RADIO TEST REPORT
FCC 47 CFR PART 15 SUBPART E

Test Standard	**FCC Part 15.407**
Brand name	**SILEX TECHNOLOGY**
Product name	**SX-PCEAC-DB Rev2**
Model No.	**SX-PCEAC-DB, SX-PCEAC**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)

Approved by: Tested by:

Kevin Tsai
Deputy Manager

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	April 17, 2020	Initial Issue	ALL	Doris Chu

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	silex technology, Inc. 2-3-1 Hikaridai, Seika-cho, Souraku-gun, Kyoto 619-0237, Japan
Manufacturer	silex technology, Inc. 2-3-1 Hikaridai, Seika-cho, Souraku-gun, Kyoto 619-0237, Japan
Equipment	SX-PCEAC-DB Rev2
Model No.	SX-PCEAC-DB, SX-PCEAC
Model Discrepancy	SX-PCEAC-DB works on 2.4GHz and 5GHz, SX-PCEAC does on 5GHz only. It is controlled by driver software.
Trade Name	SILEX TECHNOLOGY
Received Date	February 5, 2020
Date of Test	March 17, 2020
Power Operation	Power from Power Adapter. I/P: 100-240VAC, 50-60Hz, 1A MAX. O/P: 12VDC, 3A
Product H/W Version:	PW104021XX
Product F/W Version:	10.2-00082-4
Product S/W version:	Ver.1

1.2 EUT CHANNEL INFORMATION

<table>
<tr><td>Frequency Range</td><td>
<table>
<tr><th></th><th>Mode</th><th>Frequency Range (MHz)</th></tr>
<tr><td rowspan="4">UNII Band II</td><td>IEEE 802.11a</td><td>5260 ~ 5320</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5260 ~ 5320</td></tr>
<tr><td>IEEE 802.11n HT 40 MHz</td><td>5270 ~ 5310</td></tr>
<tr><td>IEEE 802.11ac VHT 80 MHz</td><td>5290</td></tr>
<tr><td rowspan="4">UNII Band III</td><td>IEEE 802.11a</td><td>5500 ~ 5700</td></tr>
<tr><td>IEEE 802.11n HT 20 MHz</td><td>5500 ~ 5700</td></tr>
<tr><td>IEEE 802.11n HT 40 MHz</td><td>5510 ~ 5670</td></tr>
<tr><td>IEEE 802.11ac VHT 80 MHz</td><td>5530 ~ 5690</td></tr>
</table>
</td></tr>
<tr><td>Modulation Type</td><td>OFDM (QPSK, BPSK, 16-QAM, 64-QAM, 256-QAM)</td></tr>
</table>

Remark:
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	**Number of frequencies**	**Location in frequency range of operation**
☐ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☒ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Specification	1. STAF / 1019-015A ROD Antenna / 4 dBi 2. Sansei Denki / ANTDC-081A0 ROD Antenna / 2 dBi 3. Sansei Denki / ANTDP-027A0 ROD Antenna / 2.1 dBi 4. JOYMAX / KWM-619BMPXX ROD Antenna / 3.81 dBi 5. Molex / 146153 PCB Antenna / 5 dBi 6. Unictron / H2B1PC1A1C (AA258) PCB Antenna / 4.4 dBi 7. Unictron / H2B1PD1A1C (AA222) PCB Antenna / 4.2 dBi

Notes:
1. Power Directional Gain: 10LOG(((10^(Ant1/10)+10^(Ant2/10))/2))

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
3M Semi Anechoic Chamber / 30MHz ~ 1GHz	+/-3.7046
3M Semi Anechoic Chamber / Above 1GHz	+/-3.0958

***Remark**: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan. (R.O.C.)

Remark: *The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.*

1.6 INSTRUMENT CALIBRATION

Dynamic Frequency Selection					
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Date**	**Calibration Due**
Attenuator	E-INSTRUMENT	EPA-600H	EC1400050	07/26/2019	07/25/2020
Coaxial Cable	Woken	WC12	DC004	06/28/2019	06/27/2020
Power Divider	Solvang Technology	STI08-0015	008	08/06/2019	08/05/2020
Spectrum Analyzer	R&S	FSU 26	100258	06/20/2019	06/19/2020
Vector Signal Generator	R&S	SMU 200A	101480	03/27/2019	03/26/2020
Software	GPIBShot,DFS-Aggregate-Time FSU,R&S Pulse Sequencer DFS				

Remark: *Each piece of equipment is scheduled for calibration once a year.*

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

Support Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.407, KDB 789033 D02 v02r01, KDB 905462 D02 v02, KDB 662911D01 V02r01.

2. TEST SUMMERY

FCC Standard Sec.	Chapter	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.407(h)	4.1	Dynamic Frequency Selection	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operating Frequency Range & Number of Channels

	Mode	Frequency Range (MHz)	Number of Channels
UNII Band II	IEEE 802.11a	5260 ~ 5320	4 Channels
	IEEE 802.11n HT 20 MHz	5260 ~ 5320	4 Channels
	IEEE 802.11n HT 40 MHz	5270 ~ 5310	2 Channels
	IEEE 802.11ac VHT 80 MHz	5290	1 Channels
UNII Band III	IEEE 802.11a	5500 ~ 5700	11 Channels
	IEEE 802.11n HT 20 MHz	5500 ~ 5700	11 Channels
	IEEE 802.11n HT 40 MHz	5510 ~ 5670	5 Channels
	IEEE 802.11ac VHT 80 MHz	5530 ~ 5690	2 Channels

Remark:
1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

4. TEST RESULT

4.1 TEST LIMIT

FCC according to §15.407 (h), 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 Device 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 mods	Master Device 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.		

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

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.	

Table 4: DFS Response requirement values

Parameter	Value
Non-occupancy period	Minimum 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.
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. **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. **Note 3:** During the U-NII Detection Bandwidth 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.	

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	
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	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.

Table 6 – Long Pulse Radar Test Signal

Radar Type	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Number of Pulses per Burst	Number of Bursts	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 Signal

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

4.2 TEST PROCEDURE

Overview Of EUT With Respect To §15.407 (H) Requirements

The firmware installed in the EUT during testing was:

Firmware Rev: 10.2-00082-4

The EUT operates over the 5250-5350 MHz range as a Client Device that does not have radar detection capability.

The EUT uses one transmitter connected to two 50-ohm coaxial antenna ports via a diversity switch. Only one antenna port is connected to the test system since the EUT has one antenna only.

The Slave device associated with the EUT during these tests does not have radar detection capability.

WLAN traffic is generated by streaming the video file TestFile.mp2 “6 ½ Magic Hours” from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

The EUT utilizes the 802.11a architecture, with a nominal channel bandwidth of 20 MHz.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is -62 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –62 + 5 = -57dBm.

The calibrated conducted DFS Detection Threshold level is set to -57 dBm. The tested level is lower than the required level hence it provides margin to the limit.

Manufacturer’s Statement Regarding Uniform Channel Spreading

The end product implements an automatic channel selection feature at startup such that operation commences on channels distributed across the entire set of allowed 5GHz channels. This feature will ensure uniform spreading is achieved while avoiding non-allowed channels due to prior radar events.

TEST AND MEASUREMENT SYSTEM

System Overview

The measurement system is based on a conducted test method.

The short pulse and long pulse signal generating system utilizes the NTIA software. 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.

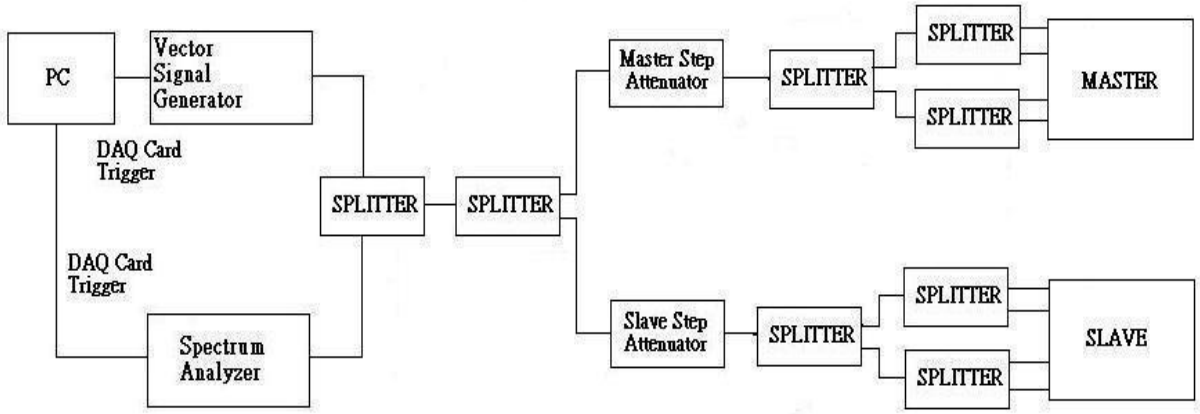
The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

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 FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from FL to FH 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 set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. 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. The time-domain resolution is 3 msec / bin with a 24 second sweep time, meeting the 22 second long pulse reporting criteria and allowing a minimum of 10 seconds after the end of the long pulse waveform.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), 50 ohm termination would be removed from the splitter so that connection can be established between splitter and the Master and/or Slave devices.

Conducted Method System Block Diagram



System Calibration

Connect the spectrum analyzer to the test system in place of the master device. Set the signal generator to CW mode. Adjust the amplitude of the signal generator to yield a measured level of –62 dBm on the spectrum analyzer.

Without changing any of the instrument settings, reconnect the spectrum analyzer to the Common port of the Spectrum Analyzer Combiner/Divider and connect a 50 ohm load to the Master Device port of the test system.

Measure the amplitude and calculate the difference from –62 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference. Confirm that the signal is displayed at –62 dBm. Readjust the RBW and VBW to 3 MHz, set the span to 10 MHz, and confirm that the signal is still displayed at –62 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 –62 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

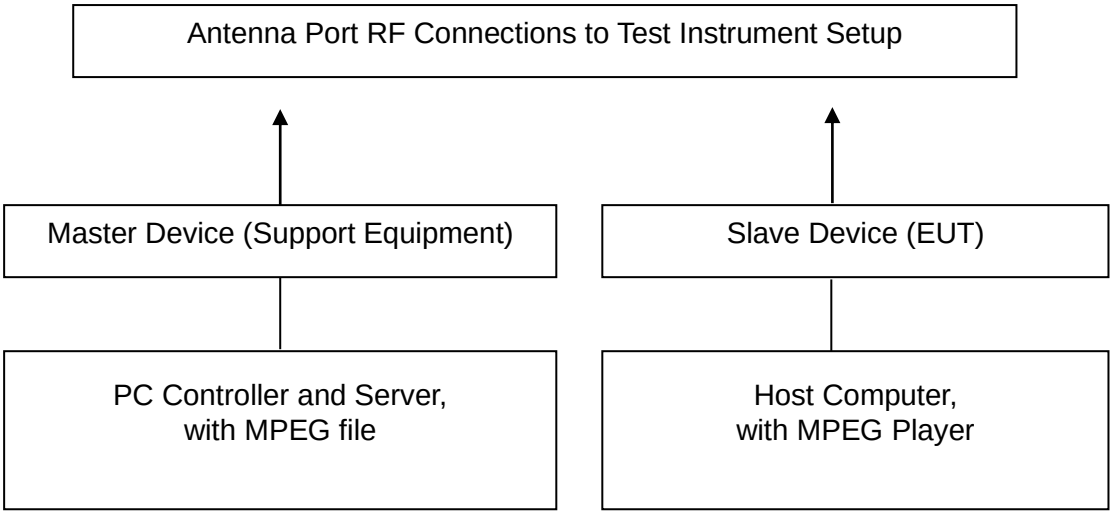
Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.

Adjustment Of Displayed Traffic Level

Establish a link between the Master and Slave, adjusting the Link Step Attenuator as needed to provide a suitable received level at the Master and Slave devices. Stream the video test file to generate WLAN traffic. Confirm that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold. Confirm that the displayed traffic is from the Master Device. For Master Device testing confirm that the displayed traffic does not include Slave Device traffic. For Slave Device testing confirm that the displayed traffic does not include Master Device traffic.

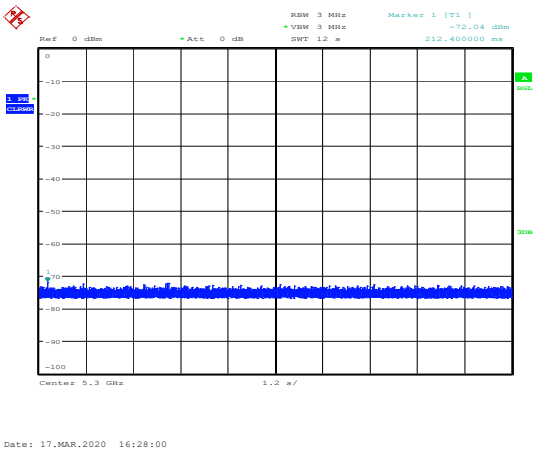
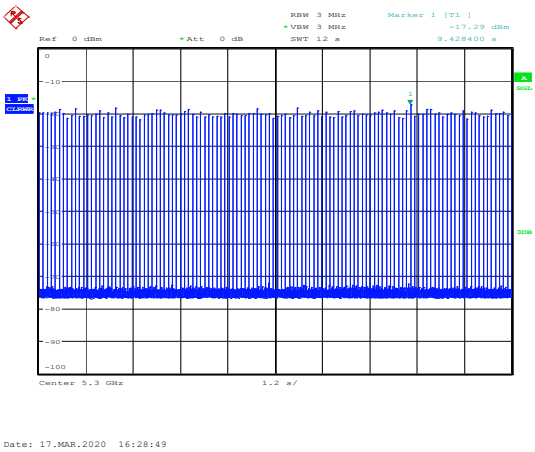
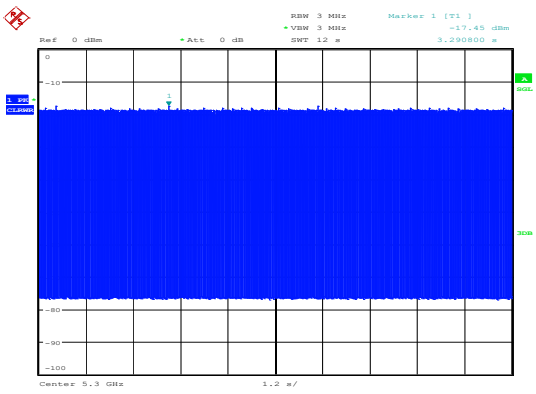
If a different setting of the Master Step Attenuator is required to meet the above conditions, perform a new System Calibration for the new Master Step Attenuator setting.

4.3 TEST SETUP



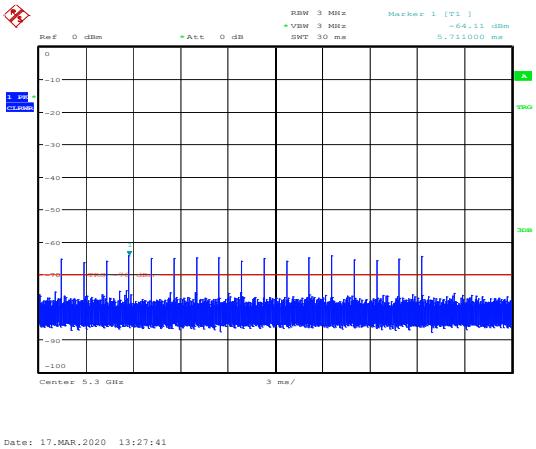
4.3.1 Test Result

U-NII-2a

IEEE 802.11a at 5300MHz	
Noise Floor	**Master Level**
	
Slave Level	
	

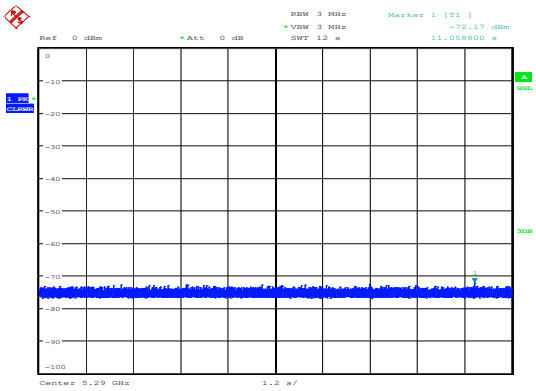
Radar Waveforms

Sample of short Pluse Radar Type 0



IEEE 802.11ac VHT 80 MHz at 5290MHz

Noise Floor



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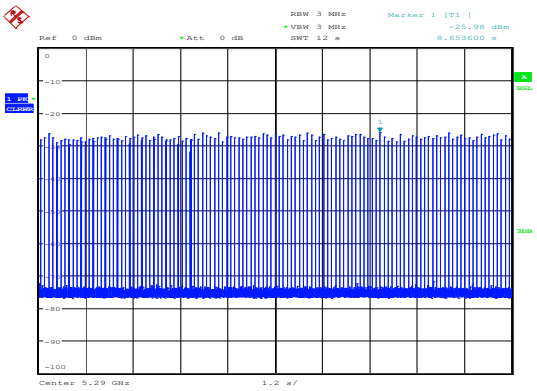
Master Level



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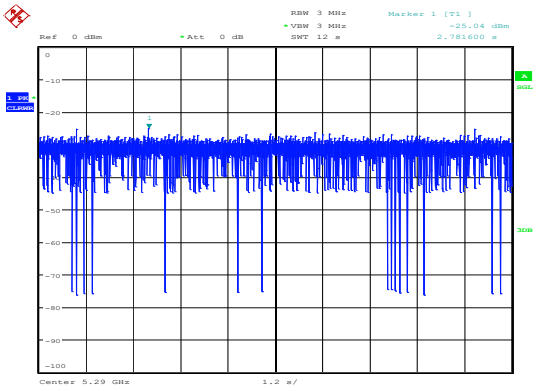
Slave Level



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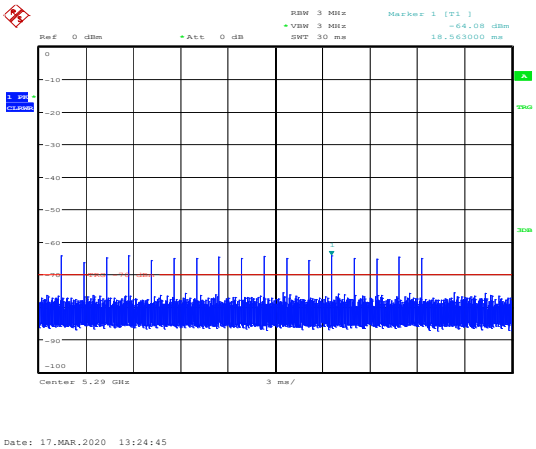
Radar Waveforms

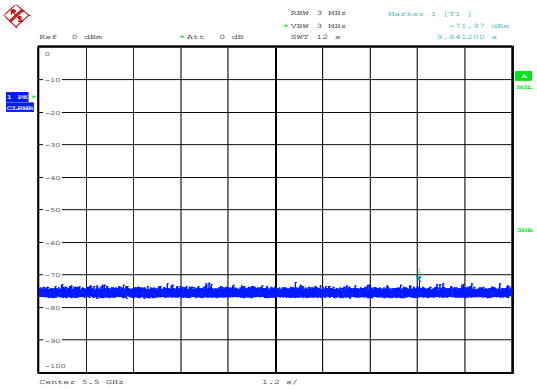
Sample of short Pluse Radar Type 0



U-NII-2c

IEEE 802.11a at 5500MHz

Noise Floor



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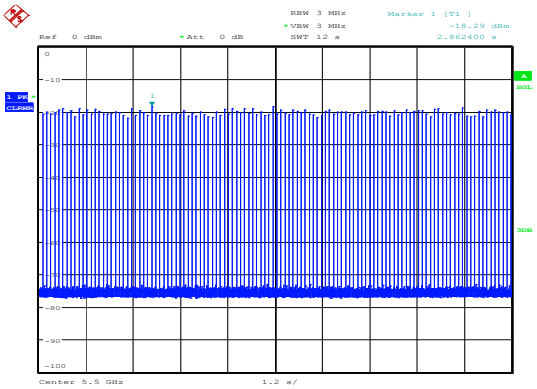
Master Level



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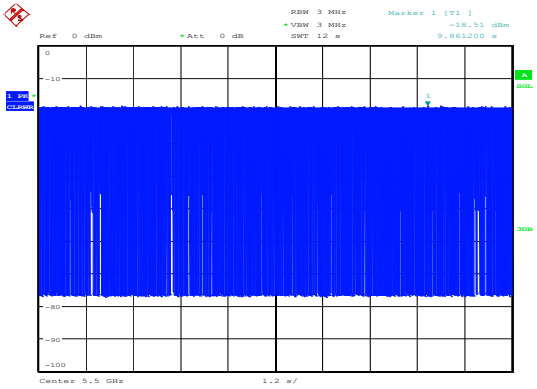
Slave Level



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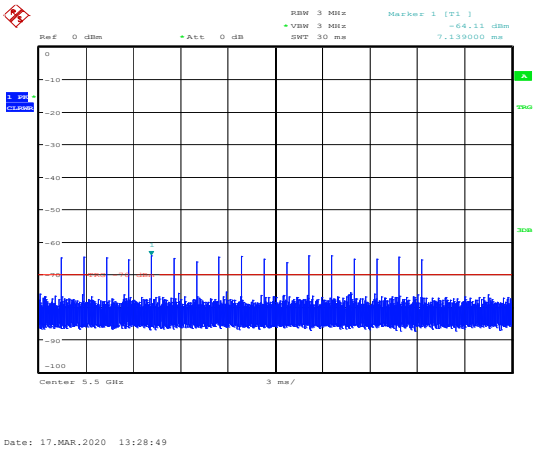
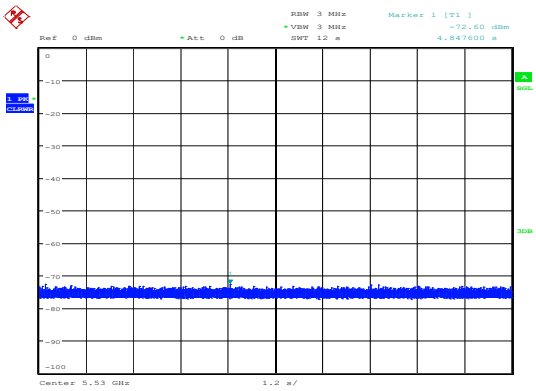
Radar Waveforms

Sample of short Pluse Radar Type 0



IEEE 802.11ac VHT 80 MHz at 5530MHz

Noise Floor



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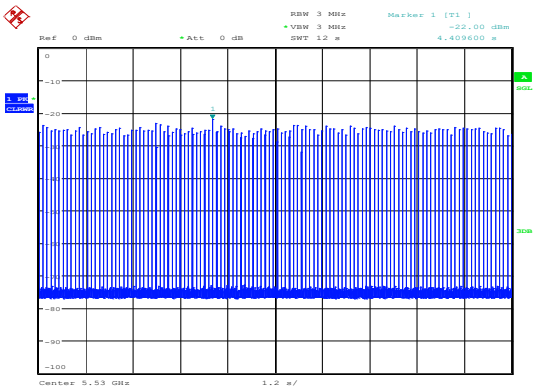
Master Level



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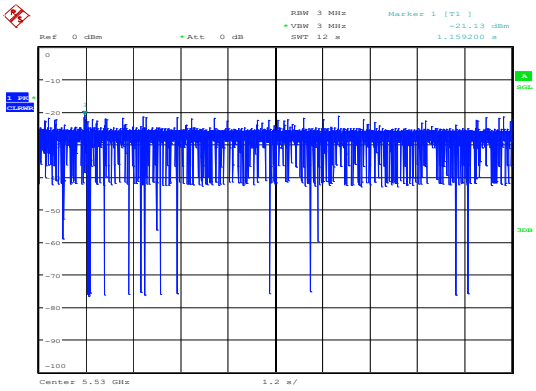
Slave Level



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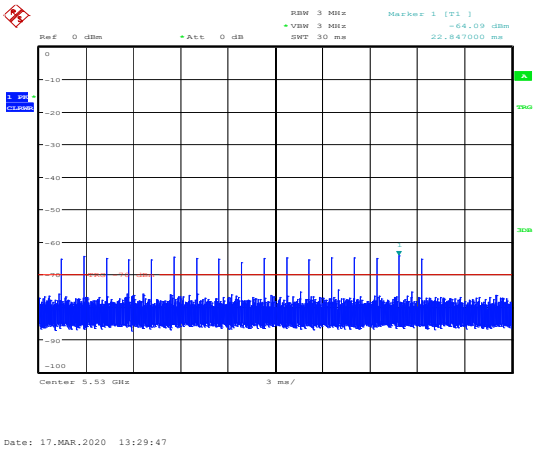
Radar Waveforms

Sample of short Pluse Radar Type 0



TEST CHANNEL AND METHOD

All tests were performed at a channel center frequency of 5310 MHz utilizing a conducted test method.

CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

GENERAL 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 =

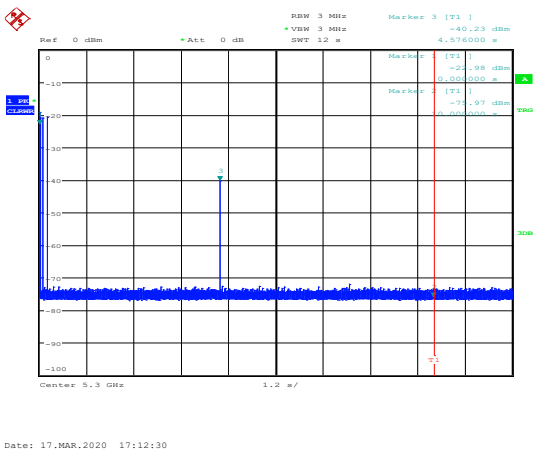
(Number of analyzer bins showing transmission) * (dwell time per bin)

The observation period over which the aggregate time is calculated

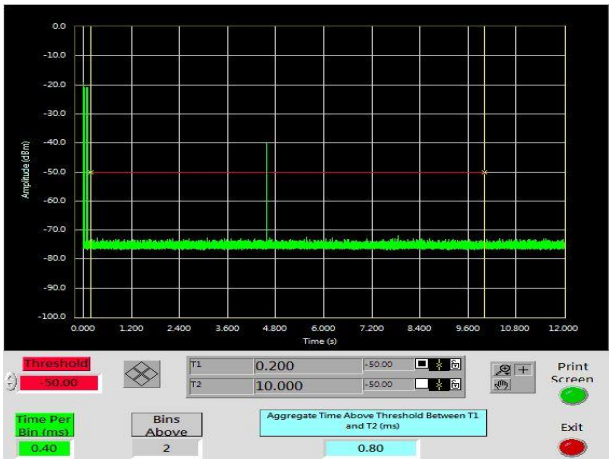
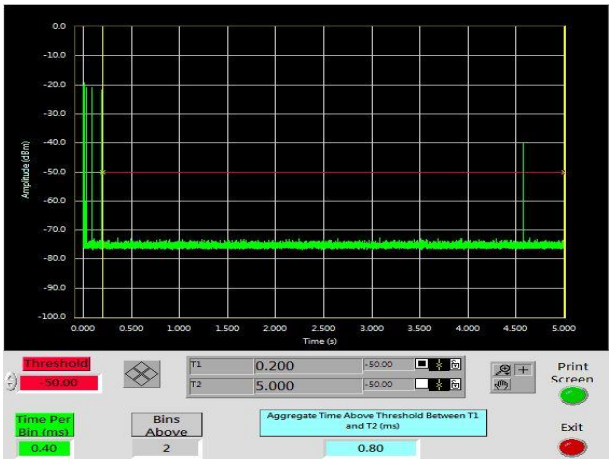
Begins at (Reference Marker + 200 msec) and

Ends no earlier than (Reference Marker + 10 sec).

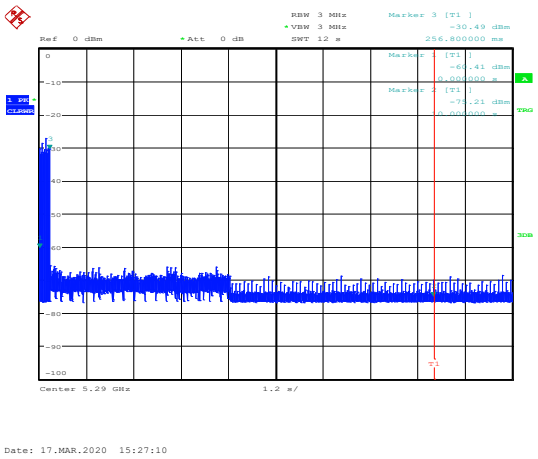
U-NII-2a

IEEE 802.11a at 5300
Type 0_Channel Move Time


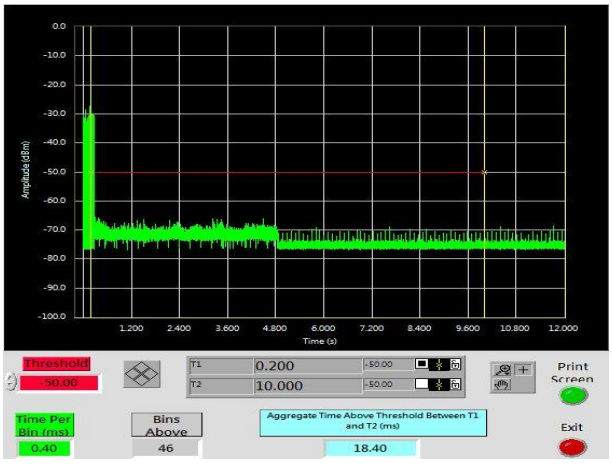
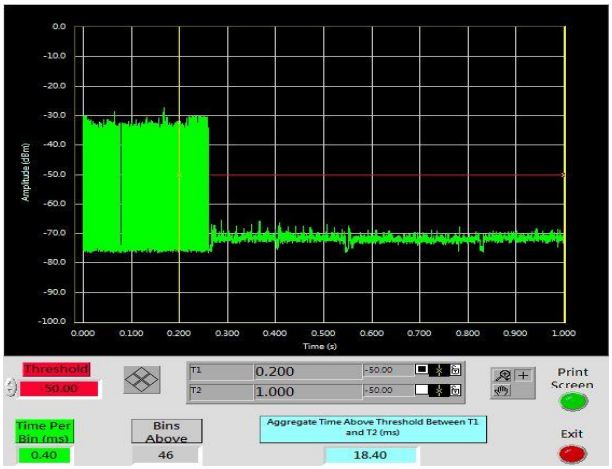
Channel Move Time (s)	Limit (s)
4.5760	10

IEEE 802.11a at 5300	
Type 0_Channel closing transmisssion time	**Type 0_Channel closing transmisssion time-caculate**
	

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
0.8	60	-59.2

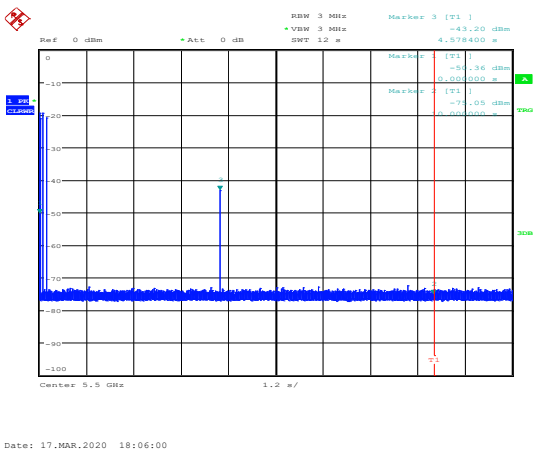
IEEE 802.11ac VHT 80 MHz at 5290	
Type 0_Channel Move Time	
	

Channel Move Time (s)	Limit (s)
0.2568	10

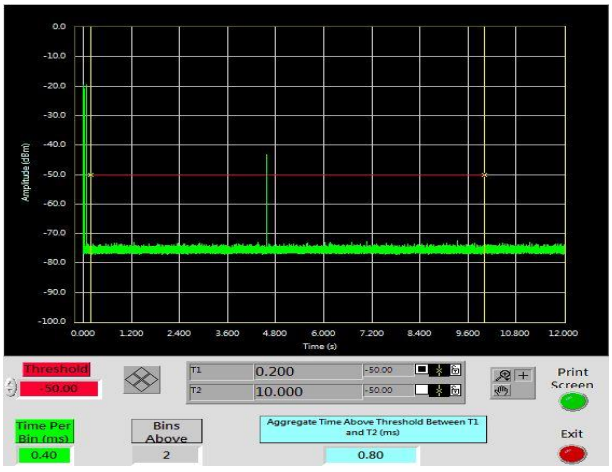
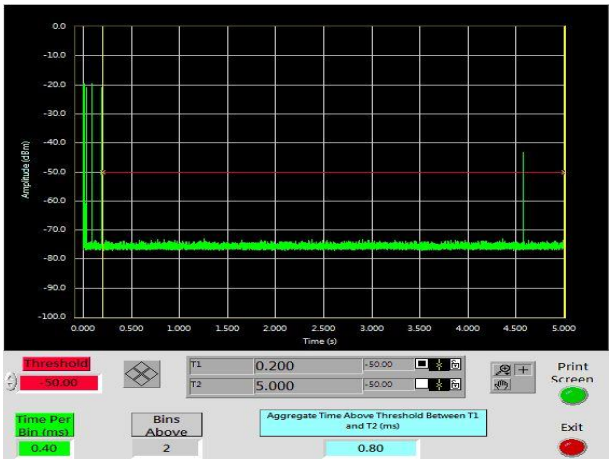
IEEE 802.11ac VHT 80 MHz at 5290	
Type 0_Channel closing transmisssion time	**Type 0_Channel closing transmisssion time-caculate**
	

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
18.40	60	-41.60

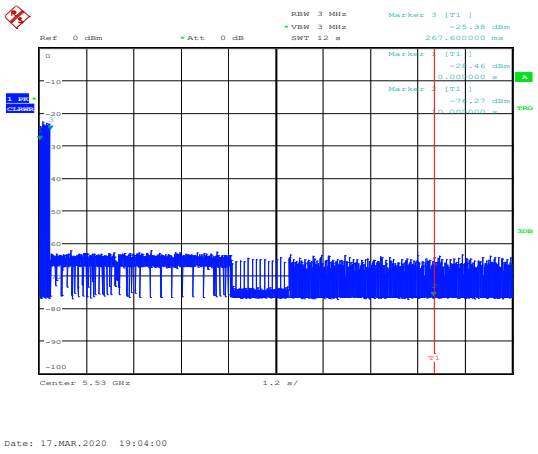
U-NII-2c

IEEE 802.11a at 5500
Type 0_Channel Move Time


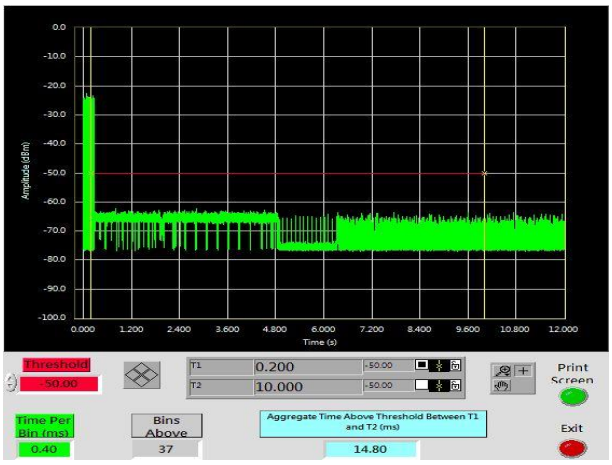
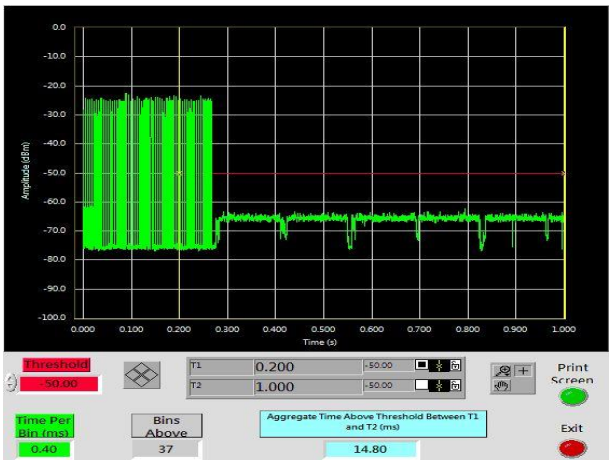
Channel Move Time (s)	Limit (s)
4.5784	10

IEEE 802.11a at 5500	
Type 0_Channel closing transmisssion time	**Type 0_Channel closing transmisssion time-caculate**
	

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
0.8	60	-59.2

IEEE 802.11ac VHT 80 MHz at 5530	
Type 0_Channel Move Time	
	

Channel Move Time (s)	Limit (s)
0.2676	10

IEEE 802.11ac VHT 80 MHz at 5530	
Type 0_Channel closing transmisssion time	**Type 0_Channel closing transmisssion time-caculate**
	

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
14.80	60	-45.20

--End of Test Report--