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DFS TEST REPORT

REPORT NO.: RF981009L05-2

MODEL NO.: WMDA-119AN

RECEIVED: Oct. 09, 2009

TESTED: Jan. 23, 2010

ISSUED: Jan. 25, 2010

APPLICANT: LG Electronics USA

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Table of Contents

1.	LAB DECLARATION.....	3
2.	EUT INFORMATION.....	4
2.1	OPERATING FREQUENCY BANDS AND MODE OF EUT	4
2.2	EUT SOFTWARE AND FIRMWARE VERSION	4
2.3	DESCRIPTION OF AVAILABLE ANTENNAS TO THE EUT	4
2.4	EUT MAXIMUM AND MINIMUM CONDUCTED POWER.....	5
2.5	EUT MAXIMUM AND MINIMUM E.I.R.P. POWER.....	5
2.6	STATEMENT OF MAUNFACTURER	5
3.	U-NII DFS RULE REQUIREMENTS.....	6
3.1	WORKING MODES AND REQUIRED TEST ITEMS	6
3.2	TEST LIMITS AND RADAR SIGNAL PARAMETERS	7
4.	TEST & SUPPORT EQUIPMENT LIST	10
4.1	TEST INSTRUMENTS	10
4.2	DESCRIPTION OF SUPPORT UNITS	10
5.	TEST PROCEDURE.....	11
5.1	BV ADT DFS MEASUREMENT SYSTEM:.....	11
5.2	CALIBRATION OF DFS DETECTION THRESHOLD LEVEL:.....	12
5.3	DEVIATION FROM TEST STANDARD	13
5.4	RADIATED TEST SETUP CONFIGURATION.....	13
6.	TEST RESULTS	14
6.1	SUMMARY OF TEST RESULTS	14
6.2	DETELED TEST RESULTS.....	15
6.2.1	TEST MODE: DEVICE OPERATING IN CLIENT WITHOUT RADAR DETECTION MODE.....	15
6.2.1.1	DFS DETECTION THRESHOLD	15
6.2.2	CHANNEL CLOSING TRANSMISSION AND CHANNEL MOVE TIME.....	16
6.2.3	NON- OCCUPANCY PERIOD	17
7.	TESTING LABORATORIES INFORMATION.....	19




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1. LAB DECLARATION

PRODUCT: RF Transmitter
MODEL NO.: WMDA-119AN
BRAND: LG
APPLICANT: LG Electronics USA
TESTED: Jan. 23, 2010
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 15, Subpart E (Section 15.407)**
FCC 06-96

The above equipment (Model: WMDA-119AN) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

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2. EUT INFORMATION

2.1 OPERATING FREQUENCY BANDS AND MODE OF EUT

TABLE 1: OPERATING FREQUENCY BANDS AND MODE OF EUT

OPERATIONAL MODE	OPERATING FREQUENCY RANGE	
	5270~5310MHz	5510~5550MHz
Client without radar detection and ad hoc function	✓	✓

2.2 EUT SOFTWARE AND FIRMWARE VERSION

TABLE 2: THE EUT SOFTWARE/FIRMWARE VERSION

NO.	PRODUCT	MODEL NO.	SOFTWARE/FIRMWARE VERSION
1	RF Transmitter	WMDA-119AN	MAC : 3.0.34 APP : 1.0.43

2.3 DESCRIPTION OF AVAILABLE ANTENNAS TO THE EUT

TABLE 3: ANTENNA LIST

NO.	ANTENNA	OPERATION FREQUENCY BAND	MAX. GAIN(dBi)
1	Dipole & Monopole	5GHz	3.5



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2.4 EUT MAXIMUM AND MINIMUM CONDUCTED POWER

TABLE 4: THE MEASURED CONDUCTED OUTPUT POWER

TX (40MHz)

ANT NO.	FREQUENCY BAND (MHz)	MAX. POWER		MIN. POWER	
		OUTPUT POWER(dBm)	OUTPUT POWER(mW)	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
1	5270~5310	16.5	44.4	7.0	5.0
1	5510~5550	16.4	43.6	7.0	5.0

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

TABLE 5: THE E.I.R.P OUTPUT POWER LIST

TX (40MHz)

ANT NO.	FREQUENCY BAND (MHz)	MAX. POWER		MIN. POWER	
		OUTPUT POWER(dBm)	OUTPUT POWER(mW)	OUTPUT POWER(dBm)	OUTPUT POWER(mW)
1	5270~5310	20.0	99.4	10.5	11.2
1	5510~5550	19.9	97.7	10.5	11.2

2.6 STATEMENT OF MAUNFACTURER

Manufacturer statement confirming that information regarding the parameters of the detected Radar Waveforms is not available to the end user. **And the device doesn't have Ad Hoc mode on DFS frequency band.**



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 6: 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 7: 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	✓



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3.2 TEST LIMITS AND RADAR SIGNAL PARAMETERS

DETECTION THRESHOLD VALUES

TABLE 8: DFS DETECTION THRESHOLDS FOR MASTER DEVICES AND CLIENT DEVICES WITH RADAR DETECTION

MAXIMUM TRANSMIT POWER	VALUE (SEE Note 1 and 2)
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 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.



TABLE 9: 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 80% of the UNII 99% transmission power bandwidth. See Note 3.

Note 1: The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows:

- For the Short Pulse Radar Test Signals this instant is the end of the Burst.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar Burst generated.
- For the Long Pulse Radar Test Signal this instant is the end of the 12 second period defining the Radar Waveform.

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 1 is used and 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 10: SHORT PULSE RADAR TEST WAVEFORMS

RADAR TYPE	PULSE WIDTH (μsec)	PRI (μsec)	NUMBER OF PULSES	MINIMUM PERCENTAGE OF SUCCESSFUL DETECTION	MINIMUM NUMBER OF TRIALS
1	1	1428	18	60%	30
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

TABLE 11: LONG PULSE RADAR TEST WAVEFORM

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 12: FREQUENCY HOPPING RADAR TEST WAVEFORM

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



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4. TEST & SUPPORT EQUIPMENT LIST

4.1 TEST INSTRUMENTS

TABLE 1: TEST INSTRUMENTS LIST.

DESCRIPTION & MANUFACTURER	MODEL NO.	BRAND	CALIBRATED UNTIL
R&S Spectrum analyzer	FSP40	R&S	2010/07/06
Signal generator	8645A	Agilent	2010/06/04
Oscilloscope	TDS 5104	Tektronix	2010/09/15
Control PC	Pavilion a320d	HP	--
Horn antenna	BBHA 9120D	SCHWARZBECK	2010/08/09
Horn antenna	BBHA 912D	SCHWARZBECK	2010/06/30
TV	32LD550-UB	LG	--
NB	PP35L	DELL	--

4.2 DESCRIPTION OF SUPPORT UNITS

TABLE 2: SUPPORT UNIT INFORMATION.

NO.	PRODUCT	BRAND	MODEL NO.	FCC ID
1	RF Receiver	LG	WMDA-118AN	BEJ-118AN

NOTE: This device was functioned as a Master Slave device during the DFS test.

TABLE 3: SOFTWARE/FIRMWARE INFORMATION.

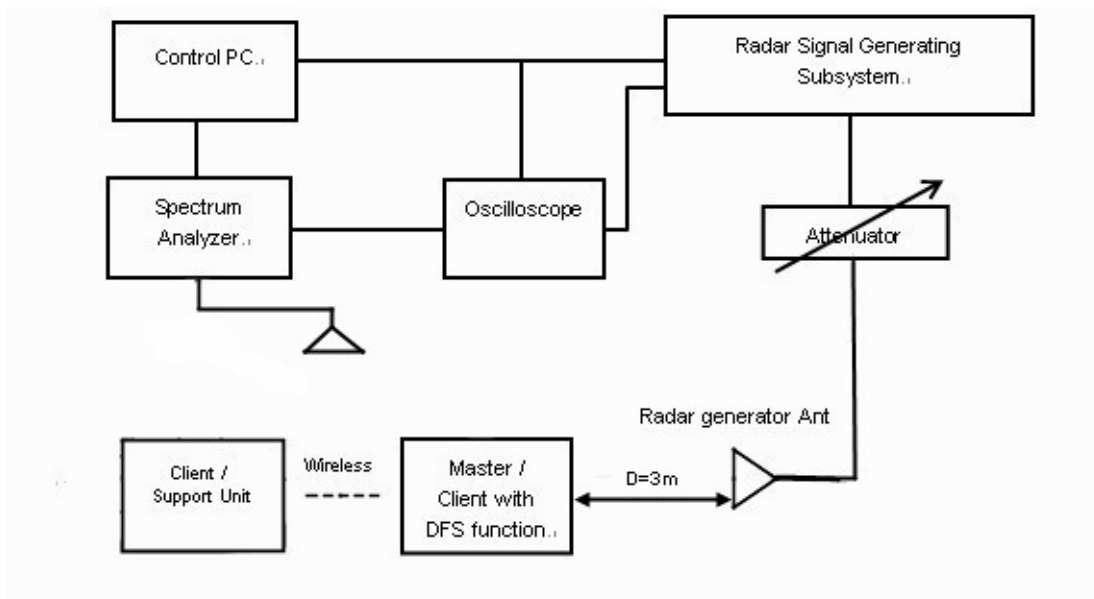
NO.	PRODUCT	MODEL NO.	SOFTWARE/FIRMWARE VERSION
1.	RF Receiver	WMDA-118AN	MAC : 3.0.34 APP : 1.0.43

5. TEST PROCEDURE

5.1 BV ADT DFS MEASUREMENT SYSTEM:

A complete BV ADT DFS Measurement System consists of two subsystems: (1) the Radar Signal Generating Subsystem and (2) the Traffic Monitoring Subsystem. The control PC is necessary for generating the Radar waveforms in Table 10, 11 and 12. The traffic monitoring subsystem is specified to the type of unit under test (UUT).

Radiated setup configuration of BV ADT DFS Measurement System



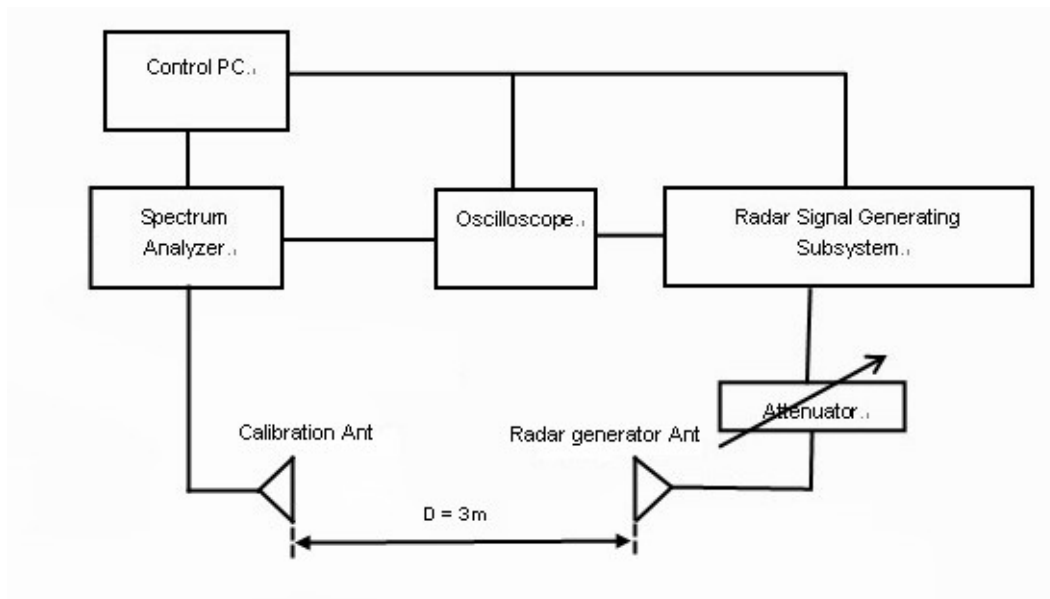
The test transmission will always be from the Master Device to the Client Device. While the Client device is set up to associate with the Master device and play the MPEG file (6 $\frac{1}{2}$ Magic Hours) from Master device, the designated MPEG test file and instructions are located at:

<http://ntiacsd.ntia.doc.gov/dfs/>.

5.2 CALIBRATION OF DFS DETECTION THRESHOLD LEVEL:

The measured channel is 5550MHz, The radar signal was the same as transmitted channels, and injected to Master or Client Device to measure Radar Detection, the channel closing transmission time and channel move time. The Calibration antenna gain is 13dBi , cable loss is 2dB and required detection threshold is -51dBm.

Radiated setup configuration of Calibration of DFS Detection Threshold Level

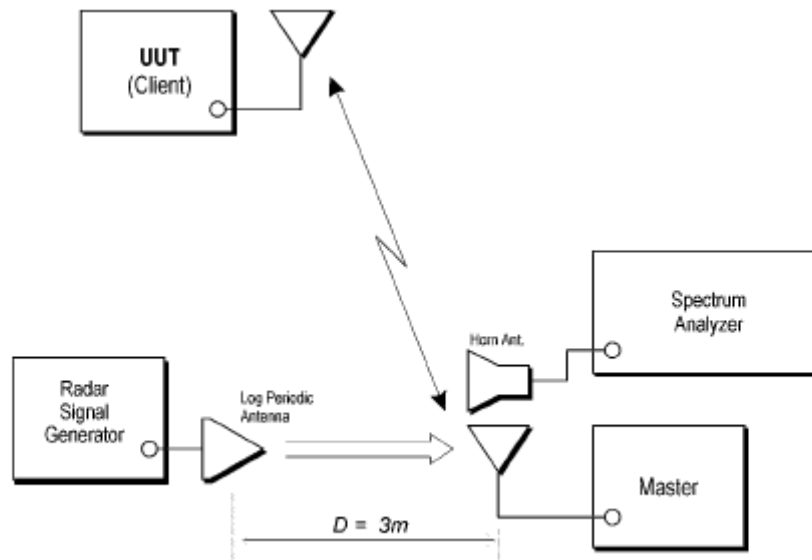


5.3 DEVIATION FROM TEST STANDARD

No deviation.

5.4 RADIATED TEST SETUP CONFIGURATION

Client with injection at the Master



The UUT is a U-NII Device operating in Master mode. The radar test signals are injected to the Master Device.



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6. TEST RESULTS

6.1 SUMMARY OF TEST RESULTS

CLAUSE	TEST PARAMETER	REMARKS	PASS/FAIL
15.407	DFS Detection Threshold	Not Applicable	NA
15.407	Channel Availability Check Time	Not Applicable	NA
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	Not Applicable	NA
15.407	U-NII Detection Bandwidth	Not Applicable	NA
15.407	Non-associated test	Not Applicable	NA

6.2 DETELED TEST RESULTS

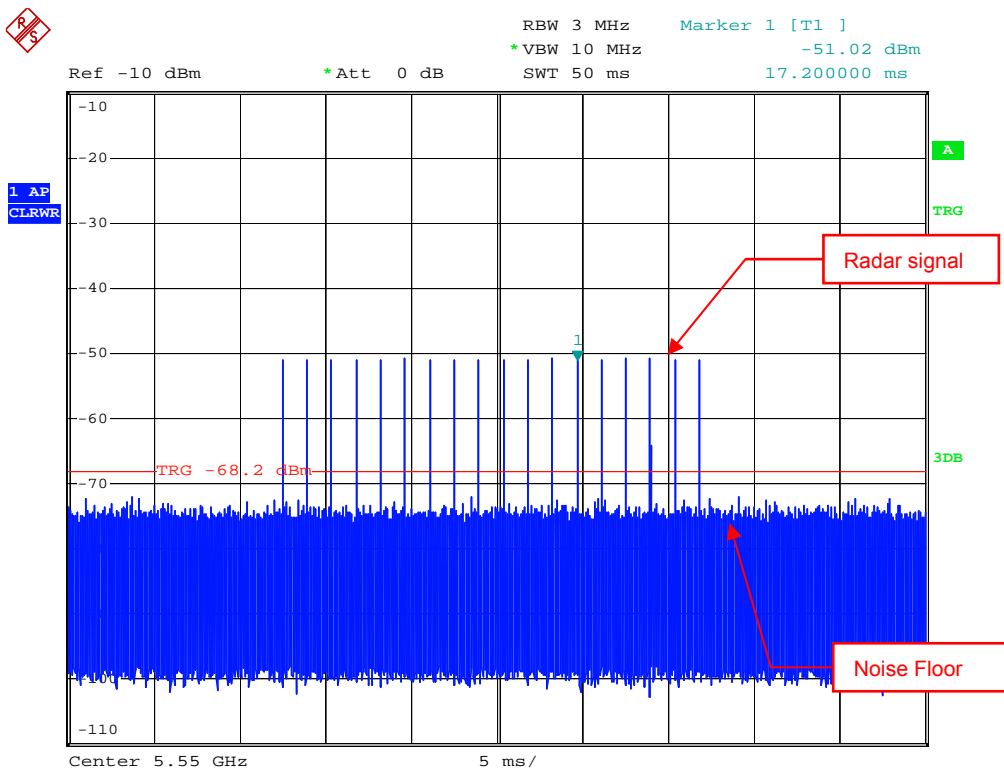
6.2.1 TEST MODE: DEVICE OPERATING IN CLIENT WITHOUT RADAR DETECTION MODE.

Client with injection at the Master. (The radar test waveforms are injected into the Master Device)

6.2.1.1 DFS DETECTION THRESHOLD

Calibration:

For a detection threshold level of -62dBm and the horn antenna gain is 13dBi , cable loss is 2dB and required detection threshold is -51dBm ($= -62-2+13$).

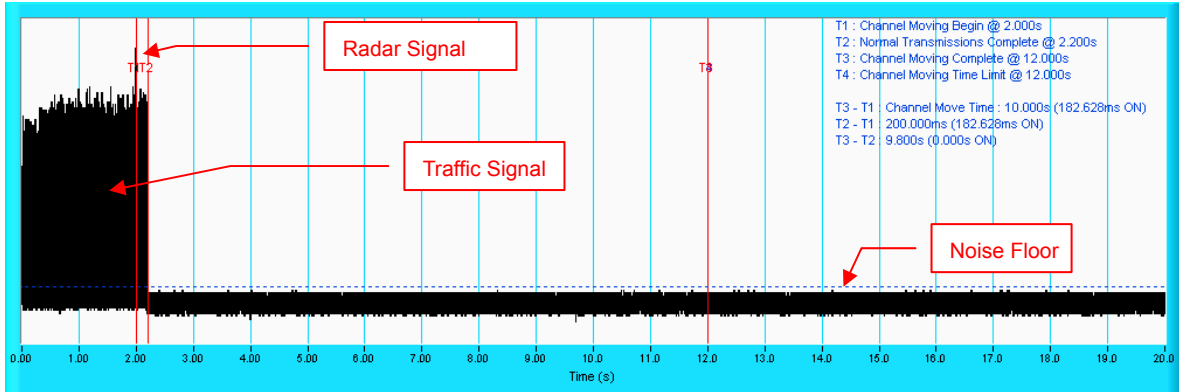


Radar Signal 1

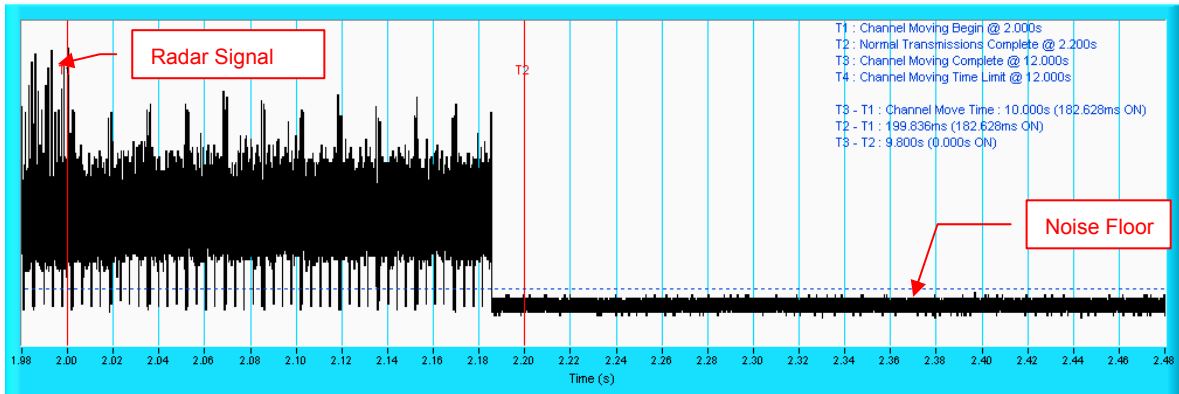
6.2.2 CHANNEL CLOSING TRANSMISSION AND CHANNEL MOVE TIME

RADAR SIGNAL 1

TX (40MHz)



NOTE: T1 denotes the start of Channel Move Time upon the end of the last Radar burst. T2 denotes the data transmission time of 200ms from T1. T3 denotes the end of Channel Move Time. T4 denotes the 10 second from T1 to observe the aggregate duration of transmissions.



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

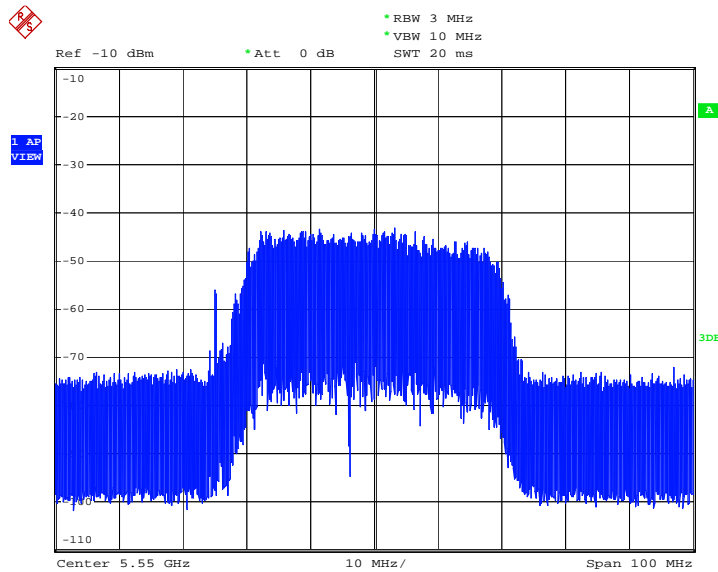
6.2.3 Non- Occupancy Period

Associate test:

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.

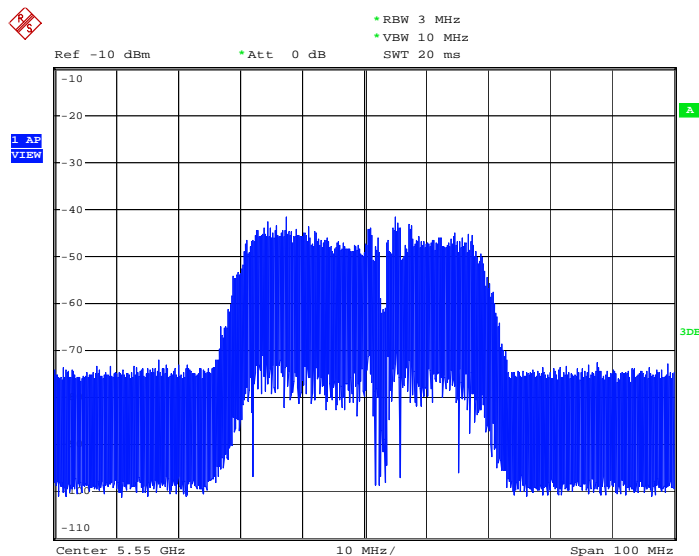
- 1) EUT links up with Master at 5500MHz.

Waveform of EUT links up with Master



- 2) EUT plays test movie from Master.

Waveform of transmission



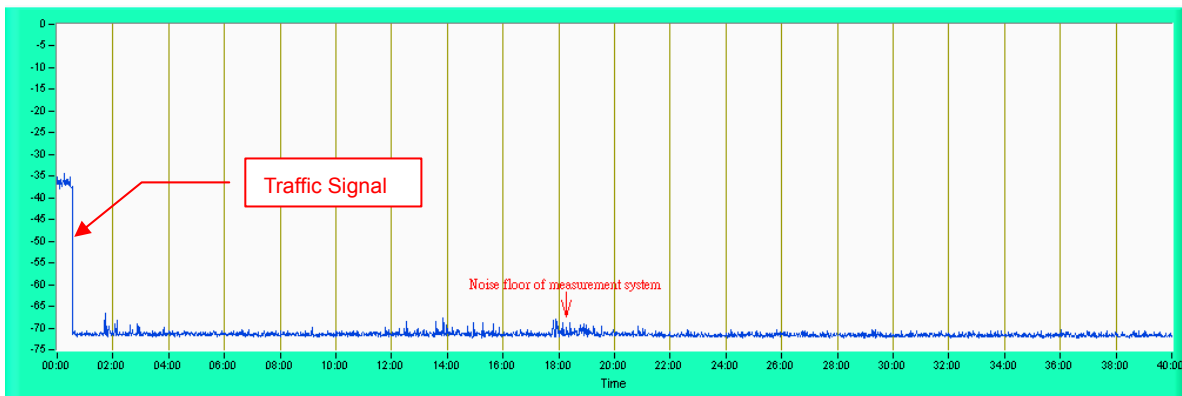
3) Radar 1 is used for DFS testing



4) 5500MHz has been monitored in 30 minutes period. In this period, no any transmission occurs.

Plot of 30minutes period

TX (40MHz)



NOTE: Test setup are shown on Test Setup Photo.pdf

5) BV ADT DFS Measurement System





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7. TESTING LABORATORIES INFORMATION

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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