

# **CERTIFICATION TEST REPORT**

**Report Number.** : S-4792147635-E11V1

**Applicant** : SAMSUNG ELECTRONICS CO., LTD.  
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,  
GYEONGGI-DO, 16677, KOREA

**Model** : SC-57G, SCG41

**FCC ID** : A3LSMF971JPN

**EUT Description** : GSM/WCDMA/LTE/5G NR Phone + BT/BLE,  
DTS/UNII a/b/g/n/ac/ax/be, NFC, WPT and UWB

**Test Standard(s)** : FCC 47 CFR PART 15 SUBPART E

**Date Of Issue:**  
2026-05-19

**Prepared by:**  
UL KOREA LTD.  
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL KOREA LTD. Suwon Laboratory  
218 Maeyeong-ro, Yeongtong-gu,  
Suwon-si, Gyeonggi-do, 16675, Korea  
TEL: (031) 337-9902  
FAX: (031) 213-5433

Revision History

| Rev. | Issue Date | Revisions     | Revised By          |
|------|------------|---------------|---------------------|
| V1   | 2026-05-19 | Initial issue | Dexter(Hyunsik) Yun |

## TABLE OF CONTENTS

|                                                                               |           |
|-------------------------------------------------------------------------------|-----------|
| <b>1. ATTESTATION OF TEST RESULTS .....</b>                                   | <b>4</b>  |
| <b>2. TEST METHODOLOGY .....</b>                                              | <b>5</b>  |
| <b>3. FACILITIES AND ACCREDITATION .....</b>                                  | <b>5</b>  |
| <b>4. CALIBRATION AND UNCERTAINTY .....</b>                                   | <b>6</b>  |
| 4.1. MEASURING INSTRUMENT CALIBRATION .....                                   | 6         |
| 4.2. MEASUREMENT UNCERTAINTY.....                                             | 6         |
| 4.3. DECISION RULE.....                                                       | 6         |
| <b>5. EQUIPMENT UNDER TEST .....</b>                                          | <b>7</b>  |
| 5.1. DESCRIPTION OF EUT .....                                                 | 7         |
| 5.2. DESCRIPTION OF AVAILABLE ANTENNAS .....                                  | 8         |
| 5.3. DESCRIPTION OF TEST SETUP.....                                           | 9         |
| <b>6. TEST AND MEASUREMENT EQUIPMENT .....</b>                                | <b>10</b> |
| <b>7. SUMMARY TABLE .....</b>                                                 | <b>10</b> |
| <b>8. MEASUREMENT METHODS .....</b>                                           | <b>10</b> |
| <b>9. DYNAMIC FREQUENCY SELECTION.....</b>                                    | <b>11</b> |
| 9.1. OVERVIEW .....                                                           | 11        |
| 9.1.1. LIMITS.....                                                            | 11        |
| 9.1.2. TEST AND MEASUREMENT SYSTEM .....                                      | 14        |
| 9.1.3. SETUP OF EUT.....                                                      | 17        |
| 9.1.4. DESCRIPTION OF EUT .....                                               | 18        |
| 9.2. RESULTS FOR 160 MHz BANDWIDTH (UNII-2A & 2C BANDS) .....                 | 19        |
| 9.2.1. TEST CHANNEL .....                                                     | 19        |
| 9.2.2. RADAR WAVEFORM AND TRAFFIC.....                                        | 19        |
| 9.2.3. OVERLAPPING CHANNEL TESTS.....                                         | 20        |
| 9.2.4. MOVE AND CLOSING TIME .....                                            | 20        |
| <b>10. Contention Based Protocol.....</b>                                     | <b>23</b> |
| 10.1. OVERVIEW.....                                                           | 23        |
| 10.1.1. LIMITS.....                                                           | 23        |
| 10.1.2. TEST AND MEASUREMENT SYSTEM .....                                     | 24        |
| 10.2. TEST RESULTS.....                                                       | 26        |
| 10.2.1. AWGN Sample signal .....                                              | 26        |
| 10.2.2. Contention Based Protocol Timing Plot (Measurement Criteria).....     | 27        |
| 10.2.3. Channel Move Plots.....                                               | 29        |
| 10.2.4. Contention Based Protocol – Incumbent Detection & Trial Results ..... | 30        |

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SAMSUNG ELECTRONICS CO., LTD.

**EUT DESCRIPTION:** GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax/be, NFC, WPT and UWB

**MODEL NUMBER:** SC-57G, SCG41

**SERIAL NUMBER:** R3GL3080F8A (CONDUCTED);

**DATE TESTED:** 2026-05-01 ~ 2026-05-19

| APPLICABLE STANDARDS     |              |
|--------------------------|--------------|
| STANDARD                 | TEST RESULTS |
| CFR 47 Part 15 Subpart E | Complies     |

UL KOREA LTD. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL KOREA LTD. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL KOREA LTD. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL KOREA LTD. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For  
UL KOREA LTD. By:



Seokhwan Hong  
Suwon Lab Engineer  
UL KOREA LTD.

Tested By:



Dexter(Hyunsik) Yun  
Suwon Lab Engineer  
UL KOREA LTD.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02
4. KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02
5. KDB 987594 D02 U-NII 6 GHz EMC Measurement v03
6. KDB 987594 D03 U-NII 6 GHz QA v03r04
7. ANSI C63.10-2020.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

| 218 Maeyeong-ro          |                                     |
|--------------------------|-------------------------------------|
| <input type="checkbox"/> | Chamber 1(3m semi-anechoic chamber) |
| <input type="checkbox"/> | Chamber 2(3m semi-anechoic chamber) |
| <input type="checkbox"/> | Chamber 3(3m semi-anechoic chamber) |
| <input type="checkbox"/> | Chamber 4(3m Full-anechoic chamber) |
| <input type="checkbox"/> | Chamber 5(3m Full-anechoic chamber) |

UL KOREA LTD. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at <https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| PARAMETER          | UNCERTAINTY |
|--------------------|-------------|
| Time (CBP and DFS) | 0.62 %      |

Uncertainty figures are valid to a confidence level of 95%.

### 4.3. DECISION RULE

Decision rule for statement(s) of conformity is based on Clause 4.4.3 in IEC Guide 115:2023.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac/ax/be, NFC, WPT and UWB. This test report addresses the NII (WLAN) signalling mode.

| Representative model | Comparison Criteria | Derivative model                              |
|----------------------|---------------------|-----------------------------------------------|
|                      |                     | SCG41                                         |
| SC-57G               | Hardware            | Identical                                     |
|                      | Software            | The UI changed according to Service Provider. |

The SC-57G model was used as the representative model for final testing. All test results in this report apply to both the representative model and its derivative variants.

#### WiFi operating mode

| Frequency rage                | Mode          | ANT1  | ANT2  |
|-------------------------------|---------------|-------|-------|
| 5GHz<br>(5150 MHz – 5925 MHz) | 802.11a MIMO  | TX/RX | TX/RX |
|                               | 802.11n MIMO  | TX/RX | TX/RX |
|                               | 802.11ac MIMO | TX/RX | TX/RX |
|                               | 802.11ax MIMO | TX/RX | TX/RX |
|                               | 802.11be MIMO | TX/RX | TX/RX |

| Frequency rage                | Mode          | ANT1  | ANT2  |
|-------------------------------|---------------|-------|-------|
| 6GHz<br>(5935 MHz – 7115 MHz) | 802.11a SISO  | TX/RX | TX/RX |
|                               | 802.11a MIMO  | TX/RX | TX/RX |
|                               | 802.11ax SISO | TX/RX | TX/RX |
|                               | 802.11ax MIMO | TX/RX | TX/RX |
|                               | 802.11be SISO | TX/RX | TX/RX |
|                               | 802.11be MIMO | TX/RX | TX/RX |

## 5.2. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

**The internal antenna was Permanently attached.  
Therefore this E.U.T Complies with the requirement of §15.203.**

The radio utilizes a internal antenna, with a maximum gain of:

| UNII Band | Frequency Range[MHz] | ANT1 Gain [dBi] | ANT2 Gain [dBi] | Correlated Chains Directional Gain[dBi] |
|-----------|----------------------|-----------------|-----------------|-----------------------------------------|
| UNII 1    | 5150–5250            | -7.19           | -5.58           | -3.34                                   |
| UNII 2A   | 5250–5350            | -6.09           | -3.14           | -1.48                                   |
| UNII 2C   | 5470–5725            | -7.78           | -4.93           | -3.23                                   |
| UNII 3    | 5725–5850            | -8.42           | -4.34           | -3.13                                   |
| UNII 4    | 5850–5925            | -6.58           | -3.83           | -2.09                                   |

For CBP test, with a minimum gain of:

| UNII Band & Range[MHz] | Frequency [MHz] | ANT1 Gain [dBi] | ANT2 Gain [dBi] | Minimum Gain[dBi] |
|------------------------|-----------------|-----------------|-----------------|-------------------|
| 5(5925 – 6425)         | 5925            | -6.58           | -7.10           | <b>-8.68</b>      |
|                        | 6025            | -6.44           | -5.92           |                   |
|                        | 6125            | -6.36           | -6.20           |                   |
|                        | 6225            | -6.85           | -7.92           |                   |
|                        | 6325            | -6.89           | -7.77           |                   |
|                        | 6425            | -6.83           | <b>-8.68</b>    |                   |
| 6(6425 – 6525)         | 6425            | -6.83           | <b>-8.68</b>    | <b>-8.68</b>      |
|                        | 6525            | -6.28           | -8.12           |                   |
| 7(6525 – 6875)         | 6525            | -6.28           | -8.12           | <b>-8.28</b>      |
|                        | 6625            | -7.56           | -8.12           |                   |
|                        | 6725            | -7.61           | -7.86           |                   |
|                        | 6825            | <b>-8.28</b>    | -6.79           |                   |
| 8(6875 – 7125)         | 6925            | -7.15           | <b>-7.86</b>    | <b>-7.86</b>      |
|                        | 7025            | -7.09           | -7.15           |                   |
|                        | 7125            | -6.72           | -7.63           |                   |

Directional gain for the MIMO operations is determined using KDB 662911 D01 Multiple Transmitter Output section F (2)(d)(1) for *Unequal antenna gains, with equal transmit powers*. The gain is calculated using the formula for correlated transmissions across the two transmit antennas.

Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}]$  dBi.

Sample calculation for this device with  $N_{ANT} = 2$

UNII-5 band's Correlated Directional gain =  $10 \log[(10^{-6.36/20} + 10^{-5.92/20})^2 / 2] = -3.13$  dBi

“SUB2” and “SUB1” as indicated in antenna specification are written as ANT1 and ANT2 in this report.

### 5.3. DESCRIPTION OF TEST SETUP

#### SUPPORT EQUIPMENT

| Support Equipment List |              |          |               |        |
|------------------------|--------------|----------|---------------|--------|
| Description            | Manufacturer | Model    | Serial Number | FCC ID |
| Charger                | SAMSUNG      | EP-T2510 | N/A           | N/A    |
| Data Cable             | SAMSUNG      | EP-DN980 | N/A           | N/A    |

#### I/O CABLE

| I/O Cable List |          |                      |                |            |                  |         |
|----------------|----------|----------------------|----------------|------------|------------------|---------|
| Cable No.      | Port     | # of identical ports | Connector Type | Cable Type | Cable Length (m) | Remarks |
| 1              | DC Power | 1                    | C Type         | Shielded   | 1.0 m            | N/A     |

#### TEST SETUP

The EUT is a stand-alone unit during the tests.  
Test software exercised the EUT to enable NII mode.

## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| Test Equipment List           |              |            |            |            |
|-------------------------------|--------------|------------|------------|------------|
| Description                   | Manufacturer | Model      | S/N        | Cal Due    |
| Spectrum Analyzer, 44 GHz     | Agilent / HP | N9030A     | MY54170614 | 2026-07-21 |
| Spectrum Analyzer, 44 GHz     | Agilent / HP | N9030A     | MY54490312 | 2026-12-29 |
| Vector Signal Generator, 6GHz | Agilent / HP | N5182B     | MY53051241 | 2026-07-21 |
| Vector Signal Generator       | R&S          | SMW200A    | 110251     | 2026-07-22 |
| Attenuator                    | PASTERNAK    | PE7087-10  | A001       | 2026-07-22 |
| Attenuator                    | PASTERNAK    | PE7087-10  | A008       | 2026-07-22 |
| Attenuator                    | PASTERNAK    | PE7004-10  | 2          | 2026-07-22 |
| Attenuator                    | PASTERNAK    | PE7087-10  | A009       | 2026-07-22 |
| Combiner                      | WEINSCHEL    | WA1534     | UL001      | 2027-01-06 |
| Combiner                      | WEINSCHEL    | WA1534     | UL003      | 2026-12-29 |
| Combiner                      | WEINSCHEL    | WA1534     | UL004      | 2027-01-06 |
| Termination                   | WEINSCHEL    | M1406A     | T08        | 2026-07-22 |
| Attenuator                    | WEINSCHEL    | WA76-30-21 | A015       | 2026-07-22 |

## 7. SUMMARY TABLE

| FCC Part Section | Test Description            | Test Limit                                                 | Test Condition | Test Result |
|------------------|-----------------------------|------------------------------------------------------------|----------------|-------------|
| 15.407(d)(6)     | Contention Based Protocol   | EUT must detect AWGN signal with 90% (or better) certainty | Conducted      | Complies    |
| 15.407(h)(2)     | Dynamic Frequency Selection | N/A                                                        |                |             |

## 8. MEASUREMENT METHODS

Dynamic Frequency Selection: KDB 905462 D03 UNII Clients Without Radar Detection New Rules v01r02

Contention Based Protocol: KDB 987594 D02 U-NII 6 GHz EMC Measurement v03

## 9. DYNAMIC FREQUENCY SELECTION

### 9.1. OVERVIEW

#### 9.1.1. LIMITS

##### FCC

§15.407 (h), FCC KDB 905462 D02 “COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVICES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION” and KDB 905462 D03 “U-NII CLIENT DEVICES WITHOUT RADAR DETECTION CAPABILITY”.

**Table 1: Applicability of DFS requirements prior to use of a channel**

| Requirement                     | Operational Mode |                                  |                               |
|---------------------------------|------------------|----------------------------------|-------------------------------|
|                                 | Master           | Client (without radar detection) | Client (with radar detection) |
| Non-Occupancy Period            | Yes              | Not required                     | Yes                           |
| DFS Detection Threshold         | Yes              | Not required                     | Yes                           |
| Channel Availability Check Time | Yes              | Not required                     | Not required                  |
| U-NII Detection Bandwidth       | Yes              | Not required                     | Yes                           |

**Table 2: Applicability of DFS requirements during normal operation**

| Requirement                       | Operational Mode |                      |                   |
|-----------------------------------|------------------|----------------------|-------------------|
|                                   | Master           | Client (without DFS) | Client (with DFS) |
| DFS Detection Threshold           | Yes              | Not required         | Yes               |
| Channel Closing Transmission Time | Yes              | Yes                  | Yes               |
| Channel Move Time                 | Yes              | Yes                  | Yes               |
| U-NII Detection Bandwidth         | Yes              | Not required         | Yes               |

| Additional requirements for devices with multiple bandwidth modes                                                                                                                                                                                                                                                                                                                | Master Device or Client with Radar DFS | Client (without DFS)                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------------|
| U-NII Detection Bandwidth and Statistical Performance Check                                                                                                                                                                                                                                                                                                                      | All BW modes must be tested            | Not required                                         |
| Channel Move Time and Channel Closing Transmission Time                                                                                                                                                                                                                                                                                                                          | Test using widest BW mode available    | Test using the widest BW mode available for the link |
| All other tests                                                                                                                                                                                                                                                                                                                                                                  | Any single BW mode                     | Not required                                         |
| <b>Note:</b> Frequencies selected for statistical performance check (Section 7.8.4) should include several frequencies within the radar detection bandwidth and frequencies near the edge of the radar detection bandwidth. For 802.11 devices it is suggested to select frequencies in all 20 MHz channel blocks and a null frequency between the bonded 20 MHz channel blocks. |                                        |                                                      |

**Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring**

| Maximum Transmit Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Value<br>(see notes) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| E.I.R.P. $\geq$ 200 mill watt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -64 dBm              |
| E.I.R.P. < 200 mill watt and<br>power spectral density < 10 dBm/MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -62 dBm              |
| E.I.R.P. < 200 mill watt that do not meet power spectral<br>density requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -64 dBm              |
| <p><b>Note 1:</b> This is the level at the input of the receiver assuming a 0 dBi receive antenna</p> <p><b>Note 2:</b> Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.</p> <p><b>Note 3:</b> E.I.R.P. is based on the highest antenna gain. For MIMO devices refer to KDB publication 662911 D01.</p> |                      |

**Table 4: DFS Response requirement values**

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Value                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <i>Non-occupancy period</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 30 minutes                                                                                                  |
| <i>Channel Availability Check Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 60 seconds                                                                                                  |
| <i>Channel Move Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10 seconds (See Note 1)                                                                                     |
| <i>Channel Closing Transmission Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 200 milliseconds +<br>approx. 60 milliseconds<br>over remaining 10<br>second period.<br>(See Notes 1 and 2) |
| <i>U-NII Detection Bandwidth</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Minimum 100% of the U-<br>NII 99% transmission<br>power bandwidth.<br>(See Note 3)                          |
| <p><b>Note 1:</b> <i>Channel Move Time</i> and the <i>Channel Closing Transmission Time</i> should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst.</p> <p><b>Note 2:</b> The <i>Channel Closing Transmission Time</i> is comprised of 200 milliseconds starting at the beginning of the <i>Channel Move Time</i> plus any additional intermittent control signals required to facilitate a <i>Channel</i> move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.</p> <p><b>Note 3:</b> During the <i>U-NII Detection Bandwidth</i> detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.</p> |                                                                                                             |

**Table 5 – Short Pulse Radar Test Waveforms**

| Radar Type                                                                                                                                                        | Pulse Width (usec) | PRI (usec)                                                                                                                                                    | Pulses                                                                      | Minimum Percentage of Successful Detection | Minimum Trials |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------|----------------|
| 0                                                                                                                                                                 | 1                  | 1428                                                                                                                                                          | 18                                                                          | See Note 1                                 | See Note 1     |
| 1                                                                                                                                                                 | 1                  | Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in table 5a                                                                     | Roundup:<br>$\{(1/360) \times (19 \times 10^6 \text{ PRI}_{\text{usec}})\}$ | 60%                                        | 30             |
|                                                                                                                                                                   |                    | Test B: 15 unique PRI values randomly selected within the range of 518-3066 usec. With a minimum increment of 1 usec, excluding PRI values selected in Test A |                                                                             |                                            |                |
| 2                                                                                                                                                                 | 1-5                | 150-230                                                                                                                                                       | 23-29                                                                       | 60%                                        | 30             |
| 3                                                                                                                                                                 | 6-10               | 200-500                                                                                                                                                       | 16-18                                                                       | 60%                                        | 30             |
| 4                                                                                                                                                                 | 11-20              | 200-500                                                                                                                                                       | 12-16                                                                       | 60%                                        | 30             |
| Aggregate (Radar Types 1-4)                                                                                                                                       |                    |                                                                                                                                                               |                                                                             | 80%                                        | 120            |
| <b>Note 1:</b> Short Pulse Radar Type 0 should be used for the <i>Detection Bandwidth</i> test, <i>Channel Move Time</i> , and <i>Channel Closing Time</i> tests. |                    |                                                                                                                                                               |                                                                             |                                            |                |

**Table 6 – Long Pulse Radar Test Signal**

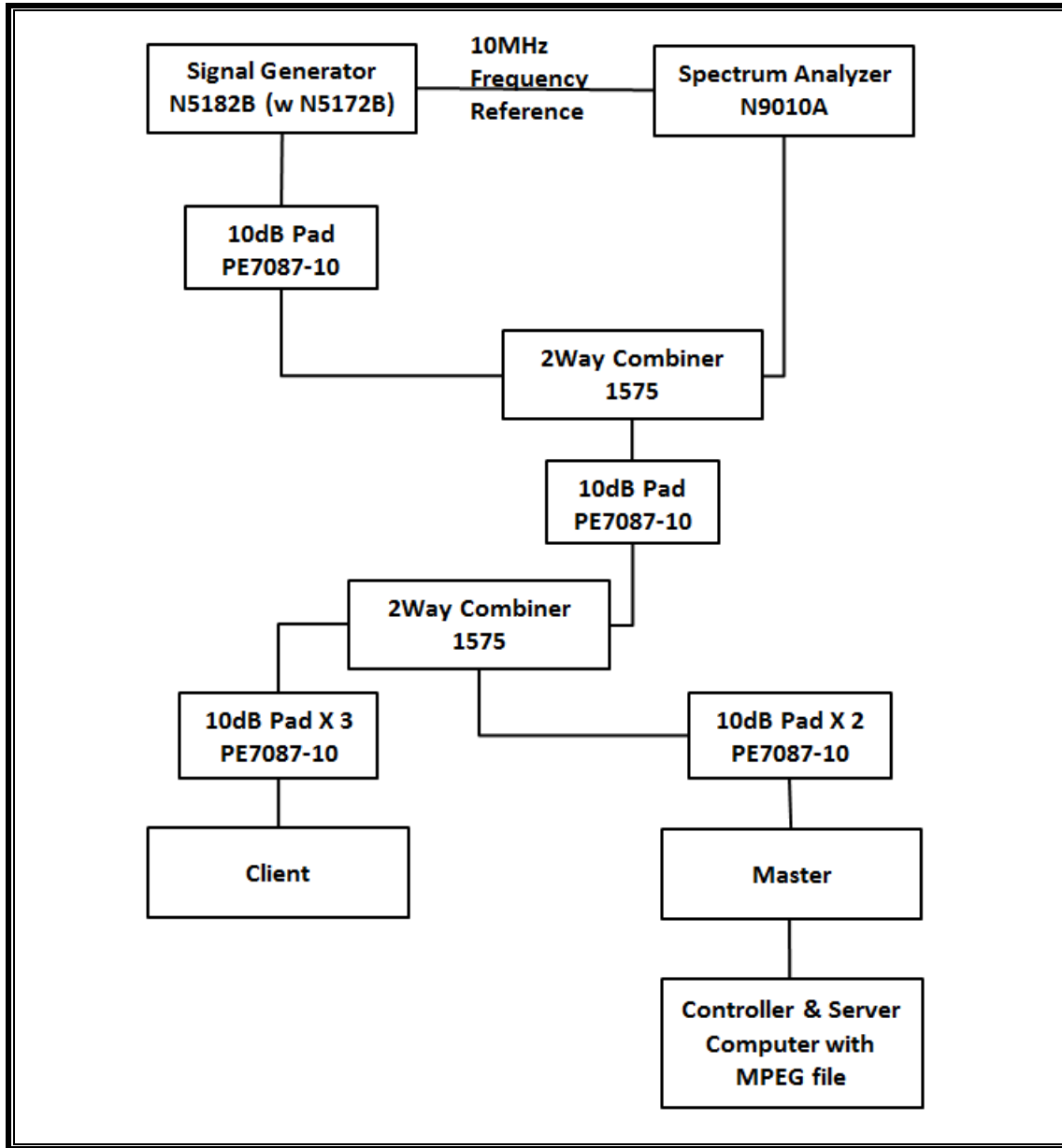
| Radar Waveform Type | Pulse Width (μsec) | Chirp Width (MHz) | PRI (μsec) | Pulses per Burst | Number of Bursts | Minimum Percentage of Successful Detection | Minimum Trials |
|---------------------|--------------------|-------------------|------------|------------------|------------------|--------------------------------------------|----------------|
| 5                   | 50-100             | 5-20              | 1000-2000  | 1-3              | 8-20             | 80%                                        | 30             |

**Table 7 – Frequency Hopping Radar Test Signal**

| Radar Waveform Type | Pulse Width (μsec) | PRI (μsec) | Pulses per Hop | Hopping Rate (kHz) | Hopping Sequence Length (msec) | Minimum Percentage of Successful Detection | Minimum Trials |
|---------------------|--------------------|------------|----------------|--------------------|--------------------------------|--------------------------------------------|----------------|
| 6                   | 1                  | 333        | 9              | 0.333              | 300                            | 70%                                        | 30             |

## 9.1.2. TEST AND MEASUREMENT SYSTEM

### CONDUCTED METHOD SYSTEM BLOCK DIAGRAM



## **SYSTEM OVERVIEW**

The short pulse and long pulse signal generating system utilizes the Keysite Signal Studio for Pulse Building as N5172B. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 1, 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of KDB 905462 D02. The frequency of the signal generator is incremented in 1 MHz steps from  $F_L$  to  $F_H$  for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

## **SYSTEM CALIBRATION**

A 50-ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to a horn antenna via a coaxial cable, with the reference level offset set to (horn antenna gain – coaxial cable loss). The signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyzer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. The Reference Level Offset of the spectrum analyzer is adjusted so that the displayed amplitude of the signal is –64 dBm.

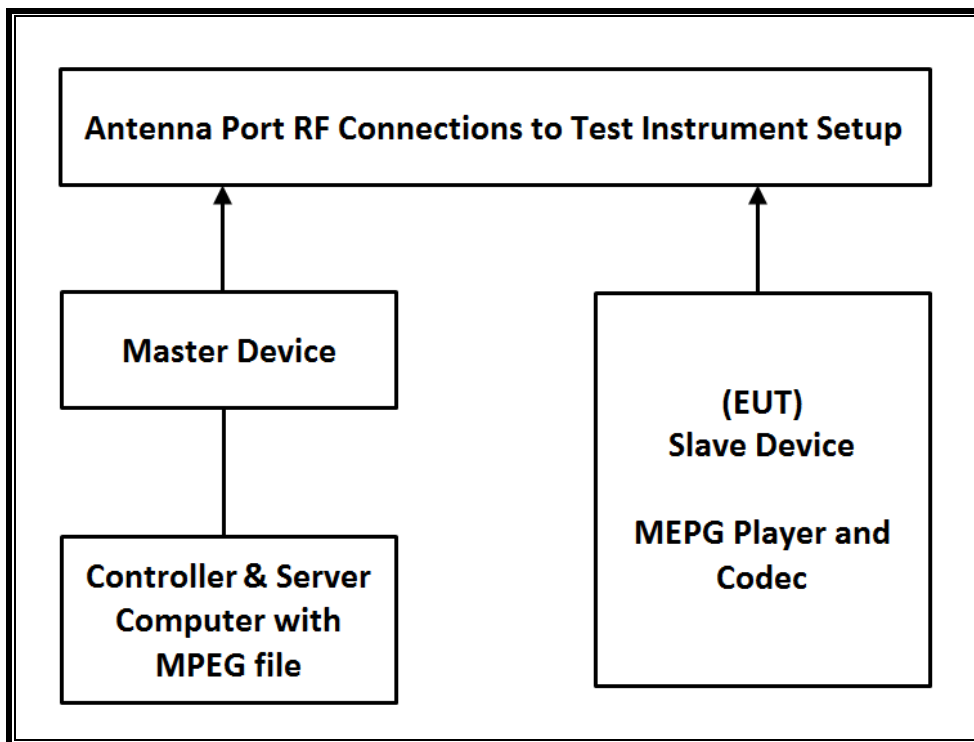
The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

### **ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL**

A link is established between the Master and Slave and the distance between the units is adjusted as needed to provide a suitable received level at the Master and Slave devices. The video test file is streamed to generate WLAN traffic. The monitoring antenna is adjusted so that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold.

### 9.1.3. SETUP OF EUT

#### CONDUCTED METHOD EUT TEST SETUP



#### SUPPORT EQUIPMENT

The following support equipment was utilized for the DFS tests documented in this report:

| PERIPHERAL SUPPORT EQUIPMENT LIST |              |                         |               |              |
|-----------------------------------|--------------|-------------------------|---------------|--------------|
| Description                       | Manufacturer | Model                   | Serial Number | FCC ID       |
| Wireless Access Point             | ASUS         | GT-AXE11000             | M3IAJF200742  | MSQ-RTAXJF00 |
| Notebook PC (Controller/Server)   | HP           | HP EliteDesk 800 G1 TWR | CZC4125J25    | DoC          |

#### **9.1.4. DESCRIPTION OF EUT**

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

The EUT is a Slave Device without Radar Detection.

The highest power level of the widest bandwidth (802.11ac VHT160) within these bands is 20.04 dBm in the 5250-5350 MHz band and 5470-5725 MHz band.

The antenna assembly utilized two antenna.

Gain of ANT1 : -6.09 dBi for UNII 2A and -7.78 dBi for UNII 2C.

Gain of ANT2 : -3.14 dBi for UNII 2A and -4.93 dBi for UNII 2C.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required conducted threshold at the antenna port is  $-64 + 1 = -63$  dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

The EUT uses one transmitter/receiver chain connected to an antenna to perform radiated tests. WLAN traffic that meets or exceeds the minimum required loading was generated by transferring a data stream from the controller/server PC to the EUT using iPerf version 2.0.5 software package.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11 architecture. 4 nominal channel bandwidth are implemented: 20 MHz, 40 MHz, 80 MHz and 160 MHz.

The software installed in the access point is 12.4(25d)JA1.

#### **UNIFORM CHANNEL SPREADING**

This requirement is not applicable to Slave radio devices.

#### **CHANNEL PUNCTURING(802.11ax)**

This EUT supports channel puncturing but in DFS test channel puncturing was not enabled.

#### **OVERVIEW OF MASTER DEVICE WITH RESPECT TO §15.407 (h) REQUIREMENTS**

The Master Device is a ASUS Access Point, FCC ID: MSQ-RTAXJF00. The minimum antenna gain for the Master Device is 6 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is -64 dBm. After correction for procedural adjustments, the required radiated threshold at the antenna port is  $-64 + 1 = -63$  dBm.

The calibrated radiated DFS Detection Threshold level is set to -64 dBm. The tested level is lower than the required level hence it provides a margin to the limit.

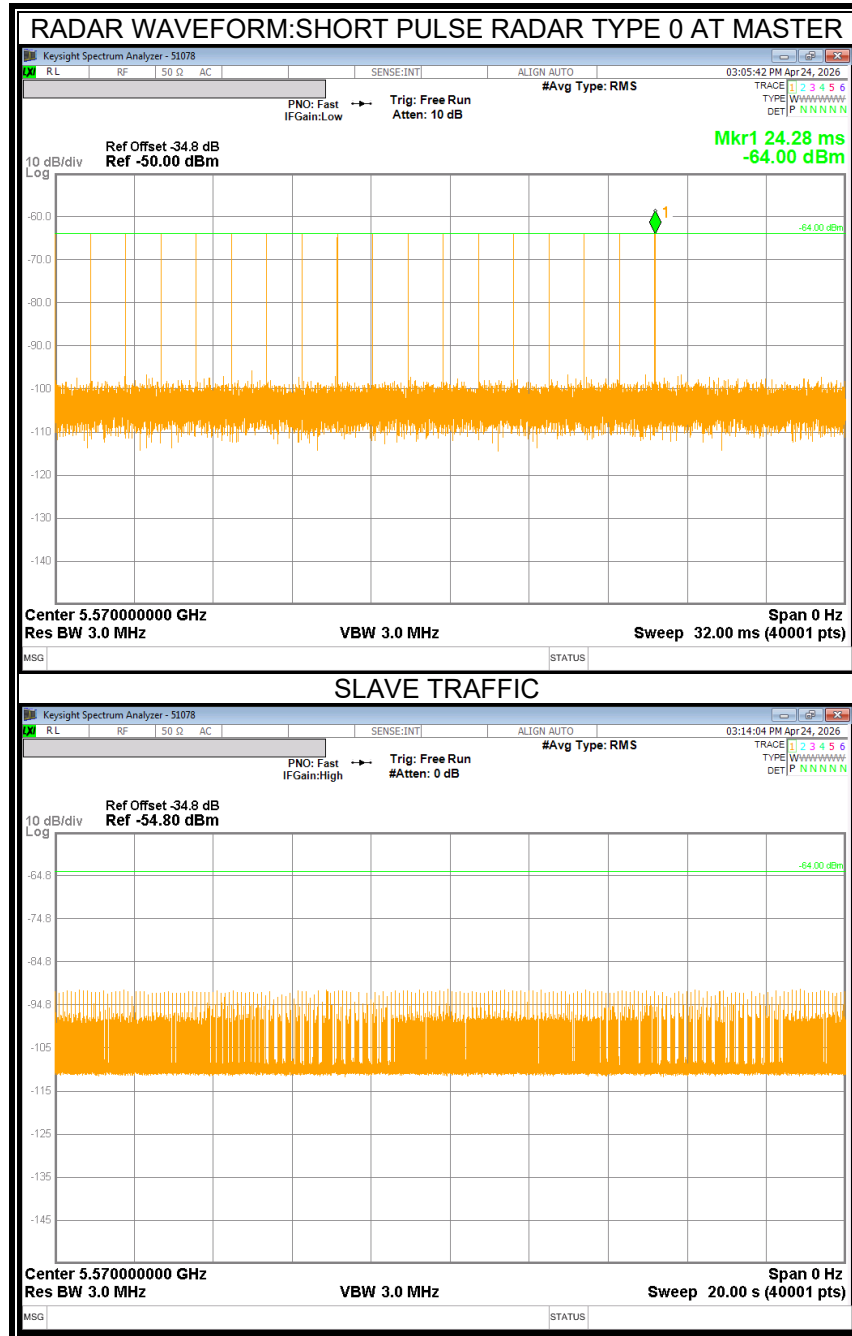
## 9.2. RESULTS FOR 160 MHz BANDWIDTH (UNII-2A & 2C BANDS)

### 9.2.1. TEST CHANNEL

All tests were performed at a channel center frequency of 5570 MHz.

### 9.2.2. RADAR WAVEFORM AND TRAFFIC

#### RADAR WAVEFORM



### 9.2.3. OVERLAPPING CHANNEL TESTS

#### RESULTS

These tests are not applicable.

### 9.2.4. MOVE AND CLOSING TIME

#### REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =  
(Number of analyzer bins showing transmission) \* (dwell time per bin)

The observation period over which the aggregate time is calculated begins at (Reference Marker + 200 msec) and ends no earlier than (Reference Marker + 10 sec).

#### RESULTS

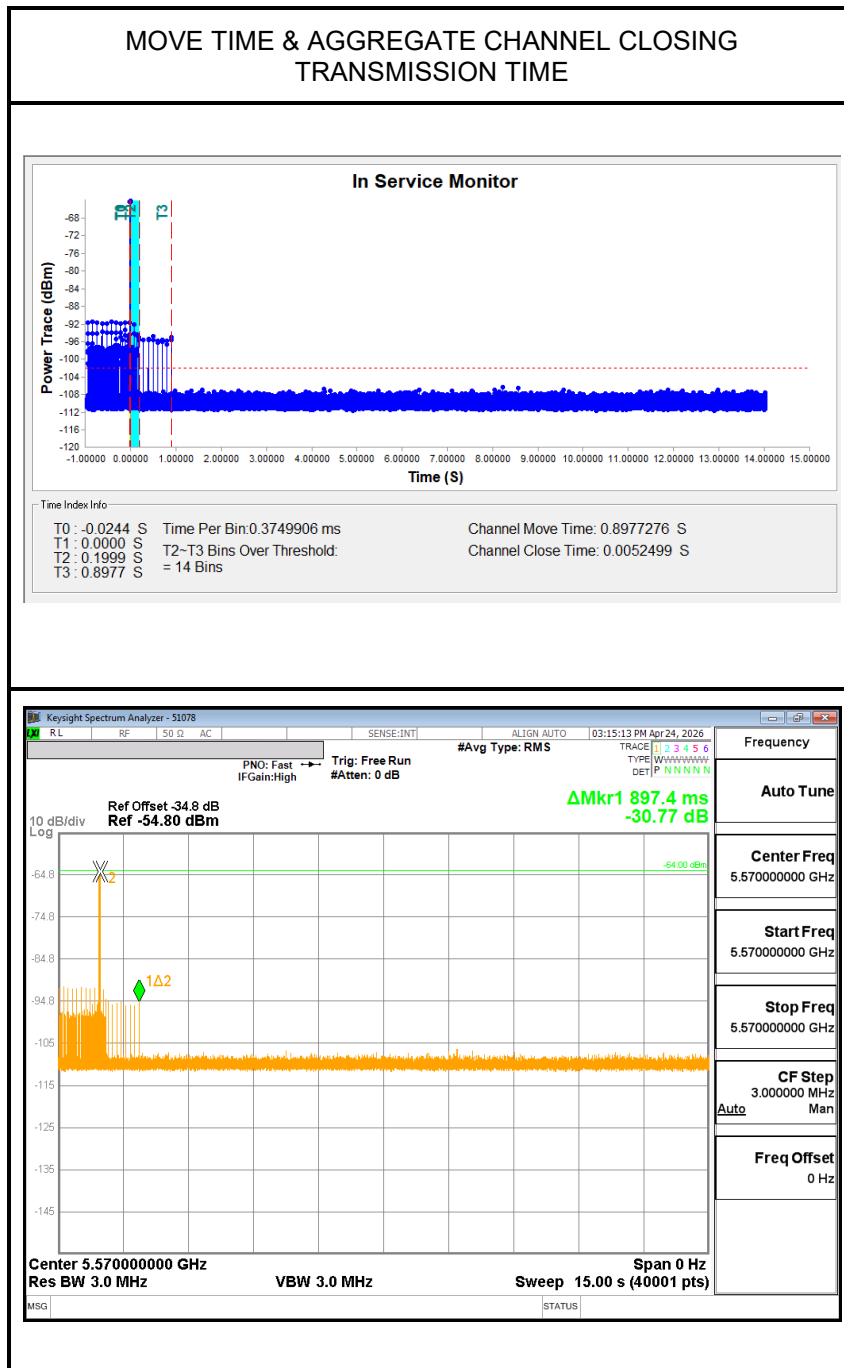
| Channel Move Time<br>(sec) | Limit<br>(sec) |
|----------------------------|----------------|
| 0.898                      | 10             |

| Aggregate Channel Closing Transmission Time<br>(msec) | Limit<br>(msec) |
|-------------------------------------------------------|-----------------|
| 5.250                                                 | 60              |

## MOVE TIME & CHANNEL CLOSING TIME

### AGGREGATE CHANNEL CLOSING TRANSMISSION TIME

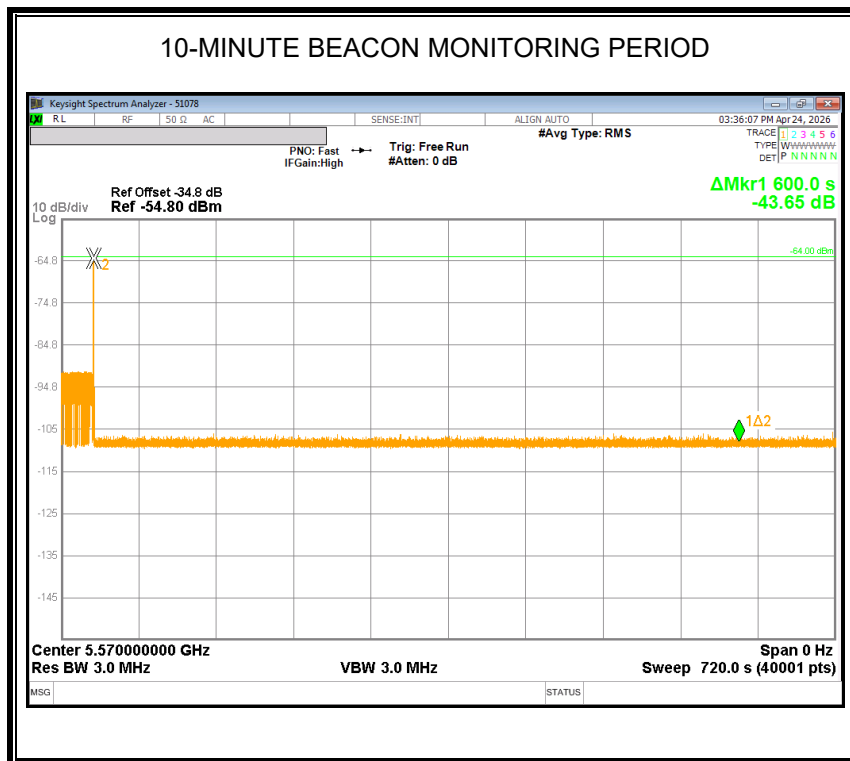
No transmissions are observed during the aggregate monitoring period.



## NON-OCCUPANCY PERIOD

## RESULTS

No EUT transmissions were observed on the test channel during the 10-minute observation time.



## 10. Contention Based Protocol

### 10.1. OVERVIEW

#### 10.1.1. LIMITS

##### FCC

§15.407 (d) (6)  
KDB 987594 D02

Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band (herein referred to as unlicensed devices) are required to use technologies that include a contention-based protocol to avoid co-channel interference with incumbent devices sharing the band. To ensure incumbent co-channel operations are detected in a technology-agnostic manner, unlicensed devices are required to detect co-channel radio frequency energy (energy detect) and avoid simultaneous transmission.

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel (in which incumbent signal is transmitted) and stay off the incumbent channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm)<sup>1</sup>. The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain.

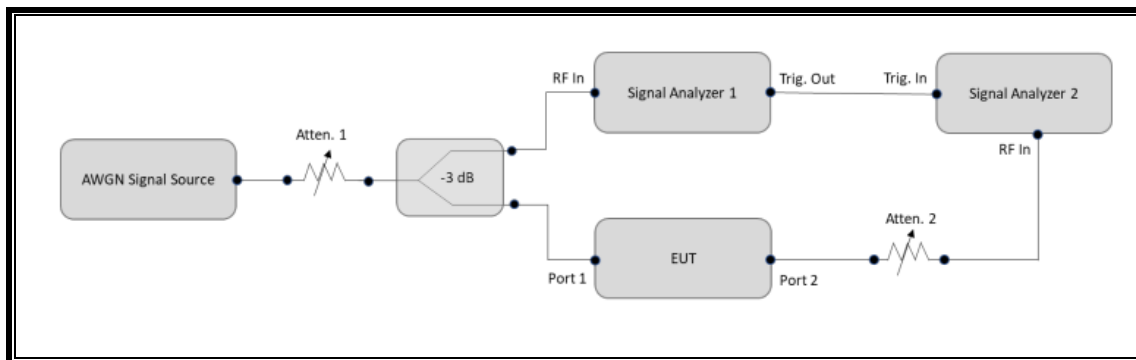
To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

##### CHANNEL PUNCTURING AND BANDWIDTH REDUCTION (802.11be)

This EUT does support channel puncturing and bandwidth reduction. Only bandwidth reduction is used to avoid the incumbent signal, channel puncturing is only used for network optimization purposes as detailed on the product operational description.

## 10.1.2. TEST AND MEASUREMENT SYSTEM

### CONDUCTED METHOD SYSTEM BLOCK DIAGRAM



### TEST SETTING

- 1) Configure the EUT to transmit with a constant duty cycle.
- 2) Set the operating parameters of the EUT including power level, operating frequency, modulation and bandwidth.
- 3) Set the signal analyzer center frequency to the nominal EUT channel center frequency. The span range of the signal analyzer shall be between two times and five times the OBW of the EUT. Connect the output port of the EUT to the signal analyzer 2, as shown in Figure 2. Ensure that the attenuator 2 provides enough attenuation to not overload the signal analyzer 2 receiver.
- 4) Monitoring the signal analyzer 2, verify the EUT is operating and transmitting with the parameters set at step two.
- 5) Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
- 6) Set the AWGN signal power to an extremely low level (more than 20 dB below the -62 dBm threshold). Connect the AWGN signal source, via a 3-dB splitter, to the signal analyzer 1 and the EUT as shown in Figure 2.
- 7) Transmit the AWGN signal (RF ON) and verify its characteristics on the signal analyzer 1.
- 8) Monitor the signal analyzer 2 to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
- 9) (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
- 10) Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 5, choose a different center frequency for the AWGN signal and repeat the process.

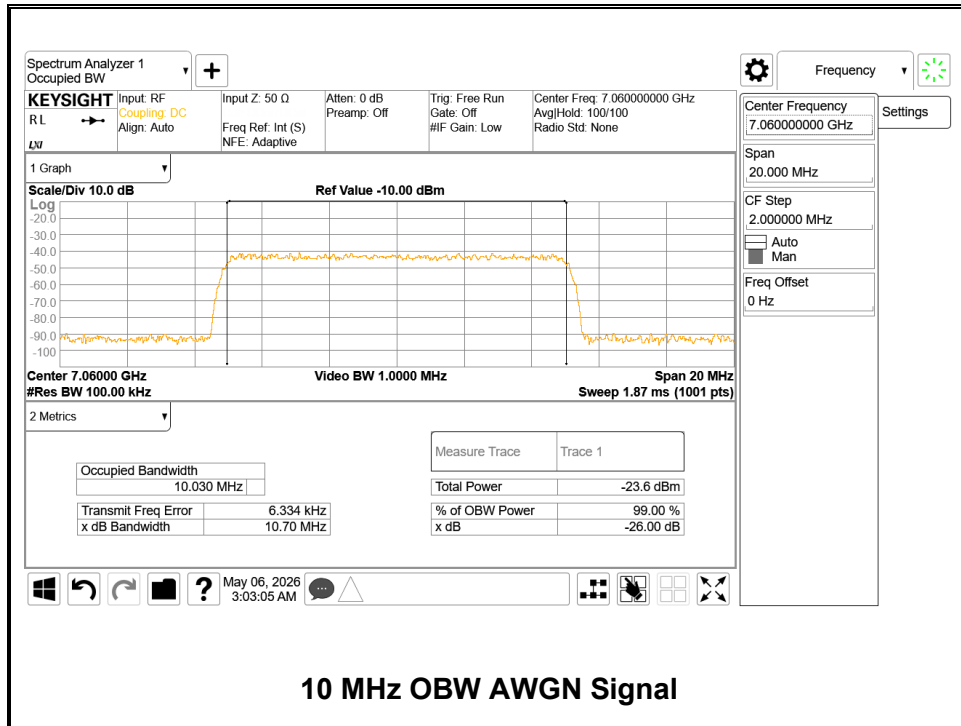
## **SUPPORT EQUIPMENT**

The following support equipment was utilized for the CBP tests documented in this report:

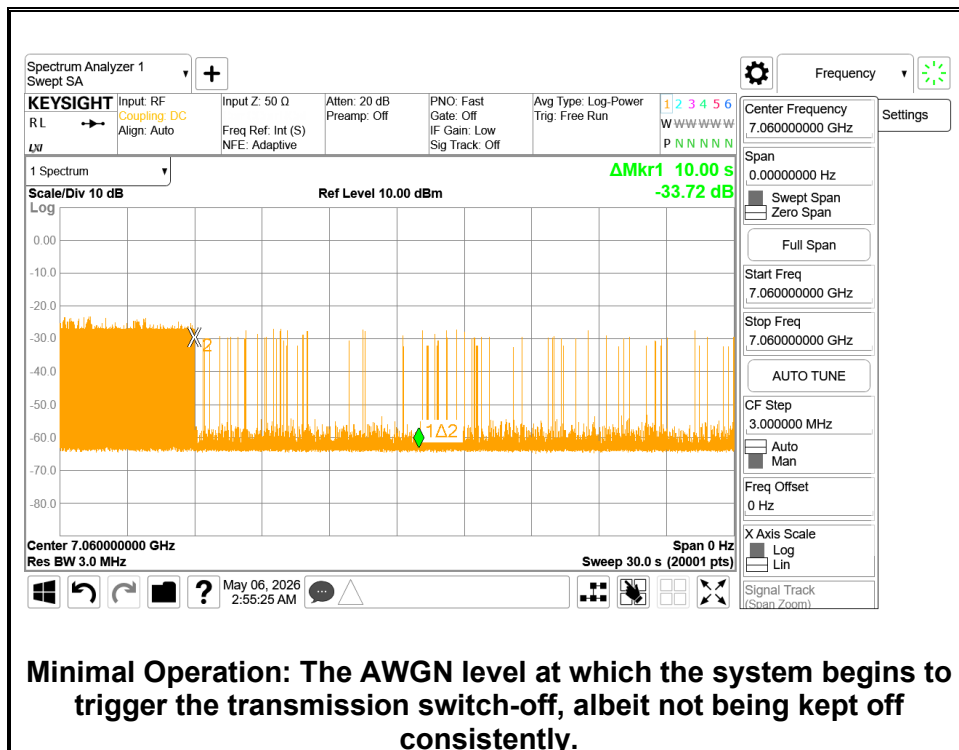
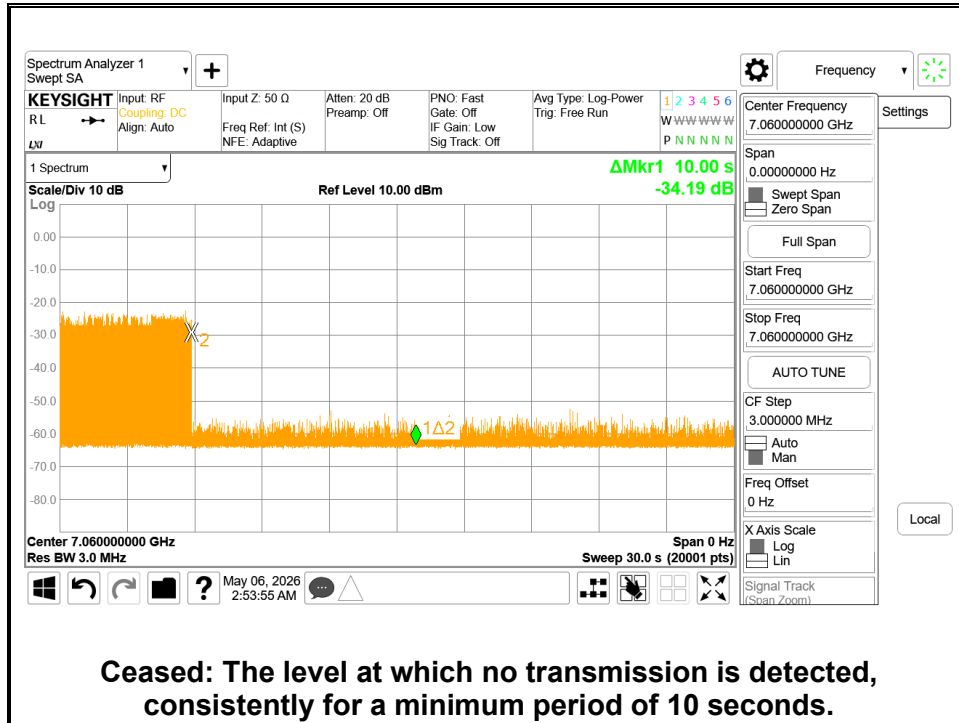
| PERIPHERAL SUPPORT EQUIPMENT LIST |              |                         |                 |              |
|-----------------------------------|--------------|-------------------------|-----------------|--------------|
| Description                       | Manufacturer | Model                   | Serial Number   | FCC ID       |
| Wireless Access Point             | ASUS         | RT-BE92U                | T6IG7L212611DY4 | MSQ-RTBE7L00 |
| Notebook PC (Controller/Server)   | HP           | HP EliteDesk 800 G1 TWR | CZC4125J25      | DoC          |

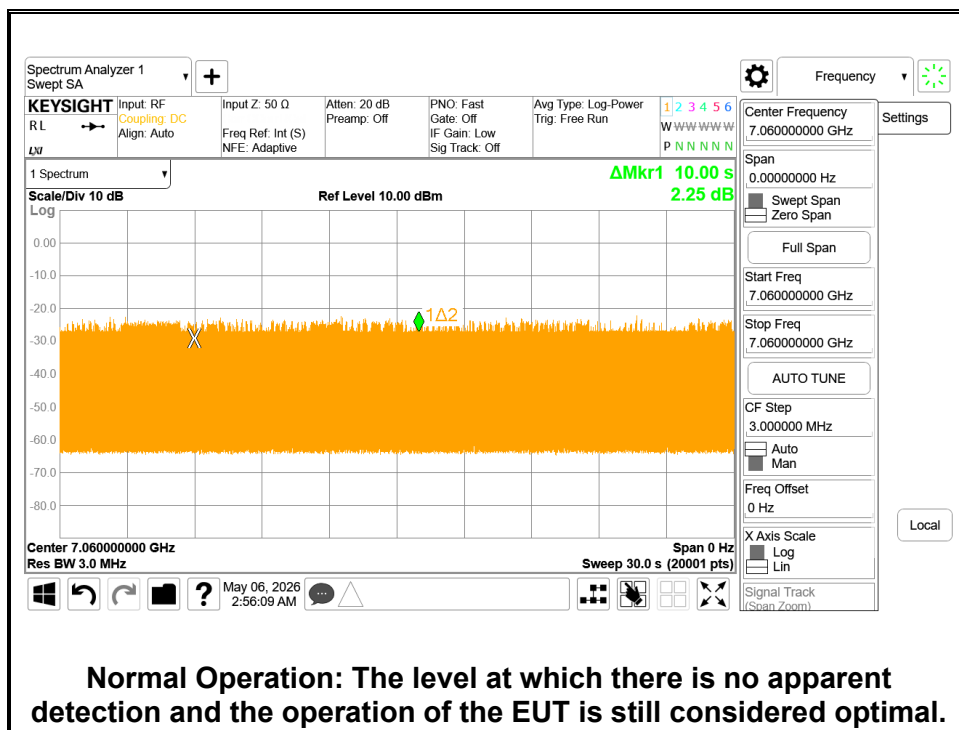
## 10.2. TEST RESULTS

### 10.2.1. AWGN Sample signal



## 10.2.2. Contention Based Protocol Timing Plot (Measurement Criteria)



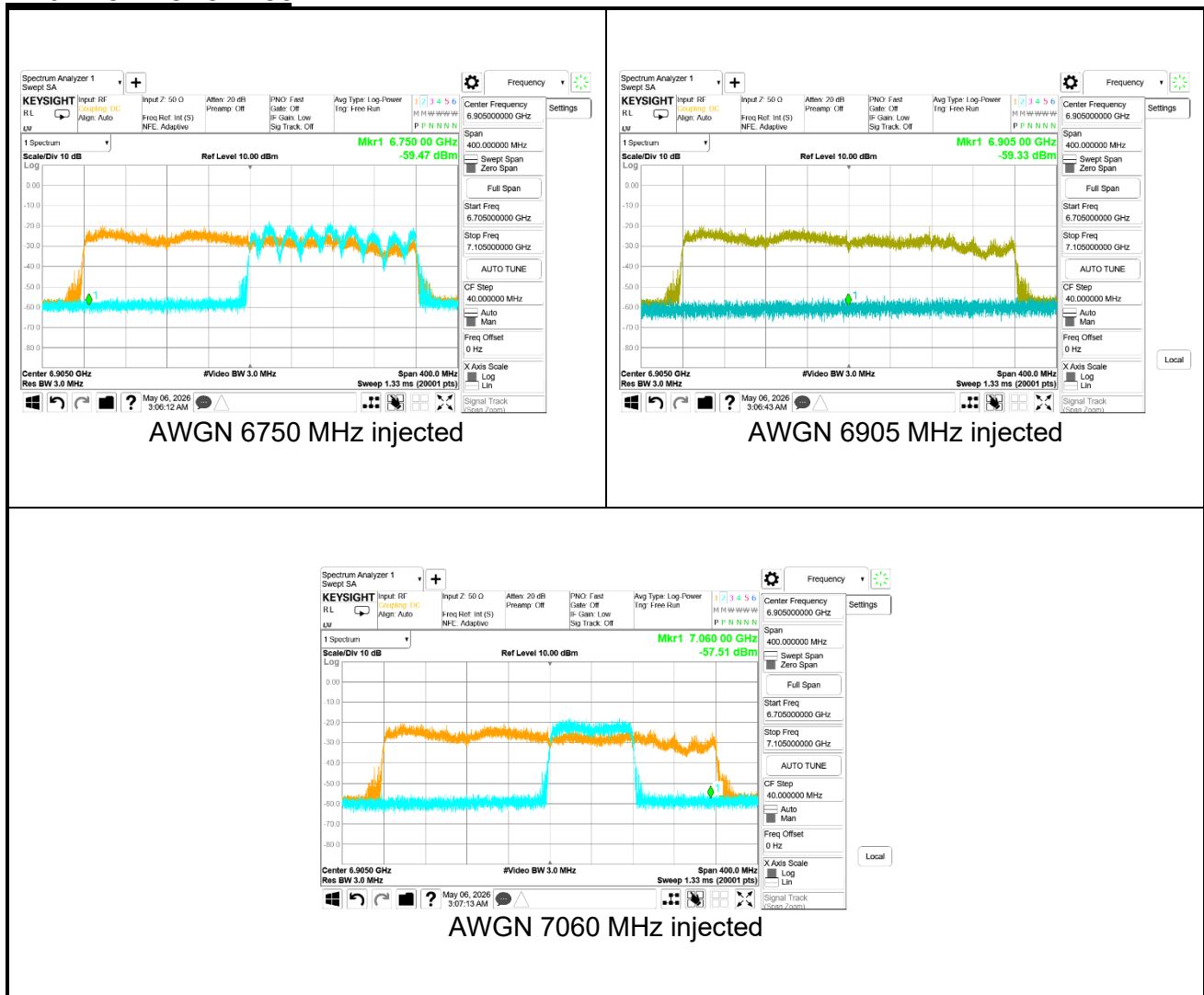


### 10.2.3. Channel Move Plots

This section demonstrates the effect of injecting the AWGN signal at various locations throughout the 802.11be 320 MHz signal. The yellow trace shows the full 320 MHz signal prior to AWGN injection while the blue trace shows the spectrum following AWGN injection. The following items were observed as demonstrated in the plot shown below:

- When a 10 MHz AWGN signal centered at 6750 MHz (lower edge of channel) is injected, only the higher sub 160 MHz bandwidth channel transmitting.
- When a 10 MHz AWGN signal centered at 6905 MHz (middle of channel) is injected, the affected channel is completely shut down.
- When a 10 MHz AWGN signal centered at 7060 MHz (upper edge of channel) is injected, only higher than middle 40 MHz channel transmitting.

#### Channel Move Plot



### 10.2.4. Contention Based Protocol – Incumbent Detection & Trial Results

| Band | Channel | Freq | BW  | Inc. Freq | Detection power level | Detection limit | Gain  | Detection limit (include Gain) | Margin | Condition |
|------|---------|------|-----|-----------|-----------------------|-----------------|-------|--------------------------------|--------|-----------|
| 5    | 85      | 6375 | 20  | 6375      | -78.86                | -62.00          | -8.68 | -70.68                         | -8.18  | Ceased    |
|      |         |      |     |           | -84.94                | -62.00          | -8.68 | -70.68                         | -14.26 | Minimal   |
|      |         |      |     |           | -86.98                | -62.00          | -8.68 | -70.68                         | -16.30 | Normal    |
|      | 63      | 6265 | 320 | 6110      | -75.97                | -62.00          | -8.68 | -70.68                         | -5.29  | Ceased    |
|      |         |      |     |           | -79.87                | -62.00          | -8.68 | -70.68                         | -9.19  | Minimal   |
|      |         |      |     |           | -86.98                | -62.00          | -8.68 | -70.68                         | -16.30 | Normal    |
|      |         |      |     | 6265      | -74.00                | -62.00          | -8.68 | -70.68                         | -3.32  | Ceased    |
|      |         |      |     |           | -78.97                | -62.00          | -8.68 | -70.68                         | -8.29  | Minimal   |
|      |         |      |     |           | -81.02                | -62.00          | -8.68 | -70.68                         | -10.34 | Normal    |
|      |         |      |     | 6420      | -78.84                | -62.00          | -8.68 | -70.68                         | -8.16  | Ceased    |
|      |         |      |     |           | -83.98                | -62.00          | -8.68 | -70.68                         | -13.30 | Minimal   |
|      |         |      |     |           | -87.00                | -62.00          | -8.68 | -70.68                         | -16.32 | Normal    |
| 6    | 101     | 6455 | 20  | 6455      | -78.98                | -62.00          | -8.68 | -70.68                         | -8.30  | Ceased    |
|      |         |      |     |           | -82.94                | -62.00          | -8.68 | -70.68                         | -12.26 | Minimal   |
|      |         |      |     |           | -86.91                | -62.00          | -8.68 | -70.68                         | -16.23 | Normal    |
|      | 95      | 6425 | 320 | 6270      | -81.06                | -62.00          | -8.68 | -70.68                         | -10.38 | Ceased    |
|      |         |      |     |           | -84.99                | -62.00          | -8.68 | -70.68                         | -14.31 | Minimal   |
|      |         |      |     |           | -88.08                | -62.00          | -8.68 | -70.68                         | -17.40 | Normal    |
|      |         |      |     | 6425      | -73.86                | -62.00          | -8.68 | -70.68                         | -3.18  | Ceased    |
|      |         |      |     |           | -76.91                | -62.00          | -8.68 | -70.68                         | -6.23  | Minimal   |
|      |         |      |     |           | -80.96                | -62.00          | -8.68 | -70.68                         | -10.28 | Normal    |
|      |         |      |     | 6580      | -80.19                | -62.00          | -8.68 | -70.68                         | -9.51  | Ceased    |
|      |         |      |     |           | -84.25                | -62.00          | -8.68 | -70.68                         | -13.57 | Minimal   |
|      |         |      |     |           | -87.17                | -62.00          | -8.68 | -70.68                         | -16.49 | Normal    |
| 7    | 149     | 6695 | 20  | 6695      | -78.99                | -62.00          | -8.28 | -70.28                         | -8.71  | Ceased    |
|      |         |      |     |           | -84.04                | -62.00          | -8.28 | -70.28                         | -13.76 | Minimal   |
|      |         |      |     |           | -87.02                | -62.00          | -8.28 | -70.28                         | -16.74 | Normal    |
|      | 159     | 6745 | 320 | 6590      | -82.11                | -62.00          | -8.28 | -70.28                         | -11.83 | Ceased    |
|      |         |      |     |           | -85.16                | -62.00          | -8.28 | -70.28                         | -14.88 | Minimal   |
|      |         |      |     |           | -87.16                | -62.00          | -8.28 | -70.28                         | -16.88 | Normal    |
|      |         |      |     | 6745      | -72.25                | -62.00          | -8.28 | -70.28                         | -1.97  | Ceased    |
|      |         |      |     |           | -76.26                | -62.00          | -8.28 | -70.28                         | -5.98  | Minimal   |
|      |         |      |     |           | -80.25                | -62.00          | -8.28 | -70.28                         | -9.97  | Normal    |
|      |         |      |     | 6900      | -77.27                | -62.00          | -8.28 | -70.28                         | -6.99  | Ceased    |
|      |         |      |     |           | -83.35                | -62.00          | -8.28 | -70.28                         | -13.07 | Minimal   |
|      |         |      |     |           | -87.34                | -62.00          | -8.28 | -70.28                         | -17.06 | Normal    |
| 8    | 197     | 6935 | 20  | 6935      | -79.28                | -62.00          | -7.86 | -69.86                         | -9.42  | Ceased    |
|      |         |      |     |           | -82.30                | -62.00          | -7.86 | -69.86                         | -12.44 | Minimal   |
|      |         |      |     |           | -86.31                | -62.00          | -7.86 | -69.86                         | -16.45 | Normal    |
|      | 191     | 6905 | 320 | 6750      | -81.21                | -62.00          | -7.86 | -69.86                         | -11.35 | Ceased    |
|      |         |      |     |           | -85.19                | -62.00          | -7.86 | -69.86                         | -15.33 | Minimal   |
|      |         |      |     |           | -88.29                | -62.00          | -7.86 | -69.86                         | -18.43 | Normal    |
|      |         |      |     | 6905      | -73.36                | -62.00          | -7.86 | -69.86                         | -3.50  | Ceased    |
|      |         |      |     |           | -76.28                | -62.00          | -7.86 | -69.86                         | -6.42  | Minimal   |
|      |         |      |     |           | -79.34                | -62.00          | -7.86 | -69.86                         | -9.48  | Normal    |
|      |         |      |     | 7060      | -80.96                | -62.00          | -7.86 | -69.86                         | -11.10 | Ceased    |
|      |         |      |     |           | -85.00                | -62.00          | -7.86 | -69.86                         | -15.14 | Minimal   |
|      |         |      |     |           | -86.94                | -62.00          | -7.86 | -69.86                         | -17.08 | Normal    |

Note. Detection limit (include gain) = Detection limit (-62 dBm) + Antenna Gain (dBi). Detection power threshold is the level of the incumbent at the antenna port and includes all losses between the signal generator and the EUT antenna port.

| band | Channel | Freq | BW  | Inc. Freq | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Detection Rate (%) |
|------|---------|------|-----|-----------|---|---|---|---|---|---|---|---|---|----|--------------------|
| 5    | 85      | 6375 | 20  | 6375      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      |         |      |     | 6110      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      | 63      | 6265 | 320 | 6265      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      |         |      |     | 6420      | O | O | O | O | O | O | O | O | O | O  | 100                |
| 6    | 101     | 6455 | 20  | 6455      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      |         |      |     | 6270      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      | 95      | 6425 | 320 | 6425      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      |         |      |     | 6580      | O | O | O | O | O | O | O | O | O | O  | 100                |
| 7    | 149     | 6695 | 20  | 6695      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      |         |      |     | 6590      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      | 159     | 6745 | 320 | 6745      | O | O | O | O | O | O | O | O | O | X  | 90                 |
|      |         |      |     | 6900      | O | O | O | O | O | O | O | O | O | O  | 100                |
| 8    | 197     | 6935 | 20  | 6935      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      |         |      |     | 6750      | O | O | O | O | O | O | O | O | O | O  | 100                |
|      | 191     | 6905 | 320 | 6905      | O | X | O | O | O | O | O | O | O | O  | 90                 |
|      |         |      |     | 7060      | O | O | O | O | O | O | O | O | O | O  | 100                |

## END OF TEST REPORT