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# TEST REPORT

**Report Number: 19071178HKG-002**

Application for Original Grant of 47 CFR Part 15 Certification

Single New of RSS-247 Issue 2 Equipment

**FCC ID: AL8-E60E**

**IC: 457A-E60E**

| Prepared and Checked by: | Approved by: |
|---|---|
| Signed On File<br>Lee Shui Tim, Tim<br>Assistant Supervisor | Digitally signed by Terry Chan<br>Location: Intertek Testing Services Hong Kong Ltd.<br>Chan Chi Hung, Terry<br>Manager<br>Date: March 09, 2020 |

# TEST REPORT

## GENERAL INFORMATION

| | |
|---|---|
| **Applicant Name:** | Plantronics, Inc. |
| **Applicant Address:** | 345 Encinal Street, Santa Cruz,<br>CA 95060, United States of America. |
| **FCC Specification Standard:** | FCC Part 15, October 1, 2018 Edition |
| **FCC ID:** | AL8-E60E |
| **FCC Model(s):** | Elara 60 E |
| **IC Specification Standard:** | RSS-247 Issue 2, February 2017<br>RSS-Gen Issue 5, April 2018 |
| **IC:** | 457A-E60E |
| **HVIN:** | Elara 60 E |
| **PMN:** | Elara 60 E |
| **Firmware Version:** | 0.8.10 |
| **Type of EUT:** | Spread Spectrum Transmitter |
| **Description of EUT:** | Mobile Phone Station with Bluetooth |
| **Serial Number:** | N/A |
| **Sample Receipt Date:** | July 23, 2019 |
| **Date of Test:** | July 23, 2019 to January 27, 2020 |
| **Report Date:** | March 09, 2020 |
| **Environmental Conditions:** | Temperature: +10 to 40°C<br>Humidity: 10 to 90% |
| **Conclusion:** | Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 / RSS-247 Issue 2 Certification. |

# TEST REPORT

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# TEST REPORT

## 1.0 TEST RESULTS SUMMARY & STATEMENT OF COMPLIANCE

### 1.1 Summary of Test Results

| Test Items | FCC Part 15 Section | RSS-247/ RSS-Gen# Section | Results | Details See Section |
|---|---|---|---|---|
| Antenna Requirement | 15.203 | 7.1.2# | Pass | 2.1 |
| Max. Conducted Output Power | 15.247(b)(1) | 5.1(b) | Pass | 4.1 |
| Max. 20 dB RF Bandwidth | 15.247(a)(1) | 5.1(a) | | 4.2 |
| Min. Number of Hopping Frequency | 15.247(a)(1) | 5.1(d) | Pass | 4.3 |
| Min. Hopping Channel Carrier Frequency Separation | 15.247(a)(1) | 5.1(b) | Pass | 4.4 |
| Average Channel Occupancy Time | 15.247(a)(1) | 5.1(d) | Pass | 4.5 |
| Out of Band Conducted Emissions | 15.247(d) | 5.5 | Pass | 4.6 |
| Radiated Emission in Restricted Bands and Spurious Emissions | 15.247(d), 15.209 & 15.109 | 5.5 | Pass | 4.8 |
| AC Power Line Conducted Emission | 15.207 & 15.107 | 7.2.4# | Pass | 4.9 |

Note: Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

### 1.2 Statement of Compliance

The equipment under test is found to be complying with the following standards:

FCC Part 15, October 1, 2018 Edition
RSS-247 Issue 2, February 2017
RSS-Gen Issue 5, April 2018

## TEST REPORT

## 2.0 GENERAL DESCRIPTION

### 2.1 Product Description

The Elara 60 E is a Mobile Phone Station with Bluetooth. A wireless mobile phone dock consisting of a base unit and either wireless headset/wireless USB dongle or corded headset. Elara 60 E is no Qi charging function.

The Equipment Under Test (EUT) operates at frequency range of 2402MHz to 2480 MHz. There are totally 79 with 1MHz channel separation and 20 active channels out of the 79 channels.

The EUT is powered by a 100-240VAC 50/60Hz AC adaptor.

The antenna used in the EUT is integral, and the test sample is a prototype.

The circuit description and frequency hopping algorithm are attached in the Appendix and saved with filename: descri.pdf.

### 2.2 Test Methodology

Both AC power line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Preliminary radiated scans and all radiated measurements were performed in radiated emission test sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application. Antenna port conducted measurements were performed according to ANSI C63.10 (2013) and KDB Publication No.558074 D01 v05r02 (02-April-2019) All other measurements were made in accordance with the procedures in 47 CFR Part 2 and RSS-Gen Issue 5 (2018).

### 2.3 Test Facility

The radiated emission test site, antenna port conducted measurement facility used to collect the radiated data, AC Power Line conducted data, and conductive data are at Intertek Testing Services Hong Kong Ltd., which is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been fully placed on file with FCC and Industry Canada No. 2042H.

## TEST REPORT

# 3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

For radiated emissions testing, the equipment under test (EUT) was setup to transmit / receive continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst case emissions.

The EUT was powered by a 100-240VAC 50/60Hz adaptor.

For the measurements, the EUT was attached to a plastic stand if necessary and placed on the wooden turntable at 0.8m height from the ground plane for emission testing at or below 1GHz and 1.5m for emission measurements above 1GHz. If the base unit attached to peripherals, they were connected and operational (as typical as possible).

The signal was maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization were varied during the search for maximum signal level. The antenna height was varied from 1 to 4 meters. Radiated emissions were taken at three meters unless the signal level was too low for measurement at that distance. If necessary, a pre-amplifier was used and/or the test was conducted at a closer distance.

For any intentional radiator powered by AC power line, measurements of the radiated signal level of the fundamental frequency component of the emission was performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

For transmitter radiated measurement, the spectrum analyzer resolution bandwidth was 100 kHz for frequencies below 1000 MHz. The resolution bandwidth was 1 MHz for frequencies above 1000 MHz.

Radiated emission measurement for transmitter were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. Receiver was performed from 30MHz to the fifth harmonic of the highest frequency or 40GHz, whichever is lower.

## TEST REPORT

3.1 Justification - Cont'd

Emission that are directly caused by digital circuits in the transmit path and transmitter portion were measured, and the limit are according to FCC Part 15 Section 15.209. Digital circuitry used to control additional functions other than the operation of the transmitter is subject to FCC Part Section 15.109 Limits.

Detector function for radiated emissions was in peak mode. Average readings, when required, were taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.3.4.

Determination of pulse desensitization was made according to *Hewlett Packard Application Note 150-2, Spectrum Analysis... Pulsed RF.* The effective period (Teff) was referred to Exhibit 4.3.4. With the resolution bandwidth 1MHz and spectrum analyzer IF bandwidth 3dB, the pulse desensitization factor was 0dB.

For AC line conducted emission test, the EUT along with its peripherals were placed on a 1.0m(W)x1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50ohm coupling impedance for measuring instrument. The LISN housing, measuring instrument case, reference ground plane, and vertical ground plane were bounded together. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were manipulated to find the maximum emission.

All relevant operation modes have been tested, and the worst case data is included in this report.

3.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

## TEST REPORT

3.3 Details of EUT and Description of Accessories

*Details of EUT:*

An AC adaptor (provided with the unit) was used to power the device. Their description are listed below.

(1) An AC adaptor (100-240VAC 50/60Hz 0.6A to 12VDC 1.5A, Model: SSC-120150) (Provided by Client)

*Description of Accessories:*

(1) Pika Cradle model: 5200 #003 and docking. (Provided by Client)
(2) Pika Cradle model: Focus #01 and docking. (Provided by Client)
(3) Pika Cradle model: USB-A #01 (Provided by Client)
(4) Bluetooth USB Model:BT600 (Provided by Client)
(5) Bluetooth hands-free model: Voyager 5200 (Provided by Client)
(6) Bluetooth headset model: B825 (Provided by Client)
(7) Wired headset model: C3220 (Provided by Client)
(8) Wired headset model: Blackwire 5220 (C5220T stereo headset + C5200 control panel kit) (Provided by Client)
(9) Bluetooth USB Dongle Model:BT900 with audio loop back mode test software (Provided by Client)
(10) USB loading 5V 1A (Provided by Intertek)
(11) Samsung S8 (provided by Intertek)

3.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test at a level of confidence of 95% has been considered. The values of the Measurement uncertainty for radiated emission test and RF conducted measurement test are ± 5.3dB and ±0.99dB respectively. The value of the Measurement uncertainty for conducted emission test is ±4.2dB.

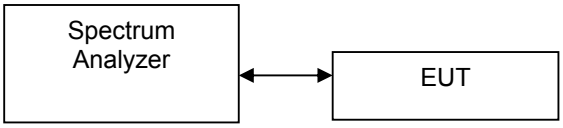
Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

## TEST REPORT

## 4.0 TEST RESULTS

RF Conducted measurement Test Setup by a Spectrum Analyzer.

The figure below shows the test setup, which is utilized to make these measurements.




4.1 Maximum Conducted (peak) Output Power at Antenna Terminals

☐ The antenna power of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

☒ The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for RBW>20dB bandwidth and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

Antenna Gain = -2.0 dBi

| Frequency (MHz) | Output in dBm | Output in mWatt |
|---|---|---|
| Low Channel: 2402 | 0.7 | 1.17 |
| Middle Channel: 2441 | 0.9 | 1.23 |
| High Channel: 2480 | 0.7 | 1.17 |

Cable loss : 0.5 dB External Attenuation : 0 dB

Cable loss, external attenuation: ☒ included in OFFSET function
☐ added to SA raw reading

dBm max. output level = 0.9 dBm

Limits:
☒ 0.125W (21dBm) for antennas with gains of 6dBi or less

☐ 0.25W (24dBm) for antennas with gains of 6dBi or less

☐ 1W (30dBm) for antennas with gains of 6dBi or less

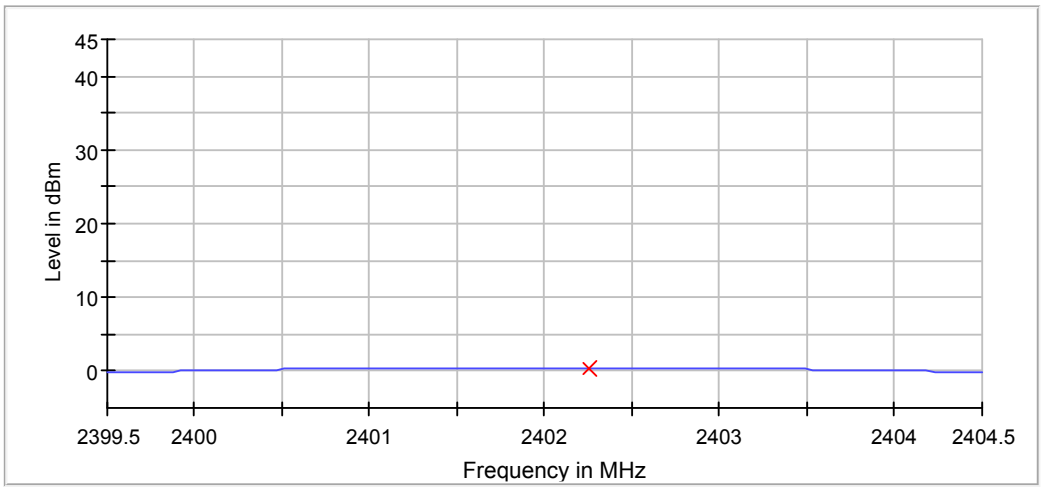
☐ ___W (___dBm) for antennas with gains more than 6dBi

The plots of conducted output power are saved as below.

# TEST REPORT

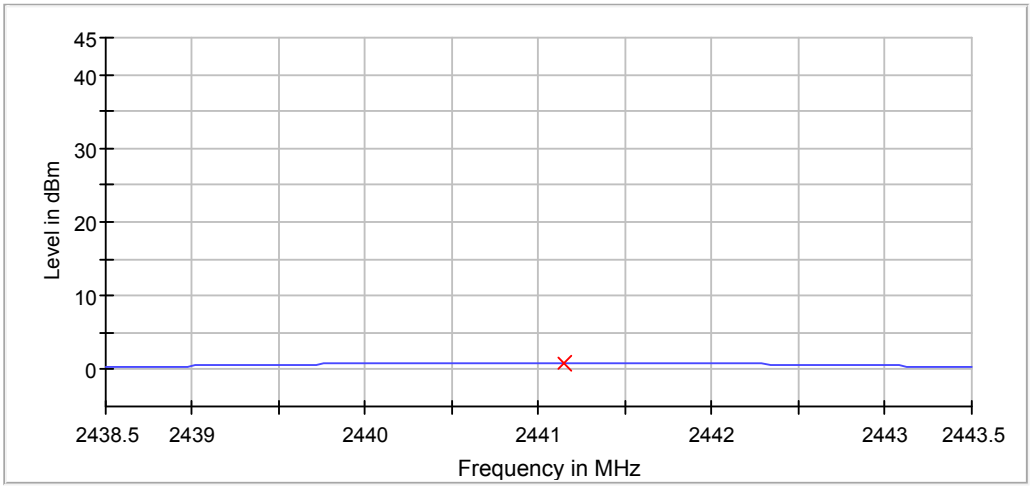
## PLOTS OF CONDUCTED OUTPUT POWER

Lowest Channel




| DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|---|---|---|---|
| 2402.000000 | 0.7 | 21.0 | PASS |

Middle Channel

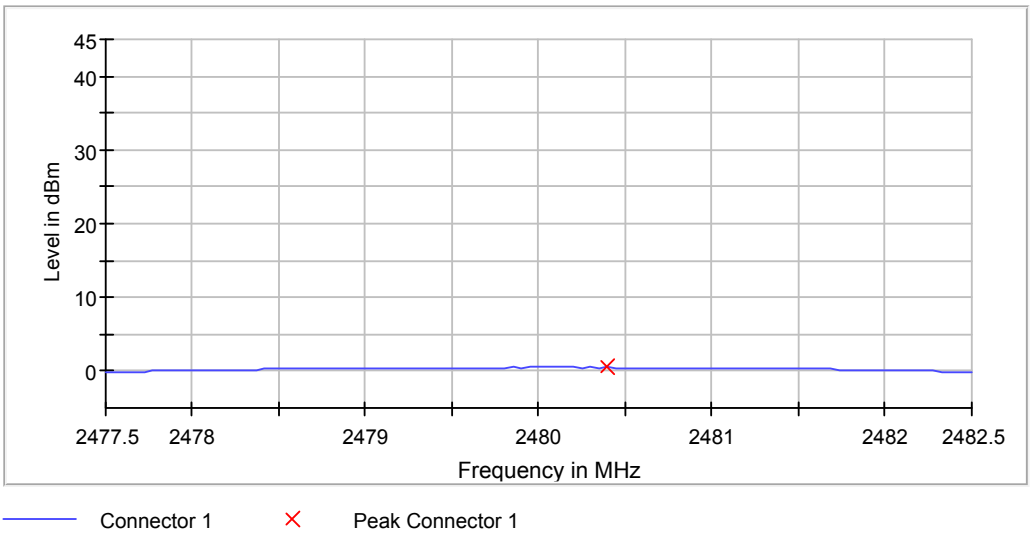



| DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|---|---|---|---|
| 2441.000000 | 0.9 | 21.0 | PASS |

# TEST REPORT

## PLOTS OF CONDUCTED OUTPUT POWER

Highest Channel




| DUT Frequency (MHz) | Peak Power (dBm) | Limit Max (dBm) | Result |
|---|---|---|---|
| 2480.000000 | 0.7 | 21.0 | PASS |

## TEST REPORT

4.2 Maximum 20 dB RF Bandwidth

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was chosen so that the display was a result of the hopping channel modulation. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level. The 20 dB bandwidth was determined from where the channel output spectrum intersected the display line.

| Frequency (MHz) | 20 dB Bandwidth (MHz) |
|---|---|
| Low Channel: 2402 | 0.445 |
| Middle Channel: 2441 | 0.440 |
| High Channel: 2480 | 0.445 |

Limits

☐ ≤500kHz for 902-928MHz

☒ N/A for 2400-2483.5MHz

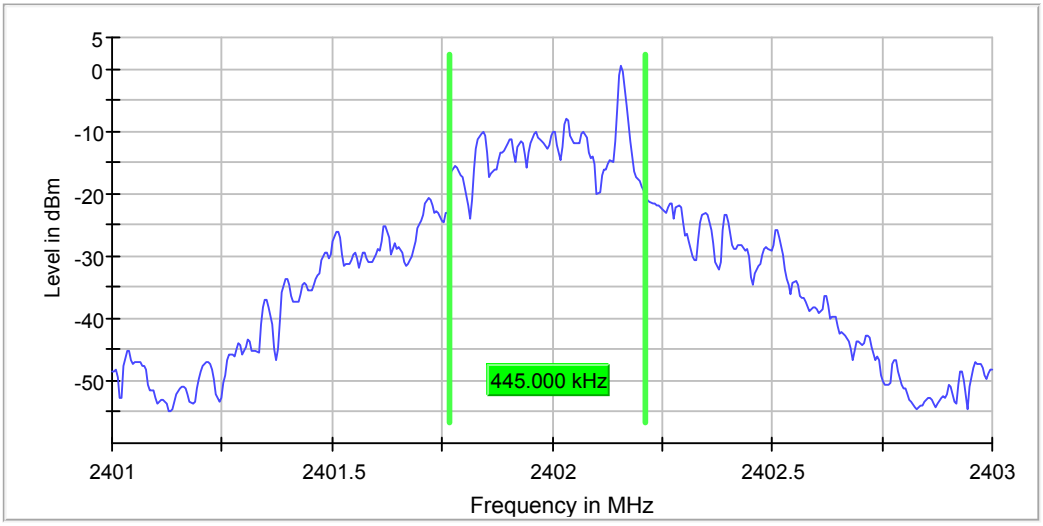
☐ ≤1MHz for 5725-5850MHz

The plots of 20dB RF bandwidth are saved as below.

# TEST REPORT

## PLOTS OF 20dB RF BANDWIDTH

Lowest Channel



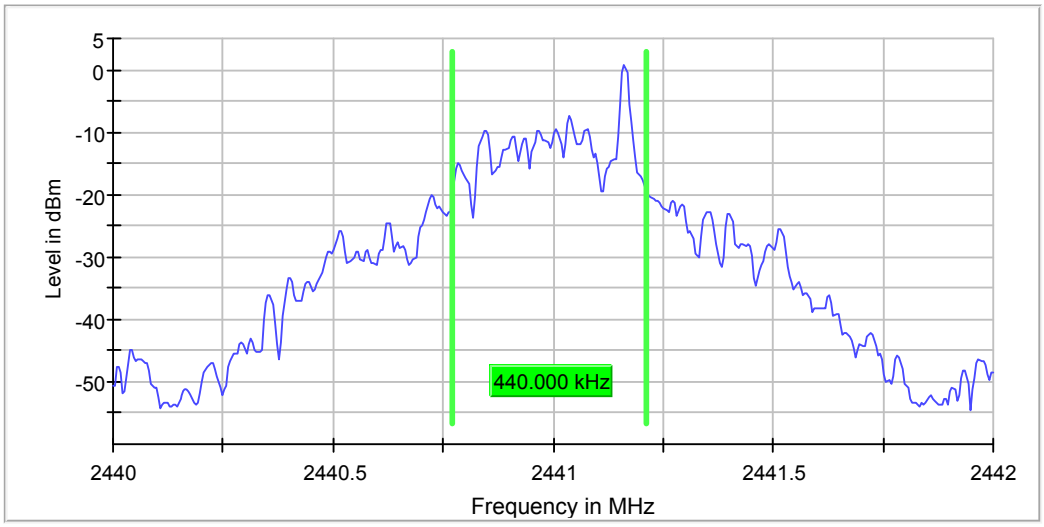

| DUT Frequency (MHz) | Bandwidth (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---|---|---|---|
| 2402.000000 | 0.445000 | 2401.767500 | 2402.212500 |

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.40100 GHz | 2.40100 GHz |
| Stop Frequency | 2.40300 GHz | 2.40300 GHz |
| Span | 2.000 MHz | 2.000 MHz |
| RBW | 10.000 kHz | ~ 10.000 kHz |
| VBW | 30.000 kHz | >= 30.000 kHz |
| SweepPoints | 400 | ~ 400 |
| Sweeptime | 189.648 µs | AUTO |
| Reference Level | -10.000 dBm | -10.000 dBm |
| Attenuation | 10.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 200 | 200 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 3 / max. 5 | max. 5 |
| Stable | 2 / 2 | 2 |
| Max Stable Difference | 0.08 dB | 0.50 dB |

# TEST REPORT

## PLOTS OF 20dB RF BANDWIDTH

Middle Channel



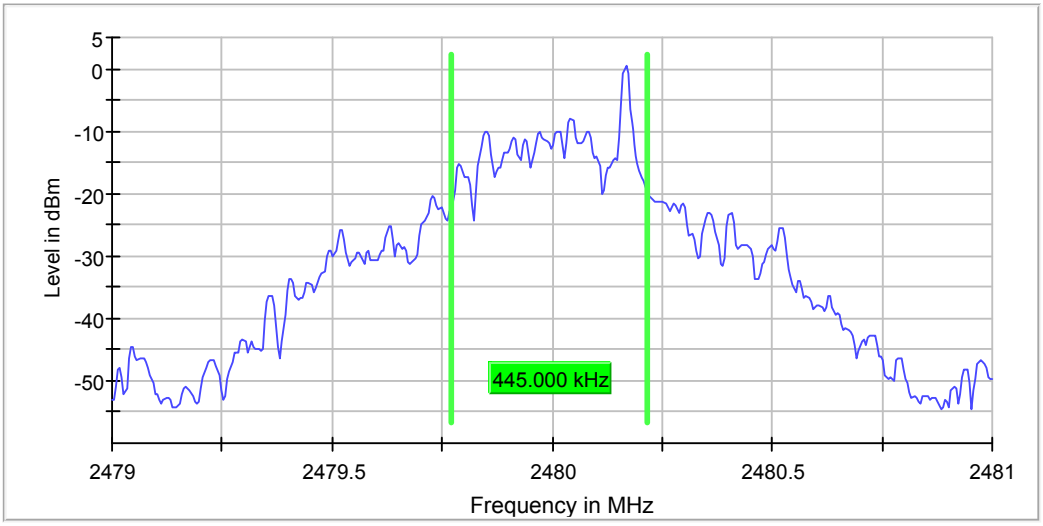

| DUT Frequency (MHz) | Bandwidth (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---|---|---|---|
| 2441.000000 | 0.440000 | 2440.772500 | 2441.212500 |

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.43900 GHz | 2.43900 GHz |
| Stop Frequency | 2.44300 GHz | 2.44300 GHz |
| Span | 4.000 MHz | 4.000 MHz |
| RBW | 100.000 kHz | ~ 100.000 kHz |
| VBW | 300.000 kHz | >= 300.000 kHz |
| SweepPoints | 101 | ~ 80 |
| Sweeptime | 18.938 µs | AUTO |
| Reference Level | -10.000 dBm | -10.000 dBm |
| Attenuation | 10.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 19 / max. 150 | max. 150 |
| Stable | 5 / 5 | 5 |
| Max Stable Difference | 0.00 dB | 0.50 dB |

# TEST REPORT

## PLOTS OF 20dB RF BANDWIDTH

Highest Channel




| DUT Frequency (MHz) | Bandwidth (MHz) | Band Edge Left (MHz) | Band Edge Right (MHz) |
|---|---|---|---|
| 2480.000000 | 0.445000 | 2479.772500 | 2480.217500 |

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.47900 GHz | 2.47900 GHz |
| Stop Frequency | 2.48100 GHz | 2.48100 GHz |
| Span | 2.000 MHz | 2.000 MHz |
| RBW | 10.000 kHz | ~ 10.000 kHz |
| VBW | 30.000 kHz | >= 30.000 kHz |
| SweepPoints | 400 | ~ 400 |
| Sweeptime | 189.648 µs | AUTO |
| Reference Level | -10.000 dBm | -10.000 dBm |
| Attenuation | 10.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 200 | 200 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | FFT | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 4 / max. 5 | max. 5 |
| Stable | 2 / 2 | 2 |
| Max Stable Difference | 0.10 dB | 0.50 dB |

## TEST REPORT

4.3 Minimum Number of Hopping Frequencies

With the analyzer set to MAX HOLD readings were taken for 2-3 minutes in each band. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

| | |
|---|---|
| No. of Hopping Channels | 79 |

Minimum Requirements:

☐ at least 50 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel < 250kHz)

☐ at least 25 hopping channels for 902MHz-928MHz (20 dB bandwidth of hopping channel ≥ 250kHz)

☒ at least 15 hopping channels for 2400MHz-2483.5MHz.

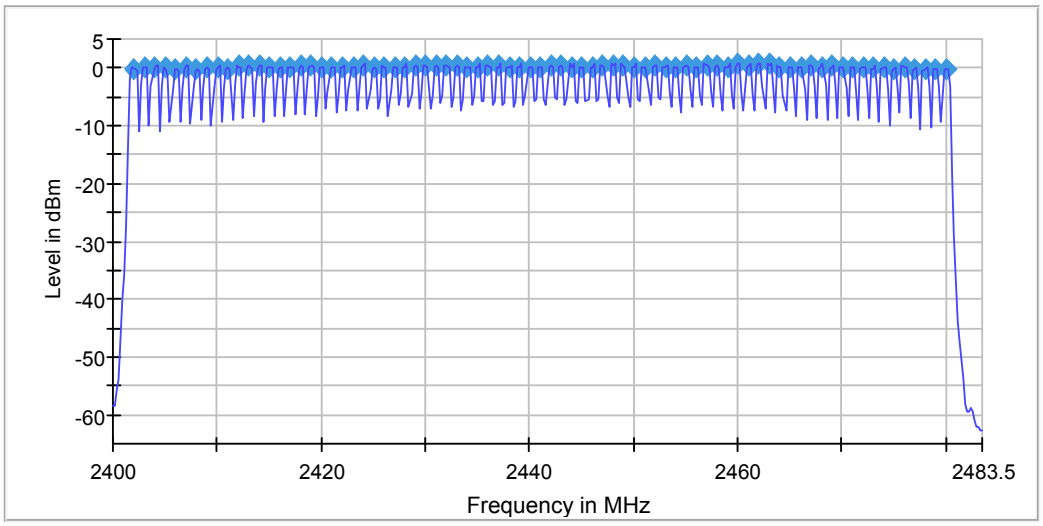
☐ at least 75 hopping channels for 5725MHz-5850MHz.

The plots of number of hopping frequencies are saved as below.

# TEST REPORT

## PLOTS OF NUMBER OF HOPPING FREQUENCIES

Plot A




| Channels | Limit Min | Limit Max | Result |
|---|---|---|---|
| 79 | 15 | --- | PASS |

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.40000 GHz | 2.40000 GHz |
| Stop Frequency | 2.48350 GHz | 2.48350 GHz |
| Span | 83.500 MHz | 83.500 MHz |
| RBW | 200.000 kHz | <= 299.000 kHz |
| VBW | 200.000 kHz | >= 200.000 kHz |
| SweepPoints | 418 | ~ 418 |
| Sweeptime | 1.060 ms | AUTO |
| Reference Level | -10.000 dBm | -10.000 dBm |
| Attenuation | 10.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 100 | 100 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | Sweep | AUTO |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 34 / max. 150 | max. 150 |
| Stable | 3 / 3 | 3 |
| Max Stable Difference | 0.40 dB | 0.50 dB |

## TEST REPORT

4.4 Minimum Hopping Channel Carrier Frequency Separation

Using the DELTA MARKER function of the analyzer, the frequency separation between two adjacent channels was measured and met the requirement.

| | |
|---|---|
| Channel Separation (2441MHz and 2442MHz) | 1.01MHz |

Limits:
The channel separation must be larger than:

☐ 25 kHz

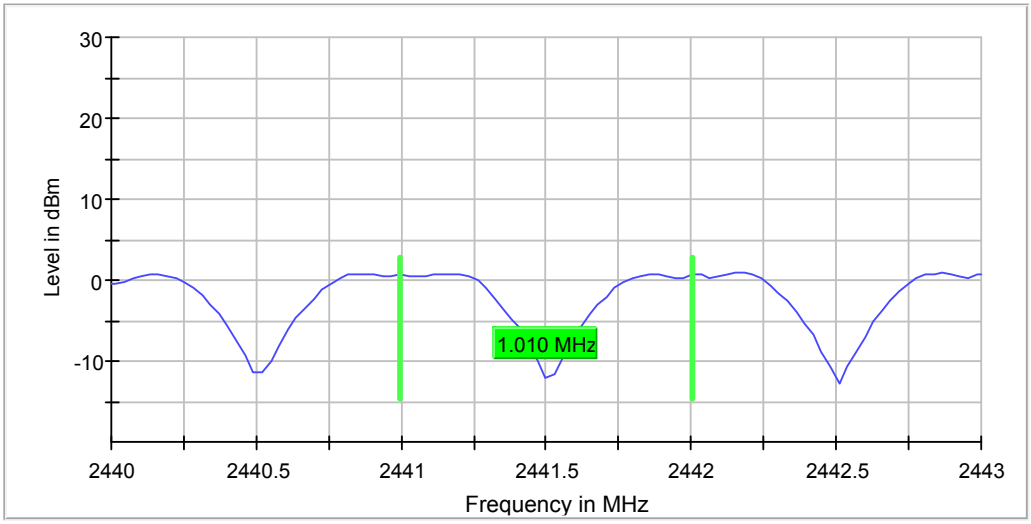
☐ 20 dB bandwidth of hopping channel: ___Hz

☒ 2/3 of 20dB bandwidth of hopping channel: __296.7_ kHz

The plot(s) of hopping channel carrier frequency separation is saved as below.

# TEST REPORT

## PLOTS OF HOPPING CHANNEL CARRIER FREQUENCY SEPARATION




| DUT Frequency (MHz) | Frequency Separation (MHz) | Limit Min (MHz) | Center Frequency low Channel (MHz) | Center Frequency high Channel (MHz) |
|---|---|---|---|---|
| 2441.000000 | 1.009900 | 0.2967 | 2440.995050 | 2442.004950 |

| Setting | Instrument Value | Target Value |
|---|---|---|
| Start Frequency | 2.44000 GHz | 2.44000 GHz |
| Stop Frequency | 2.44300 GHz | 2.44300 GHz |
| Span | 3.000 MHz | 3.000 MHz |
| RBW | 300.000 kHz | <= 300.000 kHz |
| VBW | 300.000 kHz | >= 300.000 kHz |
| SweepPoints | 101 | ~ 10 |
| Sweeptime | 1.000 ms | AUTO |
| Reference Level | -10.000 dBm | -10.000 dBm |
| Attenuation | 10.000 dB | AUTO |
| Detector | MaxPeak | MaxPeak |
| SweepCount | 200 | 200 |
| Filter | 3 dB | 3 dB |
| Trace Mode | Max Hold | Max Hold |
| Sweeptype | Sweep | Sweep |
| Preamp | off | off |
| Stablemode | Trace | Trace |
| Stablevalue | 0.50 dB | 0.50 dB |
| Run | 12 / max. 150 | max. 150 |
| Stable | 10 / 10 | 10 |
| Max Stable Difference | 0.00 dB | 0.50 dB |

## TEST REPORT

4.5 Average Channel Occupancy Time

The spectrum analyzer center frequency was set to one of the known hopping channels. The SWEEP was set to 1ms, the SPAN was set to ZERO SPAN, and the TRIGGER was set to VIDEO. The time duration of the transmission so captured was measured with the MARKER DELTA function.

The SWEEP was then set to the time required by the regulation (20 seconds for 902-928 MHz devices, if the 20dB bandwidth is less than 250kHz, 10 seconds for 902-928 MHz if the 20dB bandwidth is or greater than 250kHz, "0.4 seconds x Number of hopping channels employed" seconds for 2400-2483.5 MHz, 30 seconds for 5725-5850 MHz). The analyzer was set to SINGLE SWEEP, the total ON time was added and compared against the limit (0.4 seconds).

| | |
|---|---|
| Average Occupancy Time<br>(Traffic – in a clear RF environment) = | 340.120 |

Limits:
Average 0.4 seconds maximum occupancy in:

☒ 31.6 seconds (0.4 sec. x 79) for 2400MHz-2483.5MHz
(Traffic – in a clear RF environment)

☐ 20 seconds for 902MHz-928MHz ≥ 50 hopping channels

☐ 10 seconds for 902MHz-928MHz ≥ 25 hopping channels

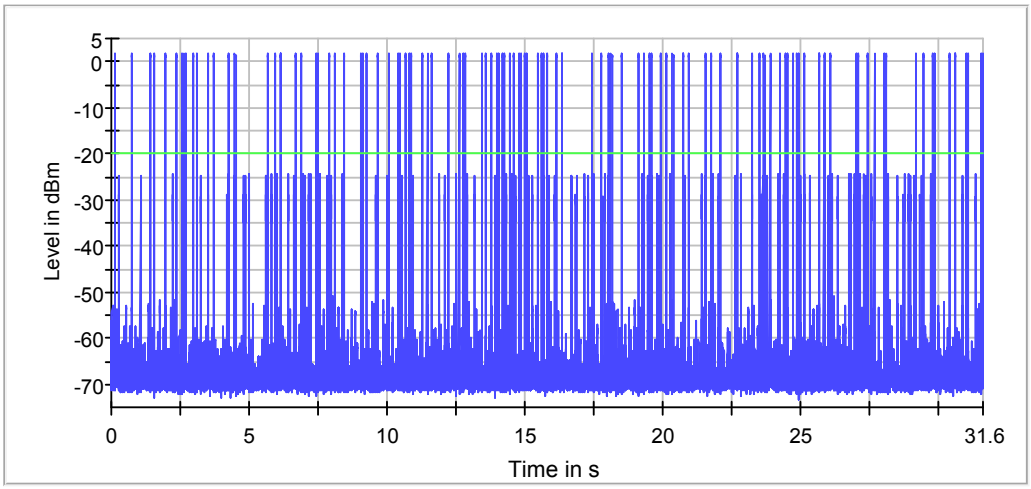
☐ 30 seconds for 5725-5850MHz

The plots of average channel occupancy time are saved as below.

# TEST REPORT

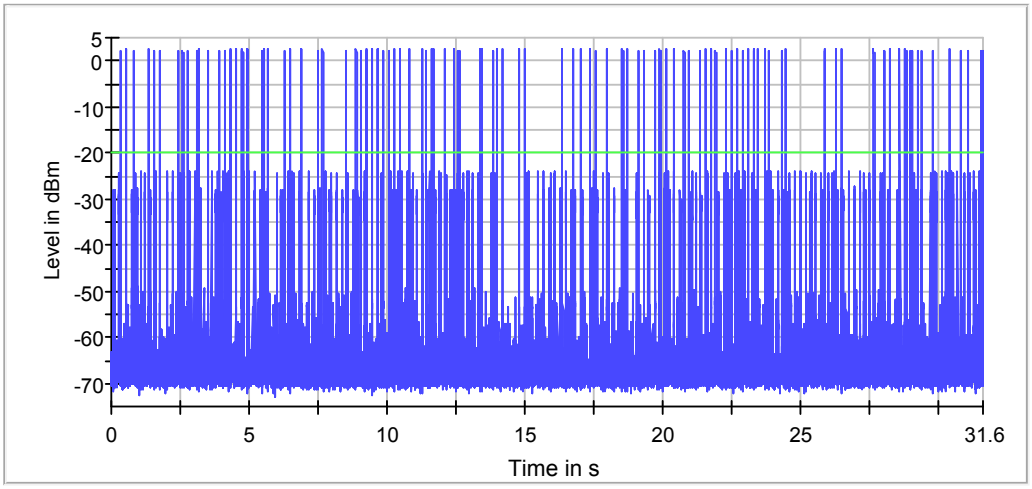
## PLOTS AVERAGE CHANNEL OCCUPANCY TIME

Plot A




| DUT Frequency (MHz) | Time (ms) | Limit Max (ms) | Limit Min (ms) | Threshold (dBm) | Result |
|---|---|---|---|---|---|
| 2402.000000 | 340.120 | 400.000 | 0.000 | -20.0 | PASS |

Plot B

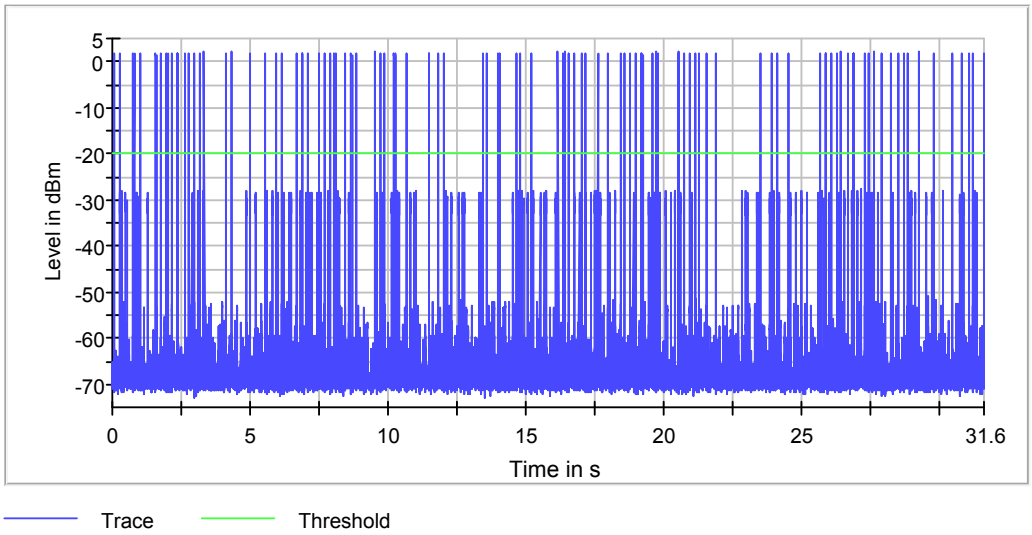



| DUT Frequency (MHz) | Time (ms) | Limit Max (ms) | Limit Min (ms) | Threshold (dBm) | Result |
|---|---|---|---|---|---|
| 2441.000000 | 332.120 | 400.000 | 0.000 | -20.0 | PASS |

# TEST REPORT

## PLOTS AVERAGE CHANNEL OCCUPANCY TIME

Plot C




| DUT Frequency (MHz) | Time (ms) | Limit Max (ms) | Limit Min (ms) | Threshold (dBm) | Result |
|---|---|---|---|---|---|
| 2480.000000 | 312.546 | 400.000 | 0.000 | -20.0 | PASS |

## TEST REPORT

4.6 Out of Band Conducted Emissions

In any 100 kHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

The plot(s) of bandedge compliance is shown the worst-case which has been already considered between enable and disable the hopping function of the EUT.

Furthermore, delta measurement technique for measuring bandedge emissions was incorporated in the test of the edge at 2483.5MHz.

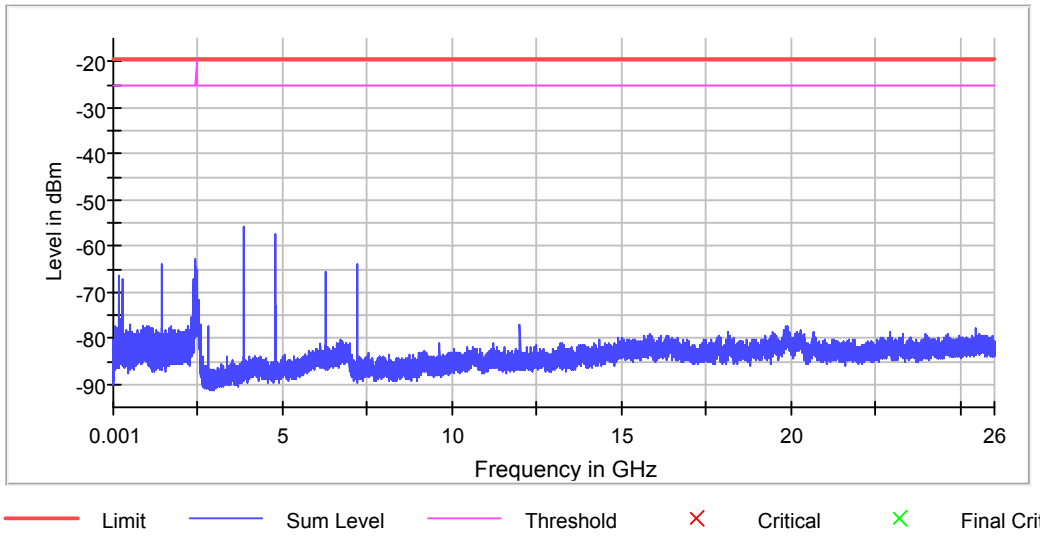
Limits:
All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

The plots of out of band conducted emissions are saved as below.

## TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Lowest Channel, Plot 1




| DUT Frequency (MHz) | Result |
|---|---|
| 2402.000000 | PASS |

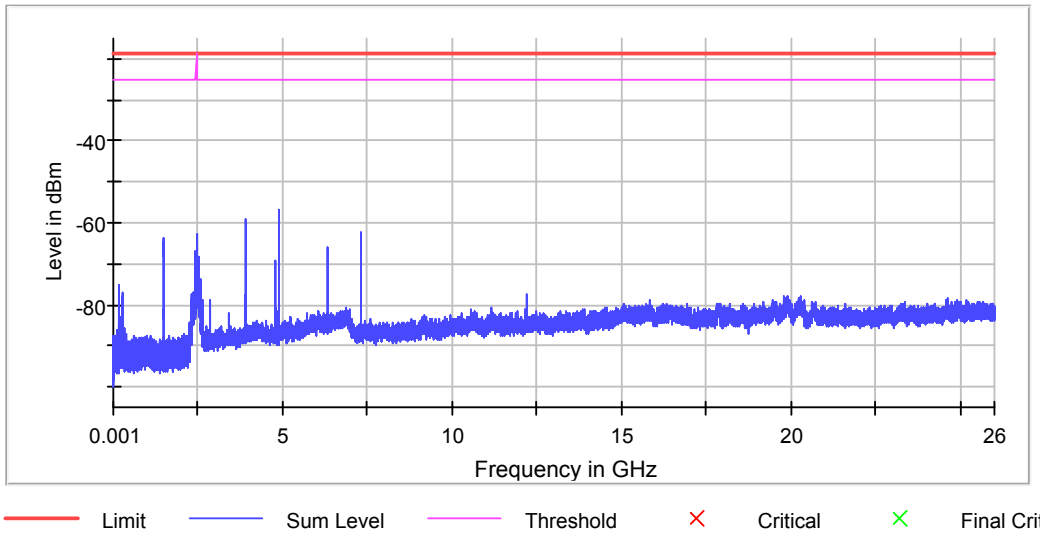
## Pre Measurements

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|---|---|---|---|
| 3843.372606 | -55.9 | -36.6 | -19.3 |
| 4804.579505 | -57.4 | -38.1 | -19.3 |
| 2400.000000 | -62.7 | -43.4 | -19.3 |
| 2399.962517 | -62.7 | -43.4 | -19.3 |
| 2399.512718 | -63.1 | -43.8 | -19.3 |
| 2399.437752 | -63.2 | -43.9 | -19.3 |
| 1441.067201 | -64.0 | -44.7 | -19.3 |
| 7206.861887 | -64.1 | -44.8 | -19.3 |
| 4803.844638 | -64.4 | -45.1 | -19.3 |
| 2399.812584 | -64.5 | -45.2 | -19.3 |
| 2399.887550 | -64.9 | -45.6 | -19.3 |
| 2398.987954 | -65.0 | -45.7 | -19.3 |
| 2399.062920 | -65.1 | -45.8 | -19.3 |
| 2498.564787 | -65.1 | -45.8 | -19.3 |
| 6245.654987 | -65.4 | -46.1 | -19.3 |

# TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Middle Channel, Plot 1



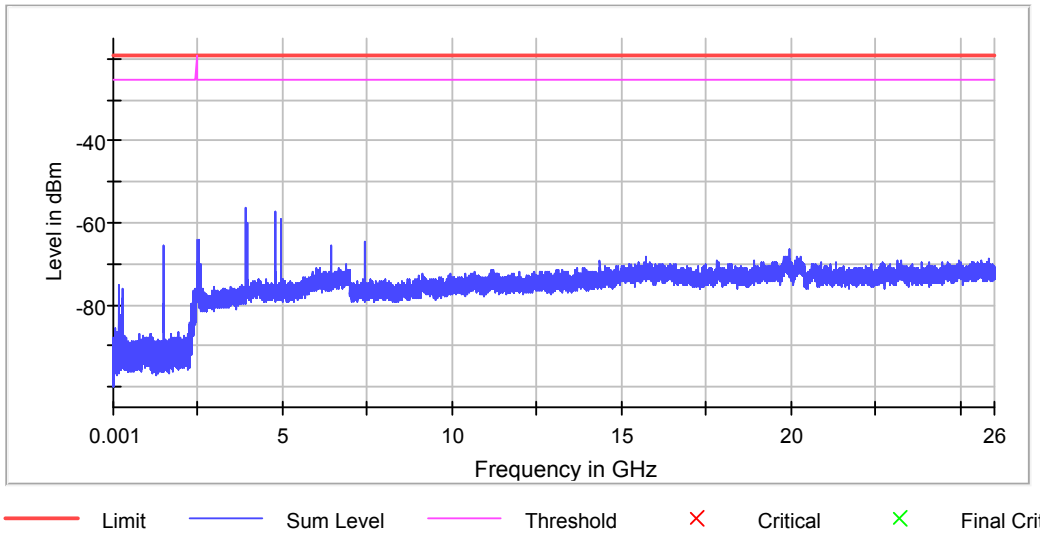

| DUT Frequency (MHz) | Result |
|---|---|
| 2440.000000 | PASS |

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|---|---|---|---|
| 4882.475477 | -56.9 | -37.6 | -19.3 |
| 3905.836357 | -59.2 | -39.9 | -19.3 |
| 4881.740610 | -59.4 | -40.1 | -19.3 |
| 7323.705845 | -62.4 | -43.1 | -19.3 |
| 2489.011507 | -62.7 | -43.4 | -19.3 |
| 1464.456720 | -63.5 | -44.2 | -19.3 |
| 1464.531687 | -64.4 | -45.1 | -19.3 |
| 1464.681619 | -64.8 | -45.5 | -19.3 |
| 3906.571224 | -65.7 | -46.4 | -19.3 |
| 6347.066724 | -66.0 | -46.7 | -19.3 |
| 2393.215540 | -66.8 | -47.5 | -19.3 |
| 2393.140574 | -67.0 | -47.7 | -19.3 |
| 7322.236110 | -67.4 | -48.1 | -19.3 |
| 6346.331857 | -68.0 | -48.7 | -19.3 |
| 2537.512773 | -68.1 | -48.8 | -19.3 |

# TEST REPORT

## PLOTS OF OUT OF BAND CONDUCTED EMISSIONS

Highest Channel, Plot 1



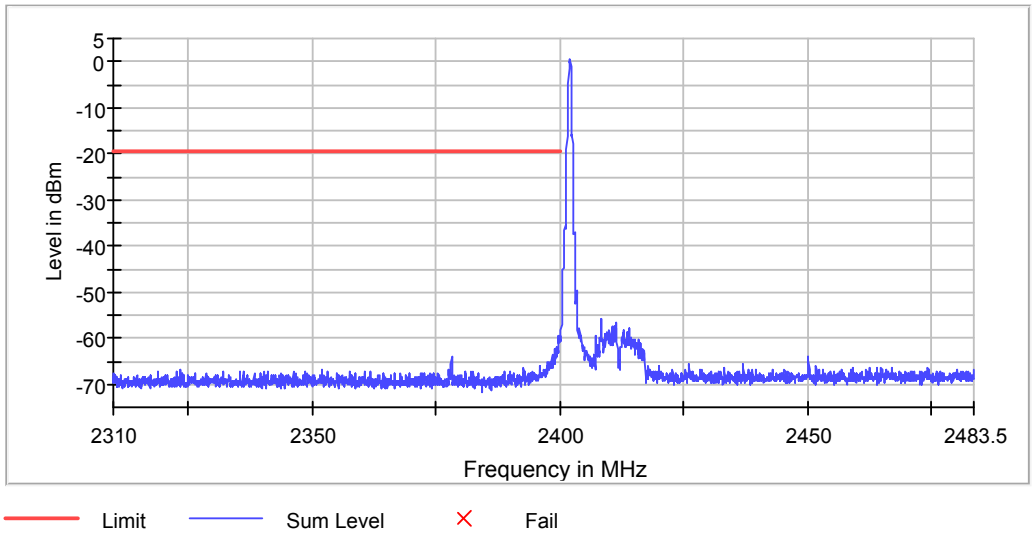

| DUT Frequency (MHz) | Result |
|---|---|
| 2480.000000 | PASS |

| Frequency (MHz) | Level (dBm) | Margin (dB) | Limit (dBm) |
|---|---|---|---|
| 3894.078474 | -56.4 | -37.3 | -19.1 |
| 4794.291358 | -57.4 | -38.3 | -19.1 |
| 4960.371449 | -59.1 | -40.0 | -19.1 |
| 3968.300108 | -60.1 | -41.0 | -19.1 |
| 2483.867434 | -64.2 | -45.1 | -19.1 |
| 2483.500000 | -64.2 | -45.1 | -19.1 |
| 2527.959493 | -64.2 | -45.1 | -19.1 |
| 7440.549803 | -64.5 | -45.4 | -19.1 |
| 4959.636582 | -64.9 | -45.8 | -19.1 |
| 6448.478462 | -65.3 | -46.2 | -19.1 |
| 1487.846239 | -65.5 | -46.4 | -19.1 |
| 1487.921206 | -65.9 | -46.8 | -19.1 |
| 19934.769765 | -66.4 | -47.3 | -19.1 |
| 4933.181346 | -66.6 | -47.5 | -19.1 |
| 1487.996172 | -67.1 | -48.0 | -19.1 |

# TEST REPORT

## PLOTS OF BANDEDGE

Lowest Bandedge



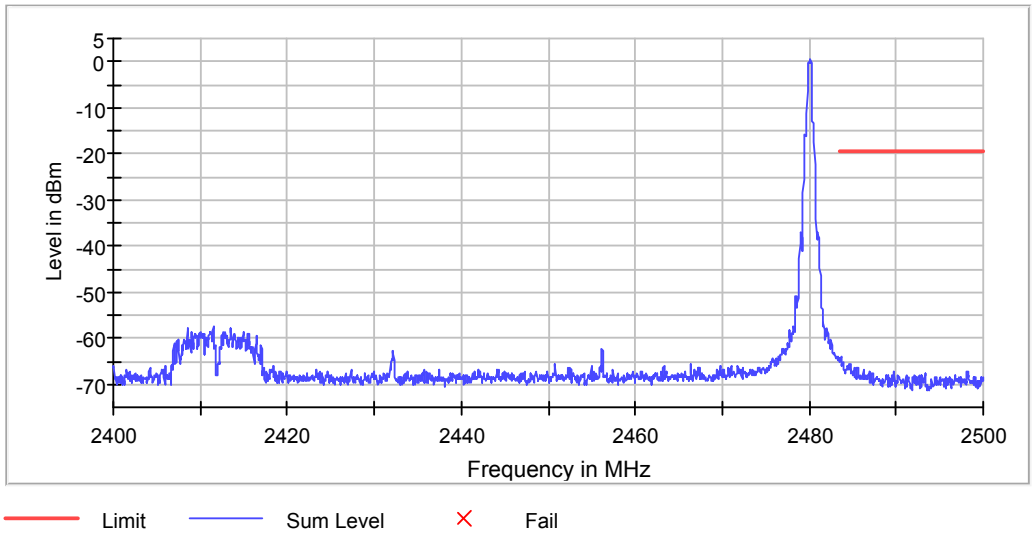

| DUT Frequency (MHz) | Result |
|---|---|
| 2402.000000 | PASS |

| Frequency (MHz) | Level (dBm) |
|---|---|
| 2402.175000 | 0.4 |

# TEST REPORT

## PLOTS OF BANDEDGE

Highest Bandedge




| DUT Frequency (MHz) | Result |
|---|---|
| 2480.000000 | PASS |

| Frequency (MHz) | Level (dBm) |
|---|---|
| 2480.175000 | 0.4 |

## TEST REPORT

4.7 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + AV

where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflects the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD +AV

Example
Assume a receiver reading of 62.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0 dBμV
AF = 7.4 dB
CF = 1.6 dB
AG = 29 dB
PD = 0 dB
AV = -10 dB
FS = 62 + 7.4 +1.6 -29 +0 + (-10) = 32 dBμV/m

Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m

## TEST REPORT

4.8 Transmitter Radiated Emissions in Restricted Bands and Spurious Emissions

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

## TEST REPORT

4.8.1 Radiated Emission Configuration Photograph

Worst Case Restricted Band Radiated Emission
at

2483.5 MHz

The worst case radiated emission configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.8.2 Radiated Emission Data

The data in tables 1-10 list the significant emission frequencies, the limit and the margin of compliance.

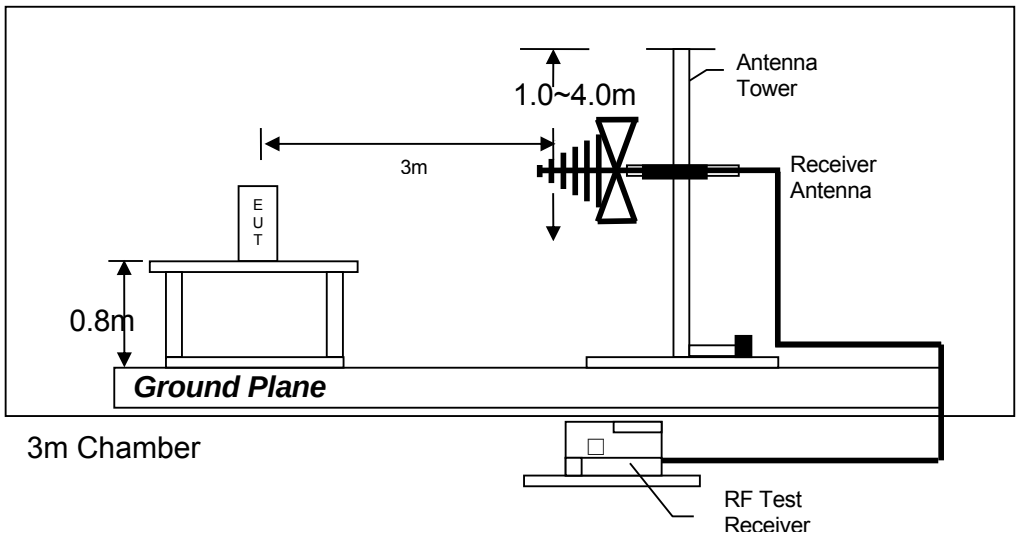
Judgement -

Base Unit: Passed by 5.4 dB

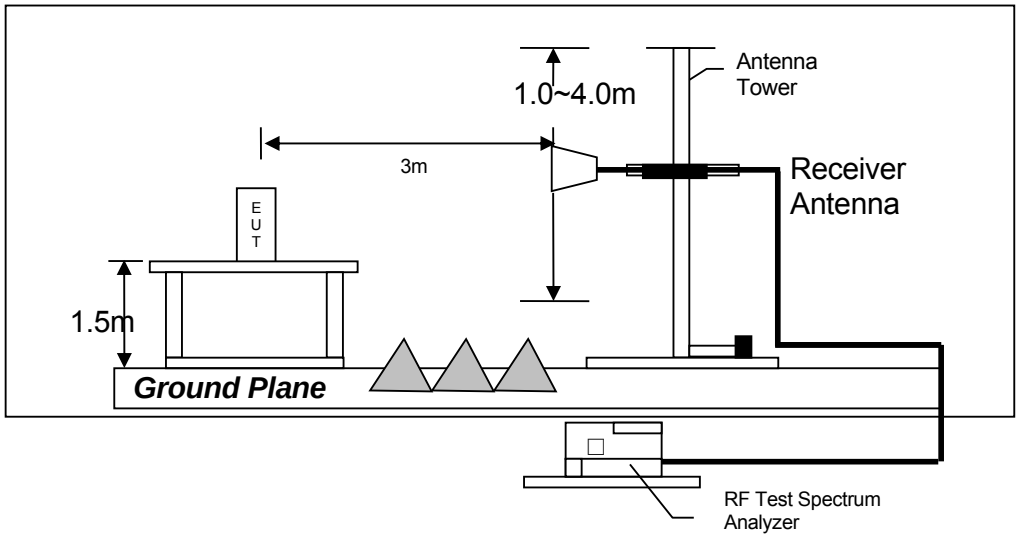
## TEST REPORT

4.8.3 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.




Test setup of radiated emissions up to 1GHz




Test setup of radiated emissions above 1GHz

## TEST REPORT

## RADIATED EMISSION DATA

Mode: TX-2402MHz

Table 1

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| H | 2390.000 | 41.7 | 33 | 29.4 | 38.1 | 0 | 38.1 | 54.0 | -15.9 |
| V | 4804.000 | 29.3 | 33 | 34.9 | 31.2 | 0 | 31.2 | 54.0 | -22.8 |
| H | 7206.000 | 28.2 | 33 | 37.9 | 33.1 | 0 | 33.1 | 54.0 | -20.9 |
| V | 9608.000 | 29.4 | 33 | 40.4 | 36.8 | 0 | 36.8 | 54.0 | -17.2 |
| V | 12010.000 | 33.7 | 33 | 40.5 | 41.2 | 0 | 41.2 | 54.0 | -12.8 |
| H | 14412.000 | 35.3 | 33 | 40.0 | 42.3 | 0 | 42.3 | 54.0 | -11.7 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| H | 2390.000 | 58.5 | 33 | 29.4 | 54.9 | 74.0 | -19.1 |
| H | 4804.000 | 39.3 | 33 | 34.9 | 41.2 | 74.0 | -32.8 |
| H | 7206.000 | 37.9 | 33 | 37.9 | 42.8 | 74.0 | -31.2 |
| H | 9608.000 | 40.4 | 33 | 40.4 | 47.8 | 74.0 | -26.2 |
| H | 12010.000 | 42.0 | 33 | 40.5 | 49.5 | 74.0 | -24.5 |
| H | 14412.000 | 45.1 | 33 | 40.0 | 52.1 | 74.0 | -21.9 |

NOTES:
1. Peak detector is used for the emission measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

## TEST REPORT

Mode: TX-2441MHz

Table 2

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| V | 4882.000 | 31.2 | 33 | 34.9 | 33.1 | 0 | 33.1 | 54.0 | -20.9 |
| H | 7323.000 | 30.3 | 33 | 37.9 | 35.2 | 0 | 35.2 | 54.0 | -18.8 |
| V | 9764.000 | 28.3 | 33 | 40.4 | 35.7 | 0 | 35.7 | 54.0 | -18.3 |
| V | 12205.000 | 31.1 | 33 | 40.5 | 38.6 | 0 | 38.6 | 54.0 | -15.4 |
| H | 14646.000 | 35.8 | 33 | 38.4 | 41.2 | 0 | 41.2 | 54.0 | -12.8 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 4882.000 | 40.3 | 33 | 34.9 | 42.2 | 74.0 | -31.8 |
| V | 7323.000 | 41.0 | 33 | 37.9 | 45.9 | 74.0 | -28.1 |
| H | 9764.000 | 40.4 | 33 | 40.4 | 47.8 | 74.0 | -26.2 |
| V | 12205.000 | 44.3 | 33 | 40.5 | 51.8 | 74.0 | -22.2 |
| V | 14646.000 | 47.4 | 33 | 38.4 | 52.8 | 74.0 | -21.2 |

NOTES:

1. Peak detector is used for the emission measurement.

2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

## TEST REPORT

Mode: TX-2480

Table 3

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| V | 2483.500 | 52.2 | 33 | 29.4 | 48.6 | 0 | 48.6 | 54.0 | -5.4 |
| V | 4960.000 | 30.2 | 33 | 34.9 | 32.1 | 0 | 32.1 | 54.0 | -21.9 |
| H | 7440.000 | 28.2 | 33 | 37.9 | 33.1 | 0 | 33.1 | 54.0 | -20.9 |
| V | 9920.000 | 28.4 | 33 | 40.4 | 35.8 | 0 | 35.8 | 54.0 | -18.2 |
| H | 12400.000 | 33.3 | 33 | 40.5 | 40.8 | 0 | 40.8 | 54.0 | -13.2 |
| H | 14880.000 | 37.7 | 33 | 38.4 | 43.1 | 0 | 43.1 | 54.0 | -10.9 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 2483.500 | 66.7 | 33 | 29.4 | 63.1 | 74.0 | -10.9 |
| V | 4960.000 | 38.6 | 33 | 34.9 | 40.5 | 74.0 | -33.5 |
| H | 7440.000 | 42.2 | 33 | 37.9 | 47.1 | 74.0 | -26.9 |
| V | 9920.000 | 43.8 | 33 | 40.4 | 51.2 | 74.0 | -22.8 |
| H | 12400.000 | 44.7 | 33 | 40.5 | 52.2 | 74.0 | -21.8 |
| H | 14880.000 | 47.7 | 33 | 38.4 | 53.1 | 74.0 | -20.9 |

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-Gen Section 8.10.

## TEST REPORT

Mode: Pika Bluetooth 3.0 + USB Dongle Bluetooth 3.0
TX - 2402MHz

Table 4

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| H | 2390.000 | 43.8 | 33 | 29.4 | 40.2 | 0 | 40.2 | 54.0 | -13.8 |
| V | 4804.000 | 28.2 | 33 | 34.9 | 30.1 | 0 | 30.1 | 54.0 | -23.9 |
| H | 7206.000 | 29.4 | 33 | 37.9 | 34.3 | 0 | 34.3 | 54.0 | -19.7 |
| V | 9608.000 | 29.7 | 33 | 40.4 | 37.1 | 0 | 37.1 | 54.0 | -16.9 |
| V | 12010.000 | 32.7 | 33 | 40.5 | 40.2 | 0 | 40.2 | 54.0 | -13.8 |
| H | 14412.000 | 36.1 | 33 | 40.0 | 43.1 | 0 | 43.1 | 54.0 | -10.9 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| H | 2390.000 | 47.0 | 33 | 29.4 | 43.4 | 74.0 | -30.6 |
| H | 4804.000 | 46.2 | 33 | 34.9 | 48.1 | 74.0 | -25.9 |
| H | 7206.000 | 39.7 | 33 | 37.9 | 44.6 | 74.0 | -29.4 |
| H | 9608.000 | 42.4 | 33 | 40.4 | 49.8 | 74.0 | -24.2 |
| H | 12010.000 | 43.7 | 33 | 40.5 | 51.2 | 74.0 | -22.8 |
| H | 14412.000 | 45.8 | 33 | 40.0 | 52.8 | 74.0 | -21.2 |

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

## TEST REPORT

Mode: Pika Bluetooth 3.0 + USB Dongle Bluetooth 3.0
TX-2442MHz

Table 5

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| V | 4882.000 | 29.3 | 33 | 34.9 | 31.2 | 0 | 34.6 | 54.0 | -19.4 |
| H | 7323.000 | 29.2 | 33 | 37.9 | 34.1 | 0 | 34.1 | 54.0 | -19.9 |
| V | 9764.000 | 29.4 | 33 | 40.4 | 36.8 | 0 | 36.8 | 54.0 | -17.2 |
| V | 12205.000 | 31.9 | 33 | 40.5 | 39.4 | 0 | 39.4 | 54.0 | -14.6 |
| H | 14646.000 | 35.8 | 33 | 38.4 | 41.2 | 0 | 41.2 | 54.0 | -12.8 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 4882.000 | 45.7 | 33 | 34.9 | 47.6 | 74.0 | -26.4 |
| V | 7323.000 | 41.9 | 33 | 37.9 | 46.8 | 74.0 | -27.2 |
| H | 9764.000 | 42.1 | 33 | 40.4 | 49.5 | 74.0 | -24.5 |
| V | 12205.000 | 44.3 | 33 | 40.5 | 51.8 | 74.0 | -22.2 |
| V | 14646.000 | 47.4 | 33 | 38.4 | 52.8 | 74.0 | -21.2 |

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

## TEST REPORT

Mode: Pika Bluetooth 3.0 + USB Dongle Bluetooth 3.0
TX-2480MHz

Table 6

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| V | 2483.500 | 51.2 | 33 | 29.4 | 47.6 | 0 | 41.1 | 54.0 | -13.0 |
| V | 4960.000 | 28.9 | 33 | 34.9 | 30.8 | 0 | 34.9 | 54.0 | -19.1 |
| H | 7440.000 | 28.5 | 33 | 37.9 | 33.4 | 0 | 33.4 | 54.0 | -20.6 |
| V | 9920.000 | 30.4 | 33 | 40.4 | 37.8 | 0 | 37.8 | 54.0 | -16.2 |
| H | 12400.000 | 33.7 | 33 | 40.5 | 41.2 | 0 | 41.2 | 54.0 | -12.8 |
| H | 14880.000 | 38.1 | 33 | 38.4 | 43.5 | 0 | 43.5 | 54.0 | -10.5 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 2483.500 | 62.9 | 33 | 29.4 | 59.3 | 74.0 | -14.7 |
| V | 4960.000 | 46.0 | 33 | 34.9 | 47.9 | 74.0 | -26.1 |
| H | 7440.000 | 42.2 | 33 | 37.9 | 47.1 | 74.0 | -26.9 |
| V | 9920.000 | 44.4 | 33 | 40.4 | 51.8 | 74.0 | -22.2 |
| H | 12400.000 | 45.3 | 33 | 40.5 | 52.8 | 74.0 | -21.2 |
| H | 14880.000 | 48.7 | 33 | 38.4 | 54.1 | 74.0 | -19.9 |

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

## TEST REPORT

Mode: Pika Bluetooth 3.0 + USB Dongle BLE 4.0
TX-2402MHz

Table 7

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| H | 2390.000 | 40.7 | 33 | 29.4 | 37.1 | 0 | 37.1 | 54.0 | -16.9 |
| V | 4804.000 | 28.2 | 33 | 34.9 | 30.1 | 0 | 30.1 | 54.0 | -23.9 |
| H | 7206.000 | 29.4 | 33 | 37.9 | 34.3 | 0 | 34.3 | 54.0 | -19.7 |
| V | 9608.000 | 29.7 | 33 | 40.4 | 37.1 | 0 | 37.1 | 54.0 | -16.9 |
| V | 12010.000 | 32.7 | 33 | 40.5 | 40.2 | 0 | 40.2 | 54.0 | -13.8 |
| H | 14412.000 | 36.1 | 33 | 40.0 | 43.1 | 0 | 43.1 | 54.0 | -10.9 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| H | 2390.000 | 53.7 | 33 | 29.4 | 50.1 | 74.0 | -23.9 |
| H | 4804.000 | 42.4 | 33 | 34.9 | 44.3 | 74.0 | -29.7 |
| H | 7206.000 | 39.7 | 33 | 37.9 | 44.6 | 74.0 | -29.4 |
| H | 9608.000 | 42.4 | 33 | 40.4 | 49.8 | 74.0 | -24.2 |
| H | 12010.000 | 43.7 | 33 | 40.5 | 51.2 | 74.0 | -22.8 |
| H | 14412.000 | 45.8 | 33 | 40.0 | 52.8 | 74.0 | -21.2 |

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

## TEST REPORT

Mode: Pika Bluetooth 3.0 + USB Dongle BLE 3.0
TX-2442MHz

Table 8

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| V | 4882.000 | 29.3 | 33 | 34.9 | 31.2 | 0 | 33.9 | 54.0 | -20.1 |
| H | 7323.000 | 29.2 | 33 | 37.9 | 34.1 | 0 | 34.1 | 54.0 | -19.9 |
| V | 9764.000 | 29.4 | 33 | 40.4 | 36.8 | 0 | 36.8 | 54.0 | -17.2 |
| V | 12205.000 | 31.9 | 33 | 40.5 | 39.4 | 0 | 39.4 | 54.0 | -14.6 |
| H | 14646.000 | 35.8 | 33 | 38.4 | 41.2 | 0 | 41.2 | 54.0 | -12.8 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 4882.000 | 42.7 | 33 | 34.9 | 44.6 | 74.0 | -29.4 |
| V | 7323.000 | 41.9 | 33 | 37.9 | 46.8 | 74.0 | -27.2 |
| H | 9764.000 | 42.1 | 33 | 40.4 | 49.5 | 74.0 | -24.5 |
| V | 12205.000 | 44.3 | 33 | 40.5 | 51.8 | 74.0 | -22.2 |
| V | 14646.000 | 47.4 | 33 | 38.4 | 52.8 | 74.0 | -21.2 |

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

## TEST REPORT

Mode: Pika Bluetooth 3.0 + USB Dongle BLE 3.0
TX-2480MHz

Table 9

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Average Factor (dB) | Calculated at 3m (dBµV/m) | Average Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|
| V | 2483.500 | 44.7 | 33 | 29.4 | 41.1 | 0 | 41.1 | 54.0 | -12.9 |
| V | 4960.000 | 36.3 | 33 | 34.9 | 38.2 | 0 | 38.2 | 54.0 | -15.8 |
| H | 7440.000 | 28.5 | 33 | 37.9 | 33.4 | 0 | 33.4 | 54.0 | -20.6 |
| V | 9920.000 | 30.4 | 33 | 40.4 | 37.8 | 0 | 37.8 | 54.0 | -16.2 |
| H | 12400.000 | 33.7 | 33 | 40.5 | 41.2 | 0 | 41.2 | 54.0 | -12.8 |
| H | 14880.000 | 38.1 | 33 | 38.4 | 43.5 | 0 | 43.5 | 54.0 | -10.5 |

| Polari-zation | Frequency (MHz) | Reading (dBµV) | Pre-Amp Gain (dB) | Antenna Factor (dB) | Net at 3m - Peak (dBµV/m) | Peak Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 2483.500 | 66.9 | 33 | 29.4 | 63.3 | 74.0 | -10.7 |
| V | 4960.000 | 39.9 | 33 | 34.9 | 41.8 | 74.0 | -32.2 |
| H | 7440.000 | 42.2 | 33 | 37.9 | 47.1 | 74.0 | -26.9 |
| V | 9920.000 | 44.4 | 33 | 40.4 | 51.8 | 74.0 | -22.2 |
| H | 12400.000 | 45.3 | 33 | 40.5 | 52.8 | 74.0 | -21.2 |
| H | 14880.000 | 48.7 | 33 | 38.4 | 54.1 | 74.0 | -19.9 |

NOTES:
1. Peak detector is used for the emission measurement.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

## TEST REPORT

Worst-Case Operating Mode: On Mode

Table 10
**Pursuant to FCC Part 15 Section 15.109 / RSS-210 4.4 Requirement**

| Polarization | Frequency (MHz) | Reading (dBµV) | Pre-amp (dB) | Antenna Factor (dB) | Net at 3m (dBµV/m) | Limit at 3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|
| V | 58.394 | 26.2 | 16 | 11.0 | 21.2 | 40.0 | -18.8 |
| V | 68.388 | 25.1 | 16 | 8.0 | 17.1 | 40.0 | -22.9 |
| V | 112.872 | 25.1 | 16 | 14.0 | 23.1 | 43.5 | -20.4 |
| V | 189.897 | 30.0 | 16 | 16.0 | 30.0 | 43.5 | -13.5 |
| V | 249.981 | 32.2 | 16 | 20.0 | 36.2 | 46.0 | -9.8 |
| H | 392.941 | 25.5 | 16 | 25.0 | 34.5 | 46.0 | -11.5 |

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

## TEST REPORT

4.9 AC Power Line Conducted Emission

☐ Not applicable – EUT is only powered by battery for operation.

☒ EUT connects to AC power line. Emission Data is listed in following pages.

☐ Base Unit connects to AC power line and has transmission. Handset connects to AC power line but has no transmission. Emission Data of Base Unit is listed in following pages.

4.9.1 AC Power Line Conducted Emission Configuration Photograph

Worst Case Line-Conducted Configuration
at

195 kHz

The worst case line conducted configuration photographs are attached in the Appendix and saved with filename: config photos.pdf

4.9.2 AC Power Line Conducted Emission Data

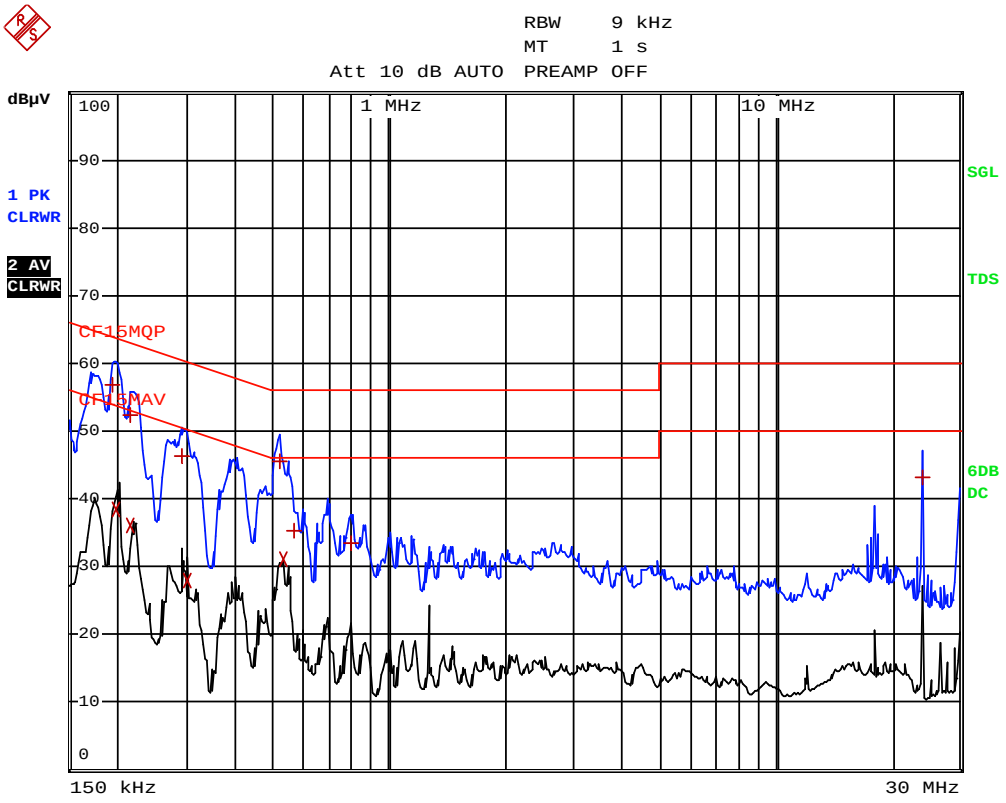
The plot(s) and data in the following pages list the significant emission frequencies, the limit and the margin of compliance.

Passed by 6.92 dB margin compare with Quasi-peak limit

# TEST REPORT

## AC POWER LINE CONDUCTED EMISSION

Worst Case: Bluetooth on mode with full load



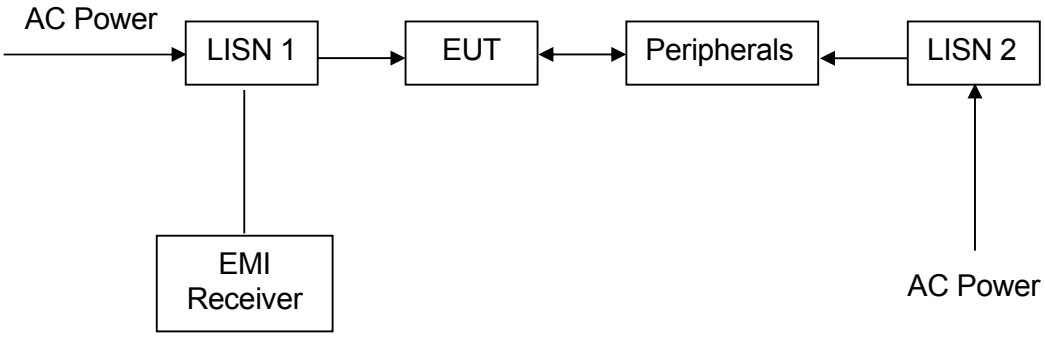

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

| | TRACE | FREQUENCY | LEVEL dBµV | | DELTA LIMIT dB |
|---|---|---|---|---|---|
| 1 | Quasi Peak | 195 kHz | 56.89 | L1 | -6.92 |
| 2 | CISPR Average | 199.5 kHz | 38.57 | N | -15.05 |
| 1 | Quasi Peak | 217.5 kHz | 52.42 | N | -10.48 |
| 2 | CISPR Average | 217.5 kHz | 36.18 | N | -16.73 |
| 1 | Quasi Peak | 294 kHz | 46.21 | N | -14.19 |
| 2 | CISPR Average | 298.5 kHz | 27.96 | L1 | -22.31 |
| 1 | Quasi Peak | 519 kHz | 45.64 | L1 | -10.35 |
| 2 | CISPR Average | 528 kHz | 31.12 | N | -14.87 |
| 1 | Quasi Peak | 568.5 kHz | 35.25 | N | -20.74 |
| 1 | Quasi Peak | 798 kHz | 33.40 | L1 | -22.59 |
| 1 | Quasi Peak | 24 MHz | 43.22 | N | -16.77 |

## TEST REPORT

4.9.3 Conducted Emission Test Setup



**TEST REPORT**

## 5.0 EQUIPMENT LIST

1) Radiated Emissions Test

| Equipment | EMI Test Receiver | Spectrum Analyzer | Biconical Antenna |
|---|---|---|---|
| Registration No. | EW-2500 | EW-2253 | EW-0571 |
| Manufacturer | R&S | R&S | EMCO |
| Model No. | ESCI | FSP40 | 3104C |
| Calibration Date | January 09, 2020 | November 18, 2019 | July 23, 2019 |
| Calibration Due Date | January 09, 2021 | November 18, 2020 | July 23, 2021 |

| Equipment | Log Periodic Antenna | Double Ridged Guide Antenna |
|---|---|---|
| Registration No. | EW-0447 | EW-1133 |
| Manufacturer | EMCO | EMCO |
| Model No. | 3146 | 3115 |
| Calibration Date | September 25, 2019 | November 29, 2018 |
| Calibration Due Date | September 25, 2021 | May 29, 2020 |

2) Conducted Emissions Test

| Equipment | EMI Test Receiver | Artificial Mains Network |
|---|---|---|
| Registration No. | EW-2500 | EW-2874 |
| Manufacturer | R&S | R&S |
| Model No. | ESCI | ENV-216 |
| Calibration Date | January 09, 2020 | May 07, 2019 |
| Calibration Due Date | January 09, 2021 | May 07, 2020 |

3) Conductive Measurement Test

| Equipment | Spectrum Analyzer |
|---|---|
| Registration No. | EW-2253 |
| Manufacturer | R&S |
| Model No. | FSP40 |
| Calibration Date | November 18, 2019 |
| Calibration Due Date | November 18, 2020 |

**END OF TEST REPORT**