InterLab®

FCC Measurement Report on

WLAN transceiver
HERMES

FCC ID: T8GHERMES
IC: 6434A-HERMES

Report Reference: MDE_HARMAN_1504_FCCc_rev1

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DAkkS
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D-PL-12140-01-01

Table of Contents

0 Applied Standards and Test Summary

0.1 Applied Standards

Type of Authorization
Certification for an Intentional Radiator (Digital Device / Spread Spectrum).

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-13 Edition) and 15 (10-1-13 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

Part 15, Subpart E – Unlicensed National Information Infrastructure Devices

§ 15.403 Definitions

§ 15.407 General technical requirements

Note:
The tests were selected and performed with reference to the FCC Public Notice "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D02 General U-NII Test Procedures v01, 2014-06-06".

Instead of applying ANSI C63.4–1992 which is referenced in the FCC Public Note, the newer ANSI C63.4–2009 is applied.

FCC ET Docket No. 13-49, FIRST REPORT AND ORDER, April 1, 2014 ("new rules") is applied.

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0.3 Measurement Summary / Signatures.

0.2 FCC-IC Correlation Table

Correlation of measurement requirements for UNII / LE-LAN (e.g. WLAN 5 GHz) equipment

UNII equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 4: 8.8
Occupied bandwidth	§ 15.403 (i) (26 dB) / § 15.407 (e) (6 dB)	RSS-247 Issue 1: 6.2.1 (1), 6.2.2 (1), 6.2.3 (1) (99%) RSS-247 Issue 1: 6.2.4 (1) (6 dB)
Maximum conducted output power	§ 15.407 (a) (1),(2),(3),(4)	RSS-247 Issue 1: : 6.2.1 (1), 6.2.2 (1), 6.2.3 (1), 6.2.4 (1)
Maximum power spectral density	§ 15.407 (a) (1),(2),(3),(5)	RSS-247 Issue 1: : 6.2.1 (1), 6.2.2 (1), 6.2.3 (1), 6.2.4 (1)
Transmitter undesirable emissions; General Field Strength Limits, Restricted Bands	15.407 (b) § 15.209 (a)	RSS-Gen Issue 4: 6.13/8.9/8.10; RSS-247 Issue 1: : 6.2.1 (2), 6.2.2 (2), 6.2.3 (2), 6.2.4 (2)
Frequency stability	§ 15.407 (g)	RSS-Gen Issue 4: 6.11/8.11
Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)	§ 15.407 (h)	RSS-247 Issue 1: 6.2.2 (1), 6.2.3 (1), 6.3
Antenna requirement	§ 15.203 / 15.204	RSS-Gen Issue 4: 8.3
Receiver spurious emissions	–	-

0.3 Measurement Summary / Signatures

FCC Part 15, Subpart C **§ 15.207**

Conducted emissions (AC power line)
The measurement was performed according to ANSI C63.4

OP-Mode	Setup	Port	Final Result
-	-	-	N/A [1)]

FCC Part 15, Subpart E **§ 15.403 (i), 15.407 (e)**

26 / 6 dB Emission bandwidth / 99 % occupied bandwidth
The measurement was performed according to FCC § 15.31

OP-Mode	Setup	Port	Final Result
a-Mode, CH 149, 20 MHz	Setup_01	Temp.ant.connector	passed
a-Mode, CH 157, 20 MHz	Setup_01	Temp.ant.connector	passed
a-Mode, CH 165, 20 MHz	Setup_01	Temp.ant.connector	passed
n-Mode, CH 149, 20 MHz	Setup_01	Temp.ant.connector	passed
n-Mode, CH 157, 20 MHz	Setup_01	Temp.ant.connector	passed
n-Mode, CH 165, 20 MHz	Setup_01	Temp.ant.connector	passed
n-Mode, CH 149, 40 MHz	Setup_01	Temp.ant.connector	passed
n-Mode, CH 157, 40 MHz	Setup_01	Temp.ant.connector	passed

FCC Part 15, Subpart E **§ 15.407 (a)(1,2,3,4)**

Maximum Conducted Output Power
The measurement was performed according to FCC § 15.31

OP-Mode	Setup	Port	Final Result FCC	IC
a-Mode, CH 36, 20 MHz	Setup_01	Temp.ant.connector	passed	N/A
a-Mode, CH 44, 20 MHz	Setup_01	Temp.ant.connector	passed	N/A
a-Mode, CH 48, 20 MHz	Setup_01	Temp.ant.connector	passed	N/A
a-Mode, CH 52, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 56, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 64, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 100, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 116, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 140, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 149, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 157, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 165, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 36, 20 MHz	Setup_01	Temp.ant.connector	passed	N/A
n-Mode, CH 44, 20 MHz	Setup_01	Temp.ant.connector	passed	N/A
n-Mode, CH 48, 20 MHz	Setup_01	Temp.ant.connector	passed	N/A
n-Mode, CH 52, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 56, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 64, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 100, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 116, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 140, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 149, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 157, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 165, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 38, 40 MHz	Setup_01	Temp.ant.connector	passed	N/A
n-Mode, CH 46, 40 MHz	Setup_01	Temp.ant.connector	passed	N/A
n-Mode, CH 54, 40 MHz	Setup_01	Temp.ant.connector	N/A	N/A

n-Mode, CH 62, 40 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 102, 40 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 110, 40 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 134, 40 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 151, 40 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 159, 40 MHz	Setup_01	Temp.ant.connector	passed	passed

FCC Part 15, Subpart E **§ 15.407 (a)(1,2,3,5)**

Maximum Power Spectral Density

The measurement was performed according to FCC § 15.31

			Final Result	
OP-Mode	**Setup**	**Port**	**FCC**	**IC**
a-Mode, CH 36, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 44, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 48, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 52, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 56, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 64, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 100, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 116, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 140, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
a-Mode, CH 149, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 157, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
a-Mode, CH 165, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 36, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 44, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 48, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 52, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 56, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 64, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 100, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 116, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 140, 20 MHz	Setup_01	Temp.ant.connector	N/A	N/A
n-Mode, CH 149, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 157, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 165, 20 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 38, 40 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 46, 40 MHz	Setup_01	Temp.ant.connector	passed	passed
n-Mode, CH 54, 40 MHz	Setup_01	Temp.ant.connector	passed	passed

FCC Part 15, Subpart C & E **§ 15.205, § 15.209**
§ 15.407 (b)(1,2,3,4,5,6)

Undesirable Emissions, General Field Strength Limits;
Restricted Bands and Radiated Emission Limits

The measurement was performed according to ANSI C63.10

			Final Result	
OP-Mode	**Setup**	**Port**	**FCC**	**IC**
a-Mode, CH 36, 20 MHz	Setup_02	Enclosure	passed	N/P
a-Mode, CH 44, 20 MHz	Setup_02	Enclosure	passed	N/P
a-Mode, CH 48, 20 MHz	Setup_02	Enclosure	passed	N/P
a-Mode, CH 52, 20 MHz	Setup_02	Enclosure	N/A	N/P
a-Mode, CH 56, 20 MHz	Setup_02	Enclosure	N/A	N/P
a-Mode, CH 64, 20 MHz	Setup_02	Enclosure	N/A	N/P
a-Mode, CH 100, 20 MHz	Setup_02	Enclosure	N/A	N/P

a-Mode, CH 116, 20 MHz	Setup_02	Enclosure	N/A	N/P
a-Mode, CH 140, 20 MHz	Setup_02	Enclosure	N/A	N/P
a-Mode, CH 149, 20 MHz	Setup_02	Enclosure	passed	N/P
a-Mode, CH 157, 20 MHz	Setup_02	Enclosure	passed	N/P
a-Mode, CH 165, 20 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 36, 20 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 44, 20 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 48, 20 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 52, 20 MHz	Setup_02	Enclosure	N/A	N/P
n-Mode, CH 56, 20 MHz	Setup_02	Enclosure	N/A	N/P
n-Mode, CH 64, 20 MHz	Setup_02	Enclosure	N/A	N/P
n-Mode, CH 100, 20 MHz	Setup_02	Enclosure	N/A	N/P
n-Mode, CH 116, 20 MHz	Setup_02	Enclosure	N/A	N/P
n-Mode, CH 140, 20 MHz	Setup_02	Enclosure	N/A	N/P
n-Mode, CH 149, 20 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 157, 20 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 165, 20 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 38, 40 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 46, 40 MHz	Setup_02	Enclosure	passed	N/P
n-Mode, CH 54, 40 MHz	Setup_02	Enclosure	N/A	N/P

FCC Part 15, Subpart E **§ 15.407 (h)**

Dynamic Frequency selection

The measurement was performed according to FCC § 15.31

OP-Mode	**Setup**	**Port**	**Final Result FCC**	**IC**
–	–	–	N/A [2)]	N/A [2)]

N/A Not applicable:
1) the EUT is powered by DC, transmitter is automatically switched off when connected to USB
2) the EUT operates only in bands where DFS is not required.

N/P Not performed

Revision History

Report version control			
Version	**Release date**	**Change Description**	**Version validity**
initial	2015-07-23	--	invalid
rev1	2015-10-20	1) Removal of UNII-Subband 2A and 2C 2) Correlation Table updated 3) Measurement Uncertainty added 4) Test Setup Drawing updated	valid

Responsible for Accreditation Scope: 

Responsible for Test Report: 

1 Administrative Data

1.1 Testing Laboratory

Company Name:	7Layers AG
Address	Borsigstr. 11 40880 Ratingen Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716 .

The test facility is also accredited by the following accreditation organisation:

Laboratory accreditation no.:	DAkkS D-PL-12140-01-01
Responsible for Accreditation Scope:	Dipl.-Ing. Bernhard Retka Dipl.-Ing. Robert Machulec Dipl.-Ing. Thomas Hoell Dipl.-Ing Andreas Petz Dipl.-Ing Marco Kullik
Report Template Version:	2014-11-24

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Carsten Steinröder
Employees who performed the tests:	documented internally at 7Layers
Date of Test(s):	2015-04-29 to 2015-05-11
Date of Report:	2015-10-20

1.3 Applicant Data

Company Name:	Harman/Becker Automotive Systems GmbH
Address:	Becker-Göring-Straße 16 76307 Karlsbad Germany
Contact Person:	Mr. Simon Voegele

1.4 Manufacturer Data

Company Name:	Please see applicant data
Address:	
Contact Person:	

2 Test object Data

2.1 General EUT Description

Equipment under Test:	IEEE 802.11a/b/g/n WLAN transceiver (5 GHz)
Type Designation:	HARMAN
Kind of Device: (optional)	WLAN 5 GHz modes a/n, 20+40 MHz BW
Voltage Type:	DC
Voltage Level:	12.0 V
Tested Modulation Type:	DBPSK; OFDM:BPSK; OFDM:64-QAM

General product description:

The EUT is designed for automotive usage and contains the following features:
GSM, UMTS, LTE , USB, Bluetooth, Wireless LAN.

The WLAN Transceiver is operating in the 5 GHz band using Direct Sequence Spread Spectrum (DSSS) Modulation and Orthogonal Frequency Division Multiplexing (OFDM).

Specific product description for the EUT:

The EUT is a dual band WLAN (802.11 a/b/g/n, 2.4 and 5 GHz) and Bluetooth module with one joint antenna connector for WLAN and Bluetooth, but simultaneous transmission is not possible and is managed by the module. In IEEE 802.11n mode it supports 20 MHz and 40 MHz bandwidth channels (both with MCS7), providing 72.2 Mbit/s, and 150 Mbit/s transfer data rates respectively.
The WLAN (Wireless Local Area Network) transceiver is operating in the 5 GHz band in the range 5.155 – 5.25 GHz and 5.725 – 5.825 GHz.
("new rules" 5.850 GHz)

The object of this test report is the WLAN transceiver, it was tested at 20 and 40 MHz channel bandwidth. Both transmit chains are always active and the duty cycle (linear) is 0.96 at 20 MHz bandwidth and 1.0 at 40 MHz (in this test mode).

The EUT provides the following ports:

Ports
Enclosure
AC-Port
DC Port
Data port

The main components of the EUT are listed and described in chapter 2.2

2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status
EUT A (Code: DE1009004aa01)	WLAN transceiver	HERMES	-	C3	Test SW
Remark: EUT A is equipped with a dual-band integral antenna with antenna gain = 1.8 dBi at 2.4 – 2.5 GHz frequency range.					
EUT B (Code: DE1009004ab01)	WLAN transceiver	HERMES	-	C3	Test SW
Remark: EUT B is equipped with a temporary antenna connector					

NOTE: The short description is used to simplify the identification of the EUT in this test report.

2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status
–	–	–	–	–	–

2.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status
AUX1	CAN BOX	NTG5 HMI CAN	–	–	–

2.5 EUT Setups

This chapter describes the combination of EUTs and equipment used for testing. The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards.

Setup	Combination of EUTs	Description and Rationale
Setup_01	EUT A + AUX1	setup for conducted radio measurements
Setup_02	EUT B	setup for radiated measurements

2.6 Operating Modes

This chapter describes the operating modes of the EUTs used for testing.

2.6.1 Test Channels

UNII-Subband 1 5150 - 5250 MHz			UNII-Subband 2A 5250 - 5350 MHz			UNII-Subband 2C 5470 - 5725 MHz			UNII-Subband 3 5725 - 5850 MHz			Nom. BW
Bottom	Middle	Top	Bottom	Middle	Top	Bottom	Middle	Top	Bottom	Middle	Top	20 MHz
36	44	48							149	157	165	Ch.-No.
5180	5220	5240							5745	5785	5825	MHz

Bottom	Middle	Top	Bottom	Middle	Top	Bottom	Middle	Top	Bottom	Middle	Top	40 MHz
38	-	46							151	-	159	Ch.-No.
5190	-	5230							5755	-	5795	MHz

2.6.1 Data rates

WLAN a-Mode; 20 MHz; 6 Mbit/s
WLAN n-Mode; 20 MHz; 72.2 Mbit/s
WLAN n-Mode; 40 MHz; 150 Mbit/s

2.7 Special software used for testing

A special test software is provided by applicant.

2.8 Product labelling

2.8.1 FCC ID label

Please refer to the documentation of the applicant.

2.8.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

3 Test Results

3.1 26 / 6 dB Emission bandwidth / 99 % occupied bandwidth

Standard FCC Part 15, Subpart E

The test was performed according to: FCC §15.31

3.1.1 Test Description

The Equipment Under Test (EUT) was setup in a shielded room to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produce the worst-case (widest) emission bandwidth (26 / 6 dB and 99%).

The EUT was connected to spectrum analyzer via a short coax cable with a known loss.

Analyzer settings:
1) 26 bandwidth, sub-bands 1, 2A and 2C:
- Resolution Bandwidth (RBW): initially approx. 1 % of nominal emission bandwidth
- Video Bandwidth (VBW): > RBW
- re-adjust RBW close to 1 % of measured bandwidth and repeat the measurement
2) 6 dB bandwidth, sub-band 3:
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): ≥ 3 times the RBW
1+2) 26 / 6 dB bandwidth:
- Detector: Peak
- Trace: Maxhold
- Sweeps: ≥ 200
- Sweeptime: at least coupled
3) 99% occupied bandwidth:
- Span: 1.5 to 5 times the occupied bandwidth
- Resolution Bandwidth (RBW): approx. ≥ 1 % of the span, but not below
- Video Bandwidth (VBW): ≥ 3 times the RBW
- Detector: Sample
- Trace: Maxhold
- Sweeps: ≥ 200
- Sweeptime: at least coupled

3.1.2 Test Requirements / Limits

FCC Part 15, Subpart E, §15.403 (i)
There exist no applicable limits for the U-NII subbands 1, 2A and 2C. The test was performed to determine the limits for the “Maximum Conducted Output Power” test case. Therefore no result was applied.

FCC Part 15, Subpart E, §15.407 (e)
Within the 5.725-5.850 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

3.1.3 Test Protocol

Temperature: 23 °C
Air Pressure: 1010 hPa
Humidity: 40 %

1) 26 dB bandwidth

WLAN a-Mode; 20 MHz; 6 Mbit/s			
UNII-Subband	**Channel No.**	**Frequency [MHz]**	**26 dB Bandwidth [MHz]**
1	36	5180	21.592
	44	5220	21.592
	48	5240	21.534
2A	52	5260	N/A
	56	5280	N/A
	64	5320	N/A
2C	100	5500	N/A
	116	5580	N/A
	140	5700	N/A
3	149	5745	21.476
	157	5785	21.534
	165	5825	21.534
WLAN n-Mode; 20 MHz; 72.2 Mbit/s			
UNII-Subband	**Channel No.**	**Frequency [MHz]**	**26 dB Bandwidth [MHz]**
1	36	5180	21.592
	44	5220	21.592
	48	5240	21.592
2A	52	5260	N/A
	56	5280	N/A
	64	5320	N/A
2C	100	5500	N/A
	116	5580	N/A
	140	5700	N/A
3	149	5745	21.592
	157	5785	21.592
	165	5825	21.650
WLAN n-Mode; 40 MHz; 150 Mbit/s			
1	36	5190	39.508
	44	5230	39.508
2A	52	5270	N/A
	60	5310	N/A
2C	100	5510	N/A
	108	5550	N/A
	132	5670	N/A
3	149	5755	39.421
	157	5795	39.508

2) 6 dB bandwidth

WLAN a-Mode; 20 MHz; 6 Mbit/s			
UNII-Subband	**Channel No.**	**Frequency [MHz]**	**6 dB Bandwidth [MHz]**
3	149	5745	16.455
	157	5785	16.455
	165	5825	16.455

WLAN n-Mode; 20 MHz; 72.2 Mbit/s			
UNII-Subband	**Channel No.**	**Frequency [MHz]**	**6 dB Bandwidth [MHz]**
3	149	5745	17.843
	157	5785	17.843
	165	5825	17.843

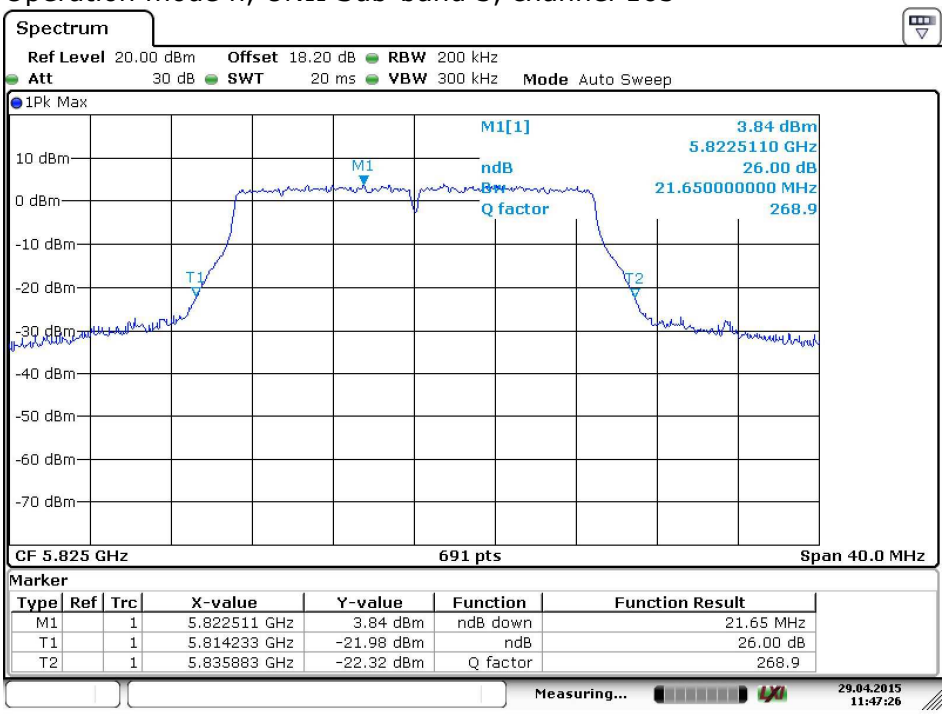
WLAN n-Mode; 40 MHz; 150 Mbit/s			
UNII-Subband	**Channel No.**	**Frequency [MHz]**	**6 dB Bandwidth [MHz]**
3	151	5755	36.643
	159	5795	36.672

3) 99% bandwidth

WLAN a-Mode; 20 MHz; 6 Mbit/s			
UNII – Sub band	**Channel No.**	**Frequency [MHz]**	**99 % Bandwidth [MHz]**
1	36	5180	17.873
	44	5220	17.800
	48	5240	17.800
2A	52	5260	N/A
	56	5280	N/A
	64	5320	N/A
2C	100	5500	N/A
	116	5580	N/A
	140	5700	N/A
3	149	5745	17.873
	157	5785	17.873
	165	5825	17.873
WLAN n-Mode; 20 MHz; 72.2 Mbit/s			
UNII – Sub band	**Channel No.**	**Frequency [MHz]**	**99 % Bandwidth [MHz]**
1	36	5180	18.452
	44	5220	18.452
	48	5240	18.379
2A	52	5260	N/A
	56	5280	N/A
	64	5320	N/A
2C	100	5500	N/A
	116	5580	N/A
	140	5700	N/A
3	149	5745	18.452
	157	5785	18.379
	165	5825	18.379
WLAN n-Mode; 40 MHz; 150 Mbit/s			
UNII – Sub band	**Channel No.**	**Frequency [MHz]**	**99 % Bandwidth [MHz]**
1	36	5190	36.324
	44	5230	36.397
2A	52	5270	N/A
	60	5310	N/A
2C	100	5510	N/A
	108	5550	N/A
	132	5670	N/A
3	149	5755	36.397
	157	5795	36.397

3.1.4 Measurement Plot (showing the highest value, "worst case")

1) 26 dB bandwidth – "worst cases" measurement plots
a) 20 MHz nominal bandwidth
Operation mode n, UNII Sub-band 3, channel 165



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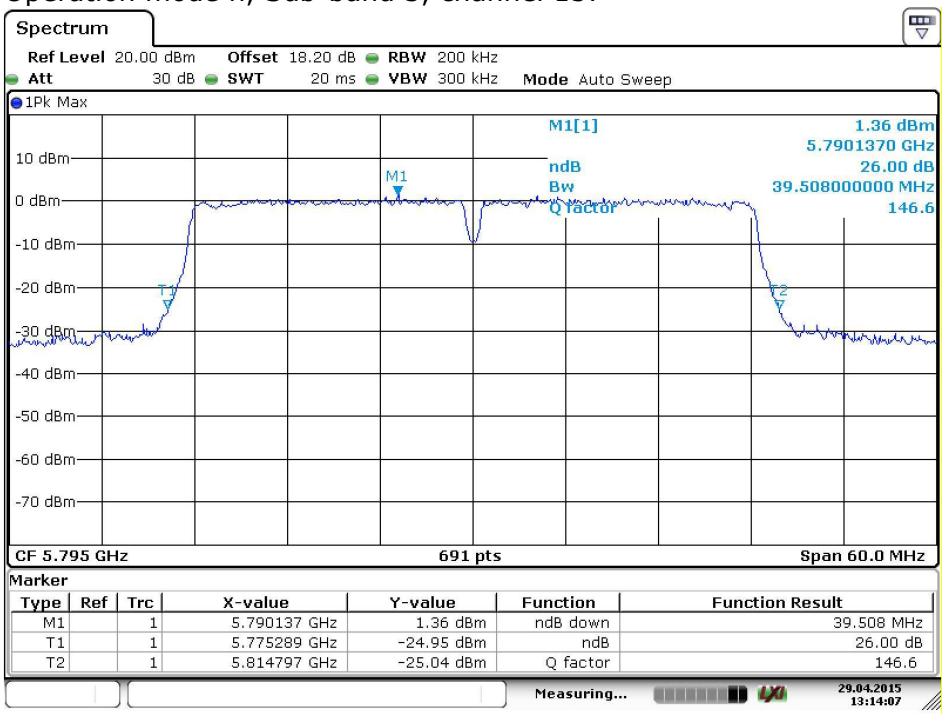
b) 40 MHz nominal bandwidth
Operation mode n, Sub-band 3, channel 157



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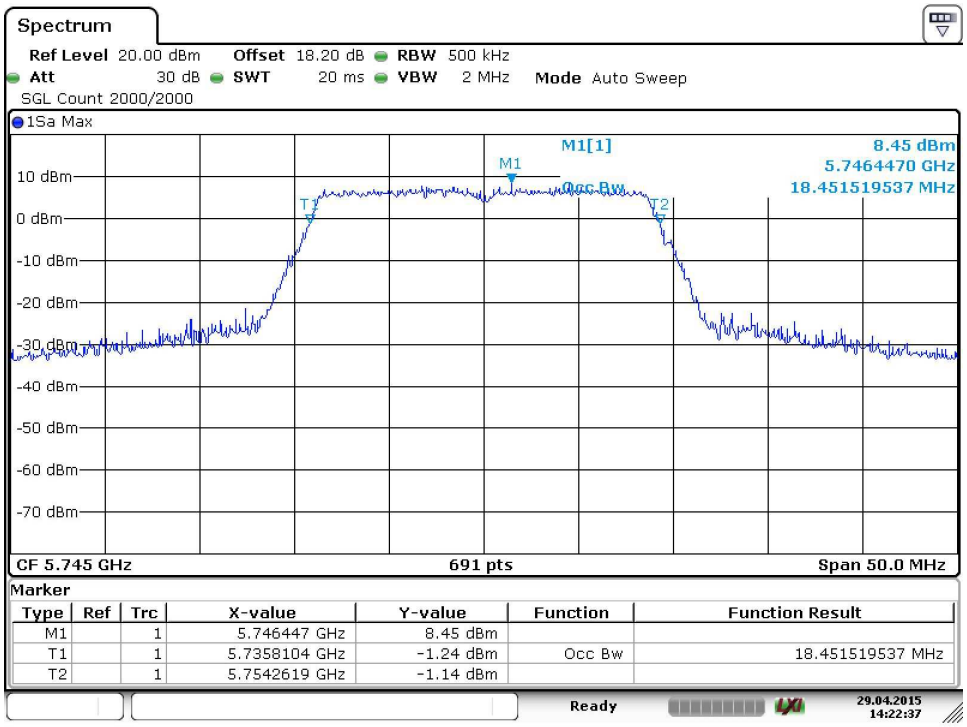
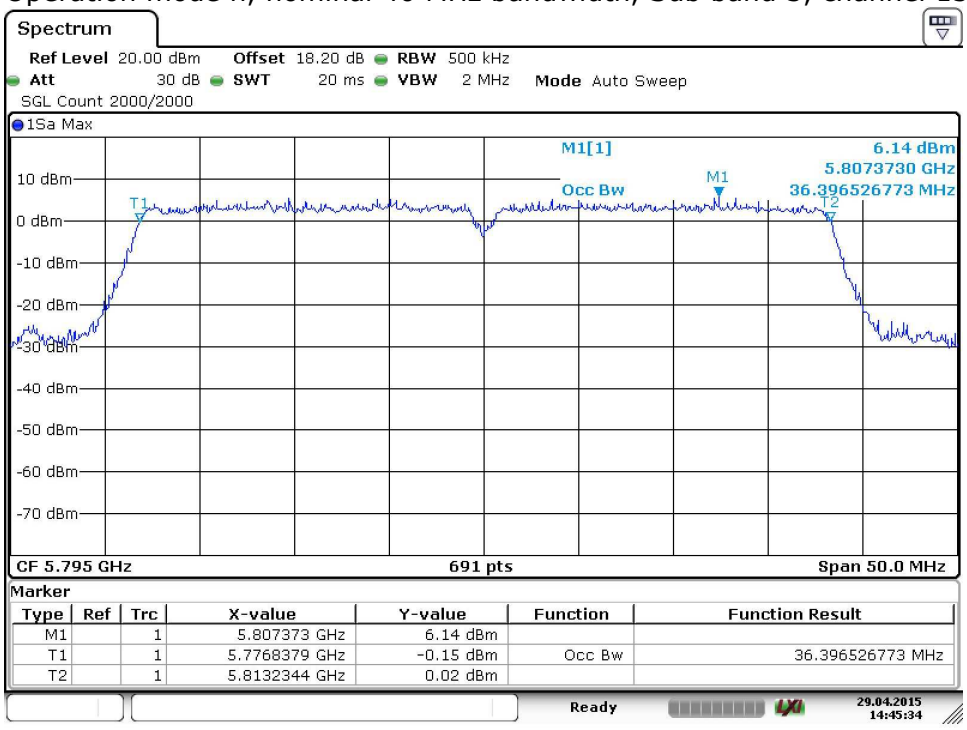
2) “worst-cases” of 99 % Bandwidth measurement

Operation mode n, nominal 20 MHz bandwidth, UNII Sub band 3, channel 149



Date: 29.APR.2015 14:22:36

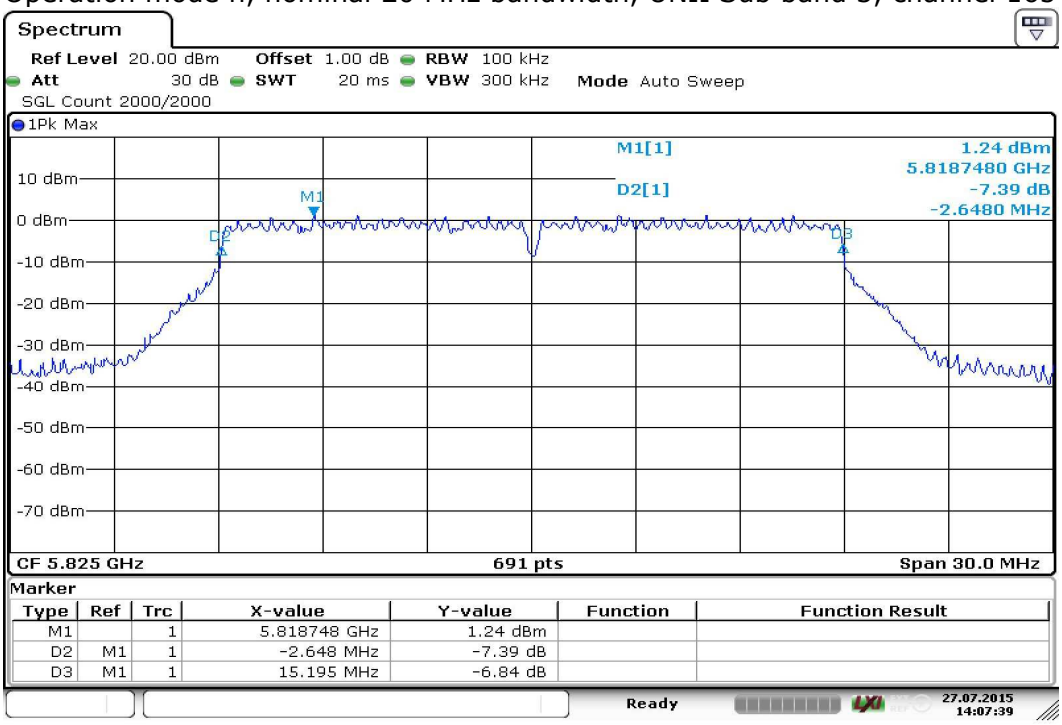
Operation mode n, nominal 40 MHz bandwidth, Sub band 3, channel 157



Date: 29.APR.2015 14:45:34

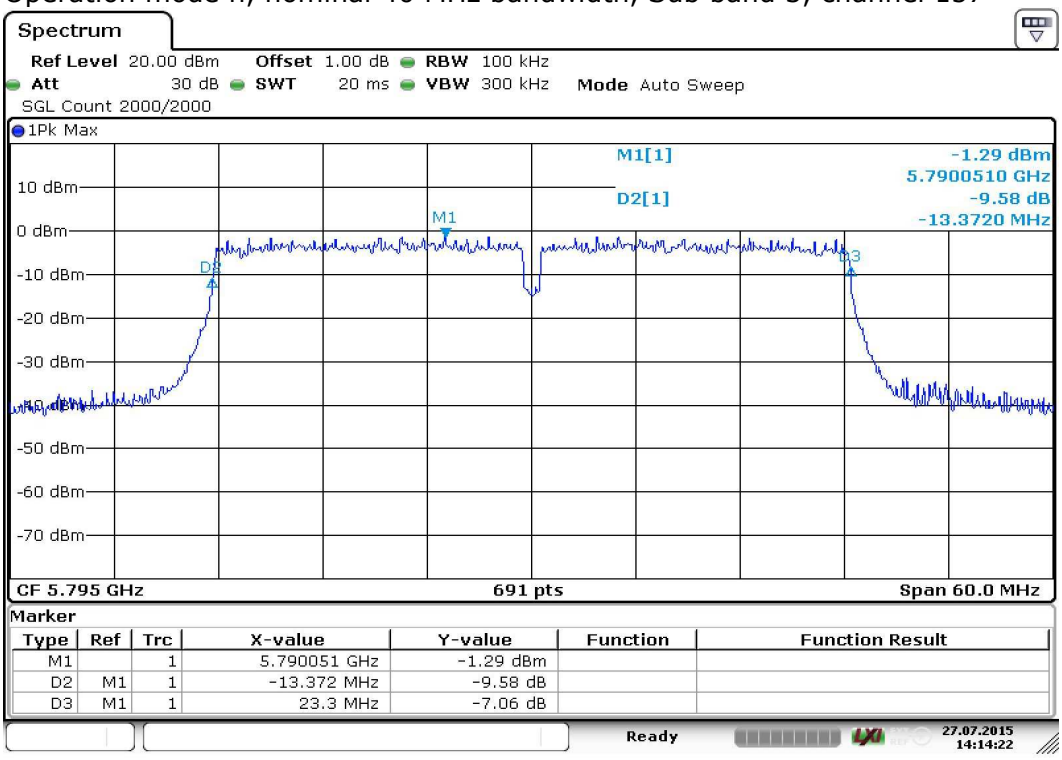
3) “worst-cases” of 6 % Bandwidth measurement

Operation mode n, nominal 20 MHz bandwidth, UNII Sub band 3, channel 165



Date: 27.JUL.2015 14:07:38

Operation mode n, nominal 40 MHz bandwidth, Sub band 3, channel 157



Date: 27.JUL.2015 14:14:22

3.2 Maximum conducted output power

Standard FCC Part 15, Subpart E

The test was performed according to: FCC §15.31

3.2.1 Test Description

The Equipment Under Test (EUT) was set up in a shielded room to perform the output power measurements. The results recorded were measured with the modulation which produces the worst-case (highest) output power. The EUT was connected to spectrum analyser via a short coax cable with a known loss.

Analyser settings:
- Resolution Bandwidth (RBW): 1 MHz
- Video Bandwidth (VBW): 3 MHz
- Detector: RMS
- Trace: Average, RMS power averaging mode
- Sweeps: 100
- Sweeptime: coupled
- Trigger: gated mode

Note:
The analyser settings are according FCC Public Note "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D01 General UNII Test Procedures v01r03, 2013-4-08", method **SA-1**.

3.2.2 Test Requirements / Limits

A) FCC
For systems using digital modulation techniques in the 5.15 – 5.25 GHz bands:
§15.407 (a) (1)
Limit: 50 mW (17 dBm) or 4 dBm + 10 log (26 dB bandwidth/MHz) whatever is the lesser.
FCC ET Docket No. 13-49, FIRST REPORT AND ORDER, April 1, 2014 ("new rules"):
§15.407 (a) (1) (i): Outdoor access point:
Limit: 1 W (30 dBm) provided the maximum antenna gain does not exceed 6 dBi.
The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
§15.407 (a) (1) (ii): Indoor access point:
Limit: 1 W (30 dBm) provided the maximum antenna gain does not exceed 6 dBi.
§15.407 (a) (1) (iv): Mobile and portable client devices:
Limit: 250 mW (24 dBm) provided the maximum antenna gain does not exceed 6 dBi.

For systems using digital modulation techniques in the 5.25 – 5.35 GHz and 5.47 – 5.725 GHz bands:
§15.407 (a) (2)
Limit: 250 mW (24 dBm) or 11 dBm + 10 log (26 dB bandwidth/MHz) whatever is the lesser.

For systems using digital modulation techniques in the 5.725 – 5.850 GHz bands:
§15.407 (a) (3)
Limit: 1 W (30 dBm) or 17 dBm + 10 log (26 dB bandwidth/MHz) whatever is the lesser.

FCC ET Docket No. 13-49, FIRST REPORT AND ORDER, April 1, 2014 (“new rules”):
§15.407 (a) (3):
Limit: 1 W (30 dBm).

§15.407 (a) (4):
The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

B) IC
Different frequency bands and limits apply, as compared to the FCC requirements.

RSS-210, A9.2 (1), Band 5150-5250 MHz, indoor operation only:
Limit (e.i.r.p.): 200 mW (23 dBm) or 10 + 10 log10 B [dBm], whichever power is less.
B is the 99% emission bandwidth in MHz.

RSS-210, A9.2 (2), Band 5250-5350 MHz:
Limits:
Maximum conducted Power: 250 mW (24 dBm) or 11 + 10 log10 B [dBm], whichever power is less.
e.i.r.p.: 1.0 W (30 dBm) or 17 + 10 log10 B [dBm], whichever power is less.

Note: For EUTs operating at a higher e.i.r.p. than 200 mW (23 dBm), compliance with the e.i.r.p. elevation mask is required.

RSS-210, A9.2 (3), Bands 5470-5600 MHz and 5650-5725 MHz:
Limits:
Maximum conducted Power: 250 mW (24 dBm) or 11 + 10 log10 B [dBm], whichever power is less.
e.i.r.p.: 1.0 W (30 dBm) or 17 + 10 log10 B [dBm], whichever power is less.

RSS-210, A9.2 (4), Band 5725-5825 MHz:
Limits:
Maximum conducted Power: 1W (30 dBm) or 17 + 10 log10 B [dBm], whichever power is less.
e.i.r.p.: 4.0 W (36 dBm) or 23 + 10 log10 B [dBm], whichever power is less.

All frequency bands: B is the 99% emission bandwidth in MHz.

3.2.3 Test Protocol

Temperature: 23 °C
Air Pressure: 1010 hPa
Humidity: 40 %

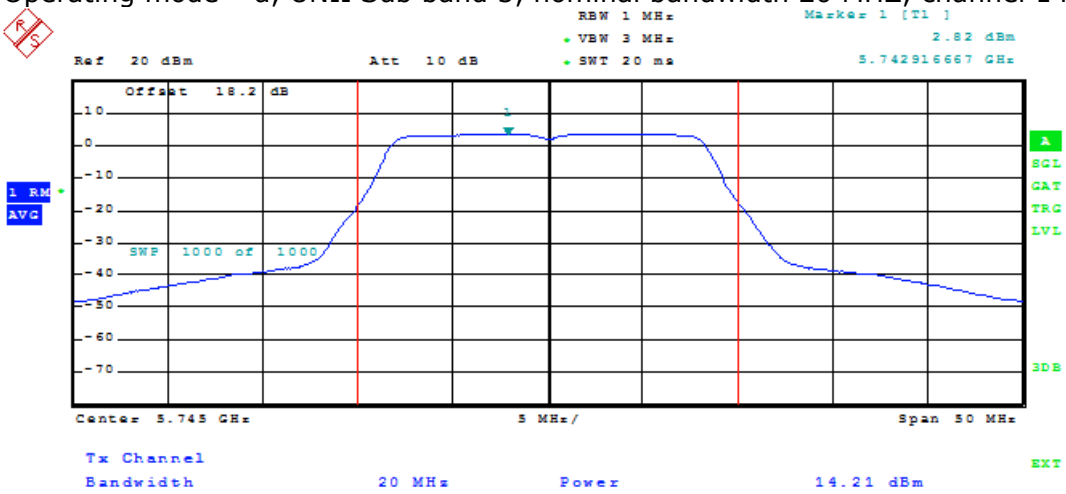
WLAN a-Mode; 20 MHz; 6 Mbit/s					FCC	
UNII-Sub-band	Ch. No.	Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	Cond. P. Limit [dBm]	Margin [dB]
1	36	5180	13.0	13.0	30.0	17.0
	44	5220	13.1	13.1	30.0	17.0
	48	5240	13.2	13.2	30.0	16.8
2A	52	5260	N/A	N/A	24.0	N/A
	56	5280	N/A	N/A	24.0	N/A
	64	5320	N/A	N/A	24.0	N/A
2C	100	5500	N/A	N/A	24.0	N/A
	116	5580	N/A	N/A	24.0	N/A
	140	5700	N/A	N/A	24.0	N/A
3	149	5745	14.2	14.2	30.0	15.8
	157	5785	13.8	13.8	30.0	16.2
	165	5825	13.8	13.8	30.0	16.2
WLAN n-Mode; 20 MHz; 72.2 Mbit/s					FCC	
UNII-Sub-band	Ch. No.	Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	Cond. P. Limit [dBm]	Margin [dB]
1	36	5180	13.3	13.3	30.0	16.7
	44	5220	12.9	12.9	30.0	17.1
	48	5240	13.0	13.0	30.0	17.0
2A	52	5260	N/A	N/A	24.0	N/A
	56	5280	N/A	N/A	24.0	N/A
	64	5320	N/A	N/A	24.0	N/A
2C	100	5500	N/A	N/A	24.0	N/A
	116	5580	N/A	N/A	24.0	N/A
	140	5700	N/A	N/A	24.0	N/A
3	149	5745	14.0	14.0	30.0	16.0
	157	5785	13.8	13.8	30.0	16.2
	165	5825	13.6	13.6	30.0	16.4
WLAN n-Mode; 40 MHz; 150 Mbit/s					FCC	
UNII-Sub-band	Ch. No.	Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	Cond. P. Limit [dBm]	Margin [dB]
1	38	5190	13.2	13.2	30.0	16.8
	46	5230	13.0	13.0	30.0	17.0
2A	54	5270	N/A	N/A	24.0	N/A
	62	5310	N/A	N/A	24.0	N/A
2C	102	5510	N/A	N/A	24.0	N/A
	110	5550	N/A	N/A	24.0	N/A
	134	5670	N/A	N/A	24.0	N/A
3	151	5755	13.9	13.9	30.0	16.1
	159	5795	13.7	13.7	30.0	16.3

WLAN a-Mode; 20 MHz; 6 Mbit/s				IC	
UNII-Sub-band	**Ch. No.**	**Cond. Limit [dBm]**	**Margin [dB]**	**EIRP Limit [dBm]**	**Margin [dB]**
1	36	N/A		22.5	9.5*
	44	N/A		22.5	9.5*
	48	N/A		22.5	9.3*
2A	52	N/A	N/A	29.5	N/A
	56	N/A	N/A	29.5	N/A
	64	N/A	N/A	29.5	N/A
2C	100	N/A	N/A	29.5	N/A
	116	N/A	N/A	29.5	N/A
	140	N/A	N/A	29.5	N/A
3	149	29.5	15.3	35.5	21.3
	157	29.5	15.7	35.5	21.7
	165	29.5	15.7	35.5	21.7
WLAN a-Mode; 20 MHz; 72.2 Mbit/s				**IC**	
UNII-Sub-band	**Ch. No.**	**Cond. Limit [dBm]**	**Margin [dB]**	**EIRP Limit [dBm]**	**Margin [dB]**
1	36	N/A		22.7	9.4*
	44	N/A		22.7	9.7*
	48	N/A		22.6	9.6*
2A	52	N/A	N/A	29.6	N/A
	56	N/A	N/A	29.6	N/A
	64	N/A	N/A	29.6	N/A
2C	100	N/A	N/A	29.7	N/A
	116	N/A	N/A	29.6	N/A
	140	N/A	N/A	29.6	N/A
3	149	29.7	15.7	35.7	21.7
	157	29.6	15.9	35.6	21.9
	165	29.6	16.0	35.6	22.0
WLAN a-Mode; 40 MHz; 150 Mbit/s				**IC**	
UNII-Sub-band	**Ch. No.**	**Cond. Limit [dBm]**	**Margin [dB]**	**EIRP Limit [dBm]**	**Margin [dB]**
1	38	N/A		23.0	9.8*
	46	N/A		23.0	10.0*
2A	54	N/A	N/A	30.0	N/A
	62	N/A	N/A	30.0	N/A
2C	102	N/A	N/A	30.0	N/A
	110	N/A	N/A	30.0	N/A
	134	N/A	N/A	30.0	N/A
3	151	30.0	16.1	36.0	22.1
	159	30.0	16.3	36.0	22.3

* no additional limit applies related to the elevation

3.2.4 Measurement plot (showing the highest value, "worst case")

Operating mode – a, UNII Sub band 3, nominal bandwidth 20 MHZ, channel 149



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3.3 Maximum Power Spectral Density

Standard FCC Part 15, Subpart E

The test was performed according to: FCC §15.31

3.3.1 Test Description

The Equipment Under Test (EUT) was set up in a shielded room to perform the Maximum Power Spectral Density measurements.
The results recorded were measured with the modulation which produces the worst-case (highest) output power.

The EUT was connected to spectrum analyser via a short coax cable with a known loss.

Analyser settings:
- Resolution Bandwidth (RBW): 1 MHz
- Video Bandwidth (VBW): 3 MHz
- Detector: RMS
- Trace: Average, RMS power averaging mode
- Sweeps: 100
- Sweeptime: coupled
- Marker: Peak
- Trigger: gated mode

Note:
The analyser settings are according FCC Public Note "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D01 General UNII Test Procedures v01r03, 2013-4-08", method **SA-1.**

3.3.2 Test Requirements / Limits

A) FCC

FCC Part 15, Subpart E, §15.407 (a) (1)
For systems using digital modulation techniques in the 5.15 – 5.25 GHz bands:
(i) and (ii), outdoor and indoor access points: Limit: 17 dBm/MHz.
(iv), mobile and portable client devices: Limit: 11 dBm/MHz.

FCC Part 15, Subpart E, §15.407 (a) (2)
For systems using digital modulation techniques in the 5.25 – 5.35 GHz and 5.47 – 5.725 GHz bands:
Limit: 11 dBm/MHz.

FCC Part 15, Subpart E, §15.407 (a) (3)
For systems using digital modulation techniques in the 5.725 – 5.850 GHz bands:
Limit: 30 dBm/500 kHz.

Note: The limit will be also fulfilled when measuring at any bandwidth greater than 500 kHz. This applies to signals where the maximum conducted output power was measured at a bandwidth exceeding 500 kHz and which fulfil that limit of 30 dBm.

B) IC
Different frequency bands and limits apply, as compared to the FCC requirements.

RSS-210, A9.2 (1), Band 5150-5250 MHz, indoor operation only:
Limit (e.i.r.p.): 10 dBm/MHz.

RSS-210, A9.2 (2), Band 5250-5350 MHz:
Limit: 11 dBm/MHz.

RSS-210, A9.2 (3), Bands 5470-5600 MHz and 5650-5725 MHz:
Limit: 11 dBm/MHz.

RSS-210, A9.2 (4), Band 5725-5825 MHz:
Limit: 17 dBm/MHz.

3.3.3 Test Protocol

Temperature: 23°C
Air Pressure: 1010 hPa
Humidity: 40 %

WLAN a-Mode; 20 MHz; 6 Mbit/s								
UNII-Sub-band	**Ch. No.**	**Freq. [MHz]**	**MPSD [dBm/ MHz]**	**FCC Limit [dBm]**	**Margin [dB]**	**IC Limit [dBm]**	**Margin [dB]**	**IC EIRP MPSD**
1	36	5180	1.6	17.0	15.4	10.0	8.4	1.6
	44	5220	1.7	17.0	15.3	10.0	8.3	1.7
	48	5240	1.8	17.0	15.2	10.0	8.2	1.8
2A	52	5260	N/A	11.0	N/A	11.0	N/A	unit: dBm/ MHz
	56	5280	N/A	11.0	N/A	11.0	N/A	
	64	5320	N/A	11.0	N/A	11.0	N/A	
2C	100	5500	N/A	11.0	N/A	11.0	N/A	
	116	5580	N/A	11.0	N/A	11.0	N/A	
	140	5700	N/A	11.0	N/A	11.0	N/A	
3	149	5745	2.8	30.0	27.2	17.0	14.2	
	157	5785	2.5	30.0	27.5	17.0	14.5	
	165	5825	2.4	30.0	27.6	17.0	14.6	
WLAN n-Mode; 20 MHz; 72.2 Mbit/s								
UNII-Sub-band	**Ch. No.**	**Freq. [MHz]**	**MPSD [dBm/ MHz]**	**FCC Limit [dBm]**	**Margin [dB]**	**IC Limit [dBm]**	**Margin [dB]**	**IC EIRP MPSD**
1	36	5180	1.7	17.0	15.3	10.0	8.3	1.7
	44	5220	1.4	17.0	15.6	10.0	8.6	1.4
	48	5240	1.5	17.0	15.5	10.0	8.5	1.5
2A	52	5260	N/A	11.0	N/A	11.0	N/A	unit: dBm/ MHz
	56	5280	N/A	11.0	N/A	11.0	N/A	
	64	5320	N/A	11.0	N/A	11.0	N/A	
2C	100	5500	N/A	11.0	N/A	11.0	N/A	
	116	5580	N/A	11.0	N/A	11.0	N/A	
	140	5700	N/A	11.0	N/A	11.0	N/A	
3	149	5745	2.5	30.0	27.5	17.0	14.5	
	157	5785	2.3	30.0	27.7	17.0	14.7	
	165	5825	2.2	30.0	27.8	17.0	14.8	

Continue on the next page

WLAN n-Mode; 40 MHz; 150 Mbit/s								
UNII-Sub-band	**Ch. No.**	**Freq. [MHz]**	**MPSD [dBm/ MHz]**	**FCC Limit [dBm]**	**Margin [dB]**	**IC Limit [dBm]**	**Margin [dB]**	**IC EIRP MPSD**
1	36	5190	-1.1	17.0	18.1	10.0	11.1	-1.1
	44	5230	-1.2	17.0	18.2	10.0	11.2	-1.2
2A	52	5270	N/A	11.0	N/A	11.0	N/A	unit:
	60	5310	N/A	11.0	N/A	11.0	N/A	dBm/
2C	100	5510	N/A	11.0	N/A	11.0	N/A	MHz
	108	5550	N/A	11.0	N/A	11.0	N/A	
	132	5670	N/A	11.0	N/A	11.0	N/A	
3	149	5755	-0.5	30.0	30.5	17.0	17.5	
	157	5795	-0.6	30.0	30.6	17.0	17.6	

Note: MPSD for subband 3 is measured at 1 MHz bandwidth.

3.3.3.1 Measurement Plot (showing the highest value, "worst case")

Please see the plot of Sub-clause 3.3.4 on page 29.
Operating mode – a, UNII Sub band 3, nominal bandwidth 20 MHZ, channel 149

3.4 Frequency Stability

Standard FCC Part 15, Subpart E

3.4.1 Test Description

The Equipment Under Test (EUT) was set up in an temperature chamber to perform the frequency stability test.
The results recorded, were measured while the EUT is transmitting a CW signal on the required frequency.

The EUT was connected to spectrum analyser via a short coax cable with a known loss.

Analyser settings:
- Frequency Counter activated, Resolution 1 Hz

3.4.2 Test Requirements / Limits

FCC Part 15, Subpart E, § 15.407 (g)

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

IC, RSS-Gen, 8.11:

If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable standard (RSS), measurement of the frequency stability is not required provided that the occupied bandwidth of the licence-exempt radio apparatus lies entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz.

3.4.3 Test Protocol

Temperature: - °C
Air Pressure: - hPa
Humidity: - %

Test was not performed.

3.5 Undesirable Emissions / General Field Strength Limits; Restricted Band and Radiated Emission Limits, Band Edge

Standard FCC Part 15, Subpart C & E

The test was performed according to: ANSI C 63.4

3.5.1 Test Description

The radiated emissions measurements were made in a typical installation configuration. The measurement procedure is implemented into the EMI test software ES-K1 from R&S.

1. Measurement up to 30 MHz
The Equipment Under Test (EUT) was set up on a non-conductive table in the anechoic chamber.
The Loop antenna HFH2-Z2 is used.
Step 1: pre measurement
- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF–Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.
Step 2: final measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.
- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF–Bandwidth: 200 Hz - 10 kHz
- Measuring time / Frequency step: 100 ms

2. Measurement above 30 MHz and up to 1 GHz
Step 1: Preliminary scan
Preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Antenna distance: 3 m
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180 to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: second measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180 to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):
- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:
- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.
For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by ±22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by ±25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –22.5° to +22.5° around the determined value
- Height variation range: –0.25 m to +0.25 m around the determined value

Step 4: final measurement with QP detector
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

Measurement above 1 GHz
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The Equipment Under Test (EUT) was set up on a non-conductive support at 1.4 m height in the fully-anechoic chamber. The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements, inverse linear-distance squared for the power reference level measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 15 GHz) and a horn antenna (15-26 GHz) are used, the steps 2-4 are omitted. Step 1 was performed with one height of the receiving antenna only.
EMI receiver settings:
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

For the data rate in mode n the test is performed as worst-case-check in order to verify that emissions have a comparable level as found at modes b and g. Typically, the measurement is performed in the frequency range 1 to 15 GHz but it depends on the emissions found during the test for the modes b and g. Please refer to the results for the used frequency range.

In the frequency range 26 – 40 GHz the measurement was performed conducted.

3.5.2 Test Requirements / Limits

A) FCC

FCC Part 15 Subpart E , §15.407 (b)(1)
For transmitters operating in the 5150–5250 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5150–5350 MHz.

FCC Part 15 Subpart E , §15.407 (b)(2)
For transmitters operating in the 5250–5350 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5150–5350 MHz.

FCC Part 15 Subpart E , §15.407 (b)(3)
For transmitters operating in the 5470–5725 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5470–5725 MHz.

FCC Part 15 Subpart E , §15.407 (b)(4)
For transmitters operating in the 5725–5850 MHz band:
Limit: –27 dBm/MHz EIRP outside of the band 5715–5860 MHz and additionally
Limit: –17 dBm/MHz EIRP within the frequency ranges 5715–5725 and 5850–5860 MHz.

B) IC
Different frequency bands and limits apply, as compared to the FCC requirements.

RSS-210, A9.2 (1), Emissions outside the band 5150-5250 MHz, indoor operation only:
Limit: –27 dBm/MHz EIRP outside of the band 5150–5250 MHz.

RSS-210, A9.2 (2), Emissions outside the band 5250-5350 MHz:
Limit: –27 dBm/MHz EIRP outside of the band 5250–5350 MHz.

RSS-210, A9.2 (3), Emissions outside the bands 5470-5600 MHz and 5650-5725 MHz:
Limit: –27 dBm/MHz EIRP outside of the band 5470–5725 MHz.
Note: No operation is permitted for the frequency range 5600–5650 MHz.

RSS-210, A9.2 (4), Emissions outside the band 5725-5825 MHz:
Limit: –27 dBm/MHz EIRP outside of the band 5715–5835 MHz and additionally
Limit: –17 dBm/MHz EIRP within the frequency ranges 5715–5725 and 5825–5835 MHz.

C) FCC & IC

FCC Part 15 Subpart E , §15.405 and §15.407 (b)(6,7)
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209. The provisions of §§ 15.203 and 15.205 are included.

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Calculated Limits(dBµV/m @10m)	Limits(dBµV/m @10m)
0.009 – 0.49	2400/F(kHz)	300 10	(48.5 – 13.8) + 59.1 dB	107.6 – 72.9
0.49 – 1.705	24000/F(kHz)	30 10	(33.8 – 23.0) + 19.1 dB	52.9 – 42.1
1.705 – 30	30	30 10	29.5 + 19.1 dB	48.6

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit (dBµV/m)
30 – 88	100	3	40.0
88 – 216	150	3	43.5
216 – 960	200	3	46.0
above 960	500	3	54.0

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)
Limit (dBµV/m) = EIRP [dBm] – 20 log (d [m]) + 104.8
where d is the measurement distance

3.5.3 Test Protocol

Limit types:
RB – Emissions falls into a "Restricted Band" according FCC §§15.205 and 15.209
UE – "Undesirable Emission Limit" according FCC §15.407
BE-RB – Band Edge Limit basing on "Restricted Band Limits"
BE-RB – Band Edge Limit basing on "Undesirable Emission Limit"

Temperature: 24–29 °C
Air Pressure: 1000–1009 hPa
Humidity: 33–49 %

3.5.3.1 Radiated spurious and undesired emissions

WLAN a-Mode; 20 MHz; 6 Mbit/s				Applied duty cycle correction (AV) [dB]:				0.3
Ch. No.	Ch. Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]	Limit Type
36	5180	5256.5	53.8	PEAK	1000	68.0	14.2	UE
44	5220	3480.0	47.8	PEAK	1000	68.0	20.2	UE
44	5220	5250.0	51.9	PEAK	1000	68.0	16.1	UE
44	5220	5295.5	52.3	PEAK	1000	68.0	15.7	UE
48	5240	5260.0	58.4	PEAK	1000	68.0	9.6	UE
48	5240	5323.0	54.3	PEAK	1000	68.0	13.7	UE
149	5745	3830.0	51.5	PEAK	1000	74.0	22.5	RB
149	5745	3830.0	49.4	AV	1000	54.0	4.6	RB
149	5745	4787.5	44.1	PEAK	1000	74.0	29.9	RB
149	5745	4787.5	34.6	AV	1000	54.0	19.4	RB
149	5745	5830.0	48.9	PEAK	1000	68.0	19.1	UE
157	5785	3856.5	52.1	PEAK	1000	74.0	21.9	RB
157	5785	3856.5	49.6	AV	1000	54.0	4.4	RB
157	5785	4821.0	43.0	PEAK	1000	74.0	31.0	RB
157	5785	4821.0	34.4	AV	1000	54.0	19.6	RB
157	5785	5863.5	50.0	PEAK	1000	68.0	18.0	UE
161	5805	3870.0	55.4	PEAK	1000	74.0	18.6	RB
161	5805	3870.0	53.9	AV	1000	54.0	0.1	RB
161	5805	5883.5	49.3	PEAK	1000	68.0	18.7	UE

WLAN n-Mode; 20 MHz; 72.2 Mbit/s				Applied duty cycle correction (AV) [dB]:				6.6
Ch. No.	Ch. Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]	Limit Type
36	5180	4748.5	44.7	PEAK	1000	74.0	29.3	UE
36	5180	4748.5	36.1	AV	1000	54.0	17.9	UE
36	5180	5105.5	53.8	PEAK	1000	74.0	20.2	UE
36	5180	5105.5	40.7	AV	1000	54.0	13.3	UE
36	5180	5146.5	54.4	PEAK	1000	74.0	19.6	UE
36	5180	5146.5	39.5	AV	1000	54.0	14.5	UE
36	5180	5264.5	57.0	PEAK	1000	68.0	11.0	UE
36	5180	10361.5	53.3	PEAK	1000	68.0	14.7	UE
44	5220	5147.0	53.5	PEAK	1000	74.0	20.5	UE
44	5220	5147.0	40.6	AV	1000	54.0	13.4	UE
44	5220	5250.0	54.9	PEAK	1000	68.0	13.1	UE
44	5220	5294.5	55.9	PEAK	1000	68.0	12.1	UE
44	5220	10441.0	52.9	PEAK	1000	68.0	15.1	UE
48	5240	3493.5	48.1	PEAK	1000	68.0	19.9	UE
48	5240	5319.5	56.0	PEAK	1000	68.0	12.0	UE
48	5240	10478.5	52.4	PEAK	1000	68.0	15.6	UE
WLAN n-Mode; 20 MHz; 72.2 Mbit/s				Applied duty cycle correction (AV) [dB]:				6.6
Ch. No.	Ch. Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]	Limit Type
149	5745	3830.0	53.5	PEAK	1000	74.0	20.5	UE
149	5745	3830.0	50.9	AV	1000	54.0	3.1	UE
149	5745	5658.0	54.1	PEAK	1000	68.0	13.9	UE
149	5745	5724.5	67.1	PEAK	1000	78.0	10.9	UE
149	5745	17246.5	54.9	PEAK	1000	68.0	13.1	UE
157	5785	3856.5	53.6	PEAK	1000	74.0	20.4	UE
157	5785	3856.5	51.0	AV	1000	54.0	3.0	UE
157	5785	5700.0	53.4	PEAK	1000	68.0	14.6	UE

WLAN n-Mode; 20 MHz; 72.2 Mbit/s				Applied duty cycle correction (AV) [dB]:				6.6
Ch. No.	Ch. Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]	Limit Type
157	5785	5872.0	52.4	PEAK	1000	68.0	15.6	UE
161	5805	3870.0	54.4	PEAK	1000	74.0	19.6	UE
161	5805	3870.0	52.1	AV	1000	54.0	1.9	UE
161	5805	5826.0	65.8	PEAK	1000	78.0	12.2	UE
165	5825	3883.5	54.7	PEAK	1000	74.0	19.3	UE
165	5825	3883.5	52.2	AV	1000	54.0	1.8	UE
165	5825	5905.0	53.4	PEAK	1000	68.0	14.6	UE
WLAN n-Mode; 40 MHz; 150 Mbit/s				Applied duty cycle correction (AV) [dB]:				6.6
Ch. No.	Ch. Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]	Limit Type
151	5755	5724.0	65.5	PEAK	1000	74.0	8.6	RB
151	5755	5724.0	48.2	AV	1000	68.0	19.8	RB
159	5795	3863.5	54.6	PEAK	1000	74.0	19.4	RB
159	5795	3863.5	51.6	AV	1000	68.0	16.4	RB

RB --> Restricted Band acc. 15.205/15.209
UE --> Undesirable Emission acc. 15.407 (b) 1-4

Note: No (further) spurious emissions in the range 20 dB below the limit found.
The results of the pre-test with peak detector have been similar for all three transmit frequencies in the frequency range 30–1000 MHz and independent from the transmit frequency. Therefore the final test applying the QP-(quasi-peak-)detector was performed only for one transmit frequency.

The tests for mode n have been performed in the frequency range 1-15 GHz in order to check i.e. for harmonics in respect to the measured conducted output power and because at pre-measurements no significant spurious emissions have been found outside this frequency range.

3.5.3.2 Band Edge

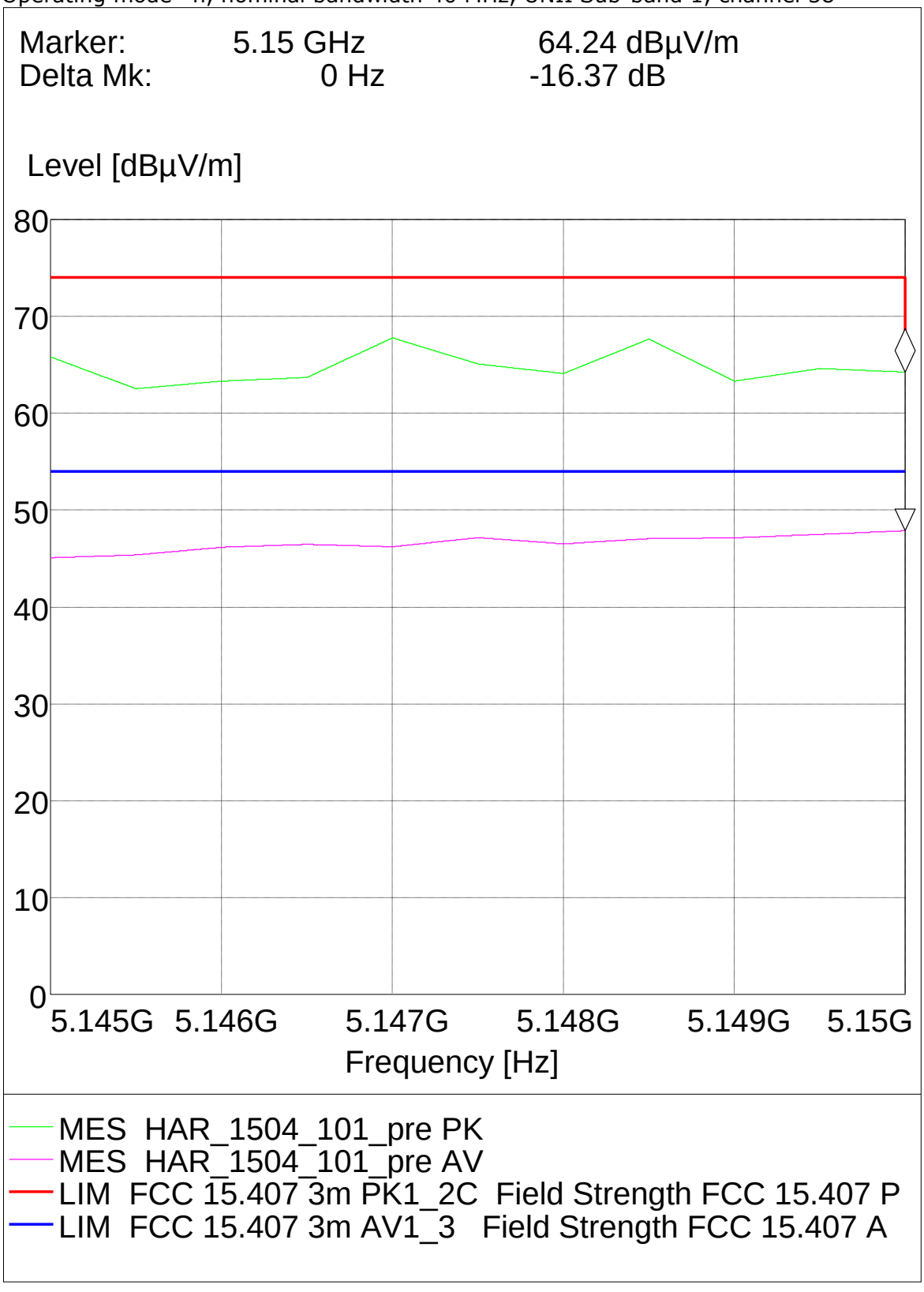
WLAN a-Mode; 20 MHz; 6 Mbit/s					Applied duty cycle correction (AV) [dB]: 0.3			
UNII-Sub-band	Ch. No.	Ch. Center Freq. [MHz]	Band Edge Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]
1	36	5180	5150.0	51.6	PEAK	1000	74.0	22.4
	36	5180	5150.0	35.0	AV	1000	54.0	19.0
2A	64	5320	5350.0	N/A				N/A
	64	5320	5350.0	N/A				N/A
2C	100	5500	5470.0	N/A				N/A
	140	5700	5725.0	N/A				N/A
3	149	5745	5725.0	53.3	PEAK	1000	78.0	24.8
	161	5805	5825.0	54.0	PEAK	1000	78.0	24.0
	165	5825	5850.0	49.2	PEAK	1000	78.0	28.8
WLAN n-Mode; 20 MHz; 72.2 Mbit/s					Applied duty cycle correction (AV) [dB]:6.6			
UNII-Sub-band	Ch. No.	Ch. Center Freq. [MHz]	Band Edge Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]
1	36	5180	5150.0	53.5	PEAK	1000	74.0	20.5
	36	5180	5150.0	37.7	AV	1000	54.0	16.3
2A	64	5320	5350.0	N/A				N/A
	64	5320	5350.0	N/A				N/A
2C	100	5500	5470.0	N/A				N/A
	140	5700	5725.0	N/A				N/A
3	149	5745	5725.0	67.1	PEAK	1000	78.0	10.9
	161	5805	5825.0	64.6	PEAK	1000	78.0	13.4
	165	5825	5850.0	55.3	PEAK	1000	78.0	22.7
WLAN n-Mode; 40 MHz; 150 Mbit/s					Applied duty cycle correction (AV) [dB]: 6.6			
UNII-Sub-band	Ch. No.	Ch. Center Freq. [MHz]	Band Edge Freq. [MHz]	Spurious Level [dBµV/m]	Detec-tor	RBW [kHz]	Limit [dBµV/m]	Margin [dB]
1	38	5190	5150.0	64.2	PEAK	1000	74.0	9.8
	38	5190	5150.0	47.9	AV	1000	54.0	6.1
2A	62	5310	5350.0	N/A				N/A
	62	5310	5350.0	N/A				N/A
2C	102	5510	5470.0	N/A				N/A
	134	5670	5725.0	N/A				N/A
3	151	5755	5725.0	64.3	PEAK	1000	78.0	13.7
	159	5795	5850.0	49.9	PEAK	1000	78.0	28.1
	159	5795	5826.5	66.5	PEAK	1000	78.0	11.5

Note: Tests at the Band Edges are implicitly performed together with the undesired emission tests, which are performed as radiated test. The measurements are performed up to the band edges using the bandwidth specified for the undesired emissions.
If this test is passed, no additional test especially at the band edges will be performed, e.g. applying a reduced bandwidth or carrying out tests using the marker-delta method. Otherwise, the results will be reported in this sub-clause.
Band Edge tests are always performed and reported when the band directly adjacent to a Restricted Band.

3.5.4 Measurement Plot Band Edge (showing the highest value, "worst case")

a) at restricted band

Operating mode –n, nominal bandwidth 40 MHz, UNII Sub-band 1, channel 38



4 Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	**Lab 2**
Manufacturer:	Frankonia
Description:	Anechoic Chamber for radiated testing
Type:	10.58x6.38x6.00 m³

Calibration Details	*Last Execution*	*Next Exec.*
NSA (FCC)	2014/01/09	2017/01/09

Single Devices for Anechoic Chamber

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m³	none	Frankonia
	Calibration Details		*Last Execution* / *Next Exec.*
	FCC listing 96716 3m Part15/18		2014/01/09 / 2017/01/08
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	CE-SYS
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID:	**Lab 2**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Antenna mast	AM 4.0	AM4.0/180/11920513	Maturo GmbH
Biconical Broadband Antenna	SBA 9119	9119-005	Schwarzbeck
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2012/06/26	2015/06/25
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright	
Horn Antenna Schwarzbeck 15-26 GHz BBHA 9170	BBHA 9170	BBHA9170262		
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2012/12/18	2015/12/17
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD Calibration		2014/11/27	2017/11/27
Standard Gain / Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH	
Standard Gain / Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH	
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	Maturo GmbH	

Test Equipment Auxiliary Test Equipment

Lab ID:	**Lab 2, Lab 3**
Manufacturer:	see single devices
Description:	Single Devices for various Test Equipment
Type:	various
Serial Number:	none

Single Devices for Auxiliary Test Equipment

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.
	Calibration Details		*Last Execution* *Next Exec.*
	Customized calibration		2013/12/04 2015/12/03
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright
Signal Analyzer	FSV30	103005	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution* *Next Exec.*
	Standard		2014/02/10 2016/02/09
Spectrum Analyser	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution* *Next Exec.*
	Standard		2012/06/13 2015/06/12
Spectrum Analyser	FSU26	200418	Rohde & Schwarz GmbH & Co.KG
	Calibration Details		*Last Execution* *Next Exec.*
	Standard calibration		2014/07/29 2015/07/28
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

Test Equipment Digital Signalling Devices

Lab ID: **Lab 2, Lab 3**
Description: Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Bluetooth Signalling Unit CBT	CBT	100589	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standart calibration		2015/01/21	2018/01/19
CMW500	CMW500	107500	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/01/27	2016/01/26
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2014/12/02	2017/12/01
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG	
	HW/SW Status		*Date of Start*	*Date of End*
	Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22 Firmware: µP1 8v50 02.05.06 ---		2007/07/16	
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2014/12/03	2017/12/02
	HW/SW Status		*Date of Start*	*Date of End*
	HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 ---		2007/01/02	
	SW: K62, K69		2008/11/03	
Vector Signal Generator	SMU200A	100912	Rohde & Schwarz GmbH & Co. KG	

Test Equipment Emission measurement devices

Lab ID:	**Lab 2**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Emission measurement devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
EMI Receiver / Spectrum Analyser	ESR 7	101424	Rohde & Schwarz	
	Calibration Details		*Last Execution*	*Next Exec.*
	Initial Factory Calibration		2014/11/13	2016/11/12
Personal Computer	Dell	30304832059	Dell	
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG	
	Standard calibration		2015/05/11	2016/05/10
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG	
	Standard calibration		2015/05/11	2016/05/10
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2014/06/24	2017/06/23
Spectrum Analyser	FSW 43	103779	Rohde & Schwarz	
	Calibration Details		*Last Execution*	*Next Exec.*
	Initial Factory Calibration		2014/11/17	2016/11/16
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2014/01/07	2016/01/31
	HW/SW Status		*Date of Start*	*Date of End*
	Firmware-Update 4.34.4 from 3.45 during calibration		2009/12/03	

Test Equipment Multimeter 03

Lab ID:	**Lab 2, Lab 3**
Description:	Fluke 177
Serial Number:	86670383

Single Devices for Multimeter 03

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.	
	Calibration Details		*Last Execution*	*Next Exec.*
	Customized calibration		2013/12/04	2015/12/03

Test Equipment Radio Lab Test Equipment

Lab ID: **Lab 3**
Description: Radio Lab Test Equipment

Single Devices for Radio Lab Test Equipment

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Broadband Power Divider SMA	WA1515	A856	Weinschel Associates
Coax Attenuator 10dB SMA 2W	4T-10	F9401	Weinschel Associates
Coax Attenuator 10dB SMA 2W	56-10	W3702	Weinschel Associates
Coax Attenuator 10dB SMA 2W	56-10	W3711	Weinschel Associates
Coax Cable Huber&Suhner	Sucotest 2,0m		Huber&Suhner
Coax Cable Rosenberger Micro Coax FA210A0010003030 SMA/SMA 1,0m	FA210A0010003030	54491-2	Rosenberger Micro-Coax
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2015/05/11 2016/05/10
RF Step Attenuator RSP	RSP	833695/001	Rohde & Schwarz GmbH & Co.KG
Rubidium Frequency Standard	Datum, Model: MFS	5489/001	Datum-Beverly
	Calibration Details		*Last Execution* *Next Exec.*
	Standard calibration		2014/07/03 2015/07/02
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
	Standard calibration		2015/05/11 2016/05/10
Signal Generator SME	SME03	827460/016	Rohde & Schwarz GmbH & Co.KG
	Calibration Details		*Last Execution* *Next Exec.*
	Standard calibration		2014/12/02 2017/12/01
Signal Generator SMP	SMP02	836402/008	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution* *Next Exec.*
	Standard calibration		2013/05/06 2016/05/05
Spectrum Analyser	FSIQ26	840061/005	Rohde & Schwarz GmbH & Co. KG
	Calibration after reparation		2015/04/02 2017/04/01

Test Equipment Regulatory Bluetooth RF Test Solution

Lab ID:	**Lab 4**
Description:	Regulatory Bluetooth RF Tests
Type:	Bluetooth RF
Serial Number:	001

Single Devices for Regulatory Bluetooth RF Test Solution

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ADU 200 Relay Box 7	Relay Box	A04380	Ontrak Control Systems Inc.	
Bluetooth Signalling Unit CBT	CBT	100302	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/08/29	2015/08/28
Power Meter NRVD	NRVD	832025/059		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/08/29	2015/08/28
Power Sensor NRV Z1 A	PROBE	832279/013		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/08/28	2015/08/27
Power Supply	NGSM 32/10	2725		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2013/06/20	2015/06/19
Rubidium Frequency Normal MFS	Datum MFS	002	Datum GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/08/29	2015/08/28
Signal Analyser FSIQ26	1119.6001.26	832695/007	Rohde & Schwarz GmbH & Co.KG	
Vector Signal Generator SMIQ03B	SMIQ03B	832870/017		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2013/06/21	2016/06/20

Test Equipment Shielded Room 07

Lab ID:	**Lab 4, Lab 5**
Description:	Shielded Room 4m x 6m

Test Equipment T/A Logger 13

Lab ID:	**Lab 2, Lab 3**
Description:	Lufft Opus10 TPR
Type:	Opus10 TPR
Serial Number:	13936

Single Devices for T/A Logger 13

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ThermoAirpressure Datalogger 13 (Environ)	Opus10 TPR (8253.00)	13936	Lufft Mess- und Regeltechnik GmbH	
	Customized calibration		2015/02/27	2017/02/26

Test Equipment T/H Logger 03

Lab ID:	**Lab 3**
Description:	Lufft Opus10
Serial Number:	7482

Single Devices for T/H Logger 03

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ThermoHygro Datalogger 03 (Environ)	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH	
	Customized calibration		2015/02/27	2017/02/26

Test Equipment T/H Logger 12

Lab ID:	**Lab 2**
Description:	Lufft Opus10
Serial Number:	12482

Single Devices for T/H Logger 12

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ThermoHygro Datalogger 12 (Environ)	Opus10 THI (8152.00)	12482	Lufft Mess- und Regeltechnik GmbH	
	Customized calibration		2015/03/10	2017/03/09

Test Equipment T/H Logger 15

Lab ID:	**Lab 4, Lab 5**
Description:	Lufft Opus10
Serial Number:	13985

Single Devices for T/H Logger 15

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ThermoHygro Datalogger 15 (Environ)	Opus10 THI (8152.00)	13985	Lufft Mess- und Regeltechnik GmbH	
	Customized calibration		2015/03/10	2017/03/09

Test Equipment Temperature Chamber 01

Lab ID:	**Lab 4, Lab 5**
Manufacturer:	see single devices
Description:	Temperature Chamber KWP 120/70
Type:	Weiss
Serial Number:	see single devices

Single Devices for Temperature Chamber 01

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Temperature Chamber Weiss 01	KWP 120/70	59226012190010	Weiss Umwelttechnik GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Customized calibration		2014/03/12	2016/03/11

Test Equipment WLAN RF Test Solution

Lab ID:	**Lab 5**
Manufacturer:	7 layers AG
Description:	Regulatory WLAN RF Tests
Type:	WLAN RF
Serial Number:	001

Single Devices for WLAN RF Test Solution

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Arbitrary Waveform Generator	TGA12101	284482		
Power Meter NRVD	NRVD	832025/059		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/08/29	2015/08/28
Power Sensor NRV Z1 A	PROBE	832279/013		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/08/28	2015/08/27
Power Supply	NGSM 32/10	2725		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2013/06/20	2015/06/19
Rubidium Frequency Normal MFS	Datum MFS	002	Datum GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/08/29	2015/08/28
Signal Analyser FSIQ26	1119.6001.26	832695/007	Rohde & Schwarz GmbH & Co.KG	
Spectrum Analyser	FSU26	100136	Rohde & Schwarz GmbH & Co.KG	
	Standard Calibration		2015/02/02	2016/02/01
	HW/SW Status		*Date of Start*	*Date of End*
	FSU FW Update to v4.61 SP3, K5 v4.60 and K73 v4.61		2011/12/05	
Spectrum Analyser	FSU3	200046	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2014/07/01	2015/06/30
	HW/SW Status		*Date of Start*	*Date of End*
	Firmware Version 4.51 SP1 Option FS-K72 4.50 SP1 Option FS-K73 4.50 SP1		2011/12/07	
TOCT Switching Unit	Switching Unit	040107	7 layers, Inc.	
Vector Signal Generator SMIQ03B	SMIQ03B	832870/017		
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2013/06/21	2016/06/20

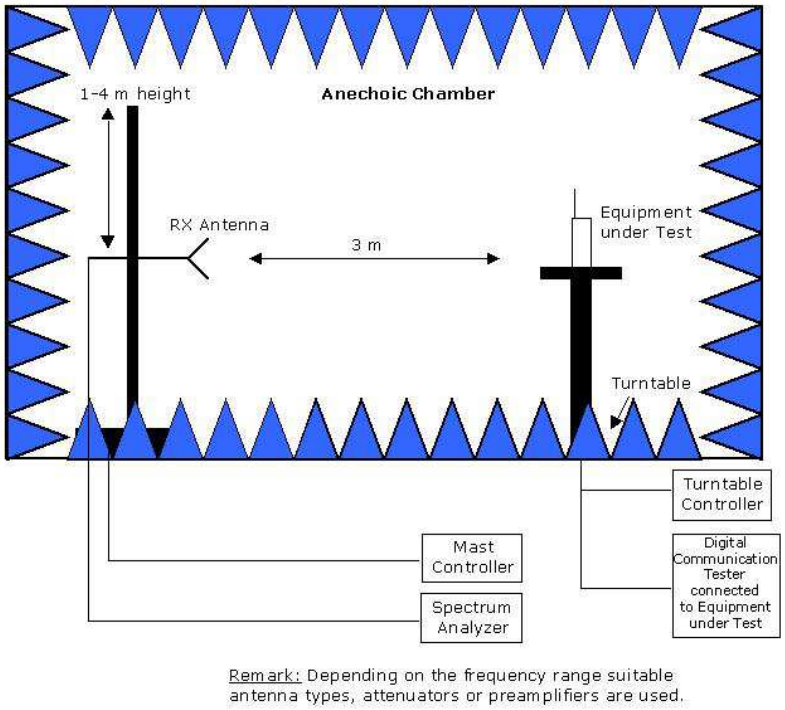
5 Photo Report

Please refer to external report.

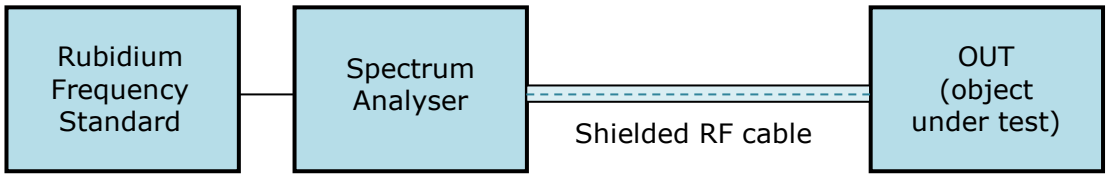
6 Measurement Uncertainty

Test Case	Parameter	Uncertainty
AC Power Line	Power	± 3.4 dB
Field Strength of spurious radiation	Power	± 5.5 dB
6 dB / 26 dB / 99% Bandwidth	Power Frequency	± 2.9 dB ± 11.2 kHz
Conducted Output Power	Power	± 2.2 dB
Band Edge Compliance	Power Frequency	± 2.2 dB ± 11.2 kHz
Frequency Stability	Frequency	± 25 Hz
Power Spectral Density	Power	± 2.2 dB

7 Setup Drawings



Drawing 1: Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting groundplane.



Drawing 2: Setup for conducted radio tests.