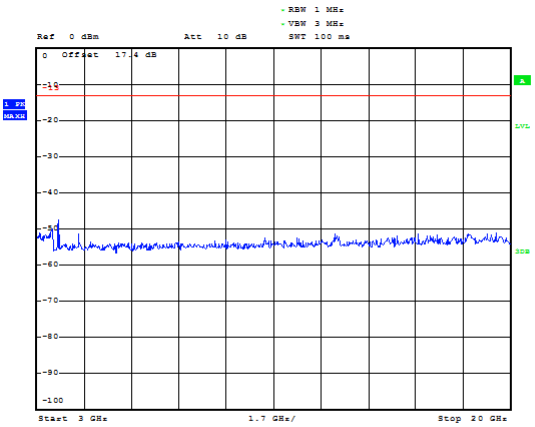
WCDMA BAND II CH-High 1GHz~3GHz



WCDMA BAND II CH-Middle 3GHz~20GHz



WCDMA BAND II CH-High 3GHz~20GHz



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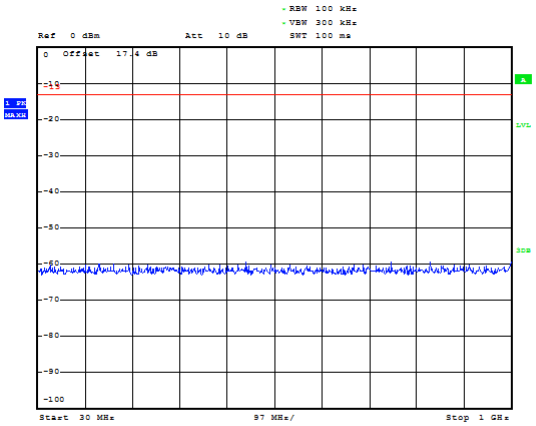
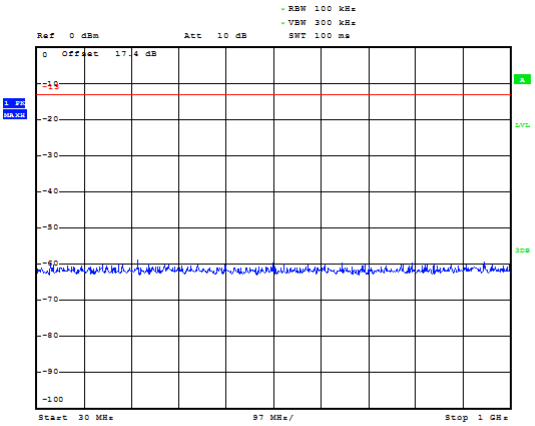
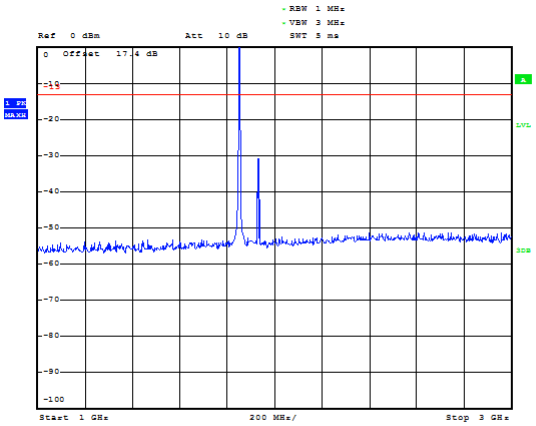
LTE Band 2 1.4MHz CH-Low 30MHz~1GHz



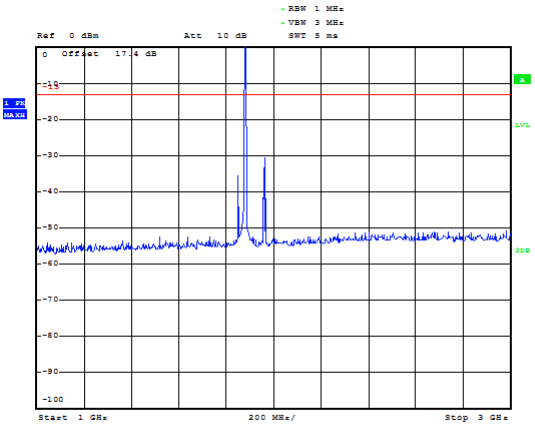
LTE Band 2 1.4MHz CH-Middle 30MHz~1GHz



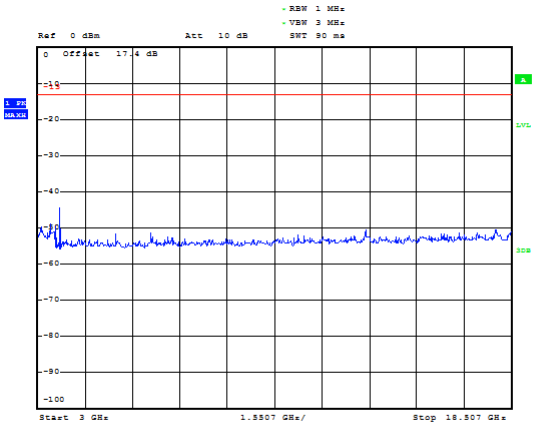
LTE Band 2 1.4MHz CH-Low 1GHz~3GHz



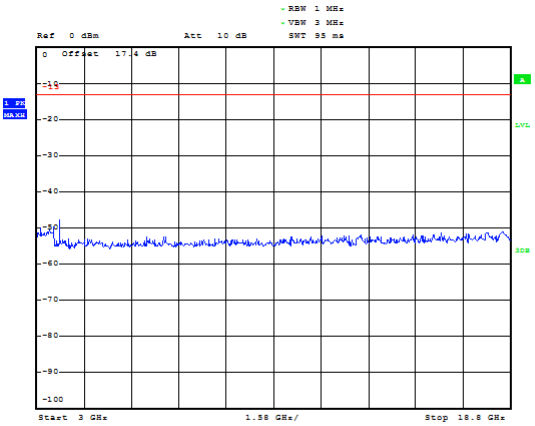
LTE Band 2 1.4MHz CH-Middle 1GHz~3GHz



LTE Band 2 1.4MHz CH-Low 3GHz~20GHz



LTE Band 2 1.4MHz CH-Middle 3GHz~20GHz



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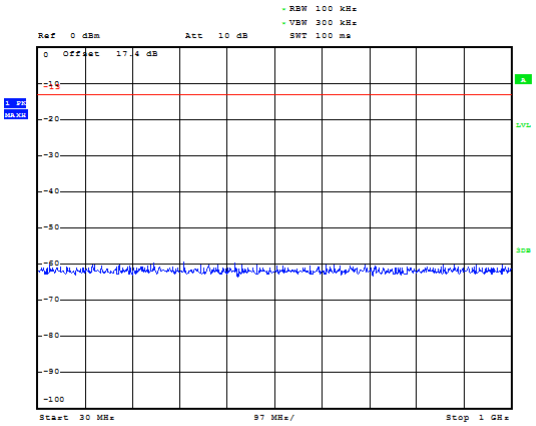
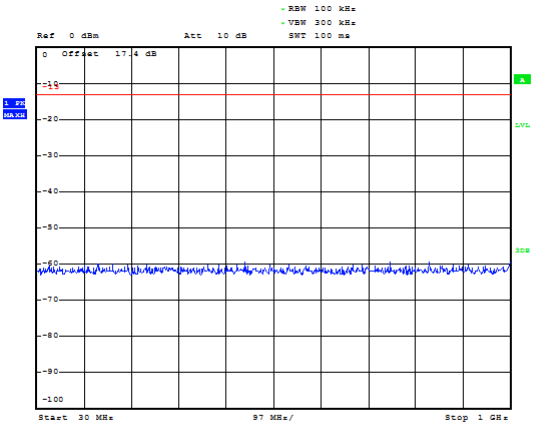
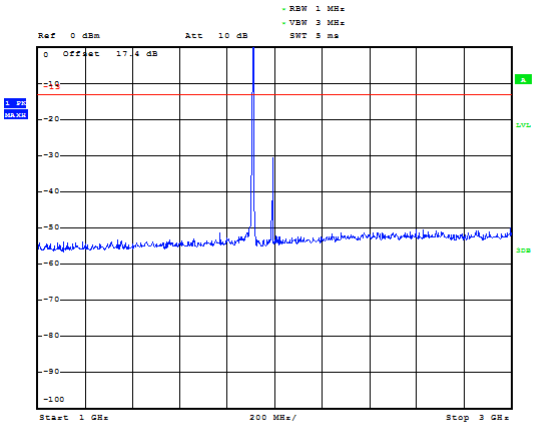
LTE Band 2 1.4MHz CH-High 30MHz~1GHz



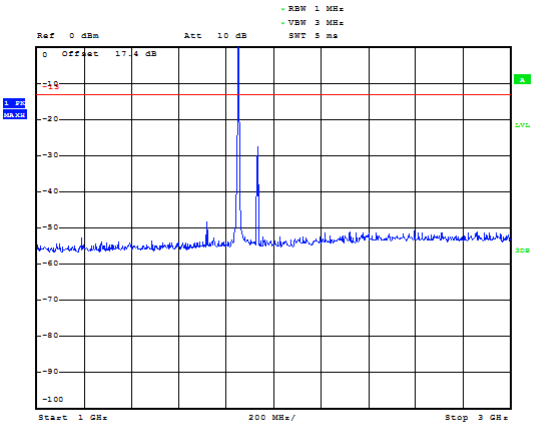
LTE Band 2 3MHz CH-Low 30MHz~1GHz



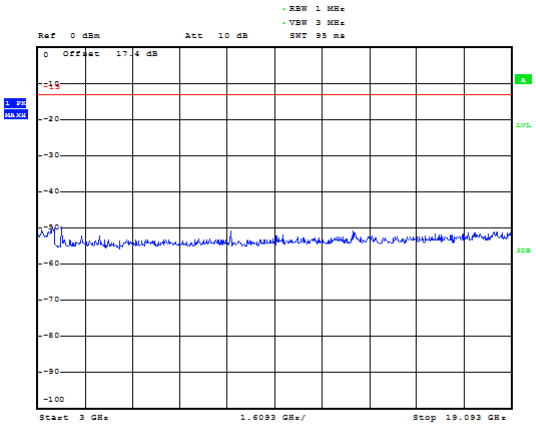
LTE Band 2 1.4MHz CH-High 1GHz~3GHz



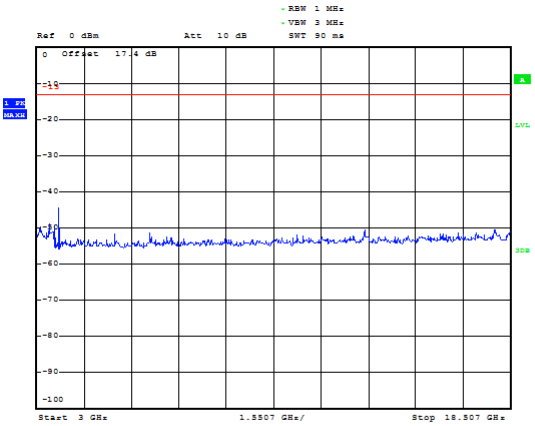
LTE Band 2 3MHz CH-Low 1GHz~3GHz



LTE Band 2 1.4MHz CH-High 3GHz~20GHz



LTE Band 2 3MHz CH-Low 3GHz~20GHz



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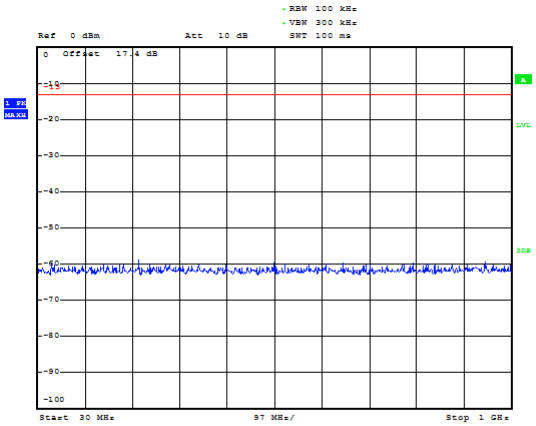
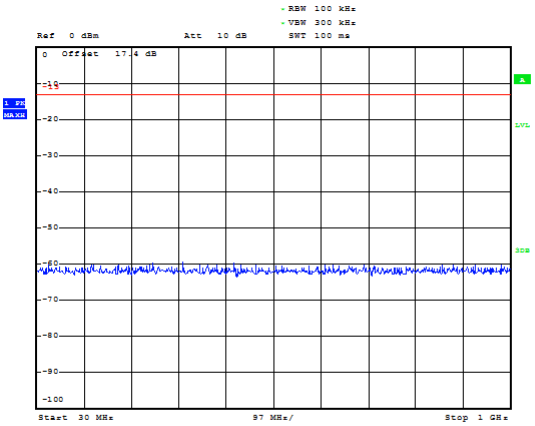
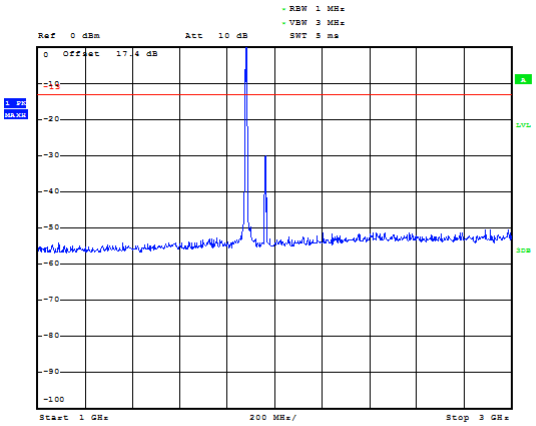
LTE Band 2 3MHz CH-Middle 30MHz~1GHz



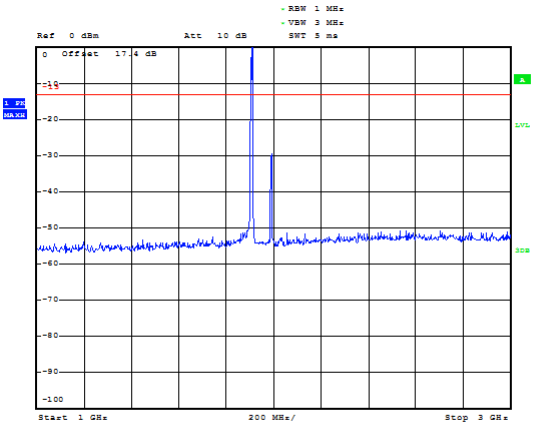
LTE Band 2 3MHz CH-High 30MHz~1GHz



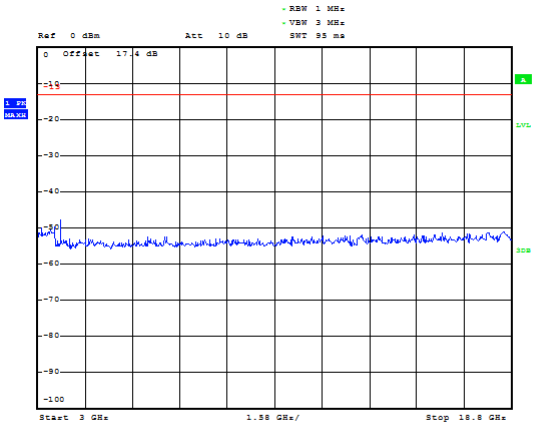
LTE Band 2 3MHz CH-Middle 1GHz~3GHz



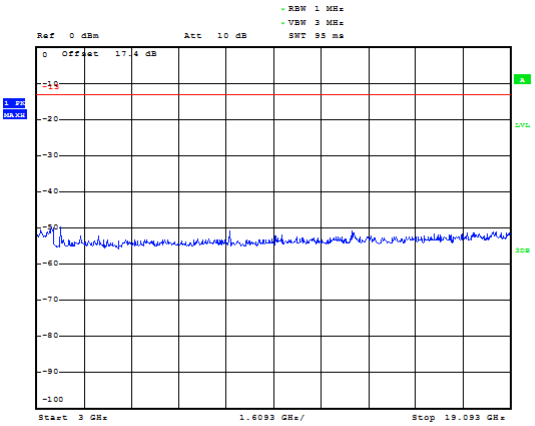
LTE Band 2 3MHz CH-High 1GHz~3GHz



LTE Band 2 3MHz CH-Middle 3GHz~20GHz



LTE Band 2 3MHz CH-High 3GHz~20GHz



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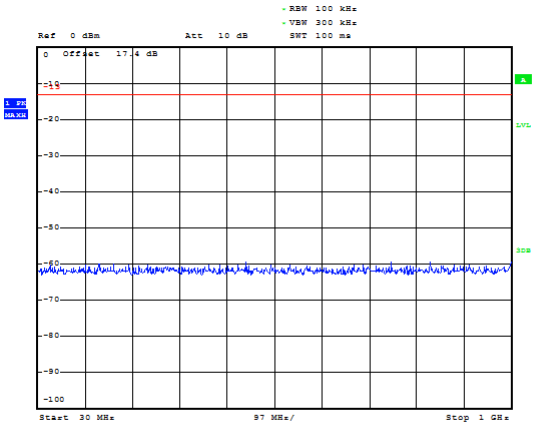
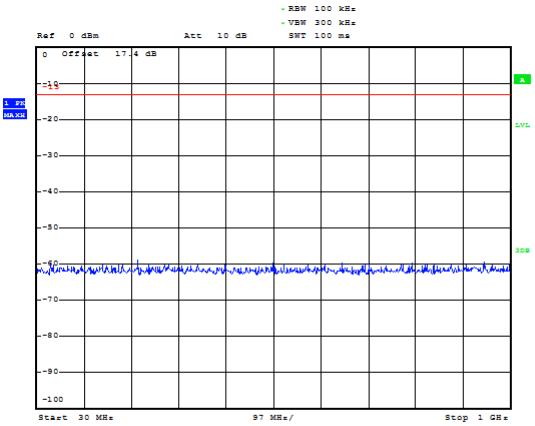
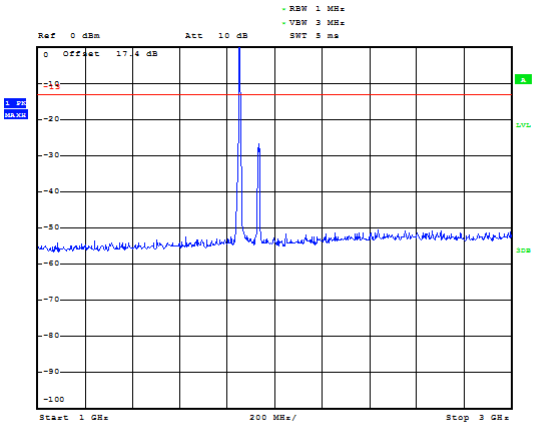
LTE Band 2 5MHz CH-Low 30MHz~1GHz



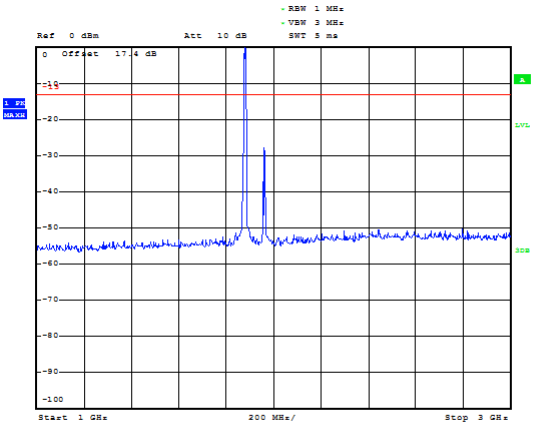
LTE Band 2 5MHz CH-Middle 30MHz~1GHz



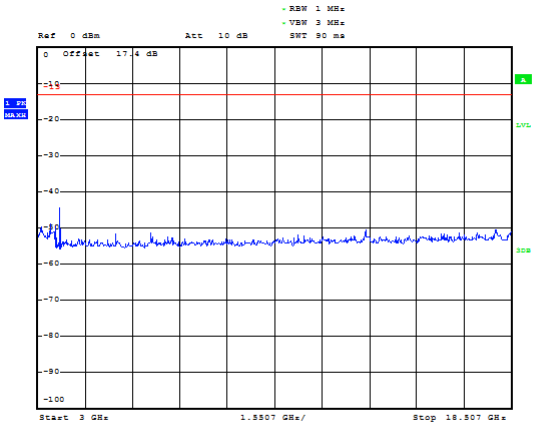
LTE Band 2 5MHz CH-Low 1GHz~3GHz



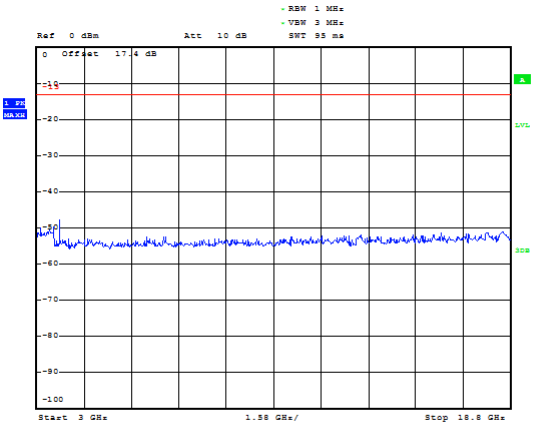
LTE Band 2 5MHz CH-Middle 1GHz~3GHz



LTE Band 2 5MHz CH-Low 3GHz~20GHz



LTE Band 2 5MHz CH-Middle 3GHz~20GHz



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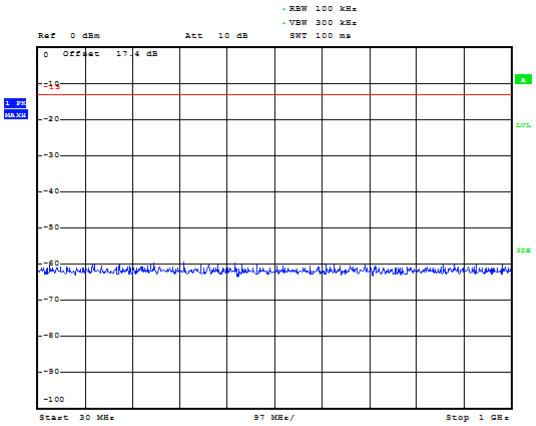
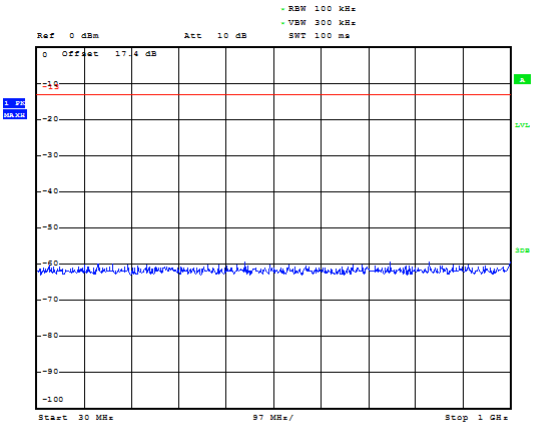
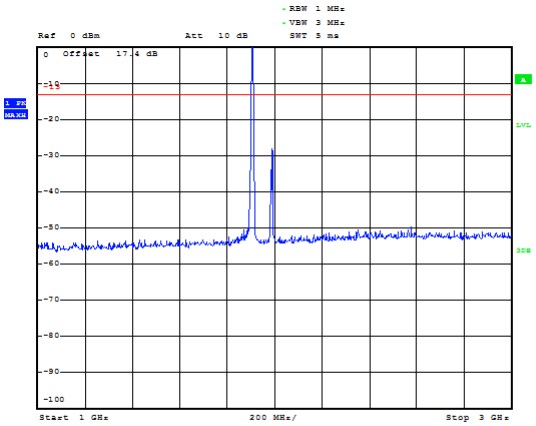
LTE Band 2 5MHz CH-High 30MHz~1GHz



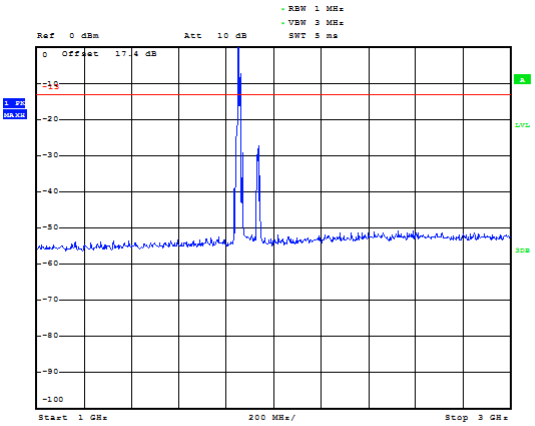
LTE Band 2 10MHz CH-Low 30MHz~1GHz



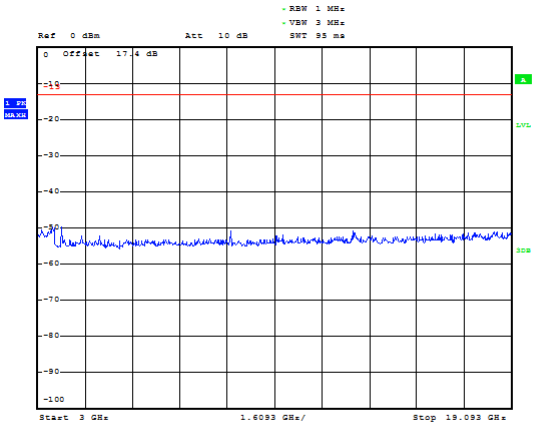
LTE Band 2 5MHz CH-High 1GHz~3GHz



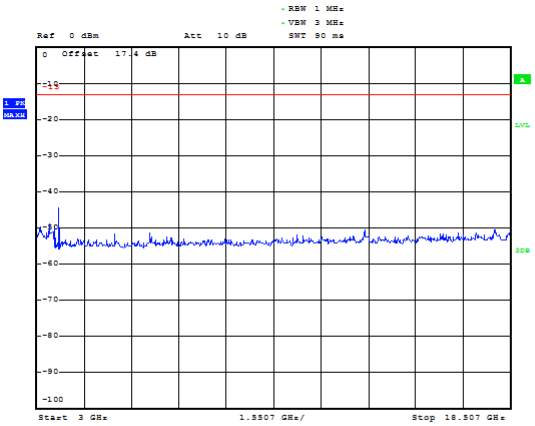
LTE Band 2 10MHz CH-Low 1GHz~3GHz



LTE Band 2 5MHz CH-High 3GHz~20GHz



LTE Band 2 10MHz CH-Low 3GHz~20GHz



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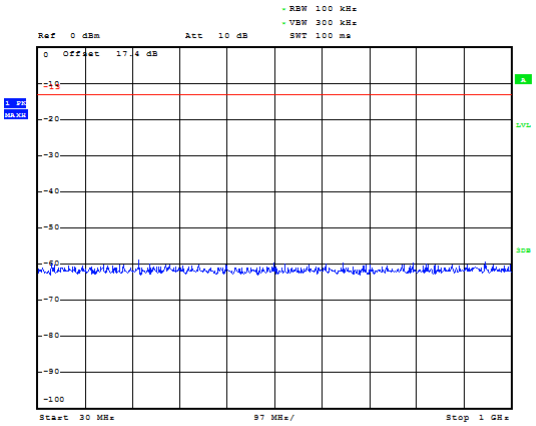
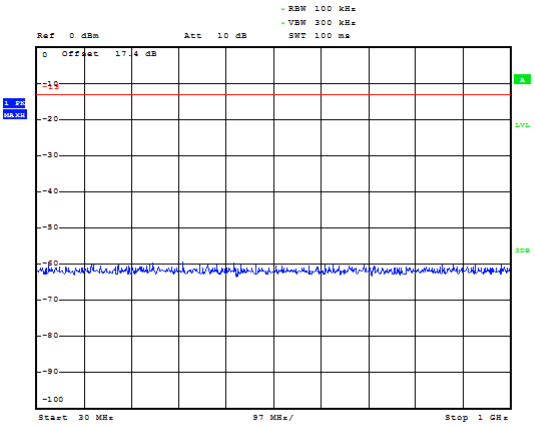
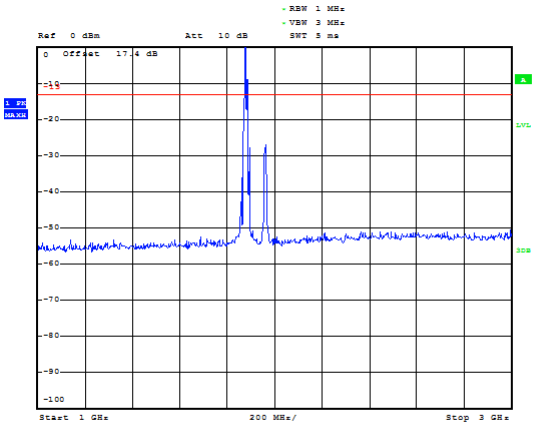
LTE Band 2 10MHz CH-Middle 30MHz~1GHz



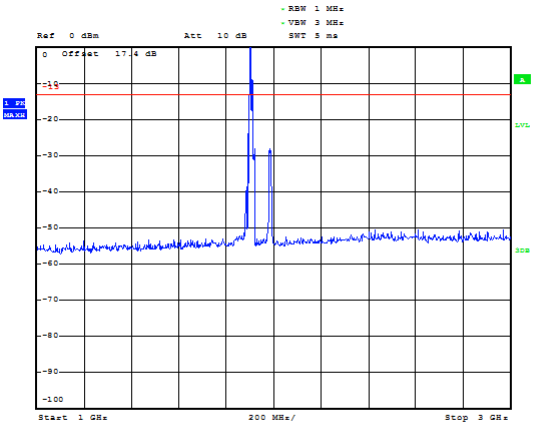
LTE Band 2 10MHz CH-High 30MHz~1GHz



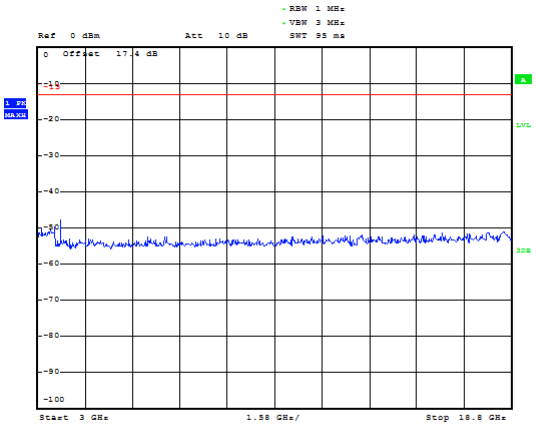
LTE Band 2 10MHz CH-Middle 1GHz~3GHz



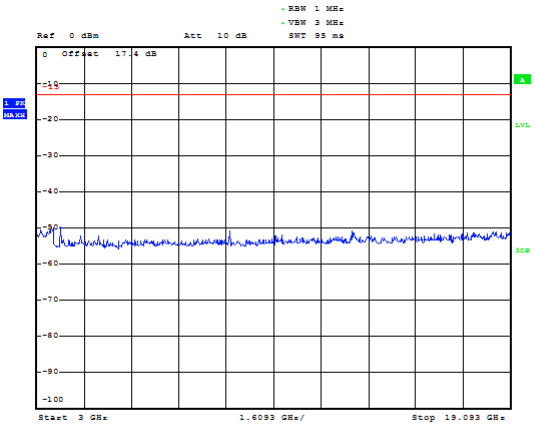
LTE Band 2 10MHz CH-High 1GHz~3GHz



LTE Band 2 10MHz CH-Middle 3GHz~20GHz



LTE Band 2 10MHz CH-High 3GHz~20GHz



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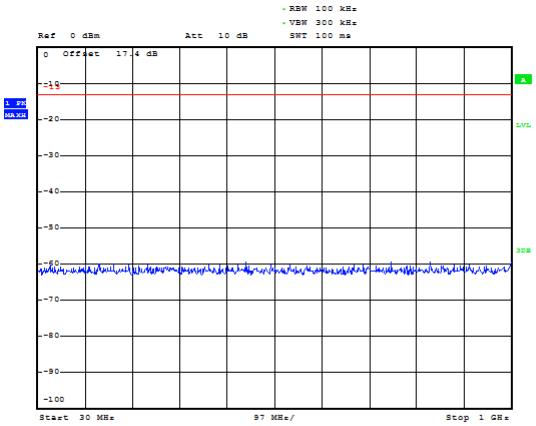
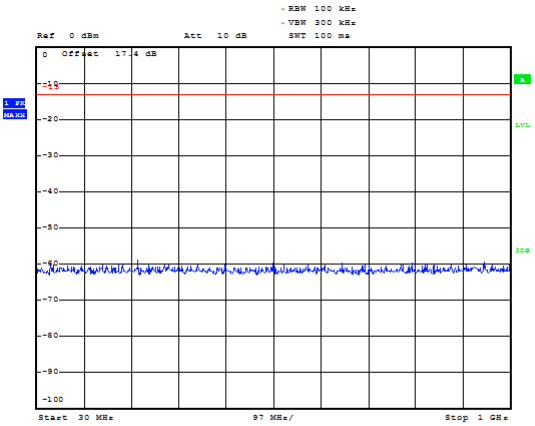
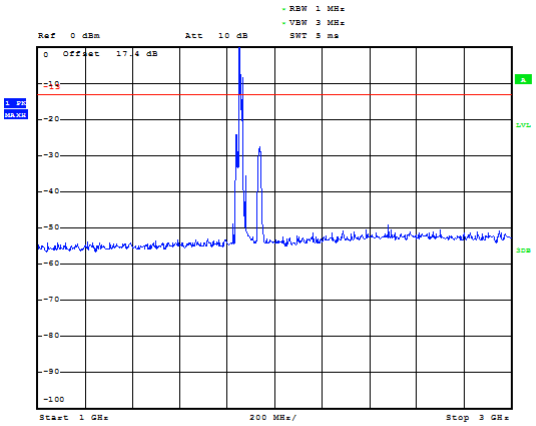
LTE Band 2 15MHz CH-Low 30MHz~1GHz



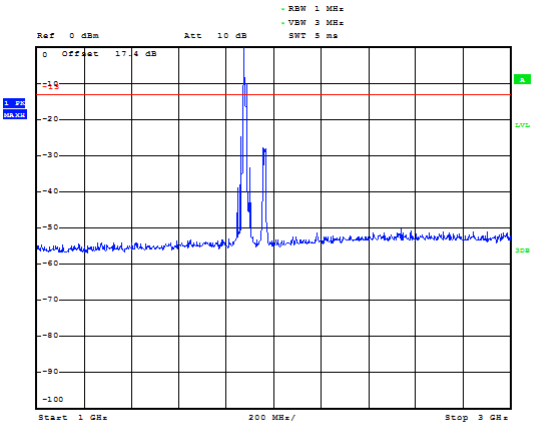
LTE Band 2 15MHz CH-Middle 30MHz~1GHz



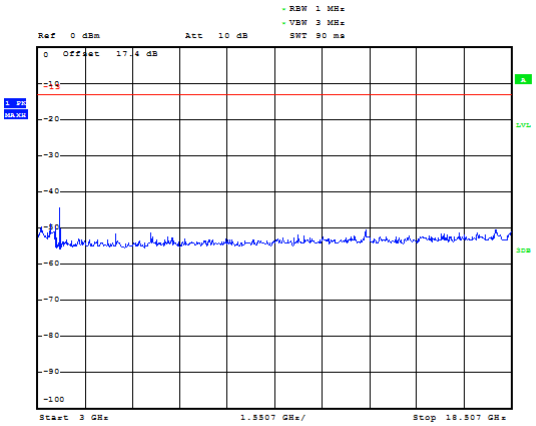
LTE Band 2 15MHz CH-Low 1GHz~3GHz



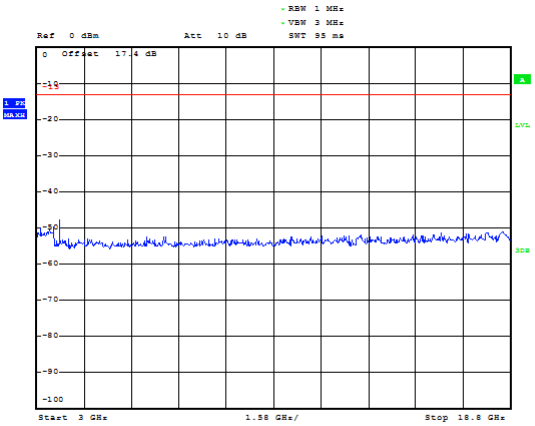
LTE Band 2 15MHz CH-Middle 1GHz~3GHz



LTE Band 2 15MHz CH-Low 3GHz~20GHz



LTE Band 2 15MHz CH-Middle 3GHz~20GHz



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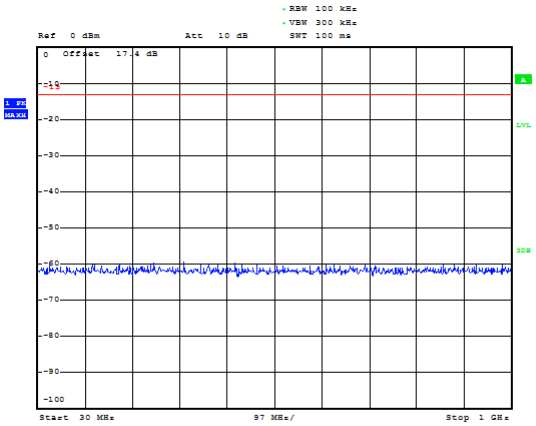
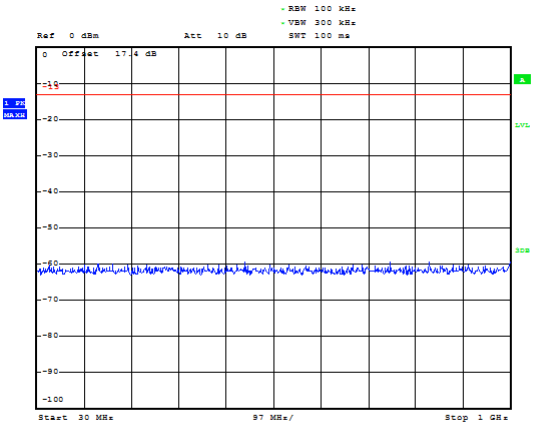
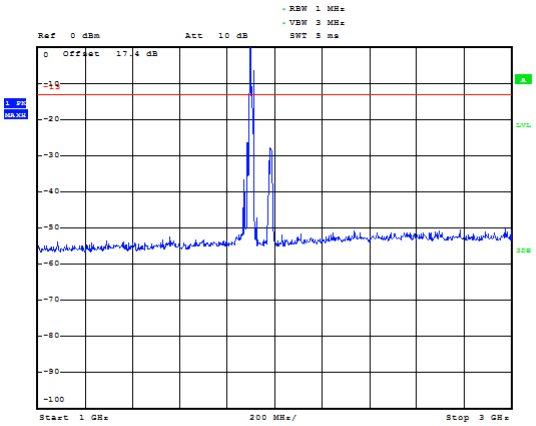
LTE Band 2 15MHz CH-High 30MHz~1GHz



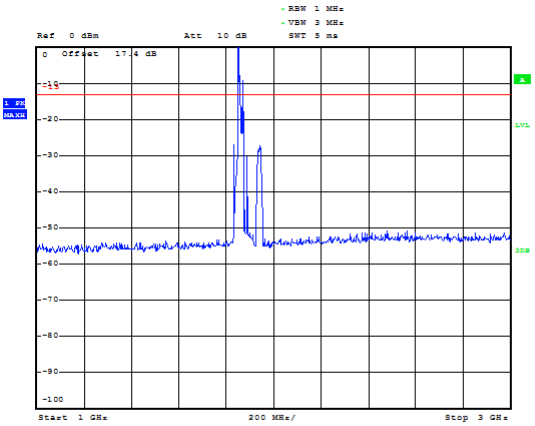
LTE Band 2 20MHz CH-Low 30MHz~1GHz



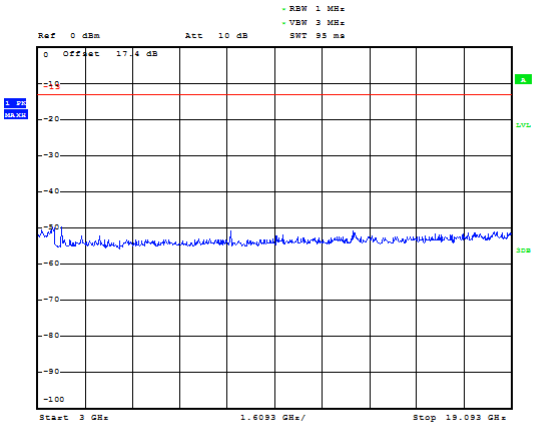
LTE Band 2 15MHz CH-High 1GHz~3GHz



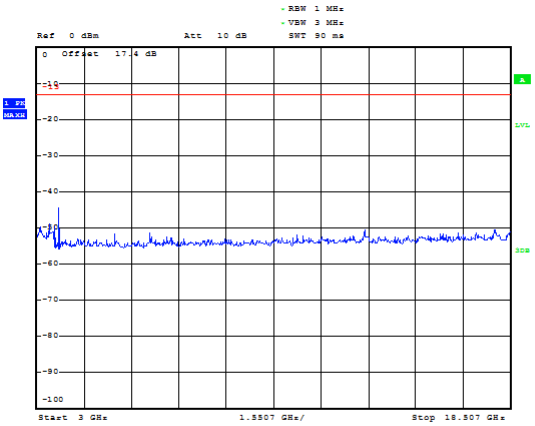
LTE Band 2 20MHz CH-Low 1GHz~3GHz



LTE Band 2 15MHz CH-High 3GHz~20GHz



LTE Band 2 20MHz CH-Low 3GHz~20GHz



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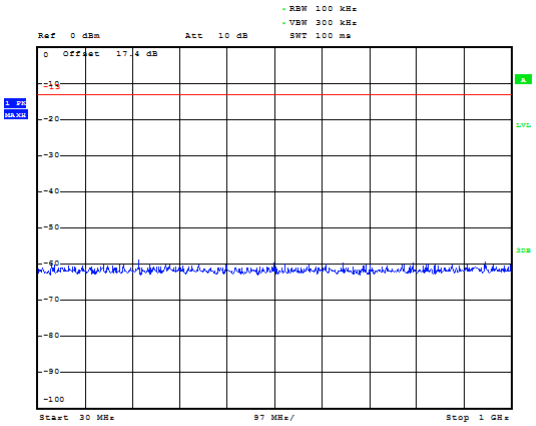
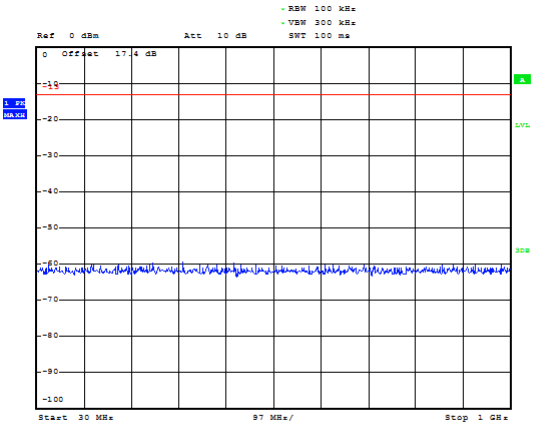
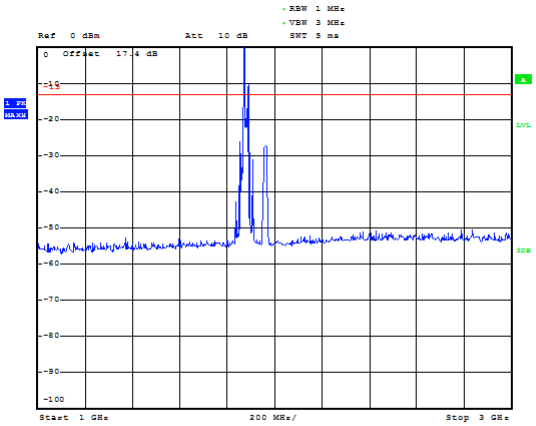
LTE Band 2 20MHz CH-Middle 30MHz~1GHz



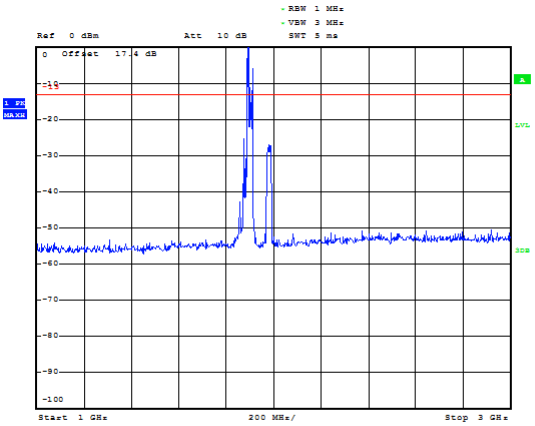
LTE Band 2 20MHz CH-High 30MHz~1GHz



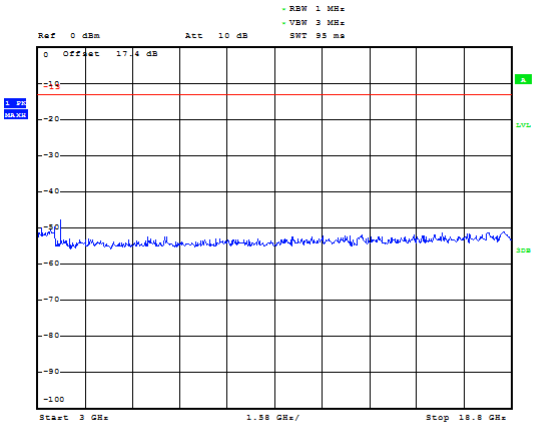
LTE Band 2 20MHz CH-Middle 1GHz~3GHz



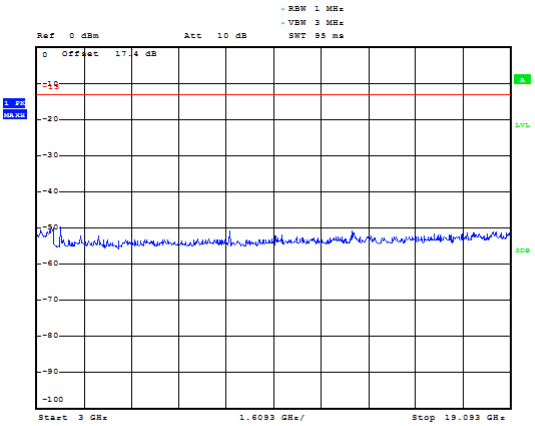
LTE Band 2 20MHz CH-High 1GHz~3GHz



LTE Band 2 20MHz CH-Middle 3GHz~20GHz



LTE Band 2 20MHz CH-High 3GHz~20GHz



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5.8. Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. The testing follows FCC KDB 971168 v03 Section 5.8 and ANSI/TIA-603-E (2016).
2. The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test.Set Test Receiver or Spectrum RBW=1MHz,VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:

Power(EIRP)=PMea- PAg - Pcl + Ga

The measurement results are amend as described below:

Power(EIRP)=PMea- Pcl + Ga

8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP = EIRP-2.15dBi.

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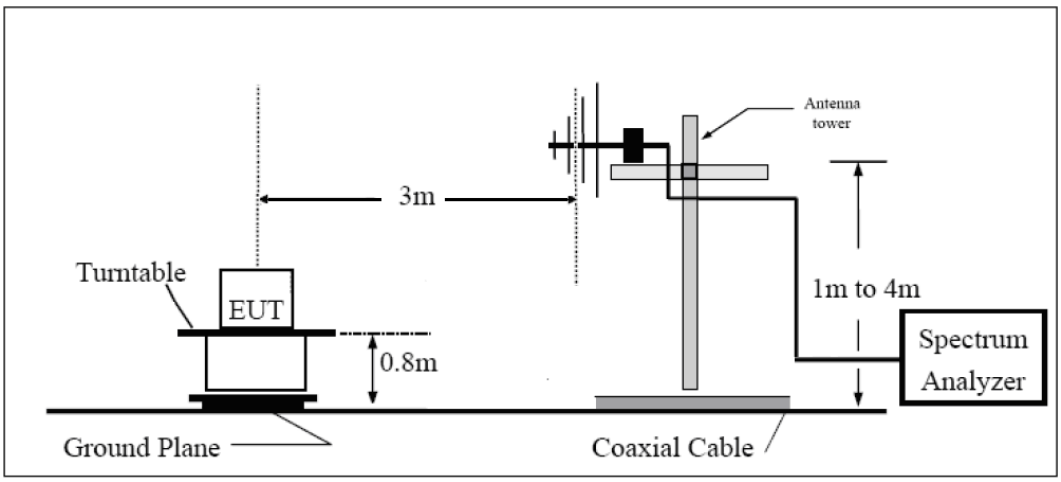
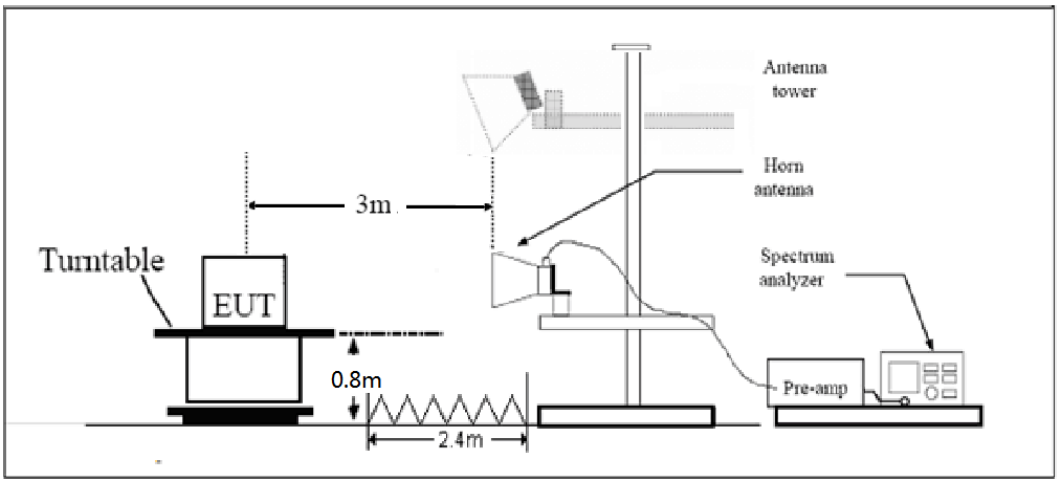
Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side: 2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

Limits

Rule Part 24.238(a) specifies that "on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB."

Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95％ confidence level for the normal distribution is with the coverage factor *k* = 1.96, *U*= 3.55 dB.

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Test Result

GSM 1900 CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.4	-51.06	5.1	11.05	Vertical	-45.11	-13.00	32.11	135
3	5550.6	-55.89	5.42	12.65	Vertical	-48.66	-13.00	35.66	45
4	7400.8	-47.77	6.7	13.85	Vertical	-40.62	-13.00	27.62	180
5	9251.0	-45.97	7.01	14.75	Vertical	-38.23	-13.00	25.23	270
6	11101.2	-46.17	7.48	15.95	Vertical	-37.70	-13.00	24.70	135
7	12951.4	-47.19	7.51	16.55	Vertical	-38.15	-13.00	25.15	45
8	14801.6	-45.79	8.24	15.35	Vertical	-38.68	-13.00	25.68	270
9	16651.8	-43.02	8.41	14.95	Vertical	-36.48	-13.00	23.48	180
10	18502.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2.The worst emission was found in the antenna is Vertical position.									

GSM 1900 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.0	-53.37	5.1	11.05	Vertical	-47.42	-13.00	34.42	135
3	5640.0	-55.44	5.42	12.65	Vertical	-48.21	-13.00	35.21	45
4	7520.0	-48.62	6.7	13.85	Vertical	-41.47	-13.00	28.47	180
5	9400.0	-46.02	7.01	14.75	Vertical	-38.28	-13.00	25.28	270
6	11280.0	-44.88	7.48	15.95	Vertical	-36.41	-13.00	23.41	135
7	13160.0	-47.85	7.51	16.55	Vertical	-38.81	-13.00	25.81	45
8	15040.0	-44.79	8.24	15.35	Vertical	-37.68	-13.00	24.68	270
9	16920.0	-42.18	8.41	14.95	Vertical	-35.64	-13.00	22.64	180
10	18800.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

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GSM 1900 CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3819.6	-57.69	5.1	11.05	Vertical	-51.74	-13.00	38.74	135
3	5729.4	-55.69	5.42	12.65	Vertical	-48.46	-13.00	35.46	45
4	7639.2	-47.65	6.7	13.85	Vertical	-40.50	-13.00	27.50	180
5	9549.0	-44.13	7.01	14.75	Vertical	-36.39	-13.00	23.39	270
6	11458.8	-44.35	7.48	15.95	Vertical	-35.88	-13.00	22.88	135
7	13368.6	-47.09	7.51	16.55	Vertical	-38.05	-13.00	25.05	45
8	15278.4	-45.45	8.24	15.35	Vertical	-38.34	-13.00	25.34	180
9	17188.2	-42.20	8.41	14.95	Vertical	-35.66	-13.00	22.66	225
10	19098.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

WCDMA Band II CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3704.8	-51.41	5.1	11.05	Vertical	-45.46	-13.00	32.46	180
3	5557.2	-46.76	5.42	12.65	Vertical	-39.53	-13.00	26.53	270
4	7409.6	-48.88	6.7	13.85	Vertical	-41.73	-13.00	28.73	135
5	9262.0	-44.70	7.01	14.75	Vertical	-36.96	-13.00	23.96	45
6	11114.4	-44.68	7.48	15.95	Vertical	-36.21	-13.00	23.21	270
7	12966.8	-46.63	7.51	16.55	Vertical	-37.59	-13.00	24.59	180
8	14819.2	-44.07	8.24	15.35	Vertical	-36.96	-13.00	23.96	270
9	16671.6	-40.28	8.41	14.95	Vertical	-33.74	-13.00	20.74	135
10	18524.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

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WCDMA Band II CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.0	-51.60	5.1	11.05	Vertical	-45.65	-13.00	32.65	270
3	5640.0	-46.11	5.42	12.65	Vertical	-38.88	-13.00	25.88	135
4	7520.0	-49.10	6.7	13.85	Vertical	-41.95	-13.00	28.95	45
5	9400.0	-44.75	7.01	14.75	Vertical	-37.01	-13.00	24.01	270
6	11280.0	-45.47	7.48	15.95	Vertical	-37.00	-13.00	24.00	180
7	13160.0	-48.05	7.51	16.55	Vertical	-39.01	-13.00	26.01	270
8	15040.0	-44.47	8.24	15.35	Vertical	-37.36	-13.00	24.36	135
9	16920.0	-42.80	8.41	14.95	Vertical	-36.26	-13.00	23.26	180
10	18800.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

WCDMA Band II CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3813.8	-52.51	5.1	11.05	Vertical	-46.56	-13.00	33.56	135
3	5722.8	-47.01	5.42	12.65	Vertical	-39.78	-13.00	26.78	45
4	7630.4	-49.29	6.7	13.85	Vertical	-42.14	-13.00	29.14	270
5	9538.0	-45.33	7.01	14.75	Vertical	-37.59	-13.00	24.59	180
6	11445.6	-45.32	7.48	15.95	Vertical	-36.85	-13.00	23.85	270
7	13353.2	-47.59	7.51	16.55	Vertical	-38.55	-13.00	25.55	135
8	15260.8	-45.49	8.24	15.35	Vertical	-38.38	-13.00	25.38	225
9	17168.4	-42.34	8.41	14.95	Vertical	-35.80	-13.00	22.80	90
10	19076.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

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LTE Band 2 1.4MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.5	-60.66	5.1	11.05	Vertical	-54.71	-13.00	41.71	45
3	5550.8	-57.46	5.42	12.65	Vertical	-50.23	-13.00	37.23	225
4	7402.8	-54.16	6.7	13.85	Vertical	-47.01	-13.00	34.01	135
5	9253.5	-52.84	7.01	14.75	Vertical	-45.10	-13.00	32.10	180
6	11104.2	-49.59	7.48	15.95	Vertical	-41.12	-13.00	28.12	180
7	12954.9	-51.83	7.51	16.55	Vertical	-42.79	-13.00	29.79	270
8	14805.6	-46.91	8.24	15.35	Vertical	-39.80	-13.00	26.80	270
9	16656.3	-51.51	8.41	14.95	Vertical	-44.97	-13.00	31.97	180
10	18507.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 2 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3759.0	-61.29	5.10	11.05	Vertical	-55.34	-13.00	42.34	135
3	5638.9	-55.41	5.42	12.65	Vertical	-48.18	-13.00	35.18	90
4	7520.0	-54.96	6.70	13.85	Vertical	-47.81	-13.00	34.81	0
5	9400.0	-52.39	7.01	14.75	Vertical	-44.65	-13.00	31.65	45
6	11280.0	-51.83	7.48	15.95	Vertical	-43.36	-13.00	30.36	225
7	13160.0	-50.91	7.51	16.55	Vertical	-41.87	-13.00	28.87	315
8	15040.0	-52.78	8.24	15.35	Vertical	-45.67	-13.00	32.67	135
9	16920.0	-52.64	8.41	14.95	Vertical	-46.10	-13.00	33.10	135
10	18800.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

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LTE Band 2 1.4MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3817.5	-61.46	5.10	11.05	Vertical	-55.51	-13.00	42.51	270
3	5726.6	-54.04	5.42	12.65	Vertical	-46.81	-13.00	33.81	270
4	7637.2	-55.01	6.70	13.85	Vertical	-47.86	-13.00	34.86	315
5	9546.5	-52.57	7.01	14.75	Vertical	-44.83	-13.00	31.83	225
6	11455.8	-50.55	7.48	15.95	Vertical	-42.08	-13.00	29.08	0
7	13365.1	-50.13	7.51	16.55	Vertical	-41.09	-13.00	28.09	180
8	15274.4	-54.31	8.24	15.35	Vertical	-47.20	-13.00	34.20	180
9	17183.7	-51.39	8.41	14.95	Vertical	-44.85	-13.00	31.85	90
10	19093.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

LTE Band 2 3MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.1	-59.24	5.10	11.05	Vertical	-53.29	-13.00	40.29	270
3	5550.8	-56.01	5.42	12.65	Vertical	-48.78	-13.00	35.78	135
4	7406.0	-54.15	6.70	13.85	Vertical	-47.00	-13.00	34.00	45
5	9257.5	-52.49	7.01	14.75	Vertical	-44.75	-13.00	31.75	270
6	11109.0	-50.25	7.48	15.95	Vertical	-41.78	-13.00	28.78	0
7	12960.5	-51.66	7.51	16.55	Vertical	-42.62	-13.00	29.62	0
8	14812.0	-47.10	8.24	15.35	Vertical	-39.99	-13.00	26.99	225
9	16663.5	-50.95	8.41	14.95	Vertical	-44.41	-13.00	31.41	45
10	18515.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

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LTE Band 2 3MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3757.5	-50.07	5.10	11.05	Vertical	-44.12	-13.00	31.12	90
3	5636.3	-41.14	5.42	12.65	Vertical	-33.91	-13.00	20.91	135
4	7515.0	-48.22	6.70	13.85	Vertical	-41.07	-13.00	28.07	225
5	9400.0	-44.96	7.01	14.75	Vertical	-37.22	-13.00	24.22	90
6	11280.0	-45.06	7.48	15.95	Vertical	-36.59	-13.00	23.59	315
7	13160.0	-48.18	7.51	16.55	Vertical	-39.14	-13.00	26.14	135
8	15040.0	-45.27	8.24	15.35	Vertical	-38.16	-13.00	25.16	0
9	16920.0	-41.71	8.41	14.95	Vertical	-35.17	-13.00	22.17	315
10	18800.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

LTE Band 2 3MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3814.1	-50.23	5.10	11.05	Vertical	-44.28	-13.00	31.28	45
3	5722.1	-40.89	5.42	12.65	Vertical	-33.66	-13.00	20.66	315
4	7629.0	-48.18	6.70	13.85	Vertical	-41.03	-13.00	28.03	180
5	9542.5	-43.96	7.01	14.75	Vertical	-36.22	-13.00	23.22	135
6	11451.0	-44.71	7.48	15.95	Vertical	-36.24	-13.00	23.24	90
7	13359.5	-49.07	7.51	16.55	Vertical	-40.03	-13.00	27.03	90
8	15268.0	-47.98	8.24	15.35	Vertical	-40.87	-13.00	27.87	0
9	17176.5	-41.28	8.41	14.95	Vertical	-34.74	-13.00	21.74	225
10	19085.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

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LTE Band 2 5MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.5	-60.70	5.10	11.05	Vertical	-54.75	-13.00	41.75	90
3	5551.5	-56.01	5.42	12.65	Vertical	-48.78	-13.00	35.78	225
4	7410.0	-54.52	6.70	13.85	Vertical	-47.37	-13.00	34.37	135
5	9262.5	-51.74	7.01	14.75	Vertical	-44.00	-13.00	31.00	270
6	11115.0	-50.83	7.48	15.95	Vertical	-42.36	-13.00	29.36	135
7	12967.5	-50.63	7.51	16.55	Vertical	-41.59	-13.00	28.59	45
8	14820.0	-47.33	8.24	15.35	Vertical	-40.22	-13.00	27.22	45
9	16672.5	-50.06	8.41	14.95	Vertical	-43.52	-13.00	30.52	0
10	18525.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 2 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3760.0	-61.08	5.10	11.05	Vertical	-55.13	-13.00	42.13	270
3	5640.0	-55.54	5.42	12.65	Vertical	-48.31	-13.00	35.31	135
4	7520.0	-54.52	6.70	13.85	Vertical	-47.37	-13.00	34.37	0
5	9400.0	-51.80	7.01	14.75	Vertical	-44.06	-13.00	31.06	90
6	11280.0	-49.12	7.48	15.95	Vertical	-40.65	-13.00	27.65	0
7	13160.0	-50.32	7.51	16.55	Vertical	-41.28	-13.00	28.28	270
8	15040.0	-50.14	8.24	15.35	Vertical	-43.03	-13.00	30.03	90
9	16920.0	-51.04	8.41	14.95	Vertical	-44.50	-13.00	31.50	180
10	18800.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

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LTE Band 2 5MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3810.8	-60.13	5.10	11.05	Vertical	-54.18	-13.00	41.18	45
3	5716.1	-53.73	5.42	12.65	Vertical	-46.50	-13.00	33.50	315
4	7621.5	-53.98	6.70	13.85	Vertical	-46.83	-13.00	33.83	315
5	9537.5	-52.13	7.01	14.75	Vertical	-44.39	-13.00	31.39	135
6	11445.0	-48.49	7.48	15.95	Vertical	-40.02	-13.00	27.02	315
7	13352.5	-49.11	7.51	16.55	Vertical	-40.07	-13.00	27.07	315
8	15260.0	-51.93	8.24	15.35	Vertical	-44.82	-13.00	31.82	180
9	17167.5	-50.64	8.41	14.95	Vertical	-44.10	-13.00	31.10	90
10	19075.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 2 10MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3700.9	-59.18	5.10	11.05	Vertical	-53.23	-13.00	40.23	135
3	5551.9	-56.19	5.42	12.65	Vertical	-48.96	-13.00	35.96	180
4	7420.0	-53.50	6.70	13.85	Vertical	-46.35	-13.00	33.35	0
5	9275.0	-51.37	7.01	14.75	Vertical	-43.63	-13.00	30.63	225
6	11130.0	-47.66	7.48	15.95	Vertical	-39.19	-13.00	26.19	90
7	12985.0	-49.85	7.51	16.55	Vertical	-40.81	-13.00	27.81	45
8	14840.0	-45.56	8.24	15.35	Vertical	-38.45	-13.00	25.45	315
9	16695.0	-50.04	8.41	14.95	Vertical	-43.50	-13.00	30.50	0
10	18550.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

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LTE Band 2 10MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3751.1	-60.29	5.10	11.05	Vertical	-54.34	-13.00	41.34	315
3	5626.9	-55.27	5.42	12.65	Vertical	-48.04	-13.00	35.04	90
4	7520.0	-54.38	6.70	13.85	Vertical	-47.23	-13.00	34.23	0
5	9400.0	-51.77	7.01	14.75	Vertical	-44.03	-13.00	31.03	90
6	11280.0	-48.88	7.48	15.95	Vertical	-40.41	-13.00	27.41	90
7	13160.0	-49.97	7.51	16.55	Vertical	-40.93	-13.00	27.93	270
8	15040.0	-51.27	8.24	15.35	Vertical	-44.16	-13.00	31.16	135
9	16920.0	-51.83	8.41	14.95	Vertical	-45.29	-13.00	32.29	90
10	18800.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 2 10MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3801.0	-60.43	5.10	11.05	Vertical	-54.48	-13.00	41.48	45
3	5701.9	-54.78	5.42	12.65	Vertical	-47.55	-13.00	34.55	135
4	7620.0	-54.81	6.70	13.85	Vertical	-47.66	-13.00	34.66	90
5	9525.0	-54.17	7.01	14.75	Vertical	-46.43	-13.00	33.43	315
6	11430.0	-49.63	7.48	15.95	Vertical	-41.16	-13.00	28.16	0
7	13335.0	-49.24	7.51	16.55	Vertical	-40.20	-13.00	27.20	270
8	15240.0	-52.21	8.24	15.35	Vertical	-45.10	-13.00	32.10	45
9	17145.0	-50.43	8.41	14.95	Vertical	-43.89	-13.00	30.89	135
10	19050.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

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LTE Band 2 15MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3701.6	-46.71	5.10	11.05	Vertical	-40.76	-13.00	27.76	45
3	5552.6	-40.53	5.42	12.65	Vertical	-33.30	-13.00	20.30	90
4	7428.4	-49.89	6.70	13.85	Vertical	-42.74	-13.00	29.74	270
5	9284.6	-44.95	7.01	14.75	Vertical	-37.21	-13.00	24.21	225
6	11149.9	-47.42	7.48	15.95	Vertical	-38.95	-13.00	25.95	90
7	13002.8	-50.54	7.51	16.55	Vertical	-41.50	-13.00	28.50	45
8	14855.6	-45.23	8.24	15.35	Vertical	-38.12	-13.00	25.12	135
9	16711.9	-43.40	8.41	14.95	Vertical	-36.86	-13.00	23.86	225
10	18575.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

LTE Band 2 15MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3746.6	-49.87	5.10	11.05	Vertical	-43.92	-13.00	30.92	135
3	5620.1	-40.19	5.42	12.65	Vertical	-32.96	-13.00	19.96	135
4	7518.0	-49.20	6.70	13.85	Vertical	-42.05	-13.00	29.05	45
5	9403.9	-46.19	7.01	14.75	Vertical	-38.45	-13.00	25.45	270
6	11280.4	-47.93	7.48	15.95	Vertical	-39.46	-13.00	26.46	135
7	13161.4	-52.26	7.51	16.55	Vertical	-43.22	-13.00	30.22	45
8	15023.3	-48.10	8.24	15.35	Vertical	-40.99	-13.00	27.99	180
9	16941.4	-44.18	8.41	14.95	Vertical	-37.64	-13.00	24.64	180
10	18800.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

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LTE Band 2 15MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3791.6	-53.74	5.10	11.05	Vertical	-47.79	-13.00	34.79	45
3	5687.6	-42.92	5.42	12.65	Vertical	-35.69	-13.00	22.69	180
4	7615.5	-50.93	6.70	13.85	Vertical	-43.78	-13.00	30.78	180
5	9514.1	-48.91	7.01	14.75	Vertical	-41.17	-13.00	28.17	225
6	11417.6	-45.81	7.48	15.95	Vertical	-37.34	-13.00	24.34	0
7	13313.3	-49.66	7.51	16.55	Vertical	-40.62	-13.00	27.62	180
8	15231.4	-47.11	8.24	15.35	Vertical	-40.00	-13.00	27.00	270
9	17125.9	-44.99	8.41	14.95	Vertical	-38.45	-13.00	25.45	90
10	19025.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

LTE Band 2 20MHz CH-Low

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3702.0	-48.22	5.10	11.05	Vertical	-42.27	-13.00	29.27	180
3	5553.4	-40.62	5.42	12.65	Vertical	-33.39	-13.00	20.39	45
4	7440.0	-47.31	6.70	13.85	Vertical	-40.16	-13.00	27.16	135
5	9300.0	-43.54	7.01	14.75	Vertical	-35.80	-13.00	22.80	180
6	11160.0	-44.99	7.48	15.95	Vertical	-36.52	-13.00	23.52	225
7	13020.0	-48.86	7.51	16.55	Vertical	-39.82	-13.00	26.82	270
8	14880.0	-42.32	8.24	15.35	Vertical	-35.21	-13.00	22.21	0
9	16740.0	-44.61	8.41	14.95	Vertical	-38.07	-13.00	25.07	180
10	18600.0	/	/	/	/	/	/	/	/

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Vertical position.

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LTE Band 2 20MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3742.1	-50.24	5.10	11.05	Vertical	-44.29	-13.00	31.29	225
3	5613.4	-39.06	5.42	12.65	Vertical	-31.83	-13.00	18.83	315
4	7483.1	-50.40	6.70	13.85	Vertical	-43.25	-13.00	30.25	0
5	9402.8	-46.13	7.01	14.75	Vertical	-38.39	-13.00	25.39	90
6	11279.3	-48.81	7.48	15.95	Vertical	-40.34	-13.00	27.34	225
7	13162.5	-50.81	7.51	16.55	Vertical	-41.77	-13.00	28.77	180
8	15041.3	-47.97	8.24	15.35	Vertical	-40.86	-13.00	27.86	45
9	16916.6	-43.39	8.41	14.95	Vertical	-36.85	-13.00	23.85	225
10	18800.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

LTE Band 2 20MHz CH-High

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	3781.9	-51.90	5.10	11.05	Vertical	-45.95	-13.00	32.95	0
3	5673.8	-45.72	5.42	12.65	Vertical	-38.49	-13.00	25.49	180
4	7564.1	-48.67	6.70	13.85	Vertical	-41.52	-13.00	28.52	135
5	9500.0	-46.26	7.01	14.75	Vertical	-38.52	-13.00	25.52	225
6	11400.0	-45.33	7.48	15.95	Vertical	-36.86	-13.00	23.86	315
7	13300.0	-47.69	7.51	16.55	Vertical	-38.65	-13.00	25.65	0
8	15200.0	-45.73	8.24	15.35	Vertical	-38.62	-13.00	25.62	90
9	17100.0	-42.44	8.41	14.95	Vertical	-35.90	-13.00	22.90	225
10	19000.0	/	/	/	/	/	/	/	/
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Vertical position.									

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6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMU200	118133	2017-05-14	2018-05-13
Base Station Simulator	R&S	CMW500	113645	2017-05-14	2018-05-13
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	2017-05-14	2018-05-13
Spectrum Analyzer	Agilent	N9010A	MY47191109	2017-05-20	2018-05-19
Universal Radio Communication Tester	Agilent	E5515C	MY48367192	2017-05-20	2018-05-19
Signal Analyzer	R&S	FSV30	100815	2017-12-17	2018-12-16
EMI Test Receiver	R&S	ESCI	100948	2017-05-20	2018-05-19
Signal generator	R&S	SMB 100A	102594	2017-05-14	2018-05-13
Signal generator	R&S	SMR27	100365	2017-05-14	2018-05-13
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2014-12-06	2019-12-05
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2020-11-17
Horn Antenna	R&S	HF907	100126	2014-12-06	2019-12-05
Climatic Chamber	Re Ce	PT-30B	20101891	2015-07-18	2018-07-17
Horn Antenna	ETS-Lindgren	3160-09	00102644	2015-01-30	2020-01-29
RF Cable	Agilent	SMA 15cm	0001	2018-02-03	2018-08-02
Preampflier	R&S	SCU18	102327	2017-06-18	2018-06-17
Software	R&S	EMC32	V 8.52.0	NA	NA
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2017-05-14	2018-05-13

*******END OF REPORT *******

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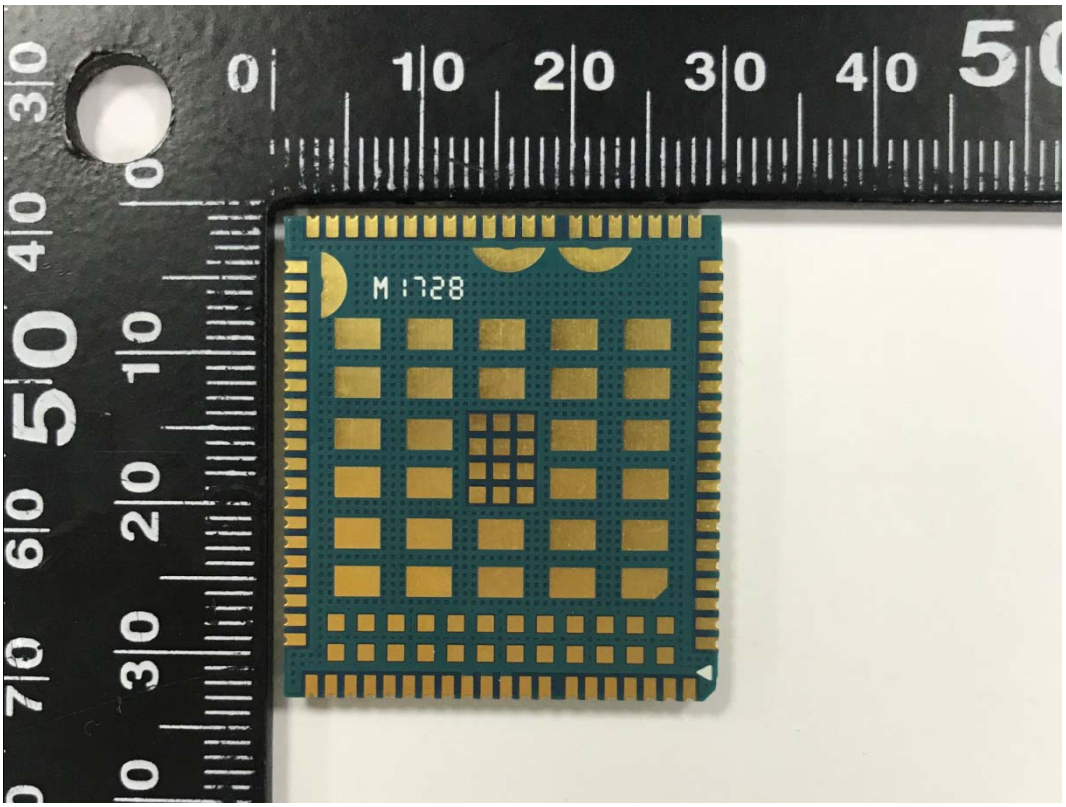
ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance

Front Side



Back Side

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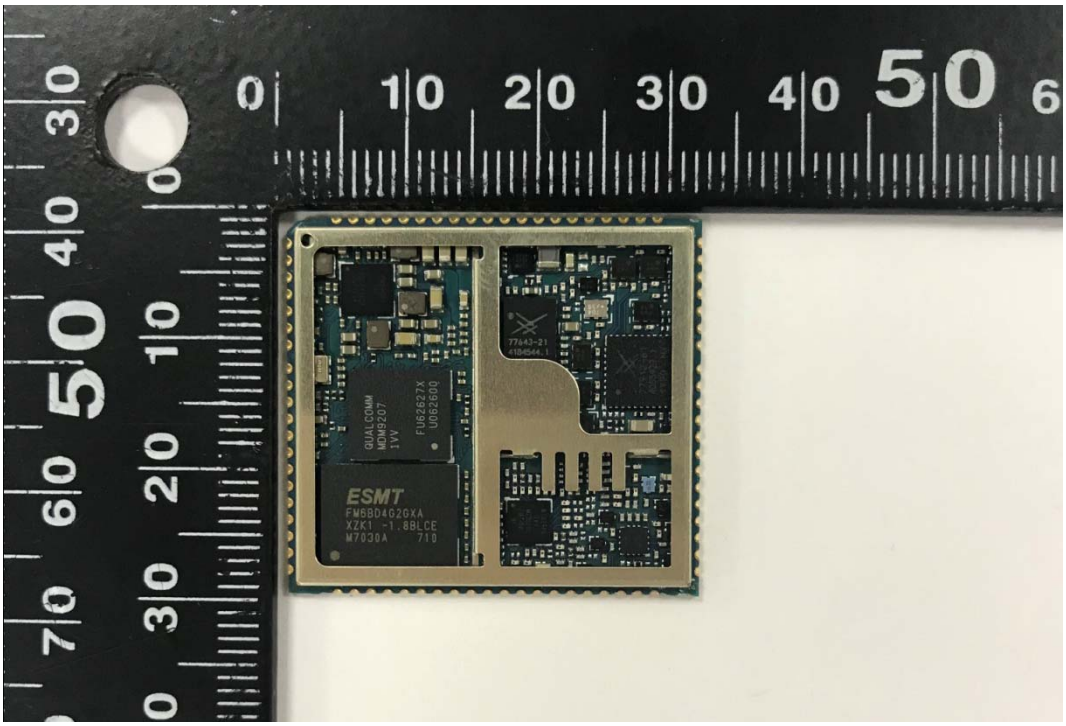

no shielding

a: EUT

Picture 1 EUT and Accessory

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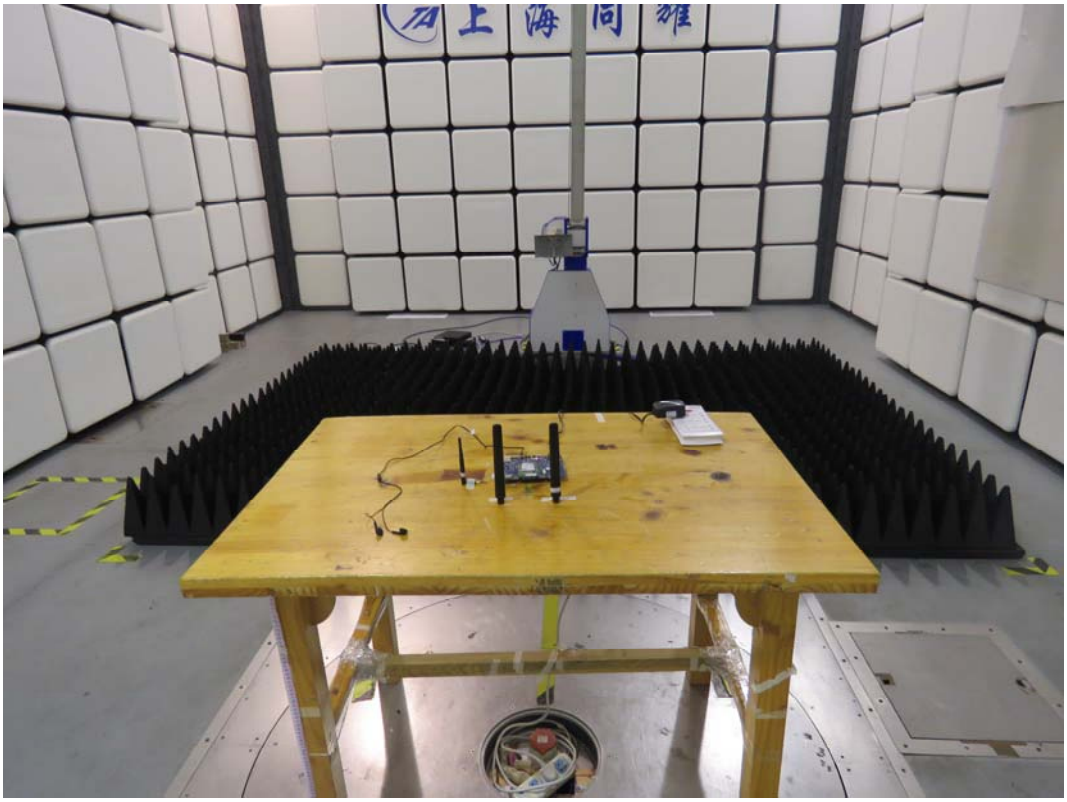
A.2 Test Setup



Picture 2: Radiated Spurious Emissions Test setup

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