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# Wireless test report – 341760-1TRFWL

Applicant:

Triacta Power Solutions LP

Product name:

WIFI bgn Radio Module

Model:

Gateway

Model variant:

8xxxx (all variants)

FCC ID:

SCR-GATEWAY

IC Registration number:

23814-GATEWAY

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.247

  Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz

- RSS-247, Issue 2, Feb 2017, Section 5

  Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

  5) Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz

Date of issue: September 6, 2018

| | | | |
|---|---|---|---|
| Test engineer(s): | Andrey Adelberg, Senior Wireless/EMC Specialist | Signature: | Andrey Adelberg |
| Reviewed by: | Kevin Rose, Wireless/EMC Specialist | Signature: | |

Test location(s)

| | |
|---|---|
| Company name | Nemko Canada Inc. |
| Address | 303 River Road |
| City | Ottawa |
| Province | Ontario |
| Postal code | K1V 1H2 |
| Country | Canada |
| Telephone | +1 613 737 9680 |
| Facsimile | +1 613 737 9691 |
| Toll free | +1 800 563 6336 |
| Website | www.nemko.com |
| Site number | FCC: CA2040; IC: 2040A-4 (3 m SAC) |

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

Copyright notification

# Table of contents

# **Section 1.** Report summary

## 1.1 Applicant and manufacturer

| | |
|---|---|
| Company name | Triacta Power Solutions LP |
| Address | 130 Industrial Avenue, Unit 100 |
| City | Carleton Place |
| Province/State | Ontario |
| Postal/Zip code | K7C 3T2 |
| Country | Canada |

## 1.2 Test specifications

| | |
|---|---|
| FCC 47 CFR Part 15, Subpart C, Clause 15.247 | Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–585 MHz |
| RSS-247, Issue 2, Feb 2017, Section 5 | Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices |

## 1.3 Test methods

| | |
|---|---|
| 558074 D01 DTS Meas Guidance v04 (April 5, 2017) | Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 |
| ANSI C63.10 v2013 | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices |

## 1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

*See "Summary of test results" for full details.*

## 1.5 Exclusions

None

## 1.6 Test report revision history

| Revision # | Date of issue | Details of changes made to test report |
|---|---|---|
| TRF | September 6, 2018 | Original report issued |

# **Section 2.** Summary of test results

## 2.1 FCC Part 15 Subpart C, general requirements test results

***Table 2.1-1:*** *FCC general requirements results*

| Part | Test description | Verdict |
|---|---|---|
| §15.207(a) | Conducted limits | Pass |
| §15.31(e) | Variation of power source | Pass |
| §15.31(m) | Number of tested frequencies | Pass |
| §15.203 | Antenna requirement | Pass |

Notes:

## 2.2 FCC Part 15 Subpart C, intentional radiators test results for digital transmission systems (DTS)

***Table 2.2-1:*** *FCC 15.247 results for DTS*

| Part | Test description | Verdict |
|---|---|---|
| §15.247(a)(2) | Minimum 6 dB bandwidth | Pass |
| §15.247(b)(3) | Maximum peak output power in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands | Pass |
| §15.247(c)(1) | Fixed point-to-point operation with directional antenna gains greater than 6 dBi | Not applicable |
| §15.247(c)(2) | Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams | Not applicable |
| §15.247(d) | Spurious emissions | Pass |
| §15.247(e) | Power spectral density | Pass |
| §15.247(f) | Time of occupancy for hybrid systems | Not applicable |

## 2.3 ISED RSS-Gen, Issue 4, test results

***Table 2.3-1:*** *RSS-Gen results*

| Part | Test description | Verdict |
|---|---|---|
| 7.1.2 | Receiver radiated emission limits | Not applicable |
| 7.1.3 | Receiver conducted emission limits | Not applicable |
| 6.8 | Number of frequencies | Pass |
| 8.8 | Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus | Pass |

Notes: [1] According to sections 5.2 and 5.3 of RSS-Gen, Issue 4 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

## 2.4 ISED RSS-247, Issue 2, test results for digital transmission systems (DTS)

***Table 2.4-1:*** *RSS-247 results for DTS*

| Part | Test description | Verdict |
|---|---|---|
| 5.2 (a) | Minimum 6 dB bandwidth | Pass |
| 5.2 (b) | Maximum power spectral density | Pass |
| 5.3 | Hybrid Systems | |
| 5.3 (a) | Digital modulation turned off | Not applicable |
| 5.3 (b) | Frequency hopping turned off | Not applicable |
| 5.4 | Transmitter output power and e.i.r.p. requirements | |
| 5.4 (d) | Systems employing digital modulation techniques | Pass |
| 5.4 (e) | Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band | Not applicable |
| 5.4 (f) | Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams | Not applicable |
| 5.5 | Unwanted emissions | Pass |

Notes: None

# **Section 3.** Equipment under test (EUT) details

## 3.1 Sample information

| | |
|---|---|
| Receipt date | February 26, 2018 |
| Nemko sample ID number | # 1 |

## 3.2 EUT information

| | |
|---|---|
| Product name | WIFI bgn Radio Module |
| Model | Gateway |
| Model variant | 8xxxx (all variants) |
| Serial number | 0217400116 |

## 3.3 Technical information

| | |
|---|---|
| Applicant IC company number | 23814 |
| IC UPN number | GATEWAY |
| All used IC test site(s) Reg. number | 2040A-4 |
| RSS number and Issue number | RSS-247 Issue 2, Feb 2017 |
| Frequency band | 2400–2483.5 MHz |
| Frequency Min (MHz) | 2412 |
| Frequency Max (MHz) | 2462 |
| RF power Min (W) | N/A |
| RF power Max (W), Conducted | 0.0391 (802.11b); 0.0206 (802.11g); 0.0136 (802.11n HT20) |
| Field strength, Units @ distance | N/A |
| Measured BW (kHz) (6 dB) | 7500 (802.11b); 16320 (802.11g); 16250 (802.11n HT20) |
| Measured BW (kHz) (99 %) | 13800 (802.11b); 16300 (802.11g); 17500 (802.11n HT20) |
| Calculated BW (kHz), as per TRC-43 | N/A |
| Type of modulation | 802.11b/g/n |
| Emission classification (F1D, G1D, D1D) | W7D |
| Transmitter spurious, dBµV/m @ 3 m | 50.96 @ 2483.5 MHz (802.11b); 50.69 @ 2483.5 MHz (802.11g); 51.69 @ 2483.5 MHz (802.11n HT20) |
| Power requirements | 120 $V_{AC}$, 60 Hz |
| Antenna information | Printed, not user-accessible antenna MN# 2450AT18B100 with 0.8 dBi maximum gain |

## 3.4 Product description and theory of operation

EUT is a Wi-Fi module operating at 2.4 GHz ISM band in accordance with intended radio approvals band.

## 3.5 EUT exercise details

EUT was set to transmit continuously on low, mid and high channel at all types of modulations and both channel bandwidths.

## 3.6 EUT setup diagram

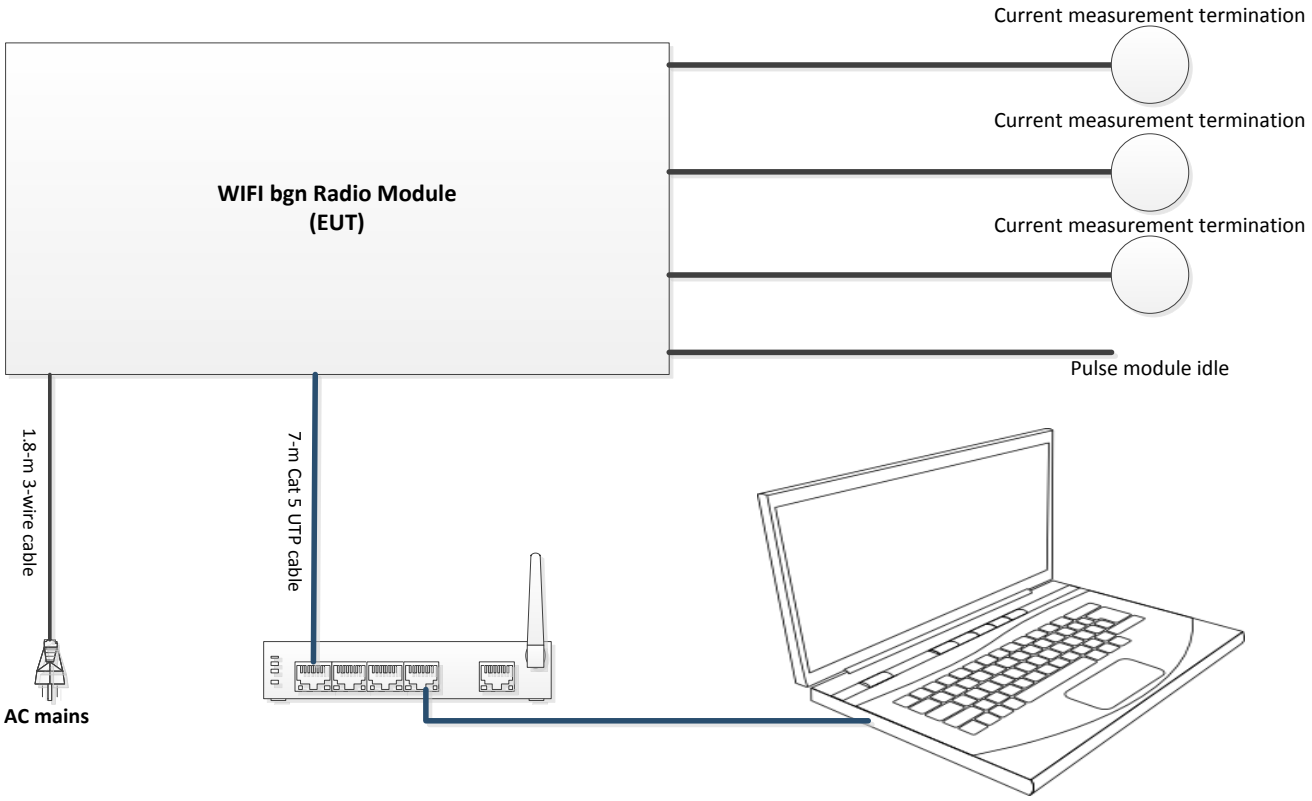



***Figure 3.6-1:*** *Setup diagram*

## 3.7 Support equipment

***Table 3.7-1:*** *Support equipment*

| Description | Brand name | Model/Part number |
|---|---|---|
| Laptop | Lenovo | MN: Think pad T460 Signature Edition, SN: 00350-80000-00000-AA420 |
| Router | D-link | PN: CIR822LCA, SN: RZSC3HB002394, Rev. C1 |

# **Section 4.** Engineering considerations

## 4.1 Modifications incorporated in the EUT

The following modifications were performed by client for compliance with radiated digital emissions:

A Corcom EMI filter (PN# 3VB3 F7125) was installed on AC input in the unit

## 4.2 Technical judgment

None

## 4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

# **Section 5.** Test conditions

## 5.1 Atmospheric conditions

| | |
|---|---|
| Temperature | 15–30 °C |
| Relative humidity | 20–75 % |
| Air pressure | 860–1060 mbar |

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

## 5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

# **Section 6.** Measurement uncertainty

## 6.1 Uncertainty of measurement

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

***Table 6.1-1:*** *Measurement uncertainty*

| Test name | Measurement uncertainty, dB |
|---|---|
| All antenna port measurements | 0.55 |
| Conducted spurious emissions | 1.13 |
| Radiated spurious emissions | 3.78 |
| AC power line conducted emissions | 3.55 |

# **Section 7.** Test equipment

## 7.1 Test equipment list

***Table 7.1-1:*** *Equipment list*

| Equipment | Manufacturer | Model no. | Asset no. | Cal cycle | Next cal. |
|---|---|---|---|---|---|
| 3 m EMI test chamber | TDK | SAC-3 | FA002047 | 1 year | Dec. 09/18 |
| Flush mount turntable | Sunol | FM2022 | FA002082 | — | NCR |
| Controller | Sunol | SC104V | FA002060 | — | NCR |
| Antenna mast | Sunol | TLT2 | FA002061 | — | NCR |
| AC Power source | Chenwa | 2700M-10k | FA002716 | — | VOU |
| Receiver/spectrum analyzer | Rohde & Schwarz | ESW 8 | SN: 101009 | 1 year | May 10 /18 |
| Spectrum analyzer | Rohde & Schwarz | FSU | FA001877 | 1 year | July 18/18 |
| Preamp (1–18 GHz) | ETS-Lindgren | 124334 | FA002877 | 1 year | Nov. 14/18 |
| Bilog antenna (20–3000 MHz) | Sunol | JB3 | FA002108 | 1 year | June 27/18 |
| Horn antenna (1–18 GHz) | EMCO | 3115 | FA000825 | 1 year | June 21/18 |
| Horn antenna (18–40 GHz) | EMCO | 3116 | FA001847 | 1 year | June 27/18 |
| Pre-amplifier (18–26 GHz) | Narda | BBS-1826N612 | FA001550 | — | VOU |
| LISN | Rohde & Schwarz | ENV216 | FA002023 | 1 year | May 19/18 |

Note: NCR - no calibration required, VOU - verify on use

# **Section 8.** Testing data

## 8.1 FCC 15.31(e) Variation of power source

### 8.1.1 Definitions and limits

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

### 8.1.2 Test date

| | |
|---|---|
| Start date | March 9, 2018 |

### 8.1.3 Observations, settings and special notes

None

### 8.1.4 Test data

| | | | |
|---|---|---|---|
| EUT Power requirements: | ☒ AC | ☐ DC | ☐ Battery |
| If EUT is an AC or a DC powered, was the noticeable output power variation observed? | ☐ YES | ☒ NO | ☐ N/A |
| If EUT is battery operated, was the testing performed using fresh batteries? | ☐ YES | ☐ NO | ☒ N/A |
| If EUT is rechargeable battery operated, was the testing performed using fully charged batteries? | ☐ YES | ☐ NO | ☒ N/A |

## 8.2 FCC 15.31(m) and RSS-Gen 6.8 Number of frequencies

### 8.2.1 Definitions and limits

**FCC:**
Measurements on intentional radiators or receivers shall be performed and, if required, reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in the following table.

**ISED:**
Except where otherwise specified, measurements shall be performed for each frequency band of operation for which the radio apparatus is to be certified, with the device operating at the frequencies in each band of operation shown in table below. The frequencies selected for measurements shall be reported in the test report.

***Table 8.2-1:*** *Frequency Range of Operation*

| Frequency Range Over Which the Device Operates (in each Band) | Number of Measurement Frequencies Required | Location of Measurement Frequency in Band of Operation |
|---|---|---|
| 1 MHz or less | 1 | Center (middle of the band) |
| 1–10 MHz | 2 | 1 near high end, 1 near low end |
| Greater than 10 MHz | 3 | 1 near high end, 1 near center and 1 near low end |

### 8.2.2 Test date

| | |
|---|---|
| Start date | March 9, 2018 |

### 8.2.3 Observations, settings and special notes

None

### 8.2.4 Test data

***Table 8.2-2:*** *Test channels selection*

| Start of Frequency range, MHz | End of Frequency range, MHz | Frequency range bandwidth, MHz | Low channel, MHz | Mid channel, MHz | High channel, MHz |
|---|---|---|---|---|---|
| 2400 | 2483.5 | 83.5 | 2412 | 2437 | 2462 |

## 8.3 FCC 15.203 Antenna requirement

### 8.3.1 Definitions and limits

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### 8.3.2 Test date

| | |
|---|---|
| Start date | March 9, 2018 |

### 8.3.3 Observations, settings and special notes

None

### 8.3.4 Test data

| | | | |
|---|---|---|---|
| Must the EUT be professionally installed? | ☐ YES | ☒ NO | |
| Does the EUT have detachable antenna(s)? | ☐ YES | ☒ NO | |
| If detachable, is the antenna connector(s) non-standard? | ☐ YES | ☐ NO | ☒ N/A |

## 8.4 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits

### 8.4.1 Definitions and limits

**FCC:**
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

**IC:**
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz, shall not exceed the limits in table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

***Table 8.4-1:*** *Conducted emissions limit*

| Frequency of emission, MHz | Conducted limit, dBµV | |
|---|---|---|
| | Quasi-peak | Average** |
| 0.15–0.5 | 66 to 56* | 56 to 46* |
| 0.5–5 | 56 | 46 |
| 5–30 | 60 | 50 |

Note: * - The level decreases linearly with the logarithm of the frequency.
** - A linear average detector is required.

### 8.4.2 Test date

| | |
|---|---|
| Start date | March 22, 2018 |

### 8.4.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

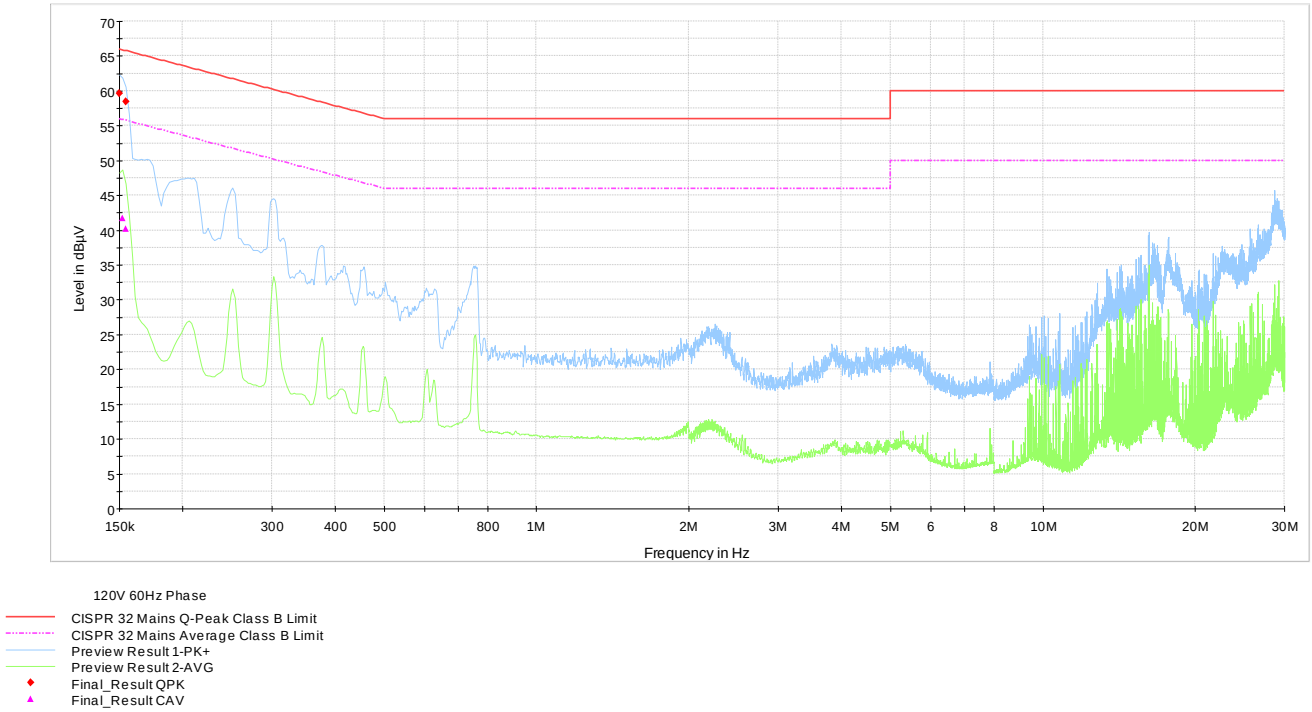
Receiver settings for preview measurements:

| | |
|---|---|
| Resolution bandwidth | 9 kHz |
| Video bandwidth | 30 kHz |
| Detector mode | Peak and Average |
| Trace mode | Max Hold |
| Measurement time | 1000 ms |

Receiver settings for final measurements:

| | |
|---|---|
| Resolution bandwidth | 9 kHz |
| Video bandwidth | 30 kHz |
| Detector mode | Quasi-Peak and Average |
| Trace mode | Max Hold |
| Measurement time | 1000 ms |

### 8.4.4 Test data



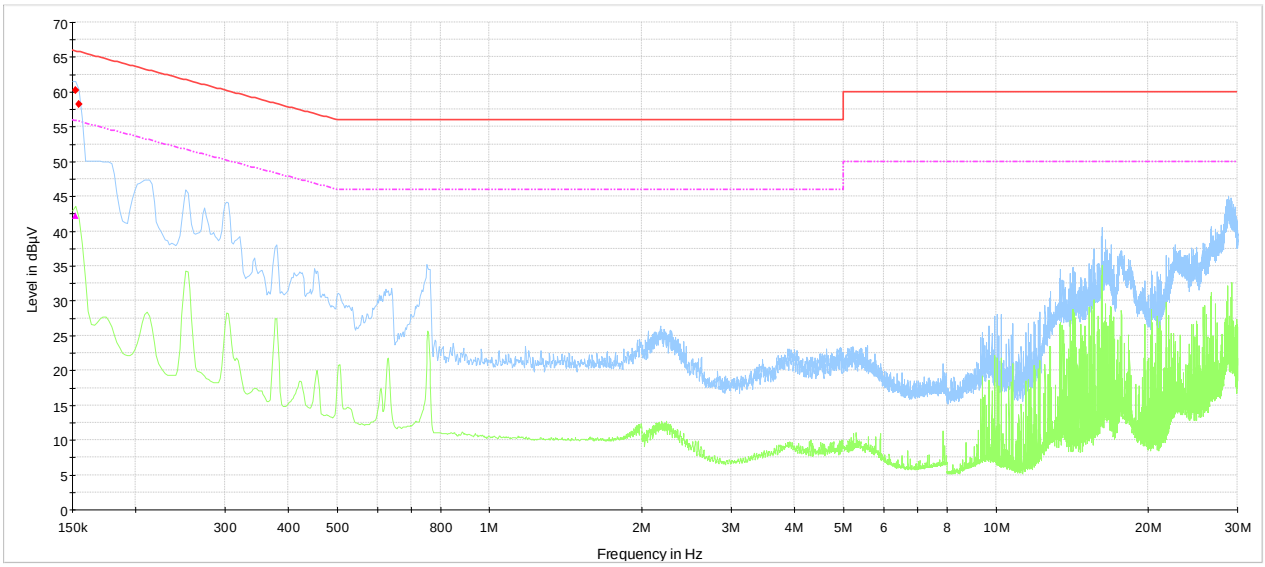

***Plot 8.4-1:*** *Conducted emissions on phase line*

***Table 8.4-2:*** *Quasi-Peak conducted emissions results on phase line*

| Frequency, MHz | Q-Peak result, dBµV | Correction, dB | Margin, dB | Limit, dBµV |
|---|---|---|---|---|
| 0.15000 | 59.67 | 9.30 | 6.33 | 66.00 |
| 0.15450 | 58.42 | 9.40 | 7.33 | 65.75 |

***Table 8.4-3:*** *Average conducted emissions results on phase line*

| Frequency, MHz | Average result, dBµV | Correction, dB | Margin, dB | Limit, dBµV |
|---|---|---|---|---|
| 0.15225 | 41.75 | 9.30 | 14.13 | 55.88 |
| 0.15450 | 40.15 | 9.40 | 15.60 | 55.75 |




***Plot 8.4-2:*** *Conducted emissions on neutral line*

***Table 8.4-4:*** *Quasi-Peak conducted emissions results on neutral line*

| Frequency, MHz | Q-Peak result, dBµV | Correction, dB | Margin, dB | Limit, dBµV |
|---|---|---|---|---|
| 0.15225 | 60.20 | 9.30 | 5.68 | 65.88 |
| 0.15450 | 58.21 | 9.40 | 7.54 | 65.75 |

***Table 8.4-5:*** *Average conducted emissions results on neutral line*

| Frequency, MHz | Average result, dBµV | Correction, dB | Margin, dB | Limit, dBµV |
|---|---|---|---|---|
| 0.15225 | 42.24 | 9.30 | 13.64 | 55.88 |

## 8.5 FCC 15.247(a)(2) and RSS-247 5.2(a) Minimum 6 dB bandwidth for DTS systems

### 8.5.1 Definitions and limits

**FCC:**
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

**ISED:**
The minimum 6 dB bandwidth shall be 500 kHz.

### 8.5.1 Test date

| | |
|---|---|
| Start date | March 9, 2018 |

### 8.5.2 Observations, settings and special notes

Spectrum analyser settings:

| | |
|---|---|
| Resolution bandwidth | 100 kHz |
| Video bandwidth | ≥3 × RBW |
| Frequency span | 30 MHz |
| Detector mode | Peak |
| Trace mode | Max Hold |

### 8.5.3 Test data

***Table 8.5-1:*** *6 dB bandwidth results*

| Modulation | Frequency, MHz | 6 dB bandwidth, MHz | Minimum limit, MHz | Margin, MHz |
|---|---|---|---|---|
| 802.11b | 2412 | 7.55 | 0.50 | 7.05 |
| | 2437 | 7.50 | 0.50 | 7.00 |
| | 2462 | 6.78 | 0.50 | 6.28 |
| 802.11g | 2412 | 16.20 | 0.50 | 15.70 |
| | 2437 | 16.32 | 0.50 | 15.82 |
| | 2462 | 16.32 | 0.50 | 15.82 |
| 802.11n HT20 | 2412 | 16.24 | 0.50 | 15.74 |
| | 2437 | 16.25 | 0.50 | 15.75 |
| | 2462 | 16.29 | 0.50 | 15.79 |

***Table 8.5-2:*** *99% occupied bandwidth results*

| Modulation | Frequency, MHz | 99 % occupied bandwidth, MHz |
|---|---|---|
| 802.11b | 2412 | 13.89 |
| | 2437 | 13.80 |
| | 2462 | 13.85 |
| 802.11g | 2412 | 16.30 |
| | 2437 | 16.30 |
| | 2462 | 16.30 |
| 802.11n HT20 | 2412 | 17.50 |
| | 2437 | 17.50 |
| | 2462 | 17.45 |

Note: there is no 99% OBW requirement, therefore these measurements provided for information only.

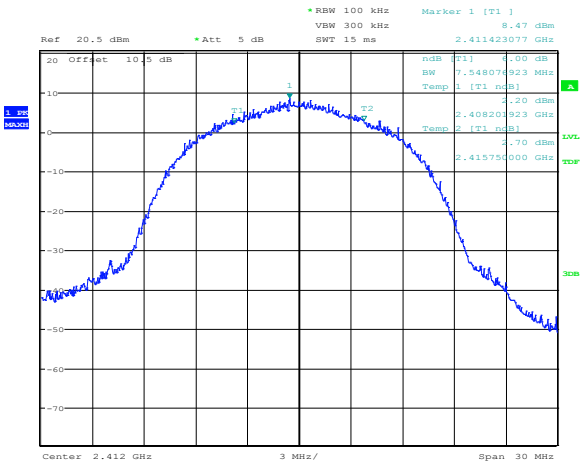



***Figure 8.5-1:*** *6 dB bandwidth on 802.11b, low channel*

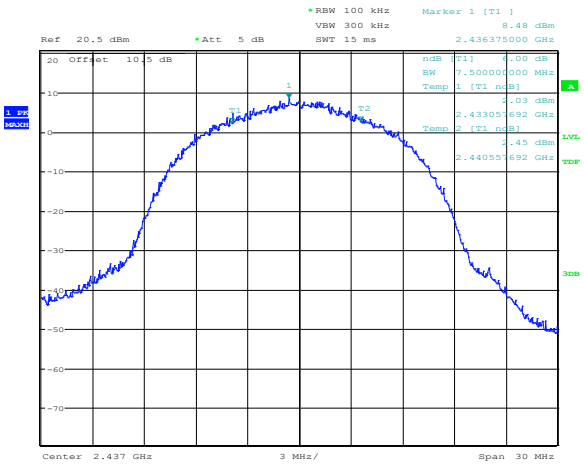



***Figure 8.5-2:*** *6 dB bandwidth on 802.11b, mid channel*

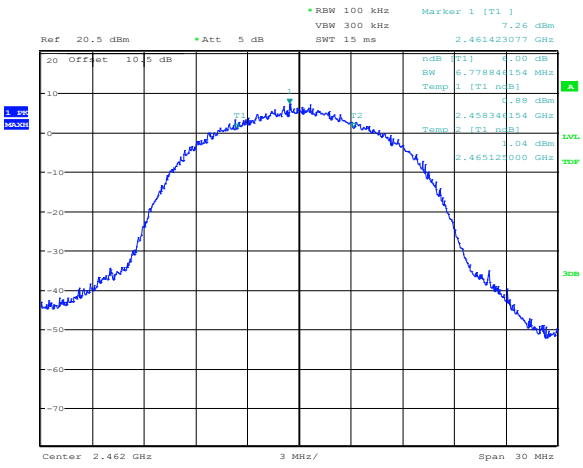



***Figure 8.5-3:*** *6 dB bandwidth on 802.11b, high channel*

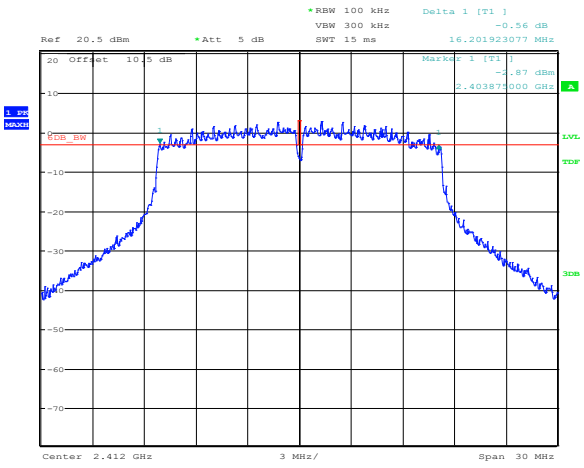



***Figure 8.5-4:*** *6 dB bandwidth on 802.11g, low channel*

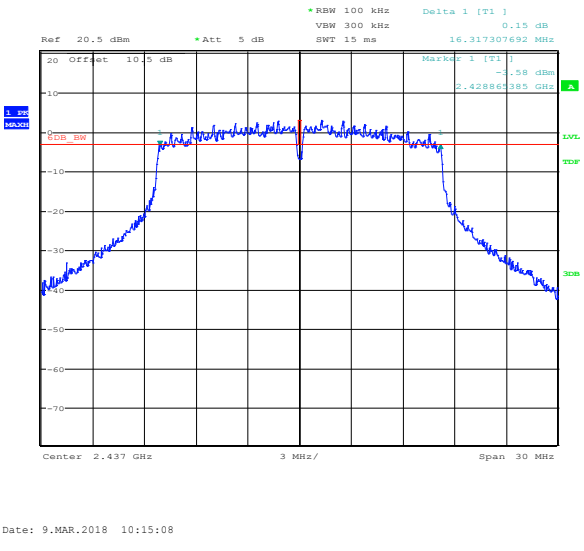



***Figure 8.5-5:*** *6 dB bandwidth on 802.11g, mid channel*

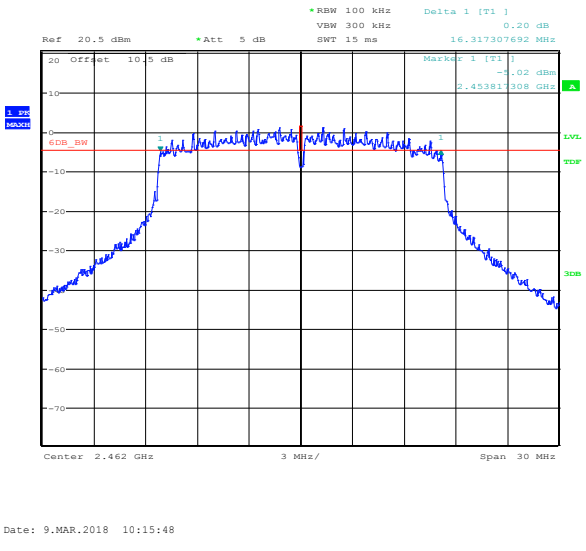



***Figure 8.5-6:*** *6 dB bandwidth on 802.11g, high channel*

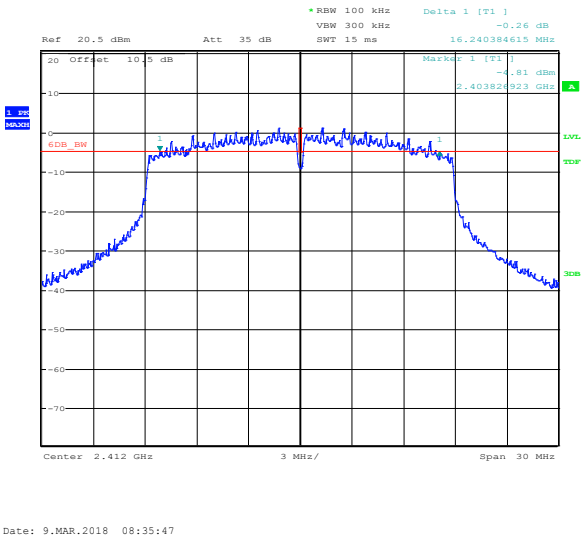



***Figure 8.5-7:*** *6 dB bandwidth on 802.11n HT20, low channel*

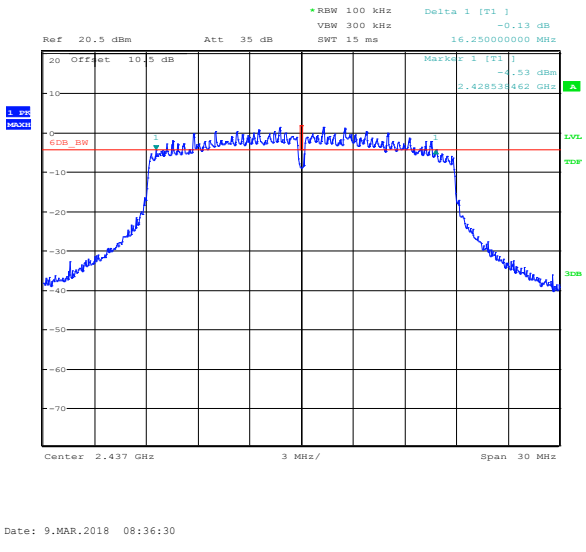



***Figure 8.5-8:*** *6 dB bandwidth on 802.11n HT20, mid channel*

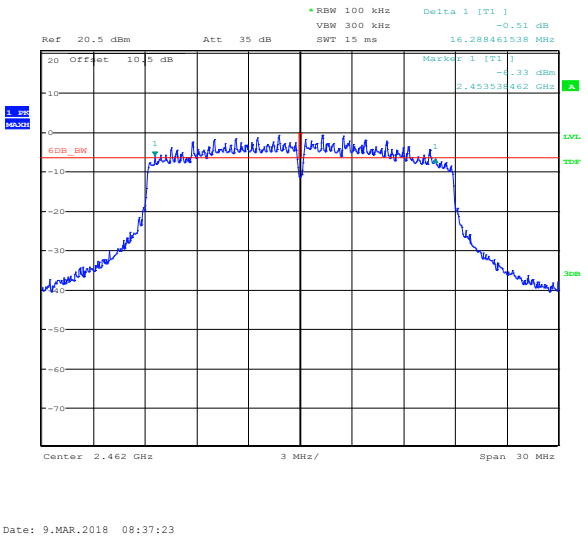



***Figure 8.5-9:*** *6 dB bandwidth on 802.11n HT20, high channel*

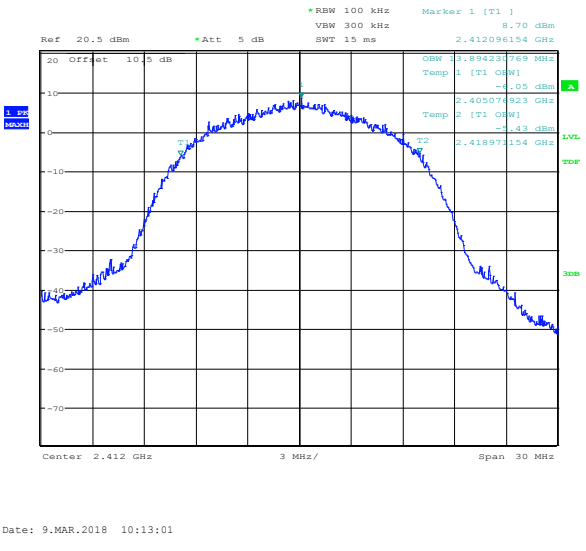



***Figure 8.5-10:*** *99% bandwidth on 802.11b, low channel*

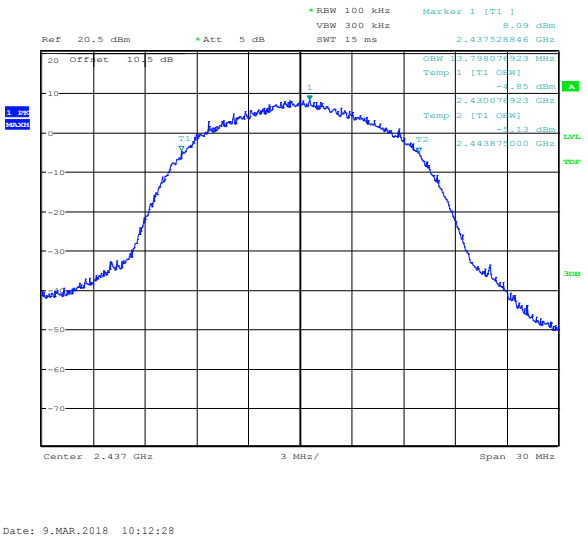



***Figure 8.5-11:*** *99% bandwidth on 802.11b, mid channel*

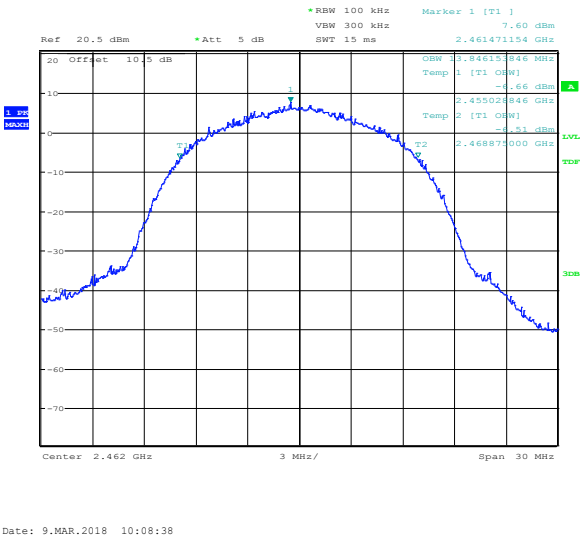



***Figure 8.5-12:*** *99% bandwidth on 802.11b, high channel*

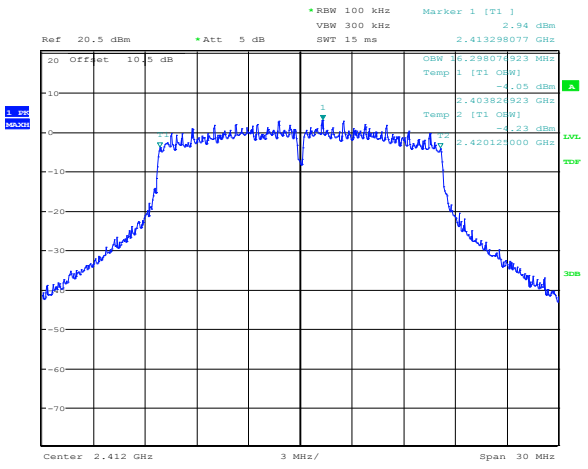



***Figure 8.5-13:*** *99% bandwidth on 802.11g, low channel*

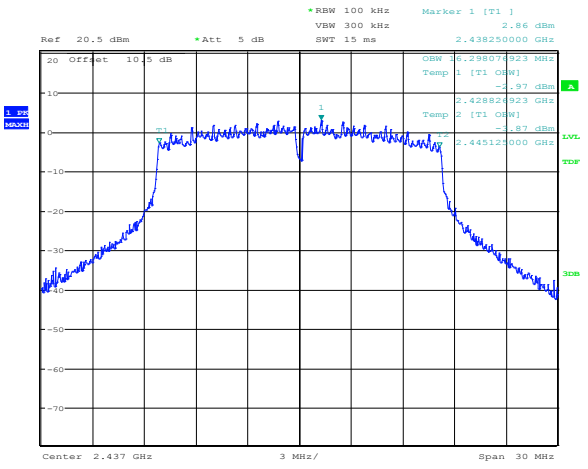



***Figure 8.5-14:*** *99% bandwidth on 802.11g, mid channel*

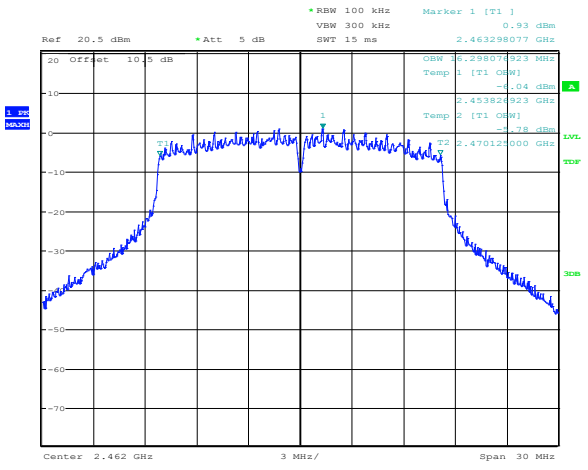



***Figure 8.5-15:*** *99% bandwidth on 802.11g, high channel*

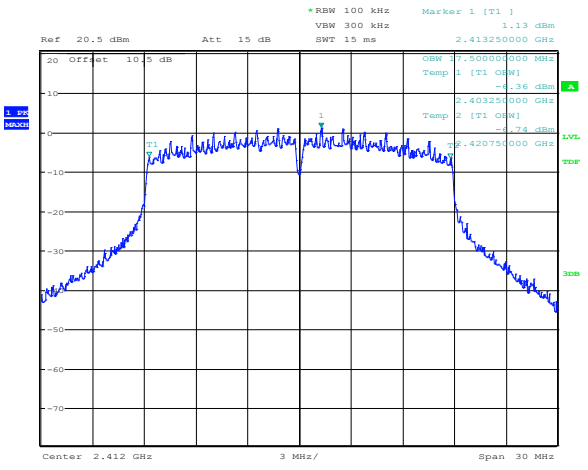



***Figure 8.5-16:*** *99% bandwidth on 802.11n HT20, low channel*

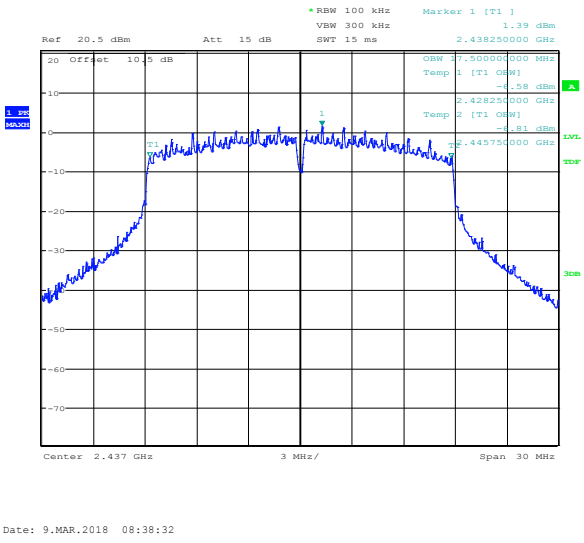



***Figure 8.5-17:*** *99% bandwidth on 802.11n HT20, mid channel*

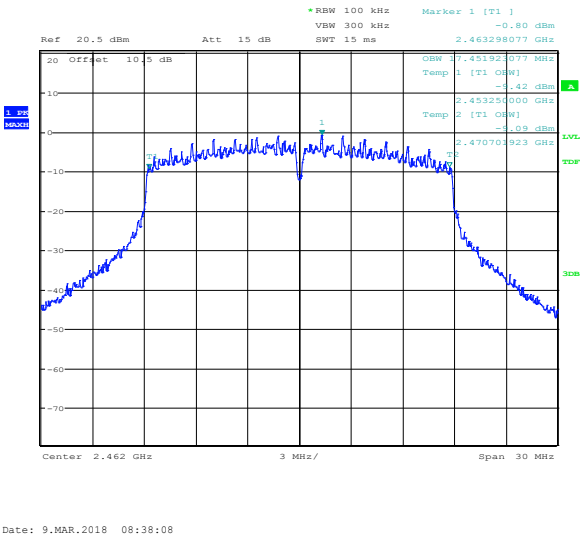



***Figure 8.5-18:*** *99% bandwidth on 802.11n HT20, high channel*

## 8.6 FCC 15.247(b) and RSS-247 5.4 (d) Transmitter output power and e.i.r.p. requirements for DTS in 2 GHz

### 8.6.1 Definitions and limits

**FCC:**

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(3) For systems using digital modulation in the 2400–2483.5 MHz band: 1 W (30 dBm). As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) and (c)(1)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(1), (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(1) or (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beamforming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

(iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

**ISED:**
d. For DTSs employing digital modulation techniques operating in the 2400–2483.5 MHz band, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.
e. Fixed point-to-point systems in the 2400–2483.5 MHz band are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding an e.i.r.p. of 4 W.
f. Transmitters operating in the band 2400–2483.5 MHz, may employ antenna systems that emit multiple directional beams simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers, provided that the emissions comply with the following:

i Different information must be transmitted to each receiver.
ii If the transmitter employs an antenna system that emits multiple directional beams, but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device (i.e. the sum of the power supplied to all antennas, antenna elements, staves, etc., and summed across all carriers or frequency channels) shall not exceed the applicable output power limit specified in sections 5.4(b) and 5.4(d). However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.
iii If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the applicable power limit specified in sections 5.4(b) and 5.4(d). If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the applicable limit specified in sections 5.4(b) and 5.4(d). In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the applicable limit specified in sections 5.4(b) and 5.4(d) by more than 8 dB.
iv Transmitters that transmit a single directional beam shall operate under the provisions of sections 5.4(b), 5.4(d) and 5.4(e).

### 8.6.1 Test date

| | |
|---|---|
| Start date | March 9, 2018 |

### 8.6.2 Observations, settings and special notes

The test was performed according to DTS guidelines using RMS average method.

### 8.6.3 Test data

***Table 8.6-1:*** *Output power measurements results for 802.11b*

| Frequency, MHz | Conducted output power, dBm | | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|---|---|---|---|---|---|---|---|
| | Measured | Limit | | | | | |
| 2412 | 15.74 | 30.00 | 14.26 | 0.80 | 16.54 | 36.00 | 19.46 |
| 2437 | 15.92 | 30.00 | 14.08 | 0.80 | 16.72 | 36.00 | 19.28 |
| 2462 | 14.31 | 30.00 | 15.69 | 0.80 | 15.11 | 36.00 | 20.89 |

***Table 8.6-2:*** *Output power measurements results for 802.11g*

| Frequency, MHz | Conducted output power, dBm | | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|---|---|---|---|---|---|---|---|
| | Measured | Limit | | | | | |
| 2412 | 12.99 | 30.00 | 17.01 | 0.80 | 13.79 | 36.00 | 22.21 |
| 2437 | 13.14 | 30.00 | 16.86 | 0.80 | 13.94 | 36.00 | 22.06 |
| 2462 | 11.24 | 30.00 | 18.76 | 0.80 | 12.04 | 36.00 | 23.96 |

***Table 8.6-3:*** *Output power measurements results for 802.11n HT20*

| Frequency, MHz | Conducted output power, dBm | | Margin, dB | Antenna gain, dBi | EIRP, dBm | EIRP limit, dBm | EIRP margin, dB |
|---|---|---|---|---|---|---|---|
| | Measured | Limit | | | | | |
| 2412 | 11.23 | 30.00 | 18.77 | 0.80 | 12.03 | 36.00 | 23.97 |
| 2437 | 11.35 | 30.00 | 18.65 | 0.80 | 12.15 | 36.00 | 23.85 |
| 2462 | 9.24 | 30.00 | 20.76 | 0.80 | 10.04 | 36.00 | 25.96 |

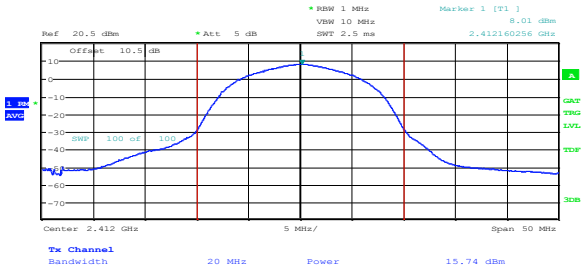



***Figure 8.6-1:*** *Output power on low channel, 802.11b*

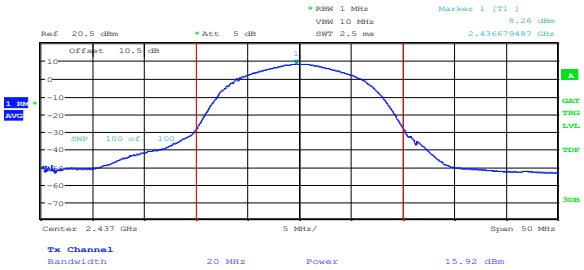



***Figure 8.6-2:*** *Output power on mid channel, 802.11b*

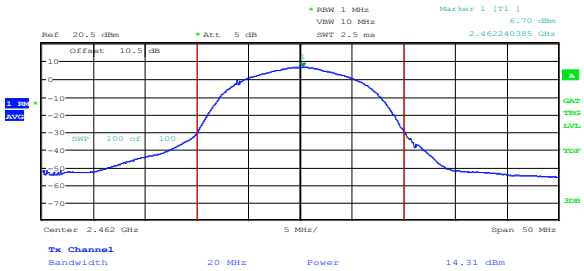



***Figure 8.6-3:*** *Output power on high channel, 802.11b*

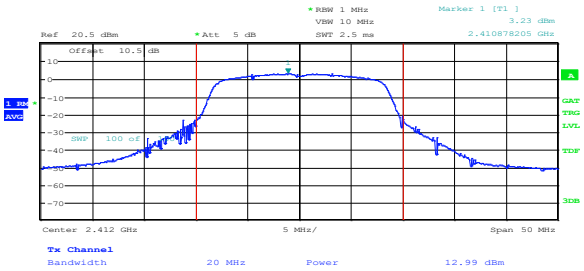



***Figure 8.6-4:*** *Output power on low channel, 802.11g*

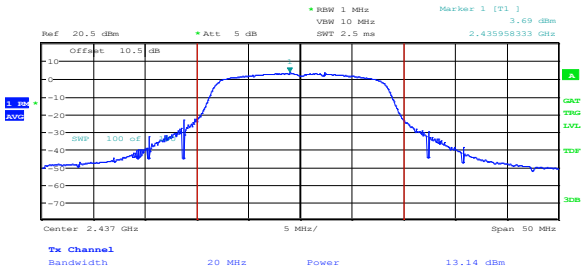



***Figure 8.6-5:*** *Output power on mid channel, 802.11g*

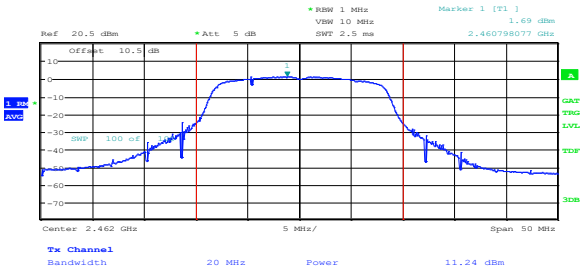



***Figure 8.6-6:*** *Output power on high channel, 802.11g*

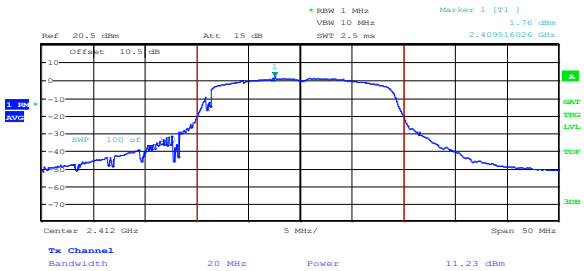



***Figure 8.6-7:*** *Output power on low channel, 802.11n HT20*

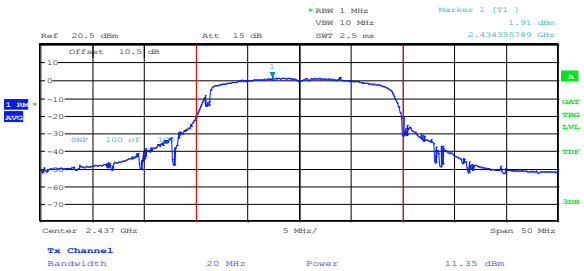



***Figure 8.6-8:*** *Output power on mid channel, 802.11n HT20*

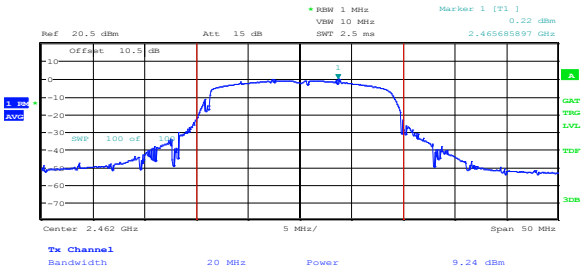



***Figure 8.6-9:*** *Output power on high channel, 802.11n HT20*

## 8.7 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) unwanted emissions

### 8.7.1 Definitions and limits

**FCC:**
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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**ISED:**
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

***Table 8.7-1:*** *FCC §15.209 and RSS-Gen – Radiated emission limits*

| Frequency, MHz | Field strength of emissions | | Measurement distance, m |
|---|---|---|---|
| | µV/m | dBµV/m | |
| 0.009–0.490 | 2400/F | $67.6 - 20 \times \log_{10}(F)$ | 300 |
| 0.490–1.705 | 24000/F | $87.6 - 20 \times \log_{10}(F)$ | 30 |
| 1.705–30.0 | 30 | 29.5 | 30 |
| 30–88 | 100 | 40.0 | 3 |
| 88–216 | 150 | 43.5 | 3 |
| 216–960 | 200 | 46.0 | 3 |
| above 960 | 500 | 54.0 | 3 |

Notes: In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

***Table 8.7-2:*** *ISED restricted frequency bands*

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090–0.110 | 12.51975–12.52025 | 399.9–410 | 5.35–5.46 |
| 2.1735–2.1905 | 12.57675–12.57725 | 608–614 | 7.25–7.75 |
| 3.020–3.026 | 13.36–13.41 | 960–1427 | 8.025–8.5 |
| 4.125–4.128 | 16.42–16.423 | 1435–1626.5 | 9.0–9.2 |
| 4.17725–4.17775 | 16.69475–16.69525 | 1645.5–1646.5 | 9.3–9.5 |
| 4.20725–4.20775 | 16.80425–16.80475 | 1660–1710 | 10.6–12.7 |
| 5.677-5.683 | 25.5–25.67 | 1718.8–1722.2 | 13.25–13.4 |
| 6.215–6.218 | 37.5–38.25 | 2200–2300 | 14.47–14.5 |
| 6.26775–6.26825 | 73–74.6 | 2310–2390 | 15.35–16.2 |
| 6.31175–6.31225 | 74.8–75.2 | 2655–2900 | 17.7–21.4 |
| 8.291–8.294 | 108–138 | 3260–3267 | 22.01–23.12 |
| 8.362–8.366 | 156.52475–156.52525 | 3332–3339 | 23.6–24.0 |
| 8.37625–8.38675 | 156.7–156.9 | 3345.8–3358 | 31.2–31.8 |
| 8.41425–8.41475 | 240–285 | 3500–4400 | 36.43–36.5 |
| 12.29–12.293 | 322–335.4 | 4500–5150 | Above 38.6 |

Note: Certain frequency bands listed in Table 8.7-2 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

***Table 8.7-3:*** *FCC restricted frequency bands*

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090–0.110 | 16.42–16.423 | 399.9–410 | 4.5–5.15 |
| 0.495–0.505 | 16.69475–16.69525 | 608–614 | 5.35–5.46 |
| 2.1735–2.1905 | 16.80425–16.80475 | 960–1240 | 7.25–7.75 |
| 4.125–4.128 | 25.5–25.67 | 1300–1427 | 8.025–8.5 |
| 4.17725–4.17775 | 37.5–38.25 | 1435–1626.5 | 9.0–9.2 |
| 4.20725–4.20775 | 73–74.6 | 1645.5–1646.5 | 9.3–9.5 |
| 6.215–6.218 | 74.8–75.2 | 1660–1710 | 10.6–12.7 |
| 6.26775–6.26825 | 108–121.94 | 1718.8–1722.2 | 13.25–13.4 |
| 6.31175–6.31225 | 123–138 | 2200–2300 | 14.47–14.5 |
| 8.291–8.294 | 149.9–150.05 | 2310–2390 | 15.35–16.2 |
| 8.362–8.366 | 156.52475–156.52525 | 2483.5–2500 | 17.7–21.4 |
| 8.37625–8.38675 | 156.7–156.9 | 2690–2900 | 22.01–23.12 |
| 8.41425–8.41475 | 162.0125–167.17 | 3260–3267 | 23.6–24.0 |
| 12.29–12.293 | 167.72–173.2 | 3332–3339 | 31.2–31.8 |
| 12.51975–12.52025 | 240–285 | 3345.8–3358 | 36.43–36.5 |
| 12.57675–12.57725 | 322–335.4 | 3600–4400 | Above 38.6 |
| 13.36–13.41 | | | |

## 8.7.1 Test date

| | |
|---|---|
| Start date | March 9, 2018 |

## 8.7.2 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10$^{th}$ harmonic.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.
Since fundamental power was tested using average method, the spurious emissions limit is −30 dBc/100 kHz.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

| | |
|---|---|
| Resolution bandwidth: | 100 kHz |
| Video bandwidth: | 300 kHz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

| | |
|---|---|
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 3 MHz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

| | |
|---|---|
| Resolution bandwidth: | 1 MHz |
| Video bandwidth: | 10 Hz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

Spectrum analyser settings for conducted spurious emissions measurements:

| | |
|---|---|
| Resolution bandwidth: | 100 kHz |
| Video bandwidth: | 300 kHz |
| Detector mode: | Peak |
| Trace mode: | Max Hold |

## 8.7.4 Test data

***Table 8.7-4:*** *Radiated field strength measurement results for 802.11b*

| Channel | Frequency, MHz | Peak Field strength, dBµV/m | | Margin, dB | Average Field strength, dBµV/m | | Margin, dB |
|---|---|---|---|---|---|---|---|
| | | Measured | Limit | | Measured | Limit | |
| Low | 2390.0 | 54.09 | 74.00 | 19.91 | 50.96 | 54.00 | 3.04 |
| High | 2483.5 | 53.42 | 74.00 | 20.58 | 49.64 | 54.00 | 4.36 |

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

***Table 8.7-5:*** *Radiated field strength measurement results for 802.11g*

| Channel | Frequency, MHz | Peak Field strength, dBµV/m | | Margin, dB | Average Field strength, dBµV/m | | Margin, dB |
|---|---|---|---|---|---|---|---|
| | | Measured | Limit | | Measured | Limit | |
| Low | 2390.0 | 54.77 | 74.00 | 19.23 | 50.69 | 54.00 | 3.31 |
| High | 2483.5 | 53.09 | 74.00 | 20.91 | 47.37 | 54.00 | 6.63 |

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

***Table 8.7-6:*** *Radiated field strength measurement results for 802.11n HT20*

| Channel | Frequency, MHz | Peak Field strength, dBµV/m | | Margin, dB | Average Field strength, dBµV/m | | Margin, dB |
|---|---|---|---|---|---|---|---|
| | | Measured | Limit | | Measured | Limit | |
| Low | 2390.0 | 54.94 | 74.00 | 19.06 | 51.69 | 54.00 | 2.31 |
| High | 2483.5 | 54.18 | 74.00 | 19.82 | 49.50 | 54.00 | 4.50 |

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

All other spurious emissions originating from the RF part of the EUT were attenuated more than 20 dB below the limits.

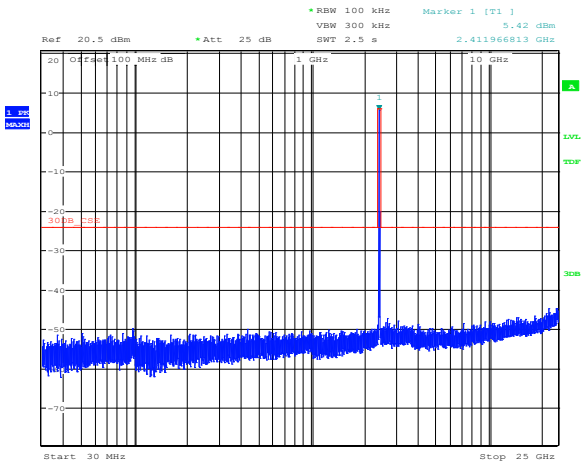



***Figure 8.7-1:*** *Conducted spurious emissions for 802.11b, low channel*

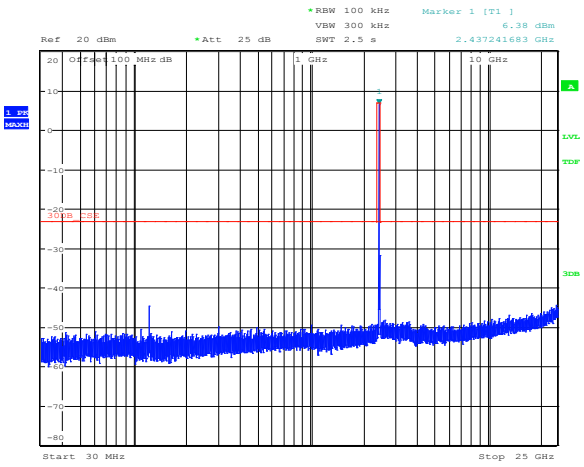



***Figure 8.7-2:*** *Conducted spurious emissions for 802.11b, mid channel*

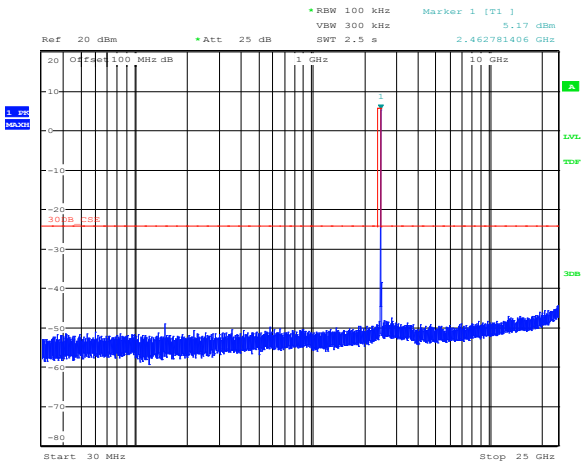



***Figure 8.7-3:*** *Conducted spurious emissions for 802.11b, high channel*

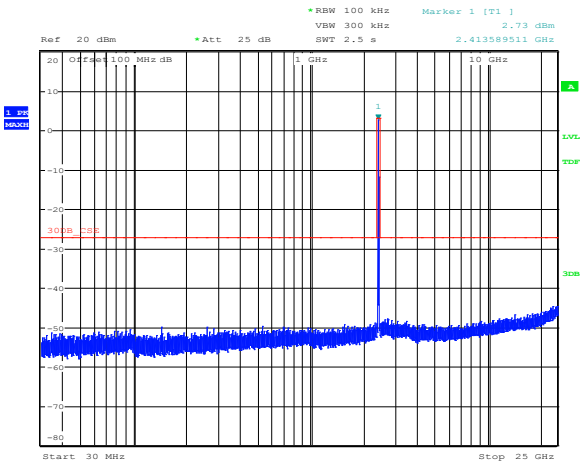



***Figure 8.7-4:*** *Conducted spurious emissions for 802.11g, low channel*

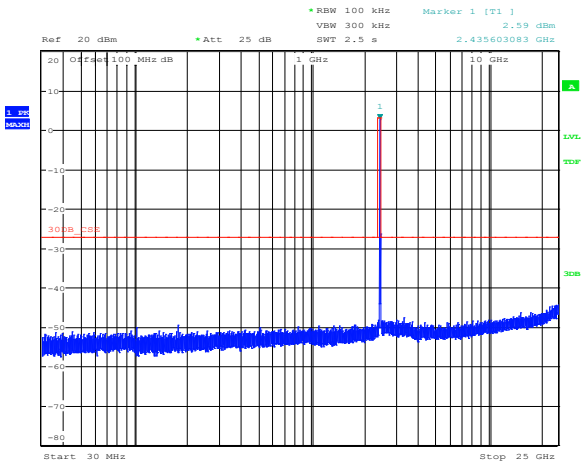



***Figure 8.7-5:*** *Conducted spurious emissions for 802.11g, mid channel*

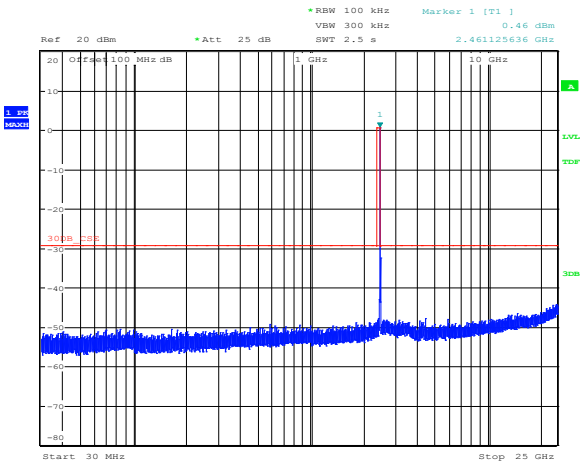



***Figure 8.7-6:*** *Conducted spurious emissions for 802.11g, high channel*

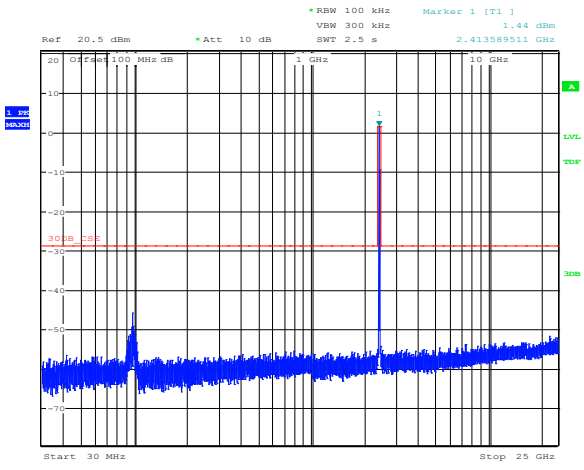



***Figure 8.7-7:*** *Conducted spurious emissions for 802.11n HT20, low channel*

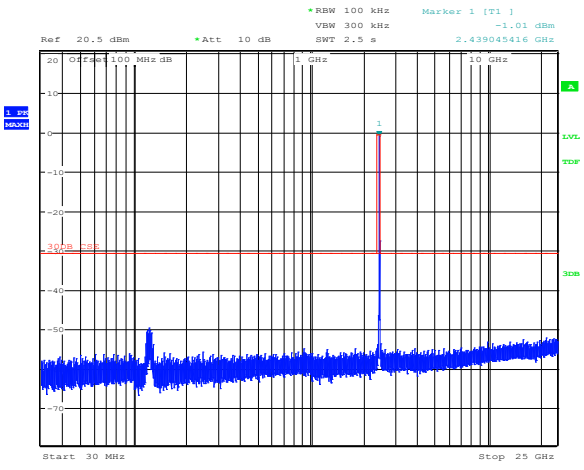



***Figure 8.7-8:*** *Conducted spurious emissions for 802.11n HT20, mid channel*

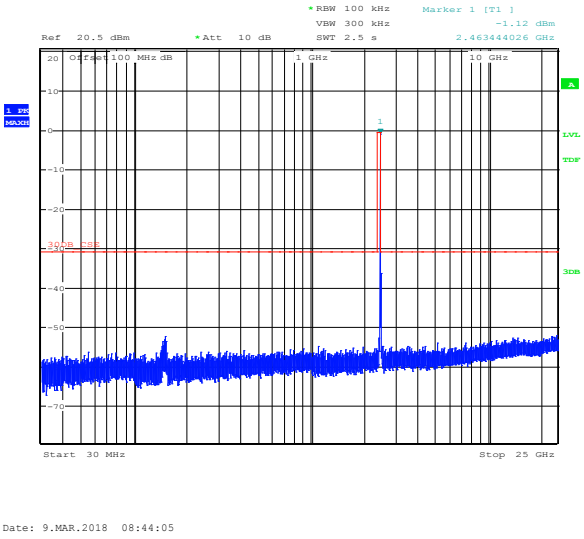



***Figure 8.7-9:*** *Conducted spurious emissions for 802.11n HT20, high channel*

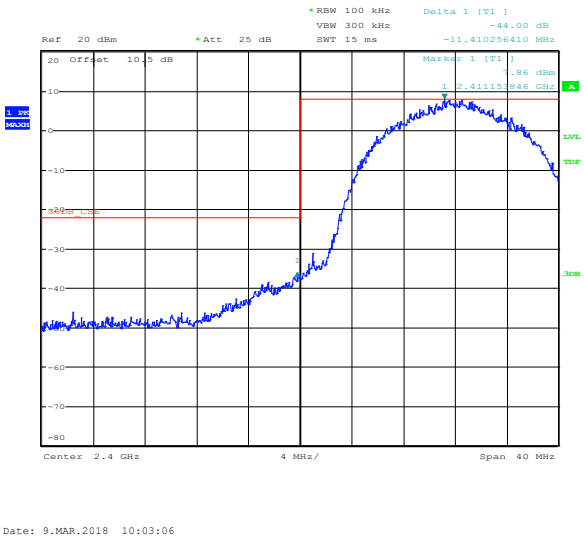



***Figure 8.7-10:*** *Conducted spurious emissions at the lower band edge for 802.11b, low channel*

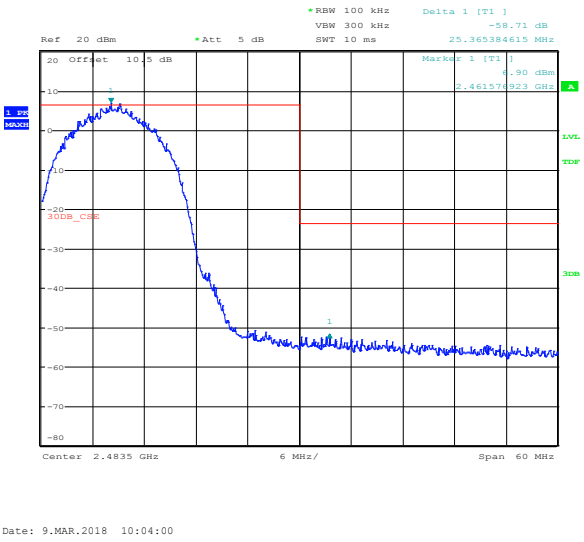



***Figure 8.7-11:*** *Conducted spurious emissions at the upper band edge for 802.11b, high channel*

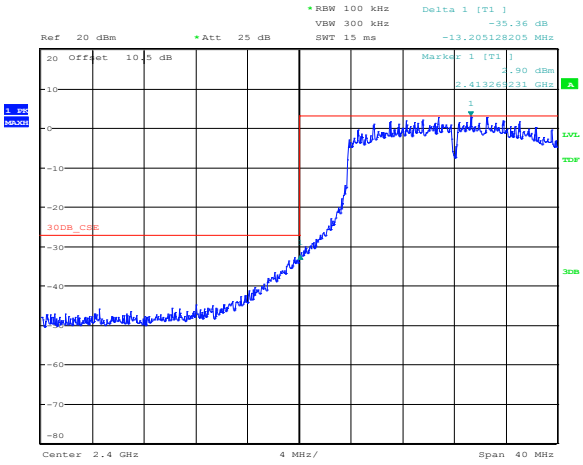



***Figure 8.7-12:*** *Conducted spurious emissions at the lower band edge for 802.11g, low channel*

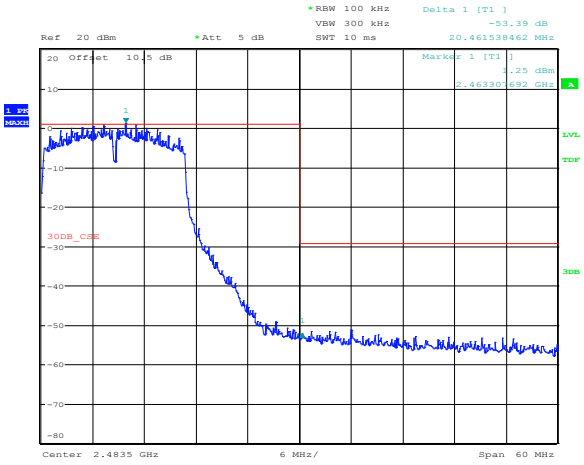



***Figure 8.7-13:*** *Conducted spurious emissions at the upper band edge for 802.11g, high channel*

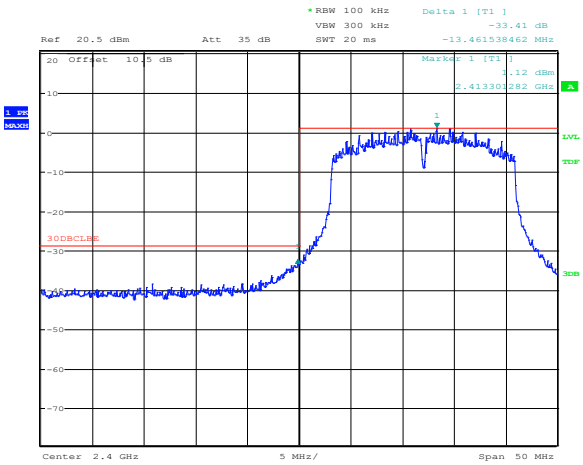



***Figure 8.7-14:*** *Conducted spurious emissions at the lower band edge for 802.11n HT20, low channel*

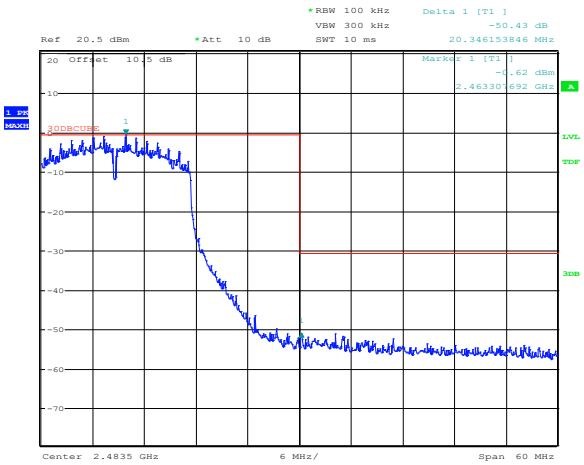



***Figure 8.7-15:*** *Conducted spurious emissions at the upper band edge for 802.11n HT20, high channel*

## 8.8 FCC 15.247(e) and RSS-247 5.2(b) Power spectral density for digitally modulated devices

### 8.8.1 Definitions and limits

**FCC:**
For digitally modulated systems, the 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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

**ISED:**
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

### 8.8.1 Test date

| | |
|---|---|
| Start date | March 9, 2018 |

### 8.8.2 Observations, settings and special notes

The test was performed using method described in section 10.3 Method AVGPSD-1 (trace averaging with EUT transmitting at full power throughout each sweep). Spectrum analyser settings:

| | |
|---|---|
| Resolution bandwidth: | 100 kHz |
| Video bandwidth: | ≥3 × RBW |
| Frequency span: | 20/30 MHz |
| Detector mode: | RMS |
| Trace mode: | Power average |
| Averaging sweeps number: | 100 |

### 8.8.3 Test data

***Table 8.8-1:*** *PSD measurements results*

| Modulation | Frequency, MHz | PSD, dBm/100 kHz | PSD limit, dBm/3 kHz | Margin, dB |
|---|---|---|---|---|
| 802.11b | 2412 | -1.41 | 8.00 | 9.41 |
| | 2437 | -1.05 | 8.00 | 9.05 |
| | 2462 | -2.94 | 8.00 | 10.94 |
| 802.11g | 2412 | -5.87 | 8.00 | 13.87 |
| | 2437 | -5.04 | 8.00 | 13.04 |
| | 2457 | -7.42 | 8.00 | 15.42 |
| 802.11n HT20 | 2412 | -5.54 | 8.00 | 13.54 |
| | 2437 | -6.04 | 8.00 | 14.04 |
| | 2462 | -7.58 | 8.00 | 15.58 |

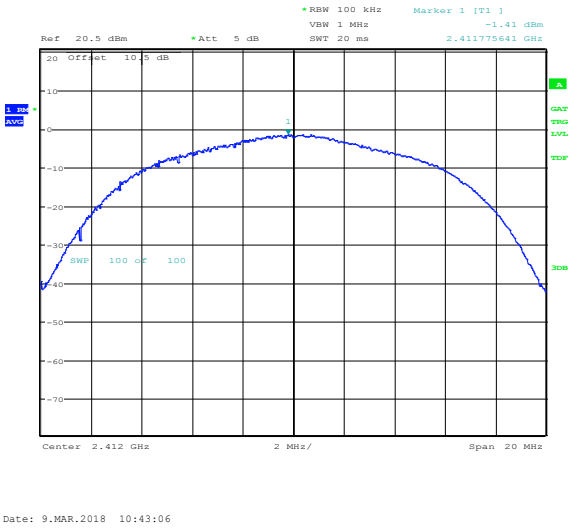



***Figure 8.8-1:*** *PSD measurement on 802.11b, low channel*

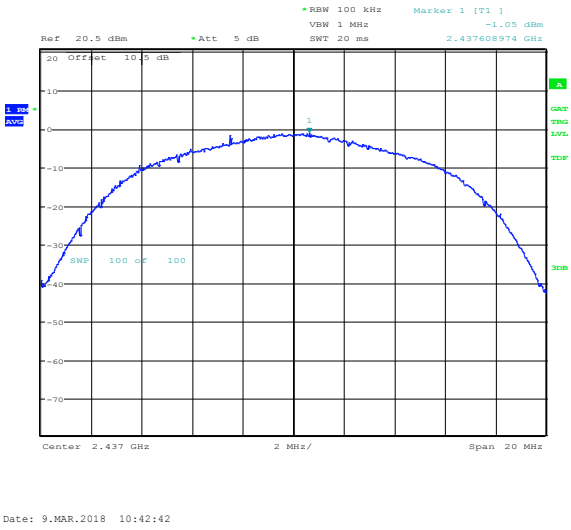



***Figure 8.8-2:*** *PSD measurement on 802.11b, mid channel*

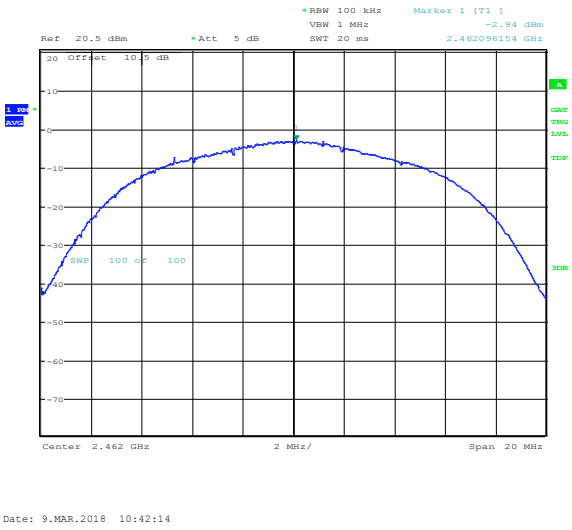



***Figure 8.8-3:*** *PSD measurement on 802.11b, high channel*

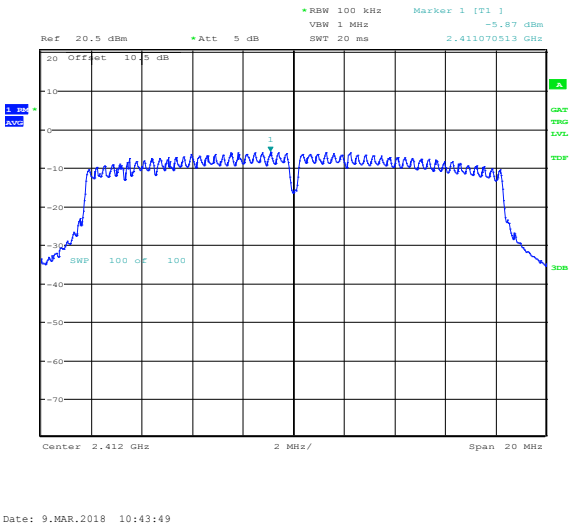



***Figure 8.8-4:*** *PSD measurement on 802.11g, low channel*

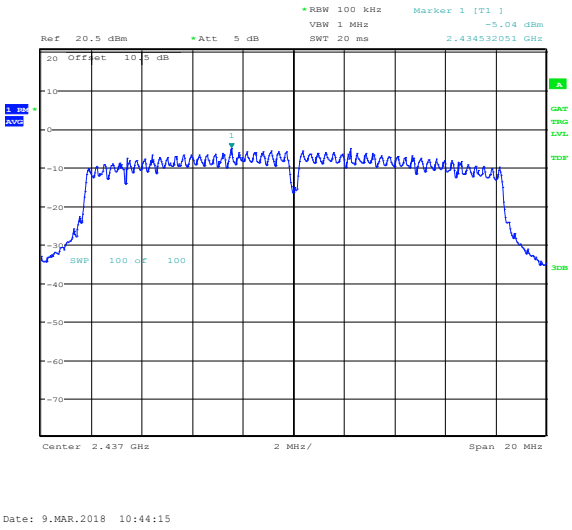



***Figure 8.8-5:*** *PSD measurement on 802.11g, mid channel*

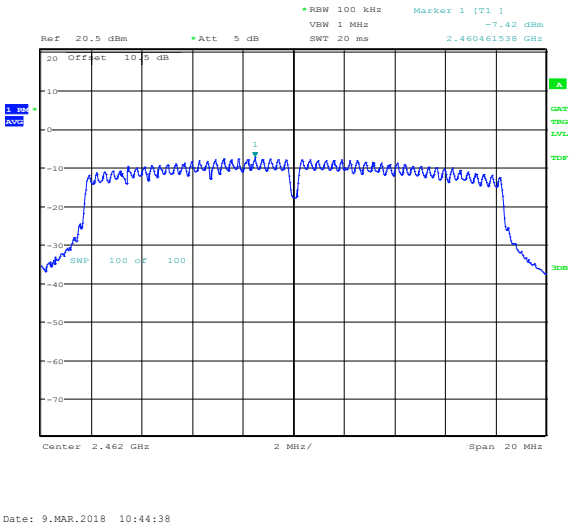



***Figure 8.8-6:*** *PSD measurement on 802.11g, high channel*

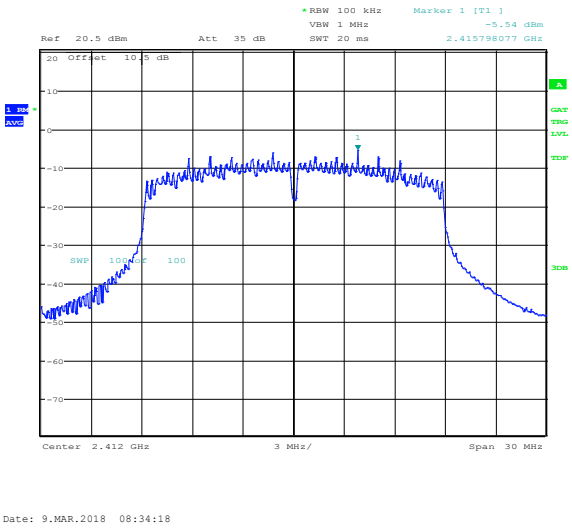



***Figure 8.8-7:*** *PSD measurement on 802.11n HT20, low channel*

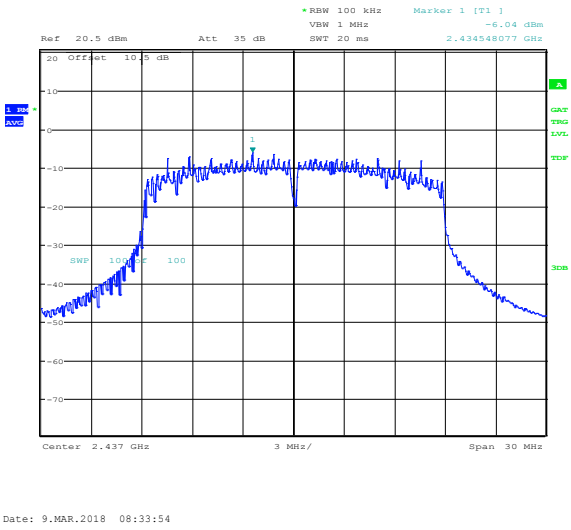



***Figure 8.8-8:*** *PSD measurement on 802.11n HT20, mid channel*

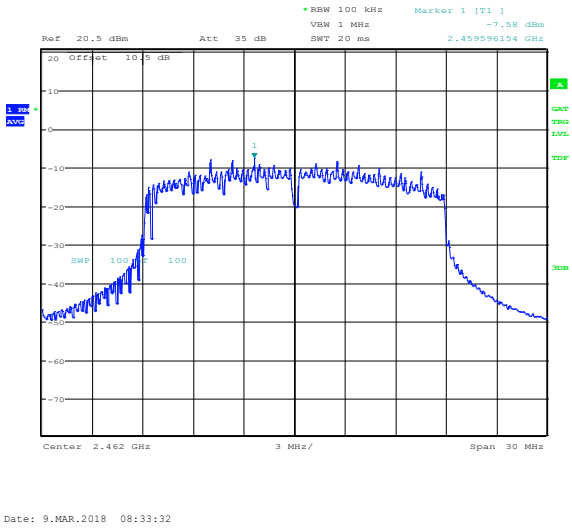
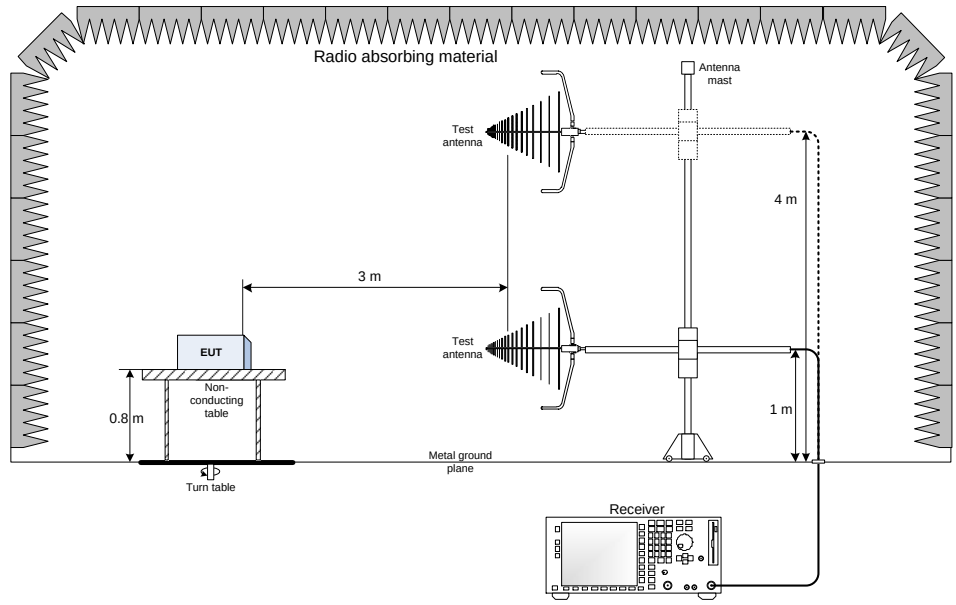


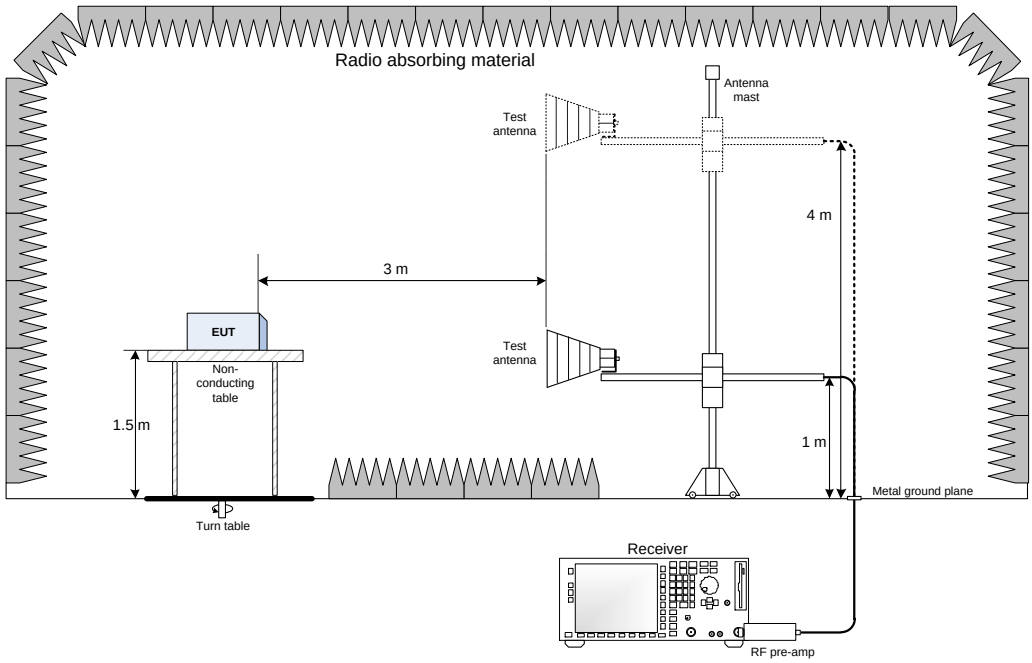

***Figure 8.8-9:*** *PSD measurement on 802.11n HT20, high channel*

# **Section 9.** Block diagrams of test set-ups

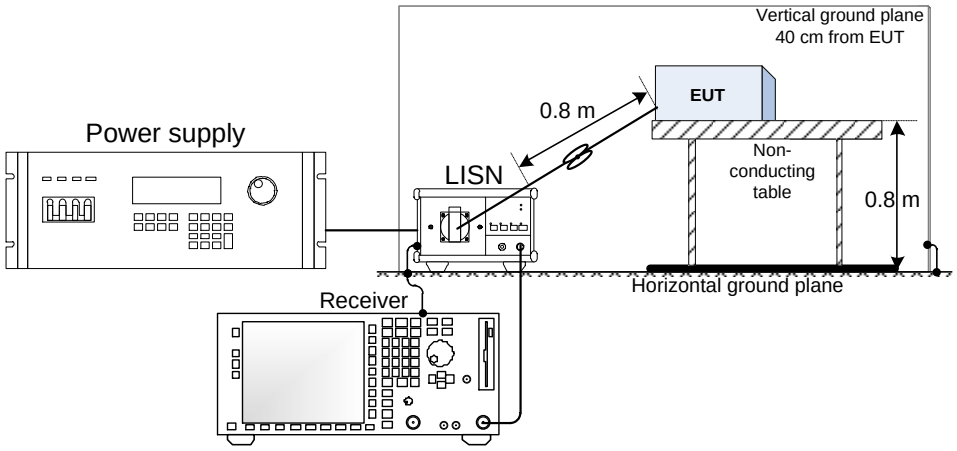
## 9.1 Radiated emissions set-up for frequencies below 1 GHz




## 9.2 Radiated emissions set-up for frequencies above 1 GHz



## 9.3 Conducted emissions set-up




## 9.4 Antenna port set-up