## 2.6 Power Spectral Density

### 2.6.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.247 (e)
ISED RSS-247, Clause 5.2
ISED RSS-GEN, Clause 6.12

### 2.6.2 Equipment Under Test and Modification State

A2941, S/N: GF6K93M959 - Modification State 0

### 2.6.3 Date of Test

07-March-2023

### 2.6.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 11.10.5.

Where the EUT duty cycle was < 98 % and repeatable within 2 %, the spectrum analyser was set to trace (power) averaging and a duty cycle correction was added as calculated in the result tables below (Method AVGPSD-2).

MIMO output port summing was performed in accordance with KDB 662911 D01 E)2)b).

### 2.6.5 Environmental Conditions

| | |
|---|---|
| Ambient Temperature | 21.5 °C |
| Relative Humidity | 31.4 % |

### 2.6.6 Test Results

2.4 GHz WLAN

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | - | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11b | Duty Cycle (%): | 100.0 |
| Data Rate: | 1 Mbps | DCCF (dB): | 0.00 |
| Antenna Configuration: | SISO | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B (Core 0) | Active Chain(s): | 0 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 51.0 | - | 2.70 | - | - | - | 8.00 | -5.30 |
| 2442 | 51.0 | - | 2.89 | - | - | - | 8.00 | -5.11 |
| 2472 | 100.0 | - | 0.35 | - | - | - | 8.00 | -7.65 |

**Table 77 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | - | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11g | Duty Cycle (%): | 97.6 |
| Data Rate: | 12 Mbps | DCCF (dB): | 0.11 |
| Antenna Configuration: | SISO | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B (Core 0) | Active Chain(s): | 0 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | -0.32 | - | - | - | 8.00 | -8.32 |
| 2442 | 100.0 | - | 4.50 | - | - | - | 8.00 | -3.50 |
| 2472 | 100.0 | - | -12.66 | - | - | - | 8.00 | -20.66 |

**Table 78 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | - | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11n HT20 | Duty Cycle (%): | 96.5 |
| Modulation Coding Scheme: | MCS2 | DCCF (dB): | 0.16 |
| Antenna Configuration: | SISO | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B (Core 0) | Active Chain(s): | 0 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | -1.43 | - | - | - | 8.00 | -9.43 |
| 2442 | 100.0 | - | 4.11 | - | - | - | 8.00 | -3.89 |
| 2472 | 100.0 | - | -12.82 | - | - | - | 8.00 | -20.82 |

**Table 79 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | - | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 SU | Duty Cycle (%): | 95.7 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.19 |
| Antenna Configuration: | SISO | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B (Core 0) | Active Chain(s): | 0 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | -3.37 | - | - | - | 8.00 | -11.37 |
| 2442 | 100.0 | - | 2.70 | - | - | - | 8.00 | -5.30 |
| 2472 | 100.0 | - | -16.40 | - | - | - | 8.00 | -24.40 |

**Table 80 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | - | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 RU26 | Duty Cycle (%): | 96.8 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.14 |
| Antenna Configuration: | SISO | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B (Core 0) | Active Chain(s): | 0 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | 1.96 | - | - | - | 8.00 | -6.04 |
| 2442 | 100.0 | - | 1.78 | - | - | - | 8.00 | -6.22 |
| 2472 | 100.0 | - | -16.20 | - | - | - | 8.00 | -24.20 |

**Table 81 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | - | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 RU52 | Duty Cycle (%): | 96.3 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.16 |
| Antenna Configuration: | SISO | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B (Core 0) | Active Chain(s): | 0 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | 2.27 | - | - | - | 8.00 | -5.73 |
| 2442 | 100.0 | - | 2.25 | - | - | - | 8.00 | -5.75 |
| 2472 | 100.0 | - | -14.32 | - | - | - | 8.00 | -22.32 |

**Table 82 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | - | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 RU106 | Duty Cycle (%): | 97.8 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.10 |
| Antenna Configuration: | SISO | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B (Core 0) | Active Chain(s): | 0 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | -0.47 | - | - | - | 8.00 | -8.47 |
| 2442 | 100.0 | - | 2.21 | - | - | - | 8.00 | -5.79 |
| 2472 | 100.0 | - | -15.72 | - | - | - | 8.00 | -23.72 |

**Table 83 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | 662911 D01 v02r01 E)2)b) | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11n HT20 | Duty Cycle (%): | 96.5 |
| Modulation Coding Scheme: | MCS2 | DCCF (dB): | 0.16 |
| Antenna Configuration: | MIMO CDD | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B+C (Core 0 + Core 1) | Active Chain(s): | 0+1 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | -2.80 | -2.13 | - | 0.56 | 8.00 | -7.44 |
| 2442 | 51.0 | - | 1.34 | 1.69 | - | 4.53 | 8.00 | -3.47 |
| 2472 | 100.0 | - | -15.18 | -15.42 | - | -12.29 | 8.00 | -20.29 |

**Table 84 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | 662911 D01 v02r01 E)2)b) | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 SU | Duty Cycle (%): | 95.9 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.18 |
| Antenna Configuration: | MIMO CDD | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B+C (Core 0 + Core 1) | Active Chain(s): | 0+1 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | -3.75 | -4.30 | - | -1.01 | 8.00 | -9.01 |
| 2437 | 51.0 | - | -0.14 | -0.18 | - | 2.85 | 8.00 | -5.15 |
| 2472 | 100.0 | - | -18.71 | -18.93 | - | -15.81 | 8.00 | -23.81 |

**Table 85 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | 662911 D01 v02r01 E)2)b) | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 RU26 | Duty Cycle (%): | 96.5 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.15 |
| Antenna Configuration: | MIMO CDD | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B+C (Core 0 + Core 1) | Active Chain(s): | 0+1 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | 1.75 | 1.60 | - | 4.69 | 8.00 | -3.31 |
| 2442 | 100.0 | - | 1.56 | 1.92 | - | 4.76 | 8.00 | -3.24 |
| 2472 | 100.0 | - | -18.85 | -17.84 | - | -15.30 | 8.00 | -23.30 |

**Table 86 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | 662911 D01 v02r01 E)2)b) | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 RU52 | Duty Cycle (%): | 96.3 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.16 |
| Antenna Configuration: | MIMO CDD | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B+C (Core 0 + Core 1) | Active Chain(s): | 0+1 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 51.0 | - | -0.70 | -0.43 | - | 2.45 | 8.00 | -5.55 |
| 2442 | 100.0 | - | 1.74 | 2.19 | - | 4.98 | 8.00 | -3.02 |
| 2472 | 100.0 | - | -15.09 | -14.95 | - | -12.01 | 8.00 | -20.01 |

**Table 87 - Maximum Power Spectral Density Results**

| Test Configuration | | | |
|---|---|---|---|
| Frequency Range: | 2400-2483.5 MHz | Band: | 2.4 GHz |
| Limit Clause(s): | 15.247 (e)<br>RSS-247 5.2 b) | Test Method(s): | C63.10 11.10.5 |
| Additional Reference(s): | 662911 D01 v02r01 E)2)b) | | |
| Note(s): | DCCF was added to the spectrum analyser reference level offset. | | |

| DUT Configuration | | | |
|---|---|---|---|
| Mode: | 802.11ax HE20 RU106 | Duty Cycle (%): | 97.9 |
| Modulation Coding Scheme: | MCS2x1 | DCCF (dB): | 0.09 |
| Antenna Configuration: | MIMO CDD | Peak Antenna Gain (dBi): | - |
| Active Port(s): | B+C (Core 0 + Core 1) | Active Chain(s): | 0+1 |

| Test Frequency (MHz) | RBW (kHz) | PSD (dBm/RBW) | | | | | Limit (dBm/3 kHz) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | ∑ | | |
| 2412 | 100.0 | - | -0.97 | -0.74 | - | 2.16 | 8.00 | -5.84 |
| 2442 | 51.0 | - | -0.91 | -0.63 | - | 2.24 | 8.00 | -5.76 |
| 2472 | 100.0 | - | -18.73 | -18.75 | - | -15.73 | 8.00 | -23.73 |

**Table 88 - Maximum Power Spectral Density Results**

FCC 47 CFR Part 15, Limit Clause 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

ISED RSS-247, Limit Clause 5.2(b)

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

### 2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 14.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Expires |
|---|---|---|---|---|---|
| Hygrometer | Rotronic | I-1000 | 3068 | 12 | 21-Sep-2023 |
| Multi-GNSS Simulator (GPS) | Spirent | GSS6700 | 4596 | 12 | 22-Aug-2023 |
| AC Programmable Power Supply | iTech | IT7324 | 5225 | - | O/P Mon |
| MXA Signal Analyser | Keysight Technologies | N9020B | 5529 | 24 | 13-Dec-2024 |
| Signal Conditioning Unit | TUV SUD | SPECTRUM SCU001 | 5546 | 12 | 06-Apr-2023 |
| Digital Multimeter | Fluke | 115 | 6145 | 12 | 17-Jun-2023 |

**Table 89**

O/P Mon - Output Monitored using calibrated equipment

# 3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

| Test Name | Measurement Uncertainty |
|---|---|
| Restricted Band Edges | 30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB |
| Emission Bandwidth | ± 545.656 kHz |
| Maximum Conducted Output Power | ± 1.38 dB |
| Authorised Band Edges | 30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB |
| Spurious Radiated Emissions | 30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB |
| Power Spectral Density | ± 1.49 dB |

**Table 90**

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.