

FC

Test Report

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.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

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



The Test Results relate only to the samples tested.
 The test report shall not be reproduced except in full without the written approval of QuietTek Corporation.
 This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : Leven Huang
 (Senior Adm. Specialist / Leven Huang)



Tested By : Sabrina Tsai
 (Assistant Engineer / Sabrina Tsai)



Approved By : Vincent Lin
 (Manager / Vincent Lin)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	5
1.1. EUT Description.....	5
1.2. Operational Description.....	7
1.3. Tested System Details.....	8
1.4. Configuration of Tested System	8
1.5. EUT Exercise Software	8
1.6. Test Facility	9
2. CONDUCTED EMISSION	10
2.1. Test Equipment.....	10
2.2. Test Setup	10
2.3. Limits.....	11
2.4. Test Procedure	11
2.5. Uncertainty	11
2.6. Test Result of Conducted Emission.....	12
3. PEAK POWER OUTPUT	12
3.1. Test Equipment.....	13
3.2. Test Setup	13
3.3. Limit	13
3.4. Test Procedure	13
3.5. Uncertainty	13
3.6. Test Result of Peak Power Output.....	14
4. RADIATED EMISSION	17
4.1. Test Equipment.....	17
4.2. Test Setup	17
4.3. Limits.....	18
4.4. Test Procedure	19
4.5. Uncertainty	19
4.6. Test Result of Radiated Emission.....	20
5. RF ANTENNA CONDUCTED TEST	25
5.1. Test Equipment.....	25
5.2. Test Setup	25
5.3. Limits.....	25
5.4. Test Procedure	25
5.5. Uncertainty	25
5.6. Test Result of RF Antenna Conducted Test.....	26
6. BAND EDGE	29
6.1. Test Equipment.....	30
6.2. Test Setup	31
6.3. Limit	32
6.4. Test Procedure	32
6.5. Uncertainty	32
6.6. Test Result of Band Edge	33
7. CHANNEL NUMBER.....	36
7.1. Test Equipment.....	36
7.2. Test Setup	36
7.3. Limit	36
7.4. Test Procedure	36
7.5. Uncertainty	36
7.6. Test Result of Channel Number.....	37
8. CHANNEL SEPARATION.....	38
8.1. Test Equipment.....	38
8.2. Test Setup	38
8.3. Limit	38
8.4. Test Procedure	38
8.5. Uncertainty	38
8.6. Test Result of Channel Separation.....	39
9. DWELL TIME.....	41
9.1. Test Equipment.....	41

9.2.	Test Setup	41
9.3.	Limit	41
9.4.	Test Procedure	41
9.5.	Uncertainty	41
9.6.	Test Result of Dwell Time	42
10.	OCCUPIED BANDWIDTH	44
10.1.	Test Equipment	44
10.2.	Test Setup	44
10.3.	Limits.....	44
10.4.	Test Procedure	44
10.5.	Uncertainty	44
10.6.	Test Result of Occupied Bandwidth	45
11.	EMI REDUCTION METHOD DURING COMPLIANCE TESTING	51
Attachment 1: EUT Test Photographs		
Attachment 2: EUT Detailed Photographs		

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 enterprose co.,ltd.	ESR80005	0dBi for 900MHz

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		

Note:

1. This device is a TRANSCEIVER with a built-in 900MHz FHSS transceiver.
2. 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)
-----------	--------------------------------

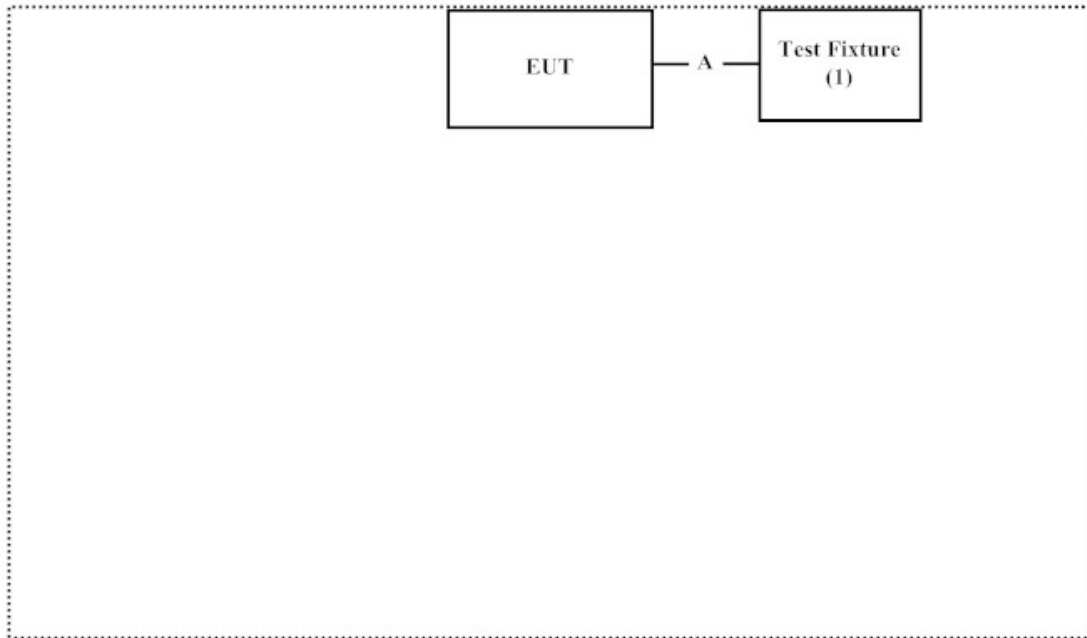
1.3. Tested System Details

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

Product	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
A Signal Cable	Non-Shielded,2.3m

1.4. Configuration of Tested System



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

Ambient conditions in the laboratory:

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 : <http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of Quietek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>

Site Description: File on
 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 : service@quietek.com

FCC Accreditation Number: TW1014



2. Conducted Emission

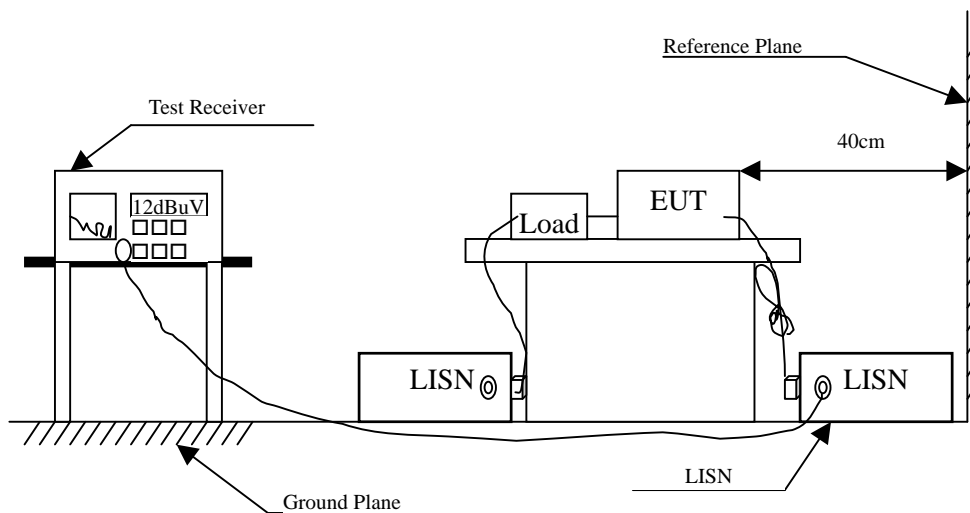
2.1. Test Equipment

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 Room			N/A	

Note: All instruments are calibrated every one year.

2.2. Test Setup



2.3. Limits

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

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 investigated 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.

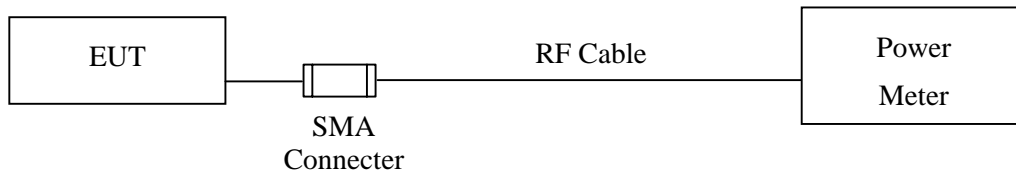
3. Peak Power Output

3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2010
X	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 (MHz)	Measurement (dBm)	Required Limit	Result
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 (MHz)	Measurement (dBm)	Required Limit	Result
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 (MHz)	Measurement (dBm)	Required Limit	Result
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

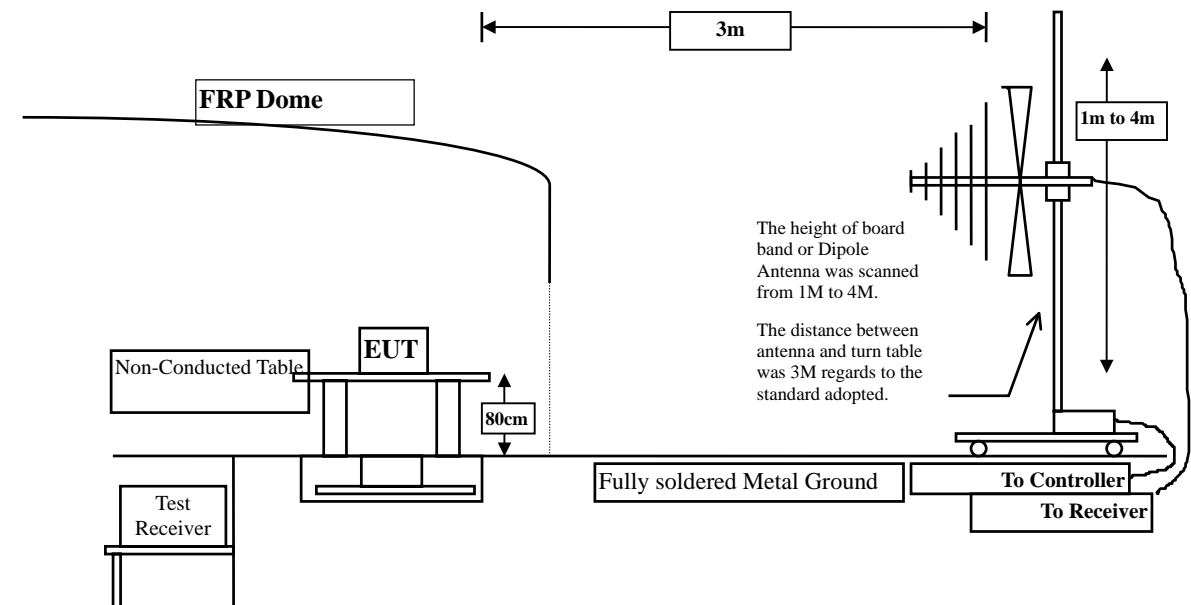
The following test equipments are used during the radiated emission test:

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

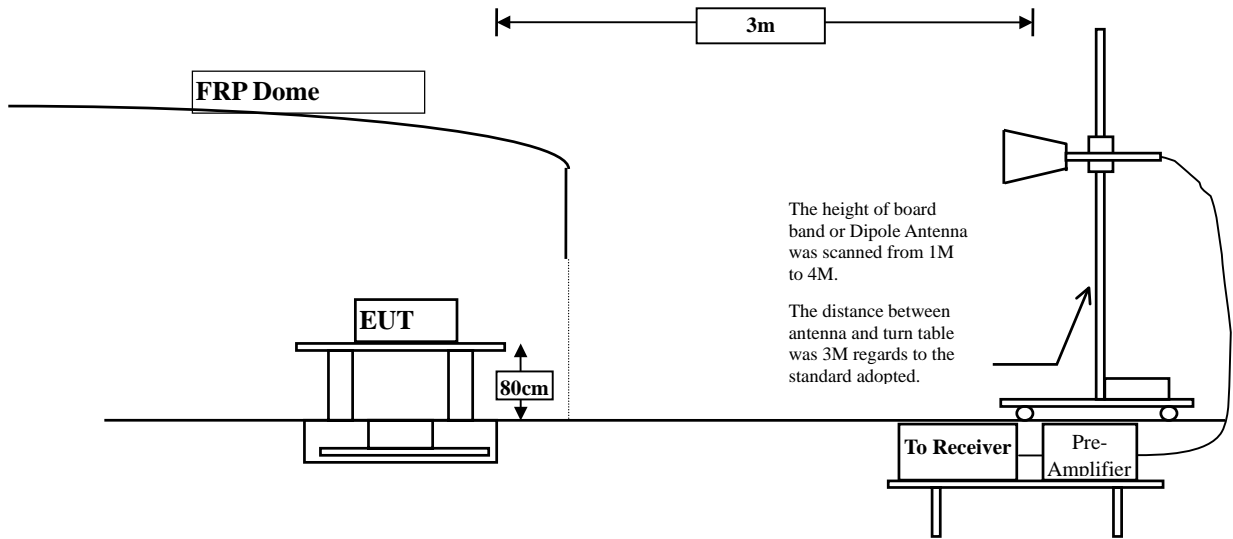
- Note: 1. All equipments are calibrated every one year.
 2. The test instruments marked by "X" are used to measure the final test results.

4.2. Test Setup

Below 1GHz



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 harmonics is checked.

4.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

4.6. Test Result of Radiated Emission

Product : TRANSCEIVER
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (FSK) (909.6MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit 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 detector:					
1819.2	-2.641	63.6	60.96	-7.146	68.106 _{note 6}

Note:

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 : TRANSCEIVER
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (FSK) (914.759MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
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					
Detector:					
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					
Detector:					
1829.518	-2.756	63.81	61.054	-4.856	65.91 _{note 6}

Note:

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 : TRANSCEIVER
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (FSK) (919.024MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit 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					
Detector:					
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					
Detector:					
1838.048	-2.852	65.68	62.828	-6.053	68.881 _{note 6}

Note:

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 : TRANSCEIVER
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (FSK) (Fundamental)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Detector
Horizontal				
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

Note:

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 : TRANSCEIVER
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (FSK) (Hopping)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit 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

Note:

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.

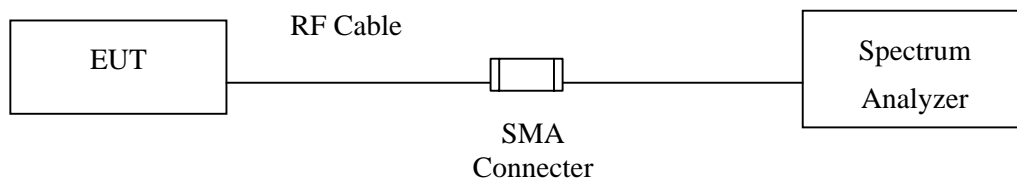
5. RF Antenna Conducted Test

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
X	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 : TRANSCIVER
 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

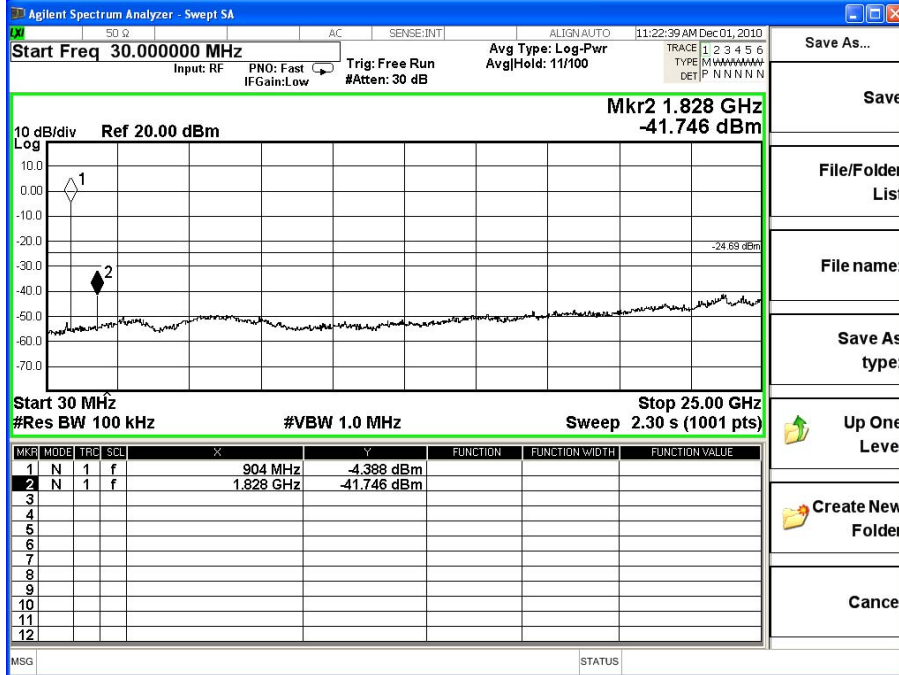


Figure Channel 12: 30MHz-25GHz

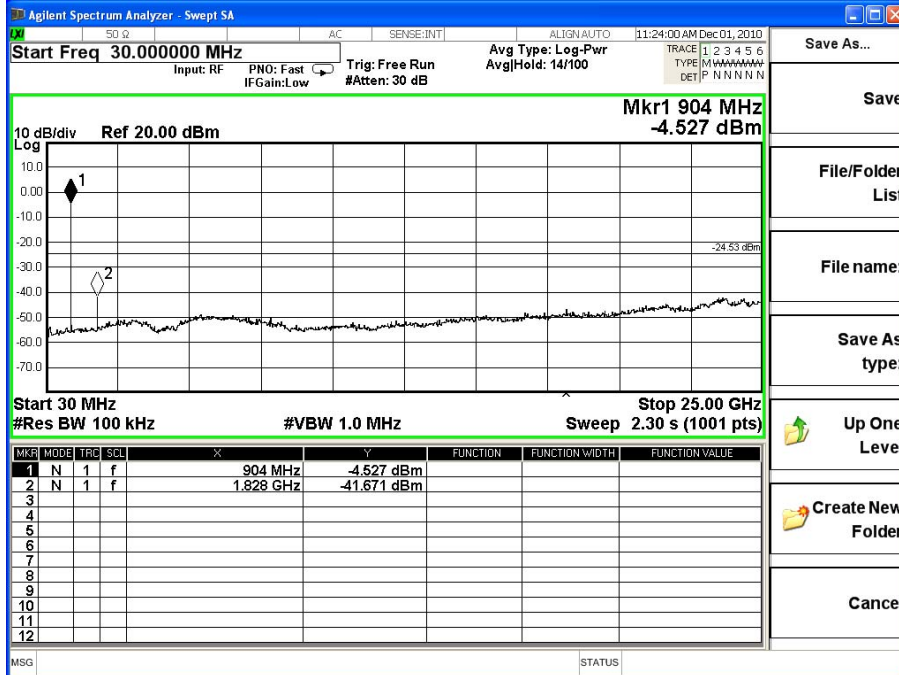
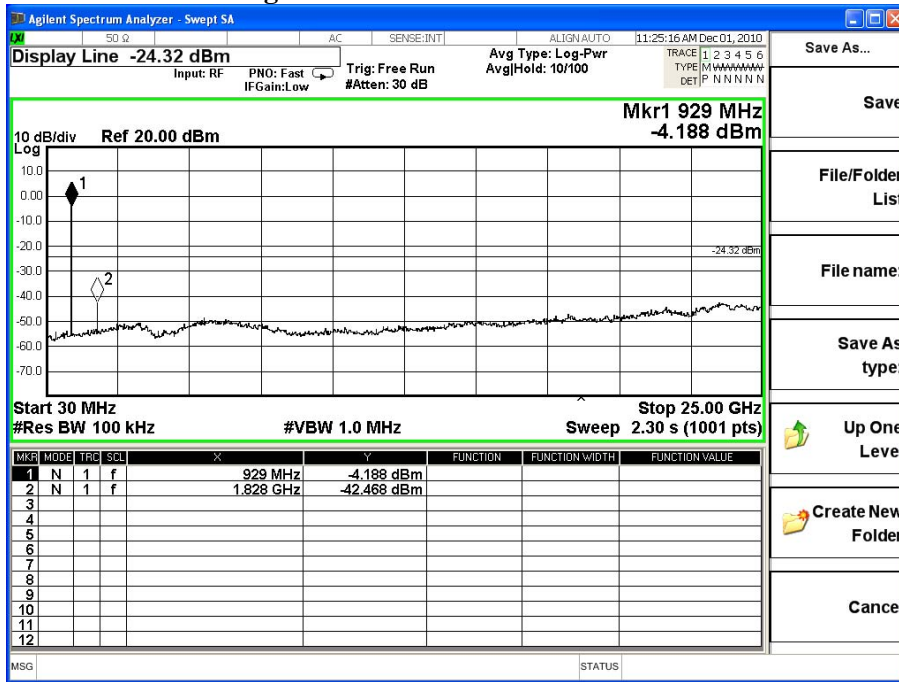


Figure Channel 24: 30MHz-25GHz



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

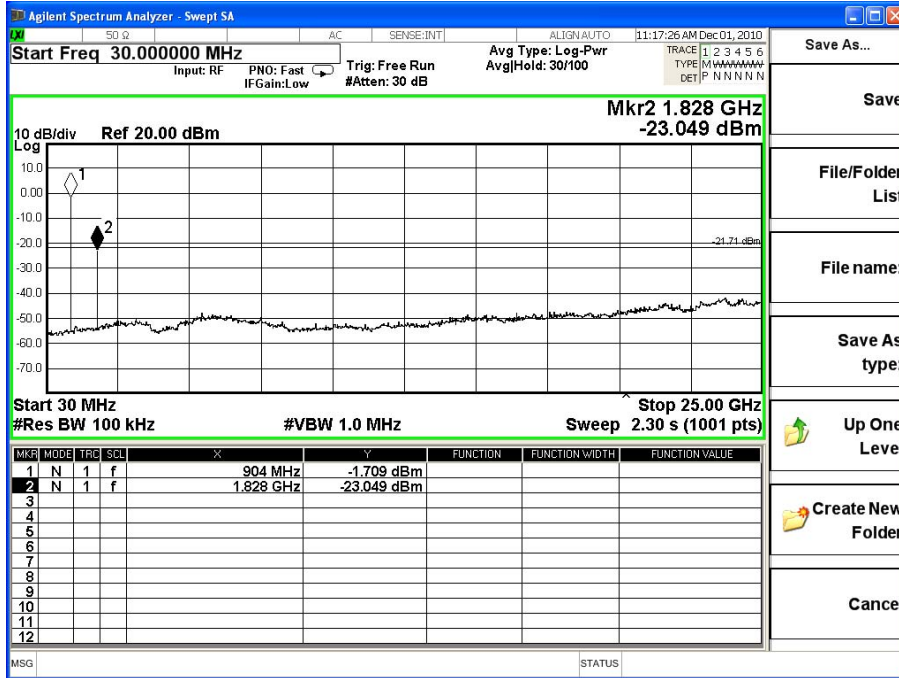


Figure Channel 12: 30MHz-25GHz

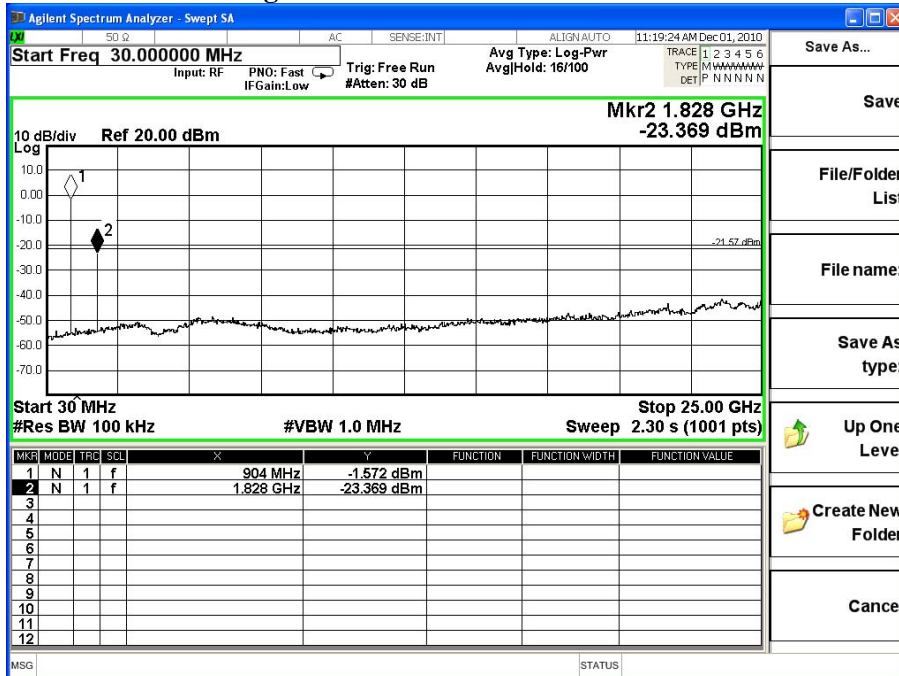
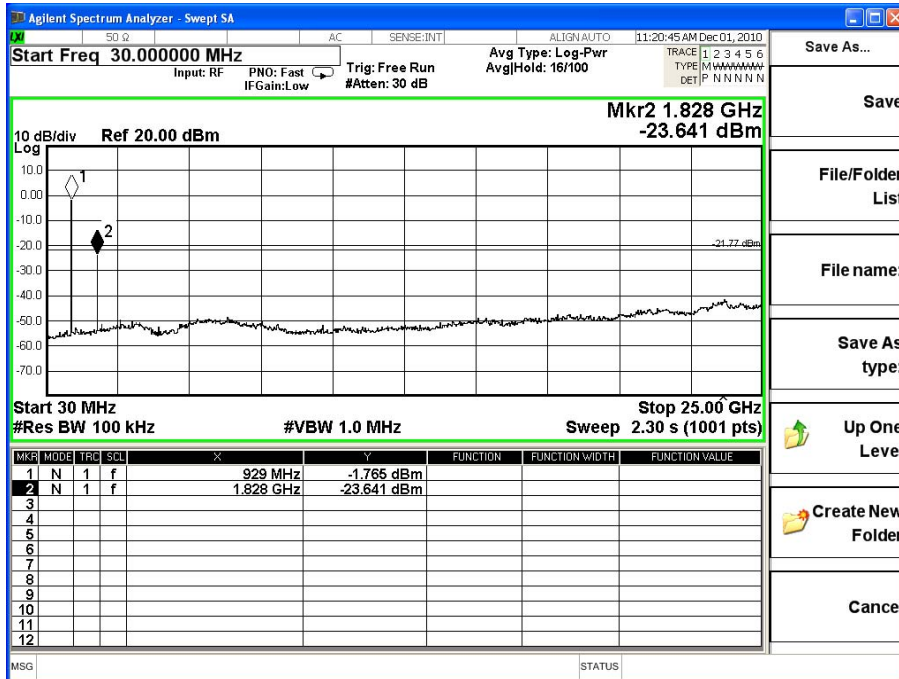


Figure Channel 24: 30MHz-25GHz



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
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2010

RF Radiated Measurement:

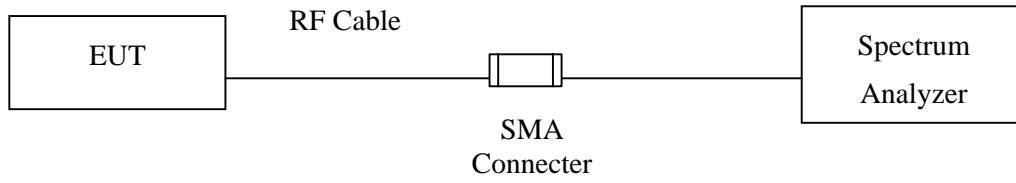
The following test equipments are used during the band edge tests:

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

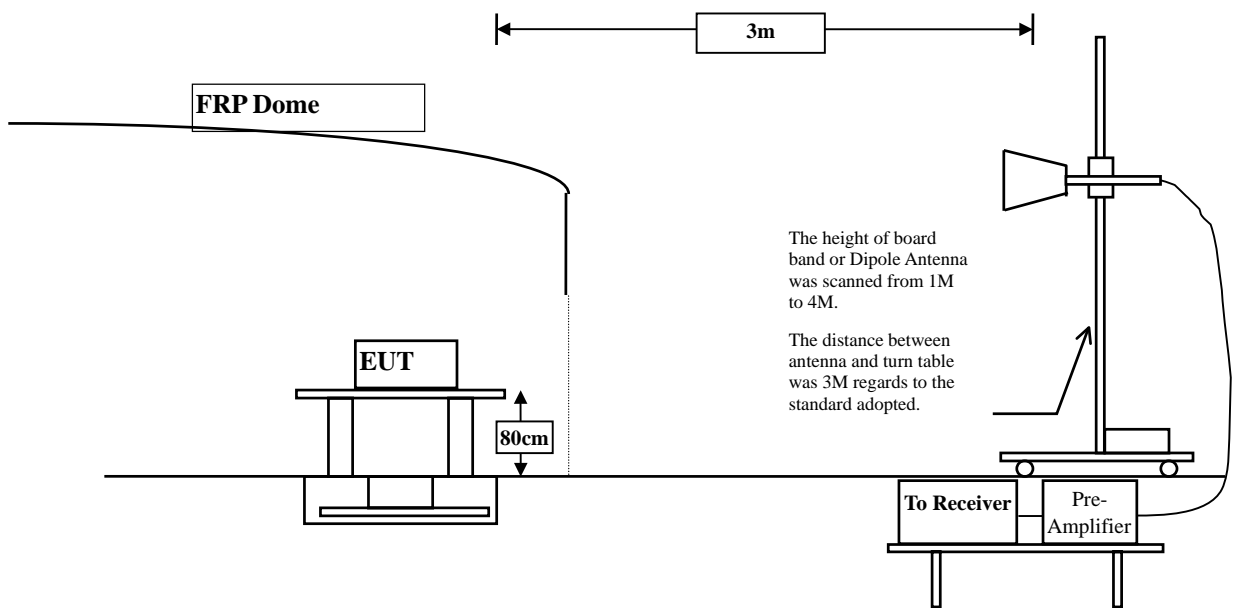
6.2. Test Setup

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)

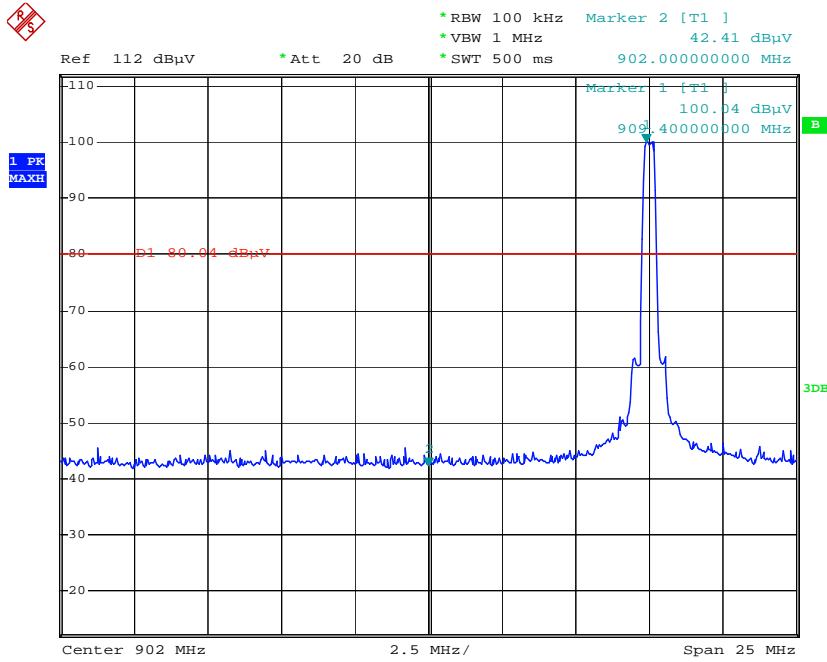
Antenna Polarization	Frequency [MHz]	Emission Level [dBuV]	Limit	Result
H	902	42.41	>20dBc	PASS
V	902	40.36	>20dBc	PASS
H	928	40.39	>20dBc	PASS
V	928	41.52	>20dBc	PASS

Note: 1: Spectrum Analyzer setting:

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

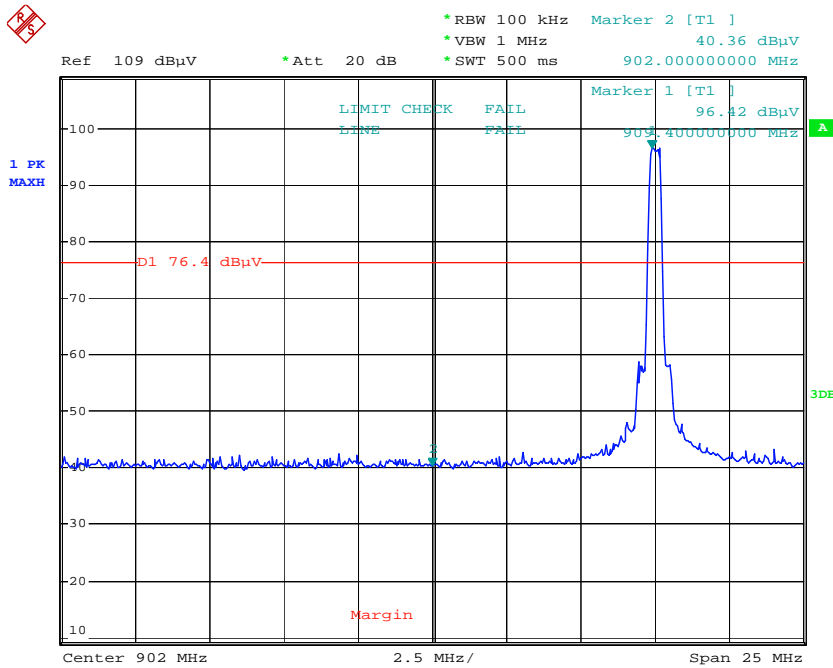
Average detector: RBW=100kHz, VBW=10Hz

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



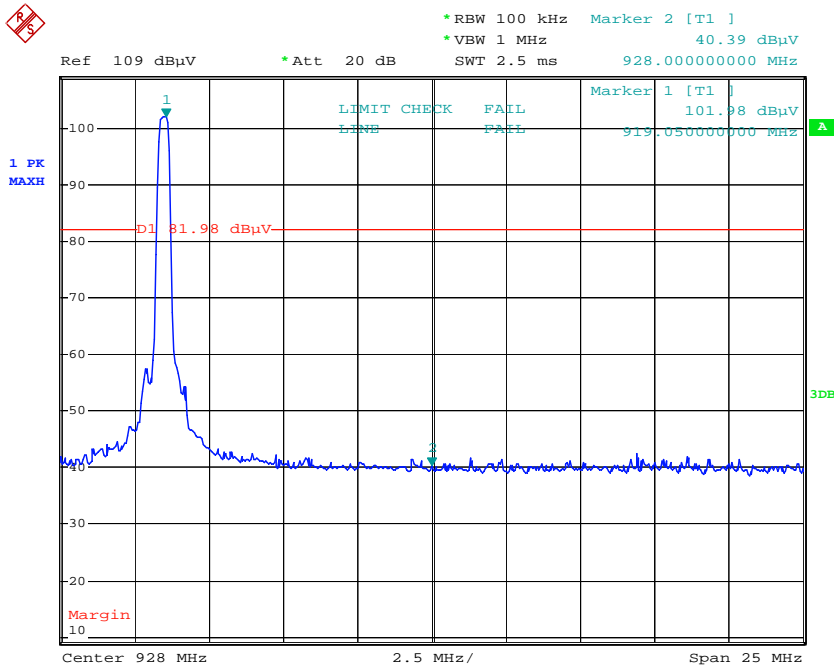
Date: 13.DEC.2010 08:33:37

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



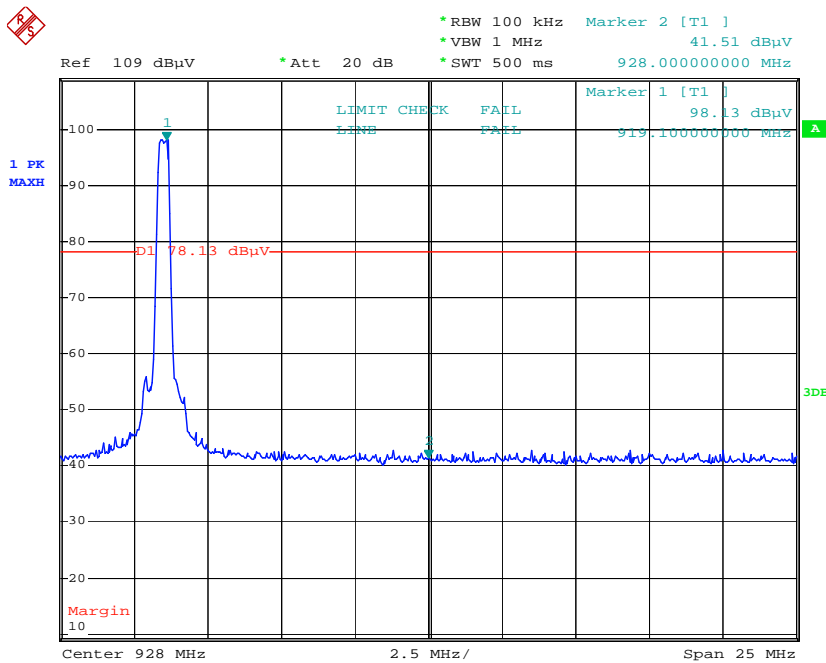
Date: 13.DEC.2010 08:43:36

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

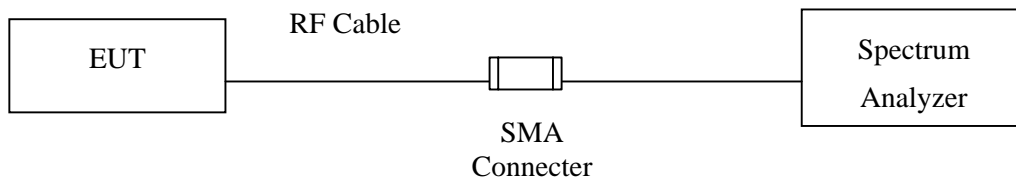
7. Channel Number

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
X	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.

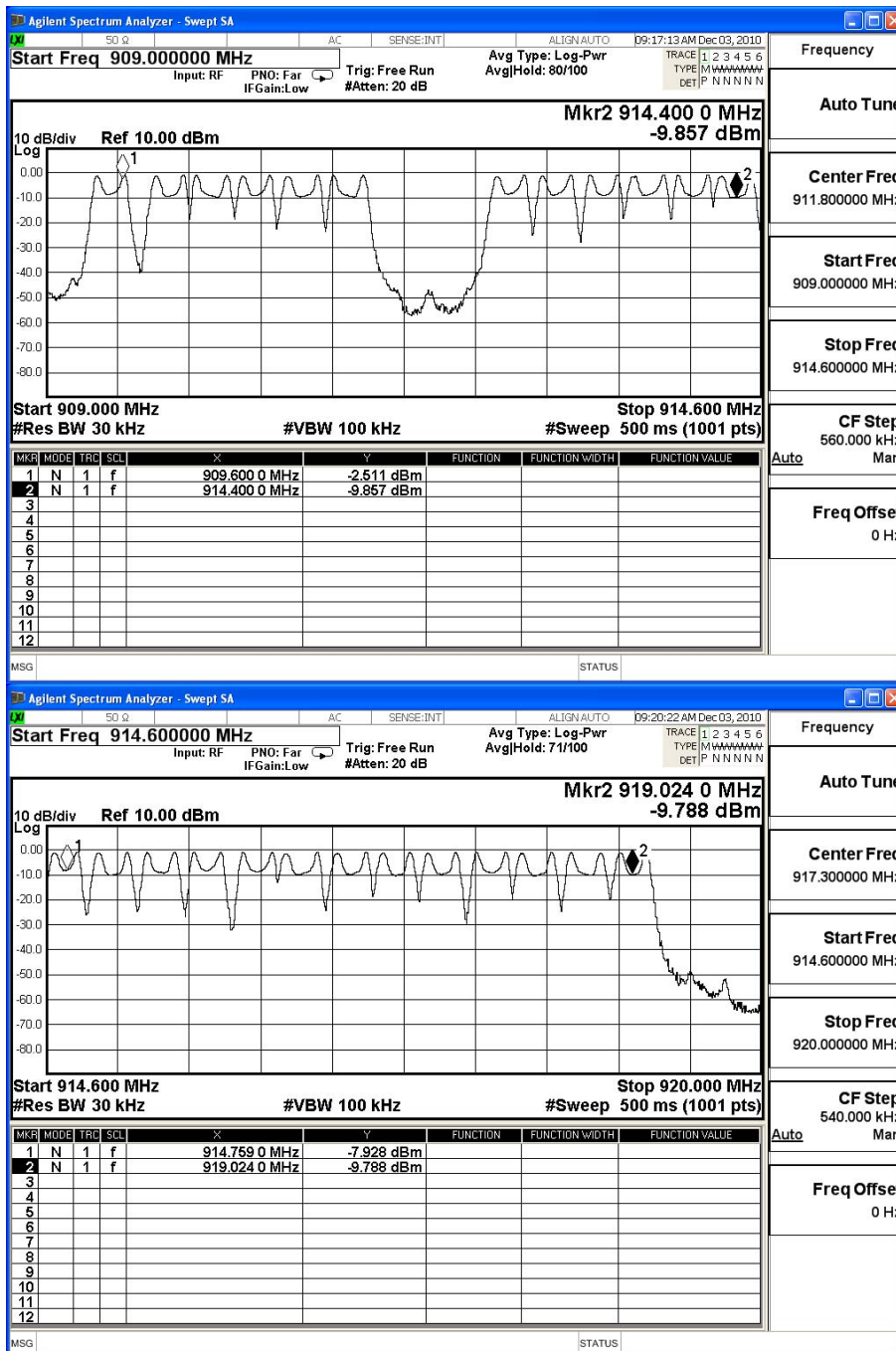
7.5. Uncertainty

N/A

7.6. Test Result of Channel Number

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

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



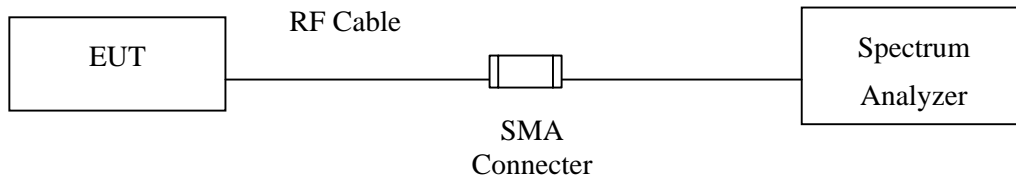
8. Channel Separation

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
X	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

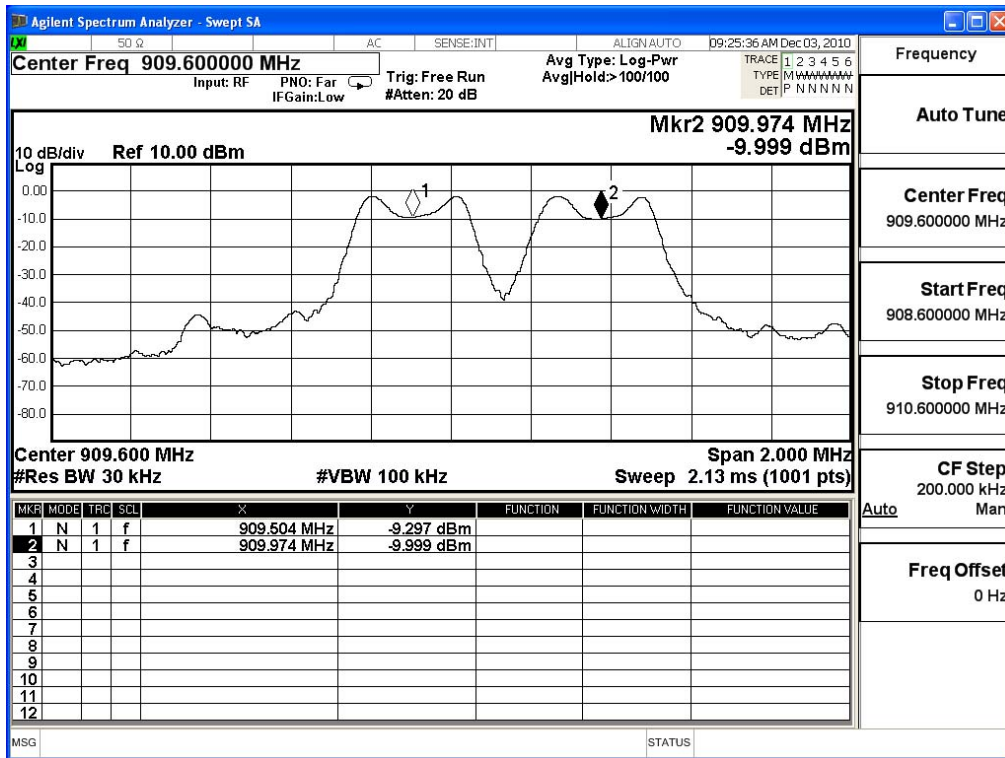
8.6. Test Result of Channel Separation

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

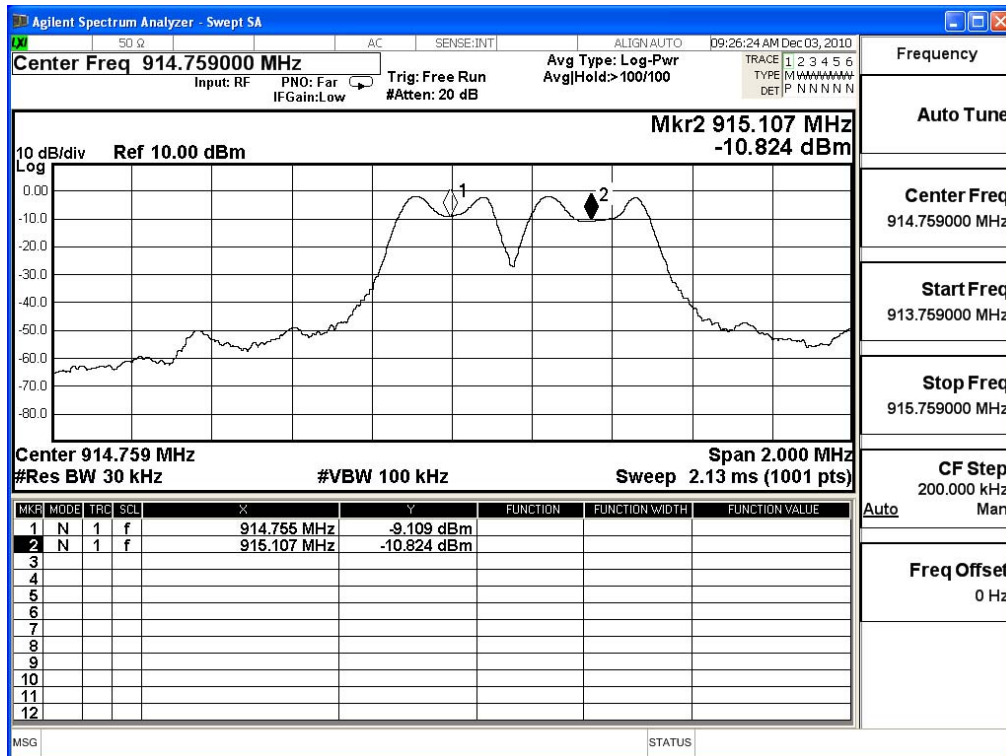
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of 20dB Bandwidth (kHz)	Result
00	909.6	470	>25 kHz	>295.0	Pass
12	914.759	352	>25 kHz	>269.0	Pass
24	919.024	356	>25 kHz	>297.0	Pass

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

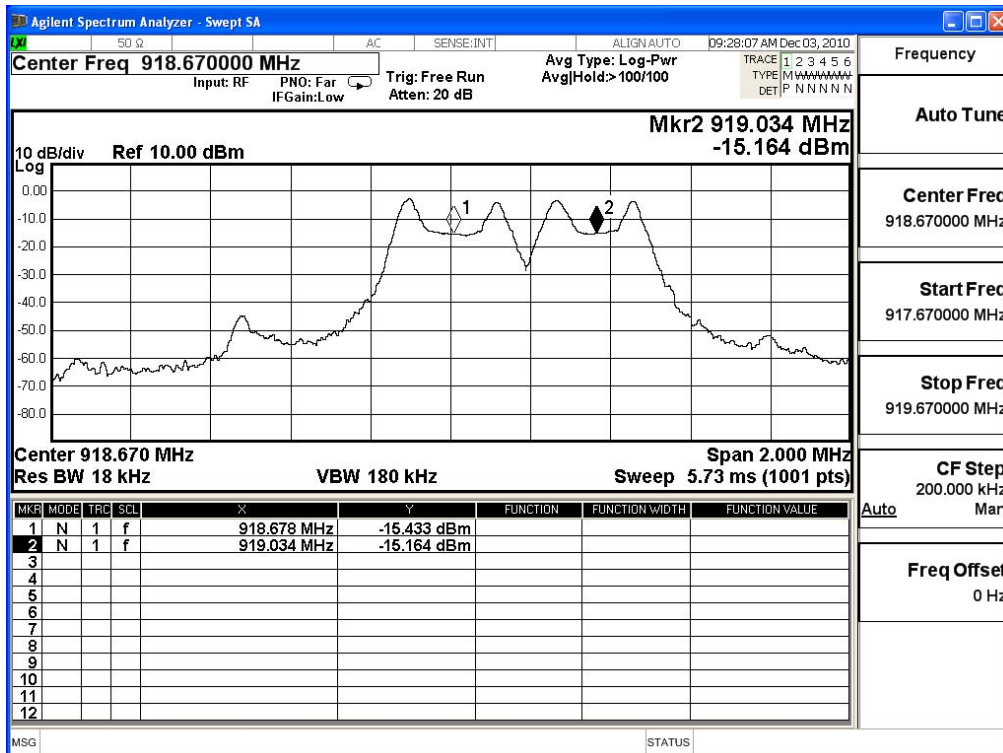
Channel 00 909.6MHz



Channel 12 914.759MHz



Channel 24 919.024MHz



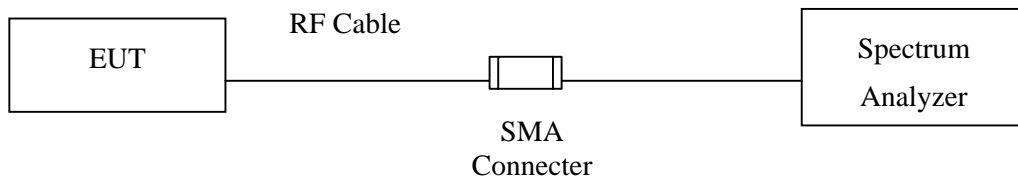
9. Dwell Time

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
X	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)

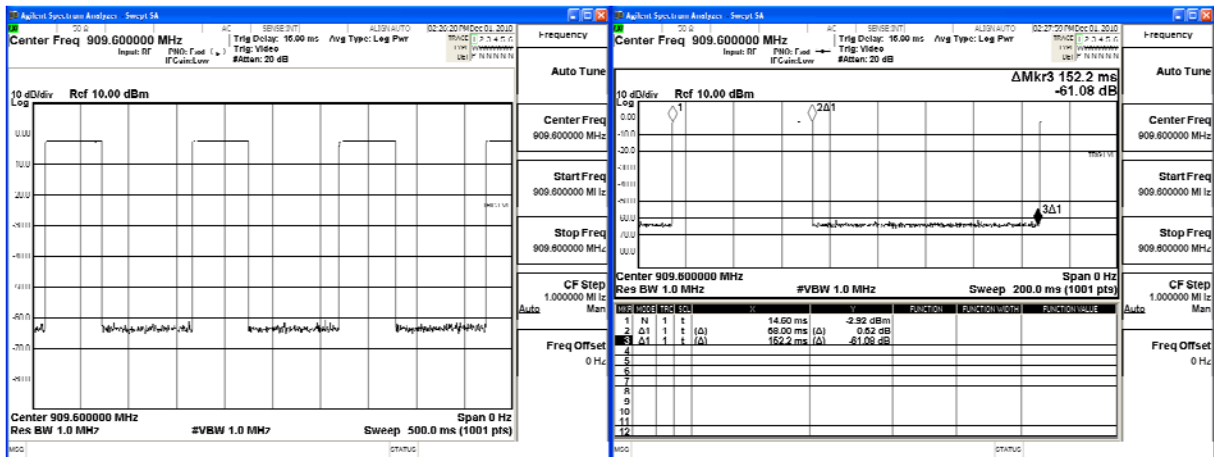
Channel No.	Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
00	909.6	58.000	4	500	0.46	0.186	0.4	Pass
12	914.759	58.000	4	500	0.46	0.186	0.4	Pass
24	919.024	58.400	4	500	0.47	0.187	0.4	Pass

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

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

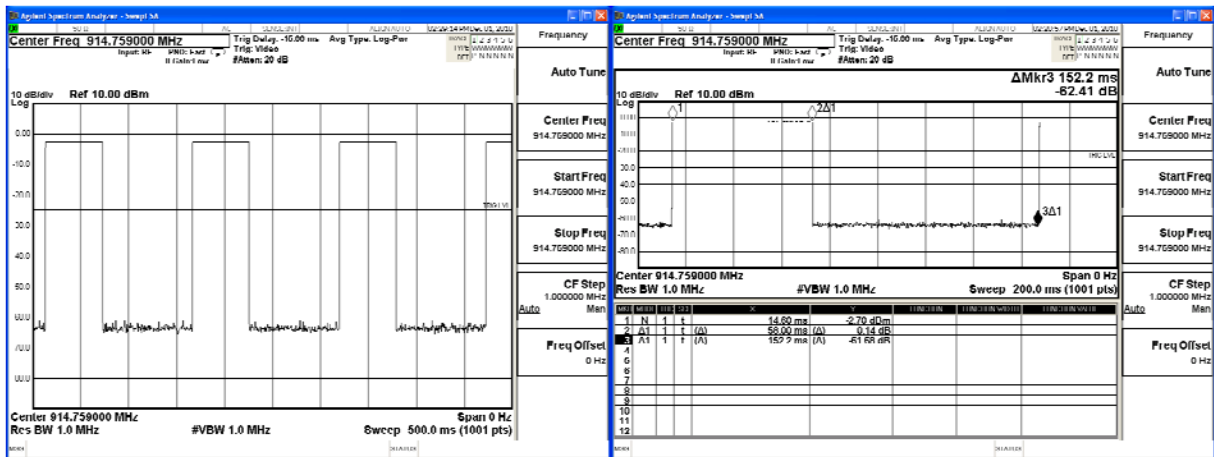
CH 00 Time Interval between hops

CH 00 Transmission Time



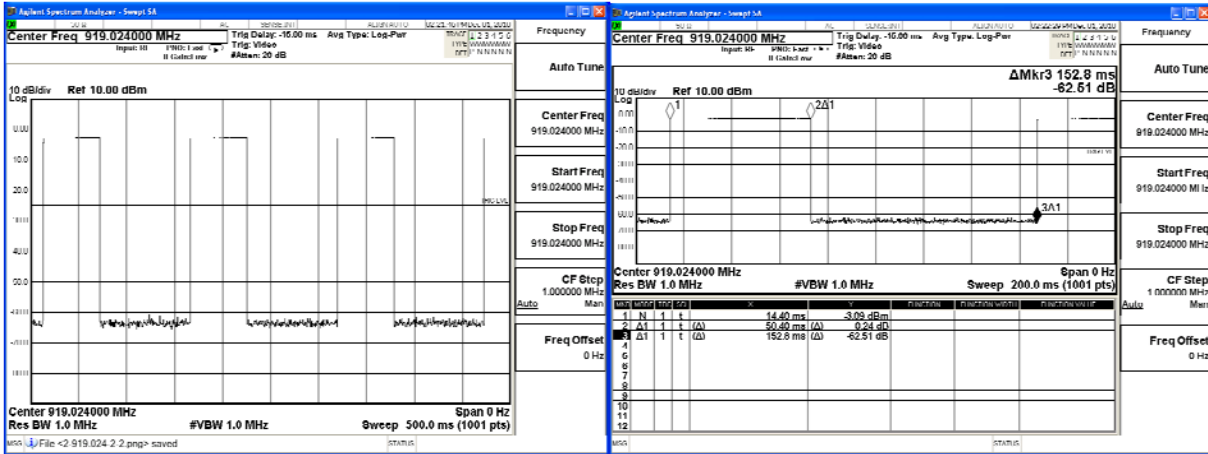
CH12 Time Interval between hops

CH 12 Transmission Time



CH 24 Time Interval between hops

CH 24 Transmission Time



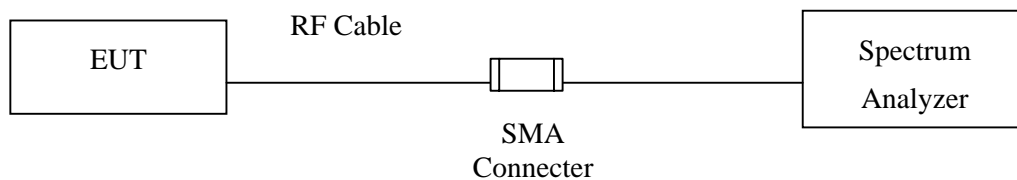
10. Occupied Bandwidth

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
X	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

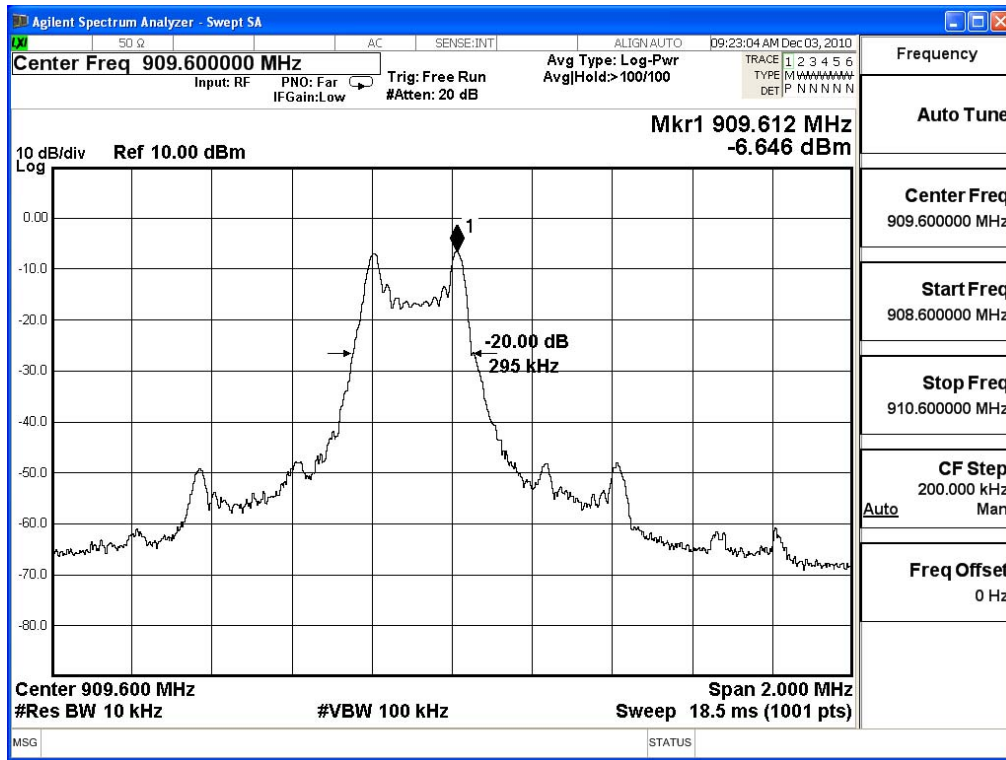
± 150Hz

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)

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

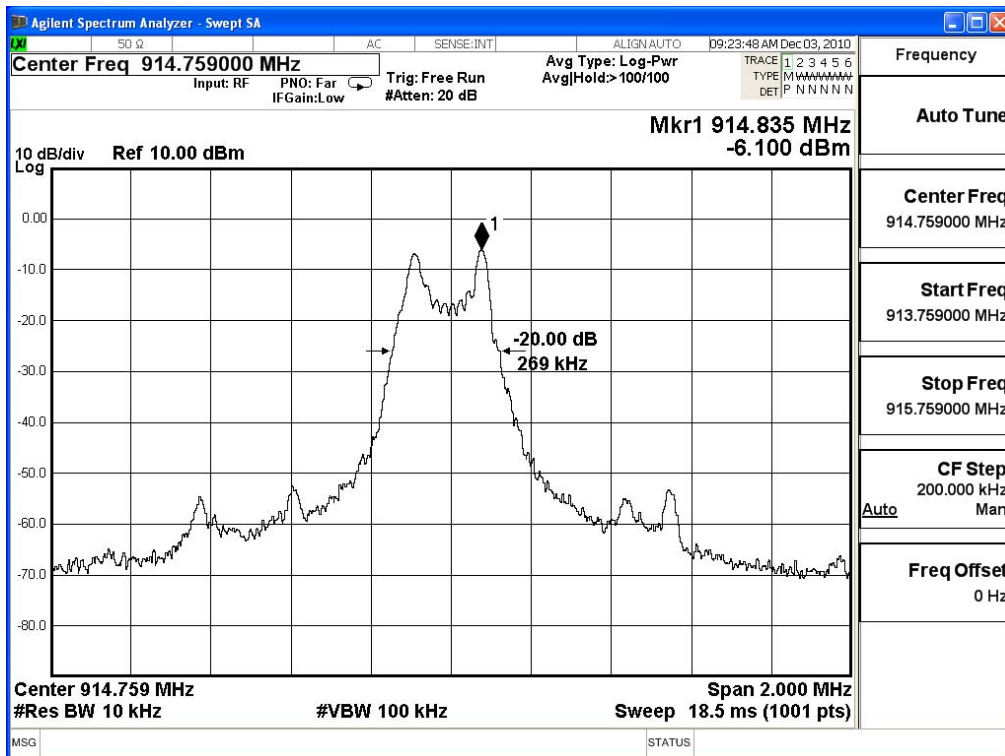
Figure Channel 00:



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

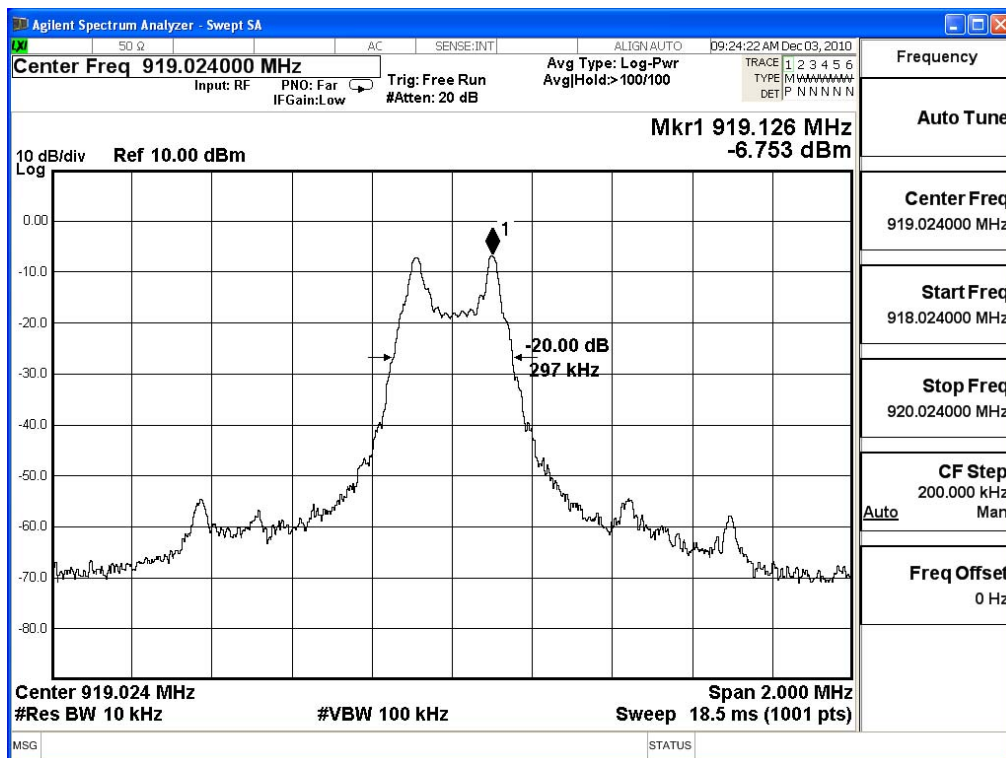
Figure Channel 12:



Product : TRANSCIEVER
 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

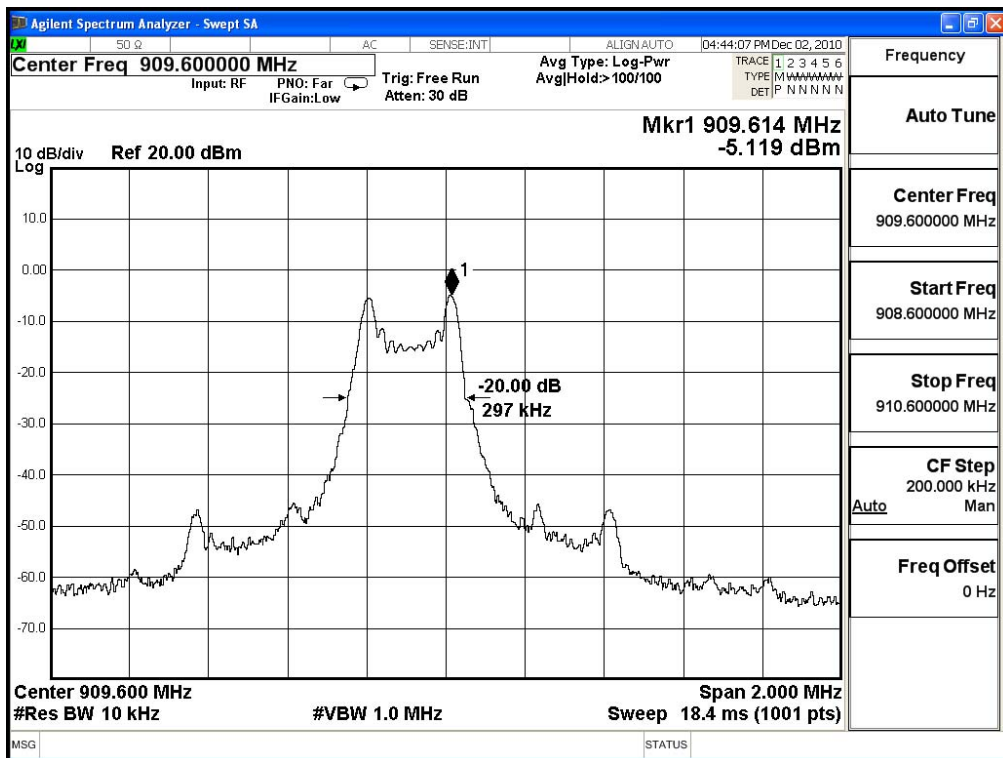
Figure Channel 24:



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

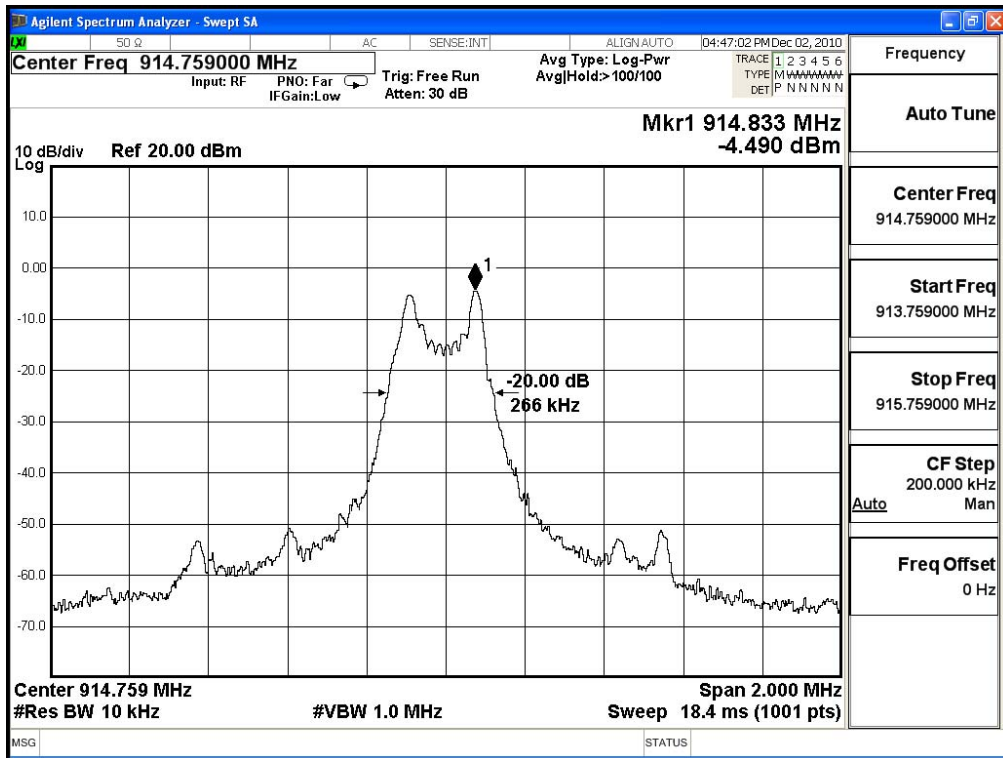
Figure Channel 00:



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

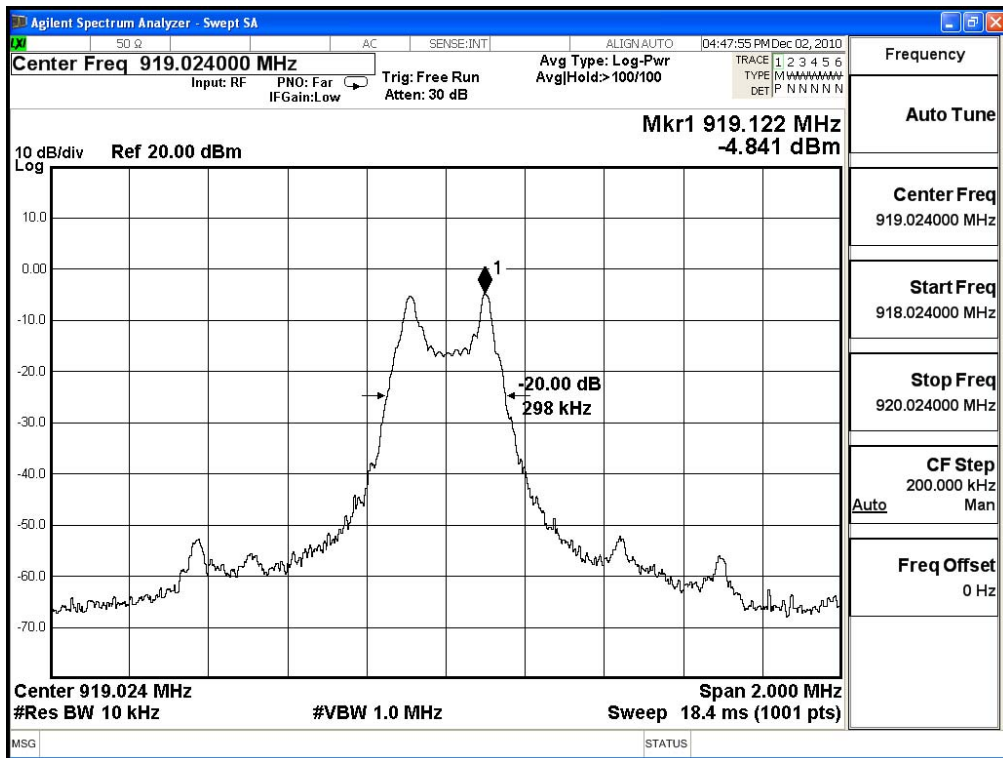
Figure Channel 12:



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:



11. EMI Reduction Method During Compliance Testing

No modification was made during testing.