FCC TEST REPORT

Test report No.:	EMC- FCC- R0115
FCC ID:	PKRNVWE362
Type of equipment:	IP Network Camera
Model Name:	6100 LTE VZW
Varient Model	IPN100LTE-VZW
Applicant:	Novatel Wireless Inc
Max.RF Output Power:	260.62mW (24.16dBm) (Cell. CDMA), 230.14mW (23.62dBm) (PCS CDMA)
FCC Rule Part(s):	§2; §22(H), §24(E)
Frequency Range:	824.70 - 848.31MHz (Cell. CDMA) 1851.25 - 1908.75MHz (PCS CDMA)
Test result:	Complied

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: July 1, 2013 ~ July 05, 2013

Issued date: July 08, 2013

Tested by: SON, MIN GI

Approved by: YU, SANG HOON.

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1. Client information

Applicant:	Novatel Wireless Inc
Address:	6715-8th Street NE Suite 200 Calgary, T2E 7H7 Canada
Telephone number:	+82-2-2093-3070
Facsimile number :	+82-2-2605-1489
Contact person:	Eun Sung, Yang / Harold.yang@udptechnology.com

Manufacturer :	LG Innotek Co., Ltd
Address:	26, Hanamsandan 5beon-ro, Gwangsan-gu, Gwangju, 506-731, Korea

2. Laboratory information

Address
EMC Compliance Ltd.
480-5 Shin-dong, Yeongtong-gu, Suwon-city, Gyunggi-do, 443-390, Korea
Telephone Number: 82 31 336 9919 Facsimile Number: 82 31 336 4767

Certificate
CBTL Testing Laboratory, KOLAS NO.: 231
FCC Filing No.: 508785
VCCI Registration No.: C-1713, R-1606, T-258
IC Recognition No.:8035A-2

SITE MAP

3. Description of E.U.T.

3.1 Basic description

Applicant :	Novatel Wireless Inc
Address of Applicant:	6715-8th Street NE Suite 200 Calgary, T2E 7H7 Canada
Manufacturer:	LG Innotek Co., Ltd
Address of Manufacturer:	26, Hanamsandan 5beon-ro, Gwangsan-gu, Gwangju, 506-731, Korea
Type of equipment:	IP Network Camera
Basic Model:	6100 LTE VZW
Serial number:	Proto Type

3.2 General description

Communication	Cell. CDMA, PCS CDMA
Frequency Range	824.70 - 848.31MHz (Cell. CDMA) / 1851.25 - 1908.75MHz (PCS CDMA)
Power supply	DC 12 V
Operating temperature	-20 ~ 50 ℃
Dimension	75 mm x 90 mm x 140 mm (W x D x H)
Antenna Model	KRS-GANYMEDE-MA
Antenna Type	Intenna(Omni directional single antenna)
Antenna Gain	824 ~ 849 MHz : -1.5 dBi, 1850 ~ 1910 MHz : -0.5 dBi
Antenna characteristic	Vertical Polarization, Omni Directional

3.3 Test frequency

824.70 - 848.31MHz (Cell. CDMA)

	CH	Frequency
Low frequency	1013	824.70 MHz
Middle frequency	384	836.52 MHz
High frequency	777	848.30 MHz

1851.25 - 1908.75MHz (PCS CDMA)

	CH	Frequency
Low frequency	25	1851.25 MHz
Middle frequency	600	1880.00 MHz
High frequency	1175	1908.75 MHz

3.4 Test Voltage

mode	Voltage
Norminal voltage	DC 12 V

4. Summary of test results

4.1 Standards & results

Rule Reference	Parameter	Report Section	Test Result
2.1049, 22.917(a), 24.238(a)	Occupied Bandwidth	5.1	NA
2.1051, 22.917(a), 24.238(a)	Band Edge / Conducted Spurious Emissions	5.2	NA
2.1046	Transmitter Conducted Output Power	5.3	NA
24.232(d)	Peak-Average Ratio	5.4	NA
2.1055, 22.355, 24.235	Frequency Stability	5.5	NA
2.1053, 22.917(a), 24.238(a)	Undesirable Emissions	5.6	C

Note: C = complies
NC = Not complies
NT = Not tested
NA = Not Applicable

4.2 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Conducted RF power	± 0.29 dB	± 0.58 dB
Radiated disturbance	30 ㎒ ~ 300 ㎒ : + 2.43 ㏈, - 2.44 ㏈ 300 ㎒~1 000 ㎒ : + 2.49㏈, - 2.50 ㏈ 1 ㎓ ~ 6 ㎓ : + 3.10 ㏈, - 3.10 ㏈ 6 ㎓ ~ 18 ㎓ : + 3.21 ㏈, - 3.27 ㏈	30 ㎒ ~ 300 ㎒ : + 4.86 ㏈, - 4.88 ㏈ 300 ㎒ ~ 1 000 ㎒ + 4.98㏈, - 4.99 ㏈ 1 ㎓ ~ 6 ㎓ : + 6.19 ㏈, - 6.20 ㏈ 6 ㎓ ~ 18 ㎓ : + 6.41 ㏈, - 6.53 ㏈

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5. Test results

5.1 Occupied Bandwidth

5.1.1 Regulation

According to § 2.1049, The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

5.1.2 Result

- Refer to Module test report

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5.2 Band Edge / Conducted Spurious Emissions

5.2.1 Regulation

According to §2.1053, 22.917(a), 22.913(a), 24.232(c), 24.238(a)
Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004: For radiated power measurements below 1GHz, a half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded. Equivalent Isotropic Radiated Power Measurements by Substitution Method according to ANSI/TIA/EIA- 603-C-2004, Aug. 17, 2004: For radiated power measurements above 1GHz, a Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.
Radiated spurious emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration. This device was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1" and in GPRS mode while transmitting with one slot active. In CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.

5.2.2 Test Result

- Refer to Module test report

5.3 Transmitter Conducted Output Power

5.3.1 Regulation

According to §2.1046, The following average conducted output power measurements for the Novatel 850/1900 GSM/GPRS/EDGE/WCDMA/CDMA/EvDO and 700MHz LTE Module FCC ID: PKRNVWE362 were measured using a R&S CMU200 base station simulator for GSM/GPRS/EDGE and WCDMA/HSPA modes and an Agilent 8960 base station simulator for CDMA/EvDO modes.

5.3.2 Test Result

- Refer to Module test report

5.4 Peak-Average Ratio

5.4.1 Regulation

According to §24.232(d) peak to average ratio measurement is performed at the conducted port of the EUT. For CDMA and WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth.

5.4.2 Test Result

- Refer to Module test report

5.5 Frequency Stability

5.5.1 Regulation

According to §2.1055, 22.355, 24.235 The frequency stability of the transmitter is measured by:

a.) Temperature: The temperature is varied from -30℃ to +50℃ in 10℃ increments using an environmental chamber.

b.) Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency. Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20℃ to provide a reference).

2. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

3. Frequency measurements are made at 10℃ intervals ranging from -30℃ to +50℃. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

5.5.2 Test Result

- Refer to Module test report

5.6 Undesirable Emissions

5.6.1 Test Result

-Complied

Cellular CDMA Radiated Measurements

OPERATING FREQUENCY: 824.70 MHz
CHANNEL: 1013

Frequency (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
41.640	38.2	-13.7	24.5	82.2	57.7
498.752	38.5	-2.7	35.8	82.2	46.4
696.148	36.8	1.8	38.6	82.2	43.6

OPERATING FREQUENCY: 836.52 MHz
CHANNEL: 384

Frequency (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
45.035	40.7	-13.3	27.4	82.2	54.8
499.116	37.9	-2.7	35.2	82.2	47.0
698.088	35.4	1.8	37.2	82.2	45.0

OPERATING FREQUENCY: 848.31 MHz
CHANNEL: 777

Frequency (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
41.733	40.1	-13.7	26.4	82.2	55.8

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PCS CDMA Radiated Measurements

OPERATING FREQUENCY: 1851.25 MHz
CHANNEL: 25

Frequency (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
1038.75	52.0	-14.6	37.4	82.2	44.8
1771.50	58.9	-10.4	48.5	82.2	33.7
2462.75	44.3	-7.0	37.3	82.2	44.9
3700.00	56.3	-4.9	51.4	82.2	30.8

OPERATING FREQUENCY: 1880.00 MHz
CHANNEL: 600

Frequency (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
1081.75	52.0	-14.3	37.7	82.2	44.5
1800.00	56.0	-10.2	45.8	82.2	36.4
2457.75	44.1	-7.1	37.0	82.2	45.2
3750.00	50.6	-4.8	45.8	82.2	36.4

OPERATING FREQUENCY: 1908.75 MHz
CHANNEL: 1175

Frequency (MHz)	Reading (dBm)	Factor (dB)	Result (dBm)	Limit (dBm)	Margin (dB)
1124.75	44.4	-14.0	30.4	82.2	51.8
1828.50	50.3	-10.0	40.3	82.2	41.9
1882.00	51.1	-9.6	41.5	82.2	40.7
2463.00	44.5	-7.0	37.5	82.2	44.7
3825.00	53.2	-4.6	48.6	82.2	33.6

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5.7 RF Exposure

5.7.1 Regulation

According to §15.247(i), 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 levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissive Exposure: RF exposure is calculated.

Frequency Range	Electric Field Strength [V/m]	Magnetic Field Strength [A/m]	Power Density [mW/cm^2]	Averaging Time [minute]
Limits for General Population / Uncontrolled Exposure				
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 ~ 1 500	/	/	f/1 500	30
1 500 ~ 15 000	/	/	1.0	30

*f=frequency in MHz, *= plane-wave equivalent power density*

MPE (Maximum Permissive Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2 \quad \left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$$

S = power density [mW/cm^2]
P = Power input to antenna [mW]
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna [cm]

EUT: Maximum peak output power = 256.448 [mW] (24.09 dBm) Antenna gain = 0.728 (-1.5 [dBi])	
100 mW, at 20 cm from an antenna 6 [dBi]	S = PG/4πR² = 100 × 6 / (4 × π × 400) = 0.791 8 [mW/cm^2] < 1.0 [mW/cm^2]
256.448 mW, at 20 cm from an antenna -1.5 [dBi]	S = PG/4πR² = 0.033 32 [mW/cm^2] < 1.0 [mW/cm^2]

5.7.2 RF Exposure Compliance Issue

The information should be included in the user's manual:
This appliance and its antenna must not be co-located or operation in conjunction with any other antenna or transmitter. A minimum separation distance of 20 cm must be maintained between the antenna and the person for this appliance to satisfy the RF exposure requirements.

5.7.3 Calculation Result of RF Exposure

Celluar CDMA

Channel	Frequency [MHz]	Ant Gain [mW]	power [dBm]	power [mW]	Power Density at 20 cm [mW/cm^2]
Lowest	824.70	0.708	23.74	236.592	0.033 32
Middle	836.52	0.708	23.73	236.048	0.033 25
Highest	848.31	0.708	24.09	256.448	0.036 12

Celluar PCS

Channel	Frequency [MHz]	Ant Gain [mW]	power [dBm]	power [mW]	Power Density at 20 cm [mW/cm^2]
Lowest	1 851.25	0.891	23.48	222.844	0.039 51
Middle	1 880.00	0.891	23.35	216.272	0.038 35
Highest	1 908.75	0.891	23.42	219.786	0.038 97

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6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
□	Temp & humidity chamber	Taekwang	TK-04	TK001	13.12.07
□	Temp & humidity chamber	Taekwang	TK-500	TK002	13.09.03
□	Frequency Counter	HP	53150A	US39250565	13.09.04
■	Spectrum Analyzer	Agilent	E4440A	MY46186407	14.06.27
□	Spectrum Analyzer	R & S	FSG13	100051	13.10.23
■	Signal Generator	R & S	SMR40	100007	14.06.27
□	Vector Signal Generator	R & S	SMBV100A	257566	14.01.07
□	Wideband Power Sensor	R & S	NRP-Z81	100677	14.05.06
□	Modulation Analyzer	HP	8901B	3538A05527	13.10.25
□	Audio Analyzer	HP	8903B	3729A19213	13.10.23
□	AC Power Supply	Kikusui	PCR2000W	GB001619	13.10.23
■	DC Power Supply	Tektronix	PS2520G	TW50517	14.03.12
□	DC Power Supply	Tektronix	PS2521G	TW53135	13.10.23
□	Attenuator	HP	8494A	2631A09825	13.10.24
□	Attenuator	HP	8496A	3308A16640	13.10.24
□	Attenuator	BIRD	50-A-MFN-20	0403002	13.10.24
□	Power Divider	Weinschel	1580-1	NX375	13.10.23
□	Power Divider	Weinschel	1580-1	NX380	13.09.09
□	Power Divider	Weinschel	1594	671	13.09.10
□	Power Divider	Krytar	7005265	143244	13.09.03
■	EMI Test Receiver	R&S	ESCI	100710	13.11.06
■	LOOP Antenna	EMCO	EMCO6502	9205-2745	14.05.23
■	BILOG Antenna	Schwarzbeck	VULB 9168	9168-440	13.09.21
■	HORN Antenna	ETS	3115	00086706	13.11.21
□	HORN Antenna	ETS	3116	00086632	13.11.15
■	Amplifier	Sonoma	310N	293004	13.11.06
■	Amplifier	Agilent	8449B	3008A01802	14.05.06
□	Attenuator	HP	8491A	27444	13.11.06
■	Antenna Mast	Innco Systems	MA4000-EP	303	-
■	Turn Table	Innco Systems	DT2000S-1t	079	-
□	Highpass Filter	Wainwright	WHK2.5/ 18G-10SS	61	14.04.12
□	Highpass Filter	Wainwright	WHKX6.5/ 18G-8SS	2	14.06.05
□	Test Receiver	R & S	843276/003	ESHS10	14.06.15
□	LISN	R & S	100267	ESH3-Z5	13.07.05
□	LISN	Schwarzbeck	8121-472	NNLK8121	13.07.13

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