

FCC PART 22H, 24E

MEASUREMENT AND TEST REPORT

For

Cubic Transportation Systems, Inc.

5650 Kearny Mesa Road, San Diego, CA 92111, USA

FCC ID: LVC312

Report Type: Original Report	Product Type: Mobile Validator (MV)
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Report Number: <u>RSZ11022301-22H&24E</u>	
Report Date: <u>2011-06-12</u>	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP*, or any agency of the Federal Government.

* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Cubic Transportation Systems, Inc.*'s product, model number: 5300-10009-3 (FCC ID: LVC312) or the "EUT" as referred to in this report is a *Mobile Validator (MV)*, which measures approximately: 20.0 cm (L) x 12.2 cm (W) x 3.5 cm (H), rated input voltage: DC 12V or DC 24V.

* All measurement and test data in this report was gathered from production sample serial number: 0000000000010 (Assigned by applicant). The EUT was received on 2011-02-23.

Objective

This type approval report is prepared on behalf of *Cubic Transportation Systems, Inc.* in accordance with Part 2, Subpart J, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, band edge and radiated margin.

The GPRS/WCDMA module built into the device is from Shanghai Simcom Ltd., FCC ID: UDV-0200901181057, all RF characteristics are exact same as the certified module.

Related Submittal(s)/Grant(s)

FCC Part 15.225 DXX, Part 15.247 DSS, DTS and Part 15B JBP submissions with FCC ID: LVC312.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services
Part 24 Subpart E - Personal Communication Services

Applicable Standards: TIA/EIA 603-C, ANSI C63.4-2003.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is ± 0.96 dB, the uncertainty of any radiation emissions measurement is ± 4.0 dB.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp.(Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010.

The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 guide accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The final qualification test was performed with the EUT operating at normal mode.

Test mode 1: GPRS transmitting

Test mode 2: WCDMA transmitting

Test mode 3: Simultaneous transmission with Wi-Fi, GPRS and 13.56 MHz radios.

Equipment Modifications

No modifications were made to the EUT.

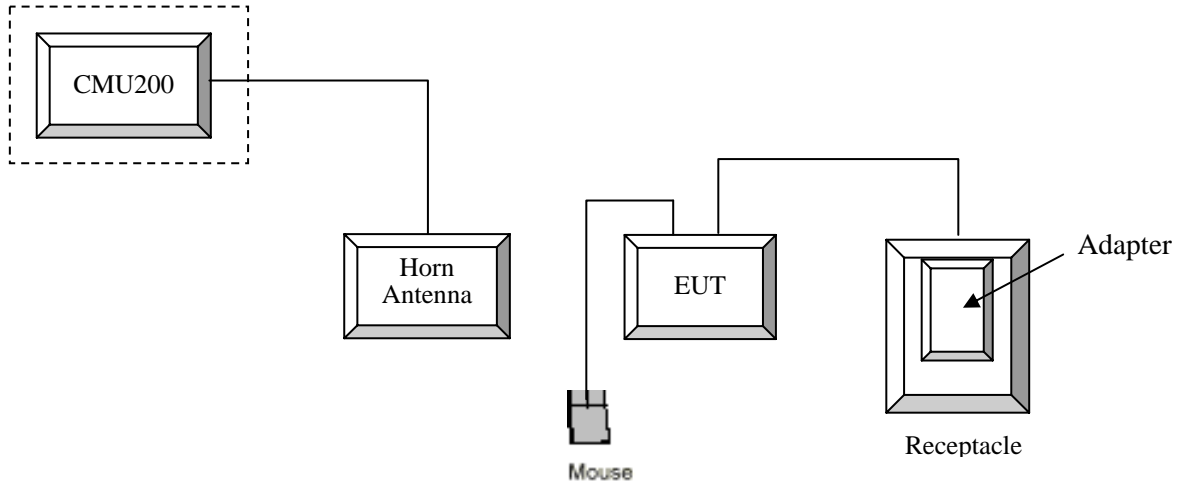
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
R & S	Universal Radio Commutation Tester	CMU200	11000008.02
I.T.E	Power Supply	SAW18-12.0-1500US	N/A
I.T.E	Power Supply	SAW18-24.0-1500US	N/A

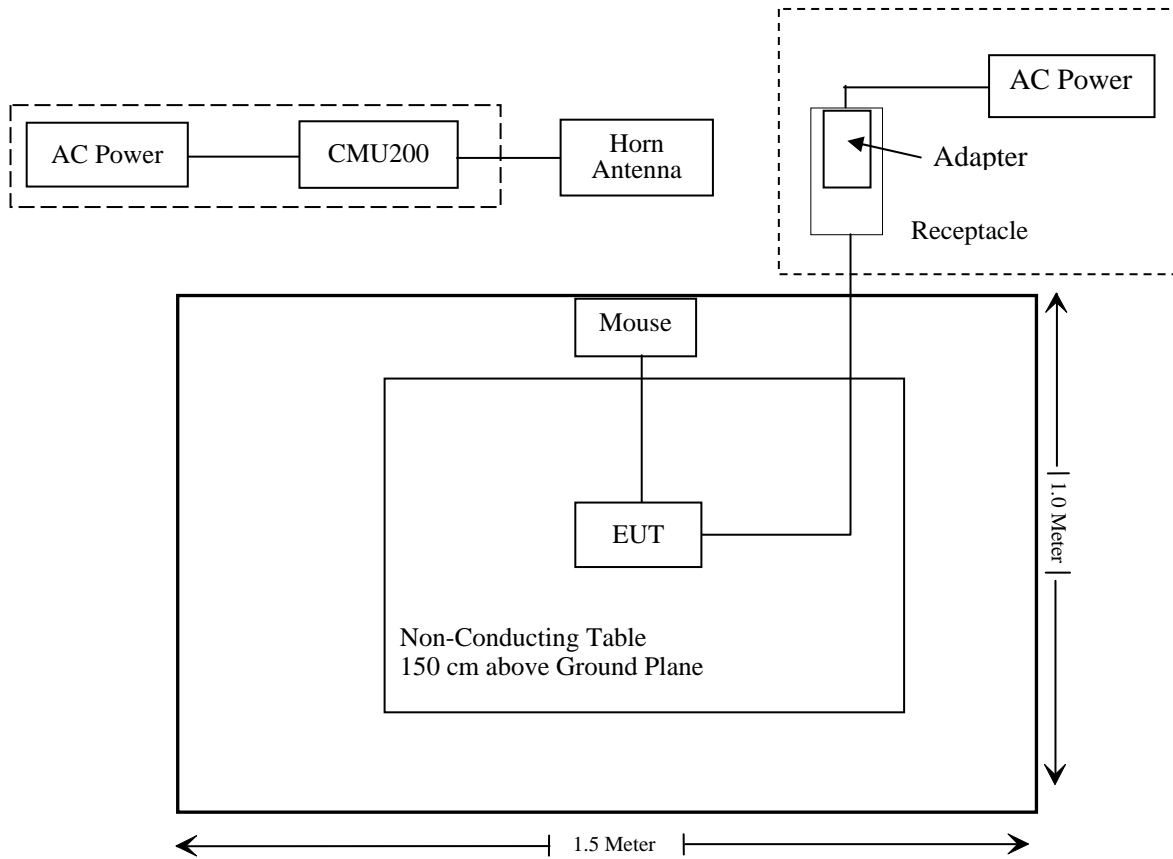
External I/O Cable

Cable Description	Length (m)	From Port	To
Unshielded Undetachable Power Cable	1.8	Adapter	LISN
Unshielded Undetachable Cable	2.0	EUT	Adapter

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307, §2.1091	RF Exposure Information	Compliance
§2.1046; §22.913 (a); §24.232 (c)	RF Output Power	Compliance
§2.1047	Modulation Characteristics	N/A
§2.1049; §22.905 §22.917; §24.238	99% & -26 dB Occupied Bandwidth	Compliance*
§2.1051, §22.917 (a); §24.238 (a)	Spurious Emissions at Antenna Terminal	Compliance*
§2.1053 §22.917 (a); §24.238 (a)	Field Strength of Spurious Radiation	Compliance
§22.917 (a); §24.238 (a)	Out of band emission, Band Edge	Compliance*
§2.1055 §22.355; §24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliance*

Note: Compliance* please refer to FCC ID: UDV-0200901181057 granted on 2009-06-22.

FCC §1.1307 & §2.1091 - RF EXPOSURE INFORMATION

Applicable Standard

According to FCC §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz;

* = Plane-wave equivalent power density;

MPE Calculation

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

S = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

G = gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Radio	Freq. (MHz)	MPE Limit (mW/cm ²)	Output Power (mW)	Duty Cycle	Antenna Gain (dBi)	Antenna Gain (Number)	Power Density at 20 cm	% of MPE at 20 cm
Wi-Fi	2412	1.0	30.69	100%	2.6	1.8	0.011	1.1%
Bluetooth	2402	1.0	1.14	100%	2.6	1.8	0.0004	0.04%
GPRS 8	824	0.549	1749.85	12.5%	0	1	0.04	7.29%
	1850	1.0	1205.04	12.5%	-1.0	0.79	0.06	6%
GPRS 10	824	0.549	572.80	25%	0	1	0.06	10.93%
	1850	1.0	1099.01	25%	-1.0	0.79	0.02	2%
GPRS 12	824	0.549	990.83	50%	0	1	0.04	7.29%
	1850	1.0	690.24	50%	-1.0	0.79	0.05	5%
WCDMA (Band V)	824	0.549	185.35	100%	0	1	0.04	7.29%
WCDMA (Band II)	1850	1.0	183.65	100%	-1.0	0.79	0.03	3%

The MPE calculations in the spreadsheet above demonstrates that the combination of the GPRS/WCDMA with the Wi-Fi/Bluetooth radio defined meets the MPE requirement stated in FCC Part 1.1310 at the 20 cm distance required for mobile exposure conditions.

FCC §2.1046, §22.913(a) & §24.232(c) - RF OUTPUT POWER

Applicable Standards

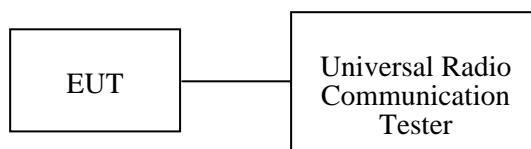
According to FCC §2.1046 and §22.913 (a), the ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

According to FCC §2.1046 and §24.232 (c), in no case may the peak output power of a base station transmitter exceed 2 watt EIRP.

Test Procedure

Conducted method:

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.



Radiated method:

TIA 603-C section 2.2.17

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2010-05-05	2011-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2010-07-08	2011-07-07
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-03-11	2012-03-11
HP	Amplifier	2VA-213+	T-E27H	2011-03-08	2012-03-07
HP	Signal Generator	HP8657A	2849U00982	2010-10-28	2011-10-27
HP	Amplifier	HP8447D	2944A09795	2010-08-02	2011-08-02
HP	Synthesized Sweeper	8341B	2624A00116	2010-11-07	2011-11-06
COM POWER	Dipole Antenna	AD-100	041000	2010-04-25	2011-04-25
A.H. System	Horn Antenna	SAS-200/571	135	2011-03-07	2012-03-06
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	109038	2010-06-11	2011-06-10

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

The testing was performed by Wayne Cheng on 2011-03-24.

Conducted Output Power:

Please refer to FCC ID: UDV-0200901181057 granted on 2009-06-22.

ERP & EIRP (worse case):

ERP for Cellular Band (Part 22H)

Indicated		Table Angle Degree	Test Antenna		Substituted			Antenna Gain Correction (dBd)	Cable Loss (dB)	Absolute Level (dBm)	Part 22H Limit (dBm)
Frequency (MHz)	S.A. Reading (dB μ V)		Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Ant. Polar (H/V)				
GPRS (GMSK), High Channel											
848.8	96.10	340	1.6	V	848.8	28.5	V	0	0.9	27.6	38.45
848.8	97.62	160	1.9	H	848.8	31.0	H	0	0.9	30.1	38.45
GPRS (8PSK), High Channel											
848.8	90.20	189	1.8	V	848.8	22.6	V	0	0.9	21.7	38.45
848.8	91.80	173	2.2	H	848.8	25.2	H	0	0.9	24.3	38.45
WCDMA Band V, Middle Channel											
836.4	84.58	253	1.8	V	836.4	16.0	V	0	0.9	15.1	38.45
836.4	87.32	283	1.9	H	836.4	20.7	H	0	0.9	19.8	38.45

EIRP for PCS Band (Part 24E)

Indicated		Table Angle Degree	Test Antenna		Substituted			Antenna Gain Correction (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Part 24E Limit (dBm)
Frequency (MHz)	S.A. Reading (dBμV)		Height (m)	Polar (H/V)	Frequency (MHz)	S.G. Level (dBm)	Ant. Polar (H/V)				
GPRS (GMSK), High Channel											
1909.8	96.04	50	1.8	H	1909.8	25.1	H	6.2	1.1	30.2	33
1909.8	94.76	328	1.8	V	1909.8	22.9	V	6.2	1.1	28.0	33
GPRS (8PSK), Low Channel											
1850.2	91.39	56	1.7	H	1850.2	20.6	H	6.2	1.1	25.7	33
1850.2	90.14	352	1.6	V	1850.2	19.3	V	6.2	1.1	24.4	33
WCDMA Band II, Middle Channel											
1880	82.00	289	2.2	H	1880	10.8	H	6.2	1.1	15.9	33
1880	84.10	304	2.4	V	1880	14.1	V	6.2	1.1	19.2	33

FCC §2.1053, §22.917 & §24.238 - SPURIOUS RADIATED EMISSIONS

Applicable Standards

FCC §2.1053, §22.917 and §24.238.

Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log₁₀ (power out in Watts)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sunol Sciences	Horn Antenna	DRH-118	A052604	2010-05-05	2011-05-04
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-03-11	2012-03-11
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2010-07-08	2011-07-07
HP	Amplifier	2VA-213+	T-E27H	2011-03-08	2012-03-07
HP	Signal Generator	HP8657A	2849U00982	2010-10-28	2011-10-27
HP	Amplifier	HP8447D	2944A09795	2010-08-02	2011-08-02
HP	Synthesized Sweeper	8341B	2624A00116	2010-11-07	2011-11-06
COM POWER	Dipole Antenna	AD-100	041000	2010-04-25	2011-04-25
A.H. System	Horn Antenna	SAS-200/571	135	2011-03-07	2012-03-06
Rohde & Schwarz	Universal Radio Communication Tester	CMU200	109038	2010-06-11	2011-06-10

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

The testing was performed by Wayne Cheng on 2011-03-26 to 2011-06-08.

Test mode: Transmitting (worse case)

Cellular Band (Part 22H)**GPRS 850:**

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)			
Middle Channel, Below 1 GHz											
162.76	38.95	260	1.6	V	162.76	-56.1	0	0.75	-55.35	-13	42.35
325.85	39.67	90	2	V	325.85	-55.3	0	0.75	-54.55	-13	41.55
389.97	42.44	165	1.3	H	389.97	-52.6	0	0.75	-51.85	-13	38.85
406.81	39.64	248	1.7	H	406.81	-55.4	0	0.75	-54.65	-13	41.65
Middle Channel, Above 1 GHz											
1672.8	54.53	265	1.8	H	1672.8	-44.5	6.2	0.94	-49.7	-13	36.7
1672.8	52.04	300	1.5	V	1672.8	-46.0	6.2	0.94	-51.2	-13	38.2
2509.2	47.51	28	1.8	H	2509.2	-49.5	7.3	1.19	-55.6	-13	42.6
2509.2	45.78	325	1.4	V	2509.2	-50.2	7.3	1.19	-56.3	-13	43.3
3345.6	43.13	185	1.6	H	3345.6	-51.9	6.7	1.38	-57.2	-13	44.2
3345.6	40.82	243	1.4	V	3345.6	-53.2	6.7	1.38	-58.5	-13	45.5

WCDMA Band V:

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dB μ V)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)			
Middle Channel, Below 1 GHz											
205.87	42.13	140	1.3	V	205.87	-51.9	0	0.65	-52.55	-13	39.55
325.66	35.60	189	1.2	V	325.66	-58.4	0	0.76	-59.16	-13	46.16
406.85	40.12	256	1.9	H	406.85	-53.9	0	0.80	-54.7	-13	41.70
885.63	37.86	334	2.0	H	885.63	-56.1	0	0.77	-56.87	-13	43.87
Middle Channel, Above 1 GHz											
1672.8	53.46	248	1.8	H	1672.8	-45.5	6.2	0.94	-40.28	-13	27.28
1672.8	51.39	30	1.5	V	1672.8	-45.6	6.2	0.94	-40.35	-13	27.35
2509.2	45.31	215	1.8	H	2509.2	-50.7	7.3	1.19	-44.58	-13	31.58
2509.2	44.20	223	1.4	V	2509.2	-50.8	7.3	1.19	-44.69	-13	31.69
3345.6	43.56	130	1.6	H	3345.6	-46.4	6.7	1.38	-41.12	-13	28.12
3345.6	40.72	150	1.4	V	3345.6	-48.3	6.7	1.38	-42.96	-13	29.96

PCS Band (Part 24E)

GPRS 1900:

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dB μ V)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)			
Middle Channel, Below 1 GHz											
162.76	42.37	259	1.8	V	162.76	-51.6	0	0.76	-52.4	-13	39.4
271.34	39.8	110	1.2	V	271.34	-54.2	0	0.8	-55.0	-13	42.0
337.85	40.12	253	2.2	H	337.85	-53.9	0	0.65	-54.5	-13	41.5
406.58	37.46	289	1.6	H	406.58	-56.5	0	0.74	-57.3	-13	44.3
Middle Channel, Above 1 GHz											
3760	46.89	154	1.8	H	3760	-48.1	6.9	1.47	-42.7	-13	29.7
3760	49.26	296	1.7	V	3760	-44.7	6.9	1.47	-39.3	-13	26.3
5640	41.56	170	1.6	H	5640	-47.4	8.3	1.76	-40.9	-13	27.9
5640	43.39	80	1.5	V	5640	-43.6	8.3	1.76	-37.1	-13	24.1
7520	40.23	180	1.5	H	7520	-45.8	7.6	2.09	-40.3	-13	27.3
7520	39.56	110	1.5	V	7520	-45.4	7.6	2.09	-39.9	-13	26.9

WCDMA Band II

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dB μ V)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)			
Middle Channel, Below 1 GHz											
162.4	40.71	242	1.2	V	162.4	-53.3	0	0.76	-54.05	-13	41.05
339.46	39.26	70	1.5	V	339.46	-54.7	0	0.8	-55.54	-13	42.54
406.35	36.45	150	1.5	H	406.35	-57.6	0	0.65	-58.20	-13	45.20
856.46	38.50	210	1.0	H	856.46	-55.5	0	0.74	-56.24	-13	43.24
Middle Channel, Above 1 GHz											
3760	52.36	256	1.5	H	3760	-42.6	6.9	1.47	-37.21	-13	24.21
3760	49.45	234	1.9	V	3760	-44.6	6.9	1.47	-39.12	-13	26.12
5640	44.12	186	2.3	H	5640	-48.9	8.3	1.76	-42.34	-13	29.34
5640	41.2	195	2.2	V	5640	-49.8	8.3	1.76	-43.26	-13	30.26
7520	46.41	255	1.8	H	7520	-40.6	7.6	2.09	-35.08	-13	22.08
7520	44.72	350	1.3	V	7520	-41.3	7.6	2.09	-35.77	-13	22.77

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