



Test report No. : 4790441603-US-R0-V0
Page : 1 of 72
Issued date : 2022/8/22
FCC ID : 2A8EI-SEC01

RADIO TEST REPORT

Product : ParSEC (Parallel Shelf Edge Camera)
Model Name : SEC01DL
FCC ID : 2A8EI-SEC01
Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date : 2022/6/17
Test Date : 2022/06/17 ~ 2022/06/24
Issued Date : 2022/8/22

Applicant : Target Corporation
1000 Nicollet Mall, TPN-0715 Minneapolis Minnesota 55403
United States

Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd.,
Zhudong Township, Hsinchu County, Taiwan



The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

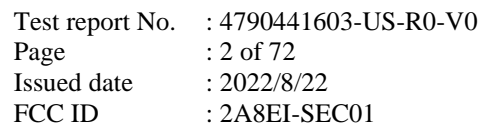
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Original Test Report No.: 4790441603-US-R0-V0

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Table of Contents

| | |
|--|-----------|
| 1. Attestation of Test Results | 4 |
| 2. Summary of Test Results | 5 |
| 3. Test Methodology and Reference Procedures..... | 6 |
| 4. Facilities and Accreditation | 6 |
| 5. Measurement Uncertainty | 7 |
| 6. Equipment under Test | 8 |
| 6.1. Description of EUT | 8 |
| 6.2. Channel List | 10 |
| 6.3. Test Condition | 11 |
| 6.4. Description of Available Antennas | 11 |
| 6.5. Test Mode Applicability and Tested Channel Detail | 12 |
| 6.6. Duty cycle | 13 |
| 7. Test Equipment | 14 |
| 8. Description of Test Setup | 15 |
| 9. Test Results | 16 |
| 9.1. 6dB Bandwidth | 16 |
| 9.2. Conducted Output Power | 21 |
| 9.3. Power Spectral Density | 24 |
| 9.4. Conducted Out of Band Emission | 29 |
| 9.5. Radiated Spurious Emission | 42 |



Test report No. : 4790441603-US-R0-V0
Page : 4 of 72
Issued date : 2022/8/22
FCC ID : 2A8EI-SEC01

1. Attestation of Test Results

APPLICANT: Target Corporation
1000 Nicollet Mall, TPN-0715 Minneapolis Minnesota 55403 United States

MANUFACTURER: Target Corporation
1000 Nicollet Mall, TPN-0715 Minneapolis Minnesota 55403 United States

EUT DESCRIPTION: ParSEC (Parallel Shelf Edge Camera)

BRAND: TARGET

MODEL: SEC01DL

SAMPLE STAGE: Pilot-run Verification Test sample

DATE of TESTED: 2022/06/17 ~ 2022/06/24

| APPLICABLE STANDARDS | |
|---|--------------|
| STANDARD | Test Results |
| FCC 47 CFR PART 15 Subpart C (Section 15.247) | PASS |

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Sally Lu
Project Handler

Date : 2022/8/22

Approved and Authorized By:

Eric Lee
Senior Laboratory Engineer

Date : 2022/8/22

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



2. Summary of Test Results

| Summary of Test Results | | |
|--------------------------------|---|--------|
| FCC Clause | Test Items | Result |
| 15.247(a)(2) | 6dB Bandwidth | PASS |
| 15.247(b) | Conducted Output Power | PASS |
| 15.247(e) | Power Spectral Density | PASS |
| 15.247(d) | Antenna Port Emission | PASS |
| 15.205 / 15.209 / 15.247(d) | Radiated Emissions and Band Edge Measurement | PASS |
| 15.207 | AC Power Conducted Emission | NA |
| 15.203 | Antenna Requirement | PASS |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB558074 D01 Meas Guidance v05r02, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

| | |
|----------------------------------|---|
| Test Location | Underwriters Laboratories Taiwan Co., Ltd. |
| Address | Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan |
| Accreditation Certificate | Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

| Measurement | Frequency | Uncertainty |
|--|----------------|--------------|
| Conducted disturbance at mains terminals ports | 150kHz ~ 30MHz | ± 2.9 dB |
| RF Conducted | 9 kHz - 40GHz | ± 2.4 dB |
| Radiated disturbance below 30MHz | 9 kHz - 30 MHz | ± 1.9 dB |
| Radiated disturbance below 1 GHz | 30MHz ~ 1GHz | ± 5.8 dB |
| Radiated disturbance above 1 GHz | 1GHz ~ 40GHz | ± 4.8 dB |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



6. Equipment under Test

6.1. Description of EUT

| | |
|-----------------------------|--|
| Product | ParSEC (Parallel Shelf Edge Camera) |
| Brand Name | TARGET |
| Model Name | SEC01DL |
| Operating Frequency | 2412MHz ~ 2462MHz |
| Modulation | CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM |
| Transfer Rate | 802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to MCS7 |
| Number of Channel | 11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40) |
| Maximum Output Power | 802.11b: 16.77 dBm 802.11g: 17.64 dBm 802.11n (HT20): 18.04 dBm 802.11n (HT40): 17.47 dBm |
| Nominal Voltage | 4.5Vdc from battery |
| S/N | Conducted Test: SEC01DL21110013 Radiated Test: SEC01DL21110015 |
| Sample ID | Conducted Test: 5068948 Radiated Test: 5068950 |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Note:

1. The product has two enclosure types (MK1 & MK2) - both are specified with same model number. The difference is only enclosure and the change in enclosure is for appearance purpose.
2. The EUT incorporates a SISO function. Physically, the EUT provides one completed transmitter and one receiver.

| Modulation Mode | Tx,Rx Function |
|-----------------|----------------|
| 802.11b | 1TX,1RX |
| 802.11g | 1TX,1RX |
| 802.11n (HT20) | 1TX,1RX |
| 802.11n (HT40) | 1TX,1RX |

3. The EUT could be supplied with rechargeable battery as the following table:

| Brand Name | Model | Description |
|------------|-------|------------------|
| Energizer | L91 | 1.5Vdc, 3500 mAh |

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



6.2. Channel List

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 1 | 2412 | 7 | 2442 |
| 2 | 2417 | 8 | 2447 |
| 3 | 2422 | 9 | 2452 |
| 4 | 2427 | 10 | 2457 |
| 5 | 2432 | 11 | 2462 |
| 6 | 2437 | - | - |

7 channels are provided for 802.11n (HT40):

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 3 | 2422 | 7 | 2442 |
| 4 | 2427 | 8 | 2447 |
| 5 | 2432 | 9 | 2452 |
| 6 | 2437 | - | - |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



6.3. Test Condition

| Test Item | Test Site No. | Environmental Condition | Input Power | Test Date | Tested by |
|------------------------------------|---------------|-------------------------|-------------|---------------------------|--------------|
| Antenna Port Conducted Measurement | SR4 | 23~25°C/ 60~65%RH | 4.5Vdc | 2022/06/17~ 2022/06/24 | Patrick Kuan |
| Radiated Spurious Emission | 966-2 | 23~25°C/ 60~65%RH | 4.5Vdc | 2022/06/17~ 2022/06/24 | Patrick Kuan |

FCC Test Firm Registration Number: 498077

6.4. Description of Available Antennas

| Ant. No. | Transmitter Circuit | Brand Name | Ant. Type | Maximum Gain (dBi) |
|----------|---------------------|------------|-----------|--------------------|
| 1 | Chain (0) | Espressif | PCB | 3.42 |

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



6.5. Test Mode Applicability and Tested Channel Detail

- The EUT power source type: 4.5Vdc from battery. Therefore only the test data of the 4.5Vdc was recorded in this report.
- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Z plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Z plane.
- For Antenna Port Conducted Measurement, it includes all test results for each mode.
- For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.
- Since the EUT has been evaluated low, middle, and high channels for radiated emission of above 1GHz. Based on this condition, we only choose the worst mode to test radiated emission of below 1GHz.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

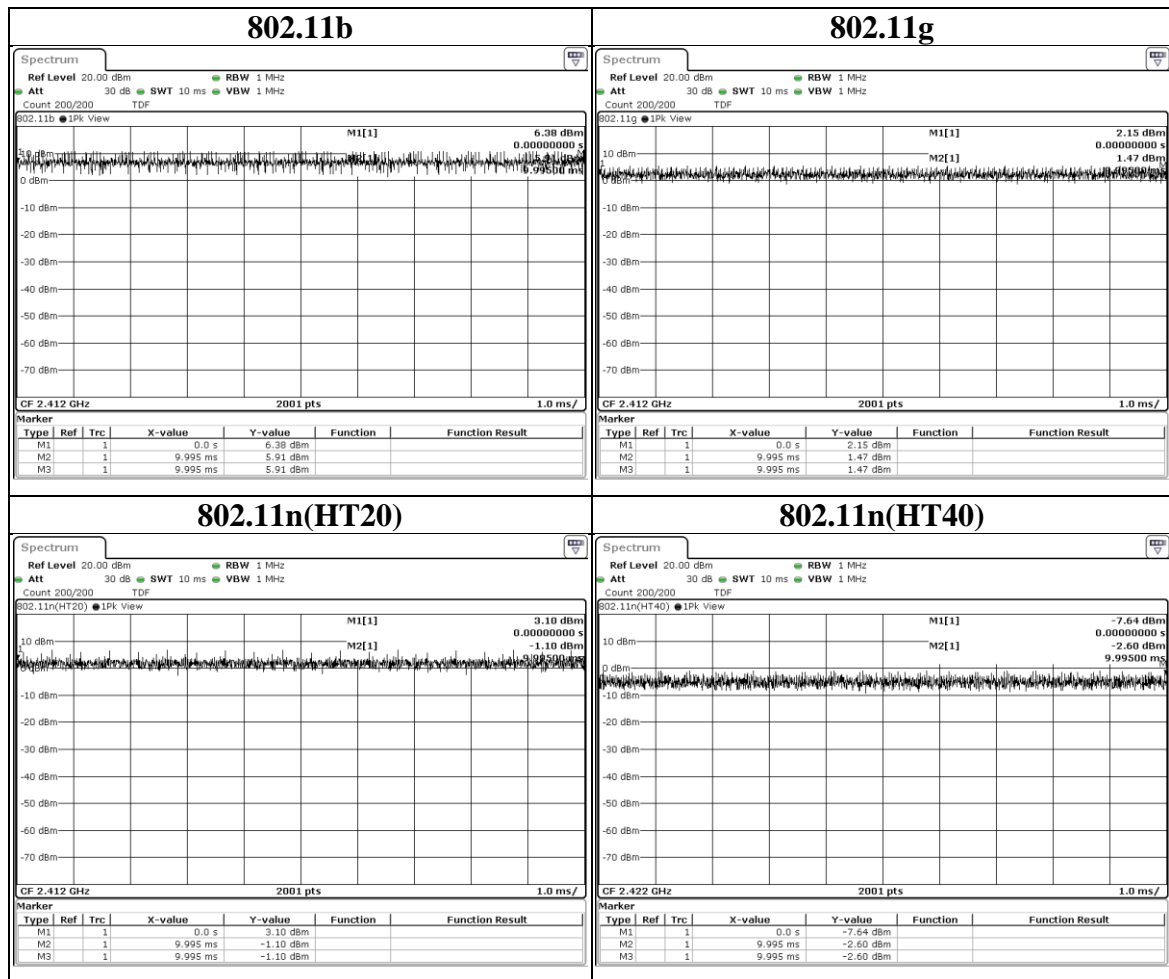
| Test Item | Mode | Modulation Technology | Modulation Type | Available Channel | Test Channel | Data Rate |
|-------------------------------------|-----------|-----------------------|-----------------|-------------------|--------------|-----------|
| Radiated Emissions (Above 1GHz) | 802.11b | DSSS | DBPSK | 1 to 11 | 1,6,11 | 1 Mbps |
| | 802.11g | OFDM | BPSK | 1 to 11 | 1,6,11 | 6 Mbps |
| | 802.11n20 | OFDM | BPSK | 1 to 11 | 1,6,11 | MCS0 |
| | 802.11n40 | OFDM | BPSK | 3 to 9 | 3,6,9 | MCS0 |
| Radiated Emissions (Below 1GHz) | 802.11n20 | OFDM | BPSK | 1 to 11 | 1 | MCS0 |
| *Antenna Port Conducted Measurement | 802.11b | DSSS | DBPSK | 1 to 11 | 1,6,11 | 1 Mbps |
| | 802.11g | OFDM | BPSK | 1 to 11 | 1,6,11 | 6 Mbps |
| | 802.11n20 | OFDM | BPSK | 1 to 11 | 1,6,11 | MCS0 |
| | 802.11n40 | OFDM | BPSK | 3 to 9 | 3,6,9 | MCS0 |

*Note: For Antenna Port Conducted Measurement item, Inner channels only test Power and Conducted Out of Band Emission.



6.6. Duty cycle

| Mode | On Time (ms) | On+Off Time (ms) | Duty Cycle | Duty Factor (dB) | VBW Set (above 1GHz) |
|---------------|--------------|------------------|------------|------------------|----------------------|
| 802.11b | 9.995 | 9.995 | 1.0000 | N/A | 10Hz |
| 802.11g | 9.995 | 9.995 | 1.0000 | N/A | 10Hz |
| 802.11n(HT20) | 9.995 | 9.995 | 1.0000 | N/A | 10Hz |
| 802.11n(HT40) | 9.995 | 9.995 | 1.0000 | N/A | 10Hz |





7. Test Equipment

| Test Equipment List | | | | | |
|--|--------------------|-------------------------|---------------------|------------|--------------|
| Equipment | Manufacturer | Model No. | Serial No. | Cal. Date | Expired date |
| Radiated Spurious Emission | | | | | |
| Spectrum Analyzer | Keysight | N9010A | MY56070827 | 2021/11/9 | 2022/11/8 |
| EMI Test Receiver | Rohde & Schwarz | ESR7 | 101754 | 2021/12/10 | 2022/12/9 |
| Loop Antenna | ETS lindgren | 6502 | 00213440 | 2021/12/23 | 2022/12/22 |
| Trilog-Broadband Antenna with 5dB Attenuator | Schwarzbeck & EMCI | VULB 9168 & N-6-05 | 774 & AT-N0538 | 2022/2/8 | 2023/2/7 |
| Horn Antenna (1-18 GHz) | Schwarzbeck | BBHA 9120 D | 01690 | 2021/12/13 | 2022/12/12 |
| Horn Antenna (18-40 GHz) | Schwarzbeck | BBHA 9170 | 781 | 2021/12/17 | 2022/12/16 |
| Preamplifier (30-1000 MHz) | EMCI | EMC330E | 980405 | 2022/6/7 | 2023/6/6 |
| Preamplifier (1-18 GHz) | EMCI | EMC051835BE | 980406 | 2022/2/16 | 2023/2/15 |
| Preamplifier (18-40GHz) | EMCI | EMC184040SEE | 980426 | 2022/5/17 | 2023/5/16 |
| Cables | Hanyitek | K1K50-UP0264-K1K50-2500 | 170214-4 & 170425-2 | 2021/12/3 | 2022/12/2 |
| Cables | Hanyitek | K1K50-UP0264-K1K50-2500 | 170214-1 & 170214-2 | 2021/12/3 | 2022/12/2 |
| Antenna Port Conducted Measurement | | | | | |
| Spectrum Analyzer | Keysight | N9010A | MY56070834 | 2021/10/29 | 2022/10/28 |
| Pulse Power Sensor | Anritsu | MA2411B | 1531202 | 2021/12/22 | 2022/12/21 |
| Power Meter | Anritsu | ML2495A | 1645002 | 2021/12/22 | 2022/12/21 |

| UL Software | | |
|-----------------------|------------------------|---------------|
| Description | Name | Version |
| Radiated measurement | e3 | 6.191211 (V6) |
| Conducted measurement | RF-Conducted-FCC 15247 | ver 1.0 |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



8. Description of Test Setup

Support Equipment

| ID | Equipment | Brand Name | Model Name | S/N | Remark |
|----|--------------------|------------|------------|----------|-------------------|
| A | USB to UART Dongle | N/A | N/A | N/A | Provide by Client |
| B | Laptop | Lenovo | T460 | PC0FWU5Y | Provide by lab |

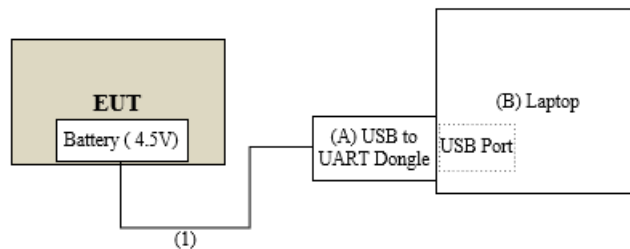
I/O Cable

| ID | Equipment | Brand Name | Model Name | Length (m) | Remark |
|----|--------------|------------|------------|------------|-------------------|
| 1 | Dupont Cable | N/A | N/A | 0.2 | Provide by Client |

Test Setup

Controlled using a bespoke application (EspRFTTestTool_v2.8) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



Under Table

Remote Site

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



9. Test Results

9.1. 6dB Bandwidth

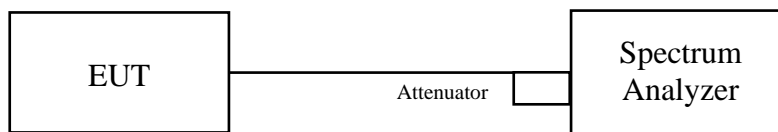
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

- Set resolution bandwidth (RBW) = 100kHz.
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

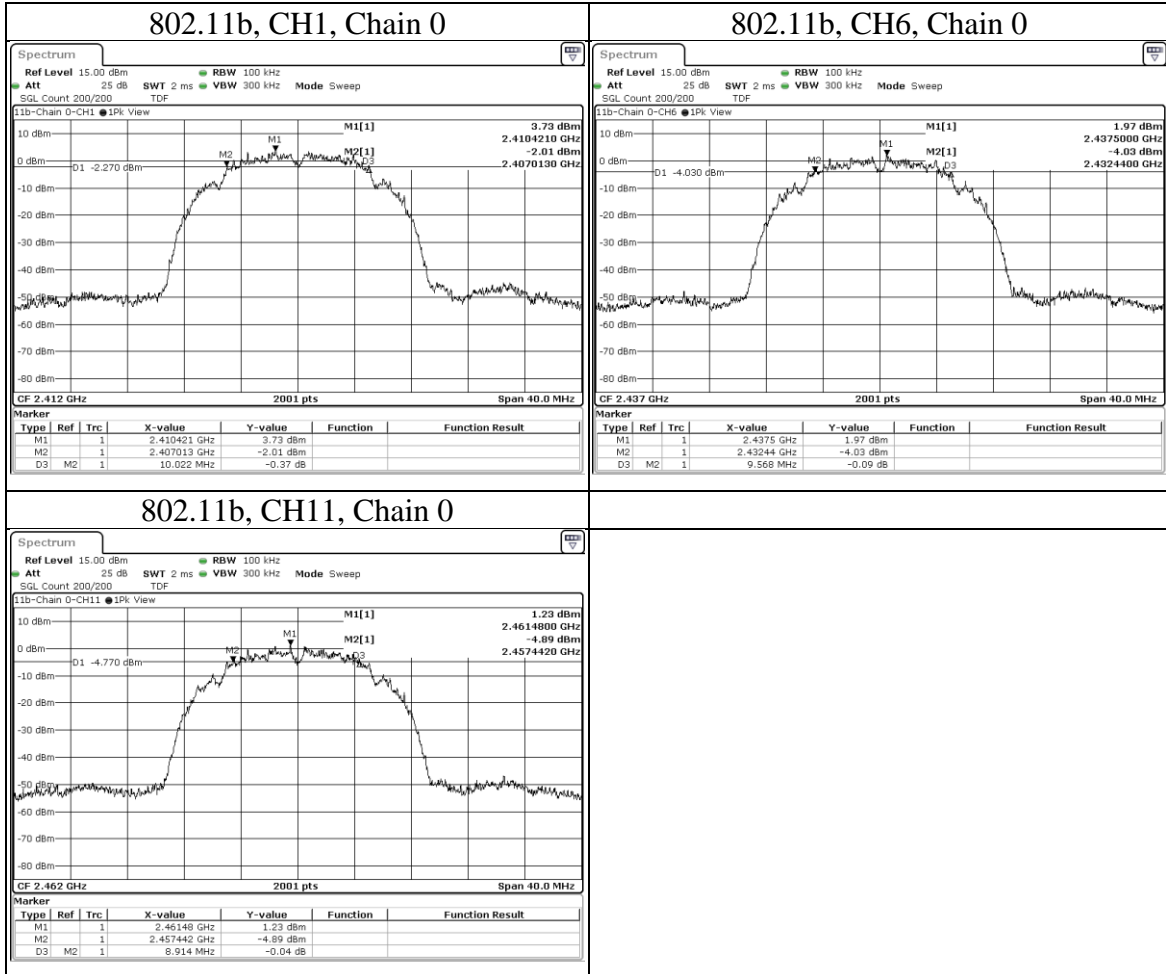
Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Test Data

| Mode | CH | Freq (MHz) | 6dB BW (MHz) | Limit (MHz) | Result |
|---------|----|------------|--------------|-------------|--------|
| | | | Chain 0 | | |
| 802.11b | 1 | 2412 | 10.022 | 0.5 | Pass |
| | 6 | 2437 | 9.568 | 0.5 | Pass |
| | 11 | 2462 | 8.914 | 0.5 | Pass |



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

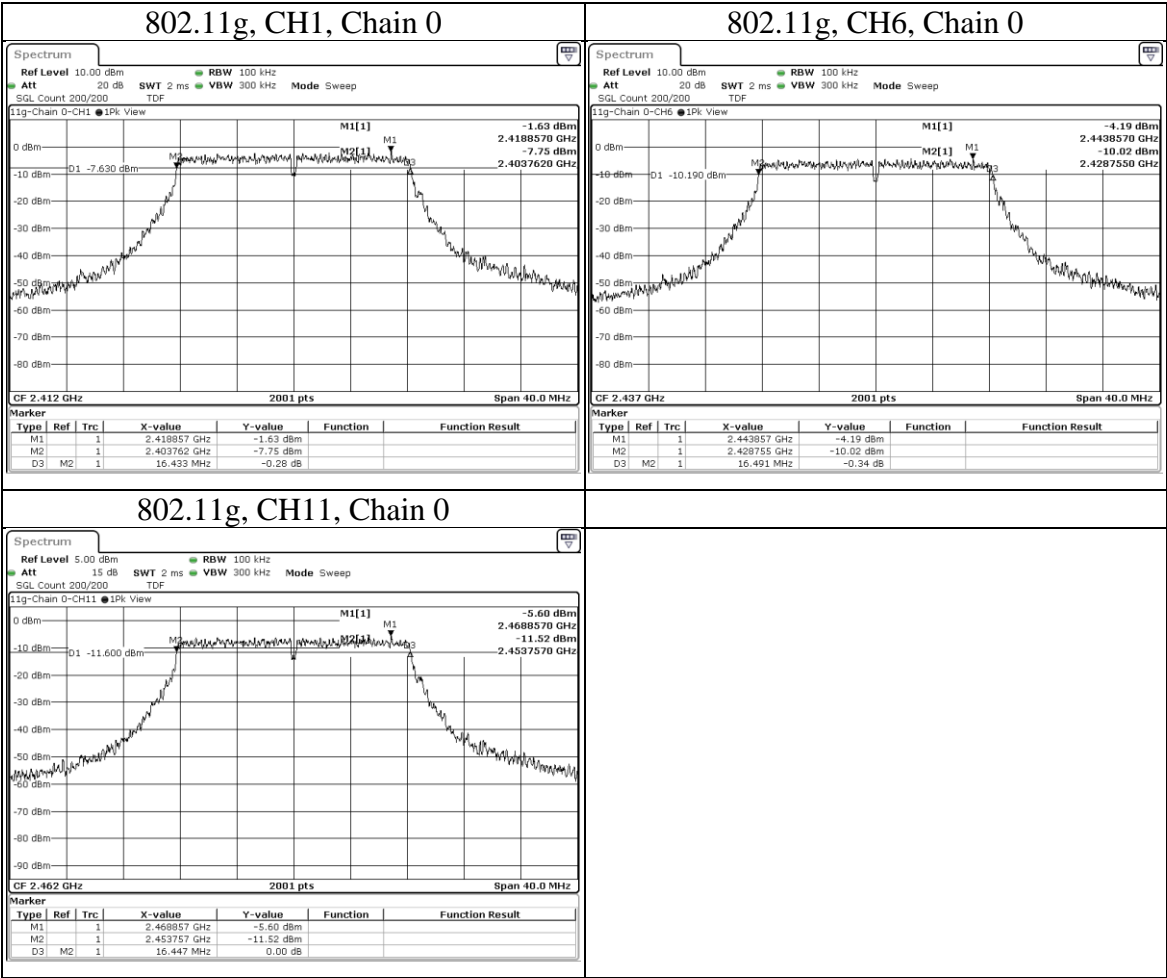
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0

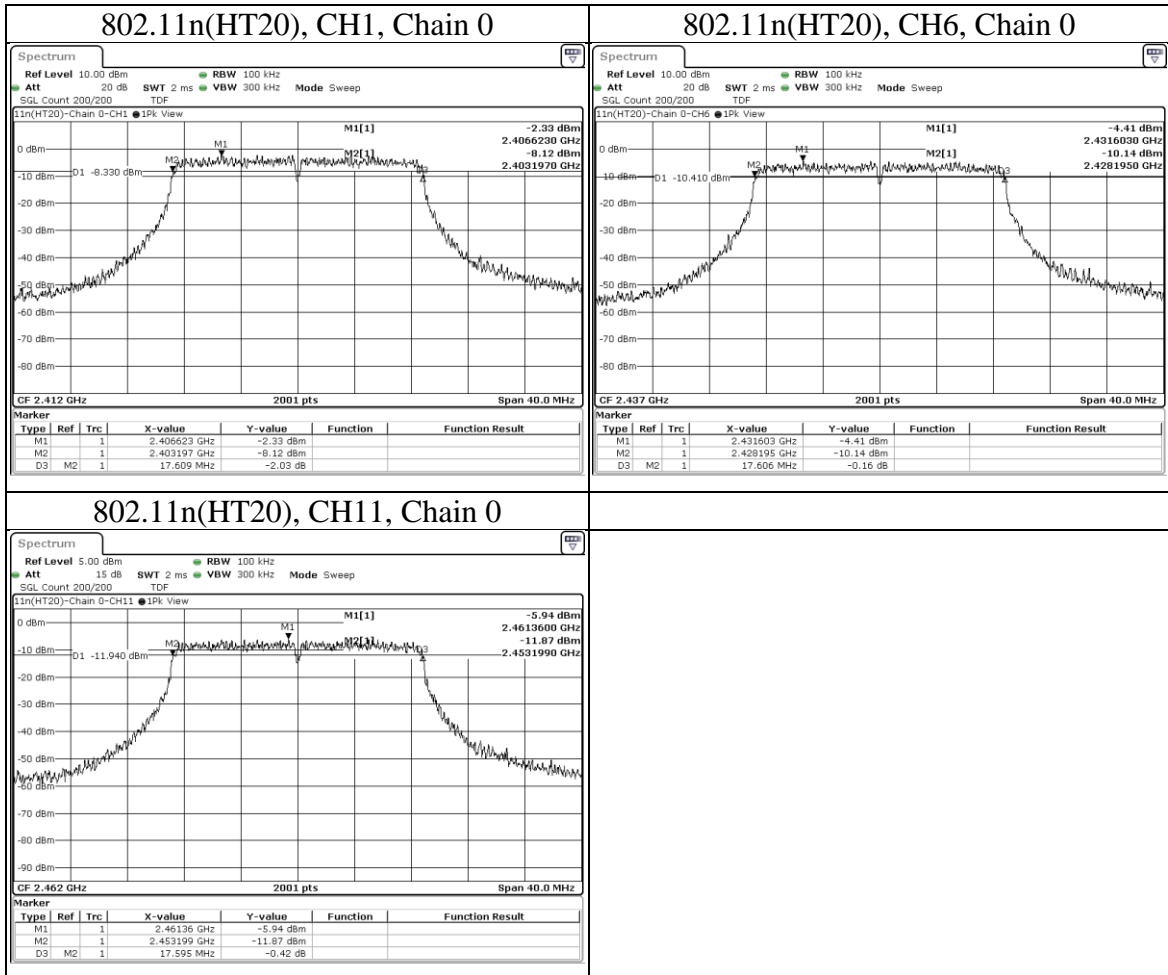


| Mode | CH | Freq (MHz) | 6dB BW (MHz) | Limit (MHz) | Result |
|---------|----|------------|--------------|-------------|--------|
| | | | Chain 0 | | |
| 802.11g | 1 | 2412 | 16.433 | 0.5 | Pass |
| | 6 | 2437 | 16.491 | 0.5 | Pass |
| | 11 | 2462 | 16.447 | 0.5 | Pass |



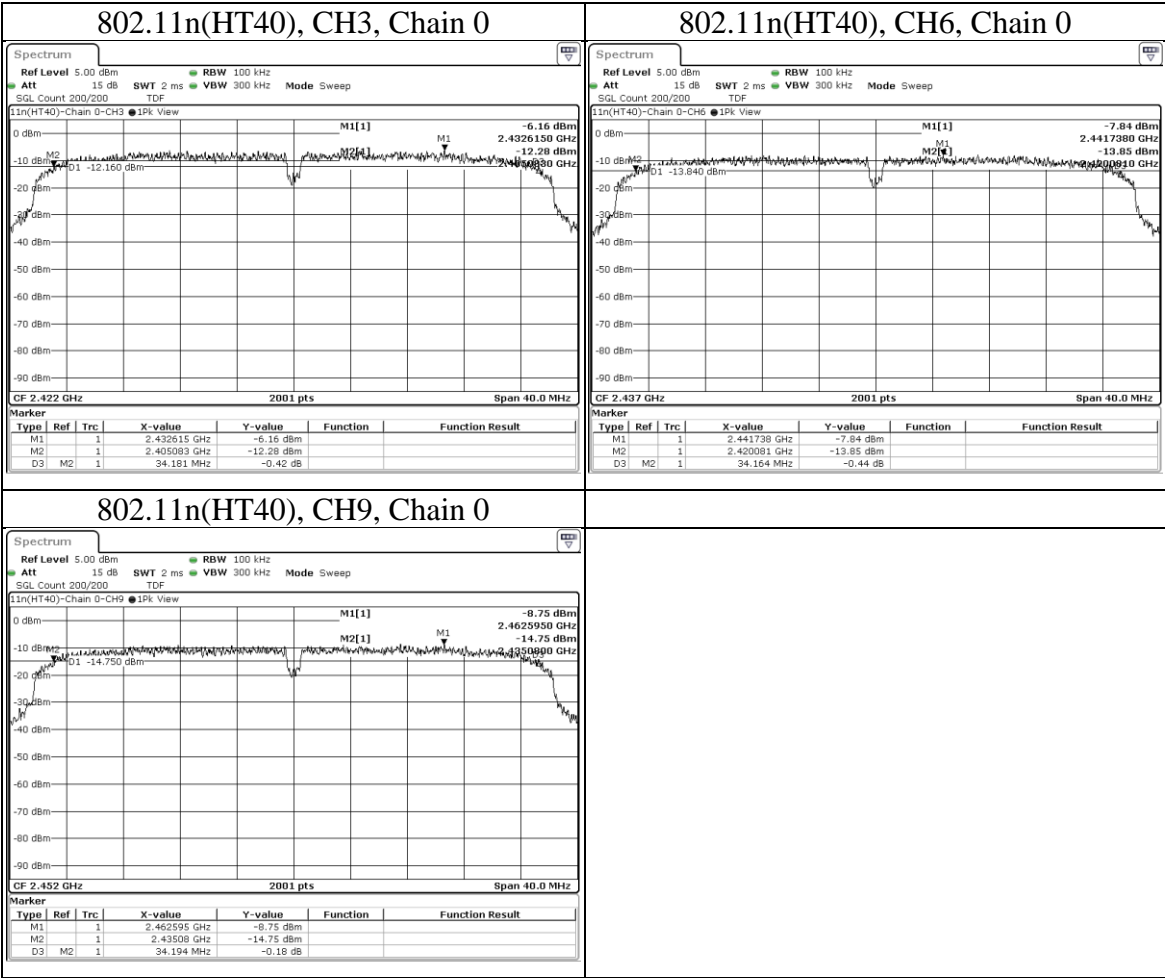


| Mode | CH | Freq (MHz) | 6dB BW (MHz) | Limit (MHz) | Result |
|---------------|----|------------|--------------|-------------|--------|
| | | | Chain 0 | | |
| 802.11n(HT20) | 1 | 2412 | 17.609 | 0.5 | Pass |
| | 6 | 2437 | 17.606 | 0.5 | Pass |
| | 11 | 2462 | 17.595 | 0.5 | Pass |





| Mode | CH | Freq (MHz) | 6dB BW (MHz) | Limit (MHz) | Result |
|---------------|----|------------|--------------|-------------|--------|
| | | | Chain 0 | | |
| 802.11n(HT40) | 3 | 2422 | 34.181 | 0.5 | Pass |
| | 6 | 2437 | 34.164 | 0.5 | Pass |
| | 9 | 2452 | 34.194 | 0.5 | Pass |





9.2. Conducted Output Power

Requirements

For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Note:

1. Directional Gain = $G_{\text{ant}} + 10 \log (N_{\text{ant}})$ dBi.

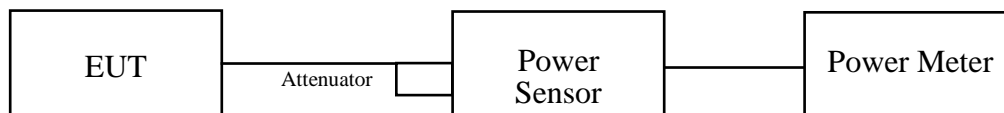
Nant: Number of Transmit Antennas

G1, G2,..., Gn: Gain of Individual Antennas (Same for Each Antenna)

Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Test Setup



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Test Data

Peak Power

802.11b

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass / Fail |
|---------|-----------------|-----------------|------------------|-------------|-------------|
| 1 | 2412 | 47.534 | 16.77 | 30 | PASS |
| 6 | 2437 | 30.549 | 14.85 | 30 | PASS |
| 11 | 2462 | 20.701 | 13.16 | 30 | PASS |

802.11g

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass / Fail |
|---------|-----------------|-----------------|------------------|-------------|-------------|
| 1 | 2412 | 58.076 | 17.64 | 30 | PASS |
| 6 | 2437 | 39.537 | 15.97 | 30 | PASS |
| 11 | 2462 | 26.122 | 14.17 | 30 | PASS |

802.11n (HT20)

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass / Fail |
|---------|-----------------|-----------------|------------------|-------------|-------------|
| 1 | 2412 | 63.68 | 18.04 | 30 | PASS |
| 6 | 2437 | 41.976 | 16.23 | 30 | PASS |
| 11 | 2462 | 28.708 | 14.58 | 30 | PASS |

802.11n (HT40)

| Channel | Frequency (MHz) | Peak Power (mW) | Peak Power (dBm) | Limit (dBm) | Pass / Fail |
|---------|-----------------|-----------------|------------------|-------------|-------------|
| 3 | 2422 | 55.847 | 17.47 | 30 | PASS |
| 6 | 2437 | 36.898 | 15.67 | 30 | PASS |
| 9 | 2452 | 23.121 | 13.64 | 30 | PASS |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Average Power (Reference Only)

802.11b

| Channel | Frequency (MHz) | Average Power (mW) | Average Power (dBm) |
|---------|-----------------|--------------------|---------------------|
| 1 | 2412 | 23.988 | 13.80 |
| 6 | 2437 | 15.136 | 11.80 |
| 11 | 2462 | 10.304 | 10.13 |

802.11g

| Channel | Frequency (MHz) | Average Power (mW) | Average Power (dBm) |
|---------|-----------------|--------------------|---------------------|
| 1 | 2412 | 16.032 | 12.05 |
| 6 | 2437 | 10.864 | 10.36 |
| 11 | 2462 | 7.047 | 8.48 |

802.11n (HT20)

| Channel | Frequency (MHz) | Average Power (mW) | Average Power (dBm) |
|---------|-----------------|--------------------|---------------------|
| 1 | 2412 | 15.276 | 11.84 |
| 6 | 2437 | 10.304 | 10.13 |
| 11 | 2462 | 6.792 | 8.32 |

802.11n (HT40)

| Channel | Frequency (MHz) | Average Power (mW) | Average Power (dBm) |
|---------|-----------------|--------------------|---------------------|
| 3 | 2422 | 14.028 | 11.47 |
| 6 | 2437 | 9.333 | 9.70 |
| 9 | 2452 | 6.026 | 7.80 |

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



9.3. Power Spectral Density

Requirements

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz (If $G_{TX} > 6$ dBi, then $PSD = 8 - (G_{TX} - 6)$).

Note:

1. PSD = Power Spectral Density, it should be measured using the final conducted output power, and the power spectral density in dBm/MHz.
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = $G_{ant} + 10 \log (N_{ant})$ dBi.

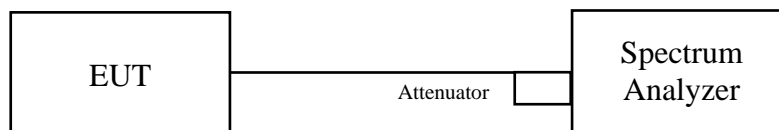
N_{ant} : Number of Transmit Antennas

G_1, G_2, \dots, G_n : Gain of Individual Antennas (Same for Each Antenna)

Test procedure

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the DTS bandwidth.
- c. Set the RBW to: $3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$.
- d. Set the VBW $\geq 3 \times RBW$.
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

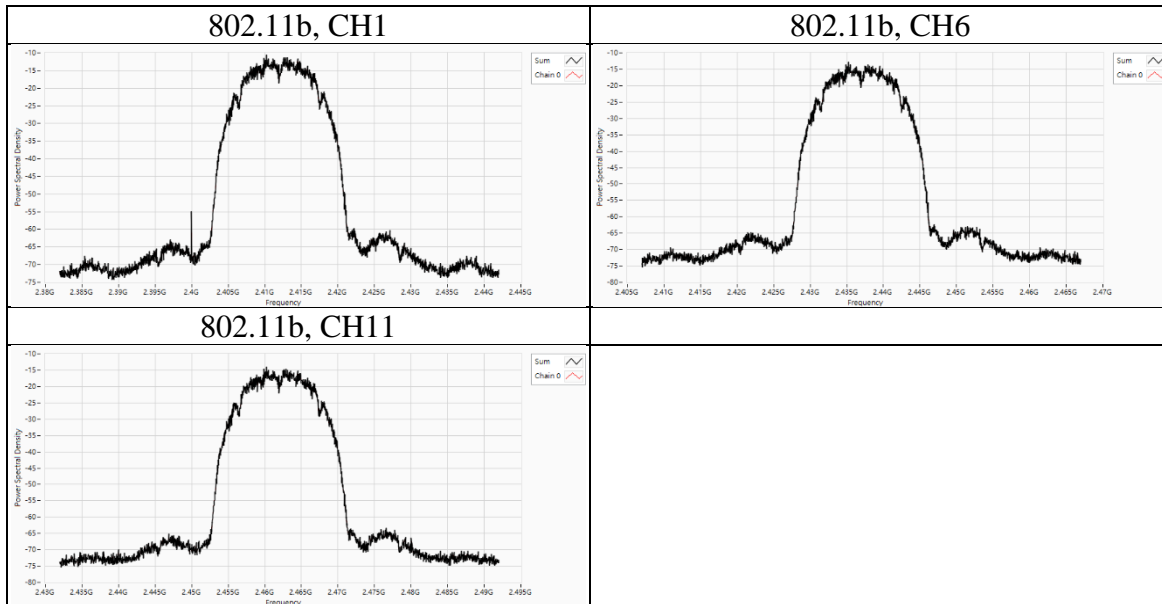
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Test Data

| Mode | CH | Freq (MHz) | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Directional Gain (dBi) | Result |
|---------|----|------------|----------------------|------------------|------------------------|--------|
| 802.11b | 1 | 2412 | -10.54 | 8 | 3.42 | Pass |
| | 6 | 2437 | -12.8 | 8 | 3.42 | Pass |
| | 11 | 2462 | -13.96 | 8 | 3.42 | Pass |



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

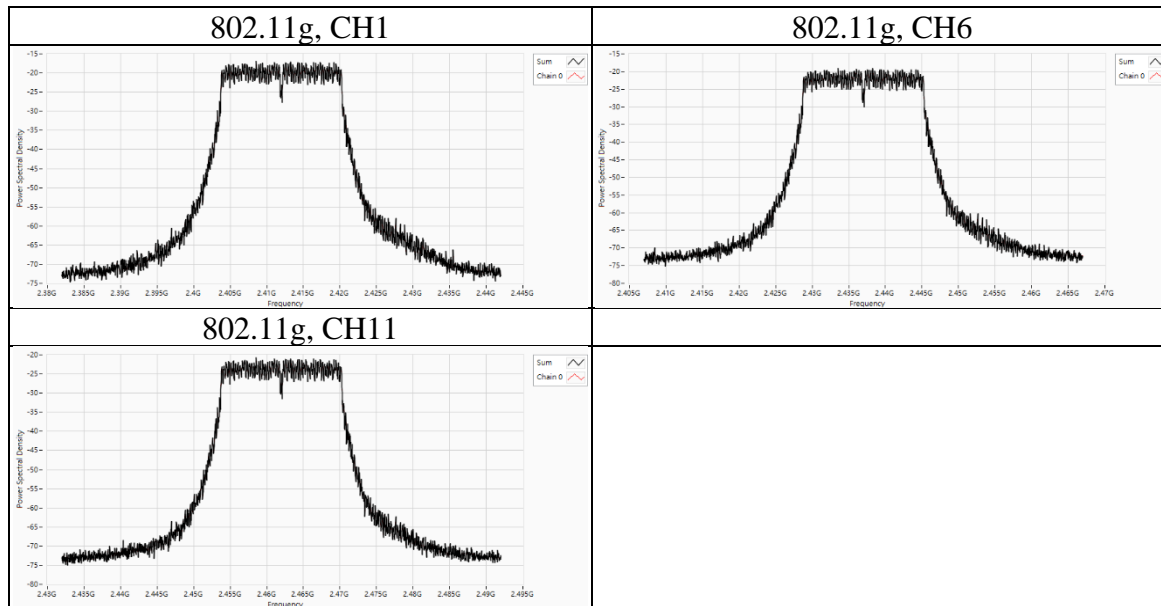
Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Test report No. : 4790441603-US-R0-V0
Page : 26 of 72
Issued date : 2022/8/22
FCC ID : 2A8EI-SEC01

| Mode | CH | Freq (MHz) | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Directional Gain (dBi) | Result |
|---------|----|------------|----------------------|------------------|------------------------|--------|
| 802.11g | 1 | 2412 | -16.96 | 8 | 3.42 | Pass |
| | 6 | 2437 | -19.11 | 8 | 3.42 | Pass |
| | 11 | 2462 | -20.72 | 8 | 3.42 | Pass |



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

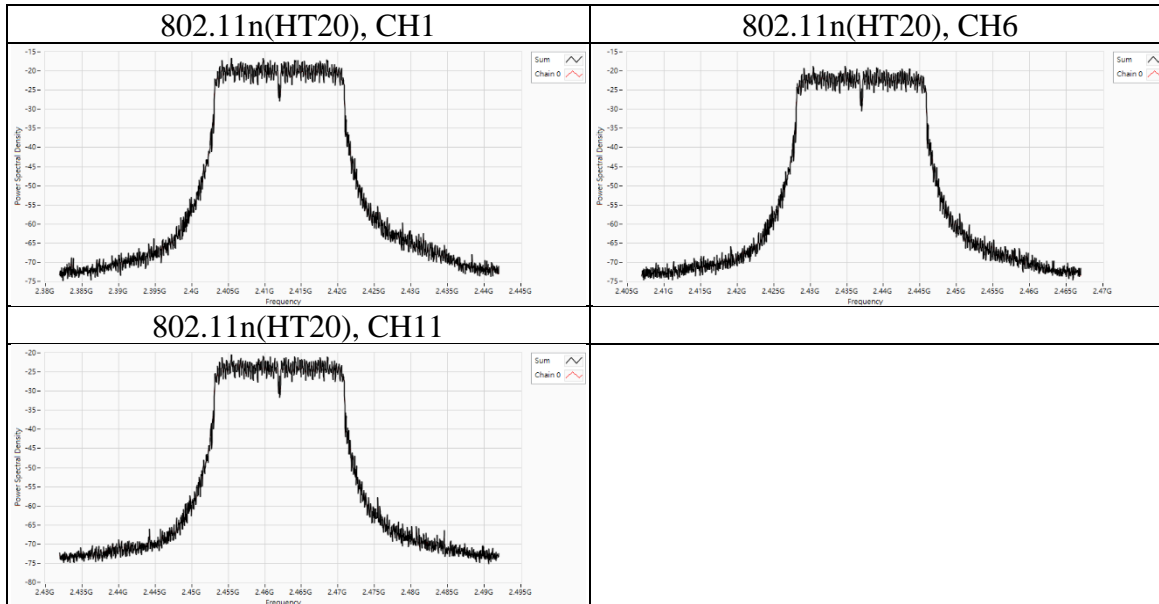
Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



| Mode | CH | Freq (MHz) | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Directional Gain (dBi) | Result |
|---------------|----|---------------|-------------------------|---------------------|------------------------------|--------|
| 802.11n(HT20) | 1 | 2412 | -16.64 | 8 | 3.42 | Pass |
| | 6 | 2437 | -18.74 | 8 | 3.42 | Pass |
| | 11 | 2462 | -20.44 | 8 | 3.42 | Pass |



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

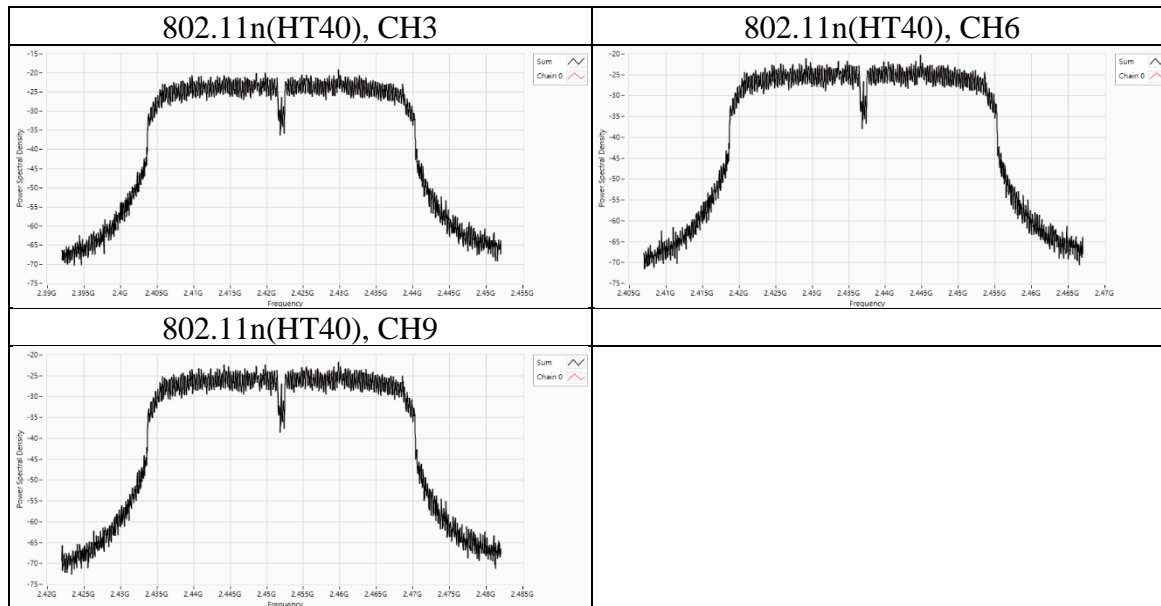
Facsimile (FAX) :+886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



Test report No. : 4790441603-US-R0-V0
Page : 28 of 72
Issued date : 2022/8/22
FCC ID : 2A8EI-SEC01

| Mode | CH | Freq (MHz) | Total PSD (dBm/3kHz) | Limit (dBm/3kHz) | Directional Gain (dBi) | Result |
|---------------|----|------------|----------------------|------------------|------------------------|--------|
| 802.11n(HT40) | 3 | 2422 | -19.13 | 8 | 3.42 | Pass |
| | 6 | 2437 | -20.26 | 8 | 3.42 | Pass |
| | 9 | 2452 | -21.8 | 8 | 3.42 | Pass |



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0



9.4. Conducted Out of Band Emission

Requirements

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.

Test procedure

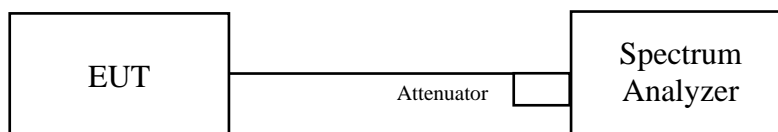
Measurement Procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 300 kHz.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

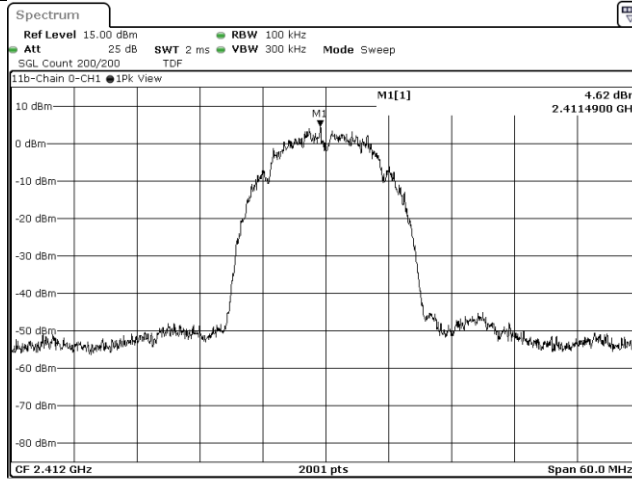
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0

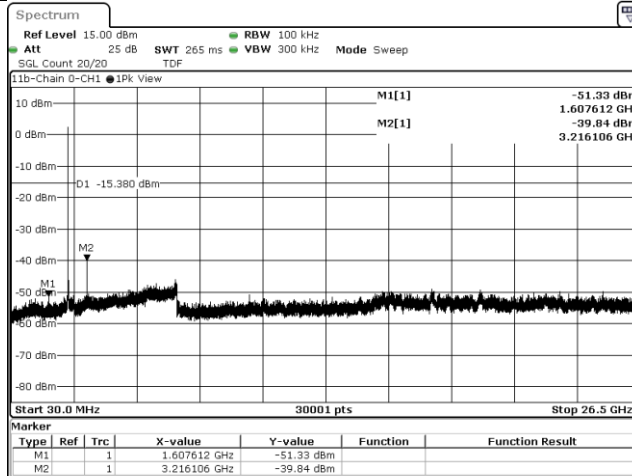


Test Data

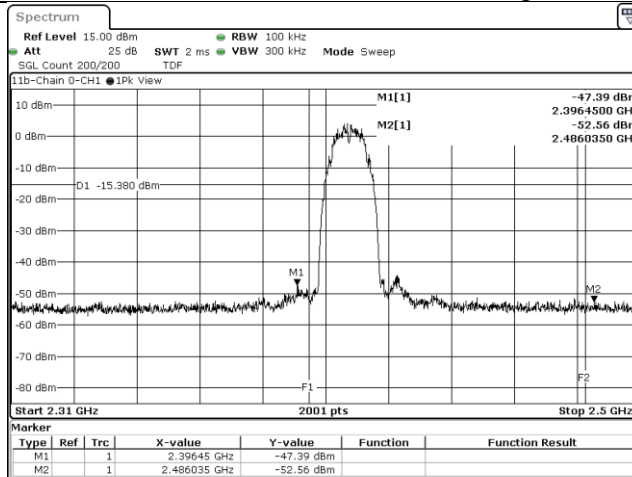
802.11b, CH1, Chain 0, Reference



802.11b, CH1, Chain 0, Conducted Emission



802.11b, CH1, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

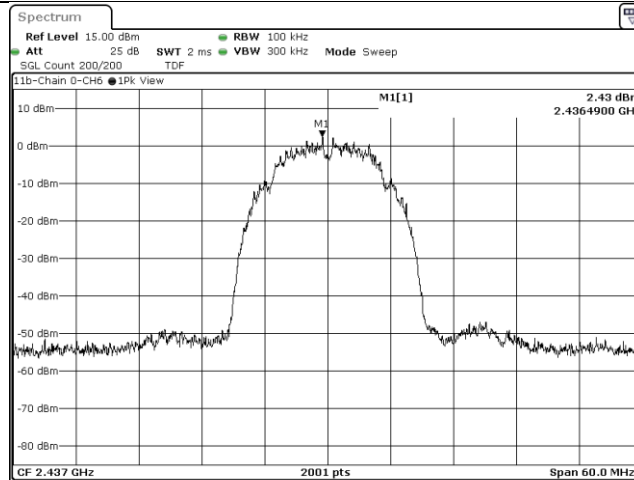
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

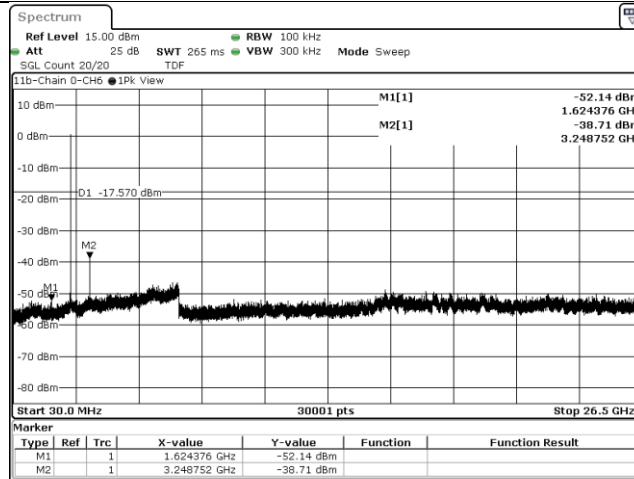
Doc No: 17-EM-F0876 / 6.0



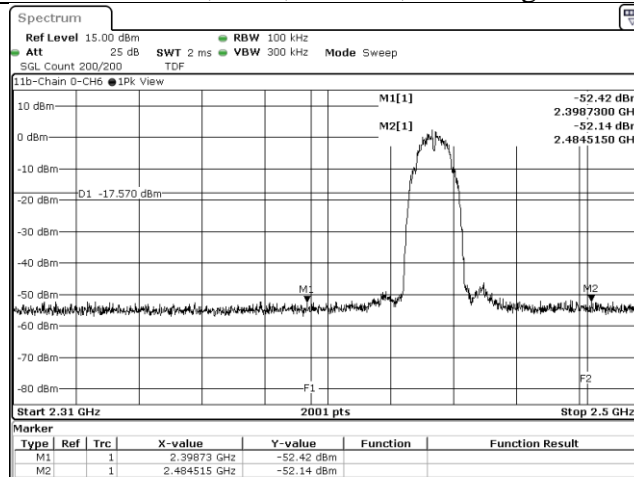
802.11b, CH6, Chain 0, Reference



802.11b, CH6, Chain 0, Conducted Emission



802.11b, CH6, Chain 0, Band edge



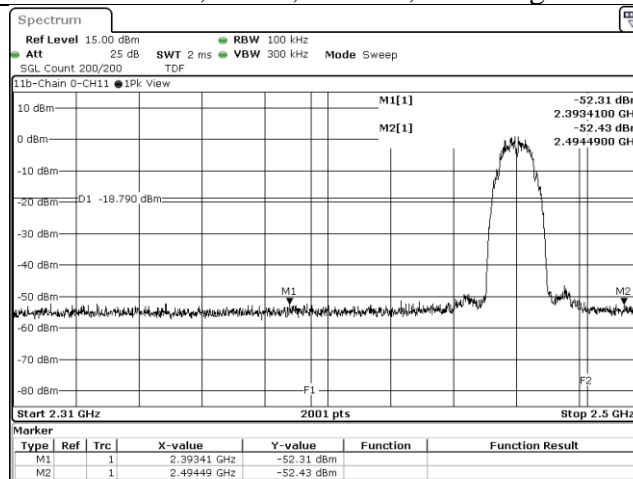
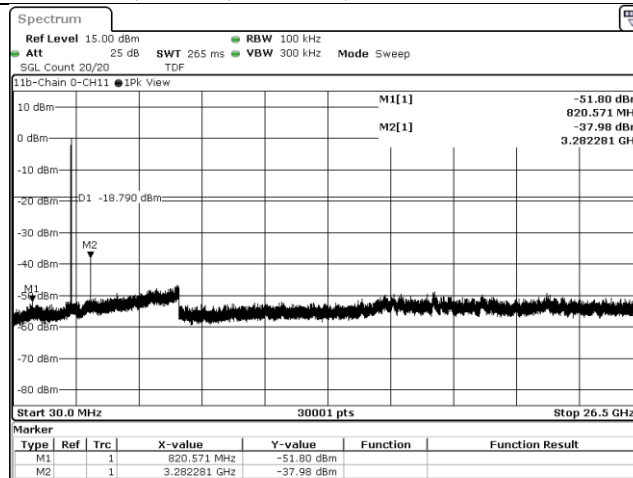
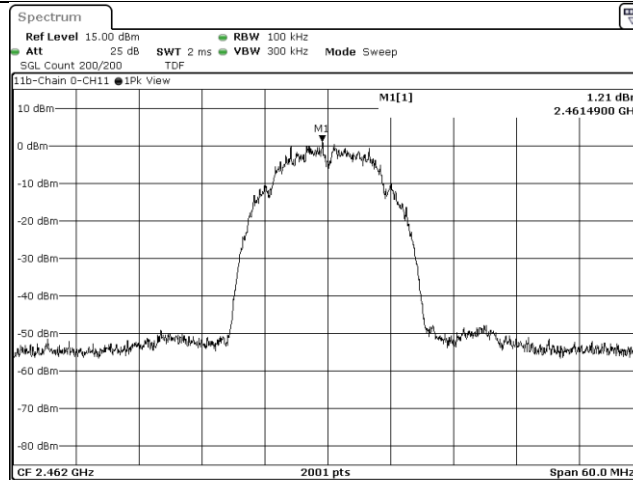
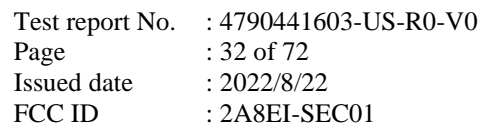
Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

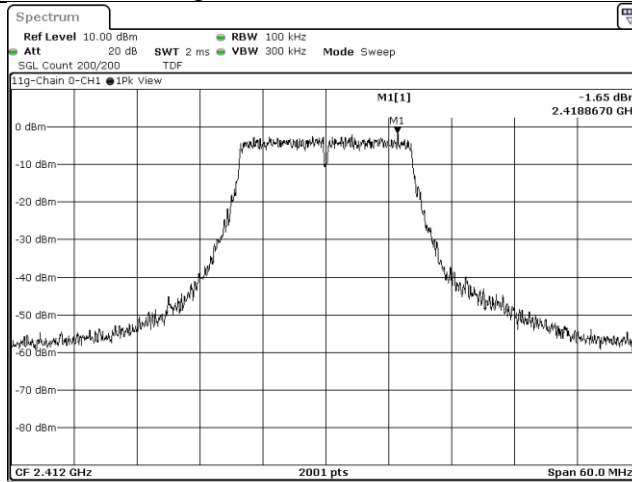
Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0

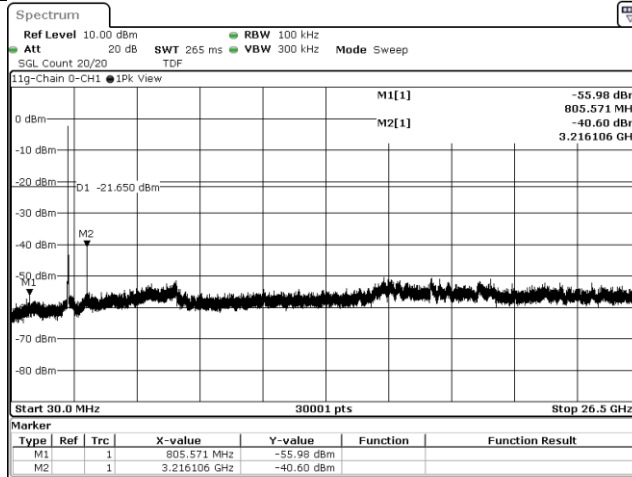




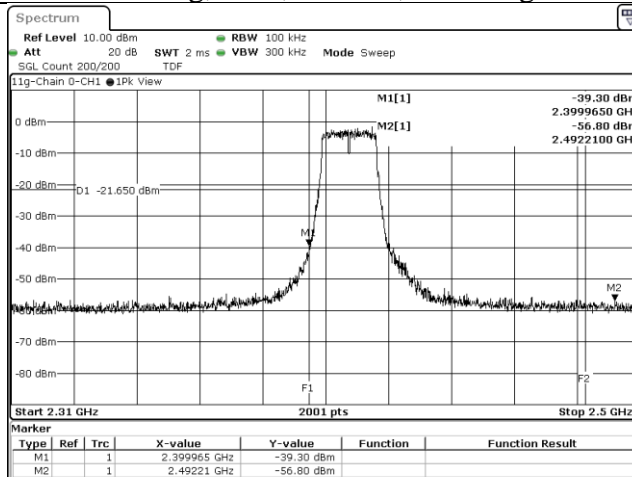
802.11g, CH1, Chain 0, Reference



802.11g, CH1, Chain 0, Conducted Emission



802.11g, CH1, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

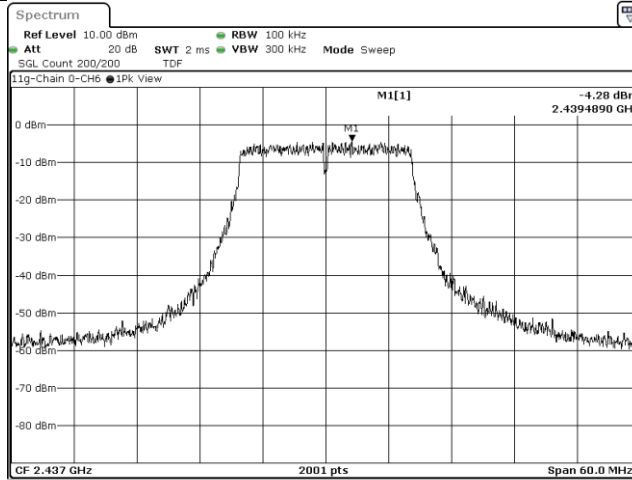
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

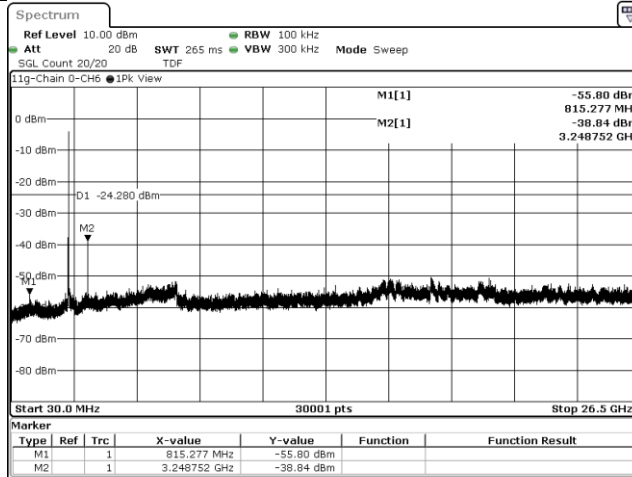
Doc No: 17-EM-F0876 / 6.0



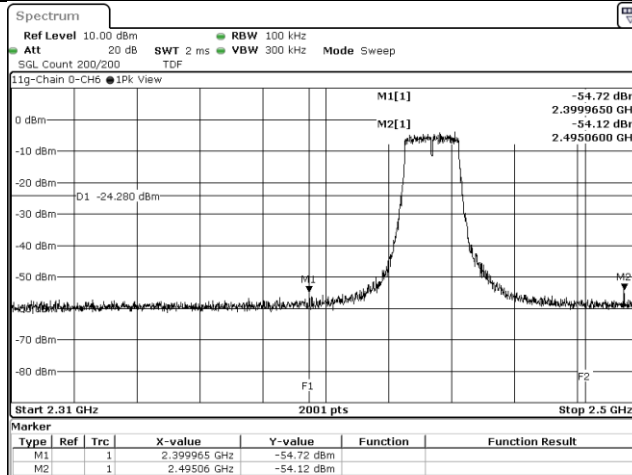
802.11g, CH6, Chain 0, Reference



802.11g, CH6, Chain 0, Conducted Emission



802.11g, CH6, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

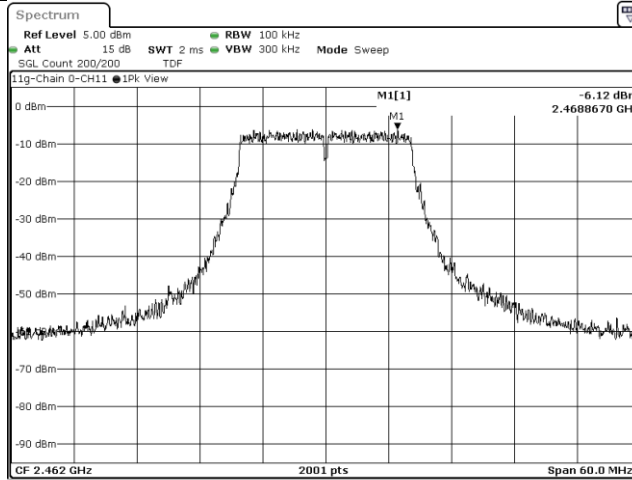
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

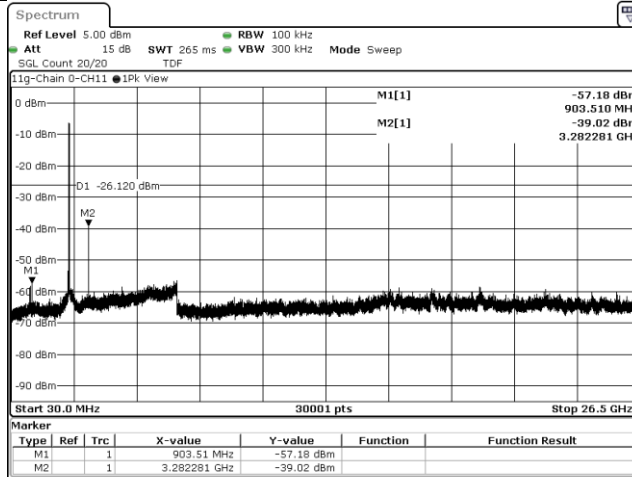
Doc No: 17-EM-F0876 / 6.0



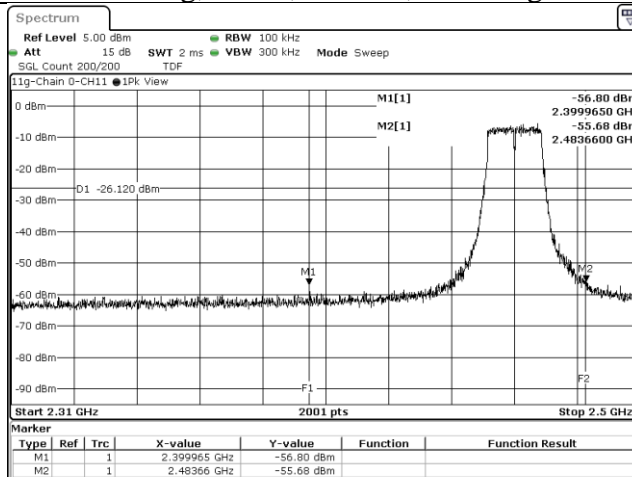
802.11g, CH11, Chain 0, Reference



802.11g, CH11, Chain 0, Conducted Emission



802.11g, CH11, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

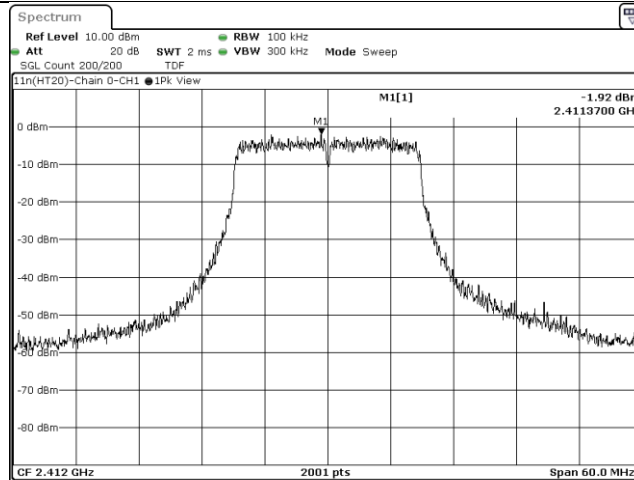
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

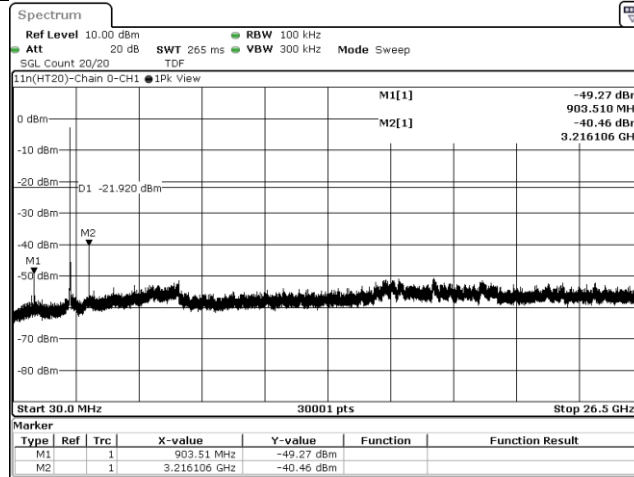
Doc No: 17-EM-F0876 / 6.0



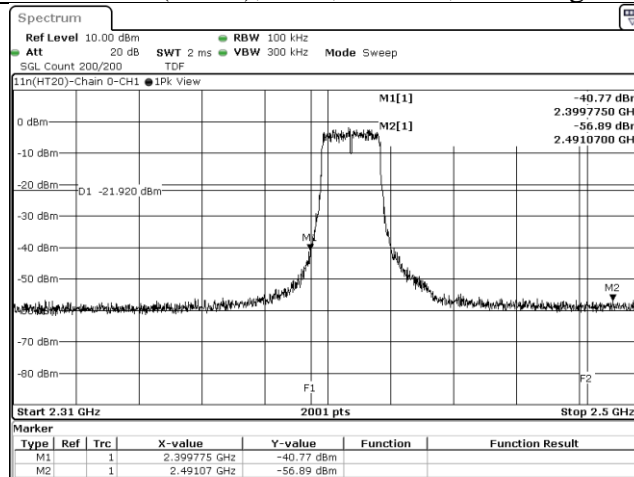
802.11n(HT20), CH1, Chain 0, Reference



802.11n(HT20), CH1, Chain 0, Conducted Emission



802.11n(HT20), CH1, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

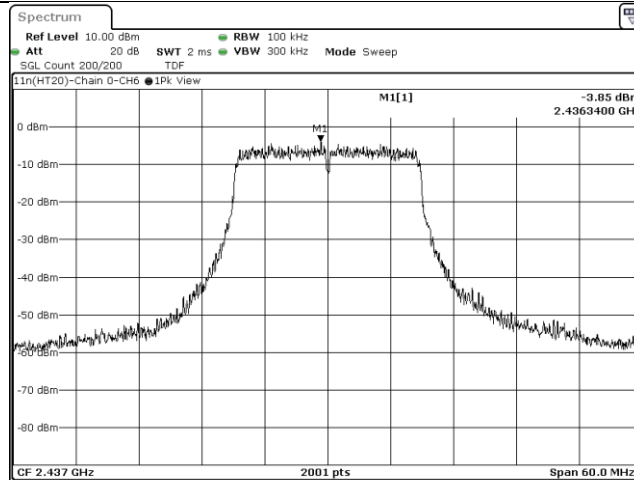
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

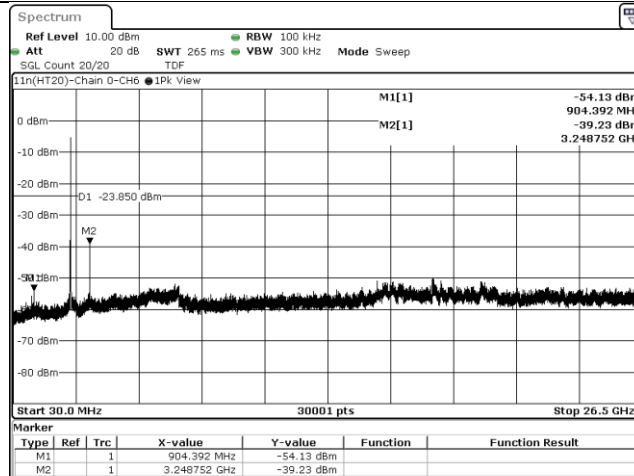
Doc No: 17-EM-F0876 / 6.0



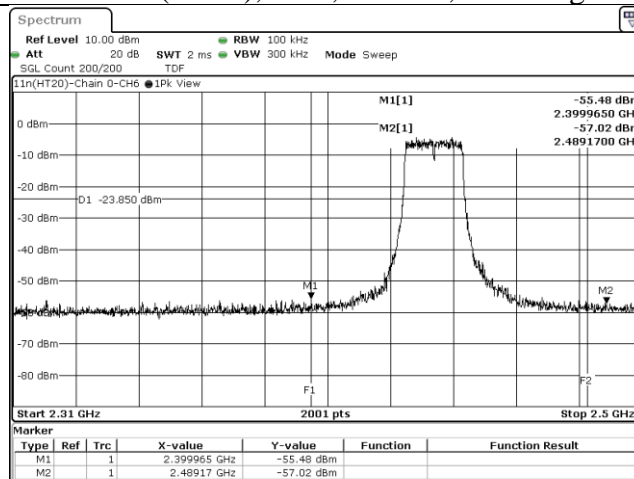
802.11n(HT20), CH6, Chain 0, Reference



802.11n(HT20), CH6, Chain 0, Conducted Emission



802.11n(HT20), CH6, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

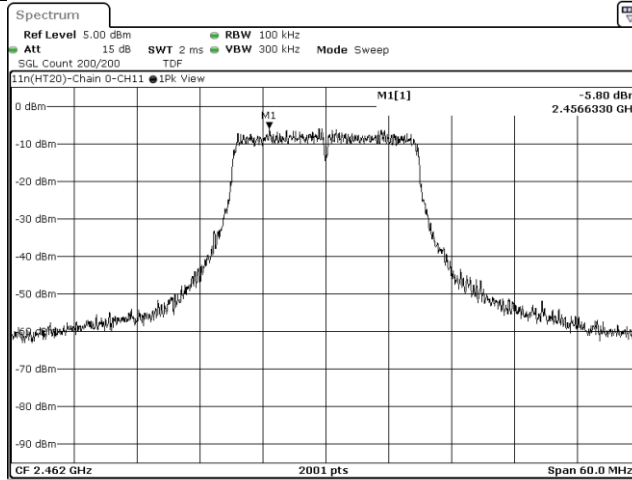
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

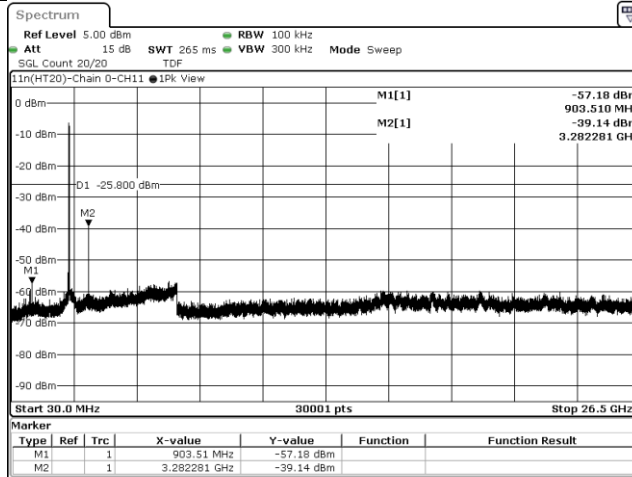
Doc No: 17-EM-F0876 / 6.0



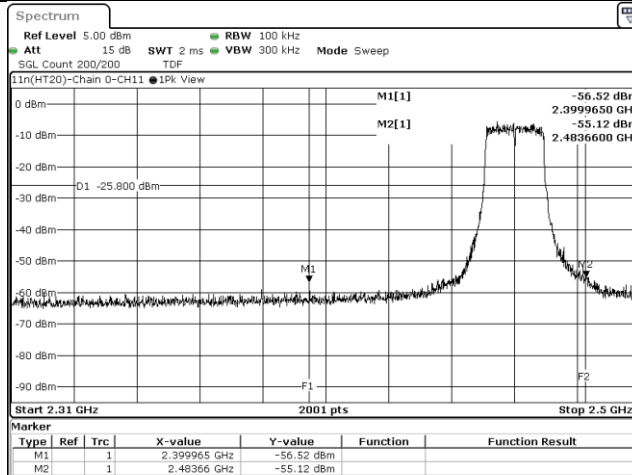
802.11n(HT20), CH11, Chain 0, Reference



802.11n(HT20), CH11, Chain 0, Conducted Emission



802.11n(HT20), CH11, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

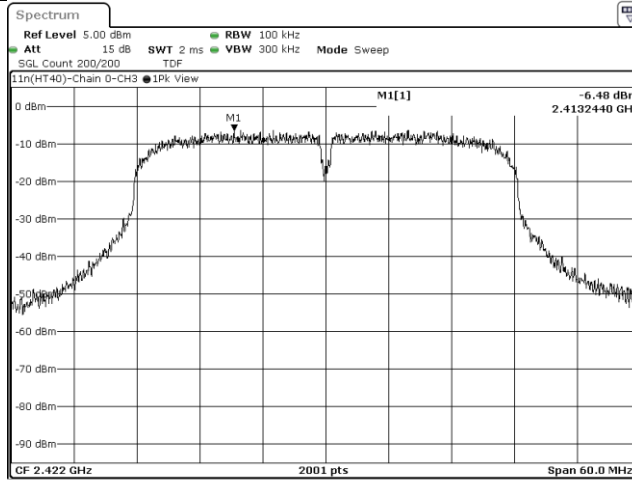
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

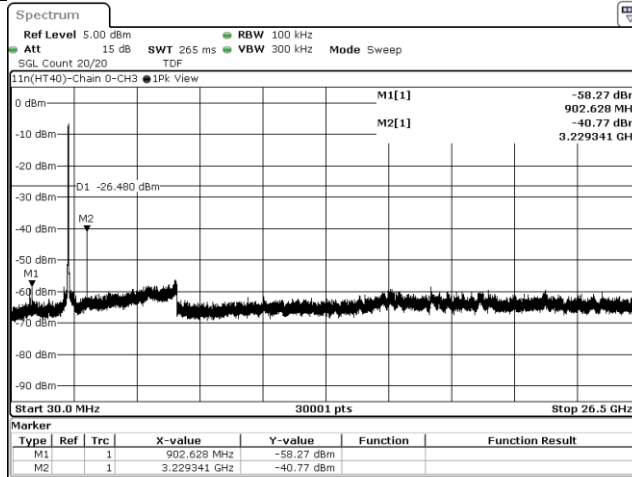
Doc No: 17-EM-F0876 / 6.0



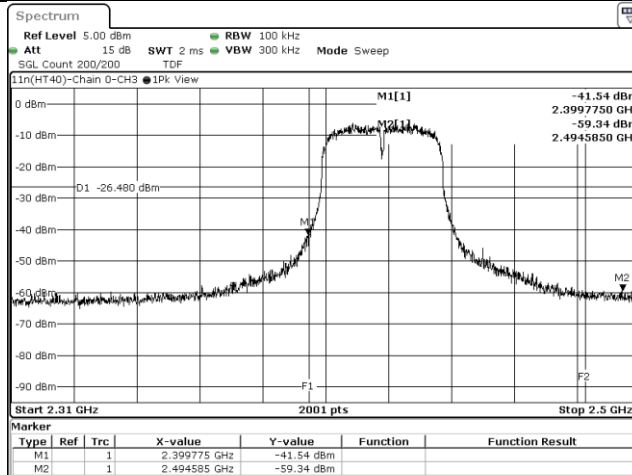
802.11n(HT40), CH3, Chain 0, Reference



802.11n(HT40), CH3, Chain 0, Conducted Emission



802.11n(HT40), CH3, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

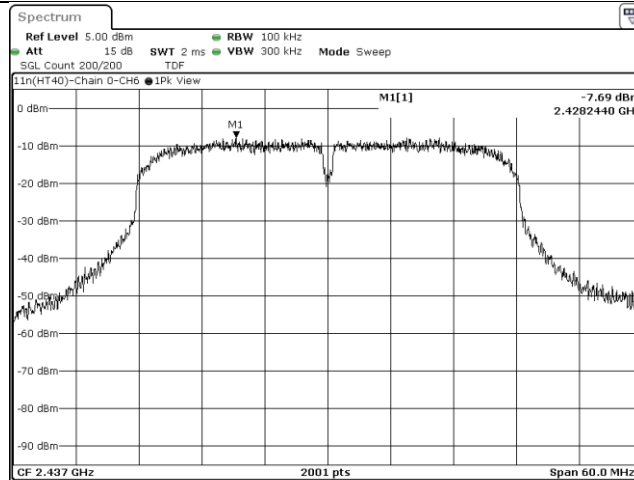
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

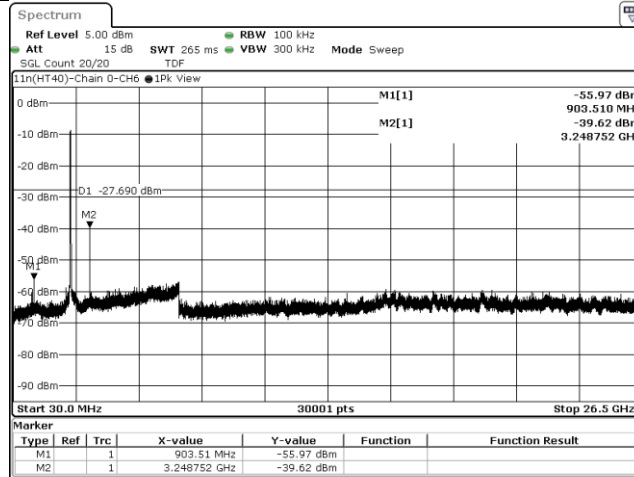
Doc No: 17-EM-F0876 / 6.0



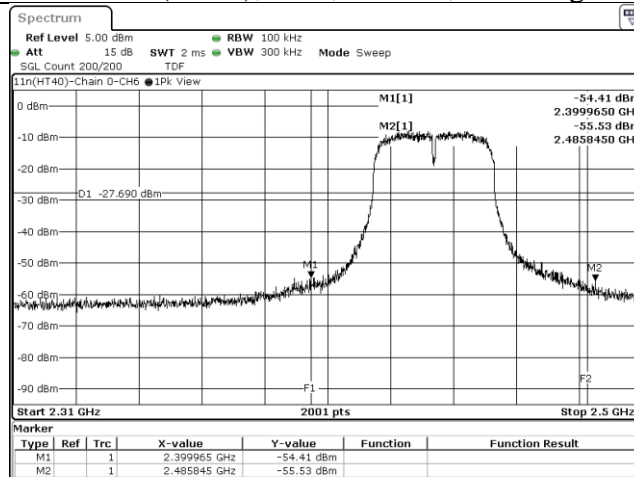
802.11n(HT40), CH6, Chain 0, Reference



802.11n(HT40), CH6, Chain 0, Conducted Emission



802.11n(HT40), CH6, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

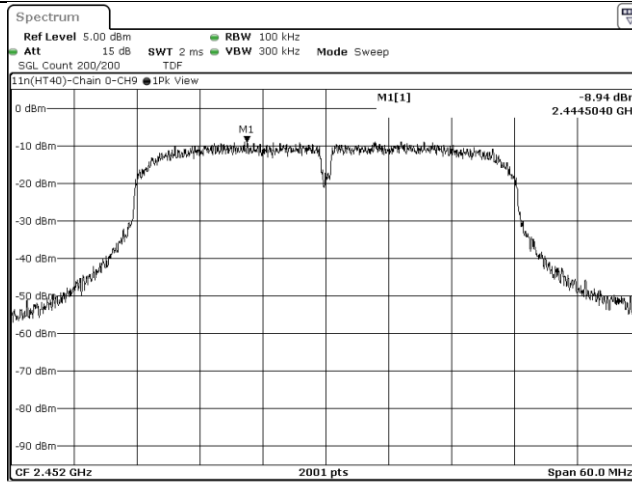
Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

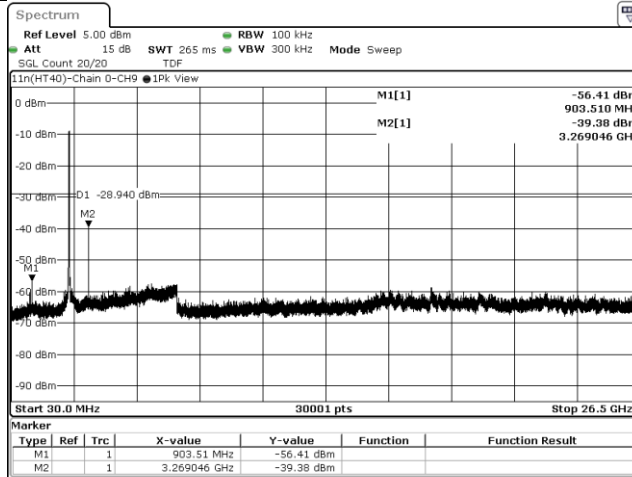
Doc No: 17-EM-F0876 / 6.0



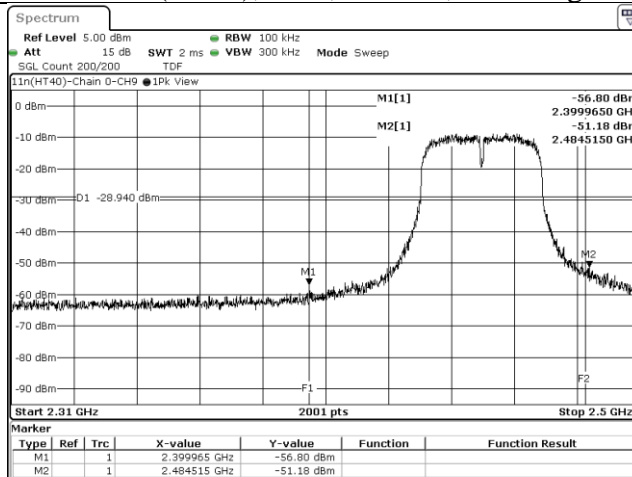
802.11n(HT40), CH9, Chain 0, Reference



802.11n(HT40), CH9, Chain 0, Conducted Emission



802.11n(HT40), CH9, Chain 0, Band edge



Underwriters Laboratories Taiwan Co., Ltd.

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone : +886-2-7737-3000

Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0876 / 6.0