Direct Communication Solutions

Application
For
Certification

FCC ID: 2ABPW-DCS559-R

Router

Model: DCS-559

WiFi Transceiver

Report No.: 131105006SZN-002

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-13]

Prepared and Checked by:	Approved by:
Sign on file	Digitally signed by Billy Li Location: Intertek Testing Services
Harry Wu Engineer	Billy Li Supervisor Date: February 10, 2014

TRF no.: FCC 15C_Tx_b

Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China
Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751 Website: www.china.intertek-etlsemko.com

LIST OF EXHIBITS

INTRODUCTION

EXHIBIT 1: Summary of Tests

EXHIBIT 2: General Description

EXHIBIT 3: System Test Configuration

EXHIBIT 4: Measurement Results

EXHIBIT 5: Equipment Photographs

EXHIBIT 6: Product Labeling

EXHIBIT 7: Technical Specifications

EXHIBIT 8: Instruction Manual

EXHIBIT 9: Miscellaneous Information

EXHIBIT 10: Test Equipment List

MEASUREMENT/TECHNICAL REPORT

Direct Communication Solutions - MODEL: DCS-559

FCC ID: 2ABPW-DCS559-R

This report concerns (check one) Original Grant ___X___ Class II Change ____

Equipment Type: DTS - Part 15 Digital Transmission Systems (WiFi transmitter portion)

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No ___X___

If yes, defer until : _____ date

Company Name agrees to notify the Commission by: _____ date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No ___X___

If no, assumed Part 15, Subpart C for intentional radiator - the new 47 CFR [10-01-13 Edition] provision.

Report prepared by:

Harry Wu
Intertek Testing Services Shenzhen Ltd.
Kejiyuan Branch
6F, Block D, Huahan Building, Langshan Road,
Nanshan District, Shenzhen, P. R. China
Phone: (86 755) 8614 0716
Fax: (86 755) 8614 6751

Table of Contents

1.0 **Summary of test results** 2

2.0 **General Description** 4
2.1 Product Description 4
2.2 Related Submittal(s) Grants 4
2.3 Test Methodology 5
2.4 Test Facility 5

3.0 **System Test Configuration** 7
3.1 Justification 7
3.2 EUT Exercising Software 7
3.3 Details of EUT and Description of Peripherals 8
3.4 Measurement Uncertainty 8
3.5 Equipment Modification 8
3.6 Support Equipment List and Description 8

4.0 **Measurement Results** 10
4.1 Maximum Conducted Output Power at Antenna Terminals 10
4.2 Minimum 6dB RF Bandwidth 16
4.3 Maximum Power Density 26
4.4 Out of Band Conducted Emissions 36
4.5 Out of Band Radiated Emissions 61
4.6 Transmitter Radiated Emissions in Restricted Bands 62
4.7 Field Strength Calculation 63
4.8 Radiated Spurious Emission 64
4.9 Conducted Emission 78
4.10 Radiated Emission from Digital Section of Transceiver 81
4.11 Transmitter Duty Cycle Calculation and Measurements 82

5.0 **Equipment Photographs** 84

6.0 **Product Labelling** 86

7.0 **Technical Specifications** 88

8.0 **Instruction Manual** 90

9.0 **Miscellaneous Information** 92

10.0 **Test Equipment List** 94

List of attached file

Exhibit Type	File Description	Filename
Cover Letter	Letter of Agency	agency.pdf
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Operation Description	Technical Description	descri.pdf
ID Label/Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Confidentiality Letter	request.pdf

EXHIBIT 1

SUMMARY OF TEST RESULTS

1.0 Summary of Test

Direct Communication Solutions - MODEL: DCS-559

FCC ID: 2ABPW-DCS559-R

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	Pass
6 dB Bandwidth	15.247(a)(2)	Pass
Max. Power Density	15.247(e)	Pass
Out of Band Antenna Conducted Emission	15.247(d)	Pass
Radiated Emission in Restricted Bands	15.247(d)	Pass
AC Conducted Emission	15.207	Pass
Antenna Requirement	15.203	Pass (See Notes)

Notes: The EUT uses reversed SMA Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

EXHIBIT 2

GENERAL DESCRIPTION

2.0 General Description

2.1 Product Description

The Equipment Under Test (EUT) is a Router with internal WiFi function operating at 2412-2462MHz for 802.11b/g/n-HT20, 11 channels with 5MHz channel spacing and 2422-2452MHz for 802.11n-HT40, 7 channels with 5MHz channel spacing. It is powered by AC/DC Adapter (model: GFP181U-090200B-2) with input of 100-240VAC, 50/60Hz and output of DC9V, 2A. For more detailed features description, please refer to the user's manual.

Type of Modulation: DBPSK,DQPSK, BPSK,QPSK, 16QAM and 64QAM.
Antenna Type: Reversed SMA Antenna.

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

2.2 Related Submittal(s) Grants

This is an application for certification of:
DTS- Part 15C Digital Transmission Systems (WiFi transmitter portion)

Remaining portions are subject to the following procedures:
1. Receiver portion of WiFi: exempt from technical requirement of this Part.
2. PC downloads (Class B personal computer and peripherals): 131105006SZN-001.
3. Router (2G&3G): 131105006SZN-003.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009) and KDB 558074. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Semi-Anechoic chamber and shield room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 3

SYSTEM TEST CONFIGURATION

3.0 System Test Configuration

3.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. The EUT was powered by the AC/DC adapter (model: GFP181U-090200B-2) which was supplied by 120VAC, 60Hz of AC mains during the test. Only the worst case data was reported.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Power Parameters of IEEE 802.11b/g/n

Test software setting of IEEE 802.11b/g/n			
Channel No.	Power Level	Data rate	Modulation type
1,6,11	16.0	802.11b: 1-11Mbps	DBPSK,DQPSK, BPSK,QPSK
	14.0	802.11g: 6-54Mbps	BPSK, QPSK, 16QAM, 64QAM
1,6,11	14.0	802.11n-20M: 6.5-65Mbps	BPSK, QPSK, 16QAM, 64QAM

3,6,9	14.0	802.11n-40M: 13.5-135Mbps	BPSK, QPSK, 16QAM, 64QAM

3.3 Special Accessories

N/A

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance – Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

3.5 Equipment Modification

Any modifications installed previous to testing by Direct Communication Solutions will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch.

3.6 Support Equipment List and Description

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
AC/DC Adapter	Direct Communication Solutions	GFP181U-090200B-2
Laptop	Lenovo	X1
Hard Disk	Smart.drive	HD-003
USB Cable	Smart.drive	Unshielded, Length 155cm
1394 Cable	Smart.drive	Unshielded, Length 180cm
USB Disk	SanDisk	U210
3 * Router	TP-Link	TL-MR11U
5 * Network Cable	N/A	Unshielded, Length: 100cm

EXHIBIT 4

MEASUREMENT RESULTS

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.0 **Measurement Results**

4.1 Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(3):

[] The antenna power of the EUT was connected to the input of a spectrum analyzer. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

[×] The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set according to the FCC KDB 558074 spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges and power was read directly in dBm. External attenuation and cable loss were compensated from the measured value.

For antennas with gains of 6 dBi or less, maximum allowed Transmitter output is 1 watt (+30 dBm).

IEEE 802.11b (Antenna Gain = 2.3 dBi) (BPSK, 1Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	19.01	79.62
Middle Channel: 2437	18.96	78.70
High Channel: 2462	18.74	74.81

IEEE 802.11g (Antenna Gain = 2.3 dBi) (DBPSK, 6Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	16.86	48.53
Middle Channel: 2437	16.89	48.87
High Channel: 2462	16.30	48.66

IEEE 802.11n 20M (Antenna Gain = 2.3 dBi) (BPSK, 6.5Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2412	16.25	42.17
Middle Channel: 2437	15.92	39.08

High Channel: 2462	15.70	37.15

IEEE 802.11n 40M (Antenna Gain = 2.3 dBi) (BPSK, 13.5Mbps)		
Frequency (MHz)	Output in dBm	Output in mWatt
Low Channel: 2422	16.60	45.71
Middle Channel: 2437	16.50	44.67
High Channel: 2452	16.18	41.50

Cable loss: 0.5 dB External Attenuation: 0 dB

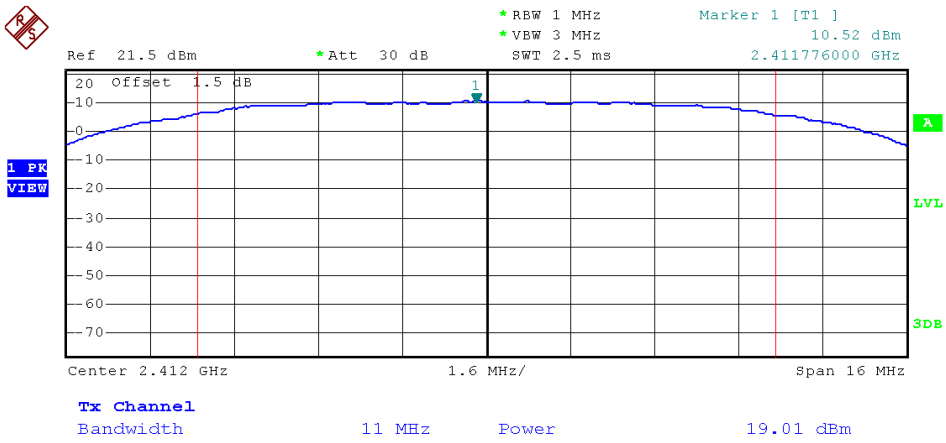
Cable loss, external attenuation has been included in OFFSET function

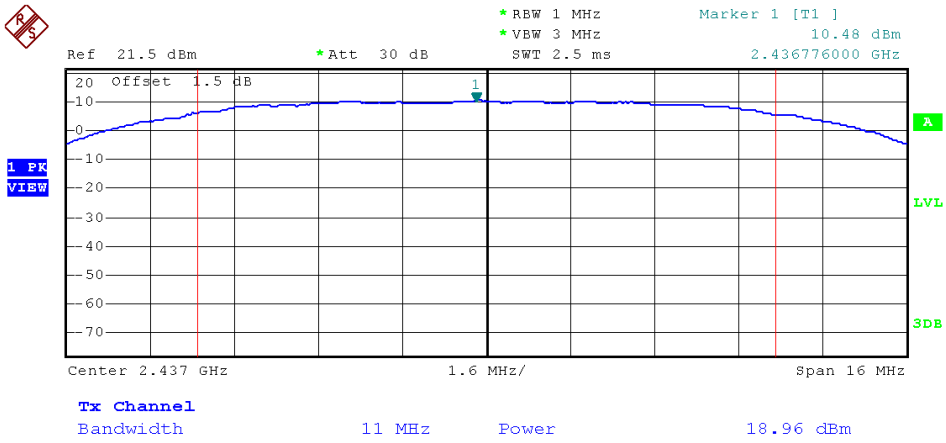
EUT dBm max. output level = 19.01 dBm

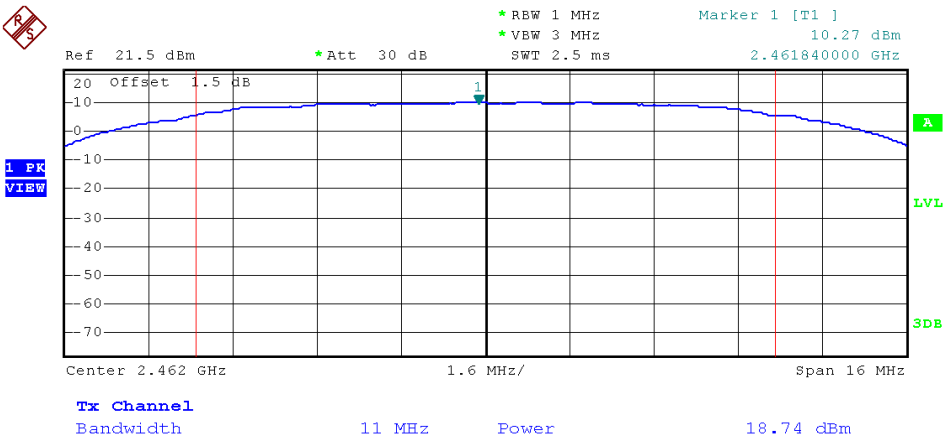
For RF Exposure, the information is saved with filename: RF exposure.pdf.

The test plots are attached as below.

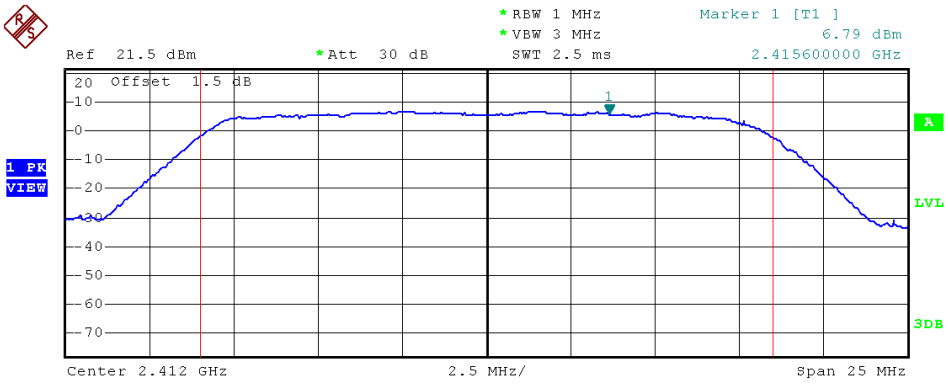
802.11b


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
10.52 dBm
2.411776000 GHz
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.412 GHz
1.6 MHz/
Span 16 MHz
Tx Channel
Bandwidth 11 MHz
Power 19.01 dBm

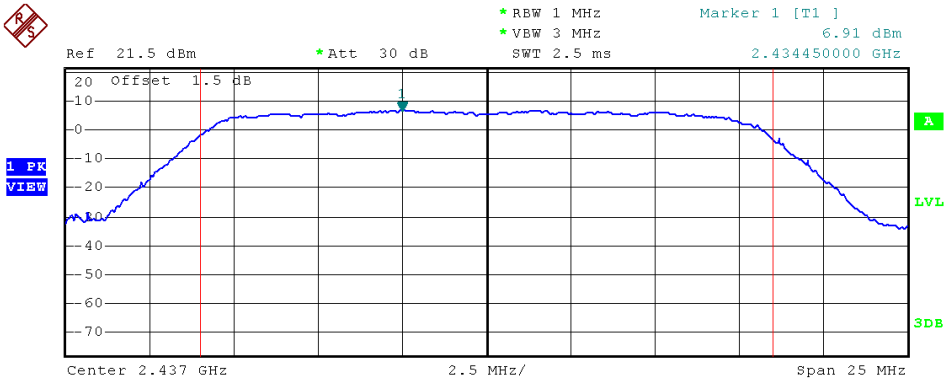

RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
10.48 dBm
2.436776000 GHz
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.437 GHz
1.6 MHz/
Span 16 MHz
Tx Channel
Bandwidth 11 MHz
Power 18.96 dBm


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
10.27 dBm
2.461840000 GHz
Ref 21.5 dBm
Att 30 dB
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.462 GHz
1.6 MHz/
Span 16 MHz
Tx Channel
Bandwidth 11 MHz
Power 18.74 dBm

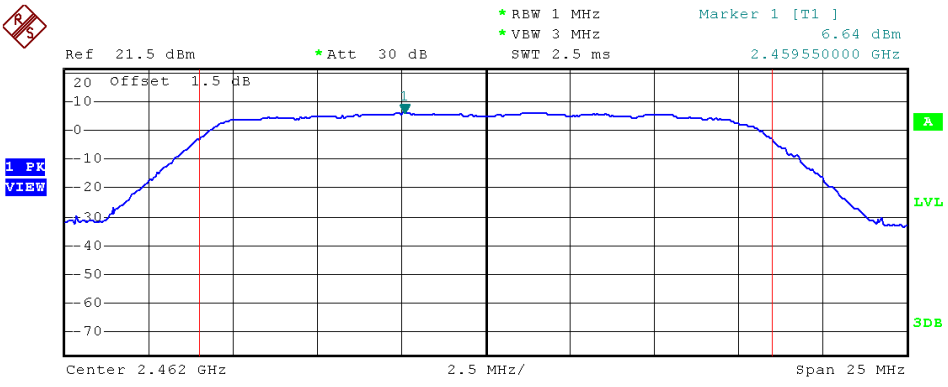
802.11g



Tx Channel
Bandwidth 17 MHz Power 16.86 dBm

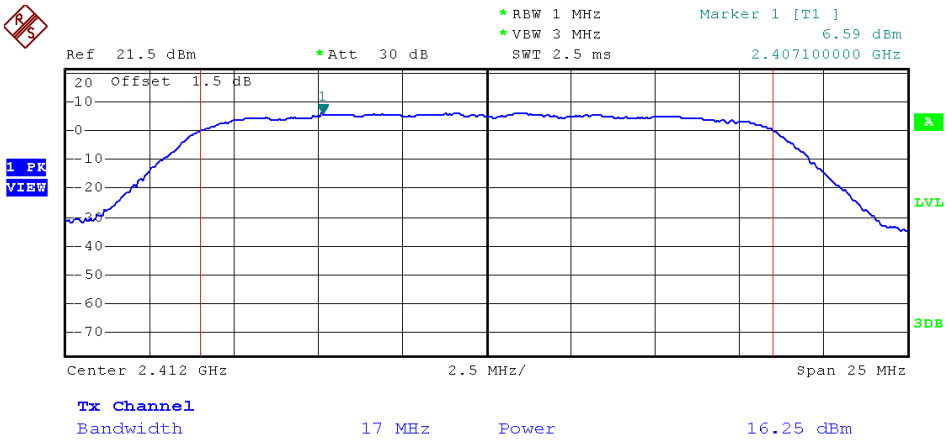


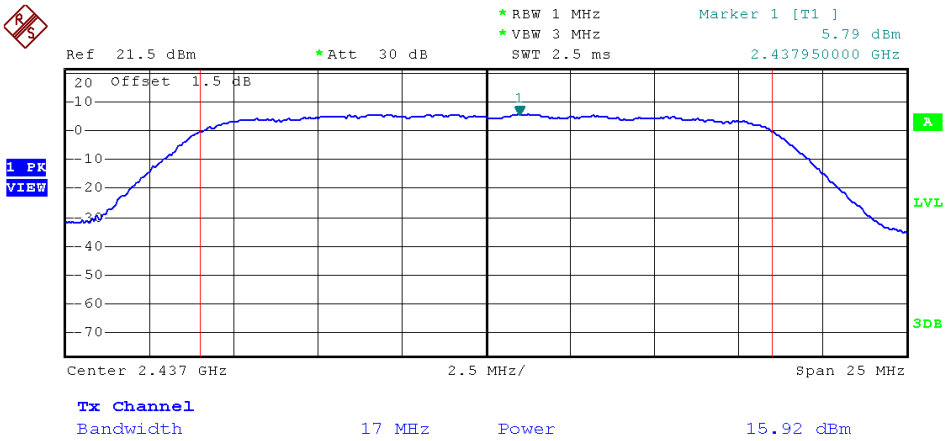
Tx Channel
Bandwidth 17 MHz Power 16.89 dBm

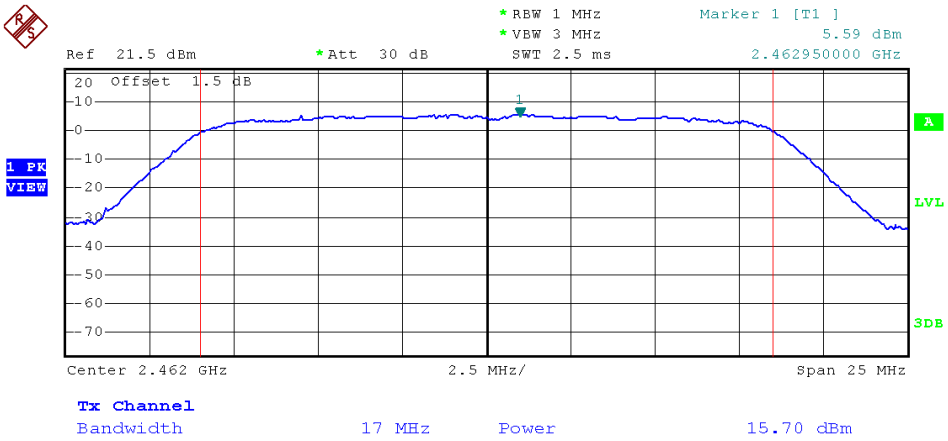


Tx Channel
Bandwidth 17 MHz Power 16.30 dBm

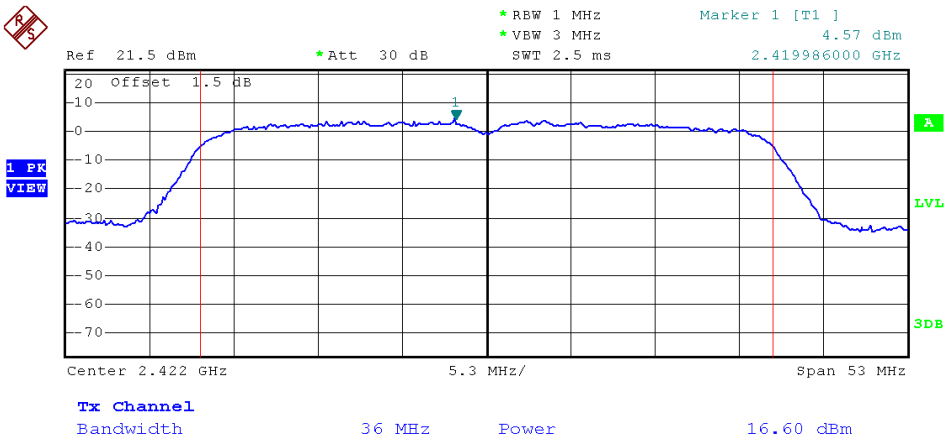
802.11n (HT-20)

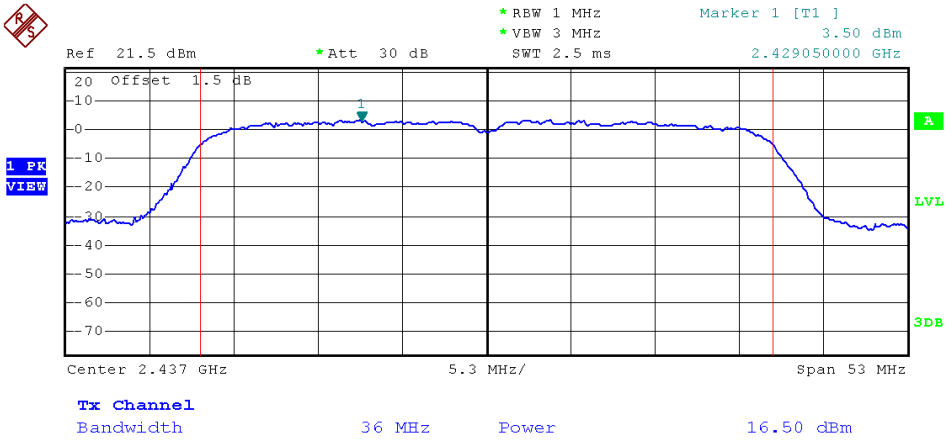

RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
6.59 dBm
2.407100000 GHz
Ref 21.5 dBm
Att 30 dB
20 Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.412 GHz
2.5 MHz/
Span 25 MHz
Tx Channel
Bandwidth
17 MHz
Power
16.25 dBm

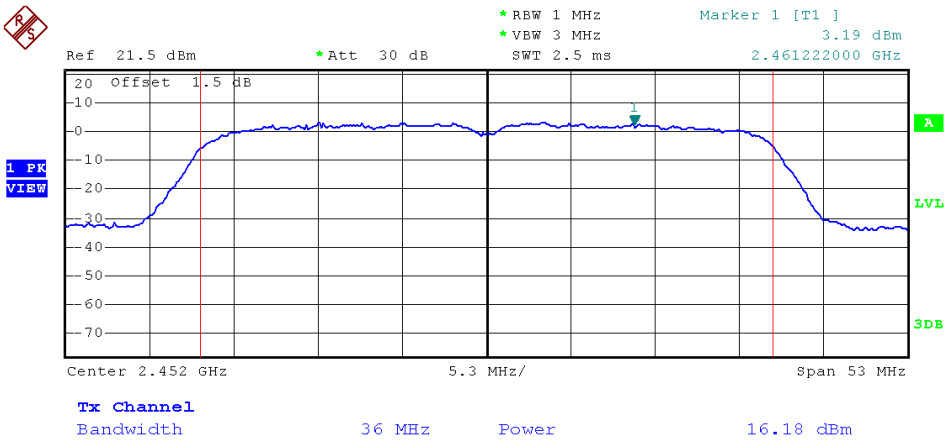

RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
5.79 dBm
2.437950000 GHz
Ref 21.5 dBm
Att 30 dB
20 Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.437 GHz
2.5 MHz/
Span 25 MHz
Tx Channel
Bandwidth
17 MHz
Power
15.92 dBm


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
5.59 dBm
2.462950000 GHz
Ref 21.5 dBm
Att 30 dB
20 Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.462 GHz
2.5 MHz/
Span 25 MHz
Tx Channel
Bandwidth
17 MHz
Power
15.70 dBm

802.11n (HT-40)


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
4.57 dBm
2.419986000 GHz
Ref 21.5 dBm
Att 30 dB
20 Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
Center 2.422 GHz
5.3 MHz/
Span 53 MHz
Tx Channel
Bandwidth 36 MHz
Power 16.60 dBm


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
3.50 dBm
2.429050000 GHz
Ref 21.5 dBm
Att 30 dB
20 Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
Center 2.437 GHz
5.3 MHz/
Span 53 MHz
Tx Channel
Bandwidth 36 MHz
Power 16.50 dBm


RBW 1 MHz
VBW 3 MHz
SWT 2.5 ms
Marker 1 [T1]
3.19 dBm
2.461222000 GHz
Ref 21.5 dBm
Att 30 dB
20 Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
Center 2.452 GHz
5.3 MHz/
Span 53 MHz
Tx Channel
Bandwidth 36 MHz
Power 16.18 dBm

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.2 Minimum 6 dB RF Bandwidth, FCC Rule 15.247(a)(2):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was set to 100 KHz according to FCC KDB 558074. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6dB bandwidth was determined from where the channel output spectrum intersected the display line.

Limit: The 6 dB Bandwidth is at least 500 kHz.

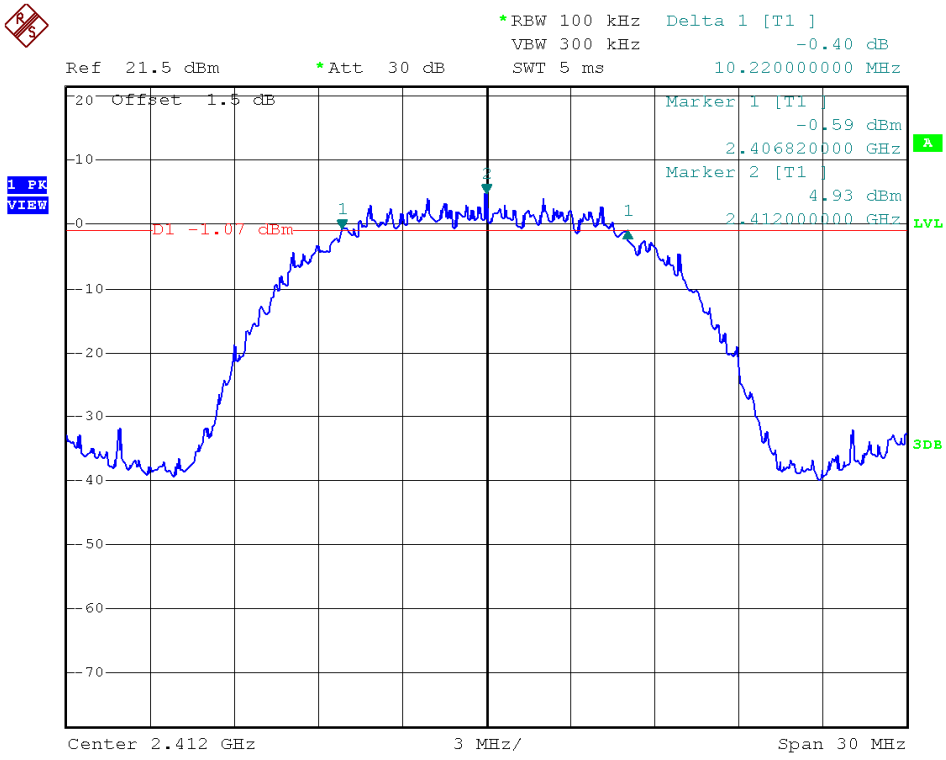
IEEE 802.11b (BPSK, 1Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	10.22
2437	10.22
2462	10.26

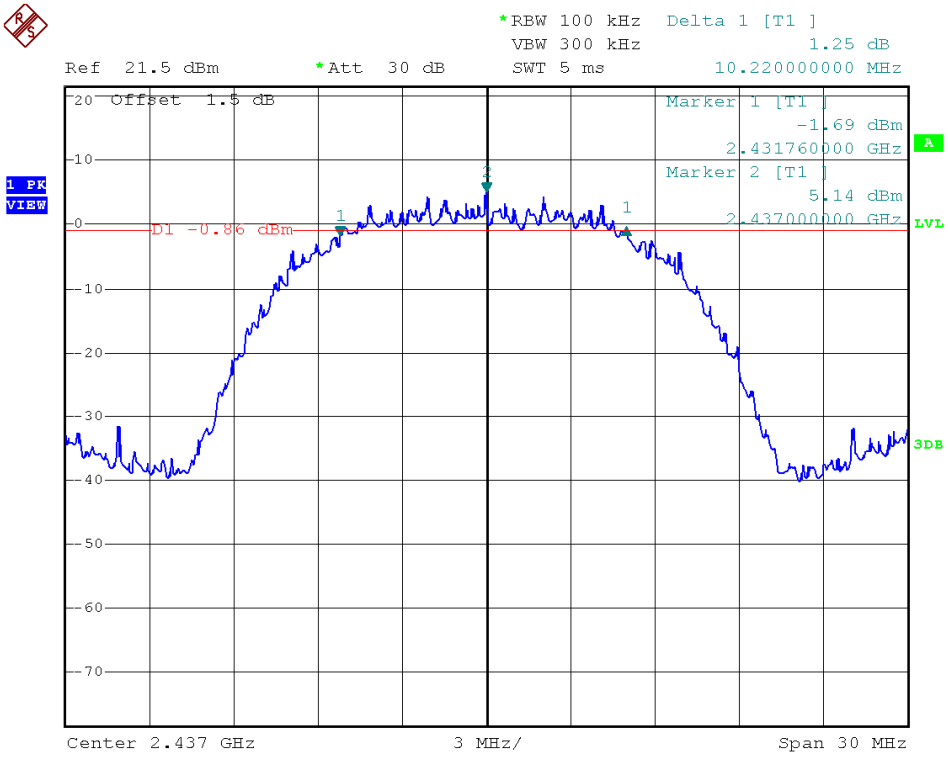
IEEE 802.11g (DBPSK, 6Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.38
2437	16.32
2462	16.32
IEEE 802.11n 20M (BPSK, 6.5Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2412	16.26
2437	16.26
2462	16.32

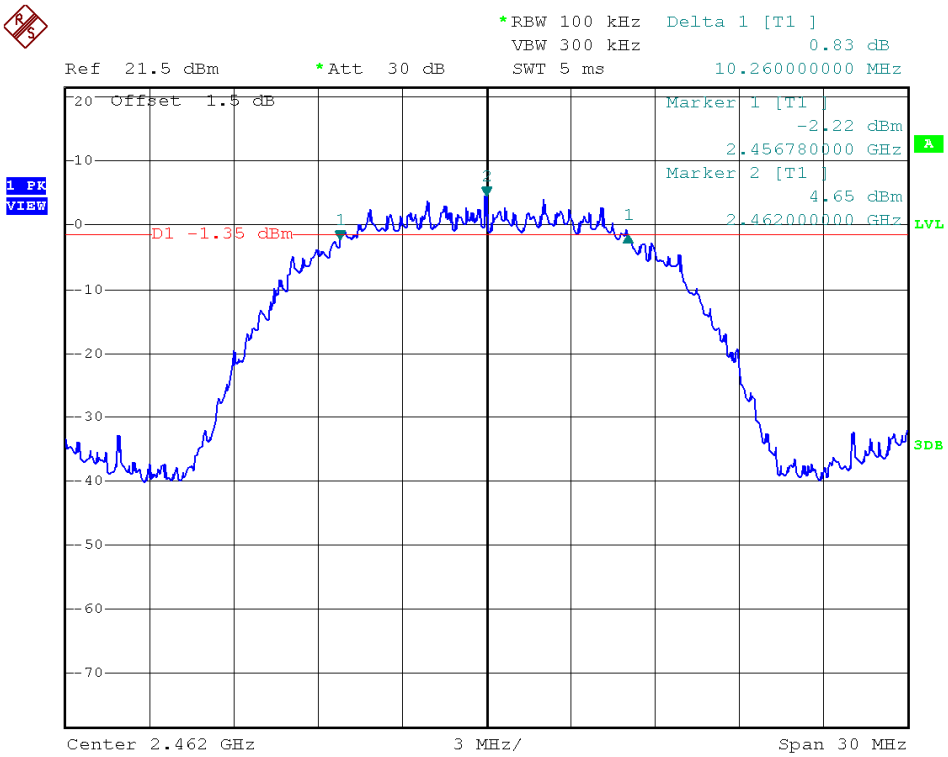
IEEE 802.11n 40M (BPSK, 13.5Mbps)	
Frequency (MHz)	6 dB Bandwidth (MHz)
2422	35.20
2437	35.20
2452	35.20

The test plots are attached as below.

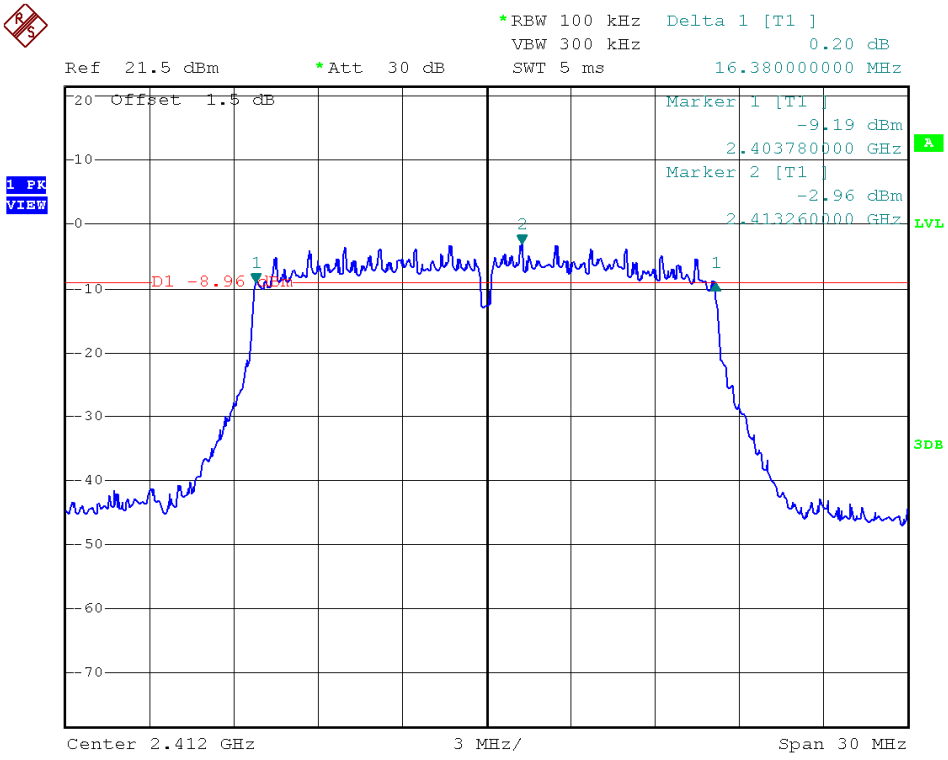
802.11b

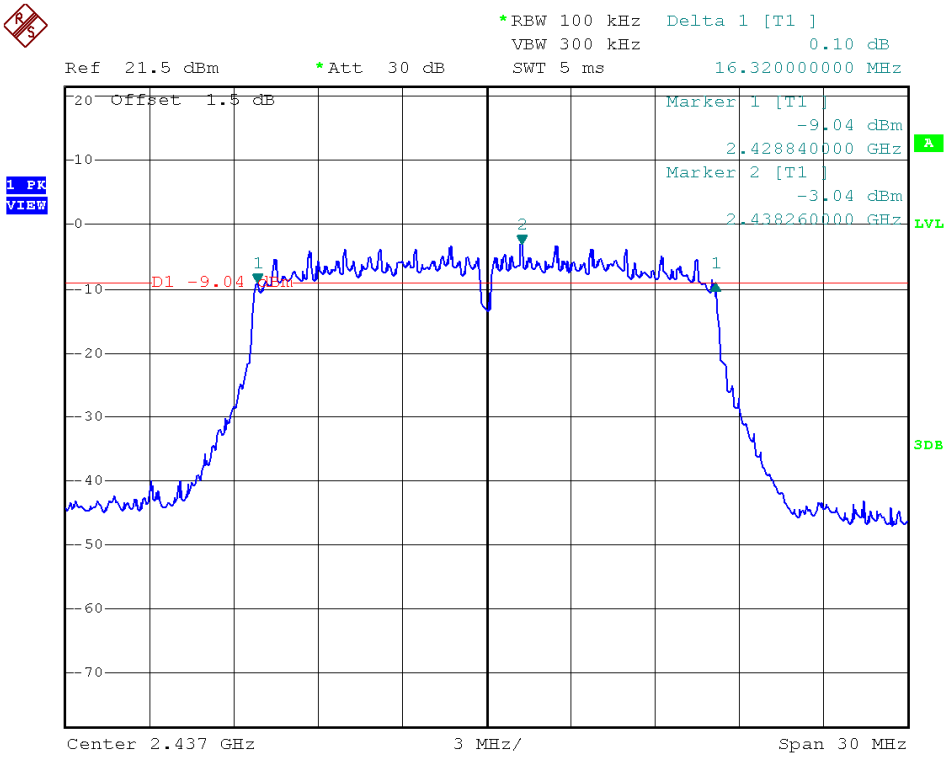

*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-0.40 dB
10.220000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-0.59 dBm
2.406820000 GHz
Marker 2 [T1]
4.93 dBm
2.412000000 GHz
D1 -1.07 dBm
1 PK VIEW
A
LVL
3DB
Center 2.412 GHz
3 MHz/
Span 30 MHz

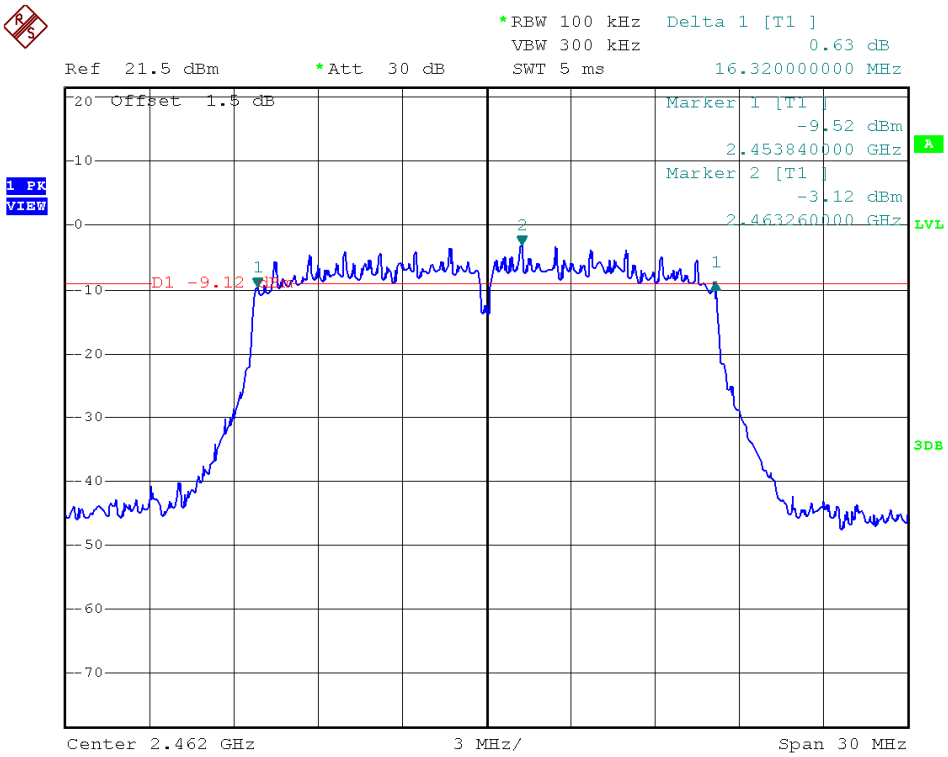

*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
1.25 dB
10.220000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-1.69 dBm
2.431760000 GHz
Marker 2 [T1]
5.14 dBm
2.437000000 GHz
D1 -0.86 dBm
1 PK VIEW
A
LVL
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz


*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
0.83 dB
10.260000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-2.22 dBm
2.456780000 GHz
Marker 2 [T1]
4.65 dBm
2.462000000 GHz
1 PK
VIEW
D1 -1.35 dBm
LVL
3DB
Center 2.462 GHz
3 MHz/
Span 30 MHz

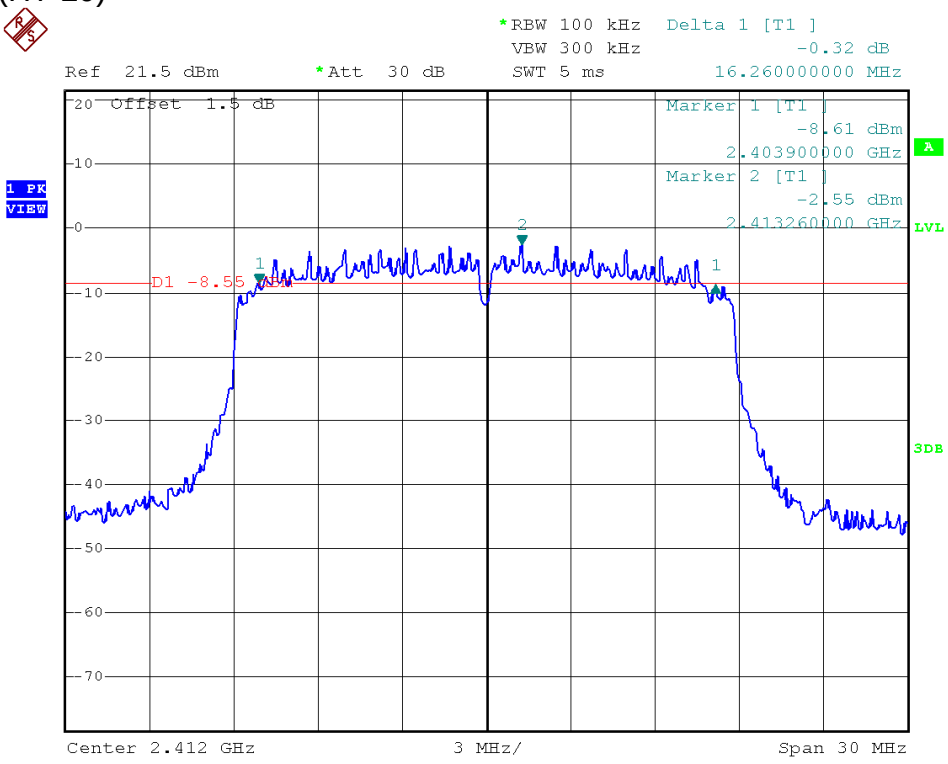
802.11g

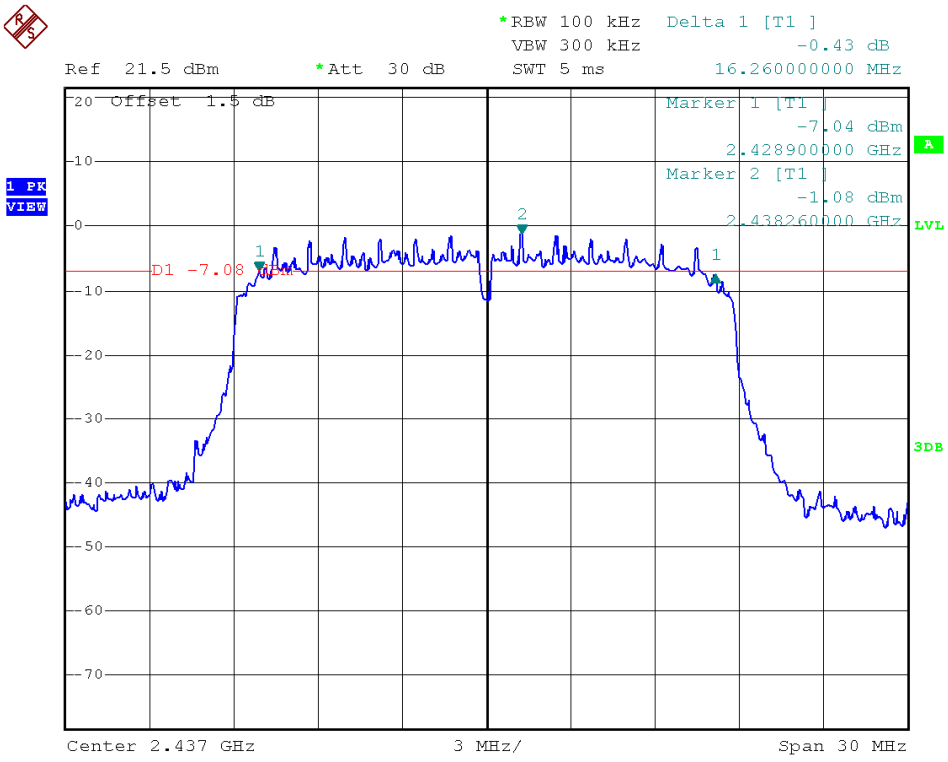

*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
0.20 dB
16.380000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-9.19 dBm
2.403780000 GHz
Marker 2 [T1]
-2.96 dBm
2.413260000 GHz
D1 -8.96 dBm
1 PK VIEW
A
LVL
3DB
Center 2.412 GHz
3 MHz/
Span 30 MHz

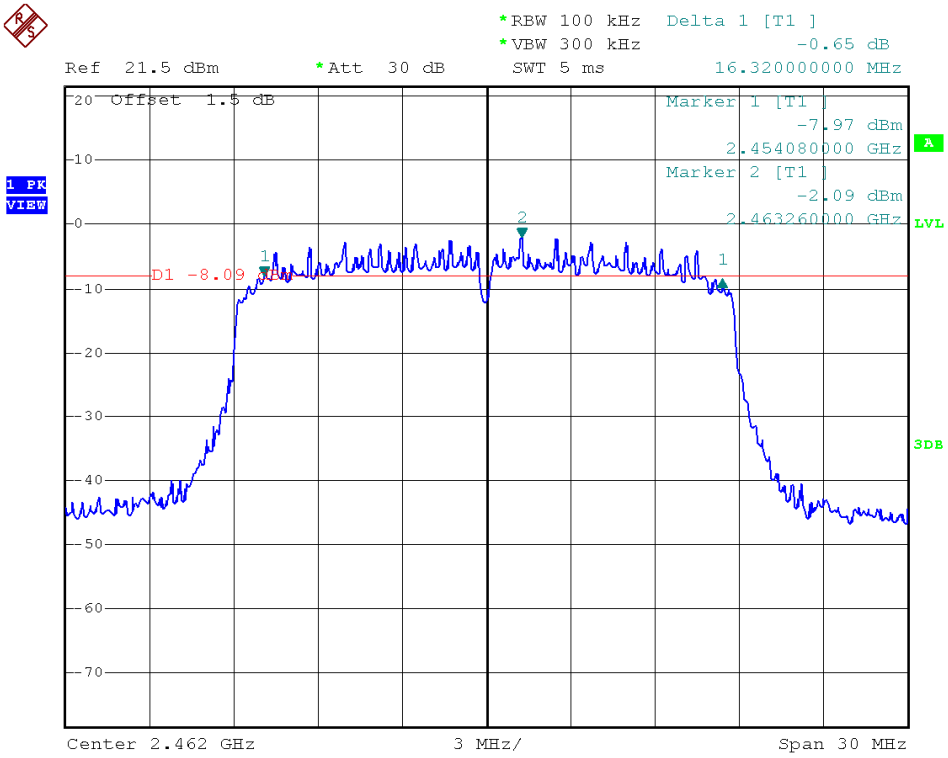

*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
0.10 dB
16.320000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-9.04 dBm
2.428840000 GHz
Marker 2 [T1]
-3.04 dBm
2.438260000 GHz
D1 -9.04 dBm
1 PK VIEW
A
LVL
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz


*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
0.63 dB
16.320000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-9.52 dBm
2.453840000 GHz
Marker 2 [T1]
-3.12 dBm
2.463260000 GHz
1 PK
VIEW
A
LVL
3DB
D1 -9.12 dBm
Center 2.462 GHz
3 MHz/
Span 30 MHz

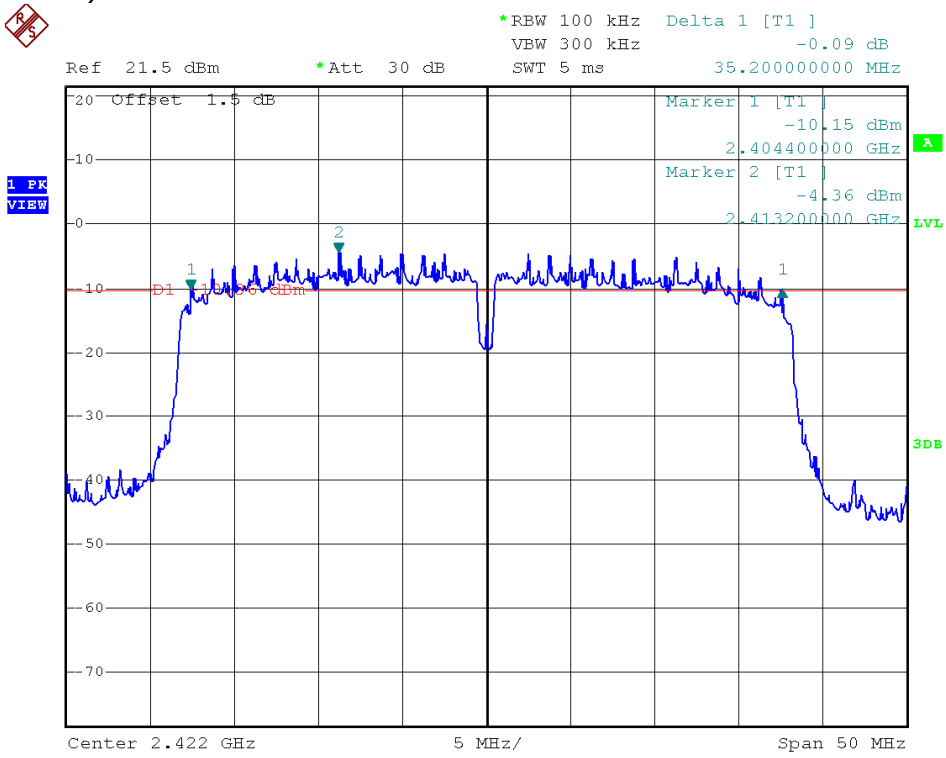
802.11n (HT-20)

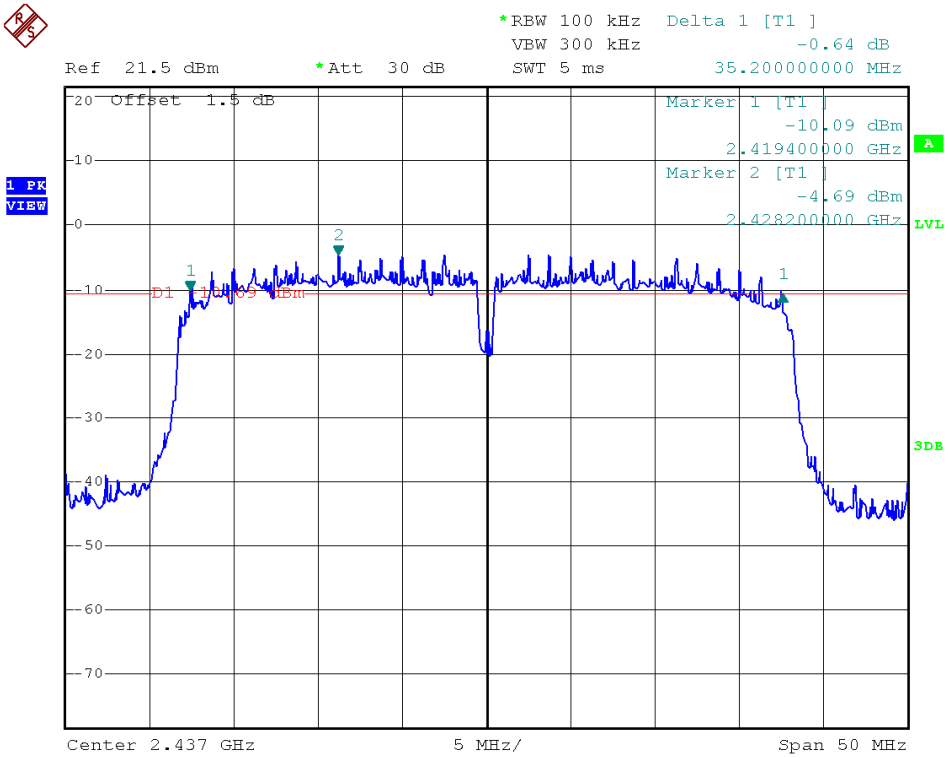

*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-0.32 dB
16.260000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-8.61 dBm
2.403900000 GHz
Marker 2 [T1]
-2.55 dBm
2.413260000 GHz
D1 -8.55 dBm
1 PK VIEW
A
LVL
3DB
Center 2.412 GHz
3 MHz/
Span 30 MHz

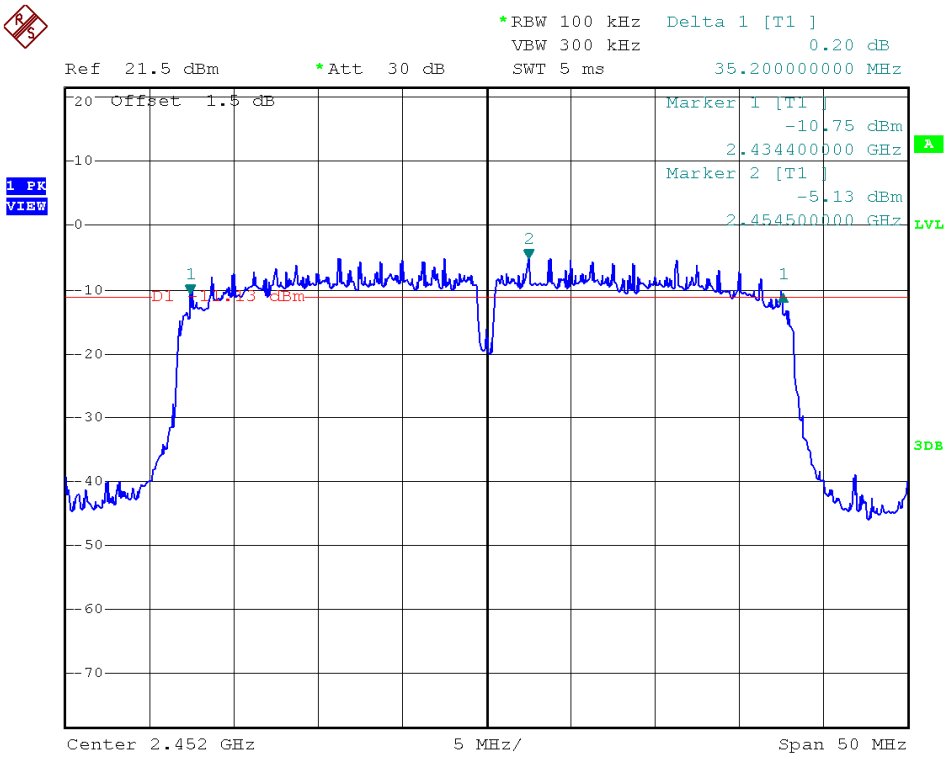

*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-0.43 dB
16.260000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-7.04 dBm
2.428900000 GHz
Marker 2 [T1]
-1.08 dBm
2.438260000 GHz
D1 -7.08 dBm
1 PK VIEW
A
LVL
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz


*RBW 100 kHz
*VBW 300 kHz
Ref 21.5 dBm
*Att 30 dB
SWT 5 ms
Delta 1 [T1]
-0.65 dB
16.320000000 MHz
Offset 1.5 dB
Marker 1 [T1]
-7.97 dBm
2.454080000 GHz
Marker 2 [T1]
-2.09 dBm
2.463260000 GHz
1 PK
VIEW
A
LVL
3DB
D1 -8.09 dBm
Center 2.462 GHz
3 MHz/
Span 30 MHz

802.11n (HT-40)


*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-0.09 dB
35.200000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-10.15 dBm
2.404400000 GHz
Marker 2 [T1]
-4.36 dBm
2.413200000 GHz
1 PK
VIEW
A
LVL
3DB
Center 2.422 GHz
5 MHz/
Span 50 MHz


*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
-0.64 dB
35.200000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-10.09 dBm
2.419400000 GHz
Marker 2 [T1]
-4.69 dBm
2.428200000 GHz
1 PK
VIEW
A
LVL
3DB
Center 2.437 GHz
5 MHz/
Span 50 MHz


*RBW 100 kHz
VBW 300 kHz
SWT 5 ms
Delta 1 [T1]
0.20 dB
35.200000000 MHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
Marker 1 [T1]
-10.75 dBm
2.434400000 GHz
Marker 2 [T1]
-5.13 dBm
2.454500000 GHz
1 PK
VIEW
A
LVL
3DB
D1 [T1] dBm
Center 2.452 GHz
5 MHz/
Span 50 MHz

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.3 Maximum Power Density Reading, FCC Rule 15.247(e):

The Measurement Procedure PKPSD was set according to the FCC KDB 558074.

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Limit: The Power Density does not exceed 8dBm/ 3 kHz.

IEEE 802.11b (BPSK, 1Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	4.95
2437	4.82
2462	4.83

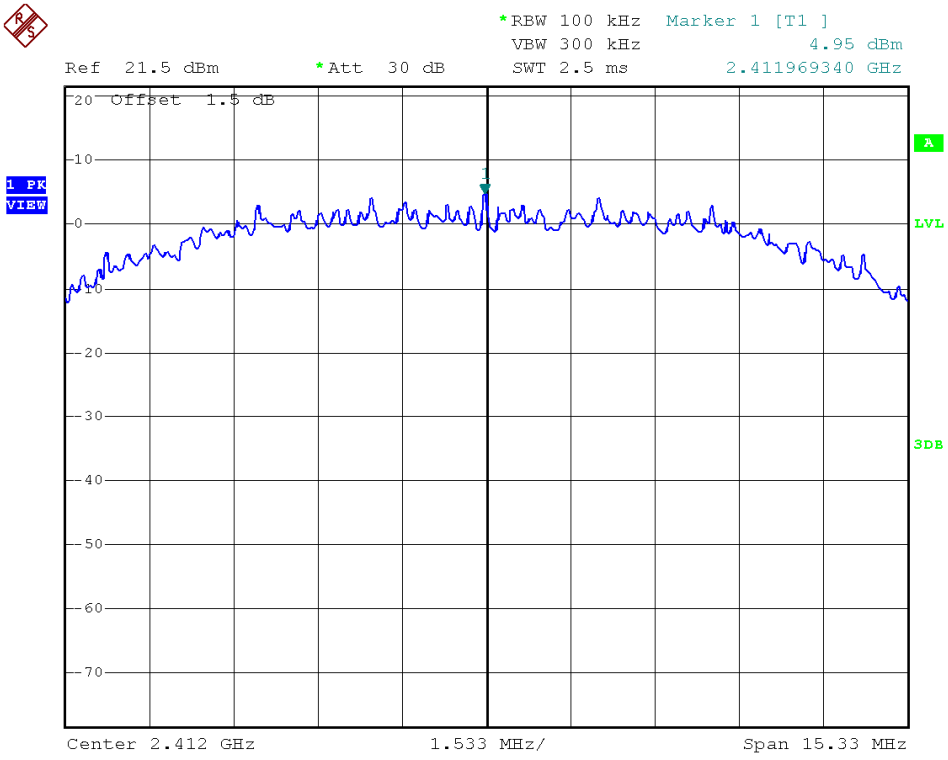
IEEE 802.11g (DBPSK, 6Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	-2.20
2437	-2.29
2462	-2.43

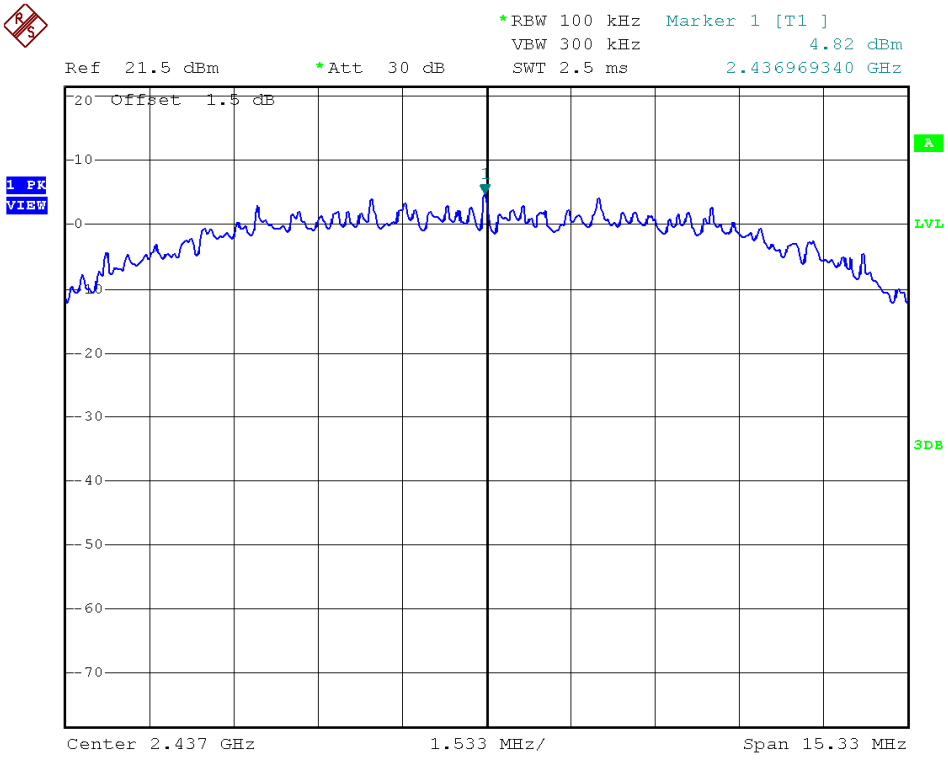
IEEE 802.11n 20M (BPSK, 6.5Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2412	-2.07
2437	-2.23
2462	-2.47

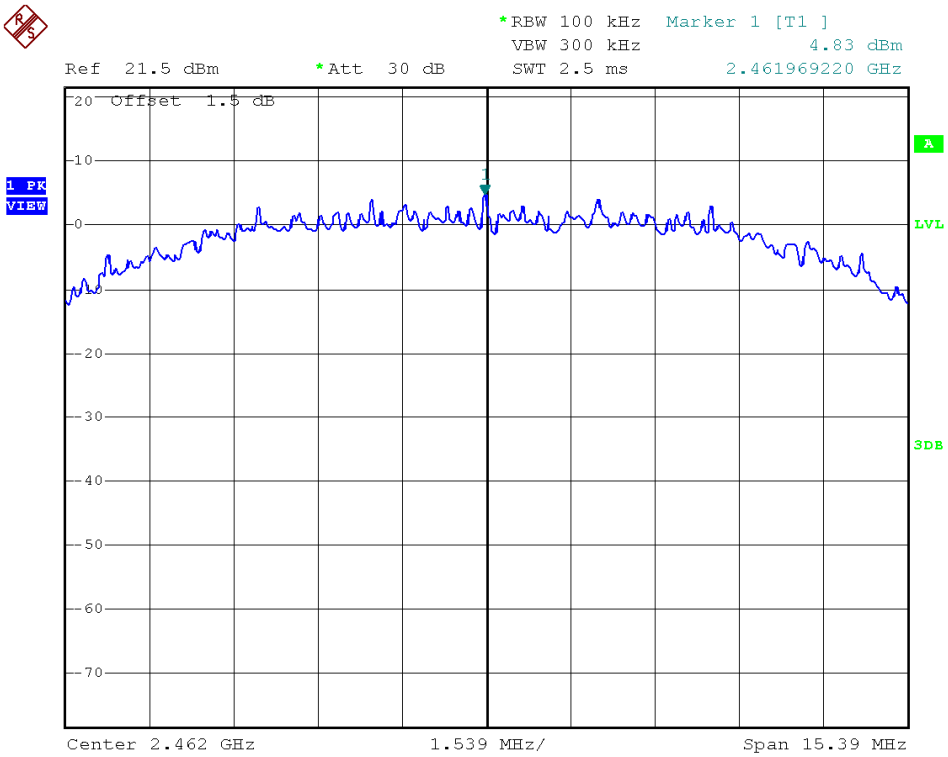
IEEE 802.11n 40M (BPSK, 13.5Mbps)	
Frequency (MHz)	Power Density with RBW 100KHz
2422	-4.72
2437	-4.90
2452	-5.32

The test plots are attached as below.

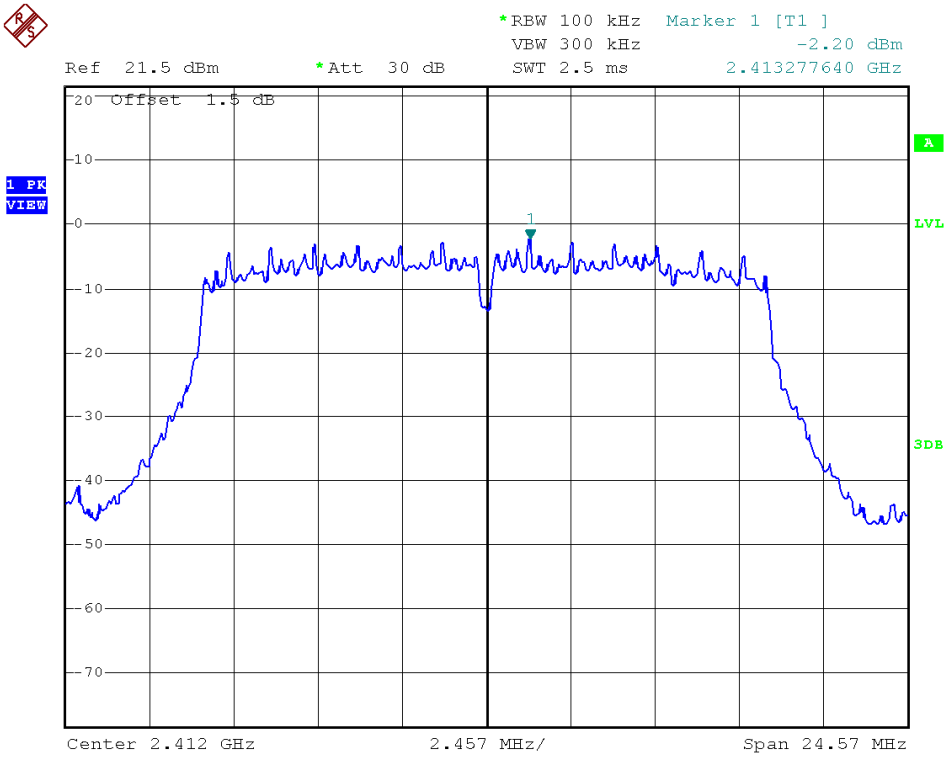
802.11b

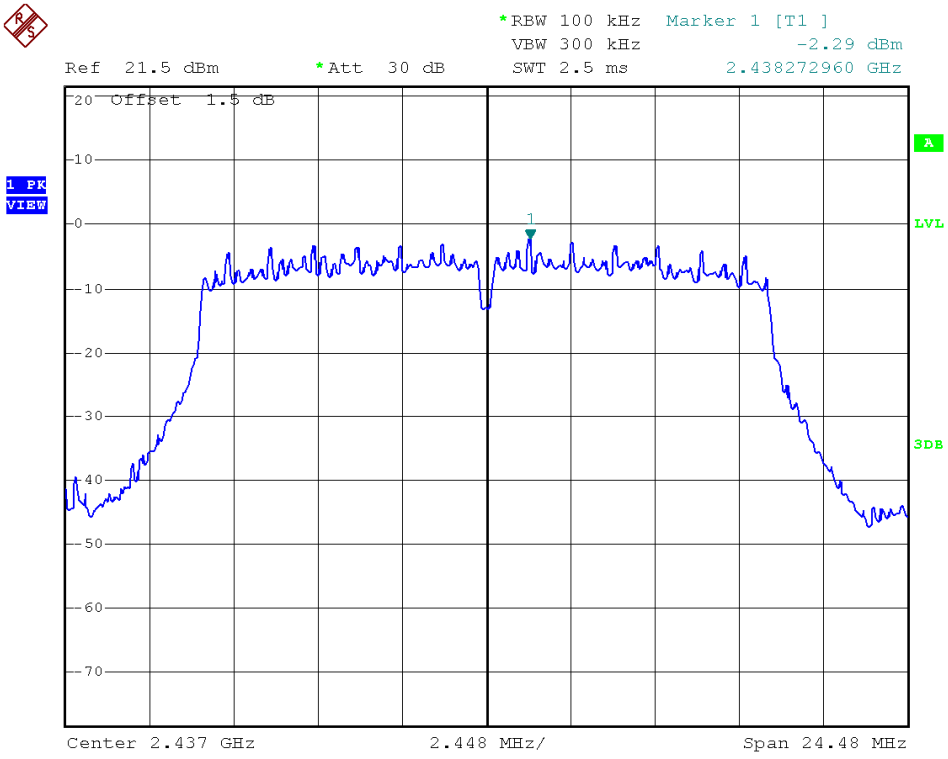

*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
4.95 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.411969340 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.412 GHz
1.533 MHz/
Span 15.33 MHz

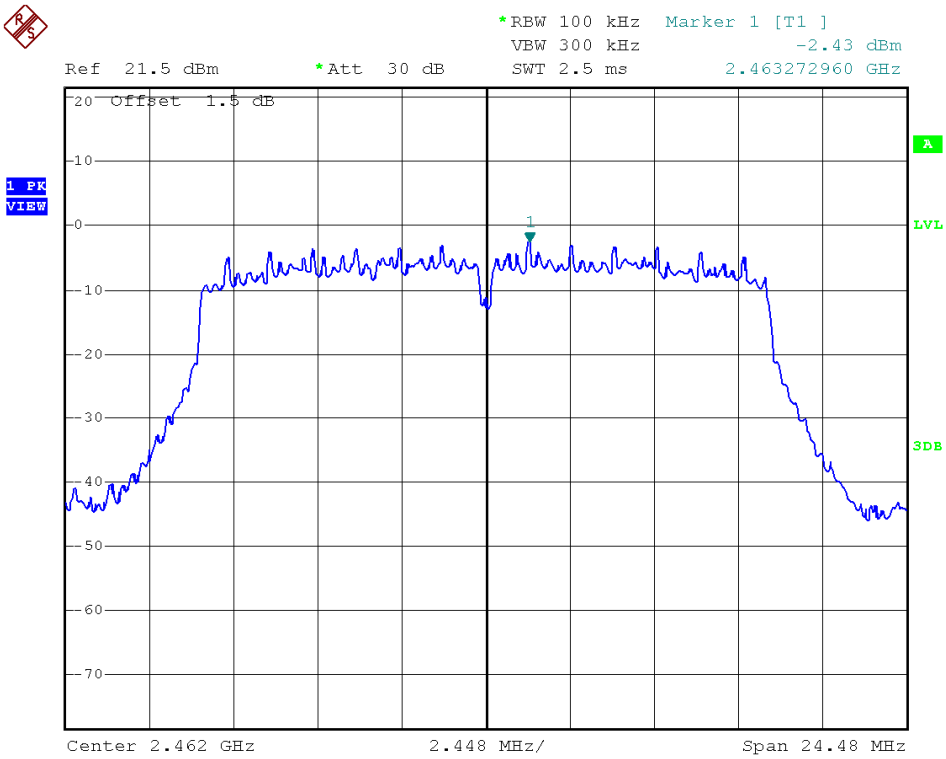

*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
4.82 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.436969340 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.437 GHz
1.533 MHz/
Span 15.33 MHz


*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
4.83 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.461969220 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.462 GHz
1.539 MHz/
Span 15.39 MHz

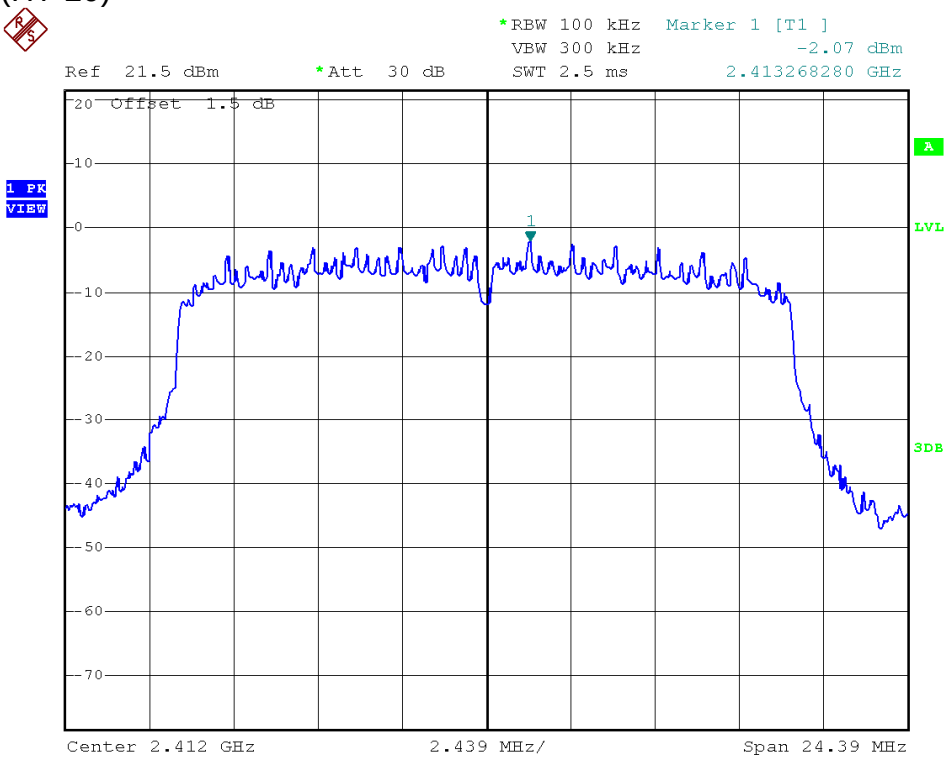
802.11g

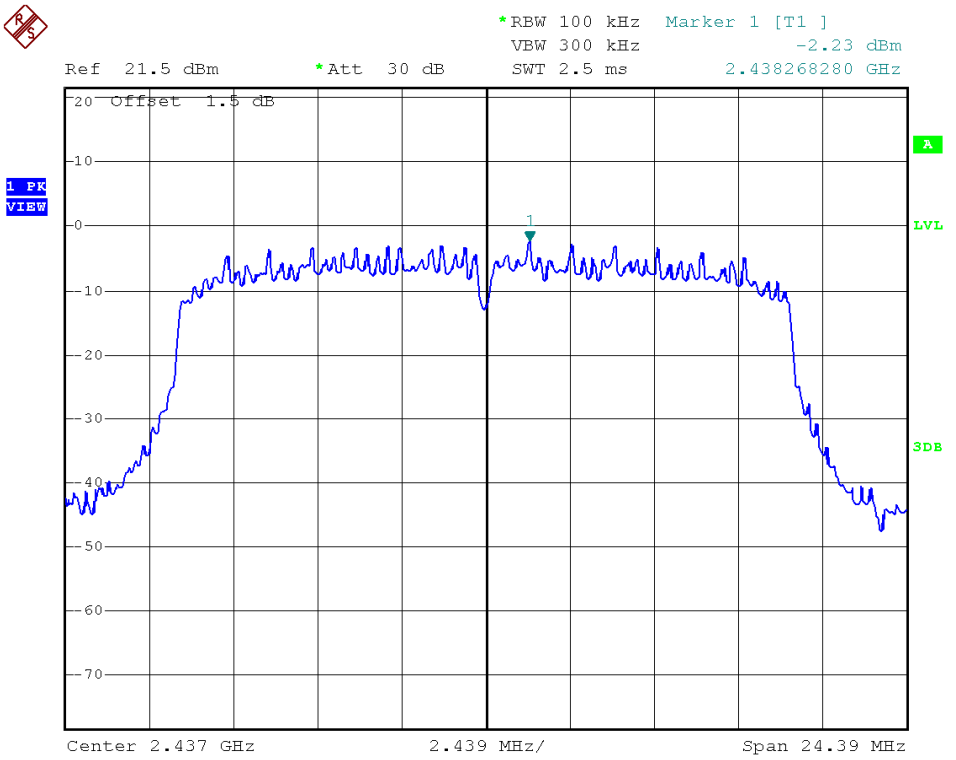

*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-2.20 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.413277640 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.412 GHz
2.457 MHz/
Span 24.57 MHz

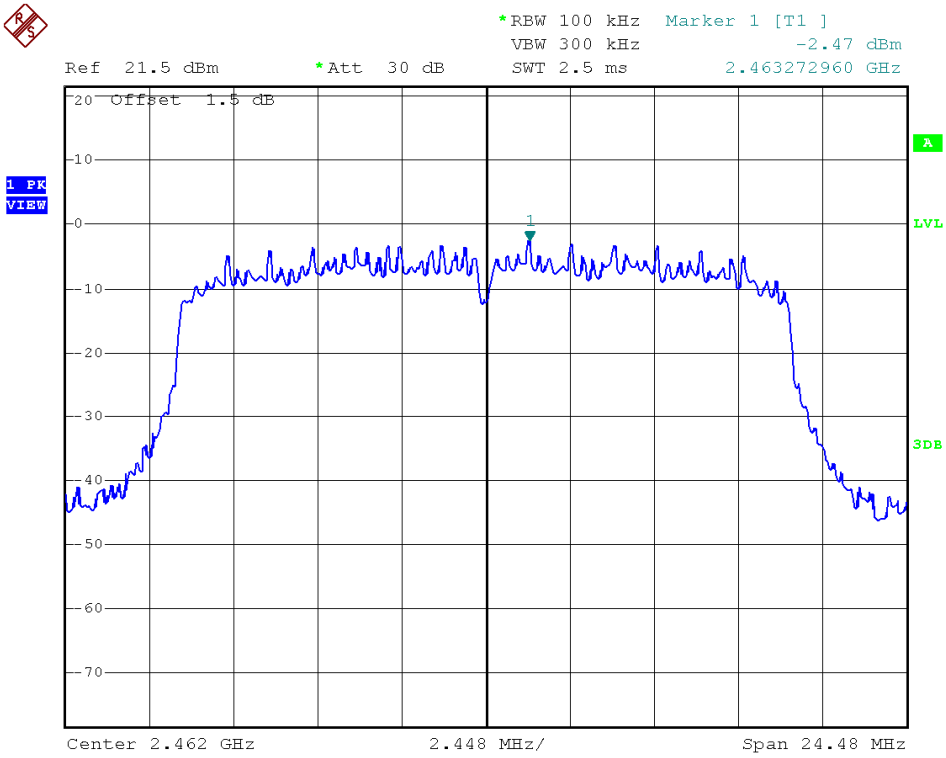

*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-2.29 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.438272960 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.437 GHz
2.448 MHz/
Span 24.48 MHz


*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-2.43 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.463272960 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.462 GHz
2.448 MHz/
Span 24.48 MHz

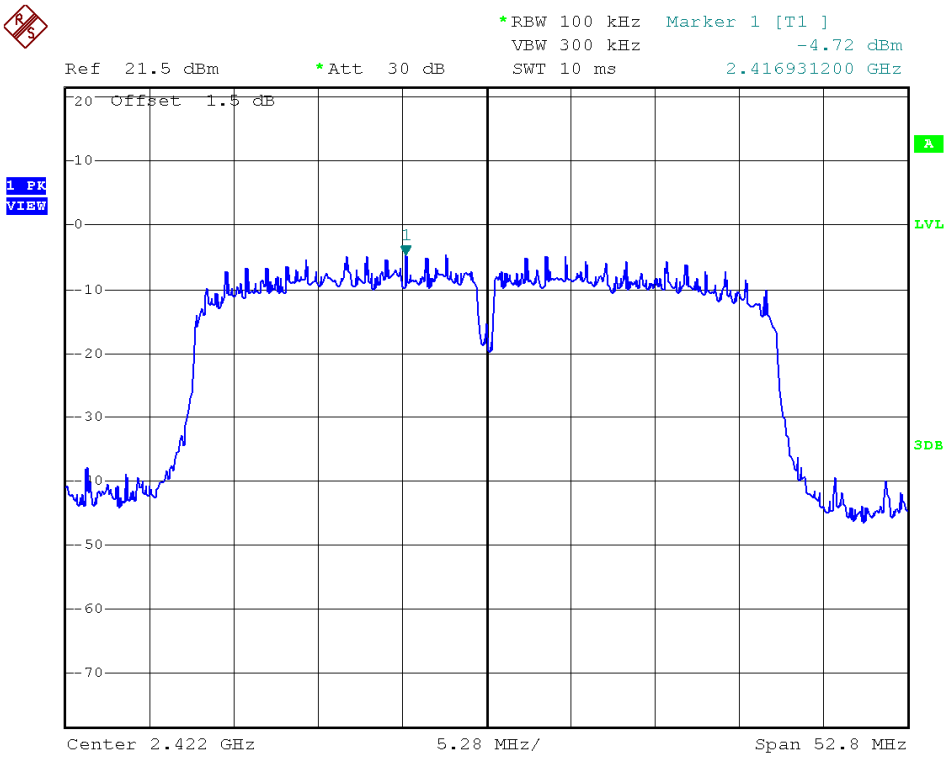
802.11n (HT-20)

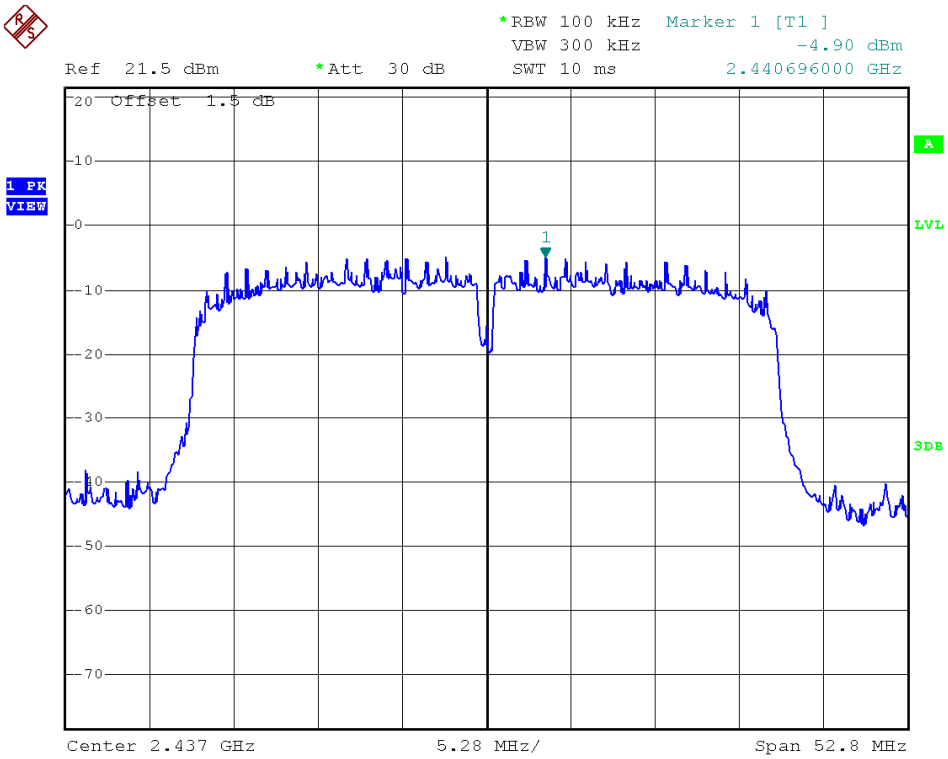

*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-2.07 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.413268280 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.412 GHz
2.439 MHz/
Span 24.39 MHz

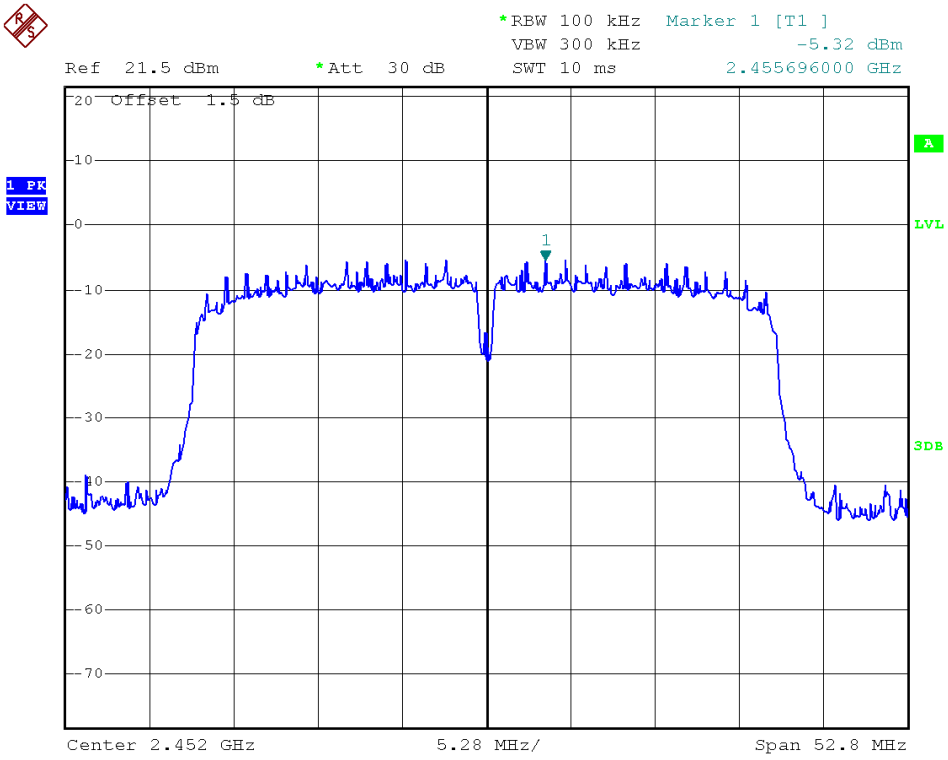

*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-2.23 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.438268280 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.437 GHz
2.439 MHz/
Span 24.39 MHz


*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-2.47 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 2.5 ms
2.463272960 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.462 GHz
2.448 MHz/
Span 24.48 MHz

802.11n (HT-40)


*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-4.72 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 10 ms
2.416931200 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.422 GHz
5.28 MHz/
Span 52.8 MHz


*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-4.90 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 10 ms
2.440696000 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.437 GHz
5.28 MHz/
Span 52.8 MHz


*RBW 100 kHz
Marker 1 [T1]
VBW 300 kHz
-5.32 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 10 ms
2.455696000 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
Center 2.452 GHz
5.28 MHz/
Span 52.8 MHz

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.4 Out of Band Conducted Emissions, FCC Rule 15.247(d)

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation. The Measurement Procedure was set according to the FCC KDB 558074.

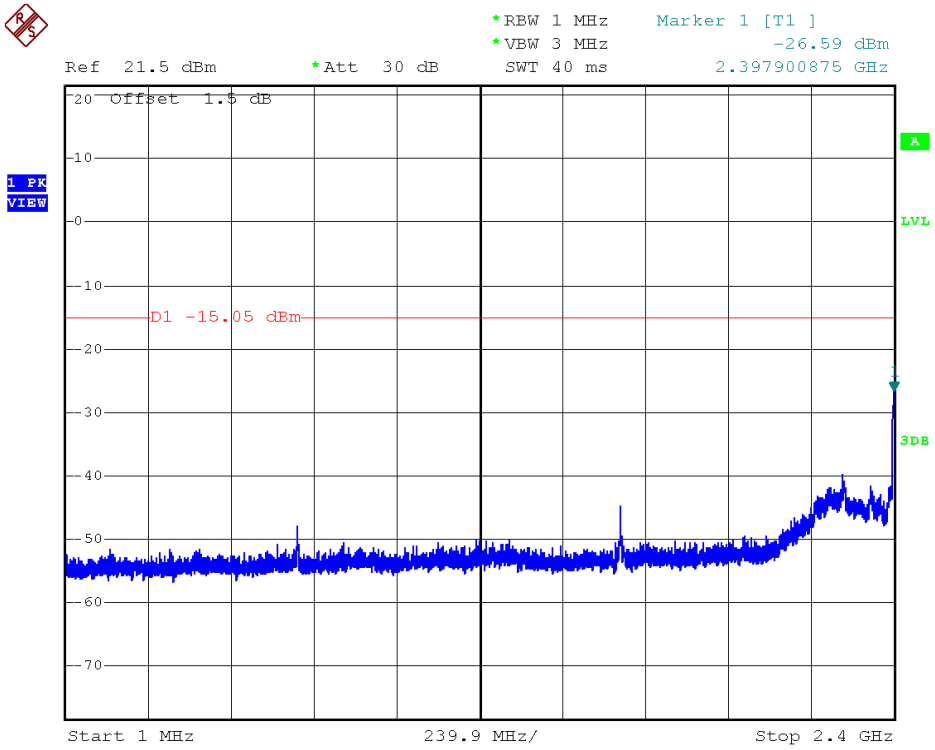
All other types of emissions from the EUT shall meet the general limits for radiated frequencies outside the passband.

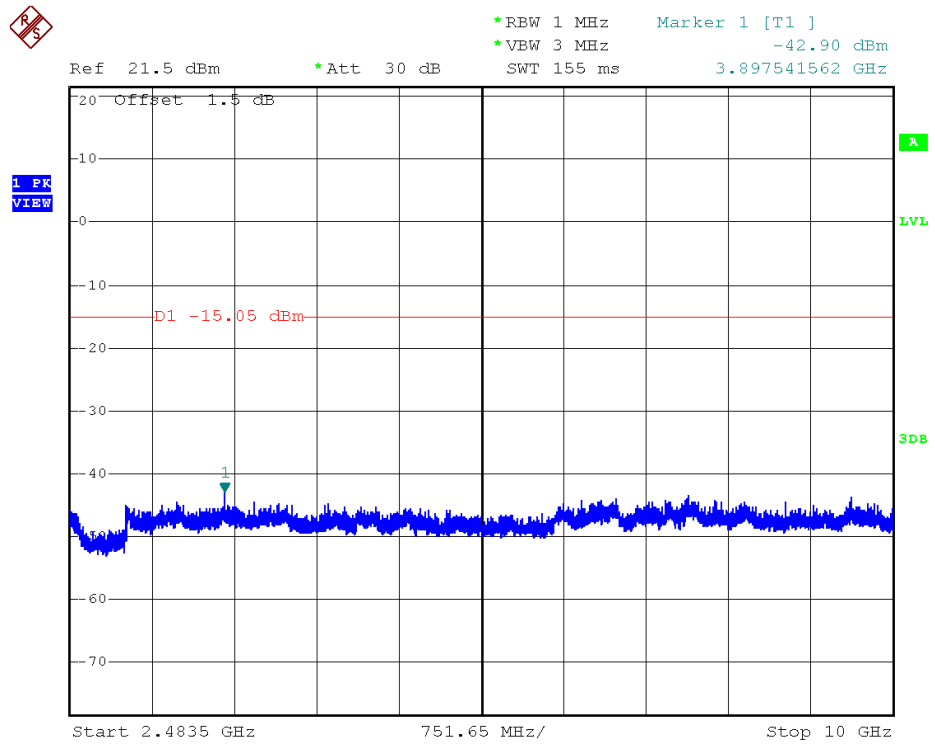
Refer to the attached test plot for out of band conducted emissions data with rate of 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n HT20 and 13.5Mbps for 802.11n HT40.

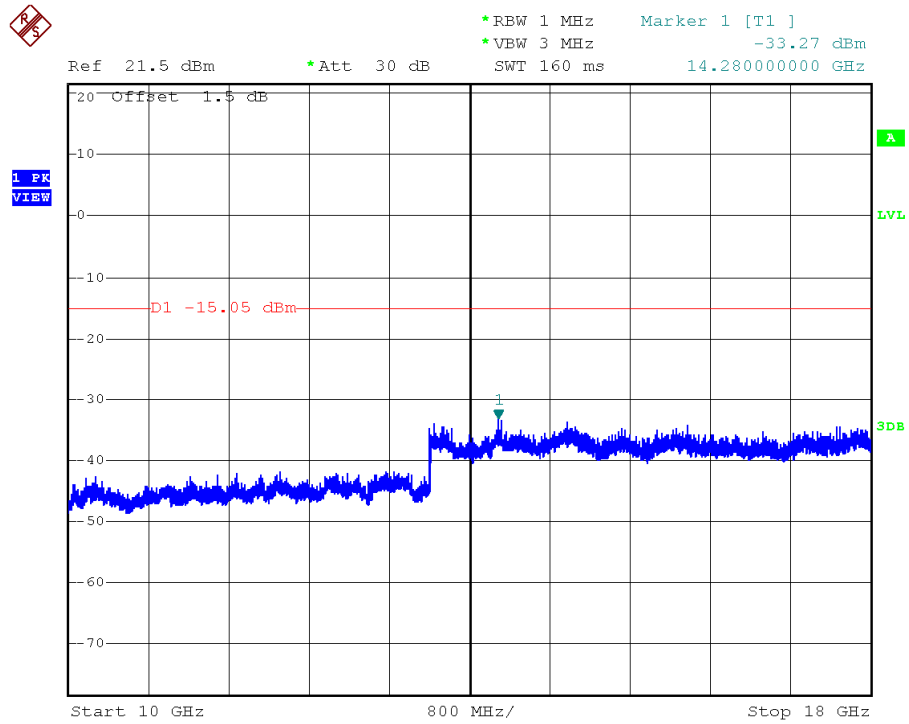
The test plots showed all spurious emission and up to the tenth harmonic were measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

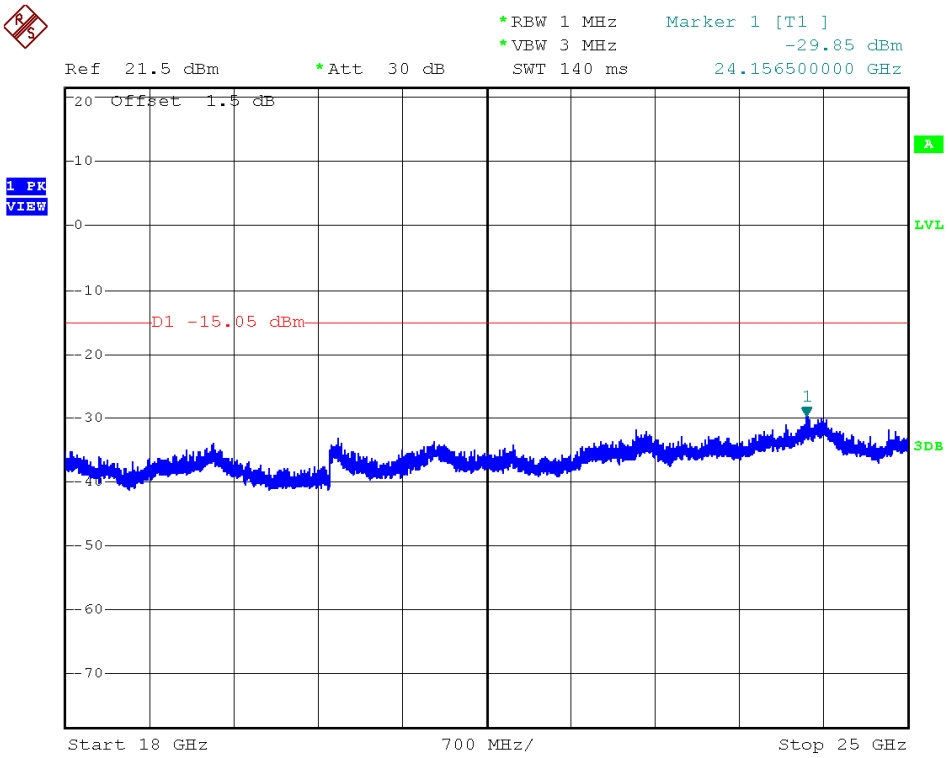
The test plots are attached as below.

802.11b
Channel 1 (2412MHz) Reference Level: 4.95dBm

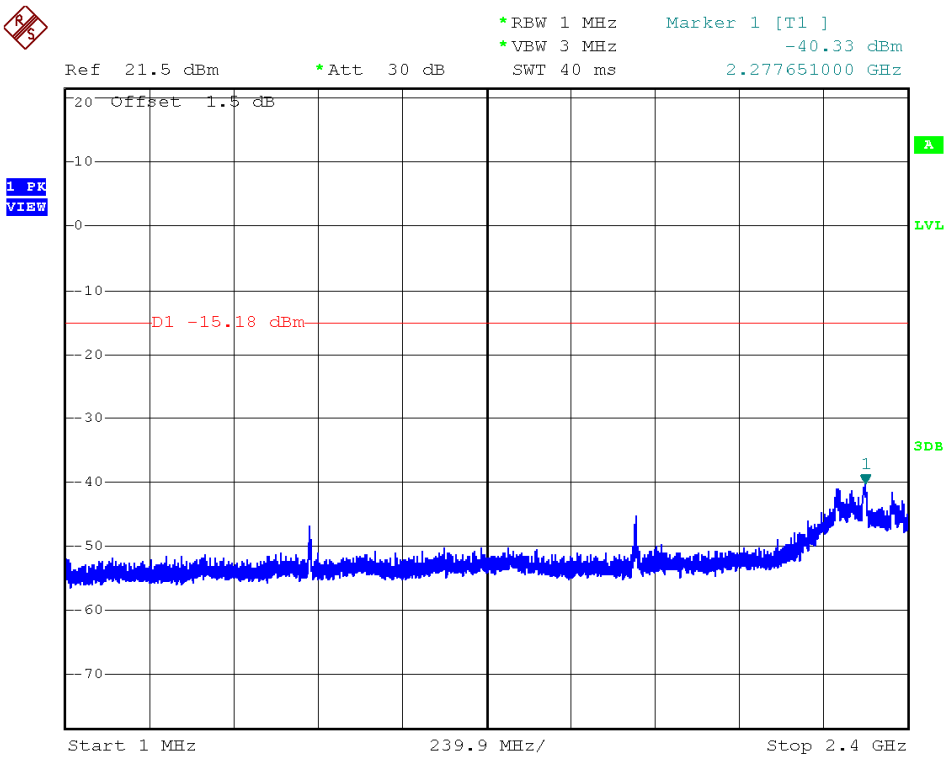


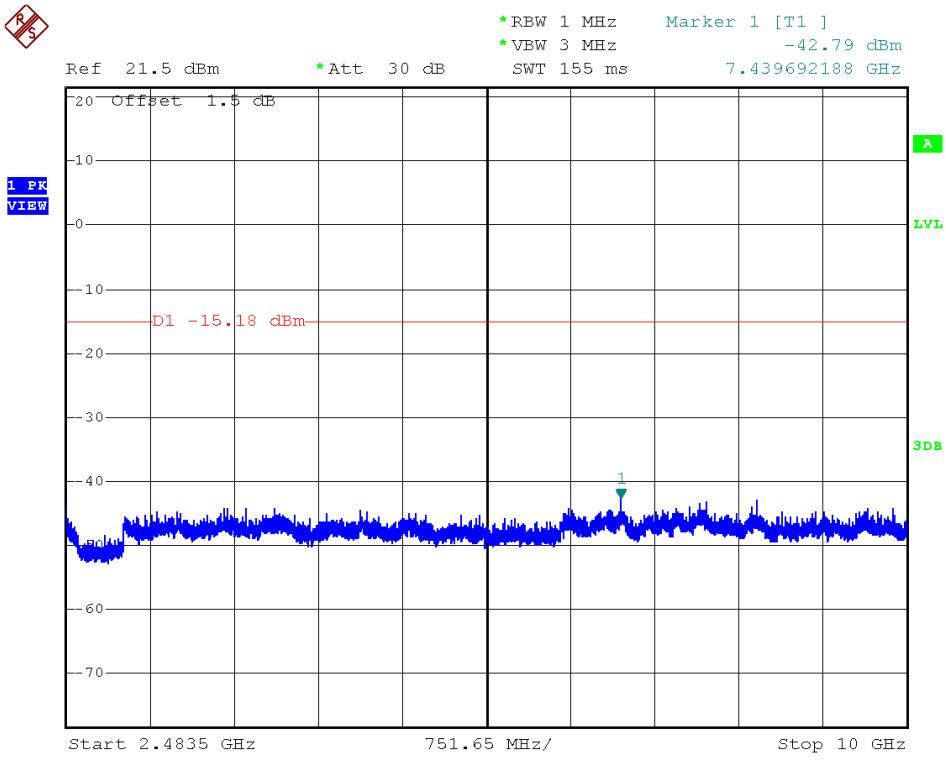


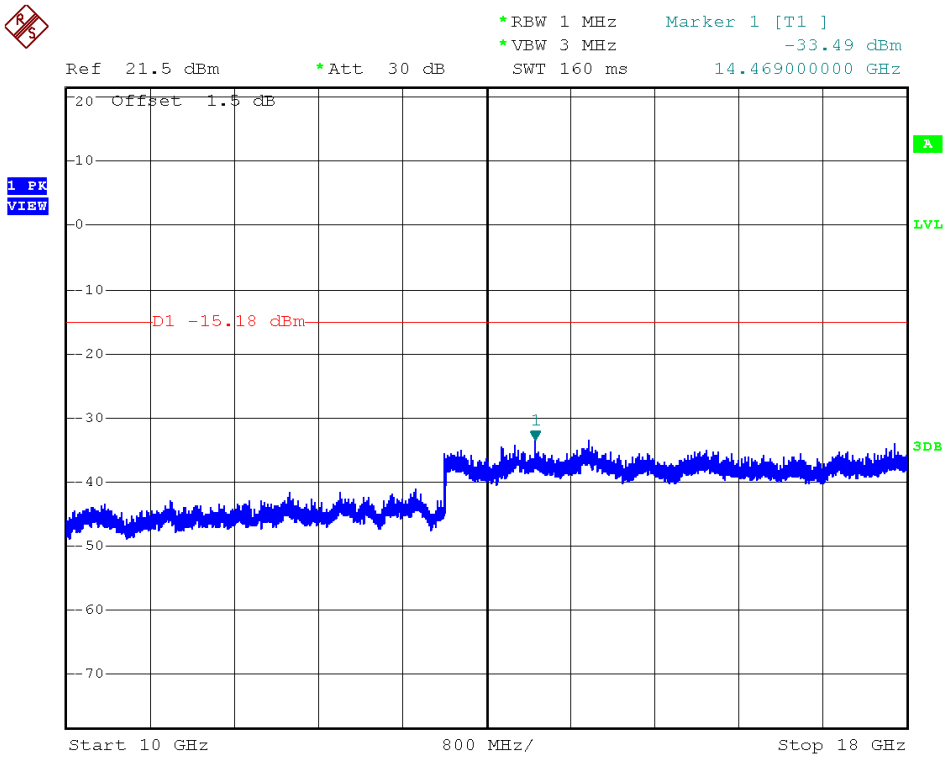

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-33.27 dBm
14.280000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
D1 -15.05 dBm
Start 10 GHz
800 MHz/
Stop 18 GHz

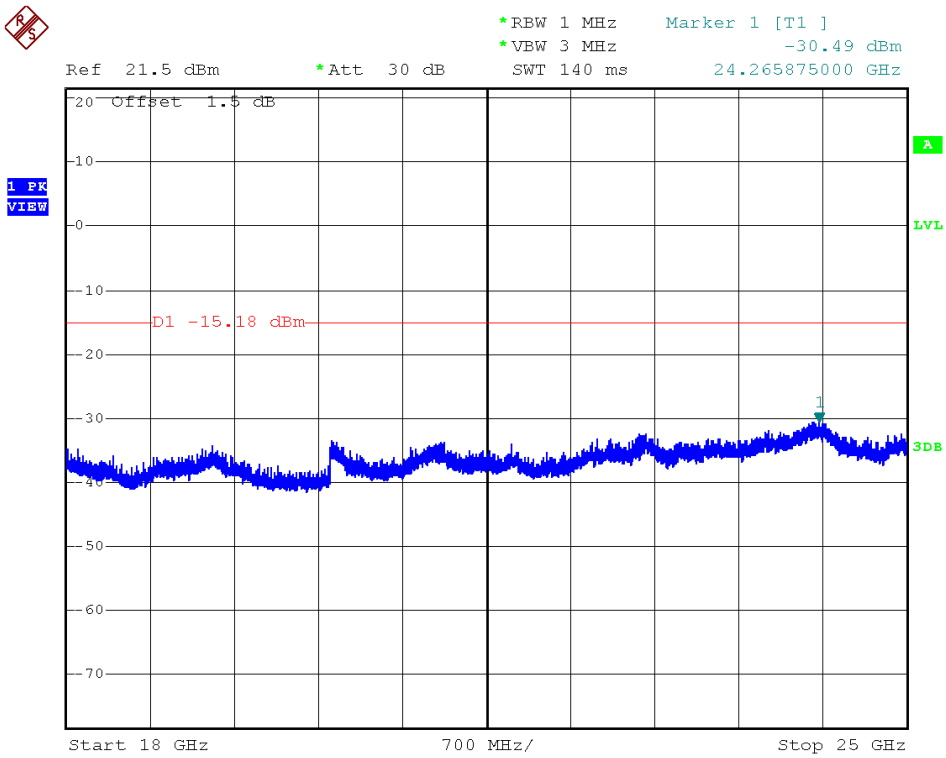

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-29.85 dBm
24.156500000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
D1 -15.05 dBm
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 6 (2437MHz) Reference Level: 4.82dBm

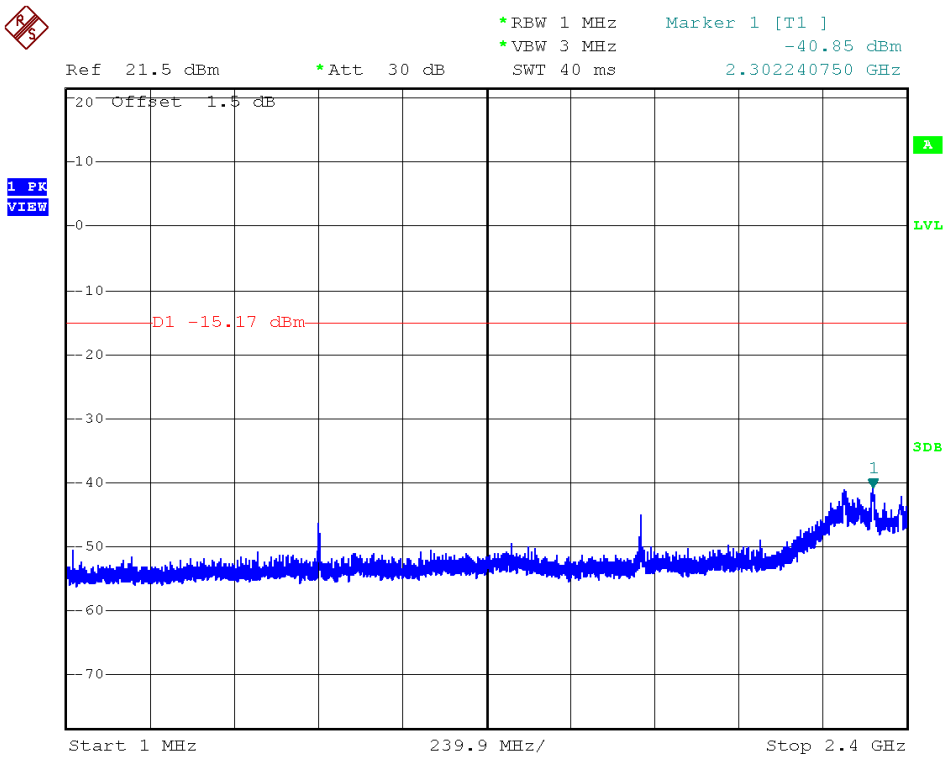


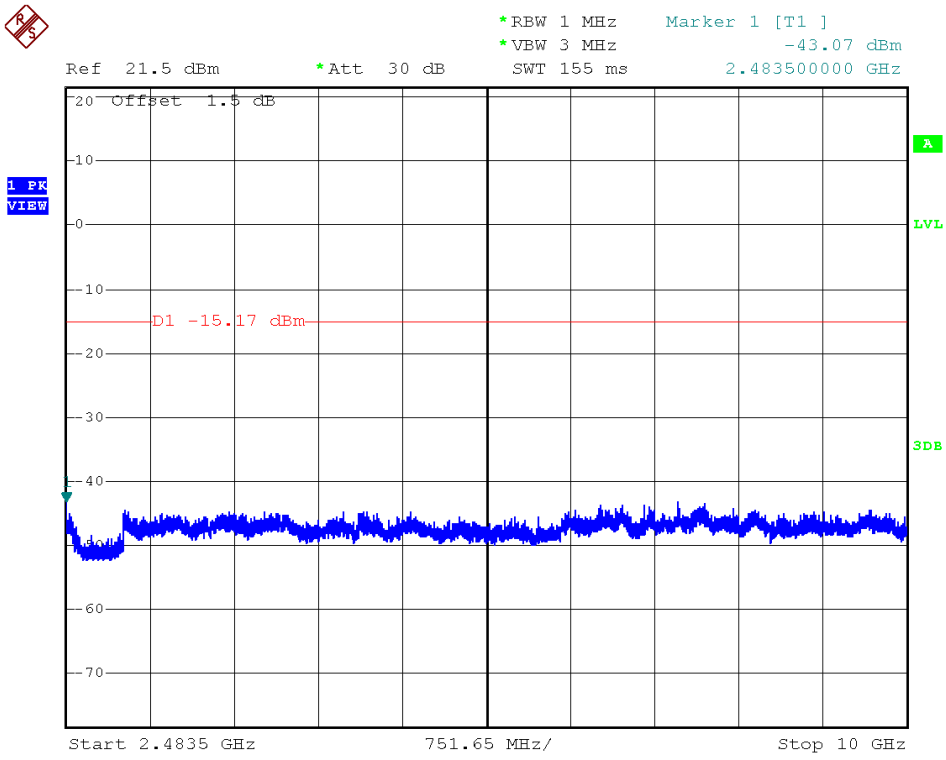


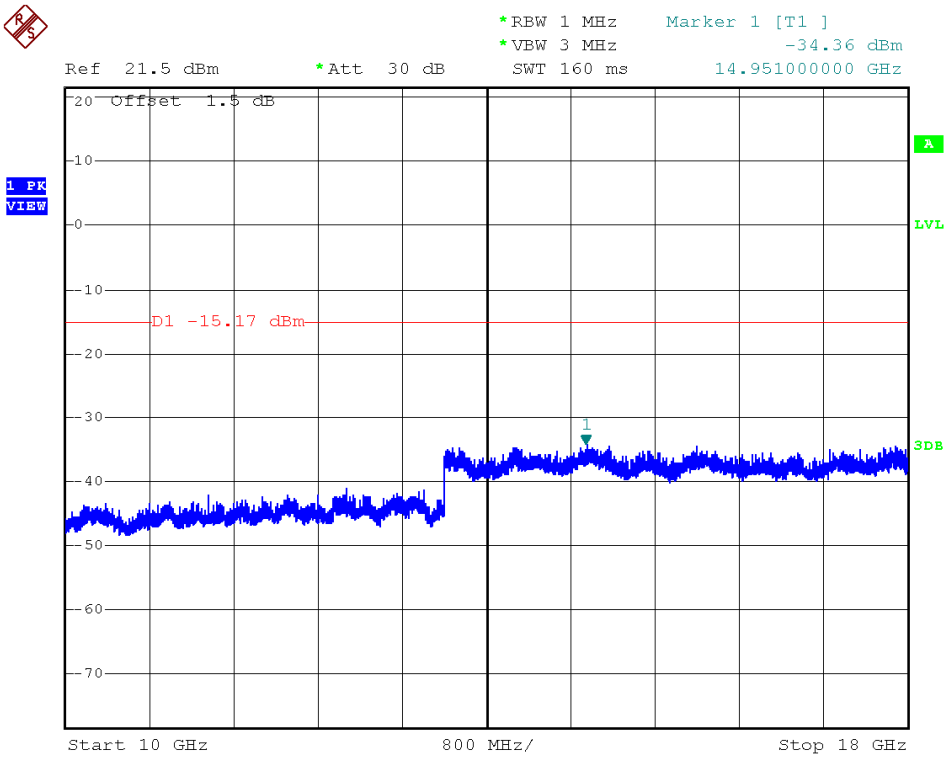

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-33.49 dBm
14.469000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -15.18 dBm
A
LVL
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

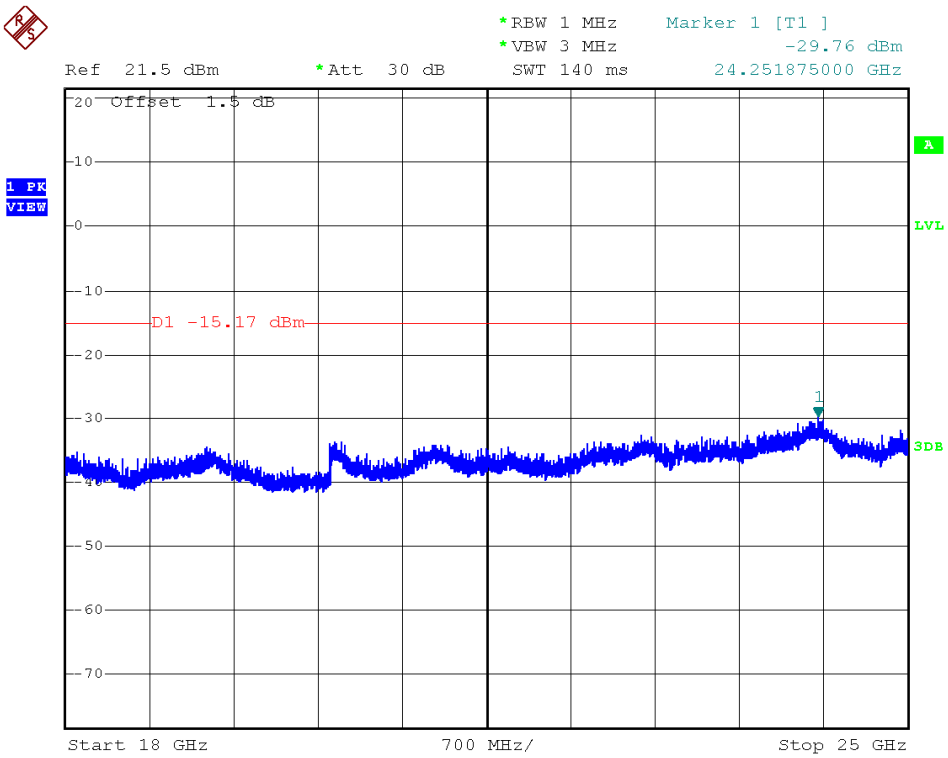

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-30.49 dBm
24.265875000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -15.18 dBm
A
LVL
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 11 (2462MHz) Reference Level: 4.83dBm

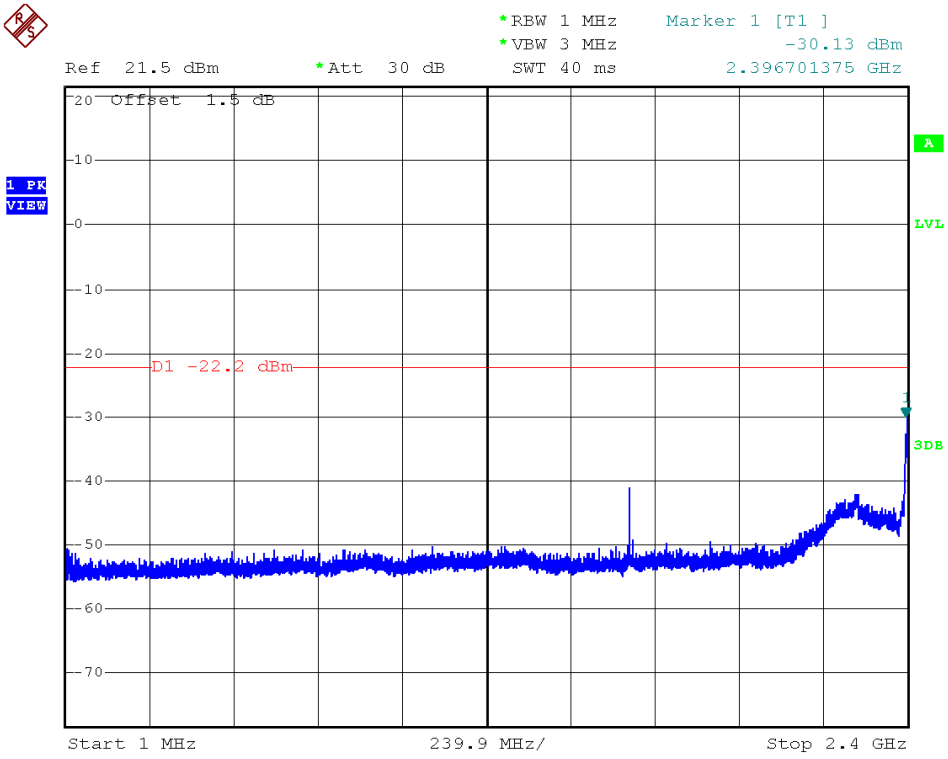


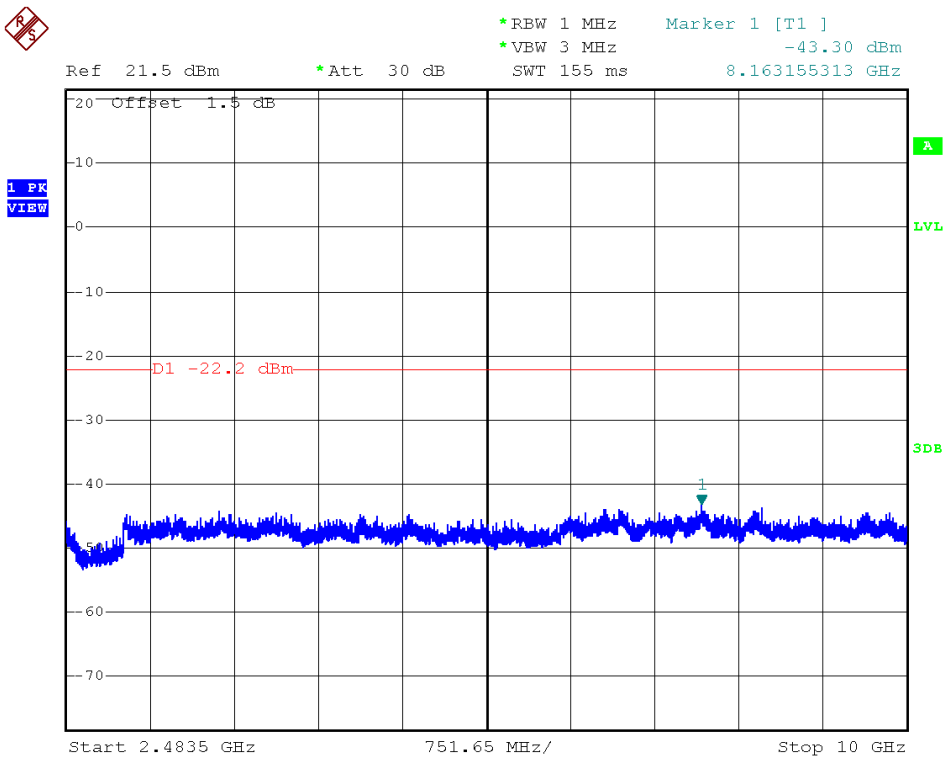


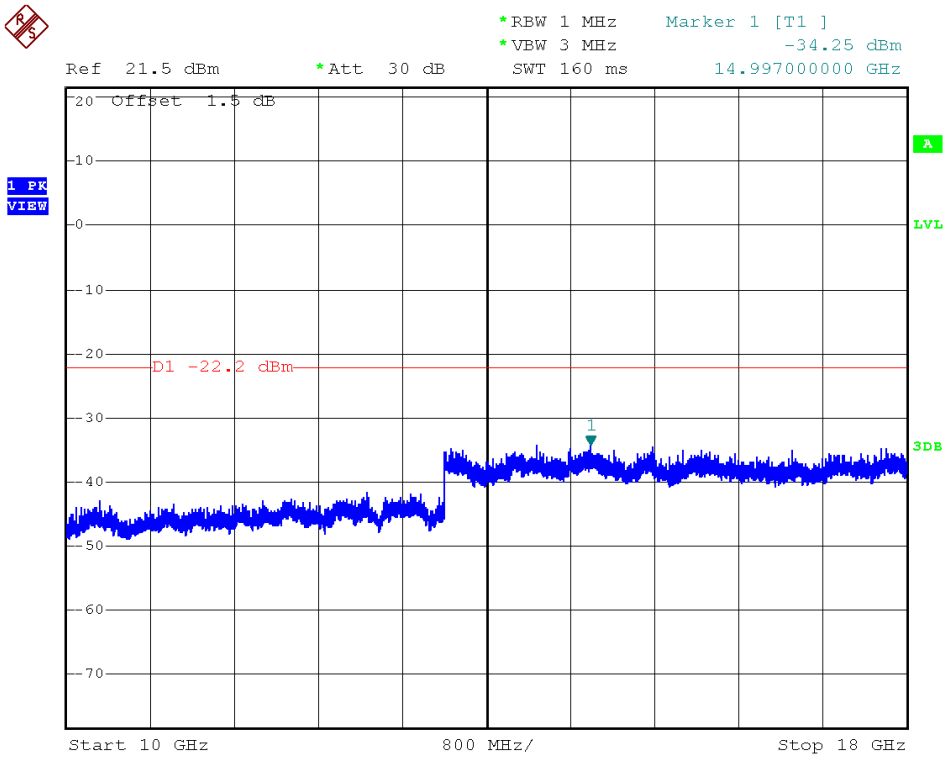

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-34.36 dBm
14.951000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
D1 -15.17 dBm
Start 10 GHz
800 MHz/
Stop 18 GHz

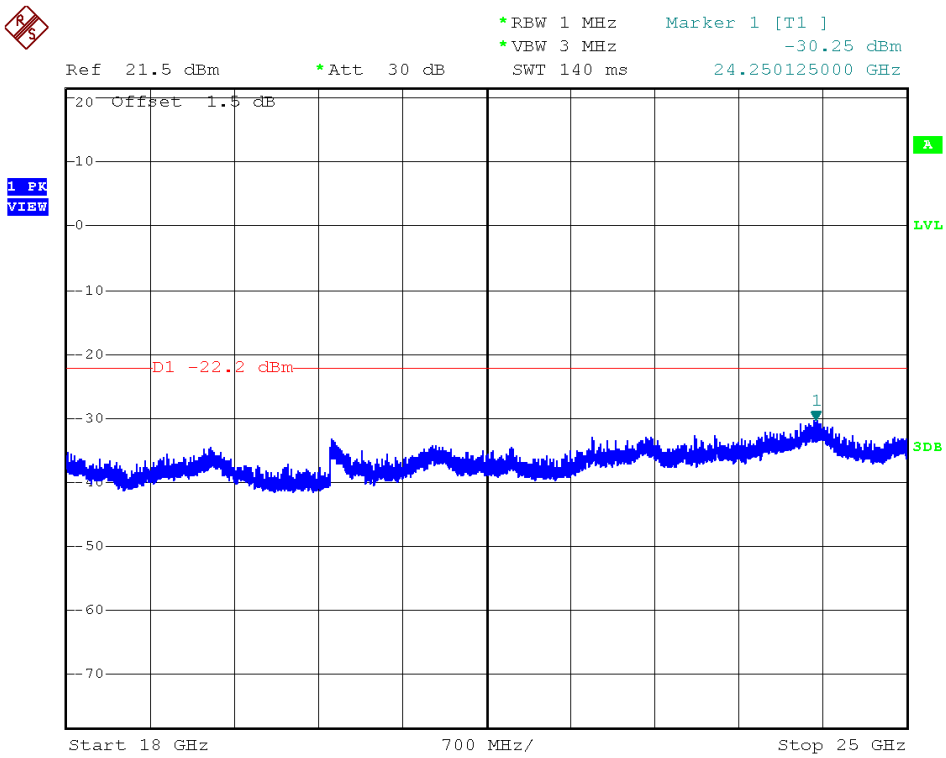

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-29.76 dBm
24.251875000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
D1 -15.17 dBm
Start 18 GHz
700 MHz/
Stop 25 GHz

802.11g
Channel 1 (2412MHz) Reference Level: -2.20dBm

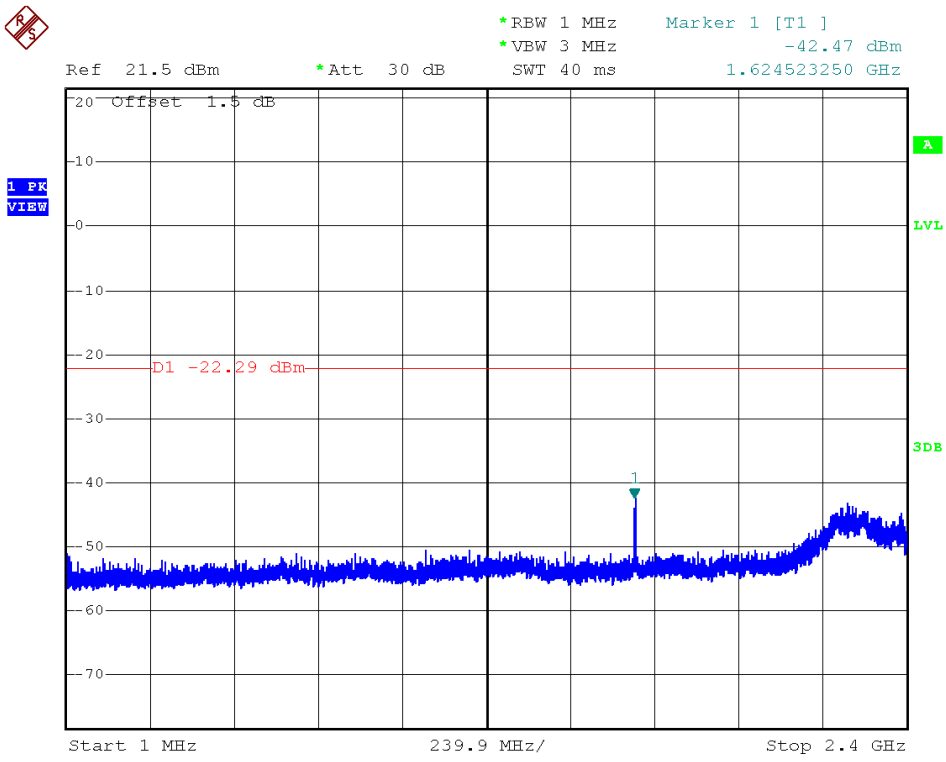


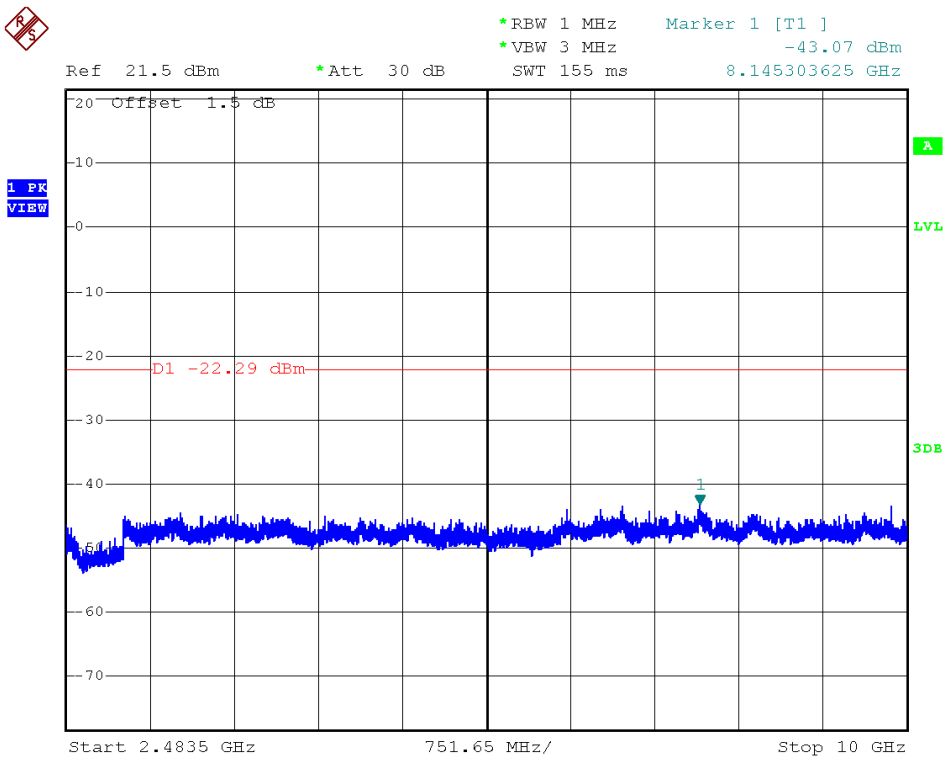


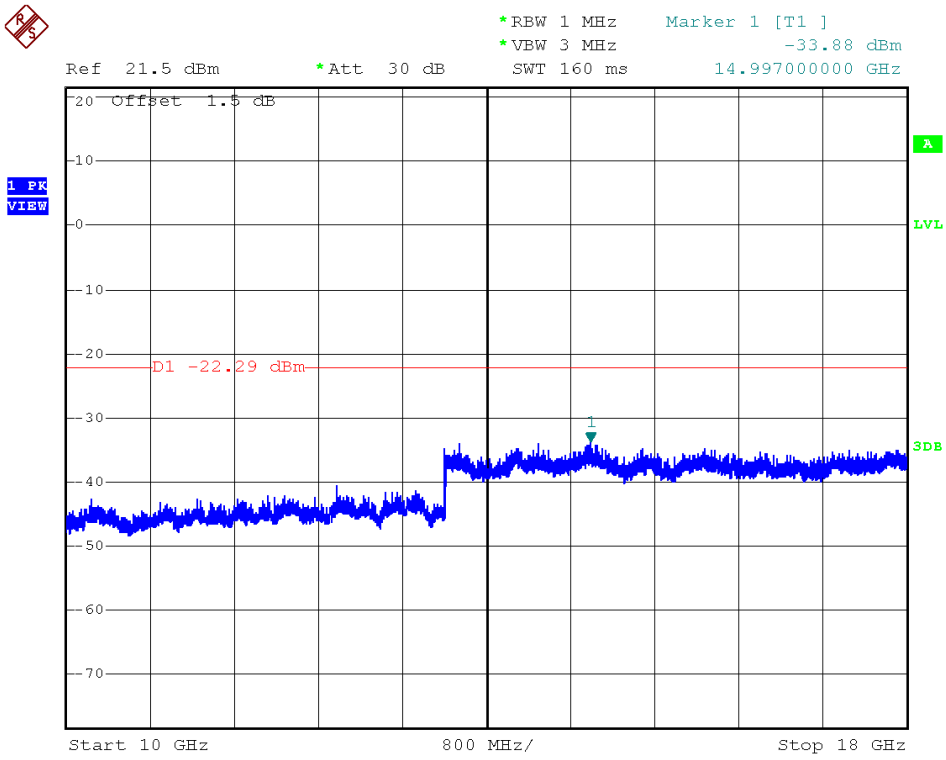

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-34.25 dBm
14.997000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
D1 -22.2 dBm
A
LVL
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

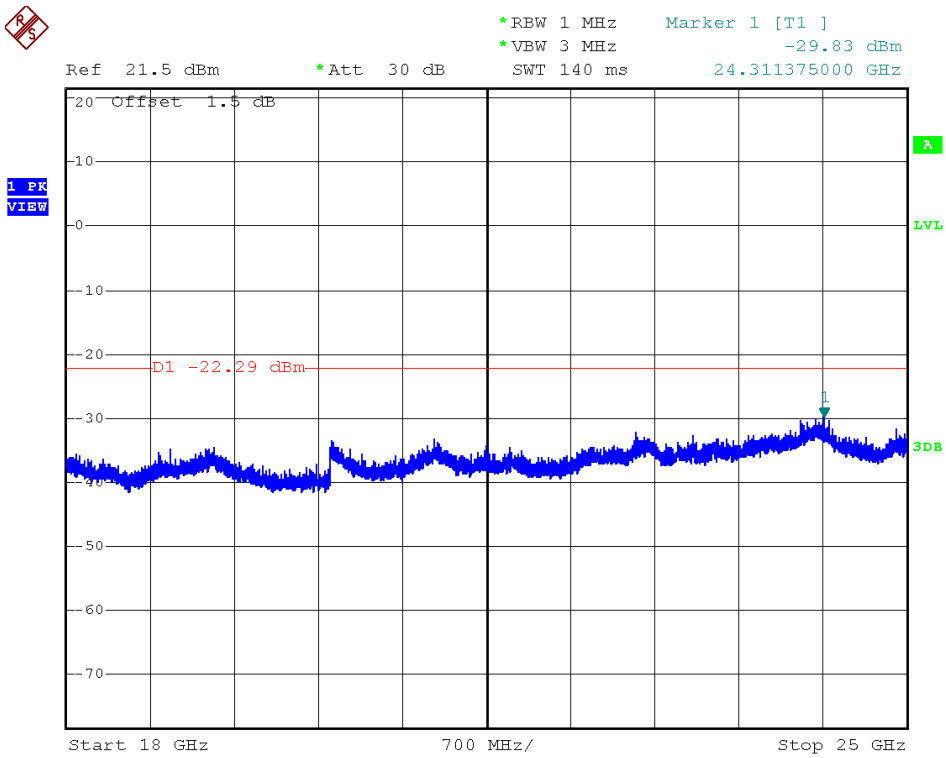

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-30.25 dBm
24.250125000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
D1 -22.2 dBm
A
LVL
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 6 (2437MHz) Reference Level: -2.29dBm

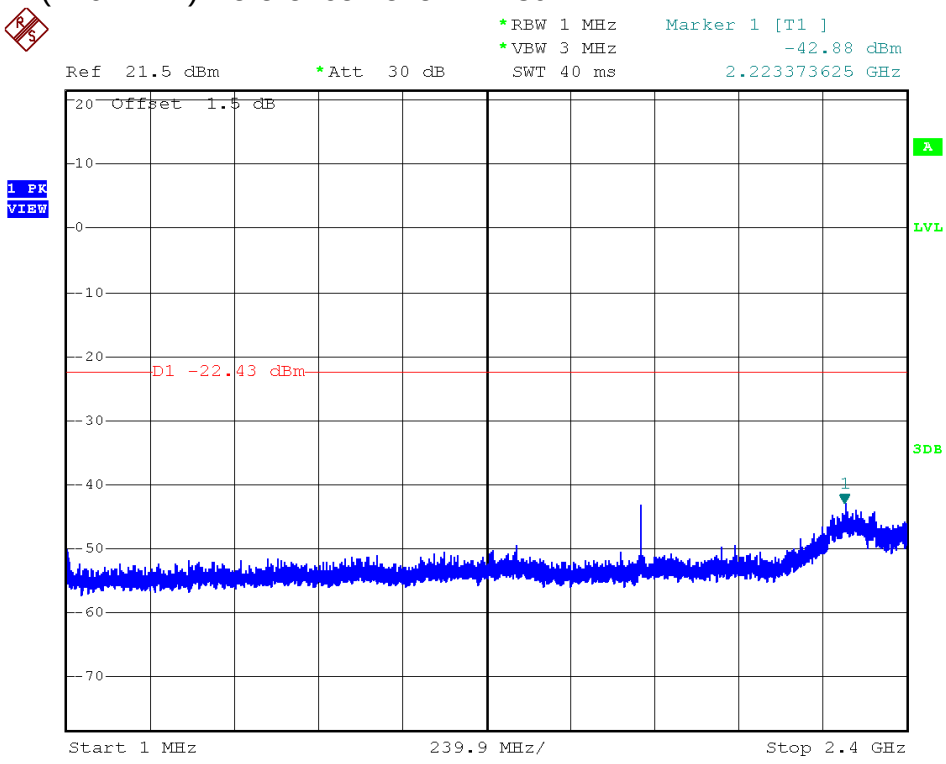


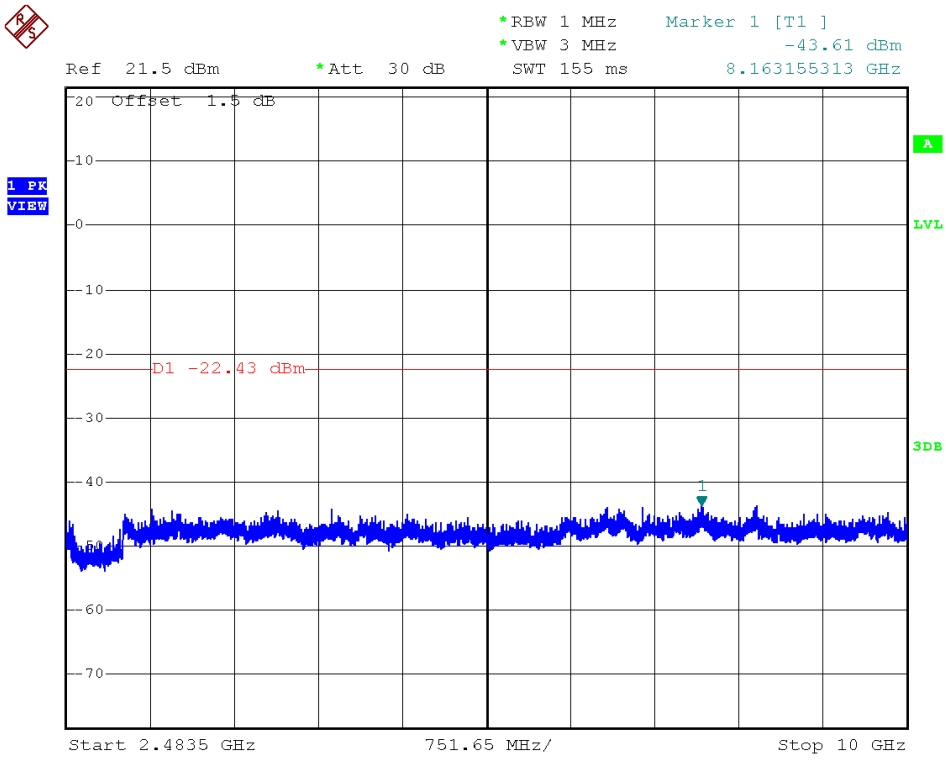


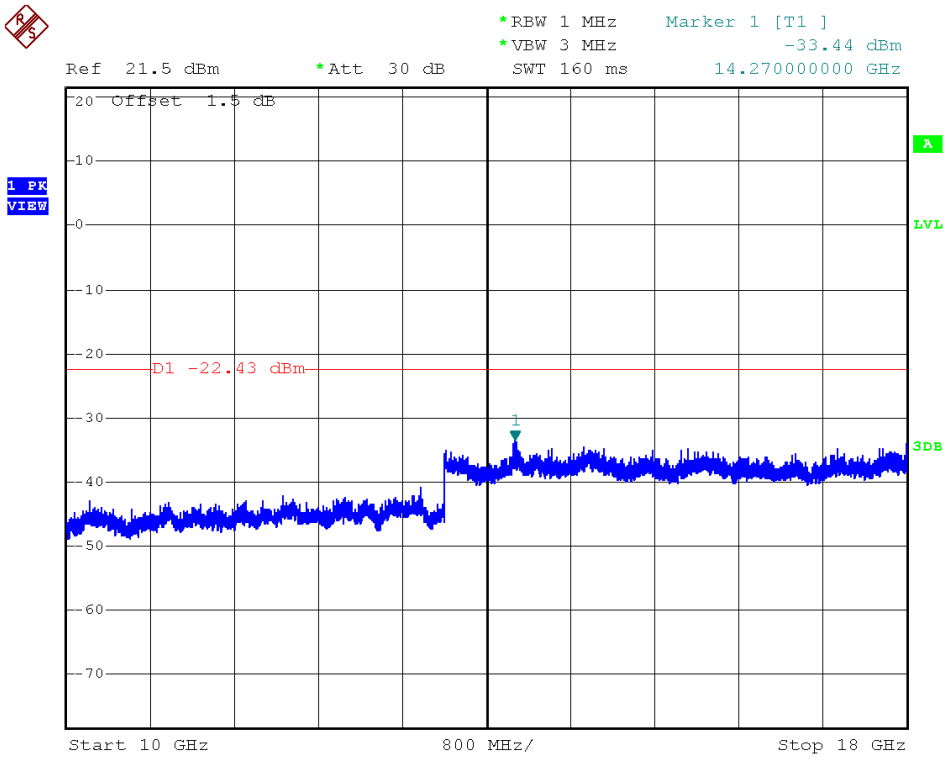

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-33.88 dBm
14.997000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
D1 -22.29 dBm
A
LVL
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

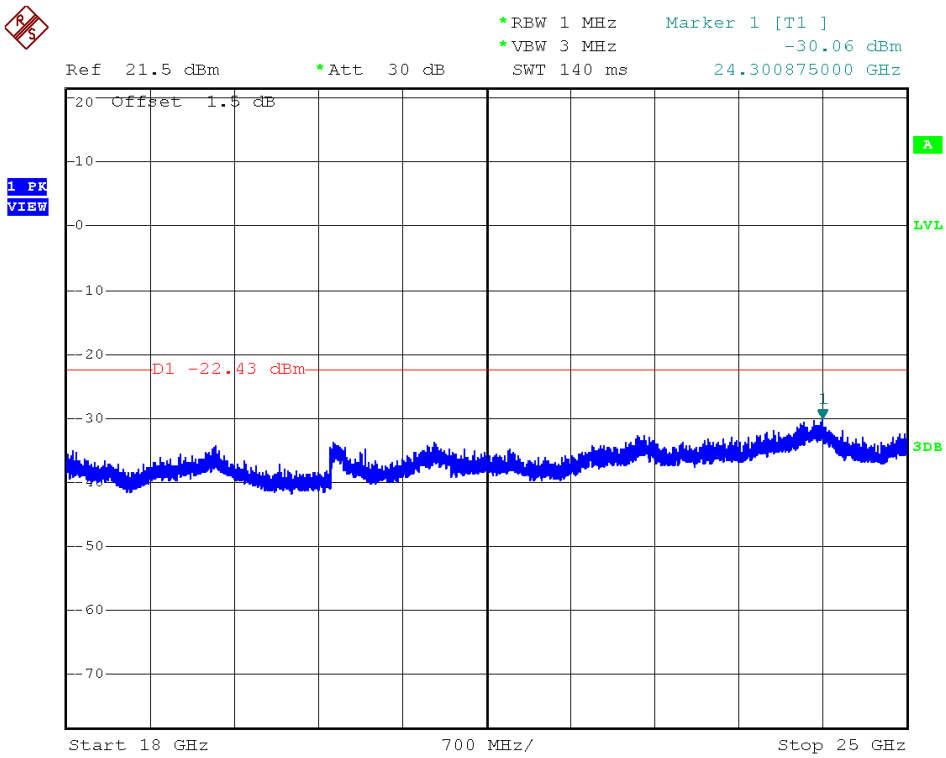

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-29.83 dBm
24.311375000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
D1 -22.29 dBm
A
LVL
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 11 (2462MHz) Reference Level: -2.43dBm

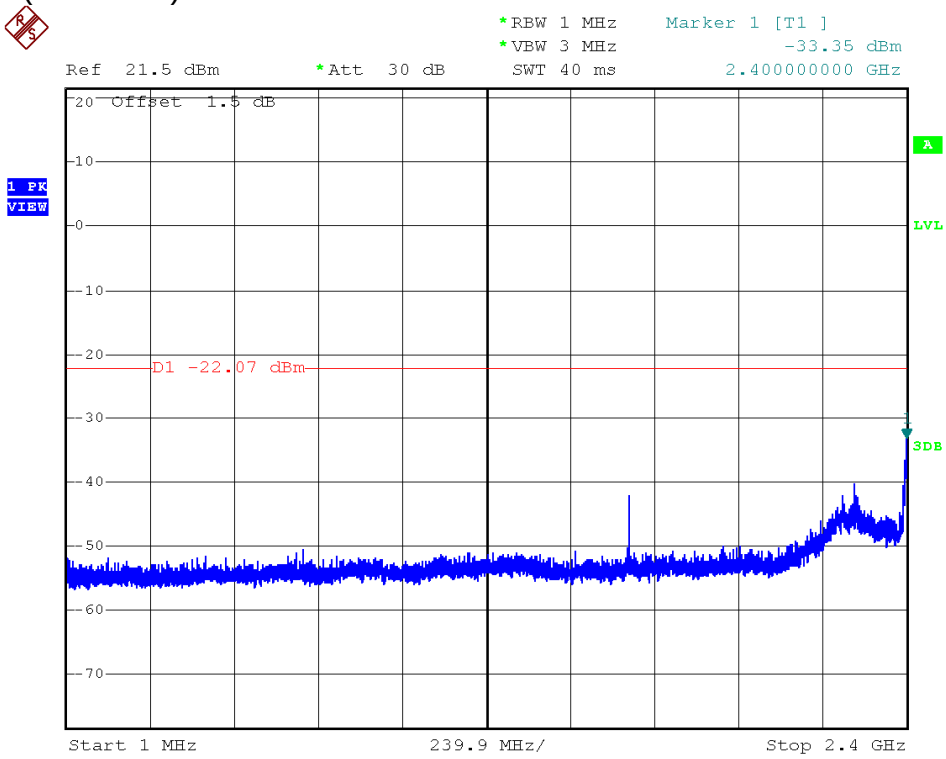


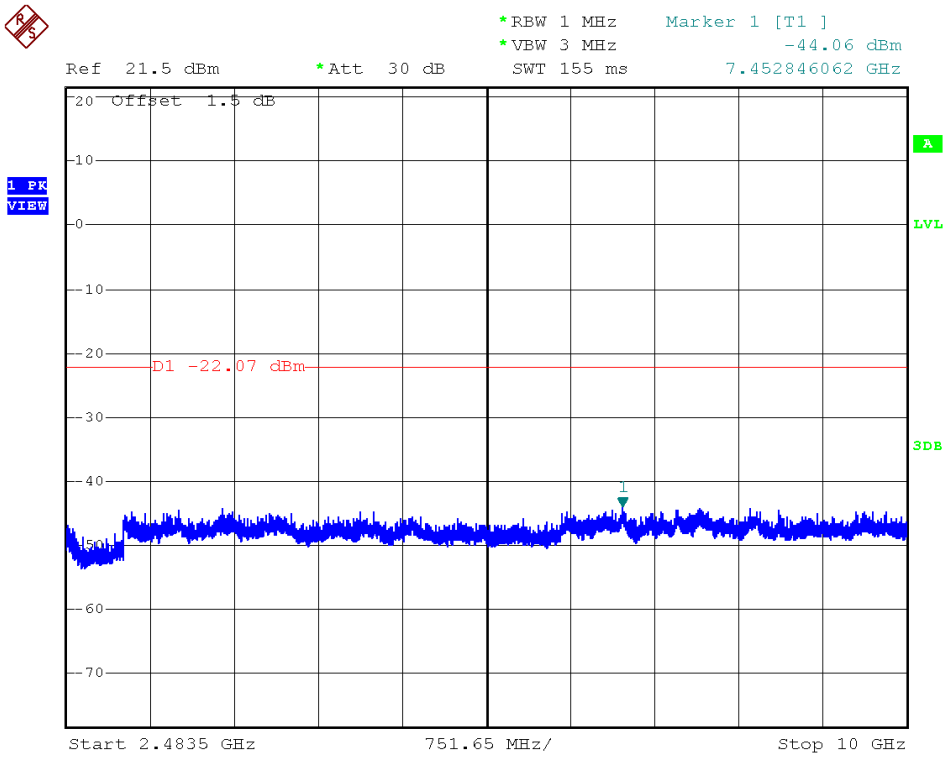


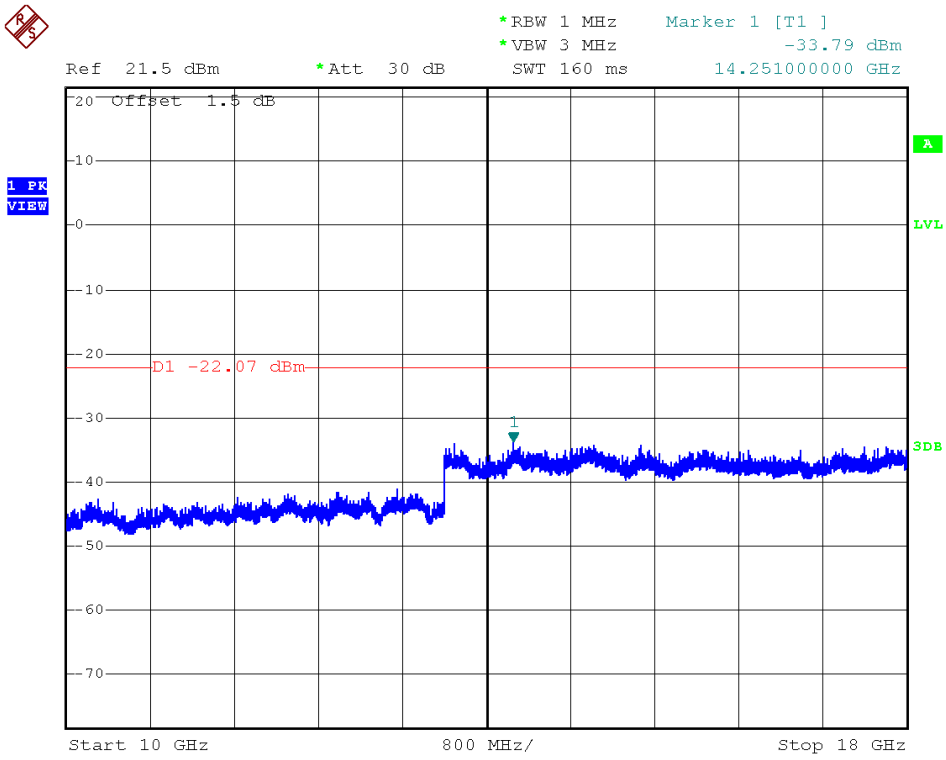

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-33.44 dBm
14.270000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -22.43 dBm
A
LVL
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

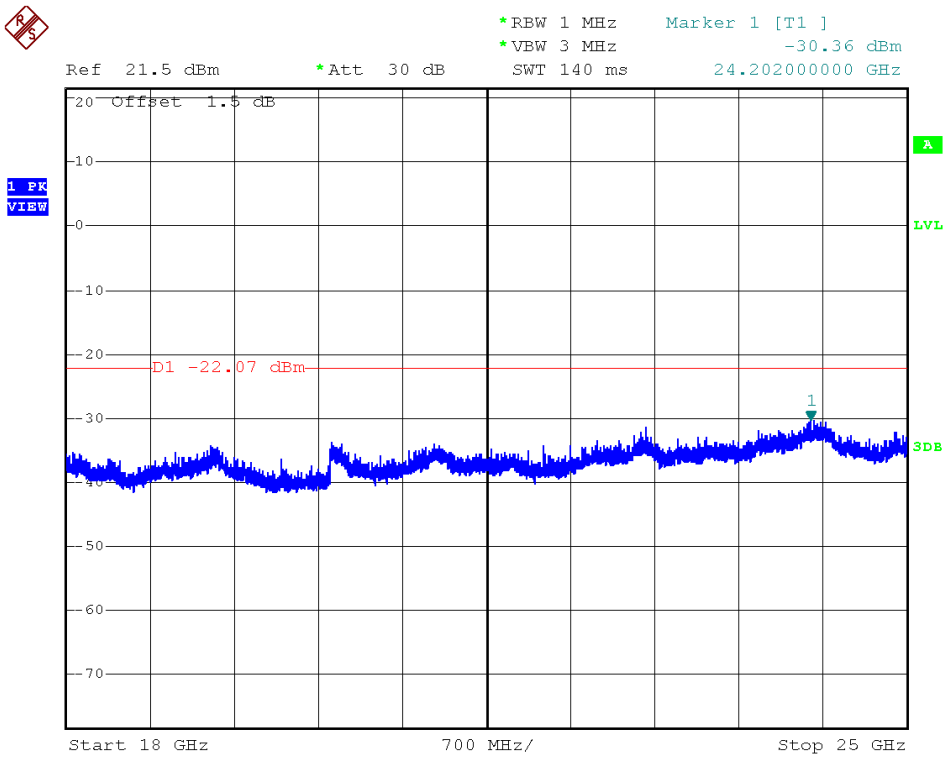

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-30.06 dBm
24.300875000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -22.43 dBm
A
LVL
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

802.11n (HT-20)
Channel 1 (2412MHz) Reference Level: -2.07dBm

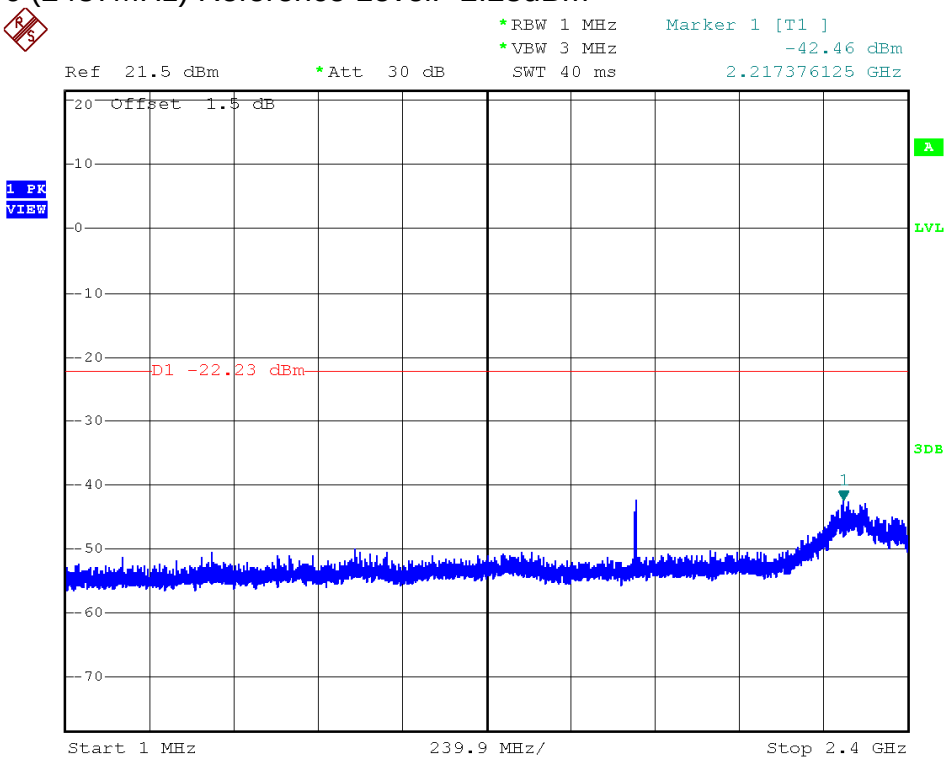


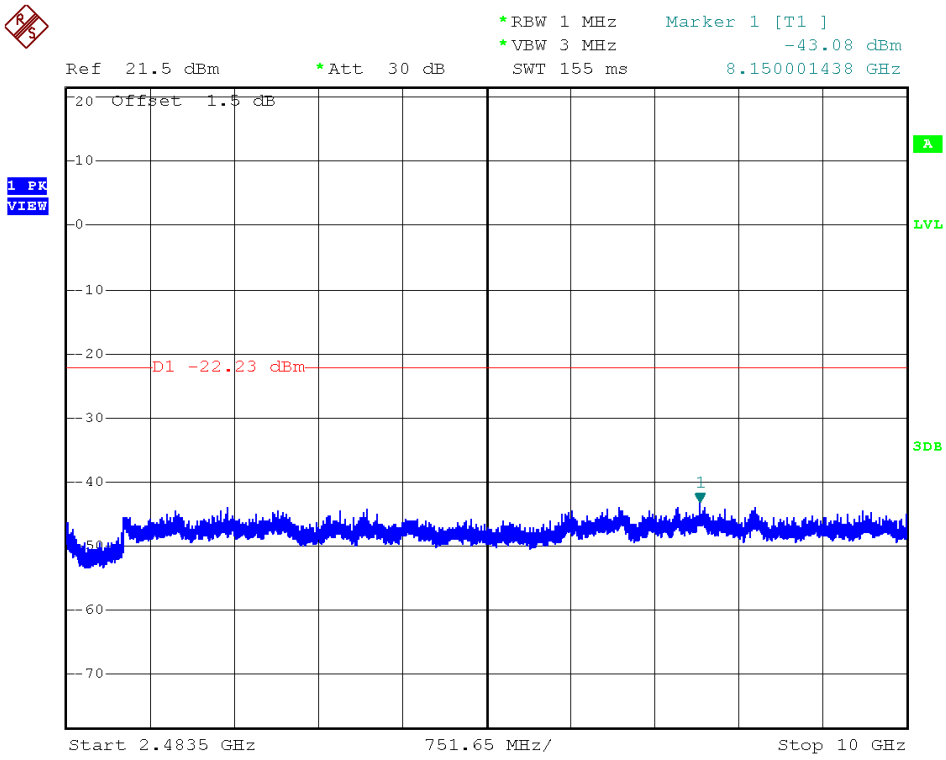


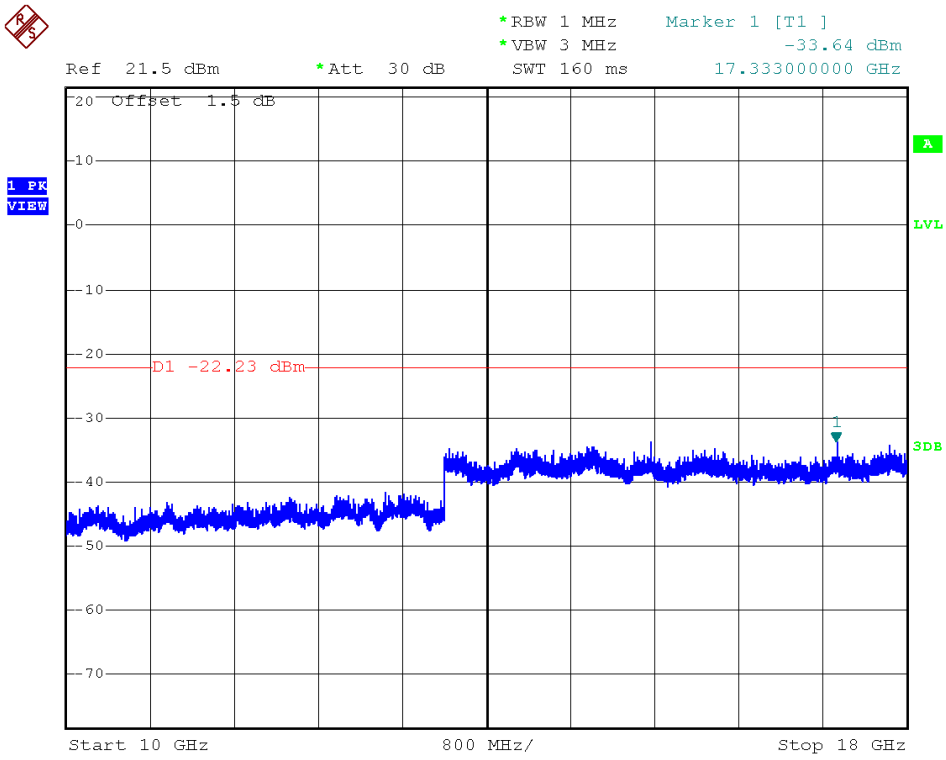

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-33.79 dBm
14.251000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -22.07 dBm
A
LVL
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

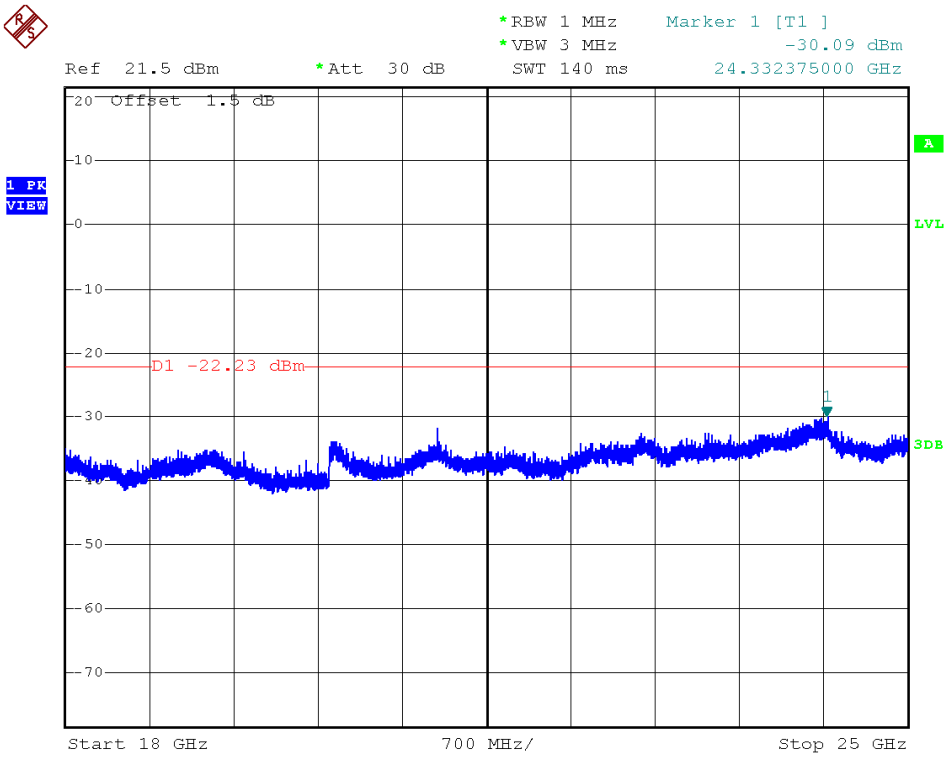

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-30.36 dBm
24.202000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -22.07 dBm
A
LVL
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 6 (2437MHz) Reference Level: -2.23dBm

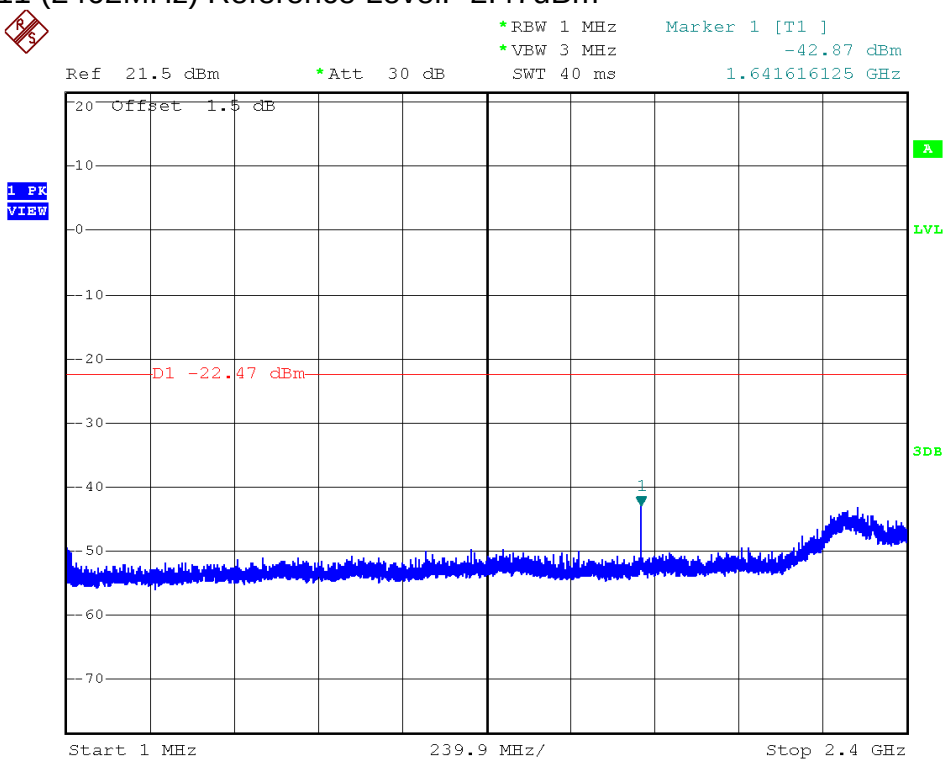


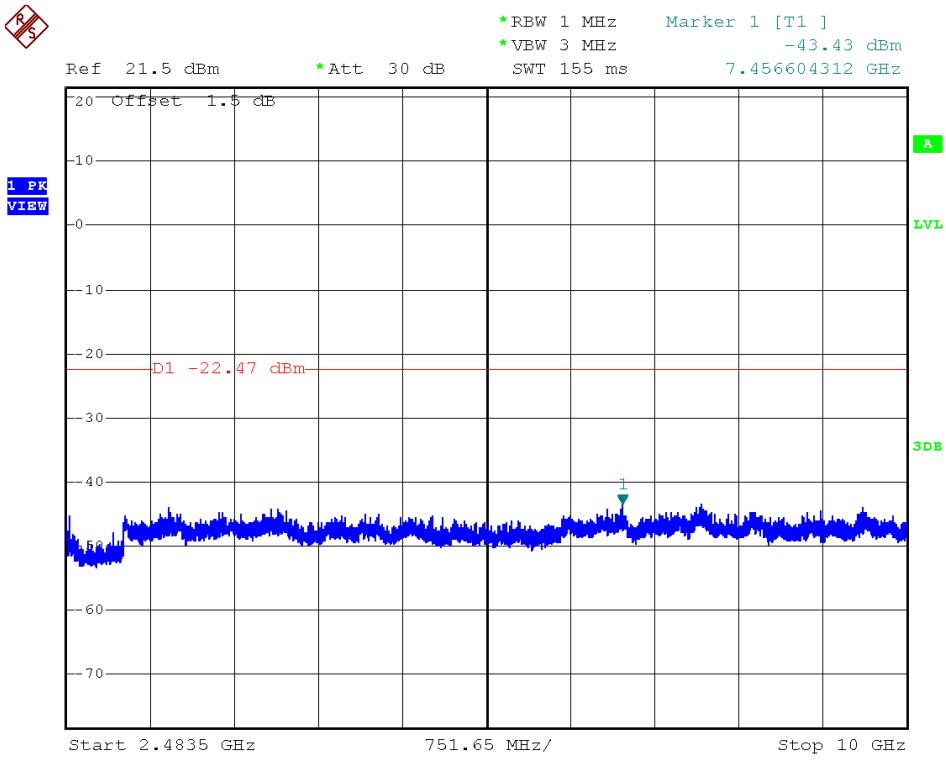


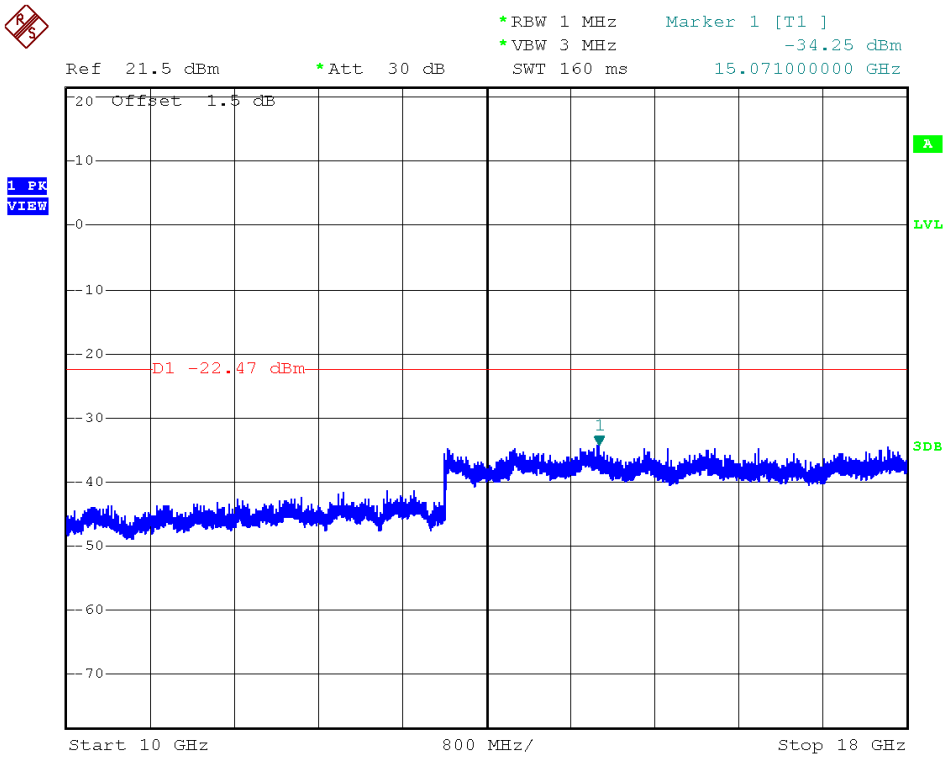

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-33.64 dBm
17.333000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -22.23 dBm
A
LVL
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

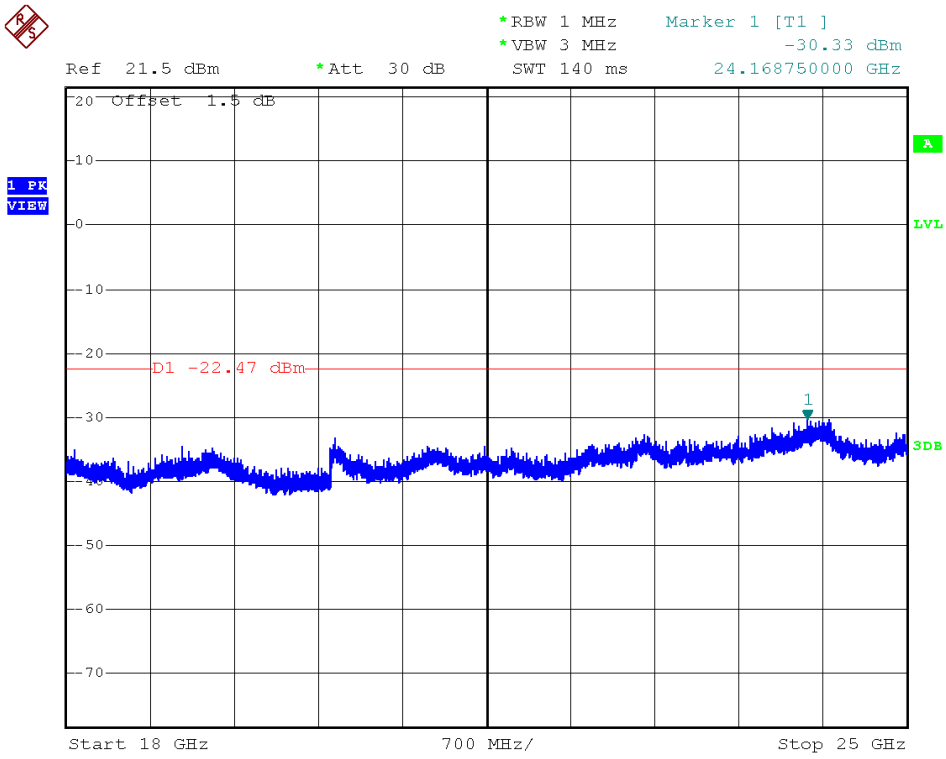

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-30.09 dBm
24.332375000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
D1 -22.23 dBm
A
LVL
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 11 (2462MHz) Reference Level: -2.47dBm

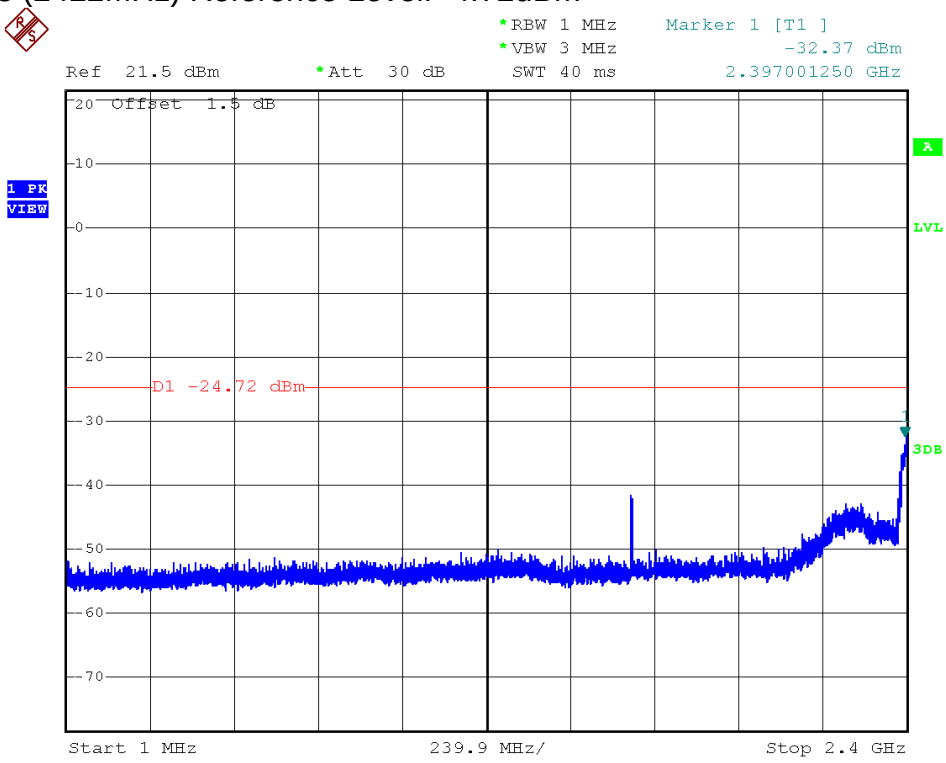


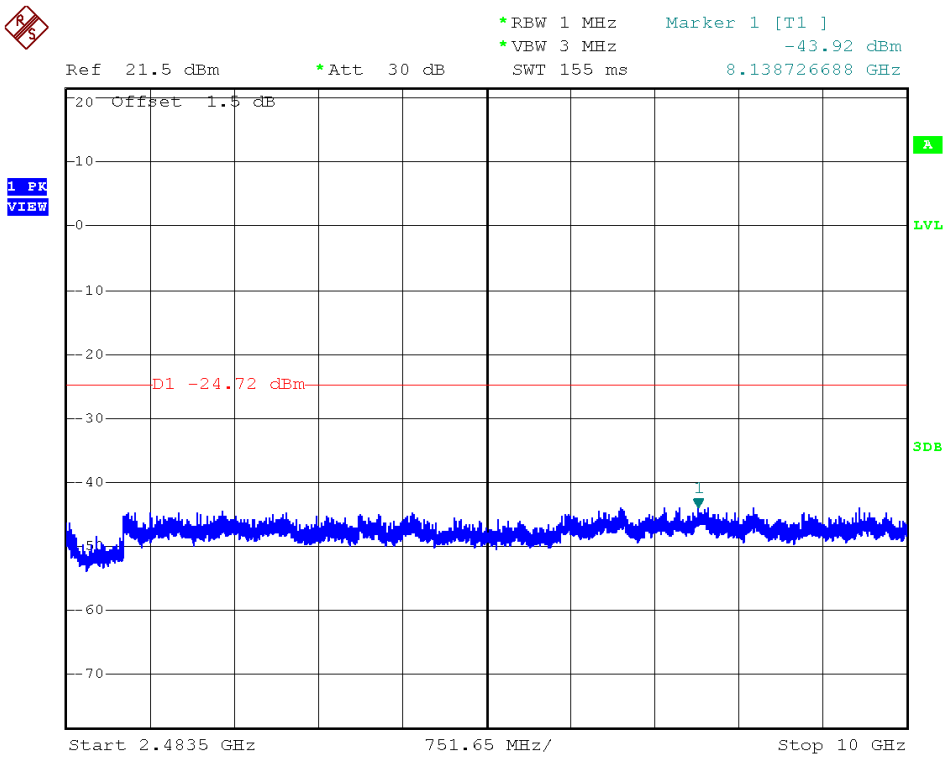


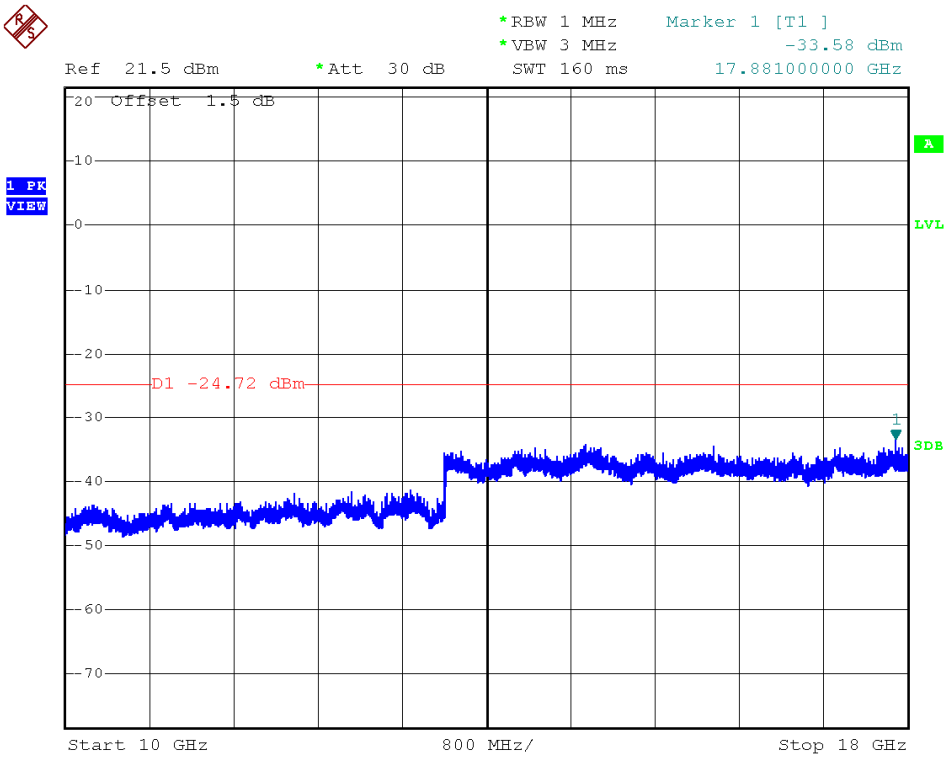

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-34.25 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 160 ms
15.071000000 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
D1 -22.47 dBm
Start 10 GHz
800 MHz/
Stop 18 GHz

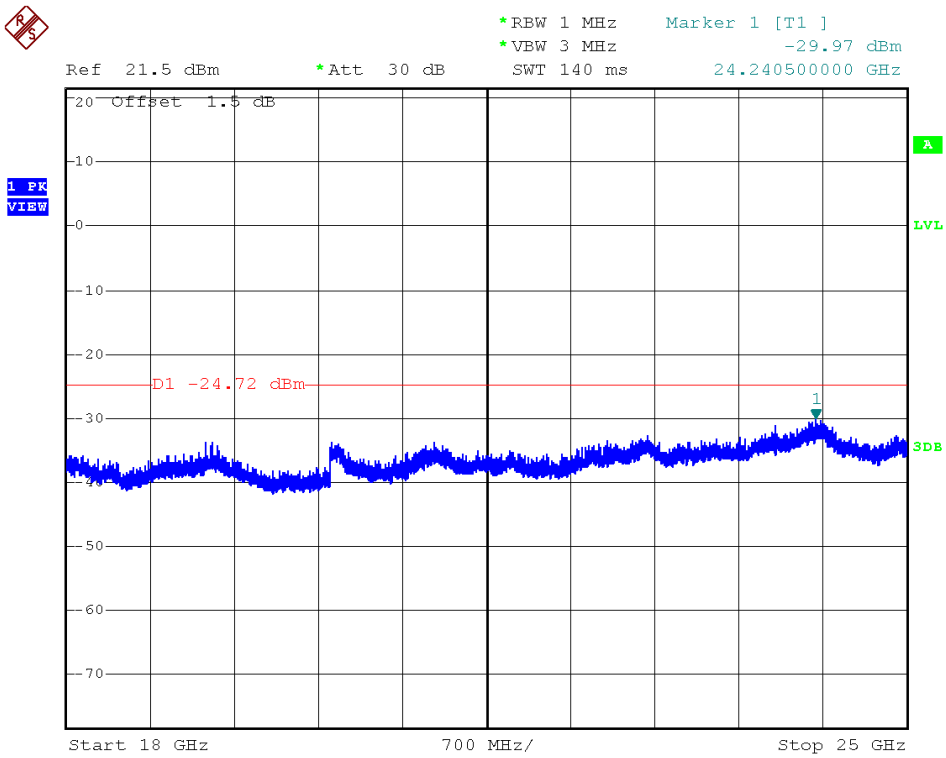

*RBW 1 MHz
Marker 1 [T1]
*VBW 3 MHz
-30.33 dBm
Ref 21.5 dBm
*Att 30 dB
SWT 140 ms
24.168750000 GHz
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
D1 -22.47 dBm
Start 18 GHz
700 MHz/
Stop 25 GHz

802.11n (HT-40)
Channel 3 (2422MHz) Reference Level: -4.72dBm

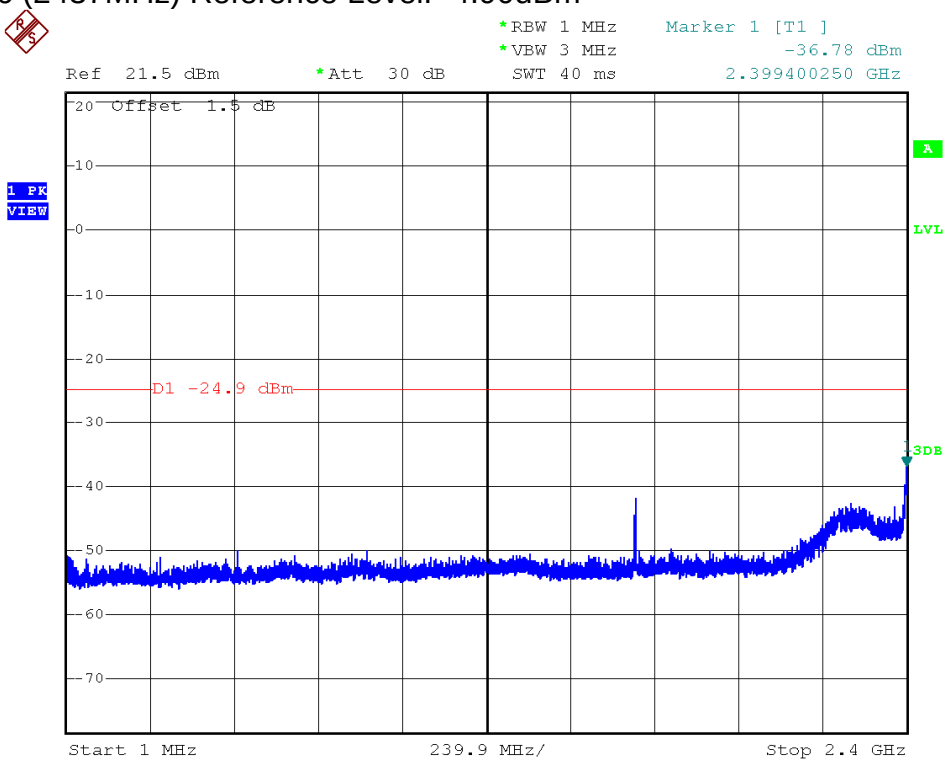


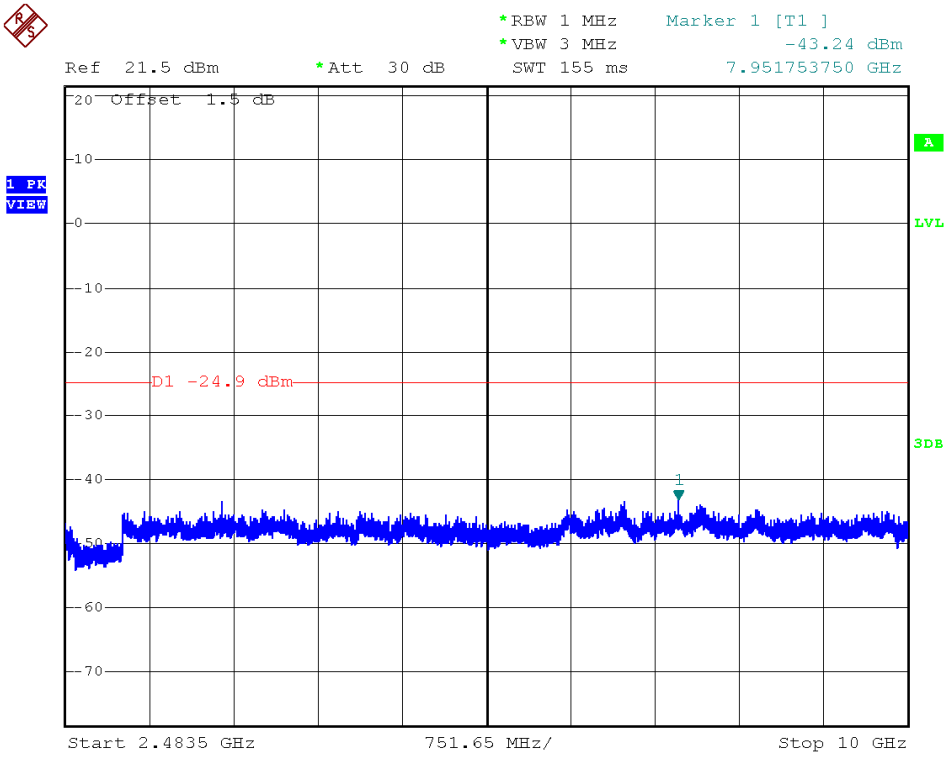


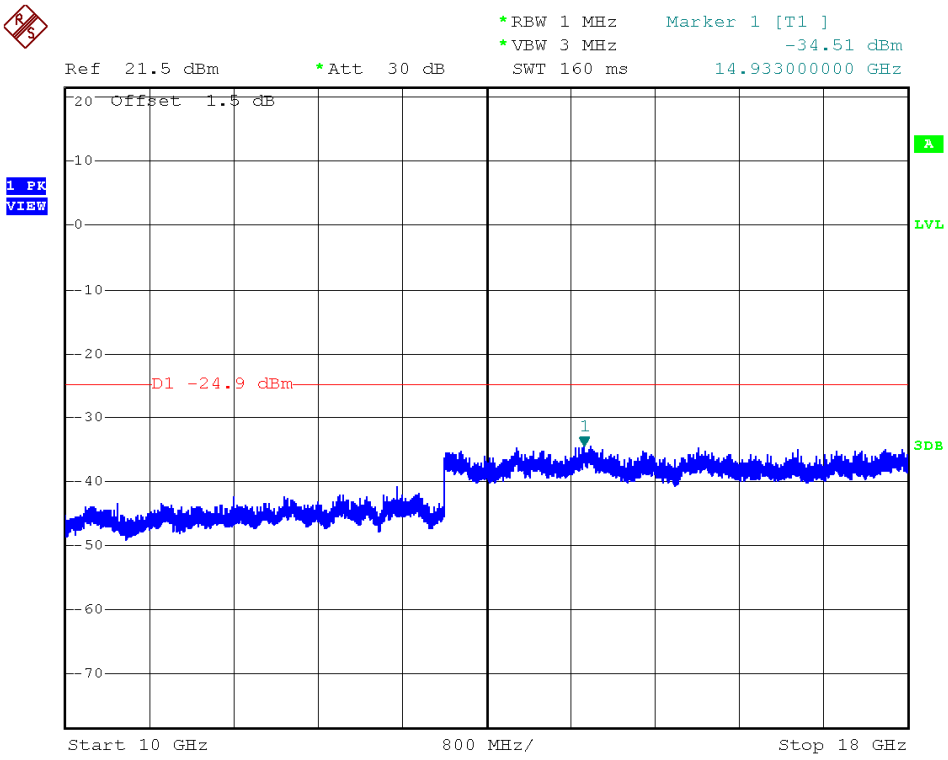

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-33.58 dBm
17.881000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
D1 -24.72 dBm
Start 10 GHz
800 MHz/
Stop 18 GHz

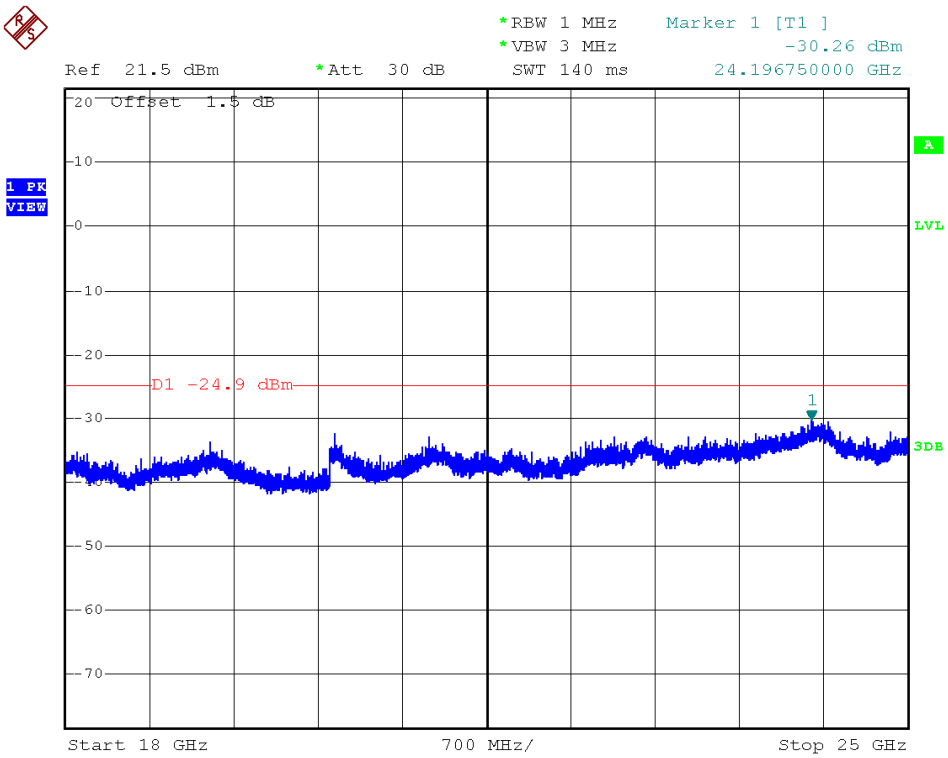

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-29.97 dBm
24.240500000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
A
LVL
3DB
D1 -24.72 dBm
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 6 (2437MHz) Reference Level: -4.90dBm

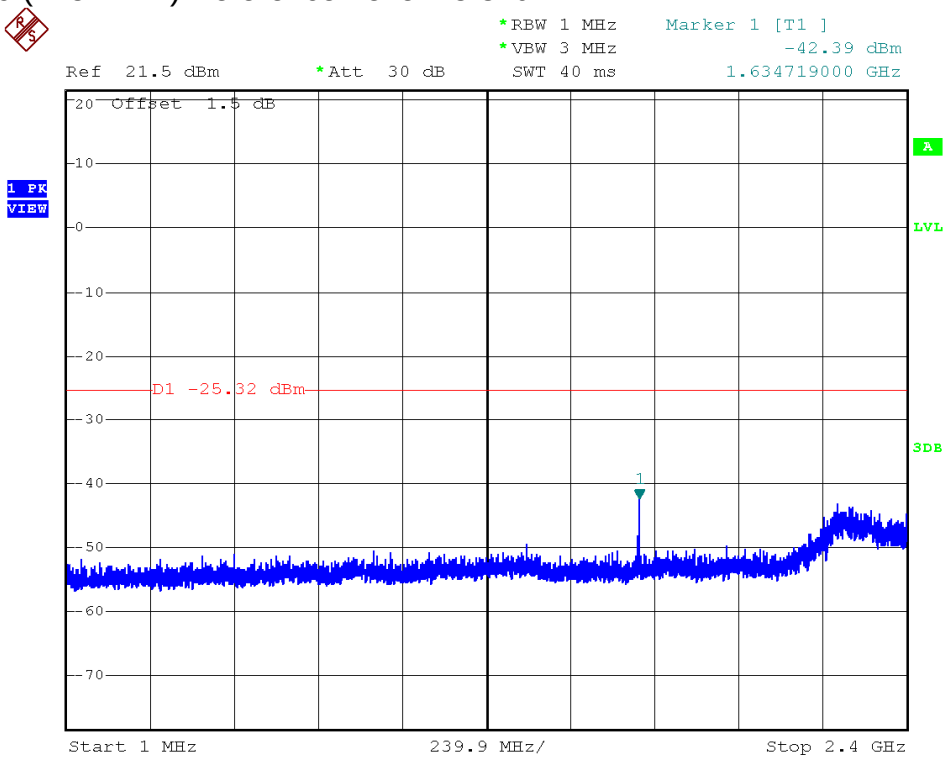


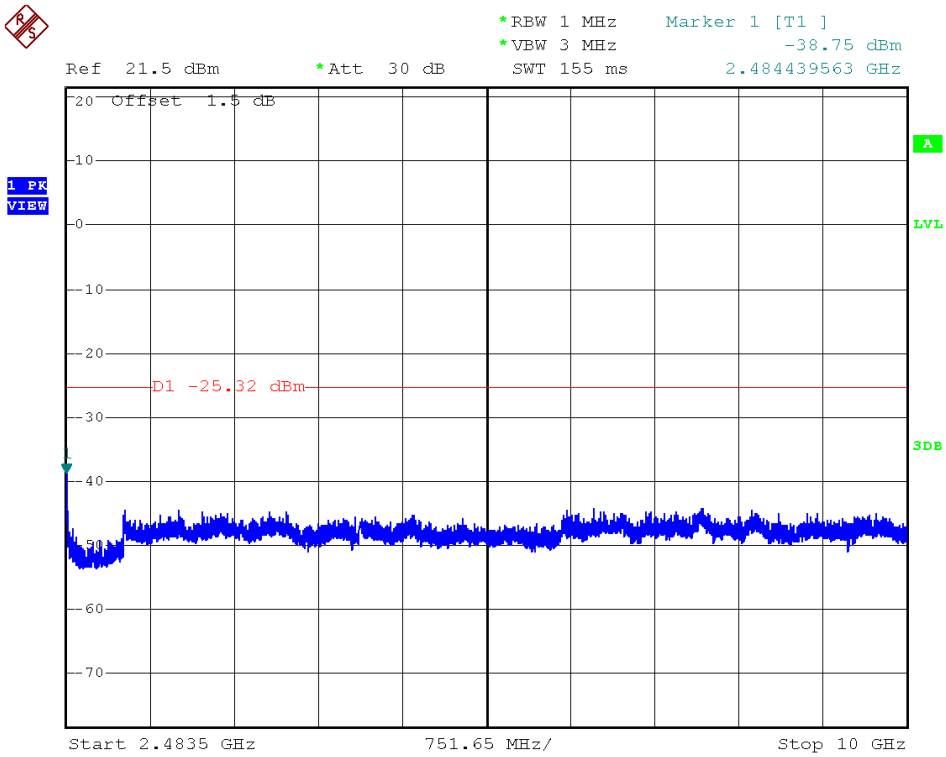


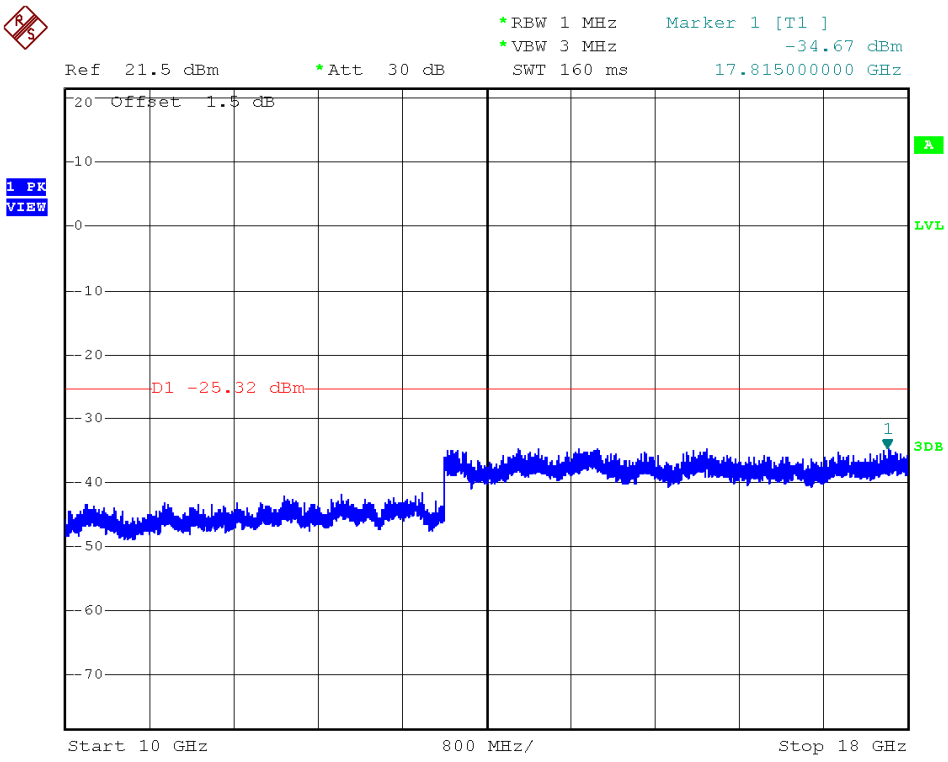

*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-34.51 dBm
14.933000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
D1 -24.9 dBm
A
LVL
3DB
Start 10 GHz
800 MHz/
Stop 18 GHz

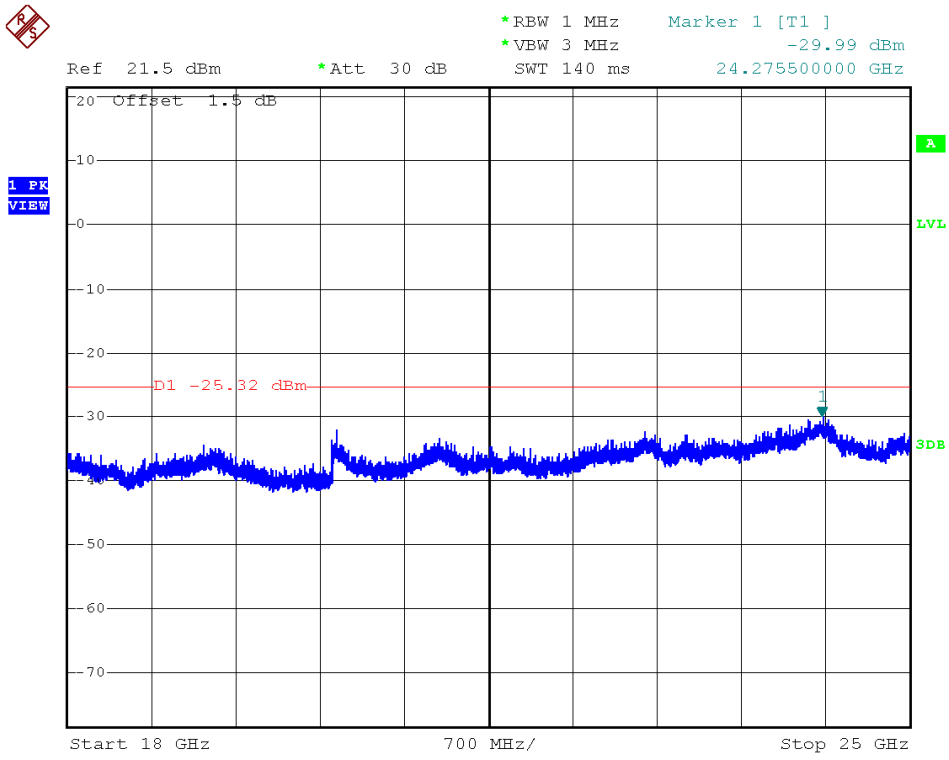

*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-30.26 dBm
24.196750000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK VIEW
D1 -24.9 dBm
A
LVL
3DB
Start 18 GHz
700 MHz/
Stop 25 GHz

Channel 9 (2452MHz) Reference Level: -5.32dBm






*RBW 1 MHz
*VBW 3 MHz
SWT 160 ms
Marker 1 [T1]
-34.67 dBm
17.815000000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
D1 -25.32 dBm
Start 10 GHz
800 MHz/
Stop 18 GHz


*RBW 1 MHz
*VBW 3 MHz
SWT 140 ms
Marker 1 [T1]
-29.99 dBm
24.275500000 GHz
Ref 21.5 dBm
*Att 30 dB
Offset 1.5 dB
1 PK
VIEW
A
LVL
3DB
D1 -25.32 dBm
Start 18 GHz
700 MHz/
Stop 25 GHz

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.5 Out of Band Radiated Emissions (for emissions in 4.4 above that are less than 20dB below carrier), FCC Rule 15.247(d):

For out of band emissions that are close to or that exceed the 20dB attenuation requirement described in the specification, radiated measurements were performed at a 3m separation distance to determine whether these emissions complied with the general radiated emission requirement.

[×] Not required, since all emissions are more than 20dB below fundamental
[ ] See attached data sheet

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.6 Transmitter Radiated Emissions in Restricted Bands, FCC Rule 15.35(b), (c):

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD

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

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB. The net field strength for comparison to the appropriate emission limit is 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBμV/m

Level in mV/m = Common Antilogarithm [(42 dBμV/m)/20] = 125.9 μV/m

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.8 Radiated Spurious Emission

Worst Case Radiated Spurious Emission (802.11g channel 11) at 2483.520MHz is passed by 1.3 dB margin.

For the electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Worst Case Operating Mode: 802.11n-HT20 (TX-Channel 11)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	250.102	44.1	20.0	13.0	37.1	46.0	-8.9
Horizontal	331.050	45.1	20.0	14.2	39.3	46.0	-6.7
Horizontal	362.245	44.6	20.0	15.6	40.2	46.0	-5.8
Vertical	94.031	50.0	20.0	8.1	38.1	43.5	-5.4
Vertical	98.470	49.6	20.0	8.3	37.9	43.5	-5.6
Vertical	137.440	45.5	20.0	9.5	35.0	43.5	-8.5

NOTES: 1. Quasi-Peak detector is used except for others stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. All emissions are below the QP limit.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11b (TX-Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	52.1	36.1	34.1	50.1	74.0	-23.9
Horizontal	*2389.900	64.8	36.7	27.2	55.3	74.0	-18.7

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	39.8	36.1	34.1	37.8	54.0	-16.2
Horizontal	*2389.920	58.9	36.7	27.2	49.4	54.0	-4.6

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11b (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	50.8	36.1	34.5	49.2	74.0	-24.8
Horizontal	*7311.000	57.5	35.6	37.1	59.0	74.0	-15.0

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	41.1	36.1	34.5	39.5	54.0	-14.5
Horizontal	*7311.000	48.9	35.6	37.1	50.4	54.0	-3.6

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11b (TX-Channel 11)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	51.2	36.1	34.7	49.8	74.0	-24.2
Horizontal	*2483.550	61.3	36.7	27.7	52.3	74.0	-21.7

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	40.5	36.1	34.7	39.1	54.0	-14.9
Horizontal	*2483.550	55.5	36.7	27.7	46.5	54.0	-7.5

NOTES:
1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11g (TX-Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	51.9	36.1	34.1	49.9	74.0	-24.1
Horizontal	*2389.980	72.3	36.7	27.2	62.8	74.0	-11.2

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	36.5	36.1	34.1	34.5	54.0	-19.5
Horizontal	*2389.980	58.1	36.7	27.2	48.6	54.0	-5.4

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11g (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	50.2	36.1	34.5	48.6	74.0	-25.4
Horizontal	*7311.000	53.3	35.6	37.1	54.8	74.0	-19.2

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	35.8	36.1	34.5	34.2	54.0	-19.8
Horizontal	*7311.000	37.7	35.6	37.1	39.2	54.0	-14.8

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11g (TX-Channel 11)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	50.4	36.1	34.7	49.0	74.0	-25.0
Horizontal	*7386.000	52.4	35.6	37.2	54.0	74.0	-20.0
Horizontal	*2483.520	76.8	36.7	27.7	67.8	74.0	-6.2

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	35.0	36.1	34.7	33.6	54.0	-20.4
Horizontal	*7386.000	36.9	35.6	37.2	38.5	54.0	-15.5
Horizontal	*2483.520	61.7	36.7	27.7	52.7	54.0	-1.3

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11n-20M (TX-Channel 01)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	51.1	36.1	34.1	49.1	74.0	-24.9
Horizontal	*2389.990	73.4	36.7	27.2	63.9	74.0	-10.1

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4824.000	36.4	36.1	34.1	34.4	54.0	-19.6
Horizontal	*2389.990	59.0	36.7	27.2	49.5	54.0	-4.5

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11n-20M (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	50.4	36.1	34.5	48.8	74.0	-25.2
Horizontal	*7311.000	51.6	35.6	37.1	53.1	74.0	-20.9

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	35.8	36.1	34.5	34.2	54.0	-19.8
Horizontal	*7311.000	35.7	35.6	37.1	37.2	54.0	-16.8

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11n-20M (TX-Channel 11)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	49.7	36.1	34.7	48.3	74.0	-25.7
Horizontal	*7386.000	51.8	35.6	37.2	53.4	74.0	-20.6
Horizontal	*2483.510	75.8	36.7	27.7	66.8	74.0	-7.2

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4924.000	35.0	36.1	34.7	33.6	54.0	-20.4
Horizontal	*7386.000	36.9	35.6	37.2	38.5	54.0	-15.5
Horizontal	*2483.510	60.9	36.7	27.7	51.9	54.0	-2.1

NOTES:
1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11n-40M (TX-Channel 03)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4844.000	50.5	36.1	34.6	49.0	74.0	-25.0
Horizontal	*2389.975	77.3	36.7	27.2	67.8	74.0	-6.2

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4844.000	35.5	36.1	34.6	34.0	54.0	-20.0
Horizontal	*2389.975	61.1	36.7	27.2	51.6	54.0	-2.4

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11n-40M (TX-Channel 06)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	49.6	36.1	34.8	48.3	74.0	-25.7
Horizontal	*7311.000	50.7	35.6	37.3	52.4	74.0	-21.6

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4874.000	35.0	36.1	34.8	33.7	54.0	-20.3
Horizontal	*7311.000	36.0	35.6	37.3	37.7	54.0	-16.3

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Mode: 802.11n-40M (TX-Channel 9)

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4904.000	49.7	36.1	34.8	48.4	74.0	-25.6
Horizontal	*7356.000	51.5	35.6	37.4	53.3	74.0	-20.7
Horizontal	*2483.510	71.5	36.7	27.7	62.5	74.0	-11.5

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	*4904.000	34.6	36.1	34.8	33.3	54.0	-20.7
Horizontal	*7356.000	36.4	35.6	37.4	38.2	54.0	-15.8
Horizontal	*2483.510	54.7	36.7	27.7	45.7	54.0	-8.3

NOTES: 1. Peak detector is used for the emission measurement (RBW=1MHz, VBW=3MHz for Peak data; RBW=1MHz, VBW=10Hz for Average data).

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna used for the emission over 1000MHz.

* Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

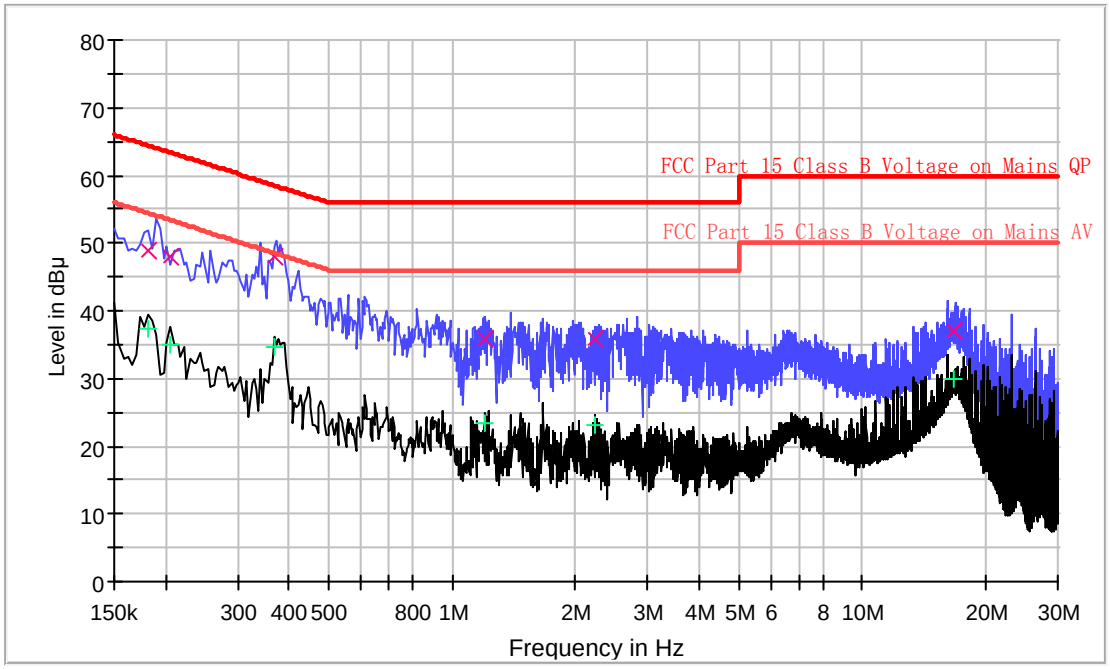
4.9 Conducted Emission

Worst Case Conducted emission at 0.370MHz is Passed by 10.5 dB margin

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

Company: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Worst Case Operating Mode: 802.11n-HT20 (TX-Channel 11)

Conducted Emission Test - FCC



Result Table QP

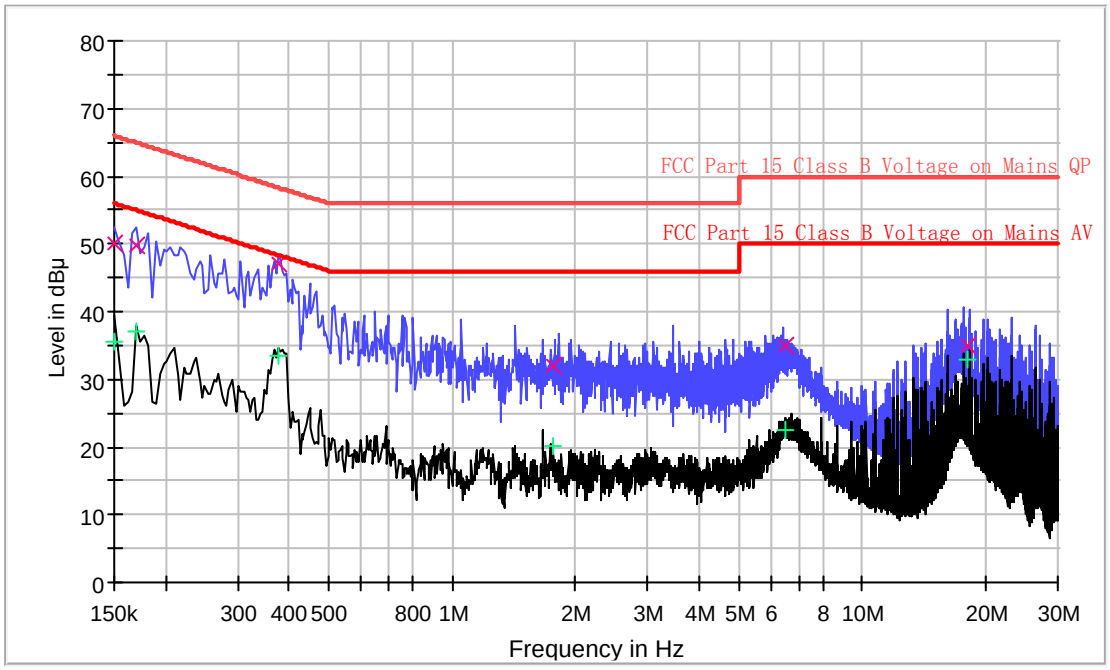
Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.182000	49.0	L1	9.7	15.4	64.4
0.206000	48.1	L1	9.7	15.3	63.4
0.370000	48.0	L1	9.7	10.5	58.5
1.206000	36.0	L1	9.8	20.0	56.0
2.226000	35.8	L1	9.8	20.2	56.0
16.792000	37.0	L1	10.2	23.0	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.182000	37.4	L1	9.7	17.0	54.4
0.206000	35.0	L1	9.7	18.4	53.4
0.370000	34.6	L1	9.7	13.9	48.5
1.206000	23.4	L1	9.8	22.6	46.0
2.226000	23.1	L1	9.8	22.9	46.0
16.792000	30.0	L1	10.2	20.0	50.0

Company: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559
Worst Case Operating Mode: 802.11n-HT20 (TX-Channel 11)

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.150000	50.0	N	10.1	16.0	66.0
0.170000	49.7	N	10.2	15.3	65.0
0.378000	47.0	N	10.2	11.3	58.3
1.758000	32.0	N	10.3	24.0	56.0
6.462000	35.0	N	10.4	25.0	60.0
18.185000	35.0	N	10.6	25.0	60.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.150000	35.5	N	10.1	20.5	56.0
0.170000	37.0	N	10.2	18.0	55.0
0.378000	33.4	N	10.2	14.9	48.3
1.758000	20.1	N	10.3	25.9	46.0
6.462000	22.4	N	10.4	27.6	50.0
18.185000	33.0	N	10.6	17.0	50.0

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.10 Radiated Emissions from Digital Section of Transceiver, FCC Ref: 15.109

[ ] Not required - No digital part

[ ] Test results are attached

[x] Included in the separated report.

Applicant: Direct Communication Solutions
Date of Test: December 30, 2013
Model: DCS-559

4.11 Transmitter Duty Cycle Calculation and Measurements, FCC Rule 15.35(b), (c)

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEP function on the analyzer was set to ZERO SPAN. The Transmitter ON time was determined from the resultant time-amplitude display:

	See attached spectrum analyzer chart (s) for Transmitter timing
	See Transmitter timing diagram provided by manufacturer
x	Not applicable, duty cycle was not used.

EXHIBIT 5

EQUIPMENT PHOTOGRAPHS

5.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.doc & internal photos.pdf.

EXHIBIT 6

PRODUCT LABELLING

6.0 **Product Labelling**

For electronic filing, the FCC ID label artwork and location is saved with filename: label.pdf.

EXHIBIT 7

TECHNICAL SPECIFICATIONS

7.0 Technical Specifications

For electronic filing, the block diagram and circuit diagram are saved with filename: block.pdf and circuit.pdf respectively.

EXHIBIT 8

INSTRUCTION MANUAL

8.0 **Instruction Manual**

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

EXHIBIT 9

MISCELLANEOUS INFORMATION

9.0 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

Pulse desensitivity is not applicable for this device since the transmitter transmits the RF signal continuously.

EXHIBIT 10

TEST EQUIPMENT LIST

10.0 **Test Equipment List**

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00066460	29-Jun-2013	29-Jun-2014
SZ185-01	EMI Receiver	R&S	ESCI	100547	12-Mar-2013	12-Mar-2014
SZ061-09	Horn Antenna	ETS	3115	00092346	16-Nov-2013	16-Nov-2014
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	27-Aug-2013	27-Aug-2014
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	13-May-2013	13-May-2014
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	12-Mar-2013	12-Mar-2014
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	12-Mar-2013	12-Mar-2014
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	2-Mar-2013	2-Mar-2014
SZ062-02	RF Cable	RADIALL	RG 213U	--	20-Jul-2013	20-Jan-2014
SZ062-06	RF Cable	RADIALL	0.04-26.5GHz	--	14-Jul-2013	14-Jan-2014
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	17-Oct-2013	17-Apr-2014
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	21-May-2013	21-May-2014
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	9-Nov-2013	9-Nov-2014
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	9-Nov-2013	9-Nov-2014
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	9-Nov-2013	9-Nov-2014
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-2013	23-Aug-2014