

Dynamic Frequency Selection (DFS)

Test Report

| | |
|--------------|----------------------|
| Product Name | Handy Skin Sensor II |
| Model No | HSS II |
| FCC ID | 2AO35-HSS2 |

| | |
|-----------|----------------------------------------------|
| Applicant | Moritex Corporation |
| Address | 3-13-45, Senzui, Asaka-shi, Saitama 351-0024 |

| | |
|-----------------|---------------------|
| Date of Receipt | Jan. 26, 2018 |
| Issued Date | Mar. 15, 2018 |
| Report No. | 1810372R-RFUSP10V00 |
| Report Version | V1.0 |



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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DFS Test Report

Issued Date: Mar. 15, 2018

Report No.: 1810372R-RFUSP10V00



| | |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name | Handy Skin Sensor II |
| Applicant | Moritex Corporation |
| Address | 3-13-45, Senzui, Asaka-shi, Saitama 351-0024 |
| Manufacturer | Moritex Corporation |
| Model No. | HSS II |
| FCC ID. | 2AO35-HSS2 |
| EUT Rated Voltage | AC 100-240V, 50/60Hz |
| EUT Test Voltage | AC 120V/60Hz |
| Trade Name | SHISEIDO |
| Applicable Standard | FCC CFR Title 47 Part 15 Subpart E 15.407 (h): 2017 KDB 905462 D02 UNII DFS Compliance Procedures KDB 905462 D03 UNII Clients Without Radar Detection FCC 14-30 |
| Test Result | Complied |

Documented By :



(Senior Adm. Specialist / Joanne Lin)

Tested By :



(Engineer / Benjamin Pan)

Approved By :



(Director / Vincent Lin)

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Attachment 1: EUT Test Photographs

1. GENERAL INFORMATION

1.1. EUT Description

| | |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Product Name | Handy Skin Sensor II |
| Trade Name | SHISEIDO |
| FCC ID. | 2AO35-HSS2 |
| Model No. | HSS II |
| Frequency Range | 802.11a/n-20MHz: 5180-5320MHz, 5500-5700MHz |
| Number of Channels | 802.11a/n-20MHz: 19 |
| Channel Control | Auto |
| Data Rate | 802.11a: 6 - 54Mbps 802.11n: up to 300Mbps |
| Type of Modulation | OFDM, BPSK, QPSK, 16QAM, 64QAM |
| DFS Function | <input type="checkbox"/> Master <input checked="" type="checkbox"/> Slave (Without Radar Detection) |
| TPC Function | <input checked="" type="checkbox"/> <500mW not required <input type="checkbox"/> \geq 500mW employ a TPC |
| Communication Mode | <input checked="" type="checkbox"/> IP Based Systems <input type="checkbox"/> Frame Based System <input type="checkbox"/> Other System |
| Antenna Type | PCB Antenna |
| Micro USB Cable | Shielded, 1.7m, with one ferrite core bonded. |
| Adapter Cable | MFR: UNIFIVE, M/N: UBX310-0520 Input: AC 100-240V ~ 50/60Hz, 0.3A Output: DC 5V, 2A |

Antenna List

| No. | Manufacturer | Part No. | Antenna Type | Peak Gain |
|-----|--------------|-----------------------|--------------|---------------------------------------------------------------------------------------|
| 1 | 株式会社モリテックス | SY-W40IE7028G060C-L01 | PCB Antenna | -0.85dBi For 5150~5250 GHz -0.58dBi For 5250~5350 GHz 0.58dBi For 5470~5725 GHz |

802.11a/n-20MHz Center Working Frequency of Each Channel:

| Channel | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
|--------------|-----------|--------------|-----------|--------------|-----------|--------------|-----------|
| Channel 036: | 5180 MHz | Channel 040: | 5200 MHz | Channel 044: | 5220 MHz | Channel 048: | 5240 MHz |
| Channel 052: | 5260 MHz | Channel 056: | 5280 MHz | Channel 060: | 5300 MHz | Channel 064: | 5320 MHz |
| Channel 100: | 5500 MHz | Channel 104: | 5520 MHz | Channel 108: | 5540 MHz | Channel 112: | 5560 MHz |
| Channel 116: | 5580 MHz | Channel 120: | 5600 MHz | Channel 124: | 5620 MHz | Channel 128: | 5640 MHz |
| Channel 132: | 5660 MHz | Channel 136: | 5680 MHz | Channel 140: | 5700 MHz | | |

| | |
|-----------|------------------|
| Test Mode | Mode 1: Transmit |
|-----------|------------------|

1.2. Standard Requirement

FCC Part 15.407:

U-NII devices operating in the 5.25-5.35 GHz band and the 5.47-5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30dBm. A TPC mechanism is not required for systems with an E.I.R.P. of less than 500mW.

U-NII devices operating in the 5.25-5.35 GHz and 5.47-5.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.

1.3. UNII Device Description

(1) The EUT operates in the following DFS band:

1. 5250-5350 MHz
2. 5470-5725 MHz

(2) The maximum EIRP of the 5GHz equipment is 7.5dBm.

Below are the available 50 ohm antenna assemblies and their corresponding gains.

0dBi gain was used to set the -63 dBm threshold level (-64dBm +1 dB) during calibration of the test setup.

| No. | Manufacturer | Part No. | Antenna Type | Peak Gain |
|-----|--------------|-----------------------|--------------|---------------------------------------------------------------------------------------|
| 1 | 株式会社モリテックス | SY-W40IE7028G060C-L01 | PCB Antenna | -0.85dBi For 5150~5250 GHz -0.58dBi For 5250~5350 GHz 0.58dBi For 5470~5725 GHz |

(3) DFS operation description:

WLAN traffic is generated by streaming the video file “TestFile.mp2” from the Master device to the Slave device in full motion video mode using the media player with the V2.61 Codec package.

(4) This device does not exceed 27dBm eirp, so no transmit power control is implemented.

(5) The master device is an Access Point and FCC ID: SK6-XR320.

1.4. Test Equipment

Dynamic Frequency Selection (DFS) / ASR6

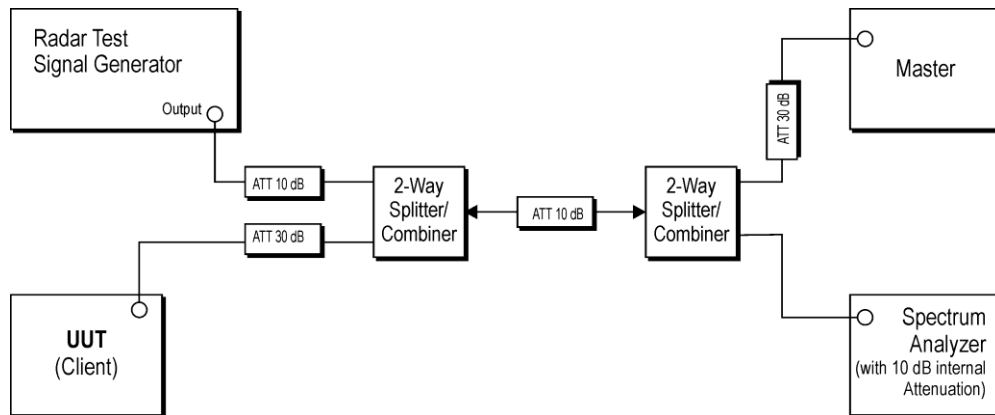
| Instrument | Manufacturer | Type No. | Serial No | Cal. Date | Cal. Date |
|-------------------------|--------------|----------|-----------|----------------|----------------|
| Spectrum Analyzer | R&S | FSV30 | 103467 | Jan., 11 2018 | Jan., 10, 2019 |
| Vector Signal Generator | R&S | SMBV100 | 261871 | Mar., 08, 2018 | Mar., 07, 2019 |

| Instrument | Manufacturer | Type No. | Serial No |
|----------------------------|---------------|-----------------------------|---------------|
| Splitter/Combiner (Qty: 2) | Mini-Circuits | ZFRSC-123-S+ | SN331000910 |
| Notebook Pc | Hp | HSTNN-155C | CNU8476RVZ |
| Notebook Pc | Dell | CPQ511VT5870Q4X320MIBNCN2Pa | CNU0060M23 |
| 8-WAY Power Divider | JFW | 50PD-647-SMA | 517518 |
| RF Cable (Qty: 4) | GORE | C86 | N/A |
| ATT (Qty: 2) | Mini-Circuits | 15542 | 30912 |
| ATT (Qty: 2) | Mini-Circuits | 15542 | 30909 |
| RF Cable | SUHNER | SUCOFLEX 104 | 309180/4 |
| RF Cable | SUHNER | SUCOFLEX 106 | 3474516 |
| Splitter/Combiner (Qty: 2) | Mini-Circuits | ZFRSC-123-S+ | SN331000910 |
| Access Point | XiRRUS | XR300 | X103502006E80 |

| Software | Manufacturer | Function |
|--------------------------|--------------|----------------------------------|
| R&S Pulse Sequencer V1.5 | R&S | Radar Signal Generation Software |

Note: All equipments are calibrated every one year.

1.5. Test Setup



1.6. 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 |

1.7. DFS requirements during normal operation

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

1.8. DFS Detection Thresholds

(1) Interference Threshold value, Master or Client incorporating In-Service Monitoring

| Maximum Transmit Power | Value (see note) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| ≥ 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 |
| <p>Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.</p> <p>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.</p> <p>Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.</p> | |

(2) DFS Response requirement values

| Parameter | Value |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Non-Occupancy Period | 30 Minutes |
| Channel Availability Check Time | 60 Seconds |
| Channel Move Time | 10 seconds See Note 1. |
| Channel Closing Transmission Time | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2. |
| U-NII Detection Bandwidth | Minimum 100% of the U-NII 99% transmission power bandwidth. See Note 3. |
| <p>Note 1: <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>Note 2: 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>Note 3: 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> | |

1.9. Radar Test Waveforms

This section provides the parameters for required test waveforms, minimum percentage of successful detections, and the minimum number of trials that must be used for determining DFS conformance. Step intervals of 0.1 microsecond for Pulse Width, 1 microsecond for PRI, 1 MHz for chirp width and 1 for the number of pulses will be utilized for the random determination of specific test waveforms.

(1) 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 |
| Note 1: 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 905462 D02 UNII DFS Compliance Procedures v01 Page 10 generated with Test B and must also be unique and not repeated from the previous waveforms in Tests A or B.

(2) Long Pulse Radar Test Signal

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

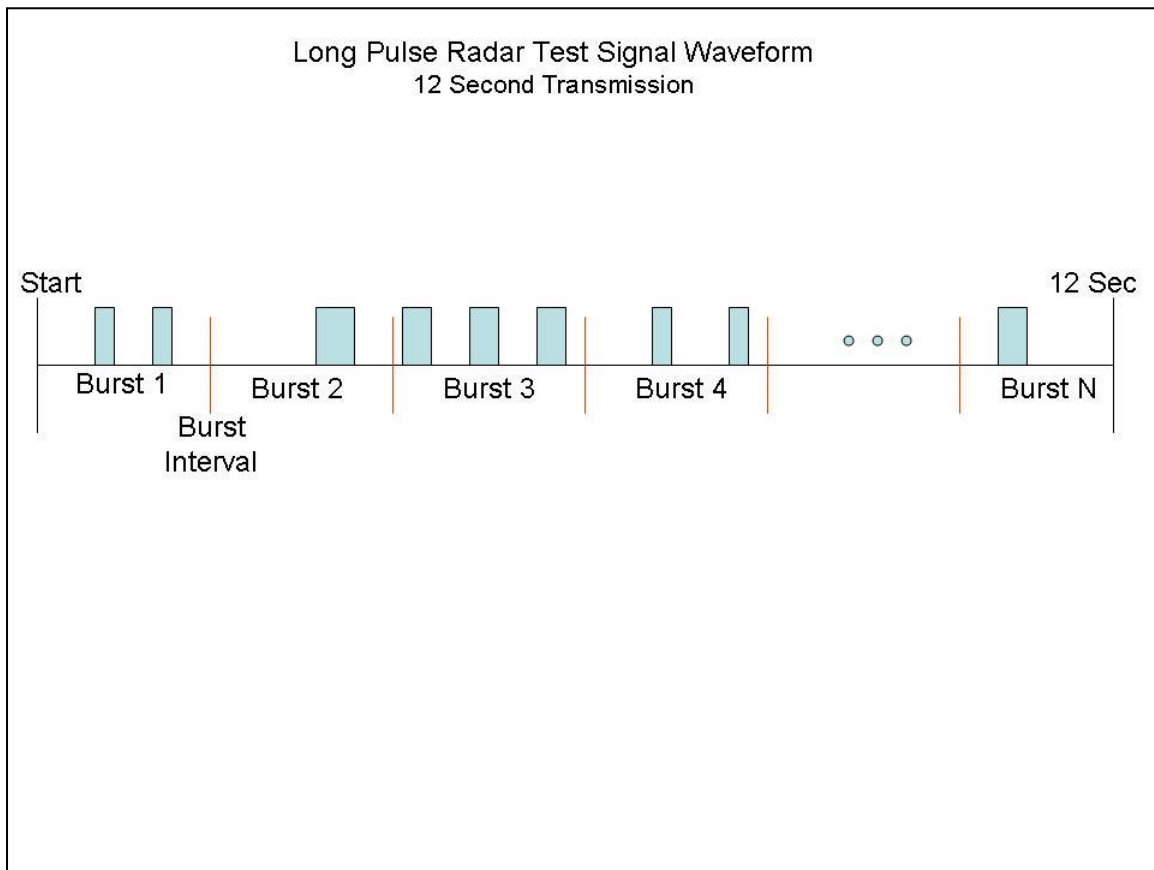
The parameters for this waveform are randomly chosen. Thirty unique waveforms are required for the long pulse radar test signal. If more than 30 waveforms are used for the long pulse radar test signal, then each additional waveform must also be unique and not repeated from the previous waveforms.

Each waveform is defined as follows:

- 1) The transmission period for the Long Pulse Radar test signal is 12 seconds.
- 2) There are a total of 8 to 20 Bursts in the 12 second period, with the number of Bursts being randomly chosen. This number is Burst Count.
- 3) Each Burst consists of 1 to 3 pulses, with the number of pulses being randomly chosen. Each Burst within the 12 second sequence may have a different number of pulses.
- 4) The pulse width is between 50 and 100 microseconds, with the pulse width being randomly chosen. Each pulse within a Burst will have the same pulse width. Pulses in different Bursts may have different pulse widths.
- 5) Each pulse has a linear frequency modulated chirp between 5 and 20 MHz, with the chirp width being randomly chosen. Each pulse within a transmission period will have the same chirp width. The chirp is centered on the pulse. For example, with a radar frequency of 5300 MHz and a 20 MHz chirped signal, the chirp starts at 5290 MHz and ends at 5310 MHz.
- 6) If more than one pulse is present in a Burst, the time between the pulses will be between 1000 and 2000 microseconds, with the time being randomly chosen. If three pulses are present in a Burst, the random time interval between the first and second pulses is chosen independently of the random time interval between the second and third pulses.
- 7) The 12 second transmission period is divided into even intervals. The number of intervals is equal to Burst Count. Each interval is of length $(12,000,000 / \text{Burst Count})$ microseconds. Each interval contains one Burst. The start time for the Burst, relative to the beginning of the interval, is between 1 and $[(12,000,000 / \text{Burst Count}) - (\text{Total Burst Length}) + (\text{One Random PRI Interval})]$ microseconds, with the start time being randomly chosen. The step interval for the start time is 1 microsecond. The start time for each Burst is chosen randomly.

A representative example of a Long Pulse radar test waveform:

- 1) The total test waveform length is 12 seconds.
- 2) Eight (8) Bursts are randomly generated for the Burst Count.
- 3) Burst 1 has 2 randomly generated pulses.
- 4) The pulse width (for both pulses) is randomly selected to be 75 microseconds.
- 5) The PRI is randomly selected to be at 1213 microseconds.
- 6) Bursts 2 through 8 are generated using steps 3 – 5.
- 7) Each Burst is contained in even intervals of 1,500,000 microseconds. The starting location for Pulse 1, Burst 1 is randomly generated (1 to 1,500,000 minus the total Burst 1 length + 1 random PRI interval) at the 325,001 microsecond step. Bursts 2 through 8 randomly fall in successive 1,500,000 microsecond intervals (i.e. Burst 2 falls in the 1,500,001 – 3,000,000 microsecond range).

Graphical Representation of a Long Pulse radar Test Waveform

(3) Frequency Hopping Radar Test Signal

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

For the Frequency Hopping Radar Type, the same *Burst* parameters are used for each waveform. The hopping sequence is different for each waveform and a 100-length segment is selected from the hopping sequence defined by the following algorithm:

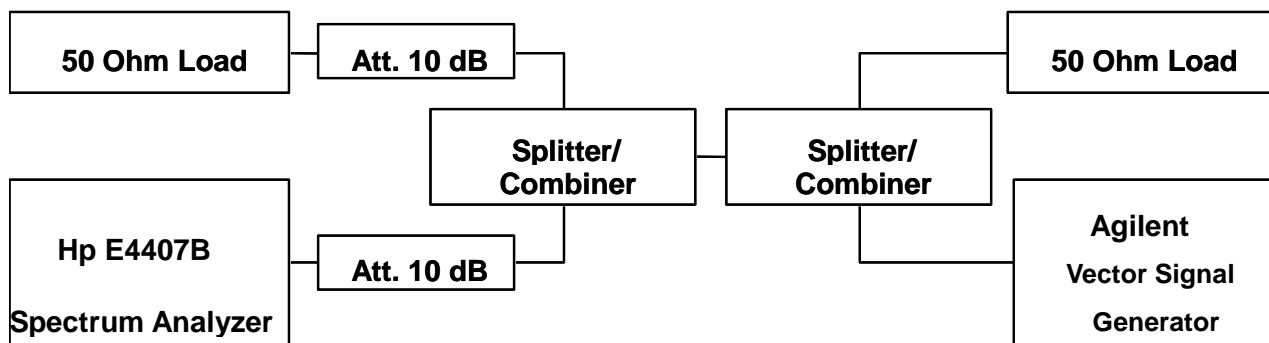
The first frequency in a hopping sequence is selected randomly from the group of 475 integer frequencies from 5250 – 5724 MHz. Next, the frequency that was just chosen is removed from the group and a frequency is randomly selected from the remaining 474 frequencies in the group. This process continues until all 475 frequencies are chosen for the set. For selection of a random frequency, the frequencies remaining within the group are always treated as equally likely.

1.10. Radar Waveform Calibration

The following equipment setup was used to calibrate the conducted radar waveform. A spectrum analyzer was used to establish the test signal level for each radar type. During this process there were replace 50ohm terminal from master and client device and no transmissions by either the master or client device. The spectrum analyzer was switched to the zero span (time domain) at the frequency of the radar waveform generator. Peak detection was utilized. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3MHz and 3 MHz.

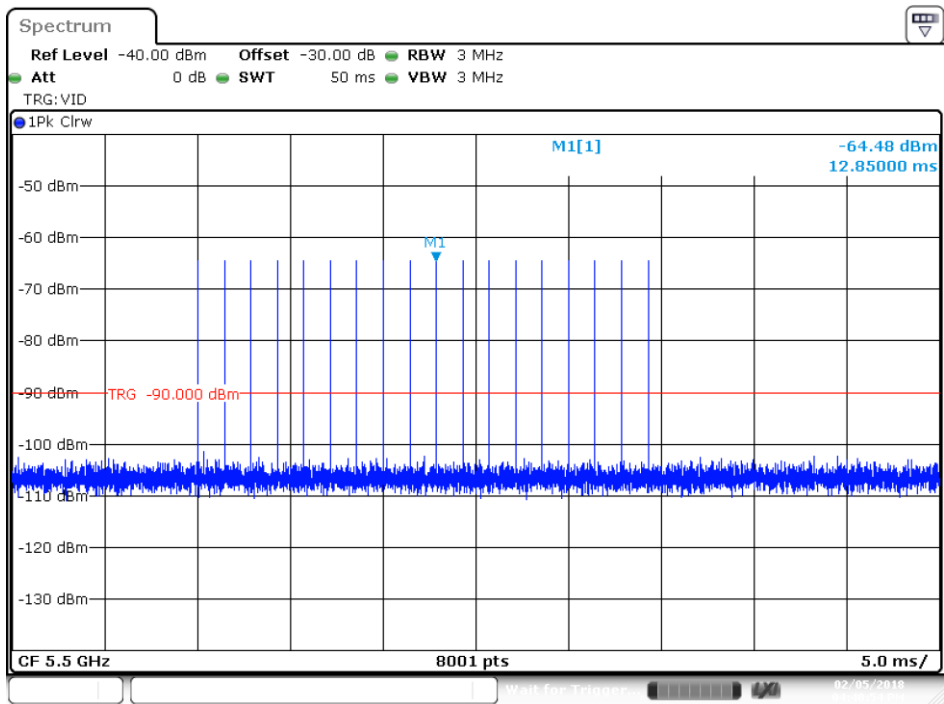
The signal generator amplitude was set so that the power level measured at the spectrum analyzer was -64dBm due to the interference threshold level is not required.

Conducted Calibration Setup



1.11. Radar Waveform Calibration Result

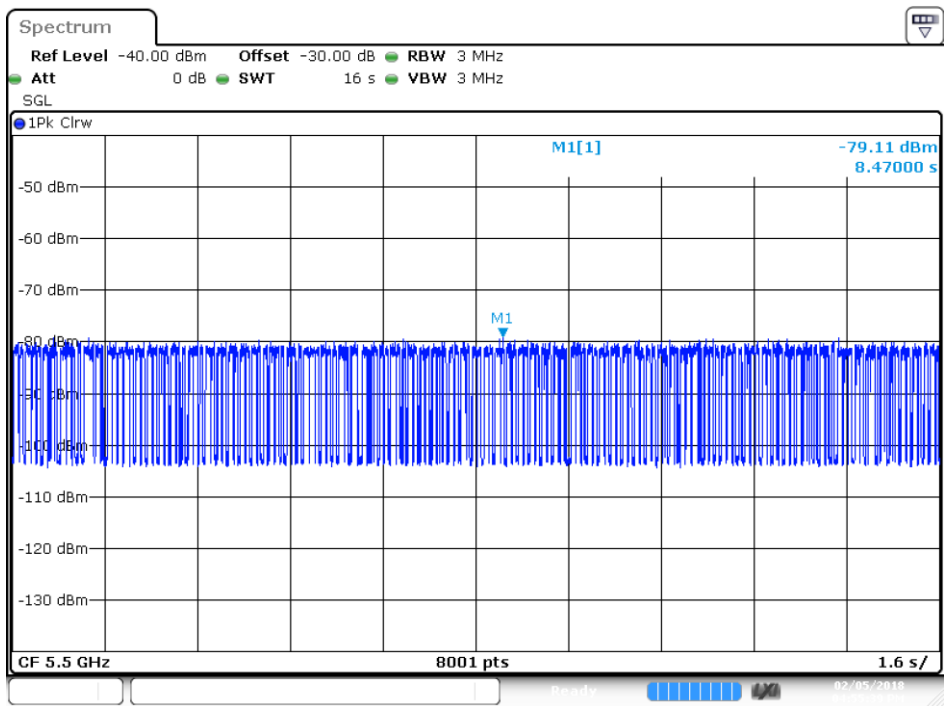
Radar Type 0 Calibration Plot (5500MHz)



Date: 5.FEB.2018 16:40:55

1.12. Slave Data Traffic Plot Result

Plot of Slave Traffic at 5500MHz



Date: 5.FEB.2018 16:55:40

2. In-Service Monitoring for Channel Move Time and Channel Closing Transmission Time and Non-Occupancy Period

2.1. Test Procedure

These tests define how the following DFS parameters are verified during In-Service Monitoring;

Channel Closing Transmission Time, Channel Move Time, and Non-Occupancy Period.. The steps below define the procedure to determine the above mentioned parameters when a radar Burst with a level equal to the DFS Detection Threshold + 1dB (-63dBm) is generated on the Operating Channel of the U-NII device.

A U-NII device operating as a Master Device will associate with the UUT (Client) at 5300 MHz and 5500MHz.

Stream the MPEG test file from the Client (TX) Device to the Master (RX) Device on the selected Channel for the entire period of the test.

At time T_0 the Radar Waveform generator sends a Burst of pulses for each of the radar types at -63dBm.

Observe the transmissions of the UUT at the end of the radar Burst on the Operating Channel for duration greater than 10 seconds. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). Compare the Channel Move Time and Channel Closing

Transmission Time results to the limits defined in the DFS Response requirement values table.

Measure the UUT for more than 30 minutes following the channel close/move time to verify that the UUT does not resume any transmissions on this Channel.

2.2. Test Requirement

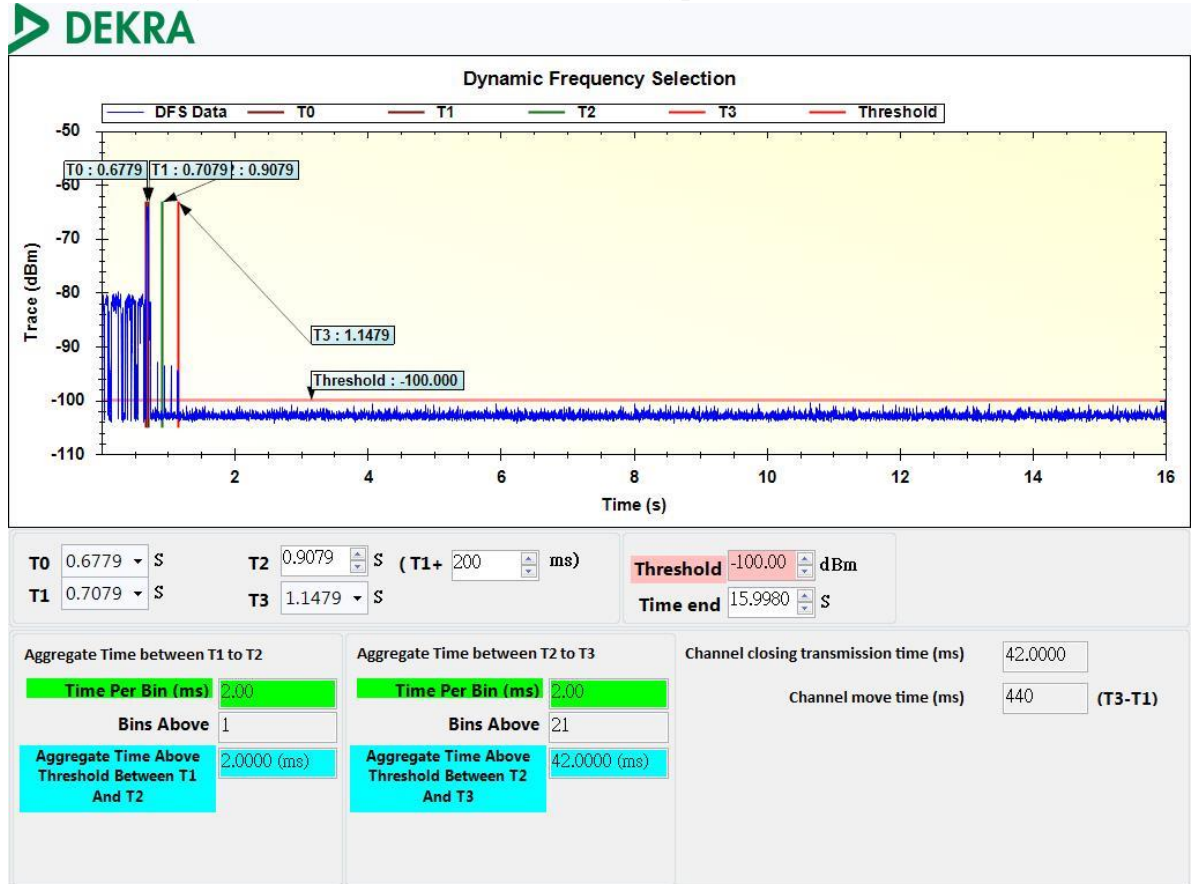
| Parameter | Value |
|-----------------------------------|-------------------------------------------------------------------------------------|
| Channel Move Time | 10 Seconds |
| Channel Closing Transmission Time | 200 milliseconds + an aggregate of 60 milliseconds over remaining 10 seconds period |
| Non-Occupancy Period | Minimum 30 minutes |

2.3. Uncertainty

$\pm 2.31\text{ms}$.

Product : Handy Skin Sensor II
 Test Item : Channel Closing Transmission Time Test
 Radar Type : Type 0
 Test Mode : Mode 1: Transmit

Channel Closing Transmission Time for Radar Test Type 0 at 5500 MHz



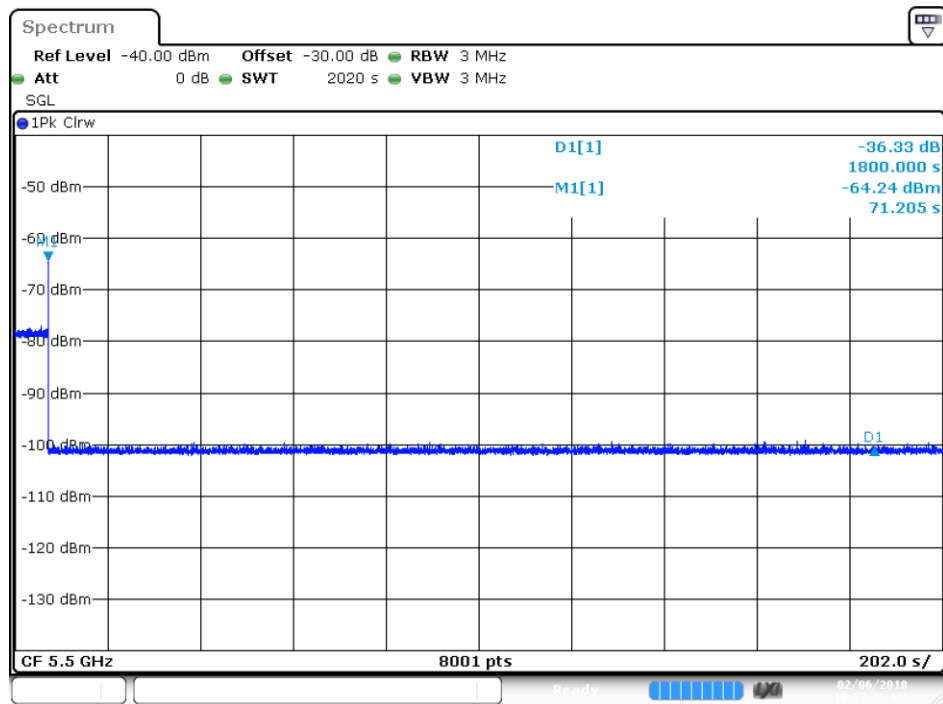
| Test Item | Test Result (ms) | Limit (ms) |
|------------------------------|------------------|-----------------------------------------------------------------------------|
| Channel Closing Transmission | 42 | 200 milliseconds + approx. 60 milliseconds over remaining 10 seconds period |

*Note: The test result is “bin number X time per bin (600 ms / 8000)”

The results showed that after radar signal injected the channel transmission closing time less than 200 milliseconds and an aggregate of no more than 60 milliseconds.

Product : Handy Skin Sensor II
 Test Item : Non-Occupancy Period Test
 Radar Type : Type 0
 Test Mode : Mode 1: Transmit

Non-Occupancy Period for Radar Test Type 0 at 5500 MHz



Date: 6.FEB.2018 10:57:26

| Test Item | Test Result (minute) | Limit (minute) |
|----------------------|-------------------------|-------------------|
| Non-Occupancy Period | >30 | 30 |