Report on the Radio Testing

For

SmarDTV (UK) Limited

on

Project N63 (Avatar)

Report no. TRA-029575-02-45-10A

2nd December 2016

Report Number: TRA-029575-02-45-10A
Issue: B

REPORT ON THE RADIO TESTING OF A
SmarDTV (UK) Limited
Project N63 (Avatar)
WITH RESPECT TO SPECIFICATION
FCC 47CFR 15.247

TEST DATE: 25th April - 26th September 2016

Tested by:	A Tosif	A Longley - A Tosif – A Wong Radio Test Engineers
Written by:	D Winstanley	D Winstanley Radio Test Engineer
Approved by:	 Digitally signed by John Charters DN: cn=John Charters, o=Element Materials Technology, ou, email=john.charters@element.com, c=GB Date: 2016.12.02 16:17:29 Z	J Charters Department Manager- Radio
Date:	2nd December 2016	

Element Materials Technology Warwick Ltd.
Registered in England and Wales. Registered Office: 5 Fleet Place, London, EC4M 7RD
Company Reg No. 02536659

1 Revision Record

Issue Number	*Issue Date*	*Revision History*
A	2nd December 2016	Original
B	2nd December 2016	EUT name change

2 Summary

TEST REPORT NUMBER:	TRA-029575-02-45-10A
WORKS ORDER NUMBER	TRA-029575-02
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(S):	47CFR15.247
EQUIPMENT UNDER TEST (EUT):	Project N63 (Avatar)
FCC IDENTIFIER:	DKN-AVBX1
EUT SERIAL NUMBER:	1604210679 & 14604210698
MANUFACTURER/AGENT:	SmarDTV (UK) Limited
ADDRESS:	Beckside Design Centre Millennium Business Park Station Rd Steeton Keighley West Yorkshire BD20 6QW United Kingdom
CLIENT CONTACT:	Chris Wordley ☎ 01535 659000 ✉ chris.wordley@smardtv.com
ORDER NUMBER:	POR01251
TEST DATE:	25th April - 26th September 2016
TESTED BY:	A Longley - A Tosif Element

2.1 Test Summary

Test Method and Description		*Requirement Clause 47CFR15*	*Applicable to this equipment*	*Result / Note*
Radiated spurious emissions (restricted bands of operation and cabinet radiation)		15.205	☒	*Pass*
AC power line conducted emissions		15.207	☐	*Note 1*
Occupied bandwidth		15.247(a)(2)	☒	*Pass*
Conducted carrier power	Peak	15.247(b)(3)	☐	*Pass*
	Max.		☒	
Conducted / radiated RF power out-of-band		15.247(d)	☒	*Pass*
Power spectral density, conducted		15.247(e)	☒	*Pass*
Calculation of duty correction		15.35(c)	☐	*N/A*

Notes:

1. See Test report TRA-029575-02-45-05A

The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

3 Contents

4 Introduction

This report TRA-029575-02-45-10A presents the results of the Radio testing on a SmarDTV (UK) Limited, Project N63 (Avatar) to specification 47CFR15 Radio Frequency Devices.

The testing was carried out for SmarDTV (UK) Limited by Element, at the address(es) detailed below.

☒ Element Hull
Unit E
South Orbital Trading Park
Hedon Road
Hull
HU9 1NJ
UK

☐ Element Skelmersdale
Unit 1
Pendle Place
Skemersdale
West Lancashire
WN8 9PN
UK

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

Throughout this report EUT denotes equipment under test.

FCC Site Listing:
Element is accredited for the above sites under the US-EU MRA, Designation number UK0009.

IC Registration Number(s):

Element Hull	3483A
Element North West	3930B

The test site requirements of ANSI C63.4-2014 are met up to 1GHz.

The test site SVSWR requirements of CISPR 16-1-4:2010 are met over the frequency range 1 GHz to 18 GHz.

5 Test Specifications

5.1 Normative References

- FCC 47 CFR Ch. I – Part 15 – Radio Frequency Devices.
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- Industry Canada RSS-247, Issue 1, May 2015 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- Industry Canada RSS-Gen, Issue 4, November 2014 – General Requirements for Compliance of Radio Apparatus

5.2 Deviations from Test Standards

There were no deviations from the test standard.

6 Glossary of Terms

§	denotes a section reference from the standard, not this document
AC	Alternating Current
ANSI	American National Standards Institute
BW	bandwidth
C	Celsius
CFR	Code of Federal Regulations
CW	Continuous Wave
dB	decibel
dBm	dB relative to 1 milliwatt
DC	Direct Current
DSSS	Direct Sequence Spread Spectrum
EIRP	Equivalent Isotropically Radiated Power
ERP	Effective Radiated Power
EUT	Equipment Under Test
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
Hz	hertz
IC	Industry Canada
ITU	International Telecommunication Union
LBT	Listen Before Talk
m	metre
max	maximum
MIMO	Multiple Input and Multiple Output
min	minimum
MRA	Mutual Recognition Agreement
N/A	Not Applicable
PCB	Printed Circuit Board
PDF	Portable Document Format
Pt-mpt	Point-to-multipoint
Pt-pt	Point-to-point
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	receiver
s	second
SVSWR	Site Voltage Standing Wave Ratio
Tx	transmitter
UKAS	United Kingdom Accreditation Service
V	volt
W	watt
Ω	ohm

7 Equipment Under Test

7.1 EUT Identification

- Name: Project N63 (Avatar)
- Serial Number: 1604210679 & 14604210698
- Model Number: S60
- Software Revision: Not Applicable
- Build Level / Revision Number: Not Applicable

7.2 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

Sample No.	*Description*	*Model No.*	*Serial No.*
S08	EUT 12 Vdc Power Adapter	EADP-40MB A	HBBD45F00A7
S11	Lenovo ThinkPad	E560	34546
S14	Thurlby Thandar Audio Generator	TF215	045441
S15	LG TV	M227WDL	002MAAK4P824
S17	Channel Master DVR	CM-7500TB1	R5YFKZ00228D
S27	Dlink USB to Ethernet adapter	DUB-E100	Q8041AA002873

7.3 EUT Mode of Operation

7.3.1 Transmission

The mode of operation for Tx tests was as follows.

Wi-Fi transmitter control was via commands sent through MTool v2.0.3.2 software. The commands provided by the manufacturer setup the device into a permanent transmit mode. For each type of test, lowest and highest date rates were investigated to find the worst case data rate. Only the worst case results are reported. The commands allowed adjustment of the following parameters of significant interest.

Power Table for EUT Operating Modes and Data Rates

Channel (MHz)	Channel Bandwidth (MHz)	Mode	Power Setting (q dBm)	Data Rate or Scheme
2412	20	CCK	64	1 Mbps
2412	20	CCK	64	11 Mbps
2437	20	CCK	68	1 Mbps
2437	20	CCK	68	11 Mbps
2462	20	CCK	60	1 Mbps
2462	20	CCK	68	11 Mbps
2412	20	OFDM	48	6 Mbps
2412	20	OFDM	48	56 Mbps
2437	20	OFDM	64	6 Mbps
2437	20	OFDM	56	56 Mbps
2462	20	OFDM	64	6 Mbps
2462	20	OFDM	56	56 Mbps
2412	20	HT	44	MCS0
2412	20	HT	44	MCS7
2437	20	HT	64	MCS0
2437	20	HT	56	MCS7
2462	20	HT	56	MCS0
2462	20	HT	56	MCS7
2432	40	HT	32	MCS0
2432	40	HT	32	MCS7
2447	40	HT	48	MCS0
2447	40	HT	48	MCS7
2462	40	HT	44	MCS0
2462	40	HT	44	MCS7
2412	20	VHT	44	MCS0NSS1
2412	20	VHT	44	MCS8NSS1
2437	20	VHT	64	MCS0NSS1
2437	20	VHT	56	MCS8NSS1
2462	20	VHT	56	MCS0NSS1
2462	20	VHT	56	MCS8NSS1
2432	40	VHT	32	MCS0NSS1
2432	40	VHT	32	MCS9NSS1
2447	40	VHT	48	MCS0NSS1
2447	40	VHT	48	MCS9NSS1
2462	40	VHT	44	MCS0NSS1
2462	40	VHT	44	MCS9NSS1

7.3.2 Reception

This report covers transmitter operation only. Results for unintentional emissions can be found in test report TRA-029575-44-00B.

7.4 EUT Radio Parameters

7.4.1 General

Frequency of operation:	2400 – 2483.5 MHz
Modulation type(s):	802.11 b / g / n HT20 / n HT40
Occupied channel bandwidth(s):	20 MHz / 40 MHz
Channel spacing:	5 MHz
Nominal Supply Voltage:	110 Vac
Location of notice for license exempt use:	Label / user manual / both.
Duty cycle:	Upto 100 %

7.4.2 Antennas

Type:	Integral
Frequency range:	2400 – 2490 MHz
Impedance:	50 Ohms
Gain:	See Table
Connector type:	U-FL
Mounting:	Case Mounted

Frequency [MHz]	DB_1 [dBm]	DB_2 [dBm]
2400	2.8	1.9
2410	2.4	2.1
2420	2.1	2.4
2430	2.3	2.6
2440	2.6	2.9
2450	2.7	3.2
2460	2.9	3.2
2470	2.9	3.3
2480	2.9	3.2
2490	3.1	3.3
Average	2.7	2.8

7.4.3 Product specific declarations

Multiple antenna configuration(s), e.g. MIMO:	Mimo
Fixed pt-pt operations (yes/no):	No
Installation manual advice on pt-pt operational restrictions (yes/no):	No
Fixed pt-mpt operations (yes/no):	No
Simultaneous tx (yes/no):	Yes

7.5 EUT Description

Error! Reference source not found. One module contains a 5 GHz Wi-Fi Access Point, and the other module contains a dual-band Wi-Fi Client and a dual-mode Bluetooth radio. All radios within the device are capable of simultaneous transmission. It is intended for both indoor and outdoor use (mobile, not portable).

This report only covers 2.4 GHz Wi-Fi.

This radio uses the following operating schemes (beamforming is not supported):

- SISO (single antenna transmission)
- SM-MIMO (multiple antenna transmission, uncorrelated)
- STBC (multiple antenna transmission, uncorrelated)
- CDD (multiple antenna transmission, correlated)

It uses 4 modulation schemes in the 2.4 GHz band:

- 802.11b (20 MHz);
- 802.11g (20 MHz);
- 802.11n (20 MHz);
- 802.11n (40 MHz);

This radio can transmit in:

- 2412–2462 MHz – Channels 1–11;

There are 2 antennas of known gain.

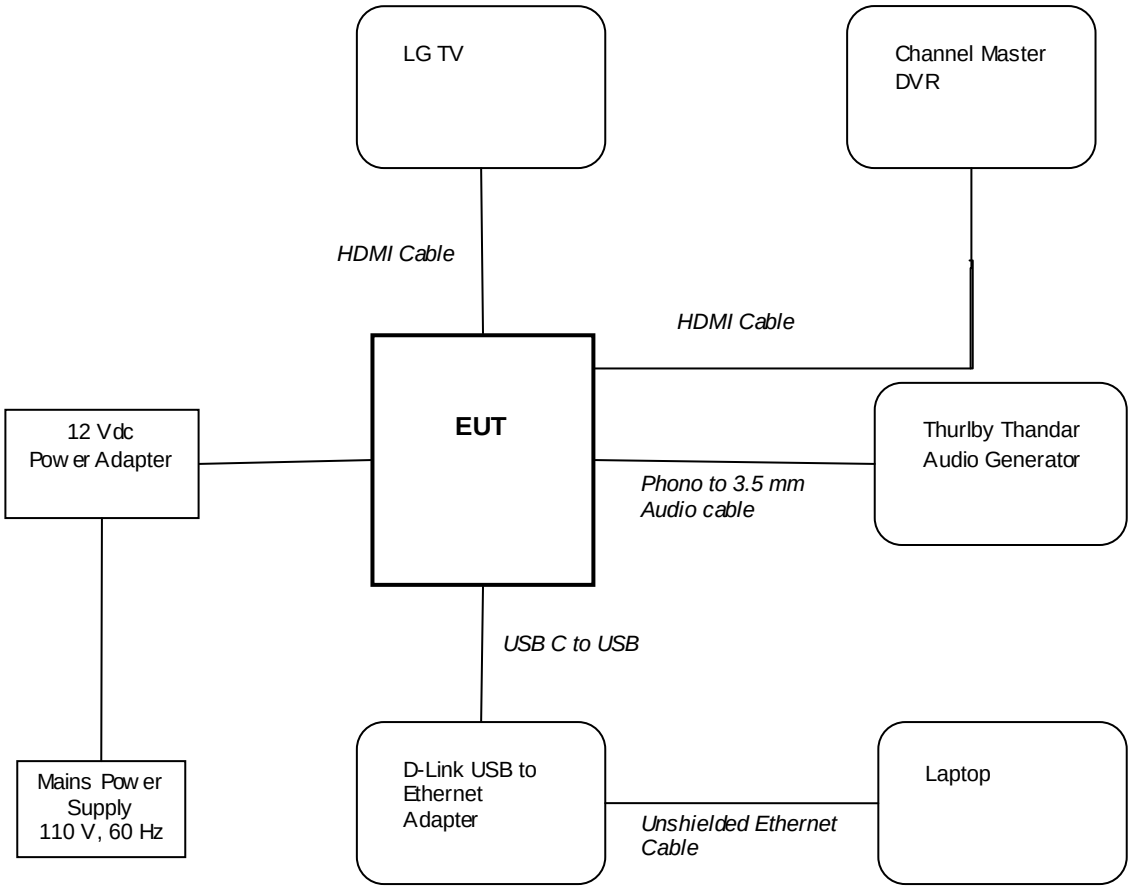
8 Modifications

No modifications were performed during this assessment.

9 EUT Test Setup

9.1 Block Diagram

The following diagram shows basic EUT interconnections with cable type and cable lengths identified:



9.2 General Set-up Photograph

The following photograph shows basic EUT set-up:

Pictures reomved for confidentiality

10 General Technical Parameters

10.1 Normal Conditions

The E U T was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source applied was approx. 5 V dc from the adaptor / 3V dc from alkaline batteries / 110 V ac, 60 Hz, from the mains.

10.2 Varying Test Conditions

There are no specific frequency stability requirements for the type of device. The results contained in this report demonstrate that the occupied bandwidth is contained within the authorised band and the manufacturer has declared sufficient frequency stability (refer to section 7.4).

Variation of supply voltage is required to ensure stability of the declared output power. During carrier power testing the following variations were made:

	Category	***Nominal***	***Variation***
☒	Mains	110 V ac +/-2 %	85 % and 115 %
☐	Battery	New battery	N/A

11 Radiated emissions

11.1 Definitions

Spurious emissions
Emissions on a frequency or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

Restricted bands
A frequency band in which intentional radiators are permitted to radiate only spurious emissions but not fundamental signals.

11.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Lab 16
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.5 and 6.6
EUT Channels / Frequencies Measured:	Low / Mid / High
EUT Channel Bandwidths:	20MHz / 40MHz
Deviations From Standard:	None
Measurement BW:	30 MHz to 1 GHz: 120 kHz Above 1 GHz: 1 MHz
Measurement Detector:	Up to 1 GHz: quasi-peak Above 1 GHz: RMS average and Peak

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)
Supply: 12 V dc	230 V ac ±10 % (as declared)

11.3 Test Limit

Unwanted emissions that fall within the restricted frequency bands shall comply with the limits specified:

General Field Strength Limits for License-Exempt Transmitters at Frequencies above 30 MHz

Frequency (MHz)	*Field Strength (µV/m at 3 m)*
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

11.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100 kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dBµV/m at the regulatory distance, using:

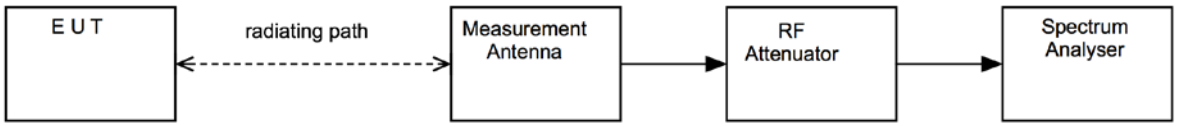
$$FS = PR + CL + AF – PA + DC – CF$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dBµV;
CL is the cable loss in dB;
AF is the test antenna factor in dB/m;
PA is the pre-amplifier gain in dB (where used);
DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);
CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

Figure i Test Setup



11.5 Test Set-up Photograph

Set up photographs are withheld per client's confidentiality request.

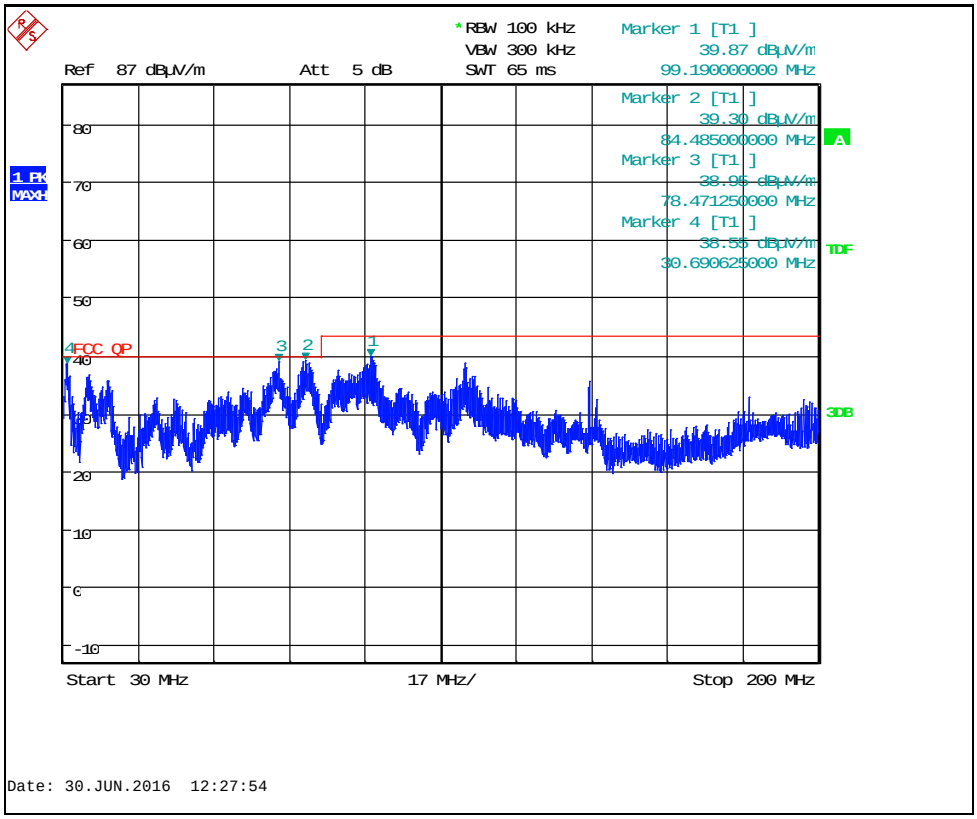
11.6 Test Equipment

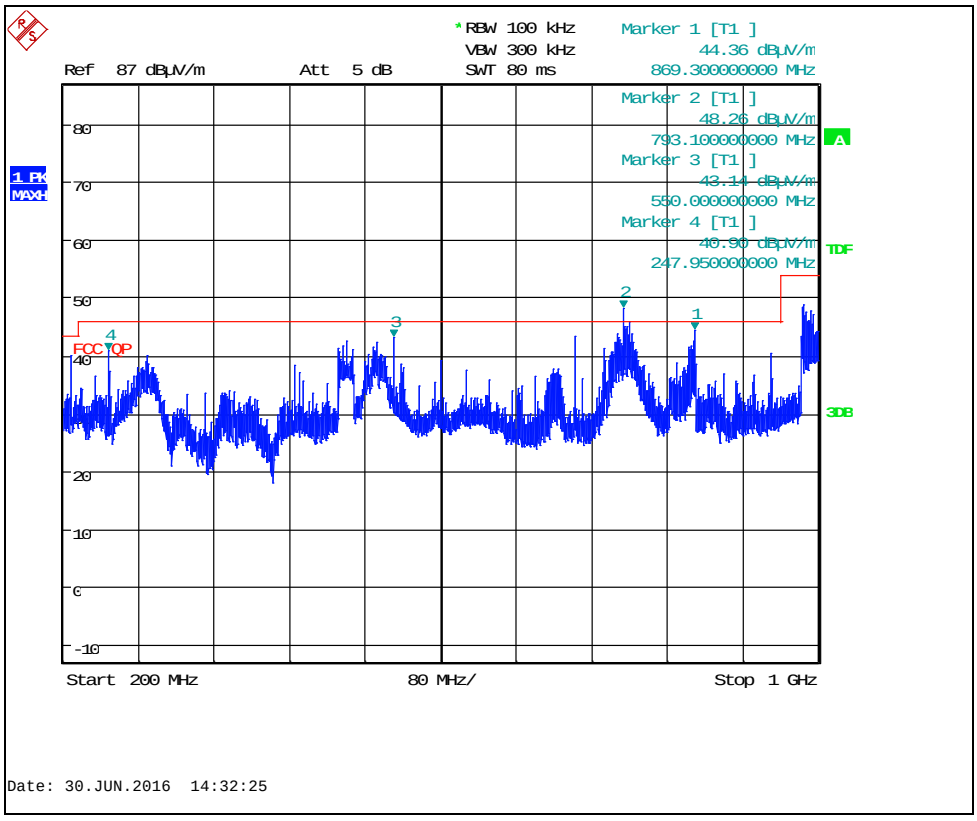
Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
ATS	Rainford	Ferrite Lined Chamber	REF886	21/07/2017
3109	EMCO	Biconical Antenna	RFG095	17/05/2019
3146	EMCO	Log Periodic Antenna	RFG191	17/05/2019
3115	EMCO	Horn Antenna	RFG129	09/02/2018
	Q-Par	Horn Antenna	RFG629	30/09/2017
310	Sonoma	Pre-Amp (9kHz – 1GHz)	REF927	30/06/2018
8449B	Agilent	Pre-Amp (1 – 26.5GHz)	REF913	02/02/2018
FSU26	R&S	Spectrum Analyser	REF909	26/04/2017
FSU46	R&S	Spectrum Analyser	REF910	05/07/2017

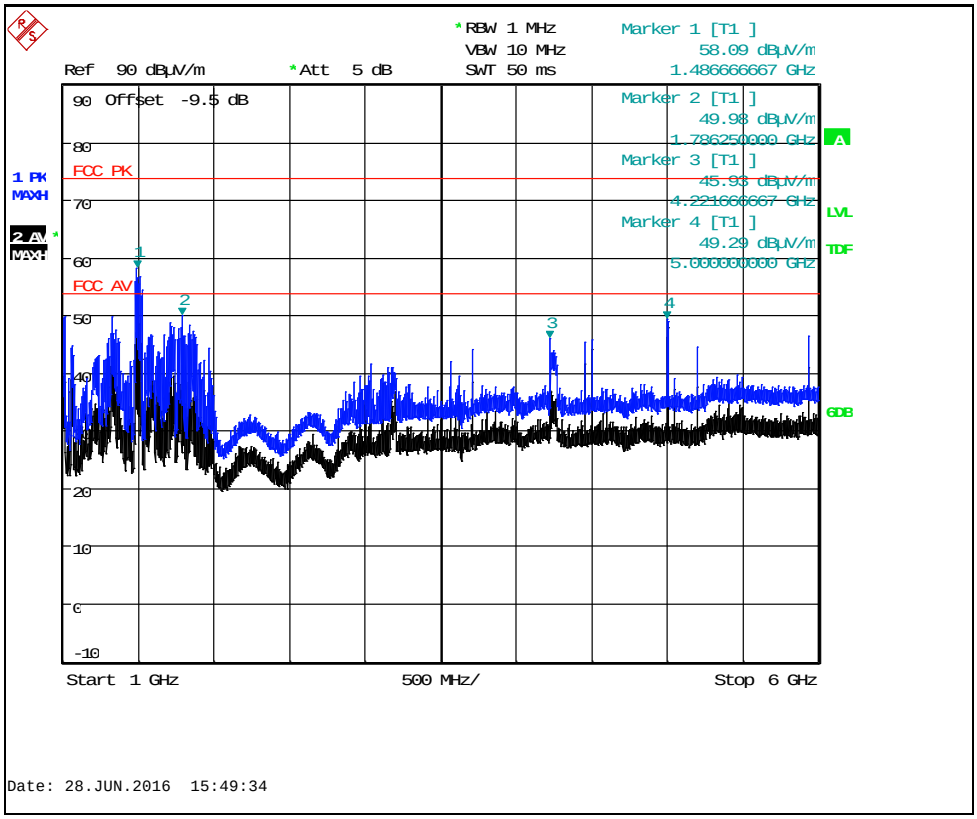
11.7 Test Results

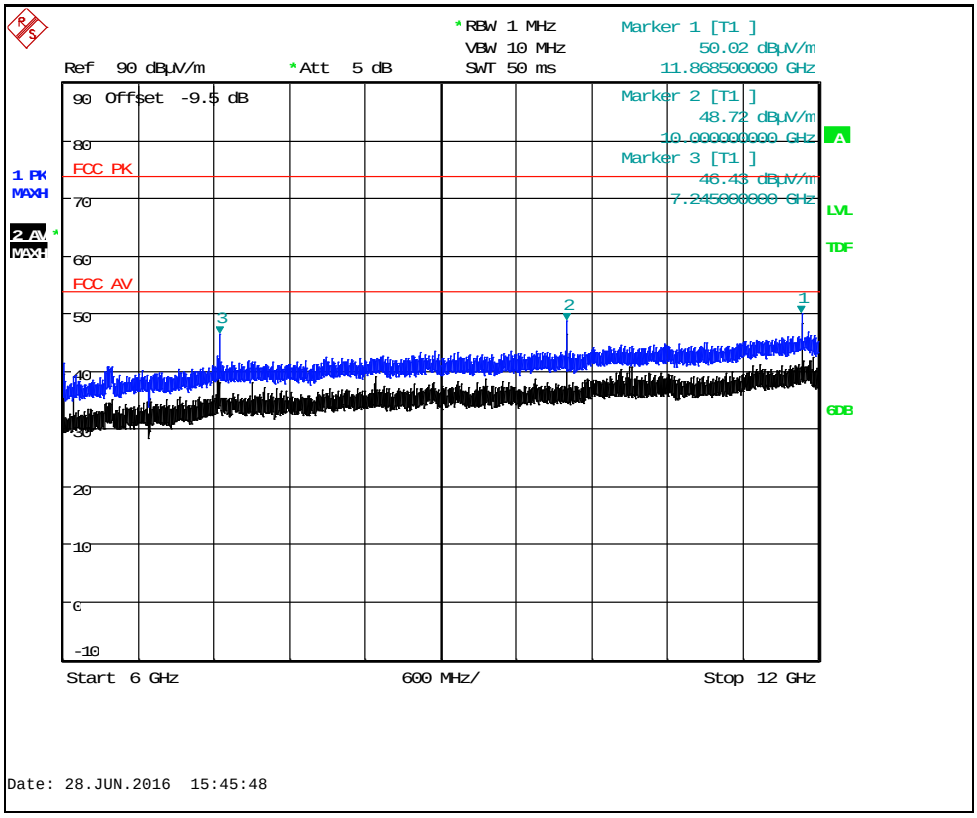
Worst case typical pre-scan results are presented here (there were no harmonic emissions detected and all emissions measured were independent of the radio operating mode):

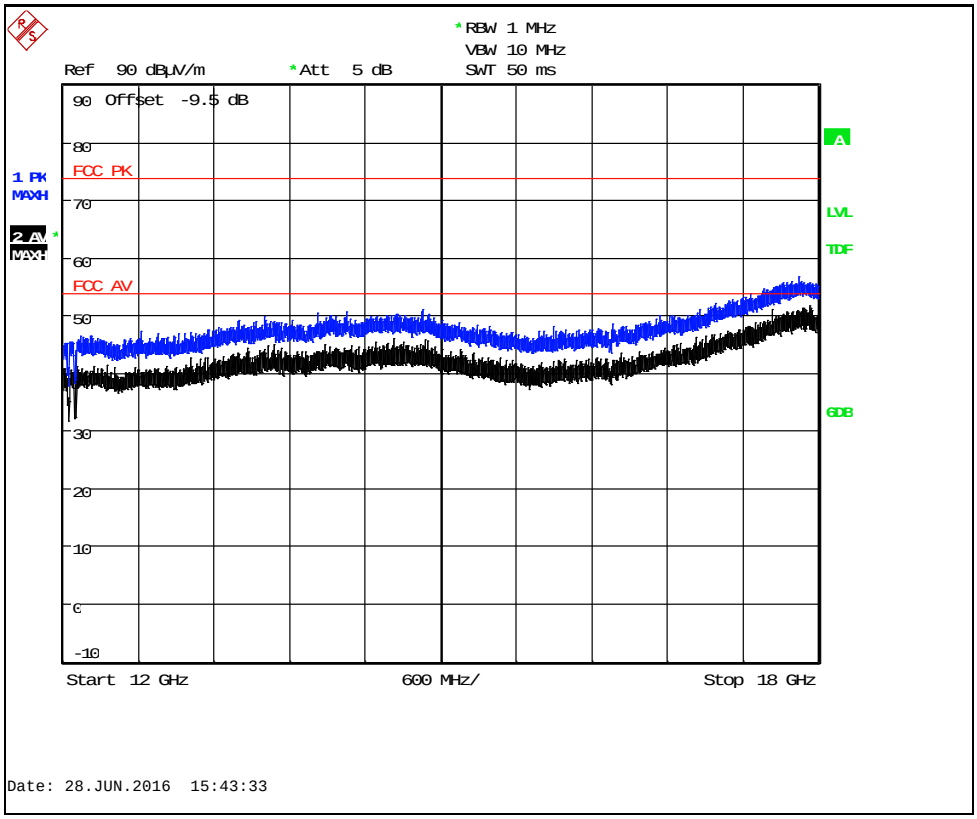
802.11n 20MHz Channel 1

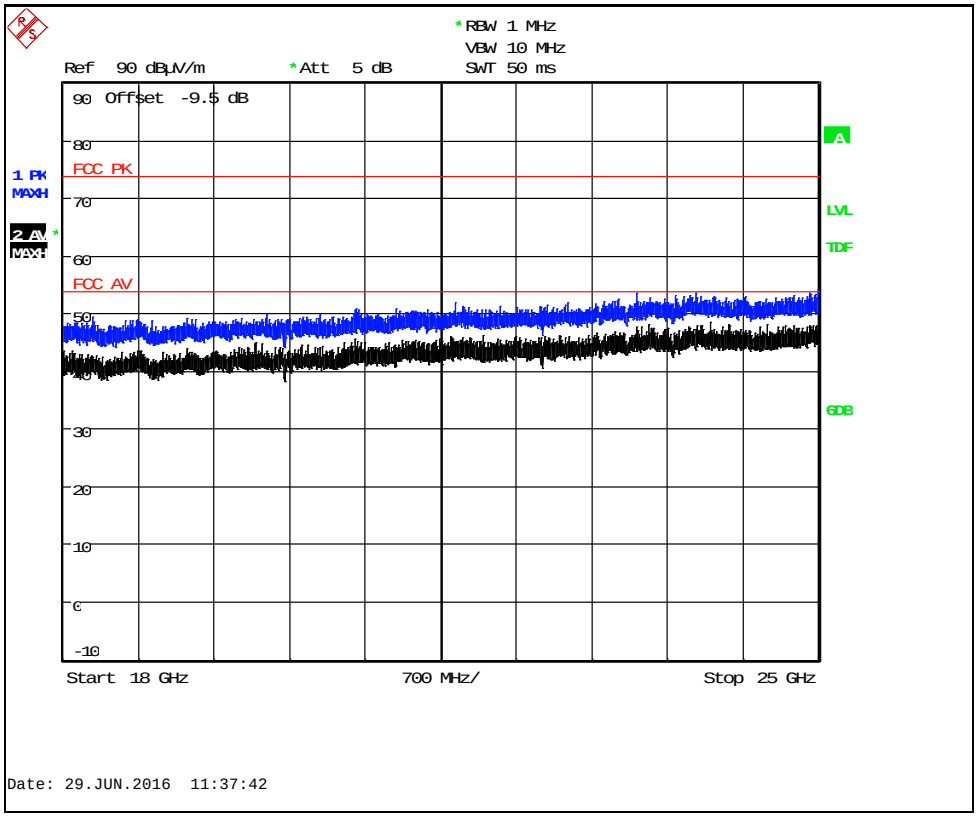




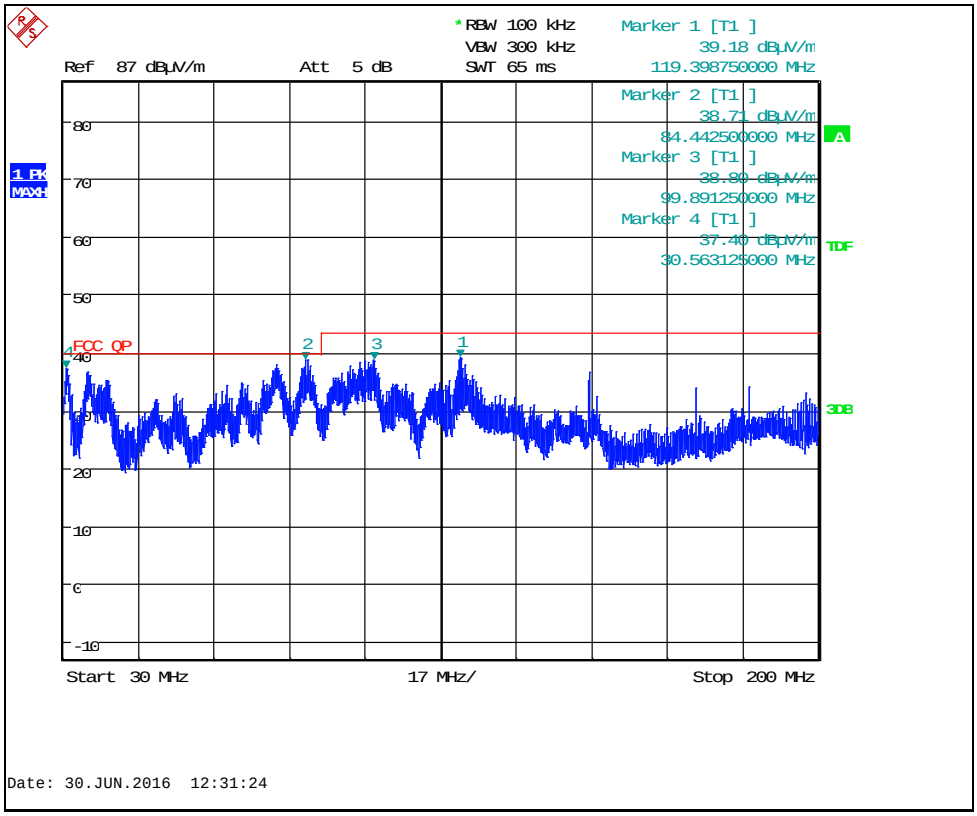

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Marker 1 [T1]
58.09 dBµV/m
1.486666667 GHz
Marker 2 [T1]
49.98 dBµV/m
1.786250000 GHz
Marker 3 [T1]
45.93 dBµV/m
4.221666667 GHz
Marker 4 [T1]
49.29 dBµV/m
5.000000000 GHz
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
LVL
TDF
6DB
Start 1 GHz
500 MHz/
Stop 6 GHz
Date: 28.JUN.2016 15:49:34

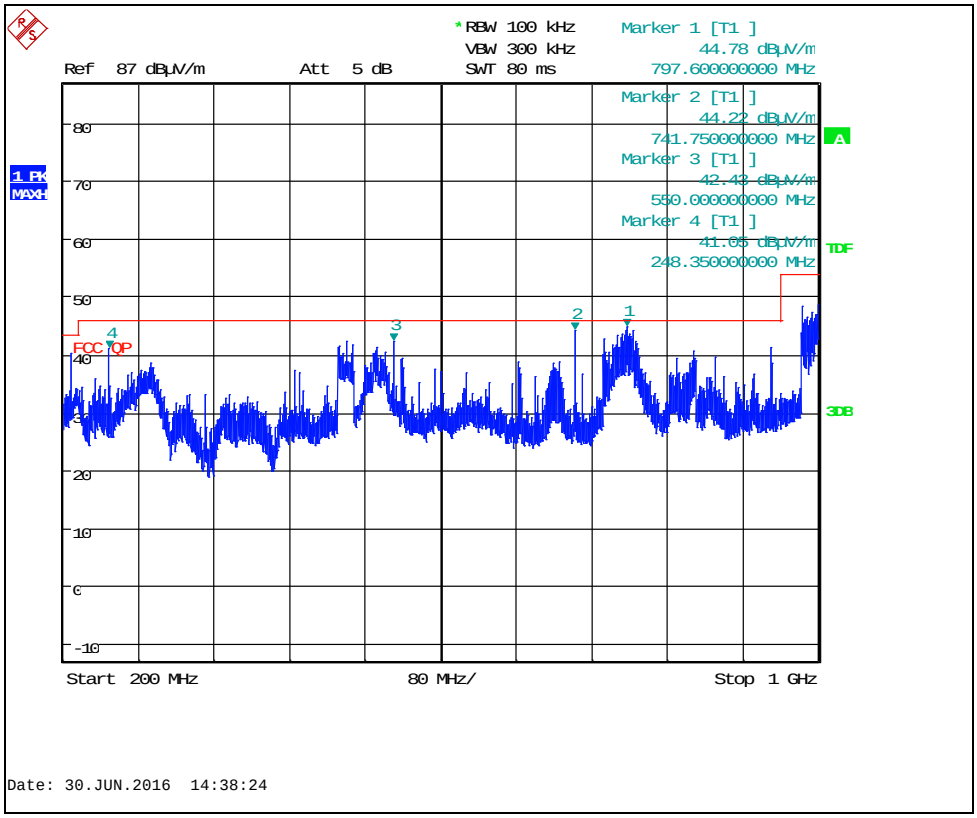

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Marker 1 [T1]
50.02 dBµV/m
11.868500000 GHz
Marker 2 [T1]
48.72 dBµV/m
10.000000000 GHz
Marker 3 [T1]
46.43 dBµV/m
7.245000000 GHz
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
LVL
TDF
6DB
Start 6 GHz
600 MHz/
Stop 12 GHz
Date: 28.JUN.2016 15:45:48

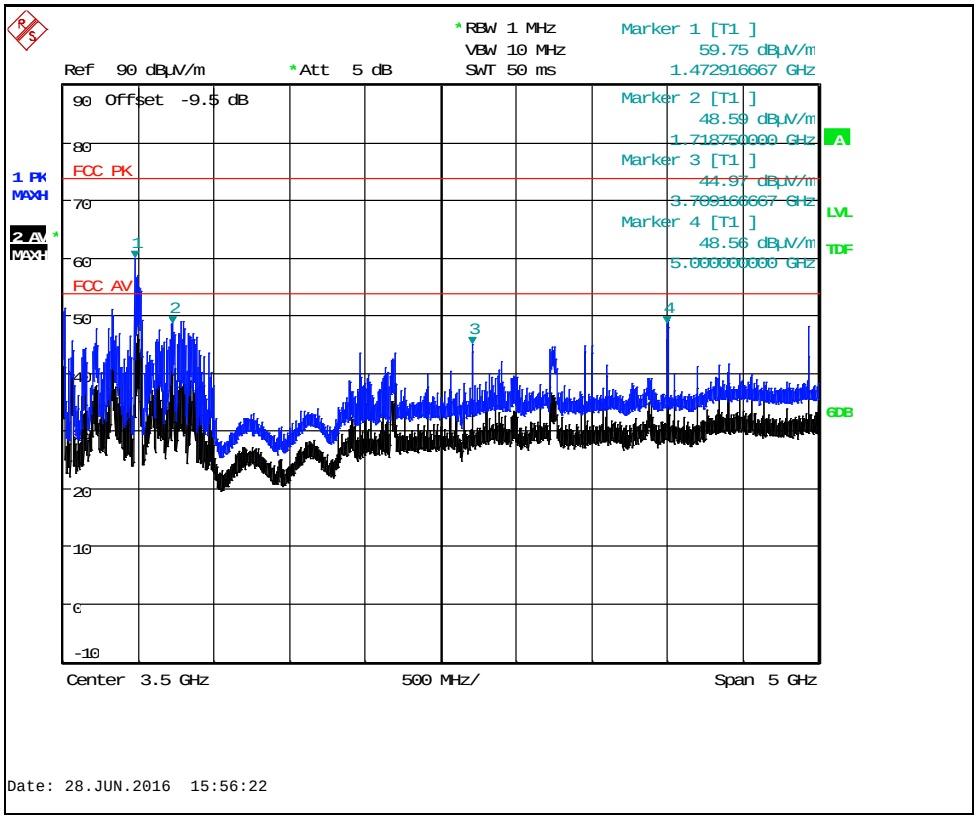

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
A
LVL
TDF
6DB
Start 12 GHz
600 MHz/
Stop 18 GHz
Date: 28.JUN.2016 15:43:33

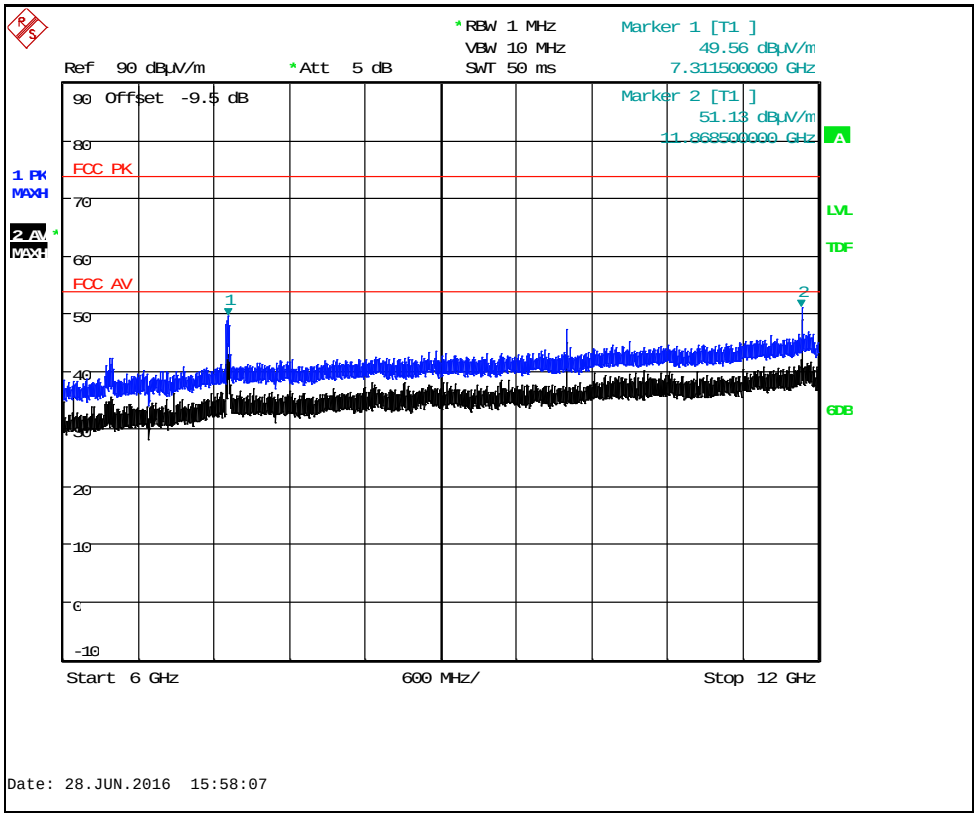

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
A
LVL
TDF
6DB
Start 18 GHz
700 MHz/
Stop 25 GHz
Date: 29.JUN.2016 11:37:42

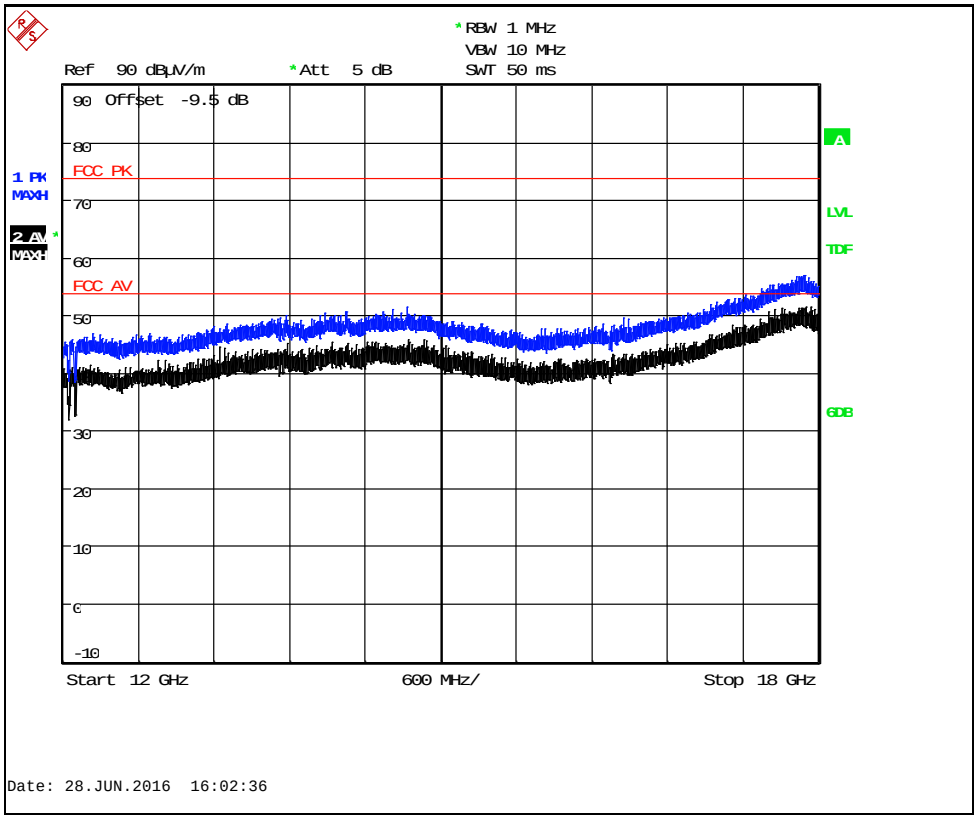
802.11n 20MHz Channel 6

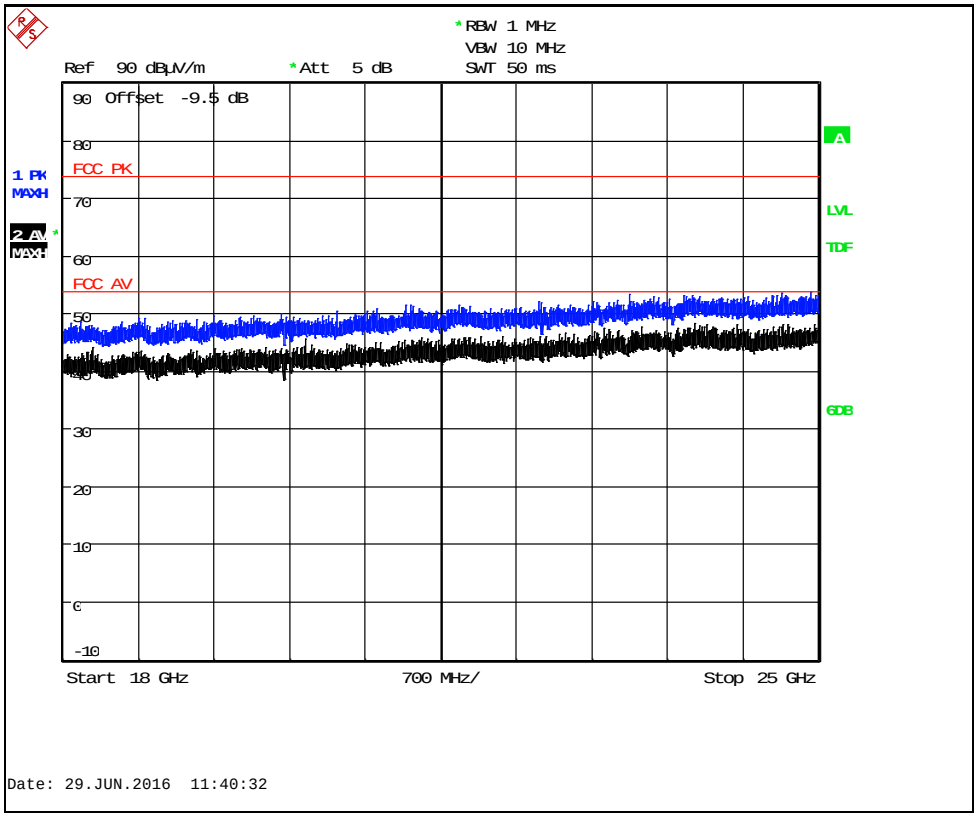




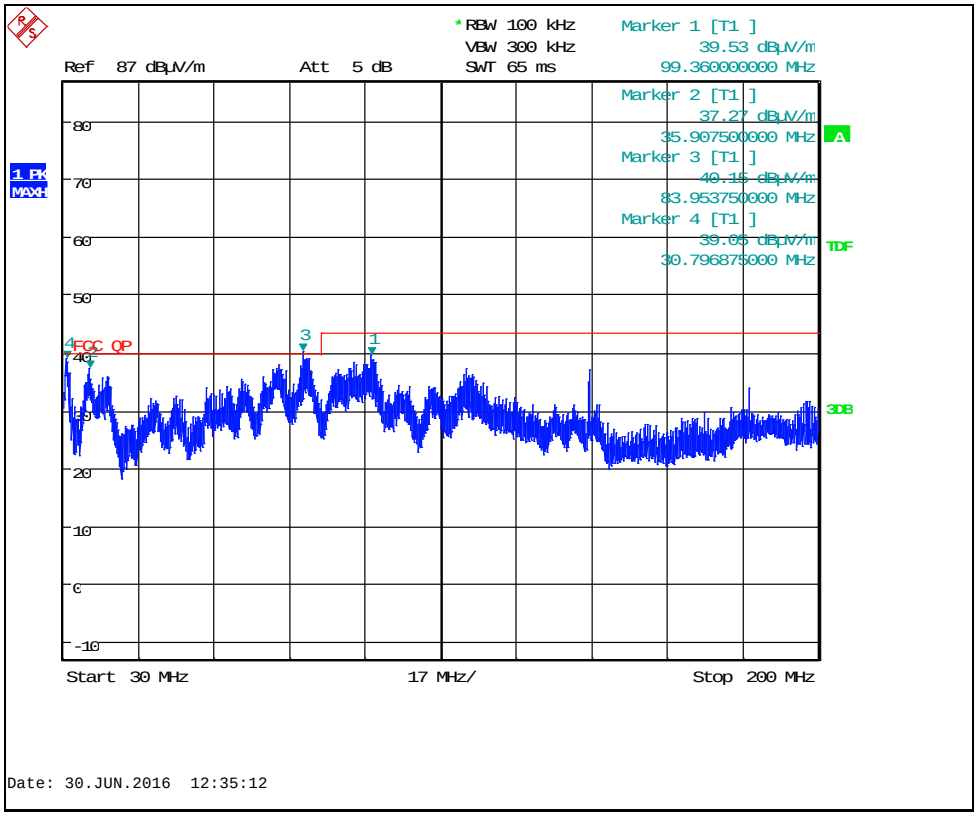

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Marker 1 [T1]
59.75 dBµV/m
1.472916667 GHz
Marker 2 [T1]
48.59 dBµV/m
1.718750000 GHz
Marker 3 [T1]
44.97 dBµV/m
3.709166667 GHz
Marker 4 [T1]
48.56 dBµV/m
5.000000000 GHz
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
LVL
TDF
GDB
Center 3.5 GHz
500 MHz/
Span 5 GHz
Date: 28.JUN.2016 15:56:22

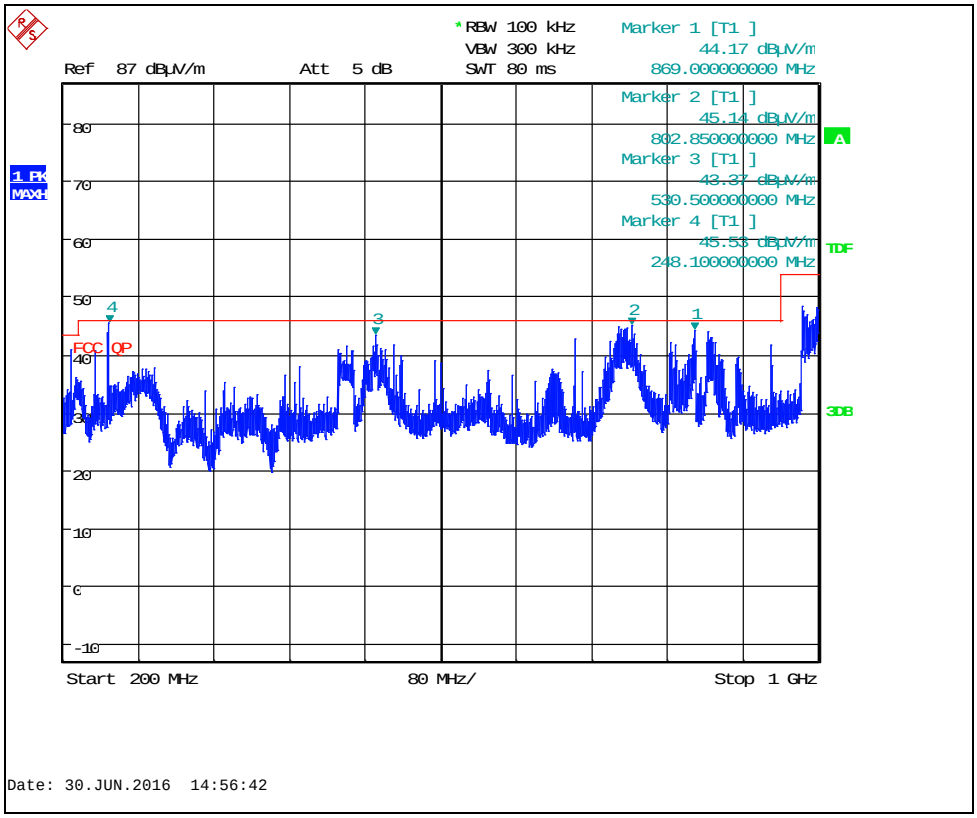

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Marker 1 [T1]
49.56 dBµV/m
7.311500000 GHz
Marker 2 [T1]
51.13 dBµV/m
11.868500000 GHz
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
LVL
TDF
GDB
Start 6 GHz
600 MHz/
Stop 12 GHz
Date: 28.JUN.2016 15:58:07

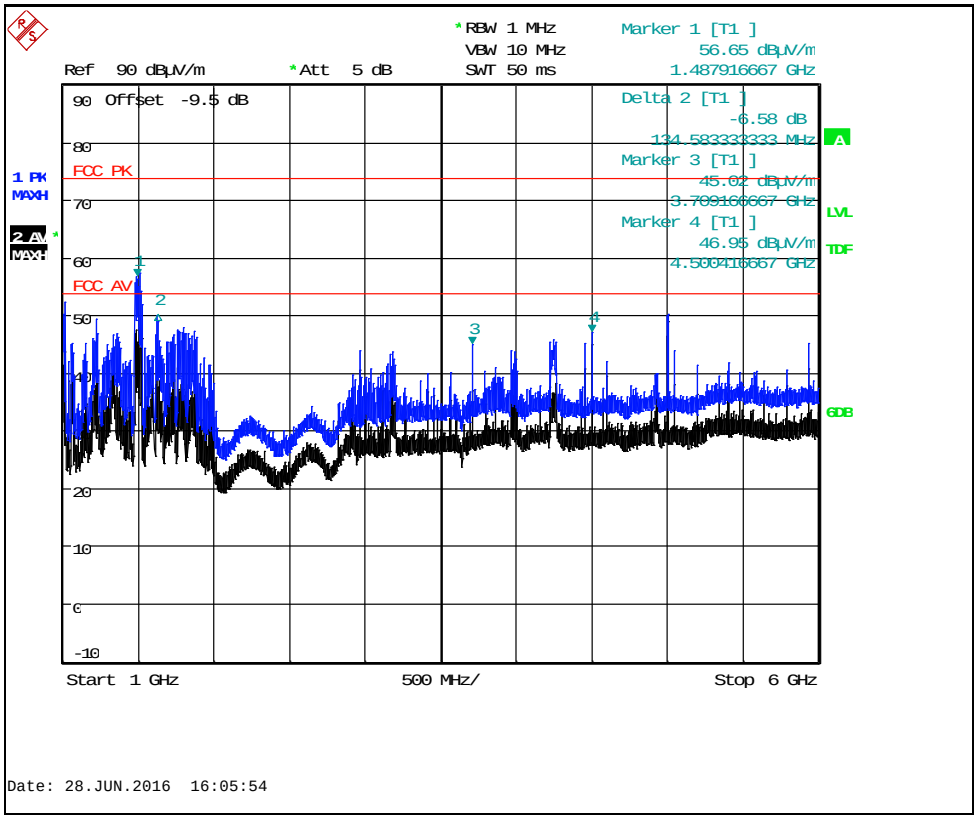

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
A
LVL
TDF
GDB
Start 12 GHz
600 MHz/
Stop 18 GHz
Date: 28.JUN.2016 16:02:36

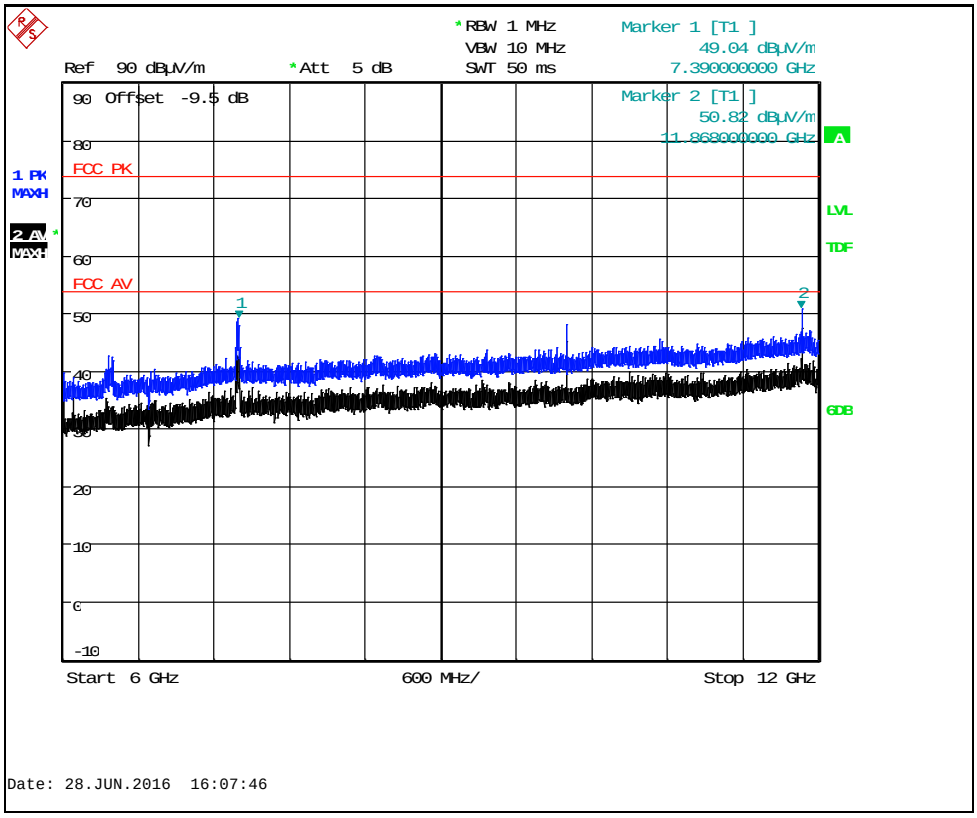

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
A
LVL
TDF
GDB
Start 18 GHz
700 MHz/
Stop 25 GHz
Date: 29.JUN.2016 11:40:32

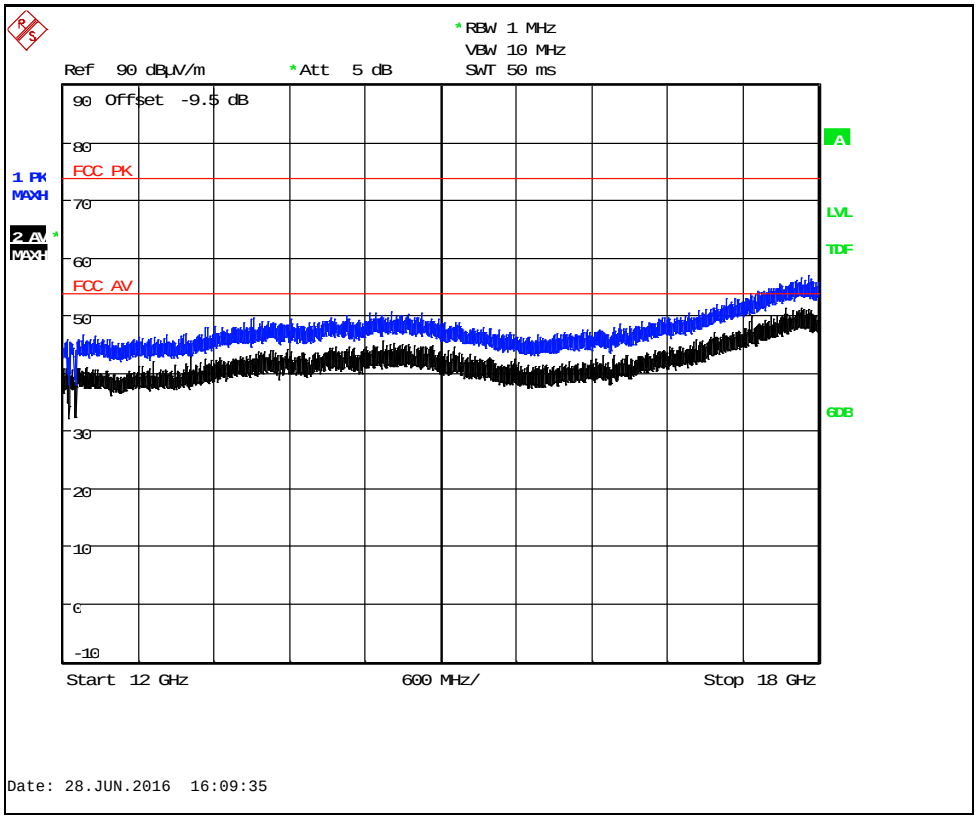
802.11n 20MHz Channel 11

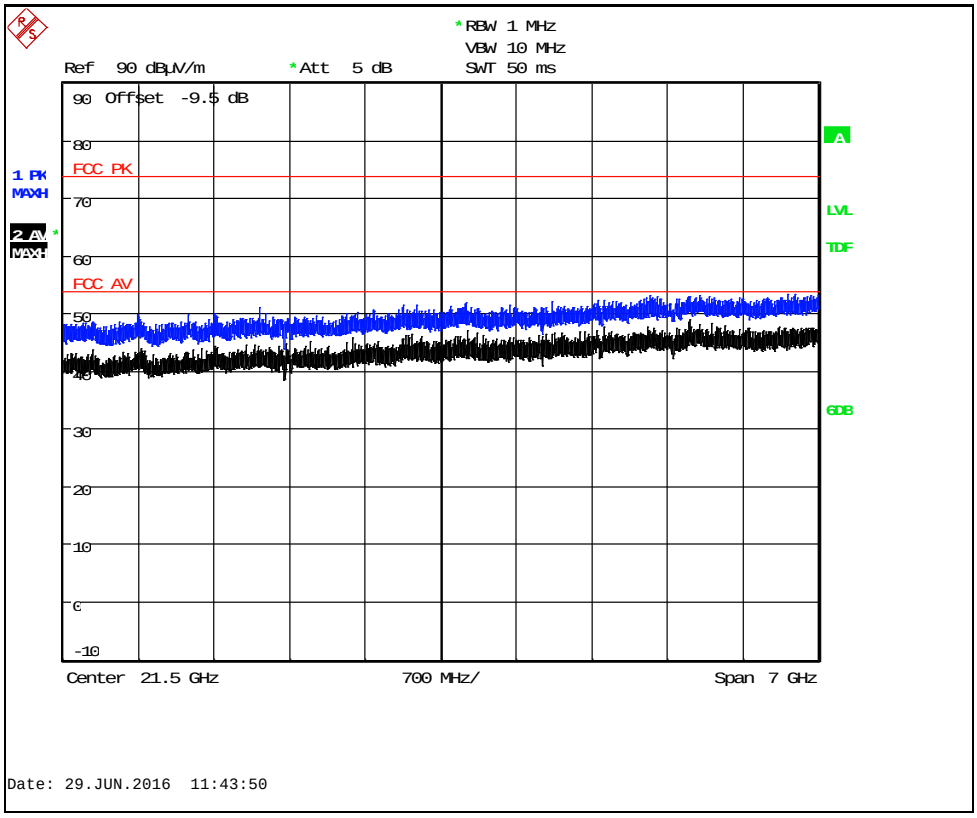





RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Marker 1 [T1]
56.65 dBµV/m
1.487916667 GHz
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
Delta 2 [T1]
-6.58 dB
134.583333333 MHz
Marker 3 [T1]
45.62 dBµV/m
3.709166667 GHz
Marker 4 [T1]
46.95 dBµV/m
4.500416667 GHz
1 PK MAXH
2 AV MAXH
FCC PK
FCC AV
LVL
TDF
GDB
Start 1 GHz
500 MHz/
Stop 6 GHz
Date: 28.JUN.2016 16:05:54


RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Marker 1 [T1]
49.04 dBµV/m
7.390000000 GHz
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
Marker 2 [T1]
50.82 dBµV/m
11.868000000 GHz
1 PK MAXH
2 AV MAXH
FCC PK
FCC AV
LVL
TDF
GDB
Start 6 GHz
600 MHz/
Stop 12 GHz
Date: 28.JUN.2016 16:07:46


RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
A
LVL
TDF
6DB
Start 12 GHz
600 MHz/
Stop 18 GHz
Date: 28.JUN.2016 16:09:35

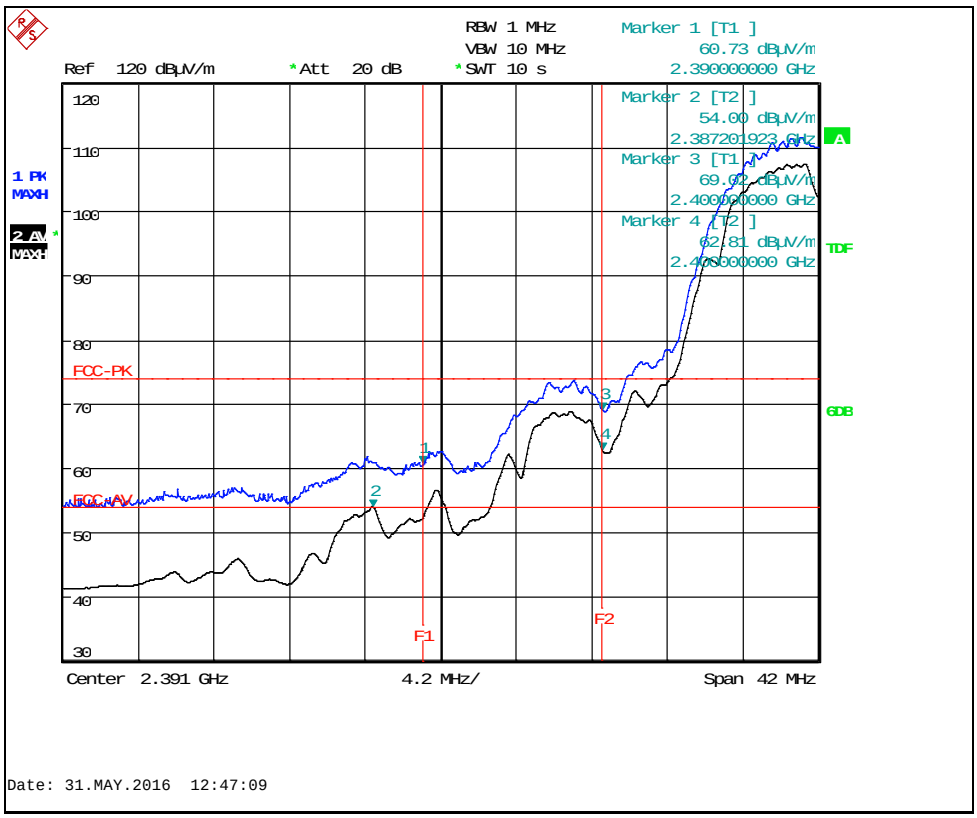

RBW 1 MHz
VBW 10 MHz
SWT 50 ms
Ref 90 dBµV/m
Att 5 dB
Offset -9.5 dB
FCC PK
FCC AV
1 PK MAXH
2 AV MAXH
A
LVL
TDF
6DB
Center 21.5 GHz
700 MHz/
Span 7 GHz
Date: 29.JUN.2016 11:43:50

Emissions not related to the transmit Frequency			
Frequency (MHz)	**Quasi Peak (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
25.700000	**33.75**	**40.00**	**6.25**
37.800000	**34.64**	**40.00**	**5.36**
42.950000	**36.39**	**40.00**	**3.62**
44.550000	**37.49**	**40.00**	**2.51**
46.150000	**33.00**	**40.00**	**7.00**
54.200000	**34.12**	**40.00**	**5.88**
62.250000	**32.58**	**40.00**	**7.42**
66.350000	**36.33**	**40.00**	**3.67**
81.200000	**38.88**	**40.00**	**1.12**
112.250000	**32.95**	**43.52**	**10.57**
140.600000	**28.54**	**43.52**	**14.98**
208.920000	**37.26**	**43.52**	**6.26**
233.480000	**37.87**	**46.02**	**8.15**
258.080000	**31.18**	**46.02**	**14.84**
289.600000	**34.00**	**46.02**	**12.02**
331.800000	**30.52**	**46.02**	**15.50**
434.280000	**27.69**	**46.02**	**18.33**
506.720000	**36.87**	**46.02**	**9.15**
530.440000	**34.18**	**46.02**	**11.84**
550.000000	**41.82**	**46.02**	**4.20**
577.560000	**35.18**	**46.02**	**10.84**
626.680000	**35.98**	**46.02**	**10.04**
651.280000	**35.49**	**46.02**	**10.53**
675.840000	**34.90**	**46.02**	**11.12**
680.720000	**23.27**	**46.02**	**22.75**
741.800000	**38.55**	**46.02**	**7.47**
793.680000	**39.05**	**46.02**	**6.97**
850.040000	**38.23**	**46.02**	**7.79**
950.000000	**37.19**	**46.02**	**8.83**
983.160000	**36.18**	**53.98**	**17.79**

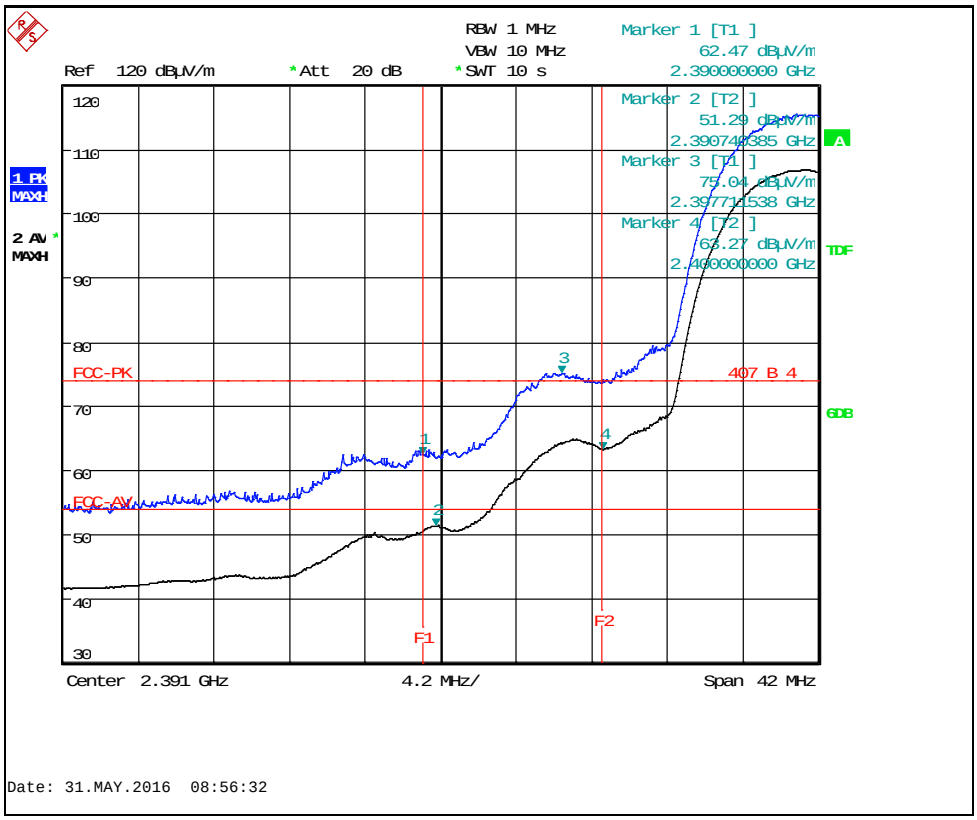
High Power; General emissions not related to transmitter										
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Cable Loss (dB)***	***Antenna Factor (dB/m)***	***Pre-amp Gain (dB)***	***Duty Cycle Corr'n (dB)***	***Distance Extrap'n Factor (dB)***	***Field Strength (dBµV/m)***	***Field Strength (µV/m)***	***Limit (µV/m)***
Pk	1231.608	67.92	2.7	25.8	35.04	0	0	51.7	384.6	5000
Av	1231.608	35.09	2.7	25.8	35.04	0	0	28.6	26.9	500
Pk	1474.274	72.79	3	25.9	34.65	0	0	67.0	2238.7	5000
Av	1474.274	46.91	3	25.9	34.65	0	0	41.2	114.8	500

High Power; Channel: 2412MHz										
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Cable Loss (dB)***	***Antenna Factor (dB/m)***	***Pre-amp Gain (dB)***	***Duty Cycle Corr'n (dB)***	***Distance Extrap'n Factor (dB)***	***Field Strength (dBµV/m)***	***Field Strength (µV/m)***	***Limit (µV/m)***
No significant emissions related to the transmitter were detected										

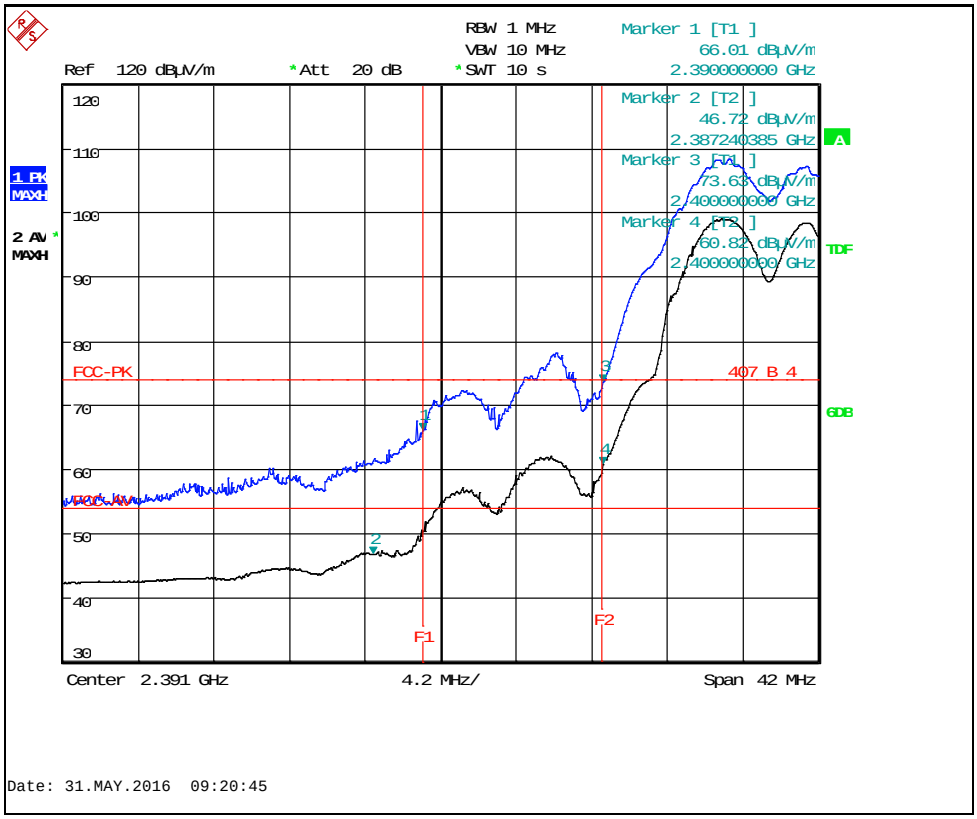
Plots for the lower band edge in all unique modes are presented here:



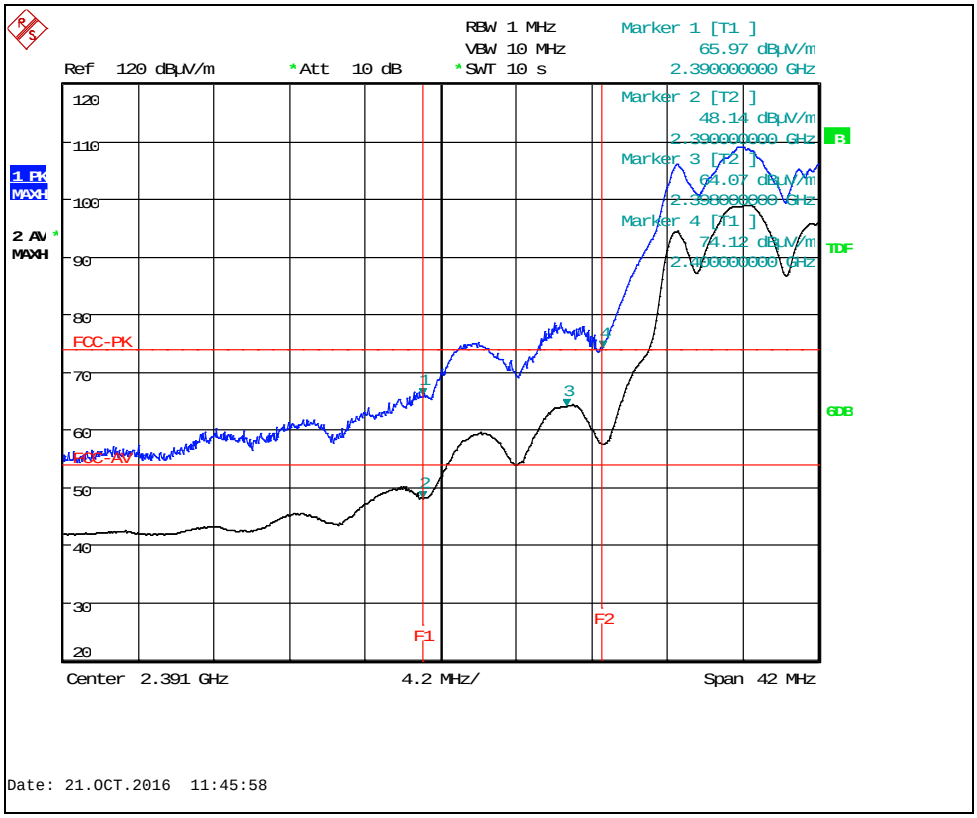
802.11b 1Mb/s



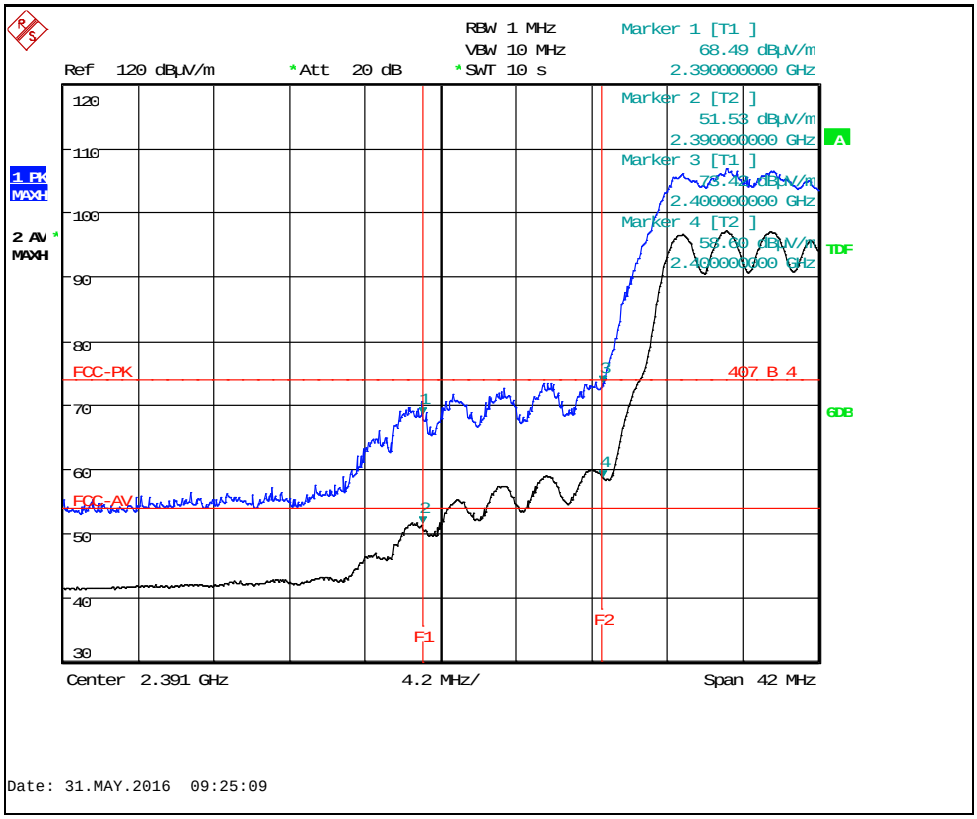
802.11b 11Mb/s



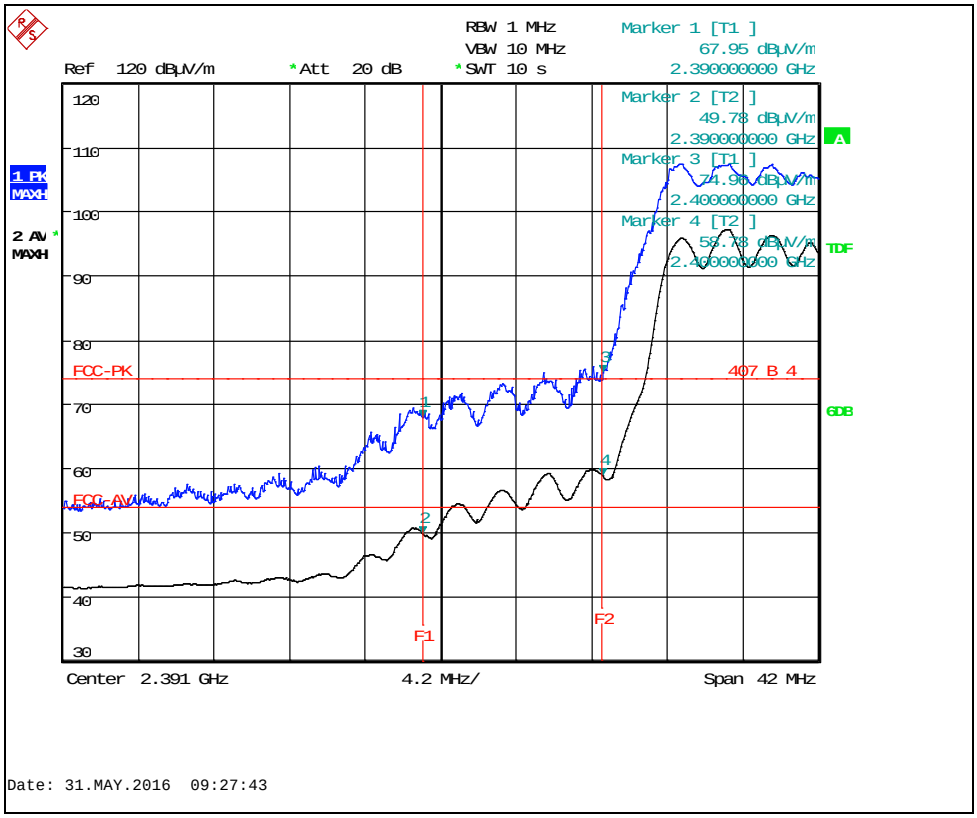
802.11g 6Mb/s



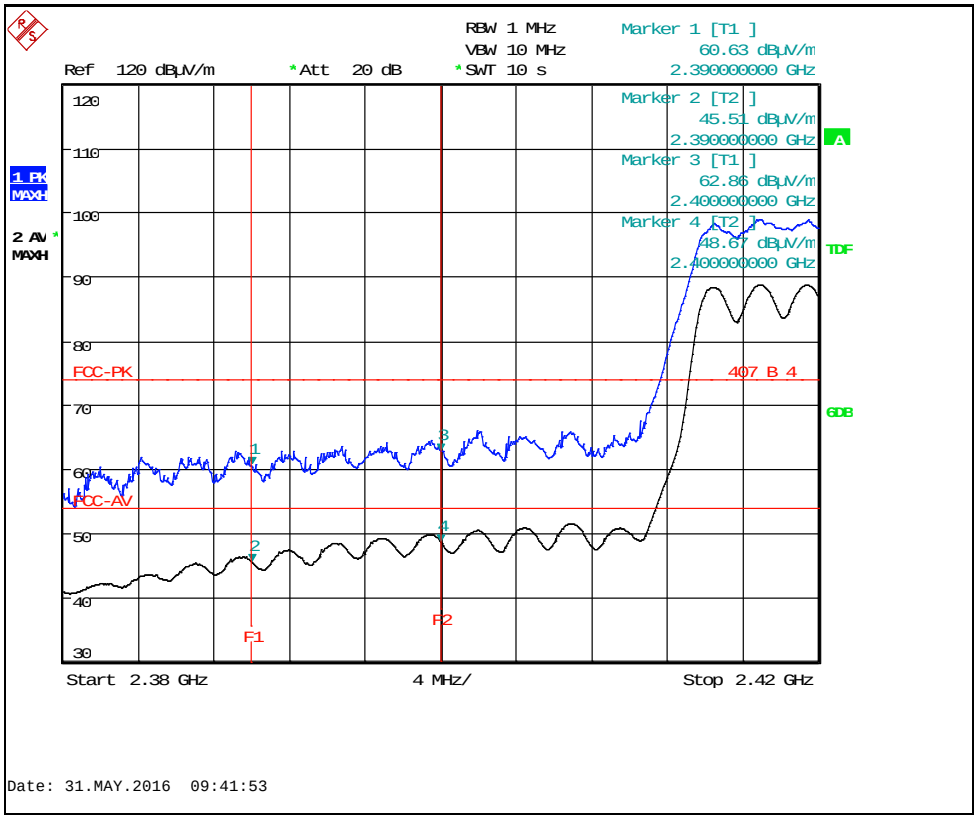
802.11g 54Mb/s



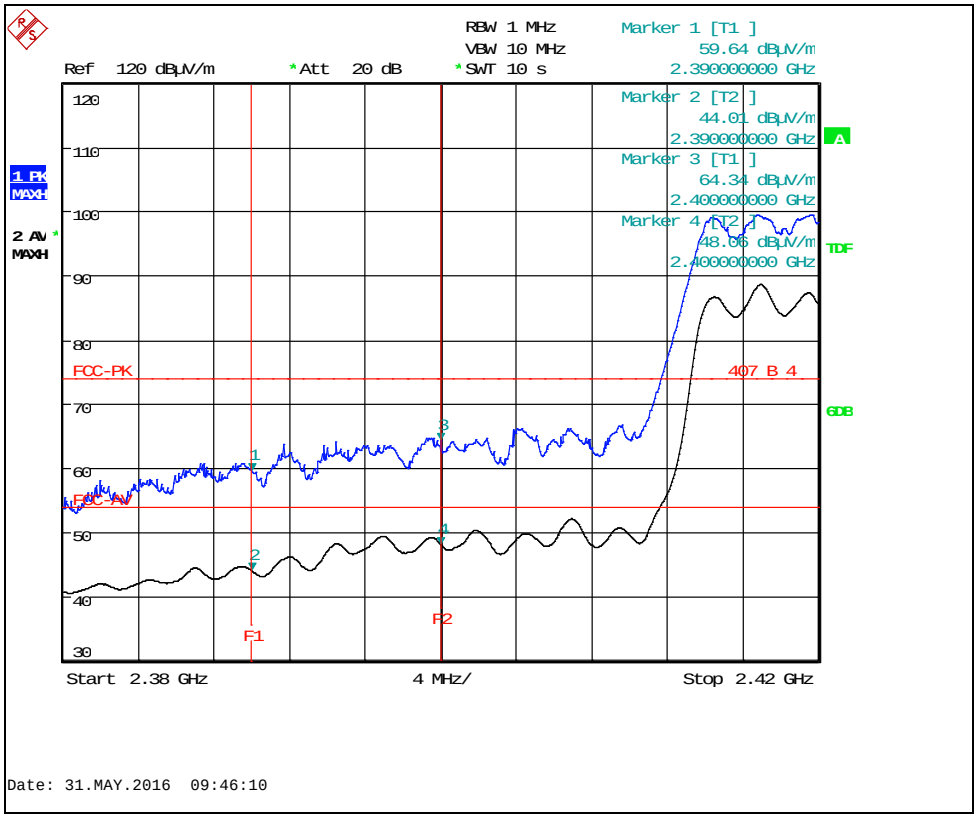
802.11n 20MHz MCS0



802.11n 20MHz MCS7



802.11n 40MHz MCS0

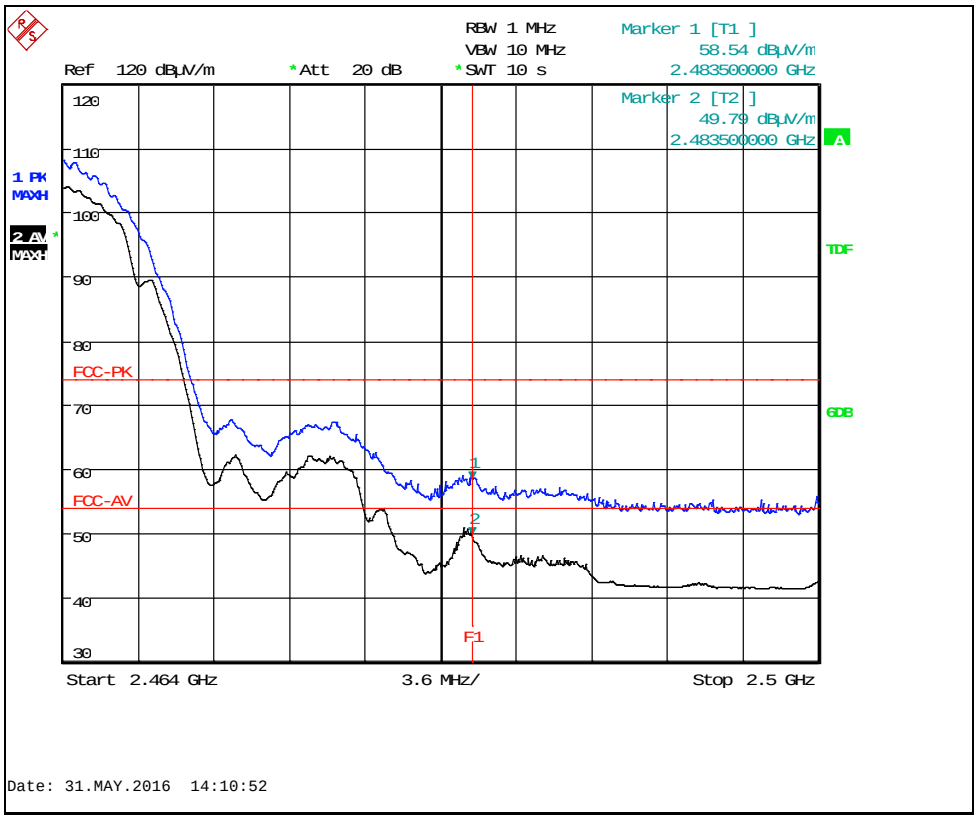


802.11n 40MHz MCS7

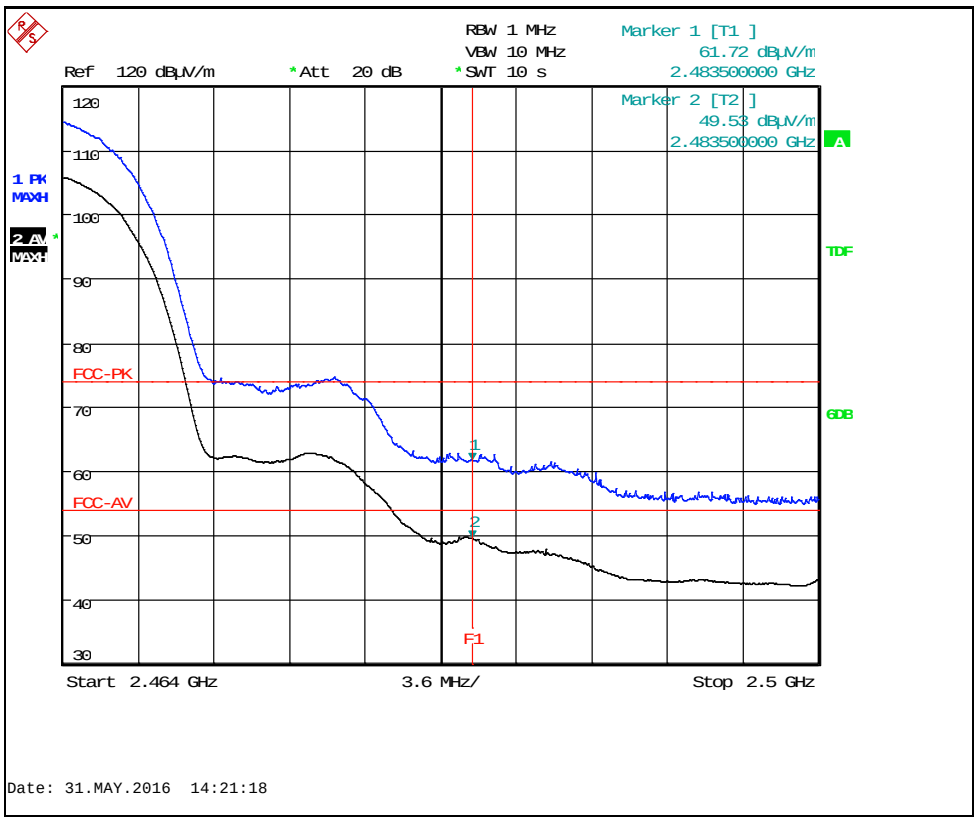
High Power; Channel: 2437MHz										
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Cable Loss (dB)***	***Antenna Factor (dB/m)***	***Pre-amp Gain (dB)***	***Duty Cycle Corr'n (dB)***	***Distance Extrap'n Factor (dB)***	***Field Strength (dBµV/m)***	***Field Strength (µV/m)***	***Limit (µV/m)***
No significant emissions related to the transmitter were detected										

High Power; Channel: 2462MHz										
Detector	***Freq. (MHz)***	***Meas'd Emission (dBµV)***	***Cable Loss (dB)***	***Antenna Factor (dB/m)***	***Pre-amp Gain (dB)***	***Duty Cycle Corr'n (dB)***	***Distance Extrap'n Factor (dB)***	***Field Strength (dBµV/m)***	***Field Strength (µV/m)***	***Limit (µV/m)***
No significant emissions related to the transmitter were detected										

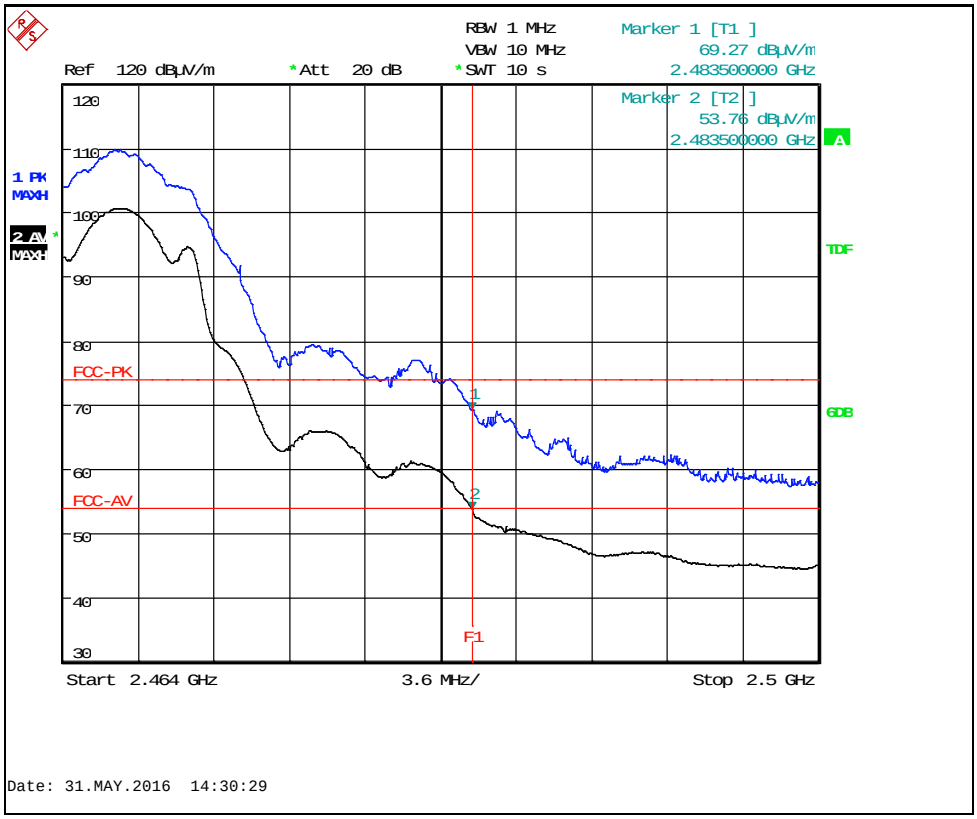
Plots for the upper band edge in all unique modes are presented here:



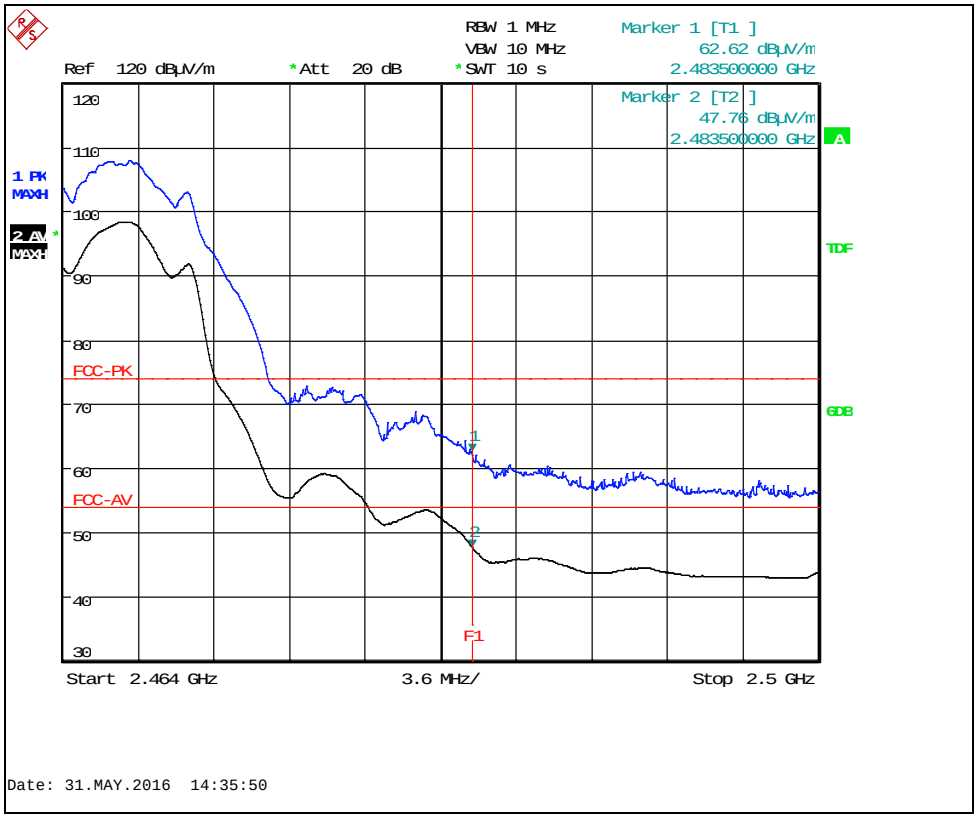
802.11b 1Mb/s



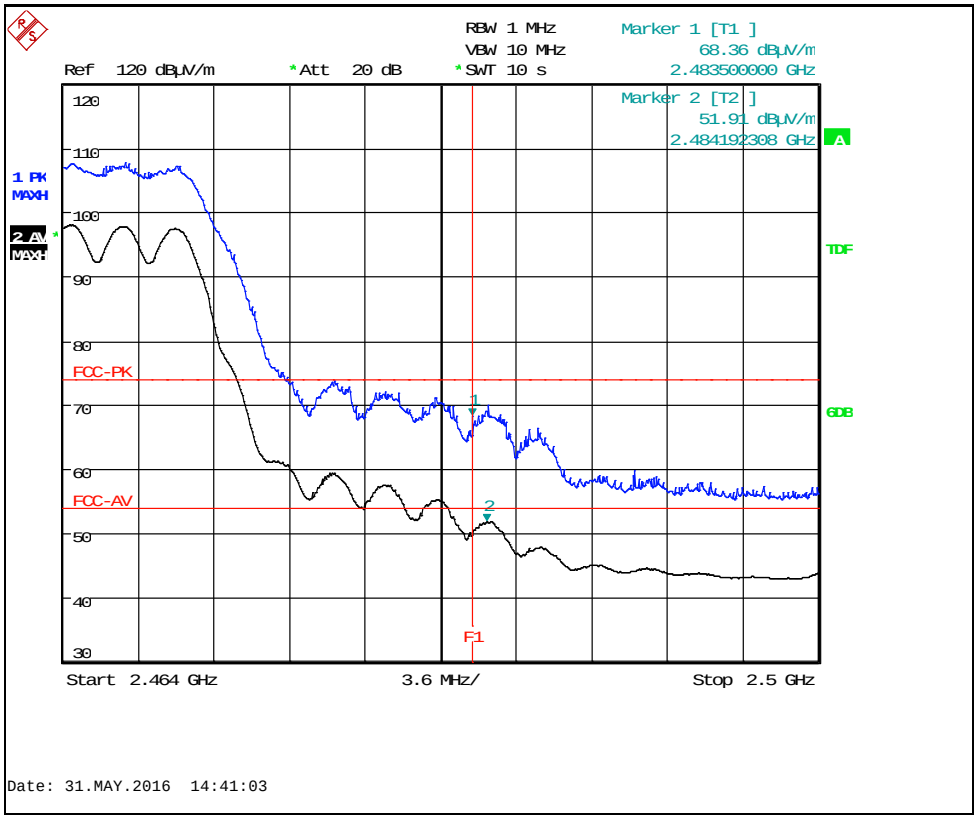
802.11b 11Mb/s



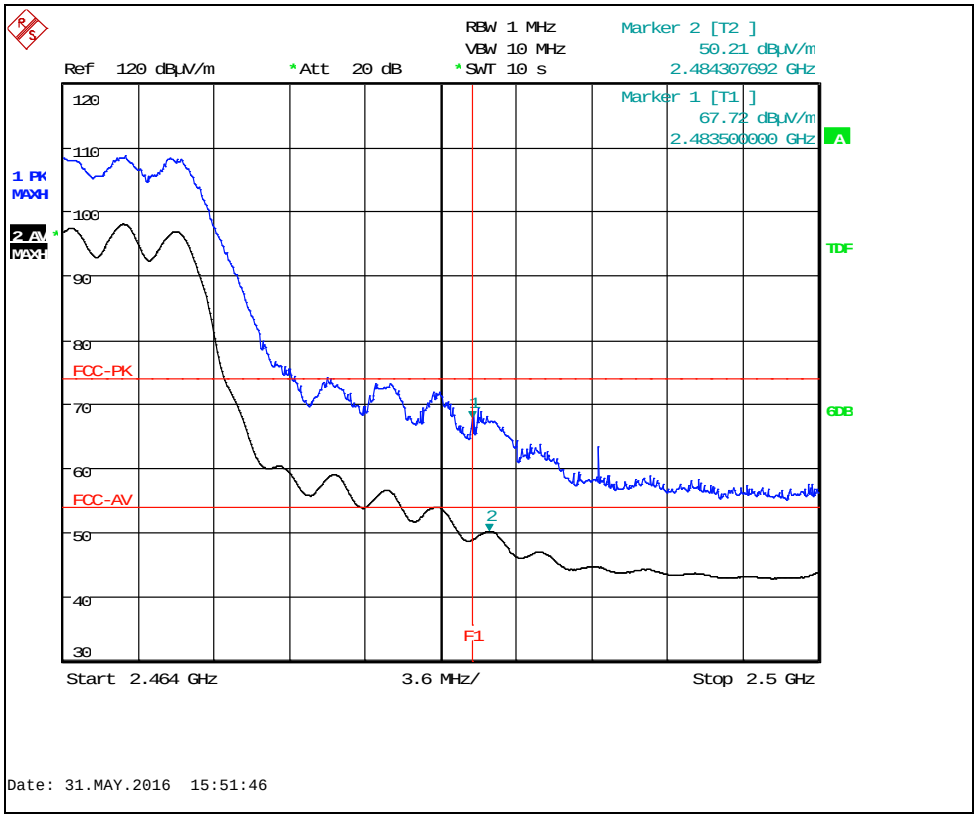
802.11g 6Mb/s



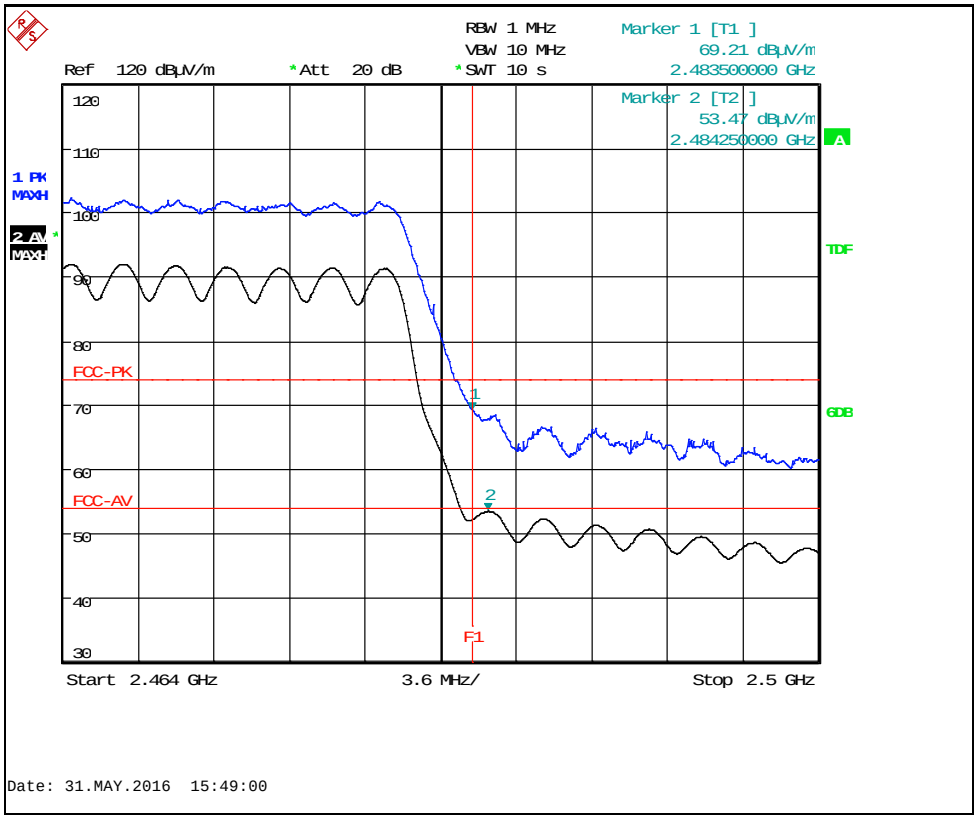
802.11g 54Mb/s



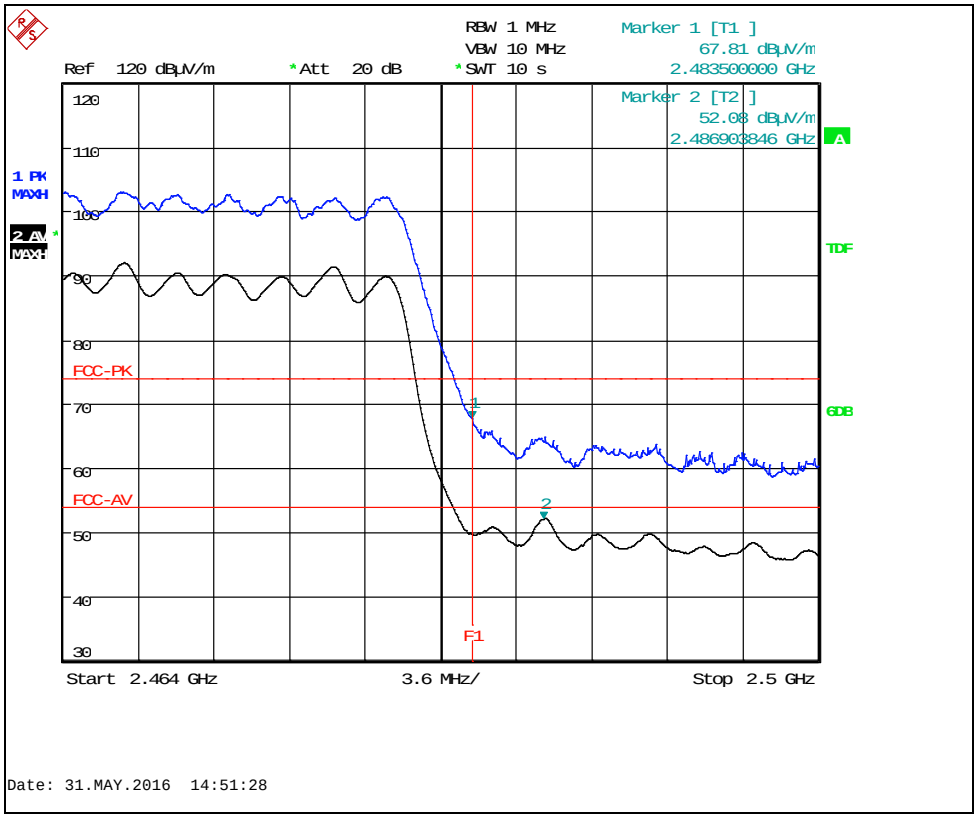
802.11n 20MHz MCS0



802.11n 20MHz MCS7



802.11n 40MHz MCS0



802.11n 40MHz MCS7

12 Occupied Bandwidth

12.1 Definition

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal.

12.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Lab4
Test Standard and Clause:	IC: ANSI C63.10-2013, Clause 6.9 FCC: ANSI C63.10-2013, Clause 11.8
EUT Channels / Frequencies Measured:	Low / Mid / High
EUT Channel Bandwidths:	20 MHz / 40 MHz
EUT Test Modulations:	802.11b/g/n/ac
Deviations From Standard:	None
Measurement BW: (IC requirement: 1% to 5% OBW; FCC requirement: 100 kHz)	100 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	300 kHz
Measurement Span:	Relevant and appropriate
Measurement Detector:	Peak

Environmental Conditions (Normal Environment)

Temperature: 25 °C	+15 ºC to +35 ºC (as declared)
Humidity: 30 % RH	20 % RH to 75 % RH (as declared)
Supply: 12 V dc	230 V ac ±10 % (as declared)

12.3 Test Limit

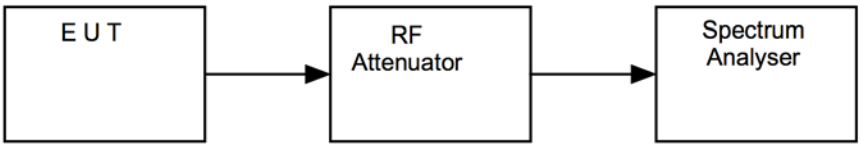
The minimum -6 dB bandwidth shall be at least 500 kHz.

12.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iii, the bandwidth of the EUT was measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

Figure iii Test Setup



12.5 Test Equipment

Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
FSU46	R&S	Spectrum Analyser	REF910	05/07/2017
FSU26	R&S	Spectrum Analyser	REF909	26/04/2017

EUT Power Table for Measurements

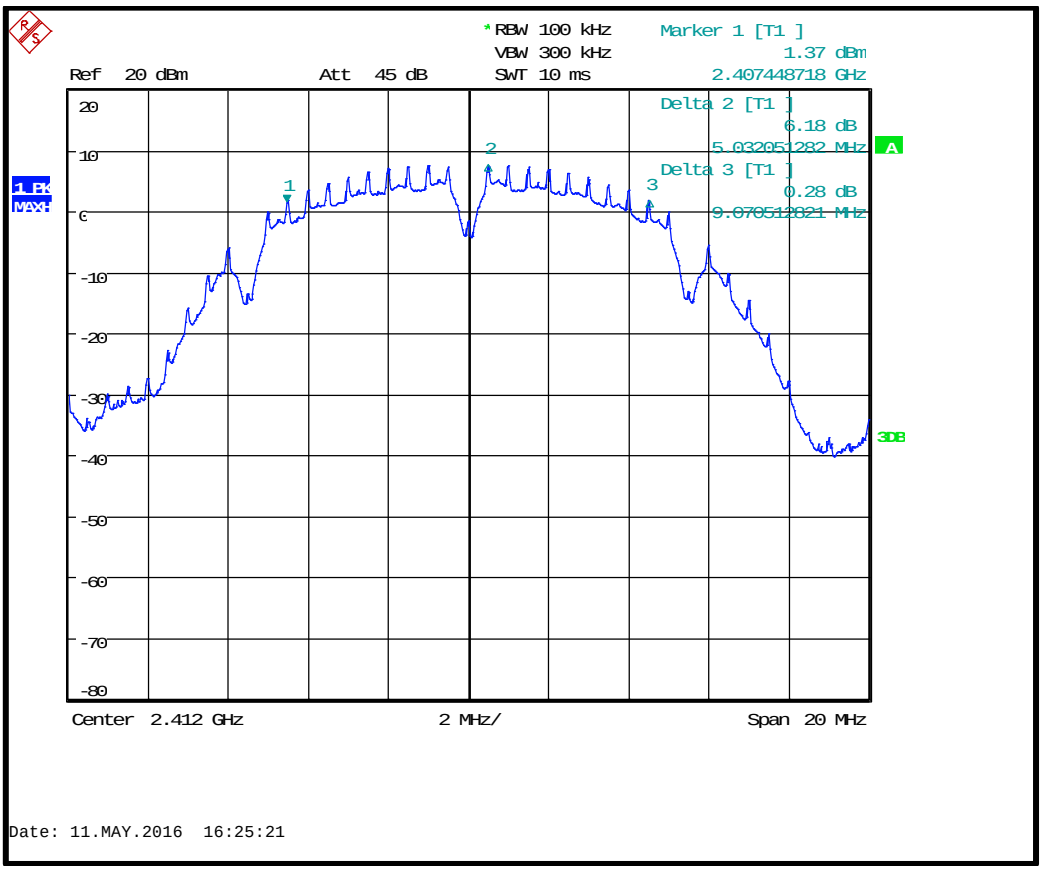
Mode (Channel No.)	Data rate (Mbps) or scheme	Power Setting (q dBm)
CCK (1)	1	64
CCK (1)	11	64
CCK (6)	1	68
CCK (6)	11	68
CCK (11)	1	60
CCK (11)	11	68
OFDM (1)	6	48
OFDM (1)	54	48
OFDM (6)	6	64
OFDM (6)	54	56
OFDM (11)	6	64
OFDM (11)	54	56
HT20 (1)	MCS0	44
HT20 (1)	MCS7	44
HT20 (6)	MCS0	64
HT20 (6)	MCS7	56
HT20 (11)	MCS0	56
HT20 (11)	MCS7	56
HT40 (1)	MCS0	32
HT40 (1)	MCS7	32
HT40 (6)	MCS0	48
HT40 (6)	MCS7	48
HT40 (9)	MCS0	44
HT40 (9)	MCS7	44
VHT20 (1)	MCS0NSS1	44
VHT20 (1)	MCS8NSS1	44
VHT20 (6)	MCS0NSS1	64
VHT20 (6)	MCS8NSS1	56
VHT20 (11)	MCS0NSS1	56
VHT20 (11)	MCS8NSS1	56
VHT40 (1)	MCS0NSS1	32
VHT40 (1)	MCS9NSS1	32
VHT40 (6)	MCS0NSS1	48
VHT40 (6)	MCS9NSS1	48
VHT40 (9)	MCS0NSS1	44
VHT40 (9)	MCS9NSS1	44

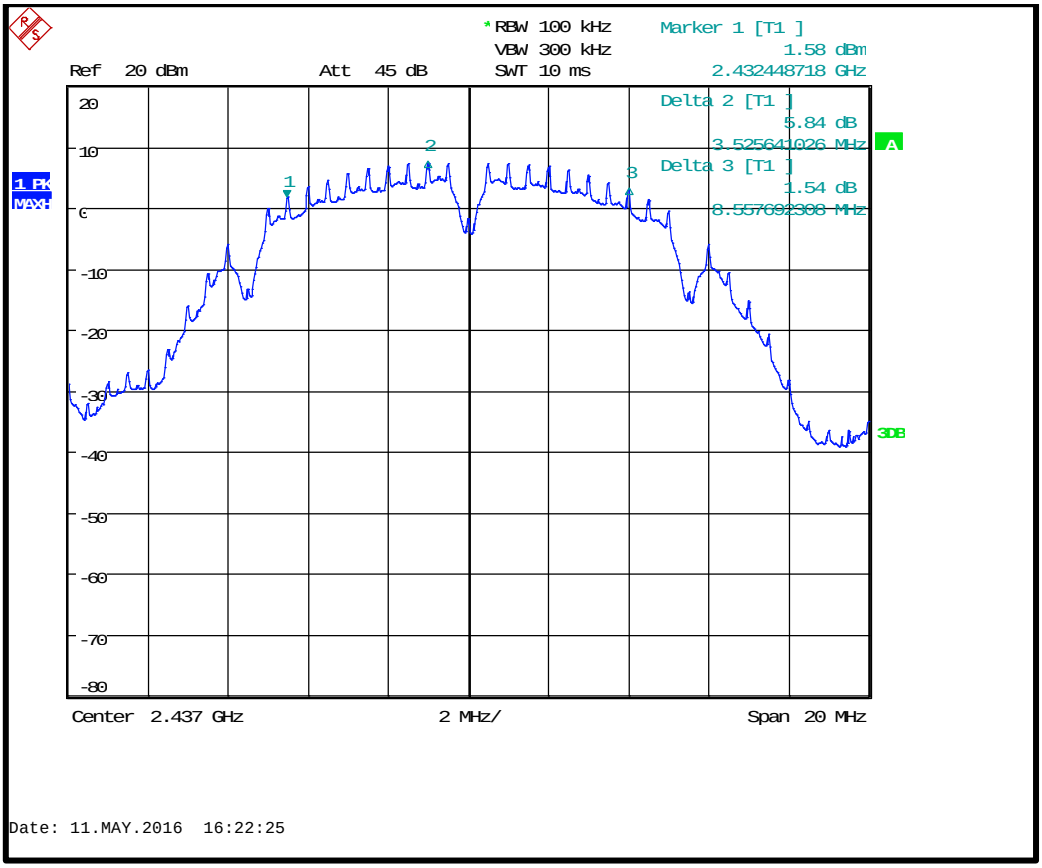
12.6 Test Results

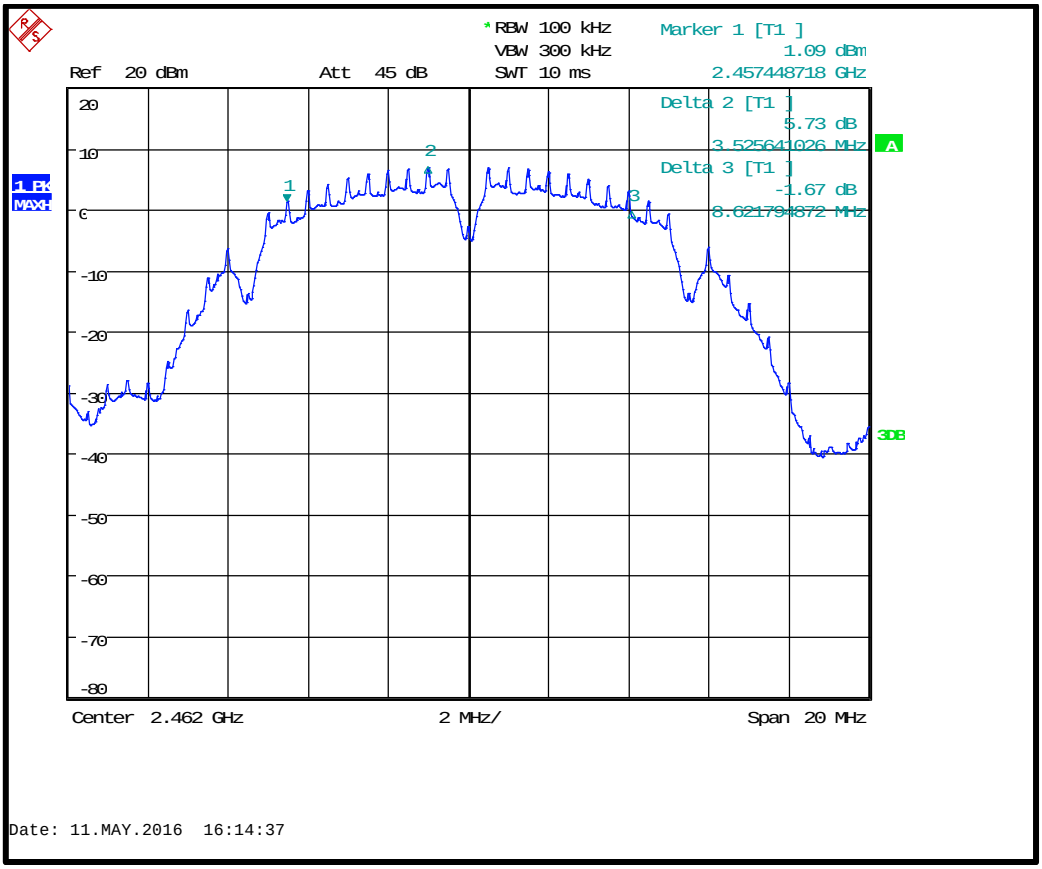
*FCC 15.247. Modulation: 802.11b; Data rate: 1Mb/s; Power settings**				
Channel Frequency (MHz)	***F_L (MHz)***	***F_H (MHz)***	***6dB Bandwidth (kHz)***	***Result***
2412	2407.448718	2416.519231	9070.51	PASS
2437	2432.448718	2441.006320	8557.60	PASS
2462	2457.448718	2466.070423	8621.80	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



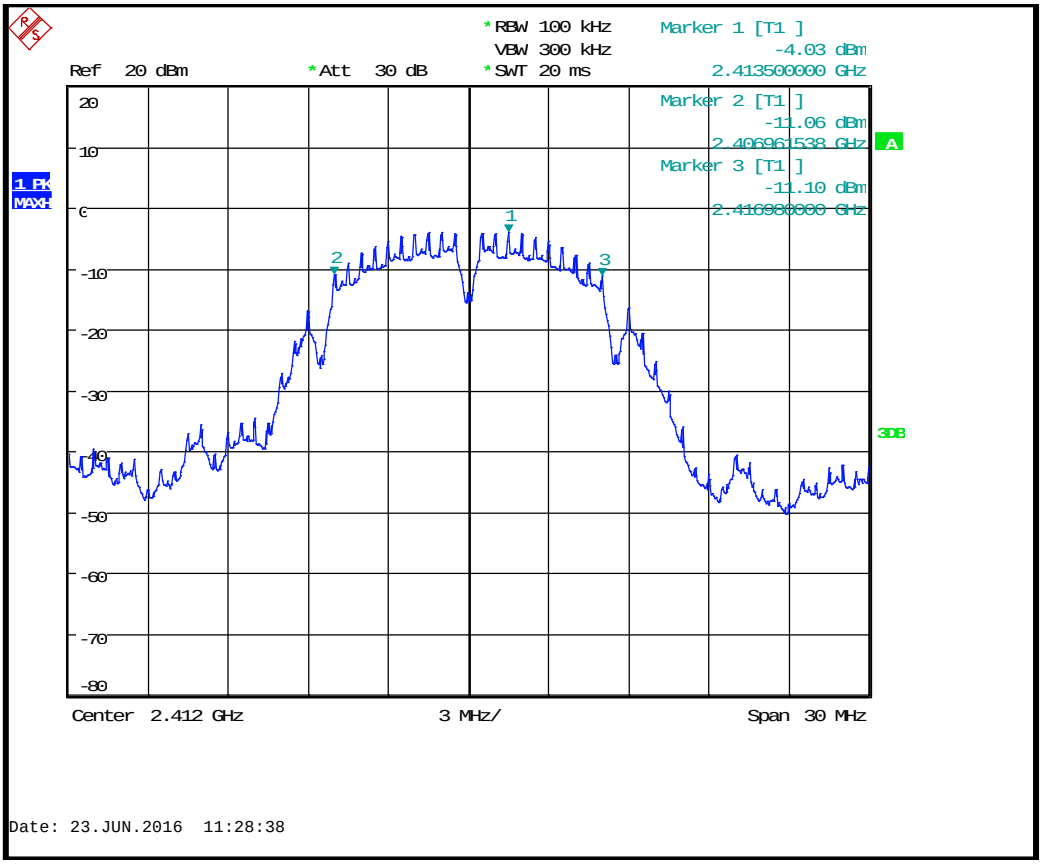

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
1.58 dBm
2.432448718 GHz
Ref 20 dBm
Att 45 dB
Delta 2 [T1]
5.84 dB
3.525641026 MHz
Delta 3 [T1]
1.54 dB
8.557692308 MHz
1 PK
MAXH
A
3DB
Center 2.437 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 16:22:25

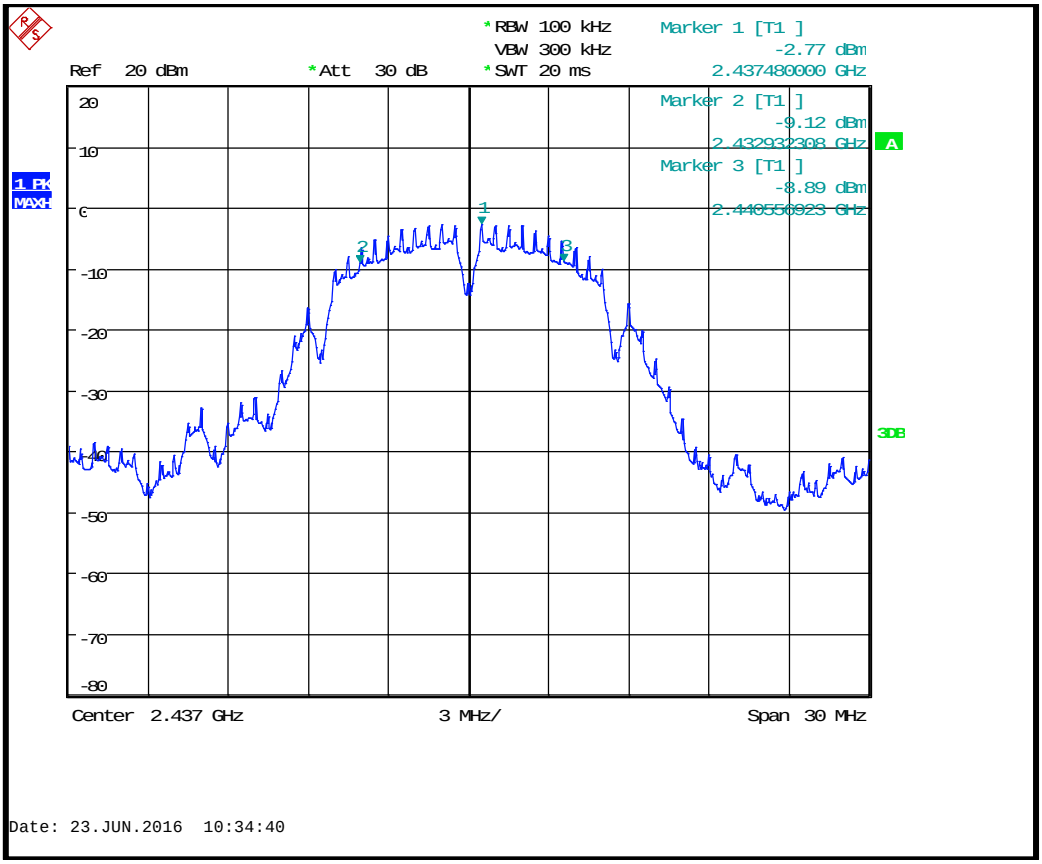

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
1.09 dBm
2.457448718 GHz
Ref 20 dBm
Att 45 dB
Delta 2 [T1]
5.73 dB
3.525641026 MHz
Delta 3 [T1]
-1.67 dB
8.621794872 MHz
1 PK
MAXH
A
3DB
Center 2.462 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 16:14:37

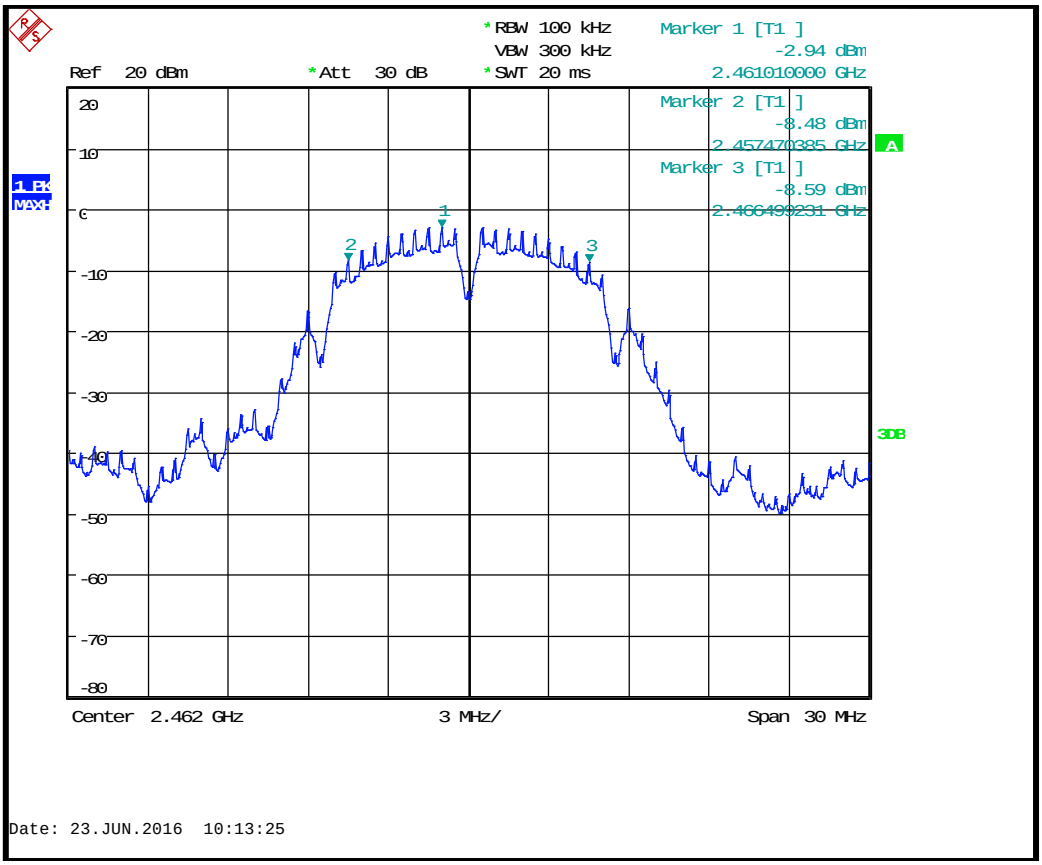
FCC 15.247. Modulation: 802.11b; Data rate: 1Mb/s; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2412	2406.961538	2416.980000	10018.00	PASS
2437	2432.932308	2440.556923	7624.615	PASS
2462	2457.470385	2466.499231	9028.846	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 1



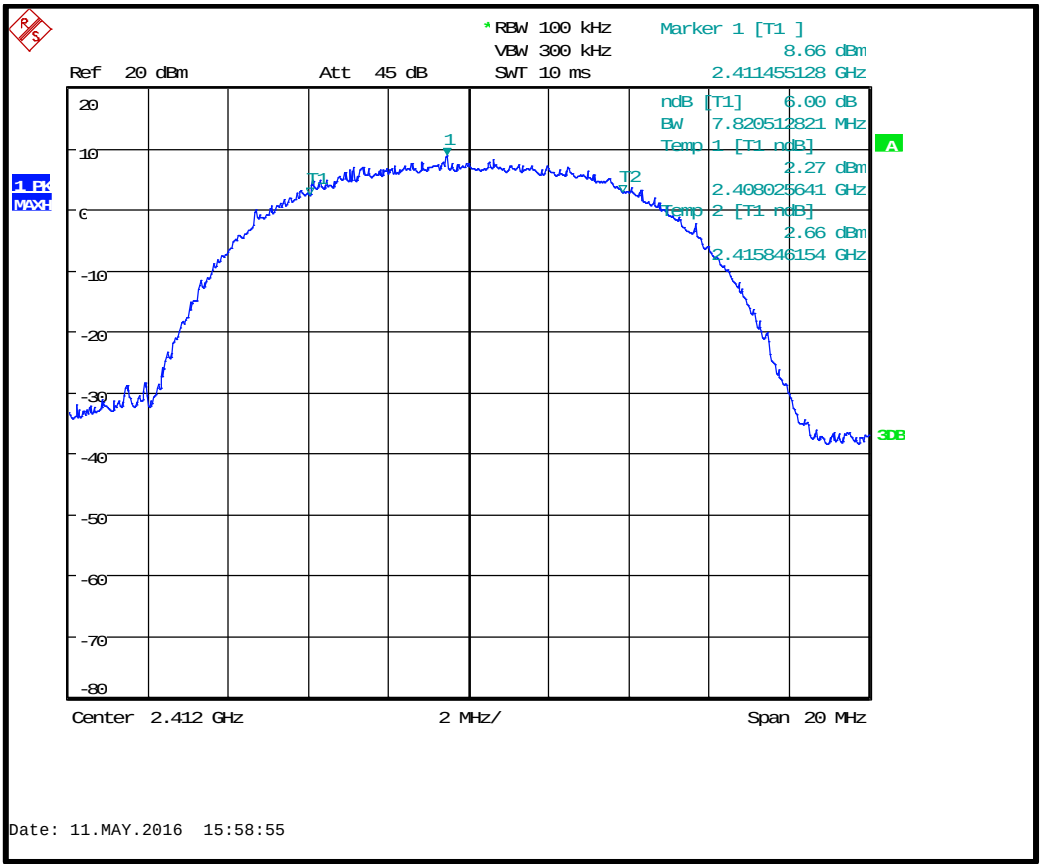

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.77 dBm
2.437480000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-9.12 dBm
2.432932308 GHz
Marker 3 [T1]
-8.89 dBm
2.440550923 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:34:40

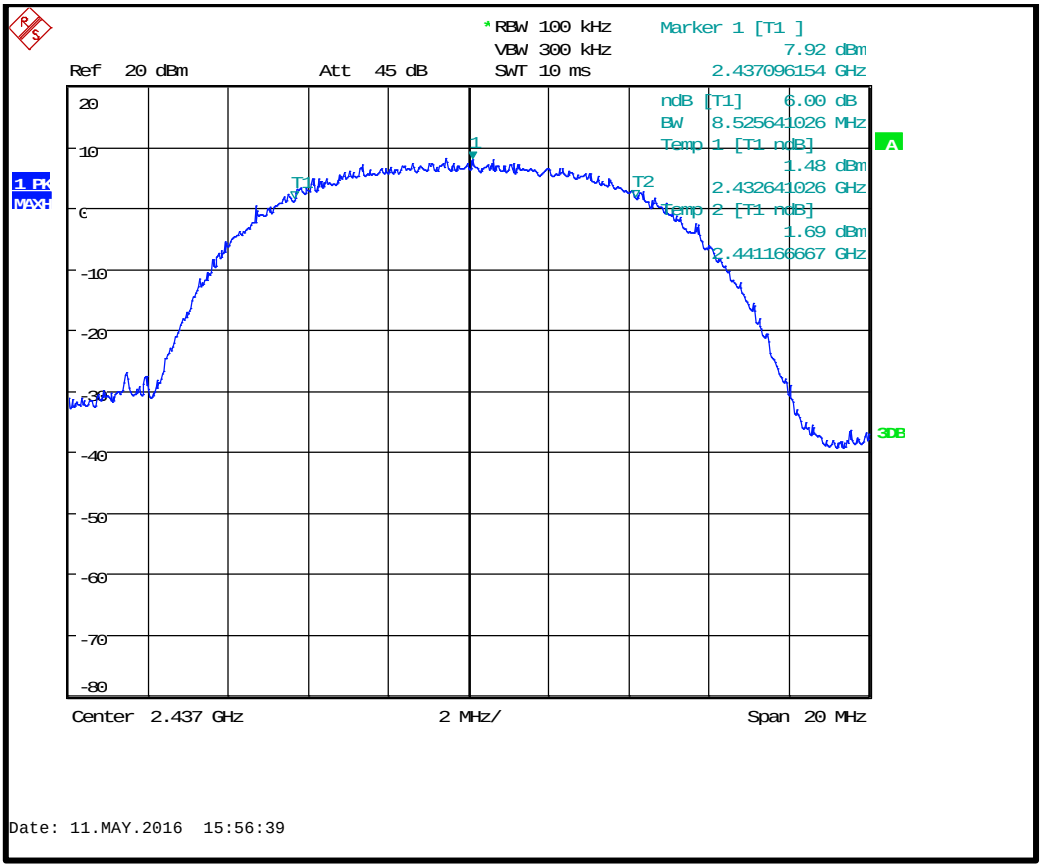

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.94 dBm
2.461010000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-8.48 dBm
2.457470385 GHz
Marker 3 [T1]
-8.59 dBm
2.466499231 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:13:25

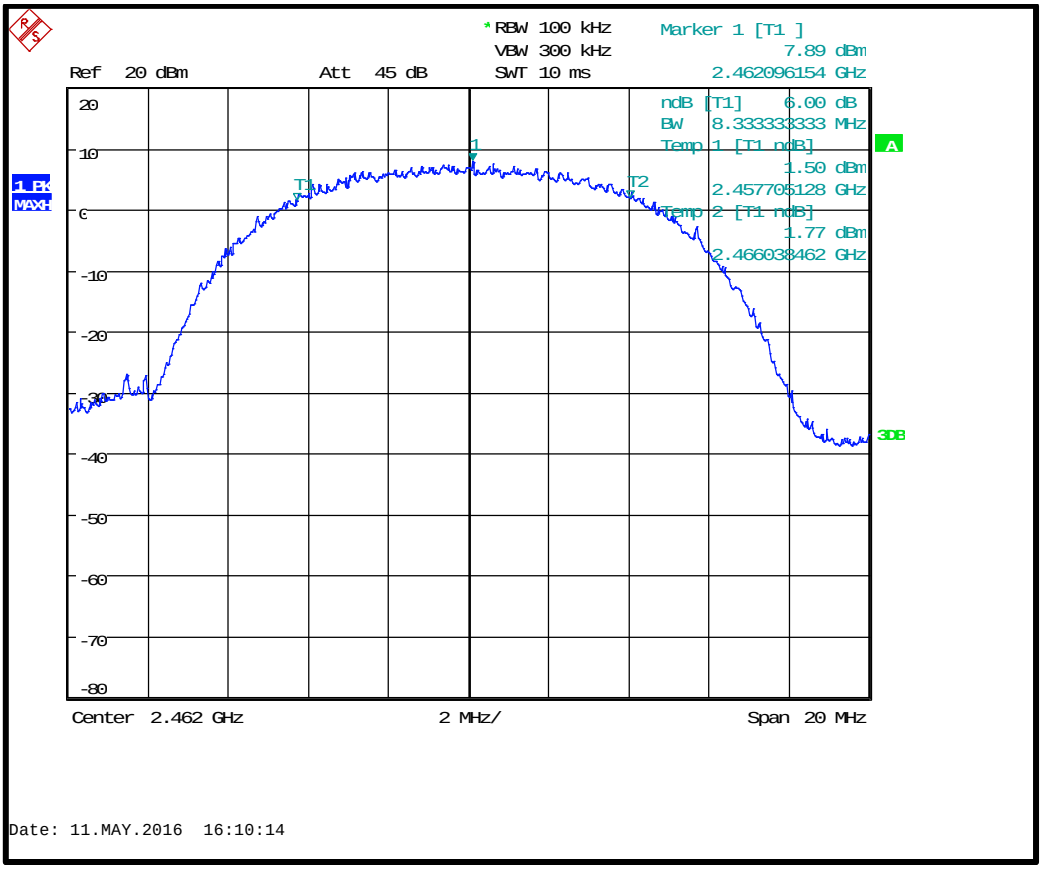
FCC 15.247. Modulation: 802.11b; Data rate: 11Mb/s; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2412	2408.025641	2415.846154	7820.512821	PASS
2437	2432.641026	2441.166667	8525.641026	PASS
2462	2457.705128	2466.038462	8333.333333	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



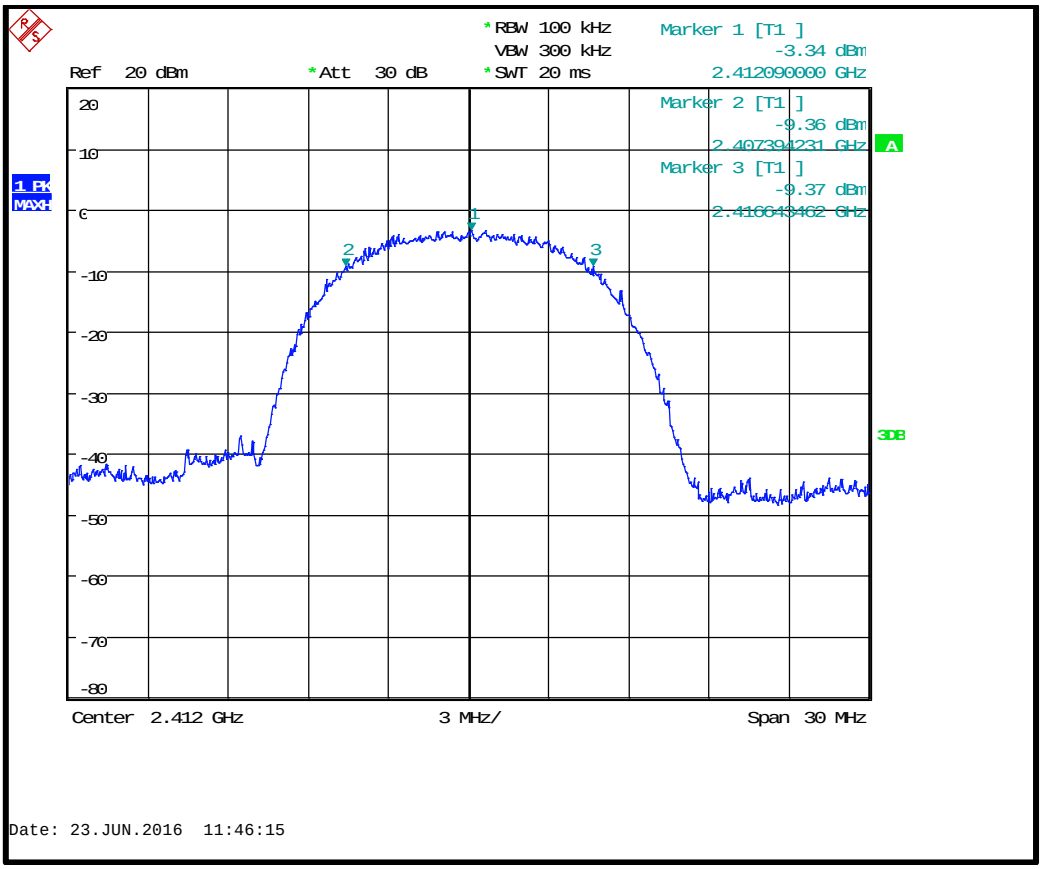

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
7.92 dBm
2.437096154 GHz
Ref 20 dBm
Att 45 dB
ndB [T1] 6.00 dB
BW 8.525641026 MHz
Temp 1 [T1 ndB]
1.48 dBm
2.432641026 GHz
Temp 2 [T1 ndB]
1.69 dBm
2.441166667 GHz
Center 2.437 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 15:56:39

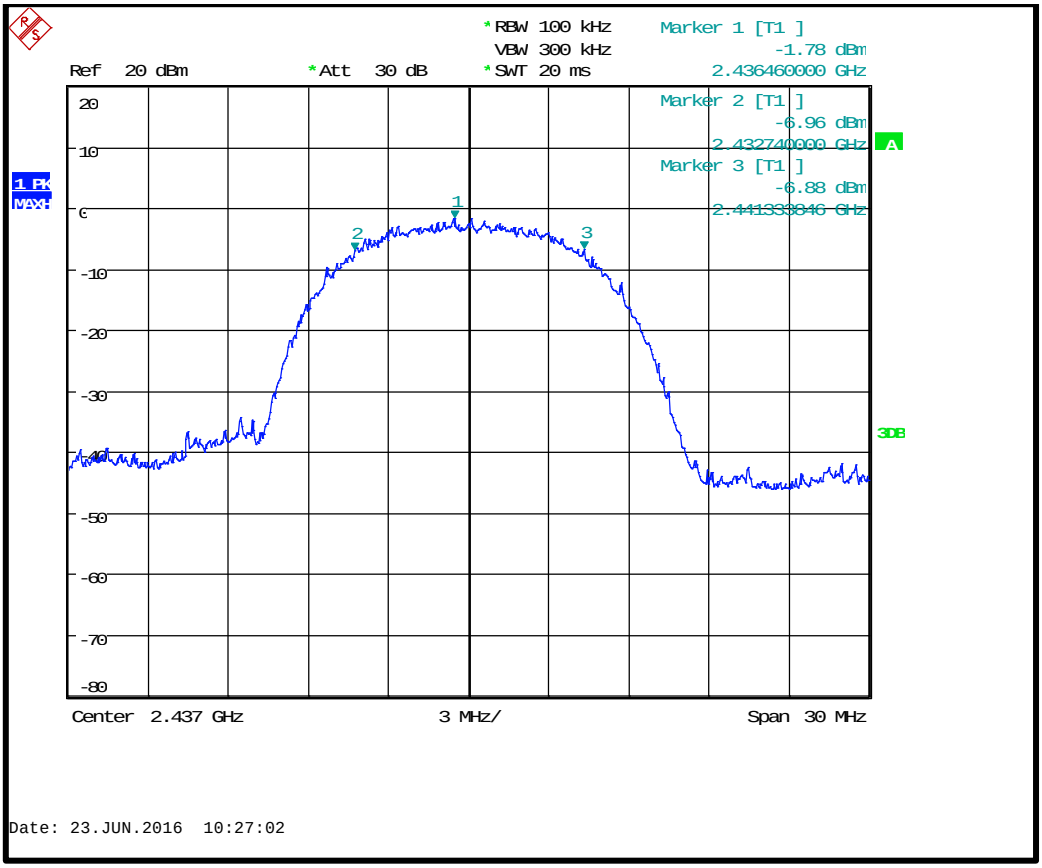

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
7.89 dBm
2.462096154 GHz
Ref 20 dBm
Att 45 dB
ndB [T1] 6.00 dB
BW 8.333333333 MHz
Temp 1 [T1 ndB]
1.50 dBm
2.457705128 GHz
Temp 2 [T1 ndB]
1.77 dBm
2.466038462 GHz
Center 2.462 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 16:10:14

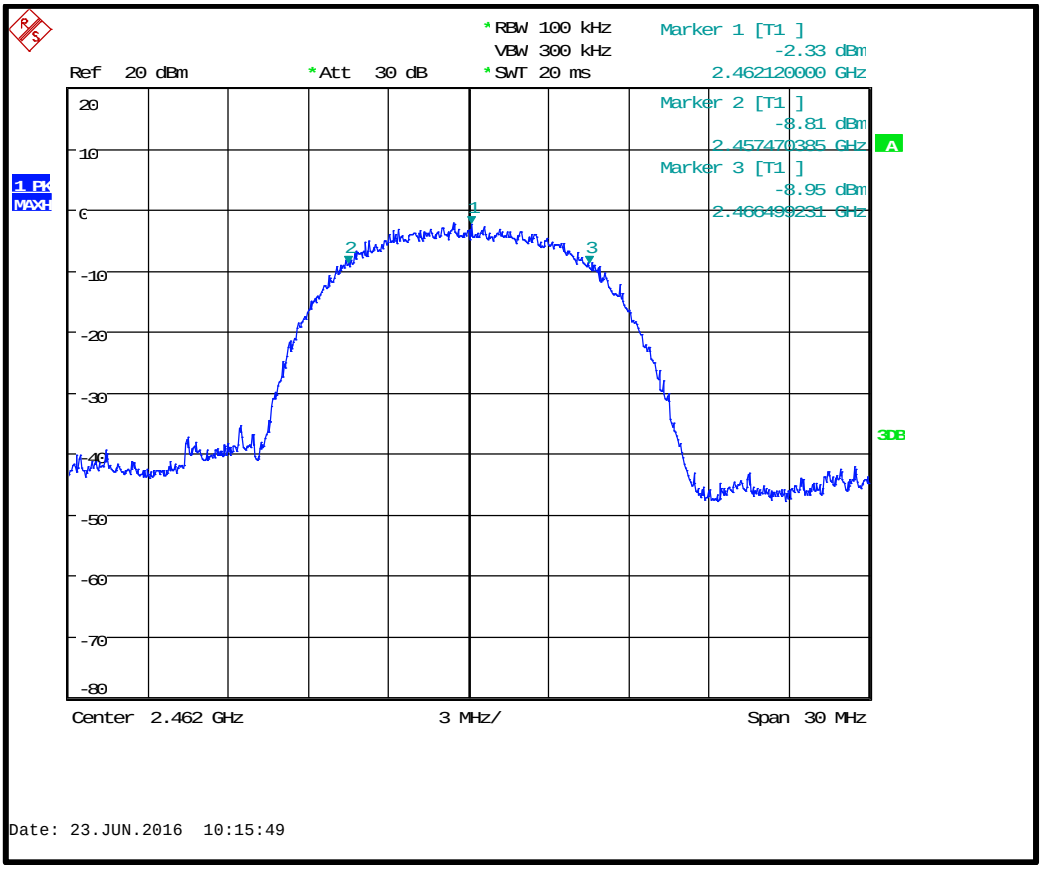
FCC 15.247. Modulation: 802.11b; Data rate: 11Mb/s; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2407.394231	2416.643462	9249.231	PASS
2437	2432.740000	2441.333846	8593.846	PASS
2462	2457.470385	2466.499231	9028.846	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 1



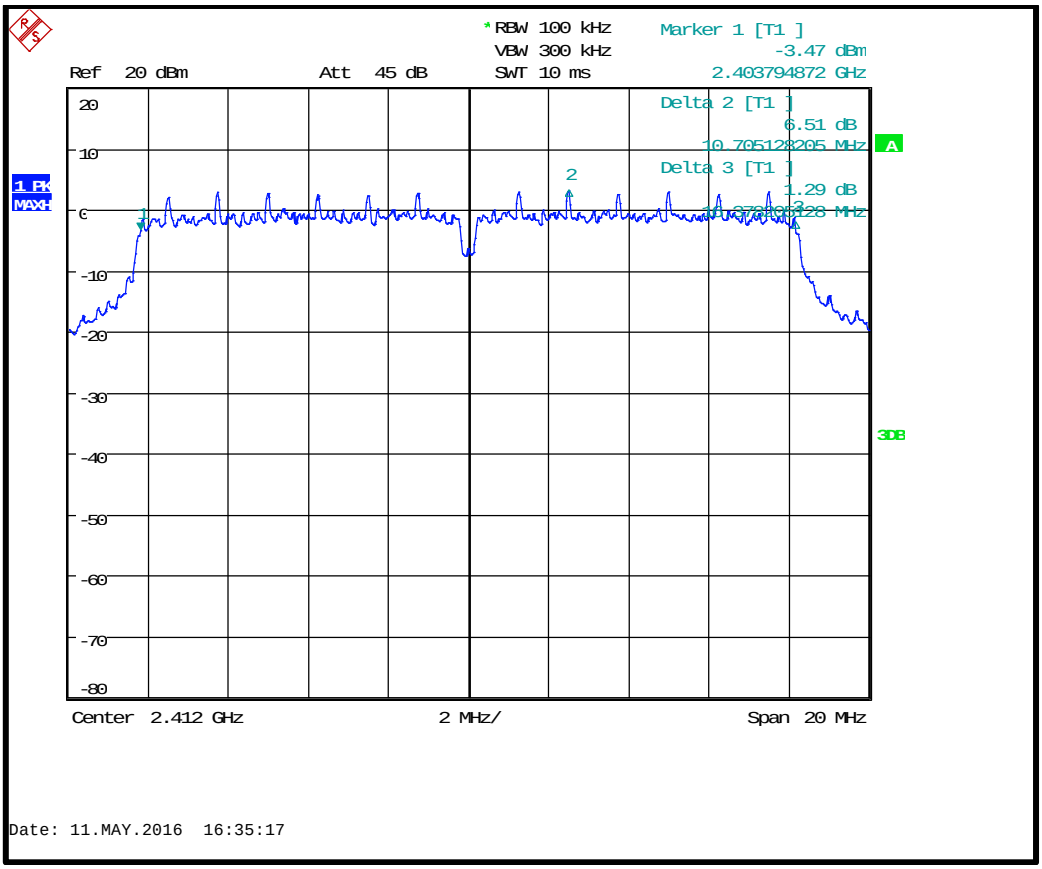

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-1.78 dBm
2.436460000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-6.96 dBm
2.432740000 GHz
Marker 3 [T1]
-6.88 dBm
2.441333846 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:27:02

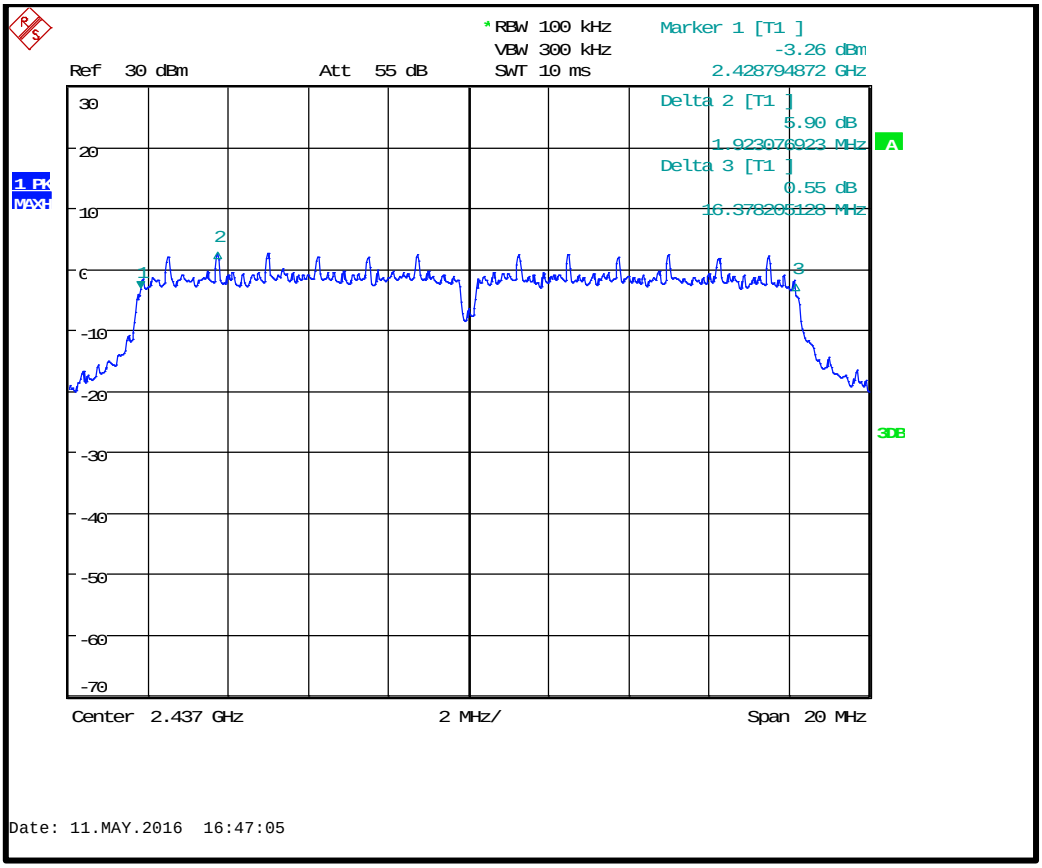

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.33 dBm
2.462120000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-8.81 dBm
2.457470385 GHz
Marker 3 [T1]
-8.95 dBm
2.466499231 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:15:49

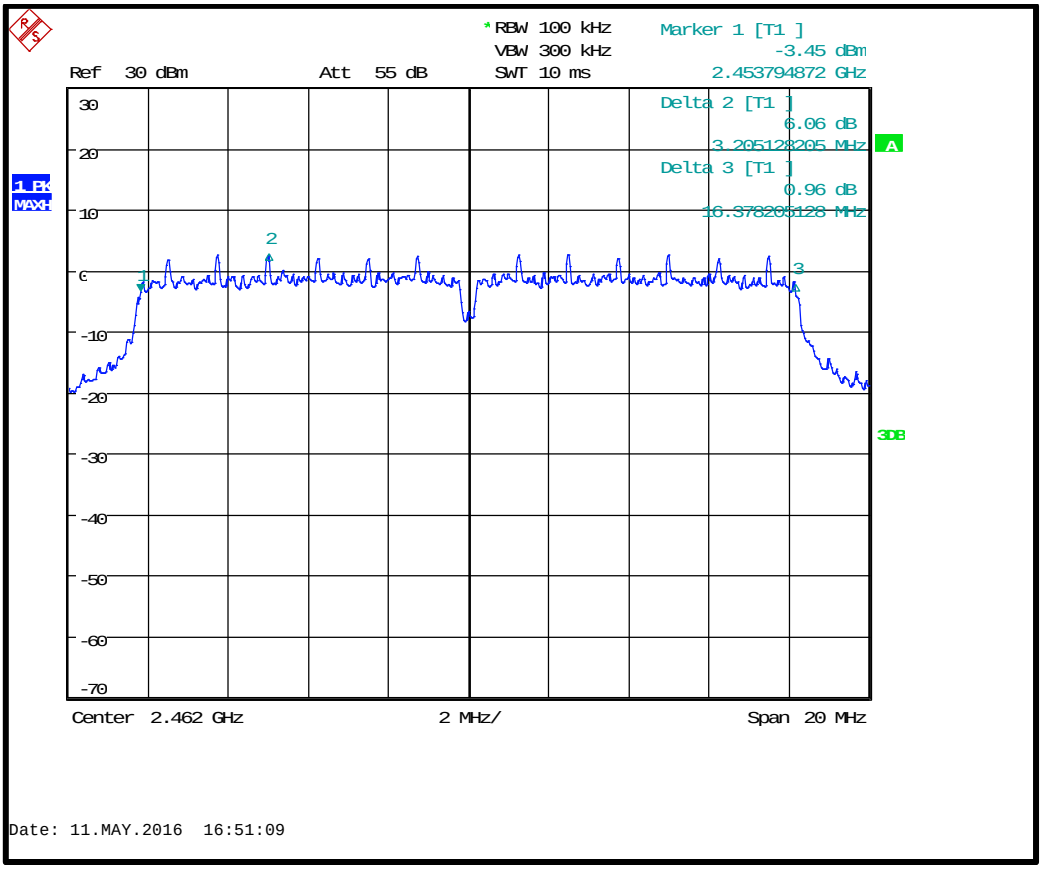
FCC 15.247. Modulation: 802.11g; Data rate: 6Mb/s; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.794872	2414.500000	16378.21	PASS
2437	2428.794872	2430.717949	16378.21	PASS
2462	2453.794872	2457.000000	16378.21	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



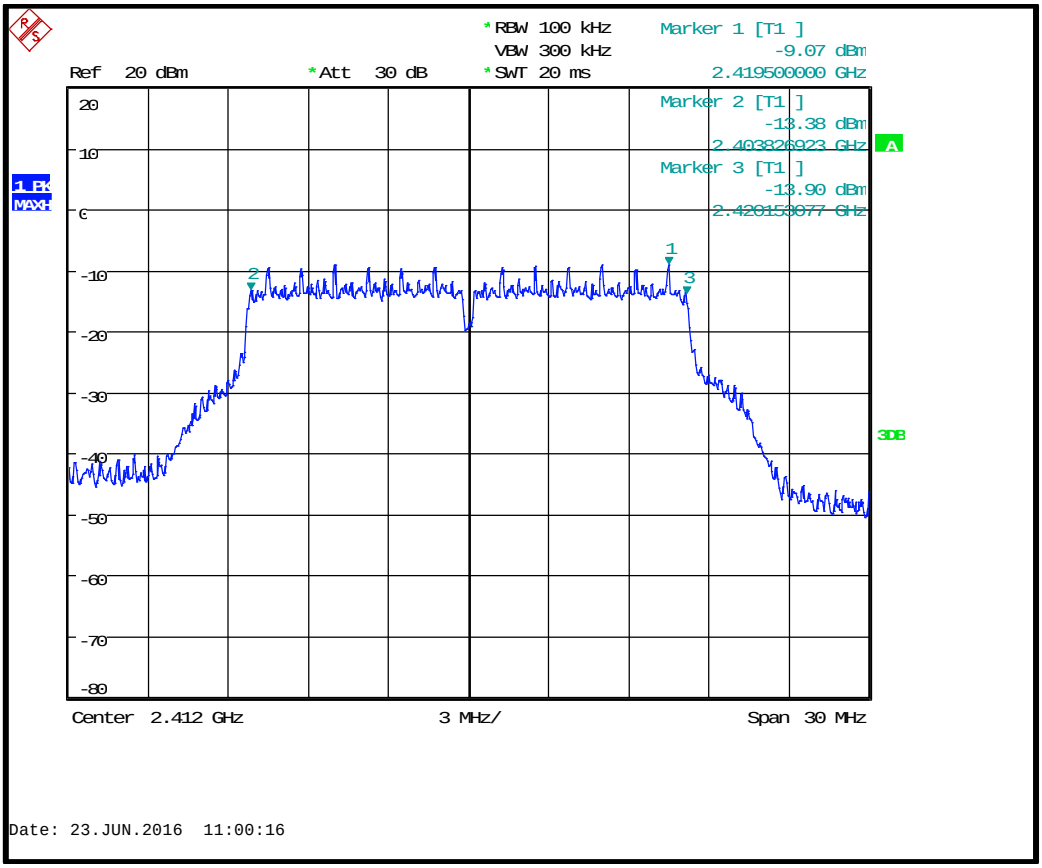

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-3.26 dBm
2.428794872 GHz
Ref 30 dBm
Att 55 dB
Delta 2 [T1]
5.90 dB
1.923076923 MHz
Delta 3 [T1]
0.55 dB
16.378205128 MHz
1 PK
MAXH
A
3DB
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.437 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 16:47:05

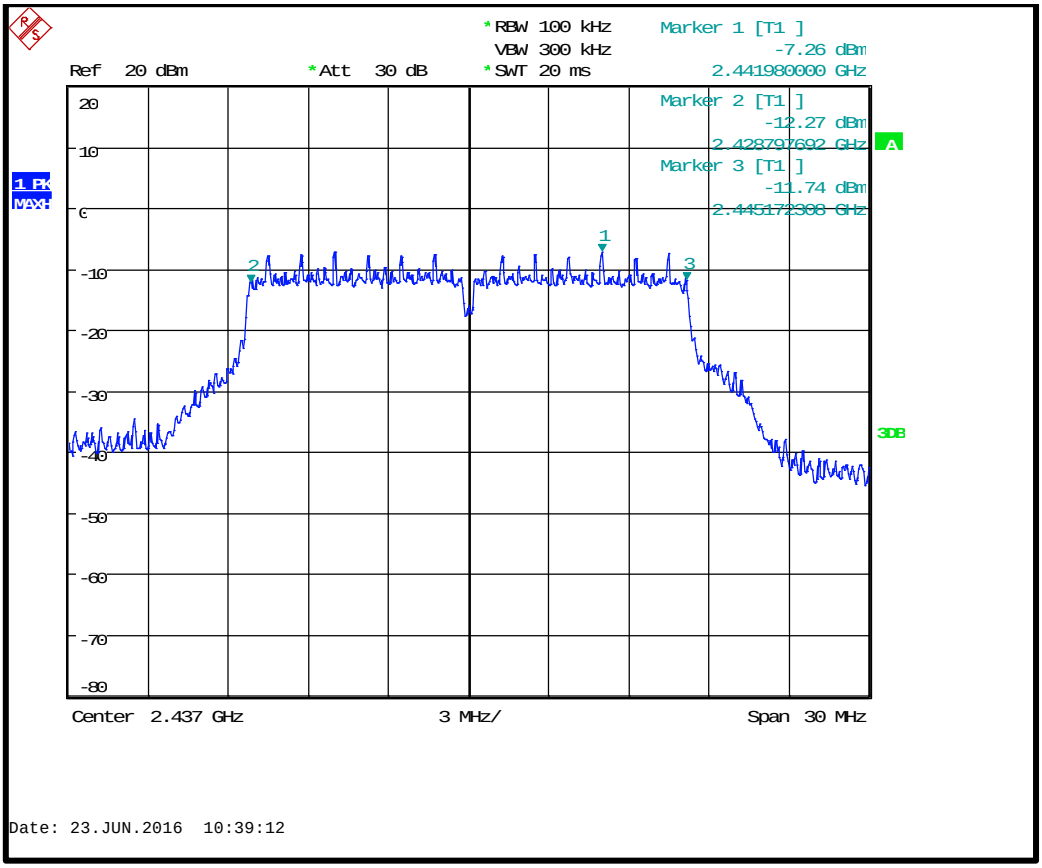

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-3.45 dBm
2.453794872 GHz
Ref 30 dBm
Att 55 dB
Delta 2 [T1]
6.06 dB
3.205128205 MHz
Delta 3 [T1]
0.96 dB
16.378205128 MHz
1 PK
MAXH
A
3DB
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.462 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 16:51:09

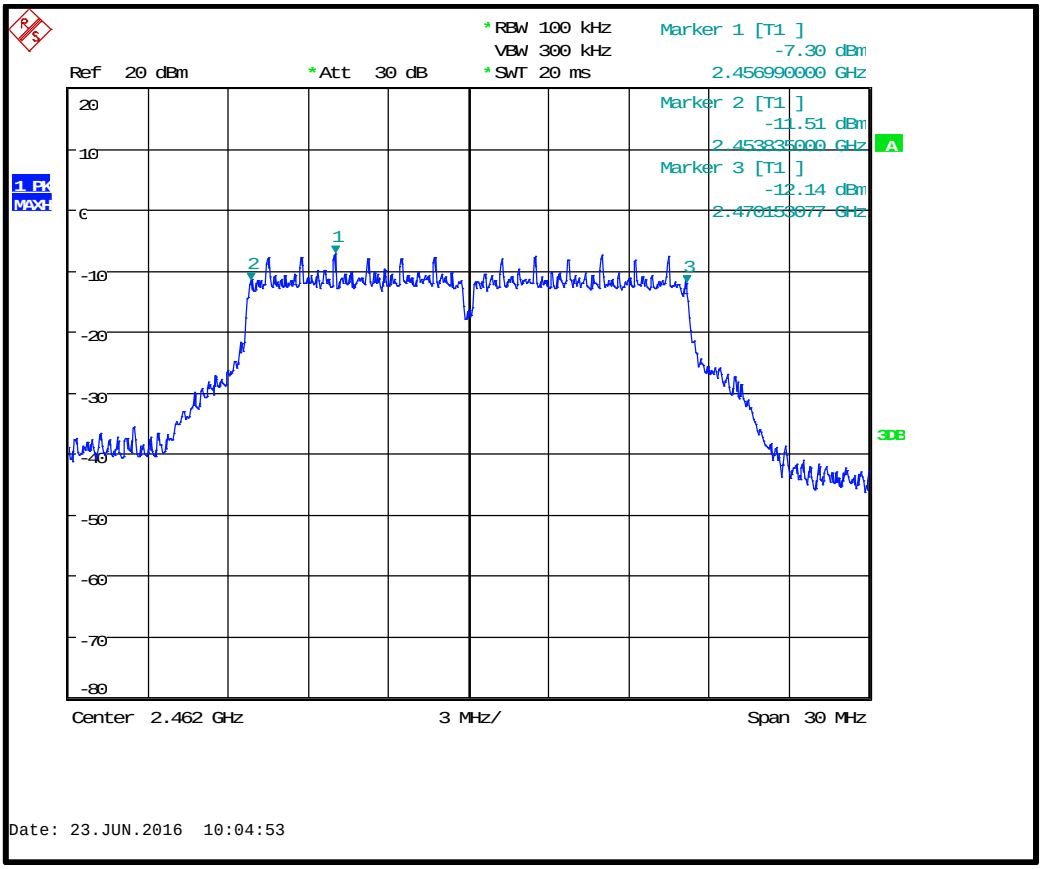
FCC 15.247. Modulation: 802.11g; Data rate: 6Mb/s; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.826923	2420.153077	16326.15	PASS
2437	2428.797692	2445.172308	16374.62	PASS
2462	2453.835000	2470.153077	16318.08	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 1



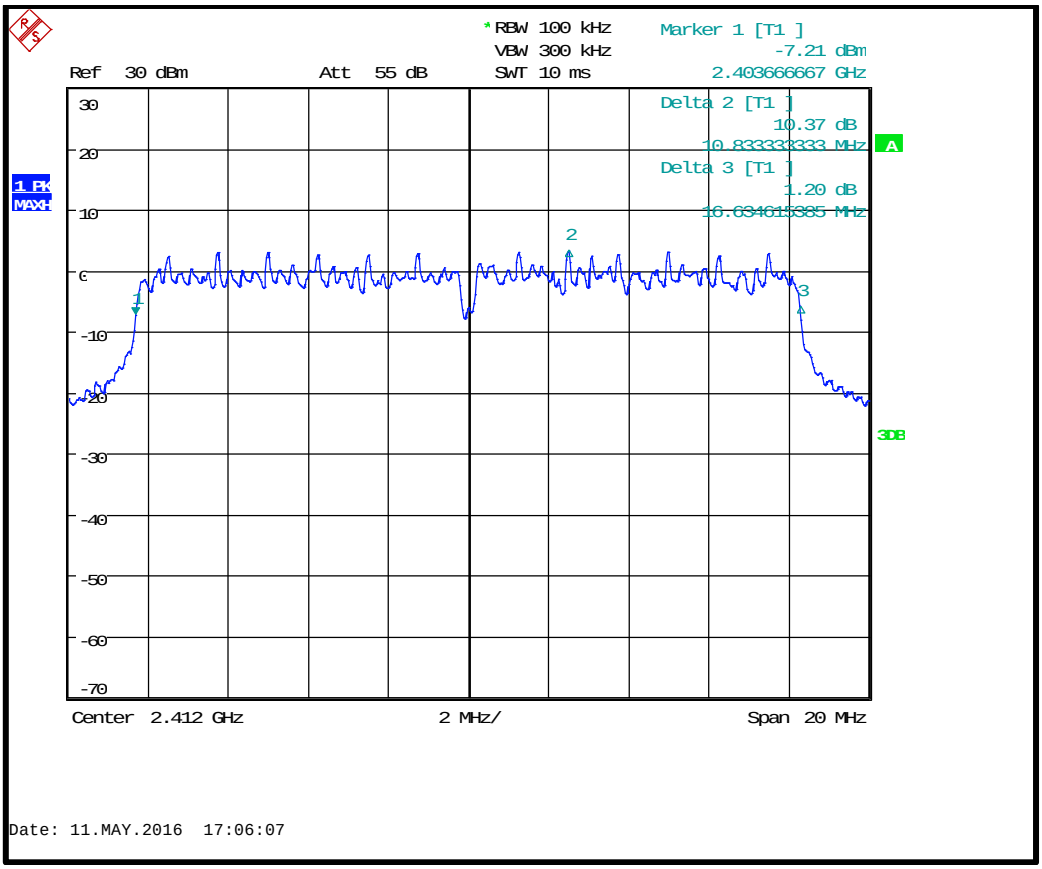

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
-7.26 dBm
2.441980000 GHz
Marker 2 [T1]
-12.27 dBm
2.428797692 GHz
Marker 3 [T1]
-11.74 dBm
2.445172308 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:39:12

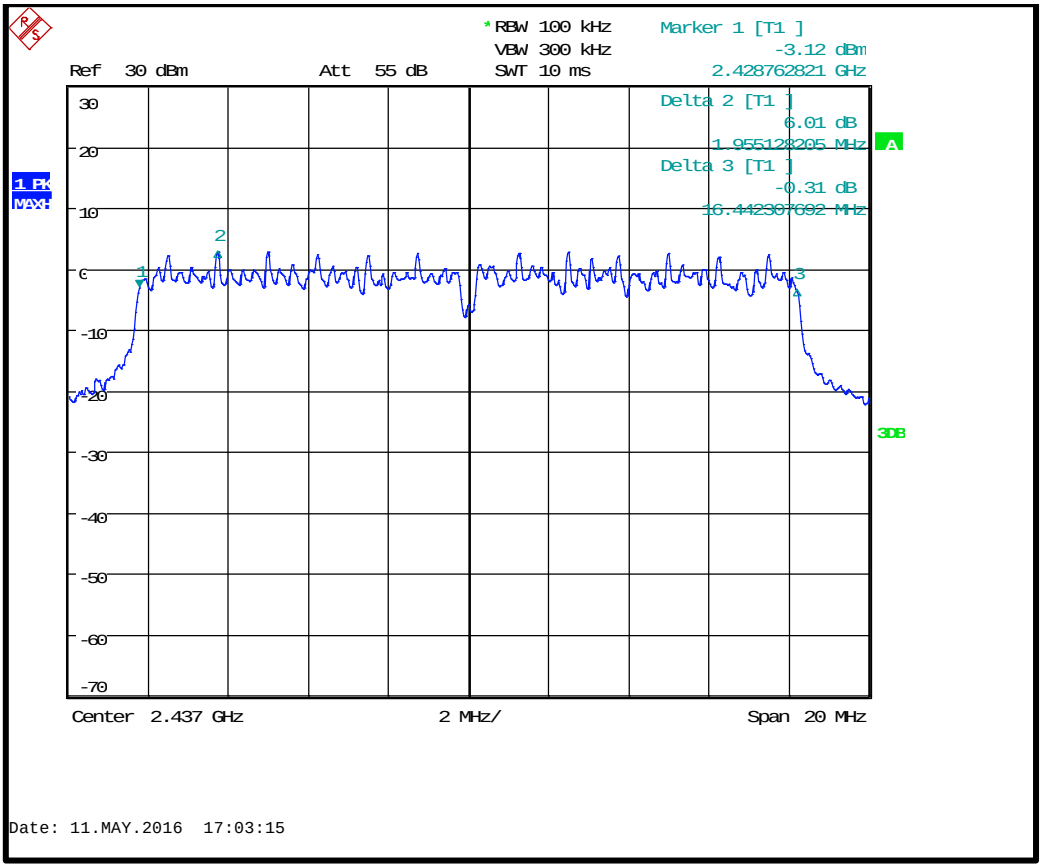

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
-7.30 dBm
2.456990000 GHz
Marker 2 [T1]
-11.51 dBm
2.453836000 GHz
Marker 3 [T1]
-12.14 dBm
2.470153077 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:04:53

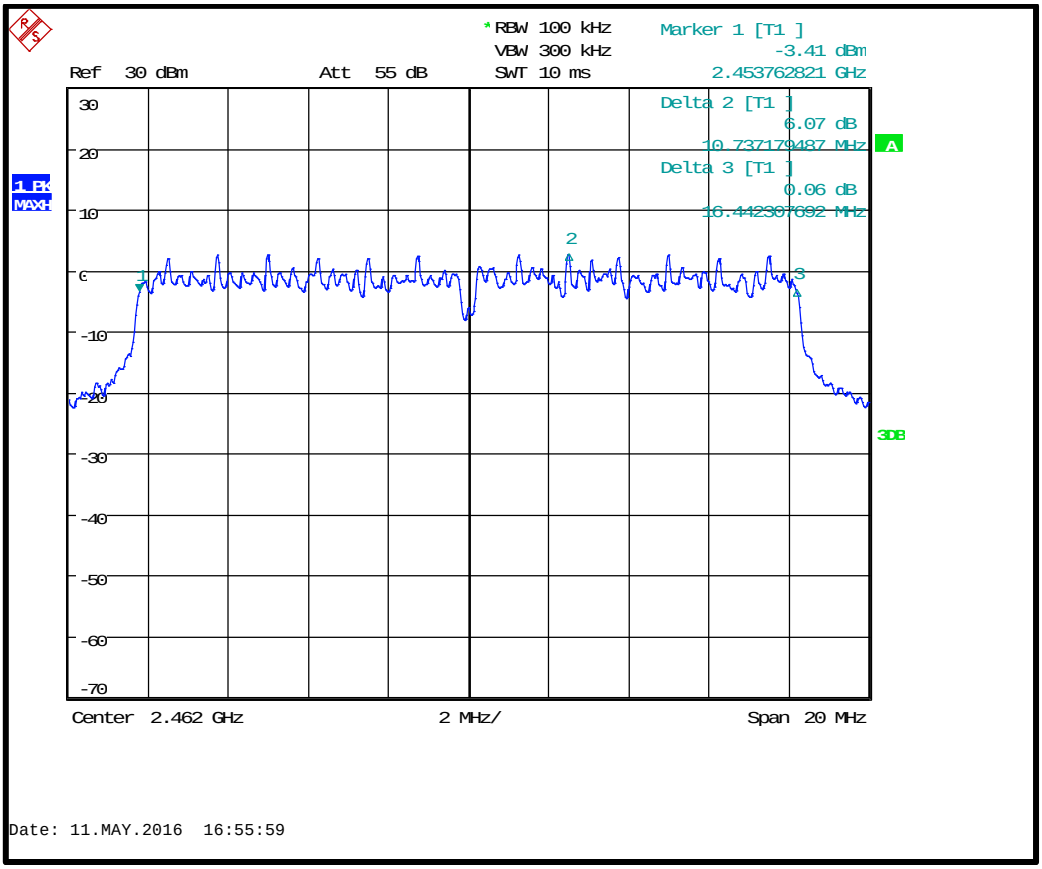
FCC 15.247. Modulation: 802.11g; Data rate: 54 Mbps; Power settings*x				
Channel Frequency (MHz)	FL (MHz)	FH (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.666667	2420.301282	16634.615385	PASS
2437	2428.762821	2445.205129	16442.307692	PASS
2462	2453.762821	2470.205129	16442.307692	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



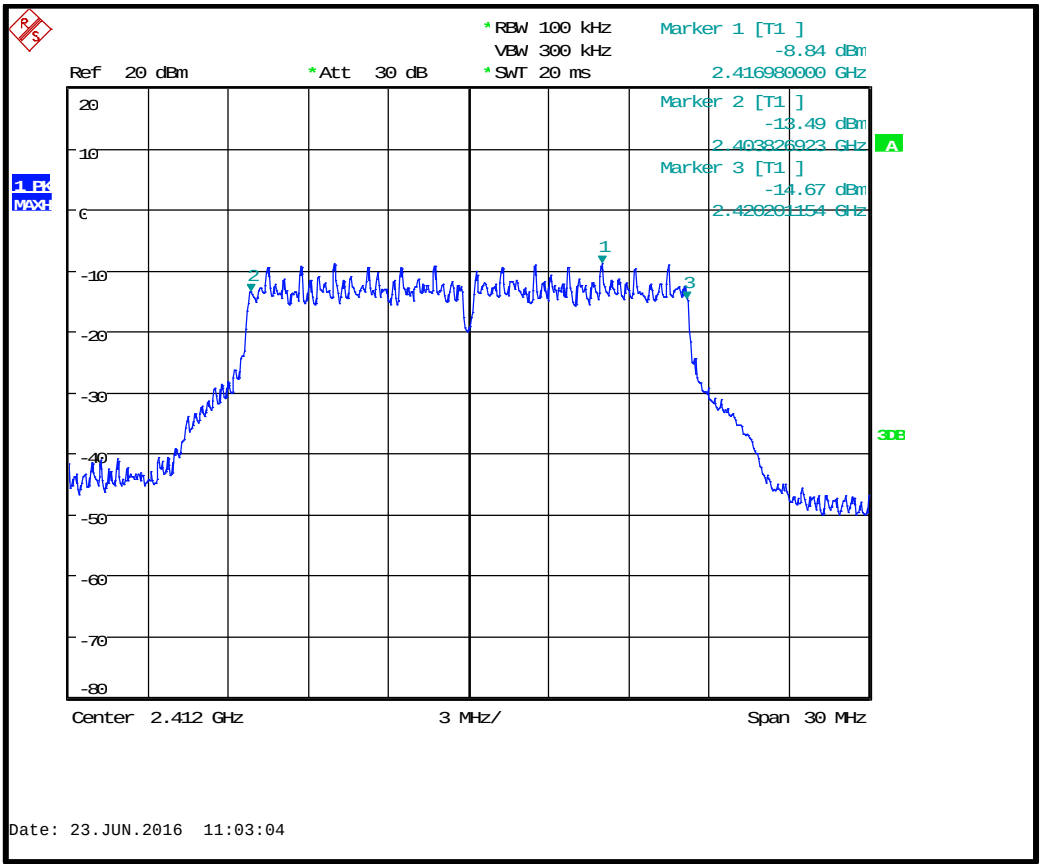

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-3.12 dBm
2.428762821 GHz
Ref 30 dBm
Att 55 dB
Delta 2 [T1]
6.01 dB
1.955128205 MHz
Delta 3 [T1]
-0.31 dB
16.442307692 MHz
1 PK
MAXH
A
3DB
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.437 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 17:03:15

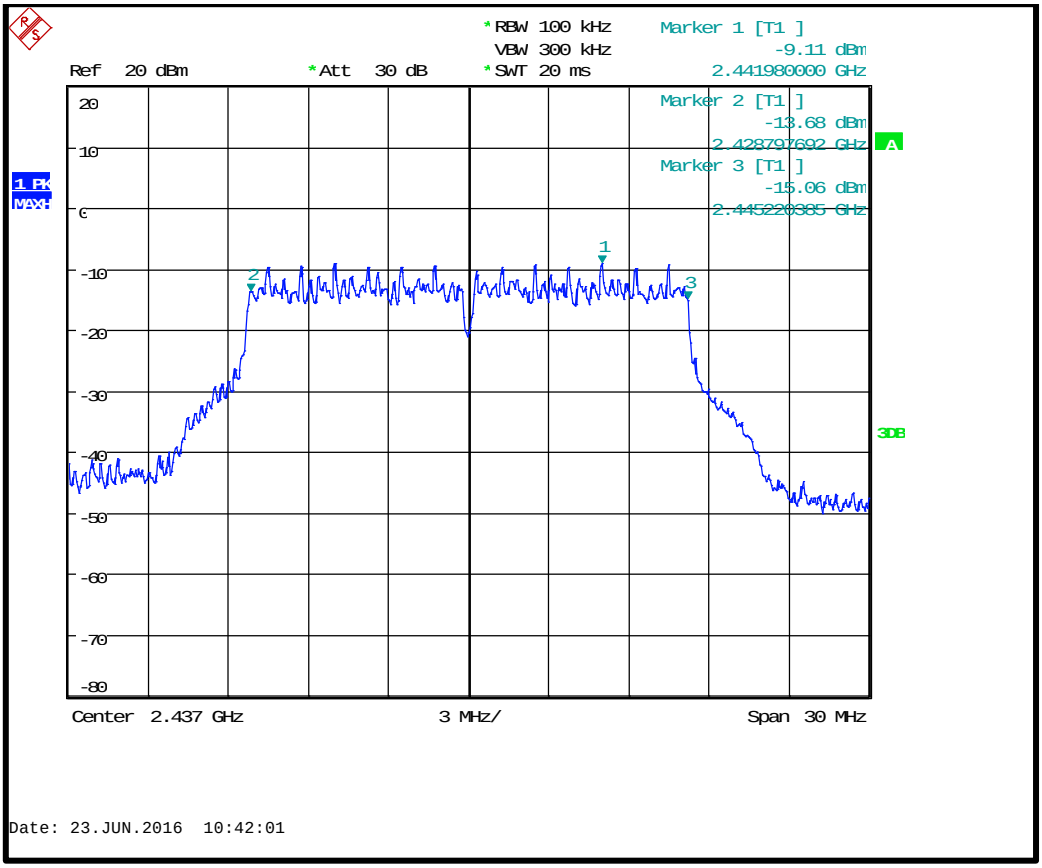

RBW 100 kHz
VBW 300 kHz
SWT 10 ms
Marker 1 [T1]
-3.41 dBm
2.453762821 GHz
Ref 30 dBm
Att 55 dB
Delta 2 [T1]
6.07 dB
10.737179487 MHz
Delta 3 [T1]
0.06 dB
16.442307692 MHz
1 PK
MAXH
A
3DB
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.462 GHz
2 MHz/
Span 20 MHz
Date: 11.MAY.2016 16:55:59

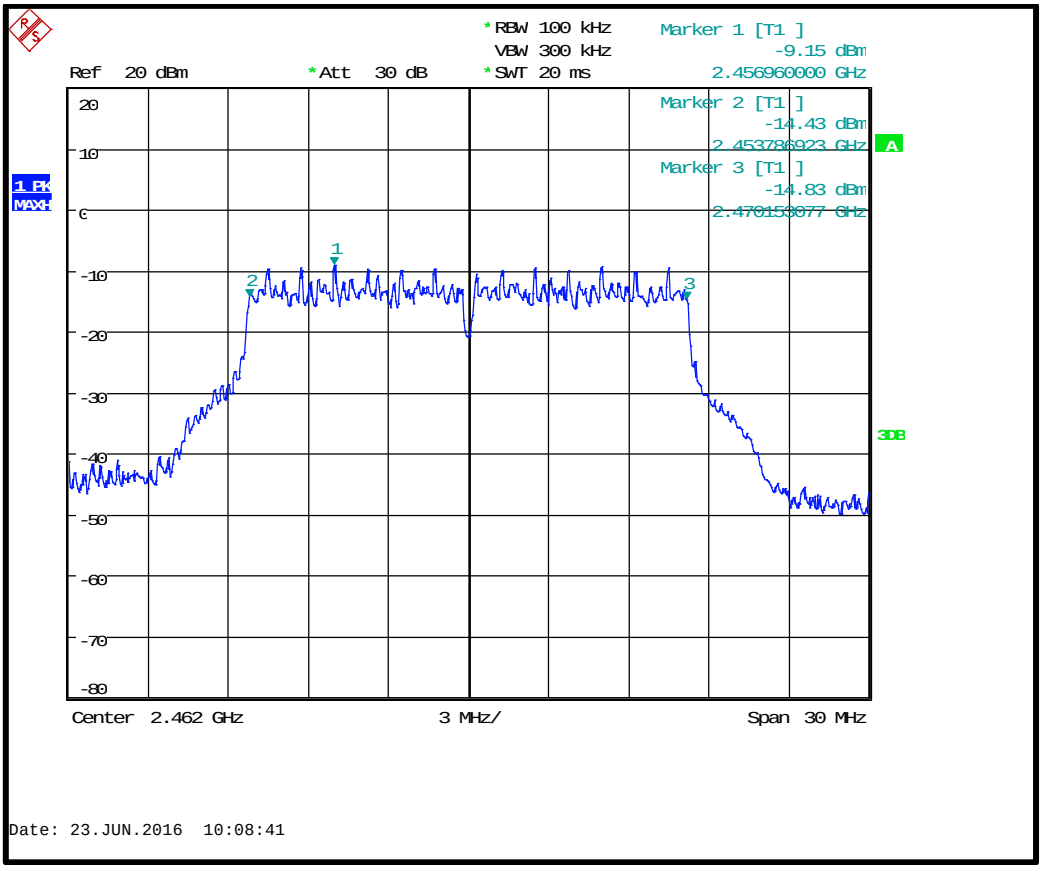
FCC 15.247. Modulation: 802.11g; Data rate: 54 Mbps; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.826923	2420.201154	16374.23	PASS
2437	2428.797692	2445.220385	16422.693	PASS
2462	2453.786923	2470.153077	16366.150	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 1



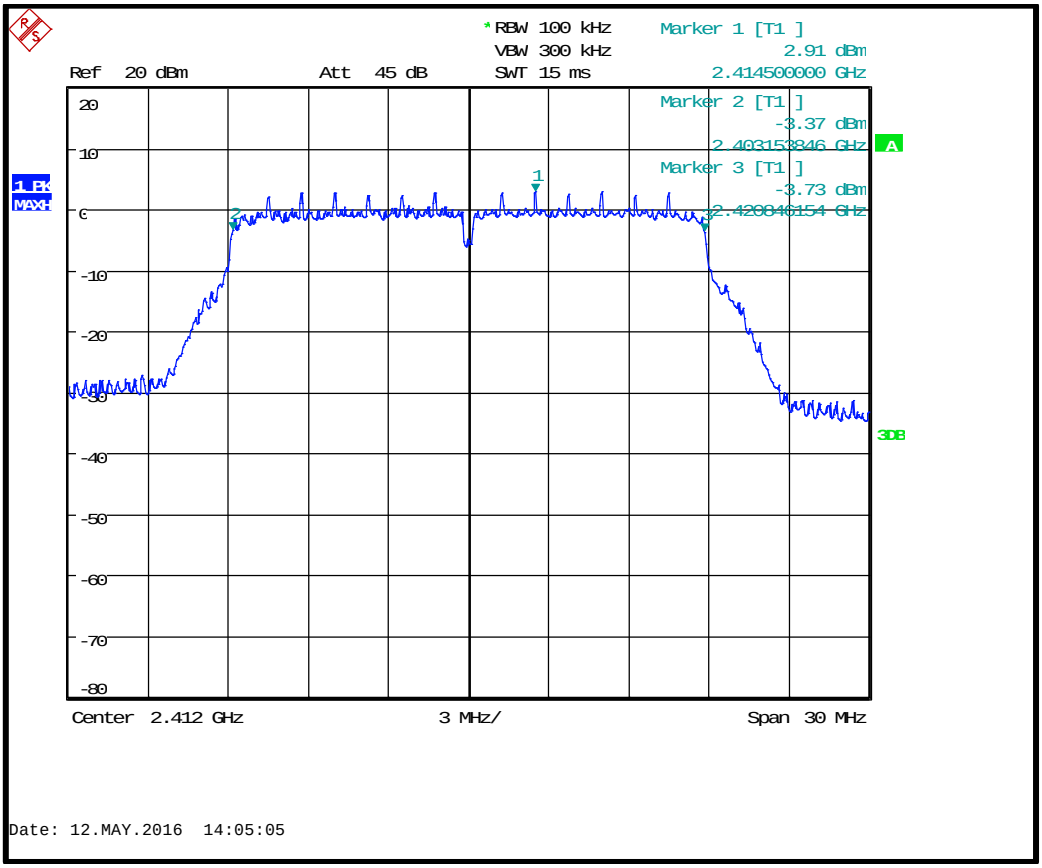

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
-9.11 dBm
2.441980000 GHz
Marker 2 [T1]
-13.68 dBm
2.428797692 GHz
Marker 3 [T1]
-15.06 dBm
2.445220385 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:42:01

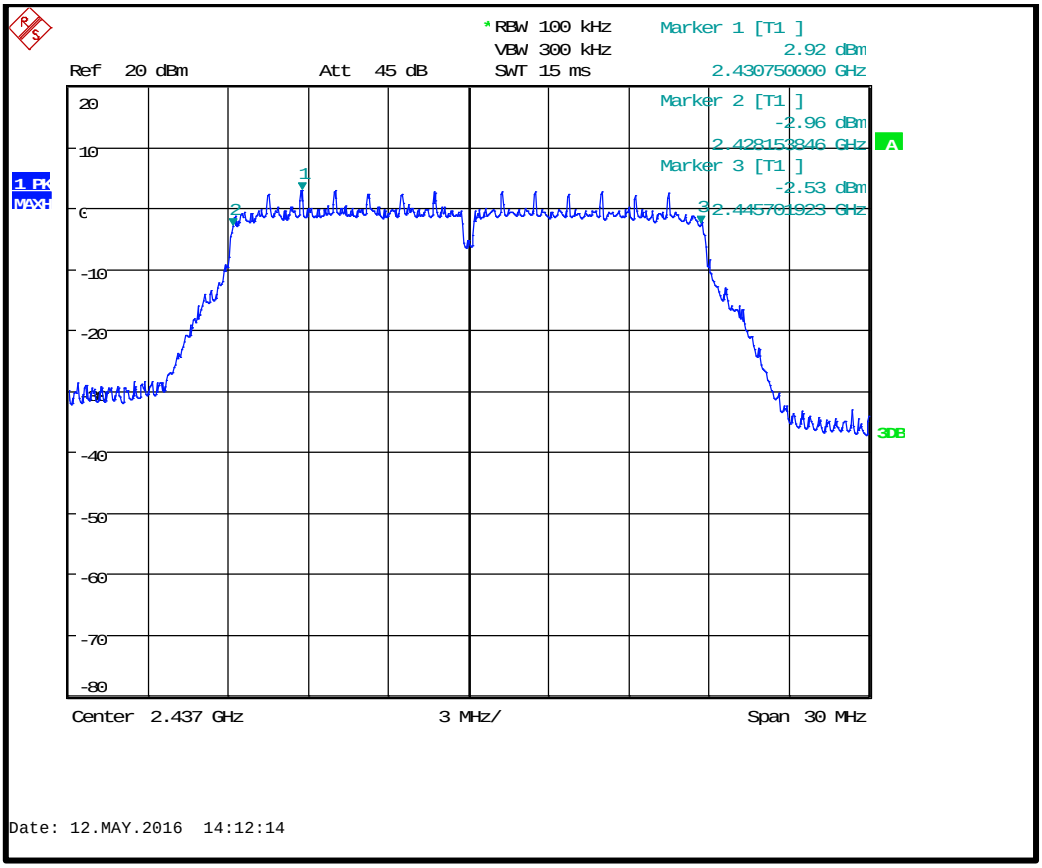

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Ref 20 dBm
Att 30 dB
Marker 1 [T1]
-9.15 dBm
2.456960000 GHz
Marker 2 [T1]
-14.43 dBm
2.453786923 GHz
Marker 3 [T1]
-14.83 dBm
2.470153077 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:08:41

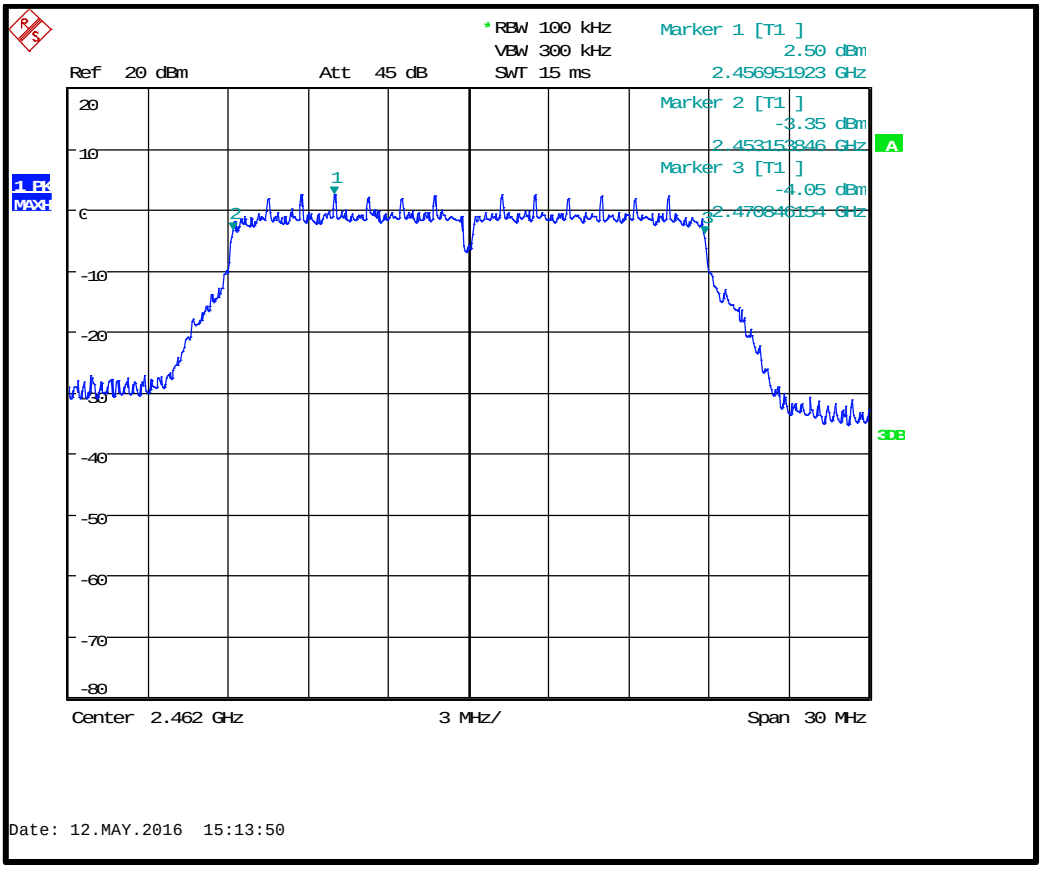
FCC 15.247. Modulation: 802.11n(HT20); Data rate: MCS0; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.153846	2420.846154	17692.31	PASS
2437	2428.153846	2445.701923	17548.08	PASS
2462	2453.153846	2470.846154	17692.31	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



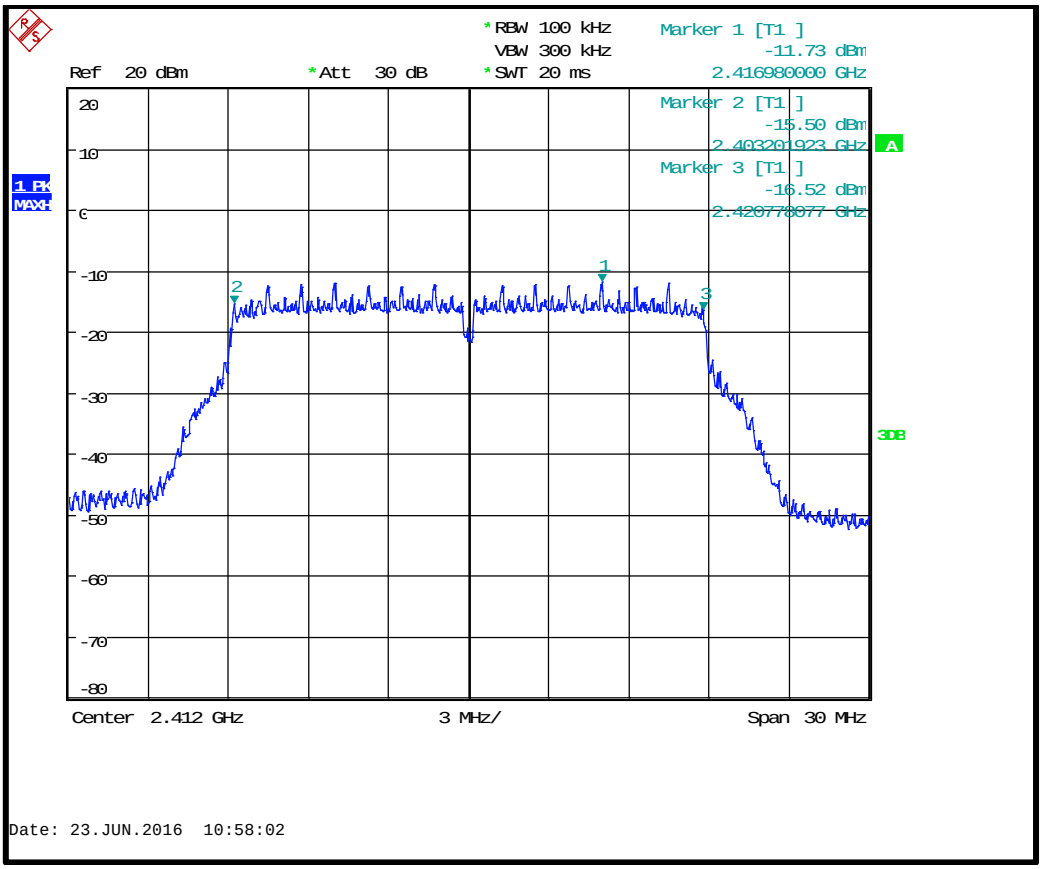

RBW 100 kHz
VBW 300 kHz
SWT 15 ms
Marker 1 [T1]
2.92 dBm
2.430750000 GHz
Marker 2 [T1]
-2.96 dBm
2.428153846 GHz
Marker 3 [T1]
-2.53 dBm
2.445701923 GHz
Ref 20 dBm
Att 45 dB
1 PK
MAXH
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 12.MAY.2016 14:12:14

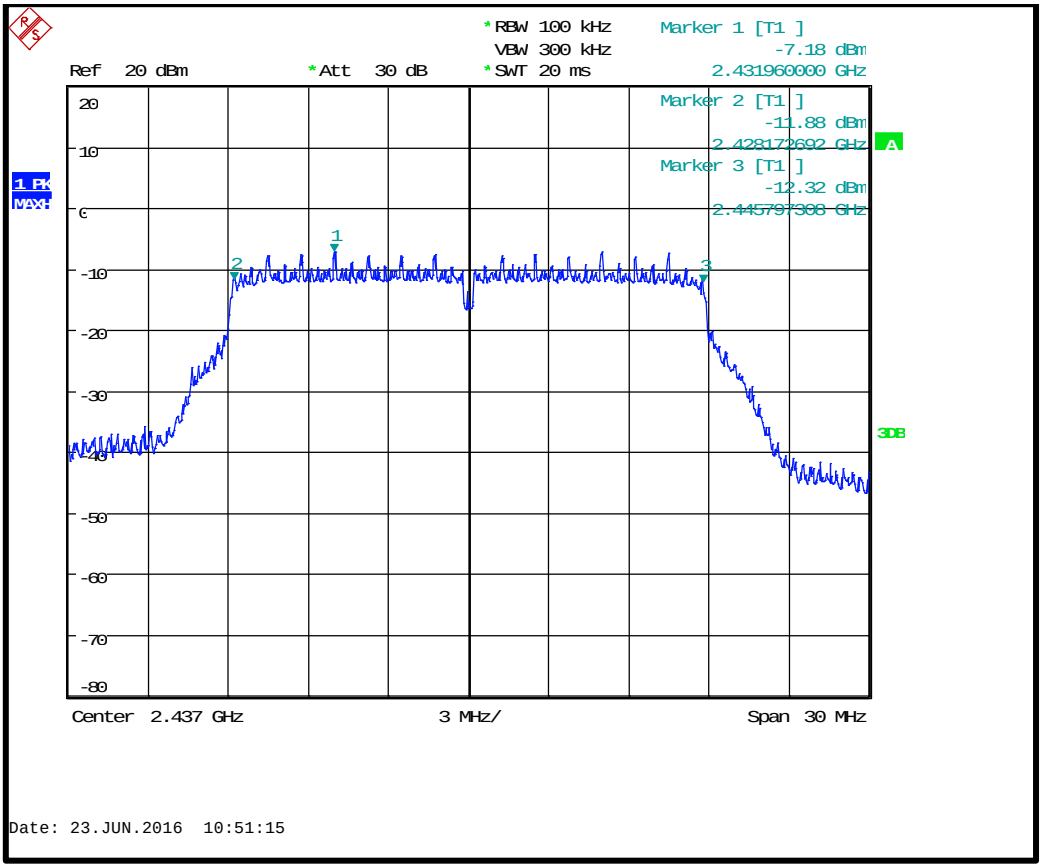

RBW 100 kHz
VBW 300 kHz
SWT 15 ms
Marker 1 [T1]
2.50 dBm
2.456951923 GHz
Marker 2 [T1]
-3.35 dBm
2.453153846 GHz
Marker 3 [T1]
-4.05 dBm
2.470846154 GHz
Ref 20 dBm
Att 45 dB
1 PK
MAXH
3DB
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 12.MAY.2016 15:13:50

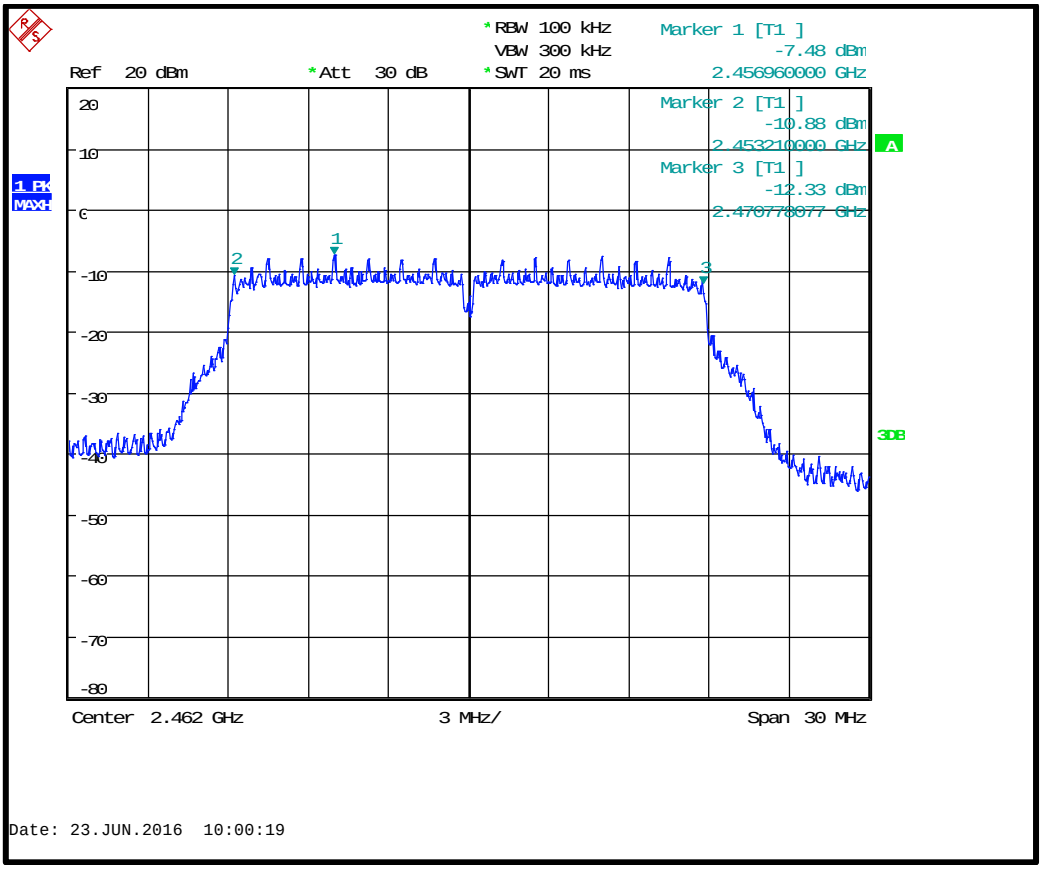
FCC 15.247. Modulation: 802.11n(HT20); Data rate: MCS0; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.201923	2420.778077	17576.15	PASS
2437	2428.172692	2445.797308	17624.616	PASS
2462	2453.210000	2470.778077	17568.08	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 1



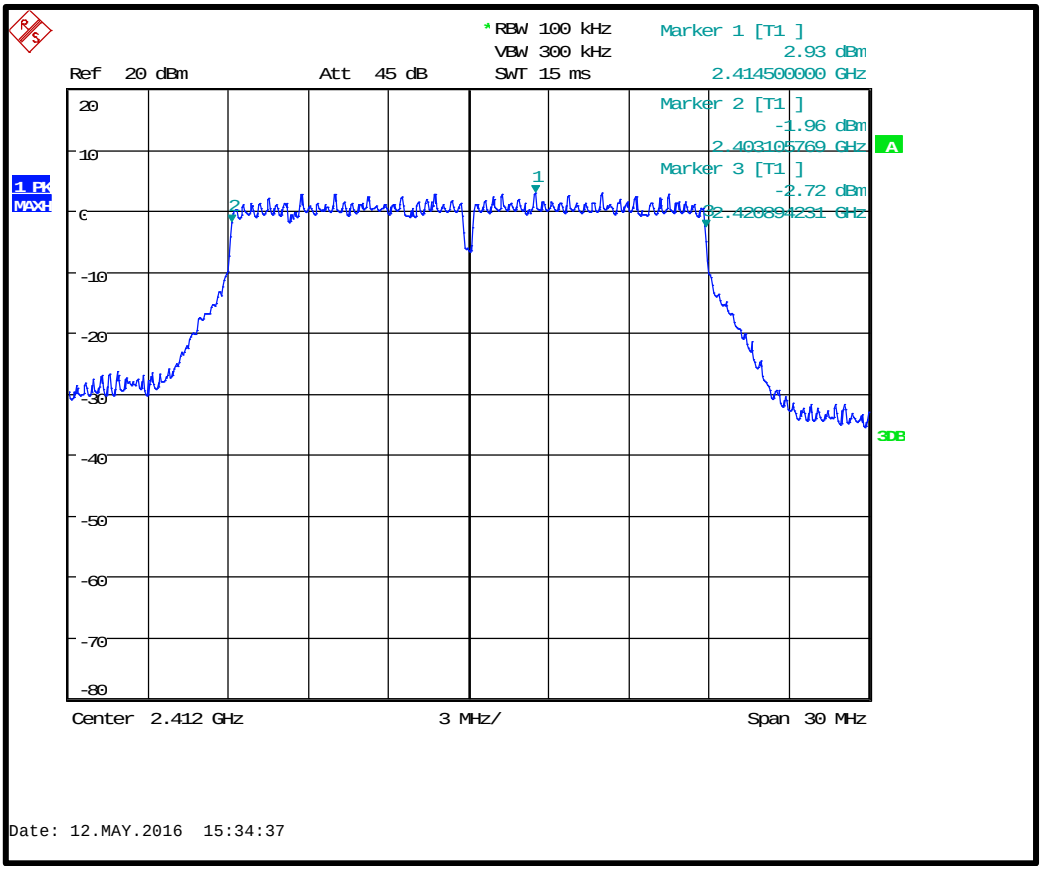

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-7.18 dBm
2.431960000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-11.88 dBm
2.428172692 GHz
Marker 3 [T1]
-12.32 dBm
2.445797308 GHz
1 PK
MAXH
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:51:15

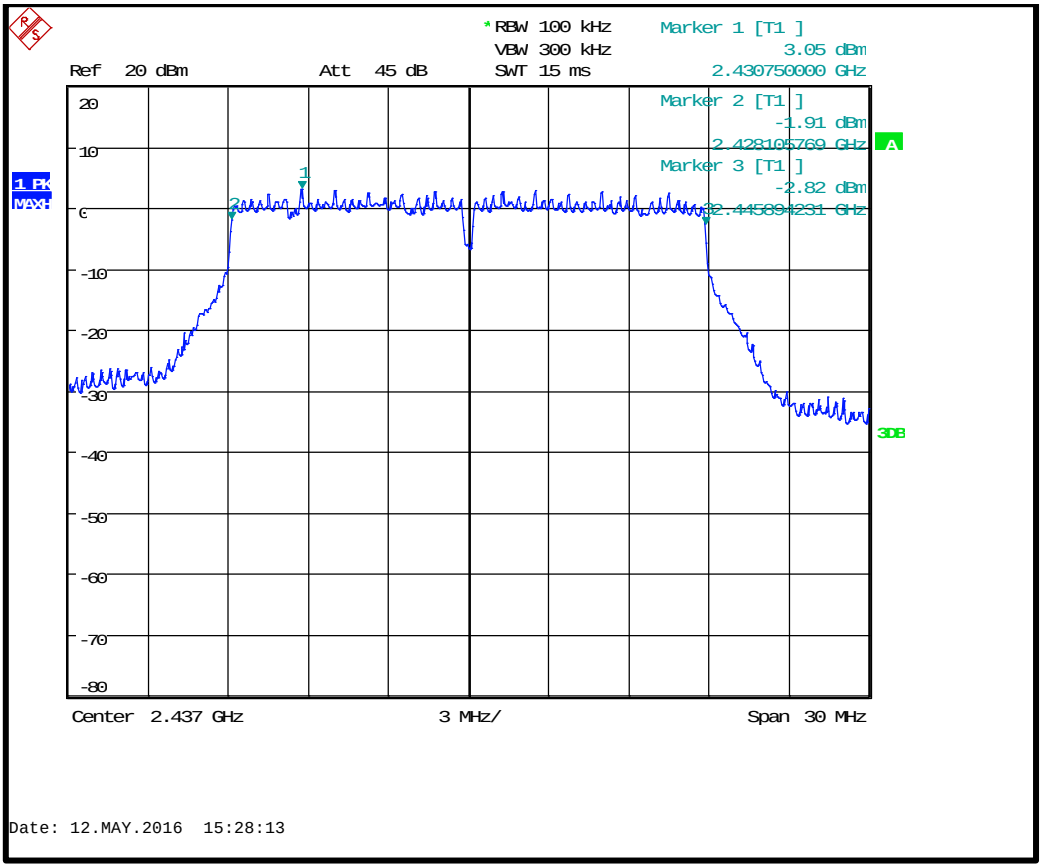

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-7.48 dBm
2.456960000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-10.88 dBm
2.453210000 GHz
Marker 3 [T1]
-12.33 dBm
2.470778077 GHz
1 PK
MAXH
3DB
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:00:19

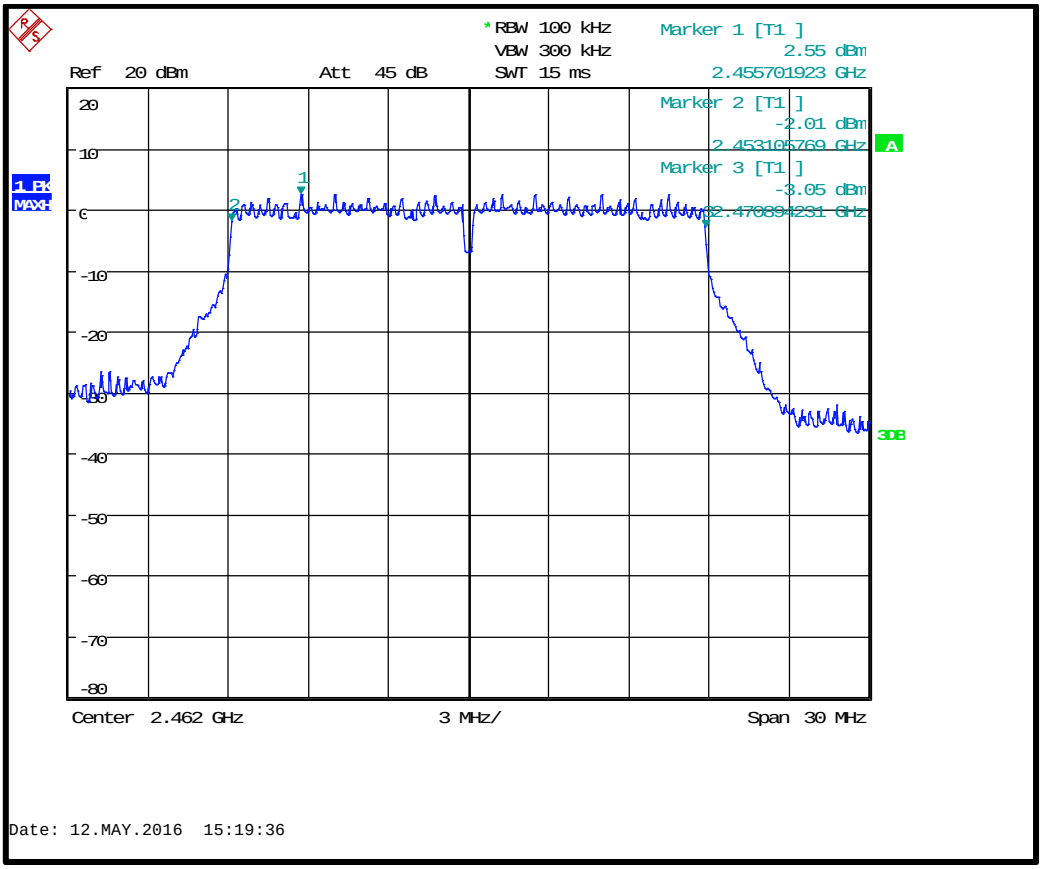
FCC 15.247. Modulation: 802.11n(HT20); Data rate: MCS7; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.105769	2420.894231	17788.46	PASS
2437	2428.105769	2445.894231	17788.46	PASS
2462	2453.105769	2470.894231	17788.46	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



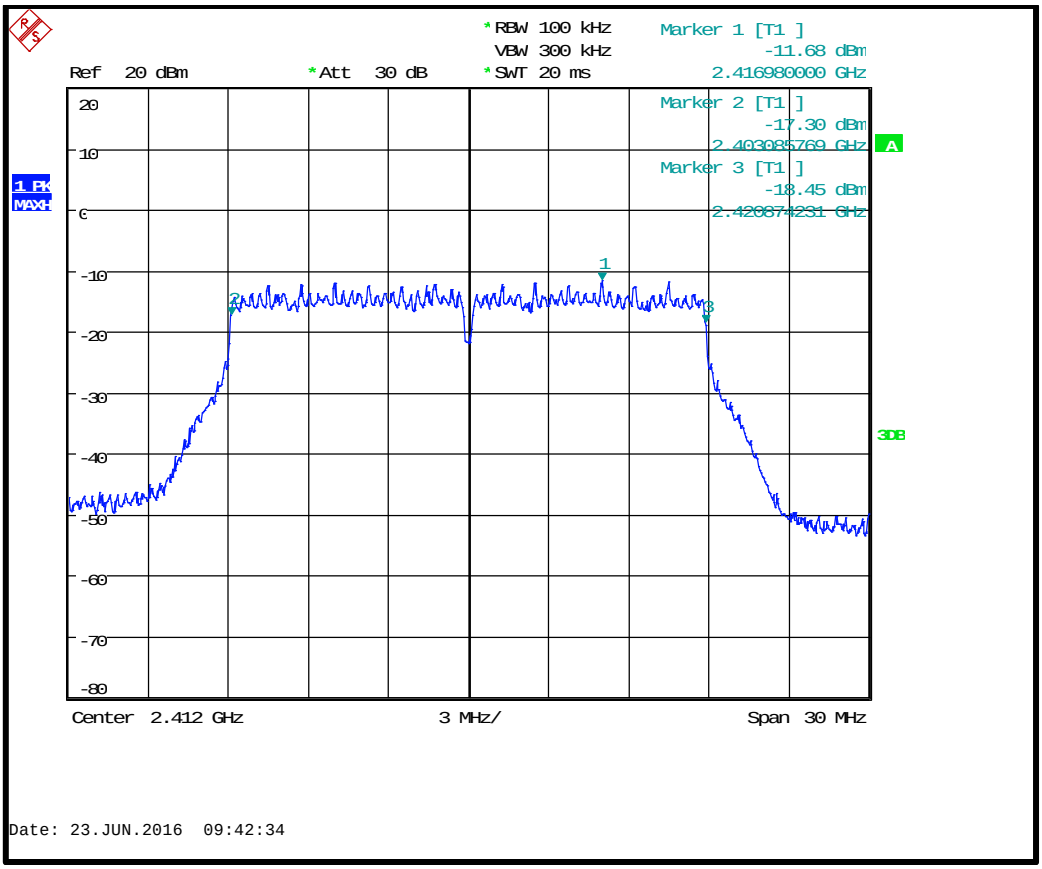

RBW 100 kHz
VBW 300 kHz
SWT 15 ms
Marker 1 [T1]
3.05 dBm
2.430750000 GHz
Marker 2 [T1]
-1.91 dBm
2.428105769 GHz
Marker 3 [T1]
-2.82 dBm
2.445894231 GHz
Ref 20 dBm
Att 45 dB
1 PK MAXH
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 12.MAY.2016 15:28:13

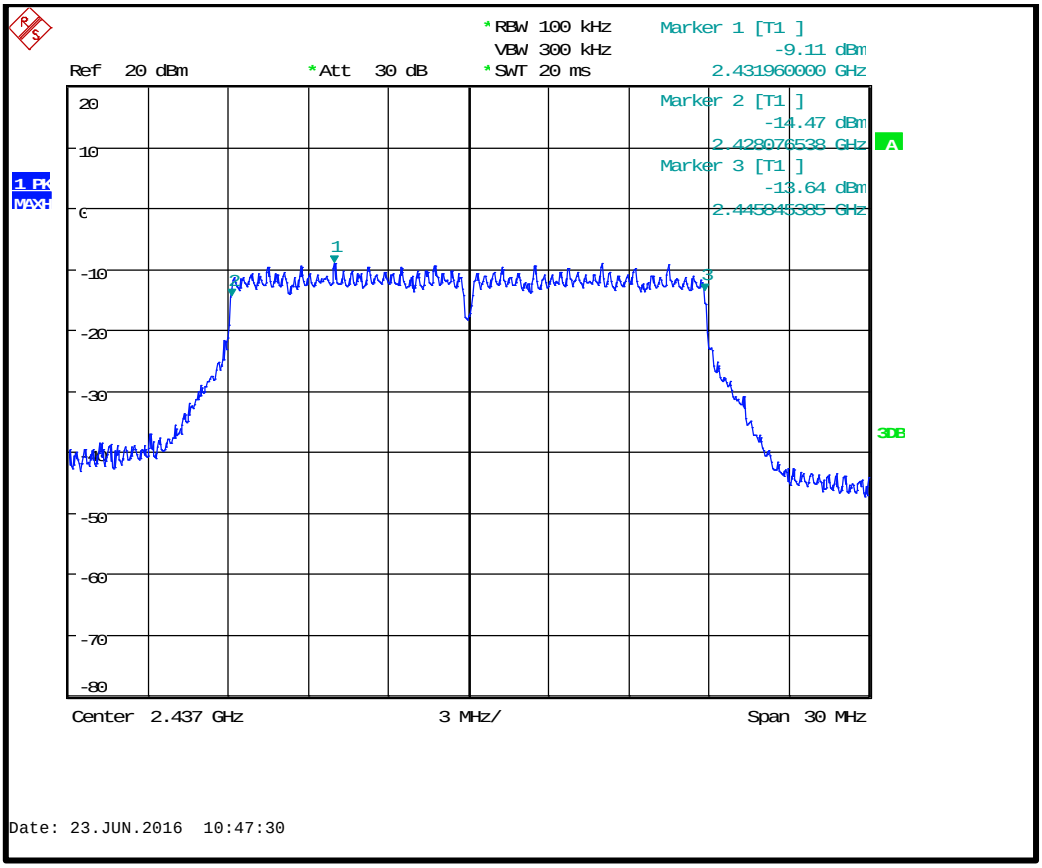

RBW 100 kHz
VBW 300 kHz
SWT 15 ms
Marker 1 [T1]
2.55 dBm
2.455701923 GHz
Marker 2 [T1]
-2.01 dBm
2.453105769 GHz
Marker 3 [T1]
-3.05 dBm
2.470894231 GHz
Ref 20 dBm
Att 45 dB
1 PK MAXH
3DB
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 12.MAY.2016 15:19:36

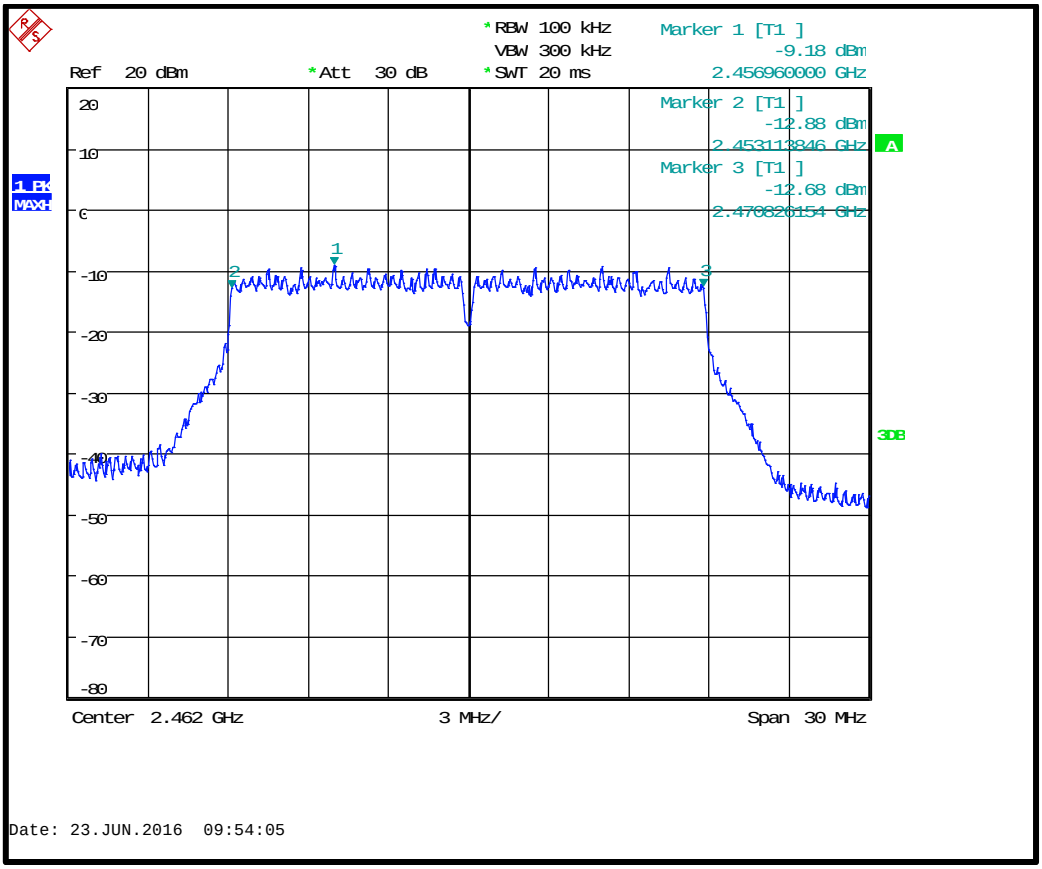
FCC 15.247. Modulation: 802.11n(HT20); Data rate: MCS7; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2412	2403.085769	2420.874231	17788.462	PASS
2437	2428.076538	2445.845385	17768.847	PASS
2462	2453.113846	2470.826154	17712.308	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 1



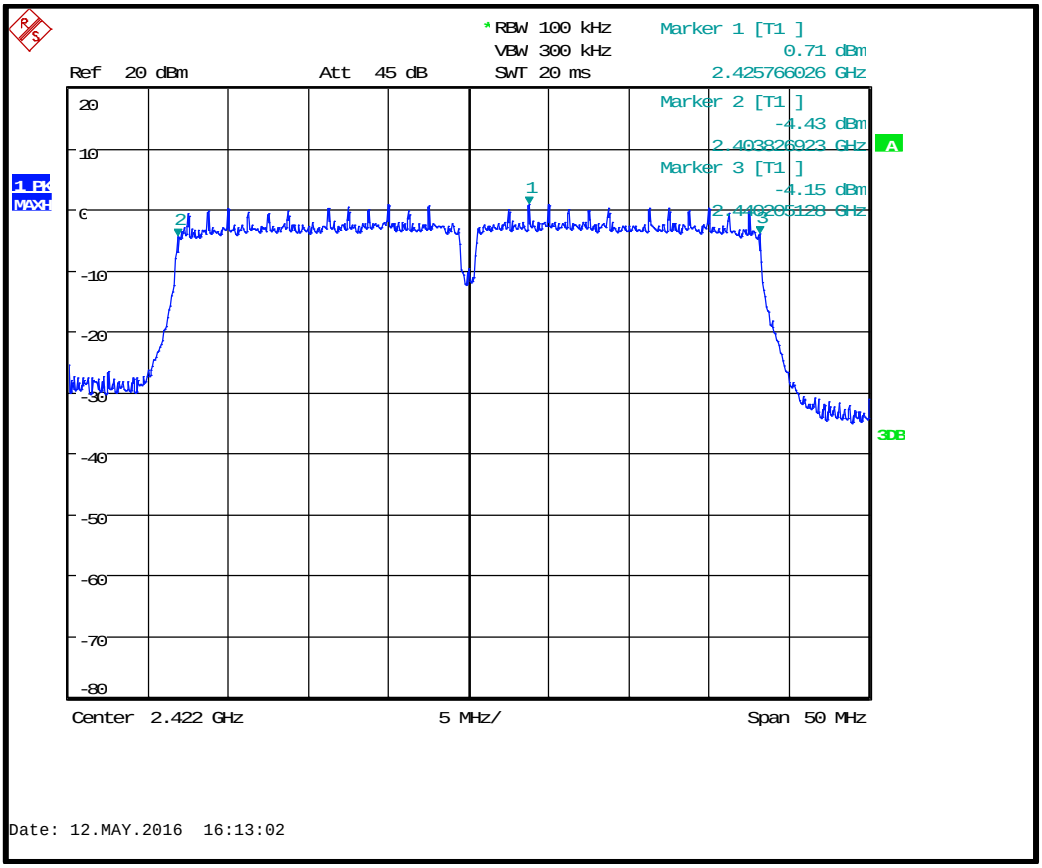

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-9.11 dBm
2.431960000 GHz
Marker 2 [T1]
-14.47 dBm
2.428076538 GHz
Marker 3 [T1]
-13.64 dBm
2.445843385 GHz
Ref 20 dBm
Att 30 dB
1 PK
MAXH
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 10:47:30

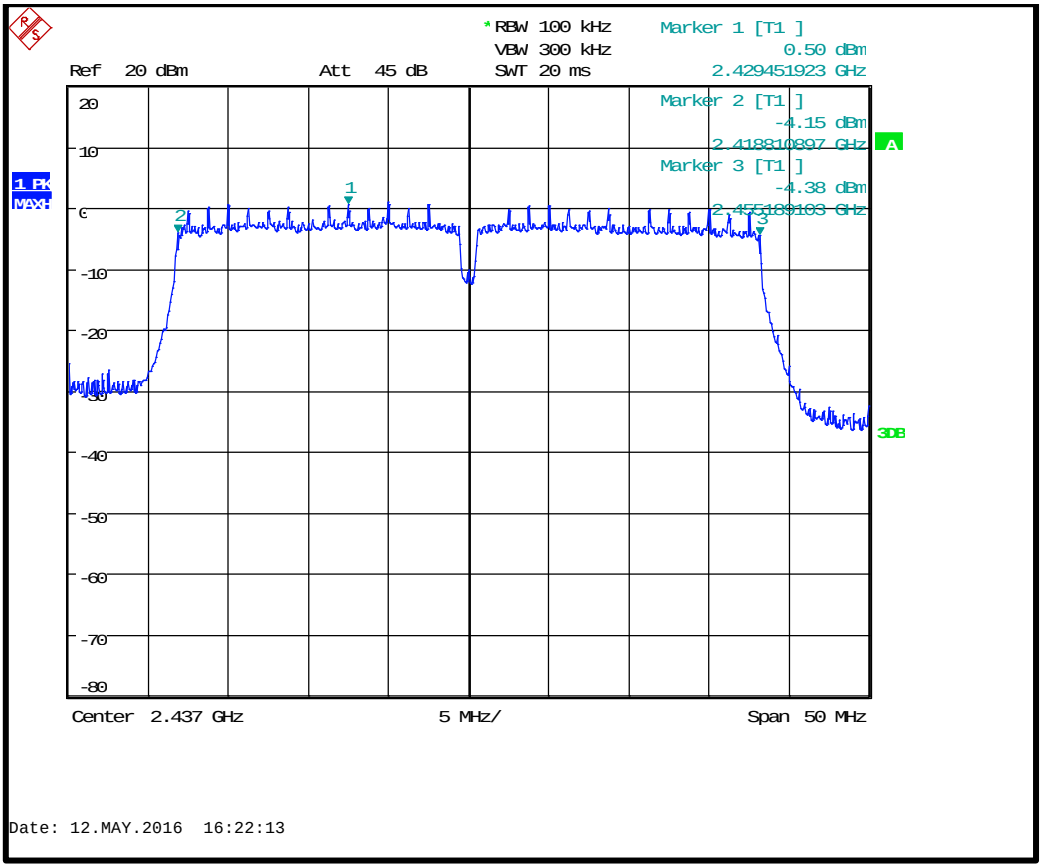

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-9.18 dBm
2.456960000 GHz
Marker 2 [T1]
-12.88 dBm
2.453113846 GHz
Marker 3 [T1]
-12.68 dBm
2.470820154 GHz
Ref 20 dBm
Att 30 dB
1 PK
MAXH
3DB
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 23.JUN.2016 09:54:05

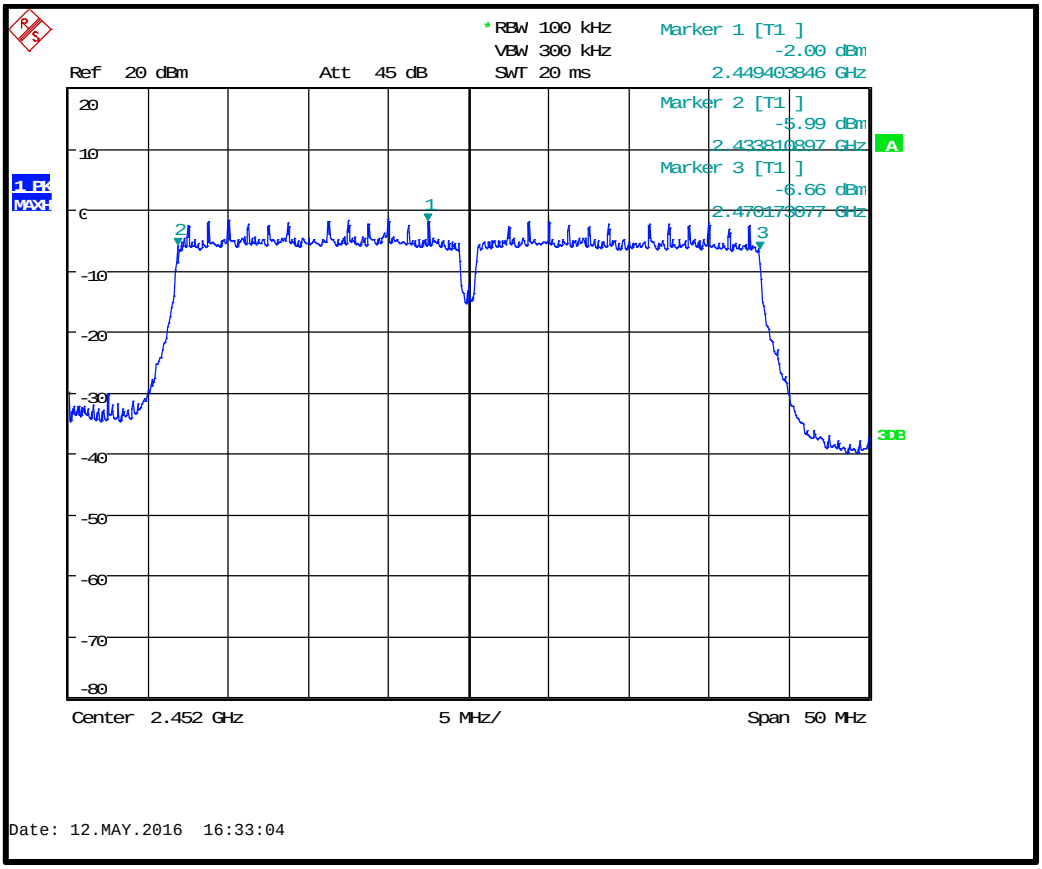
FCC 15.247. Modulation: 802.11n(HT40); Data rate: MCS0; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2422	2403.826923	2440.205128	36378.21	PASS
2437	2418.810897	2455.189103	36378.21	PASS
2452	2433.810897	2470.173077	36362.18	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



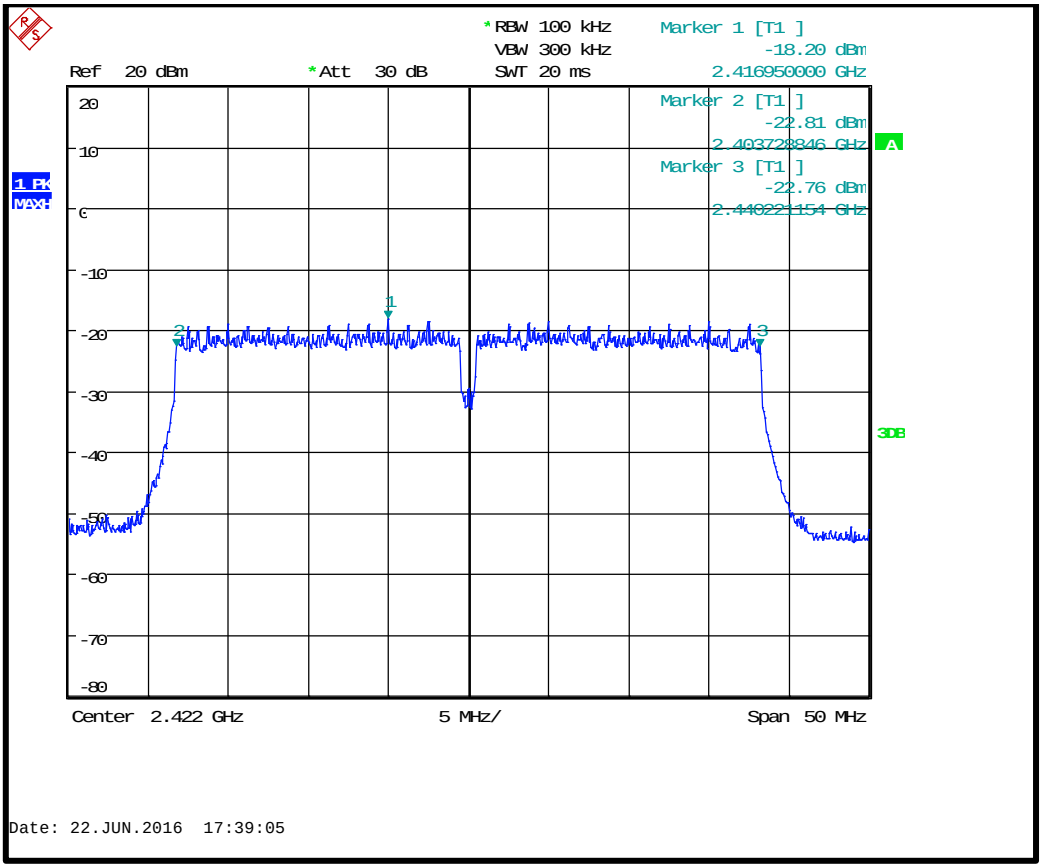

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
0.50 dBm
2.429451923 GHz
Marker 2 [T1]
-4.15 dBm
2.418810897 GHz
Marker 3 [T1]
-4.38 dBm
2.455189183 GHz
Ref 20 dBm
Att 45 dB
1 PK MAXH
A
3DB
Center 2.437 GHz
5 MHz/
Span 50 MHz
Date: 12.MAY.2016 16:22:13

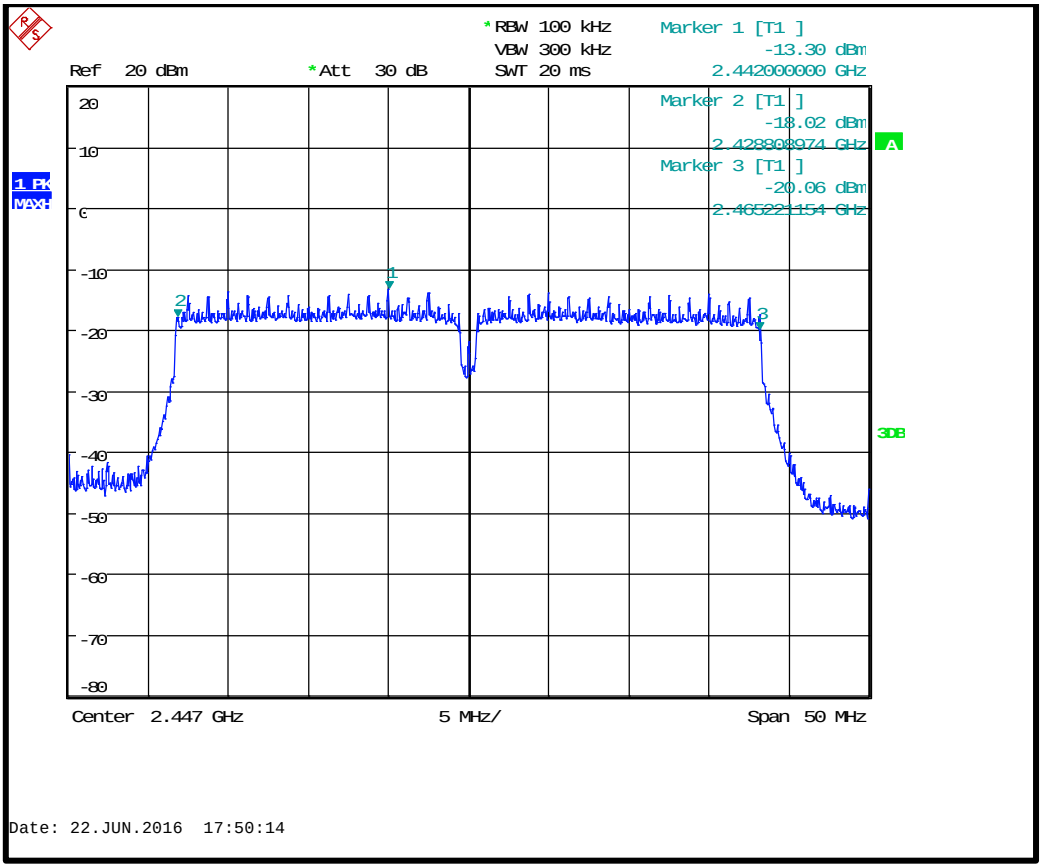

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.00 dBm
2.449403846 GHz
Marker 2 [T1]
-5.99 dBm
2.433810897 GHz
Marker 3 [T1]
-6.66 dBm
2.470173077 GHz
Ref 20 dBm
Att 45 dB
1 PK MAXH
A
3DB
Center 2.452 GHz
5 MHz/
Span 50 MHz
Date: 12.MAY.2016 16:33:04

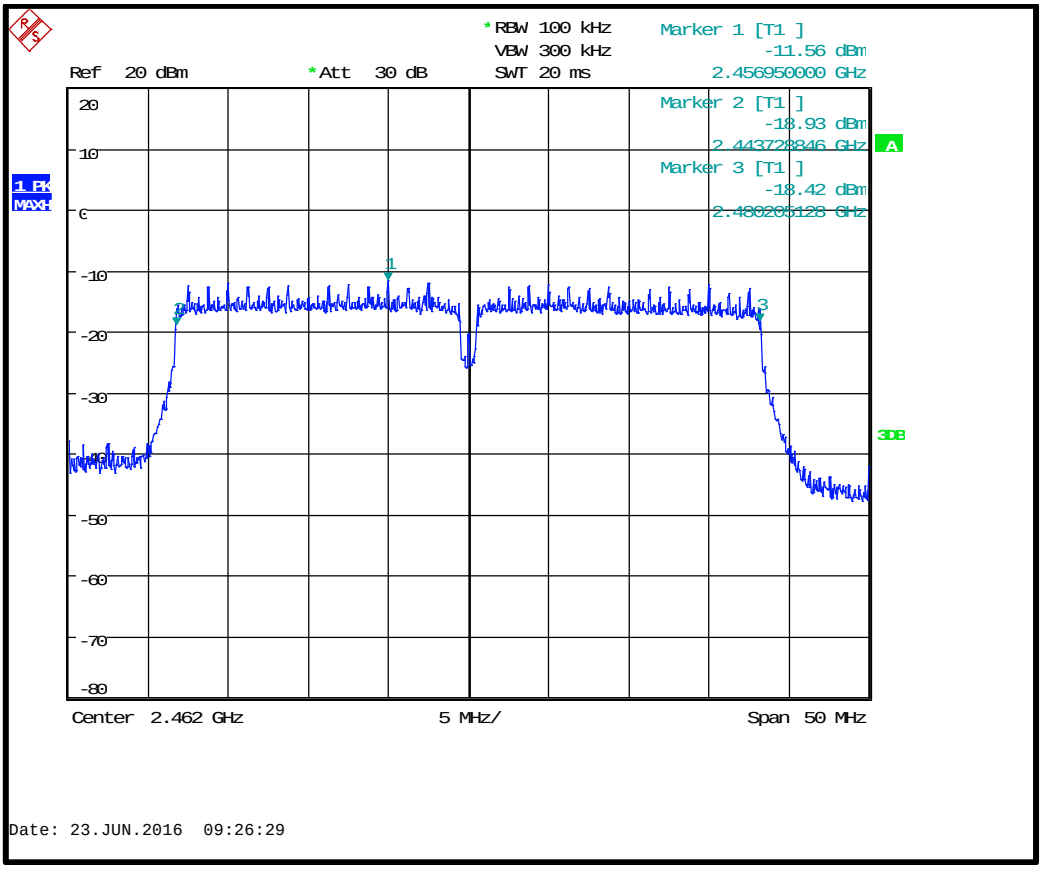
FCC 15.247. Modulation: 802.11n(HT40); Data rate: MCS0; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2422	2403.728846	2440.221154	36492.31	PASS
2447	2428.808974	2465.221154	36412.18	PASS
2452	2443.728846	2480.205128	36476.28	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 1



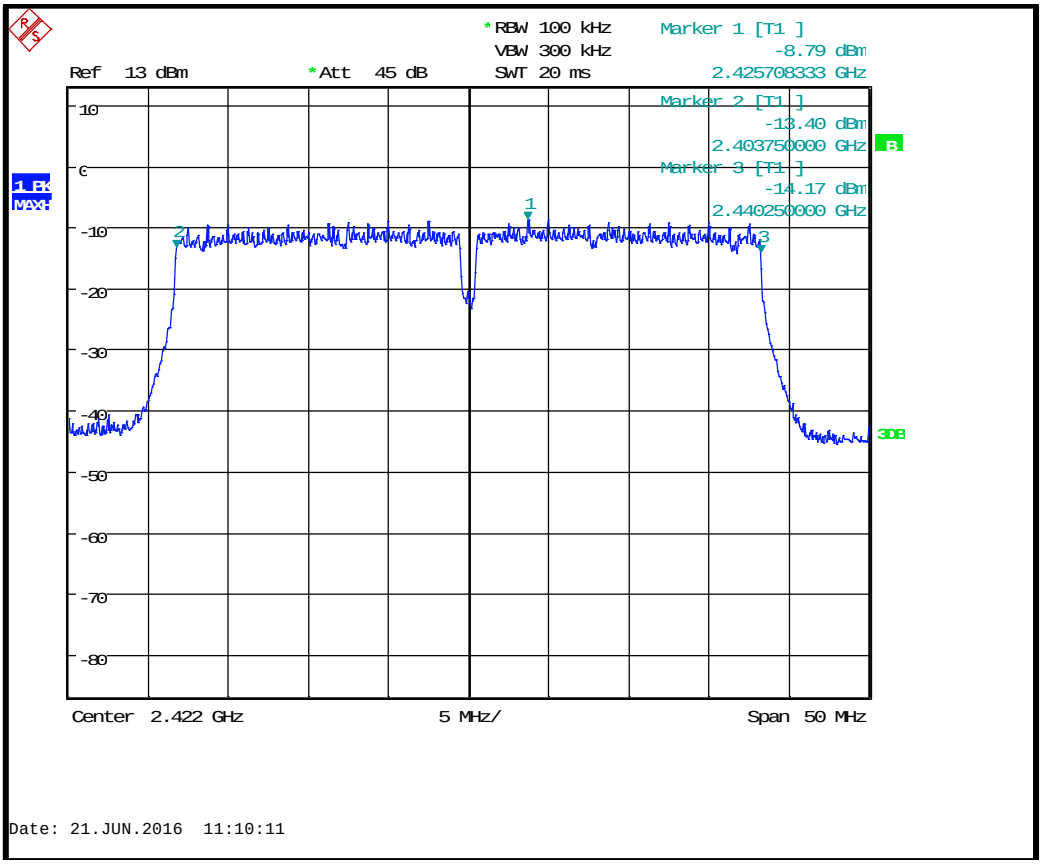

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-13.30 dBm
2.442000000 GHz
Marker 2 [T1]
-18.02 dBm
2.428808974 GHz
Marker 3 [T1]
-20.06 dBm
2.465221154 GHz
Ref 20 dBm
Att 30 dB
1 PK MAXH
3DB
Center 2.447 GHz
5 MHz/
Span 50 MHz
Date: 22.JUN.2016 17:50:14

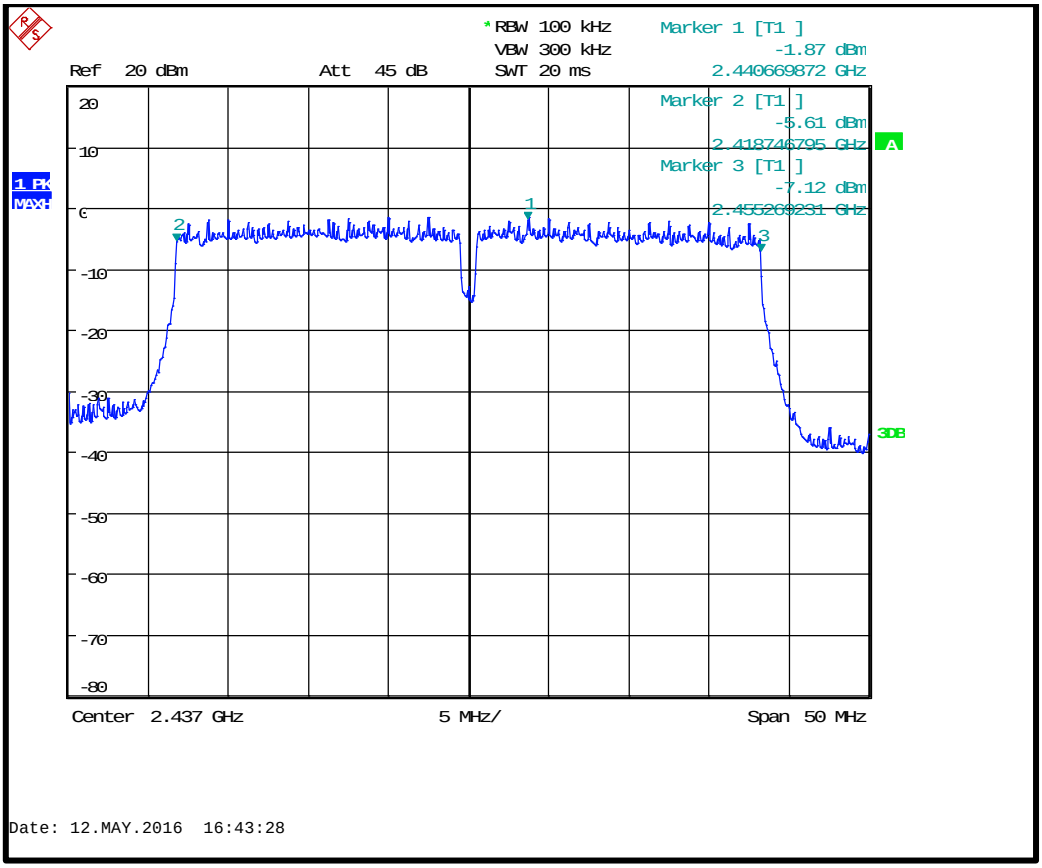

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-11.56 dBm
2.456950000 GHz
Marker 2 [T1]
-18.93 dBm
2.443728846 GHz
Marker 3 [T1]
-18.42 dBm
2.480206128 GHz
Ref 20 dBm
Att 30 dB
1 PK MAXH
3DB
Center 2.462 GHz
5 MHz/
Span 50 MHz
Date: 23.JUN.2016 09:26:29

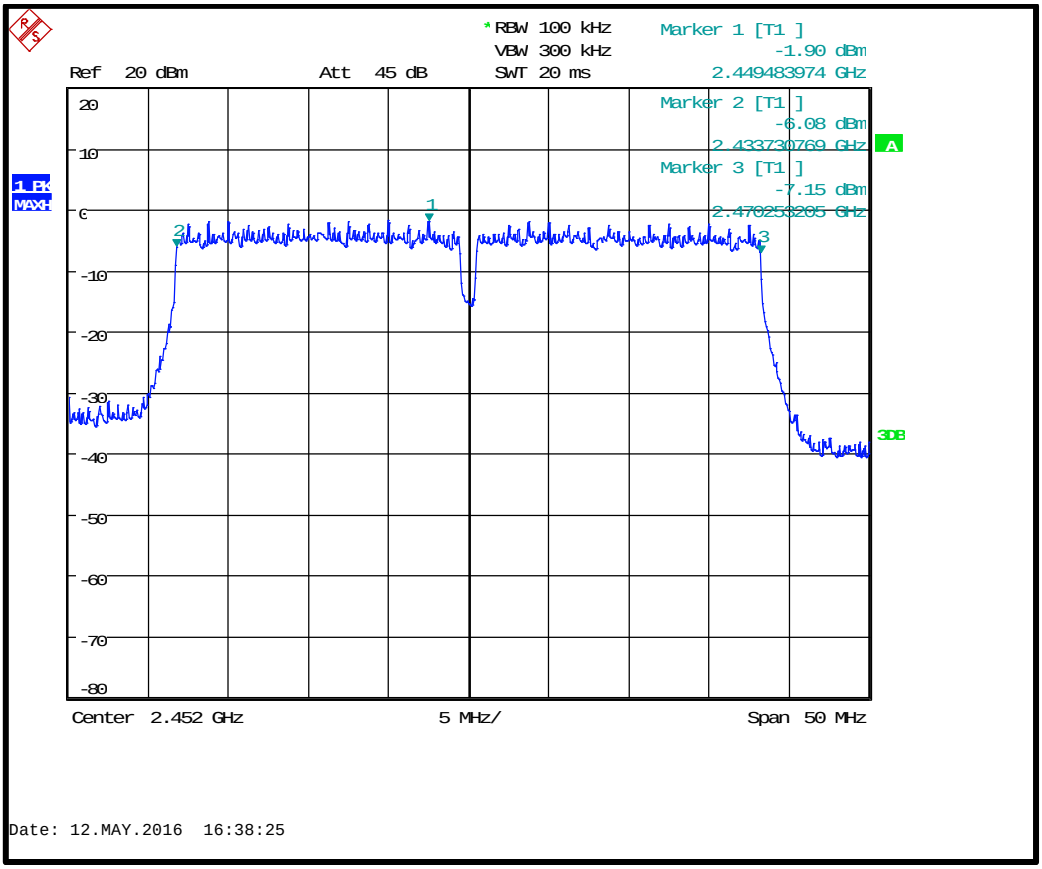
FCC 15.247. Modulation: 802.11n(HT40); Data rate: MCS7; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2422	2403.750000	2440.250000	36500.00	PASS
2437	2418.746795	2455.269231	36522.44	PASS
2452	2433.730769	2470.253205	36522.44	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



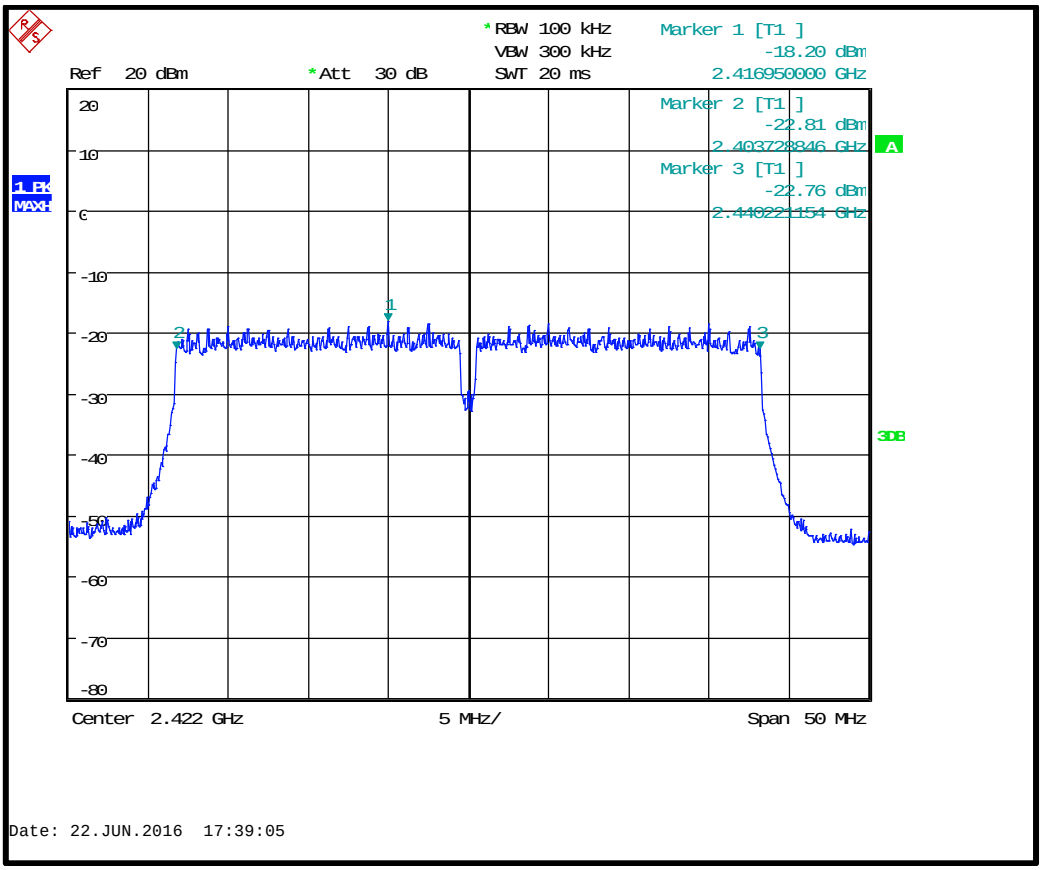

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-1.87 dBm
2.440669872 GHz
Marker 2 [T1]
-5.61 dBm
2.418746795 GHz
Marker 3 [T1]
-7.12 dBm
2.455269231 GHz
Ref 20 dBm
Att 45 dB
1 PK MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.437 GHz
5 MHz/
Span 50 MHz
Date: 12.MAY.2016 16:43:28

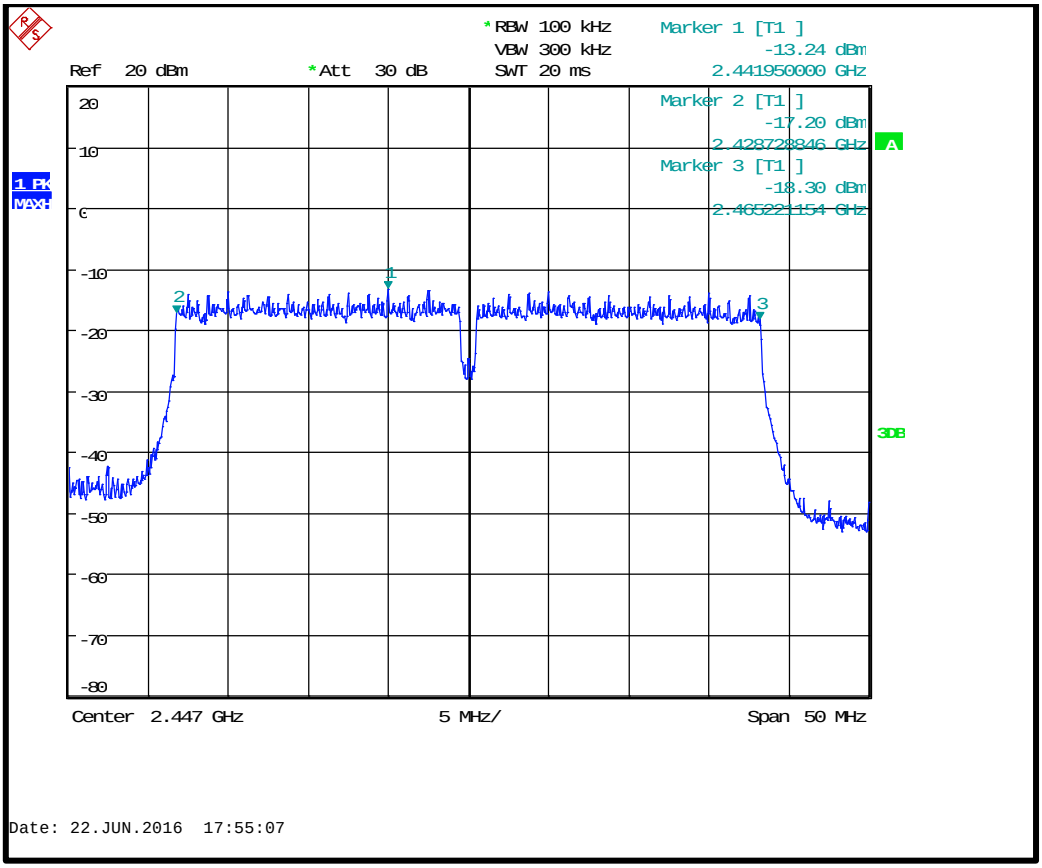

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-1.90 dBm
2.449483974 GHz
Marker 2 [T1]
-6.08 dBm
2.433730769 GHz
Marker 3 [T1]
-7.15 dBm
2.470258205 GHz
Ref 20 dBm
Att 45 dB
1 PK MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.452 GHz
5 MHz/
Span 50 MHz
Date: 12.MAY.2016 16:38:25

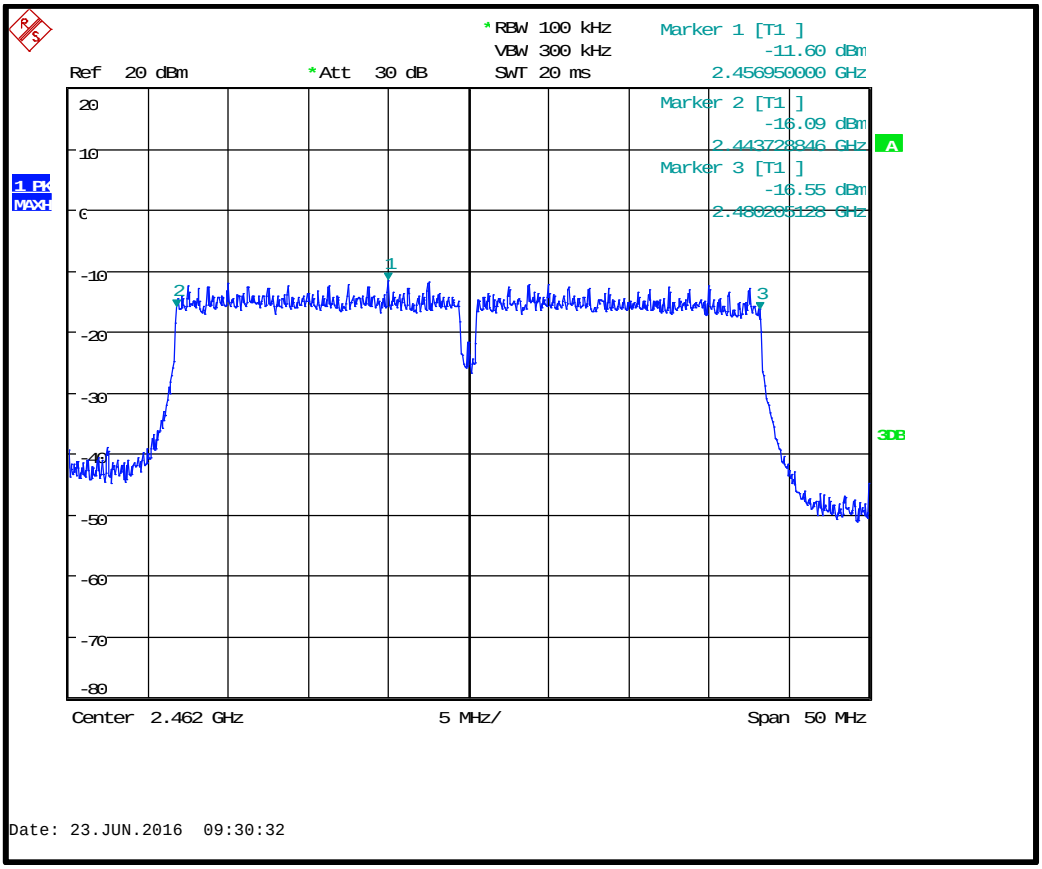
FCC 15.247. Modulation: 802.11ac(HT40); Data rate: MCS7; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2422	2403.728846	2440.221154	36492.308	PASS
2447	2428.728846	2465.221154	36492.308	PASS
2452	2443.728846	2480.205128	36476.282	PASS

*Please refer to the EUT Power Table for Measurements

Ant 1



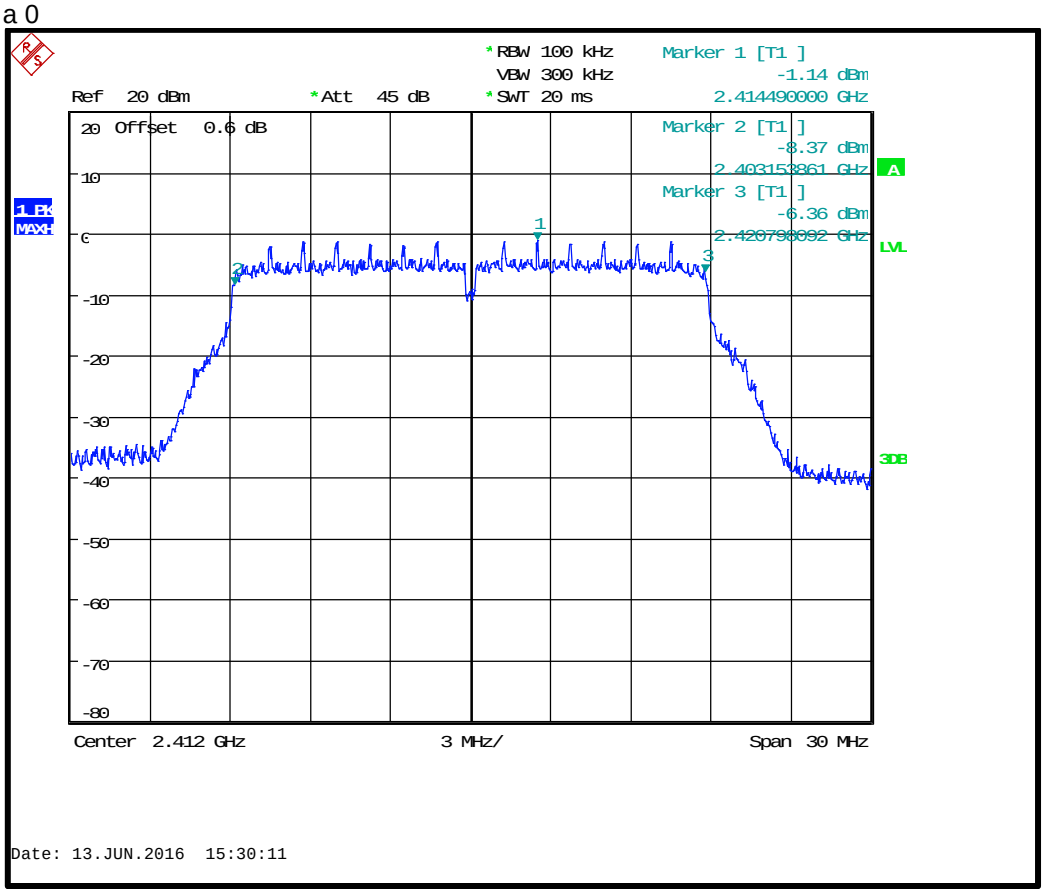

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-13.24 dBm
2.441950000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-17.20 dBm
2.428728846 GHz
Marker 3 [T1]
-18.30 dBm
2.465228154 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.447 GHz
5 MHz/
Span 50 MHz
Date: 22.JUN.2016 17:55:07

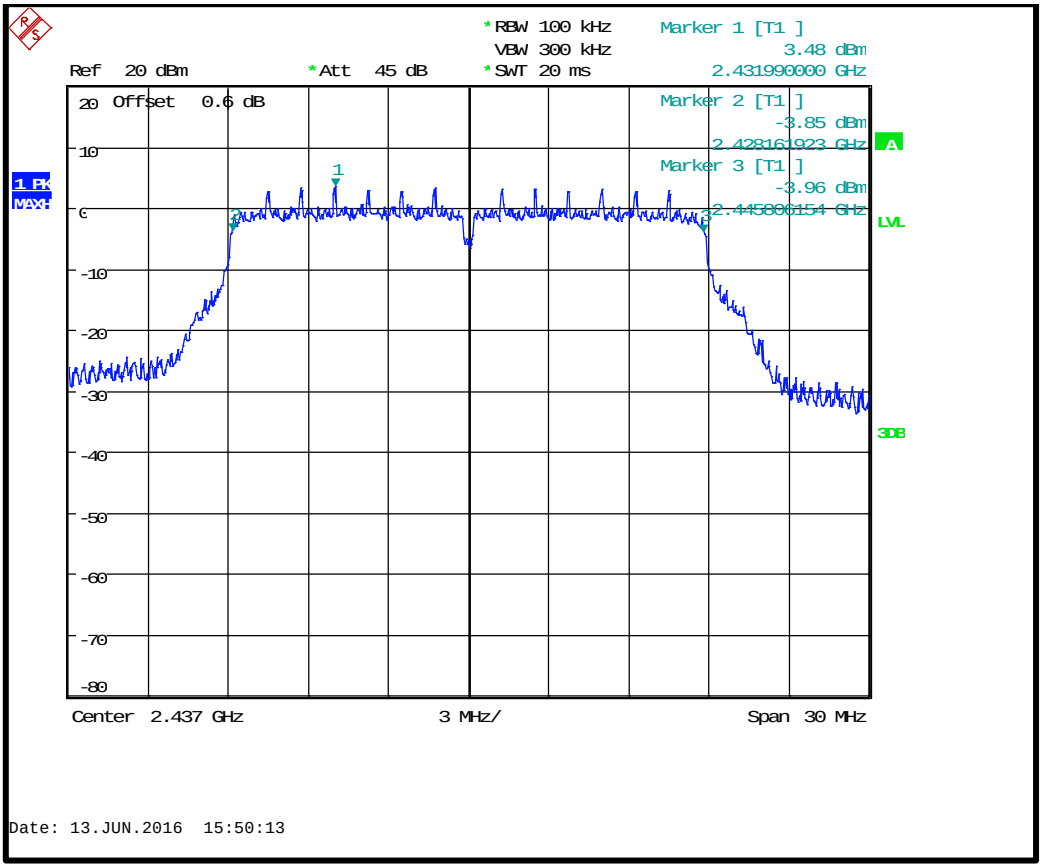

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-11.60 dBm
2.456950000 GHz
Ref 20 dBm
Att 30 dB
Marker 2 [T1]
-16.09 dBm
2.443728846 GHz
Marker 3 [T1]
-16.55 dBm
2.480206128 GHz
1 PK
MAXH
A
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.462 GHz
5 MHz/
Span 50 MHz
Date: 23.JUN.2016 09:30:32

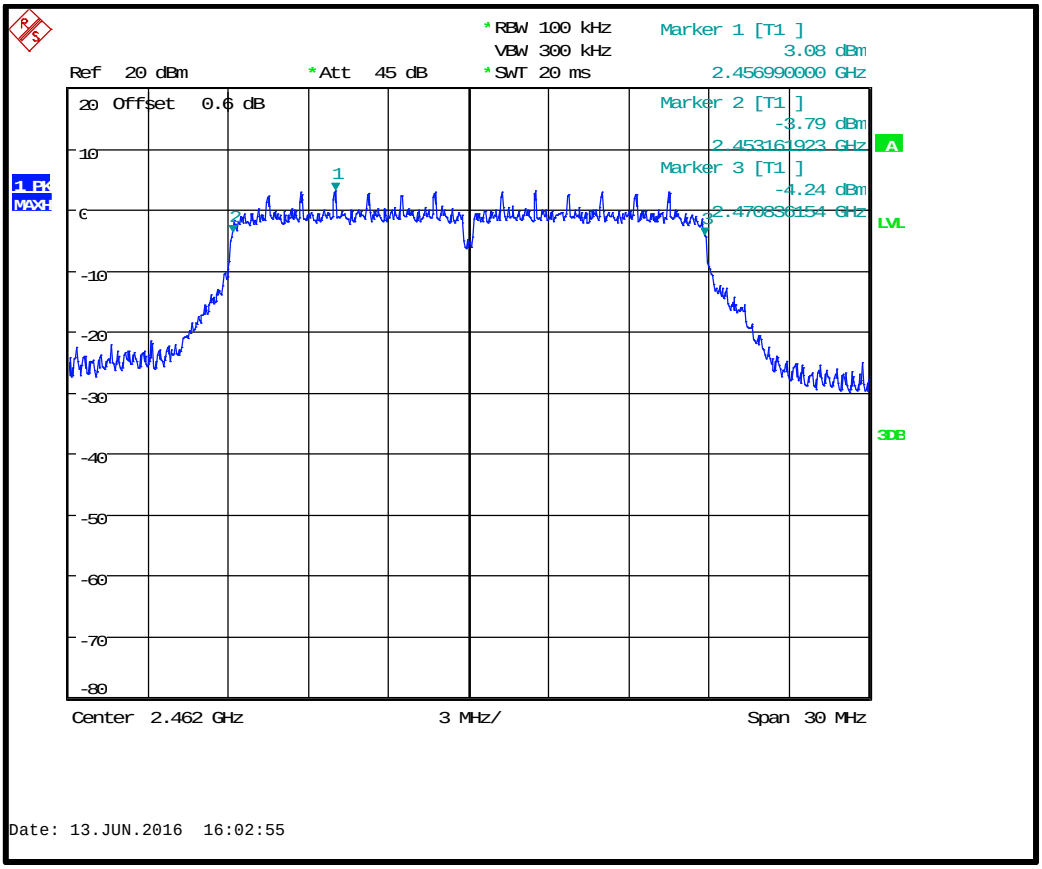
FCC 15.247. Modulation: 801.11ac(VHT20); Data rate: MCS0NSS1; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2412	2403.153861	2420.798092	17644.23	PASS
2437	2428.161923	2445.806154	17644.23	PASS
2462	2453.161923	2470.836154	17674.23	PASS

*Please refer to the EUT Power Table for Measurements

Antenna 0



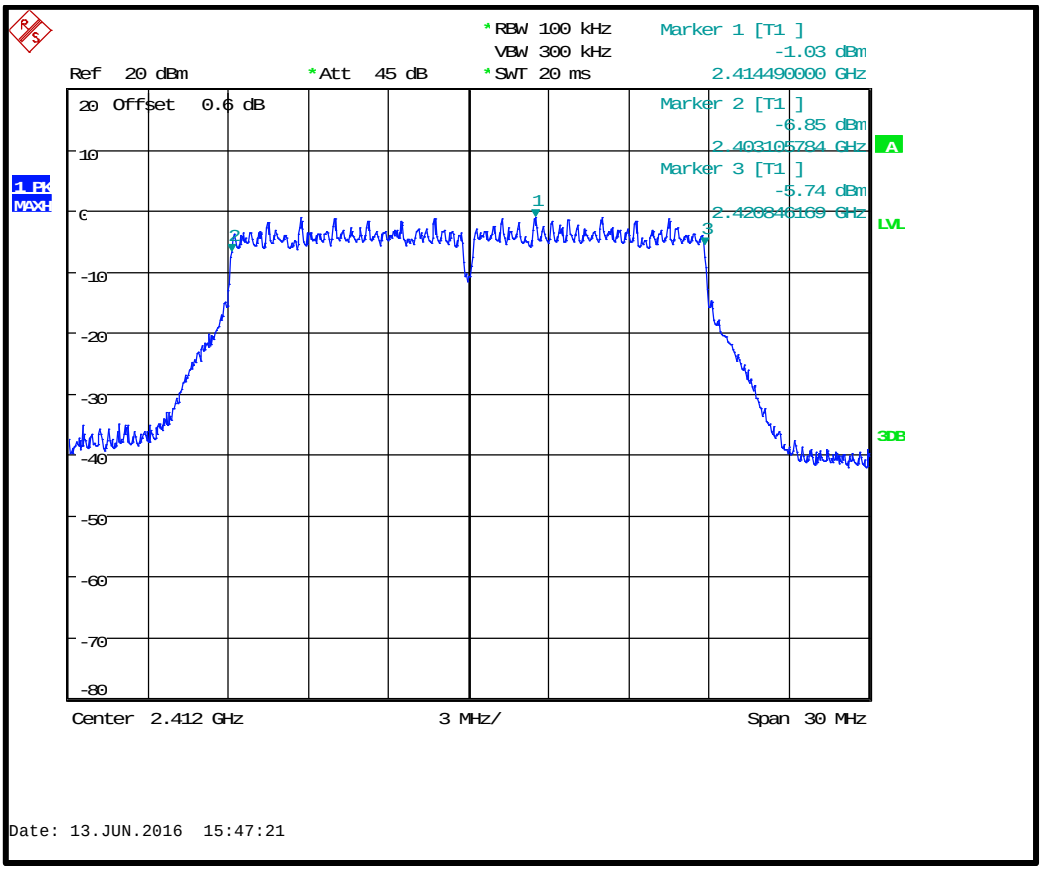

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
3.48 dBm
2.431990000 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-3.85 dBm
2.428161923 GHz
Marker 3 [T1]
-3.96 dBm
2.445806154 GHz
1 PK MAXH
A
LVL
3DB
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 13.JUN.2016 15:50:13

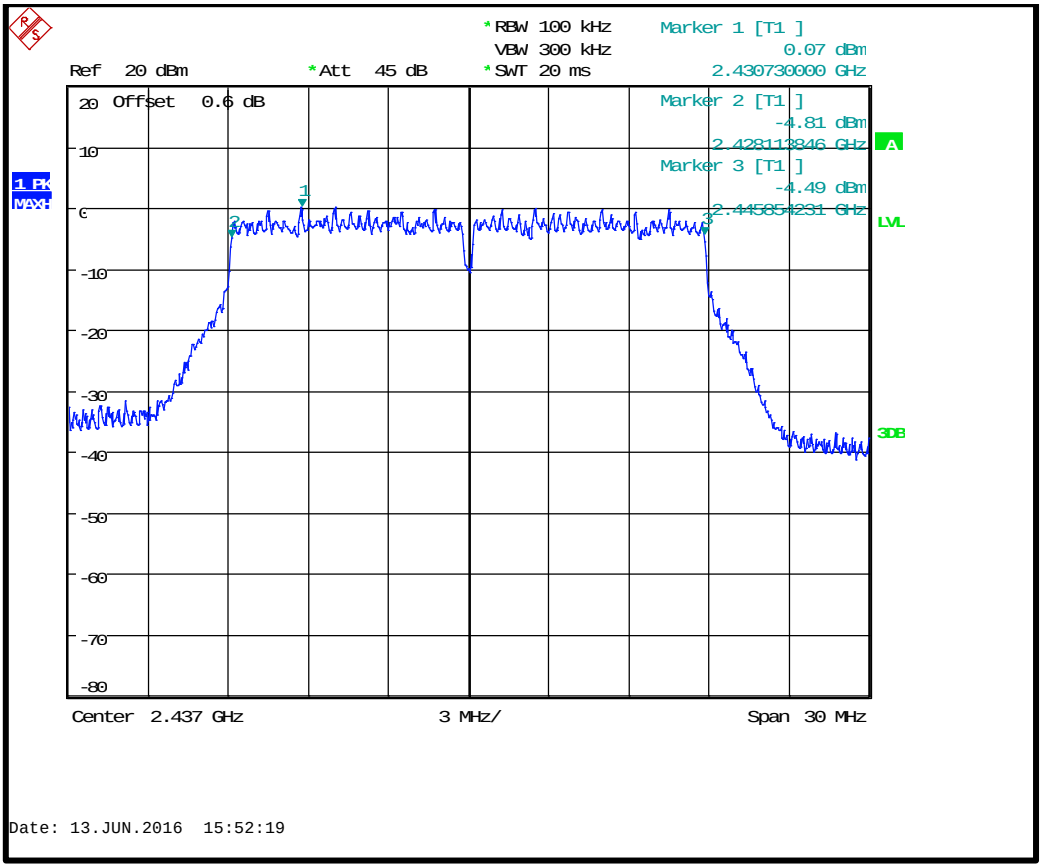

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
3.08 dBm
2.456990000 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-3.79 dBm
2.453161923 GHz
Marker 3 [T1]
-4.24 dBm
2.470836154 GHz
1 PK MAXH
A
LVL
3DB
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 13.JUN.2016 16:02:55

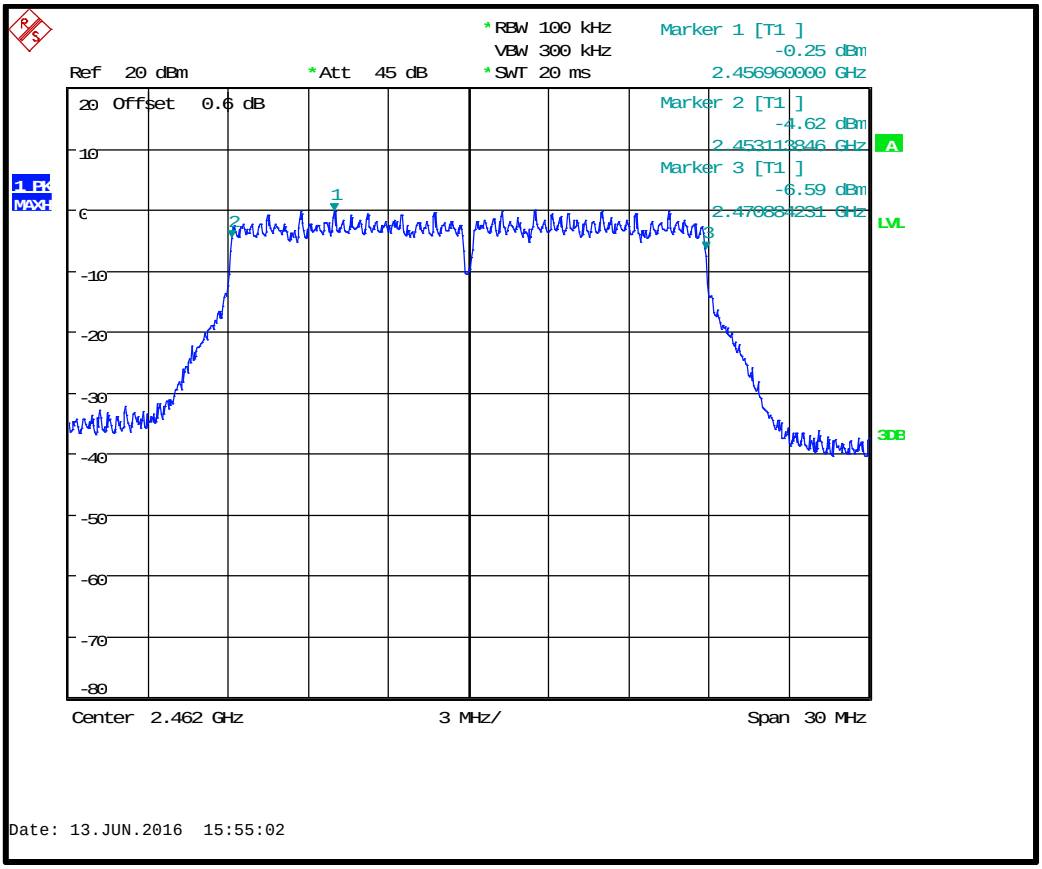
FCC 15.247. Modulation: 802.11ac(VHT20); Data rate: MCS8NSS1; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2412	2403.105784	2420.846169	17740.39	PASS
2437	2428.113846	2445.854231	17740.38	PASS
2462	2453.113846	2470.884231	17770.38	PASS

*Please refer to the EUT Power Table for Measurements

Ant 0



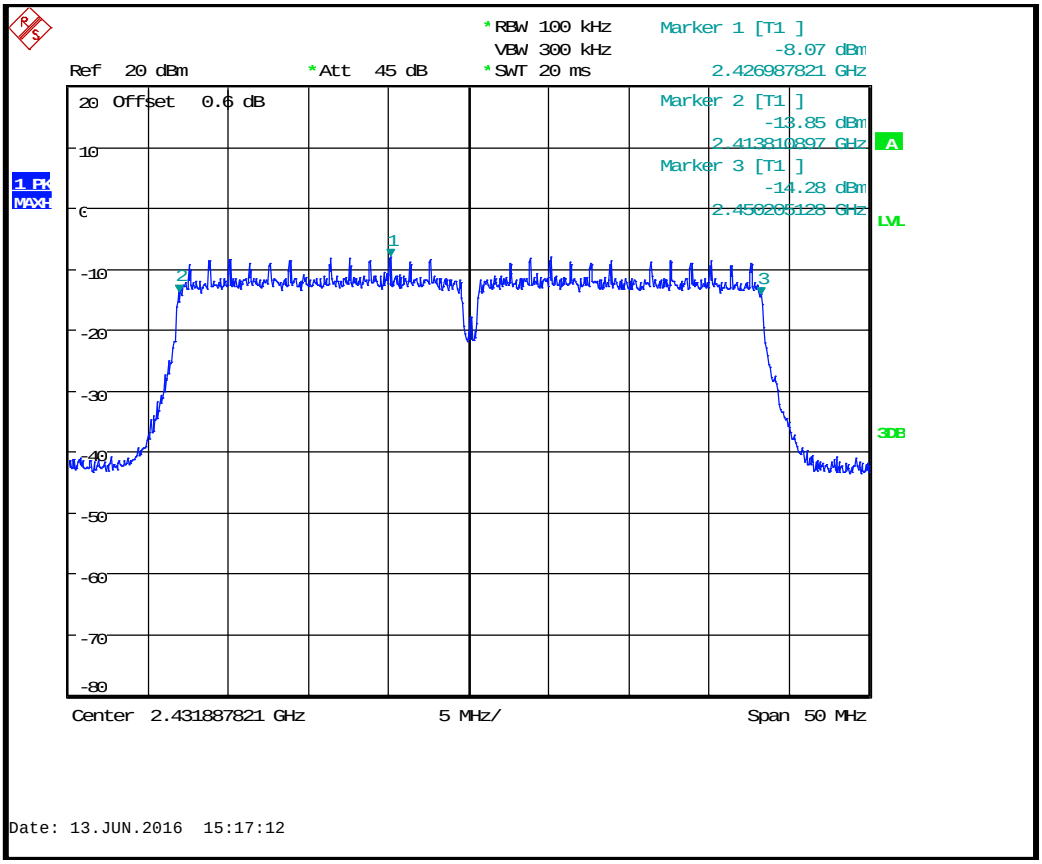

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
0.07 dBm
2.430730000 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-4.81 dBm
2.428113846 GHz
Marker 3 [T1]
-4.49 dBm
2.445854231 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.437 GHz
3 MHz/
Span 30 MHz
Date: 13.JUN.2016 15:52:19

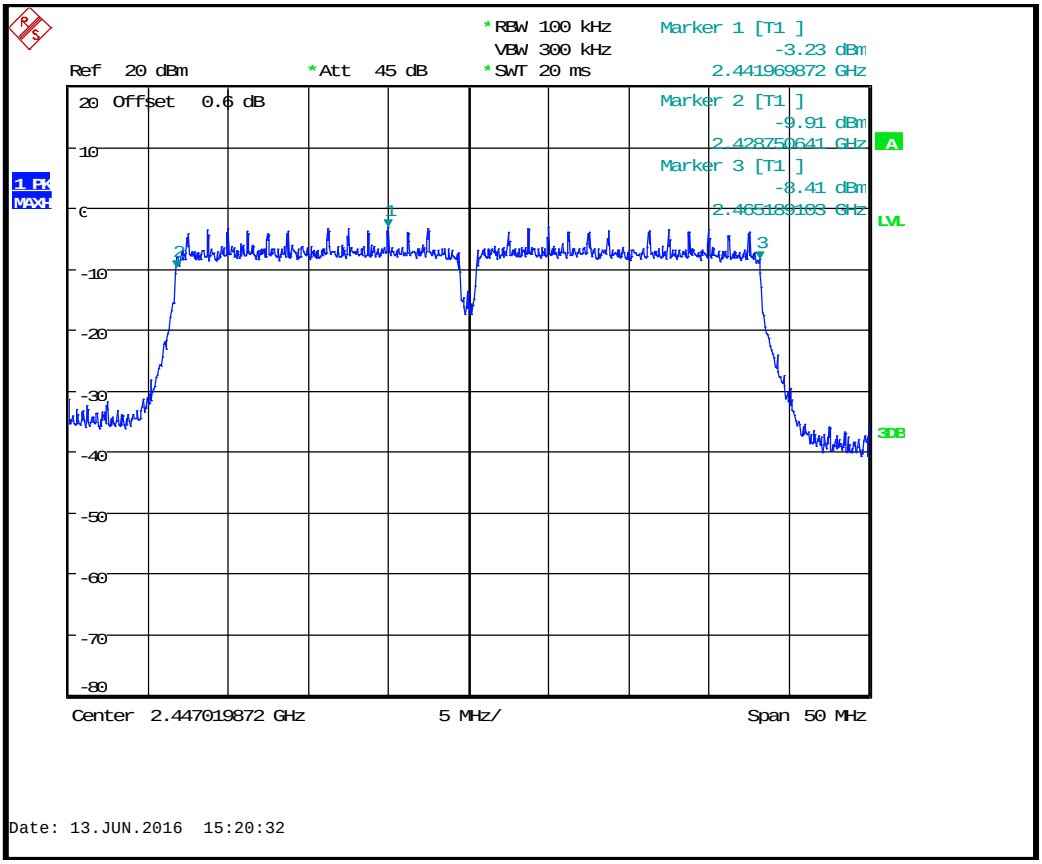

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-0.25 dBm
2.456960000 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-4.62 dBm
2.453113846 GHz
Marker 3 [T1]
-6.59 dBm
2.470884231 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.462 GHz
3 MHz/
Span 30 MHz
Date: 13.JUN.2016 15:55:02

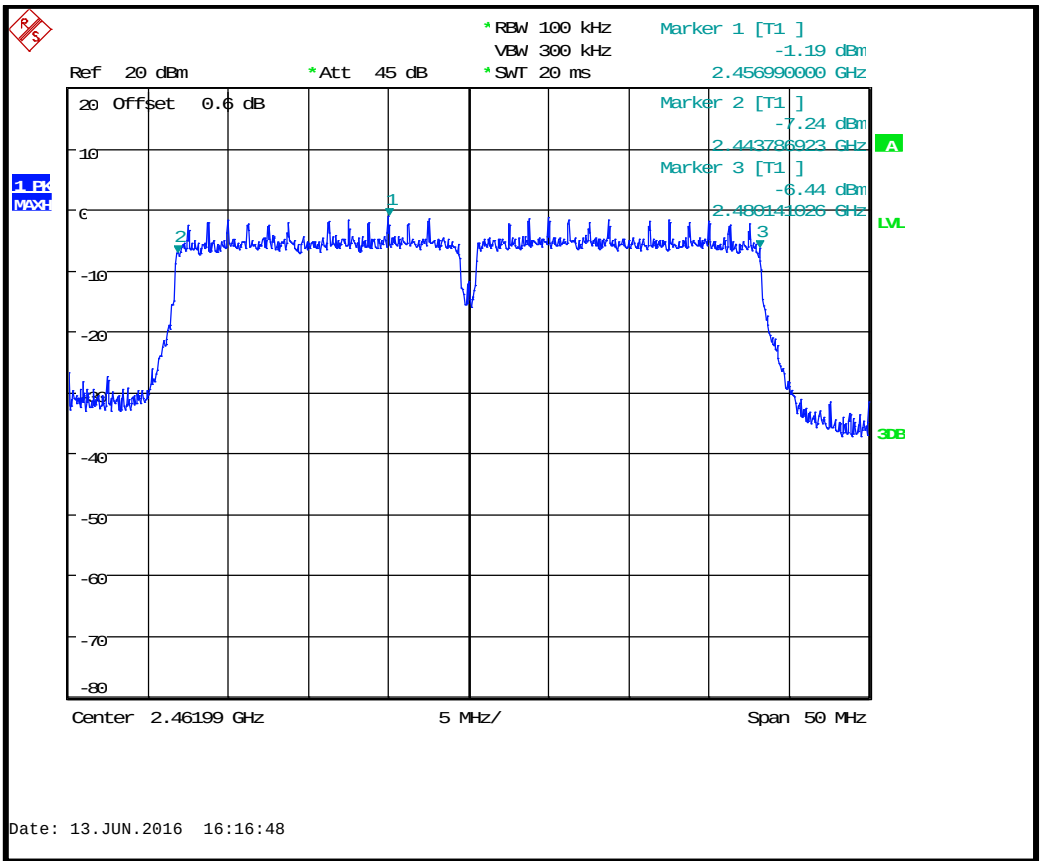
FCC 15.247. Modulation: 802.11ac(VHT40); Data rate: MCS0NSS1; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2432	2413.810897	2450.205128	36394.231	PASS
2447	2428.750641	2465.189103	36438.462	PASS
2452	2443.786923	2480.141026	36354.103	PASS

*Please refer to the EUT Power Table for Measurements

Ant 0



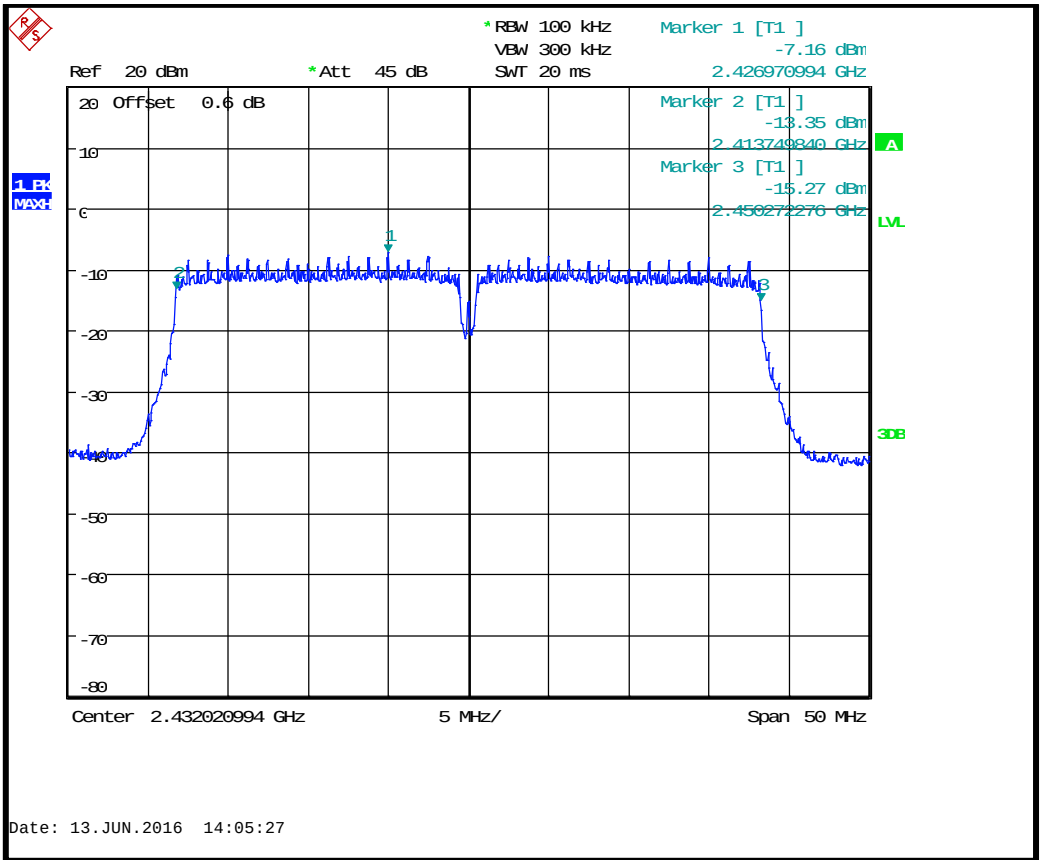

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-3.23 dBm
2.441969872 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-9.91 dBm
2.428750641 GHz
Marker 3 [T1]
-8.41 dBm
2.465189103 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.447019872 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 15:20:32

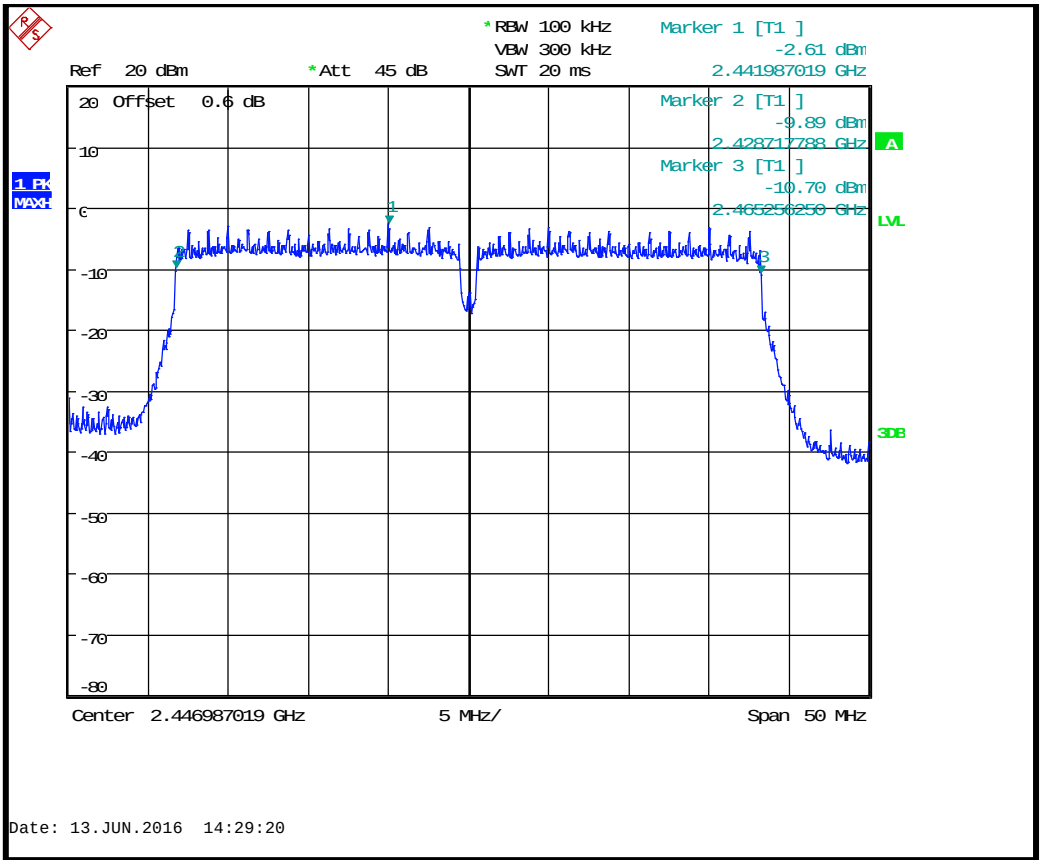

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-1.19 dBm
2.456990000 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-7.24 dBm
2.443786923 GHz
Marker 3 [T1]
-6.44 dBm
2.480141026 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.46199 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 16:16:48

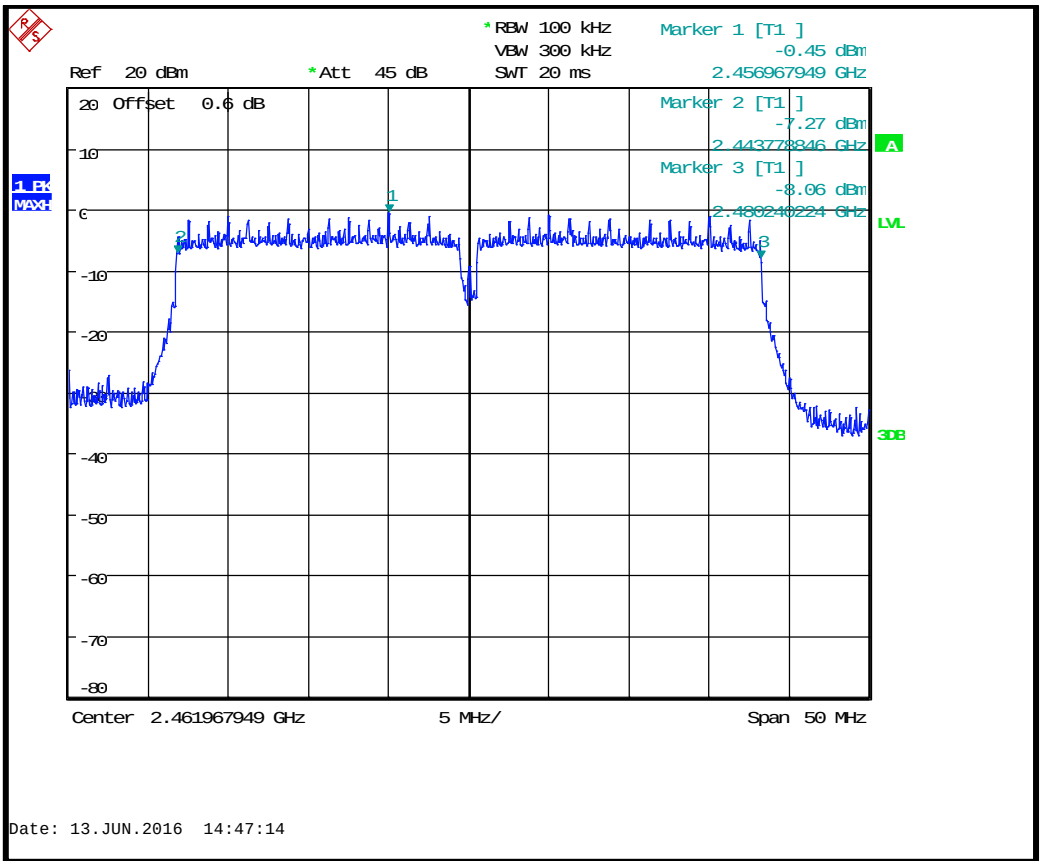
FCC 15.247. Modulation: 802.11ac(VHT40); Data rate: MCS0NSS1; Power settings*				
Channel Frequency (MHz)	F_L (MHz)	F_H (MHz)	6dB Bandwidth (kHz)	Result
2432	2413.749840	2450.272276	36522.436	PASS
2447	2428.717788	2465.256250	36538.460	PASS
2462	2443.778846	2480.240224	36461.378	PASS

*Please refer to the EUT Power Table for Measurements

Ant 1



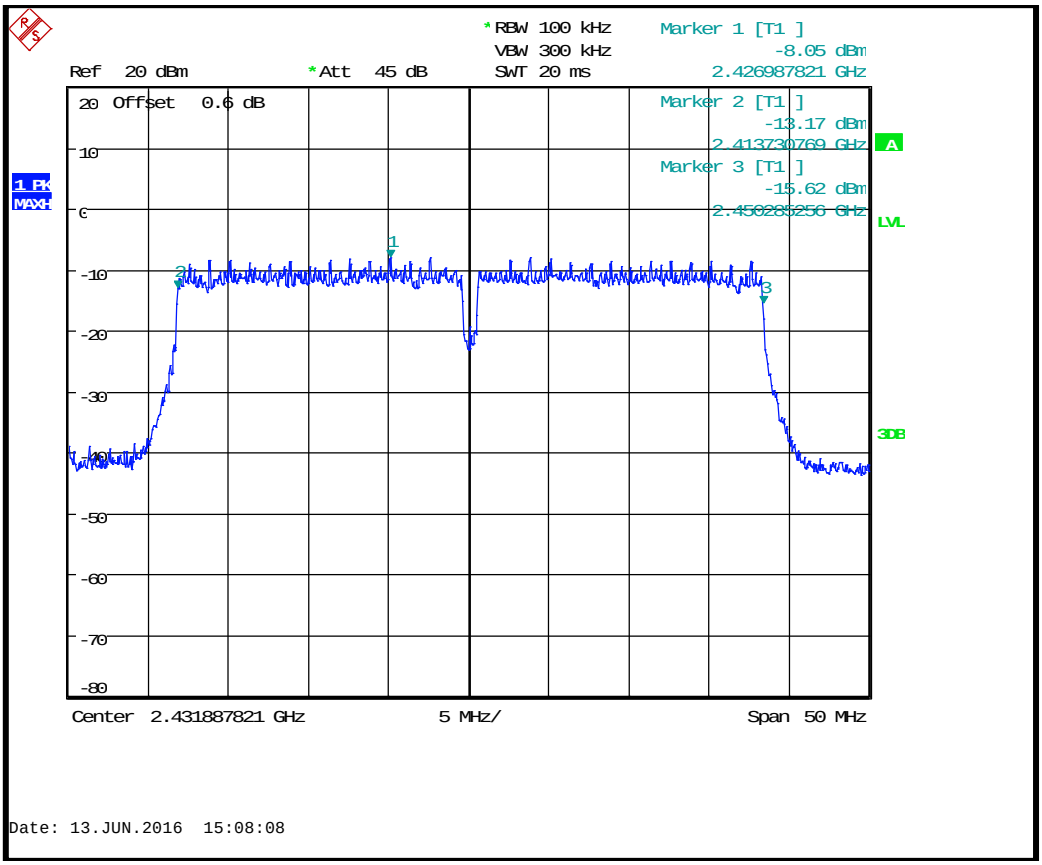

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.61 dBm
2.441987019 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-9.89 dBm
2.428717788 GHz
Marker 3 [T1]
-10.70 dBm
2.465256250 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.446987019 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 14:29:20

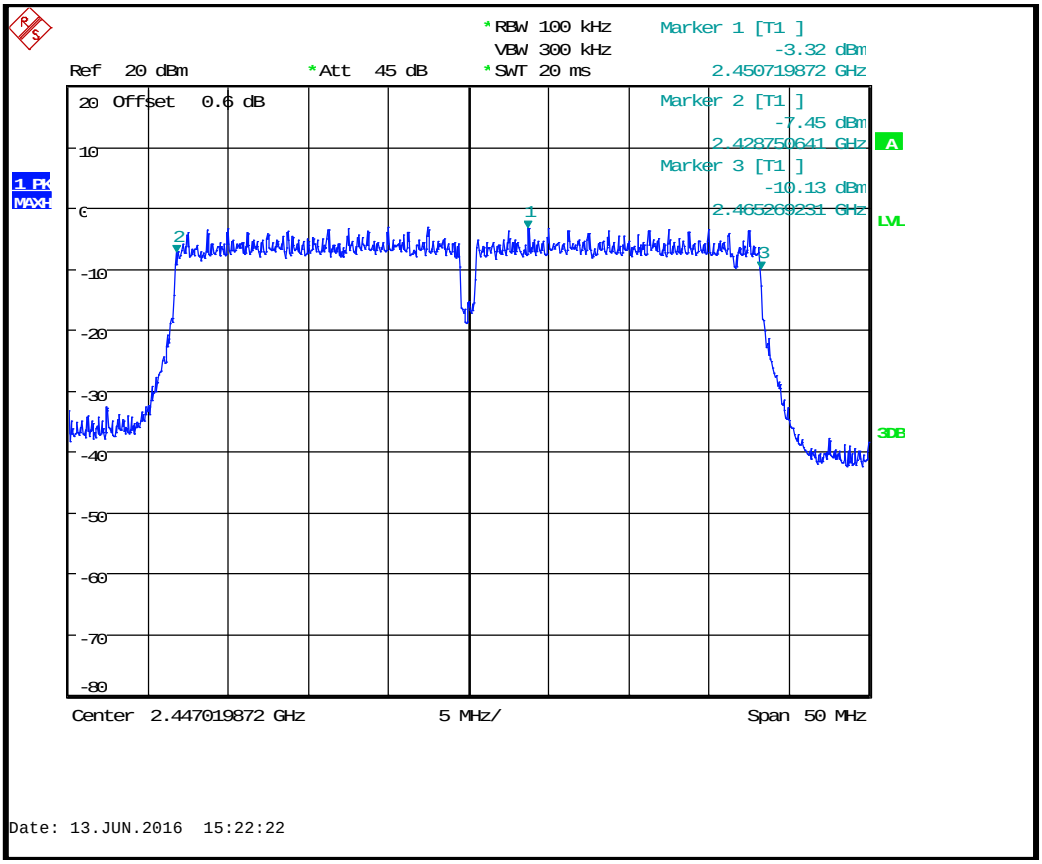

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-0.45 dBm
2.456967949 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-7.27 dBm
2.443778846 GHz
Marker 3 [T1]
-8.06 dBm
2.480240224 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.461967949 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 14:47:14

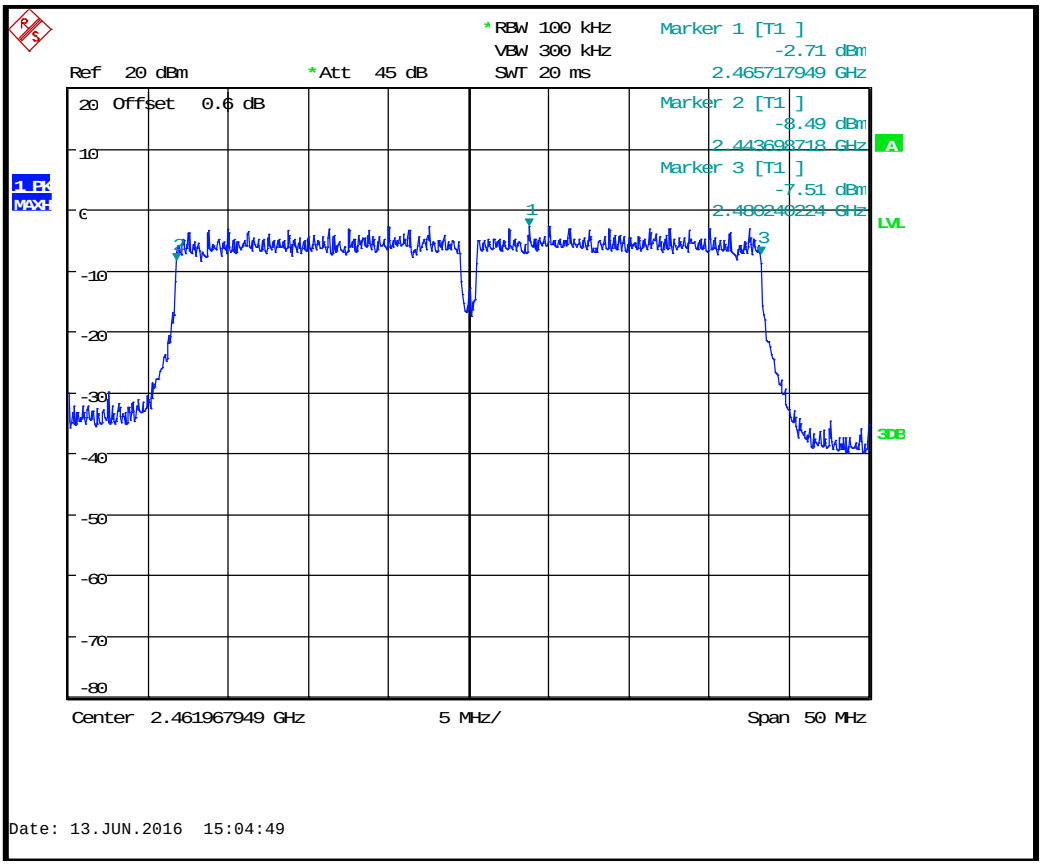
FCC 15.247. Modulation: 802.11ac(VHT40); Data rate: MCS9NSS1; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2432	2413.730769	2450.285256	36554.487	PASS
2447	2428.750641	2465.269231	36518.590	PASS
2462	2443.698718	2480.240224	36541.506	PASS

*Please refer to the EUT Power Table for Measurements

Ant 0



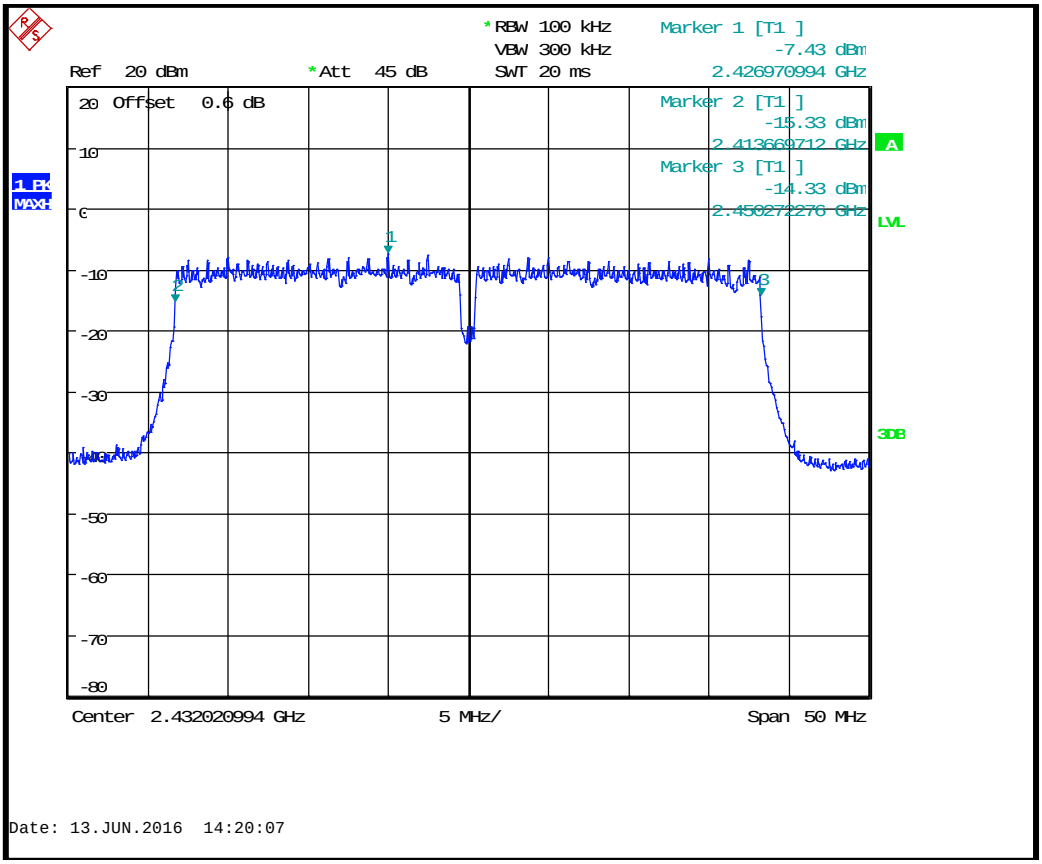

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-3.32 dBm
2.450719872 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-7.45 dBm
2.428750641 GHz
Marker 3 [T1]
-10.13 dBm
2.465269231 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.447019872 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 15:22:22

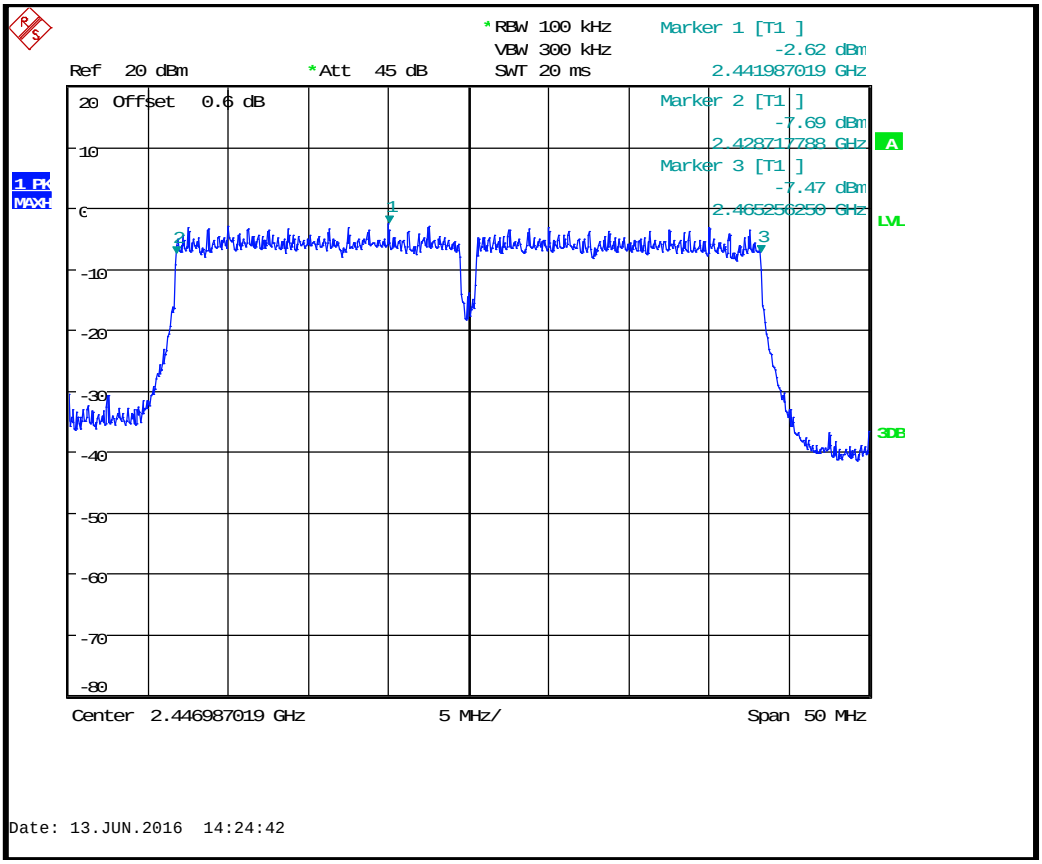

RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.71 dBm
2.465717949 GHz
Ref 20 dBm
Att 45 dB
Offset 0.6 dB
Marker 2 [T1]
-8.49 dBm
2.443698718 GHz
Marker 3 [T1]
-7.51 dBm
2.488248224 GHz
1 PK
MAXH
A
LVL
3DB
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.461967949 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 15:04:49

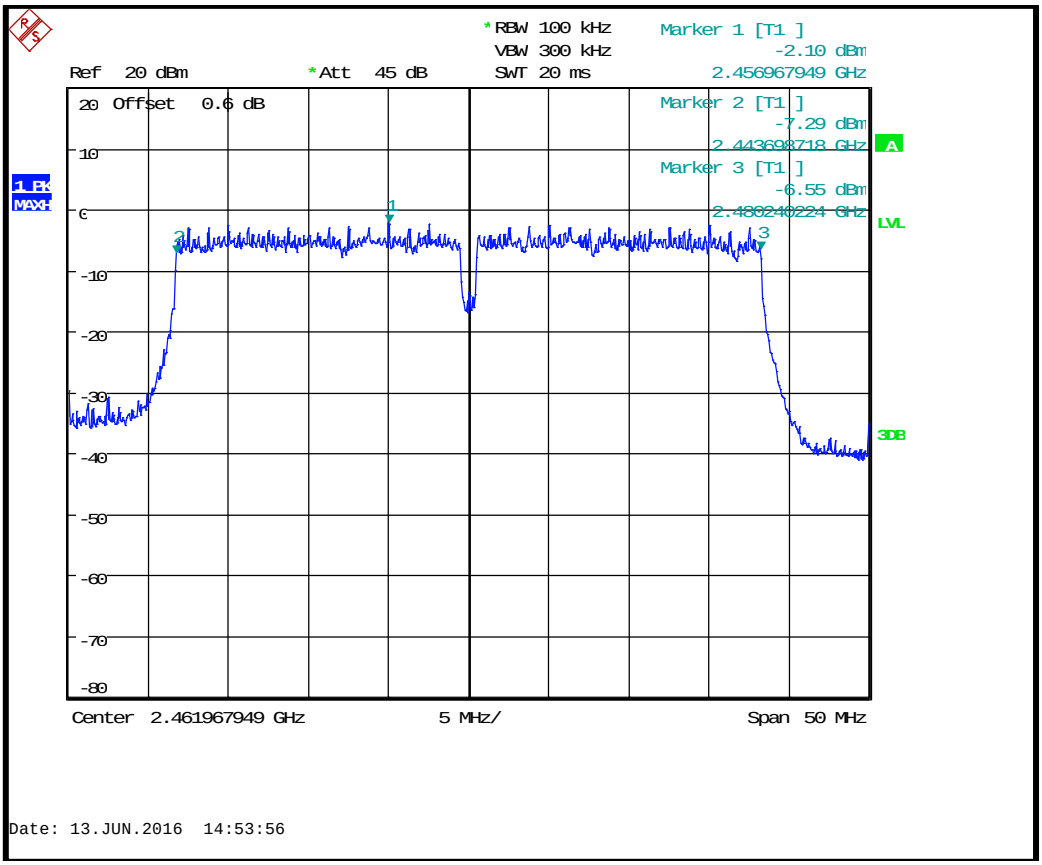
FCC 15.247. Modulation: 802.11ac(VHT40); Data rate: MCS9NSS1; Power settings*				
Channel Frequency (MHz)	**F_L (MHz)**	**F_H (MHz)**	**6dB Bandwidth (kHz)**	**Result**
2432	2428.717788	2465.25625	36538.462	PASS
2447	2413.669712	2450.272276	36602.56	PASS
2462	2443.698718	2480.240224	36541.506	PASS

*Please refer to the EUT Power Table for Measurements

Ant 1




RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.62 dBm
2.441987019 GHz
Ref 20 dBm
Att 45 dB
20 Offset 0.6 dB
Marker 2 [T1]
-7.69 dBm
2.428717788 GHz
Marker 3 [T1]
-7.47 dBm
2.465256258 GHz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
A
LVL
3DB
Center 2.446987019 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 14:24:42


RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Marker 1 [T1]
-2.10 dBm
2.456967949 GHz
Ref 20 dBm
Att 45 dB
20 Offset 0.6 dB
Marker 2 [T1]
-7.29 dBm
2.443698718 GHz
Marker 3 [T1]
-6.55 dBm
2.480240224 GHz
10
0
-10
-20
-30
-40
-50
-60
-70
-80
A
LVL
3DB
Center 2.461967949 GHz
5 MHz/
Span 50 MHz
Date: 13.JUN.2016 14:53:56

13 Maximum conducted output power

13.1 Definition

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the signal bandwidth.

The maximum conducted output power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level.

13.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Lab 4
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.9.2
EUT Channels / Frequencies Measured:	Low / Mid / High
EUT Occupied Bandwidths:	20 MHz and 40 MHz
EUT Duty Cycle:	Greater than 99%
Deviations From Standard:	None
Measurement BW:	Wideband meter used
Measurement Span:	Wideband meter used
Measurement Points:	Wideband meter used
Measurement Detector:	RMS
Voltage Extreme Environment Test Range:	Mains Power = 85 % and 115 % of Nominal (FCC only requirement);

Environmental Conditions (Normal Environment)

Temperature: 22 °C	+15 ºC to +35 ºC (as declared)
Humidity: 44 % RH	20 % RH to 75 % RH (as declared)

13.3 Test Limit

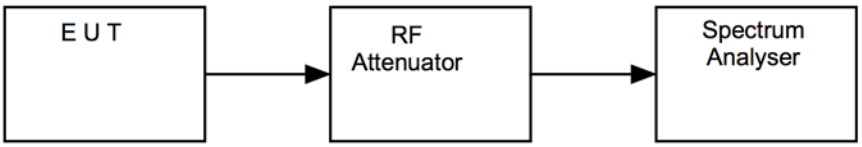
For systems employing digital modulation techniques operating in the bands 902 to 928 MHz, 2400 to 2483.5 MHz and 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W.

13.4 Test Method

The EUT was setup as per section 9 of this report and, as per Figure iv, the analyser was used to measure each antenna output in turn, having taken account of all path losses. The resolution bandwidth of the spectrum analyser was set between 1 and 5 % of the EUT occupied bandwidth and the analyser band power function used to calculate the average power. The results were summed as in the tables below.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure iv Test Set-up



13.5 Test Equipment

Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
RPR3006W	Dare	Power Meter	REF2112	22/03/2017
Attenuation pad		10 dB pad		In use

13.6 Test Results

Channel: 2412 MHz; Modulation: CCK; Data rate: 1 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	18.6	0	72.44
1	18.4	0	69.18
Total:			141.63
Result:			PASS

Channel: 2412 MHz; Modulation: CCK; Data rate: 11 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	18.8	0	75.86
1	18.4	0	69.18
Total:			145.04
Result:			PASS

Channel: 2437 MHz; Modulation: CCK; Data rate: 1 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	20.0	0	100.00
1	19.4	0	87.10
Total:			187.10
Result:			PASS

Channel: 2437 MHz; Modulation: CCK; Data rate: 11 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	19.8	0	95.50
1	19.6	0	91.20
Total:			186.70
Result:			PASS

Channel: 2462 MHz; Modulation: CCK; Data rate: 1 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	17.1	0	51.29
1	17.5	0	56.23
Total:			107.52
Result:			PASS

Channel: 2462 MHz; Modulation: CCK; Data rate: 11 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	19.4	0	87.10
1	19.7	0	93.33
Total:			180.42
Result:			PASS

Channel: 2412 MHz; Modulation: OFDM; Data rate: 6 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	15.4	0	34.67
1	16.2	0	41.69
Total:			76.36
Result:			PASS

Channel: 2412 MHz; Modulation: OFDM; Data rate: 54 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	16.6	0	45.71
1	16.4	0	43.65
Total:			89.36
Result:			PASS

Channel: 2437 MHz; Modulation: OFDM; Data rate: 6 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	19.4	0	87.10
1	19.5	0	89.13
Total:			176.22
Result:			PASS

Channel: 2437 MHz; Modulation: OFDM; Data rate: 54 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	18.1	0	64.57
1	17.2	0	52.48
Total:			117.05
Result:			PASS

Channel: 2462 MHz; Modulation: OFDM; Data rate: 6 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	19.2	0	83.18
1	18.9	0	77.62
Total:			160.80
Result:			PASS

Channel: 2462 MHz; Modulation: OFDM; Data rate: 54 Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	17.7	0	58.88
1	18.2	0	66.07
Total:			124.95
Result:			PASS

Channel: 2412 MHz; Modulation: HT20; Data rate: MCS0; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	15.1	0	32.36
1	14.1	0	25.70
Total:			58.06
Result:			PASS

Channel: 2412 MHz; Modulation: HT20; Data rate: MCS7; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	16.0	0	39.81
1	16.2	0	41.69
Total:			81.50
Result:			PASS

Channel: 2437 MHz; Modulation: HT20; Data rate: MCS0; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	19.2	0	83.18
1	18.8	0	75.86
Total:			159.03
Result:			PASS

Channel: 2437 MHz; Modulation: HT20; Data rate: MCS7; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	19.0	0	79.43
1	19.0	0	79.43
Total:			158.87
Result:			PASS

Channel: 2462 MHz; Modulation: HT20; Data rate: MCS0; Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	17.5	0	56.23
1	18.0	0	63.10
Total:			119.33
Result:			PASS

Channel: 2462 MHz; Modulation: HT20; Data rate: MCS7; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	18.6	0	72.44
1	18.5	0	70.79
Total:			143.24
Result:			PASS

Channel: 2432 MHz; Modulation: HT40; Data rate: MCS0; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	9.0	0	7.94
1	9.7	0	9.33
Total:			17.28
Result:			PASS

Channel: 2432 MHz; Modulation: HT40; Data rate: MCS7; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	11.0	0	12.59
1	11.3	0	13.49
Total:			26.08
Result:			PASS

Channel: 2447 MHz; Modulation: HT40; Data rate: MCS0; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	14.3	0	26.92
1	15.2	0	33.11
Total:			60.03
Result:			PASS

Channel: 2447 MHz; Modulation: HT40; Data rate: MCS7; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	16.0	0	39.81
1	16.2	0	41.69
Total:			81.50
Result:			PASS

Channel: 2462 MHz; Modulation: HT40; Data rate: MCS0; Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	14.5	0	28.19
1	14.0	0	25.12
Total:			53.31
Result:			PASS

Channel: 2462 MHz; Modulation: HT40; Data rate: MCS7; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	15.1	0	32.36
1	16.1	0	40.74
Total:			73.10
Result:			PASS

Channel: 2412 MHz; Modulation: VHT20; Data rate: MCS0NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	14.6	0	28.84
1	14.6	0	28.84
Total:			57.68
Result:			PASS

Channel: 2412 MHz; Modulation: VHT20; Data rate: MCS8NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	15.2	0	33.11
1	16.2	0	41.69
Total:			74.80
Result:			PASS

Channel: 2437 MHz; Modulation: VHT20; Data rate: MCS0NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	20.1	0	102.33
1	19.1	0	81.28
Total:			183.61
Result:			PASS

Channel: 2437 MHz; Modulation: VHT20; Data rate: MCS8NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	16.9	0	48.98
1	17.5	0	56.23
Total:			105.21
Result:			PASS

Channel: 2462 MHz; Modulation: VHT20; Data rate: MCS0NSS1; Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	18.9	0	77.62
1	19.2	0	83.18
Total:			160.80
Result:			PASS

Channel: 2462 MHz; Modulation: VHT20; Data rate: MCS8NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	17.0	0	50.12
1	17.3	0	53.70
Total:			103.82
Result:			PASS

Channel: 2432 MHz; Modulation: VHT40; Data rate: MCS0NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	9.8	0	9.55
1	9.7	0	9.33
Total:			18.88
Result:			PASS

Channel: 2432 MHz; Modulation: VHT40; Data rate: MCS9NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	***Analyzer Level (dBm)***	***Cable loss (dB)***	***Power (mW)***
0	10.4	0	10.96
1	10.8	0	12.02
Total:			22.99
Result:			PASS

Channel: 2447 MHz; Modulation: VHT40; Data rate: MCS0NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	14.6	0	28.84
1	14.8	0	30.20
Total:			59.04
Result:			PASS

Channel: 2447 MHz; Modulation: VHT40; Data rate: MCS9NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	15.4	0	34.67
1	15.9	0	38.90
Total:			73.58
Result:			PASS

Channel: 2462 MHz; Modulation: VHT40; Data rate: MCS0NSS1; Mbps; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	16.5	0	44.67
1	16.6	0	45.71
Total:			90.38
Result:			PASS

Channel: 2462 MHz; Modulation: VHT40; Data rate: MCS9NSS1; Power setting (Please refer to the Power Table for EUT Operating Modes)			
Antenna Chain	**Analyzer Level (dBm)**	**Cable loss (dB)**	**Power (mW)**
0	16.0	0	39.81
1	16.1	0	40.74
Total:			80.55
Result:			PASS

14 Out-of-band and conducted spurious emissions

14.1 Definition

Out-of-band emission.
Emission on a frequency or frequencies immediately outside the necessary bandwidth that results from the modulation process but excluding spurious emissions.

Spurious emission.
Emission on a frequency or frequencies that are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products, and frequency conversion products, but exclude out-of-band emissions.

14.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Lab 4
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.11
EUT Channels / Frequencies Measured:	Low / Mid / High
EUT Channel Bandwidths:	20MHz / 40MHz
Deviations From Standard:	None
Measurement BW:	100 kHz
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	300 kHz
Measurement Detector:	Peak
Measurement Range:	30 MHz to 26.5 GHz

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)
Supply: 12 Vdc	

14.3 Test Limit

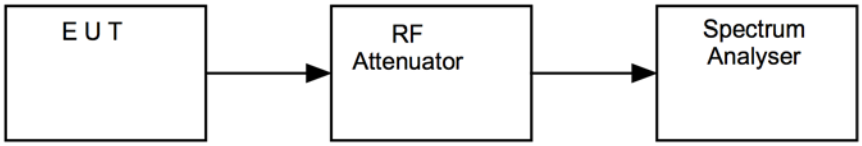
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in FCC 47CFR15.209(a) / RSS-Gen is not required.

14.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure v, the emissions from the EUT were measured on a spectrum analyser.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure v Test Setup



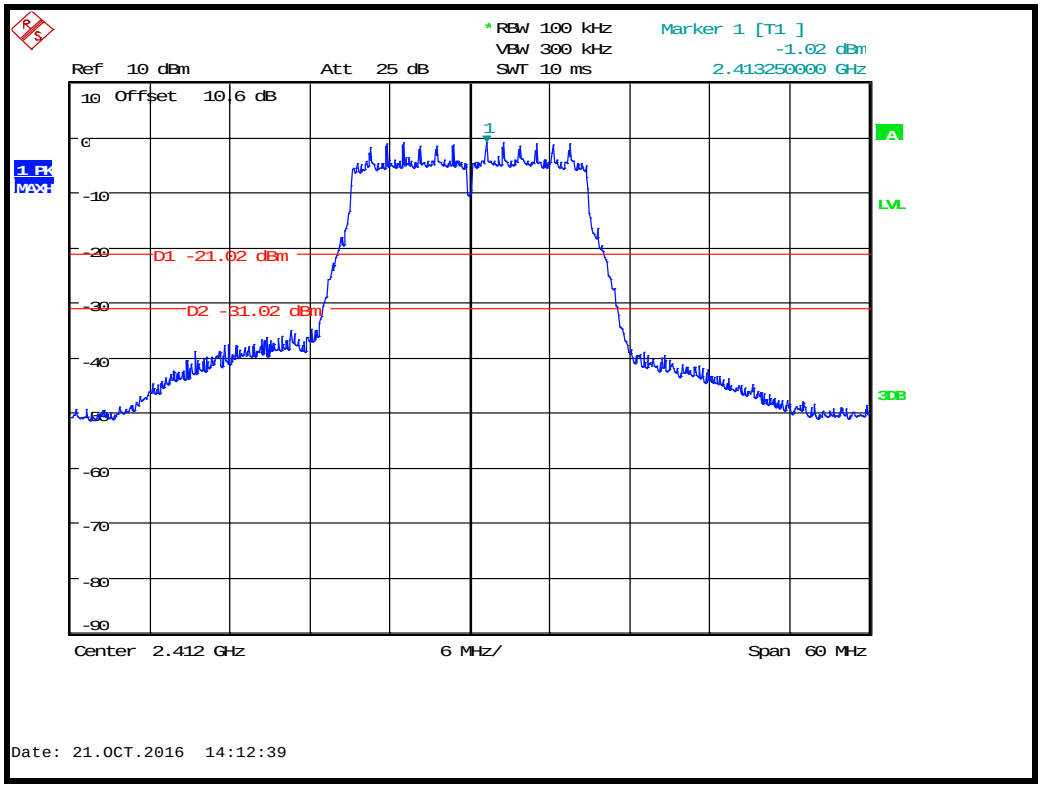
14.5 Test Equipment

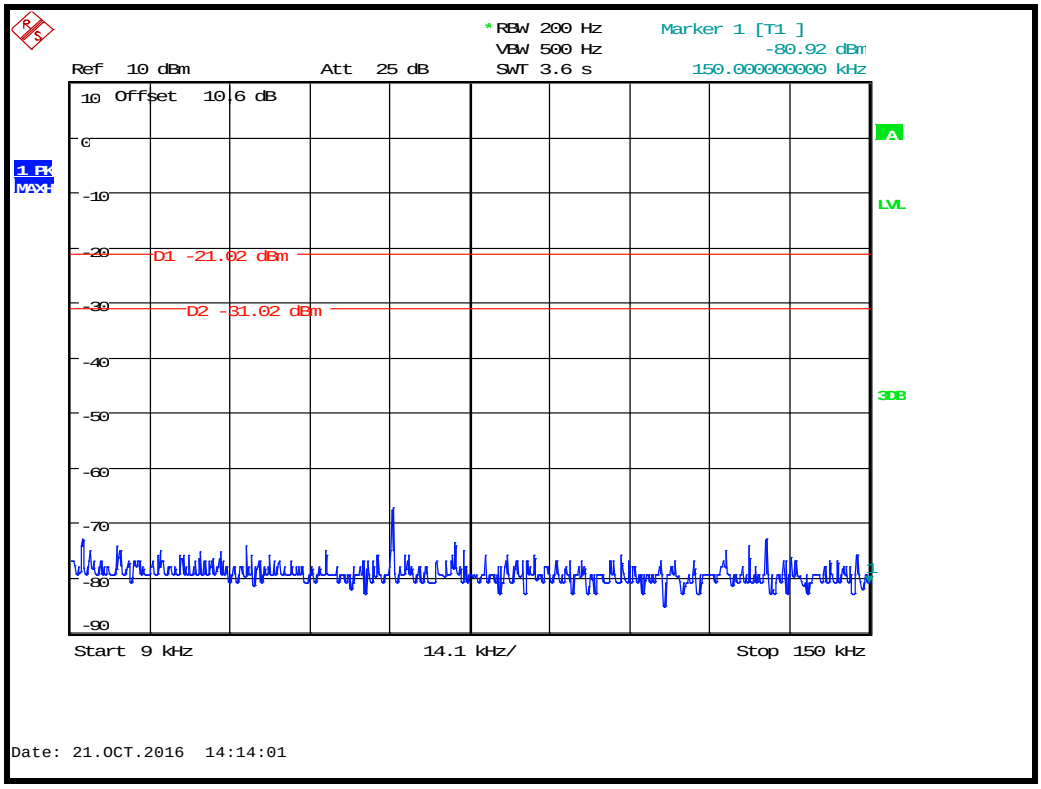
Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
FSU26	R&S	Spectrum Analyser	REF909	26/04/2017

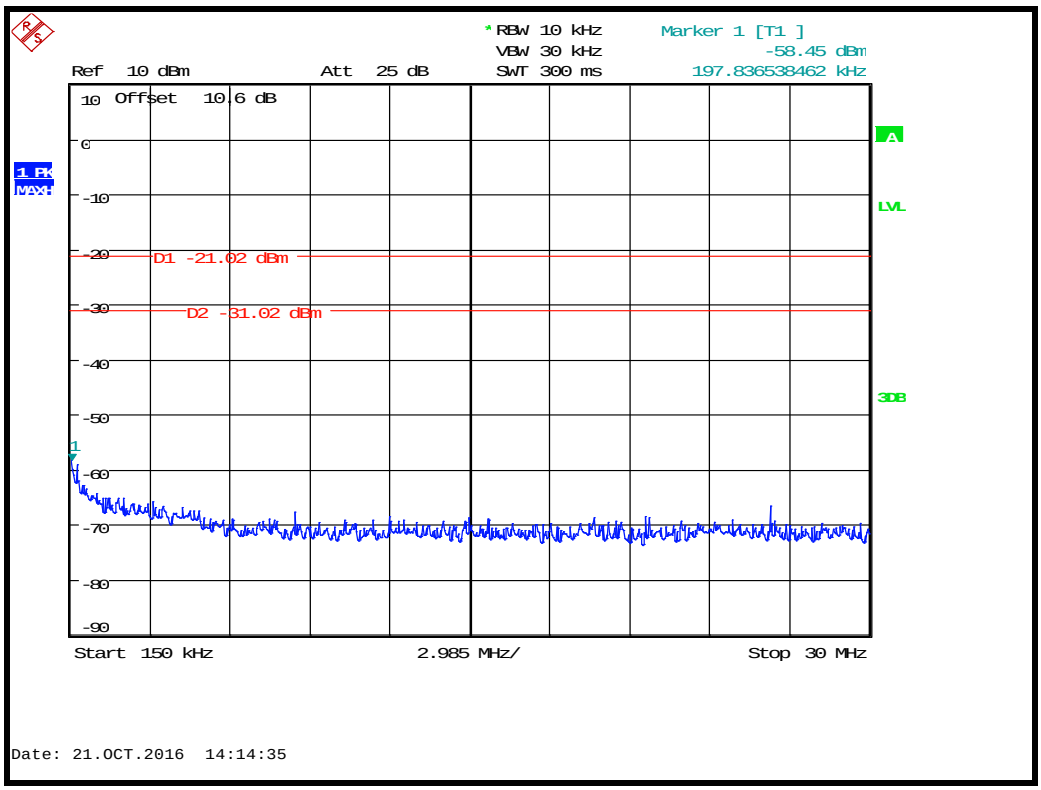
14.6 Test Results

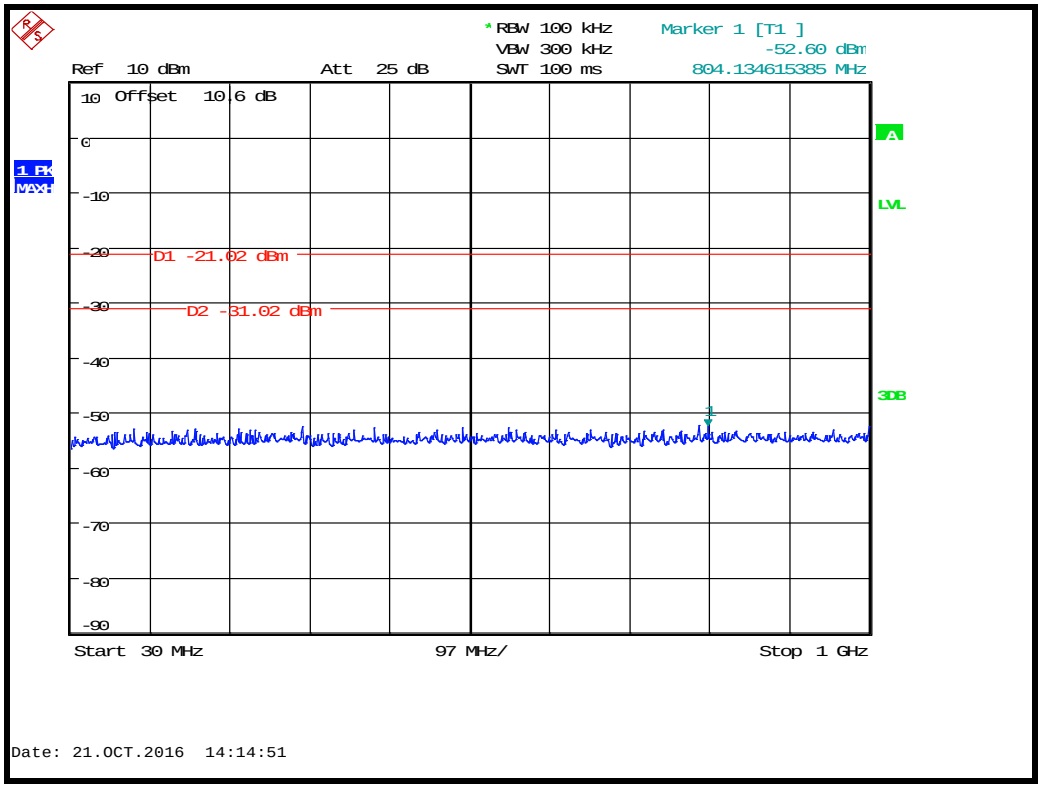
Results presented in this section represent the worst case mode.

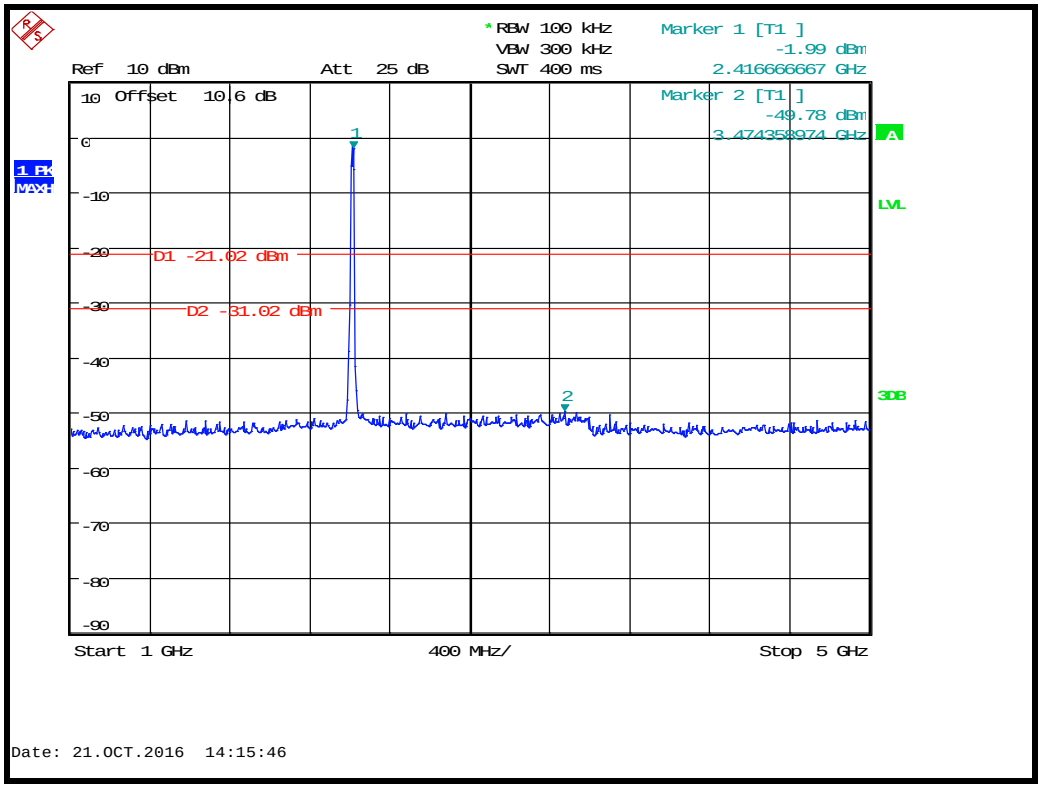
Modulation: HT20; Data rate: MCS0; Power setting: 44qdBm						
Channel Frequency (MHz)	***Emission Frequency (MHz)***	***Analyzer Level (dBm)***	***Emission Level (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
2412	2413.25	-1.02	-1.02	N/A	N/A	PASS
	24775.641	-46.49	-46.49	-31.02	-15.47	PASS

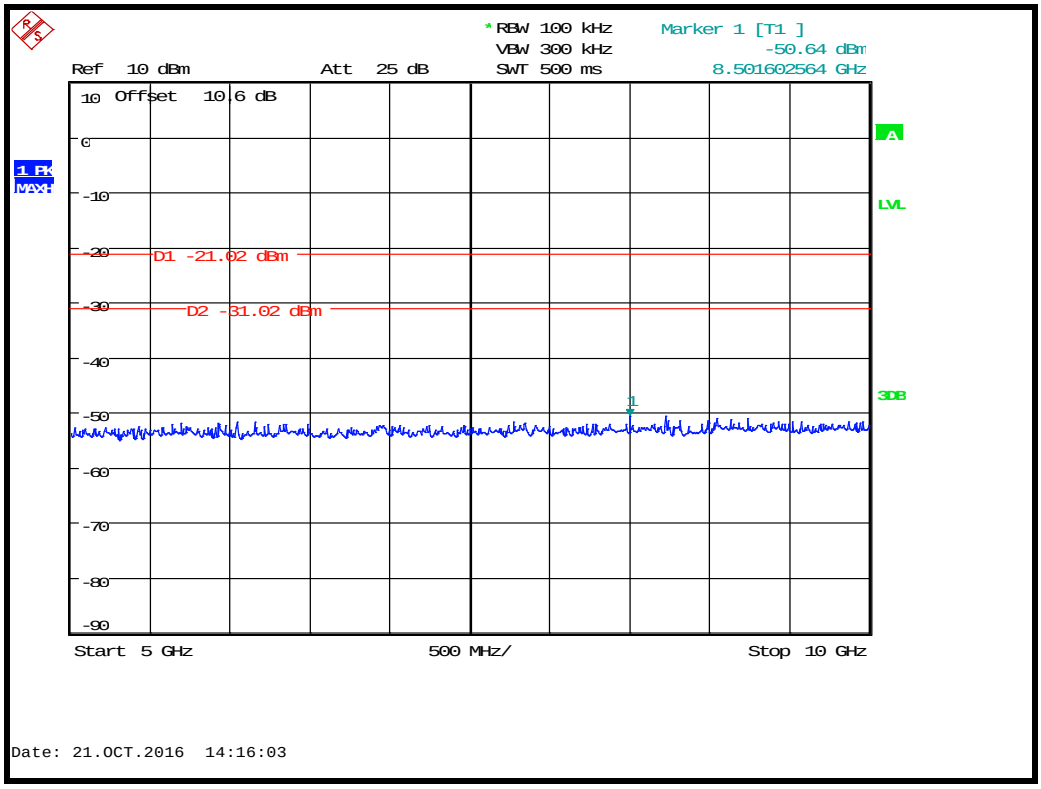


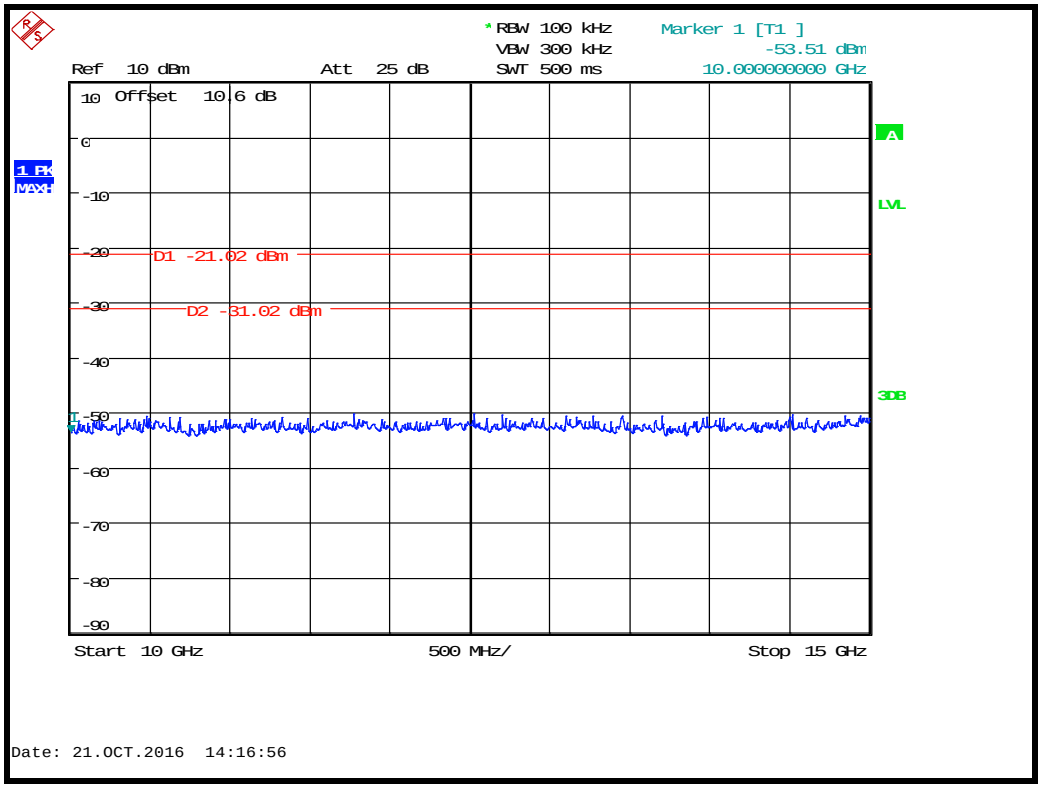

RBW 200 Hz
VBW 500 Hz
SWT 3.6 s
Marker 1 [T1]
-80.92 dBm
150.000000000 kHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 9 kHz
14.1 kHz/
Stop 150 kHz
Date: 21.OCT.2016 14:14:01

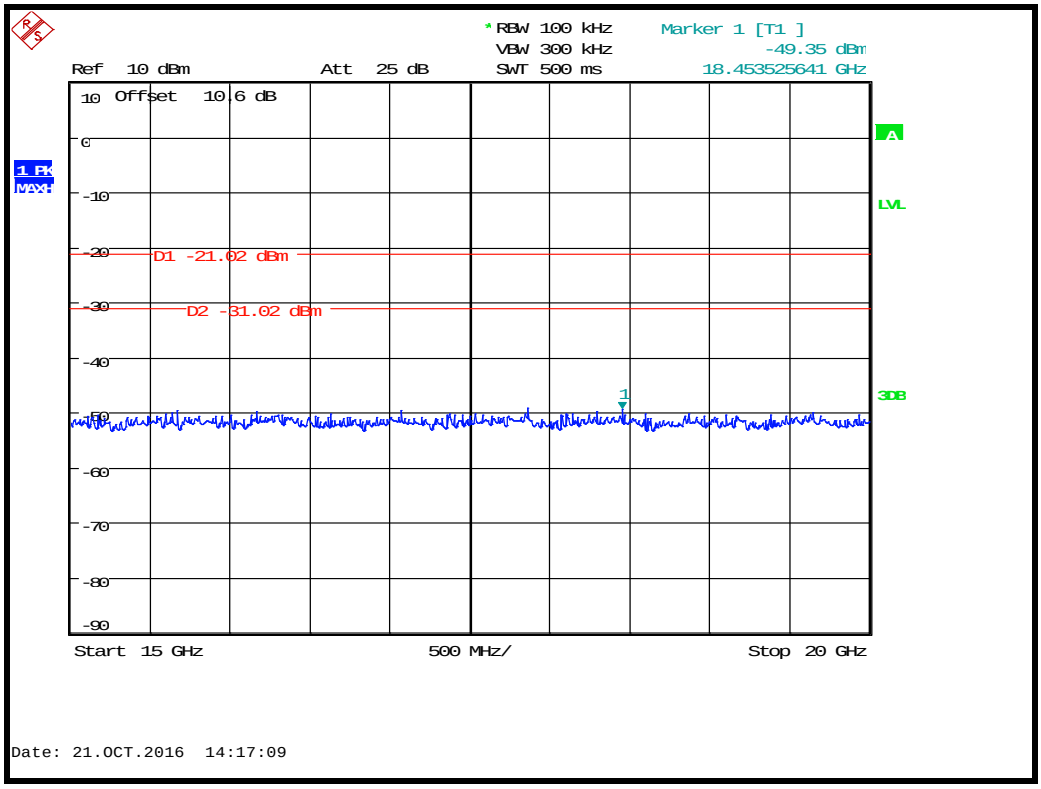

RBW 10 kHz
VBW 30 kHz
SWT 300 ms
Marker 1 [T1]
-58.45 dBm
197.836538462 kHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 150 kHz
2.985 MHz/
Stop 30 MHz
Date: 21.OCT.2016 14:14:35

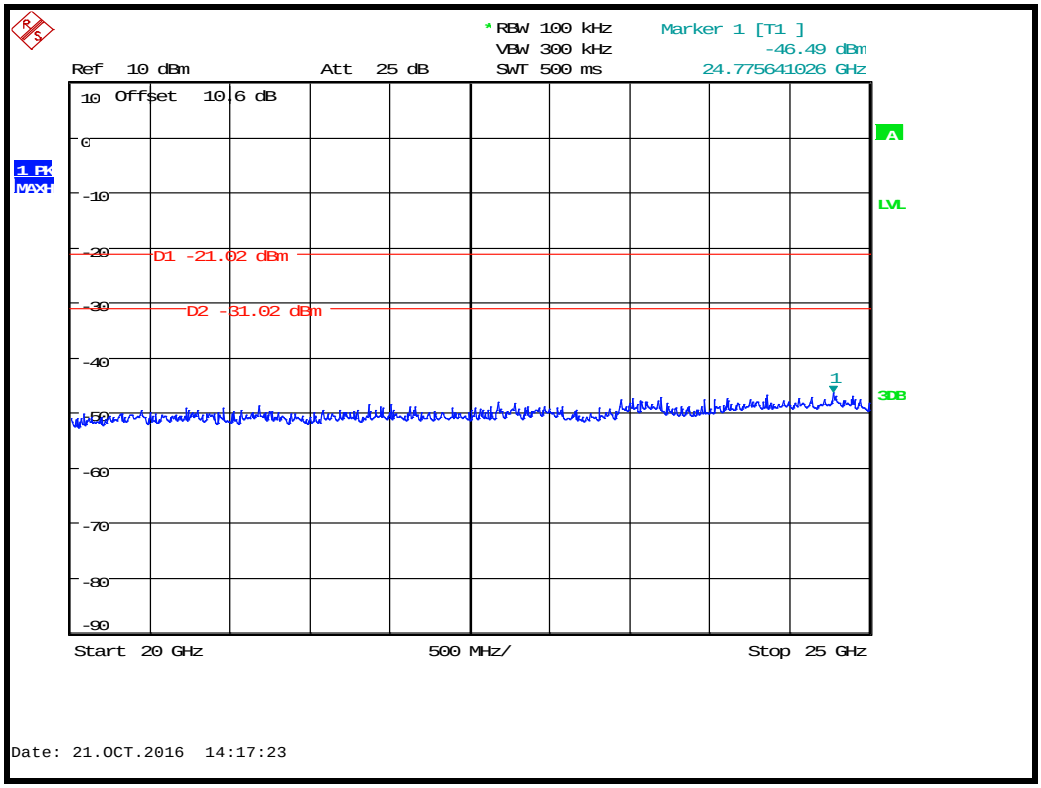

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Marker 1 [T1]
-52.60 dBm
804.134615385 MHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 21.OCT.2016 14:14:51


RBW 100 kHz
VBW 300 kHz
SWT 400 ms
Marker 1 [T1]
-1.99 dBm
2.416666667 GHz
Marker 2 [T1]
-49.78 dBm
3.474358974 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 1 GHz
400 MHz/
Stop 5 GHz
Date: 21.OCT.2016 14:15:46

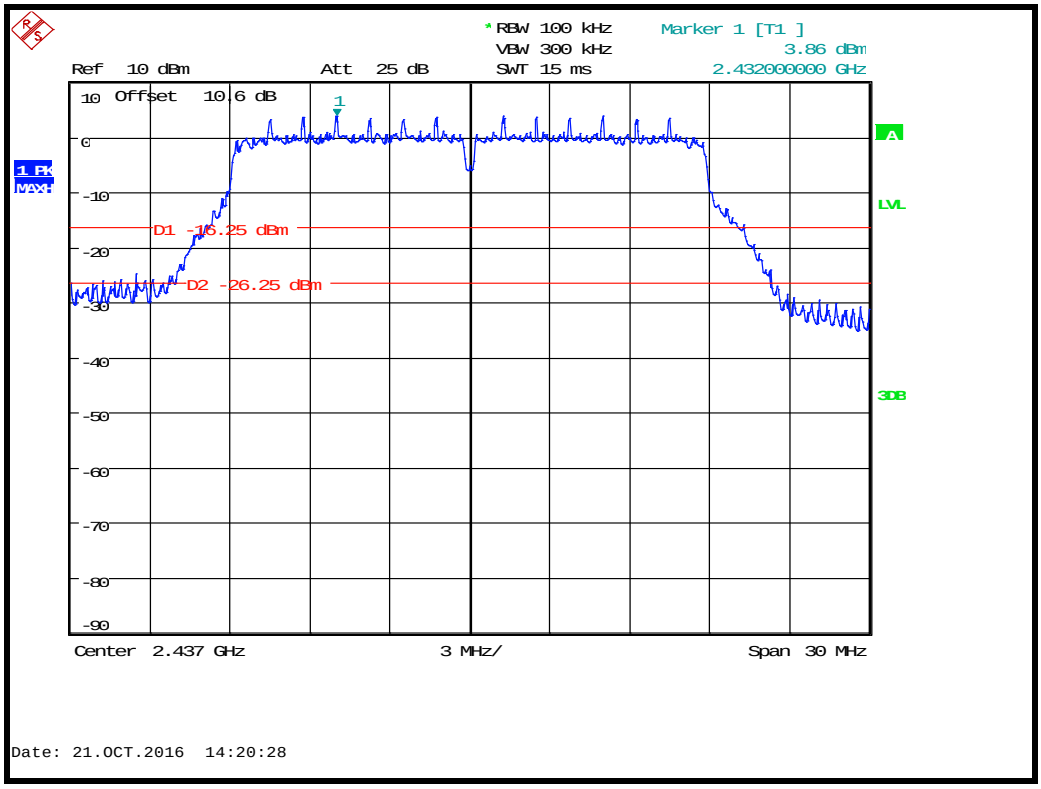

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-50.64 dBm
8.501602564 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 5 GHz
500 MHz/
Stop 10 GHz
Date: 21.OCT.2016 14:16:03

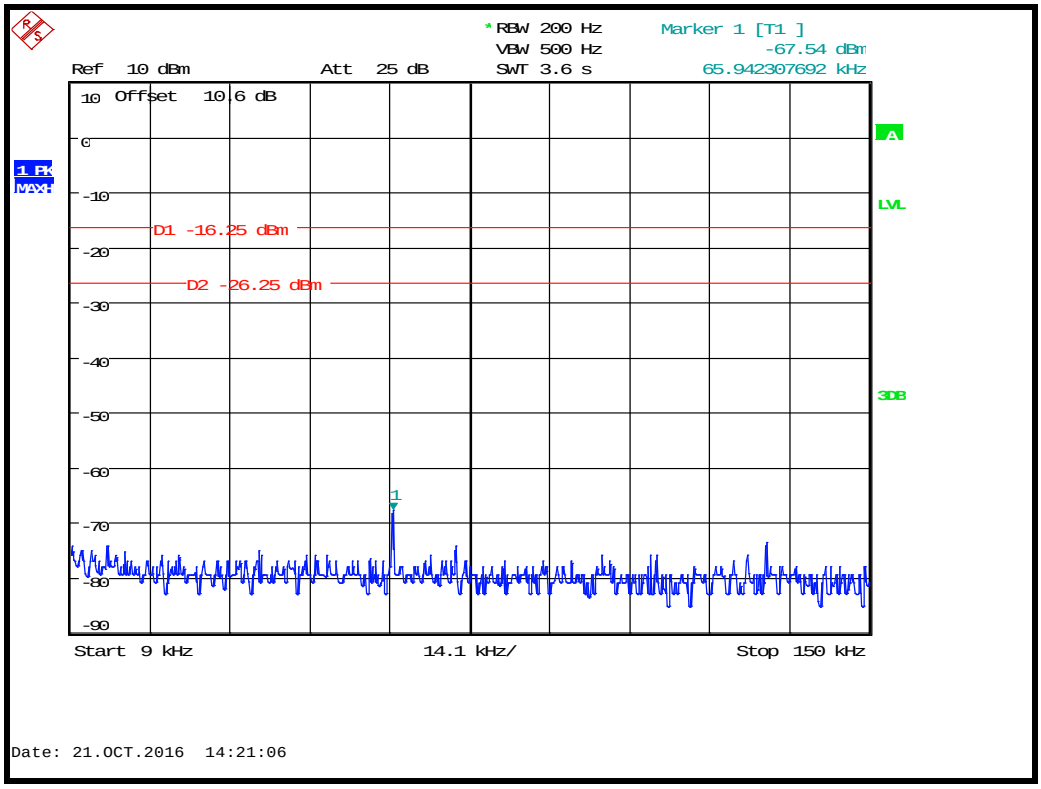

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-53.51 dBm
10.000000000 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 21.OCT.2016 14:16:56

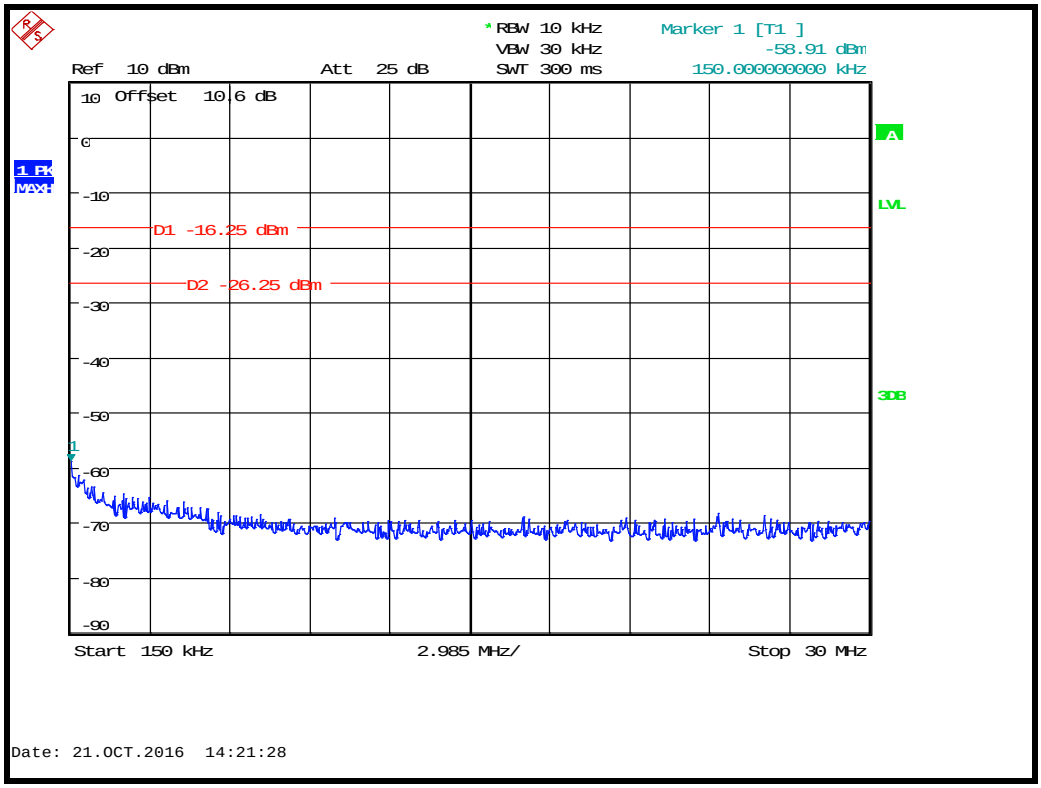

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-49.35 dBm
18.453525641 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.OCT.2016 14:17:09

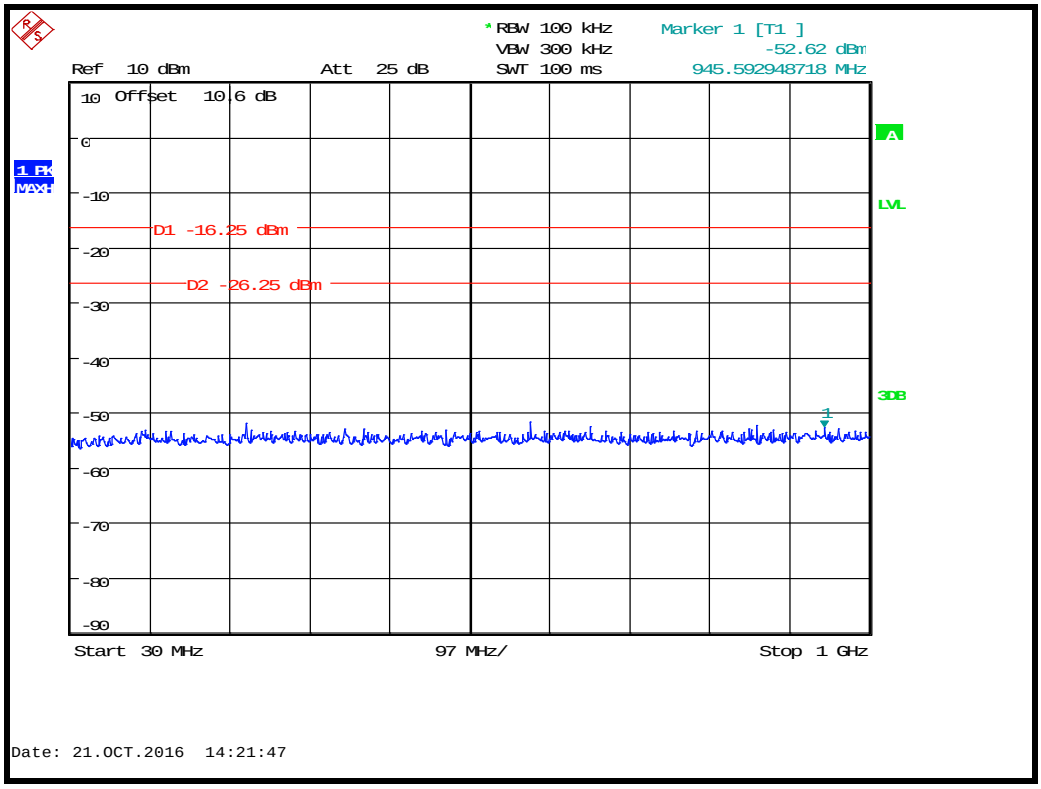

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-46.49 dBm
24.775641026 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -21.02 dBm
D2 -31.02 dBm
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.OCT.2016 14:17:23

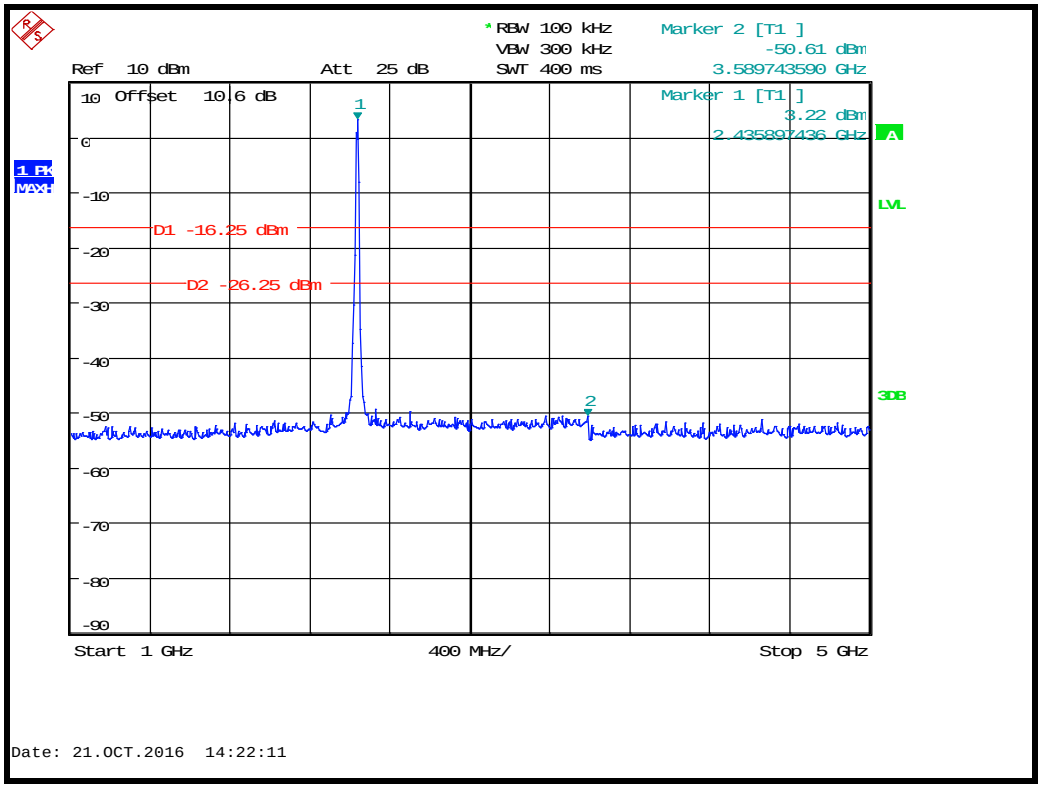
Modulation: HT20; Data rate: MCS0; Power setting: 64qdBm						
Channel Frequency (MHz)	Emission Frequency (MHz)	Analyzer Level (dBm)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Result
2437	3432	3.86	3.86	N/A	N/A	PASS
2437	24887.820	-46.89	-46.89	-26.25	20.64	PASS

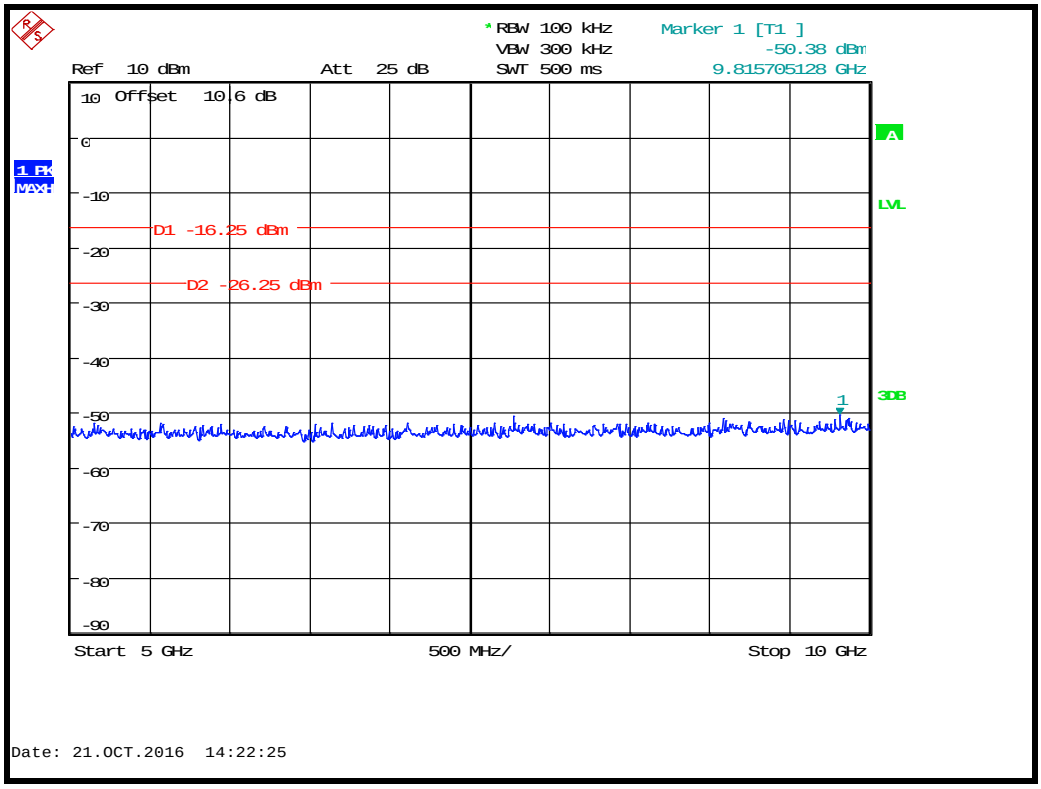


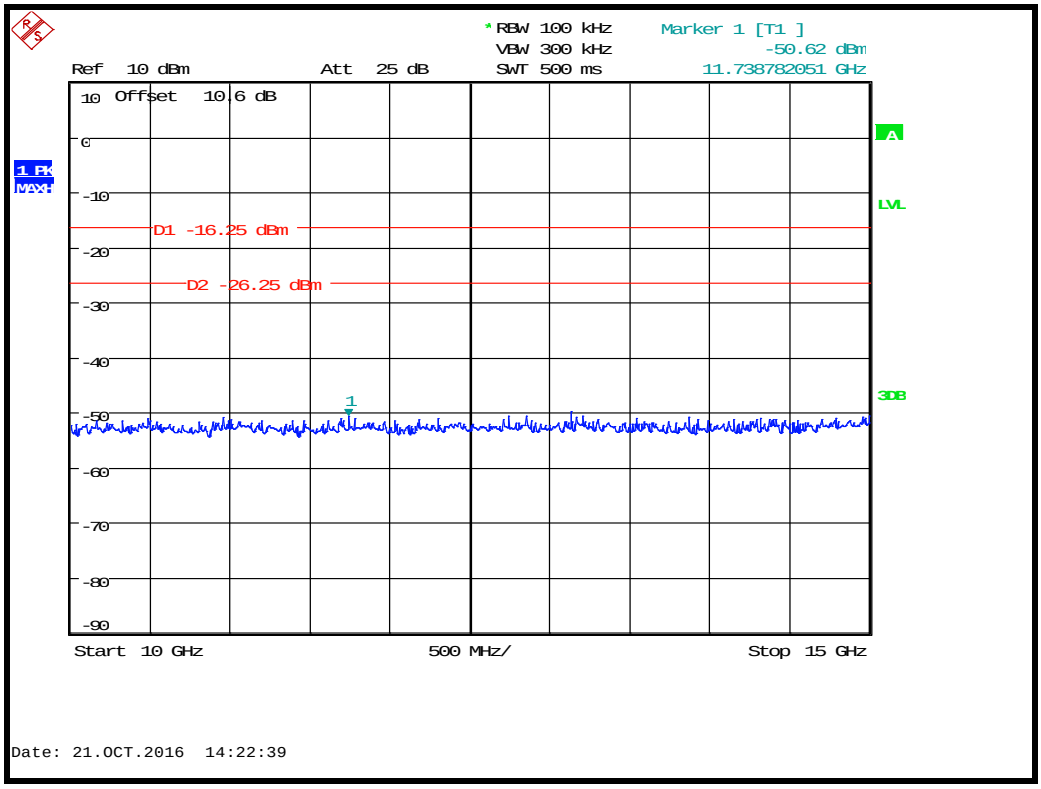

*RBW 200 Hz
VBW 500 Hz
SWT 3.6 s
Marker 1 [T1]
-67.54 dBm
65.942307692 kHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 9 kHz
14.1 kHz/
Stop 150 kHz
Date: 21.OCT.2016 14:21:06

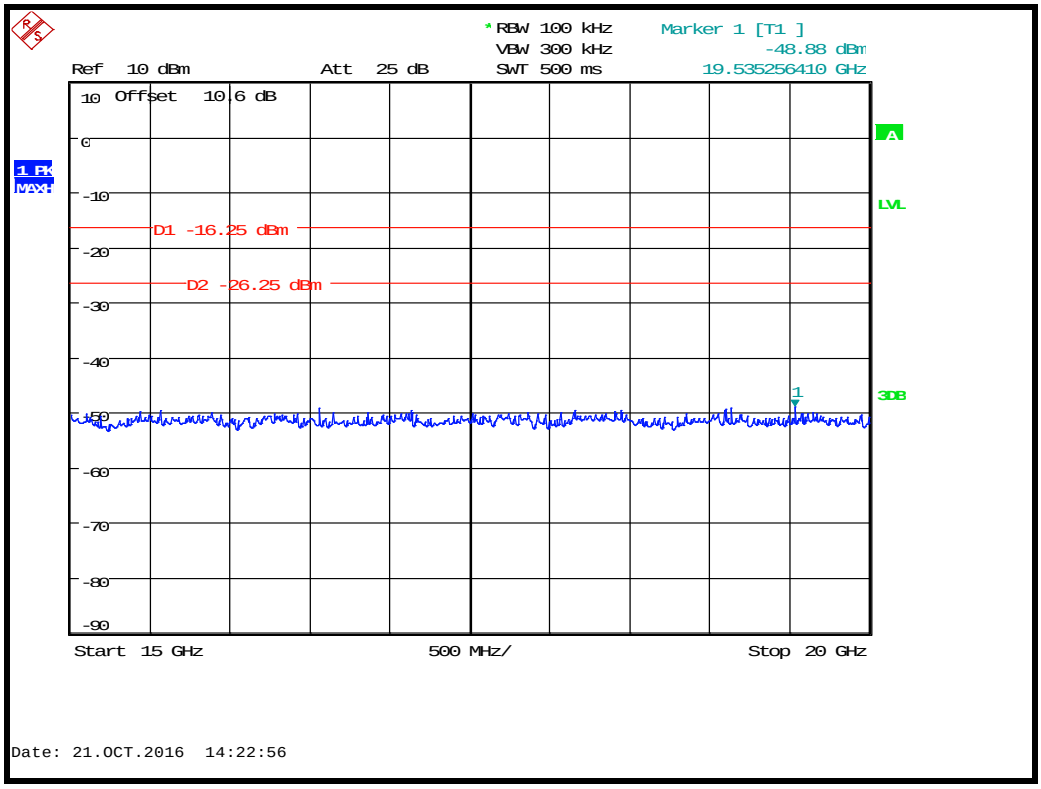

*RBW 10 kHz
VBW 30 kHz
SWT 300 ms
Marker 1 [T1]
-58.91 dBm
150.000000000 kHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 150 kHz
2.985 MHz/
Stop 30 MHz
Date: 21.OCT.2016 14:21:28

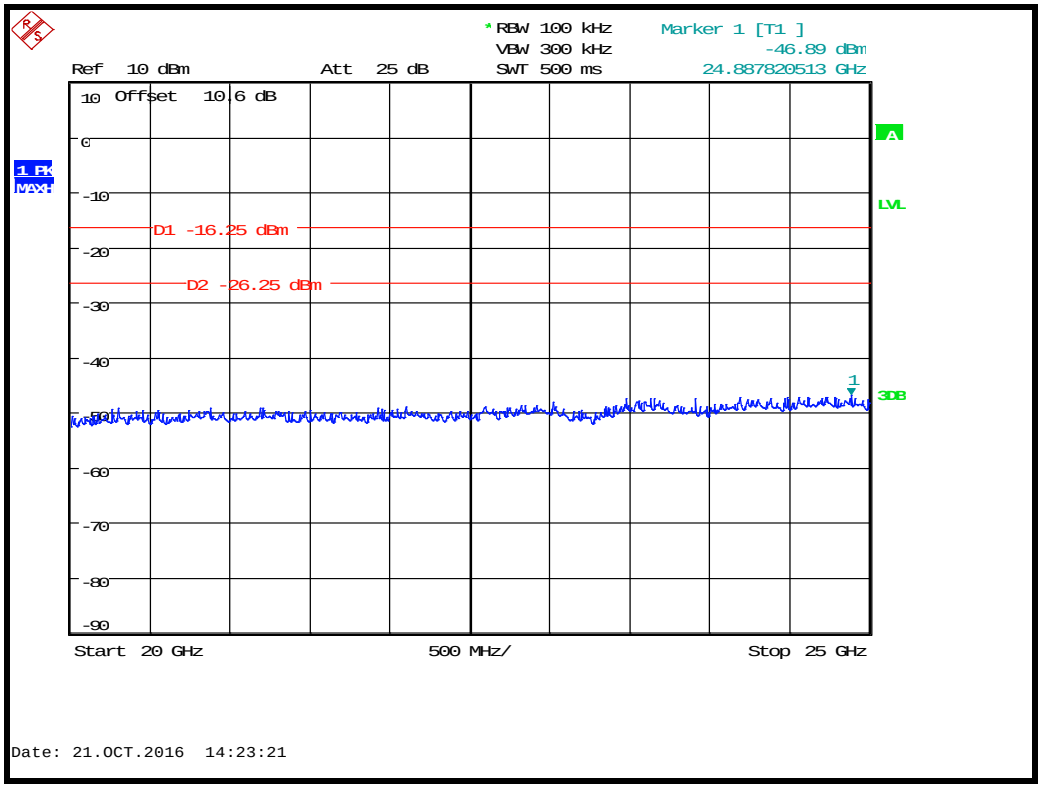

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Marker 1 [T1]
-52.62 dBm
945.592948718 MHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 21.OCT.2016 14:21:47


RBW 100 kHz
VBW 300 kHz
SWT 400 ms
Marker 2 [T1]
-50.61 dBm
3.589743590 GHz
Marker 1 [T1]
3.22 dBm
2.435897436 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 1 GHz
400 MHz/
Stop 5 GHz
Date: 21.OCT.2016 14:22:11

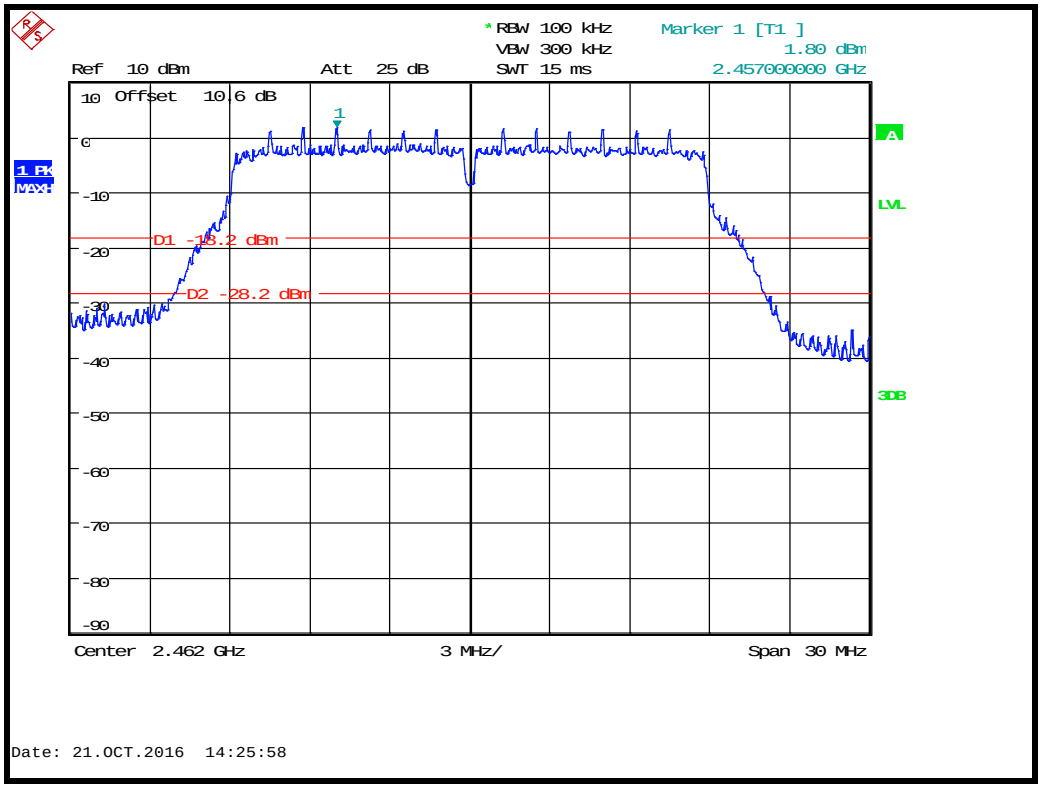

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-50.38 dBm
9.815705128 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 5 GHz
500 MHz/
Stop 10 GHz
Date: 21.OCT.2016 14:22:25

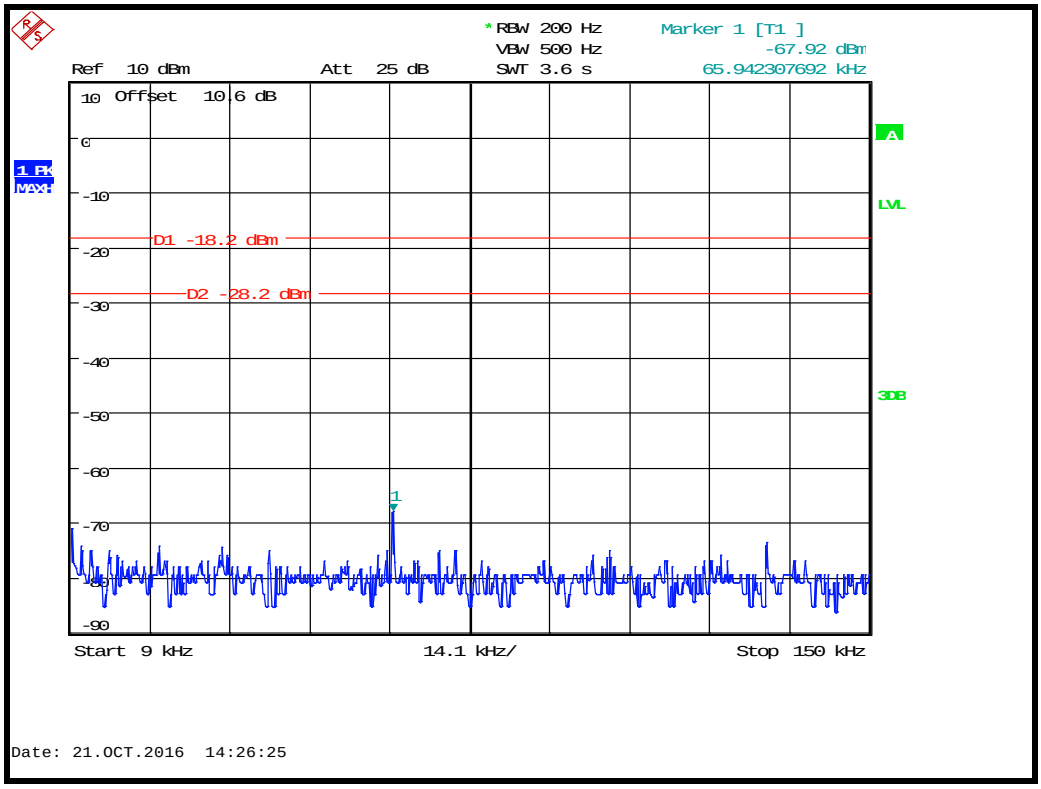

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-50.62 dBm
11.738782051 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 21.OCT.2016 14:22:39

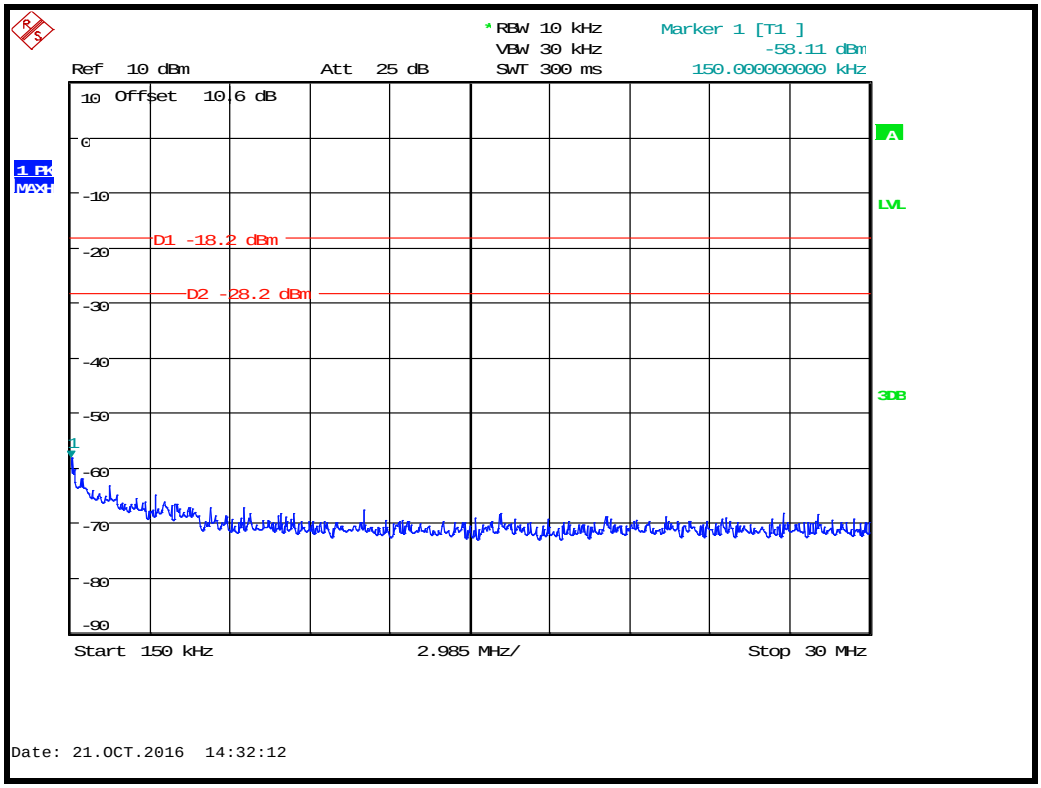

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-48.88 dBm
19.535256410 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.OCT.2016 14:22:56

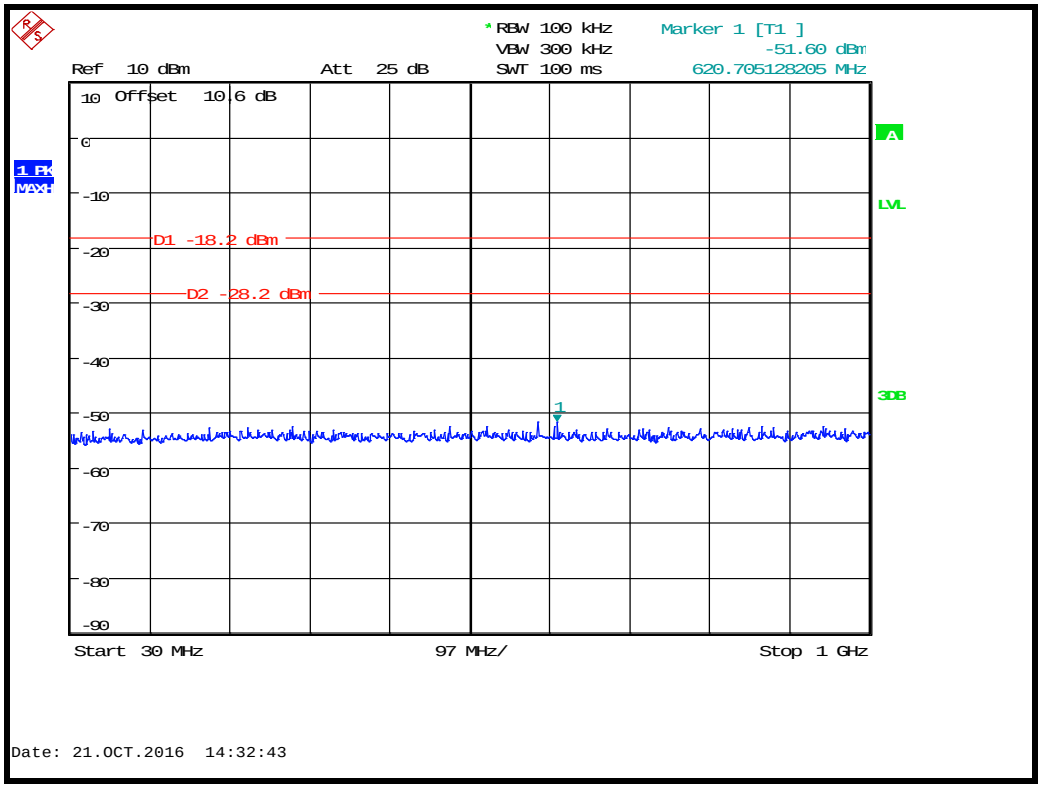

RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-46.89 dBm
24.887820513 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -16.25 dBm
D2 -26.25 dBm
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.OCT.2016 14:23:21

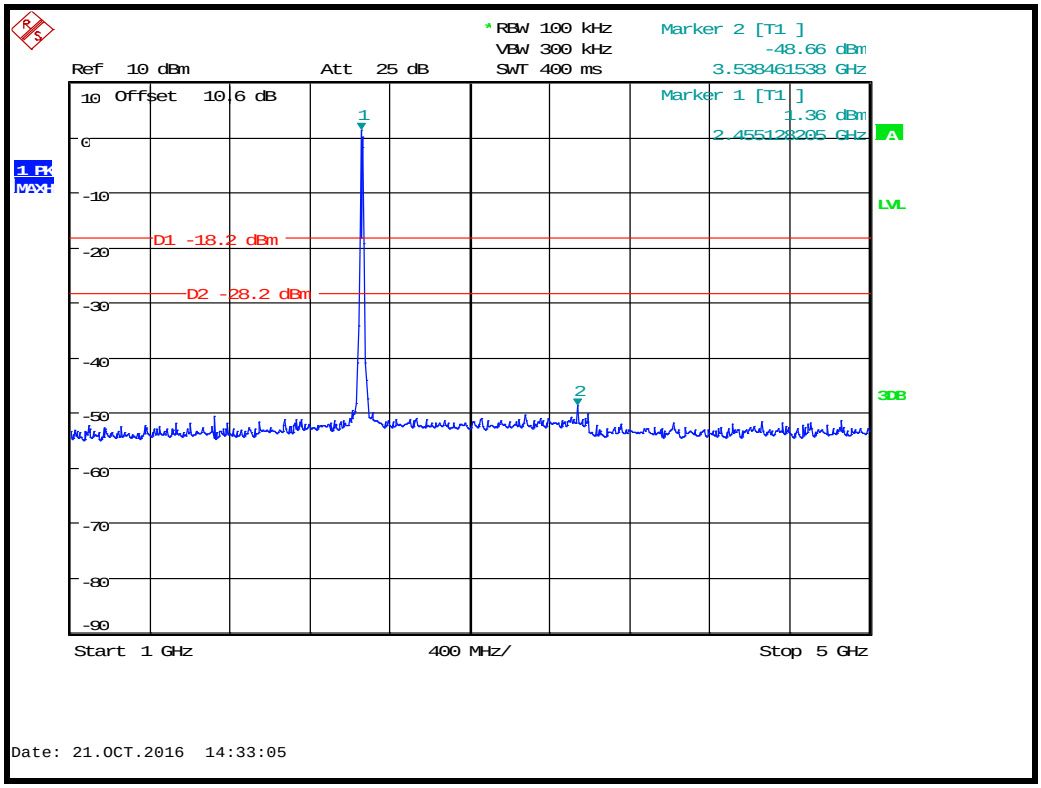
Modulation: HT20; Data rate: MCS0; Power setting: 56qdBm						
Channel Frequency (MHz)	***Emission Frequency (MHz)***	***Analyzer Level (dBm)***	***Emission Level (dBm)***	***Limit (dBm)***	***Margin (dB)***	***Result***
2462	2457.0	1.80	1.80	N/A	N/A	PASS
2462	24551.282	-45.85	-45.85	-28.2	-17.65	PASS

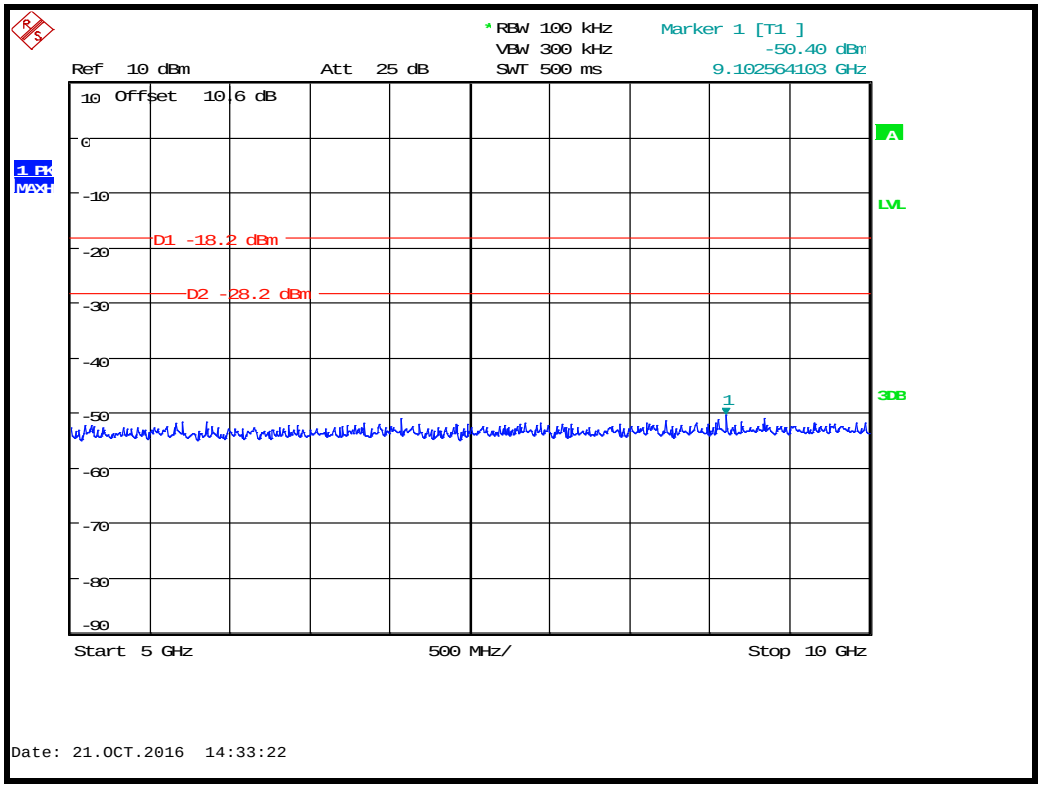


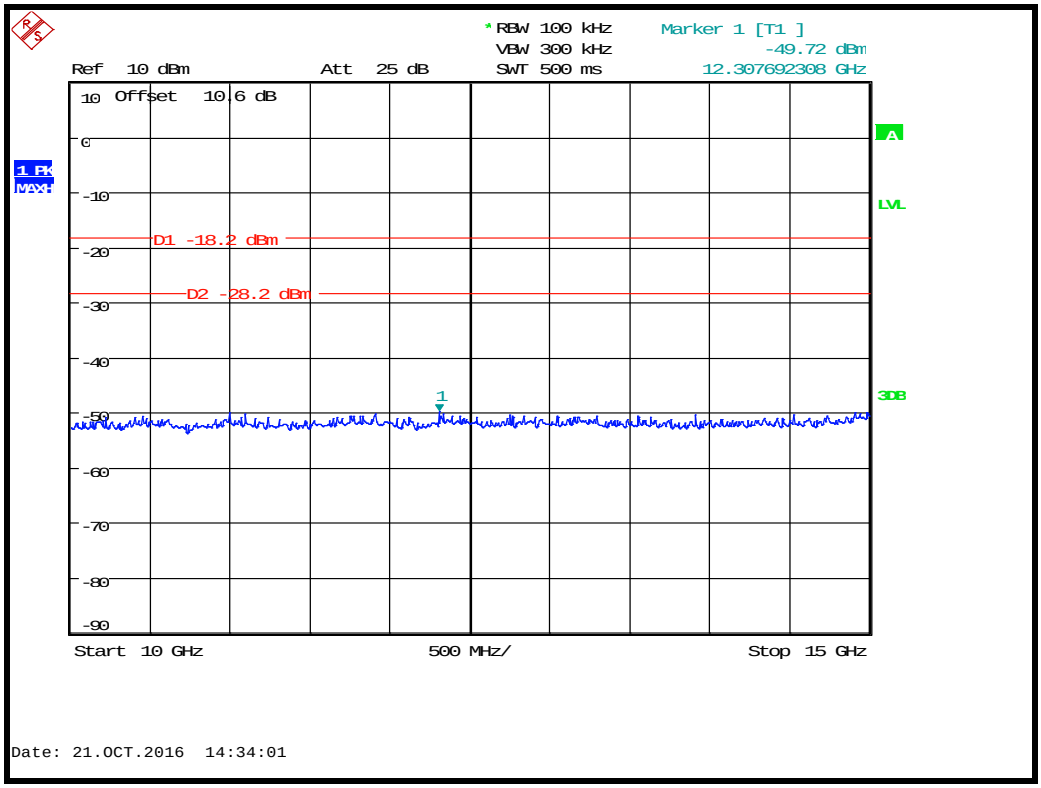

RBW 200 Hz
VBW 500 Hz
SWT 3.6 s
Marker 1 [T1]
-67.92 dBm
65.942307692 kHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 9 kHz
14.1 kHz/
Stop 150 kHz
Date: 21.OCT.2016 14:26:25

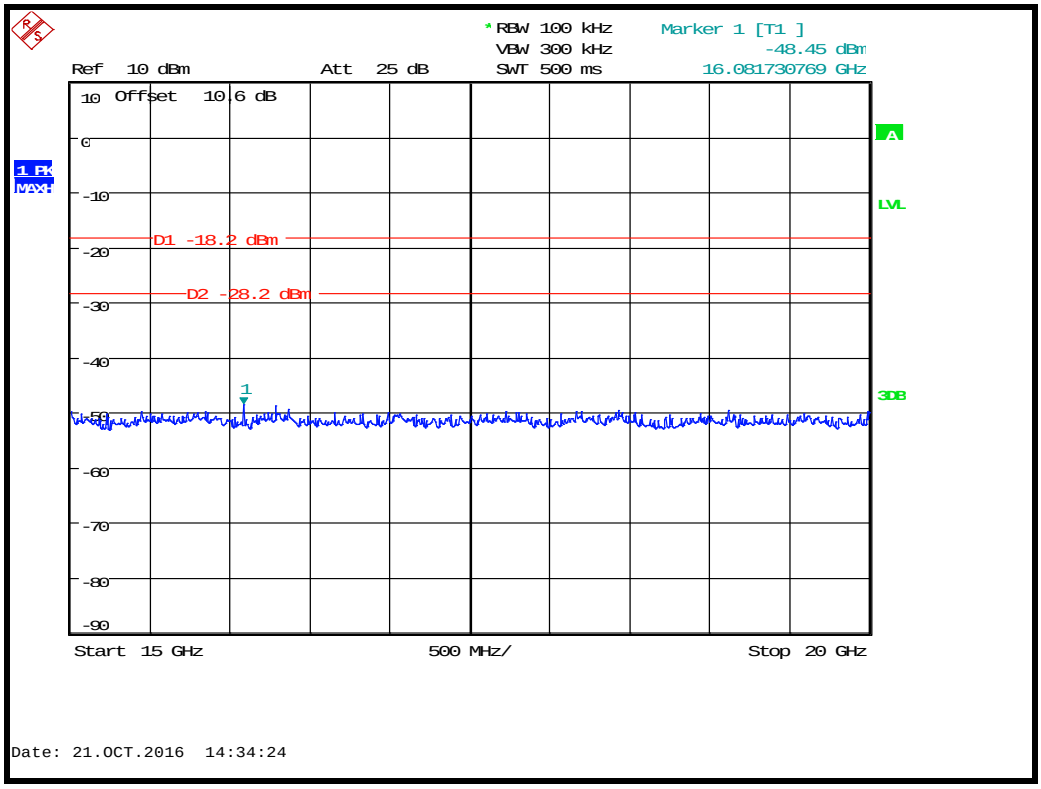

RBW 10 kHz
VBW 30 kHz
SWT 300 ms
Marker 1 [T1]
-58.11 dBm
150.000000000 kHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 150 kHz
2.985 MHz/
Stop 30 MHz
Date: 21.OCT.2016 14:32:12

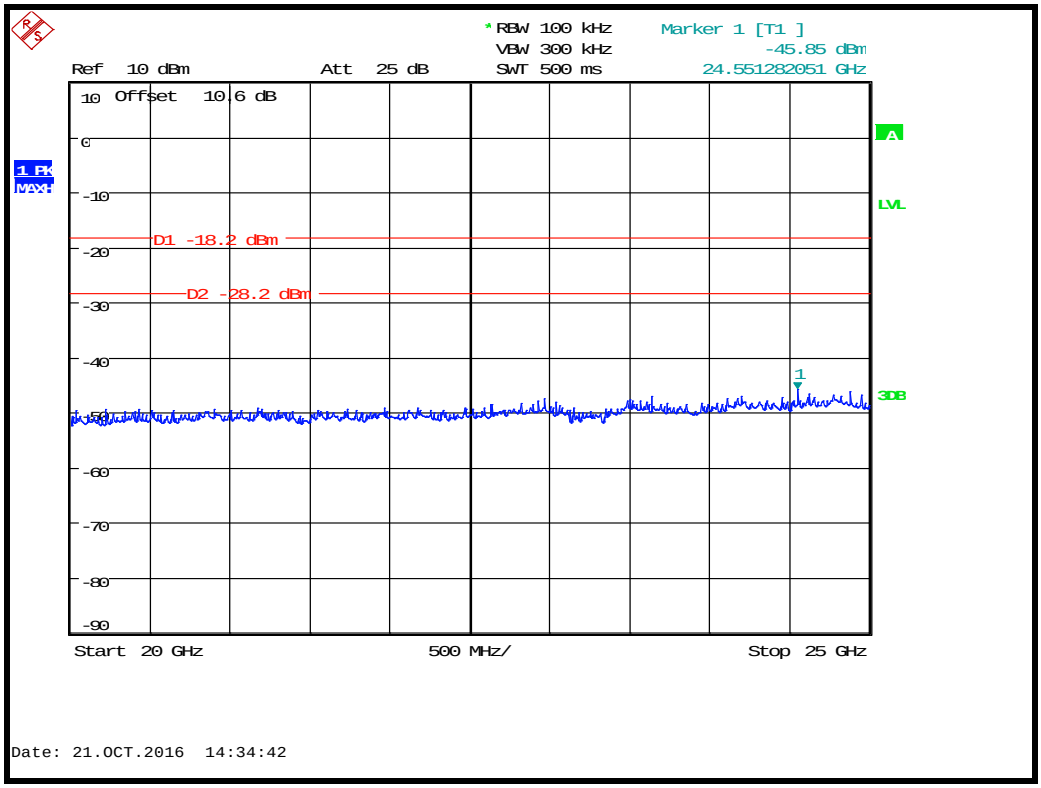

RBW 100 kHz
VBW 300 kHz
SWT 100 ms
Marker 1 [T1]
-51.60 dBm
620.705128205 MHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 21.OCT.2016 14:32:43


RBW 100 kHz
VBW 300 kHz
SWT 400 ms
Marker 2 [T1]
-48.66 dBm
3.538461538 GHz
Marker 1 [T1]
1.36 dBm
2.455128205 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 1 GHz
400 MHz/
Stop 5 GHz
Date: 21.OCT.2016 14:33:05


RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-50.40 dBm
9.102564103 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 5 GHz
500 MHz/
Stop 10 GHz
Date: 21.OCT.2016 14:33:22


RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-49.72 dBm
12.307692308 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 10 GHz
500 MHz/
Stop 15 GHz
Date: 21.OCT.2016 14:34:01


RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-48.45 dBm
16.081730769 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 15 GHz
500 MHz/
Stop 20 GHz
Date: 21.OCT.2016 14:34:24


RBW 100 kHz
VBW 300 kHz
SWT 500 ms
Marker 1 [T1]
-45.85 dBm
24.551282051 GHz
Ref 10 dBm
Att 25 dB
Offset 10.6 dB
1 PK MAXH
A
LVL
3DB
D1 -18.2 dBm
D2 -28.2 dBm
Start 20 GHz
500 MHz/
Stop 25 GHz
Date: 21.OCT.2016 14:34:42

15 Power spectral density

15.1 Definition

The power per unit bandwidth.

15.2 Test Parameters

Test Location:	Element Hull
Test Chamber:	Lab 4
Test Standard and Clause:	ANSI C63.10-2013, Clause 11.10
EUT Channels / Frequencies Measured:	Low / Mid / High
EUT Channel Bandwidths:	20 MHz & 40 MHz
Deviations From Standard:	None
Measurement BW:	3 kHz or 5 kHz (for 20 MHz or 40 MHz channels)
Spectrum Analyzer Video BW: (requirement at least 3x RBW)	10 kHz or 20 kHz (for 20 MHz or 40 MHz channels)
Measurement Span: (requirement 1.5 times Channel BW)	30 MHz or 60 MHz (for 20 MHz or 40 MHz channels)
Measurement Detector:	Max. Peak

Environmental Conditions (Normal Environment)

Temperature: 21 °C	+15 ºC to +35 ºC (as declared)
Humidity: 45 % RH	20 % RH to 75 % RH (as declared)
Supply: 12 V dc	

15.3 Test Limit

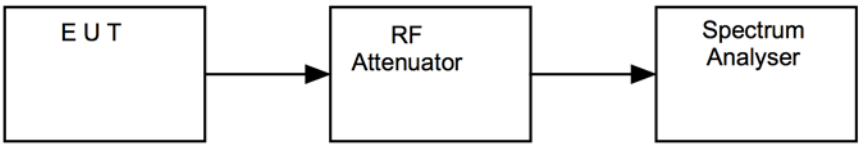
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

15.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure vi, the peak emission of the EUT was measured on a spectrum analyser, with path losses taken into account.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst case configuration in each bandwidth.

Figure vi Test Setup



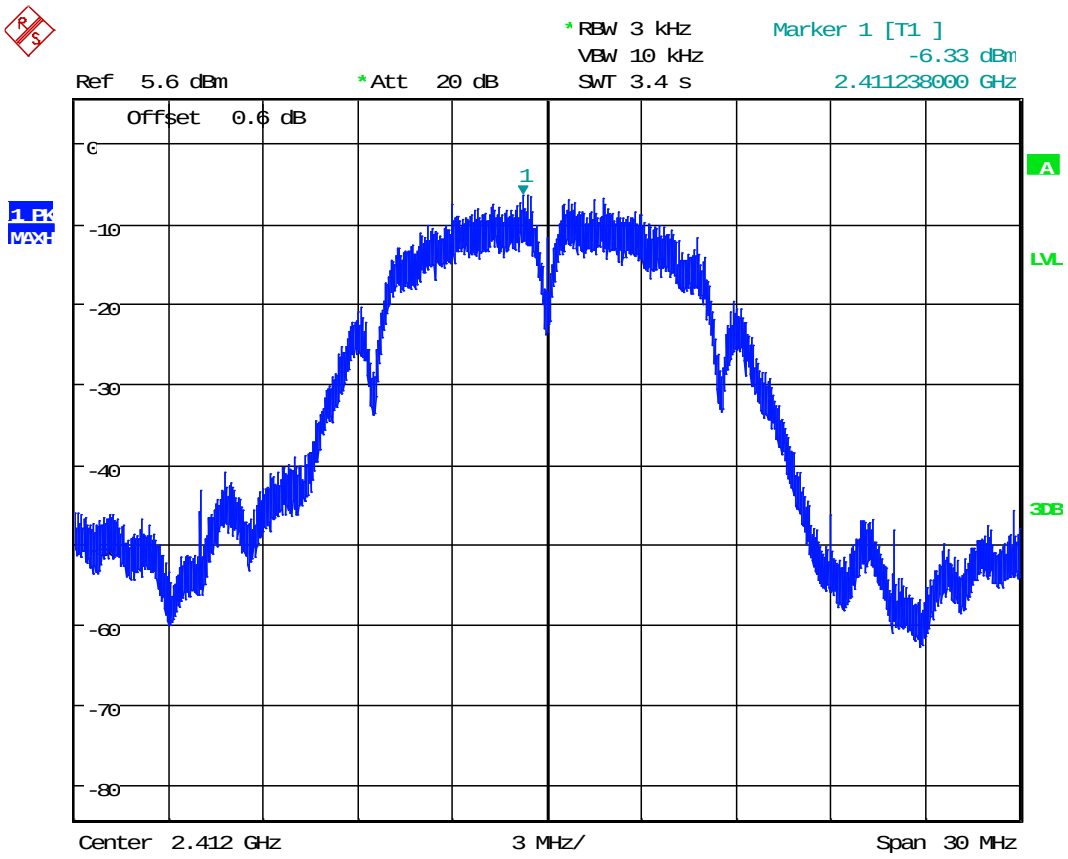
15.5 Test Equipment

Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
Cable	T&R	Low Loss SMA RF Cable	REF2144	01/03/2017
FSU46	R&S	Spectrum Analyser	REF910	05/07/2017
FSU26	R&S	Spectrum Analyser	REF909	26/04/2017

15.6 Test Results

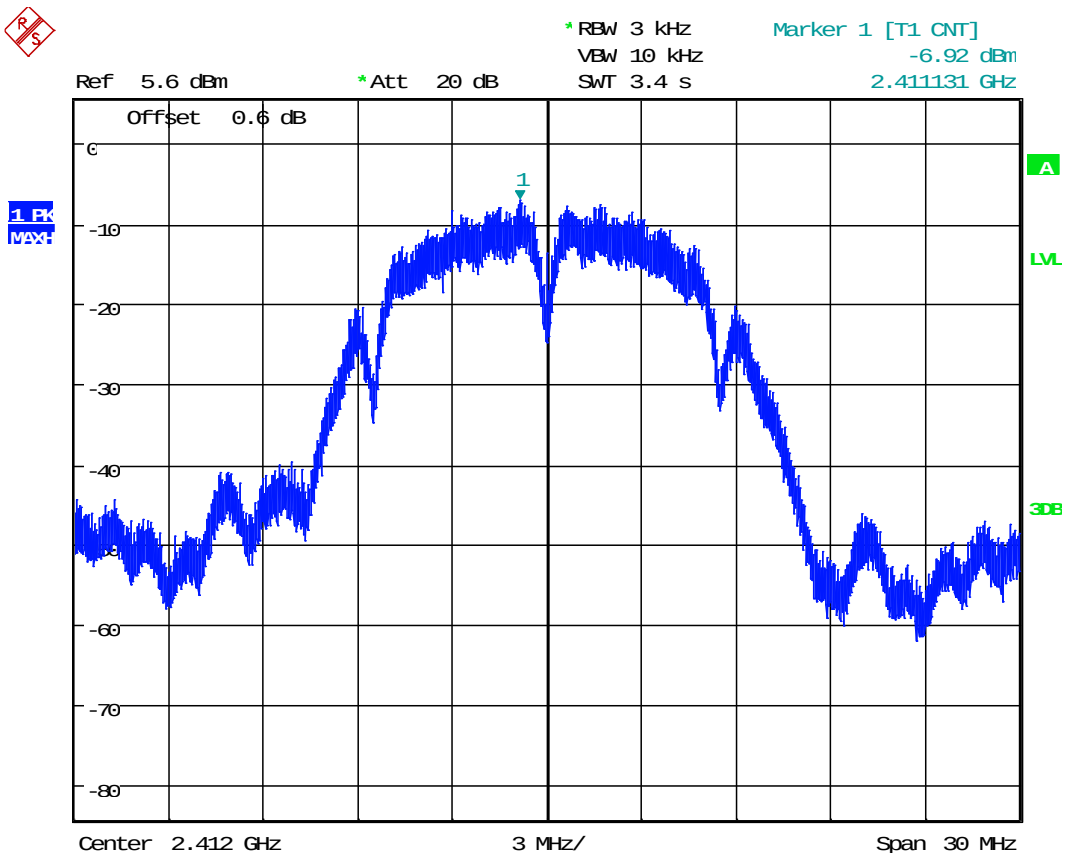
	Modulation:CCK; Data rate: 1 Mbps; CDD				
Channel Frequency (MHz)	***Analyzer Level* Ant0 (dBm/3kHz)***	***Analyzer Level* Ant1 (dBm/3kHz)***	***Combined PSD (dBm/3kHz)***	***Power Setting (q dBm)***	***Result***
2412	-6.33	-6.92	-3.6	64	PASS
2437	-6.15	-5.80	-3.0	68	PASS
2462	-8.84	-8.03	-5.4	60	PASS

*Analyser level includes 0.6 dB offset for cable loss



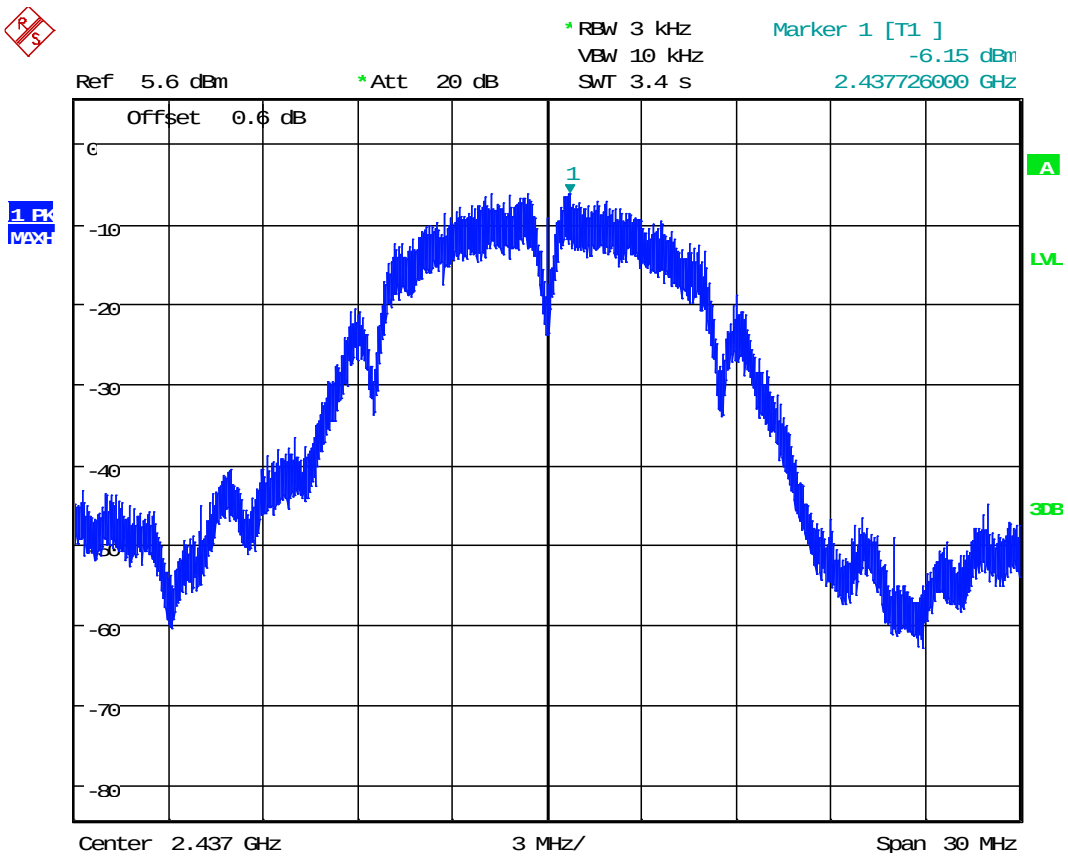
Date: 9.JUN.2016 13:55:42

Ant0



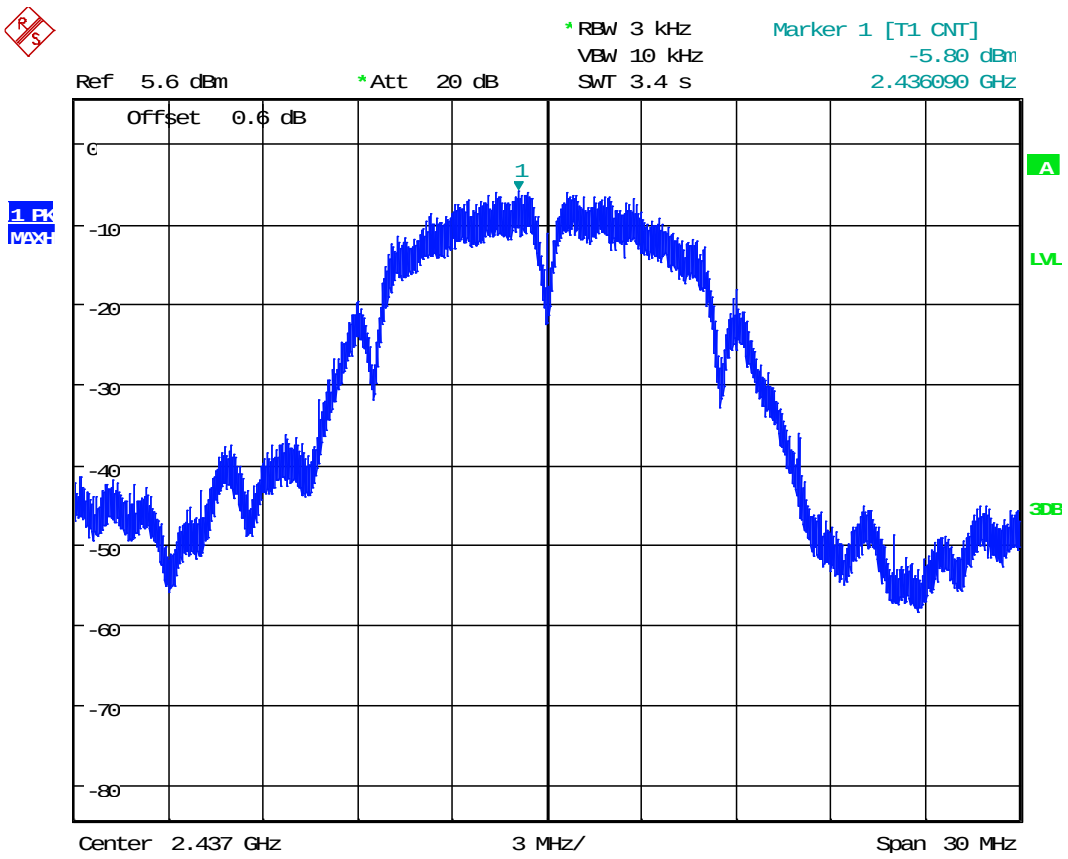
Date: 8.JUN.2016 15:42:29

Ant1



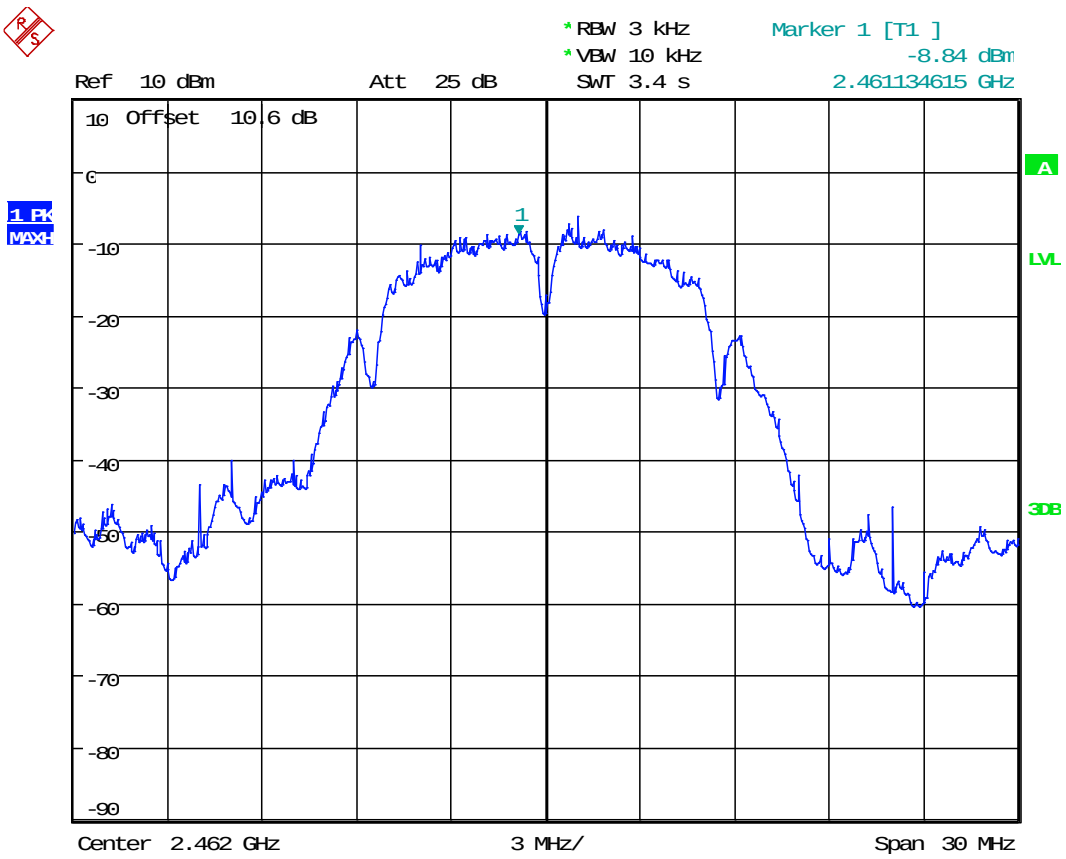
Date: 9.JUN.2016 11:24:06

Ant0



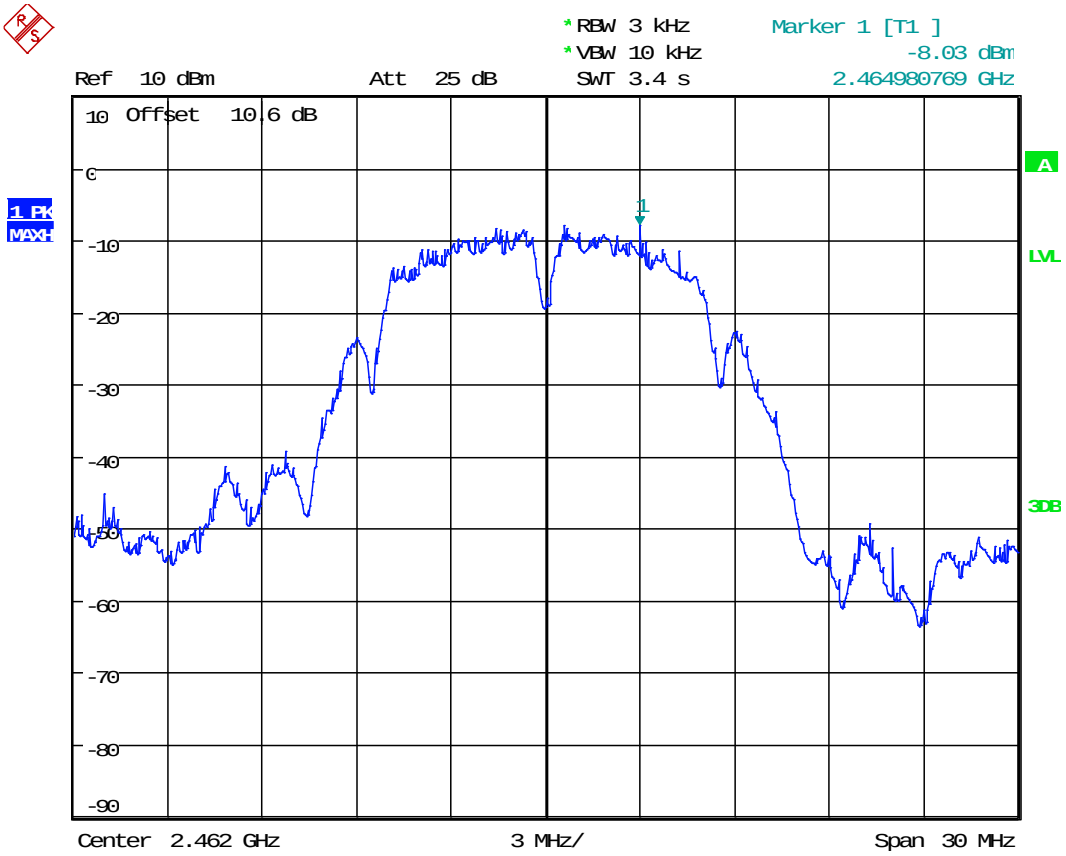
Date: 8.JUN.2016 15:38:21

Ant1



Date: 21.OCT.2016 12:51:25

Ant0



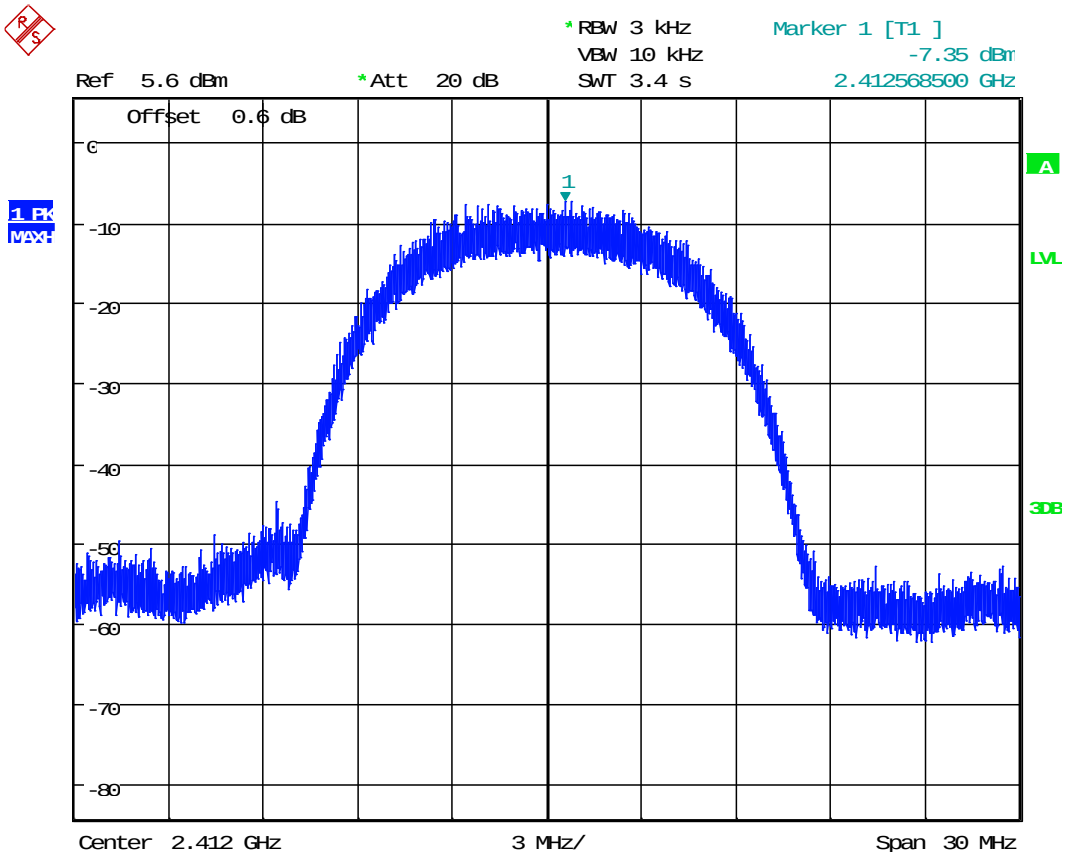
Date: 21.OCT.2016 12:53:27

Ant1

	Modulation:CCK; Data rate: 11 Mbps; CDD				
Channel Frequency (MHz)	Analyzer Level* Ant0 (dBm/3kHz)	Analyzer Level* Ant1 (dBm/3kHz)	Combined PSD (dBm/3kHz)	Power Setting (q dBm)	Result
2412	-7.35	-6.84	-4.1	64	PASS
2437	-5.55	-5.84	-2.7	68	PASS
2462	-6.21	-6.25	-3.2	68	PASS

*Analyser level includes 0.6 dB offset for cable loss

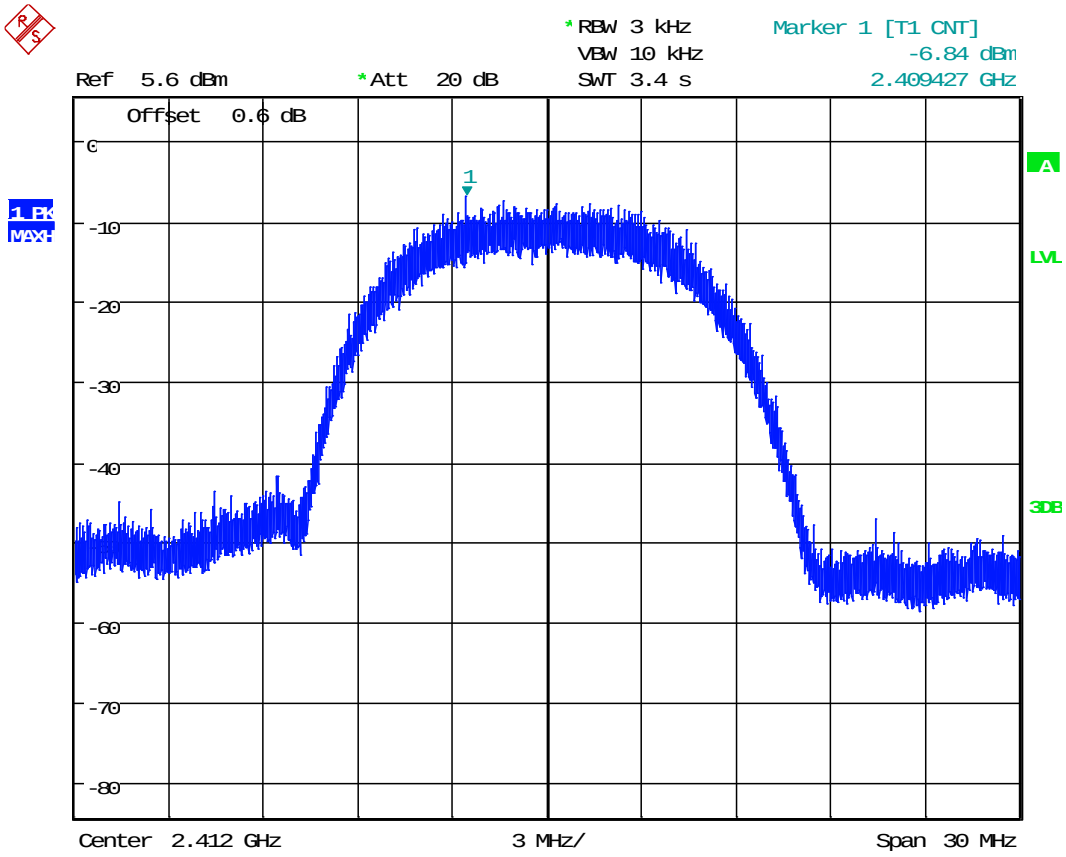
Ch1



Date: 9.JUN.2016 14:53:59

Ant0

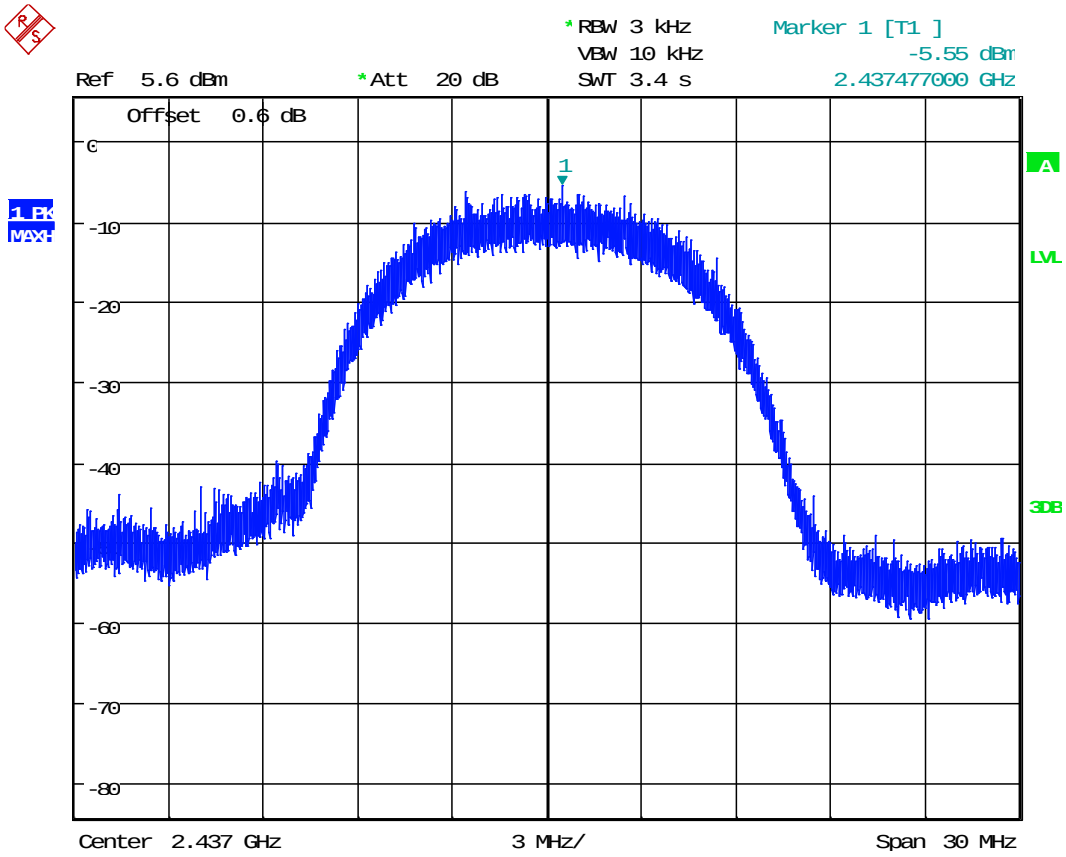
Ch1



Date: 8.JUN.2016 15:47:24

Ant1

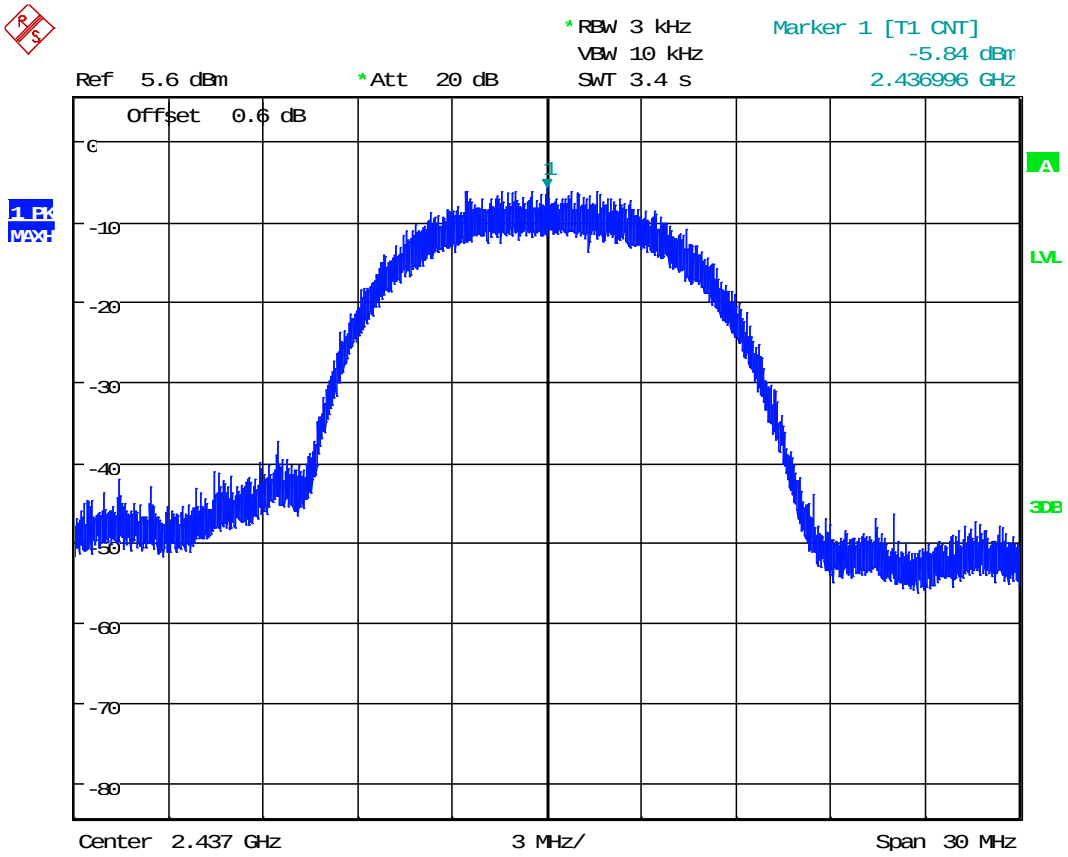
Ch6



Date: 9.JUN.2016 11:27:27

Ant0

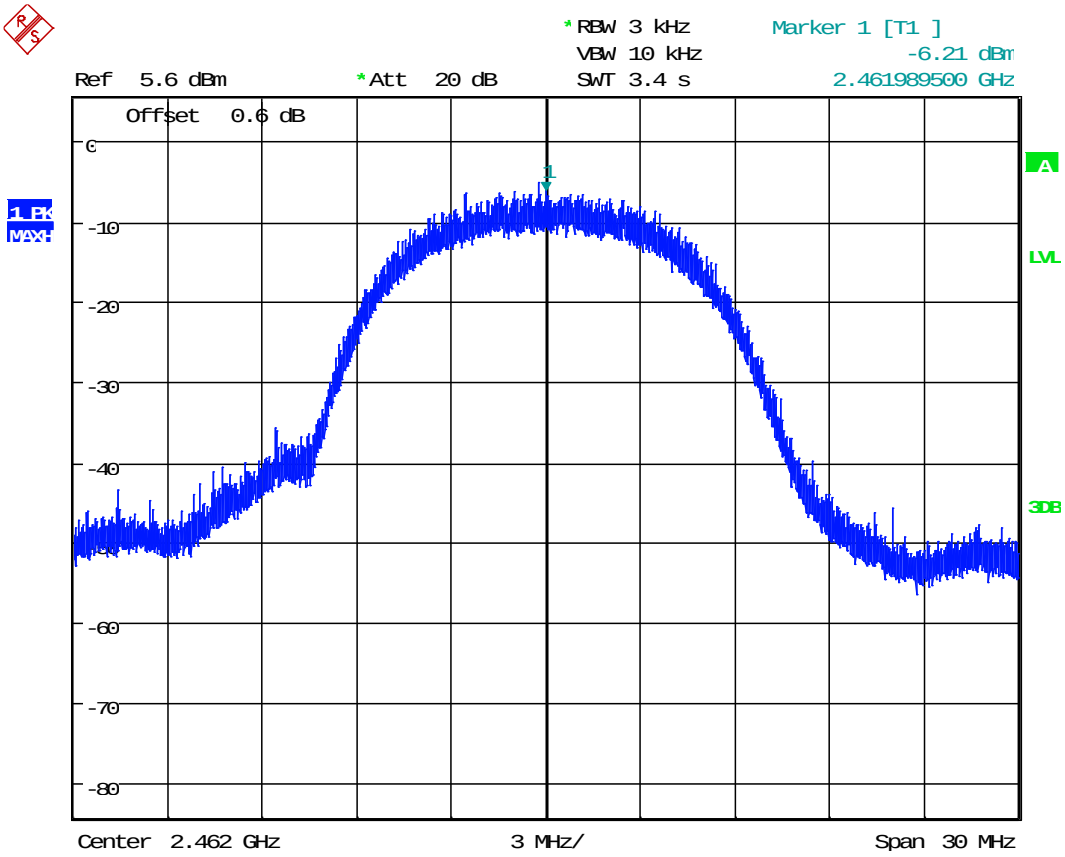
Ch6



Date: 8.JUN.2016 15:33:48

Ant1

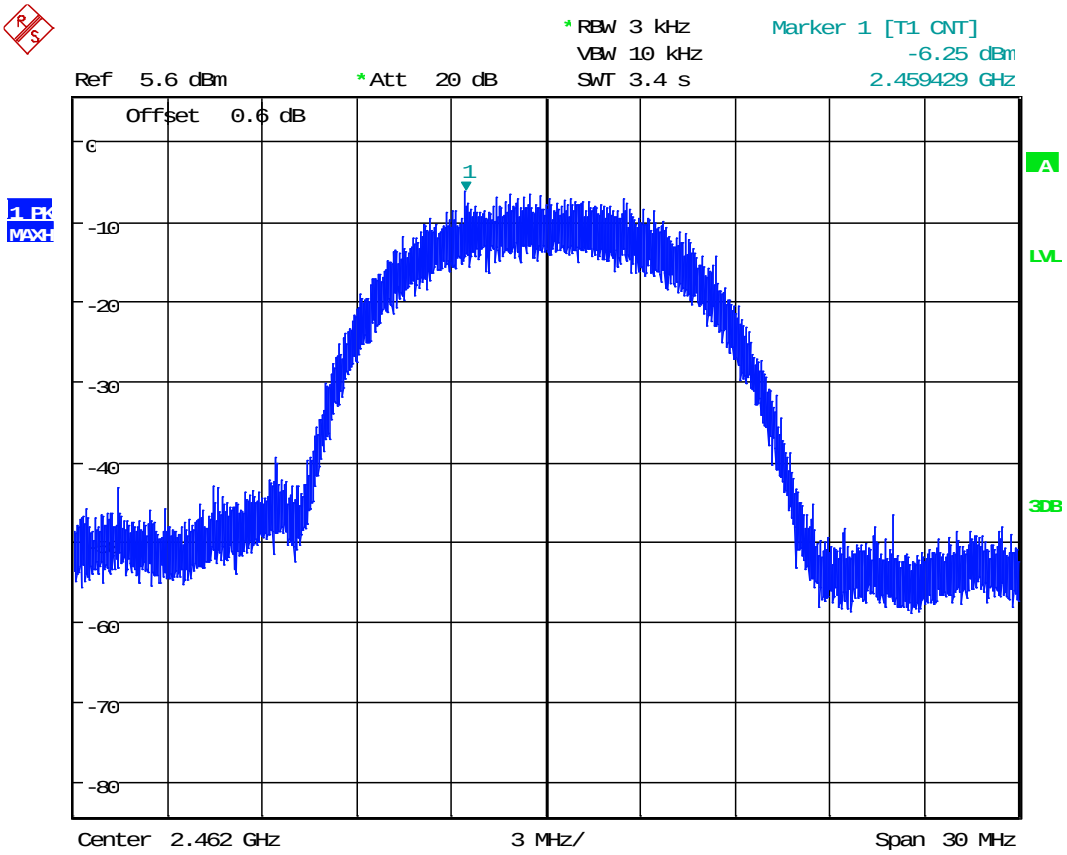
Ch11



Date: 9.JUN.2016 08:58:06

Ant0

Ch11



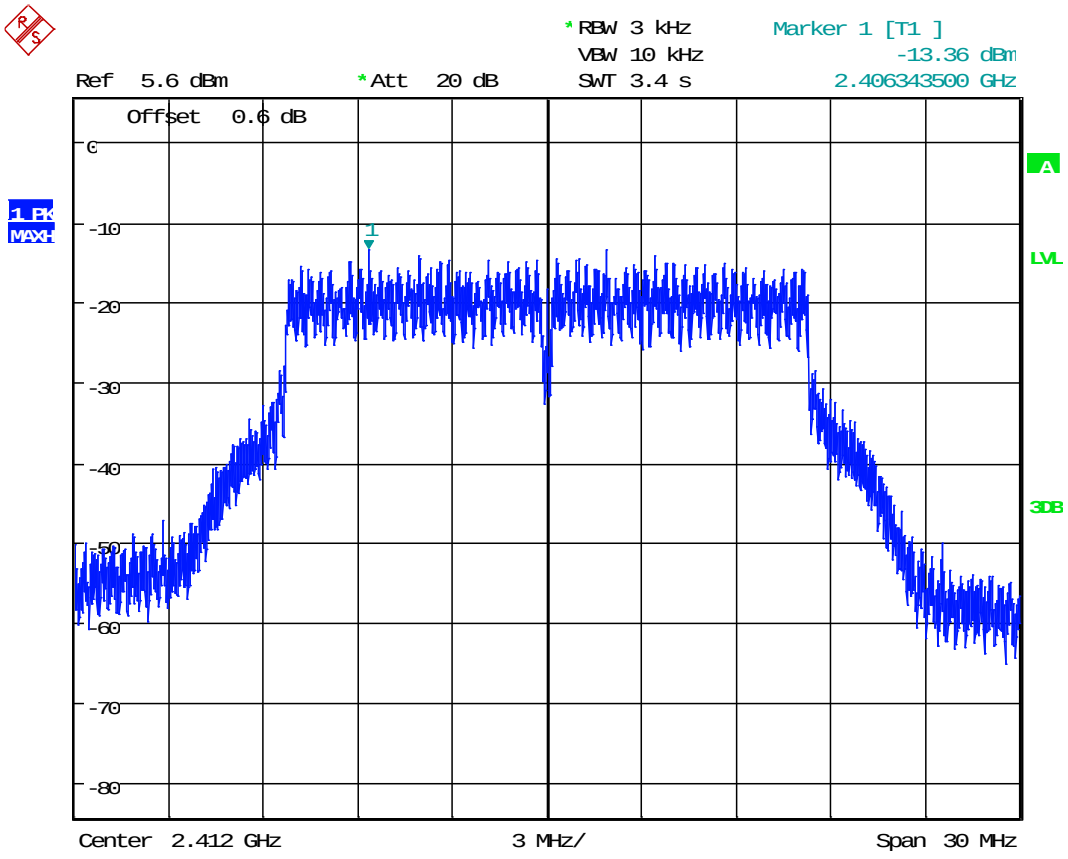
Date: 8.JUN.2016 16:24:31

Ant1

	Modulation: OFDM; Data rate: 6 Mbps; CDD				
Channel Frequency (MHz)	**Analyzer Level* Ant0 (dBm/3kHz)**	**Analyzer Level* Ant1 (dBm/3kHz)**	**Combined PSD (dBm/3kHz)**	**Power Setting (q dBm)**	**Result**
2412	-13.36	-13.41	-10.4	48	PASS
2437	-10.26	-9.94	-7.1	64	PASS
2462	-10.06	-10.27	-7.2	64	PASS

Analyser level includes 0.6 dB offset for cable loss

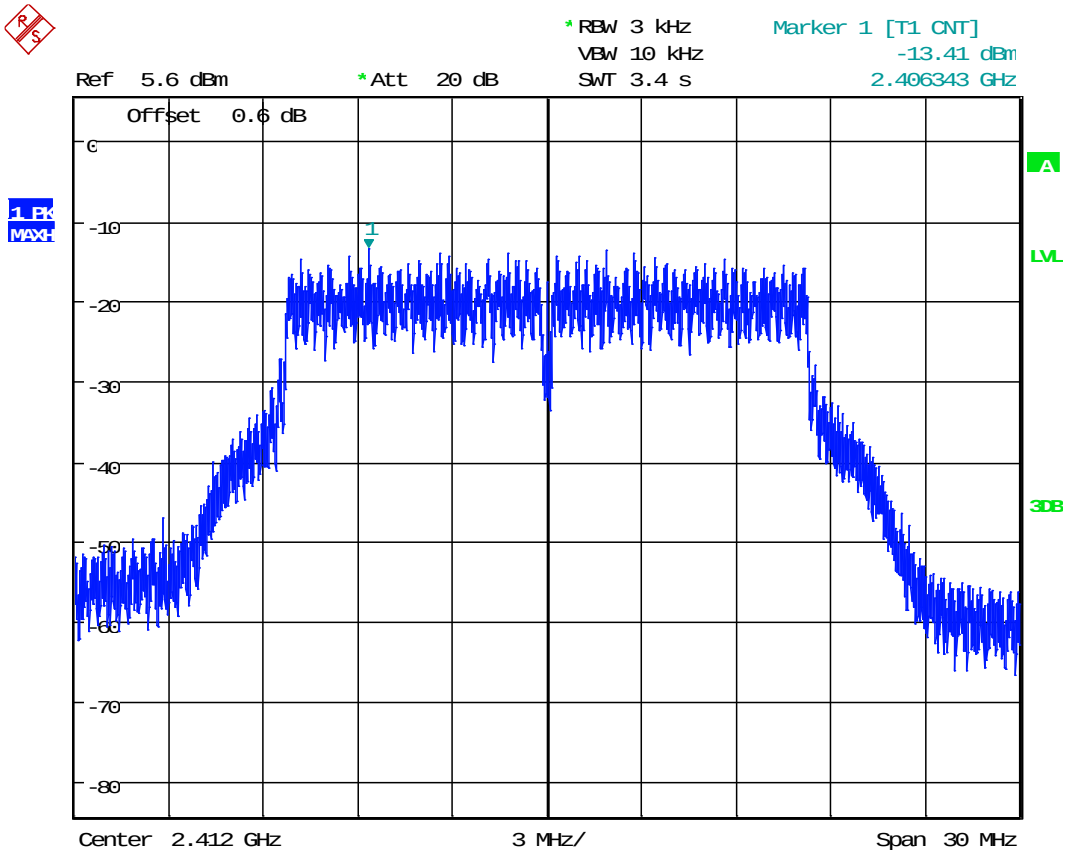
Ch1



Date: 9.JUN.2016 13:49:43

Ant0

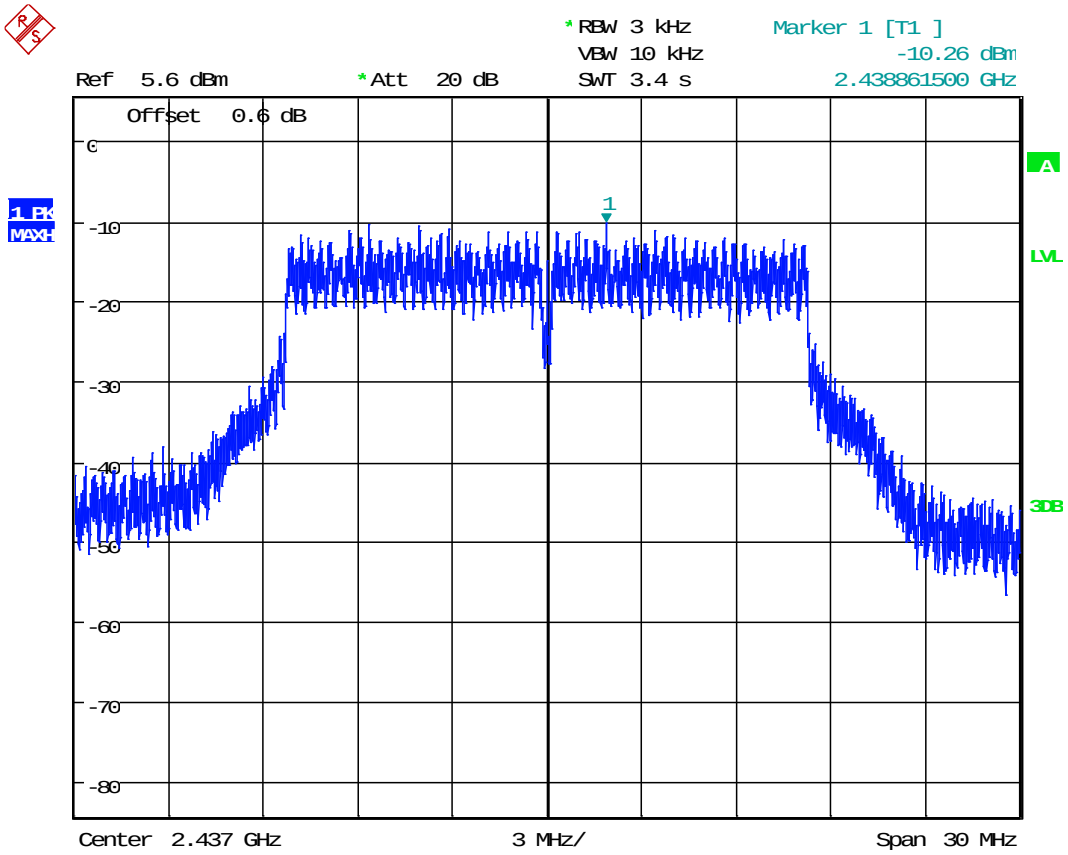
Ch1



Date: 8.JUN.2016 15:51:15

Ant1

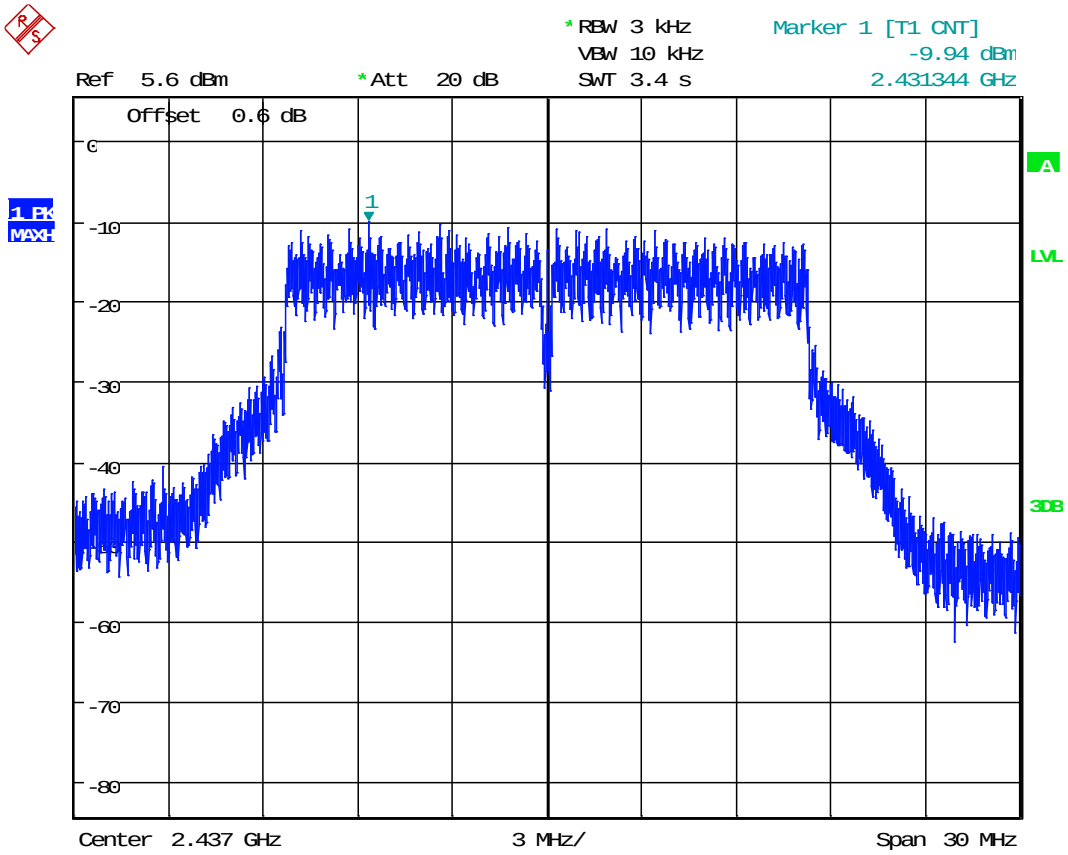
Ch6



Date: 9.JUN.2016 11:32:04

Ant0

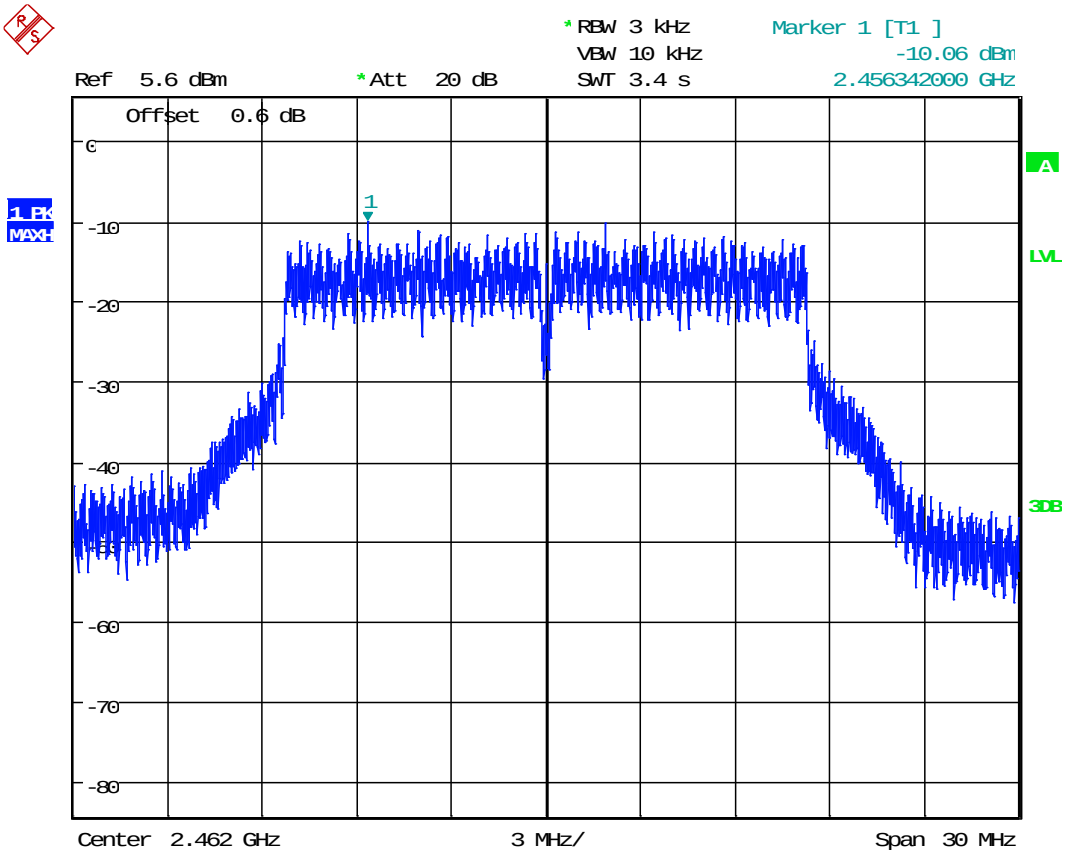
Ch6



Date: 8.JUN.2016 15:19:49

Ant1

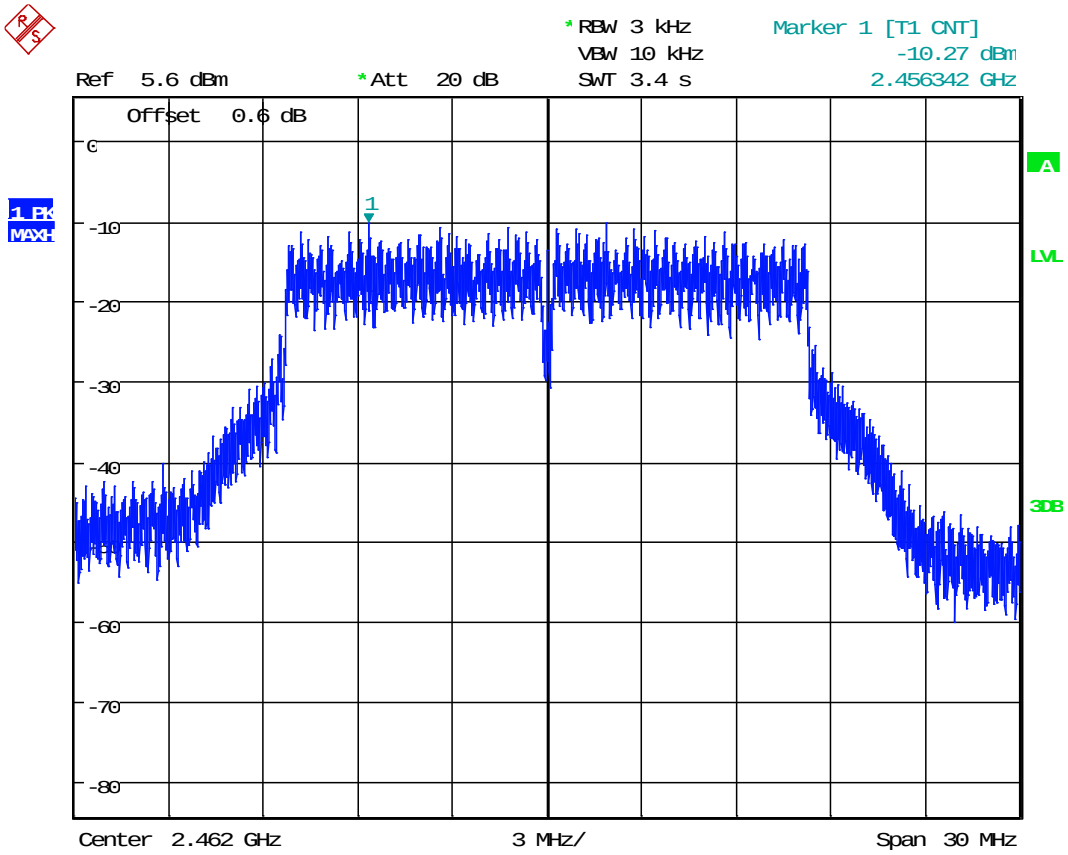
Ch11



Date: 9.JUN.2016 09:27:03

Ant0

Ch11



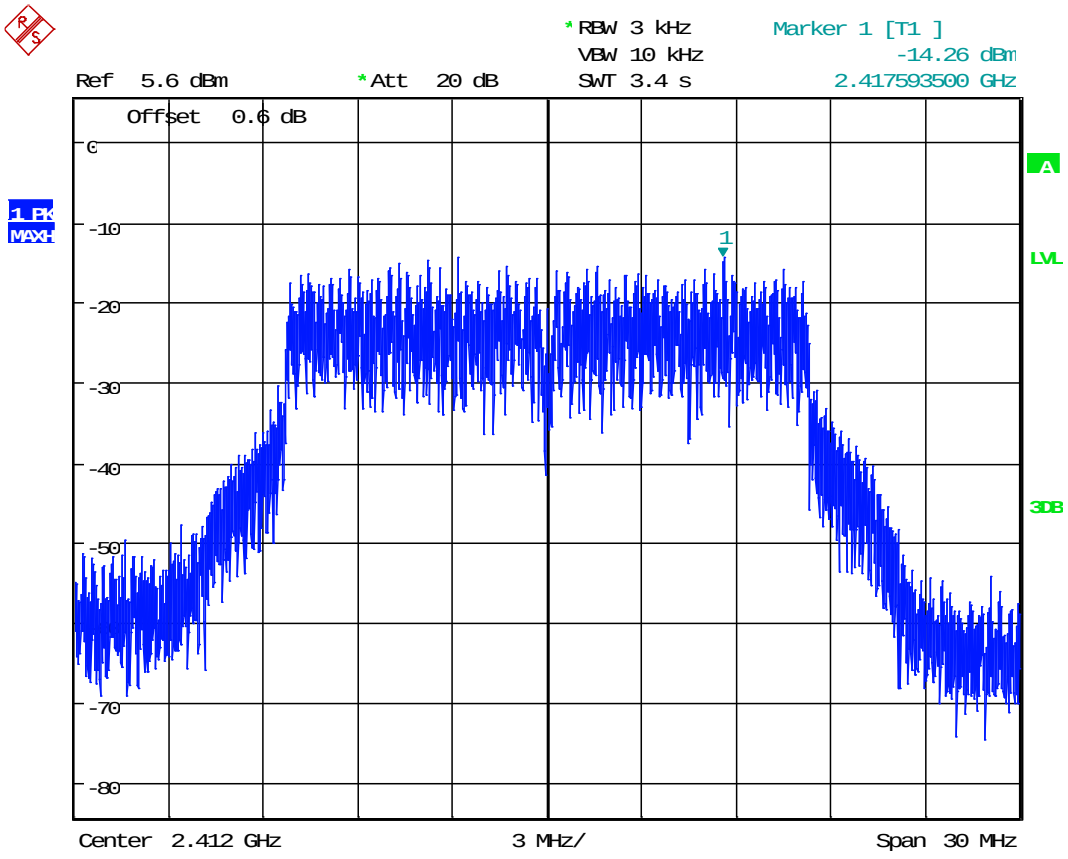
Date: 8.JUN.2016 16:00:08

Ant1

	Modulation: OFDM; Data rate: 54 Mbps; CDD				
Channel Frequency (MHz)	Analyzer Level* Ant0 (dBm/3kHz)	Analyzer Level* Ant1 (dBm/3kHz)	Combined PSD (dBm/3kHz)	Power Setting (q dBm)	Result
2412	-14.26	-13.87	-11.05	48	PASS
2437	-12.88	-12.14	-9.5	56	PASS
2462	-12.69	-12.32	-9.5	56	PASS

Analyser level includes 0.6 dB offset for cable loss

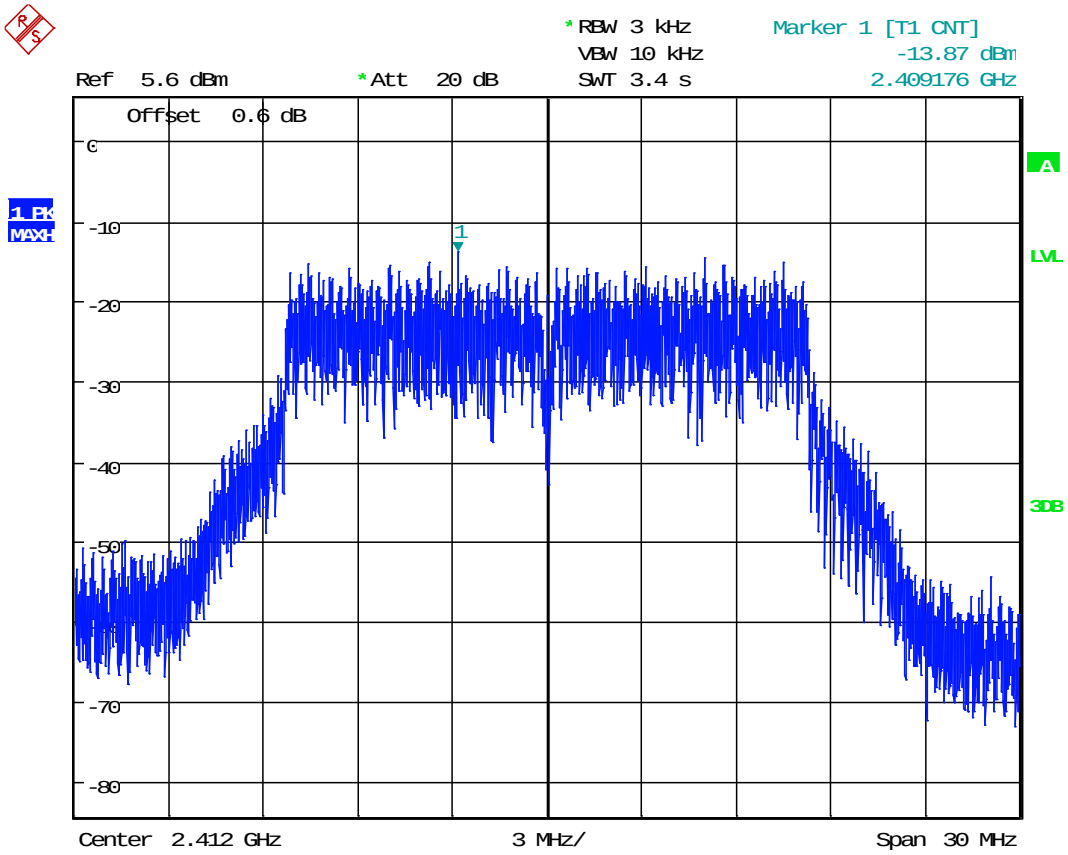
Ch1



Date: 9.JUN.2016 13:51:55

Ant0

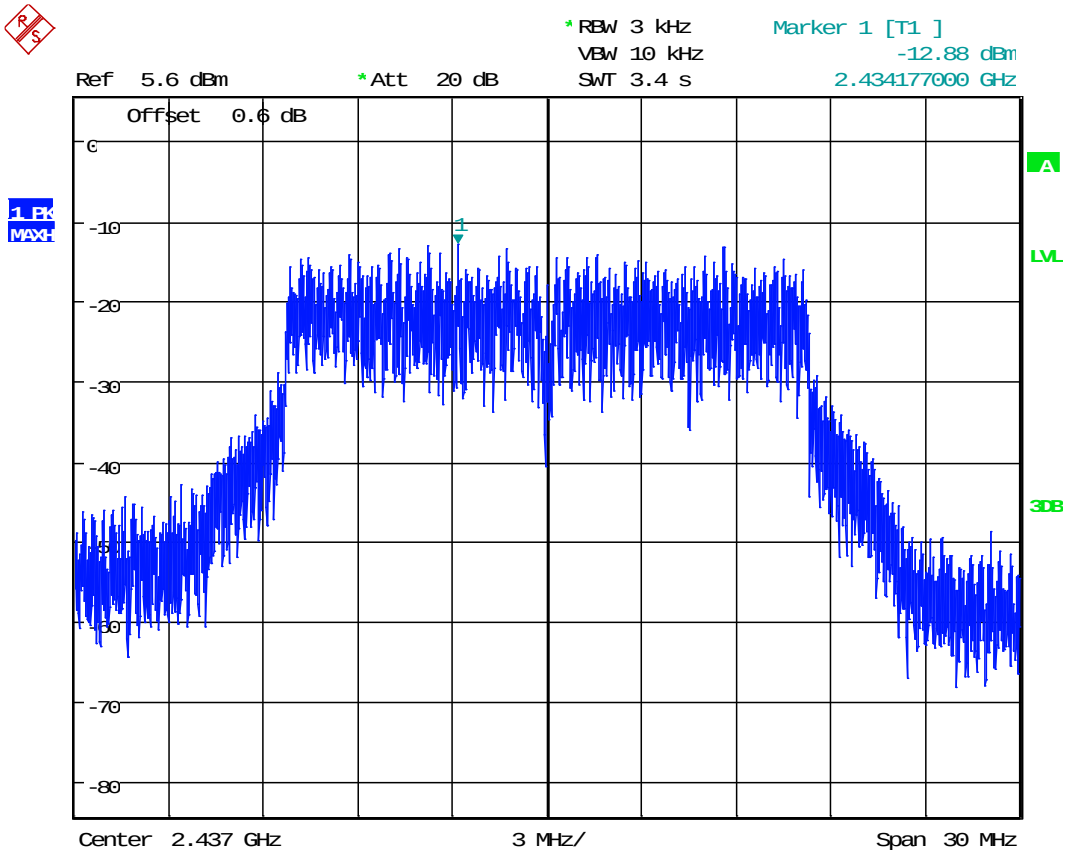
Ch1



Date: 8.JUN.2016 15:53:38

Ant1

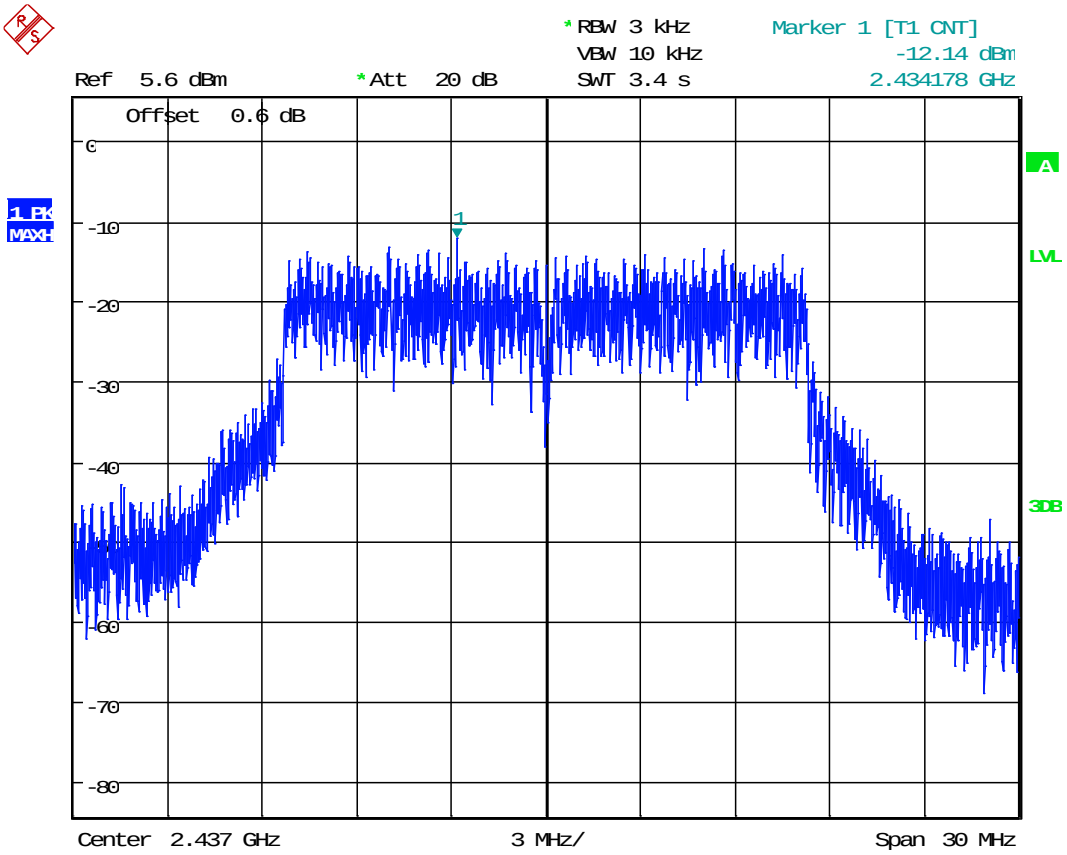
Ch6



Date: 9.JUN.2016 11:35:54

Ant0

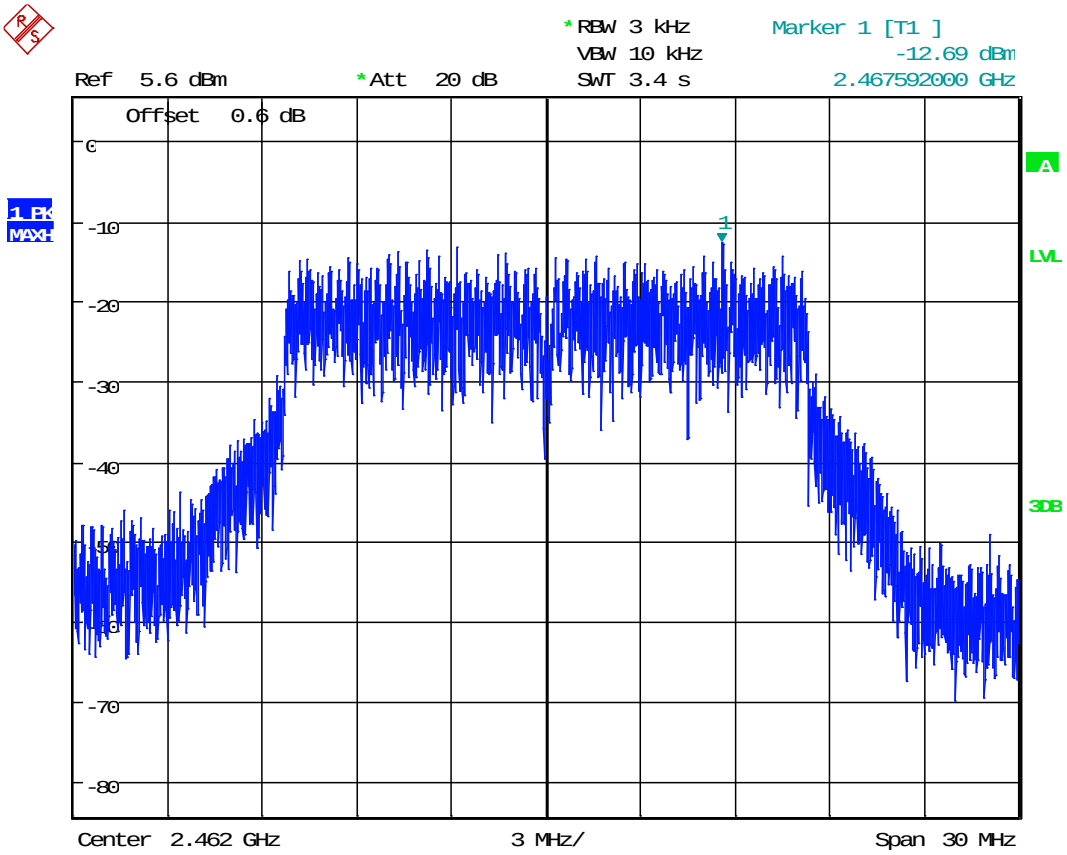
Ch6



Date: 8.JUN.2016 15:10:10

Ant1

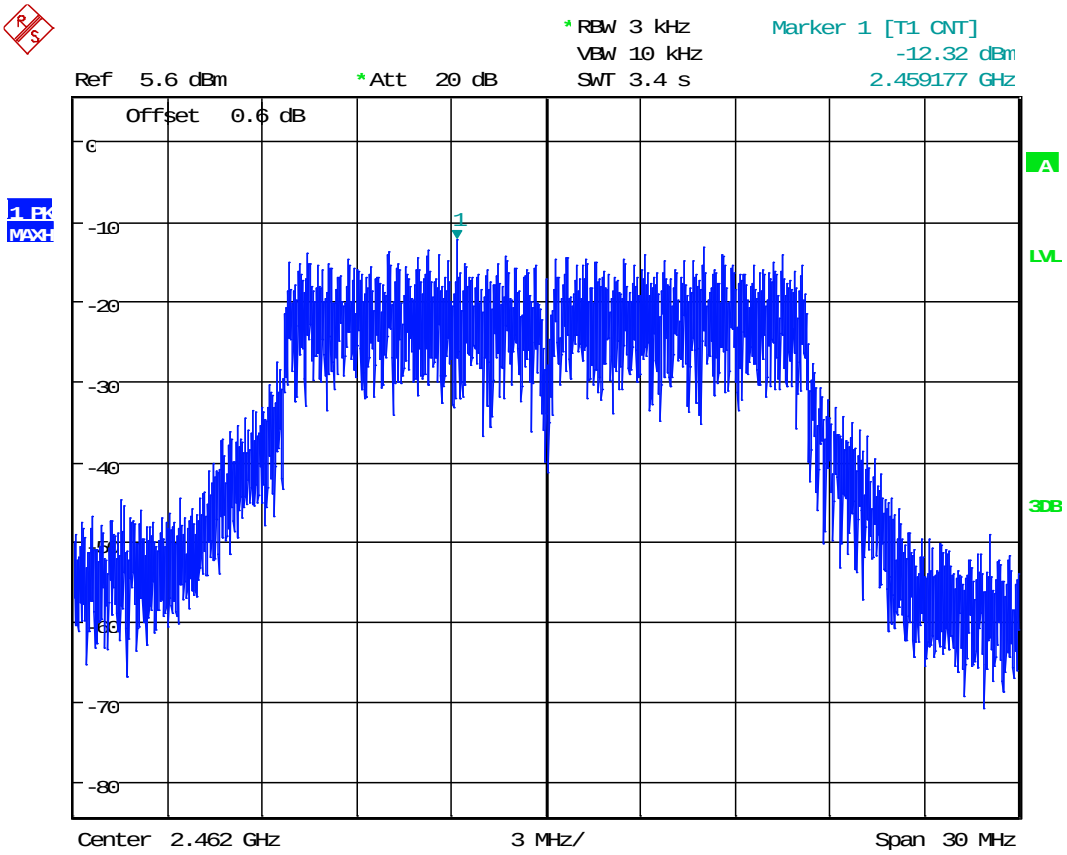
Ch11



Date: 9.JUN.2016 09:29:40

Ant0

Ch11



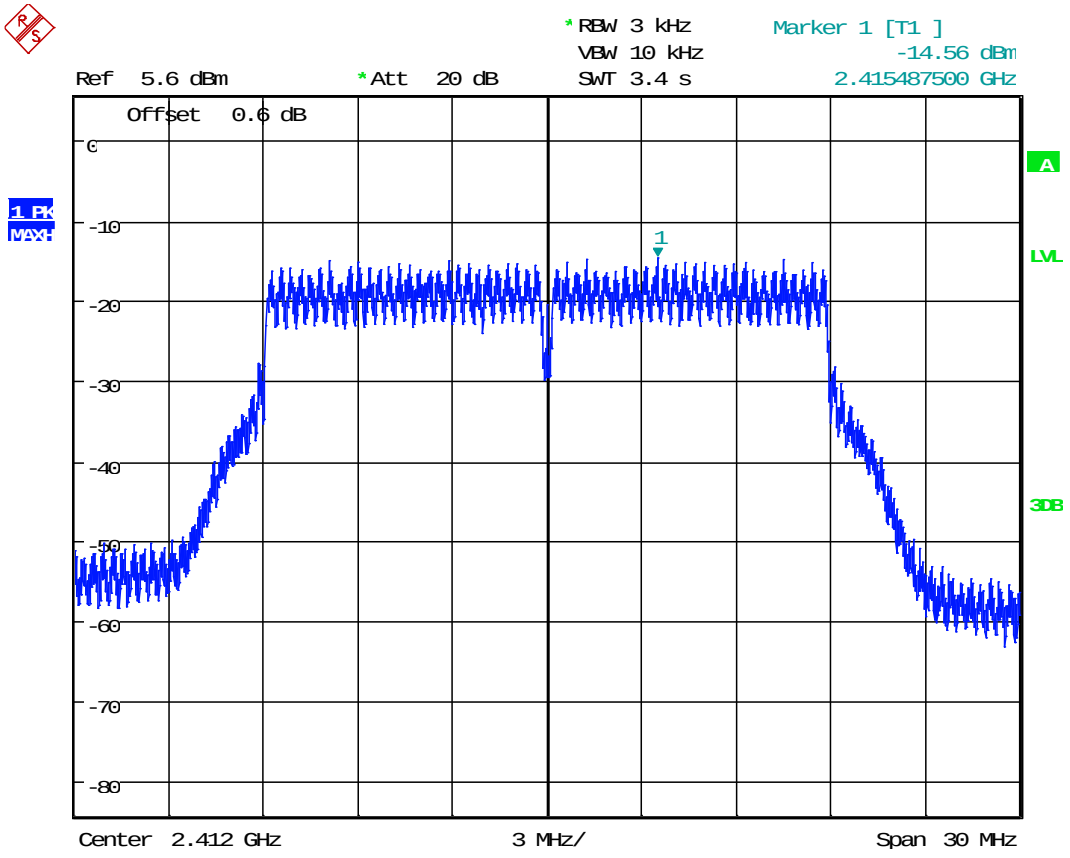
Date: 8.JUN.2016 15:57:52

Ant1

	Modulation: HT20; Data rate: MCS0; CDD				
Channel Frequency (MHz)	**Analyzer Level* Ant0 (dBm/3kHz)**	**Analyzer Level* Ant1 (dBm/3kHz)**	**Combined PSD (dBm/3kHz)**	**Power Setting (q dBm)**	**Result**
2412	-14.56	-14.63	-11.6	44	PASS
2437	-9.52	-8.39	-5.9	64	PASS
2462	-12.61	-11.95	-9.3	56	PASS

Analyser level includes 0.6 dB offset for cable loss

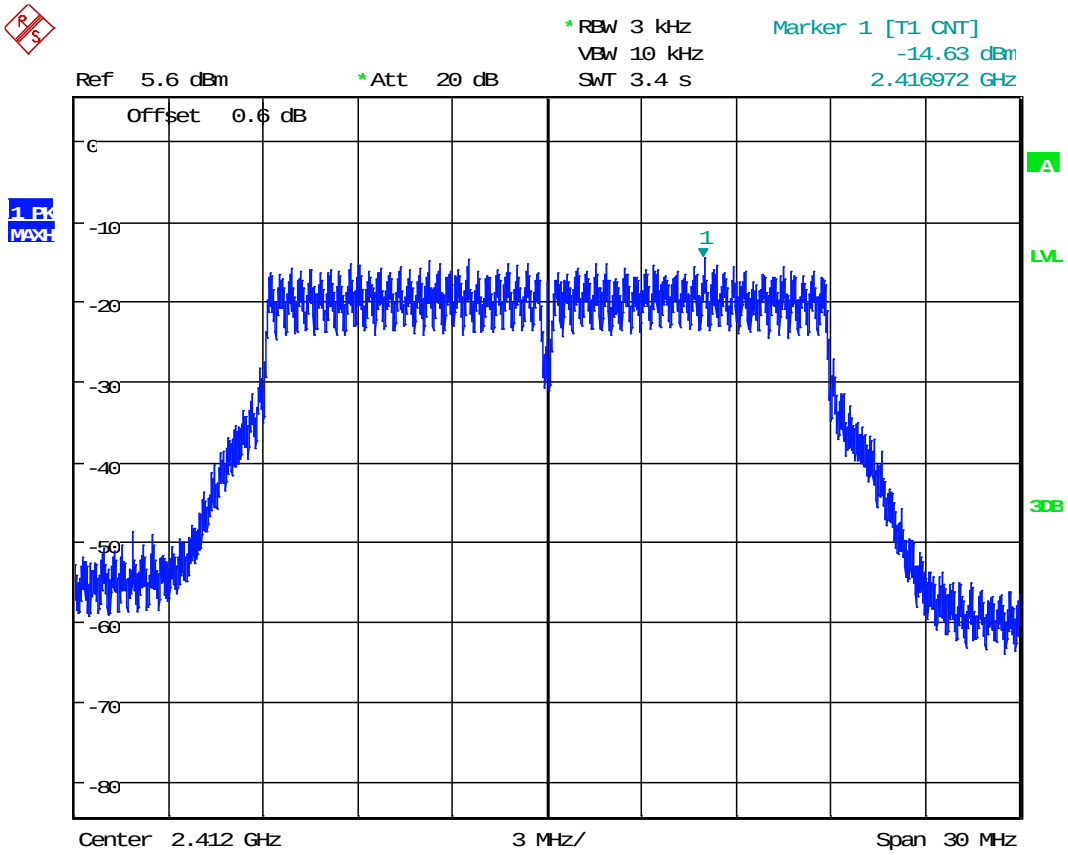
Ch1



Date: 9.JUN.2016 13:33:50

Ant0

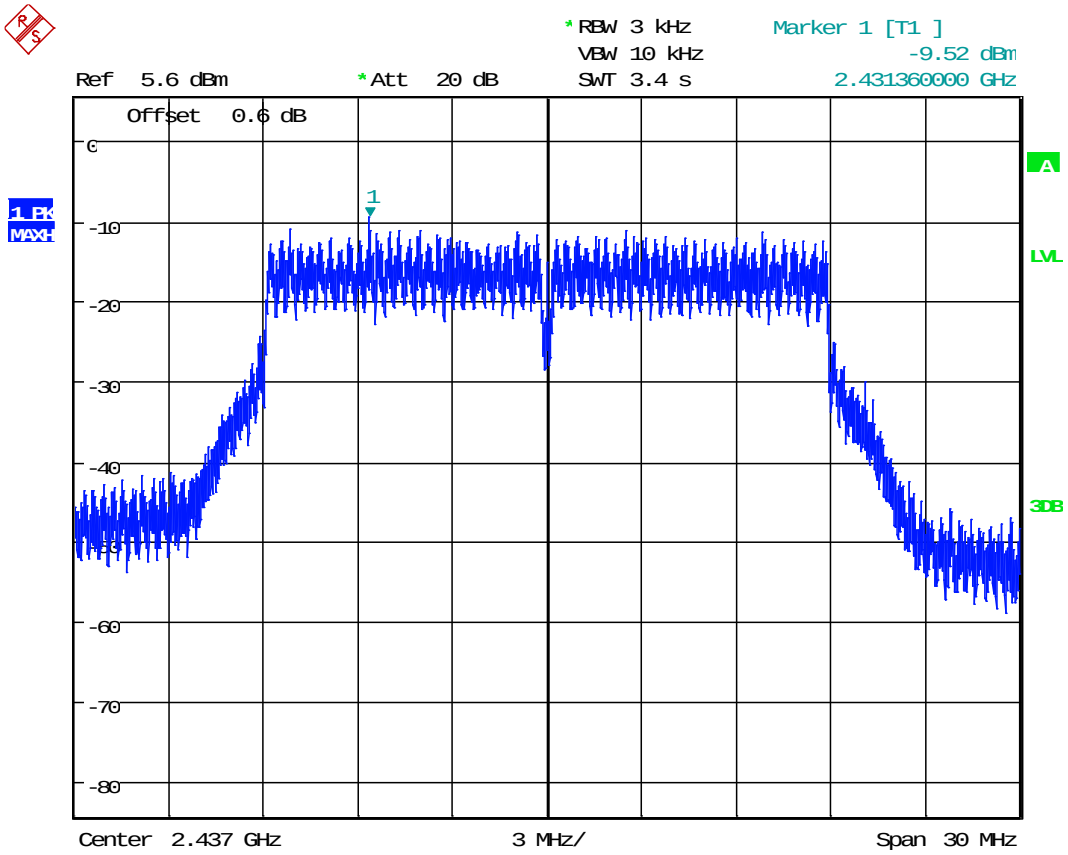
Ch1



Date: 8.JUN.2016 14:41:57

Ant1

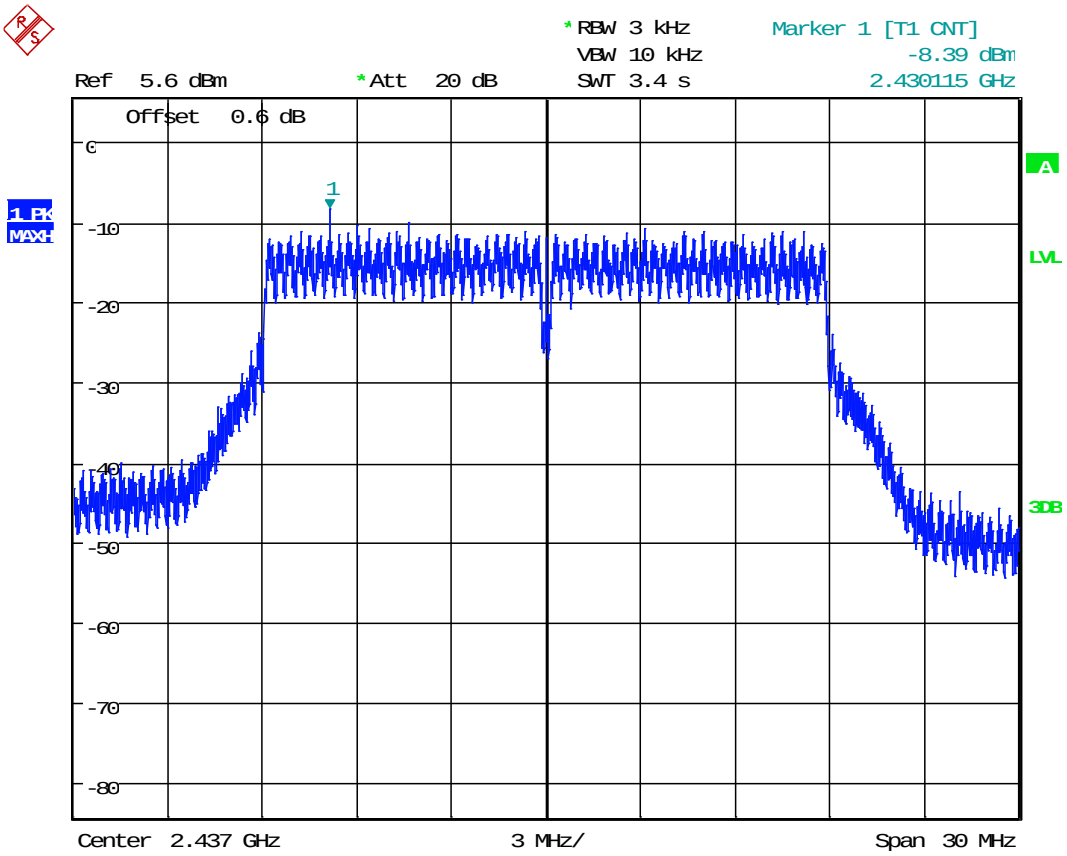
Ch6



Date: 9.JUN.2016 11:39:01

Ant0

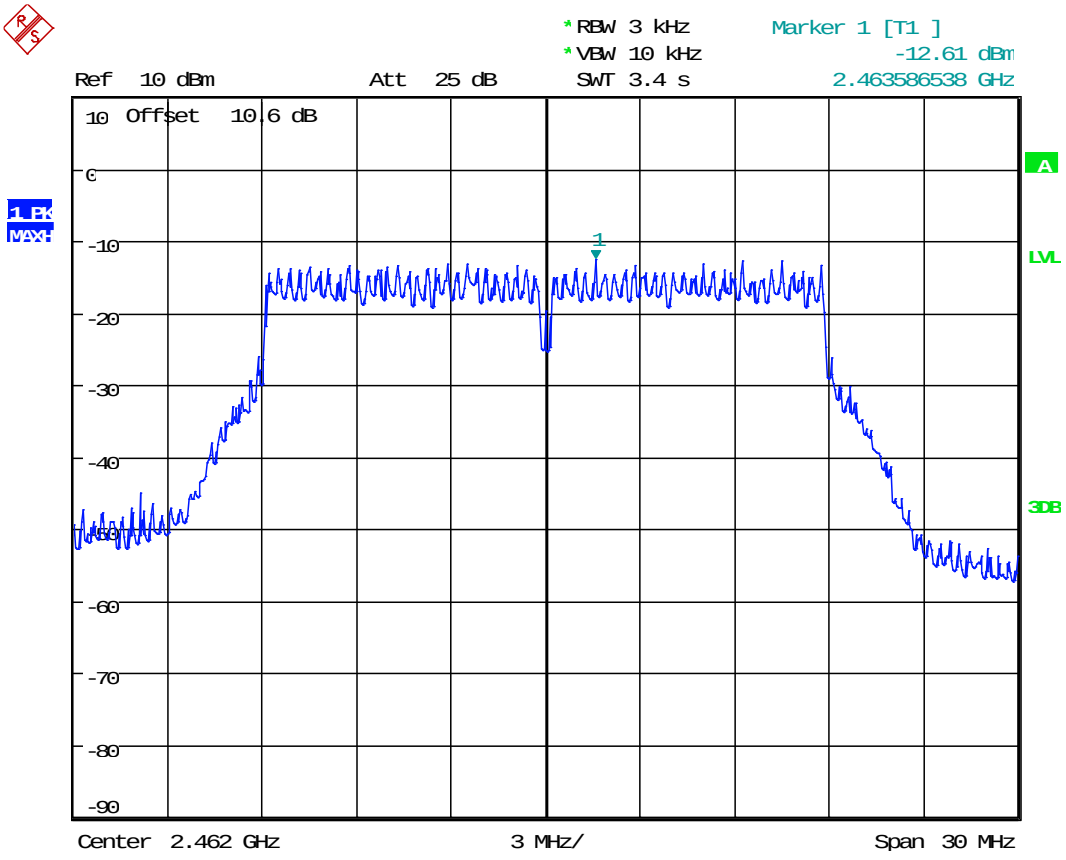
Ch6



Date: 8.JUN.2016 14:50:01

Ant1

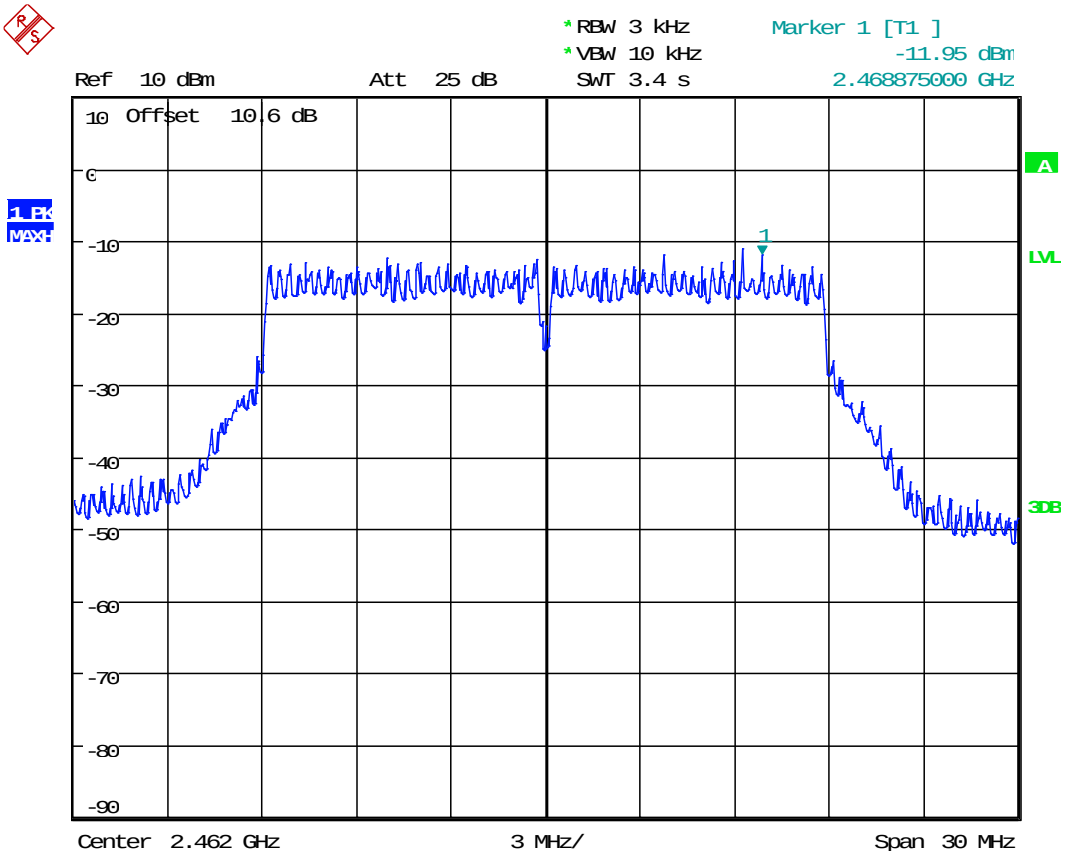
Ch11



Date: 21.OCT.2016 13:00:40

Ant0

Ch11



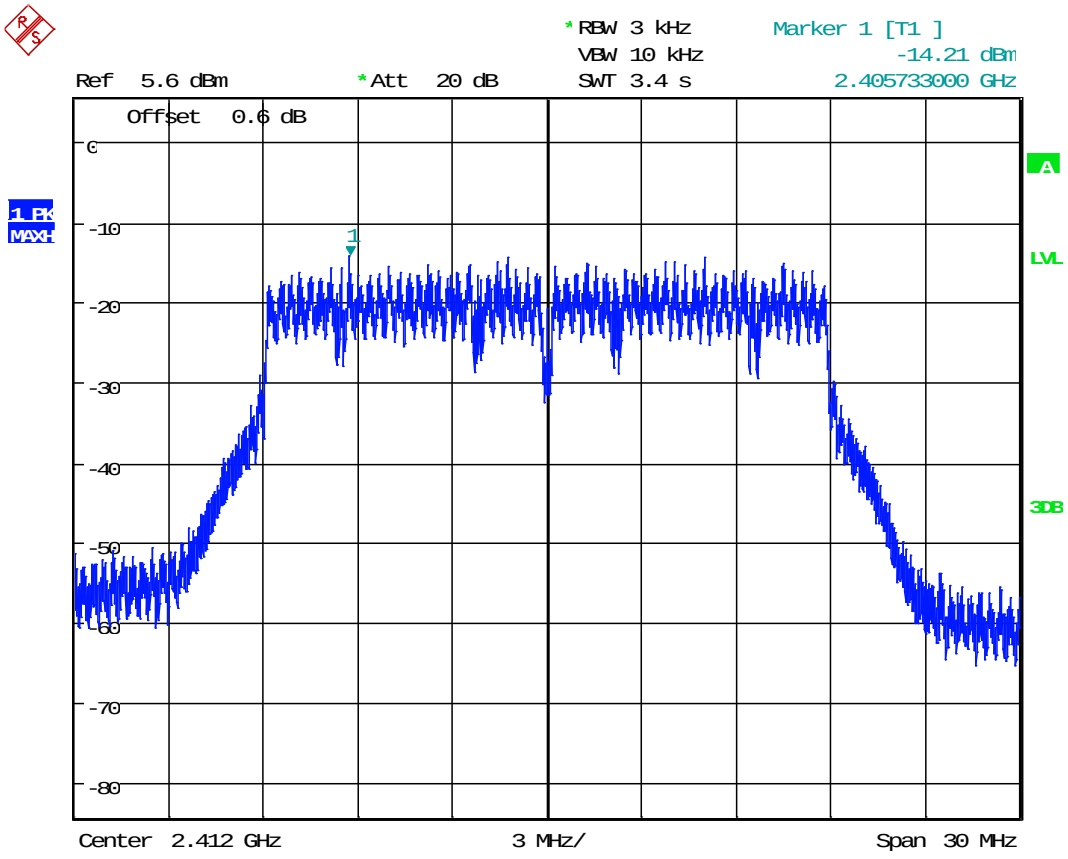
Date: 21.OCT.2016 13:02:04

Ant1

	Modulation: HT20; Data rate: MCS7; CDD				
Channel Frequency (MHz)	**Analyzer Level* Ant0 (dBm/3kHz)**	**Analyzer Level* Ant1 (dBm/3kHz)**	**Combined PSD (dBm/3kHz)**	**Power Setting (q dBm)**	**Result**
2412	-14.21	-15.03	-11.6	44	PASS
2437	-11.88	-11.28	-8.6	56	PASS
2462	-12.64	-11.84	-9.2	56	PASS

Analyser level includes 0.6 dB offset for cable loss

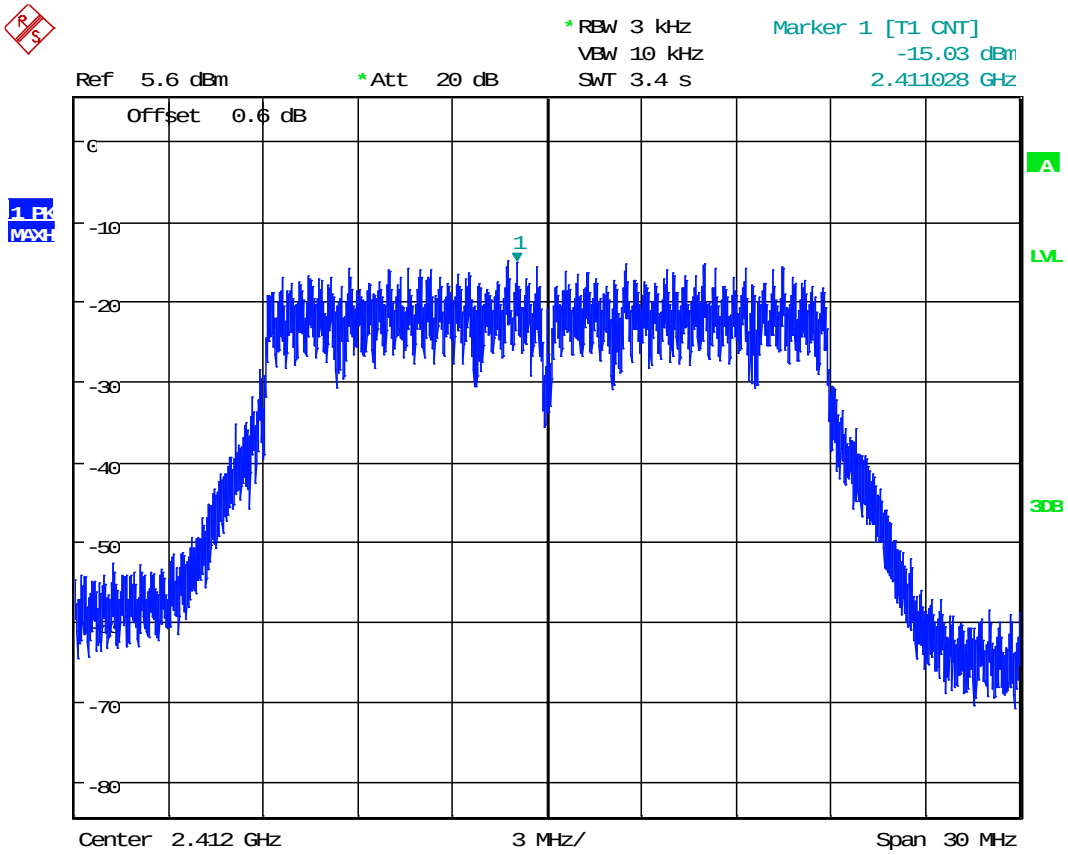
Ch1



Date: 9.JUN.2016 13:39:00

Ant0

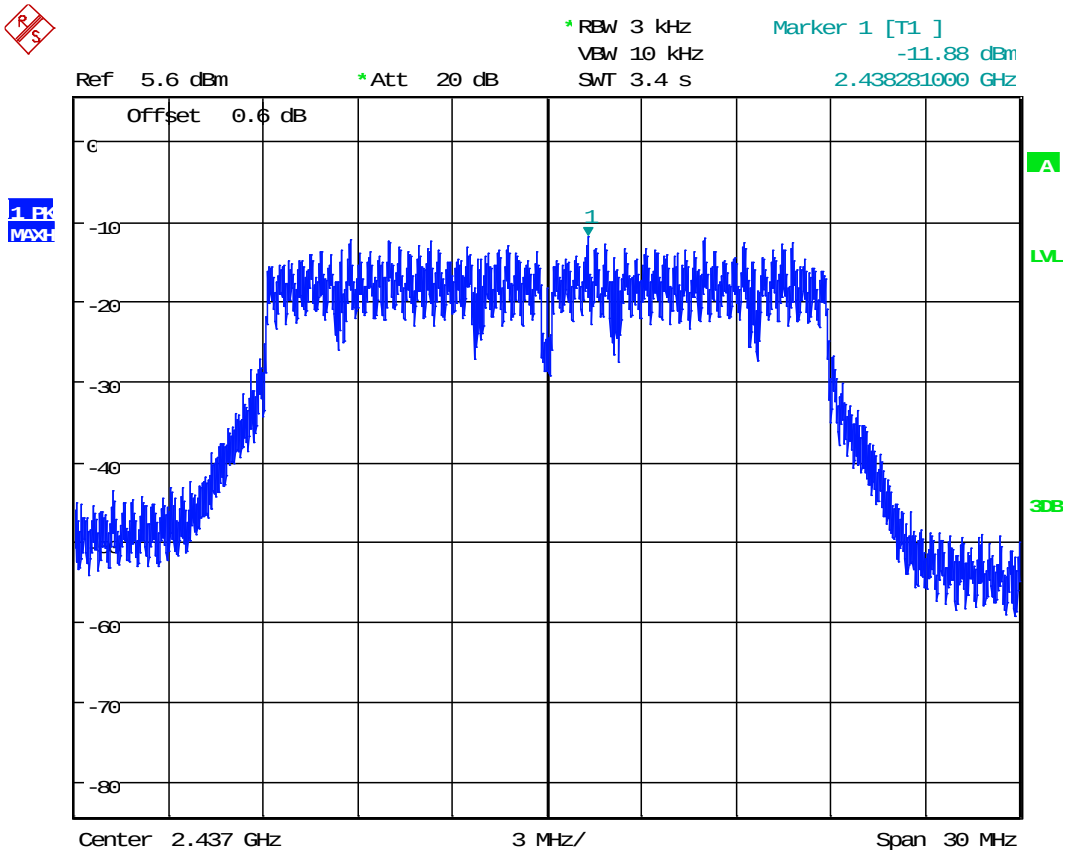
Ch1



Date: 8.JUN.2016 14:44:06

Ant1

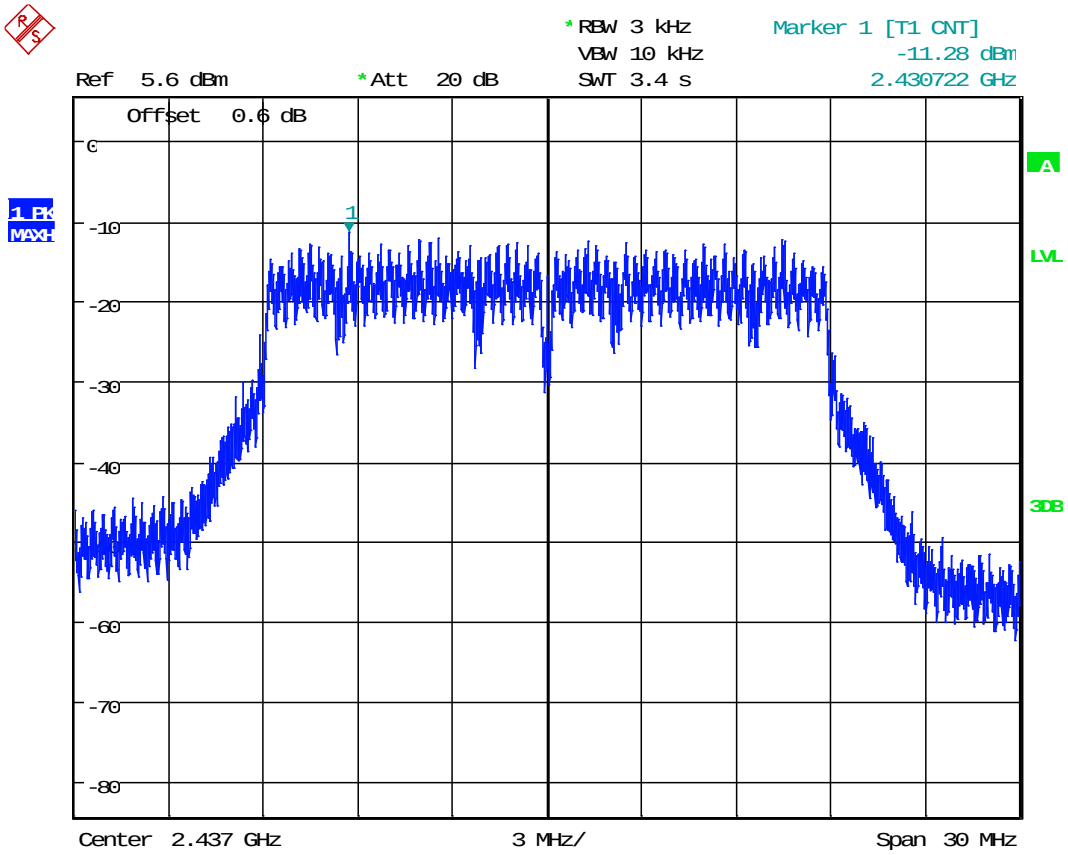
Ch6



Date: 9.JUN.2016 11:43:25

Ant0

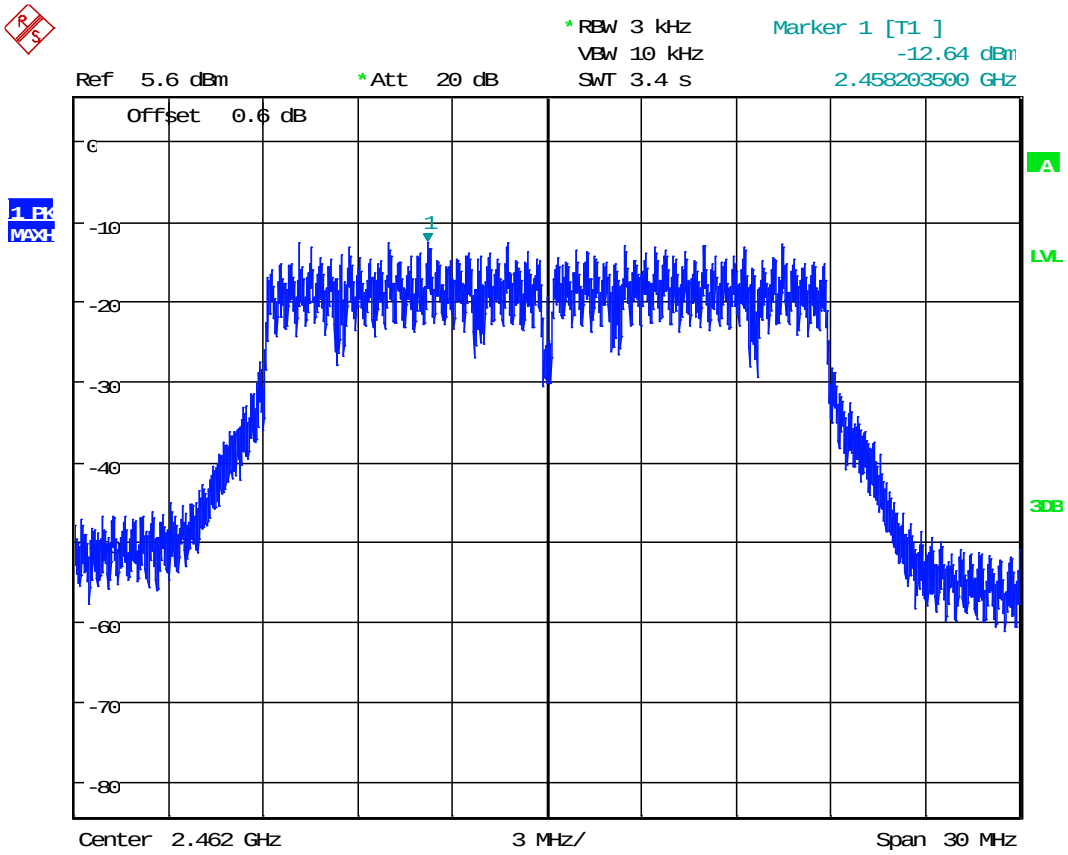
Ch6



Date: 8.JUN.2016 14:53:10

Ant1

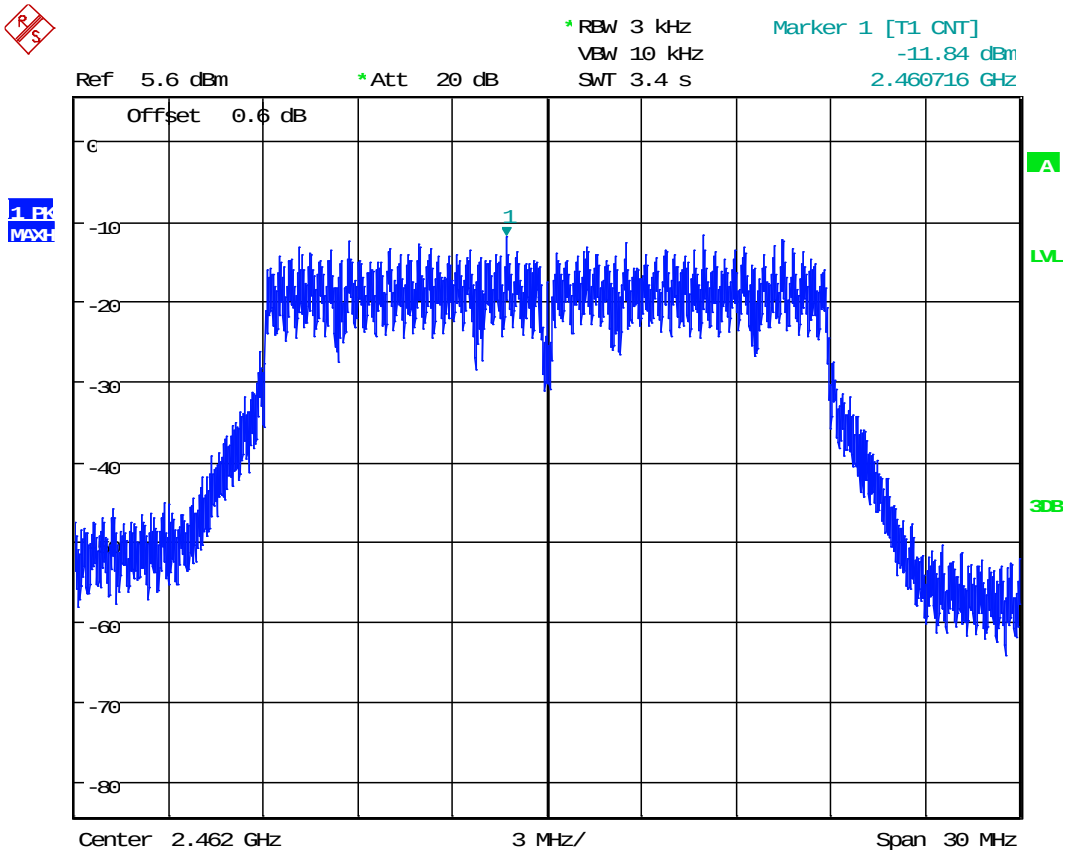
Ch11



Date: 9.JUN.2016 09:39:05

Ant0

Ch11



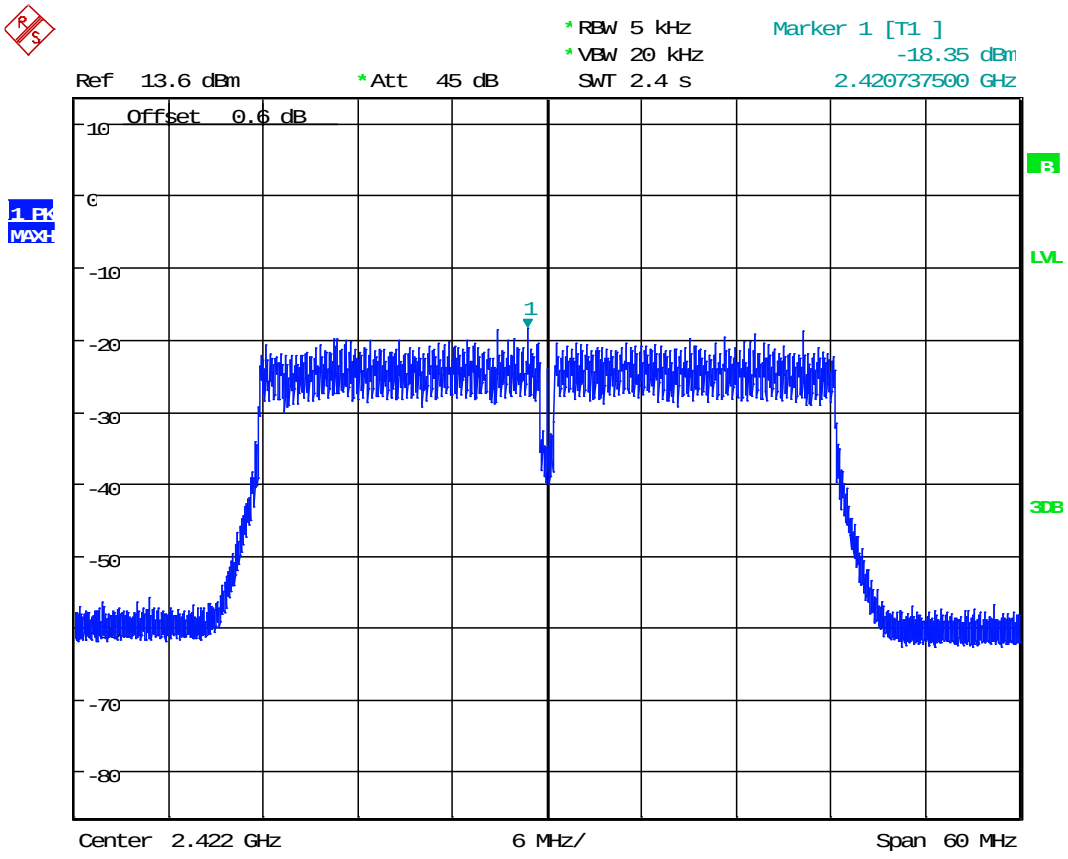
Date: 8.JUN.2016 16:16:11

Ant1

	Modulation: HT40; Data rate: MCS0; CDD				
Channel Frequency (MHz)	**Analyzer Level* Ant0 (dBm/3kHz)**	**Analyzer Level* Ant1 (dBm/3kHz)**	**Combined PSD (dBm/3kHz)**	**Power Setting (q dBm)**	**Result**
2422	-18.35	-21.82	-16.7	32	PASS
2447	-13.55	-12.73	-10.1	48	PASS
2462	-17.04	-16.68	-13.8	44	PASS

Analyser level includes 0.6 dB offset for cable loss

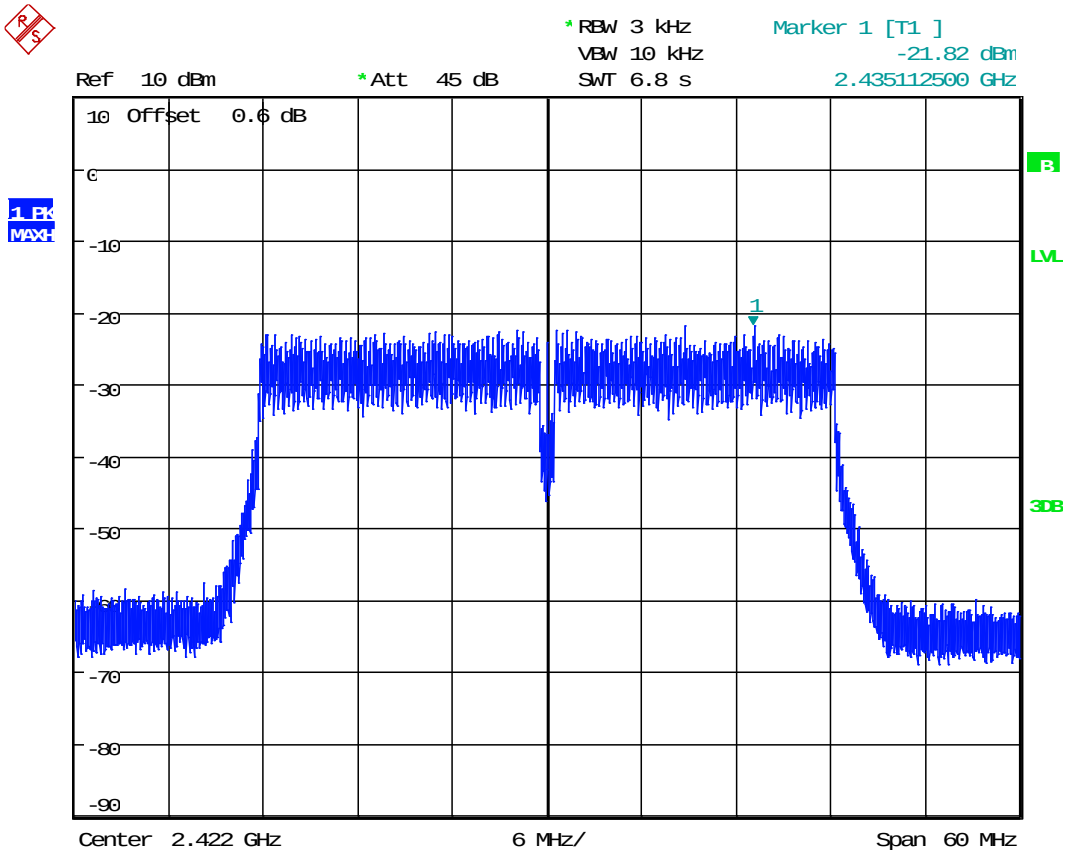
Ch1



Date: 21.JUN.2016 12:14:16

Ant0

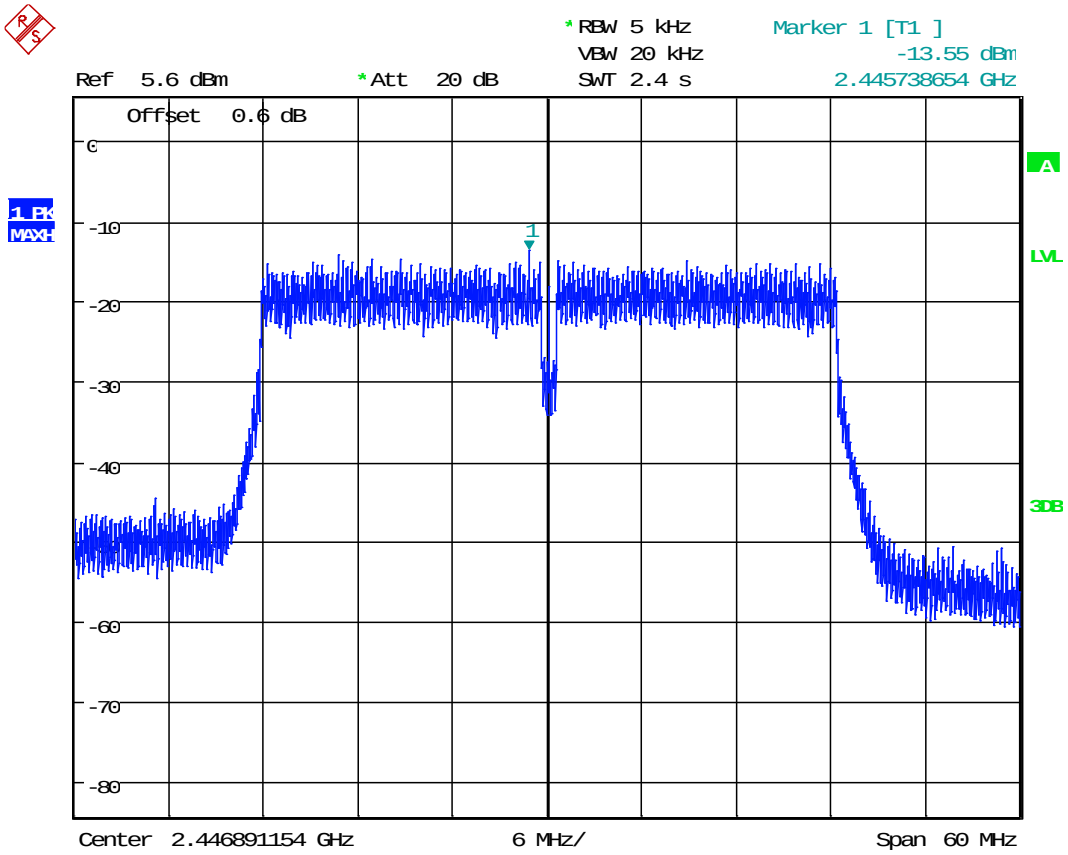
Ch1



Date: 21.JUN.2016 13:59:11

Ant1

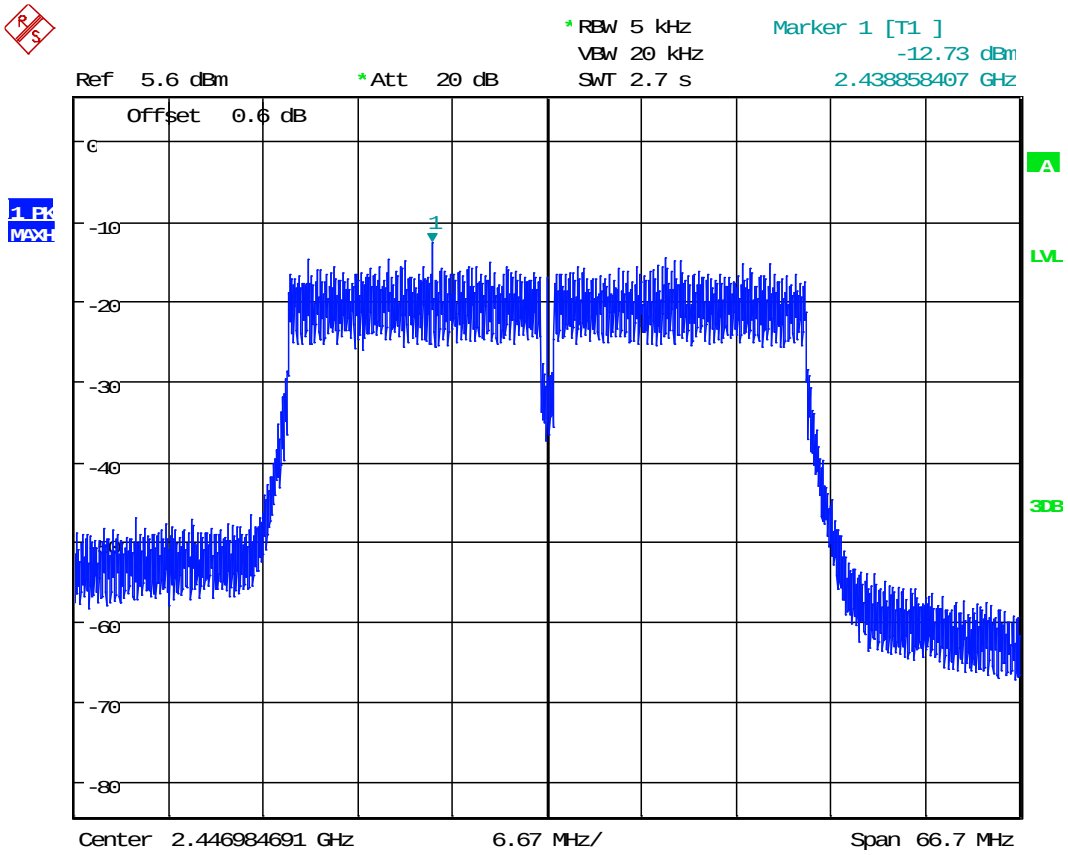
Ch6



Date: 9.JUN.2016 11:05:14

Ant0

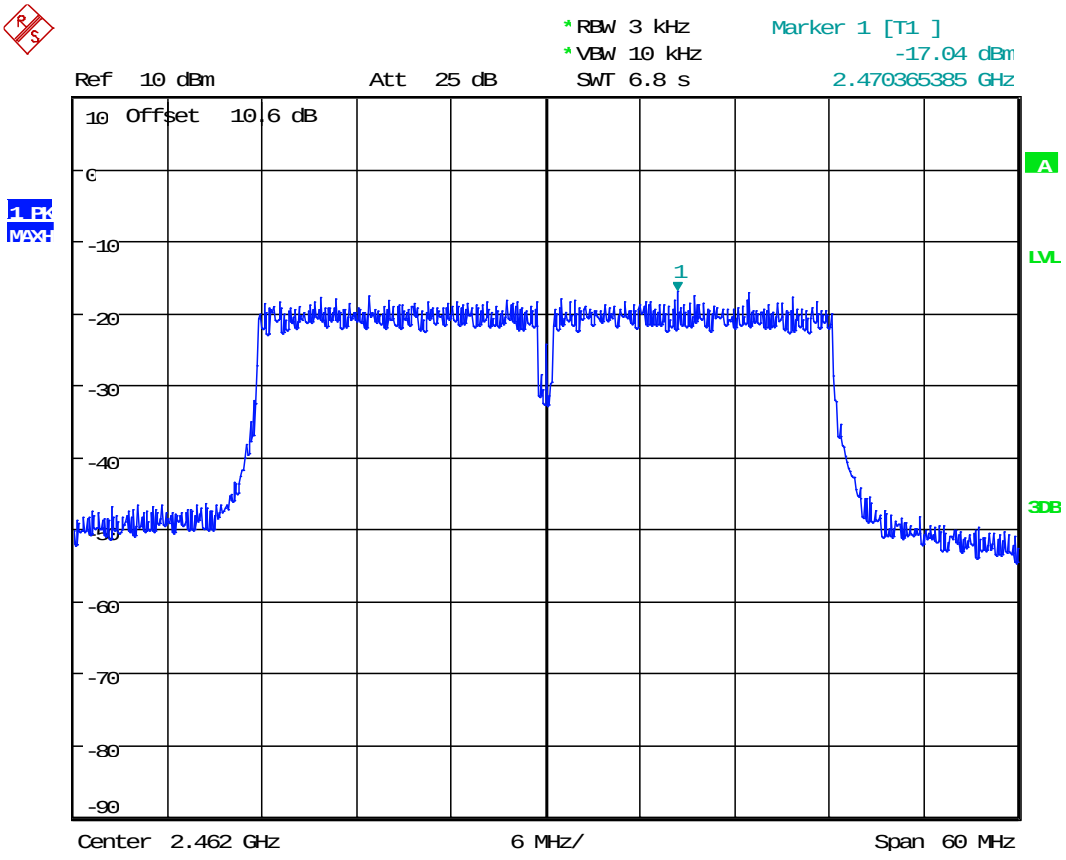
Ch6



Date: 8.JUN.2016 12:15:40

Ant1

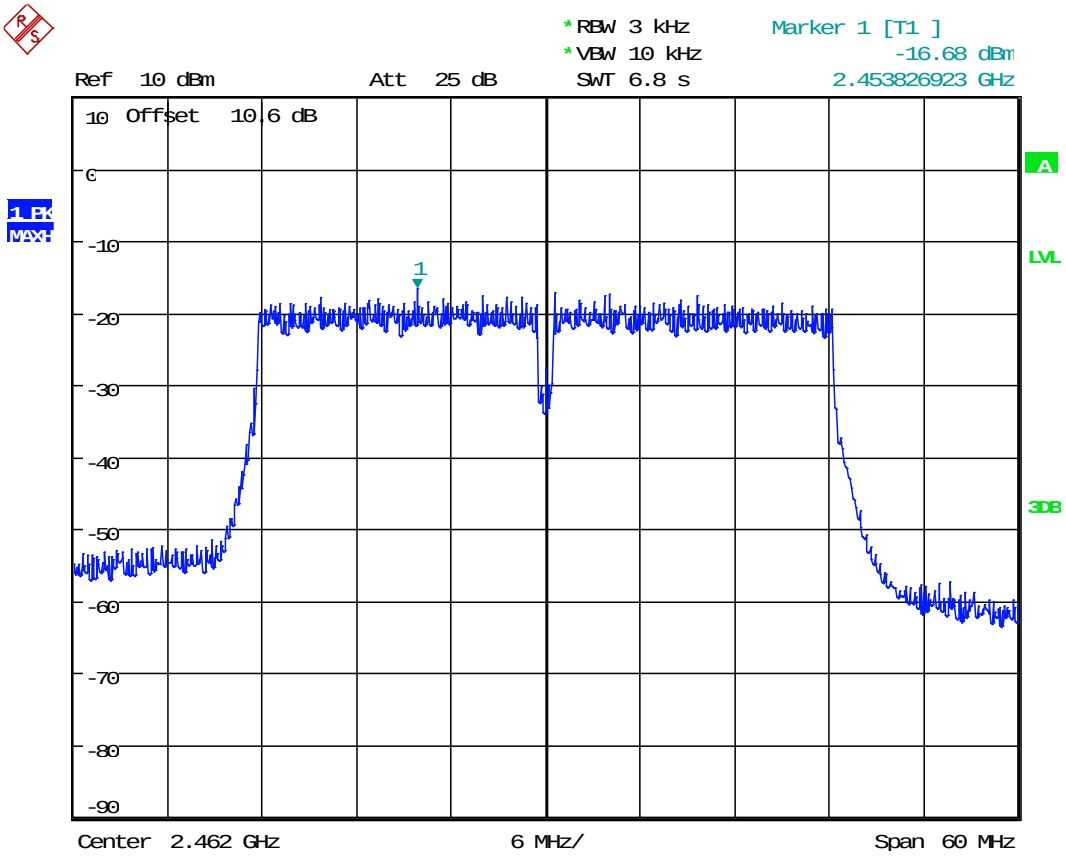
Ch9



Date: 21.OCT.2016 13:49:26

Ant0

Ch9



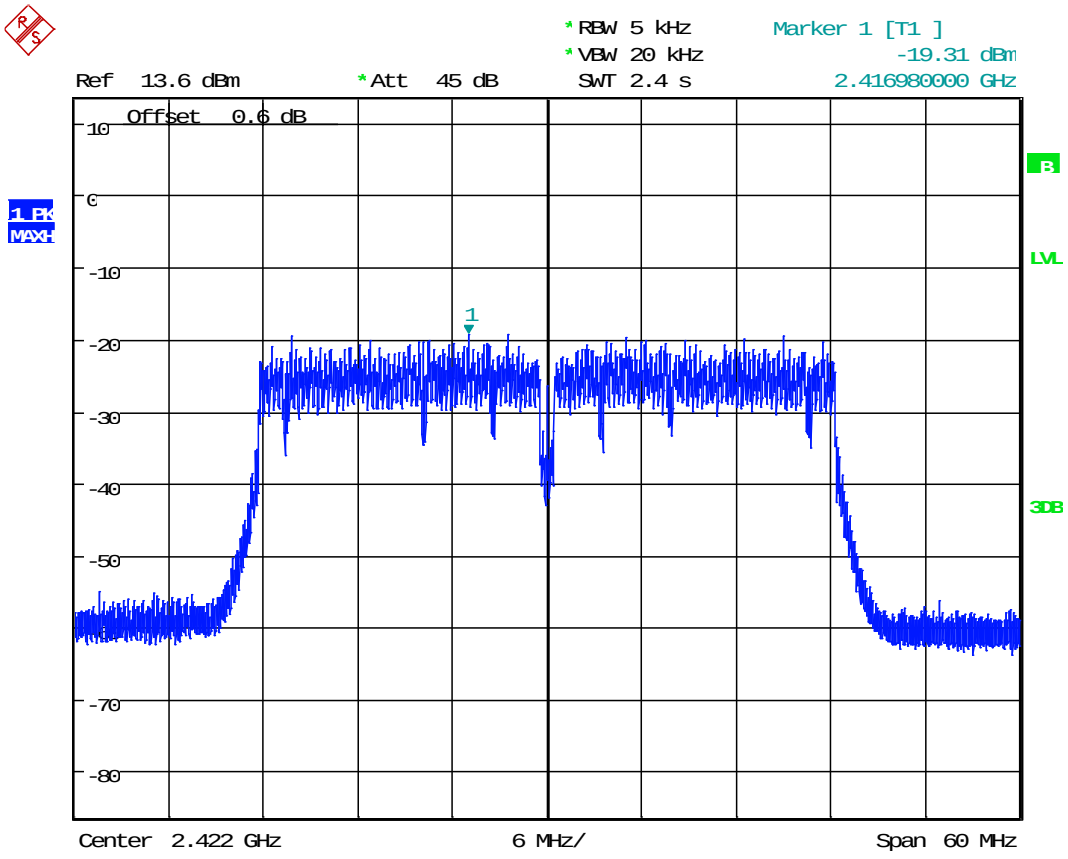
Date: 21.OCT.2016 13:53:48

Ant1

	Modulation: HT40; Data rate: MCS7; CDD				
Channel Frequency (MHz)	**Analyzer Level* Ant0 (dBm/3kHz)**	**Analyzer Level* Ant1 (dBm/3kHz)**	**Combined PSD (dBm/3kHz)**	**Power Setting (q dBm)**	**Result**
2412	-19.31	-19.47	-16.4	32	PASS
2447	-13.68	-13.33	-10.5	48	PASS
2462	-16.72	-15.67	-13.2	44	PASS

Analyser level includes 0.6 dB offset for cable loss

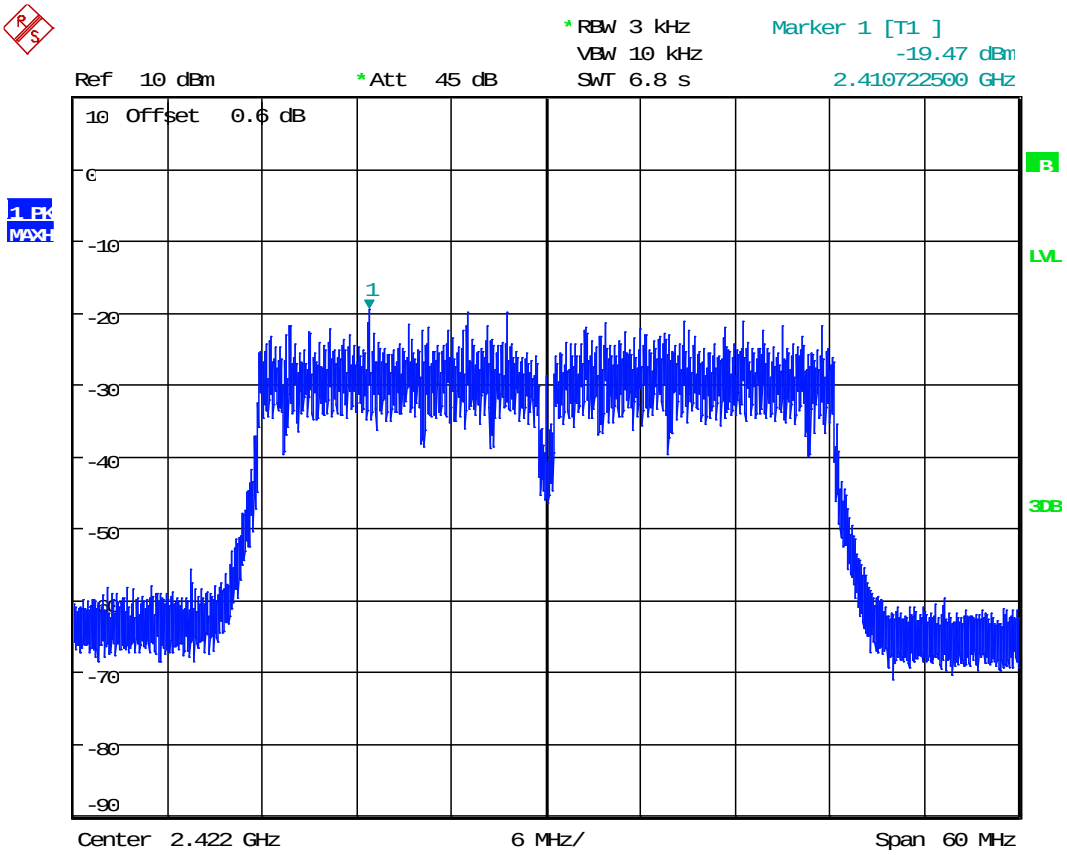
Ch1



Date: 21.JUN.2016 13:16:07

Ant0

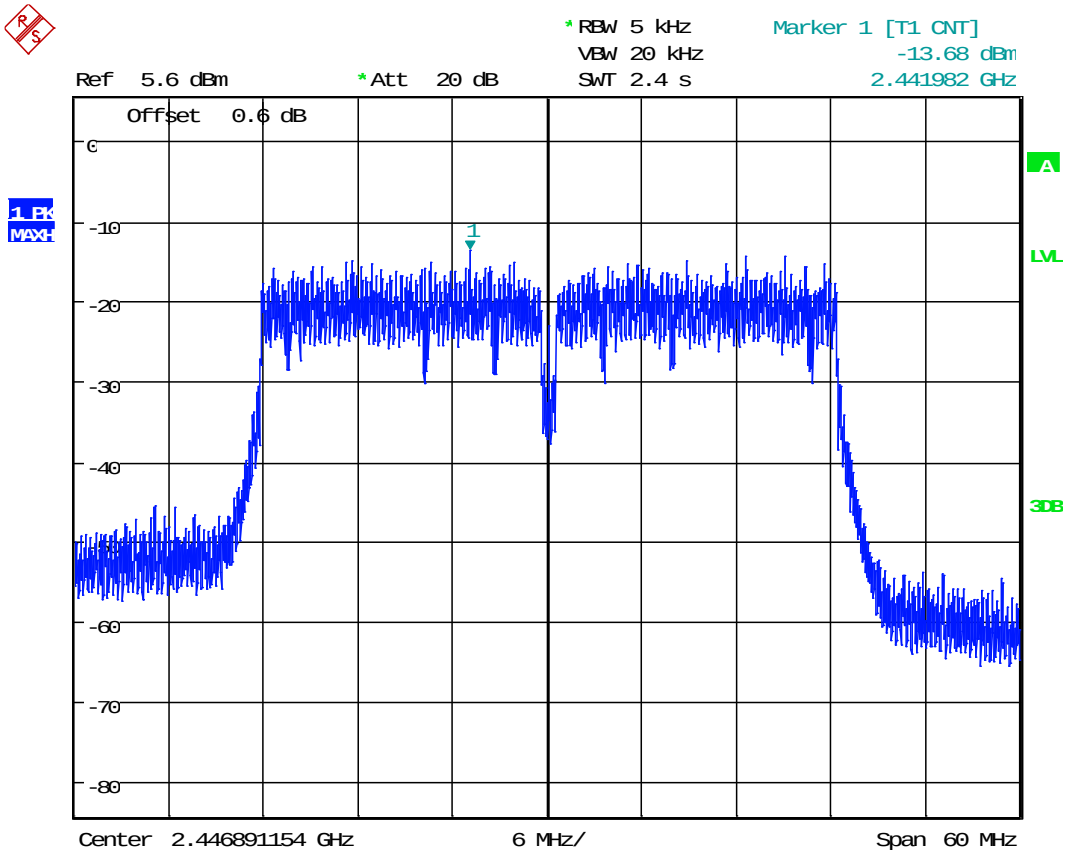
Ch1



Date: 21.JUN.2016 14:01:20

Ant1

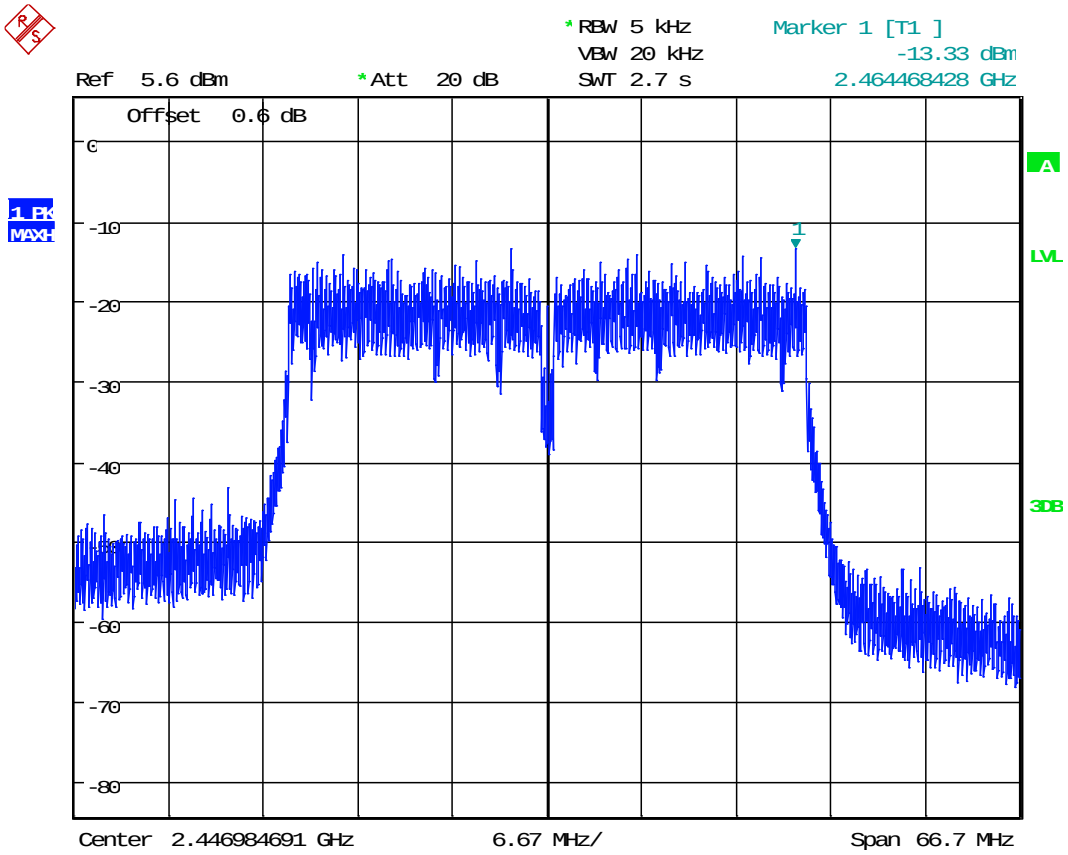
Ch6



Date: 9.JUN.2016 11:09:31

Ant0

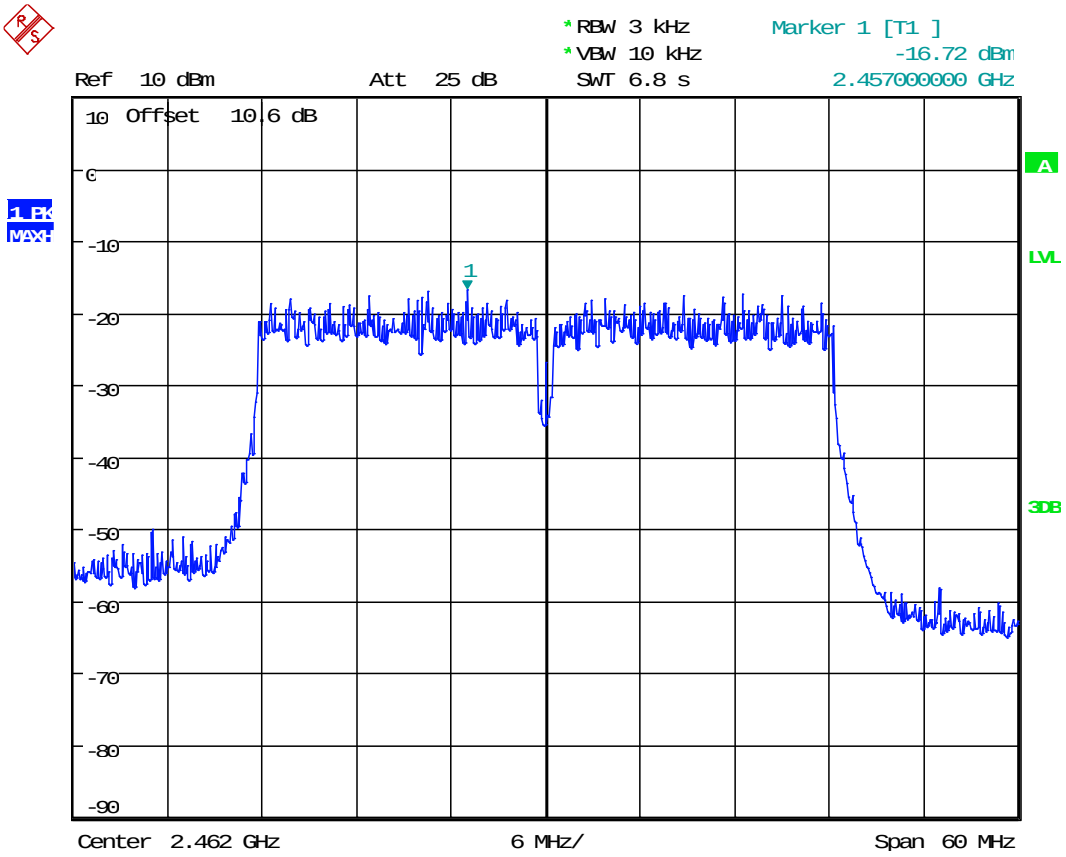
Ch6



Date: 8.JUN.2016 12:18:37

Ant1

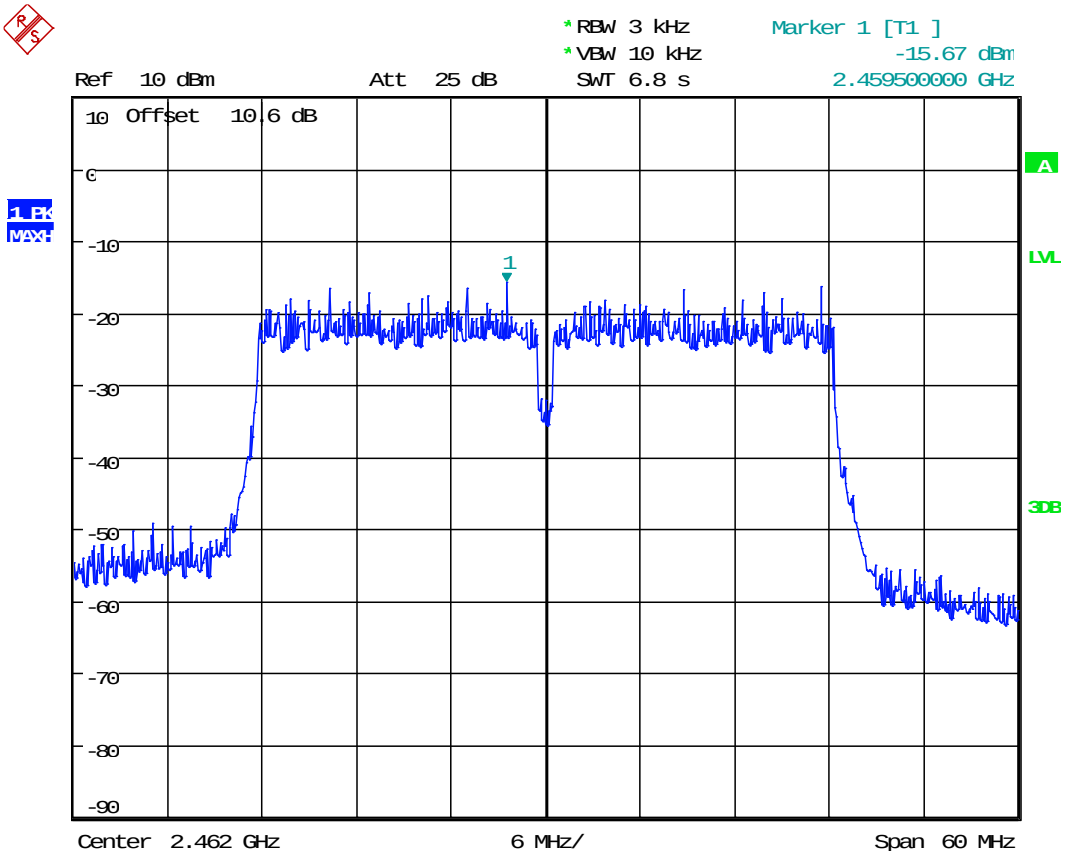
Ch9



Date: 21.OCT.2016 13:59:37

Ant0

Ch9



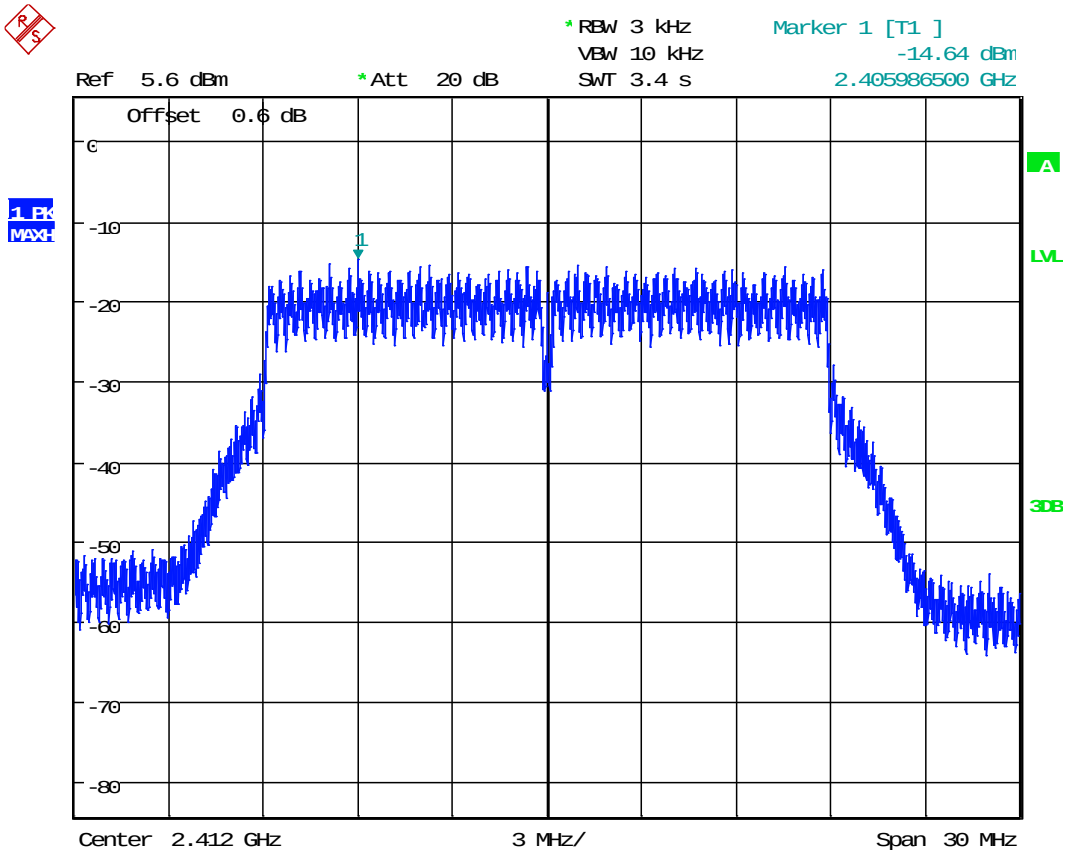
Date: 21.OCT.2016 14:01:08

Ant1

	Modulation: VHT20; Data rate: MCS0NSS1; CDD				
Channel Frequency (MHz)	Analyzer Level* Ant0 (dBm/3kHz)	Analyzer Level* Ant1 (dBm/3kHz)	Combined PSD (dBm/3kHz)	Power Setting (q dBm)	Result
2412	-14.64	-13.75	-11.2	44	PASS
2437	-10.19	-9.38	-6.8	64	PASS
2462	-9.04	-9.81	-6.4	56	PASS

Analyser level includes 0.6 dB offset for cable loss

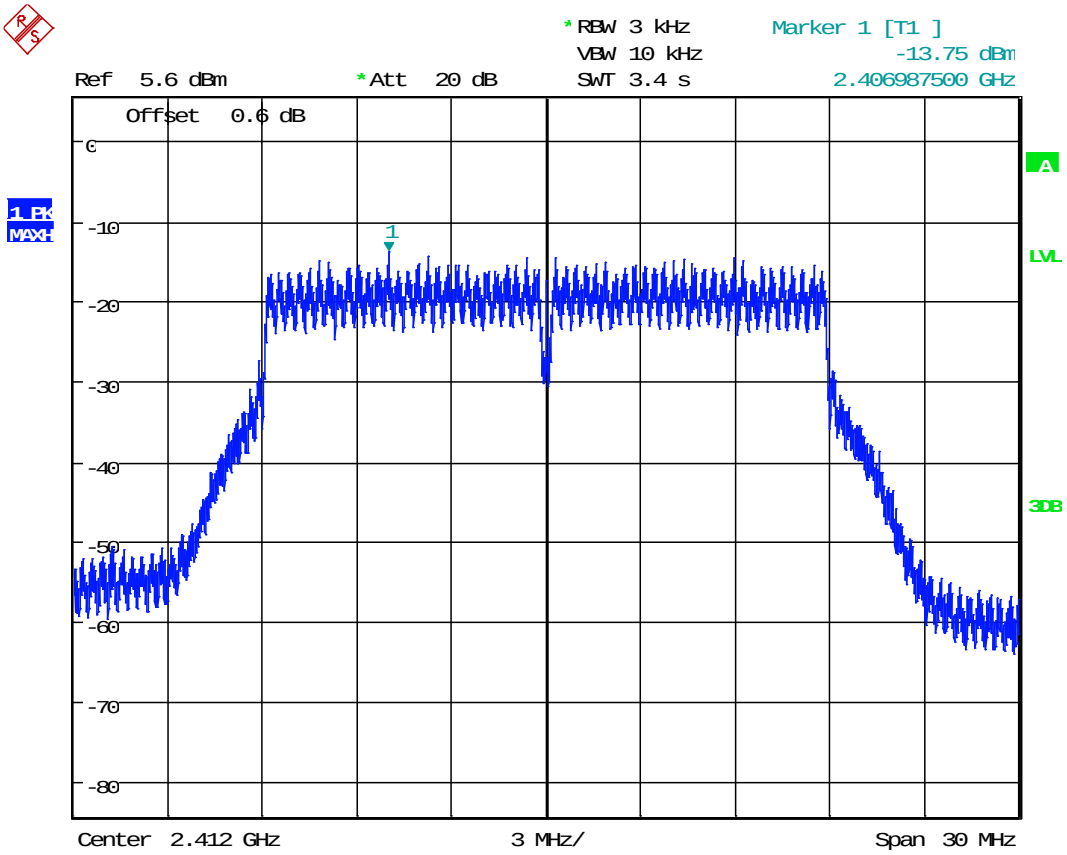
Ch1



Date: 9.JUN.2016 13:13:07

Ant0

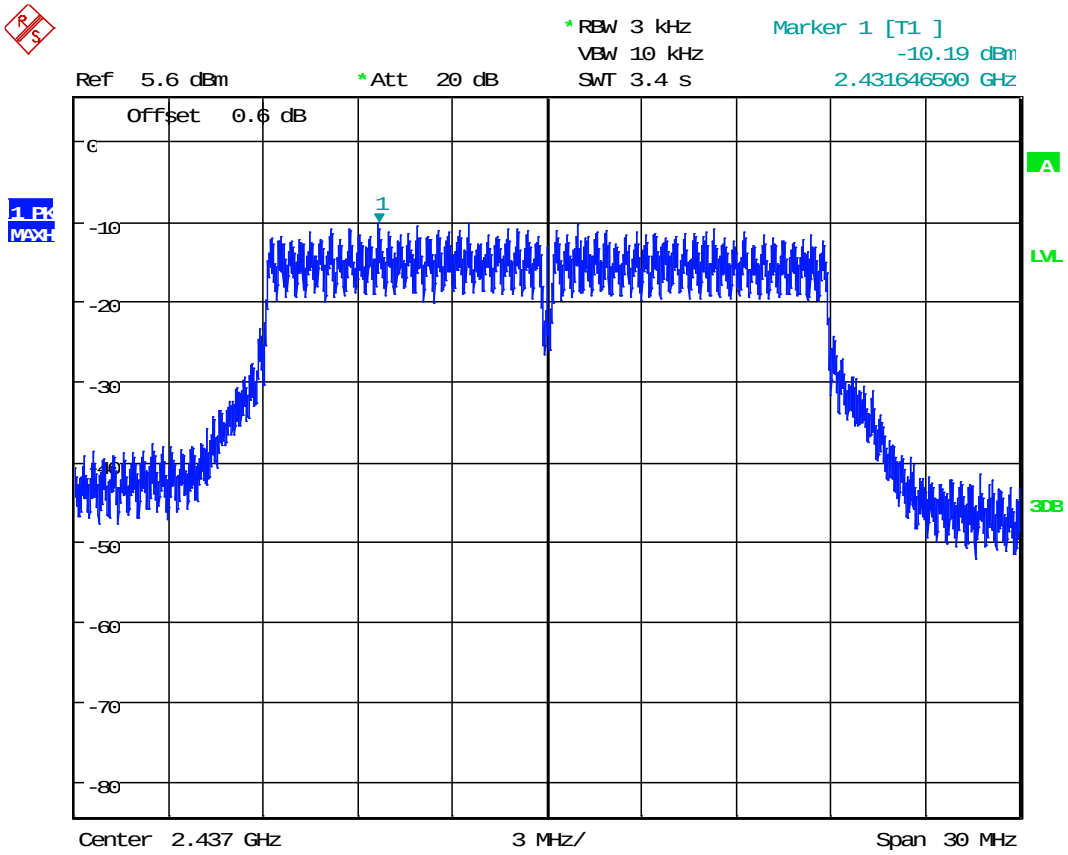
Ch1



Date: 8.JUN.2016 14:02:20

Ant1

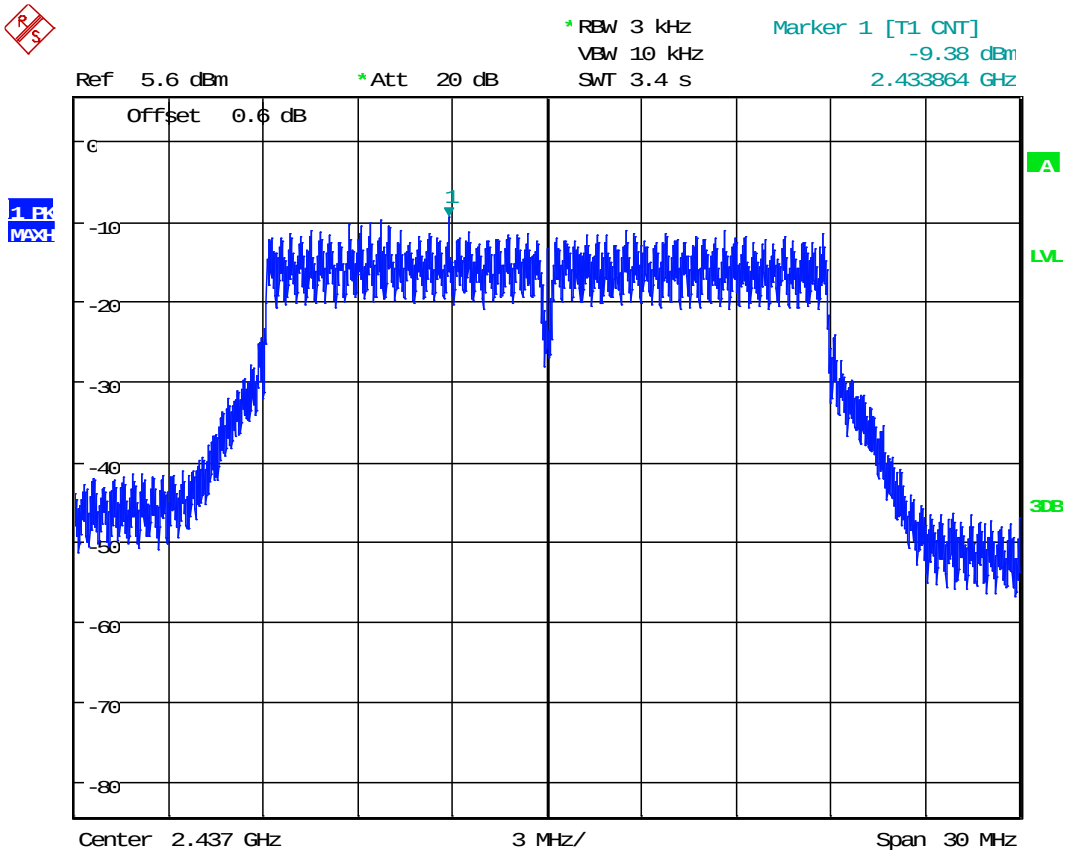
Ch6



Date: 9.JUN.2016 11:54:50

Ant0

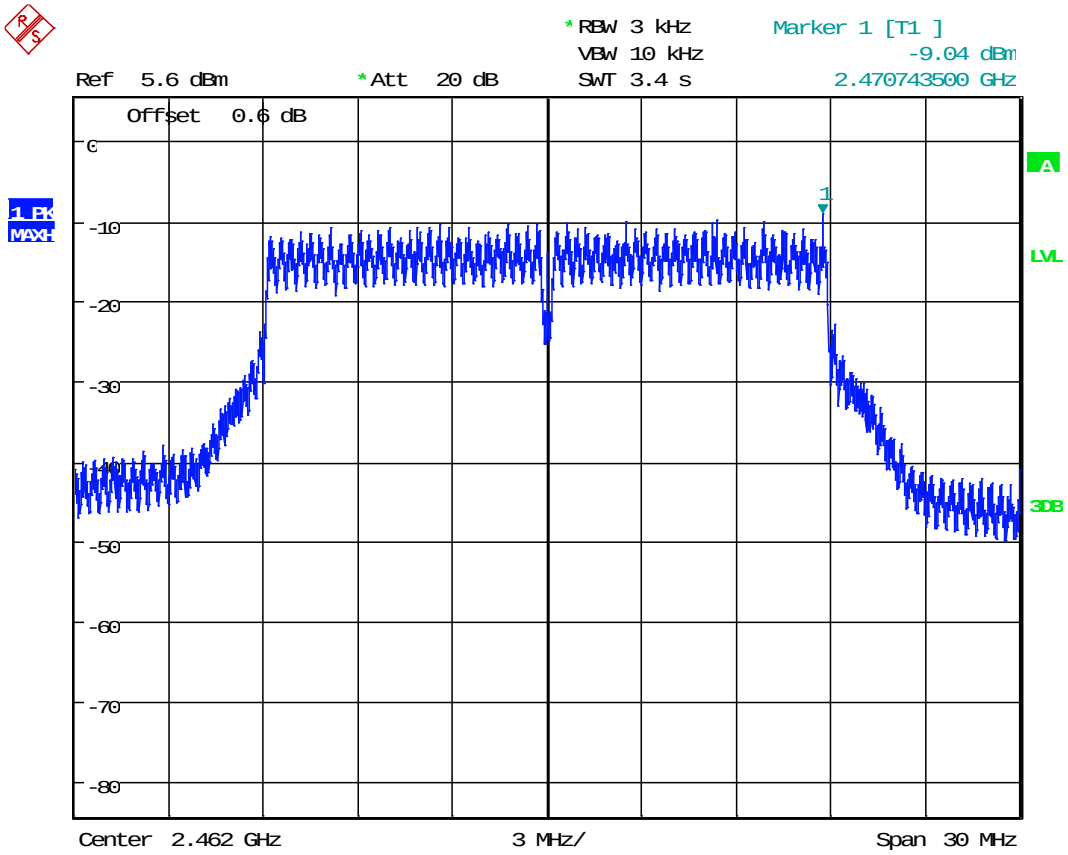
Ch6



Date: 8.JUN.2016 14:11:46

Ant1

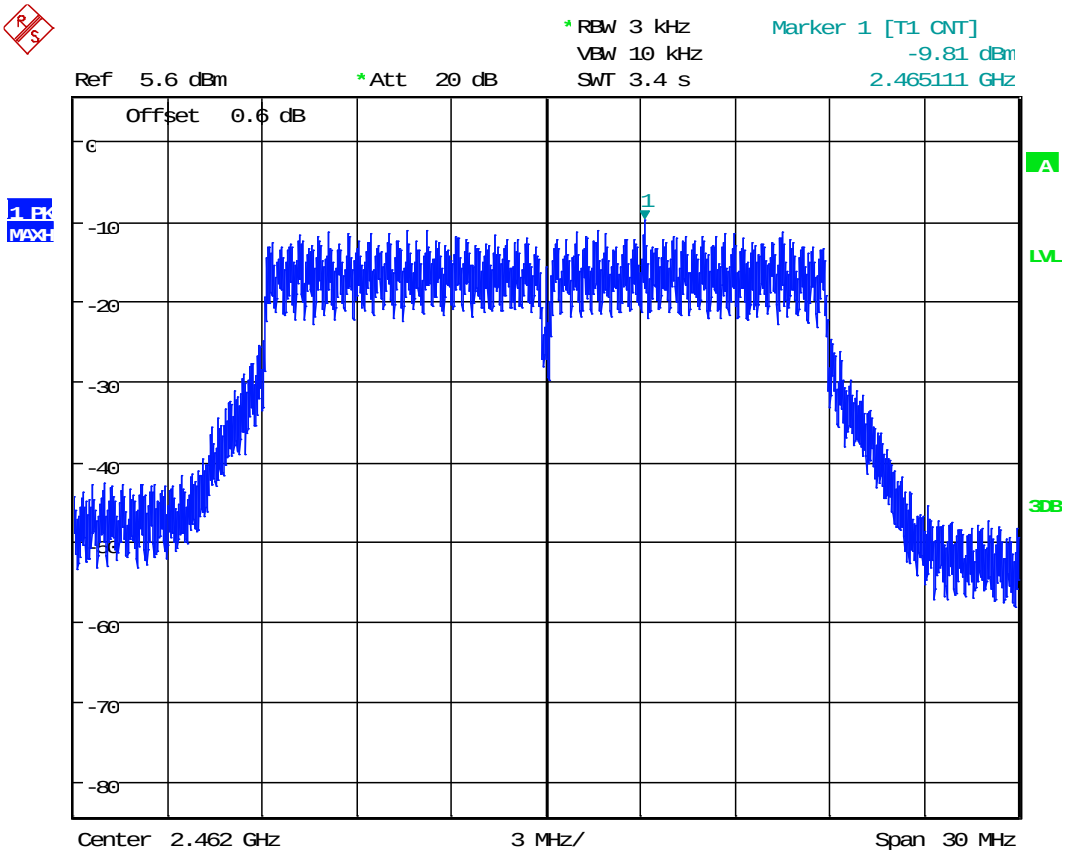
Ch11



Date: 9.JUN.2016 10:09:49

Ant0

Ch11



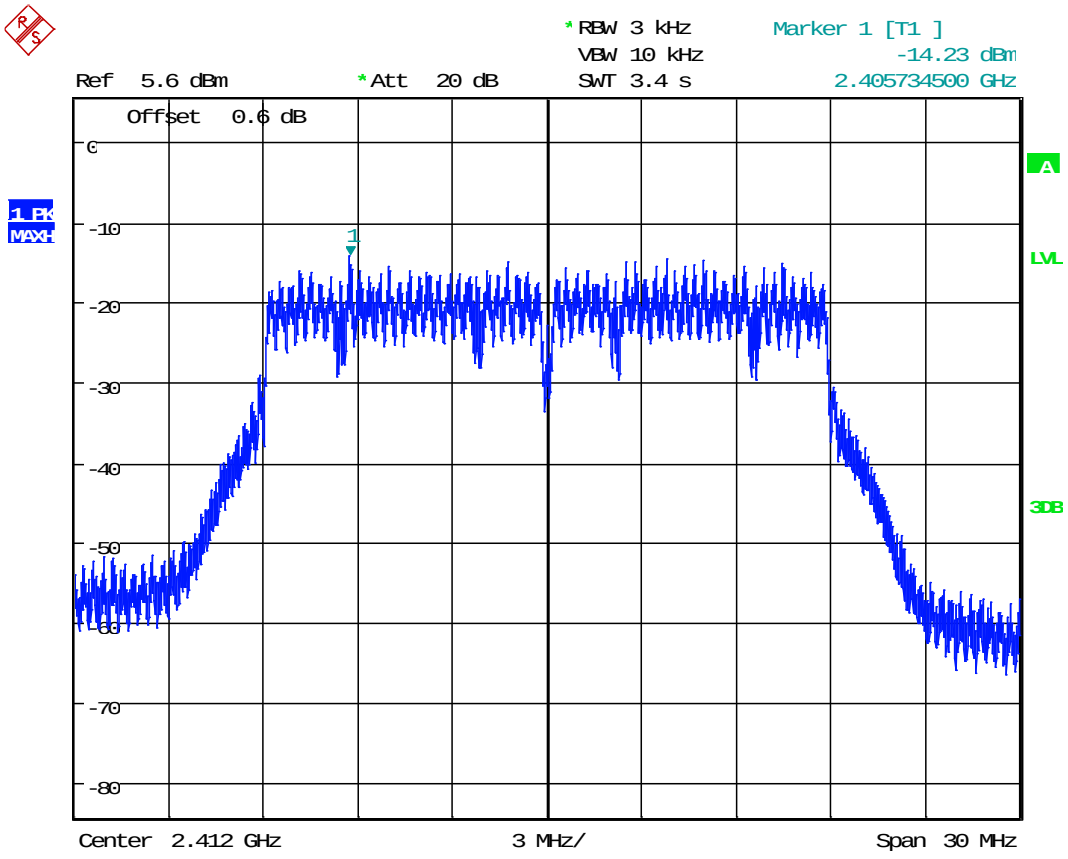
Date: 8.JUN.2016 14:15:56

Ant1

	Modulation: VHT20; Data rate: MCS8NSS1; CDD				
Channel Frequency (MHz)	Analyzer Level* Ant0 (dBm/3kHz)	Analyzer Level* Ant1 (dBm/3kHz)	Combined PSD (dBm/3kHz)	Power Setting (q dBm)	Result
2412	-14.23	-14.25	-11.2	44	PASS
2437	-12.76	-12.59	-9.7	50	PASS
2462	-13.23	-12.78	-10.0	50	PASS

Analyser level includes 0.6 dB offset for cable loss

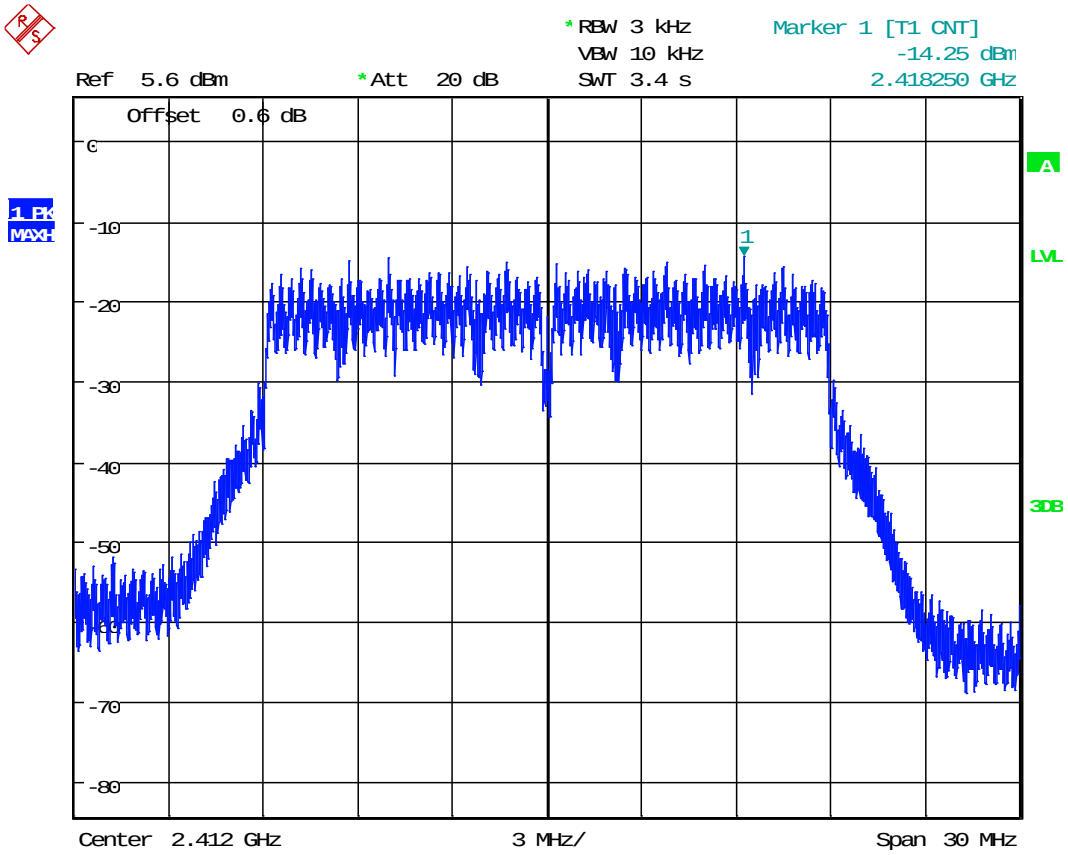
Ch1



Date: 9.JUN.2016 13:18:00

Ant0

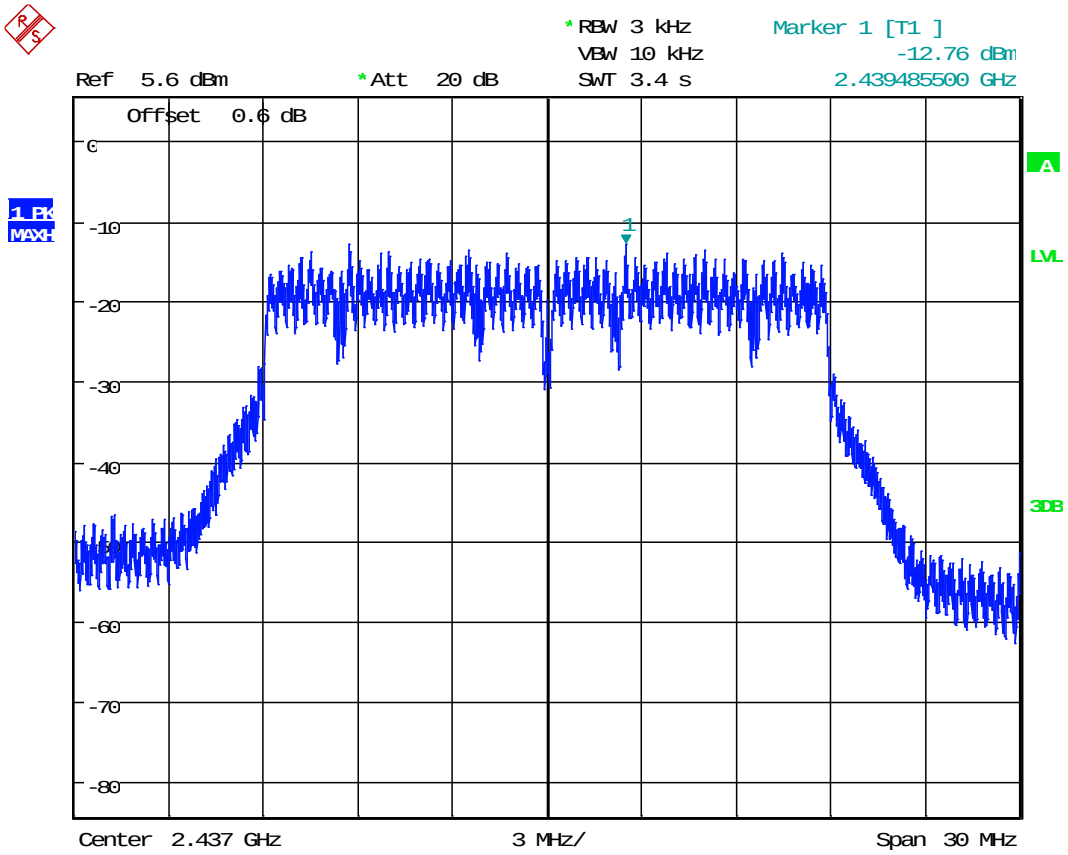
Ch1



Date: 8.JUN.2016 14:04:52

Ant1

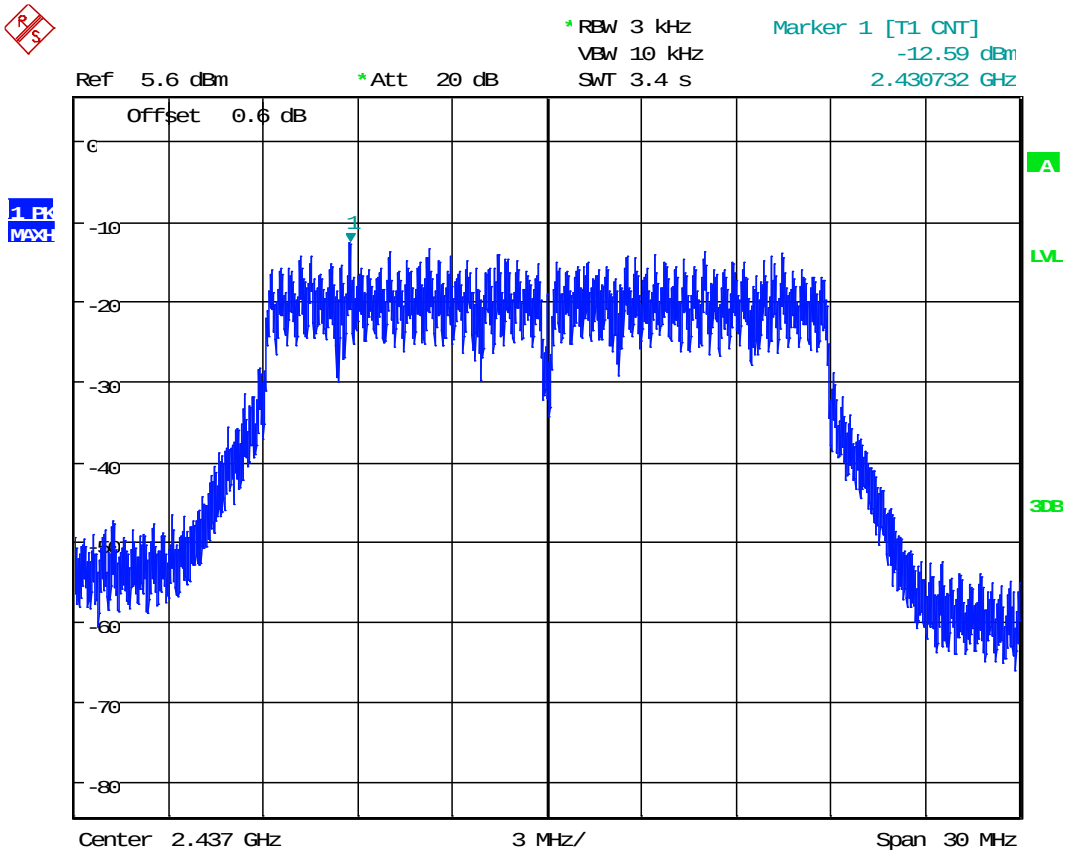
Ch6



Date: 9.JUN.2016 12:01:23

Ant0

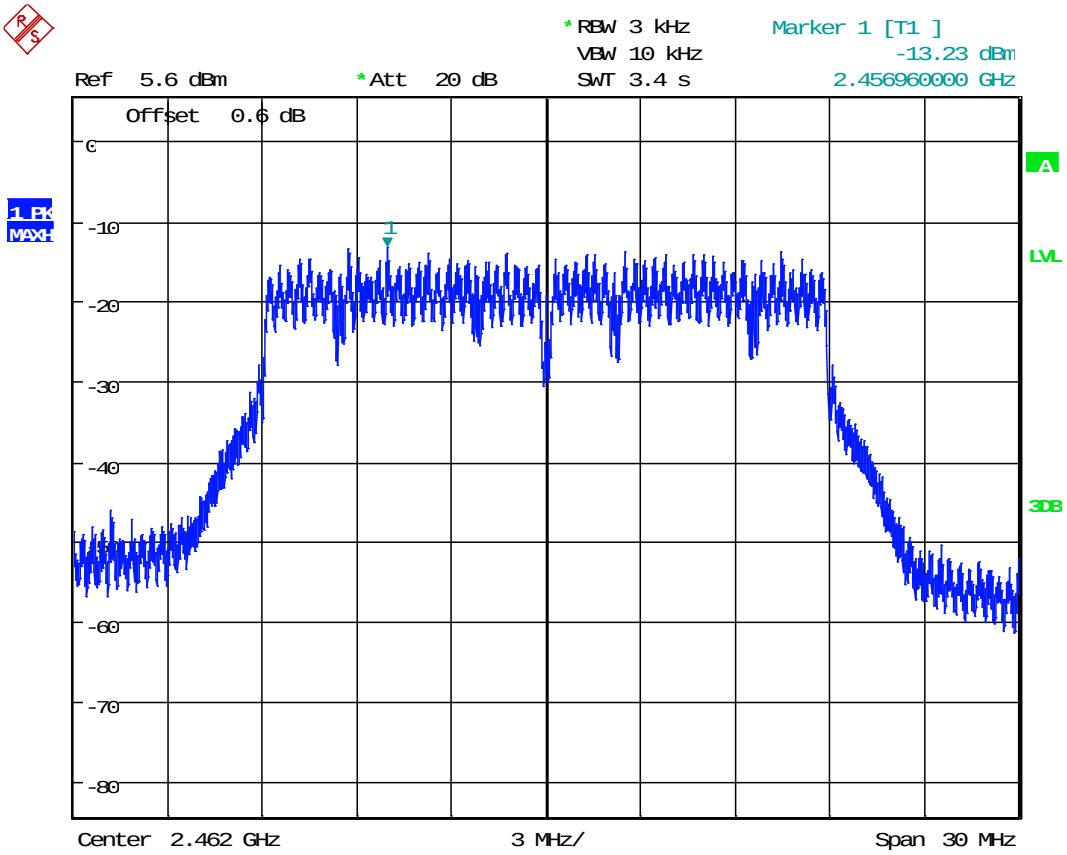
Ch6



Date: 8.JUN.2016 14:08:02

Ant1

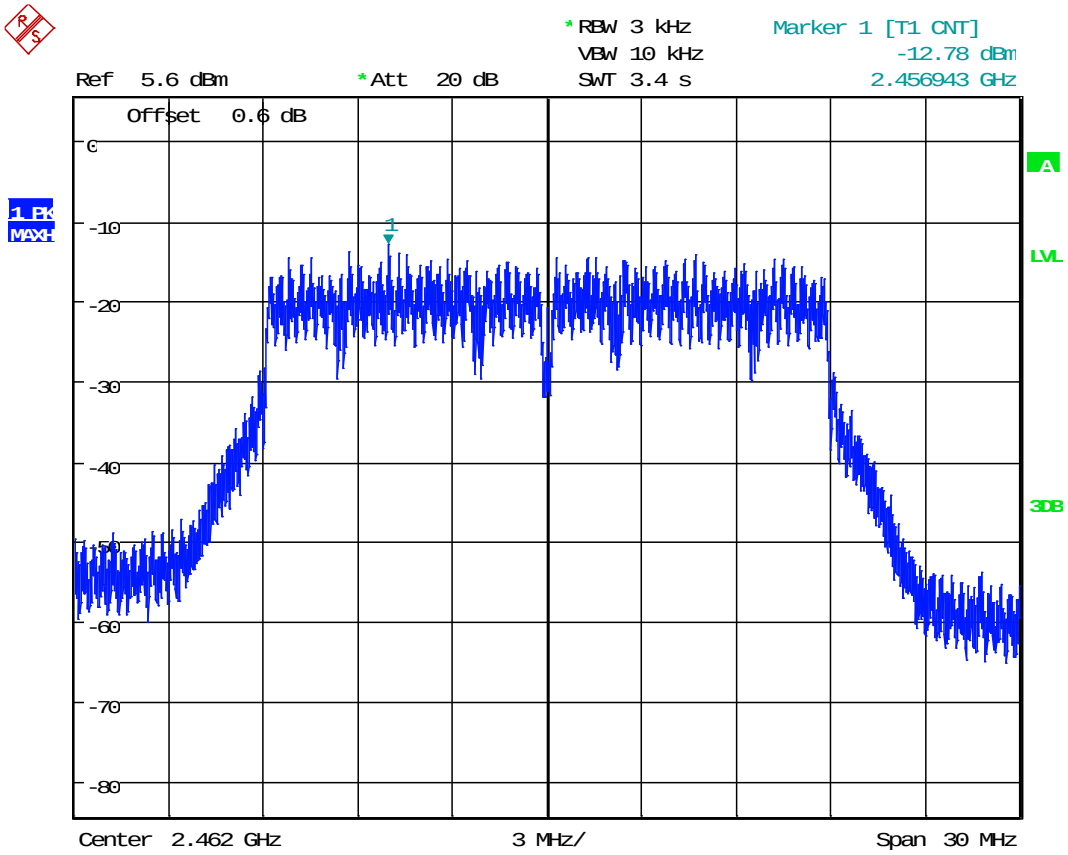
Ch11



Date: 9.JUN.2016 09:52:58

Ant0

Ch11



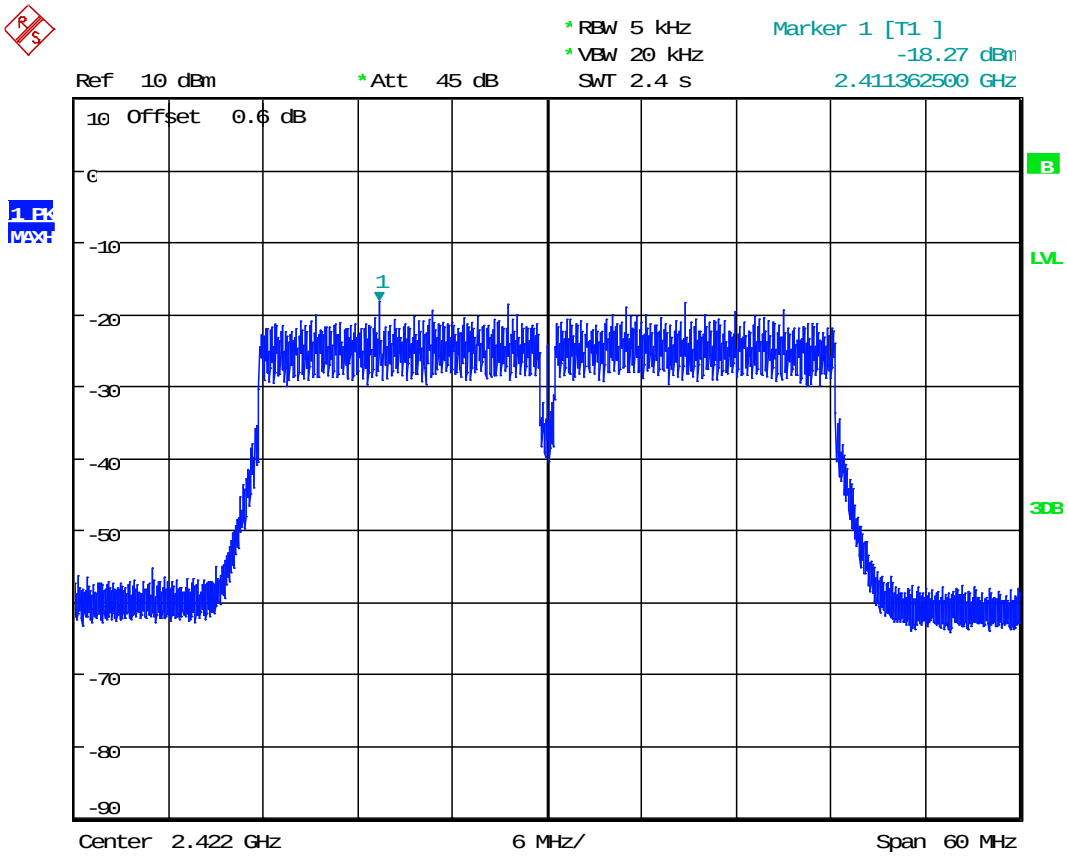
Date: 8.JUN.2016 14:18:35

Ant1

	Modulation: VHT40; Data rate: MCS0NSS1; CDD				
Channel Frequency (MHz)	**Analyzer Level* Ant0 (dBm/3kHz)**	**Analyzer Level* Ant1 (dBm/3kHz)**	**Combined PSD (dBm/3kHz)**	**Power Setting (q dBm)**	**Result**
2422	-18.27	--20.76	-16.3	32	PASS
2447	-13.04	-12.68	-9.8	48	PASS
2462	-11.45	-10.63	-8.0	44	PASS

Analyser level includes 0.6 dB offset for cable loss

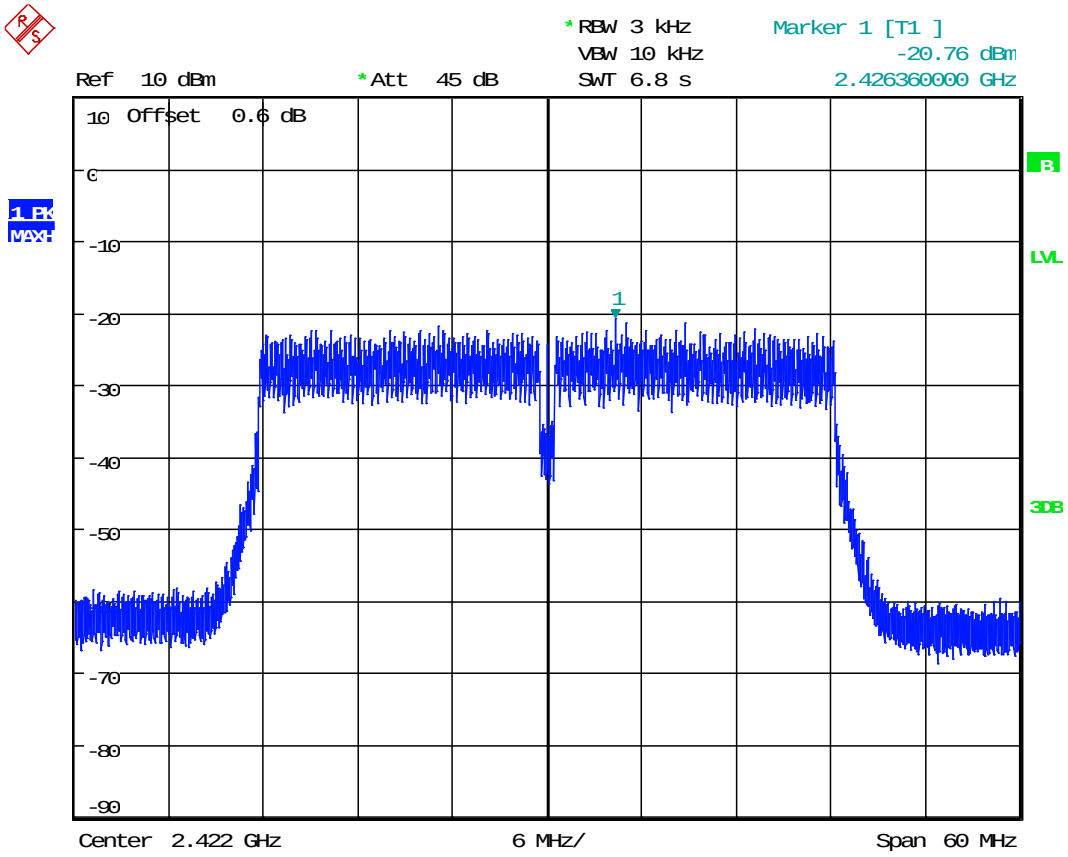
Ch1



Date: 21.JUN.2016 13:26:55

Ant0

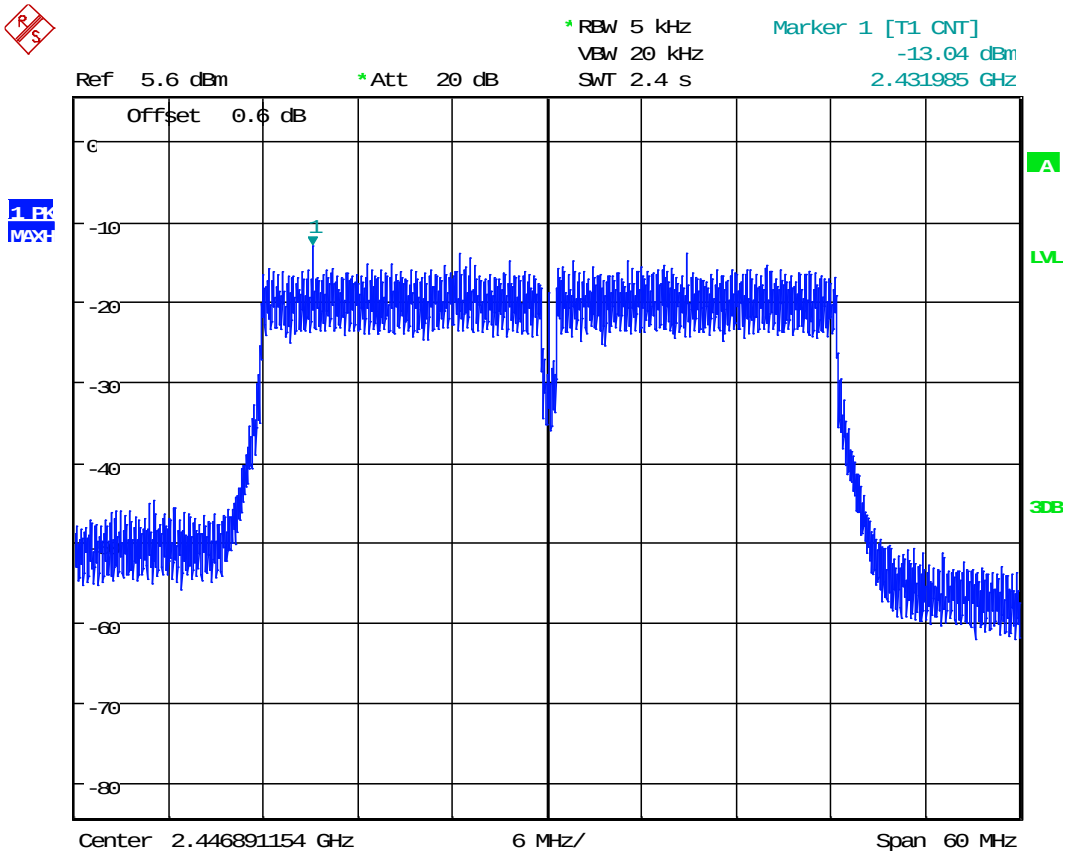
Ch1



Date: 21.JUN.2016 13:48:21

Ant1

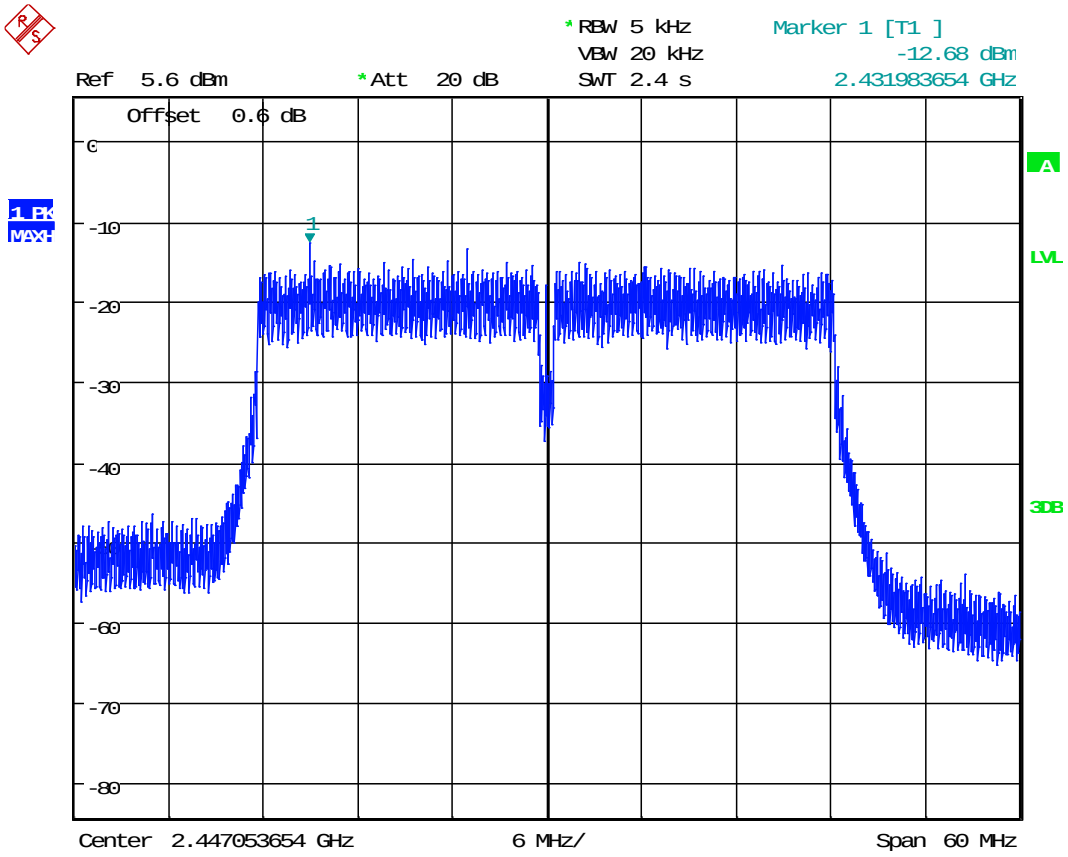
Ch6



Date: 9.JUN.2016 11:14:44

Ant0

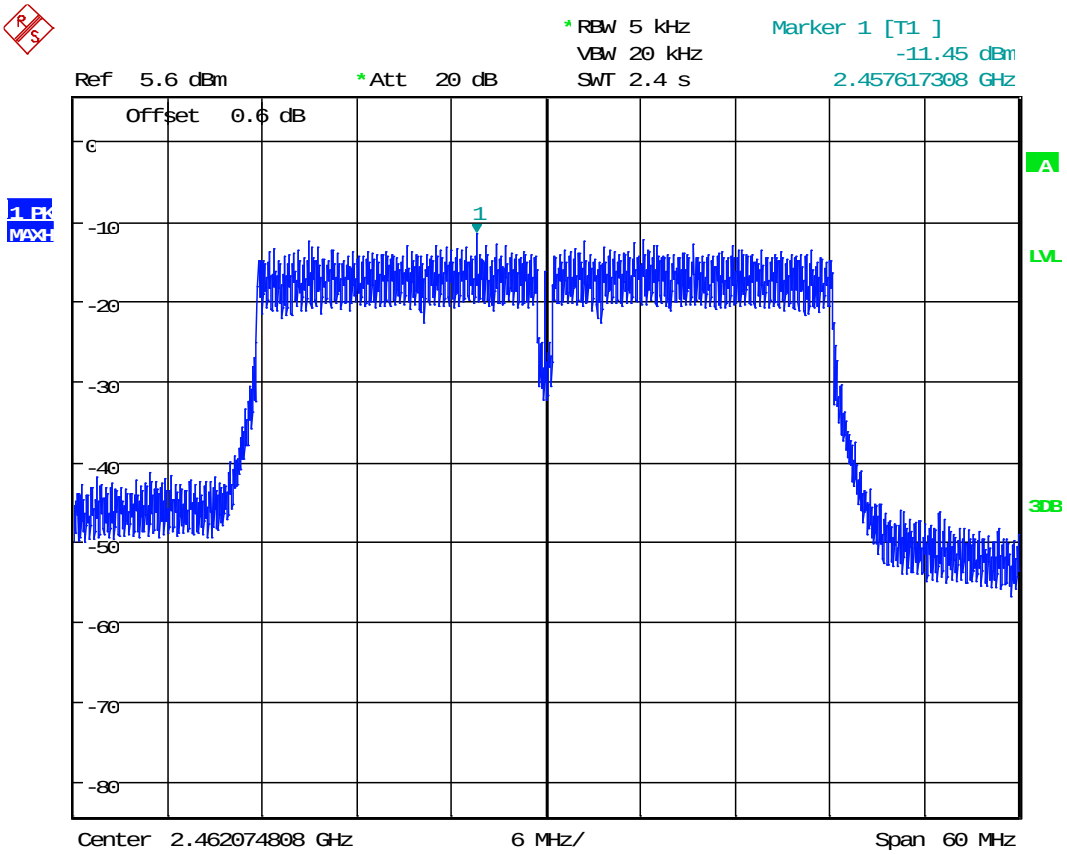
Ch6



Date: 8.JUN.2016 13:45:38

Ant1

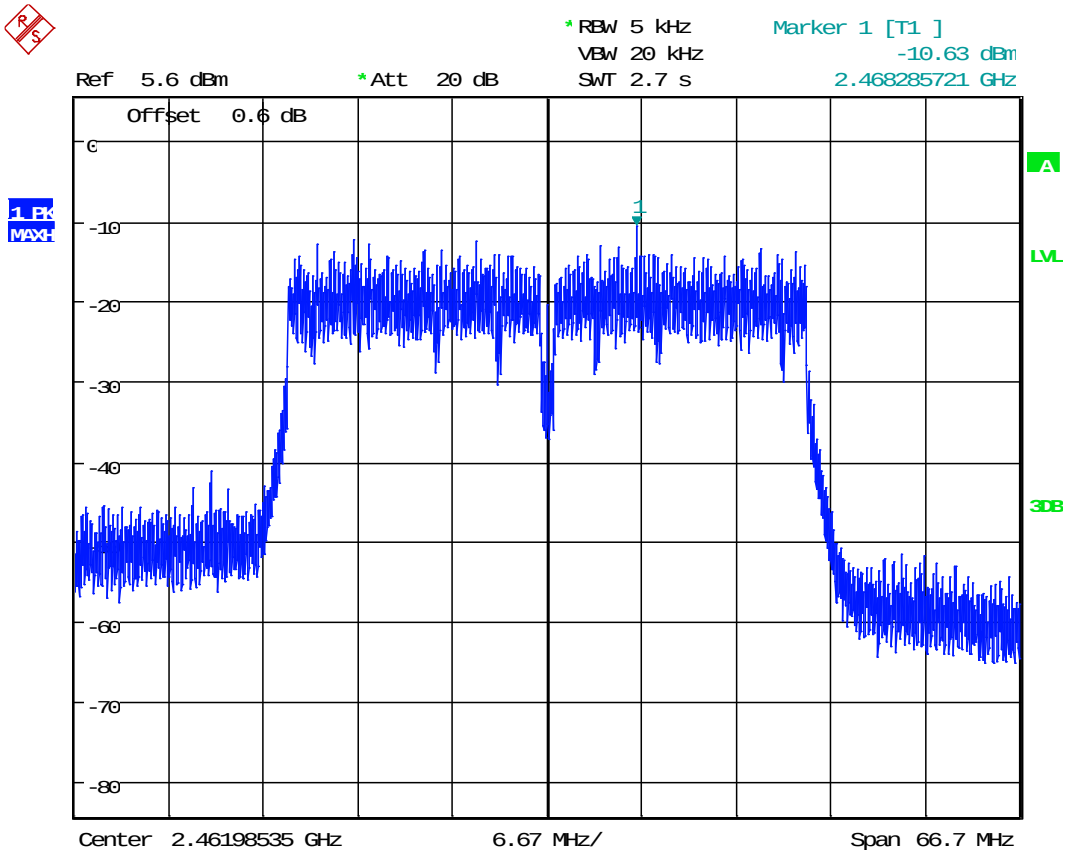
Ch9



Date: 9.JUN.2016 10:31:03

Ant0

Ch9



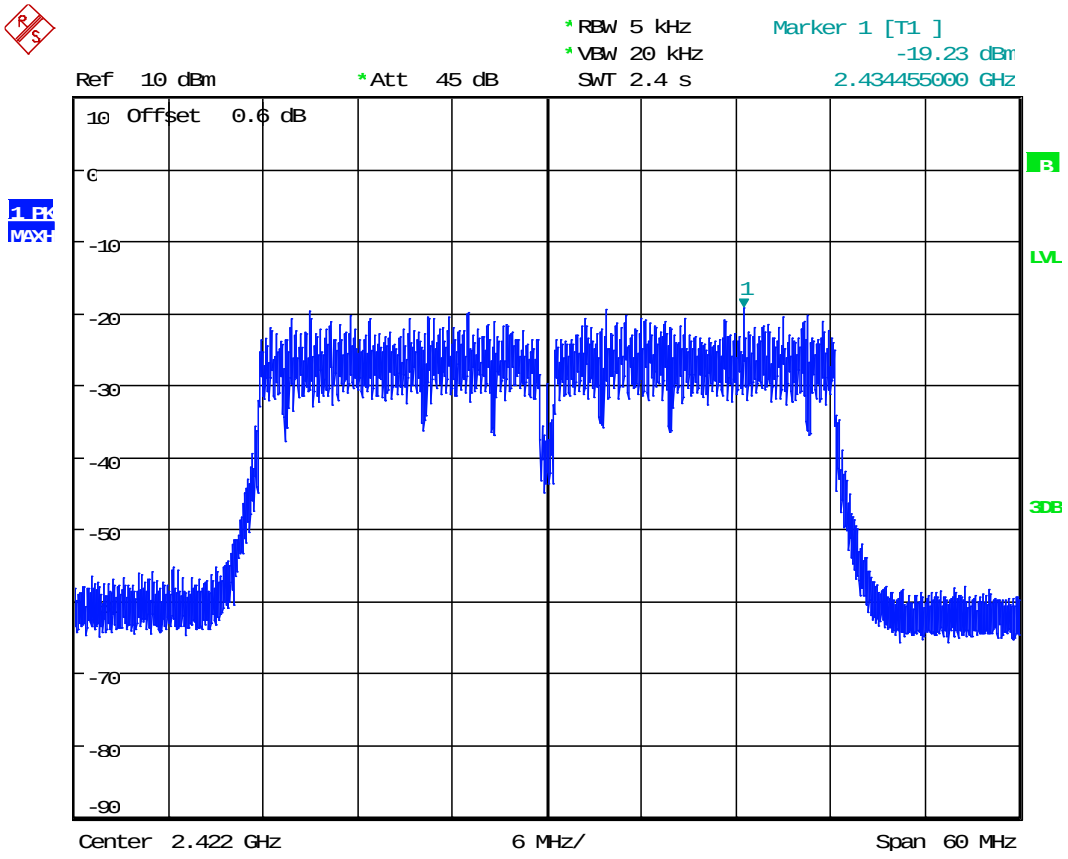
Date: 8.JUN.2016 13:32:34

Ant1

	Modulation: VHT40; Data rate: MCS9NSS1; CDD				
Channel Frequency (MHz)	Analyzer Level* Ant0 (dBm/3kHz)	Analyzer Level* Ant1 (dBm/3kHz)	Combined PSD (dBm/3kHz)	Power Setting (q dBm)	Result
2412	-19.23	-19.46	-16.3	32	PASS
2447	-15.07	-13.81	-11.4	48	PASS
2462	-13.92	-11.58	-9.6	44	PASS

Analyser level includes 0.6 dB offset for cable loss

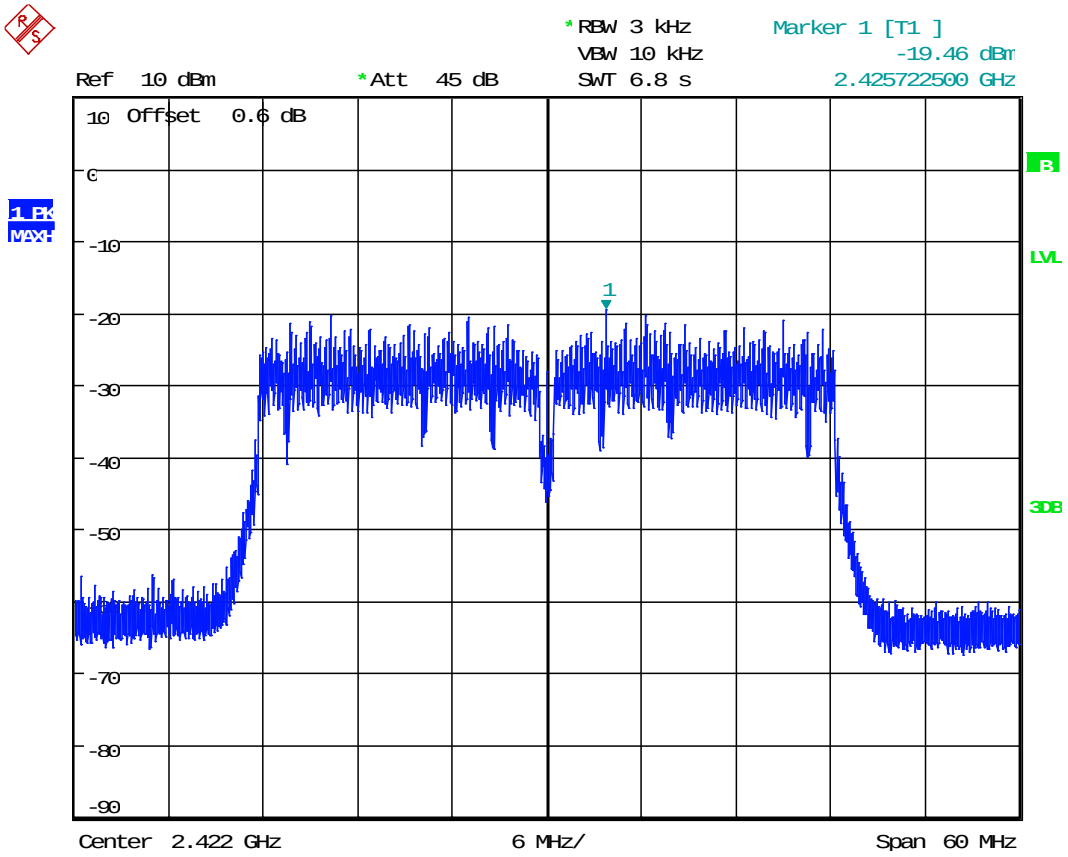
Ch1



Date: 21.JUN.2016 13:29:09

Ant0

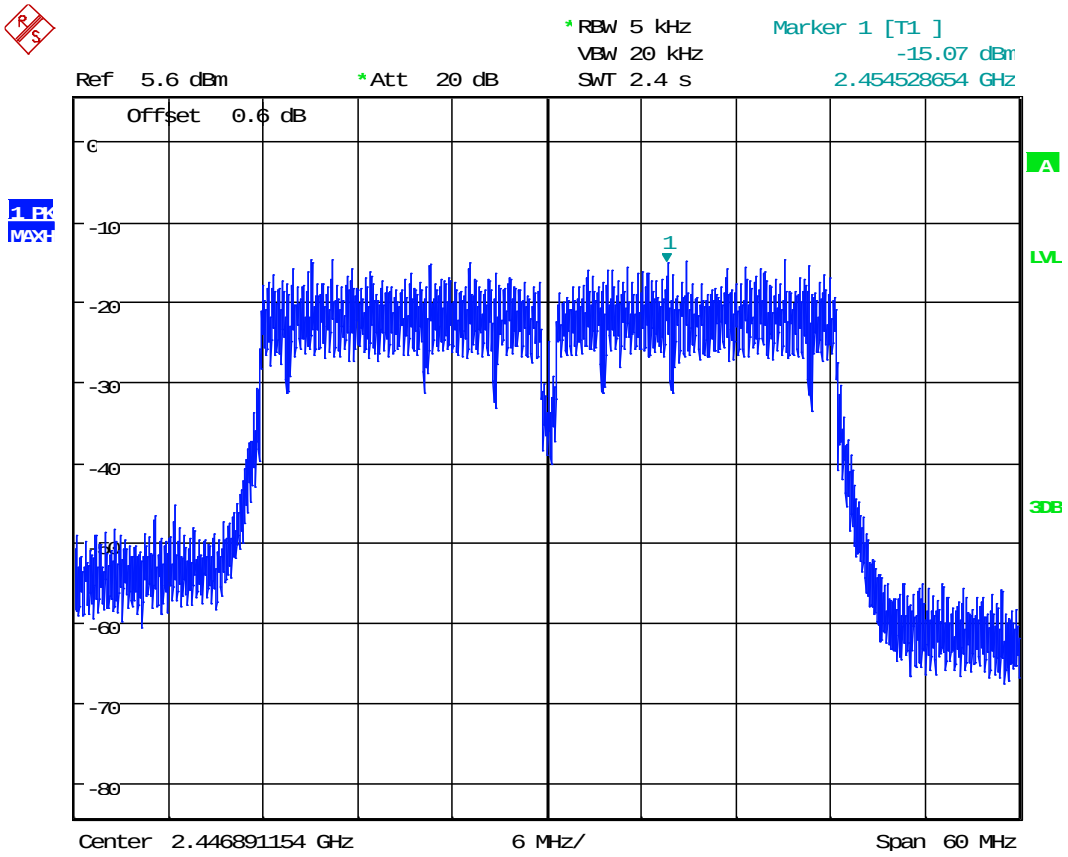
Ch1



Date: 21.JUN.2016 13:52:20

Ant1

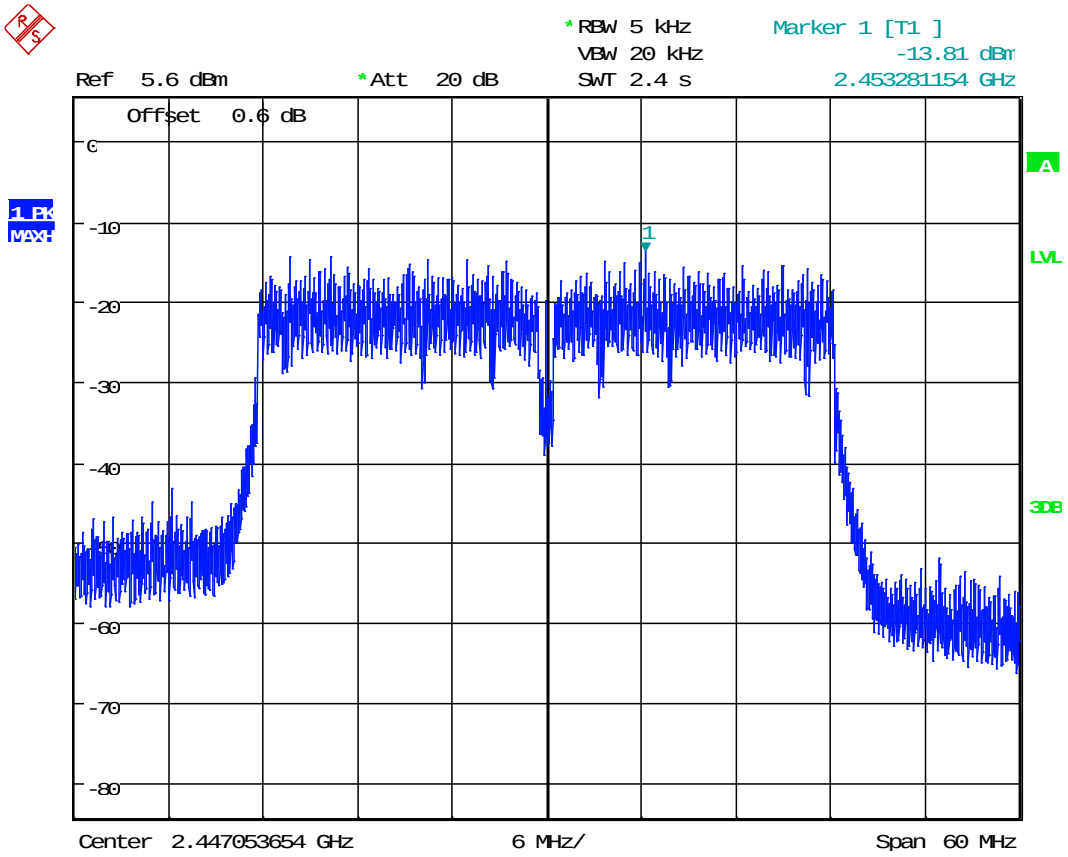
Ch6



Date: 9.JUN.2016 11:17:24

Ant0

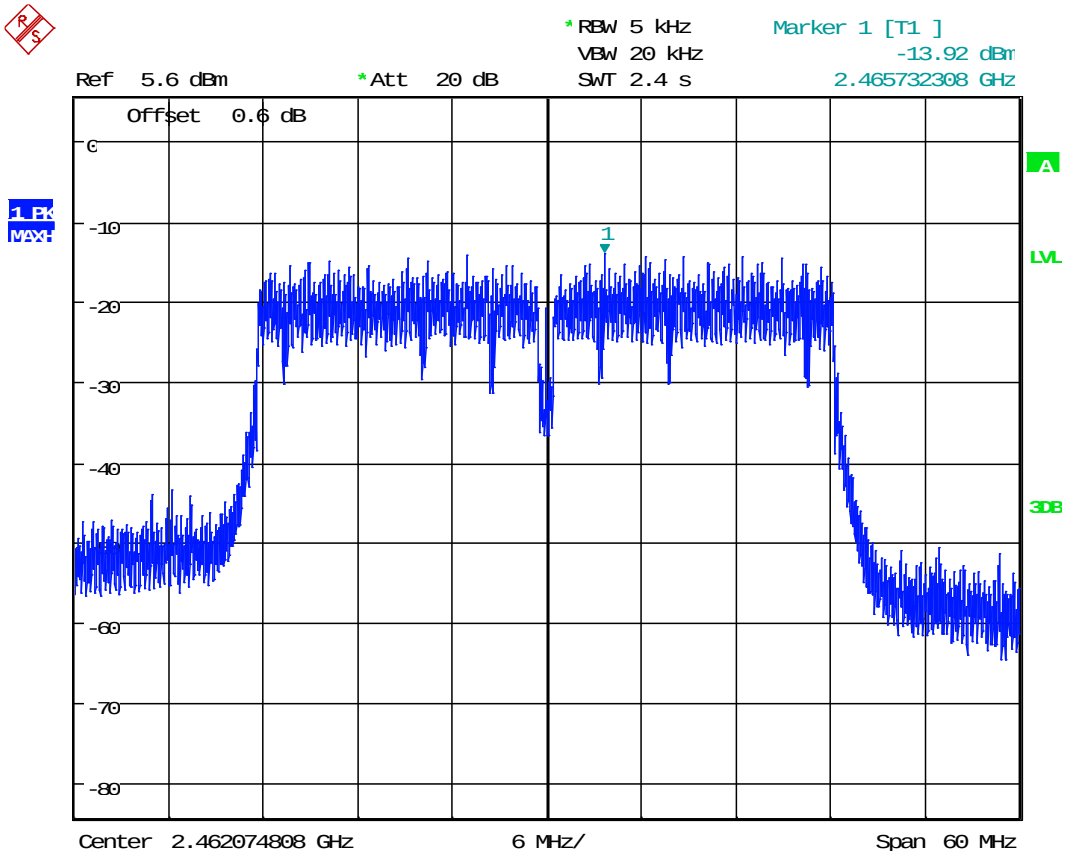
Ch6



Date: 8.JUN.2016 13:42:59

Ant1

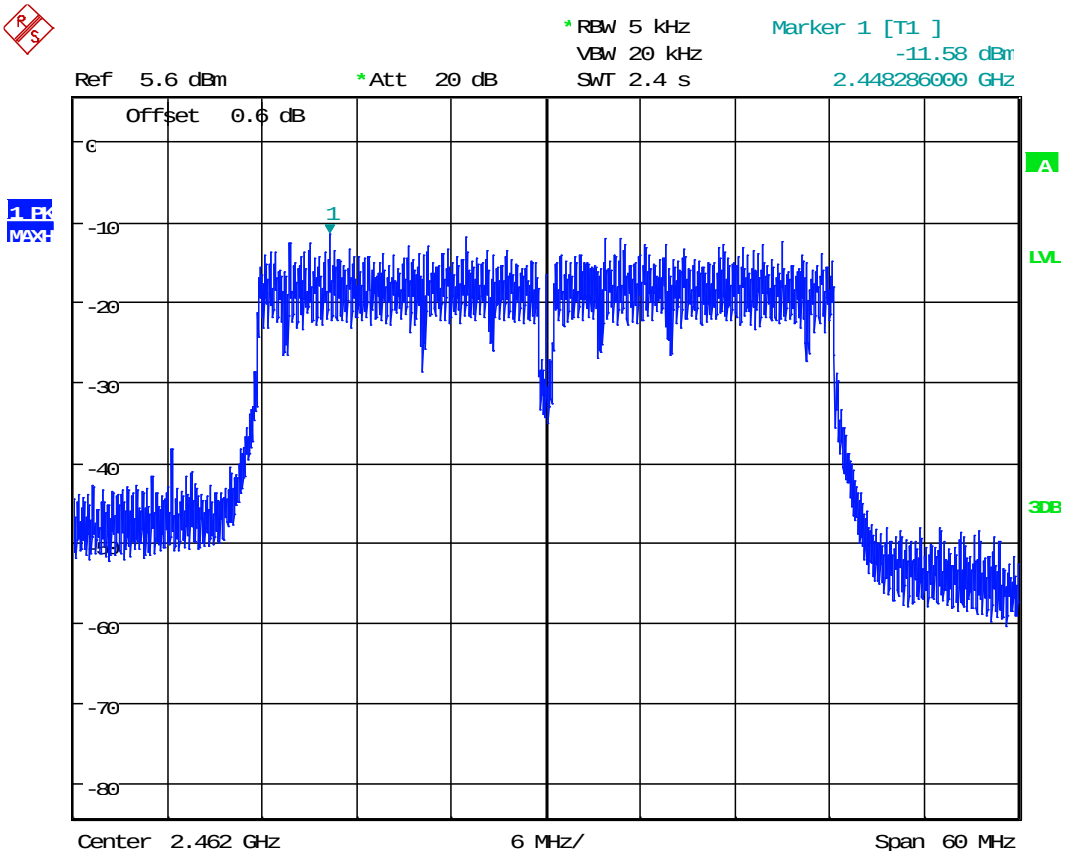
Ch9



Date: 9.JUN.2016 10:37:08

Ant0

Ch9



Date: 8.JUN.2016 11:12:00

Ant1

16 Measurement Uncertainty

Calculated Measurement Uncertainties

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95 % confidence:

[1] Radiated spurious emissions

Uncertainty in test result (30 MHz to 1 GHz) = **4.6 dB**
Uncertainty in test result (1 GHz to 18 GHz) = **4.7 dB**

[2] AC power line conducted emissions

Uncertainty in test result = **3.4 dB**

[3] Occupied bandwidth

Uncertainty in test result = **15.5 %**

[4] Conducted carrier power

Uncertainty in test result (Power Meter) = **1.08 dB**

[5] Conducted / radiated RF power out-of-band

Uncertainty in test result – up to 8.1 GHz = **3.31 dB**
Uncertainty in test result – 8.1 GHz to 15.3 GHz = **4.43 dB**
Uncertainty in test result (30 MHz to 1 GHz) = **4.6 dB**
Uncertainty in test result (1 GHz to 18 GHz) = **4.7 dB**

[6] Power spectral density

Uncertainty in test result (Spectrum Analyser) = **2.48 dB**