

Product Name	TRANSCEIVER
Model No.	SS2PBL
FCC ID.	ELVATRIG

Applicant	NUTEK CORPORATION
Address	No.167,Lane 235,Bauchiau Rd.,Shindian
	City, Taipei County, Taiwan

Date of Receipt	Nov. 12, 2010
Issued Date	Dec. 02, 2010
Report No.	10B274R-RFUSP43V01
Report Version	V1.0

The Test Results relate only to the samples tested.

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# Test Report Certification

Issued Date: Dec. 02, 2010 Report No.: 10B274R-RFUSP43V01



Product Name	TRANSCEIVER		
Applicant	NUTEK CORPORATION		
Address	No.167,Lane 235,Bauchiau Rd.,Shindian City,Taipei County,Taiwan		
Manufacturer	NUTEK CORPORATION		
Model No.	SS2PBL		
FCC ID.	ELVATRIG		
EUT Rated Voltage	DC 12V		
EUT Test Voltage	DC 12V by Battery		
Trade Name	NUTEK		
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2009		
	ANSI C63.4: 2003		
Test Result	Complied NVLAP Lab Code: 200533-0		

The Test Results relate only to the samples tested.

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Documented By :





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Tested By

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Approved By

(Manager / Vincent Lin )



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# 1. GENERAL INFORMATION

# 1.1. EUT Description

Product Name	TRANSCEIVER
Trade Name	NUTEK
Model No.	SS2PBL
FCC ID.	ELVATRIG
Frequency Range	909.60 –919.024MHz
Channel Number	25
Type of Modulation	FSK
Antenna Type	Monopole
Channel Control	Auto
Antenna Gain	Refer to the table "Antenna List"

#### Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	JMS spring	ESR80005	0dBi for 900MHz
	enterprose co.,ltd.		

Note: The antenna of EUT is conform to FCC 15.203

Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	909.60 MHz	Channel 07:	912.980 MHz	Channel 14:	915.459 MHz	Channel 21:	917.943 MHz
Channel 01:	909.957MHz	Channel 08:	913.362 MHz	Channel 15:	915.810 MHz	Channel 22:	918.303 MHz
Channel 02:	910.286 MHz	Channel 09:	913.714 MHz	Channel 16:	916.190 MHz	Channel 23:	918.667 MHz
Channel 03:	910.638 MHz	Channel 10:	914.065 MHz	Channel 17:	916.528 MHz	Channel 24:	919.024 MHz
Channel 04:	911.000 MHz	Channel 11:	914.400 MHz	Channel 18:	916.889 MHz		
Channel 05:	911.360 MHz	Channel 12:	914.759 MHz	Channel 19:	917.231 MHz		
Channel 06:	912.627 MHz	Channel 13:	915.111 MHz	Channel 20:	917.581 MHz		

- 1. This device is a TRANSCEIVER with a built-in 900MHz FHSS transceiver.
- These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
- 3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
- 4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

# **1.2.** Operational Description

The EUT is a TRANSCEIVER with built-in 900MHz FHSS transceiver. The number of the channels is 25 in 909 - 919MHz. The device adapts the frequency hopping spread spectrum modulation. The antenna is monopole and solder on PCB and provides diversity function to improve the receiving function.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. The transmitter is presented with a continuous data stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its 25 channels and over the minimum number of hopping channels (25 channels).

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The frequency shift keying (FSK) transceiver intended for use in half-duplex, bidirectional RF links. The multi-channeled FSK transceiver is intended for UHF radio equipment.

The transmitter consists of a PLL frequency synthesizer and power amplifier. The frequency synthesizer consists of a voltage-controlled oscillator (VCO), a crystal oscillator, dual modulus prescaler, programmable frequency dividers, and a phasedetector. The loop-filter is external for flexibility and can be a simple passive circuit. The output power of the power amplifier can be programmed to seven levels. A lock-detect circuit detects when the PLL is in lock. In receive mode, the PLL synthesizer generates the local oscillator (LO) signal. The N, M, and A values that give the LO frequency are stored in the N0, M0, and A0 registers.

Another detail information please refer to spec of chipset.

Test Mode Mode 1: Transmit - 1Mbps (FSK)
--

# **1.3.** Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Pro	duct	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1	Test Fixture	NUTEK	N/A	N/A	N/A	N/A

Signal Cable Type		Signal cable Description		
А	Signal Cable	Non-Shielded,2.3m		

# 1.4. Configuration of Tested System

:		r r		[
			Test Eistune	
	EUT	— A —	Test Fixture	
	Let		(1)	
	L			

#### **1.5.** EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4
- (2) Execute the program (the continuous transmission program) on the EUT
- (3) Setup the test mode, the test channel, and the data rate.
- (4) Press OK to start the transmission.
- (5) Verify that the EUT works correctly.

# 1.6. Test Facility

	-	
Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : <u>http://www.quietek.com/tw/ctg/cts/accreditations.htm</u> The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <u>http://www.quietek.com/</u>

Ambient conditions in the laboratory:

Federal Communications Commission FCC Engineering Laboratory 7435 Oakland Mills Road Columbia, MD 21046 Registration Number: 92195

Accreditation on NVLAP NVLAP Lab Code: 200533-0





Site Name: Quietek Corporation Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen, Lin-Kou Shiang, Taipei, Taiwan, R.O.C. TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789 E-Mail : <u>service@quietek.com</u>

FCC Accreditation Number: TW1014



# 2. Conducted Emission

# 2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/014	Feb., 2010	
2	L.I.S.N.	R & S	ESH3-Z5/825562/002	Feb., 2010	EUT
3	L.I.S.N.	R & S	ENV4200/848411/010	Feb., 2010	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2/100410	July, 2010	
5	No.1 Shielded Roor	n		N/A	

Note: All instruments are calibrated every one year.

# 2.2. Test Setup



FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit					
Frequency	Lir	nits			
MHz	QP	AV			
0.15 - 0.50	66-56	56-46			
0.50-5.0	56	46			
5.0 - 30	60	50			

### 2.3. Limits

Remarks: In the above table, the tighter limit applies at the band edges.

# 2.4. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

# 2.5. Uncertainty

± 2.26 dB

# 2.6. Test Result of Conducted Emission

Owing to the DC (by Battery) operation of EUT, this test item is not performed.

# **3.** Peak Power Output

# **3.1.** Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Х	Power Meter	Anritsu	ML2495A/6K00003357	May, 2010
Х	Power Sensor	Anritsu	MA2411B/0738448	Jun, 2010

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

# 3.2. Test Setup



# **3.3.** Limit

The maximum peak power shall be less 1Watt.

# **3.4.** Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

# 3.5. Uncertainty

± 1.27 dB

# 3.6. Test Result of Peak Power Output

Product	:	TRANSCEIVER
Test Item	:	Peak Power Output
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (ANT A)

Channel No.	Frequency	Measurement	Required Limit	Result
	(MHz)	(dBm)		
Channel 00	909.600	0.44	0.25 Watt= 23.97 dBm	Pass
Channel 12	914.759	1.00	0.25 Watt= 23.97 dBm	Pass
Channel 24	919.024	0.87	0.25 Watt= 23.97 dBm	Pass

Product	:	TRANSCEIVER		
Test Item	:	Peak Power Output		
Test Site	:	No.3 OATS		
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)	(ANT B)	

Channel No.	Frequency	Measurement	Required Limit	Result
	(MHz)	(dBm)		
Channel 00	909.6	1.66	0.25 Watt= 23.97 dBm	Pass
Channel 12	914.759	1.80	0.25 Watt= 23.97 dBm	Pass
Channel 24	919.024	1.65	0.25 Watt= 23.97 dBm	Pass

Product	:	TRANSCEIVER		
Test Item	:	Peak Power Output		
Test Site	:	No.3 OATS		
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)	(ANT A+ANT B)	

Channel No.	Frequency	Measurement	Required Limit	Result
	(MHz)	(dBm)		
Channel 00	909.6	4.10	0.25 Watt= 23.97 dBm	Pass
Channel 12	914.759	4.42	0.25 Watt= 23.97 dBm	Pass
Channel 24	919.024	4.28	0.25 Watt= 23.97 dBm	Pass

# 4. Radiated Emission

#### 4.1. Test Equipment

The following test equipments are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3	Х	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2010
	Х	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2010
	Х	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2010
	Х	Pre-Amplifier	QTK	AP-180C/CHM 0906076	Sep., 2010
	Х	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2010
	Х	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2010
	Х	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2010
	Х	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	Χ	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

# 4.2. Test Setup

Below 1GHz



QuieTer

Above 1GHz



### 4.3. Limits

### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits											
Frequency MHz	uV/m @3m	dBuV/m@3m									
30-88	100	40									
88-216	150	43.5									
216-960	200	46									
Above 960	500	54									

Remarks: 1. RF Voltage  $(dBuV) = 20 \log RF$  Voltage (uV)

- 2. In the Above Table, the tighter limit applies at the band edges.
- 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

# 4.4. Test Procedure

The EUT was setup according to ANSI C63.4, 2003 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2003 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement. The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB beamwidth of the antenna. The worst radiated emission is measured on the Final Measurement.

The frequency range from 30MHz to 10th harminics is checked.

#### 4.5. Uncertainty

- ± 3.9 dB above 1GHz
- ± 3.8 dB below 1GHz

-

Product	: TRANS	SCEIVER			
Test Item	: Harmor	nic Radiated Emiss	sion		
Test Site	: No.3 O	ATS			
Test Mode	: Mode 1	: Transmit - 1Mbp	os (FSK) (909.6MHz)		
Frequency	Correct	Reading	Measurement	Margin	Limit
	Factor	Level	Level		
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
1819.2	-4.378	65.52	61.143	-22.799	83.942 note 6
2728.800	-1.052	56.440	55.388	-18.612	74.000
3638.400	-0.443	45.430	44.987	-29.013	74.000
4548.000	1.915	40.450	42.365	-31.635	74.000
5457.600	4.322	38.870	43.192	-30.808	74.000
Average					
detector:					
1819.2	-4.378	63.63	59.253	-17.979	77.232 note 6
2728.800	-1.052	54.580	53.528	-0.472	54.000
Vertical					
Peak Detector:					
1819.2	-2.641	64.53	61.89	-12.416	74.306 note 6
2728.800	-1.207	52.620	51.413	-22.587	74.000
3638.400	0.361	44.420	44.781	-29.219	74.000
4548.000	5.454	41.040	46.494	-27.506	74.000
5457.600	6.024	38.780	44.804	-29.196	74.000
Average etector:					
1819.2	-2.641	63.6	60.96	-7.146	68.106 note 6

## 4.6. Test Result of Radiated Emission

- 1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
- 2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz •
- 3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:20MHz  $\,\circ\,$
- 4. Emission Level = Reading Level + Correct Factor.
- 5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
- 6. The limit is 20dB down of fundamental.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	: TRANS	CEIVER			
Test Item	: Harmor	ic Radiated Emis	sion		
Test Site	: No.3 O	ATS			
Test Mode	: Mode 1	: Transmit - 1Mbp	os (FSK) (914.759MH	[z)	
Fraguanay	Corrot	Dooding	Magguramont	Morgin	Limit
Frequency	Easter	Laval	Laval	Margin	Lillill
MIT	Factor	Level		ID	
MHZ	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
<b>Peak Detector:</b>					
1829.518	-4.319	65.35	61.031	-24.402	85.433 note 6
2744.277	-0.949	54.190	53.241	-20.759	74.000
3659.036	-0.656	44.340	43.684	-30.316	74.000
4573.795	1.974	40.220	42.193	-31.807	74.000
5488.554	4.735	38.200	42.935	-31.065	74.000
Average					
<b>Detector:</b>					
1829.518	-4.319	64.49	60.171	-18.952	79.123 note 6
Vertical					
Peak Detector:					
1829.518	-2.756	64.98	62.224	-10.056	72.28 note 6
2744.277	-1.115	54.750	53.635	-20.365	74.000
3659.036	0.283	44.190	44.473	-29.527	74.000
4573.795	5.661	39.390	45.050	-28.950	74.000
5488.554	6.240	37.980	44.220	-29.780	74.000
Average					
<b>Detector:</b>					
1829.518	-2.756	63.81	61.054	-4.856	65.91 note 6

- 1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
- 2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz °
- 3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:20MHz •
- 4. Emission Level = Reading Level + Correct Factor.
- 5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
- 6. The limit is 20dB down of fundamental.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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Product	: TRANS	SCEIVER			
Test Item	: Harmor	nic Radiated Emiss	sion		
Test Site	: No.3 O	ATS			
Test Mode	: Mode 1	: Transmit - 1Mbp	os (FSK) (919.024MH	[z)	
Frequency	Correct	Reading	Measurement	Margin	Limit
Trequency	Factor	Level	Level	i i i i gin	
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
1838.048	-4.273	65.29	61.017	-26.851	87.868 note 6
2757.072	-0.864	52.970	52.106	-21.894	74.000
3676.096	-0.833	44.620	43.787	-30.213	74.000
4595.120	2.022	40.400	42.422	-31.578	74.000
5514.144	4.775	39.620	44.396	-29.604	74.000
Average					
<b>Detector:</b>					
1838.048	-4.273	64.46	60.187	-21.381	81.568 note 6
Vertical					
Peak Detector:					
1838.048	-2.852	66.45	63.598	-11.683	75.281 note 6
2757.072	-1.039	54.290	53.251	-20.749	74.000
3676.096	0.217	46.590	46.807	-27.193	74.000
4595.120	5.819	39.150	44.970	-29.030	74.000
5514.144	6.232	37.930	44.162	-29.838	74.000
Average					
<b>Detector:</b>					
1838.048	-2.852	65.68	62.828	-6.053	68.881 note 6

- 1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
- 2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz •
- 3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:20MHz °
- 4. Emission Level = Reading Level + Correct Factor.
- 5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
- 6. The limit is 20dB down of fundamental.
- 7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	:	TRANSCEIVE	R		
Test Item	:	Harmonic Radia	ated Emission		
Test Site	:	No.3 OATS			
Test Mode	:	Mode 1: Transn	nit - 1Mbps (FSK)	(Fundamental)	
Frequency		Correct	Reading	Measurement	Detector
		Factor	Level	Level	
MHz		dB	dBuV	dBuV/m	
Horizonta	1				
909.600		6.091	97.850	103.942	Peak
909.600		6.091	91.140	97.232	Average
914.759		6.083	99.350	105.433	Peak
914.759		6.083	93.040	99.123	Average
919.024		6.438	101.430	107.868	Peak
919.024		6.438	95.130	101.568	Average
Vertical					
909.600		2.505	91.800	94.306	Peak
909.600		2.505	85.600	88.106	Average
914.759		1.020	91.260	92.280	Peak
914.759		1.020	84.890	85.910	Average
919.024		4.661	90.620	95.281	Peak
919.024		4.661	84.220	88.881	Average

- 1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
- 2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz •
- 3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:20MHz •
- 4. Emission Level = Reading Level + Correct Factor.
- 5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product	: TRANS	CEIVER						
Test Item	: General	Radiated Emissio	n					
Test Site	: No.3 OA	ATS						
Test Mode	: Mode 1: Transmit - 1Mbps (FSK) (Hopping)							
		1						
Frequency	Correct	Reading	Measurement	Margin	Limit			
	Factor	Level	Level					
MHz	dB	dBuV	dBuV/m	dB	dBuV/m			
Horizontal								
30.000	2.120	21.855	23.975	-16.025	40.000			
109.540	-7.488	23.463	15.975	-27.525	43.500			
326.820	-4.548	32.166	27.619	-18.381	46.000			
511.120	1.499	30.853	32.352	-13.648	46.000			
604.240	4.770	23.784	28.554	-17.446	46.000			
730.340	3.395	39.300	42.695	-3.305	46.000			
Vertical								
31.940	-0.487	22.328	21.842	-18.158	40.000			
107.600	-0.318	24.207	23.889	-19.611	43.500			
293.840	-7.738	30.197	22.460	-23.540	46.000			
398.600	-4.678	33.909	29.231	-16.769	46.000			
516.940	-0.876	24.476	23.600	-22.400	46.000			
740.040	-0.347	32.293	31.946	-14.054	46.000			

- 1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
- 2. "means the worst emission level.
- 3. Measurement Level = Reading Level + Correct Factor.
- 4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pretested. Only the worst case is shown on the report.
- 5. The emission levels of other frequencies are very lower than the limit and not show in test report.

# 5. RF Antenna Conducted Test

# 5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2010

Note: 1. All equipments are calibrated every one year.

2. The test instruments Marked "X" are used to measure the final test results.

# 5.2. Test Setup



# 5.3. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

# 5.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

# 5.5. Uncertainty

± 150Hz

# 5.6. Test Result of RF Antenna Conducted Test

Product	:	TRANSCEIVER
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (ANT A)

# Figure Channel 00: 30MHz-25GHz

D Ag	ilent S	Spect	rum /	analyzer -	Swept SA										
⊯ Sta	rt Fi	req	50 Ω <b>30</b>	.00000	00 MH:	z		AC SE	NSE:INT	A	/g Type	ALIGNAUTO	11:22:39 A TRAC	M Dec 01, 2010	Save As
10 d	B/div	,	Ref	In 20.00	d <b>Bm</b>	PNO: IFGain	Fast 🕞 n:Low	#Atten: 3	0 dB		ginola	N	™ 1kr2 1.8 -41.74	28 GHz 46 dBm	Sav
Log 10.0 0.00		> <sup>1</sup>													File/Folde Lis
-20.0 -30.0 -40.0		4	2											-24.69 dBm	File name
-50.0 -60.0 -70.0		anga nati		and the second of	per tal a apri		<sup>و</sup> ر میروند میروند از میروند میروند از میروند از میروند از میروند از میروند میروند از میروند میروند از میروند می	e-solven en anderen	4. may 4. was	a and a second and a second and a second	بيە <sup>لىر</sup> ىرىن	, A	and a start and		Save A type
Sta #Re MKR	rt 30 es B1 MODE N	) MI W 1	Ĥz 00   SEU	(Hz	×	904 M	#VBW	/ 1.0 MHz Y -4.388 d	Bm	FUNCTION	FU	Sweep	Stop 2 2.30 s (	5.00 GHz 1001 pts) NVALUE	👌 Up On Leve
2 3 4 5 6 7	N	1	f			1.828 G	Hz	-41.746 d	Bm						Create Nev Folde
8 9 10 11 12															Cance
MSG												STATUS			

#### Figure Channel 12: 30MHz-25GHz

D Ag	ilent S	Spect	rum /	nalyzer -	Swept S	A												
⊯ Sta	rt Fi	req	50 Ω <b>30</b>	.00000	00 MH	łz		A	C S	ENSE:	INT	Avg	Type	ALIGNAUTO	11:24:00/ TRA	M Dec 01, 2010	Sa	ive As
10 d	B/div	,	Ref	In 20.00 (	put: RF d <b>B</b> m	PN IFG	10: Fas Sain:Lo	st 😱 w	#Atten: \$	30 dB	3	Avgir	1010.	14/100	، Mkr1 9 -4.5	et P NNNNN 04 MHz 27 dBm		Save
10.0 0.00 -10.0		1																File/Folder List
-20.0 -30.0 -40.0		(	2													-24.53 dBm		File name:
-50.0 -60.0 -70.0	hun	-	ngen dirke	and the second			-torto-to	in puncture of	aan oo Miglalaan poorisiin		e-rife-trades/star	Josley PLJL-93	,,,Marana 4	nan de de la construise	ALVELING - MA			Save As type:
Stai #Re MKR	nt 30 s B1 M000	) Mi N/ 1 1200	lz 00 l SEL	Hz	×	90	#\ 4 MHz	VBW	1.0 MH: -4.527 c	z	FUN	CTION	FUN	Sweep	Stop 2 2.30 s	25.00 GHz (1001 pts)	٦	Up One Level
2 3 4 5 6 7	N	1	f			1.82	8 GHz	2	-41.671 (	dBm							ø	reate New Folder
8 9 10 11 12																		Cancel
MSG														STATUS				



					-	I Igui	e one			00.			UIII/		
D Ag	ilent S	Spectr	um i	Analyzer - S	iwept SA										
LXI Dia			50 Ω	04.00	10		AC	SENSE:	NT	A	AL	IGN AUTO	11:25:16/	M Dec 01, 2010	Save As
DIS	piay	LIN	ie	-24.32 Inp	aBM out: RF	PNO: Fast IFGain:Lov	Trig:	Free Ru en: 30 dB	n	Avg H	lold: 10	)/100	TY	ET P N N N N N	
10 d	B/div	, 1	Ref	20.00 c	lBm								Mkr1 9 -4.1	29 MHz 88 dBm	Save
Log 10.0		1													File/Folder
0.00 -10.0															List
-20.0				_										-24.32 dBm	
-30.0 -40.0		$\langle \rangle$	2												File name:
-50.0	JAL	mandrider	wre	white and	and marking	www.	and webe and	1 the Marine	H-CARA	oologi, Labo		y Incorrect Nation	provide the sea	and they	Sava Ac
-60.0															type:
Sta #Re	rt 30 es Bi	) MH W 10	Iz 00	kHz		#V	'BW 1.0 N	/IHz				Śweep	Stop 2 2.30 s	25.00 GHz (1001 pts)	🁌 Up One
MKR 1	MODE	TRC 1	SCL f		Х	929 MHz	Y	88 dBm	FUNC	TION	FUNC	TION WIDTH	FUNCT	ON VALUE	Level
2	N	1	f		1	.828 GHz	-42.4	38 dBm			1				
4											0				对 Create New
5															- Folder
7															
8	_			-											
10															Cancel
11															
MSG												STATUS			

### Figure Channel 24: 30MHz-25GHz

Product	:	TRANSCEIVER
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (ANT B)

# Figure Channel 00: 30MHz-25GHz

								Swept SA	Analyzer -	Spectrum	ilent S
Save As	M Dec 01, 2010 E 1 2 3 4 5 6 E M WWWWW	11:17:26 A TRAC TYP	ALIGNAUTO : Log-Pwr 30/100	Avg Type AvgIHold		C SE		00 MHz	Ω 0.0000	50 req 3	rt Fr
Save	28 GHz 49 dBm	₀ 1kr2 1.8 -23.04	N		) dB	#Atten: 30	Gain:Low	dBm	" f 20.00	· Re	B/div
File/Folde Lis										) <sup>1</sup>	
File name	-21.71 dBm									<sup>2</sup>	
Save A type			http://tex.worker	· <del></del> -	North and my of the other	البناحيهاور معلمه	and an and an and an	and a shall be a sure of the second	and the second	romania	-
🎒 Up On Leve	5.00 GHz 1001 pts)	2.30 Stop 2	Sweep	STION FU	3m	1.0 MHz	#VBV	×	kHz	MHz W 100	rt 30 es B\ MODE
Create New Folde					3m	-23.049 dl	28 GHz	1.8			N
Cance											
20			STATUS								

# Figure Channel 12: 30MHz-25GHz

🍺 Agilent Spe	Agilent Spectrum Analyzer - Swept SA 📃 🗖 🔀												
₩ Start Fre	50 G q 30	0.000000 MHz		AC SEN	ISE:INT	Avg Typ	ALIGNAUTO e: Log-Pwr	11:19:24 A TRAC	M Dec 01, 2010	Save As			
10 dB/div	Ref	7 20.00 dBm	NO: Fast 🕞 Gain:Low	#Atten: 30	dB	Arginok	N	™ 1kr2 1.8 -23.3	28 GHz 69 dBm	Save			
10.0 0.00										File/Folder List			
-20.0 -30.0 -40.0	<b>♦</b> <sup>2</sup>								-21.57 dBm	File name:			
-50.0 +60.0 -70.0	n. aren 19	and the second	an a second and a se	a tort reason when the	and and a second se	and a start of the	an a			Save As type:			
Start 30 M #Res BW	1Hz 100 6 SEU	kHz × 90	#VBW	Y 1.0 MHz Y -1.572 dE	FUN 3m	CTION FI	Sweep	Stop 2 2.30 s (	5.00 GHz 1001 pts) NVALUE	👌 Up One Level			
2 N 1 3 4 5 6	f	1.82	8 GHz	-23.369 dE	3m					Create New Folder			
10 12										Cancel			
MSG							STATUS						



THE A		· · · · ·				8	• • •					UTTE		
	gnent	speci	50.0	analyzer -	swept SA		AC	CENCE-	TNIT	19	ALIGNALITO	11:20:457	M Dec 01 2010	
Sta	rt F	req	30	).0000( In	DO MHZ put: RF	PNO: Fast	Tri	g: Free Ru ten: 30 dE	in 3	Avg T Avg Ho	ype: Log-Pwr old: 16/100	TRA TY D	CE 1 2 3 4 5 6 PE MWWWWW ET P N N N N N	Save As
10 c	iB/di	v	Ref	20.00	dBm						Γ	/lkr2 1.8 -23.6	28 GHz 41 dBm	Save
Log 10.1 0.01 -10.(		∕_ <b>1</b>	-											File/Folder List
-20.0 -30.0 -40.0			)2										-21.77 dBm	File name:
-50.0 -60.0 -70.0	אייייי איייייין (	Jahore	dere sede	alt make of the		ring and low second	on de orient		an ndress years	then juger	aug - rako (- stora a bas			Save As type:
Sta #Ro MKE	nt 30 es B M	0 Mi W 1	Hz 100	kHz	×	#V	BW 1.0	MHz 765 dBm	FUN	CTION	Sweet	Stop 2 2.30 s (	25.00 GHz 1001 pts)	🏂 Up One Level
2 3 4 5 6	N	1	f		1.	828 GHz	-23.0	541 dBm						Create New Folder
7 8 9 10 11														Cancel
MSG									1		STATU	5		

#### Figure Channel 24: 30MHz-25GHz

# 6. Band Edge

\_\_\_\_

# 6.1. Test Equipment

#### **RF** Conducted Measurement

The following test equipments are used during the band edge tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
Х	Spectrum Analyzer	Agilent	N9010A/MY48030495	Apr., 2010

#### **RF Radiated Measurement:**

The following test equipments are used during the band edge tests:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 3		Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2010
	Х	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2010
		Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2010
	X Pre-Amplifier		QTK	AP-180C/CHM 0906076	Sep., 2010
	Х	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2010
		Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2010
	Х	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2010
	Х	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	Х	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.



# 6.2. Test Setup

#### **RF** Conducted Measurement



#### **RF Radiated Measurement:**

#### Above 1GHz



## 6.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

# 6.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2003 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz. The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

# 6.5. Uncertainty

- ± 3.9 dB above 1GHz
- ± 3.8 dB below 1GHz

# 6.6. Test Result of Band Edge

Product	:	TRANSCEIVER
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)

Antenna	Frequency	<b>Emission Level</b>	Limit	Result
Polarization	[MHz]	[dBuV]		
Н	902	42.41	>20dBc	PASS
V	902	40.36	>20dBc	PASS
Н	928	40.39	>20dBc	PASS
V	928	41.52	>20dBc	PASS

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=100kHz, VBW=1MHz

Average detector: RBW=100kHz, VBW=10Hz



### Lower Channel Peak Detector of Radiation Band Edge Delta (Horizontal)

#### Lower Channel Peak Detector of Radiation Band Edge Delta (Vertical)



Date: 13.DEC.2010 08:43:36

Date: 13.DEC.2010 08:33:37



#### High Channel Peak Detector of Radiation Band Edge Delta (Horizontal)

Date: 13.DEC.2010 08:55:36



# High Channel Peak Detector of Radiation Band Edge Delta (Vertical)

Date: 13.DEC.2010 09:00:22

# 7. Channel Number

### 7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2010

Note: 1. All equipments are calibrated every one year.2. The test instruments marked by "X" are used to measure the final test results.

# 7.2. Test Setup



# 7.3. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

# 7.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

# 7.5. Uncertainty

N/A

# 7.6. Test Result of Channel Number

Product	:	TRANSCEIVER
Test Item	:	Channel Number
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)

Frequency Range	Measurement	Required Limit	Result		
(MHZ)	(Hopping Channel)	(Hopping Channel)			
902 ~ 928	25	>=25	Pass		

D Ag	ilent	Spect	trum	Analyzer -	Swept SA											
sta	rt F	req	50 s	ລ 09.000 	000 MHz 1put: RF P	NO: Far		C SE Trig: Free	NSE:IN e Run	IT	Avg 1 Avg H	ype old:	ALIGN AUTO : Log-Pwr 80/100	09:17:13 A TRAC TY	M Dec 03, 2010 E 1 2 3 4 5 6 E M	Frequency
10 d	B/di	v	Re	f 10.00	dBm	Gain:Lov	N	#Atten: 20	0 dB		0.239		Mkr2	914.400 -9.8	0 0 MHz 57 dBm	Auto Tune
Log 0.00 -10.0 -20.0			J		hh	$\gamma$	1	4			P	V	Y	m	$\mathcal{M}^2$	Center Freq 911.800000 MHz
-30.0 -40.0 -50.0	~			V				- L	L.M.	wawe war	/					Start Freq 909.000000 MHz
-70.0 -80.0																<b>Stop Freq</b> 914.600000 MHz
Stai #Re	nt 90 Is B	09.0 W 3	00 80 k	MHz Hz	×	#V	BW	100 kHz		FUNC	CTION	FUR	#Sweep	Stop 914 500 ms (	.600 MHz 1001 pts)	CF Step 560.000 kHz <u>Auto</u> Man
1 2 3 4 5 6	N	1	f		909.600 914.400	0 MHz 0 MHz		-2.511 di -9.857 di	Bm Bm							Freq Offset 0 Hz
7 9 10 11 12																
MSG													STATUS	5		
D Ag	ilent	Spect	trum	Analyzer -	Swept SA			c l or						00.00.00.0		
Sta	rt F	req	9	14.600 	000 MHz 1put: RF P	NO: Far Sain:Lov		Trig: Free #Atten: 20	e Run d B		Avg 1 Avg H	ype old:	: Log-Pwr 71/100	D9:20:22 A TRAC TYI D	E 1 2 3 4 5 6 MWWWWW P NNNNN	Frequency
10 d	B/di	v	Re	f 10.00	dBm								Mkr2	919.024 -9.7	IOMHz 88 dBm	Auto Tune
0.00 -10.0 -20.0	N	*/	V	M	M	n	N	M.	N	$\mathbb{A}$	Y		$\gamma\gamma$			Center Freq 917.300000 MHz
-30.0 -40.0 -50.0														Luk.	have t	Start Freq 914.600000 MHz
-70.0 -80.0															Manu	Stop Freq 920.000000 MHz
Star #Re	s B	14.6 W 3	00 30 k	MHZ Hz	×	#V	BW	100 kHz		FUN	CTION	FUR	#Sweep	Stop 920 500 ms (	.000 MHz 1001 pts)	<b>CF Step</b> 540.000 kHz <u>Auto</u> Man
1 2 3 4 5 6	N	1	f		914.759 919.024	0 MHz 0 MHz		-7.928 dl -9.788 dl	Bm Bm							Freq Offset 0 Hz
7 8 9 10																
12 MSG	_	1											STATUS	5		

# 8. Channel Separation

#### 8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
Х	Spectrum Analyzer	Agilent	N9010A/MY48030495	Apr., 2010

Note: 1. All equipments are calibrated every one year.

2. The test instruments mark by "X" are used to measure the final test results.

# 8.2. Test Setup



#### 8.3. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

# 8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

# 8.5. Uncertainty

± 150Hz

# 8.6. Test Result of Channel Separation

Product	:	TRANSCEIVER
Test Item	:	Channel Separation
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)

	Fraguanay	Measurement	Limit	Limit of 20dB	
Channel No.	(MH <sub>2</sub> )	Level	$(l_{2}\mathbf{U}_{2})$	Dondwidth (kHz)	Result
	(MIIIZ)	(kHz)	(KHZ)	Daliuwiulii (KHZ)	
00	909.6	470	>25 kHz	>295.0	Pass
12	914.759	352	>25 kHz	>269.0	Pass
24	919.024	356	>25 kHz	>297.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

D Agilent S	opectrum	Analyzer -	Swept SA								
ø Center	50 Freq	<sup>2</sup> 909.60	0000 MH	Z	AC SE		Avg Typ Avg Hold	ALIGNAUTO e: Log-Pwr	09:25:36 A TRAC TYP	M Dec 03, 2010 E 1 2 3 4 5 6	Frequency
10 dB/div	Re	f 10.00 (	dBm	NU: Far Gain:Low	#Atten: 20	) dB		Mkr	2 909.9 -9.9	74 MHz 99 dBm	Auto Tune
-10.0						$\mathbf{h}$		2			Center Freq 909.600000 MHz
-30.0 -40.0 -50.0				$\sim$						~	Start Freq 908.600000 MHz
-60.0	~~~~~										Stop Freq 910.600000 MHz
Center 9 #Res BN	909.60 N 30 k	0 MHz Hz	× 909.504	#VB	W 100 kHz -9.297 d	FUN 3m	ICTION FL	Sweep	Span 2 2.13 ms (	.000 MHz 1001 pts) N VALUE	<b>CF Step</b> 200.000 kHz <u>Auto</u> Man
2 N 3 4 5 7 8 9 10 11	1 f		909.974	4 MHz	-9.999 dl	3m					Freq Offset 0 Hz
MSG							<u>l</u> .	STATUS			

#### Channel 00 909.6MHz

	gilent S	Spect	rum /	Analyzer -	Swept SA									202	
(XI Cei	nter	Fre	50 ດ pe	914.75	9000 MF	łz	AC	SENSE:INT	Г	Avg Ty	ALIGNAUTO	09:26:24 A	M Dec 03, 2010	Fr	equency
				In	iput: RF F IF	PNO: Far Gain:Low	₽ Trig: I #Atter	ree Run 1:20 dB		AVGIHO	Mk	r2 915.1			Auto Tune
10 c	IB/di∖	1	Ref	10.00	dBm							-10.8	24 dBm		
0.00 -10.0 -20.0	) ) )							\$	$\bigvee$					<b>(</b> 914	<b>Center Freq</b> 1.759000 MHz
-30.0 -40.0 -50.0					-				4			harry		913	Start Freq 8.759000 MHz
-60.0 -70.0 -80.0	)	~~~		-~~;										915	Stop Freq 5.759000 MHz
Cer #Re	nter es Bl	914 N 3	.75 0 k	9 MHz Hz		#VE	W 100 k	Hz			Sweep	Span 2 2.13 ms	2.000 MHz (1001 pts)		CF Step 200.000 kHz
MKR 1	MODE N	1	SCL f		× 914.75	5 MHz	-9.10	dBm	FUNC	TION	FUNCTION WIDT	H FUNCTI	ON VALUE	<u>Auto</u>	Man
3 4 5 6	N	-			310.10		-10.02	+ ubiii						)	Freq Offset 0 Hz
7 8 9 10 11															
12 MSG											STATU	IS			

# Channel 12 914.759MHz

# Channel 24 919.024MHz

🎾 Agilent Spec	ctrum Analyzer	- Swept SA								
Center Fr	50 Ω req 918.6	70000 MH	z	AC SE		Avg Type Avg Hold	ALIGNAUTO Log-Pwr	09:28:07 A TRAC	M Dec 03, 2010	Frequency
10 dB/div	Ref 10.00	Input: RF F IF dBm	'NO: Far 🕞 Gain:Low	Atten: 20	dB		Mkr	2 919.0 -15.1	34 MHz 64 dBm	Auto Tune
-10.0 -20.0						$\bigwedge$	2			Center Freq 918.670000 MHz
-30.0 -40.0 -50.0			- and the second		\\			Langer and the second s		Start Freq 917.670000 MHz
-60.0 -70.0 -80.0	Junnah									<b>Stop Freq</b> 919.670000 MHz
Center 91 Res BW 1 MKR MODE TR	8.670 MHz 8 kHz	× 918.67	VBW	180 kHz -15.433 d	FUNG	CTION FU	Sweep :	Span 2 5.73 ms (	.000 MHz 1001 pts) NVALUE	CF Step 200.000 kHz <u>Auto</u> Man
2 N 1 3 4 5 6	f	919.03	4 MHz	-15.164 d	Bm					Freq Offset 0 Hz
7 8 9 10 11 12										
MSG							STATUS			

# 9. Dwell Time

### 9.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
Х	Spectrum Analyzer	Agilent	N9010A/MY48030495	Apr., 2010

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

# 9.2. Test Setup



### **9.3.** Limit

The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

# 9.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

# 9.5. Uncertainty

± 25msec

# 9.6. Test Result of Dwell Time

Product	:	TRANSCEIVER
Test Item	:	Dwell Time
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)

Channel No.	Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
00	909.6	58.000	4	500	0.46	0.186	0.4	Pass
12	914.759	58.000	4	500	0.46	0.186	0.4	Pass
24	919.024	58.400	4	500	0.47	0.187	0.4	Pass

Duty cycle =((Time slot length(ms)\*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle / 25) \* (25\*0.4)

#### CH 00 Time Interval between hops

#### CH 00 Transmission Time

III Agilent Spectrum Analyzer - Sweyt SA		- 6 🛛	🔀 🍽 Agilent Spectrum Analyzer - Swept SA 🖉 🗖 🗖
Center Freq 909.600000 MHz Trig Delay: 15.00 ms Avg Type: Log Pwr	02:20:20 PMDec 01, 2010 12:405 1 2:0:4:5:6 10:100	Frequency	Center Freq 909.600000 MHz Trig Dolars 10.00 ms /vg Type: Leg Pwr 10.227:27MDecol 2010 Frequency
10 dEldiv Ref 10.00 dBm	UEI P NNNNN	Auto Tune	memorial (10 (10) 4 (10)
		Center Freq 909.600000 MHz	
100	HISTM	Start Freq 909.600000 MI Iz	
-000		Stop Freq 909.600000 MH2	will be addressed with the condensate of th
an		CF Step 1.000000 Mi lz	Center 999.600000 MHz PD Res BW 1.0 MHz #VBW 1.0 MHz Sweep 200.0 ms (1001 pts) 1.000000 Mi
-200 ครั้ง รายปากรุณาสารสารเสียง (การสารสารสารสารสารสารสารสารสารสารสารสารสา	atquique stPedightstof	Auto Man Freg Offset	J N     1 L     1 L     1 L     1 L     22 dBN
-am		0 Hz	H4 4 0 0H
Center 909.600000 MHz Res BW 1.0 MH7 #VBW 1.0 MH7 Sweep 50	Span 0 Hz 00.0 ms (1001 pts)		
MSG STATUS			MGG CTATUS

#### CH12 Time Interval between hops

#### CH 12Transmission Time

	gilant 3	Spectrum	n Analy	wr - 51	AC Igen																	8.	Agilen	ni Speci	rum I	Analyzer	- Swap	I SA														a
Cei	nter	Freq	914	.759	000 N	ЛНZ		<i>N</i> .	Trig De	stan Ing.	-15.00	110.	Avg	, Турч.	Log-P	Per	02126	14 PM	12315	10	Frequency	Ce	ente	er Fre	90 B	: 914.7	5900	IO ME	łz		//. Trè	g Delag	-15.00 i	na Avg	Турч	Log-Per	) ju	220:57 P	ADec 01, 2 1 2 3 1	200	Frequency	
				Inpi	if: KF	PN0 II Gal	t Fast In 1 mar	-	fAtten:	20	B							0FT	PNNNN	i N	Auto Turo						Input: H	а в П	NO: Es Galect	et (* mu	žA,	ten: 20	dB					nr	PNNN	NN	Auto Tum	
10 0	dB/dlv	v Re	ef 10.	00 di	Bm															ļ	Auto Tune	10	dB/c	dīv	Ref	10.00	) dBm	n									ΔMI	r3 15 -6	52.2 n 2.41 c	IS IB	Auto Tune	1
Log	ľ																			٦ſ	Center Freq		۳F		1		-			<u>_</u> 22	1						-	_		٦r	Center Free	a
0.0	╟╴	_	F	-		+	_	+	_	+		+	_	+	_	1	-	+	_	╢	914.769000 MHz	1																1			914.769000 MH	z
-10.0	•																			lĒ		-20																	INC	. 76		7
																				Ш	Start Freq	40			+		+		-	+	-			+	_		+		-	-11	Start Fred	9
-/11	Ή		$\square$	_		+	_	_	_	_		_	+	_				_	1991 V	4	514.105000 min iz	50	0.0															3Δ1		1	214.102000 111.1	
30.0	•																				Stop Freq	-81 -70	"h	وريهما						-up-		and the	ماري (Ve باس	nia apren	وجريعها	an a	-	,		I	Stop Free	q
40.0																				Ш	914.769000 MHz	-81	h		+		+		-		-			+	_		+		-	-11	914.769000 MH	z
																				IF	05.0144	Ce	ente	r 914	.759	9000 1	WHZ								_			S	pan O	HZ	05.01	-
50.0	°																				1.000000 MHz	Re	:s B	W 1.	D MH	Hz			4	VBW	/ 1.0	MH2				Sweep :	200.	) ms (	1001 p	(S)	1.000000 MH	ż
60.0	۰.				العدا	رايہ			. L.							i	هيل يا	ياريد		ľ	<u>Auto</u> Man	1	I M	1 1	en t			× 14	.60 m	a		2.70 dE	m	NULIN		DINWD		TIMOT	NWNTE		Auto Mar	a
70.1	r		1	~~F	- Diana Mar	Ϋ́	~4		roj	T	- J.	۳	parti i			-	- Industry	100	491		Freq Offset	l i		1 1	ţ	(A) (A)		58	2 2 m	8 ( <u>A)</u> 8 (A)		0.14 61.68 /	IB IR		+		+			H٢	FreqOffse	
	1																			Ш	0 Hz	Ģ	5																		он:	z
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c		014 74	5000		,																	10		-						-							-			뀌		
Ret	s BW	V 1.0 N	VIHz	/ min	2		#VE	BW 1	.0 MH	łz				8	wee	р 5	00.0 п	91 IS (1	001 pts	5)		11 12	2																			
MORE															8	IAIUS						MORE	•													SIAR	28					1



# CH 24 Time Interval between hops

#### CH 24 Transmission Time

		Be Agreet spectrum Analyzer - swept sa	
X     Selection     Austration     betain for the construction       Center Freq     919.024000 MHz     Trig Delay: -16.00 ms     Avg Type: Log-Pwr     TW/F [12.3.4.5]	Frequency	OX     SOLD     ALL     ALLOWARDO     DE2220VMDec.05,2020       Center Freq. 919,024000 MHz     Trig Deley16:00 ms. Avg Type. Log-Per     MMX12,211,010	Frequency
10 dBldiv Ref 10.00 dBm	Auto Tune	Input: BA     PRICE Aug. ***     Tigg Vide Aug.       If Calabian     #Mexes: 20 dB     ΔMK/31 152.8 ms       U oblider     Ref 10.00 dBm     -62.2 ft dB	Auto Tune
	Center Freq 919.024000 MHz		Center Freq 919.024000 MHz
200	Start Freq 919.024000 MHz		Start Freq 919.024000 MI Iz
	Stop Freq 919.024000 MHz	000 when all	Stop Freq 919.024000 MHz
	CF Step 1.000000 MHz <u>Auto</u> Man	Conter 910.024000 MHz Epan 0 Hz Res BW 1.0 MHz #VBW 1.0 MHz Sweep 200.0 ms (1001 pts) EXENSIBLE RES 100 MHz 400 ms 300 48m (1000 ms) 400 ms)	СF Step 1 000000 МН7 ulu Мыл
kul yelesijeştihistiştihi kanşterişterinde kanaliterişterinde kanaliterinde kanaliter	Freq Offset 0 Hz	2     Δ1     1     t     (Δ)     55.460     50.460       3     Δ1     1     t     (Δ)     152.6 ms     (Δ)     -62.51 dB     -6       6     -	Freq Offset 0 Hz
Span 0 Kt Street 1919.024000 MHz System 500 0 mc 4001 str	Z		
KG JFIC <2 919.024 2 2 pnp> saved Sav	<b>7</b>	121	

# 10. Occupied Bandwidth

# **10.1.** Test Equipment

_	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2010
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2010
Х	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2010

Note: 1. All equipments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

# 10.2. Test Setup



### 10.3. Limits

N/A

# 10.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

#### 10.5. Uncertainty

± 150Hz

# 10.6. Test Result of Occupied Bandwidth

Product	:	TRANSCEIVER
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (909.6MHz) (ANT A)
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (909.6MHz) (ANT

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	909.600	295	200< Level <500	NA

# Figure Channel 00:

DAgilent Spectrum	Analyzer - S	Swept SA								
Center Freq	Ω 909.60	0000 MH	7	C SEr	NSE:INT	Avg Type	ALIGNAUTO	09:23:04 A	M Dec 03, 2010 E 1 2 3 4 5 6	Frequency
10 dB/div Re	f 10.00 c	iBm	— NO: Far ⊊ Gain:Low	┘ Trig: Free #Atten: 20	Run I dB	Avg Hold:	>100/100 Mk	r1 909.6 -6.64	12 MHz 46 dBm	Auto Tune
0.00					1					Center Freq 909.600000 MHz
-10.0				hund	-20.0	0 dB				Start Freq 908.600000 MHz
-30.0					295	KHZ				Stop Freq 910.600000 MHz
-50.0	$\Lambda$	Washburd	n pl			whommen				CF Step 200.000 kHz <u>Auto</u> Man
-70.0	N WY MAR						<sup>าไ</sup> ม่ใกลู่ใ <sub>ช่ไป</sub> รูสา	hand warder	h h h h h h h h h h h h h h h h h h h	Freq Offset
-80.0										0 12
Center 909.60 #Res BW 10 k	)0 MHz (Hz		#VBW	100 kHz		<u> </u>	Sweep	Span 2 18.5 ms (	.000 MHz 1001 pts)	
MSG							STATU	JS		

Product	:	TRANSCEIVER
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)( 914.759MHz) (ANT A)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
12	914.759	269	200< Level <500	NA

# Figure Channel 12:

D Agilent Spectrum Analyzer - Swept SA					
00 50 Ω Center Freg 914.759000 MH		NSE:INT Avg Typ	ALIGNAUTO	09:23:48 AM Dec 03, 2010 TRACE 1 2 3 4 5 6	Frequency
Input: RF IF	VNO: Far Trig: Free Gain:Low #Atten: 20	≥Run Avg Hol )dB	d:>100/100	TYPE MWWWWW DET P N N N N N	
10 dB/div Ref 10.00 dBm	10 W 11		MKI	-1 914.835 MHz -6.100 dBm	
					Center Freq
0.00		<b>●</b> <sup>1</sup>			914.759000 MHz
-10.0	Λ	$ \Lambda $	-		
	1 / m				Start Freq
-20.0		-20.00 dB			913.739000 Mil 12
-30.0		269 kHz	-		Stop Frog
- 10.0	<b> </b>				915.759000 MHz
-40.0	ł				
-50.0	N				CF Step
-60.0 AAV	1 June 1	Willing Walling	MA		Auto Man
Why Wh			C. AND	Am	
-70.0			-	Mar	Freq Offset
-80.0					0 Hz
0.0					
Center 914.759 MHz				Span 2.000 MHz	
#Res BW 10 kHz	#VBW 100 kHz		Sweep	18.5 ms (1001 pts)	
MSG			STATUS	5	

Product	:	TRANSCEIVER
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (919.024MHz) (ANT A)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
24	919.024	297	200< Level <500	NA

# Figure Channel 24:

💴 Agilent Spectrum Analyzer - Swept SA				
20 Ω Center Freg 919.024000 MHz	AC SENSE:INT	ALIGNAUTO Avg Type: Log-Pwr	09:24:22 AM Dec 03, 2010 TRACE 1 2 3 4 5 6	Frequency
Input: RF PNO: IFGain	Far 🕞 Trig: Free Run h:Low #Atten: 20 dB	Avg Hold>100/100	DET P N N N N N	Auto Turo
10 dB/div Ref 10.00 dBm		Mk	r1 919.126 MHz -6.753 dBm	Auto Tune
Log				Center Freq
0.00		1		919.024000 MHz
-10.0				
				Start Freq
-20.0		-20.00 dB		918.024000 MHz
-30.0		297 kHz		<b>21</b> - <b>5</b>
	<b>\</b>	1		920.024000 MHz
-40.0	r			
-50.0	 	- M.		CF Step
	14 per or the state	man at h	л	Auto Man
-00.0		an a	pup the	
-70.0 for year and a north and a north and a north and a north			Whatepart	Freq Offset
00.0				0 Hz
-00.0				
Center 919.024 MHz			Span 2.000 MHz	
#Res BW 10 kHz	#VBW 100 kHz	Sweep	18.5 ms (1001 pts)	
MSG		STATU	3	

Product	:	TRANSCEIVER
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (909.6MHz) (ANT B)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	909.600	297	200< Level <500	NA

# Figure Channel 00:

Dagilent Spectrum Analyzer - Swept SA				
Center Freq 909.600000 MI	AC SENSE:INT IZ Trig: Free Run	ALIGNAUTO Avg Type: Log-Pwr Avg Hold>100/100	04:44:07 PMDec 02, 2010 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Frequency
10 dB/div Ref 20.00 dBm	Gain:Low Atten: 30 dB	Mkr	1 909.614 MHz -5.119 dBm	Auto Tune
10.0				Center Freq 909.600000 MHz
-10.0				Start Freq 908.600000 MHz
-20.0	-20	0.00 dB 7 kHz		<b>Stop Freq</b> 910.600000 MHz
-40.0	m wh	% A o		CF Step 200.000 kHz <u>Auto</u> Man
-50.0		Me Welling Limman	Mar What Marshow	Freq Offset 0 Hz
-70.0 Center 909.600 MHz			Span 2.000 MHz	
#Res BW 10 kHz	#VBW 1.0 MHz	Sweep	18.4 ms (1001 pts)	

Product	:	TRANSCEIVER
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK)( 914.759MHz) (ANT B)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
12	914.759	266	200< Level <500	NA

# Figure Channel 12:

💴 Agilent S	Spectrum Analyzer -	Swept SA								- 7 🛛
Kanter	50Ω Freg 914 75	9000 MH	م   A	IC SEI	NSE:INT	Avg Type	ALIGNAUTO E: Log-Pwr	04:47:02 PM TRACE	Dec 02, 2010	Frequency
	Bof 20.00	put: RF PI IFG	NO: Far 😱 iain:Low	┘ Trig: Free Atten: 30	e Run dB	Avg Hold	⇒100/100 Mk	r1 914.83 -4 49	3 MHz	Auto Tune
										Center Freq 914.759000 MHz
0.00										Start Freq 913.759000 MHz
-20.0			-	-	-2	0.00 dB 66 kHz				Stop Freq 915.759000 MHz
-40.0			N	/	4	1.				CF Step 200.000 kHz <u>Auto</u> Man
-60.0	Am Carrow war	H Walashan	www.			who was a first of the second	m	www.ll.lug.vl.m.e.	Mar Carly ward	Freq Offset 0 Hz
-70.0 Center #Res B	914.759 MHz W 10 kHz		#VBW	1.0 MHz			Sweep	Span 2.0 18.4 ms (10	000 MHz 001 pts)	
MSG							STAT	US		

Product	:	TRANSCEIVER
Test Item	:	Occupied Bandwidth Data
Test Site	:	No.3 OATS
Test Mode	:	Mode 1: Transmit - 1Mbps (FSK) (919.024MHz) (ANT B)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
24	919.024	298	200< Level <500	NA

#### Figure Channel 24:

💭 Agilent Spectrum Analyzer - Swep	pt SA			
Σ 50 Ω Center Freq 919.02400	OO MHZ	NSE:INT ALIGN AUT Avg Type: Log-Pw Avg Hold > 100/100	04:47:55 PM Dec 02, 2010	Frequency
Input:	RF PNO: Far ( ) 119,1199 IFGain:Low Atten: 30	dB M	kr1 919.122 MHz	Auto Tune
10 dB/div Ref 20.00 dBr	m	20.00.01	-4.841 dBm	
10.0				Center Freq 919.024000 MHz
0.00		1		
-10.0				Start Freq 918.024000 MHz
-20.0	/ h	~~~~ \		Stop Freg
-30.0		298 kHz		920.024000 MHz
-40.0	/			CF Step
-50.0	, M			Auto Man
-60.0	ar many when	mannether		Freq Offset
-70.0			when a companyour	0 Hz
2222				
Center 919.024 MHz #Res BW 10 kHz	#VBW 1.0 MHz	Sweep	Span 2.000 MHz 5 18.4 ms (1001 pts)	
MSG		ST/	ATUS	L

# 11. EMI Reduction Method During Compliance Testing

No modification was made during testing.