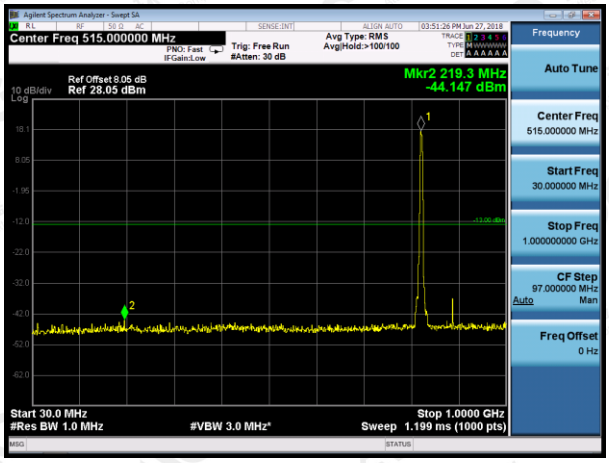
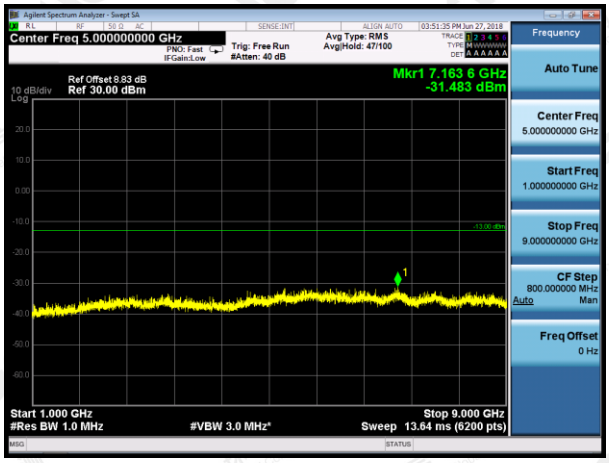
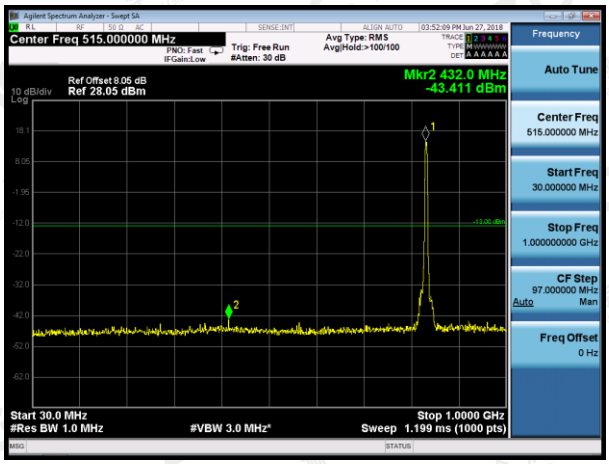
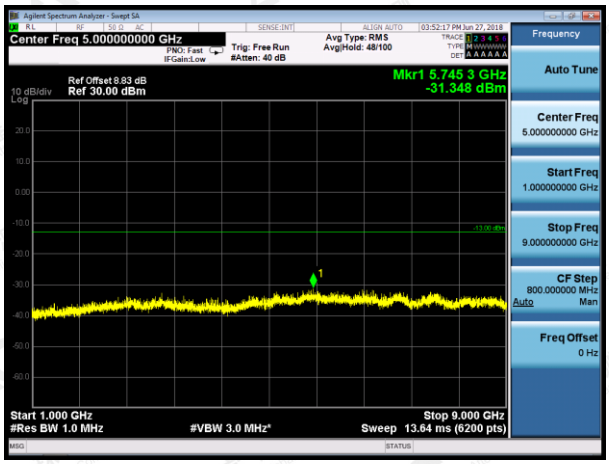
Test Band=WCDMA850/WCDMA 1900

Test Mode=UMTS

WCDMA 850-LCH	WCDMA 850-LCH
	

WCDMA 850-MCH	WCDMA 850-MCH
	

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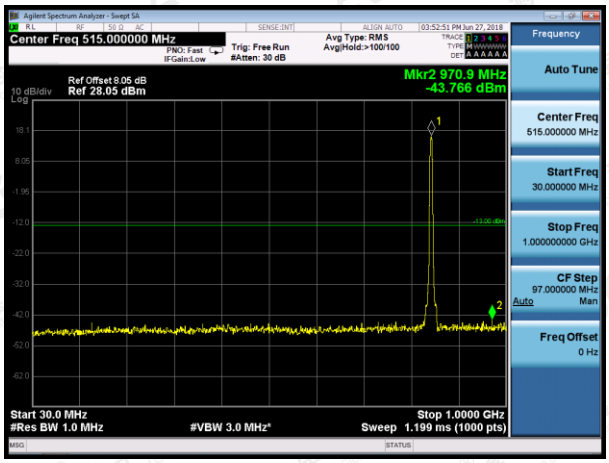
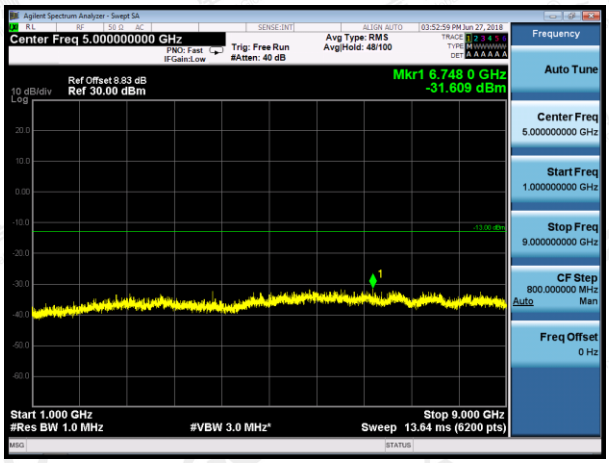
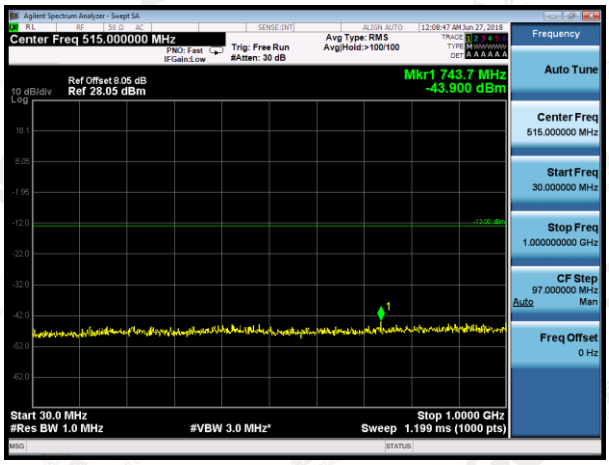
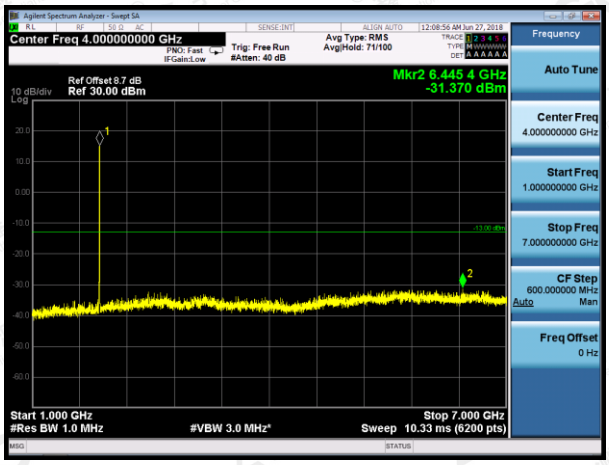
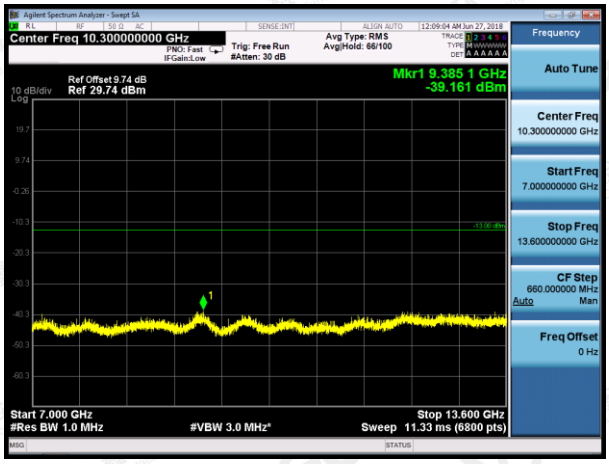
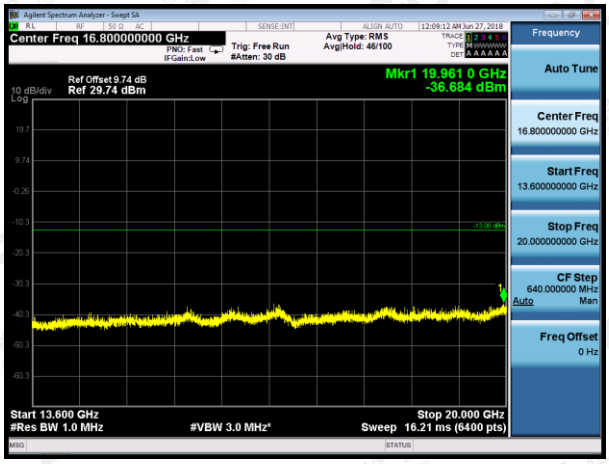
WCDMA 850-HCH	WCDMA 850-HCH
	

WCDMA 1900-LCH	WCDMA 1900-LCH
	

WCDMA 1900-LCH	WCDMA 1900-LCH
	

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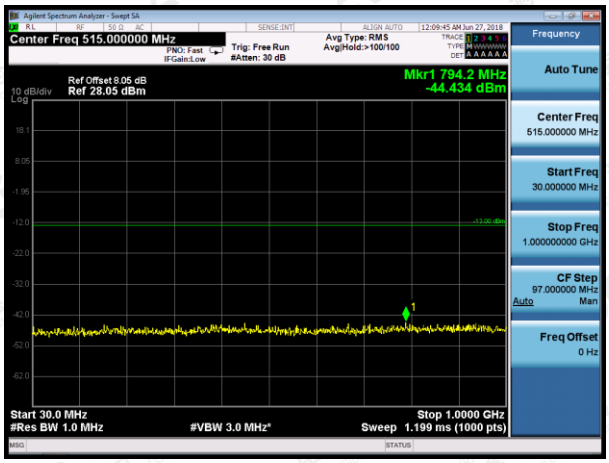
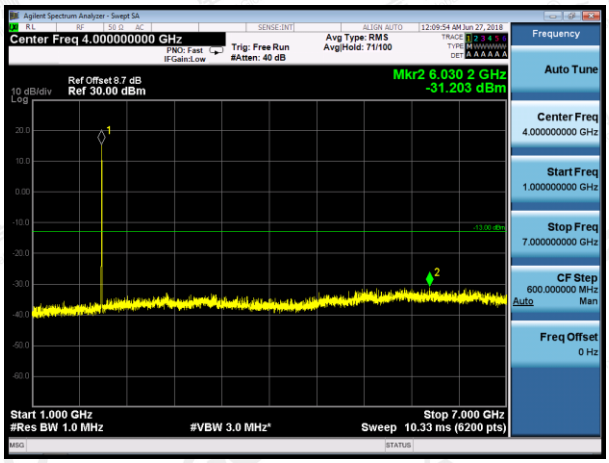
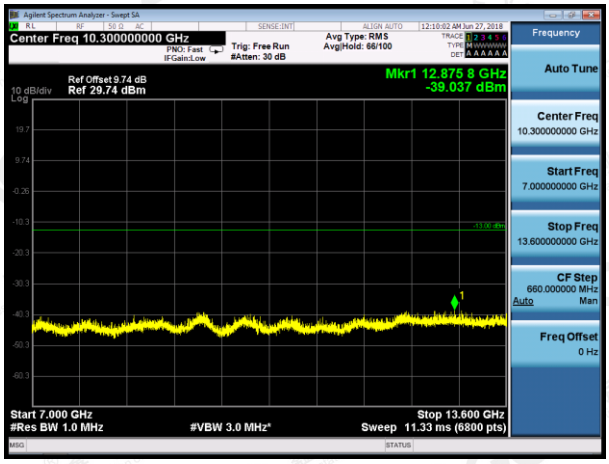
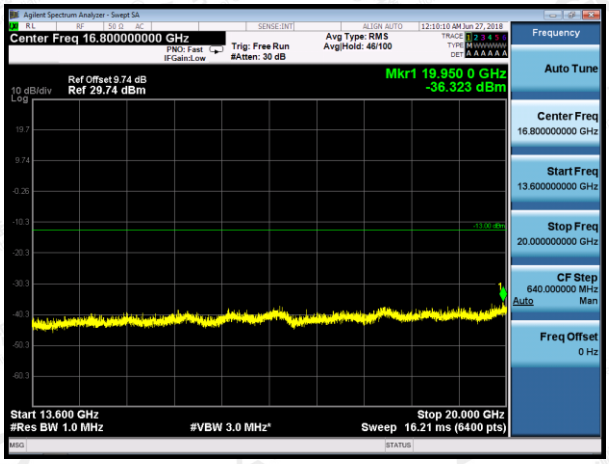
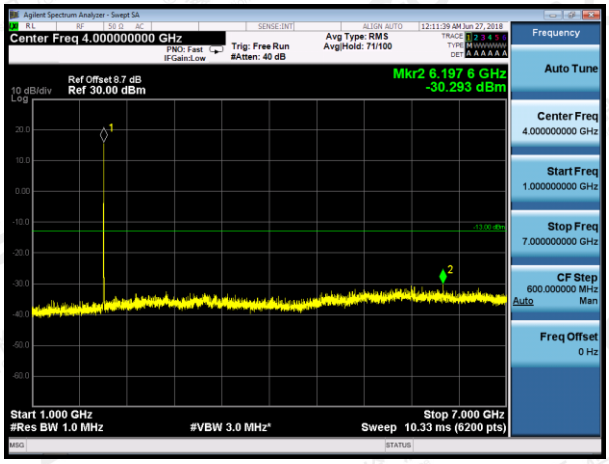
WCDMA 1900-MCH	WCDMA 1900-MCH
	

WCDMA 1900-MCH	WCDMA 1900-MCH
	

WCDMA 1900-HCH	WCDMA 1900-HCH
	

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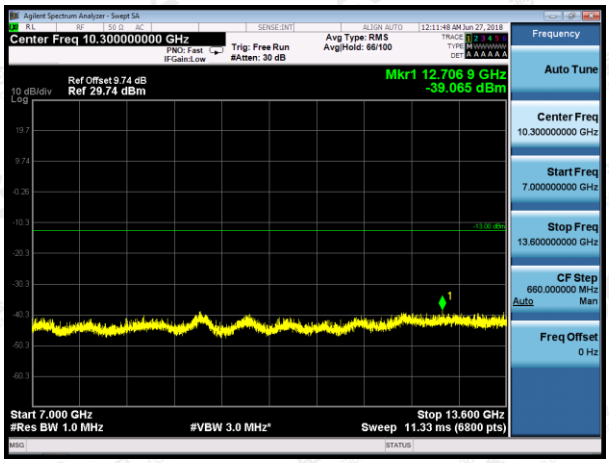
WCDMA 1900-HCH	WCDMA 1900-HCH
	

Note:1. Below 30MHZ no Spurious found and Above is the worst mode data.

2. As no emission found in standby or receive mode, no recording in this report.

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9.2 RADIATED SPURIOUS EMISSION

9.2.1MEASUREMENT METHOD

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

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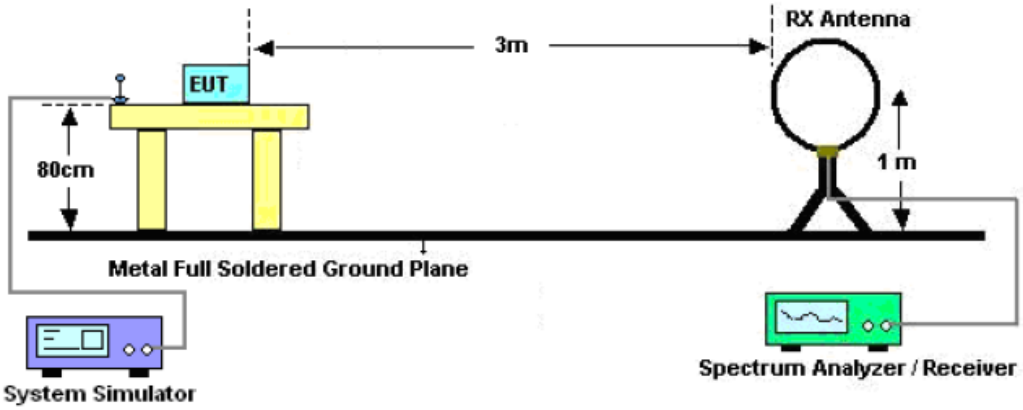
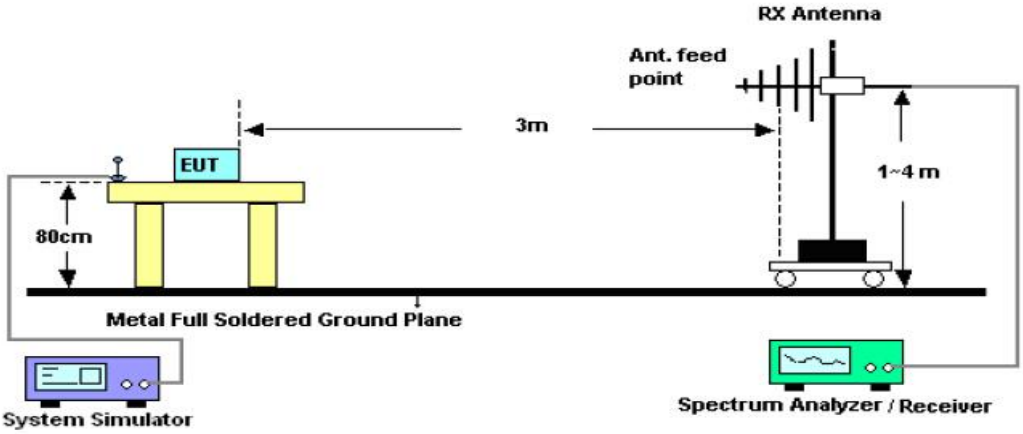
9.2.2 TEST SETUP

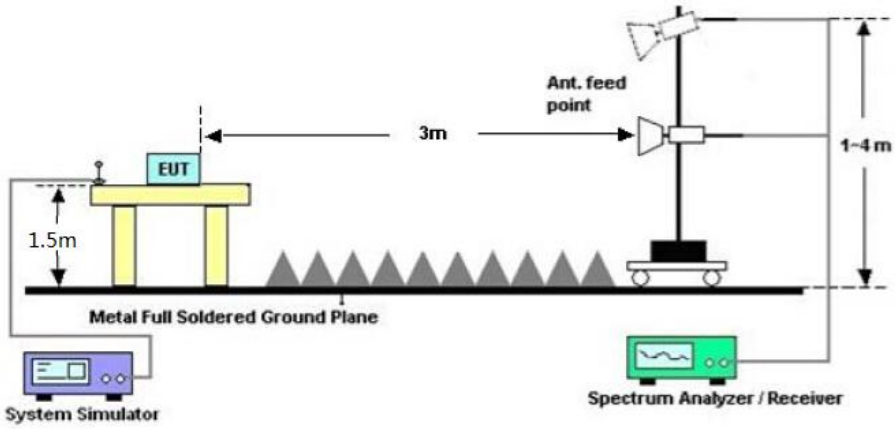
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



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9.2.3 PROVISIONS APPLICABLE

(a) On any frequency outside a licensee's frequency block (e.g. A, D, B, etc.) within the USPCS spectrum, the power of any emission shall be attenuated below the transmitter power (P, in Watts) by at least 43+10Log(P) dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

Note: only result the worst condition of each test mode:

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9.2.4 MEASUREMENT RESULT

GSM 850:

The Worst Test Results for Channel 251/848.8 MHz(1GHz-9GHz)				
Frequency (MHz)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Comment
1696.47	-47.51	-13	-34.51	Horizontal
2358.69	-34.79	-13	-21.79	Horizontal
3746.46	-37.21	-13	-24.21	Horizontal
1696.47	-48.28	-13	-35.28	Vertical
2358.69	-36.45	-13	-23.45	Vertical
3746.46	-37.49	-13	-24.49	Vertical

PCS 1900:

The Worst Test Results for Channel 810/1909.8MHz(1GHz-20GHz)				
Frequency (MHz)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Comment
1837.33	-47.39	-13	-34.39	Horizontal
3842.46	-34.78	-13	-21.78	Horizontal
7652.49	-37.26	-13	-24.26	Horizontal
1769.54	-48.33	-13	-35.33	Vertical
3821.38	-36.49	-13	-23.49	Vertical
7655.57	-37.51	-13	-24.51	Vertical

HSPA band V:

The Worst Test Results for Channel 4233/846.6MHz(1GHz-9GHz)				
Frequency (MHz)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Comment
1674.15	-47.46	-13	-34.46	Horizontal
2377.59	-34.80	-13	-21.80	Horizontal
3755.42	-37.30	-13	-24.30	Horizontal
1636.11	-48.38	-13	-35.38	Vertical
2347.69	-36.54	-13	-23.54	Vertical
3770.55	-37.53	-13	-24.53	Vertical

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HSPA band II:

The Worst Test Results for Channel 9538/1907.6MHz(1GHz-20GHz)				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
1870.51	-47.50	-13	-34.50	Horizontal
3746.15	-34.82	-13	-21.82	Horizontal
7526.42	-37.36	-13	-24.36	Horizontal
1880.55	-48.41	-13	-35.41	Vertical
3696.49	-36.57	-13	-23.57	Vertical
7611.53	-37.58	-13	-24.58	Vertical

RESULT: PASS

Note:

1. Margin = Emission Level -Limit
2. Below 30MHZ no Spurious found and Above is the worst mode data.

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10. FREQUENCY STABILITY

10.1 MEASUREMENT METHOD

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMU200 DIGITAL RADIO COMMUNICATION TESTER.

1 Measure the carrier frequency at room temperature.

2 Subject the EUT to overnight soak at -10℃.

3 With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

4 Repeat the above measurements at 10℃ increments from -10℃ to +50℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

5 Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1 1/2 hours unpowered, to allow any self-heating to stabilize, before continuing.

6 Subject the EUT to overnight soak at +50℃.

7 With the EUT, powered via nominal voltage, connected to the CMU200 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.

8 Repeat the above measurements at 10℃ increments from +50℃ to -10℃. Allow at least 1 1/2 hours at each temperature, unpowered, before making measurements.

9 At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

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10.2 PROVISIONS APPLICABLE

10.2.1 FOR HAND CARRIED BATTERY POWERED EQUIPMENT

According to the ANSI/TIA-603-E-2016, the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of between 3.3VDC and 4.2VDC, with a nominal voltage of 3.7VDC. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress. These voltages represent a tolerance of -10 % and +12.5 %. For the purposes of measuring frequency stability these voltage limits are to be used.

10.2.2 FOR EQUIPMENT POWERED BY PRIMARY SUPPLY VOLTAGE

According to the ANSI/TIA-603-E-2016，the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. For this EUT section 2.1055(d)(1) applies. This requires varying primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment, the normal environment temperature is 20°C.

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10.3 MEASUREMENT RESULT

Test Results

Frequency Error vs. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
GSM850	GSM	LCH	TN	VL	-15.17	-0.02	±2.5	PASS
			TN	VN	-15.37	-0.02	±2.5	PASS
			TN	VH	-15.63	-0.02	±2.5	PASS
		MCH	TN	VL	-11.95	-0.01	±2.5	PASS
			TN	VN	-13.82	-0.02	±2.5	PASS
			TN	VH	-12.46	-0.01	±2.5	PASS
		HCH	TN	VL	-11.43	-0.01	±2.5	PASS
			TN	VN	-12.20	-0.01	±2.5	PASS
			TN	VH	-12.53	-0.01	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt. (V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
PCS 1900	GSM	LCH	TN	VL	20.99	0.01	±2.5	PASS
			TN	VN	17.95	0.01	±2.5	PASS
			TN	VH	16.72	0.01	±2.5	PASS
		MCH	TN	VL	16.34	0.01	±2.5	PASS
			TN	VN	17.05	0.01	±2.5	PASS
			TN	VH	17.11	0.01	±2.5	PASS
		HCH	TN	VL	21.37	0.01	±2.5	PASS
			TN	VN	22.99	0.01	±2.5	PASS
			TN	VH	22.21	0.01	±2.5	PASS

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Frequency Error vs. Temperature:

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
GSM850	GSM	LCH	VN	-10	-13.88	-0.02	±2.5	PASS
			VN	0	-15.05	-0.02	±2.5	PASS
			VN	10	-14.92	-0.02	±2.5	PASS
			VN	20	-13.56	-0.02	±2.5	PASS
			VN	30	-13.17	-0.02	±2.5	PASS
			VN	40	-16.98	-0.02	±2.5	PASS
			VN	50	-13.69	-0.02	±2.5	PASS
GSM850	GSM	MCH	VN	-10	-16.14	-0.02	±2.5	PASS
			VN	0	-14.46	-0.02	±2.5	PASS
			VN	10	-14.21	-0.02	±2.5	PASS
			VN	20	-12.14	-0.01	±2.5	PASS
			VN	30	-16.01	-0.02	±2.5	PASS
			VN	40	-12.01	-0.01	±2.5	PASS
			VN	50	-12.85	-0.02	±2.5	PASS
GSM850	GSM	HCH	VN	-10	-14.21	-0.02	±2.5	PASS
			VN	0	-14.14	-0.02	±2.5	PASS
			VN	10	-12.59	-0.02	±2.5	PASS
			VN	20	-14.27	-0.02	±2.5	PASS
			VN	30	-13.43	-0.02	±2.5	PASS
			VN	40	-11.69	-0.01	±2.5	PASS
			VN	50	-13.82	-0.02	±2.5	PASS

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Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
PCS 1900	GSM	LCH	VN	-10	21.18	0.01	±2.5	PASS
			VN	0	18.53	0.01	±2.5	PASS
			VN	10	18.53	0.01	±2.5	PASS
			VN	20	16.01	0.01	±2.5	PASS
			VN	30	17.37	0.01	±2.5	PASS
			VN	40	21.89	0.01	±2.5	PASS
			VN	50	18.98	0.01	±2.5	PASS
PCS 1900	GSM	MCH	VN	-10	19.44	0.01	±2.5	PASS
			VN	0	17.63	0.01	±2.5	PASS
			VN	10	18.02	0.01	±2.5	PASS
			VN	20	19.76	0.01	±2.5	PASS
			VN	30	20.66	0.01	±2.5	PASS
			VN	40	19.18	0.01	±2.5	PASS
			VN	50	17.43	0.01	±2.5	PASS
PCS 1900	GSM	HCH	VN	-10	20.40	0.01	±2.5	PASS
			VN	0	19.63	0.01	±2.5	PASS
			VN	10	16.14	0.01	±2.5	PASS
			VN	20	16.79	0.01	±2.5	PASS
			VN	30	22.08	0.01	±2.5	PASS
			VN	40	22.47	0.01	±2.5	PASS
			VN	50	24.80	0.01	±2.5	PASS

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Frequency Error vs. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA850	UMTS	LCH	TN	VL	0.27	0.00	±2.5	PASS
			TN	VN	-2.73	0.00	±2.5	PASS
			TN	VH	0.63	0.00	±2.5	PASS
		MCH	TN	VL	3.30	0.00	±2.5	PASS
			TN	VN	2.53	0.00	±2.5	PASS
			TN	VH	3.80	0.00	±2.5	PASS
		HCH	TN	VL	1.48	0.00	±2.5	PASS
			TN	VN	2.38	0.00	±2.5	PASS
			TN	VH	1.36	0.00	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.(V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA1900	UMTS	LCH	TN	VL	27.89	0.02	±2.5	PASS
			TN	VN	26.82	0.01	±2.5	PASS
			TN	VH	29.07	0.02	±2.5	PASS
		MCH	TN	VL	28.85	0.02	±2.5	PASS
			TN	VN	28.47	0.02	±2.5	PASS
			TN	VH	30.27	0.02	±2.5	PASS
		HCH	TN	VL	29.65	0.02	±2.5	PASS
			TN	VN	35.54	0.02	±2.5	PASS
			TN	VH	31.05	0.02	±2.5	PASS

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Frequency Error vs. Temperature:

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA850	UMTS	LCH	VN	-10	-2.46	0.00	±2.5	PASS
			VN	0	-1.75	0.00	±2.5	PASS
			VN	10	2.84	0.00	±2.5	PASS
			VN	20	0.08	0.00	±2.5	PASS
			VN	30	4.26	0.01	±2.5	PASS
			VN	40	1.46	0.00	±2.5	PASS
			VN	50	-4.59	-0.01	±2.5	PASS
WCDMA850	UMTS	MCH	VN	-10	0.09	0.00	±2.5	PASS
			VN	0	-0.32	0.00	±2.5	PASS
			VN	10	4.24	0.01	±2.5	PASS
			VN	20	0.49	0.00	±2.5	PASS
			VN	30	0.12	0.00	±2.5	PASS
			VN	40	4.87	0.01	±2.5	PASS
			VN	50	2.44	0.00	±2.5	PASS
WCDMA850	UMTS	HCH	VN	-10	1.50	0.00	±2.5	PASS
			VN	0	4.65	0.01	±2.5	PASS
			VN	10	3.83	0.00	±2.5	PASS
			VN	20	7.29	0.01	±2.5	PASS
			VN	30	2.52	0.00	±2.5	PASS
			VN	40	2.24	0.00	±2.5	PASS
			VN	50	3.80	0.00	±2.5	PASS

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Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA1900	UMTS	LCH	VN	-10	27.65	0.01	±2.5	PASS
			VN	0	27.65	0.01	±2.5	PASS
			VN	10	31.91	0.02	±2.5	PASS
			VN	20	25.13	0.01	±2.5	PASS
			VN	30	25.31	0.01	±2.5	PASS
			VN	40	33.94	0.02	±2.5	PASS
			VN	50	30.35	0.02	±2.5	PASS
WCDMA1900	UMTS	MCH	VN	-10	30.03	0.02	±2.5	PASS
			VN	0	33.45	0.02	±2.5	PASS
			VN	10	28.43	0.02	±2.5	PASS
			VN	20	30.94	0.02	±2.5	PASS
			VN	30	32.73	0.02	±2.5	PASS
			VN	40	28.79	0.02	±2.5	PASS
			VN	50	30.27	0.02	±2.5	PASS
WCDMA1900	UMTS	HCH	VN	-10	28.66	0.02	±2.5	PASS
			VN	0	30.26	0.02	±2.5	PASS
			VN	10	36.07	0.02	±2.5	PASS
			VN	20	28.76	0.02	±2.5	PASS
			VN	30	28.11	0.01	±2.5	PASS
			VN	40	33.87	0.02	±2.5	PASS
			VN	50	29.98	0.02	±2.5	PASS

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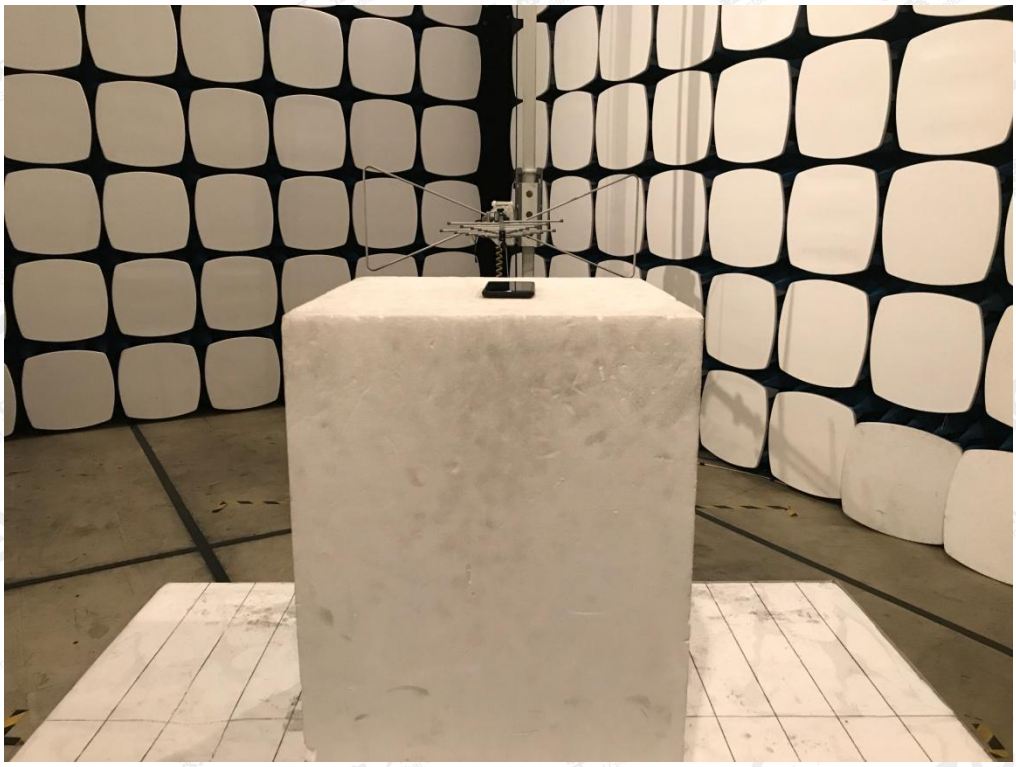
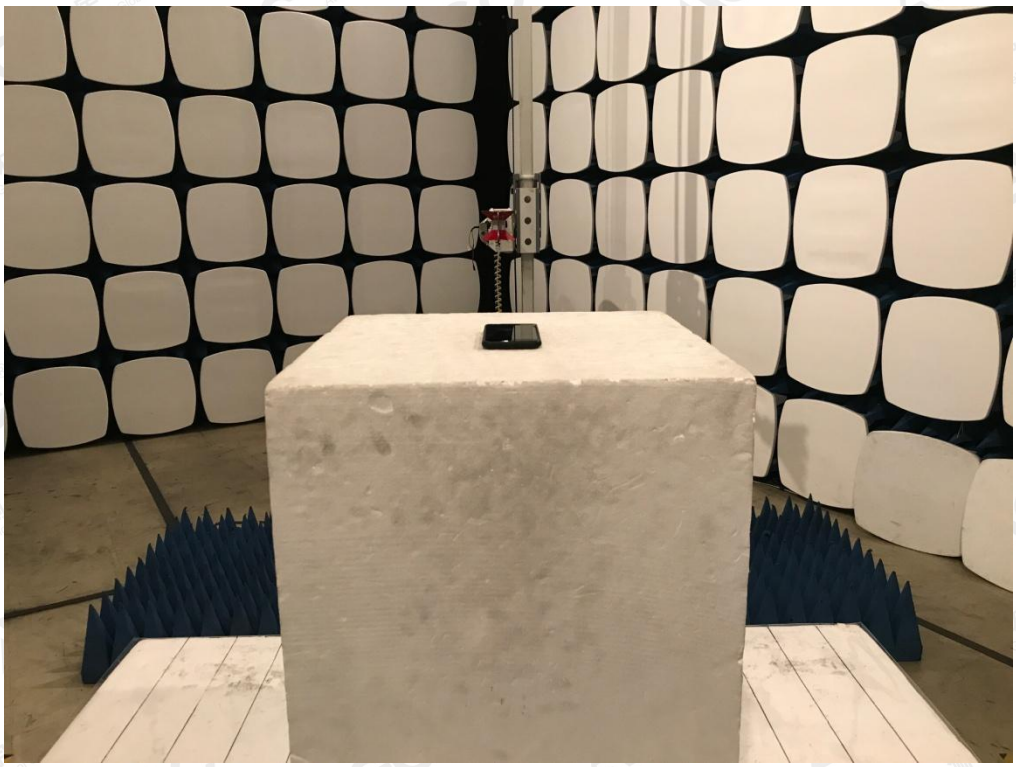
APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED SPURIOUS EMISSION



RADIATED SPURIOUS ABOVE 1G EMISSION



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CONDUCTED MEASUREMENTS

----END OF REPORT----

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