



**GCPAT**

**WDS**

**FCC 15.247:2020  
2.4 GHz DTS Radio**

**Report: GCPA0001.3, Issue Date: November 17, 2020**



NVLAP LAB CODE: 200881-0



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# CERTIFICATE OF TEST



Last Date of Test: May 13, 2020

GCPAT

EUT: WDS

## Radio Equipment Testing

### Standards

| Specification   | Method                       |
|-----------------|------------------------------|
| FCC 15.247:2020 | ANSI C63.10:2013, KDB 558074 |

### Results

| Method Clause                     | Test Description                    | Applied | Results | Comments                                |
|-----------------------------------|-------------------------------------|---------|---------|-----------------------------------------|
| 6.2                               | Powerline Conducted Emissions       | No      | N/A     | Not required for a battery powered EUT. |
| 6.5, 6.6,<br>11.12.1,<br>11.13.2, | Spurious Radiated Emissions         | Yes     | Pass    |                                         |
| 11.6                              | Duty Cycle                          | Yes     | N/A     |                                         |
| 11.8.2                            | Occupied Bandwidth                  | Yes     | Pass    |                                         |
| 11.9.1.1                          | Output Power                        | Yes     | Pass    |                                         |
| 11.9.1.1                          | Equivalent Isotropic Radiated Power | Yes     | Pass    |                                         |
| 11.10.2                           | Power Spectral Density              | Yes     | Pass    |                                         |
| 11.11                             | Band Edge Compliance                | Yes     | Pass    |                                         |
| 11.11                             | Spurious Conducted Emissions        | Yes     | Pass    |                                         |

### Deviations From Test Standards

None

### Approved By:

Eric Brandon, Department Manager

*Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.*

# REVISION HISTORY



| Revision Number | Description | Date<br>(yyyy-mm-dd) | Page Number |
|-----------------|-------------|----------------------|-------------|
| 00              | None        |                      |             |

# ACCREDITATIONS AND AUTHORIZATIONS



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## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

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## Canada

**ISED** - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

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## European Union

**European Commission** – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

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## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

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## Korea

**MSIT / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

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## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

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## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

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## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

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## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

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## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

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## SCOPE

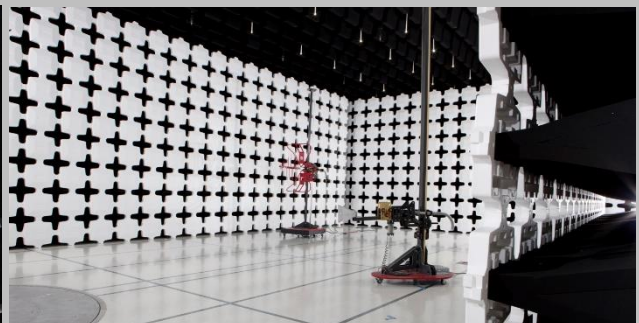
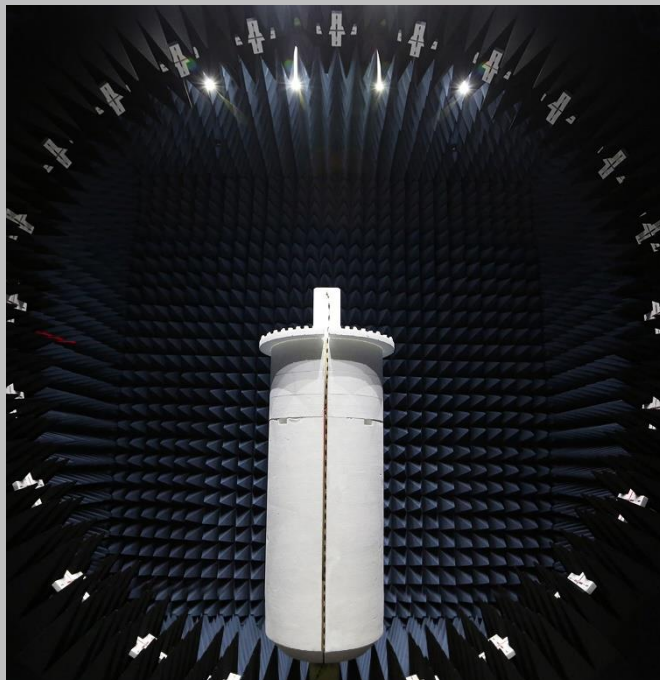
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

# FACILITIES



|                                                                                       |                                                                                                       |                                                                                                       |                                                                                        |                                                                                                           |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>California</b><br>Labs OC01-17<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918   | <b>Minnesota</b><br>Labs MN01-10<br>9349 W Broadway Ave.<br>Brooklyn Park, MN 55445<br>(612)-638-5136 | <b>Oregon</b><br>Labs EV01-12<br>6775 NE Evergreen Pkwy #400<br>Hillsboro, OR 97124<br>(503) 844-4066 | <b>Texas</b><br>Labs TX01-09<br>3801 E Plano Pkwy<br>Plano, TX 75074<br>(469) 304-5255 | <b>Washington</b><br>Labs NC01-05<br>19201 120 <sup>th</sup> Ave NE<br>Bothell, WA 98011<br>(425)984-6600 |
| <b>NVLAP</b>                                                                          |                                                                                                       |                                                                                                       |                                                                                        |                                                                                                           |
| NVLAP Lab Code: 200676-0                                                              | NVLAP Lab Code: 200881-0                                                                              | NVLAP Lab Code: 200630-0                                                                              | NVLAP Lab Code:201049-0                                                                | NVLAP Lab Code: 200629-0                                                                                  |
| <b>Innovation, Science and Economic Development Canada</b>                            |                                                                                                       |                                                                                                       |                                                                                        |                                                                                                           |
| 2834B-1, 2834B-3                                                                      | 2834E-1, 2834E-3                                                                                      | 2834D-1                                                                                               | 2834G-1                                                                                | 2834F-1                                                                                                   |
| <b>BSMI</b>                                                                           |                                                                                                       |                                                                                                       |                                                                                        |                                                                                                           |
| SL2-IN-E-1154R                                                                        | SL2-IN-E-1152R                                                                                        | SL2-IN-E-1017                                                                                         | SL2-IN-E-1158R                                                                         | SL2-IN-E-1153R                                                                                            |
| <b>VCCI</b>                                                                           |                                                                                                       |                                                                                                       |                                                                                        |                                                                                                           |
| A-0029                                                                                | A-0109                                                                                                | A-0108                                                                                                | A-0201                                                                                 | A-0110                                                                                                    |
| <b>Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA</b> |                                                                                                       |                                                                                                       |                                                                                        |                                                                                                           |
| US0158                                                                                | US0175                                                                                                | US0017                                                                                                | US0191                                                                                 | US0157                                                                                                    |



# MEASUREMENT UNCERTAINTY

## Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

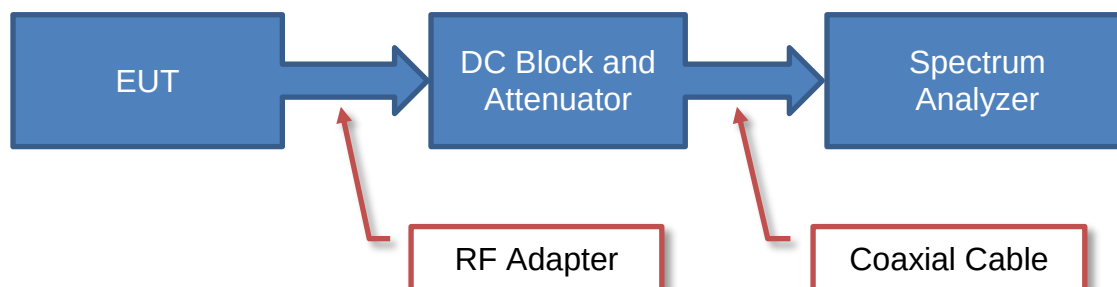
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

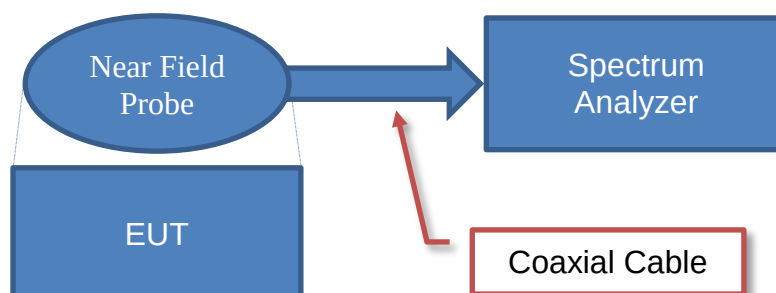
| Test                                  | + MU    | - MU     |
|---------------------------------------|---------|----------|
| Frequency Accuracy                    | 0.0007% | -0.0007% |
| Amplitude Accuracy (dB)               | 1.2 dB  | -1.2 dB  |
| Conducted Power (dB)                  | 1.2 dB  | -1.2 dB  |
| Radiated Power via Substitution (dB)  | 0.7 dB  | -0.7 dB  |
| Temperature (degrees C)               | 0.7°C   | -0.7°C   |
| Humidity (% RH)                       | 2.5% RH | -2.5% RH |
| Voltage (AC)                          | 1.0%    | -1.0%    |
| Voltage (DC)                          | 0.7%    | -0.7%    |
| Field Strength (dB)                   | 5.2 dB  | -5.2 dB  |
| AC Powerline Conducted Emissions (dB) | 2.6 dB  | -2.6 dB  |

# Test Setup Block Diagrams

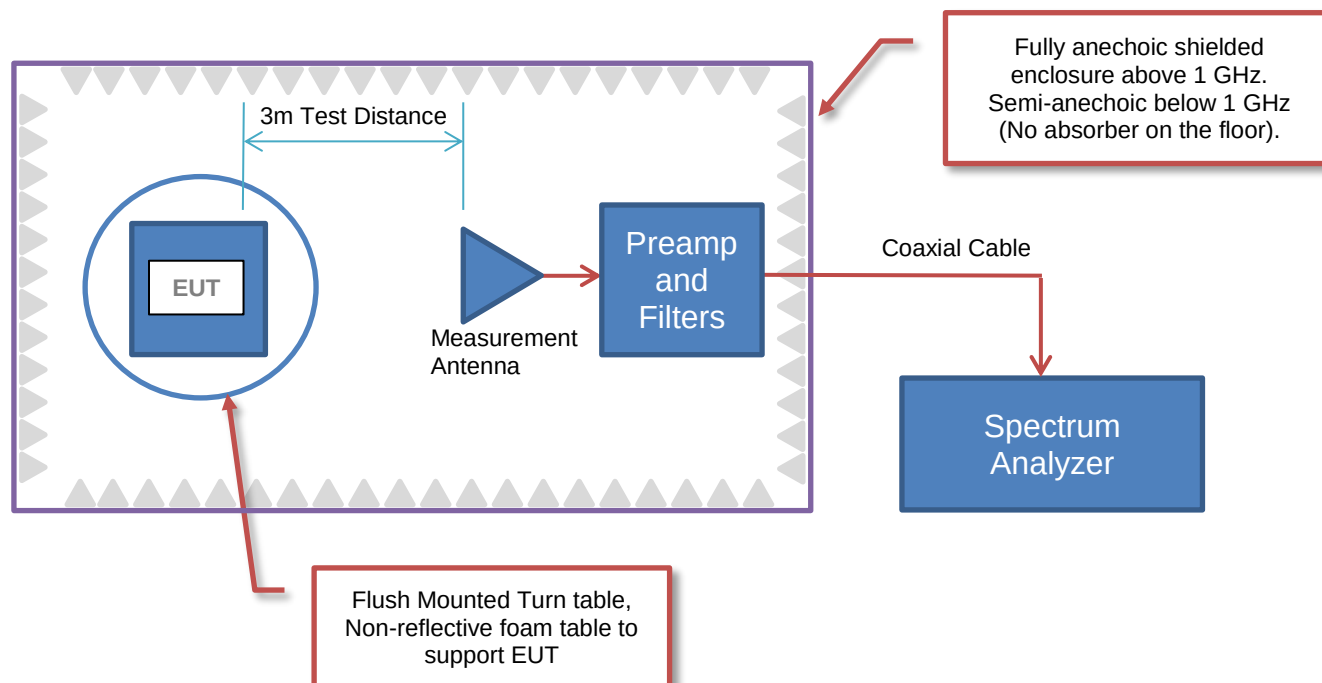
## Antenna Port Conducted Measurements



## Near Field Test Fixture Measurements



## Spurious Radiated Emissions



# PRODUCT DESCRIPTION



## Client and Equipment Under Test (EUT) Information

|                          |                      |
|--------------------------|----------------------|
| Company Name:            | GCPAT                |
| Address:                 | 62 Whittemore Avenue |
| City, State, Zip:        | Cambridge, MA 02140  |
| Test Requested By:       | Mike Castro          |
| EUT:                     | WDS                  |
| First Date of Test:      | May 12, 2020         |
| Last Date of Test:       | May 13, 2020         |
| Receipt Date of Samples: | May 12, 2020         |
| Equipment Design Stage:  | Production           |
| Equipment Condition:     | No Damage            |
| Purchase Authorization:  | Verified             |

## Information Provided by the Party Requesting the Test

### Functional Description of the EUT:

Wireless Drum Sensor for Vehicle. Device operates on a single channel.

### Testing Objective:

To demonstrate compliance of the 2.4 GHz 6LoWPan (IPv6 over Low -Power Wireless Personal Area Networks) DTS radio to FCC 15.247 requirements.

# CONFIGURATIONS

## Configuration GCPA0001- 1

| EUT                  |              |                   |                  |
|----------------------|--------------|-------------------|------------------|
| Description          | Manufacturer | Model/Part Number | Serial Number    |
| Wireless Drum Sensor | GCPAT        | WDS               | 2019-EW6762-8151 |

| Peripherals in test setup boundary |              |                   |               |
|------------------------------------|--------------|-------------------|---------------|
| Description                        | Manufacturer | Model/Part Number | Serial Number |
| DC Power Supply                    | Agilent      | U8002A            | TPZ           |

| Cables        |        |            |         |                      |                 |
|---------------|--------|------------|---------|----------------------|-----------------|
| Cable Type    | Shield | Length (m) | Ferrite | Connection 1         | Connection 2    |
| DC Leads (x2) | No     | 0.55 m     | No      | Wireless Drum Sensor | DC Power Supply |
| AC Cable      | No     | 1.8 m      | No      | AC Mains             | DC Power Cable  |

## Configuration GCPA0001- 2

| EUT                  |              |                   |                  |
|----------------------|--------------|-------------------|------------------|
| Description          | Manufacturer | Model/Part Number | Serial Number    |
| Wireless Drum Sensor | GCPAT        | WDS               | 2019-EW6762-8149 |

| Peripherals in test setup boundary |              |                   |               |
|------------------------------------|--------------|-------------------|---------------|
| Description                        | Manufacturer | Model/Part Number | Serial Number |
| DC Power Supply                    | Agilent      | U8002A            | TPZ           |

| Cables            |        |            |         |                    |                      |
|-------------------|--------|------------|---------|--------------------|----------------------|
| Cable Type        | Shield | Length (m) | Ferrite | Connection 1       | Connection 2         |
| Banana Cable (x2) | No     | 1.0 m      | No      | DC Power Supply    | DC Leads (x2)        |
| DC Leads (x2)     | No     | 0.55 m     | No      | Banana Cables (x2) | Wireless Drum Sensor |
| AC Cable          | No     | 1.8 m      | No      | AC Mains           | DC Power Cable       |

# MODIFICATIONS

## Equipment Modifications

| Item | Date       | Test                                | Modification                         | Note                                                                | Disposition of EUT                          |
|------|------------|-------------------------------------|--------------------------------------|---------------------------------------------------------------------|---------------------------------------------|
| 1    | 2020-05-12 | Duty Cycle                          | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 2    | 2020-05-12 | Occupied Bandwidth                  | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 3    | 2020-05-12 | Output Power                        | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 4    | 2020-05-12 | Equivalent Isotropic Radiated Power | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 5    | 2020-05-12 | Power Spectral Density              | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 6    | 2020-05-12 | Band Edge Compliance                | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 7    | 2020-05-12 | Spurious Conducted Emissions        | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 8    | 2020-05-13 | Spurious Radiated Emissions         | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed.            |

# POWER SETTINGS AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information.

## ANTENNA GAIN (dBi)

| Type     | Provided by: | Frequency Range (MHz) | Gain (dBi) |
|----------|--------------|-----------------------|------------|
| SWLP2450 | Manufacturer | 2.44GHz - 2.525GHz    | 2          |

No adjustable power settings were provided. The EUT was tested using power settings pre-defined by the manufacturer.

# DUTY CYCLE - WDS



XMIT 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                 | ID  | Last Cal. | Cal. Due  |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Power Supply - DC            | Agilent            | U8002A                | TPZ | NCR       | NCR       |
| Generator - Signal           | Agilent            | E4422B                | TGQ | 15-Mar-18 | 15-Mar-21 |
| Block - DC                   | Fairview Microwave | SD3379                | AMI | 6-Aug-19  | 6-Aug-20  |
| Attenuator                   | S.M. Electronics   | SA26B-20              | RFW | 10-Feb-20 | 10-Feb-21 |
| Cable                        | Micro-Coax         | UFD150A-1-0720-200200 | MNL | 15-Sep-19 | 15-Sep-20 |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A (EXA)          | AFQ | 21-Dec-19 | 21-Dec-20 |

## TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

# DUTY CYCLE - WDS

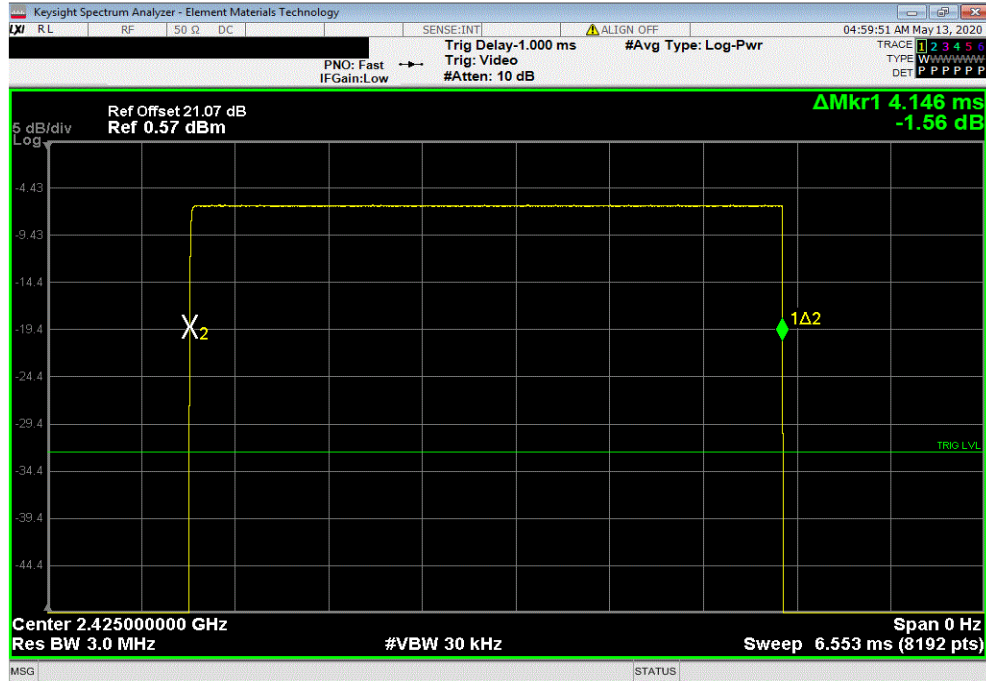


XMIT 2020 03.25.0

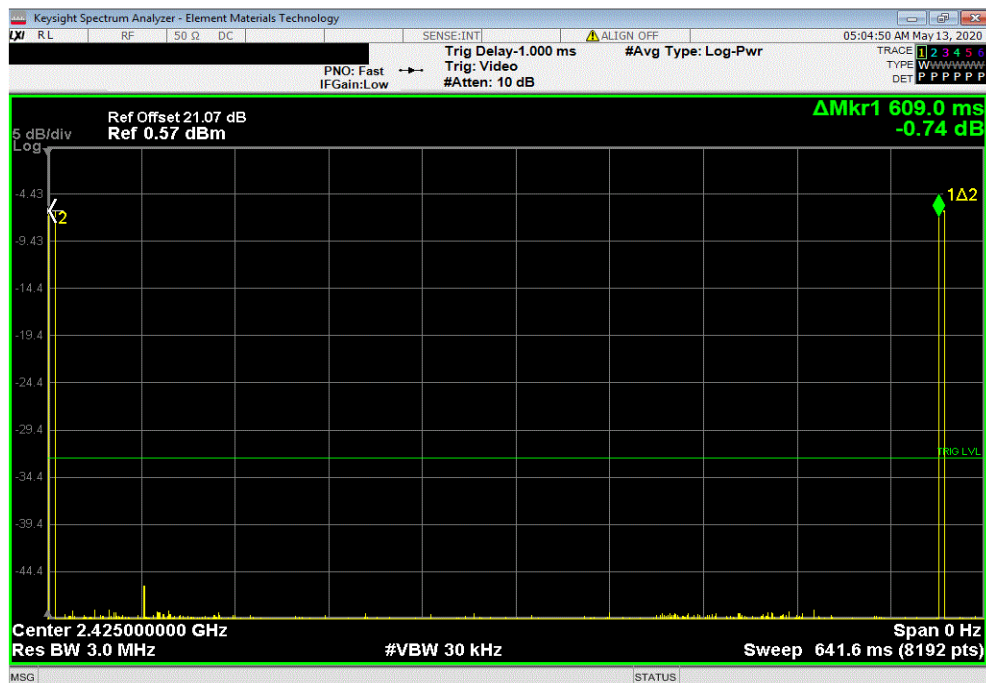
|                                                                                   |                |                                 |             |
|-----------------------------------------------------------------------------------|----------------|---------------------------------|-------------|
| EUT: WDS                                                                          |                | Work Order: GCPA0001            |             |
| Serial Number: 2019-EW6762-8151                                                   |                | Date: 12-May-20                 |             |
| Customer: GCPAT                                                                   |                | Temperature: 22.6 °C            |             |
| Attendees: None                                                                   |                | Humidity: 22.1% RH              |             |
| Project: None                                                                     |                | Barometric Pres.: 1026 mbar     |             |
| Tested by: Andrew Rogstad                                                         | Power: 3.6 VDC | Job Site: MN08                  |             |
| TEST SPECIFICATIONS                                                               |                | Test Method                     |             |
| FCC 15.247:2020                                                                   |                | ANSI C63.10:2013                |             |
| COMMENTS                                                                          |                |                                 |             |
| Reference level offset includes measurment cable, DC block, and 20 DB attenuator. |                |                                 |             |
| DEVIATIONS FROM TEST STANDARD                                                     |                |                                 |             |
| None                                                                              |                |                                 |             |
| Configuration #                                                                   | 1              | Signature <i>Andrew Rogstad</i> |             |
|                                                                                   |                | Pulse Width (ms)                | Period (ms) |
| 250 kBits/s, Single Channel, 2425 MHz, Pulse Width                                |                | 4.15                            | N/A         |
| 250 kBits/s, Single Channel, 2425 MHz, Period                                     |                | N/A                             | 609         |
| 250 kBits/s, Single Channel, 2425 MHz, Pulse Train                                |                | N/A                             | N/A         |
|                                                                                   |                | Value (%)                       | Limit       |
|                                                                                   |                | N/A                             | N/A         |
|                                                                                   |                | 0.68                            | N/A         |
|                                                                                   |                | N/A                             | N/A         |
|                                                                                   |                |                                 | Result      |
|                                                                                   |                |                                 | N/A         |
|                                                                                   |                |                                 | N/A         |
|                                                                                   |                |                                 | N/A         |

# DUTY CYCLE - WDS

| 250 kBits/s, Single Channel, 2425 MHz, Pulse Width |                |              |       |        |  |  |
|----------------------------------------------------|----------------|--------------|-------|--------|--|--|
| Pulse Width<br>(ms)                                | Period<br>(ms) | Value<br>(%) | Limit | Result |  |  |
| 4.15                                               | N/A            | N/A          | N/A   | N/A    |  |  |



| 250 kBits/s, Single Channel, 2425 MHz, Period |                |              |       |        |  |  |
|-----------------------------------------------|----------------|--------------|-------|--------|--|--|
| Pulse Width<br>(ms)                           | Period<br>(ms) | Value<br>(%) | Limit | Result |  |  |
| N/A                                           | 609            | 0.68         | N/A   | N/A    |  |  |

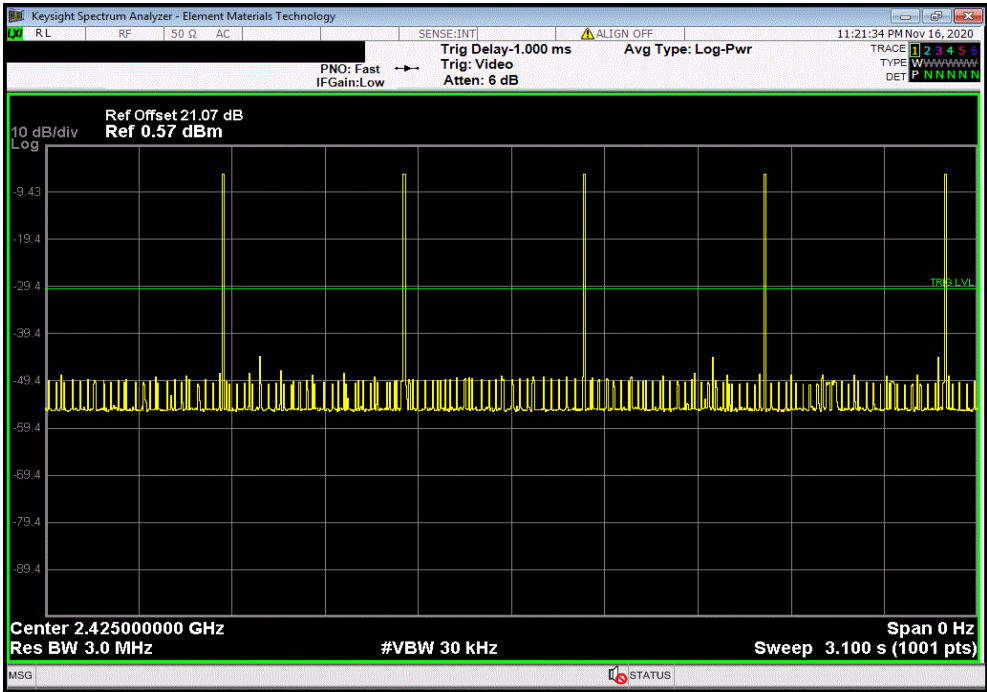


DUTY CYCLE - CWR



XMR 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz, Pulse Train |  |        |  |       |       |        |
|----------------------------------------------------|--|--------|--|-------|-------|--------|
| Pulse Width                                        |  | Period |  | Value | Limit | Result |
| (ms)                                               |  | (ms)   |  | (%)   |       |        |
| N/A                                                |  | N/A    |  | N/A   | N/A   | N/A    |



# SPURIOUS RADIATED EMISSIONS - WDS



PSA-ESCI 2020.04.03.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## MODES OF OPERATION

Transmitting at 2425 MHz, 250 kBits/s

## POWER SETTINGS INVESTIGATED

3.6 VDC

## CONFIGURATIONS INVESTIGATED

GCPA0001 - 2

## FREQUENCY RANGE INVESTIGATED

|                 |        |                |           |
|-----------------|--------|----------------|-----------|
| Start Frequency | 30 MHz | Stop Frequency | 26500 MHz |
|-----------------|--------|----------------|-----------|

## SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                          | ID  | Last Cal.  | Interval |
|------------------------------|--------------------|--------------------------------|-----|------------|----------|
| Filter - High Pass           | Micro-Tronics      | HPM50111                       | LFN | 2019-09-12 | 12 mo    |
| Attenuator                   | Fairview Microwave | SA18E-20                       | TWZ | 2019-09-17 | 12 mo    |
| Attenuator                   | Fairview Microwave | SA18E-10                       | TYA | 2019-09-17 | 12 mo    |
| Amplifier - Pre-Amplifier    | Miteq              | JSD4-18002600-26-8P            | APU | 2019-09-11 | 12 mo    |
| Cable                        | ESM Cable Corp.    | TTBJ141 KMKM-72                | MNP | 2019-09-11 | 12 mo    |
| Antenna - Standard Gain      | ETS Lindgren       | 3160-09                        | AHG | NCR        | 0 mo     |
| Amplifier - Pre-Amplifier    | Miteq              | AMF-6F-12001800-30-10P         | AVW | 2020-01-17 | 12 mo    |
| Antenna - Standard Gain      | ETS Lindgren       | 3160-08                        | AIQ | NCR        | 0 mo     |
| Amplifier - Pre-Amplifier    | Miteq              | AMF-6F-08001200-30-10P         | AVV | 2020-01-17 | 12 mo    |
| Cable                        | ESM Cable Corp.    | Standard Gain Horn Cables      | MNJ | 2020-03-10 | 12 mo    |
| Antenna - Standard Gain      | ETS Lindgren       | 3160-07                        | AXP | NCR        | 0 mo     |
| Amplifier - Pre-Amplifier    | Miteq              | AMF-3D-00100800-32-13P         | AVT | 2020-01-17 | 12 mo    |
| Cable                        | ESM Cable Corp.    | Double Ridge Guide Horn Cables | MNI | 2019-09-17 | 12 mo    |
| Antenna - Double Ridge       | ETS-Lindgren       | 3115                           | AJQ | 2019-01-16 | 24 mo    |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A                         | AFN | 2019-12-23 | 12 mo    |
| Amplifier - Pre-Amplifier    | Miteq              | AM-1616-1000                   | AVO | 2019-10-18 | 12 mo    |
| Cable                        | ESM Cable Corp.    | Bilog Cables                   | MNH | 2019-10-18 | 12 mo    |
| Antenna - Biconilog          | ETS Lindgren       | 3142D                          | AXO | 2019-09-03 | 24 mo    |

## TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector

PK = Peak Detector

AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of  $10 \cdot \log(1/dc)$ . In the case of an EUT with a fixed duty cycle, the formula  $20 \cdot \log(dc)$  is used to derive the duty cycle correction factor that is added to the peak measurement to calculate the average measurement.

# SPURIOUS RADIATED EMISSIONS - WDS

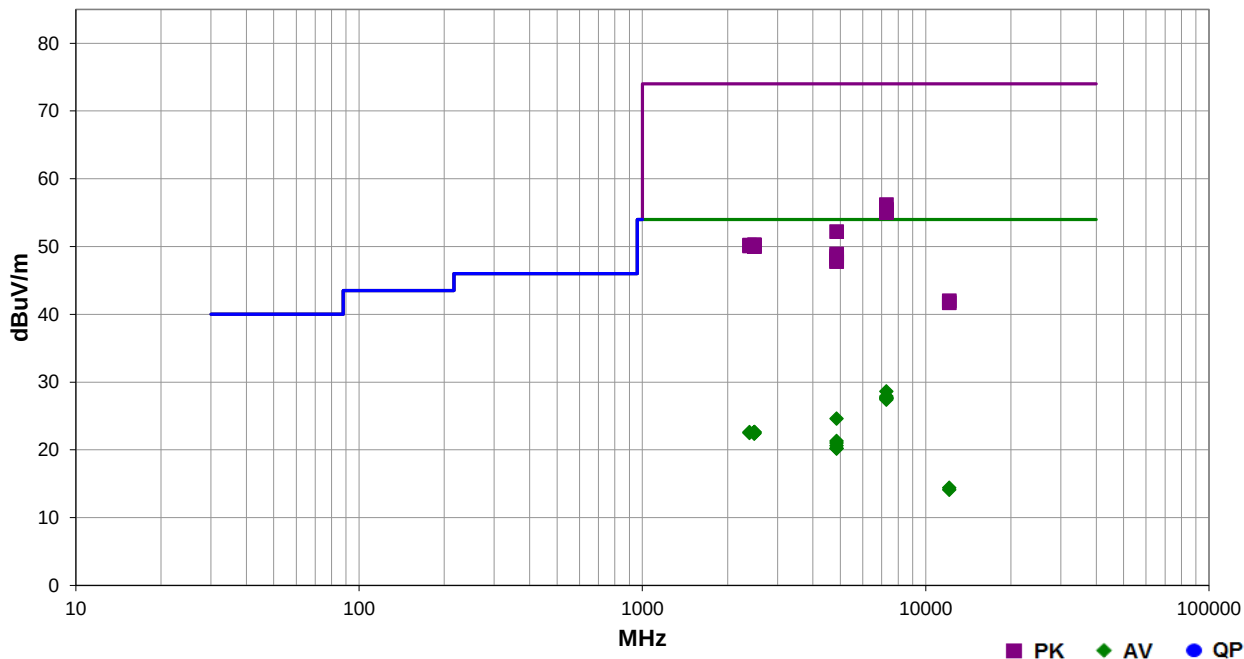


EmiR5 2020.04.20.0

PSA-ESCI 2020.04.03.0

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                |                   |            |                           |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|---------------------------|
| Work Order:     | GCPA0001                                                                                                                                                                                                                                                                                                                                                                                                       | Date:             | 2020-05-13 |                           |
| Project:        | None                                                                                                                                                                                                                                                                                                                                                                                                           | Temperature:      | 21.2 °C    |                           |
| Job Site:       | MN05                                                                                                                                                                                                                                                                                                                                                                                                           | Humidity:         | 23% RH     |                           |
| Serial Number:  | 2019-EW6762-8149                                                                                                                                                                                                                                                                                                                                                                                               | Barometric Pres.: | 1021 mbar  | Tested by: Andrew Rogstad |
| EUT:            | WDS                                                                                                                                                                                                                                                                                                                                                                                                            |                   |            |                           |
| Configuration:  | 2                                                                                                                                                                                                                                                                                                                                                                                                              |                   |            |                           |
| Customer:       | GCPAT                                                                                                                                                                                                                                                                                                                                                                                                          |                   |            |                           |
| Attendees:      | None                                                                                                                                                                                                                                                                                                                                                                                                           |                   |            |                           |
| EUT Power:      | 3.6 VDC                                                                                                                                                                                                                                                                                                                                                                                                        |                   |            |                           |
| Operating Mode: | Transmitting at 2425 MHz, 250 kBits/s                                                                                                                                                                                                                                                                                                                                                                          |                   |            |                           |
| Deviations:     | None                                                                                                                                                                                                                                                                                                                                                                                                           |                   |            |                           |
| Comments:       | The EUT, as tested, was measured to have an on time of 4.146 ms in a 100 ms window. The customer indicated that this was the maximum on time in any 100 ms window as the EUT only transmits once every 30 seconds, so a Duty Cycle Correction Factor (DCCF) of -27.6 dB was calculated via the equation $DCCF = 20 \cdot \log(DC)$ . The DCCF was added to the peak measurements to derive the average values. |                   |            |                           |

| Test Specifications |   |                   |   | Test Method       |           |         |      |
|---------------------|---|-------------------|---|-------------------|-----------|---------|------|
| FCC 15.247:2020     |   |                   |   | ANSI C63.10:2013  |           |         |      |
|                     |   |                   |   |                   |           |         |      |
| Run #               | 4 | Test Distance (m) | 3 | Antenna Height(s) | 1 to 4(m) | Results | Pass |



| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Duty Cycle Correction Factor (dB) | External Attenuation (dB) | Polarity/ Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments    |
|------------|------------------|-------------|-------------------------|-------------------|-----------------------------------|---------------------------|---------------------------|----------|--------------------------|-------------------|----------------------|------------------------|-------------|
| 7273.742   | 42.8             | 13.4        | 1.2                     | 220.0             | 0.0                               | 0.0                       | Horz                      | PK       | 0.0                      | 56.2              | 74.0                 | -17.8                  | EUT vert    |
| 7273.208   | 42.2             | 13.3        | 1.5                     | 209.0             | 0.0                               | 0.0                       | Horz                      | PK       | 0.0                      | 55.5              | 74.0                 | -18.5                  | EUT horz    |
| 7274.575   | 41.9             | 13.4        | 3.3                     | 132.9             | 0.0                               | 0.0                       | Horz                      | PK       | 0.0                      | 55.3              | 74.0                 | -18.7                  | EUT on side |
| 7276.892   | 41.8             | 13.4        | 1.5                     | 70.0              | 0.0                               | 0.0                       | Vert                      | PK       | 0.0                      | 55.2              | 74.0                 | -18.8                  | EUT horz    |
| 7275.708   | 41.8             | 13.4        | 1.1                     | 128.9             | 0.0                               | 0.0                       | Vert                      | PK       | 0.0                      | 55.2              | 74.0                 | -18.8                  | EUT on side |
| 7273.408   | 41.7             | 13.3        | 1.5                     | 139.9             | 0.0                               | 0.0                       | Vert                      | PK       | 0.0                      | 55.0              | 74.0                 | -19.0                  | EUT vert    |
| 4850.833   | 47.7             | 4.5         | 1.5                     | 182.0             | 0.0                               | 0.0                       | Vert                      | PK       | 0.0                      | 52.2              | 74.0                 | -21.8                  | EUT horz    |
| 2484.943   | 44.0             | -3.8        | 1.5                     | 1.9               | 0.0                               | 10.0                      | Horz                      | PK       | 0.0                      | 50.2              | 74.0                 | -23.8                  | EUT horz    |
| 2483.680   | 44.0             | -3.8        | 1.5                     | 181.9             | 0.0                               | 10.0                      | Vert                      | PK       | 0.0                      | 50.2              | 74.0                 | -23.8                  | EUT horz    |
| 2483.933   | 44.0             | -3.8        | 1.5                     | 175.9             | 0.0                               | 10.0                      | Horz                      | PK       | 0.0                      | 50.2              | 74.0                 | -23.8                  | EUT on side |
| 2484.283   | 44.0             | -3.8        | 1.5                     | 41.8              | 0.0                               | 10.0                      | Vert                      | PK       | 0.0                      | 50.2              | 74.0                 | -23.8                  | EUT vert    |
| 2389.817   | 43.9             | -3.7        | 1.5                     | 351.0             | 0.0                               | 10.0                      | Vert                      | PK       | 0.0                      | 50.2              | 74.0                 | -23.8                  | EUT horz    |
| 2388.923   | 43.8             | -3.7        | 1.5                     | 234.1             | 0.0                               | 10.0                      | Horz                      | PK       | 0.0                      | 50.1              | 74.0                 | -23.9                  | EUT horz    |

| Freq<br>(MHz) | Amplitude<br>(dBuV) | Factor<br>(dB) | Antenna Height<br>(meters) | Azimuth<br>(degrees) | Duty Cycle<br>Correction<br>Factor<br>(dB) | External<br>Attenuation<br>(dB) | Polarity/<br>Transducer<br>Type | Detector | Distance<br>Adjustment<br>(dB) | Adjusted<br>(dBuV/m) | Spec. Limit<br>(dBuV/m) | Compared to<br>Spec.<br>(dB) | Comments    |
|---------------|---------------------|----------------|----------------------------|----------------------|--------------------------------------------|---------------------------------|---------------------------------|----------|--------------------------------|----------------------|-------------------------|------------------------------|-------------|
| 2485.033      | 43.8                | -3.8           | 1.5                        | 163.1                | 0.0                                        | 10.0                            | Vert                            | PK       | 0.0                            | 50.0                 | 74.0                    | -24.0                        | EUT on side |
| 2484.843      | 43.8                | -3.8           | 1.5                        | 37.9                 | 0.0                                        | 10.0                            | Horz                            | PK       | 0.0                            | 50.0                 | 74.0                    | -24.0                        | EUT vert    |
| 4850.875      | 44.4                | 4.5            | 1.5                        | 11.9                 | 0.0                                        | 0.0                             | Horz                            | PK       | 0.0                            | 48.9                 | 74.0                    | -25.1                        | EUT vert    |
| 4849.583      | 44.1                | 4.5            | 1.5                        | 55.8                 | 0.0                                        | 0.0                             | Vert                            | PK       | 0.0                            | 48.6                 | 74.0                    | -25.4                        | EUT vert    |
| 4850.992      | 43.7                | 4.5            | 1.7                        | 76.9                 | 0.0                                        | 0.0                             | Vert                            | PK       | 0.0                            | 48.2                 | 74.0                    | -25.8                        | EUT on side |
| 4850.283      | 43.3                | 4.5            | 1.5                        | 55.9                 | 0.0                                        | 0.0                             | Horz                            | PK       | 0.0                            | 47.8                 | 74.0                    | -26.2                        | EUT horz    |
| 4849.292      | 43.3                | 4.5            | 1.5                        | 22.0                 | 0.0                                        | 0.0                             | Horz                            | PK       | 0.0                            | 47.8                 | 74.0                    | -26.2                        | EUT on side |
| 12126.280     | 42.2                | -0.2           | 1.5                        | 163.0                | 0.0                                        | 0.0                             | Horz                            | PK       | 0.0                            | 42.0                 | 74.0                    | -32.0                        | EUT horz    |
| 12122.560     | 41.8                | -0.1           | 1.5                        | 316.9                | 0.0                                        | 0.0                             | Vert                            | PK       | 0.0                            | 41.7                 | 74.0                    | -32.3                        | EUT horz    |
| 7273.742      | 42.8                | 13.4           | 1.2                        | 220.0                | -27.6                                      | 0.0                             | Horz                            | AV       | 0.0                            | 28.6                 | 74.0                    | -45.4                        | EUT vert    |
| 7273.208      | 42.2                | 13.3           | 1.5                        | 209.0                | -27.6                                      | 0.0                             | Horz                            | AV       | 0.0                            | 27.9                 | 74.0                    | -46.1                        | EUT horz    |
| 7274.575      | 41.9                | 13.4           | 3.3                        | 132.9                | -27.6                                      | 0.0                             | Horz                            | AV       | 0.0                            | 27.7                 | 74.0                    | -46.3                        | EUT on side |
| 7276.892      | 41.8                | 13.4           | 1.5                        | 70.0                 | -27.6                                      | 0.0                             | Vert                            | AV       | 0.0                            | 27.6                 | 74.0                    | -46.4                        | EUT horz    |
| 7275.708      | 41.8                | 13.4           | 1.1                        | 128.9                | -27.6                                      | 0.0                             | Vert                            | AV       | 0.0                            | 27.6                 | 74.0                    | -46.4                        | EUT on side |
| 7273.408      | 41.7                | 13.3           | 1.5                        | 139.9                | -27.6                                      | 0.0                             | Vert                            | AV       | 0.0                            | 27.4                 | 74.0                    | -46.6                        | EUT vert    |
| 4850.833      | 47.7                | 4.5            | 1.5                        | 182.0                | -27.6                                      | 0.0                             | Vert                            | AV       | 0.0                            | 24.6                 | 74.0                    | -49.4                        | EUT horz    |
| 2484.943      | 44.0                | -3.8           | 1.5                        | 1.9                  | -27.6                                      | 10.0                            | Horz                            | AV       | 0.0                            | 22.6                 | 74.0                    | -51.4                        | EUT horz    |
| 2483.680      | 44.0                | -3.8           | 1.5                        | 181.9                | -27.6                                      | 10.0                            | Vert                            | AV       | 0.0                            | 22.6                 | 74.0                    | -51.4                        | EUT horz    |
| 2483.933      | 44.0                | -3.8           | 1.5                        | 175.9                | -27.6                                      | 10.0                            | Horz                            | AV       | 0.0                            | 22.6                 | 74.0                    | -51.4                        | EUT on side |
| 2484.283      | 44.0                | -3.8           | 1.5                        | 41.8                 | -27.6                                      | 10.0                            | Vert                            | AV       | 0.0                            | 22.6                 | 74.0                    | -51.4                        | EUT vert    |
| 2389.817      | 43.9                | -3.7           | 1.5                        | 351.0                | -27.6                                      | 10.0                            | Vert                            | AV       | 0.0                            | 22.6                 | 74.0                    | -51.4                        | EUT horz    |
| 2388.923      | 43.8                | -3.7           | 1.5                        | 234.1                | -27.6                                      | 10.0                            | Horz                            | AV       | 0.0                            | 22.5                 | 74.0                    | -51.5                        | EUT horz    |
| 2485.033      | 43.8                | -3.8           | 1.5                        | 163.1                | -27.6                                      | 10.0                            | Vert                            | AV       | 0.0                            | 22.4                 | 74.0                    | -51.6                        | EUT on side |
| 2484.843      | 43.8                | -3.8           | 1.5                        | 37.9                 | -27.6                                      | 10.0                            | Horz                            | AV       | 0.0                            | 22.4                 | 74.0                    | -51.6                        | EUT vert    |
| 4850.875      | 44.4                | 4.5            | 1.5                        | 11.9                 | -27.6                                      | 0.0                             | Horz                            | AV       | 0.0                            | 21.3                 | 74.0                    | -52.7                        | EUT vert    |
| 4849.583      | 44.1                | 4.5            | 1.5                        | 55.8                 | -27.6                                      | 0.0                             | Vert                            | AV       | 0.0                            | 21.0                 | 74.0                    | -53.0                        | EUT vert    |
| 4850.992      | 43.7                | 4.5            | 1.7                        | 76.9                 | -27.6                                      | 0.0                             | Vert                            | AV       | 0.0                            | 20.6                 | 74.0                    | -53.4                        | EUT on side |
| 4850.283      | 43.3                | 4.5            | 1.5                        | 55.9                 | -27.6                                      | 0.0                             | Horz                            | AV       | 0.0                            | 20.2                 | 74.0                    | -53.8                        | EUT horz    |
| 4849.292      | 43.3                | 4.5            | 1.5                        | 22.0                 | -27.6                                      | 0.0                             | Horz                            | AV       | 0.0                            | 20.2                 | 74.0                    | -53.8                        | EUT on side |
| 12126.280     | 42.2                | -0.2           | 1.5                        | 163.0                | -27.6                                      | 0.0                             | Horz                            | AV       | 0.0                            | 14.4                 | 74.0                    | -59.6                        | EUT horz    |
| 12122.560     | 41.8                | -0.1           | 1.5                        | 316.9                | -27.6                                      | 0.0                             | Vert                            | AV       | 0.0                            | 14.1                 | 74.0                    | -59.9                        | EUT horz    |

# OCCUPIED BANDWIDTH - WDS



XMIT 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                 | ID  | Last Cal. | Cal. Due  |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Power Supply - DC            | Agilent            | U8002A                | TPZ | NCR       | NCR       |
| Generator - Signal           | Agilent            | E4422B                | TGQ | 15-Mar-18 | 15-Mar-21 |
| Block - DC                   | Fairview Microwave | SD3379                | AMI | 6-Aug-19  | 6-Aug-20  |
| Attenuator                   | S.M. Electronics   | SA26B-20              | RFW | 10-Feb-20 | 10-Feb-21 |
| Cable                        | Micro-Coax         | UFD150A-1-0720-200200 | MNL | 15-Sep-19 | 15-Sep-20 |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A (EXA)          | AFQ | 21-Dec-19 | 21-Dec-20 |

## TEST DESCRIPTION

The EUT was set to the channels and modes listed in the datasheet.

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

# OCCUPIED BANDWIDTH - WDS



TSTx 2019.08.30.0 XMR 2020.03.25.0

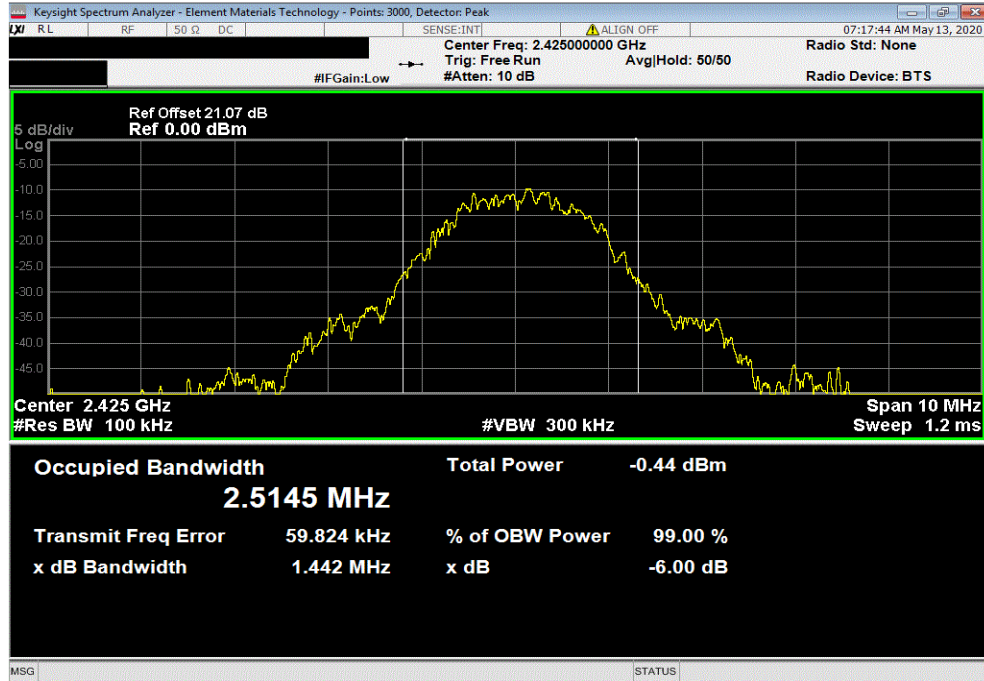
|                                                                                   |   |                                 |              |
|-----------------------------------------------------------------------------------|---|---------------------------------|--------------|
| EUT: WDS                                                                          |   | Work Order: GCPA0001            |              |
| Serial Number: 2019-EW6762-8151                                                   |   | Date: 12-May-20                 |              |
| Customer: GCPAT                                                                   |   | Temperature: 23.5 °C            |              |
| Attendees: None                                                                   |   | Humidity: 22.5% RH              |              |
| Project: None                                                                     |   | Barometric Pres.: 1025 mbar     |              |
| Tested by: Andrew Rogstad                                                         |   | Power: 3.6 VDC                  |              |
|                                                                                   |   | Job Site: MN08                  |              |
| TEST SPECIFICATIONS                                                               |   | Test Method                     |              |
| FCC 15.247:2020                                                                   |   | ANSI C63.10:2013                |              |
| COMMENTS                                                                          |   |                                 |              |
| Reference level offset includes measurment cable, DC block, and 20 DB attenuator. |   |                                 |              |
| DEVIATIONS FROM TEST STANDARD                                                     |   |                                 |              |
| None                                                                              |   |                                 |              |
| Configuration #                                                                   | 1 | Signature <i>Andrew Rogstad</i> |              |
|                                                                                   |   | Value                           | Limit<br>(>) |
| 250 kBits/s, Single Channel, 2425 MHz                                             |   | 1.442 MHz                       | 500 kHz      |
|                                                                                   |   |                                 | Result       |
|                                                                                   |   |                                 | Pass         |

# OCCUPIED BANDWIDTH - WDS



TbTx 2019.08.30.0 XMR 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz |  |  |  |           |         |        |
|---------------------------------------|--|--|--|-----------|---------|--------|
|                                       |  |  |  | Value     | Limit   | Result |
|                                       |  |  |  | 1.442 MHz | 500 kHz | Pass   |



# OUTPUT POWER - WDS



XMIT 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                 | ID  | Last Cal. | Cal. Due  |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Power Supply - DC            | Agilent            | U8002A                | TPZ | NCR       | NCR       |
| Generator - Signal           | Agilent            | E4422B                | TGQ | 15-Mar-18 | 15-Mar-21 |
| Block - DC                   | Fairview Microwave | SD3379                | AMI | 6-Aug-19  | 6-Aug-20  |
| Attenuator                   | S.M. Electronics   | SA26B-20              | RFW | 10-Feb-20 | 10-Feb-21 |
| Cable                        | Micro-Coax         | UFD150A-1-0720-200200 | MNL | 15-Sep-19 | 15-Sep-20 |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A (EXA)          | AFQ | 21-Dec-19 | 21-Dec-20 |

## TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

# OUTPUT POWER - WDS



TSTx 2019.08.30.0 XMR 2020.03.25.0

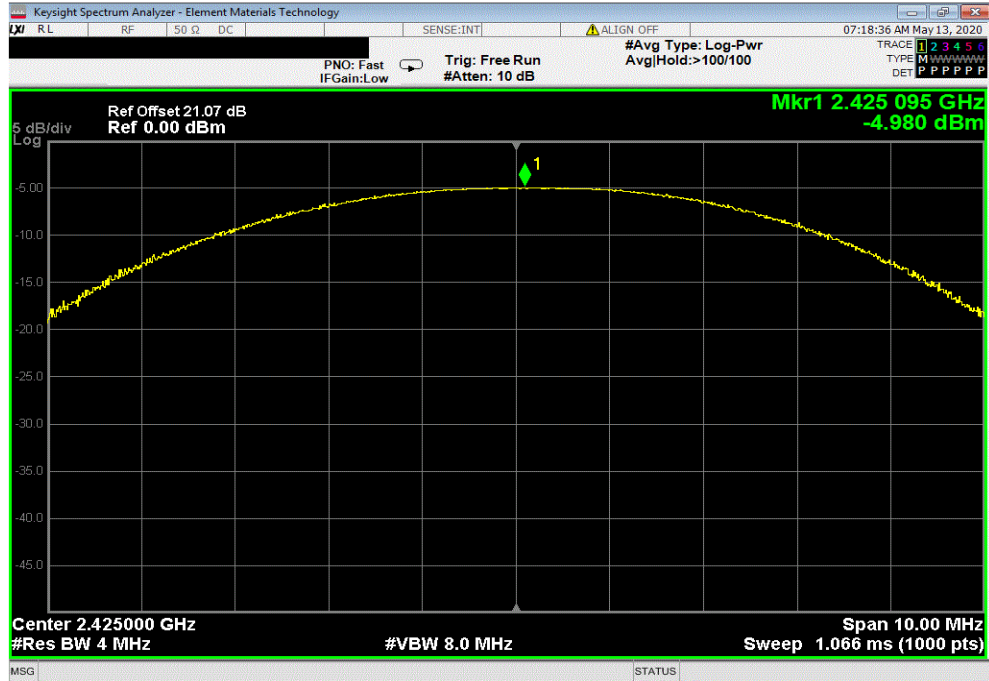
|                                                                                   |   |                                 |             |
|-----------------------------------------------------------------------------------|---|---------------------------------|-------------|
| EUT: WDS                                                                          |   | Work Order: GCPA0001            |             |
| Serial Number: 2019-EW6762-8151                                                   |   | Date: 12-May-20                 |             |
| Customer: GCPAT                                                                   |   | Temperature: 23.5 °C            |             |
| Attendees: None                                                                   |   | Humidity: 22.4% RH              |             |
| Project: None                                                                     |   | Barometric Pres.: 1025 mbar     |             |
| Tested by: Andrew Rogstad                                                         |   | Power: 3.6 VDC                  |             |
|                                                                                   |   | Job Site: MN08                  |             |
| TEST SPECIFICATIONS                                                               |   |                                 |             |
| FCC 15.247:2020                                                                   |   | Test Method                     |             |
|                                                                                   |   | ANSI C63.10:2013                |             |
| COMMENTS                                                                          |   |                                 |             |
| Reference level offset includes measurment cable, DC block, and 20 DB attenuator. |   |                                 |             |
| DEVIATIONS FROM TEST STANDARD                                                     |   |                                 |             |
| None                                                                              |   |                                 |             |
| Configuration #                                                                   | 1 | Signature <i>Andrew Rogstad</i> |             |
|                                                                                   |   | Out Pwr (dBm)                   | Limit (dBm) |
| 250 kBits/s, Single Channel, 2425 MHz                                             |   | -4.98                           | 30          |
|                                                                                   |   |                                 | Result      |
|                                                                                   |   |                                 | Pass        |

# OUTPUT POWER - WDS



TbTx 2019.08.30.0 XMt 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz |  |  |  |                  |                |        |
|---------------------------------------|--|--|--|------------------|----------------|--------|
|                                       |  |  |  | Out Pwr<br>(dBm) | Limit<br>(dBm) | Result |
|                                       |  |  |  | -4.98            | 30             | Pass   |



# EQUIVALENT ISOTROPIC RADIATED POWER (EIRP) - WDS



XMIT 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                 | ID  | Last Cal. | Cal. Due  |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Power Supply - DC            | Agilent            | U8002A                | TPZ | NCR       | NCR       |
| Generator - Signal           | Agilent            | E4422B                | TGQ | 15-Mar-18 | 15-Mar-21 |
| Block - DC                   | Fairview Microwave | SD3379                | AMI | 6-Aug-19  | 6-Aug-20  |
| Attenuator                   | S.M. Electronics   | SA26B-20              | RFW | 10-Feb-20 | 10-Feb-21 |
| Cable                        | Micro-Coax         | UFD150A-1-0720-200200 | MNL | 15-Sep-19 | 15-Sep-20 |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A (EXA)          | AFQ | 21-Dec-19 | 21-Dec-20 |

## TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

The antenna gain was added to the measured conducted output power to calculate the EIRP.

# EQUIVALENT ISOTROPIC RADIATED POWER (EIRP) - WDS



TSTx 2019.08.30.0 XMR 2020.03.25.0

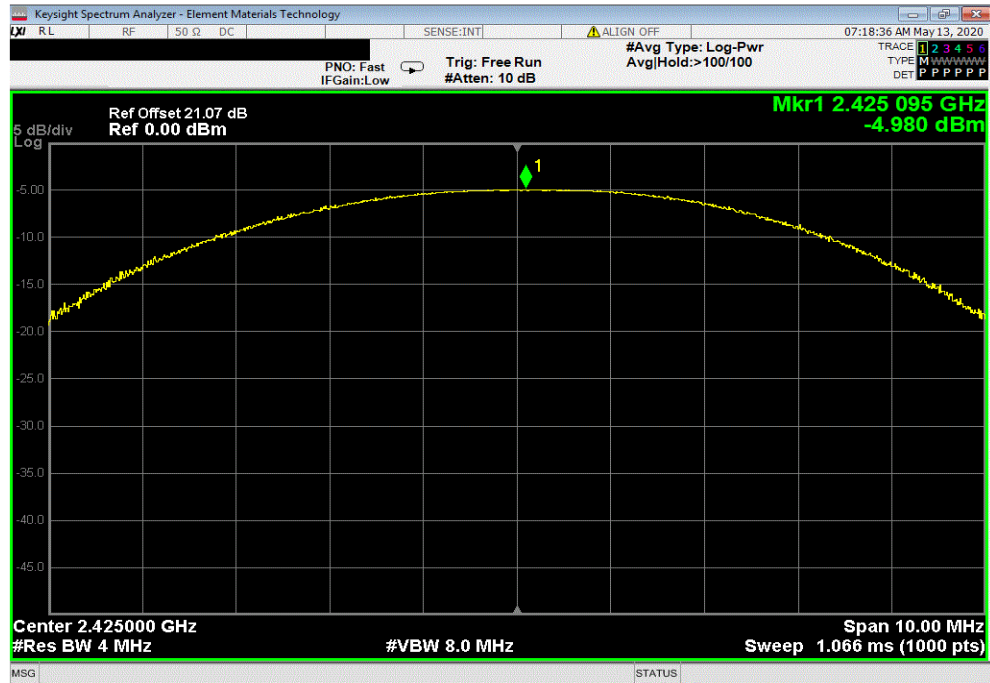
|                                                                                   |   |                                 |                    |
|-----------------------------------------------------------------------------------|---|---------------------------------|--------------------|
| EUT: WDS                                                                          |   | Work Order: GCPA0001            |                    |
| Serial Number: 2019-EW6762-8151                                                   |   | Date: 12-May-20                 |                    |
| Customer: GCPAT                                                                   |   | Temperature: 23.4 °C            |                    |
| Attendees: None                                                                   |   | Humidity: 21.7% RH              |                    |
| Project: None                                                                     |   | Barometric Pres.: 1025 mbar     |                    |
| Tested by: Andrew Rogstad                                                         |   | Power: 3.6 VDC                  |                    |
|                                                                                   |   | Job Site: MN08                  |                    |
| TEST SPECIFICATIONS                                                               |   | Test Method                     |                    |
| FCC 15.247:2020                                                                   |   | ANSI C63.10:2013                |                    |
| COMMENTS                                                                          |   |                                 |                    |
| Reference level offset includes measurment cable, DC block, and 20 DB attenuator. |   |                                 |                    |
| DEVIATIONS FROM TEST STANDARD                                                     |   |                                 |                    |
| None                                                                              |   |                                 |                    |
| Configuration #                                                                   | 1 | Signature <i>Andrew Rogstad</i> |                    |
|                                                                                   |   | Out Pwr (dBm)                   | Antenna Gain (dBi) |
|                                                                                   |   | EIRP (dBm)                      | EIRP Limit (dBm)   |
|                                                                                   |   |                                 | Result             |
| 250 kBits/s, Single Channel, 2425 MHz                                             |   | -4.98                           | 2                  |
|                                                                                   |   | -2.98                           | 36                 |
|                                                                                   |   |                                 | Pass               |

# EQUIVALENT ISOTROPIC RADIATED POWER (EIRP) - WDS



TbTtx 2019.08.30.0 XMt 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz |                    |            |                  |        |  |
|---------------------------------------|--------------------|------------|------------------|--------|--|
| Out Pwr (dBm)                         | Antenna Gain (dBi) | EIRP (dBm) | EIRP Limit (dBm) | Result |  |
| -4.98                                 | 2                  | -2.98      | 36               | Pass   |  |



# POWER SPECTRAL DENSITY - WDS



XMIT 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                 | ID  | Last Cal. | Cal. Due  |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Power Supply - DC            | Agilent            | U8002A                | TPZ | NCR       | NCR       |
| Generator - Signal           | Agilent            | E4422B                | TGQ | 15-Mar-18 | 15-Mar-21 |
| Block - DC                   | Fairview Microwave | SD3379                | AMI | 6-Aug-19  | 6-Aug-20  |
| Attenuator                   | S.M. Electronics   | SA26B-20              | RFW | 10-Feb-20 | 10-Feb-21 |
| Cable                        | Micro-Coax         | UFD150A-1-0720-200200 | MNL | 15-Sep-19 | 15-Sep-20 |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A (EXA)          | AFQ | 21-Dec-19 | 21-Dec-20 |

## TEST DESCRIPTION

The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

# POWER SPECTRAL DENSITY - WDS



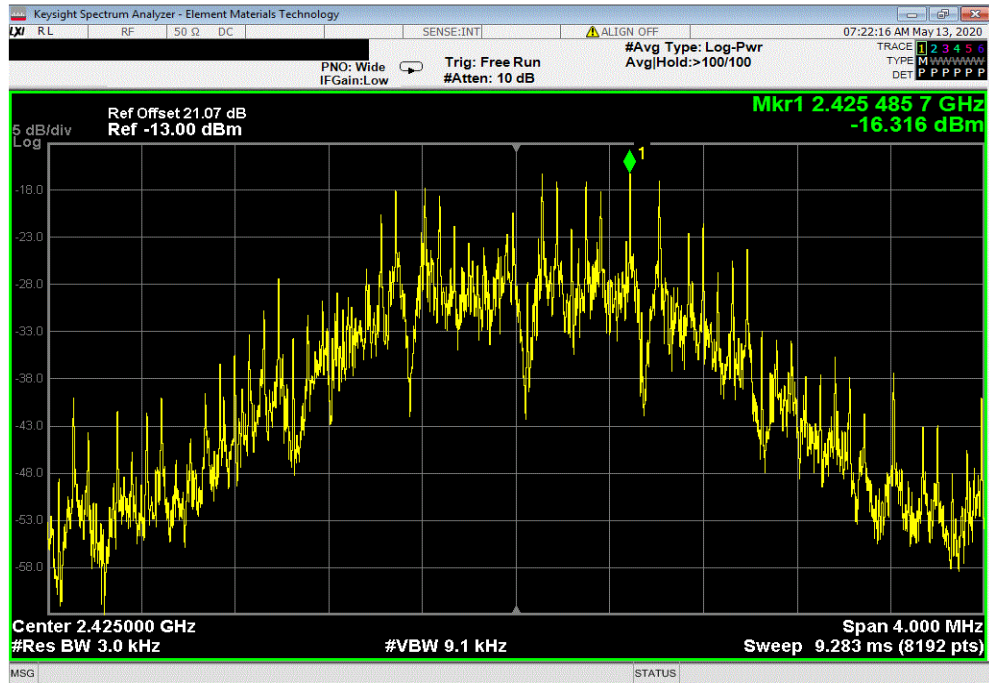
|                                                                                   |   |                                 |                     |
|-----------------------------------------------------------------------------------|---|---------------------------------|---------------------|
| EUT: WDS                                                                          |   | Work Order: GCPA0001            |                     |
| Serial Number: 2019-EW6762-8151                                                   |   | Date: 12-May-20                 |                     |
| Customer: GCPAT                                                                   |   | Temperature: 23.5 °C            |                     |
| Attendees: None                                                                   |   | Humidity: 22.4% RH              |                     |
| Project: None                                                                     |   | Barometric Pres.: 1025 mbar     |                     |
| Tested by: Andrew Rogstad                                                         |   | Power: 3.6 VDC                  |                     |
|                                                                                   |   | Job Site: MN08                  |                     |
| TEST SPECIFICATIONS                                                               |   | Test Method                     |                     |
| FCC 15.247:2020                                                                   |   | ANSI C63.10:2013                |                     |
| COMMENTS                                                                          |   |                                 |                     |
| Reference level offset includes measurment cable, DC block, and 20 DB attenuator. |   |                                 |                     |
| DEVIATIONS FROM TEST STANDARD                                                     |   |                                 |                     |
| None                                                                              |   |                                 |                     |
| Configuration #                                                                   | 1 | Signature <i>Andrew Rogstad</i> |                     |
|                                                                                   |   | Value<br>dBm/3kHz               | Limit<br>< dBm/3kHz |
| 250 kBits/s, Single Channel, 2425 MHz                                             |   | -16.316                         | 8                   |
|                                                                                   |   |                                 | Results<br>Pass     |

# POWER SPECTRAL DENSITY - WDS



TbTtx 2019.08.30.0 XMt 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz |  |  |  |          |            |         |
|---------------------------------------|--|--|--|----------|------------|---------|
|                                       |  |  |  | Value    | Limit      | Results |
|                                       |  |  |  | dBm/3kHz | < dBm/3kHz |         |
|                                       |  |  |  | -16.316  | 8          | Pass    |



# BAND EDGE COMPLIANCE - WDS



XMI 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                 | ID  | Last Cal. | Cal. Due  |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Power Supply - DC            | Agilent            | U8002A                | TPZ | NCR       | NCR       |
| Generator - Signal           | Agilent            | E4422B                | TGQ | 15-Mar-18 | 15-Mar-21 |
| Block - DC                   | Fairview Microwave | SD3379                | AMI | 6-Aug-19  | 6-Aug-20  |
| Attenuator                   | S.M. Electronics   | SA26B-20              | RFW | 10-Feb-20 | 10-Feb-21 |
| Cable                        | Micro-Coax         | UFD150A-1-0720-200200 | MNL | 15-Sep-19 | 15-Sep-20 |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A (EXA)          | AFQ | 21-Dec-19 | 21-Dec-20 |

## TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

# BAND EDGE COMPLIANCE - WDS



TSTx 2019.08.30.0 XMR 2020.03.25.0

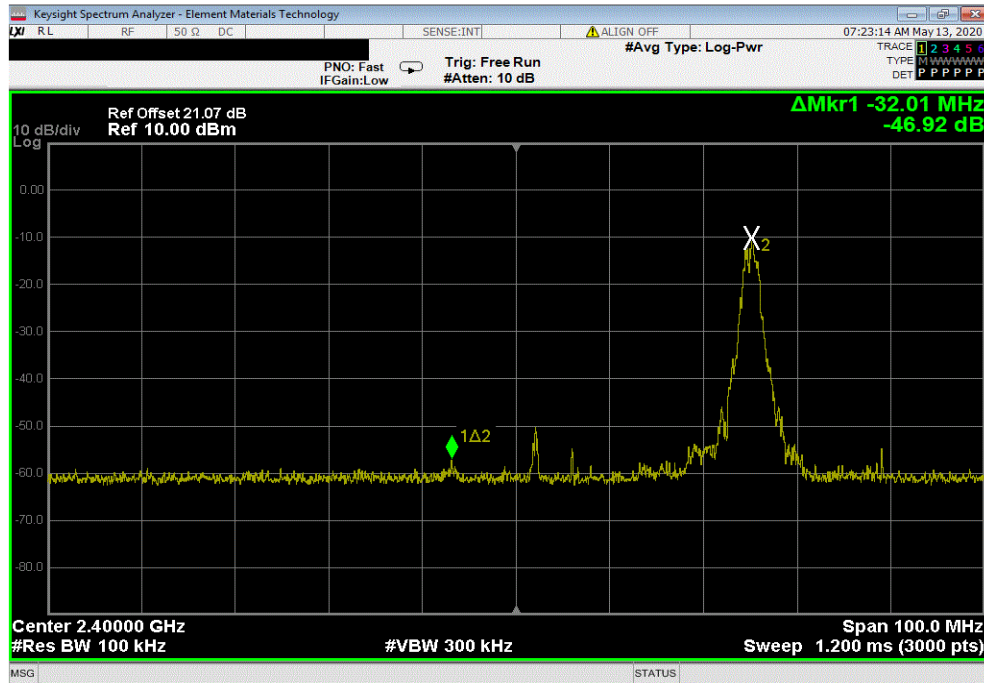
|                                                                                    |   |                                 |                      |      |
|------------------------------------------------------------------------------------|---|---------------------------------|----------------------|------|
| EUT: WDS                                                                           |   | Work Order: GCPA0001            |                      |      |
| Serial Number: 2019-EW6762-8151                                                    |   | Date: 12-May-20                 |                      |      |
| Customer: GCPAT                                                                    |   | Temperature: 23.4 °C            |                      |      |
| Attendees: None                                                                    |   | Humidity: 21.6% RH              |                      |      |
| Project: None                                                                      |   | Barometric Pres.: 1025 mbar     |                      |      |
| Tested by: Andrew Rogstad                                                          |   | Power: 3.6 VDC                  |                      |      |
|                                                                                    |   | Job Site: MN08                  |                      |      |
| TEST SPECIFICATIONS                                                                |   |                                 |                      |      |
| FCC 15.247:2020                                                                    |   | Test Method                     |                      |      |
|                                                                                    |   | ANSI C63.10:2013                |                      |      |
| COMMENTS                                                                           |   |                                 |                      |      |
| Reference level offset includes measurement cable, DC block, and 20 DB attenuator. |   |                                 |                      |      |
| DEVIATIONS FROM TEST STANDARD                                                      |   |                                 |                      |      |
| None                                                                               |   |                                 |                      |      |
| Configuration #                                                                    | 1 | Signature <i>Andrew Rogstad</i> |                      |      |
|                                                                                    |   | Value (dBc)                     | Limit ≤ (dBc) Result |      |
| 250 kBits/s, Single Channel, 2425 MHz, Low Band Edge                               |   | -46.92                          | -20                  | Pass |
| 250 kBits/s, Single Channel, 2425 MHz, High Band Edge                              |   | -46.35                          | -20                  | Pass |

# BAND EDGE COMPLIANCE - WDS

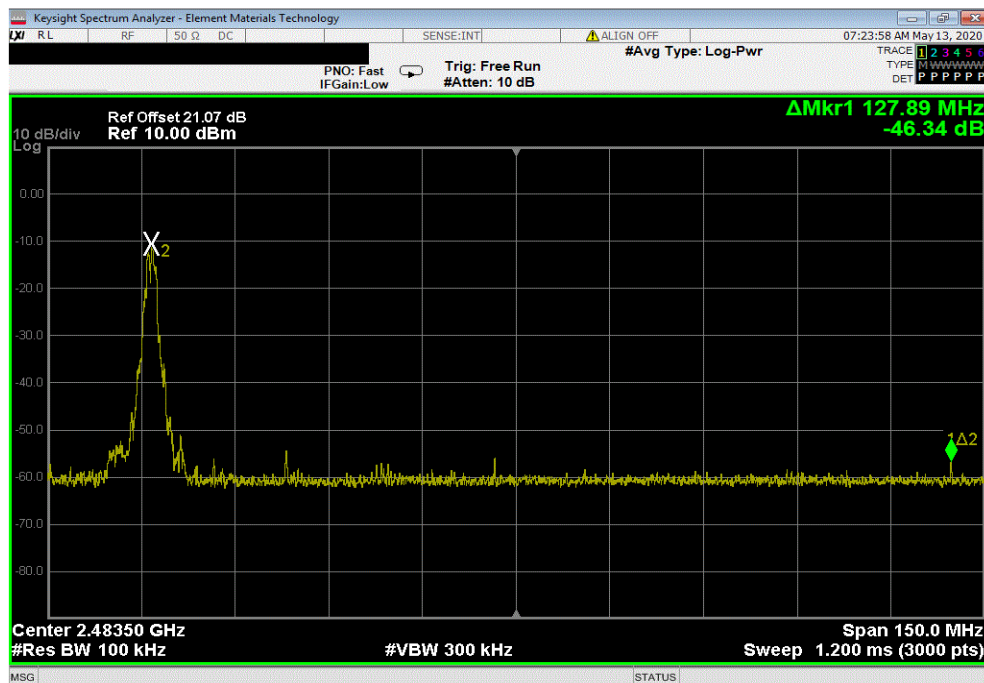


TbTx 2019.08.30.0 XMR 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz, Low Band Edge |  |  |  |                |                  |        |
|------------------------------------------------------|--|--|--|----------------|------------------|--------|
|                                                      |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|                                                      |  |  |  | -46.92         | -20              | Pass   |



| 250 kBits/s, Single Channel, 2425 MHz, High Band Edge |  |  |  |                |                  |        |
|-------------------------------------------------------|--|--|--|----------------|------------------|--------|
|                                                       |  |  |  | Value<br>(dBc) | Limit<br>≤ (dBc) | Result |
|                                                       |  |  |  | -46.35         | -20              | Pass   |



# SPURIOUS CONDUCTED EMISSIONS - WDS



XMIT 2020.03.25.0

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

| Description                  | Manufacturer       | Model                 | ID  | Last Cal. | Cal. Due  |
|------------------------------|--------------------|-----------------------|-----|-----------|-----------|
| Power Supply - DC            | Agilent            | U8002A                | TPZ | NCR       | NCR       |
| Generator - Signal           | Agilent            | E4422B                | TGQ | 15-Mar-18 | 15-Mar-21 |
| Block - DC                   | Fairview Microwave | SD3379                | AMI | 6-Aug-19  | 6-Aug-20  |
| Attenuator                   | S.M. Electronics   | SA26B-20              | RFW | 10-Feb-20 | 10-Feb-21 |
| Cable                        | Micro-Coax         | UFD150A-1-0720-200200 | MNL | 15-Sep-19 | 15-Sep-20 |
| Analyzer - Spectrum Analyzer | Keysight           | N9010A (EXA)          | AFQ | 21-Dec-19 | 21-Dec-20 |

## TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

# SPURIOUS CONDUCTED EMISSIONS - WDS



TSTx 2019.08.30.0 XMR 2020.03.25.0

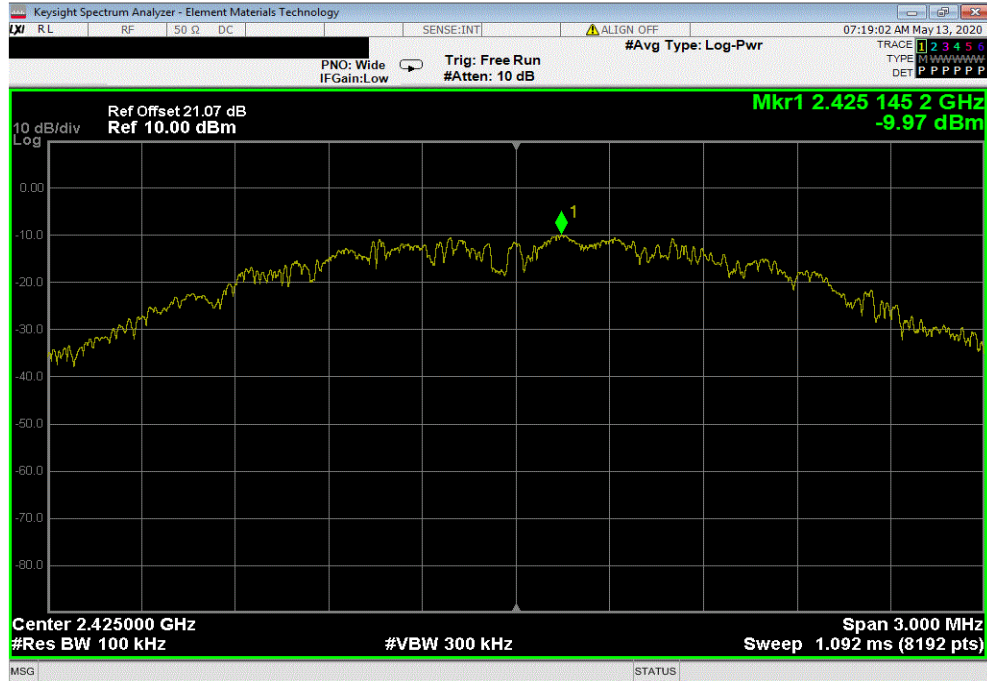
|                                                                                   |                |                                 |                     |
|-----------------------------------------------------------------------------------|----------------|---------------------------------|---------------------|
| EUT: WDS                                                                          |                | Work Order: GCPA0001            |                     |
| Serial Number: 2019-EW6762-8151                                                   |                | Date: 12-May-20                 |                     |
| Customer: GCPAT                                                                   |                | Temperature: 23.5 °C            |                     |
| Attendees: None                                                                   |                | Humidity: 22% RH                |                     |
| Project: None                                                                     |                | Barometric Pres.: 1025 mbar     |                     |
| Tested by: Andrew Rogstad                                                         | Power: 3.6 VDC | Job Site: MN08                  |                     |
| TEST SPECIFICATIONS                                                               |                |                                 |                     |
| FCC 15.247:2020                                                                   |                | Test Method                     |                     |
|                                                                                   |                | ANSI C63.10:2013                |                     |
| COMMENTS                                                                          |                |                                 |                     |
| Reference level offset includes measurment cable, DC block, and 20 DB attenuator. |                |                                 |                     |
| DEVIATIONS FROM TEST STANDARD                                                     |                |                                 |                     |
| None                                                                              |                |                                 |                     |
| Configuration #                                                                   | 1              | Signature <i>Andrew Rogstad</i> |                     |
|                                                                                   |                | Frequency Range                 | Measured Freq (MHz) |
| 250 kBits/s, Single Channel, 2425 MHz                                             |                | Fundamental                     | 2425.15             |
| 250 kBits/s, Single Channel, 2425 MHz                                             |                | 30 MHz - 12.5 GHz               | 2168.98             |
| 250 kBits/s, Single Channel, 2425 MHz                                             |                | 12.5 GHz - 25 GHz               | 24427.73            |
|                                                                                   |                | Max Value (dBc)                 | Limit ≤ (dBc)       |
|                                                                                   |                | N/A                             | N/A                 |
|                                                                                   |                | -37.46                          | -20                 |
|                                                                                   |                | -40.82                          | -20                 |
|                                                                                   |                |                                 | Result              |
|                                                                                   |                |                                 | N/A                 |
|                                                                                   |                |                                 | Pass                |
|                                                                                   |                |                                 | Pass                |

# SPURIOUS CONDUCTED EMISSIONS - WDS

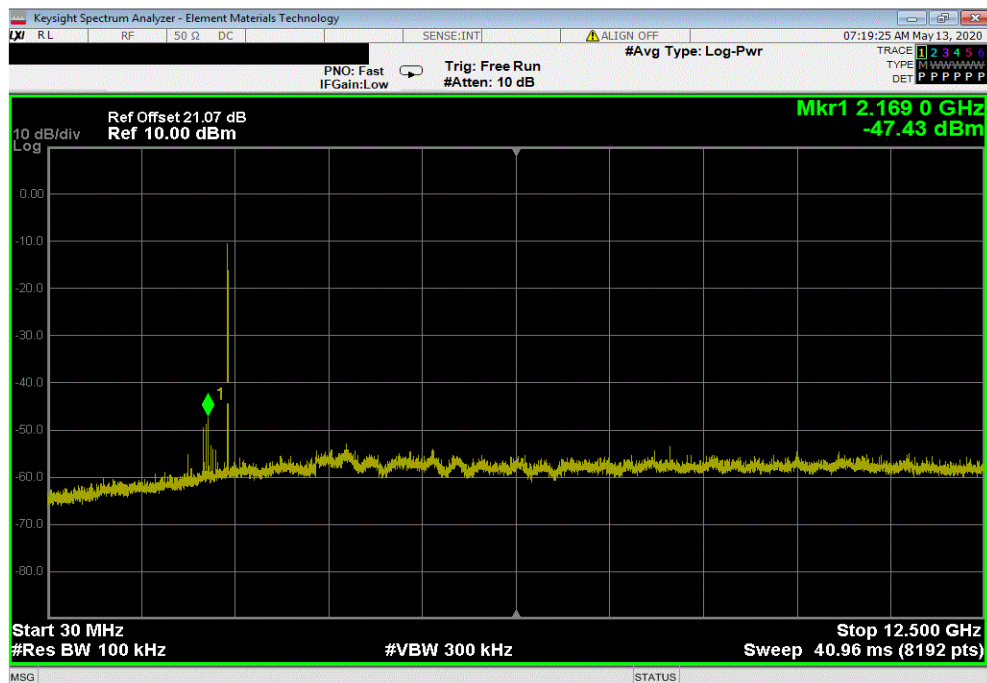


TbTtx 2019.08.30.0 XMt 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz |                     |                 |               |        |  |  |
|---------------------------------------|---------------------|-----------------|---------------|--------|--|--|
| Frequency Range                       | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result |  |  |
| Fundamental                           | 2425.15             | N/A             | N/A           | N/A    |  |  |



| 250 kBits/s, Single Channel, 2425 MHz |                     |                 |               |        |  |  |
|---------------------------------------|---------------------|-----------------|---------------|--------|--|--|
| Frequency Range                       | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result |  |  |
| 30 MHz - 12.5 GHz                     | 2168.98             | -37.46          | -20           | Pass   |  |  |



# SPURIOUS CONDUCTED EMISSIONS - WDS



TbTx 2019.08.30.0 XMt 2020.03.25.0

| 250 kBits/s, Single Channel, 2425 MHz |                     |                 |               |        |  |
|---------------------------------------|---------------------|-----------------|---------------|--------|--|
| Frequency Range                       | Measured Freq (MHz) | Max Value (dBc) | Limit ≤ (dBc) | Result |  |
| 12.5 GHz - 25 GHz                     | 24427.73            | -40.82          | -20           | Pass   |  |

