

# FCC Measurement/Technical Report on

## Oshkosh NGDV

## SCM2

### FCC ID: 2AJW5-SCM2

**Test Report Reference:** MDE\_CONTI\_2308\_FCC\_02

#### Test Laboratory:

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Borsigstrasse 11  
40880 Ratingen  
Germany



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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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## Table of Contents

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>Applied Standards and Test Summary</b>                  | <b>3</b>  |
| 1.1      | Applied Standards  | 3         |
| 1.2      | FCC-IC Correlation Table                                   | 4         |
| 1.3      | Measurement Summary  | 5         |
| <b>2</b> | <b>Revision History / Signatures</b>                       | <b>9</b>  |
| <b>3</b> | <b>Administrative Data</b>                                 | <b>10</b> |
| 3.1      | Testing Laboratory   | 10        |
| 3.2      | Project Data   | 10        |
| 3.3      | Applicant Data   | 10        |
| 3.4      | Manufacturer Data  | 11        |
| <b>4</b> | <b>Test object Data</b>                                    | <b>12</b> |
| 4.1      | General EUT Description                                    | 12        |
| 4.2      | EUT Main components  | 12        |
| 4.3      | Ancillary Equipment  | 13        |
| 4.4      | Auxiliary Equipment  | 14        |
| 4.5      | EUT Setups   | 14        |
| 4.6      | Operating Modes / Test Channels                            | 15        |
| 4.7      | Product labelling  | 16        |
| <b>5</b> | <b>Test Results</b>  | <b>17</b> |
| 5.1      | Occupied Bandwidth (6 dB)                                  | 17        |
| 5.2      | Occupied Bandwidth (99%)                                   | 21        |
| 5.3      | Peak Power Output  | 25        |
| 5.4      | Spurious RF Conducted Emissions                            | 29        |
| 5.5      | Transmitter Spurious Radiated Emissions                    | 34        |
| 5.6      | Band Edge Compliance Conducted                             | 51        |
| 5.7      | Band Edge Compliance Radiated                              | 58        |
| 5.8      | Power Density  | 66        |
| <b>6</b> | <b>Test Equipment</b>                                      | <b>71</b> |
| 6.1      | Test Equipment Hardware                                    | 71        |
| 6.2      | Test Equipment Software                                    | 74        |
| <b>7</b> | <b>Antenna Factors, Cable Loss and Sample Calculations</b> | <b>75</b> |
| 7.1      | Antenna R&S HFH2-Z2 (9 kHz – 30 MHz)                       | 75        |
| 7.2      | Antenna R&S HL562 (30 MHz – 1 GHz)                         | 76        |
| 7.3      | Antenna R&S HF907 (1 GHz – 18 GHz)                         | 77        |
| 7.4      | Antenna EMCO 3160-09 (18 GHz – 26.5 GHz)                   | 78        |
| <b>8</b> | <b>Measurement Uncertainties</b>                           | <b>79</b> |
| <b>9</b> | <b>Photo Report</b>  | <b>80</b> |

## 1 APPLIED STANDARDS AND TEST SUMMARY

### 1.1 APPLIED STANDARDS

#### **Type of Authorization**

Certification for an Intentional Radiator.

#### **Applicable FCC Rules**

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 and 15 (10-1-21 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

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz

#### **Note:**

The tests were selected and performed with reference to the FCC Public Notice "Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules, 558074 D01 15.247 Meas Guidance v05r02, 2019-04-02". ANSI C63.10–2013 is applied.

## 1.2 FCC-IC CORRELATION TABLE

### Correlation of measurement requirements for DTS (e.g. WLAN 2.4 GHz, BT LE) equipment from FCC and IC

#### DTS equipment

| Measurement                                 | FCC reference                 | IC reference  |
|---|-------------------------------|---|
| Conducted emissions on AC Mains             | § 15.207                      | RSS-Gen Issue 5: 8.8                                      |
| Occupied bandwidth                          | § 15.247 (a) (2)              | RSS-247 Issue 2: 5.2 (a)                                  |
| Peak conducted output power                 | § 15.247 (b) (3), (4)         | RSS-247 Issue 2: 5.4 (d)                                  |
| Transmitter spurious RF conducted emissions | § 15.247 (d)                  | RSS-Gen Issue 5: 6.13 / 8.9/8.10;<br>RSS-247 Issue 2: 5.5 |
| Transmitter spurious radiated emissions     | § 15.247 (d);<br>§ 15.209 (a) | RSS-Gen Issue 5: 6.13 / 8.9/8.10;<br>RSS-247 Issue 2: 5.5 |
| Band edge compliance                        | § 15.247 (d)                  | RSS-247 Issue 2: 5.5                                      |
| Power density                               | § 15.247 (e)                  | RSS-247 Issue 2: 5.2 (b)                                  |
| 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 § 15.247 (a) (2)**  
**Subpart C §15.247**

Occupied Bandwidth (6 dB)  
 The measurement was performed according to ANSI C63.10, chapter 11.8.1 **Final Result**

| <b>OP-Mode</b>                        | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|---------------------------------------|--------------|-------------|------------|-----------|
| Radio Technology, Operating Frequency |              |             |            |           |
| Bluetooth LE 1 Mbps, high             | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, low              | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, mid              | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, high                          | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, low                           | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, mid                           | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| WLAN g, high                          | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, low                           | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, mid                           | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, high                   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, low                    | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, mid                    | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, high                   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, low                    | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, mid                    | S01_AF01     | 2023-09-13  | Passed     | Passed    |

**47 CFR CHAPTER I FCC PART 15 IC RSS-Gen; Ch. 6.7 & Ch. 8**  
**Subpart C §15.247**

Occupied Bandwidth (99%)  
 The measurement was performed according to ANSI C63.10, chapter 6.9.3 **Final Result**

| <b>OP-Mode</b>                        | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|---------------------------------------|--------------|-------------|------------|-----------|
| Radio Technology, Operating Frequency |              |             |            |           |
| Bluetooth LE 1 Mbps, high             | S01_AF01     | 2023-09-14  | N/A        | Performed |
| Bluetooth LE 1 Mbps, low              | S01_AF01     | 2023-09-14  | N/A        | Performed |
| Bluetooth LE 1 Mbps, mid              | S01_AF01     | 2023-09-14  | N/A        | Performed |
| WLAN b, high                          | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN b, low                           | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN b, mid                           | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN g, high                          | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN g, low                           | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN g, mid                           | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN n 20 MHz, high                   | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN n 20 MHz, low                    | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN n 20 MHz, mid                    | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN n 40 MHz, high                   | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN n 40 MHz, low                    | S01_AF01     | 2023-09-13  | N/A        | Performed |
| WLAN n 40 MHz, mid                    | S01_AF01     | 2023-09-13  | N/A        | Performed |

**47 CFR CHAPTER I FCC PART 15**  
**Subpart C §15.247**

**§ 15.247 (b) (3)**

Peak Power Output

The measurement was performed according to ANSI C63.10, chapter 11.9.1.3

**Final Result**

| <b>OP-Mode</b><br>Radio Technology, Operating Frequency,<br>Measurement method | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|--|--------------|-------------|------------|-----------|
| Bluetooth LE 1 Mbps, high, conducted   | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, low, conducted  | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, mid, conducted  | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, high, conducted  | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN b, low, conducted   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN b, mid, conducted   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, high, conducted  | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, low, conducted   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, mid, conducted   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, high, conducted   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, low, conducted  | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, mid, conducted  | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, high, conducted   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, low, conducted  | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, mid, conducted  | S01_AF01     | 2023-09-13  | Passed     | Passed    |

**47 CFR CHAPTER I FCC PART 15**  
**Subpart C §15.247**

**§ 15.247 (d)**

Spurious RF Conducted Emissions

The measurement was performed according to ANSI C63.10, chapter 11.11

**Final Result**

| <b>OP-Mode</b><br>Radio Technology, Operating Frequency | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|---|--------------|-------------|------------|-----------|
| Bluetooth LE 1 Mbps, high                               | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, low                                | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, mid                                | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN b, high  | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN b, low   | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN b, mid   | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN g, high  | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN g, low   | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN g, mid   | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN n 20 MHz, high                                     | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN n 20 MHz, low                                      | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN n 20 MHz, mid                                      | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN n 40 MHz, high                                     | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN n 40 MHz, low                                      | S01_AB01     | 2023-11-15  | Passed     | Passed    |
| WLAN n 40 MHz, mid                                      | S01_AB01     | 2023-11-15  | Passed     | Passed    |

**47 CFR CHAPTER I FCC PART 15**  
**Subpart C §15.247**

**§ 15.247 (d)**

Transmitter Spurious Radiated Emissions

The measurement was performed according to ANSI C63.10, chapter 6.4, 6.5, 6.6.5

**Final Result**

| <b>OP-Mode</b>   | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|--|--------------|-------------|------------|-----------|
| Radio Technology, Operating Frequency, Measurement range |              |             |            |           |
| Bluetooth LE 1 Mbps, high, 1 GHz - 26 GHz                | S01_AA01     | 2023-10-13  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, high, 30 MHz - 1 GHz                | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, low, 1 GHz - 26 GHz                 | S01_AA01     | 2023-10-13  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, low, 30 MHz - 1 GHz                 | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, mid, 1 GHz - 26 GHz                 | S01_AA01     | 2023-10-13  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, mid, 30 MHz - 1 GHz                 | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, mid, 9 kHz - 30 MHz                 | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, high, 1 GHz - 26 GHz                             | S01_AK01     | 2023-09-06  | Passed     | Passed    |
| WLAN b, high, 30 MHz - 1 GHz                             | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, low, 1 GHz - 26 GHz                              | S01_AK01     | 2023-09-06  | Passed     | Passed    |
| WLAN b, low, 30 MHz - 1 GHz                              | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, mid, 1 GHz - 26 GHz                              | S01_AK01     | 2023-09-06  | Passed     | Passed    |
| WLAN b, mid, 30 MHz - 1 GHz                              | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, mid, 9 kHz - 30 MHz                              | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| WLAN g, high, 1 GHz - 26 GHz                             | S01_AA01     | 2023-09-29  | Passed     | Passed    |
| WLAN g, low, 1 GHz - 26 GHz                              | S01_AA01     | 2023-09-29  | Passed     | Passed    |
| WLAN g, mid, 1 GHz - 26 GHz                              | S01_AA01     | 2023-09-29  | Passed     | Passed    |
| WLAN b + Bluetooth LE 1 Mbps, high + low, 1 GHz - 26 GHz | S01_AA01     | 2023-09-29  | Passed     | Passed    |

**47 CFR CHAPTER I FCC PART 15**  
**Subpart C §15.247**

**§ 15.247 (d)**

Band Edge Compliance Conducted

The measurement was performed according to ANSI C63.10, chapter 11.11

**Final Result**

| <b>OP-Mode</b>                                   | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|--|--------------|-------------|------------|-----------|
| Radio Technology, Operating Frequency, Band Edge |              |             |            |           |
| Bluetooth LE 1 Mbps, high, high                  | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, low, low                    | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, high, high                               | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN b, low, low                                 | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, high, high                               | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, low, low                                 | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, high, high                        | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, low, low                          | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, high, high                        | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, low, low                          | S01_AF01     | 2023-09-13  | Passed     | Passed    |

**47 CFR CHAPTER I FCC PART 15 § 15.247 (d)**  
**Subpart C §15.247**

Band Edge Compliance Radiated  
 The measurement was performed according to ANSI C63.10, chapter 6.6.5 **Final Result**

| <b>OP-Mode</b>                                   | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|--|--------------|-------------|------------|-----------|
| Radio Technology, Operating Frequency, Band Edge |              |             |            |           |
| Bluetooth LE 1 Mbps, high, high                  | S01_AA01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, high, high                               | S01_AK01     | 2023-09-06  | Passed     | Passed    |
| WLAN g, high, high                               | S01_AA01     | 2023-09-29  | Passed     | Passed    |
| WLAN n 20 MHz, high, high                        | S01_AA01     | 2023-09-29  | Passed     | Passed    |
| WLAN n 40 MHz, high, high                        | S01_AA01     | 2023-09-29  | Passed     | Passed    |

**47 CFR CHAPTER I FCC PART 15 § 15.247 (e)**  
**Subpart C §15.247**

Power Density  
 The measurement was performed according to ANSI C63.10, chapter 11.10.2 **Final Result**

| <b>OP-Mode</b>                        | <b>Setup</b> | <b>Date</b> | <b>FCC</b> | <b>IC</b> |
|---------------------------------------|--------------|-------------|------------|-----------|
| Radio Technology, Operating Frequency |              |             |            |           |
| Bluetooth LE 1 Mbps, high             | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, low              | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| Bluetooth LE 1 Mbps, mid              | S01_AF01     | 2023-09-14  | Passed     | Passed    |
| WLAN b, high                          | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN b, low                           | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN b, mid                           | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, high                          | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, low                           | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN g, mid                           | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, high                   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, low                    | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 20 MHz, mid                    | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, high                   | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, low                    | S01_AF01     | 2023-09-13  | Passed     | Passed    |
| WLAN n 40 MHz, mid                    | S01_AF01     | 2023-09-13  | 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                | 2023-11-29   | --                 | valid            |
| --                     | --           | --                 | --               |

COMMENT:



(responsible for accreditation scope)  
Dipl.-Ing. Daniel Gall



(responsible for testing and report)  
BSc. Mhd Mouaz Saad



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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. Daniel Gall

Report Template Version: 2023-09-29

#### 3.2 PROJECT DATA

Responsible for testing and report: BSc. Mhd Mouaz Saad  
Employees who performed the tests: documented internally at 7Layers  
Date of Report: 2023-11-29  
Testing Period: 2023-09-06 to 2023-10-13

#### 3.3 APPLICANT DATA

Company Name: Continental Automotive Technologies GmbH  
Address: Heinrich-Hertz-Str. 45  
78052, Villingen- Schwenningen  
Germany  
Contact Person: Marion Grüner

### 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<br>product description           | vehicle mounted telematics device   |
| Product name                                    | Oshkosh NGDV  |
| Type  | SCM2  |
| <b>Declared EUT data by the supplier</b>        |   |
| Voltage Level / Type                            | 12 V (DC)   |
| Antenna / Gain                                  | Integral / 5.7 dBi  |
| Tested Modulation Type                          | BTLE: GFSK<br>WLAN: WLAN b: DSSS, WLAN g/n: OFDM  |
| General product<br>description                  | <p>TCU is a vehicle mounted telematics device incorporating:</p> <ul style="list-style-type: none"> <li>- GNSS for vehicle location and tracking</li> <li>- 2.4 GHz Wi-Fi and dual mode Bluetooth for peripheral connectivity</li> <li>- LTE/UMTS/GSM data-modem for offloading data to back-end servers.</li> </ul> <p>Internal Bluetooth/WiFi on-board antennas are included. For GNSS and cellular external antennas are required</p> <p>Relevant for this report is Bluetooth Low Energy and WLAN. The Bluetooth Low Energy transmitter supports 1 Mbps, the WLAN transmitter supports WLAN b, g and n in 20 MHz BW as well as n in 40 MHz BW. 20 MHz channels 12 and 13 are not supported.</p> |
| EUT ports (connected<br>cables during testing): | <ul style="list-style-type: none"> <li>- DC cable Harness</li> <li>- GNSS/Cellular antenna port</li> <li>- USB connector (for testing purposes only)</li> </ul>   |
| Tested datarates                                | BTLE: 1Mbps<br>WLAN b: 1 Mbps, WLAN g: 6 Mbps, WLAN n: MCS0   |
| Special software used<br>for testing            | ADB Shell   |

### 4.2 EUT MAIN COMPONENTS

| Sample Name      | Sample Code               | Description     |
|------------------|---------------------------|-----------------|
| EUT A            | DE1304048aa01             | Radiated Sample |
| Sample Parameter | Value                     |                 |
| Serial No.       | FCC003                    |                 |
| HW Version       | AAA2358110000             |                 |
| SW Version       | SW Version: LEAP 29.1.0.0 |                 |
| Comment          | -                         |                 |

| <b>Sample Name</b>      | <b>Sample Code</b>        | <b>Description</b> |
|-------------------------|---------------------------|--------------------|
| EUT B                   | DE1304048ab01             | Conducted Sample   |
| <b>Sample Parameter</b> | <b>Value</b>              |                    |
| Serial No.              | OBT001                    |                    |
| HW Version              | AAA2358110000             |                    |
| SW Version              | SW Version: LEAP 29.1.0.0 |                    |
| Comment                 | -                         |                    |

| <b>Sample Name</b>      | <b>Sample Code</b>        | <b>Description</b> |
|-------------------------|---------------------------|--------------------|
| EUT F                   | DE1304048af01             | Conducted Sample   |
| <b>Sample Parameter</b> | <b>Value</b>              |                    |
| Serial No.              | OBT003                    |                    |
| HW Version              | AAA2358110000             |                    |
| SW Version              | SW Version: LEAP 29.1.0.0 |                    |
| Comment                 | -                         |                    |

| <b>Sample Name</b>      | <b>Sample Code</b>        | <b>Description</b> |
|-------------------------|---------------------------|--------------------|
| EUT K                   | DE1304048ak01             | Radiated Sample    |
| <b>Sample Parameter</b> | <b>Value</b>              |                    |
| Serial No.              | FCC001                    |                    |
| HW Version              | AAA2358110000             |                    |
| SW Version              | SW Version: LEAP 29.1.0.0 |                    |
| 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.

| <b>Device</b> | <b>Details<br/>(Manufacturer, Type Model, OUT Code)</b> | <b>Description</b> |
|---------------|---|--------------------|
| -             | -   | -                  |

#### 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.

| <b>Device</b> | <b>Details<br/>(Manufacturer, Type Model, HW,<br/>SW, S/N)</b> | <b>Description</b>        |
|---------------|--|---------------------------|
| AUX01         | Molex, -, -, -, -  | Cellular/GNSS Antenna     |
| AUX02         | Continental, Tyco, -, -, 638677                                | Main Connector 28 PIN     |
| AUX03         | Rosenberger, -, -, -, 5921D                                    | Cellular/GNSS Fakra cable |

#### 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.

| <b>Setup</b> | <b>Combination of EUTs</b>    | <b>Description and Rationale</b> |
|--------------|-------------------------------|----------------------------------|
| S01_AA01     | EUT A, AUX 01, AUX 02, AUX 03 | Radiated Setup                   |
| S01_AB01     | EUT B, AUX 02, AUX 03         | Conducted Setup                  |
| S01_AF01     | EUT F, AUX 02, AUX 03         | Conducted Setup                  |
| S01_AK01     | EUT K, AUX 01, AUX 02, AUX 03 | Radiated Setup                   |

#### 4.6 OPERATING MODES / TEST CHANNELS

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

##### WLAN

##### 20 MHz Test Channels:

Channel:

Frequency [MHz]

| 2.4 GHz ISM<br>2400 - 2483.5 MHz |      |      |
|----------------------------------|------|------|
| low                              | mid  | high |
| 1                                | 6    | 11   |
| 2412                             | 2437 | 2462 |

##### 40 MHz Test Channels:

Channel:

Frequency [MHz]

| low  | mid  | high |
|------|------|------|
| 3    | 6    | 11   |
| 2422 | 2437 | 2462 |

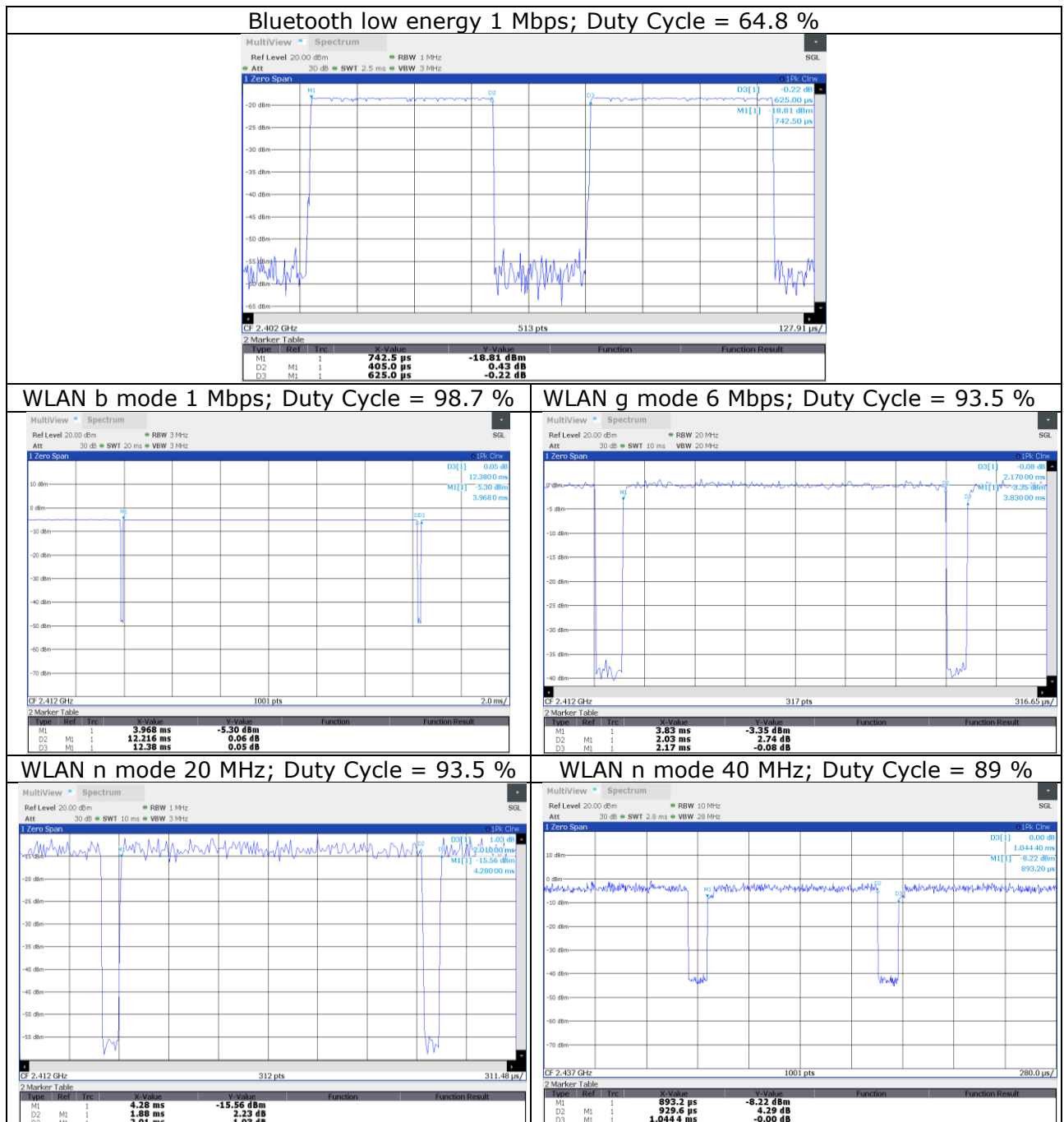
##### BT LE Test Channels:

Channel:

Frequency [MHz]

| 2.4 GHz ISM<br>2400 - 2483.5 MHz |      |      |
|----------------------------------|------|------|
| low                              | mid  | high |
| 0                                | 19   | 39   |
| 2402                             | 2440 | 2480 |

## Duty Cycle:



## 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 OCCUPIED BANDWIDTH (6 DB)

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**

ANSI C63.10, chapter 11.8.1

#### 5.1.1 TEST DESCRIPTION

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

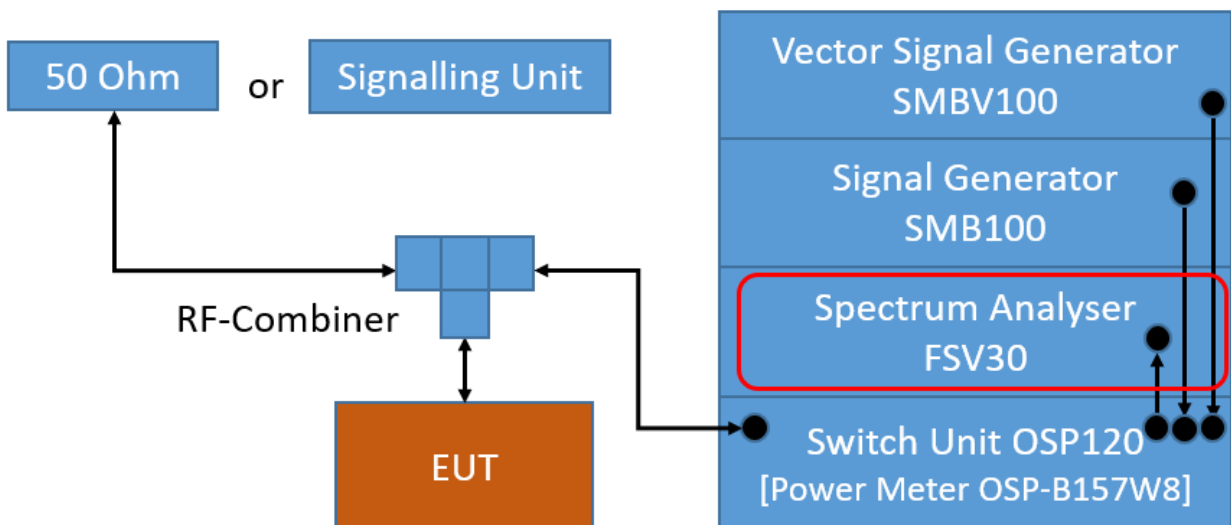
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

The results recorded were measured with the modulation which produce the worst-case (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.

Analyser settings:

- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Span: Two times nominal bandwidth
- Trace: Maxhold
- Sweeps: Till stable (min. 500, max. 15000)
- Sweeptime: Auto
- Detector: Peak



TS8997; Channel Bandwidth

### 5.1.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (a) (2)

Systems using digital modulation techniques may operate in the 902-928 MHz and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### 5.1.3 TEST PROTOCOL

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 BT LE 1 Mbit/s

| Band / Mode | Channel No. | Frequency [MHz] | 6 dB Bandwidth [MHz] | Limit [MHz] | Margin to Limit [MHz] |
|-------------|-------------|-----------------|----------------------|-------------|-----------------------|
| 2.4 GHz ISM | 0           | 2402            | 0.792                | 0.5         | 0.292                 |
|             | 19          | 2440            | 0.713                | 0.5         | 0.213                 |
|             | 39          | 2480            | 0.745                | 0.5         | 0.245                 |

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s

| Band        | Channel No. | Frequency [MHz] | 6 dB Bandwidth [MHz] | Limit [MHz] | Margin to Limit [MHz] |
|-------------|-------------|-----------------|----------------------|-------------|-----------------------|
| 2.4 GHz ISM | 1           | 2412            | 7.7                  | 0.5         | 7.2                   |
|             | 6           | 2437            | 8.2                  | 0.5         | 7.7                   |
|             | 11          | 2462            | 8.2                  | 0.5         | 7.7                   |

WLAN g-Mode; 20 MHz; 6 Mbit/s

| Band        | Channel No. | Frequency [MHz] | 6 dB Bandwidth [MHz] | Limit [MHz] | Margin to Limit [MHz] |
|-------------|-------------|-----------------|----------------------|-------------|-----------------------|
| 2.4 GHz ISM | 1           | 2412            | 15.8                 | 0.5         | 15.3                  |
|             | 6           | 2437            | 16.1                 | 0.5         | 15.6                  |
|             | 11          | 2462            | 16.4                 | 0.5         | 15.9                  |

WLAN n-Mode; 20 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | 6 dB Bandwidth [MHz] | Limit [MHz] | Margin to Limit [MHz] |
|-------------|-------------|-----------------|----------------------|-------------|-----------------------|
| 2.4 GHz ISM | 1           | 2412            | 16.6                 | 0.5         | 16.1                  |
|             | 6           | 2437            | 16.8                 | 0.5         | 16.3                  |
|             | 11          | 2462            | 17.7                 | 0.5         | 17.2                  |

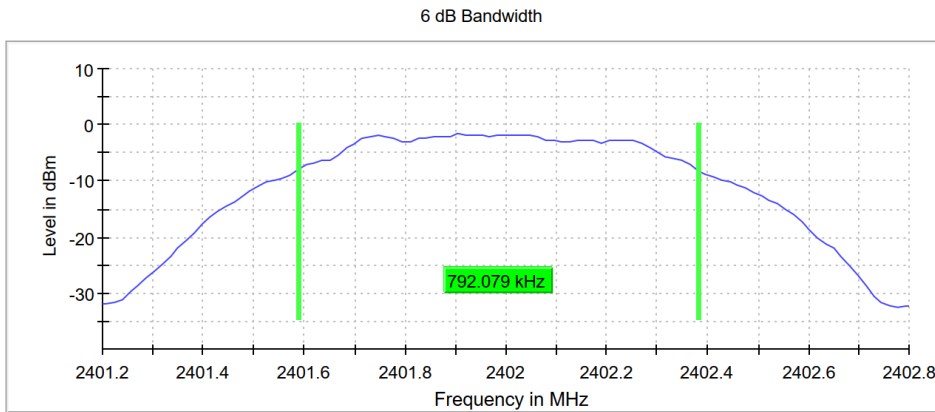
WLAN n-Mode; 40 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | 6 dB Bandwidth [MHz] | Limit [MHz] | Margin to Limit [MHz] |
|-------------|-------------|-----------------|----------------------|-------------|-----------------------|
| 2.4 GHz ISM | 3           | 2422            | 35.4                 | 0.5         | 34.9                  |
|             | 6           | 2437            | 35.3                 | 0.5         | 34.8                  |
|             | 11          | 2462            | 35.6                 | 0.5         | 35.1                  |

Remark: Please see next sub-clause for the measurement plot.

### 5.1.4 MEASUREMENT PLOT (EXAMPLE PLOT, SHOWING WORST CASE, IF APPLICABLE)

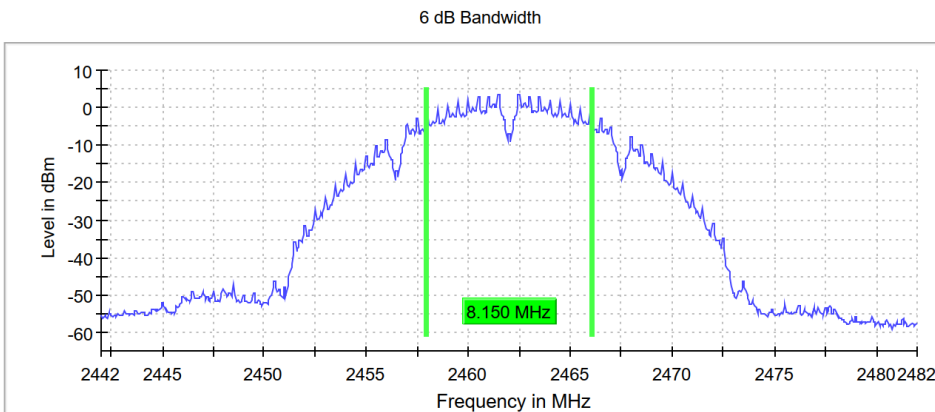
Modulation= Bluetooth LE 1 Mbps, Operating Channel = low  
(S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.40120 GHz      |
| Stop Frequency        | 2.40280 GHz      |
| Span                  | 1.600 MHz        |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 101              |
| Sweptime              | 41.920 $\mu$ s   |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | FFT              |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 13 / max. 150    |
| Stable                | 5 / 5            |
| Max Stable Difference | 0.10 dB          |

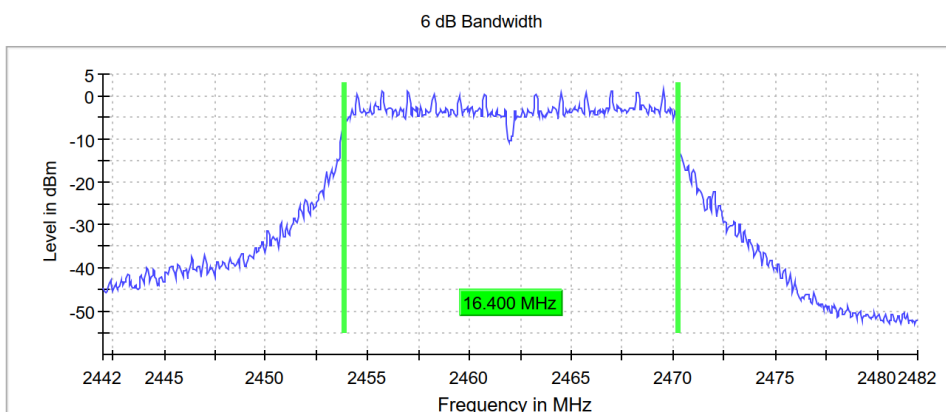
Modulation= WLAN b, Operating Channel = high  
(S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.44200 GHz      |
| Stop Frequency        | 2.48200 GHz      |
| Span                  | 40.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 800              |
| Sweptime              | 1.040 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 18 / max. 150    |
| Stable                | 5 / 5            |
| Max Stable Difference | 0.14 dB          |

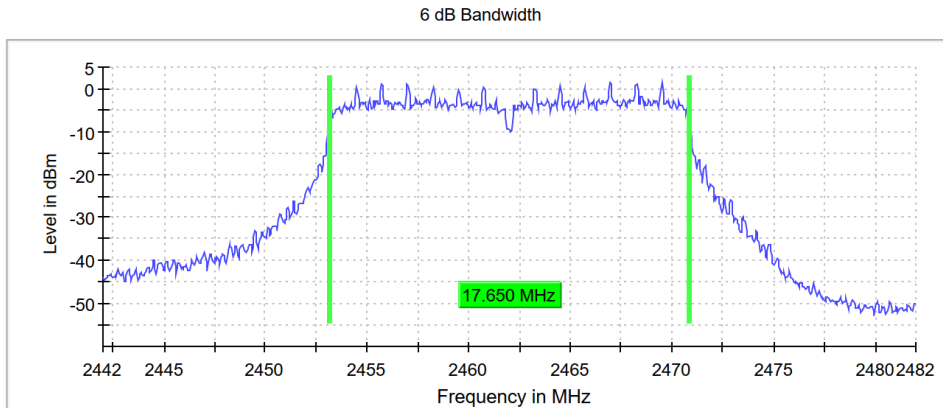
Modulation= WLAN g, Operating Channel = high  
(S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.44200 GHz      |
| Stop Frequency        | 2.48200 GHz      |
| Span                  | 40.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 800              |
| Sweptime              | 1.040 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 22 / max. 150    |
| Stable                | 5 / 5            |
| Max Stable Difference | 0.31 dB          |

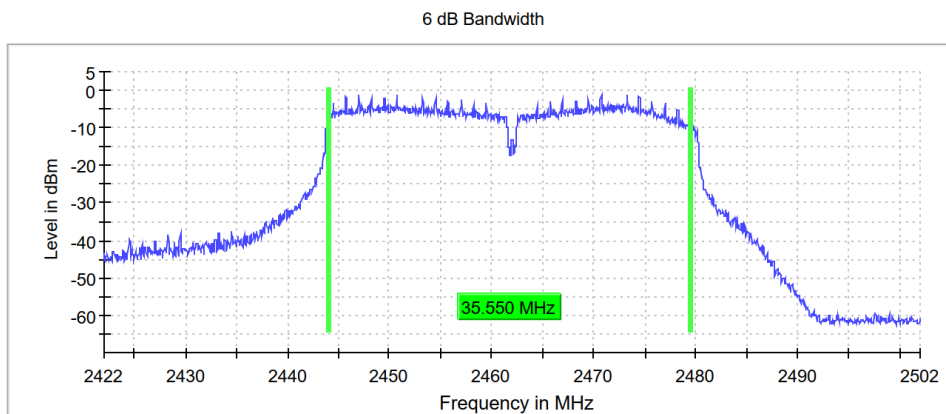
Modulation= WLAN n 20 MHz, Operating Channel = high  
(S01\_AF01)



### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.44200 GHz      |
| Stop Frequency        | 2.48200 GHz      |
| Span                  | 40.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 800              |
| SweepTime             | 1.040 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 26 / max. 150    |
| Stable                | 5 / 5            |
| Max Stable Difference | 0.18 dB          |

Modulation= WLAN n 40 MHz, Operating Channel = high  
(S01\_AF01)



### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.42200 GHz      |
| Stop Frequency        | 2.50200 GHz      |
| Span                  | 80.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 1600             |
| SweepTime             | 1.600 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 88 / max. 150    |
| Stable                | 5 / 5            |
| Max Stable Difference | 0.24 dB          |

## 5.1.5 TEST EQUIPMENT USED

- R&S TS8997

## 5.2 OCCUPIED BANDWIDTH (99%)

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**  
ANSI C63.10, chapter 6.9.3

### 5.2.1 TEST DESCRIPTION

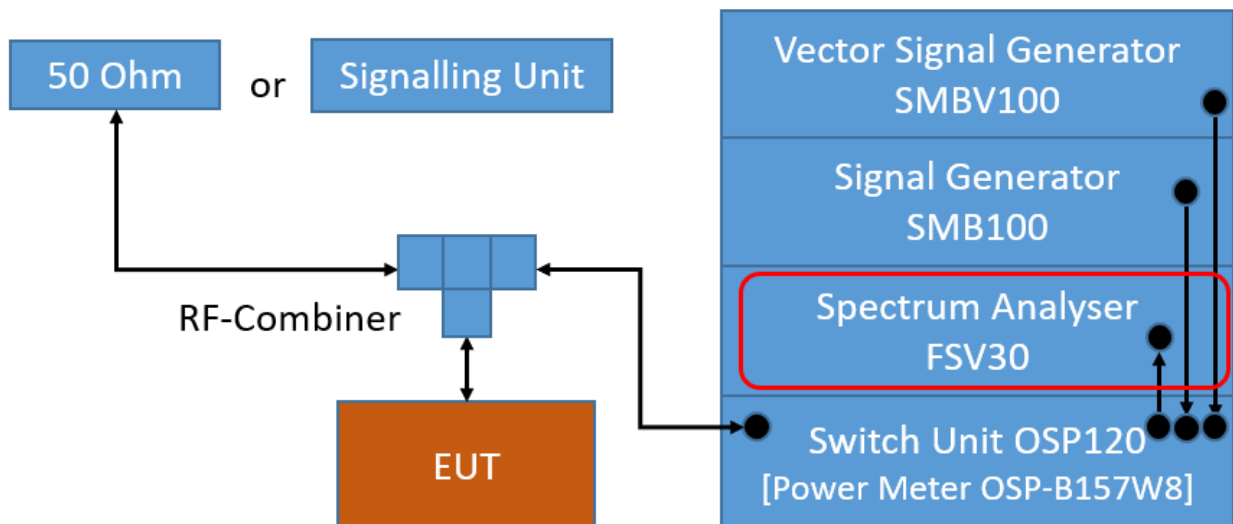
The Equipment Under Test (EUT) was set up to perform the occupied bandwidth measurements.

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 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.

Analyser settings:

- Resolution Bandwidth (RBW): 1 to 5 % of the OBW
- Video Bandwidth (VBW):  $\geq 3$  times the RBW
- Span: 1.5 to 5 times the OBW
- Trace: Maxhold
- Sweeps: Till stable (min. 500, max. 75000)
- Sweptime: Auto
- Detector: Peak



TS8997; Channel Bandwidth

### 5.2.2 TEST REQUIREMENTS / LIMITS

No applicable limit.

### 5.2.3 TEST PROTOCOL

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 BT LE 1 Mbit/s

| Band        | Channel No. | Frequency [MHz] | 99 % Bandwidth [MHz] |
|-------------|-------------|-----------------|----------------------|
| 2.4 GHz ISM | 0           | 2402            | 1.050                |
|             | 19          | 2440            | 1.050                |
|             | 39          | 2480            | 1.050                |

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s

| Band        | Channel No. | Frequency [MHz] | 99 % Bandwidth [MHz] |
|-------------|-------------|-----------------|----------------------|
| 2.4 GHz ISM | 1           | 2412            | 13.0                 |
|             | 6           | 2437            | 13.0                 |
|             | 11          | 2462            | 13.4                 |

WLAN g-Mode; 20 MHz; 6 Mbit/s

| Band        | Channel No. | Frequency [MHz] | 99 % Bandwidth [MHz] |
|-------------|-------------|-----------------|----------------------|
| 2.4 GHz ISM | 1           | 2412            | 16.4                 |
|             | 6           | 2437            | 16.5                 |
|             | 11          | 2462            | 16.6                 |

WLAN n-Mode; 20 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | 99 % Bandwidth [MHz] |
|-------------|-------------|-----------------|----------------------|
| 2.4 GHz ISM | 1           | 2412            | 17.5                 |
|             | 6           | 2437            | 17.6                 |
|             | 11          | 2462            | 17.7                 |

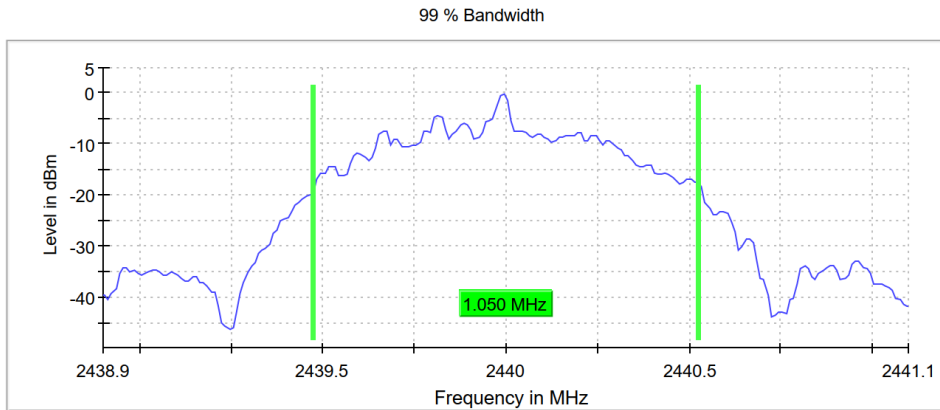
WLAN n-Mode; 40 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | 99 % Bandwidth [MHz] |
|-------------|-------------|-----------------|----------------------|
| 2.4 GHz ISM | 3           | 2422            | 36.5                 |
|             | 6           | 2437            | 36.3                 |
|             | 11          | 2462            | 36.3                 |

Remark: Please see next sub-clause for the measurement plot.

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

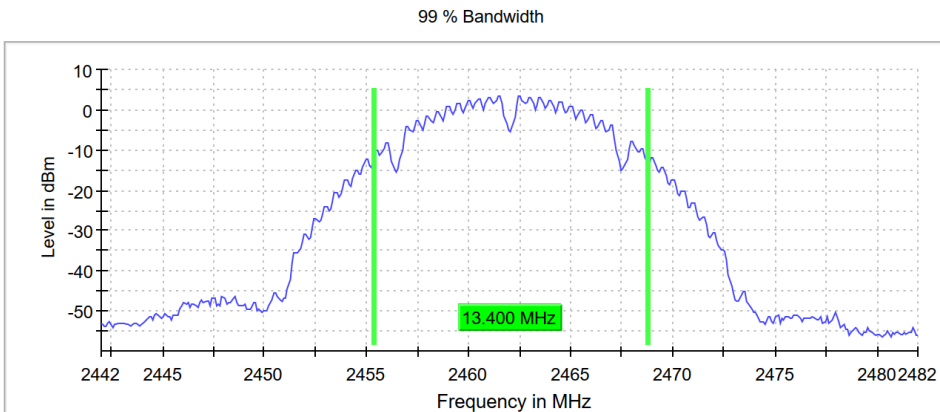
Modulation= Bluetooth LE 1 Mbps, Operating Channel = mid (S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.43890 GHz      |
| Stop Frequency        | 2.44110 GHz      |
| Span                  | 2.200 MHz        |
| RBW                   | 20.000 kHz       |
| VBW                   | 100.000 kHz      |
| SweepPoints           | 220              |
| Sweptime              | 210.000 µs       |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | FFT              |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.30 dB          |
| Run                   | 10 / max. 150    |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.05 dB          |

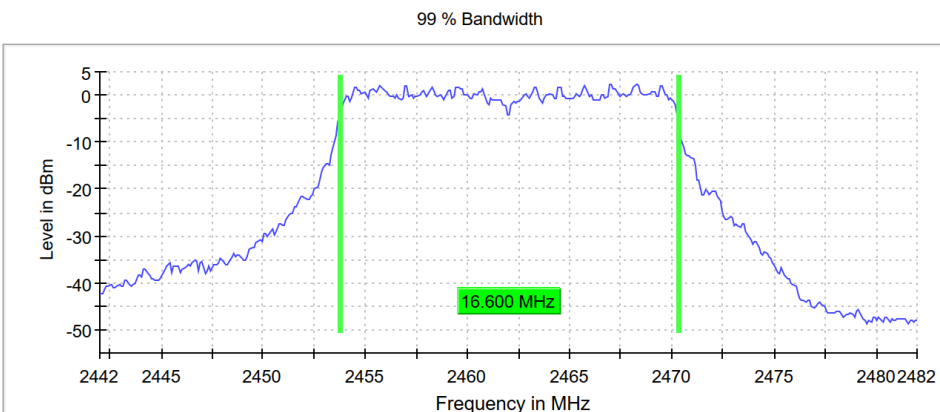
Modulation= WLAN b, Operating Channel = high (S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.44200 GHz      |
| Stop Frequency        | 2.48200 GHz      |
| Span                  | 40.000 MHz       |
| RBW                   | 200.000 kHz      |
| VBW                   | 1.000 MHz        |
| SweepPoints           | 400              |
| Sweptime              | 1.000 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.30 dB          |
| Run                   | 7 / max. 150     |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.19 dB          |

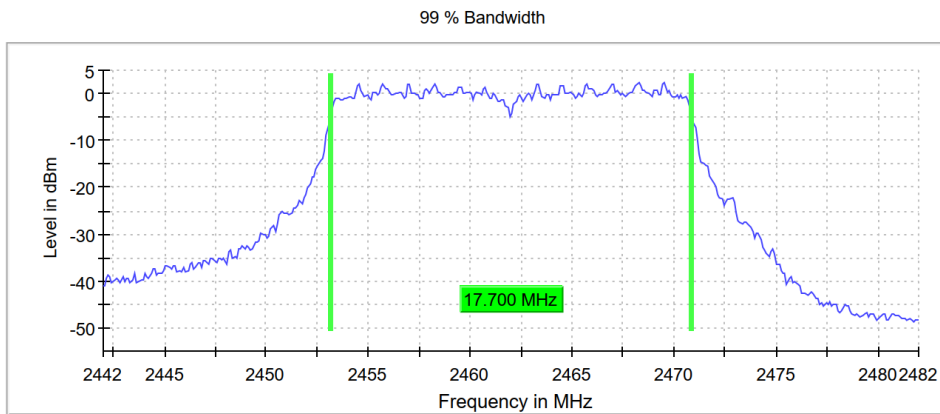
Modulation= WLAN g, Operating Channel = high (S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.44200 GHz      |
| Stop Frequency        | 2.48200 GHz      |
| Span                  | 40.000 MHz       |
| RBW                   | 200.000 kHz      |
| VBW                   | 1.000 MHz        |
| SweepPoints           | 400              |
| Sweptime              | 1.000 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.30 dB          |
| Run                   | 31 / max. 150    |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.18 dB          |

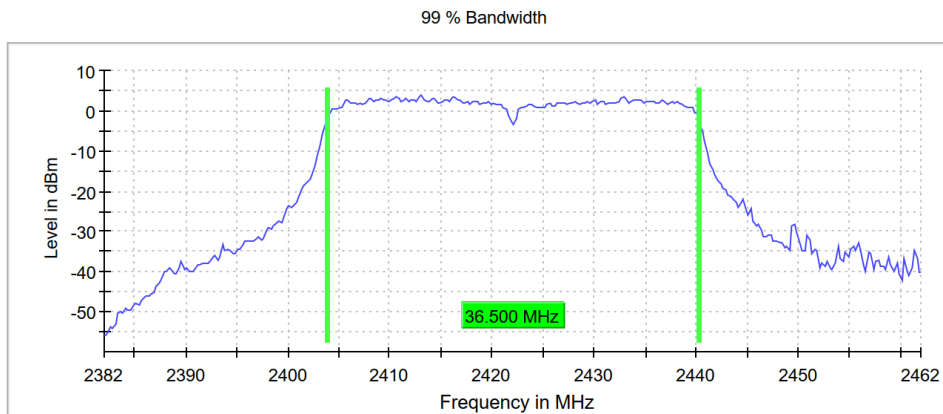
Modulation= WLAN n 20 MHz, Operating Channel = high  
(S01\_AF01)



### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.44200 GHz      |
| Stop Frequency        | 2.48200 GHz      |
| Span                  | 40.000 MHz       |
| RBW                   | 200.000 kHz      |
| VBW                   | 1.000 MHz        |
| SweepPoints           | 400              |
| Sweptime              | 1.000 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.30 dB          |
| Run                   | 39 / max. 150    |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.18 dB          |

Modulation= WLAN n 40 MHz, Operating Channel = low  
(S01\_AF01)



### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.38200 GHz      |
| Stop Frequency        | 2.46200 GHz      |
| Span                  | 80.000 MHz       |
| RBW                   | 500.000 kHz      |
| VBW                   | 2.000 MHz        |
| SweepPoints           | 320              |
| Sweptime              | 1.000 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.30 dB          |
| Run                   | 21 / max. 150    |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.16 dB          |

## 5.2.5 TEST EQUIPMENT USED

- R&S TS8997



### 5.3 PEAK POWER OUTPUT

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**

ANSI C63.10, chapter 11.9.1.3

#### 5.3.1 TEST DESCRIPTION

DTS EQUIPMENT:

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.

Maximum peak conducted output power (e.g. Bluetooth Low Energy):

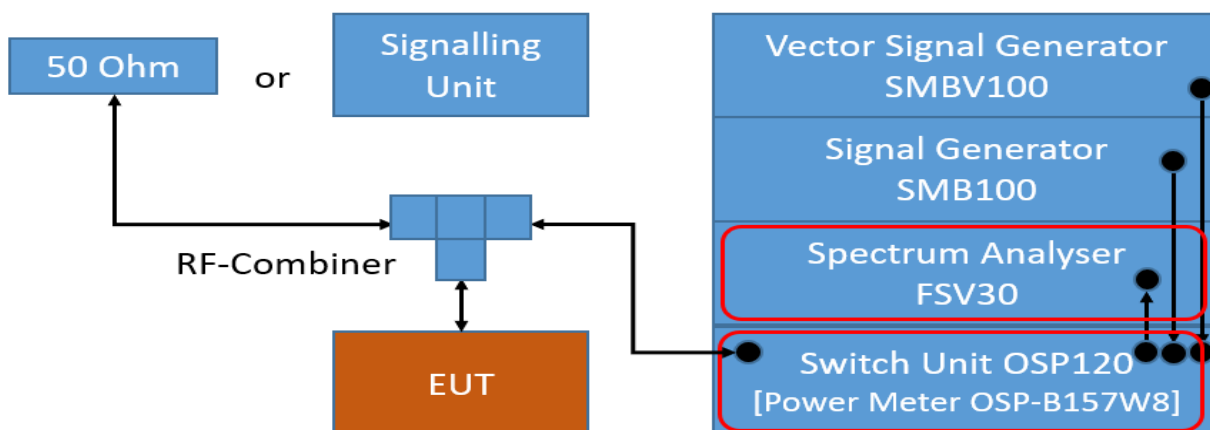
The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered. The reference level of the spectrum analyser was set higher than the output power of the EUT.

Analyser settings:

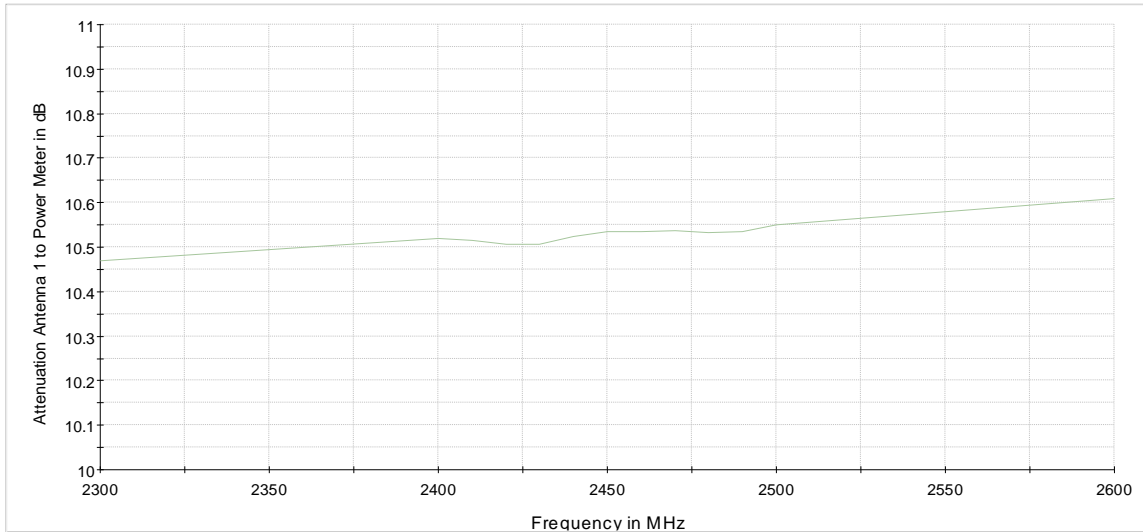
- Resolution Bandwidth (RBW):  $\geq$  DTS bandwidth
- Video Bandwidth (VBW):  $\geq$  3 times RBW or maximum of analyzer
- Span:  $\geq$  3 times RBW
- Trace: Maxhold
- Sweeps: Till stable (min. 300, max. 15000)
- Sweeptime: Auto
- Detector: Peak

Maximum conducted average output power (e.g. WLAN):

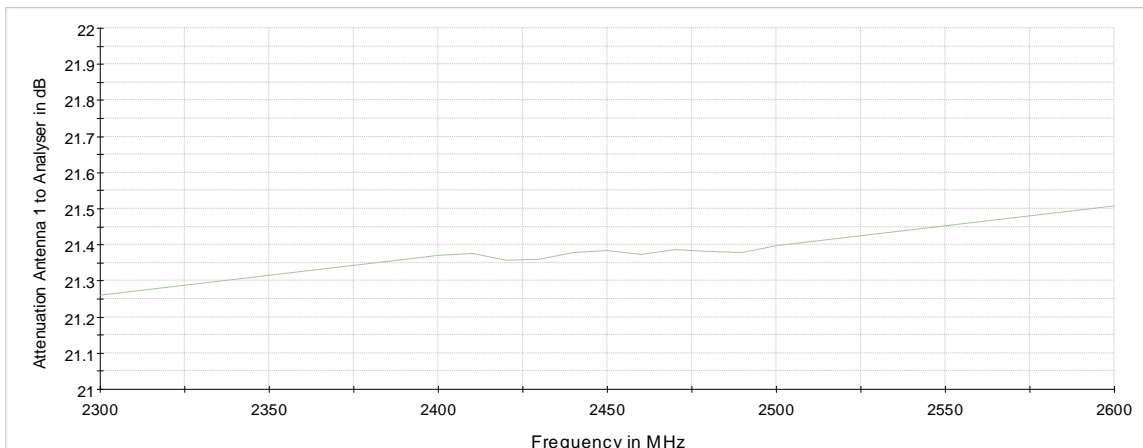
The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered. Measurement is performed using the gated RF average power meter integrated in the OSP 120 module OSP-B157W8 with signal bandwidth  $>300$  MHz.



TS8997; Output Power



Attenuation of the measurement path to Power Meter



Attenuation of the measurement path to Analyser

### 5.3.2 TEST REQUIREMENTS / LIMITS

**DTS devices:**

FCC Part 15, Subpart C, §15.247 (b) (3)

For systems using digital modulation techniques in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1 watt.

==> Maximum conducted peak output power: 30 dBm (excluding antenna gain, if antennas with directional gains that do not exceed 6 dBi are used).

Used conversion factor: Limit (dBm) = 10 log (Limit (W)/1mW)

### 5.3.3 TEST PROTOCOL

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 BT LE 1 Mbit/s

| Band        | Channel No. | Frequency [MHz] | Peak Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 0           | 2402            | 0.2              | 30.0        | 29.8                 | 5.9           |
|             | 19          | 2440            | 2.1              | 30.0        | 27.9                 | 7.8           |
|             | 39          | 2480            | 0.3              | 30.0        | 29.7                 | 6.0           |

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s

| Band        | Channel No. | Frequency [MHz] | Maximum Average Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|-----------------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 1           | 2412            | 12.8                        | 30.0        | 17.2                 | 18.5          |
|             | 6           | 2437            | 11.8                        | 30.0        | 18.2                 | 17.5          |
|             | 11          | 2462            | 11.3                        | 30.0        | 18.7                 | 17.0          |

WLAN g-Mode; 20 MHz; 6 Mbit/s

| Band        | Channel No. | Frequency [MHz] | Maximum Average Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|-----------------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 1           | 2412            | 13.1                        | 30.0        | 16.9                 | 18.8          |
|             | 6           | 2437            | 12.6                        | 30.0        | 17.4                 | 18.3          |
|             | 11          | 2462            | 12.3                        | 30.0        | 17.7                 | 18.0          |

WLAN n-Mode; 20 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | Maximum Average Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|-----------------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 1           | 2412            | 13.1                        | 30.0        | 16.9                 | 18.8          |
|             | 6           | 2437            | 12.5                        | 30.0        | 17.5                 | 18.2          |
|             | 11          | 2462            | 12.2                        | 30.0        | 17.8                 | 17.9          |

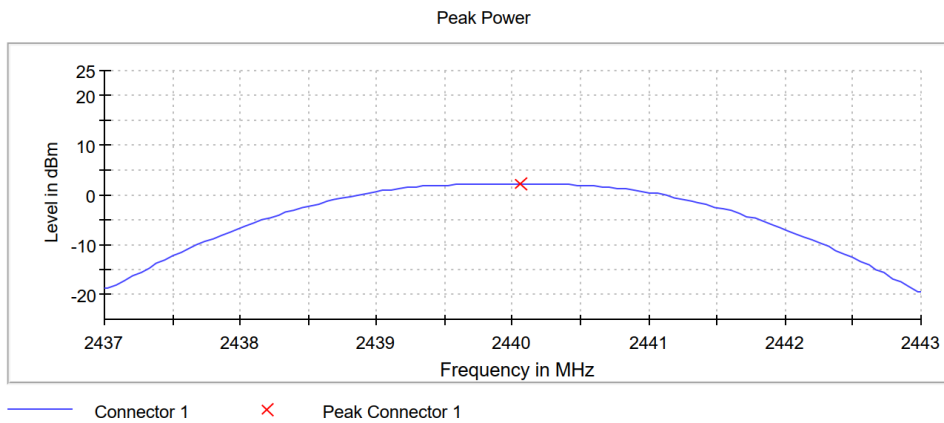
WLAN n-Mode; 40 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | Maximum Average Power [dBm] | Limit [dBm] | Margin to Limit [dB] | E.I.R.P [dBm] |
|-------------|-------------|-----------------|-----------------------------|-------------|----------------------|---------------|
| 2.4 GHz ISM | 3           | 2422            | 13.2                        | 30.0        | 16.8                 | 18.9          |
|             | 6           | 2437            | 13.3                        | 30.0        | 16.7                 | 19.0          |
|             | 11          | 2462            | 12.3                        | 30.0        | 17.7                 | 18.0          |

Remark: Please see next sub-clause for the measurement plot.  
 No plots are provided for WLAN (power meter measurements)

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

Modulation= Bluetooth LE 1 Mbps, Operating Channel = mid  
(S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.43700 GHz      |
| Stop Frequency        | 2.44300 GHz      |
| Span                  | 6.000 MHz        |
| RBW                   | 2.000 MHz        |
| VBW                   | 10.000 MHz       |
| SweepPoints           | 101              |
| SweepTime             | 1.000 ms         |
| Reference Level       | 10.000 dBm       |
| Attenuation           | 20.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| SweepType             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 4 / max. 150     |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.04 dB          |

### 5.3.5 TEST EQUIPMENT USED

- R&S TS8997

## 5.4 SPURIOUS RF CONDUCTED EMISSIONS

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**

ANSI C63.10, chapter 11.11

### 5.4.1 TEST DESCRIPTION

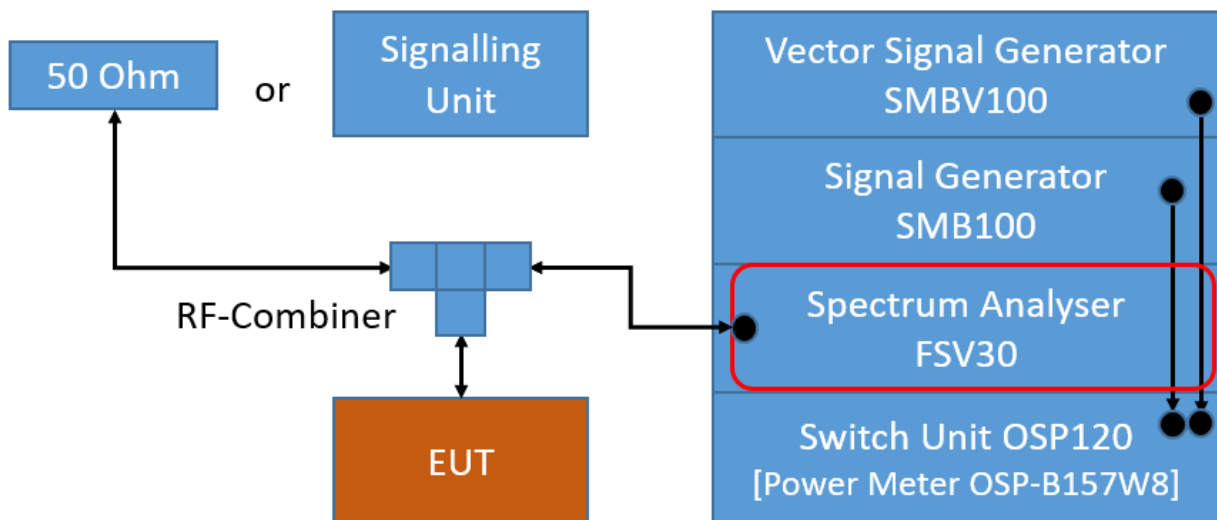
The Equipment Under Test (EUT) was set up to perform the spurious emissions measurements.

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.

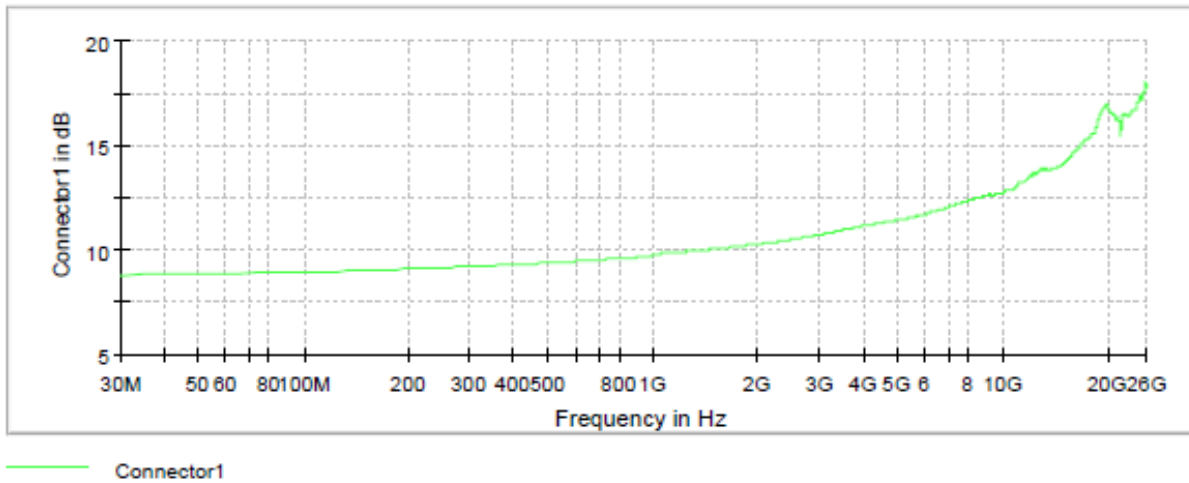
Analyser settings:

- Frequency range: 30 – 26000 MHz
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Trace: Maxhold
- Sweeps: Till Stable (max. 120)
- Sweep Time: Auto
- Detector: Peak

The reference value for the measurement of the spurious RF conducted emissions is determined during the test "band edge compliance conducted". This value is used to calculate the 20 dBc or 30 dBc limit.



TS8997; Spurious RF Conducted Emissions



Attenuation of the measurement part

#### 5.4.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (c)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 5.4.3 TEST PROTOCOL

Ambient temperature: 21 °C  
 Air Pressure: 1003 hPa  
 Humidity: 38 %  
 BT LE 1 Mbit/s

| Channel No | Channel Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|------------|----------------------------|----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 0          | 2402                       | 2395.0               | -58.5                | PEAK     | 100       | -1.5             | -21.5       | 37.0                 |
| 19         | 2440                       | 4877.1               | -66.8                | PEAK     | 100       | -0.2             | -20.2       | 46.6                 |
| 39         | 2480                       | 2488.5               | -61.5                | PEAK     | 100       | 0.1              | -19.9       | 41.6                 |

Ambient temperature: 21 °C  
 Air Pressure: 1003 hPa  
 Humidity: 38 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s

| Channel No | Channel Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|------------|----------------------------|----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 1          | 2412                       | 2395.0               | -35.7                | PEAK     | 100       | 3.2              | -26.8       | 8.9                  |
| 6          | 2437                       | 2395.0               | -52.2                | PEAK     | 100       | 3.0              | -27.0       | 25.2                 |
| 11         | 2462                       | 2488.5               | -49.7                | PEAK     | 100       | 2.1              | -27.9       | 21.8                 |

WLAN g-Mode; 20 MHz; 6 Mbit/s

| Channel No | Channel Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|------------|----------------------------|----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 1          | 2412                       | 2395.0               | -35.0                | PEAK     | 100       | -1.0             | -31.0       | 4.0                  |
| 6          | 2437                       | 2395.0               | -52.2                | PEAK     | 100       | -1.0             | -31.0       | 21.2                 |
| 11         | 2462                       | 2488.5               | -50.4                | PEAK     | 100       | -2.3             | -32.3       | 18.1                 |

WLAN n-Mode; 20 MHz; MCS0

| Channel No | Channel Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|------------|----------------------------|----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 1          | 2412                       | 2395.0               | -36.0                | PEAK     | 100       | 1.7              | -28.3       | 7.7                  |
| 6          | 2437                       | 2395.0               | -53.5                | PEAK     | 100       | 1.1              | -28.9       | 24.6                 |
| 11         | 2462                       | 2488.5               | -50.3                | PEAK     | 100       | -0.2             | -30.2       | 20.1                 |

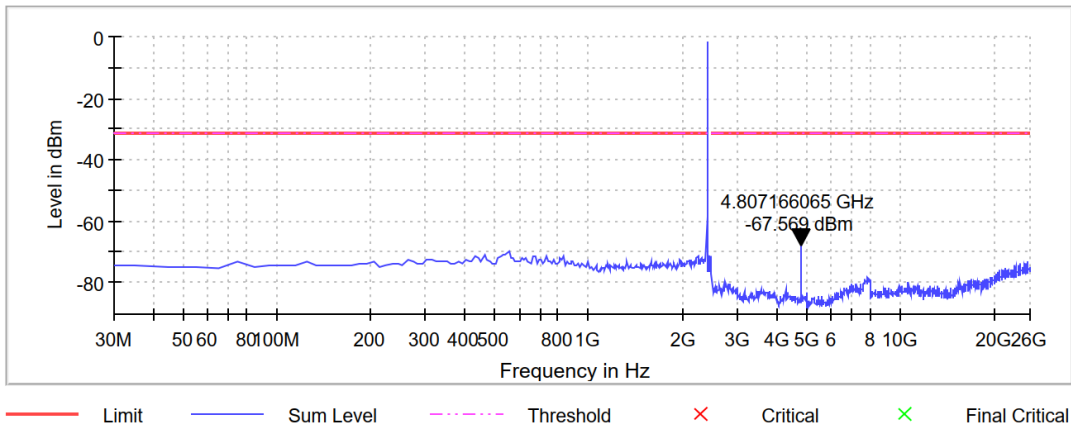
WLAN n-Mode; 40 MHz; MCS0

| Channel No | Channel Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|------------|----------------------------|----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 3          | 2422                       | 2395.0               | -34.8                | PEAK     | 100       | -1.5             | -31.5       | 3.3                  |
| 6          | 2437                       | 2395.0               | -41.4                | PEAK     | 100       | -0.6             | -30.6       | 10.8                 |
| 11         | 2462                       | 2488.5               | -37.7                | PEAK     | 100       | -2.0             | -32.0       | 5.7                  |

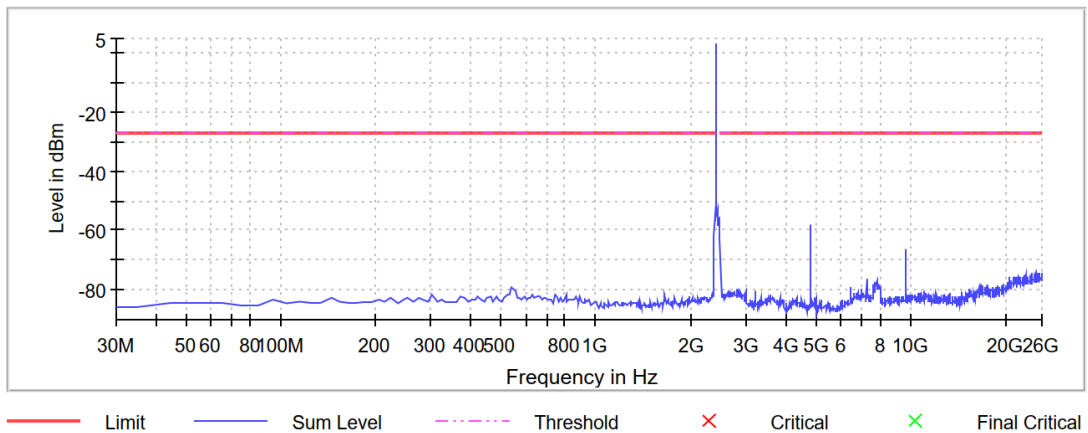
Remark: Please see next sub-clause for the measurement plot.

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

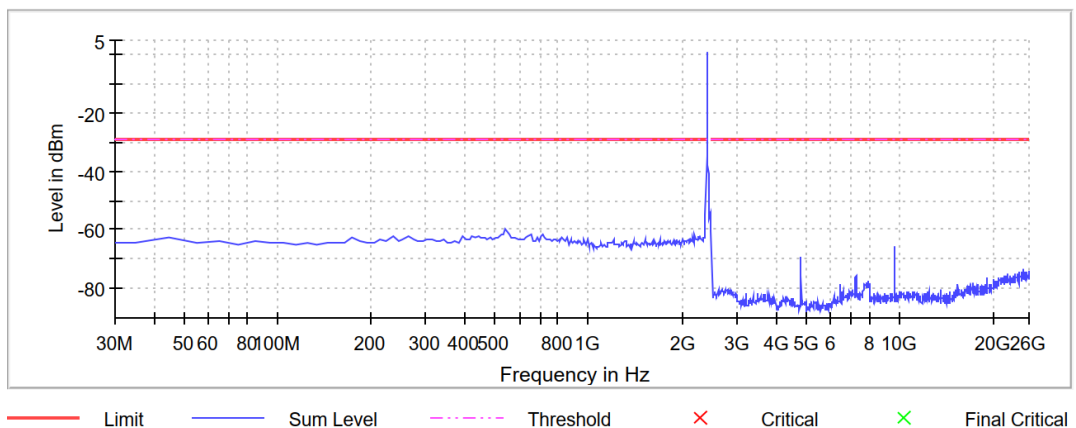
Modulation= Bluetooth LE 1 Mbps, Operating Channel = low  
(S01\_AB01)  
Spurious



Modulation= WLAN b, Operating Channel = low  
(S01\_AB01)  
Spurious

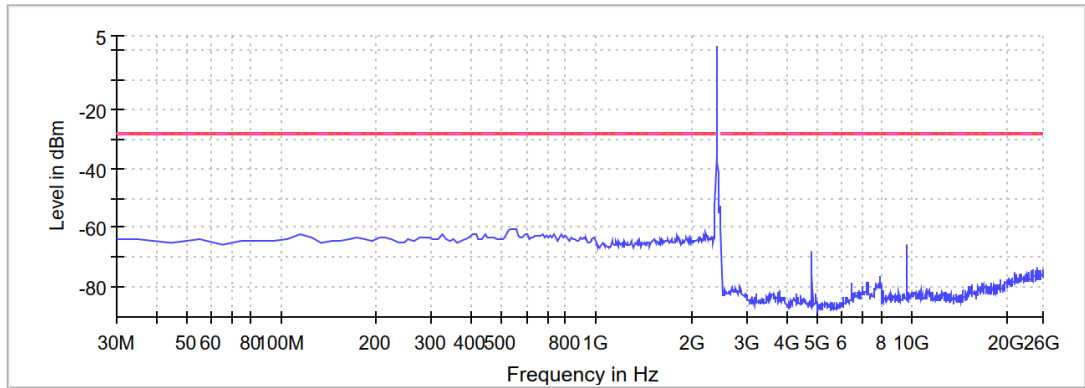


Modulation= WLAN g, Operating Channel = low  
(S01\_AB01)  
Spurious



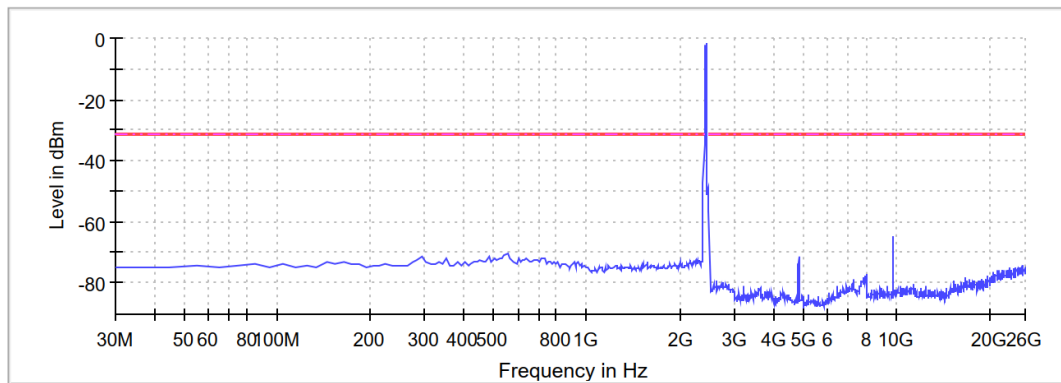


Modulation= WLAN n 20 MHz, Operating Channel = low  
 (S01\_AB01)  
 Spurious



— Limit — Sum Level - - - Threshold × Critical × Final Critical

Modulation= WLAN n 40 MHz, Operating Channel = low  
 (S01\_AB01)  
 Spurious



— Limit — Sum Level - - - Threshold × Critical × Final Critical

#### 5.4.5 TEST EQUIPMENT USED

- R&S TS8997

## 5.5 TRANSMITTER SPURIOUS RADIATED EMISSIONS

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**

ANSI C63.10, chapter 6.4, 6.5, 6.6.5

### 5.5.1 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:

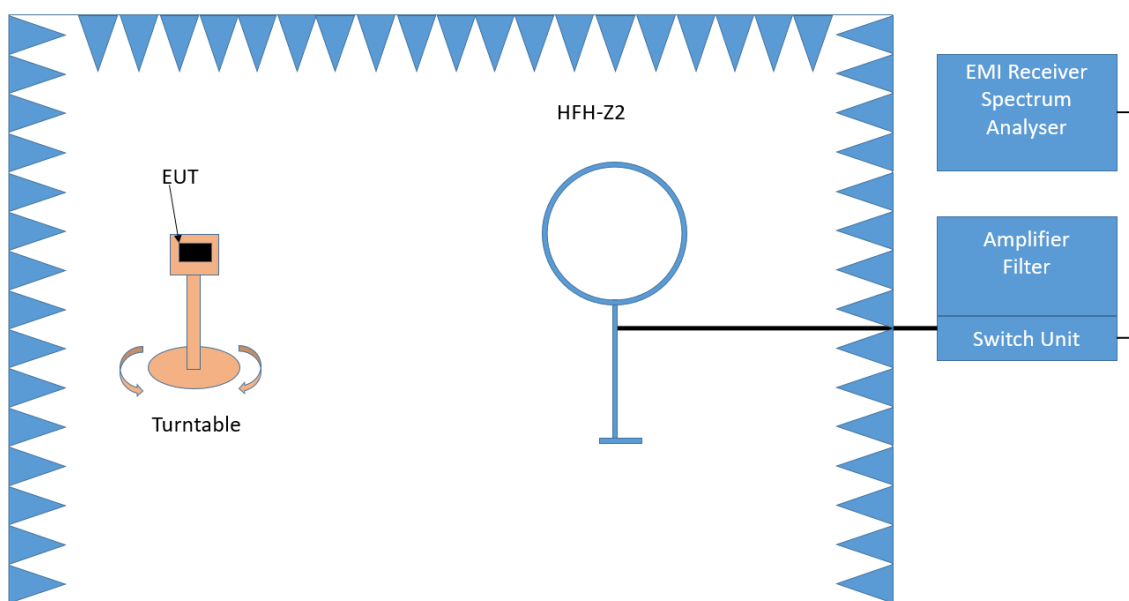
- < 30 MHz: Chapter 6.4
- 30 MHz – 1 GHz: Chapter 6.5
- > 1 GHz: Chapter 6.6 (procedure according 6.6.5 used)

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
- Antenna height: 1 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)

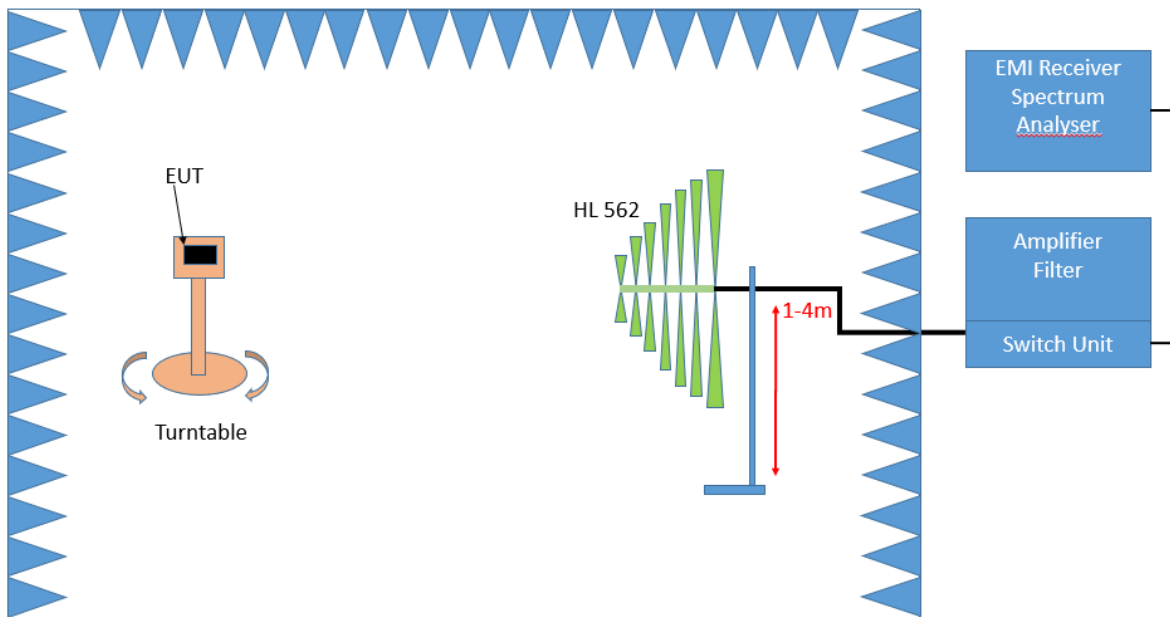
Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

**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.

- Detector: Quasi-Peak (9 kHz - 150 kHz, Peak / Average 150 kHz- 30 MHz)
- 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 360°. 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 between 1 – 4 meter. 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

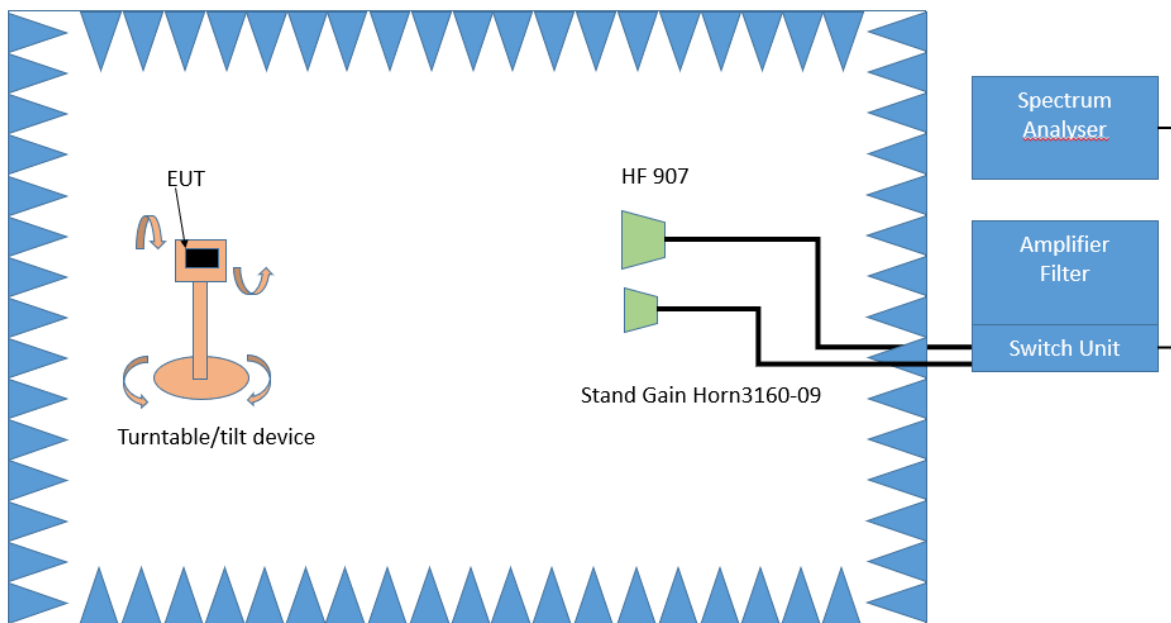
After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

### 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 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

## 5.5.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (d)

... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

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)

## 5.5.3 TEST PROTOCOL

Ambient temperature: 27 °C  
 Air Pressure: 1016 hPa  
 Humidity: 39 %  
 BT LE 1 Mbit/s  
 Applied duty cycle correction (AV): 0.0 dB

| Ch. No. | Ch. Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBµV/m] | Detector | RBW [kHz] | Limit [dBµV/m] | Margin to Limit [dB] | Limit Type |
|---------|------------------------|----------------------|-------------------------|----------|-----------|----------------|----------------------|------------|
| 0       | 2402                   | 16019.8              | 40.0                    | AV       | 1000      | 54.0           | 14.0                 | RB         |
| 0       | 2402                   | 16019.8              | 52.7                    | PEAK     | 1000      | 74.0           | 21.3                 | RB         |
| 0       | 2402                   | 16029.6              | 40.4                    | AV       | 1000      | 54.0           | 13.6                 | RB         |
| 0       | 2402                   | 16029.6              | 54.0                    | PEAK     | 1000      | 74.0           | 20.0                 | RB         |
| 19      | 2440                   | 15617.5              | 42.6                    | AV       | 1000      | 54.0           | 11.4                 | RB         |
| 19      | 2440                   | 15617.5              | 55.5                    | PEAK     | 1000      | 74.0           | 18.5                 | RB         |
| 19      | 2440                   | 17957.0              | 46.6                    | AV       | 1000      | 54.0           | 7.4                  | RB         |
| 19      | 2440                   | 17957.0              | 59.5                    | PEAK     | 1000      | 74.0           | 14.5                 | RB         |
| 39      | 2480                   | 2483.7               | 37.9                    | AV       | 1000      | 54.0           | 16.1                 | RB         |
| 39      | 2480                   | 2483.7               | 53.7                    | PEAK     | 1000      | 74.0           | 20.3                 | RB         |
| 39      | 2480                   | 15600.8              | 42.5                    | AV       | 1000      | 54.0           | 11.5                 | RB         |
| 39      | 2480                   | 15600.8              | 55.7                    | PEAK     | 1000      | 74.0           | 18.3                 | RB         |
| 39      | 2480                   | 17904.5              | 44.9                    | AV       | 1000      | 54.0           | 9.1                  | RB         |
| 39      | 2480                   | 17904.5              | 58.5                    | PEAK     | 1000      | 74.0           | 15.5                 | RB         |

Ambient temperature: 25 °C  
 Air Pressure: 1004 hPa  
 Humidity: 40 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s  
 Applied duty cycle correction (AV): 0.1 dB

| Ch. No. | Ch. Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBµV/m] | Detector | RBW [kHz] | Limit [dBµV/m] | Margin to Limit [dB] | Limit Type |
|---------|------------------------|----------------------|-------------------------|----------|-----------|----------------|----------------------|------------|
| 1       | 2412                   | -                    | ---                     | ---      | ---       | ---            | ---                  | RB         |
| 6       | 2437                   | -                    | ---                     | ---      | ---       | ---            | ---                  | RB         |
| 11      | 2462                   | 2483.7               | 37.5                    | AV       | 1000      | 54.0           | 16.5                 | RB         |
| 11      | 2462                   | 2483.7               | 49.8                    | PEAK     | 1000      | 74.0           | 24.2                 | RB         |
| 11      | 2462                   | 2484.3               | 37.5                    | AV       | 1000      | 54.0           | 16.5                 | RB         |
| 11      | 2462                   | 2484.3               | 50.6                    | PEAK     | 1000      | 74.0           | 23.4                 | RB         |

WLAN g-Mode; 20 MHz; 6 Mbit/s  
 Applied duty cycle correction (AV): 0.6 dB

| Ch. No. | Ch. Center Freq. [MHz] | Spurious Freq. [MHz] | Spurious Level [dBµV/m] | Detector | RBW [kHz] | Limit [dBµV/m] | Margin to Limit [dB] | Limit Type |
|---------|------------------------|----------------------|-------------------------|----------|-----------|----------------|----------------------|------------|
| 1       | 2412                   | 2389.7               | 46.0                    | AV       | 1000      | 54.0           | 8.0                  | RB         |
| 1       | 2412                   | 2389.7               | 63.6                    | PEAK     | 1000      | 74.0           | 10.4                 | RB         |
| 11      | 2462                   | 2484.9               | 43.7                    | AV       | 1000      | 54.0           | 10.3                 | RB         |
| 11      | 2462                   | 2484.9               | 58.3                    | PEAK     | 1000      | 74.0           | 15.7                 | RB         |

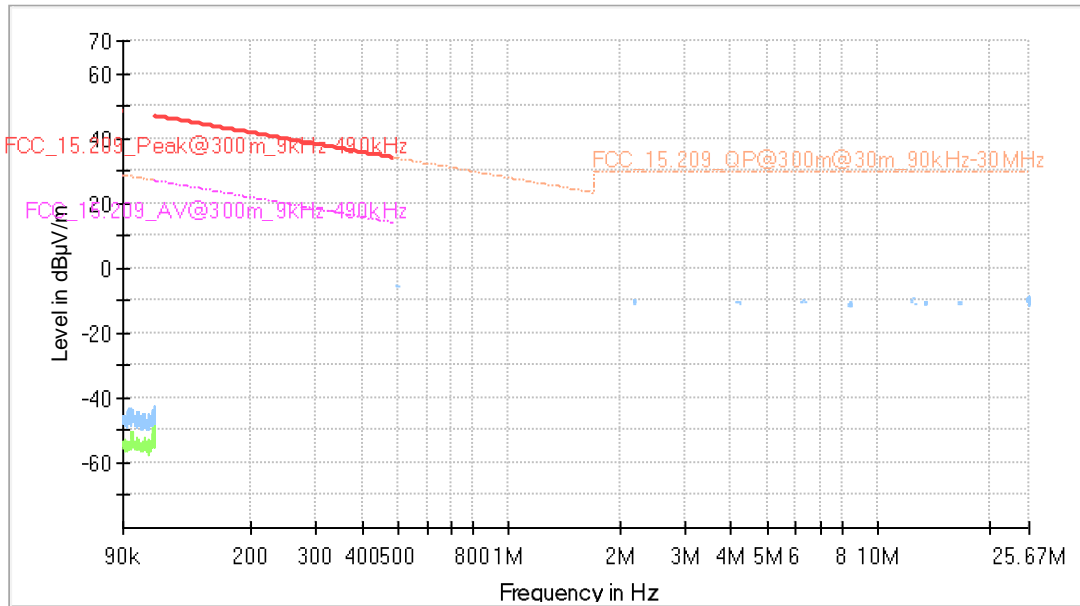
WLAN b + Bluetooth LE; BTLE: 1 Mbit/s, WLAN: 20 MHz, ; 6 Mbit/s  
 Applied duty cycle correction (AV): 0.0 dB

| Ch. No.             | Ch. Center Freq. [MHz]   | Spurious Freq. [MHz] | Spurious Level [dBµV/m] | Detector | RBW [kHz] | Limit [dBµV/m] | Margin to Limit [dB] | Limit Type |
|---------------------|--------------------------|----------------------|-------------------------|----------|-----------|----------------|----------------------|------------|
| BTLE: 0<br>WLAN: 11 | BTLE: 2402<br>WLAN: 2462 | 4924.0               | 35.3                    | AV       | 1000      | 54.0           | 18.7                 | RB         |
| BTLE: 0<br>WLAN: 11 | BTLE: 2402<br>WLAN: 2462 | 4924.0               | 48.4                    | PEAK     | 1000      | 74.0           | 25.6                 | RB         |

Remark: Please see next sub-clause for the measurement plot.  
 For Band Edge Results at the upper band edge see test case Band Edge.

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

Modulation= Bluetooth LE 1 Mbps, Operating Channel = mid,  
 Measurement range = 9 kHz – 30 MHz  
 (S01\_AA01)

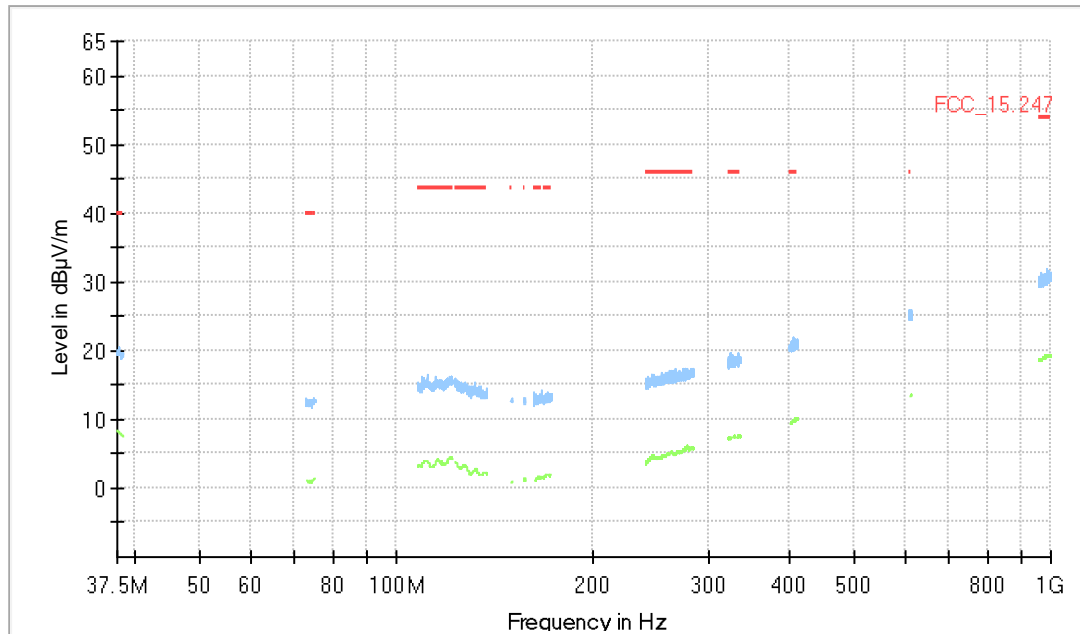


### Final\_Result

| Frequency (MHz) | MaxPeak (dBµV/m) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|---------------|--------------|
| ---             | ---              | ---                | ---            | ---         | ---             | ---             | ---         | ---           | ---          |



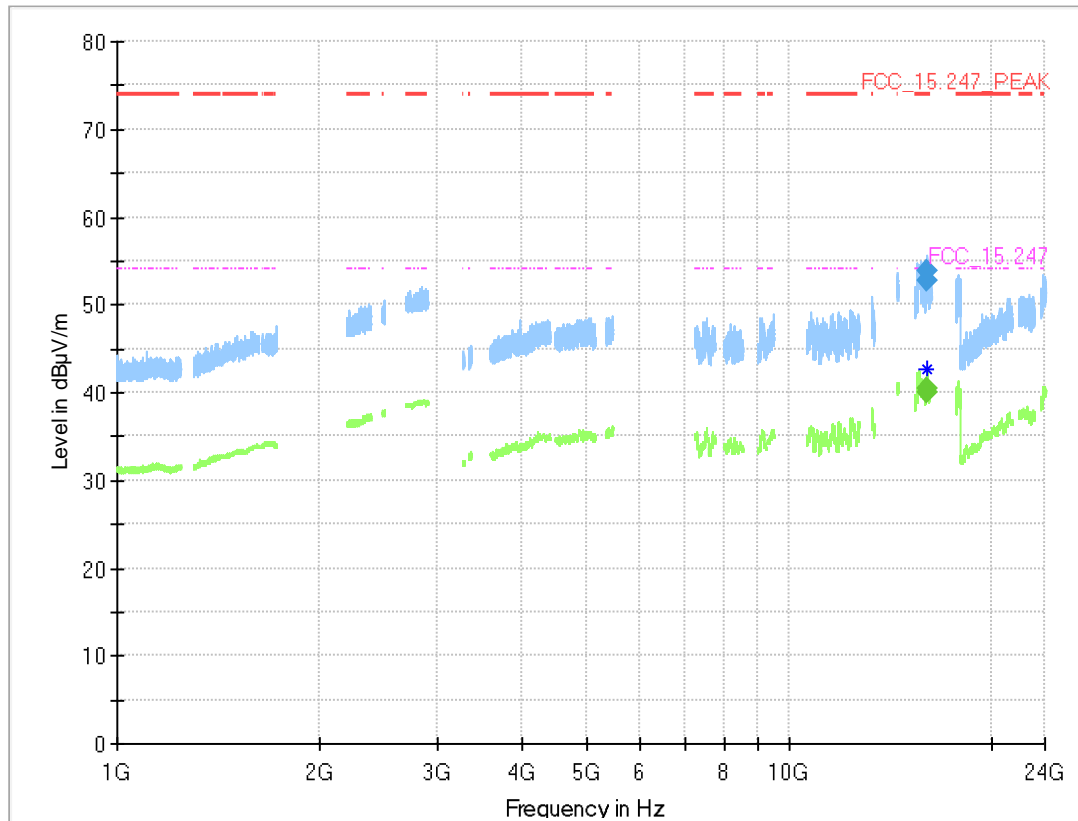
Modulation= Bluetooth LE 1 Mbps, Operating Channel = low,  
 Measurement range = 30 MHz - 1 GHz  
 (S01\_AA01)



### Final\_Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| ---             | ---                | ---            | ---         | ---             | ---             | ---         | --- | ---           | ---          |

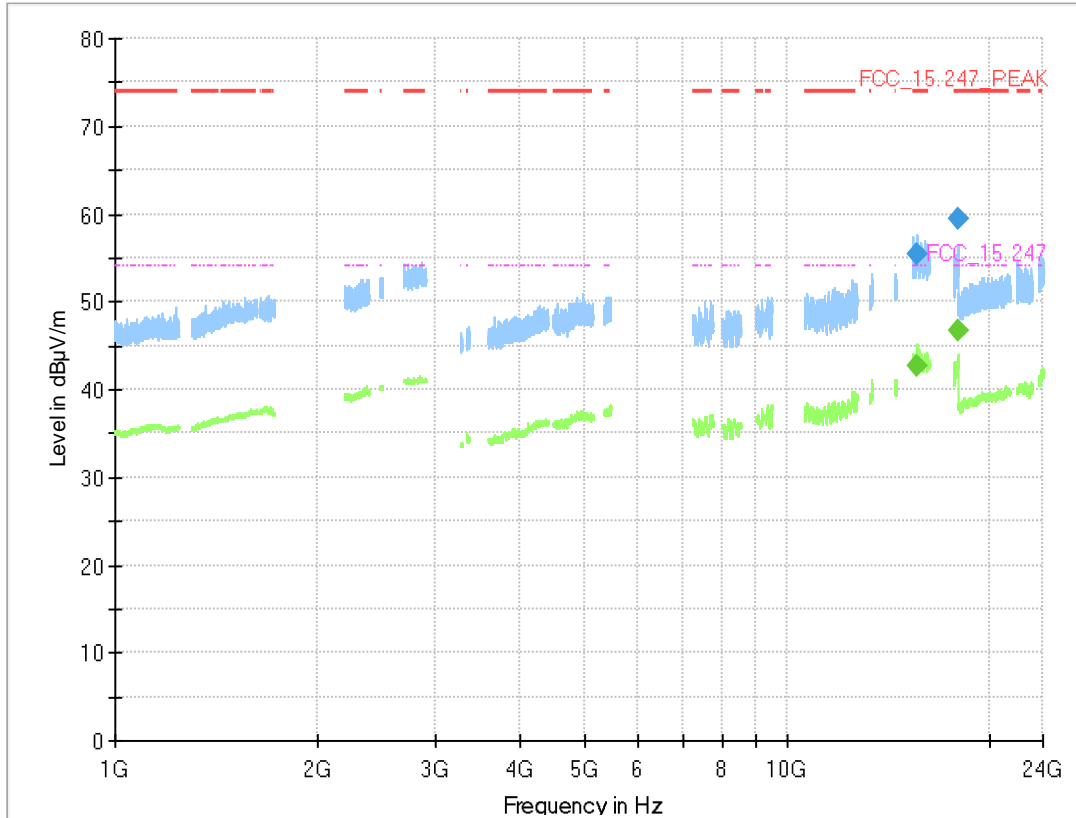
Modulation= Bluetooth LE 1 Mbps, Operating Channel = low,  
Measurement range = 1 GHz - 26 GHz



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 16019.800       | ---              | 40.0              | 54.00          | 14.04       | 1000.0          | 1000.000        | 150.0       | V   | -79.0         | -6.0            | -2.0         |
| 16019.800       | 52.7             | ---               | 74.00          | 21.30       | 1000.0          | 1000.000        | 150.0       | V   | -79.0         | -6.0            | -2.0         |
| 16029.575       | ---              | 40.4              | 54.00          | 13.61       | 1000.0          | 1000.000        | 150.0       | V   | 157.0         | 105.0           | -1.6         |
| 16029.575       | 54.0             | ---               | 74.00          | 20.04       | 1000.0          | 1000.000        | 150.0       | V   | 157.0         | 105.0           | -1.6         |

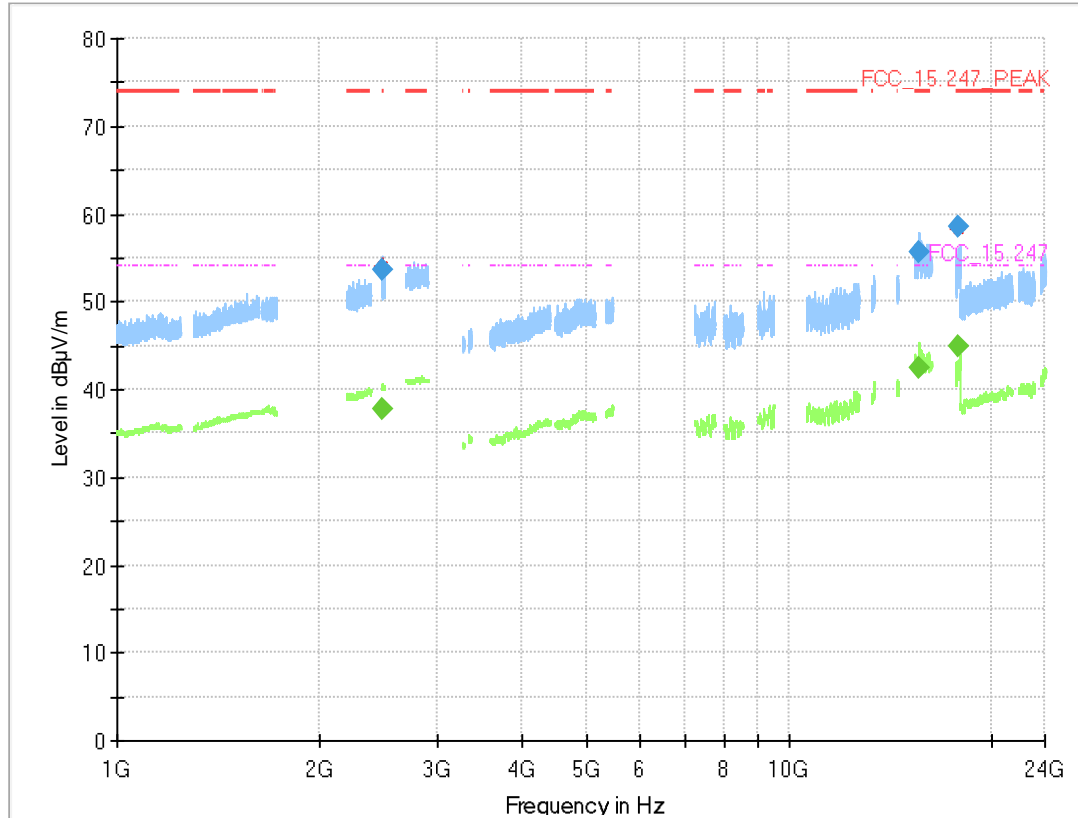
Modulation= Bluetooth LE 1 Mbps, Operating Channel = mid,  
Measurement range = 1 GHz - 26 GHz



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 15617.467       | ---              | 42.6              | 54.00          | 11.41       | 1000.0          | 1000.000        | 150.0       | V   | -128.0        | 15.0            | 0.0          |
| 15617.467       | 55.5             | ---               | 74.00          | 18.48       | 1000.0          | 1000.000        | 150.0       | V   | -128.0        | 15.0            | 0.0          |
| 17956.950       | ---              | 46.6              | 54.00          | 7.36        | 1000.0          | 1000.000        | 150.0       | V   | 53.0          | 101.0           | 2.8          |
| 17956.950       | 59.5             | ---               | 74.00          | 14.48       | 1000.0          | 1000.000        | 150.0       | V   | 53.0          | 101.0           | 2.8          |

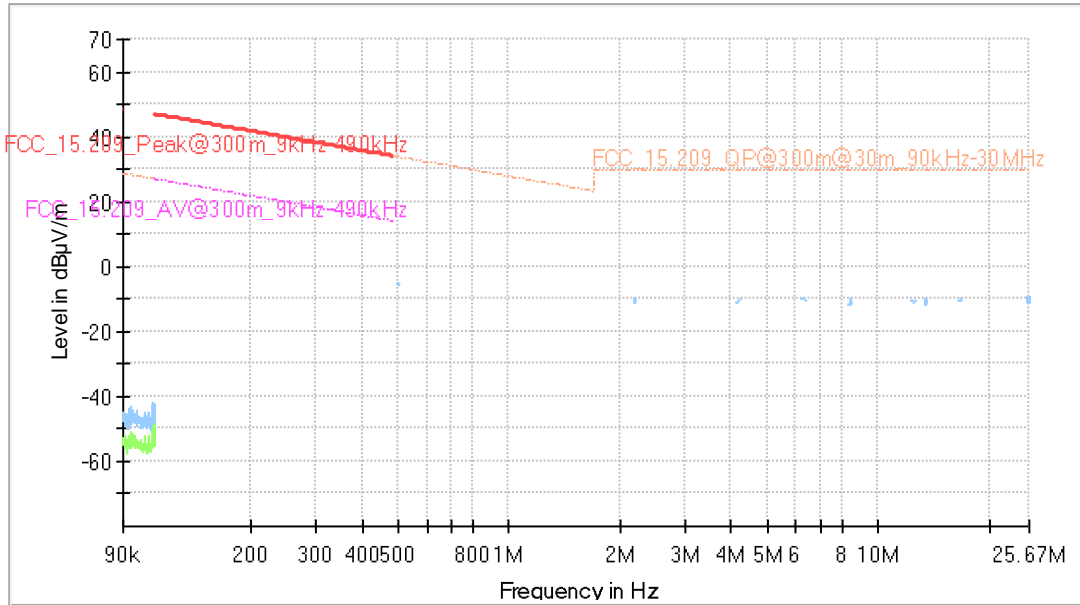
Modulation= Bluetooth LE 1 Mbps, Operating Channel = high,  
Measurement range = 1 GHz - 26 GHz



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2483.665        | ---              | 37.9              | 54.00          | 16.13       | 1000.0          | 1000.000        | 150.0       | V   | 30.0          | 95.0            | 7.8          |
| 2483.665        | 53.7             | ---               | 74.00          | 20.30       | 1000.0          | 1000.000        | 150.0       | V   | 30.0          | 95.0            | 7.8          |
| 15600.750       | ---              | 42.5              | 54.00          | 11.50       | 1000.0          | 1000.000        | 150.0       | H   | 156.0         | 15.0            | 0.4          |
| 15600.750       | 55.7             | ---               | 74.00          | 18.32       | 1000.0          | 1000.000        | 150.0       | H   | 156.0         | 15.0            | 0.4          |
| 17904.450       | ---              | 44.9              | 54.00          | 9.15        | 1000.0          | 1000.000        | 150.0       | V   | 101.0         | 15.0            | 2.4          |
| 17904.450       | 58.5             | ---               | 74.00          | 15.46       | 1000.0          | 1000.000        | 150.0       | V   | 101.0         | 15.0            | 2.4          |

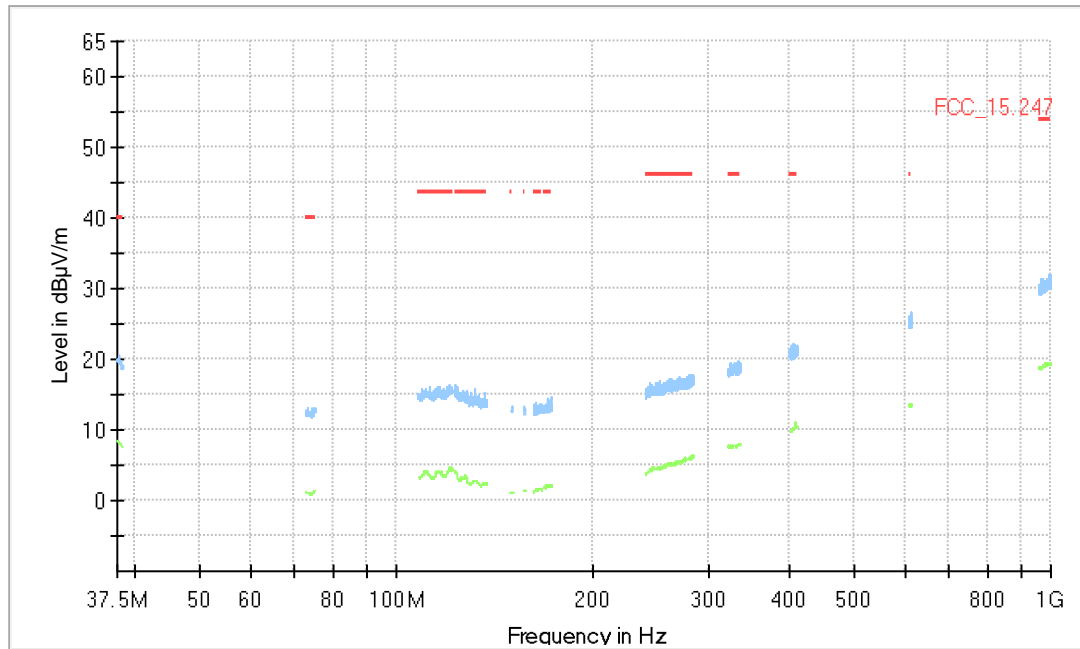
Modulation= WLAN b, Operating Channel = mid,  
 Measurement range = 9 kHz – 30 MHz  
 (S01\_AA01)



### Final\_Result

| Frequency (MHz) | MaxPeak (dBµV/m) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Azimuth (deg) | Corr. (dB/m) |
|-----------------|------------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|---------------|--------------|
| ---             | ---              | ---                | ---            | ---         | ---             | ---             | ---         | ---           | ---          |

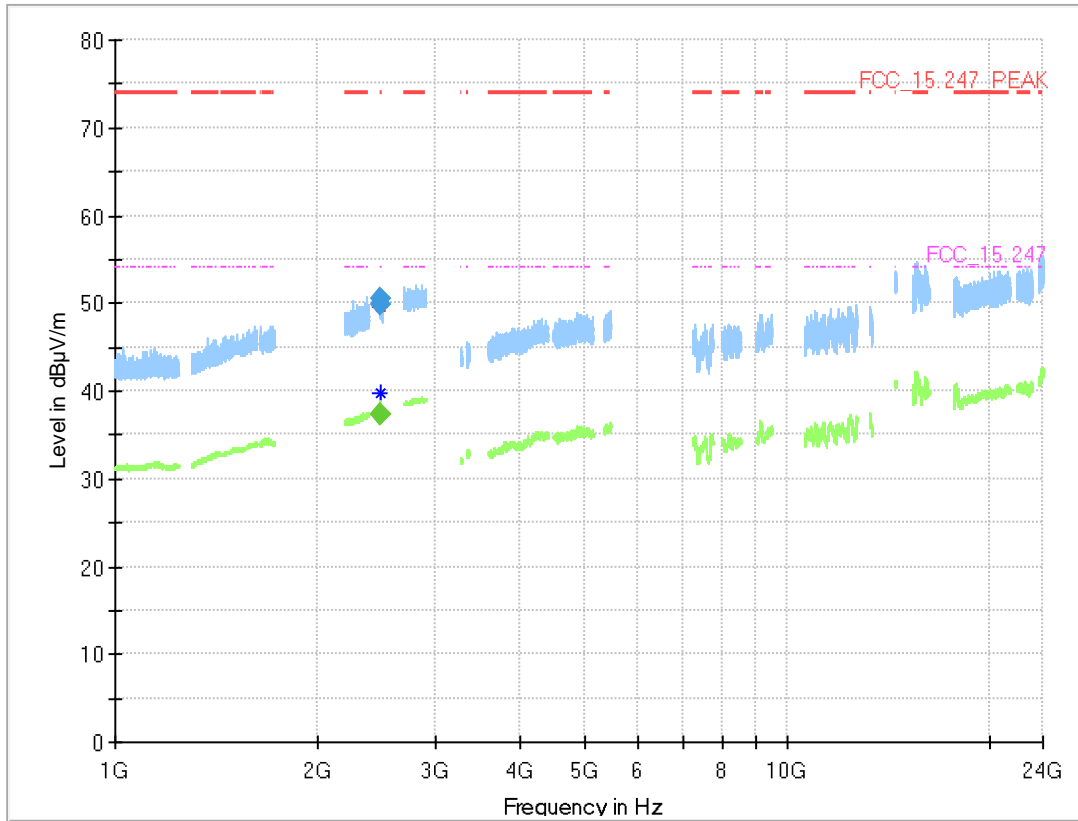
Modulation= WLAN b, Operating Channel = high,  
Measurement range = 30 MHz - 1 GHz  
(S01\_AA01)



### Final\_Result

| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| ---             | ---                | ---            | ---         | ---             | ---             | ---         | --- | ---           | ---          |

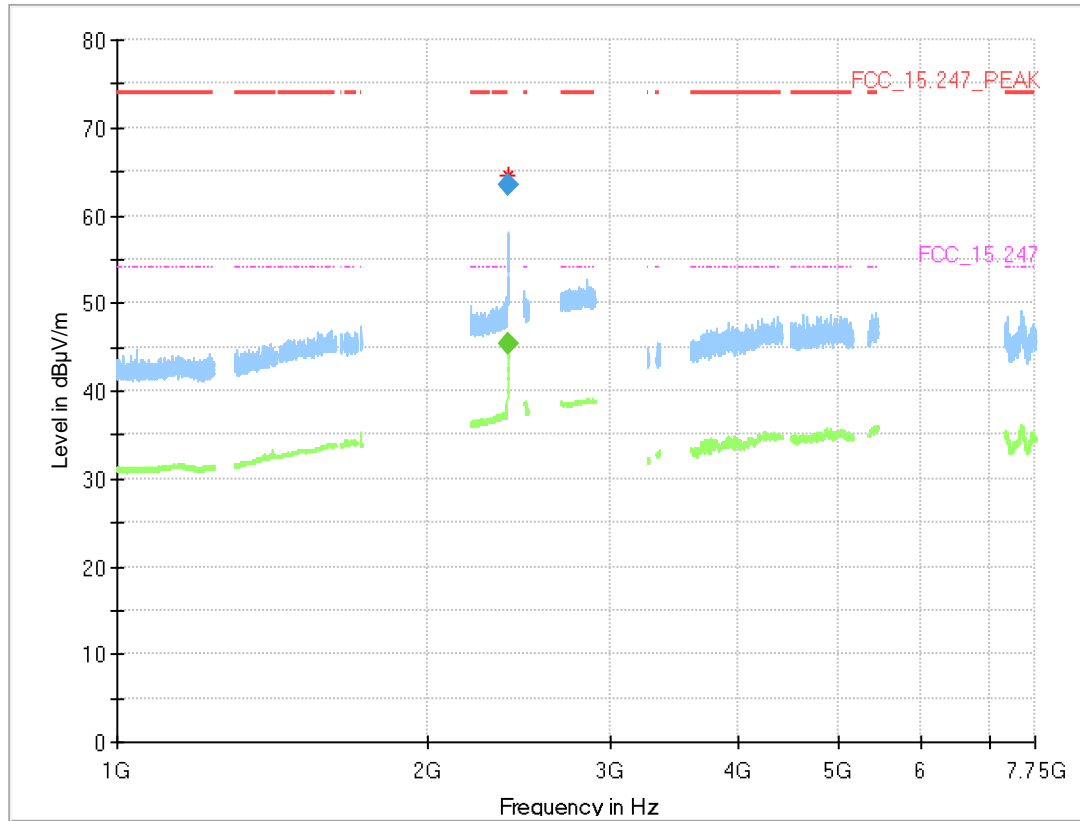
Modulation= WLAN b, Operating Channel = high,  
 Measurement range = 1 GHz - 26 GHz  
 (S01\_AK01)



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2483.748        | ---              | 37.4              | 54.00          | 16.64       | 1000.0          | 1000.000        | 150.0       | V   | -9.0          | 96.0            | 5.3          |
| 2483.748        | 49.8             | ---               | 74.00          | 24.16       | 1000.0          | 1000.000        | 150.0       | V   | -9.0          | 96.0            | 5.3          |
| 2484.325        | ---              | 37.4              | 54.00          | 16.62       | 1000.0          | 1000.000        | 150.0       | H   | 6.0           | 0.0             | 5.3          |
| 2484.325        | 50.6             | ---               | 74.00          | 23.43       | 1000.0          | 1000.000        | 150.0       | H   | 6.0           | 0.0             | 5.3          |

Modulation= WLAN g, Operating Channel = low,  
 Measurement range = 1 GHz - 8 GHz  
 (S01\_AA01)

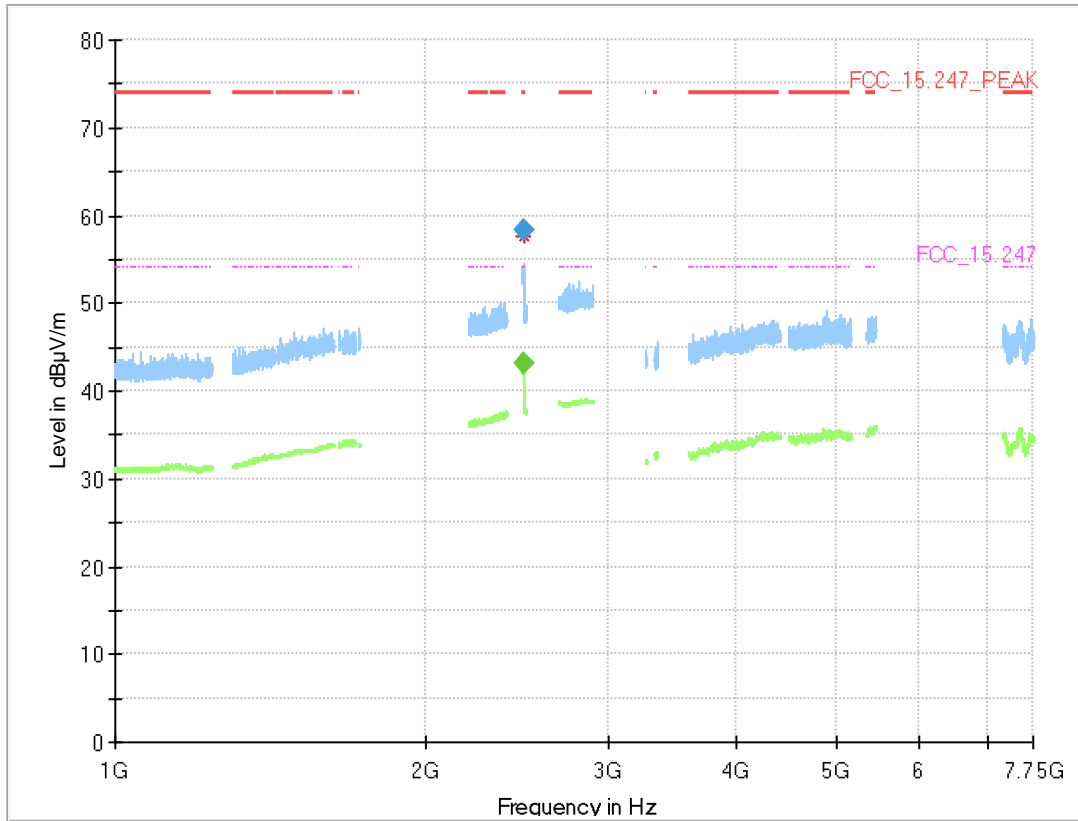


### Final Result

| 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2389.680        | ---              | 45.4              | 54.00          | 8.65        | 1000.0          | 1000.000        | 150.0       | V   | -32.0         | 35.0            | 4.9          |
| 2389.680        | 63.6             | ---               | 74.00          | 10.44       | 1000.0          | 1000.000        | 150.0       | V   | -32.0         | 35.0            | 4.9          |



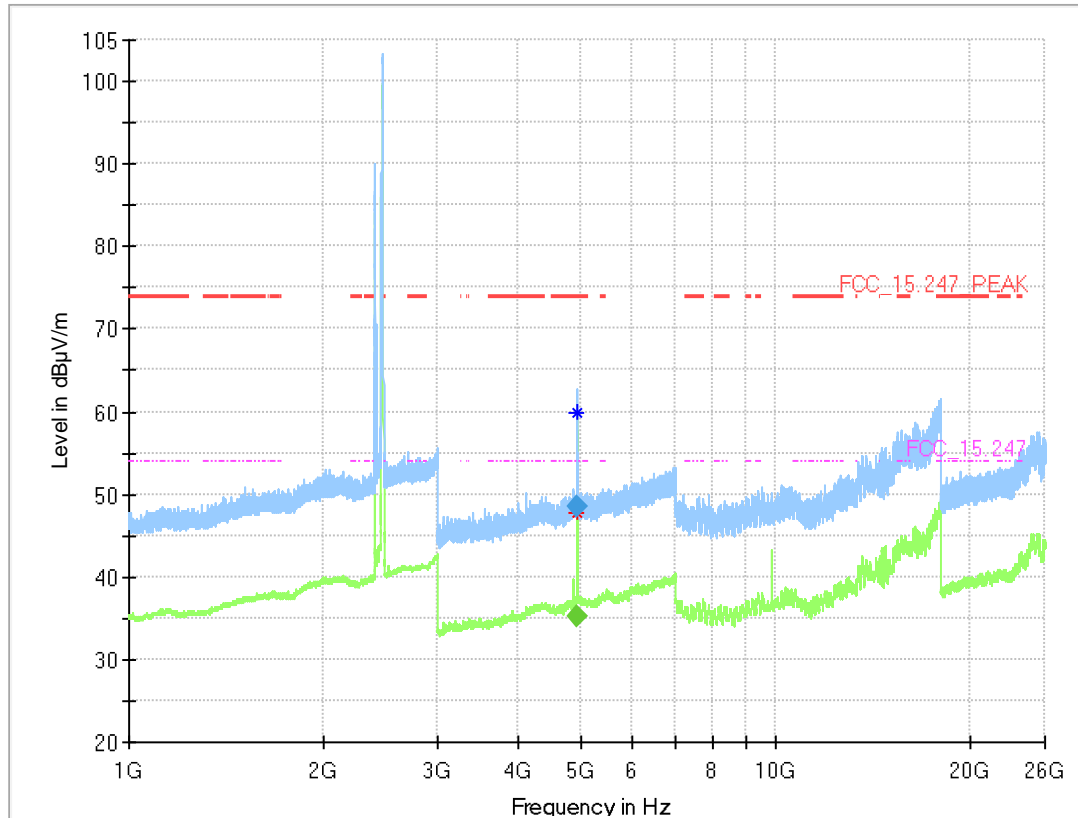
Modulation= WLAN g, Operating Channel = high,  
 Measurement range = 1 GHz - 8 GHz  
 (S01\_AA01)



**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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2484.903        | ---              | 43.1              | 54.00          | 10.87       | 1000.0          | 1000.000        | 150.0       | V   | 15.0          | 36.0            | 5.3          |
| 2484.903        | 58.3             | ---               | 74.00          | 15.75       | 1000.0          | 1000.000        | 150.0       | V   | 15.0          | 36.0            | 5.3          |

Modulation= WLAN b + Bluetooth LE 1 Mbps, Operating Channel: WLAN = high + BTLE = low,  
 Measurement range = 1 GHz - 26 GHz  
 (S01\_AA01)



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 4924.000        | ---              | 35.3              | 54.00          | 18.72       | 1000.0          | 1000.000        | 150.0       | H   | -68.0         | 105.0           | 6.6          |
| 4924.000        | 48.4             | ---               | 74.00          | 25.60       | 1000.0          | 1000.000        | 150.0       | H   | -68.0         | 105.0           | 6.6          |

### 5.5.5 TEST EQUIPMENT USED

- Radiated Emissions FAR 2.4 GHz FCC
- Radiated Emissions SAC H-Field
- Radiated Emissions SAC up to 1 GHz

## 5.6 BAND EDGE COMPLIANCE CONDUCTED

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**

ANSI C63.10, chapter 11.11

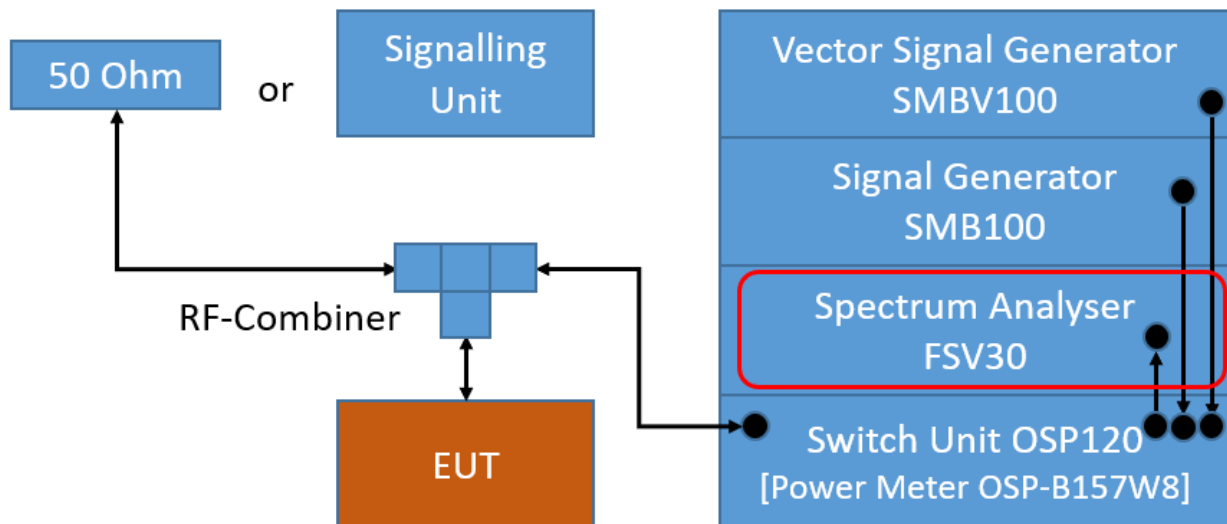
### 5.6.1 TEST DESCRIPTION

For the conducted measurement, the Equipment Under Test (EUT) is placed in a shielded room. The reference power was measured in the test case "Spurious RF Conducted Emissions".

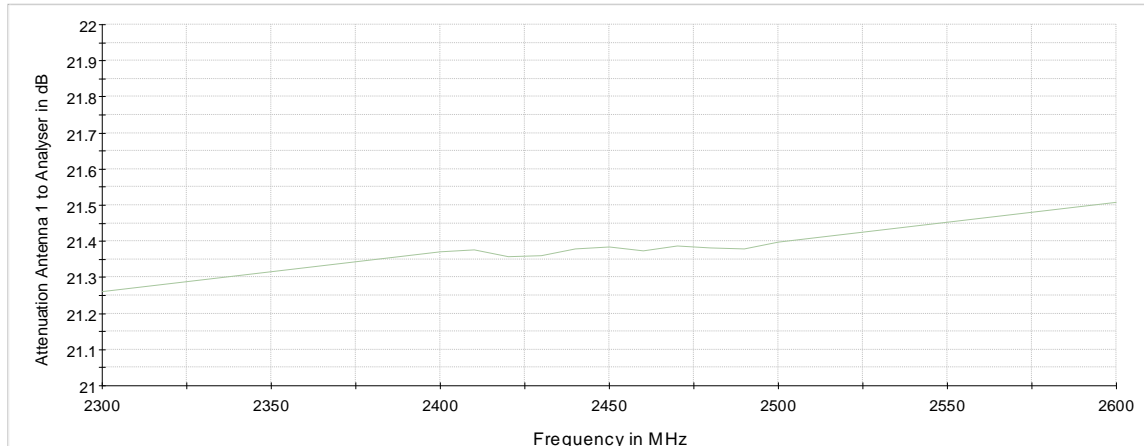
The EUT was connected to the test system as described in the block diagram below. The complete attenuation of the measurement path is known and considered.

Analyser settings:

- Lower Band Edge:  
Measured range: 2310.0 MHz to 2483.5 MHz  
Upper Band Edge  
Measured range: 2400.0 MHz to 2500 MHz
- Detector: Peak
- Resolution Bandwidth (RBW): 100 kHz
- Video Bandwidth (VBW): 300 kHz
- Sweptime: Auto
- Sweeps: Till stable (min. 300, max. 15000)
- Trace: Maxhold



TS8997; Band Edge Conducted



Attenuation of the measurement path

## 5.6.2 TEST REQUIREMENTS / LIMITS

### FCC Part 15.247 (d)

“In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. ...

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).”

For the conducted measurement the RF power at the band edge shall be “at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power...”

### 5.6.3 TEST PROTOCOL

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 BT LE 1  
 Mbit/s

| Channel No. | Channel Center Frequency [MHz] | Band Edge Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|-------------|--------------------------------|-----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 0           | 2402                           | 2400.0                | -54.7                | PEAK     | 100       | -0.1             | -20.1       | 34.6                 |
| 39          | 2480                           | 2483.5                | -56.0                | PEAK     | 100       | 0.0              | -20.0       | 36.0                 |

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s

| Channel No. | Channel Center Frequency [MHz] | Band Edge Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|-------------|--------------------------------|-----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 1           | 2412                           | 2400.0                | -45.6                | PEAK     | 100       | 5.0              | -25.0       | 20.6                 |
| 11          | 2462                           | 2483.5                | -54.5                | PEAK     | 100       | 3.5              | -26.5       | 28.0                 |

WLAN g-Mode; 20 MHz; 6 Mbit/s

| Channel No. | Channel Center Frequency [MHz] | Band Edge Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|-------------|--------------------------------|-----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 1           | 2412                           | 2400.0                | -33.6                | PEAK     | 100       | 1.9              | -28.1       | 5.5                  |
| 11          | 2462                           | 2483.5                | -49.0                | PEAK     | 100       | 1.4              | -28.6       | 20.4                 |

WLAN n-Mode; 20 MHz; MCS0

| Channel No. | Channel Center Frequency [MHz] | Band Edge Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|-------------|--------------------------------|-----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 1           | 2412                           | 2400.0                | -32.1                | PEAK     | 100       | 2.0              | -28.0       | 4.1                  |
| 11          | 2462                           | 2483.5                | -47.4                | PEAK     | 100       | 1.4              | -28.6       | 18.8                 |

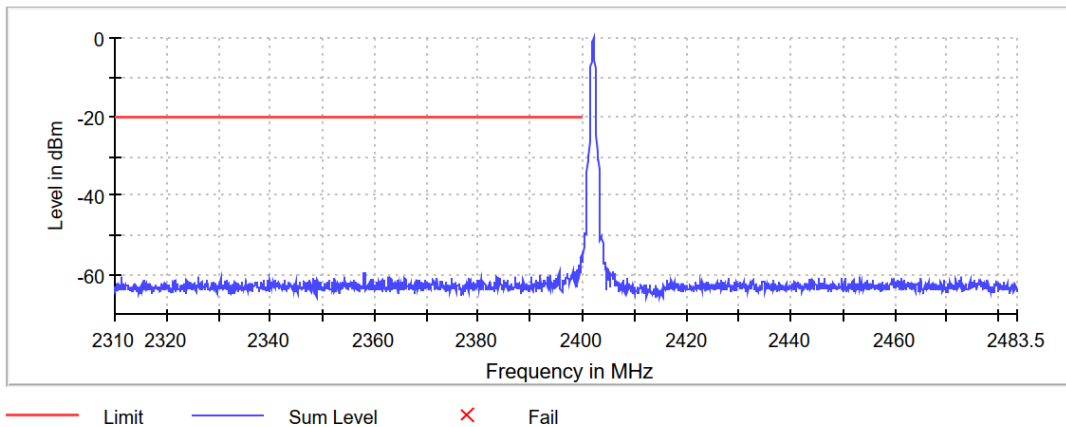
WLAN n-Mode; 40 MHz; MCS0

| Channel No. | Channel Center Frequency [MHz] | Band Edge Freq. [MHz] | Spurious Level [dBm] | Detector | RBW [kHz] | Ref. Level [dBm] | Limit [dBm] | Margin to Limit [dB] |
|-------------|--------------------------------|-----------------------|----------------------|----------|-----------|------------------|-------------|----------------------|
| 3           | 2422                           | 2400.0                | -32.0                | PEAK     | 100       | -1.0             | -31.0       | 1.0                  |
| 11          | 2462                           | 2483.5                | -31.4                | PEAK     | 100       | -1.2             | -31.2       | 0.2                  |

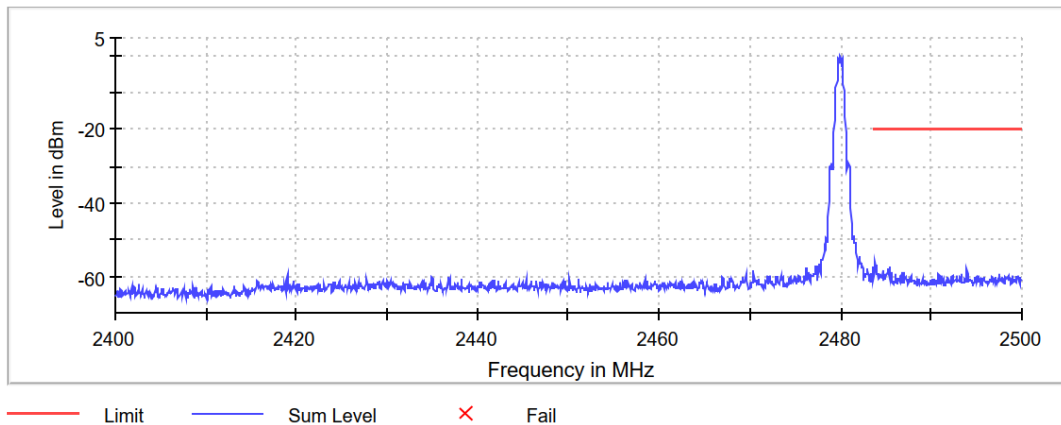
Remark: Please see next sub-clause for the measurement plot.

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

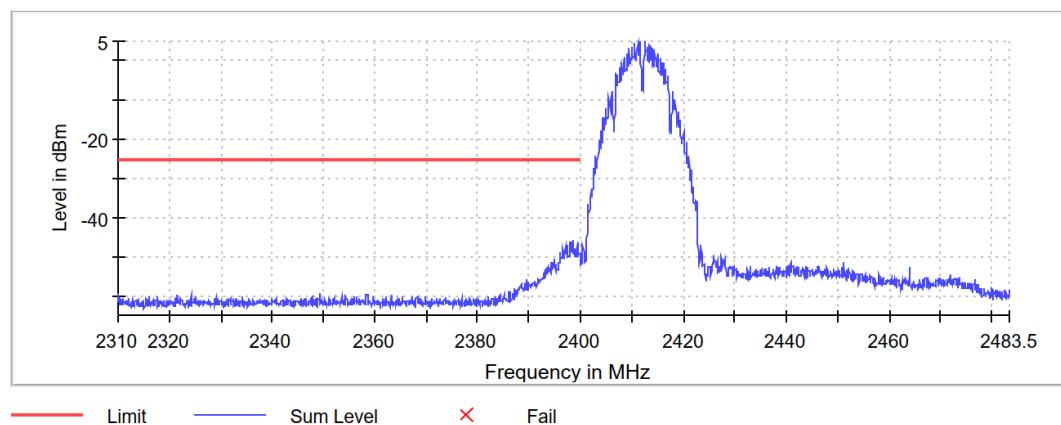
Modulation= Bluetooth LE 1 Mbps, Operating Channel = low, Band Edge = low  
(S01\_AF01)  
Band Edge



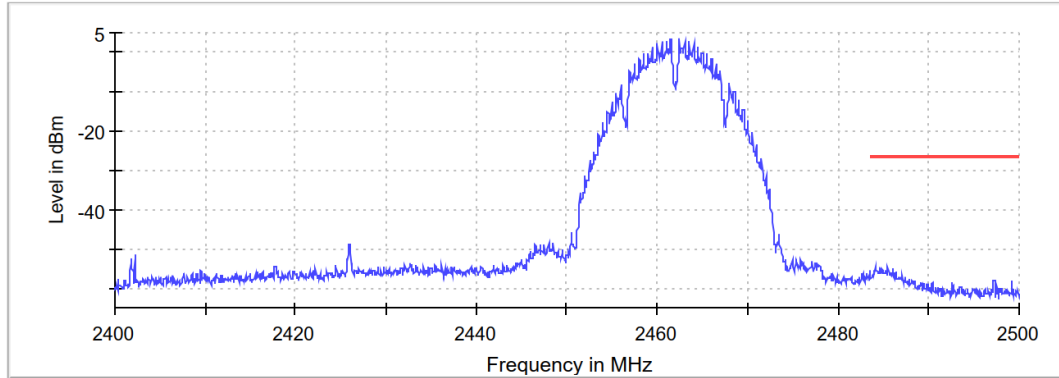
Modulation= Bluetooth LE 1 Mbps, Operating Channel = high, Band Edge = high  
(S01\_AF01)  
Band Edge



Modulation= WLAN b, Operating Channel = low, Band Edge = low  
(S01\_AF01)  
Band Edge

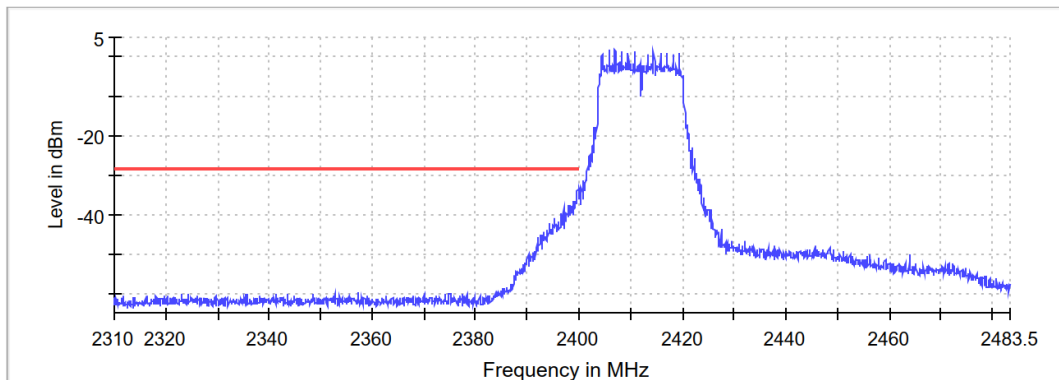


Modulation= WLAN b, Operating Channel = high, Band Edge = high  
(S01\_AF01)  
Band Edge



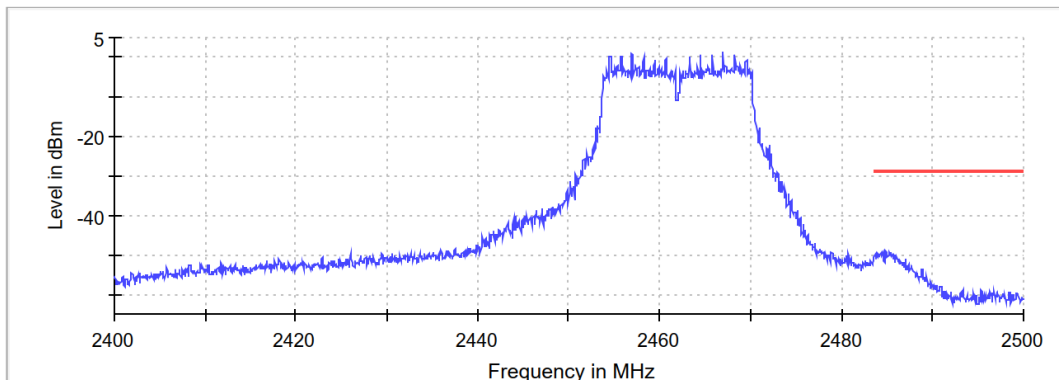
— Limit    — Sum Level    × Fail

Modulation= WLAN g, Operating Channel = low, Band Edge = low  
(S01\_AF01)  
Band Edge



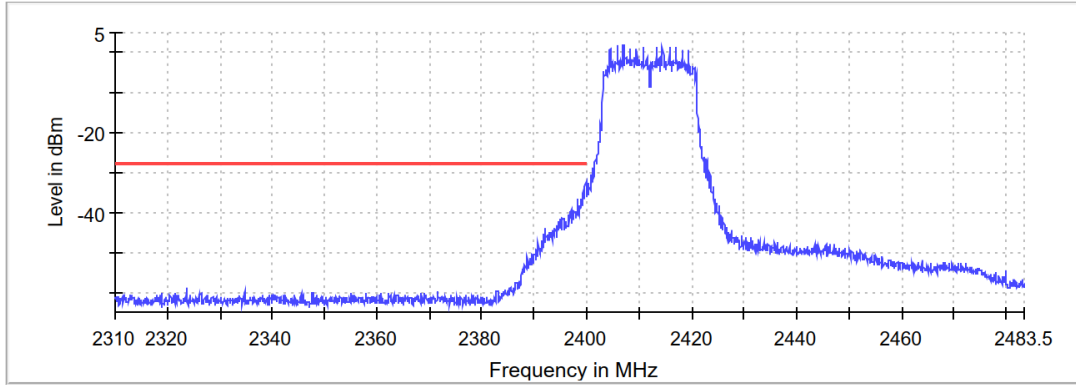
— Limit    — Sum Level    × Fail

Modulation= WLAN g, Operating Channel = high, Band Edge = high  
(S01\_AF01)  
Band Edge



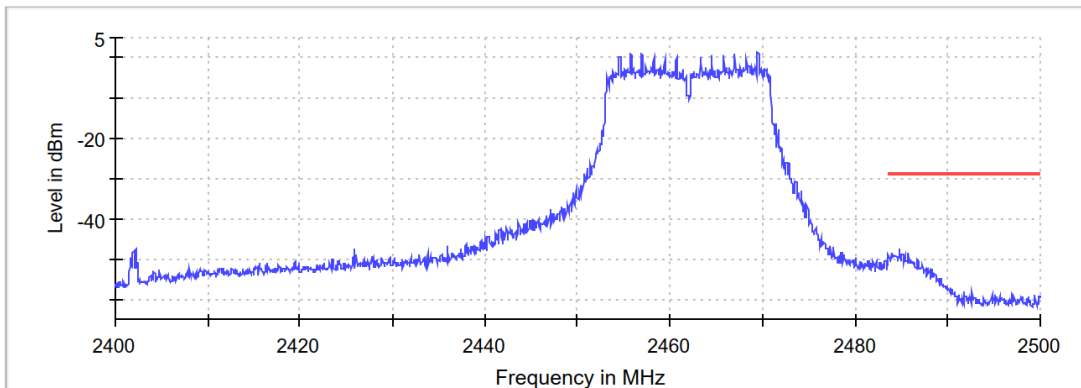
— Limit    — Sum Level    × Fail

Modulation= WLAN n 20 MHz, Operating Channel = low, Band Edge = low  
(S01\_AF01)  
Band Edge



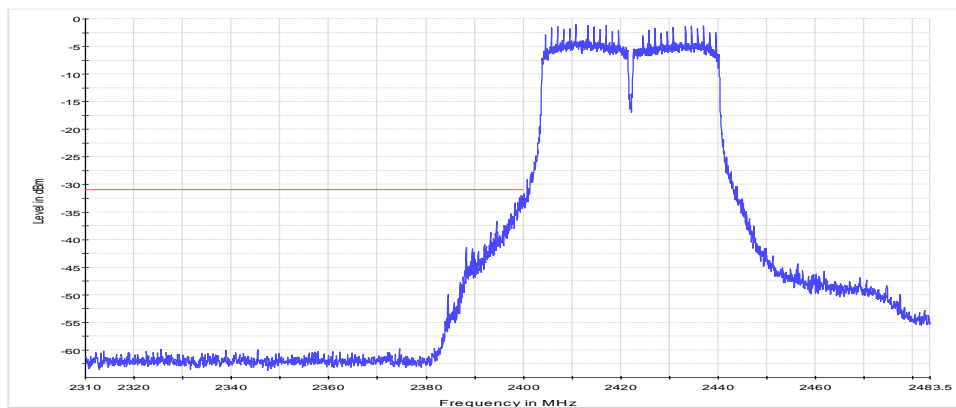
— Limit    — Sum Level    × Fail

Modulation= WLAN n 20 MHz, Operating Channel = high, Band Edge = high  
(S01\_AF01)  
Band Edge



— Limit    — Sum Level    × Fail

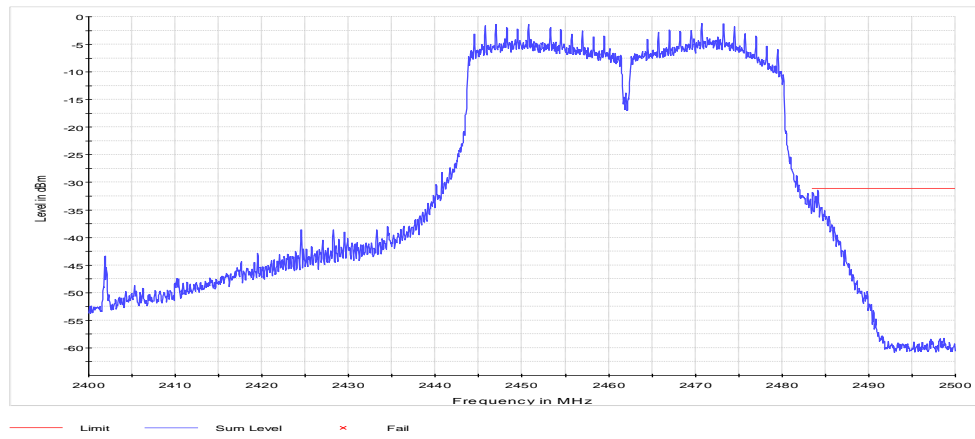
Modulation= WLAN n 40 MHz, Operating Channel = low, Band Edge = low  
(S01\_AF01)  
Band Edge



— Limit    — Sum Level    × Fail



Modulation= WLAN n 40 MHz, Operating Channel = high, Band Edge = high  
(S01\_AF01)



### 5.6.5 TEST EQUIPMENT USED

- R&S TS8997

## 5.7 BAND EDGE COMPLIANCE RADIATED

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**

ANSI C63.10, chapter 6.6.5

### 5.7.1 TEST DESCRIPTION

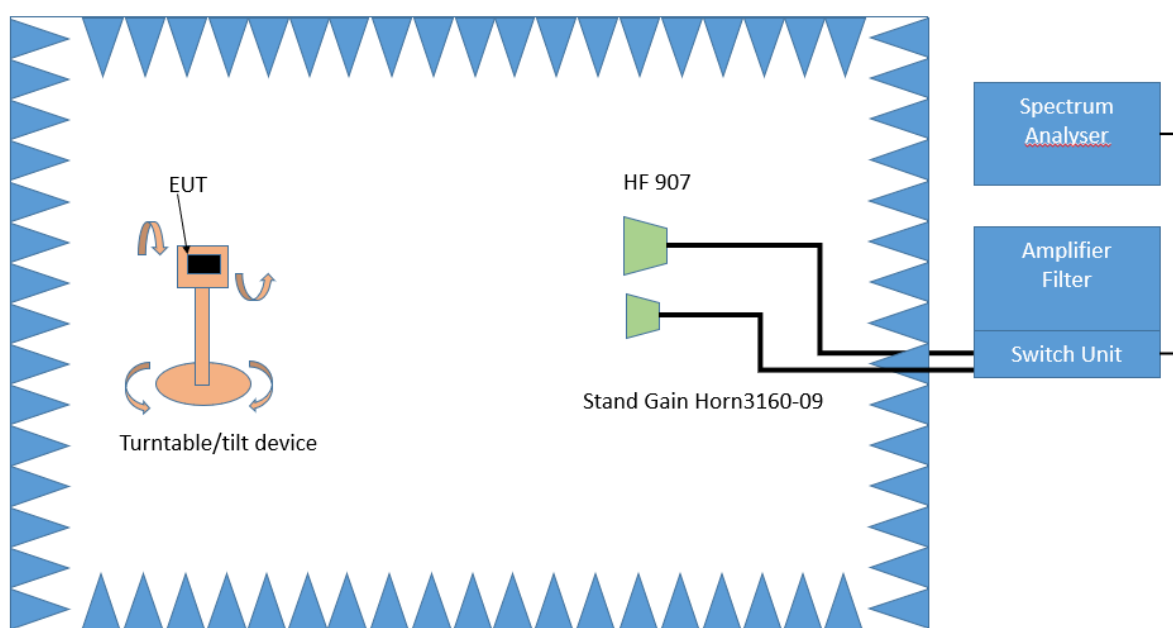
The test set-up was made in accordance to the general provisions of ANSI C63.10 in a typical installation configuration. The measurements were performed according the following sub-chapter of ANSI C63.10:

- 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

## 5.7.2 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 ( $\mu\text{V}/\text{m}$ ) | Measurement distance (m) | Limits ( $\text{dB}\mu\text{V}/\text{m}$ ) |
|------------------|----------------------------------|--------------------------|--|
| 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 ( $\mu\text{V}/\text{m}$ ) | Measurement distance (m) | Limits ( $\text{dB}\mu\text{V}/\text{m}$ ) |
|------------------|----------------------------------|--------------------------|--|
| 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:  $\text{Limit (dB}\mu\text{V}/\text{m)} = 20 \log (\text{Limit } (\mu\text{V}/\text{m})/1\mu\text{V}/\text{m})$

### 5.7.3 TEST PROTOCOL

Ambient temperature: 27 °C  
 Air Pressure: 1016 hPa  
 Humidity: 39 %  
 BT LE 1 Mbit/s  
 Applied duty cycle correction (AV): 0.0 dB

| Ch. No. | Ch. Center Freq. [MHz] | Band Edge Freq. [MHz] | Spurious Level [dB $\mu$ V/m] | Detec-tor | RBW [kHz] | Limit [dB $\mu$ V/m] | Margin to Limit [dB] |
|---------|------------------------|-----------------------|-------------------------------|-----------|-----------|----------------------|----------------------|
| 39      | 2480                   | 2483.5                | 53.7                          | PEAK      | 1000      | 74.0                 | 20.3                 |
| 39      | 2480                   | 2483.5                | 37.9                          | AV        | 1000      | 54.0                 | 16.1                 |

Ambient temperature: 25 °C  
 Air Pressure: 1004 hPa  
 Humidity: 40 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s  
 Applied duty cycle correction (AV): 0.1 dB

| Ch. No. | Ch. Center Freq. [MHz] | Band Edge Freq. [MHz] | Spurious Level [dB $\mu$ V/m] | Detec-tor | RBW [kHz] | Limit [dB $\mu$ V/m] | Margin to Limit [dB] |
|---------|------------------------|-----------------------|-------------------------------|-----------|-----------|----------------------|----------------------|
| 11      | 2462                   | 2483.5                | 49.8                          | PEAK      | 1000      | 74.0                 | 24.2                 |
| 11      | 2462                   | 2483.5                | 37.5                          | AV        | 1000      | 54.0                 | 16.5                 |

WLAN g-Mode; 20 MHz; 6 Mbit/s  
 Applied duty cycle correction (AV): 0.6 dB

| Ch. No. | Ch. Center Freq. [MHz] | Band Edge Freq. [MHz] | Spurious Level [dB $\mu$ V/m] | Detec-tor | RBW [kHz] | Limit [dB $\mu$ V/m] | Margin to Limit [dB] |
|---------|------------------------|-----------------------|-------------------------------|-----------|-----------|----------------------|----------------------|
| 11      | 2462                   | 2483.5                | 58.3                          | PEAK      | 1000      | 74.0                 | 15.7                 |
| 11      | 2462                   | 2483.5                | 43.7                          | AV        | 1000      | 54.0                 | 10.3                 |

WLAN n-Mode; 20 MHz; MCS0  
 Applied duty cycle correction (AV): 0.6 dB

| Ch. No. | Ch. Center Freq. [MHz] | Band Edge Freq. [MHz] | Spurious Level [dB $\mu$ V/m] | Detec-tor | RBW [kHz] | Limit [dB $\mu$ V/m] | Margin to Limit [dB] |
|---------|------------------------|-----------------------|-------------------------------|-----------|-----------|----------------------|----------------------|
| 11      | 2462                   | 2483.5                | 54.3                          | PEAK      | 1000      | 74.0                 | 19.7                 |
| 11      | 2462                   | 2483.5                | 41.6                          | AV        | 1000      | 54.0                 | 12.4                 |

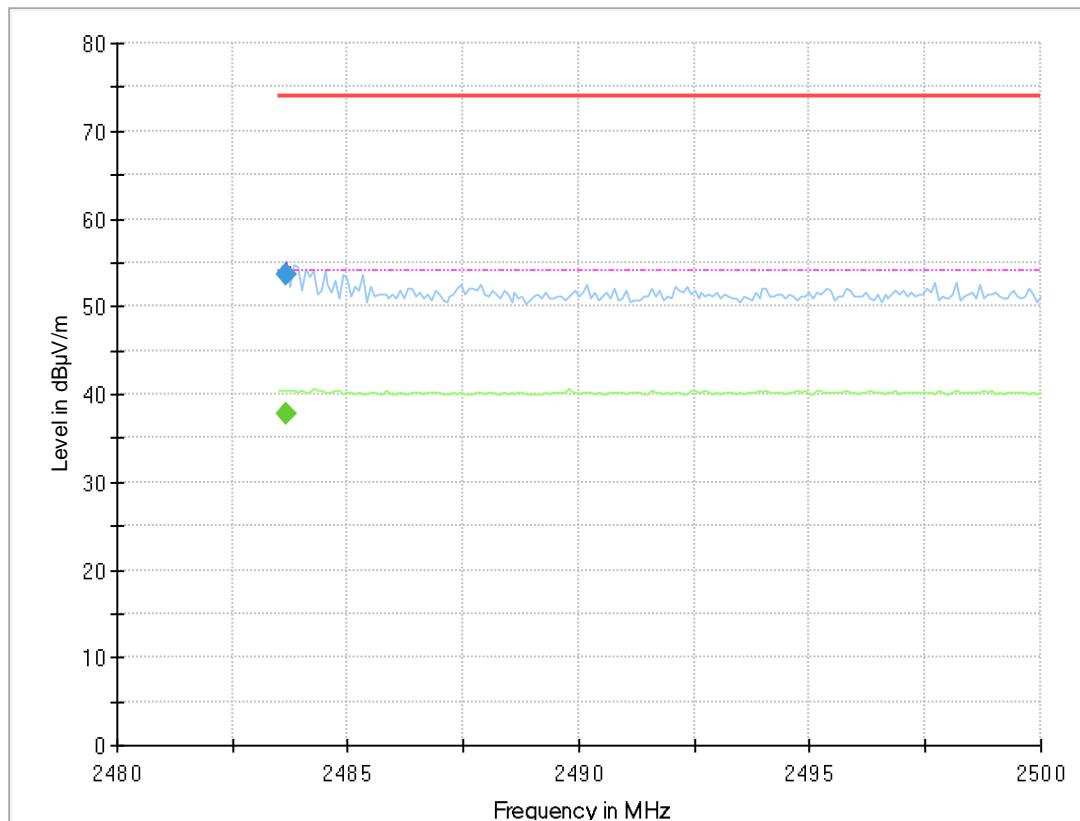
WLAN n-Mode; 40 MHz; MCS0  
 Applied duty cycle correction (AV): 1 dB

| Ch. No. | Ch. Center Freq. [MHz] | Band Edge Freq. [MHz] | Spurious Level [dB $\mu$ V/m] | Detec-tor | RBW [kHz] | Limit [dB $\mu$ V/m] | Margin to Limit [dB] |
|---------|------------------------|-----------------------|-------------------------------|-----------|-----------|----------------------|----------------------|
| 11      | 2462                   | 2483.5                | 71.5                          | PEAK      | 1000      | 74.0                 | 2.5                  |
| 11      | 2462                   | 2483.5                | 53.5                          | AV        | 1000      | 54.0                 | 0.5                  |

Remark: Please see next sub-clause for the measurement plot.

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

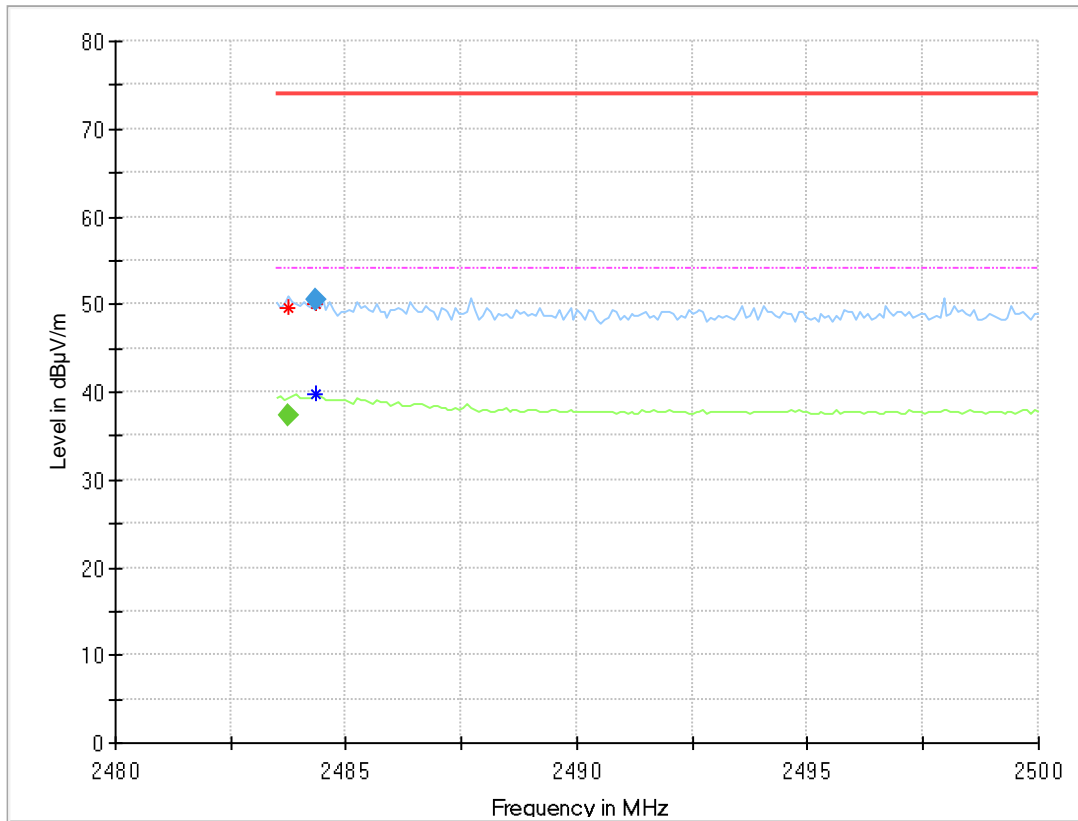
Modulation= Bluetooth LE 1 Mbps, Operating Channel = high, Band Edge = high (S01\_AA01)



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2483.665        | ---              | 37.9              | 54.00          | 16.13       | 1000.0          | 1000.000        | 150.0       | V   | 30.0          | 95.0            | 7.8          |
| 2483.665        | 53.7             | ---               | 74.00          | 20.30       | 1000.0          | 1000.000        | 150.0       | V   | 30.0          | 95.0            | 7.8          |

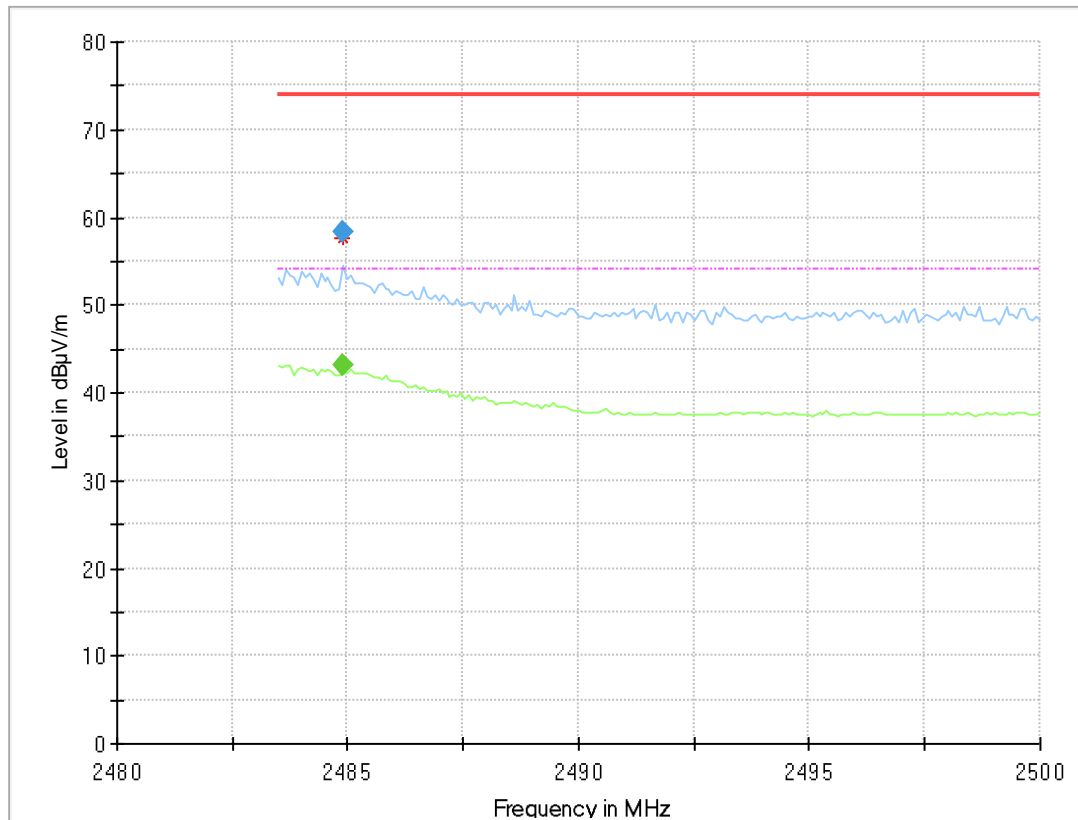
Modulation= WLAN b, Operating Channel = high, Band Edge = high (S01\_AK01)



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2483.748        | ---              | 37.4              | 54.00          | 16.64       | 1000.0          | 1000.000        | 150.0       | V   | -9.0          | 96.0            | 5.3          |
| 2484.325        | 50.6             | ---               | 74.00          | 23.43       | 1000.0          | 1000.000        | 150.0       | H   | 6.0           | 0.0             | 5.3          |

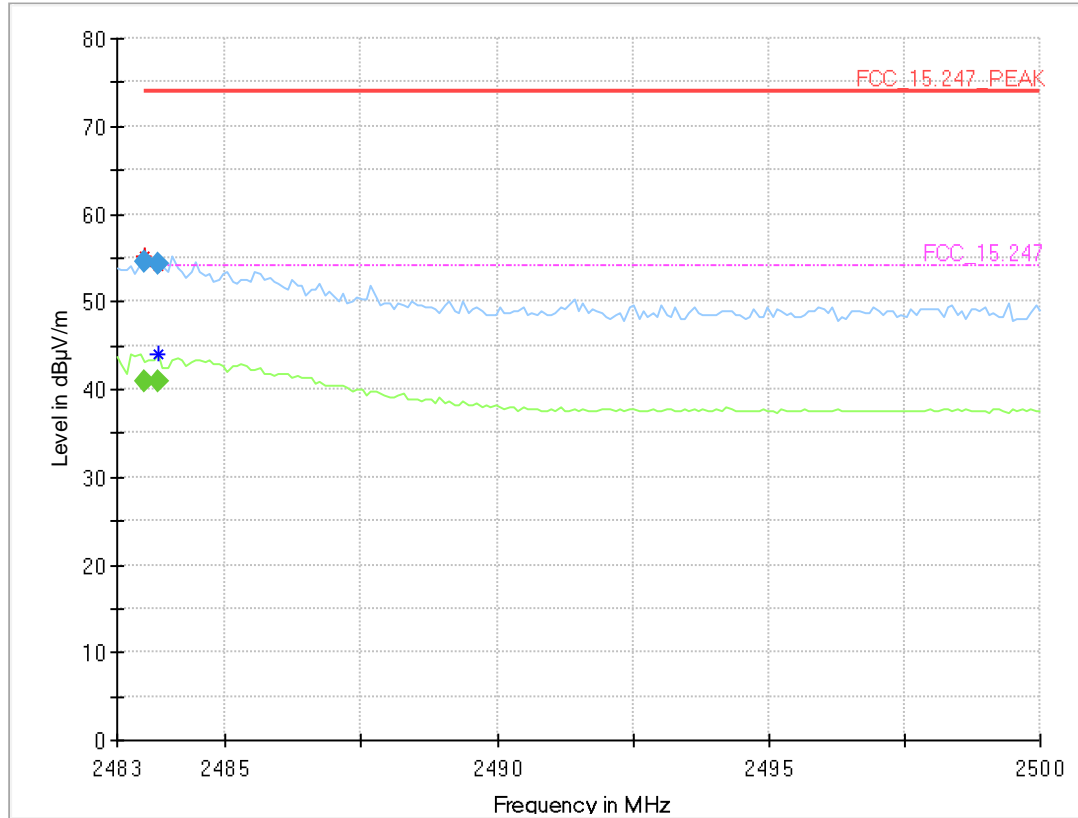
Modulation= WLAN g, Operating Channel = high, Band Edge = high  
(S01\_AA01)



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2484.903        | ---              | 43.1              | 54.00          | 10.87       | 1000.0          | 1000.000        | 150.0       | V   | 15.0          | 36.0            | 5.3          |
| 2484.903        | 58.3             | ---               | 74.00          | 15.75       | 1000.0          | 1000.000        | 150.0       | V   | 15.0          | 36.0            | 5.3          |

Modulation= WLAN n 20 MHz, Operating Channel = high, Band Edge = high  
(S01\_AA01)

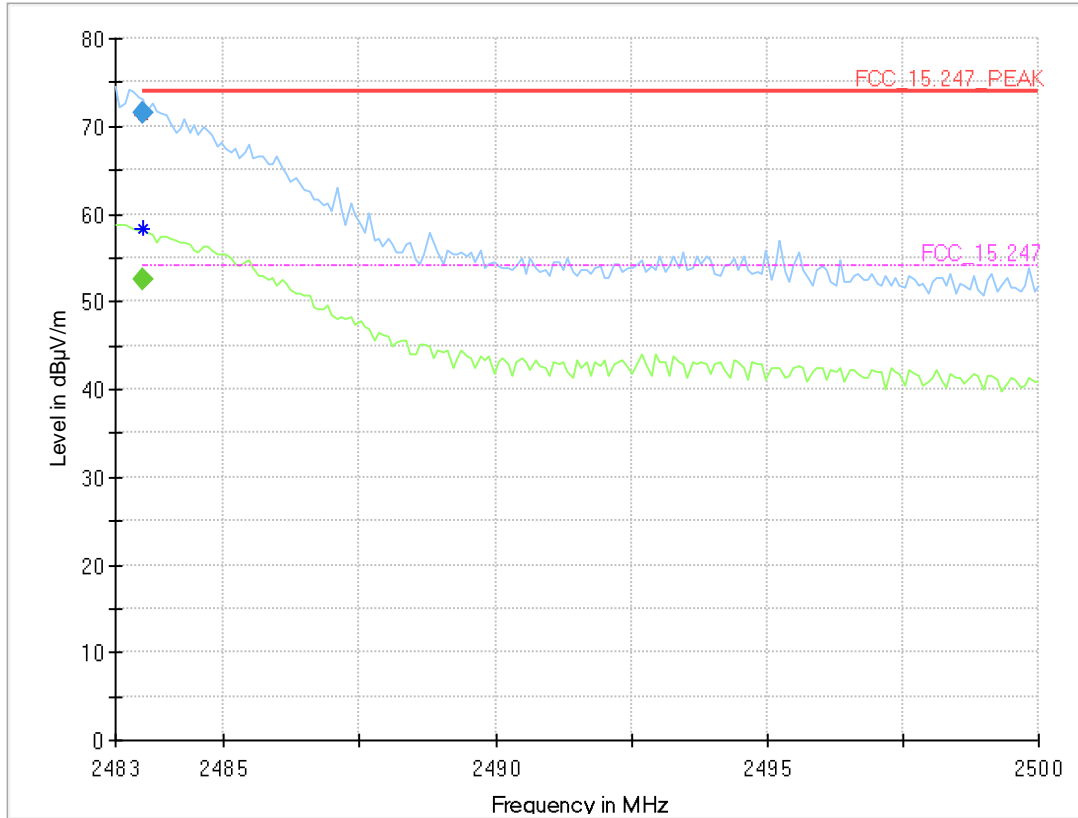


### Final Result

| 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2483.510        | ---              | 41.0              | 54.00          | 13.05       | 1000.0          | 1000.000        | 150.0       | V   | 19.0          | 92.0            | 5.3          |
| 2483.510        | 54.5             | ---               | 74.00          | 19.52       | 1000.0          | 1000.000        | 150.0       | V   | 19.0          | 92.0            | 5.3          |
| 2483.765        | ---              | 41.0              | 54.00          | 13.03       | 1000.0          | 1000.000        | 150.0       | V   | 19.0          | 92.0            | 5.3          |
| 2483.765        | 54.3             | ---               | 74.00          | 19.75       | 1000.0          | 1000.000        | 150.0       | V   | 19.0          | 92.0            | 5.3          |



Modulation= WLAN n 40 MHz, Operating Channel = high, Band Edge = high (S01\_AA01)



### 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/m) |
|-----------------|------------------|-------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|-----------------|--------------|
| 2483.510        | ---              | 52.5              | 54.00          | 1.47        | 1000.0          | 1000.000        | 150.0       | H   | -11.0         | -11.0           | 5.3          |
| 2483.510        | 71.5             | ---               | 74.00          | 2.47        | 1000.0          | 1000.000        | 150.0       | H   | -11.0         | -11.0           | 5.3          |

### 5.7.5 TEST EQUIPMENT USED

- Radiated Emissions FAR 2.4 GHz FCC

## 5.8 POWER DENSITY

Standard **FCC Part 15 Subpart C**

**The test was performed according to:**

ANSI C63.10, chapter 11.10.2

### 5.8.1 TEST DESCRIPTION

The Equipment Under Test (EUT) was set up in a shielded room to perform the Power Density measurements.

The results recorded were measured with the modulation which produces the worst-case (highest) power density.

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.

Maximum Peak Power Spectral Density (e.g. Bluetooth low energy):

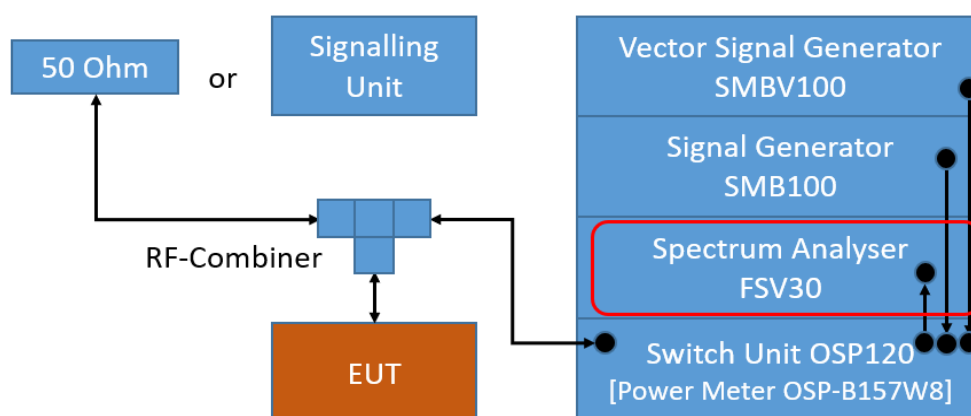
Analyser settings:

- Resolution Bandwidth (RBW): 100 kHz, 10 kHz or 3 kHz
- Video Bandwidth (VBW):  $\geq 3$  times RBW
- Trace: Maxhold
- Sweeps: Till stable (min. 200, max. 15000)
- Sweeptime: Auto
- Detector: Peak

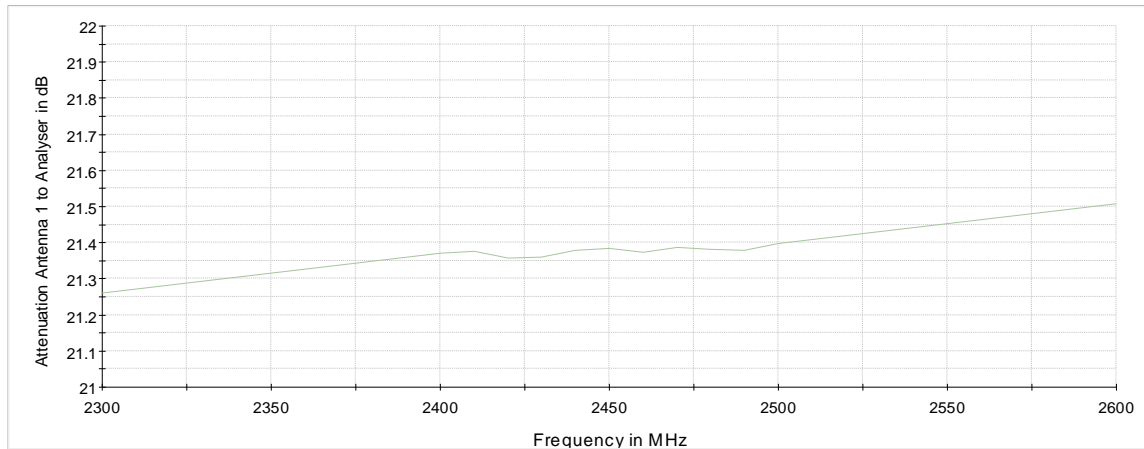
Maximum Average Power Spectral Density (e.g. WLAN):

Analyser settings:

- Resolution Bandwidth (RBW): 100 kHz, 10 kHz or 3 kHz
- Video Bandwidth (VBW):  $\geq 3$  times RBW
- Sweep Points:  $\geq 2$  times span / RBW
- Trace: Maxhold
- Sweeps: Till stable (max. 150)
- Sweeptime:  $\leq$  Number of Sweep Points x minimum transmission duration
- Detector: RMS



TS8997; Power Spectral Density



Attenuation of the measurement path

## 5.8.2 TEST REQUIREMENTS / LIMITS

FCC Part 15, Subpart C, §15.247 (e)

For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

...

The same method of determining the conducted output power shall be used to determine the power spectral density.

FCC Part 15, Subpart C, §15.247 (f)

(f) For the purposes of this section, hybrid systems are those that employ a combination of both frequency hopping and digital modulation techniques.

...

The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

### 5.8.3 TEST PROTOCOL

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 BT LE 1 Mbit/s

| Band        | Channel No. | Frequency [MHz] | Power Density [dBm / RBW] | RBW [kHz] | Limit [dBm/3kHz] | Margin to Limit [dB] |
|-------------|-------------|-----------------|---------------------------|-----------|------------------|----------------------|
| 2.4 GHz ISM | 0           | 2402            | -6.5                      | 10.0      | 8.0              | 14.5                 |
|             | 19          | 2440            | -4.6                      | 10.0      | 8.0              | 12.6                 |
|             | 39          | 2480            | -6.5                      | 10.0      | 8.0              | 14.5                 |

Ambient temperature: 23 °C  
 Air Pressure: 1001 hPa  
 Humidity: 39 %  
 WLAN b-Mode; 20 MHz; 1 Mbit/s

| Band        | Channel No. | Frequency [MHz] | Power Density [dBm / RBW] | RBW [kHz] | Limit [dBm/3kHz] | Margin to Limit [dB] |
|-------------|-------------|-----------------|---------------------------|-----------|------------------|----------------------|
| 2.4 GHz ISM | 1           | 2412            | -1.7                      | 100.0     | 8.0              | 9.7                  |
|             | 6           | 2437            | -2.7                      | 100.0     | 8.0              | 10.7                 |
|             | 11          | 2462            | -3.0                      | 100.0     | 8.0              | 11.0                 |

WLAN g-Mode; 20 MHz; 6 Mbit/s

| Band        | Channel No. | Frequency [MHz] | Power Density [dBm / RBW] | RBW [kHz] | Limit [dBm/3kHz] | Margin to Limit [dB] |
|-------------|-------------|-----------------|---------------------------|-----------|------------------|----------------------|
| 2.4 GHz ISM | 1           | 2412            | -6.8                      | 100.0     | 8.0              | 14.8                 |
|             | 6           | 2437            | -7.3                      | 100.0     | 8.0              | 15.3                 |
|             | 11          | 2462            | -7.5                      | 100.0     | 8.0              | 15.5                 |

WLAN n-Mode; 20 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | Power Density [dBm / RBW] | RBW [kHz] | Limit [dBm/3kHz] | Margin to Limit [dB] |
|-------------|-------------|-----------------|---------------------------|-----------|------------------|----------------------|
| 2.4 GHz ISM | 1           | 2412            | -7.5                      | 100.0     | 8.0              | 15.5                 |
|             | 6           | 2437            | -8.2                      | 100.0     | 8.0              | 16.2                 |
|             | 11          | 2462            | -8.5                      | 100.0     | 8.0              | 16.5                 |

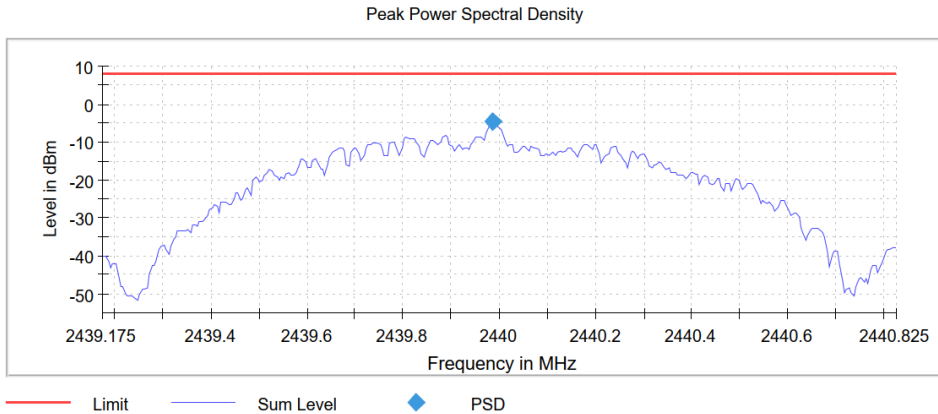
WLAN n-Mode; 40 MHz; MCS0

| Band        | Channel No. | Frequency [MHz] | Power Density [dBm / RBW] | RBW [kHz] | Limit [dBm/3kHz] | Margin to Limit [dB] |
|-------------|-------------|-----------------|---------------------------|-----------|------------------|----------------------|
| 2.4 GHz ISM | 3           | 2422            | -10.3                     | 100.0     | 8.0              | 18.3                 |
|             | 6           | 2437            | -9.7                      | 100.0     | 8.0              | 17.7                 |
|             | 11          | 2462            | -10.3                     | 100.0     | 8.0              | 18.3                 |

Remark: Please see next sub-clause for the measurement plot.

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

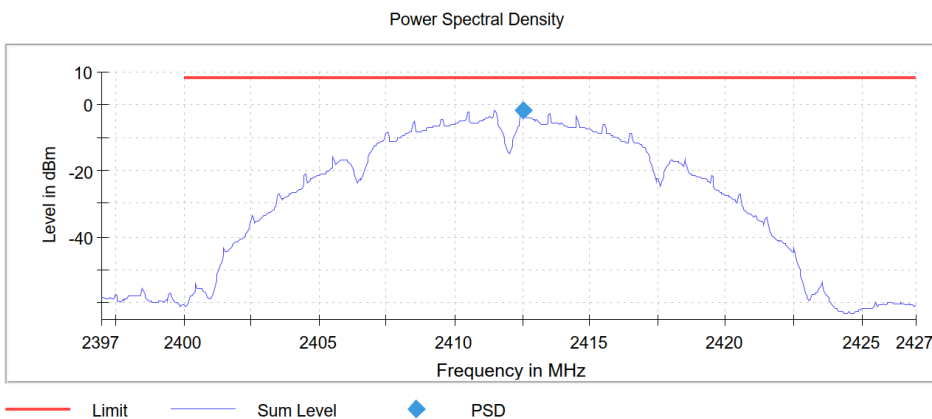
Modulation= Bluetooth LE 1 Mbps, Operating Channel = mid  
(S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.43918 GHz      |
| Stop Frequency        | 2.44083 GHz      |
| Span                  | 1.650 MHz        |
| RBW                   | 10.000 kHz       |
| VBW                   | 30.000 kHz       |
| SweepPoints           | 330              |
| Sweeptime             | 1.650 ms         |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | MaxPeak          |
| SweepCount            | 100              |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 4 / max. 150     |
| Stable                | 2 / 2            |
| Max Stable Difference | 0.09 dB          |

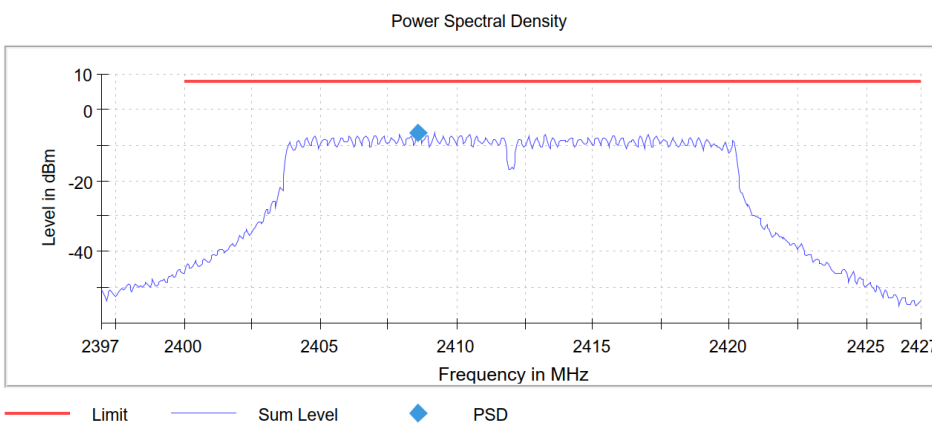
Modulation= WLAN b, Operating Channel = low  
(S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.39700 GHz      |
| Stop Frequency        | 2.42700 GHz      |
| Span                  | 30.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 600              |
| Sweeptime             | 600.000 ms       |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | RMS              |
| SweepCount            | 1                |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 37 / max. 150    |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.13 dB          |

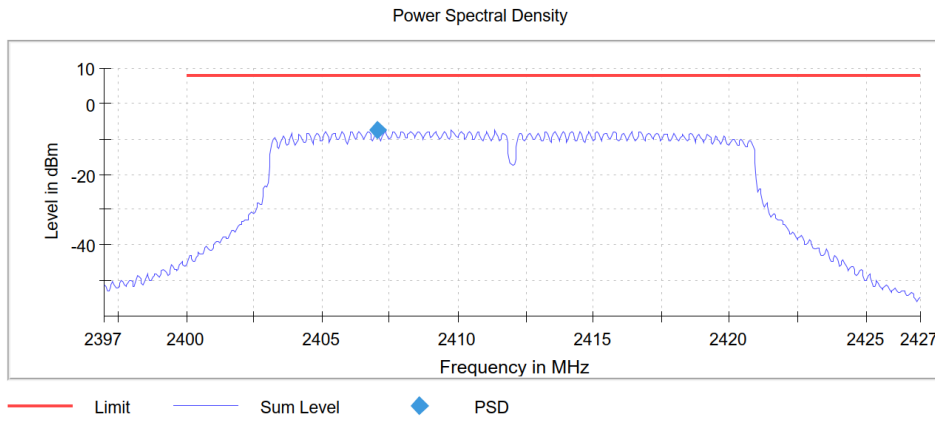
Modulation= WLAN g, Operating Channel = low  
(S01\_AF01)



#### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.39700 GHz      |
| Stop Frequency        | 2.42700 GHz      |
| Span                  | 30.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 600              |
| Sweeptime             | 600.000 ms       |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | RMS              |
| SweepCount            | 1                |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 6 / max. 150     |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.29 dB          |

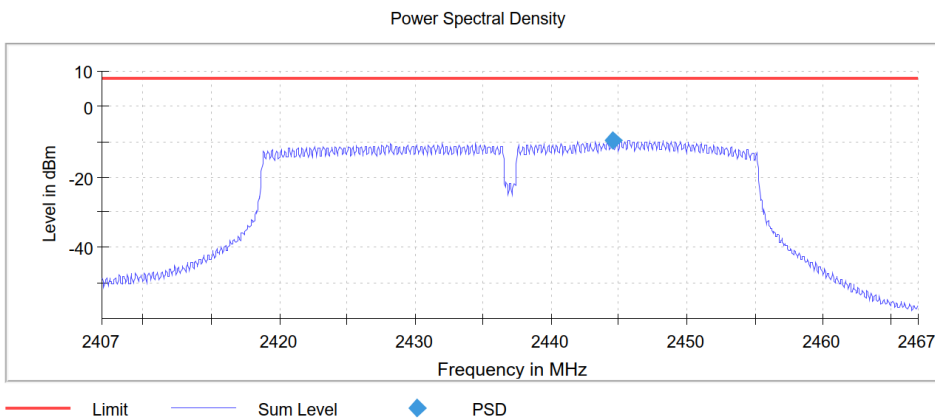
Modulation= WLAN n 20 MHz, Operating Channel = low  
(S01\_AF01)



### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.39700 GHz      |
| Stop Frequency        | 2.42700 GHz      |
| Span                  | 30.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 600              |
| Sweptime              | 600.000 ms       |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | RMS              |
| SweepCount            | 1                |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 8 / max. 150     |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.32 dB          |

Modulation= WLAN n 40 MHz, Operating Channel = mid  
(S01\_AF01)



### Measurement

| Setting               | Instrument Value |
|-----------------------|------------------|
| Start Frequency       | 2.40700 GHz      |
| Stop Frequency        | 2.46700 GHz      |
| Span                  | 60.000 MHz       |
| RBW                   | 100.000 kHz      |
| VBW                   | 300.000 kHz      |
| SweepPoints           | 1200             |
| Sweptime              | 1.200 s          |
| Reference Level       | 0.000 dBm        |
| Attenuation           | 10.000 dB        |
| Detector              | RMS              |
| SweepCount            | 1                |
| Filter                | 3 dB             |
| Trace Mode            | Max Hold         |
| Sweeptype             | Sweep            |
| Preamp                | off              |
| Stablemode            | Trace            |
| Stablevalue           | 0.50 dB          |
| Run                   | 19 / max. 150    |
| Stable                | 3 / 3            |
| Max Stable Difference | 0.46 dB          |

## 5.8.5 TEST EQUIPMENT USED

- R&S TS8997

## 6 TEST EQUIPMENT

### 6.1 TEST EQUIPMENT HARDWARE

- 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     | SMB100A                        | Signal Generator 9 kHz - 6 GHz                          | Rohde & Schwarz                   | 107695         | 2021-06          | 2024-06         |
| 1.2     | EX520                          | Digital Multimeter 12                                   | Extech Instruments Corp           | 05157876       | 2022-06          | 2024-06         |
| 1.3     | FSV30                          | Signal Analyzer 10 Hz - 30 GHz                          | Rohde & Schwarz                   | 103005         | 2023-08          | 2025-08         |
| 1.4     | NGSM 32/10                     | Power Supply  | Rohde & Schwarz GmbH & Co. KG     | 3456           | 2022-01          | 2024-01         |
| 1.5     | Temperature Chamber KWP 120/70 | Temperature Chamber Weiss 01                            | Weiss                             | 59226012190010 | 2022-05          | 2024-05         |
| 1.6     | Temperature Chamber VT 4002    | Temperature Chamber Vötsch 03                           | Vötsch                            | 58566002150010 | 2022-05          | 2024-05         |
| 1.7     | FSW43                          | Signal Analyser   | Rohde & Schwarz GmbH & Co. KG     | 102013         | 2023-07          | 2025-07         |
| 1.8     | Opus10 THI (8152.00)           | T/H Logger 14   | Lufft Mess- und Regeltechnik GmbH | 13993          |                  |                 |
| 1.9     | SMBV100A                       | Vector Signal Generator 9 kHz - 6 GHz                   | Rohde & Schwarz                   | 259291         | 2023-01          | 2026-01         |
| 1.10    | OSP120                         | Contains Power Meter and Switching Unit OSP-B157W8 PLUS | Rohde & Schwarz                   | 101158         | 2021-08          | 2024-08         |
| 1.11    | CS-RUB6                        | Rubidium Frequency Standard                             | Rohde & Schwarz GmbH & Co. KG     | 100321         | 2023-10          | 2024-10         |

- 2 Radiated Emissions FAR 2.4 GHz FCC  
Radiated emission tests for 2.4 GHz ISM devices in a fully anechoic room

| Ref.No. | Device Name             | Description                            | Manufacturer       | Serial Number           | Last Calibration | Calibration Due |
|---------|-------------------------|--|--------------------|-------------------------|------------------|-----------------|
| 2.1     | Innco Systems CO3000    | Controller for bore sight mast FAC     |                    | CO3000/1460/54 740522/P | N/A              | N/A             |
| 2.2     | AMF-7D00101800-30-10P-R | Broadband Amplifier 100 MHz - 18 GHz   | Miteq              |                         | N/A              | N/A             |
| 2.3     | Anechoic Chamber 03     | FAR, 8.80m x 4.60m x 4.05m (l x w x h) | Albatross Projects | P26971-647-001-PRB      | N/A              | N/A             |
| 2.4     | Fluke 177               | Digital Multimeter 03 (Multimeter)     | Fluke Europe B.V.  | 86670383                | 2023-08          | 2025-08         |

| Ref.No. | Device Name               | Description  | Manufacturer                        | Serial Number          | Last Calibration | Calibration Due |
|---------|---------------------------|--|-------------------------------------|------------------------|------------------|-----------------|
| 2.5     | JS4-18002600-32-5P        | Broadband Amplifier 18 GHz - 26 GHz                      | Miteq                               | 849785                 | N/A              | N/A             |
| 2.6     | FSW43                     | Spectrum Analyzer  | Rohde & Schwarz GmbH & Co. KG       | 103779                 | 2023-04          | 2025-04         |
| 2.7     | EP 1200/B, NA/B1          | AC Source, Amplifier with integrated variable Oscillator | Spitzenberger & Spies GmbH & Co. KG | B6278                  | N/A              | N/A             |
| 2.8     | 3160-09                   | Standard Gain / Pyramidal Horn Antenna 26.5 GHz          | EMCO Elektronik GmbH                | 00083069               | N/A              | N/A             |
| 2.9     | WHKX 7.0/18G-8SS          | High Pass Filter   | Wainwright Instruments GmbH         | 09                     | N/A              | N/A             |
| 2.10    | MA3000/0800-XP-ET-compact | Bore Sight Antenna Mast                                  |                                     |                        | N/A              | N/A             |
| 2.11    | TT 1.5 WI                 | Turn Table   | Maturo GmbH                         | -                      | N/A              | N/A             |
| 2.12    | 5HC3500/18000-1.2-KK      | High Pass Filter   | Trilithic                           | 200035008              | N/A              | N/A             |
| 2.13    | Opus 20 THI (8120.00)     | ThermoHygro Datalogger                                   | Lufft Mess- und Regeltechnik GmbH   | 115.0318.0802.033      | 2023-08          | 2025-08         |
| 2.14    | TD1.5-10kg                | EUT Tilt Device (Rohacell)                               | Maturo GmbH                         | TD1.5-10kg/024/3790709 | N/A              | N/A             |
| 2.15    | AFS42-00101800-25-S-42    | Broadband Amplifier 25 MHz - 18 GHz                      | Miteq                               | 2035324                | N/A              | N/A             |
| 2.16    | HF 907                    | Double-ridged horn                                       | Rohde & Schwarz                     | 102444                 | 2021-09          | 2024-09         |

3 Radiated Emissions SAC H-Field  
Radiated emission tests in the H-Field in a semi anechoic room

| Ref.No. | Device Name          | Description  | Manufacturer                        | Serial Number | Last Calibration | Calibration Due |
|---------|----------------------|--|-------------------------------------|---------------|------------------|-----------------|
| 3.1     | N5000/NP             | Filter for EUT, 2 Lines, 250 V, 16 A                     | ETS-LINDGREN                        | 241515        | N/A              | N/A             |
| 3.2     | ESW44                | EMI Receiver / Spectrum Analyzer                         | Rohde & Schwarz GmbH & Co. KG       | 101603        | 2022-01          | 2024-01         |
| 3.3     | Anechoic Chamber 01  | SAC/FAR, 10.58 m x 6.38 m x 6.00 m                       | Frankonia                           | none          | N/A              | N/A             |
| 3.4     | Fluke 177            | Digital Multimeter 03 (Multimeter)                       | Fluke Europe B.V.                   | 86670383      | 2023-08          | 2025-08         |
| 3.5     | Opus10 THI (8152.00) | T/H Logger 10  | Lufft Mess- und Regeltechnik GmbH   | 12488         | N/A              | N/A             |
| 3.6     | EP 1200/B, NA/B1     | AC Source, Amplifier with integrated variable Oscillator | Spitzenberger & Spies GmbH & Co. KG | B6278         | N/A              | N/A             |



| Ref.No. | Device Name | Description                  | Manufacturer                  | Serial Number | Last Calibration | Calibration Due |
|---------|-------------|------------------------------|-------------------------------|---------------|------------------|-----------------|
| 3.7     | DS 420S     | Turn Table 2 m diameter      | HD GmbH                       | 420/573/99    | N/A              | N/A             |
| 3.8     | HFH2-Z2     | Loop Antenna + 3 Axis Tripod | Rohde & Schwarz GmbH & Co. KG | 829324/006    | 2021-01          | 2024-01         |
| 3.9     | CS-RUB6     | Rubidium Frequency Standard  | Rohde & Schwarz GmbH & Co. KG | 100321        | 2023-10          | 2024-10         |

4 Radiated Emissions SAC up to 1 GHz  
 Radiated emission tests up to 1 GHz in a semi anechoic room

| Ref.No. | Device Name          | Description  | Manufacturer                        | Serial Number       | Last Calibration | Calibration Due |
|---------|----------------------|--|-------------------------------------|---------------------|------------------|-----------------|
| 4.1     | N5000/NP             | Filter for EUT, 2 Lines, 250 V, 16 A                               | ETS-LINDGREN                        | 241515              | N/A              | N/A             |
| 4.2     | ESW44                | EMI Receiver / Spectrum Analyzer                                   | Rohde & Schwarz GmbH & Co. KG       | 101603              | 2022-01          | 2024-01         |
| 4.3     | Anechoic Chamber 01  | SAC/FAR, 10.58 m x 6.38 m x 6.00 m                                 | Frankonia                           | none                | N/A              | N/A             |
| 4.4     | HL 562 ULTRALOG      | Biconical-log-per antenna (30 MHz - 3 GHz) with HL 562E biconicals | Rohde & Schwarz GmbH & Co. KG       | 830547/003          | 2021-09          | 2024-09         |
| 4.5     | Fluke 177            | Digital Multimeter 03 (Multimeter)                                 | Fluke Europe B.V.                   | 86670383            | 2023-08          | 2025-08         |
| 4.6     | Opus10 THI (8152.00) | T/H Logger 10  | Lufft Mess- und Regeltechnik GmbH   | 12488               | N/A              | N/A             |
| 4.7     | EP 1200/B, NA/B1     | AC Source, Amplifier with integrated variable Oscillator           | Spitzenberger & Spies GmbH & Co. KG | B6278               | N/A              | N/A             |
| 4.8     | DS 420S              | Turn Table 2 m diameter  | HD GmbH                             | 420/573/99          | N/A              | N/A             |
| 4.9     | CS-RUB6              | Rubidium Frequency Standard  | Rohde & Schwarz GmbH & Co. KG       | 100321              | 2023-10          | 2024-10         |
| 4.10    | AM 4.0               | Antenna Mast 4 m   | Maturo GmbH                         | AM4.0/180/1192 0513 | N/A              | N/A             |

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

## 6.2 TEST EQUIPMENT SOFTWARE

| <b>Semi-Anechoic Chamber:</b>  |          |
|--------------------------------|----------|
| Software                       | Version  |
| EMC32 Measurement Software     | 10.60.10 |
| INNCO Mast Controller          | 1.02.62  |
| MATURO Mast Controller         | 12.19    |
| MATURO Turn-Table Controller   | 30.10    |
| <b>Fully-Anechoic Chamber:</b> |          |
| Software                       | Version  |
| EMC32 Measurement Software     | 10.60.10 |
| MATURO Turn-Unit Controller    | 11.10    |
| MATURO Mast Controller         | 12.10    |
| MATURO Turntable Controller    | 12.11    |
| INNCO Mast Controller          | 1.02.62  |
| <b>TS 8997</b>                 |          |
| WMS32 Measurement Software     | 11.40.00 |

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

| Frequency<br>MHz | AF<br>HFH-Z2)<br>dB (1/m) | Corr.<br>dB | cable<br>loss 1<br>(inside<br>chamber)<br>dB | cable<br>loss 2<br>(outside<br>chamber)<br>dB | cable<br>loss 3<br>(switch<br>unit)<br>dB | cable<br>loss 4<br>(to<br>receiver)<br>dB | distance<br>corr.<br>(-40 dB/<br>decade)<br>dB | d <sub>Limit</sub><br>(meas.<br>distance<br>(limit)<br>m | d <sub>used</sub><br>(meas.<br>distance<br>(used)<br>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

## 7.2 ANTENNA R&S HL562 (30 MHZ – 1 GHZ)

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

| Frequency | AF<br>R&S<br>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<br>loss 1<br>(inside<br>chamber) | cable<br>loss 2<br>(outside<br>chamber) | cable<br>loss 3<br>(switch<br>unit) | cable<br>loss 4<br>(to<br>receiver) | distance<br>corr.<br>(-20 dB/<br>decade) | $d_{Limit}$<br>(meas.<br>distance<br>(limit)) | $d_{used}$<br>(meas.<br>distance<br>(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   |

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

|      |      |      |
|------|------|------|
| 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)

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

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

Tables show an extract of values.

### 7.3 ANTENNA R&S HF907 (1 GHZ – 18 GHZ)

| Frequency<br>MHz | AF<br>R&S<br>HF907<br>dB (1/m) | Corr.<br>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<br>loss 1<br>(relay +<br>cable<br>inside<br>chamber)<br>dB | cable<br>loss 2<br>(outside<br>chamber)<br>dB | cable<br>loss 3<br>(switch<br>unit,<br>atten-<br>uator &<br>pre-amp)<br>dB | cable<br>loss 4 (to<br>receiver)<br>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<br>MHz | AF<br>R&S<br>HF907<br>dB (1/m) | Corr.<br>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<br>loss 1<br>(relay<br>inside<br>chamber)<br>dB | cable<br>loss 2<br>(inside<br>chamber)<br>dB | cable<br>loss 3<br>(outside<br>chamber)<br>dB | cable<br>loss 4<br>(switch<br>unit,<br>atten-<br>uator &<br>pre-amp)<br>dB | cable<br>loss 5 (to<br>receiver)<br>dB | used<br>for<br>FCC<br>15.247 |
|---|--|---|--|--|------------------------------|
| 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<br>MHz | AF<br>R&S<br>HF907<br>dB (1/m) | Corr.<br>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<br>loss 1<br>(relay<br>inside<br>chamber)<br>dB | cable<br>loss 2<br>(High<br>Pass)<br>dB | cable<br>loss 3<br>(pre-<br>amp)<br>dB | cable<br>loss 4<br>(inside<br>chamber)<br>dB | cable<br>loss 5<br>(outside<br>chamber)<br>dB | cable<br>loss 6<br>(to<br>receiver)<br>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

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

U = Receiver reading

AF = Antenna factor

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

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

Tables show an extract of values.

#### 7.4 ANTENNA EMCO 3160-09 (18 GHZ – 26.5 GHZ)

| Frequency<br>MHz | AF<br>EMCO<br>3160-09<br>dB (1/m) | Corr.<br>dB | cable<br>loss 1<br>(inside<br>chamber)<br>dB | cable<br>loss 2<br>(pre-<br>amp)<br>dB | cable<br>loss 3<br>(inside<br>chamber)<br>dB | cable<br>loss 4<br>(switch<br>unit)<br>dB | cable<br>loss 5<br>(to<br>receiver)<br>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)

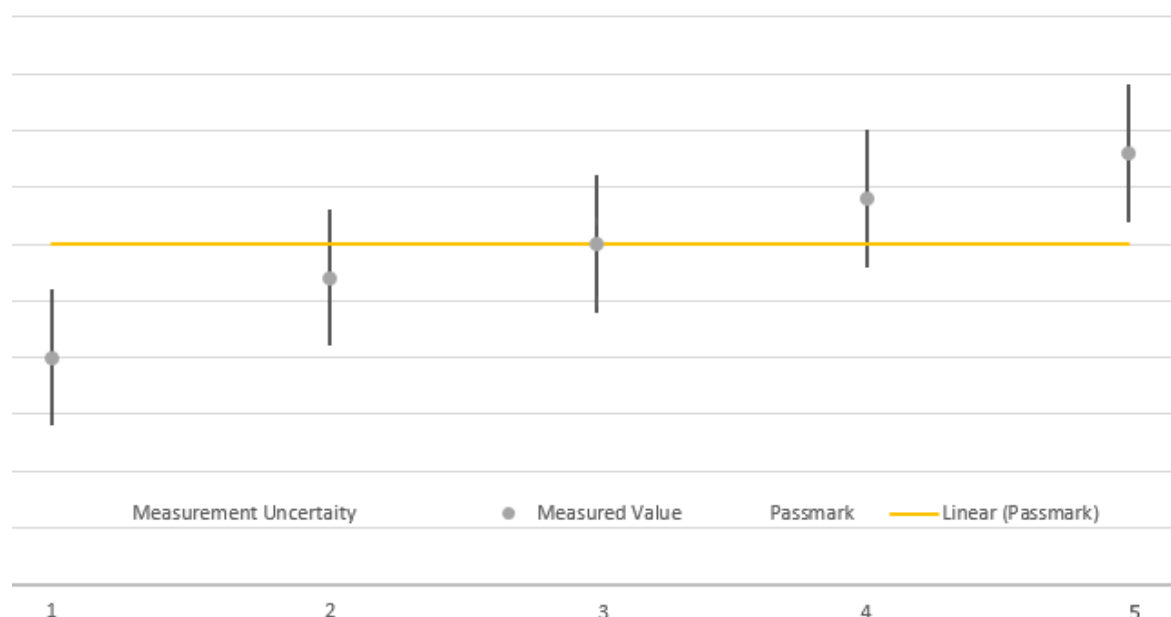
Linear interpolation will be used for frequencies in between the values in the table.

Table shows an extract of values.

## 8 MEASUREMENT UNCERTAINTIES

| Test Case                            | Parameter          | Uncertainty                    |
|--------------------------------------|--------------------|--------------------------------|
| AC Power Line                        | Power              | $\pm 3.4$ dB                   |
| Field Strength of spurious radiation | Power              | $\pm 5.5$ dB                   |
| 6 dB / 26 dB / 99% Bandwidth         | Power<br>Frequency | $\pm 2.9$ dB<br>$\pm 11.2$ kHz |
| Conducted Output Power               | Power              | $\pm 2.2$ dB                   |
| Band Edge Compliance                 | Power<br>Frequency | $\pm 2.2$ dB<br>$\pm 11.2$ kHz |
| Frequency Stability                  | Frequency          | $\pm 25$ Hz                    |
| Power Spectral Density               | Power              | $\pm 2.2$ 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    | on pass mark    | within pass mark  | Passed  |
| 4    | above pass mark | within pass mark  | Failed  |
| 5    | 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.

\*\*\*\*\*END OF TEST REPORT\*\*\*\*\*