Variant FCC RF Test Report

APPLICANT	:	Honeywell International Inc.
EQUIPMENT	:	Dolphin 9700 Mobile computer
BRAND NAME	:	Honeywell
MODEL NAME	:	Dolphin 9700
FCC ID	:	HD59700LUP
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	Digital Transmission System (DTS)

This is a variant report which is only valid together with the original test report. The product was received on Jul. 30, 2011 and completely tested on Aug. 26, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai

Jones Tsai / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR9O3036-03A	Rev. 01	This is a variant report which can be referred Product Equality Declaration as appendix C. All the test cases were performed on original report which can be referred to Sporton Report Number FR9O3036A as appendix D. Based on the original report, the worst case of radiation test was verified.	Sep. 02, 2011

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
2.1	15.247(b)	A8.4	Power Output	≤ 30dBm	Pass	-
3.1	15.247(d)	A8.5	Frequency Band Edges	≤ 20dBc	Pass	-
3.2	15.247(d)	A8.5	Transmitter Radiated Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.58 dB at 4924 MHz
3.3	15.203 & 15.247(b)	A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Honeywell International Inc.
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.2 Manufacturer

Honeywell International Inc.
9680 Old Bailes Road, Fort Mill, SC 29707 USA

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Dolphin 9700 Mobile computer
Brand Name	Honeywell
Model Name	Dolphin 9700
FCC ID	HD59700LUP
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	11
Carrier Frequency of Each Channel	2412+(n-1)*5 MHz; n=1~11
Channel Spacing	5 MHz
Maximum Output Power to Antenna	802.11b : 18.65 dBm (0.0733 W) 802.11g : 22.08 dBm (0.1614 W)
Antenna Type	PIFA Antenna with gain 2.39 dBi
HW Version	2.1
SW Version	01
Type of Modulation	802.11b : DSSS (BPSK / QPSK / CCK) 802.11g : OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Production Unit

Remark:

1. For other wireless features of this EUT, test report will be issued separately.
2. This test report recorded only product characteristics and test results of Digital Transmission System (DTS).
3. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	03CH06-HY	722060/4086B-1

1.5 Applied Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 (Measurement Guidelines of DTS)
- ANSI C63.4-2003
- IC RSS-210 Issue 8

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B (DoC), recorded in a separate test report.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
3.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

2 Test Configuration of Equipment Under Test

2.1 RF Power

Preliminary tests were performed in different data rate and recorded the RF power output in the following table:

802.11b RF Peak Power (dBm)					
Channel	Frequency (MHz)	Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	-	**18.65**	-	-
CH 06	2437 MHz	-	18.27	-	-
CH 11	2462 MHz	-	18.31	-	-

802.11g RF Peak Power (dBm)									
Channel	Frequency (MHz)	Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	-	-	-	-	**22.08**	-	-	-
CH 06	2437 MHz	-	-	-	-	21.61	-	-	-
CH 11	2462 MHz	-	-	-	-	21.29	-	-	-

Average Power:

802.11b RF Average Power (dBm)					
Channel	Frequency (MHz)	Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 01	2412 MHz	-	16.03	-	-
CH 06	2437 MHz	-	15.76	-	-
CH 11	2462 MHz	-	15.65	-	-

802.11g RF Average Power (dBm)									
Channel	Frequency (MHz)	Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 01	2412 MHz	-	-	-	-	12.32	-	-	-
CH 06	2437 MHz	-	-	-	-	11.95	-	-	-
CH 11	2462 MHz	-	-	-	-	11.38	-	-	-

Remark:

1. The data rates of WLAN 802.11b/g were set in 6Mbps for 802.11b and 24Mbps for 802.11g, for all the test cases due to the highest RF output power.
2. The EUT is programmed to transmit signals continuously for all testing.

2.2 Test Mode

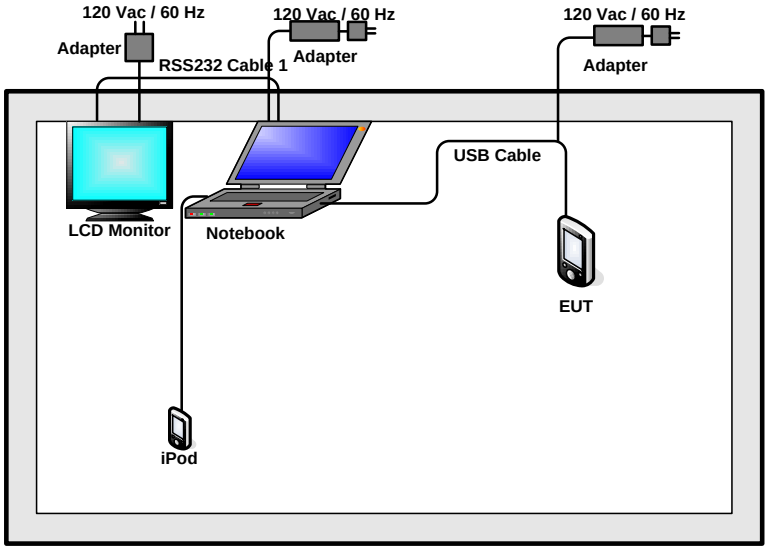
The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz), radiated emission (30 MHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Pre-scanned tests, X, Y, Z in three orthogonal panels, were conducted to determine the final configuration from all possible combinations, laptop / tablet modes.

The following tables are showing the test modes as the worst cases and recorded in this report.

Test Cases	
Test Item	**802.11b**
Radiated TCs	Mode 1 : 802.11b CH11_2462 MHz (EUT with Keypad 1, Scanner 2 and RS232 Cable 1)

2.3 Connection Diagram of Test System



2.4 RF Utility

The programmed RF utility, “MyLabTool868.exe” is installed in EUT to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

3 Test Result

3.1 Band Edges Measurement

3.1.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB.

3.1.2 Measuring Instruments

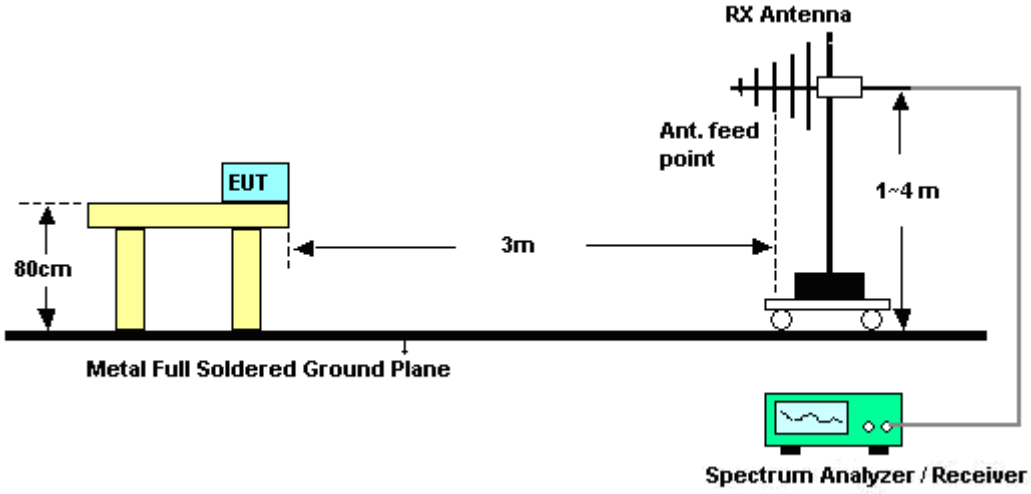
See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.4-2003 and FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Conducted emission test: Set RBW = 100 kHz, Video bandwidth (VBW) ≥ RBW. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.
3. Radiated emission test: Apply to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep=Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation as in FCC Section 15.35(b) and (c).

3.1.4 Test Setup

<Radiated Band Edges>



3.1.5 Test Result of Radiated Band Edges

Test Mode :	Mode 1	**Temperature :**	23~24℃
Test Band :	802.11b	**Relative Humidity :**	45~46%
Test Channel :	11	**Test Engineer :**	Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	**Level (dBuV/m)**	**Over Limit (dB)**	**Limit Line (dBuV/m)**	**Read Level (dBuV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2485.37	52.82	-21.18	74	49.69	31.98	5.52	34.37	100	70	Peak
2485.37	40.8	-13.2	54	37.67	31.98	5.52	34.37	100	70	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	**Level (dBuV/m)**	**Over Limit (dB)**	**Limit Line (dBuV/m)**	**Read Level (dBuV)**	**Antenna Factor (dB)**	**Cable Loss (dB)**	**Preamp Factor (dB)**	**Ant Pos (cm)**	**Table Pos (deg)**	**Remark**
2488.98	53.17	-20.83	74	50.02	32	5.52	34.37	103	322	Peak
2488.98	41.1	-12.9	54	37.95	32	5.52	34.37	103	322	Average

3.2 Radiated Emission Measurement

3.2.1 Limit of Radiated Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2 Measuring Instruments

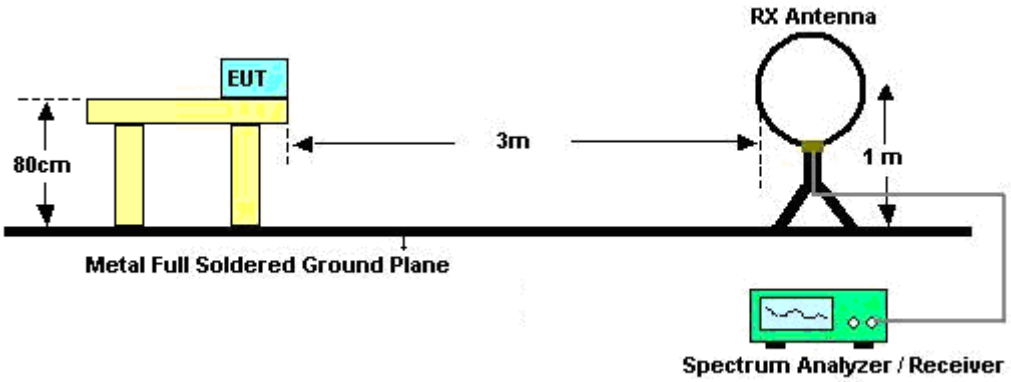
See list of measuring instruments of this test report.

3.2.3 Test Procedures

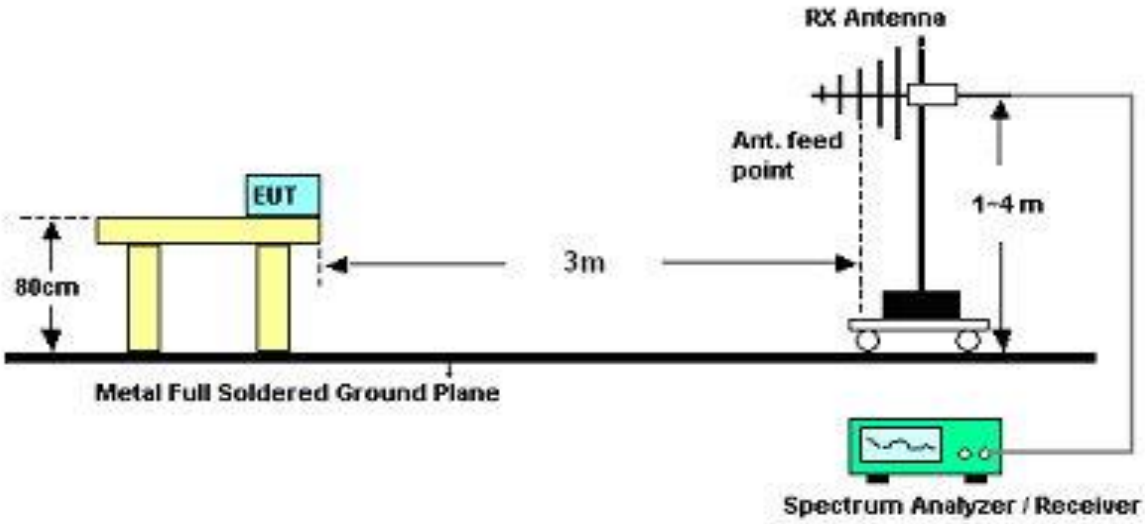
1. The testing follows the guidelines in FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Use the following spectrum analyzer settings:
   (1) Span = wide enough to fully capture the emission being measured; RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
   (2) Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.
   Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB)
3. Follow the guidelines in ANSI C63.4-2003 with respect to maximizing the emission by rotating the EUT, measuring the emission for three EUT orthogonal planes, and adjusting the measurement antenna height and polarization. A pre-amp and a high pass filter are used for this test in order to get the good signal level.

3.2.4 Test Setup

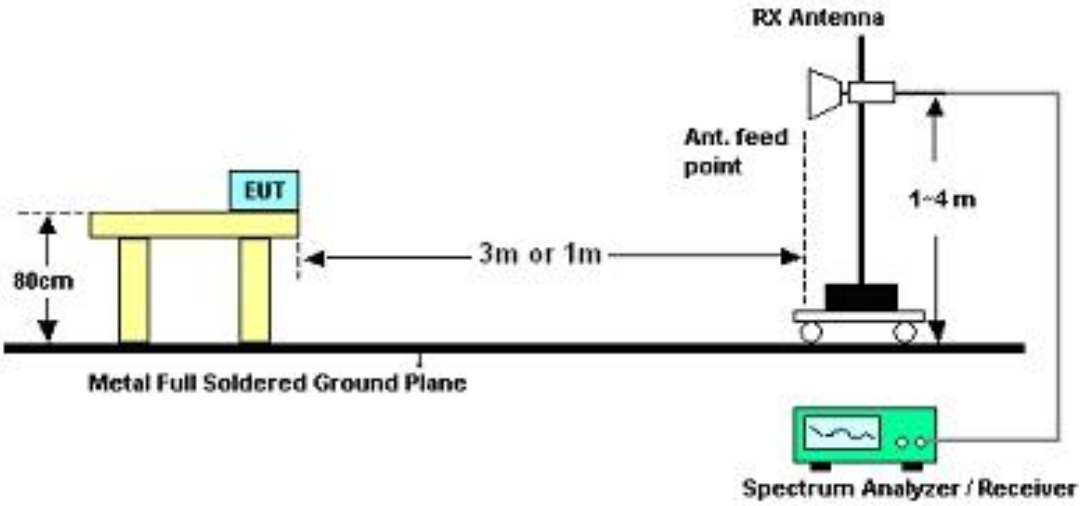
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

Test Engineer :	Kai Wang	**Temperature :**	23~24℃
		Relative Humidity :	45~46%

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

3.2.6 Test Result of Radiated Emission (30 MHz ~ 10th Harmonic)

Test Mode :	Mode 1	Temperature :	23~24℃
Test Channel :	11	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Horizontal
Remark :	2462 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
138.54	37.2	-6.3	43.5	56.02	11.44	1.44	31.7	100	182	Peak
172.83	30.07	-13.43	43.5	50.54	9.64	1.57	31.68	-	-	Peak
224.94	33.55	-12.45	46	52.43	11.01	1.75	31.64	-	-	Peak
353.9	33.87	-12.13	46	48.48	14.71	2.24	31.56	-	-	Peak
719.3	22.64	-23.36	46	31.73	19.66	3.3	32.05	-	-	Peak
918.8	26.12	-19.88	46	32.06	21.71	3.77	31.42	-	-	Peak
2390	51.73	-22.27	74	48.82	31.9	5.4	34.39	100	70	Peak
2390	37.57	-16.43	54	34.66	31.9	5.4	34.39	100	70	Average
2462	105.83	-	-	102.75	31.97	5.49	34.38	100	70	Peak
2462	101.13	-	-	98.05	31.97	5.49	34.38	100	70	Average
2485.37	52.82	-21.18	74	49.69	31.98	5.52	34.37	100	70	Peak
2485.37	40.8	-13.2	54	37.67	31.98	5.52	34.37	100	70	Average
4924	54.75	-19.25	74	68.27	34.34	8.04	55.9	100	24	Peak
4924	50.42	-3.58	54	63.94	34.34	8.04	55.9	100	24	Average
7386	55.31	-18.69	74	64.82	35.56	11.22	56.29	100	10	Peak
7386	49.07	-4.93	54	58.58	35.56	11.22	56.29	100	10	Average
138.54	37.2	-6.3	43.5	56.02	11.44	1.44	31.7	100	182	Peak

Test Mode :	Mode 1	Temperature :	23~24℃
Test Channel :	11	Relative Humidity :	45~46%
Test Engineer :	Kai Wang	Polarization :	Vertical
Remark :	2462 MHz is Fundamental Signals which can be ignored.		

Frequency (MHz)	Level (dBuV/m)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
109.38	28.52	-14.98	43.5	47.53	11.42	1.28	31.71	-	-	Peak
138.54	37.47	-6.03	43.5	56.29	11.44	1.44	31.7	100	28	Peak
224.94	30.22	-15.78	46	49.1	11.01	1.75	31.64	-	-	Peak
355.3	27.88	-18.12	46	42.46	14.73	2.25	31.56	-	-	Peak
754.3	23.47	-22.53	46	32.08	20.14	3.35	32.1	-	-	Peak
901.3	25.27	-20.73	46	31.46	21.63	3.76	31.58	-	-	Peak
2388	48.87	-25.13	74	45.96	31.9	5.4	34.39	103	322	Peak
2388	37.54	-16.46	54	34.63	31.9	5.4	34.39	103	322	Average
2462	106.72	-	-	103.64	31.97	5.49	34.38	103	322	Peak
2462	102.04	-	-	98.96	31.97	5.49	34.38	103	322	Average
2488.98	53.17	-20.83	74	50.02	32	5.52	34.37	103	322	Peak
2488.98	41.1	-12.9	54	37.95	32	5.52	34.37	103	322	Average
4924	54.33	-19.67	74	67.85	34.34	8.04	55.9	100	14	Peak
4924	49.43	-4.57	54	62.95	34.34	8.04	55.9	100	14	Average
7386	54.09	-19.91	74	63.6	35.56	11.22	56.29	121	8	Peak
7386	48.66	-5.34	54	58.17	35.56	11.22	56.29	121	8	Average

3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.3.2 Antenna Connected Construction

The antennas type used in this product is PIFA Antenna without connector and it is considered to meet antenna requirement.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 13, 2011	Jun. 12, 2012	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 13, 2010	Sep. 12, 2011	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 14, 2010	Sep. 13, 2011	Conducted (TH02-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Feb. 18, 2011	Feb. 17, 2012	Conducted (TH02-HY)
Thermal Chamber	Ten Billion	TTH-D35P	TBN-930701	N/A	Jul. 27, 2011	Jul. 26, 2012	Conducted (TH02-HY)
Spectrum Analyzer	R&S	FSP40	100057	9KHz-40GHz	Oct. 25, 2010	Oct. 24, 2011	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/003	20MHz-1000MHz	May 10, 2011	May 09, 2012	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz -2GHz	Oct. 31, 2010	Oct. 30, 2011	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz~18GHz	Aug. 01, 2011	Jul. 31, 2012	Radiation (03CH06-HY)
Double Ridge Horn Antenna	Training Research	AH-0801	95119	8GHz~18GHz	Oct. 20, 2010	Oct. 19, 2011	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH06-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 14, 2011	Apr. 13, 2012	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz~1GHz	Apr. 14, 2011	Apr. 13, 2012	Radiation (03CH06-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
Combined Standard Uncertainty Uc(y)	**1.13**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**		

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

Contribution	Uncertainty of X_i		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
Combined Standard Uncertainty Uc(y)	**1.27**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**		

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	±0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	±1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	±0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site Imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR Γ1 = 0.197 Antenna VSWR Γ2 = 0.194 Uncertainty = 20Log(1-Γ1*Γ2)	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty Uc(y)	**2.36**				
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**				

Appendix A. Photographs of EUT

Please refer to Sporton report number EP9O3036-03 as below.

Appendix C. Product Equality Declaration

Honeywell

Honeywell International Inc
Honeywell Scanning and Mobility
9680 Old Bailes Road
Fort Mill, SC 29707 USA

Date: September 1, 2011

Product Equality Declaration

We, Honeywell International Inc., declare on our sole responsibility for the product of Dolphin 9700 (model name) as below:

The difference of Dolphin 9700 is:

1. Change the battery cell and capacity
2. Change the adapter
3. Change Applicant and Manufacturer address

Except Listings above, the others are the same as previous version.

Should you have any questions or comments regarding this matter, please have my best attention.

Contact Person: Michael Robinson

Sincerely,

Product Compliance - Imaging Systems
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(315) 554-6000 telephone USA

Michael Robinson
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Skaneateles Falls, NY 13153-0208 USA

Appendix D. Original Report

Please refer to Sporton report number FR9O3036A as below.