# TEST REPORT

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|---|---|---|

1. Customer
   - Name : LG Electronics USA, Inc.
   - Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey 07632
2. Use of Report : FCC & IC Original Grant
3. Product Name (FCC ID / IC): RF Module (BEJLGSWFAC73 / 2703H-LGSWFAC73)
4. Date of Test : 2016.06.22 ~ 2016.07.21
5. Test Method Used : FCC Part 15.407
   RSS-247 Issue 1 (2015-05), RSS-GEN Issue 4 (2014-11)
6. Testing Environment : See appended test report
7. Test Result : ☒ Pass ☐ Fail

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

| Affirmation | Tested by<br>Name : JungWoo Kim (Signature) | Technical Manager<br>Name : GeunKi Son (Signature) |
|---|---|---|

**2016 . 07 . 22 .**

**DT&C Co., Ltd.**

* If this test report is required to confirmation of authenticity, please contact to report@dtnc.net

# Test Report Version

| Test Report No. | Date | Description |
|---|---|---|
| DRTFCC1607-0105 | Jul. 22, 2016 | Initial issue |
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# 1. EUT DESCRIPTION

| | | | |
|---|---|---|---|
| **FCC equipment class** | Unlicensed National Information Infrastructure (UNII) | | |
| **Product** | RF Module | | |
| **Model name** | LGSWFAC73 | | |
| **Add model name** | N.A | | |
| **Hardware version** | 1.0 | | |
| **Software version** | 1.0 | | |
| **EUT capabilities** | DFS | | |
| **Power supply** | DC 3.3 V | | |
| **Test condition** | ☒ Conducted | ☐ Radiated | |
| **Channel bandwidth** | 802.11a/n: 20 MHz | | |
| | 802.11n: 40 MHz | | |
| | 802.11ac: 80 MHz | | |
| **Frequency Range** | **U-NII 2A(5250 ~ 5350 MHz)**<br>▪ 802.11a/n(HT20)/ac(VHT20): 5260 ~ 5320 MHz<br>▪ 802.11n(HT40)/ac(VHT40): 5270 ~ 5310 MHz<br>▪ 802.11ac(VHT80): 5290 MHz<br>**U-NII 2C(5470 ~ 5725 MHz)**<br>▪ 802.11a/n(HT20)/ac(VHT20): 5500 ~ 5720 MHz<br>▪ 802.11n(HT40)/ac(VHT40): 5510 ~ 5710 MHz<br>▪ 802.11ac(VHT80): 5530, 5690 MHz | | |
| **Modulation type** | OFDM | | |
| **Operational mode** | ☐ Master mode<br>☒ Client mode without radar detection<br>☐ Client mode with radar detection | | |
| **Antenna specification** | Antenna type: FPCB wireless Antenna | | |
| | Antenna gain | U-NII-2A | ANT 1: 0.62 dBi & ANT 2: 1.10 dBi |
| | | U-NII-2C | ANT 1: 0.92 dBi & ANT 2: -0.60 dBi |

Note1: The above EUT information was declared by the manufacturer.
Note2: Refer to UNII report

## 1.1. Auxiliary equipment

| Equipment | Model No. | Serial No. | Manufacturer | Note |
|---|---|---|---|---|
| Access Point (Master) | DIR-868L | R3X81E6000093 | D-Link | FCCID: RRK2012060056-1 |
| - | - | - | - | - |

# 2. DYNAMIC FREQUENCY SELECTION TEST DESCRIPTION

## 2.1. 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 |

## 2.2. Applicability of DFS requirements during normal operation

| Requirement | Operational mode | |
|---|---|---|
| | Master or client with radar detection | Client without radar detection |
| DFS Detection Threshold | Yes | Not required |
| Channel Closing Transmission Time | Yes | Yes |
| Channel Move time | Yes | Yes |
| U-NII Detection Bandwidth | Yes | Not required |

| Additional requirements for devices with multiple bandwidth modes | Operational mode | |
|---|---|---|
| | Master or client with radar detection | Client without radar detection |
| 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 |
| **Note:** 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. | | |

The EUT was tested according to the following specification:
**905462 D02 UNII DFS Compliance Procedure New Rules v02**

## 2.3. Requirements of client devices

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.

b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.

c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.

d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.

e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.

## 2.4. DFS response requirement values

| Parameter | Value |
|---|---|
| Non-occupancy period | Minimum 30 minutes |
| Channel availability check time | 60 seconds |
| Channel move time | 10 seconds<br>See Note 1. |
| Channel closing transmission time | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2. |
| **Note 1**: 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.<br>**Note 2**: 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.. | |

## 2.5. DFS detection thresholds

Below provides the DFS Detection Thresholds for Master Devices as well as Client Devices incorporating In-Service Monitoring.

| **Maximum Transmit Power** | **Value** **(See Notes 1, 2, and 3)** |
|---|---|
| EIRP ≥ 200 milliwatt | -64 dBm |
| EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz | -62 dBm |
| EIRP < 200 milliwatt that do not meet the power spectral density requirement | -64 dBm |

**Note 1**: This is the level at the input of the receiver assuming a 0 dBi receive antenna.

**Note 2**: 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.

**Note3**: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.

## 2.6. 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 section 2.6.2. | $\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{PRI_{\mu sec}}\right)\right\}$ | 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 |

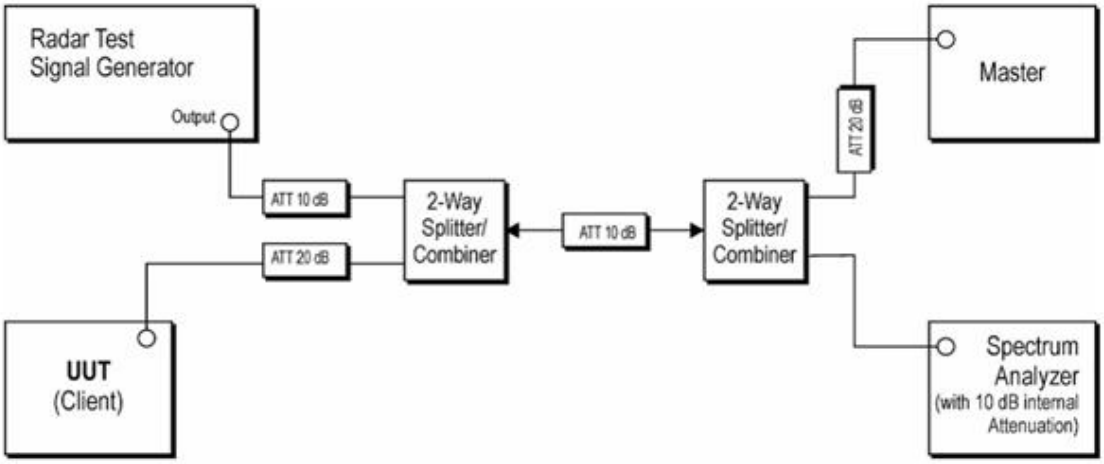
**Note 1**: As the EUT is a Client Device with no Radar Detection only one type radar pulse is required for the testing. Radar Pulse type 0 was used in the evaluation of the Client device for the purpose of measuring the Channel Move Time and the Channel Closing Transmission Time.

**Note 2**: This report was applied Short Pulse Radar Type 0.

# 3. Test procedure

## 3.1. Setup for Client with injection at the Master

The setup method is shown below diagram. The method according to the 905462 D02 UNII DFS Compliance Procedure New Rules v02 - section 7.2




## 3.2. Spectrum analyzer setting parameter

The setting parameter is shown below and it according to the 905462 D02 UNII DFS Compliance Procedure New Rules v02 - section 7.5

1) **RBW /VBW ≥ 3MHz**
2) **Detector = Peak**
3) **Span = zero span**
4) **Sweep time ≥ 12s**

## 3.3. Conducted test procedure

1) One frequency will be chosen from the Operating Channels of the UUT within the 5250-5350 MHz or 5470-5725 MHz bands.
2) The Client Device (EUT) is set up the above diagram and communications between the Master device and the Client is established.
3) Stream the channel loading test file from the Master Device to the Client Device on the test Channel for the entire period of the test. (The MPEG file specified by the FCC (*"6 ½ Magic Hours"*))
4) An additional 1 dB is added to the radar test signal to ensure it is at or above the DFS Detection Threshold, accounting for equipment variations/errors.
5) Observe the transmissions of the UUT at the end of the Burst on the Operating Channel for duration greater than 12 seconds for Radar Type 0 to ensure detection occurs.
6) After the initial radar burst the channel is monitored for 30 minutes to ensure no transmissions or beacons occur. A second monitoring setup is used to verify that the Master and Client have both moved to different channels.

# 4. SUMMARY OF TESTS

| **Parameter** | **Limit** | **Status** Note 1 |
|---|---|---|
| Channel move time | 10 seconds | **C** Note 2 |
| Channel closing transmission time | 200ms + aggregate of 60ms over remaining 10 second period | **C** Note 2, 3 |
| Non-occupancy period | 30 minutes | **C** |

**Note 1**: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

**Note 2**: 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.

**Note 3**: 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.

# 5. LIST OF EQUIPMENTS

| Type | Manufacturer | Model | Cal.Date (yy/mm/dd) | Next.Cal.Date (yy/mm/dd) | S/N |
|---|---|---|---|---|---|
| MXA Signal Analyzer | Agilent | N9020A | 15/09/14 | 16/09/14 | MY50200834 |
| DFS Bridge System | DTNC | DFS-01 | 15/12/04 | 16/12/04 | T001 |
| PXIS-2670(G) | ADLINK | 3025C | 15/08/28 | 16/08/28 | 302581/834 |
| PXIS-2670(G) | ADLINK | 3035C | 15/08/28 | 16/08/28 | 303581/927 |
| Companion Device(AP) | D-Link | DIR-868L | N/A | N/A | R3X81E6000093 |

# 6. TEST RESULTS

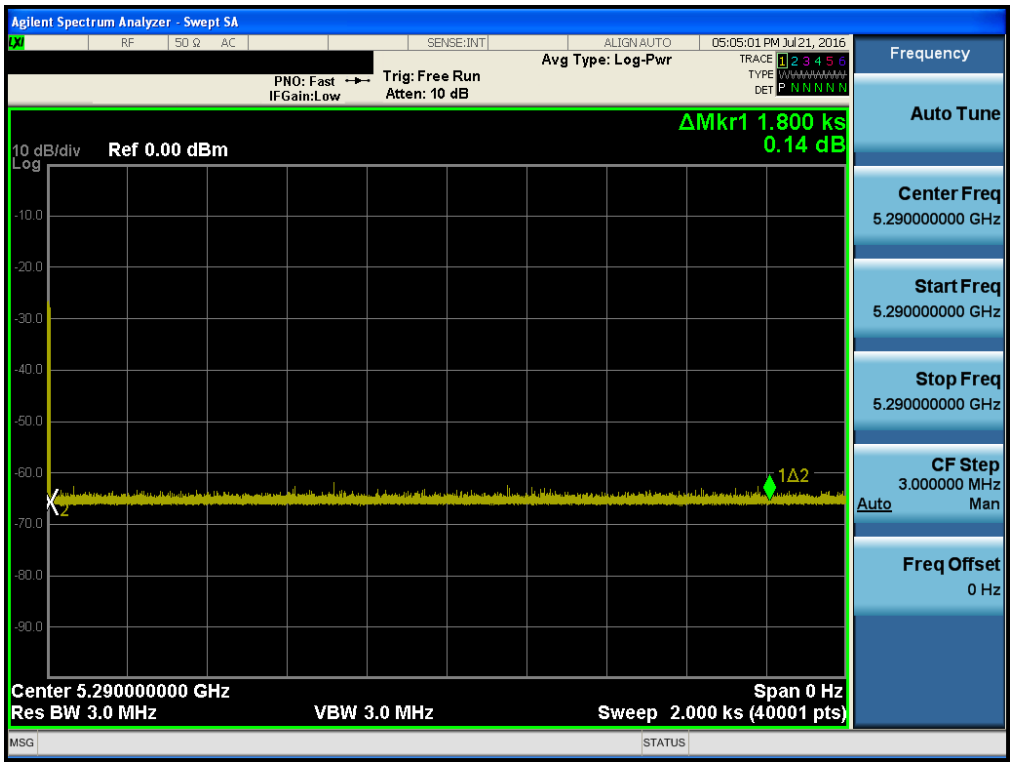
## 6.1. Move time and aggregate time

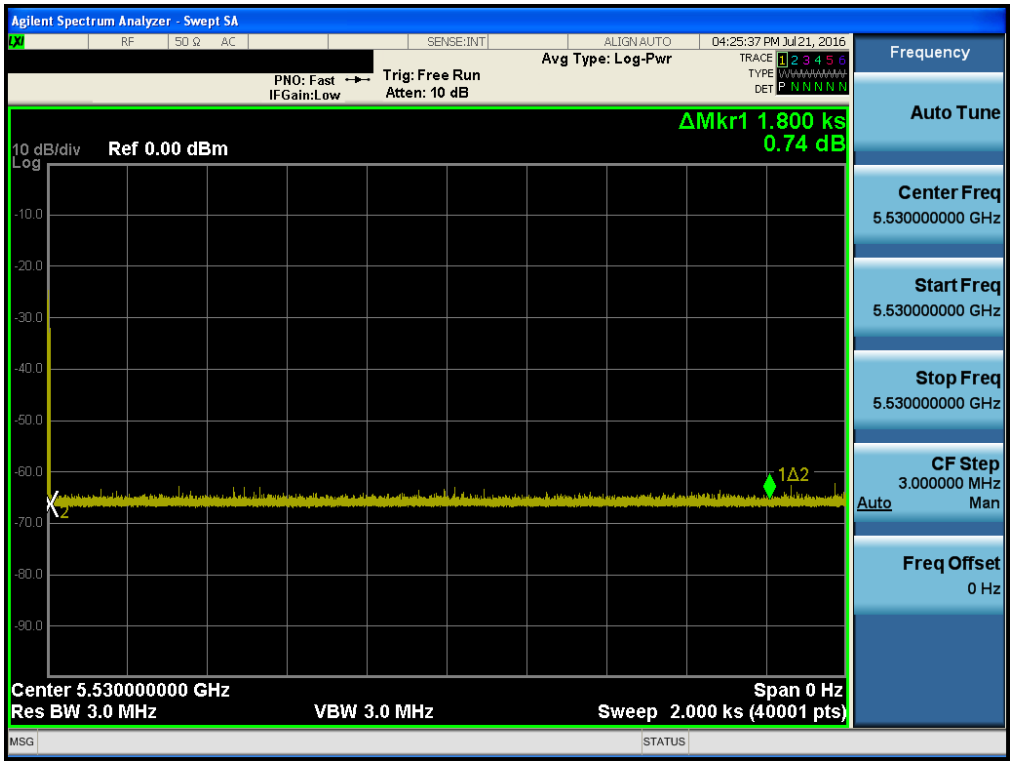
### 6.1.1. U-NII-2A : 802.11ac(VHT80), 5290 MHz

### 6.1.2. U-NII-2C : 802.11ac(VHT80), 5530 MHz

## 6.2. Non-occupancy period

### 6.2.1. U-NII-2A : 802.11ac(VHT80), 5290 MHz




### 6.2.2. U-NII-2C : 802.11ac(VHT80), 5530 MHz