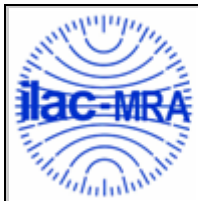


ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C & E REQUIREMENT REFERENCING TEST DATA ACROSS SEPARATE EQUIPMENT VERIFICATION

OF

Product Name: PeopleNet Connected Tablet
Brand Name: PeopleNet
Model No.: MS5
Model Difference: N/A
FCC ID: NKS-MS5N2
Report No.: E2/2018/70107
Issue Date: Sep. 14, 2018
FCC Rule Part: §15.247, Cat: DTS & DSS & §15.407
Prepared for: PEOPLENET
 4400 Baker Road, Minnetonka, MN 55343, USA
Prepared by: SGS Taiwan Ltd.
 Electronics & Communication Laboratory
 No.2, Keji 1st Rd., Guishan District, Taoyuan
 City, Taiwan 333



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f (886-2) 2298-0488

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VERIFICATION OF COMPLIANCE

Applicant: PeopleNet
4400 Baker Road, Minnetonka, MN 55343, USA

Product Name: PeopleNet Connected Tablet

Brand Name: PeopleNet

Model No.: MS5

Model Difference: N/A

FCC ID: NKS-MS5N2

Report Number: E2/2018/70107

Date of test: Jul. 25, 2018 ~ Sep. 13, 2018

Date of EUT Received: Jul. 25, 2018

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Test By:

Vito Pei

Date:

Sep. 14, 2018

Vito Pei / Engineer

Prepared By:

Yuri Tsou

Date:

Sep. 14, 2018

Yuri Tsai / Clerk

Approved By:

Jim Chang

Date:

Sep. 14, 2018

Jim Chang / Manager

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Revision History

| Report Number | Revision | Description | Issue Date |
|---------------|----------|------------------------------|---------------|
| E2/2018/70107 | Rev.00 | Initial creation of document | Sep. 14, 2018 |
| | | | |
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| | | | |

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1 GENERAL INFORMATION

1.1 Product description

General:

| | | |
|--|--|-------------------------------------|
| Product Name: | PeopleNet Connected Tablet | |
| Brand Name: | PeopleNet | |
| Model No.: | MS5 | |
| Model Difference: | N/A | |
| Hardware Version: | N/A | |
| Software Version: | N/A | |
| Tablet Docking Station | Model No.: MS-57602, Supplier: MSI | |
| Power Cable | P/N: L016-0576, Supplier: ELECTRI-CORD MFG.CO. | |
| Power Supply: | 7.4Vdc from LITHIUM-ION rechargeable battery or 12/24Vdc from DC Car battery | |
| | Battery: | Model No.: MS5760 , Supplier: Getac |
| Referencing test data across separate equipment: | According to KDB484596, Spot-check data based on the worst-case result in the original FCC ID: NKS-MS5 filing has been submitted with this application for verification. | |

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance

FCC Part 15, Subpart E §15.407

FCC KDB 789033 D02 General UNII Test Procedures New Rules

FCC KDB 484596 D01 Referencing Test Data DR01-42712

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd.,
Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Registration Numbers are: 735305 / TW0002

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5 Configuration of Tested System

Fig 2-2 Radiated Emission Configuration

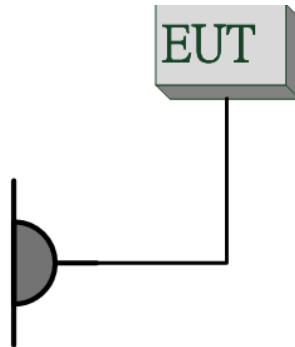


Table 2-1 Equipment Used in Tested System

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Data Cable | Power Cord |
|------|--------------------|-----------|----------------|------------|------------|------------|
| 1 | WLAN Test Software | N/A | N/A | N/A | N/A | N/A |
| 2 | BT Test Software | N/A | N/A | N/A | N/A | N/A |

3 SUMMARY OF TEST RESULTS

| FCC Rules | Description Of Test | Result |
|------------|--------------------------------------|-----------|
| §15.247(b) | Peak Output Power | Compliant |
| §15.407(a) | The Maximum Output Power Measurement | Compliant |
| §15.247(d) | Radiated Spurious Emission | Compliant |
| §15.407(b) | Undesirable Radiated Emissions | Compliant |

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

40 channels are provided for Bluetooth LE

| CHANNEL | FREQUENCY | CHANNEL | FREQUENCY | CHANNEL | FREQUENCY |
|---------|-----------|---------|-----------|---------|-----------|
| 0 | 2402 MHz | 14 | 2430 MHz | 28 | 2458 MHz |
| 1 | 2404 MHz | 15 | 2432 MHz | 29 | 2460 MHz |
| 2 | 2406 MHz | 16 | 2434 MHz | 30 | 2462 MHz |
| 3 | 2408 MHz | 17 | 2436 MHz | 31 | 2464 MHz |
| 4 | 2410 MHz | 18 | 2438 MHz | 32 | 2466 MHz |
| 5 | 2412 MHz | 19 | 2440 MHz | 33 | 2468 MHz |
| 6 | 2414 MHz | 20 | 2442 MHz | 34 | 2470 MHz |
| 7 | 2416MHz | 21 | 2444 MHz | 35 | 2472 MHz |
| 8 | 2418 MHz | 22 | 2446 MHz | 36 | 2474 MHz |
| 9 | 2420 MHz | 23 | 2448 MHz | 37 | 2476 MHz |
| 10 | 2422 MHz | 24 | 2450 MHz | 38 | 2478 MHz |
| 11 | 2424 MHz | 25 | 2452 MHz | 39 | 2480 MHz |
| 12 | 2426 MHz | 26 | 2454 MHz | | |
| 13 | 2428 MHz | 27 | 2456 MHz | | |

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79 channels are provided for Bluetooth

| CH | FREQUENCY | CH | FREQUENCY | CH | FREQUENCY | CH | FREQUENCY |
|----|-----------|----|-----------|----|-----------|----|-----------|
| 0 | 2402 MHz | 20 | 2422 MHz | 40 | 2442 MHz | 70 | 2462 MHz |
| 1 | 2403 MHz | 21 | 2423 MHz | 41 | 2443 MHz | 71 | 2463 MHz |
| 2 | 2404 MHz | 22 | 2424 MHz | 42 | 2444 MHz | 72 | 2464 MHz |
| 3 | 2405 MHz | 23 | 2425 MHz | 43 | 2445 MHz | 73 | 2465 MHz |
| 4 | 2406 MHz | 24 | 2426 MHz | 44 | 2446 MHz | 74 | 2466 MHz |
| 5 | 2407 MHz | 25 | 2427 MHz | 45 | 2447 MHz | 75 | 2467 MHz |
| 6 | 2408 MHz | 26 | 2428 MHz | 46 | 2448 MHz | 76 | 2468 MHz |
| 7 | 2409 MHz | 27 | 2429 MHz | 47 | 2449 MHz | 77 | 2469 MHz |
| 8 | 2410 MHz | 28 | 2430 MHz | 48 | 2450 MHz | 78 | 2470 MHz |
| 9 | 2411 MHz | 29 | 2431 MHz | 49 | 2451 MHz | 79 | 2471 MHz |
| 10 | 2412 MHz | 30 | 2432 MHz | 50 | 2452 MHz | 70 | 2472 MHz |
| 11 | 2413 MHz | 31 | 2433 MHz | 51 | 2453 MHz | 71 | 2473 MHz |
| 12 | 2414 MHz | 32 | 2434 MHz | 52 | 2454 MHz | 72 | 2474 MHz |
| 13 | 2415 MHz | 33 | 2435 MHz | 53 | 2455 MHz | 73 | 2475 MHz |
| 14 | 2416 MHz | 34 | 2436 MHz | 54 | 2456 MHz | 74 | 2476 MHz |
| 15 | 2417 MHz | 35 | 2437 MHz | 55 | 2457 MHz | 75 | 2477 MHz |
| 16 | 2418 MHz | 36 | 2438 MHz | 56 | 2458 MHz | 76 | 2478 MHz |
| 17 | 2419 MHz | 37 | 2439 MHz | 57 | 2459 MHz | 77 | 2479 MHz |
| 18 | 2420 MHz | 38 | 2440 MHz | 58 | 2460 MHz | 78 | 2480 MHz |
| 19 | 2421 MHz | 39 | 2441 MHz | 59 | 2461 MHz | | |

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

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

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Operated band in 5150 MHz ~5250 MHz:

| 802.11a / n HT20 Mode | |
|-----------------------|-----------|
| Channel | Frequency |
| 36 | 5180 |
| 40 | 5200 |
| 44 | 5220 |
| 48 | 5240 |

Operated band in 5250 MHz ~5350 MHz:

| 802.11a / n HT20 | |
|------------------|-----------|
| channel | Frequency |
| 52 | 5260 |
| 56 | 5280 |
| 60 | 5300 |
| 64 | 5320 |

Operated band in 5500 MHz ~5700 MHz:

| 802.11a / n HT20 Mode | |
|-----------------------|-----------|
| Channel | Frequency |
| 100 | 5500 |
| 104 | 5520 |
| 108 | 5540 |
| 112 | 5560 |
| 116 | 5580 |
| 120 | 5600 |
| 124 | 5620 |
| 128 | 5640 |
| 132 | 5660 |
| 136 | 5680 |
| 140 | 5700 |

Operated band in 5745 MHz ~5850 MHz:

| 802.11a / n HT20 | |
|------------------|-----------|
| Channel | Frequency |
| 149 | 5745 |
| 153 | 5765 |
| 157 | 5785 |
| 161 | 5805 |
| 165 | 5825 |

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done base on the worst case of original FCC ID:NKS-MS5.

RADIATED EMISSION TEST:

| RADIATED EMISSION TEST (ABOVE 1 GHz) | | | | |
|--------------------------------------|-------------------|----------------|------------|------------------|
| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION | DATA RATE (Mbps) |
| Bluetooth LE | 2402 to 2480 | 2442 | GFSK | 1 |
| Bluetooth | 2402 to 2480 | 2441 | GFSK | DH5 |
| 802.11b | 1 to 11 | 6 | DSSS | 1 |
| 802.11a | 36 to 48 | 44 | OFDM | 6 |
| | 52 to 64 | 60 | OFDM | 6 |
| | 100 to 144 | 116 | OFDM | 6 |
| | 149 to 165 | 157 | OFDM | 6 |

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

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ANTENNA PORT CONDUCTED MEASUREMENT:

| CONDUCTED TEST | | | | |
|----------------|-------------------|----------------|------------|------------------|
| MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION | DATA RATE (Mbps) |
| Bluetooth LE | 0 to 39 | 0,20,39 | GFSK | 1 |
| Bluetooth | 0 to 78 | 0,39,78 | GFSK | 1 |
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | 1 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | 6 |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | MCS0 |

| CONDUCTED TEST | | | | | |
|----------------|----------------------|-------------------|----------------|------------|------------------|
| MODE | FREQUENCY BAND (MHz) | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION | DATA RATE (Mbps) |
| 802.11a | 5180~5240 | 36 to 48 | 36,44,48 | OFDM | 6 |
| 802.11n_HT20 | | | | OFDM | MCS0 |
| 802.11a | 5260~5320 | 52 to 64 | 52,60,64 | OFDM | 6 |
| 802.11n_HT20 | | | | OFDM | MCS0 |
| 802.11a | 5500~5700 | 100 to 140 | 100,116,140 | OFDM | 6 |
| 802.11n_HT20 | | | | OFDM | MCS0 |
| 802.11a | 5745~5825 | 149 to 165 | 149,157,165 | OFDM | 6 |
| 802.11n_HT20 | | | | OFDM | MCS0 |

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5 MEASUREMENT UNCERTAINTY

| Test Items | Uncertainty |
|---|-----------------------------|
| AC Power Line Conducted Emission | +/- 2.586 dB |
| Peak Output Power | +/- 0.84 dB |
| 6dB Bandwidth | +/- 51.33 Hz |
| 100 KHz Bandwidth Of Frequency Band Edges | +/- 0.84 dB |
| Peak Power Density | +/- 1.3 dB |
| Temperature | +/- 0.65 °C |
| Humidity | +/- 4.6 % |
| DC / AC Power Source | DC= +/- 0.13%, AC= +/- 0.2% |

Radiated Spurious Emission:

| | |
|--|----------------------------|
| Measurement uncertainty (Polarization : Vertical) | 9kHz – 30MHz: +/- 2.87 dB |
| | 30MHz - 180MHz: +/- 3.37dB |
| | 180MHz -417MHz: +/- 3.19dB |
| | 0.417GHz-1GHz: +/- 3.19dB |
| | 1GHz - 18GHz: +/- 4.04dB |
| | 18GHz - 40GHz: +/- 4.04dB |

| | |
|--|----------------------------|
| Measurement uncertainty (Polarization : Horizontal) | 9kHz – 30MHz: +/- 2.87 dB |
| | 30MHz - 167MHz: +/- 4.22dB |
| | 167MHz -500MHz: +/- 3.44dB |
| | 0.5GHz-1GHz: +/- 3.39dB |
| | 1GHz - 18GHz: +/- 4.08dB |
| | 18GHz - 40GHz: +/- 4.08dB |

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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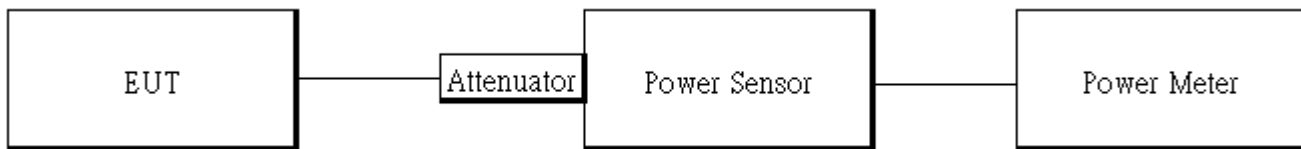
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6. PEAK OUTPUT POWER MEASUREMENT

6.1 Measurement Equipment Used:

| Conducted Emission Test Site | | | | | |
|------------------------------|--------------|--------------------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due |
| Spectrum Analyzer | KEYSIGHT | N9010A | MY51440113 | 2018/06/20 | 2019/06/19 |
| Power Meter | Anritsu | ML2496A | 1326001 | 2018/06/23 | 2019/06/22 |
| Power Sensor | Anritsu | MA2411B | 1315048 | 2018/06/23 | 2019/06/22 |
| Power Sensor | Anritsu | MA2411B | 1315049 | 2018/06/23 | 2019/06/22 |
| Coaxial Cable 30cm | WOKEN | 00100A1F1A195 C | RF01 | 2017/12/24 | 2018/12/23 |
| DC Block | PASTERNAK | PE8210 | RF29 | 2017/12/24 | 2018/12/23 |
| Splitter | RF-LAMBAD | RFLT2W1G18G | RF35 | 2017/12/24 | 2018/12/23 |
| Attenuator | WOKEN | 218FS-10 | RF23 | 2017/12/24 | 2018/12/23 |
| DC Power Supply | Agilent | E3640A | MY53140006 | 2018/05/02 | 2019/05/01 |

6.2 Test Set-up:



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6.3 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Power Meter.
5. Repeat above procedures until all test default channel measured was complete.

6.4 Measurement Result:

BLE mode:

| Frequency (MHz) | Reading Power (dBm) | Peak Output Power (W) | Limit (W) |
|-----------------|---------------------|-----------------------|-----------|
| 2402.00 | -3.28 | 0.00047 | 1 |
| 2442.00 | -2.23 | 0.00060 | 1 |
| 2480.00 | -4.72 | 0.00034 | 1 |

| Frequency (MHz) | Reading Power (dBm) | Avg. Output Power (W) | Limit (W) |
|-----------------|---------------------|-----------------------|-----------|
| 2402.00 | -3.60 | 0.00044 | 1 |
| 2442.00 | -2.46 | 0.00057 | 1 |
| 2480.00 | -5.00 | 0.00032 | 1 |

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BR mode (GFSK) (Peak):

| Frequency (MHz) | Reading Power (dBm) | Output Power (W) | Limit (W) |
|-----------------|---------------------|------------------|-----------|
| 2402.00 | -3.52 | 0.00044 | 0.125 |
| 2441.00 | -2.01 | 0.00063 | 0.125 |
| 2480.00 | -4.22 | 0.00038 | 0.125 |

BR mode (GFSK) (Average):

| Frequency (MHz) | Reading Power (dBm) | Output Power (W) | Limit (W) |
|-----------------|---------------------|------------------|-----------|
| 2402.00 | -4.89 | 0.00032 | 0.125 |
| 2441.00 | -3.37 | 0.00046 | 0.125 |
| 2480.00 | -5.59 | 0.00028 | 0.125 |

EDR mode ($\pi/4$ DQPSK) (Peak):

| Frequency (MHz) | Reading Power (dBm) | Output Power (W) | Limit (W) |
|-----------------|---------------------|------------------|-----------|
| 2402.00 | -1.11 | 0.00077 | 0.125 |
| 2441.00 | 0.48 | 0.00112 | 0.125 |
| 2480.00 | -1.78 | 0.00066 | 0.125 |

EDR mode ($\pi/4$ DQPSK) (Average):

| Frequency (MHz) | Reading Power (dBm) | Output Power (W) | Limit (W) |
|-----------------|---------------------|------------------|-----------|
| 2402.00 | -5.07 | 0.00031 | 0.125 |
| 2441.00 | -3.44 | 0.00045 | 0.125 |
| 2480.00 | -5.61 | 0.00027 | 0.125 |

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EDR mode (8DPSK) (Peak):

| Frequency (MHz) | Reading Power (dBm) | Output Power (W) | Limit (W) |
|-----------------|---------------------|------------------|-----------|
| 2402.00 | -0.72 | 0.00085 | 0.125 |
| 2441.00 | 0.91 | 0.00123 | 0.125 |
| 2480.00 | -1.51 | 0.00071 | 0.125 |

EDR mode (8DPSK) (Average):

| Frequency (MHz) | Reading Power (dBm) | Output Power (W) | Limit (W) |
|-----------------|---------------------|------------------|-----------|
| 2402.00 | -4.96 | 0.00032 | 0.125 |
| 2441.00 | -3.34 | 0.00046 | 0.125 |
| 2480.00 | -5.77 | 0.00026 | 0.125 |

802.11b

| CH | Frequency (MHz) | Data Rate | Peak Output Power (dBm) | Peak Output Power (mW) | Limit |
|----|-----------------|-----------|-------------------------|------------------------|-----------------|
| 1 | 2412 | 1 | 19.14 | 82.04 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 19.24 | 83.95 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 18.93 | 78.16 | 1 Watt = 30 dBm |
| CH | Frequency (MHz) | Data Rate | Avg. Output Power (dBm) | Avg. Output Power (mW) | Limit |
| 1 | 2412 | 1 | 16.79 | 47.75 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 16.75 | 47.32 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 16.90 | 48.98 | 1 Watt = 30 dBm |

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802.11g

| CH | Frequency (MHz) | Data Rate | Peak Output Power (dBm) | Peak Output Power (mW) | Limit |
|----|-----------------|-----------|-------------------------|------------------------|-----------------|
| 1 | 2412 | 1 | 20.13 | 103.04 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 20.37 | 108.89 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 20.09 | 102.09 | 1 Watt = 30 dBm |
| CH | Frequency (MHz) | Data Rate | Avg. Output Power (dBm) | Avg. Output Power (mW) | Limit |
| 1 | 2412 | 1 | 13.74 | 23.66 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 13.72 | 23.55 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 13.82 | 24.10 | 1 Watt = 30 dBm |

802.11n_HT20

| CH | Frequency (MHz) | Data Rate | Peak Output Power (dBm) | Peak Output Power (mW) | Limit |
|----|-----------------|-----------|-------------------------|------------------------|-----------------|
| 1 | 2412 | 1 | 20.14 | 103.28 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 20.22 | 105.20 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 20.02 | 100.46 | 1 Watt = 30 dBm |
| CH | Frequency (MHz) | Data Rate | Avg. Output Power (dBm) | Avg. Output Power (mW) | Limit |
| 1 | 2412 | 1 | 12.94 | 19.68 | 1 Watt = 30 dBm |
| 6 | 2437 | 1 | 12.90 | 19.50 | 1 Watt = 30 dBm |
| 11 | 2462 | 1 | 12.98 | 19.86 | 1 Watt = 30 dBm |

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802.11a

| CH | Frequency (MHz) | TOTAL POWER (dBm) | TOTAL POWER (mW) | REQUIRED LIMIT (dBm) | RESULT |
|-----|-----------------|-------------------|------------------|---------------------------------|--------|
| 36 | 5180 | 13.95 | 24.83 | 23.98 | PASS |
| 44 | 5220 | 13.95 | 24.83 | 23.98 | PASS |
| 48 | 5240 | 13.97 | 24.95 | 23.98 | PASS |
| 52 | 5260 | 13.96 | 24.89 | 23.98 or $11+10\log(B) = 23.17$ | PASS |
| 60 | 5300 | 13.98 | 25.00 | 23.98 or $11+10\log(B) = 23.15$ | PASS |
| 64 | 5320 | 13.73 | 23.60 | 23.98 or $11+10\log(B) = 23.12$ | PASS |
| 100 | 5500 | 13.76 | 23.77 | 23.98 or $11+10\log(B) = 23.12$ | PASS |
| 116 | 5600 | 13.89 | 24.49 | 23.98 or $11+10\log(B) = 23.15$ | PASS |
| 140 | 5700 | 13.97 | 24.95 | 23.98 or $11+10\log(B) = 23.11$ | PASS |
| 149 | 5745 | 13.76 | 23.77 | 30 | PASS |
| 157 | 5785 | 13.98 | 25.00 | 30 | PASS |
| 165 | 5825 | 13.83 | 24.15 | 30 | PASS |

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802.11n_HT20

| CH | Frequency (MHz) | TOTAL POWER (dBm) | TOTAL POWER (mW) | REQUIRED LIMIT (dBm) | RESULT |
|-----|-----------------|-------------------|------------------|---------------------------------|--------|
| 36 | 5180 | 12.97 | 19.82 | 23.98 | PASS |
| 44 | 5220 | 12.99 | 19.91 | 23.98 | PASS |
| 48 | 5240 | 12.71 | 18.66 | 23.98 | PASS |
| 52 | 5260 | 12.73 | 18.75 | 23.98 or $11+10\log(B) = 23.17$ | PASS |
| 60 | 5300 | 12.77 | 18.92 | 23.98 or $11+10\log(B) = 23.15$ | PASS |
| 64 | 5320 | 12.85 | 19.28 | 23.98 or $11+10\log(B) = 23.12$ | PASS |
| 100 | 5500 | 12.99 | 19.91 | 23.98 or $11+10\log(B) = 23.12$ | PASS |
| 116 | 5580 | 12.77 | 18.92 | 23.98 or $11+10\log(B) = 23.15$ | PASS |
| 140 | 5700 | 12.69 | 18.58 | 23.98 or $11+10\log(B) = 23.11$ | PASS |
| 149 | 5745 | 12.86 | 19.32 | 30 | PASS |
| 157 | 5785 | 12.72 | 18.71 | 30 | PASS |
| 165 | 5825 | 12.97 | 19.82 | 30 | PASS |

***Note: Measured by power meter**

*** Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.**

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7. RADIATED SPURIOUS EMISSION MEASUREMENT

7.1 Measurement Equipment Used:

| 966 Chamber | | | | | |
|-------------------|-----------------|-----------------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Broadband Antenna | TESEQ | CBL 6112D | 35243 | 2017/11/10 | 2018/11/09 |
| Horn Antenna | Schwarzbeck | BBHA9120D | 1187 | 2018/01/04 | 2019/01/03 |
| Horn Antenna | SCHWAZBECK | BBHA9170 | 184 | 2017/12/12 | 2018/12/11 |
| Loop Antenna | ETS.LINDGREN | 6502 | 148045 | 2017/09/26 | 2018/09/25 |
| EMI Test Receiver | R&S | ESU 40 | 100363 | 2018/04/11 | 2019/04/10 |
| Pre-Amplifier | EMC Instruments | EMC330 | 980096 | 2017/12/26 | 2018/12/25 |
| Pre-Amplifier | EMC Instruments | EMC0011830 | 980199 | 2017/12/26 | 2018/12/25 |
| Pre-Amplifier | EMC Instruments | EMC184045B | 980135 | 2017/10/27 | 2018/10/26 |
| Attenuator | Marvelous | WATT-218FS-10 | RF246 | 2017/12/26 | 2018/12/25 |
| Highpass Filter | Micro Tronics | BRM50701-01 | G008 | 2017/12/26 | 2018/12/25 |
| Coaxial Cable | Huber+Suhner | RG 214/U | W21.01 | 2017/12/26 | 2018/12/25 |
| Coaxial Cable | Huber Suhner | EMC106-SM-SM -7200 | 150703 | 2017/12/26 | 2018/12/25 |
| Coaxial Cable | Huber Suhner | SUCOFLEX 104 | MY17388/4 | 2017/12/26 | 2018/12/25 |
| Coaxial Cable | Huber Suhner | RG 214/U | W22.03 | 2017/12/26 | 2018/12/25 |

NOTE: N.C.R refers to Not Calibrated Required.

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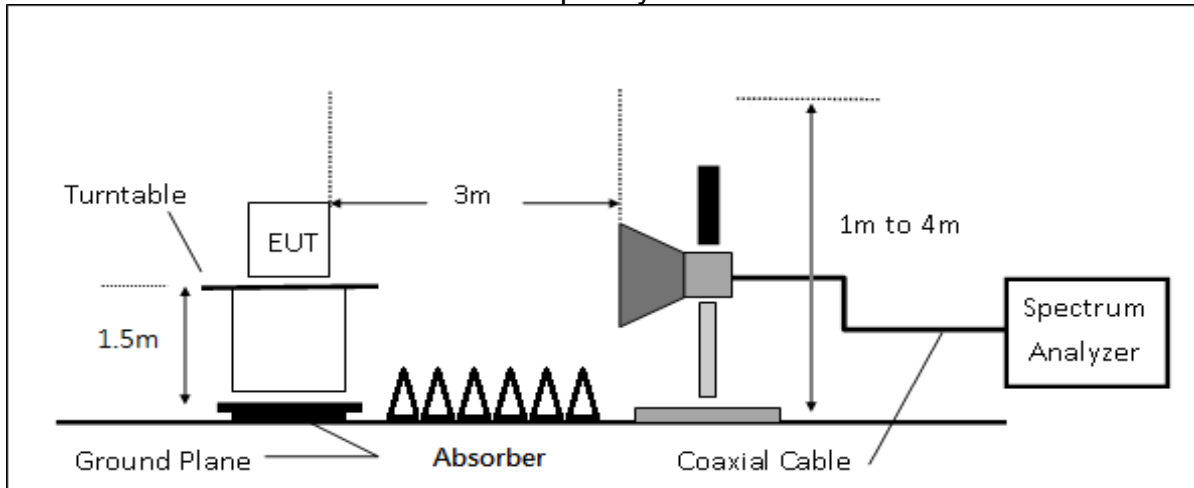
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7.2 Test SET-UP

Radiated Emission Test Set-UP Frequency Over 1 GHz



7.3 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
2. The EUT was placed on a turn table with 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
8. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
9. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
10. Repeat above procedures until all default test channel measured were complete.

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7.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

| | |
|---------------------------|--|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

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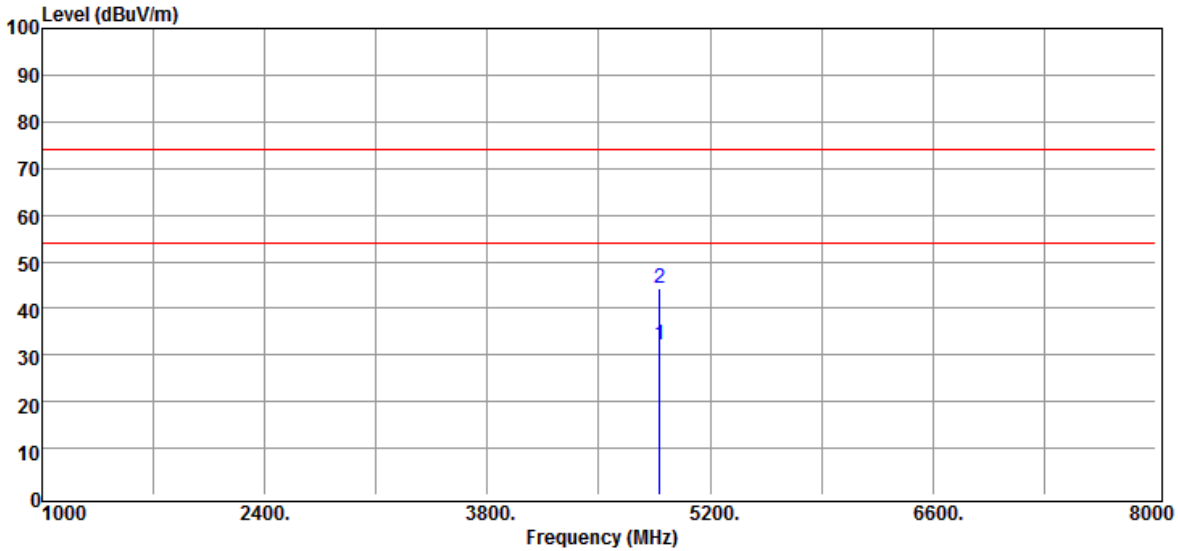
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7.5 Measurement Result

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BLE | Test Date | :2018-09-13 |
| Test Mode | :TX CH MID | Temp./Humi. | :24/62 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2442 MHz | Engineer | :Ashton |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBuV | Factor dB | Actual FS dBuV/m | Limit @3m dBuV/m | Margin dB |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 4884.00 | Average | 19.61 | 12.63 | 32.24 | 54.00 | -21.76 |
| 4884.00 | Peak | 31.77 | 12.63 | 44.40 | 74.00 | -29.60 |

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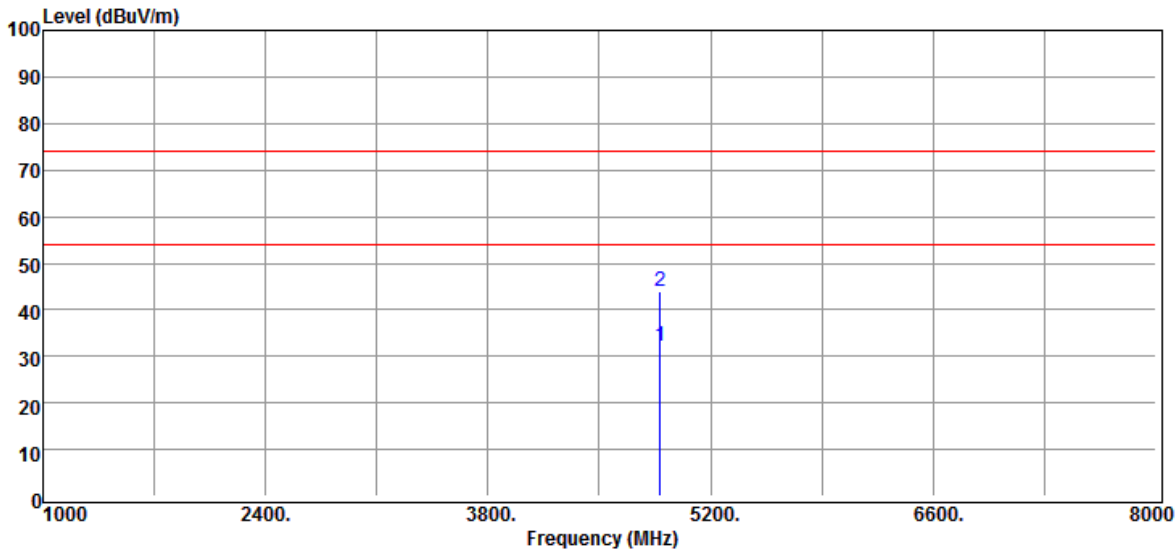
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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BLE | Test Date | :2018-09-13 |
| Test Mode | :TX CH MID | Temp./Humi. | :24/62 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2442 MHz | Engineer | :Ashton |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 4884.00 | Average | 19.61 | 12.63 | 32.24 | 54.00 | -21.76 |
| 4884.00 | Peak | 31.43 | 12.63 | 44.06 | 74.00 | -29.94 |

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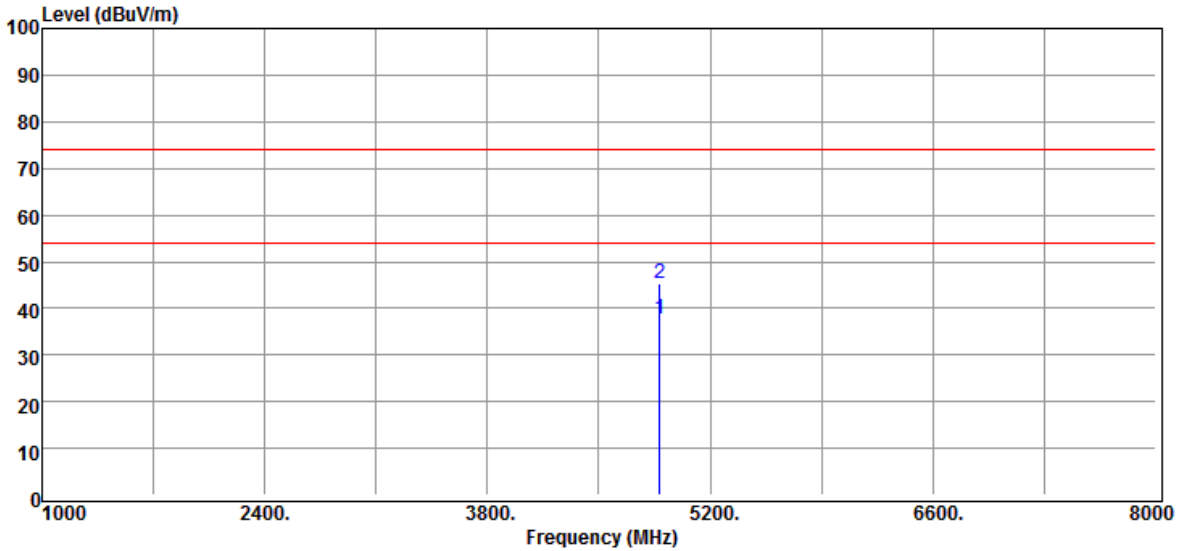
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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2018-09-13 |
| Test Mode | :TX CH MID | Temp./Humi. | :24/62 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2441 MHz | Engineer | :Ashton |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 4882.00 | Average | 25.20 | 12.61 | 37.81 | 54.00 | -16.19 |
| 4882.00 | Peak | 32.67 | 12.61 | 45.28 | 74.00 | -28.72 |

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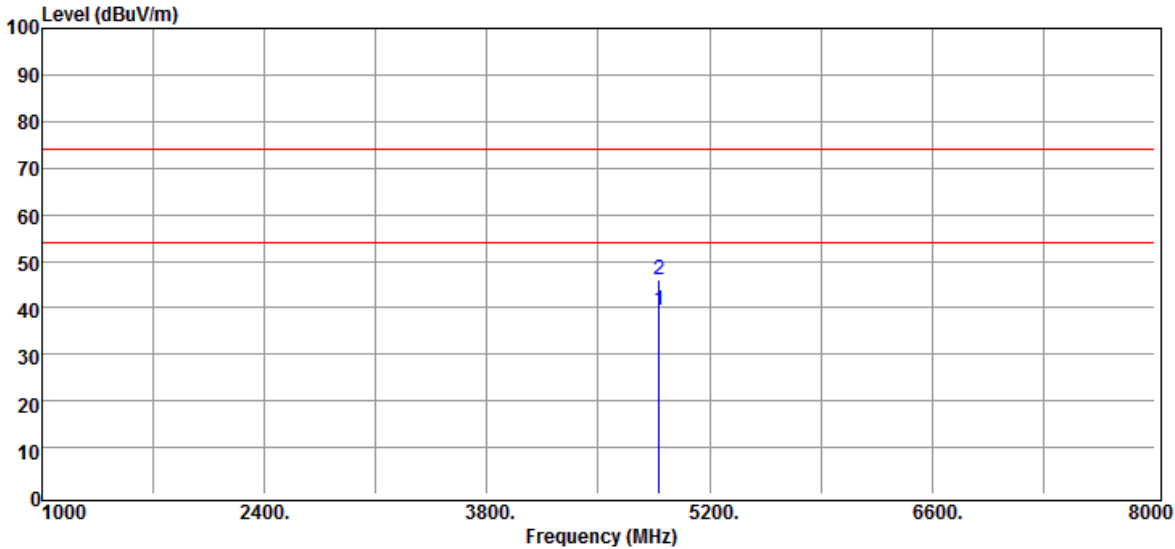
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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2018-09-13 |
| Test Mode | :TX CH MID | Temp./Humi. | :24/62 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2441 MHz | Engineer | :Ashton |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 4882.00 | Average | 26.82 | 12.61 | 39.43 | 54.00 | -14.57 |
| 4882.00 | Peak | 33.47 | 12.61 | 46.08 | 74.00 | -27.92 |

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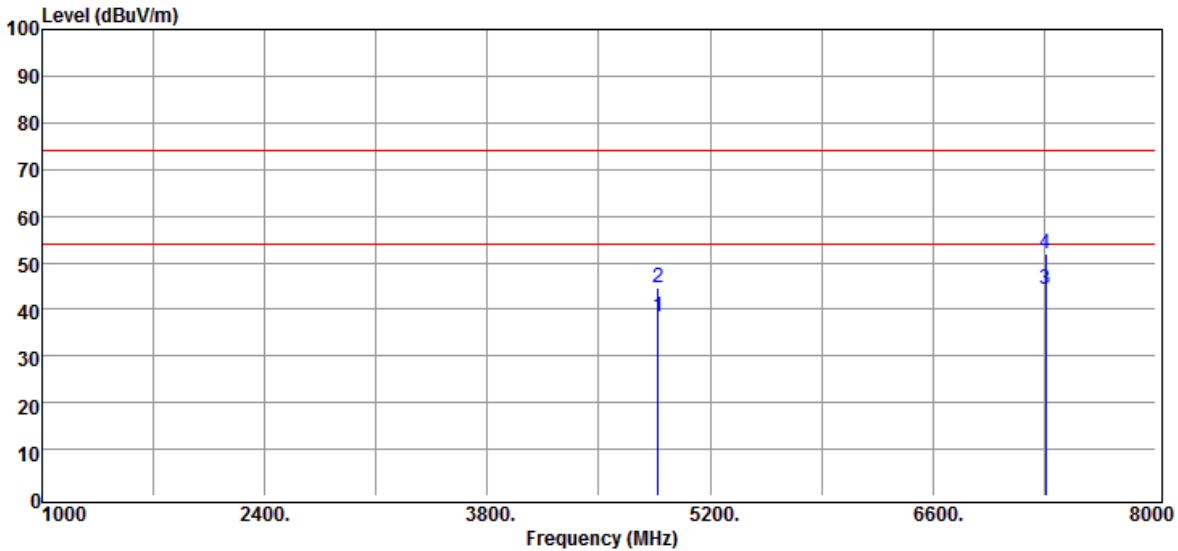
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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :802.11b | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2437 MHz | Engineer | :Enzo |



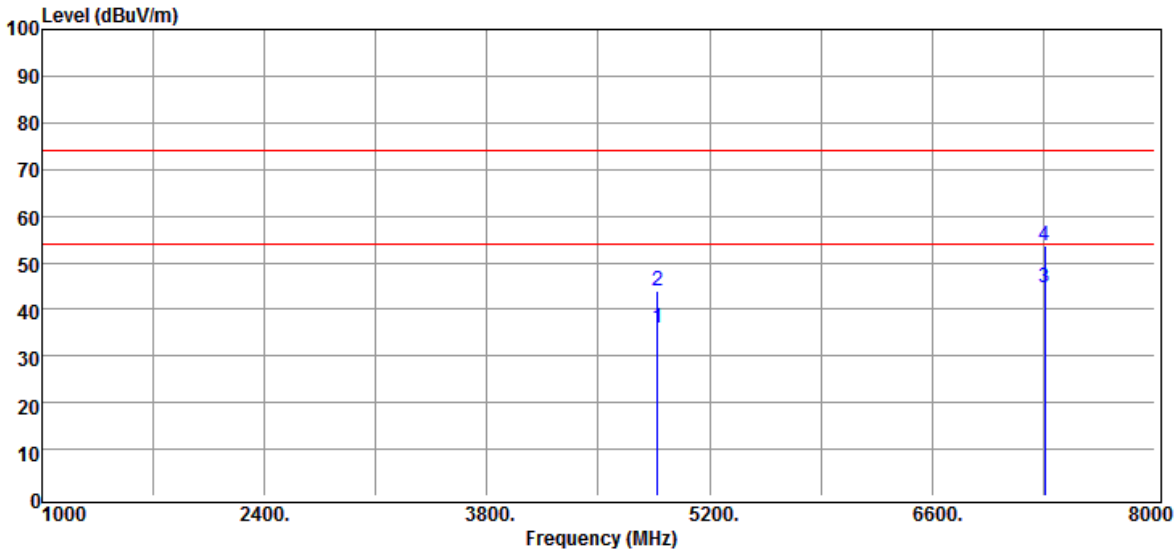
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 4874.00 | Average | 25.75 | 12.58 | 38.33 | 54.00 | -15.67 |
| 4874.00 | Peak | 32.21 | 12.58 | 44.79 | 74.00 | -29.21 |
| 7311.00 | Average | 24.15 | 20.06 | 44.21 | 54.00 | -9.79 |
| 7311.00 | Peak | 31.83 | 20.06 | 51.89 | 74.00 | -22.11 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :802.11b | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2437 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 4874.00 | Average | 23.42 | 12.58 | 36.00 | 54.00 | -18.00 |
| 4874.00 | Peak | 31.48 | 12.58 | 44.06 | 74.00 | -29.94 |
| 7311.00 | Average | 24.48 | 20.06 | 44.54 | 54.00 | -9.46 |
| 7311.00 | Peak | 33.42 | 20.06 | 53.48 | 74.00 | -20.52 |

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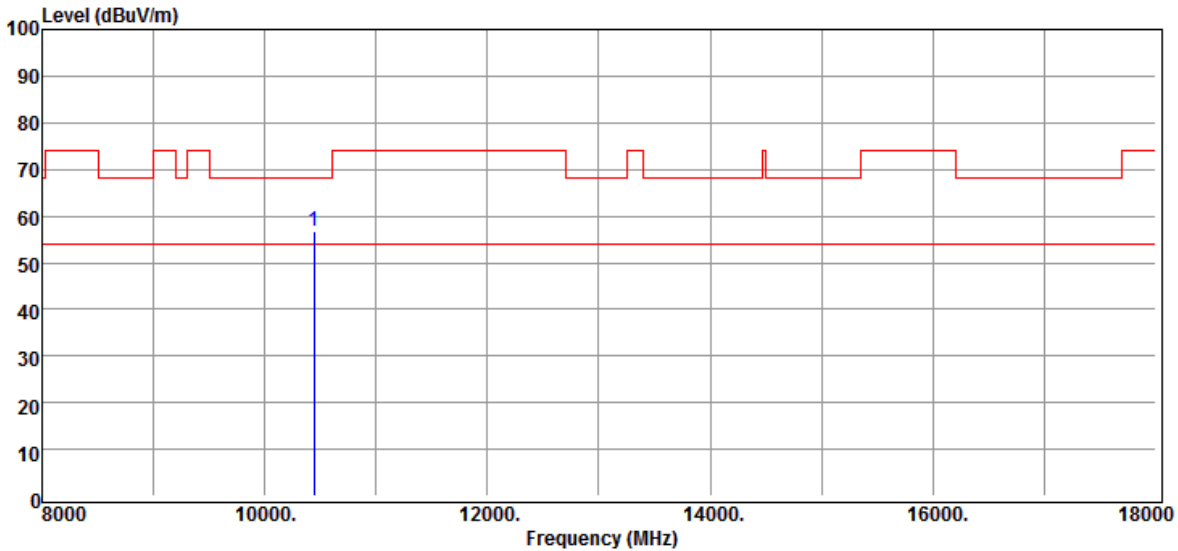
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| | | | |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :5220 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10440.00 | Peak | 29.77 | 26.98 | 56.75 | 68.20 | -11.45 |

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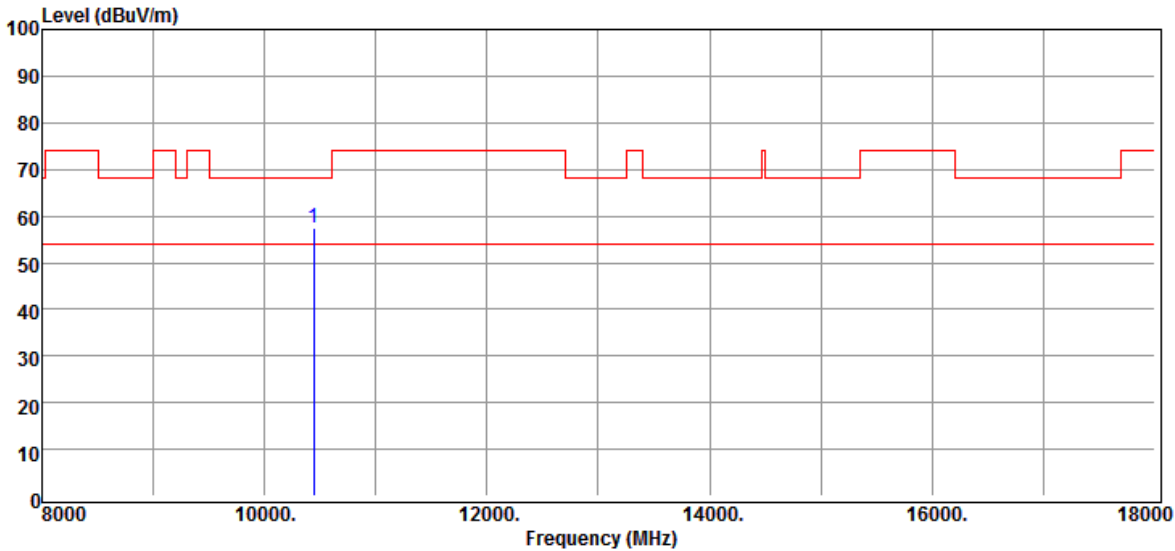
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|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 1 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :5220 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10440.00 | Peak | 30.45 | 26.98 | 57.43 | 68.20 | -10.77 |

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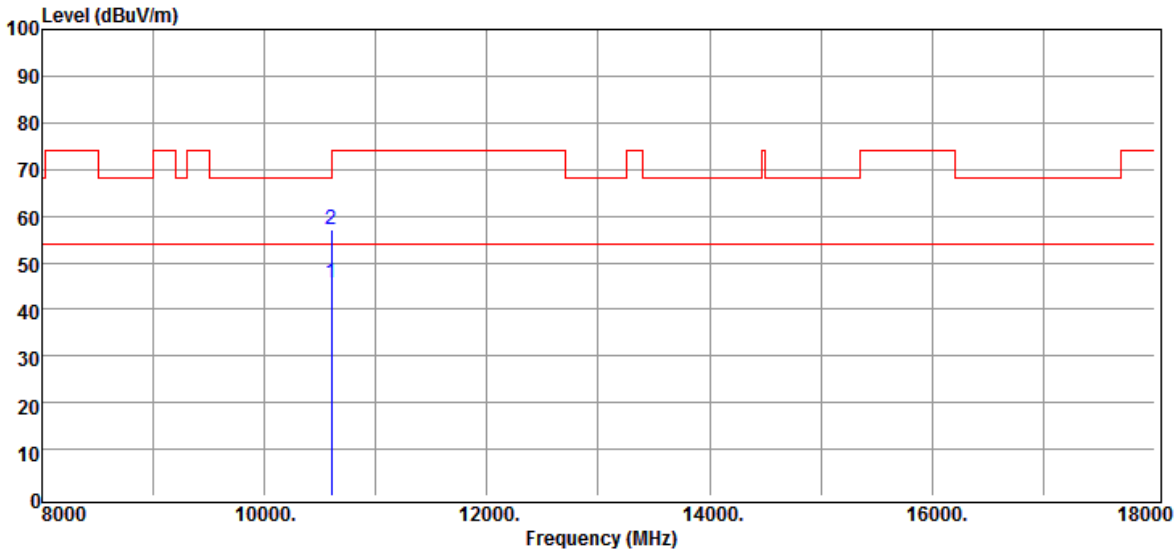
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|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 2 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :5300 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10600.00 | Average | 18.47 | 27.21 | 45.68 | 54.00 | -8.32 |
| 10600.00 | Peak | 29.74 | 27.21 | 56.95 | 68.20 | -11.25 |

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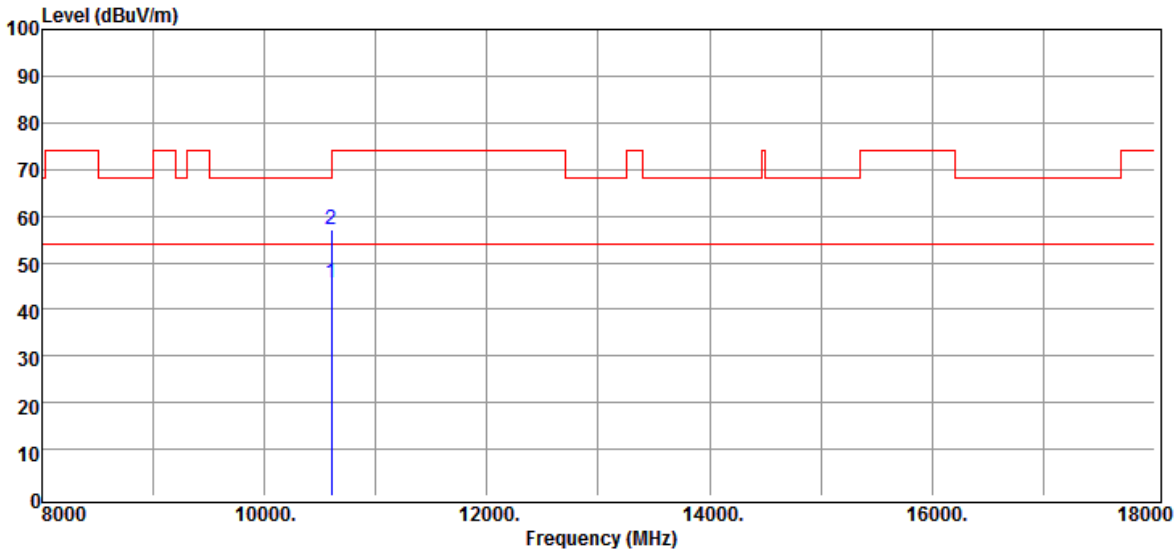
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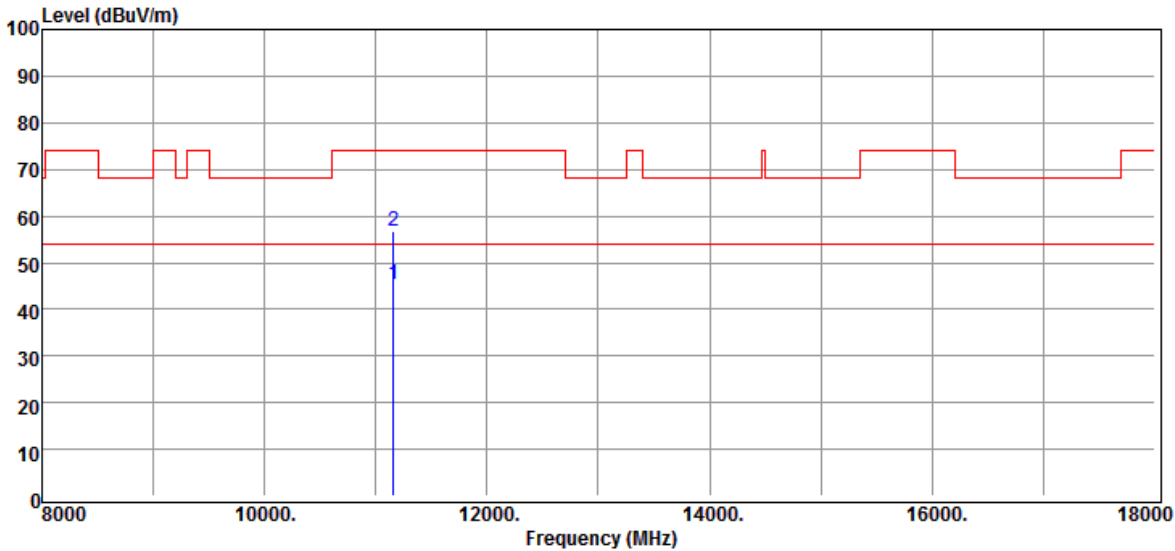
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|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 2 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :5300 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 10600.00 | Average | 18.47 | 27.21 | 45.68 | 54.00 | -8.32 |
| 10600.00 | Peak | 29.79 | 27.21 | 57.00 | 68.20 | -11.20 |

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| | | | |
|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 3 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :5580 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 11160.00 | Average | 18.57 | 26.67 | 45.24 | 54.00 | -8.76 |
| 11160.00 | Peak | 29.93 | 26.67 | 56.60 | 74.00 | -17.40 |

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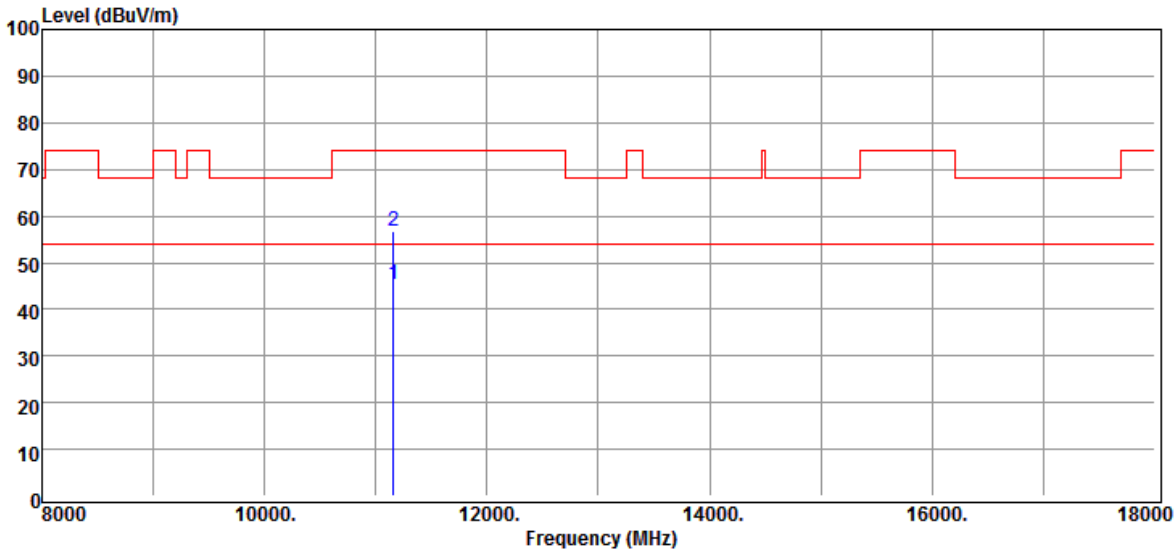
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|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 3 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :5580 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 11160.00 | Average | 18.55 | 26.67 | 45.22 | 54.00 | -8.78 |
| 11160.00 | Peak | 30.04 | 26.67 | 56.71 | 74.00 | -17.29 |

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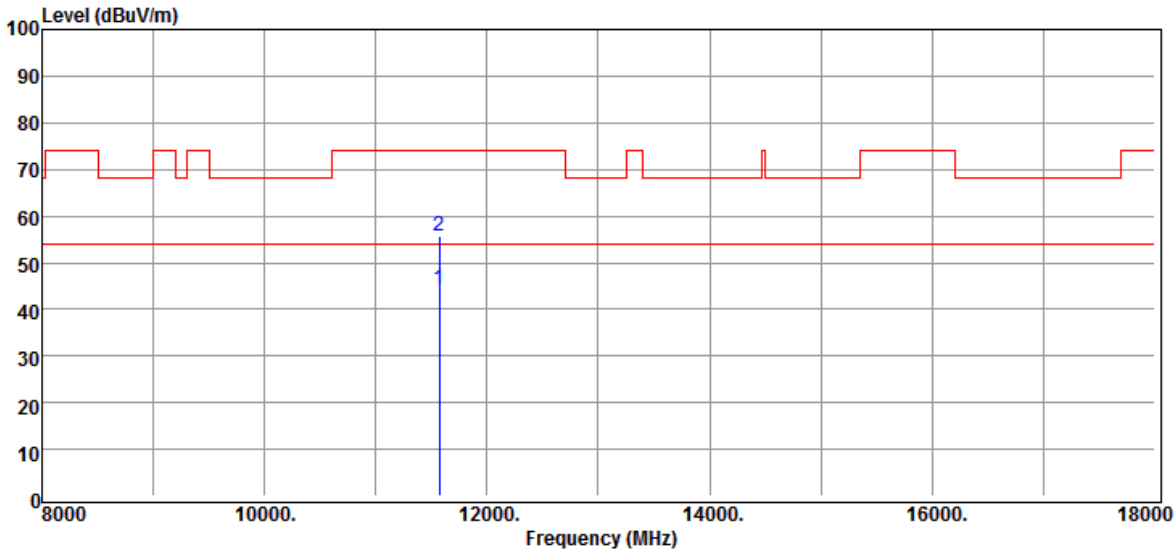
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|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 4 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :5785 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBμV | Factor dB | Actual FS dBμV/m | Limit @3m dBμV/m | Margin dB |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 11570.00 | Average | 18.47 | 25.87 | 44.34 | 54.00 | -9.66 |
| 11570.00 | Peak | 30.00 | 25.87 | 55.87 | 74.00 | -18.13 |

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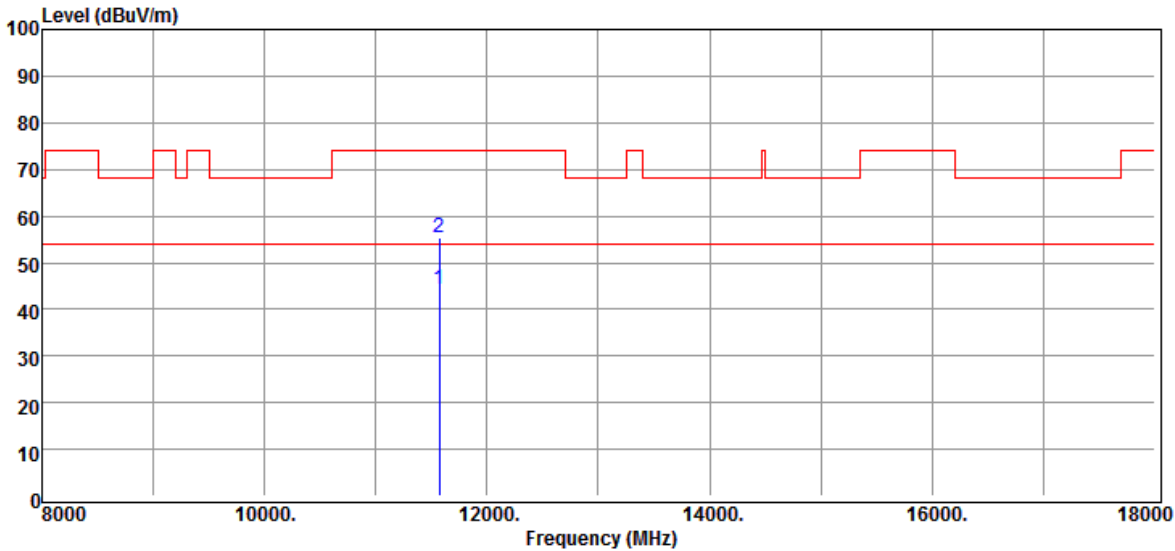
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|----------------|-------------------|--------------|-------------|
| Operation Mode | :802.11a / Band 4 | Test Date | :2018-08-10 |
| Test Mode | :TX CH MID | Temp./Humi. | :25/60 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :5785 MHz | Engineer | :Enzo |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|---|--------------|------------------------------|------------------------------|--------------|
| 11570.00 | Average | 18.45 | 25.87 | 44.32 | 54.00 | -9.68 |
| 11570.00 | Peak | 29.65 | 25.87 | 55.52 | 74.00 | -18.48 |

~ End of Report ~

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