EMISSIONS TEST REPORT

Report Number: 3173180BOX-009a
Project Number: 3173180

Testing performed on the

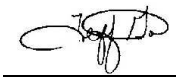
Zigbee Spread Sprectrum Transceiver Module
Model: MRF24J40

To
CFR47 "Telecommunications"
FCC Part 15 Subpart C "Intentional Radiators" 15.247:2009
IC RSS-210 "Low Power License Exempt Radiocommunications Devices"
Issue 7 June 2007 Annex 8 "Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz"

For
Microchip

Test Performed by:	Test Authorized by:
Intertek – ETL SEMKO	Microchip
70 Codman Hill Road	2355 West Chandler Boulevard
Boxborough, MA 01719	Chandler, AZ 85224

Prepared by:  Date: June 10, 2009
Nicholas Abbondante

Reviewed by:  Date: 06/11/09
Jeff Goulet

1.0 Job Description

1.1 Client Information

This EUT has been tested at the request of:

Company:	Microchip 2355 West Chandler Boulevard Chandler, AZ 85224
Contact:	Mr. Scott MacDonald
Telephone:	480-792-7344
Fax:	N/A
Email:	Scott.macdonald@microchip.com

1.2 Equipment Under Test

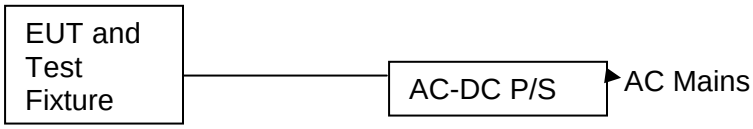
Equipment Type:	Zigbee Spread Spectrum Transceiver
Model Number(s):	MRF24J40
Serial number(s):	15
Manufacturer:	Microchip
EUT receive date:	05/14/2009
EUT received condition:	Prototype in Good Condition
Test start date:	06/01/2009
Test end date:	06/10/2009

1.3 Test Plan Reference: Tested according to the standards listed and ANSI C63.4:2003, and with guidance from KDB 558074 and IC RSS-Gen Issue 2 June 2007

1.4 Test Configuration/Operating Voltage

120 VAC/60 Hz

1.4.1 Block Diagram



1.4.2. Cables:

Cable	Shielding	Connector	Length (m)	Qty.
DC Power	None	Wire	1.8	1

1.4.3. Support Equipment:

Name: CUI Inc. AC/DC Power Supply
Model No.: EPS045100
Serial No.: N/L

Name: Microchip Zigbee Module Test Fixture
Model No.: 02-01785-R2
Serial No.: BUR054420401

1.5 Mode(s) of Operation:

The EUT was tested as a module. It was placed in a test fixture board which allowed for communication with the module through a serial port connection in order to change channels and output power settings, as well as to put the radio into test mode. The serial connection was then removed during the testing. The EUT was powered from 4.5 VDC, provided by the AC-DC power supply, which itself was powered from 120V/60Hz AC power. The EUT was programmed to transmit using the -1.9 dBm power setting with the internal PA on. Transmission was repetitive throughout testing, transmitting approximately every 7 ms with a 9.87% duty cycle. Channels 11 (2405 MHz), 18 (2440 MHz), and 25 (2475 MHz) were selected for test.

1.6 Floor Standing Equipment: Applicable: __ Not Applicable: _X__

2.0 Test Summary

TEST STANDARD	RESULTS	
FCC Part 15 Subpart C 15.247 IC RSS-210 Annex 8		
SUB-TEST	**TEST PARAMETER**	**COMMENT**
RF Output Power and Human RF Exposure FCC §15.247(b)(3-5) RSS-210 A8.4, RSS-102 4.3	The RF output power must not exceed 36 dBm EIRP. The human RF Exposure limit is 1 mW/cm^2.	Pass
6 dB Bandwidth FCC §15.247(a)(2), RSS-210 A8.2	The 6dB bandwidth must exceed 500 kHz.	Pass
Peak Power Spectral Density FCC §15.247(e), RSS-210 A8.2	The peak power spectral density must not exceed 8 dBm in any 3 kHz bandwidth.	Pass
Band Edge Compliance FCC §15.215, §15.247(d) RSS-210 2.1, A8.5	Spurious emissions at the band edges must be at least 20 dB lower than the fundamental field strength when measured with a 100 kHz bandwidth. Emissions at the upper band edge which fall into the restricted band from 2483.5 – 2500 MHz must meet the general requirements of 15.209 using a 1 MHz bandwidth.	Pass
Radiated Emissions and Duty Cycle FCC §15.205, §15.209, §15.247(d) RSS-210 2.2, 2.7, A8.5 RSS-Gen Section 6.1	Spurious emissions must be at least 20 dB lower than the fundamental field strength when measured with a 100 kHz bandwidth. Emissions which fall in the restricted bands of 15.205 must meet the general limits of 15.209. Emissions which fall in the restricted bands of RSS-210 2.2 Table 1 must meet the general limits of RSS-210 2.7 Tables 2 and 3. There is no limit on duty cycle. Receiver spurious emissions must not exceed the limits of RSS-Gen Table 1.	Pass
AC Line-Conducted Emissions FCC §15.207, RSS-Gen Section 7.2.2	The AC line-conducted emissions must not exceed the FCC 15.207 and RSS-Gen Section 7.2.2 Table 2 limits.	Pass

REVISION SUMMARY – The following changes have been made to this Report:

Date	Project No.	Project Handler	Page(s)	Item	Description of Change

3.0 Sample Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBµV/m

Level in µV/m = [10(32 dBµV/m)/20] = 39.8 µV/m

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBµV
RF = Reading from receiver in dBµV
LF = LISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBµV to µV or mV the following was used:

$UF = 10^{(NF / 20)}$
Where UF = Net Reading in µV
NF = Net Reading in dBµV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBµV
$UF = 10^{(49.1\ dB\mu V / 20)}$ = 285.1 µV

3.1 Measurement Uncertainty

For radiated emissions, U_{lab} (4.9 dB at 3m and 4.2 dB at 10m) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

For conducted emissions, U_{lab} (3.2 dB in worst case) < U_{CISPR} (3.6 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

3.2 Site Description

Test Site(s): OATS 2

Our OATS are 3m and 10m sheltered emissions measurement ranges located in a light commercial environment in Boxborough, Massachusetts. They meet the technical requirements of ANSI C63.4-2003 and CISPR 22:1993/EN 55022:1994 for radiated and conducted emission measurements. The shelter structure is entirely fiberglass and plastic, with outside dimensions of 33 ft x 57 ft. The structure resembles a quonset hut with a center ceiling height of 16.5 ft.

The testing floor is covered by a galvanized sheet metal groundplane that is earth-grounded via copper rods around the perimeter of the site. The joints between individual metal sheets are bridged with a 2 inch wide metal strips to provide low RF impedance contact throughout. The sheets are screwed in place with stainless steel, round-head screws every three inches. Site illumination and HVAC are provided from beneath the ground reference plane through flush entry ports, the port covers are electrically bonded to the ground plane.

A flush metal turntable with 12 ft. diameter and 5000 lb. load capacity is provided for floor-standing equipment. A wooden table 80 cm high is used for table-top equipment. The turntable is electrically connected to the ground plane with three copper straps. The straps are connected to the turntable at the center of it with ground braid. The copper strap is directly connected to the groundplane at the edges of the turntable. The turntable is located on the south end of the structure and the antennas are mounted 3 and 10 meters away to the north. The antenna mast is a non-conductive with remote control of antenna height and polarization. The antenna height is adjustable from 1 to 4 meters.

All final radiated emission measurements are performed with the testing personnel and measurement equipment located below the ground reference plane. The site has a full basement underneath the turntable where support equipment may be remotely located. Operation of the antenna, turntable and equipment under test is controlled by remote controls that manipulate the antenna height and polarization and with a turntable control. Test personnel are located below the ellipse when measurements are performed, however the site maintains the ability of having personnel manipulate cables while monitoring test equipment. Ambient radiated emissions are 6 dB or more below the relevant FCC emission limits.

AC mains power is brought to the equipment under test through a power line filter, to remove ambient conducted noise. 50 Hz (240 VAC single phase), 60 Hz power (120 VAC single phase, 208 VAC three phase), and 60 Hz (480 VAC three phase) are available. Conducted emission measurements are performed with a Line Impedance Stabilization Network (LISN) or Artificial Mains Network (AMN) bonded to the ground reference plane. A removable vertical groundplane (2 meter X 2 meter area) is used for line-conducted measurements for table top equipment. The vertical groundplane is electrically connected to the reference groundplane.

The EMC Lab has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference groundplanes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.247, Industry Canada RSS-210 Annex 8

Test: RF Output Power and Human RF Exposure

Performance Criterion: The RF output power must not exceed 36 dBm EIRP. The human RF Exposure limit is 1 mW/cm^2.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	See Table	Humidity (%):	See Table	Pressure (hPa):	See Table
Pretest Verification Performed		Yes		Equipment under Test:		Zigbee Spread Spectrum Transceiver M/N: MRF24J40	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		15	
Engineer's Initials:	NNA	Date Test Performed:	06/02-04/2009	Reviewer's Initials:	JG	Date Reviewed:	06/11/09

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	MAN1	06/13/2009
2	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
3	High Frequency Cable	Megaphase	TM40-K1K1-197	8148601-001	12/10/2009
4	HORN ANTENNA	EMCO	3115	9602-4675	10/13/2009
5	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/01/2009

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.5612.5606)
EMI Boxborough.xls	Intertek	4/17/09

Test Details:

Notes: The EUT was measured in a radiated fashion. The RF output power was measured using a resolution bandwidth greater than the 6 dB bandwidth of the emission. The data obtained was adjusted for equipment losses and converted from a field strength reading to a power reading using the provisions of KDB 558074 and RSS-Gen 4.6. The general human RF exposure limit is 1 mW/cm^2. The power density S generated by some value of EIRP at a given distance d is related by the equation:

$$S=EIRP / (4\pi d^2)$$

The distance, given a maximum EIRP of 20.47 dBm (111.4 mW), at which the radiated power density of the EUT is equal to the human RF exposure limit is 2.98 cm from the antenna.

The EUT is a module so it is unknown whether it will be used in a mobile or a portable configuration. 111.4 mW is above the exemption threshold for SAR evaluation for both FCC and Industry Canada (25 mW and 20 mW respectively). Therefore a SAR RF exposure evaluation is required for portable applications used within 20 cm of the human body.

Special Radiated Emissions

Company:	Microchip Technology			Antenna & Cables:	LF	Bands: N, LF, HF, SHF	
Model #:	MRF24J40			Antenna:	Horn2 V3m 10-13-09.txt	Horn2 H3m 10-13-09.txt	
Serial #:	15			Cable(s):	MEG001 06-05-09.txt	MEG005 12-10-2009.txt	
Engineers:	Nicholas Abbondante	Location:	Site 2	Barometer:	MAN1	Filter:	NONE
Project #:	3173180	Date(s):	06/02/09 06/04/09				
Standard:	FCC Part 15 Subpart C 15.247/IC RSS-210 Annex 8			Temp/Humidity/Pressure:	24c	40%	1005mB
Receiver:	R&S FSEK-30 (ROS001) 12-01-2009	Limit Distance (m):	3		23c	39%	1005mB
PreAmp:	PRE9 04-03-10.txt	Test Distance (m):	3				
PreAmp Used? (Y or N):	N	Voltage/Frequency:	120V/60Hz	Frequency Range:	1-4 GHz		

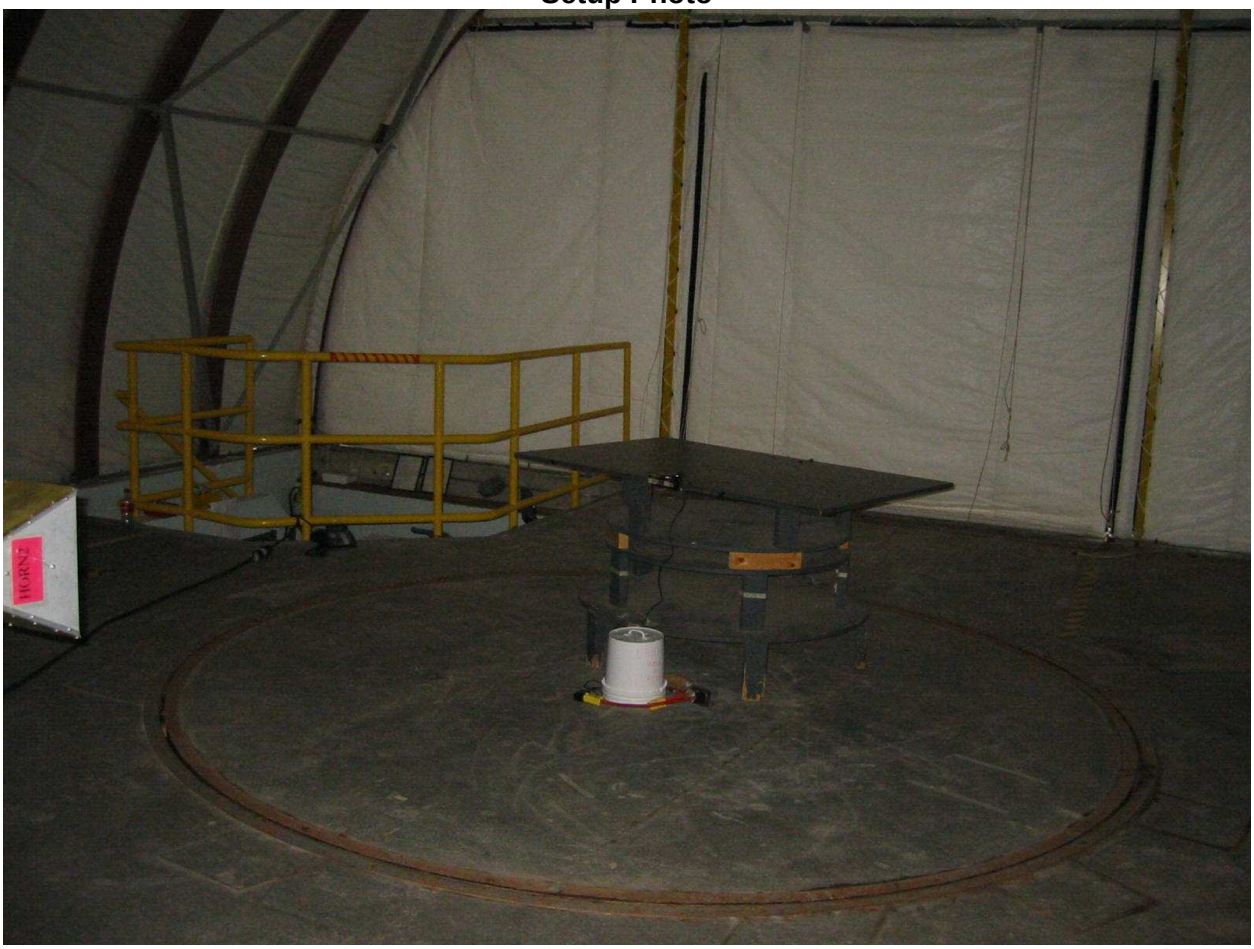
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: 1 MHz Reference, Duty Cycle 9.87% (20.11 dB)													
PK	H	2405.000	79.92	28.23	6.03	0.00	0.00	114.18	-	-	1/3 MHz		
AVG	H	2405.000	59.81	28.23	6.03	0.00	0.00	94.07	-	-	1/3 MHz		
PK	H	2440.000	79.66	28.29	6.08	0.00	0.00	114.04	-	-	1/3 MHz		
AVG	H	2440.000	59.55	28.29	6.08	0.00	0.00	93.93	-	-	1/3 MHz		
PK	H	2475.000	80.83	28.36	6.13	0.00	0.00	115.32	-	-	1/3 MHz		
AVG	H	2475.000	60.72	28.36	6.13	0.00	0.00	95.21	-	-	1/3 MHz		
Note: 100 kHz Reference													
PK	H	2405.000	75.31	28.23	6.03	0.00	0.00	109.57	-	-	100/300 kHz		
PK	H	2440.000	74.75	28.29	6.08	0.00	0.00	109.13	-	-	100/300 kHz		
PK	H	2475.000	76.18	28.36	6.13	0.00	0.00	110.67	-	-	100/300 kHz		
Note: Full Bandwidth Fundamental Field Strength Measurement													
PK	H	2405.000	80.41	28.23	6.03	0.00	0.00	19.44	36.00	-16.56	3/10 MHz		
PK	H	2440.000	79.92	28.29	6.08	0.00	0.00	19.07	36.00	-16.93	3/10 MHz		
PK	H	2475.000	81.21	28.36	6.13	0.00	0.00	20.47	36.00	-15.53	3/10 MHz		

Setup Photo

Setup Photo



Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.247, Industry Canada RSS-210 Annex 8

Test: 6dB Bandwidth

Performance Criterion: The 6dB bandwidth must exceed 500 kHz.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	23	Humidity (%):	39	Pressure (hPa):	1005
Pretest Verification Performed		Yes		Equipment under Test:		Zigbee Spread Spectrum Transceiver M/N: MRF24J40	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		15	
Engineer's Initials:	NNA	Date Test Performed:	06/04/2009	Reviewer's Initials:	JG	Date Reviewed:	06/11/09

Test Equipment Used:

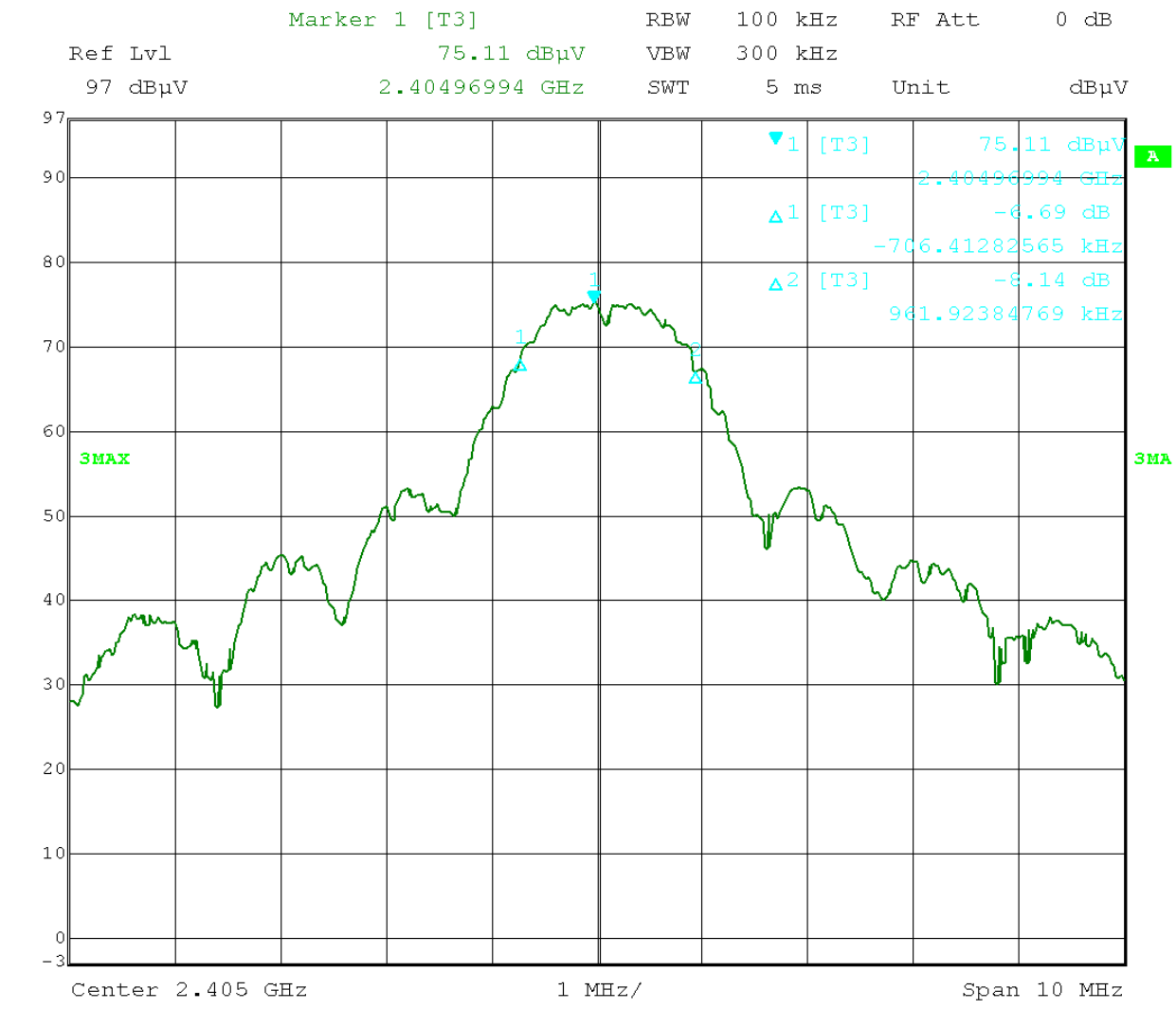
TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	MAN1	06/13/2009
2	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
3	High Frequency Cable	Megaphase	TM40-K1K1-197	8148601-001	12/10/2009
4	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/01/2009
5	HORN ANTENNA	EMCO	3115	9602-4675	10/13/2009

Software Utilized:

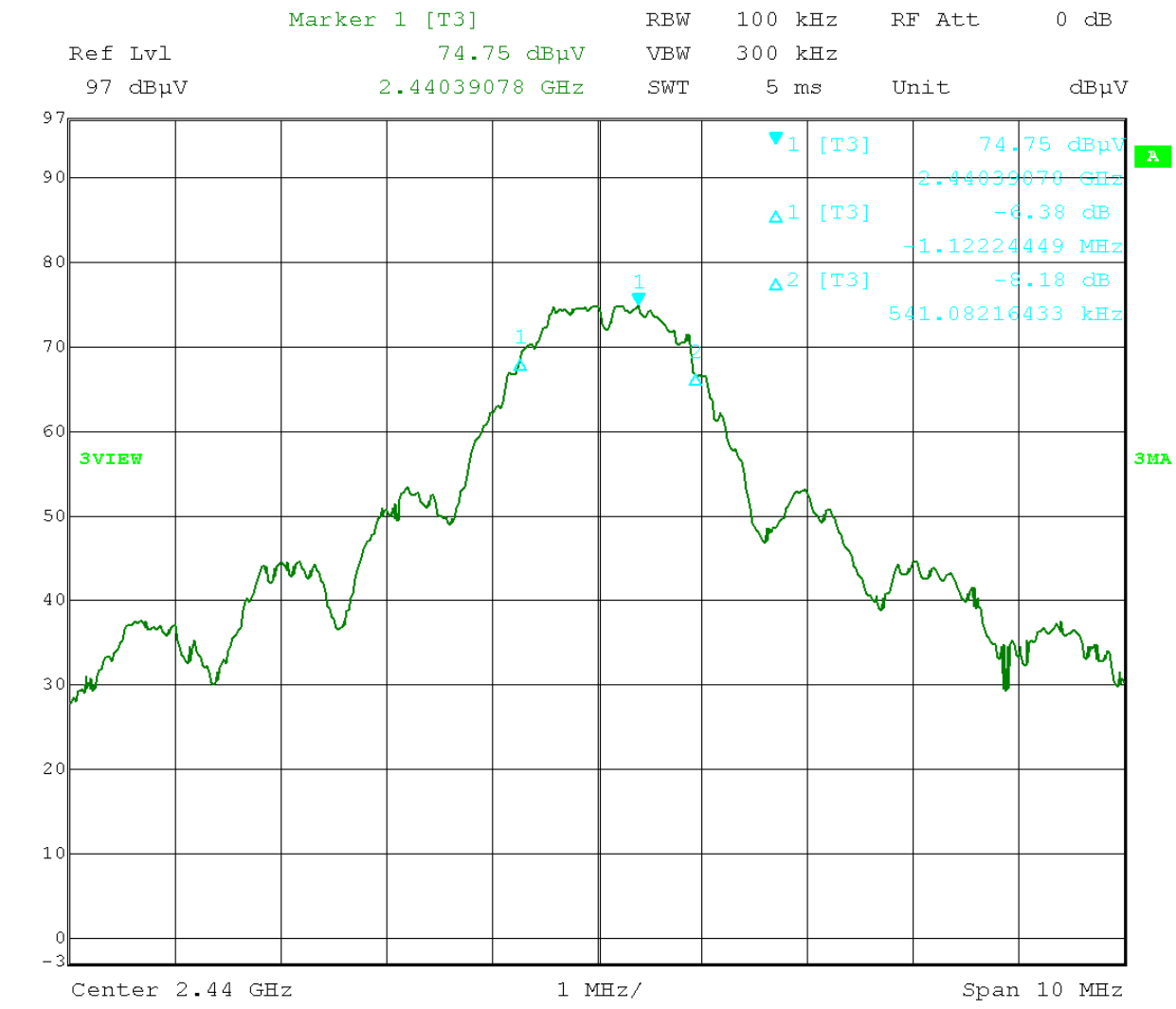
Name	Manufacturer	Version
None		

Test Details:

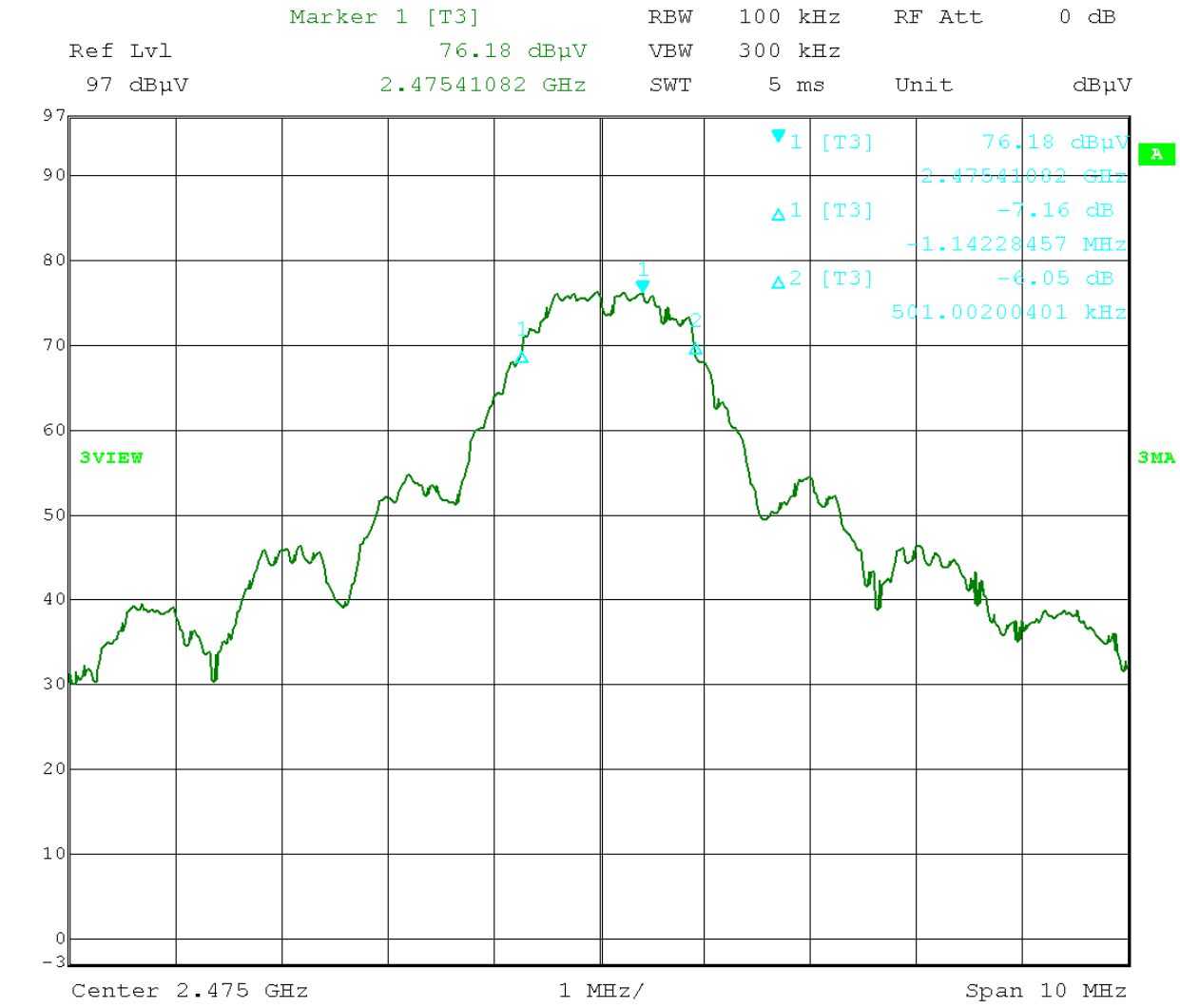
Notes: The EUT passed when tested as received. This is a relative measurement and the plots do not represent the actual EUT output power.



Ch11 6 dB Bandwidth 1.668 MHz



Ch18 6 dB Bandwidth 1.664 MHz



Ch25 6 dB Bandwidth 1.643 MHz

Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.247, Industry Canada RSS-210 Annex 8

Test: Peak Power Spectral Density

Performance Criterion: The peak power spectral density must not exceed 8 dBm in any 3 kHz bandwidth.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	23	Humidity (%):	39	Pressure (hPa):	1005
Pretest Verification Performed		Yes		Equipment under Test:		Zigbee Spread Spectrum Transceiver M/N: MRF24J40	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		15	
Engineer's Initials:	NNA	Date Test Performed:	06/04/2009	Reviewer's Initials:	JG	Date Reviewed:	06/11/09

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	MAN1	06/13/2009
2	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
3	High Frequency Cable	Megaphase	TM40-K1K1-197	8148601-001	12/10/2009
4	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/01/2009
5	HORN ANTENNA	EMCO	3115	9602-4675	10/13/2009

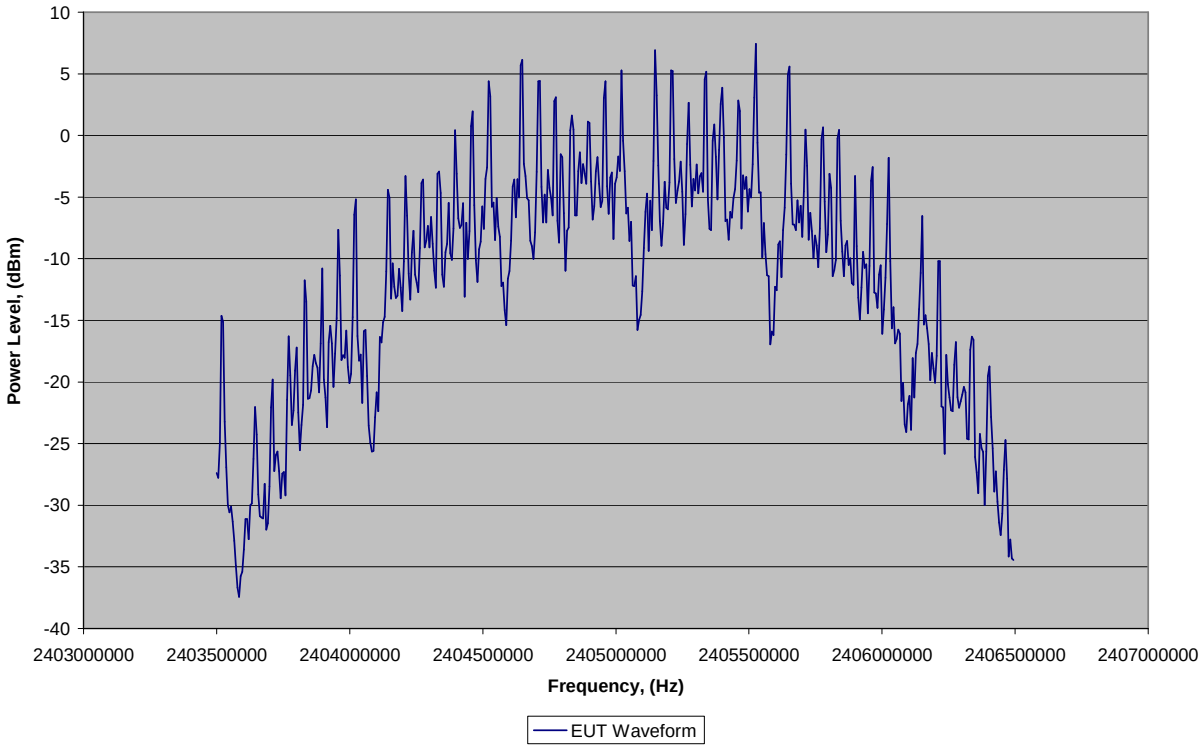
Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.5612.5606)

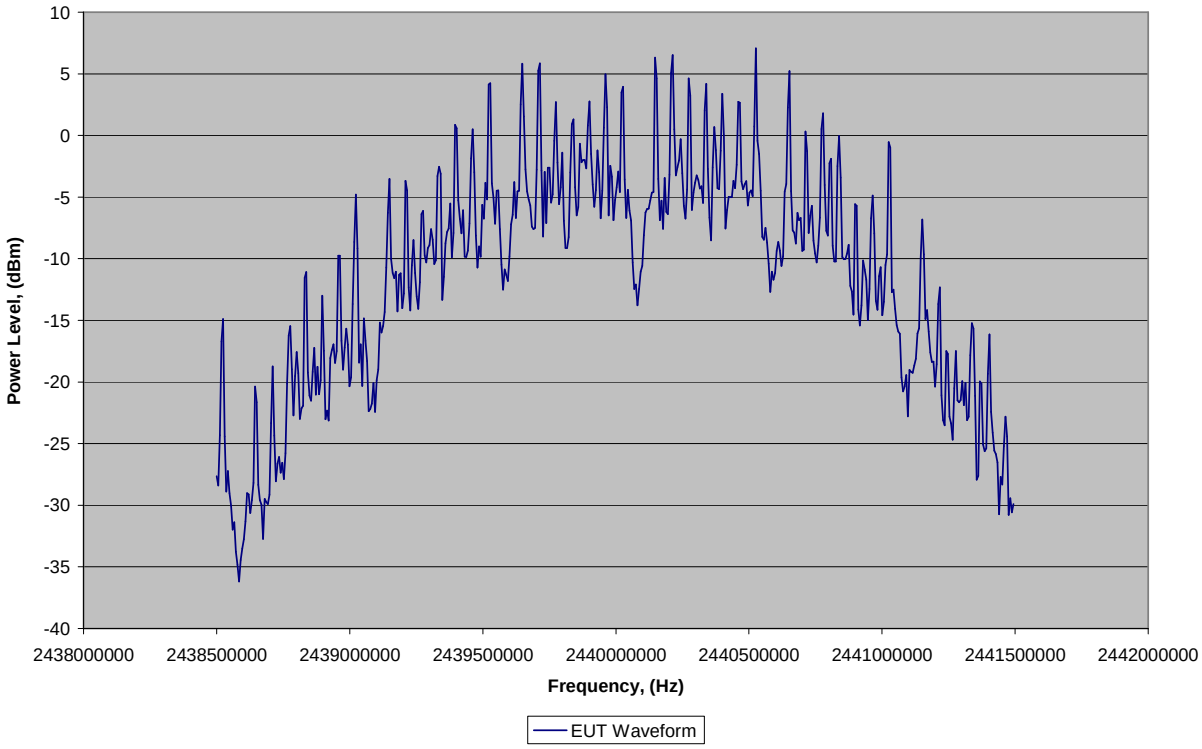
Test Details:

Notes: The EUT passed when tested as received. The EUT was measured in a radiated fashion. The peak power spectral density was measured using a 3.0 MHz span with a peak detector and a 3 kHz resolution bandwidth. The data obtained was adjusted for equipment losses and converted from a field strength reading to a power reading using the provisions of KDB 558074 and RSS-Gen 4.6.

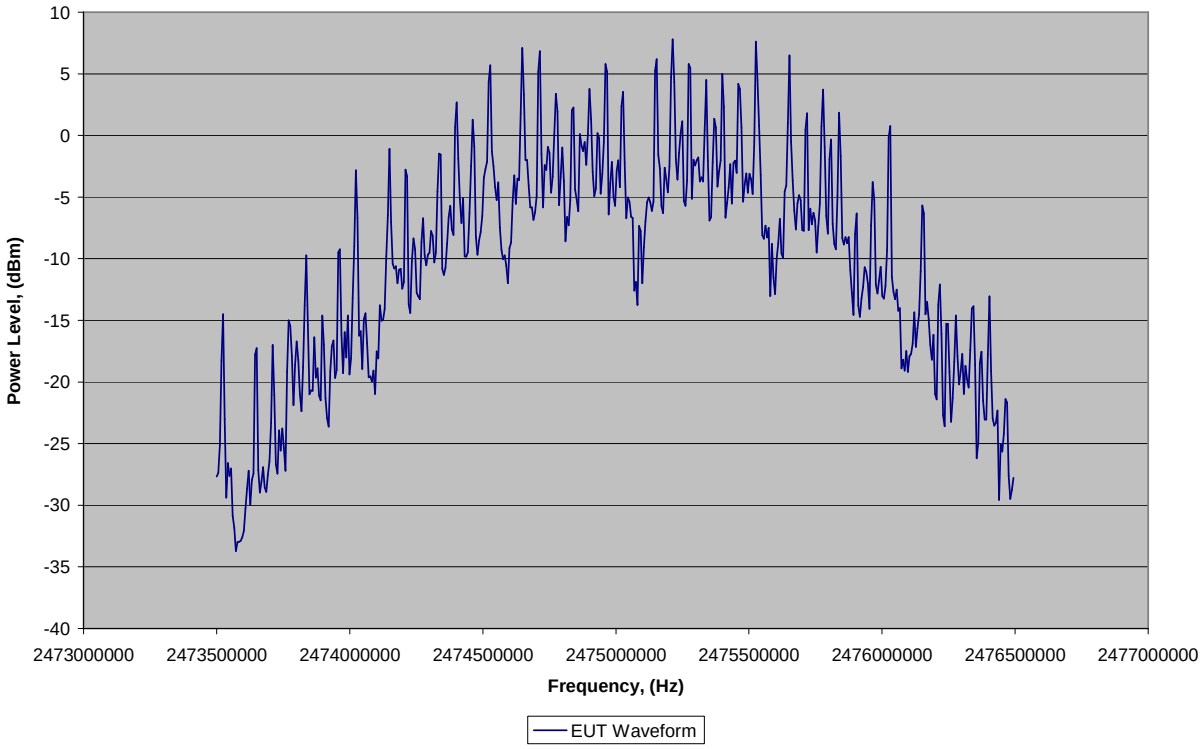
Peak Power Spectral Density, Channel 11, 7.42 dBm



Peak Power Spectral Density, Channel 18, 7.08 dBm



Peak Power Spectral Density, Channel 25, 7.81 dBm



Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.247, Industry Canada RSS-210 Annex 8

Test: Band Edge Compliance

Performance Criterion: Spurious emissions at the band edges must be at least 20 dB lower than the fundamental field strength when measured with a 100 kHz bandwidth. Emissions at the upper band edge which fall into the restricted band from 2483.5 – 2500 MHz must meet the general requirements of 15.209 using a 1 MHz bandwidth.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	24 23	Humidity (%):	40 39	Pressure (hPa):	1005 1005
Pretest Verification Performed		Yes		Equipment under Test:		Zigbee Spread Spectrum Transceiver M/N: MRF24J40	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		15	
Engineer's Initials:	NNA	Date Test Performed:	06/02-04/2009	Reviewer's Initials:	JG	Date Reviewed:	06/11/09

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	MAN1	06/13/2009
2	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
3	High Frequency Cable	Megaphase	TM40-K1K1-197	8148601-001	12/10/2009
4	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/01/2009
5	HORN ANTENNA	EMCO	3115	9602-4675	10/13/2009

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.5612.5606)
EMI Boxborough.xls	Intertek	4/17/09

Test Details:

Notes: The EUT passed when tested as received. The marker-delta method was used to show compliance at the upper band edge.

Special Radiated Emissions

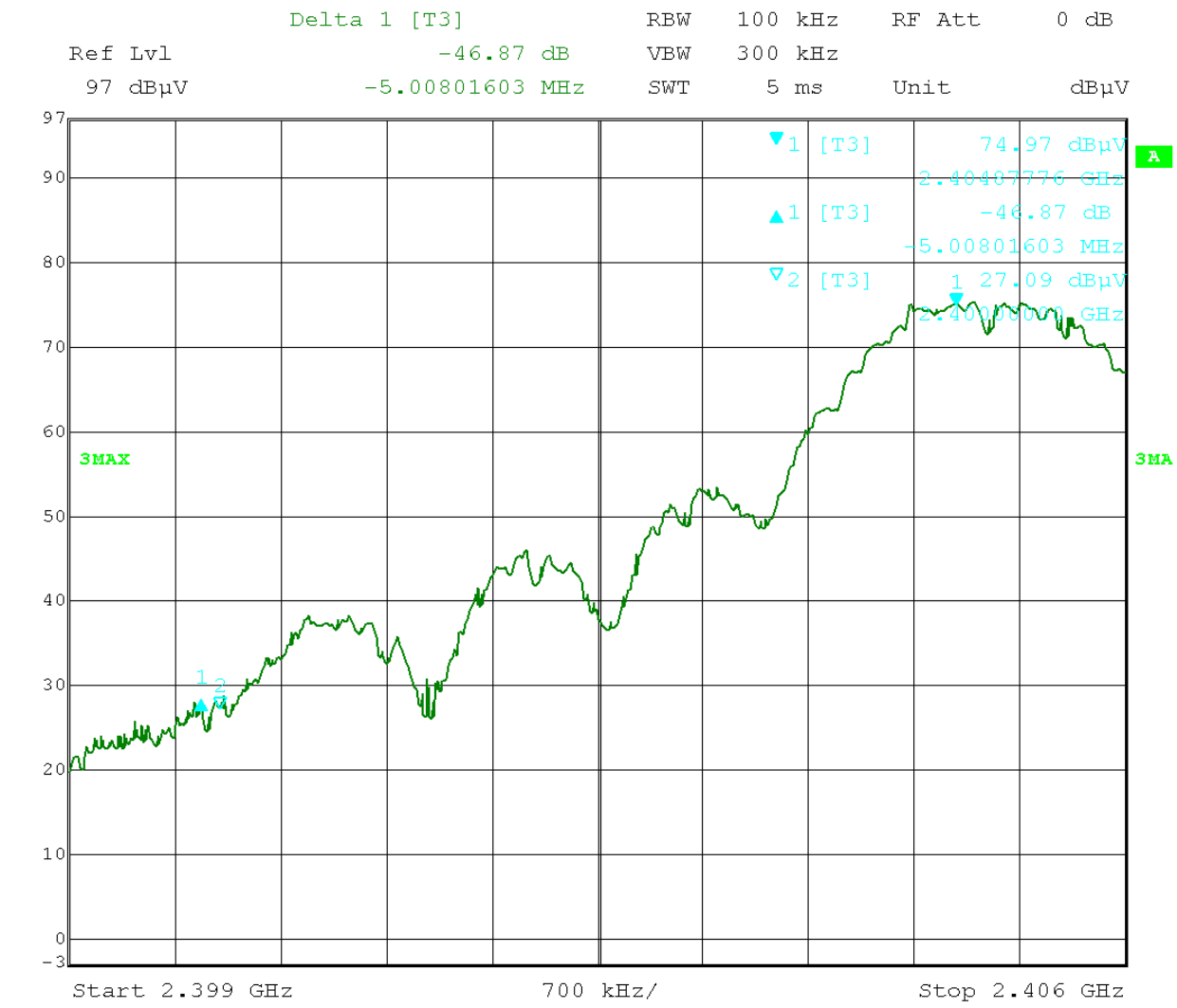
Company:	Microchip Technology		Antenna & Cables:	LF	Bands: N, LF, HF, SHF
Model #:	MRF24J40		Antenna:	Horn2 V3m 10-13-09.txt	Horn2 H3m 10-13-09.txt
Serial #:	15		Cable(s):	MEG001 06-05-09.txt	MEG005 12-10-2009.txt
Engineers:	Nicholas Abbondante	Location: Site 2	Barometer:	MAN1	Filter: NONE
Project #:	3173180	Date(s): 06/02/09 06/04/09			
Standard:	FCC Part 15 Subpart C 15.247/IC RSS-210 Annex 8		Temp/Humidity/Pressure:	24c	40% 1005mB
Receiver:	R&S FSEK-30 (ROS001) 12-01-2009	Limit Distance (m): 3		23c	39% 1005mB
PreAmp:	PRE9 04-03-10.txt	Test Distance (m): 3			

PreAmp Used? (Y or N): N Voltage/Frequency: 120V/60Hz Frequency Range: 1-4 GHz

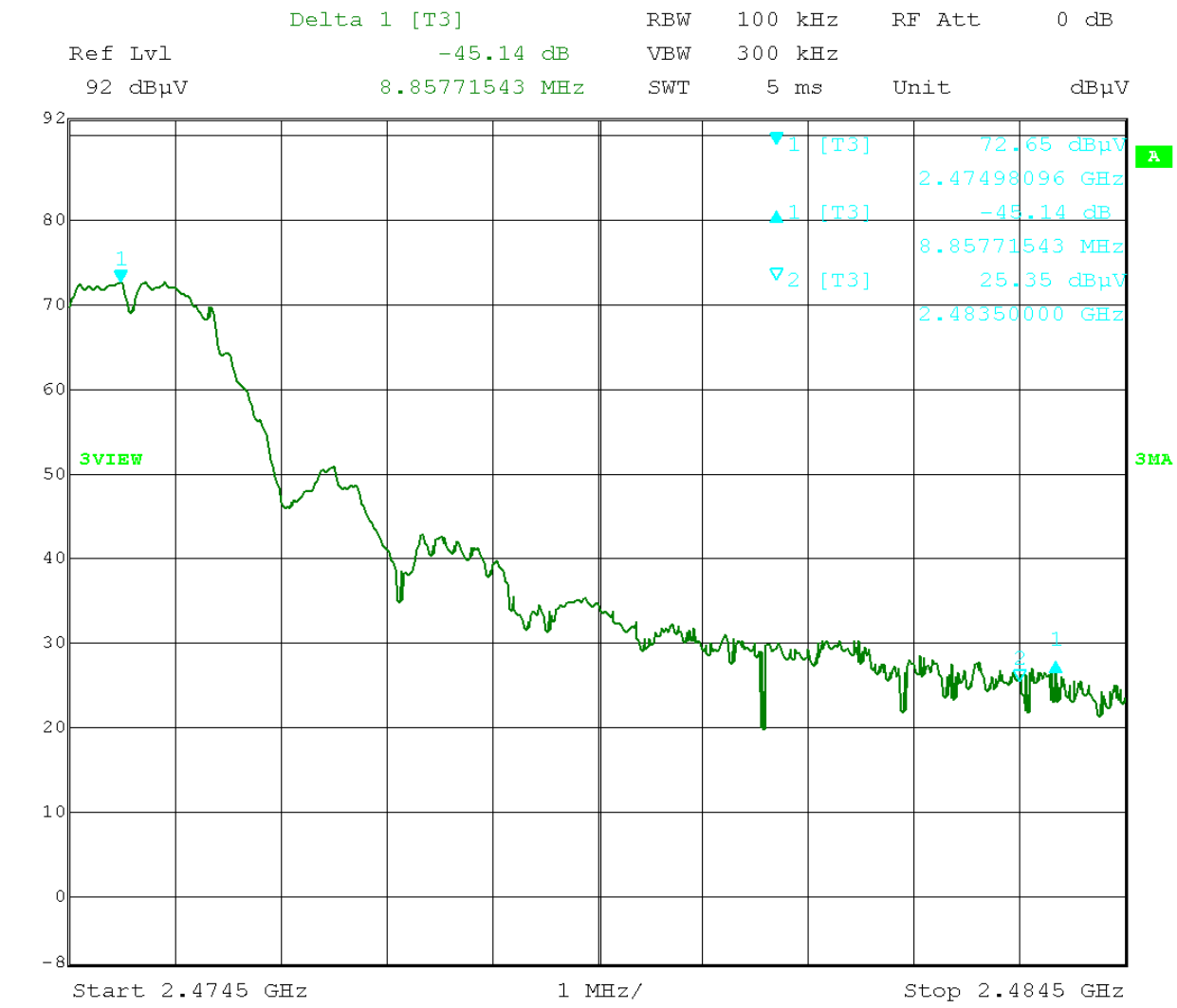
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Lower Band Edge Compliance, Direct Measurement													
PK	H	2400.000	28.42	28.22	6.03	0.00	0.00	62.67	90.67	-28.00	100/300 kHz		
Note: Upper Band Edge Compliance, Marker-Delta 45.14 dB													
PK	H	2483.500	35.69	28.37	6.15	0.00	0.00	70.21	74.00	-3.79	1/3 MHz	RB	
AVG	H	2483.500	15.58	28.37	6.15	0.00	0.00	50.10	54.00	-3.90	1/3 MHz	RB	



Lower Band Edge Compliance



Upper Band Edge Compliance, Marker-Delta 45.14 dB

Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.247, Industry Canada RSS-210 Annex 8, Industry Canada RSS-Gen

Test: Radiated Spurious Emissions and Duty Cycle

Performance Criterion: Spurious emissions must be at least 20 dB lower than the fundamental field strength when measured with a 100 kHz bandwidth. Emissions which fall in the restricted bands of 15.205 must meet the general limits of 15.209. Emissions which fall in the restricted bands of RSS-210 2.2 Table 1 must meet the general limits of RSS-210 2.7 Tables 2 and 3. If the emissions meet the general limits of 15.209 outside of the restricted bands, it is not necessary to demonstrate compliance to the 20 dBc limit in a 100 kHz bandwidth. There is no limit on duty cycle. Receiver spurious emissions must not exceed the limits of RSS-Gen Table 1.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	See Tables	Humidity (%):	See Tables	Pressure (hPa):	See Tables
Pretest Verification Performed		Yes		Equipment under Test:		Zigbee Spread Spectrum Transceiver M/N: MRF24J40	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		15	
Engineer's Initials:	NNA	Date Test Performed:	06/01-05/2009 06/08-10/2009	Reviewer's Initials:	JG	Date Reviewed:	06/11/09

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	MAN1	06/13/2009
2	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	12/10/2009
3	40 GHz Cable	Megaphase	TM40-K1K1-80	7030802 002	06/05/2009
4	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	01/27/2010
5	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	04/03/2010
6	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	12/01/2009
7	HORN ANTENNA	EMCO	3115	9602-4675	10/13/2009
8	High Frequency Cable	Megaphase	TM40-K1K1-197	8148601-001	12/10/2009
9	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	10/15/2009
10	18GHz High Pass Filter	Reactel, Inc	7HS-18G/40GK11	(06)1	04/21/2010
11	40GHz Cable	Megaphase	TM40-K1K1-197	7030801 001	06/05/2009
12	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	02/17/2010
13	3 Meter In floor cable for site 2	ITS	RG214B/U	S2 3M FLR	02/20/2010
14	4 Line Digital Barometer *	Mannix	0ABA116	SAF291	02/11/2010
15	40 GHz Cable	Megaphase	TM40-K1K1-80	58013901001	05/26/2010
16	1GHz High Pass Filter	Reactel, Inc	7HS-1G/10G-S11	06-1	10/15/2009
17	ANTENNA	EMCO	3142	9711-1224	12/12/2009

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.5612.5606)
EMI Boxborough.xls	Intertek	4/17/09

Test Details:

Notes: The EUT passed when tested as received. Average was obtained by applying a duty cycle correction factor. The duty cycle was measured, and it was found that the worst-case burst length was 696.4 us, while the worst-case burst period was 7.05 ms. This yields a worst-case duty cycle of 9.87%. The corresponding duty cycle averaging factor, 20*LOG(0.0987), is 20.11 dB.

Special Radiated Emissions

Company: Microchip Technology
Model #: MRF24J40
Serial #: 15
Engineers: Nicholas Abbondante
Project #: 3173180
Standard: FCC Part 15 Subpart C 15.247/IC RSS-210 Annex 8
Receiver: R&S ESCI (ROS002) 02-17-2010
PreAmp: PRE9 04-03-10.txt

Location: Site 2
Date(s): 06/05/09
Limit Distance (m): 3
Test Distance (m): 3

Antenna & Cables: N
Antenna: LOG3 V3m 12-12-09.txt
Cable(s): S2 3M FLR 02-20-2010.txt
Barometer: MAN1

Bands: N, LF, HF, SHF
LOG3 H3m 12-12-09.txt
NONE.
Filter: NONE

Temp/Humidity/Pressure: 19c 41% 1004mB

PreAmp Used? (Y or N): N
Voltage/Frequency: 120V/60Hz
Frequency Range: 30-1000 MHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Channel 11													
PK	V	50.056	30.60	8.48	0.78	0.00	0.00	39.87	90.67	-50.80	120/300 kHz		
QP	V	118.480	25.40	7.62	1.26	0.00	0.00	34.28	43.50	-9.22	120/300 kHz	RB	RB
QP	V	125.840	13.20	7.52	1.30	0.00	0.00	22.02	43.50	-21.48	120/300 kHz	RB	RB
QP	V	166.640	0.10	9.93	1.51	0.00	0.00	11.54	43.50	-31.96	120/300 kHz	RB	
PK	V	166.640	7.00	9.93	1.51	0.00	0.00	18.44	90.67	-72.23	120/300 kHz	RB	
PK	H	300.000	12.90	14.40	2.13	0.00	0.00	29.43	90.67	-61.24	120/300 kHz		
QP	V	400.000	3.10	15.40	2.47	0.00	0.00	20.97	46.00	-25.03	120/300 kHz	RB	RB
PK	V	958.400	4.00	23.20	4.42	0.00	0.00	31.62	90.67	-59.05	120/300 kHz		
Note: Channel 18													
PK	V	50.880	31.50	8.24	0.79	0.00	0.00	40.52	90.67	-50.15	120/300 kHz		
QP	V	119.336	6.20	7.55	1.26	0.00	0.00	15.02	43.50	-28.48	120/300 kHz	RB	RB
QP	V	127.120	12.30	7.54	1.31	0.00	0.00	21.15	43.50	-22.35	120/300 kHz	RB	RB
QP	V	166.640	5.50	9.93	1.51	0.00	0.00	16.94	43.50	-26.56	120/300 kHz	RB	
PK	V	166.640	21.60	9.93	1.51	0.00	0.00	33.04	90.67	-57.63	120/300 kHz	RB	
PK	H	300.000	12.10	14.40	2.13	0.00	0.00	28.63	90.67	-62.04	120/300 kHz		
QP	V	400.324	5.80	15.41	2.47	0.00	0.00	23.68	46.00	-22.32	120/300 kHz	RB	RB
PK	V	943.280	3.50	22.77	4.37	0.00	0.00	30.63	90.67	-60.04	120/300 kHz		
Note: Channel 25													
PK	V	51.600	30.80	8.20	0.79	0.00	0.00	39.79	90.67	-50.88	120/300 kHz		
QP	V	115.931	2.00	7.83	1.24	0.00	0.00	11.07	43.50	-32.43	120/300 kHz	RB	RB
QP	V	123.360	8.40	7.50	1.29	0.00	0.00	17.19	43.50	-26.31	120/300 kHz	RB	RB
QP	V	166.640	7.20	9.93	1.51	0.00	0.00	18.64	43.50	-24.86	120/300 kHz	RB	
PK	V	166.640	20.50	9.93	1.51	0.00	0.00	31.94	90.67	-58.73	120/300 kHz	RB	
PK	H	300.000	15.70	14.40	2.13	0.00	0.00	32.23	90.67	-58.44	120/300 kHz		
QP	V	400.029	6.30	15.40	2.47	0.00	0.00	24.17	46.00	-21.83	120/300 kHz	RB	RB
PK	V	945.200	3.60	22.81	4.37	0.00	0.00	30.79	90.67	-59.88	120/300 kHz		

Special Radiated Emissions

Company:	Microchip Technology		Antenna & Cables:	LF	Bands: N, LF, HF, SHF
Model #:	MRF24J40		Antenna:	Horn2 V3m 10-13-09.txt	Horn2 H3m 10-13-09.txt
Serial #:	15		Cable(s):	MEG001 06-05-09.txt	MEG005 12-10-2009.txt
Engineers:	Nicholas Abbondante	Location: Site 2	Barometer:	MAN1	Filter: NONE
Project #:	3173180	Date(s): 06/02/09 06/04/09			
Standard:	FCC Part 15 Subpart C 15.247/IC RSS-210 Annex 8		Temp/Humidity/Pressure:	24c	40% 1005mB
Receiver:	R&S FSEK-30 (ROS001) 12-01-2009	Limit Distance (m): 3		23c	39% 1005mB
PreAmp:	PRE9 04-03-10.txt	Test Distance (m): 3			

PreAmp Used? (Y or N): N Voltage/Frequency: 120V/60Hz Frequency Range: 1-4 GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Spurious Emissions													
PK	H	2157.900	37.58	27.78	5.68	0.00	0.00	71.04	90.67	-19.63	100/300 kHz		

Radiated Emissions

Company: Microchip Technology
Model #: MRF24J40
Serial #: 15
Engineers: Nicholas Abbondante Location: Site 2
Project #: 3173180 Date(s): 06/01/09 06/02/09
Standard: FCC Part 15 Subpart C 15.247/IC RSS-210 Annex 8
Receiver: R&S FSEK-30 (ROS001) 12-01-2009 Limit Distance (m): 3
PreAmp: PRE9 04-03-10.txt Test Distance (m): 3
PreAmp Used? (Y or N): Y Voltage/Frequency: 120V/60Hz Frequency Range: 4-18 GHz

Antenna & Cables: HF Bands: N, LF, HF, SHF
Antenna: Horn2 V3m 10-13-09.txt Horn2 H3m 10-13-09.txt
Cable(s): MEG005 12-10-2009.txt CBL030 12-10-09.txt
Barometer: MAN1 Filter: REA004
Temp/Humidity/Pressure: 24c 41% 994mB
23c 42% 1007mB

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: -1.9 dBm Tx Power Setting; Duty Cycle 9.87%, Average obtained using 20.1 dB duty cycle correction factor													
PK	H	4810.000	54.35	32.73	6.31	28.09	0.00	65.31	74.00	-8.69	1/3 MHz	RB	RB
AVG	H	4810.000	34.25	32.73	6.31	28.09	0.00	45.21	54.00	-8.79	1/3 MHz	RB	RB
PK	V	7215.000	51.25	35.60	8.02	27.30	0.00	67.57	90.67	-23.10	100/300 kHz		
PK	V	9620.000	51.37	37.94	9.45	26.44	0.00	72.33	90.67	-18.34	100/300 kHz		
PK	V	12025.000	49.14	39.28	10.76	26.34	0.00	72.84	74.00	-1.16	1/3 MHz	RB	RB
AVG	V	12025.000	29.04	39.28	10.76	26.34	0.00	52.74	54.00	-1.26	1/3 MHz	RB	RB
PK	H	14430.000	28.57	41.89	12.24	26.39	0.00	56.31	90.67	-34.36	100/300 kHz		
PK	V	16835.000	26.41	39.81	13.62	27.24	0.00	52.59	90.67	-38.08	100/300 kHz		
PK	H	4880.000	53.26	32.83	6.36	28.09	0.00	64.36	74.00	-9.64	1/3 MHz	RB	RB
AVG	H	4880.000	33.16	32.83	6.36	28.09	0.00	44.26	54.00	-9.74	1/3 MHz	RB	RB
PK	V	7320.000	53.98	35.90	8.10	27.26	0.00	70.71	74.00	-3.29	1/3 MHz	RB	RB
AVG	V	7320.000	33.88	35.90	8.10	27.26	0.00	50.61	54.00	-3.39	1/3 MHz	RB	RB
PK	V	9760.000	49.20	38.11	9.54	26.39	0.00	70.47	90.67	-20.20	100/300 kHz		
PK	V	12200.000	42.07	39.10	10.84	26.34	0.00	65.67	74.00	-8.33	1/3 MHz	RB	RB
AVG	V	12200.000	21.97	39.10	10.84	26.34	0.00	45.57	54.00	-8.43	1/3 MHz	RB	RB
PK	H	14640.000	27.31	41.31	12.36	26.39	0.00	54.59	90.67	-36.08	100/300 kHz		
PK	H	17080.000	28.11	40.82	13.76	27.36	0.00	55.33	90.67	-35.34	100/300 kHz		
PK	H	4950.000	51.18	32.93	6.41	28.10	0.00	62.43	74.00	-11.57	1/3 MHz	RB	RB
AVG	H	4950.000	31.08	32.93	6.41	28.10	0.00	42.33	54.00	-11.67	1/3 MHz	RB	RB
PK	V	7425.000	51.78	36.19	8.18	27.23	0.00	68.93	74.00	-5.07	1/3 MHz	RB	RB
AVG	V	7425.000	31.68	36.19	8.18	27.23	0.00	48.83	54.00	-5.17	1/3 MHz	RB	RB
PK	V	9900.000	48.02	38.28	9.63	26.34	0.00	69.59	90.67	-21.08	100/300 kHz		
PK	H	12375.000	40.14	38.90	10.92	26.35	0.00	63.62	74.00	-10.39	1/3 MHz	RB	RB
AVG	H	12375.000	20.04	38.90	10.92	26.35	0.00	43.52	54.00	-10.49	1/3 MHz	RB	RB
PK	V	14850.000	26.08	40.53	12.48	26.40	0.00	52.70	90.67	-37.97	100/300 kHz		
PK	H	17325.000	26.84	42.09	13.90	27.47	0.00	55.36	90.67	-35.31	100/300 kHz		

Special Radiated Emissions

Company: Microchip Technology
Model #: MRF24J40
Serial #: 15
Engineers: Nicholas Abbondante Location: Site 2
Project #: 3173180 Date(s): 06/04/09
Standard: FCC Part 15 Subpart C 15.247/IC RSS-210 Annex 8
Receiver: R&S FSEK-30 (ROS001) 12-01-2009 Limit Distance (m): 3
PreAmp: PRE9 04-03-10.txt Test Distance (m): 3
PreAmp Used? (Y or N): Y Voltage/Frequency: 120V/60Hz Frequency Range: 18-25 GHz

Antenna & Cables: SHF Bands: N, LF, HF, SHF
Antenna: EMC04 V1m 01-27-2010.txt EMC04 H1m 01-27-2010.txt
Cable(s): CBL030 12-10-09.txt MEG004 06-05-09.txt
Barometer: MAN1 Filter: REA006
Temp/Humidity/Pressure: 22c 41% 1005mB

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
PK	H	19240.000	36.57	45.58	8.37	28.35	0.00	62.17	74.00	-11.83	1/3 MHz	RB	RB
AVG	H	19240.000	24.08	45.58	8.37	28.35	0.00	49.68	54.00	-4.32	1/3 MHz	RB	RB
PK	V	21645.000	26.95	45.79	9.00	29.06	0.00	52.68	90.67	-37.99	100/300 kHz		
PK	V	24050.000	27.29	45.74	9.72	29.58	0.00	53.16	90.67	-37.51	100/300 kHz		
PK	V	19520.000	36.71	45.68	8.45	28.48	0.00	62.36	74.00	-11.64	1/3 MHz	RB	RB
AVG	V	19520.000	25.28	45.68	8.45	28.48	0.00	50.93	54.00	-3.07	1/3 MHz	RB	RB
PK	H	21960.000	27.50	45.57	9.11	29.12	0.00	53.06	90.67	-37.61	100/300 kHz		
PK	H	24400.000	27.50	45.95	9.82	29.65	0.00	53.61	90.67	-37.06	100/300 kHz		
PK	H	19800.000	37.93	45.45	8.52	28.61	0.00	63.30	74.00	-10.70	1/3 MHz	RB	RB
AVG	H	19800.000	25.69	45.45	8.52	28.61	0.00	51.06	54.00	-2.94	1/3 MHz	RB	RB
PK	V	22275.000	36.36	45.72	9.25	29.19	0.00	62.13	74.00	-11.87	1/3 MHz	RB	RB
AVG	V	22275.000	24.55	45.72	9.25	29.19	0.00	50.32	54.00	-3.68	1/3 MHz	RB	RB
PK	V	24750.000	27.47	46.31	9.94	29.73	0.00	53.99	90.67	-36.68	100/300 kHz		

Radiated Emissions, Receiver

Company:	Microchip			Antenna & Cables:	N	Bands: N, LF, HF, SHF	
Model #:	MRF24J40			Antenna:	LOG3 V3m 12-12-09.txt	LOG3 H3m 12-12-09.txt	
Serial #:	15			Cable(s):	S2 3M FLR 02-20-2010.txt	NONE.	
Engineers:	Nicholas Abbondante		Location: Site 2	Barometer:	SAF291	Filter:	NONE
Project #:	3173180	Date(s):	06/08/09 06/09/10				
Standard:	RSS-Gen Table 1			Temp/Humidity/Pressure:	23c	43%	1005mB
Receiver:	R&S ESCI (ROS002) 02-17-2010	Limit Distance (m):	3		22c	46%	1006mB
PreAmp:	PRE9 04-03-10.txt	Test Distance (m):	3				

PreAmp Used? (Y or N): N Voltage/Frequency: 120V/60Hz Frequency Range: 30-1000 MHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
QP	V	48.000	18.50	8.70	0.77	0.00	0.00	27.97	40.00	-12.03	120/300 kHz		
QP	V	166.200	1.10	9.90	1.51	0.00	0.00	12.50	43.50	-31.00	120/300 kHz	RB	
QP	V	304.000	1.30	14.28	2.12	0.00	0.00	17.70	46.00	-28.30	120/300 kHz		
QP	V	316.000	2.30	14.12	2.14	0.00	0.00	18.56	46.00	-27.44	120/300 kHz		
QP	H	384.000	1.80	16.32	2.42	0.00	0.00	20.54	46.00	-25.46	120/300 kHz		
QP	H	396.000	2.40	17.02	2.45	0.00	0.00	21.87	46.00	-24.13	120/300 kHz		

Radiated Emissions, Receiver

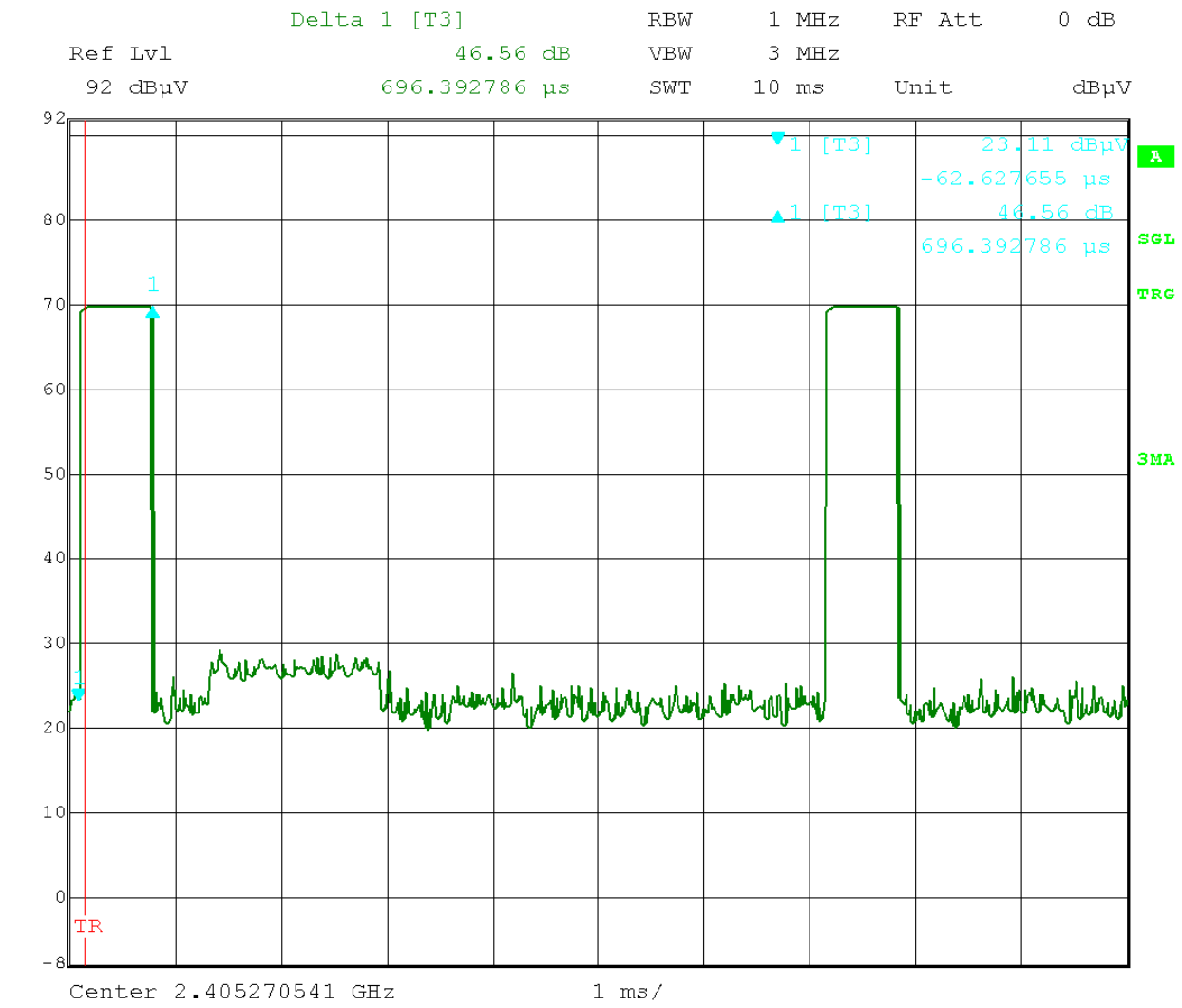
Company:	Microchip			Antenna & Cables:	HF	Bands: N, LF, HF, SHF	
Model #:	MRF24J40			Antenna:	Horn2 V3m 10-13-09.txt	Horn2 H3m 10-13-09.txt	
Serial #:	15			Cable(s):	MEG005 12-10-2009.txt	MEG003 05-26-10.txt	
Engineers:	Nicholas Abbondante	Location:	Site 2	Barometer:	SAF291	Filter:	REA003
Project #:	3173180	Date(s):	06/10/09				
Standard:	RSS-Gen Table 1			Temp/Humidity/Pressure:	22c	46%	1006mB
Receiver:	R&S FSEK-30 (ROS001) 12-01-2009	Limit Distance (m):	3				
PreAmp:	PRE9 04-03-10.txt	Test Distance (m):	3				

PreAmp Used? (Y or N): Y Voltage/Frequency: 120V/60Hz Frequency Range: 1-7.5 GHz

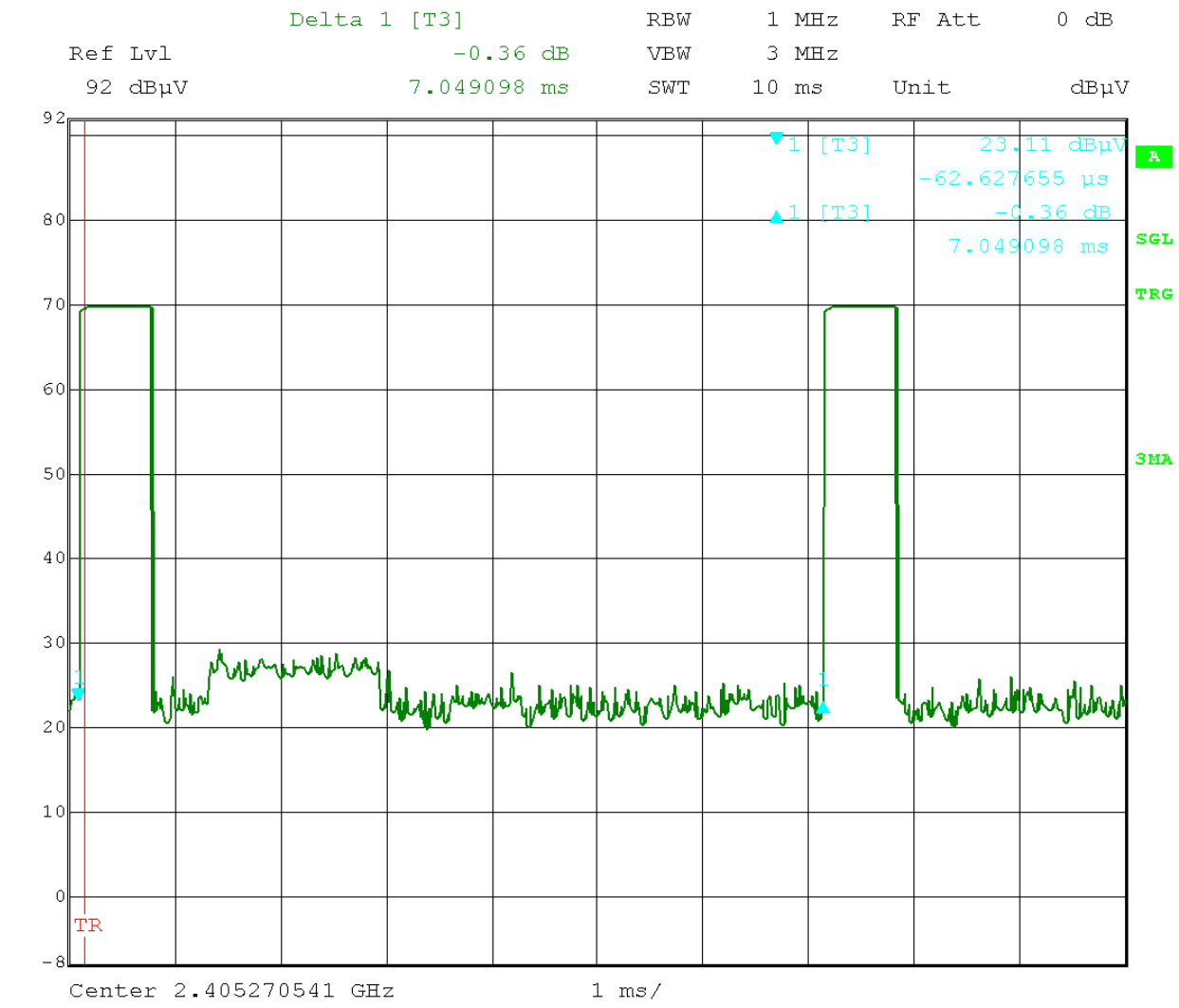
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: The emissions listed are a measurement of instrumentation noise floor.													
PK	H	2414.800	34.50	28.25	4.10	27.91	0.00	38.94	74.00	-35.06	1/3 MHz		
AVG	H	2414.800	25.06	28.25	4.10	27.91	0.00	29.50	54.00	-24.50	1/3 MHz		
PK	H	3509.000	35.02	31.12	5.02	27.99	0.00	43.17	74.00	-30.83	1/3 MHz		RB
AVG	H	3509.000	25.68	31.12	5.02	27.99	0.00	33.83	54.00	-20.17	1/3 MHz		RB
PK	V	7248.500	36.35	35.70	7.96	27.29	0.00	52.72	74.00	-21.28	1/3 MHz		
AVG	V	7248.500	27.80	35.70	7.96	27.29	0.00	44.17	54.00	-9.83	1/3 MHz		

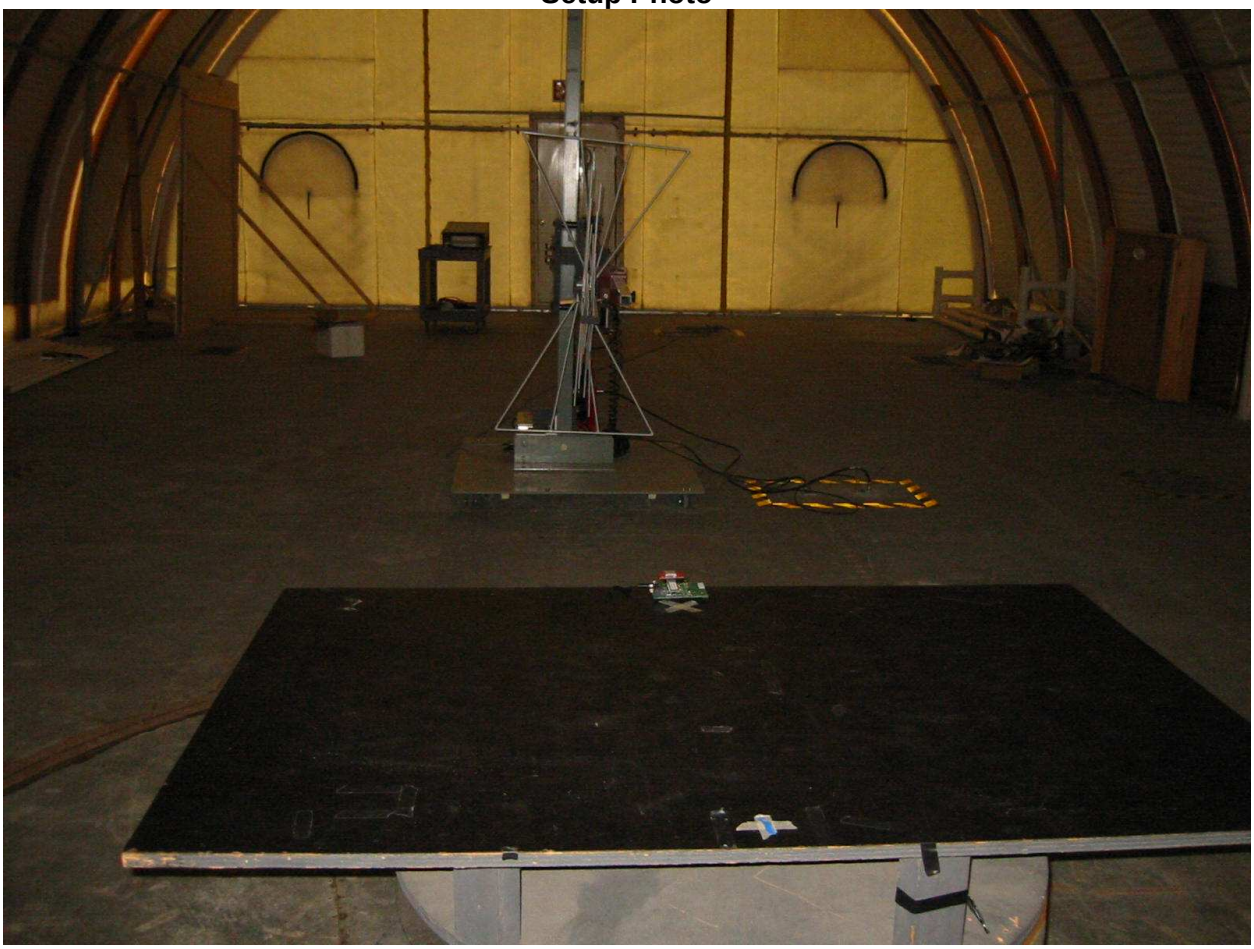


Burst Length, 696.4 us



Burst Period, 7.05 ms

Setup Photo



Radiated Emissions, 30-1000 MHz

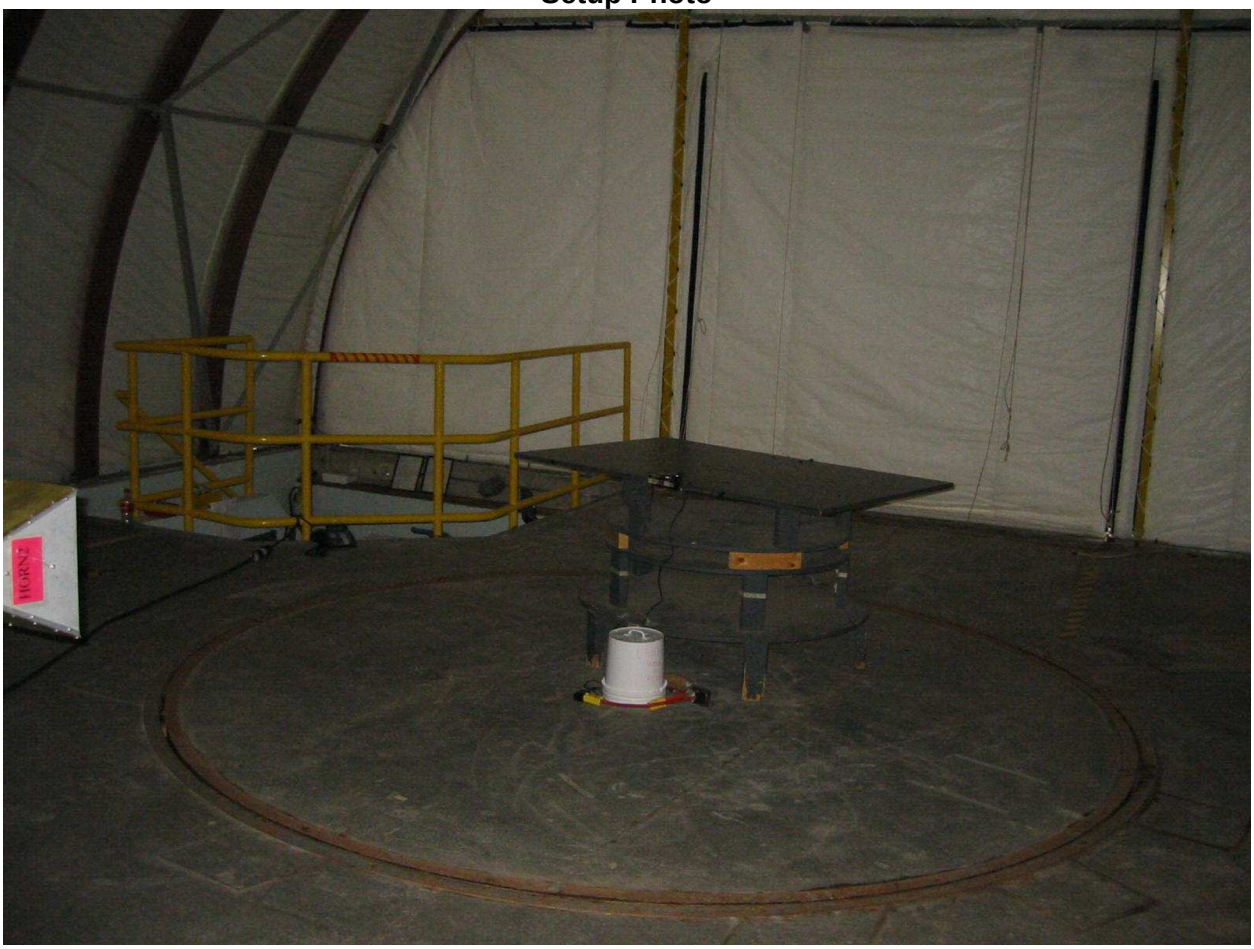
Setup Photo

Radiated Emissions, 30-1000 MHz

Setup Photo

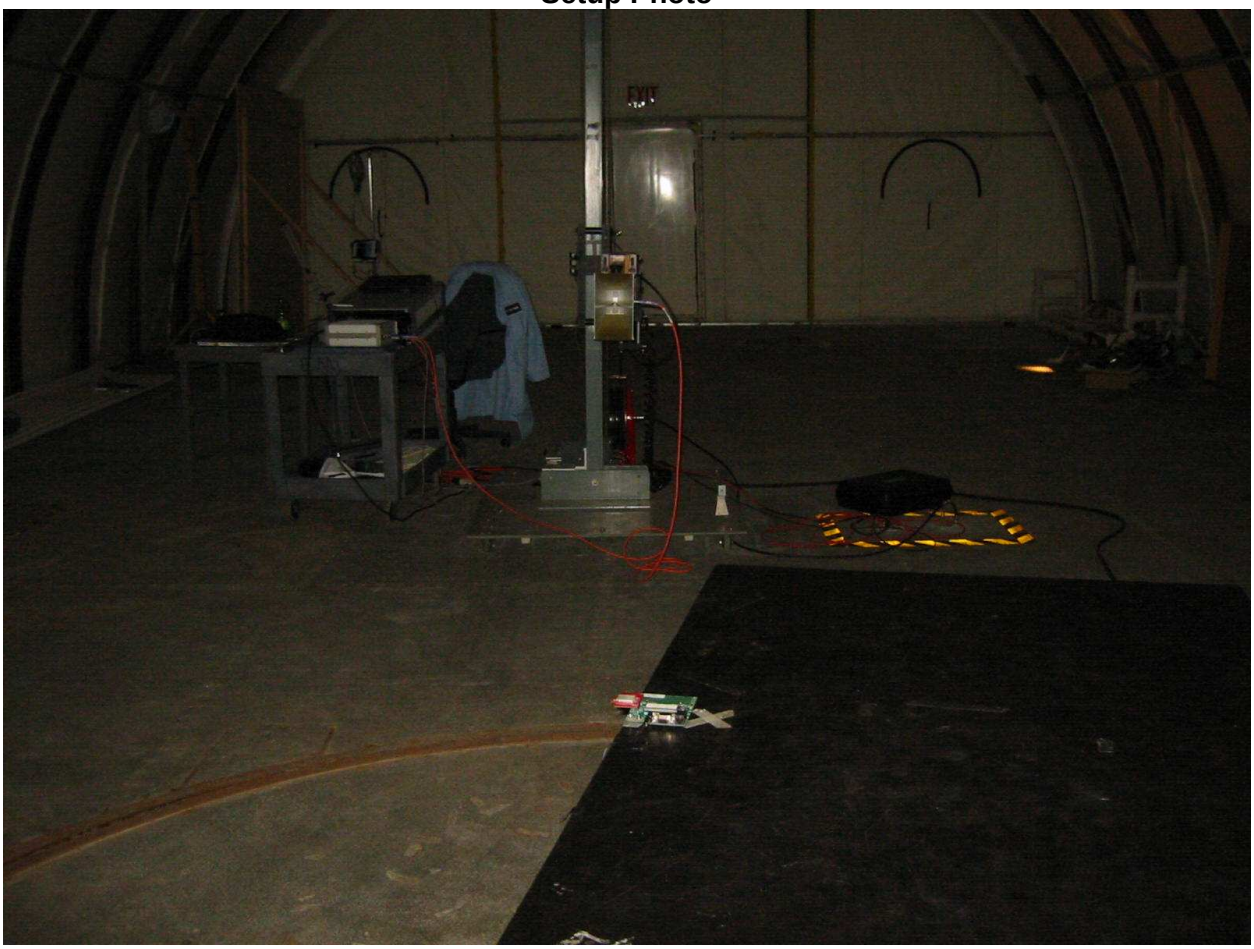
Radiated Emissions, 1-4 GHz

Setup Photo



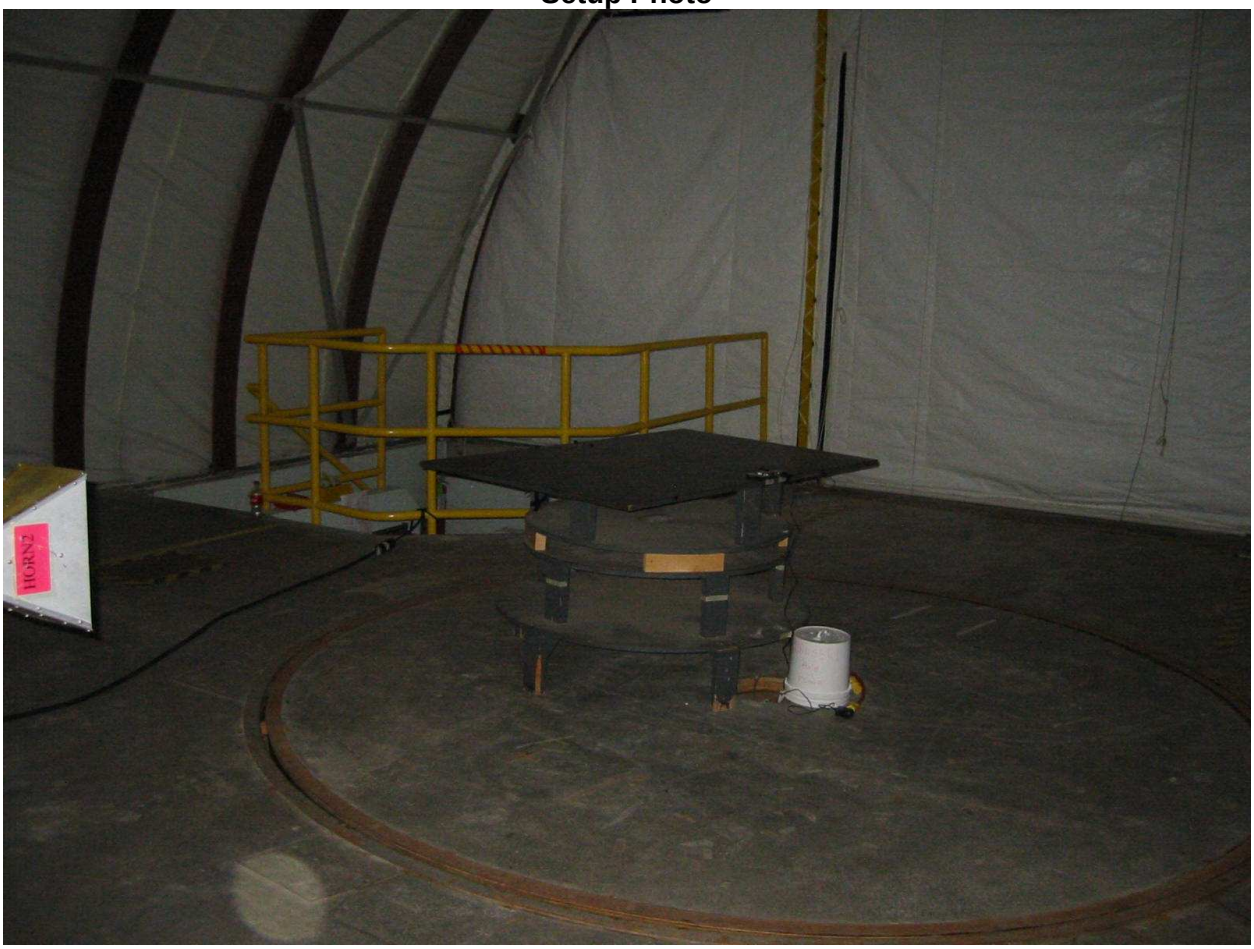
Radiated Emissions, 1-4 GHz

Setup Photo



Radiated Emissions, 4-18 GHz

Setup Photo



Radiated Emissions, 4-18 GHz

Setup Photo

Radiated Emissions, 18-25 GHz

Setup Photo

Radiated Emissions, 18-25 GHz

Test Results: Pass

Test Standard: FCC Part 15 Subpart C 15.247, IC RSS-Gen

Test: AC Line-Conducted Emissions

Performance Criterion: The AC line-conducted emissions must not exceed the FCC 15.207 and RSS-Gen Section 7.2.2 Table 2 limits.

Test Environment:

Environmental Conditions During Testing:		Ambient (°C):	23	Humidity (%):	42	Pressure (hPa):	1004
Pretest Verification Performed		Yes		Equipment under Test:		Zigbee Spread Spectrum Transceiver M/N: MRF24J40	
Test Engineer(s):	Nicholas Abbondante			EUT Serial Number:		15	
Engineer's Initials:	NNA	Date Test Performed:	06/05/2009	Reviewer's Initials:	JG	Date Reviewed:	06/11/09

Test Equipment Used:

TEST EQUIPMENT LIST					
Item	**Equipment Type**	**Make**	**Model No.**	**Serial No.**	**Next Cal. Due**
1	Digital 4 Line Barometer	Mannix	0ABA116	MAN1	06/13/2009
2	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	02/17/2010
3	CABLE, BNC/BNC	Alpha	RG58B/U	CBL310E	03/12/2010
4	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS22A	09/23/2009
5	LISN, 50uH, .01 - 50MHz, 24A	Solar Electronics	9252-50-R-24-BNC	955107	06/05/2009

Software Utilized:

Name	Manufacturer	Version
Excel 2003	Microsoft	(11.5612.5606)
EMI Boxborough.xls	Intertek	4/17/09

Test Details:
Notes: The EUT passed when tested as received.

Conducted Emissions

Company: Microchip Technology
Model #: MRF24J40
Serial #: 15
Engineer(s): Nicholas Abbondante
Project #: 3173180
Standard: FCC Part 15 Subpart C 15.207/IC RSS-Gen
Barometer: MAN1

Location: Site 2
Date: 06/05/09
Temp/Humidity/Pressure: 23c 42% 1004mB
Voltage/Frequency: 120V/60Hz

Receiver: R&S ESCI (ROS002) 02-17-2010
Cable: CBL310E 3-12-10.txt
LISN 1: LISN13(1) 06_05_09.TXT
LISN 2: LISN13(2) 06_05_09.TXT
LISN 3: NONE.
LISN 4: NONE.
Attenuator: DS22A 09-24-09.txt
Frequency Range: 150 kHz - 30 MHz

Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.150	26.80	26.10			45.40	66.00	-20.60	9/30 kHz
QP	0.306	33.20	29.80			52.54	60.07	-7.53	9/30 kHz
QP	0.601	29.90	25.60			49.36	56.00	-6.64	9/30 kHz
QP	0.959	33.80	28.70			53.05	56.00	-2.95	9/30 kHz
QP	1.198	28.10	24.40			47.35	56.00	-8.65	9/30 kHz
QP	25.000	14.00	13.80			33.45	60.00	-26.55	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.150	10.50	5.30			29.10	56.00	-26.90	9/30 kHz
AVG	0.306	17.60	13.10			36.94	50.07	-13.13	9/30 kHz
AVG	0.601	12.80	9.70			32.26	46.00	-13.74	9/30 kHz
AVG	0.959	14.90	11.00			34.15	46.00	-11.85	9/30 kHz
AVG	1.198	13.60	10.20			32.85	46.00	-13.15	9/30 kHz
AVG	25.000	7.40	7.30			26.85	50.00	-23.15	9/30 kHz

AC Line-Conducted Emissions Setup Photo