

FCC Measurement/Technical Report on

Wireless HD-Video-Transceiver

Q1025

FCC ID: 2ABQT-Q1025
IC: 23072-Q1025

Test Report Reference: MDE_TQSYS_2003_FCC_01_rev01

Test Laboratory:

7layers GmbH
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Germany



Deutsche
Akkreditierungsstelle
D-PL-12140-01-01
D-PL-12140-01-02
D-PL-12140-01-03

Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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1 APPLIED STANDARDS AND TEST SUMMARY

1.1 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 (10-1-19 Edition) and 15 (10-1-19 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 New Rules v02r01, 2017-12-14”.

ANSI C63.10-2013 is applied.

Some tests were performed according to older versions of the rules. However the tests inside of this document also comply with the current version.

1.2 FCC-IC CORRELATION TABLE

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

UNII equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC Mains	§ 15.207	RSS-Gen Issue 5: 8.8
Occupied bandwidth	§ 15.403 (i) (26 dB) / § 15.407 (e) (6 dB)	RSS-247 Issue 2: 6.2.1.1, 6.2.2.1, 6.2.3.1 (99%) RSS-247 Issue 2: 6.2.4.1 (6 dB)
Maximum conducted output power	§ 15.407 (a) (1),(2),(3),(4)	RSS-247 Issue 2: 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 2: 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 5: 6.13/8.9/8.10; RSS-247 Issue 2: 3.3/6.2 6.2.1.2, 6.2.2.2, 6.2.3.2, 6.2.4.2
Frequency stability	§ 15.407 (g)	RSS-Gen Issue 5: 6.11/8.11
Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS)	§ 15.407 (h)	RSS-247 Issue 2: 6.2.2.1, 6.2.3.1, 6.3
Antenna requirement	§ 15.203 / 15.204	RSS-Gen Issue 5: 8.3
Receiver spurious emissions	–	–

1.3 MEASUREMENT SUMMARY

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407

FCC §15.207

AC Conducted Emissions

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode	Setup	Date	FCC	IC
Operating mode worst case	S01_G05RX	2015-07-27	Passed	Passed

47 CFR CHAPTER I FCC PART 15 Subpart E §15.407

FCC §15.31, §15.403 (i)

26 dB Bandwidth

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Frequency, Subband				
Video 20 MHz, high, U-NII-1	S01_W03RX	2014-02-01	Performed	N/A
Video 20 MHz, high, U-NII-2A	S01_W03RX	2014-02-01	Performed	N/A
Video 20 MHz, high, U-NII-2C	S01_W03RX	2014-02-01	Performed	N/A
Video 20 MHz, high, U-NII-3	S01_W03RX	2014-01-21	Performed	N/A
Video 20 MHz, low, U-NII-1	S01_W03RX	2014-02-01	Performed	N/A
Video 20 MHz, low, U-NII-2A	S01_W03RX	2014-02-03	Performed	N/A
Video 20 MHz, low, U-NII-2C	S01_W03RX	2014-02-01	Performed	N/A
Video 20 MHz, low, U-NII-3	S01_W03RX	2014-02-01	Performed	N/A
Video 20 MHz, mid, U-NII-1	S01_W03RX	2014-02-01	Performed	N/A
Video 20 MHz, mid, U-NII-2A	S01_W03RX	2014-02-03	Performed	N/A
Video 20 MHz, mid, U-NII-2C	S01_W03RX	2014-02-03	Performed	N/A
Video 20 MHz, mid, U-NII-3	S01_W03RX	2014-02-01	Performed	N/A
Video 40 MHz, high, U-NII-1	S01_W03RX	2014-02-01	Performed	N/A
Video 40 MHz, high, U-NII-2A	S01_W03RX	2014-02-01	Performed	N/A
Video 40 MHz, high, U-NII-2A	S01_AA02RX	2021-03-17	Performed	N/A
Video 40 MHz, high, U-NII-2C	S01_W03RX	2014-02-01	Performed	N/A
Video 40 MHz, high, U-NII-3	S01_W03RX	2014-01-21	Performed	N/A
Video 40 MHz, low, U-NII-1	S01_W03RX	2014-02-01	Performed	N/A
Video 40 MHz, low, U-NII-2A	S01_W03RX	2014-02-03	Performed	N/A
Video 40 MHz, low, U-NII-2C	S01_W03RX	2014-02-01	Performed	N/A
Video 40 MHz, low, U-NII-3	S01_W03RX	2014-02-01	Performed	N/A
Video 40 MHz, mid, U-NII-2C	S01_W03RX	2014-02-03	Performed	N/A

47 CFR CHAPTER I FCC PART 15
Subpart E §15.407

FCC §15.31, §15.407 (e)

6 dB Bandwidth

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
Video 20 MHz, high, U-NII-3	S01_E04RX	2014-05-27	Passed	Passed
Video 20 MHz, low, U-NII-3	S01_E04RX	2014-05-27	Passed	Passed
Video 20 MHz, mid, U-NII-3	S01_E04RX	2014-05-27	Passed	Passed
Video 40 MHz, high, U-NII-3	S01_E04RX	2014-06-05	Passed	Passed
Video 40 MHz, low, U-NII-3	S01_E04RX	2014-06-05	Passed	Passed
Video 40 MHz, low, U-NII-3	S01_AA02RX	2021-03-17	Passed	Passed

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FCC §15.31, IC RSS 247 Ch. 6.2.x

99 % Bandwidth

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
Video 20 MHz, high, U-NII-1	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, high, U-NII-2A	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, high, U-NII-2C	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, high, U-NII-3	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, low, U-NII-1	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, low, U-NII-2A	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, low, U-NII-2C	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, low, U-NII-3	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, mid, U-NII-1	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, mid, U-NII-2A	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, mid, U-NII-2C	S01_AA01RX	2021-02-01	Performed	Performed
Video 20 MHz, mid, U-NII-3	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, high, U-NII-1	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, high, U-NII-2A	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, high, U-NII-2C	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, high, U-NII-3	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, low, U-NII-1	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, low, U-NII-2A	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, low, U-NII-2C	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, low, U-NII-3	S01_AA01RX	2021-02-01	Performed	Performed
Video 40 MHz, mid, U-NII-2C	S01_AA01RX	2021-02-01	Performed	Performed

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FCC §15.31, §15.407 (a)(1)

Maximum Conducted Output Power

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
Video 20 MHz, high, U-NII-1	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, high, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, high, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, high, U-NII-3	S01_W03RX	2014-01-21	Passed	Passed
Video 20 MHz, low, U-NII-1	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, low, U-NII-2A	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, low, U-NII-2C	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, low, U-NII-3	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, mid, U-NII-1	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, mid, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, mid, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, mid, U-NII-3	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-1	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-3	S01_W03RX	2014-01-21	Passed	Passed
Video 40 MHz, low, U-NII-1	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, low, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, low, U-NII-2A	S01_AA02RX	2021-03-17	Passed	Passed
Video 40 MHz, low, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, low, U-NII-3	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, mid, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed

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FCC §15.31, §15.407 (a) (1),(5)

Peak Power Spectral Density

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode Radio Technology, Operating Frequency, Subband	Setup	Date	FCC	IC
Video 20 MHz, high, U-NII-1	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, high, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, high, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, high, U-NII-3	S01_W03RX	2014-01-21	Passed	Passed
Video 20 MHz, low, U-NII-1	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, low, U-NII-2A	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, low, U-NII-2C	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, low, U-NII-3	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, mid, U-NII-1	S01_W03RX	2014-01-02	Passed	Passed
Video 20 MHz, mid, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 20 MHz, mid, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed

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FCC §15.31, §15.407 (a) (1),(5)

Peak Power Spectral Density

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Frequency, Subband				
Video 20 MHz, mid, U-NII-3	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-1	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-2A	S01_AA02RX	2021-03-17	Passed	Passed
Video 40 MHz, high, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, high, U-NII-3	S01_W03RX	2014-01-21	Passed	Passed
Video 40 MHz, low, U-NII-1	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, low, U-NII-2A	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, low, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, low, U-NII-3	S01_W03RX	2014-01-03	Passed	Passed
Video 40 MHz, mid, U-NII-2C	S01_W03RX	2014-01-03	Passed	Passed

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FCC §15.407 (b), (1),(2),(3),(4); FCC §15.205, §15.209, §15.407 (b) (5),(6)

Undesirable Emissions; General Field Strength Limits

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Frequency, Measurement range, Subband				
Video 20 MHz, high, 1GHz - 26GHz, U-NII-1	S01_A01RX	2012-10-30	Passed	Passed
Video 20 MHz, high, 1GHz - 26GHz, U-NII-2A	S01_W03RX	2014-03-14	Passed	Passed
Video 20 MHz, high, 1GHz - 26GHz, U-NII-2C	S01_W03RX	2012-10-30	Passed	Passed
Video 20 MHz, high, 1GHz - 26GHz, U-NII-3	S01_G05RX	2015-11-13	Passed	Passed
Video 20 MHz, high, 26GHz - 40GHz, U-NII-2A	S01_W03RX	2013-08-29	Passed	Passed
Video 20 MHz, high, 26GHz - 40GHz, U-NII-2C	S01_W03RX	2013-08-29	Passed	Passed
Video 20 MHz, high, 30MHz - 1GHz, U-NII-2A	S01_W03RX	2013-08-08	Passed	Passed
Video 20 MHz, high, 30MHz - 1GHz, U-NII-2C	S01_W03RX	2013-08-08	Passed	Passed
Video 20 MHz, high, 30MHz - 1GHz, U-NII-3	S01_G05RX	2015-07-27	Passed	Passed
Video 20 MHz, low, 1GHz - 26GHz, U-NII-1	S01_A01RX	2012-10-30	Passed	Passed
Video 20 MHz, low, 1GHz - 26GHz, U-NII-2A	S01_A01RX	2012-10-30	Passed	Passed
Video 20 MHz, low, 1GHz - 26GHz, U-NII-2C	S01_A01RX	2012-10-30	Passed	Passed
Video 20 MHz, low, 1GHz - 26GHz, U-NII-3	S01_G05RX	2015-11-13	Passed	Passed
Video 20 MHz, low, 26GHz - 40GHz, U-NII-1	S01_W03RX	2013-08-29	Passed	Passed
Video 20 MHz, low, 26GHz - 40GHz, U-NII-2A	S01_W03RX	2013-08-29	Passed	Passed
Video 20 MHz, low, 30MHz - 1GHz, U-NII-1	S01_W03RX	2013-08-07	Passed	Passed
Video 20 MHz, low, 30MHz - 1GHz, U-NII-2A	S01_W03RX	2013-08-07	Passed	Passed
Video 20 MHz, low, 30MHz - 1GHz, U-NII-2C	S01_W03RX	2013-08-08	Passed	Passed
Video 20 MHz, low, 30MHz - 1GHz, U-NII-3	S01_G05RX	2015-07-27	Passed	Passed
Video 20 MHz, low, 9kHz - 30MHz, U-NII-2A	S01_W03RX	2013-08-09	Passed	Passed
Video 20 MHz, mid, 1GHz - 26GHz, U-NII-1	S01_W03RX	2014-03-14	Passed	Passed
Video 20 MHz, mid, 1GHz - 26GHz, U-NII-2A	S01_W03RX	2014-03-14	Passed	Passed

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Subpart E §15.407**

**FCC §15.407 (b), (1),(2),(3),(4); FCC
§15.205, §15.209, §15.407 (b) (5),(6)**

Undesirable Emissions; General Field Strength Limits

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Frequency, Measurement range, Subband				
Video 20 MHz, mid, 1GHz - 26GHz, U-NII-2C	S01_G05RX	2014-03-14	Passed	Passed
Video 20 MHz, mid, 1GHz - 26GHz, U-NII-3	S01_G05RX	2015-11-13	Passed	Passed
Video 20 MHz, mid, 26GHz - 40GHz, U-NII-2C	S01_W03RX	2013-08-29	Passed	Passed
Video 20 MHz, mid, 30MHz - 1GHz, U-NII-2C	S01_G05RX	2013-08-08	Passed	Passed
Video 20 MHz, mid, 30MHz - 1GHz, U-NII-3	S01_G05RX	2015-07-27	Passed	Passed
Video 20 MHz, mid, 9kHz - 30MHz, U-NII-3	S01_W03RX	2013-08-09	Passed	Passed

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FCC §15.407 (b), (1),(2),(3),(4)

Band Edge

The measurement was performed according to ANSI C63.10

Final Result

OP-Mode	Setup	Date	FCC	IC
Radio Technology, Operating Frequency, Subband				
Video 20 MHz, high, U-NII-1	S01_AB01RX	2021-02-08	Passed	Passed
Video 20 MHz, high, U-NII-2A	S01_AB01RX	2021-02-17	Passed	Passed
Video 20 MHz, high, U-NII-2C	S01_AB01RX	2021-02-22	Passed	Passed
Video 20 MHz, high, U-NII-3	S01_AB01RX	2021-02-22	Passed	Passed
Video 20 MHz, low, U-NII-1	S01_AB01RX	2021-02-17	Passed	Passed
Video 20 MHz, low, U-NII-2C	S01_AB01RX	2021-02-17	Passed	Passed
Video 20 MHz, low, U-NII-3	S01_AB01RX	2021-02-22	Passed	Passed
Video 40 MHz, high, U-NII-1	S01_AB01RX	2021-02-22	Passed	Passed
Video 40 MHz, high, U-NII-2A	S01_AB01RX	2021-02-22	Passed	Passed
Video 40 MHz, high, U-NII-2C	S01_AB01RX	2021-02-22	Passed	Passed
Video 40 MHz, high, U-NII-3	S01_AB01RX	2021-02-22	Passed	Passed
Video 40 MHz, low, U-NII-1	S01_AB01RX	2021-02-22	Passed	Passed
Video 40 MHz, low, U-NII-2C	S01_AB01RX	2021-02-22	Passed	Passed
Video 40 MHz, low, U-NII-3	S01_AB01RX	2021-02-22	Passed	Passed

N/A: Not applicable

N/P: Not performed

2 REVISION HISTORY / SIGNATURES

Report version control			
Version	Release date	Change Description	Version validity
initial	2021-03-17	--	valid
rev01	2021-04-16	Added additional comment to test case undesirable emissions and this page.	valid

COMMENT: For results of the applicable DFS tests see report MDE_TQSYS_2001_FCC_01.
The applicant will limit the output power setting of the final product to maximum 11 dBm. The tests performed at higher power setting were not repeated, since in comparison they are worst case.



(responsible for accreditation scope)
Dipl.-Ing. Andreas Petz



(responsible for testing and report)
Dipl.-Ing. Daniel Gall



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3 ADMINISTRATIVE DATA

3.1 TESTING LABORATORY

Company Name: 7layers GmbH
Address: Borsigstr. 11
40880 Ratingen
Germany

The test facility is accredited by the following accreditation organisation:

Laboratory accreditation no: DAKKS D-PL-12140-01-01 | -02 | -03
FCC Designation Number: DE0015
FCC Test Firm Registration: 929146
ISED CAB Identifier: DE0007; ISED#: 3699A

Responsible for accreditation scope: Dipl.-Ing. Andreas Petz
Report Template Version: 2021-01-13

3.2 PROJECT DATA

Responsible for testing and report: Dipl.-Ing. Daniel Gall
Employees who performed the tests: documented internally at 7Layers
Date of Report: 2021-04-16
Testing Period: 2012-10-30 to 2021-03-17

3.3 APPLICANT DATA

Company Name: TQ-Systems Durach GmbH
Address: Johann-Georg-Halske-Strasse 1
87471 Durach
Germany

Contact Person: Mr. Bernd Wein

3.4 MANUFACTURER DATA

Company Name: please see Applicant Data

Address:

Contact Person:

4 TEST OBJECT DATA

4.1 GENERAL EUT DESCRIPTION

Kind of Device product description	Wireless HD-Video-Transceiver
Product name	Wireless HD-Video-Transceiver
Type	Q1025
Declared EUT data by the supplier	
Voltage Type	DC
Voltage Level	12 V at Auxiliary Baseboard, 5 V at EUT
Tested Modulation Type	OFDM, 16-QAM
General product description	The Transceiver is operating in the 5 GHz band using Orthogonal Frequency Division Multiplexing (OFDM).
Specific product description	The EUT is a module which enables video transmission in the 5 GHz bands as part of a video system. It is using bi-directional communication with a proprietary modulation scheme and supports 20 MHz and 40 MHz bandwidth channels. The transceiver is operating in the 5 GHz band in the ranges 5.15 – 5.25 GHz, 5.25 – 5.35 GHz, 5.470 – 5.725 GHz and 5.725 – 5.850 GHz. The EUT is part of a video transfer system which uses a “logical transmitter” and a “logical receiver”. Both devices are RF transceivers. The object of this test report is the “logical video receiver”, it was tested at 20 and 40 MHz nominal bandwidth. In receive direction for the video signal, 4 RX receive chains are operating in MIMO mode while the transmitter operates with 1 TX transmit chain in order to send control commands. For the tests a synthetic signal (OFDM) is provided as test mode, 1 transmit chain is always active.
Ports of the device	Enclosure Data / DC port (system connector to ANC1) 5 GHz Antennas (5x UFL connector) DC power (at ANC1)
Antennas	All antennas are integral antennas with a gain of 2 dBi.
Special software used for testing	A tool which is called “AppCom” is used to set the EUT into the desired test modes. From the software, PRBS script files provided by the applicant, are used to control directly the EUT via a RS-232 port. A software tool “Debug View” is used to check the correct execution of the commands (at the software layer).

4.2 EUT MAIN COMPONENTS

Sample Name	Sample Code	Description
EUT a01 RX	V5010a01	
Sample Parameter	Value	
Serial No.	Q1025-M-D2/ SRI/ CO222218	
HW Version	M-D2	
SW Version	1.1	
Comment		

Sample Name	Sample Code	Description
EUT aa01 RX	DE1059004aa01	Conducted Sample
Sample Parameter	Value	
Serial No.	SRI2034028677	
HW Version	270275.0200 - SRI Q1025-X100-LN REV.0200	
SW Version	4.2.28.141	
Comment		

Sample Name	Sample Code	Description
EUT aa02 RX	DE1059004aa02	Conducted Sample
Sample Parameter	Value	
Serial No.	SRI2034028677	
HW Version	270275.0200 - SRI Q1025-X100-LN REV.0200	
SW Version	4.3.28.141	
Comment		

Sample Name	Sample Code	Description
EUT ab01 RX	DE1059004ab01	Radiated Sample
Sample Parameter	Value	
Serial No.	SRI2034028669	
HW Version	270275.0200 - SRI Q1025-X100-LN REV.0200	
SW Version	4.2.28.141	
Comment		

Sample Name	Sample Code	Description
EUT e04 RX	V5010e04	
Sample Parameter	Value	
Serial No.	Q1025-M-5/ SRI132228 1769	
HW Version	M-6	
SW Version	1.1	
Comment		

Sample Name	Sample Code	Description
EUT g05 RX	V5010g05	
Sample Parameter	Value	
Serial No.	SRI1419217936	
HW Version	Q1025-X100-2	
SW Version	3.x.28.1	
Comment		

Sample Name	Sample Code	Description
EUT w03 RX	V5010w03	
Sample Parameter	Value	
Serial No.	Q1025-M-6/ SRI132228 1886	
HW Version	M-6	
SW Version	1.1	
Comment		

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

4.3 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.

Device	Details (Manufacturer, Type Model, OUT Code)	Description
-	-	-

4.4 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.

Device	Details (Manufacturer, Type Model, HW, SW, S/N)	Description
AUX_A_RX	TQ-Systems, RX BaseBoard SDI (Q1034-M-6), -, -, -	Baseboard
AUX_C_RX	TQ-Systems, RX BaseBoard SDI (Q1034-M-6) , -, -, SRI1322281809	Baseboard
AUX_D_RX	TQ-Systems, RX BaseBoard SDI (Q1034-M-6) , -, -, -	Baseboard
AUX_E_RX	TQ-Systems, RX_MOD_HDMI_V2 (Q1042-M-2), -, -, SRI1423229930	Baseboard
AUX_F_RX	AMIMON, Q1036-M-1, Rev 1.0, -, -, -	Controllerboard
AUX_G_RX	Fujitsu, HP-OL093E03P, -, -, F3- 080701850701	AC/DC Adapter
AUX_H_RX	FRIWO Gerätebau GmbH, FW8001M/12, -, -, -	AC/DC Adapter
AUX_I_RX	AMIMON, AMN043PCB, Rev 1.0, -, -, -	Debug Board
AUX_J_RX	TQ-Systems, Q1042-M-4, -, -, , SRI2034028818	Baseboard

Device	Details (Manufacturer, Type Model, HW, SW, S/N)	Description
AUX_K_RX	TQ-Systems, Q1042-M-4, -, - , SRI2039029458	Baseboard

4.5 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
S01_G05RX	EUT g05 RX, AUX_F_RX, AUX_G_RX, AUX_E_RX,	Standalone test setup
S01_AB01RX	EUT ab01 RX, AUX_H_RX, AUX_I_RX, AUX_J_RX	Standalone test setup
S01_E04RX	EUT e04 RX, AUX_F_RX, AUX_D_RX,	Standalone test setup
S01_AA01RX	EUT aa01 RX, AUX_H_RX, AUX_I_RX, AUX_K_RX	Standalone test setup
S01_AA02RX	EUT aa02 RX, AUX_H_RX, AUX_I_RX, AUX_K_RX	Standalone test setup
S01_W03RX	EUT w03 RX, AUX_C_RX, AUX_F_RX,	Standalone test setup
S01_A01RX	EUT a01 RX, AUX_A_RX, AUX_F_RX,	Standalone test setup

4.6 OPERATING MODES / TEST CHANNELS

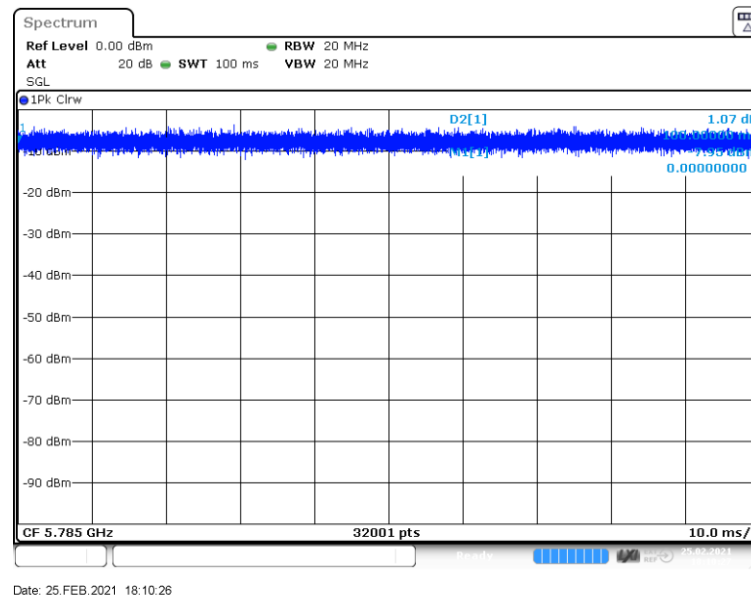
This chapter describes the operating modes of the EUTs used for testing.

U-NII-Subband 1 5150 - 5250 MHz			U-NII-Subband 2A 5250 - 5350 MHz			U-NII-Subband 2C 5470 - 5725 MHz			U-NII-Subband 3 5725 - 5850 MHz			Nom. BW
low	mid	high	low	mid	high	low	mid	high	low	mid	high	20 MHz
36	40/44*	48	52	56/60*	64	100	116	140	149	157	165	Ch.- No.
5180	5200/5220*	5240	5260	5280/5300*	5320	5500	5580	5700	5745	5785	5825	MHz

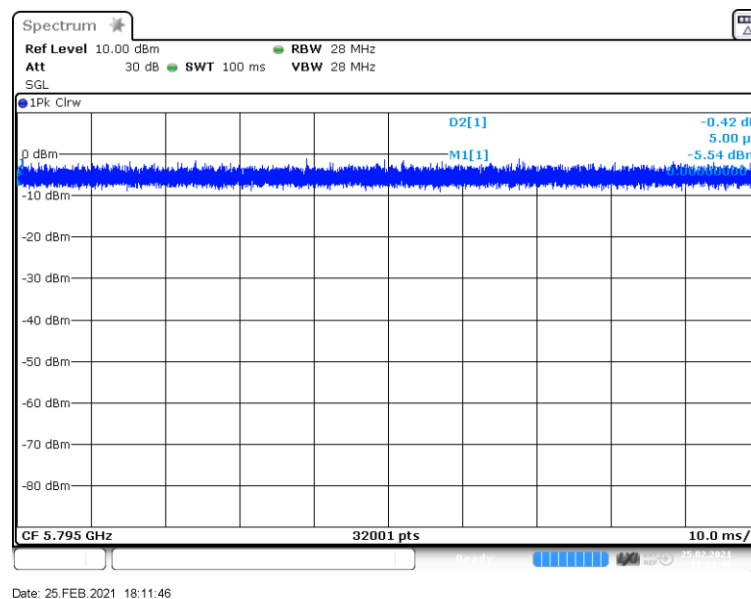
low	mid	high	low	mid	high	low	mid	high	low	mid	high	40 MHz
38	-	46	54	-	62	102	110	138	151	-	159	Ch.- No.
5190	-	5230	5270	-	5310	5510	5550	5690	5755	-	5795	MHz

*) Used channel for 99 % bandwidth: 5200 MHz + 5300 MHz. For all other test cases: 5220 MHz / 5280 MHz.

Duty Cycle Plots



20 MHz BW, 100 % DC



40 MHz BW, 100 % DC

4.7 PRODUCT LABELLING

4.7.1 FCC ID LABEL

Please refer to the documentation of the applicant.

4.7.2 LOCATION OF THE LABEL ON THE EUT

Please refer to the documentation of the applicant.

5 TEST RESULTS

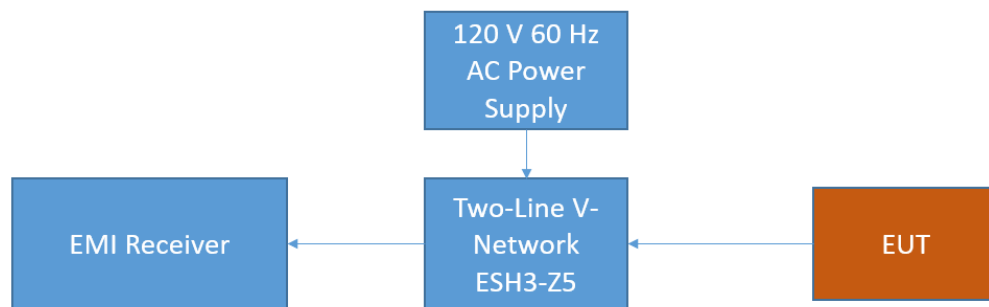
5.1 AC CONDUCTED EMISSIONS

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.1.1 TEST DESCRIPTION

The test set-up was made in accordance to the general provisions of ANSI C 63.10. The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.



FCC Conducted Emissions on AC

The measurement procedure consists of two steps. It is implemented into the EMI test software EMC-32 from R&S.

Step 1: Preliminary scan

Intention of this step is, to determine the conducted EMI-profile of the EUT.

EMI receiver settings:

- Detector: Peak – Maxhold & Average
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 2.5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement

Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.

EMI receiver settings:

- Detector: Quasi-Peak & (CISPR) Average

- IF Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:

- 1) Neutral lead - reference ground (PE grounded)
- 2) Phase lead - reference ground (PE grounded)
- 3) Neutral lead - reference ground (PE floating)
- 4) Phase lead - reference ground (PE floating)

The highest value is reported.

5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.207

Frequency (MHz)	QP Limits (dBµV)	AV Limits (dBµV)
0.15 – 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

5.1.3 TEST PROTOCOL

Temperature: 27 °C
Air Pressure: 996 hPa
Humidity: 41 %

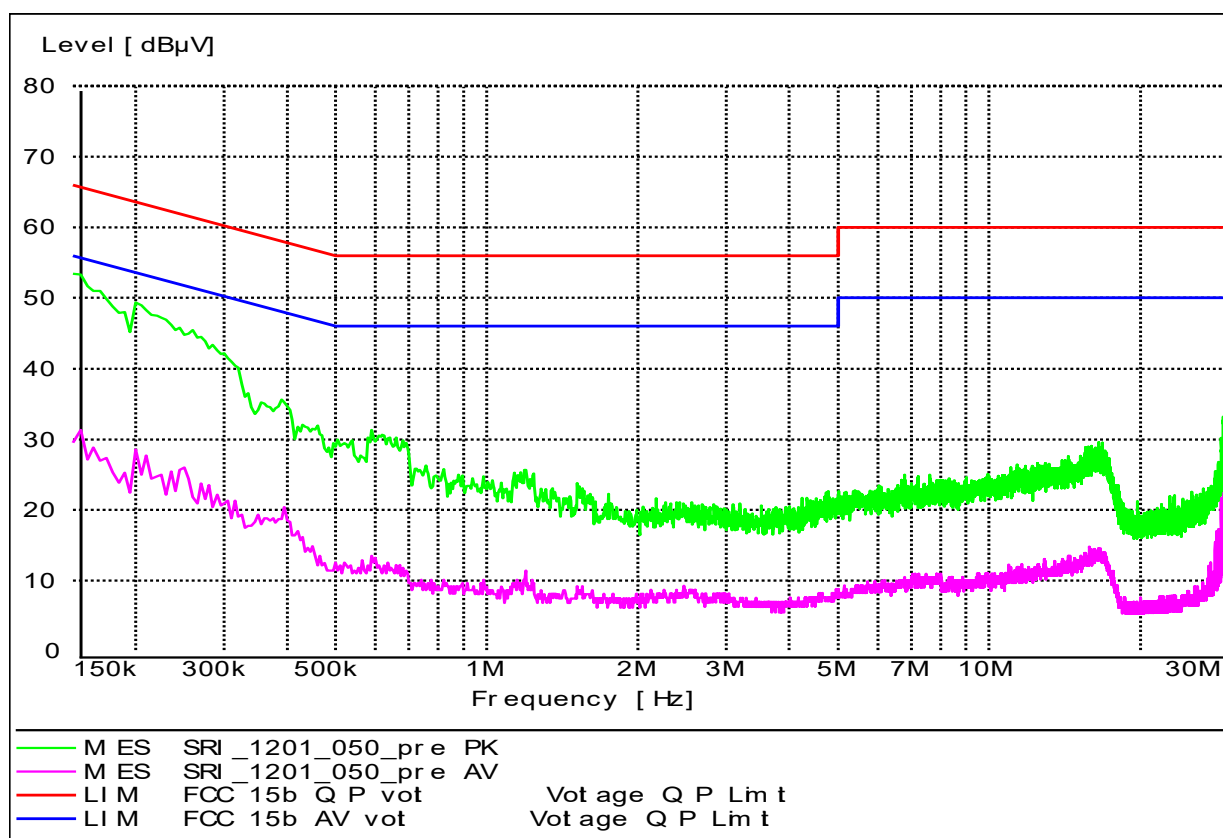
Power line	PE	Frequency [MHz]	Measured value QP [dBµV]	Measured value AV [dBµV]	Limit [dBµV]	Margin [dB]
-	-	-	-	-	-	>10

Remark: No final measurement was performed because no frequencies (peaks) were found within the offset for acceptance analysis during the preliminary scan.
Please see next sub-clause for the measurement plot. The chosen operating mode is selected as representative mode to generate "worst-case" conditions, i.e. high power consumption.
The EUT is operated at 12 V DC while supplied by AUX_G_RX which is connected to AC Mains at 120 V / 60 Hz.

5.1.4 MEASUREMENT PLOT

Operating mode = worst case
(S01_G05RX)

AC MAINS CONDUCTED



nominal output power set to: 11 dBm

5.1.5 TEST EQUIPMENT USED

- Conducted Emissions

5.2 26 DB BANDWIDTH

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.2.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the occupied bandwidth measurements.

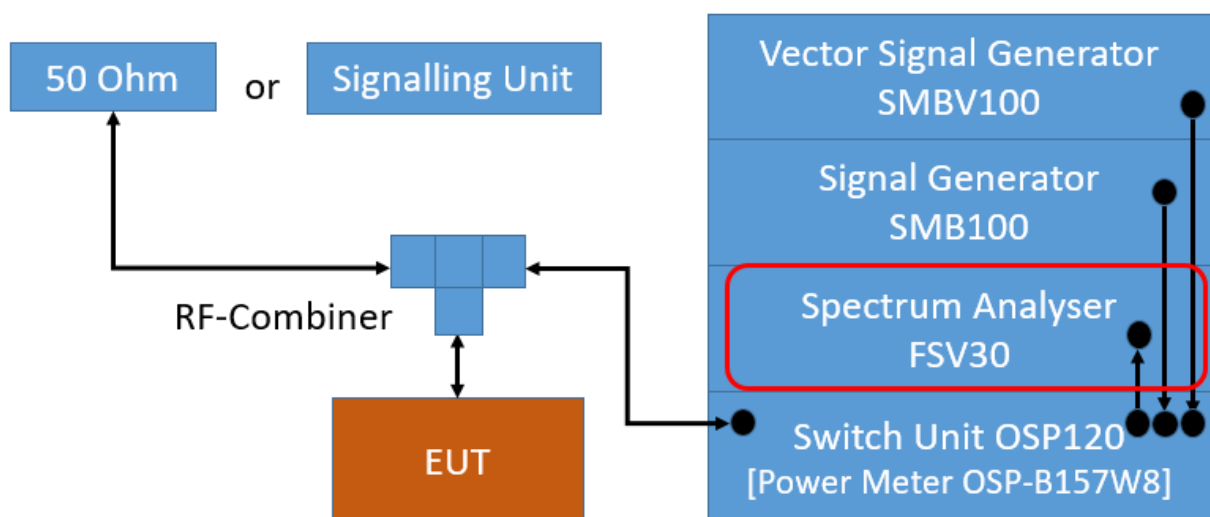
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

The results recorded were measured with the modulation which produce the worst-case (widest) emission bandwidth.

The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyzer settings:

- Resolution Bandwidth (RBW): initially approx. 1 % of nominal emission bandwidth
- Video Bandwidth (VBW): > RBW
- Span: 40 / 80 / 160 / 320 MHz (for 20 / 40 / 80 / 160 MHz nominal bandwidth)
- Trace: Maxhold
- Sweeps: Until the trace is stable
- Sweep time: Auto
- Detector: Peak



TS8997; Occupied Channel Bandwidth 6 dB / 26 dB / 99 %

Note: Deviant from the above picture, the EUT was directly connected to the spectrum analyser for the tests in this report.

5.2.2 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.

5.2.3 TEST PROTOCOL

Ambient temperature: 22–25 °C
Air Pressure: 997–1026 hPa
Humidity: 34–47 %

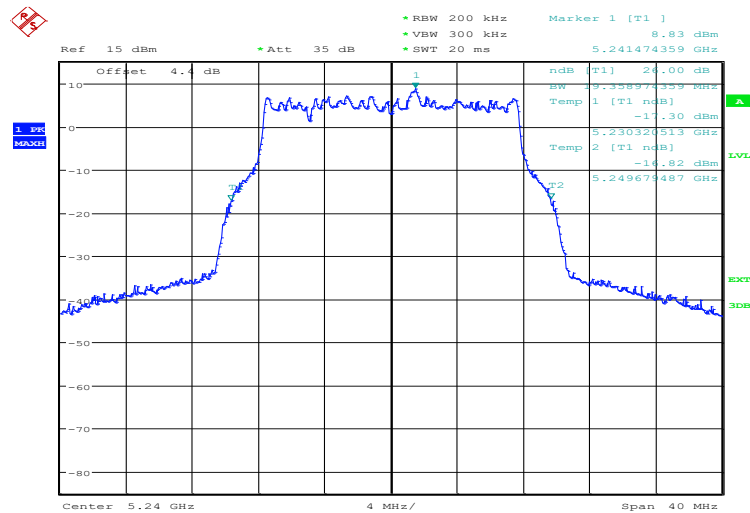
Radio Technology	Operating Frequency	Subband	26 dB Bandwidth [MHz]
WLAN n 20 MHz	low	U-NII-1	19.6
WLAN n 20 MHz	mid	U-NII-1	19.4
WLAN n 20 MHz	high	U-NII-1	19.4
WLAN n 20 MHz	low	U-NII-2A	19.4
WLAN n 20 MHz	mid	U-NII-2A	19.4
WLAN n 20 MHz	high	U-NII-2A	19.6
WLAN n 20 MHz	low	U-NII-2C	19.6
WLAN n 20 MHz	mid	U-NII-2C	19.5
WLAN n 20 MHz	high	U-NII-2C	19.6
WLAN n 20 MHz	low	U-NII-3	19.6
WLAN n 20 MHz	mid	U-NII-3	19.4
WLAN n 20 MHz	high	U-NII-3	19.6
WLAN n 40 MHz	low	U-NII-1	37.9
WLAN n 40 MHz	high	U-NII-1	38.1
WLAN n 40 MHz	low	U-NII-2A	38.2
WLAN n 40 MHz	high	U-NII-2A	37.8
WLAN n 40 MHz	high	U-NII-2A	38.2
WLAN n 40 MHz	low	U-NII-2C	38.1
WLAN n 40 MHz	mid	U-NII-2C	38.2
WLAN n 40 MHz	high	U-NII-2C	38.2
WLAN n 40 MHz	low	U-NII-3	38.3
WLAN n 40 MHz	high	U-NII-3	38.3

1) Spot check with current sample.

Remark: Nominal output power set to: 17 dBm
Please see next sub-clause for the measurement plot.

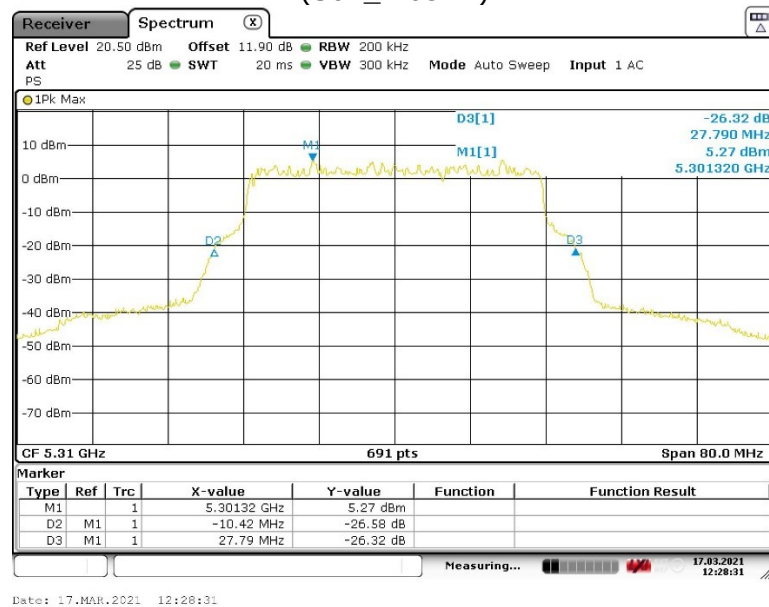
5.2.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-1 (S01_W03RX)



Date: 2.JAN.2014 10:21:57

Radio Technology = WLAN n 40 MHz, Operating Frequency = high, Subband = U-NII-2A (S01_W03RX)



Date: 17.MAR.2021 12:28:31

Spot check with current sample with the same settings as original measurement

5.2.5 TEST EQUIPMENT USED

- WLAN RF Test Solution
- R&S TS8997 (spot check measurement using ESR)

5.3 6 DB BANDWIDTH

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.3.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was setup in a shielded room to perform the occupied bandwidth measurements.

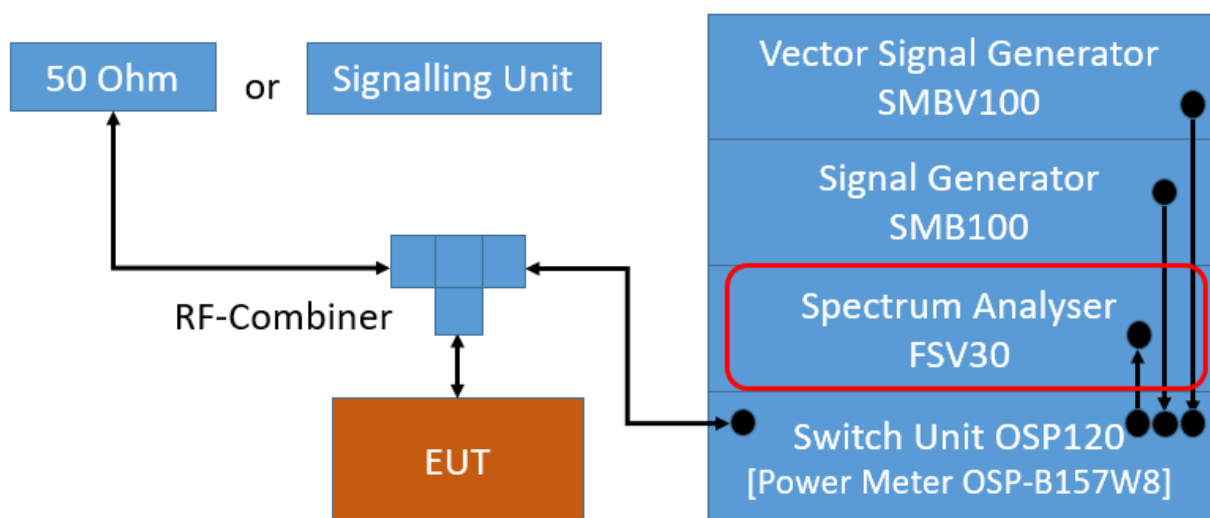
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

The results recorded were measured with the modulation which produce the worst-case (smallest) emission bandwidth.

The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyzer settings:

- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Span: 40 / 80 / 160 / 320 MHz (for 20 / 40 / 80 / 160 MHz nominal bandwidth))
- Trace: Maxhold
- Sweeps: Until the trace is stable
- Sweeptime: Auto
- Detector: Peak



TS8997; Occupied Channel Bandwidth 6 dB / 26 dB / 99 %

Note: Deviant from the above picture, the EUT was directly connected to the spectrum analyser for the tests in this report.

5.3.2 TEST REQUIREMENTS / LIMITS

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.

5.3.3 TEST PROTOCOL

Ambient temperature: 22–25 °C
 Air Pressure: 997–1026 hPa
 Humidity: 34–47 %

Radio Technology	Operating Frequency	6 dB Bandwidth [MHz]	Limit [MHz]	Margin [MHz]	
WLAN n 20 MHz	low	15.46	0.5	14.96	
WLAN n 20 MHz	mid	15.50	0.5	15.00	
WLAN n 20 MHz	high	15.50	0.5	15.00	
WLAN n 40 MHz	low	31.05	0.5	30.55	
WLAN n 40 MHz	low	31.05	0.5	31.1	1)
WLAN n 40 MHz	high	31.05	0.5	30.55	

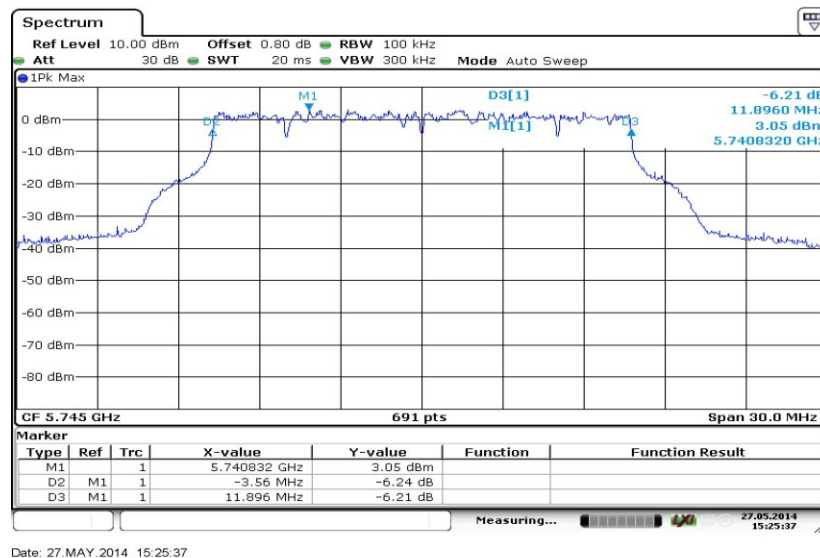
1) Spot check with current sample.

Remark: Nominal output power set to: 17 dBm.

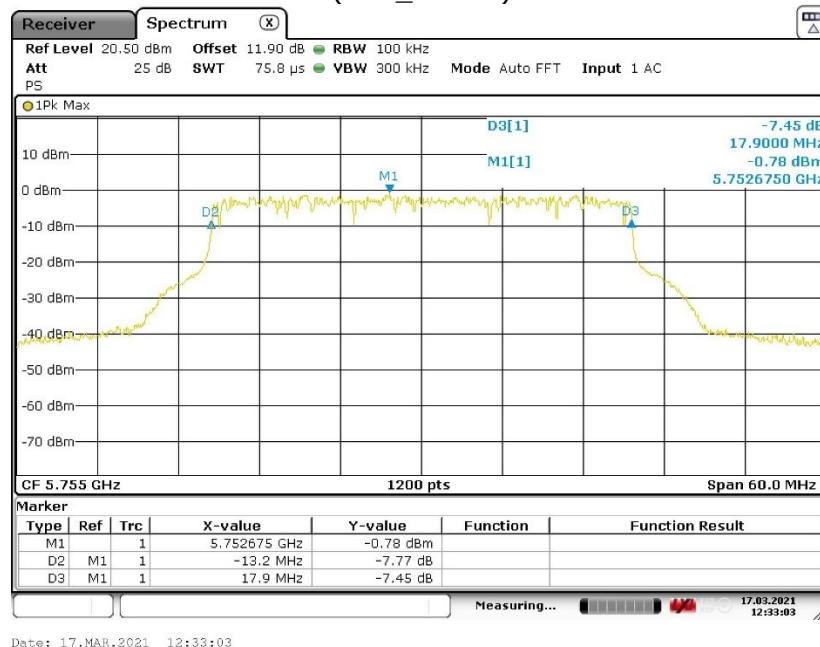
Please see next sub-clause for the measurement plot.

5.3.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_E04RX)



Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_E04RX)



Spot check with current sample with the same settings as original measurement

5.3.5 TEST EQUIPMENT USED

- WLAN RF Test Solution
- R&S TS8997 (spot check measurement using ESR)

5.4 99 % BANDWIDTH

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.4.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up to perform the occupied bandwidth measurements.

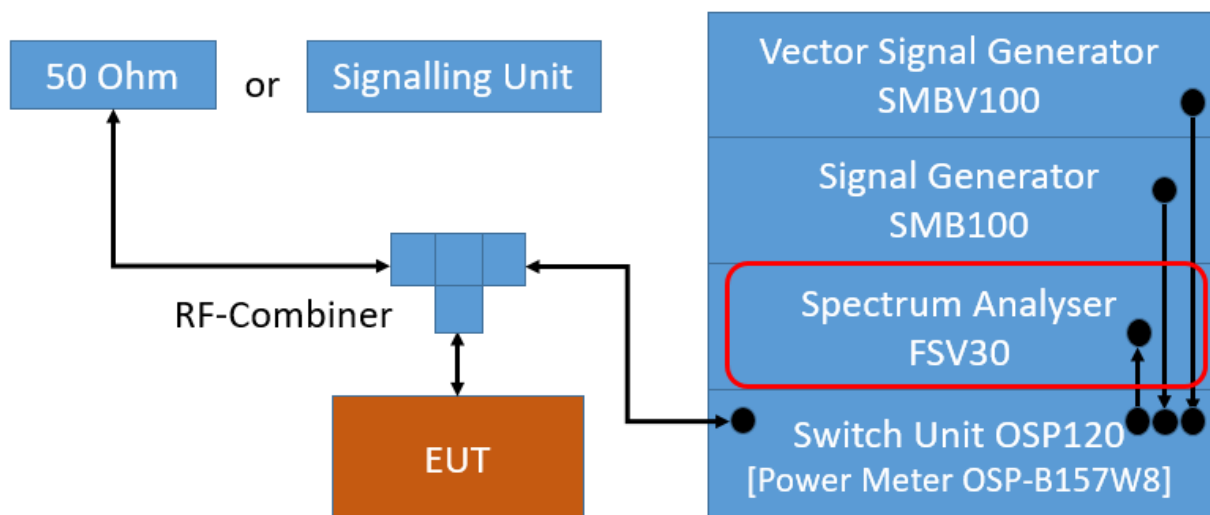
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

The results recorded were measured with the modulation which produce the worst-case (widest) emission bandwidth.

The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyzer settings:

- Resolution Bandwidth (RBW): approx. ≥ 1 % of the span, but not below
- Video Bandwidth (VBW): ≥ 3 times the RBW
- Span: 40 / 80 / 160 / 320 MHz (for 20 / 40 / 80 / 160 MHz nominal bandwidth)
- Trace: Maxhold
- Sweeps: Until the trace is stable
- Sweep time: Auto
- Detector: Peak



TS8997; Occupied Channel Bandwidth 6 dB / 26 dB / 99 %

5.4.2 TEST REQUIREMENTS / LIMITS

No applicable limit.

5.4.3 TEST PROTOCOL

Ambient temperature: 25 °C
Air Pressure: 997 hPa
Humidity: 32 %

Radio Technology	Operating Frequency	Subband	99% Bandwidth [MHz]
WLAN n 20 MHz	low	U-NII-1	15.6
WLAN n 20 MHz	mid	U-NII-1	15.5
WLAN n 20 MHz	high	U-NII-1	15.5
WLAN n 20 MHz	low	U-NII-2A	15.5
WLAN n 20 MHz	mid	U-NII-2A	15.6
WLAN n 20 MHz	high	U-NII-2A	15.5
WLAN n 20 MHz	low	U-NII-2C	15.5
WLAN n 20 MHz	mid	U-NII-2C	15.6
WLAN n 20 MHz	high	U-NII-2C	15.5
WLAN n 20 MHz	low	U-NII-3	15.5
WLAN n 20 MHz	mid	U-NII-3	15.5
WLAN n 20 MHz	high	U-NII-3	15.6
WLAN n 40 MHz	low	U-NII-1	31.3
WLAN n 40 MHz	high	U-NII-1	31.3
WLAN n 40 MHz	low	U-NII-2A	31.3
WLAN n 40 MHz	high	U-NII-2A	31.3
WLAN n 40 MHz	low	U-NII-2C	31.3
WLAN n 40 MHz	mid	U-NII-2C	31.3
WLAN n 40 MHz	high	U-NII-2C	31.3
WLAN n 40 MHz	low	U-NII-3	31.3
WLAN n 40 MHz	high	U-NII-3	31.0

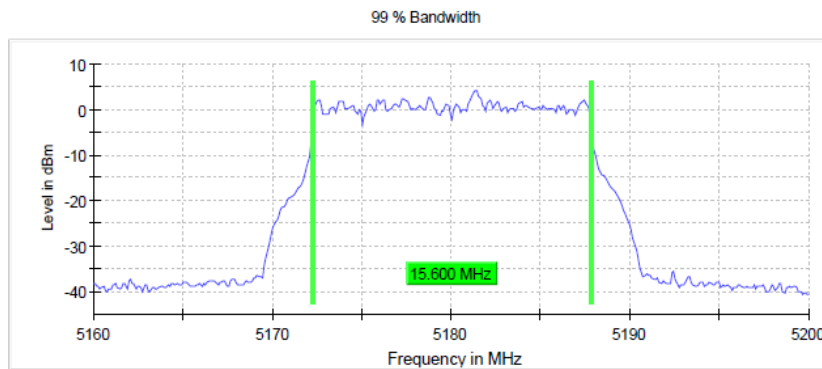
Remark: Nominal output power set to: 15 dBm.
Please see next sub-clause for the measurement plot.

5.4.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AA01RX)

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
5180.000000	15.600000	---	---	5172.250000	5187.850000	PASS

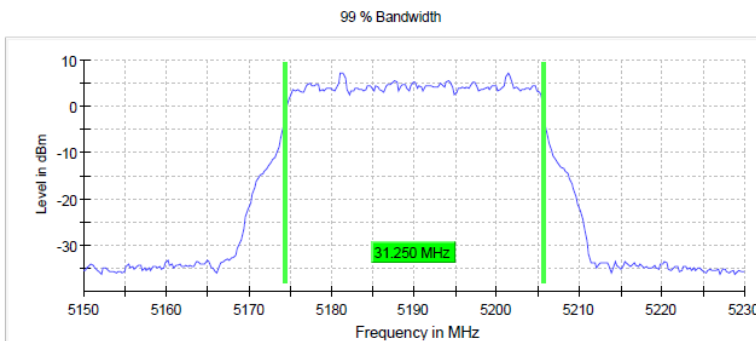


Setting	Instrument Value
Start Frequency	5.16000 GHz
Stop Frequency	5.20000 GHz
Span	40.000 MHz
RBW	200.000 kHz
VBW	1.000 MHz
SweepPoints	400
Sweptime	28.477 μ s
Reference Level	0.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	200
Filter	3 dB
Trace Mode	Max Hold
SweepType	FFT
Preamp	off
Stablemode	Trace
Stablevalue	0.30 dB
Run	22 / max. 150
Stable	5 / 5
Max Stable Difference	0.15 dB

Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AA01RX)

99 % Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Result
5190.000000	31.250000	---	---	5174.375000	5205.625000	PASS



Setting	Instrument Value
Start Frequency	5.15000 GHz
Stop Frequency	5.23000 GHz
Span	80.000 MHz
RBW	500.000 kHz
VBW	2.000 MHz
SweepPoints	320
Sweptime	18.906 μ s
Reference Level	0.000 dBm
Attenuation	20.000 dB
Detector	MaxPeak
SweepCount	200
Filter	3 dB
Trace Mode	Max Hold
SweepType	FFT
Preamp	off
Stablemode	Trace
Stablevalue	0.30 dB
Run	25 / max. 150
Stable	5 / 5
Max Stable Difference	0.00 dB

5.4.5 TEST EQUIPMENT USED

- R&S TS8997 (using FSV)

5.5 MAXIMUM CONDUCTED OUTPUT POWER

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.5.1 TEST DESCRIPTION

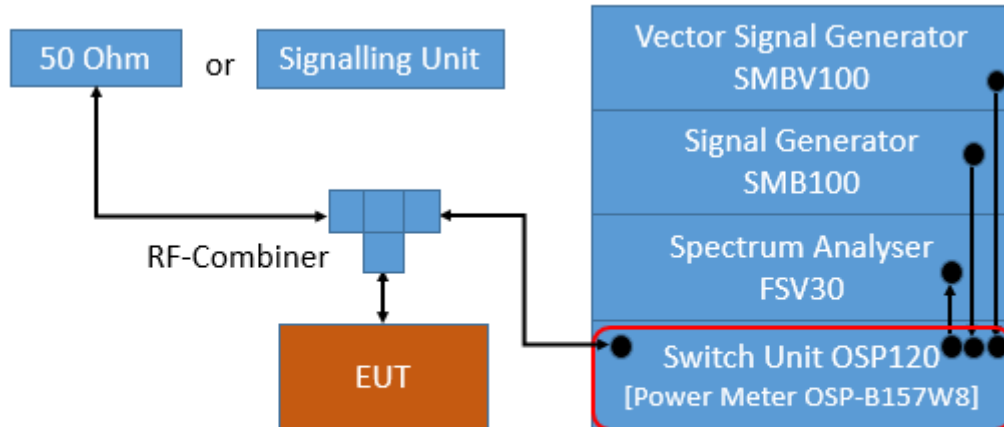
The Equipment Under Test (EUT) was set up to perform the output power measurements. The results recorded were measured with the modulation which produces the worst-case (highest) output power

The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

The OSP-B157W is a gated RF average power meter with a signal bandwidth > 300 MHz.

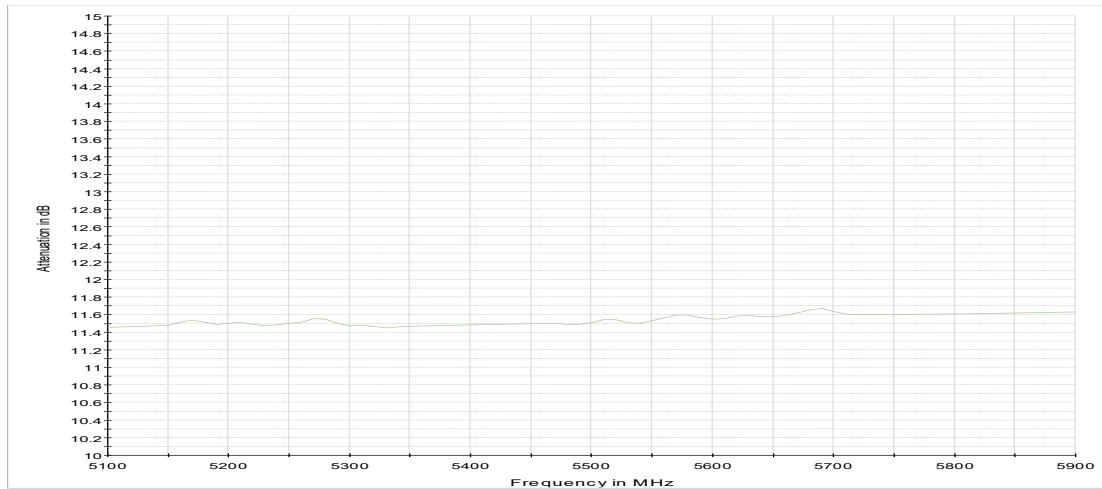
Note:

The measurement was performed according FCC Public Note "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E, 789033 D02", method **PM-G**.



TS8997; Maximum Conducted Output Power

Note: Deviant from the above picture, the EUT was directly connected to the spectrum analyser for the tests in this report. The channel power function was used to determine the output power. See example plots for the respective Analyser settings.



Attenuation of measurement path

5.5.2 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 $4 \text{ dBm} + 10 \log (26 \text{ dB bandwidth/MHz})$ 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 $11 \text{ dBm} + 10 \log (26 \text{ dB bandwidth/MHz})$ 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 $17 \text{ dBm} + 10 \log (26 \text{ dB bandwidth/MHz})$ 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-247, 6.2.1 (1), Band 5150-5250 MHz, indoor operation only:

Limit (e.i.r.p.): 200 mW (23 dBm) or $10 + 10 \log_{10} B$ [dBm], whichever power is less.

B is the 99% emission bandwidth in MHz.

RSS-247, 6.2.2 (1), Band 5250-5350 MHz:

Limits:

Maximum conducted Power: 250 mW (24 dBm) or $11 + 10 \log_{10} B$ [dBm], whichever power is less.

e.i.r.p.: 1.0 W (30 dBm) or $17 + 10 \log_{10} B$ [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-247, 6.2.3 (1), Bands 5470-5600 MHz and 5650-5725 MHz:

Limits:

Maximum conducted Power: 250 mW (24 dBm) or $11 + 10 \log_{10} B$ [dBm], whichever power is less.

e.i.r.p.: 1.0 W (30 dBm) or $17 + 10 \log_{10} B$ [dBm], whichever power is less.

RSS-247, 6.2.4 (1), Band 5725-5825 MHz:

Limits:

Maximum conducted Power: 1W (30 dBm) or $17 + 10 \log_{10} B$ [dBm], whichever power is less.

e.i.r.p.: 4.0 W (36 dBm) or $23 + 10 \log_{10} B$ [dBm], whichever power is less.

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

5.5.3 TEST PROTOCOL

Temperature: 20–25 °C
 Air Pressure: 994–1031 hPa
 Humidity: 35–48 %
 Video Transmission 20 MHz BW

U-NII-Subband	Ch. No.	Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	IC Cond. Limit [dBm]	Margin [dB]	IC EIRP Limit [dBm]	Margin [dB]	
1	36	5180	13.7	15.7	30.0	16.3	N/A		21.9	6.2	1)
	44	5220	14.0	16.0	30.0	16.0	N/A		21.9	5.9	1)
	48	5240	13.7	15.7	30.0	16.3	N/A		21.9	6.2	1)
2A	52	5260	13.9	15.9	23.9	10.0	22.9	9.0	28.9	13.0	1)
	56	5280	13.7	15.7	23.9	10.2	22.9	9.2	28.9	13.2	1)
	64	5320	14.0	16.0	23.9	9.9	22.9	8.9	28.9	12.9	1)
2C	100	5500	13.9	15.9	23.9	10.0	22.9	9.0	28.9	13.0	
	116	5580	13.6	15.6	23.9	10.3	22.9	9.3	28.9	13.3	
	140	5700	13.2	15.2	23.9	10.7	22.9	9.7	28.9	13.7	
3	149	5745	12.7	14.7	30.0	17.3	30.0	17.3	36.0	21.3	
	157	5785	12.7	14.7	30.0	17.3	30.0	17.3	36.0	21.3	
	165	5825	12.2	14.2	30.0	17.8	30.0	17.8	36.0	21.8	

Video Transmission 40 MHz BW

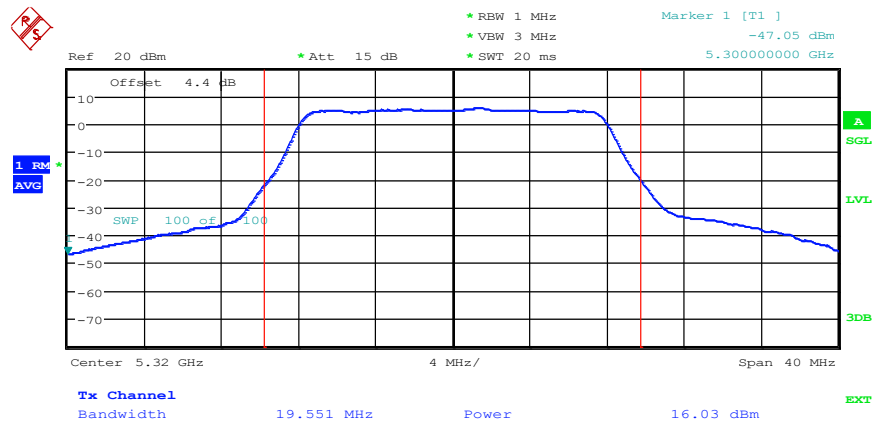
U-NII-Subband	Ch. No.	Freq. [MHz]	Cond. Power [dBm]	EIRP [dBm]	FCC Cond. Limit [dBm]	Margin [dB]	IC Cond. Limit [dBm]	Margin [dB]	IC EIRP Limit [dBm]	Margin [dB]	
1	38	5190	15.7	17.7	30.0	14.3	N/A		23.0	5.3	1)
	46	5230	15.5	17.5	30.0	14.5	N/A		23.0	5.5	1)
2A	54	5270	15.8	17.8	24.0	8.2	24.0	8.2	30.0	12.2	1)
	54	5270	15.9	17.9	24.0	8.1	24.0	8.1	30.0	12.1	1)2)
	62	5310	15.5	17.5	24.0	8.5	24.0	8.5	30.0	12.5	1)
2C	102	5510	15.7	17.7	24.0	8.3	24.0	8.3	30.0	12.3	
	110	5550	14.9	16.9	24.0	9.1	24.0	9.1	30.0	13.1	
	134	5670	14.8	16.8	24.0	9.2	24.0	9.2	30.0	13.2	
3	151	5755	14.3	16.3	30.0	15.7	30.0	15.7	36.0	19.7	
	159	5795	14.2	16.2	30.0	15.8	30.0	15.8	36.0	19.8	

- 1) No additional limit applies to the elevation.
- 2) Spot check with current sample on worst case power.

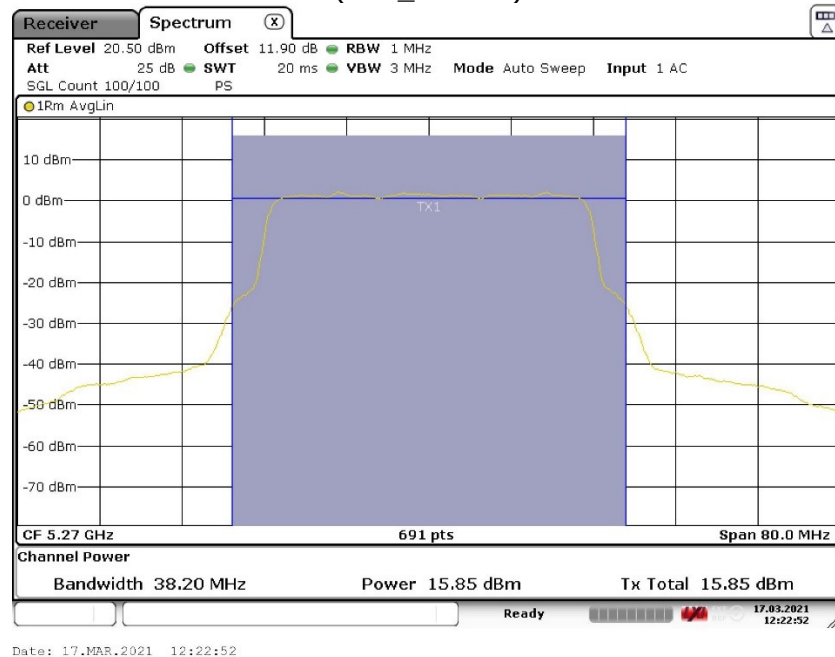
Remark: Nominal output power set to: 17 dBm.
 Please see next sub-clause for the measurement plot.

5.5.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-2A (S01_W03RX)



Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-2A (S01_W03RX)



Spot check with current sample on worst case power. Result without antenna gain

5.5.5 TEST EQUIPMENT USED

- WLAN RF Test Solution
- R&S TS8997 (using ESR)

5.6 PEAK POWER SPECTRAL DENSITY

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.6.1 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.

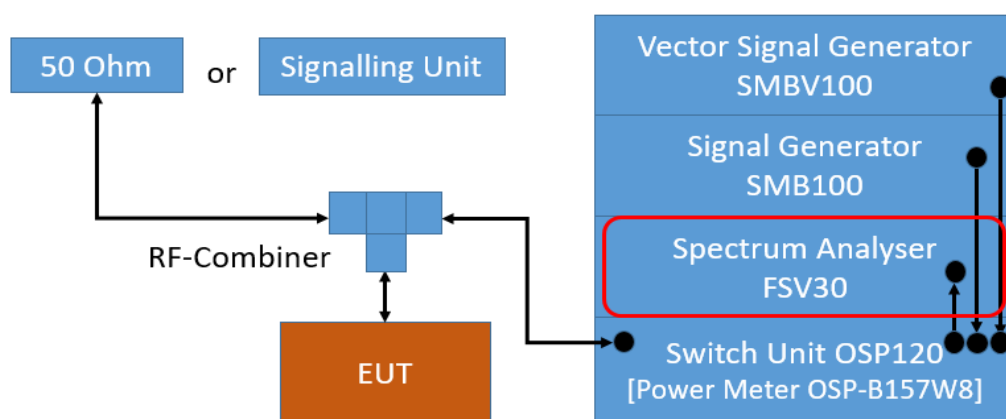
The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyzer settings:

- Resolution Bandwidth (RBW): 1 MHz (for subband 3: 500 kHz)
- Video Bandwidth (VBW): 3 MHz (for subband 3: 2 MHz)
- Trace: Average, RMS power averaging mode
- Sweeps: 100
- Sweep time: 5 ms
- Detector: RMS
- Trigger: gated mode

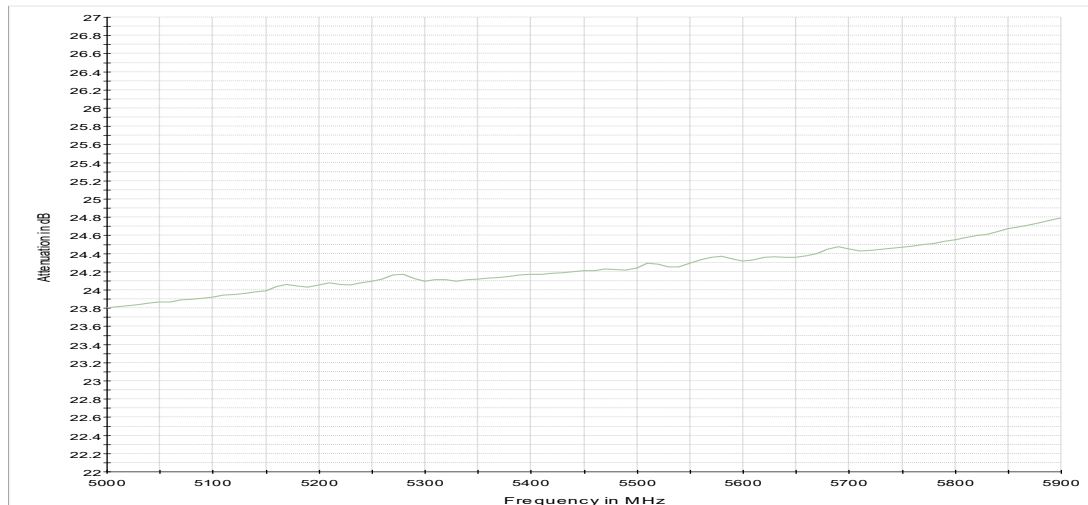
Note:

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 D02", method **SA-3**.



TS8997; Maximum Power Spectral Density

Note: For the measurements the EUT was directly connected to the spectrum analyser.



Attenuation of the measurement path

5.6.2 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-247, 6.2.1 (1), Band 5150-5250 MHz, indoor operation only:

Limit (e.i.r.p.): 10 dBm/MHz.

RSS-247, 6.2.2 (1), Band 5250-5350 MHz:

Limit: 11 dBm/MHz.

RSS-247, 6.2.3 (1), Bands 5470-5600 MHz and 5650-5725 MHz:

Limit: 11 dBm/MHz.

RSS-247, 6.2.4 (1), Band 5725-5850 MHz:

Limit: 30 dBm/500 kHz.

5.6.3 TEST PROTOCOL

Temperature: 20–25 °C
 Air Pressure: 994–1031 hPa
 Humidity: 35–48 %
 Video Transmission 20 MHz BW

U-NII-Subband	Ch. No.	Freq. [MHz]	MPSD [dBm/MHz]	FCC Limit [dBm/MHz]	Margin [dB]	IC Limit [dBm/MHz]	Margin [dB]	IC EIRP MPSD
1	36	5180	4.3	17.0	12.7	10.0	3.7	6.3
	44	5220	3.8	17.0	13.2	10.0	4.2	5.8
	48	5240	3.6	17.0	13.4	10.0	4.4	5.6
2A	52	5260	3.7	11.0	7.3	11.0	7.3	unit:
	56	5280	3.4	11.0	7.6	11.0	7.6	dBm/
	64	5320	4.8	11.0	6.2	11.0	6.2	MHz
2C	100	5500	4.1	11.0	6.9	11.0	6.9	
	116	5580	3.0	11.0	8.0	11.0	8.0	
	140	5700	2.9	11.0	8.1	11.0	8.1	
3	149	5745	2.4	30.0	27.6	30.0	27.6	
	157	5785	2.3	30.0	27.7	30.0	27.7	
	165	5825	1.9	30.0	28.1	30.0	28.1	

Video Transmission 40 MHz BW

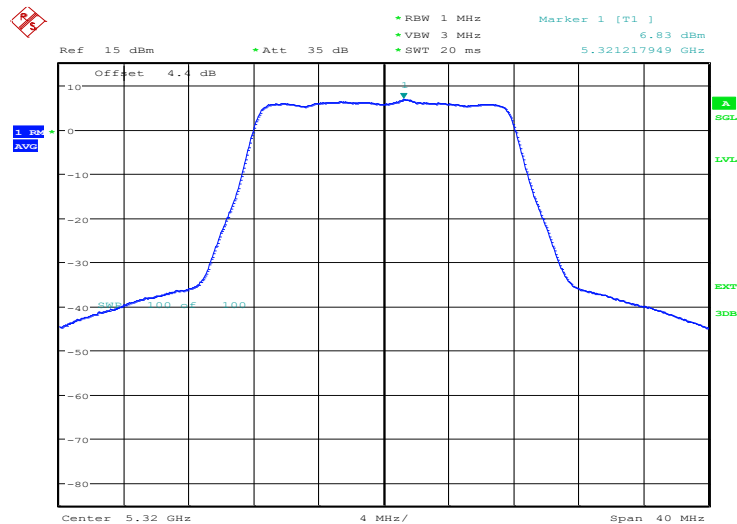
U-NII-Subband	Ch. No.	Freq. [MHz]	MPSD [dBm/MHz]	FCC Limit [dBm/MHz]	Margin [dB]	IC Limit [dBm/MHz]	Margin [dB]	IC EIRP MPSD
1	38	5190	2.5	17.0	14.5	10.0	5.5	4.5
	46	5230	2.3	17.0	14.7	10.0	5.7	4.3
2A	54	5270	2.6	11.0	8.4	11.0	8.4	unit:
	62	5310	2.7	11.0	8.3	11.0	8.3	dBm/
	62	5310	2.3	11.0	8.7	11.0	8.7	MHz
2C	102	5510	2.2	11.0	8.8	11.0	8.8	
	110	5550	1.5	11.0	9.5	11.0	9.5	
	134	5670	1.6	11.0	9.4	11.0	9.4	
3	151	5755	1.1	30.0	28.9	30.0	28.9	
	159	5795	0.7	30.0	29.3	30.0	29.3	

1) Spot check with current sample.

Remark: Nominal output power set to: 17 dBm.
 Please see next sub-clause for the measurement plot.

5.6.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-2A (S01_W03RX)



Date: 2.JAN.2014 13:52:03

Radio Technology = WLAN n 40 MHz, Operating Frequency = high, Subband = U-NII-2A (S01_W03RX)



5.6.5 TEST EQUIPMENT USED

- WLAN RF Test Solution

5.7 UNDESIRABLE EMISSIONS; GENERAL FIELD STRENGTH LIMITS

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.7.1 TEST DESCRIPTION

The test set-up was made in accordance to the general provisions of ANSI C63.10 in a typical installation configuration. The measurements were performed according the following sub-chapters of ANSI C63.10:

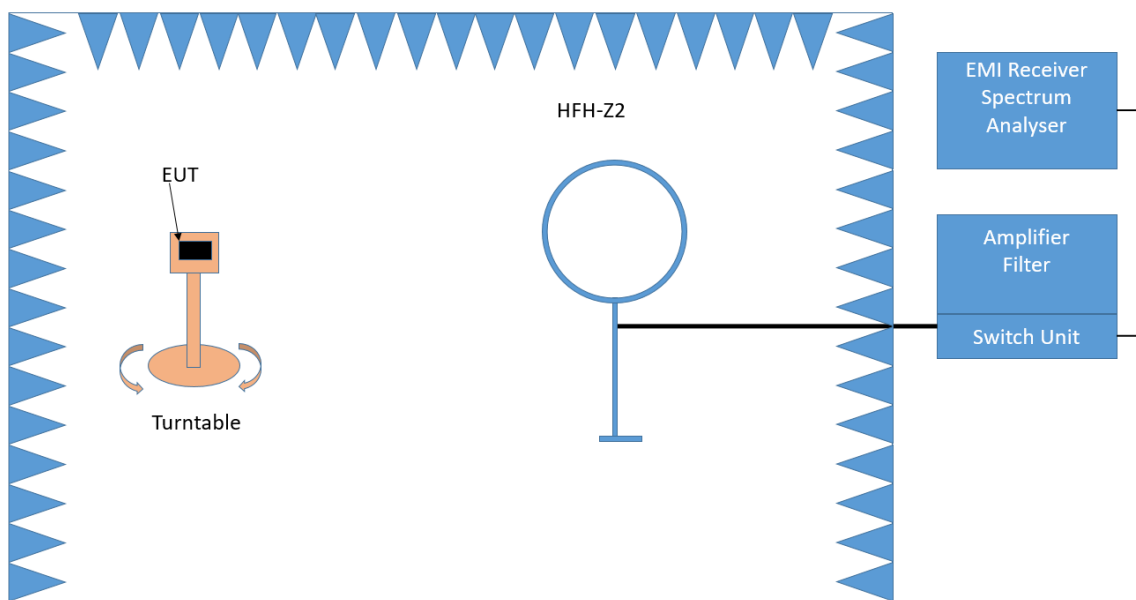
- < 30 MHz: Chapter 6.4
- 30 MHz – 1 GHz: Chapter 6.5
- > 1 GHz: Chapter 6.6 (procedure according 6.6.5 used)

The measurement procedure is implemented into the EMI test software EMC32 from R&S. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is also performed at 3 axes. A pre-check is performed while the EUT is powered.

Below 1 GHz:

The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.

1. Measurement up to 30 MHz



Test Setup; Spurious Emission Radiated (SAC), 9 kHz – 30 MHz

The Loop antenna HFH2-Z2 is used.

Step 1: pre measurement

- Anechoic chamber
- Antenna distance: 3 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 MHz and 0.15 - 30 MHz
- Frequency steps: 0.05 kHz and 2.25 kHz
- IF-Bandwidth: 0.2 kHz and 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)

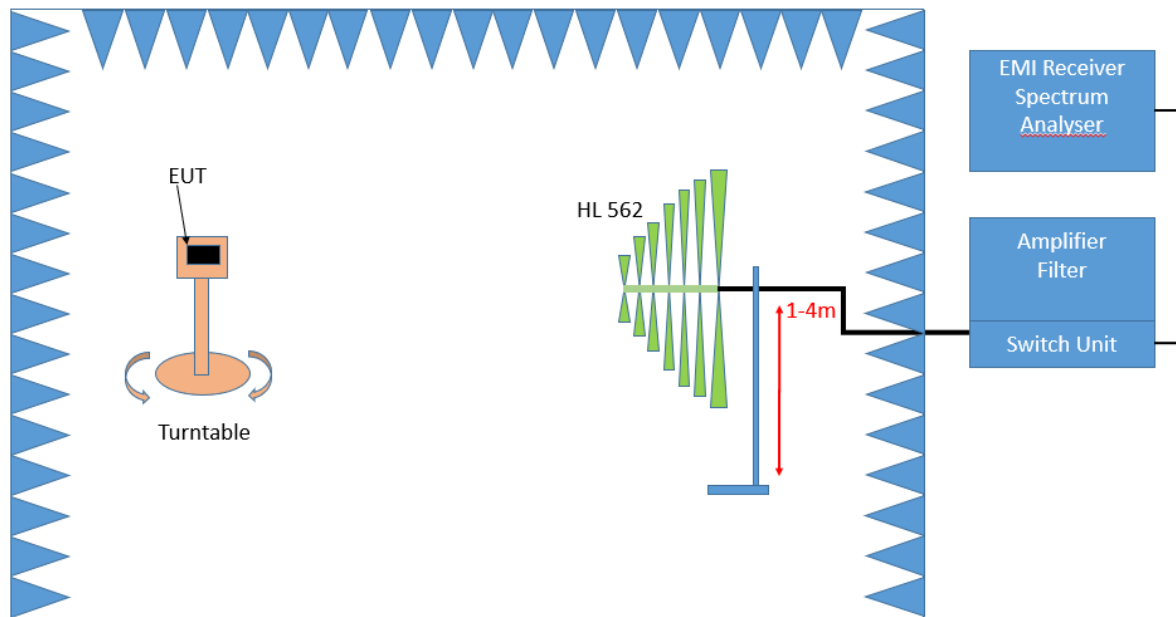
Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

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 site
- 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: 0.2 - 10 kHz
- Measuring time / Frequency step: 1 s

2. Measurement above 30 MHz and up to 1 GHz



Test Setup; Spurious Emission Radiated (SAC), 30 MHz- 1GHz

Step 1: Preliminary scan

This is a preliminary test to identify the highest amplitudes relative to the limit.

Settings for step 1:

- Antenna distance: 3 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 - 1000 MHz
- Frequency steps: 30 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range: -180° to 90°

- Turntable step size: 90°
- Height variation range: 1 – 4 m
- Height variation step size: 1.5 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: Adjustment 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 slowly vary by $\pm 45^\circ$ 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 will also slowly vary by ± 100 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: 360 °
- Height variation range: 1 – 4 m
- Antenna Polarisation: max. value determined in step 1

Step 3: Final measurement with QP detector

With the settings determined in step 2, the final measurement will be performed:

EMI receiver settings for step 3:

- Detector: Quasi-Peak (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

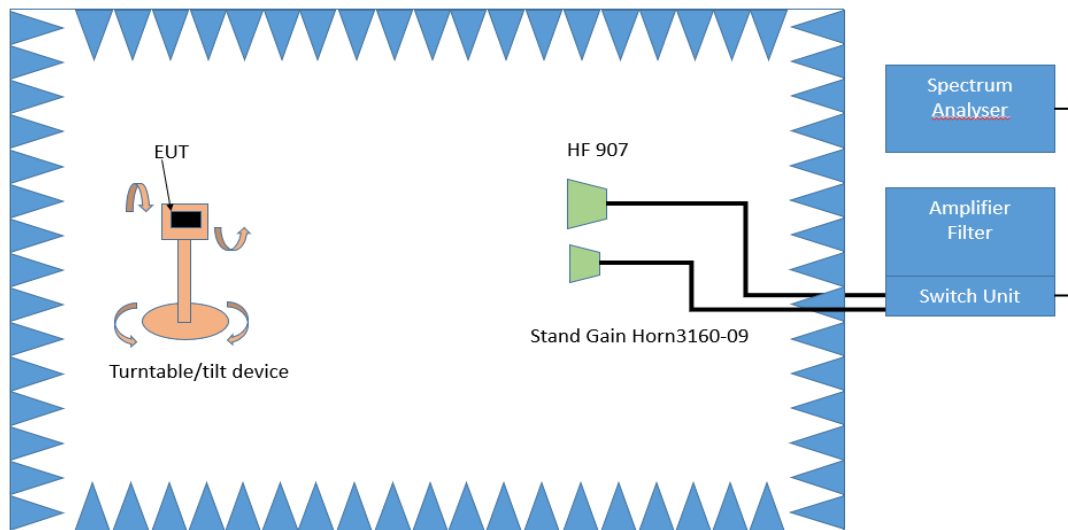
After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

Above 1 GHz:

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.

All steps were performed with one height (1.5 m) of the receiving antenna only.

3. Measurement 1 GHz up to 26.5 GHz



Test Setup; Spurious Emission Radiated (FAC), 1 GHz-26.5 GHz

Note: For measurements before 2020 antenna HF 906 was used instead of HF 907.

Step 1:

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.

All steps were performed with one height (1.5 m) of the receiving antenna only.

The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 90 °.

The turn table step size (azimuth angle) for the preliminary measurement is 45 °.

Step 2:

Due to the fact, that in this frequency range the test is performed in a fully anechoic room, the height scan of the receiving antenna in step 2 is omitted. Instead of this, a maximum search with a step size $\pm 45^\circ$ for the elevation axis is performed.

The turn table azimuth will slowly vary by $\pm 22.5^\circ$.

The elevation angle will slowly vary by $\pm 45^\circ$

EMI receiver settings (for all steps):

- Detector: Peak, Average
- IF Bandwidth = 1 MHz

Step 3:

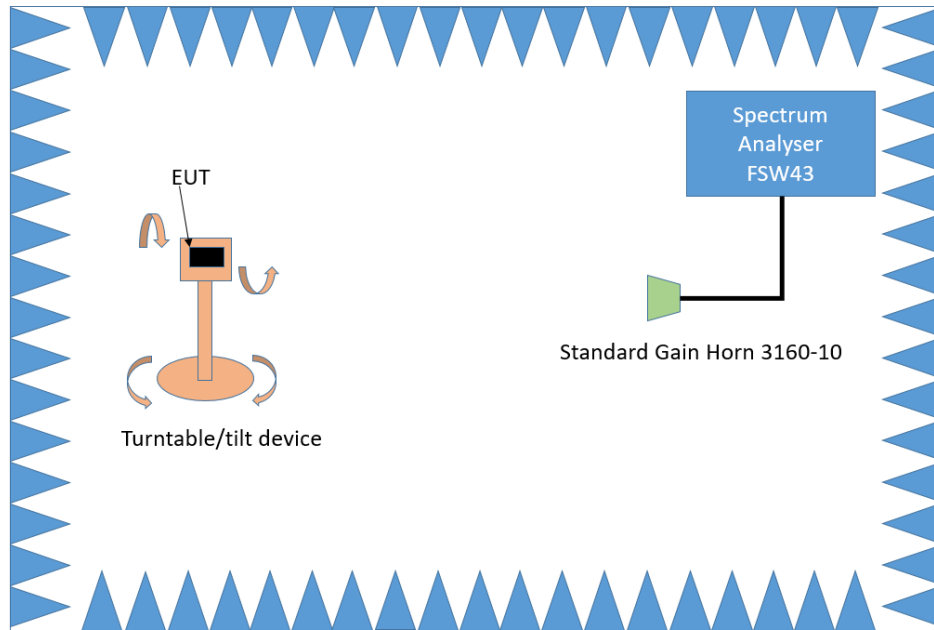
Spectrum analyser settings for step 3:

- Detector: Peak / Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

4. Measurement above 26.5 GHz up to 40 GHz

The following modifications, compared to the frequency range 1 GHz – 26.5 GHz, apply to the measurement procedure for the frequency range above 26.5 GHz:

- Measurement distance: 1m



Test Setup; Spurious Emission Radiated (FAC), 26.5 – 40 GHz

5.7.2 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 at 75 MHz or more above or below the band edge
 increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge
 increasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edge
 increasing linearly to 27 dBm/MHz at the band edge.

B) IC

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

RSS-247, 6.2.1.2, Emissions outside the band 5150-5250 MHz, indoor operation only:
Limit: -27 dBm/MHz EIRP outside of the band 5150-5250 MHz.

RSS-247, 6.2.2.2, Emissions outside the band 5250-5350 MHz:
Limit: -27 dBm/MHz EIRP outside of the band 5250-5350 MHz.

RSS-247, 6.2.3.2, Emissions outside the bands 5470-5600 MHz and 5650-5725 MHz:
Limit: -27 dBm/MHz EIRP outside of the band 5470-5725 MHz.
However, devices with bandwidth overlapping the band edge of 5725 MHz can meet the emission limit of -27 dBm/MHz e.i.r.p. at 5850 MHz instead of 5725 MHz.
Note: No operation is permitted for the frequency range 5600-5650 MHz.

RSS-247, 6.2.4.2, Emissions outside the band 5725-5850 MHz:

- 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
- 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
- 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and
- 27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

C) FCC & IC

FCC Part 15 Subpart E, §15.405
The provisions of §§ 15.203 and 15.205 are included.

§15.407 (b)(6)
Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.

§15.407 (b)(7)
The provisions of §15.205 apply to intentional radiators operating under this section

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

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
0.009 – 0.49	2400/F(kHz)@300m	3	(48.5 – 13.8)@300m
0.49 – 1.705	24000/F(kHz)@30m	3	(33.8 – 23.0)@30m
1.705 – 30	30@30m	3	29.5@30m

The measured values are corrected with an inverse linear distance extrapolation factor (40 dB/decade) according FCC 15.31 (2).

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 – 26000	500@3m	3	54.0@3m
26000 – 40000	500@3m	1	54.0@3m

The measured values above 26 GHz are corrected with an inverse linear distance extrapolation factor (20 dB/decade).

§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 (dB μ V/m) = 20 log (Limit (μ V/m)/1 μ V/m)
- Limit (dB μ V/m) = EIRP [dBm] - 20 log (d [m]) + 104.8

Limit types (in result tables on next page):

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-UE – Band Edge Limit basing on "Undesirable Emission Limit"

*) Below 1 GHz the limits of §15.209 are applied for all frequencies.

5.7.3 TEST PROTOCOL

Ambient temperature: 21–28 °C
 Air Pressure: 994–1038 hPa
 Humidity: 32–49 %
 Video Transmission 20 MHz BW
 Applied duty cycle correction (AV): 0 dB

Ch. No.	Ch. Center Freq. [MHz]	Spurious Freq. [MHz]	Spurious Level [dBμV/m]	Detector	RBW [kHz]	Limit [dBμV/m]	Margin [dB]	Limit Type
36	5180	46.0	28.7	QP	120	40.0	11.3	RB
36	5180	113.0	36.9	QP	100	43.5	6.6	RB
36	5180	240.0	36.1	QP	100	46.0	9.9	RB
36	5180	360.0	33.6	QP	100	46.0	12.4	RB
36	5180	400.0	44.9	QP	100	46.0	1.1	RB
36	5180	431.9	42.9	QP	100	46.0	3.1	RB
36	5180	575.9	29.1	QP	100	46.0	16.9	RB
36	5180	719.9	26.2	QP	100	46.0	19.8	RB
36	5180	863.8	36.6	QP	100	46.0	9.4	RB
36	5180	21000.0	55.0	PEAK	1000	74.0	19.0	RB
36	5180	21000.0	51.2	AV	1000	54.0	2.8	RB
52	5260	46.8	29.5	QP	100	40.0	10.5	RB
52	5260	148.3	30.1	QP	100	43.5	13.4	RB
52	5260	160.0	35.9	QP	100	43.5	7.6	RB
52	5260	240.0	39.2	QP	100	46.0	6.8	RB
52	5260	300.0	33.9	QP	100	46.0	12.1	RB
52	5260	360.0	38.0	QP	100	46.0	8.0	RB
52	5260	400.0	41.0	QP	100	46.0	5.0	RB
52	5260	21040.5	57.4	PEAK	1000	74.0	16.6	RB
52	5260	21040.5	53.9	AV	1000	54.0	0.1	RB
64	5320	46.9	29.9	QP	100	40.0	10.1	RB
64	5320	128.6	29.7	QP	100	43.5	13.8	RB
64	5320	148.4	33.8	QP	100	43.5	9.7	RB
64	5320	160.0	35.4	QP	100	43.5	8.1	RB
64	5320	240.0	38.8	QP	100	46.0	7.2	RB
64	5320	300.0	36.2	QP	100	46.0	9.8	RB
64	5320	360.0	39.8	QP	100	46.0	6.2	RB
64	5320	400.0	40.4	QP	100	46.0	5.6	RB
64	5320	21280.5	57.7	PEAK	1000	74.0	16.3	RB
64	5320	21280.5	52.9	AV	1000	54.0	1.1	RB
100	5500	45.9	30.1	QP	100	40.0	9.9	RB
100	5500	80.0	25.8	QP	100	40.0	14.2	RB
100	5500	147.5	32.1	QP	100	43.5	11.4	RB
100	5500	160.0	35.1	QP	100	43.5	8.4	RB
100	5500	240.0	38.0	QP	100	46.0	8.0	RB
100	5500	280.0	28.2	QP	100	46.0	17.8	RB
100	5500	360.0	34.0	QP	100	46.0	12.0	RB
100	5500	400.0	38.9	QP	100	46.0	7.1	RB
100	5500	800.0	31.1	QP	100	46.0	14.9	RB
100	5500	22001.0	57.9	PEAK	1000	68.2	10.3	UE
116	5580	31.6	31.7	PEAK	100	40.0	8.3	RB
116	5580	160.0	33.4	PEAK	100	43.5	10.1	RB
116	5580	320.0	35.5	PEAK	100	46.0	10.5	RB
116	5580	22320.5	57.7	PEAK	1000	74.0	16.3	RB
116	5580	22320.5	53.0	AV	1000	54.0	1.0	RB
140	5700	131.6	33.6	QP	100	43.5	9.9	RB
140	5700	160.0	36.1	QP	100	43.5	7.4	RB
140	5700	240.0	38.2	QP	100	46.0	7.8	RB
140	5700	280.0	32.0	QP	100	46.0	14.0	RB
140	5700	400.0	39.8	QP	100	46.0	6.2	RB
140	5700	22801.0	55.7	PEAK	1000	74.0	18.3	RB
140	5700	22801.0	48.4	AV	1000	54.0	5.6	RB
149	5745	31.7	28.3	QP	100	40.0	11.7	RB
149	5745	55.0	24.0	QP	100	40.0	16.0	RB

149	5745	116.7	27.8	QP	100	43.5	15.7	RB
149	5745	160.0	28.5	QP	100	43.5	15.0	RB
149	5745	17432.0	61.5	PEAK	1000	68.2	6.7	UE
157	5785	31.2	30.1	QP	100	40.0	9.9	RB
157	5785	53.3	25.2	QP	100	40.0	14.8	RB
157	5785	123.4	29.9	QP	100	43.5	13.6	RB
157	5785	160.0	28.1	QP	100	43.5	15.4	RB
157	5785	22000.5	59.3	PEAK	1000	68.2	8.9	UE
165	5825	31.7	29.8	QP	100	40.0	10.2	RB
165	5825	55.4	25.8	QP	100	40.0	14.2	RB
165	5825	125.7	28.3	QP	100	43.5	15.2	RB
165	5825	160.0	28.6	QP	100	43.5	14.9	RB
165	5825	17108.8	62.5	PEAK	1000	68.2	5.7	UE

Remark: Setup S01_A01RX, nominal output power set to: 15 dBm.

Setup S01_W03RX, nominal output power set to: 14 dBm.

Setup S01_G05RX, nominal output power set to: 11 dBm

No (further) spurious emissions in the range 20 dB below the limit found.

Spurious emissions in the range 20 dB below the limit need not to be reported.

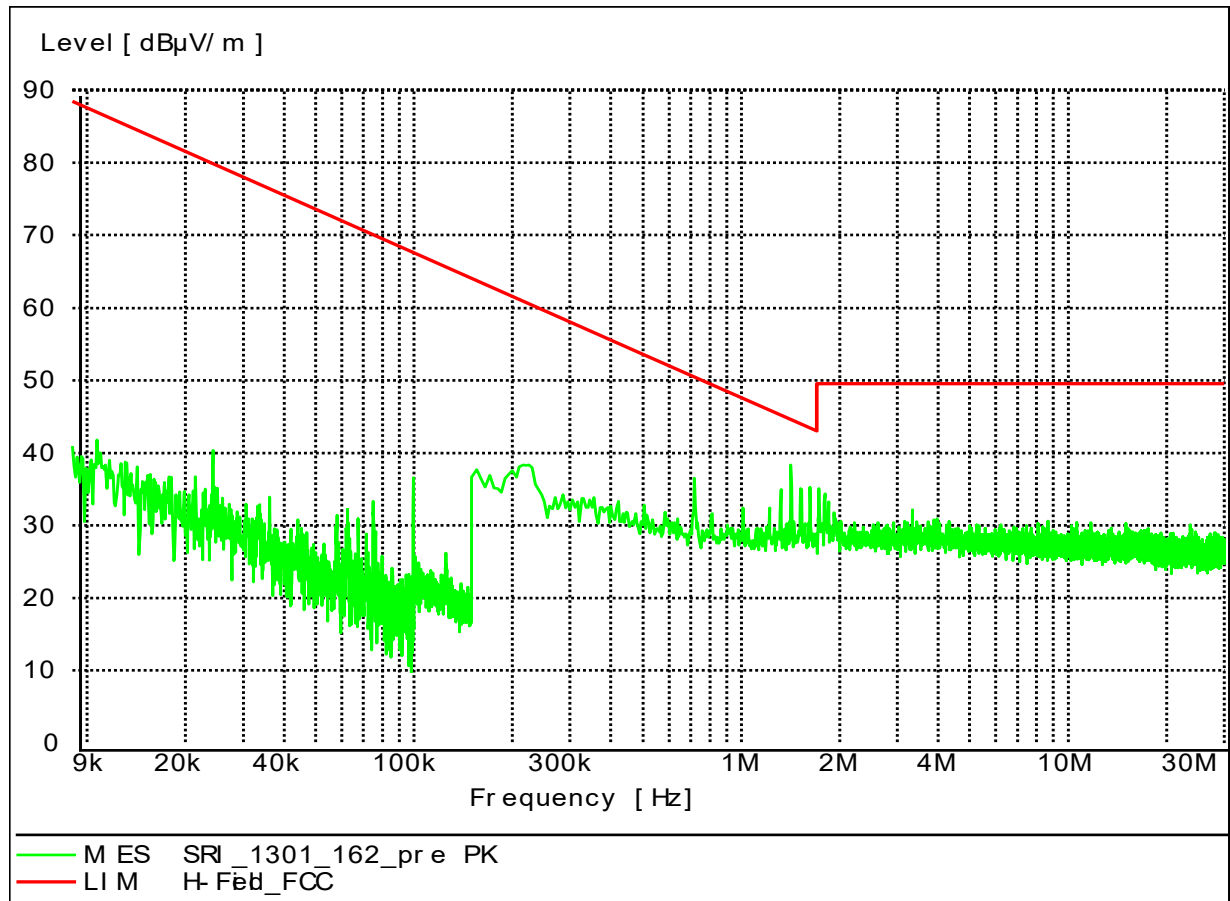
The measurement was performed from 9 kHz to 30 MHz for Setup S01_W03RX on CH52 and 157, from 30 MHz to 1 GHz for Setup S01_W03RX on CH36, 52, 64, 100 and 140, for Setup S01_G05RX on CH116, 149, 157 and 165, from 26 to 40 GHz for Setup S01_W03RX on CH36, 52, 64, 116, and 140 only because at pre-measurements no significant spurious emissions have been found.

Please see next sub-clause for the measurement plot.

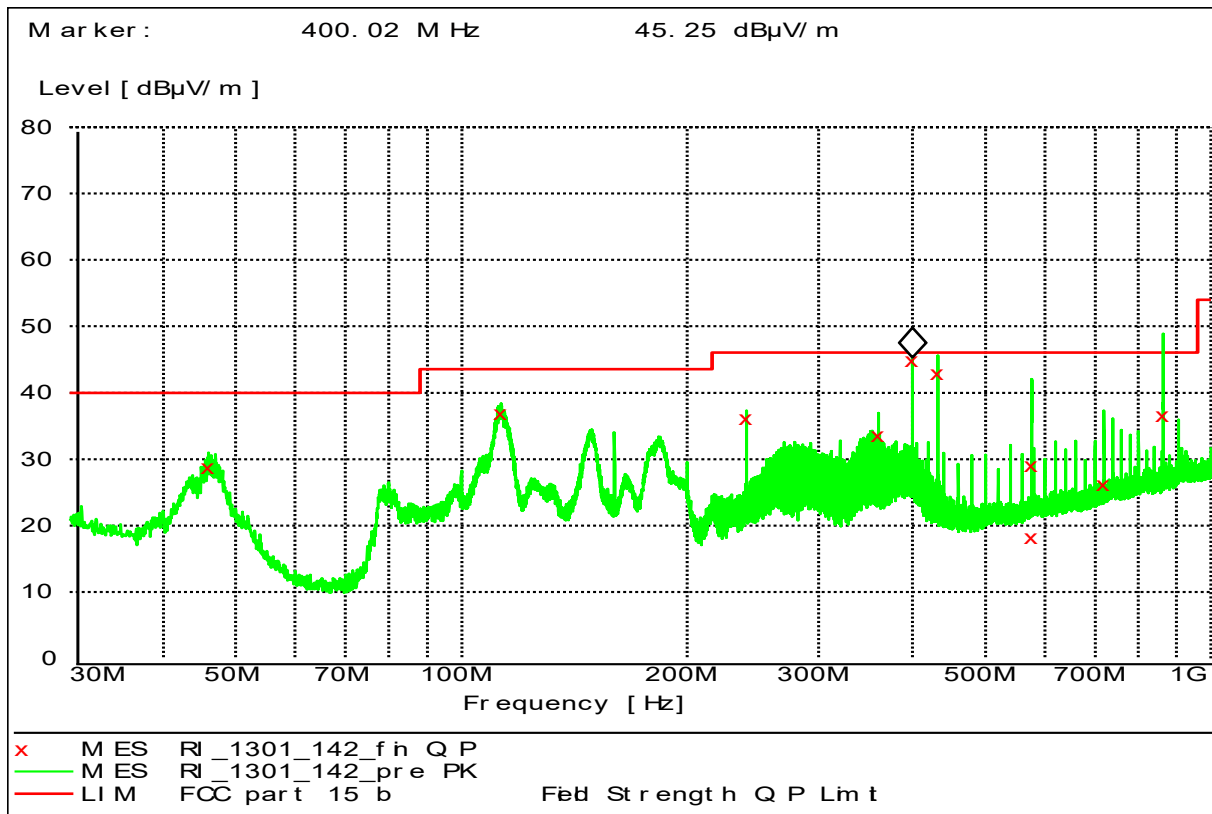
The applicant will limit the output power setting of the final product to maximum 11 dBm. Since all tests runs using higher output power than 11 dBm are worst case, they were not repeated with the lower output power.

5.7.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Measurement range = 9kHz - 30MHz, Subband = U-NII-2A (S01_W03RX)



Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Measurement range = 30MHz - 1GHz, Subband = U-NII-1 (S01_W03RX)

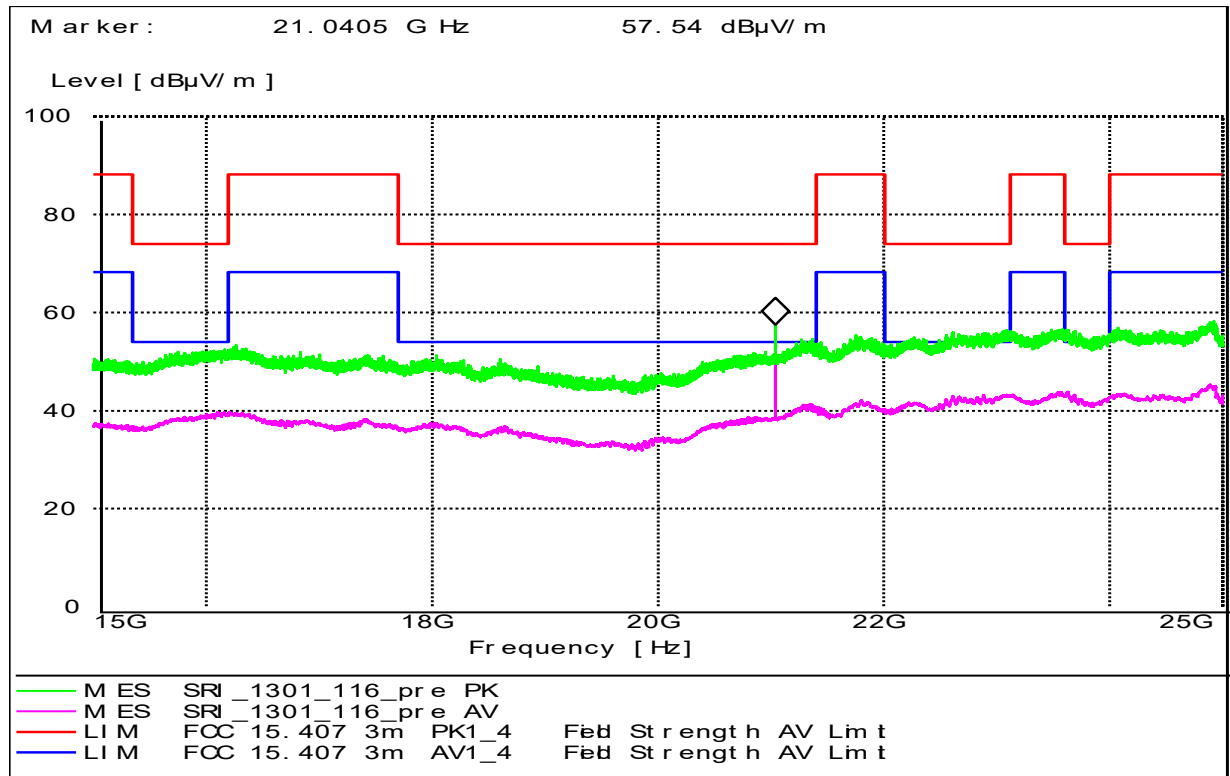


MEASUREMENT RESULT: "RI_1301_142_fin QP"

07.08.2013 12:59

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
45.960000	28.70	11.4	40.0	11.3	100.0	22.00	VERTICAL
112.860000	36.90	11.4	43.5	6.6	100.0	67.00	VERTICAL
240.000000	36.10	10.8	46.0	9.9	100.0	292.00	HORIZONTAL
360.000000	33.60	14.6	46.0	12.4	100.0	132.00	HORIZONTAL
400.020000	44.90	15.6	46.0	1.1	101.0	68.00	HORIZONTAL
431.880000	42.90	16.4	46.0	3.1	102.0	68.00	HORIZONTAL
575.880000	29.10	19.5	46.0	16.9	100.0	188.00	VERTICAL
576.120000	18.20	19.5	46.0	27.8	300.0	22.00	VERTICAL
719.940000	26.20	21.7	46.0	19.8	125.0	247.00	HORIZONTAL
863.760000	36.60	23.4	46.0	9.4	100.0	10.00	HORIZONTAL

Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Measurement range = 1GHz
- 26GHz, Subband = U-NII-2A
(S01_A01RX)



5.7.5 TEST EQUIPMENT USED

- Radiated Emissions

5.8 BAND EDGE

Standard **FCC Part 15 Subpart E**

The test was performed according to:
ANSI C63.10

5.8.1 TEST DESCRIPTION

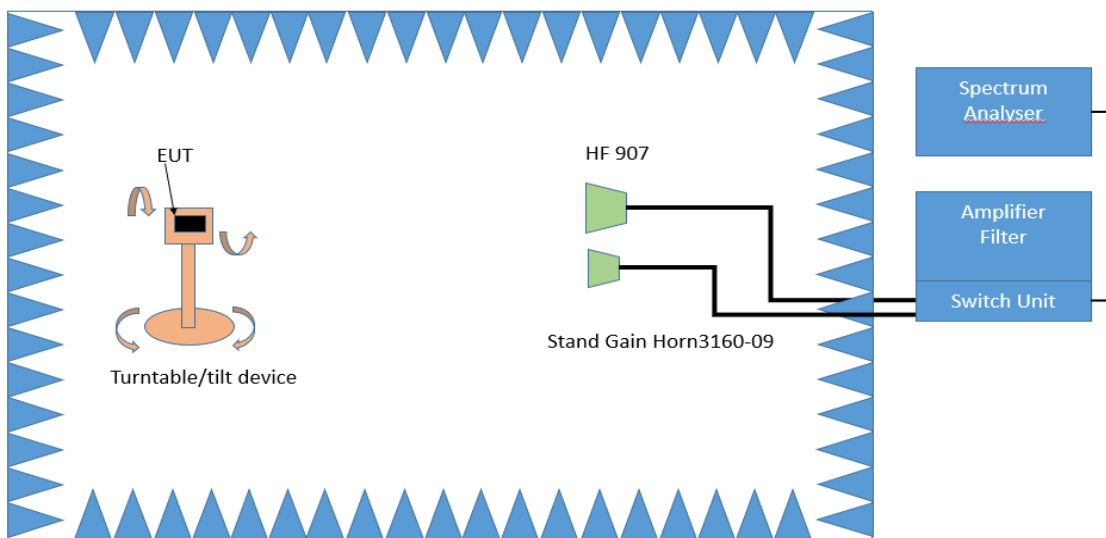
The test set-up was made in accordance to the general provisions of ANSI C63.10 in a typical installation configuration. The measurements were performed according the following sub-chapter of ANSI C63.10:

- Chapter 6.10.5

The Equipment Under Test (EUT) was set up on a non-conductive support (tilt device) at 1.5 m height in the fully-anechoic chamber.

All steps were performed with one height (1.5 m) of the receiving antenna only (procedure according ANSI C63.10, chapter 6.6.5).

3. Measurement above 1 GHz



Test Setup; Spurious Emission Radiated (FAC), 1 GHz-26.5 GHz

Step 1:

The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 90 °.

The turn table step size (azimuth angle) for the preliminary measurement is 45 °.

Spectrum analyser settings:

- Detector: Peak, Average
- RBW = 1 MHz
- VBW = 3 MHz

Step 2:

The turn table azimuth will slowly vary by $\pm 22.5^\circ$.

The elevation angle will slowly vary by $\pm 45^\circ$

Spectrum analyser settings:

- Detector: Peak

Step 3:

Spectrum analyser settings for step 3:

- Detector: Peak / CISPR Average
- Measured frequencies: in step 1 determined frequencies
- RBW = 1 MHz
- VBW = 3 MHz
- Measuring time: 1 s

5.8.2 TEST REQUIREMENTS / LIMITS

For band edges connected to a restricted band, the limits are specified in Section 15.209(a)

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

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
0.009 – 0.49	2400/F(kHz)@300m	3	(48.5 – 13.8)@300m
0.49 – 1.705	24000/F(kHz)@30m	3	(33.8 – 23.0)@30m
1.705 – 30	30@30m	3	29.5@30m

The measured values are corrected with an inverse linear distance extrapolation factor (40 dB/decade) according FCC 15.31 (2).

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limits (dBµV/m)
30 – 88	100@3m	3	40.0@3m
88 – 216	150@3m	3	43.5@3m
216 – 960	200@3m	3	46.0@3m
960 – 26000	500@3m	3	54.0@3m
26000 – 40000	500@3m	1	54.0@3m

The measured values above 26 GHz are corrected with an inverse linear distance extrapolation factor (20 dB/decade).

§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)

5.8.3 TEST PROTOCOL

Ambient temperature: 24 °C
 Air Pressure: 1010 hPa
 Humidity: 33 %
 Video Transmission 20 MHz BW
 Applied duty cycle correction (AV): 0 dB

U-NII-Subband	Ch. No.	Ch. Center Freq. [MHz]	Band Edge Freq. [MHz]	Spurious Level [dBμV/m]	Detector	RBW [kHz]	Limit [dBμV/m]	Margin [dB]	Limit Type	FCC/IC?
1	36	5180	5150.0	55.2	PEAK	1000	74.0	18.8	BE-RB	FCC&IC
	36	5180	5150.0	42.9	AV	1000	54.0	11.1	BE-RB	FCC&IC
2A	64	5320	5350.0	55.4	PEAK	1000	74.0	18.6	BE-RB	FCC&IC
	64	5320	5350.0	43.3	AV	1000	54.0	10.7	BE-RB	FCC&IC
2C	100	5500	5460.0	55.7	PEAK	1000	74.0	18.3	BE-RB	FCC&IC
	100	5500	5460.0	43.1	AV	1000	54.0	10.9	BE-RB	FCC&IC
	100	5500	5470.0	56.2	PEAK	1000	68.2	12.0	BE-UE	FCC&IC
	140	5700	5725.0	55.7	PEAK	1000	68.2	12.5	BE-UE	FCC&IC
3	149	5745	5725.0	63.2	PEAK	1000	102.0	38.8	BE-UE	FCC&IC
	165	5825	5850.0	58.6	PEAK	1000	102.0	43.4	BE-UE	FCC&IC

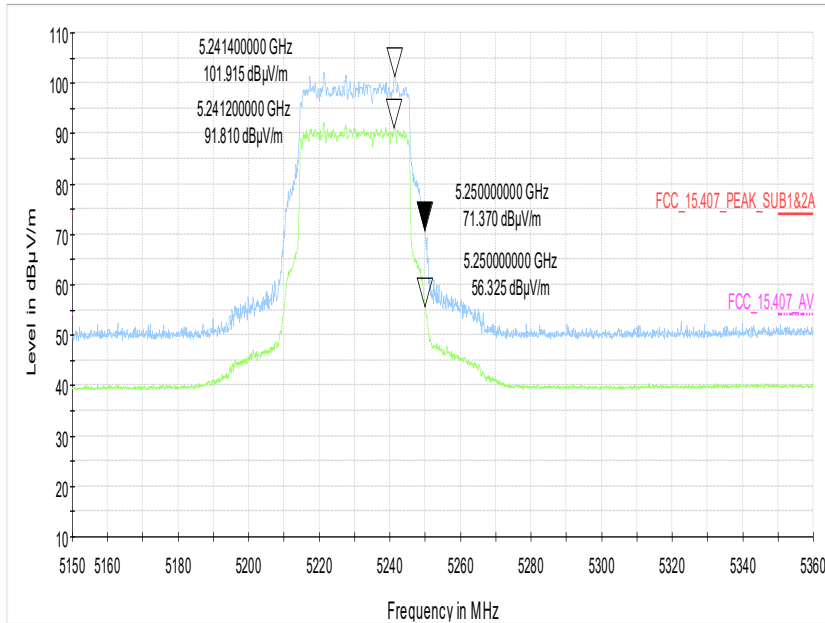
Video Transmission 40 MHz BW
 Applied duty cycle correction (AV): 0 dB

U-NII-Subband	Ch. No.	Ch. Center Freq. [MHz]	Band Edge Freq. [MHz]	Spurious Level [dBμV/m]	Detector	RBW [kHz]	Limit [dBμV/m]	Margin [dB]	Limit Type	FCC/IC?
1	38	5190	5150.0	58.1	PEAK	1000	74.0	15.9	BE-RB	FCC&IC
	38	5190	5150.0	44.7	AV	1000	54.0	9.3	BE-RB	FCC&IC
2A	62	5310	5350.0	59.3	PEAK	1000	74.0	14.7	BE-RB	FCC&IC
	62	5310	5350.0	48.2	AV	1000	54.0	5.8	BE-RB	FCC&IC
2C	102	5510	5460.0	57.2	PEAK	1000	74.0	16.8	BE-RB	FCC&IC
	102	5510	5460.0	43.8	AV	1000	54.0	10.2	BE-RB	FCC&IC
	102	5510	5470.0	61.3	PEAK	1000	68.2	6.9	BE-UE	FCC&IC
	134	5670	5725.0	56.6	PEAK	1000	68.2	11.6	BE-UE	FCC&IC
3	151	5755	5725.0	70.3	PEAK	1000	102.0	31.7	BE-UE	FCC&IC
	159	5795	5850.0	56.6	PEAK	1000	102.0	45.4	BE-UE	FCC&IC

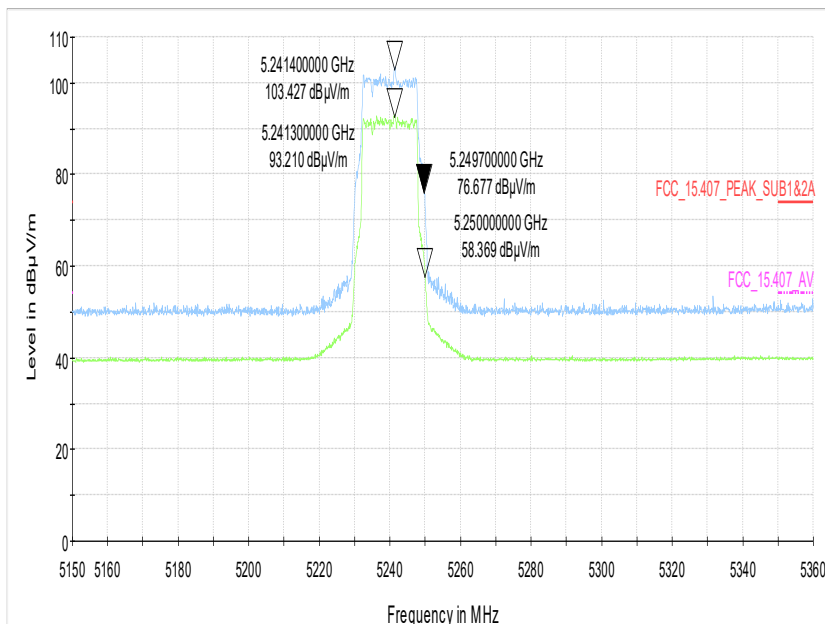
Remark: Nominal output power set to: 15 dBm.
 Please see next sub-clause for the measurement plot.

5.8.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

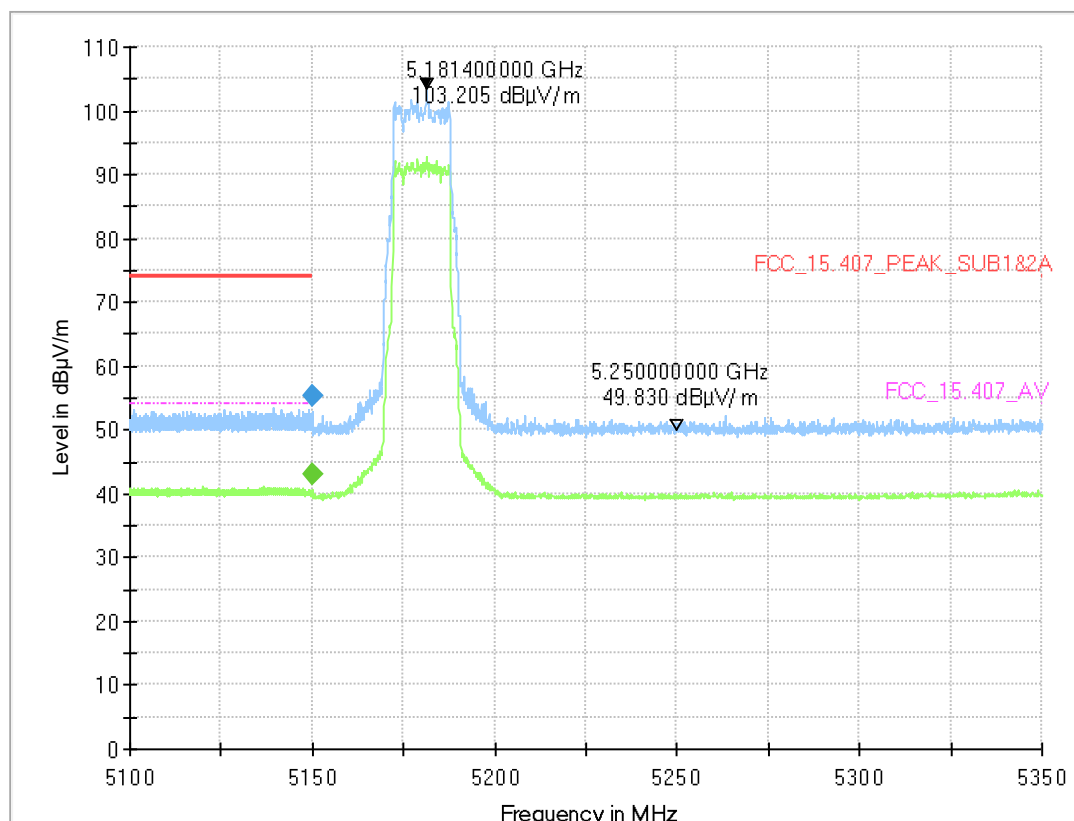
Radio Technology = WLAN n 40 MHz, Operating Frequency = high, Subband = U-NII-1 (S01_AB01RX)



Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-1 (S01_AB01RX)



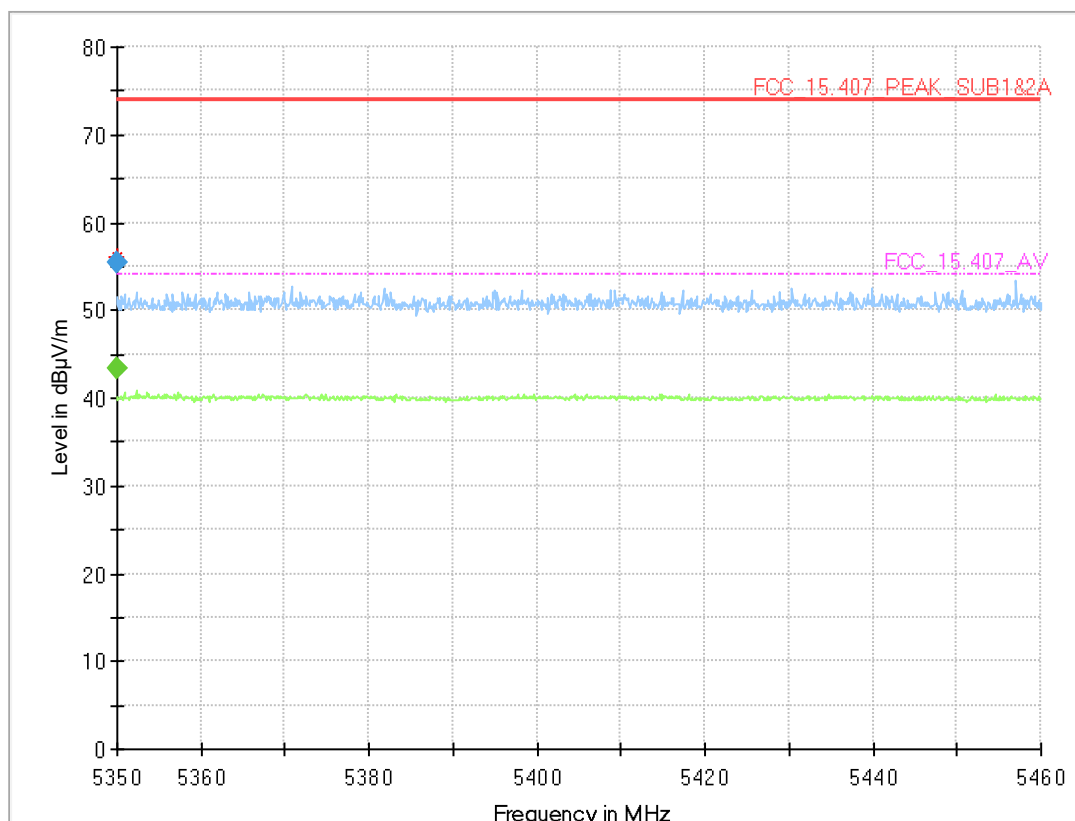
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5149.888	55.2	---	74.00	18.75	1000.0	1000.000	150.0	V	-174.0	105.0	13.2
5149.988	---	42.9	54.00	11.11	1000.0	1000.000	150.0	H	-169.0	-4.0	13.2

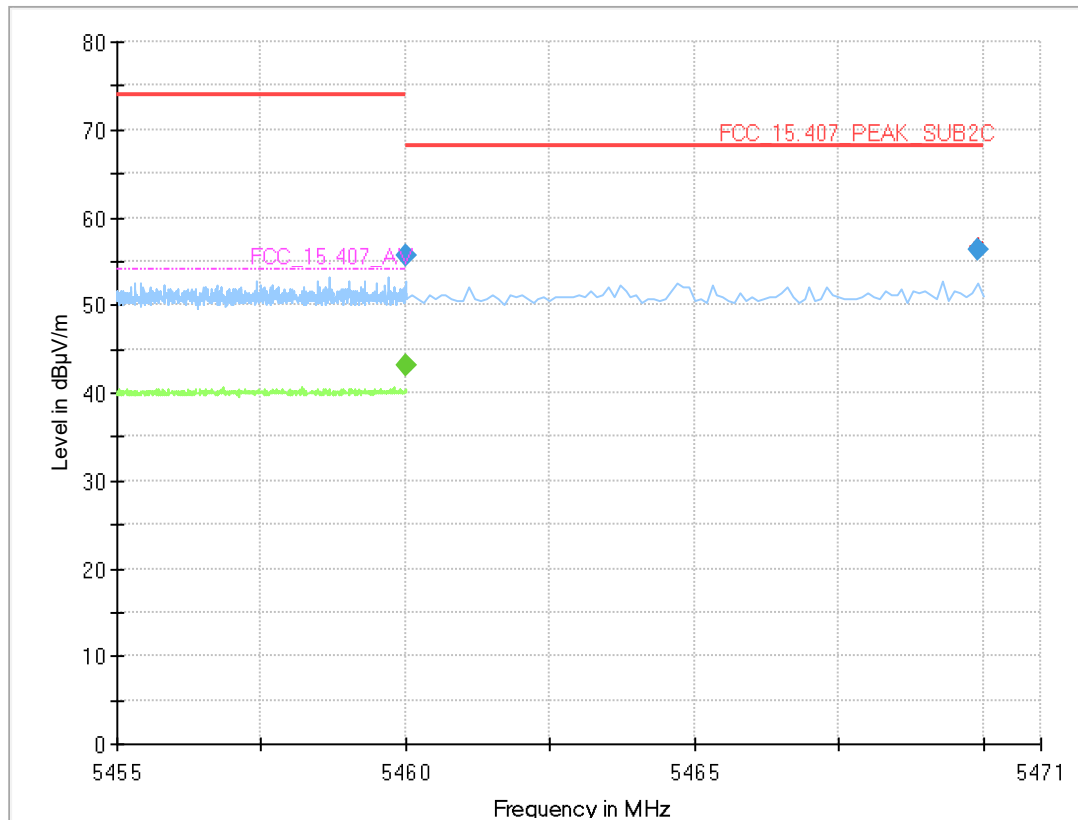
Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-2A (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5350.000	55.4	---	74.00	18.61	1000.0	1000.000	150.0	H	-95.0	87.0	13.9
5350.000	---	43.3	54.00	10.69	1000.0	1000.000	150.0	V	-145.0	75.0	13.9

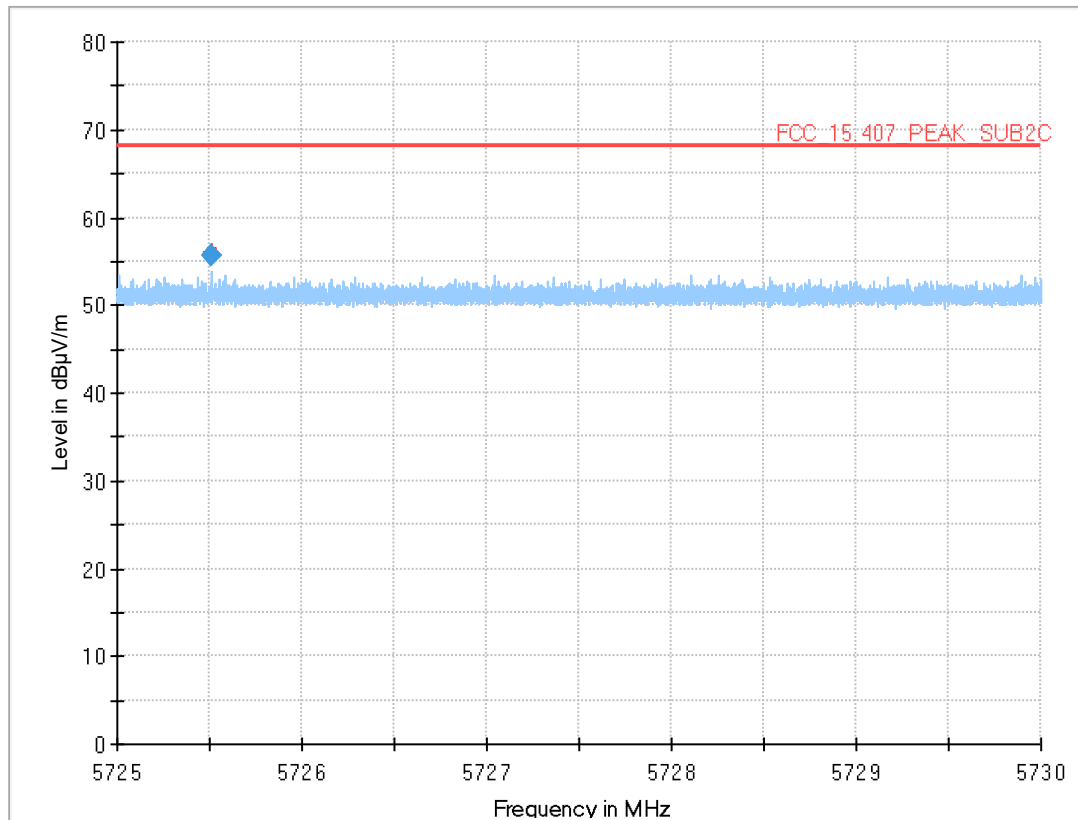
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-2C (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5459.990	---	43.1	54.00	10.85	1000.0	1000.000	150.0	H	-90.0	-12.0	14.1
5459.990	55.7	---	74.00	18.25	1000.0	1000.000	150.0	H	-79.0	4.0	14.1
5469.900	56.2	---	68.20	11.97	1000.0	1000.000	150.0	V	-6.0	104.0	14.0

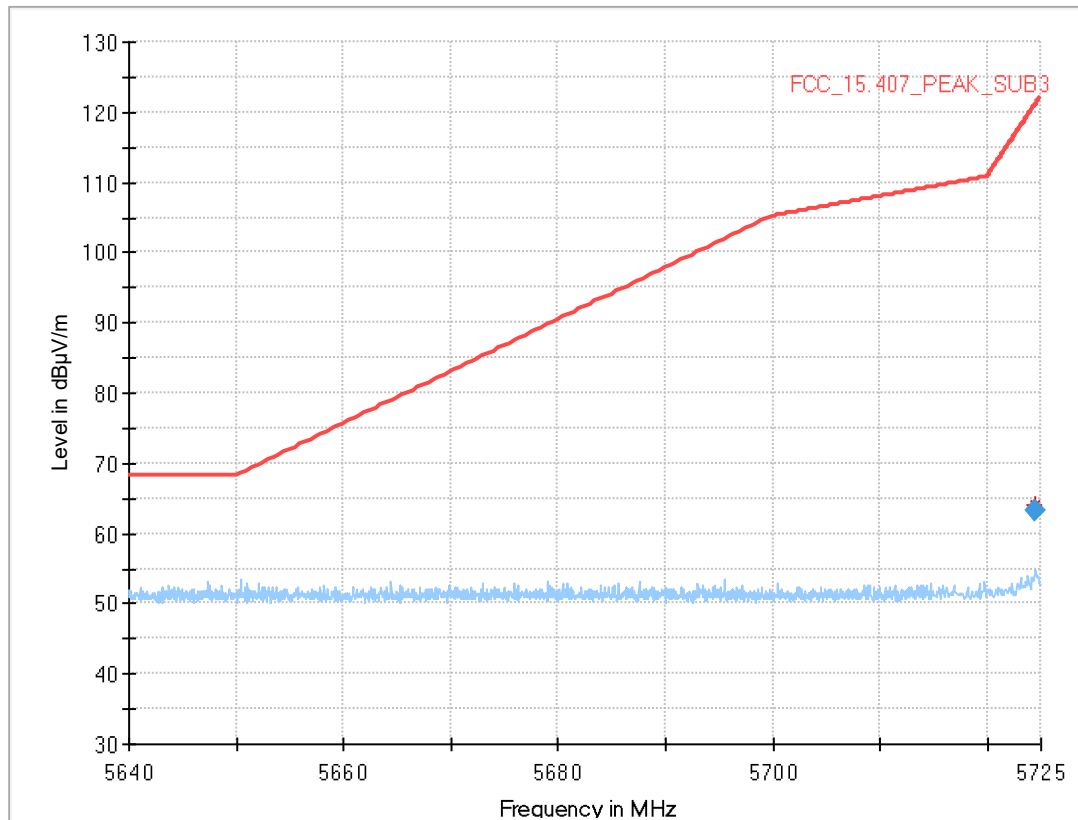
Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-2C (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr (dB)
5725.513	55.7	---	68.20	12.51	1000.0	1000.000	150.0	H	-131.0	15.0	14.1

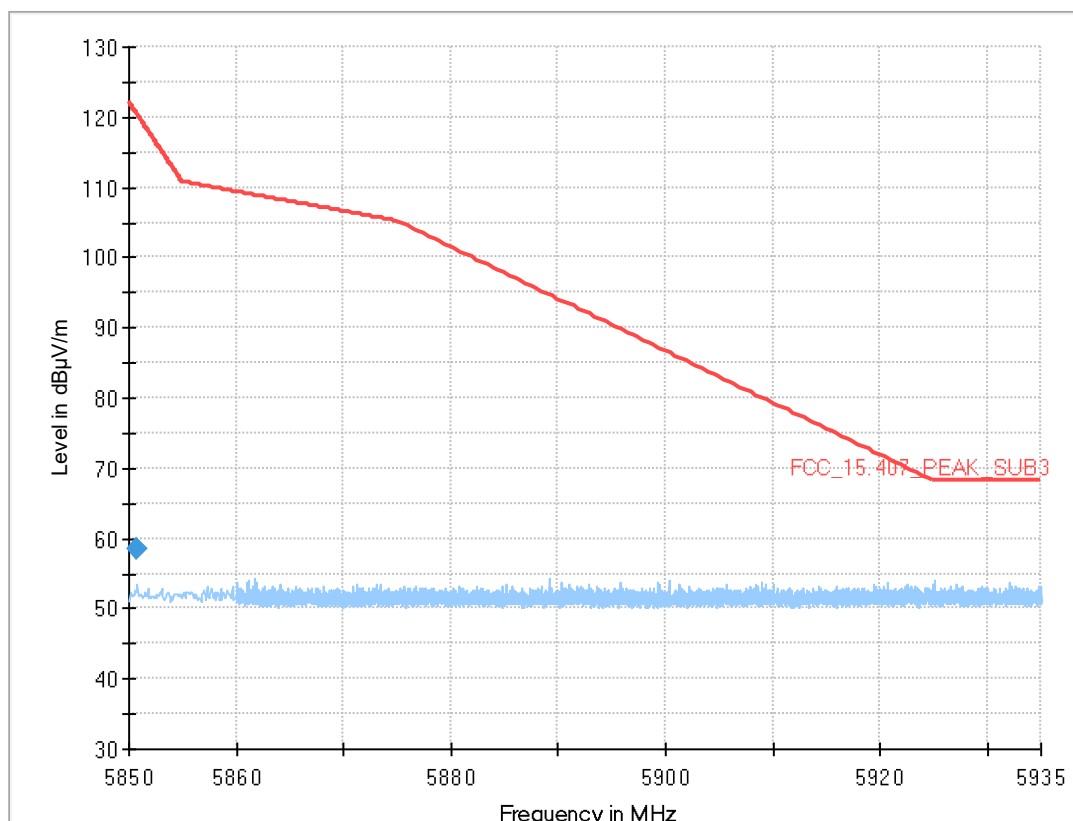
Radio Technology = WLAN n 20 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5724.500	63.2	---	121.0	57.84	1000.0	1000.000	150.0	H	-174.0	4.0	14.1

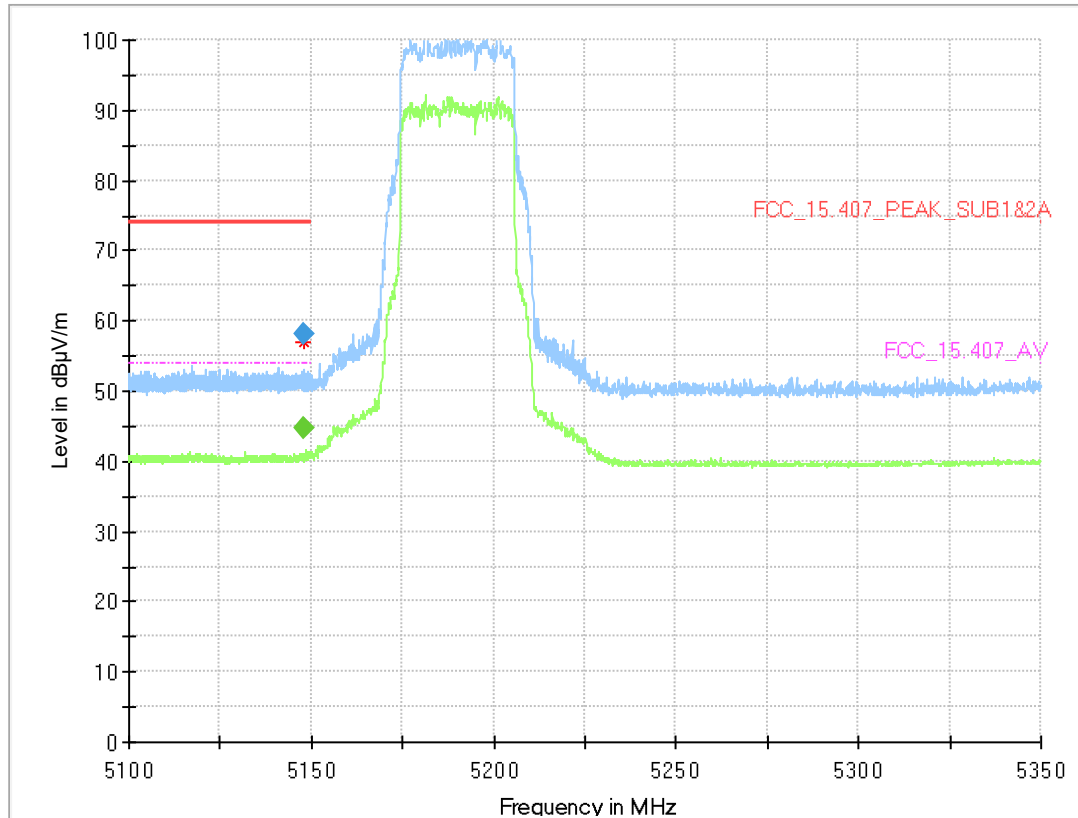
Radio Technology = WLAN n 20 MHz, Operating Frequency = high, Subband = U-NII-3 (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Correction (dB)
5850.800	58.6	---	120.3	61.76	1000.0	1000.000	150.0	H	-191.0	8.0	14.7

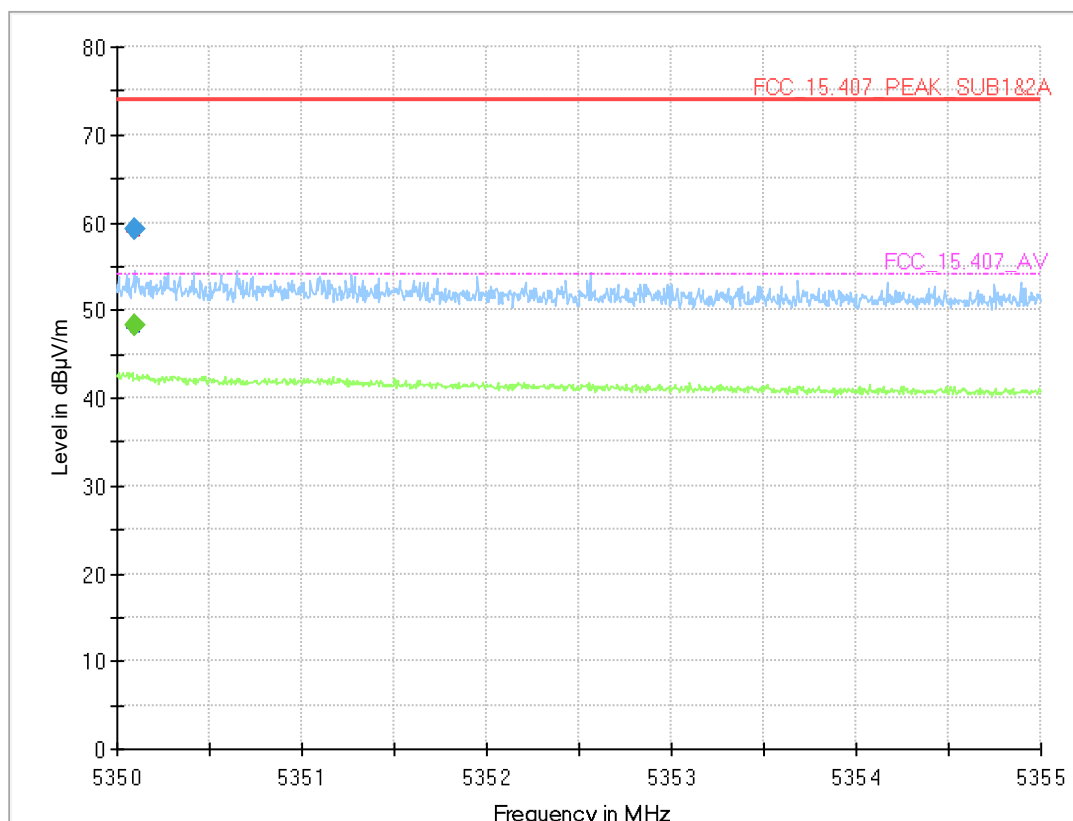
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-1 (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5148.075	---	44.7	54.00	9.30	1000.0	1000.000	150.0	H	-191.0	3.0	13.2
5148.075	58.1	---	74.00	15.92	1000.0	1000.000	150.0	H	-169.0	6.0	13.2

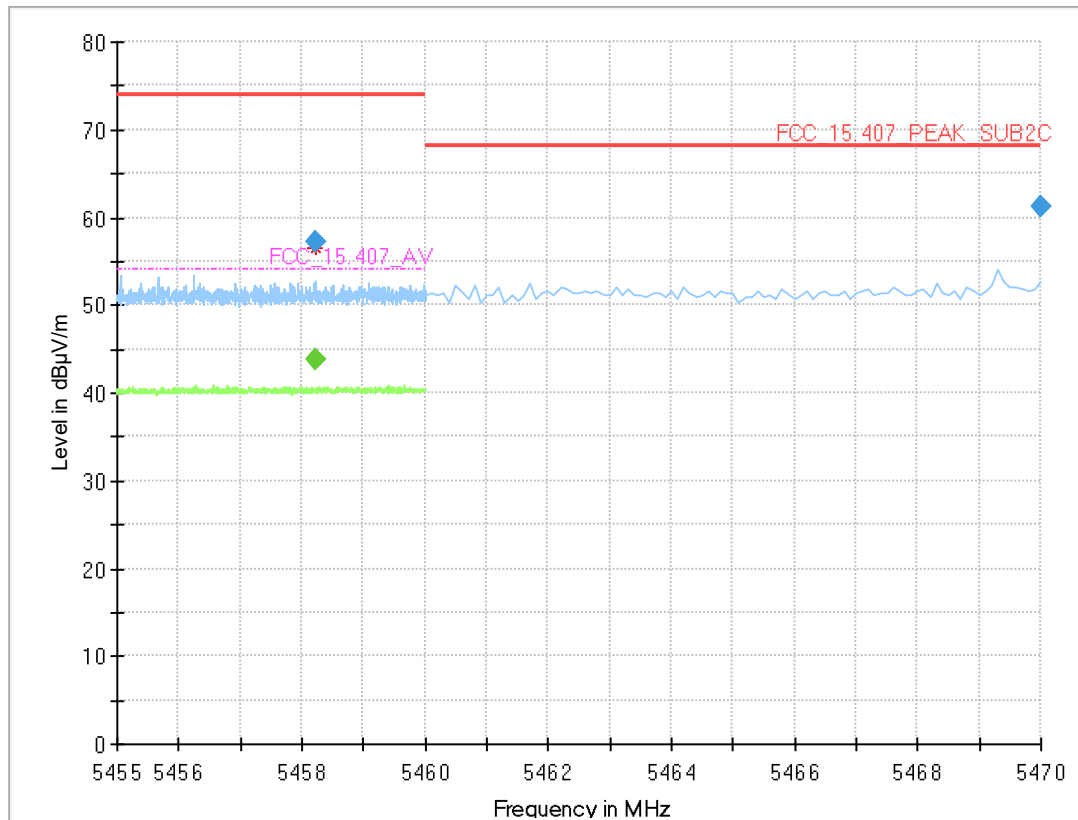
Radio Technology = WLAN n 40 MHz, Operating Frequency = high, Subband = U-NII-2A (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5350.095	---	48.2	54.00	5.80	1000.0	1000.000	150.0	H	-188.0	4.0	13.9
5350.095	59.3	---	74.00	14.68	1000.0	1000.000	150.0	V	35.0	98.0	13.9

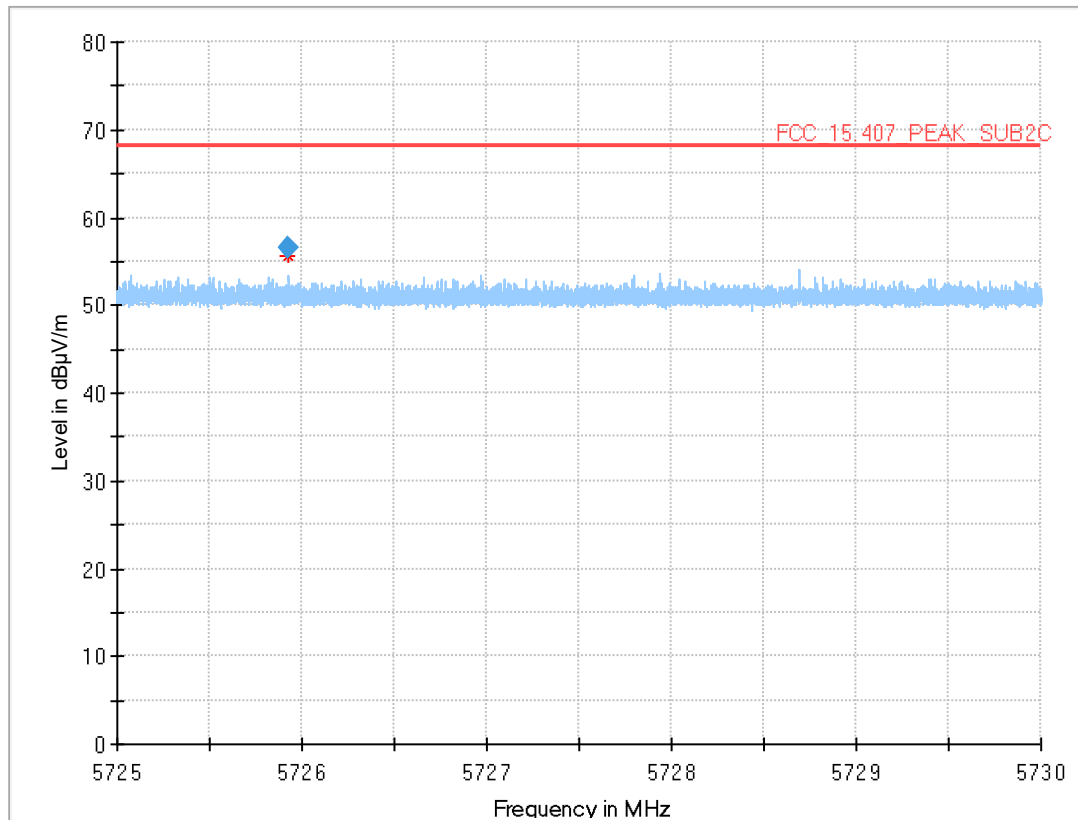
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-2C (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5458.220	---	43.8	54.00	10.19	1000.0	1000.000	150.0	H	-183.0	3.0	14.0
5458.220	57.2	---	74.00	16.82	1000.0	1000.000	150.0	H	-188.0	6.0	14.0
5470.000	61.3	---	68.20	6.91	1000.0	1000.000	150.0	H	-184.0	3.0	14.0

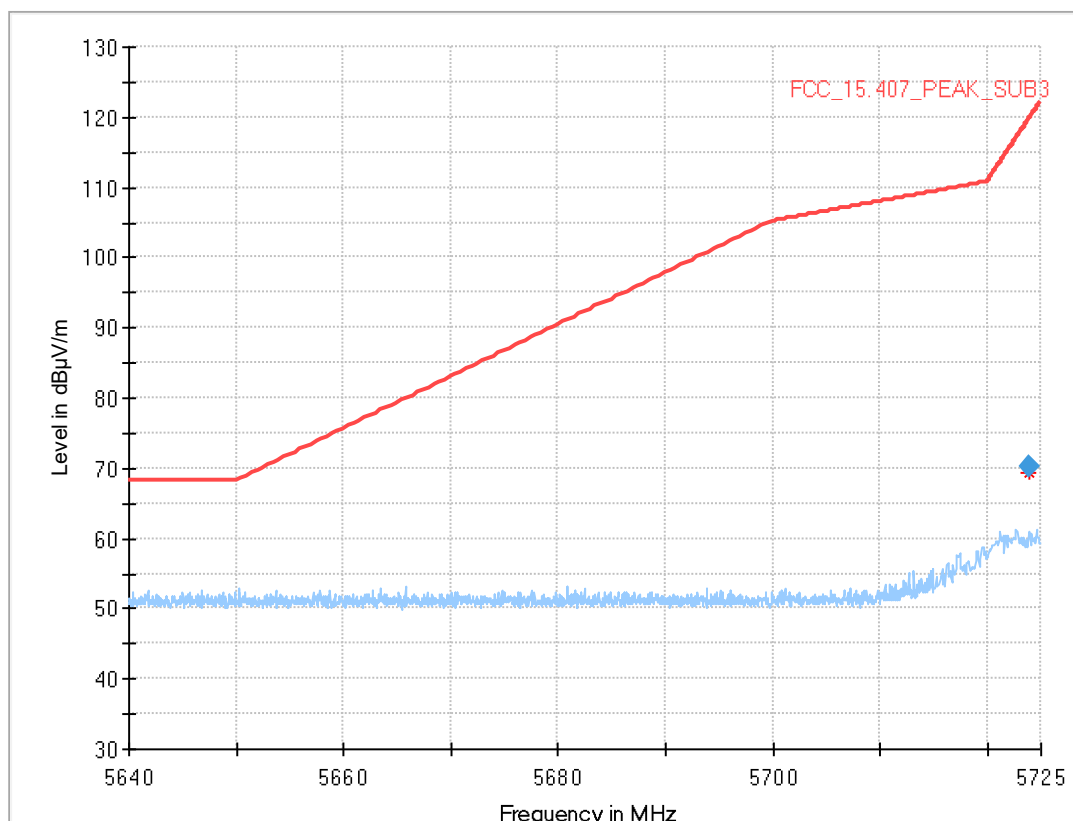
Radio Technology = WLAN n 40 MHz, Operating Frequency = high, Subband = U-NII-2C (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5725.931	56.6	---	68.20	11.58	1000.0	1000.000	150.0	V	6.0	105.0	14.1

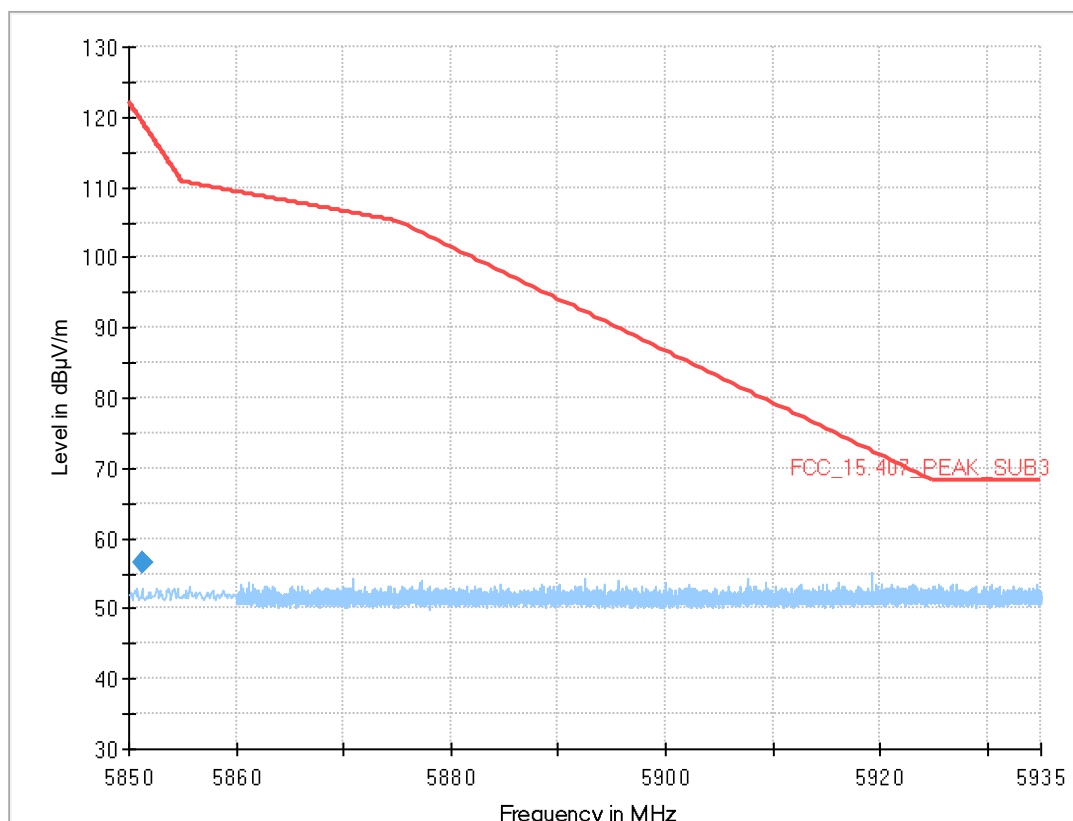
Radio Technology = WLAN n 40 MHz, Operating Frequency = low, Subband = U-NII-3 (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5723.900	70.3	---	119.6	49.40	1000.0	1000.000	150.0	H	-190.0	6.0	14.1

Radio Technology = WLAN n 40 MHz, Operating Frequency = high, Subband = U-NII-3 (S01_AB01RX)



Final Result

Frequency (MHz)	MaxPeak (dBμV/m)	CAverage (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB/)
5851.200	56.6	---	119.4	62.82	1000.0	1000.000	150.0	H	-79.0	-15.0	14.7

5.8.5 TEST EQUIPMENT USED

- Radiated Emissions

6 TEST EQUIPMENT

Test Equipment of tests performed in 2021

- 1 R&S TS8997
2.4 and 5 GHz Bands Conducted Test Lab

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
1.1	MFS	Rubidium Frequency Standard	Datum-Beverly	5489/001	2020-09	2021-09
1.2	FSV30	Signal Analyzer 10 Hz - 30 GHz	Rohde & Schwarz	103005	2020-05	2022-05
1.3	ESR 7	EMI Receiver / Spectrum Analyzer	Rohde & Schwarz	101424	2021-01	2023-01
1.4	Opus10 THI (8152.00)	T/H Logger 15	Lufft Mess- und Regeltechnik GmbH	13985	2019-06	2021-06
1.5	Opus10 THI (8152.00)	T/H Logger 14	Lufft Mess- und Regeltechnik GmbH	13993	2019-06	2021-06
1.6	Opus10 THI (8152.00)	T/H Logger 03	Lufft Mess- und Regeltechnik GmbH	7482	2019-06	2021-06
1.7	OSP120	Contains Power Meter and Switching Unit OSP-B157W8	Rohde & Schwarz	101158	2018-05	2021-05

- 2 Radiated Emissions
Lab to perform radiated emission tests

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.1	MFS	Rubidium Frequency Normal MFS	Datum GmbH	002	2020-11	2021-11
2.2	Opus10 TPR (8253.00)	T/P Logger 13	Lufft Mess- und Regeltechnik GmbH	13936	2019-05	2021-05
2.3	AMF-7D00101800-30-10P-R	Broadband Amplifier 100 MHz - 18 GHz	Miteq			
2.4	ASP 1.2/1.8-10 kg	Antenna Mast	Maturo GmbH	-		
2.5	Anechoic Chamber 03	FAR, 8.80m x 4.60m x 4.05m (l x w x h)	Albatross Projects	P26971-647-001-PRB	2018-06	2020-06
2.6	Opus10 THI (8152.00)	T/H Logger 10	Lufft Mess- und Regeltechnik GmbH	12488	2019-06	2021-06
2.7	JS4-18002600-32-5P	Broadband Amplifier 18 GHz - 26 GHz	Miteq	849785		
2.8	FSW 43	Spectrum Analyzer	Rohde & Schwarz	103779	2019-02	2021-08

Ref.No.	Device Name	Description	Manufacturer	Serial Number	Last Calibration	Calibration Due
2.9	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	00083069		
2.10	WHKX 7.0/18G-8SS	High Pass Filter	Wainwright Instruments GmbH	09		
2.11	3160-09	Standard Gain / Pyramidal Horn Antenna 26.5 GHz	EMCO Elektronik GmbH	9910-1184		
2.12	JS4-00102600-42-5A	Broadband Amplifier 30 MHz - 26 GHz	Miteq	619368		
2.13	TT 1.5 WI	Turn Table	Maturo GmbH	-		
2.14	HL 562 ULTRALOG	Biconical-log-per Antenna (30 MHz - 3 GHz)	Rohde & Schwarz GmbH & Co. KG	100609	2019-05	2022-05
2.15	3160-10	Standard Gain / Pyramidal Horn Antenna 40 GHz	EMCO Elektronik GmbH	00086675		
2.16	JUN-AIR Mod. 6-15	Air Compressor	JUN-AIR Deutschland GmbH	612582		
2.17	Opus10 THI (8152.00)	T/H Logger 12	Lufft Mess- und Regeltechnik GmbH	12482	2019-06	2021-06
2.18	JS4-00101800-35-5P	Broadband Amplifier 30 MHz - 18 GHz	Miteq	896037		
2.19	AS 620 P	Antenna Mast (pneumatic polarisation)	HD GmbH	620/37		
2.20	TD1.5-10kg	EUT Tilt Device (Rohacell)	Maturo GmbH	TD1.5-10kg/024/3790709		
2.21	HF 907-2	Double-ridged horn	Rohde & Schwarz	102817	2019-04	2022-04
2.22	PAS 2.5 - 10 kg	Antenna Mast	Maturo GmbH	-		
2.23	AFS42-00101800-25-S-42	Broadband Amplifier 25 MHz - 18 GHz	Miteq	2035324		
2.24	HF 907	Double-ridged horn	Rohde & Schwarz	102444	2018-07	2021-07

The calibration interval is the time interval between "Last Calibration" and "Calibration Due".

Test Equipment of tests performed before 2021

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

Test Equipment Anechoic Chamber

Lab ID: Lab 3
Manufacturer: Frankonia
Description: Anechoic Chamber for radiated testing
Type: 10.58x6.38x6.00 m³

Calibration Details	Last Execution	Next Exec.
NSA (FCC, IC)	2011/01/10	2014/01/10
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 m ³ FCC listing 96716 3m Part15/18 IC listing 3699A-1 3m FCC listing 96716 3m Part15/18	none	Frankonia 2011/01/11 2014/01/10 2011/02/07 2014/02/06 2014/01/09 2017/01/08
Controller Innco 2000	CO 2000	CO2000/328/12470 406/L	Innco innovative constructions GmbH
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 Conducted emissions

Lab ID: Lab 1
Manufacturer: Rohde & Schwarz GmbH & Co.KG
Description: EMI Conducted Auxiliary Equipment

Single Devices for Auxiliary Equipment for Conducted emissions

Single Device Name	Type	Serial Number	Manufacturer	
AC Power Source	Chroma 6404	64040001304	Chroma ATE INC.	
Cable "LISN to ESI"	RG214 Path Calibration	W18.03+W48.03	Huber&Suhner	2011/11/11 2012/11/10
Impedance Stabilization Network	ISN T800	36159	Teseq GmbH	
Calibration Details			Last Execution	Next Exec.
Standard Calibration			2014/02/06	2016/02/28
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ENY41	100002	Rohde & Schwarz GmbH & Co. KG	
Standard calibration			2011/01/20	2013/01/31
Standard calibration			2013/03/01	2015/03/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ST08	36292	Teseq GmbH	
Calibration Details			Last Execution	Next Exec.
Standard calibration			2014/01/10	2016/01/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN T8-Cat6	32187	Teseq GmbH	
Calibration Details			Last Execution	Next Exec.
Standard Calibration			2014/01/08	2016/01/31
One-Line V-Network	ESH 3-Z6	100489	Rohde & Schwarz GmbH & Co. KG	
standard calibration			2014/06/18	2017/11/30
Standard calibration			2011/02/08	2014/02/07
One-Line V-Network	ESH 3-Z6	100570	Rohde & Schwarz GmbH & Co. KG	
Calibration Details			Last Execution	Next Exec.
Standard Calibration			2013/11/25	2016/11/24
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG	
Calibration Details			Last Execution	Next Exec.
Standard Calibration			2013/03/01	2015/03/31
DAkks Calibration			2015/03/30	2017/03/31
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG	
Standard Calibration			2013/03/01	2015/02/28
DAkks Calibration			2015/03/30	2017/03/31
DKD Calibration			2011/01/20	2013/01/19

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID: Lab 3
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		
Antenna mast	AS 620 P	620/37	HD GmbH		
Biconical Broadband Antenna	SBA 9119	9119-005	Schwarzbeck Mess-Elektronik OHG		
	Calibration Details			Last Execution	Next Exec.
	Standard Calibration			2009/06/04	2014/06/03
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck Mess-Elektronik OHG		
	Standard Calibration			2012/01/18	2015/01/17
Broadband Amplifier 1 GHz - 4 GHz	AFS4-01000400-1Q-10P-4	-	Miteq		
	Path Calibration			2012/05/24	2012/11/23
Broadband Amplifier 18 GHz - 26 GHz	JS4-18002600-32-5P	849785	Miteq		
	Path Calibration			2012/05/24	2012/11/23
Broadband Amplifier 30 MHz - 18 GHz	JS4-00101800-35-5P	896037	Miteq		
	Path Calibration			2012/05/24	2012/11/23
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch		
	Path Calibration			2012/05/24	2012/11/23
Cable "ESI to Horn Antenna"	SucoFlex	W18.02-2+W38.02-2	HUBER+SUHNER		
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax		
	Path Calibration			2012/05/24	2012/11/23
	Path Calibration			2012/11/23	2013/05/22
	Path Calibration			2013/05/22	2013/11/23
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG		
	Standard Calibration			2012/06/26	2015/06/25
	Standard Calibration			2015/06/23	2018/06/22
Double-ridged horn	HF 907	102444	Rohde & Schwarz GmbH & Co. KG		
	Calibration Details			Last Execution	Next Exec.
	Standard Calibration			2015/05/11	2018/05/10
Double-ridged horn-duplicated 2015-07-15 10:47:55	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG		
Dreheinheit	DE 325		HD GmbH		
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic		
	Path Calibration			2012/05/24	2012/11/23
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic		
	Path Calibration			2012/05/24	2012/11/23
High Pass Filter	5HC3500/18000-1.2-KK	200035008	Trilithic		
	Path Calibration			2012/05/24	2012/11/23

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>
High Pass Filter	WHKX 7.0/18G-8SS Path Calibration	09	Wainwright 2012/05/24 2012/11/23
Horn Antenna Schwarzbeck 15-26.5 GHz BBHA 9170	BBHA 9170	BBHA9170262	Schwarzbeck Mess-Elektronik OHG
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution Next Exec.</i>
	Standard Calibration		2012/12/18 2015/12/17
Log.-per. Antenna (upgraded)	HL 562 Ultralog new biconicals	830547/003	Rohde & Schwarz GmbH & Co. KG
	Standard Calibration		2015/06/30 2018/06/29
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
	DKD Calibration		2014/11/27 2017/11/27
	Standard calibration		2011/10/27 2014/10/26
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 Emission measurement devices

Lab ID: Lab 1, Lab 3
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		
	Calibration Details			Last Execution	Next Exec.
	Standard calibration			2012/05/22	2013/05/21
	Standard calibration			2013/05/03	2014/05/02
	Standard calibration			2014/05/13	2015/05/10
	Standard calibration			2015/05/11	2016/05/10
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz GmbH & Co. KG		
Powermeter	NRVS	836333/064	Rohde & Schwarz GmbH & Co. KG		
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG		
	Calibration Details			Last Execution	Next Exec.
	Standard calibration			2012/05/21	2013/05/20
	Standard calibration			2013/04/30	2014/04/29
	Standard calibration			2014/05/13	2015/05/10
	Standard calibration			2015/05/11	2016/05/10
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG		
	standard calibration			2011/05/12	2014/05/11
	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		
	Standard Calibration			2011/12/05	2013/12/31
	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 WLAN RF Test Solution

Lab ID: Lab 6
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	2012/07/24	2013/07/23
	Standard Calibration		2013/08/26	2014/08/25
	Standard calibration		2014/08/29	2015/08/28
Power Sensor NRV Z1 A	PROBE	832279/013		
	Standard Calibration		2012/07/23	2013/07/22
	Standard calibration		2013/08/28	2014/08/27
	Standard calibration		2014/08/28	2015/08/27
Power Supply	NGSM 32/10	2725	2011/06/15	2013/06/14
	Standard Calibration		2013/06/20	2015/06/19
	Standard calibration		2015/06/22	2016/06/21
Rubidium Frequency Normal MFS	Datum MFS	002	Datum GmbH	
	Standard Calibration		2012/08/20	2013/08/19
	Standard calibration		2013/08/27	2014/08/26
	Standard calibration		2014/08/29	2015/08/28
Signal Analyser FSIQ26	1119.6001.26	832695/007	Rohde & Schwarz GmbH & Co.KG	
Signal Generator	SMP03	833680/003	Rohde & Schwarz GmbH & Co.KG	
	Standard		2013/10/29	2016/10/28
Spectrum Analyser	FSU26	100136	Rohde & Schwarz GmbH & Co.KG	
	Standard calibration		2012/06/20	2012/12/20
	Standard calibration		2012/12/21	2014/01/05
	Standard Calibration		2014/01/06	2015/02/01
	Standard Calibration		2015/02/02	2016/02/01
	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	
	Standard calibration		2012/05/15	2013/06/19
	Standard calibration		2013/06/20	2014/06/30
	Standard calibration		2014/07/01	2015/06/30
	Standard calibration		2015/06/22	2016/06/21
	Firmware Version 4.51 SP1		2011/12/07	
	Option FS-K72 4.50 SP1			
	Option FS-K73 4.50 SP1			
TOCT Switching Unit	Switching Unit	040107	7 layers, Inc.	
Vector Signal Generator SMIQ03B	SMIQ03B	832870/017		
	Standard Calibration		2010/06/23	2013/06/22
	Standard calibration		2013/06/21	2016/06/20

7 ANTENNA FACTORS, CABLE LOSS AND SAMPLE CALCULATIONS

This chapter contains the antenna factors with their corresponding path loss of the used measurement path for all antennas as well as the insertion loss of the LISN.

7.1 LISN R&S ESH3-Z5 (150 KHZ – 30 MHZ)

Frequency		Corr.	LISN insertion loss ESH3- Z5	cable loss (incl. 10 dB atten- uator)
MHz		dB	dB	dB
0.15		10.1	0.1	10.0
5		10.3	0.1	10.2
7		10.5	0.2	10.3
10		10.5	0.2	10.3
12		10.7	0.3	10.4
14		10.7	0.3	10.4
16		10.8	0.4	10.4
18		10.9	0.4	10.5
20		10.9	0.4	10.5
22		11.1	0.5	10.6
24		11.1	0.5	10.6
26		11.2	0.5	10.7
28		11.2	0.5	10.7
30		11.3	0.5	10.8

Sample calculation

$$U_{\text{LISN}} (\text{dB } \mu\text{V}) = U (\text{dB } \mu\text{V}) + \text{Corr. (dB)}$$

U = Receiver reading

LISN Insertion loss = Voltage Division Factor of LISN

Corr. = sum of single correction factors of used LISN, cables, switch units (if used)

Linear interpolation will be used for frequencies in between the values in the table.

7.2 ANTENNA R&S HFH2-Z2 (9 KHZ – 30 MHZ)

Frequency MHz	AF HFH-Z2) dB (1/m)	Corr. dB	cable loss 1 (inside chamber) dB	cable loss 2 (outside chamber) dB	cable loss 3 (switch unit) dB	cable loss 4 (to receiver) dB	distance corr. (-40 dB/ decade) dB	d _{Limit} (meas. distance (limit) m	d _{used} (meas. distance (used) m
0.009	20.50	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.01	20.45	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.015	20.37	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.02	20.36	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.025	20.38	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.03	20.32	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.05	20.35	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.08	20.30	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.1	20.20	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.2	20.17	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.3	20.14	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.49	20.12	-79.6	0.1	0.1	0.1	0.1	-80	300	3
0.490001	20.12	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.5	20.11	-39.6	0.1	0.1	0.1	0.1	-40	30	3
0.8	20.10	-39.6	0.1	0.1	0.1	0.1	-40	30	3
1	20.09	-39.6	0.1	0.1	0.1	0.1	-40	30	3
2	20.08	-39.6	0.1	0.1	0.1	0.1	-40	30	3
3	20.06	-39.6	0.1	0.1	0.1	0.1	-40	30	3
4	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
5	20.05	-39.5	0.2	0.1	0.1	0.1	-40	30	3
6	20.02	-39.5	0.2	0.1	0.1	0.1	-40	30	3
8	19.95	-39.5	0.2	0.1	0.1	0.1	-40	30	3
10	19.83	-39.4	0.2	0.1	0.2	0.1	-40	30	3
12	19.71	-39.4	0.2	0.1	0.2	0.1	-40	30	3
14	19.54	-39.4	0.2	0.1	0.2	0.1	-40	30	3
16	19.53	-39.3	0.3	0.1	0.2	0.1	-40	30	3
18	19.50	-39.3	0.3	0.1	0.2	0.1	-40	30	3
20	19.57	-39.3	0.3	0.1	0.2	0.1	-40	30	3
22	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
24	19.61	-39.3	0.3	0.1	0.2	0.1	-40	30	3
26	19.54	-39.3	0.3	0.1	0.2	0.1	-40	30	3
28	19.46	-39.2	0.3	0.1	0.3	0.1	-40	30	3
30	19.73	-39.1	0.4	0.1	0.3	0.1	-40	30	3

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

distance correction = $-40 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values

7.3 ANTENNA R&S HL562 (30 MHz – 1 GHz)

($d_{\text{Limit}} = 3 \text{ m}$)

Frequency	AF R&S HL562	Corr.
MHz	dB (1/m)	dB
30	18.6	0.6
50	6.0	0.9
100	9.7	1.2
150	7.9	1.6
200	7.6	1.9
250	9.5	2.1
300	11.0	2.3
350	12.4	2.6
400	13.6	2.9
450	14.7	3.1
500	15.6	3.2
550	16.3	3.5
600	17.2	3.5
650	18.1	3.6
700	18.5	3.6
750	19.1	4.1
800	19.6	4.1
850	20.1	4.4
900	20.8	4.7
950	21.1	4.8
1000	21.6	4.9

cable loss 1 (inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit)	cable loss 4 (to receiver)	distance corr. (-20 dB/ decade)	d_{Limit} (meas. distance (limit))	d_{used} (meas. distance (used))
dB	dB	dB	dB	dB	m	m
0.29	0.04	0.23	0.02	0.0	3	3
0.39	0.09	0.32	0.08	0.0	3	3
0.56	0.14	0.47	0.08	0.0	3	3
0.73	0.20	0.59	0.12	0.0	3	3
0.84	0.21	0.70	0.11	0.0	3	3
0.98	0.24	0.80	0.13	0.0	3	3
1.04	0.26	0.89	0.15	0.0	3	3
1.18	0.31	0.96	0.13	0.0	3	3
1.28	0.35	1.03	0.19	0.0	3	3
1.39	0.38	1.11	0.22	0.0	3	3
1.44	0.39	1.20	0.19	0.0	3	3
1.55	0.46	1.24	0.23	0.0	3	3
1.59	0.43	1.29	0.23	0.0	3	3
1.67	0.34	1.35	0.22	0.0	3	3
1.67	0.42	1.41	0.15	0.0	3	3
1.87	0.54	1.46	0.25	0.0	3	3
1.90	0.46	1.51	0.25	0.0	3	3
1.99	0.60	1.56	0.27	0.0	3	3
2.14	0.60	1.63	0.29	0.0	3	3
2.22	0.60	1.66	0.33	0.0	3	3
2.23	0.61	1.71	0.30	0.0	3	3

($d_{\text{Limit}} = 10 \text{ m}$)

30	18.6	-9.9
50	6.0	-9.6
100	9.7	-9.2
150	7.9	-8.8
200	7.6	-8.6
250	9.5	-8.3
300	11.0	-8.1
350	12.4	-7.9
400	13.6	-7.6
450	14.7	-7.4
500	15.6	-7.2
550	16.3	-7.0
600	17.2	-6.9
650	18.1	-6.9
700	18.5	-6.8
750	19.1	-6.3
800	19.6	-6.3
850	20.1	-6.0
900	20.8	-5.8
950	21.1	-5.6
1000	21.6	-5.6

0.29	0.04	0.23	0.02	-10.5	10	3
0.39	0.09	0.32	0.08	-10.5	10	3
0.56	0.14	0.47	0.08	-10.5	10	3
0.73	0.20	0.59	0.12	-10.5	10	3
0.84	0.21	0.70	0.11	-10.5	10	3
0.98	0.24	0.80	0.13	-10.5	10	3
1.04	0.26	0.89	0.15	-10.5	10	3
1.18	0.31	0.96	0.13	-10.5	10	3
1.28	0.35	1.03	0.19	-10.5	10	3
1.39	0.38	1.11	0.22	-10.5	10	3
1.44	0.39	1.20	0.19	-10.5	10	3
1.55	0.46	1.24	0.23	-10.5	10	3
1.59	0.43	1.29	0.23	-10.5	10	3
1.67	0.34	1.35	0.22	-10.5	10	3
1.67	0.42	1.41	0.15	-10.5	10	3
1.87	0.54	1.46	0.25	-10.5	10	3
1.90	0.46	1.51	0.25	-10.5	10	3
1.99	0.60	1.56	0.27	-10.5	10	3
2.14	0.60	1.63	0.29	-10.5	10	3
2.22	0.60	1.66	0.33	-10.5	10	3
2.23	0.61	1.71	0.30	-10.5	10	3

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + \text{AF (dB 1/m)} + \text{Corr. (dB)}$
 U = Receiver reading
 AF = Antenna factor
 Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)
 $\text{distance correction} = -20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$
 Linear interpolation will be used for frequencies in between the values in the table.
 Tables show an extract of values.

7.4 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
1000	24.4	-19.4
2000	28.5	-17.4
3000	31.0	-16.1
4000	33.1	-14.7
5000	34.4	-13.7
6000	34.7	-12.7
7000	35.6	-11.0

cable loss 1 (relay + cable inside chamber)	cable loss 2 (outside chamber)	cable loss 3 (switch unit, atten- uator & pre-amp)	cable loss 4 (to receiver)		
dB	dB	dB	dB		
0.99	0.31	-21.51	0.79		
1.44	0.44	-20.63	1.38		
1.87	0.53	-19.85	1.33		
2.41	0.67	-19.13	1.31		
2.78	0.86	-18.71	1.40		
2.74	0.90	-17.83	1.47		
2.82	0.86	-16.19	1.46		

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
3000	31.0	-23.4
4000	33.1	-23.3
5000	34.4	-21.7
6000	34.7	-21.2
7000	35.6	-19.8

cable loss 1 (relay inside chamber)	cable loss 2 (inside chamber)	cable loss 3 (outside chamber)	cable loss 4 (switch unit, atten- uator & pre-amp)	cable loss 5 (to receiver)	used for FCC 15.247
dB	dB	dB	dB	dB	
0.47	1.87	0.53	-27.58	1.33	
0.56	2.41	0.67	-28.23	1.31	
0.61	2.78	0.86	-27.35	1.40	
0.58	2.74	0.90	-26.89	1.47	
0.66	2.82	0.86	-25.58	1.46	

Frequency	AF R&S HF907	Corr.
MHz	dB (1/m)	dB
7000	35.6	-57.3
8000	36.3	-56.3
9000	37.1	-55.3
10000	37.5	-56.2
11000	37.5	-55.3
12000	37.6	-53.7
13000	38.2	-53.5
14000	39.9	-56.3
15000	40.9	-54.1
16000	41.3	-54.1
17000	42.8	-54.4
18000	44.2	-54.7

cable loss 1 (relay inside chamber)	cable loss 2 (High Pass)	cable loss 3 (pre- amp)	cable loss 4 (inside chamber)	cable loss 5 (outside chamber)	cable loss 6 (to receiver)
dB	dB	dB	dB	dB	dB
0.56	1.28	-62.72	2.66	0.94	1.46
0.69	0.71	-61.49	2.84	1.00	1.53
0.68	0.65	-60.80	3.06	1.09	1.60
0.70	0.54	-61.91	3.28	1.20	1.67
0.80	0.61	-61.40	3.43	1.27	1.70
0.84	0.42	-59.70	3.53	1.26	1.73
0.83	0.44	-59.81	3.75	1.32	1.83
0.91	0.53	-63.03	3.91	1.40	1.77
0.98	0.54	-61.05	4.02	1.44	1.83
1.23	0.49	-61.51	4.17	1.51	1.85
1.36	0.76	-62.36	4.34	1.53	2.00
1.70	0.53	-62.88	4.41	1.55	1.91

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Tables show an extract of values.

7.5 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

Frequency	AF EMCO 3160-09	Corr.	cable loss 1 (inside chamber)	cable loss 2 (pre- amp)	cable loss 3 (inside chamber)	cable loss 4 (switch unit)	cable loss 5 (to receiver)
MHz	dB (1/m)	dB	dB	dB	dB	dB	dB
18000	40.2	-23.5	0.72	-35.85	6.20	2.81	2.65
18500	40.2	-23.2	0.69	-35.71	6.46	2.76	2.59
19000	40.2	-22.0	0.76	-35.44	6.69	3.15	2.79
19500	40.3	-21.3	0.74	-35.07	7.04	3.11	2.91
20000	40.3	-20.3	0.72	-34.49	7.30	3.07	3.05
20500	40.3	-19.9	0.78	-34.46	7.48	3.12	3.15
21000	40.3	-19.1	0.87	-34.07	7.61	3.20	3.33
21500	40.3	-19.1	0.90	-33.96	7.47	3.28	3.19
22000	40.3	-18.7	0.89	-33.57	7.34	3.35	3.28
22500	40.4	-19.0	0.87	-33.66	7.06	3.75	2.94
23000	40.4	-19.5	0.88	-33.75	6.92	3.77	2.70
23500	40.4	-19.3	0.90	-33.35	6.99	3.52	2.66
24000	40.4	-19.8	0.88	-33.99	6.88	3.88	2.58
24500	40.4	-19.5	0.91	-33.89	7.01	3.93	2.51
25000	40.4	-19.3	0.88	-33.00	6.72	3.96	2.14
25500	40.5	-20.4	0.89	-34.07	6.90	3.66	2.22
26000	40.5	-21.3	0.86	-35.11	7.02	3.69	2.28
26500	40.5	-21.1	0.90	-35.20	7.15	3.91	2.36

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

7.6 ANTENNA EMCO 3160-10 (26.5 GHZ – 40 GHZ)

Frequency GHz	AF EMCO 3160-10 dB (1/m)	Corr. dB	cable loss 1 (inside chamber) dB	cable loss 2 (outside chamber) dB	cable loss 3 (switch unit) dB	cable loss 4 (to receiver) dB	distance corr. (-20 dB/ decade) dB	d _{Limit} (meas. distance (limit) m	d _{used} (meas. distance (used) m
26.5	43.4	-11.2	4.4				-9.5	3	1.0
27.0	43.4	-11.2	4.4				-9.5	3	1.0
28.0	43.4	-11.1	4.5				-9.5	3	1.0
29.0	43.5	-11.0	4.6				-9.5	3	1.0
30.0	43.5	-10.9	4.7				-9.5	3	1.0
31.0	43.5	-10.8	4.7				-9.5	3	1.0
32.0	43.5	-10.7	4.8				-9.5	3	1.0
33.0	43.6	-10.7	4.9				-9.5	3	1.0
34.0	43.6	-10.6	5.0				-9.5	3	1.0
35.0	43.6	-10.5	5.1				-9.5	3	1.0
36.0	43.6	-10.4	5.1				-9.5	3	1.0
37.0	43.7	-10.3	5.2				-9.5	3	1.0
38.0	43.7	-10.2	5.3				-9.5	3	1.0
39.0	43.7	-10.2	5.4				-9.5	3	1.0
40.0	43.8	-10.1	5.5				-9.5	3	1.0

Sample calculation

$E \text{ (dB } \mu\text{V/m)} = U \text{ (dB } \mu\text{V)} + AF \text{ (dB 1/m)} + Corr. \text{ (dB)}$

U = Receiver reading

AF = Antenna factor

Corr. = sum of single correction factors of used cables, switch unit, distance correction, amplifier (if applicable)

Linear interpolation will be used for frequencies in between the values in the table.

distance correction = $-20 * \text{LOG} (d_{\text{Limit}} / d_{\text{used}})$

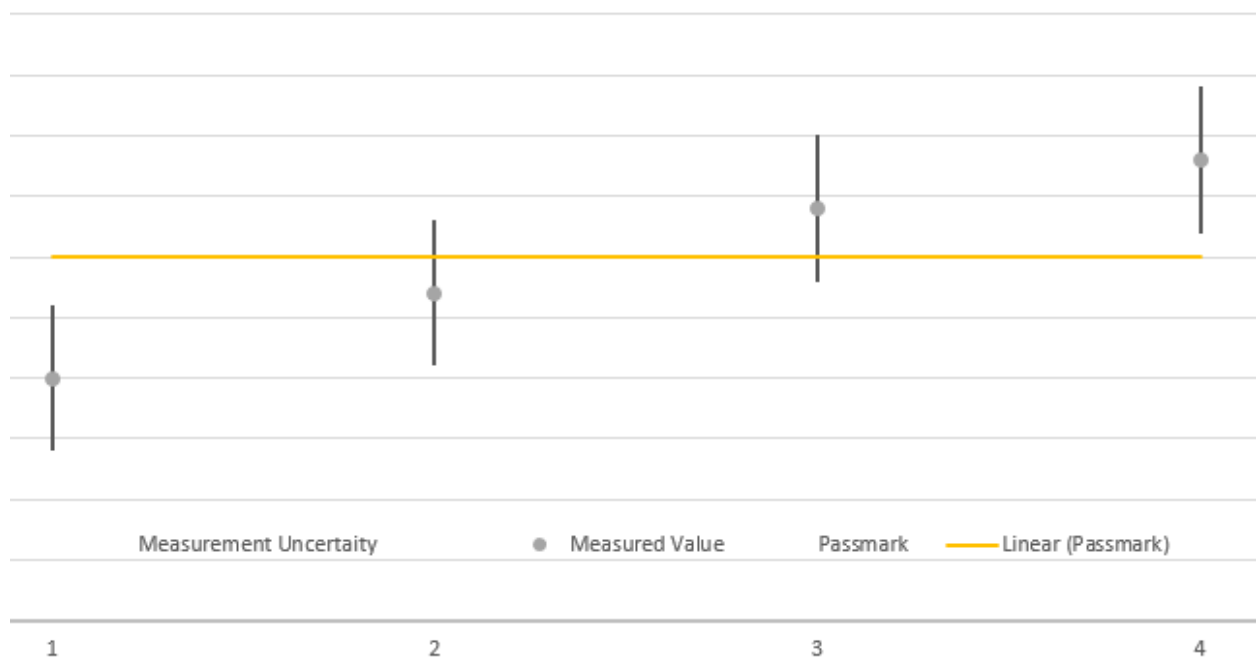
Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

8 MEASUREMENT UNCERTAINTIES

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

The measurement uncertainties for all parameters are calculated with an expansion factor (coverage factor) $k = 1.96$. This means, that the true value is in the corresponding interval with a probability of 95 %.



The verdicts in this test report are given according the above diagram:

Case	Measured Value	Uncertainty Range	Verdict
1	below pass mark	below pass mark	Passed
2	below pass mark	within pass mark	Passed
3	above pass mark	within pass mark	Failed
4	above pass mark	above pass mark	Failed

That means, the laboratory applies, as decision rule (see ISO/IEC 17025:2017), the so called shared risk principle.

9 PHOTO REPORT

Please see separate photo report.