

Report No.: SEWM2306000197RG01
 Rev.: 01
 Page: 1 of 67

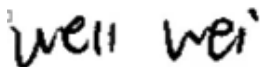
TEST REPORT

Application No.: SEWM2306000197RG
Applicant: Quectel Wireless Solutions Co., Ltd.
Address of Applicant: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer: Quectel Wireless Solutions Co., Ltd.
Address of Manufacturer: Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
EUT Description: Wi-Fi & Bluetooth Module
Model No.: FCS950R
Trade Mark: Quectel
FCC ID: XMR2023FCS950R
Standards: FCC 47 CFR Part 2, Subpart J
 FCC 47 CFR Part 15, Subpart C
Date of Receipt: 2023/06/13
Date of Test: 2023/06/13 to 2023/07/12
Date of Issue: 2023/07/13

| | |
|----------------------|---------------|
| Test Result : | PASS * |
|----------------------|---------------|

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:



Well Wei
 Wireless Laboratory Manager



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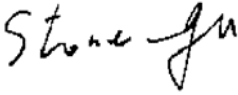
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1 Version

| Revision Record | | | | |
|-----------------|---------|------------|----------|----------|
| Version | Chapter | Date | Modifier | Remark |
| 01 | | 2023/07/13 | | Original |

| | | |
|--------------------|--|---|
| Prepared By | |  <hr/> (Ives Cheng) / Test Engineer |
| Checked By | |  <hr/> (Stone Gu) / Reviewer |



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2 Test Summary

| Test Item | FCC Rule No. | Test Method | Test Result | Result |
|---|-----------------------------|--|-------------|--------------------|
| Antenna Requirement | 15.203/15.247(b) | -- | Clause 4.1 | PASS |
| AC Power Line Conducted Emission | 15.207 | ANSI C63.10-2020 Section 6.2 | Clause 4.3 | PASS |
| Conducted Peak Output Power | 15.247 (b)(1) | ANSI C63.10-2020 Section 11.9.1.2 | Clause 4.4 | PASS |
| 20dB Emission Bandwidth & 99% Occupied Bandwidth | 15.247 (a)(1) | ANSI C63.10-2020 Section 6.9.2/6.9.3 | Clause 4.5 | For Report Purpose |
| Carrier Frequencies Separation | 15.247 (a)(1) | ANSI C63.10-2020 Section 7.8.2 | Clause 4.6 | PASS |
| Hopping Channel Number | 15.247 (a)(1) | ANSI C63.10-2020 Section 7.8.3 | Clause 4.7 | PASS |
| Dwell Time | 15.247 (a)(1) | ANSI C63.10-2020 Section 7.8.4 | Clause 4.8 | PASS |
| Band-edge for RF Conducted Emissions | 15.247(d) | ANSI C63.10-2020 Section 7.8.7.2 | Clause 4.9 | PASS |
| RF Conducted Spurious Emissions | 15.247(d) | ANSI C63.10-2020 Section 7.8.7.1 | Clause 4.10 | PASS |
| Radiated Spurious emissions | 15.247(d); 15.205/15.209 | ANSI C63.10-2020 Section 6.4 / 6.5 / 6.6 | Clause 4.11 | PASS |
| Restricted bands around fundamental frequency (Radiated Emission) | 15.247(d); 15.205/15.209 | ANSI C63.10-2020 Section 6.10.5 | Clause 4.12 | PASS |



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3 General Information

3.1 Details of Client

| | |
|--------------------------|---|
| Applicant: | Quectel Wireless Solutions Co., Ltd. |
| Address of Applicant: | Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233 |
| Manufacturer: | Quectel Wireless Solutions Co., Ltd. |
| Address of Manufacturer: | Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233 |

3.2 Test Location

| | |
|----------------|--|
| Company: | SGS-CSTC Standards Technical Services (Suzhou) Co., Ltd. |
| Address: | South of No. 6 Plant, No. 1, Runsheng Road, Suzhou Industrial Park, Suzhou Area, China (Jiangsu) Pilot Free Trade Zone |
| Post code: | 215000 |
| Test engineer: | Ives Cheng, Tizy Song |

3.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

| |
|--|
| <ul style="list-style-type: none"> • A2LA (Certificate No. 6336.01) SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6336.01. • Innovation, Science and Economic Development Canada SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized by ISED as an accredited testing laboratory. CAB identifier: CN0120. IC#: 27594. • FCC –Designation Number: CN1312 SGS-CSTC STANDARDS TECHNICAL SERVICES (SUZHOU) CO., LTD. has been recognized as an accredited testing laboratory. Designation Number: CN1312. Test Firm Registration Number: 717327 |
|--|



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3.4 General Description of EUT

| | |
|-----------------------|--|
| EUT Description: | Wi-Fi & Bluetooth Module |
| Model No.: | FCS950R |
| Trade Mark: | Quectel |
| Hardware Version: | R1.0 |
| Software Version: | NA |
| SN: | E1N23DT07000059 |
| Operation Frequency: | 2400MHz~2483.5MHz $f_c = 2402 \text{ MHz} + N * 1 \text{ MHz}$, where: - f_c = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 0 to 78. |
| Bluetooth version: | Bluetooth V4.2 |
| Modulation Technique: | Frequency Hopping Spread Spectrum(FHSS) |
| Modulation Type: | GFSK, $\pi/4$ DQPSK, 8DPSK |
| Number of Channel: | 79 |
| Hopping Channel Type: | Adaptive Frequency Hopping systems |
| Antenna Type: | Dipole Antenna |
| Antenna Gain: | 0.73dBi (Ant0) Note: The antenna gain are derived from the gain information report provided by the manufacturer. |
| RF Cable: | 1.0dB |
| Remark: | As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information. |



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| Operation Frequency of each channel | | | | | | | |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 0 | 2402MHz | 20 | 2422MHz | 40 | 2442MHz | 60 | 2462MHz |
| 1 | 2403MHz | 21 | 2423MHz | 41 | 2443MHz | 61 | 2463MHz |
| 2 | 2404MHz | 22 | 2424MHz | 42 | 2444MHz | 62 | 2464MHz |
| 3 | 2405MHz | 23 | 2425MHz | 43 | 2445MHz | 63 | 2465MHz |
| 4 | 2406MHz | 24 | 2426MHz | 44 | 2446MHz | 64 | 2466MHz |
| 5 | 2407MHz | 25 | 2427MHz | 45 | 2447MHz | 65 | 2467MHz |
| 6 | 2408MHz | 26 | 2428MHz | 46 | 2448MHz | 66 | 2468MHz |
| 7 | 2409MHz | 27 | 2429MHz | 47 | 2449MHz | 67 | 2469MHz |
| 8 | 2410MHz | 28 | 2430MHz | 48 | 2450MHz | 68 | 2470MHz |
| 9 | 2411MHz | 29 | 2431MHz | 49 | 2451MHz | 69 | 2471MHz |
| 10 | 2412MHz | 30 | 2432MHz | 50 | 2452MHz | 70 | 2472MHz |
| 11 | 2413MHz | 31 | 2433MHz | 51 | 2453MHz | 71 | 2473MHz |
| 12 | 2414MHz | 32 | 2434MHz | 52 | 2454MHz | 72 | 2474MHz |
| 13 | 2415MHz | 33 | 2435MHz | 53 | 2455MHz | 73 | 2475MHz |
| 14 | 2416MHz | 34 | 2436MHz | 54 | 2456MHz | 74 | 2476MHz |
| 15 | 2417MHz | 35 | 2437MHz | 55 | 2457MHz | 75 | 2477MHz |
| 16 | 2418MHz | 36 | 2438MHz | 56 | 2458MHz | 76 | 2478MHz |
| 17 | 2419MHz | 37 | 2439MHz | 57 | 2459MHz | 77 | 2479MHz |
| 18 | 2420MHz | 38 | 2440MHz | 58 | 2460MHz | 78 | 2480MHz |
| 19 | 2421MHz | 39 | 2441MHz | 59 | 2461MHz | | |

Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel | Frequency |
|---------------------------|-----------|
| The Lowest channel(CH0) | 2402MHz |
| The Middle channel(CH39) | 2441MHz |
| The Highest channel(CH78) | 2480MHz |



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3.5 Test Environment

| | | |
|---|--|------------|
| Environment Parameter | 101.0 kPa Selected Values During Tests | |
| Relative Humidity | 44-46 % RH Ambient | |
| Value | Temperature(°C) | Voltage(V) |
| NTNV | 22~23 | 3.3 |
| Remark: NV: Normal Voltage NT: Normal Temperature | | |

3.6 Description of Support Units

The EUT has been tested as an independent unit.



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4 Test results and Measurement Data

4.1 Antenna Requirement

| | |
|--|--|
| Standard requirement: | 47 CFR Part 15C Section 15.203 /247(b) |
| <p>15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p> | |
| <p>The antenna is Dipole Antenna on the main PCB and no consideration of replacement. The best case gain of the antenna is 0.73dBi (Ant0). *</p> <p><i>*Note:</i> The antenna gain are derived from the gain information report provided by the manufacturer.</p> <p><i>Remark:</i> As above information is provided and confirmed by the applicant. SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.</p> | |



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4.2 Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence

4.2.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247(a)(1),(g),(h)

4.2.2 Conclusion

Standard Requirement:

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals. Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Compliance for section 15.247(a)(1):

According to Technical Specification, the pseudo random sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.

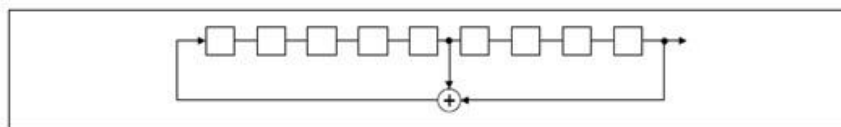
> Number of shift register stages: 9

> Length of pseudo-random sequence: $2^9 - 1 = 511$ bits

> Longest sequence of zeros: 8 (non-inverted signal)

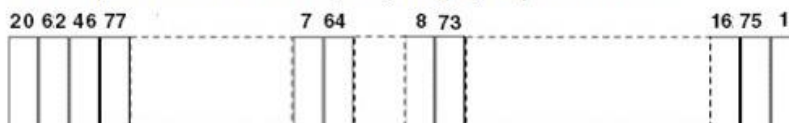
Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:



Each frequency used equally on the average by each transmitter.



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Rev.: 01

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According to Technical Specification, the receivers are designed to have input and IF bandwidths that match the hopping channel bandwidths of any transmitters and shift frequencies in synchronization with the transmitted signals.

Compliance for section 15.247(g):

According to Technical Specification, the system transmits the packet with the pseudorandom hopping frequency with a continuous data and the short burst transmission from the RF system is also transmitted under the frequency hopping system with the pseudorandom hopping frequency system.

Compliance for section 15.247(h):

According to Technical specification, the system incorporates with an adaptive system to detect other user within the spectrum band so that it individually and independently to avoid hopping on the occupied channels. The system is designed not have the ability to coordinated with other FHSS System in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitter.



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4.3 AC Power Line Conducted Emissions

| | | | |
|--|--|--------------|-----------|
| Test Requirement: | 47 CFR Part 15C Section 15.207 | | |
| Test Method: | ANSI C63.10-2020 Section 6.2 | | |
| Test Frequency Range: | 150kHz to 30MHz | | |
| Receiver Setup: | RBW = 9kHz, VBW = 30kHz | | |
| Limit: | Frequency range (MHz) | Limit (dBuV) | |
| | | Quasi-peak | Average |
| | 0.15-0.5 | 66 to 56* | 56 to 46* |
| | 0.5-5 | 56 | 46 |
| | 5-30 | 60 | 50 |
| * Decreases with the logarithm of the frequency. | | | |
| Test Procedure: | <ol style="list-style-type: none"> 1) The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane. 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10-2020 on conducted measurement. | | |



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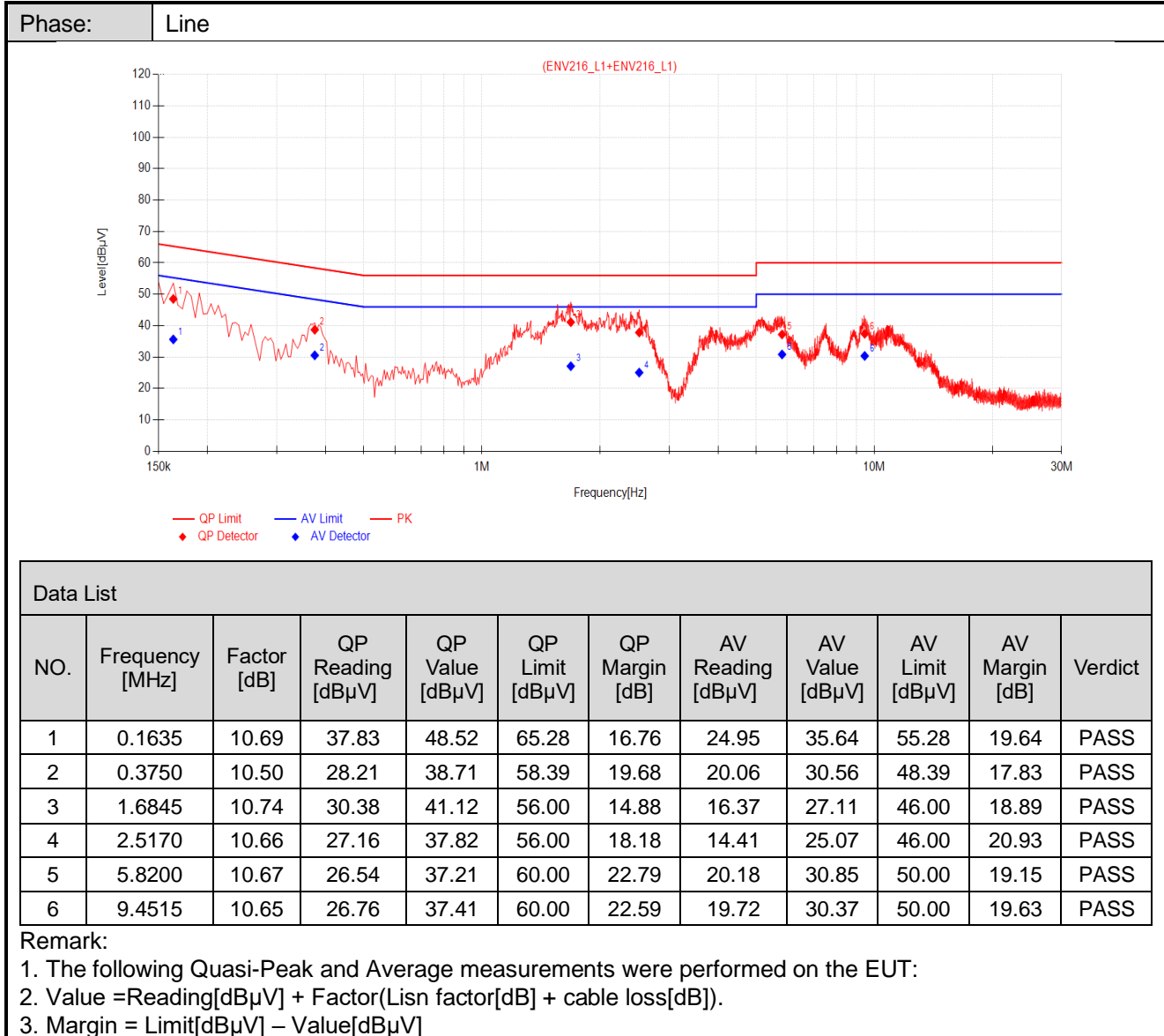
| | |
|--------------------------|---|
| <p>Test Setup:</p> | |
| <p>Test Mode:</p> | <p>Non-hopping transmitting mode with all kind of modulation and all kind of data type at the lowest, middle, high channel. Charge + Transmitting mode.</p> |
| <p>Final Test Mode:</p> | <p>Through Pre-scan, find the DH5 of data type and GFSK modulation at the lowest channel is the worst case. Charge + Transmitting mode Only the worst case is recorded in the report.</p> |
| <p>Instruments Used:</p> | <p>Refer to section 6 for details.</p> |
| <p>Test Results:</p> | <p>Pass</p> |



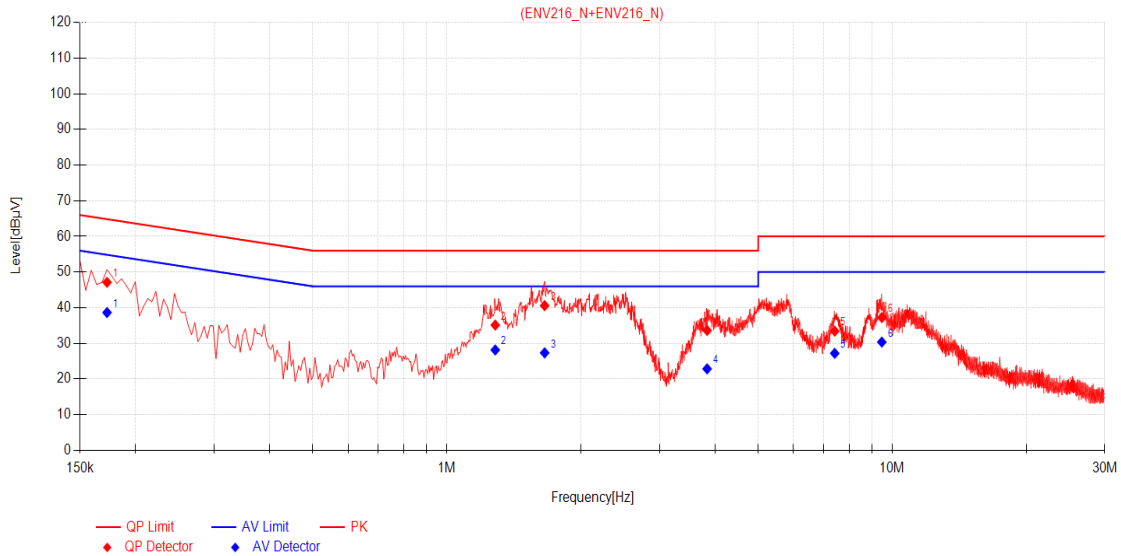
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Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.



Phase: Neutral



| Data List | | | | | | | | | | | |
|-----------|-----------------|-------------|-------------------|-----------------|-----------------|----------------|-------------------|-----------------|-----------------|----------------|---------|
| NO. | Frequency [MHz] | Factor [dB] | QP Reading [dBµV] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Reading [dBµV] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Verdict |
| 1 | 0.1725 | 10.71 | 36.41 | 47.12 | 64.84 | 17.72 | 27.93 | 38.64 | 54.84 | 16.20 | PASS |
| 2 | 1.2840 | 10.78 | 24.35 | 35.13 | 56.00 | 20.87 | 17.36 | 28.14 | 46.00 | 17.86 | PASS |
| 3 | 1.6575 | 10.77 | 29.81 | 40.58 | 56.00 | 15.42 | 16.56 | 27.33 | 46.00 | 18.67 | PASS |
| 4 | 3.8400 | 10.72 | 22.90 | 33.62 | 56.00 | 22.38 | 12.13 | 22.85 | 46.00 | 23.15 | PASS |
| 5 | 7.4265 | 10.54 | 22.89 | 33.43 | 60.00 | 26.57 | 16.66 | 27.20 | 50.00 | 22.80 | PASS |
| 6 | 9.4740 | 10.64 | 26.59 | 37.23 | 60.00 | 22.77 | 19.72 | 30.36 | 50.00 | 19.64 | PASS |

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Value = Reading[dBµV] + Factor(Lisn factor[dB] + cable loss[dB]).
3. Margin = Limit[dBµV] – Value[dBµV]



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4.4 Conducted Output Power

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(1)&15.247 (b)(1) |
| Test Method: | ANSI C63.10-2020 Section 11.9.1.2 |
| Test Setup: | <p>* Test with power meter (Detector function: Peak)</p> |
| Test Instruments: | Refer to section 6 for details |
| Exploratory Test Mode: | Non-hopping transmitting with all kind of modulation and all kind of data type. |
| Final Test Mode: | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. |
| Limit: | 0.125 watts |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



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4.5 20dB Emission Bandwidth & 99% Occupied Bandwidth

| | |
|---|--|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10-2020 Section 6.9.2 and 6.9.3 |
| Test Setup: | |
| Instruments Used: | Refer to section 6 for details |
| Exploratory Test Mode: | Non-hopping transmitting with all kind of modulation and all kind of data type. |
| Final Test Mode: | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. |
| Limit: | NA |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



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4.6 Carrier Frequencies Separation

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10-2020 Section 7.8.2 |
| Test Setup: | |
| Test Instruments: | Refer to section 6 for details |
| Exploratory Test Mode: | Hopping transmitting with all kind of modulation and all kind of data type. |
| Final Test Mode: | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. |
| Limit: | 2/3 of the 20dB bandwidth Remark: the transmission power is less than 0.125W. |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



4.7 Hopping Channel Number

| | |
|---|--|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10-2020 Section 7.8.3 |
| Test Setup: | |
| Instruments Used: | Refer to section 6 for details |
| Test Mode: | Hopping transmitting with all kind of modulation |
| Limit: | At least 15 channels |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



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4.8 Dwell Time

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (a)(1) |
| Test Method: | ANSI C63.10-2020 Section 7.8.4 |
| Test Setup: | |
| Instruments Used: | Refer to section 6 for details |
| Test Mode: | Hopping transmitting with all kind of modulation and all kind of data type. |
| Limit: | 0.4 Second |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



4.9 Band-edge for RF Conducted Emissions

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (d) |
| Test Method: | ANSI C63.10-2020 Section 7.8.7.2 |
| Test Setup: | |
| Instruments Used: | Refer to section 6 for details |
| Exploratory Test Mode: | Hopping and Non-hopping transmitting with all kind of modulation and all kind of data type. |
| Final Test Mode: | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



4.10 Spurious RF Conducted Emissions

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15C Section 15.247 (d) |
| Test Method: | ANSI C63.10-2020 Section 7.8.7.1 |
| Test Setup: | |
| Instruments Used: | Refer to section 6 for details |
| Exploratory Test Mode: | Non-hopping transmitting with all kind of modulation and all kind of data type. |
| Final Test Mode: | Through Pre-scan, find the DH5 of data type is the worst case of GFSK modulation type, 2-DH5 of data type is the worst case of $\pi/4$ DQPSK modulation type, 3-DH5 of data type is the worst case of 8DPSK modulation type. |
| Limit: | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



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4.11 Radiated Spurious Emissions

| | | | | | |
|---|--|----------------------------------|----------------|------------|--------------------------|
| Test Requirement: | 47 CFR Part 15C Section 15.209 and 15.205 | | | | |
| Test Method: | ANSI C63.10-2020 Section 6.4 / 6.5 / 6.6 | | | | |
| Test Site: | Measurement Distance: 3m (Semi-Anechoic Chamber) | | | | |
| Test Frequency: | 9kHz ~ 25GHz | | | | |
| Limit: | Frequency | Field strength (microvolt/meter) | Limit (dBuV/m) | Remark | Measurement distance (m) |
| | 0.009MHz-0.490MHz | 2400/F(kHz) | - | - | 300 |
| | 0.490MHz-1.705MHz | 24000/F(kHz) | - | - | 30 |
| | 1.705MHz-30MHz | 30 | - | - | 30 |
| | 30MHz-88MHz | 100 | 40.0 | Quasi-peak | 3 |
| | 88MHz-216MHz | 150 | 43.5 | Quasi-peak | 3 |
| | 216MHz-960MHz | 200 | 46.0 | Quasi-peak | 3 |
| | 960MHz-1GHz | 500 | 54.0 | Quasi-peak | 3 |
| | Above 1GHz | 500 | 54.0 | Average | 3 |
| Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device. | | | | | |

Test Setup:

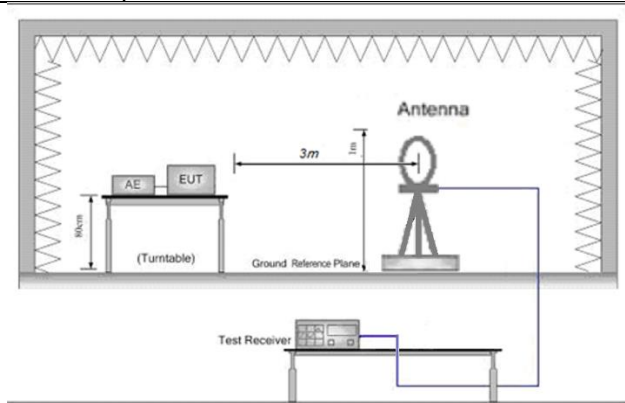


Figure 1. Below 30MHz

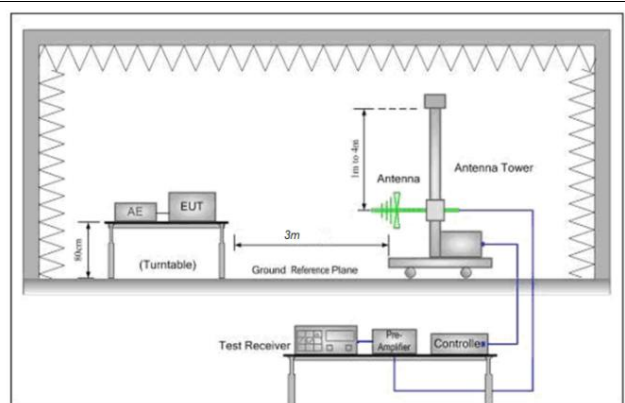


Figure 2. 30MHz to 1GHz



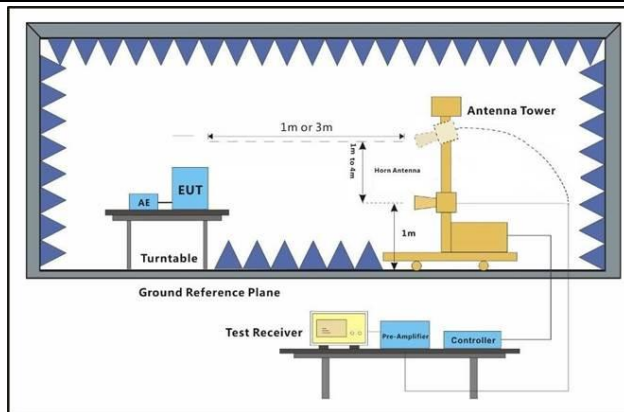


Figure 3. Above 1 GHz

| | |
|----------------------------|---|
| <p>Test Procedure:</p> | <ol style="list-style-type: none"> For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation (Distance from antenna to EUT is 1m for measurements >18GHz). The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Test the EUT in the lowest channel, the middle channel, the Highest channel. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. Repeat above procedures until all frequencies measured was complete. The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported The disturbance above 18GHz was very low, and the harmonics were the highest point could be found when testing, so only the harmonics had been displayed. At a measurement distance of 1 meter the limit line was increased by $20 \cdot \text{LOG}(3/1) = 9.54 \text{ dB}$. |
| <p>Test Configuration:</p> | <p>Measurements below 30MHz</p> <ul style="list-style-type: none"> RBW = 10 kHz VBW = 30 kHz Detector = Peak & Average & Quasi-peak Trace mode = max hold <p>Measurements Below 1000MHz</p> |



| | |
|---|---|
| | <ul style="list-style-type: none"> • RBW = 120 kHz • VBW = 300 kHz • Detector = Quasi-peak • Trace mode = max hold <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> • RBW = 1 MHz • VBW ≥ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold <p>Average Measurements Above 1000MHz</p> <p>Use duty cycle correction factor method per 15.35(c).</p> <p>Duty cycle = On time / 100 milliseconds</p> <p>On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{N-1} * L_{N-1} + N_N * L_N$</p> <p>Where N_1 is number of type 1 pulse, L_1 is length of type 1 pulses, etc.</p> <p>Average Value = Peak Value + 20*log(Duty cycle).</p> |
| Exploratory Test Mode: | <p>Non-hopping transmitting mode with all kind of modulation and all kind of data type</p> <p>Charge + Transmitting mode.</p> |
| Final Test Mode: | <p>Through Pre-scan, find the DH5 of data type and GFSK modulation is the worst case.</p> <p>Pretest the EUT at Charge + Transmitting mode</p> <p>For below 1GHz part, through pre-scan, the worst case is the lowest channel.</p> <p>Only the worst case is recorded in the report.</p> |
| Instruments Used: | Refer to section 6 for details |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



4.12 Restricted bands around fundamental frequency

| | | | |
|-------------------|--|----------------|---------------|
| Test Requirement: | 47 CFR Part 15C Section 15.209 and 15.205 | | |
| Test Method: | ANSI C63.10-2020 Section 6.10.5 | | |
| Test Site: | Measurement Distance: 3m (Semi-Anechoic Chamber) | | |
| Limit: | Frequency | Limit (dBuV/m) | Remark |
| | 30MHz-88MHz | 40.0 | Quasi-peak |
| | 88MHz-216MHz | 43.5 | Quasi-peak |
| | 216MHz-960MHz | 46.0 | Quasi-peak |
| | 960MHz-1GHz | 54.0 | Quasi-peak |
| | Above 1GHz | 54.0 | Average Value |
| | | 74.0 | Peak Value |

Test Setup:

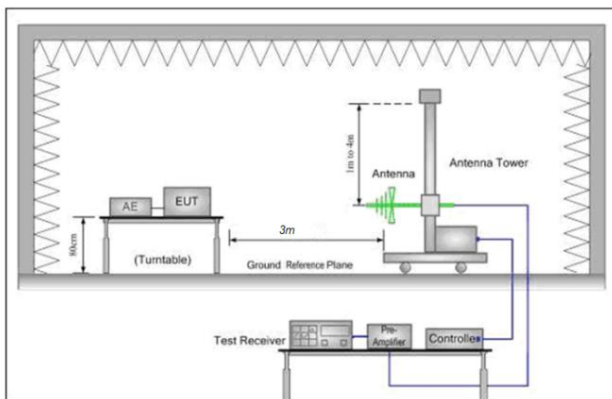


Figure 1. 30MHz to 1GHz

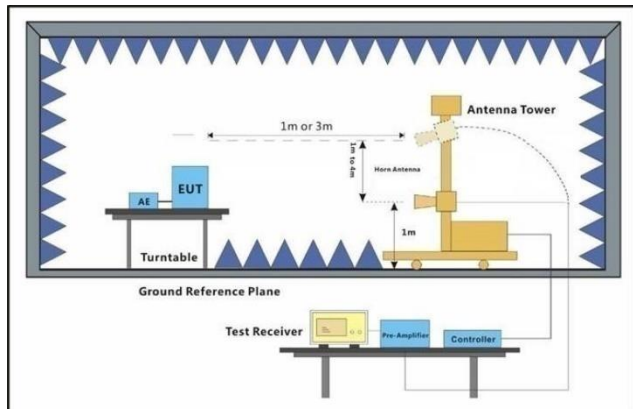


Figure 2. Above 1 GHz

Test Procedure:

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- Place a marker at the end of the restricted band closest to the transmit



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| | |
|---|---|
| | <p>frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel</p> <p>h. Test the EUT in the lowest channel , the Highest channel</p> <p>i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case.</p> <p>j. Repeat above procedures until all frequencies measured was complete.</p> |
| Test Configuration: | <p>Measurements Below 1000MHz</p> <ul style="list-style-type: none"> • RBW = 120 kHz • VBW = 300 kHz • Detector = Quasi-peak • Trace mode = max hold <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none"> • RBW = 1 MHz • VBW ≥ 3 MHz • Detector = Peak • Sweep time = auto • Trace mode = max hold <p>Average Measurements Above 1000MHz</p> <p>Use duty cycle correction factor method per 15.35(c).</p> <p>Duty cycle = On time / 100 milliseconds</p> <p>On time = $N_1 * L_1 + N_2 * L_2 \dots + N_{N-1} * L_{N-1} + N_N * L_N$</p> <p>Where N_1 is number of type 1 pulse, L_1 is length of type 1 pulses, etc.</p> <p>Average Value = Peak Value + 20 * log(Duty cycle).</p> |
| Exploratory Test Mode: | <p>Non-hopping transmitting mode with all kind of modulation and all kind of data type</p> <p>Charge + Transmitting mode.</p> |
| Final Test Mode: | <p>Through Pre-scan, find the DH5 of data type and GFSK modulation is the worst case.</p> <p>Pretest the EUT at Charge + Transmitting mode,</p> <p>Only the worst case is recorded in the report.</p> |
| Instruments Used: | Refer to section 6 for details |
| Test Results: | Pass |
| The detailed test data see: Appendix | |



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5 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item | Measurement Uncertainty |
|-----|-------------------------------|----------------------------|
| 1 | Total RF power, conducted | ±0.54dB |
| 2 | RF power density, conducted | ±1.03dB |
| 3 | Spurious emissions, conducted | ±0.54dB |
| 4 | Radio Frequency | ±1.0 % |
| 5 | Duty Cycle | ±0.37% |
| 6 | Occupied Bandwidth | ±1.0 % |
| 7 | Conduction Emission | ± 2.90dB (150kHz to 30MHz) |
| 8 | Radiated Emission | ± 3.13dB (9k to 30MHz) |
| | | ± 4.88dB (30M to 1GHz) |
| | | ± 4.75dB (1GHz to 18GHz) |
| | | ± 4.77dB (Above 18GHz) |

Remark:

The U_{lab} (lab Uncertainty) is less than $U_{CISPR/ETSI}$ (CISPR/ETSI Uncertainty), so the test results
 – compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
 – non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.



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6 Equipment List

| RF Test Equipment | | | | | |
|-------------------------------------|---------------|-------------------------------|---------------|------------------------|---------------------------|
| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. date (yyyy/mm/dd) | Cal.Due date (yyyy/mm/dd) |
| Shielding Room | Brilliant-emc | N/A | SUWI-04-01-06 | 2021/05/08 | 2024/05/07 |
| Temperature and humidity meter | MingGao | TH101B | SUWI-01-01-07 | 2023/02/06 | 2024/02/05 |
| Measurement Software | Tonscend | JS1120-3 Test System V 3.3.20 | SUWI-02-09-09 | NCR | NCR |
| Signal Analyzer | ROHDE&SCHWARZ | FSW43 | SUWI-01-02-04 | 2023/05/11 | 2024/05/10 |
| Wideband Radio Communication Tester | ROHDE&SCHWARZ | CMW500 | SUWI-01-16-05 | 2023/02/06 | 2024/02/05 |
| DC Power Supply | HYELEC | HY3005B | SUWI-01-18-01 | 2023/02/06 | 2024/02/05 |
| Power meter | Anritsu | ML2495A | SUWI-01-31-01 | 2022/11/23 | 2023/11/22 |
| Pulse power sensor | Anritsu | MA2411B | SUWI-01-32-01 | 2022/11/23 | 2023/11/22 |
| MXG Vector signal genitor | KEYSIGHT | N5182B | SUWI-01-38-01 | 2023/02/06 | 2024/02/05 |
| Temperature Chamber | ESPEC | SU-242 | SUWI-01-13-01 | 2023/02/06 | 2024/02/05 |

| Conduction Test Equipment | | | | | |
|--------------------------------|---------------|------------------|---------------|------------------------|---------------------------|
| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. date (yyyy/mm/dd) | Cal.Due date (yyyy/mm/dd) |
| Shielding Room | Brilliant-emc | N/A | SUWI-04-03-01 | 2021/05/08 | 2024/05/07 |
| Test receiver | ROHDE&SCHWARZ | ESR7 | SUWI-01-10-01 | 2023/02/08 | 2024/02/07 |
| Temperature and humidity meter | MingGao | TH101B | SUWI-01-01-06 | 2023/02/07 | 2024/02/06 |
| Artificial network | ROHDE&SCHWARZ | ENV216 | SUWI-01-19-03 | 2023/02/08 | 2024/02/07 |
| Artificial network | ROHDE&SCHWARZ | ENV216 | SUWI-01-19-04 | 2023/02/08 | 2024/02/07 |
| Measurement Software | Tonscend | JS32-CE V4.0.0.2 | SUWI-02-09-05 | NCR | NCR |



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| RSE Test System | | | | | |
|--------------------------------|----------------------------|------------------|---------------|------------------------|---------------------------|
| Test Equipment | Manufacturer | Model No. | Inventory No. | Cal. date (yyyy/mm/dd) | Cal.Due date (yyyy/mm/dd) |
| Semi-Anechoic Chamber | Brilliant-emc | N/A | SUWI-04-02-02 | 2021/11/25 | 2024/11/24 |
| Temperature and humidity meter | MingGao | TH101B | SUWI-01-01-13 | 2023/02/07 | 2024/02/06 |
| Signal Analyzer | ROHDE&SCHWARZ | FSW43 | SUWI-01-02-04 | 2023/05/11 | 2024/05/10 |
| Signal Analyzer | KEYSIGHT | N9020A | SUWI-01-02-06 | 2022/11/23 | 2023/11/22 |
| Test receiver | ROHDE&SCHWARZ | ESR7 | SUWI-01-10-01 | 2023/02/08 | 2024/02/07 |
| Receiving antenna | SCHWRZBECK MESS-ELEKTRONIK | VULB 9168 | SUWI-01-11-04 | 2021/12/05 | 2023/12/04 |
| Receiving antenna | SCHWRZBECK MESS-ELEKTRONIK | BBHA 9120D | SUWI-01-11-05 | 2021/12/05 | 2023/12/04 |
| Receiving antenna | SCHWRZBECK MESS-ELEKTRONIK | BBHA 9170 | SUWI-01-11-03 | 2023/05/12 | 2024/05/11 |
| Active Loop Antenna | SCHWRZBECK MESS-ELEKTRONIK | FMZB 1519B | SUWI-01-21-01 | 2023/05/13 | 2024/05/12 |
| Amplifier | Tonscend | TAP9K3G32 | SUWI-01-14-06 | 2022/11/23 | 2023/11/22 |
| Amplifier | Tonscend | TAP01018050 | SUWI-01-14-04 | 2022/11/23 | 2023/11/22 |
| Amplifier | Tonscend | TAP30M7G30 | SUWI-01-14-05 | 2022/11/23 | 2023/11/22 |
| Measurement Software | Tonscend | JS32-RE V4.0.0.0 | SUWI-02-09-04 | NCR | NCR |



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7 Photographs - Setup Photos

Refer to Appendix A.2 WLAN Setup Photos.



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Appendix



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20dB Emission Bandwidth

Test Result

| TestMode | Antenna | Frequency[MHz] | 20dB EBW[MHz] | FL[MHz] | FH[MHz] | Verdict |
|----------|---------|----------------|---------------|---------|---------|--------------------|
| DH5 | Ant0 | 2402 | 0.95 | 2401.54 | 2402.49 | For Report Purpose |
| DH5 | Ant0 | 2441 | 0.95 | 2440.54 | 2441.49 | |
| DH5 | Ant0 | 2480 | 0.95 | 2479.54 | 2480.49 | |
| 2DH5 | Ant0 | 2402 | 1.22 | 2401.39 | 2402.61 | |
| 2DH5 | Ant0 | 2441 | 1.22 | 2440.39 | 2441.61 | |
| 2DH5 | Ant0 | 2480 | 1.23 | 2479.39 | 2480.62 | |
| 3DH5 | Ant0 | 2402 | 1.21 | 2401.41 | 2402.62 | |
| 3DH5 | Ant0 | 2441 | 1.20 | 2440.42 | 2441.62 | |
| 3DH5 | Ant0 | 2480 | 1.21 | 2479.42 | 2480.62 | |

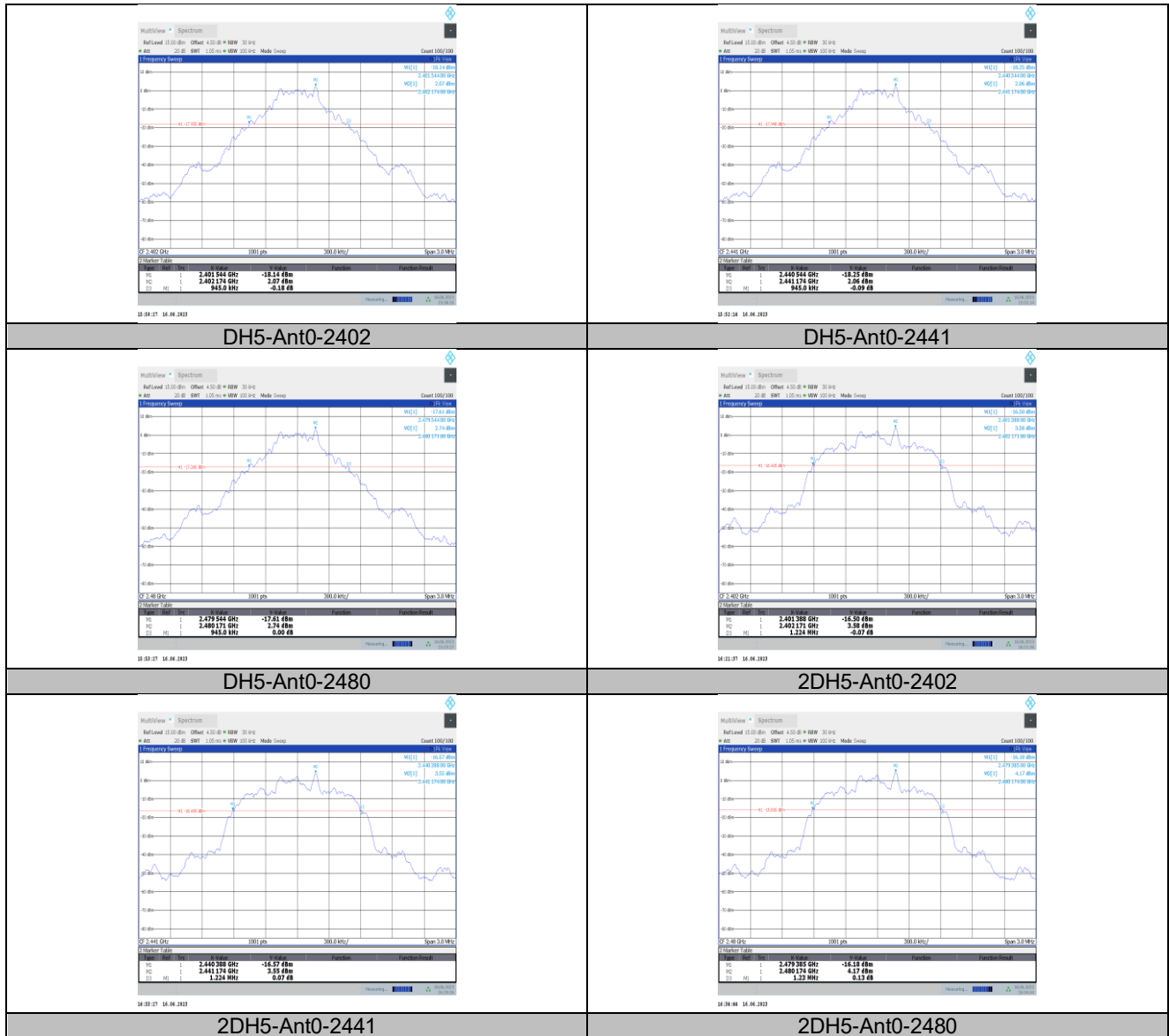


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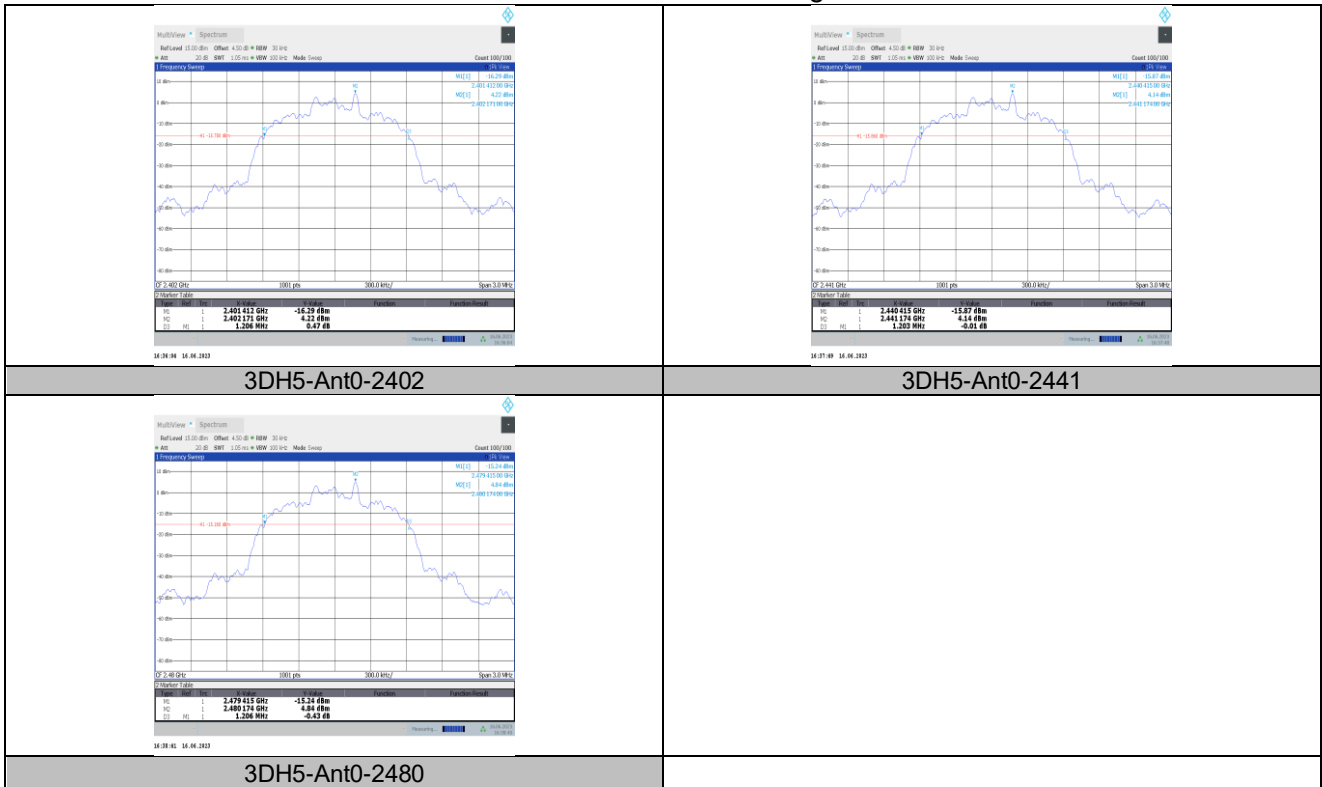
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Occupied Channel Bandwidth

Test Result

| TestMode | Antenna | Frequency[MHz] | OCB [MHz] | FL[MHz] | FH[MHz] | Verdict |
|----------|---------|----------------|-----------|-----------|-----------|--------------------|
| DH5 | Ant0 | 2402 | 0.851 | 2401.5786 | 2402.4298 | For Report Purpose |
| DH5 | Ant0 | 2441 | 0.851 | 2440.5783 | 2441.4291 | |
| DH5 | Ant0 | 2480 | 0.852 | 2479.5776 | 2480.4296 | |
| 2DH5 | Ant0 | 2402 | 1.129 | 2401.4387 | 2402.5679 | |
| 2DH5 | Ant0 | 2441 | 1.129 | 2440.4389 | 2441.5684 | |
| 2DH5 | Ant0 | 2480 | 1.13 | 2479.4385 | 2480.5682 | |
| 3DH5 | Ant0 | 2402 | 1.126 | 2401.4450 | 2402.5711 | |
| 3DH5 | Ant0 | 2441 | 1.126 | 2440.4447 | 2441.5711 | |
| 3DH5 | Ant0 | 2480 | 1.126 | 2479.4448 | 2480.5709 | |



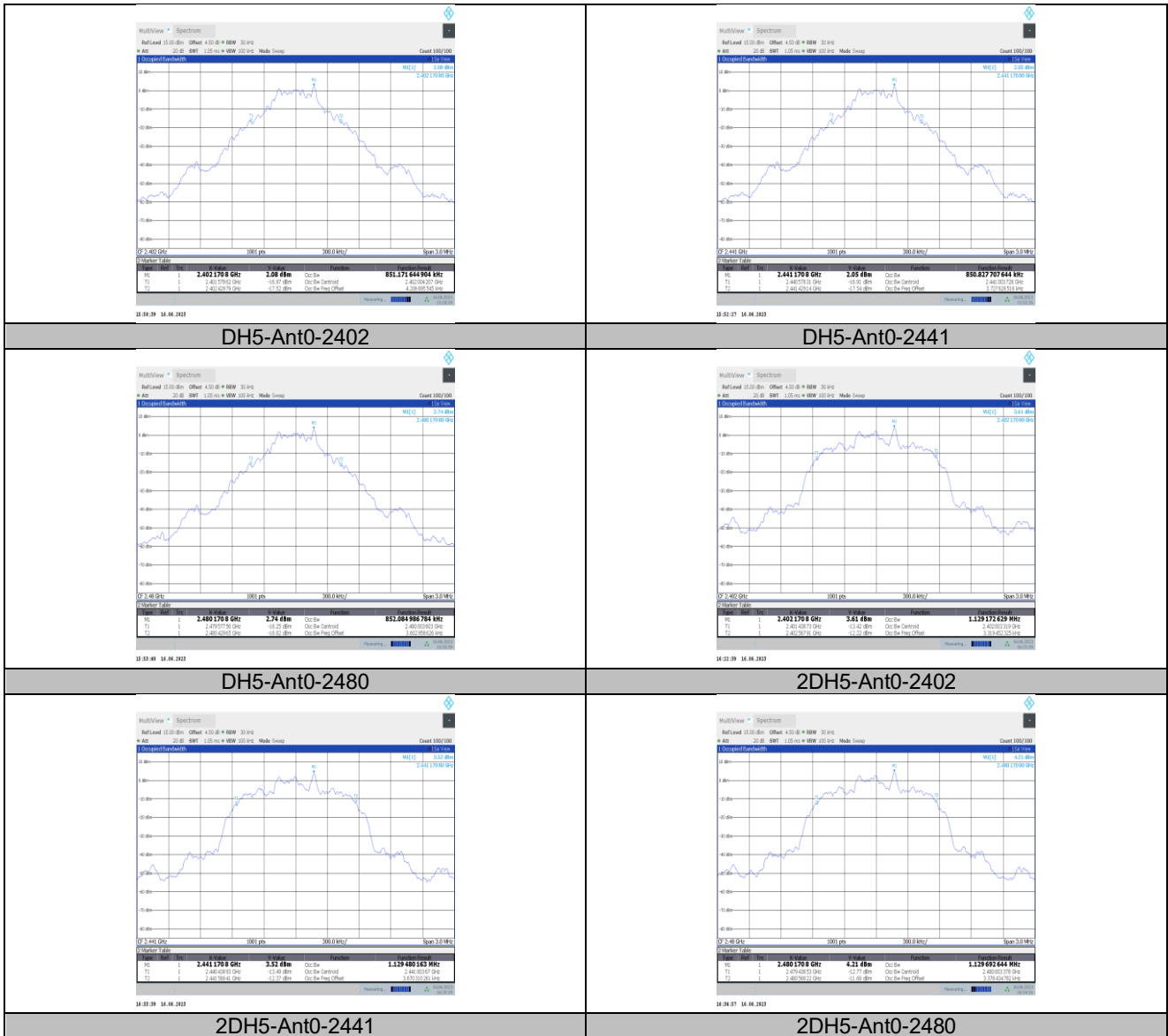
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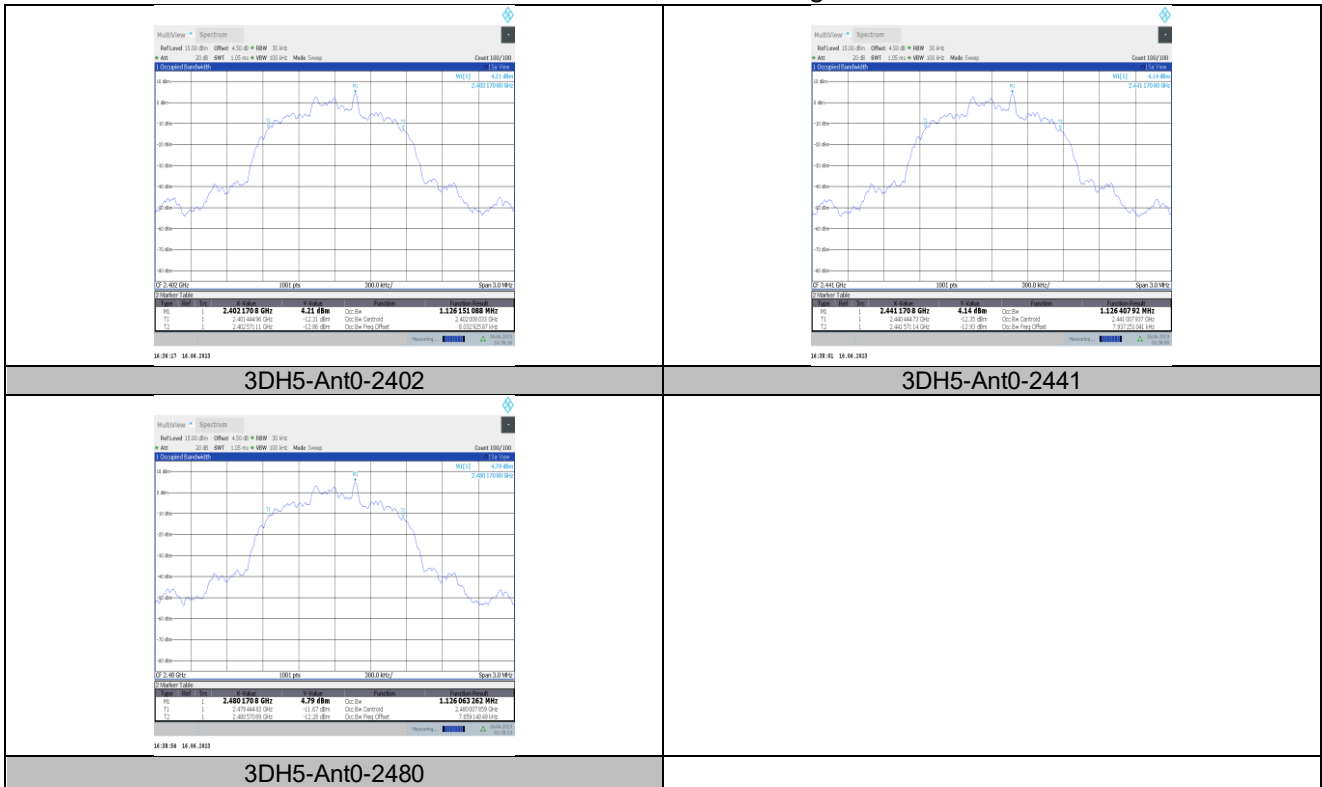
Test Graphs



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Maximum conducted output power

Test Result Peak

| Test Mode | Antenna | Frequency[MHz] | Conducted Peak Power[dBm] | Conducted Limit[dBm] | Verdict |
|-----------|---------|----------------|---------------------------|----------------------|---------|
| DH5 | Ant0 | 2402 | 8.09 | ≤20.97 | PASS |
| DH5 | Ant0 | 2441 | 8.36 | ≤20.97 | PASS |
| DH5 | Ant0 | 2480 | 8.65 | ≤20.97 | PASS |
| 2DH5 | Ant0 | 2402 | 9.76 | ≤20.97 | PASS |
| 2DH5 | Ant0 | 2441 | 10.16 | ≤20.97 | PASS |
| 2DH5 | Ant0 | 2480 | 10.23 | ≤20.97 | PASS |
| 3DH5 | Ant0 | 2402 | 9.69 | ≤20.97 | PASS |
| 3DH5 | Ant0 | 2441 | 10.32 | ≤20.97 | PASS |
| 3DH5 | Ant0 | 2480 | 10.12 | ≤20.97 | PASS |



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Carrier frequency separation

Test Result

| TestMode | Antenna | Hop/No Hop | Result[MHz] | Limit[MHz] | Verdict |
|----------|---------|------------|-------------|------------|---------|
| DH5 | Ant0 | Hop | 0.982 | ≥0.633 | PASS |
| 2DH5 | Ant0 | Hop | 1.000 | ≥0.820 | PASS |
| 3DH5 | Ant0 | Hop | 0.992 | ≥0.807 | PASS |

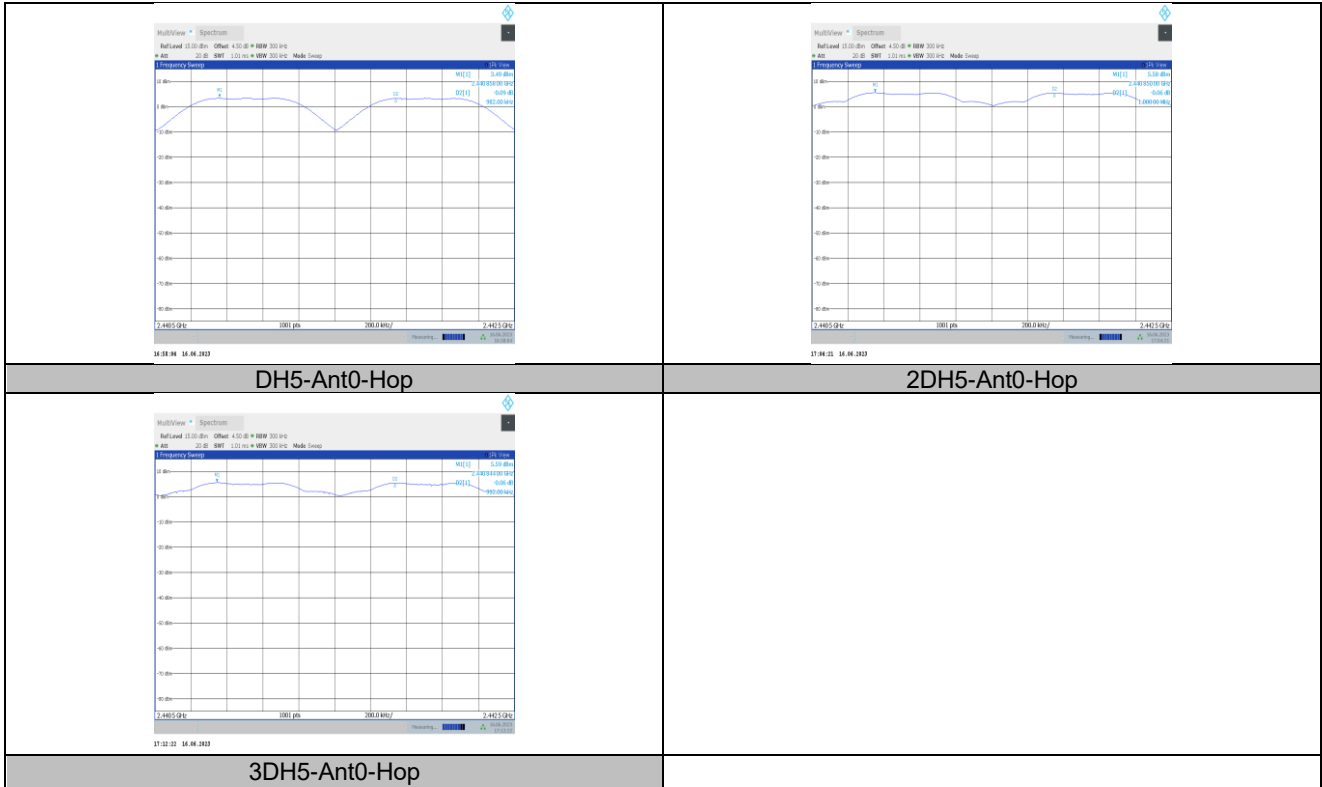


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Test Graphs



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Time of occupancy

Test Result

| TestMode | Antenna | Hop/No Hop | BurstWidth [ms] | TotalHops [Num] | Result[s] | Limit[s] | Verdict |
|----------|---------|------------|-----------------|-----------------|-----------|----------|---------|
| DH5 | Ant0 | Hop | 2.870 | 110 | 0.316 | ≤0.4 | PASS |
| DH1 | Ant0 | Hop | 0.360 | 320 | 0.115 | ≤0.4 | PASS |
| DH3 | Ant0 | Hop | 1.620 | 130 | 0.211 | ≤0.4 | PASS |
| 2DH5 | Ant0 | Hop | 2.880 | 100 | 0.288 | ≤0.4 | PASS |
| 2DH1 | Ant0 | Hop | 0.370 | 320 | 0.118 | ≤0.4 | PASS |
| 2DH3 | Ant0 | Hop | 1.630 | 190 | 0.31 | ≤0.4 | PASS |
| 3DH5 | Ant0 | Hop | 2.880 | 130 | 0.374 | ≤0.4 | PASS |
| 3DH1 | Ant0 | Hop | 0.380 | 330 | 0.125 | ≤0.4 | PASS |
| 3DH3 | Ant0 | Hop | 1.620 | 140 | 0.227 | ≤0.4 | PASS |

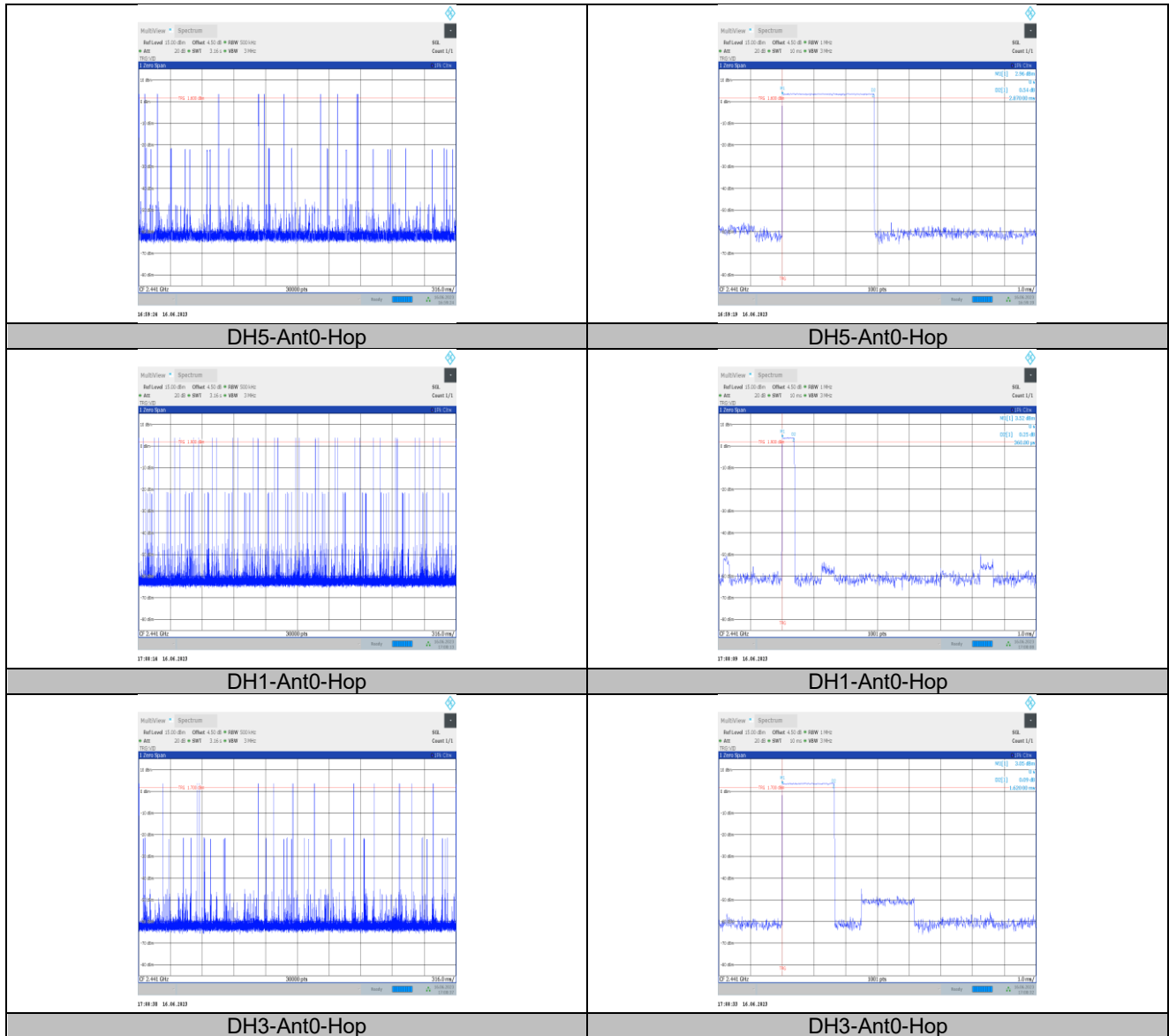


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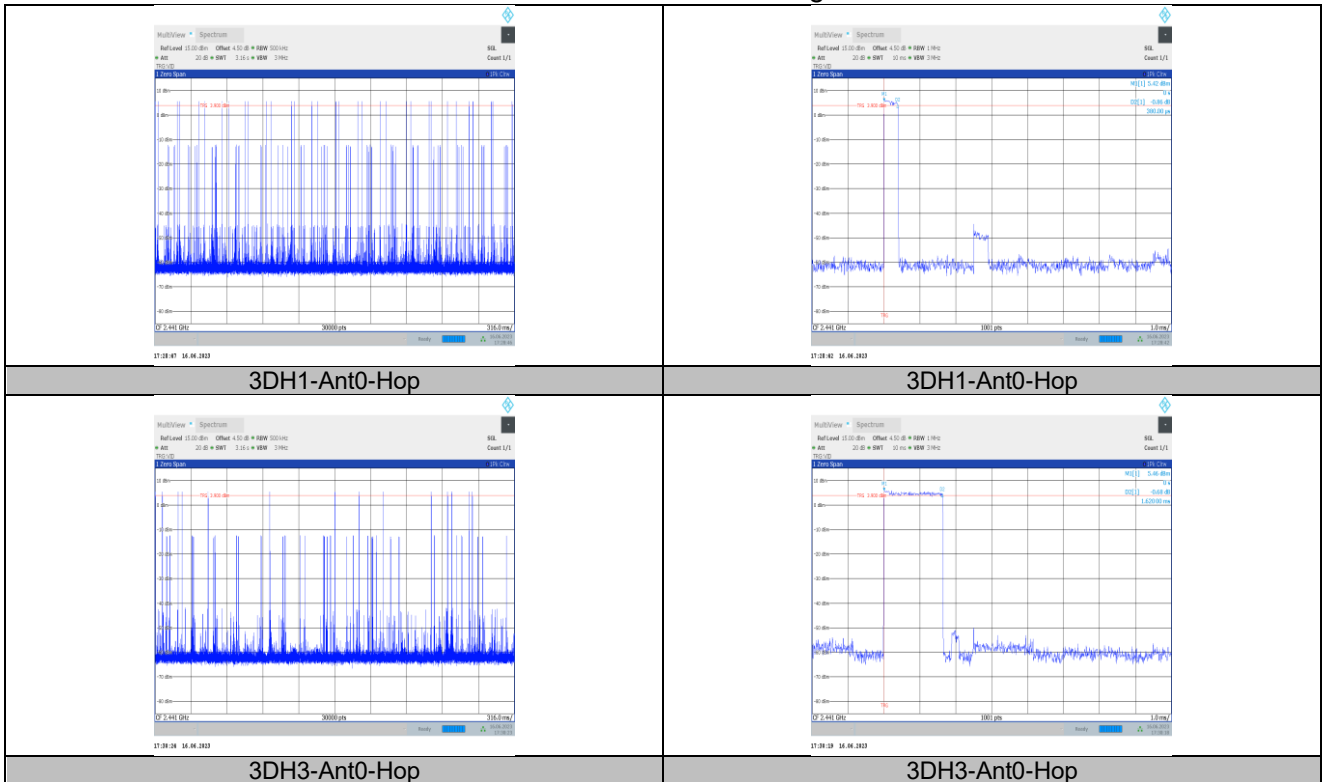


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Number of hopping channels

Test Result

| TestMode | Antenna | Hop/No Hop | Result[Num] | Limit[Num] | Verdict |
|----------|---------|------------|-------------|------------|---------|
| DH5 | Ant0 | Hop | 79 | ≥15 | PASS |
| 2DH5 | Ant0 | Hop | 79 | ≥15 | PASS |
| 3DH5 | Ant0 | Hop | 79 | ≥15 | PASS |

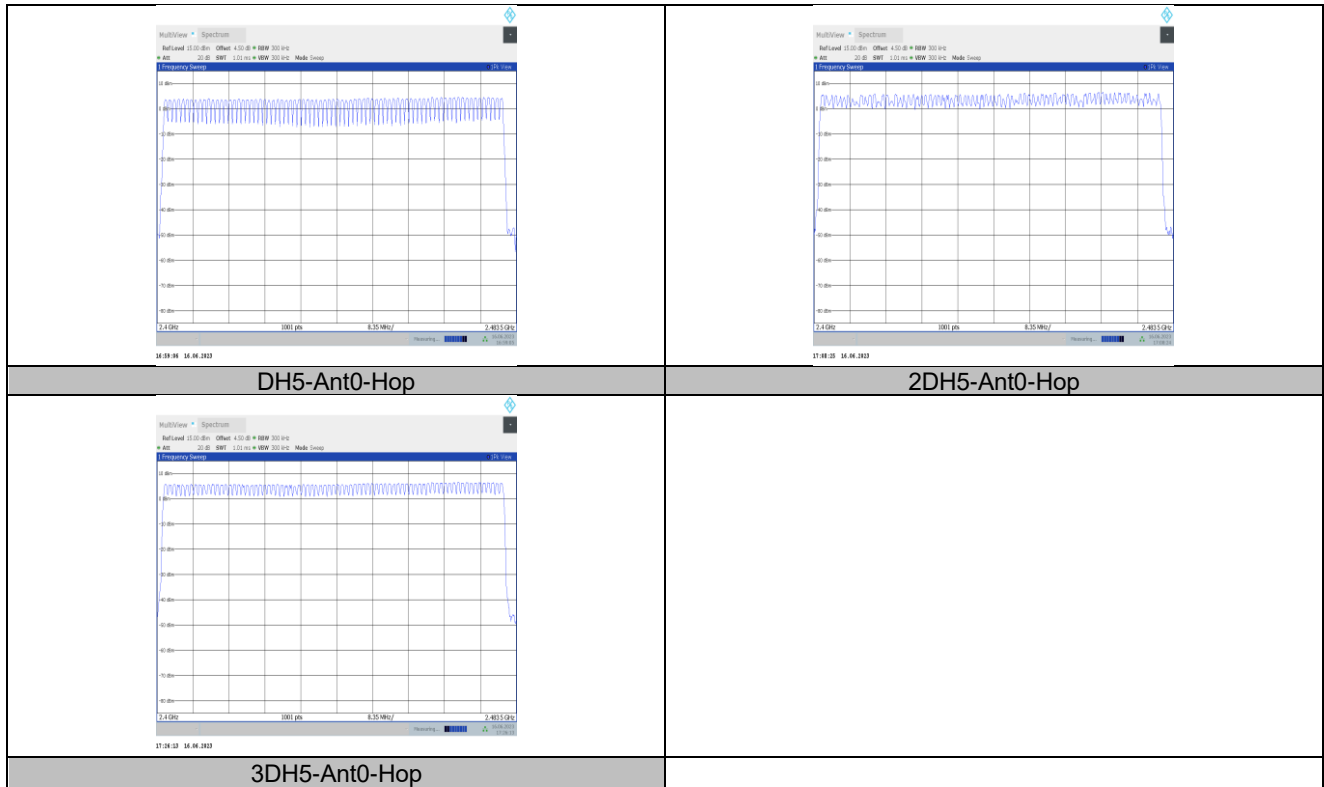


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Test Graphs



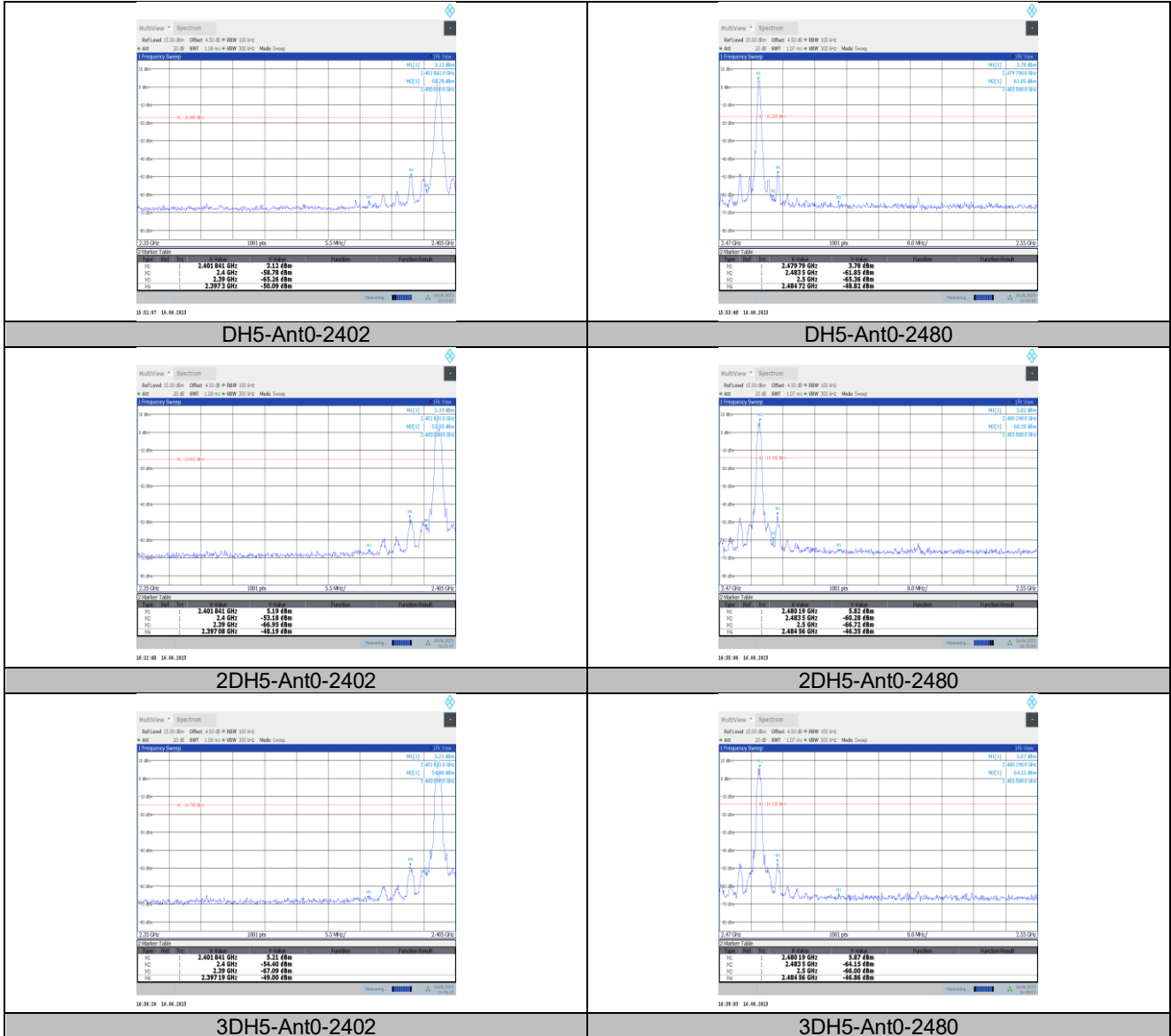
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Band edge measurements

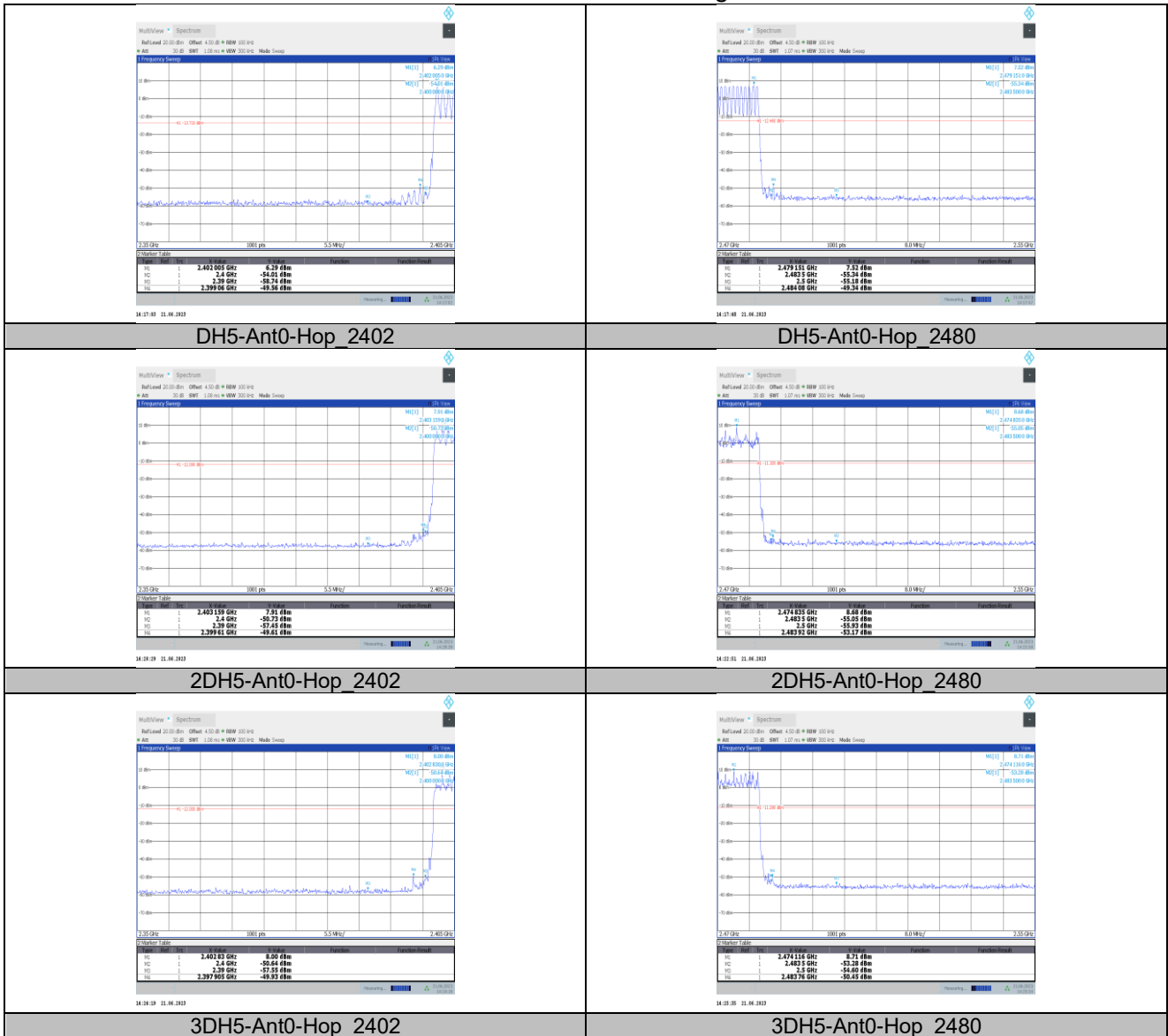
Test Graphs



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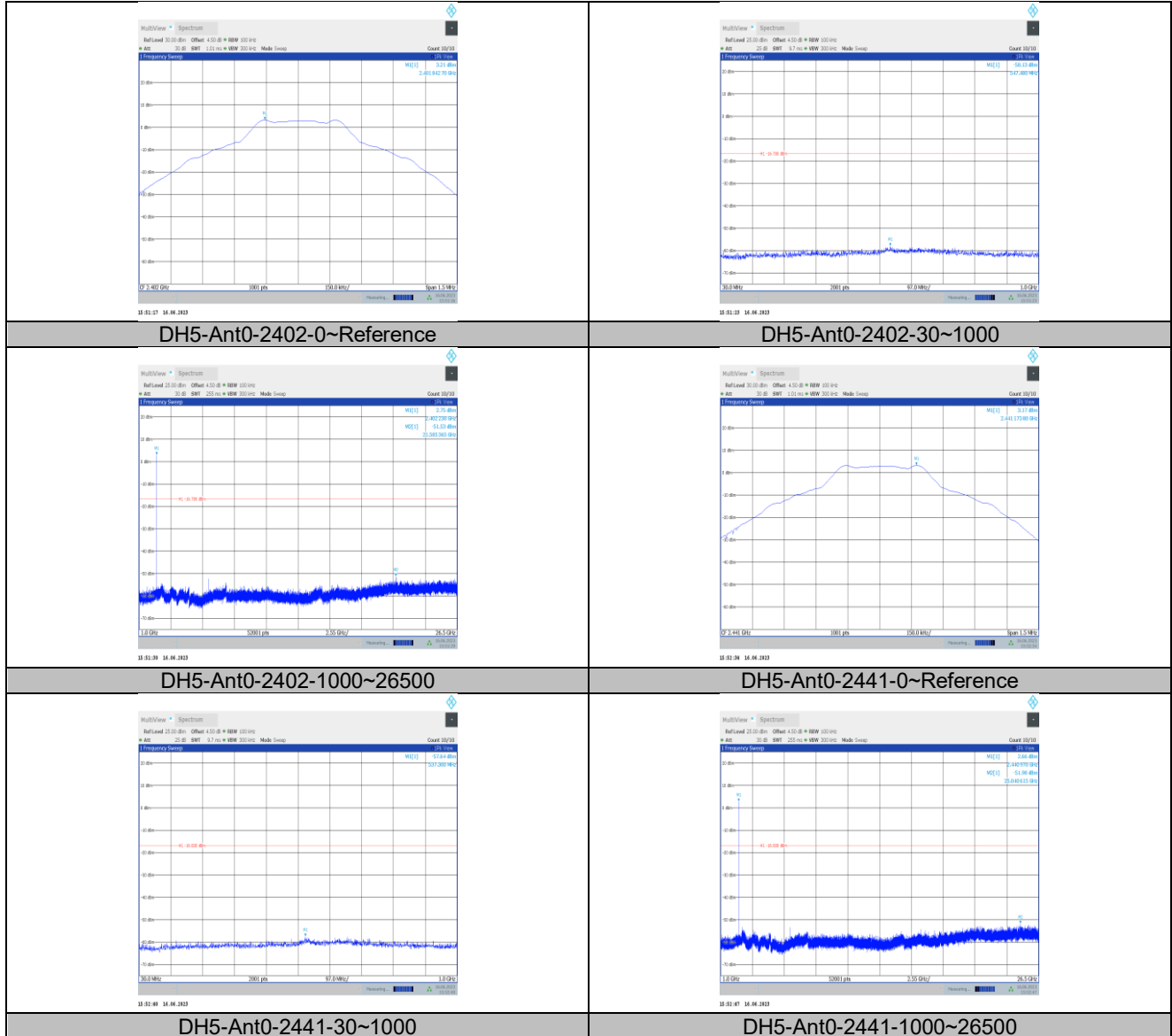
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Conducted Spurious Emission

Test Graphs

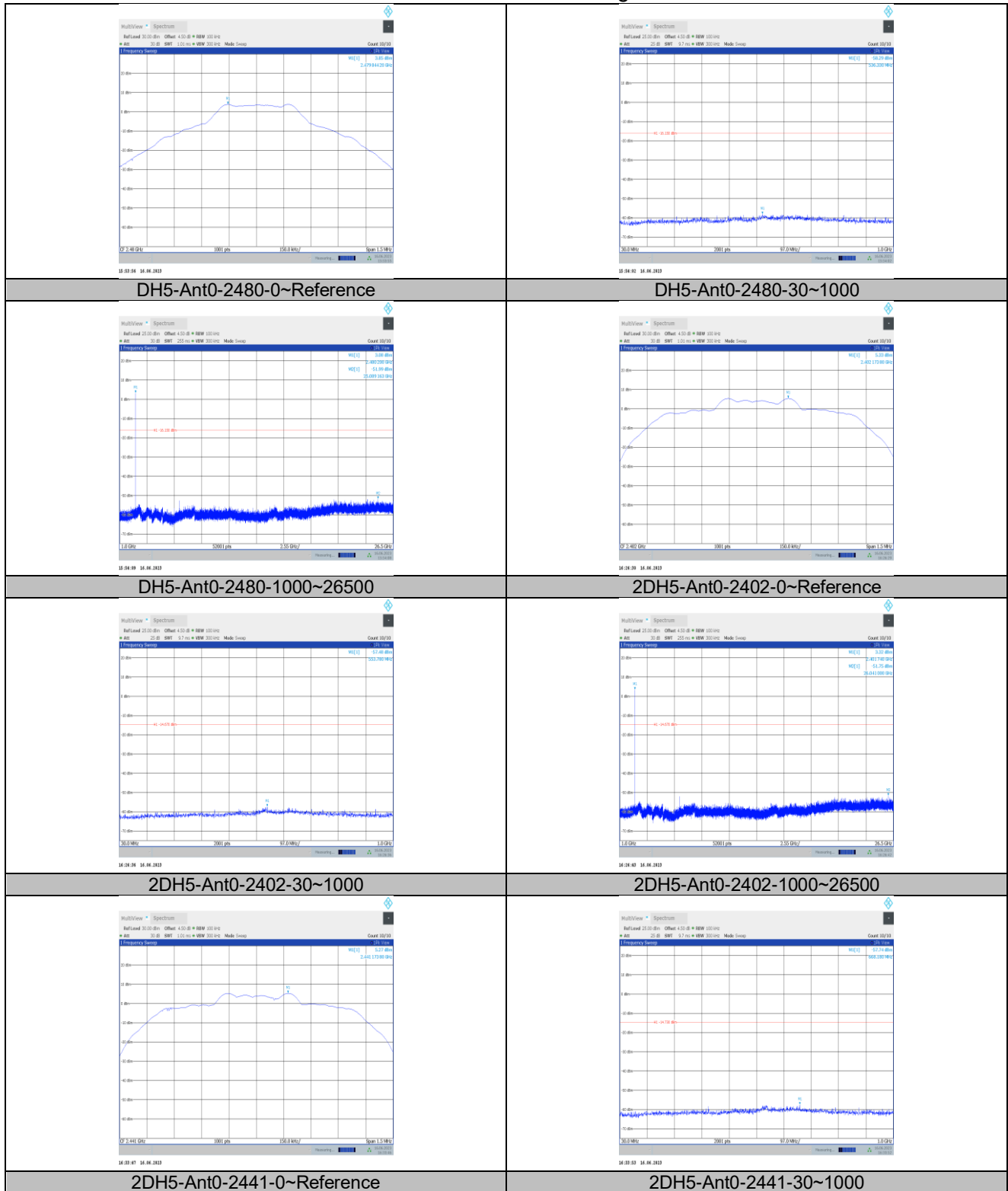


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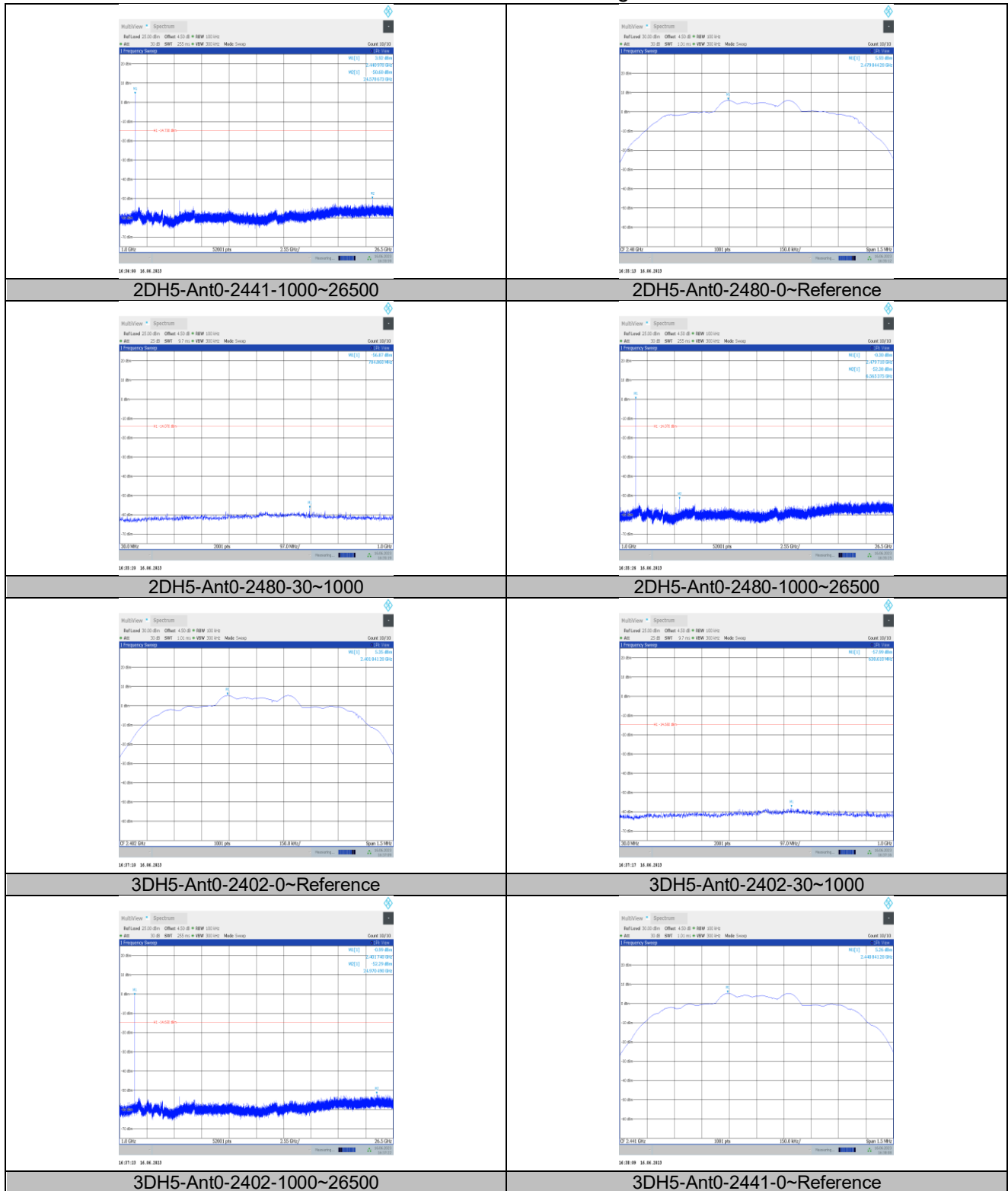
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| | |
|-----------------------------------|----------------------------------|
| | |
| <p>3DH5-Ant0-2441-30~1000</p> | <p>3DH5-Ant0-2441-1000~26500</p> |
| | |
| <p>3DH5-Ant0-2480-0~Reference</p> | <p>3DH5-Ant0-2480-30~1000</p> |
| | |
| <p>3DH5-Ant0-2480-1000~26500</p> | |



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Report No.: SEWM2306000197RG01

Rev.: 01

Page: 54 of 67

Duty Cycle Test Result

| TestMode | Antenna | Frequency[MHz] | ON Time [ms] | Period [ms] | Duty Cycle [%] | Duty Cycle Factor[dB] |
|----------|---------|----------------|--------------|-------------|----------------|-----------------------|
| DH5 | Ant0 | 2402 | 2.89 | 3.76 | 76.86 | 1.14 |
| DH5 | Ant0 | 2441 | 2.89 | 3.76 | 76.86 | 1.14 |
| DH5 | Ant0 | 2480 | 2.89 | 3.75 | 77.07 | 1.13 |

Note:

Duty cycle = on time / 100ms = 2 * 2.89 / 100 = 5.78%

Duty cycle Correction factor = 20*log(Duty cycle) = -24.76dB

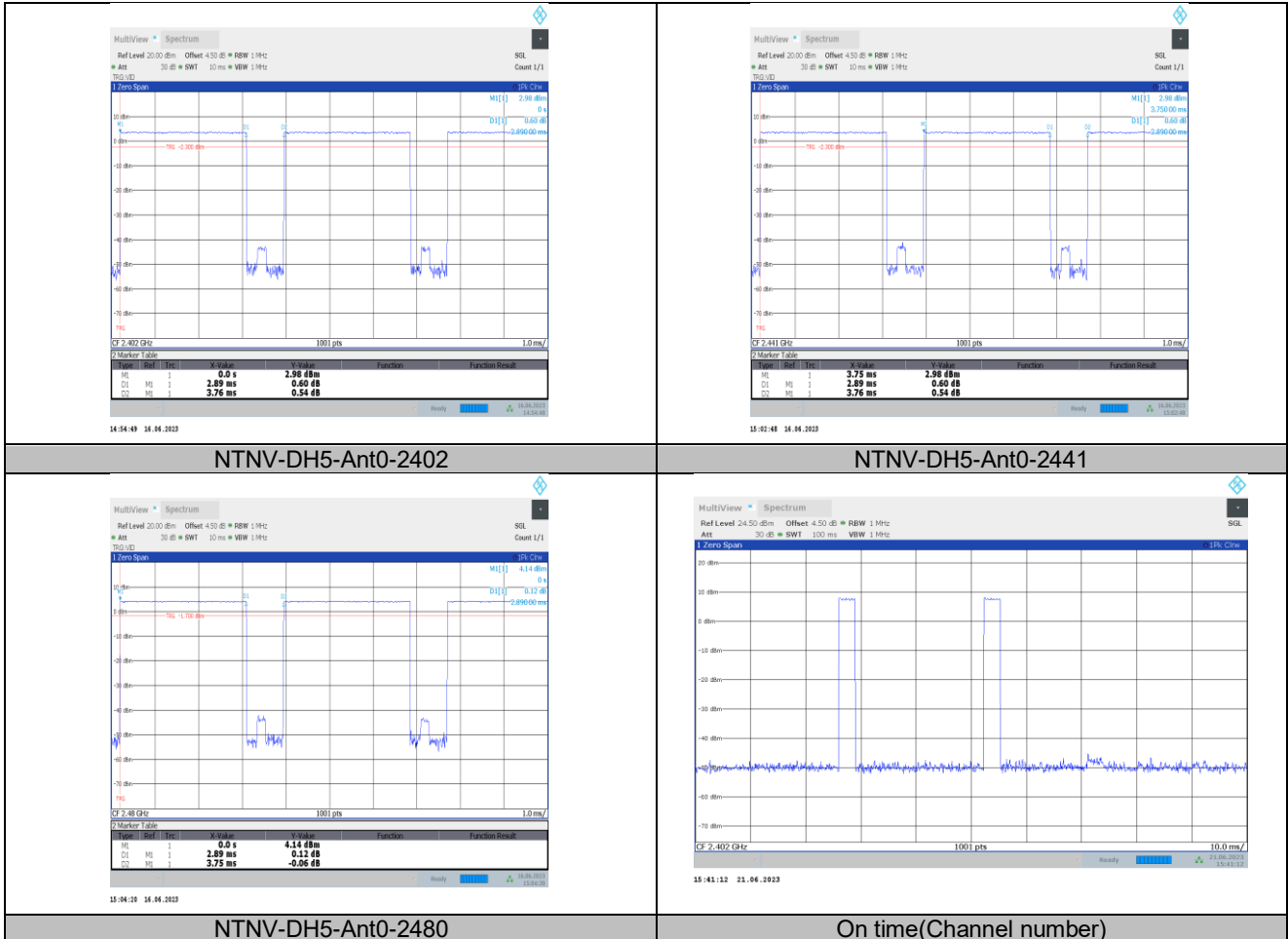


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Test Graphs



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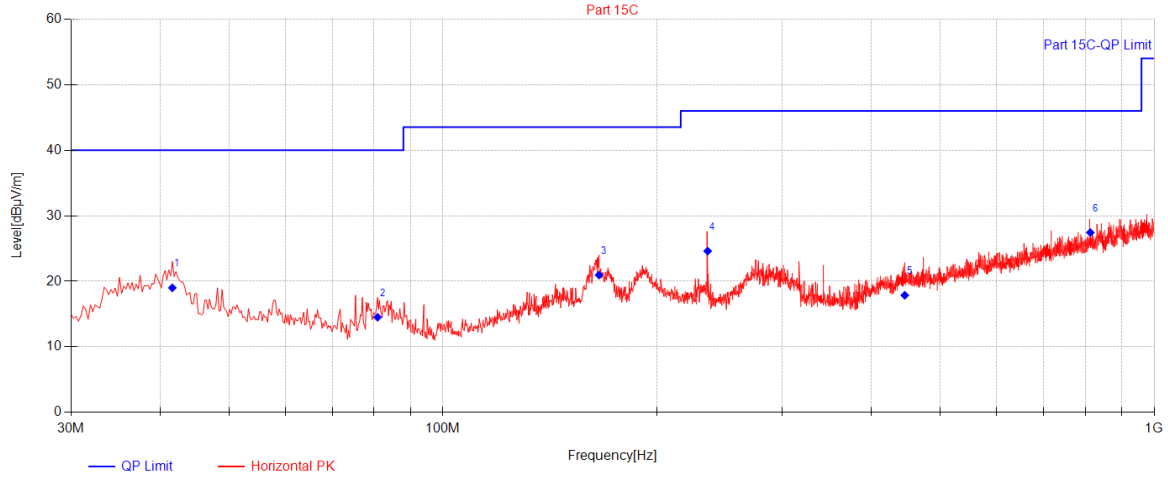
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Radiated Spurious Emissions

Radiated emission below 1GHz

Worst case Mode: GFSK_Channel 78



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-------------|-----------|-------------------|-------------------|----------------|-------------|-----------|------------|
| NO. | Frequency [MHz] | Reading [dBµV] | Factor [dB] | AF [dB/m] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 41.64 | 41.33 | -36.25 | 13.93 | 19.01 | 40.00 | 20.99 | 159 | 161 | Horizontal |
| 2 | 80.925 | 40.92 | -35.70 | 9.30 | 14.52 | 40.00 | 25.48 | 241 | 323 | Horizontal |
| 3 | 165.8 | 41.88 | -35.22 | 14.30 | 20.96 | 43.50 | 22.54 | 183 | 357 | Horizontal |
| 4 | 235.64 | 48.35 | -34.83 | 11.09 | 24.61 | 46.00 | 21.39 | 264 | 50 | Horizontal |
| 5 | 446.13 | 35.19 | -33.19 | 15.87 | 17.87 | 46.00 | 28.13 | 155 | 61 | Horizontal |
| 6 | 813.5175 | 37.83 | -31.19 | 20.79 | 27.44 | 46.00 | 18.56 | 123 | 61 | Horizontal |

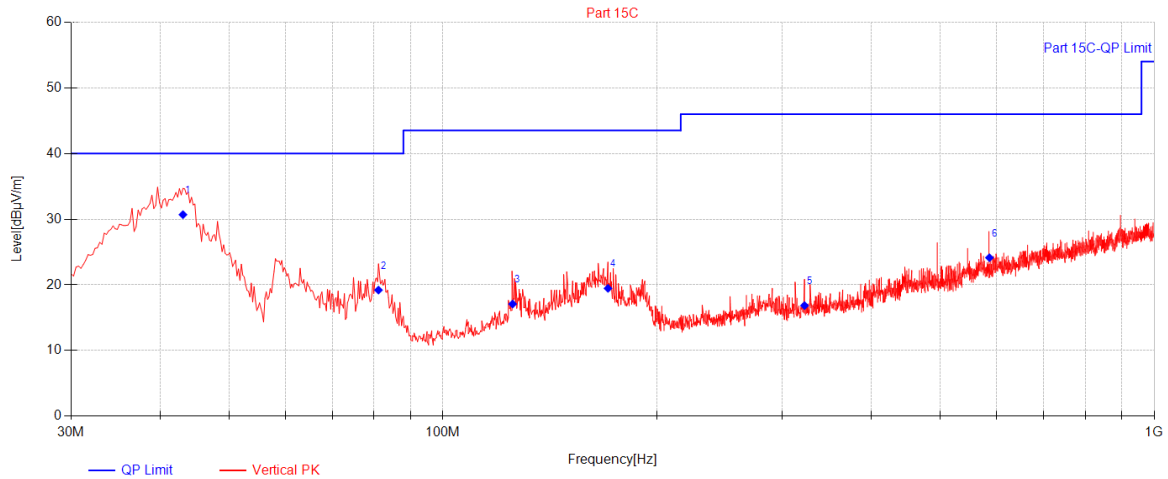


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| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-------------|-----------|-------------------|-------------------|----------------|-------------|-----------|----------|
| NO. | Frequency [MHz] | Reading [dBµV] | Factor [dB] | AF [dB/m] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 43.095 | 53.11 | -36.23 | 13.81 | 30.69 | 40.00 | 9.31 | 156 | 198 | Vertical |
| 2 | 81.1675 | 45.63 | -35.72 | 9.31 | 19.21 | 40.00 | 20.79 | 231 | 260 | Vertical |
| 3 | 125.3025 | 40.44 | -35.88 | 12.53 | 17.09 | 43.50 | 26.41 | 188 | 55 | Vertical |
| 4 | 170.65 | 40.19 | -35.15 | 14.43 | 19.47 | 43.50 | 24.03 | 214 | 260 | Vertical |
| 5 | 322.455 | 38.04 | -34.45 | 13.26 | 16.85 | 46.00 | 29.15 | 106 | 178 | Vertical |
| 6 | 586.78 | 38.56 | -32.49 | 18.07 | 24.14 | 46.00 | 21.86 | 189 | 207 | Vertical |

Remark:

- The field strength is calculated by adding the Antenna Factor, Cable Factor & Pre-amplifier gain. The basic equation with a sample calculation is as follows:
 $Value = Reading(dB\mu V) + AF(dB/m) + Factor(dB)$
 $AF = Antenna\ Factor(dB/m)$
 $Factor = Cable\ Factor(dB) - Pre-amplifier\ gain(dB)$
 $Margin = Limit(dB\mu V/m) - Value(dB\mu V/m)$
- All channels have been tested, but only the worst case data displayed in this report.



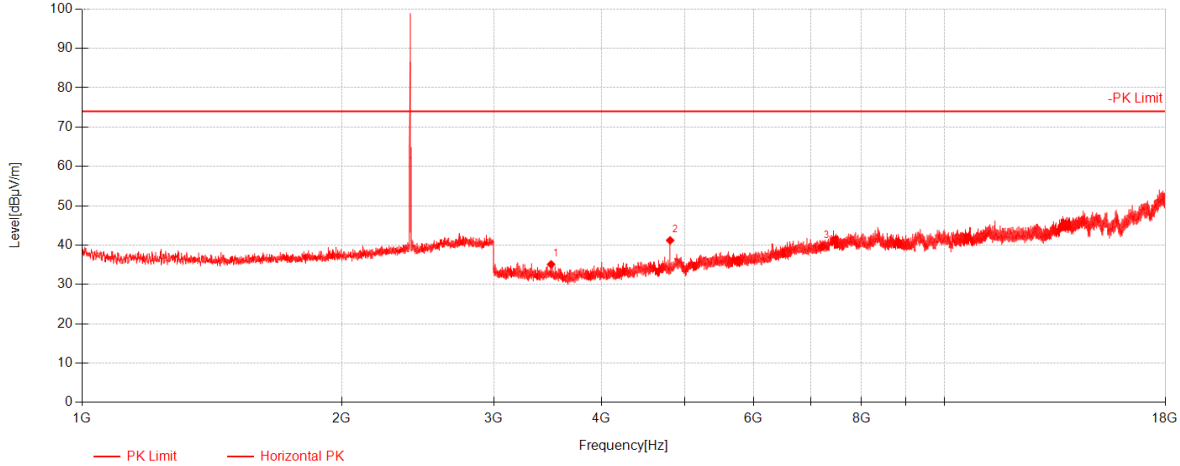
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Transmitter emission Above 1GHz

GFSK_Channel 00



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|------------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 3496.5 | 52.76 | 28.60 | -46.26 | 35.10 | 74.00 | 38.90 | 223 | 179 | Horizontal |
| 2 | 3496.5 | - | - | - | 10.34 | 54.00 | 43.66 | - | - | Horizontal |
| 3 | 4804.0000 | 55.77 | 30.97 | -45.54 | 41.20 | 74.00 | 32.80 | 169 | 358 | Horizontal |
| 4 | 4804.0000 | - | - | - | 16.44 | 54.00 | 37.56 | - | - | Horizontal |
| 5 | 7206.0000 | 47.24 | 35.78 | -43.44 | 39.58 | 74.00 | 34.42 | 249 | 16 | Horizontal |
| 6 | 7206.0000 | - | - | - | 14.82 | 54.00 | 39.18 | - | - | Horizontal |

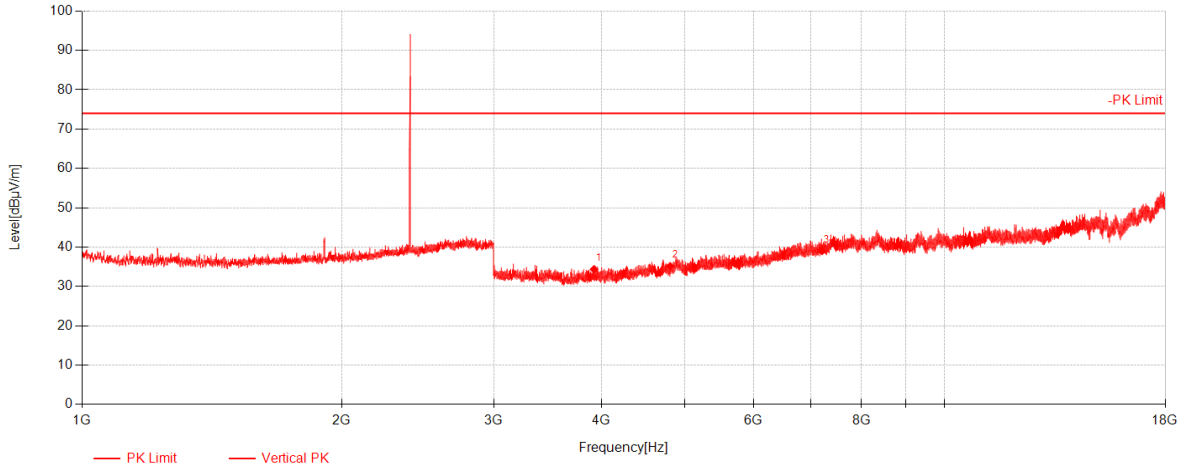


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GFSK_Channel 00



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|----------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 3921 | 51.56 | 29.02 | -46.23 | 34.35 | 74.00 | 39.65 | 115 | 219 | Vertical |
| 2 | 3921 | - | - | - | 9.59 | 54.00 | 44.41 | - | - | Vertical |
| 3 | 4804.0000 | 49.72 | 30.97 | -45.54 | 35.15 | 74.00 | 38.85 | 269 | 360 | Vertical |
| 4 | 4804.0000 | - | - | - | 10.39 | 54.00 | 43.61 | - | - | Vertical |
| 5 | 7206.0000 | 46.70 | 35.78 | -43.44 | 39.04 | 74.00 | 34.96 | 187 | 300 | Vertical |
| 6 | 7206.0000 | - | - | - | 14.28 | 54.00 | 39.72 | - | - | Vertical |

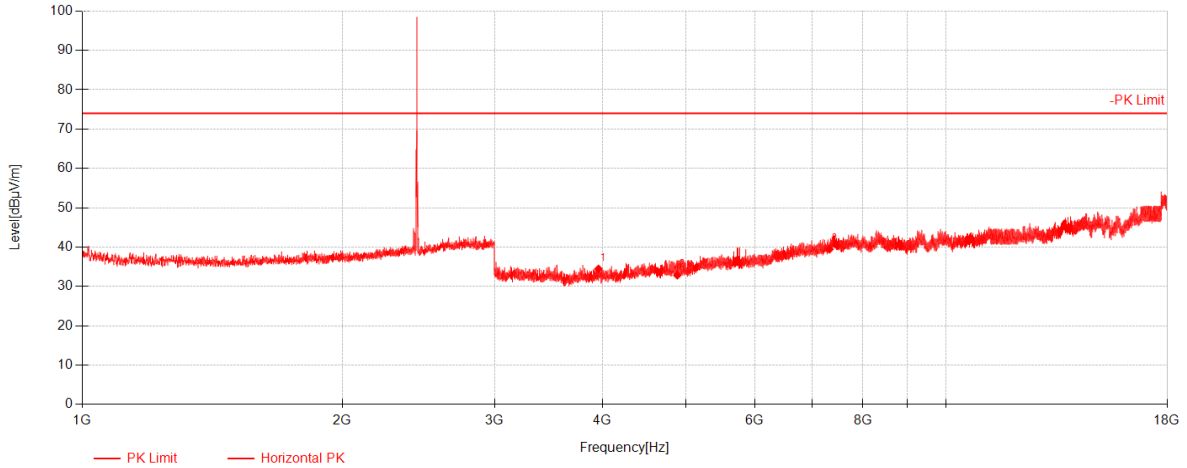


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GFSK_Channel 39



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|------------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 3957.5 | 51.54 | 29.06 | -46.14 | 34.46 | 74.00 | 39.54 | 110 | 166 | Horizontal |
| 2 | 3957.5 | - | - | - | 9.70 | 54.00 | 44.30 | - | - | Horizontal |
| 3 | 4882.0000 | 47.23 | 31.14 | -45.53 | 32.84 | 74.00 | 41.16 | 156 | 139 | Horizontal |
| 4 | 4882.0000 | - | - | - | 8.08 | 54.00 | 45.92 | - | - | Horizontal |
| 5 | 7323.0000 | 47.03 | 36.10 | -43.67 | 39.46 | 74.00 | 34.54 | 291 | 16 | Horizontal |
| 6 | 7323.0000 | - | - | - | 14.70 | 54.00 | 39.30 | - | - | Horizontal |



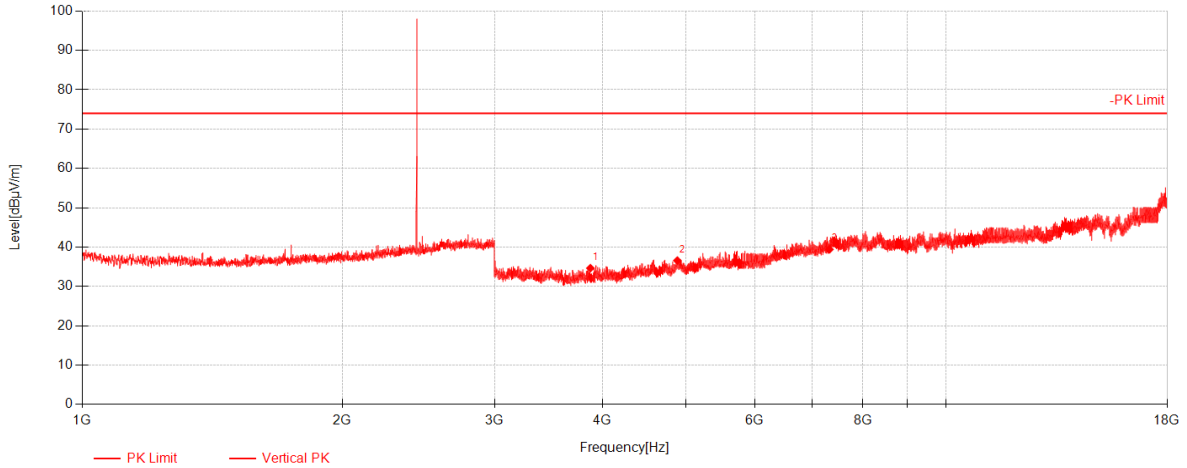
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GFSK_Channel 39



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|----------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 3872.5 | 51.86 | 28.97 | -46.18 | 34.65 | 74.00 | 39.35 | 255 | 288 | Vertical |
| 2 | 3872.5 | - | - | - | 9.89 | 54.00 | 44.11 | - | - | Vertical |
| 3 | 4882.0000 | 50.98 | 31.14 | -45.53 | 36.59 | 74.00 | 37.41 | 163 | 233 | Vertical |
| 4 | 4882.0000 | - | - | - | 11.83 | 54.00 | 42.17 | - | - | Vertical |
| 5 | 7323.0000 | 47.00 | 36.10 | -43.67 | 39.43 | 74.00 | 34.57 | 213 | 327 | Vertical |
| 6 | 7323.0000 | - | - | - | 14.67 | 54.00 | 39.33 | - | - | Vertical |

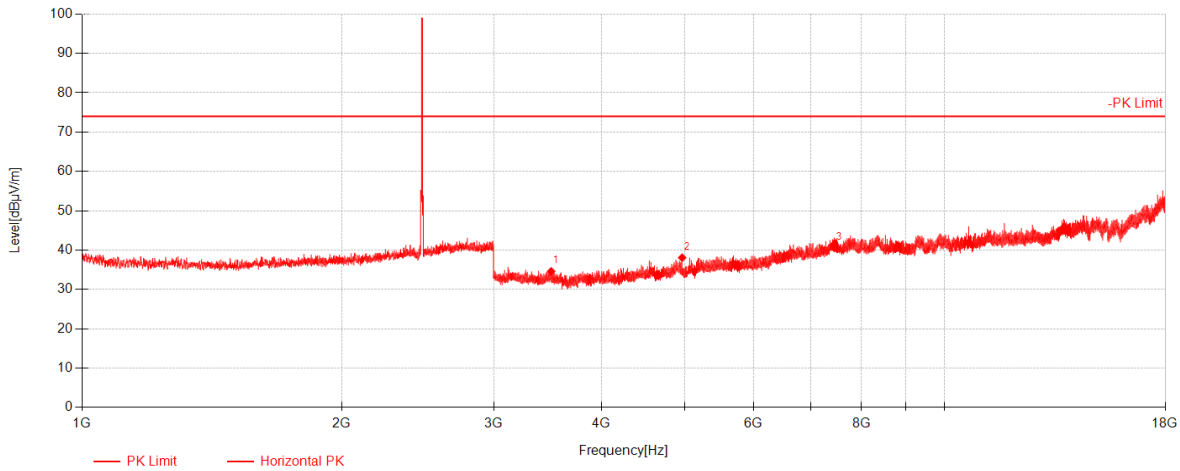


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GFSK_Channel 78



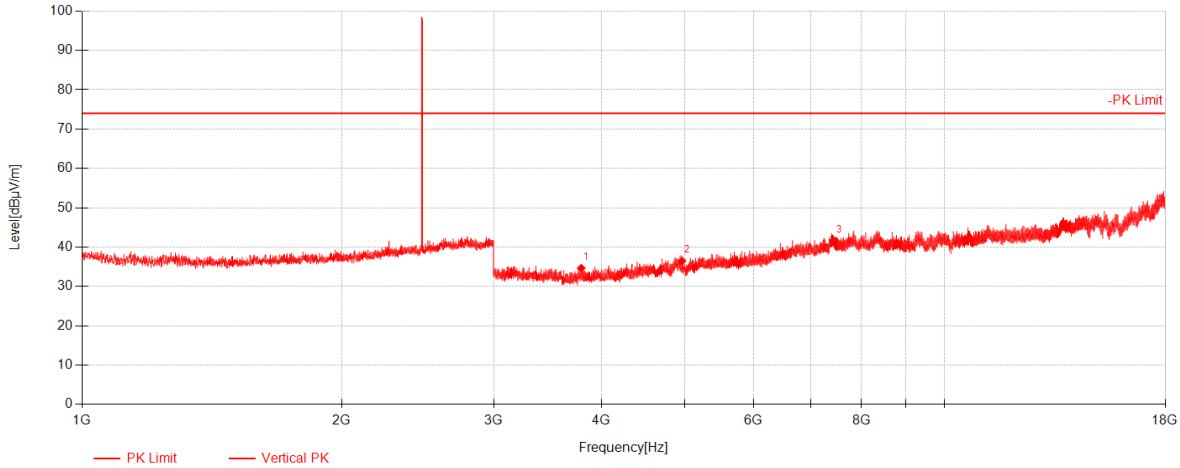
| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|------------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 3497 | 52.26 | 28.60 | -46.26 | 34.60 | 74.00 | 39.40 | 142 | 358 | Horizontal |
| 2 | 3497 | - | - | - | 9.84 | 54.00 | 44.16 | - | - | Horizontal |
| 3 | 4960.0000 | 52.35 | 31.31 | -45.60 | 38.07 | 74.00 | 35.93 | 156 | 220 | Horizontal |
| 4 | 4960.0000 | - | - | - | 13.31 | 54.00 | 40.69 | - | - | Horizontal |
| 5 | 7440.0000 | 47.47 | 36.43 | -43.30 | 40.60 | 74.00 | 33.40 | 298 | 70 | Horizontal |
| 6 | 7440.0000 | - | - | - | 15.84 | 54.00 | 38.16 | - | - | Horizontal |



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GFSK_Channel 78



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|----------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 3789 | 51.62 | 28.89 | -45.87 | 34.64 | 74.00 | 39.36 | 254 | 327 | Vertical |
| 2 | 3789 | - | - | - | 9.88 | 54.00 | 44.12 | - | - | Vertical |
| 3 | 4960.0000 | 50.75 | 31.31 | -45.60 | 36.47 | 74.00 | 37.53 | 199 | 96 | Vertical |
| 4 | 4960.0000 | - | - | - | 11.71 | 54.00 | 42.29 | - | - | Vertical |
| 5 | 7440.0000 | 48.42 | 36.43 | -43.30 | 41.55 | 74.00 | 32.45 | 203 | 178 | Vertical |
| 6 | 7440.0000 | - | - | - | 16.79 | 54.00 | 37.21 | - | - | Vertical |

Remark:

- The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier gain. The basic equation with a sample calculation is as follows:
 $Level = Reading(dB\mu V) + AF(dB/m) + Factor(dB)$
 $AF = Antenna\ Factor(dB/m)$
 $Factor = Cable\ Factor(dB) - Preamplifier\ gain(dB)$
 $Margin = Limit(dB\mu V/m) - Level(dB\mu V/m)$
- All channels have been tested, but only the worst case data displayed in this report.

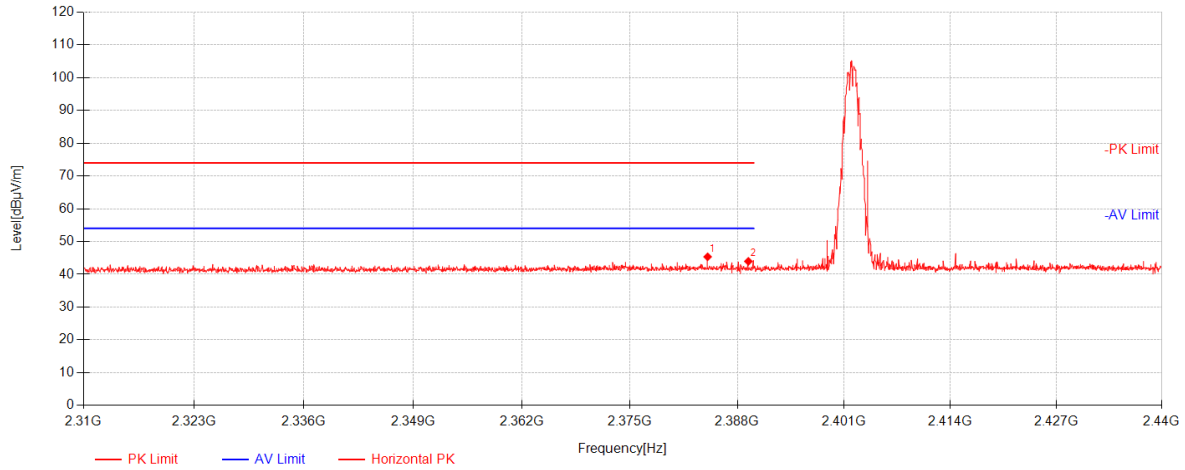


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Restricted bands around fundamental frequency

GFSK_Channel 00



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|------------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 2384.4033 | 41.95 | 26.98 | -23.57 | 45.35 | 74.00 | 28.65 | 210 | 188 | Horizontal |
| 2 | 2384.4033 | - | - | - | 20.59 | 54.00 | 33.41 | - | - | Horizontal |
| 3 | 2389.3433 | 40.54 | 26.99 | -23.57 | 43.96 | 74.00 | 30.04 | 210 | 188 | Horizontal |
| 4 | 2389.3433 | - | - | - | 19.20 | 54.00 | 34.80 | - | - | Horizontal |

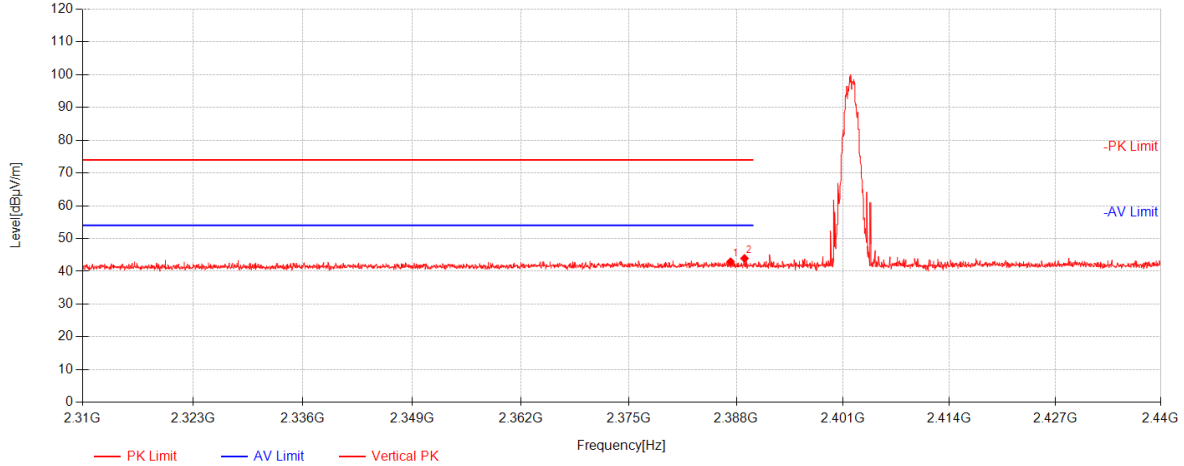


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GFSK_Channel 00



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|----------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 2387.3067 | 39.54 | 26.98 | -23.57 | 42.95 | 74.00 | 31.05 | 269 | 210 | Vertical |
| 2 | 2387.3067 | - | - | - | 18.19 | 54.00 | 35.81 | - | - | Vertical |
| 3 | 2388.9967 | 40.53 | 26.99 | -23.57 | 43.95 | 74.00 | 30.05 | 269 | 210 | Vertical |
| 4 | 2388.9967 | - | - | - | 19.19 | 54.00 | 34.81 | - | - | Vertical |



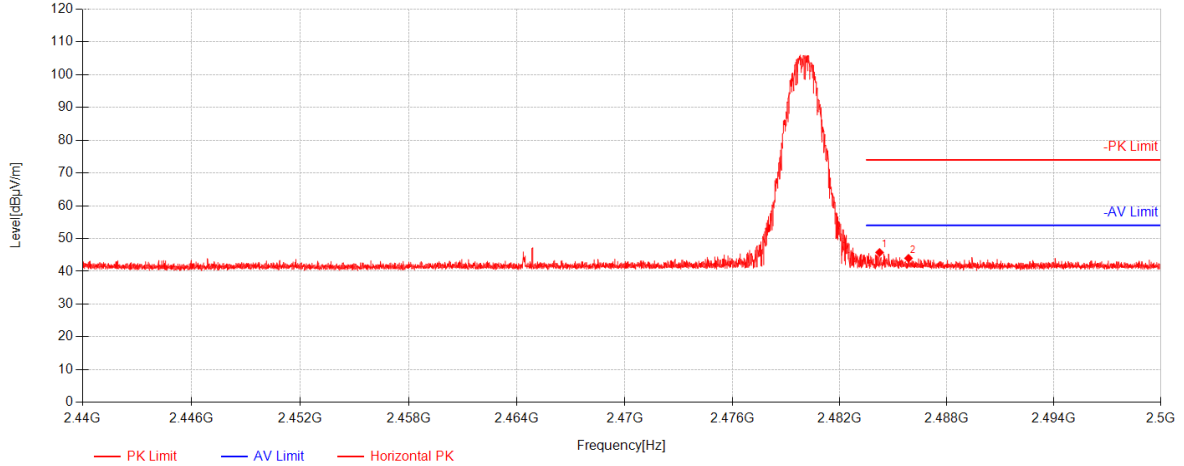
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GFSK_Channel 78



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|------------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 2484.2275 | 42.05 | 27.26 | -23.54 | 45.76 | 74.00 | 28.24 | 187 | 332 | Horizontal |
| 2 | 2484.2275 | - | - | - | 21.00 | 54.00 | 33.00 | - | - | Horizontal |
| 3 | 2485.8475 | 40.27 | 27.26 | -23.54 | 43.99 | 74.00 | 30.01 | 187 | 332 | Horizontal |
| 4 | 2485.8475 | - | - | - | 19.23 | 54.00 | 34.77 | - | - | Horizontal |

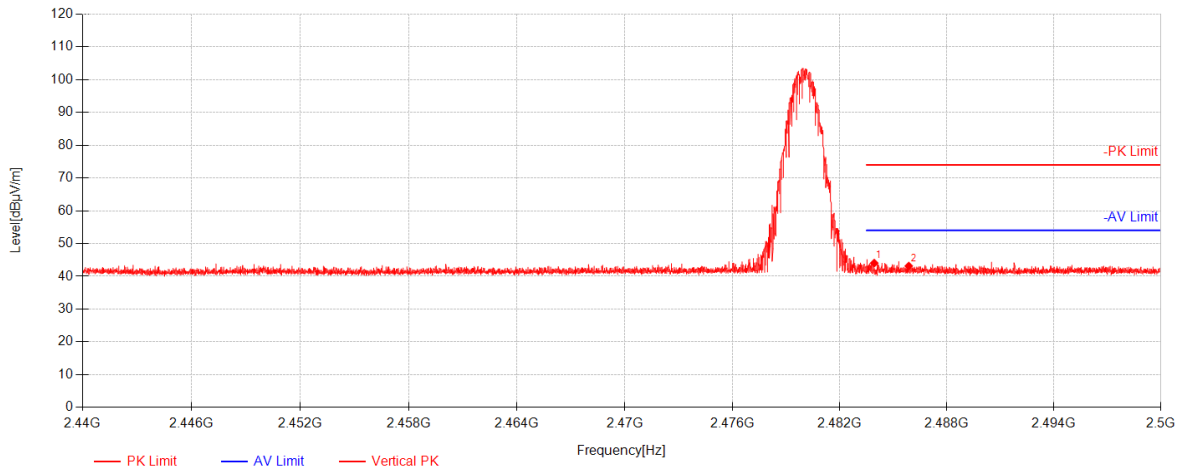


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GFSK_Channel 78



| Data List | | | | | | | | | | |
|-----------|-----------------|----------------|-----------|-------------|----------------|----------------|-------------|-------------|-----------|----------|
| NO. | Frequency [MHz] | Reading [dBµV] | AF [dB/m] | Factor [dB] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 2483.9275 | 40.33 | 27.25 | -23.54 | 44.04 | 74.00 | 29.96 | 153 | 62 | Vertical |
| 2 | 2483.9275 | - | - | - | 19.28 | 54.00 | 34.72 | - | - | Vertical |
| 3 | 2485.8625 | 39.43 | 27.26 | -23.54 | 43.15 | 74.00 | 30.85 | 153 | 62 | Vertical |
| 4 | 2485.8625 | - | - | - | 18.39 | 54.00 | 35.61 | - | - | Vertical |

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier gain. The basic equation with a sample calculation is as follows:

Level = Reading(dBµV) + AF(dB/m) + Factor(dB):
 AF = Antenna Factor(dB/m)
 Factor = Cable Factor(dB) - Preamplifier gain(dB)
 Margin = Limit(dBµV/m) – Level(dBµV/m)

---End of Report---

