

Report No.: TZ191201191-E6



5.5.2 RADIATED SPURIOUS EMISSION

5.5.2.1 MEASUREMENT METHOD

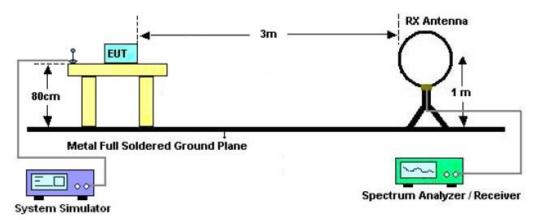
- 1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 2. Power on the EUT and all the supporting units. The turntable was rotated 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.

5.5.2.2 TEST SETUP

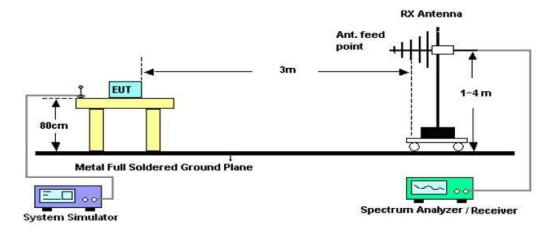




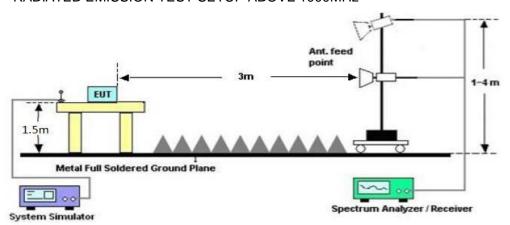
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz

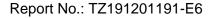


RADIATED EMISSION TEST SETUP ABOVE 1000MHz



5.5.2.3 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:





5.5.2.4 MEASUREMENT RESULT

GSM 850:

	The Worst Test Results for Channel 190/836.6 MHz										
Frequency	Emission Level	Limits	Margin	Commont							
(MHz)	(MHz) (dBm)		(dB)	Comment							
1672.86	-56.13	-13	43.13	Horizontal							
3346.13	-38.72	-13	25.72	Horizontal							
5019.21	-50.87	-13	37.87	Horizontal							
1672.88	-42.44	-13	29.44	Vertical							
3346.02	-48.69	-13	35.69	Vertical							
5019.37	-48.55	-13	35.55	Vertical							

PCS 1900:

	The Worst Test Results for Channel 661/1880 MHz										
Frequency	Emission Level	Limits	Margin	Comment							
(MHz)	(dBm)	(dBm)	(dB)	Comment							
3759.71	-56.54	-13	43.54	Horizontal							
7519.77	-38.63	-13	25.63	Horizontal							
11279.74	-51.73	-13	38.73	Horizontal							
3759.64	-39.21	-13	26.21	Vertical							
7519.74	-49.64	-13	36.64	Vertical							
11279.78	-43.87	-13	30.87	Vertical							

WCDMA BAND II:

	The Worst Test Results for Channel 9400/1880 MHz										
Frequency	Emission Level	Limits	Margin	Comment							
(MHz)	(MHz) (dBm)		(dB)	Comment							
3759.67	-55.62	-13	42.62	Horizontal							
7519.68	-41.73	-13	28.73	Horizontal							
11279.74	-51.18	-13	38.18	Horizontal							
3759.77	-41.39	-13	28.39	Vertical							
7519.72	-50.70	-13	37.70	Vertical							
11279.74	-44.99	-13	31.99	Vertical							





WCDMA BAND V:

	The Worst Test Results for Channel 4233/846.6MHz										
Frequency	Emission Level	Limits	Margin	Comment							
(MHz)	(MHz) (dBm)		(dB)	Comment							
1692.92	-55.79	-13	42.79	Horizontal							
3386.19	-40.17	-13	27.17	Horizontal							
5079.35	-51.88	-13	38.88	Horizontal							
1692.85	-42.93	-13	29.93	Vertical							
3386.13	-52.39	-13	39.39	Vertical							
5079.22	-46.71	-13	33.71	Vertical							

RESULT: PASS

Note:

11. Margin = Limit - Emission Level

12. Below 30MHZ no Spurious found and Above is the worst mode data.





5.6 FREQUENCY STABILITY

5.6.1 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 channel 661 for PCS 1900 band, channel 190 for GSM 850 band, channel 9400 for UMTS band II, channel 1412 for UMTS band IV and channel 4175 for UMTS band V 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°C increments from -10°C to +50°C. 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°C.
- 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° C increments from $+50^{\circ}$ C to -10° C. 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 °C during the measurement procedure.

5.6.2 PROVISIONS APPLICABLE

5.6.2.1 FOR HAND CARRIED BATTERY POWERED EQUIPMENT

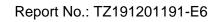
According to the ANSI/TIA-603-E-2016, the frequency stability of the carrier shall be accurate to within 0.1 ppm of the received frequency from the base station. This accuracy is sufficient to meet Sec. 24.235, Frequency Stability. The frequency stability shall be sufficient to ensure that the fundamental 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 3.5VDC and 4.35VDC, with a nominal voltage of 3.8VDC. 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.





5.6.2.2 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.





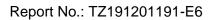
5.6.3 MEASUREMENT RESULT

Test Results

Frequency Error vs. Voltage:

Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit	\/a mali a4
Band	Mode	Channel	Temp.	Volt.(V)	(Hz)	(ppm)	(ppm)	Verdict
			TN	VL	-13.07	-0.02	±2.5	PASS
		LCH	TN	VN	-5.37	-0.01	±2.5	PASS
			TN	VH	14.87	0.02	±2.5	PASS
			TN	VL	13.13	0.02	±2.5	PASS
GSM850	GPRS	MCH	TN	VN	-18.43	-0.02	±2.5	PASS
			TN	VH	-15.57	-0.02	±2.5	PASS
		НСН	TN	VL	9.14	0.01	±2.5	PASS
			TN	VN	10.48	0.01	±2.5	PASS
			TN	VH	18.68	0.02	±2.5	PASS

Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit) / a mali a t
Band	Mode	Channel	Temp.	Volt.(V)	(Hz)	(ppm)	(ppm)	Verdict
			TN	VL	-21.25	-0.03	±2.5	PASS
		LCH	TN	VN	-9.38	-0.01	±2.5	PASS
			TN	VH	13.93	0.02	±2.5	PASS
		GPRS MCH	TN	VL	-17.82	-0.02	±2.5	PASS
GSM850	EGPRS		TN	VN	-13.72	-0.02	±2.5	PASS
			TN	VH	-15.01	-0.02	±2.5	PASS
		НСН	TN	VL	27.66	0.03	±2.5	PASS
			TN	VN	-26.43	-0.03	±2.5	PASS
			TN	VH	26.49	0.03	±2.5	PASS





Test	Test	Test	Test	Test	Freq. Error	Freq.vs.rated	Limit	Verdict
Band	Mode	Channel	Temp.	Volt. (V)	(Hz)	(ppm)	(ppm)	
			TN	VL	12.26	0.01	±2.5	PASS
		LCH	TN	VN	-14.94	-0.01	±2.5	PASS
			TN	VH	-7.86	0.00	±2.5	PASS
DCC		RS MCH	TN	VL	11.55	0.01	±2.5	PASS
PCS 1900	GPRS		TN	VN	-13.96	-0.01	±2.5	PASS
1900			TN	VH	-11.40	-0.01	±2.5	PASS
		НСН	TN	VL	-24.61	-0.01	±2.5	PASS
			TN	VN	26.12	0.01	±2.5	PASS
			TN	VH	-26.11	-0.01	±2.5	PASS

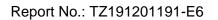
Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit	Verdict
Band	Mode	Channel	Temp.	Volt. (V)	(Hz)	(ppm)	(ppm)	
			TN	VL	12.08	0.01	±2.5	PASS
		LCH	TN	VN	17.62	0.01	±2.5	PASS
			TN	VH	16.98	0.01	±2.5	PASS
PCS			TN	VL	16.42	0.01	±2.5	PASS
1900	EGPRS	MCH	TN	VN	11.19	0.01	±2.5	PASS
1900			TN	VH	19.34	0.01	±2.5	PASS
		НСН	TN	VL	-26.22	-0.01	±2.5	PASS
			TN	VN	25.15	0.01	±2.5	PASS
			TN	VH	29.95	0.02	±2.5	PASS





Frequency Error vs. Temperature:

Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit	\/a naliat
Band	Mode	Channel	Volt.	Volt. (V)	(Hz)	(ppm)	(ppm)	Verdict
			VN	-10	16.65	0.02	±2.5	PASS
			VN	0	3.13	0.00	±2.5	PASS
			VN	10	-6.53	-0.01	±2.5	PASS
GSM850	GPRS	LCH	VN	20	10.57	0.01	±2.5	PASS
			VN	30	29.41	0.04	±2.5	PASS
			VN	40	18.55	0.02	±2.5	PASS
			VN	50	30.54	0.04	±2.5	PASS
			VN	-10	-9.48	-0.01	±2.5	PASS
			VN	0	-13.76	-0.02	±2.5	PASS
			VN	10	7.34	0.01	±2.5	PASS
GSM850	GPRS	MCH	VN	20	-17.39	-0.02	±2.5	PASS
			VN	30	-36.11	-0.04	±2.5	PASS
			VN	40	-11.49	-0.01	±2.5	PASS
			VN	50	-24.36	-0.03	±2.5	PASS
			VN	-10	-37.60	-0.04	±2.5	PASS
			VN	0	-35.64	-0.04	±2.5	PASS
			VN	10	-8.40	-0.01	±2.5	PASS
GSM850	GSM850 GPRS	PRS HCH	VN	20	-11.64	-0.01	±2.5	PASS
			VN	30	28.18	0.03	±2.5	PASS
			VN	40	12.99	0.02	±2.5	PASS
			VN	50	-30.36	-0.04	±2.5	PASS



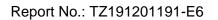


Test Band	Test Mode	Test Channel	Test Volt.	Test Volt. (V)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict
Dana	IVIOGO	Onamici	VN	-10	20.99	0.03	±2.5	PASS
			VN	0	-1.56	0.00	±2.5	PASS
			VN	10	-12.09	-0.01	±2.5	PASS
GSM850	EGPR	LCH	VN	20	-10.81	-0.01	±2.5	PASS
	S		VN	30	-30.17	-0.04	±2.5	PASS
			VN	40	-10.03	-0.01	±2.5	PASS
			VN	50	-31.90	-0.04	±2.5	PASS
			VN	-10	-12.84	-0.02	±2.5	PASS
		MCH	VN	0	-7.83	-0.01	±2.5	PASS
			VN	10	-10.92	-0.01	±2.5	PASS
GSM850	EGPR		VN	20	18.35	0.02	±2.5	PASS
	S		VN	30	-36.94	-0.04	±2.5	PASS
			VN	40	10.46	0.01	±2.5	PASS
			VN	50	-31.92	-0.04	±2.5	PASS
			VN	-10	-37.31	-0.04	±2.5	PASS
			VN	0	-37.28	-0.04	±2.5	PASS
			VN	10	9.77	0.01	±2.5	PASS
GSM850	EGPR		VN	20	12.29	0.01	±2.5	PASS
	S		VN	30	-30.47	-0.04	±2.5	PASS
			VN	40	6.84	0.01	±2.5	PASS
			VN	50	-28.28	-0.03	±2.5	PASS



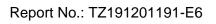


Test Band	Test Mode	Test Channel	Test Volt.	Test Tem. (°C)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict	
Dana	Wodo	Onamo	VN	-10	-9.25	0.00	±2.5	PASS	
			VN	0	1.08	0.00	±2.5	PASS	
				VN	10	-38.16	-0.02	±2.5	PASS
PCS	GPRS	LCH	VN	20	26.00	0.01	±2.5	PASS	
1900			VN	30	10.90	0.01	±2.5	PASS	
			VN	40	-13.01	-0.01	±2.5	PASS	
			VN	50	-35.18	-0.02	±2.5	PASS	
			VN	-10	-11.52	-0.01	±2.5	PASS	
			VN	0	0.65	0.00	±2.5	PASS	
PCS			VN	10	38.39	0.02	±2.5	PASS	
1900	GPRS	MCH	VN	20	-32.91	-0.02	±2.5	PASS	
1900			VN	30	-26.03	-0.01	±2.5	PASS	
			VN	40	-42.99	-0.02	±2.5	PASS	
			VN	50	-36.95	-0.02	±2.5	PASS	
			VN	-10	30.17	0.02	±2.5	PASS	
			VN	0	-4.39	0.00	±2.5	PASS	
PCS			VN	10	17.30	0.01	±2.5	PASS	
1900	GPRS	HCH	VN	20	-27.17	-0.01	±2.5	PASS	
1300			VN	30	-39.04	-0.02	±2.5	PASS	
			VN	40	11.95	0.01	±2.5	PASS	
			VN	50	34.31	0.02	±2.5	PASS	





Test Band	Test Mode	Test Channel	Test Volt.	Test Tem. (°C)	Freq.Error (Hz)	Freq.vs.rated (ppm)	Limit (ppm)	Verdict		
			VN	-10	10.73	0.01	±2.5	PASS		
			VN	0	1.81	0.00	±2.5	PASS		
D00			VN	10	-41.23	-0.02	±2.5	PASS		
PCS 1900	EGPR	LCH	VN	20	-29.50	-0.02	±2.5	PASS		
1900	S		VN	30	10.38	0.01	±2.5	PASS		
			VN	40	13.30	0.01	±2.5	PASS		
			VN	50	31.64	0.02	±2.5	PASS		
			VN	-10	-13.62	-0.01	±2.5	PASS		
		MCH	VN	0	2.00	0.00	±2.5	PASS		
PCS			VN	10	-32.16	-0.02	±2.5	PASS		
1900	EGPR		VN	20	-29.37	-0.02	±2.5	PASS		
1900	S		VN	30	-27.08	-0.01	±2.5	PASS		
			VN	40	-42.51	-0.02	±2.5	PASS		
			VN	50	31.11	0.02	±2.5	PASS		
					VN	-10	-31.83	-0.02	±2.5	PASS
			VN	0	-4.67	0.00	±2.5	PASS		
PCS			VN	10	14.24	0.01	±2.5	PASS		
1900	EGPR	SPR HCH	VN	20	-24.33	-0.01	±2.5	PASS		
1900	S		VN	30	33.29	0.02	±2.5	PASS		
			VN	40	-14.86	-0.01	±2.5	PASS		
			VN	50	30.56	0.02	±2.5	PASS		





Frequency Error vs. Voltage:

Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit	Verdict
Band	Mode	Channel	Temp.	Volt.(V)	(Hz)	(ppm)	(ppm)	
WCDMA850	UMTS	LCH	TN	VL	13.47	0.02	±2.5	PASS
			TN	VN	-12.66	-0.02	±2.5	PASS
			TN	VH	-10.95	-0.01	±2.5	PASS
		MCH	TN	VL	14.92	0.02	±2.5	PASS
			TN	VN	12.66	0.02	±2.5	PASS
			TN	VH	-9.40	-0.01	±2.5	PASS
		НСН	TN	VL	12.80	0.02	±2.5	PASS
			TN	VN	15.03	0.02	±2.5	PASS
			TN	VH	11.09	0.01	±2.5	PASS

Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit	Vordiet
Band	Mode	Channel	Temp.	Volt.(V)	(Hz)	(ppm)	(ppm)	Verdict
WCDMA1900	UMTS	LCH	TN	VL	-22.06	-0.03	±2.5	PASS
			TN	VN	15.52	0.02	±2.5	PASS
			TN	VH	-8.45	-0.01	±2.5	PASS
		MCH	TN	VL	15.80	0.02	±2.5	PASS
			TN	VN	20.33	0.02	±2.5	PASS
			TN	VH	14.70	0.02	±2.5	PASS
		НСН	TN	VL	-24.61	-0.03	±2.5	PASS
			TN	VN	29.10	0.03	±2.5	PASS
			TN	VH	-28.77	-0.03	±2.5	PASS





Frequency Error vs. Temperature:

Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit	\
Band	Mode	Channel	Volt.	Tem. (°C)	(Hz)	(ppm)	(ppm)	Verdict
	UMTS	LCH	VN	-10	-14.80	-0.02	±2.5	PASS
			VN	0	-3.27	0.00	±2.5	PASS
WCDMA850			VN	10	-6.79	-0.01	±2.5	PASS
			VN	20	-6.44	-0.01	±2.5	PASS
			VN	30	31.58	0.04	±2.5	PASS
			VN	40	15.38	0.02	±2.5	PASS
			VN	50	34.78	0.04	±2.5	PASS
	UMTS	МСН	VN	-10	14.62	0.02	±2.5	PASS
			VN	0	7.41	0.01	±2.5	PASS
			VN	10	-8.42	-0.01	±2.5	PASS
WCDMA850			VN	20	-10.76	-0.01	±2.5	PASS
			VN	30	-33.36	-0.04	±2.5	PASS
			VN	40	-15.27	-0.02	±2.5	PASS
			VN	50	23.98	0.03	±2.5	PASS
	UMTS	нсн	VN	-10	30.22	0.04	±2.5	PASS
WCDMA850			VN	0	37.50	0.04	±2.5	PASS
			VN	10	8.57	0.01	±2.5	PASS
			VN	20	-5.41	-0.01	±2.5	PASS
			VN	30	-32.08	-0.04	±2.5	PASS
			VN	40	7.72	0.01	±2.5	PASS
			VN	50	-30.77	-0.04	±2.5	PASS





Test	Test	Test	Test	Test	Freq.Error	Freq.vs.rated	Limit	Verdict
Band	Mode	Channel	Volt.	Tem. (℃)	(Hz)	(ppm)	(ppm)	
	UMTS	LCH	VN	-10	12.83	0.01	±2.5	PASS
			VN	0	-3.77	0.00	±2.5	PASS
WCDMA1900			VN	10	-35.10	-0.02	±2.5	PASS
			VN	20	28.12	0.01	±2.5	PASS
			VN	30	-13.18	-0.01	±2.5	PASS
			VN	40	-20.00	-0.01	±2.5	PASS
			VN	50	-26.58	-0.01	±2.5	PASS
	UMTS	МСН	VN	-10	-10.82	-0.01	±2.5	PASS
WCDMA1900			VN	0	-1.01	0.00	±2.5	PASS
			VN	10	37.74	0.02	±2.5	PASS
			VN	20	-29.23	-0.02	±2.5	PASS
			VN	30	-24.97	-0.01	±2.5	PASS
			VN	40	41.61	0.02	±2.5	PASS
			VN	50	37.19	0.02	±2.5	PASS
WCDMA1900	UMTS	S HCH	VN	-10	35.00	0.02	±2.5	PASS
			VN	0	-4.75	0.00	±2.5	PASS
			VN	10	-20.26	-0.01	±2.5	PASS
			VN	20	24.73	0.01	±2.5	PASS
			VN	30	29.57	0.02	±2.5	PASS
			VN	40	18.20	0.01	±2.5	PASS
			VN	50	31.61	0.02	±2.5	PASS





5 Test Set up Photos of the EUT

Please refer to separated files for Test Setup Photos of the EUT.

6 External Photos of the EUT

Please refer to separated files for External Photos of the EUT.

7 Internal Photos of the EUT

Please refer to separated files for Internal Photos of the EUT.