
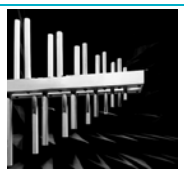
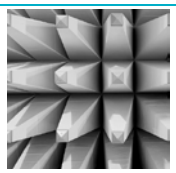

Bundesnetzagentur

BNetzA-CAB-02/21-102

# TEST REPORT

**Test report no.: 1-5761_23-01-07-A**

## Testing laboratory


**CTC advanced GmbH**
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**Accredited Testing Laboratory:**
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2018-03) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate starting with the registration number: D-PL-12076-01.

## Applicant


**SAGEMCOM BROADBAND SAS**
250, route de l´ Empereur
92848 Rueil-Malmaison Cedex / FRANCE
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Contact: Benjamin Murindangabo
e-mail: benjamin.murindangabo-ext@sagemcom.com


## Manufacturer


**SAGEMCOM BROADBAND SAS**
250, route de l´ Empereur
92848 Rueil-Malmaison Cedex / FRANCE


## Test standard/s

| | |
|---|---|
| FCC - Title 47 CFR Part 15 | FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices |

For further applied test standards please refer to section 3 of this test report.

## Test Item

| | |
|---|---|
| **Kind of test item:** | **Video SoundBox** |
| **Model name:** | **VSB3918 UHD ALT US** |
| **FCC ID:** | **VW3VSB3918** |
| Frequency: | 5150 MHz to 5850 MHz |
| Technology tested: | WLAN (DFS only) |
| Antenna: | Two integrated antennas |
| Power supply: | 115V AC by mains |
| Temperature range: | 0°C to 40°C |

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

## Test report authorized:

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David Lang
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Andreas Kurzkurt
Testing Manager
Radio Labs

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# 2 General information

## 2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CTC advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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In no case this test report can be considered as a Letter of Approval.

This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

**This test report replaces the test report with the number 1-5761_23-01-07 and dated 2023-03-07.**

## 2.2 Application details

| | |
|---|---|
| Date of receipt of order: | 2023-01-31 |
| Date of receipt of test item: | 2023-01-30 |
| Start of test:* | 2023-02-28 |
| End of test:* | 2023-02-28 |
| Person(s) present during the test: | -/- |

*Date of each measurement, if not shown in the plot, can be requested. Dates are stored in the measurement software.

## 2.3 Test laboratories sub-contracted

None

## 3 Test standard/s, references and accreditations

| Test standard | Date | Description |
|---|---|---|
| FCC - Title 47 CFR Part 15 | | FCC - Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices |

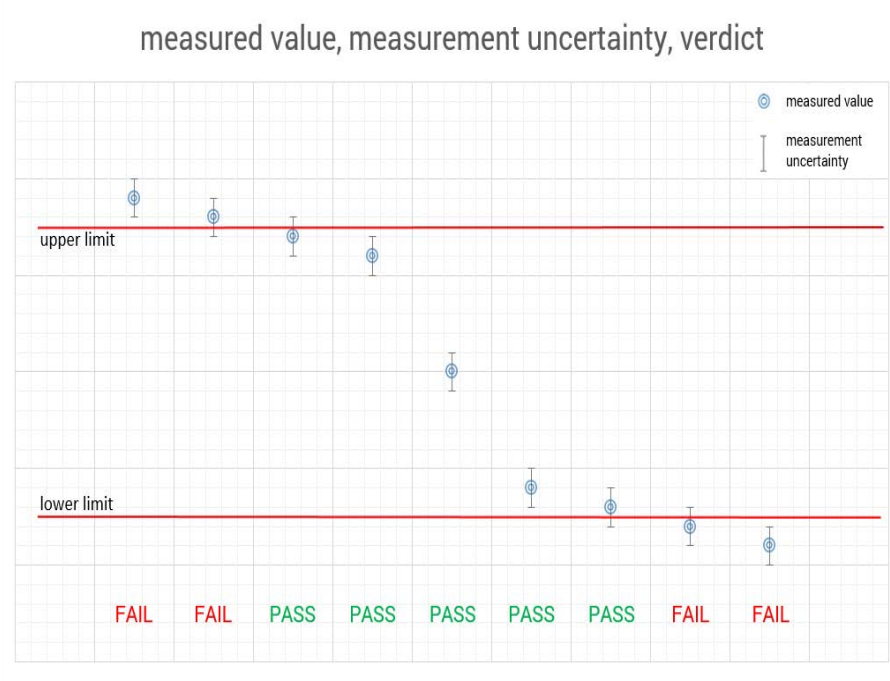
| Guidance | Version | Description |
|---|---|---|
| KDB 789033 D02 | v02r01 | Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E |
| ANSI C63.4-2014 | -/- | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |
| ANSI C63.10-2013 | -/- | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |
| KDB 662911 D01 | v02r01 | Emissions Testing of Transmitters with Multiple Outputs in the Same Band |
| UNII: KDB 905462 D02 | v02 | Compliance measurement procedures for unlicensed - national information infrastructure devices operating in the 5250 - 5350 MHz and 5470 - 5725 MHz bands incorporating dynamic frequency selection |
| UNII: KDB 905462 D03 | v01r02 | Client Without DFS New Rules |
| UNII: KDB 905462 D04 | v01 | Operational Modes for DFS Testing New Rules |

| Accreditation | Description |
|---|---|
| D-PL-12076-01-05 | Telecommunication FCC requirements<br>https://www.dakks.de/as/ast/d/D-PL-12076-01-05e.pdf |

FCC designation number: DE0002

## 4 Reporting statements of conformity – decision rule

Only the measured values related to their corresponding limits will be used to decide whether the equipment under test meets the requirements of the test standards listed in chapter 3.
The measurement uncertainty is mentioned in this test report, see chapter 7, but is not taken into account - neither to the limits nor to the measurement results. Measurement results with a smaller margin to the corresponding limits than the measurement uncertainty have a potential risk of more than 5% that the decision might be wrong."



# 5 Test environment

| | | | |
|---|---|---|---|
| Temperature | : | $T_{nom}$<br>$T_{max}$<br>$T_{min}$ | 20 °C during room temperature tests<br>No tests under extreme temperature conditions required.<br>No tests under extreme temperature conditions required. |
| Relative humidity content | : | | 35 % |
| Barometric pressure | : | | Not relevant for this kind of testing |
| Power supply | : | $V_{nom}$<br>$V_{max}$<br>$V_{min}$ | 115 V AC by mains<br>No tests under extreme voltage conditions required.<br>No tests under extreme voltage conditions required. |

# 6 Test item

## 6.1 General description

| | | |
|---|---|---|
| Kind of test item | : | Video SoundBox |
| Model name | : | VSB3918 UHD ALT US |
| S/N serial number | : | Config#1 |
| Hardware status | : | M393 AL VSB-3 |
| Software status | : | N/A |
| Firmware status | : | N/A |
| Frequency band | : | 5150 MHz to 5850 MHz |
| Type of radio transmission<br>Use of frequency spectrum | :<br>: | OFDM |
| Type of modulation | : | (D)BPSK, (D)QPSK, 16 – QAM, 64 – QAM |
| Number of channels | : | 25 with 20 MHz channel bandwidth<br>12 with 40 MHz channel bandwidth<br>6 with 80 MHz channel bandwidth |
| Antenna | : | Two integrated antennas |
| Power supply | : | 115 V AC by mains |
| Temperature range | : | 0°C to 40°C |

## 6.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup and EUT photos are included in test report: 1-5761/23-01-01_AnnexA
1-5761/23-01-01_AnnexB
1-5761/23-01-01_AnnexD

# 7 Measurement uncertainty

| Measurement uncertainty | |
|---|---|
| **Test case** | **Uncertainty** |
| Frequency accuracy (radar burst) | 0.2 Hz |
| Level accuracy (radar burst) | ± 1.83 dB |

## 8 Summary of measurement results

| | |
|---|---|
| ☒ | No deviations from the technical specifications were ascertained |
| ☐ | There were deviations from the technical specifications ascertained |
| ☒ | This test report is only a partial test report.<br>The content and verdict of the performed test cases are listed below. |

| TC Identifier | Description | Verdict | Date | Remark |
|---|---|---|---|---|
| DFS-Testing | CFR Part 15, FCC 06-96 | Pass | 2023-04-12 | DFS only |

| Test Standard Clause | Test Case | Bandwidth | C | NC | NA | NP | Remark |
|---|---|---|---|---|---|---|---|
| 7.8.1*3 | U-NII Detection Bandwidth | -/- | ☐ | ☐ | ☒ | ☐ | *1*2*3 |
| §15.407 (h)(2) | DFS Detection Threshold | -/- | ☐ | ☐ | ☒ | ☐ | *1*2*3 |
| §15.407 (h)(2) (ii) & 7.8.2*3 | Channel Availability Check Time | -/- | ☐ | ☐ | ☒ | ☐ | *1*3 |
| §15.407 (h)(2) (iv) & 7.8.3*3 | Non-Occupancy Period | -/- | ☐ | ☐ | ☒ | ☐ | *2 |
| §15.407 (h)(2) (iii) & 7.8.2*3 | Channel Move Time / Channel Closing Transmission Time | 80 MHz | ☒ | ☐ | ☐ | ☐ | *2 |
| 7.8.3 & 7.8.4*3 | In-Service Monitoring / Statistical Performance Check | -/- | ☐ | ☐ | ☒ | ☐ | *2*3 |

**Abbreviations/References:**

C Compliant
NC Not compliant
NA Not applicable
NP Not performed
*1 Prior to use of a channel
*2 During normal operation
*3 Not applicable for Client Devices without radar detection.

## 9 Additional comments

Reference documents: None

Configuration descriptions: Iperf was used to generate the required channel load (duty cycle greater 17 percent).

DFS functionality:

- ☐ Master device
- ☐ Client with radar detection
- ☒ Client without radar detection

EUT selection:

- ☒ Only one device available
- ☐ Devices selected by the customer
- ☐ Devices selected by the laboratory (Randomly)

# 10 RF measurements

## 10.1 Description of test setup

### 10.1.1 Conducted measurements

**Setup**

Figure 1 shows a setup whereby the UUT is a RLAN device operating in slave mode, without Radar Interference Detection function. This setup also contains a RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with the master device.

Figure 1 shows an example

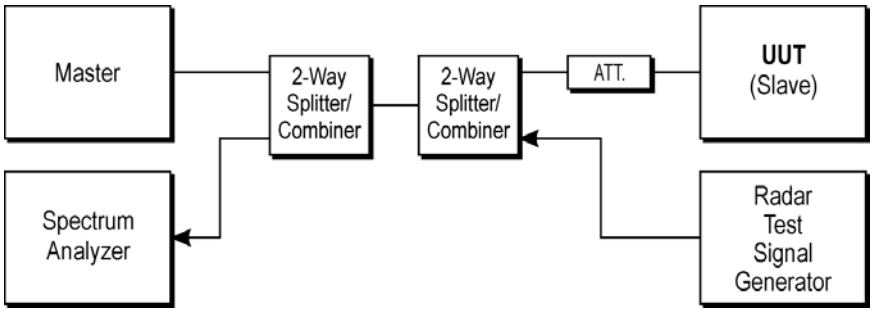



Figure 1: Setup

RPP = SG - CA
(RPP-radar pulse power; SG-signal generator power; CA-loss signal path)

Example calculation:
RPP [dBm] = -30.0 [dBm] – 33.0 [dB] = -63.0 [dBm]

**Equipment table:**

| No. | Lab / Item | Equipment | Type | Manufacturer | Serial No. | INV. No Cetecom | Kind of Calibration | Last Calibration | Next Calibration |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | Spectrum Analyzer 9kHz - 30 GHz | FSP30 | R&S | 100623 | 300003464 | vIKI! | 14.12.2022 | 31.12.2024 |
| 2 | A | Vector Signal Generator | SMU200A | R&S | 101633 | 300003496 | vIKI! | 04.01.2022 | 31.01.2025 |
| 3 | A | DFS-test site | div. Splitter, Cables, Attenuators | Mini-Circuits | na | 300004557 | ev | -/- | -/- |
| 4 | A | RF-Cable WLAN-Tester Port 2 | ST18/SMAm/SMAm /48 | Huber & Suhner | Batch no. 54877 | 400001217 | ev | -/- | -/- |
| 5 | A | RF-Cable WLAN-Tester Port 1 | ST18/SMAm/SMAm /48 | Huber & Suhner | Batch no. 54877 | 400001218 | ev | -/- | -/- |
| 6 | A | RF-Cable WLAN-Tester Analyzer | ST18/SMAm/SMAm /36 | Huber & Suhner | Batch no. 54876 | 400001220 | ev | -/- | -/- |
| 7 | A | RF-Cable WLAN-Tester Vector Signal Generator | ST18/SMAm/SMAm /60 | Huber & Suhner | Batch no. 606844 | 400001222 | ev | -/- | -/- |
| 8 | A | Dual Band Gigabit Router | RT-AC68U* | Asus | F1IMOH056666 | 400001244 | ne | -/- | -/- |
| 9 | A | Isolating Transformer | RT5A | Grundig | 12780 | 300001166 | ev | -/- | -/- |

* FCC ID: MSQ-RTAC68U

## 10.2 Parameters of DFS test signals

### 10.2.1 DFS Detection Thresholds for Master Devices as well as Client Devices With Radar Detection

| Maximum Transmit Power EIRP | Value (see note) |
|---|---|
| ≥ 200 mW | -64 dBm |
| < 200 mW and power spectral density < 10 dBm/MHz | -62 dBm |
| < 200 mW and That do not meet the power spectral density < 10 dBm/MHz | -64 dBm |

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.
Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

### 10.2.2 DFS Response Requirement Values

| Parameter | Value |
|---|---|
| Non-occupancy period | minimum 30 minutes |
| Channel Availability Check Time | 60 seconds |
| Channel Move Time | 10 seconds See Note 1. |
| Channel Closing Transmission Time | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2. |
| U-NII Detection Bandwidth | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3. |

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.
Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.
Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.

### 10.2.3 Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance.

**Short Pulse Radar Test Waveforms**

| Radar Type | Pulse Width (µsec) | PRI (µsec) | Number of Pulses | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|---|---|---|---|---|---|
| 0 | 1 | 1428 | 18 | See Note 1 | See Note 1 |
| 1 | 1 | Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a | Roundup $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\mathrm{PRI}_{\mu\mathrm{sec}}}\right)\right\}$ | 60% | 30 |
| | | Test B: 15 unique PRI values randomly selected within the range of 518-3066 µsec, with a minimum increment of 1 µsec, excluding PRI values selected in Test A | | | |
| 2 | 1-5 | 150-230 | 23-29 | 60% | 30 |
| 3 | 6-10 | 200-500 | 16-18 | 60% | 30 |
| 4 | 11-20 | 200-500 | 12-16 | 60% | 30 |
| Aggregate (Radar Types 1-4) | | | | 80% | 120 |
| Note 1: Short Pulse Radar Type 0 should be used for the detection bandwidth test, channel move time, and channel closing time tests. | | | | | |

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4.

**Pulse Repetition Intervals Values for Test A**

| Pulse Repetition Frequency Number | Pulse Repetition Frequency (Pulses Per Second) | Pulse Repetition Interval (Microseconds) |
|---|---|---|
| 1 | 1930.5 | 518 |
| 2 | 1858.7 | 538 |
| 3 | 1792.1 | 558 |
| 4 | 1730.1 | 578 |
| 5 | 1672.2 | 598 |
| 6 | 1618.1 | 618 |
| 7 | 1567.4 | 638 |
| 8 | 1519.8 | 658 |
| 9 | 1474.9 | 678 |
| 10 | 1432.7 | 698 |
| 11 | 1392.8 | 718 |
| 12 | 1355 | 738 |
| 13 | 1319.3 | 758 |
| 14 | 1285.3 | 778 |
| 15 | 1253.1 | 798 |
| 16 | 1222.5 | 818 |
| 17 | 1193.3 | 838 |
| 18 | 1165.6 | 858 |
| 19 | 1139 | 878 |
| 20 | 1113.6 | 898 |
| 21 | 1089.3 | 918 |
| 22 | 1066.1 | 938 |
| 23 | 326.2 | 3066 |

**Long Pulse Radar Test Waveform**

| Radar Type | Pulse Width (µsec) | Chirp Width (MHz) | PRI (µsec) | Number of Pulses per Burst | Number of Bursts | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|---|---|---|---|---|---|---|---|
| 5 | 50-100 | 5-20 | 1000-2000 | 1-3 | 8-20 | 80% | 30 |

The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the Long Pulse Radar Type waveforms.

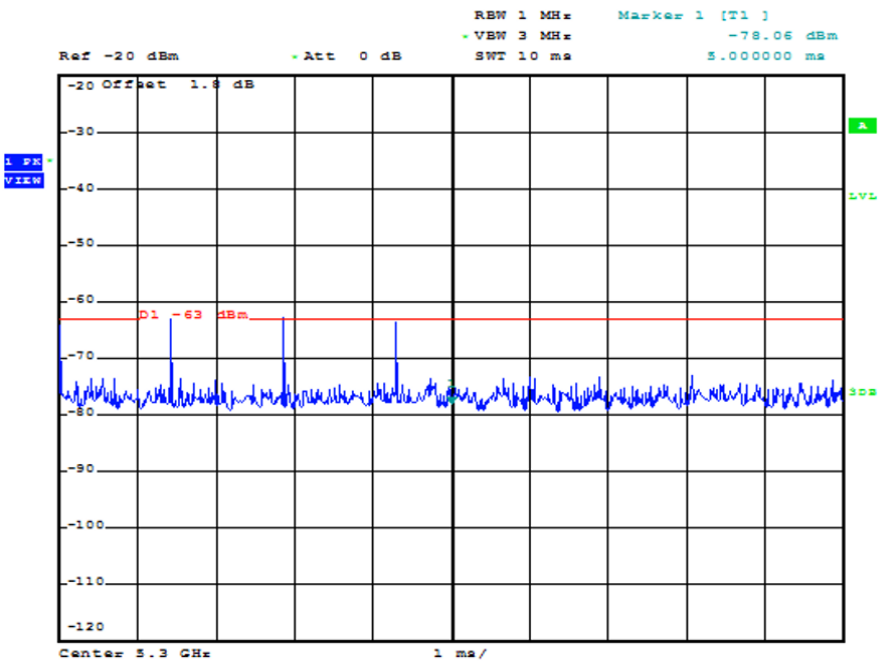
**Frequency Hopping Radar Test Waveform**

| Radar Type | Pulse Width (µsec) | Chirp Width (MHz) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (msec) | Minimum Percentage of Successful Detection | Minimum Number of Trials |
|---|---|---|---|---|---|---|---|
| 6 | 1 | 333 | 9 | 0.333 | 300 | 70% | 30 |

For the Frequency Hopping Radar Type, the same Burst parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined.
The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set.

## 10.3 Test preparation

### 10.3.1 Setting the test signal level of all radar pulses as of 10.2.1 (only pulse 0 recorded).

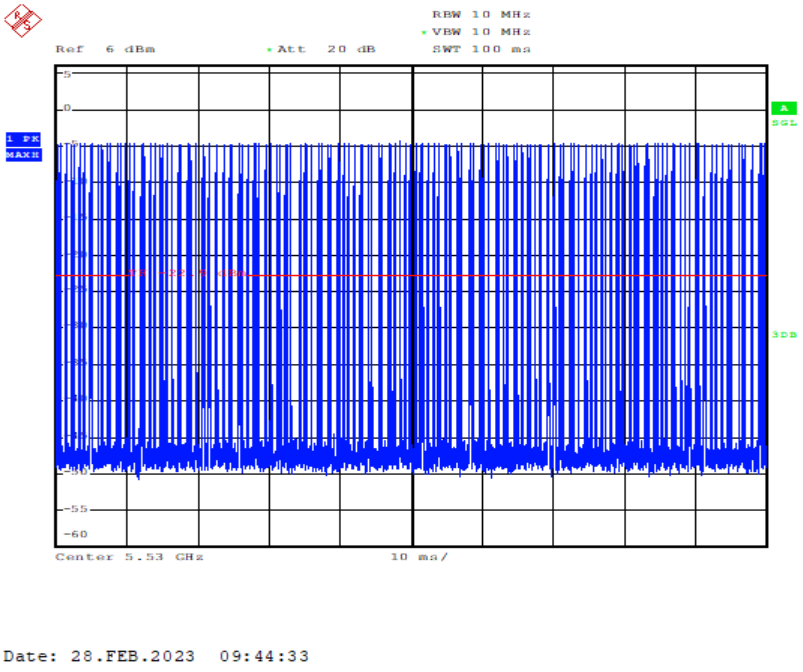



**Plot 1**

## 10.3.2 Channel loading

Timing plots are required with calculations demonstrating a minimum channel loading of approximately 17% or greater. For example, channel loading can be estimated by setting the spectrum analyzer for zero span and approximate the Time On/ (Time On + Off Time). This can be done with any appropriate channel BW and modulation type.

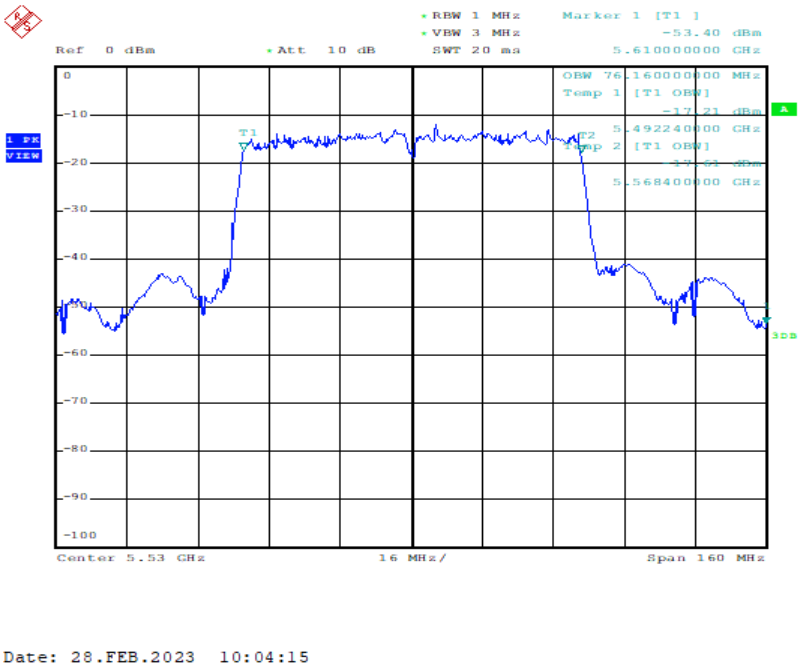
HT80-Mode: Calculated duty cycle = 17.4%




**Plot 2**

## 10.3.3 99% Bandwidth to determine the U-NII-bandwidth

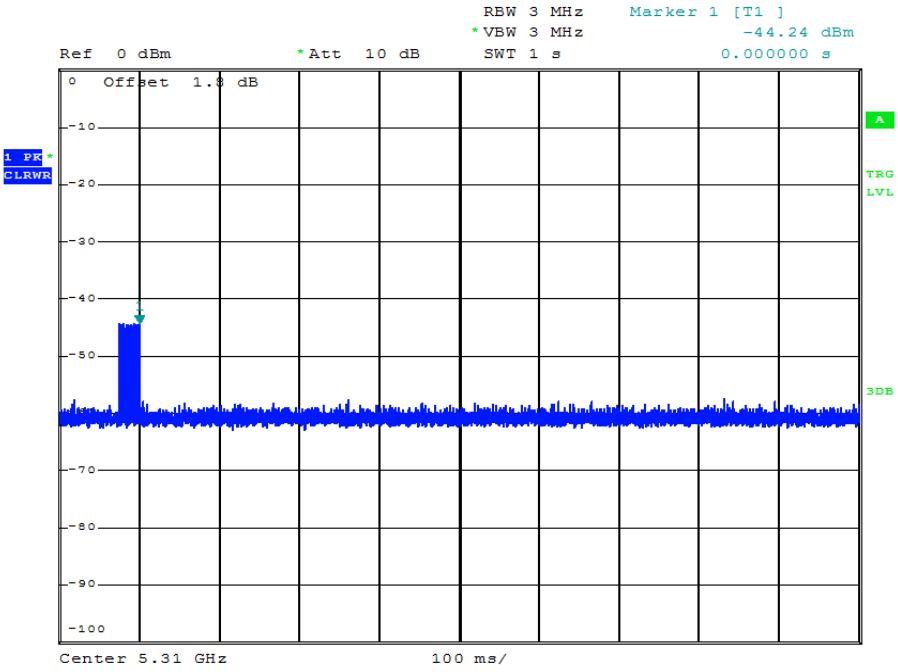
HT80-Mode: 76.16 MHz




**Plot 3**

### 10.3.4 Radar burst timing signal

To accurately determine the channel closing time and channel closing transmission time the spectrum analyser is triggered at the end of the radar burst (see marker at *t* = 0ms).




**Plot 4**

## 10.4 Test results (prior to use of a channel)

Not applicable.

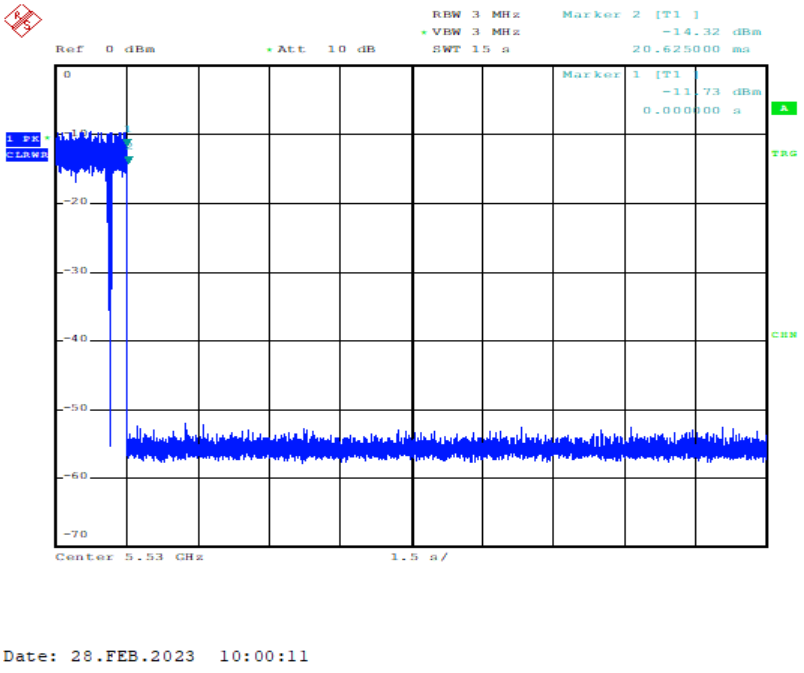
## 10.5 Test results (during normal operation)

### 10.5.1 Channel move time / channel closing transmission time

After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel not exceeding 60ms.

The test is performed during normal operation with the highest bandwidth supported by the DUT.

**Channel Closing Time**

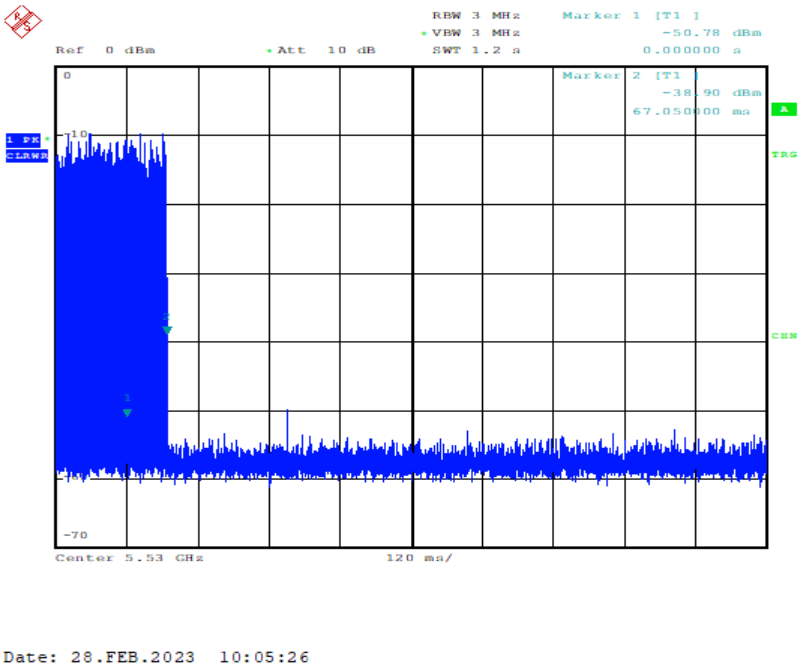



**Plot 5**

Note: With Marker 1 at the end of the radar pulse ($t$ = 0ms) the Channel Closing Time is determined by setting

a Delta-Marker to the point where the last transmission occurred.
The Channel Closing Time is 20.6ms.

## Channel Closing Transmission Time




**Plot 6**

Note: The accumulated transmission time is calculated by the number of bins occurring after t = 0ms multiplied with the Time-per-sweep point-factor resulting from the Sweep Time and number of Sweep Points of the Spectrum Analyser.
The Channel Closing Transmission Time is 0.0ms.

## 11 Observations

No observations except those reported with the single test cases have been made.

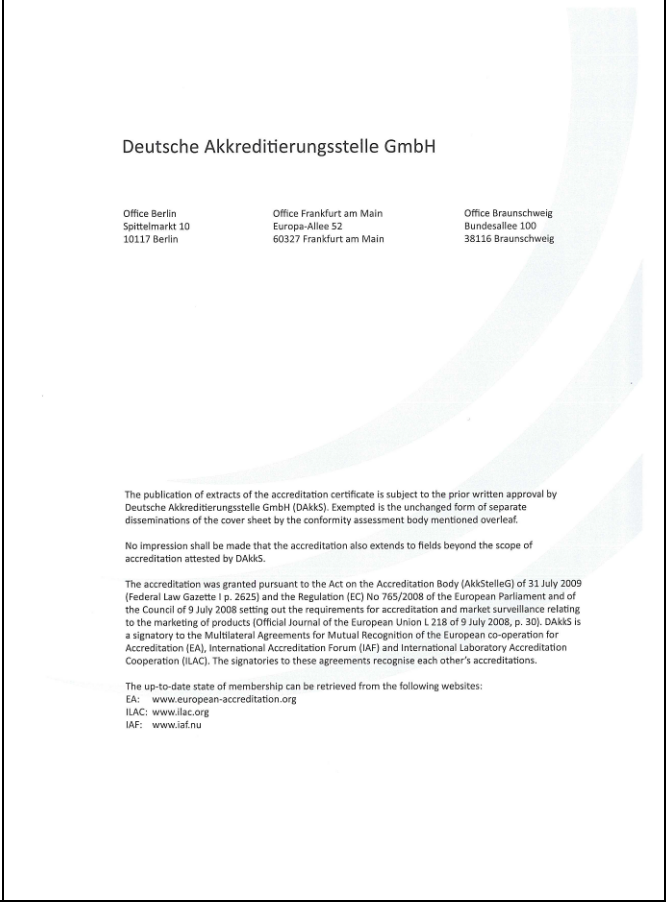
## 12 Glossary

| | |
|---|---|
| **EUT** | Equipment under test |
| **DUT** | Device under test |
| **UUT** | Unit under test |
| **FCC** | Federal Communications Commission |
| **FCC ID** | Company Identifier at FCC |
| **IC** | Industry Canada |
| **PMN** | Product marketing name |
| **HMN** | Host marketing name |
| **HVIN** | Hardware version identification number |
| **FVIN** | Firmware version identification number |
| **EMC** | Electromagnetic Compatibility |
| **HW** | Hardware |
| **SW** | Software |
| **Inv. No.** | Inventory number |
| **S/N or SN** | Serial number |
| **C** | Compliant |
| **NC** | Not compliant |
| **NA** | Not applicable |
| **NP** | Not performed |
| **PP** | Positive peak |
| **AVG** | Average |
| **OC** | Operating channel |
| **OCW** | Operating channel bandwidth |
| **OBW** | Occupied bandwidth |
| **OOB** | Out of band |
| **DFS** | Dynamic frequency selection |
| **CAC** | Channel availability check |
| **OP** | Occupancy period |
| **NOP** | Non occupancy period |
| **DC** | Duty cycle |
| **CW** | Clean wave |
| **MC** | Modulated carrier |
| **WLAN** | Wireless local area network |
| **RLAN** | Radio local area network |
| **DSSS** | Dynamic sequence spread spectrum |
| **OFDM** | Orthogonal frequency division multiplexing |
| **FHSS** | Frequency hopping spread spectrum |
| **GNSS** | Global Navigation Satellite System |

## 13 Document history

| Version | Applied changes | Date of release |
|---|---|---|
| -/- | Initial release | 2023-03-07 |
| A | FCC ID corrected | 2023-04-12 |

## 14 Accreditation Certificate – D-PL-12076-01-05

| first page | last page |
|---|---|
|  |  |





**Note: The current certificate annex is published on the websites (link see below).**

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf

or

https://cetecomadvanced.com/files/pdfs/d-pl-12076-01-05_tcb_usa.pdf

########## END OF TEST REPORT ##########