



TESTING LABORATORY  
CERTIFICATE #4820.01



FCC PART 15.407  
RSS-247, ISSUE 2, FEBRUARY 2017  
DYNAMIC FREQUENCY SELECTION  
TEST REPORT

For

**Shenzhen Jingwah Information Technology Co., Ltd.**

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**FCC ID: RBD-S5003L**  
**IC: 20054-S5003L**

|                                        |                                                                                                                                                                                                                                                       |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Report Type:</b><br>Original Report | <b>Product Type:</b><br>Smart Phone                                                                                                                                                                                                                   |
| <b>Report Number:</b>                  | RGMA190305001-00E                                                                                                                                                                                                                                     |
| <b>Report Date:</b>                    | 2019-03-22                                                                                                                                                                                                                                            |
| <b>Reviewed By:</b>                    | Jerry Zhang<br>EMC Manager <i>Jerry Zhang</i>                                                                                                                                                                                                         |
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or  
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## GENERAL INFORMATION

### Product Description for Equipment under Test (EUT)

|                             |                |                                          |
|-----------------------------|----------------|------------------------------------------|
| <b>EUT Name:</b>            |                | Smart Phone                              |
| <b>EUT Model :</b>          |                | S5003L                                   |
| <b>Multiple Model:</b>      |                | A5000-PB                                 |
| <b>Rated Input Voltage:</b> |                | DC3.7V from Battery or DC5V from adapter |
| <b>Adapter Information</b>  | <b>Model:</b>  | TPA-95A050100UU                          |
|                             | <b>Input:</b>  | AC 100-240V, 50/60Hz, 0.15A              |
|                             | <b>Output:</b> | DC5V, 1000mA                             |
| <b>External Dimension:</b>  |                | 146mm(L)* 73mm(W)*11mm(H)                |
| <b>Serial Number:</b>       |                | 181226002                                |
| <b>EUT Received Date:</b>   |                | 2019.01.03                               |

*Note: The series product model A5000-PB is electrically identical with model S5003L, we selected S5003L for fully testing, the differences details was explained in the declaration letter.*

### Objective

This report is prepared on behalf of *Shenzhen Jingwah Information Technology Co., Ltd.* in accordance with Part 2-Subpart J, Part 15-Subparts E of the Federal Communications Commission's rules, and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada.

The objective is to determine compliance with FCC Part 15, Subpart E, section 15.407 and RSS-247, Issue 2, February 2017 of the Innovation, Science and Economic Development Canada Dynamic Frequency Selection (DFS) for devices operating in the bands 5250-5350 MHz, 5470-5725 MHz.

### Test Methodology

FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02.

### Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 897218, the FCC Designation No. : CN1220.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0022.

## SYSTEM TEST CONFIGURATION

### Description of Test Configuration

The EUT was configured for testing in an engineering mode which was provided by the manufacturer.

### EUT Exercise Software

The test was performed under: DOS command, which was provided by the manufacturer.

### Equipment Modifications

N/A

### Support Equipment List and Details

| Manufacturer | Description     | Model    | Serial Number   |
|--------------|-----------------|----------|-----------------|
| ThinkPad     | Laptop          | E450     | PF-0MR8KV 16/08 |
| Huawei       | Wireless Router | HG8245Q2 | N/A             |

Note: The mater AP model: HG8245Q2, FCC ID: QISHG8245Q2

### External Cable

| Cable Description | Shielding Type | Ferrite Core | Length (m) | From Port             | To            |
|-------------------|----------------|--------------|------------|-----------------------|---------------|
| RJ45 Cable        | No             | No           | 10         | RJ45 Port of Notebook | GPON Terminal |

## SUMMARY OF TEST RESULTS

The following result table represents the list of measurements required under the CFR §47 Part 15.407(h), RSS-247 Clause 6.3 and KDB: 905462 D02 UNII DFS Compliance Procedures New Rules v02

| Items                          | Description of Test                           | Result         |
|--------------------------------|-----------------------------------------------|----------------|
| Detection Bandwidth            | UNII Detection Bandwidth                      | Not applicable |
| Performance Requirements Check | Initial Channel Availability Check Time (CAC) | Not applicable |
|                                | Radar Burst at the Beginning of the CAC       | Not applicable |
|                                | Radar Burst at the End of the CAC             | Not applicable |
| In-Service Monitoring          | Channel Move Time                             | Compliant      |
|                                | Channel Closing Transmission Time             | Compliant      |
|                                | Non-Occupancy Period                          | Compliant      |
| Radar Detection                | Statistical Performance Check                 | Not applicable |

Note:

- 1) Not applicable: the EUT is a client unit without radar detection.

## APPLICABLE STANDARDS

### DFS Requirement

CFR §47 Part 15.407(h)&RSS-247 Clause 6.3

FCC KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

**Table 1: Applicability of DFS Requirements Prior to Use of a Channel**

| Requirement                            | Operational Mode |                                |                             |
|----------------------------------------|------------------|--------------------------------|-----------------------------|
|                                        | Master           | Client Without Radar Detection | Client With Radar Detection |
| <i>Non-Occupancy Period</i>            | Yes              | Not required                   | Yes                         |
| <i>DFS Detection Threshold</i>         | Yes              | Not required                   | Yes                         |
| <i>Channel Availability Check Time</i> | Yes              | Not required                   | Not required                |
| <i>U-NII Detection Bandwidth</i>       | Yes              | Not required                   | Yes                         |

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

| Requirement                              | Operational Mode                             |                                |
|------------------------------------------|----------------------------------------------|--------------------------------|
|                                          | Master Device or Client with Radar Detection | Client Without Radar Detection |
| <i>DFS Detection Threshold</i>           | Yes                                          | Not required                   |
| <i>Channel Closing Transmission Time</i> | Yes                                          | Yes                            |
| <i>Channel Move Time</i>                 | Yes                                          | Yes                            |
| <i>U-NII Detection Bandwidth</i>         | Yes                                          | Not required                   |

| Additional requirements for devices with multiple bandwidth modes                                                                                                                                                                                                                                                                                            | Master Device or Client with Radar Detection | Client Without Radar Detection                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------|
| <i>U-NII Detection Bandwidth and Statistical Performance Check</i>                                                                                                                                                                                                                                                                                           | All BW modes must be tested                  | Not required                                         |
| <i>Channel Move Time and Channel Closing Transmission Time</i>                                                                                                                                                                                                                                                                                               | Test using widest BW mode available          | Test using the widest BW mode available for the link |
| <i>All other tests</i>                                                                                                                                                                                                                                                                                                                                       | 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 each of the bonded 20 MHz channels and the channel center frequency. |                                              |                                                      |

**Table 3: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection**

| Maximum Transmit Power                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Value<br>(See Notes 1, 2, and 3) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| EIRP $\geq$ 200 milliwatt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -64 dBm                          |
| EIRP < 200 milliwatt and<br>power spectral density < 10 dBm/MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -62 dBm                          |
| EIRP < 200 milliwatt that do not meet the 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>Note3:</b> EIRP 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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Minimum 30 minutes                                                                                                    |
| <i>Channel Availability Check Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 60 seconds                                                                                                            |
| <i>Channel Move Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 10 seconds<br>See Note 1.                                                                                             |
| <i>Channel Closing Transmission Time</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 200 milliseconds + an<br>aggregate of 60<br>milliseconds over<br>remaining 10 second<br>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. See<br>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 (μsec) | PRI (μsec)                                                                                                                                                    | Number of Pulses                                                                                                              | Minimum Percentage of Successful Detection | Minimum Number of 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 $\left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right) \right\}$ | 60%                                        | 30                       |
|                                                                                                                                             |                    | Test B: 15 unique PRI values randomly selected within the range of 518-3066 μsec, with a minimum increment of 1 μsec, 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 detection bandwidth test, channel move time, and channel closing time tests. |                    |                                                                                                                                                               |                                                                                                                               |                                            |                          |

A minimum of 30 unique waveforms are required for each of the Short Pulse Radar Types 2 through 4. If more than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additional waveform must also be unique and not repeated from the previous waveforms. If more than 30 waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

For example if in Short Pulse Radar Type 1 Test B a PRI of 3066 usec is selected, the number of pulses

would be  $\text{Roundup} \left\{ \left( \frac{1}{360} \right) \cdot \left( \frac{19 \cdot 10^6}{3066} \right) \right\} = \text{Roundup} \{17.2\} = 18.$

**Table 5a - Pulse Repetition Intervals Values for Test A**

| <b>Pulse Repetition Frequency Number</b> | <b>Pulse Repetition Frequency (Pulses Per Second)</b> | <b>Pulse Repetition Interval (Microseconds)</b> |
|------------------------------------------|-------------------------------------------------------|-------------------------------------------------|
| 1                                        | 1930.5                                                | 518                                             |
| 2                                        | 1858.7                                                | 538                                             |
| 3                                        | 1792.1                                                | 558                                             |
| 4                                        | 1730.1                                                | 578                                             |
| 5                                        | 1672.2                                                | 598                                             |
| 6                                        | 1618.1                                                | 618                                             |
| 7                                        | 1567.4                                                | 638                                             |
| 8                                        | 1519.8                                                | 658                                             |
| 9                                        | 1474.9                                                | 678                                             |
| 10                                       | 1432.7                                                | 698                                             |
| 11                                       | 1392.8                                                | 718                                             |
| 12                                       | 1355                                                  | 738                                             |
| 13                                       | 1319.3                                                | 758                                             |
| 14                                       | 1285.3                                                | 778                                             |
| 15                                       | 1253.1                                                | 798                                             |
| 16                                       | 1222.5                                                | 818                                             |
| 17                                       | 1193.3                                                | 838                                             |
| 18                                       | 1165.6                                                | 858                                             |
| 19                                       | 1139                                                  | 878                                             |
| 20                                       | 1113.6                                                | 898                                             |
| 21                                       | 1089.3                                                | 918                                             |
| 22                                       | 1066.1                                                | 938                                             |
| 23                                       | 326.2                                                 | 3066                                            |

The aggregate is the average of the percentage of successful detections of Short Pulse Radar Types 1-4. For example, the following table indicates how to compute the aggregate of percentage of successful detections.

| <b>Radar Type</b>                                    | <b>Number of Trials</b> | <b>Number of Successful Detections</b> | <b>Minimum Percentage of Successful Detection</b> |
|------------------------------------------------------|-------------------------|----------------------------------------|---------------------------------------------------|
| 1                                                    | 35                      | 29                                     | 82.9%                                             |
| 2                                                    | 30                      | 18                                     | 60%                                               |
| 3                                                    | 30                      | 27                                     | 90%                                               |
| 4                                                    | 50                      | 44                                     | 88%                                               |
| Aggregate $(82.9\% + 60\% + 90\% + 88\%)/4 = 80.2\%$ |                         |                                        |                                                   |

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

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

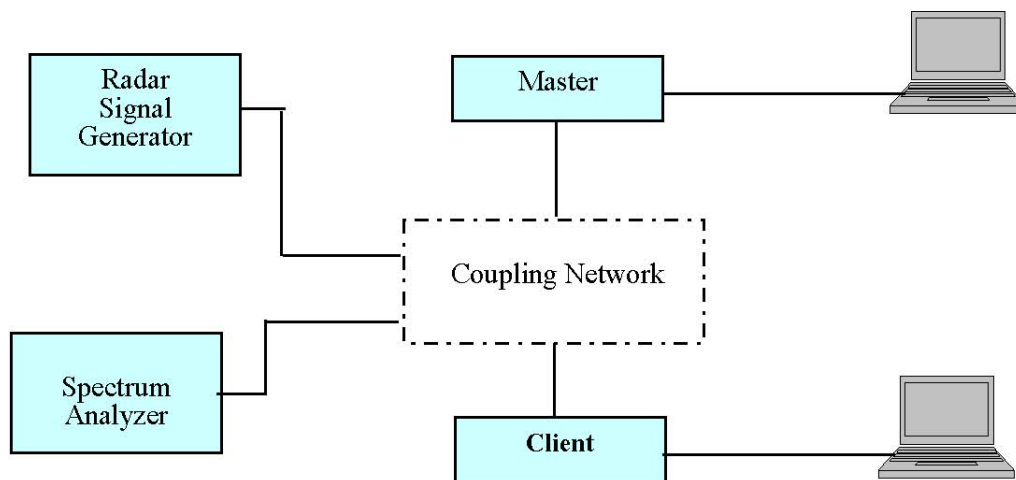
**Table 7 – Frequency Hopping Radar Test Waveform**

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

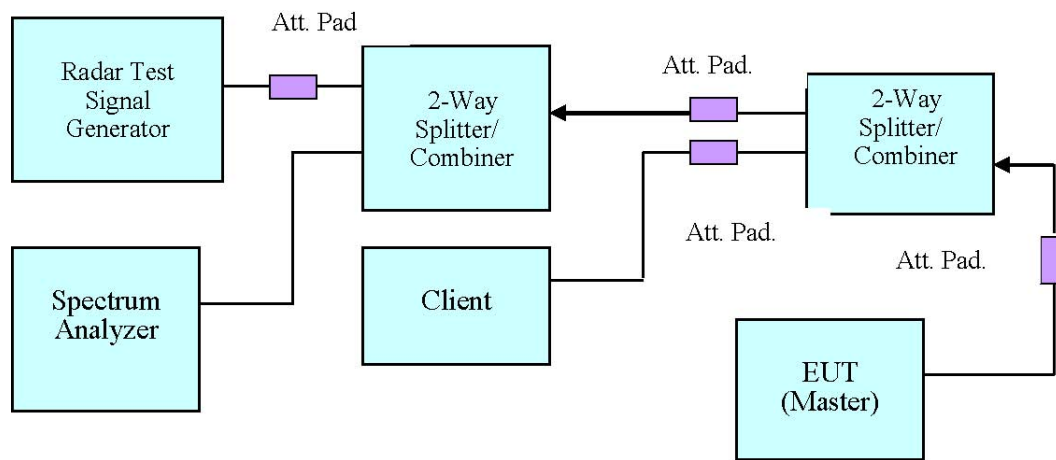
### DFS Measurement System

BACL DFS measurement system consists of two subsystems: (1) The radar signal generating subsystem and (2) the traffic monitoring subsystem.

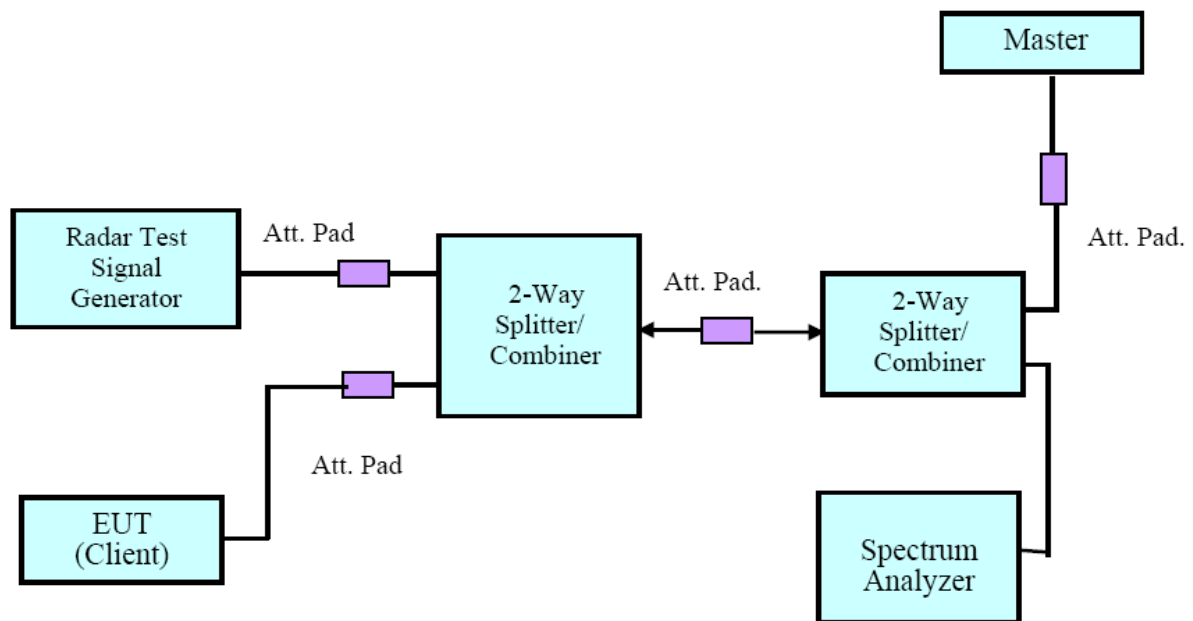
### System Block Diagram



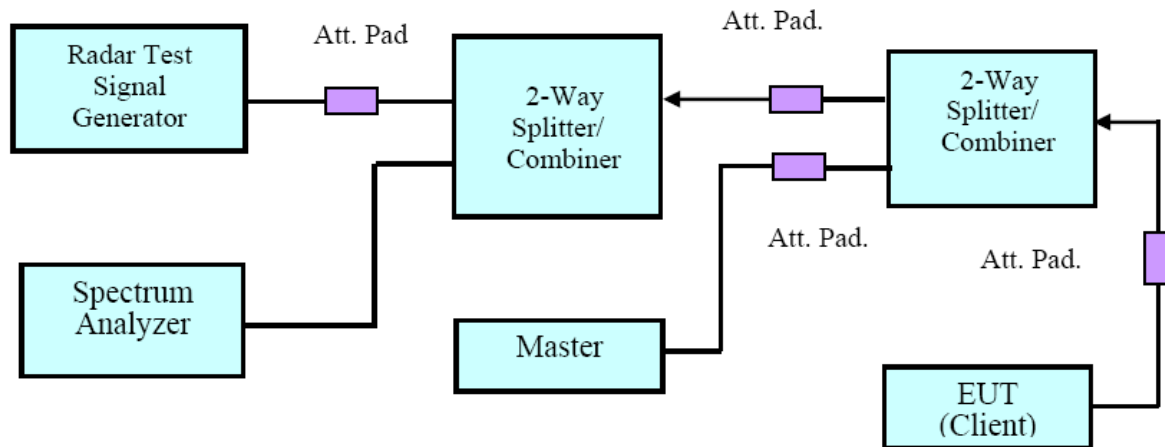
## Conducted Method



## Setup for Master with injection at the Master

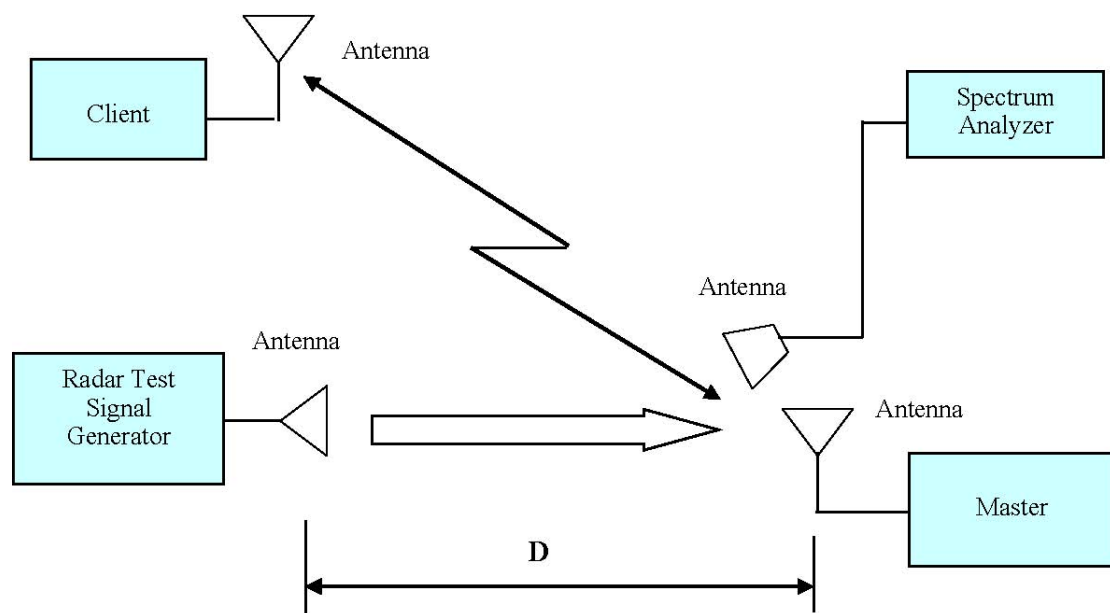


## Setup for Client with injection at the Master



**Setup for Client with injection at the Client**

### Radiated Method



### Test Procedure

A spectrum analyzer is used as a monitor verifies that the EUT status including Channel Closing Transmission Time and Channel Move Time, and does not transmit on a Channel during the Non-Occupancy Period after the diction and Channel move. It is also used to monitor EUT transmissions during the Channel Availability Check Time.

## TEST RESULTS

### Description of EUT

The calibrated radiated DFS detection threshold level is set to -64 dBm is more stringent.

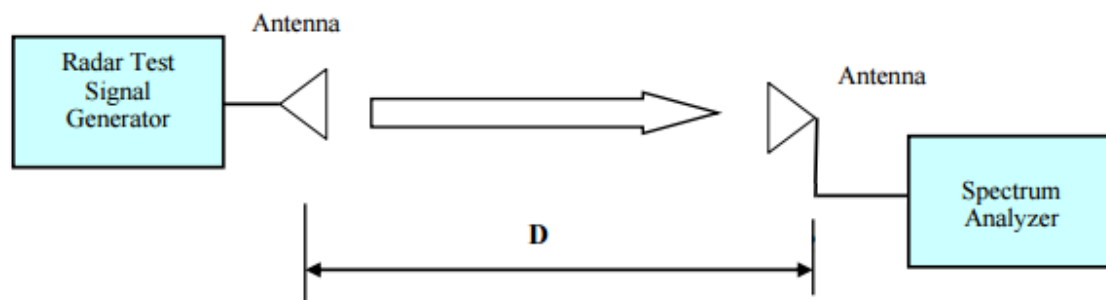
WLAN traffic is generated by software “Tfgen”, software is used by IP and Frame based systems for loading the test channel during the In-service compliance testing of the U-NII device. Datapackage streamed from the Access Point to the Client using the software “Tfgen”.

### Test Equipment List and Details

| Manufacturer         | Description                  | Model    | Serial Number | Calibration Date | Calibration Due Date |
|----------------------|------------------------------|----------|---------------|------------------|----------------------|
| National Instruments | NI PXI-1042 8-Slot chassis   | PXI-1042 | VOBX40FBD     | N/A              | N/A                  |
| National Instruments | Arbitrary Waveform Generator | PXI-5421 | N/A           | N/A              | N/A                  |
| National Instruments | RF Upconverter               | PXI-5610 | N/A           | N/A              | N/A                  |
| ASCOR                | Upconverter                  | AS-7202  | N/A           | N/A              | N/A                  |
| Agilent              | Spectrum Analyzer            | E4440A   | SG43360054    | 2019-01-04       | 2020-01-04           |
| Ditorn               | Splitter/Combiner            | D3C4080  | SN2244        | N/A              | N/A                  |
| TDK RF               | horn antenna                 | HRN-0118 | 130 084       | 2019-01-05       | 2022-01-04           |
| ETS LINDGREN         | horn antenna                 | 3115     | 000 527 35    | 2019-01-05       | 2022-01-04           |

**\* Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

## Radar Waveform Calibration



**Radiated Calibration Setup Block Diagram**

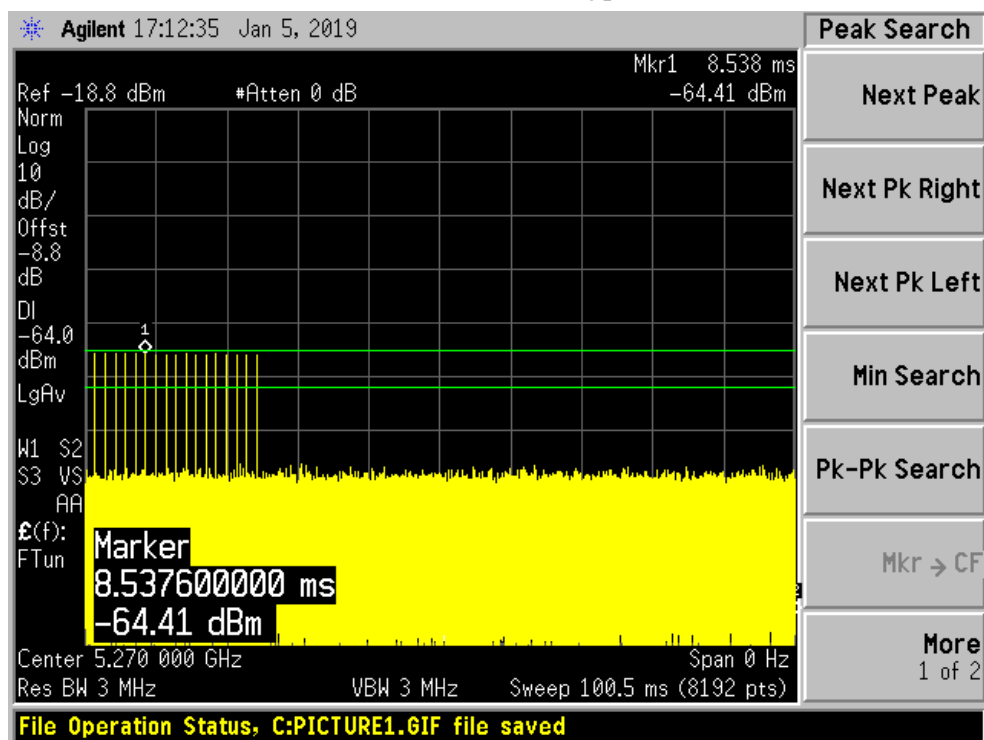
## Test Environmental Conditions

|                           |           |
|---------------------------|-----------|
| <b>Temperature:</b>       | 25.2 °C   |
| <b>Relative Humidity:</b> | 44 %      |
| <b>ATM Pressure:</b>      | 101.6 kPa |

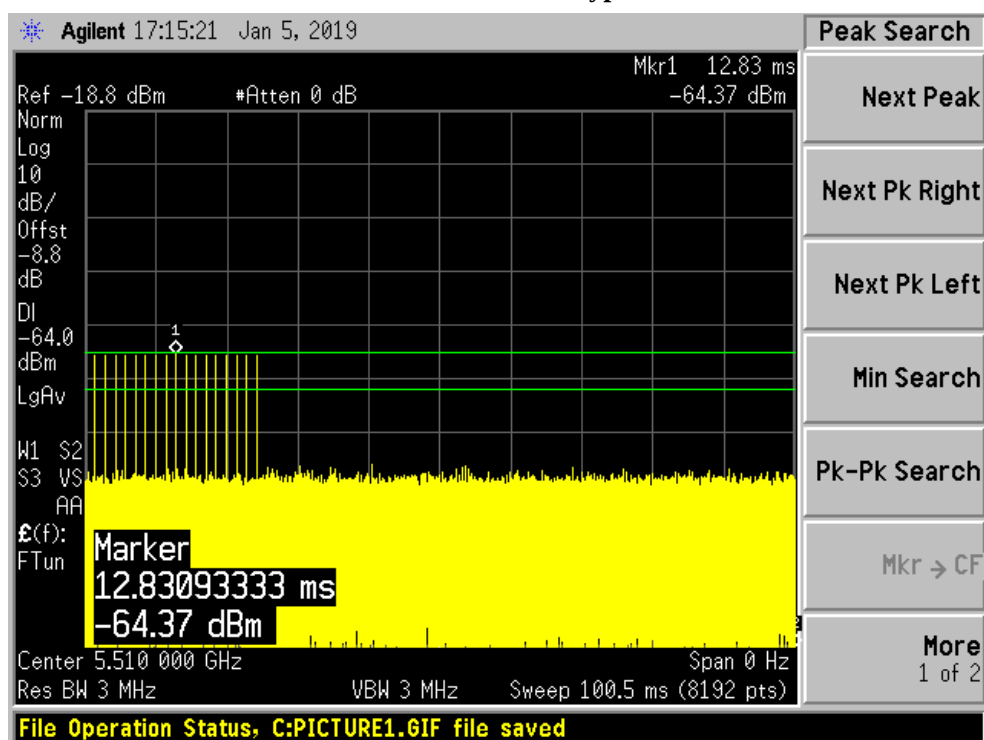
*The testing was performed by Elena Lei and Tiago Huang on 2019-01-05.*

Plots of Radar Waveforms

## 5270 MHz: Radar Type 0



## 5510 MHz: Radar Type 0



## CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

### Test Procedure

Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. repeat using a long pulse radar type5 waveform.

The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel 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.

The aggregate channel closing transmission time is calculated as follows:

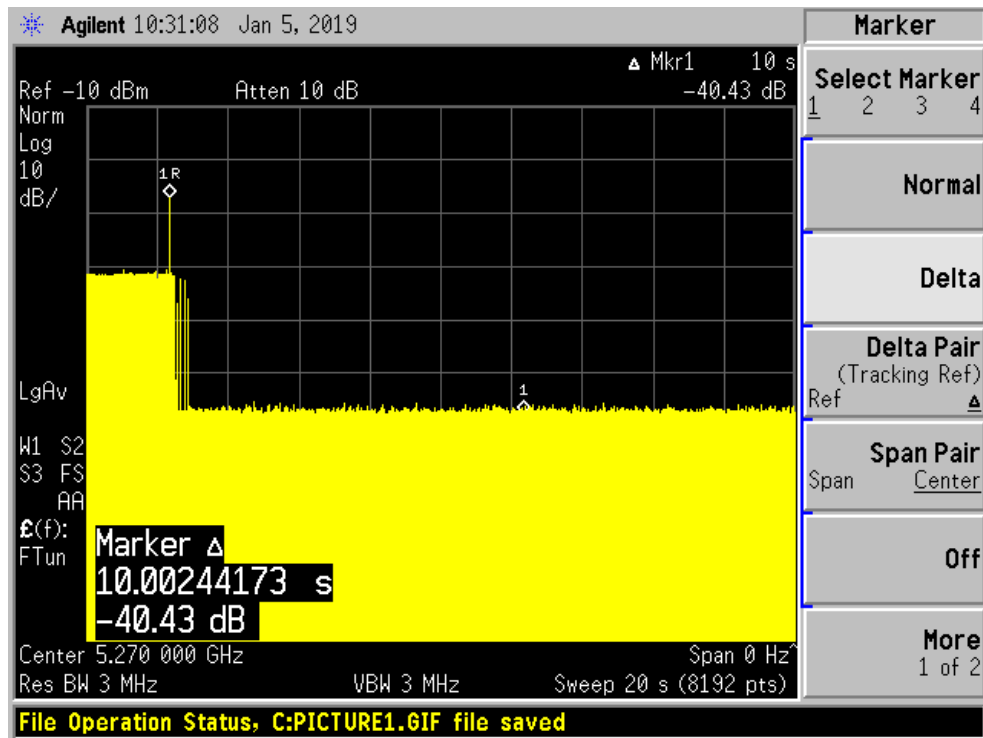
Aggregate Transmission Time =  $N \times \text{Dwell Time}$

N is the number of spectrum analyzer bins showing a device transmission Dwell Time is the dwell time per bin (i.e.  $\text{Dwell Time} = S/B$ , S is the sweep time and B is the number of bin, i.e. 8192)

### Test Results

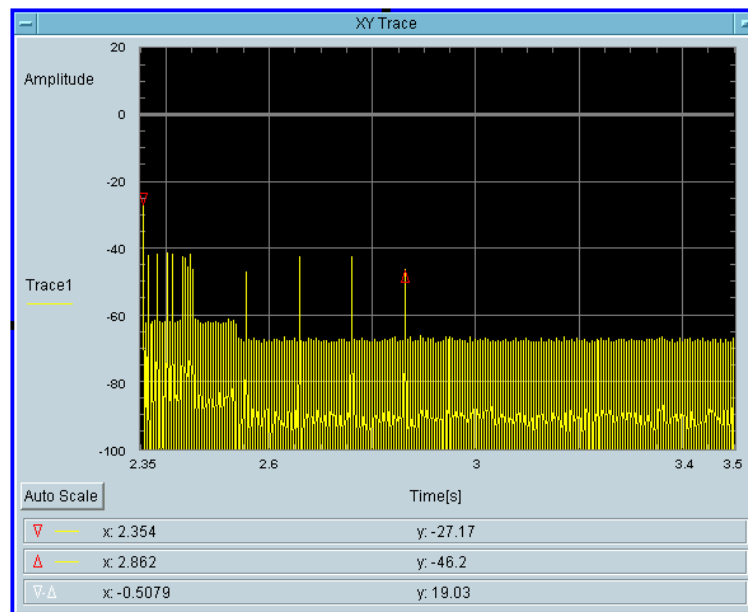
| Frequency (MHz) | Bandwidth (MHz) | Radar Type | Results   |
|-----------------|-----------------|------------|-----------|
| 5270            | 40              | Type 0     | Compliant |
| 5510            | 40              | Type 0     | Compliant |

Please refer to the following tables and plots.

**5270 MHz**Type 0 radar channel move time result:

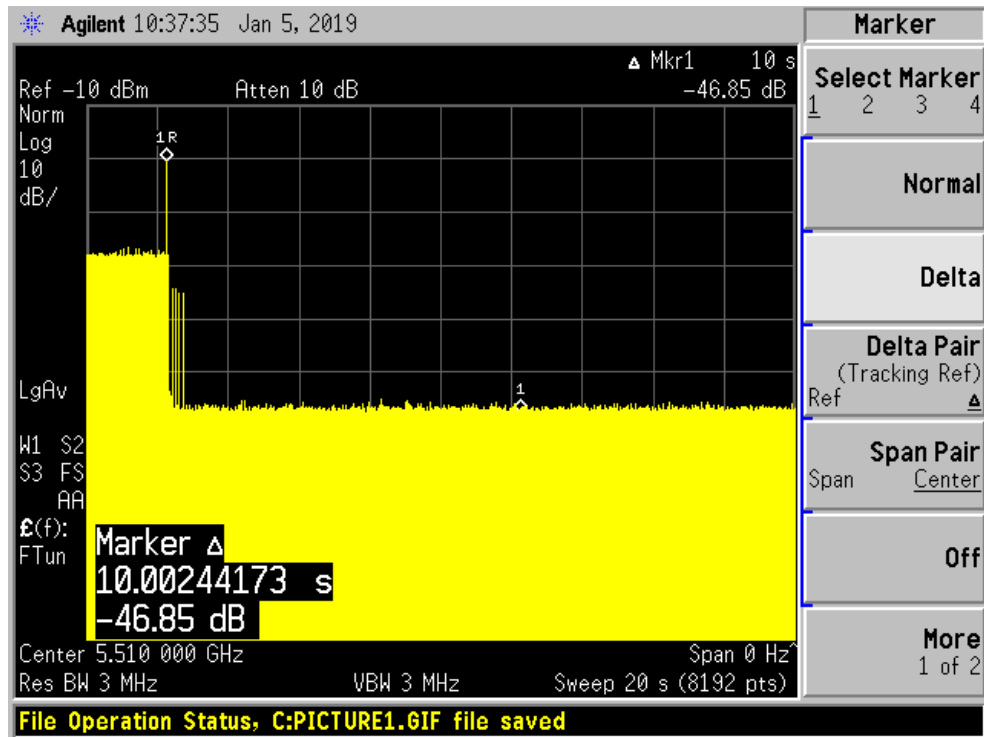
Type0 radar channel closing transmission time result:

| Transmission After 200ms | Aggregate Transmission Time After 200ms Delay (ms) | Limit for Aggregate Transmission Time After 200ms Delay (ms) | Result |
|--------------------------|----------------------------------------------------|--------------------------------------------------------------|--------|
| Yes                      | 4.883                                              | 60                                                           | Pass   |



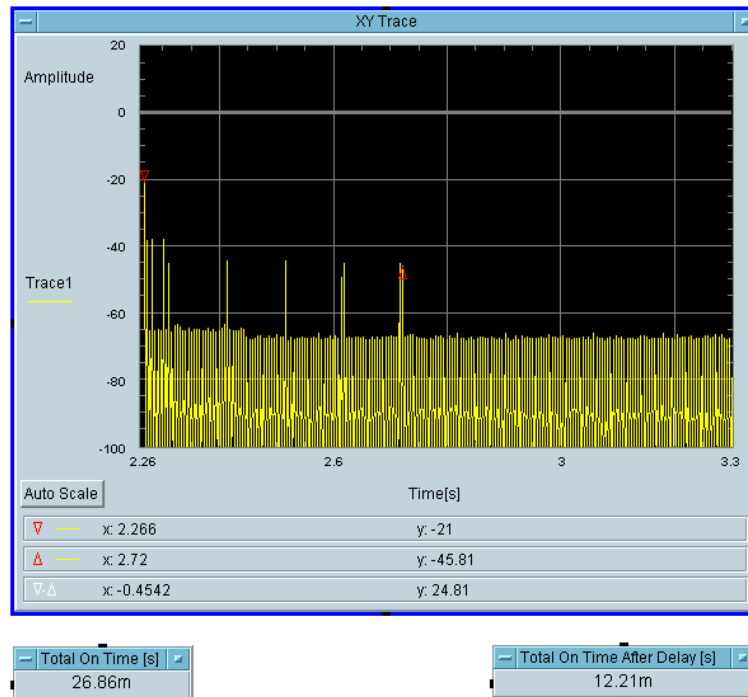
Total On Time [s]  
34.18m

Total On Time After Delay [s]  
9.766m

**5510 MHz**Type 0 radar channel move time result:

Type0 radar channel closing transmission time result:

| Transmission After 200ms | Aggregate Transmission Time After 200ms Delay (ms) | Limit for Aggregate Transmission Time After 200ms Delay (ms) | Result |
|--------------------------|----------------------------------------------------|--------------------------------------------------------------|--------|
| Yes                      | 7.324                                              | 60                                                           | Pass   |



## NON-OCCUPANCY PERIOD

### Test Procedure

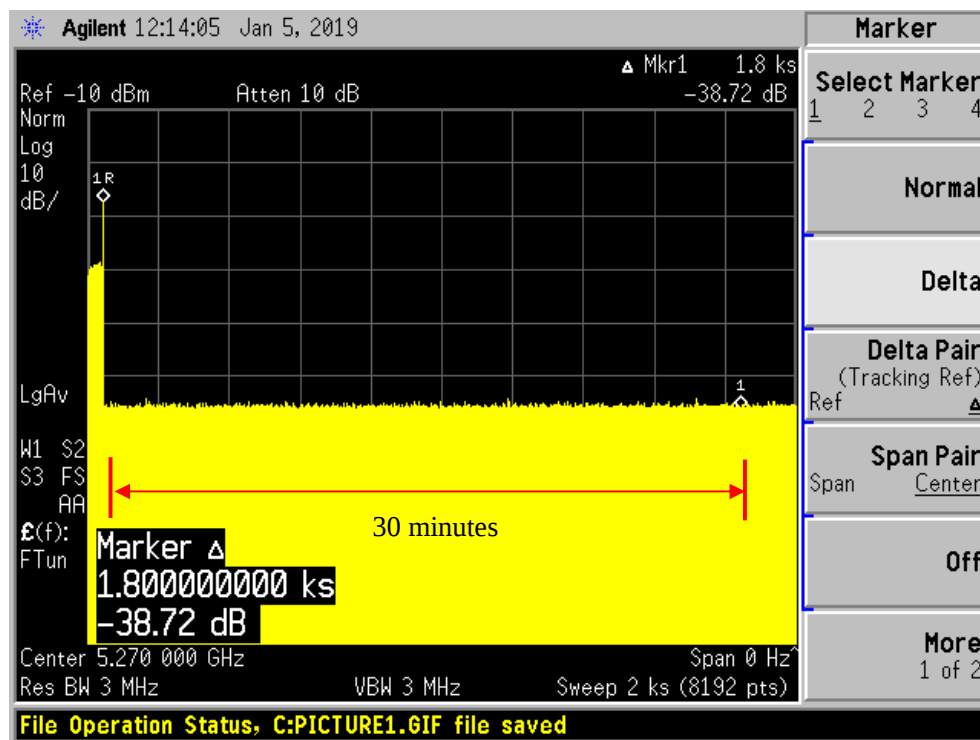
Measure the EUT for more than 30 minutes following the channel close/move time to verify that the EUT does not resume any transmissions on this channel. Provide one plot to demonstrate no transmission on the channel for the non-occupancy period (30 minutes observation time)

### Test Result

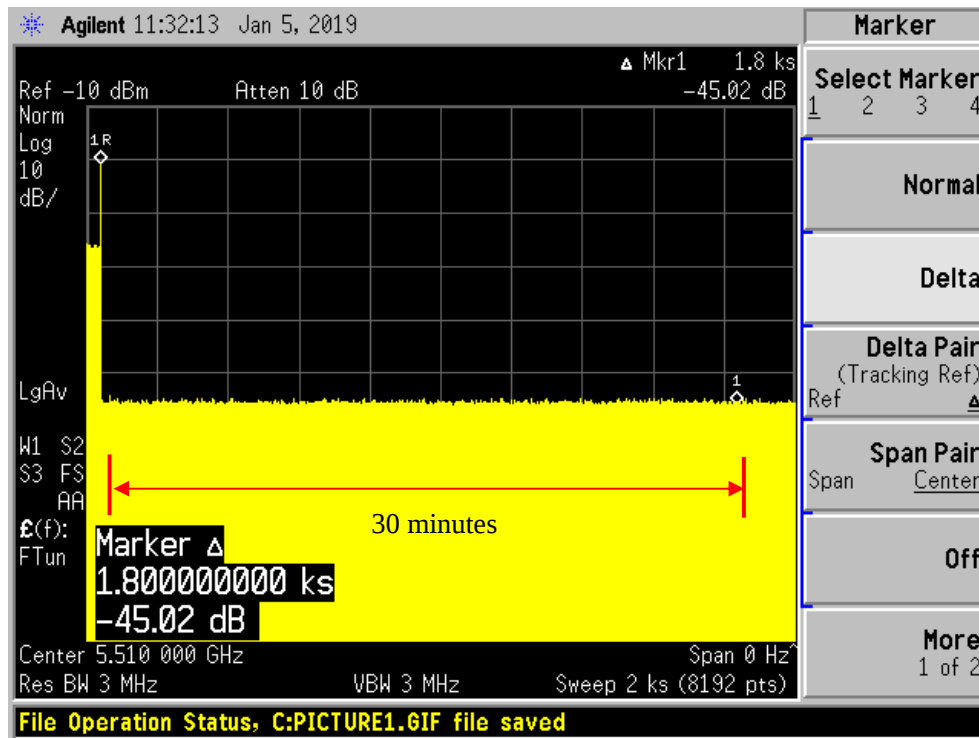
| Frequency(MHz) | Bandwidth (MHz) | Spectrum Analyzer Display         |
|----------------|-----------------|-----------------------------------|
| 5270           | 40              | No transmission within 30 minutes |
| 5510           | 40              | No transmission within 30 minutes |

Please refer to the following plots.

5270 MHz



5510 MHz



\*\*\*\*\* END OF REPORT \*\*\*\*\*