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FCC and IC Test Report for Part 15.247and RSS-247

Product name	: Deeper Smart Sonar PRO+
Applicant	: Deeper UAB
FCC ID	: 2AHKO-PRO
IC ID	: 21307-PRO

Test report No. : 160200396 301 Ver 1.00

Laboratory information

Accreditation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Telefication is designated by the FCC as an Accredited Test Firm for compliance testing of equipment subject to Certification under Parts 15 & 18. The Designation number is: NL0001

The Industry Canada registration number for the 3 meter test chamber of Telefication is: 4173A-1.

Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Netherland

Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31316583180 Fax. +31316583189
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.50	10-05-2016	First draft version	RvB
V1.00	17-05-2016	Release version	RvB

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Summary of Test results

FCC	IC	Description	Section in report	Verdict
15.247(a)	RSS-247 5.2 (1)	6dB Bandwidth	3.1	Pass
--	RSS-GEN 4.6.1	99% Bandwidth	3.2	Pass
15.247(b)	RSS-247 5.1 (2)	RF output power	3.3	Pass
15.247(e)	RSS-247 5.2 (2)	Power spectral density	3.4	Pass
15.247(d)	RSS-247 5.5	Conducted Spurious emissions	3.5	Pass
15.247(d)	RSS-247 5.5	Conducted Band edge	3.5	Pass
15.247(d)	RSS-247 5.4	Radiated Spurious emissions	3.6	Pass
15.109(a)	RSS-GEN 7.1.2	RX radiated spurious emissions	3.7	Pass

1 General Description

1.1 Applicant

Client name:	Deeper UAB
Address	Sauletekio ave 15, Vilnius, Lithuania
Zip code:	10224
Telephone:	+37065033273
Contact name:	D. Malinauskas
E-mail:	donatas.malinauskas@deeper.eu

1.2 Manufacturer

Manufacturer name:	Deeper UAB
Address:	Sauletekio ave 15, Vilnius, Lithuania
Zip code:	10224
Telephone:	+37065033273
Contact name:	D. Malinauskas
E-mail:	donatas.malinauskas@deeper.eu

1.3 Tested Equipment Under Test (EUT)

Product name:	Deeper Smart Sonar PRO+
Brand name:	Deeper Smart Sonar
Product type:	Wireless Smart Sonar
FCC ID:	2AHKO-PRO
IC ID	21307-PRO
Model(s):	DP1H10S10
Software version:	v1.0
Hardware version:	H12
Date of receipt	21-03-2016
Tests started:	31-03-2016
Testing ended:	09-05-2016

1.4 Product specifications of Equipment under test

Tx Frequencies:	2402 – 2483.5 MHz
Rx frequencies:	2402 – 2483.5 MHz
Maximum output power to antenna:	20 dBm
Antenna type and gain:	Omnidirectional Antenna, -2.3 dBi at 2.4 GHz
Type of modulation:	802.11b: DSSS 802.11g: OFDM
Emission designator:	22M0G1D

1.5 Modification of the Equipment Under Test (EUT)

The tested (conducted)sample was modified to include an conducted antenna connector.

1.6 Environmental conditions

Test date	31-03-2016	09-05-2016
Ambient temperature	20.6°C	23.3°C
Humidity	34.7 %	40.1 %

1.7 Measurement standards

- FCC KDB Publication No. 558074 D01DTS Meas. Guidance V03r05
- ANSI C63.10:2013

1.8 Applicable standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247.
- FCC Part 15 Subpart C §15.109.
- RSS-247 Issue 1, RSS-GEN Issue 4.

1.9 Conclusions

The sample of the product showed NO NON-COMPLIANCES to the specifications stated in paragraph 1.8 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.8 *"Applicable standards"*.

All tests are performed by:

Name : ing R. van Barneveld

Review of test methods and report by:

Name : ing. P.A. Suringa

The above conclusions have been verified by the following signatory:

Date : 17-05-2016

Name : ing M.T.P.M Wouters v/d Oudenweijer

Function : Director Certification

Signature :

2 Test configuration of the Equipment Under Test

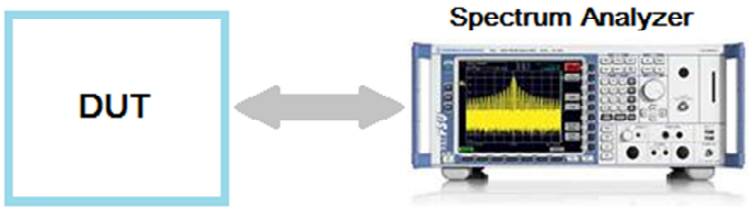
2.1 Test mode

The applicant provided test mode firmware for the EUT, in which it was possible to configure the EUT into different test channels.

2.2 Tested channels and Data rates

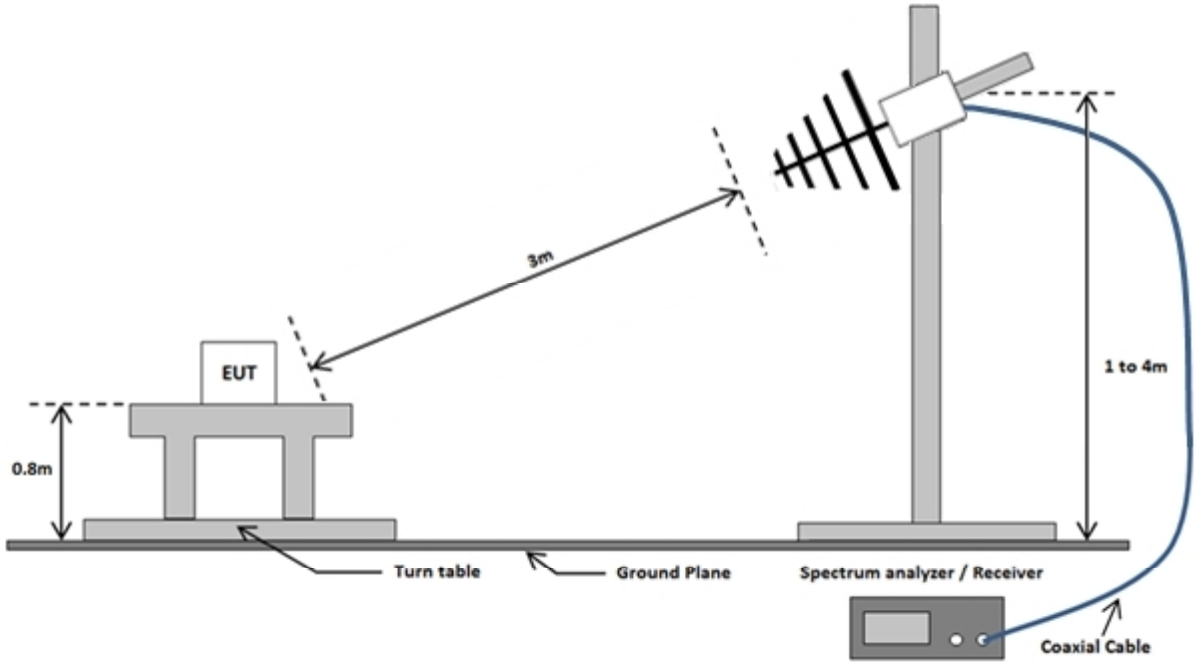
Technology	Channels	Data rate	Frequency (MHz)
IEEE 802.11b	1(Low)	11 Mbps	2412
	6(Mid)	11 Mbps	2437
	11 (High)	11 Mbps	2462
IEEE 802.11g	1(Low)	54 Mbps	2412
	6(Mid)	54 Mbps	2437
	11(High)	54 Mbps	2462

2.3 Conducted Test setup

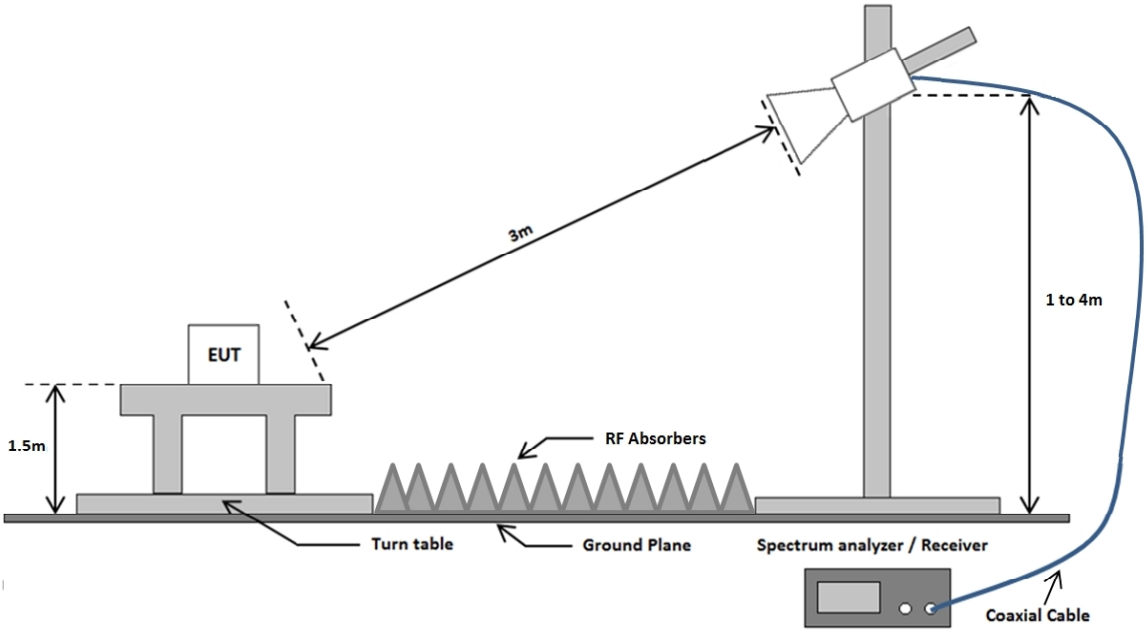


2.4 Radiated Test setup

Radiated emissions test setup 30 MHz - 1 GHz



Radiated emissions test setup above 1 GHz



2.5 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Signal Generator	Hewlett Packard	83650B	TE00487	3.1 to 3.5
Spectrum Analyzer	Rohde & Schwarz	FSV	TE01269	3.1 to 3.5
Spectrum Analyzer	Rohde & Schwarz	FSP40	TE11125	3.6
EMI receiver	Rohde & Schwarz	ESR7	TE01220	3.6
10 MHz distribution Amplifier	Stanford Research Systems	FS735/1	TE01278	3.1 to 3.5
USB to GPIB adapter	National Instruments	-	TE01283	3.1 to 3.5
Pre-amplifier	Miteq	AFS42-041001800-29-OP-42	TE11132	3.6
Biconilog Antenna	Chase	CBL6112A	TE00967	3.6
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.6
SAC Chamber	Comtest Engineering BV	-	TE00861	3.6

2.6 Explanation of the Measurement results for all conducted test items

The path loss between the EUT and the spectrum analyser for the frequency range of 30 MHz to 40 GHz has been measured and stored in the transducer table of the spectrum analyser. This transducer table is used for level offset of the spectrum analyser. With this level offset the spectrum analysers reading will be exactly the RF output.

2.7 Sample calculations

Field Strength Measurement example:

Frequency (GHz)	Polarization	Height(m)	Peak (dBµV/m)
7,2	Vertical	4	42.2

The following realtion applies:

E (dBµV/m) = U(dBµV) + AF (dB/m) – G (dB) + CL (dB)

Where:

E = Electric field strength
U = Measuring reveiver voltage
AF = Antenna factor
G = Gain of the pre-amplifier
CL = Cable loss

(42.2 = 36.02 + 36.4 - 37.62 + 7.2)

3 Test results

3.1 6dB bandwidth Measurement

3.1.1 Limit

The minimum 6 dB Bandwidth shall be at least 500 kHz.

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.1.4 Test procedure

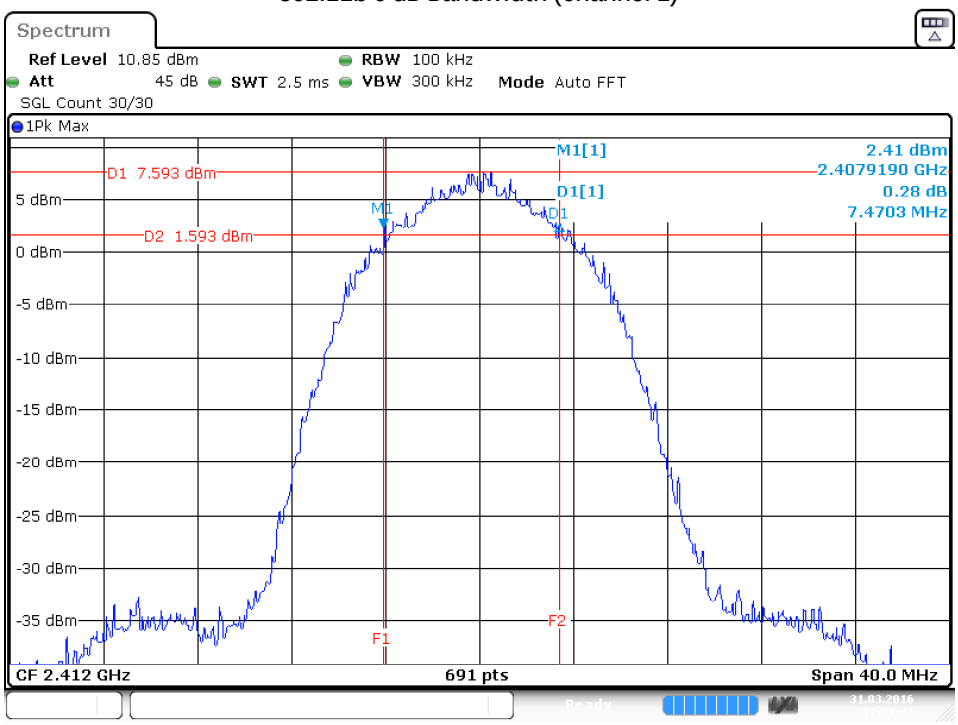
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyser by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement. This path loss is stored within the transducer table of the Spectrum analyser.

3.1.5 Test Results of the 6 dB bandwidth Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (kHz)
IEEE 802.11b	1(Low)	2412	11 Mbps	7470.33
	6(Mid)	2437	11 Mbps	6943.56
	11 (High)	2462	11 Mbps	7458.76
IEEE 802.11g	1(Low)	2412	54 Mbps	16274.96
	6(Mid)	2437	54 Mbps	15759.77
	11 (High)	2462	54 Mbps	16049.20
Uncertainty	±707 kHz			

3.1.6 Plots of the 6 dB bandwidth Measurement

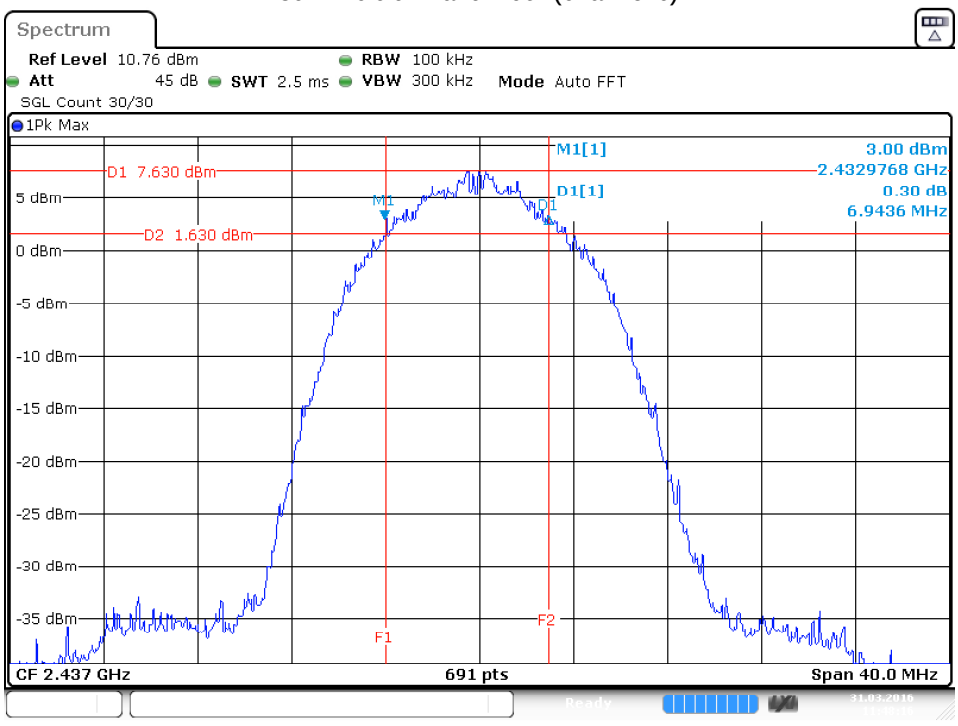
802.11b 6 dB Bandwidth (Channel 1)



IEEE802_11b_QBPSK_11M, channel: 1 : 6dB BW measurement

Date: 31.MAR.2016 11:47:42

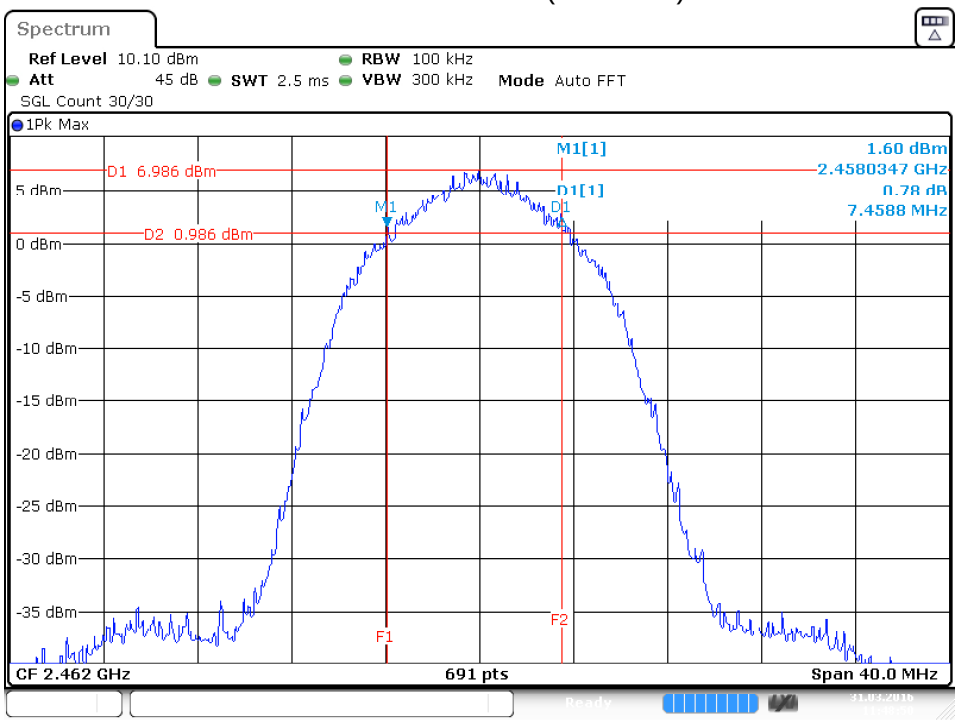
802.11b 6 dB Bandwidth (Channel 6)



IEEE802_11b_QBPSK_11M, channel: 6 : 6dB BW measurement

Date: 31.MAR.2016 11:48:17

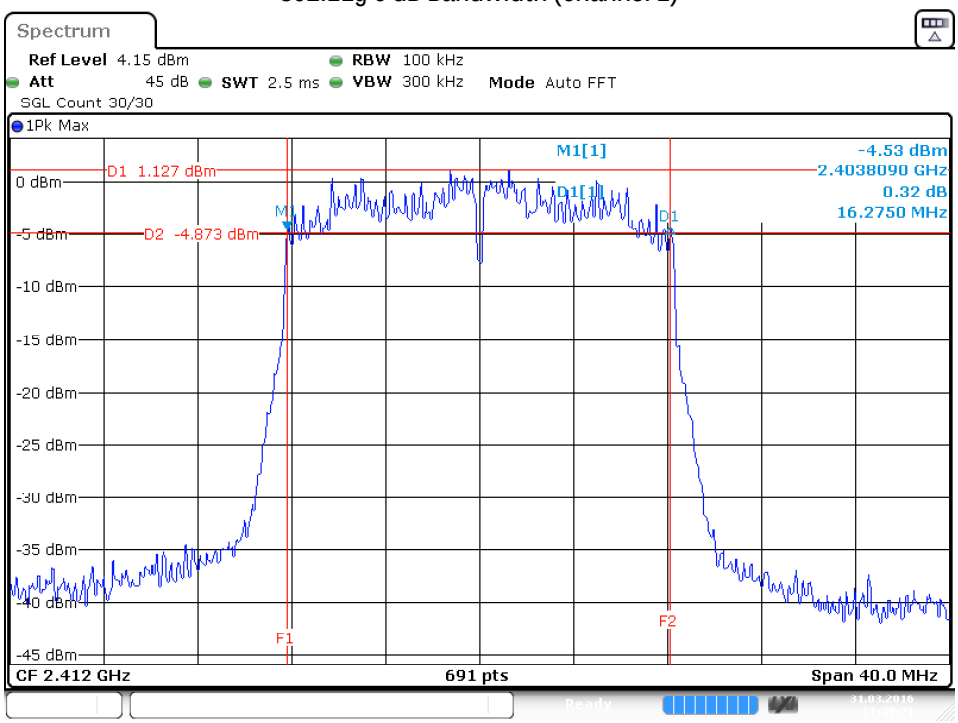
802.11b 6 dB Bandwidth (Channel 11)



IEEE802_11b_QBPSK_11M, channel: 11 : 6dB BW measurement

Date: 31.MAR.2016 11:48:50

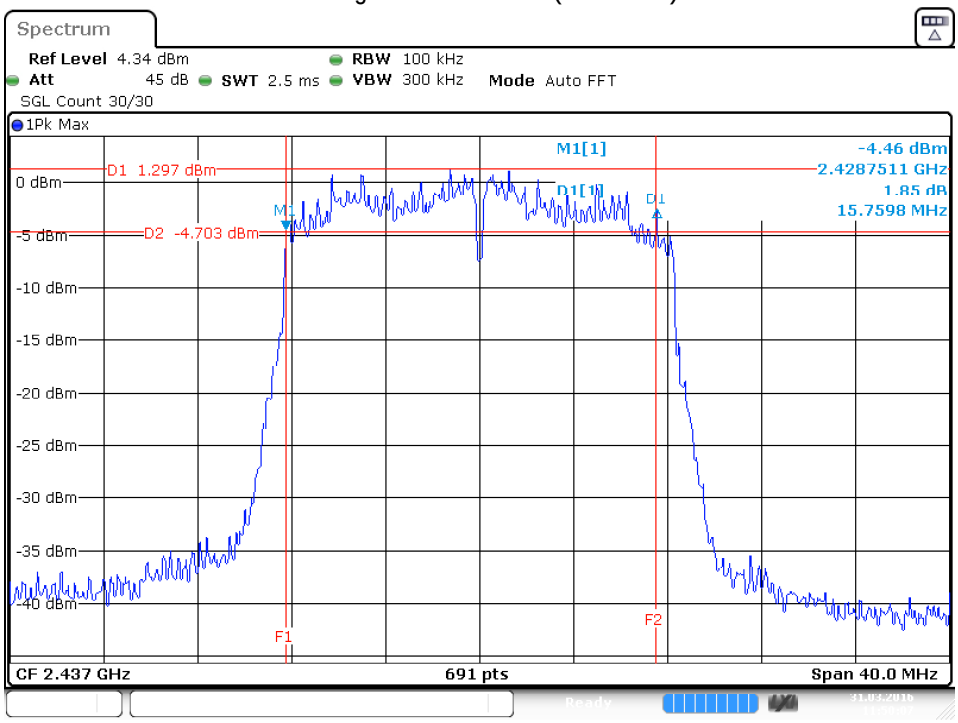
802.11g 6 dB Bandwidth (Channel 1)



IEEE802_11g_OFDM_54M, channel: 1 : 6dB BW measurement

Date: 31.MAR.2016 11:49:21

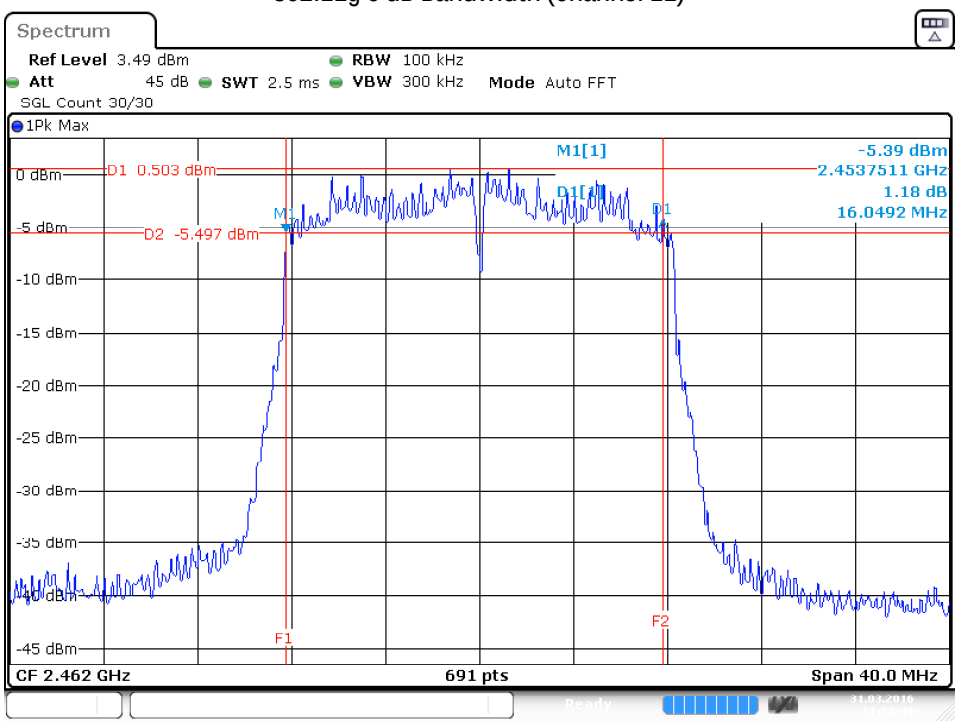
802.11g 6 dB Bandwidth (Channel 6)



IEEE802_11g_OFDM_54M, channel: 6 : 6dB BW measurement

Date: 31.MAR.2016 11:50:07

802.11g 6 dB Bandwidth (Channel 11)



IEEE802_11g_OFDM_54M, channel: 11 : 6dB BW measurement

Date: 31.MAR.2016 11:50:50

3.2 99% Occupied Bandwidth

3.2.1 Limit

According to RSS-Gen 4.6.1.

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.5 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.2.4 Test procedure

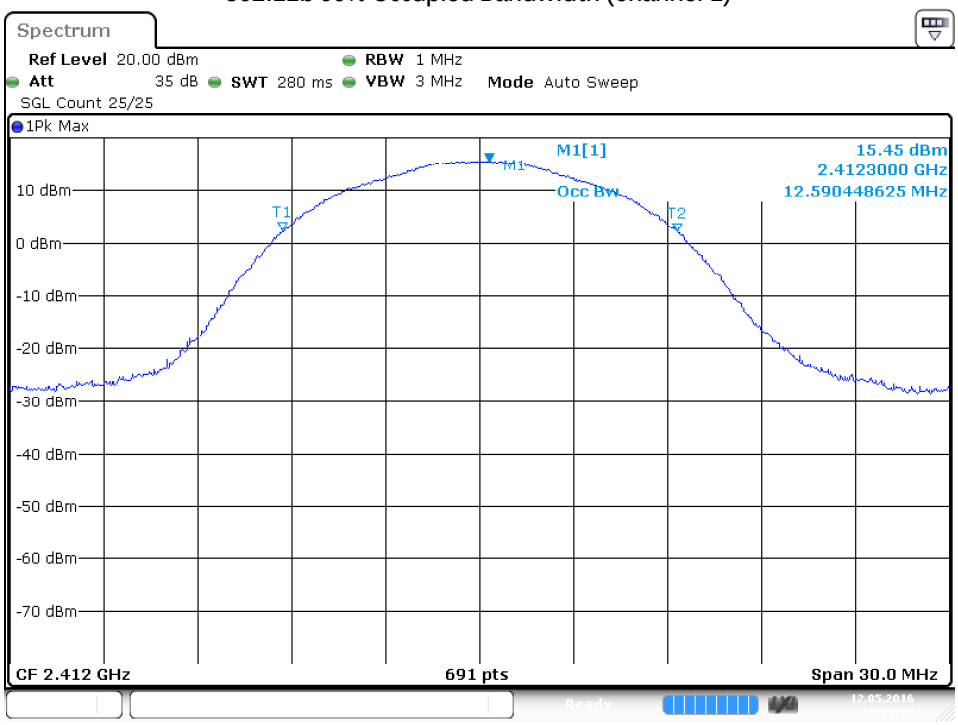
1 Set the centre frequency to the nominal EUT channel centre frequency.
2 Set span = 1.5 times to 0.5 times the Occupied Bandwidth.
3 Set VBW ≥ 3 x RBW.
4 Video averaging is not permitted. Where practical detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode(until the trace stabilizes) shall be used.

3.2.5 Test results of the 99% Occupied Bandwidth Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	99% bandwidth (MHz)
IEEE 802.11b	1(Low)	2412	11 Mbps	12.590
	6(Mid)	2437	11 Mbps	12.590
	11 (High)	2462	11 Mbps	12.590
IEEE 802.11g	1(Low)	2412	54 Mbps	17.106
	6(Mid)	2437	54 Mbps	17.149
	11 (High)	2462	54 Mbps	17.106
Uncertainty	±707 kHz			

3.2.6 Plots of the 99% Occupied Bandwidth Measurement

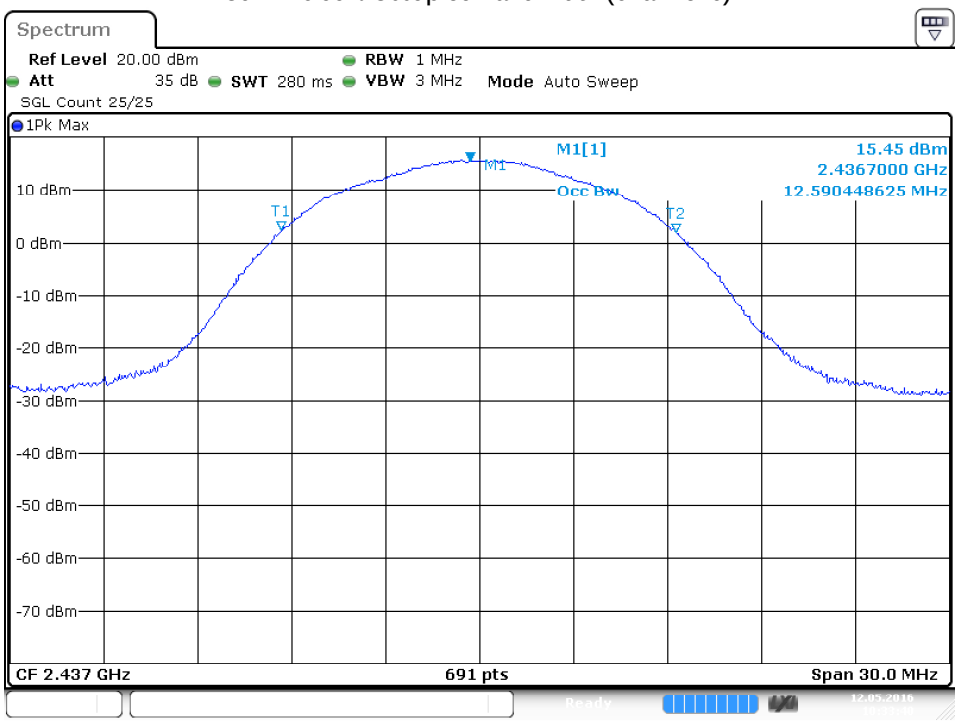
802.11b 99% Occupied Bandwidth (Channel 1)



IEEE802_11 Channel: 1 : Measure Occupied Bandwidth

Date: 12.MAY.2016 10:33:20

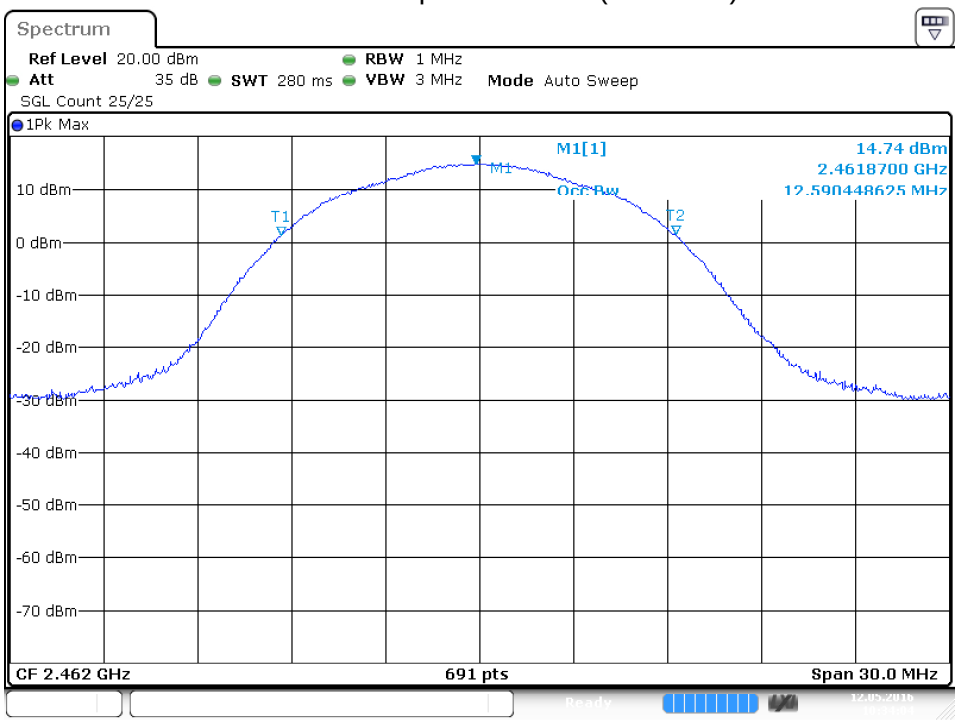
802.11b 99% Occupied Bandwidth (Channel 6)



IEEE802_11 Channel: 6 : Measure Occupied Bandwidth

Date: 12.MAY.2016 10:33:40

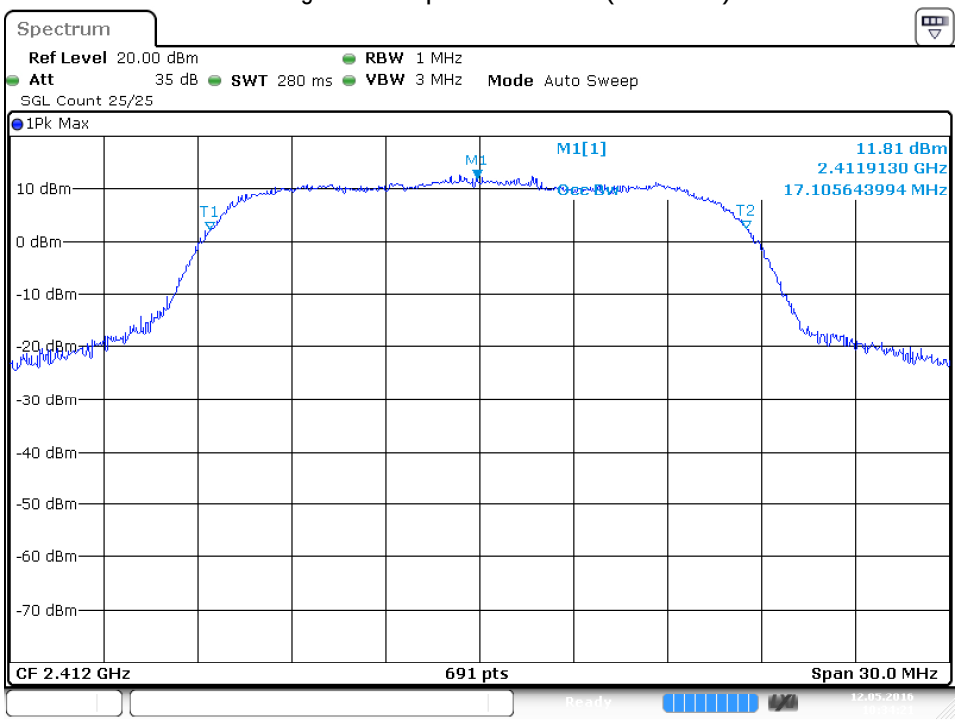
802.11b 99% Occupied Bandwidth (Channel 11)



IEEE802_11 Channel: 11 : Measure Occupied Bandwidth

Date: 12.MAY.2016 10:34:04

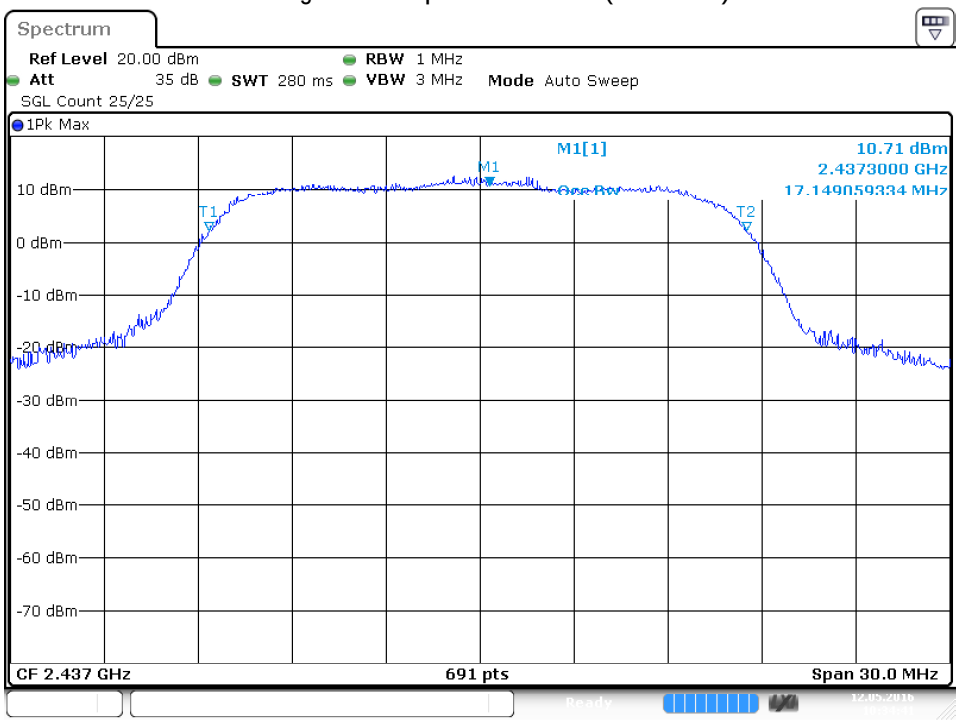
802.11g 99% Occupied Bandwidth (Channel 1)



IEEE802_11 Channel: 1 : Measure Occupied Bandwidth

Date: 12.MAY.2016 10:34:22

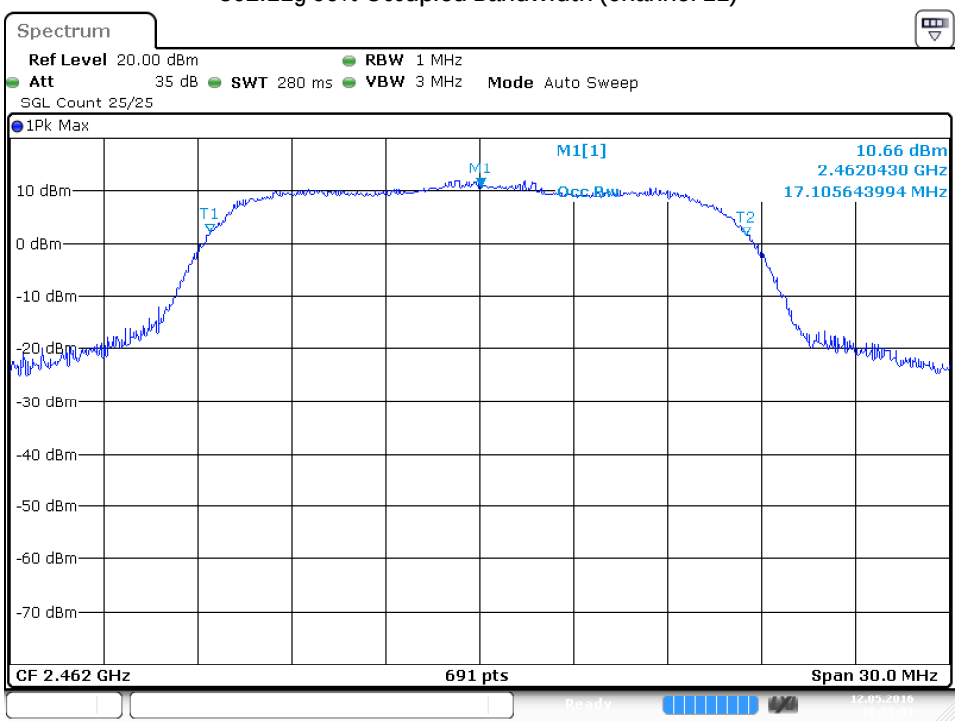
802.11g 99% Occupied Bandwidth (Channel 6)



IEEE802_11 Channel: 6 : Measure Occupied Bandwidth

Date: 12.MAY.2016 10:34:40

802.11g 99% Occupied Bandwidth (Channel 11)



IEEE802_11 Channel: 11 : Measure Occupied Bandwidth

Date: 12.MAY.2016 10:35:03