ENGINEERING TEST REPORT

RFSC1 Module
Model No.: RFSC1
FCC ID: ZTL-RFSC1

Applicant:

Monnit Corporation
450 South Simmons Way, Suite 670,
Kaysville, UT 84037
USA

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Digital Modulation Systems (DTS) Operating in 902 – 928 MHz Band

UltraTech's File No.: MONN-005QF15C247

This Test report is Issued under the Authority of Tri M. Luu, BASc Vice President of Engineering UltraTech Group of Labs Date: July 29, 2011	
Report Prepared by: Steven Lu Issued Date: July 29, 2011	Tested by: Mr. Hung Trinh Test Dates: March 30 ~ July 5, 2011

The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.
This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15
Purpose of Test:	Equipment Certification for Digital Modulation Systems (DTS) Transmitter operating in the Frequency Band 902-928 MHz.
Test Procedures:	▪ ANSI C63.4-2003 ▪ FCC, KDB Publication No. 558074
Environmental Classification:	[x] Commercial, industrial or business environment [x] Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2010	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2003 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Ed 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1, +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances
FCC, KDB No. 558074	2005	Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Monnit Corporation
Address:	450 South Simmons Way, Suite 670, Kaysville, UT 84037 USA
Contact Person:	Mr. Kelly S. Lewis Phone #: +1 (801) 561 - 5555 Fax #: +1 (801) 561 - 5575 Email Address: kellyl@monnit.com

MANUFACTURER	
Name:	Monnit Corporation
Address:	450 South Simmons Way, Suite 670, Kaysville, UT 84037 USA
Contact Person:	Mr. Kelly S. Lewis Phone #: +1 (801) 561 - 5555 Fax #: +1 (801) 561 - 5575 Email Address: kellyl@monnit.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Monnit Corporation
Product Name:	RFSC1 Module
Model Name or Number:	RFSC1
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	External Regulated DC Sources
Primary User Functions of EUT:	Wireless Sensors to remotely monitor information and activities

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	• Mobile • Base Station (fixed use)
Intended Operating Environment:	Commercial, industrial or business
Power Supply Requirement:	2.0 – 3.6 VDC
RF Output Power Rating:	+8 dBm MAX
Operating Frequency Range:	902 - 928 MHz
RF Output Impedance:	N/A
Channel Size:	1MHz
Number of Channels:	25
Modulation Type:	2-FSK
Antenna Connector Types:	Soldered Integral Antenna, U.FL
Antenna Description:	Manufacturer: Specialized Manufacturing Type: Wire Antenna Model No.: MC-ANT-20/4.0C Freq. Range: N/A (No published spec.) Gain: N/A (No published spec. Less then than 2.1 dBi)
	Manufacturer: Hyperlink Type: Omnidirectional ½ Wave Model No.: HG905RD-RSP Freq. Range: 900 - 930 MHz Gain: 5.1 dBi

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Sensor Port	0	10-pin 2mm pitch header	Non-shielded

2.5. ANCILLARY EQUIPMENT

None.

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 °C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	2.0 – 3.6 VDC

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	Each of lowest, middle and highest channel frequencies transmits continuously for emissions measurements.
Special Test Software:	Special software and hardware provided by the Applicant to operate the EUT at each channel frequency continuously. For example, the transmitter will be operated at each of the lowest, middle and highest frequencies individually continuously during testing.
Special Hardware Used:	The RF Module tested as stand-alone unit.
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	902 - 928 MHz
Frequency(ies) Tested: (Near lowest, near middle & near highest frequencies in the frequency range of operation.)	903, 915 and 927 MHz
RF Power Output: (measured maximum output power at antenna terminals)	7.99 dBm (6.3 mW) Peak
Normal Test Modulation:	2 - FSK
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2014-04-04.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes*
15.207(a)	Power Line Conducted Emissions	Yes
15.247(a)(2)	6 dB Bandwidth	Yes
15.247(b)(3)	Peak Conducted Output Power - DTS	Yes
15.247(d)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	Yes
15.247(i) 1.1307, 1.1310 & 2.1091	RF Exposure	Yes

* The EUT complies with the requirement; it employs a permanently mounted integral antenna.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4-2003 and FCC KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems.

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.
Refer to Exhibit 7 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUACTURER

The RFSC1 Module is a Sensor Platform for WIT Wireless Sensors.

5.5. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.5.1. Limit(s)

The equipment shall meet the limits of the following table:

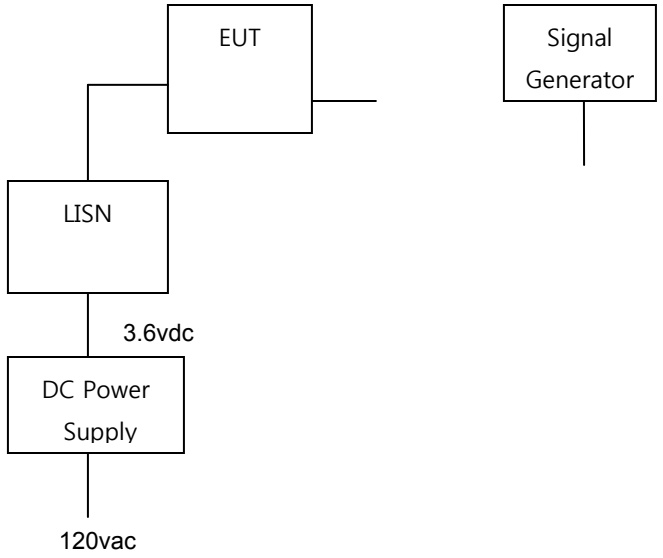
Frequency of emission (MHz)	Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5 .....……..	66 to 56*	56 to 46*
0.5–5 .....……..	56	46
5-30 ……..	60 ..……..	50

*Decreases linearly with the logarithm of the frequency

5.5.2. Method of Measurements

ANSI C63.4-2003

5.5.3. Test Arrangement

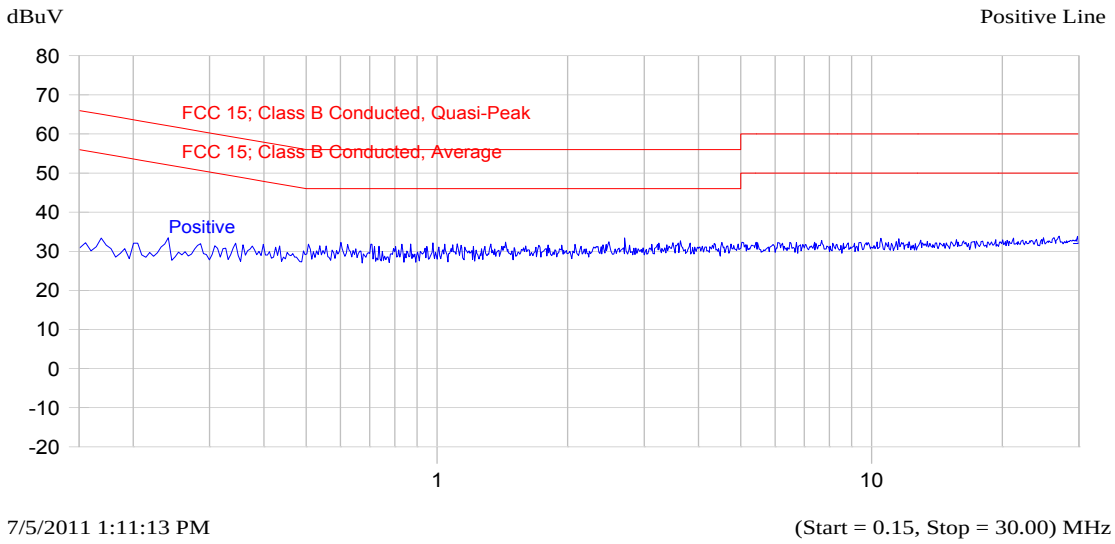


TX Mode do not have signal generator

5.5.4. Test Data

Plot 5.5.4.1. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 3.6 VDC
Line Tested: Positive

Current Graph

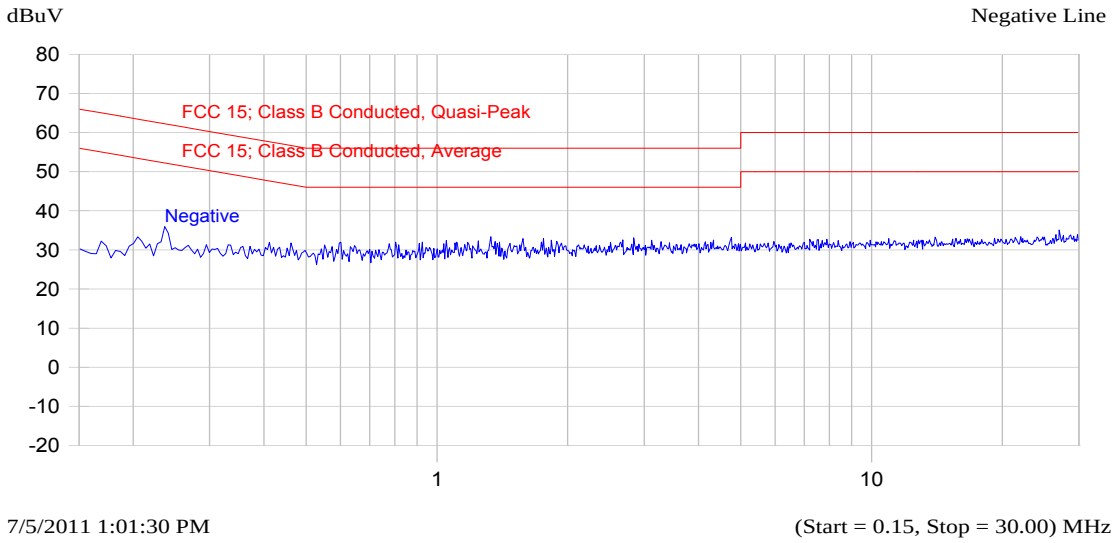


Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta Qp-Qp Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.232	29.9	27.0	-36.6	25.7	-27.9	Positive

Plot 5.5.4.2. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 3.6 VDC
Line Tested: Negative

Current Graph

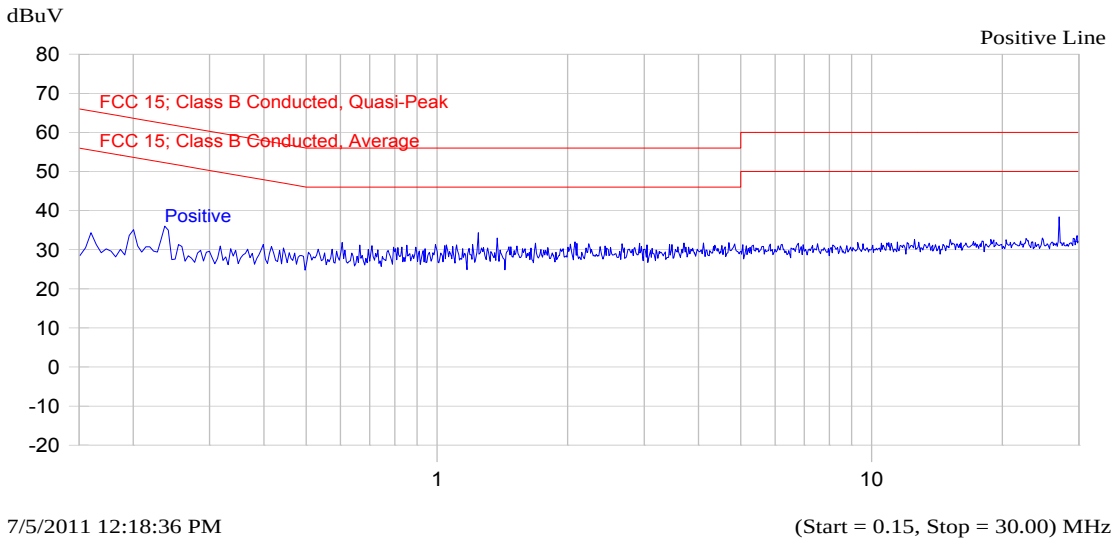


Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta Qp-Qp Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.232	33.2	31.4	-32.2	30.6	-23.0	Negative

Plot 5.5.4.3. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 3.6 VDC
Line Tested: Positive

Current Graph

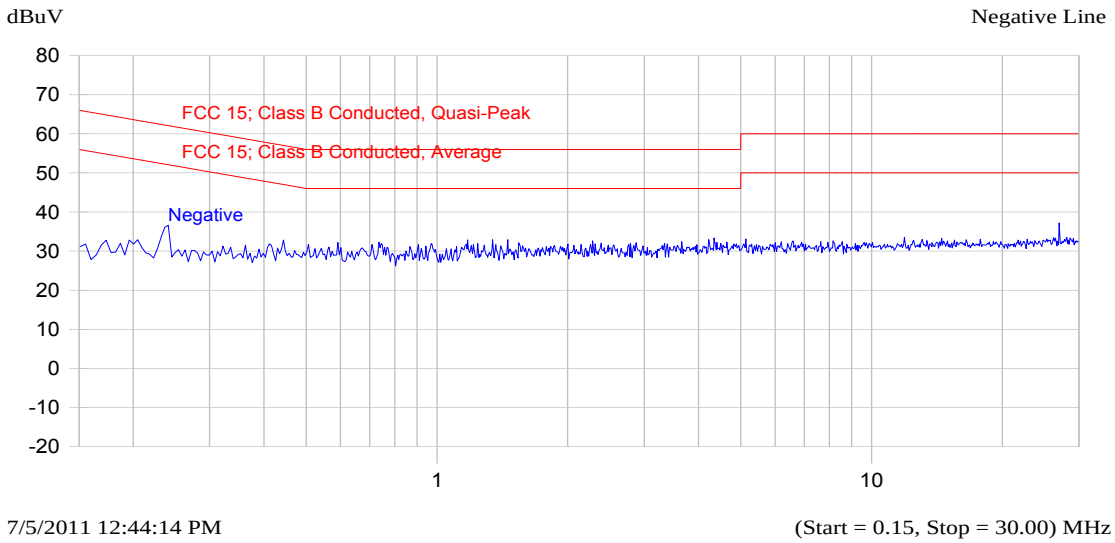


Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta Qp-Qp Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.174	25.4	19.8	-45.5	15.0	-40.3	Positive
0.230	31.1	28.4	-35.2	27.3	-26.4	Positive
1.238	31.7	28.6	-27.4	27.3	-18.7	Positive
27.000	36.9	35.8	-24.2	35.6	-14.4	Positive

Plot 5.5.4.4. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 3.6 VDC
Line Tested: Negative

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta Qp-Qp Limit dB	Avg dBuV	Delta Avg-Avg Limit dB	Trace Name
0.234	34.4	32.6	-31.0	31.8	-21.7	Negative
26.999	35.5	34.4	-25.6	34.1	-15.9	Negative

5.6. OCCUPIED BANDWIDTH [§ 15.247(a)(2)]

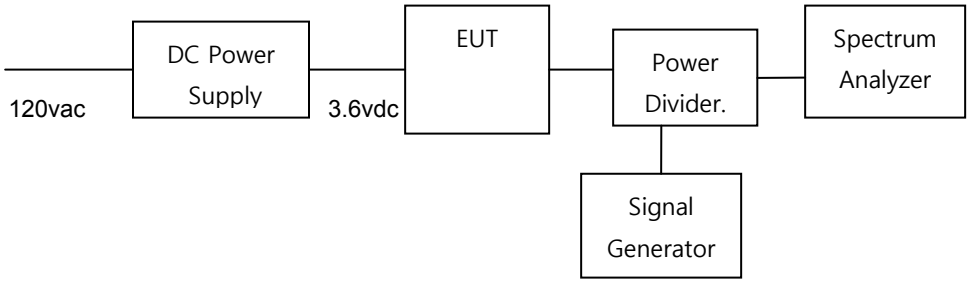
5.6.1. Limit(s)

For a Digital Modulation System, the minimum 6 dB bandwidth shall be at least 500 KHz.

5.6.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247) and ANSI C63.4-2003.

5.6.3. Test Arrangement

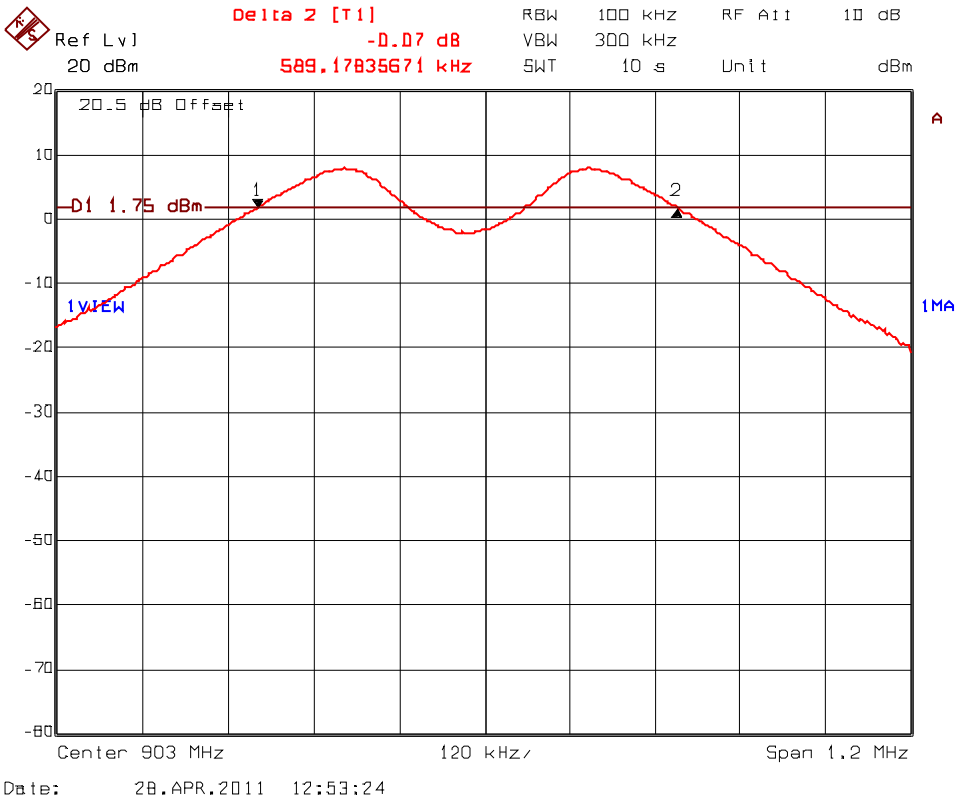


5.6.4. Test Data

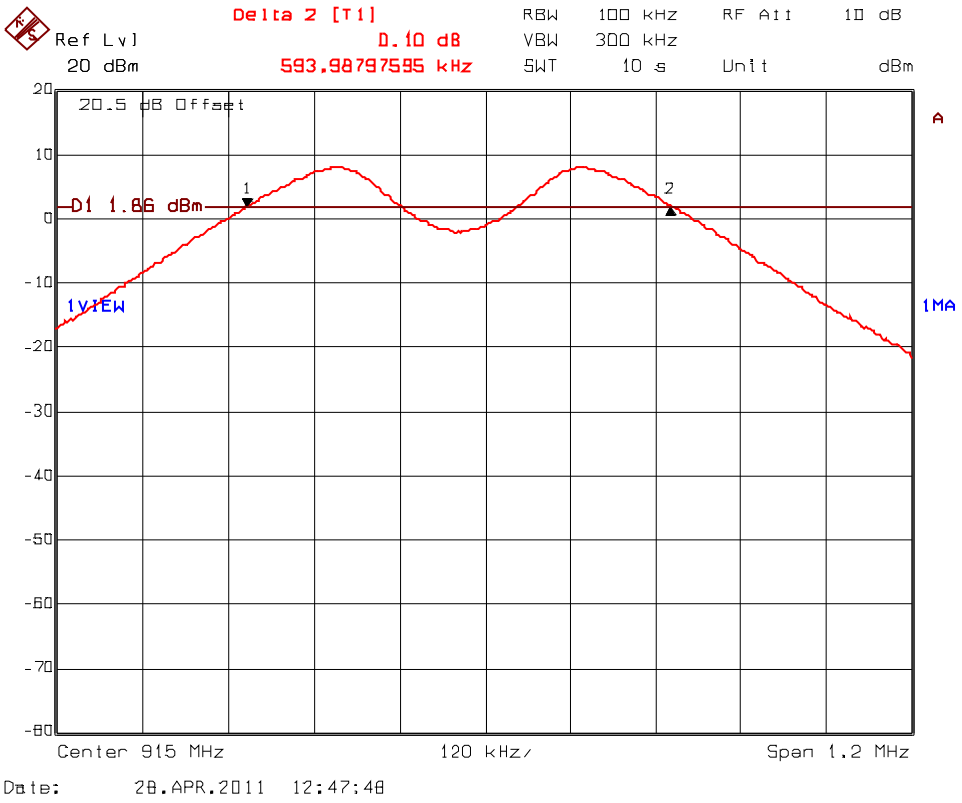
Frequency (MHz)	Modulation	6 dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
903	2-FSK	0.589	0.522
915	2-FSK	0.594	0.524
927	2-FSK	0.592	0.522

See the following plots for detailed measurements.

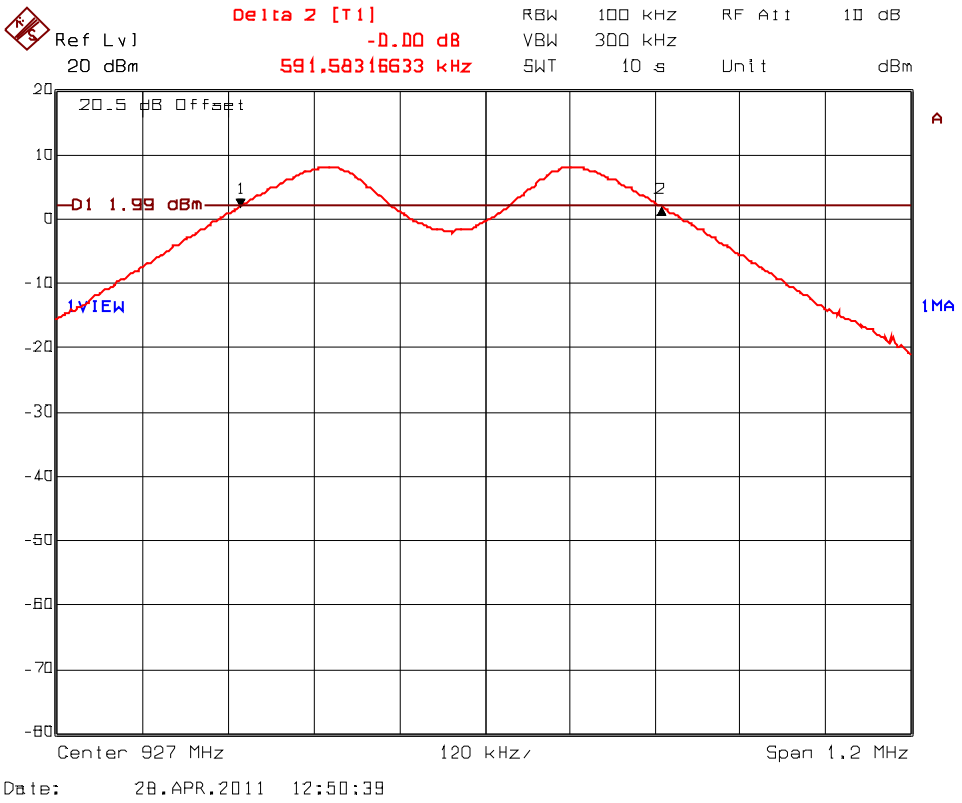
Plot 5.6.4.1. 6 dB Bandwidth, 2-FSK
Test Frequency: 903 MHz



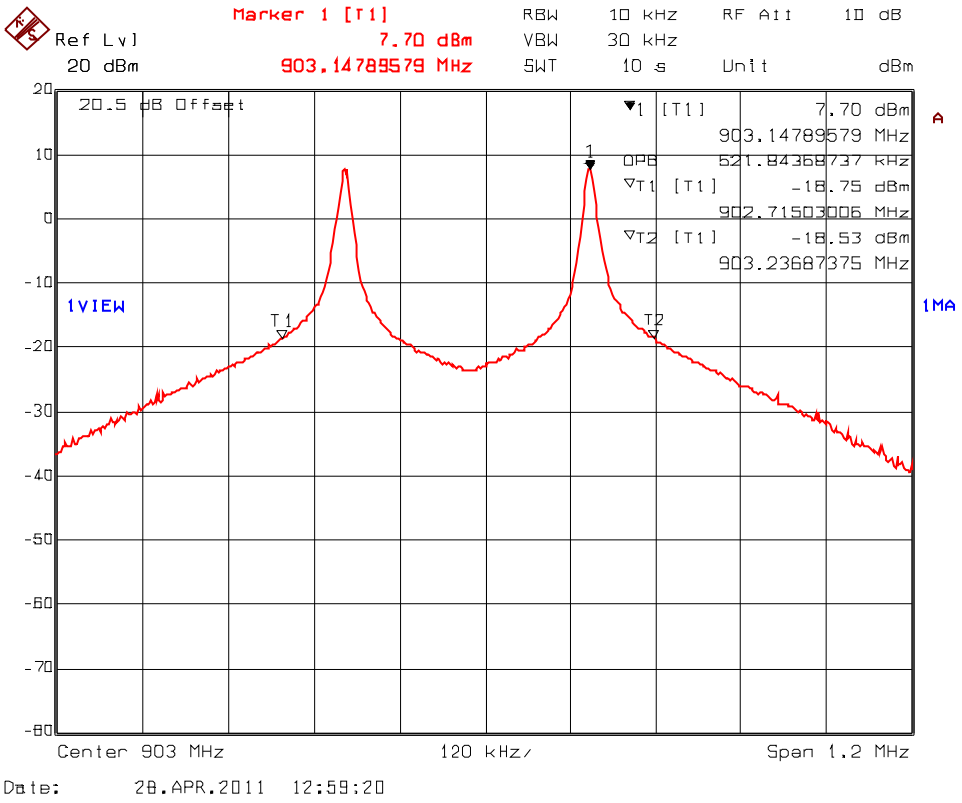
Plot 5.6.4.2. 6 dB Bandwidth, 2-FSK modulation
Test Frequency: 915 MHz



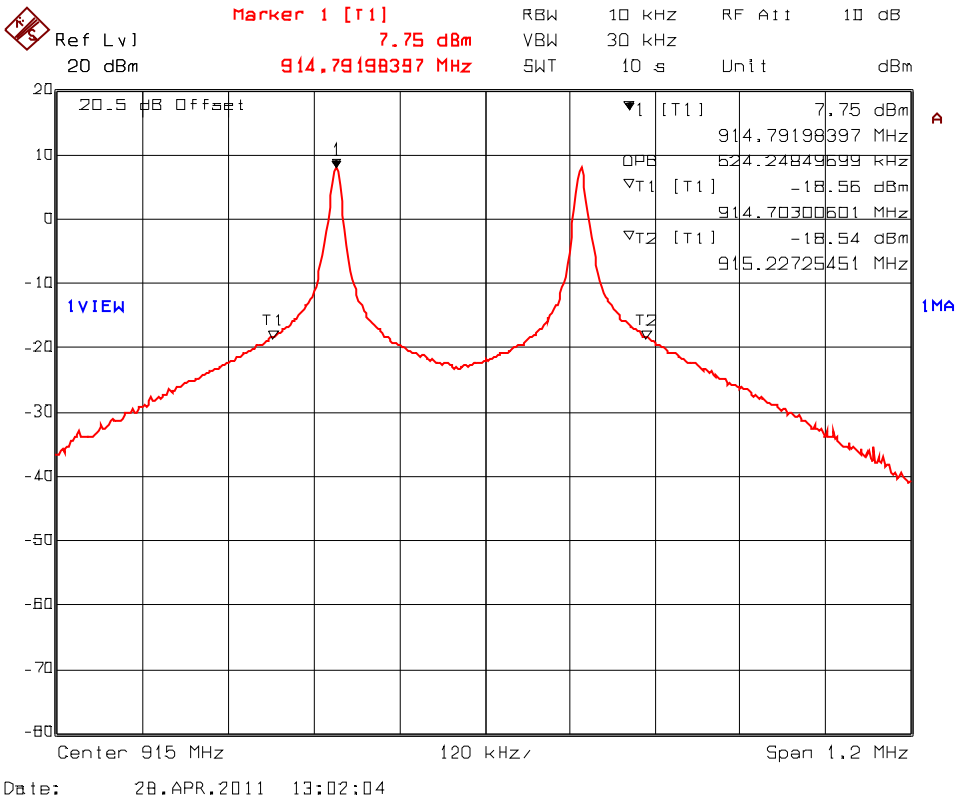
Plot 5.6.4.3. 6 dB Bandwidth, 2-FSK modulation
Test Frequency: 927 MHz



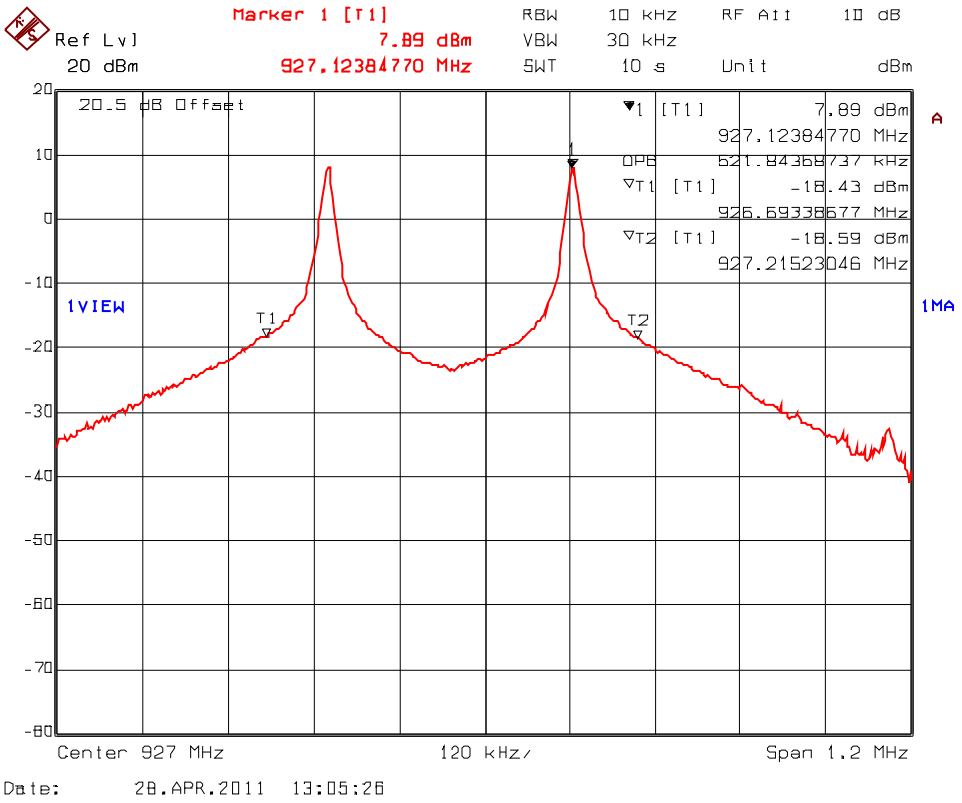
Plot 5.6.4.4. 99% Occupied Bandwidth, 2-FSK modulation
Test Frequency: 903 MHz



Plot 5.6.4.5. 99% Occupied Bandwidth, 2-FSK modulation
Test Frequency: 915 MHz



Plot 5.6.4.6. 99% Occupied Bandwidth, 2-FSK modulation
Test Frequency: 927 MHz



5.7. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]

5.7.1. Limit(s)

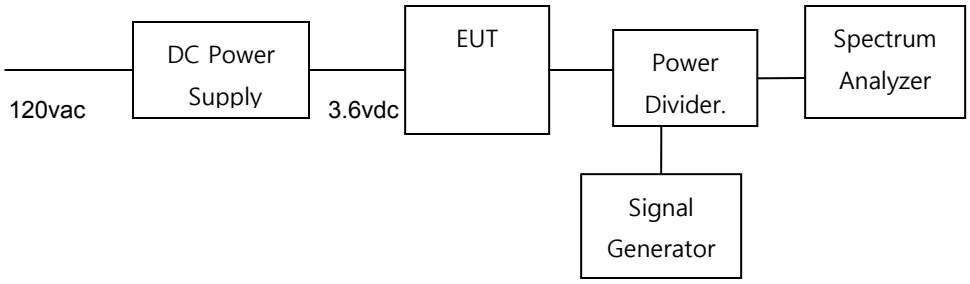
§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.7.2. Method of Measurements & Test Arrangement

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247).

5.7.3. Test Arrangement



5.7.4. Test Data

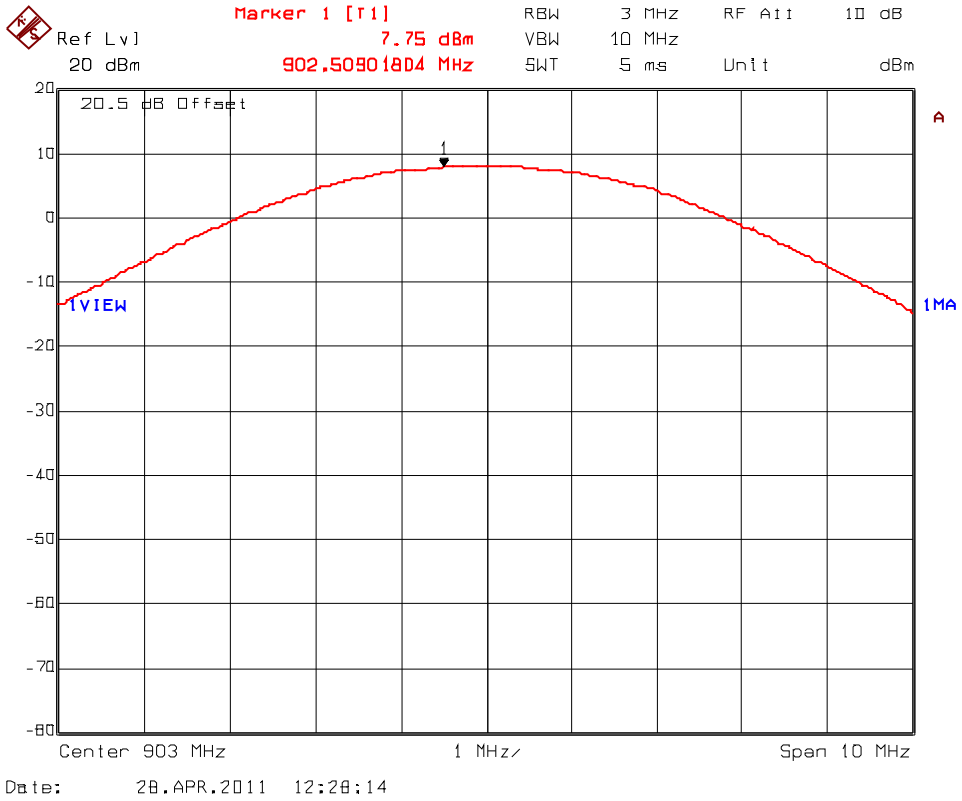
Remark(s):
Test method used: Power output option 1, peak measurement.

Frequency (MHz)	Modulation	Peak Conducted Power (dBm)	Peak EIRP(Note 1, 2, 3) (dBm)	Peak Conducted Power Limit (dBm)	EIRP Limit (dBm)
903	2-FSK	7.75	12.38	30	36
915	2-FSK	7.89	12.52	30	36
927	2-FSK	7.99	12.62	30	36

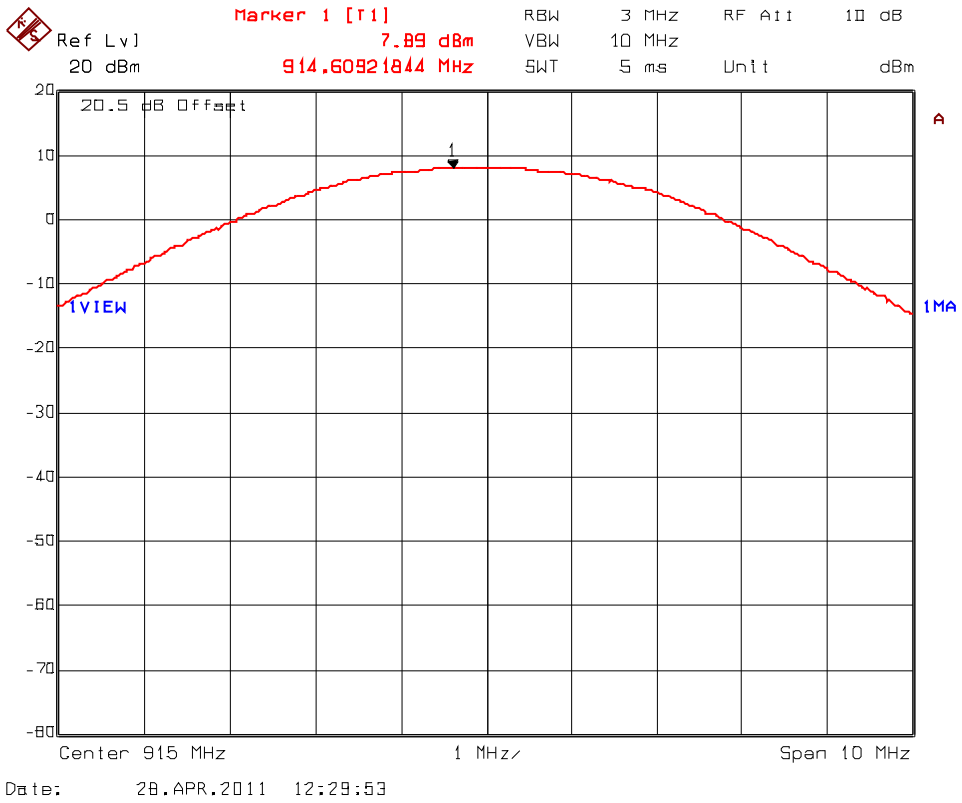
Note 1: The Peak EIRP is calculated as the sum of Peak Conducted Power in dBm and antenna assembly gain of EUT in dBi (antenna gain – cable loss).
Note 2: The maximum assembly antenna gain: 4.63 dBi
Note 3: EUT is connected to antenna with an (4" RPSMA to U-FL) antenna cable, a loss of 0.37dB.

See the following plots for details.

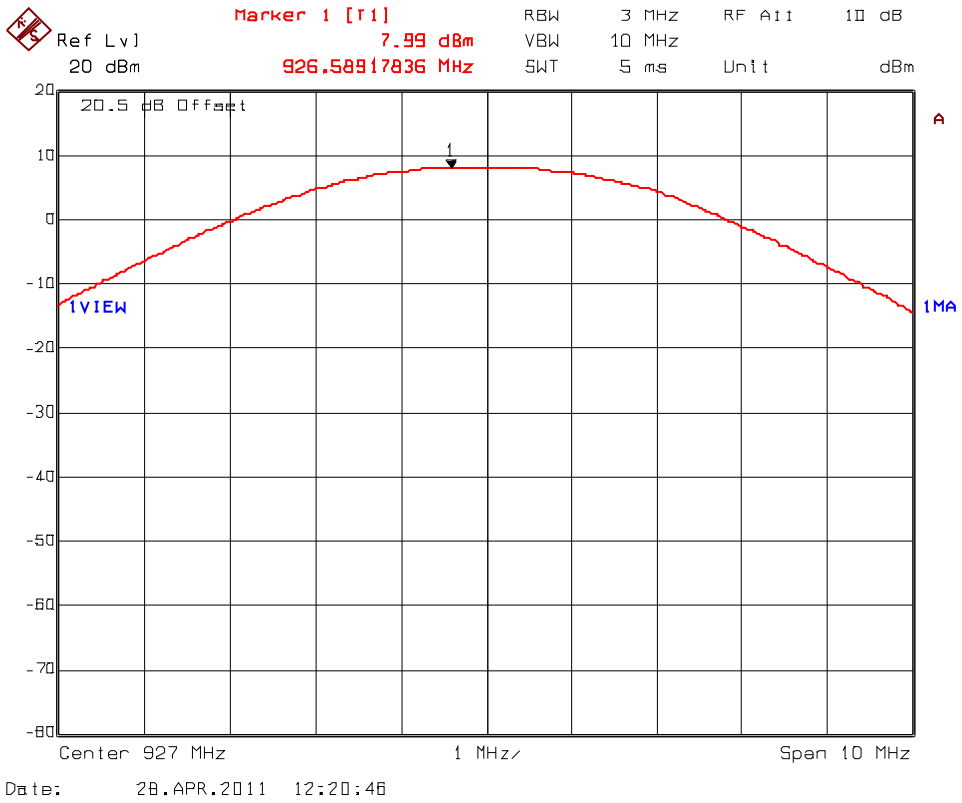
Plot 5.7.4.1. Peak Conducted Output Power
Frequency: 903 MHz MHz; Input Voltage: 3.6 VDC



Plot 5.7.4.2. Peak Conducted Output Power
Frequency: 915 MHz MHz; Input Voltage: 3.6 VDC



Plot 5.7.4.3. Peak Conducted Output Power
Frequency: 927 MHz MHz; Input Voltage: 3.6 VDC



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

5.8. TRANSMITTER BAND-EDGE & SPURIOUS CONDUCTED EMISSIONS [§ 15.247(d)]

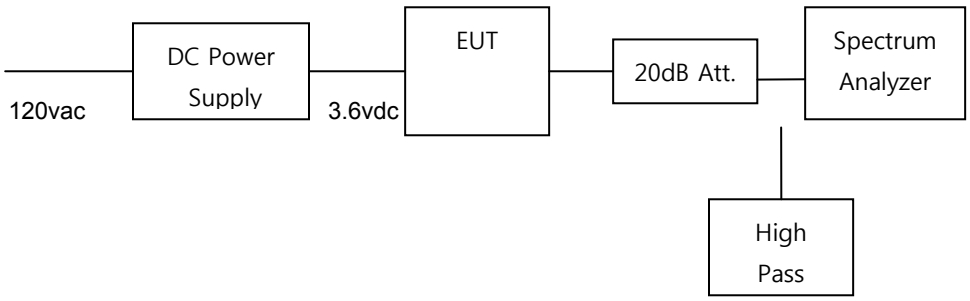
5.8.1. Limit(s)

§ 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 a radiated 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, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.8.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247).

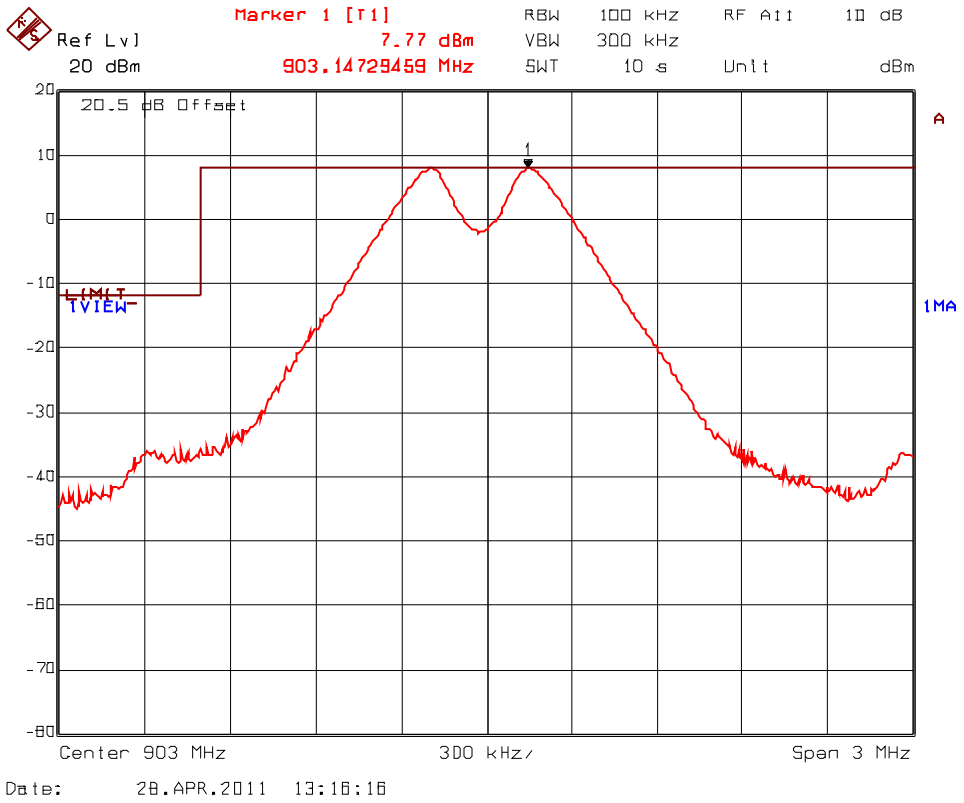
5.8.3. Test Arrangement



5.8.4. Test Data

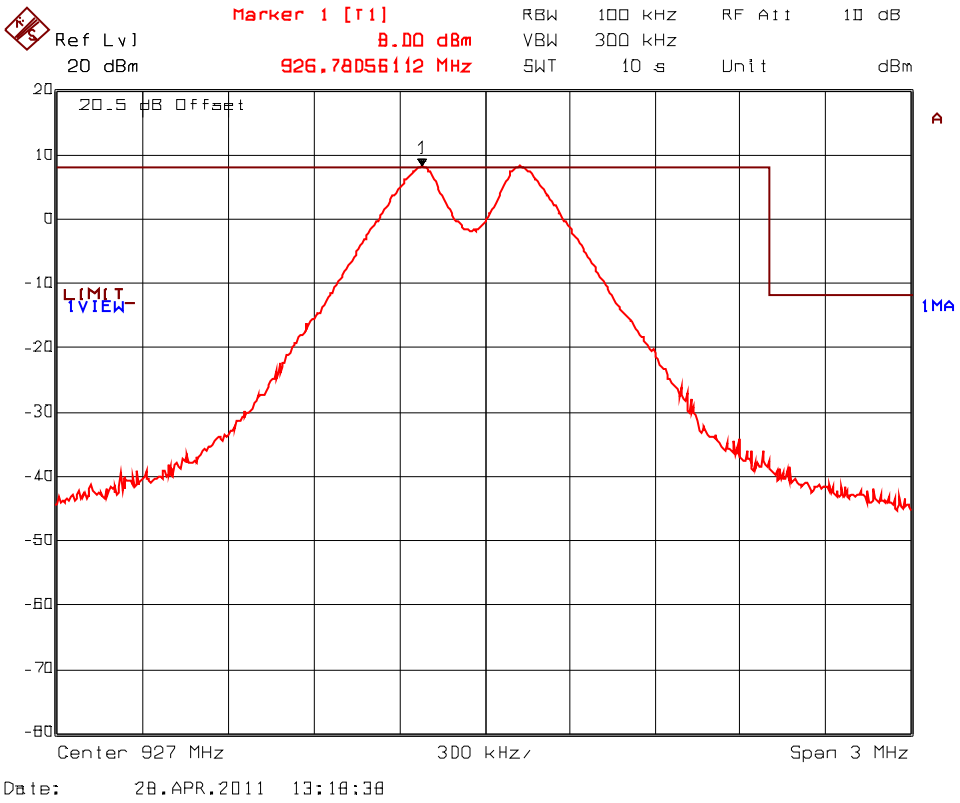
5.8.4.1. Band-Edge RF Conducted Emissions

Plot 5.8.4.1.1. Band-Edge RF Conducted Emissions, 2-FSK modulation
Low End of Frequency Band (903 MHz)



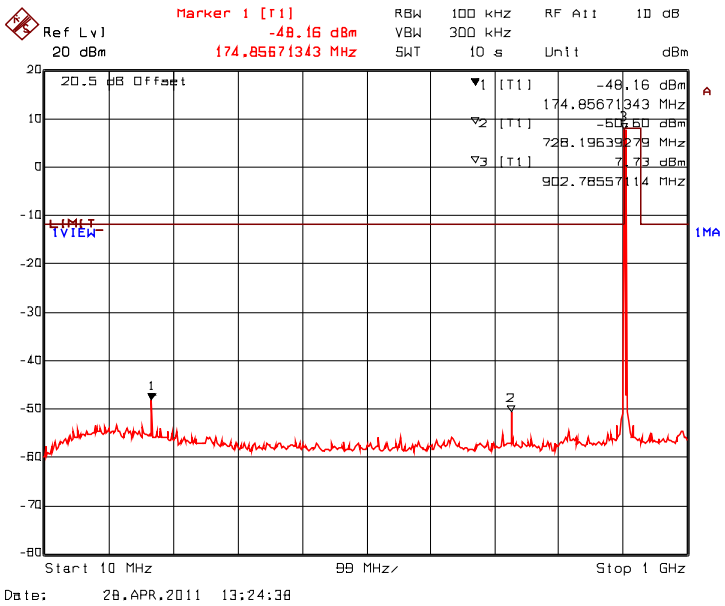
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.8.4.1.2. Band-Edge RF Conducted Emissions, 2-FSK modulation
High End of Frequency Band (927 MHz)

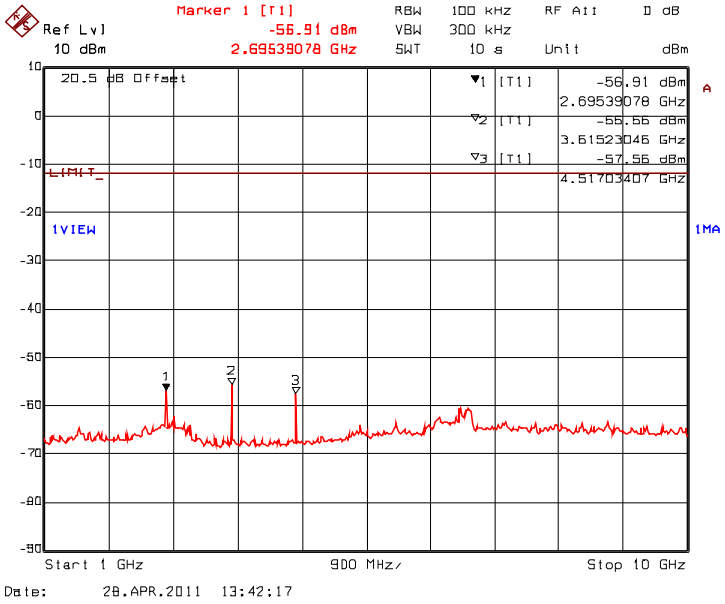


5.8.4.2. Spurious RF Conducted Emissions

Plot 5.8.4.2.1. Spurious RF Conducted Emissions, 2-FSK modulation, 10MHz - 1 GHz
Transmitter Frequency: 903 MHz

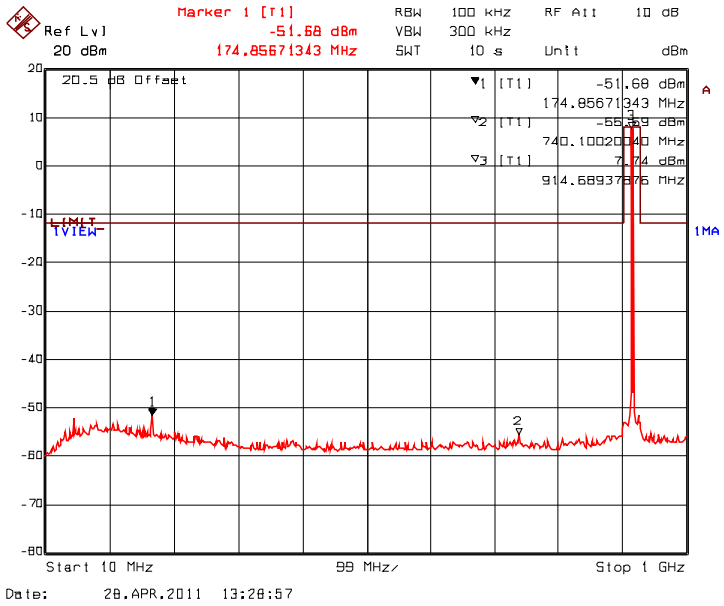


Plot 5.8.4.2.2. Spurious RF Conducted Emissions, 2-FSK modulation, 1GHz - 10 GHz
Transmitter Frequency: 903 MHz

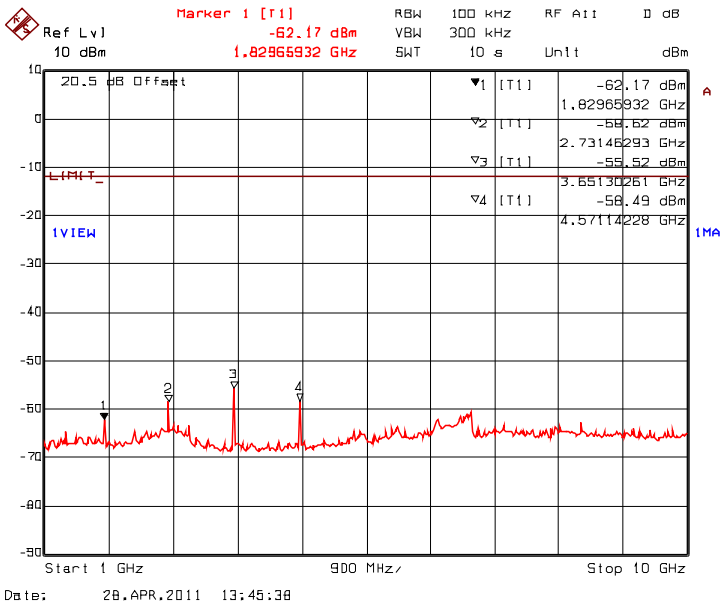


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

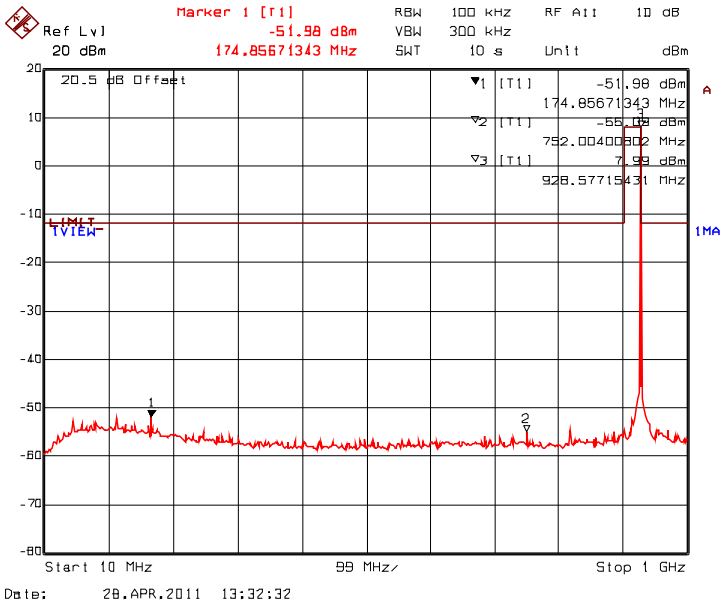
Plot 5.8.4.2.3. Spurious RF Conducted Emissions, 2-FSK modulation, 10MHz - 1 GHz
Transmitter Frequency: 915 MHz



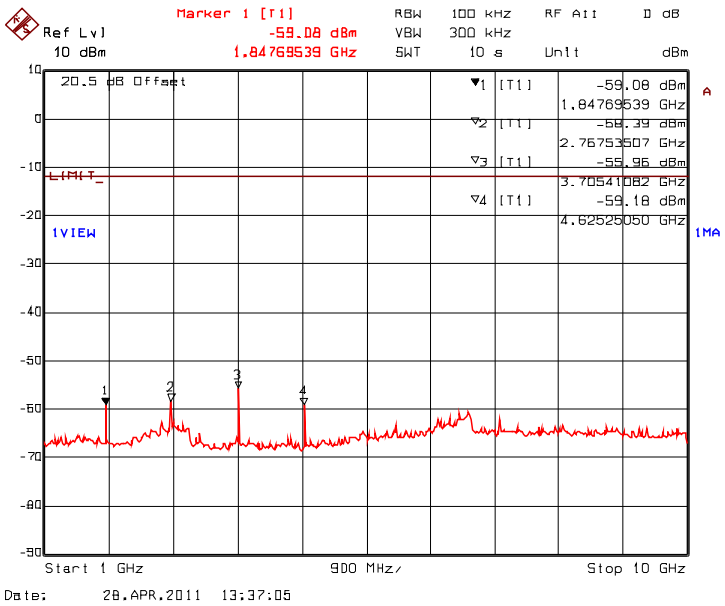
Plot 5.8.4.2.4. Spurious RF Conducted Emissions, 2-FSK modulation, 1GHz - 10 GHz
Transmitter Frequency: 915 MHz



Plot 5.8.4.2.5. Spurious RF Conducted Emissions, 2-FSK modulation, 10MHz - 1 GHz
Transmitter Frequency: 927 MHz



Plot 5.8.4.2.6. Spurious RF Conducted Emissions, 2-FSK modulation, 1GHz - 10 GHz
Transmitter Frequency: 927 MHz



5.9. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.9.1. Limit(s)

§ 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 a radiated 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, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. 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)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	([2])
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

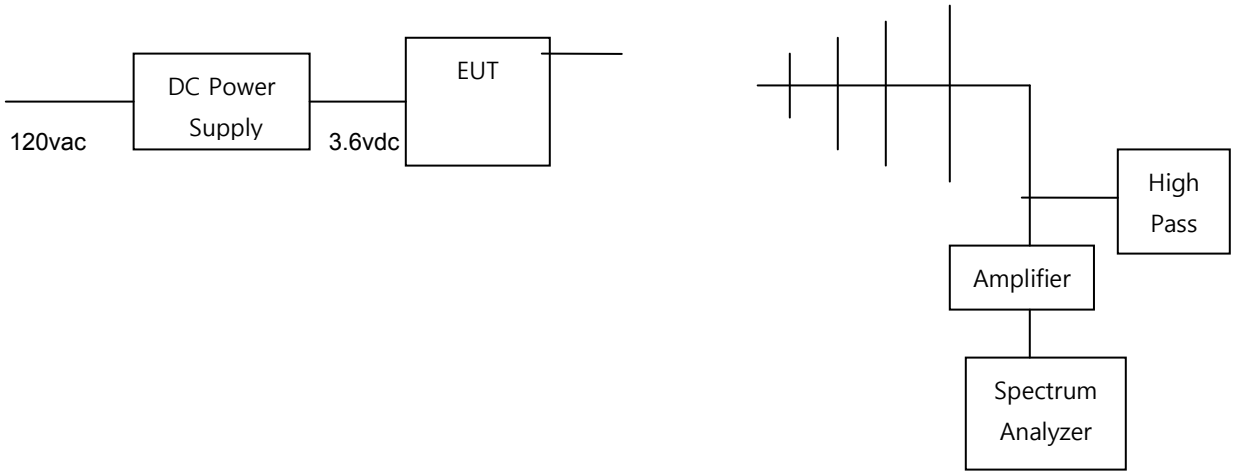
Section 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.9.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247) and ANSI C63.4-2003.

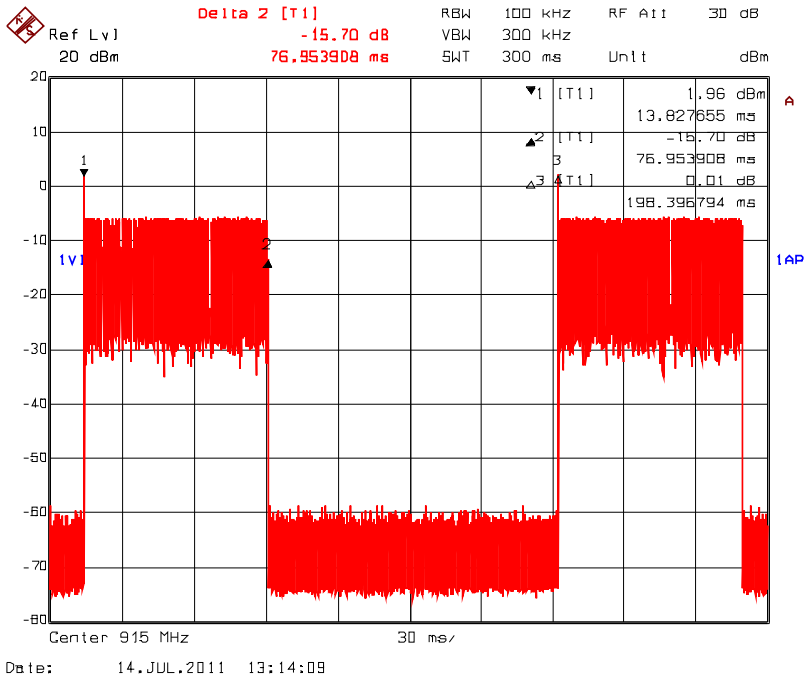
5.9.3. Test Arrangement

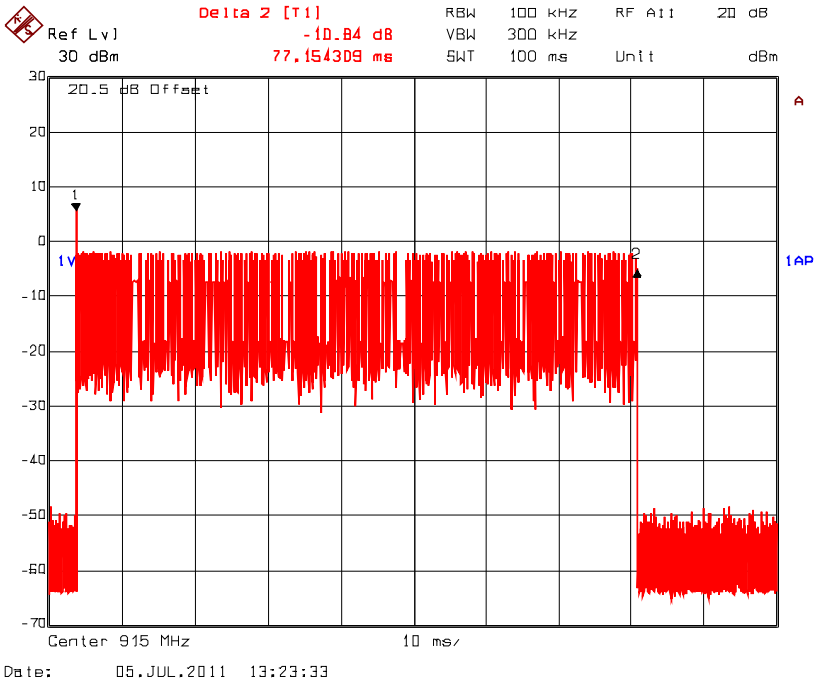


5.9.4. Test Data

Remarks:

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- The RF Average level above 1GHz is corrected by the duty cycle factor (-2.25dB) shown below:


Delta 2 [T1]
-15.70 dB
76.953908 ms
RBW 100 kHz
VBW 300 kHz
SWT 300 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1 [T1] 1.96 dBm
13.827655 ms
2 [T1] -15.70 dB
76.953908 ms
3 [T1] 0.01 dB
198.396794 ms
1VI
1AP
Center 915 MHz
30 ms/
Date: 14.JUL.2011 13:14:09


Delta 2 [T1]
-10.84 dB
77.154309 ms
RBW 100 kHz
VBW 300 kHz
SWT 100 ms
RF Att 20 dB
Unit dBm
Ref Lvl
30 dBm
20.5 dB Offset
1VI
1AP
Center 915 MHz
10 ms/
Date: 05.JUL.2011 13:23:33

5.9.4.1. EUT with Wire Antenna

Fundamental Frequency:	903 MHz						
Test Frequency Range:	30 MHz – 10 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit Table 5 (dBµV/m)**	**Limit Section A8.5 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
903	106.66	--	V	--	--	--	--
903	108.21	--	H	--	--	--	--
2709	58.31	52.00	V	54.0	88.2	-2.00	Pass*
2709	57.37	50.79	H	54.0	88.2	-3.21	Pass*
3612	60.83	51.45	V	54.0	88.2	-2.55	Pass*
3612	59.99	51.18	H	54.0	88.2	-2.82	Pass*
4515	60.49	48.51	V	54.0	88.2	-5.49	Pass*
4515	60.05	48.70	H	54.0	88.2	-5.30	Pass*
5418	56.68	42.33	V	54.0	88.2	-11.67	Pass*
5418	51.44	36.61	H	54.0	88.2	-17.39	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	915 MHz						
Test Frequency Range:	30 MHz – 10 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit Table 5 (dBµV/m)**	**Limit Section A8.5 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
915	106.87	--	V	--	--	--	--
915	105.79	--	H	--	--	--	--
2745	57.75	50.83	V	54.0	86.9	-3.17	Pass*
2745	59.68	53.14	H	54.0	86.9	-0.86	Pass*
3660	60.51	51.22	V	54.0	86.9	-2.78	Pass*
3660	61.40	52.09	H	54.0	86.9	-1.91	Pass*
4575	63.71	52.57	V	54.0	86.9	-1.43	Pass*
4575	60.22	48.50	H	54.0	86.9	-5.50	Pass*

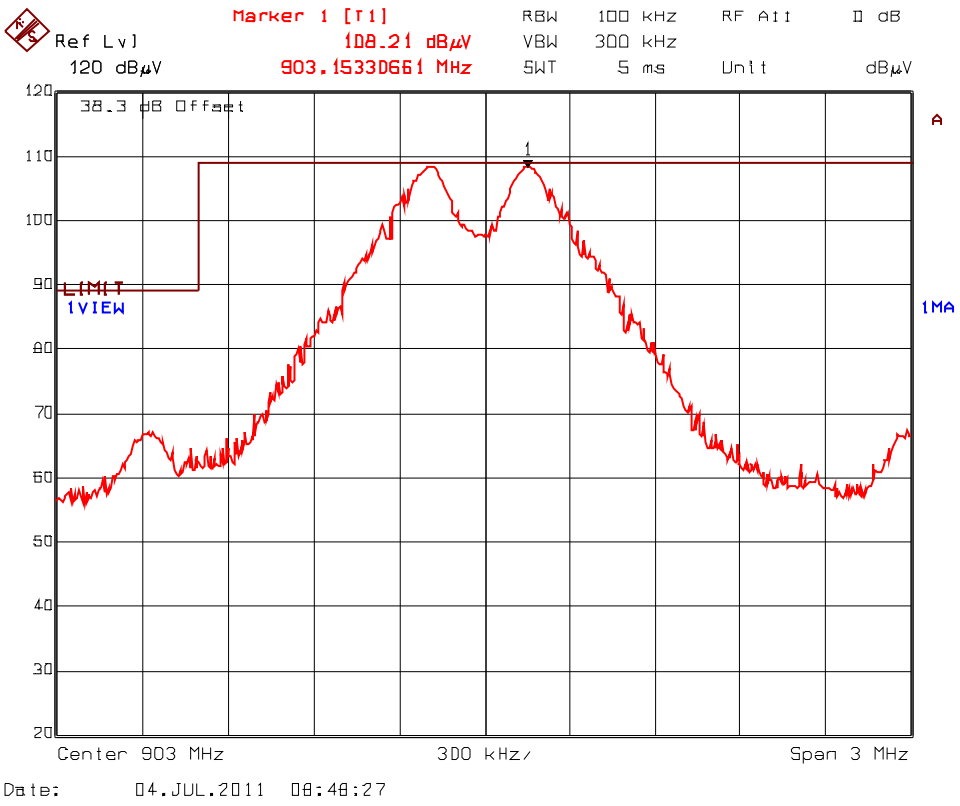
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:	927 MHz						
Test Frequency Range:	30 MHz – 10 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit Table 5 (dBµV/m)**	**Limit Section A8.5 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
927	107.46	--	V	--	--	--	--
927	108.72	--	H	--	--	--	--
2781	57.30	40.92	V	54.0	88.7	-13.08	Pass*
2781	58.39	52.06	H	54.0	88.7	-1.94	Pass*
3708	61.76	53.13	V	54.0	88.7	-0.87	Pass*
3708	60.46	51.07	H	54.0	88.7	-2.93	Pass*
4635	61.32	49.19	V	54.0	88.7	-4.81	Pass*
4635	58.58	44.35	H	54.0	88.7	-9.65	Pass*
7416	53.05	37.86	V	54.0	88.7	-16.14	Pass*
7416	52.87	37.29	H	54.0	88.7	-16.71	Pass*

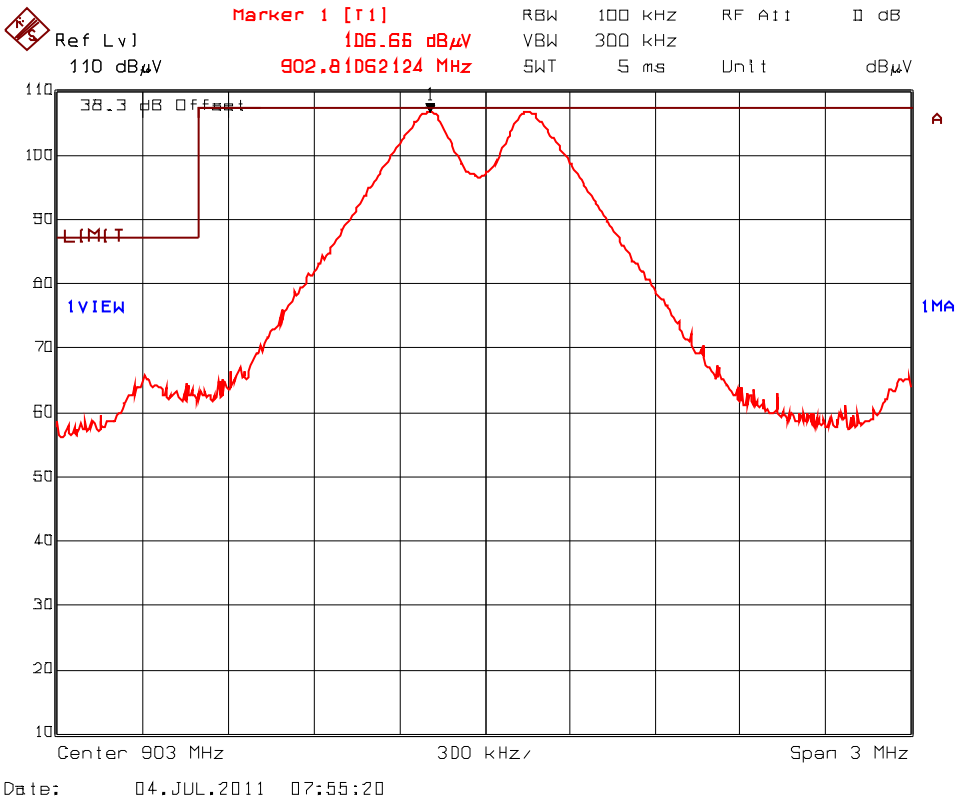
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

See the following test data plots for band-edge emissions.

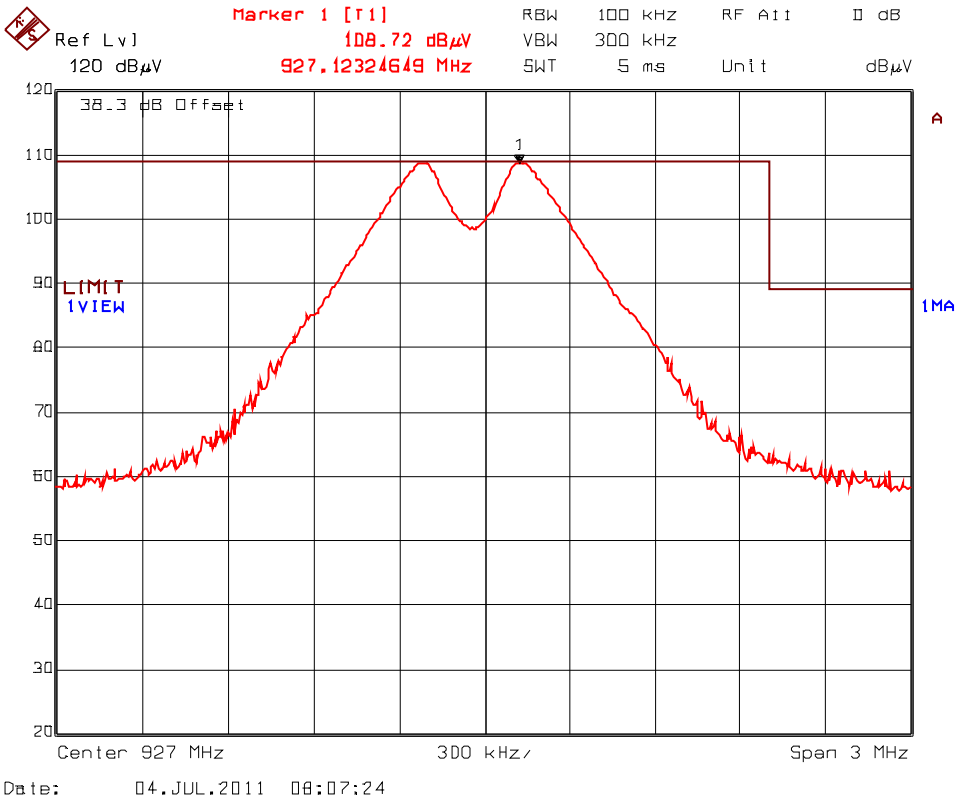
Plot 5.9.4.1.1. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Wire Antenna
Low End of Frequency Band (903 MHz)
Rx Antenna Orientation: Horizontal



Plot 5.9.4.1.2. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Wire Antenna
Low End of Frequency Band, 903 MHz
Rx Antenna Orientation: Vertical

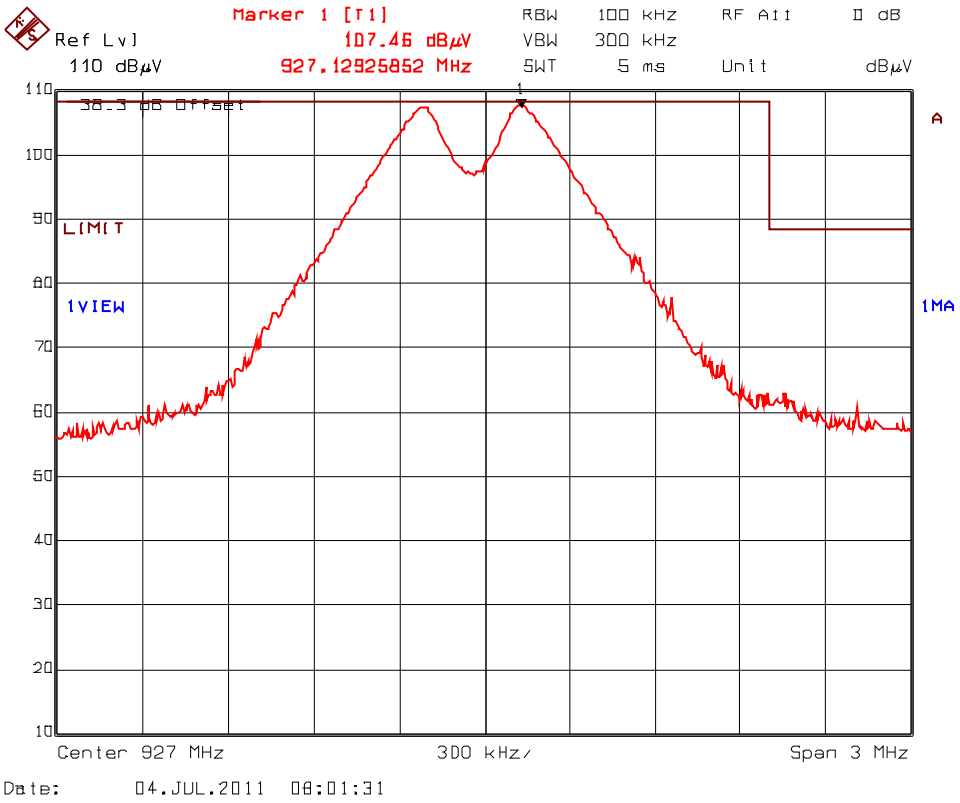


Plot 5.9.4.1.3. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Wire Antenna
High End of Frequency Band (927 MHz)
Rx Antenna Orientation: Horizontal



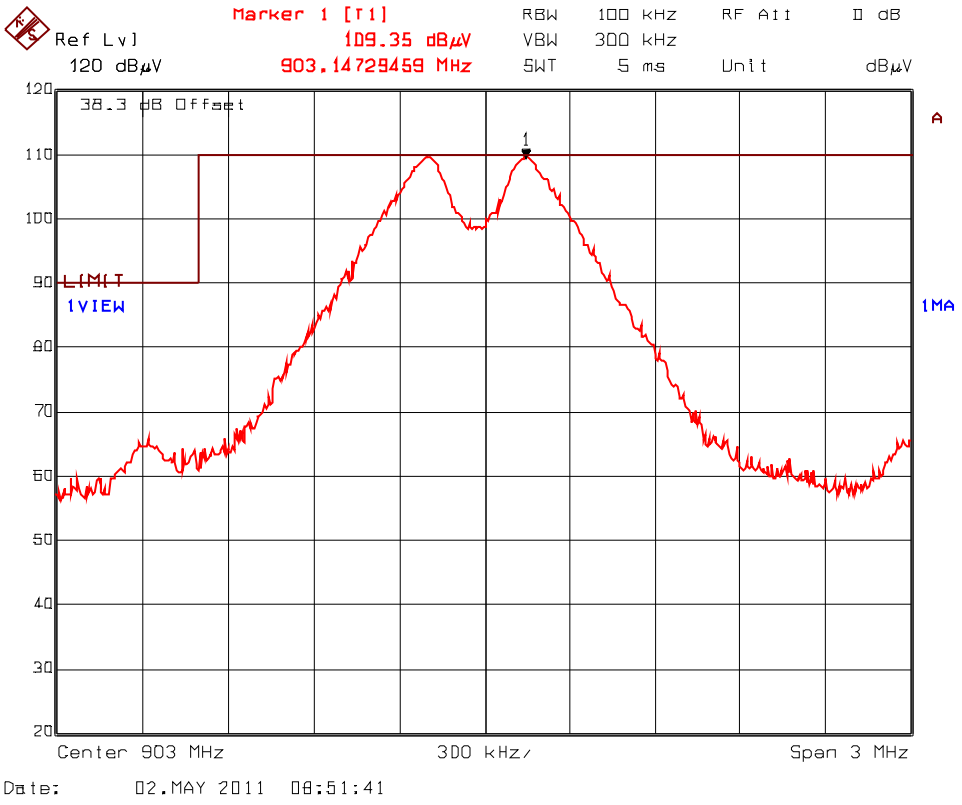
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.9.4.1.4. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Wire Antenna
High End of Frequency Band (927 MHz)
Rx Antenna Orientation: Vertical

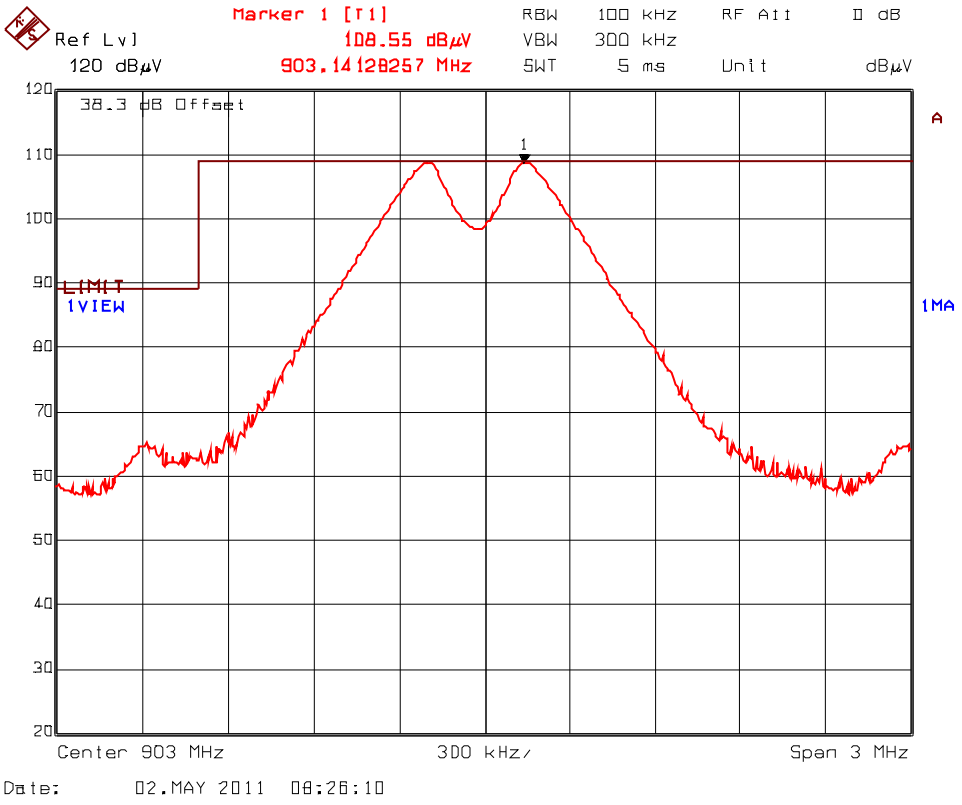


All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.9.4.1.5. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Rubber Ducky Antenna
Low End of Frequency Band (903 MHz)
Rx Antenna Orientation: Horizontal



Plot 5.9.4.1.6. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Rubber Ducky Antenna
Low End of Frequency Band, 903 MHz
Rx Antenna Orientation: Vertical



5.9.4.2. EUT with Rubber Ducky Antenna

Fundamental Frequency: 903 MHz
Test Frequency Range: 30 MHz – 10 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit Table 5 (dBµV/m)	Limit Section A8.5 (dBµV/m)	Margin (dB)	Pass/ Fail
903	108.55	--	V	--	--	--	--
903	109.35	--	H	--	--	--	--
2709	56.75	49.30	V	54.0	89.4	-4.70	Pass*
2709	54.45	45.57	H	54.0	89.4	-8.43	Pass*
3612	60.94	52.54	V	54.0	89.4	-1.46	Pass*
3612	61.73	53.32	H	54.0	89.4	-0.68	Pass*
4515	63.83	53.35	V	54.0	89.4	-0.65	Pass*
4515	63.29	52.95	H	54.0	89.4	-1.05	Pass*
5418	54.17	41.07	V	54.0	89.4	-12.93	Pass*
5418	51.55	37.60	H	54.0	89.4	-16.40	Pass*

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in RSS-Gen, Table 5.

Fundamental Frequency: 915 MHz
Test Frequency Range: 30 MHz – 10 GHz

Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit Table 5 (dBµV/m)	Limit Section A8.5 (dBµV/m)	Margin (dB)	Pass/ Fail
915	106.96	--	V	--	--	--	--
915	108.73	--	H	--	--	--	--
2745	59.19	52.75	V	54.0	88.7	-1.25	Pass*
2745	52.35	43.28	H	54.0	88.7	-10.72	Pass*
3660	59.77	50.09	V	54.0	88.7	-3.91	Pass*
3660	61.55	52.69	H	54.0	88.7	-1.31	Pass*
4575	62.27	51.03	V	54.0	88.7	-2.97	Pass*
4575	61.19	49.28	H	54.0	88.7	-4.72	Pass*

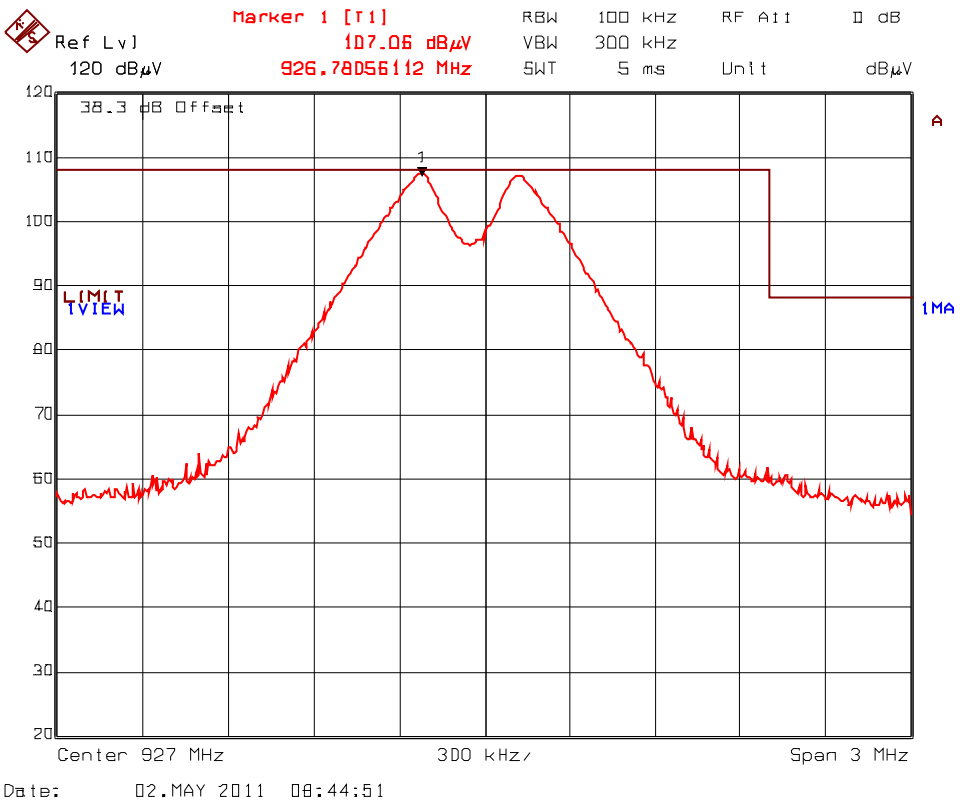
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in RSS-Gen, Table 5.

Fundamental Frequency:	927 MHz						
Test Frequency Range:	30 MHz – 10 GHz						
Frequency (MHz)	**RF Peak Level (dBµV/m)**	**RF Avg Level (dBµV/m)**	**Antenna Plane (H/V)**	**Limit Table 5 (dBµV/m)**	**Limit Section A8.5 (dBµV/m)**	**Margin (dB)**	**Pass/ Fail**
927	107.60	--	V	--	--	--	--
927	107.06	--	H	--	--	--	--
2781	54.07	47.50	V	54.0	87.6	-6.50	Pass*
2781	50.76	42.66	H	54.0	87.6	-11.34	Pass*
3708	61.00	52.39	V	54.0	87.6	-1.61	Pass*
3708	61.92	53.49	H	54.0	87.6	-0.51	Pass*
4635	59.60	48.41	V	54.0	87.6	-5.59	Pass*
4635	62.37	51.66	H	54.0	87.6	-2.34	Pass*

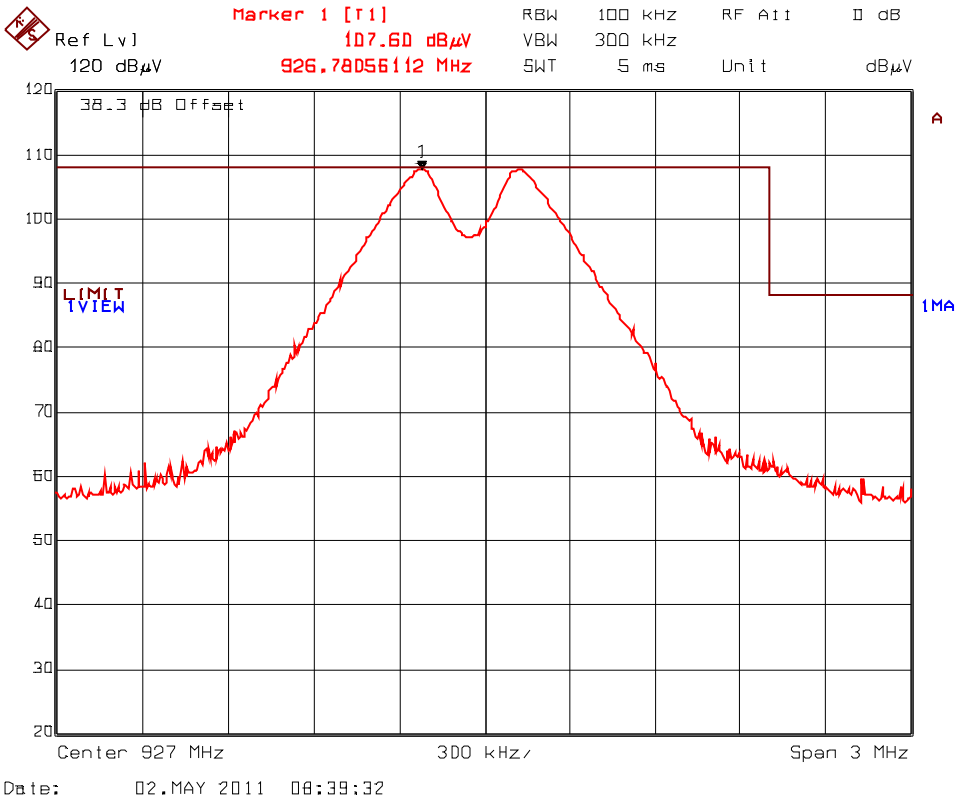
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in RSS-Gen, Table 5.

See the following test data plots for band-edge emissions.

Plot 5.9.4.2.1. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Rubber Ducky Antenna
High End of Frequency Band (927 MHz)
Rx Antenna Orientation: Horizontal



Plot 5.9.4.2.2. Band-Edge RF Radiated Emissions @ 3 m, 2-FSK modulation, Rubber Ducky Antenna
High End of Frequency Band (927 MHz)
Rx Antenna Orientation: Vertical



5.10. POWER SPECTRAL DENSITY [§ 15.247(e)]

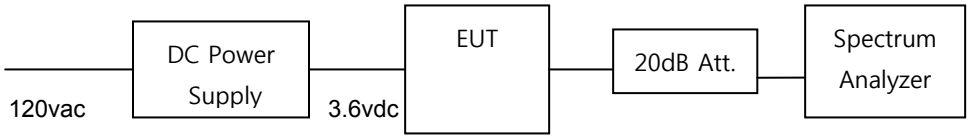
5.10.1. Limit(s)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

5.10.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247).

5.10.3. Test Arrangement



5.10.4. Test Data

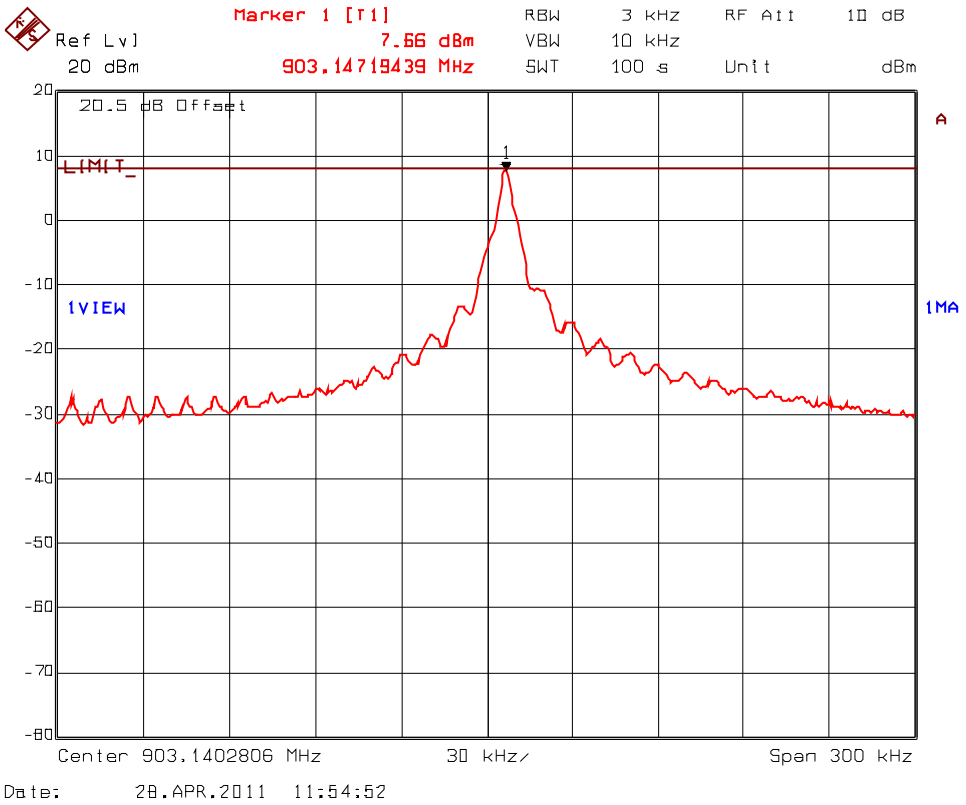
Remarks:

- Measurement method: Power spectral density (PSD) Option 1.
- Investigation of all combinations of modulations and data rates were carried out to determine the worst-case operation and the highest level is recorded in the following table.

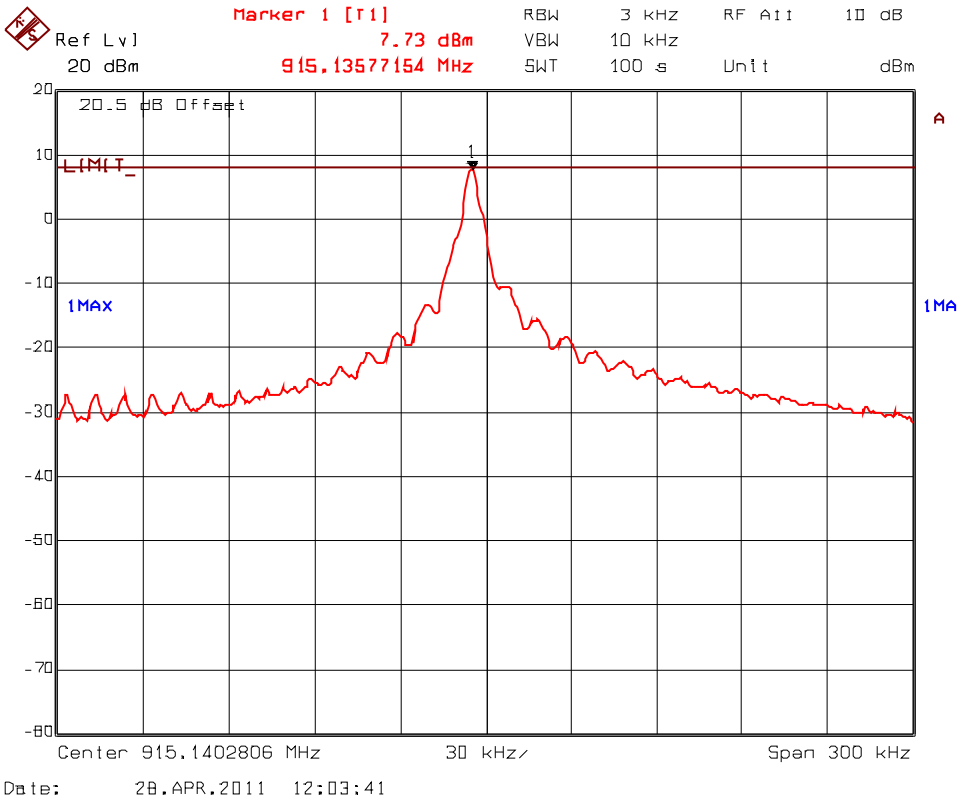
Frequency (MHz)	Modulation	*PSD in 3 kHz BW (dBm)	Limit (dBm)	Margin (dB)
903	2-FSK	7.66	8	-0.34
915	2-FSK	7.73	8	-0.27
927	2-FSK	7.9	8	-0.1

*See the following plots for measurement details.

Plot 5.10.4.1. Power Spectral Density, 2-FSK modulation
Test Frequency: 903 MHz

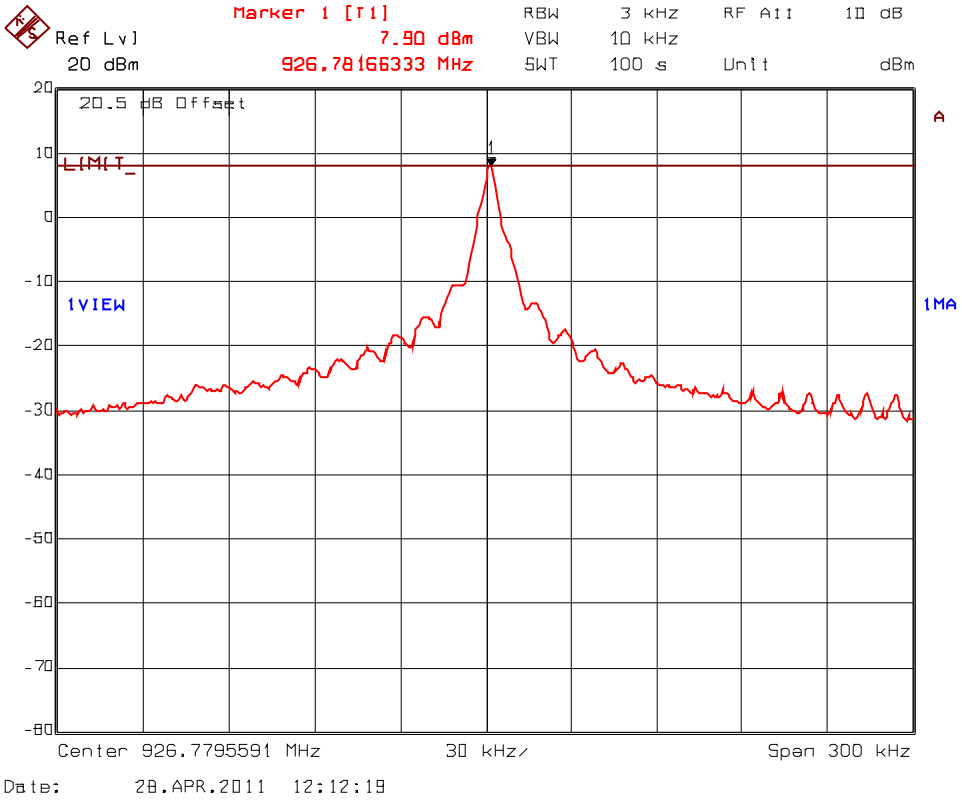


Plot 5.10.4.2. Power Spectral Density, 2-FSK modulation
Test Frequency: 915 MHz



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Plot 5.10.4.3. Power Spectral Density, 2-FSK modulation
Test Frequency: 927 MHz



5.11. RF EXPOSURE REQUIRMENTS [§§ 15.247(e)(i), 1.1310 & 2.1091]

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FCC 47 CFR § 1.1310:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.11.1. Method of Measurements

Refer to Sections 1.1310, 2.1091

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

5.11.2. RF Evaluation

This device is categorically excluded form routine environmental evaluation for RF Exposure requirement as per section 2.1093.

This device may be used as stand-alone portable exposure conditions with no restrictions on host platforms when the source-based time-averaged output power is ≤ $60/f_{(GHz)}$ mW as specified in sec 2(a)(1) of FCC KDB 447498 v04.

Measured Maximum Peak Conducted Power = 6.3 mW

SAR is not required as Peak Conducted Power (6.3 mW) is well below the threshold value of 64 mW for 927 MHz band as calculated below.

Threshold Value = [60/f(GHz)] mW
= (60/0.927) mW
= 64 mW

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz	14 Aug 2011
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz – 40 GHz	15 Mar 2012
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	17 Feb 2012
RF Amplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	15 Mar 2012
High Pass Filter	K & L	11SH10-1500/T8000	2	Cut off 900 MHz	Cal. on use
Horn Antenna	Emco	3155	6570	1 – 18 GHz	22 Feb 2012
Horn Antenna	Emco	3155	5955	1 – 18 GHz	09 Jan 2012
Biconi-Log Antenna	Emco	3142C	00034792	26 – 3000 MHz	26 April 2012
Dipole Antenna	Emco	3121C	434	26 – 1000 MHz	16 Aug 2011
Signal Generator	Hewlett Packard	8648C	3443U00391	100 kHz – 3200 MHz	16 Dec, 2011
Power Divider	Mini-Circuits	15542	0235	DC – 18 GHz	Cal. on use
Attenuator	Narda	4768-20	-	DC – 40 GHz	Cal. on use
Spectrum Analyzer	Agilent	E7401A	US40240432	9 kHz – 1.5 GHz	10 Jan 2012
LISN	EMCO	3825/2	8907-1531	10 kHz – 100 MHz	30 Mar 2012
Attenuator	Pasternack	PE7010-20	-	-	18 Jan 2012

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (150 kHz – 30 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.57**	**± 1.8**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.14**	**± 3.6**

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.15**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.30**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 2.39**	**± 2.6**
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 4.78**	**± 5.2**

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	**Measured**	**Limit**
u_c	**Combined standard uncertainty:** $u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)}$	**± 1.87**	Under consideration
U	**Expanded uncertainty U:** $U = 2u_c(y)$	**± 3.75**	Under consideration