Report On

FCC and Industry Canada Testing of the
Motorola Solutions Inc RFD5500
In accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210

COMMERCIAL-IN-CONFIDENCE

FCC ID: UZ7RFD5500
IC ID: 109AN-RFD5500

Document 75921071 Report 02 Issue 2 February 2013

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REPORT ON

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Motorola Solutions Inc RFD5500
In accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210

Document 75921071 Report 02 Issue 2

February 2013

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DATED 26 February 2013

This report has been up issued to Issue 2 to include missing test results.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 15C, Industry Canada RSS-210. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler S Milliken

UKAS TESTING 0141

Product Service

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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Motorola Solutions Inc RFD5500
In accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC and Industry Canada Testing of the Motorola Solutions Inc RFD5500 to the requirements of FCC CFR 47 Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Motorola Solutions Inc
Model Number(s)	RFD5500-G011US
Serial Number(s)	1234400505716 1234400505715
Hardware Version	Revision A
Software Version	Control Board Version 2.1.0, RFID Radio Board Version 2.6.0
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2012) Industry Canada RSS-210 (2010)
Incoming Release Date	Application Form 29 January 2013
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	NP5547700 10 December 2012
Start of Test	15 January 2013
Finish of Test	28 January 2013
Name of Engineer(s)	G Lawler S Milliken
Related Document(s)	ANSI C63.10: 2009

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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210 is shown below.

Section	Spec Clause		Test Description	Result	Comments/Base Standard
RFD5500 - Transmit Mode					
2.1	15.207	7.2.4	AC Line Conducted Emissions	Pass	
2.2	15.247 (b)(3)	A8.4 (2)	Maximum Peak Conducted Output Power	Pass	
2.3	15.247 (a)(1)	A8.1 (a)(b)	Frequency Hopping Systems - 20 dB Bandwidth and Channel Sep	Pass	
2.4	15.247 (a)(1)(iii)	A8.1 (d)	Frequency Hopping Systems - Dwell Time & No of Hopping Channels	Pass	
2.6	15.247 (d)	A8.5	Spurious and Band Edge Emissions	Pass	
Co-location: RFD5500 with MC55N0					
2.5	15.247 (b)(4)	A8.4 (4)	EIRP Peak Power	Pass	
2.6	15.247 (d)	A8.5	Spurious and Band Edge Emissions	Pass	
Co-location: RFD5500 with MC55A0					
2.5	15.247 (b)(4)	A8.4 (4)	EIRP Peak Power	Pass	
2.6	15.247 (d)	A8.5	Spurious and Band Edge Emissions	Pass	

Product Service

1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	RFD5500
Part Number	
FCC ID (if applicable)	UZ7RFD5500
Industry Canada ID (if applicable)	109AN-RFD5500
Technical Description (Please provide a brief description of the intended use of the equipment)	A UHF RFID reader for use with Motorola MC55 mobile computers.

EXTREME TEMPERATURE RANGE over which the equipment is to be type tested
☐ -20°C to +55°C
☒ Other (2)
☐ Not applicable (no extreme temperature testing required)
Extreme temperature range for the host(s): -10°C to 50°C

(2) The equipment shall be tested over the following temperature ranges :

a) 0°C to +35°C for equipment for indoor use only, or intended for used in areas where the temperature is controlled within this range.

b) Over the extremes of the temperature range(s) of the declared host equipment(s) in case of plug-in radio devices.

TYPE OF ANTENNA
☒ Integral
Temporary RF connector provided: ☒ Yes ☐ No
☐ Antenna connector
☐ Number of antenna assembly(ies) submitted
Gain of the antenna intended for normal use:
2.5dBi dBi for assembly identified as C
dBi for assembly identified as
dBi for assembly identified as
dBi for assembly identified as
dBi for assembly identified as

TRANSMITTER TECHNICAL CHARACTERISTICS		
TRANSMITTER OPERATING FREQUENCY RANGE(S)		
	FCC and/or Industry Canada	**EU**
Bluetooth	to MHz	to MHz
WLAN	to MHz	to MHz
FCC and/or Industry Canada (only)		
Highest Internally Generated Frequency 928 MHz		

Product Service

SPREAD SPECTRUM PARAMETERS			
☐ **Bluetooth**		Version:	
FHSS: Channel ☐ 79 Other		EDR ☐ Yes ☐ No	
Medium Access Protocol (Customer Declaration)			
"We have implemented Bluetooth protocol which satisfies the medium access protocol requirement of EN 300 328".			
☐ **WLAN**			
IEEE 802.11(b) – DSSS ☐			
IEEE 802.11(g) – OFDM ☐			
IEEE 802.11(n) – OFDM ☐			
Supported Spatial Streams		2.4 GHz	5GHz
	Transmitter (Tx)		
	Receiver (Rx)		
GI (Guard Interval) ☐ 800 ns ☐ 400 ns			
Band Width ☐ 20 MHz ☐ 40 MHz			
Medium Access Protocol (Customer Declaration)			
"We have implemented IEEE 802.11 (b/g/n) protocol which satisfies the medium access protocol requirement of EN 300 328".			
☒ **Other Technology**			
☐ Direct Sequence ☒ Frequency Hopping ☐ Combined ☐ Other			
DSSS	Chip Sequence Length	bit	
	Spectrum Width	MHz	
FHSS	Total Number of Hops	50	
	Dwell Time	<400 ms	
	Bandwidth Per Hop	0.5 MHz	
	Maximum Separation of Hops	MHz for ETSI EN 300 328	
Other			
Medium Access Protocol (Customer Declaration)			
"We have implemented a protocol which satisfies the medium access protocol requirement of EN 300 328".			

Product Service

TRANSMITTER POWER CHARACTERSITICS									
Bluetooth									
Maximum Rated Transmitter Output									
Effective radiated power (for equipment with antenna connector)					W				
Effective radiated power (for equipment with integral antenna)				0.8	W				
Minimum Rated Transmitter Output									
Effective radiated power (for equipment with antenna connector)					W				
Effective radiated power (for equipment with integral antenna)				0.01	W				
Is transmitter intended for :									
Continuous duty						☒	Yes	☐	No
Intermittent duty						☐	Yes	☐	No
If intermittent state DUTY CYCLE									
Transmitter ON	seconds		Transmitter OFF		minutes				
Is continuous operation possible for testing purposes?						☒	Yes	☐	No
Is transmitter output power variable:						☒	Yes	☐	No
State during the test:									
Transmitter duty cycle	Tx on	0.015	Seconds	Tx Off	0.035	Seconds			
Duty cycle (Tx on /(Tx on +Tx off))		33	%						
☐ Continuously variable			☒ Stepped						
0.1 dB per step									
WLAN									
Maximum Rated Transmitter Output									
Effective radiated power (for equipment with antenna connector)					W				
Effective radiated power (for equipment with integral antenna)					W				
Minimum Rated Transmitter Output									
Effective radiated power (for equipment with antenna connector)					W				
Effective radiated power (for equipment with integral antenna)					W				
Is transmitter intended for :									
Continuous duty						☐	Yes	☐	No
Intermittent duty						☐	Yes	☐	No
If intermittent state DUTY CYCLE									
Transmitter ON	seconds		Transmitter OFF		minutes				
Is continuous operation possible for testing purposes?						☐	Yes	☐	No
Is transmitter output power variable:						☐	Yes	☐	No
State during the test:									
Transmitter duty cycle	Tx on		Seconds	Tx Off		Seconds			
Duty cycle (Tx on /(Tx on +Tx off))			%						
☐ Continuously variable			☐ Stepped						
dB per step									

Product Service

TRANSMITTER POWER SOURCE (3)				
☒ Common power source for transmitter and receiver				
☐ AC mains		State voltage		
AC supply frequency	(Hz)	VAC	Max Current	Hz
☐ Single phase		☐ Three phase		
And / Or				
☐ External DC supply				
Nominal voltage		Max Current	A	
Extreme upper voltage		Extreme lower voltage		
Battery				
☐ Nickel Cadmium				
☐ Lead acid (Vehicle regulated)				
☐ Alkaline				
☒ Lithium				
☐ Other Details :				
Volts nominal.				
End point voltage as quoted by equipment manufacturer		V		

(3) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF	
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.	
☐ Applies	V cut-off voltage
☐ Does not apply	

Product Service

RECEIVER POWER SOURCE (4)					
☐ AC mains		State voltage			
AC supply frequency	(Hz)	VAC	Max Current		Hz
☐ Single phase		☐ Three phase			
And / Or					
☐ External DC supply					
Nominal voltage		Max Current		A	
Extreme upper voltage		Extreme lower voltage			
Battery					
☐ Nickel Cadmium					
☐ Lead acid (Vehicle regulated)					
☐ Alkaline					
☐ Lithium					
☐ Other Details :					
Volts nominal.					
End point voltage as quoted by equipment manufacturer			V		

(4) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.
☐ Applies V cut-off voltage
☐ Does not apply

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature: Name: Alan Parrish

Position held: Director, Regulatory Compliance Date: 29th January 2013

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Motorola Solutions Inc RFD5500. A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 110 V AC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard or test plan were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Motorola Solutions Inc RFD5500
In accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN

2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.207
Industry Canada RSS-210, Clause 7.2.4

2.1.2 Equipment Under Test and Modification State

RFD5500-G011US S/N: 1234400505716 - Modification State 0

2.1.3 Date of Test

16 January 2013

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

The EUT is set up on a test table 800mm above a horizontal ground plane. A vertical ground plane is also required and is placed 400mm from the EUT. Where a EUT is floor standing it will be stood on but insulated from the ground plane by up to 12mm.

The EUT is powered through a Line Impedance Stabilisation Network (LISN) which is bonded to the ground plane. The EUT is located so that the distance between the EUT and the LISN is no less than 800mm. Where possible the cable between the mains input of the EUT and the LISN is 1m. Where this is not possible the cable is non inductively bundled with the bundle not exceeding 400mm in length.

A preliminary profile of the Conducted Emissions is obtained over the frequency range 150kHz to 30MHz. Any points of interest are noted for formal measurements.

During formal measurements, the measuring receiver is tuned to the emission of interest where Quasi – Peak and Average measurements are performed in a 9kHz Video and Resolution Bandwidth.

2.1.6 Environmental Conditions

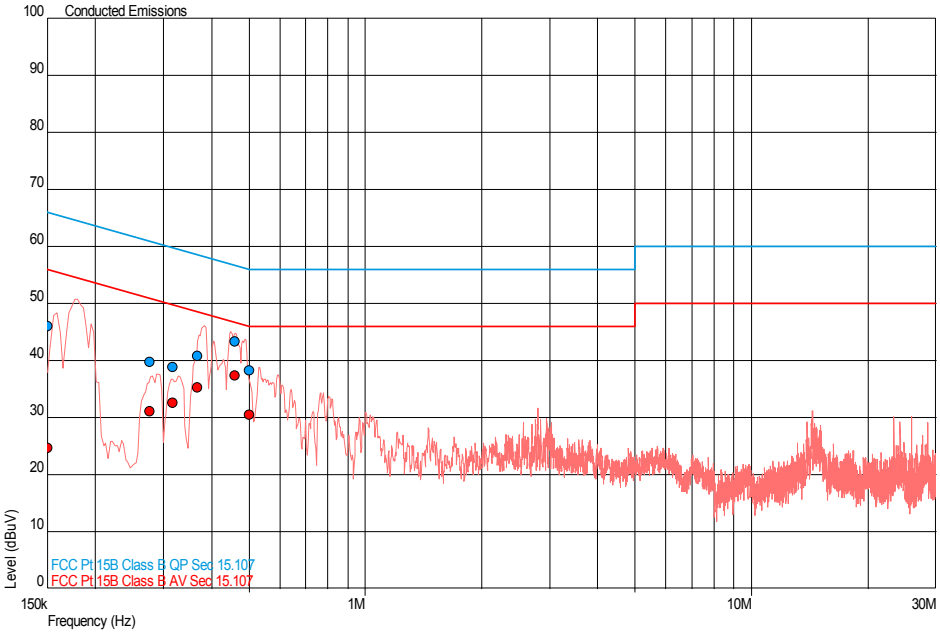
Ambient Temperature	16.4°C
Relative Humidity	29.0%

Product Service

2.1.7 Test Results

RFD5500 - Transmit Mode

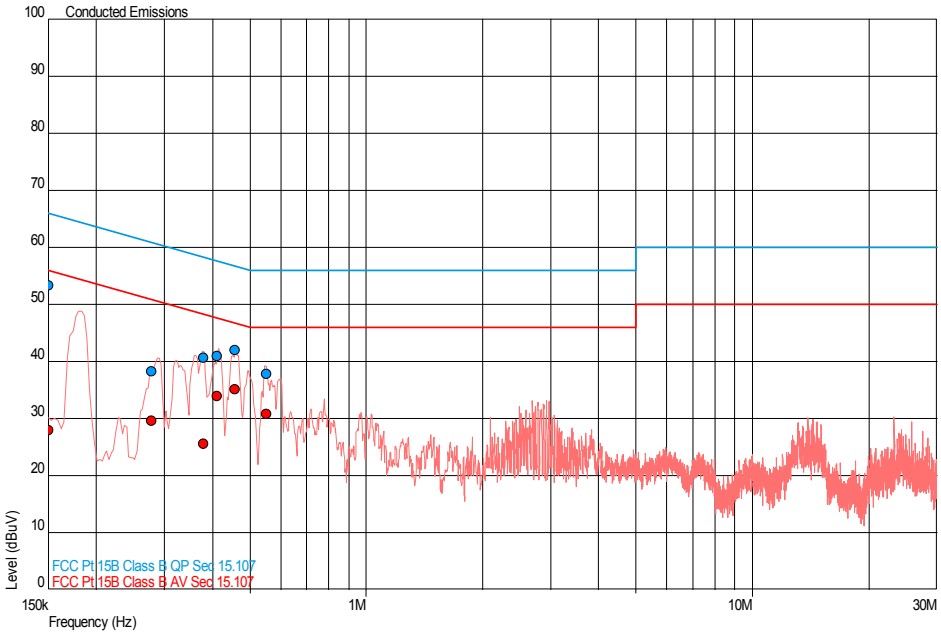
Live Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.150	46.0	66.0	-20.0	24.6	56.0	-31.4
0.277	39.8	60.9	-21.1	31.2	50.9	-19.7
0.317	38.8	59.8	-21.0	32.6	49.8	-17.2
0.367	40.8	58.6	-17.8	35.3	48.6	-13.3
0.459	43.3	56.7	-13.4	37.3	46.7	-9.4
0.500	38.3	56.0	-17.7	30.5	46.0	-15.5

Product Service

Neutral Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.150	53.4	66.0	-12.6	28.0	56.0	-28.0
0.277	38.2	60.9	-22.6	29.6	50.9	-21.3
0.379	40.6	58.3	-17.7	25.6	48.3	-22.7
0.412	40.9	57.6	-16.7	34.0	47.6	-13.6
0.456	41.9	56.8	-14.8	35.1	46.8	-11.7
0.550	37.8	56.0	-18.2	30.9	46.0	-15.1

2.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(3)
Industry Canada RSS-210, Clause A8.4 (2)

2.2.2 Equipment Under Test and Modification State

RFD5500-G011US S/N: 1234400505715 - Modification State 0

2.2.3 Date of Test

16 January 2013

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

The EUT was transmitted at maximum power via a cable to the Peak Power Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a reference level offset was entered to account for the measurement path loss. The measurement bandwidth was set according to the signal being measured and the peak and average levels were recorded.

2.2.6 Environmental Conditions

Ambient Temperature	21.5°C
Relative Humidity	27.7%

Product Service

2.2.7 Test Results

RFD5500 - Transmit Mode

3.7 V DC Supply

Maximum Peak Conducted Output Power					
dBm			mW		
902.75 MHz	915.25 MHz	927.25 MHz	902.75 MHz	915.25 MHz	927.25 MHz
29.98	29.93	29.91	995.4	984.0	979.5

Limit Clause

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

2.3 FREQUENCY HOPPING SYSTEMS - 20 DB BANDWIDTH AND CHANNEL SEPARATION

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)
Industry Canada RSS-210, Clause A8.1 (a)(b)

2.3.2 Equipment Under Test and Modification State

RFD5500-G011US S/N: 1234400505715 - Modification State 0

2.3.3 Date of Test

15 January 2013 & 16 January 2013

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

The EUT was transmitted at maximum power via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen. The peak point of the trace was measured and the markers positioned to give the -20dBc points of the displayed spectrum.

The EUT was transmitted at maximum power into a Spectrum Analyser. The trace was set to Max Hold to store several adjacent channels on screen. Using the marker delta function, the markers were positioned to show the separation between adjacent channels.

2.3.6 Environmental Conditions

Ambient Temperature	21.5°C
Relative Humidity	27.7%

Product Service

2.3.7 Test Results

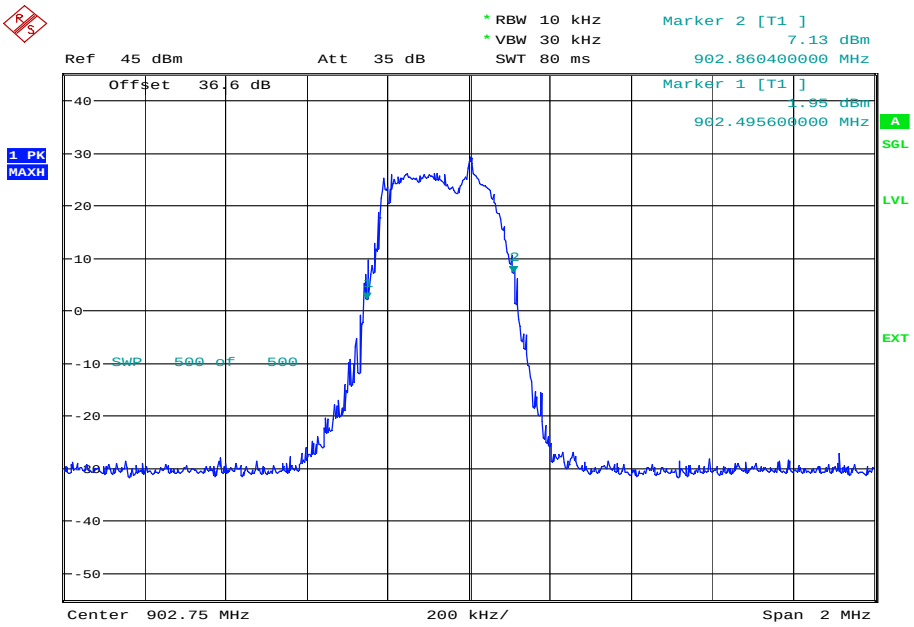
RFD5500 - Transmit Mode

3.7 V DC Supply

20dB Bandwidth

902.75 MHz

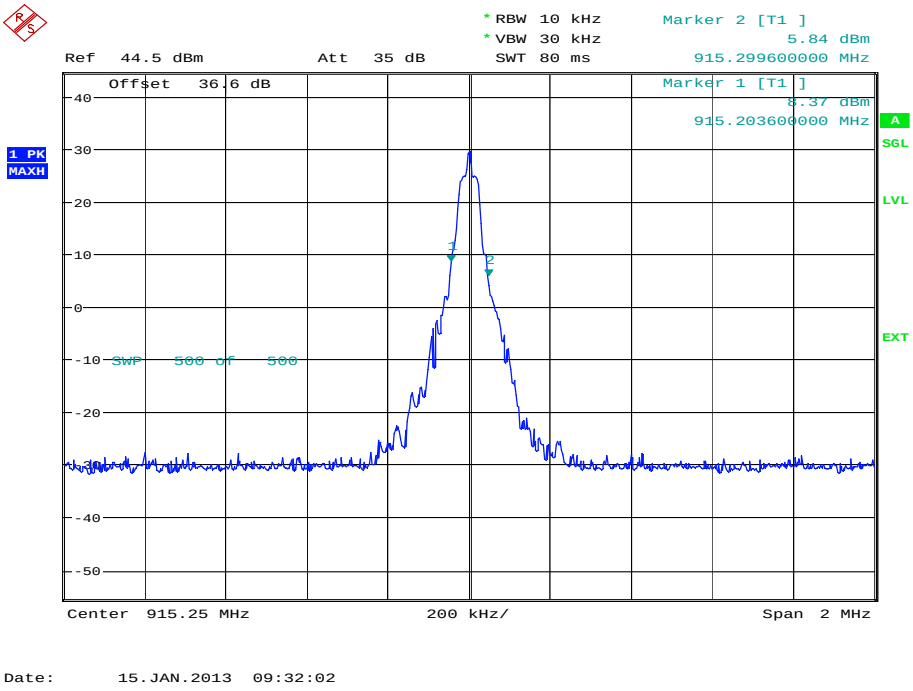
Data Rate (Mbps)	20dB Bandwidth (kHz)
N/A	364.8



Product Service

915.25 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
N/A	96.0



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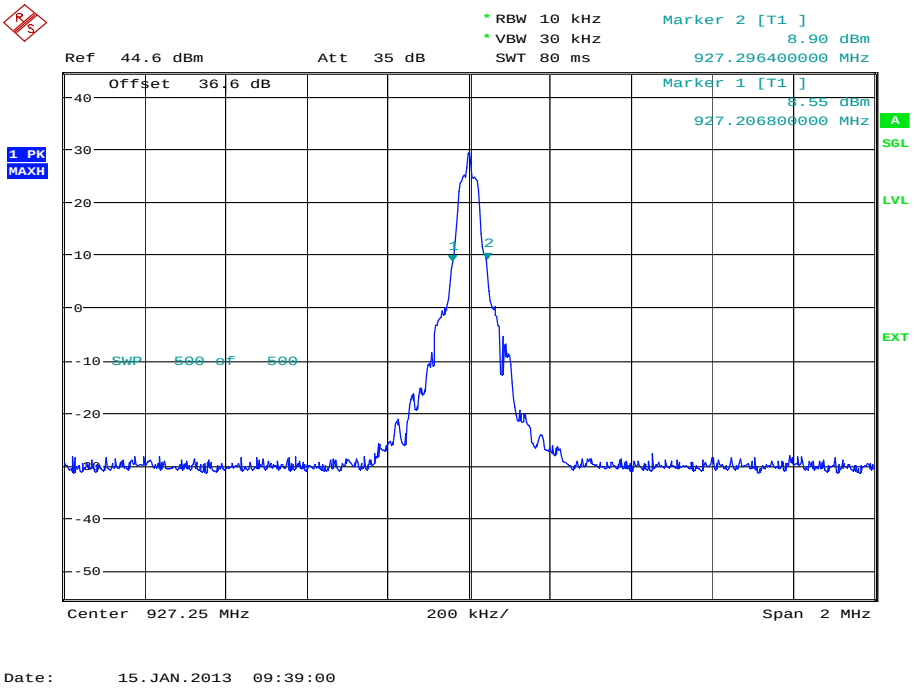
Product Service

927.25 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
N/A	89.6



Limit Clause

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

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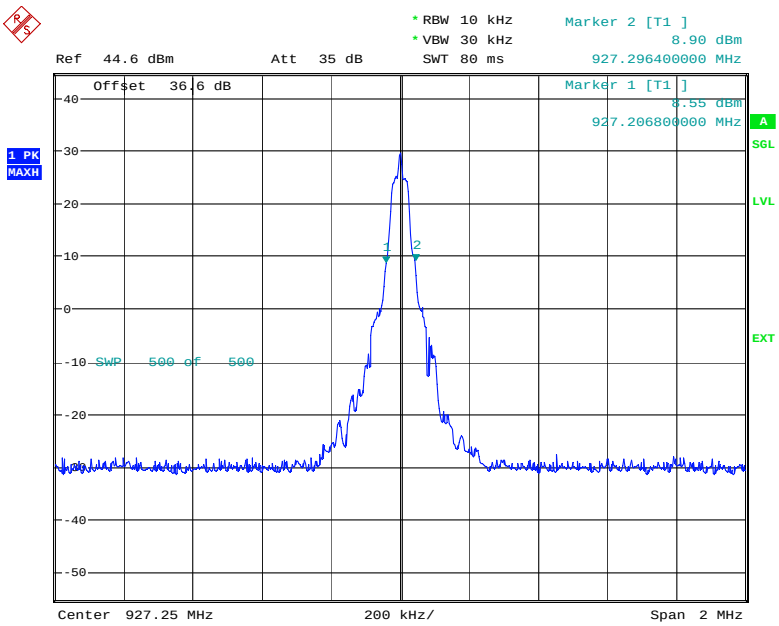
Channel Separation

Channel Separation: 0.5 MHz



Limit Clause

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.

Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W.

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

2.4 FREQUENCY HOPPING SYSTEMS - DWELL TIME & NO OF HOPPING CHANNELS

2.4.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)(iii)
Industry Canada RSS-210, Clause A8.1 (d)

2.4.2 Equipment Under Test and Modification State

RFD5500-G011US S/N: 1234400505715 - Modification State 0

2.4.3 Date of Test

15 January 2013 & 16 January 2013

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

On Time = 18.480769 ms
Off Time = 37.326923 ms

1 Tx/Rx Cycle = 18.480769 + 37.326923 = 55.807692 ms

Over a 1 second period = 1/55.807692 ms = 17.919 bursts

Therefore 17.919 x 18.480769 = 0.331157 seconds

0.331157/50 channels = 0.00662314 seconds/channel

Over a 20 second period: 0.00662314 x 20 = 0.1324628 seconds

The EUT was connected to a Spectrum Analyser via a cable. The EUT was set to transmit on maximum power and on the middle channel to measure the dwell time. To measure the number of hopping channels, the EUT was set to transmit on maximum power and hopping on all channels. The span was adjusted to show the individual channels. The display trace was set to Max Hold and the plots recorded.

2.4.6 Environmental Conditions

Ambient Temperature	21.5°C
Relative Humidity	27.7%

Product Service

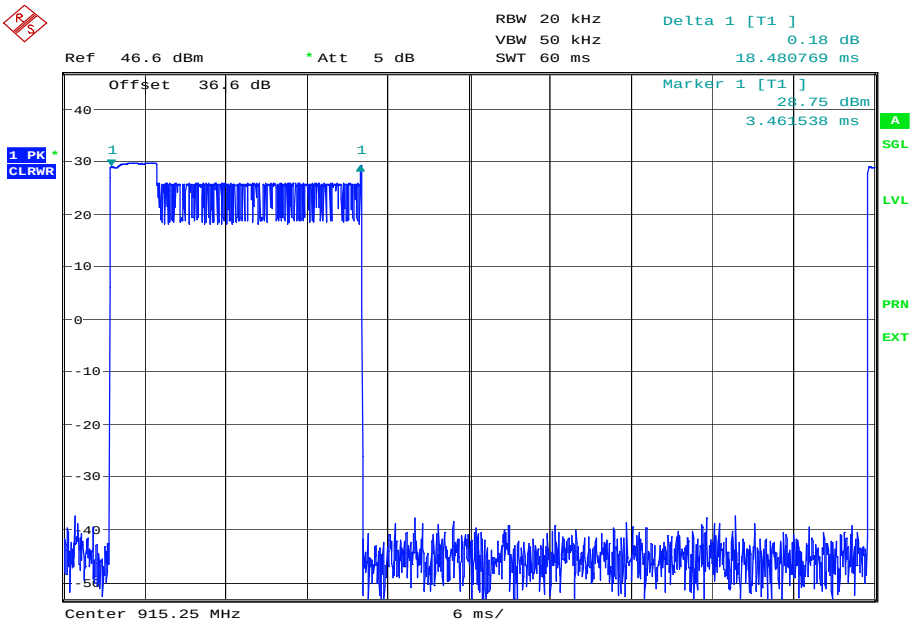
2.4.7 Test Results

RFD5500 - Transmit Mode

3.7 V DC Supply

Channel Dwell Time

18.48 ms



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Limit

Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

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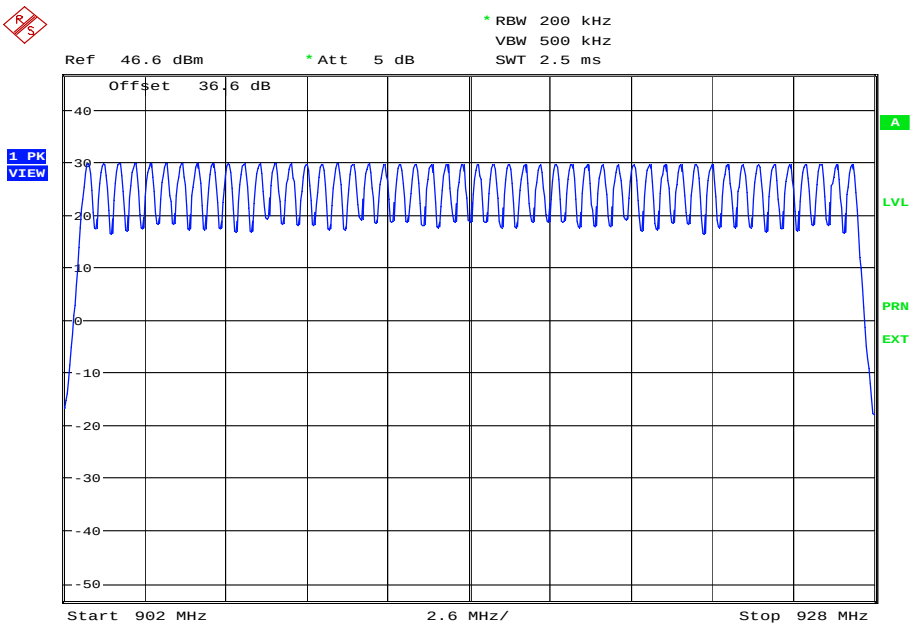
Number of Hopping Channels

50 channels



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Limit

≥ 15 channels

2.5 EIRP PEAK POWER

2.5.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(4)
Industry Canada RSS-210, Clause A8.4 (4)

2.5.2 Equipment Under Test and Modification State

RFD5500-G011US S/N: 1234400505716 - Modification State 0

2.5.3 Date of Test

15 January 2013

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

The EUT was transmitted at maximum power via a cable to the Peak Power Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a reference level offset was entered to account for the measurement path loss. The measurement bandwidth was set according to the signal being measured and the peak and average levels were recorded.

2.5.6 Environmental Conditions

Ambient Temperature	16.5°C
Relative Humidity	33.0%

Product Service

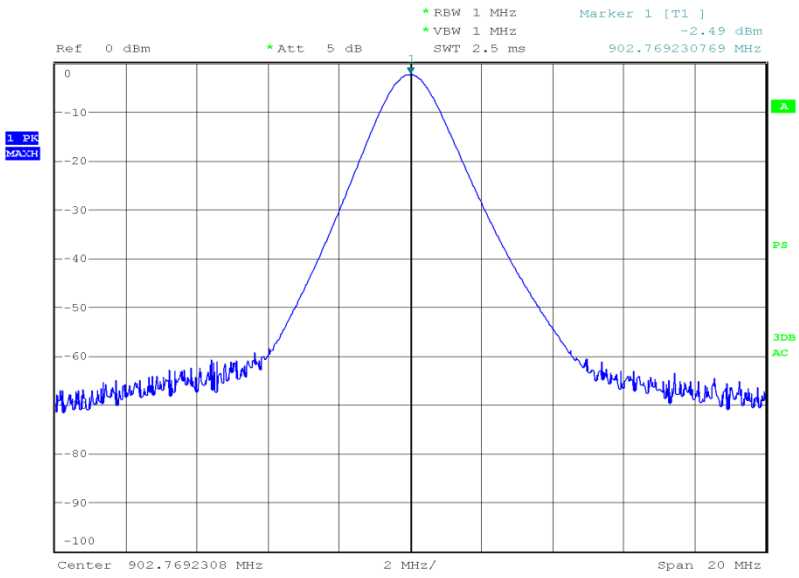
2.5.7 Test Results

Co-location: RFD5500 with MC55A0

3.7 V DC Supply

902.75 MHz

EIRP (dBm)	EIRP (mW)
29.49	889.20



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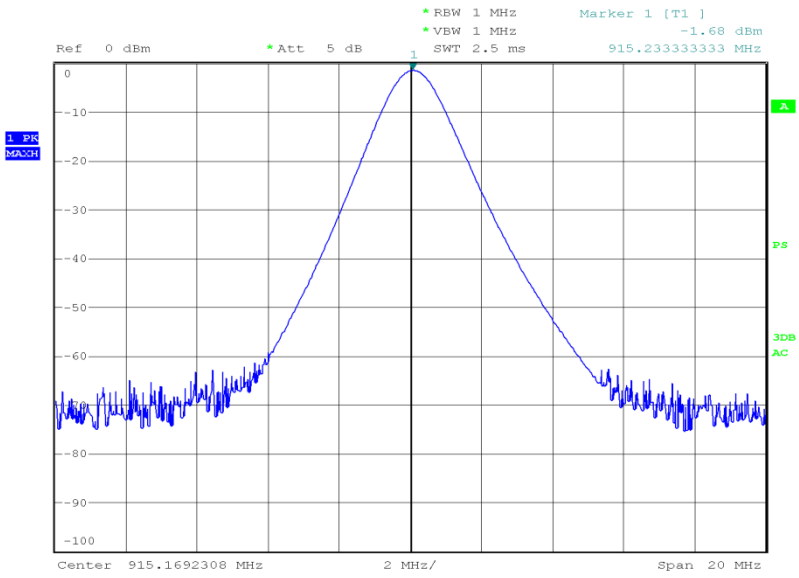
Product Service

915.25 MHz

EIRP (dBm)	EIRP (mW)
29.47	885.16



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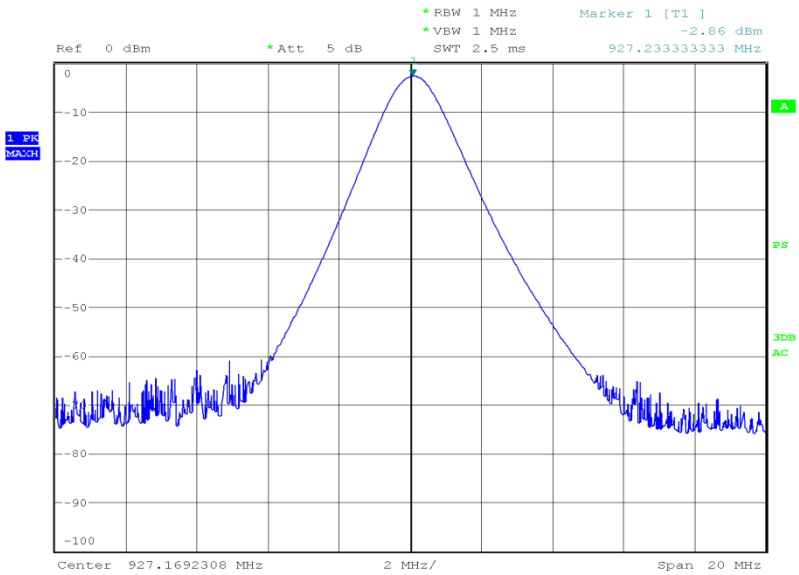
Product Service

927.25 MHz

EIRP (dBm)	EIRP (mW)
28.05	638.26



Date: 15.JAN.2013 19:14:43

Limit

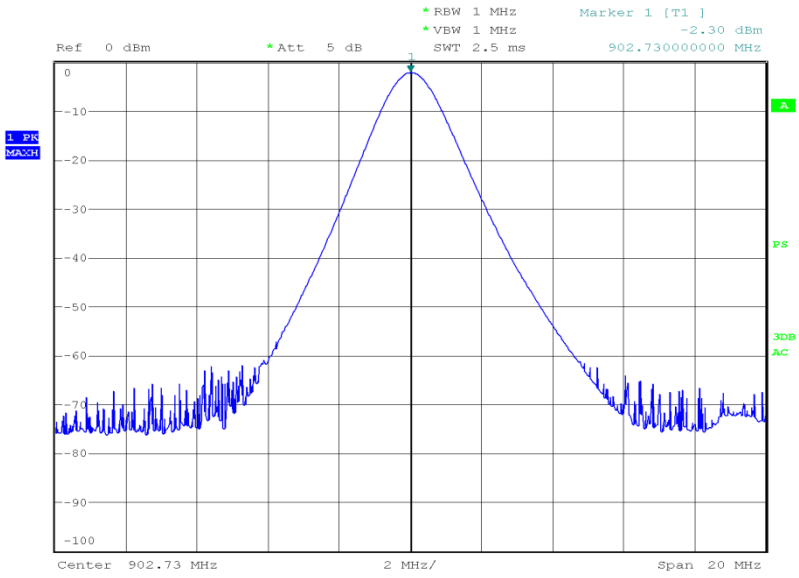
Limit EIRP (dBm)	Limit EIRP(mW)
36.0	4000

Co-location: RFD5500 with MC55N0

3.7 V DC Supply

902.75 MHz

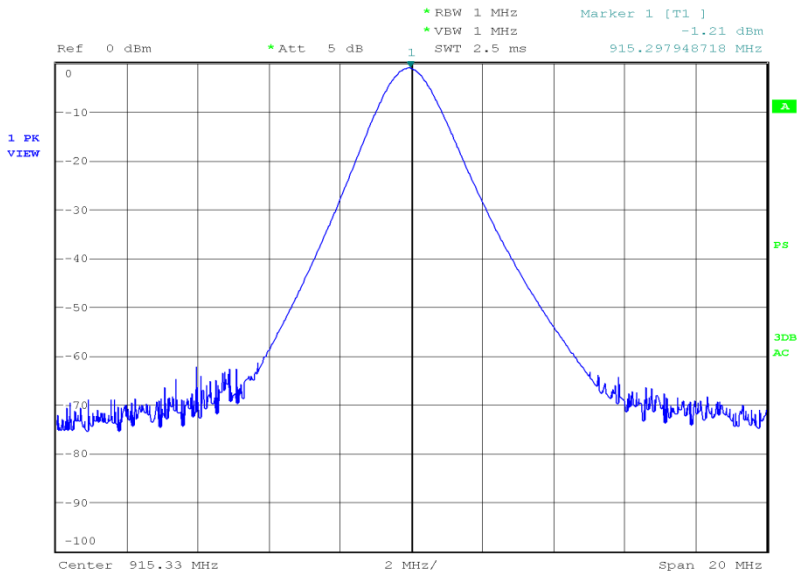
EIRP (dBm)	EIRP (mW)
29.68	928.97



Date: 15.JAN.2013 18:15:34

915.25 MHz

EIRP (dBm)	EIRP (mW)
29.94	968.28

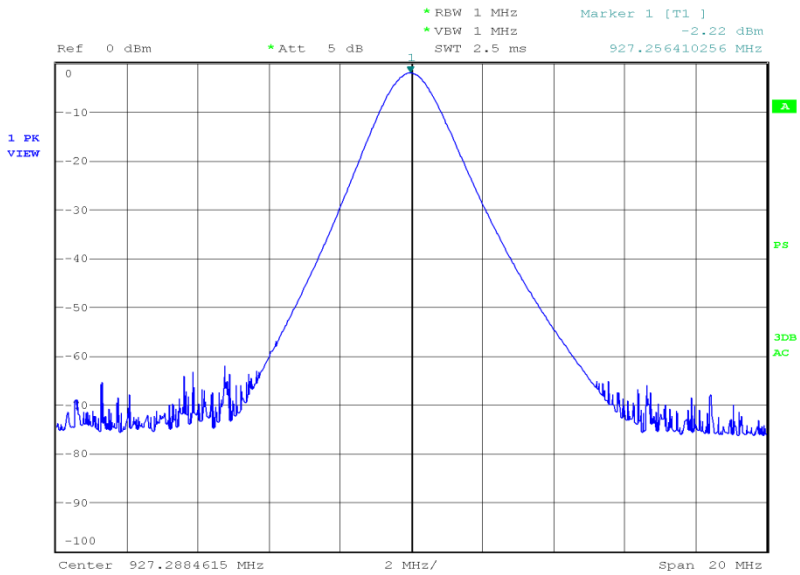


Date: 15.JAN.2013 18:22:25

Product Service

927.25 MHz

EIRP (dBm)	EIRP (mW)
28.69	739.61



Date: 15.JAN.2013 18:40:39

Limit

Limit EIRP (dBm)	Limit EIRP(mW)
36.0	4000

2.6 SPURIOUS AND BAND EDGE EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (d)
Industry Canada RSS-210, Clause A8.5

2.6.2 Equipment Under Test and Modification State

RFD5500-G011US S/N: 1234400505716 - Modification State 0
RFD5500-G011US S/N: 1234400505715 - Modification State 0

2.6.3 Date of Test

16 January 2013, 27 January 2013 & 28 January 2013

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

The band edge measurements were performed in accordance with ANSI C63.10, Clause 6.9.3. The results were analysed to ensure compliance with restricted bands. The EUT was set to the lowest and highest operating frequencies.

2.6.6 Environmental Conditions

Ambient Temperature	19.5 - 22.8°C
Relative Humidity	22.6 - 37.0%

Product Service

2.6.7 Test Results

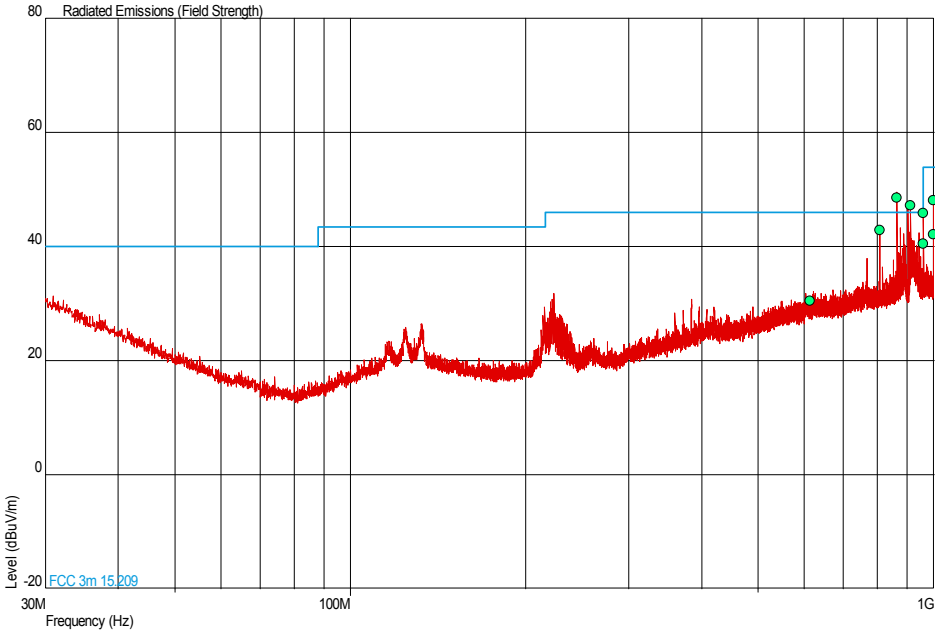
Co-location: RFD5500 with MC55A0

3.7 V DC Supply

Spurious Radiated Emissions

902.75 MHz

30 MHz to 1 GHz

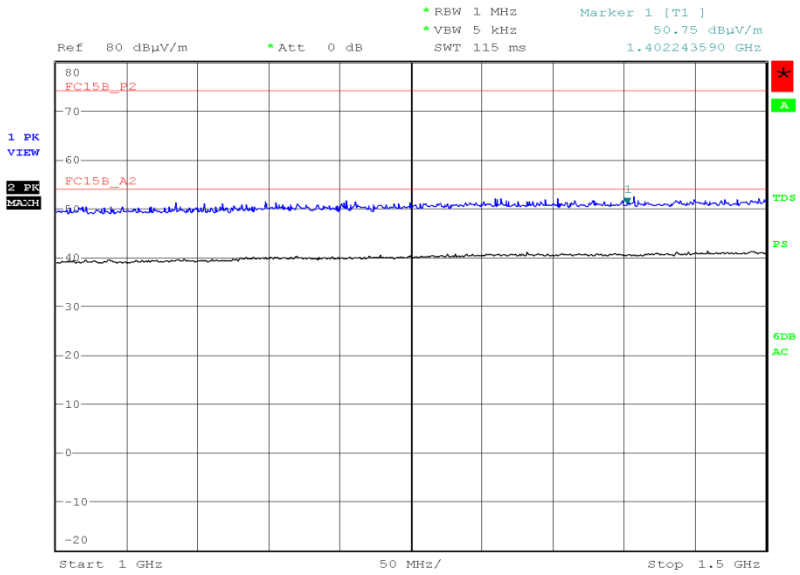


Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
614.000	30.6	33.9	46.0	200	-15.4	166.1	334	1.00	Horizontal
960.000	40.6	107.2	46.0	200	-5.4	92.8	354	1.00	Horizontal
960.000	45.9	197.2	46.0	200	-0.1	2.8	188	1.03	Vertical
998.745	42.1	127.4	54.0	500	-11.9	372.6	278	1.00	Horizontal
998.749	48.1	254.1	54.0	500	-5.9	245.9	146	1.00	Vertical

1GHz to 25GHz

Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
2.708	Horizontal	108	330	63.19	45.75
4.514	Vertical	119	233	59.46	42.01
8.124	Vertical	100	059	49.61	32.16

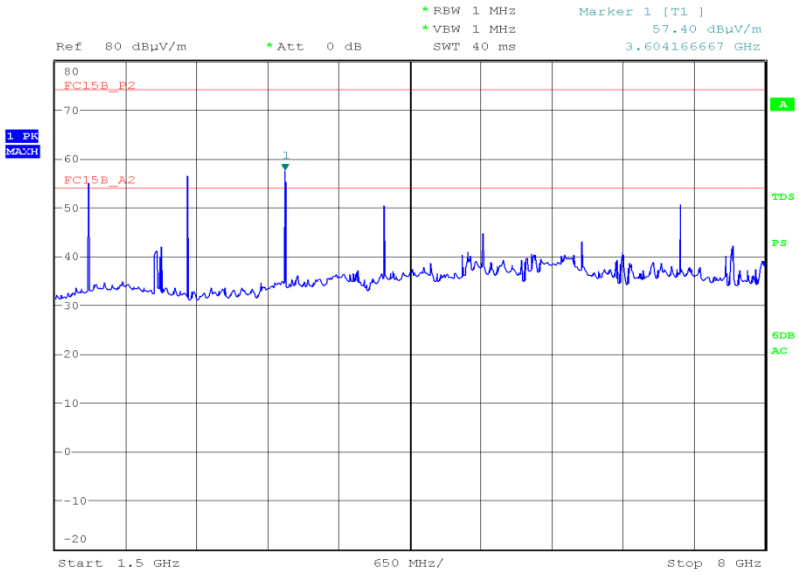
1 GHz to 1.5 GHz



Date: 23.JAN.2013 19:05:05

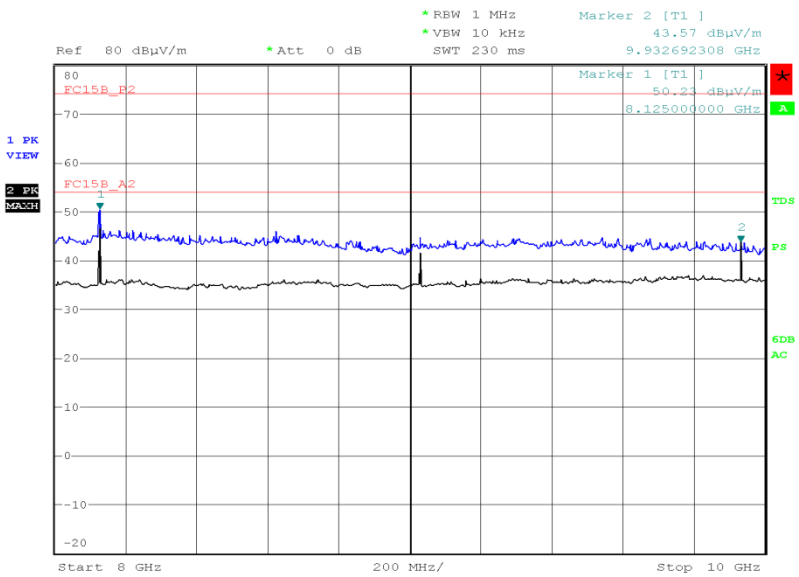
Product Service

1.5 GHz to 8 GHz



Date: 22.JAN.2013 18:37:37

8 GHz to 10 GHz



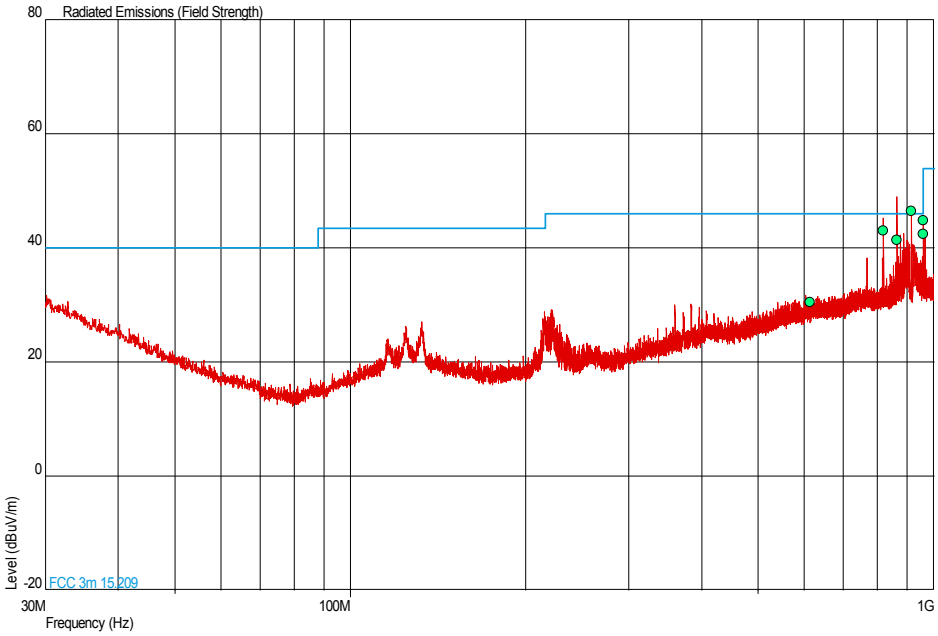
Date: 23.JAN.2013 20:00:02

Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

915.25 MHz

30 MHz to 1 GHz

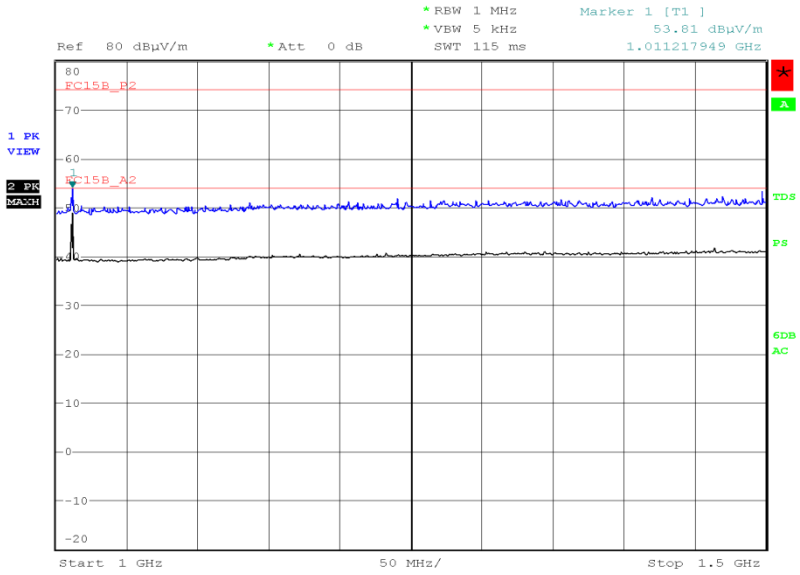


Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
614.000	30.6	33.9	46.0	200	-15.4	166.1	232	1.00	Horizontal
960.000	42.5	133.4	46.0	200	-3.5	66.6	248	1.68	Horizontal
960.000	44.8	173.8	46.0	200	-1.2	26.2	204	1.37	Vertical

1GHz to 25GHz

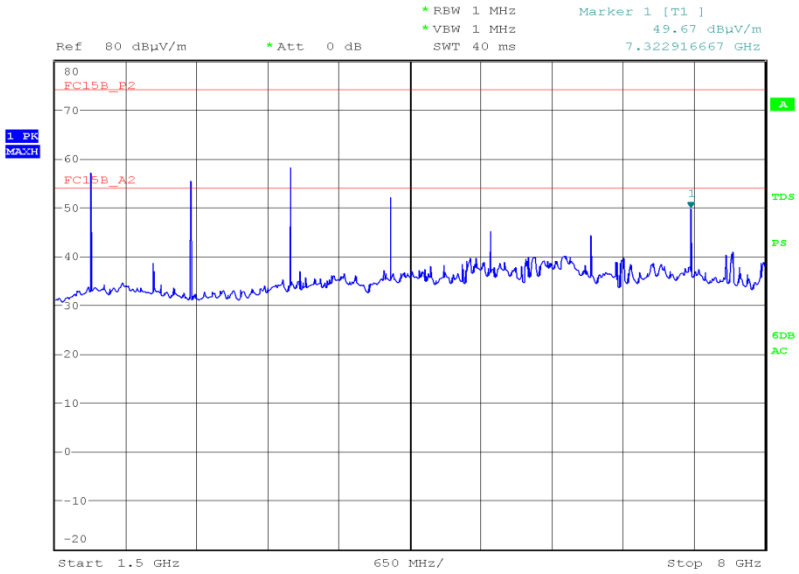
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
2.746	Vertical	157	022	59.87	42.42
4.576	Horizontal	145	316	58.45	41.00
7.322	Horizontal	123	120	63.76	46.31
1.011	Vertical	110	190	55.47	38.02

1 GHz to 1.5 GHz



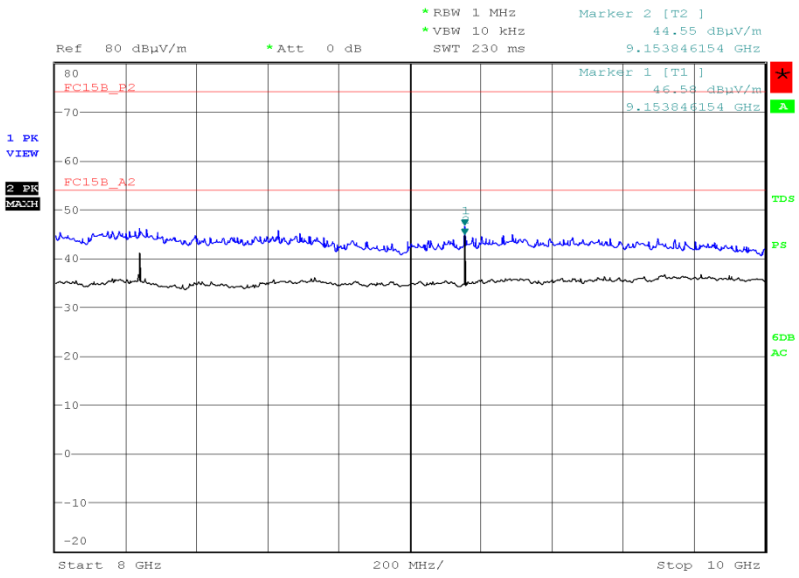
Product Service

1.5 GHz to 8 GHz



Date: 22.JAN.2013 18:41:10

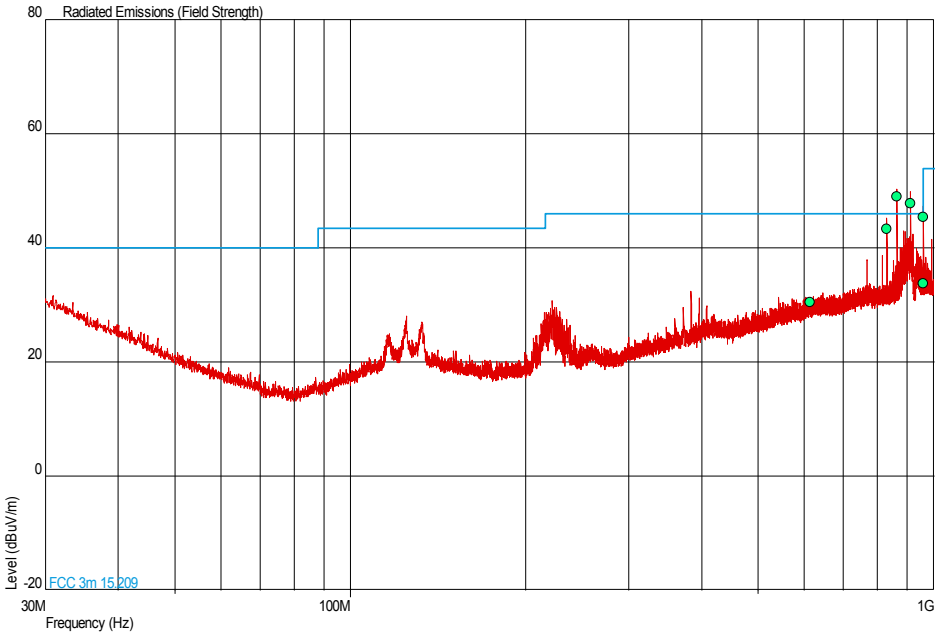
8 GHz to 10 GHz



Date: 23.JAN.2013 20:19:06

927.25 MHz

30 MHz to 1 GHz

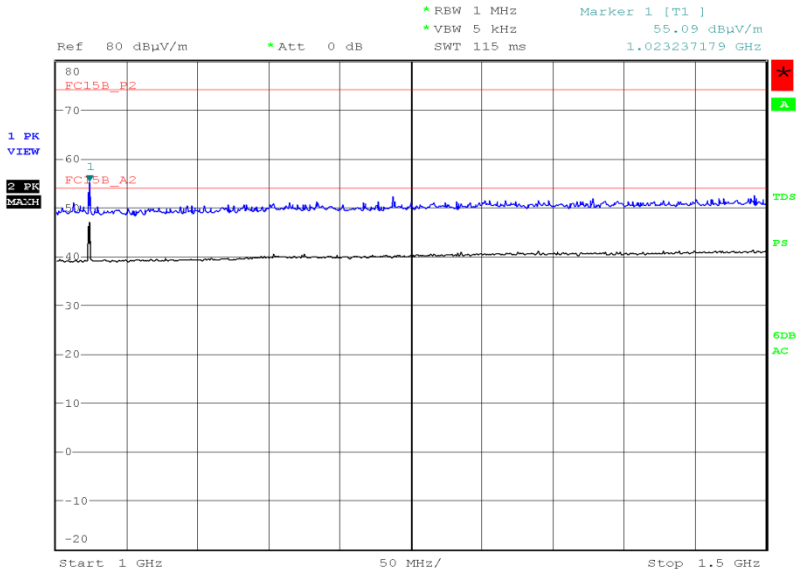


Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
614.000	30.6	33.9	46.0	200	-15.4	166.1	360	1.00	Horizontal
960.000	33.8	49.0	46.0	200	-12.2	151.0	230	1.00	Horizontal
960.000	45.5	188.4	46.0	200	-0.5	11.6	170	1.00	Vertical

1GHz to 25GHz

Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
2.781	Vertical	120	035	58.97	41.52
4.636	Horizontal	162	302	62.97	45.52
7.412	Vertical	172	160	65.58	48.14
1.023	Vertical	110	178	56.52	39.07

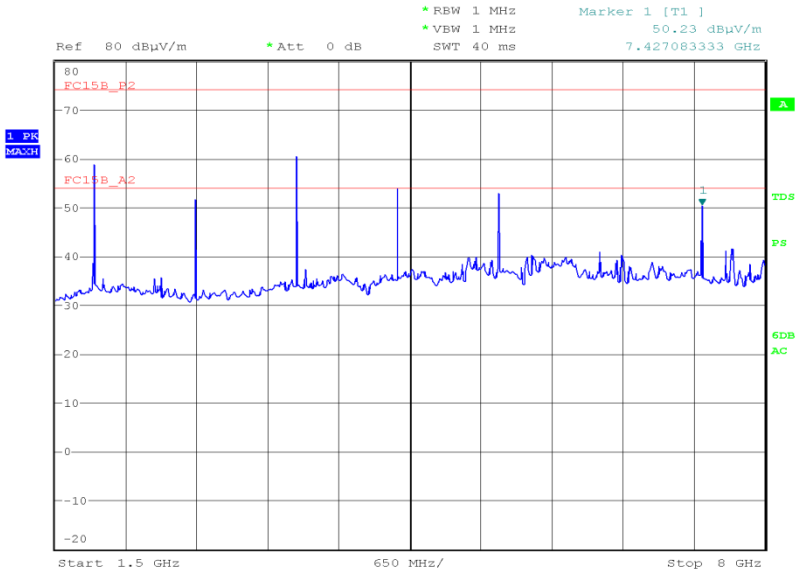
1 GHz to 1.5 GHz



Date: 23.JAN.2013 19:25:09

Product Service

1.5 GHz to 8 GHz



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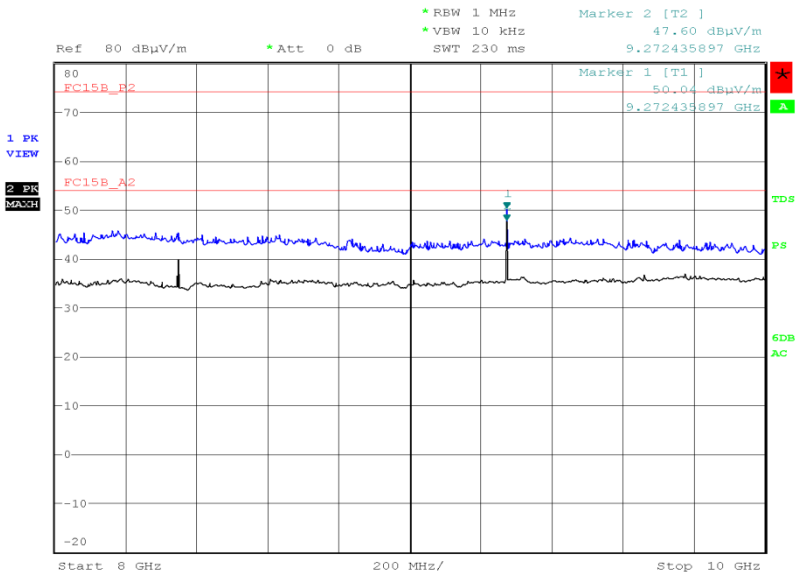
8 GHz to 10 GHz



Date: 23.JAN.2013 20:23:22

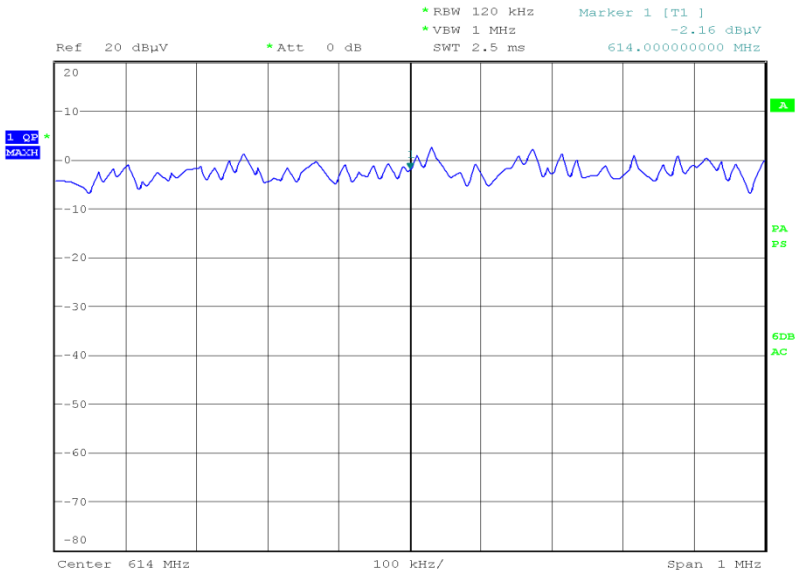
Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

Band Edge Emissions

902.75 MHz

Polarisation	Final Quasi Peak (dBµV/m)
Horizontal	30.6

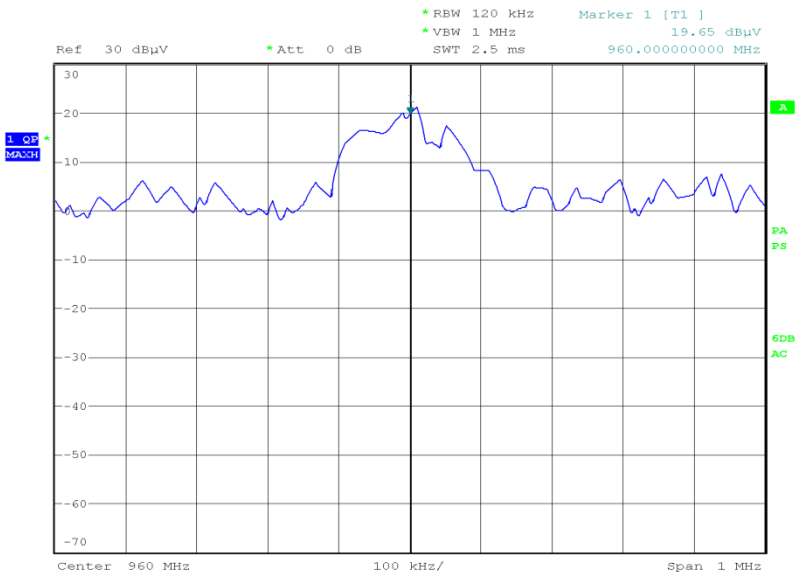


Date: 28.JAN.2013 21:59:07

Product Service

927.25 MHz

Polarisation	Final Quasi Peak (dBµV/m)
Vertical	45.5



Date: 28.JAN.2013 22:12:47

Limit

Quasi Peak (dBµV/m)
46.0

This test has been performed using a MC55A0 unit of which the test software version was updated to change the duty cycle to approximately 15% at the request of the customer. As a result the average result was reduced as a result of a duty cycle correction factor of -17.445 dB which was applied to the peak measurement.

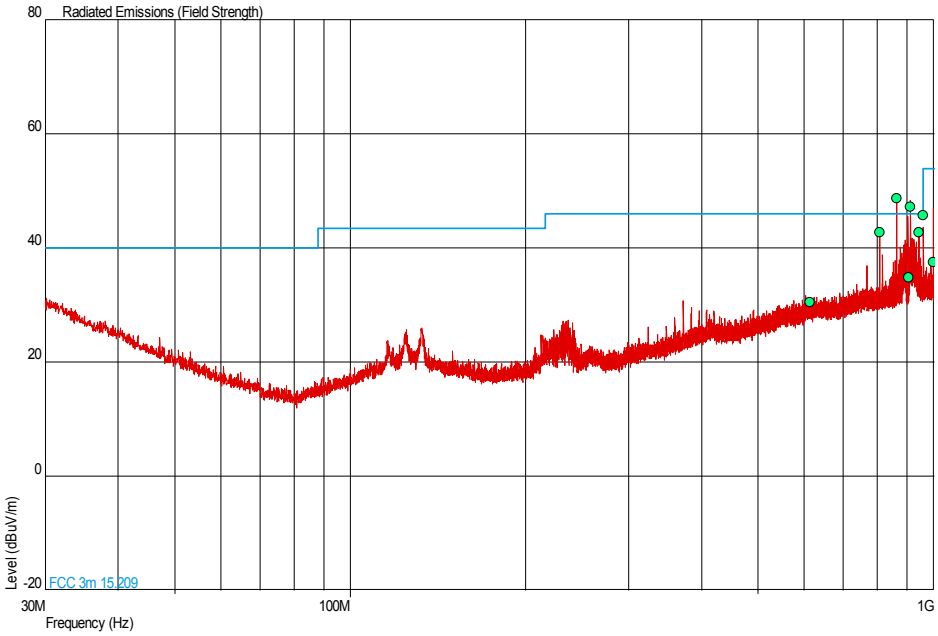
Co-location: RFD5500 with MC55N0

3.7 V DC Supply

Spurious Radiated Emissions

902.75 MHz

30 MHz to 1 GHz

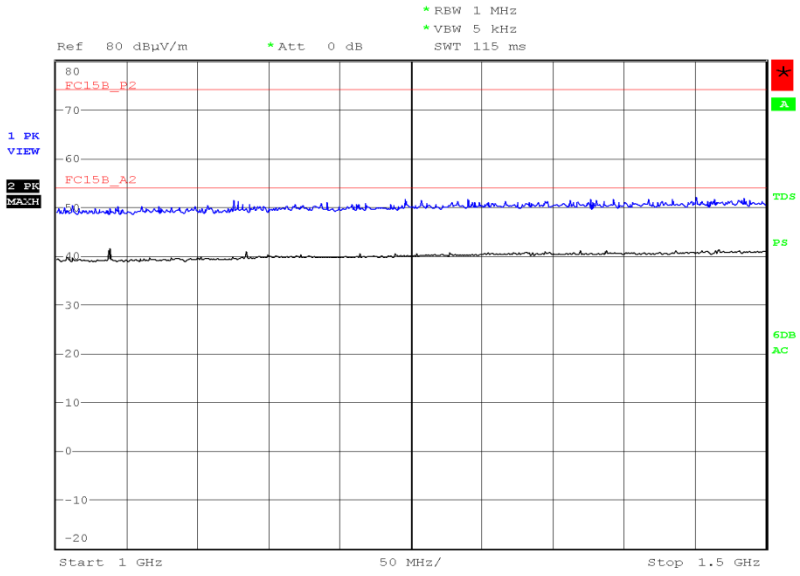


Frequency (MHz)	QP Level (dBµV/m)	QP Level (µV/m)	QP Limit (dBµV/m)	QP Limit (µV/m)	QP Margin (dBµV/m)	QP Margin (µV/m)	Angle (Deg)	Height (m)	Polarity
614.000	30.5	33.5	46.0	200	-15.5	166.5	74	1.00	Horizontal
960.000	45.7	192.8	46.0	200	-0.3	166.5	240	3.96	Horizontal
998.654	37.5	75.0	54.0	500	-16.5	425.0	219	1.00	Vertical

1GHz to 25GHz

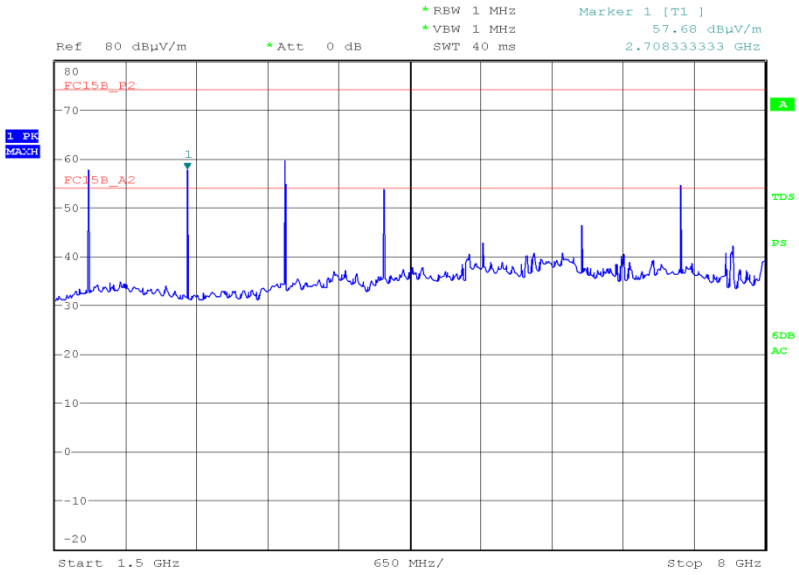
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
4.514	Vertical	100	240	59.69	42.25
2.708	Vertical	161	034	64.02	46.58

1 GHz to 1.5 GHz



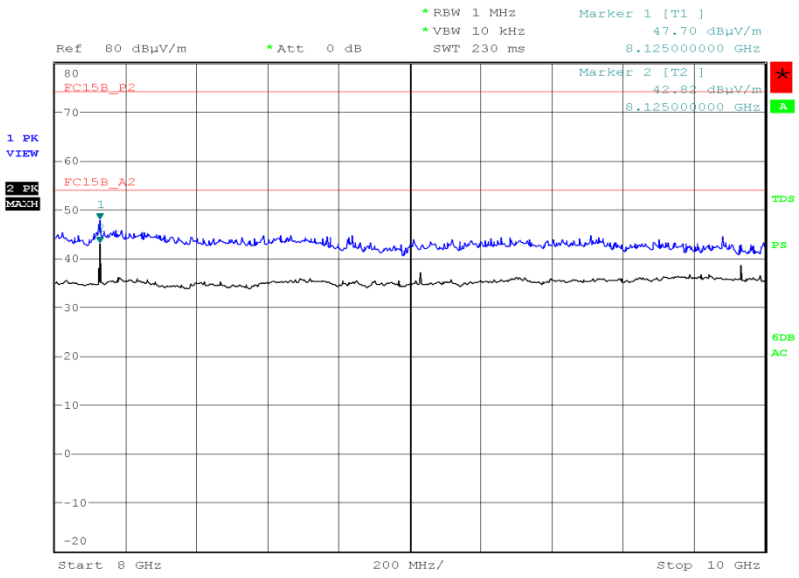
Product Service

1.5 GHz to 8 GHz



Date: 22.JAN.2013 21:18:40

8 GHz to 10 GHz



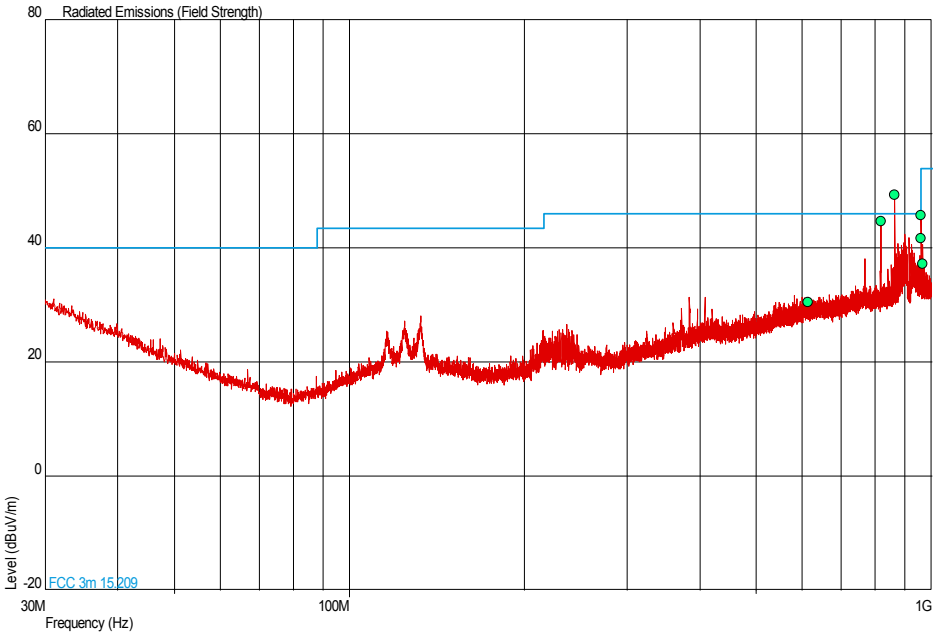
Date: 23.JAN.2013 20:28:03

Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

915.25 MHz

30 MHz to 1 GHz



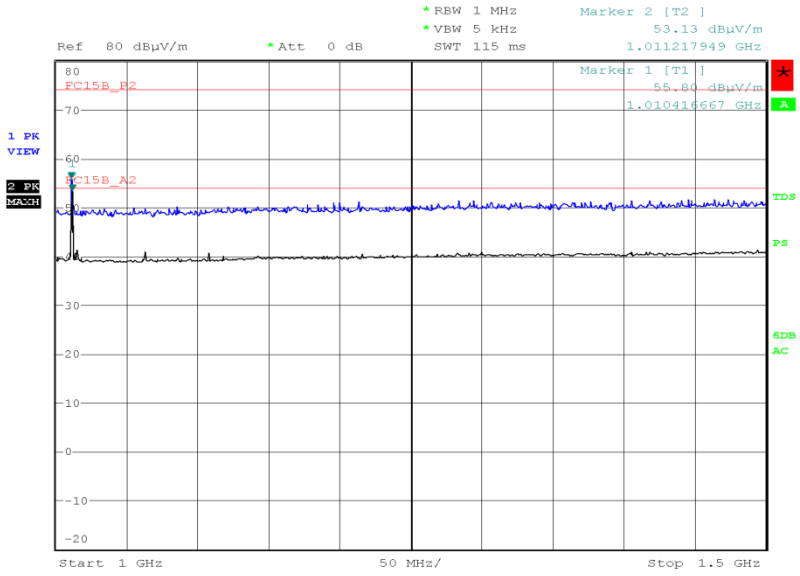
Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
614.000	30.5	33.5	46.0	200	-15.5	166.5	154	1.00	Horizontal
960.000	45.8	195.0	46.0	200	-0.2	5.0	168	1.16	Vertical
960.000	41.8	123.0	46.0	200	-4.2	77.0	254	1.88	Horizontal
966.496	37.2	72.4	54.0	501	-16.8	428.6	0	1.03	Vertical

Product Service

1GHz to 25GHz

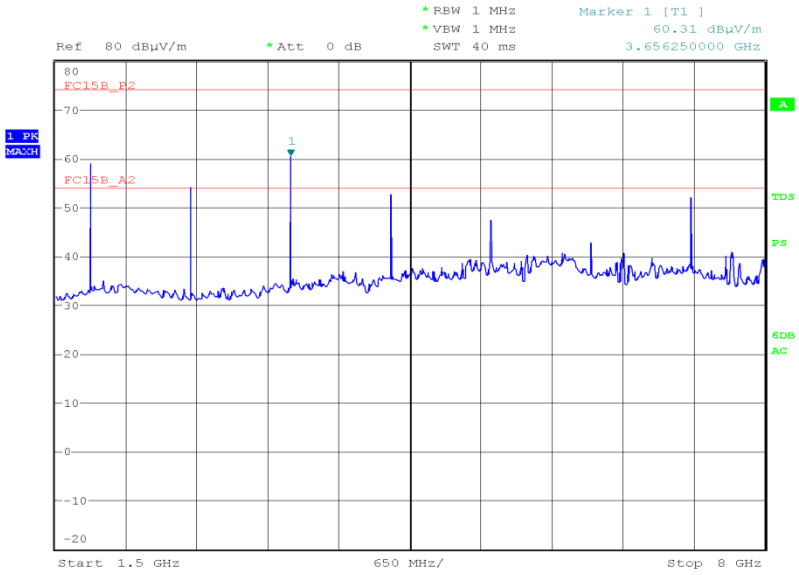
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
2.746	Vertical	123	032	60.93	43.48
4.576	Vertical	100	033	60.53	43.08
7.322	Horizontal	100	111	64.19	46.75
1.011	Vertical	100	158	53.30	35.85

1 GHz to 1.5 GHz



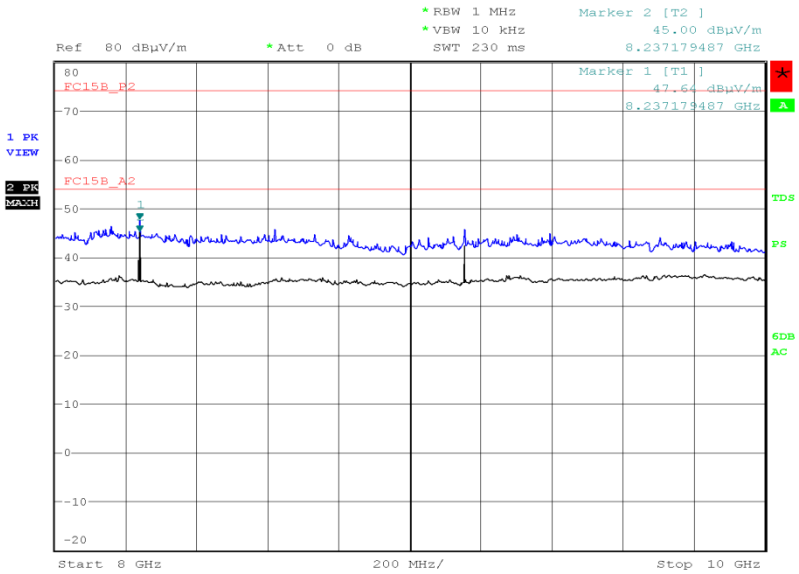
Product Service

1.5 GHz to 8 GHz



Date: 22.JAN.2013 21:47:04

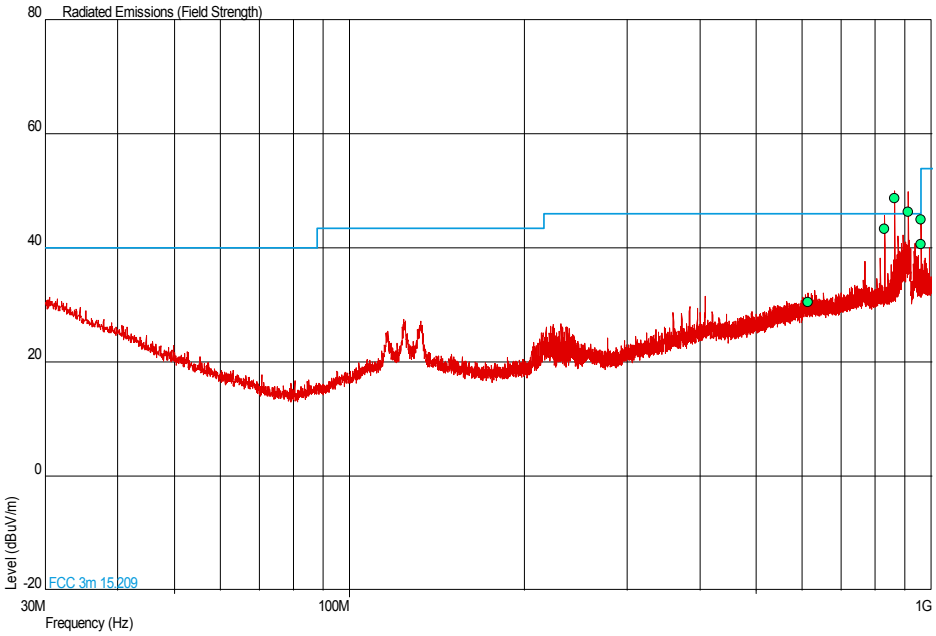
8 GHz to 10 GHz



Date: 23.JAN.2013 20:32:30

927.25 MHz

30 MHz to 1 GHz



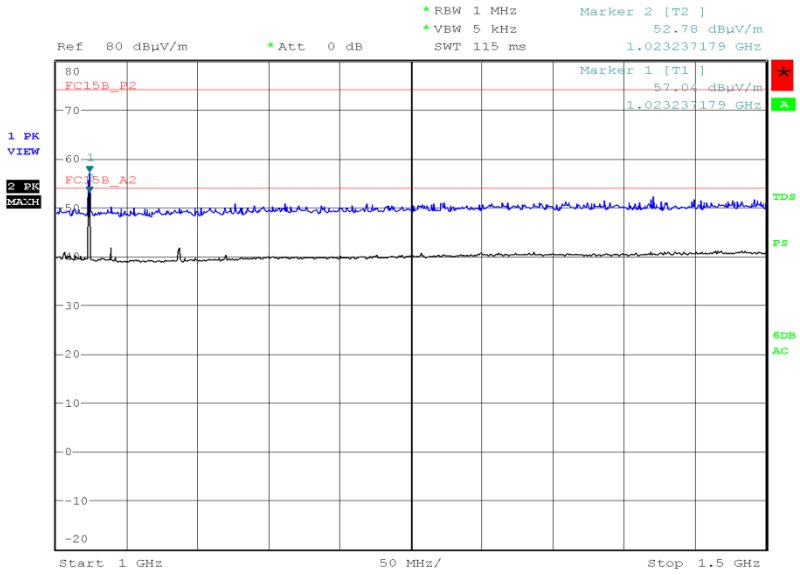
Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
614.000	30.5	33.5	46.0	200	-15.5	166.5	19	2.08	Horizontal
960.000	40.6	107.2	46.0	200	-5.4	92.8	242	1.00	Horizontal
960.000	44.9	175.8	46.0	200	-1.1	24.2	146	1.00	Vertical

Product Service

1GHz to 25GHz

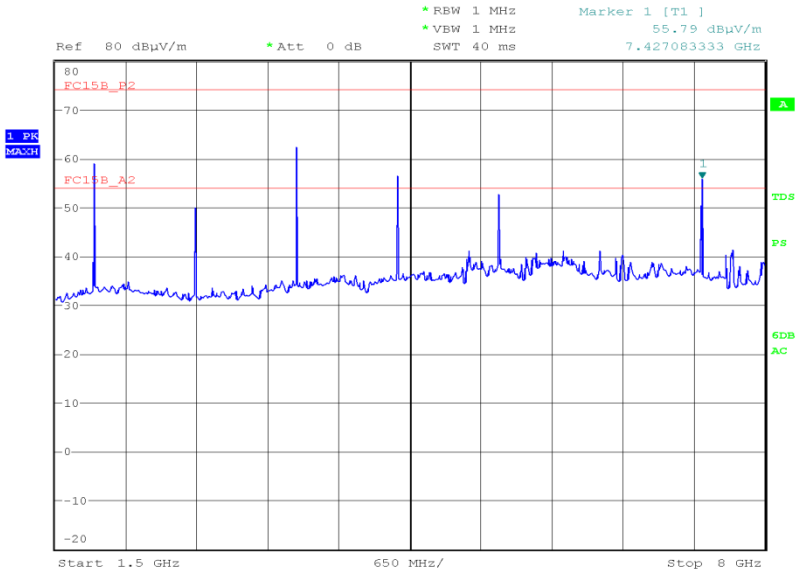
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
2.781	Vertical	120	039	57.91	40.46
4.636	Horizontal	100	140	61.29	43.84
7.412	Horizontal	105	117	66.67	49.23
1.023	Vertical	100	182	54.95	37.50

1 GHz to 1.5 GHz



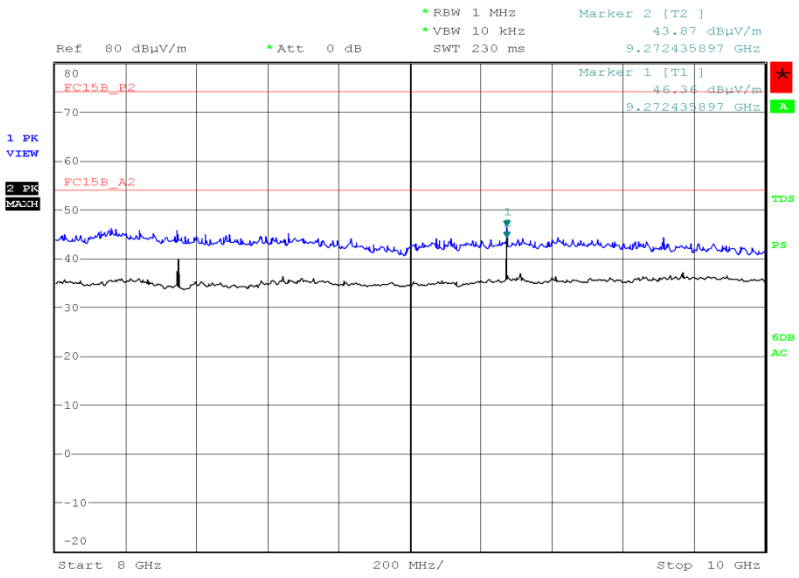
Product Service

1.5 GHz to 8 GHz



Date: 22.JAN.2013 22:21:12

8 GHz to 10 GHz



Date: 23.JAN.2013 20:36:43

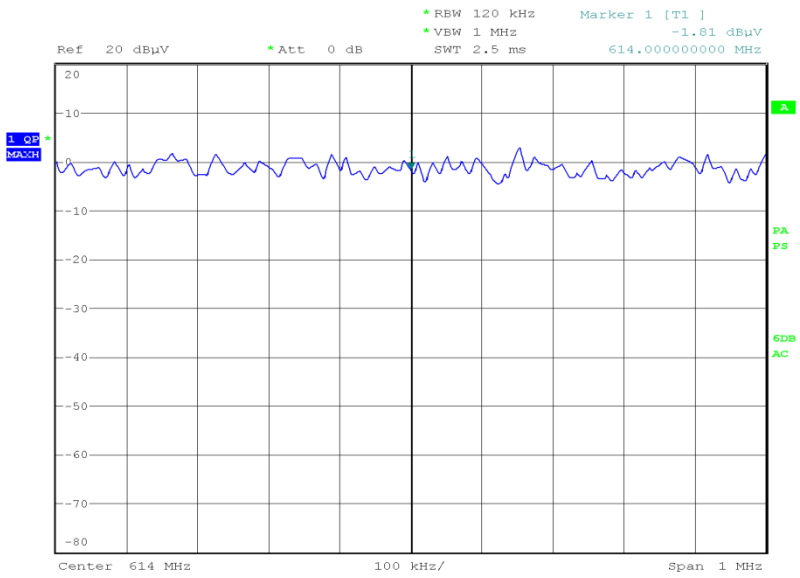
Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

Band Edge Emissions

902.75 MHz

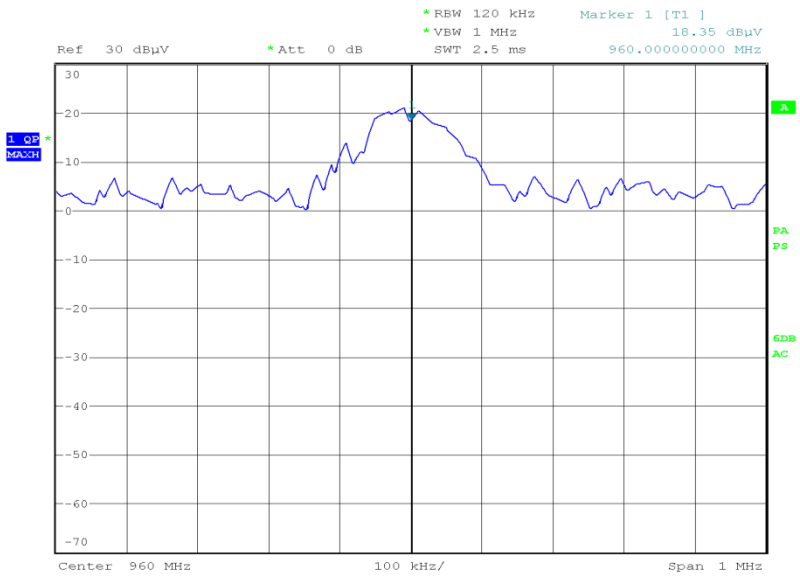
Polarisation	Final Quasi Peak (dBµV/m)
Horizontal	30.5



Date: 28.JAN.2013 22:18:45

927.25 MHz

Polarisation	Final Quasi Peak (dBµV/m)
Vertical	44.9



Date: 28.JAN.2013 22:09:32

Limit

Quasi Peak (dBµV/m)
46.0

This test has been performed using a MC55N0 unit of which the test software version was updated to change the duty cycle to approximately 15% at the request of the customer. As a result the average result was reduced as a result of a duty cycle correction factor of -17.445 dB which was applied to the peak measurement.

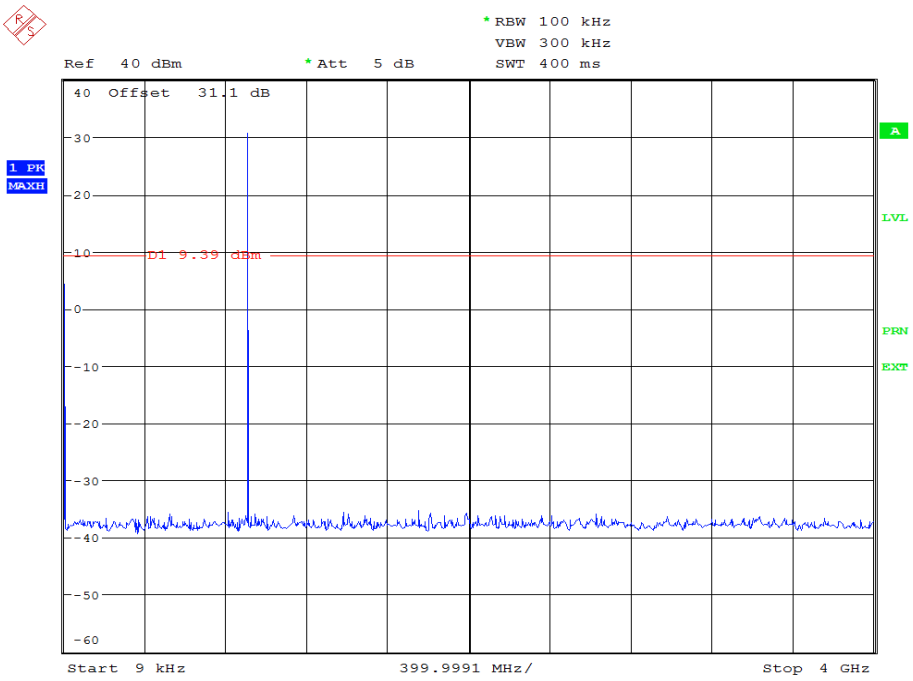
RFD5500 - Transmit Mode

3.7 V DC Supply

Spurious Conducted Emissions

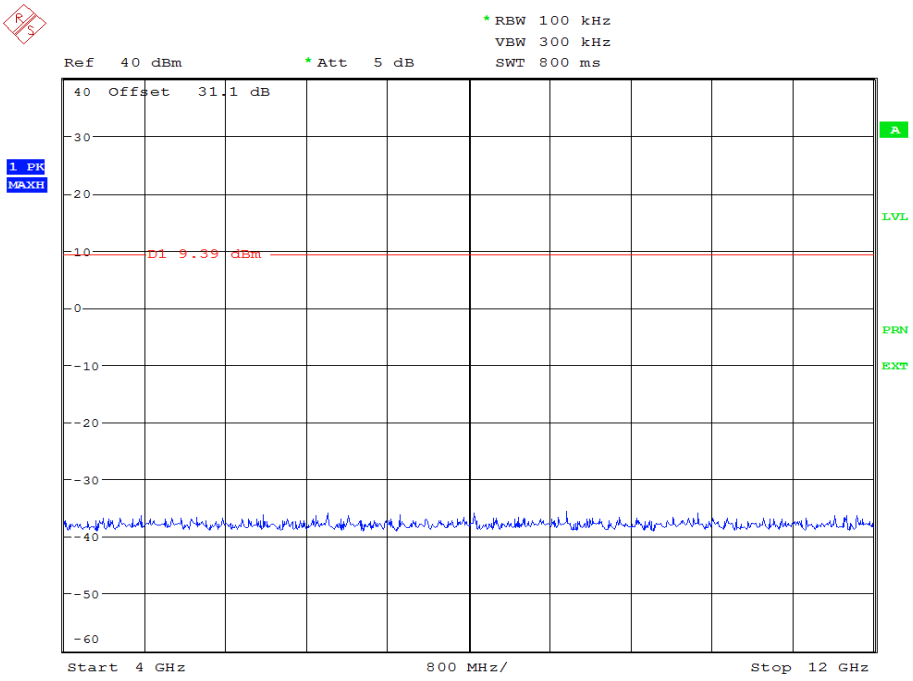
902.75 MHz

9 kHz to 4 GHz



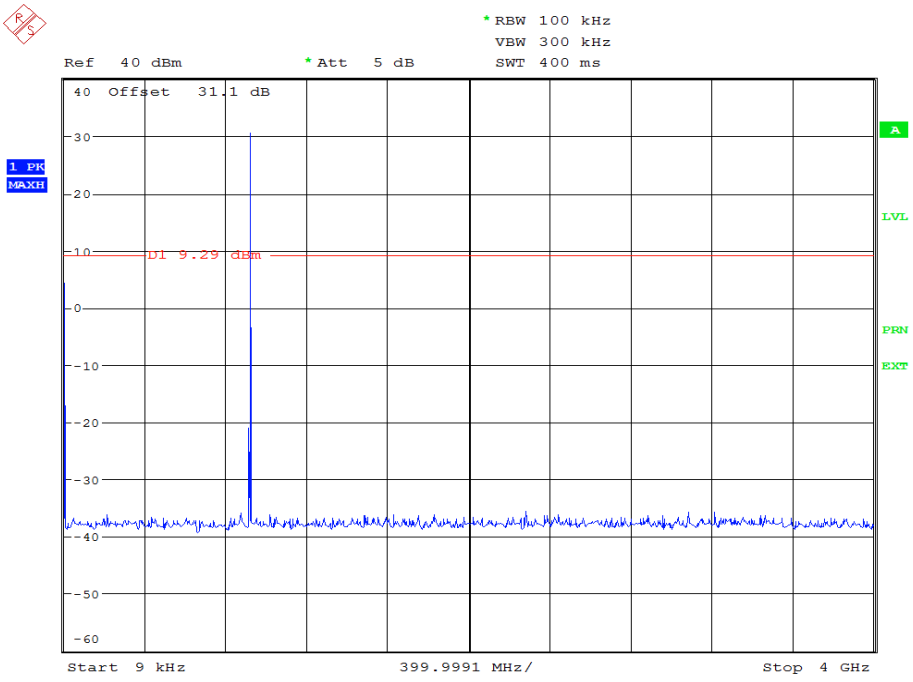
Product Service

4 GHz to 12 GHz



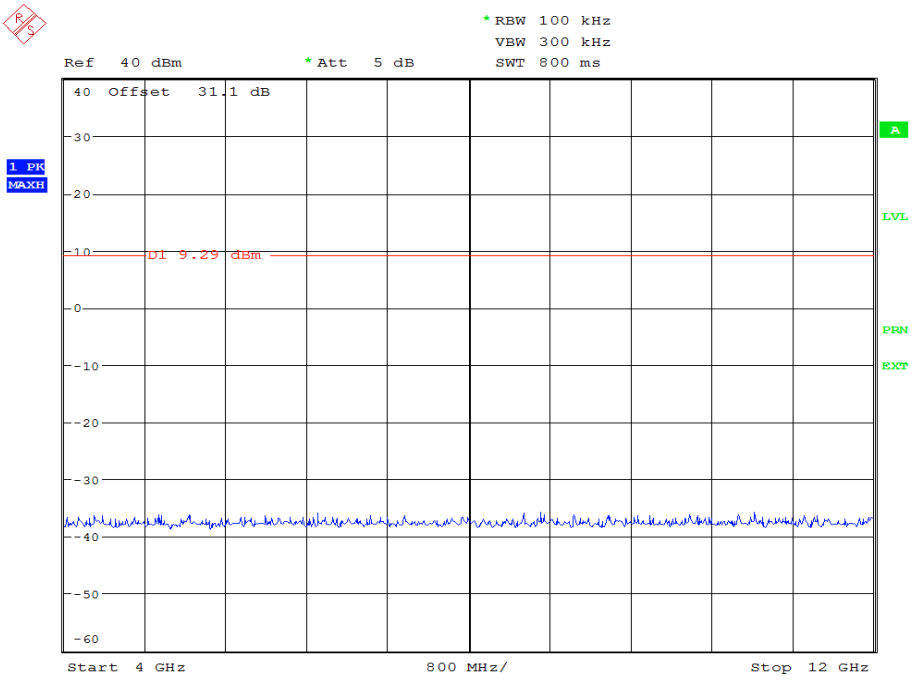
915.25 MHz

9 kHz to 4 GHz



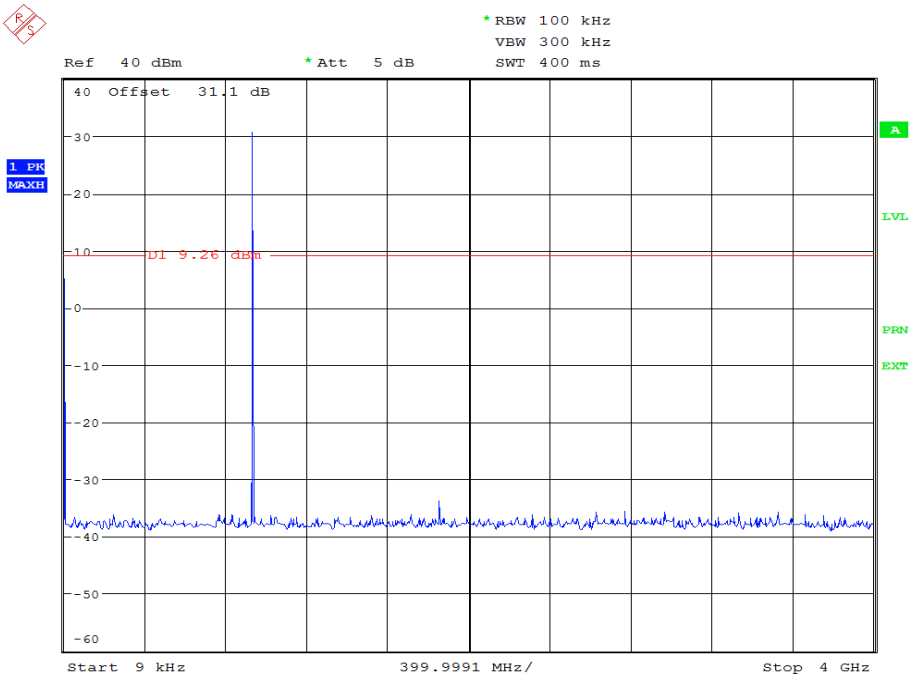
Product Service

4 GHz to 12 GHz



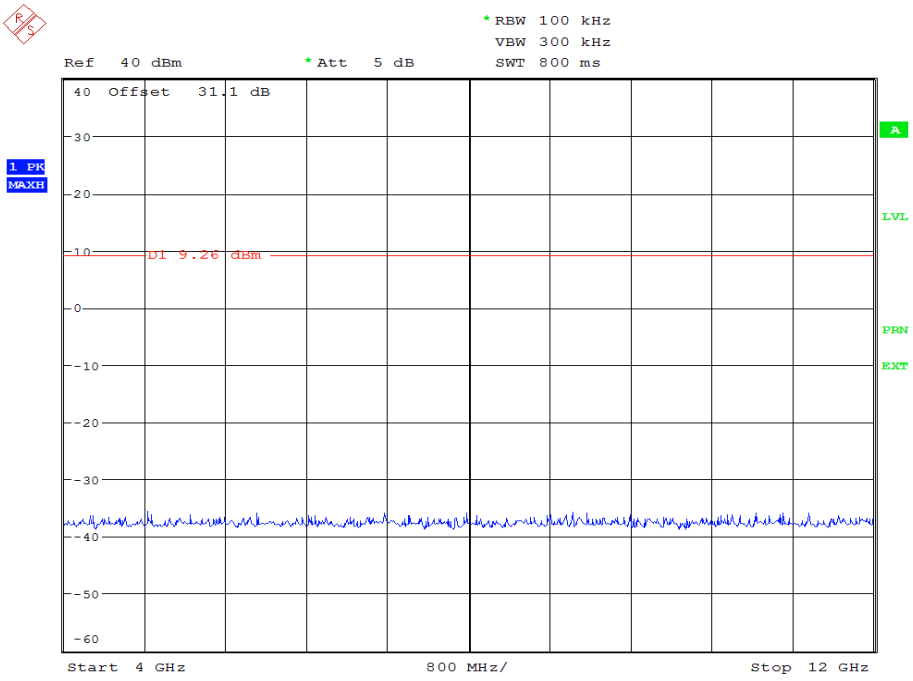
927.25 MHz

9 kHz to 4 GHz



Product Service

4 GHz to 12 GHz



Limit Clause

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 the attenuation required shall be 30 dB instead of 20 dB.

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 – AC Line Conducted Emissions					
LISN (1 Phase)	Chase	MN 2050	336	12	23-Mar-2013
Transient Limiter	Hewlett Packard	11947A	1032	12	28-Jun-2013
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	11-Oct-2013
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
Section 2.2 - Maximum Peak Conducted Output Power					
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	30-Nov-2013
Power Divider	Weinschel	1506A	3345	12	8-May-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2013
P-Series Power Meter	Agilent	N1911A	3981	12	17-Sep-2013
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4106	12	25-Oct-2013
Section 2.3 - Frequency Hopping Systems - 20 dB Bandwidth and Channel Separation					
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	30-Nov-2013
Power Divider	Weinschel	1506A	3345	12	8-May-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2013
P-Series Power Meter	Agilent	N1911A	3981	12	17-Sep-2013
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4106	12	25-Oct-2013
Section 2.4 - Frequency Hopping Systems - Dwell Time & No of Hopping Channels					
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	30-Nov-2013
Power Divider	Weinschel	1506A	3345	12	8-May-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2013
P-Series Power Meter	Agilent	N1911A	3981	12	17-Sep-2013
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4106	12	25-Oct-2013
Section 2.5 - EIRP Peak Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	9-Nov-2013
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	30-Aug-2013
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 - Spurious and Band Edge Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	9-Nov-2013
Filter (Tuneable Bandreject)	K&L Microwave	5TNF-500/1000-N/N	439	-	TU
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	19-Jan-2013
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	30-Nov-2013
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	31-Jan-2013
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	30-Aug-2013
Power Divider	Weinschel	1506A	3345	12	8-May-2013
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Aug-2013
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	11-Oct-2013
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	27-Jan-2013
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	27-Jun-2013
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	-	TU
P-Series Power Meter	Agilent	N1911A	3981	12	17-Sep-2013
1 Metre K Type Cable	Rhophase	KPS-1501A-1000-KPS	4106	12	25-Oct-2013

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Spurious and Band Edge Emissions	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Frequency Hopping Systems - 20 dB Bandwidth and Channel Sep	± 16.74 kHz
EIRP Peak Power	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Frequency Hopping Systems - Dwell Time & No of Hopping Channels	-
Maximum Peak Conducted Output Power	± 0.70 dB
AC Line Conducted Emissions	± 3.2 dB

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).