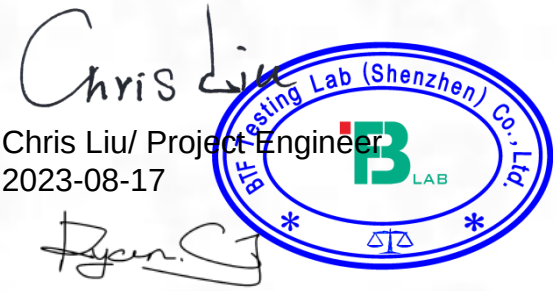
# RF Test Report

## For

| | |
|---|---|
| **Applicant Name:** | **ShenZhen Foscam Intelligent Technology Co., Ltd.** |
| Address: | Room 901, Unit B, Building 7, Xingke 1st Street, Vanke Cloud City Phase 1, Nanshan Dist., Shenzhen, Guangdong, China |
| EUT Name: | QHD WiFi IP Camera |
| Brand Name: | FOSCAM |
| Model Number: | V5P |
| Series Model Number: | Refer to section 2 |

## Issued By

| | |
|---|---|
| **Company Name:** | **BTF Testing Lab (Shenzhen) Co., Ltd.** |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Report Number: | BTF230801R00202 |
| Test Standards: | 47 CFR Part 15E |
| Test Conclusion: | Pass |
| FCC ID: | ZDEV5P |
| Test Date: | 2023-08-01 to 2023-08-16 |
| Date of Issue: | 2023-08-17 |

Prepared By: 

Chris Liu/ Project Engineer

Date: 2023-08-17

Approved By: 

Ryan.CJ / EMC Manager

Date: 2023-08-17

*Note: All the test results in this report only related to the testing samples. Which can be duplicated completely for the legal use with approval of applicant; it shall not be reproduced except in full without the written approval of BTF Testing Lab (Shenzhen) Co., Ltd., All the objections should be raised within thirty days from the date of issue. To validate the report, you can contact us.*

| Revision History | | |
|---|---|---|
| Version | Issue Date | Revisions Content |
| R_V0 | 2023-08-17 | Original |
| | | |
| *Note: Once the revision has been made, then previous versions reports are invalid.* | | |



BTF Testing Lab (Shenzhen) Co., Ltd.
F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

# Table of Contents

1 INTRODUCTION ..... 5
1.1 Identification of Testing Laboratory ..... 5
1.2 Identification of the Responsible Testing Location ..... 5
1.3 Announcement ..... 5
2 PRODUCT INFORMATION ..... 6
2.1 Application Information ..... 6
2.2 Manufacturer Information ..... 6
2.3 Factory Information ..... 6
2.4 General Description of Equipment under Test (EUT) ..... 6
2.5 Technical Information ..... 6
3 SUMMARY OF TEST RESULTS ..... 7
3.1 Test Standards ..... 7
3.2 Uncertainty of Test ..... 7
3.3 Summary of Test Result ..... 7
4 TEST CONFIGURATION ..... 8
4.1 Test Equipment List ..... 8
4.2 Test Auxiliary Equipment ..... 14
4.3 Test Modes ..... 14
5 EVALUATION RESULTS (EVALUATION) ..... 15
5.1 Antenna requirement ..... 15
6 RADIO SPECTRUM MATTER TEST RESULTS (RF) ..... 15
6.1 Conducted Emission at AC power line ..... 15
6.1.1 E.U.T. Operation: ..... 15
6.1.2 Test Setup Diagram: ..... 15
6.1.3 Test Data: ..... 16
6.2 Duty Cycle ..... 18
6.2.1 E.U.T. Operation: ..... 18
6.2.2 Test Data: ..... 18
6.3 Maximum conducted output power ..... 19
6.3.1 E.U.T. Operation: ..... 20
6.3.2 Test Data: ..... 20
6.4 Power spectral density ..... 21
6.4.1 E.U.T. Operation: ..... 22
6.4.2 Test Data: ..... 22
6.5 Emission bandwidth and occupied bandwidth ..... 23
6.5.1 E.U.T. Operation: ..... 24
6.5.2 Test Data: ..... 24
6.6 Band edge emissions (Radiated) ..... 25
6.6.1 E.U.T. Operation: ..... 26
6.6.2 Test Setup Diagram: ..... 27
6.6.3 Test Data: ..... 28
6.7 Undesirable emission limits (below 1GHz) ..... 30
6.7.1 E.U.T. Operation: ..... 31
6.7.2 Test Setup Diagram: ..... 32
6.7.3 Test Data: ..... 33
6.8 Undesirable emission limits (above 1GHz) ..... 35
6.8.1 E.U.T. Operation: ..... 36



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6.8.2 Test Data: .....37
**7 TEST SETUP PHOTOS .....40**
**8 EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS).....42**
**APPENDIX.....43**



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# 1 Introduction

## 1.1 Identification of Testing Laboratory

| | |
|---|---|
| Company Name: | BTF Testing Lab (Shenzhen) Co., Ltd. |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Phone Number: | +86-0755-23146130 |
| Fax Number: | +86-0755-23146130 |

## 1.2 Identification of the Responsible Testing Location

| | |
|---|---|
| Company Name: | BTF Testing Lab (Shenzhen) Co., Ltd. |
| Address: | F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China |
| Phone Number: | +86-0755-23146130 |
| Fax Number: | +86-0755-23146130 |
| FCC Registration Number: | 518915 |
| Designation Number: | CN1330 |

## 1.3 Announcement

(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
(4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
(5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
(6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

# 2 Product Information

## 2.1 Application Information

| | |
|---|---|
| Company Name: | ShenZhen Foscam Intelligent Technology Co., Ltd. |
| Address: | Room 901, Unit B, Building 7, Xingke 1st Street, Vanke Cloud City Phase 1, Nanshan Dist., Shenzhen, Guangdong, China |

## 2.2 Manufacturer Information

| | |
|---|---|
| Company Name: | ShenZhen Foscam Intelligent Technology Co., Ltd. |
| Address: | Room 901, Unit B, Building 7, Xingke 1st Street, Vanke Cloud City Phase 1, Nanshan Dist., Shenzhen, Guangdong, China |

## 2.3 Factory Information

| | |
|---|---|
| Company Name: | ShenZhen Foscam Intelligent Technology Co., Ltd. |
| Address: | Room 901, Unit B, Building 7, Xingke 1st Street, Vanke Cloud City Phase 1, Nanshan Dist., Shenzhen, Guangdong, China |

## 2.4 General Description of Equipment under Test (EUT)

| | |
|---|---|
| EUT Name: | QHD WiFi IP Camera |
| Test Model Number: | V5P |
| Series Model Number: | V5S, V9905P, V9915P |
| Description of Model name differentiation: | Different names are used for different sales regions, and there is no difference in products |

## 2.5 Technical Information

| | |
|---|---|
| Power Supply: | AC 120V 60Hz |
| Operation Frequency Range | U-NII Band 1: 5.18~5.24 GHz<br>U-NII Band 3: 5.745~5.825 GHz |
| Frequency Block | U-NII Band 1: 5.15~5.25 GHz<br>U-NII Band 3: 5.725~5.825 GHz |
| Channel Bandwidth | 802.11a: 20 MHz<br>802.11n: 20 MHz, 40 MHz<br>802.11ac: 20 MHz, 40 MHz, 80 MHz |
| Antenna Type: | external antenna |
| Antenna Gain: | 2 dBi |

Note:

#: The antenna gain provided by the applicant, and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.



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# 3 Summary of Test Results

## 3.1 Test Standards

The tests were performed according to following standards:
**47 CFR Part 15E:** Unlicensed National Information Infrastructure Devices

## 3.2 Uncertainty of Test

| Item | Measurement Uncertainty |
|---|---|
| Conducted Emission (150 kHz-30 MHz) | ±2.64dB |
| The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. | |

## 3.3 Summary of Test Result

| Item | Standard | Requirement | Result |
|---|---|---|---|
| Antenna requirement | 47 CFR Part 15E | Part 15.203 | Pass |
| Conducted Emission at AC power line | 47 CFR Part 15E | 47 CFR Part 15.207(a) | Pass |
| Maximum conducted output power | 47 CFR Part 15E | 47 CFR Part 15.407(a)(1)(i)<br>47 CFR Part 15.407(a)(1)(ii)<br>47 CFR Part 15.407(a)(1)(iii)<br>47 CFR Part 15.407(a)(1)(iv)<br>47 CFR Part 15.407(a)(2)<br>47 CFR Part 15.407(a)(3)(i) | Pass |
| Power spectral density | 47 CFR Part 15E | 47 CFR Part 15.407(a)(1)(i)<br>47 CFR Part 15.407(a)(1)(ii)<br>47 CFR Part 15.407(a)(1)(iii)<br>47 CFR Part 15.407(a)(1)(iv)<br>47 CFR Part 15.407(a)(2)<br>47 CFR Part 15.407(a)(3)(i) | Pass |
| Emission bandwidth and occupied bandwidth | 47 CFR Part 15E | U-NII 1, U-NII 2A, U-NII 2C:<br>No limits, only for report use.<br>47 CFR Part 15.407(e) | Pass |
| Channel Availability Check Time | 47 CFR Part 15E | 47 CFR Part 15.407(h)(2)(ii) | Pass |
| U-NII Detection Bandwidth | 47 CFR Part 15E | 47 CFR Part 15.407(h)(2) | Pass |
| Statistical Performance Check | 47 CFR Part 15E | KDB 935210 D02, Clause 5.1 Table 2 | Pass |
| Channel Move Time, Channel Closing Transmission Time | 47 CFR Part 15E | 47 CFR Part 15.407(h)(2)(iii) | Pass |
| Non-Occupancy Period Test | 47 CFR Part 15E | 47 CFR Part 15.407(h)(2)(iv) | Pass |
| DFS Detection Thresholds | 47 CFR Part 15E | KDB 905462 D02, Clause 5.2 Table 3 | Pass |
| Band edge emissions (Radiated) | 47 CFR Part 15E | 47 CFR Part 15.407(b)(1)<br>47 CFR Part 15.407(b)(2)<br>47 CFR Part 15.407(b)(4)<br>47 CFR Part 15.407(b)(10) | Pass |
| Undesirable emission limits (below 1GHz) | 47 CFR Part 15E | 47 CFR Part 15.407(b)(9) | Pass |
| Undesirable emission limits (above 1GHz) | 47 CFR Part 15E | 47 CFR Part 15.407(b)(1)<br>47 CFR Part 15.407(b)(2)<br>47 CFR Part 15.407(b)(4)<br>47 CFR Part 15.407(b)(10) | Pass |



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# 4 Test Configuration

## 4.1 Test Equipment List

| Conducted Emission at AC power line | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Pulse Limiter | SCHWARZBECK | VTSD 9561-F | 00953 | 2022-11-24 | 2023-11-23 |
| Coaxial Switcher | SCHWARZBECK | CX210 | CX210 | 2022-11-24 | 2023-11-23 |
| V-LISN | SCHWARZBECK | NSLK 8127 | 01073 | 2022-11-24 | 2023-11-23 |
| LISN | AFJ | LS16/110VAC | 16010020076 | 2023-02-23 | 2024-02-22 |
| EMI Receiver | ROHDE&SCHWARZ | ESCI3 | 101422 | 2022-11-24 | 2023-11-23 |

| Duty Cycle | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| Maximum conducted output power | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |



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| Power spectral density | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| Emission bandwidth and occupied bandwidth | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| Channel Availability Check Time | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |



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| | | | | | |
|---|---|---|---|---|---|
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| U-NII Detection Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| Statistical Performance Check | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| Channel Move Time, Channel Closing Transmission Time | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |



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| | | | | | |
|---|---|---|---|---|---|
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| Non-Occupancy Period Test | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| DFS Detection Thresholds | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| RFTest software | / | V1.00 | / | / | / |
| RF Control Unit | Techy | TR1029-1 | / | 2022-11-24 | 2023-11-23 |
| RF Sensor Unit | Techy | TR1029-2 | / | 2022-11-24 | 2023-11-23 |
| Programmable constant temperature and humidity box | ZZCKONG | ZZ-K02A | 20210928007 | 2022-11-24 | 2023-11-23 |
| Adjustable Direct Current Regulated Power Supply | Dongguan Tongmen Electronic Technology Co., LTD | etm-6050c | 20211026123 | 2022-11-24 | 2023-11-23 |
| WIDEBAND RADIO COMMNUNICATION TESTER | Rohde & Schwarz | CMW500 | 161997 | 2022-11-24 | 2023-11-23 |
| MXA Signal Analyzer | KEYSIGHT | N9020A | MY50410020 | 2022-11-24 | 2023-11-23 |

| Band edge emissions (Radiated) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Coaxial cable Multiflex 141 | Schwarzbeck | N/SMA 0.5m | 517386 | 2023-03-24 | 2024-03-23 |
| Preamplifier | SCHWARZBECK | BBV9744 | 00246 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-10m | 21101566 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-10m | 21101570 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-1m | 21101568 | 2022-11-24 | 2023-11-23 |



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| | | | | | |
|---|---|---|---|---|---|
| RE Cable | REBES Talent | UF2-NMNM-1m | 21101576 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-2.5m | 21101573 | 2022-11-24 | 2023-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 01157 | 2021-11-28 | 2023-11-27 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI7 | 101032 | 2022-11-24 | 2023-11-23 |
| SIGNAL ANALYZER | ROHDE&SCHWARZ | FSQ40 | 100010 | 2022-11-24 | 2023-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Broadband Preamplilifier | SCHWARZBECK | BBV9718D | 00008 | 2023-03-24 | 2024-03-23 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 2597 | 2022-05-22 | 2024-05-21 |
| EZ_EMC | Frad | FA-03A2 RE+ | / | / | / |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Log periodic antenna | SCHWARZBECK | VULB 9168 | 01328 | 2021-11-28 | 2023-11-27 |

| **Undesirable emission limits (below 1GHz)** | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Coaxial cable Multiflex 141 | Schwarzbeck | N/SMA 0.5m | 517386 | 2023-03-24 | 2024-03-23 |
| Preamplifier | SCHWARZBECK | BBV9744 | 00246 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-10m | 21101566 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-10m | 21101570 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-1m | 21101568 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-1m | 21101576 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-2.5m | 21101573 | 2022-11-24 | 2023-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 01157 | 2021-11-28 | 2023-11-27 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI7 | 101032 | 2022-11-24 | 2023-11-23 |
| SIGNAL ANALYZER | ROHDE&SCHWARZ | FSQ40 | 100010 | 2022-11-24 | 2023-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Broadband Preamplilifier | SCHWARZBECK | BBV9718D | 00008 | 2023-03-24 | 2024-03-23 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 2597 | 2022-05-22 | 2024-05-21 |
| EZ_EMC | Frad | FA-03A2 RE+ | / | / | / |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Log periodic antenna | SCHWARZBECK | VULB 9168 | 01328 | 2021-11-28 | 2023-11-27 |



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| Undesirable emission limits (above 1GHz) | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Coaxial cable Multiflex 141 | Schwarzbeck | N/SMA 0.5m | 517386 | 2023-03-24 | 2024-03-23 |
| Preamplifier | SCHWARZBECK | BBV9744 | 00246 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-10m | 21101566 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-10m | 21101570 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF1-SMASMAM-1m | 21101568 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-1m | 21101576 | 2022-11-24 | 2023-11-23 |
| RE Cable | REBES Talent | UF2-NMNM-2.5m | 21101573 | 2022-11-24 | 2023-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Horn Antenna | SCHWARZBECK | BBHA9170 | 01157 | 2021-11-28 | 2023-11-27 |
| EMI TEST RECEIVER | ROHDE&SCHWARZ | ESCI7 | 101032 | 2022-11-24 | 2023-11-23 |
| SIGNAL ANALYZER | ROHDE&SCHWARZ | FSQ40 | 100010 | 2022-11-24 | 2023-11-23 |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Broadband Preamplilifier | SCHWARZBECK | BBV9718D | 00008 | 2023-03-24 | 2024-03-23 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 2597 | 2022-05-22 | 2024-05-21 |
| EZ_EMC | Frad | FA-03A2 RE+ | / | / | / |
| POSITIONAL CONTROLLER | SKET | PCI-GPIB | / | / | / |
| Log periodic antenna | SCHWARZBECK | VULB 9168 | 01328 | 2021-11-28 | 2023-11-27 |



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## 4.2 Test Auxiliary Equipment

The EUT was tested as an independent device.

## 4.3 Test Modes

| No. | Test Modes | Description |
|---|---|---|
| TM1 | 802.11a mode | Keep the EUT connect to AC power line and works in continuously transmitting mode with 802.11a modulation type. All data rates has been tested and found the data rate @ 6Mbps is the worst case. Only the data of worst case is recorded in the report. |
| TM2 | 802.11n mode | Keep the EUT connect to AC power line and works in continuously transmitting mode with 802.11n modulation type. All bandwidth and data rates has been tested and found the data rate @ MCS0 is the worst case. Only the data of worst case is recorded in the report. |
| TM3 | 802.11ac mode | Keep the EUT connect to AC power line and works in continuously transmitting mode with 802.11ac modulation type. Only the data of worst case is recorded in the report. |
| TM4 | Normal Operating | Keep the EUT works in normal operating mode and connect to companion device |



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# 5 Evaluation Results (Evaluation)

## 5.1 Antenna requirement

| | |
|---|---|
| Test 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 shall be considered sufficient to comply with the provisions of this section. |

# 6 Radio Spectrum Matter Test Results (RF)

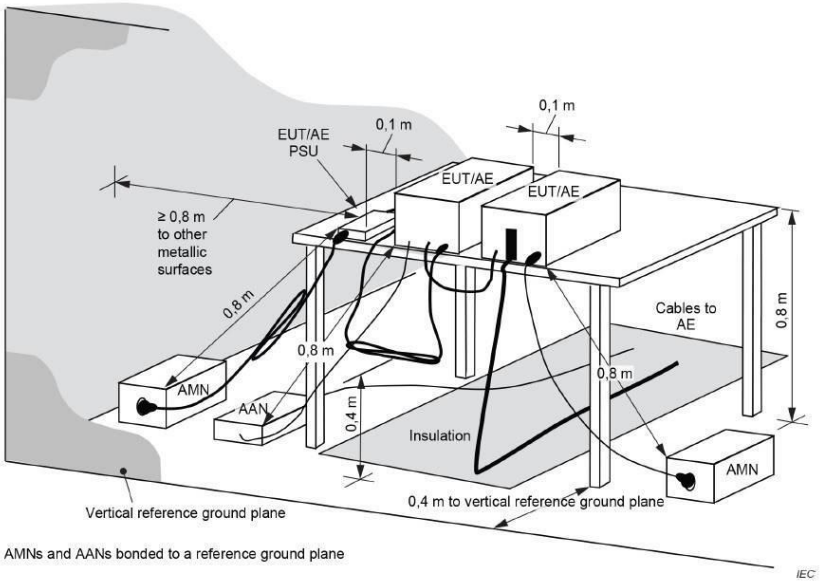
## 6.1 Conducted Emission at AC power line

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.207(a) |
| Test Method: | Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices |
| Test Limit: | Frequency of emission (MHz) / Conducted limit (dBμV): Quasi-peak / Average<br>0.15-0.5: 66 to 56* / 56 to 46*<br>0.5-5: 56 / 46<br>5-30: 60 / 50<br>*Decreases with the logarithm of the frequency. |

### 6.1.1 E.U.T. Operation:

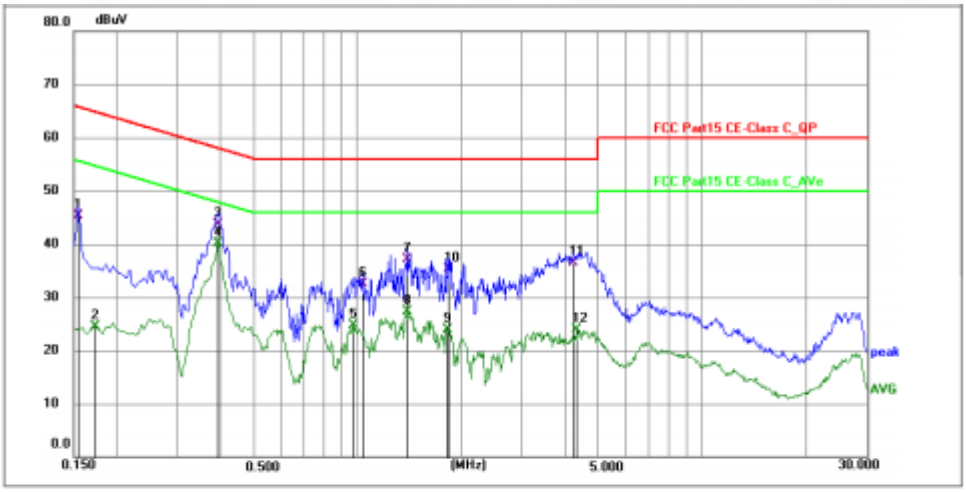
| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

### 6.1.2 Test Setup Diagram:



### 6.1.3 Test Data:

TM1 / Line: Line / Band: U-NII 1 / BW: 20 / CH: L




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.1544 | 34.75 | 10.55 | 45.30 | 65.76 | -20.46 | QP | P | |
| 2 | 0.1723 | 13.98 | 10.56 | 24.54 | 54.85 | -30.31 | AVG | P | |
| 3 | 0.3930 | 33.10 | 10.60 | 43.70 | 58.00 | -14.30 | QP | P | |
| 4 * | 0.3930 | 29.42 | 10.60 | 40.02 | 48.00 | -7.98 | AVG | P | |
| 5 | 0.9690 | 14.00 | 10.77 | 24.77 | 46.00 | -21.23 | AVG | P | |
| 6 | 1.0363 | 21.82 | 10.78 | 32.60 | 56.00 | -23.40 | QP | P | |
| 7 | 1.3965 | 26.36 | 10.74 | 37.10 | 56.00 | -18.90 | QP | P | |
| 8 | 1.3965 | 16.53 | 10.74 | 27.27 | 46.00 | -18.73 | AVG | P | |
| 9 | 1.8285 | 13.24 | 10.71 | 23.95 | 46.00 | -22.05 | AVG | P | |
| 10 | 1.8330 | 24.70 | 10.70 | 35.40 | 56.00 | -20.60 | QP | P | |
| 11 | 4.2404 | 25.75 | 10.75 | 36.50 | 56.00 | -19.50 | QP | P | |
| 12 | 4.3573 | 13.24 | 10.76 | 24.00 | 46.00 | -22.00 | AVG | P | |



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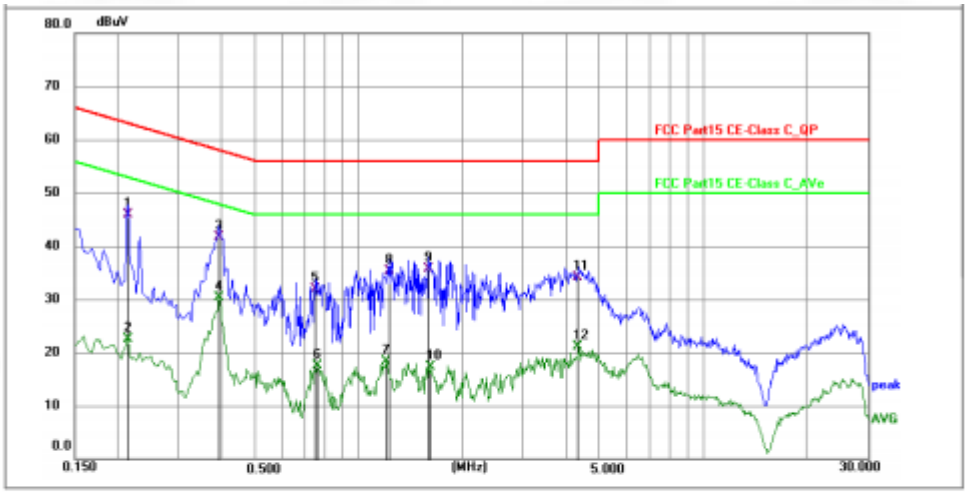
TM1 / Line: Neutral / Band: U-NII 1 / BW: 20 / CH: L




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB) | Level (dBuV) | Limit (dBuV) | Margin (dB) | Detector | P/F | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.2130 | 35.31 | 10.59 | 45.90 | 63.09 | -17.19 | QP | P | |
| 2 | 0.2130 | 11.93 | 10.59 | 22.52 | 53.09 | -30.57 | AVG | P | |
| 3 * | 0.3930 | 31.20 | 10.60 | 41.80 | 58.00 | -16.20 | QP | P | |
| 4 | 0.3930 | 19.72 | 10.60 | 30.32 | 48.00 | -17.68 | AVG | P | |
| 5 | 0.7485 | 21.16 | 10.74 | 31.90 | 56.00 | -24.10 | QP | P | |
| 6 | 0.7620 | 6.81 | 10.74 | 17.55 | 46.00 | -28.45 | AVG | P | |
| 7 | 1.1983 | 7.46 | 10.76 | 18.22 | 46.00 | -27.78 | AVG | P | |
| 8 | 1.2255 | 24.64 | 10.76 | 35.40 | 56.00 | -20.60 | QP | P | |
| 9 | 1.5945 | 25.07 | 10.73 | 35.80 | 56.00 | -20.20 | QP | P | |
| 10 | 1.6213 | 6.65 | 10.72 | 17.37 | 46.00 | -28.63 | AVG | P | |
| 11 | 4.3573 | 23.34 | 10.76 | 34.10 | 56.00 | -21.90 | QP | P | |
| 12 | 4.3573 | 10.34 | 10.76 | 21.10 | 46.00 | -24.90 | AVG | P | |



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## 6.2 Duty Cycle

| | |
|---|---|
| Test Requirement: | All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum-power transmission duration, T, are required for each tested mode of operation. |
| Test Method: | ANSI C63.10-2013 section 12.2 (b) |
| Test Limit: | No limits, only for report use. |
| Procedure: | i) Set the center frequency of the instrument to the center frequency of the transmission.<br>ii) Set RBW >= EBW if possible; otherwise, set RBW to the largest available value.<br>iii) Set VBW >= RBW.<br>iv) Set detector = peak.<br>v) The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T, where T is defined in item a1) of 12.2, and the number of sweep points across duration T exceeds 100. |

### 6.2.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

### 6.2.2 Test Data:

Please Refer to Appendix for Details.



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## 6.3 Maximum conducted output power

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.407(a)(1)(i)<br>47 CFR Part 15.407(a)(1)(ii)<br>47 CFR Part 15.407(a)(1)(iii)<br>47 CFR Part 15.407(a)(1)(iv)<br>47 CFR Part 15.407(a)(2)<br>47 CFR Part 15.407(a)(3)(i) |
| Test Method: | ANSI C63.10-2013, section 12.3 |
| Test Limit: | For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).<br><br>For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.<br><br>For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.<br>Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power.<br>For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power is required for each 1 dB of antenna gain in excess of 23 dBi.<br>Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.<br><br>For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.<br><br>For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. |



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| | |
|---|---|
| | For the band 5.725-5.850 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.<br>However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations. |
| Procedure: | Method SA-1<br>a) Set span to encompass the entire 26 dB EBW or 99% OBW of the signal.<br>b) Set RBW = 1 MHz.<br>c) Set VBW >= 3 MHz.<br>d) Number of points in sweep >= [2 × span / RBW]. (This gives bin-to-bin spacing <= RBW / 2, so<br>that narrowband signals are not lost between frequency bins.)<br>e) Sweep time = auto.<br>f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.<br>g) If transmit duty cycle < 98%, use a video trigger with the trigger level set to enable triggering<br>only on full power pulses. The transmitter shall operate at maximum power control level for the<br>entire duration of every sweep. If the EUT transmits continuously (i.e., with no OFF intervals) or<br>at duty cycle >= 98%, and if each transmission is entirely at the maximum power control level,<br>then the trigger shall be set to “free run.”<br>h) Trace average at least 100 traces in power averaging (rms) mode.<br>i) Compute power by integrating the spectrum across the 26 dB EBW or 99% OBW of the signal<br>using the instrument’s band power measurement function, with band limits set equal to the<br>EBW or OBW band edges. If the instrument does not have a band power function, then sum the<br>spectrum levels (in power units) at 1 MHz intervals extending across the 26 dB EBW or 99%<br>OBW of the spectrum. |

### 6.3.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

### 6.3.2 Test Data:

Please Refer to Appendix for Details.



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## 6.4 Power spectral density

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.407(a)(1)(i)<br>47 CFR Part 15.407(a)(1)(ii)<br>47 CFR Part 15.407(a)(1)(iii)<br>47 CFR Part 15.407(a)(1)(iv)<br>47 CFR Part 15.407(a)(2)<br>47 CFR Part 15.407(a)(3)(i) |
| Test Method: | ANSI C63.10-2013, section 12.5 |
| Test Limit: | For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.<br><br>For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.<br><br>For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band.<br>Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.<br>Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.<br><br>For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.<br><br>For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.<br><br>For the band 5.725-5.850 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.<br>If transmitting antennas of directional gain greater than 6 dBi are used, the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter |



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| | |
|---|---|
| | conducted power.<br>Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations. |
| Procedure: | a) Create an average power spectrum for the EUT operating mode being tested by following the<br>instructions in 12.3.2 for measuring maximum conducted output power using a spectrum<br>analyzer or EMI receiver; that is, select the appropriate test method (SA-1, SA-2, SA-3, or their<br>respective alternatives) and apply it up to, but not including, the step labeled, “Compute<br>power….” (This procedure is required even if the maximum conducted output power<br>measurement was performed using the power meter method PM.)<br>b) Use the peak search function on the instrument to find the peak of the spectrum.<br>c) Make the following adjustments to the peak value of the spectrum, if applicable:<br>1) If method SA-2 or SA-2A was used, then add [10 log (1 / D)], where D is the duty cycle, to the peak of the spectrum.<br>2) If method SA-3A was used and the linear mode was used in step h) of 12.3.2.7, add<br>1 dB to the final result to compensate for the difference between linear averaging and<br>power averaging.<br>d) The result is the PPSD.<br>e) The procedure in item a) through item c) requires the use of 1 MHz resolution bandwidth to<br>satisfy the 1 MHz measurement bandwidth specified by some regulatory authorities.This<br>requirement also permits use of resolution bandwidths less than 1 MHz “provided that the<br>measured power is integrated to show the total power over the measurement bandwidth” (i.e.,<br>1 MHz). If measurements are performed using a reduced resolution bandwidth and integrated<br>over 1 MHz bandwidth, the following adjustments to the procedures apply:<br>1) Set RBW >= 1 / T, where T is defined in 12.2 a).<br>2) Set VBW >= [3 × RBW].<br>3) Care shall be taken such that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle. |

### 6.4.1 E.U.T. Operation:

| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

### 6.4.2 Test Data:

Please Refer to Appendix for Details.



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## 6.5 Emission bandwidth and occupied bandwidth

| | |
|---|---|
| Test Requirement: | U-NII 1, U-NII 2A, U-NII 2C: No limits, only for report use.<br><br>U-NII 3, U-NII 4: 47 CFR Part 15.407(e) |
| Test Method: | ANSI C63.10-2013, section 6.9.3 & 12.4<br>KDB 789033 D02, Clause C.2 |
| Test Limit: | U-NII 1, U-NII 2A, U-NII 2C: No limits, only for report use.<br><br>U-NII 3, U-NII 4: Within the 5.725-5.850 GHz and 5.850-5.895 GHz bands, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz. |
| Procedure: | Emission bandwidth:<br>a) Set RBW = approximately 1% of the emission bandwidth.<br>b) Set the VBW > RBW.<br>c) Detector = peak.<br>d) Trace mode = max hold.<br>e) Measure the maximum width of the emission that is 26 dB down from the peak of the emission.<br>Compare this with the RBW setting of the instrument. Readjust RBW and repeat measurement<br>as needed until the RBW/EBW ratio is approximately 1%.<br><br>Occupied bandwidth:<br>a) The instrument center frequency is set to the nominal EUT channel center frequency. The<br>frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.<br>b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW,<br>and VBW shall be approximately three times the RBW, unless otherwise specified by the<br>applicable requirement.<br>c) Set the reference level of the instrument as required, keeping the signal from exceeding the<br>maximum input mixer level for linear operation. In general, the peak of the spectral envelope<br>shall be more than [10 log (OBW/RBW)] below the reference level. Specific guidance is given<br>in 4.1.5.2.<br>d) Step a) through step c) might require iteration to adjust within the specified range.<br>e) Video averaging is not permitted. Where practical, a sample detection and single sweep mode<br>shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be<br>used.<br>f) Use the 99% power bandwidth function of the instrument (if available) and report the measured<br>bandwidth.<br>g) If the instrument does not have a 99% power bandwidth function, then the trace data points are<br>recovered and directly summed in linear power terms. The recovered amplitude data points,<br>beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached;<br>that frequency is recorded as the lower frequency. The process is repeated until |



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| | |
|---|---|
| | 99.5% of the<br>total is reached; that frequency is recorded as the upper frequency. The 99% power bandwidth is<br>the difference between these two frequencies.<br>h) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument<br>display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may<br>be reported in addition to the plot(s).<br><br>6 dB emission bandwidth:<br>a) Set RBW = 100 kHz.<br>b) Set the video bandwidth (VBW) ≥ 3 >= RBW.<br>c) Detector = Peak.<br>d) Trace mode = max hold.<br>e) Sweep = auto couple.<br>f) Allow the trace to stabilize.<br>g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. |

**6.5.1 E.U.T. Operation:**

| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |

**6.5.2 Test Data:**

Please Refer to Appendix for Details.



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## 6.6 Band edge emissions (Radiated)

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.407(b)(1)<br>47 CFR Part 15.407(b)(2)<br>47 CFR Part 15.407(b)(4)<br>47 CFR Part 15.407(b)(10) |
| Test Method: | ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6 |
| Test Limit: | For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.<br><br>For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.<br><br>For transmitters operating solely in the 5.725-5.850 GHz band:<br>All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. |

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| [1]0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | ([2]) |
| 13.36-13.41 | | | |

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2]Above 38.6

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35apply to these measurements.

Except as provided elsewhere in this subpart, the emissions from an intentional



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| | |
|---|---|
| | radiator shall not exceed the field strength levels specified in the following table:<br>Frequency (MHz) / Field strength (microvolts/meter) / Measurement distance (meters)<br>0.009-0.490 / 2400/F(kHz) / 300<br>0.490-1.705 / 24000/F(kHz) / 30<br>1.705-30.0 / 30 / 30<br>30-88 / 100 ** / 3<br>88-216 / 150 ** / 3<br>216-960 / 200 ** / 3<br>Above 960 / 500 / 3 |
| Procedure: | Above 1GHz:<br>a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>c. 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.<br>d. 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.<br>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.<br>g. Test the EUT in the lowest channel, the middle channel, the Highest channel.<br>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.<br>i. Repeat above procedures until all frequencies measured was complete.<br>Remark:<br>1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor<br>2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.<br>3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.<br>4. The disturbance above 18GHz were very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. |

**6.6.1 E.U.T. Operation:**

| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |



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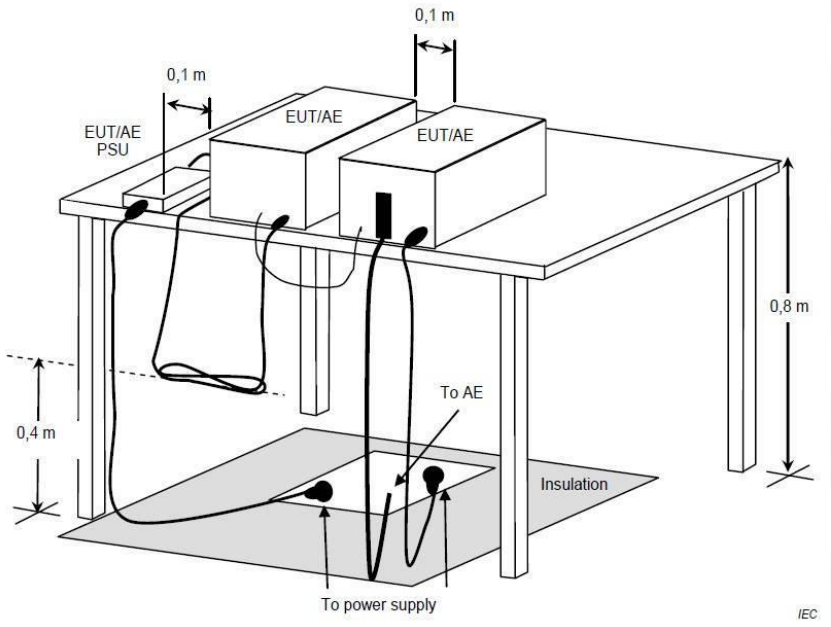
| Atmospheric Pressure: | 1010 mbar |
|---|---|

### 6.6.2 Test Setup Diagram:



### 6.6.3 Test Data:

Note:All mode are tested and only the worst mode of 802.11a data is shown

UNII-1 20M_5180MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5140.000 | 83.13 | -31.01 | 52.12 | 68.20 | -16.08 | peak | P |
| 2 | 5150.000 | 83.73 | -30.97 | 52.76 | 68.20 | -15.44 | peak | P |

UNII-1 20M_5180MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5141.500 | 75.63 | -30.61 | 45.02 | 68.20 | -23.18 | peak | P |
| 2 | 5150.000 | 76.23 | -30.57 | 45.66 | 68.20 | -22.54 | peak | P |

UNII-1 20M_5240MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5350.000 | 84.72 | -31.61 | 53.11 | 68.20 | -15.09 | peak | P |
| 2 | 5358.400 | 82.09 | -31.57 | 50.52 | 68.20 | -17.68 | peak | P |

UNII-1 20M_5240MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5350.000 | 84.12 | -31.01 | 53.11 | 68.20 | -15.09 | peak | P |
| 2 | 5356.700 | 81.49 | -30.97 | 50.52 | 68.20 | -17.68 | peak | P |

UNII-3_20M_5745MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5650.000 | 85.76 | -31.94 | 53.82 | 68.20 | -14.38 | peak | P |
| 2 | 5700.000 | 92.70 | -32.05 | 60.65 | 105.60 | -44.95 | peak | P |
| 3 | 5720.000 | 93.60 | -32.11 | 61.49 | 110.8 | -49.31 | peak | P |

UNII-3_20M_5745MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5650.000 | 85.76 | -31.94 | 53.82 | 68.20 | -14.38 | peak | P |
| 2 | 5700.000 | 92.70 | -32.05 | 60.65 | 105.60 | -44.95 | peak | P |
| 3 | 5720.000 | 93.60 | -32.11 | 61.49 | 110.8 | -49.31 | peak | P |

UNII-3_20M_5825MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5850.000 | 84.16 | -31.62 | 52.54 | 122.20 | -69.66 | peak | P |
| 2 | 5875.000 | 91.10 | -31.73 | 59.37 | 110.80 | -51.43 | peak | P |
| 3 | 5925.000 | 92.00 | -31.79 | 60.21 | 68.20 | -7.99 | peak | P |



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UNII-3_20M_5825MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 5850.000 | 84.76 | -31.12 | 53.64 | 122.20 | -68.56 | peak | P |
| 2 | 5875.000 | 91.70 | -31.23 | 60.47 | 110.80 | -50.33 | peak | P |
| 3 | 5925.000 | 92.60 | -31.29 | 61.31 | 68.20 | -6.89 | peak | P |



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## 6.7 Undesirable emission limits (below 1GHz)

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.407(b)(9) |
| Test Method: | ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6 |
| Test Limit: | Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in § 15.209.<br><br>Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:<br>Frequency (MHz) / Field strength (microvolts/meter) / Measurement distance (meters)<br>0.009-0.490 / 2400/F(kHz) / 300<br>0.490-1.705 / 24000/F(kHz) / 30<br>1.705-30.0 / 30 / 30<br>30-88 / 100 ** / 3<br>88-216 / 150 ** / 3<br>216-960 / 200 ** / 3<br>Above 960 / 500 / 3 |
| Procedure: | Below 1GHz:<br>a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 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.<br>b. 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.<br>c. 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.<br>d. 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.<br>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using quasi-peak method as specified and then reported in a data sheet.<br>g. Test the EUT in the lowest channel, the middle channel, the Highest channel.<br>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.<br>i. Repeat above procedures until all frequencies measured was complete.<br>Remark:<br>1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor<br>2. Scan from 9kHz to 30MHz, the disturbance below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.<br>3. The disturbance below 1GHz was very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.<br><br>Above 1GHz: |



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| | |
|---|---|
| | a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>c. 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.<br>d. 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.<br>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.<br>g. Test the EUT in the lowest channel, the middle channel, the Highest channel.<br>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.<br>i. Repeat above procedures until all frequencies measured was complete.<br>Remark:<br>1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor<br>2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.<br>3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.<br>4. The disturbance above 18GHz were very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. |

**6.7.1 E.U.T. Operation:**

| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |



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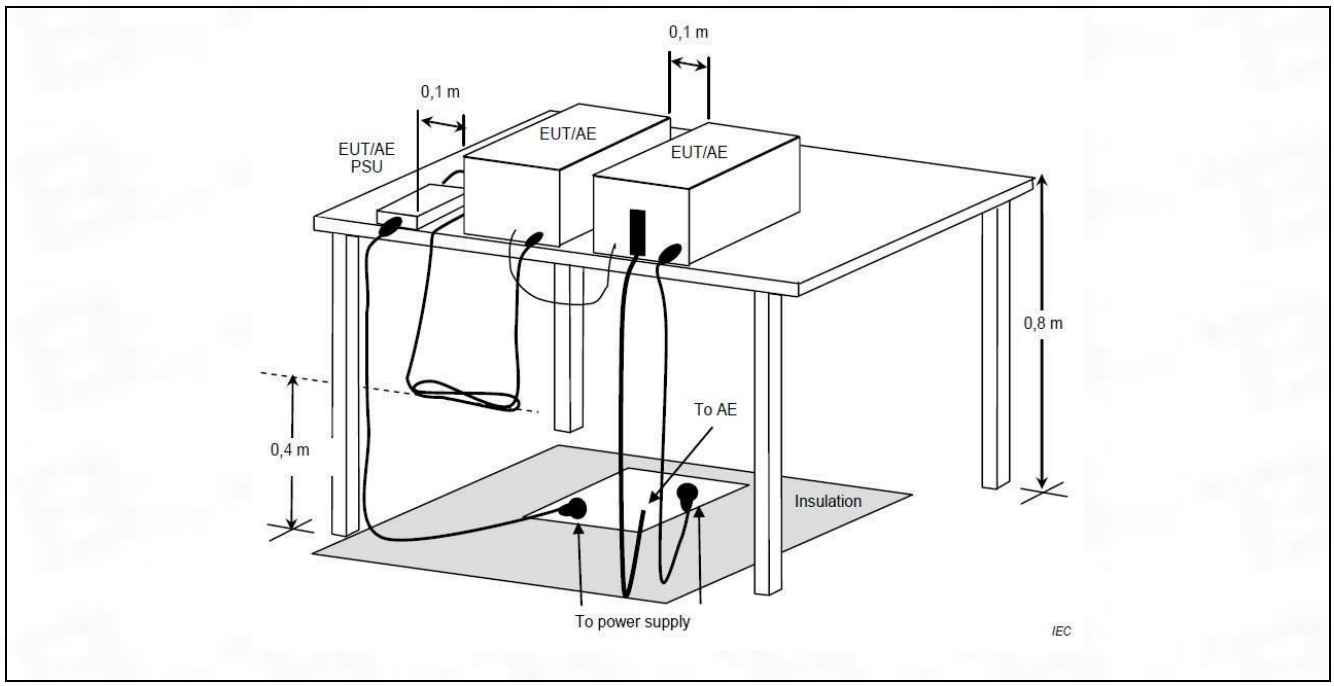
### 6.7.2 Test Setup Diagram:



### 6.7.3 Test Data:

Note: All the mode have been tested, and only the worst case mode are in the report
TM1 / Polarization: Horizontal / Band: U-NII 1 / BW: 20 / CH: L


| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 239.9873 | 56.96 | -25.94 | 31.02 | 46.00 | -14.98 | QP | P |
| 2 | 299.3158 | 59.80 | -25.43 | 34.37 | 46.00 | -11.63 | QP | P |
| 3 * | 424.2835 | 65.89 | -23.49 | 42.40 | 46.00 | -3.60 | QP | P |
| 4 | 461.5355 | 61.53 | -22.03 | 39.50 | 46.00 | -6.50 | QP | P |
| 5 ! | 520.8881 | 63.45 | -21.35 | 42.10 | 46.00 | -3.90 | QP | P |
| 6 | 600.3730 | 60.42 | -22.21 | 38.21 | 46.00 | -7.79 | QP | P |



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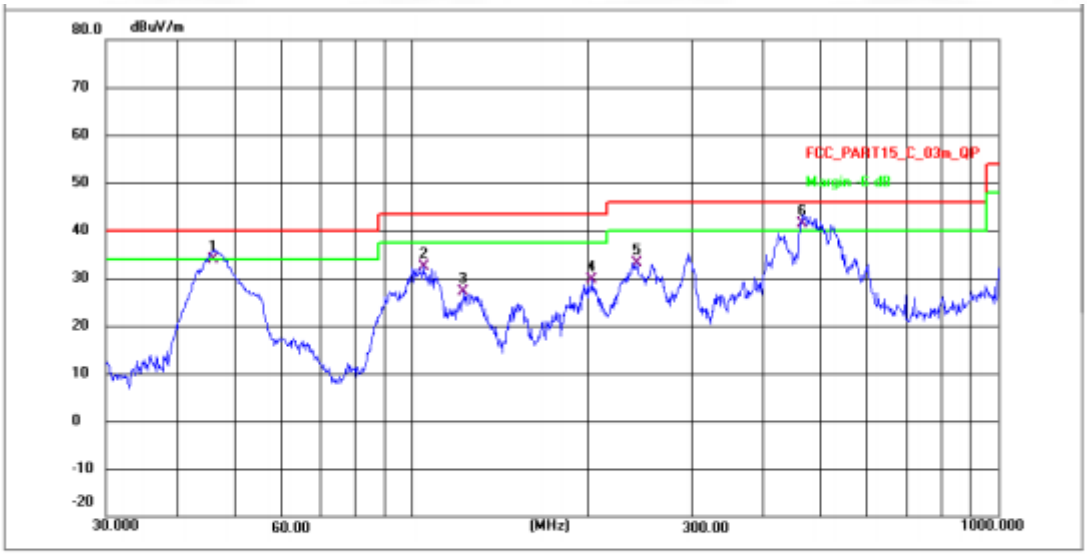
F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

TM1 / Polarization: Vertical / Band: U-NII 1 / BW: 20 / CH: L




| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 45.7750 | 54.31 | -20.41 | 33.90 | 40.00 | -6.10 | QP | P |
| 2 | 104.9033 | 60.53 | -28.19 | 32.34 | 43.50 | -11.16 | QP | P |
| 3 | 122.6188 | 55.27 | -28.02 | 27.25 | 43.50 | -16.25 | QP | P |
| 4 | 203.1663 | 56.81 | -27.19 | 29.62 | 43.50 | -13.88 | QP | P |
| 5 | 242.1004 | 59.11 | -25.92 | 33.19 | 46.00 | -12.81 | QP | P |
| 6 * | 467.2349 | 63.19 | -21.89 | 41.30 | 46.00 | -4.70 | QP | P |



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## 6.8 Undesirable emission limits (above 1GHz)

| | |
|---|---|
| Test Requirement: | 47 CFR Part 15.407(b)(1)<br>47 CFR Part 15.407(b)(2)<br>47 CFR Part 15.407(b)(4)<br>47 CFR Part 15.407(b)(10) |
| Test Method: | ANSI C63.10-2013, section 12.7.4, 12.7.5, 12.7.6 |
| Test Limit: | For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.<br>For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.<br><br>For transmitters operating solely in the 5.725-5.850 GHz band:<br>All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge. |

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| [1]0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | ([2]) |
| 13.36-13.41 | | | |

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35apply to these measurements.

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field strength | Measurement |
|---|---|---|



BTF Testing Lab (Shenzhen) Co., Ltd.
F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China

| | | | |
|---|---|---|---|
| | | (microvolts/meter) | distance (meters) |
| | 0.009-0.490 | 2400/F(kHz) | 300 |
| | 0.490-1.705 | 24000/F(kHz) | 30 |
| | 1.705-30.0 | 30 | 30 |
| | 30-88 | 100 ** | 3 |
| | 88-216 | 150 ** | 3 |
| | 216-960 | 200 ** | 3 |
| | Above 960 | 500 | 3 |
| Procedure: | Above 1GHz:<br>a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.<br>b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.<br>c. 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.<br>d. 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.<br>e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.<br>f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak or average method as specified and then reported in a data sheet.<br>g. Test the EUT in the lowest channel, the middle channel, the Highest channel.<br>h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.<br>i. Repeat above procedures until all frequencies measured was complete.<br>Remark:<br>1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor<br>2. Scan from 18GHz to 40GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.<br>3. As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.<br>4. The disturbance above 18GHz were very low and the harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. | | |

**6.8.1 E.U.T. Operation:**

| Operating Environment: | |
|---|---|
| Temperature: | 25.5 °C |
| Humidity: | 50.6 % |
| Atmospheric Pressure: | 1010 mbar |



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### 6.8.2 Test Data:

Note:All mode are tested and only the worst mode of 802.11a data is shown

UNII-1_20M_5180MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3224.300 | 79.40 | -29.89 | 49.51 | 68.20 | -18.69 | peak | P |
| 2 | 5201.600 | 81.14 | -30.40 | 50.74 | 68.20 | -17.46 | peak | P |
| 3 | 7816.680 | 82.80 | -30.62 | 52.18 | 68.20 | -16.02 | peak | P |
| 4 | 8796.950 | 84.10 | -31.40 | 52.70 | 68.20 | -15.50 | peak | P |
| 5 | 11098.841 | 84.81 | -31.89 | 52.92 | 68.20 | -15.28 | peak | P |
| 6 | 14757.452 | 85.66 | -34.28 | 51.38 | 68.20 | -16.82 | peak | P |

UNII-1_20M_5180MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3527.300 | 79.51 | -29.67 | 49.84 | 68.20 | -18.36 | peak | P |
| 2 | 5504.600 | 81.25 | -30.18 | 51.07 | 68.20 | -17.13 | peak | P |
| 3 | 8119.680 | 82.91 | -30.40 | 52.51 | 68.20 | -15.69 | peak | P |
| 4 | 9099.950 | 84.21 | -31.18 | 53.03 | 68.20 | -15.17 | peak | P |
| 5 | 11401.841 | 84.92 | -31.67 | 53.25 | 68.20 | -14.95 | peak | P |
| 6 | 15060.452 | 85.77 | -34.06 | 51.71 | 68.20 | -16.49 | peak | P |

UNII-1_20M_5200MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3467.300 | 78.53 | -29.72 | 48.81 | 68.20 | -19.39 | peak | P |
| 2 | 5444.600 | 80.27 | -30.23 | 50.04 | 68.20 | -18.16 | peak | P |
| 3 | 8059.680 | 81.93 | -30.45 | 51.48 | 68.20 | -16.72 | peak | P |
| 4 | 9039.950 | 83.23 | -31.23 | 52.00 | 68.20 | -16.20 | peak | P |
| 5 | 11341.841 | 83.94 | -31.72 | 52.22 | 68.20 | -15.98 | peak | P |
| 6 | 15000.452 | 84.79 | -34.11 | 50.68 | 68.20 | -17.52 | peak | P |

UNII-1_20M_5200MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3485.300 | 79.52 | -28.72 | 50.80 | 68.20 | -17.40 | peak | P |
| 2 | 5462.600 | 81.26 | -29.23 | 52.03 | 68.20 | -16.17 | peak | P |
| 3 | 8077.680 | 82.92 | -29.45 | 53.47 | 68.20 | -14.73 | peak | P |
| 4 | 9057.950 | 84.22 | -30.23 | 53.99 | 68.20 | -14.21 | peak | P |
| 5 | 11359.841 | 84.93 | -30.72 | 54.21 | 68.20 | -13.99 | peak | P |
| 6 | 15018.452 | 85.78 | -33.11 | 52.67 | 68.20 | -15.53 | peak | P |



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UNII-1_20M_5240MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3587.300 | 79.41 | -29.32 | 50.09 | 68.20 | -18.11 | peak | P |
| 2 | 5564.600 | 81.15 | -29.83 | 51.32 | 68.20 | -16.88 | peak | P |
| 3 | 8179.680 | 82.81 | -30.05 | 52.76 | 68.20 | -15.44 | peak | P |
| 4 | 9159.950 | 84.11 | -30.83 | 53.28 | 68.20 | -14.92 | peak | P |
| 5 | 11461.841 | 84.82 | -31.32 | 53.50 | 68.20 | -14.70 | peak | P |
| 6 | 15120.452 | 85.67 | -33.71 | 51.96 | 68.20 | -16.24 | peak | P |

UNII-1_20M_5240MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3834.300 | 77.73 | -28.63 | 49.10 | 68.20 | -19.10 | peak | P |
| 2 | 5811.600 | 79.47 | -29.14 | 50.33 | 68.20 | -17.87 | peak | P |
| 3 | 8426.680 | 81.13 | -29.36 | 51.77 | 68.20 | -16.43 | peak | P |
| 4 | 9406.950 | 82.43 | -30.14 | 52.29 | 68.20 | -15.91 | peak | P |
| 5 | 11708.841 | 83.14 | -30.63 | 52.51 | 68.20 | -15.69 | peak | P |
| 6 | 15367.452 | 83.99 | -33.02 | 50.97 | 68.20 | -17.23 | peak | P |

UNII-3_20M_5745MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3057.300 | 77.49 | -27.70 | 49.79 | 68.20 | -18.41 | peak | P |
| 2 | 5034.600 | 79.23 | -28.21 | 51.02 | 68.20 | -17.18 | peak | P |
| 3 | 7649.680 | 80.89 | -28.43 | 52.46 | 68.20 | -15.74 | peak | P |
| 4 | 8629.950 | 82.19 | -29.21 | 52.98 | 68.20 | -15.22 | peak | P |
| 5 | 10931.841 | 82.90 | -29.70 | 53.20 | 68.20 | -15.00 | peak | P |
| 6 | 14590.452 | 83.75 | -32.09 | 51.66 | 68.20 | -16.54 | peak | P |

UNII-3_20M_5745MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3213.300 | 78.19 | -28.60 | 49.59 | 68.20 | -18.61 | peak | P |
| 2 | 5190.600 | 79.93 | -29.11 | 50.82 | 68.20 | -17.38 | peak | P |
| 3 | 7805.680 | 81.59 | -29.33 | 52.26 | 68.20 | -15.94 | peak | P |
| 4 | 8785.950 | 82.89 | -30.11 | 52.78 | 68.20 | -15.42 | peak | P |
| 5 | 11087.841 | 83.60 | -30.60 | 53.00 | 68.20 | -15.20 | peak | P |
| 6 | 14746.452 | 84.45 | -32.99 | 51.46 | 68.20 | -16.74 | peak | P |



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UNII-3_20M_5785MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 3287.300 | 77.53 | -29.42 | 48.11 | 68.20 | -20.09 | peak | P |
| 2 | 5264.600 | 79.27 | -29.93 | 49.34 | 68.20 | -18.86 | peak | P |
| 3 | 7879.680 | 80.93 | -30.15 | 50.78 | 68.20 | -17.42 | peak | P |
| 4 | 8859.950 | 82.23 | -30.93 | 51.30 | 68.20 | -16.90 | peak | P |
| 5 | 11161.841 | 82.94 | -31.42 | 51.52 | 68.20 | -16.68 | peak | P |
| 6 | 14820.452 | 83.79 | -33.81 | 49.98 | 68.20 | -18.22 | peak | P |

UNII-3_20M_5785MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4447.300 | 78.20 | -28.67 | 49.53 | 68.20 | -18.67 | peak | P |
| 2 | 6424.600 | 79.94 | -29.18 | 50.76 | 68.20 | -17.44 | peak | P |
| 3 | 9039.680 | 81.60 | -29.40 | 52.20 | 68.20 | -16.00 | peak | P |
| 4 | 10019.950 | 82.90 | -30.18 | 52.72 | 68.20 | -15.48 | peak | P |
| 5 | 12321.841 | 83.61 | -30.67 | 52.94 | 68.20 | -15.26 | peak | P |
| 6 | 15980.452 | 84.46 | -33.06 | 51.40 | 68.20 | -16.80 | peak | P |

UNII-3_20M_5825MHz_Horizontal

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4244.300 | 78.52 | -28.70 | 49.82 | 68.20 | -18.38 | peak | P |
| 2 | 6221.600 | 80.26 | -29.21 | 51.05 | 68.20 | -17.15 | peak | P |
| 3 | 8836.680 | 81.92 | -29.43 | 52.49 | 68.20 | -15.71 | peak | P |
| 4 | 9816.950 | 83.22 | -30.21 | 53.01 | 68.20 | -15.19 | peak | P |
| 5 | 12118.841 | 83.93 | -30.70 | 53.23 | 68.20 | -14.97 | peak | P |
| 6 | 15777.452 | 84.78 | -33.09 | 51.69 | 68.20 | -16.51 | peak | P |

UNII-3_20M_5825MHz_Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector | P/F |
|---|---|---|---|---|---|---|---|---|
| 1 | 4199.300 | 78.42 | -29.59 | 48.83 | 68.20 | -19.37 | peak | P |
| 2 | 6176.600 | 80.16 | -30.10 | 50.06 | 68.20 | -18.14 | peak | P |
| 3 | 8791.680 | 81.82 | -30.32 | 51.50 | 68.20 | -16.70 | peak | P |
| 4 | 9771.950 | 83.12 | -31.10 | 52.02 | 68.20 | -16.18 | peak | P |
| 5 | 12073.841 | 83.83 | -31.59 | 52.24 | 68.20 | -15.96 | peak | P |
| 6 | 15732.452 | 84.68 | -33.98 | 50.70 | 68.20 | -17.50 | peak | P |



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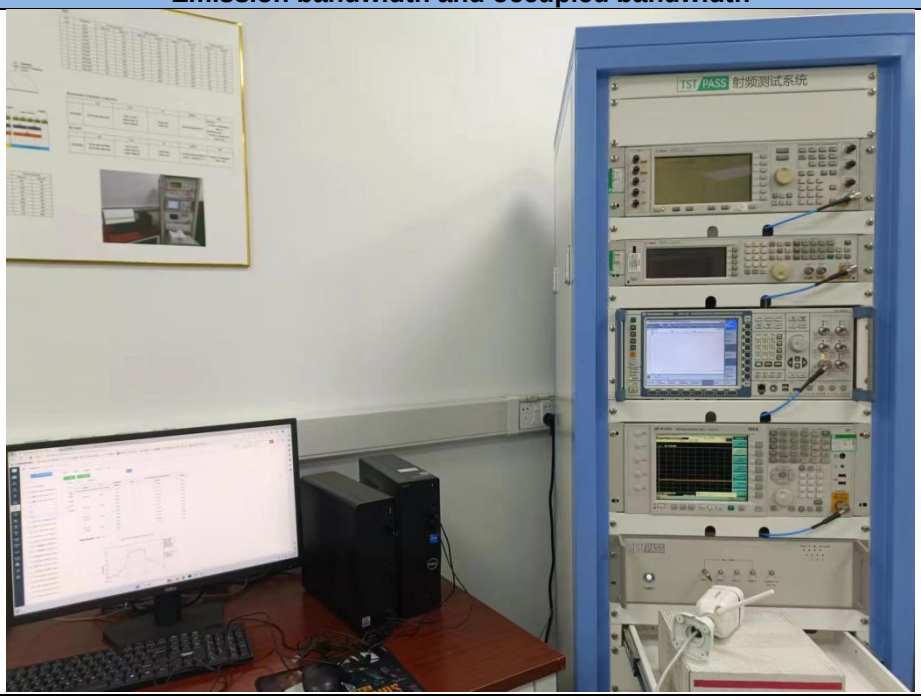
# 7 Test Setup Photos

**Conducted Emission at AC power line**

**Duty Cycle**
**Maximum conducted output power**
**Power spectral density**
**Emission bandwidth and occupied bandwidth**



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| Band edge emissions (Radiated)<br>Undesirable emission limits (above 1GHz) |
| --- |
|  |

| Undesirable emission limits (below 1GHz) |
| --- |
|  |



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# 8 EUT Constructional Details (EUT Photos)

Please refer to the report No.BTF230801R00201

# Appendix



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# 1. Duty Cycle

## 1.1 Ant1

### 1.1.1 Test Result

| Ant1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Mode | TX Type | Frequency (MHz) | T_on (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | Max. DC Variation (%) |
| 802.11a | SISO | 5180 | 1.394 | 1.428 | 97.62 | 0.10 | 0.06 |
| | | 5200 | 1.393 | 1.428 | 97.55 | 0.11 | 0.10 |
| | | 5240 | 1.394 | 1.428 | 97.62 | 0.10 | 0.07 |
| | | 5745 | 1.392 | 1.427 | 97.55 | 0.11 | 0.03 |
| | | 5785 | 1.392 | 1.427 | 97.55 | 0.11 | 0.03 |
| | | 5825 | 1.392 | 1.427 | 97.55 | 0.11 | 0.03 |
| 802.11n (HT20) | SISO | 5180 | 1.302 | 1.336 | 97.46 | 0.11 | 0.04 |
| | | 5200 | 1.302 | 1.336 | 97.46 | 0.11 | 0.04 |
| | | 5240 | 1.300 | 1.336 | 97.31 | 0.12 | 0.04 |
| | | 5745 | 1.300 | 1.335 | 97.38 | 0.12 | 0.03 |
| | | 5785 | 1.300 | 1.335 | 97.38 | 0.12 | 0.03 |
| | | 5825 | 1.300 | 1.336 | 97.31 | 0.12 | 0.03 |
| 802.11n (HT40) | SISO | 5190 | 0.649 | 0.683 | 95.02 | 0.22 | 0.03 |
| | | 5230 | 0.648 | 0.683 | 94.88 | 0.23 | 0.07 |
| | | 5755 | 0.648 | 0.683 | 94.88 | 0.23 | 0.07 |
| | | 5795 | 0.648 | 0.683 | 94.88 | 0.23 | 0.07 |
| 802.11ac (VHT20) | SISO | 5180 | 1.312 | 1.347 | 97.40 | 0.11 | 0.07 |
| | | 5200 | 1.312 | 1.348 | 97.33 | 0.12 | 0.03 |
| | | 5240 | 1.314 | 1.348 | 97.48 | 0.11 | 0.07 |
| | | 5745 | 1.313 | 1.348 | 97.40 | 0.11 | 0.07 |
| | | 5785 | 1.314 | 1.349 | 97.41 | 0.11 | 0.10 |
| | | 5825 | 1.312 | 1.347 | 97.40 | 0.11 | 0.03 |
| 802.11ac (VHT40) | SISO | 5190 | 0.652 | 0.687 | 94.91 | 0.23 | 0.04 |
| | | 5230 | 0.652 | 0.687 | 94.91 | 0.23 | 0.04 |
| | | 5755 | 0.652 | 0.687 | 94.91 | 0.23 | 0.03 |
| | | 5795 | 0.653 | 0.687 | 95.05 | 0.22 | 0.03 |
| 802.11ac (VHT80) | SISO | 5210 | 0.325 | 0.359 | 90.53 | 0.43 | 0.10 |
| | | 5775 | 0.324 | 0.358 | 90.50 | 0.43 | 0.07 |



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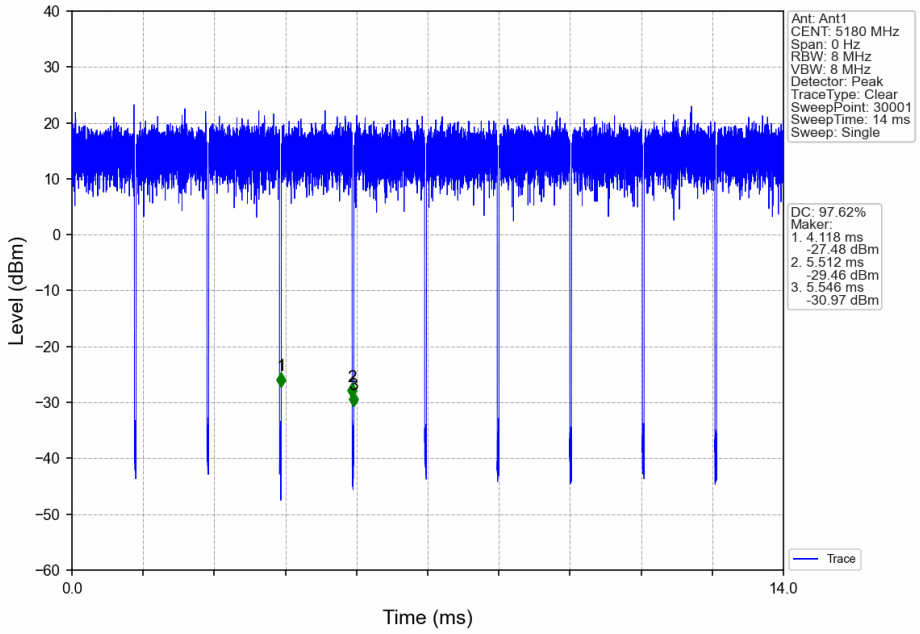
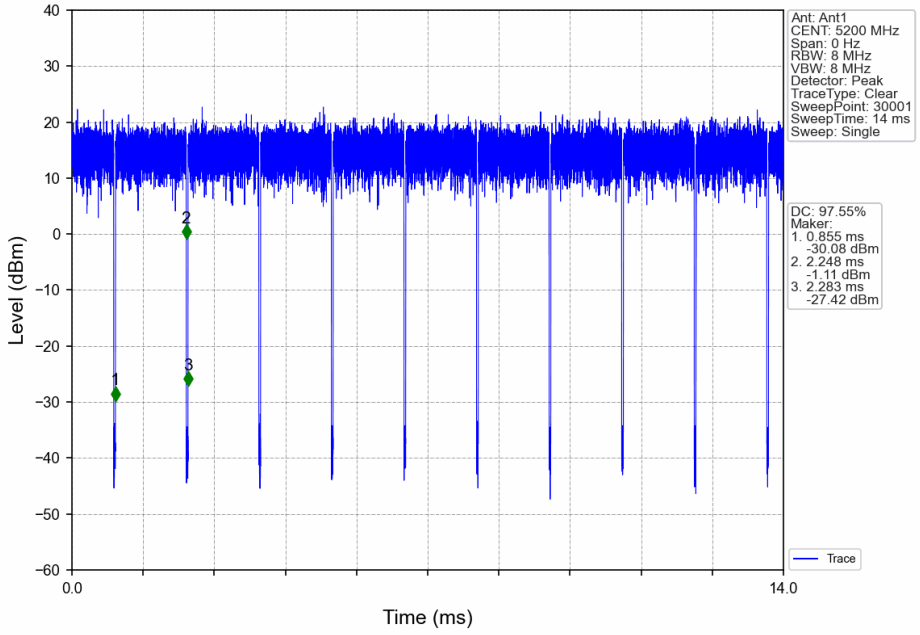
## 1.1.2 Test Graph

802.11a_LCH_5180MHz_Ant1_NTNV




802.11a_MCH_5200MHz_Ant1_NTNV



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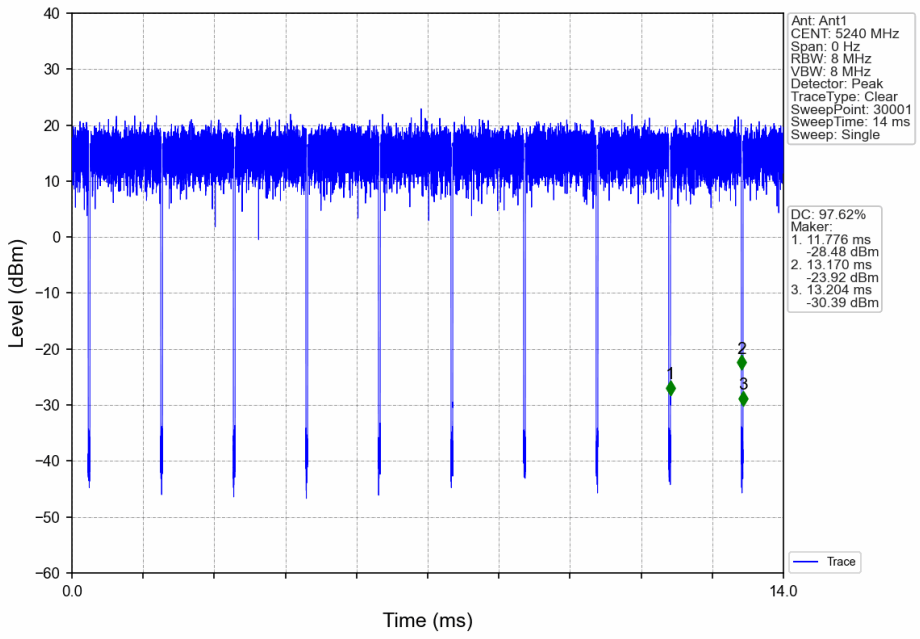
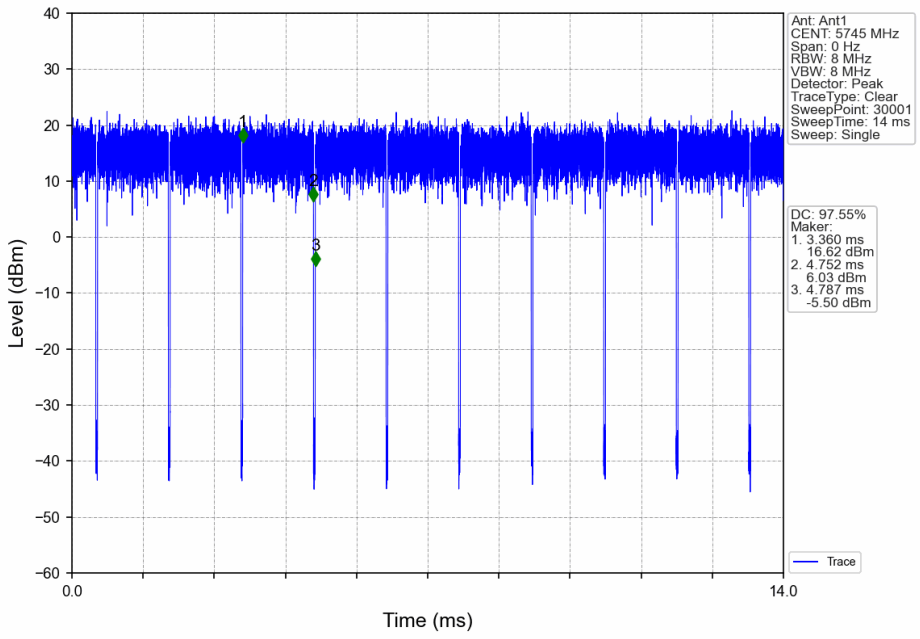
802.11a_HCH_5240MHz_Ant1_NTNV




802.11a_LCH_5745MHz_Ant1_NTNV



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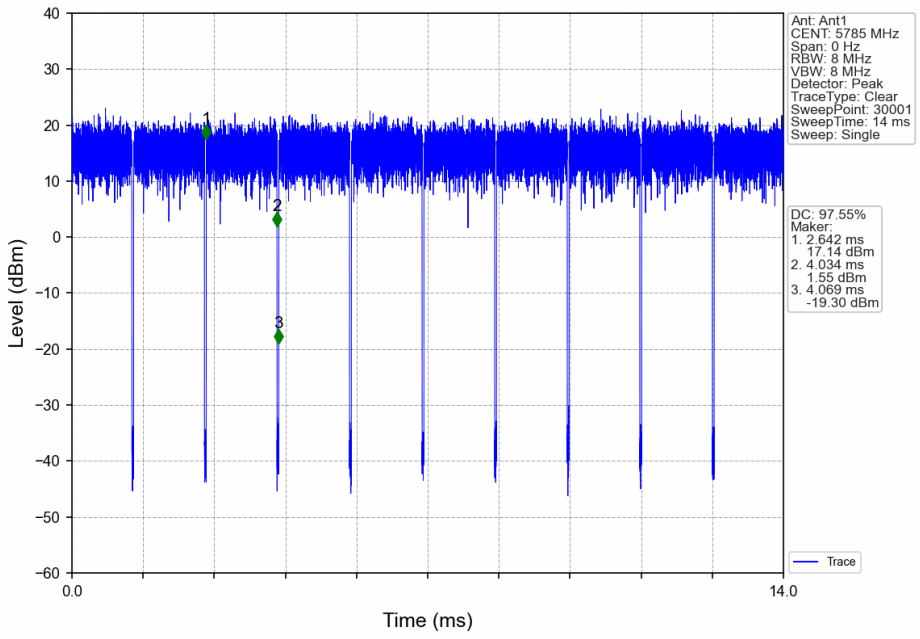
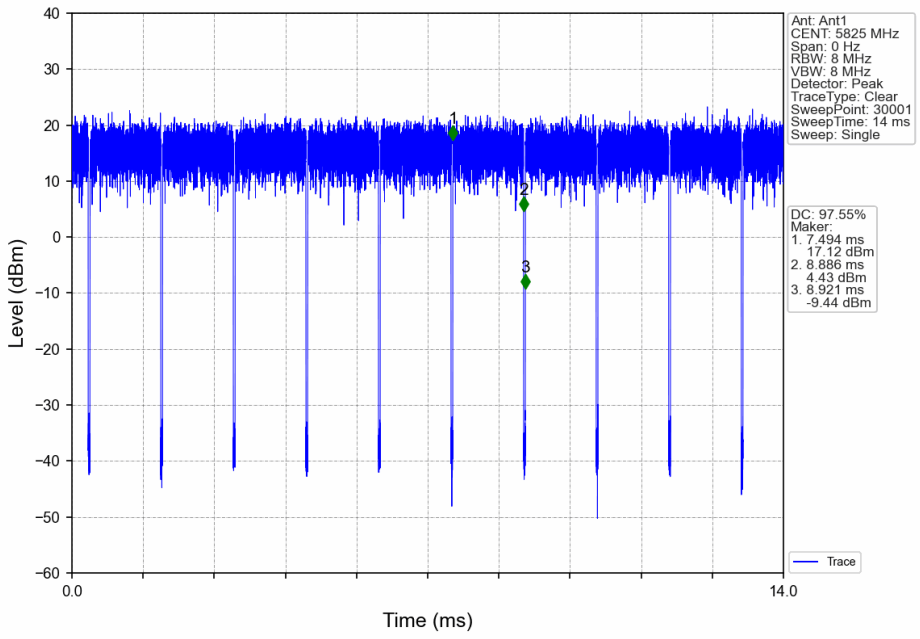
802.11a_MCH_5785MHz_Ant1_NTNV




802.11a_HCH_5825MHz_Ant1_NTNV



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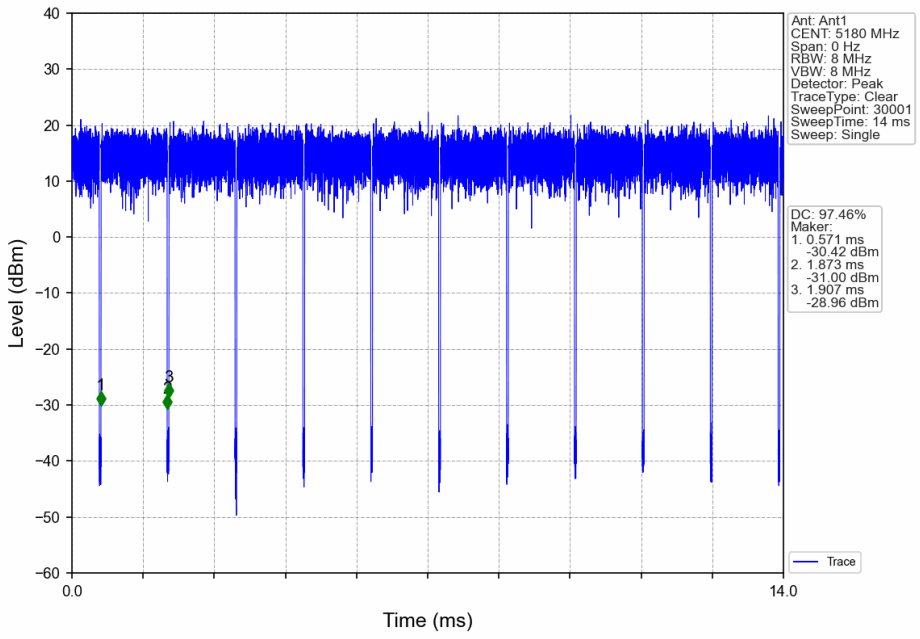
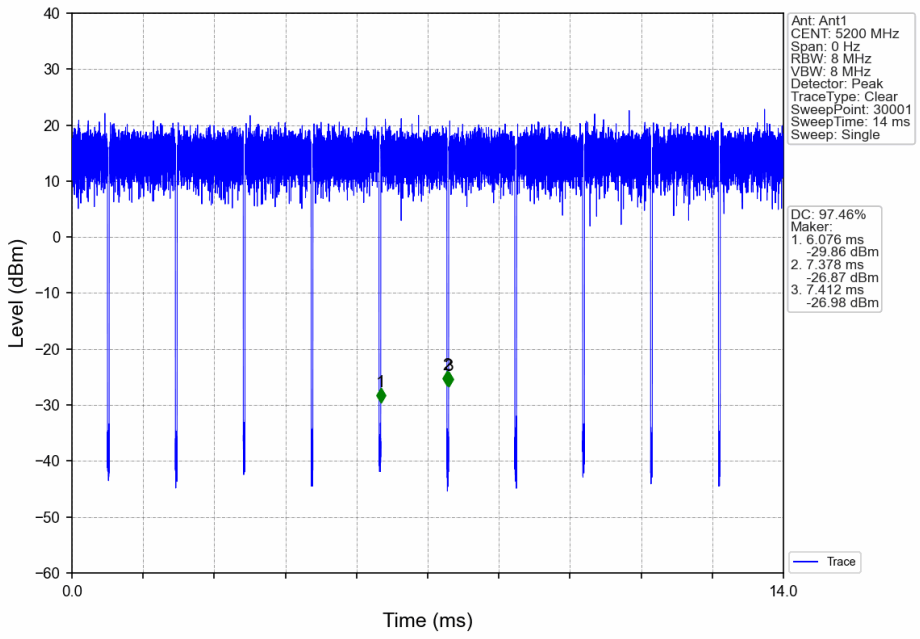
802.11n(HT20)_LCH_5180MHz_Ant1_NTNV




802.11n(HT20)_MCH_5200MHz_Ant1_NTNV



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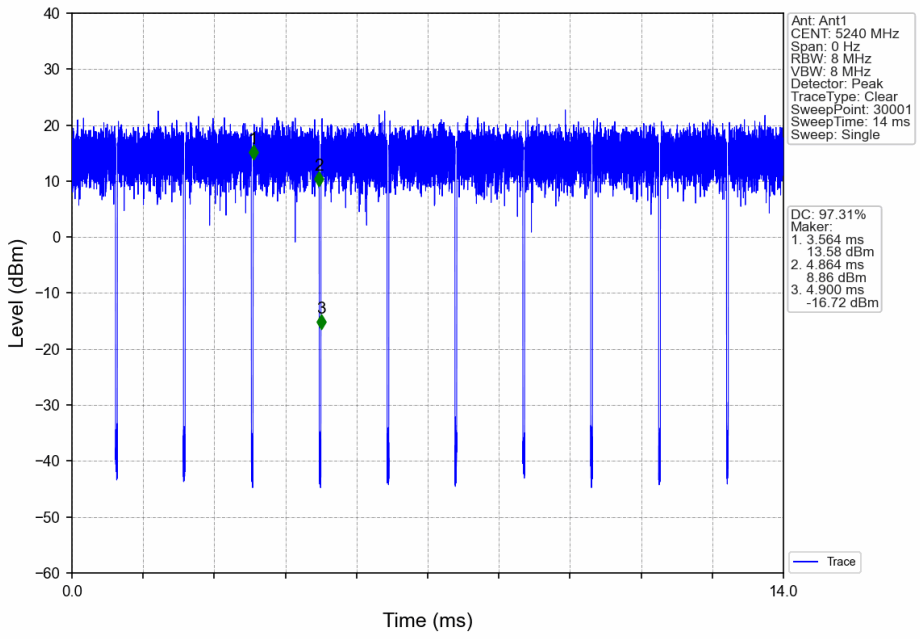
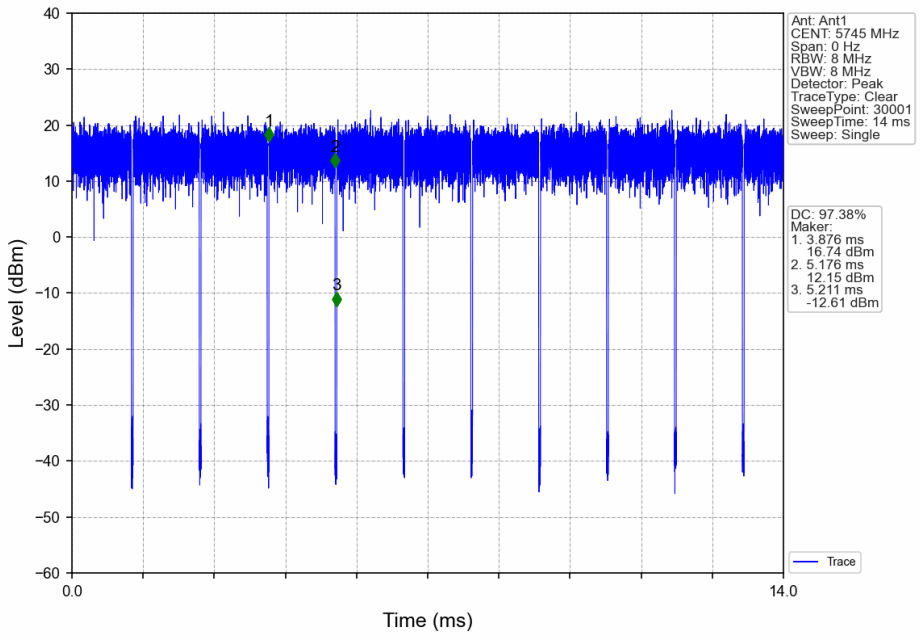
802.11n(HT20)_HCH_5240MHz_Ant1_NTNV




802.11n(HT20)_LCH_5745MHz_Ant1_NTNV



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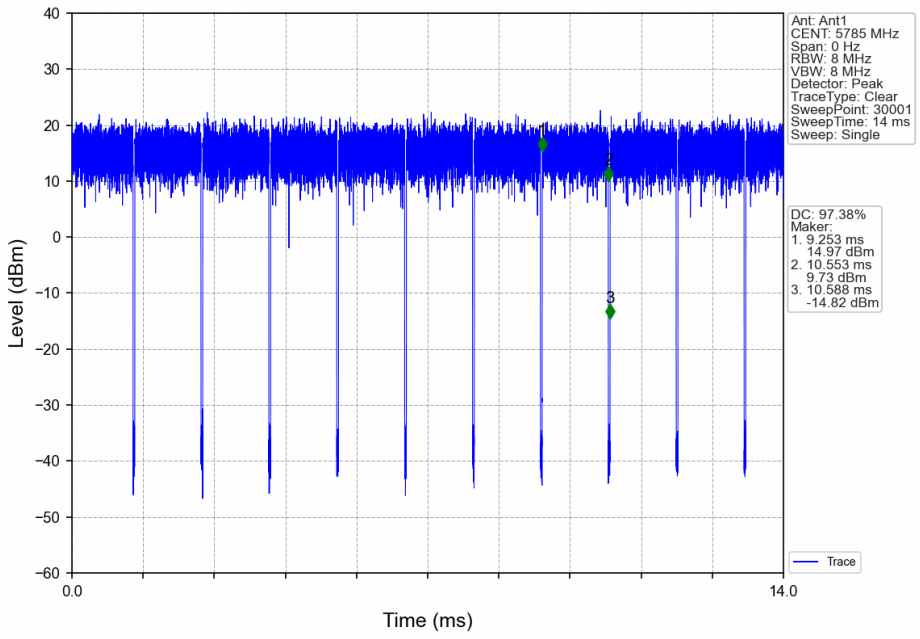
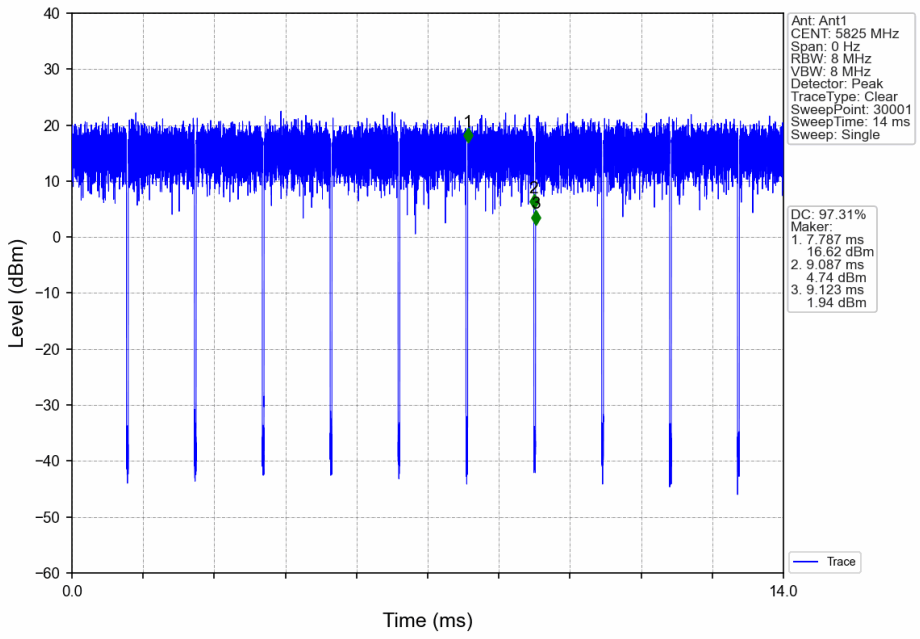
802.11n(HT20)_MCH_5785MHz_Ant1_NTNV




802.11n(HT20)_HCH_5825MHz_Ant1_NTNV



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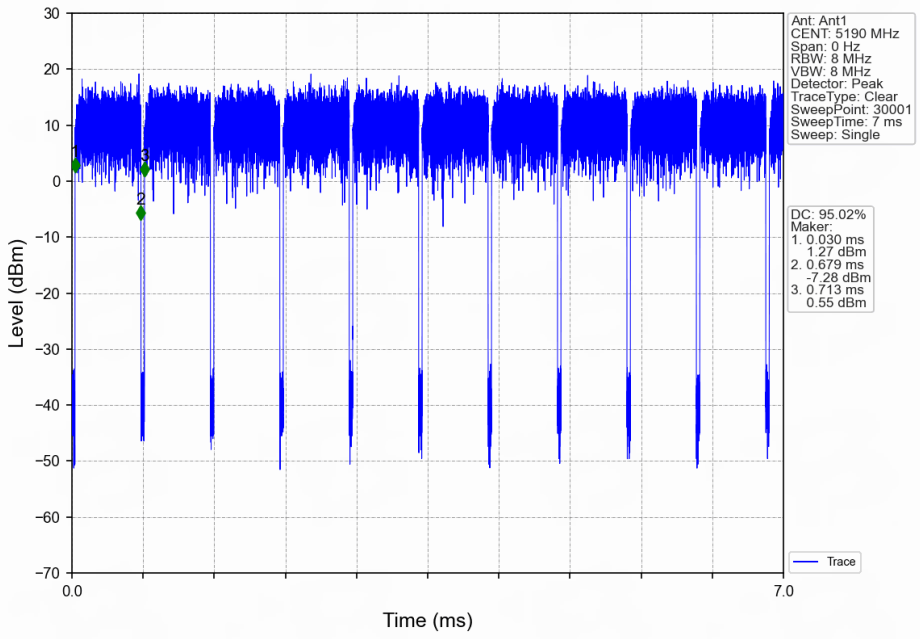
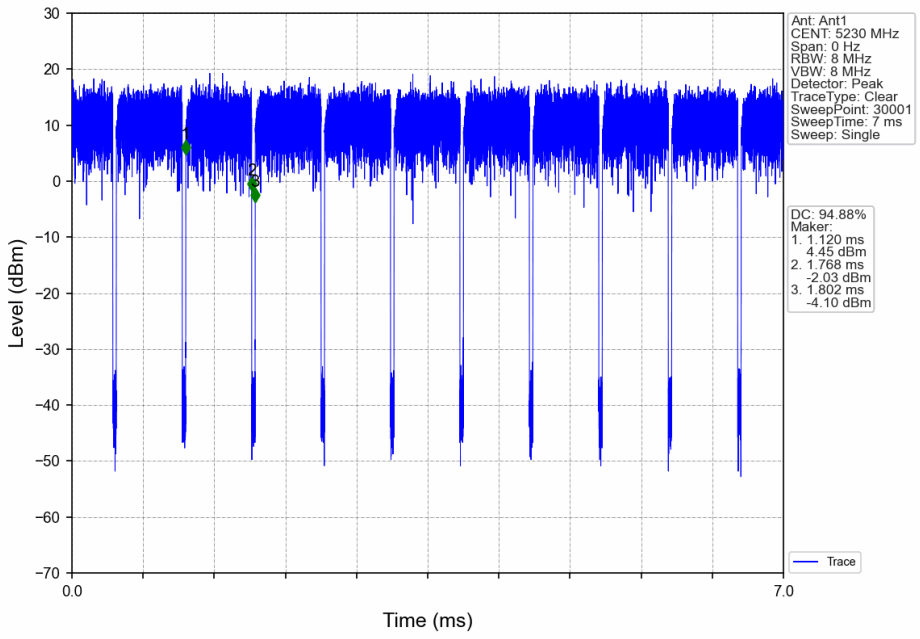
802.11n(HT40)_LCH_5190MHz_Ant1_NTNV




802.11n(HT40)_HCH_5230MHz_Ant1_NTNV



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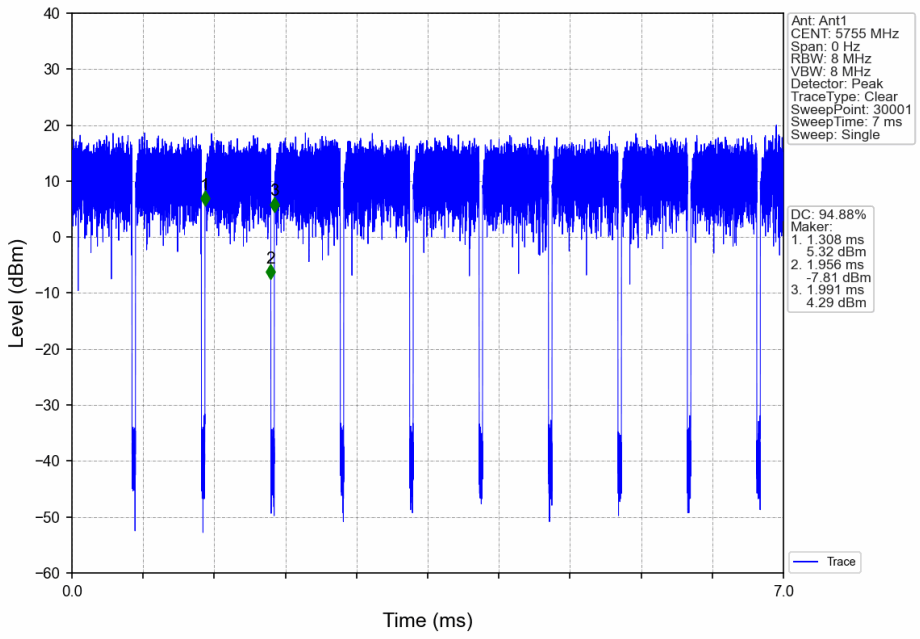
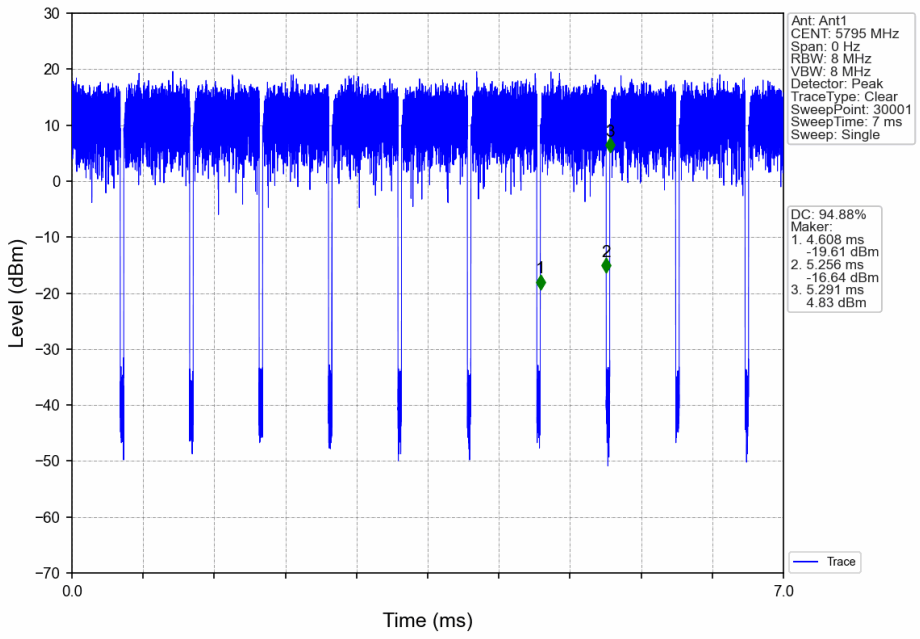
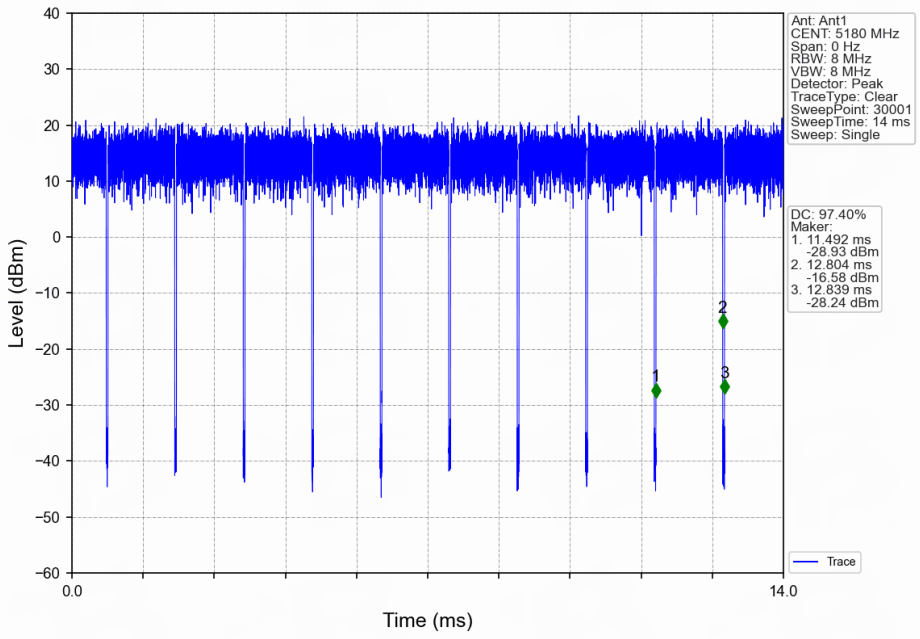
802.11n(HT40)_LCH_5755MHz_Ant1_NTNV



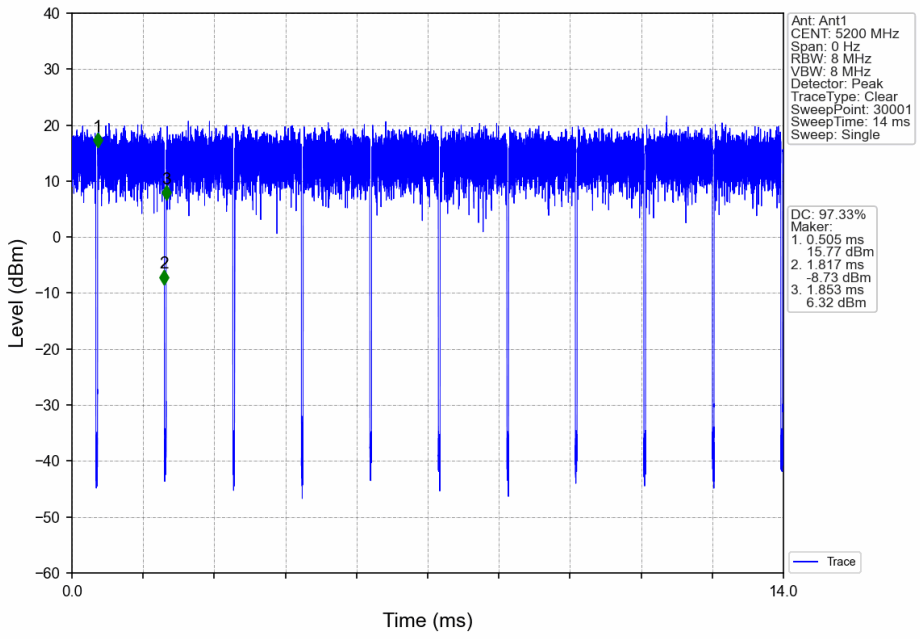

802.11n(HT40)_HCH_5795MHz_Ant1_NTNV



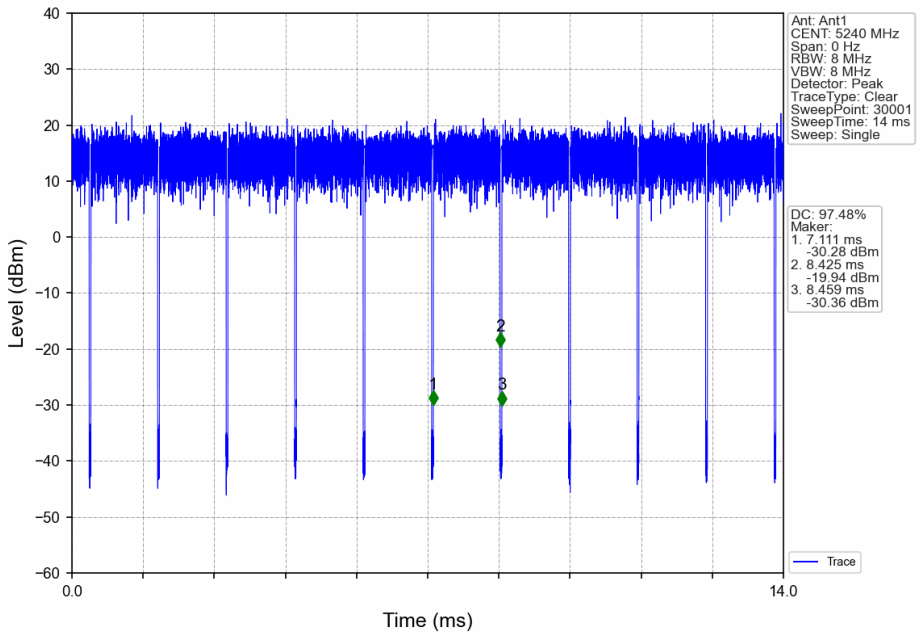
802.11ac(VHT20)_LCH_5180MHz_Ant1_NTNV



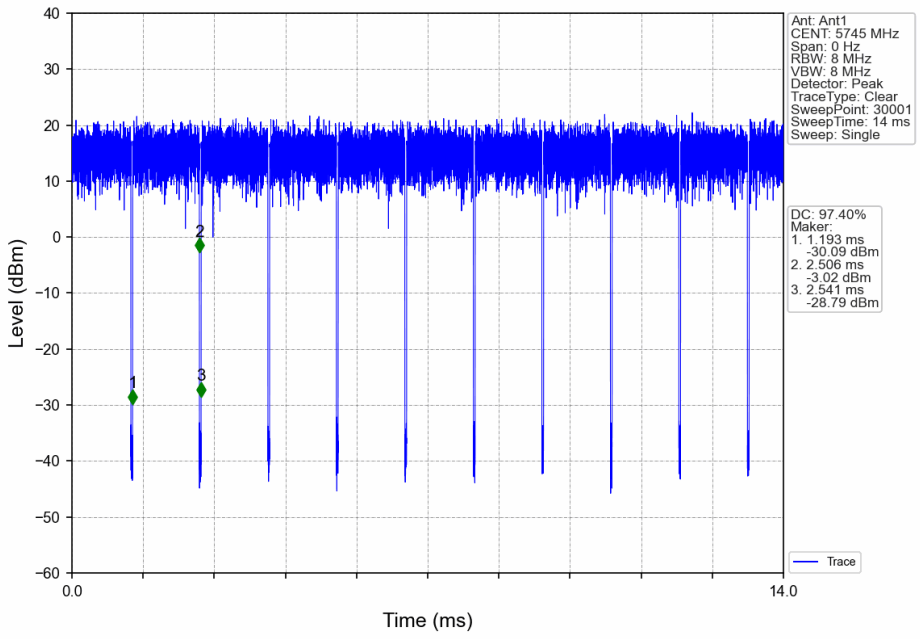

802.11ac(VHT20)_MCH_5200MHz_Ant1_NTNV



802.11ac(VHT20)_HCH_5240MHz_Ant1_NTNV




802.11ac(VHT20)_LCH_5745MHz_Ant1_NTNV



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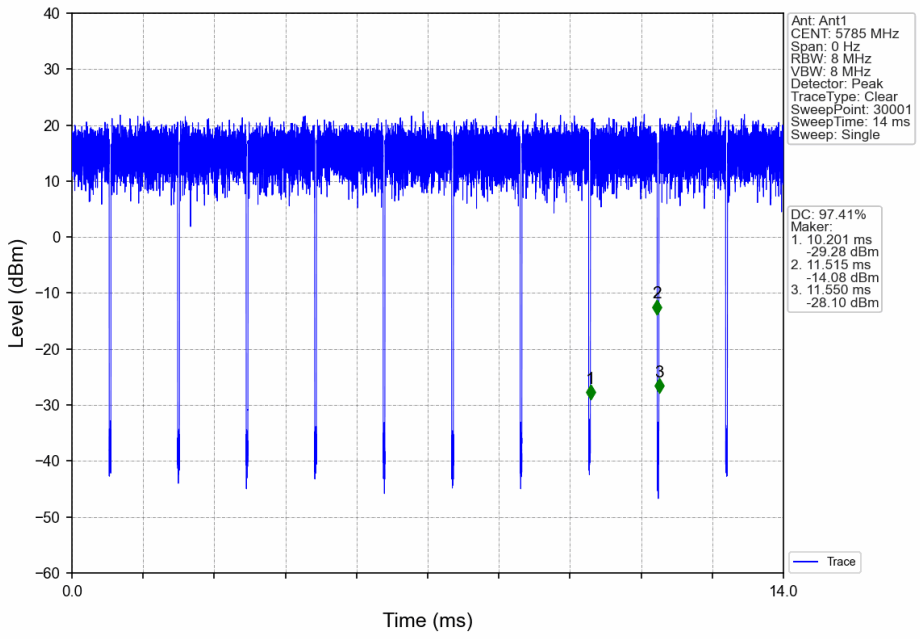
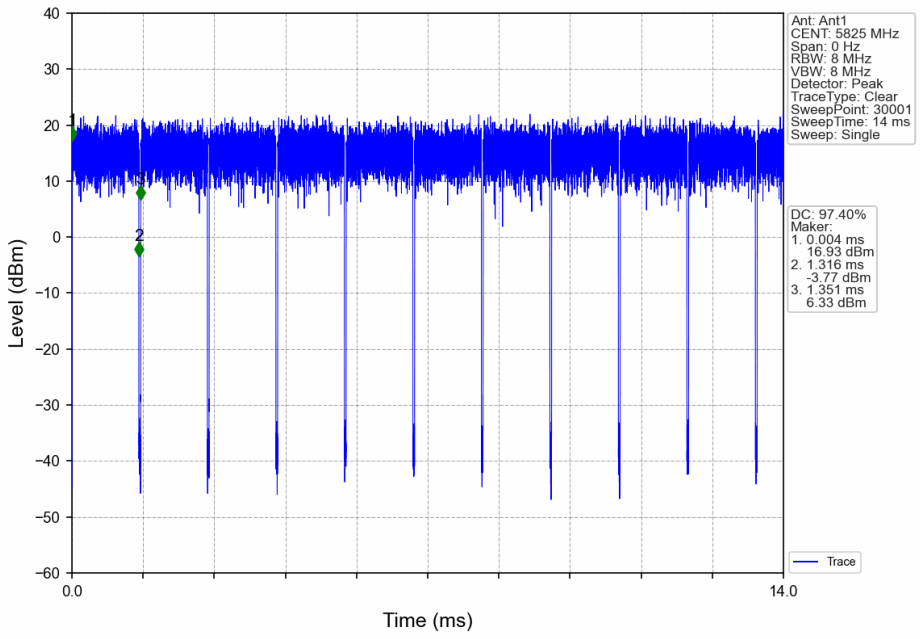
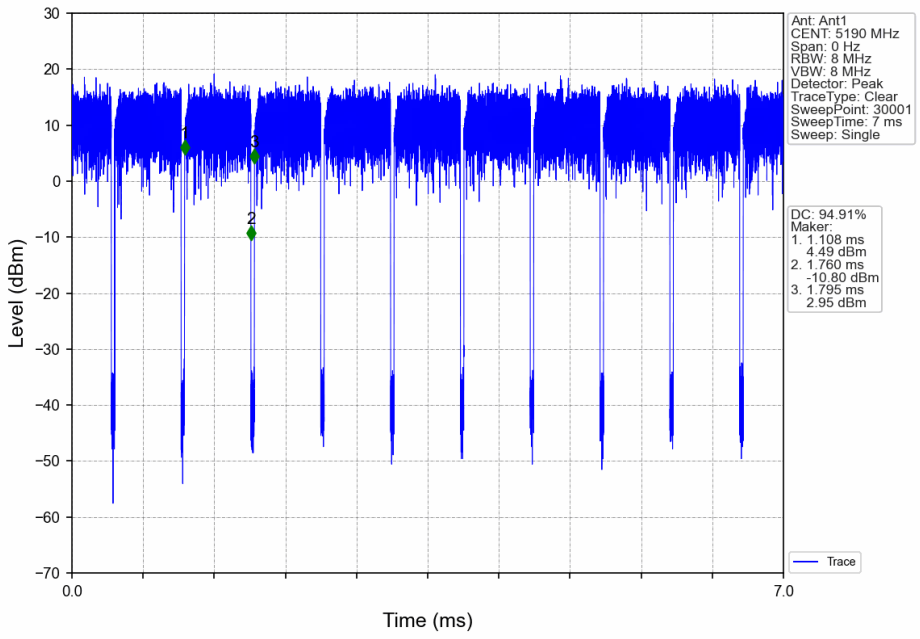
802.11ac(VHT20)_MCH_5785MHz_Ant1_NTNV



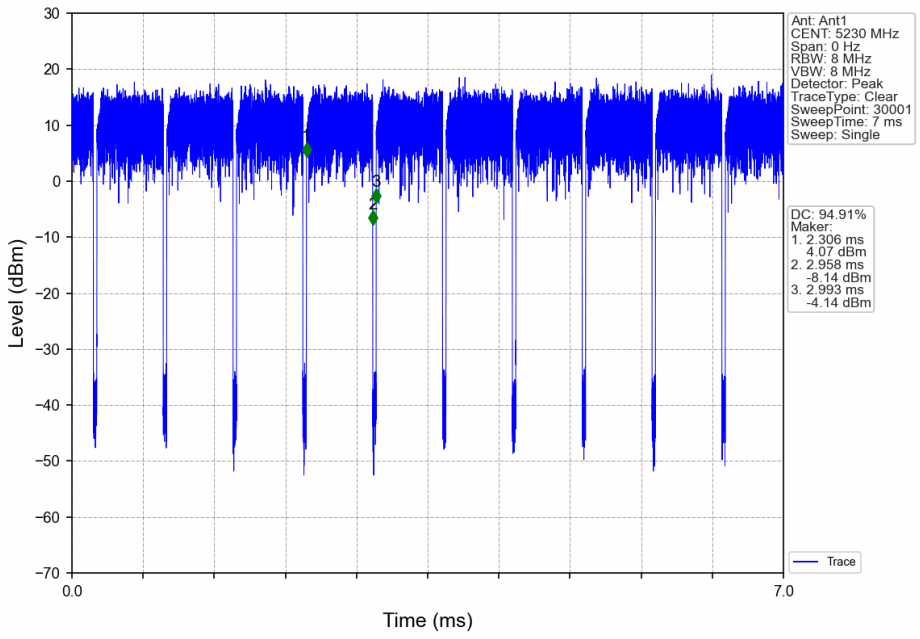

802.11ac(VHT20)_HCH_5825MHz_Ant1_NTNV



802.11ac(VHT40)_LCH_5190MHz_Ant1_NTNV




802.11ac(VHT40)_HCH_5230MHz_Ant1_NTNV



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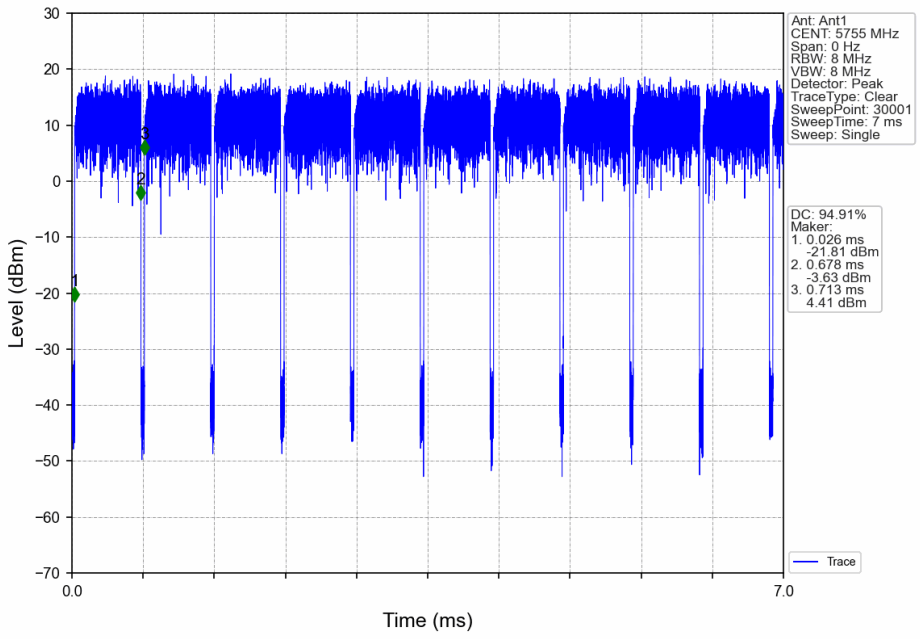
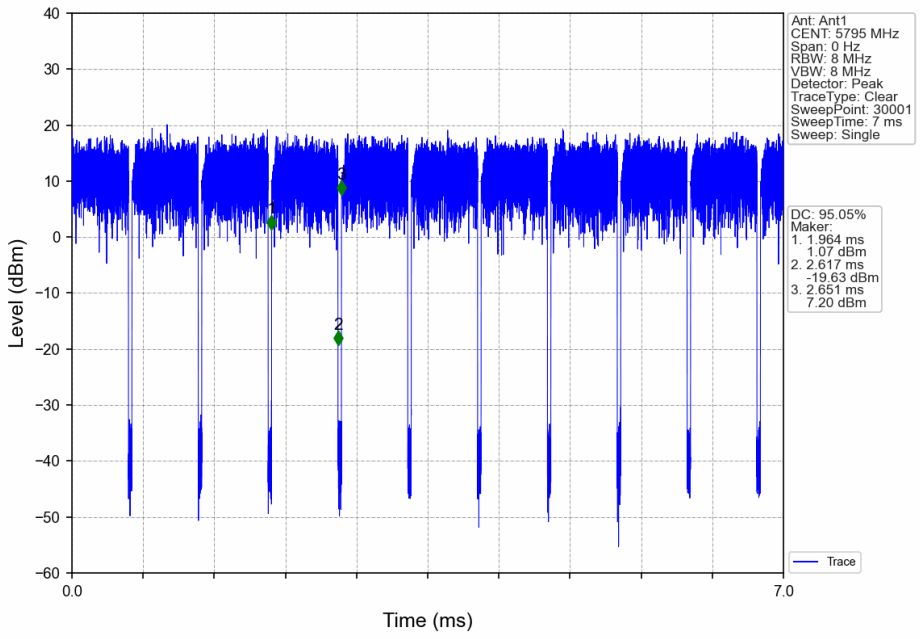
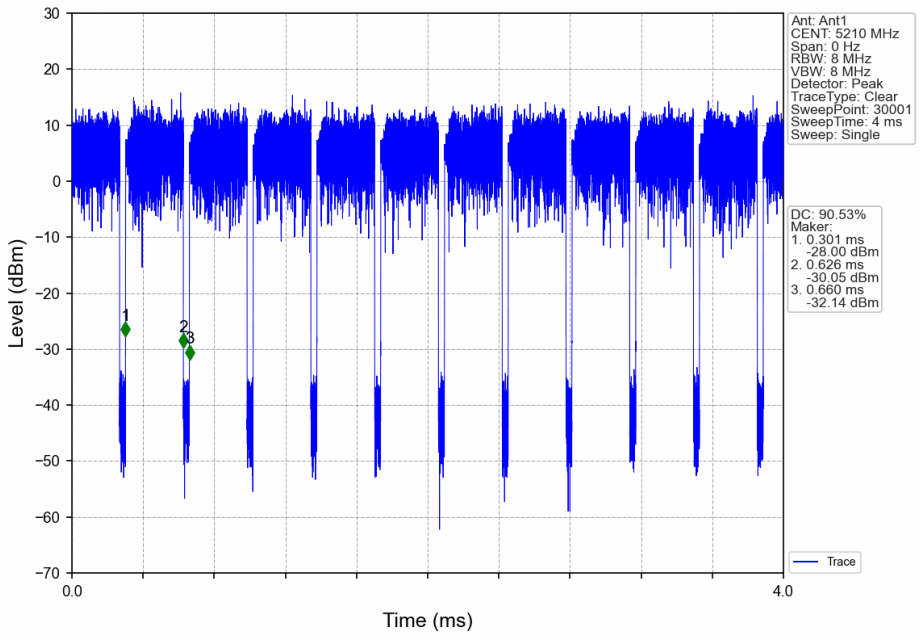
802.11ac(VHT40)_LCH_5755MHz_Ant1_NTNV



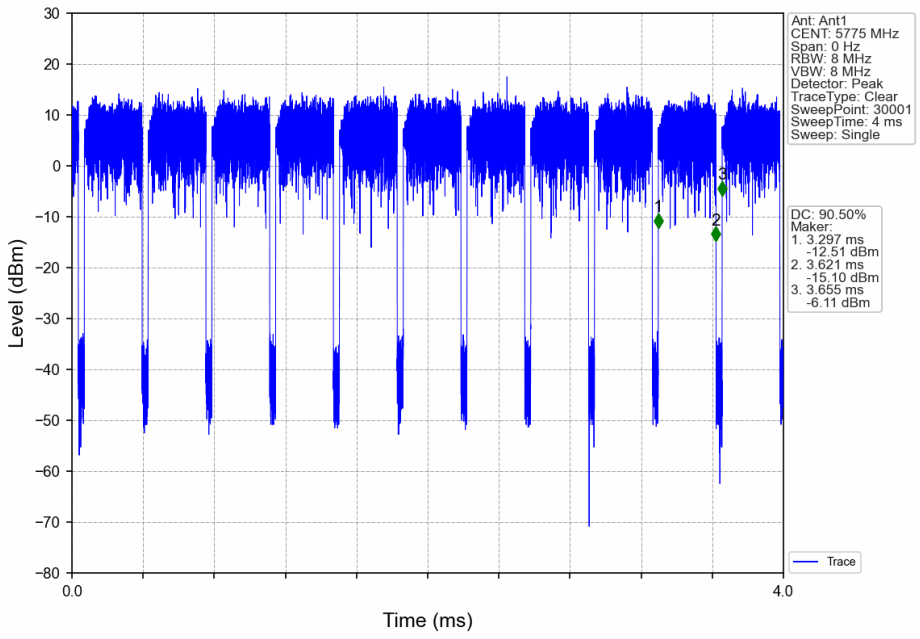

802.11ac(VHT40)_HCH_5795MHz_Ant1_NTNV



802.11ac(VHT80)_MCH_5210MHz_Ant1_NTNV




802.11ac(VHT80)_MCH_5775MHz_Ant1_NTNV



# 2. Bandwidth

## 2.1 OBW

### 2.1.1 Test Result

| Mode | TX Type | Frequency (MHz) | ANT | 99% Occupied Bandwidth (MHz) Result | Verdict |
|---|---|---|---|---|---|
| 802.11a | SISO | 5180 | 1 | 17.412 | Pass |
| | | 5200 | 1 | 17.377 | Pass |
| | | 5240 | 1 | 17.486 | Pass |
| | | 5745 | 1 | 17.503 | Pass |
| | | 5785 | 1 | 17.501 | Pass |
| | | 5825 | 1 | 17.537 | Pass |
| 802.11n (HT20) | SISO | 5180 | 1 | 18.449 | Pass |
| | | 5200 | 1 | 18.440 | Pass |
| | | 5240 | 1 | 18.462 | Pass |
| | | 5745 | 1 | 18.491 | Pass |
| | | 5785 | 1 | 18.518 | Pass |
| | | 5825 | 1 | 18.477 | Pass |
| 802.11n (HT40) | SISO | 5190 | 1 | 36.822 | Pass |
| | | 5230 | 1 | 36.830 | Pass |
| | | 5755 | 1 | 36.969 | Pass |
| | | 5795 | 1 | 36.990 | Pass |
| 802.11ac (VHT20) | SISO | 5180 | 1 | 18.274 | Pass |
| | | 5200 | 1 | 18.252 | Pass |
| | | 5240 | 1 | 18.284 | Pass |
| | | 5745 | 1 | 18.305 | Pass |
| | | 5785 | 1 | 18.358 | Pass |
| | | 5825 | 1 | 18.311 | Pass |
| 802.11ac (VHT40) | SISO | 5190 | 1 | 36.469 | Pass |
| | | 5230 | 1 | 36.486 | Pass |
| | | 5755 | 1 | 36.543 | Pass |
| | | 5795 | 1 | 36.581 | Pass |
| 802.11ac (VHT80) | SISO | 5210 | 1 | 75.664 | Pass |
| | | 5775 | 1 | 75.747 | Pass |



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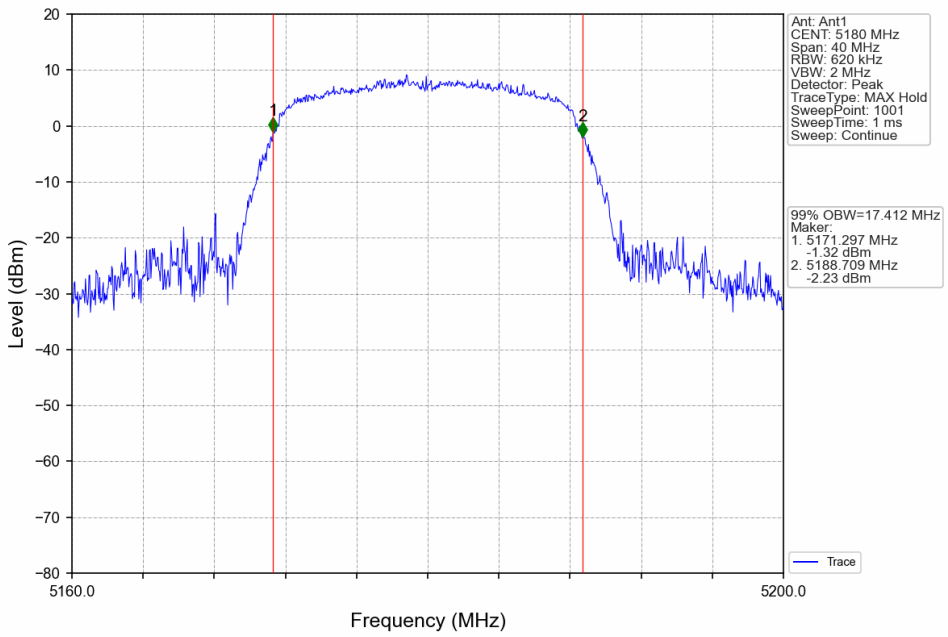
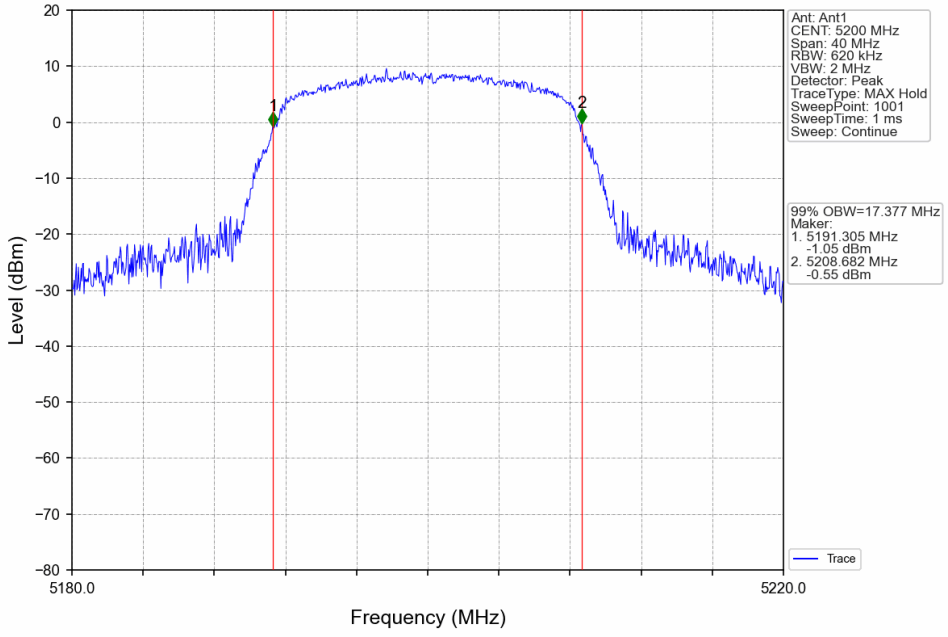
## 2.1.2 Test Graph

802.11a_LCH_5180MHz_Ant1_NTNV




802.11a_MCH_5200MHz_Ant1_NTNV



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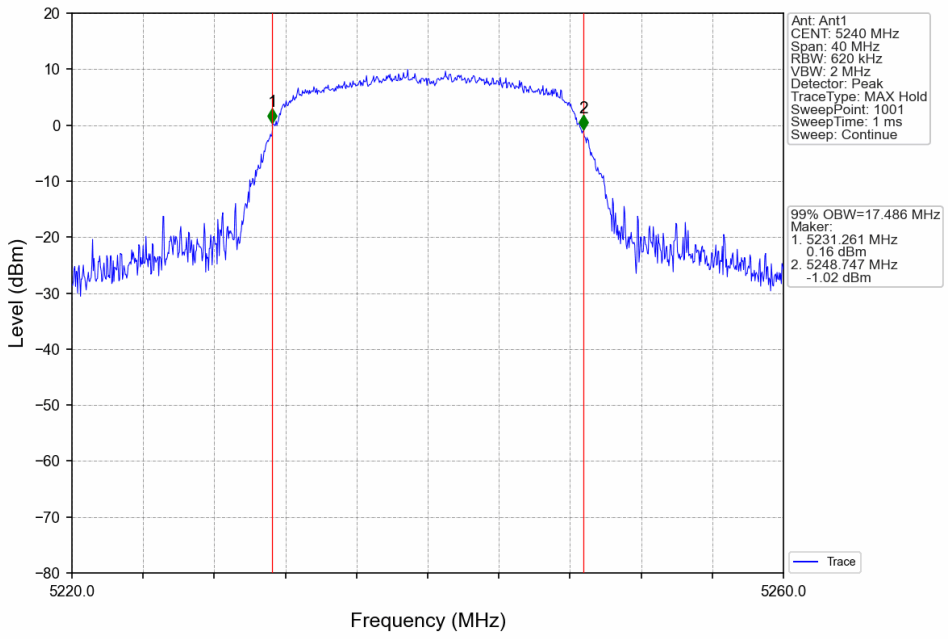
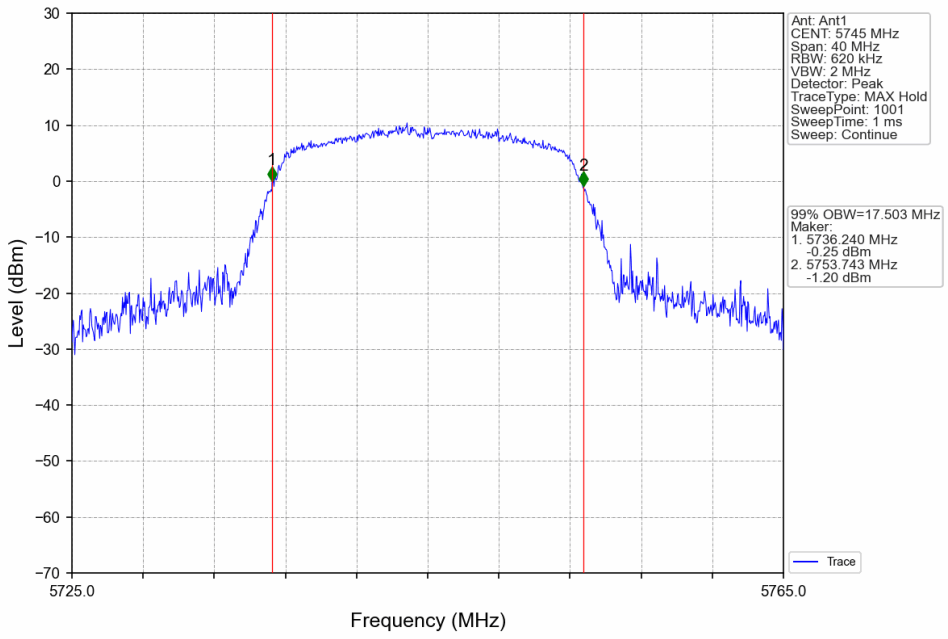
802.11a_HCH_5240MHz_Ant1_NTNV




802.11a_LCH_5745MHz_Ant1_NTNV



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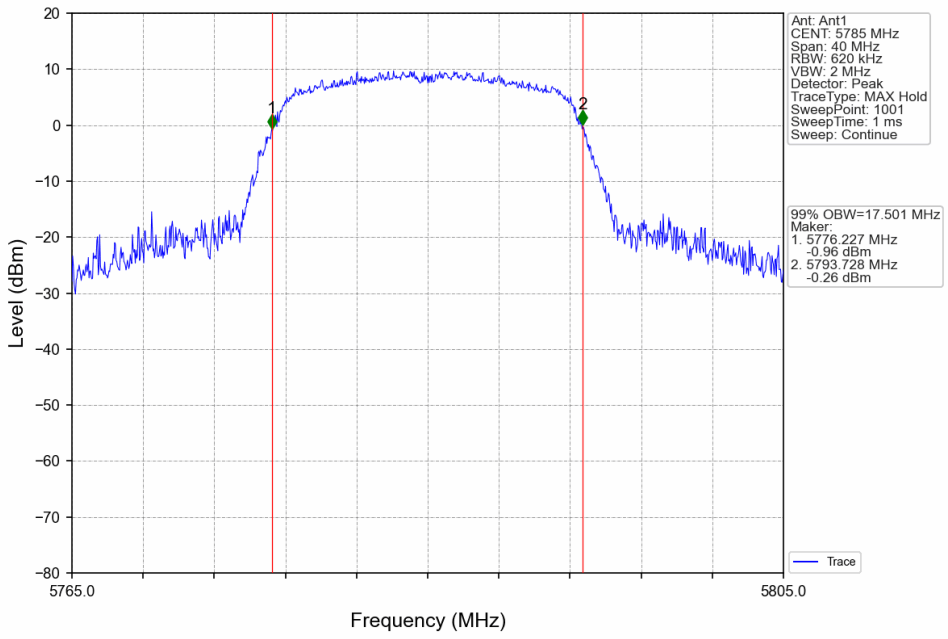
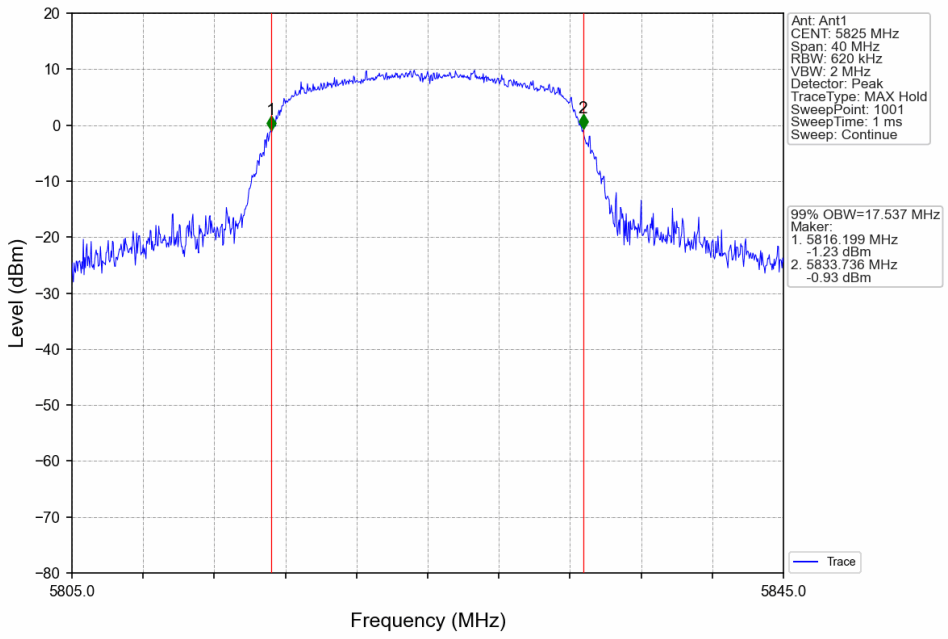
802.11a_MCH_5785MHz_Ant1_NTNV




802.11a_HCH_5825MHz_Ant1_NTNV



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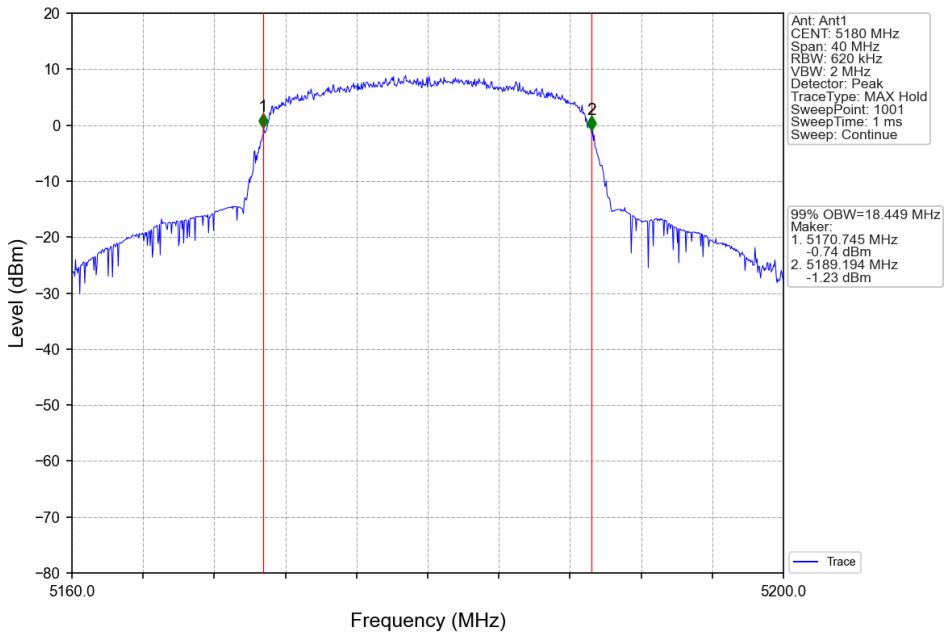
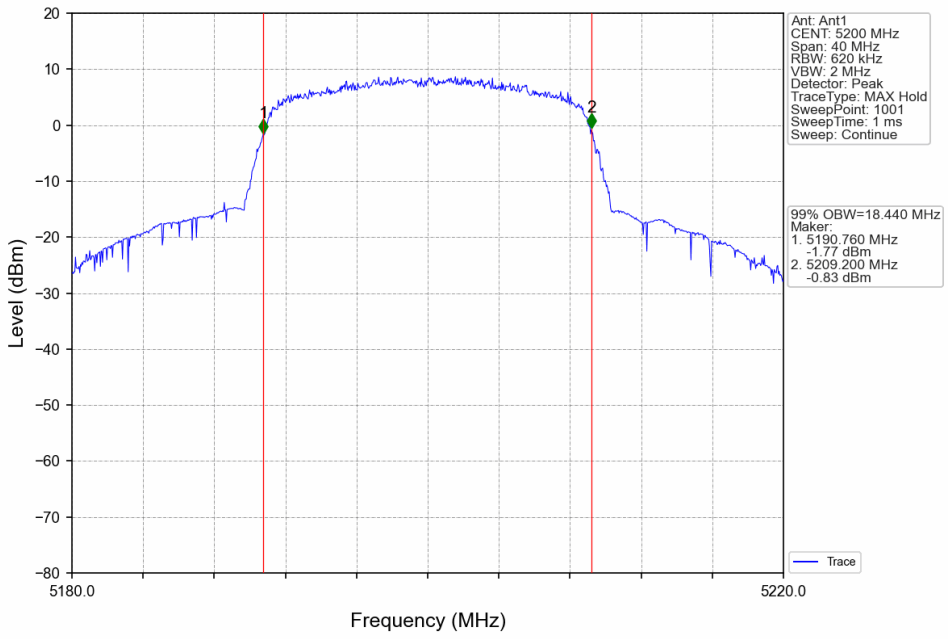
802.11n(HT20)_LCH_5180MHz_Ant1_NTNV




802.11n(HT20)_MCH_5200MHz_Ant1_NTNV



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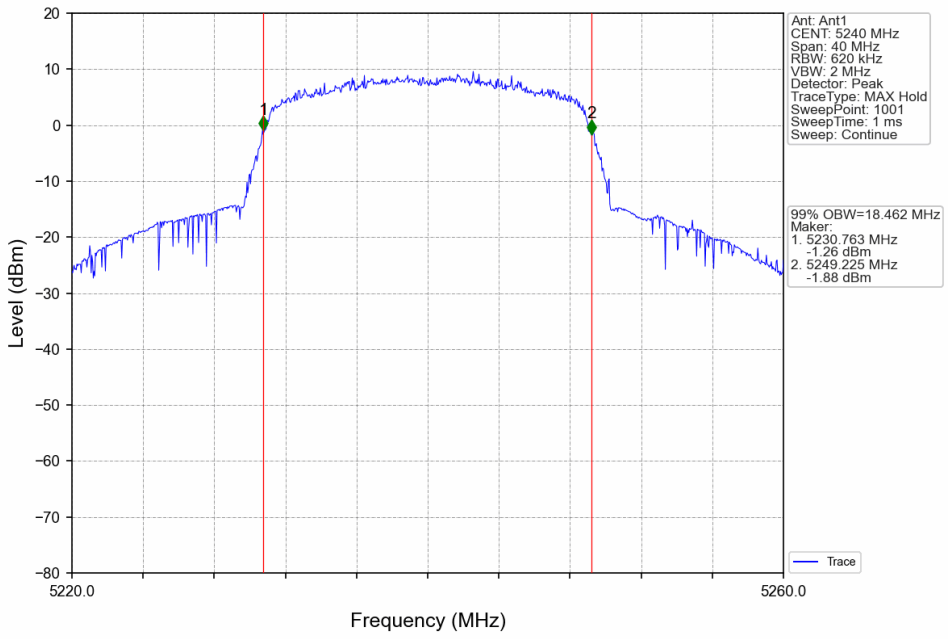
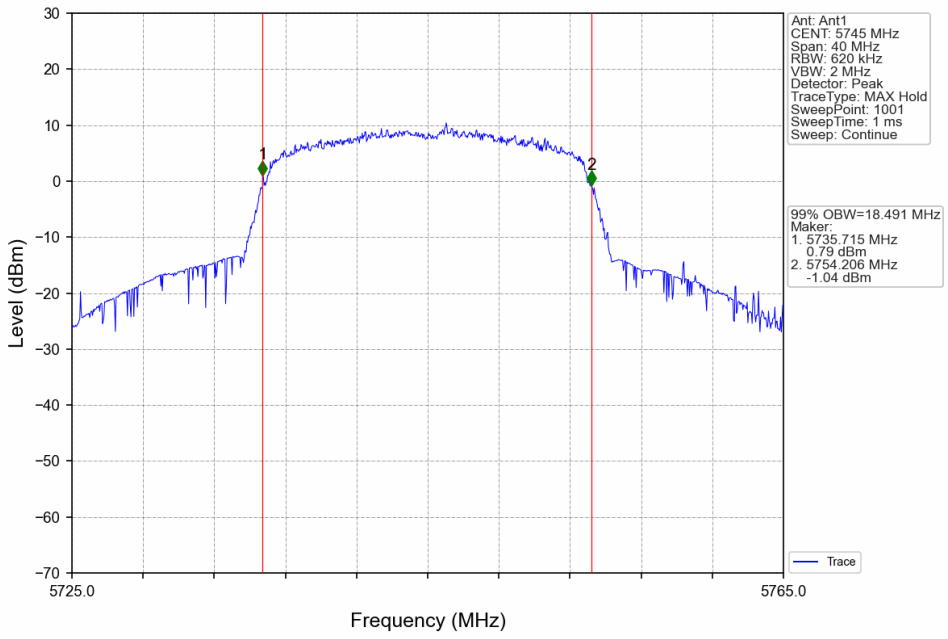
802.11n(HT20)_HCH_5240MHz_Ant1_NTNV




802.11n(HT20)_LCH_5745MHz_Ant1_NTNV



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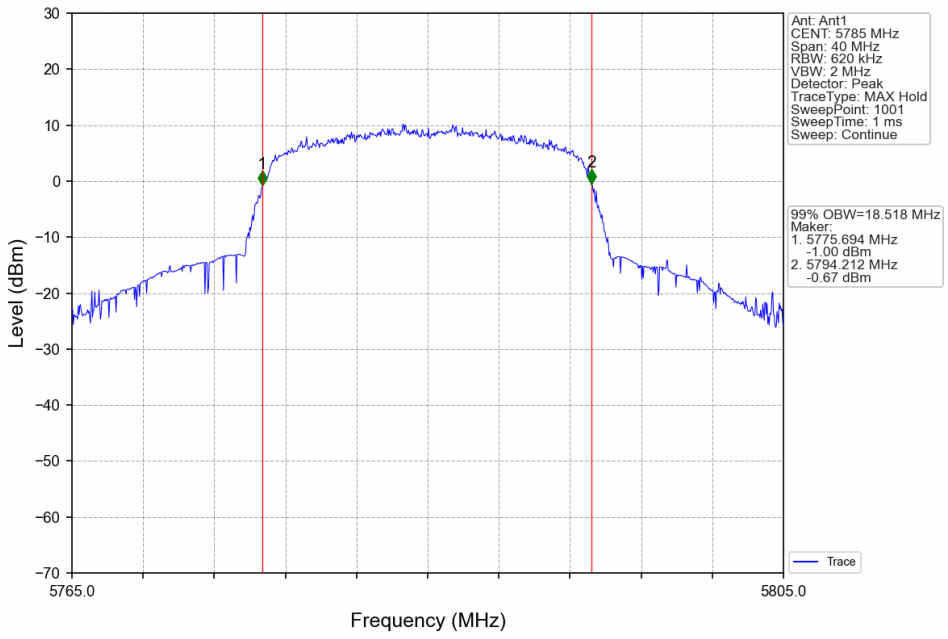
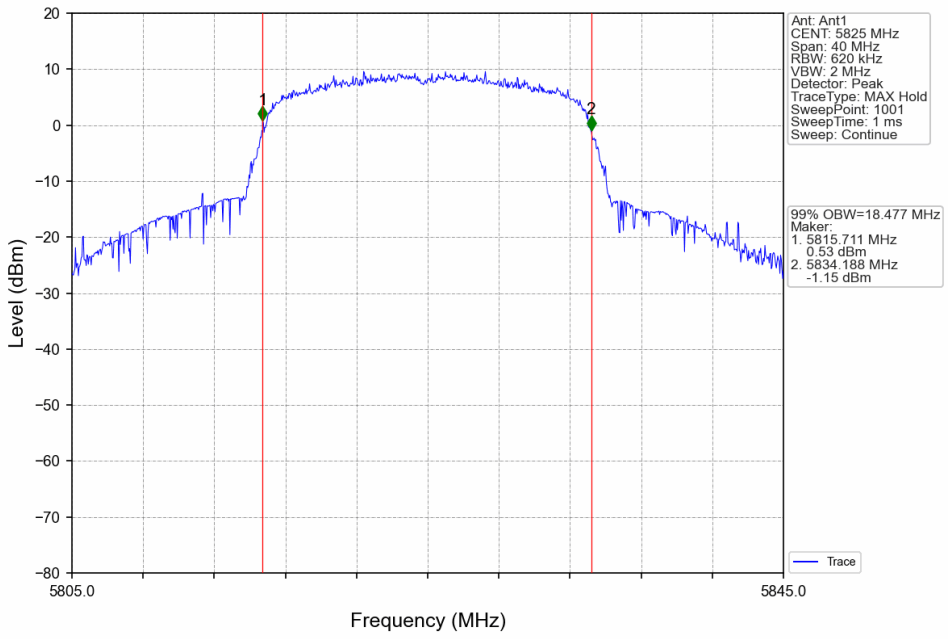
802.11n(HT20)_MCH_5785MHz_Ant1_NTNV




802.11n(HT20)_HCH_5825MHz_Ant1_NTNV



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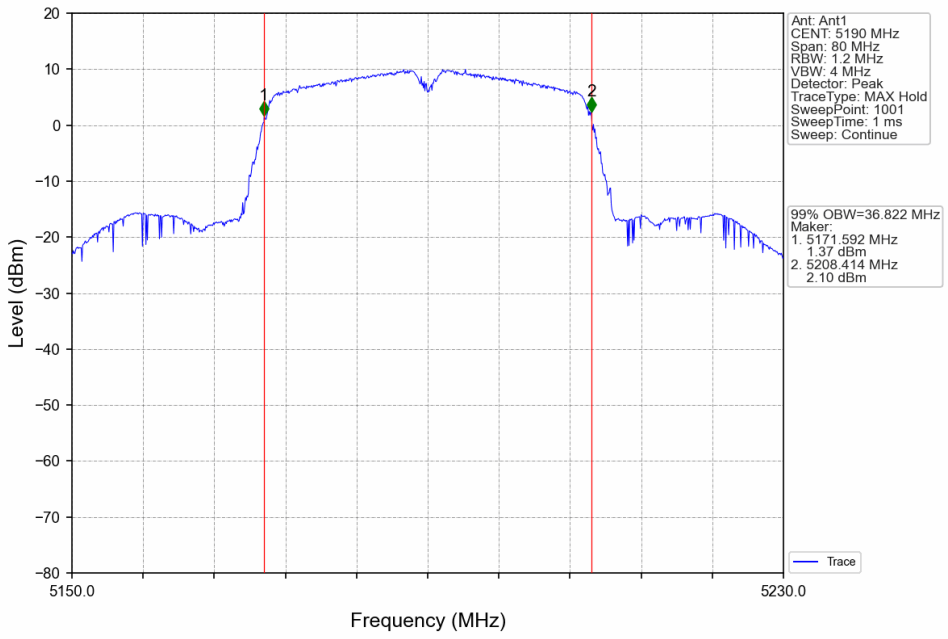
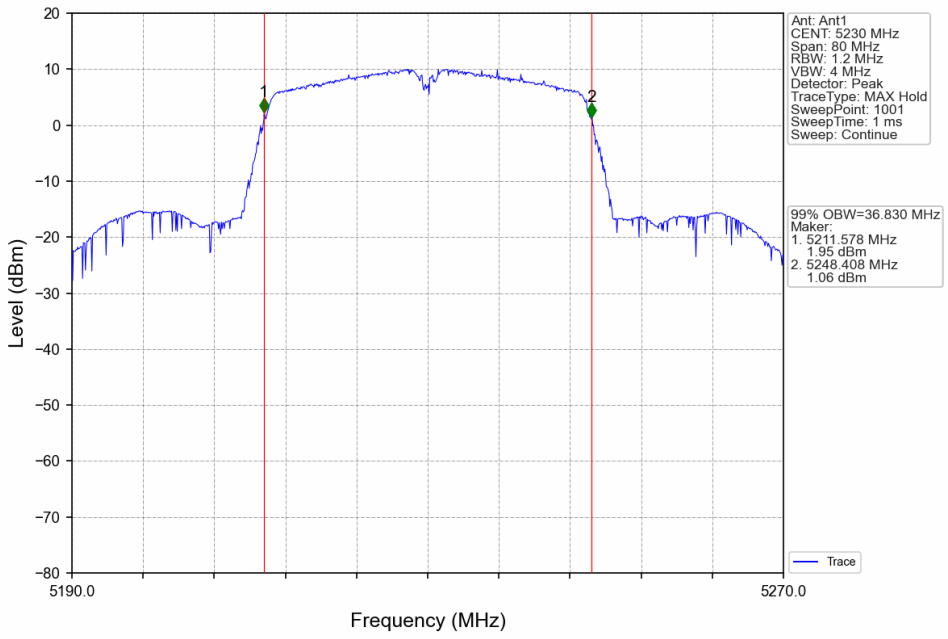
802.11n(HT40)_LCH_5190MHz_Ant1_NTNV




802.11n(HT40)_HCH_5230MHz_Ant1_NTNV



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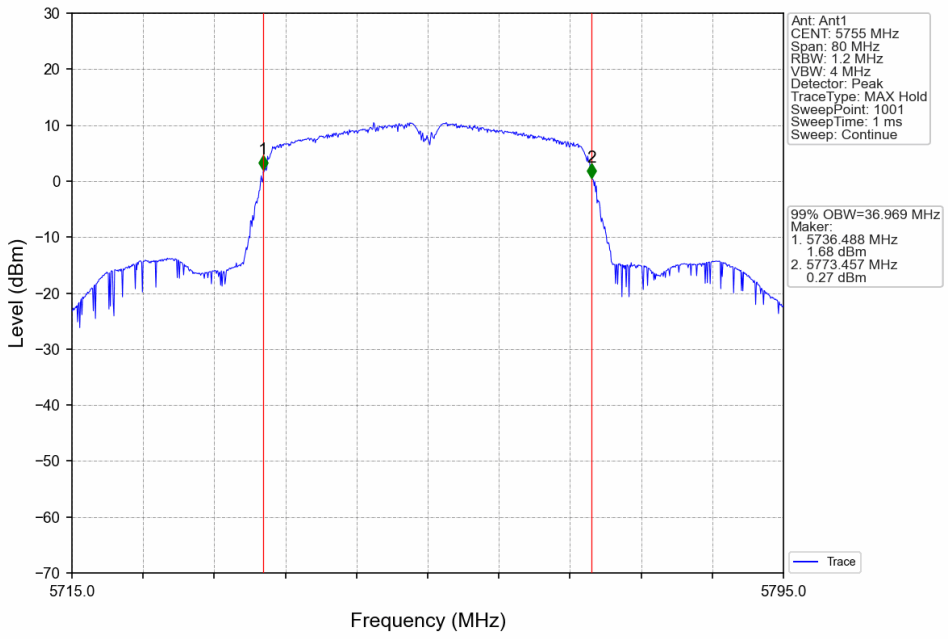
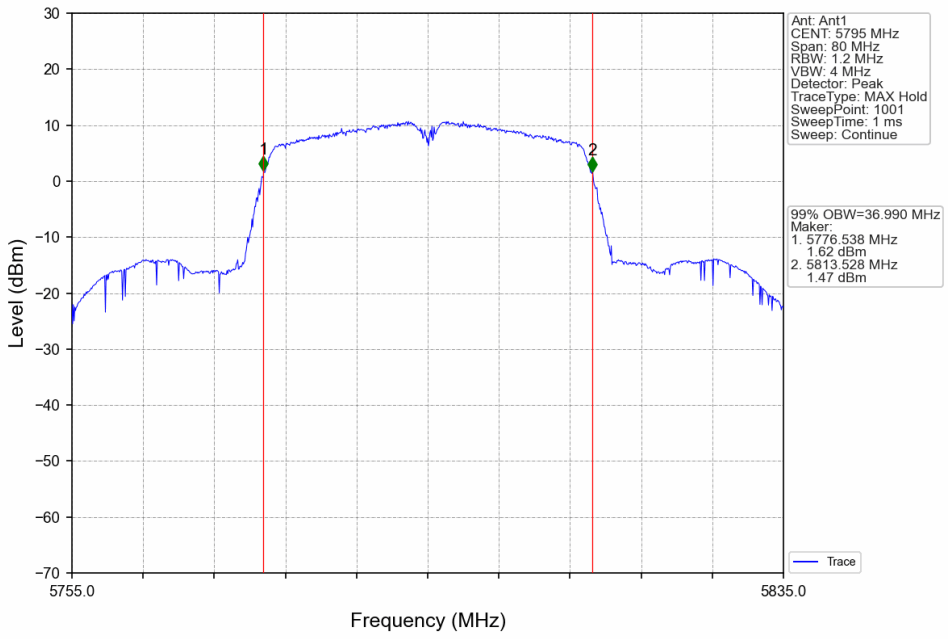
802.11n(HT40)_LCH_5755MHz_Ant1_NTNV




802.11n(HT40)_HCH_5795MHz_Ant1_NTNV



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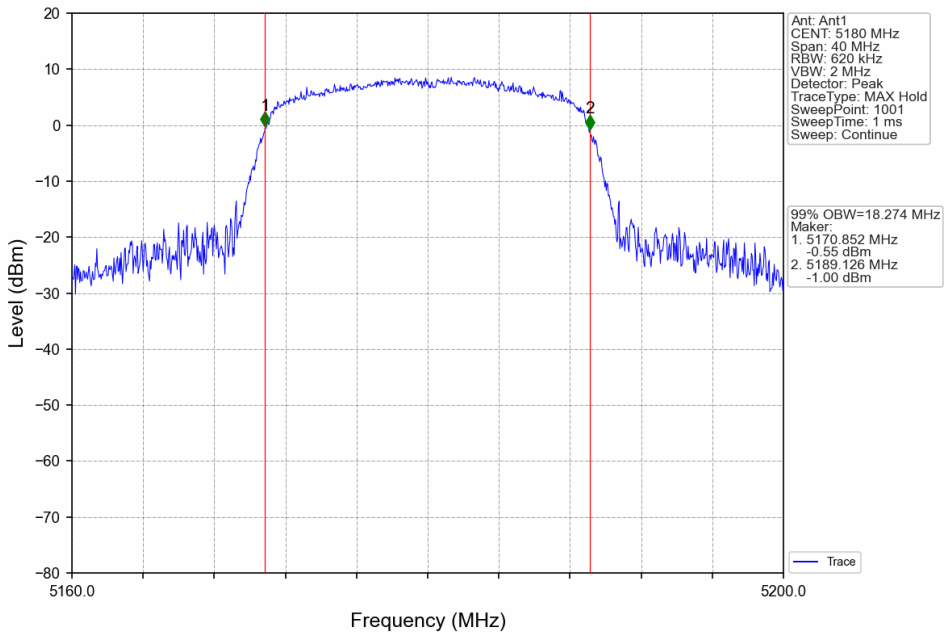
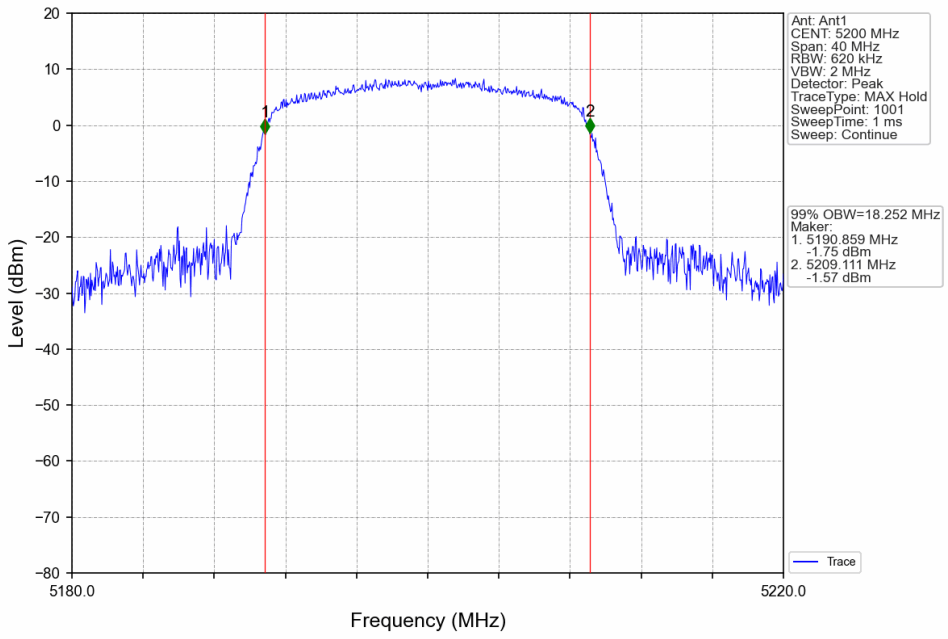
802.11ac(VHT20)_LCH_5180MHz_Ant1_NTNV




802.11ac(VHT20)_MCH_5200MHz_Ant1_NTNV



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