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| Prüfbericht-Nr.: <i>Test Report No.:</i> | JP21PGQD 001 | Auftrags-Nr.: <i>Order No.:</i> | 150232700 | Seite 1 von 77 <i>Page 1 of 77</i> |
| Kunden-Referenz-Nr.: <i>Client Reference No.:</i> | N/A | Auftragsdatum: <i>Order Date:</i> | 2020-12-25 | |
| Auftraggeber: <i>Client:</i> | Mitsubishi Electric Corporation Sanda Works 2-3-33, Miwa, Sanda-city, Hyogo, 669-1513, Japan | | | |
| Prüfgegenstand: <i>Test Item:</i> | Display Audio | | | |
| Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i> | NR-000 | Serien-Nr.: <i>Serial No.:</i> | Refer to section 4.3 | |
| Auftrags-Inhalt: <i>Order Content:</i> | Radio Testing | | | |
| Prüfgrundlage: <i>Test Specification:</i> | FCC 47 CFR Part 15, Subpart C, Section 15.247 ANSI C63.10-2013 KDB Publication No. 558074 D01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (v05) | | | |
| Wareneingangsdatum: <i>Date of Receipt:</i> | 2021-01-07, 2021-01-20 | | | |
| Prüfmuster-Nr.: <i>Test Sample No.:</i> | A00292387, A002991001, A002990060 | | | |
| Prüfzeitraum: <i>Testing Period:</i> | 2021-01-13 - 2021-01-24 | | | |
| Ort der Prüfung: <i>Place of Testing:</i> | Yokohama EMC Laboratory | | | |
| Prüflaboratorium: <i>Testing Laboratory:</i> | TÜV Rheinland Japan Ltd. | | | |
| Prüfergebnis*: <i>Test Result*:</i> | Pass | | | |
| Überprüft von: <i>Reviewed by:</i> | | Genehmigt von: <i>Authorized by:</i> | | |
| Datum: 2021-02-26 <i>Date:</i> | _____ | Datum: 2021-02-26 <i>Date:</i> | _____ | |
| Stellung / Position: | Inspector | Stellung / Position: | Reviewer | |
| Sonstiges / Other: | | | | |
| Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the Test Item at Delivery:</i> | Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i> | | | |
| * Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) * Legend: P(ass) = passed a.m. test specification(s) | F(ail) = entspricht nicht o.g. Prüfgrundlage(n) F(ail) = failed a.m. test specification(s) | N/A = nicht anwendbar N/A = not applicable | N/T = nicht getestet N/T = not tested | |
| Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i> | | | | |

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REVISIONS

| Report No. | Issue date | Changes / Remarks |
|--------------|------------|-----------------------------------|
| JP21PGQD 001 | 2021-02-26 | Original document for WLAN 2.4GHz |

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1. General Remarks

1.1 Test Specifications

Table 1: Test Summary

| Test | Specifications | Result |
|--|--|-----------|
| Radio: FCC 47 CFR Part 15, Subpart C, Section 15.247 ANSI C63.10-2013 KDB Publication No. 558074 D01: Guidance for Compliance Measurement on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operation under Section 15.247 of the FCC Rules (v05r02) | | |
| Conducted Output Power | FCC 15.247(b)(3) | Pass |
| Conducted Spurious Emissions | FCC 15.247(d) | Pass |
| Peak Power Spectral Density | FCC 15.247(e) | Pass |
| 6dB Bandwidth | FCC 15.215(c), 15.247(a)(2) | Pass |
| 99% Bandwidth | For reference | Performed |
| Radiated Spurious Emissions of Transmitter | FCC 15.205, FCC 15.209, FCC 15.247(d) | Pass |
| Conducted Emission on AC Power Ports | FCC 15.207 Not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line. | N/A |

1.2 Test Report Purpose

The purpose of this test report is to show compliance of the EUT (Equipment Under Test) with the requirements of the FCC rules listed in section 1.1.

This test report is intended for C2PC application due to modifications on the certified radio transmitter in accordance with the KDB Publication No. 178919 D01 v06.

This test report covers WLAN (2.4GHz) part of the product, who has multiple wireless connectivity: Bluetooth, WLAN (2.4GHz and 5GHz)

1.3 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The test facility is recognized by the Federal Communications Commission (FCC) as Accredited Testing Laboratory under designation number JP0017.

The test facility is accredited by VLAC (member of ILAC) under number VLAC-017 according to ISO/IEC 17025:2017.

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

| Kind of Equipment | Manufacturer | Model Name | Serial Number | Equip. ID | Cal. Interval | Cal. Date | Next Cal. |
|--|------------------|----------------------|---------------|-----------|---------------|------------|------------|
| For Antenna Port Conducted Emission | | | | | | | |
| EMI Receiver | Rohde & Schwarz | ESW 26 | 101316 | RF-0812 | 1 year | 2020-04-22 | 2021-04-22 |
| 3dB Attenuator | Huber + Suhner | 6603_SMA-50-1/199_NE | - | RF-0761 | 1 year | 2020-03-16 | 2021-03-16 |
| For Radiated Emission (RE) | | | | | | | |
| Radiated Emission Measurement Soft-ware (above 30MHz) | Toyo Corporation | EP7/RE | VER. 8.0.90 | RF-0026 | 1 year | 2020-02-25 | 2021-02-25 |
| EMI Receiver | Rohde & Schwarz | ESU 40 | 100029 | RF-0021 | 1 year | 2020-08-17 | 2021-08-17 |
| RF Selector (10m Chamber) | Toyo Corporation | NS4900 | 0703-182 | RF-0029 | 1 year | 2020-02-25 | 2021-02-25 |
| Loop Antenna with Amplifier, 9kHz-30MHz | Rohde & Schwarz | HFH2-Z2 | 100139 | RF-0048 | 1 year | 2020-04-24 | 2021-04-24 |
| Trilog Antenna No. 2, 30-1000MHz | Schwarzbeck | VULB 9168 | 9168-475 | RF-0462 | 1 year | 2020-04-28 | 2021-04-28 |
| 5dB Attenuator | Pasternack | PE7047-5 | - | RF-0731 | 1 year | 2020-04-28 | 2021-04-28 |
| Horn Antenna, 1-8GHz | Schwarzbeck | BBHA 9120 D | 1059 | RF-0553 | 1 year | 2020-04-18 | 2021-04-18 |
| Microwave Preamplifier, 1-8GHz | Toyo Corporation | TPA0108-40 | 0634 | RF-0052 | 1 year | 2021-01-06 | 2022-01-06 |
| Horn Antenna with Preamplifier, 8-18GHz (RX) | Toyo Corporation | HAP06-18W | 00000025 | RF-0065 | 1 year | 2020-04-18 | 2021-04-18 |
| 2.4GHz Band Reject Filter | Creowave | CW-BSF-2400-2483.5 | 746001 | RF-0591 | 1 year | 2021-01-06 | 2022-01-06 |
| High Pass Filter, 8-18GHz | Micro-Tronics | HPM50107 | 006 | RF-0334 | 1 year | 2020-04-18 | 2021-04-18 |
| Horn Antenna with Preamplifier, 18-26.5GHz (RX) | Toyo Corporation | HAP18-26N | 00000010 | RF-0070 | 1 year | 2020-04-18 | 2021-04-18 |
| Constant Voltage Constant Frequency Stabilizers and Power Accessories | | | | | | | |
| CVCF (10m Chamber) | NF Corporation | ES2000U | 9067307 | RF-0212 | 1 year | 2020-03-13 | 2021-03-13 |
| CVCF Booster (10m Chamber) | NF Corporation | ES2000B | 9074408 | RF-0213 | 1 year | 2020-03-13 | 2021-03-13 |
| True RMS Multimeter | Fluke | 87V | 97680445 | RF-0281 | 1 year | 2020-12-15 | 2021-12-15 |
| True RMS Multimeter | Fluke | 87V | 16110176 | RF-0414 | 1 year | 2020-06-18 | 2021-06-18 |
| DC Power Supply | Kikusui | PWR800L | NA003235 | PV-0039 | 1 year | 2020-10-07 | 2021-10-07 |

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 3: Emission Measurement Uncertainty

| Measurement Type | Frequency | Uncertainty |
|----------------------------------|----------------|-------------|
| AC Power Line Conducted Emission | 150kHz - 30MHz | ±2.0dB |
| Antenna Port Conducted Emission | 20Hz - 40GHz | ±1.5dB |
| Radiated Emission | 150kHz - 30MHz | ±4.7dB |
| | 30MHz - 1GHz | ±4.8dB |
| | > 1GHz | ±3.8dB |

Note:

The measurement instrumentation uncertainty (MIU) was determined according to CISPR 16-4-2 and ETSI TR 100-028. All MIU values mentioned in the above table are smaller than the uncertainty budgets specified by CISPR 16-4-2 and ETSI TR 100-028, therefore compliance for all emission measurements is deemed to occur if no measured disturbance level exceeds the disturbance limit.

3. General Product Information

3.1 Product Function and Intended Use

The **EUT** (Equipment Under Test) is a display audio installed in vehicles with wireless connectivity of Bluetooth, WLAN (2.4GHz) and GNSS.

3.2 Ratings and System Details

| | |
|------------------------|---|
| Radio standard: | IEEE 802.11b, IEEE 802.11g, IEEE 802.11n (20HT) |
| Frequency range: | 2412 - 2462MHz |
| Antenna gain: | +0.29dBi |
| Antenna type: | Pattern antenna (Inverted F) |
| Antenna mounting type: | Internal |
| Modulation type: | IEEE 802.11b (DSSS): BPSK, QPSK, CCK IEEE 802.11g (OFDM): BPSK, QPSK, 16 QAM, 64QAM IEEE 802.11n (20HT): (OFDM): BPSK, QPSK, 16 QAM, 64QAM |
| Signal spreading: | DSSS and OFDM (coupled with modulation type above) |
| Transmit speed: | IEEE 802.11b: 11 / 5.5 / 2 / 1 Mbps IEEE 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps IEEE 802.11n (20HT): 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5 Mbps |
| Number of channels: | 11 |
| Channel spacing: | 5MHz |
| Rated temperature: | -30 to +70°C |
| Rated voltage: | DC 12V |
| Rated input Current: | 1.4A |
| Protection class: | III |
| Test voltage: | DC 13.2V for radio testing |

3.3 Noise Generating and Noise Suppressing Parts

The highest frequency generated or used by the EUT is 900MHz as digital interface portion, 2462MHz as radio portion.

3.4 Submitted Documents and Information

Following documents have been submitted by the client:

Block Diagram, BOM, Label and location.

Following information provided in this test report has been submitted by the client:

- client name and address;
- EUT identification, ratings, system details, and description of product function and intended use;
- information related to noise generating and noise suppressing parts (if any).

4. Test Setup and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247 and KDB Publication No. 558074 D01.

The test methods, which have been used, are based on ANSI C63.10.

For details, see under each test item.

4.2 Operation Modes

Testing was performed at the lowest operating frequency (2412MHz), at the operating frequency in the middle of the specified frequency band (2437MHz) and at the highest operating frequency (2462MHz).

The basic operation modes used for testing are:

- A. EUT transmits (TX mode), with full power, at lowest channel (2412MHz), a continuous modulated signal streaming.
- B. EUT transmits (TX mode), with full power, at middle channel (2437MHz), a continuous modulated signal streaming.
- C. EUT transmits (TX mode), with full power, at highest channel (2462MHz), a continuous modulated signal streaming.

Note: The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)

Note: Since 11g and 11n-20 have the same modulation method and no differences in transmitting specification, test was performed on the representative mode that had the highest peak output power.

Note: The above mentioned operation modes from A to C were coupled to the following operation configurations:

- 1. EUT operates with IEEE 802.11b radio
- 2. EUT operates with IEEE 802.11g radio
- 3. EUT operates with IEEE 802.11n (20HT) radio

4.3 Physical Configuration for Testing

The test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10.

Figure 1: Block Diagram (Internal Amplifier model, Conducted Radio Testing)

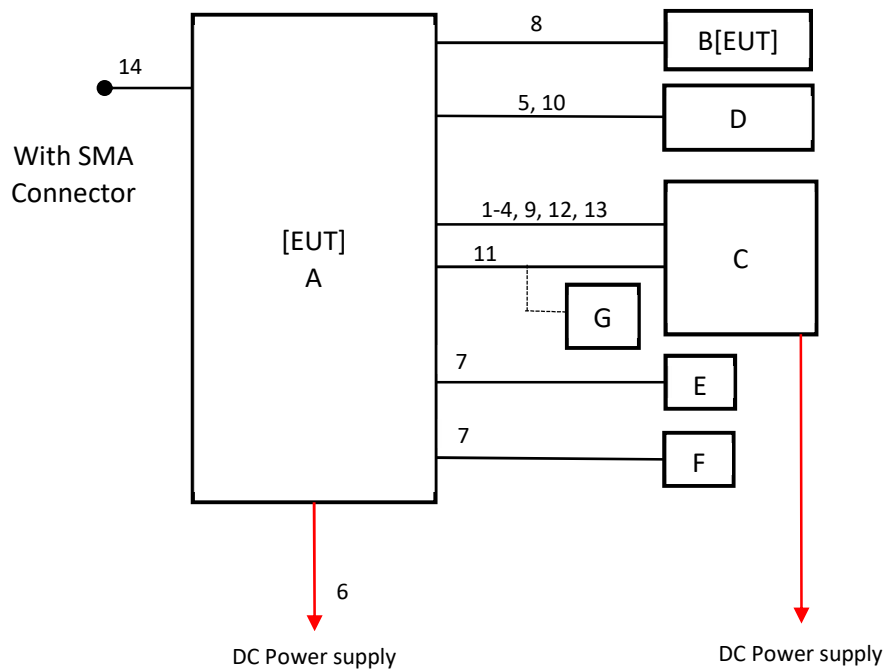


Figure 2: Block Diagram (Internal Amplifier model, Radiated Radio Testing)

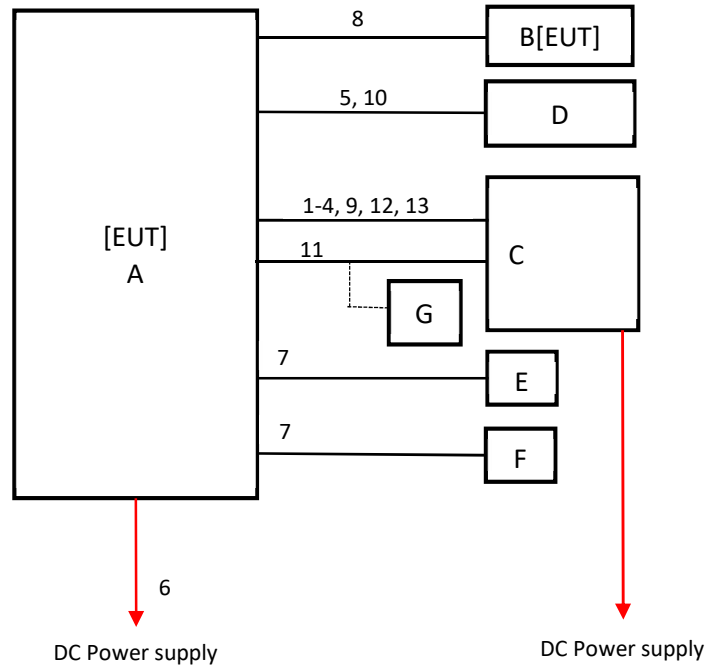


Table 4: The System consists of the Following Units

| No. | Item | Model No. | Serial Number | Manufacturer | Remarks |
|------|------------------|----------------|-----------------------|---|---------|
| A | UNIT ASSY, AUDIO | NR-000 | <i>See Note below</i> | Mitsubishi Electric Corporation Sanda Works | EUT |
| B | GPS Antenna | -/- | Unspecified | Mitsubishi Electric Corporation Sanda Works | EUT |
| C | Dummy load | -/- | Unspecified | Mitsubishi Electric Corporation Sanda Works | -/- |
| D | Display | 39710-TBAA-A11 | 506VIBB000701 | LG | -/- |
| E, F | Speaker | TP1371 | Unspecified | Tiaoping | -/- |
| G | HD Video Capture | GV-HDREC | Unspecified | I-O DATA DEVICE, INC | -/- |

Note:

For more details, refer to section: Photographs of the Test Set-Up.

The samples of the model NR-000 with the following S/N were available;

- No. 90ZPU003 for conducted radio measurements;
- No. 90ZPU004 for radiated radio measurements.

Table 5: Interfaces present on the EUT

| No. | Name | Length(m) | Shield | | Remarks |
|-----|---------------|-----------|---------------------|------------|------------------------------------|
| | | | Cable | Connector | |
| 1 | Signal cable | 2m | Shielded | Shielded | - |
| 2 | Signal cable | 2m | Shielded/Unshielded | Unshielded | - |
| 3 | Signal cable | 2m | Shielded/Unshielded | Unshielded | - |
| 4 | Signal cable | 2m | Shielded/Unshielded | Unshielded | - |
| 5 | Display cable | 1m | Shielded | Shielded | - |
| 6 | DC cable | 1m | Unshielded | Unshielded | - |
| 7 | Signal cable | 1m | Unshielded | Unshielded | - |
| 8 | GPS cable | 3m | Shielded | Shielded | - |
| 9 | Signal cable | 2m | Shielded | Shielded | - |
| 10 | Display cable | 2m | Unshielded | Unshielded | - |
| 11 | Signal cable | 2m | Shielded | Shielded | - |
| 12 | Signal cable | 2m | Shielded | Shielded | - |
| 13 | Signal cable | 2m | Shielded | Shielded | - |
| 14 | Coaxial cable | 0.18m | Shielded | Shielded | For conducted testing purpose only |

For more details, refer to section: Photographs of the Test Setup.

4.4 Test Software

The EUT was provided by the manufacturer with suitable software to allow operation in all the required modes.

Software used for testing: TBAW #12.9a by Mitsubishi Electric Corporation Sanda Works.

This firmware was running on the EUT. It was used to enable the operation modes (mode A to C) listed in section 4.2 as appropriate.

4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Product: Dummy Load
Manufacturer: Mitsubishi Electric Corporation Sanda Works
Rated Voltage: DC 12V
Serial Number: Unspecified
2. Product: Display
Manufacturer: LG
Model: 39710-TBAA-A11
Rated Voltage: DC 13.2V
Serial Number: 506VIBB000701
3. Product: Speaker × 2
Manufacturer: Tiaoping
Model: TP1371
Serial Number: Unspecified
4. Product: HD Video Caputure
Manufacturer: I-O DATA DEVICE, INC
Model: GV-HDREC
Rated Voltage: DC 5V
Input Current: 840mA
Protection Class: III
Serial Number: K4W10527455T

4.6 Countermeasures to achieve Compliance

No additional measures were employed to achieve compliance.

5. Test Results RADIO

5.1 Technical Requirements

5.1.1 Supply Voltage Requirements

RESULT:

PASS

Requirements:

FCC 15.31(e)

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.

Verdict:

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the supply voltage requirements.

5.1.2 Antenna Requirements

RESULT:

PASS

Requirements:

FCC 15.203

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.

Verdict:

The EUT has an internal antenna which is not user accessible. Hence it complies with the antenna requirements.

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5.1.3 Restricted Bands of Operation

RESULT:

PASS

Requirements:

FCC 15.205

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

The EUT operation frequency range is 2400-2483.5MHz. Therefore only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

5.2 Conducted Measurements at Antenna Port

5.2.1 Maximum Peak Output Power

RESULT:

PASS

Date of testing: 2021-01-21

Ambient temperature: 22°C

Relative humidity: 31%

Atmospheric pressure: 1019hPa

Requirements:

FCC 15.247(b)(3)

For systems using digital modulation in the 2400-2483.5MHz band, the maximum peak output power is 1W (30dBm).

If transmitting antennas of directional gain greater than 6dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Test procedure:

KDB Publication No. 558074 D01.

The maximum peak output power was measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth and the video bandwidth were set to 20MHz.

The readings of the measurements take into account the loss generated by all the involved cables.

The measurement was performed at all the available modulations (data rates) in order to identify the one producing the highest output power for each of the 802.11b, 802.11g and 802.11n (20HT) radios. The results given here below show that the worst case output power is found at the data rate of 11Mbps for the radio 802.11b, of 54Mbps for the radio 802.11g and of MCS7 for the radio 802.11n (20HT). Therefore, all the other measurements for the evaluation of the radio properties of the EUT have been performed using this data rates.

Maximum average output power was measured for reference. Method AVGSA-2 according to clause 11.9.2.2.4 of ANSI C63.10:2013 was applied.

Table 6: Maximum Peak Output Power, 802.11b

| Freq. [MHz] | Peak Output Power [dBm] | Limit [dBm] | Margin [dB] |
|-------------|-------------------------|-------------|-------------|
| 2412 | 13.85 | 30 | 16.15 |
| 2437 | 13.83 | 30 | 16.17 |
| 2462 | 13.80 | 30 | 16.20 |

Table 7: Maximum Peak Output Power, 802.11b, Mode B (2437MHz), all Data Rates

| Data Rate [Mbps] | Peak Output Power [dBm] | Remark |
|------------------|-------------------------|--------|
| 1 | 13.52 | |
| 2 | 13.54 | |
| 5.5 | 13.57 | |
| 11 | 13.83 | Worst |

Table 8: Maximum Peak Output Power, 802.11g

| Freq. [MHz] | Peak Output Power [dBm] | Limit [dBm] | Margin [dB] |
|-------------|-------------------------|-------------|-------------|
| 2412 | 18.92 | 30 | 11.08 |
| 2437 | 18.82 | 30 | 11.18 |
| 2462 | 18.86 | 30 | 11.14 |

Table 9: Maximum Peak Output Power, 802.11g, Mode B (2437MHz), all Data Rates

| Data Rate [Mbps] | Peak Output Power [dBm] | Remark |
|------------------|-------------------------|--------|
| 6 | 16.74 | |
| 9 | 16.82 | |
| 12 | 17.64 | |
| 18 | 17.03 | |
| 24 | 17.17 | |
| 36 | 18.74 | |
| 48 | 18.74 | |
| 54 | 18.82 | Worst |

Table 10: Maximum Peak Output Power, 802.11n (20HT)

| Freq. [MHz] | Peak Output Power [dBm] | Limit [dBm] | Margin [dB] |
|-------------|-------------------------|-------------|-------------|
| 2412 | 18.83 | 30 | 11.08 |
| 2437 | 18.89 | 30 | 11.18 |
| 2462 | 18.87 | 30 | 11.14 |

Table 11: Maximum Peak Output Power, 802.11n (20HT), Mode B (2437MHz), all Data Rates

| Data Rate [MCS] | Peak Output Power [dBm] | Remark |
|-----------------|-------------------------|--------|
| 0 | 16.70 | |
| 1 | 16.75 | |
| 2 | 16.92 | |
| 3 | 17.16 | |
| 4 | 18.61 | |
| 5 | 18.64 | |
| 6 | 16.77 | |
| 7 | 18.89 | Worst |

Table 12: Maximum Average Output Power, 802.11b (For Reference)

| Freq. [MHz] | Conducted Reading [dBm] | Duty Cycle Factor [dB] | Maximum Average Output Power [dBm] |
|-------------|-------------------------|------------------------|------------------------------------|
| 2412 | 10.10 | 0.28 | 10.38 |
| 2437 | 10.14 | 0.28 | 10.42 |
| 2462 | 10.12 | 0.28 | 10.40 |

Note: The duty cycle for the worst data rate (1Mbps) is 93.8%.
Duty cycle factor = $10 \times \log(1/\text{duty cycle})$

Table 13: Maximum Average Output Power, 802.11b, Mode B (2437MHz), all Data Rates

| Data Rate [Mbps] | Conducted Reading [dBm] | Remark |
|------------------|-------------------------|--------|
| 1 | 10.14 | Worst |
| 2 | 9.79 | |
| 5.5 | 8.42 | |
| 11 | 7.13 | |

Table 14: Maximum Average Output Power, 802.11g (For Reference)

| Freq. [MHz] | Conducted Reading [dBm] | Duty Cycle Factor [dB] | Maximum Average Output Power [dBm] |
|-------------|-------------------------|------------------------|------------------------------------|
| 2412 | 6.09 | 1.50 | 7.59 |
| 2437 | 6.20 | 1.50 | 7.70 |
| 2462 | 6.05 | 1.50 | 7.55 |

Note: The duty cycle for the worst data rate (6Mbps) is 70.8%.
 Duty cycle factor = 10 x log (1/duty cycle)

Table 15: Maximum Average Output Power, 802.11g, Mode B (2437MHz), all Data Rates

| Data Rate [Mbps] | Conducted Reading [dBm] | Remark |
|------------------|-------------------------|--------|
| 6 | 6.2 | Worst |
| 9 | 5.13 | |
| 12 | 4.34 | |
| 18 | 2.91 | |
| 24 | 1.15 | |
| 36 | -0.68 | |
| 48 | -2.01 | |
| 54 | -2.9 | |

Table 16: Maximum Average Output Power, 802.11n (20HT) (For Reference)

| Freq. [MHz] | Conducted Reading [dBm] | Duty Cycle Factor [dB] | Maximum Average Output Power [dBm] |
|-------------|-------------------------|------------------------|------------------------------------|
| 2412 | 6.02 | 1.59 | 7.61 |
| 2437 | 5.83 | 1.59 | 7.42 |
| 2462 | 6.08 | 1.59 | 7.67 |

Note: The duty cycle for the worst data rate (MCS0) is 69.4%.
 Duty cycle factor = 10 x log (1/duty cycle)

Table 17: Maximum Average Output Power, 802.11n (20HT), Mode B (2437MHz), all Data Rates

| Data Rate [MCS] | Conducted Reading [dBm] | Remark |
|-----------------|-------------------------|--------|
| 0 | 5.83 | Worst |
| 1 | 4.32 | |
| 2 | 2.74 | |
| 3 | 16.7 | |
| 4 | -0.26 | |
| 5 | -1.51 | |
| 6 | -2.02 | |
| 7 | -2.4 | |

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5.2.2 6dB Bandwidth

RESULT:

PASS

Date of testing: 2021-01-21, 2021-01-22

Ambient temperature: 22, 22°C
Relative humidity: 31, 39%
Atmospheric pressure: 1019, 1014hPa

Requirements:

FCC 15.215(c), 15.247(a)(2)

For systems using digital modulation in the 2400-2483.5MHz band, the 6dB bandwidth shall be at least 500kHz. Additionally, for FCC, the 6dB bandwidth shall be contained within the frequency band designated in the rule section under which the equipment is operated.

Test procedure:

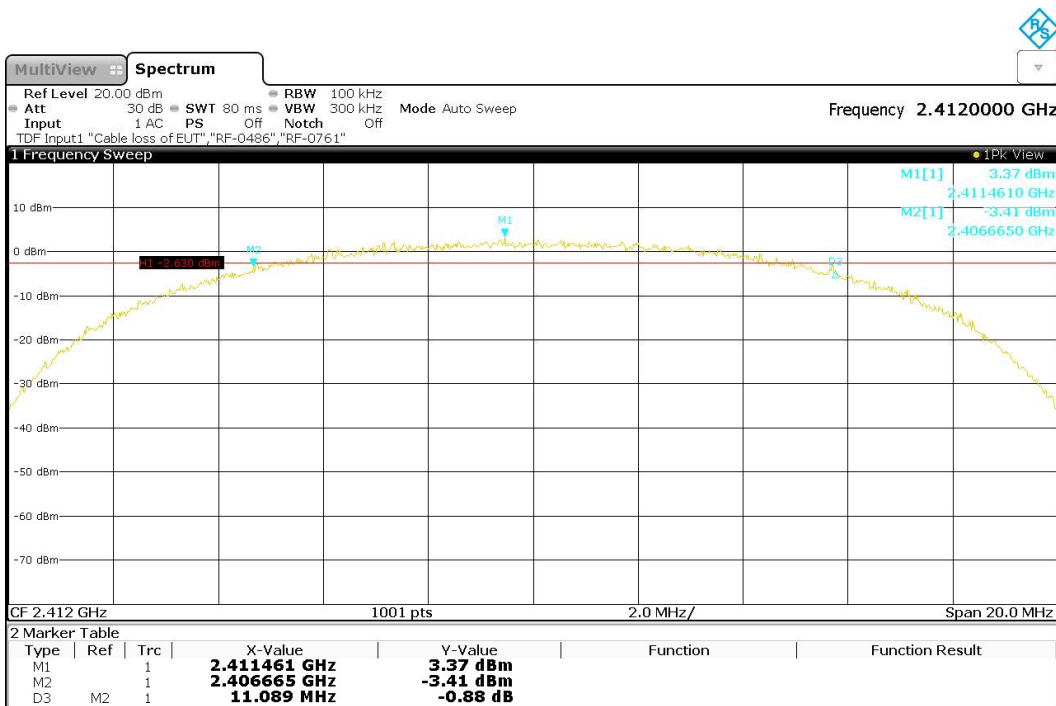
KDB Publication No. 558074 D01.

The 6dB bandwidth was measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth was set to 100kHz and the video bandwidth to 300kHz. Markers placed at the lowest and highest intersections of the trace with a 6dBc line were used to calculate the emission bandwidth.

Table 18: 6dB Bandwidth, 802.11b

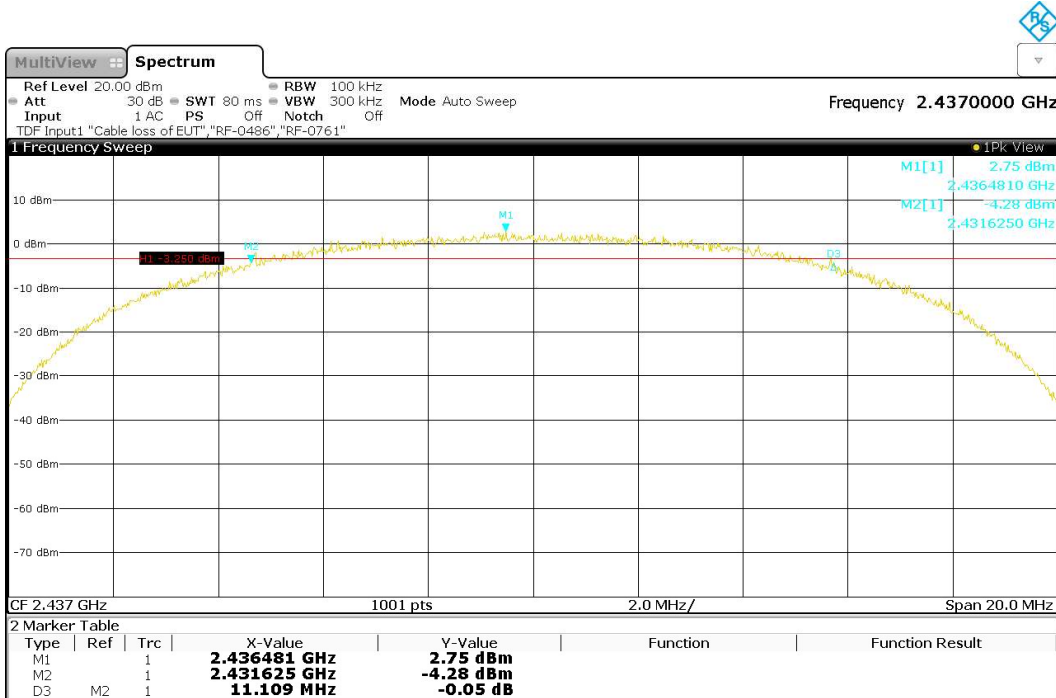
| Operating Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [MHz] |
|---------------------------|---------------------|-------------|
| 2412 | 11.089 | >0.5 |
| 2437 | 11.109 | >0.5 |
| 2462 | 11.689 | >0.5 |

Figure 3: 6dB Bandwidth, 802.11b, Mode A (2412MHz)



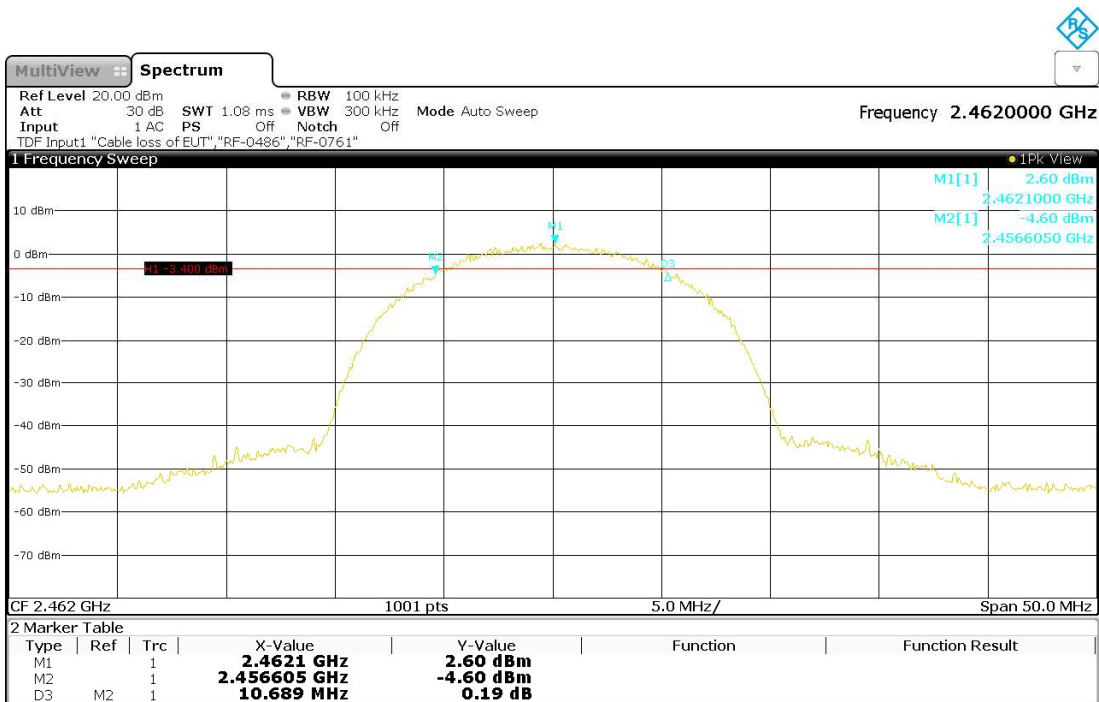
17:17:05 21.01.2021

Figure 4: 6dB Bandwidth, 802.11b, Mode B (2437MHz)



17:48:30 21.01.2021

Figure 5: 6dB Bandwidth, 802.11b, Mode C (2462MHz)

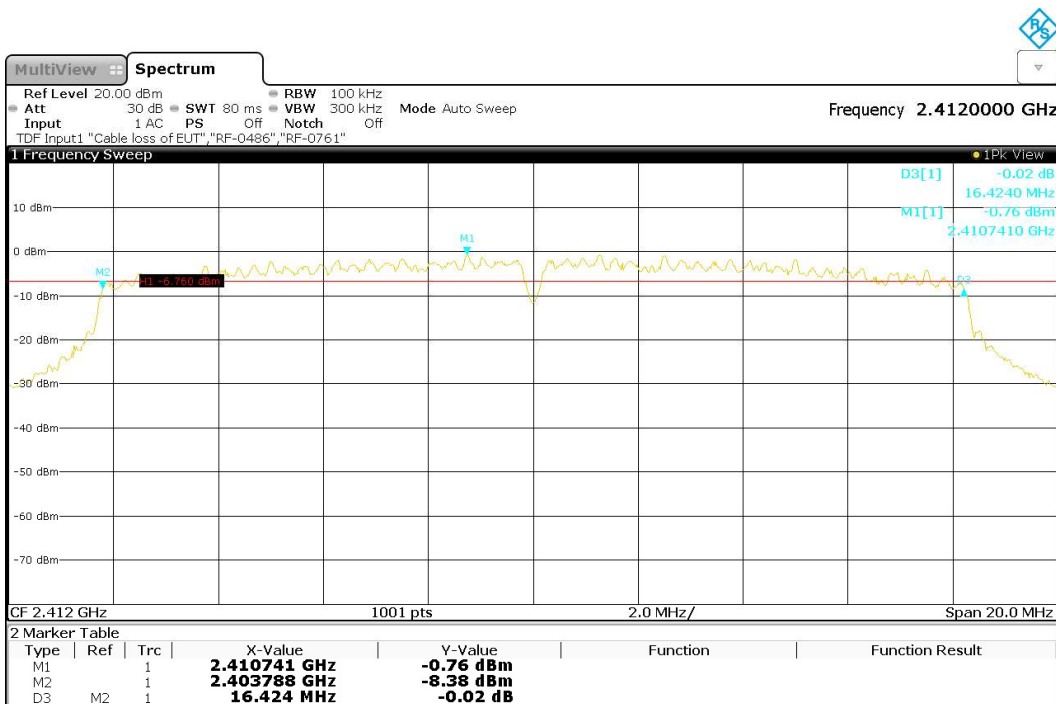


09:55:41 22.01.2021

Table 19: 6dB Bandwidth, 802.11g

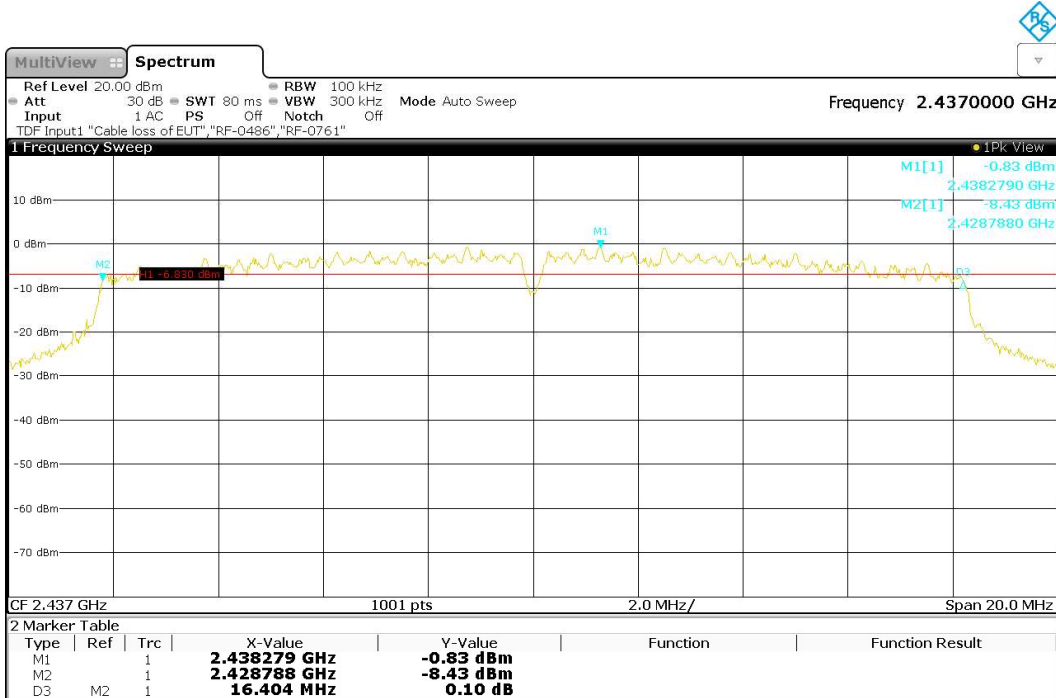
| Operating Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [MHz] |
|---------------------------|---------------------|-------------|
| 2412 | 16.424 | >0.5 |
| 2437 | 16.404 | >0.5 |
| 2462 | 16.434 | >0.5 |

Figure 6: 6dB Bandwidth, 802.11g, Mode A (2412MHz)



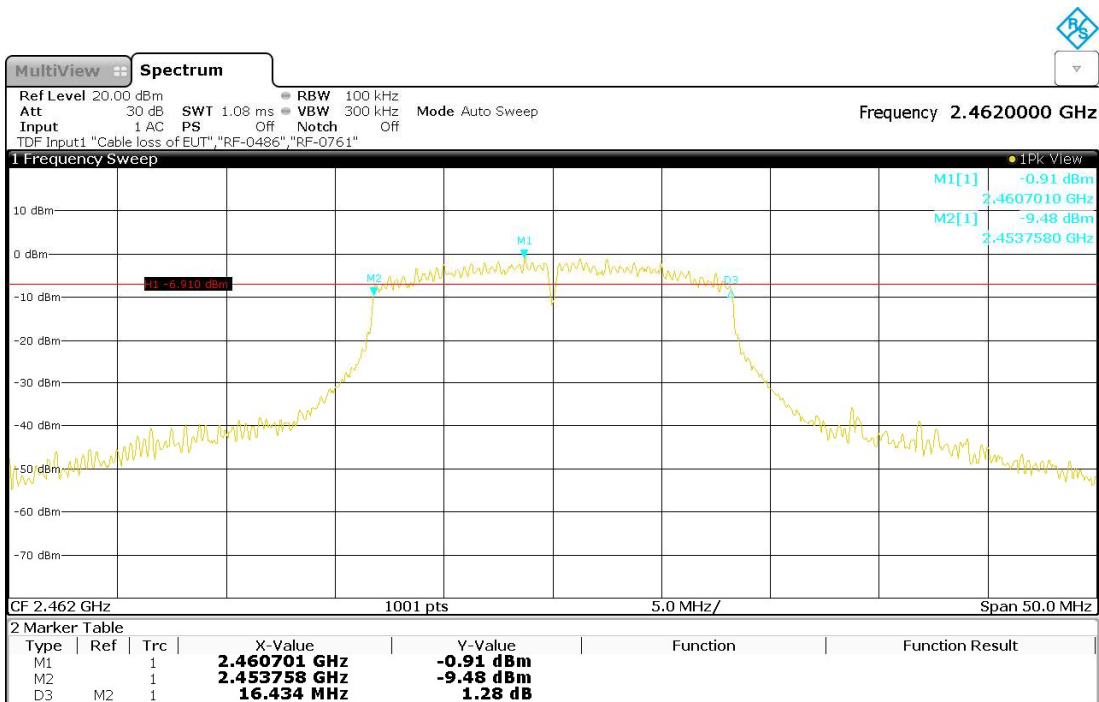
17:24:04 21.01.2021

Figure 7: 6dB Bandwidth, 802.11g, Mode B (2437MHz)



17:45:19 21.01.2021

Figure 8: 6dB Bandwidth, 802.11g, Mode C (2462MHz)

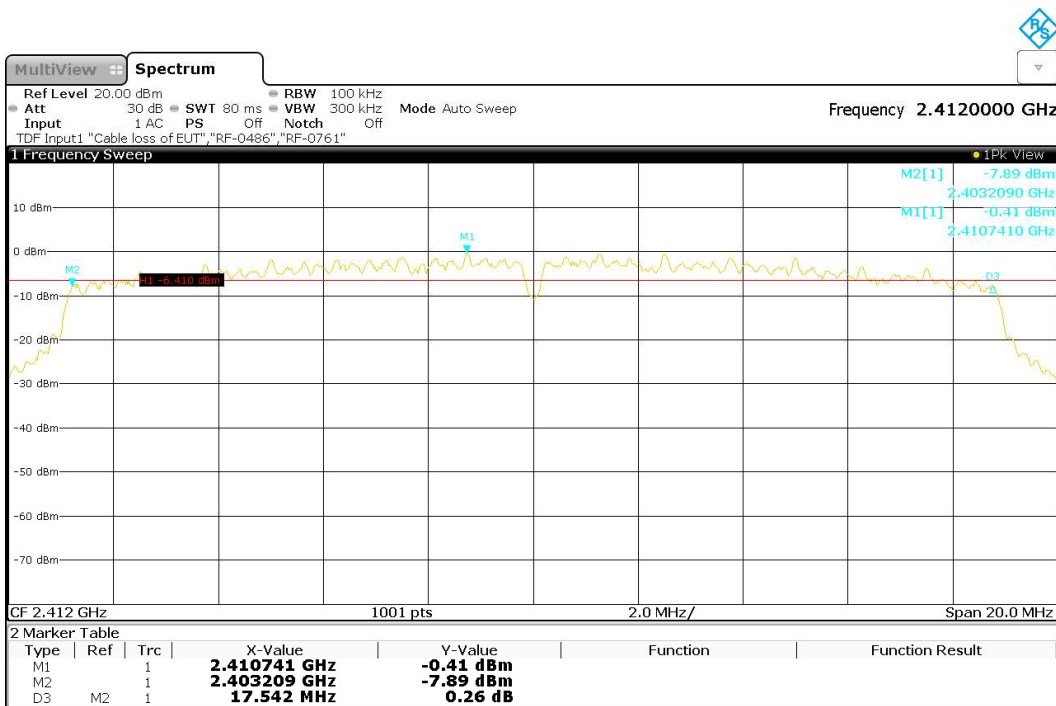


09:59:00 22.01.2021

Table 20: 6dB Bandwidth, 802.11n (20HT)

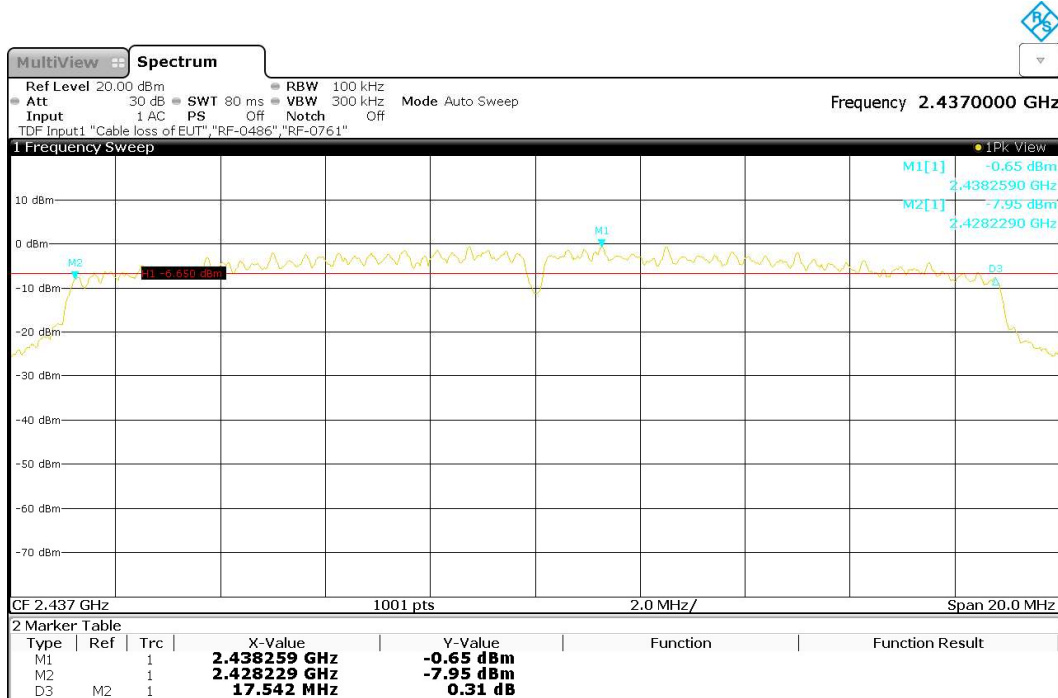
| Operating Frequency [MHz] | 6dB Bandwidth [MHz] | Limit [MHz] |
|---------------------------|---------------------|-------------|
| 2412 | 17.542 | >0.5 |
| 2437 | 17.542 | >0.5 |
| 2462 | 17.582 | >0.5 |

Figure 9: 6dB Bandwidth, 802.11n (20HT), Mode A (2412MHz)



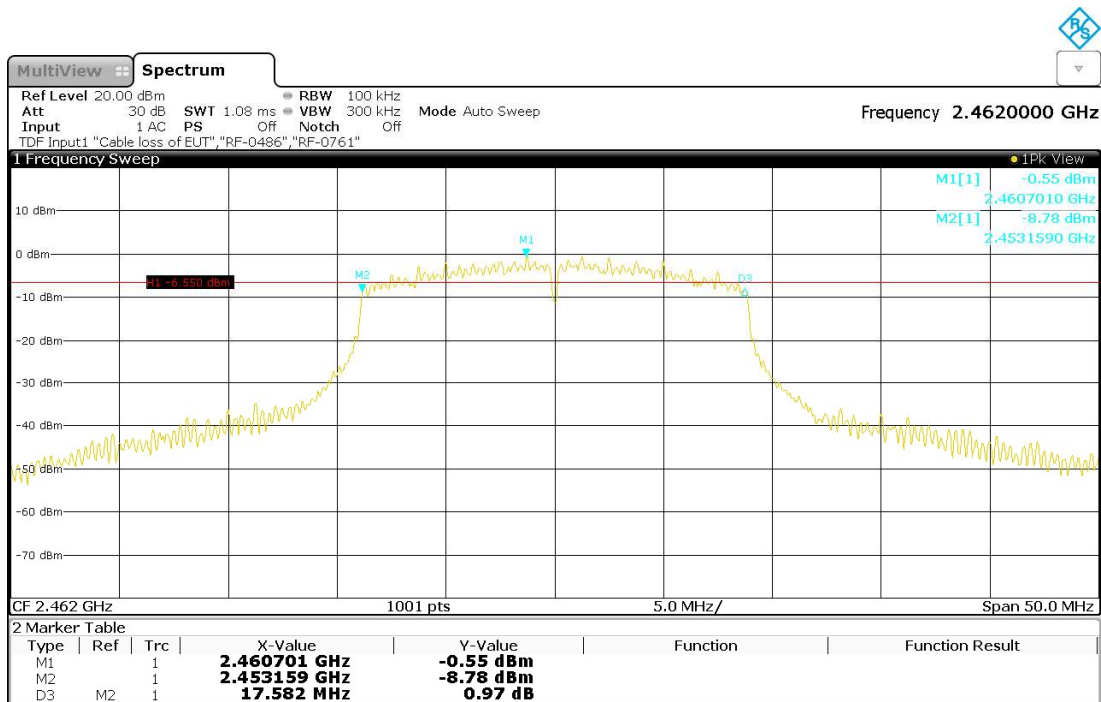
17:29:44 21.01.2021

Figure 10: 6dB Bandwidth, 802.11n (20HT), Mode B (2437MHz)



17:42:45 21.01.2021

Figure 11: 6dB Bandwidth, 802.11n (20HT), Mode C (2462MHz)



10:02:08 22.01.2021

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5.2.3 99% Bandwidth

RESULT:

PERFORMED

Date of testing: 2021-01-21

Ambient temperature: 22°C

Relative humidity: 31%

Atmospheric pressure: 1019hPa

Test procedure:

ANSI C63.10 §6.9.3

The 99% bandwidth was measured at the antenna port with a spectrum analyzer using a peak detector with the following settings: RBW = 300kHz, VBW = 1MHz. The value of the emission bandwidth was obtained by using the OBW function of the analyzer with a 99% coverage setting.

Table 21: 99% Bandwidth, 802.11b

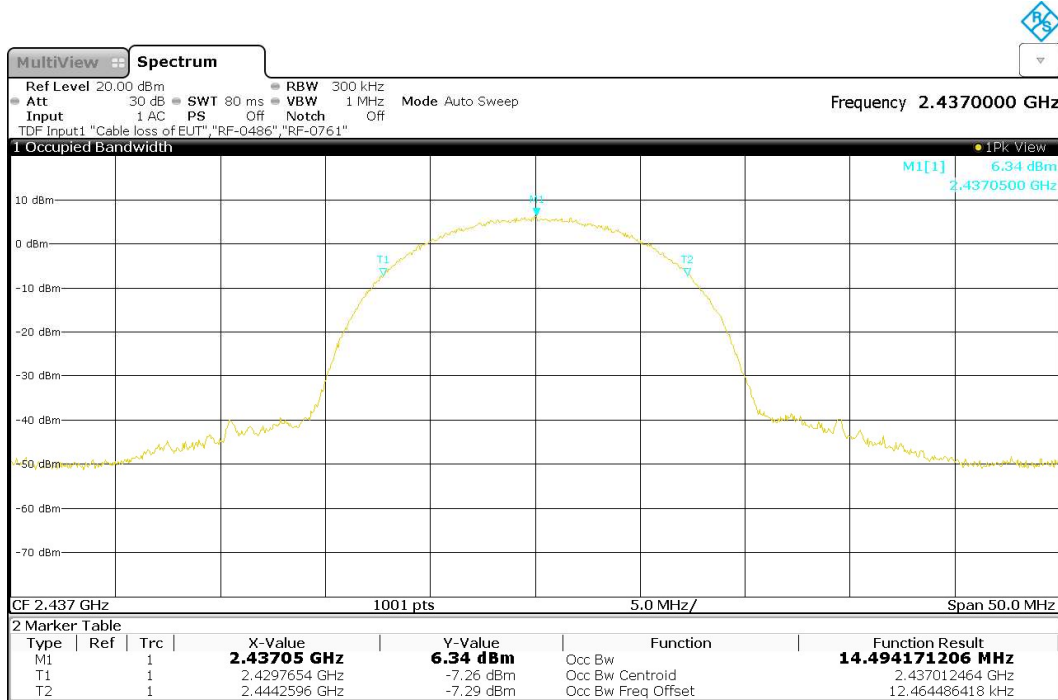
| Operating Frequency [MHz] | 99% Bandwidth [MHz] |
|---------------------------|---------------------|
| 2412 | 14.487 |
| 2437 | 14.494 |
| 2462 | 14.470 |

Figure 12: 99% Bandwidth, 802.11b, Mode A (2412MHz)



16:54:47 21.01.2021

Figure 13: 99% Bandwidth, 802.11b, Mode B (2437MHz)



16:42:25 21.01.2021

Figure 14: 99% Bandwidth, 802.11b, Mode C (2462MHz)

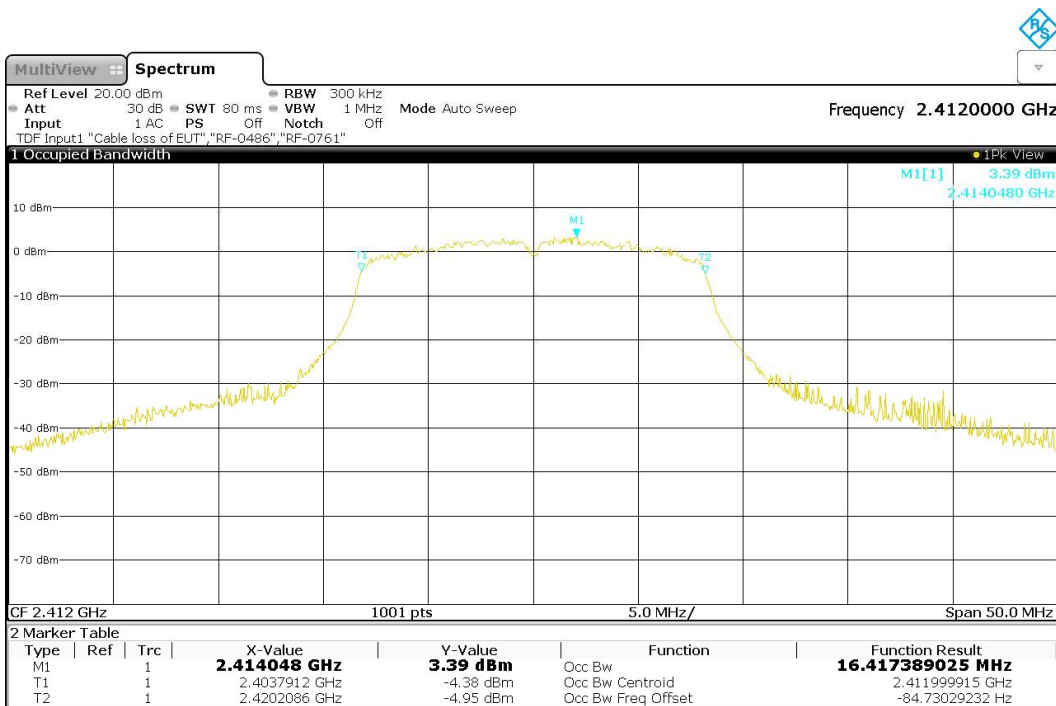


16:33:49 21.01.2021

Table 22: 99% Bandwidth, 802.11g

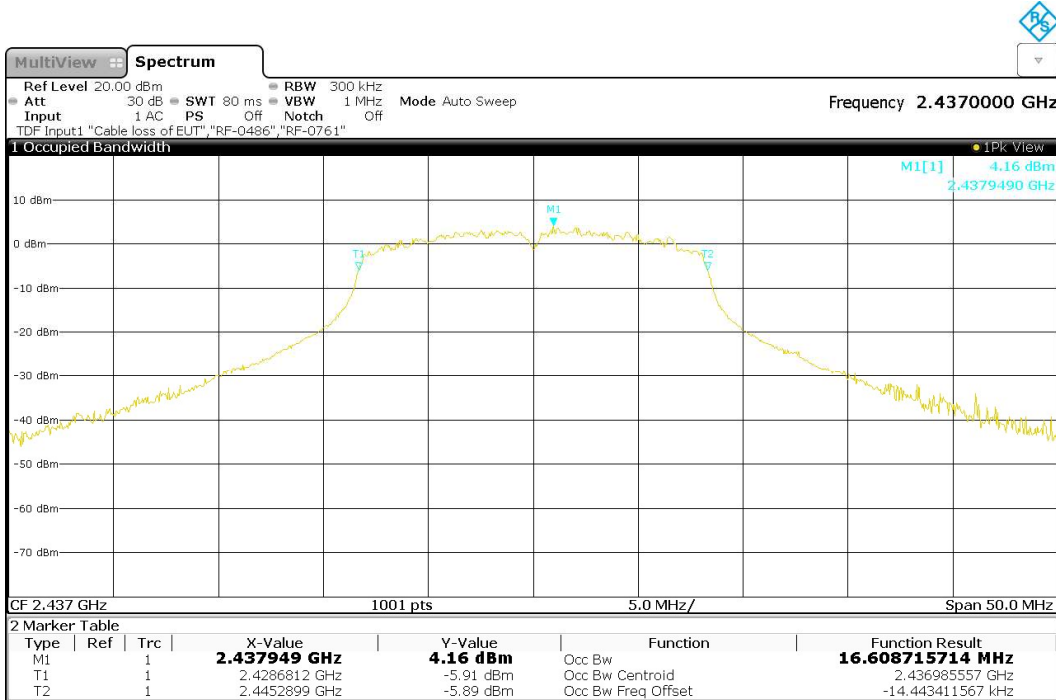
| Operating Frequency [MHz] | 99% Bandwidth [MHz] |
|---------------------------|---------------------|
| 2412 | 16.417 |
| 2437 | 16.609 |
| 2462 | 16.424 |

Figure 15: 99% Bandwidth, 802.11g, Mode A (2412MHz)



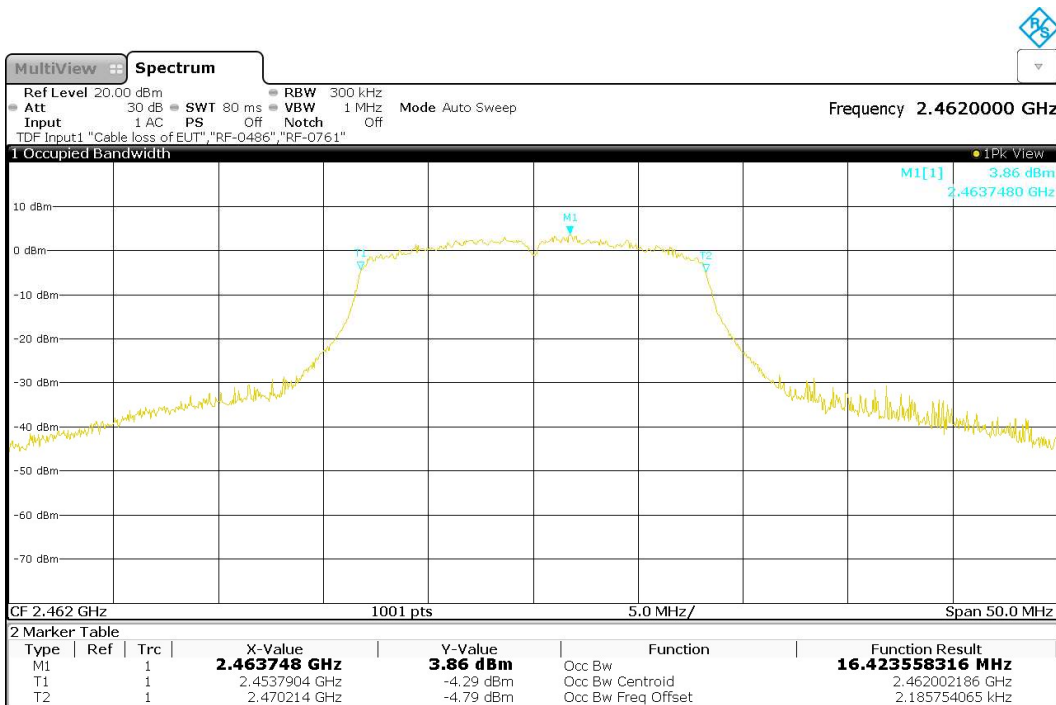
16:52:45 21.01.2021

Figure 16: 99% Bandwidth, 802.11g, Mode B (2437MHz)



16:44:29 21.01.2021

Figure 17: 99% Bandwidth, 802.11g, Mode C (2462MHz)

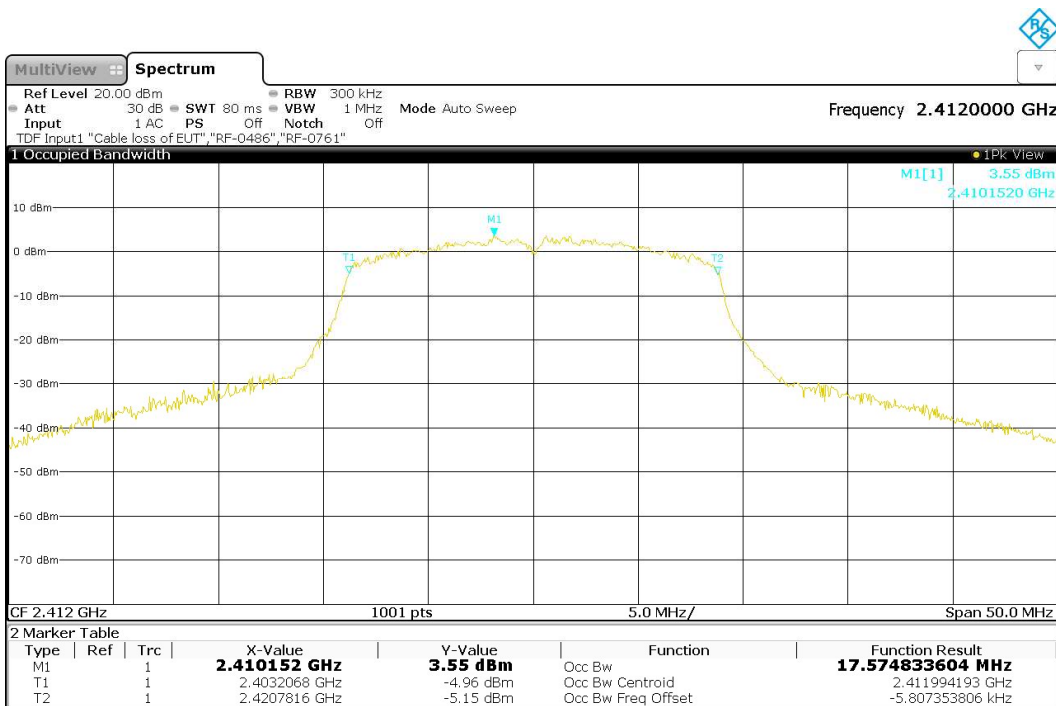


16:36:42 21.01.2021

Table 23: 99% Bandwidth, 802.11n (20HT)

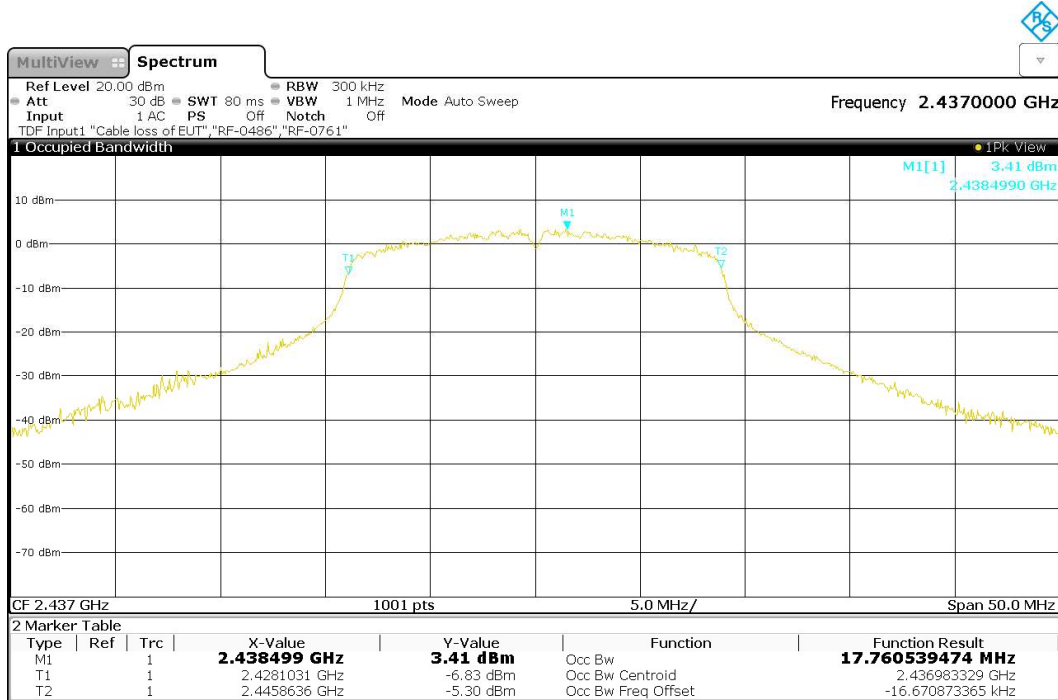
| Operating Frequency [MHz] | 99% Bandwidth [MHz] |
|---------------------------|---------------------|
| 2412 | 17.575 |
| 2437 | 17.761 |
| 2462 | 17.570 |

Figure 18: 99% Bandwidth, 802.11n (20HT), Mode A (2412MHz)



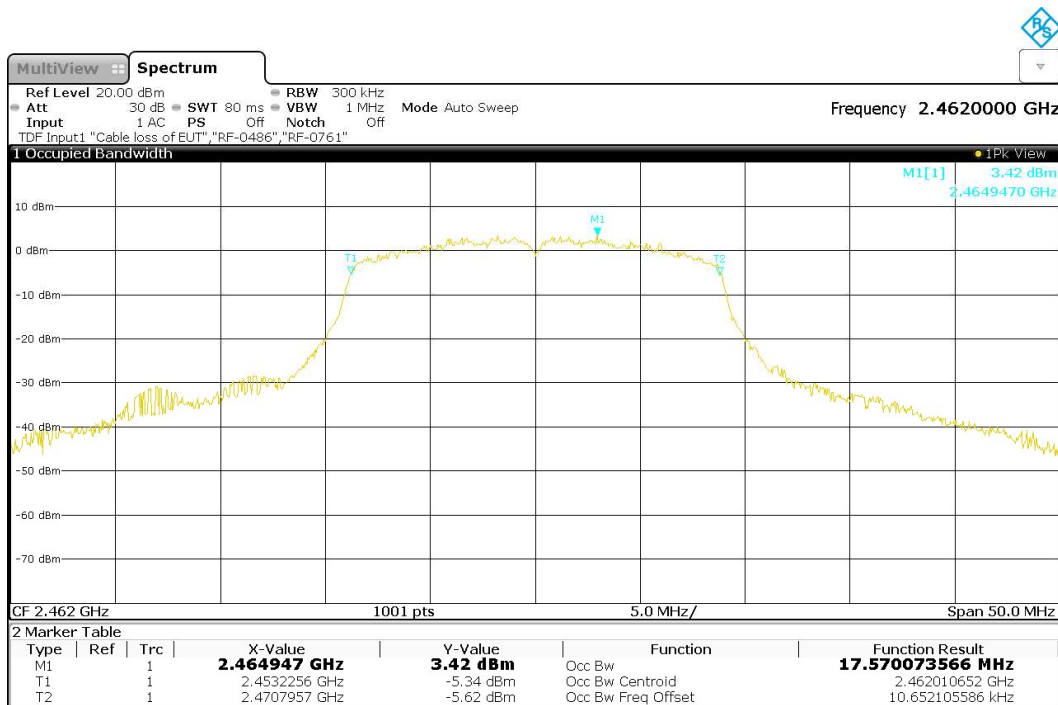
16:50:22 21.01.2021

Figure 19: 99% Bandwidth, 802.11n (20HT), Mode B (2437MHz)



16:46:39 21.01.2021

Figure 20: 99% Bandwidth, 802.11n (20HT), Mode C (2462MHz)



16:40:29 21.01.2021