



FCC RADIO TEST REPORT

FCC ID : LHJ-FE4NA0210
Equipment : FE4NA0210
Brand Name : Continental
Model Name : FE4NA0210
Applicant : Continental Automotive Systems, Inc.
21440 W Lake Cook Rd.
Manufacturer : Continental Automotive Systems, Inc.
21440 W Lake Cook Rd.
Standard : FCC 47 CFR Part 2, 22(H), 24(E), 27(L)

The product was received on Nov. 30, 2021 and testing was performed from Dec. 29, 2021 to Jan. 10, 2022. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

Sportun International Inc. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



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History of this test report



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.2	§2.1046	Conducted Output Power	Pass	-
	§22.913 (a)(5)	Effective Radiated Power (WCDMA Band V)		
	§24.232 (c)	Equivalent Isotropic Radiated Power (WCDMA Band II)		
	§27.50 (d)(4)	Equivalent Isotropic Radiated Power (WCDMA Band IV)		
-	§24.232 (d)	Peak-to-Average Ratio	Not Required	-
-	§2.1049 §22.917 (b) §24.238 (b) §27.53 (g)	Occupied Bandwidth (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	Not Required	-
-	§2.1051 §22.917 (a) §24.238 (a) §27.53 (g)	Band Edge Measurement (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	Not Required	-
-	§2.1051 §22.917 (a) §24.238 (a) §27.53 (g)	Conducted Emission (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	Not Required	-
-	§2.1055 §22.355 §24.235 §27.54	Frequency Stability Temperature & Voltage	Not Required	-
4.4	§2.1053 §22.917 (a) §24.238 (a) §27.53 (h)	Field Strength of Spurious Radiation (WCDMA Band V) (WCDMA Band II) (WCDMA Band IV)	Pass	34.71 dB under the limit at 9546.000 MHz

Remark:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report by adding host information. All the test cases were performed on original report which can be referred to Sporton Report Number FG031205-01A. Based on the original report, the test cases were verified.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Yun Huang

Report Producer: Cindy Liu



1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	FE4NA0210
Brand Name	Continental
Model Name	FE4NA0210
FCC ID	LHJ-FE4NA0210
Integrated the Host	Equipment: G12N410G1, G12N410M1 Brand Name: Continental Model Name: G12N410G1, G12N410M1
EUT supports Radios application	WCDMA/HSPA/LTE/GNSS
HW Version	P4
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

Antenna Information				
External Antenna	Brand Name	Continental	Peak gain(dBi)	Cellular Band: 3.86 PCS Band: 6.90 AWS Band: 4.95
	Model Name	84650406	Type	Cell
Internal Antenna	Brand Name	Continental	Peak gain(dBi)	Cellular Band: 3.88 PCS Band: 3.90 AWS Band: 4.88
	Model Name	INTANT01	Type	TCP

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx Frequency	WCDMA: Band V: 826.4 MHz ~ 846.6 MHz Band II: 1852.4 MHz ~ 1907.6 MHz Band IV: 1712.4 MHz ~ 1752.6 MHz
Rx Frequency	WCDMA: Band V: 871.4 MHz ~ 891.6 MHz Band II: 1932.4 MHz ~ 1987.6 MHz Band IV: 2112.4 MHz ~ 2152.6 MHz
Maximum Output Power to Antenna	WCDMA: Band V: 22.85 dBm Band II: 22.71 dBm Band IV: 22.59 dBm
Type of Modulation	WCDMA: BPSK (Uplink) HSDPA: 64QAM (Downlink) HSUPA: QPSK (Uplink)

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.



1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sportun International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sportun Site No. 03CH07-HY
Test Engineer	Stan Hsieh and Ken Wu
Temperature (°C)	22.4~23.6
Relative Humidity (%)	56.9~60.7

Note: The test site complies with ANSI C63.4 2014 requirement.

Test Site	Sportun International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	Sportun Site No. TH05-HY (TAF Code: 3786)
Test Engineer	Hao En Zhang
Temperature (°C)	20.3~23.6
Relative Humidity (%)	43.3~54.3
Remark	The Conducted test item subcontracted to Sporton International Inc. Wensan Laboratory

FCC Designation No.: TW1190 and TW3786



1.5 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ ANSI C63.26-2015
- ♦ ANSI / TIA-603-E
- ♦ FCC 47 CFR Part 2, 22(H), 24(E), 27(L)
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 412172 D01 Determining ERP and EIRP v01r01
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated emissions were investigated as following frequency range:

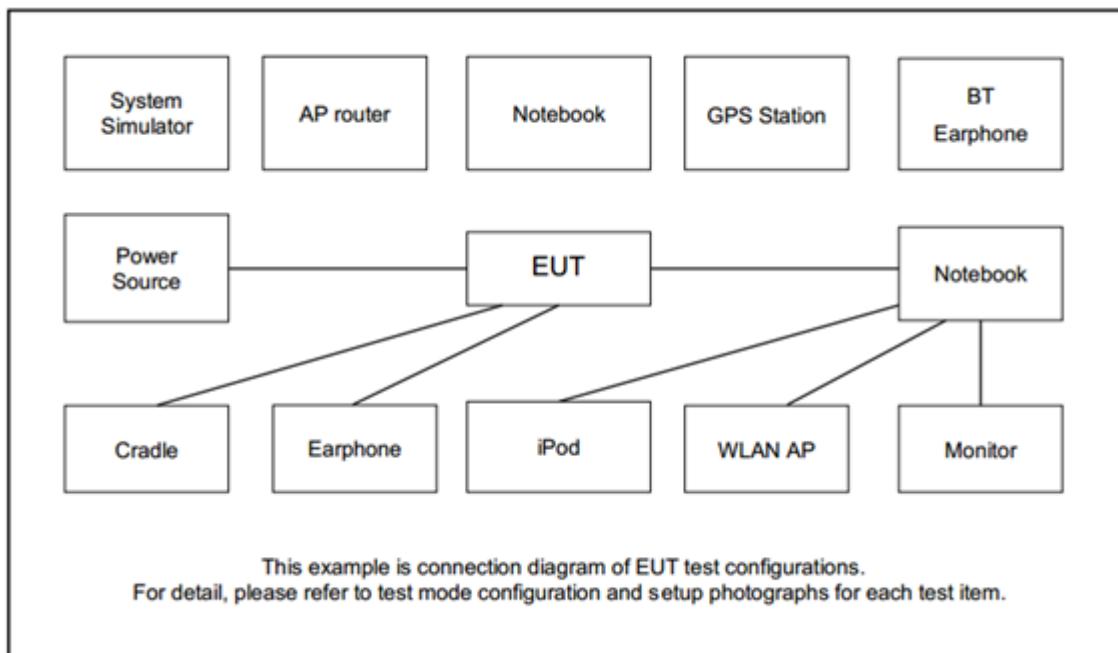
1. 30 MHz to 19100 MHz for WCDMA Band II

All modes, data rates and positions were investigated.

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

Test Modes		
Band	Radiated TCs	Conducted TCs
WCDMA Band V	-	■ RMC 12.2Kbps Link
WCDMA Band II	■ RMC 12.2Kbps Link	■ RMC 12.2Kbps Link
WCDMA Band IV	-	■ RMC 12.2Kbps Link

2.2 Connection Diagram of Test System





2.3 Support Unit used in test configuration

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	Shark fin antenna	Continental	84650406	N/A	N/A	N/A
2.	Teddy Jr Load Box	Continental	N/A	N/A	N/A	N/A
3.	Metal Plate	N/A	N/A	N/A	N/A	N/A
4.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
5.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
6.	DC Power Supply	Topward	3303D	N/A	N/A	N/A

2.4 Frequency List of Low/Middle/High Channels

Frequency List				
Band	Channel/Frequency(MHz)	Lowest	Middle	Highest
WCDMA Band V	Channel	4132	4182	4233
	Frequency	826.4	836.4	846.6
WCDMA Band II	Channel	9262	9400	9538
	Frequency	1852.4	1880.0	1907.6
WCDMA Band IV	Channel	1312	1413	1513
	Frequency	1712.4	1732.6	1752.6

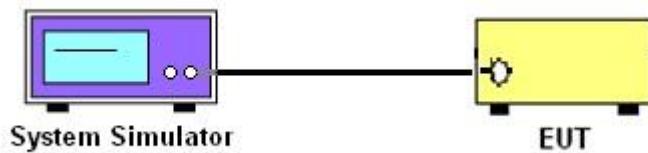
3 Conducted Test Result

3.1 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.1 Test Setup

3.1.2 Conducted Output Power



3.1.3 Test Result of Conducted Test

Please refer to Appendix A.



3.2 Conducted Output Power and ERP/EIRP

3.2.1 Description of the Conducted Output Power and ERP/EIRP

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for WCDMA Band V

The EIRP of mobile transmitters must not exceed 2 Watts for WCDMA Band II

The EIRP of mobile transmitters must not exceed 1 Watts for WCDMA Band IV

According to KDB 412172 D01 Power Approach,

$EIRP = P_T + G_T - L_c$, $ERP = EIRP - 2.15$, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_c = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2.2 Test Procedures

1. The transmitter output port is connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select the lowest, middle, and the highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

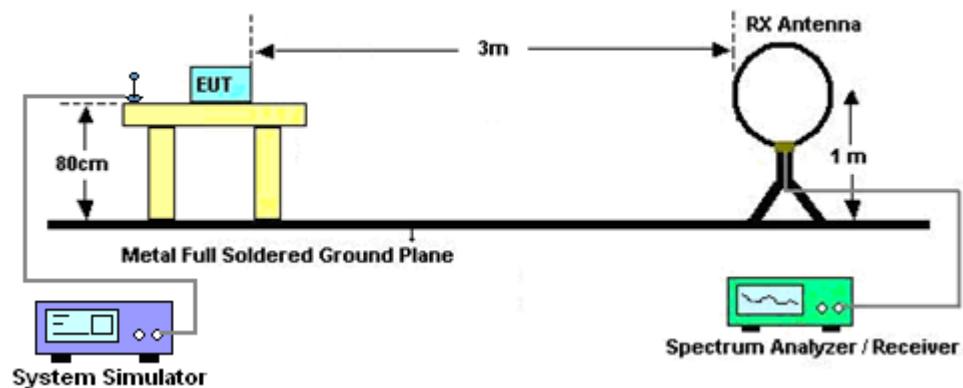
4 Radiated Test Items

4.1 Measuring Instruments

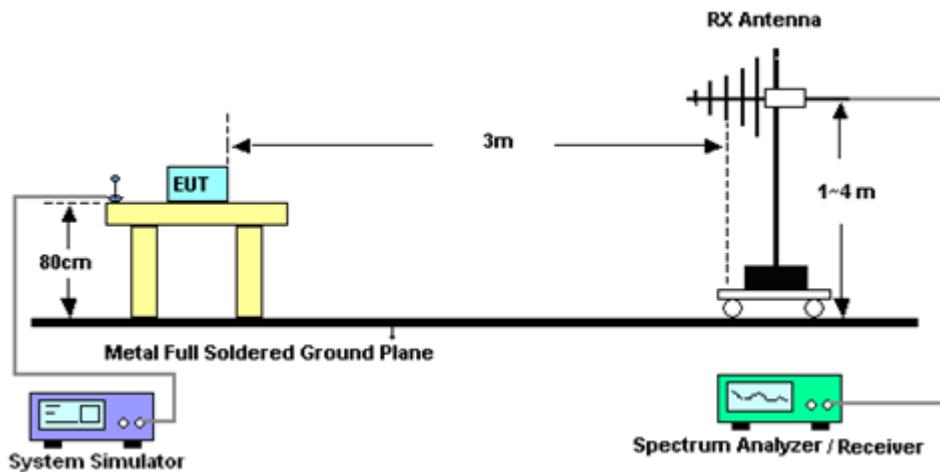
Please refer to the measuring equipment list in this test report.

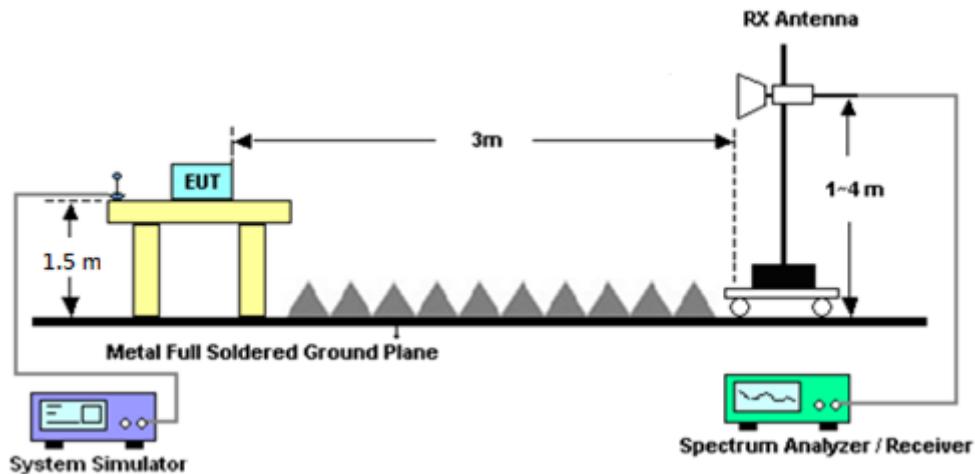
4.2 Test Setup

For radiated test below 30MHz



For radiated test from 30MHz to 1GHz



For radiated test above 1GHz

4.3 Test Result of Radiated Test

Please refer to Appendix B.

Note:

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.



4.4 Field Strength of Spurious Radiation Measurement

4.4.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

4.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT is placed on a rotatable wooden table 0.8 meters for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz above the ground.
2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the antenna tower.
3. The table is rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1 MHz, VBW = 3 MHz, taking record of maximum spurious emission.
6. A horn antenna is substituted in place of the EUT and is driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Take the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. $EIRP \text{ (dBm)} = S.G. \text{ Power} - Tx \text{ Cable Loss} + Tx \text{ Antenna Gain}$
11. $ERP \text{ (dBm)} = EIRP - 2.15$
12. The RF fundamental frequency shall be excluded against the limit line in the operating frequency band.
13. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)



5 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 28, 2021	Dec. 29, 2021~Jan. 06, 2022	Apr. 27, 2022	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Dec. 03, 2021	Dec. 29, 2021~Jan. 06, 2022	Dec. 02, 2022	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	1GHz~18GHz	Apr. 22, 2021	Dec. 29, 2021~Jan. 06, 2022	Apr. 21, 2022	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 04, 2021	Dec. 29, 2021~Jan. 06, 2022	Oct. 03, 2022	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Oct. 04, 2021	Dec. 29, 2021~Jan. 06, 2022	Oct. 03, 2022	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Jul. 23, 2021	Dec. 29, 2021~Jan. 06, 2022	Jul. 22, 2022	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Jul. 22, 2021	Dec. 29, 2021~Jan. 06, 2022	Jul. 21, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682-4	30MHz to 18GHz	Feb. 24, 2021	Dec. 29, 2021~Jan. 06, 2022	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971-4	9kHz to 18GHz	Feb. 24, 2021	Dec. 29, 2021~Jan. 06, 2022	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655-4	9kHz to 18GHz	Feb. 24, 2021	Dec. 29, 2021~Jan. 06, 2022	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2,80 1606/2	18GHz~40GHz	Feb. 24, 2021	Dec. 29, 2021~Jan. 06, 2022	Feb. 23, 2022	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/126E	30MHz~18GHz	Sep. 17, 2021	Dec. 29, 2021~Jan. 06, 2022	Sep. 16, 2022	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Dec. 29, 2021~Jan. 06, 2022	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Dec. 29, 2021~Jan. 06, 2022	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Dec. 29, 2021~Jan. 06, 2022	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Dec. 29, 2021~Jan. 06, 2022	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Dec. 29, 2021~Jan. 06, 2022	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Mar. 09, 2021	Dec. 29, 2021~Jan. 06, 2022	Mar. 08, 2022	Radiation (03CH07-HY)
Horn Antenna	EMCO	3117	00143261	1GHz~18GHz	Jan. 26, 2021	Dec. 29, 2021~Jan. 06, 2022	Jan. 25, 2022	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA917025 1	BBHA917025 1	18GHz~40GHz	Nov. 30, 2021	Dec. 29, 2021~Jan. 06, 2022	Nov. 29, 2022	Radiation (03CH07-HY)
Signal Generator	Anritsu	MG3710A	6261943042	2G / 3G / LTE / 5G FR1	May 10, 2021	Dec. 29, 2021~Jan. 06, 2022	May 09, 2022	Radiation (03CH07-HY)
Radio Communication Analyzer	Anritsu	MT8821C	6261849015	LTE	Oct. 06, 2021	Jan. 10, 2022	Oct. 05, 2022	Conducted (TH05-HY)



6 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.16 dB
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.71 dB
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.16 dB
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Appendix A. Test Results of Conducted Test

Conducted Output Power(Average power) & ERP / EIRP

WCDMA Band V Maximum Average Power [dBm] (GT - LC = 3.88 dB)				
Channel	4132	4182	4233	ERP (dBm)
Frequency	826.4	836.4	846.6	ERP (W)
RMC 12.2K	22.85	22.74	22.65	
HSDPA Subtest-1	22.29	22.29	22.14	
HSDPA Subtest-2	22.28	22.24	22.14	
HSDPA Subtest-3	21.79	21.76	21.69	
HSDPA Subtest-4	21.76	21.70	21.68	
HSUPA Subtest-1	22.35	22.22	22.09	24.58
HSUPA Subtest-2	20.25	20.27	20.16	0.2871
HSUPA Subtest-3	21.33	21.26	21.17	
HSUPA Subtest-4	20.30	20.16	20.18	
HSUPA Subtest-5	22.30	22.30	22.20	
Limit	ERP < 7W			Result
				Pass

WCDMA Band II Maximum Average Power [dBm] (GT - LC = 6.9 dB)				
Channel	9262	9400	9538	EIRP (dBm)
Frequency	1852.4	1880	1907.6	EIRP (W)
RMC 12.2K	22.57	22.69	22.71	
HSDPA Subtest-1	21.90	22.00	22.09	
HSDPA Subtest-2	21.85	21.97	22.12	
HSDPA Subtest-3	21.33	21.43	21.59	
HSDPA Subtest-4	21.34	21.44	21.57	29.61
HSUPA Subtest-1	21.80	22.03	22.11	0.9141
HSUPA Subtest-2	19.82	19.95	20.10	
HSUPA Subtest-3	20.73	21.01	21.21	
HSUPA Subtest-4	19.79	20.06	20.23	
HSUPA Subtest-5	21.90	22.00	22.00	
Limit	EIRP < 2W			Result
				Pass

WCDMA Band IV Maximum Average Power [dBm] (GT - LC = 4.95 dB)				
Channel	1312	1413	1513	EIRP (dBm)
Frequency	1712.4	1732.6	1752.6	EIRP (W)
RMC 12.2K	22.47	22.59	22.57	
HSDPA Subtest-1	21.76	22.01	21.89	
HSDPA Subtest-2	21.74	22.02	21.92	
HSDPA Subtest-3	21.21	21.51	21.38	
HSDPA Subtest-4	21.24	21.47	21.53	27.54
HSUPA Subtest-1	21.77	22.02	21.59	0.5675
HSUPA Subtest-2	19.83	19.98	19.55	
HSUPA Subtest-3	20.82	21.08	20.98	
HSUPA Subtest-4	19.74	20.02	19.63	
HSUPA Subtest-5	21.80	22.00	21.55	
Limit	EIRP < 1W			Result
				Pass



Appendix B. Test Results of Radiated Test

<External Antenna>

WCDMA 1900

WCDMA 1900									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Highest	3816	-57.72	-13	-44.72	-78.26	-64.4	1.70	8.38	H
	5724	-55.16	-13	-42.16	-80.43	-62.2	2.75	9.79	H
	7632	-53.41	-13	-40.41	-80.56	-62.9	2.39	11.88	H
									H
									H
									H
									H
	3816	-56.62	-13	-43.62	-77.28	-63.3	1.70	8.38	V
	5724	-55.16	-13	-42.16	-80.49	-62.2	2.75	9.79	V
	7632	-53.61	-13	-40.61	-81.07	-63.1	2.39	11.88	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.



<Internal Antenna>

WCDMA 1900

WCDMA 1900									
Channel	Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Highest	3816	-58.35	-13	-45.35	-79.09	-65.03	1.70	8.38	H
	5724	-55.44	-13	-42.44	-81.07	-62.48	2.75	9.79	H
	7632	-54.24	-13	-41.24	-81.62	-63.73	2.39	11.88	H
	9546	-49.82	-13	-36.82	-80.98	-59.69	2.60	12.47	H
									H
									H
									H
	3816	-58.37	-13	-45.37	-79.15	-65.05	1.70	8.38	V
	5724	-55.55	-13	-42.55	-81.25	-62.59	2.75	9.79	V
	7632	-53.09	-13	-40.09	-80.82	-62.58	2.39	11.88	V
	9546	-47.71	-13	-34.71	-79.35	-57.58	2.60	12.47	V
									V
									V
									V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.