Lexmark International, Inc.
740 New Circle Road
Lexington, KY USA
40511

LEXMARK INTERNATIONAL

Test Report
for
FCC Part 15
Industry Canada RSS-247
Industry Canada RSS-GEN
using
ANSI C63.10-2013

TRADE NAME: Module for UHF RFID Option Tray

FCC ID: IYL0528RFU
IC: 2376A-0528RFU

Test Report Number: L862-EMC-2016-FCC-11072016

Date: November 7, 2016

A2LA Certificate No. 0872.01

The results in this test report relate only
to the sample which was tested.

1 TABLE OF CONTENTS

2 TECHNICAL REPORT

Manufacturer of Equipment-under-test	Lexmark International, Inc.
Address of Manufacturer	740 New Circle Road Lexington, Kentucky 40511

Test Laboratory	Lexmark International, Inc.
Address of Test Laboratory	740 New Circle Road Lexington, Kentucky 40511
FCC Registration No.	991141 (Expires 7/12/2017)
Industry Canada Registration No.	2376A-3 (Expires 2/5/2017)

Equipment Under Test	
Trade Name(s)	UHF RFID Option Tray
FCC ID	IYL0528RFU
Industry Canada ID	2376A-0528RFU
Device Category	Mobile
RF Exposure Category	General Population/Uncontrolled Environment
Frequency Range (MHz)	902 - 928 MHz
Antenna Type	PCB
Antenna Location	Internal
Antenna Gain	-9.6 dBi
Software for EUT Control	Universal Reader Assistant by Thingmagic (Trimble Navigation Ltd.) V2.8.16.16 Region selected = NA
Radio Firmware Version	1.05.00.22
Rated EUT Transmit Power	30 dBm
Emission Designator	61K1A7D
Type of Modulation	PR-ASK

2.1 PURPOSE OF TESTING

The purpose of this testing was to evaluate the EUT for compliance to the requirements of the standards [1] – [3] using the procedures found in [4]. The EUT is a UHF RFID Module for use in a paper tray option for Lexmark printers. The module includes the UHF radio and unique antenna and can be installed in various paper trays for use with Lexmark laser printers.

2.2 APPLIED STANDARDS

[1] FCC Part 15, Subpart C.

[2] Industry Canada RSS-247, Issue 1, May 2015.

[3] Industry Canada RSS-GEN, Issue 4, November 2014.

[4] ANSI C63.10:2013, *American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices*.

3 SUMMARY

The purpose of this testing was to evaluate the EUT for compliance to the requirements of the standards [1] - [3]. The test procedures found in [4] were applied for this test report. The EUT is a UHF RFID Module for use in a paper tray option for Lexmark printers. The module includes the UHF radio and unique antenna and can be installed in various paper trays for use with Lexmark laser printers. The data in this report demonstrates that the EUT complies with the requirements in [1] - [3].

No modifications were made to the EUT in order to meet any of the requirements found in this test report. No tune-up or adjustment procedures were required during the testing.

FCC Part 15			
Reference	**Description of Test**	**Result**	**Page of Report**
§15.247(a)(1)(i)	20 dB bandwidth	Compliant	10
§15.247(a)(1)(i)	Number of hopping frequencies	Compliant	16
§15.247(a)(1)	Hopping frequency separation	Compliant	13
§15.247(a)(1)(i)	Time of occupancy	Compliant	18
§15.247(b)(2)	Output power	Compliant	21
§15.247(d)	Conducted spurious emissions	Compliant	22
§15.247(d)	Radiated spurious emissions	Compliant	32
15.207	AC conducted spurious emissions	Compliant	38

Industry Canada RSS			
Reference	**Description of Test**	**Result**	**Page of Report**
RSS-247 §5.1(3)	Number of hopping frequencies	Compliant	16
RSS-247 §5.1(2)	Hopping frequency separation	Compliant	13
RSS-247 §5.1(3)	Time of occupancy	Compliant	18
RSS-247 §5.4(1)	Output power	Compliant	21
RSS-247 §5.5	Conducted spurious emissions	Compliant	22
	Radiated spurious emissions	Compliant	32
RSS-GEN §8.8	AC conducted spurious emissions	Compliant	38
RSS-GEN §6.6	Occupied bandwidth	Compliant	55

This report has been reviewed by:

John Fessler	John T. Fessler	November 7, 2016
Name	Signature	Date

4 DESCRIPTION OF EUT

The Equipment Under Test (EUT) is an RFID UHF radio module which is intended to be installed in an option drawer and used with a Lexmark laserprinter. It allows the programming of RFID tags via the printer

The radio used in the EUT is a Thingmagic Micro-LTE embedded RFID reader. The antenna is a planar, PCB antenna positioned to illuminate a tag located on a piece of paper as it passes through the paper path of the printer. The Thingmagic radio is mounted on a carrier PCB which includes support I/O circuitry to allow communication with the radio via a standard USB interface and interfaces with the paper drawer to obtain 24 VDC to power the radio.

A plastic cover is installed over the radio and carrier card. See Figures 1 and 3 for photos of the EUT with this plastic cover installed and Figures 2 and 4 for photos of the EUT with the plastic cover removed.

4.1 EUT PHOTOS

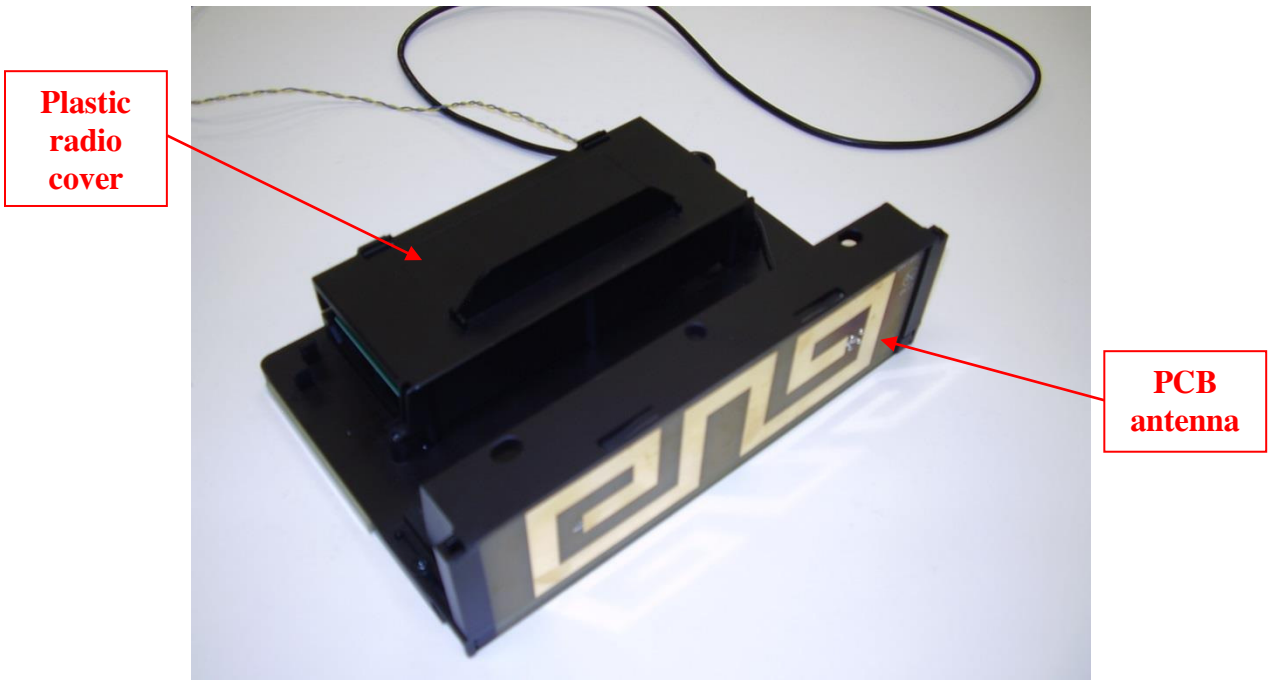


Figure 1. Front view of EUT (cover installed).

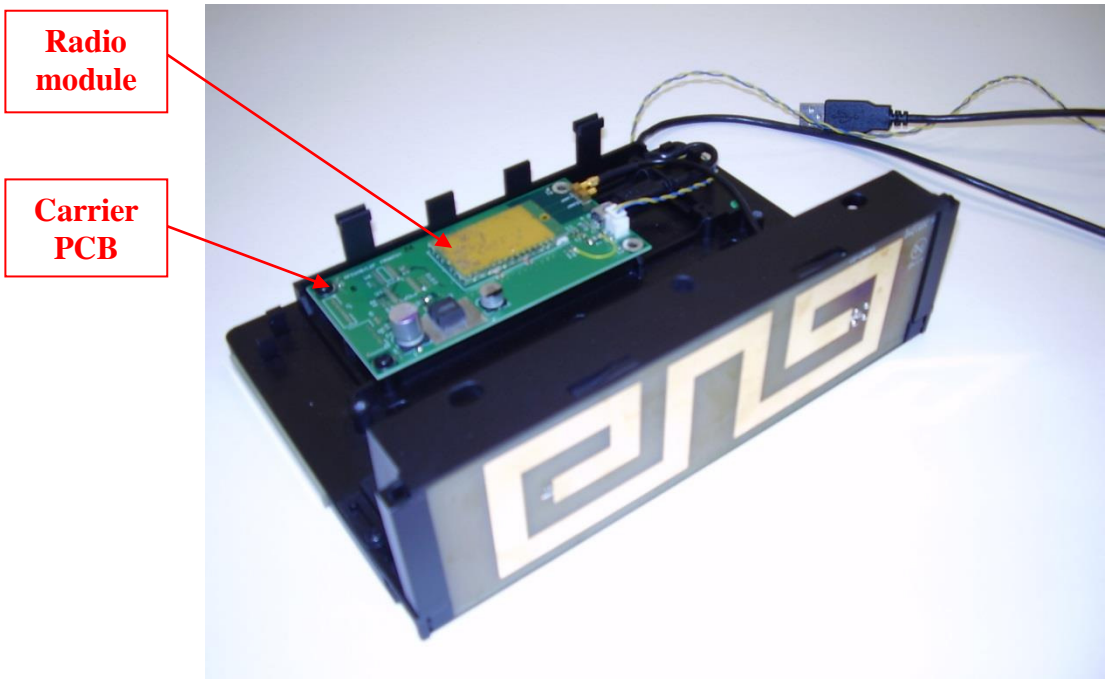


Figure 2. Front view of EUT (cover removed).

Figure 3. Rear view of EUT (cover installed).

Figure 4. Rear view of EUT (cover removed).

4.2 EUT ANTENNA

The EUT employs a planar PCB antenna mounted vertically in the module fixture as shown in Figures 1 - 4. The gain of this PCB antenna is -9.6 dBi. The antenna PCB includes a reverse-thread SMA connector which allows the antenna to be connected to the radio via a short coaxial cable. The RF port of the Thingmagic Micro-LTE radio is a U.FL connector.

The EUT is intended to be mounted inside an option tray. Installed at the factory, the user does not have access to the radio or the antenna. As a result of this and the unique connectors on the radio and antenna, the EUT meets the requirements in Part 15.203 of the FCC Rules.

5 TEST CONFIGURATION

Testing was performed with the EUT in a standalone configuration as shown in Figure 5. A personal computer is used to control the EUT and put it in the various modes for testing. The external power supply provides +24 VDC to power the EUT. The carrier PCB provides for mounting the radio module, interfacing with the PC via USB and power supply.

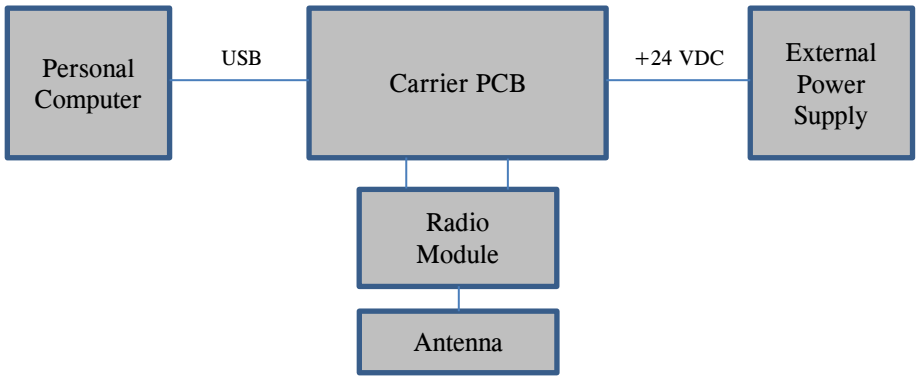


Figure 5. Block diagram of the test setup.

Software provided by the radio manufacturer (Thingmagic – Trimble Navigation Ltd) was used to control the radio (transmit ON/OFF, hopping ON/OFF, etc.).

5.1 NORMAL TEST CONDITIONS

The normal temperature and humidity conditions for the testing shall be the following:

- Temperature in the range +15°C to +35°C;
- Relative humidity in the range 20% to 75%.

The EUT module is intended to be installed in a printer option drawer which provides 24 VDC to the carrier card.

6 TESTING & MEASUREMENT EQUIPMENT

Description	Manufacturer	Model Number	Serial Number	Calibration Due Date
Spectrum analyzer	Rhode & Schwarz	ESI40	839283	9/2018
Spectrum analyzer	Rhode & Schwarz	ESIB40	100148	10/2017
Spectrum analyzer	Rhode & Schwarz	FSP40	100101	11/2017
EMI Receiver	Gauss Instruments	TDEMI X6	1312001	9/2017
Bilog antenna	Schaffner	CBL6111C	2460	8/2017
Double Ridge Horn Antenna	ETS Lindgren	3117	135195	10/2017
EMI Receiver	Rhode & Schwarz	ESCI	100346	10/2017
EMI Receiver	Gauss Instruments	TDEMI X6	1307025	12/2016
LISN (EUT)	Rhode & Schwarz	ESH2-Z5	848765/017	10/2017
LISN (AE)	Rhode & Schwarz	ESH3-Z3	825562/015	4/2018
LISN (AE)	Rhode & Schwarz	ESH3-Z3	825562/018	4/2018
Humidity & Temperature meter	Omega	ITHX-M	2290387	9/2/2017

7 MEASUREMENT UNCERTAINTIES

The uncertainties for the measurement of each parameter in this test report are given in Table 1.

Parameter	Uncertainty
AC Conducted emissions (ESCI)	1.53 dB
AC conducted emissions (TDEMI)	1.64 dB
Radiated emissions 30-1000 MHz (ESIB)	3.73 dB
Radiated emissions (30-1000 MHz) (TDEMI)	3.73 dB
Radiated emissions > 1 GHz	3.40 dB
RF power, conducted	0.85 dB
Unwanted emissions, conducted	1.56 dB
DC voltages	±0.0036%
Occupied channel bandwidth	±1.046%

Note: Uncertainties are expressed at approximately the 95% confidence level with a coverage factor $k = 2$.

Table 1. Measurement uncertainties.

8 TEST RESULTS FOR FCC PART 15

8.1 20 dB BANDWIDTH

Criteria for 20 dB Bandwidth: The maximum allowed 20 dB bandwidth is 500 kHz.

Test Procedure for 20 dB Bandwidth: The test procedures given in Section 6.9.2 of [4] are used to measure the 20 dB bandwidth of the EUT.

The output power of the EUT was set to 25 dBm. An external 10 dB attenuator was installed between the EUT and the spectrum analyzer with the insertion loss of the connecting cable and attenuator stored as a transducer factor.

The *n-dB down* marker function of the spectrum analyser was used to measure the 20 dB bandwidth.

Results for 20 dB Bandwidth: The 20 dB bandwidths of the low, middle and high channels of the EUT were measured. These results are found in Figures 6 – 8 and summarized in Table 2. The maximum bandwidth observed on these channels was 50.6 kHz. The EUT met the requirements for 20 dB bandwidth.

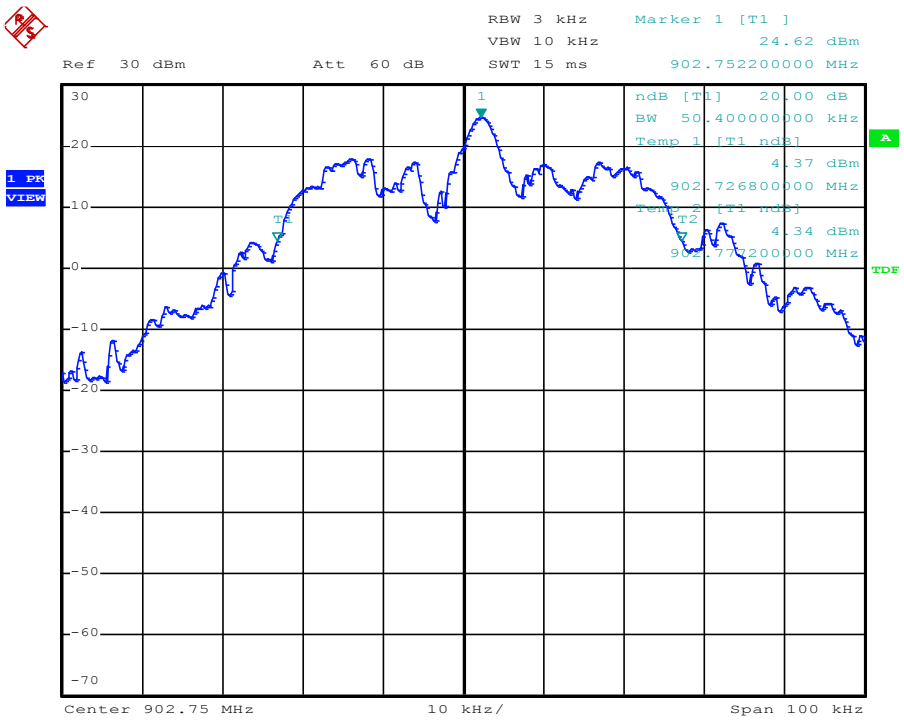


Figure 6. 20 dB bandwidth; Channel 1.

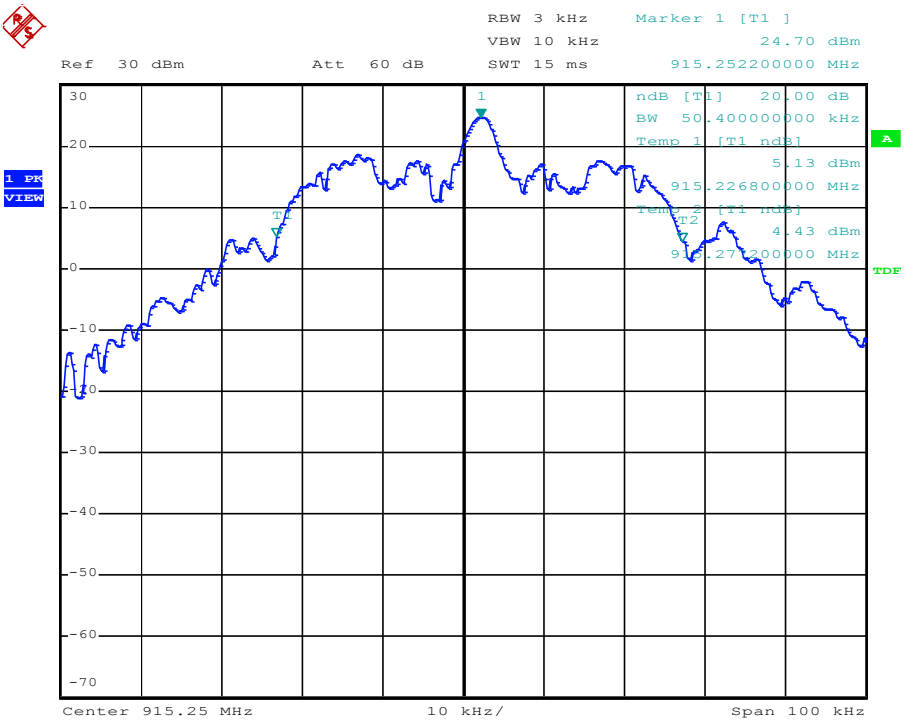


Figure 7. 20 dB bandwidth; Channel 26.

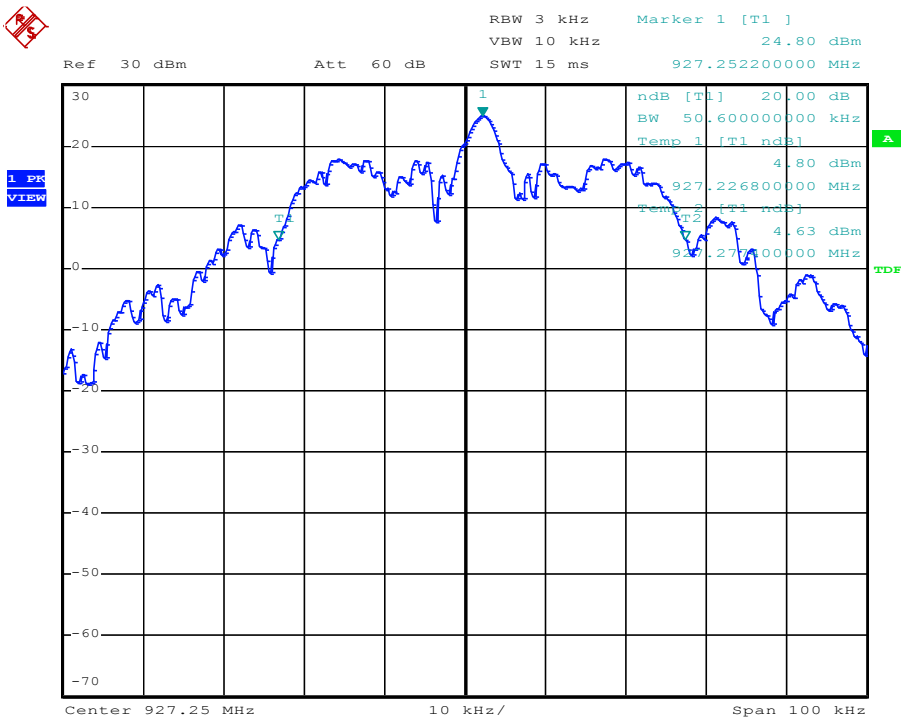


Figure 8. 20 dB bandwidth; Channel 50.

Channel No.	Channel Frequency (MHz)	20 dB Bandwidth (kHz)
1	902.75	50.4
26	915.25	50.4
50	927.25	50.6

Table 2. Summary of 20 dB bandwidths measured on low, middle and high channels.

8.2 CHANNEL FREQUENCY SEPARATION

Criteria for Channel Frequency Separation: 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.

Test Procedure for Channel Frequency Separation: The test procedures given in Section 7.8.2 of [4] are used to measure the channel frequency separation of the EUT.

The output power of the EUT was set to 25 dBm. An external 10 dB attenuator was installed between the EUT and the spectrum analyzer with the insertion loss of the connecting cable and attenuator stored as a transducer factor.

Results for Channel Frequency Separation: The measured results of the channel separation between the lowest two, middle two and highest two channels are shown in Figures 9 - 11. In all of these cases, the measured channel separation is 502 kHz.

From Section 8.1, the maximum 20 dB bandwidth of the EUT is 50.6 kHz. Based upon this, the channel separation must be a minimum of 50.6 kHz. The EUT meets the requirements for channel frequency separation.

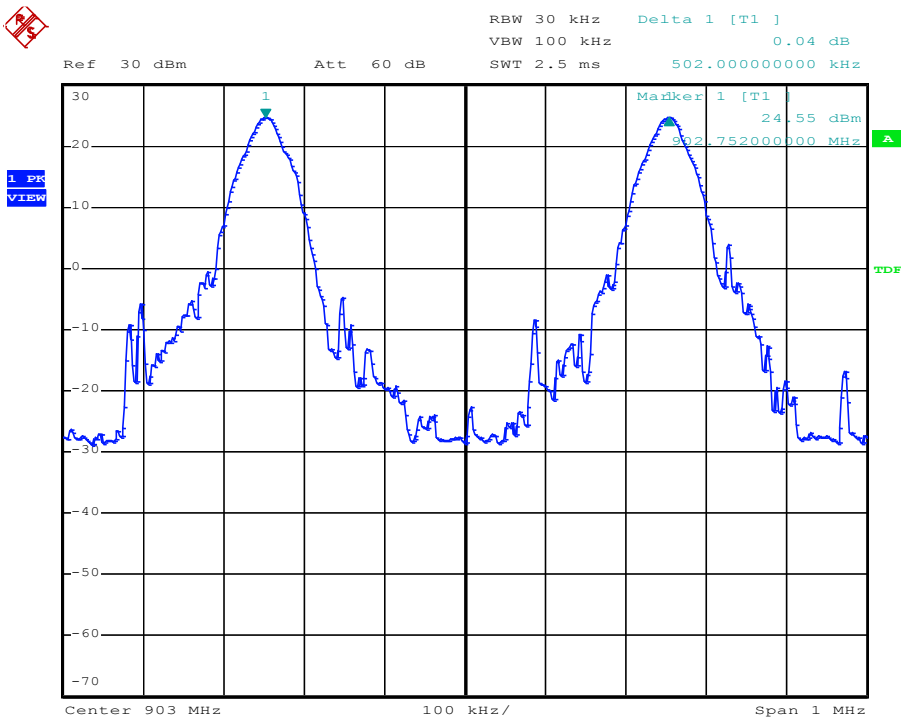


Figure 9. Channel frequency separation; low channels.

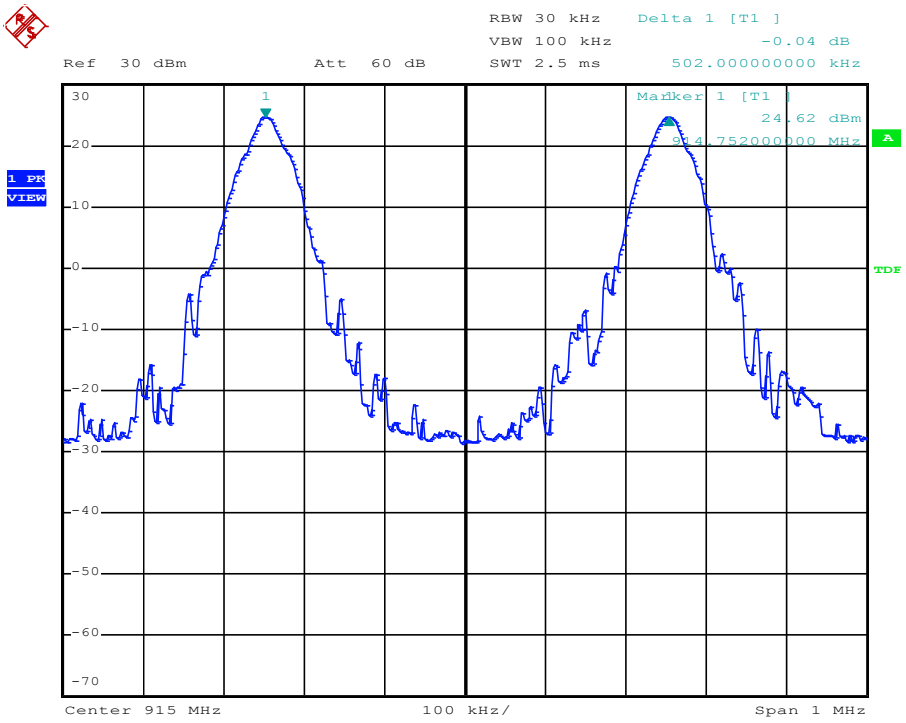


Figure 10. Channel frequency separation; middle channels.

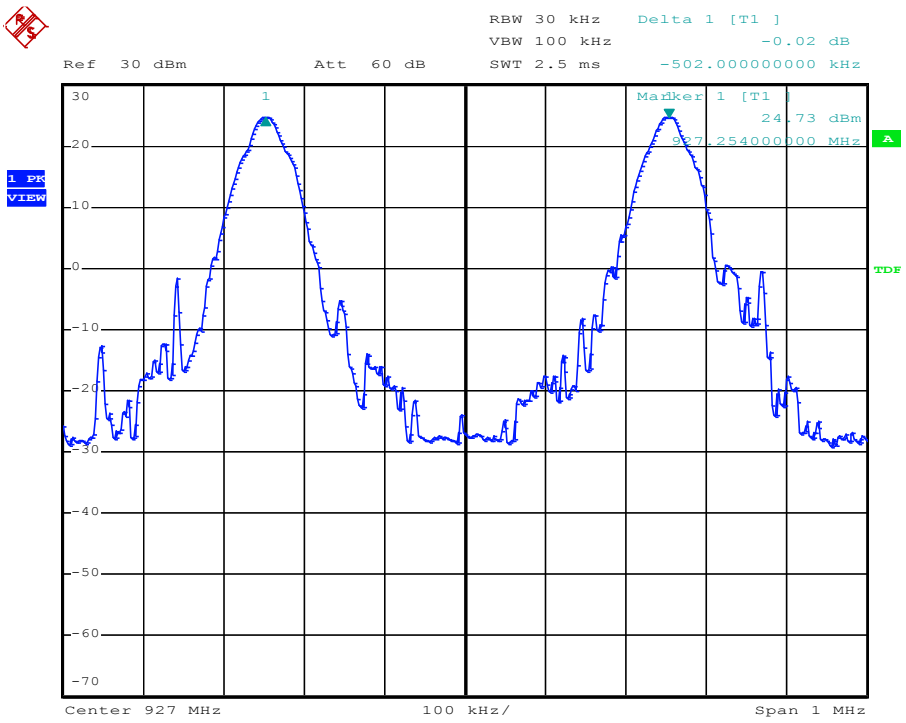


Figure 11. Channel frequency separation; high channels.

8.3 NUMBER OF HOPPING FREQUENCIES

Criteria for Number of Hopping Frequencies: If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the EUT shall use at least 50 hopping frequencies. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

Test Procedure for Number of Hopping Frequencies: The test procedures given in Section 7.8.3 of [4] are used to measure the number of hopping frequencies of the EUT.

The output power of the EUT was set to 25 dBm. An external 10 dB attenuator was installed between the EUT and the spectrum analyzer with the insertion loss of the connecting cable and attenuator stored as a transducer factor.

Results for Number of Hopping Frequencies: The measured results for the number of hopping frequencies are shown in Figure 12. The number of hopping frequencies used by the EUT is 50.

From Section 8.1, the 20 dB bandwidth of the EUT is 50.6 kHz. Based upon this, the EUT must use at least 50 hopping frequencies. The EUT meets the requirements for number of hopping frequencies.

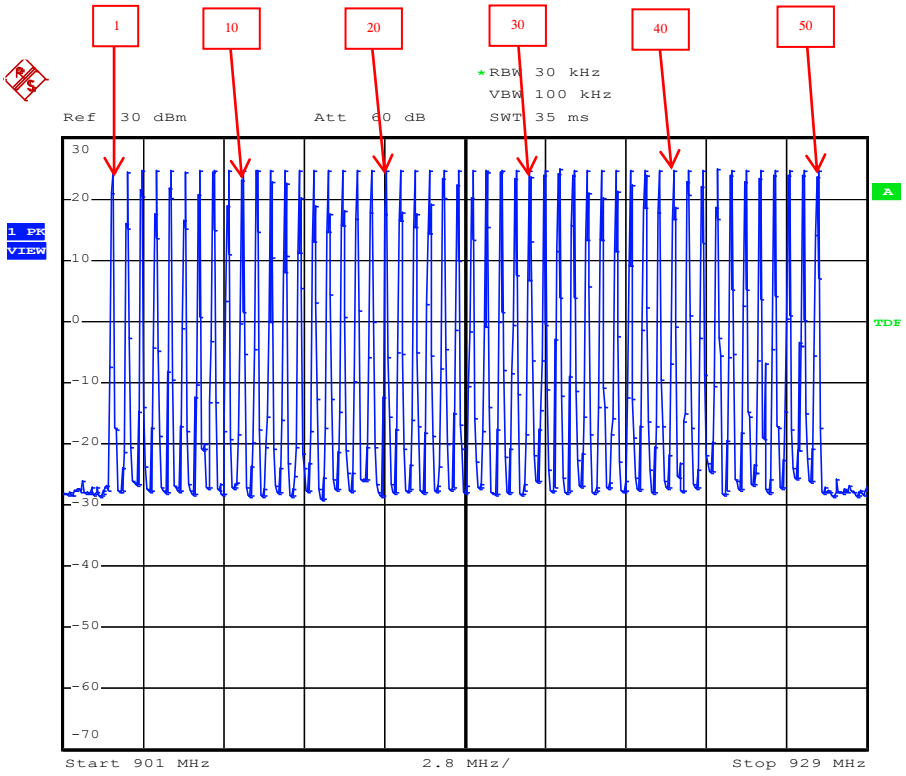


Figure 12. Number of hopping frequencies.

8.4 TIME OF OCCUPANCY

Criteria for Time of Occupancy: If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Test Procedure for Time of Occupancy: The test procedures given in Section 7.8.4 of [4] are used to measure the average time of occupancy of the EUT.

The output power of the EUT was set to 25 dBm. An external 10 dB attenuator was installed between the EUT and the spectrum analyzer with the insertion loss of the connecting cable and attenuator stored as a transducer factor.

Results for Time of Occupancy: The results for single sample measurements for the time of occupancy are found in Figures 13 - 14. These results were measured on the lowest channel. In Figure 13 the total sweep time was set to 500 ms so that only a single hop to the channel is shown. In Figure 14 the sweep time is set to 20 secs so that two consecutive hops to the channel are shown.

A total of ten samples were measured for both the short sweep time and the long sweep time and results are tabulated in Table 3. The average dwell and repetition times of these ten samples are calculated and used in the following calculations.

The average time of occupancy is calculated using the following equation:

$$Average\ Time\ of\ Occupancy = \frac{20\ secs}{Average\ Rep\ Time} \times Average\ Dwell\ Time$$

Using the values summarized in Table and this equation, the Average Time of Occupancy is found to be:

$$Average\ Time\ of\ Occupancy = \frac{20\ secs}{18.77\ secs} \times 374.8\ ms = 399.36\ ms$$

The EUT meets the requirement for time of occupancy.

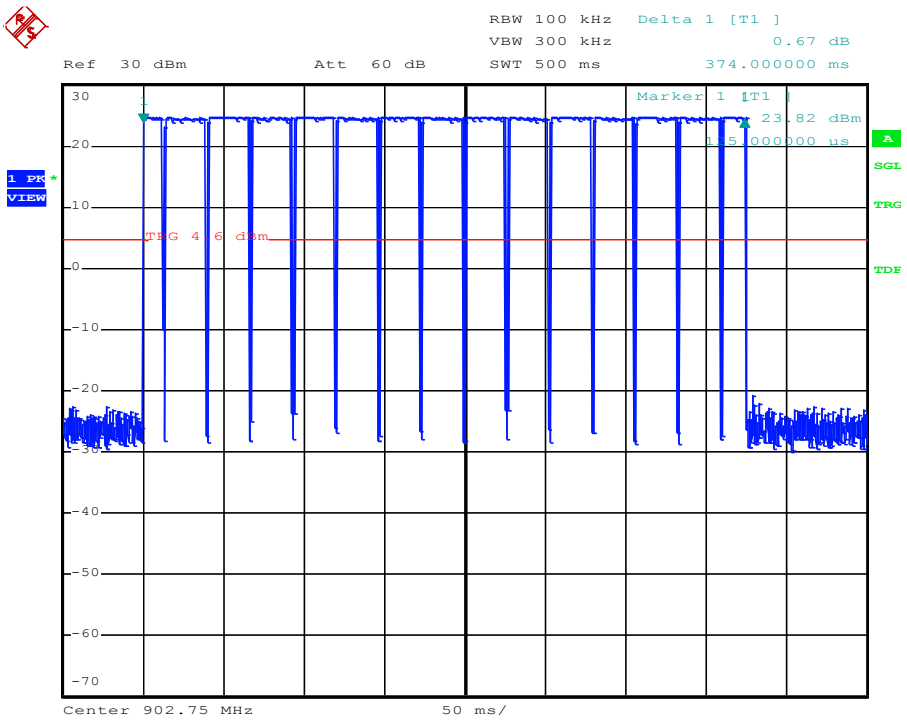


Figure 13. Time of occupancy, channel 1, short sweep time.

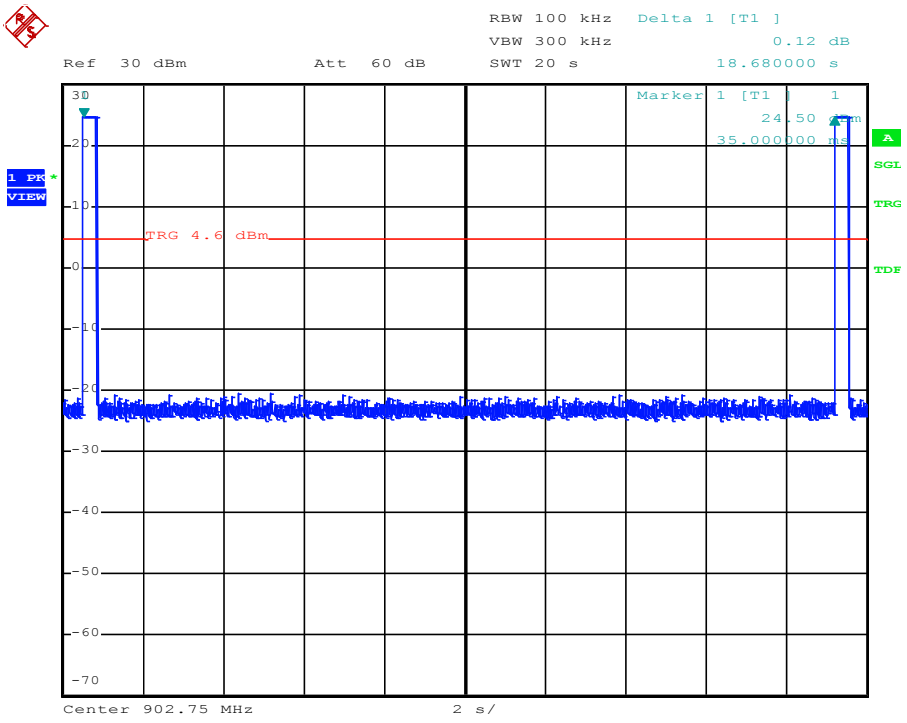


Figure 14. Time of occupancy, channel 1, long sweep time.

Sample No.	Dwell Time (ms)	Repetition Time (secs)
1	374	18.76
2	382	18.80
3	374	18.76
4	374	18.76
5	374	18.76
6	374	18.80
7	374	18.76
8	374	18.76
9	374	18.76
10	374	18.76
Averages	374.8	18.77

Table 3. Summary of dwell and repetition times for computing time of occupancy.

8.5 OUTPUT POWER

Criteria for Output Power: For frequency hopping systems operating in the 902-928 MHz band, the maximum peak conducted output power shall not exceed 1 watt (30 dBm) for systems employing at least 50 hopping channels. For systems employing less than 50 hopping channels, but at least 25 hopping channels, the maximum peak conducted power shall not exceed 0.25 watts 24 dBm).

Test Procedure for Output Power: The test procedures given in Section 7.8.5 of [4] are used to measure the average time of occupancy of the EUT.

The RF output port of the EUT was connected to the input of the spectrum analyzer via a short coaxial cable. The loss of this cable was stored as a transducer factor in the spectrum analyzer and automatically applied to the readings. For measurements with the EUT at its highest ouput power setting, an external 10 dB attenuator was also installed between the EUT and the spectrum analyzer. The loss of this attenuator is accounted for manually in the measurements.

The conducted output power is measured with the EUT voltage set to the values in the following table:

Test Voltage	Voltage (VDC)
V_{nom}	24.0
V_{nom} – 15%	20.4
V_{nom} + 15%	27.6

Results for Output Power: The measurement results for the EUT at its highest output power setting (30 dBm) are found in Figures 15 - 23. The results are also summarized in Table 4.

The measurement results for the EUT at its lowest output power setting (5 dBm) are summarized in Table 5.

These results indicate that the EUT meets the requirements for conducted output power.

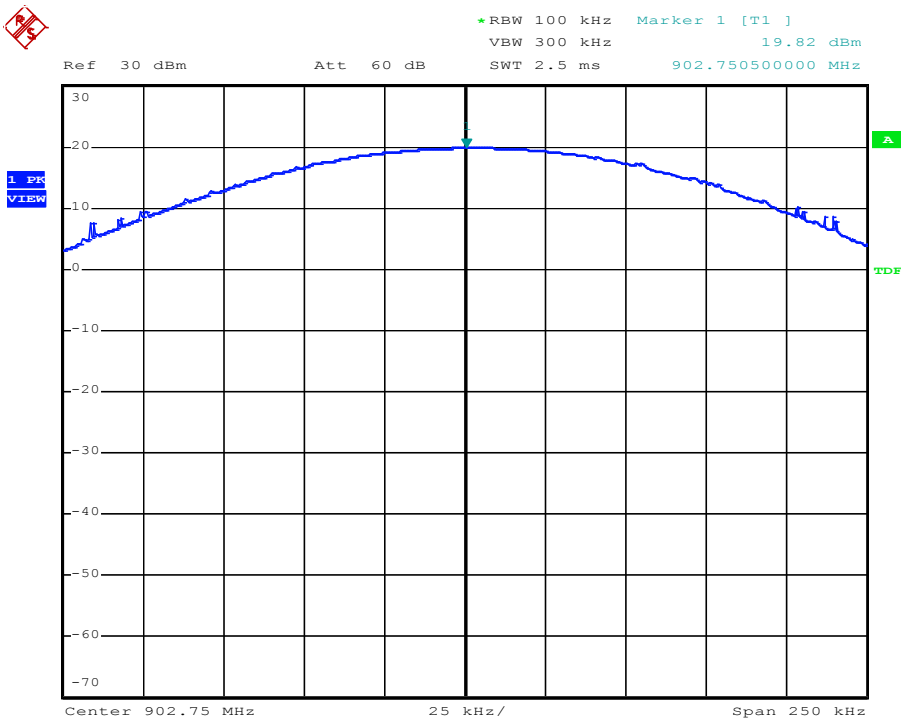


Figure 15. Conducted output power, Channel 1, highest power setting. Voltage = 24 VDC.

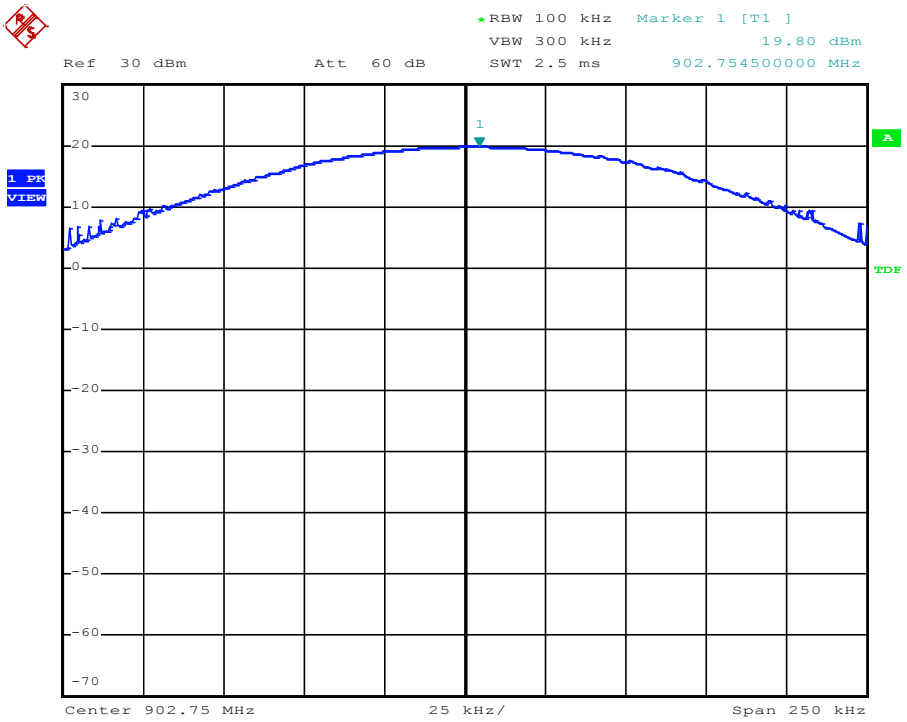


Figure 16. Conducted output power, Channel 1, highest power setting. Voltage = 20.4 VDC.

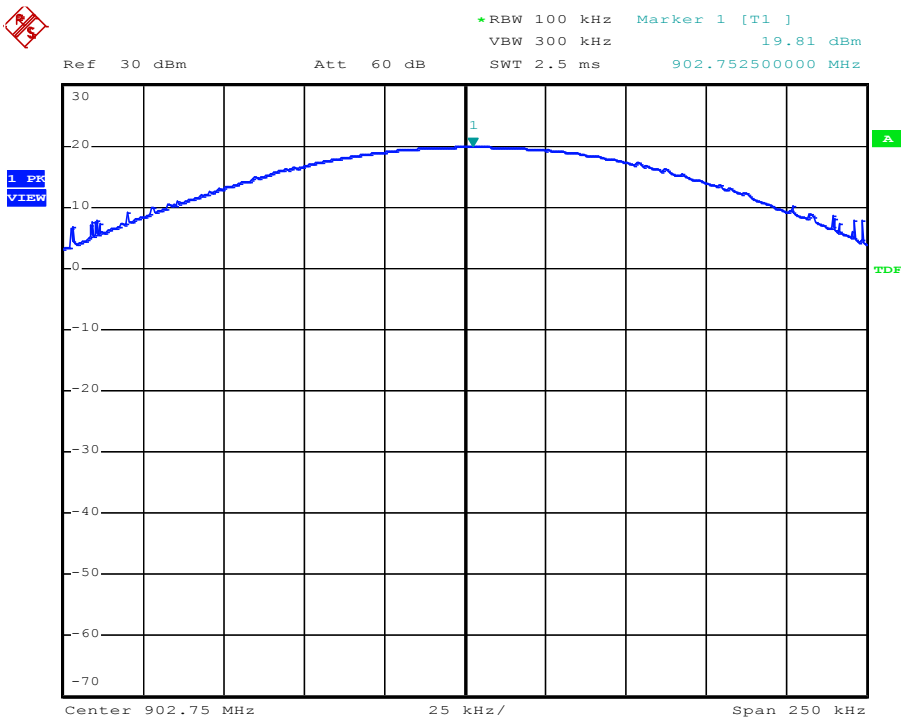


Figure 17. Conducted output power, Channel 1, highest power setting. Voltage = 27.6 VDC.

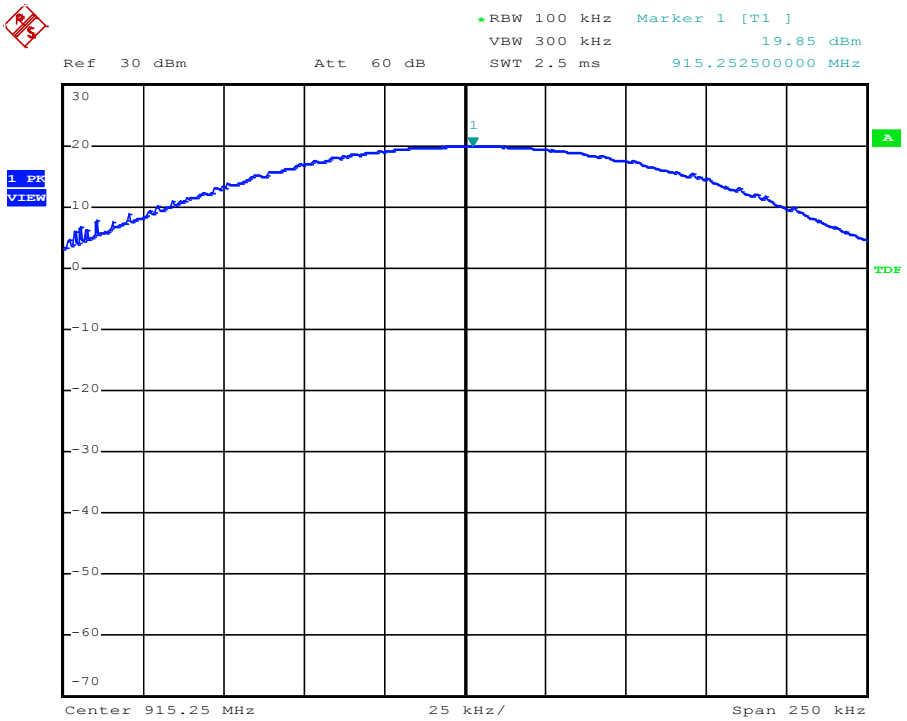


Figure 18. Conducted output power, Channel 26, highest power setting. Voltage = 24 VDC.

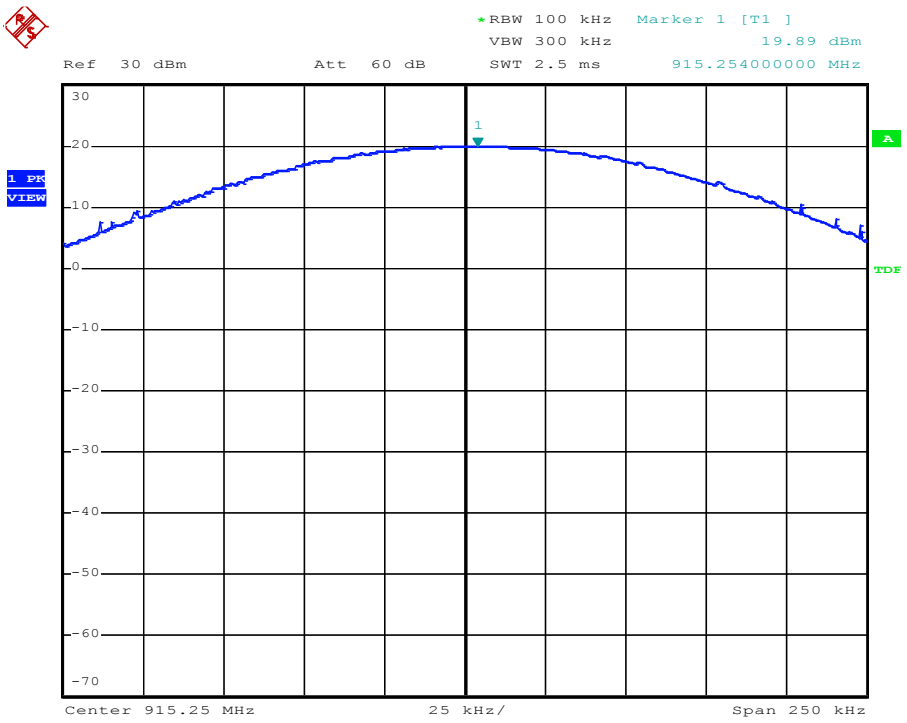


Figure 19. Conducted output power, Channel 26, highest power setting. Voltage = 20.4 VDC.

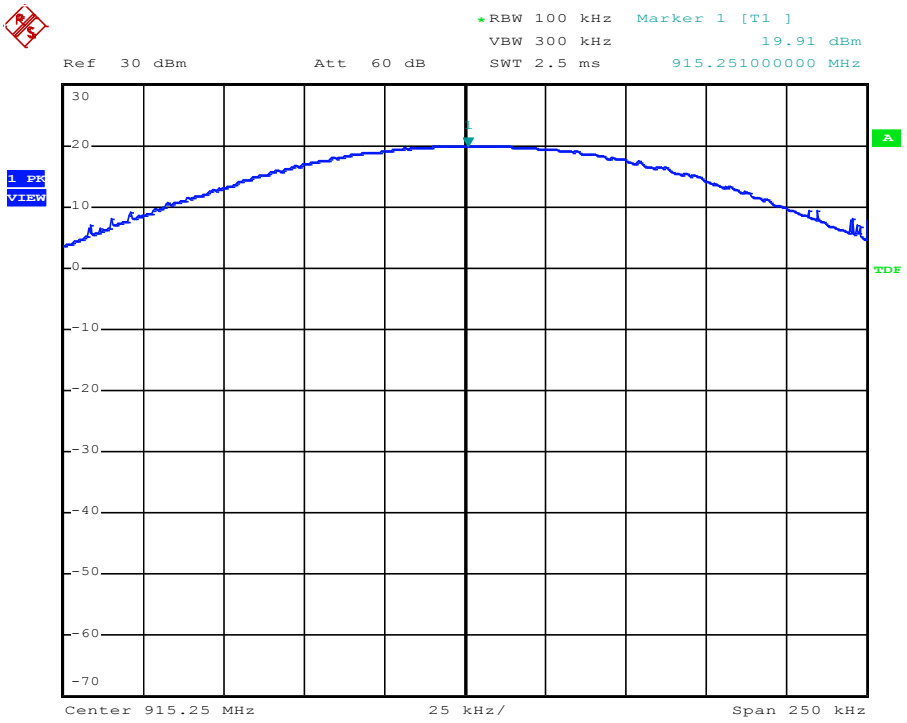


Figure 20. Conducted output power, Channel 26, highest power setting. Voltage = 27.6 VDC.

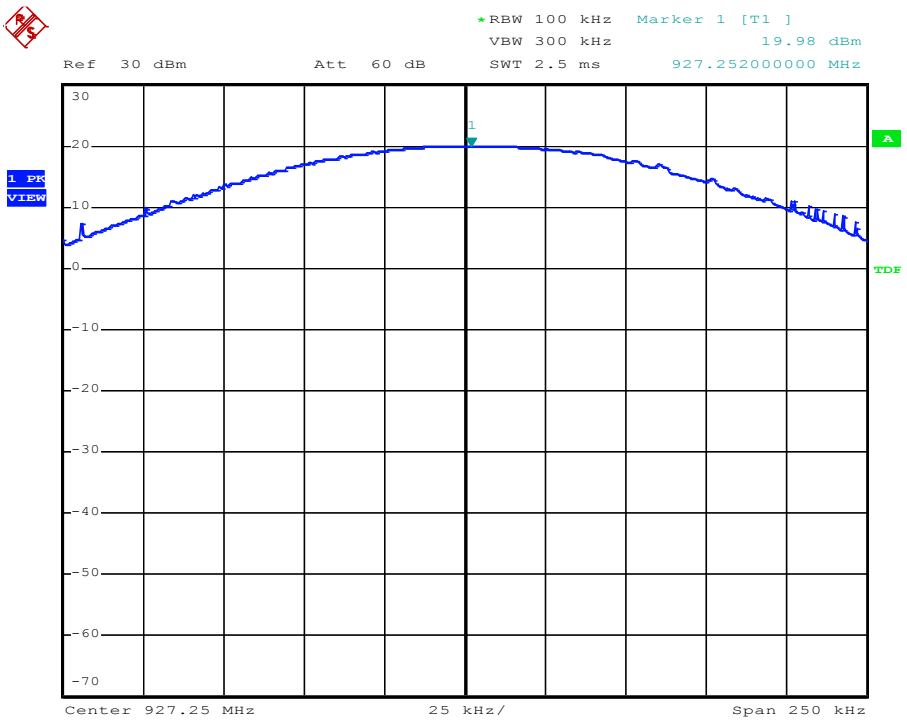


Figure 21. Conducted output power, Channel 50, highest power setting. Voltage = 24 VDC.

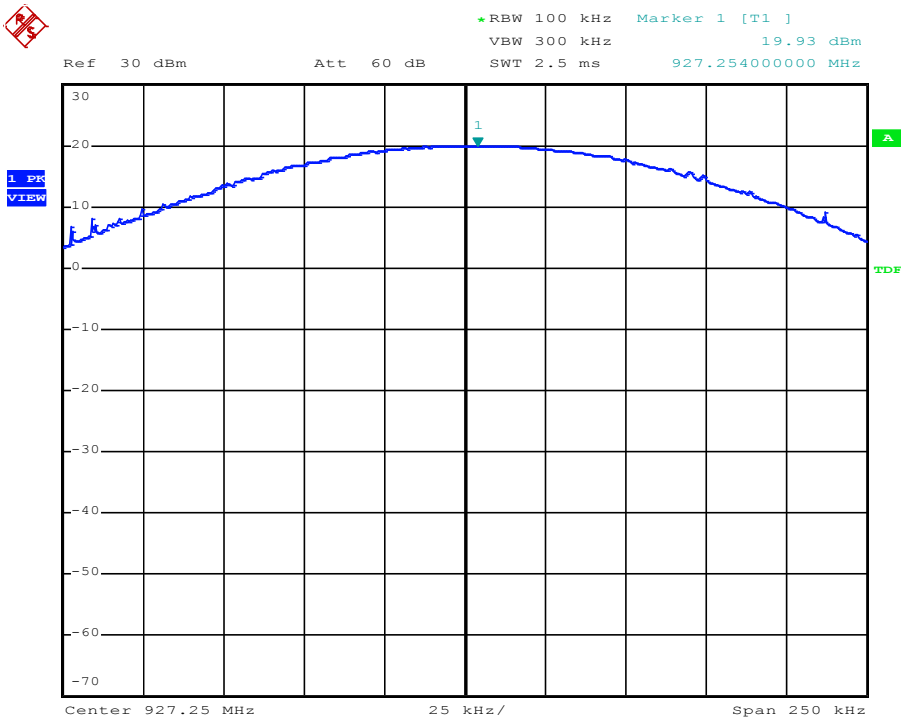


Figure 22. Conducted output power, Channel 50, highest power setting. Voltage = 20.4 VDC.

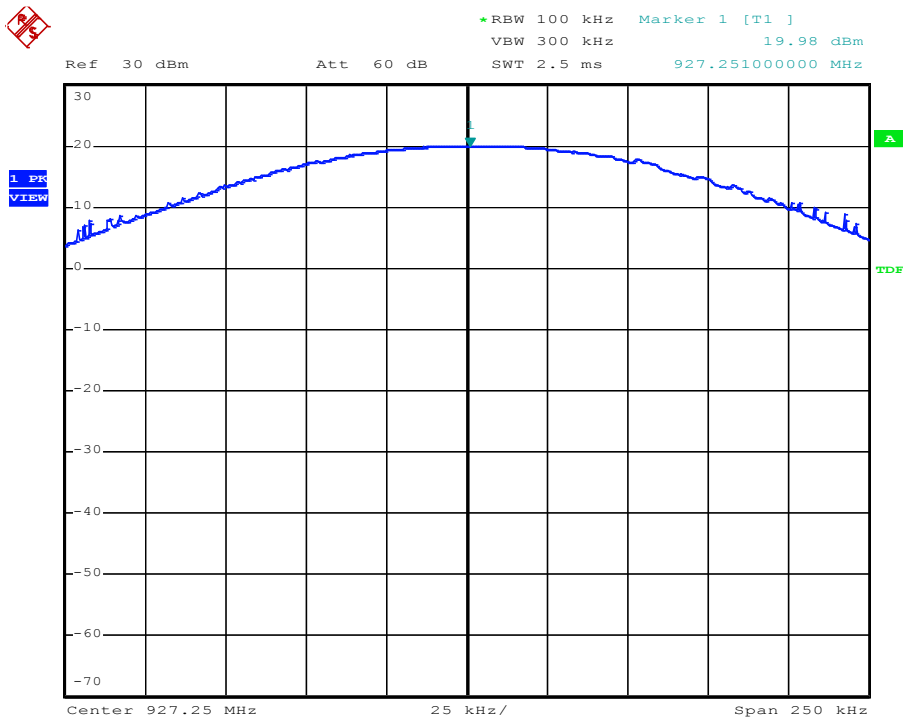


Figure 23. Conducted output power, Channel 50, highest power setting. Voltage = 27.6 VDC.

Channel No.	Frequency (MHz)	Voltage (VDC)	Measured Power (dBm)	Attenuator Loss (dB)	Total Power (dBm)	Limit (dBm)	Result
1	902.75	24.0	19.82	9.58	29.40	30	Pass
		20.4	19.80	9.58	29.38	30	Pass
		27.6	19.81	9.58	29.39	30	Pass
26	915.25	24.0	19.85	9.58	29.43	30	Pass
		20.4	19.89	9.58	29.47	30	Pass
		27.6	19.91	9.58	29.49	30	Pass
50	927.25	24.0	19.98	9.57	29.55	30	Pass
		20.4	19.93	9.57	29.50	30	Pass
		27.6	19.98	9.57	29.55	30	Pass

Table 4. Summary of measurements for conducted output power. Highest power setting.

Channel No.	Frequency (MHz)	Voltage (VDC)	Measured Power (dBm)	Attenuator Loss (dB)	Total Power (dBm)	Limit (dBm)	Result
1	902.75	24.0	4.93	0	4.93	30	Pass
		20.4	4.79	0	4.79	30	Pass
		27.6	4.83	0	4.83	30	Pass
26	915.25	24.0	5.01	0	5.01	30	Pass
		20.4	5.07	0	5.07	30	Pass
		27.6	5.03	0	5.03	30	Pass
50	927.25	24.0	5.15	0	5.15	30	Pass
		20.4	5.34	0	5.34	30	Pass
		27.6	5.20	0	5.20	30	Pass

Table 5. Summary of measurements for conducted output power. Lowest power setting.

8.6 CONDUCTED SPURIOUS EMISSIONS

Criteria for Conducted Spurious Emissions: In any 100 kHz bandwidth outside the frequency band in which the 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.

Test Procedure for Conducted Spurious Emissions: The test procedures given in Section 7.8.8 of [4] are used to measure the conducted spurious emissions of the EUT.

The output power of the EUT was set to 30 dBm. An external 10 dB attenuator was installed between the EUT and the spectrum analyzer with the insertion loss of the connecting cable and attenuator stored as a transducer factor.

Results for Conducted Spurious Emissions: The spurious emissions in the frequency range immediately adjacent to the band edges are verified with results shown in Figures 25 and 26 for the low channels and Figures 27 and 28 for the high channels. Results are shown with the frequency hopping function enabled Figures (26 and 28) and also with the hopping function disabled and the lowest channel selected (Figure 25) and the highest channel selected (Figure 24).

The results for the spurious emissions over the frequency range 30 MHz – 10 GHz are shown in Figures 29 and 30. These measurements were taken with the hopping function enabled.

These results indicate that the EUT meets the requirements for conducted spurious emissions.

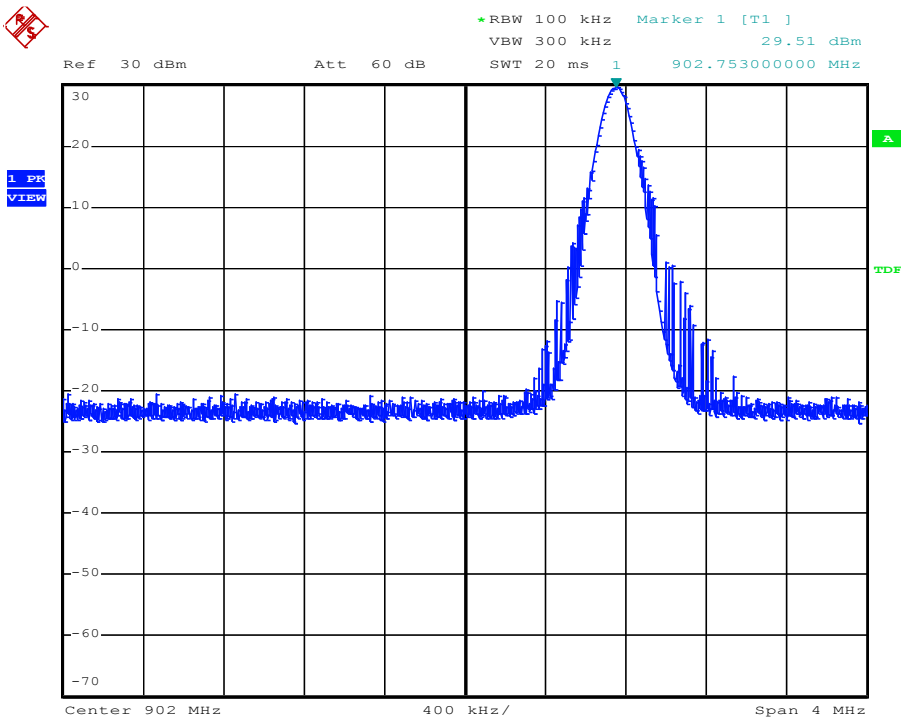


Figure 25. Conducted spurious emissions. Low band edge, frequency hopping off.

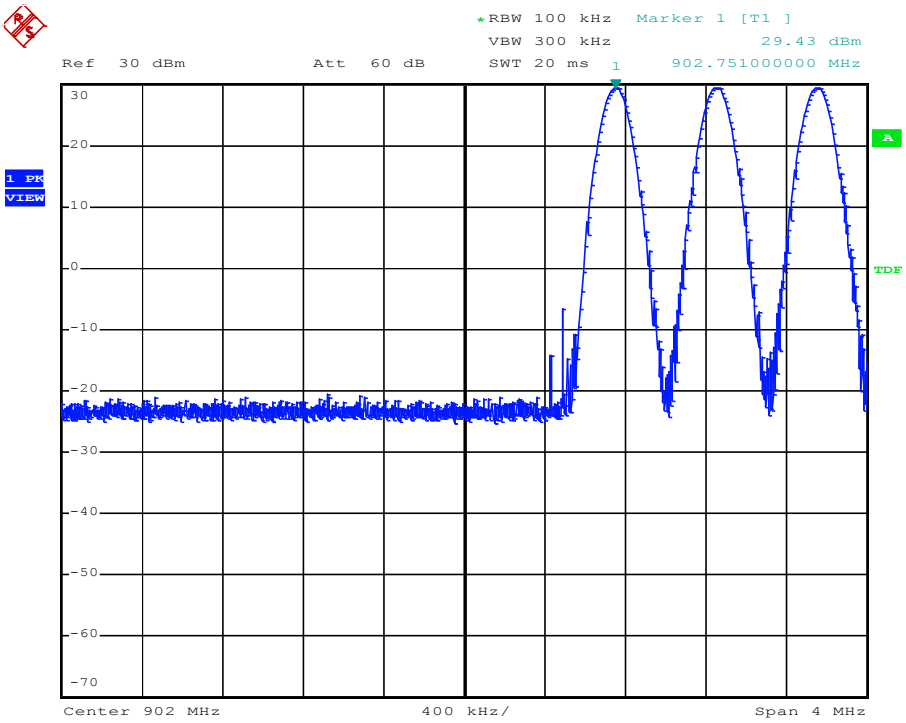


Figure 26. Conducted spurious emissions. Low band edge, frequency hopping on.

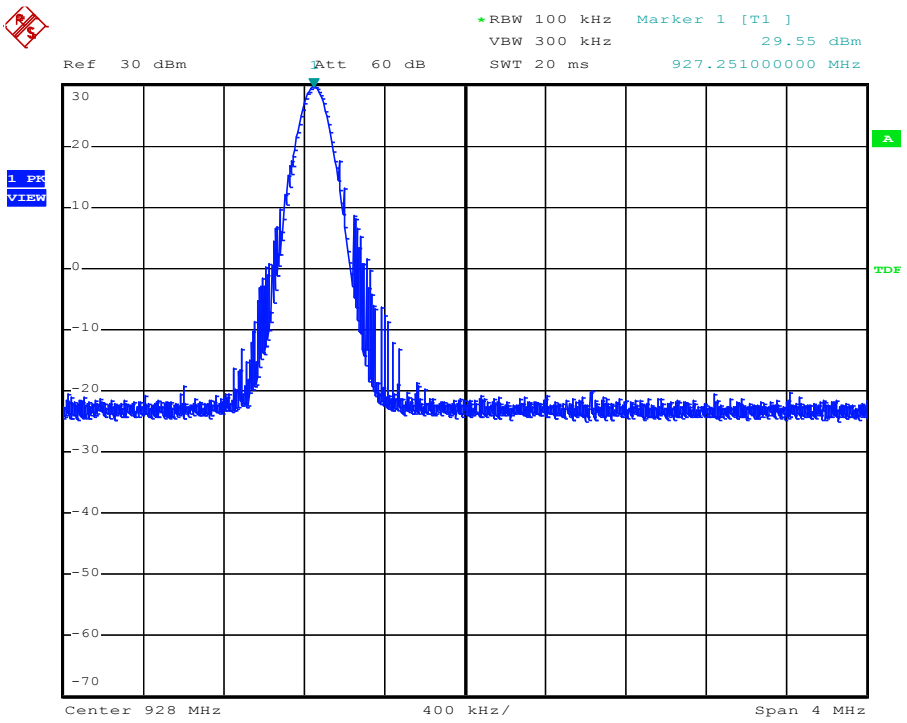


Figure 27. Conducted spurious emissions. High band edge, frequency hopping off.

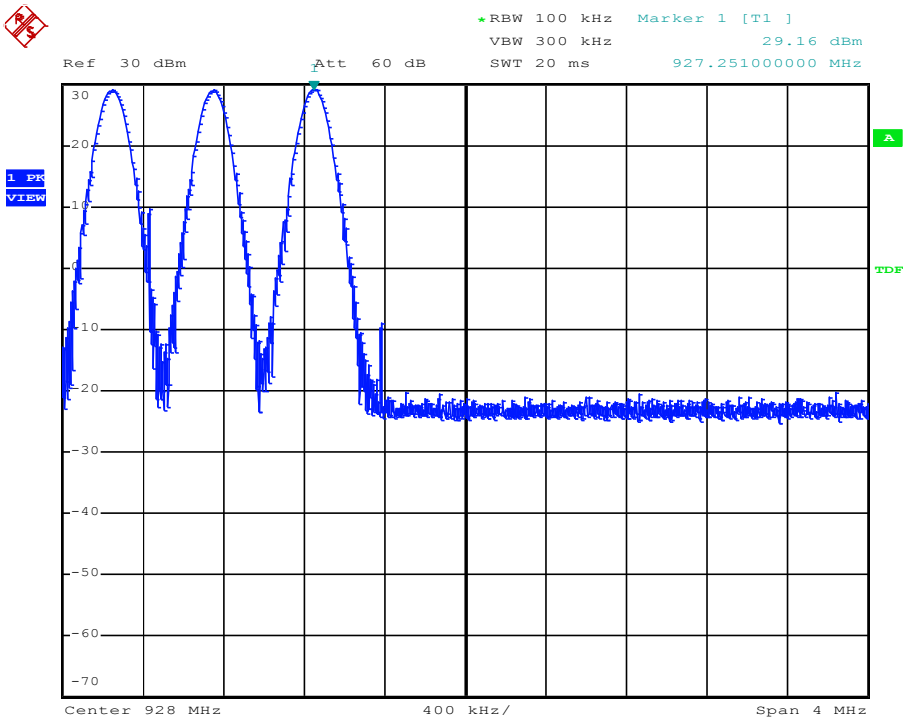


Figure 28. Conducted spurious emissions. High band edge, frequency hopping on.

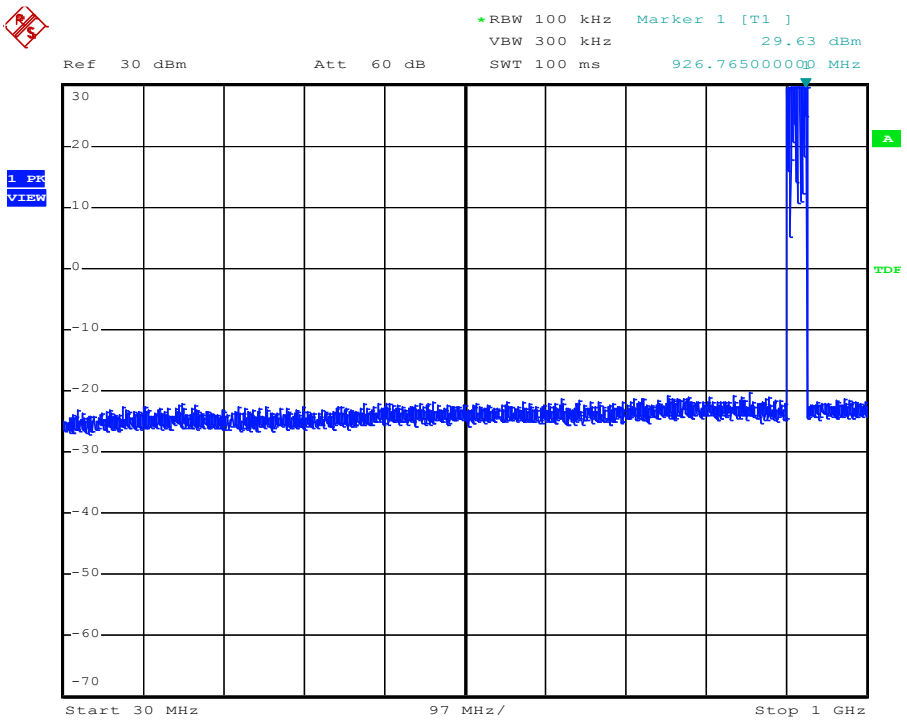


Figure 29. Conducted spurious emissions, 30 MHz – 1 GHz.

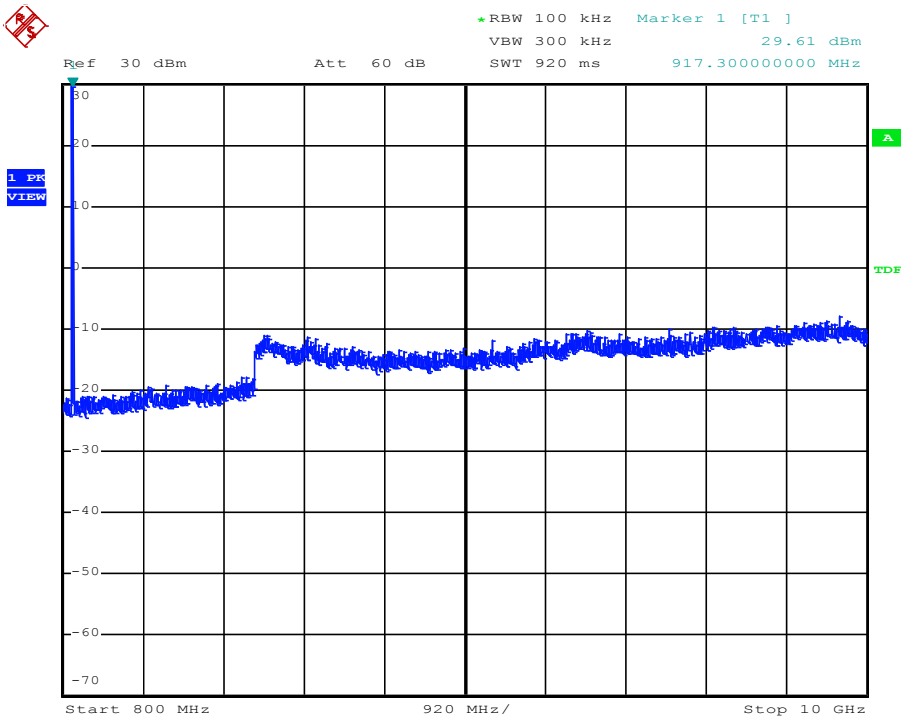


Figure 30. Conducted spurious emissions, 800 MHz – 10 GHz.

8.7 RADIATED SPURIOUS EMISSIONS

Criteria for Radiated Spurious Emissions: The field strength of emissions appearing within the restricted frequency bands shown below:

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	2690-2900	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			

shall comply with the limits in the following table.

Frequency Range	Limit of Electric Field Strength (dB(uV/m))	Measurement Distance (meters)
30 MHz – 88 MHz	40	3
88 MHz – 216 MHz	43.5	3
216 MHz – 960 MHz	46	3
Above 960 MHz	54	3

Below 1000 MHz compliance with these limits shall be demonstrated using a quasi-peak detector. Above 1000 MHz, compliance with these limits shall be demonstrated using an average detector.

Test Procedure for Radiated Spurious Emissions: The test procedures given in Sections 6.5 and 6.6 of [4] are used to measure the radiated spurious emissions of the EUT.

The radiated spurious emissions were measured in a semi-anechoic chamber at a test distance of 3 meters. A bilog antenna was used to measure the emissions over the frequency range 30 MHz – 1000 MHz. A double-ridged horn waveguide antenna was used to measure the radiated emissions over the frequency range of 1 GHz – 10 GHz. The test setup for the radiated emissions in the frequency range 30 MHz – 1000 MHz is shown in Figures 31 and 32. For measurements in the frequency range 30 MHz – 1000 MHz, the EUT was placed on a non-conducting table of height 80 cm. The setup for radiated emissions in the frequency range 1 GHz – 10 GHz is shown in Figures 33 and 34. In this case, RF absorbing material was installed on the floor in region between the EUT and the antenna and the DRWG horn antenna replaced the bilog antenna. Cardboard boxes were placed on top of the 80 cm non-conducting table in order to raise the height of the EUT, external power supply and personal computer to 150 cm.

The EUT is intended to be oriented in only a single direction. Since the EUT is a module intended to be installed in a paper drawer. As a result, the orientation is limited to a horizontal layout. In addition, the EUT is design to have a maximum radiation in a horizontal direction so testing it with the EUT position on the table as shown in Figures 31 and 32 allows the main radiation beam to be directed at the receive antenna. For these reasons, this is the only orientation required to be tested in radiated spurious emissions.

The value of the electric field reported in the results is given by the following equation:

$$Amplitude_{dB(\mu V/m)} = V_{dB(\mu V)} + AF_{dB(1/m)} + CL_{dB}$$

where

Amplitude = amplitude of the electric field in dB(uV/m) and is compared against the limit;

V = the voltage reading on the EMI receiver using the appropriate detector;

AF = the antenna factor of the receive antenna used;

CL = the net loss of the interconnecting cable between the receive antenna and the EMI receiver or spectrum analyzer including any preamplification included in the path. A negative cable loss indicates a net gain.

The margins reported in the tables are given by the equation:

$$Margin_{dB} = Limit_{dB(\mu V/m)} - Amplitude_{dB(\mu V/m)}$$

The radiated spurious emissions are measured at the highest and lowest power settings of the EUT. For measurements in the frequency range 30 MHz – 1000 MHz, the frequency hopping function of the EUT was enabled. For measurements in the frequency range 1 GHz – 10 GHz, the frequency hopping function was enabled for the lowest power setting of the EUT. During the measurements at the highest power setting, the frequency hopping function was disabled and three sets of measurements were performed with the EUT set to the lowest, middle and highest channels.

Results for Radiated Spurious Emissions: The results for the radiated spurious emissions over the frequency range 30 MHz – 1000 MHz are shown in Figures 35 and 36 for the idle or standby mode. For the transmitting mode, the results for the lowest power setting are found in Figures 37 and 38 and the results for the highest power setting are found in Figures 39 and 40.

The highest emissions over the frequency range 1 GHz – 10 GHz are found in Tables 6 - 10. The highest emissions for the idle or standby mode are found in Table 6. The highest emissions with the EUT set to the transmit mode with the highest power setting and at the lowest, middle and highest channels are found in Tables 7 - 9, respectively. The emissions for the EUT set to the transmit mode with the lowest power setting and frequency hopping enabled are found in Table 10.

This data indicates that the EUT meets the requirements for radiated spurious emissions.

Figure 31. Test setup for radiated spurious emissions 30 MHz – 1000 MHz; front view.

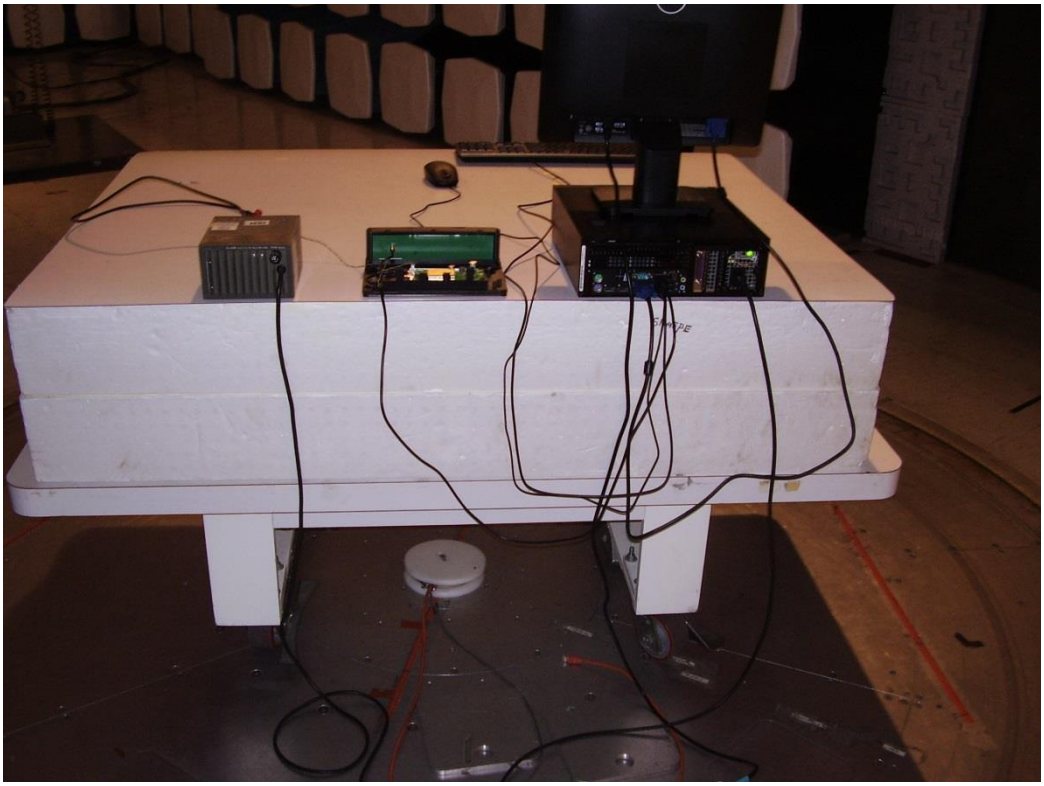


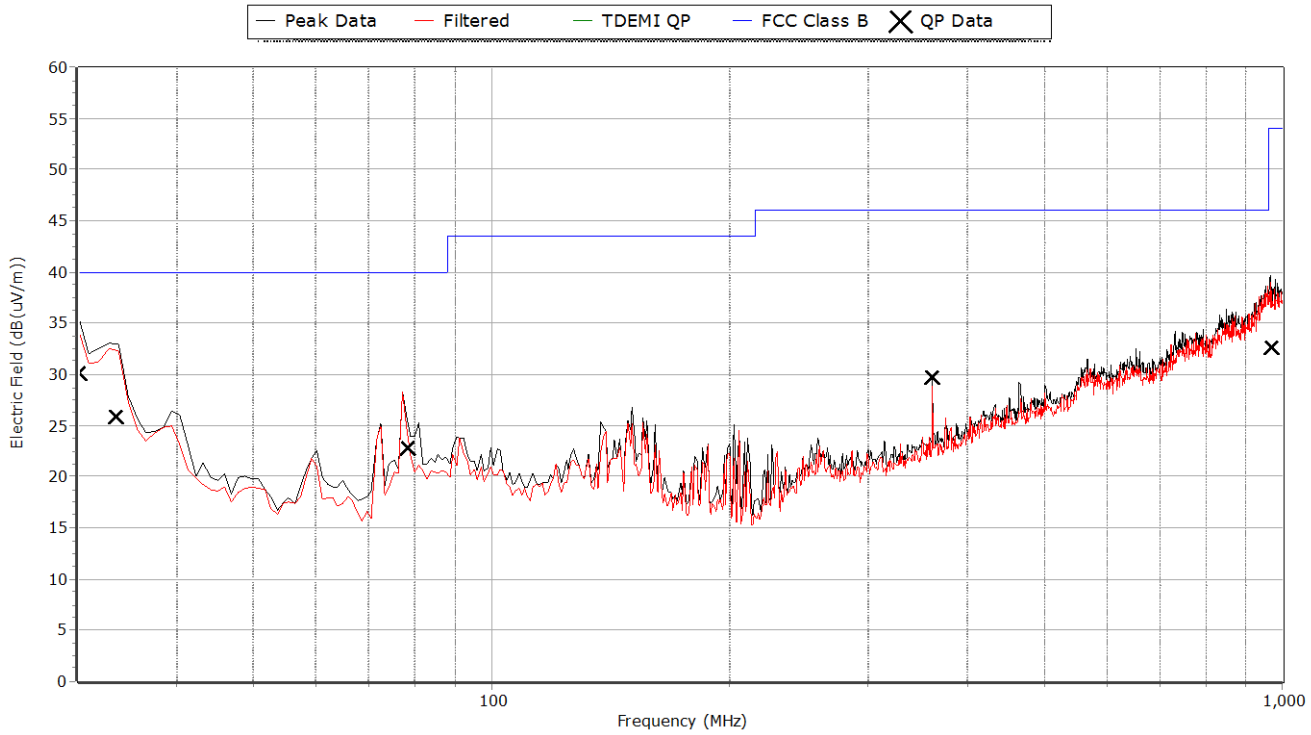
Figure 32. Test setup for radiated spurious emissions 30 MHz – 1000 MHz; rear view.

Figure 33. Test setup for radiated spurious emissions 1 GHz – 10 GHz; front view.

Figure 34. Test setup for radiated spurious emissions 1 GHz – 10 GHz; rear view.

Radiated Project: Redstone
Date and Time: 7/19/2016 3:03:03 PM
Temperature: 71.2F
Polarization: Vertical
Product Name: Redstone
EUT Line Voltage: 110V/60Hz
Measurement Filter Used: None
Mode: Standby
Test Setup: PC #1053, LCD #1035, PC on right
HP 6216A power supply
24VDC, 30 dBm power setting
LCD turned off
Additional Information:

Run Number: 7
Tested By: JTF
Relative Humidity: 55.1%
Measurement Distance: 3 meters
Serial Number: 001
Frequency Range: Full

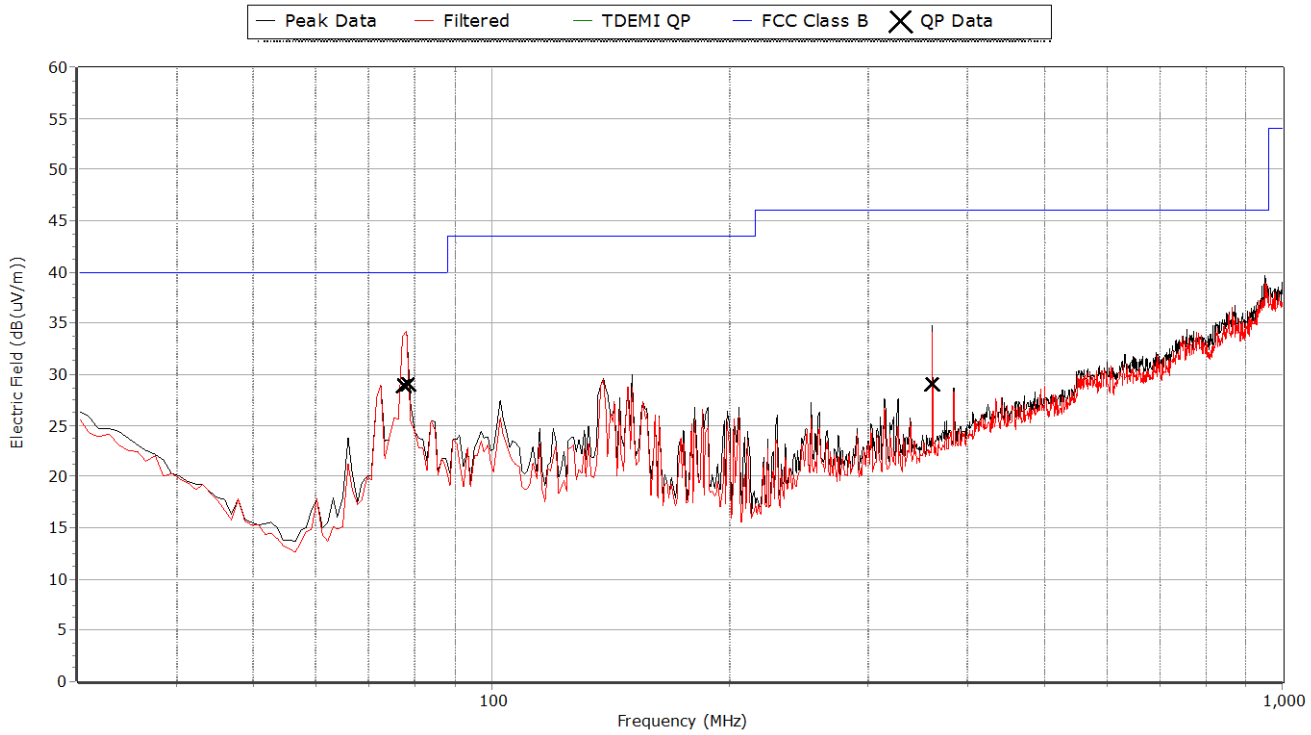


Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
30.176	V3	-13.305	18.903	QP	1	63	40	30.086	9.914
33.456	V3	-13.277	17.099	QP	1	197	40	25.924	14.076
78.433	V3	-12.686	7.265	QP	3.3	125	40	22.819	17.181
360.407	V3	-10.635	14.72	QP	1.6	107	46	29.727	16.273
968.974	V3	-6.75	24.851	QP	1	358	54	32.673	21.327

Figure 35. Radiated spurious emissions 30 – 1000 MHz; idle; vertical polarization.

Radiated Project: Redstone
Date and Time: 7/19/2016 3:19:41 PM
Temperature: 71.2F
Polarization: Horizontal
Product Name: Redstone
EUT Line Voltage: 110V/60Hz
Measurement Filter Used: None
Mode: Standby
Test Setup: PC #1053, LCD #1035, PC on right
HP 6216A power supply
24VDC, 30 dBm power setting
LCD turned off
Additional Information:

Run Number: 8
Tested By: JTF
Relative Humidity: 55.1%
Measurement Distance: 3 meters
Serial Number: 001
Frequency Range: Full

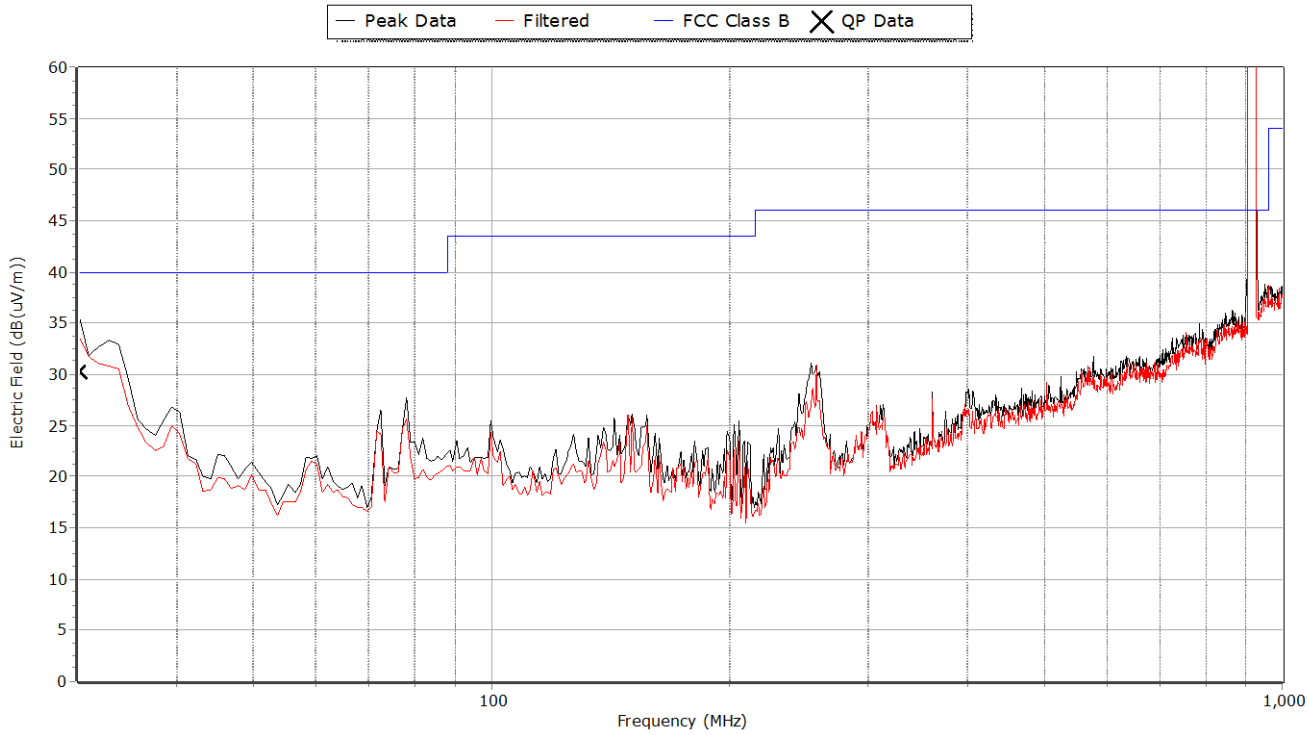


Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
77.482	H3	-12.706	7.122	QP	4	208	40	28.882	11.118
78.414	H3	-12.687	7.262	QP	2.4	192	40	29.008	10.992
360.377	H3	-10.634	14.719	QP	3.3	87	46	29.058	16.942

Figure 36. Radiated spurious emissions 30 – 1000 MHz; idle; horizontal polarization.

Radiated Project: Redstone
Date and Time: 7/19/2016 5:53:14 PM
Temperature: 71.2F
Polarization: Vertical
Product Name: Redstone
EUT Line Voltage: 110V/60Hz
Measurement Filter Used: None
Mode: Transmit w/ tag
Test Setup: PC #1053, LCD #1035, PC on right
HP 6216A power supply
24VDC, 5 dBm power setting
LCD turned off
Additional Information:

Run Number: 13
Tested By: JTF
Relative Humidity: 55.1%
Measurement Distance: 3 meters
Serial Number: 001
Frequency Range: Full

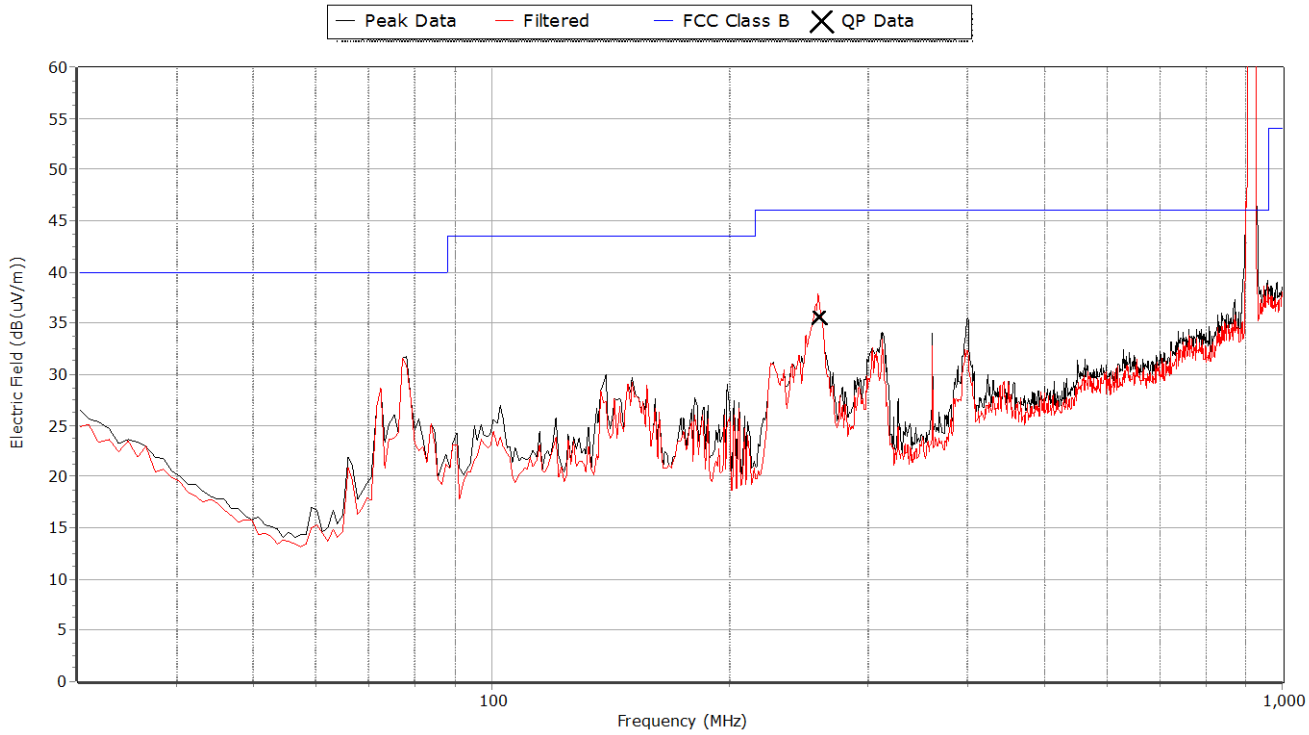


Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
30.146	V3	-13.305	18.92	QP	1	109	40	30.316	9.684

Figure 37. Radiated spurious emissions 30 – 1000 MHz; transmitting; vertical polarization; lowest power setting.

Radiated Project: Redstone
Date and Time: 7/19/2016 6:04:22 PM
Temperature: 71.2F
Polarization: Horizontal
Product Name: Redstone
EUT Line Voltage: 110V/60Hz
Measurement Filter Used: None
Mode: Transmit w/ tag
Test Setup: PC #1053, LCD #1035, PC on right
HP 6216A power supply
24VDC, 5 dBm power setting
LCD turned off
Additional Information:

Run Number: 14
Tested By: JTF
Relative Humidity: 55.1%
Measurement Distance: 3 meters
Serial Number: 001
Frequency Range: Full

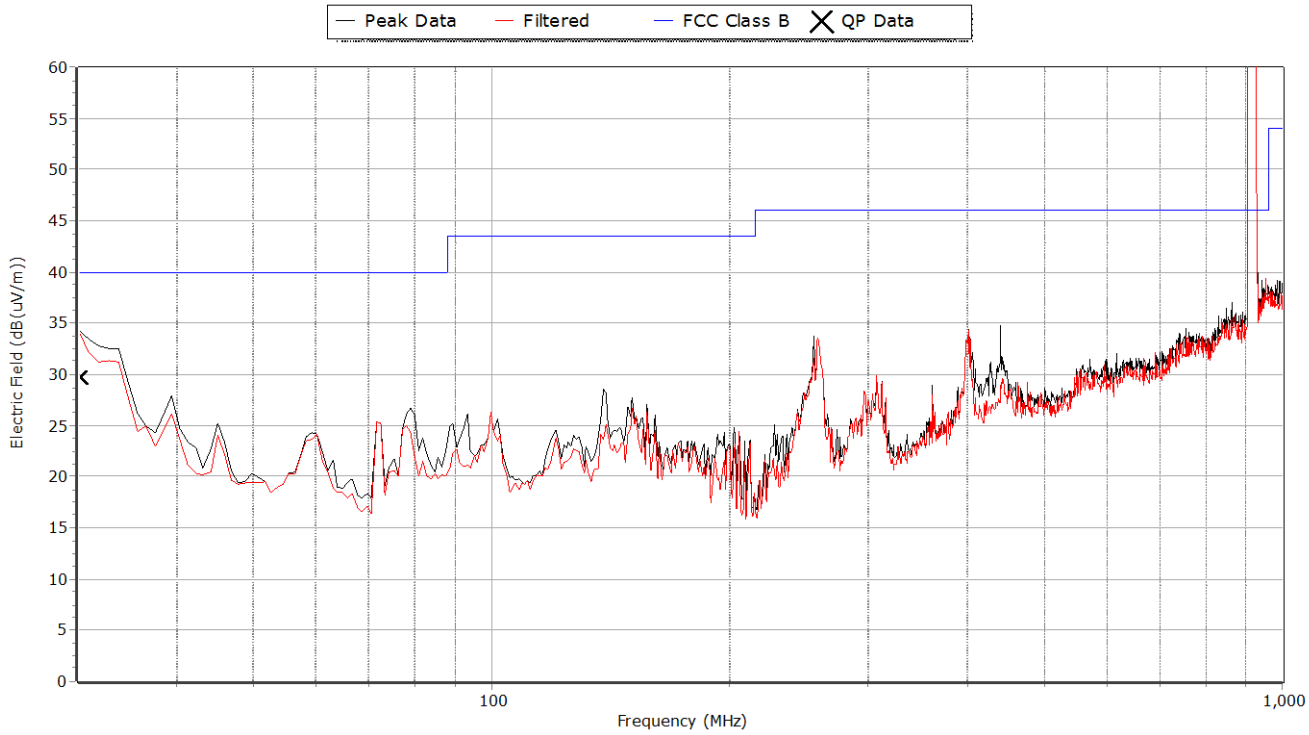


Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
259.699	H3	-11.131	14.155	QP	1.1	358	46	35.584	10.416

Figure 38. Radiated spurious emissions 30 – 1000 MHz; transmitting; horizontal polarization; lowest power setting.

Radiated Project: Redstone
Date and Time: 7/19/2016 6:14:44 PM
Temperature: 71.2F
Polarization: Vertical
Product Name: Redstone
EUT Line Voltage: 110V/60Hz
Measurement Filter Used: None
Mode: Transmit w/ tag
Test Setup: PC #1053, LCD #1035, PC on right
HP 6216A power supply
24VDC, 30 dBm power setting
LCD turned off
Additional Information:

Run Number: 15
Tested By: JTF
Relative Humidity: 55.1%
Measurement Distance: 3 meters
Serial Number: 001
Frequency Range: Full



Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
30.266	V3	-13.306	18.854	QP	1	167	40	29.755	10.245

Figure 39. Radiated spurious emissions 30 – 1000 MHz; transmitting; vertical polarization; highest power setting.

Radiated Project: Redstone
Date and Time: 7/19/2016 6:26:00 PM
Temperature: 71.2F
Polarization: Horizontal
Product Name: Redstone
EUT Line Voltage: 110V/60Hz
Measurement Filter Used: None
Mode: Transmit w/ tag
Test Setup: PC #1053, LCD #1035, PC on right
HP 6216A power supply
24VDC, 30 dBm power setting
LCD turned off
Additional Information:

Run Number: 16
Tested By: JTF
Relative Humidity: 55.1%
Measurement Distance: 3 meters
Serial Number: 001
Frequency Range: Full

Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
258.835	H3	-11.165	14.025	QP	1	330	46	39.386	6.614

Figure 40. Radiated spurious emissions 30 – 1000 MHz; transmitting; horizontal polarization; highest power setting.

Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
1039.575	V3	-27.646	27.067	PK	1	143	74	38.774	35.226
1039.575	V3	-27.646	27.067	AVG	1	143	54	21.237	32.76
1119.846	H3	-27.306	27.413	PK	1.5	99	74	37.479	36.521
1119.846	H3	-27.306	27.413	AVG	1.5	99	54	21.069	32.93
1199.675	V3	-26.943	28.317	PK	1.2	234	74	47.735	26.265
1199.675	V3	-26.943	28.317	AVG	1.2	234	54	26.522	27.48
1577.735	V3	-25.128	28.3	PK	1.9	264	74	41.308	32.692
1577.735	V3	-25.128	28.3	AVG	1.9	264	54	23.54	30.46
1616.372	H3	-24.954	28.45	PK	1.4	136	74	41.125	32.875
1616.372	H3	-24.954	28.45	AVG	1.4	136	54	23.583	30.42
3983.497	V3	-21.188	33.419	PK	1.5	154	74	45.525	28.475
3983.497	V3	-21.188	33.419	AVG	1.5	154	54	28.494	25.51

Table 6. Radiated spurious emissions 1 GHz – 10 GHz; standby mode.

Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
1805.5	H3	-22.972	30.175	PK	1	63	74	53.082	20.918
1805.5	H3	-22.972	30.175	AVG	1	63	54	49.651	4.35
1805.5	V3	-22.972	30.175	PK	2.9	23	74	54.789	19.211
1805.5	V3	-22.972	30.175	AVG	2.9	23	54	51.447	2.55
2708.25	H3	-22.116	32.211	PK	3.2	48	74	46.828	27.172
2708.25	H3	-22.116	32.211	AVG	3.2	48	54	39.681	14.32
2708.25	V3	-22.116	32.211	PK	2.1	74	74	52.343	21.657
2708.25	V3	-22.116	32.211	AVG	2.1	74	54	48.149	5.85
3611	H3	-19.716	33.036	PK	2.9	84	74	48.915	25.085
3611	H3	-19.716	33.036	AVG	2.9	84	54	41.765	12.24
3611	V3	-19.716	33.036	PK	3.2	121	74	51.937	22.063
3611	V3	-19.716	33.036	AVG	3.2	121	54	46.64	7.36
4513.75	H3	-18.869	33.84	PK	3.4	24	74	47.584	26.416
4513.75	H3	-18.869	33.84	AVG	3.4	24	54	38.761	15.24
4513.75	V3	-18.869	33.84	PK	3.3	110	74	52.472	21.528
4513.75	V3	-18.869	33.84	AVG	3.3	110	54	47.021	6.98
5416.5	V3	-19.36	34.367	PK	1	117	74	56.628	17.372
5416.5	V3	-19.36	34.367	AVG	1	117	54	52.446	1.55
6319.25	V3	-18.713	35.51	PK	1	112	74	55.653	18.347
6319.25	V3	-18.713	35.51	AVG	1	112	54	51.091	2.91

Table 7. Radiated spurious emissions 1 GHz – 10 GHz; transmit mode, highest output power, lowest channel.

Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
1830.5	H3	-22.979	30.408	PK	1.4	71	74	50.711	23.289
1830.5	H3	-22.979	30.408	AVG	1.4	71	54	46.24	7.76
1830.5	V3	-22.979	30.408	PK	1	151	74	51.082	22.918
1830.5	V3	-22.979	30.408	AVG	1	151	54	46.923	7.08
2745.75	H3	-22.005	32.25	PK	2.2	61	74	47.105	26.895
2745.75	H3	-22.005	32.25	AVG	2.2	61	54	40.351	13.65
2745.75	V3	-22.005	32.25	PK	2.4	75	74	51.495	22.505
2745.75	V3	-22.005	32.25	AVG	2.4	75	54	47.226	6.77
3661	H3	-19.636	33.133	PK	1.2	1	74	47.31	26.69
3661	H3	-19.636	33.133	AVG	1.2	1	54	40.017	13.98
3661	V3	-19.636	33.133	PK	3.1	117	74	51.994	22.006
3661	V3	-19.636	33.133	AVG	3.1	117	54	46.868	7.13
4576.25	V3	-18.848	33.974	PK	3.4	87	74	52.882	21.118
4576.25	V3	-18.848	33.974	AVG	3.4	87	54	47.011	6.99
4576.325	H3	-18.848	33.974	PK	3.2	136	74	47.46	26.54
4576.325	H3	-18.848	33.974	AVG	3.2	136	54	38.162	15.84
5491.5	V3	-19.396	34.373	PK	3.7	119	74	54.205	19.795
5491.5	V3	-19.396	34.373	AVG	3.7	119	54	48.872	5.13
6406.75	V3	-18.616	35.475	PK	1.3	123	74	53.849	20.151
6406.75	V3	-18.616	35.475	AVG	1.3	123	54	49.019	4.98

Table 8. Radiated spurious emissions 1 GHz – 10 GHz; transmit mode, highest output power, middle channel.

Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
1854.5	H3	-22.985	30.631	PK	3.7	52	74	52.432	21.568
1854.5	H3	-22.985	30.631	AVG	3.7	52	54	47.993	6.01
1854.5	V3	-22.985	30.631	PK	2.8	106	74	51.923	22.077
1854.5	V3	-22.985	30.631	AVG	2.8	106	54	47.736	6.26
2781.75	H3	-21.91	32.286	PK	2.5	59	74	47.109	26.891
2781.75	H3	-21.91	32.286	AVG	2.5	59	54	40.527	13.47
2781.75	V3	-21.91	32.286	PK	1	72	74	51.627	22.373
2781.75	V3	-21.91	32.286	AVG	1	72	54	47.108	6.89
3709	H3	-19.607	33.221	PK	3.2	131	74	49.209	24.791
3709	H3	-19.607	33.221	AVG	3.2	131	54	43.228	10.77
3709	V3	-19.607	33.221	PK	1	113	74	50.987	23.013
3709	V3	-19.607	33.221	AVG	1	113	54	45.662	8.34
4636.25	H3	-18.87	34.036	PK	1.4	89	74	47.499	26.501
4636.25	H3	-18.87	34.036	AVG	1.4	89	54	37.937	16.06
4636.25	V3	-18.87	34.036	PK	2.5	97	74	51.77	22.23
4636.25	V3	-18.87	34.036	AVG	2.5	97	54	46.591	7.41
5563.5	V3	-19.367	34.415	PK	1.8	124	74	52.677	21.323
5563.5	V3	-19.367	34.415	AVG	1.8	124	54	46.797	7.2
6490.75	V3	-18.421	35.547	PK	2.8	110	74	54.371	19.629
6490.75	V3	-18.421	35.547	AVG	2.8	110	54	49.695	4.31
7418	H3	-15.571	35.588	PK	2.6	41	74	53.426	20.574
7418	H3	-15.571	35.588	AVG	2.6	41	54	42.878	11.12
7418	V3	-15.571	35.588	PK	3.7	68	74	55.481	18.519
7418	V3	-15.571	35.588	AVG	3.7	68	54	47.262	6.74
8345.25	V3	-12.844	35.783	PK	1.5	237	74	54.182	19.818
8345.25	V3	-12.844	35.783	AVG	1.5	237	54	40.341	13.66

Table 9. Radiated spurious emissions 1 GHz – 10 GHz; transmit mode, highest output power, highest channel.

Frequency (MHz)	Polarity	Cable Loss (dB)	Antenna Factor (dB(1/m))	Detector	Max Height (meters)	Max Angle (Deg)	Limit (dB(uV/m))	Amplitude (dB(uV/m))	Margin (dB)
1830.5	H3	-22.979	30.408	PK	1.2	114	74	40.319	33.681
1830.5	H3	-22.979	30.408	AVG	1.2	114	54	26.376	27.62
1830.5	V3	-22.979	30.408	PK	2.1	253	74	40.723	33.277
1830.5	V3	-22.979	30.408	AVG	2.1	253	54	27.051	26.95
2745.75	H3	-22.005	32.25	PK	1	91	74	40.73	33.27
2745.75	H3	-22.005	32.25	AVG	1	91	54	27.743	26.26
2745.75	V3	-22.005	32.25	PK	1	68	74	42.167	31.833
2745.75	V3	-22.005	32.25	AVG	1	68	54	28.021	25.98

Table 10. Radiated spurious emissions 1 GHz – 10 GHz; transmit mode, lowest output power, frequency hopping on.

8.8 AC CONDUCTED EMISSIONS

Criteria for AC Conducted Emissions: The EUT emissions conducted onto the AC mains shall meet the limits specified in the following table.

Frequency range MHz	Limits dB(µV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50
NOTE 1 The lower limit shall apply at the transition frequencies. NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

Test Procedure for AC Conducted Emissions: The conformance test for this requirement is given in clause 6.2 of [4].

The test setup for AC conducted emissions is shown in Figure 41. Since the EUT itself does not include a power supply which connects directly to the AC mains, conducted emissions on the AC mains of both the external DC power supply and the personal computer used to control the EUT were measured.

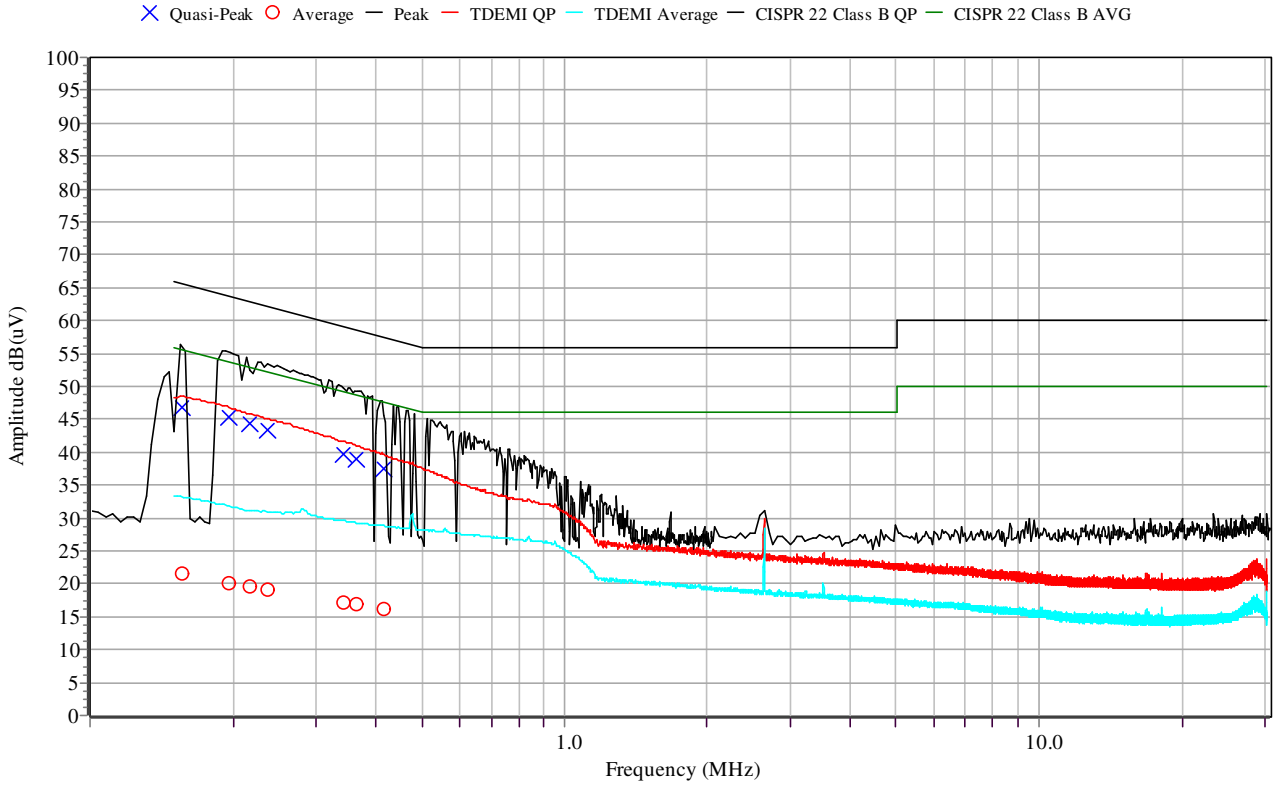
The EUT was placed on a non-conducting table with a height of 80 cm. A vertical conducting plane (wall of shielded room) was located 40 cm behind the table.

Results for AC Conducted Emissions: AC conducted emissions were measured with the EUT in both the idle and transmitting mode with frequency hopping enabled. The results for the emissions measured on the AC mains of the external power supply are found in Figures 42 - 45 and in Figures 46 – 49 for the emissions measured on the AC mains of the personal computer.

These results indicate that the EUT meets the requirements for AC conducted emissions.

Figure 41. Test setup for AC conducted emissions.

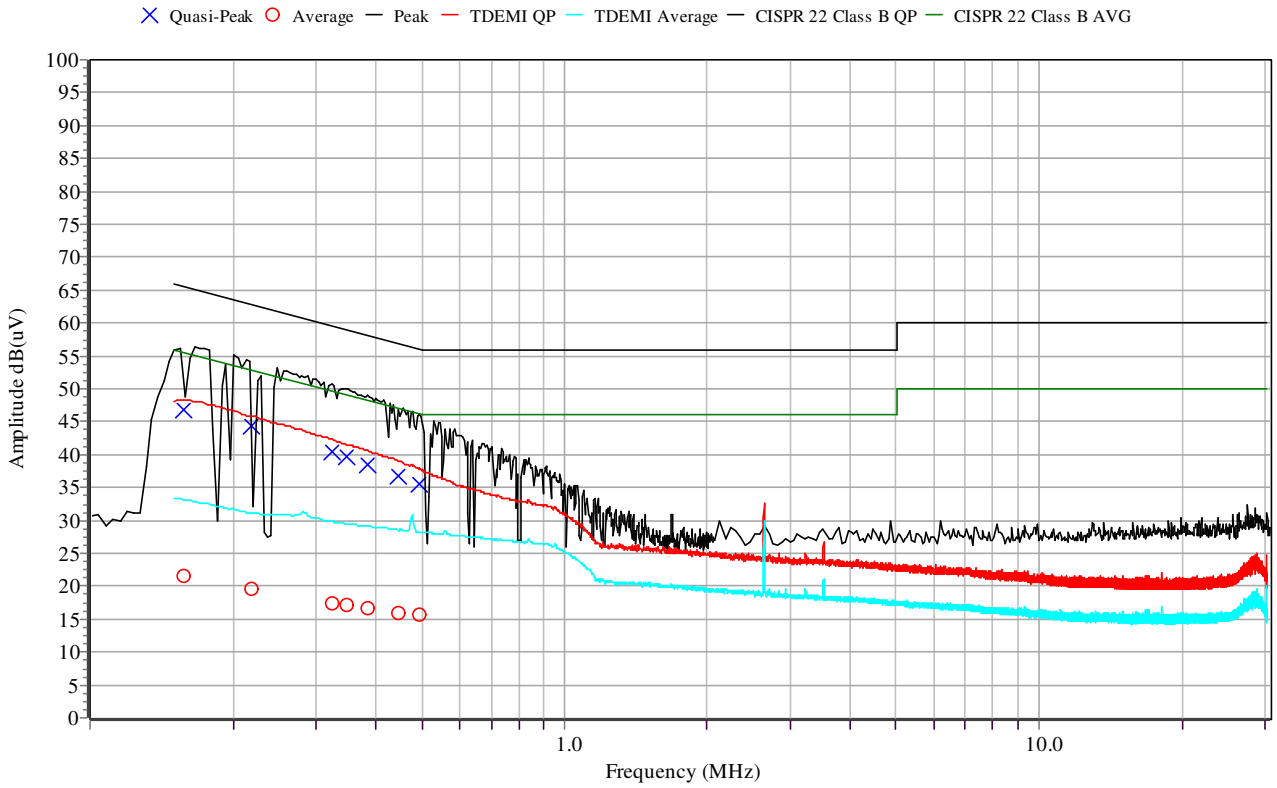
Project: Redstone RFID
6/15/2016 2:49:13 PM
Temperature: 75.7F
Product Name: Redstone RFID
Mode: Idle
Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001
Run Number: 3
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Phase
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
Power supply plugged into EUT LISN
25 dBm power output
Additional Information:



Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.157	Phase	17.023	46.83	65.63	18.80	21.58	55.63	34.05
.196	Phase	16.526	45.25	63.78	18.53	20.20	53.78	33.58
.216	Phase	16.263	44.26	62.95	18.69	19.53	52.95	33.42
.237	Phase	16.149	43.44	62.21	18.77	19.03	52.21	33.18
.341	Phase	16.079	39.79	59.18	19.39	17.11	49.18	32.07
.365	Phase	16.072	39.09	58.62	19.53	16.79	48.62	31.83
.414	Phase	16.07	37.61	57.57	19.96	16.17	47.57	31.40
0.288*	Phase	26.099	43.31	60.59	17.28	30.73	50.59	19.86
0.477*	Phase	26.070	38.44	56.39	17.95	30.71	46.39	15.68
0.559*	Phase	26.075	36.29	56	19.71	28.34	46	17.66

Figure 42. Results for AC conducted emissions; power supply emissions; idle; phase conductor.

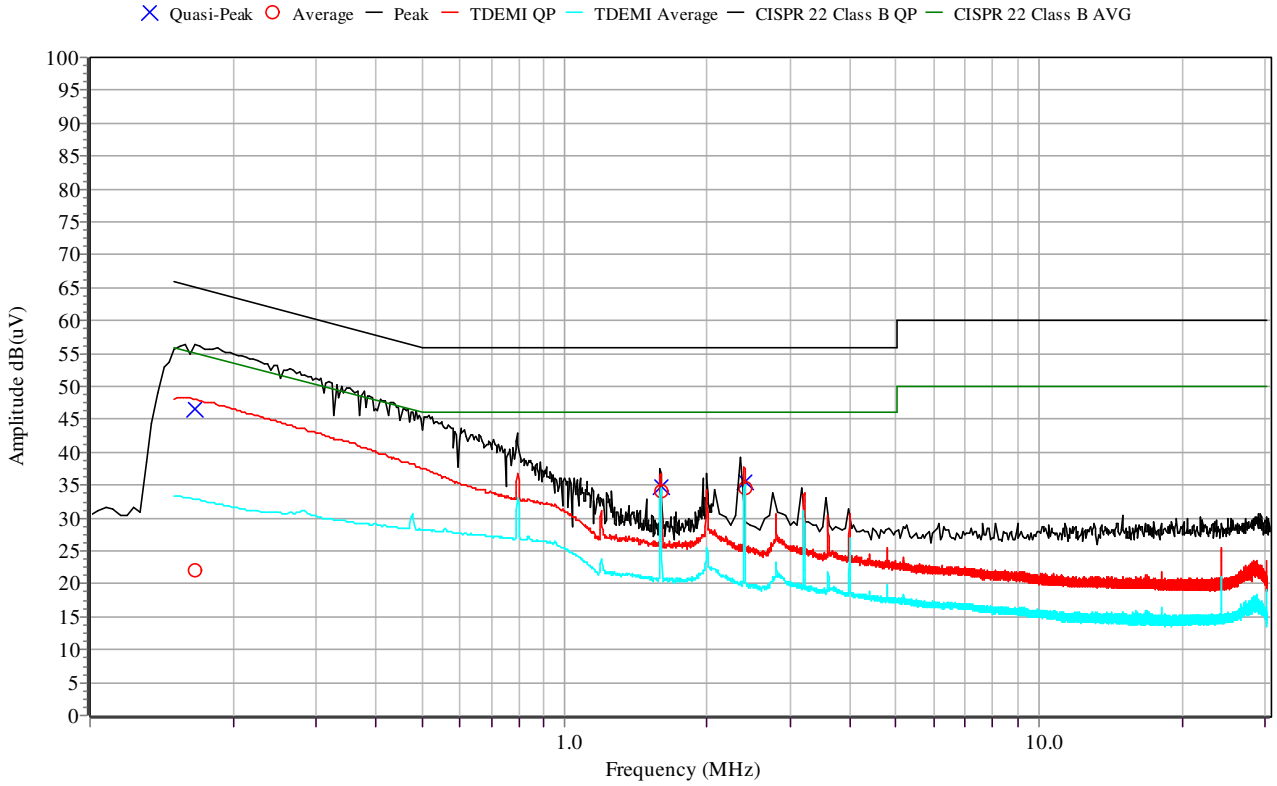
Project: Redstone RFID
6/15/2016 3:00:28 PM
Temperature: 75.7F
Product Name: Redstone RFID
Mode: Idle
Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001
Run Number: 4
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Neutral
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
Power supply plugged into EUT LISN
25 dBm power output
Additional Information:



Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.158	Neutral	17.053	46.85	65.59	18.74	21.62	55.59	33.97
.219	Neutral	16.277	44.27	62.87	18.60	19.49	52.87	33.38
.323	Neutral	16.114	40.43	59.64	19.21	17.39	49.64	32.25
.346	Neutral	16.107	39.69	59.05	19.36	17.06	49.05	31.99
.384	Neutral	16.1	38.54	58.2	19.66	16.56	48.2	31.64
.447	Neutral	16.1	36.81	56.93	20.12	15.91	46.93	31.02
.495	Neutral	16.094	35.56	56.08	20.52	15.58	46.08	30.50
0.271*	Neutral	26.147	43.93	61.1	17.17	30.78	51.1	20.32
0.559*	Neutral	26.104	36.30	56	19.70	28.41	46	17.59
2.628*	Neutral	26.192	32.55	56	23.45	29.79	46	16.21

Figure 43. Results for AC conducted emissions; power supply emissions; idle; neutral conductor.

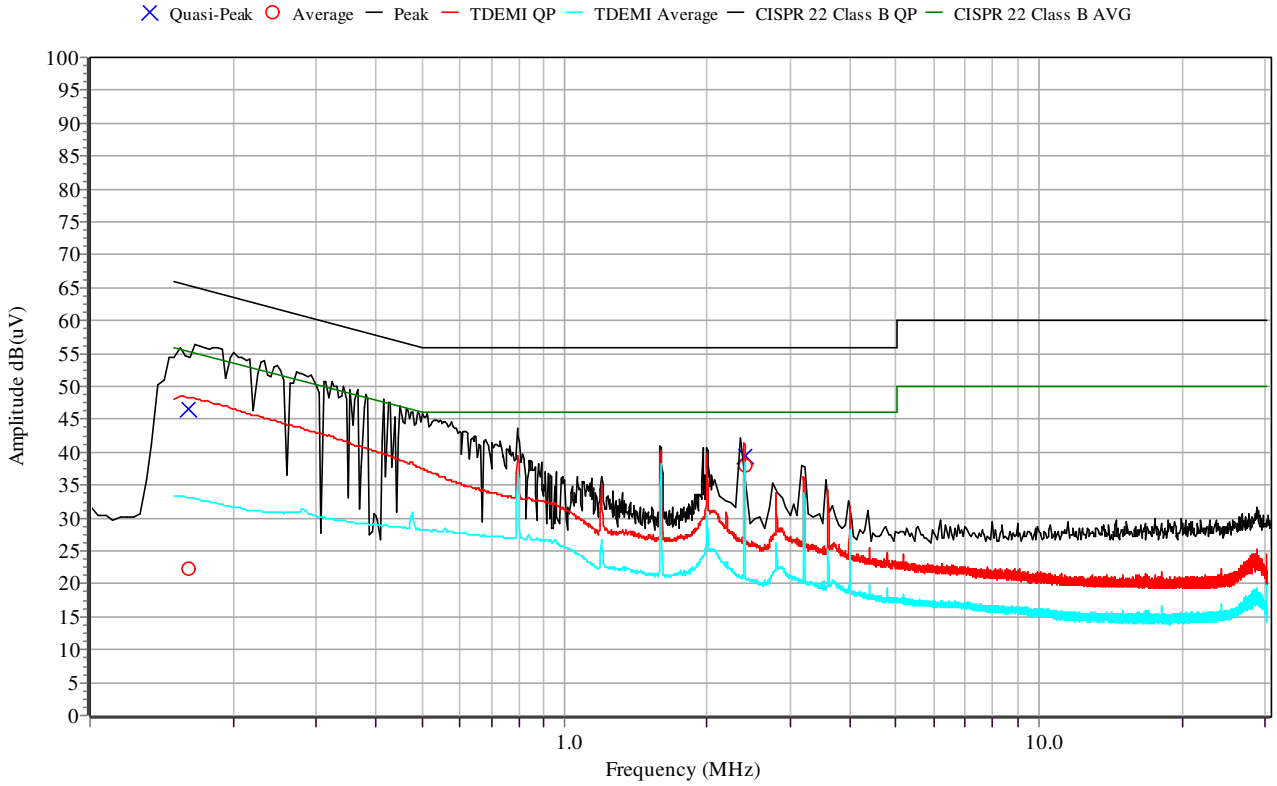
Project: Redstone RFID
6/15/2016 2:35:30 PM
Temperature: 75.7F
Product Name: Redstone RFID
Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001
Run Number: 1
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Phase
Mode: Transmitting with hopping turned on
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
Power supply plugged into EUT LISN
25 dBm power output
Additional Information:



Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.166	Phase	16.906	46.47	65.16	18.69	22.02	55.16	33.14
1.594	Phase	16.094	34.85	56	21.15	34.13	46	11.87
2.392	Phase	16.11	35.60	56	20.40	34.46	46	11.54

Figure 44. Results for AC conducted emissions; power supply emissions; transmitting; phase conductor.

Project: Redstone RFID
6/15/2016 2:41:39 PM
Temperature: 75.7F
Product Name: Redstone RFID
Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001
Run Number: 2
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Neutral
Mode: Transmitting with hopping turned on
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
Power supply plugged into EUT LISN
25 dBm power output
Additional Information:



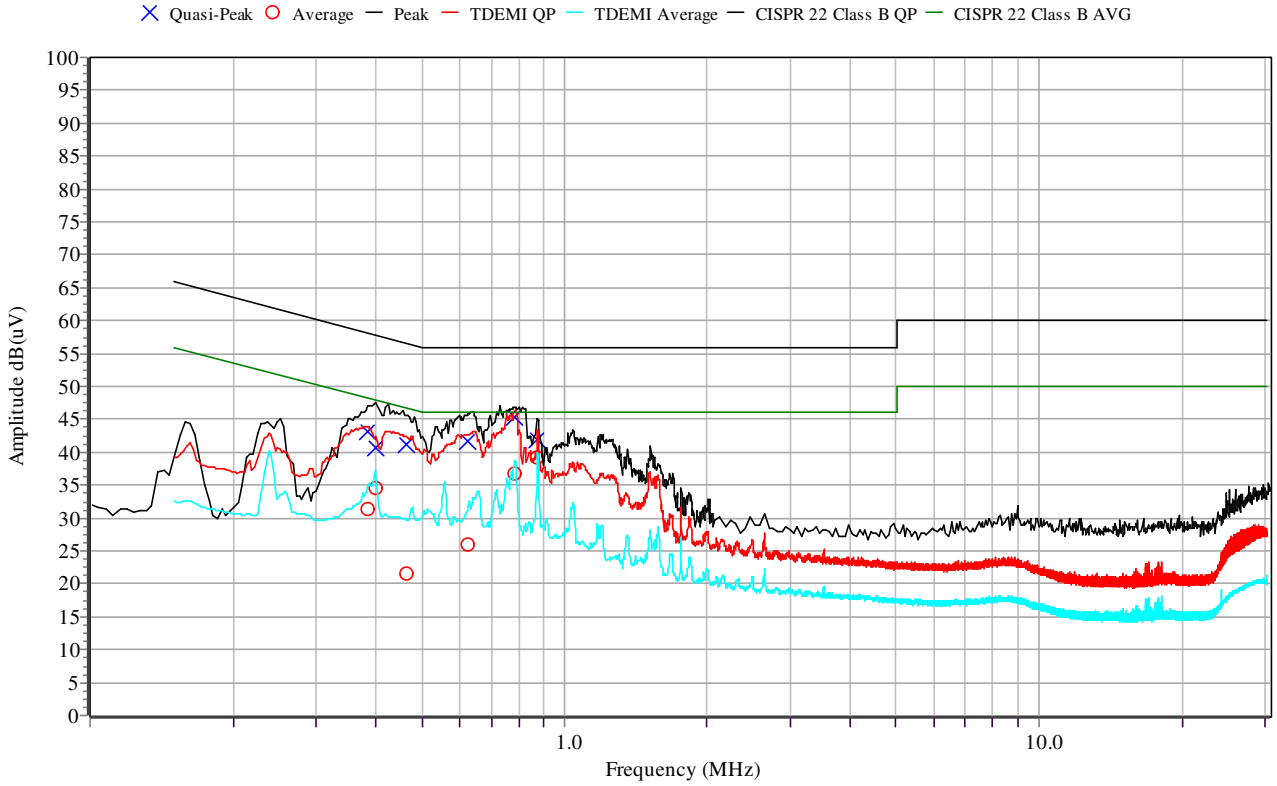
Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.161	Neutral	17.01	46.68	65.41	18.73	22.21	55.41	33.20
2.392	Neutral	16.18	39.58	56	16.42	38.03	46	7.97

Figure 45. Results for AC conducted emissions; power supply emissions; transmitting; neutral conductor.

Project: Redstone RFID
6/15/2016 3:16:18 PM
Temperature: 75.7F
Product Name: Redstone RFID
Mode: Idle
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
PC plugged into EUT LISN
25 dBm power output
Additional Information:

Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001

Run Number: 5
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Phase



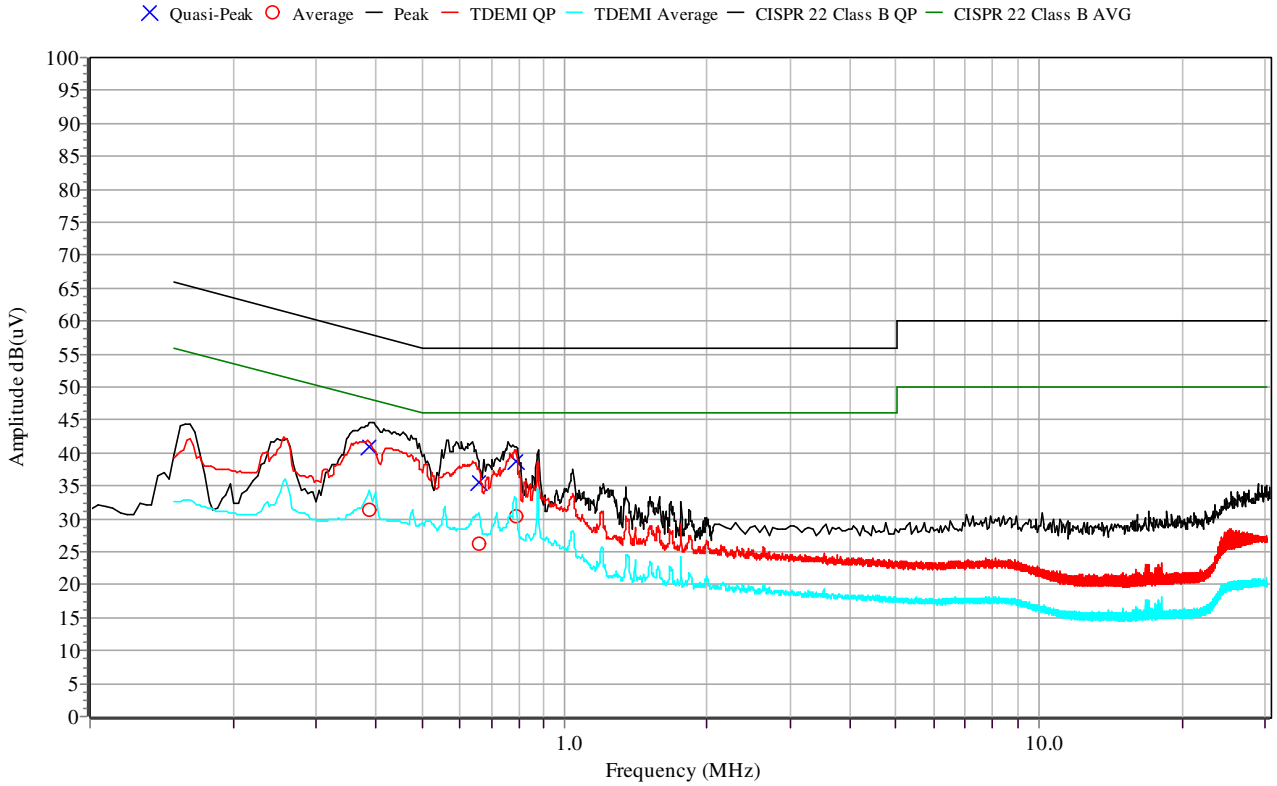
Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.384	Phase	16.07	43.14	58.18	15.04	31.47	48.18	16.71
.4	Phase	16.07	40.60	57.86	17.26	34.54	47.86	13.32
.464	Phase	16.07	41.29	56.62	15.33	21.62	46.62	25.00
.626	Phase	16.08	41.57	56	14.43	25.87	46	20.13
.785	Phase	16.085	45.33	56	10.67	36.89	46	9.11
.877	Phase	16.075	41.87	56	14.13	39.22	46	6.78
0.239*	Phase	26.139	42.89	62.15	19.26	40.31	52.15	11.83
0.559*	Phase	26.075	40.69	56	15.31	35.49	46	10.51
0.714*	Phase	26.081	42.32	56	13.68	33.74	46	12.26
1.041*	Phase	26.071	38.37	56	17.63	32.34	46	13.66

Figure 46. Results for AC conducted emissions; PC emissions; idle; phase conductor.

Project: Redstone RFID
6/15/2016 3:26:09 PM
Temperature: 75.7F
Product Name: Redstone RFID
Mode: Idle
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
PC plugged into EUT LISN
25 dBm power output
Additional Information:

Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001

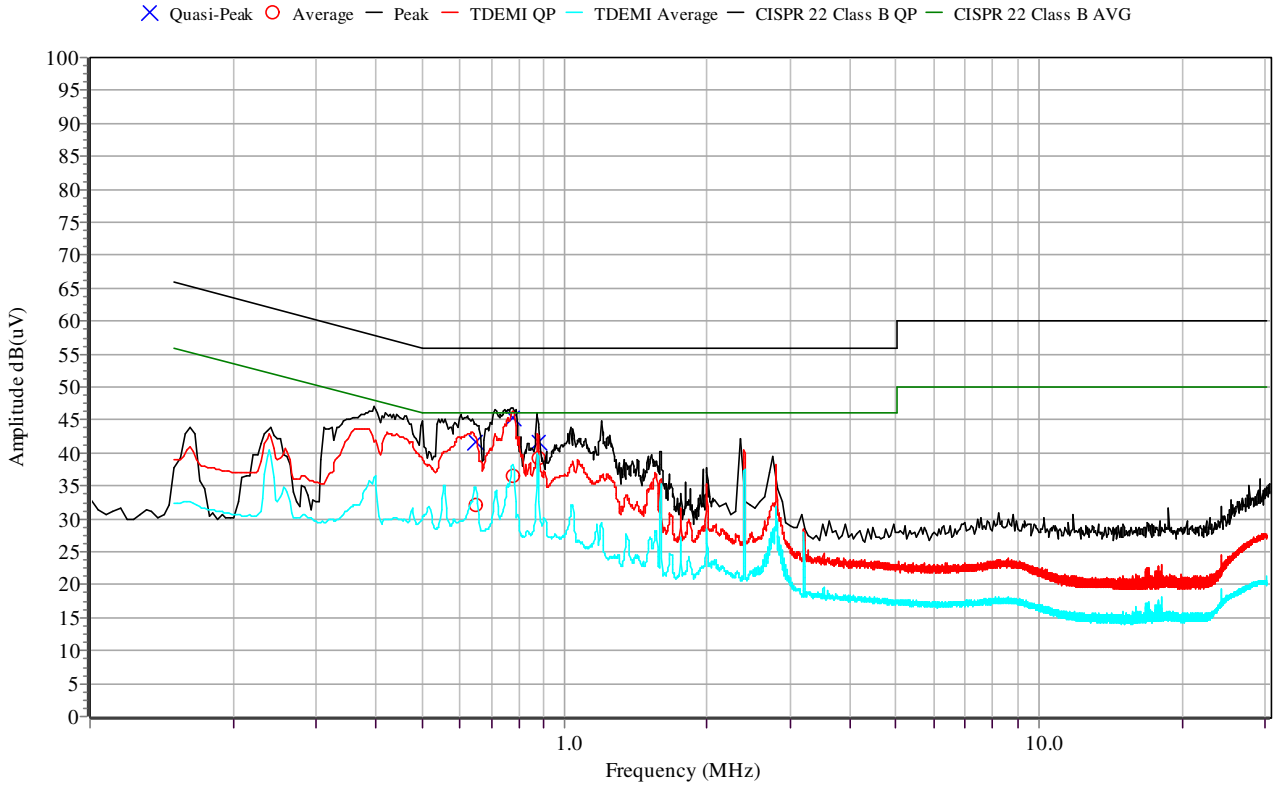
Run Number: 6
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Neutral



Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.389	Neutral	16.1	40.86	58.1	17.24	31.34	48.1	16.76
.658	Neutral	16.12	35.56	56	20.44	26.35	46	19.65
.786	Neutral	16.111	38.62	56	17.38	30.30	46	15.70

Figure 47. Results for AC conducted emissions; PC emissions; idle; neutral conductor.

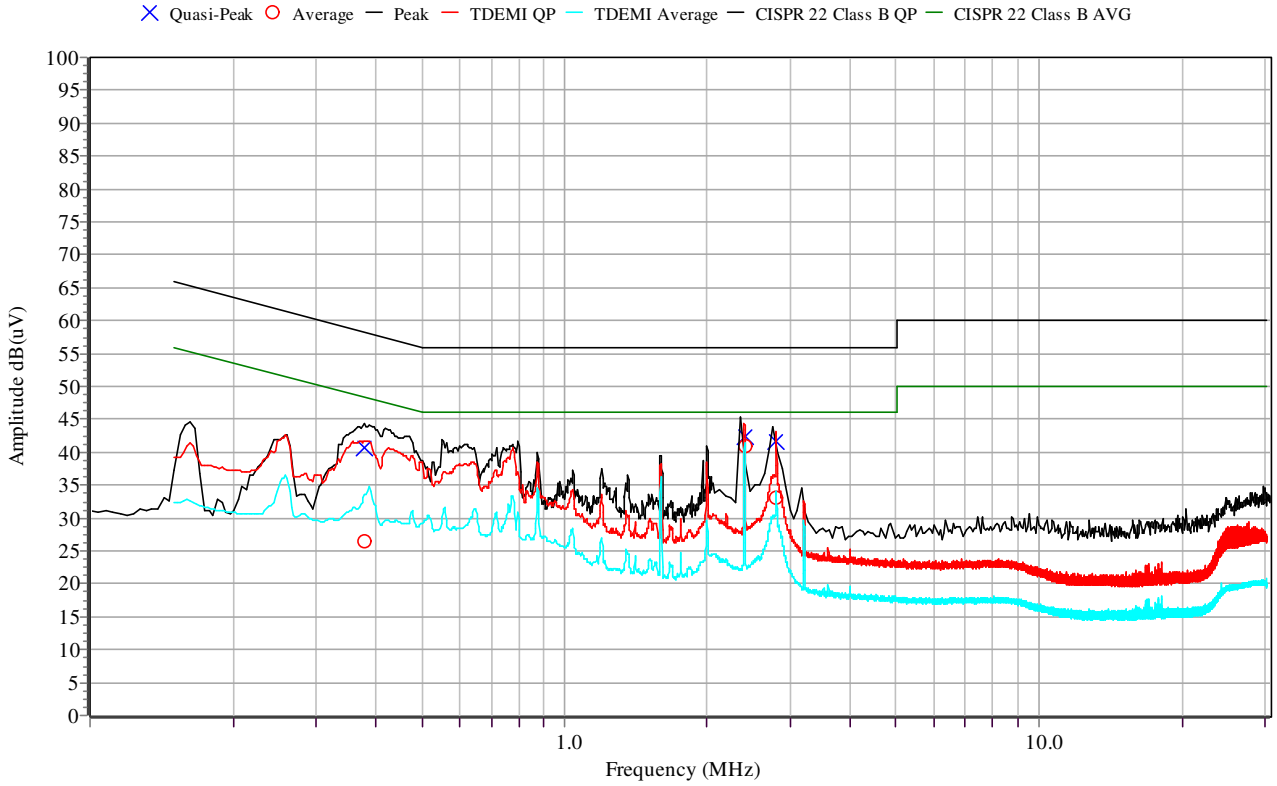
Project: Redstone RFID
6/15/2016 3:32:00 PM
Temperature: 75.7F
Product Name: Redstone RFID
Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001
Run Number: 7
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Phase
Mode: Transmitting with hopping turned on
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
PC plugged into EUT LISN
25 dBm power output
Additional Information:



Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.647	Phase	16.08	41.55	56	14.45	32.11	46	13.89
.779	Phase	16.084	45.27	56	10.73	36.61	46	9.39
.877	Phase	16.075	41.67	56	14.33	39.14	46	6.86
0.239*	Phase	26.139	42.88	62.15	19.26	40.49	52.15	11.65
0.399*	Phase	26.063	41.85	57.88	16.03	36.52	47.88	11.37
0.556*	Phase	26.074	40.25	56	15.75	35.13	46	10.87
1.038*	Phase	26.071	38.54	56	17.46	32.13	46	13.87
1.595*	Phase	26.097	35.99	56	20.01	35.21	46	10.79
2.389*	Phase	26.110	40.03	56	15.97	37.41	46	8.59
2.788*	Phase	26.134	36.94	56	19.06	31.83	46	14.17

Figure 48. Results for AC conducted emissions; PC emissions; transmitting; phase conductor.

Project: Redstone RFID
6/15/2016 3:43:24 PM
Temperature: 75.7F
Product Name: Redstone RFID
Station: Conducted 1
Frequency Range: Full
Relative Humidity: 51.4%
Serial Number: 001
Run Number: 8
Tested By: JTF
EUT Line Voltage: 110V-60Hz
Neutral
Mode: Transmitting with hopping turned on
Test Setup: PC #1053, LCD #1039, EUT on right
DC power supply = HP 6216A
PC plugged into EUT LISN
25 dBm power output
Additional Information:



Freq (MHz)	Test Type	Factor (dB)	QP Amp (dBuV)	QP Limit (dBuV)	Margin QP (dB)	Avg Amp (dBuV)	Avg Limit (dBuV)	Margin Avg (dB)
.38	Neutral	16.1	40.78	58.29	17.51	26.47	48.29	21.82
2.393	Neutral	16.179	42.48	56	13.52	40.96	46	5.04
2.784	Neutral	16.183	41.67	56	14.33	33.05	46	12.95
0.258*	Neutral	26.159	42.64	61.49	18.85	36.56	51.49	14.93
0.559*	Neutral	26.104	37.12	56	18.88	31.63	46	14.37
0.647*	Neutral	26.113	38.27	56	17.73	31.49	46	14.51
0.775*	Neutral	26.110	40.46	56	15.54	33.39	46	12.61
0.797*	Neutral	26.110	36.94	56	19.06	30.96	46	15.04
0.876*	Neutral	26.103	38.50	56	17.50	34.50	46	11.50
1.595*	Neutral	26.133	38.11	56	17.89	36.18	46	9.82

Figure 49. Results for AC conducted emissions; PC emissions; transmitting; neutral conductor.

8.9 OCCUPIED BANDWIDTH

Criteria for Occupied Bandwidth: A criteria for the occupied bandwith (99% emission bandwidth) is not specified in [1] – [3]. A criteria for the 20 dB bandwith is specified in both [1] and [2] and the results are found in Section 8.1. As specified in [3], when a limit on the occupied bandwidth is not stated in the applicable Industry Canada RSS standard(s), the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

Test Procedure for Occupied Bandwidth: The conformance test for this requirement is given in clause 6.6 of [3].

The RF output port of the EUT was connected to the input of the spectrum analyzer via a short coaxial cable. The insertion loss of the cable was stored as a transducer factor in the spectrum analyzer and automatically applied to the readings. The EUT was set to an output power of 25 dBm. A 10 dB pad was inserted at the input to the spectrum analyzer. The 99% emission bandwidth was found using the automated function of the spectrum analyzer.

The hopping function was turned off for these measurements.

Results for Occupied Bandwidth: The measured results for the occupied bandwidths for channels 1, 26 and 50 are found in Figures 50 - 52. The results are also summarized in Table 11.

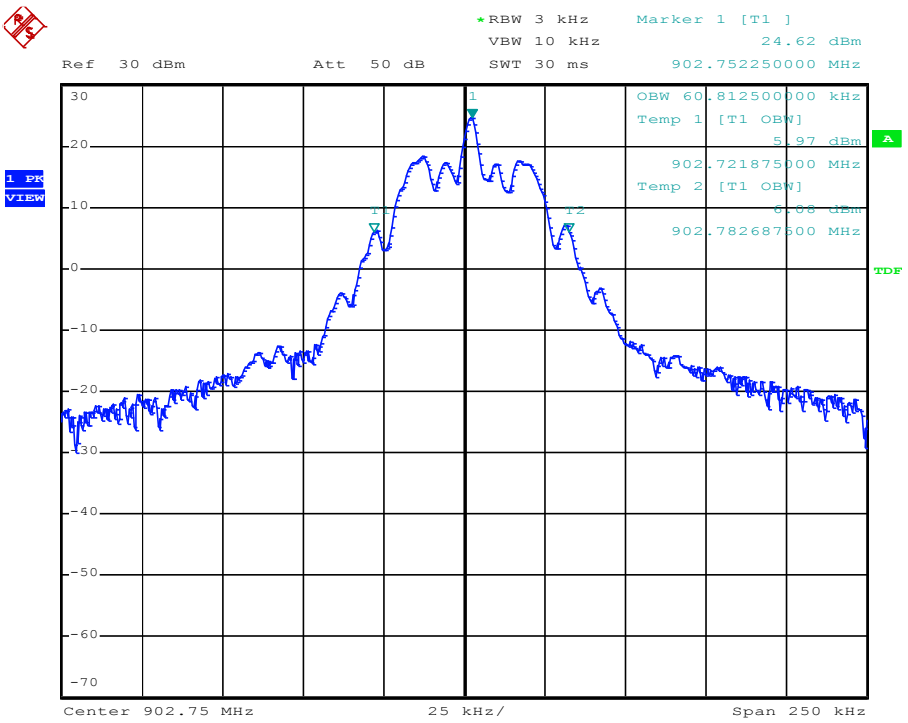


Figure 50. Occupied bandwidth (99%) for lowest channel.

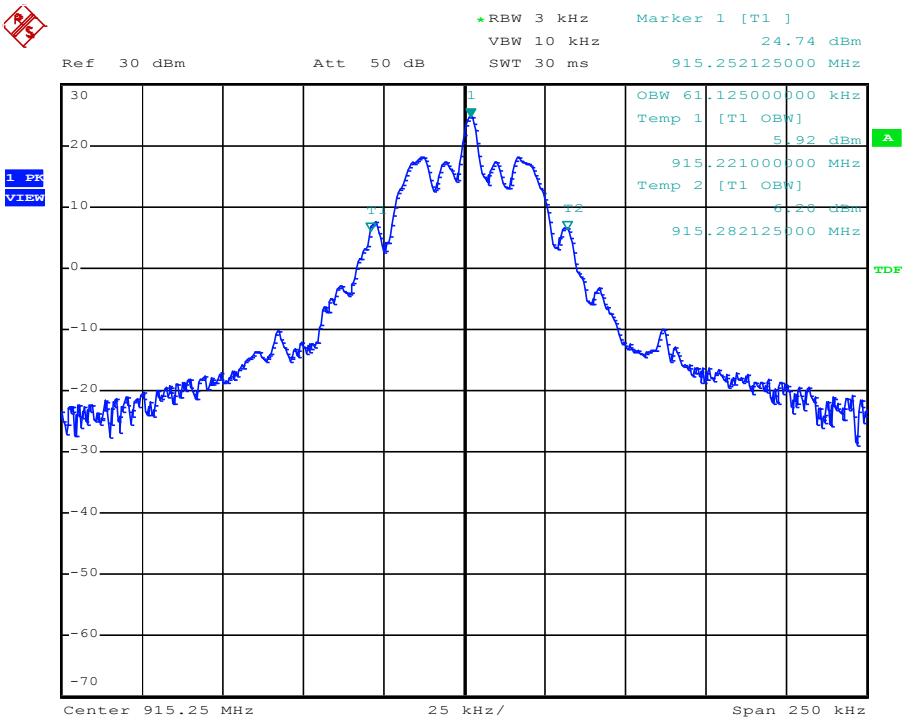


Figure 51. Occupied bandwidth (99%) for middle channel.

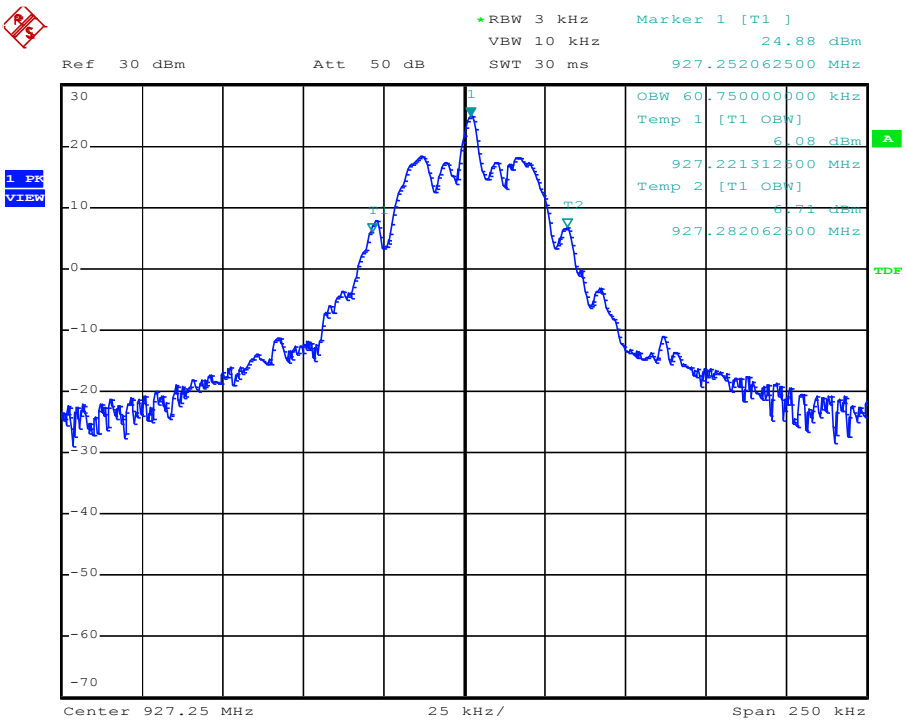


Figure 52. Occupied bandwidth (99%) for highest channel.

Channel No.	Frequency (MHz)	Occupied Bandwidth (kHz)
1	902.75	60.81
26	915.25	61.13
50	927.25	60.75

Table 11. Summary of occupied bandwidths.

** End of report **