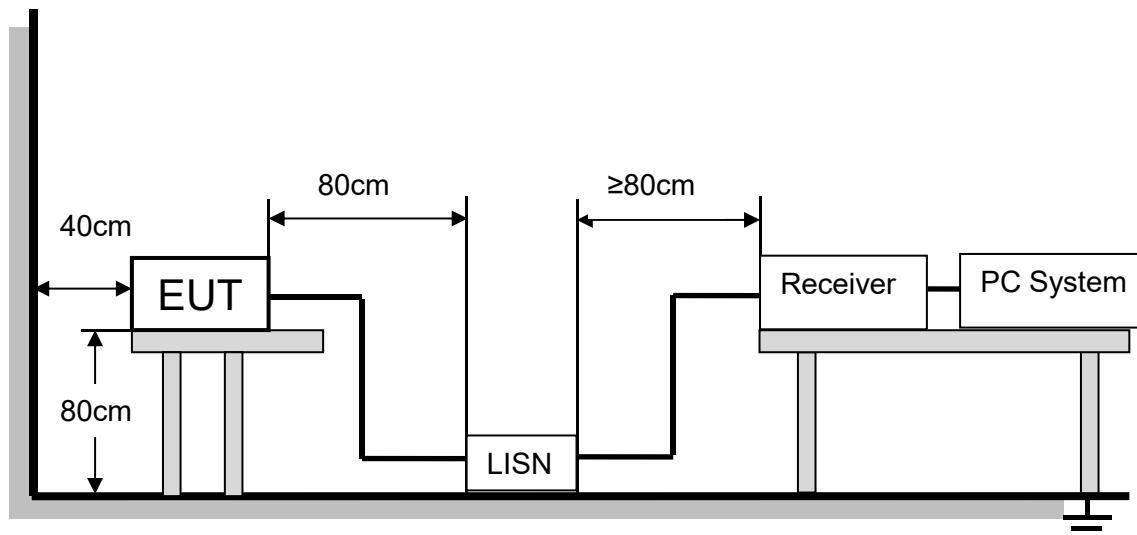






14. AC Power Line Conducted Emissions

14.1. Block Diagram of Test Setup



The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

14.2. Limits

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8.

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	56 - 46 *
0.50 - 5.0	56.00	46.00
5.0 - 30.0	60.00	50.00

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

14.3. Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

14.4. Test Result

Pass. (See below detailed test result)

Note1: All emissions not reported below are too low against the prescribed limits.

Note2: Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/50Hz, recorded worse case.

14.5. Original Test Data

AC Power Line Conducted Emission Test Data Refer to appendix C

15. Dynamic Frequency Selection

15.1. Applicability of DFS Requirements

A U-NII network will employ a DFS function to detect signals from radar systems and to avoid co-channel operation with these systems. This applies to the 5250-5350 MHz and/or 5470-5725 MHz bands.

Within the context of the operation of the DFS function, a U-NII device will operate in either Master Mode or Client Mode. U-NII devices operating in Client Mode can only operate in a network controlled by a U-NII device operating in Master Mode.

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

Requirement	Operational Mode		
	<input checked="" type="checkbox"/> Master	<input type="checkbox"/> Client Without Radar Detection	<input type="checkbox"/> 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	
	<input checked="" type="checkbox"/> Master Device or Client with Radar Detection	<input type="checkbox"/> 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	<input checked="" type="checkbox"/> Master Device or Client with Radar Detection	<input type="checkbox"/> 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 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.		

15.2. Limit

(1) DFS Detection Thresholds

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

Maximum Transmit Power	Value (See Notes 1, 2, and 3)
EIRP \geq 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) DFS Response Requirements

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 facilitating 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.

15.3. Parameters of Radar Test Waveform

This section provides the parameters for required test waveforms, minimum percentage of successful detection, 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.

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	Roundup $\left\lceil \frac{1}{360} \cdot \frac{19 \cdot 10^6}{\text{PRI}_{\mu\text{sec}}} \right\rceil$	60%	30
		Test B			
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.					
Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a					
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					

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. Test aggregate is average of the percentage of successful detections of short pulse radar types 1-4

15.4. Calibration of Radar Waveform

Radar Waveform Calibration Procedure:

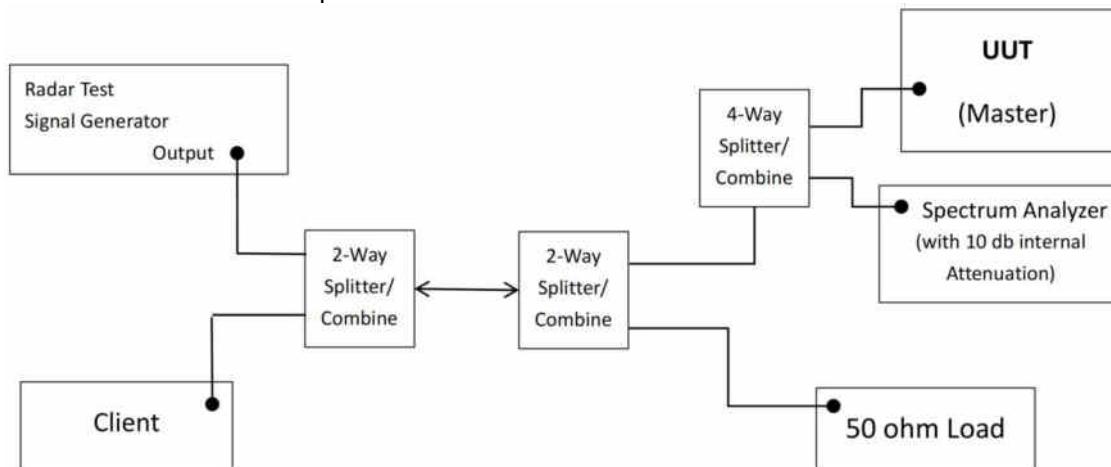
A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected to place of the master

The interference Radar Detection Threshold Level is $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$ that had been taken into account the output power range and antenna gain.

The following equipment setup was used to calibrate the conducted radar waveform. A vector signal generator was utilized to establish the test signal level for radar type 0. During this process there were no transmissions by either the master or client device. The spectrum analyzer was switched to the zero spans (time domain) at the frequency of the radar waveform generator. Peak detection was used. The spectrum analyzer resolution bandwidth (RBW) and video bandwidth (VBW) were set to 3 MHz. The spectrum analyzer had offset -1.0dB to compensate RF cable loss 1.0dB .

The vector signal generator amplitude was set so that the power level measured at the spectrum analyzer was $-62\text{dBm} + 0\text{dBi} + 1\text{dB} = -61\text{dBm}$. Capture the spectrum analyzer plots on short pulse radar waveform.

Conducted Calibration Setup:



Note: 1. Use the software "Web" to set the frequency channel.

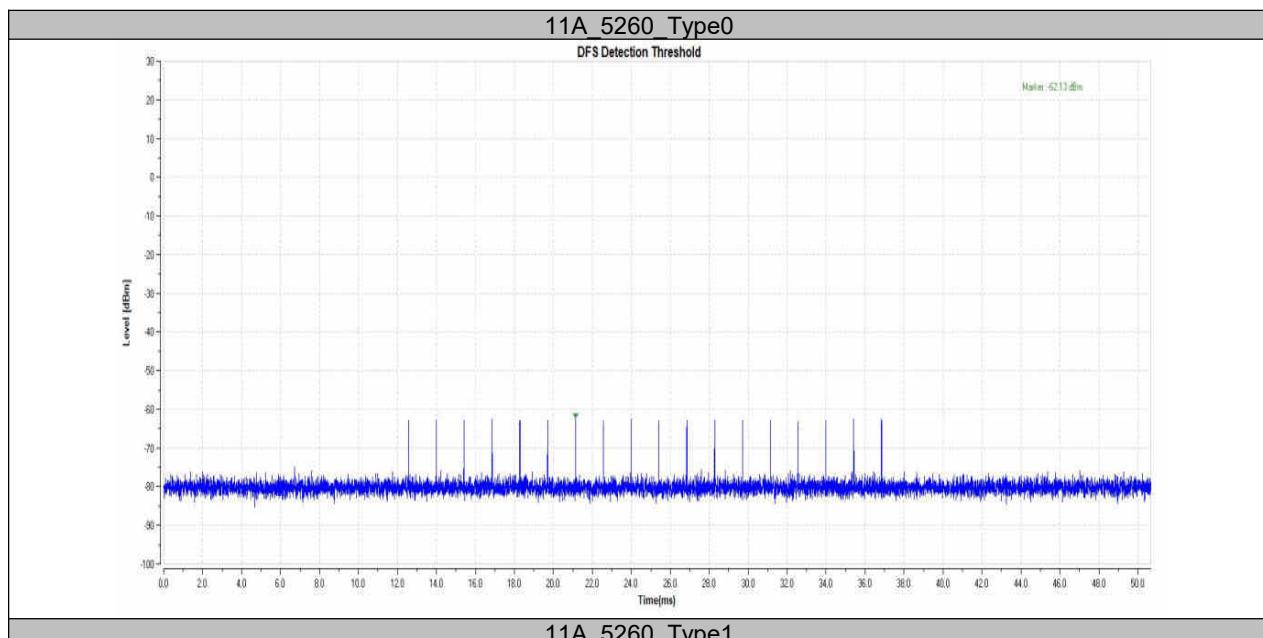
2. EUT is not support TPC and not with Radar detection.

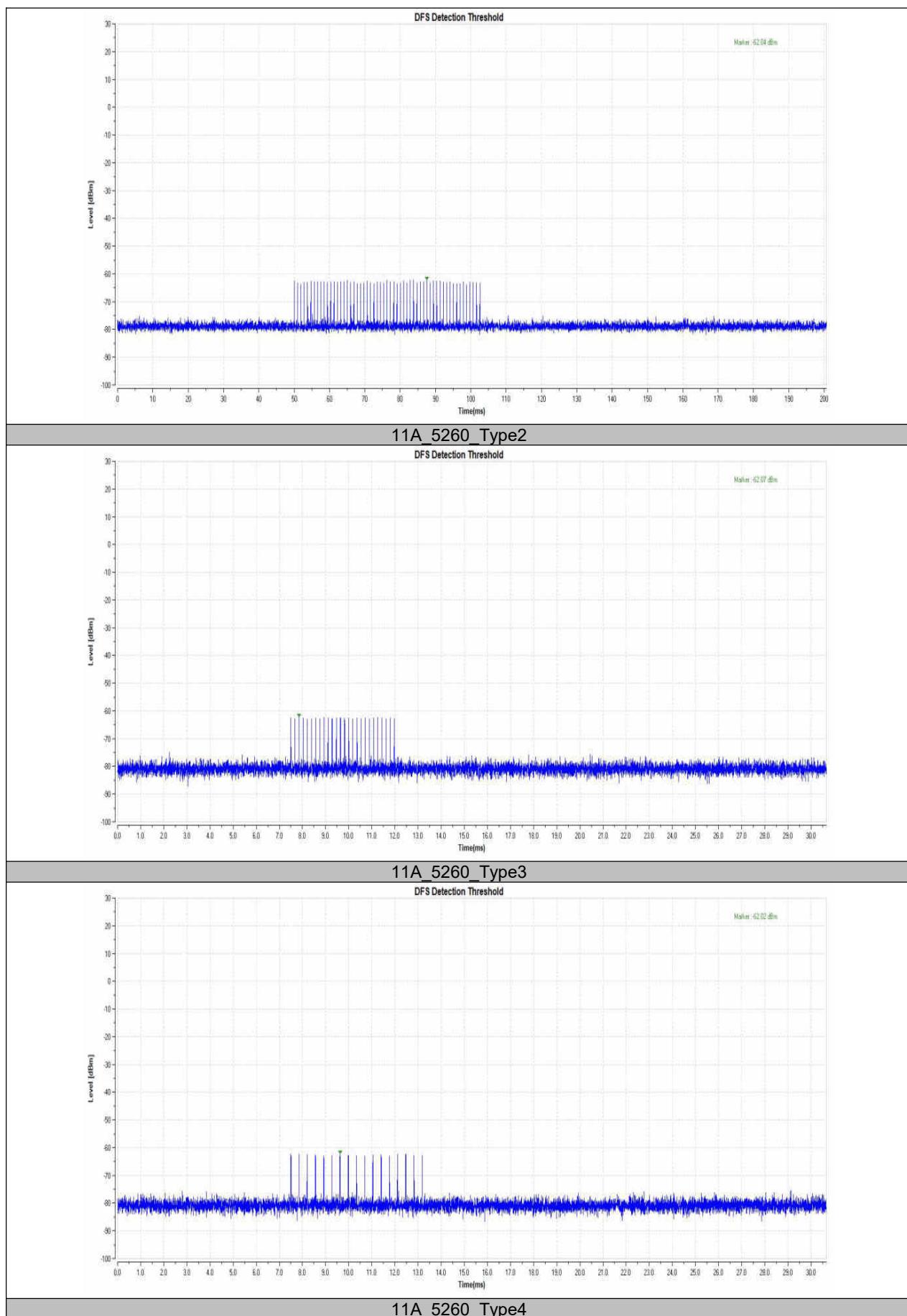
Radar Waveform Calibration Result:

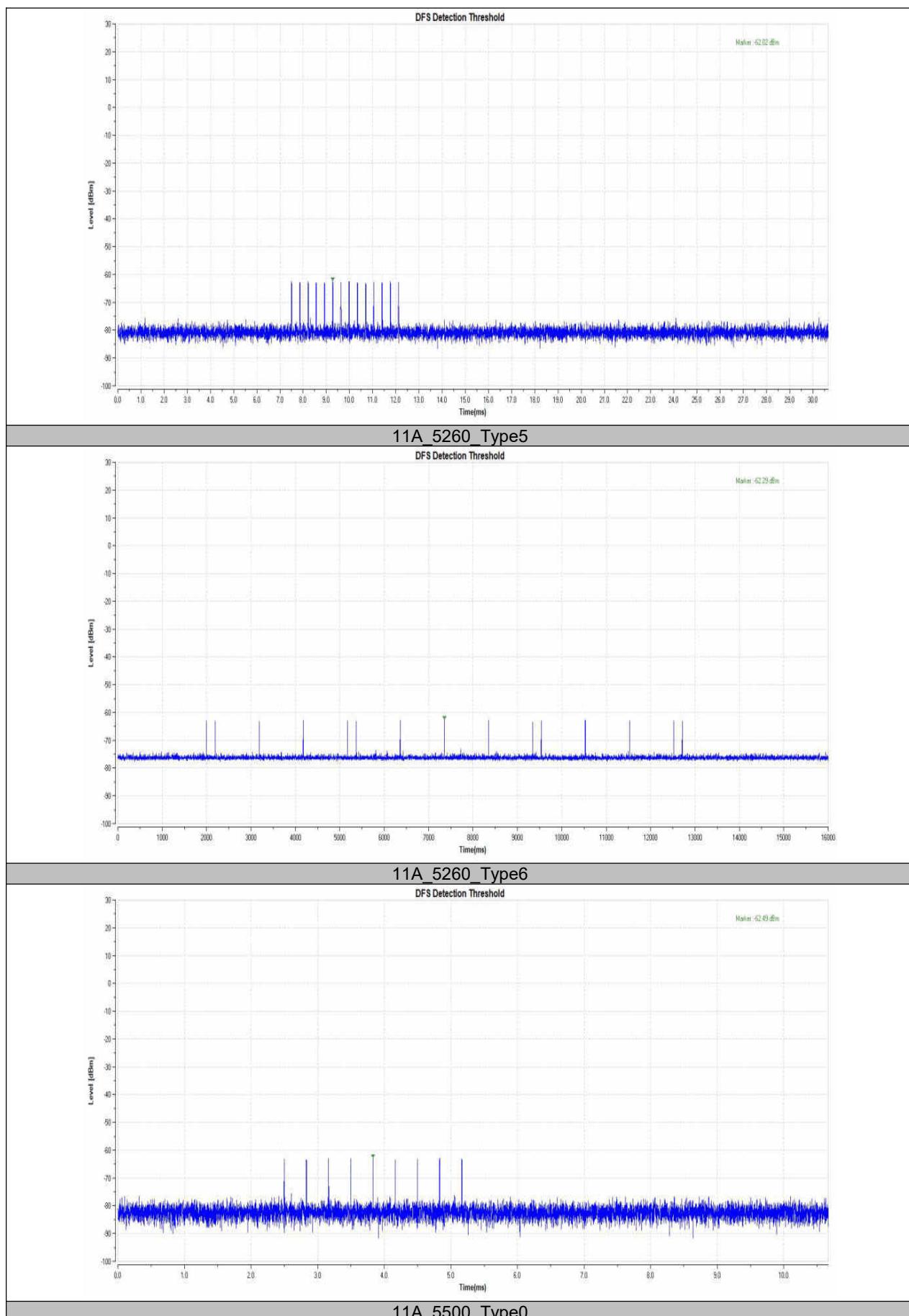
Radar Type 0

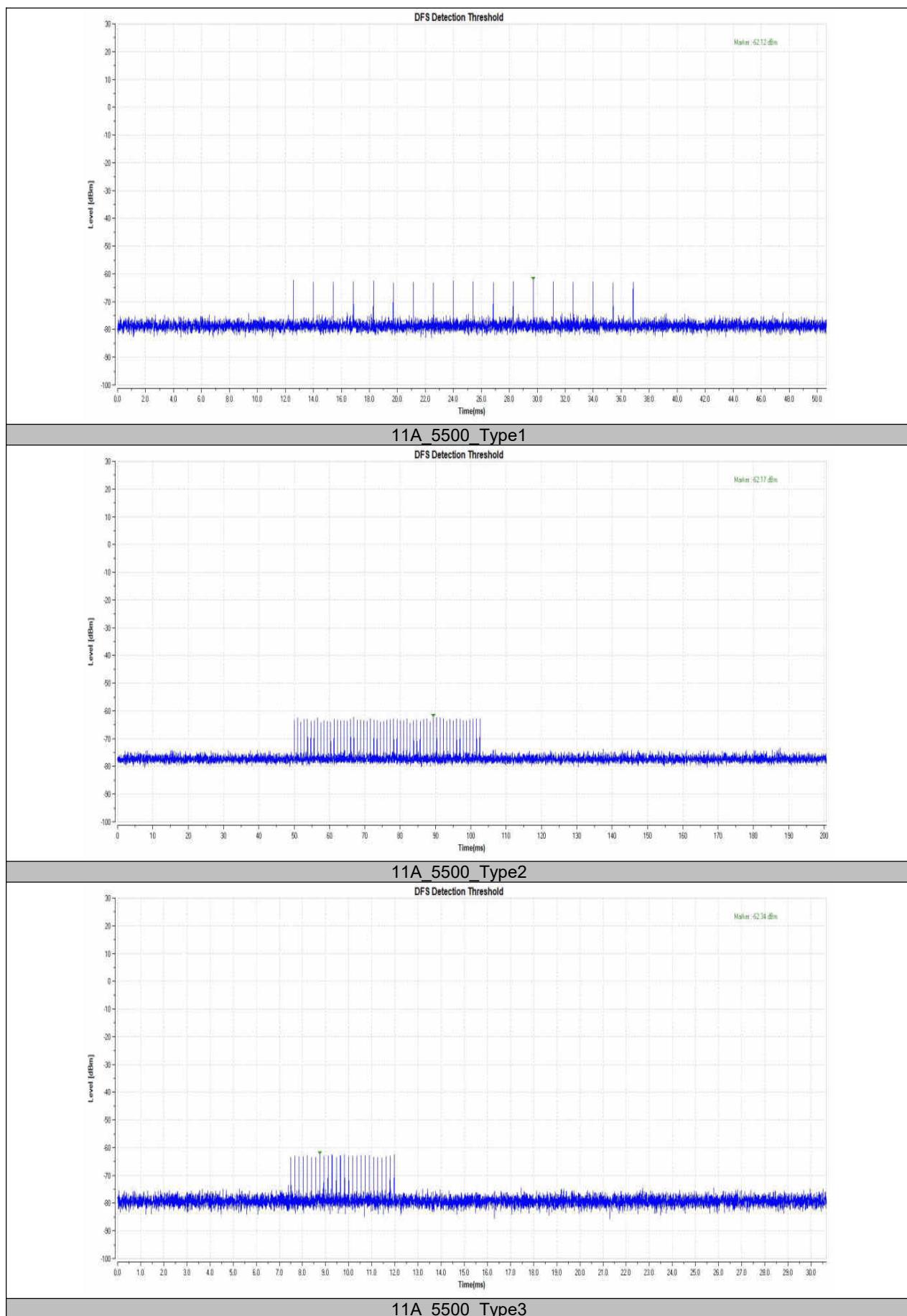
Test Mode	Frequency[dbm]	Radar Type	Result	Limit[dbm]	Verdict
11A	5260	Type0	-57.20	-57.12	PASS
		Type1	-57.12	-57.12	PASS
		Type2	-57.32	-57.12	PASS
		Type3	-57.14	-57.12	PASS
		Type4	-57.27	-57.12	PASS
		Type5	-57.32	-57.12	PASS
		Type6	-60.78	-57.12	PASS
	5500	Type0	-57.23	-57.12	PASS
		Type1	-57.56	-57.12	PASS
		Type2	-57.39	-57.12	PASS
		Type3	-57.28	-57.12	PASS
		Type4	-57.26	-57.12	PASS
		Type5	-57.12	-57.12	PASS
		Type6	-57.20	-57.12	PASS
11N40MIMO	5270	Type0	-57.52	-57.12	PASS
		Type1	-57.33	-57.12	PASS
		Type2	-57.26	-57.12	PASS
		Type3	-57.22	-57.12	PASS

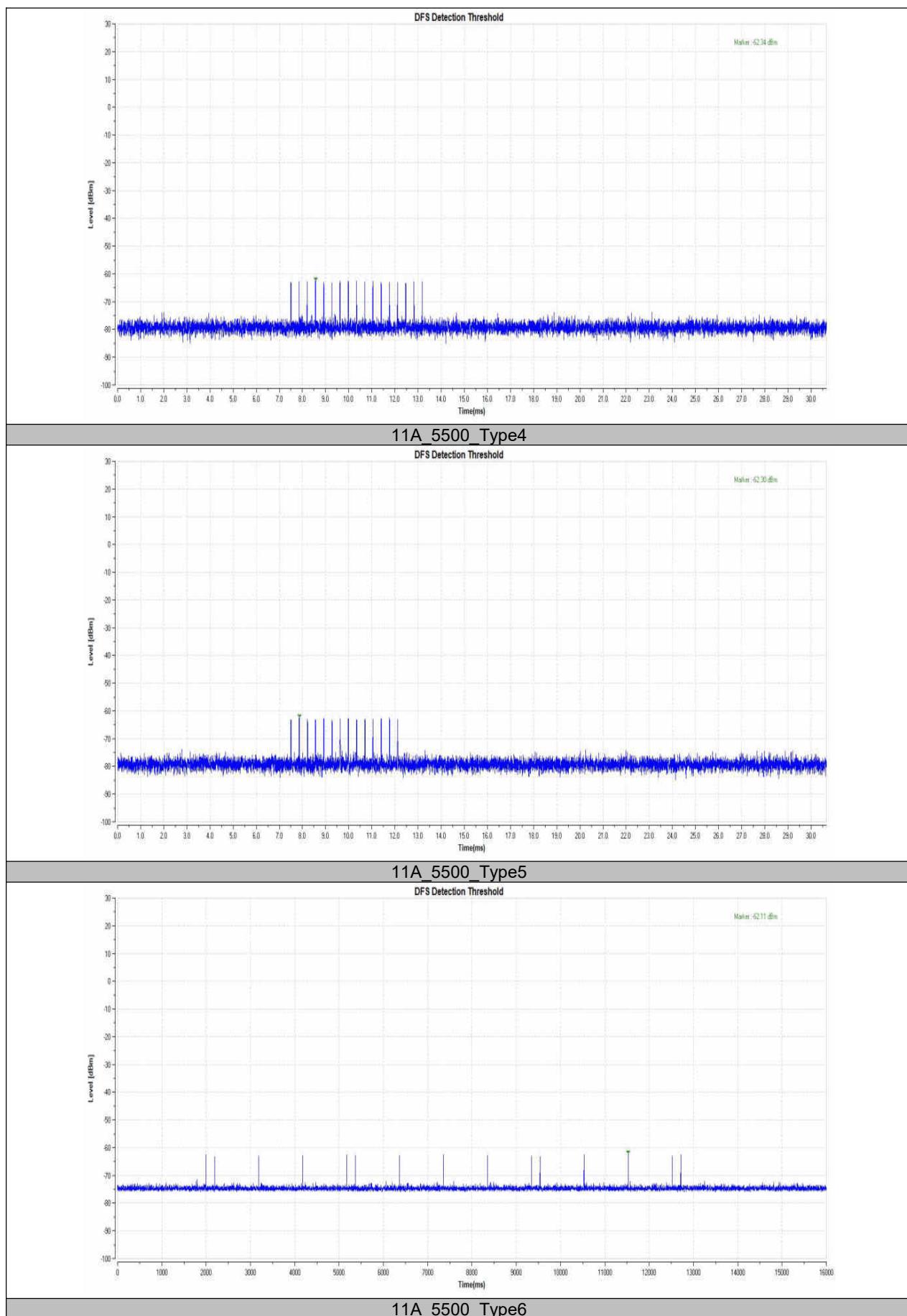
11AC80MIMO	5510	Type4	-57.16	-57.12	PASS
		Type5	-57.19	-57.12	PASS
		Type6	-57.53	-57.12	PASS
	5290	Type0	-57.25	-57.12	PASS
		Type1	-57.47	-57.12	PASS
		Type2	-57.54	-57.12	PASS
		Type3	-57.30	-57.12	PASS
	5530	Type4	-57.36	-57.12	PASS
		Type5	-57.35	-57.12	PASS
		Type6	-57.30	-57.12	PASS
		Type0	-57.54	-57.12	PASS
		Type1	-57.54	-57.12	PASS
		Type2	-57.40	-57.12	PASS
		Type3	-57.40	-57.12	PASS

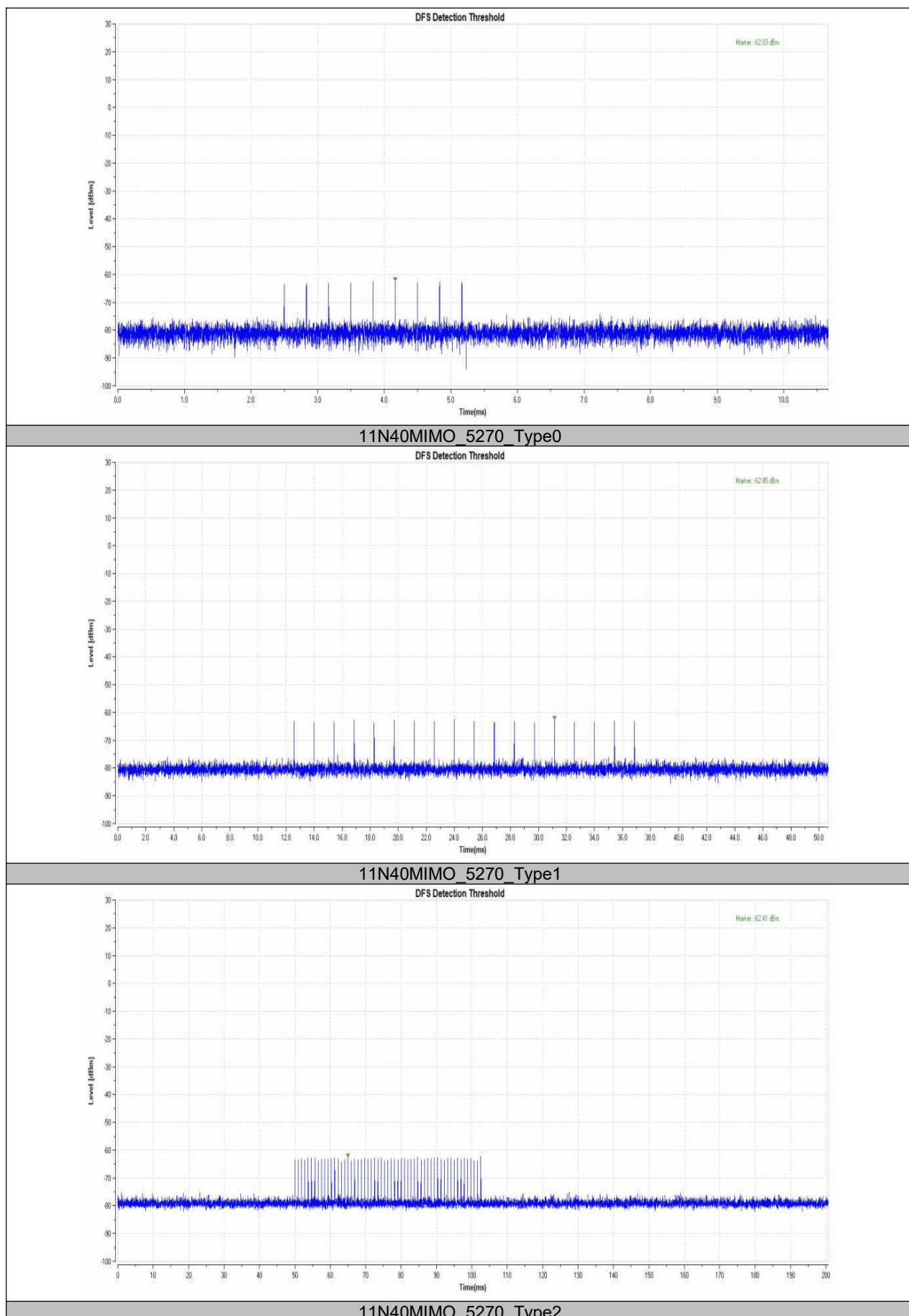


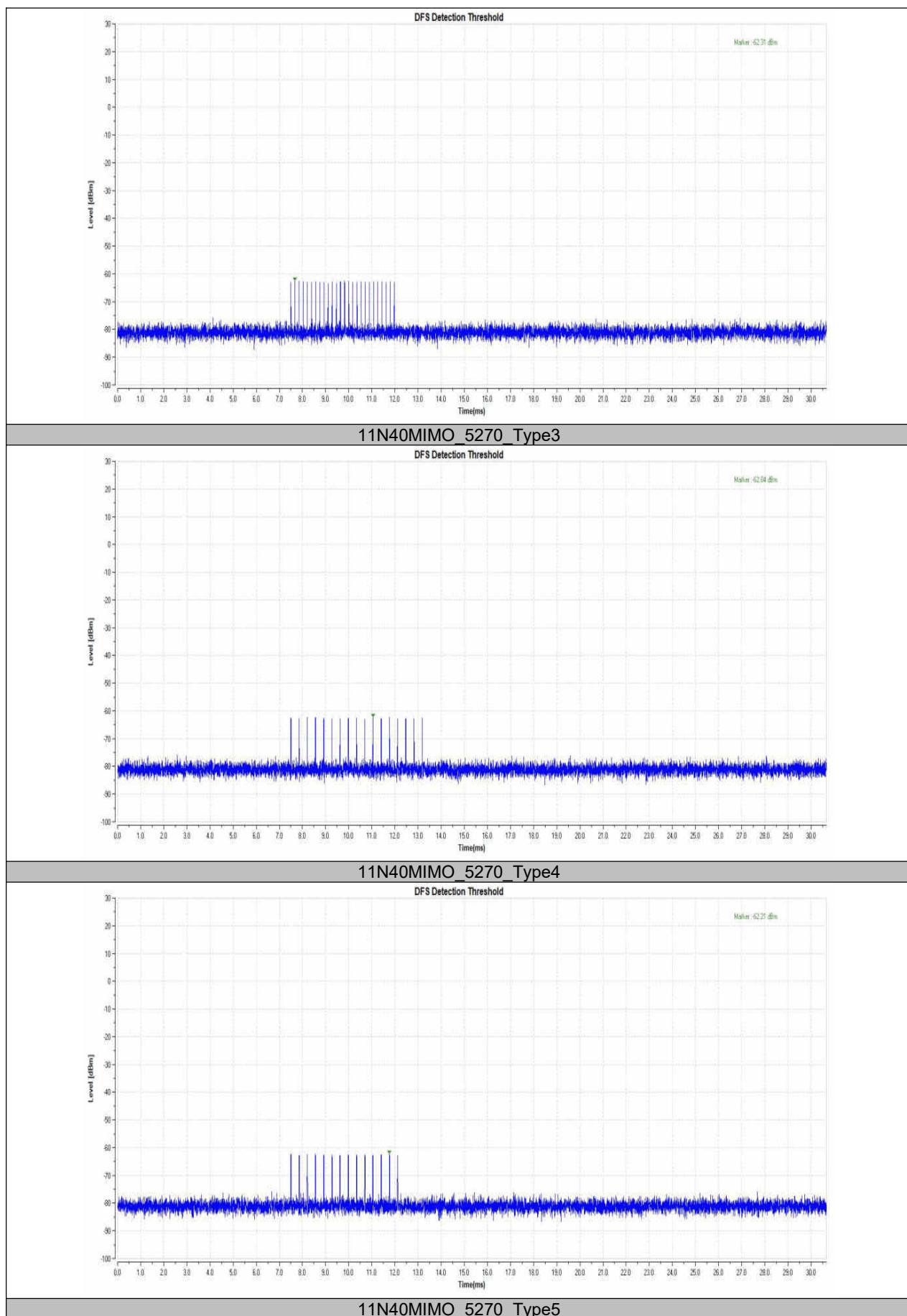


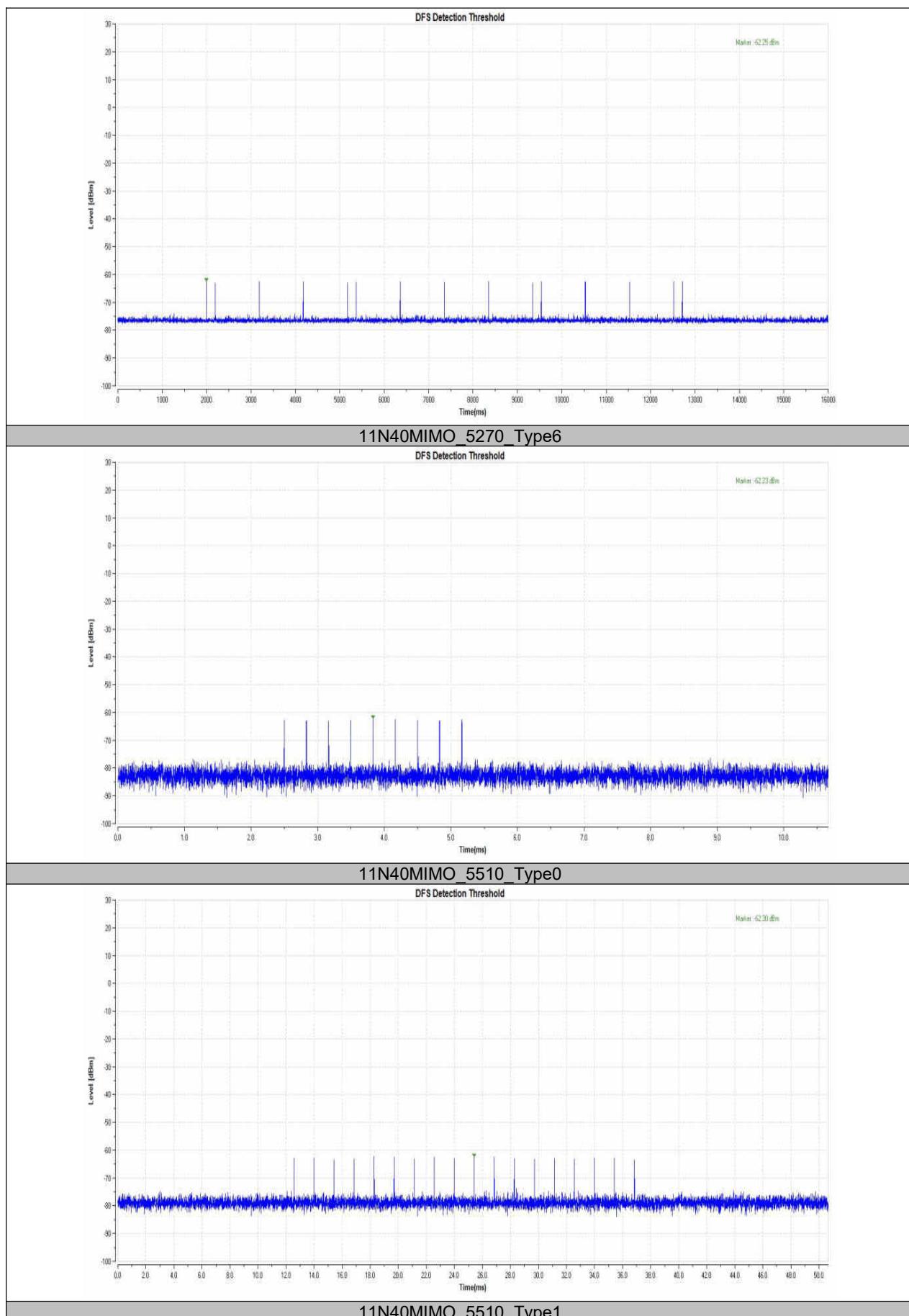


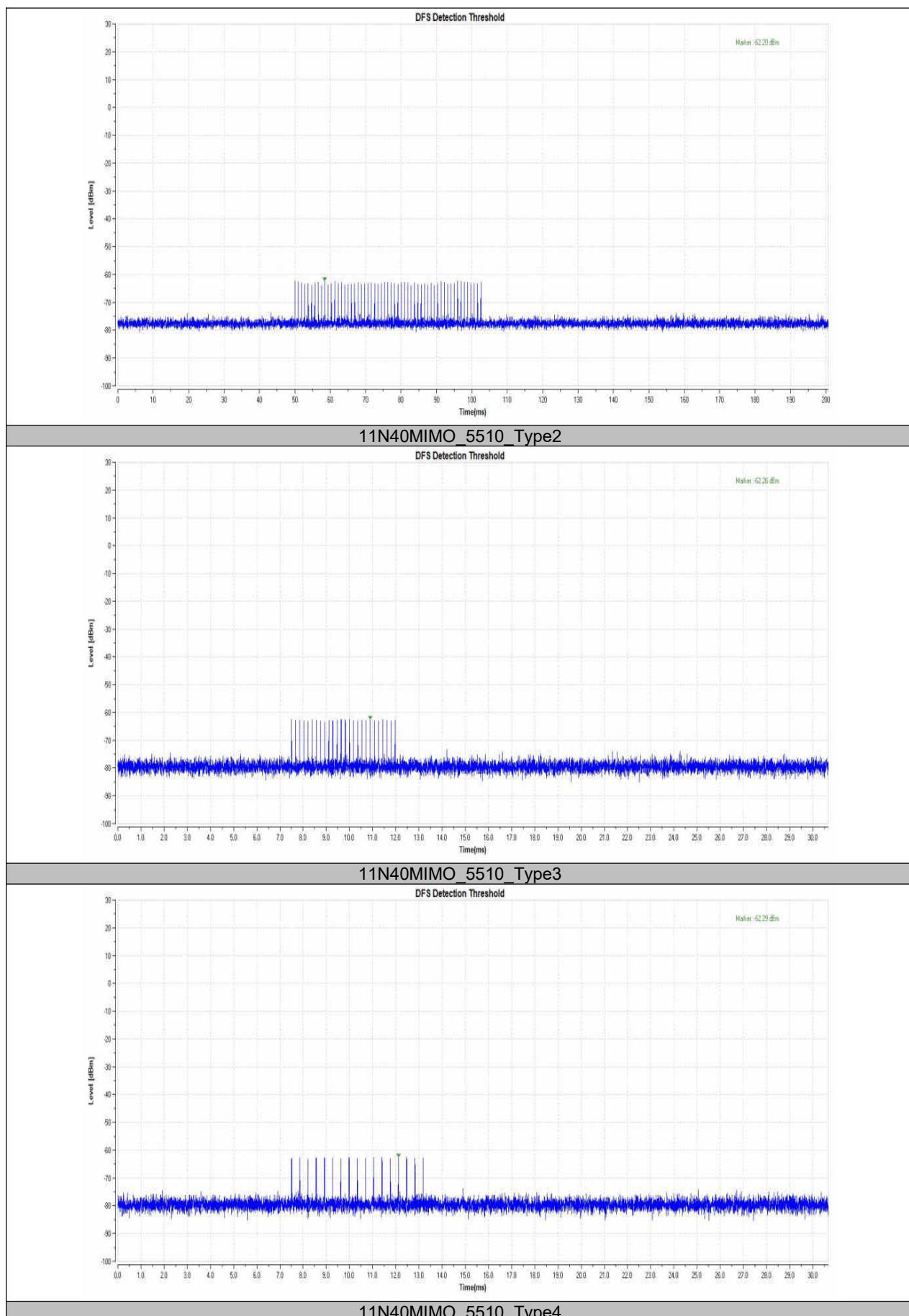


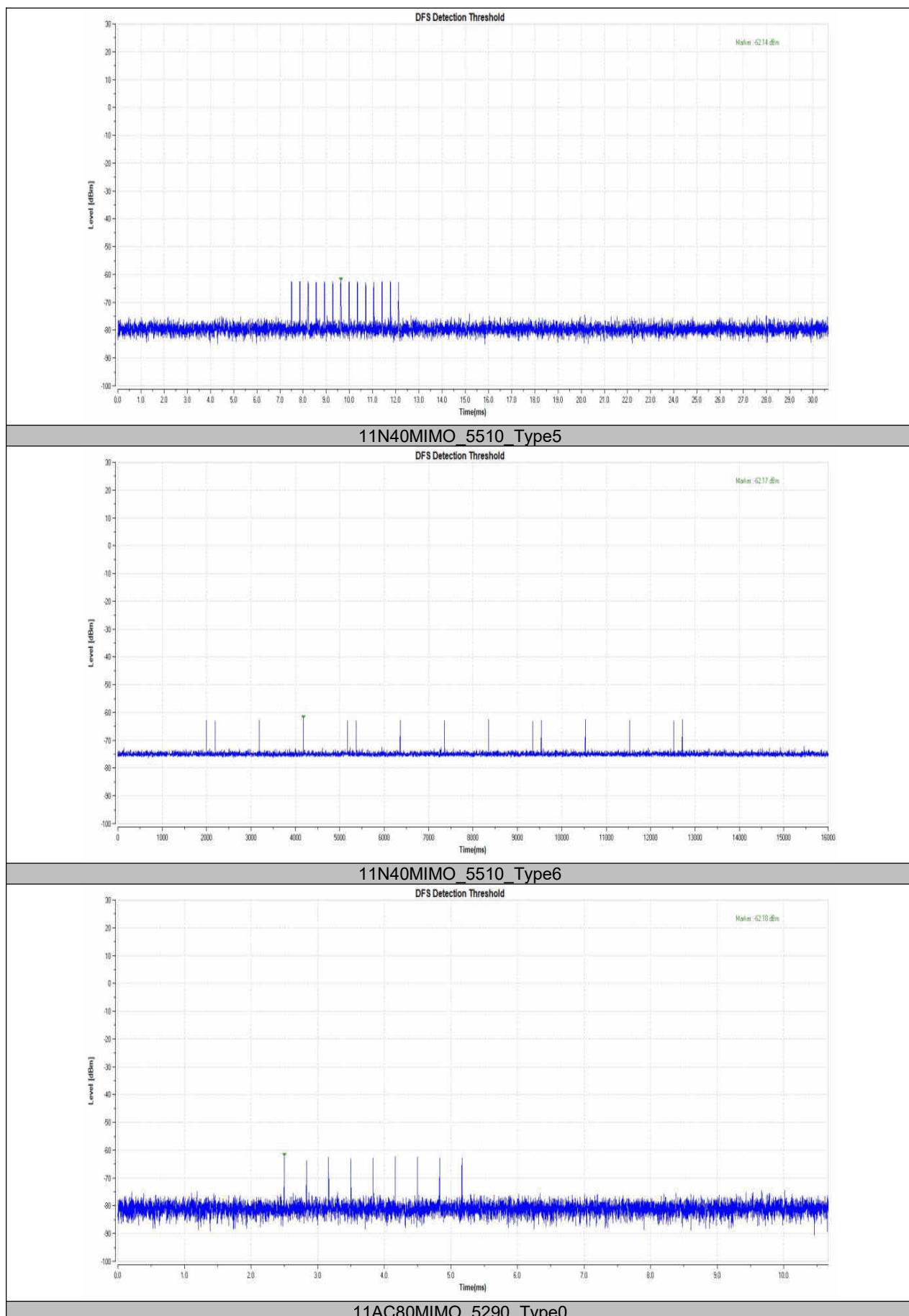


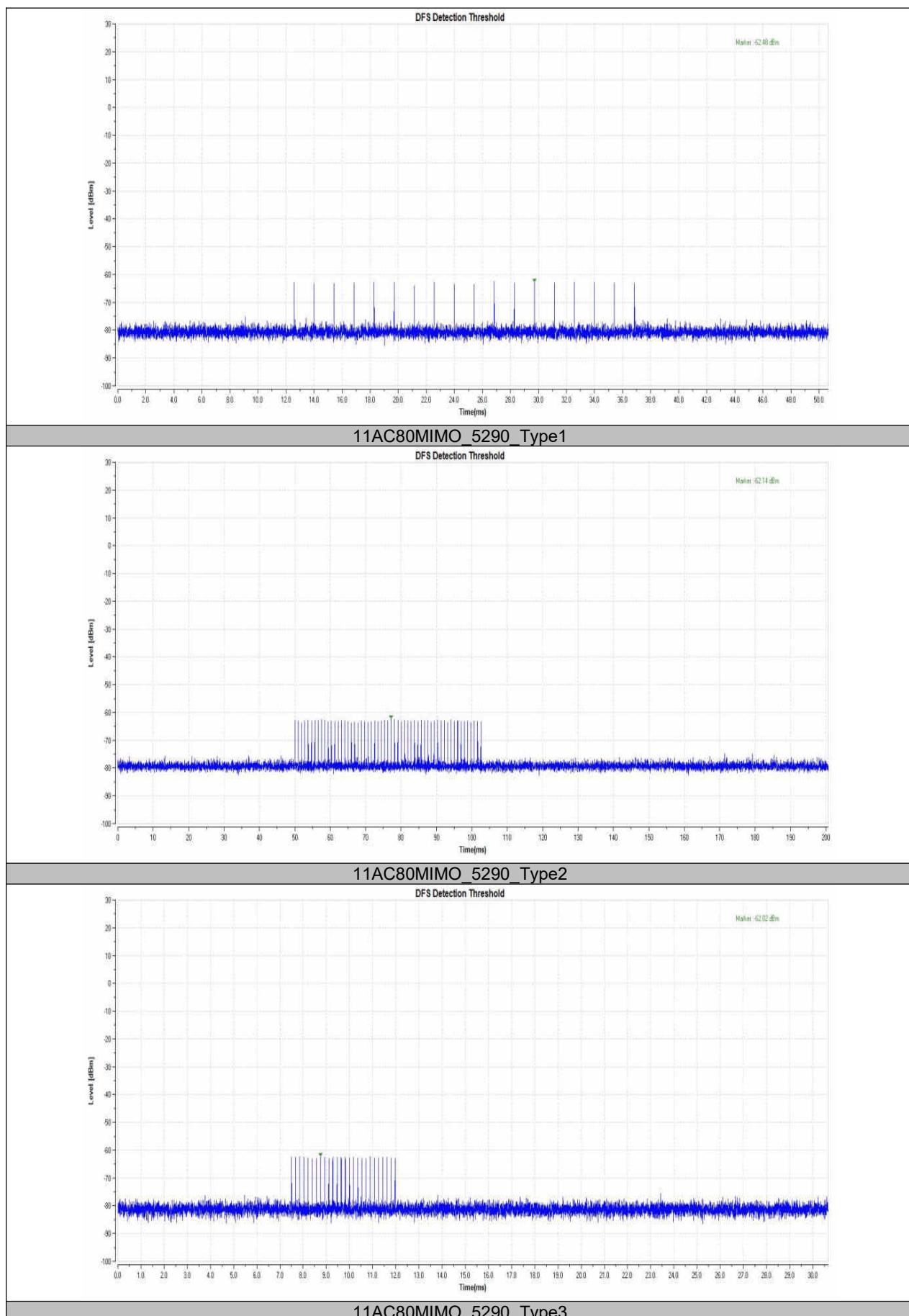


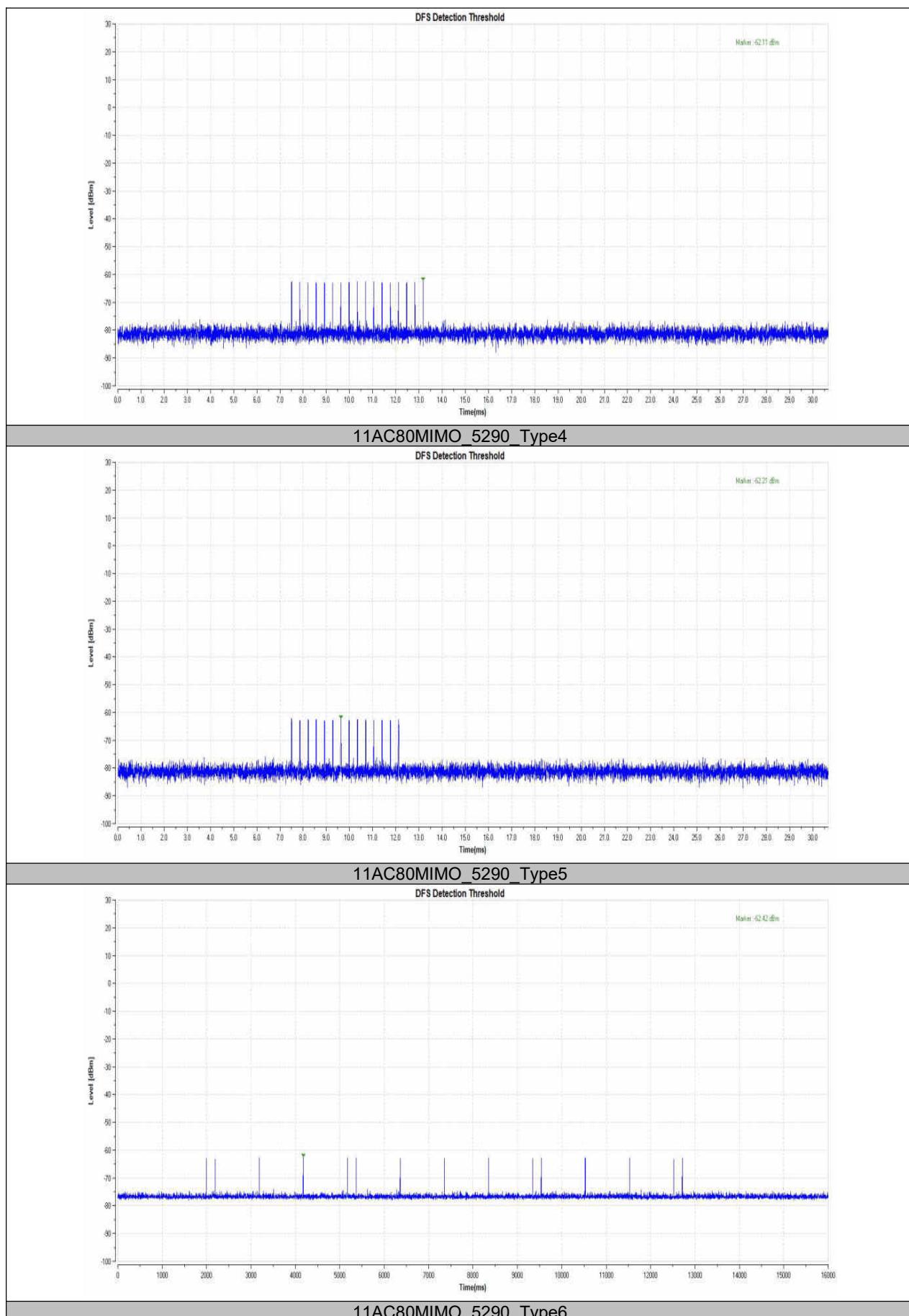


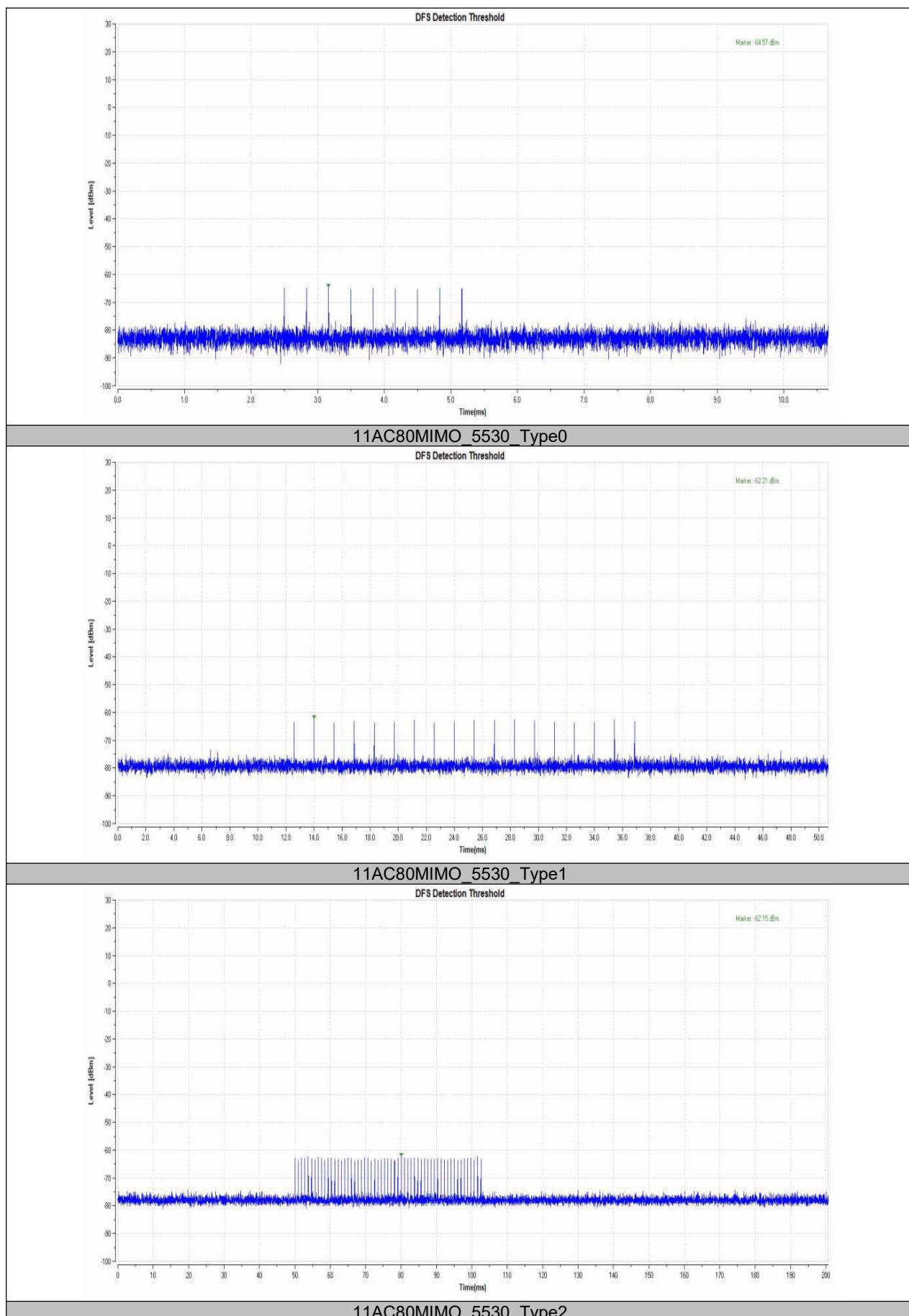


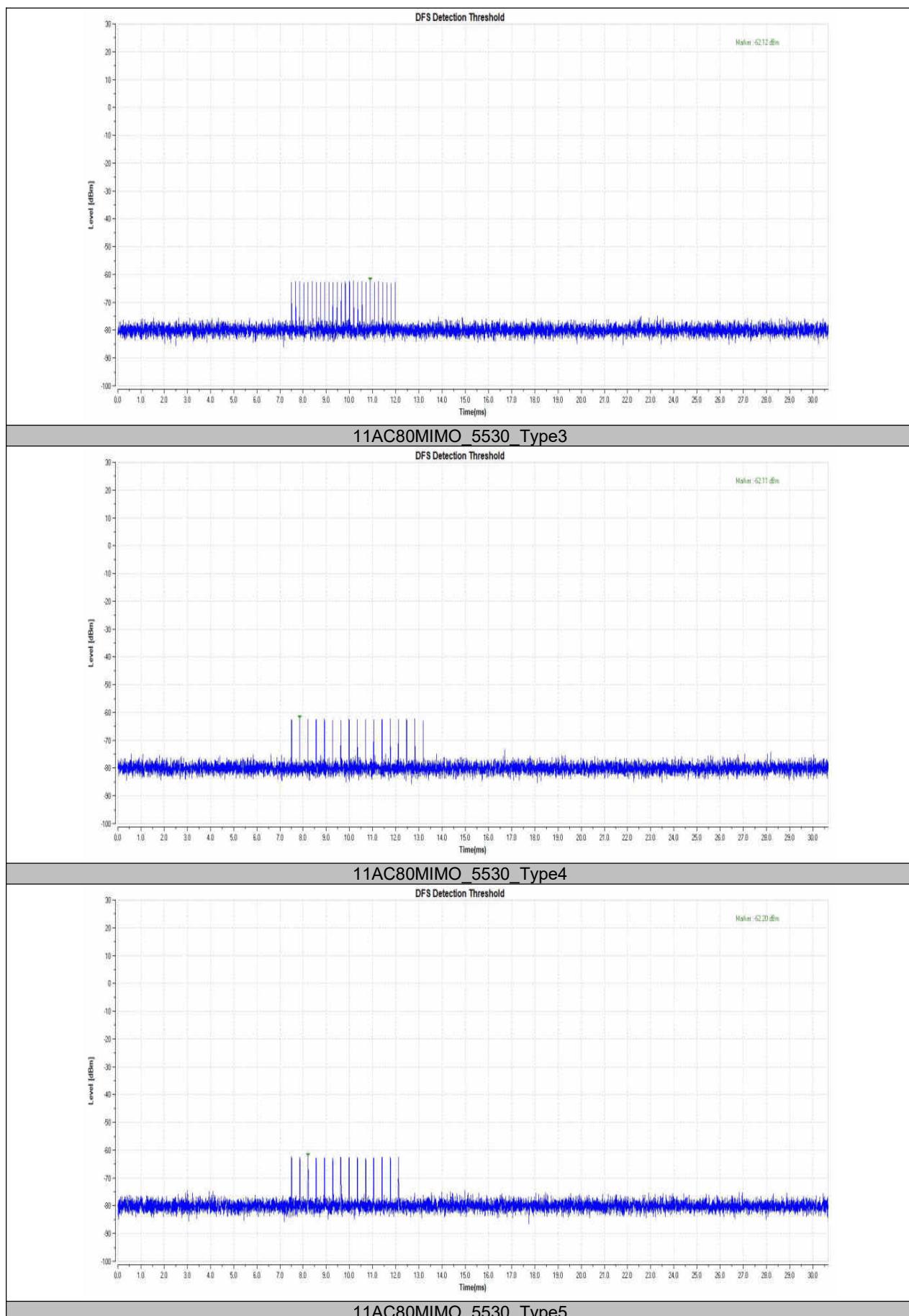


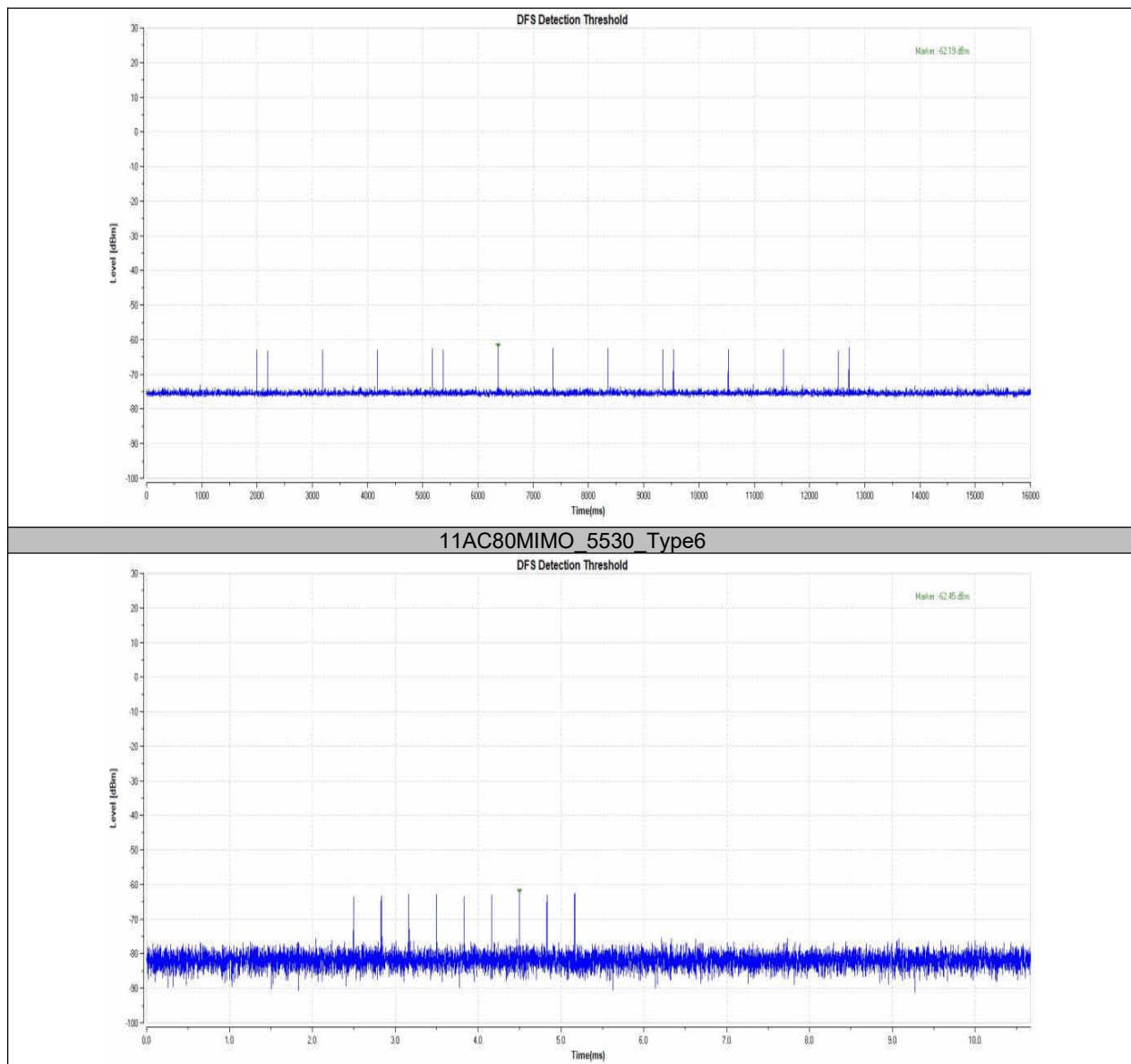












15.5. Channel Closing Transmission Time, Channel Move Time and Non-Occupancy Period

Block diagram of test setup Test Procedure:

The radar pulse generator is setup to provide a pulse at frequency that the master and client are operating. A type 0 radar pulse with a 1us pulse width and a 1428us PRI is used for the testing.

The vector signal generator is adjusted to provide the radar burst (18 pulses) at the level of approximately -61dBm at the antenna port of the master device.

A trigger is provided from the pulse generator to the DFS monitoring system in order to capture the traffic and the occurrence of the radar pulse.

EUT will associate with the master at channel. The file “iperf.exe” specified by the FCC is streamed from the PC 2 through the master and the client device to the PC 1 and played in full motion video using Test Software in order to properly load the network for the entire period of the test.

When radar burst with a level equal to the DFS Detection Threshold +1dB is generated on the operating channel of the U-NII device. At time T0 the radar waveform generator sends a burst of pulse of the radar waveform at Detection Threshold +1dB.

Observe the transmissions of the EUT at the end of the radar Burst on the Operating Channel. Measure and record the transmissions from the UUT during the observation time (Channel Move Time). One 15 seconds plot is reported for the Short Pulse Radar Type 0. The plot for the Short Pulse Radar Types start at the end of the radar burst. The Channel Move Time will be calculated based on the zoom in 600ms plot of the Short Pulse Radar Type.

Measurement of the aggregate duration of the Channel Closed Transmission Time method. With the

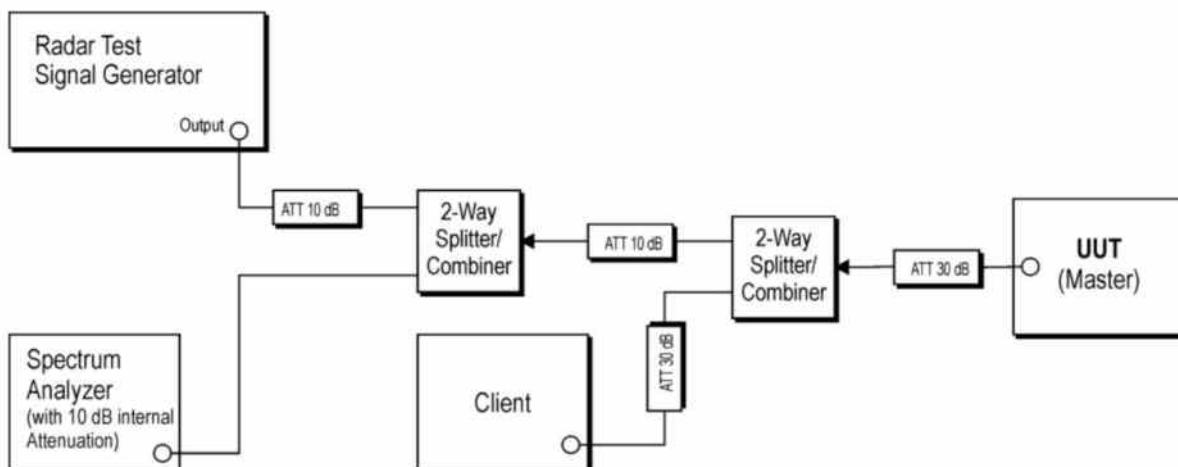
spectrum analyzer set to zero span tuned to the center frequency of the EUT operating channel at the radar simulated frequency, peak detection, and max hold, the dwell time per bin is given by: Dwell (0.3ms) = S (12000ms) / B (4000); where Dwell is the dwell time per spectrum analyzer sampling bin, S is sweep time and B is the number of spectrum analyzer sampling bins. An upper bound of the aggregate duration of the intermittent control signals of Channel Closing Transmission Time is calculated by: C (ms) = N X Dwell (0.3ms); where C is the Closing Time, N is the number of spectrum analyzer sampling bins (intermittent control signals) showing a U-NII transmission and Dwell is the dwell time per bin.

Measurement the EUT for more than 30 minutes following the channel move time to verify that no transmission or beacons occur on this channel.

15.6. Test Setup

Setup for Master with injection at the Master

Client Name	Brand Name	Model Name	FCC ID	Run-up Time(s)
IEEE 802.11 a/b/g/n/ac 2T2R USB Wi-Fi Module Integrated Bluetooth 2.1/3.0/4.2/5.3	/	SKO.WB822EU.10	2AR82-SKOWB822 EU10	20



15.7. Test Result

Channel Loading

Test Mode	Frequency[MHz]	Result	Limit [%]	Verdict
11A	5260	19.65	17	PASS
	5500	86.74	17	PASS
11N40MIMO	5270	65.39	17	PASS
	5510	61.2	17	PASS
11AC80MIMO	5290	40.83	17	PASS
	5530	59.69	17	PASS

Initial Channel Availability Check Time

Test Mode	Frequency[MHz]	Result	Verdict
11A	5260	See test Graph	PASS
	5500	See test Graph	PASS

Beginning of Channel Availability Check Time

Test Mode	Frequency[MHz]	Result	Verdict
11A	5260	See test Graph	PASS
	5500	See test Graph	PASS

End of Channel Availability Check Time

Test Mode	Frequency[MHz]	Result			Verdict
11A	5260	See test Graph			PASS
	5500	See test Graph			PASS

Channel Move Time and Channel Closing Transmission Time

Test Mode	Frequency[MHz]	CCTT[ms]	Limit[ms]	CMT[ms]	Limit[ms]	Verdict
11AC80MIMO	5290	200+9.1	200+60	559	10000	PASS
	5530	200+54.6	200+60	755.3	10000	PASS

Non-Occupancy Period

Test Mode	Frequency[MHz]	Result			Limit[s]	Verdict
11AC80MIMO	5290	see test graph			≥1800	PASS
	5530	see test graph			≥1800	PASS

U-NII Detection Bandwidth

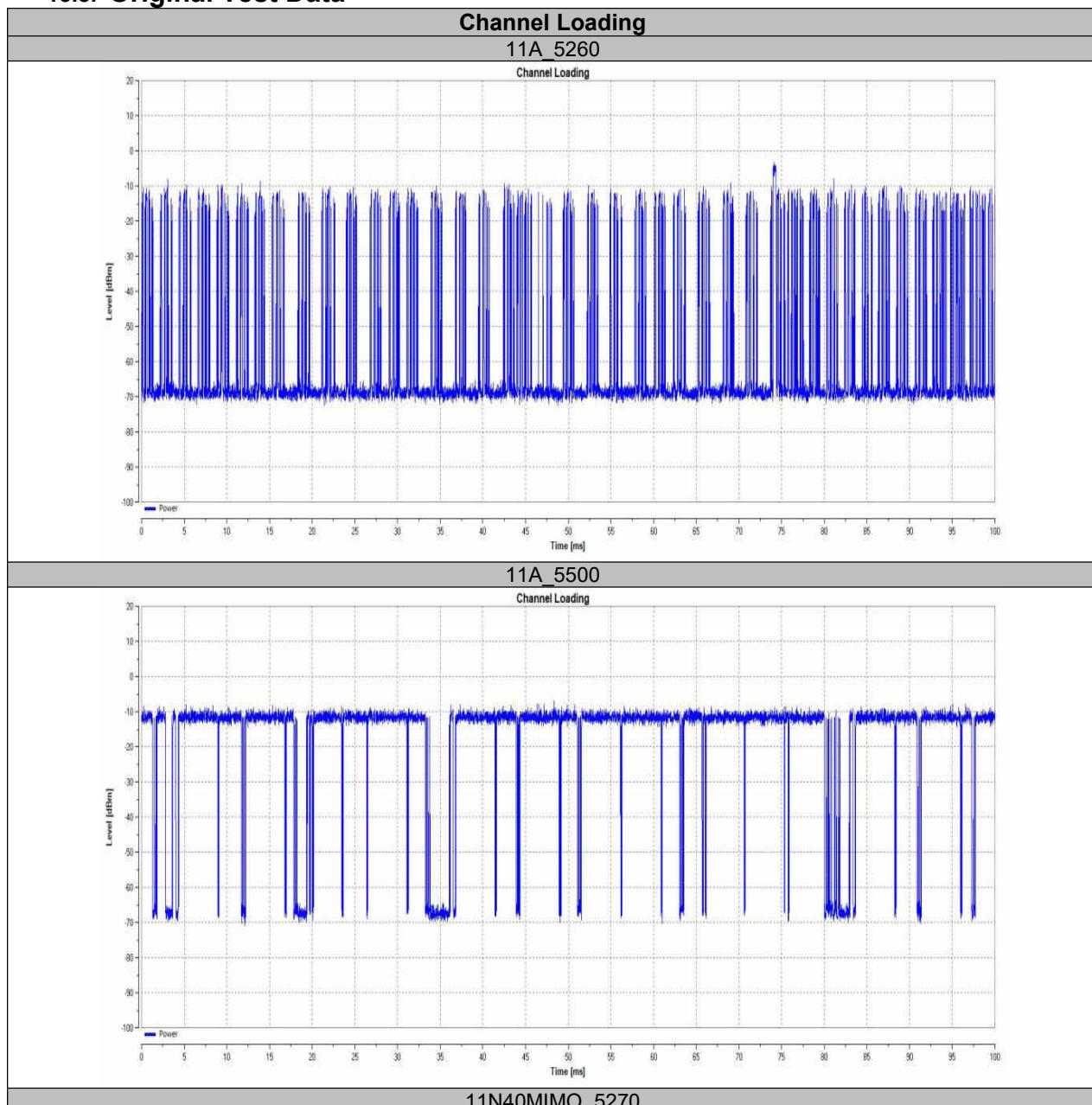
Test Mode	Frequency[MHz]	FL[MHz]	FH[MHz]	Detection Bandwidth [MHz]	OCB [MHz]	Ratio [%]	Limit [%]	Verdict
11A	5260	5245	5275	30	17.626	170.20	≥100	PASS
	5500	5483	5517	34	17.637	192.78	≥100	PASS
11N40MIMO	5270	5242	5300	58	36.71	158.00	≥100	PASS
	5510	5480	5541	61	36.341	167.85	≥100	PASS
11AC80MIMO	5290	5232	5356	124	75.136	165.03	≥100	PASS
	5530	5470	5591	121	75.537	160.19	≥100	PASS

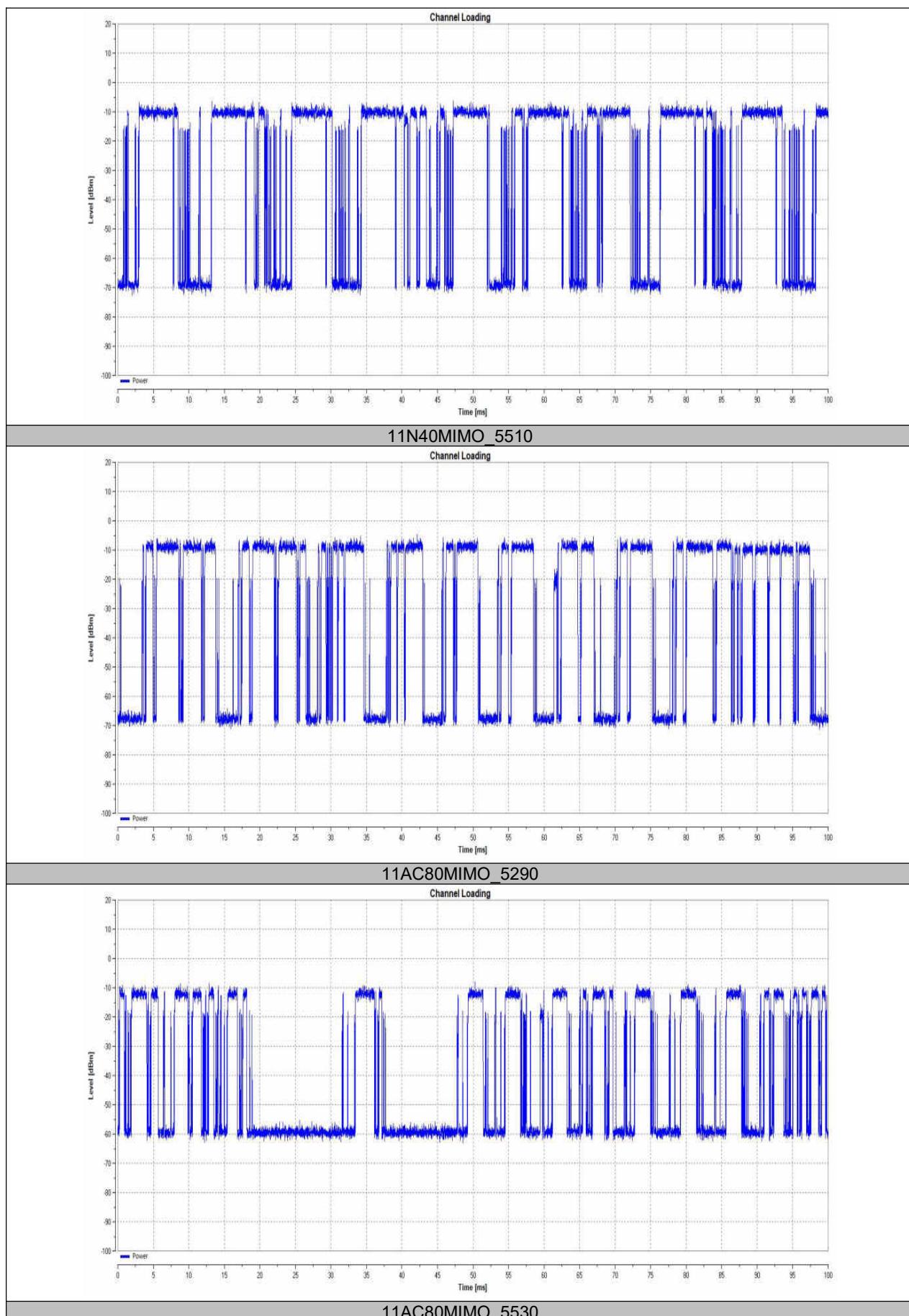
Statistical Performance check

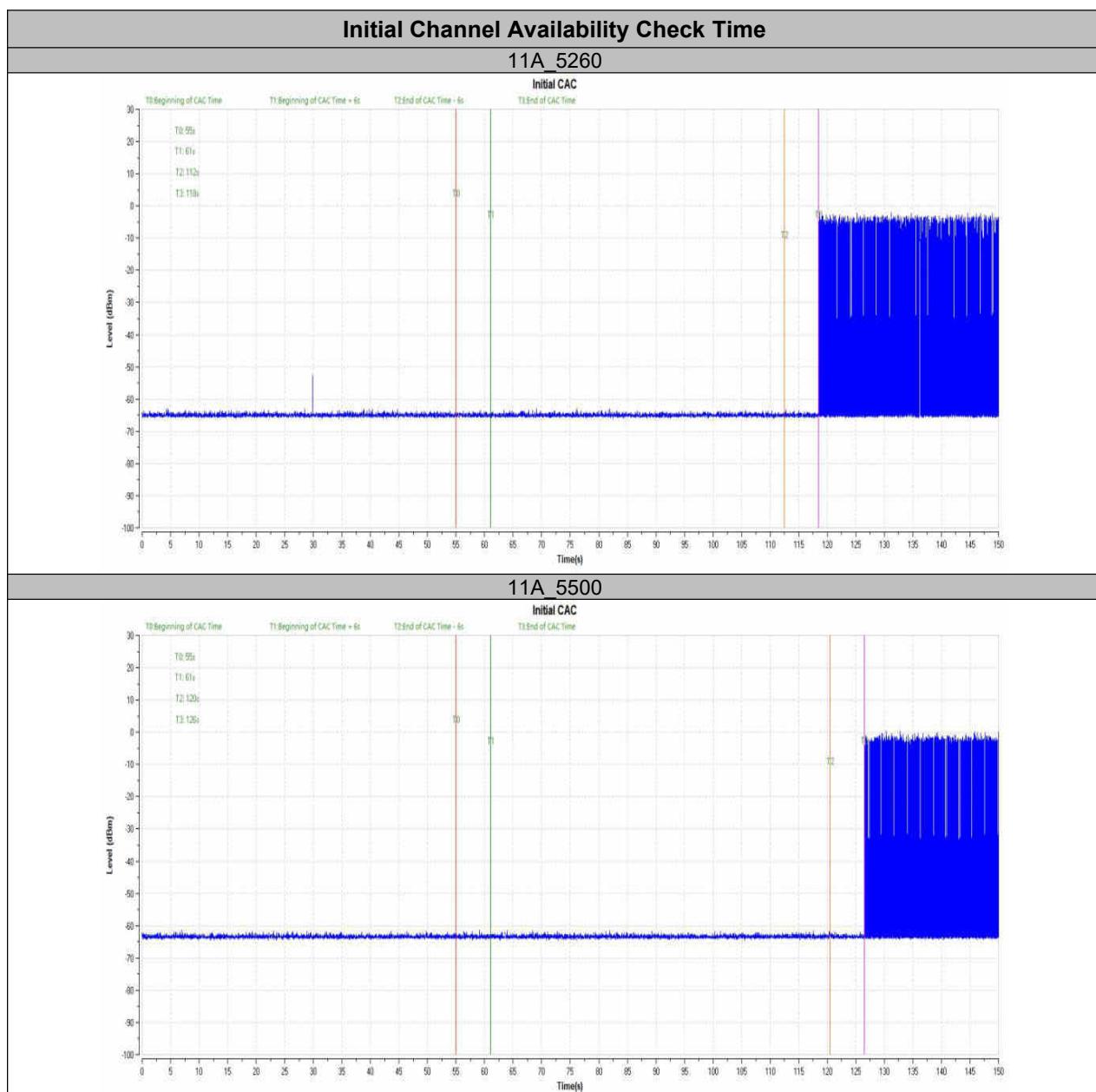
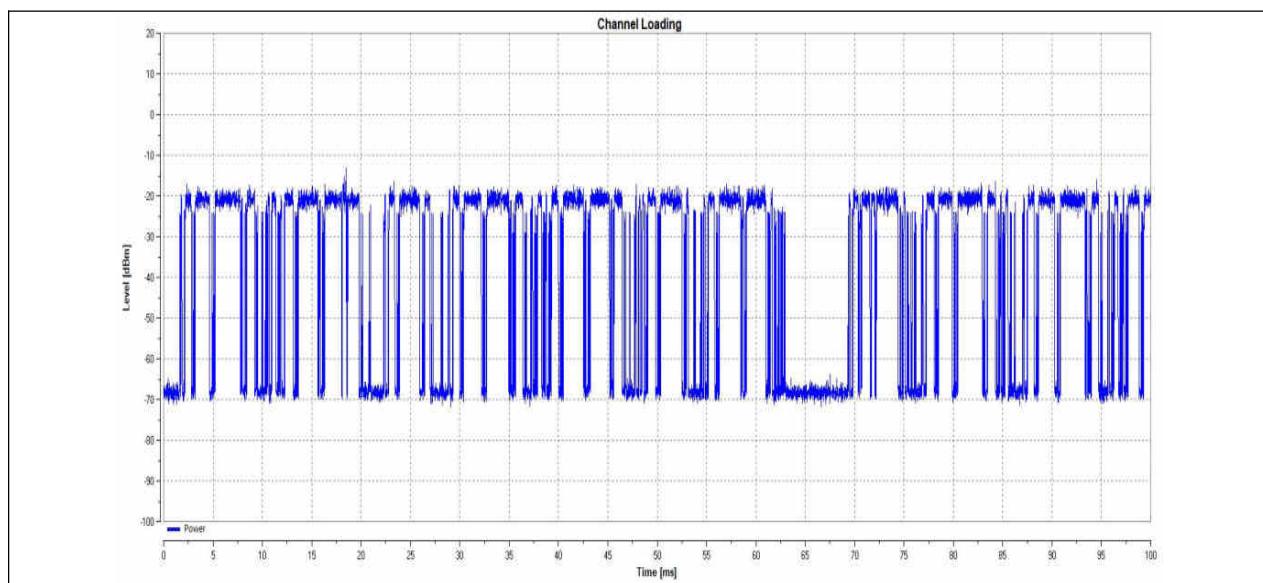
Test Mode	Frequency[MHz]	Radar Type	Pass Times	Fail Times	Probability (%)	Limit (%)	Verdict
11A	5260	Type0	30	0	100.00	60	PASS
		Type1	30	0	100.00	60	PASS
		Type2	18	12	60.00	60	PASS
		Type3	30	0	100.00	60	PASS
		Type4	29	1	96.67	60	PASS
		Type 1-4	---	---	89.17	80	PASS
		Type5	30	0	100.00	80	PASS
	5500	Type6	30	0	100.00	70	PASS
		Type0	30	0	100.00	60	PASS
		Type1	22	8	73.33	60	PASS
		Type2	30	0	100.00	60	PASS
		Type3	30	0	100.00	60	PASS
		Type4	29	1	96.67	60	PASS
		Type 1-4	---	---	92.50	80	PASS
11N40MIMO	5270	Type5	30	0	100.00	80	PASS
		Type6	30	0	100.00	70	PASS
		Type0	30	0	100.00	60	PASS
		Type1	24	6	80.00	60	PASS
		Type2	30	0	100.00	60	PASS
		Type3	30	0	100.00	60	PASS
		Type4	29	1	96.67	60	PASS
	5510	Type 1-4	---	---	94.17	80	PASS
		Type5	30	0	100.00	80	PASS
		Type6	30	0	100.00	70	PASS
		Type0	30	0	100.00	60	PASS
		Type1	30	0	100.00	60	PASS
		Type2	30	0	100.00	60	PASS
		Type3	24	6	80.00	60	PASS

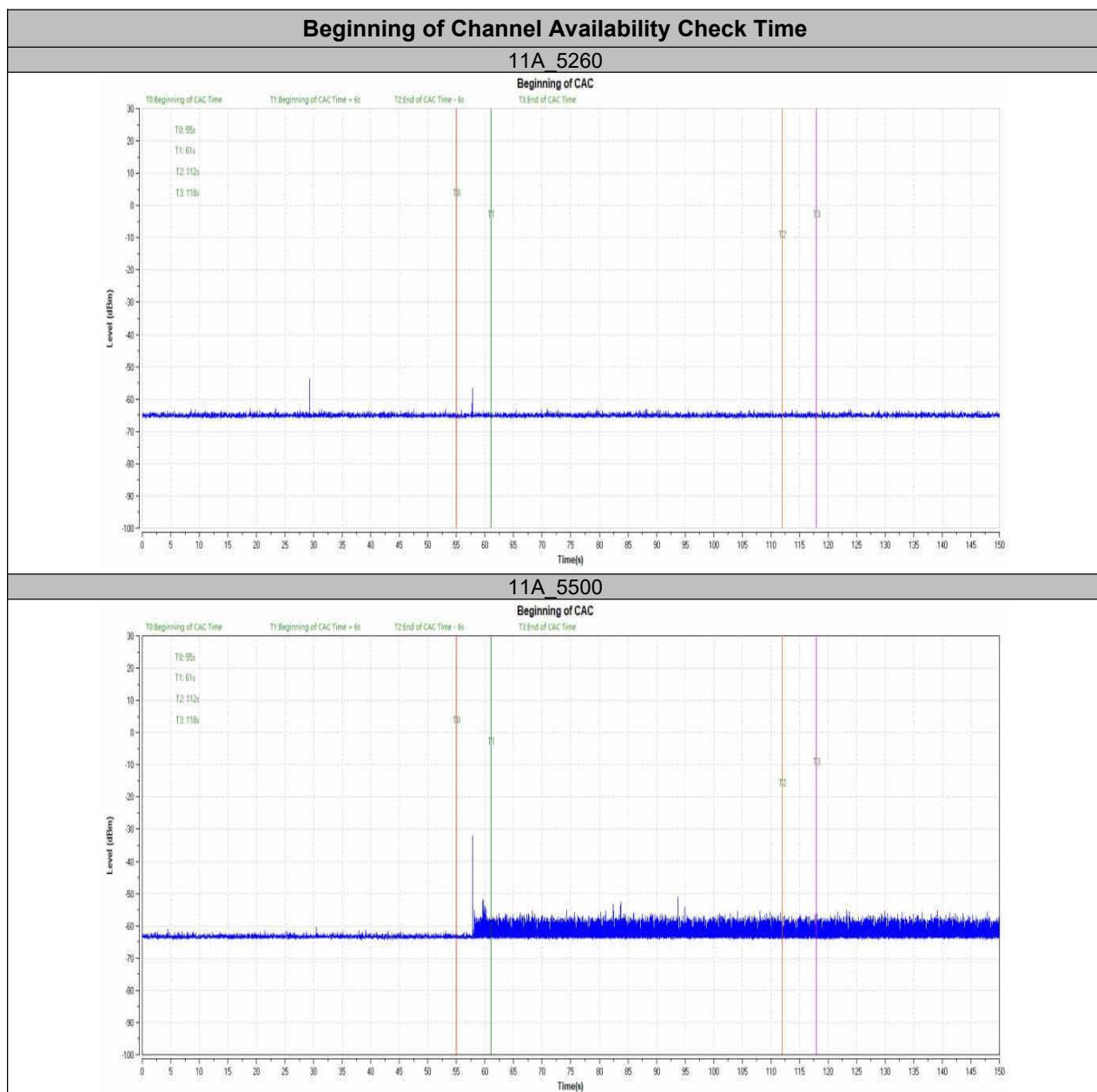
		Type5	30	0	100.00	80	PASS
11AC80MIMO	5290	Type0	30	0	100.00	60	PASS
		Type1	22	8	73.33	60	PASS
		Type2	30	0	100.00	60	PASS
		Type3	30	0	100.00	60	PASS
		Type4	19	11	63.33	60	PASS
		Type 1-4	---	---	84.17	80	PASS
		Type5	28	2	93.33	80	PASS
		Type6	30	0	100.00	70	PASS
	5530	Type0	30	0	100.00	60	PASS
		Type1	28	2	93.33	60	PASS
		Type2	30	0	100.00	60	PASS
		Type3	30	0	100.00	60	PASS
		Type4	30	0	100.00	60	PASS
		Type 1-4	---	---	98.33	80	PASS
		Type5	4	0	100.00	80	PASS
		Type6	30	0	100.00	70	PASS

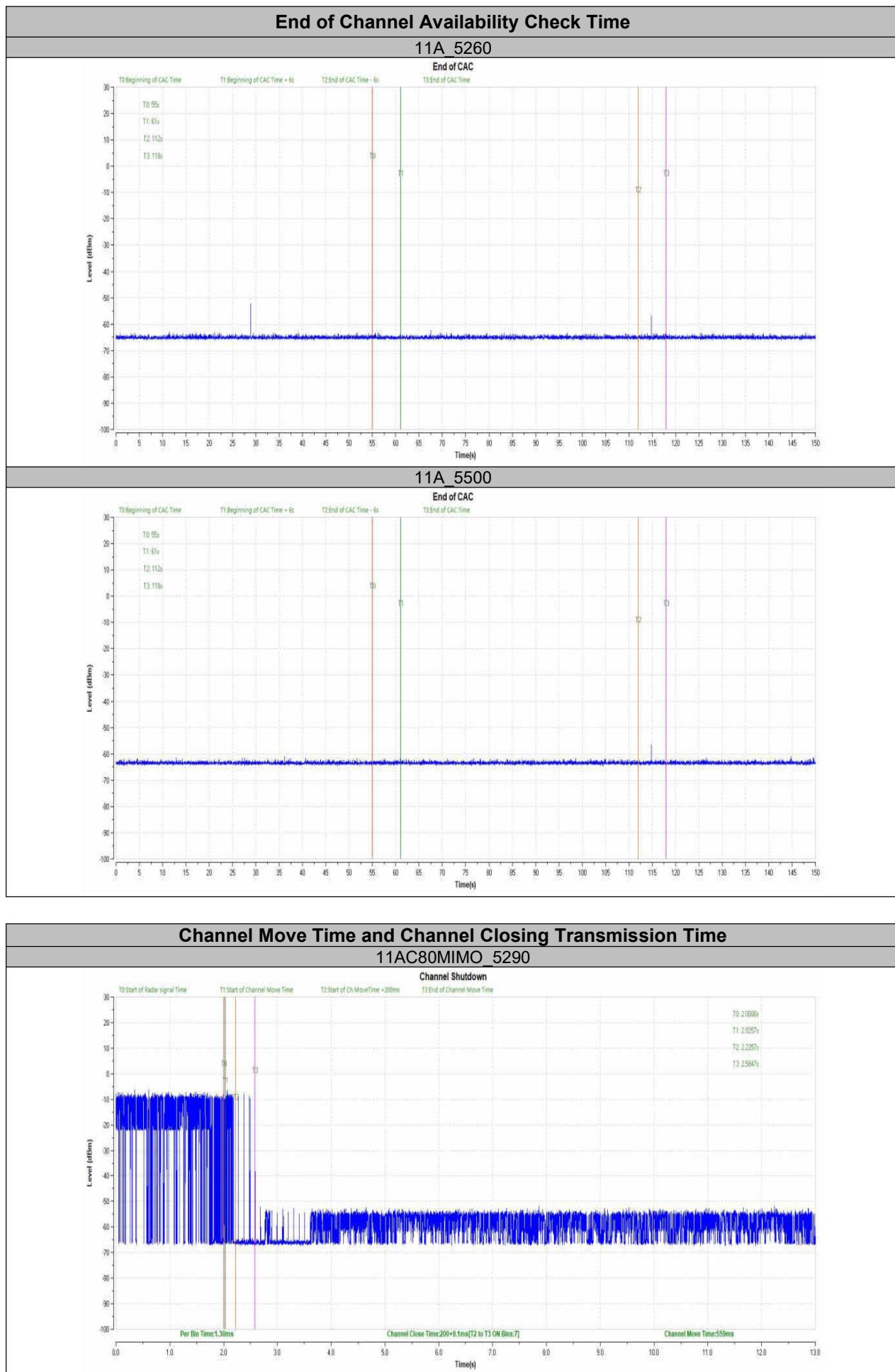
15.8. Original Test Data

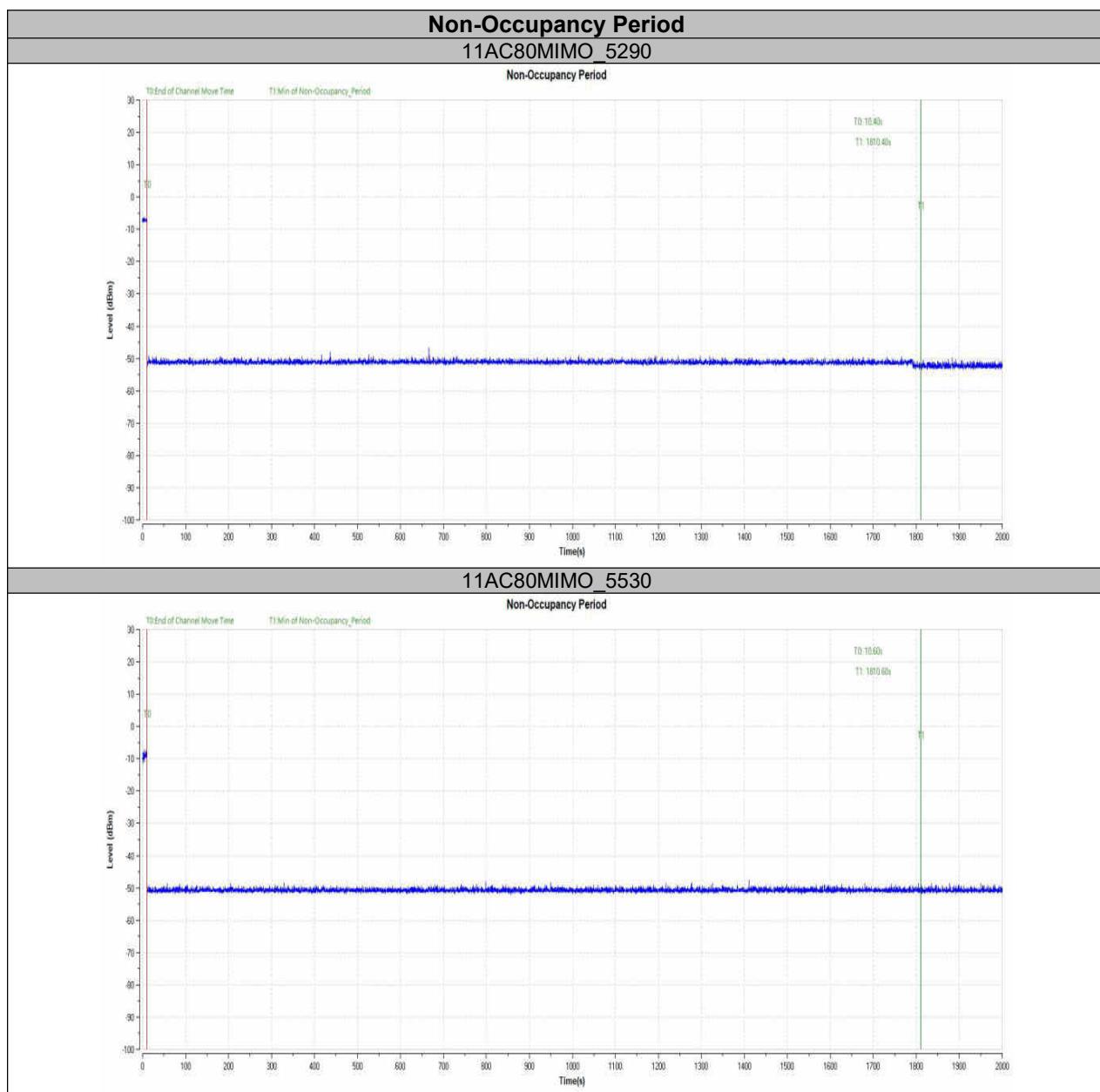
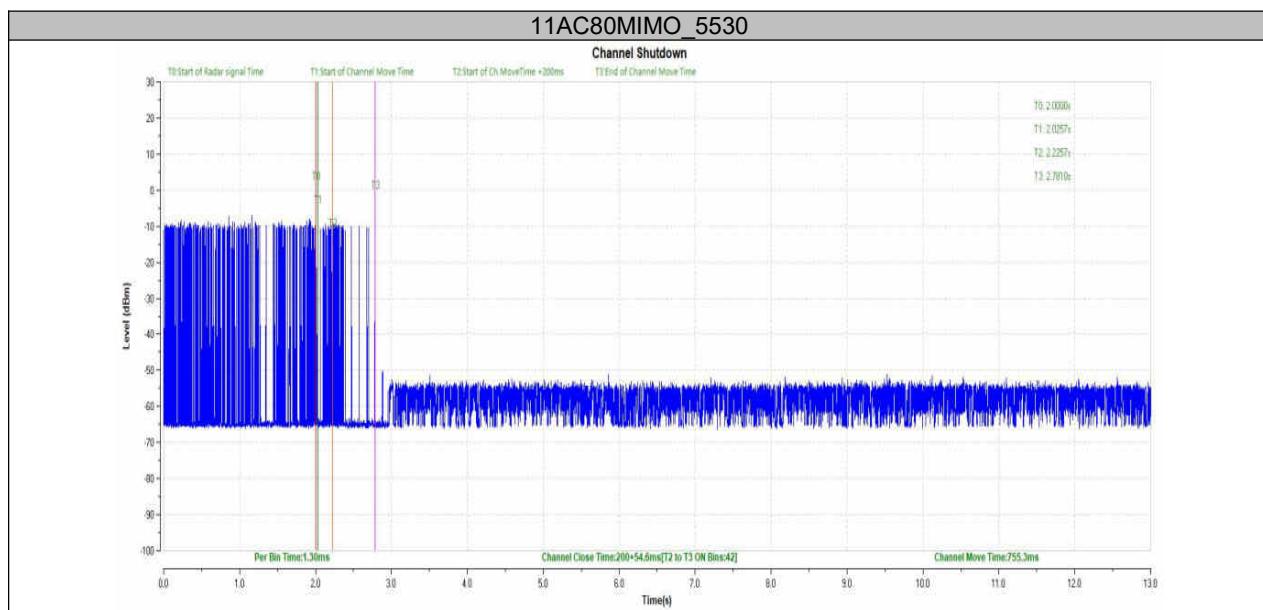




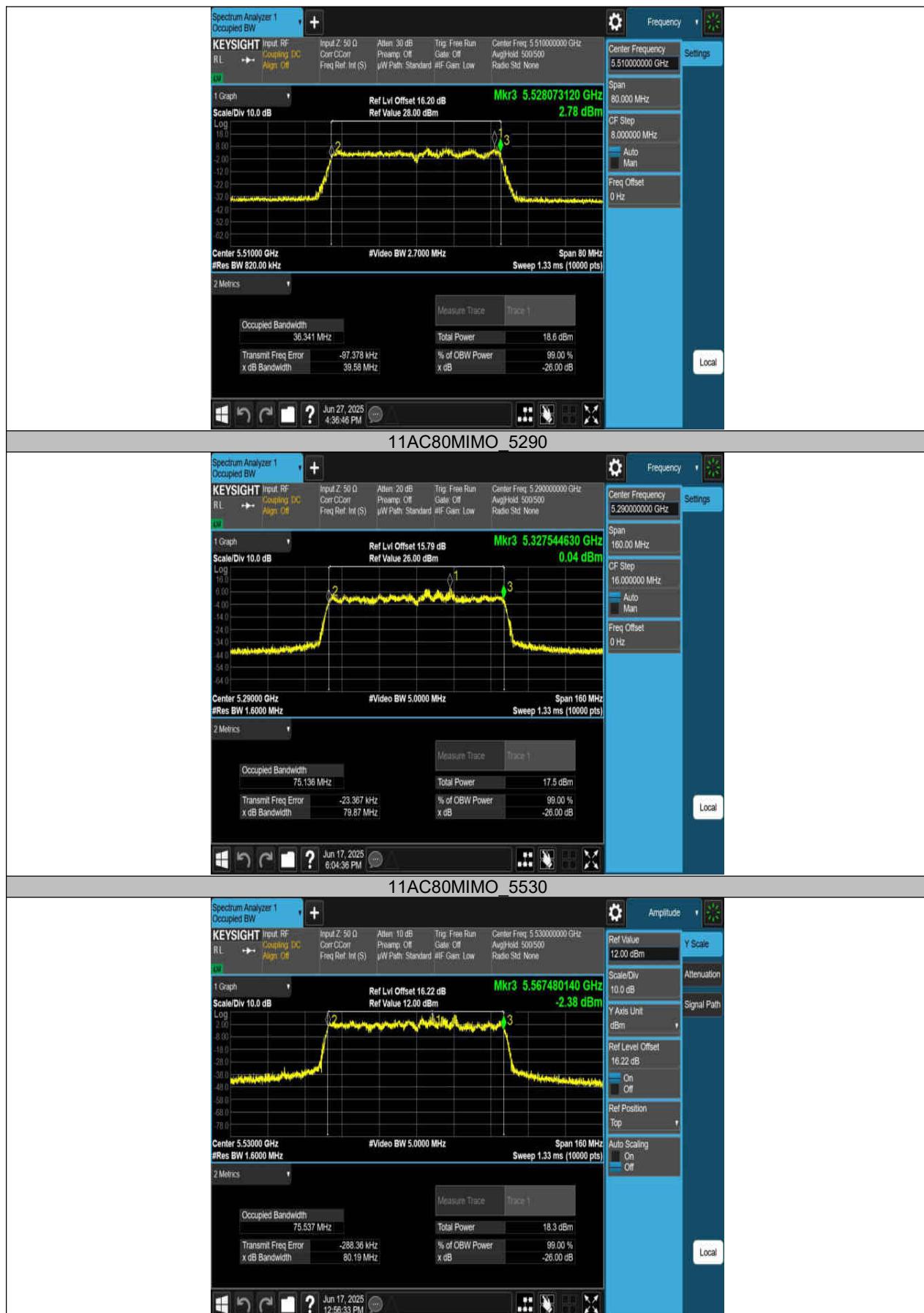












16. Antenna Requirements

16.1. Applicable Requirements

Please refer to FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

16.2. Result

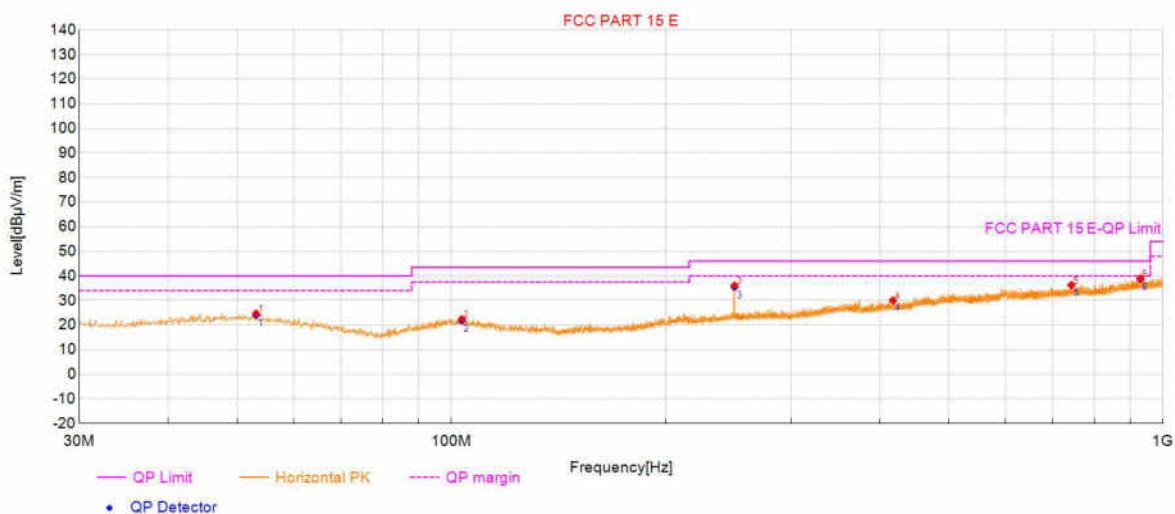
The antenna used for this product is PCB antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 4.88 dBi.

APPENDIX A - Radiated Emission Below 1GHz Test Data Test Report

Project Information			
EUT:	IEEE 802.11 a/b/g/n/ac AP Model		
Customer:			
Model:	SKO.W2890.1	SN:	
Mode:	11A_5180	Voltage:	DC 12V
Environment:	23.1°C 45%	Engineer:	Soho Liu
Remark:	Power Set:Default		
Test Standard: FCC PART 15 E			

Start of Test:2025-06-11 19:56:58

Test Graph



Suspected Data List									
NO.	Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Angle (°)	Polarity	Verdict
1	53.19	24.78	21.11	40.00	15.22	100	177	Horizontal	PASS
2	103.44	22.47	19.85	43.50	21.03	100	133	Horizontal	PASS
3	250.02	36.14	22.01	46.00	9.86	100	78	Horizontal	PASS
4	417.36	30.04	25.87	46.00	15.96	100	321	Horizontal	PASS
5	743.22	36.29	32.02	46.00	9.71	100	252	Horizontal	PASS
6	929.47	39.08	34.42	46.00	6.92	100	31	Horizontal	PASS

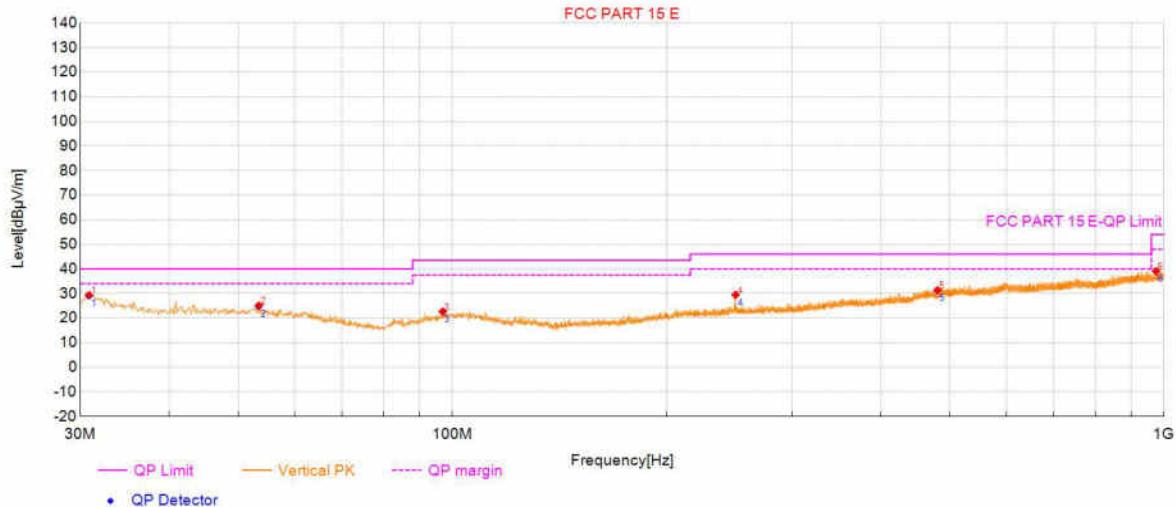
Final Data List									
NO.	Frequency (MHz)	Factor (dB)	QP Value (dB μ V/m)	QP Limit (dB μ V/m)	QP Margin (dB)	Height (cm)	Angle (°)	Polarity	Verdict
1	53.19	21.11	24.11	40.00	15.89	100	177	Horizontal	PASS
2	103.44	19.85	21.80	43.50	21.70	100	133	Horizontal	PASS
3	250.02	22.01	35.47	46.00	10.53	100	78	Horizontal	PASS
4	417.36	25.87	30.01	46.00	15.99	100	321	Horizontal	PASS
5	743.22	32.02	36.26	46.00	9.74	100	252	Horizontal	PASS
6	929.47	34.42	38.69	46.00	7.31	100	31	Horizontal	PASS

Test Report

Project Information			
EUT:	IEEE 802.11 a/b/g/n/ac AP Model		
Customer:			
Model:	SKO.W2890.1	SN:	
Mode:	11A_5180	Voltage:	DC 12V
Environment:	23.1°C 45%	Engineer:	Soho Liu
Remark:	Power Set:Default		
Test Standard: FCC PART 15 E			

Start of Test: 2025-06-11 19:57:43

Test Graph



Suspected Data List									
NO.	Frequency (MHz)	Level (dB μ V/m)	Factor (dB)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Angle (°)	Polarity	Verdict
1	30.87	29.47	17.52	40.00	10.53	100	37	Vertical	PASS
2	53.48	25.21	21.07	40.00	14.79	100	202	Vertical	PASS
3	96.94	22.68	19.41	43.50	20.82	100	224	Vertical	PASS
4	250.02	29.46	22.01	46.00	16.54	100	358	Vertical	PASS
5	480.42	31.36	26.91	46.00	14.64	100	254	Vertical	PASS
6	974.39	39.12	34.84	54.00	14.88	100	114	Vertical	PASS

Final Data List									
NO.	Frequency (MHz)	Factor (dB)	QP Value (dB μ V/m)	QP Limit (dB μ V/m)	QP Margin (dB)	Height (cm)	Angle (°)	Polarity	Verdict
1	30.87	17.52	29.09	40.00	10.91	100	37	Vertical	PASS
2	53.48	21.07	24.83	40.00	15.17	100	202	Vertical	PASS
3	96.94	19.41	22.66	43.50	20.84	100	224	Vertical	PASS
4	250.02	22.01	29.44	46.00	16.56	100	358	Vertical	PASS
5	480.42	26.91	31.34	46.00	14.66	100	254	Vertical	PASS
6	974.39	34.84	39.10	54.00	14.90	100	114	Vertical	PASS