FCC DFS Test Report

FCC ID: QISR240D

This report concerns (check one): ☒**Original Grant** ☐**Class I Change** ☐**Class II Change**

Project No.	:	1602C034
Equipment	:	Remote Radio Unit
Model Name	:	R240D
Applicant	:	Huawei Technologies Co.,Ltd.
Address	:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen China

Date of Receipt	:	Feb. 29, 2016
Date of Test	:	Feb. 29, 2016 ~ Apr. 11, 2016
Issued Date	:	Apr. 12, 2016
Tested by	:	BTL Inc.

Testing Engineer : shawn xiao
(Shawn Xiao)

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-3-1602C034	Original Issue.	Apr. 12, 2016

1. CERTIFICATION

Equipment	:	Remote Radio Unit
Brand Name	:	HUAWEI
Model Name	:	R240D
Applicant	:	Huawei Technologies Co.,Ltd.
Manufacturer	:	Huawei Technologies Co.,Ltd.
Address	:	Administration Building, Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R.China
Factory	:	Huawei Technologies Co.,Ltd.
Address	:	Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R.China
Date of Test:	:	Feb. 29, 2016 ~ Apr. 11, 2016
Test Sample	:	Engineering Sample
Standard(s)	:	FCC Part 15, Subpart E (Section 15.407) FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r02 905462 D02 UNII DFS Compliance Procedures New Rules v02

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-3-1602C034) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. EUT INFORMATION

2.1 EUT SPECIFICATION TABLE

Table 1: Specification of EUT

Product name	Remote Radio Unit
Brand Name	N/A
Model	R240D
Operational Mode	Master
Operating FrequencyRange	5260~5320MHz & 5500~5700MHz
Modulation	OFDM

Note: This device was functioned as a ☒Master ☐Slave device during the DF
This device does not support TPC function

2.2 DESCRIPTION OF AVAILABLE ANTENNAS TO THE EUT

Antenna Specification:

Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	Shanghai Jinghong Communication Technology Co., Ltd	N/A	Internal	N/A	5.5	5GHz
2	Shanghai Jinghong Communication Technology Co., Ltd	N/A	Internal	N/A	5.5	5GHz

Note:
1. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and receivers (2T2R).
2. ANT 1 for 1TX was found to be the worst case and recorded.

Remark:
For 2TX with beamforming
The EUTwith beamforming function, then, Direction gain = G_{ANT} + 10log(N_{ANT}/N_{SS}), where N_{SS} = the number of independent spatial streams of data.
Directional gain=5.5+10log(2/2)=5.5 + 0=5.5 dBi.

2.3 CONDUCTED OUTPUT POWER AND EIRP POWER

TABLE 3: THE CONDUCTED OUTPUT POWER LIST

TX (11a)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
5260~5320	17.14	51.76
5500~5700	19.60	91.20

TX (11n 40MHz)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
5270~5310	15.76	37.67
5510~5670	16.36	43.25

TX (11ac 80 MHz)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
5290	14.93	31.12
5530	12.95	19.72

2.4 EUT MAXIMUM AND MINIMUM E.I.R.P. POWER

TABLE 4: THE MAX EIRP LIST

TX (11a)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
5260~5320	22.64	183.65
5500~5700	25.10	323.59

TX (11n40MHz)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
5270~5310	21.26	133.66
5510~5670	21.86	153.46

TX (11ac 80 MHz)

FREQUENCY BAND (MHz)	MAX. POWER	
	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
5290	20.43	110.41
5530	18.45	69.98

3.U-NII DFS RULE REQUIREMENTS

3.1 WORKING MODES AND REQUIRED TEST ITEMS

The manufacturer shall state whether the UUT is capable of operating as a Master and/or a Client. If the UUT is capable of operating in more than one operating mode then each operating mode shall be tested separately. See tables 1 and 2 for the applicability of DFS requirements for each of the operational modes.

Table 5: Applicability of DFS requirements prior to use a channel

Requirement	Operational Mode		
	Master	Client without radar detection	Client with radar detection
Non-Occupancy Period	✓	Not required	✓
DFS Detection Threshold	✓	Not required	✓
Channel Availability Check Time	✓	Not required	Not required
Uniform Spreading	✓	Not required	Not required
U-NII Detection Bandwidth	✓	Not required	✓

Table 6: Applicability of DFS requirements during normal operation.

Requirement	Operational Mode		
	Master	Client without radar detection	Client with radar detection
DFS Detection Threshold	✓	Not required	✓
Channel Closing Transmission Time	✓	✓	✓
Channel Move Time	✓	✓	✓
U-NII Detection Bandwidth	✓	Not required	✓

3.2 TEST LIMITS AND RADAR SIGNAL PARAMETERS

DETECTION THRESHOLD VALUES

Table 7: DFS Detection Thresholds for Master Devices and Client Devices With Radar Detection.

Maximum Transmit Power	Value (See Notes 1 and 2)
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 spectraldensity 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 testtransmission waveforms to account for variations in measurement equipment. This will ensure that thetest 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 662911D01.

Table 8: 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 UNII 99% transmissionpower bandwidth. SeeNote 3.

Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed withRadar 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.

PARAMETERS OF DFS TEST SIGNALS

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 9: 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 $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{PRI_{\mu sec}}\right)\right\}$	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: 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. Ifmore than 30 waveforms are used for Short Pulse Radar Types 2 through 4, then each additionalwaveform must also be unique and not repeated from the previous waveforms. If more than 30waveforms are used for Short Pulse Radar Type 1, then each additional waveform is generated with TestB and must also be unique and not repeated from the previous waveforms in Tests A or B.

Table 10: Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulsesper 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

The parameters for this waveform are randomly chosen（The center frequency for each of the 30 trials of the Bin 5 radar shall be randomly selected within 80% of the Occupied Bandwidth.） Thirty unique waveforms are required for the Long Pulse Radar Type waveforms. If more than 30 waveforms are used for the Long Pulse Radar Type waveforms, then each additional waveform must also be unique and not repeated from the previous waveforms.

Table 11: Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulsesper Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

4. TEST INSTRUMENTS

Table 1: Test instruments list.

DESCRIPTION	MANUFACTURER	MODEL NO.	Serial No	Calibration Until
EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017
Signal Generator	Agilent	E4438C	MY49071316	Mar. 27, 2017
POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Feb. 26, 2017
POWER SPLITTER	Mini-Circuits	ZN4PD1-63-S+	SF9335D1045-1	Feb. 23, 2017
Attenuator	WOKEN	6SM3502	VAS1214NL	Mar. 02, 2017
EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Mar. 27, 2017

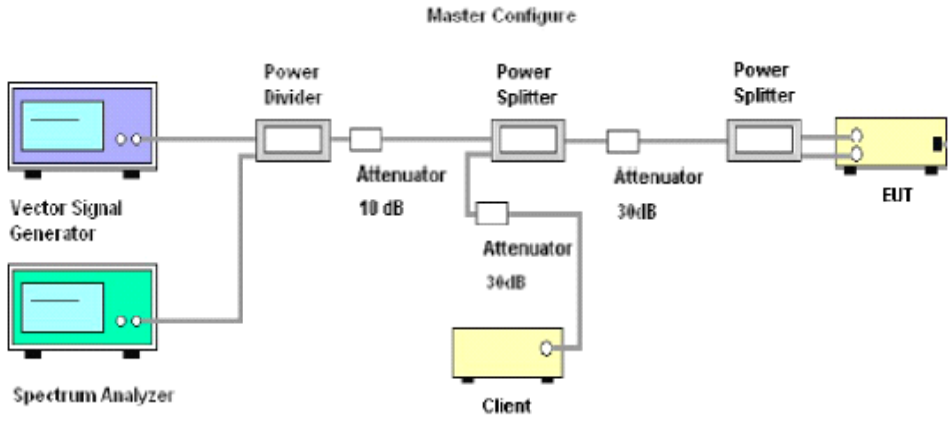
Note:Calibration interval of instruments listed above is one year.

5.EMC EMISSION TEST

5.1 DFS MEASUREMENT SYSTEM:

CONDUCTED METHOD SYSTEM BLOCK DIAGRAM

Master Conducted Measurement



SYSTEM OVERVIEW

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 Freqeuncy Hopping Radar Waveform Generating Subsystem of FCC 06-96. 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.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), additional combiner/dividers are inserted between the Master Combiner/Divider and the pad connected to the Master Device (and/or between the Slave Combiner/Divider and the pad connected to the Slave Device). Additional pads are utilized such that there is one pad at each RF port on each EUT.

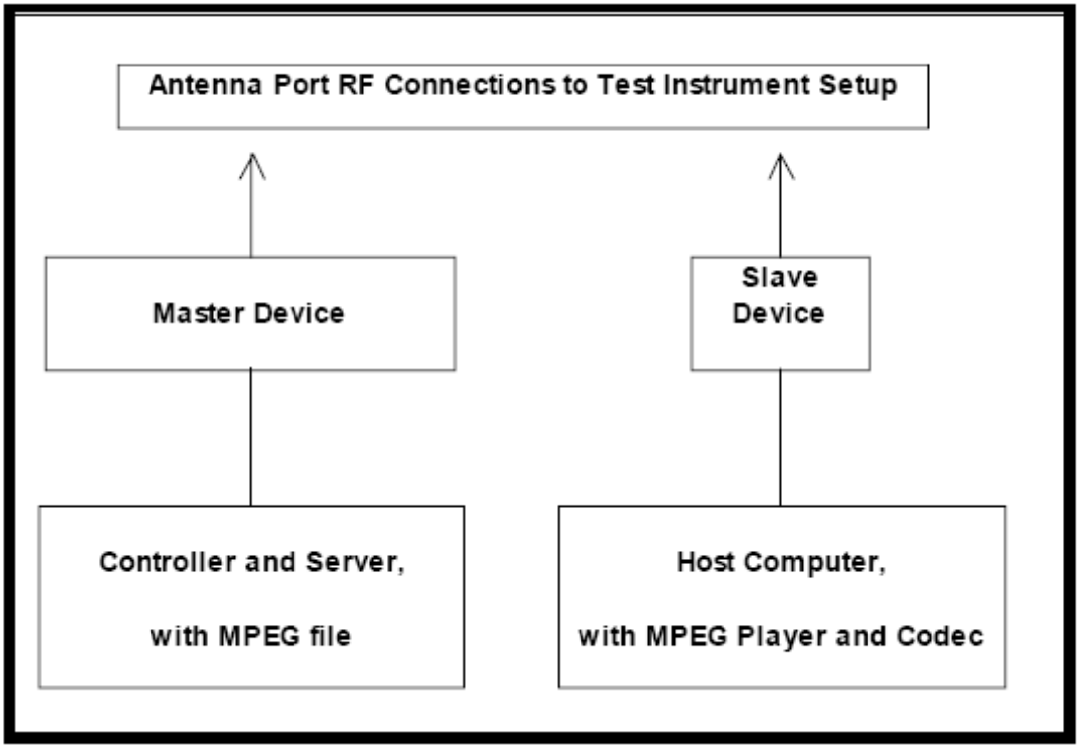
5.2 CALIBRATION OF DFS DETECTION THRESHOLD LEVEL:

A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected in place of the master device and the signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –62 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. Measure the amplitude and calculate the difference from –62 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference.

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.



5.3 DEVIATION FROM TEST STANDARD

No deviation.

6. TEST RESULTS

6.1 SUMMARY OF TEST RESULT

Clause	Test Parameter	Remarks	Pass/Fail
15.407	DFS Detection Threshold	Applicable	Pass
15.407	Channel Availability Check Time	Applicable	Pass
15.407	Channel Move Time	Applicable	Pass
15.407	Channel Closing Transmission Time	Applicable	Pass
15.407	Non- Occupancy Period	Applicable	Pass
15.407	Uniform Spreading	Applicable	Pass
15.407	U-NII Detection Bandwidth	Applicable	Pass

6.2 TEST MODE: DEVICE OPERATING IN MASTER MODE.

Master with injection at the Master. (Radar Test Waveforms are injected into the Master)

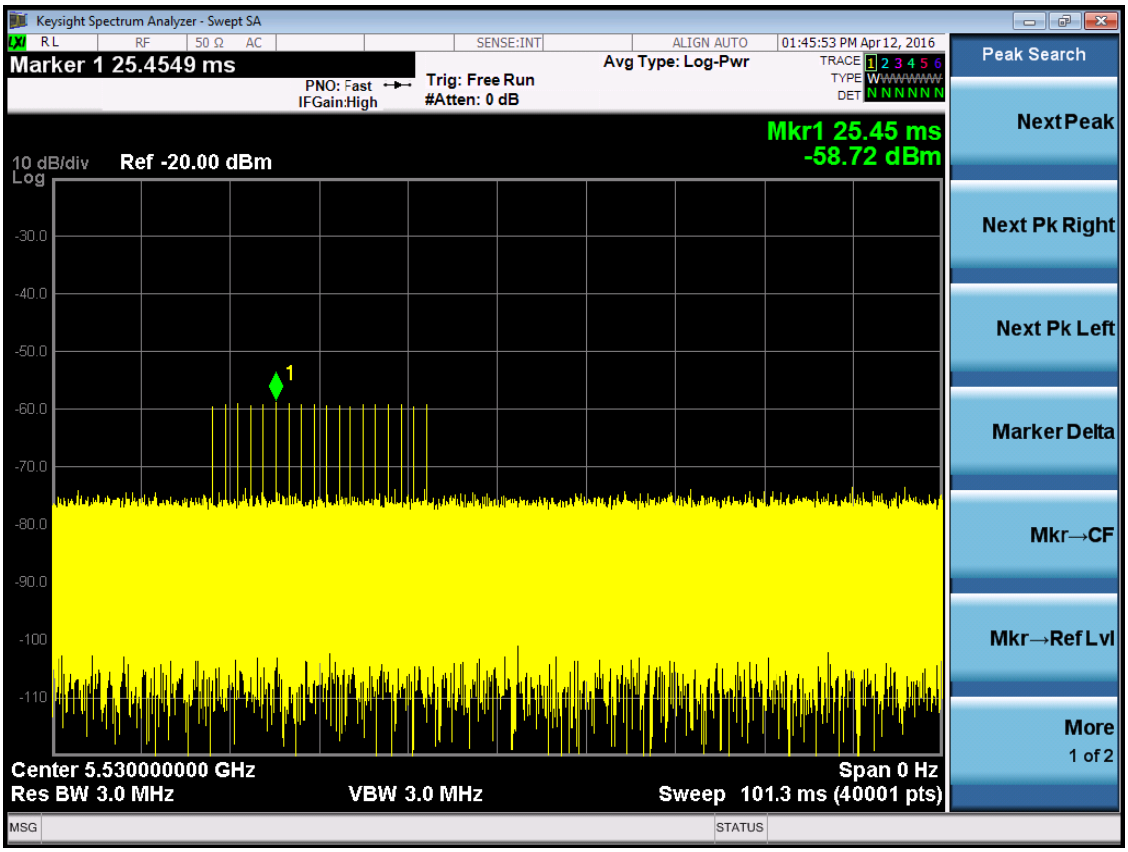
6.3 DFS DETECTION THRESHOLD

Calibration:

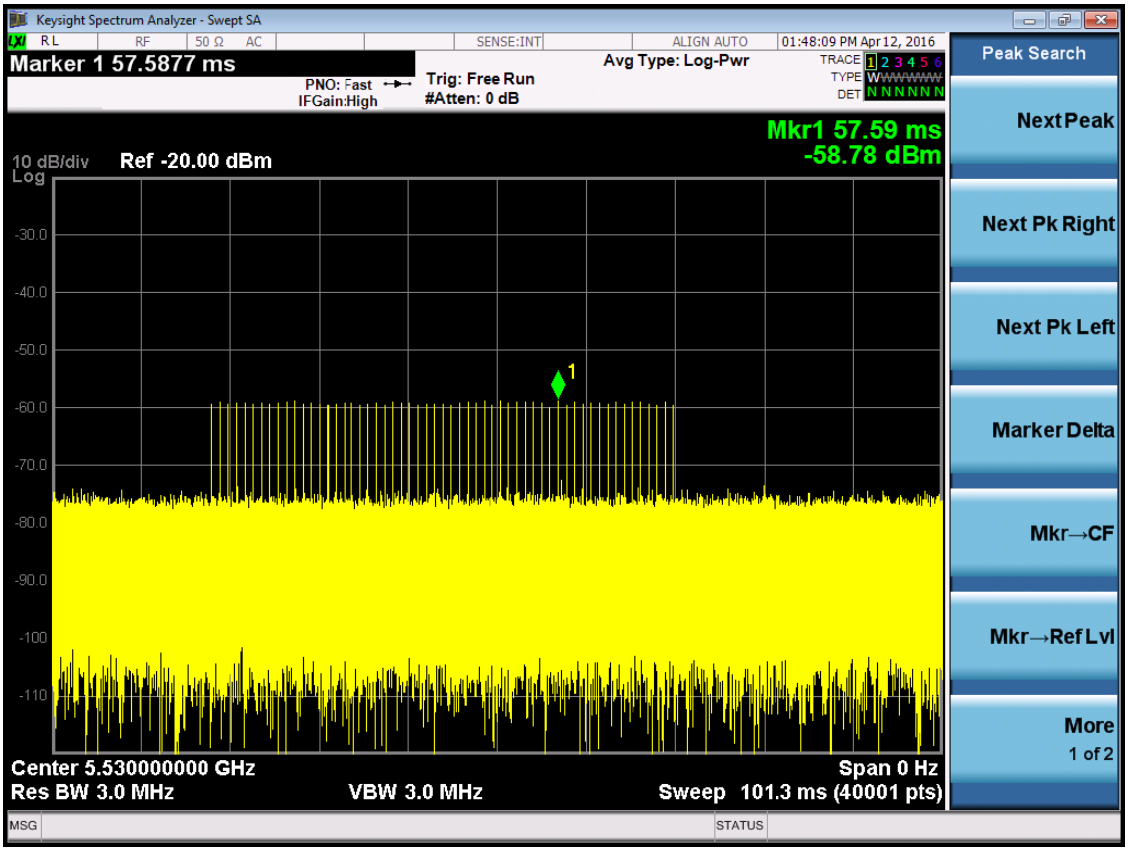
For a detection threshold level of -64dBmand the Master antenna gain is 5.5dBi, required detection threshold is -58.5 dBm (= -64+5.5).

Note: Maximum Transmit Power is more than 200 milliwatt in this report, so detection threshold level is -64dBm (please refer to Table 7 [page 9]).

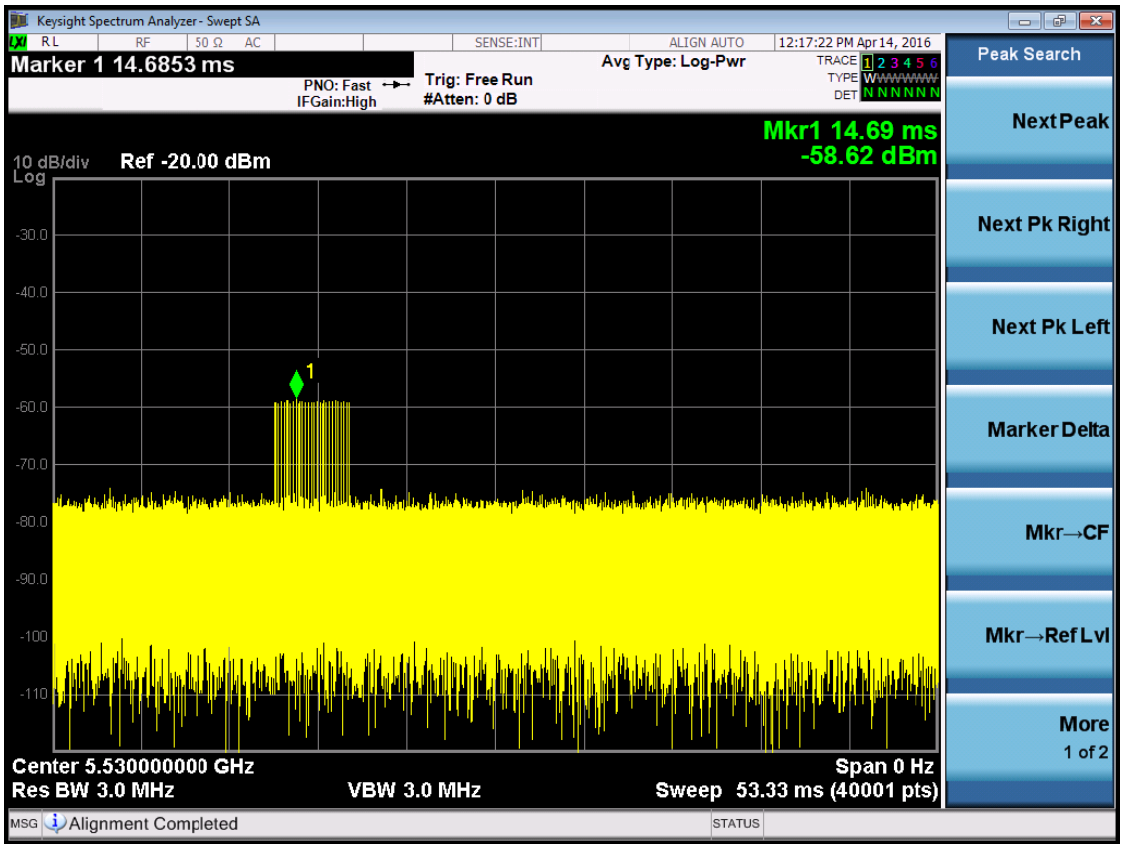
Radar Signal 0



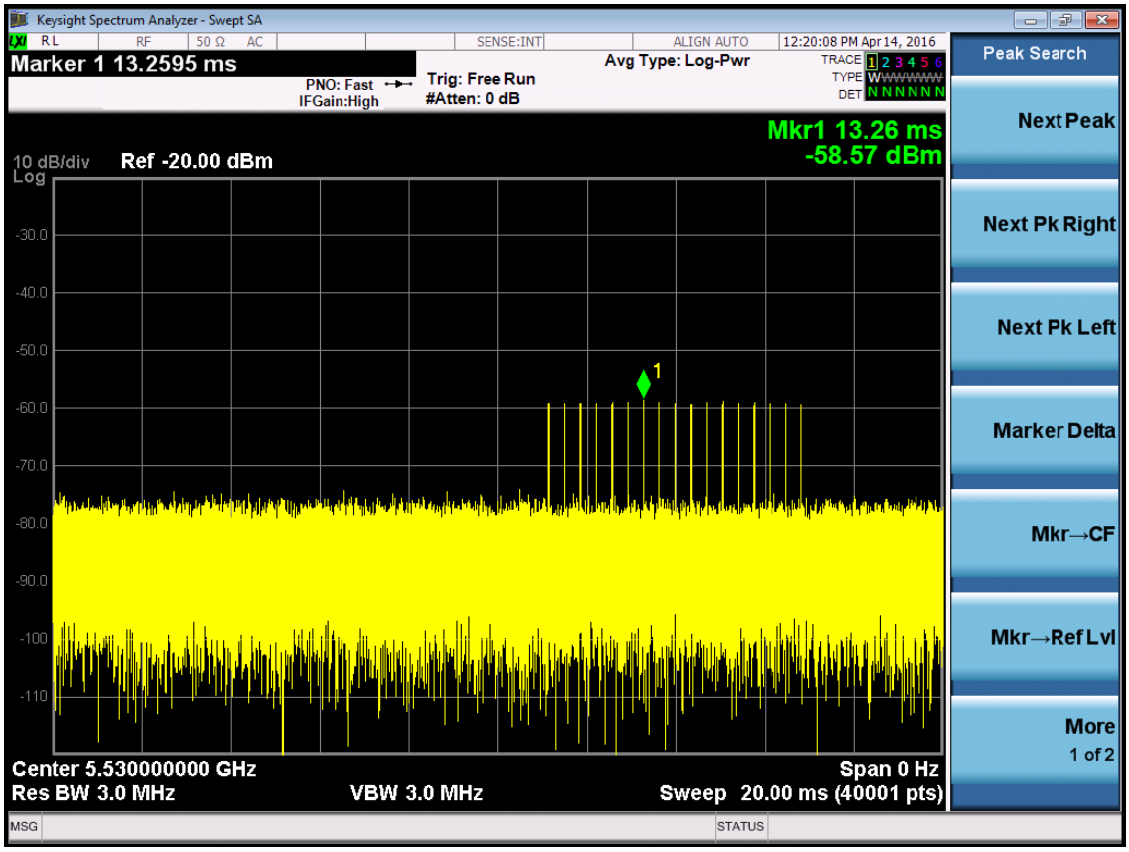
Radar Signal 1



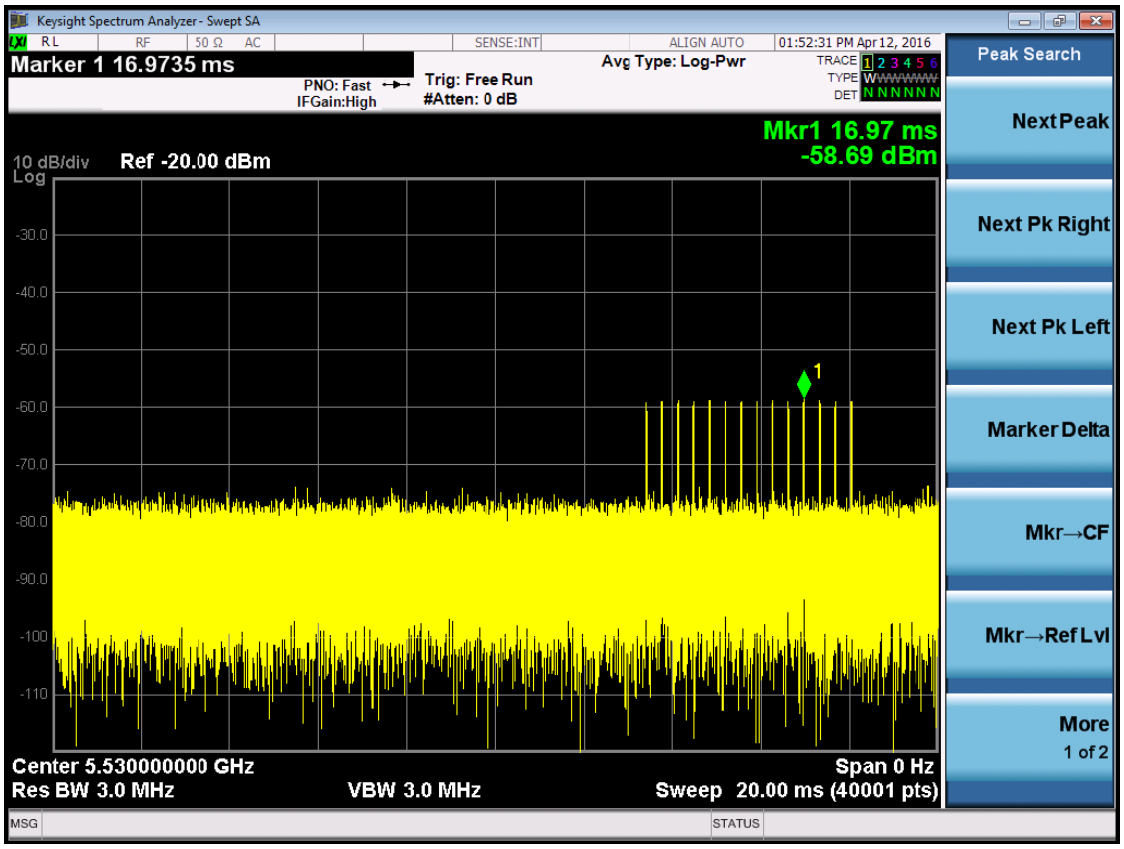
Radar Signal 2



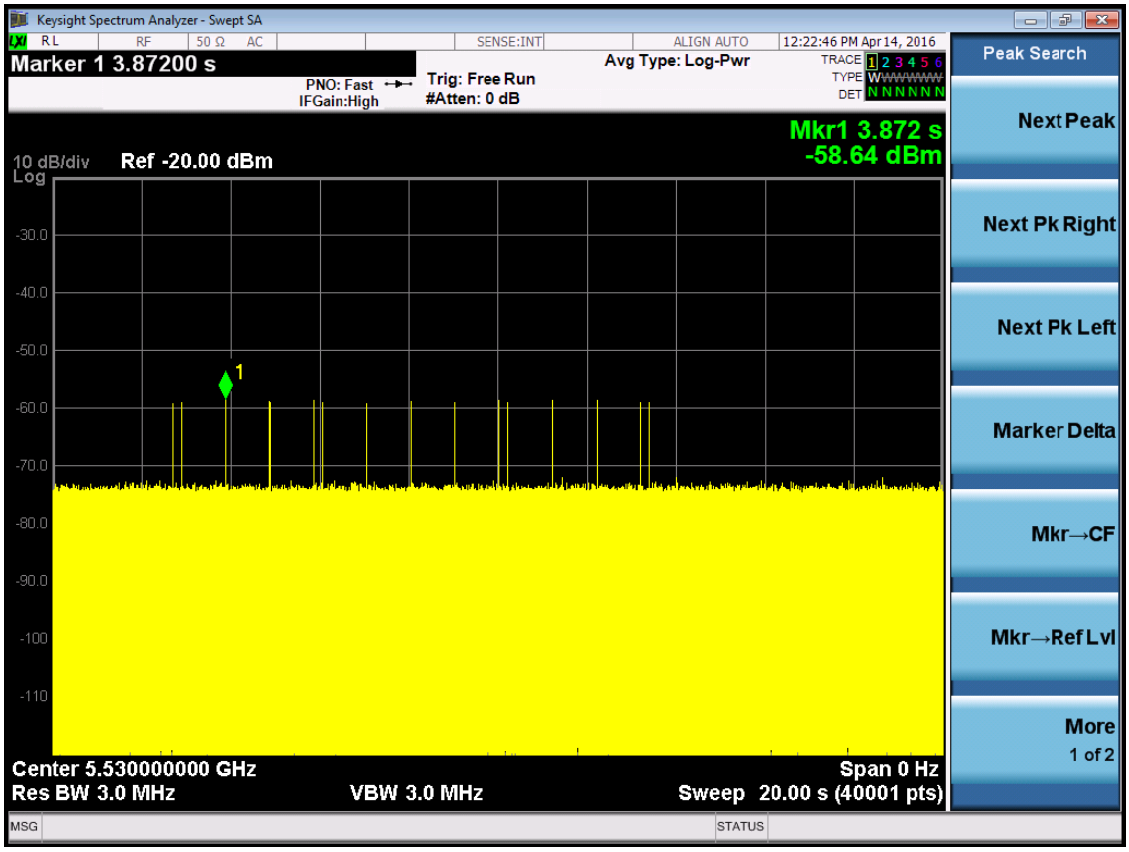
Radar Signal 3



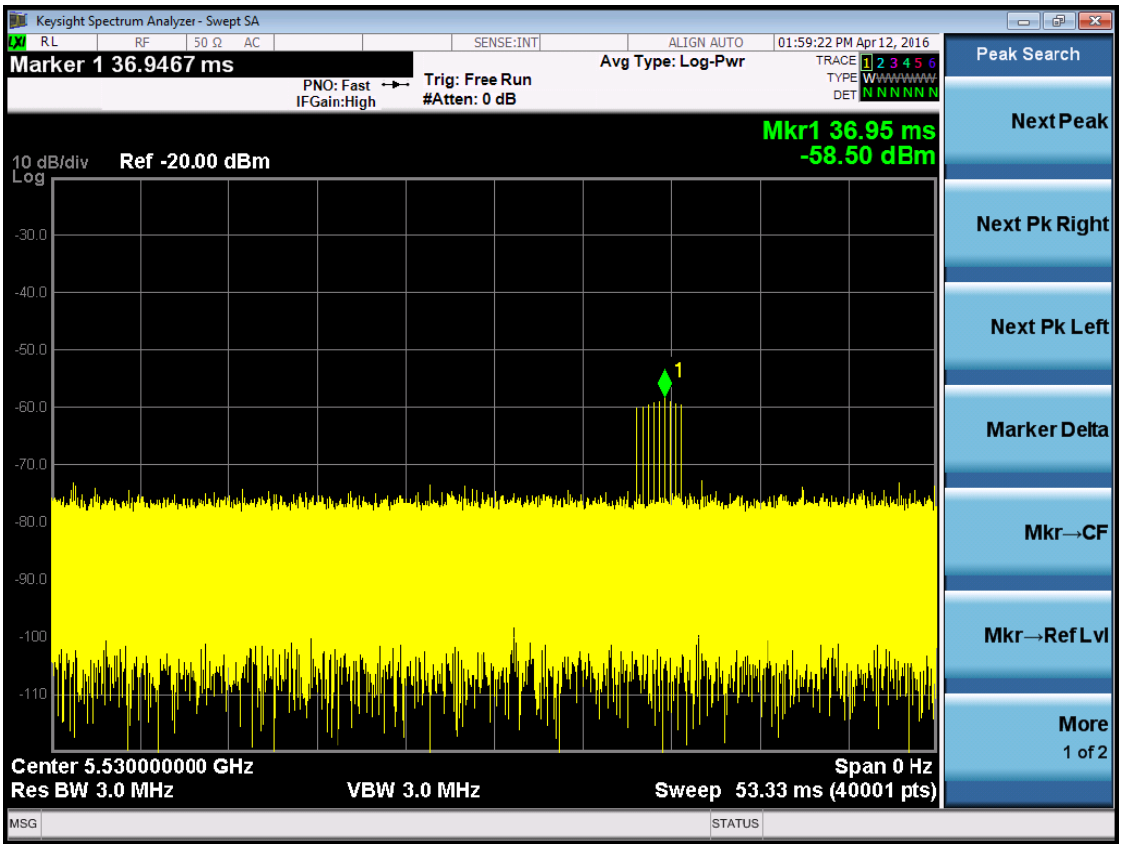
Radar Signal 4



Radar Signal 5



Radar Signal 6



Radar 0 Statical Performances				
Trial #	Pluse per Burst	Pluse Width (us)	PRI (us)	Waveform Length (us)
1	18	1.0	1428	25704
2	18	1.0	1428	25704
3	18	1.0	1428	25704
4	18	1.0	1428	25704
5	18	1.0	1428	25704
6	18	1.0	1428	25704
7	18	1.0	1428	25704
8	18	1.0	1428	25704
9	18	1.0	1428	25704
10	18	1.0	1428	25704
11	18	1.0	1428	25704
12	18	1.0	1428	25704
13	18	1.0	1428	25704
14	18	1.0	1428	25704
15	18	1.0	1428	25704
16	18	1.0	1428	25704
17	18	1.0	1428	25704
18	18	1.0	1428	25704
19	18	1.0	1428	25704
20	18	1.0	1428	25704
21	18	1.0	1428	25704
22	18	1.0	1428	25704
23	18	1.0	1428	25704
24	18	1.0	1428	25704
25	18	1.0	1428	25704
26	18	1.0	1428	25704
27	18	1.0	1428	25704
28	18	1.0	1428	25704
29	18	1.0	1428	25704
30	18	1.0	1428	25704

Radar 1 Statical Performances				
Trial #	Pluse per Burst	Pluse Width (us)	PRI (us)	Waveform Length (us)
1	57	1.0	938	53466
2	76	1.0	698	53048
3	86	1.0	618	53148
4	99	1.0	538	53262
5	61	1.0	878	53558
6	18	1.0	3066	55188
7	83	1.0	638	52954
8	58	1.0	918	53244
9	63	1.0	838	52794
10	62	1.0	858	53196
11	67	1.0	798	53466
12	74	1.0	718	53132
13	92	1.0	578	53176
14	89	1.0	598	53222
15	95	1.0	558	53010
16	21	1.0	2536	53256
17	55	1.0	966	53130
18	64	1.0	827	52928
19	22	1.0	2501	55022
20	21	1.0	2595	54495
21	48	1.0	1114	53472
22	41	1.0	1302	53382
23	18	1.0	3045	54810
24	33	1.0	1624	53592
25	19	1.0	2878	54682
26	52	1.0	1027	53404
27	22	1.0	2485	54670
28	33	1.0	1600	52800
29	46	1.0	1172	53912
30	45	1.0	1177	52965

Radar 2 Statical Performances				
Trial #	Pluse per Burst	Pluse Width (us)	PRI (us)	Waveform Length (us)
1	26	3.2	179	4654
2	23	1.1	207	4761
3	24	2.1	230	5520
4	29	4.8	200	5800
5	28	3.9	214	5992
6	26	2.9	222	5772
7	26	3.2	204	5304
8	25	2.5	192	4800
9	26	3.1	164	4264
10	23	1.2	156	3588
11	27	3.9	210	5670
12	29	4.6	201	5829
13	26	3.2	162	4212
14	25	2.2	197	4925
15	29	4.5	163	4727
16	26	3	203	5278
17	29	5	168	4872
18	25	2.4	217	5425
19	26	2.9	191	4966
20	25	2.3	166	4150
21	27	3.7	150	4050
22	25	2.2	176	4400
23	29	4.9	195	5655
24	26	2.9	202	5252
25	25	2.5	178	4450
26	23	1.1	206	4738
27	27	3.8	155	4185
28	29	4.7	157	4553
29	25	2.4	224	5600
30	28	4.2	159	4452

Radar 3 Statical Performances				
Trial #	Pluse per Burst	Pluse Width (us)	PRI (us)	Waveform Length (us)
1	17	8.2	355	6035
2	16	6.1	487	7792
3	16	7.1	344	5504
4	18	9.8	288	5184
5	18	8.9	230	4140
6	17	7.9	432	7344
7	17	8.2	207	3519
8	17	7.5	443	7531
9	17	8.1	439	7463
10	16	6.2	223	3568
11	18	8.9	208	3744
12	18	9.6	463	8334
13	17	8.2	441	7497
14	16	7.2	323	5168
15	18	9.5	297	5346
16	17	8	412	7004
17	18	10	324	5832
18	17	7.4	271	4607
19	17	7.9	349	5933
20	16	7.3	409	6544
21	18	8.7	373	6714
22	16	7.2	254	4064
23	18	9.9	274	4932
24	17	7.9	278	4726
25	17	7.5	317	5389
26	16	6.1	260	4160
27	18	8.8	211	3798
28	18	9.7	272	4896
29	17	7.4	264	4488
30	18	9.2	284	5112

Radar 4 Statical Performances				
Trial #	Pluse per Burst	Pluse Width (us)	PRI (us)	Waveform Length (us)
1	14	16	355	4970
2	12	11.3	487	5844
3	13	13.5	344	4472
4	16	19.4	288	4608
5	15	17.5	230	3450
6	14	15.3	432	6048
7	14	15.9	207	2898
8	13	14.3	443	5759
9	14	15.8	439	6146
10	12	11.5	223	2676
11	15	17.4	208	3120
12	16	19	463	7408
13	14	16	441	6174
14	13	13.8	323	4199
15	16	18.9	297	4752
16	14	15.5	412	5768
17	16	19.9	324	5184
18	13	14.1	271	3523
19	14	15.2	349	4886
20	13	13.8	409	5317
21	15	17.1	373	5595
22	13	13.8	254	3302
23	16	19.8	274	4384
24	14	15.3	278	3892
25	13	14.5	317	4121
26	12	11.3	260	3120
27	15	17.3	211	3165
28	16	19.2	272	4352
29	13	14.2	264	3432
30	15	18.2	284	4260

Radar 5 Statical Performances			
Trial #	Pluse per Burst	Pluse Width (us)	Chirp Width (MHz)
1	15	0.8	12
2	8	1.5	12
3	11	1.1	12
4	20	0.6	12
5	17	0.7	12
6	14	0.9	12
7	15	0.8	12
8	12	1	12
9	14	0.9	12
10	8	1.5	12
11	17	0.7	12
12	19	0.6	12
13	15	0.8	12
14	12	1	12
15	9	0.6	12
16	14	0.9	12
17	20	0.6	12
18	12	1	12
19	14	0.9	12
20	12	1	12
21	16	0.8	12
22	12	1	12
23	20	0.6	12
24	14	0.9	12
25	13	0.9	12
26	8	1.5	12
27	17	0.7	12
28	19	0.6	12
29	12	1	12
30	18	0.7	12

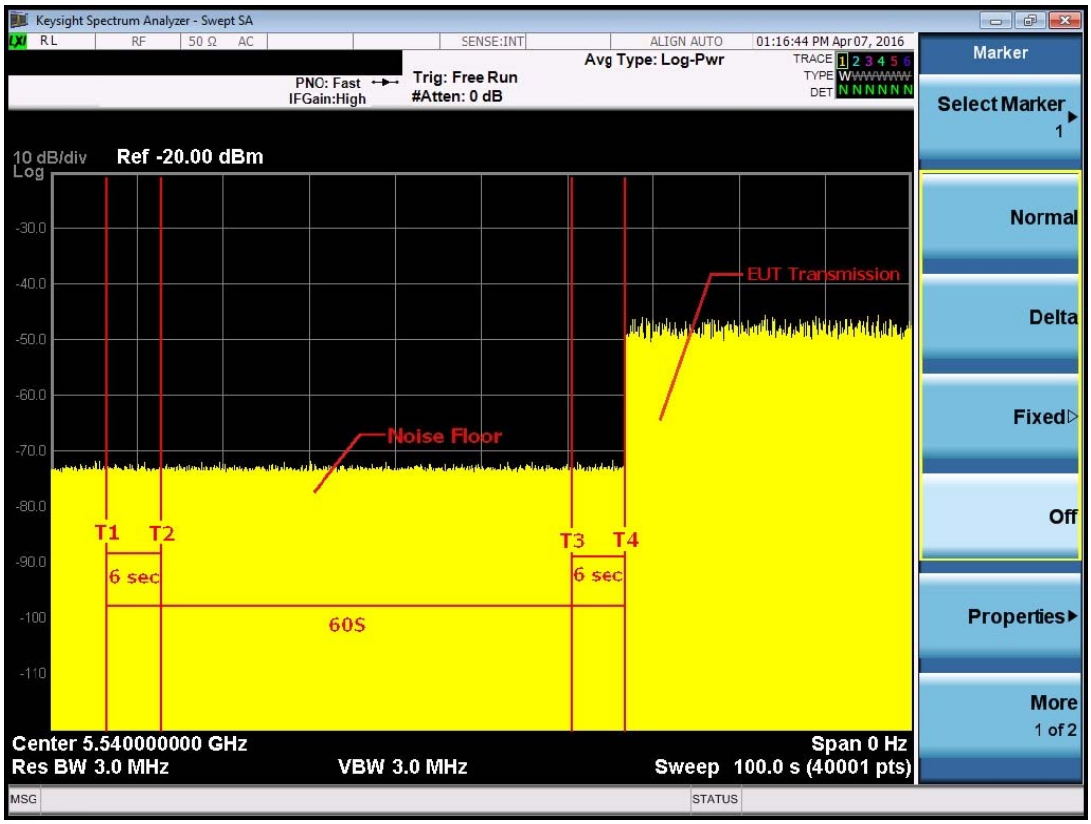
Radar 6 Statical Performances				
Trial #	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Number ofTrials
1	1	333	9	16
2	1	333	9	10
3	1	333	9	14
4	1	333	9	19
5	1	333	9	15
6	1	333	9	18
7	1	333	9	14
8	1	333	9	14
9	1	333	9	21
10	1	333	9	15
11	1	333	9	16
12	1	333	9	24
13	1	333	9	13
14	1	333	9	20
15	1	333	9	17
16	1	333	9	20
17	1	333	9	16
18	1	333	9	18
19	1	333	9	14
20	1	333	9	16
21	1	333	9	20
22	1	333	9	19
23	1	333	9	23
24	1	333	9	17
25	1	333	9	16
26	1	333	9	13
27	1	333	9	13
28	1	333	9	18
29	1	333	9	19
30	1	333	9	20

6.4 CHANNEL AVAILABILITY CHECK TIME

If the UUT successfully detected the radar burst, it should be observed as the UUT has no transmissions occurred until the UUT starts transmitting on another channel.

11a Mode

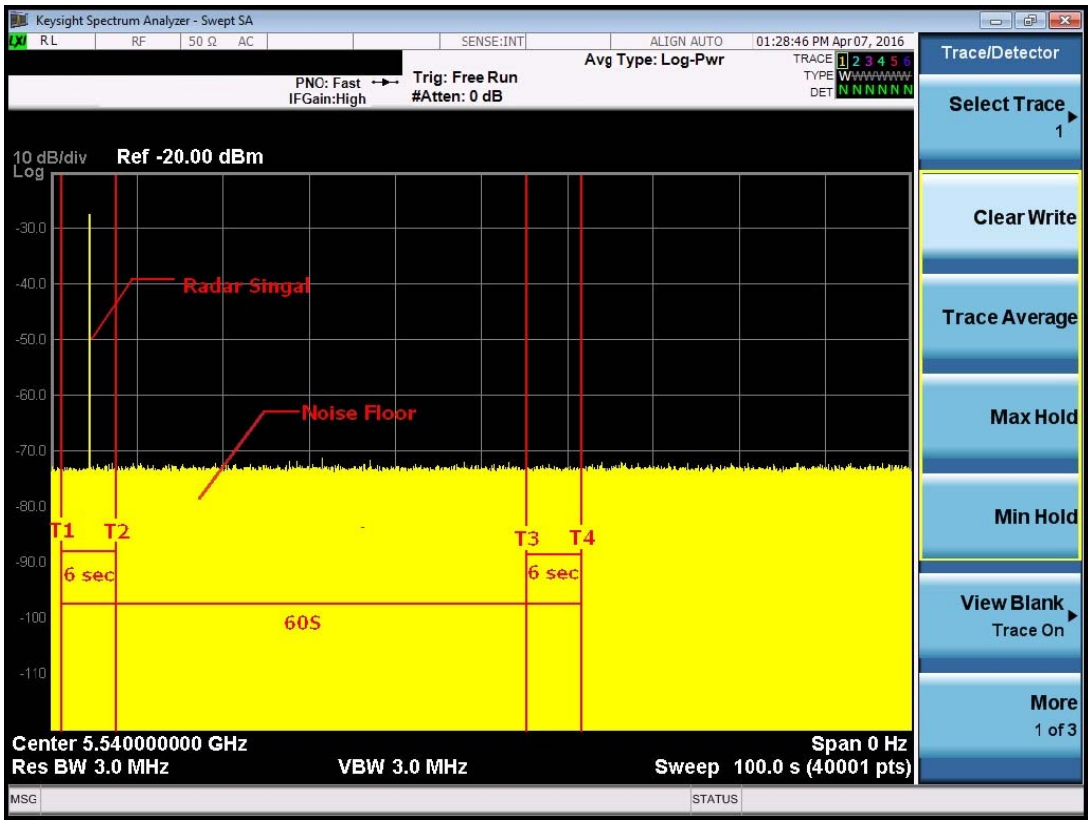
Initial Channel Availability Check Time



Note: T1 denotes the end of power-up time period is 6 second.
T4 denotes the end of Channel Availability Check time is 66 second. Channel Availability Check time is equal to (T4 – T1) 60 seconds.

11a Mode

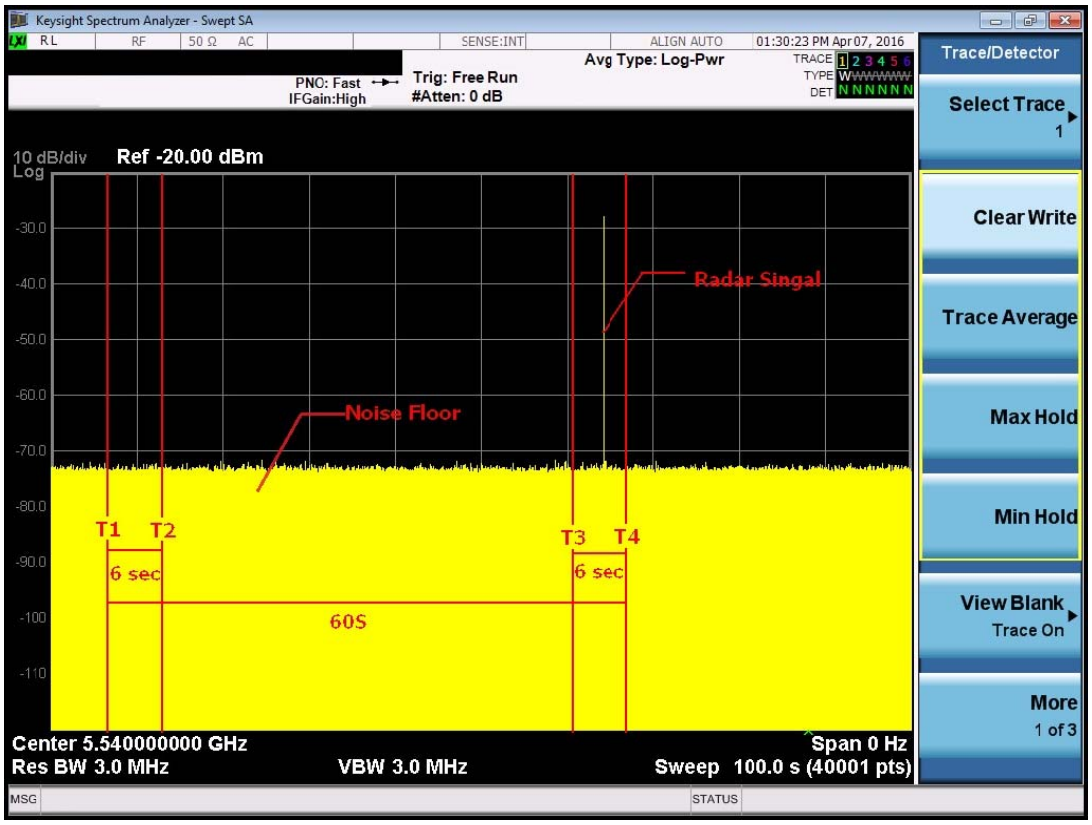
Radar Burst at the Beginning of the Channel Availability Check Time



Note: T1 denotes the end of power up time period is 6 second.
T2 denotes 12 second. the radar burst was commenced within a 6 second window starting from the end of power-up sequence.
T4 denotes the 66 second.

11a Mode

Radar Burst at the End of the Channel Availability Check Time



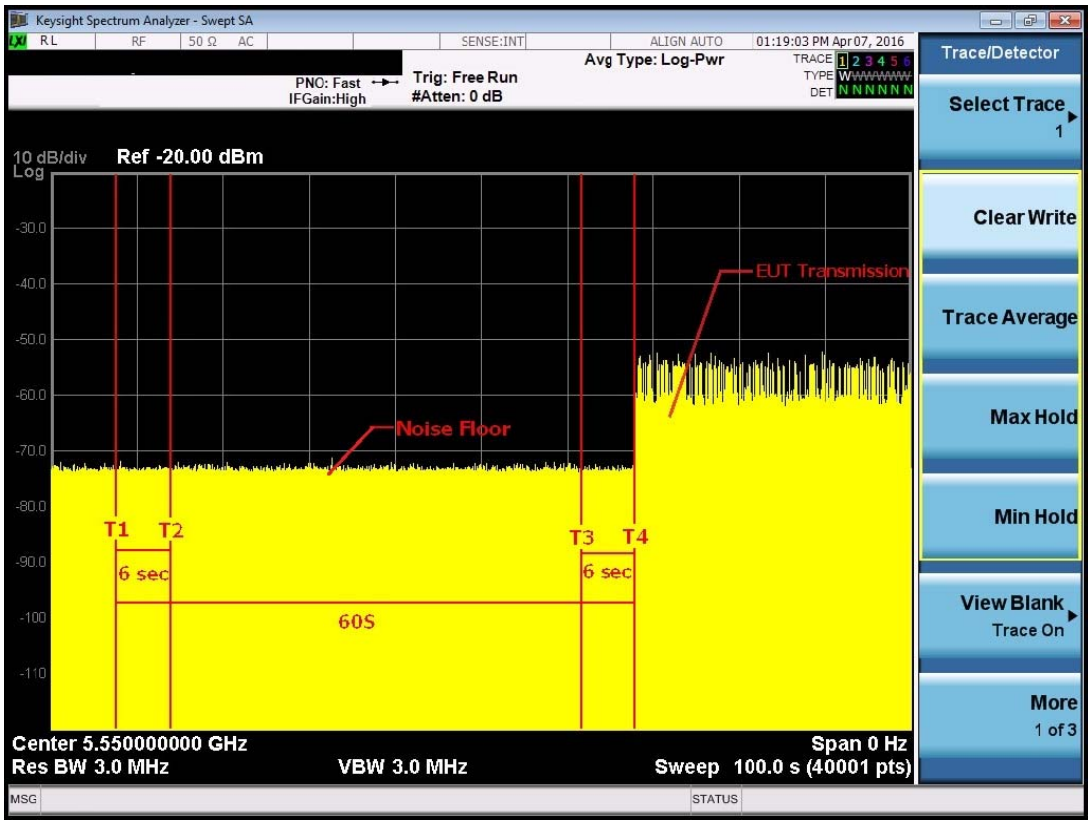
Note: T1 denotes the end of power up time period is 6 second.

T3 denotes 66 second and radar burst was commenced within 54thsecond to 60thsecondindow starting from the end of power-up sequence.

T4 denotes the 66 second

11n 40MHz Mode

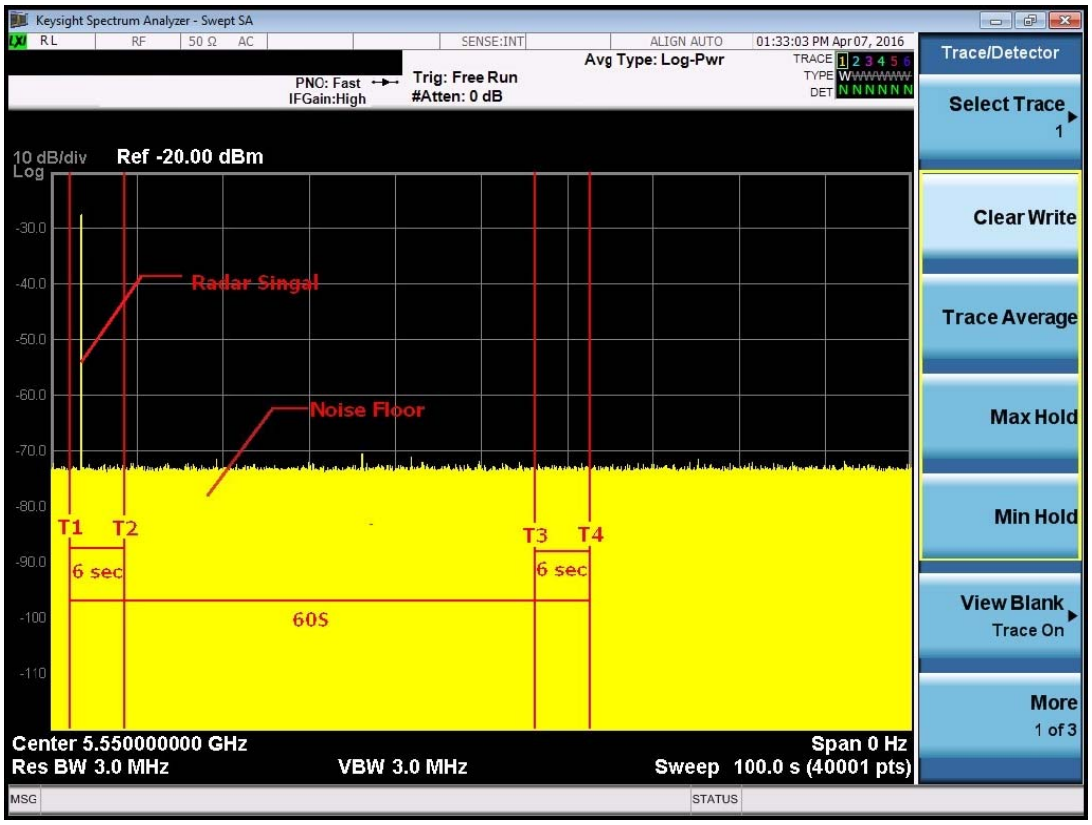
Initial Channel Availability Check Time



Note: T1 denotes the end of power-up time period is 6 second.
T4 denotes the end of Channel Availability Check time is 66 second. Channel Availability Check time is equal to (T4 – T1) 60 seconds.

11n 40MHz Mode

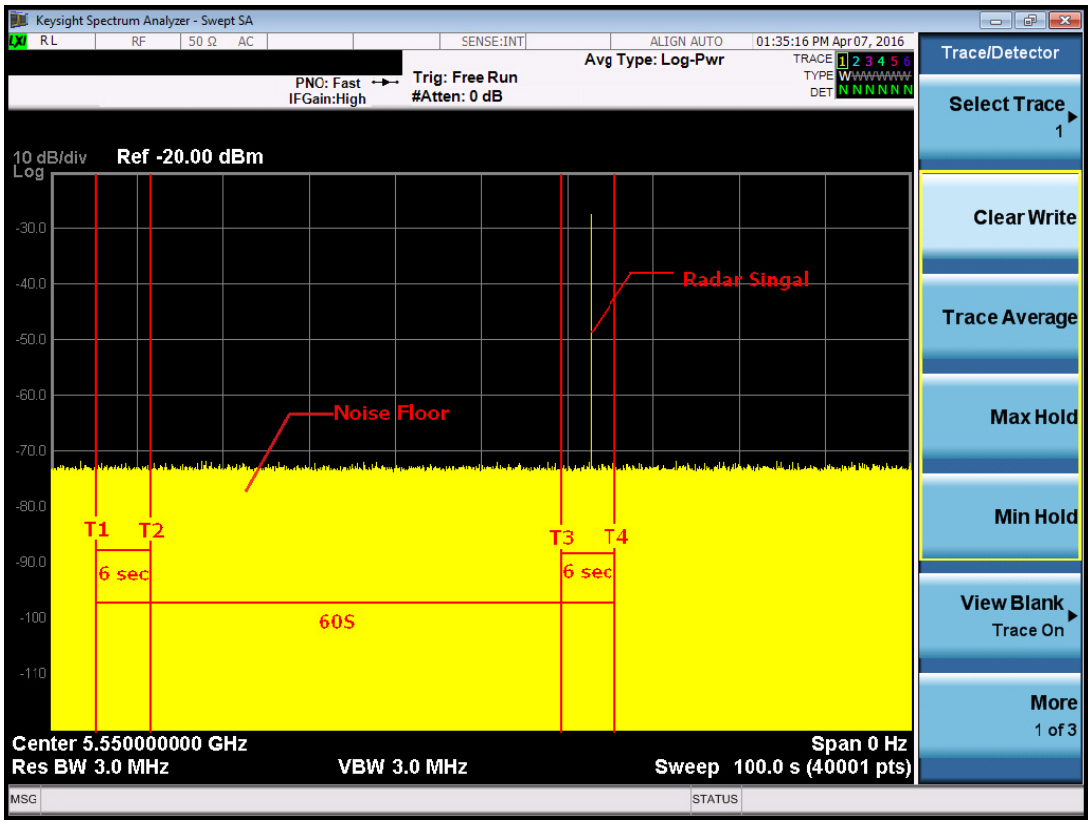
Radar Burst at the Beginning of the Channel Availability Check Time



Note: T1 denotes the end of power up time period is 6 second.
T2 denotes 12 second. the radar burst was commenced within a 6 second window starting from the end of power-up sequence.
T4 denotes the 66 second.

11n 40MHz Mode

Radar Burst at the End of the Channel Availability Check Time



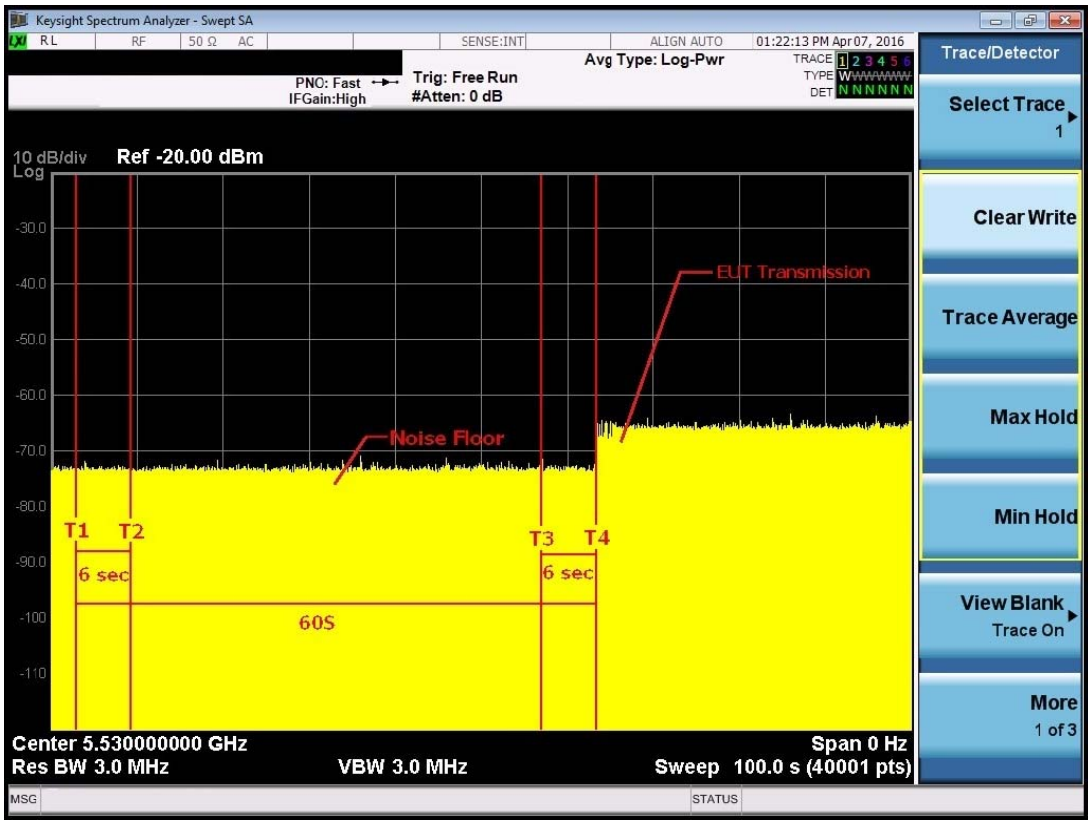
Note: T1 denotes the end of power up time period is 6 second.

T3 denotes 66 second and radar burst was commenced within 54thsecond to 60thsecondindow starting from the end of power-up sequence.

T4 denotes the 66 second

11ac 80MHz Mode

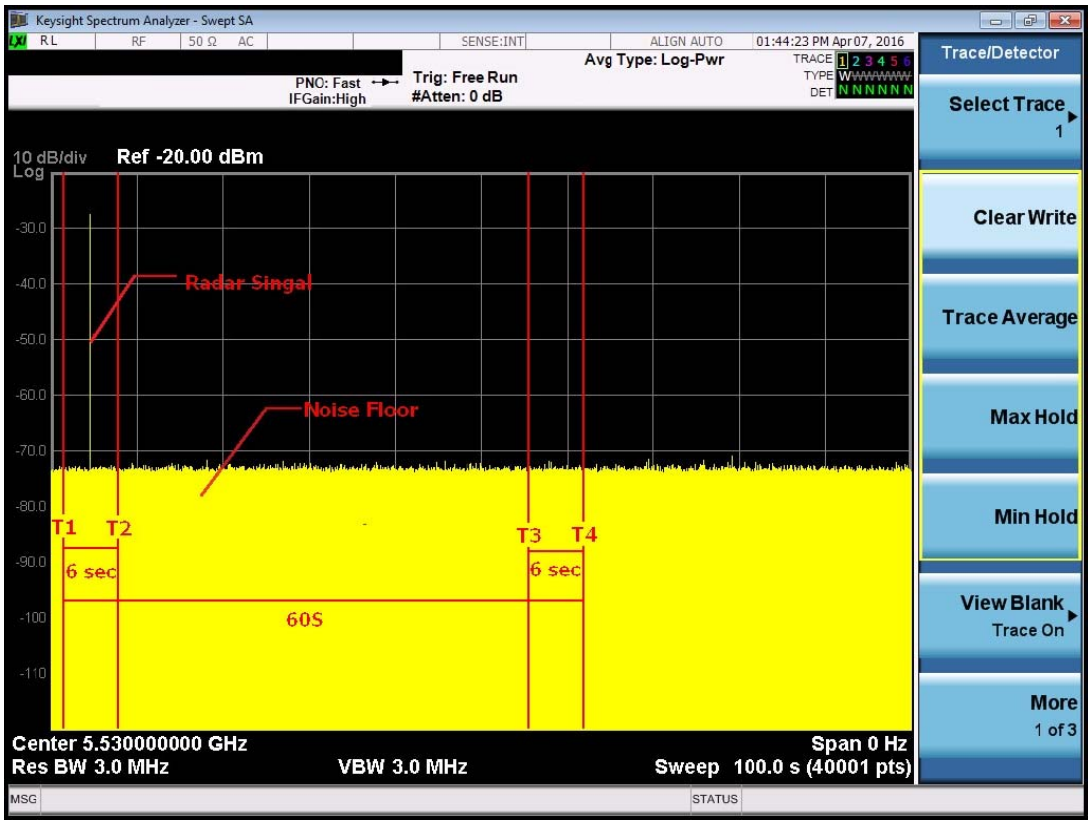
Initial Channel Availability Check Time



Note: T1 denotes the end of power-up time period is 6 second.
T4 denotes the end of Channel Availability Check time is 66 second. Channel Availability Check time is equal to (T4 – T1) 60 seconds.

11ac 80MHz Mode

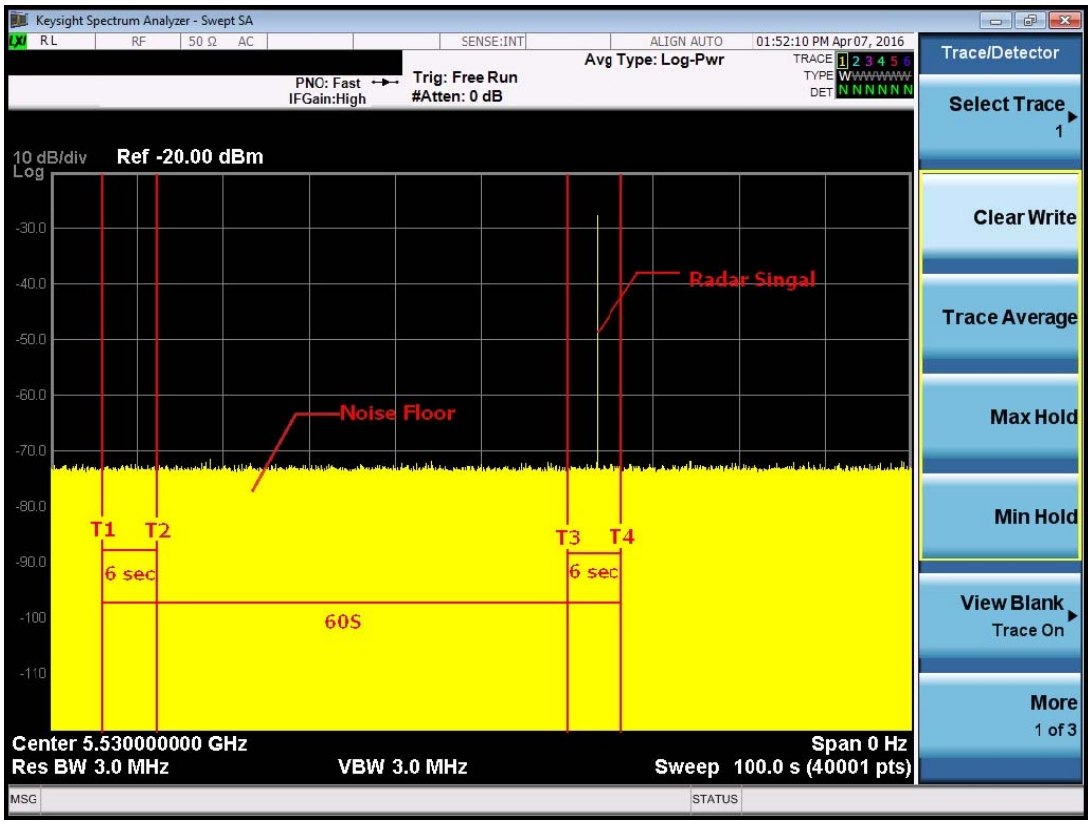
Radar Burst at the Beginning of the Channel Availability Check Time



Note: T1 denotes the end of power up time period is 6 second.
T2 denotes 12 second. the radar burst was commenced within a 6 second window starting from the end of power-up sequence.
T4 denotes the 66 second.

11ac 80MHz Mode

Radar Burst at the End of the Channel Availability Check Time



Note: T1 denotes the end of power up time period is 6 second.

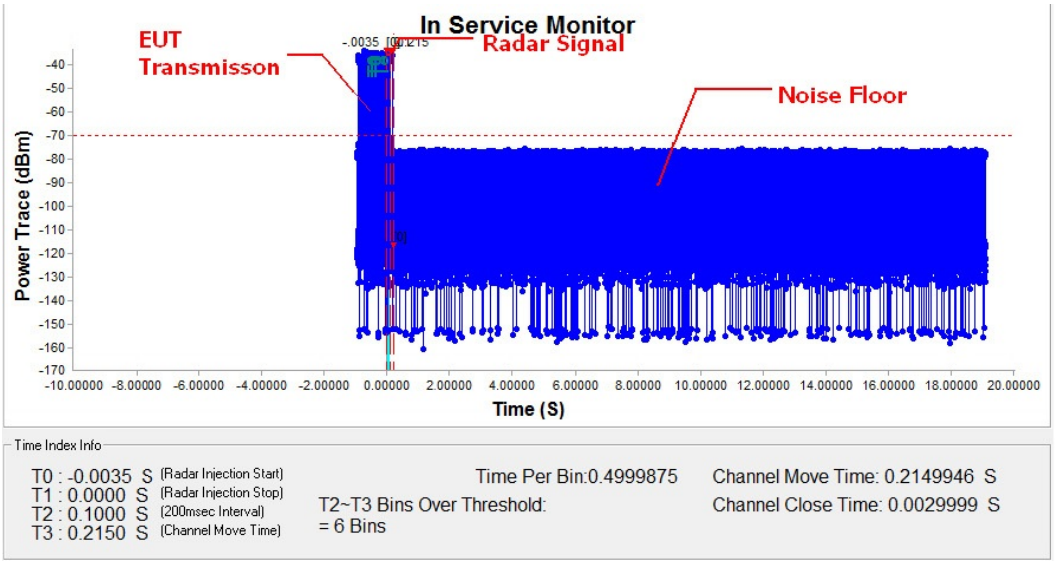
T3 denotes 66 second and radar burst was commenced within 54thsecond to 60thsecondindow starting from the end of power-up sequence.

T4 denotes the 66 second

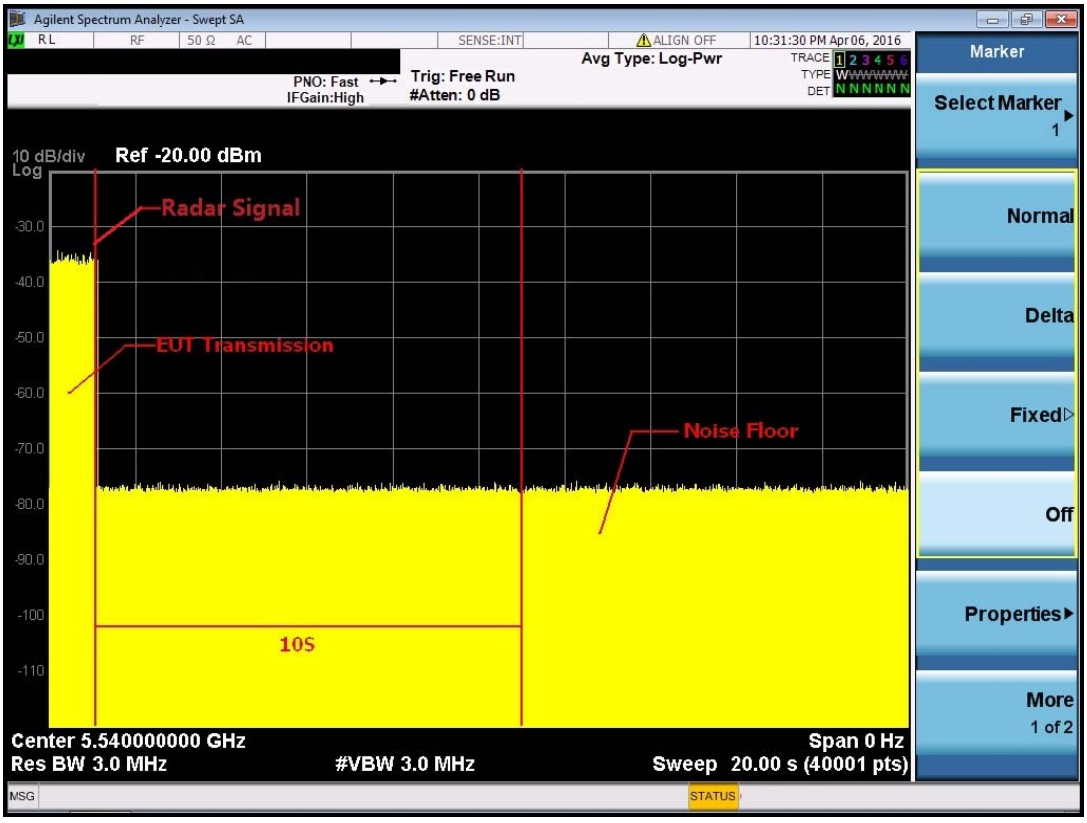
6.5 CHANNEL CLOSING TRANSMISSION AND CHANNEL MOVE TIME WLAN TRAFFIC

TX (11a Mode)

Radar signal 0



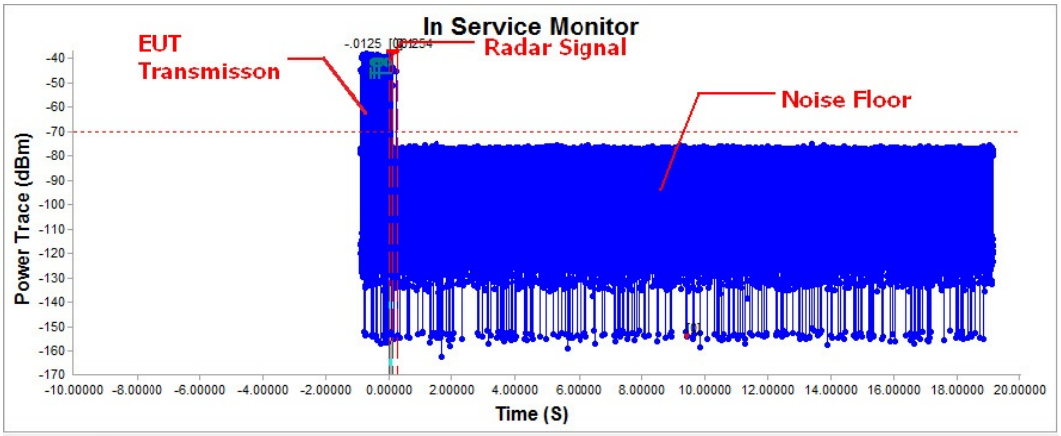
Note: T0 denotes the start of Channel Move Time upon the end of the last Radar burst.
T1 denotes the data transmission time of 200ms from T0.
T2 denotes the end of Channel Move Time.
T3 denotes the 10 second from T0 to observe the aggregate duration of transmissions.



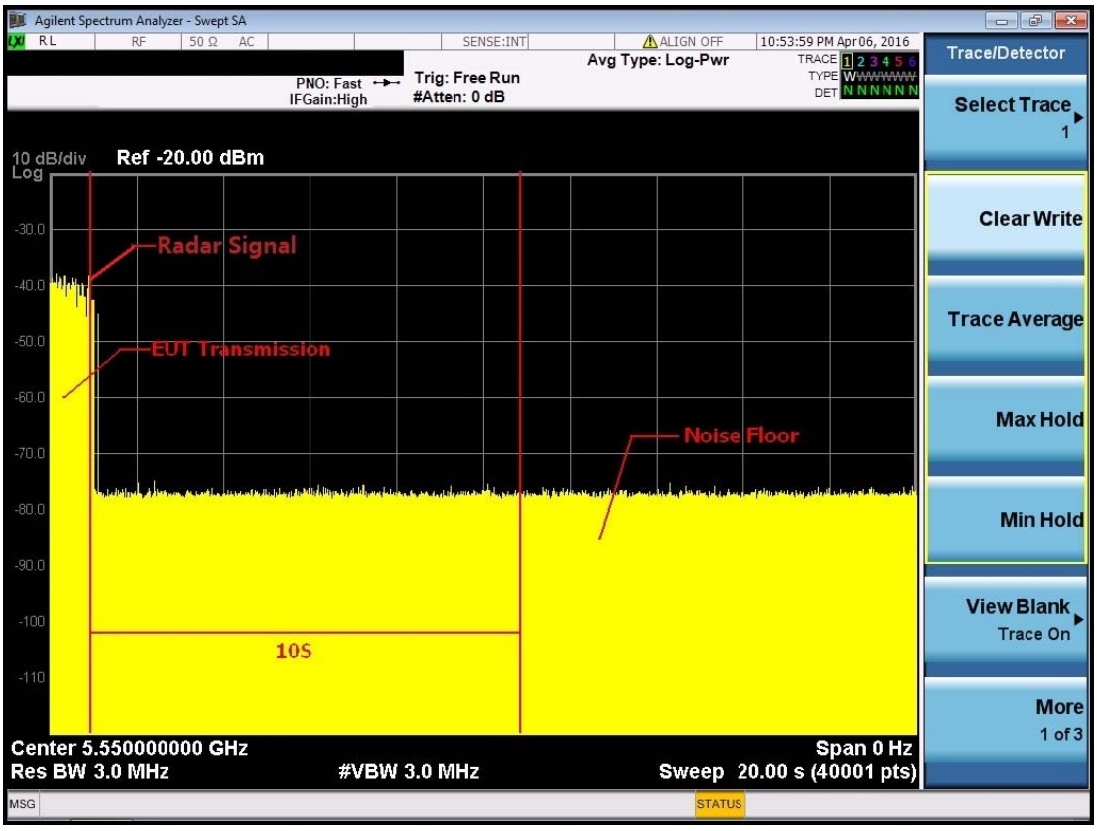
Note: An expanded plot for the device vacates the channel in the required 500ms

TX (11n 40MHz Mode)

Radar signal 0

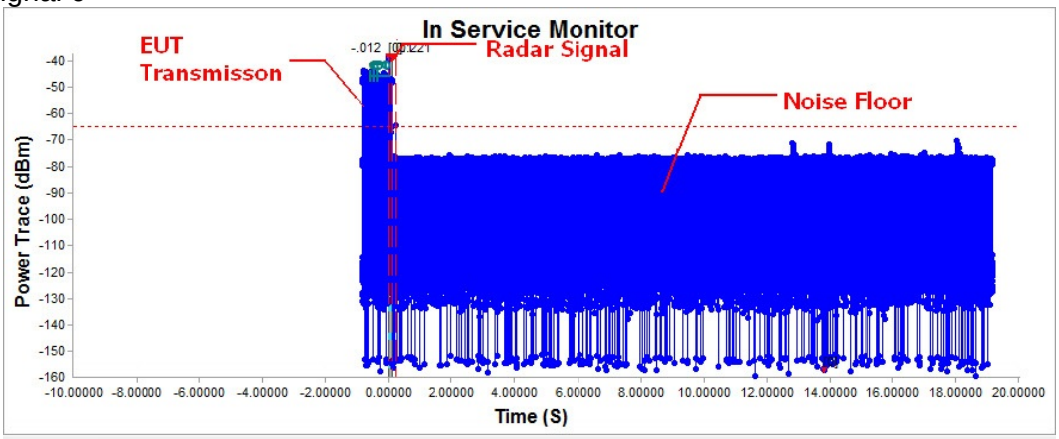


Note: T0 denotes the start of Channel Move Time upon the end of the last Radar burst.
T1 denotes the data transmission time of 200ms from T0.
T2 denotes the end of Channel Move Time.
T3 denotes the 10 second from T0 to observe the aggregate duration of transmissions.

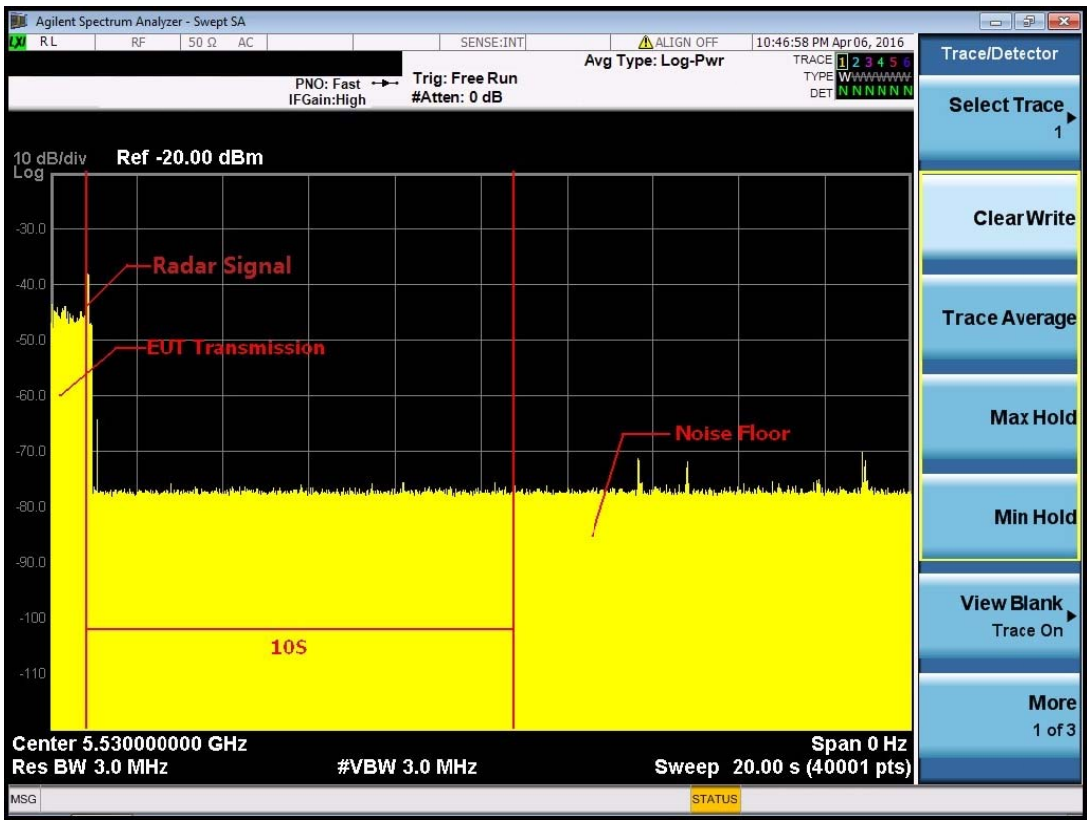


Note: An expanded plot for the device vacates the channel in the required 500ms

TX (11ac 80MHz Mode)
Radar signal 0



Note: T0 denotes the start of Channel Move Time upon the end of the last Radar burst.
T1 denotes the data transmission time of 200ms from T0.
T2 denotes the end of Channel Move Time.
T3 denotes the 10 second from T0 to observe the aggregate duration of transmissions.



Note: An expanded plot for the device vacates the channel in the required 500ms

6.6 STATISTICAL PERFORMANCE CHECK

Test Precedure

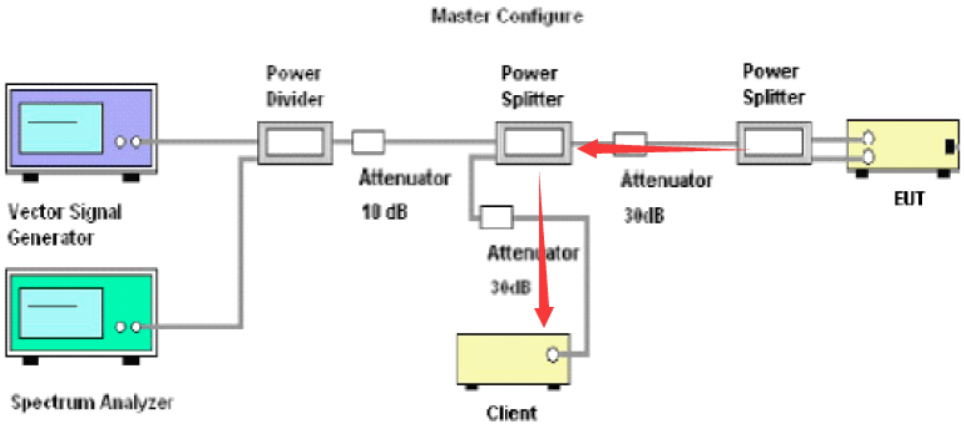
1.Master device and client device are set up by conduction method as the following configuration.

2.The client device is connected to notebook and to access a IP address on wireless connection with the master device.

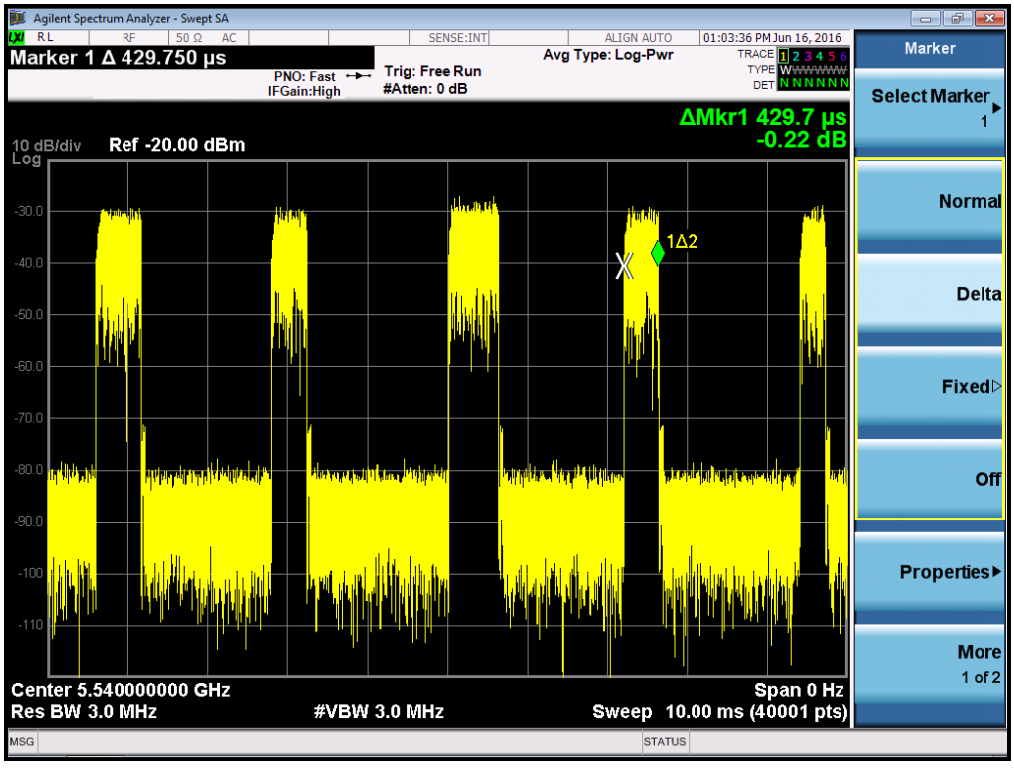
3.Then the master device is connected to another notebook to access a IP address.

4.Finally, let the two IP addresses run traffic with each other through the Run flow software “Lan test” to reach 17% channel loading as below

Setup



Channel Loading



TX (11a Mode)

Table 1: Short Pulse Radar Test Waveforms.

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Pass times	Fail times	Percentage of Successful Detection (%)
1	1	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	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	26	4	87
2	1-5	150-230	23-29	27	3	90
3	6-10	200-500	16-18	26	4	87
4	11-20	200-500	12-16	27	3	90
Aggregate (Radar Types 1-4)			-	106	14	88

Table 2: Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses Per Burst	Number of Bursts	Pass times	Fail times	Percentage of Successful Detection (%)
5	50-100	5-20	1000-2000	1-3	8-20	26	4	87

Table 3: Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Pass times	Fail times	Percentage of Successful Detection (%)
6	1	333	9	0.333	300	26	4	87

TX (11n 40MHz Mode)

Table 1: Short Pulse Radar Test Waveforms.

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Pass times	Fail times	Percentage of Successful Detection (%)
1	1	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	$\text{Roundup}\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{\text{PRI}_{\mu\text{sec}}}\right)\right\}$	26	4	87
2	1-5	150-230	23-29	27	3	90
3	6-10	200-500	16-18	27	3	90
4	11-20	200-500	12-16	27	3	90
Aggregate (Radar Types 1-4)			-	107	13	89

Table 2: Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Pass times	Fail times	Percentage of Successful Detection (%)
5	1	333	9	0.333	300	27	3	90

Table 3: Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Pass times	Fail times	Percentage of Successful Detection (%)
6	1	333	9	0.333	300	28	2	93

TX (11ac 80MHz Mode)

Table 1: Short Pulse Radar Test Waveforms.

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Pass times	Fail times	Percentage of Successful Detection (%)
1	1	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	Roundup $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot10^6}{PRI_{\mu sec}}\right)\right\}$	27	3	90
2	1-5	150-230	23-29	27	3	90
3	6-10	200-500	16-18	26	4	87
4	11-20	200-500	12-16	26	4	87
Aggregate (Radar Types 1-4)			-	106	14	88

Table 2: Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Numberof Pulses PerBurst	Number of Bursts	Pass times	Fail times	Percentage of Successful Detection (%)
5	50-100	5-20	1000-2000	1-3	8-20	26	4	87

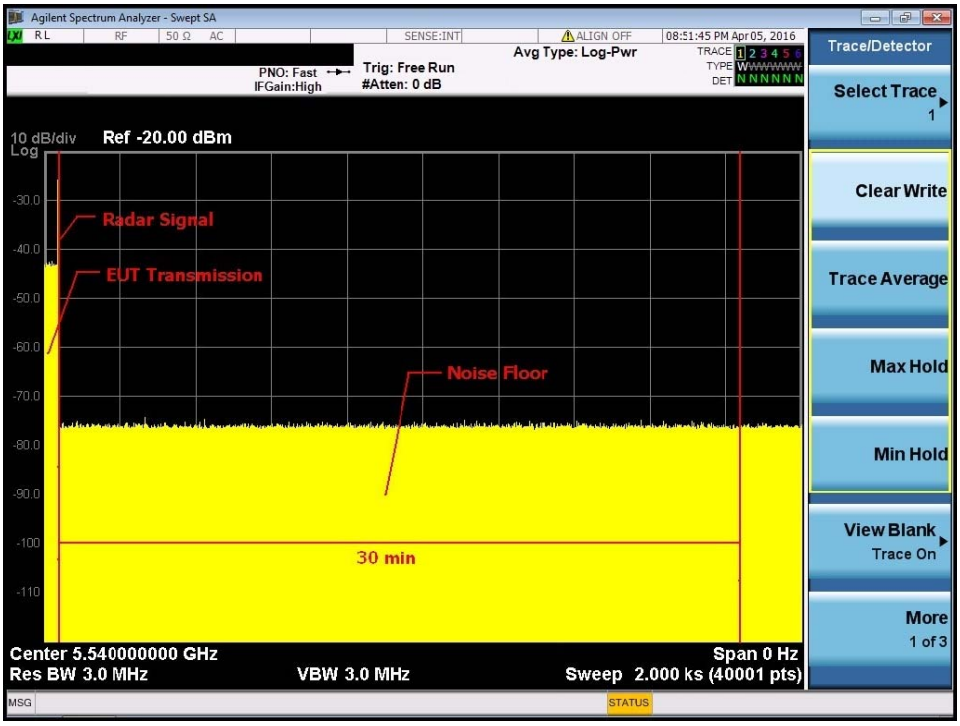
Table 3: Frequency Hopping Radar Test Waveform

Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per Hop	Hopping Rate (kHz)	Hopping Sequence Length (msec)	Pass times	Fail times	Percentage of Successful Detection (%)
6	1	333	9	0.333	300	27	3	90

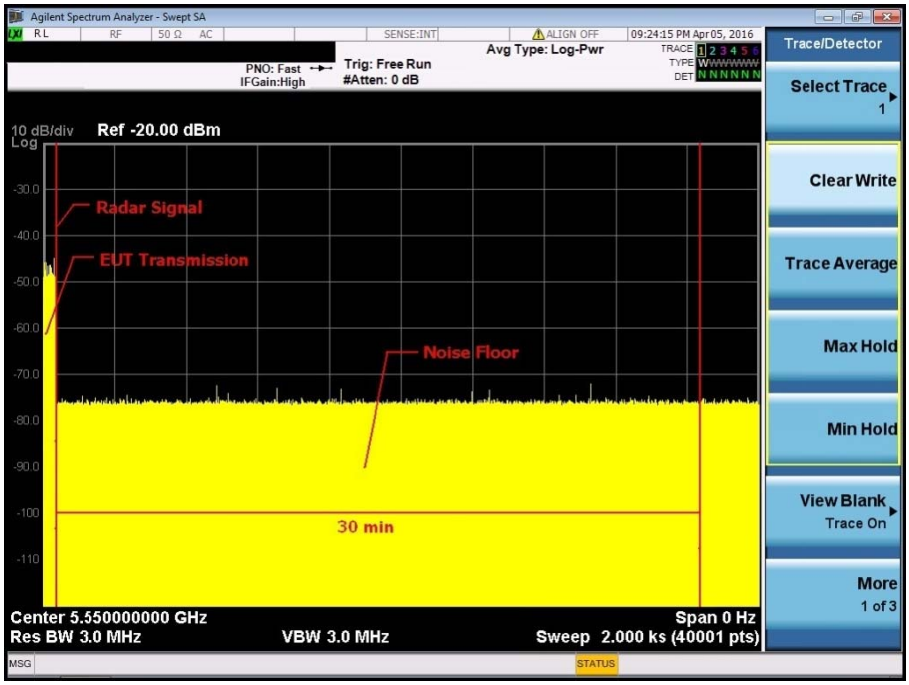
6.7 NON- OCCUPANCY PERIOD

During the 30 minutes observation time, UUT did not make any transmissions on a channel after a radar signal was detected on that channel by either the Channel Availability Check or the In-Service Monitoring.

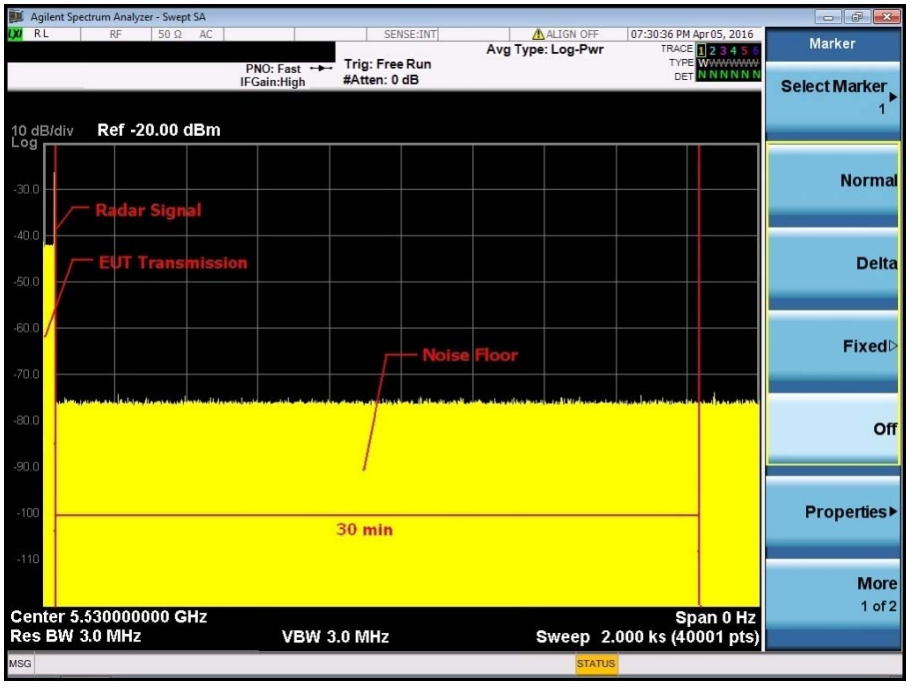
5540 Non-Occupancy perrod



5550 Non-Occupancy perrod



5530 Non-Occupancy perrod

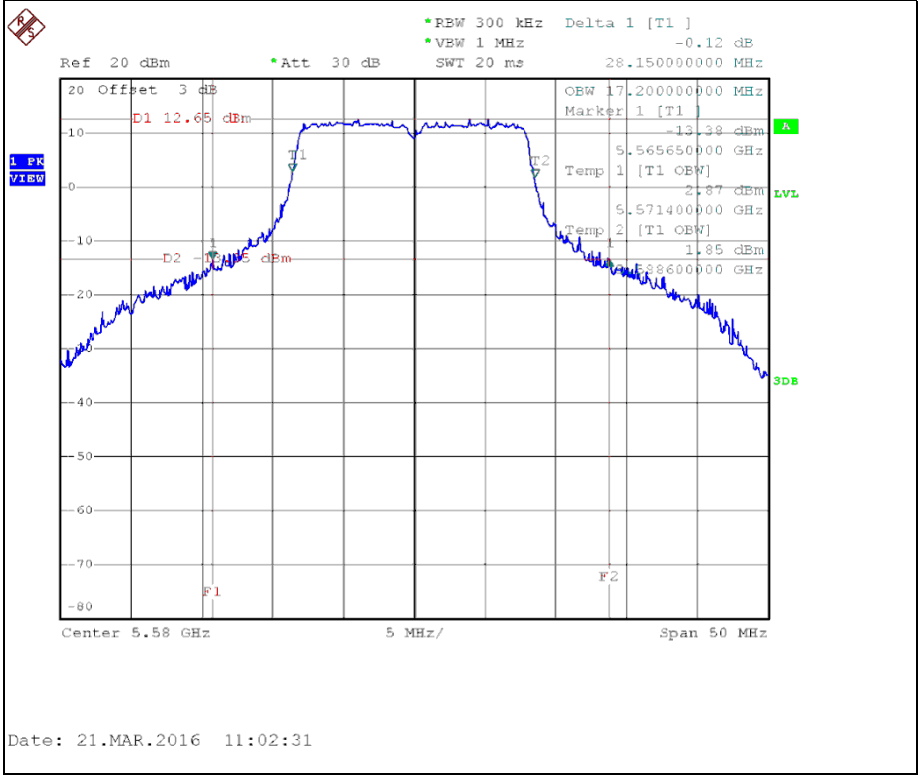


6.8 UNIFORM SPREADING

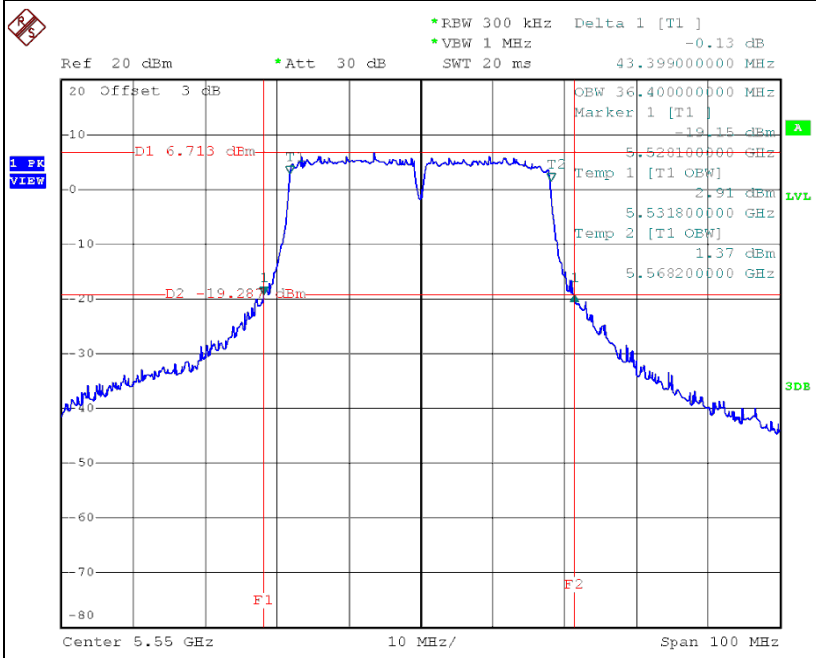
The intention of the uniform spreading is to provide, on aggregate, a uniform loading of the spectrum. The UUT using the bands 5250 to 5350MHz and 5470 to 5600 MHz channels so that the probability of selecting a given channel shall be the same for channels. The UUT will select channel by random mode and remember this channel when detect radar signal, so that will select unused channel by random mode.

6.9 U-NII DETECTION BANDWIDTH

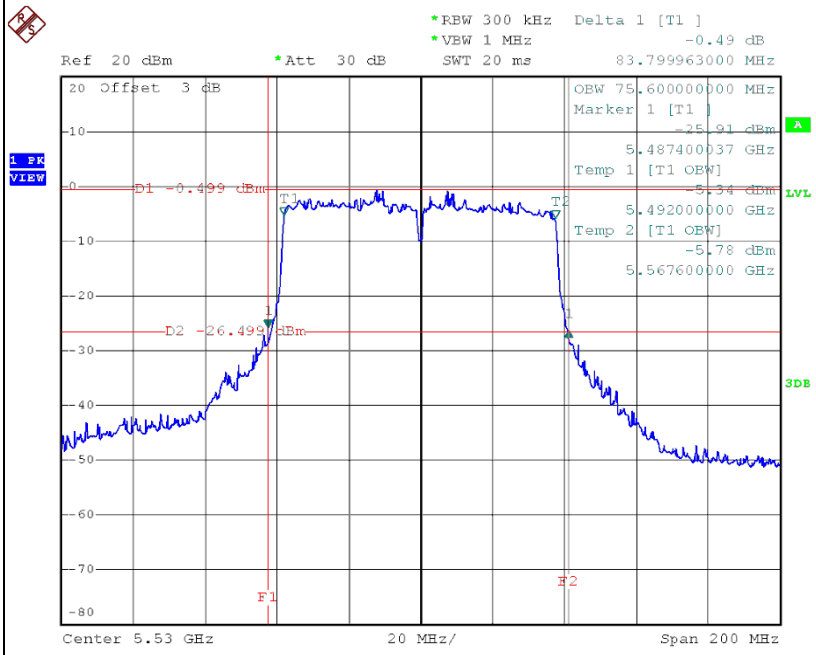
TX (11a Mode)
U-NII 99% Channel bandwidth



TX (11n 40MHz Mode)
U-NII 99% Channel bandwidth



TX (11ac 80MHz Mode)
U-NII 99% Channel bandwidth



11a Mode

Detection Bandwith test tranmission 20M											
EUT FREQUENCY	5500M										
EUT power bandwith	16.9MHz										
Detection Bandwith limit(100%of EUT 99% Power bandwith)	17.73										
Detection Bandwith(5509(FH)-5491(FL))	18										
Test Result	PASS										
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Freq (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5489	1	0	0	1	1	0	0	0	1	1	50
5490	1	1	0	0	0	1	0	1	0	1	50
5491(FL)	1	1	1	1	1	0	1	1	1	1	90
5492	1	1	1	1	1	1	1	1	0	1	90
5493	1	1	1	1	1	1	1	1	1	1	100
5494	1	1	1	1	1	1	1	1	1	1	100
5495	1	1	1	1	1	1	1	1	1	1	100
5496	1	1	1	1	1	1	1	1	1	1	100
5497	1	1	1	1	1	1	1	1	1	1	100
5498	1	1	1	1	1	1	1	1	1	1	100
5499	1	1	1	1	1	1	1	1	1	1	100
5500	1	1	1	1	1	1	1	1	1	1	100
5501	1	1	1	1	1	1	1	1	1	1	100
5502	1	1	1	1	1	1	1	1	1	1	100
5503	1	1	1	1	1	1	1	1	0	1	90
5504	1	1	1	1	1	1	1	1	1	1	100
5505	1	1	1	1	1	1	1	1	1	1	100
5506	1	1	1	1	1	1	1	1	1	1	100
5507	1	1	1	1	1	1	1	1	1	1	100
5508	1	1	1	1	1	1	1	1	1	1	100
5509(FH)	1	1	1	1	1	1	1	1	1	1	100
5510	0	1	0	0	0	1	0	0	0	1	40
5511	1	0	1	0	0	0	1	0	1	1	50

11n 40MHz Mode

Detection Bandwith test tranmission	40M										
EUT FREQUENCY	5550M										
EUT power bandwith	36.4MHz										
Detection Bandwith limit(100%of EUT 99% Power bandwith)	36.036										
Detection Bandwith(5568(FH)-5532(FL))	36										
Test Result	PASS										
	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Freq (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5529	1	0	1	0	0	1	1	0	1	0	50
5530	1	1	1	0	1	0	1	0	1	0	60
5531	1	0	1	0	1	1	0	1	0	0	50
5532(FL)	1	1	1	1	1	1	1	1	1	1	100
5533	1	1	1	1	1	1	1	1	1	1	100
5534	1	1	1	1	1	1	1	1	1	1	100
5535	1	1	1	1	1	1	1	1	1	1	100
5536	1	1	1	1	1	1	1	1	1	1	100
5537	1	1	1	1	1	1	1	1	1	1	100
5538	1	1	1	1	1	1	1	1	1	1	100
5539	1	1	1	1	1	1	1	1	1	1	100
5540	1	1	1	1	1	1	1	1	1	1	100
5541	1	1	1	1	1	1	1	1	1	1	100
5542	1	1	1	1	1	1	1	1	1	1	100
5543	1	1	1	1	1	1	1	1	1	1	100
5544	1	1	1	1	1	1	1	1	1	1	100
5545	1	1	1	1	1	1	1	1	1	1	100
5546	1	1	1	1	1	1	1	1	1	1	100
5547	1	1	1	1	1	1	1	1	1	1	100
5548	1	1	1	1	1	1	1	1	1	1	100
5549	1	1	1	1	1	1	1	1	1	1	100
5550	1	1	1	1	1	1	1	1	1	1	100
5551	1	1	1	1	1	1	1	1	1	1	100
5552	1	1	1	1	1	1	1	1	1	1	100
5553	1	1	1	1	1	1	1	1	1	1	100
5554	1	1	1	1	1	1	1	1	1	1	100
5555	1	1	1	1	1	1	1	1	1	1	100
5556	1	1	1	1	1	1	1	1	1	1	100
5557	1	1	1	1	1	1	1	1	1	1	100
5558	1	1	1	1	1	1	1	1	1	1	100
5559	1	1	1	1	1	1	1	1	1	1	100
5560	1	1	1	1	1	1	1	1	1	1	100
5561	1	1	1	1	1	1	1	1	1	1	100
5562	1	1	1	1	1	1	1	1	1	1	100
5563	1	1	1	1	1	1	1	1	1	1	100
5564	1	1	1	1	1	1	1	1	1	1	100
5565	1	1	1	1	1	1	1	1	1	1	100
5566	1	1	1	1	1	1	1	1	1	1	100
5567	1	1	1	1	1	1	1	1	1	1	100
5568(FH)	1	1	1	1	1	1	1	1	1	1	100
5569	0	0	0	1	0	1	1	0	1	1	50
5570	1	0	1	1	0	1	0	0	1	0	50
5571	1	0	0	1	0	0	1	0	0	1	40

11ac 80MHz Mode

Detection Bandwith test tranmission	80M
EUT FREQUENCY	5530M
EUT power bandwith	75.6
Detection Bandwith limit(100%of EUT 99% Power bandwith)	74.84
Detection Bandwith(5568(FH)-5492(FL))	76
Test Result	PASS

	DFS Detection Trials (1=Detection, 0= No Detection)										
Radar Freq (MHz)	1	2	3	4	5	6	7	8	9	10	Detection Rate (%)
5489	1	0	0	0	1	0	1	0	0	0	30
5490	1	0	0	0	1	0	1	0	0	0	30
5491	1	0	0	0	1	0	1	0	0	0	30
5492(FL)	1	1	1	1	1	1	1	1	1	1	100
5493	1	1	1	1	1	1	1	1	1	1	100
5494	1	1	1	1	1	1	1	1	1	1	100
5495	1	1	1	1	1	1	1	1	1	1	100
5496	1	1	1	1	1	1	1	1	1	1	100
5497	1	1	1	1	1	1	1	1	1	1	100
5498	1	1	1	1	1	1	1	1	1	1	100
5499	1	1	1	1	1	1	1	1	1	1	100
5500	1	1	1	1	1	1	1	1	1	1	100
5501	1	1	1	1	1	1	1	1	1	1	100
5502	1	1	1	1	1	1	1	1	1	1	100
5503	1	1	1	1	1	1	1	1	1	1	100
5504	1	1	1	1	1	1	1	1	1	1	100
5505	1	1	1	1	1	1	1	1	1	1	100
5506	1	1	1	1	1	1	1	1	1	1	100
5507	1	1	1	1	1	1	1	1	1	1	100
5508	1	1	1	1	1	1	1	1	1	1	100
5509	1	1	1	1	1	1	1	1	1	1	100
5510	1	1	1	1	1	1	1	1	1	1	100
5511	1	1	1	1	1	1	1	1	1	1	100
5512	1	1	1	1	1	1	1	1	1	1	100
5513	1	1	1	1	1	1	1	1	1	1	100
5514	1	1	1	1	1	1	1	1	1	1	100
5515	1	1	1	1	1	1	1	1	1	1	100
5516	1	1	1	1	1	1	1	1	1	1	100
5517	1	1	1	1	1	1	1	1	1	1	100
5518	1	1	1	1	1	1	1	1	1	1	100
5519	1	1	1	1	1	1	1	1	1	1	100
5520	1	1	1	1	1	1	1	1	1	1	100
5521	1	1	1	1	1	1	1	1	1	1	100
5522	1	1	1	1	1	1	1	1	1	1	100
5523	1	1	1	1	1	1	1	1	1	1	100
5524	1	1	1	1	1	1	1	1	1	1	100
5525	1	1	1	1	1	1	1	1	1	1	100
5526	1	1	1	1	1	1	1	1	1	1	100
5527	1	1	1	1	1	1	1	1	1	1	100
5528	1	1	1	1	1	1	1	1	1	1	100
5529	1	1	1	1	1	1	1	1	1	1	100
5530	1	1	1	1	1	1	1	1	1	1	100
5531	1	1	1	1	1	1	1	1	1	1	100
5532	1	1	1	1	1	1	1	1	1	1	100
5533	1	1	1	1	1	1	1	1	1	1	100
5534	1	1	1	1	1	1	1	1	1	1	100
5535	1	1	1	1	1	1	1	1	1	1	100
5536	1	1	1	1	1	1	1	1	1	1	100
5537	1	1	1	1	1	1	1	1	1	1	100
5538	1	1	1	1	1	1	1	1	1	1	100

5539	1	1	1	1	1	1	1	1	1	1	100
5540	1	1	1	1	1	1	1	1	1	1	100
5541	1	1	1	1	1	1	1	1	1	1	100
5542	1	1	1	1	1	1	1	1	1	1	100
5543	1	1	1	1	1	1	1	1	1	1	100
5544	1	1	1	1	1	1	1	1	1	1	100
5545	1	1	1	1	1	1	1	1	1	1	100
5546	1	1	1	1	1	1	1	1	1	1	100
5547	1	1	1	1	1	1	1	1	1	1	100
5548	1	1	1	1	1	1	1	1	1	1	100
5549	1	1	1	1	1	1	1	1	1	1	100
5550	1	1	1	1	1	1	1	1	1	1	100
5551	1	1	1	1	1	1	1	1	1	1	100
5552	1	1	1	1	1	1	1	1	1	1	100
5553	1	1	1	1	1	1	1	1	1	1	100
5554	1	1	1	1	1	1	1	1	1	1	100
5555	1	1	1	1	1	1	1	1	1	1	100
5556	1	1	1	1	1	1	1	1	1	1	100
5557	1	1	1	1	1	1	1	1	1	1	100
5558	1	1	1	1	1	1	1	1	1	1	100
5559	1	1	1	1	1	1	1	1	1	1	100
5560	1	1	1	1	1	1	1	1	1	1	100
5561	1	1	1	1	1	1	1	1	1	1	100
5562	1	1	1	1	1	1	1	1	1	1	100
5563	1	1	1	1	1	1	1	1	1	1	100
5564	1	1	1	1	1	1	1	1	1	1	100
5565	1	1	1	1	1	1	1	1	1	1	100
5566	1	1	1	1	1	1	1	1	1	1	100
5567	1	1	1	1	1	1	1	1	1	1	100
5568(FL)	1	1	1	1	1	0	1	1	1	1	90
5569	0	1	0	0	0	0	1	0	0	0	20
5570	0	1	0	0	0	0	0	0	0	0	10
5571	0	1	0	0	0	0	0	0	0	0	10