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:

9.2.4 MEASUREMENT RESULT

GSM 850:

The Worst Test Results for Channel 251/848.8 MHz(1GHz-9GHz)				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
1696.47	-48.56	-13	-35.56	Horizontal
2358.69	-35.47	-13	-22.47	Horizontal
3746.46	-38.03	-13	-25.03	Horizontal
1696.47	-48.74	-13	-35.74	Vertical
2358.69	-36.44	-13	-23.44	Vertical
3746.46	-35.59	-13	-22.59	Vertical

PCS 1900:

The Worst Test Results for Channel 810/1909.8MHz(1GHz-20GHz)				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
1837.33	-48.97	-13.00	-35.97	Horizontal
3842.46	-39.44	-13.00	-26.44	Horizontal
7652.49	-36.52	-13.00	-23.52	Horizontal
1769.54	-49.15	-13.00	-36.15	Vertical
3821.38	-39.44	-13.00	-26.44	Vertical
7655.57	-36.69	-13.00	-23.69	Vertical

HSPA band V:

The Worst Test Results for Channel 4233/846.6MHz(1GHz-9GHz)				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
1674.15	-49.63	-13	-36.63	Horizontal
2377.59	-36.11	-13	-23.11	Horizontal
3755.42	-35.42	-13	-22.42	Horizontal
1636.11	-49.46	-13	-36.46	Vertical
2347.69	-39.33	-13	-26.33	Vertical
3770.55	-35.65	-13	-22.65	Vertical

HSPA band IV:

The Worst Test Results for Channel 810/1909.8MHz				
Frequency	Emission Level	Limits	Margin	Comment
(MHz)	(dBm)	(dBm)	(dB)	
1947.56	-49.55	-13	-36.55	Horizontal
3244.69	-37.64	-13	-24.64	Horizontal
7499.41	-37.40	-13	-24.40	Horizontal
1697.15	-49.61	-13	-36.61	Vertical
3545.56	-38.33	-13	-25.33	Vertical
7511.42	-33.17	-13	-20.17	Vertical

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	-48.55	-13	-35.55	Horizontal
3746.15	-38.36	-13	-25.36	Horizontal
7526.42	-35.16	-13	-22.16	Horizontal
1880.55	-50.55	-13	-37.55	Vertical
3696.49	-39.14	-13	-26.14	Vertical
7611.53	-34.49	-13	-21.49	Vertical

RESULT: PASS

Note:

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

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 +55℃. 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 +55℃.

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 +55℃ 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.

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 3.4VDC and 4.2VDC, with a nominal voltage of3.7VDC. 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^{o}C.

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	1.74	0.00	±2.5	PASS
			TN	VN	6.20	0.01	±2.5	PASS
			TN	VH	3.03	0.00	±2.5	PASS
		MCH	TN	VL	1.55	0.00	±2.5	PASS
			TN	VN	3.49	0.00	±2.5	PASS
			TN	VH	4.20	0.01	±2.5	PASS
		HCH	TN	VL	2.84	0.00	±2.5	PASS
			TN	VN	2.84	0.00	±2.5	PASS
			TN	VH	4.91	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
GSM850	GPRS	LCH	TN	VL	0.97	0.00	±2.5	PASS
			TN	VN	4.00	0.00	±2.5	PASS
			TN	VH	2.84	0.00	±2.5	PASS
		MCH	TN	VL	6.26	0.01	±2.5	PASS
			TN	VN	3.49	0.00	±2.5	PASS
			TN	VH	0.65	0.00	±2.5	PASS
		HCH	TN	VL	-3.10	0.00	±2.5	PASS
			TN	VN	-0.90	0.00	±2.5	PASS
			TN	VH	4.26	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	-11.75	-0.01	±2.5	PASS
			TN	VN	-5.88	0.00	±2.5	PASS
			TN	VH	-1.74	0.00	±2.5	PASS
		MCH	TN	VL	4.52	0.00	±2.5	PASS
			TN	VN	7.94	0.00	±2.5	PASS
			TN	VH	3.62	0.00	±2.5	PASS
		HCH	TN	VL	7.10	0.00	±2.5	PASS
			TN	VN	8.39	0.00	±2.5	PASS
			TN	VH	6.78	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
PCS 1900	GPRS	LCH	TN	VL	11.11	0.01	±2.5	PASS
			TN	VN	14.85	0.01	±2.5	PASS
			TN	VH	10.65	0.01	±2.5	PASS
		MCH	TN	VL	4.07	0.00	±2.5	PASS
			TN	VN	3.16	0.00	±2.5	PASS
			TN	VH	0.26	0.00	±2.5	PASS
		HCH	TN	VL	5.17	0.00	±2.5	PASS
			TN	VN	7.43	0.00	±2.5	PASS
			TN	VH	5.94	0.00	±2.5	PASS

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	6.78	0.01	±2.5	PASS
			VN	0	3.87	0.00	±2.5	PASS
			VN	10	3.81	0.00	±2.5	PASS
			VN	20	2.65	0.00	±2.5	PASS
			VN	30	3.49	0.00	±2.5	PASS
			VN	40	3.03	0.00	±2.5	PASS
			VN	50	5.10	0.01	±2.5	PASS
GSM850	GSM	MCH	VN	-10	7.62	0.01	±2.5	PASS
			VN	0	5.68	0.01	±2.5	PASS
			VN	10	5.55	0.01	±2.5	PASS
			VN	20	4.13	0.00	±2.5	PASS
			VN	30	4.52	0.01	±2.5	PASS
			VN	40	3.87	0.00	±2.5	PASS
			VN	50	4.52	0.01	±2.5	PASS
GSM850	GSM	HCH	VN	-10	4.58	0.01	±2.5	PASS
			VN	0	3.55	0.00	±2.5	PASS
			VN	10	1.81	0.00	±2.5	PASS
			VN	20	3.29	0.00	±2.5	PASS
			VN	30	1.61	0.00	±2.5	PASS
			VN	40	6.20	0.01	±2.5	PASS
			VN	50	0.97	0.00	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
GSM850	GPRS	LCH	VN	-10	2.39	0.00	±2.5	PASS
			VN	0	6.20	0.01	±2.5	PASS
			VN	10	2.97	0.00	±2.5	PASS
			VN	20	3.55	0.00	±2.5	PASS
			VN	30	4.46	0.01	±2.5	PASS
			VN	40	-0.77	0.00	±2.5	PASS
			VN	50	2.13	0.00	±2.5	PASS
GSM850	GPRS	MCH	VN	-10	0.77	0.00	±2.5	PASS
			VN	0	-2.52	0.00	±2.5	PASS
			VN	10	4.07	0.00	±2.5	PASS
			VN	20	1.81	0.00	±2.5	PASS
			VN	30	0.65	0.00	±2.5	PASS
			VN	40	1.10	0.00	±2.5	PASS
			VN	50	-4.07	0.00	±2.5	PASS
GSM850	GPRS	HCH	VN	-10	-3.10	0.00	±2.5	PASS
			VN	0	-3.03	0.00	±2.5	PASS
			VN	10	-6.26	-0.01	±2.5	PASS
			VN	20	-1.16	0.00	±2.5	PASS
			VN	30	-6.59	-0.01	±2.5	PASS
			VN	40	-5.36	-0.01	±2.5	PASS
			VN	50	-1.10	0.00	±2.5	PASS

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	7.55	0.00	±2.5	PASS
			VN	0	3.81	0.00	±2.5	PASS
			VN	10	3.81	0.00	±2.5	PASS
			VN	20	5.75	0.00	±2.5	PASS
			VN	30	5.29	0.00	±2.5	PASS
			VN	40	5.68	0.00	±2.5	PASS
			VN	50	6.46	0.00	±2.5	PASS
PCS 1900	GSM	MCH	VN	-10	3.49	0.00	±2.5	PASS
			VN	0	5.75	0.00	±2.5	PASS
			VN	10	2.84	0.00	±2.5	PASS
			VN	20	6.26	0.00	±2.5	PASS
			VN	30	3.10	0.00	±2.5	PASS
			VN	40	1.23	0.00	±2.5	PASS
			VN	50	4.84	0.00	±2.5	PASS
PCS 1900	GSM	HCH	VN	-10	9.88	0.01	±2.5	PASS
			VN	0	7.81	0.00	±2.5	PASS
			VN	10	10.78	0.01	±2.5	PASS
			VN	20	5.36	0.00	±2.5	PASS
			VN	30	8.65	0.00	±2.5	PASS
			VN	40	10.78	0.01	±2.5	PASS
			VN	50	7.94	0.00	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
PCS 1900	GPRS	LCH	VN	-10	25.25	0.01	±2.5	PASS
			VN	0	26.47	0.01	±2.5	PASS
			VN	10	25.57	0.01	±2.5	PASS
			VN	20	30.67	0.02	±2.5	PASS
			VN	30	27.38	0.01	±2.5	PASS
			VN	40	25.96	0.01	±2.5	PASS
			VN	50	16.34	0.01	±2.5	PASS
PCS 1900	GPRS	MCH	VN	-10	11.69	0.01	±2.5	PASS
			VN	0	0.71	0.00	±2.5	PASS
			VN	10	0.52	0.00	±2.5	PASS
			VN	20	1.55	0.00	±2.5	PASS
			VN	30	5.94	0.00	±2.5	PASS
			VN	40	9.10	0.00	±2.5	PASS
			VN	50	10.98	0.01	±2.5	PASS
PCS 1900	GPRS	HCH	VN	-10	-1.36	0.00	±2.5	PASS
			VN	0	0.90	0.00	±2.5	PASS
			VN	10	9.88	0.01	±2.5	PASS
			VN	20	5.94	0.00	±2.5	PASS
			VN	30	2.84	0.00	±2.5	PASS
			VN	40	-8.65	0.00	±2.5	PASS
			VN	50	7.04	0.00	±2.5	PASS

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	-3.95	0.00	±2.5	PASS
			TN	VN	-5.72	-0.01	±2.5	PASS
			TN	VH	-5.69	-0.01	±2.5	PASS
		MCH	TN	VL	-0.27	0.00	±2.5	PASS
			TN	VN	-1.02	0.00	±2.5	PASS
			TN	VH	1.14	0.00	±2.5	PASS
		HCH	TN	VL	-1.62	0.00	±2.5	PASS
			TN	VN	2.88	0.00	±2.5	PASS
			TN	VH	0.21	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
WCDMA1700	UMTS	LCH	TN	VL	19.26	0.01	±2.5	PASS
			TN	VN	17.96	0.01	±2.5	PASS
			TN	VH	24.69	0.01	±2.5	PASS
		MCH	TN	VL	25.68	0.01	±2.5	PASS
			TN	VN	25.91	0.01	±2.5	PASS
			TN	VH	27.77	0.02	±2.5	PASS
		HCH	TN	VL	22.20	0.01	±2.5	PASS
			TN	VN	24.17	0.01	±2.5	PASS
			TN	VH	26.69	0.02	±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	31.08	0.02	±2.5	PASS
			TN	VN	30.14	0.02	±2.5	PASS
			TN	VH	28.98	0.02	±2.5	PASS
		MCH	TN	VL	28.79	0.02	±2.5	PASS
			TN	VN	30.59	0.02	±2.5	PASS
			TN	VH	29.02	0.02	±2.5	PASS
		HCH	TN	VL	23.90	0.01	±2.5	PASS
			TN	VN	29.50	0.02	±2.5	PASS
			TN	VH	33.23	0.02	±2.5	PASS

Frequency Error vs. Temperature:

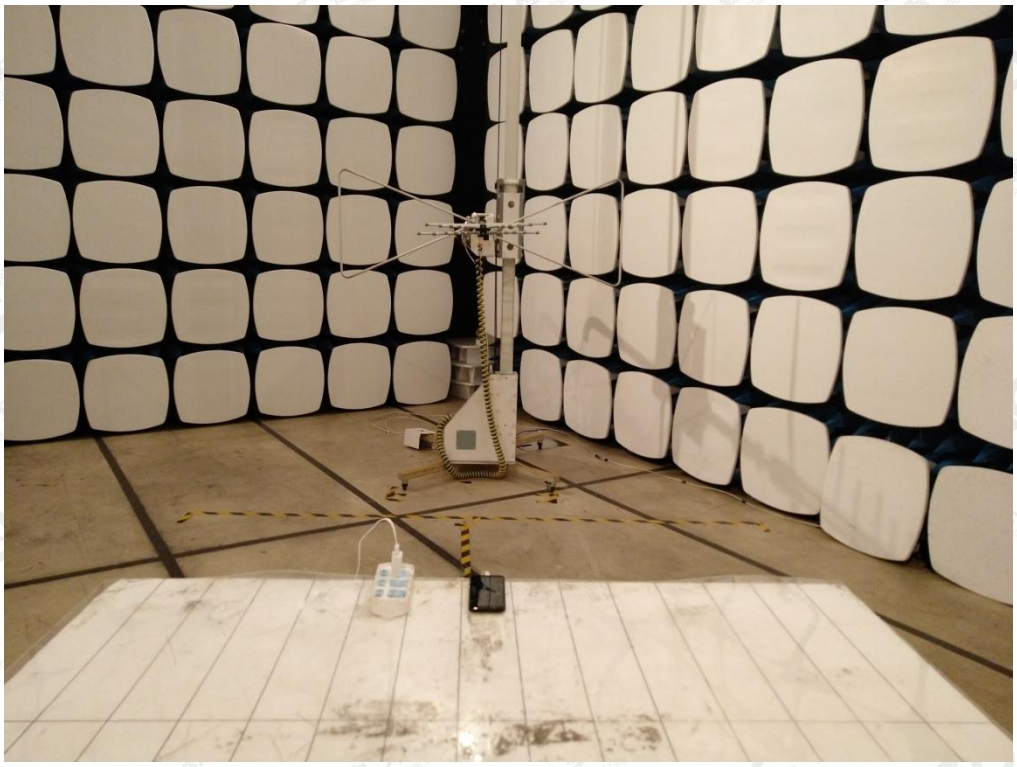
Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA850	UMTS	LCH	VN	-10	-1.91	0.00	±2.5	PASS
			VN	0	-4.65	-0.01	±2.5	PASS
			VN	10	-1.43	0.00	±2.5	PASS
			VN	20	-1.48	0.00	±2.5	PASS
			VN	30	-4.55	-0.01	±2.5	PASS
			VN	40	-3.23	0.00	±2.5	PASS
			VN	50	-4.38	-0.01	±2.5	PASS
WCDMA850	UMTS	MCH	VN	-10	2.14	0.00	±2.5	PASS
			VN	0	-0.27	0.00	±2.5	PASS
			VN	10	-2.21	0.00	±2.5	PASS
			VN	20	-1.71	0.00	±2.5	PASS
			VN	30	-2.14	0.00	±2.5	PASS
			VN	40	-0.18	0.00	±2.5	PASS
			VN	50	-1.48	0.00	±2.5	PASS
WCDMA850	UMTS	HCH	VN	-10	1.19	0.00	±2.5	PASS
			VN	0	1.83	0.00	±2.5	PASS
			VN	10	1.48	0.00	±2.5	PASS
			VN	20	1.63	0.00	±2.5	PASS
			VN	30	-1.30	0.00	±2.5	PASS
			VN	40	0.66	0.00	±2.5	PASS
			VN	50	0.37	0.00	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA1700	UMTS	LCH	VN	-10	23.90	0.01	±2.5	PASS
			VN	0	19.50	0.01	±2.5	PASS
			VN	10	17.75	0.01	±2.5	PASS
			VN	20	20.23	0.01	±2.5	PASS
			VN	30	20.32	0.01	±2.5	PASS
			VN	40	24.67	0.01	±2.5	PASS
			VN	50	19.24	0.01	±2.5	PASS
WCDMA1700	UMTS	MCH	VN	-10	26.31	0.02	±2.5	PASS
			VN	0	29.89	0.02	±2.5	PASS
			VN	10	20.78	0.01	±2.5	PASS
			VN	20	27.91	0.02	±2.5	PASS
			VN	30	25.82	0.01	±2.5	PASS
			VN	40	28.29	0.02	±2.5	PASS
			VN	50	25.54	0.01	±2.5	PASS
WCDMA1700	UMTS	HCH	VN	-10	23.76	0.01	±2.5	PASS
			VN	0	24.67	0.01	±2.5	PASS
			VN	10	23.74	0.01	±2.5	PASS
			VN	20	23.67	0.01	±2.5	PASS
			VN	30	19.70	0.01	±2.5	PASS
			VN	40	23.85	0.01	±2.5	PASS
			VN	50	19.33	0.01	±2.5	PASS

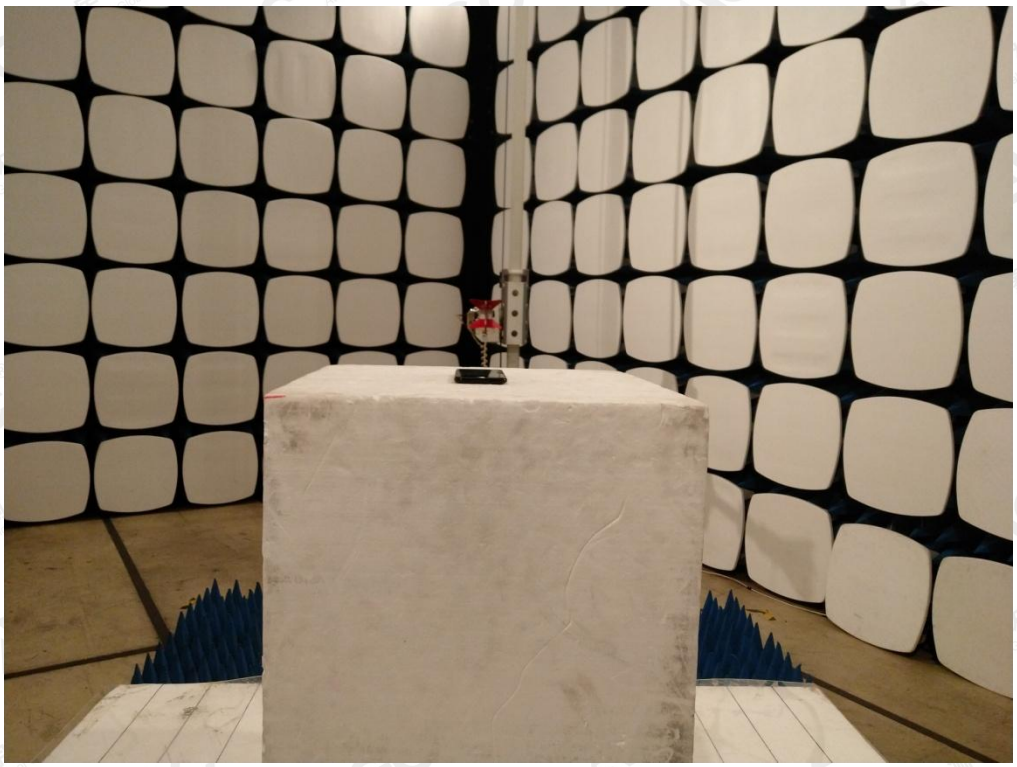
Test Band	Test Mode	Test Channel	Test Volt.	Test Temp. ℃	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
WCDMA1900	UMTS	LCH	VN	-10	29.08	0.02	±2.5	PASS
			VN	0	28.78	0.02	±2.5	PASS
			VN	10	31.57	0.02	±2.5	PASS
			VN	20	27.85	0.02	±2.5	PASS
			VN	30	34.42	0.02	±2.5	PASS
			VN	40	27.24	0.01	±2.5	PASS
			VN	50	25.83	0.01	±2.5	PASS
WCDMA1900	UMTS	MCH	VN	-10	35.29	0.02	±2.5	PASS
			VN	0	28.58	0.02	±2.5	PASS
			VN	10	29.94	0.02	±2.5	PASS
			VN	20	32.10	0.02	±2.5	PASS
			VN	30	28.63	0.02	±2.5	PASS
			VN	40	31.97	0.02	±2.5	PASS
			VN	50	31.91	0.02	±2.5	PASS
WCDMA1900	UMTS	HCH	VN	-10	31.40	0.02	±2.5	PASS
			VN	0	26.38	0.01	±2.5	PASS
			VN	10	35.06	0.02	±2.5	PASS
			VN	20	32.38	0.02	±2.5	PASS
			VN	30	29.28	0.02	±2.5	PASS
			VN	40	28.75	0.02	±2.5	PASS
			VN	50	29.19	0.02	±2.5	PASS

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED SPURIOUS EMISSION



RADIATED SPURIOUS ABOVE 1G EMISSION



CONDUCTED MEASUREMENTS

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