

CE DFS Test Report

Equipment : 802.11abgn, USB module
Brand Name : SparkLAN
Model No. : WUBR-508N
Applicant : SparkLAN Communications, Inc.
Manufacturer : 8F., No. 257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan
Standard : EN 301 893 V1.8.1 2015-03
Operate Mode : Slave without radar detection

The product sample received on Apr. 10, 2012 and completely tested on Apr. 19, 2012. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in EN 301 893 V1.8.1 2015-03 and shown compliance with the applicable technical standards. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation: Directive 1999/5/EC (until 12 June 2016) and Directive 2014/53/EU (from 13 June 2016).

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

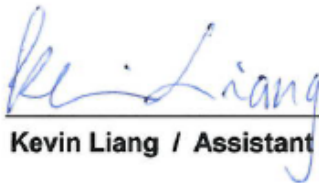

Kevin Liang / Assistant Manager



Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Accessories and Support Equipment	6
1.3	Testing Applied Standards	6
1.4	Testing Location Information	6
1.5	Measurement Uncertainty	7
2	TEST CONFIGURATION OF EUT.....	8
2.1	DFS and TPC Information	8
2.2	The Worst Case Measurement Configuration.....	8
3	DYNAMIC FREQUENCY SELECTION (DFS) TEST RESULT	9
3.1	General DFS Information	9
3.2	Channel Shutdown	13
4	TEST EQUIPMENT AND CALIBRATION DATA	16
5	APPENDIX A. TEST PHOTOS	17

Summary of Test Result

Harmonized Standard Requirements and Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
-	4.7.2.1	DFS: Channel Availability Check	N/A	EN 301 893 Table D.1, D.5	N/A
-	4.7.2.2	DFS: Off-Channel CAC - Radar Detection Threshold	N/A	EN 301 893 Table D.1, D.5	N/A
-	4.7.2.2	DFS: Off-Channel CAC - Detection Probability	N/A	EN 301 893 Table D.1, D.5	N/A
-	4.7.2.3	DFS: In-service Monitoring	N/A	EN 301 893 Table D.1, D.5	N/A
3.2	4.7.2.4	DFS: Channel Shutdown	CMT < 10sec CCTT < 1sec	EN 301 893 Table D.1	Complied
-	4.7.2.5	DFS: Non-occupancy Period	N/A	EN 301 893 Table D.1	N/A
-	4.7.2.6	DFS: Uniform Spreading	N/A	EN 301 893 Clause 4.7.2.6.1	N/A
3.1.6	4.10	User Access Restrictions	Manufacturer attestation NOT accessible to user	DFS controls	Complied



SPORTON INTERNATIONAL INC.
TEL : 886-3-327-3456
FAX : 886-3-327-0973

1 General Description

1.1 Information

1.1.1 RF General Information

IEEE Std. 802.11	Channel Bandwidth (MHz)
a, n (HT20)	20
n (HT40)	40
802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation. 802.11ac uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.	

1.1.2 Antenna Information

Antenna Category	
☐	Integral antenna (antenna permanently attached)
☐	Temporary RF connector provided
☐	No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
☒	External antenna (dedicated antennas)
☐	Single power level with corresponding antenna(s).
☒	Multiple power level and corresponding antenna(s).

Antenna General Information			
No.	Ant. Cat.	Ant. Type	Gain (dBi)
1	External	Dipole	5.00
☒ For conducted tests, antenna ports are used for the tests and Master lowest antenna gain [3] dBi that was used to set the DFS Detection Threshold level during calibration of the test setup.			

1.2 Accessories and Support Equipment

Support Equipment			
No.	Equipment	Brand Name	Model Name
1	Access Point	3Com	WL-605
2	Notebook	HP	Presario B1251TU
3	Notebook	DELL	E5510

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ EN 301 893 V1.8.1 2015-03

1.4 Testing Location Information

Testing Location			
☒	HWA YA	ADD : No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973	
Test Condition		Test Site No.	Test Engineer
DFS Site		DFS01 -HY	Bear
		Test Environment	
		24.8°C / 62%	

1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty			
Test Item		Uncertainty	Limit
Radio frequency		$\pm 8.7 \times 10^{-7}$	$\pm 1 \times 10^{-5}$
RF output power, conducted		± 0.63 dB	± 1.5 dB
RF power radiated		± 2.59 dB	± 6 dB
Spurious emissions, conducted	30 – 1000 MHz	± 0.51 dB	± 3 dB
	1 – 18 GHz	± 0.67 dB	± 3 dB
	18 – 26 GHz	± 0.83 dB	± 3 dB
Spurious emissions, radiated	30 – 1000 MHz	± 2.28 dB	± 6 dB
	1 – 18 GHz	± 2.59 dB	± 6 dB
	18 – 26 GHz	± 2.87 dB	± 6 dB
Temperature		± 0.8 °C	± 1 °C
Humidity		± 3 %	± 5 %
Time		± 1.42 %	± 10 %

2 Test Configuration of EUT

2.1 DFS and TPC Information

The DFS Related Operating Mode(s) of the Equipment			
☐ Master			
☐ Slave with radar detection			
☒ Slave without radar detection			
Software / Firmware Version		Ver 3.2.4.0	
Communication Mode		☒ IP Based (Load Based)	☐ Frame Based
IEEE Std. 802.11 Protocol	Frequency Range (MHz)	TPC (Transmit Power Control)	Passive Scan
a n (HT20/HT40)	☒ 5250-5350	Yes	Yes
	☒ 5470-5725	Yes	Yes
	☒ 5600-5650	Yes	Yes

2.2 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	Dynamic Frequency Selection (DFS)
Test Condition	Conducted measurement at transmit chains The EUT shall be configured to operate at the highest transmitter output power setting. If more than one antenna assembly is intended for this power setting, the gain of the antenna assembly with the lowest gain shall be used.
Modulation Mode	11a, n (HT20), n (HT40)
Modulation modes consist of below configuration: 11a: IEEE 802.11a, HT20/HT40: IEEE 802.11n	

3 Dynamic Frequency Selection (DFS) Test Result

3.1 General DFS Information

3.1.1 DFS Parameters

Table D.1: DFS requirement values

Parameter	Value
Channel Availability Check Time	60 seconds (see note 1)
Minimum Off-Channel CAC Time	6 minutes (see note 2)
Maximum Off-Channel CAC Time	4 hours (see note 2)
Channel Move Time	10 seconds
Channel Closing Transmission Time	1 second.
Non-occupancy period	Minimum 30 minutes

Note 1: For channels whose nominal bandwidth falls completely or partly within the band 5600 MHz to 5650 MHz, the *Channel Availability Check Time* shall be 10 minutes.

Note 2: For channels whose nominal bandwidth falls completely or partly within the band 5600 MHz to 5650 MHz, the *Maximum Off-Channel CAC Time* shall be 24 hours.

Table D.2: Interference threshold values

EIRP Spectral Density (dBm/MHz)	Value (see notes 1 and 2)
10	-62

Note 1: This is the level at the input of the receiver of a RLAN device with a maximum EIRP density of 10 dBm/MHz and assuming a 0 dBi receive antenna. For devices employing different EIRP spectral density and/or a different receive antenna gain G (dBi) the DFS threshold level at the receiver input follows the following relationship: DFS Detection Threshold (dBm) = -62 + 10 · EIRP Spectral Density (dBm/MHz) + G (dBi), however the DFS threshold level shall not be lower than -64 dBm assuming a 0 dBi receive antenna gain.

Note 2: Slave devices with a maximum EIRP of less than 23 dBm do not have to implement radar detection.

Table D.3: Parameters of the reference DFS test signal

Pulse width W [μs]	Pulse repetition frequency PRF [pps]	Pulses per burst [PPB]
1	700	18

Table D.4: Parameters of radar test signals

Radar test signal # (note 1 to 3)	Pulse width W [μ s]		Pulse repetition frequency PRF (PPS)		Number of different PRFs	Pulses per burst for each PRF (PPB) (note 5)
	Min	Max	Min	Max		
1	0.5	5	200	1000	1	10 (note 6)
2	0.5	15	200	1600	1	15 (note 6)
3	0.5	15	2300	4000	1	25
4	20	30	2000	4000	1	20
5	0.5	2	300	400	2/3	10 (note 6)
6	0.5	2	400	1200	2/3	15 (note 6)

Note 1: Radar test signals 1 to 4 are constant PRF based signals. See figure D.1. These radar test signals are intended to simulate also radars using a packet based Staggered PRF. See figure D.2.

Note 2: Radar test signal 4 is a modulated radar test signal. The modulation to be used is a chirp modulation with a ± 2.5 MHz frequency deviation which is described below.

Note 3: Radar test signals 5 and 6 are single pulse based Staggered PRF radar test signals using 2 or 3 different PRF values. For radar test signal 5, the difference between the PRF values chosen shall be between 20 and 50 pps. For radar test signal 6, the difference between the PRF values chosen shall be between 80 and 400 pps. See figure D.3

Note 4: Apart for the Off-Channel CAC testing, the radar test signals above shall only contain a single burst of pulses. See figure D.1, D.2 and D.3. For the Off-Channel CAC testing, repetitive bursts shall be used for the total duration of the test. See figure D.4.

Note 5: The total number of pulses in a burst is equal to the number of pulses for a single PRF multiplied by the number of different PRFs used.

Note 6: For the CAC and Off-Channel CAC requirements, the minimum number of pulses (for each PRF) for any of the radar test signals to be detected in the band 5600 to 5650 MHz shall be 18.

3.1.2 Radar Test Signal Figure

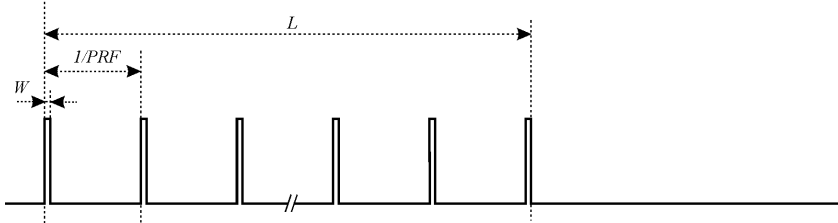
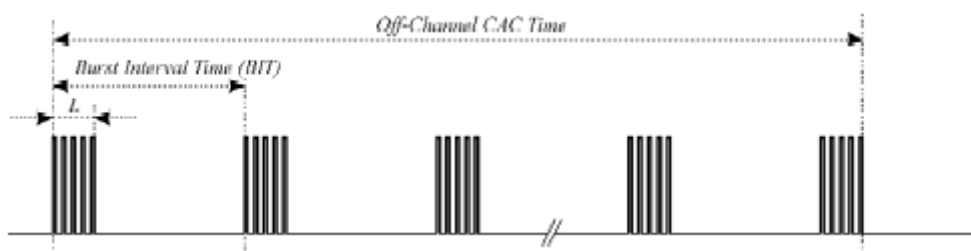
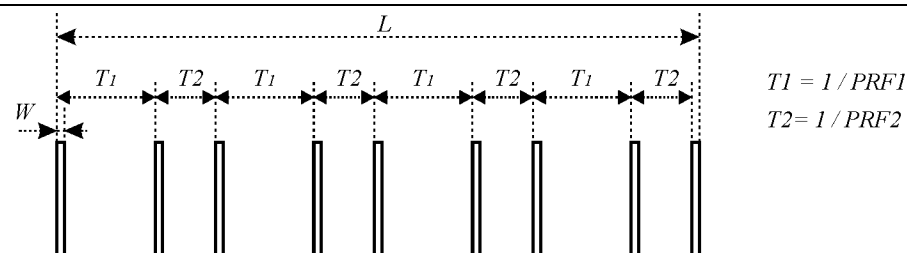
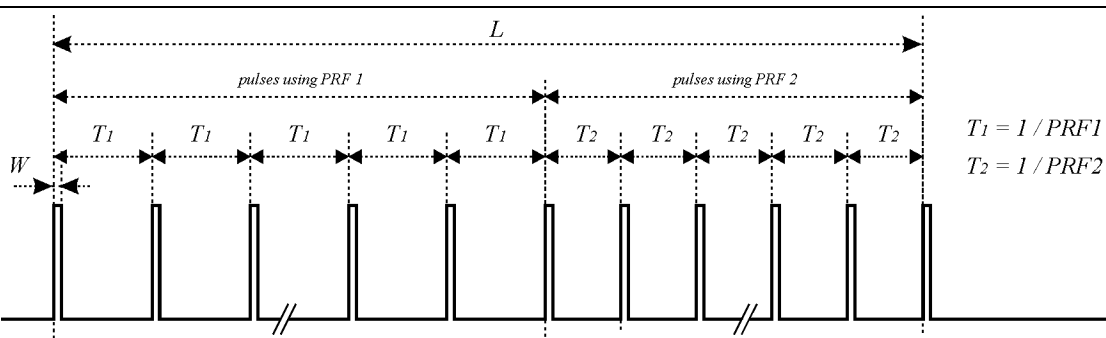
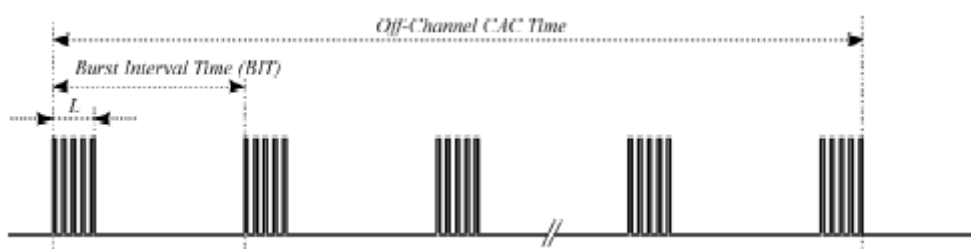
Figure D.1: General structure of a single burst / constant PRF based radar test signal

Figure D.2: General structure of a multiple burst / constant PRF based radar test signal


Figure D.3: General structure of a single burst/single pulse based staggered PRF radar test signal

Figure D.4: General structure of a single burst / packet based staggered PRF radar test signal

Figure D.5: Structure of a multiple burst / packet based staggered PRF based radar test signal


3.1.3 DFS Technical Requirements Specifications

Requirement	DFS Operational mode		
	Master	Slave without radar detection (see table D.2)	Slave with radar detection (see table D.2)
Channel Availability Check	✓	Not required	☐ ✓ (note 2)
Off-Channel CAC (note 1)	✓	Not required	☐ ✓ (note 2)
In-Service Monitoring	✓	Not required	✓
Channel Shutdown	✓	✓	✓
Non-Occupancy Period	✓	Not required	✓
Uniform Spreading	✓	Not required	Not required

Note 1: Where implemented by the manufacturer.

Note 2: A slave with radar detection is not required to perform a CAC or Off-Channel CAC at initial use of the channel but only after the slave has detected a radar signal on a channel by In-Service Monitoring.

3.1.4 Master DFS Threshold Level

DFS Threshold Level	
DFS Threshold level: -56.93 dBm	☒ at the antenna connector (-56.93 dBm conducted)
	☐ in front of the antenna (-64 dBm e.i.r.p.)
Note 1: DFS Detection Threshold (dBm) = -62 + 10 - EIRP Spectral Density (dBm/MHz) The DFS Detection Threshold Level is (-62dBm) + 10 - 7.93 + 3 dBi = -56.93 dBm Note 2: However, the DFS threshold level shall not be lower than -64 dBm assuming a 0 dBi receive antenna gain. If more than one antenna is intended for this TPC, range or power setting, the antenna gain of the antenna with the lowest gain shall be used.	

3.1.5 Off Channel CAC Feature Implemented

Off Channel CAC Feature Implemented	
☒ No	
☐ Yes	
If yes, specify the Off Channel CAC Time:	Hours
If the <i>Off Channel CAC Time</i> for the band 5600 MHz to 5650 MHz is different from the <i>Off-Channel CAC Time</i> for frequencies outside this band, please specify the <i>Off-Channel CAC Time</i> for the band	
If yes, specify the Off Channel CAC Time:5600 MHz to 5650 MHz:	Hours
Minimum Off-Channel CAC Time	

3.1.6 User Access Restrictions

User Access Restrictions
☒ DFS controls (hardware or software) related to radar detection are NOT accessible to the user

3.1.7 Channel Loading/Data Streaming

☒ Test transmission sequence is from the Master to the Slave.
☒ Channel Shutdown, Off-Channel CAC Check and In-Service Monitoring with about 30% loading over 100 ms interval. ☐ No transmissions on channels being checked during a Channel Availability Check or during an Off Channel CAC check.

3.2 Channel Shutdown

3.2.1 Channel Shutdown Limit

Channel Shutdown Limit	
☒	The <i>Channel Move Time</i> shall not exceed the limit defined in clause 3.1.1 table D.1.
☒	The <i>Channel Closing Transmission Time</i> shall not exceed the limit defined in clause 3.1.1 table D.1.

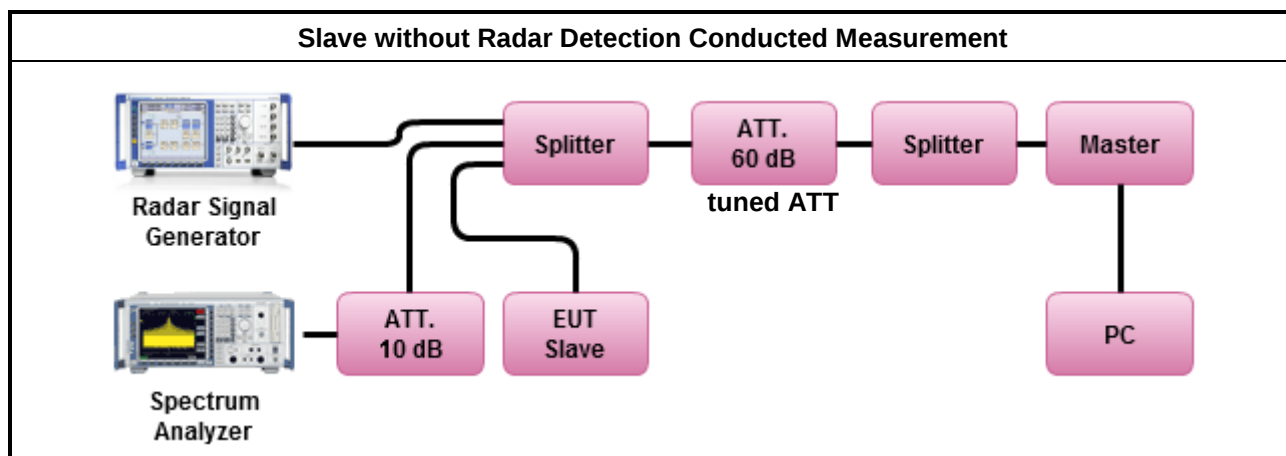
3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.2.3 Test Procedures

Test Method	
☒	Refer as EN 301 893, clause 5.1.3 for test channel. One channel out of the declared channels for this frequency range. If more than one nominal channel bandwidth has been declared for this sub-band, testing shall be performed using the lowest and highest nominal channel bandwidth. Where the declared channel plan includes channels whose nominal channel bandwidth falls completely or partly within the 5600 MHz to 5650 MHz band, the tests for the <i>Channel Availability Check</i> (and where implemented, for the <i>Off-Channel CAC</i>) shall be performed on one of these channels in addition to a channel within the band 5470 MHz to 5600 MHz or 5650 MHz to 5725 MHz band.
☒	Refer as EN 301 893, clause 5.3.8.2.1.5 for <i>Channel Shutdown</i>
☒	Refer as EN 301 893, clause 5.3.8.2.1 for conducted measurement.
☒	For conducted measurements on devices with multiple transmit chains and receive chains. The power splitter/combiner shall be used to combine all the transmit/receive chains (antenna outputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.
☐	Refer as EN 301 893, clause 5.3.8.2.2 for radiated measurement.

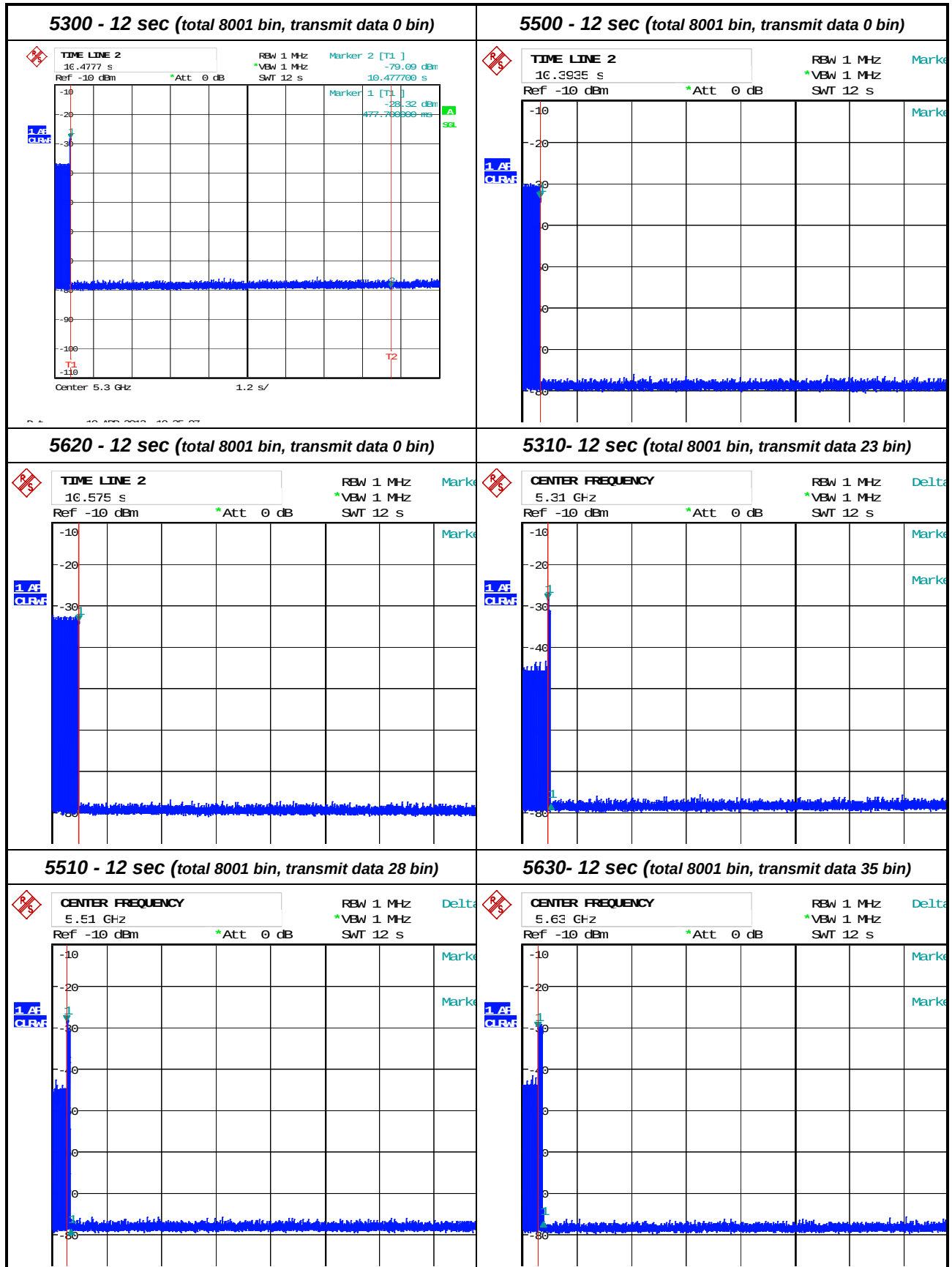
3.2.4 Test Setup



3.2.5 Test Result of Channel Shutdown

Channel Shutdown Result				
Minimum Antenna Gain (dBi)			5.00	
Detection Threshold Level (dBm)			-54 (DFS Detection Threshold -64 + 10 dB)	
Modulation Mode	Freq. (MHz)	Radar Test Signal	Channel Closing Transmission Time (ms)	Channel Move Time (s)
HT20	5300	table D.3	0	0
HT20	5500	table D.3	0	0
HT20	5620	table D.3	0	0
HT40	5310	table D.3	34.50	0.0750
HT40	5510	table D.3	42.00	0.1025
HT40	5630	table D.3	52.50	0.1020
Limit			1 sec	10 sec
Result			Complied	
Note 1: Table D.3: Parameters of the reference DFS test signal.				

3.2.6 Channel Shutdown Plots



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date
Spectrum Analyzer	R&S	FSP 7	100643	9kHz ~ 7GHz	Aug. 23, 2011	Aug. 22, 2012
Vector Signal Generator	R&S	SMU200A	102098	100kHz ~ 6GHz	Oct. 05, 2011	Oct. 04, 2012
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	302338	1 ~ 26.5GHz	Jan. 01, 2012	Dec. 31, 2012
RF Cable-10m	HUBER+SUHNER	SUCOFLEX_104	302345	1 ~ 26.5GHz	Jan. 01, 2012	Dec. 31, 2012
Horn Antenna	ETS-LINDGREN	3117	00091920	1 ~ 18GHz	Nov. 15, 2011	Nov. 14, 2012
Horn Antenna	COM-POWER	AH-118	711064	1 ~ 18GHz	Jul. 27, 2011	Jul. 26, 2012

5 Appendix A. Test Photos

Photographs of DFS Test Configuration

