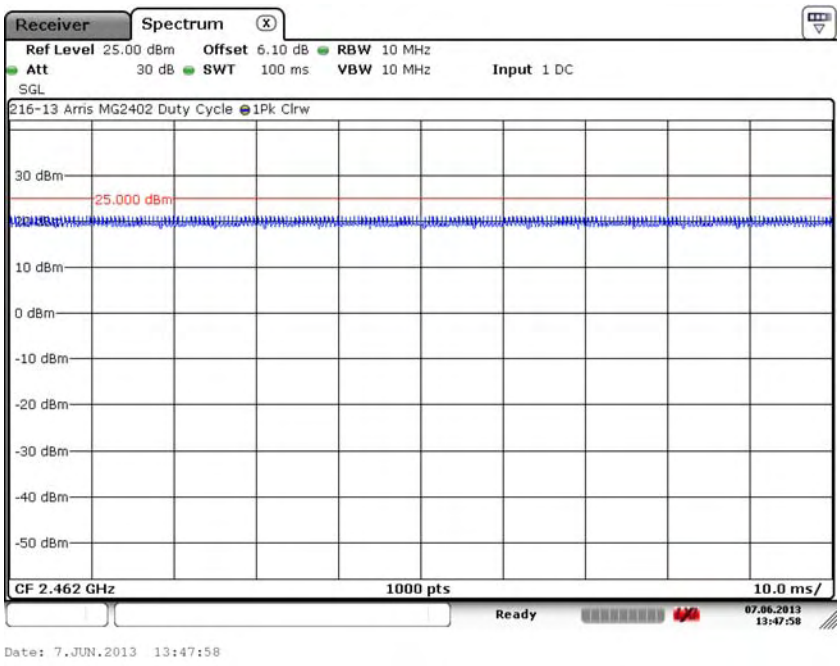
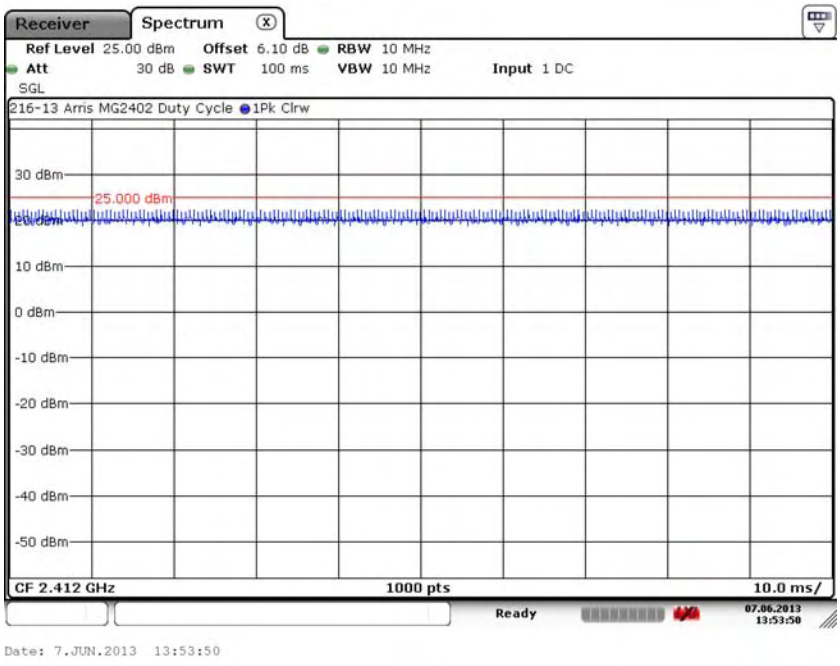
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.18. 2.4 GHz 802.11g: High Channel – 11, J2402



7.10.19. 2.4 GHz HT20: Low Channel – 1, J2400



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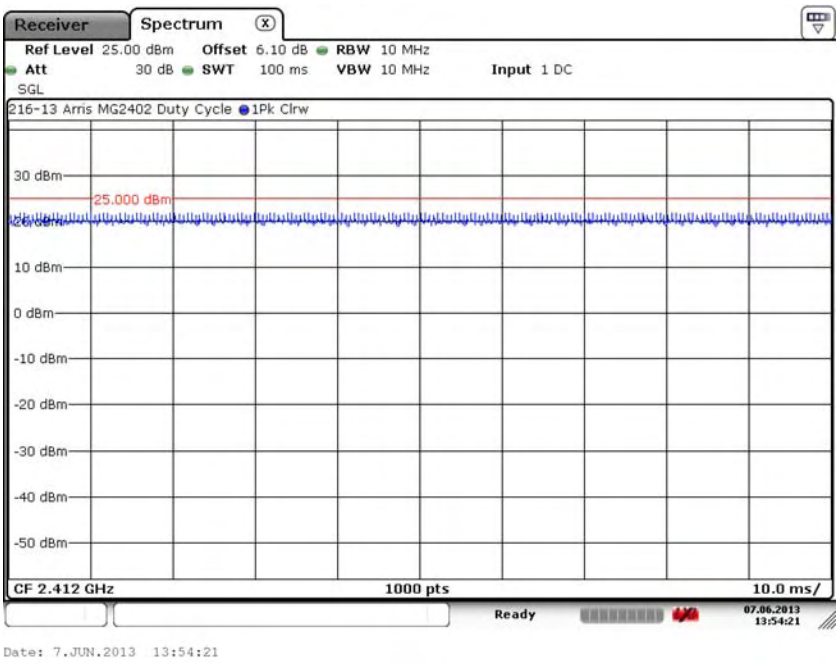
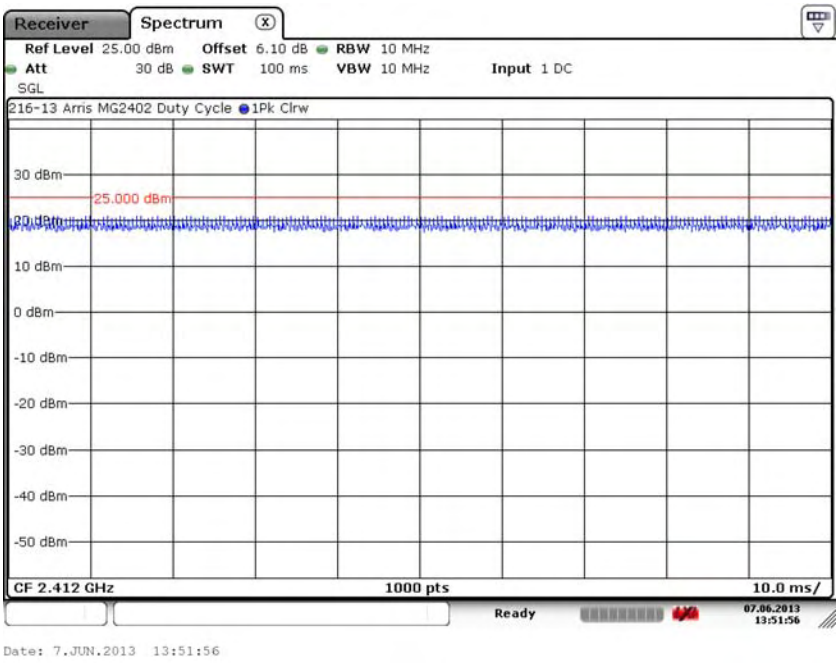
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.20. 2.4 GHz HT20: Low Channel – 1, J2401



7.10.21. 2.4 GHz HT20: Low Channel – 1, J2402



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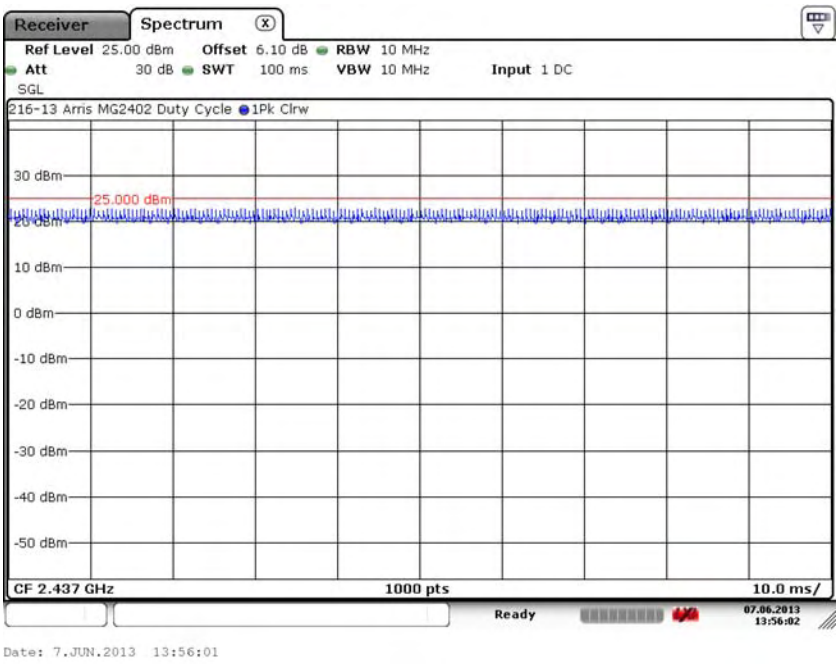
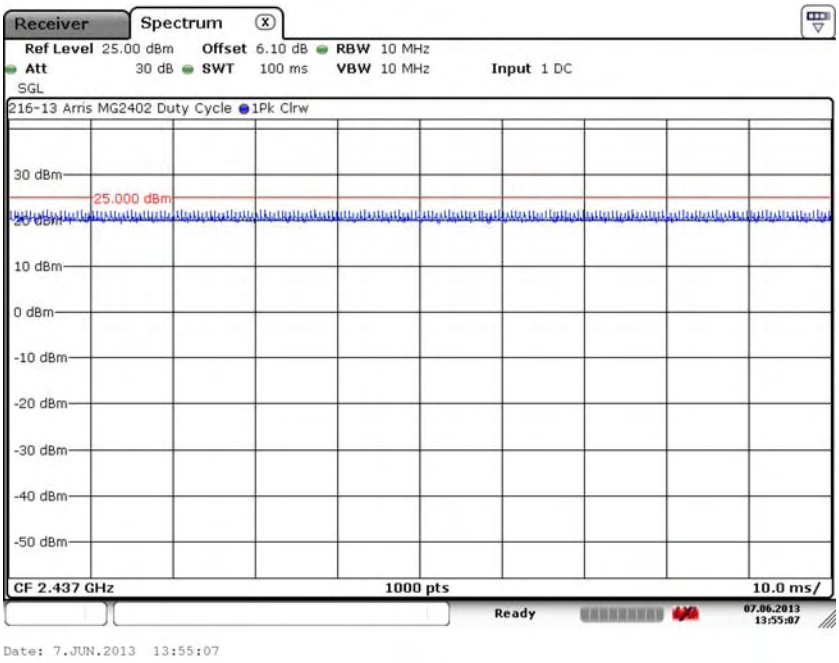
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.22. 2.4 GHz HT20: Middle Channel – 6, J2400



7.10.23. 2.4 GHz HT20: Middle Channel – 6, J2401



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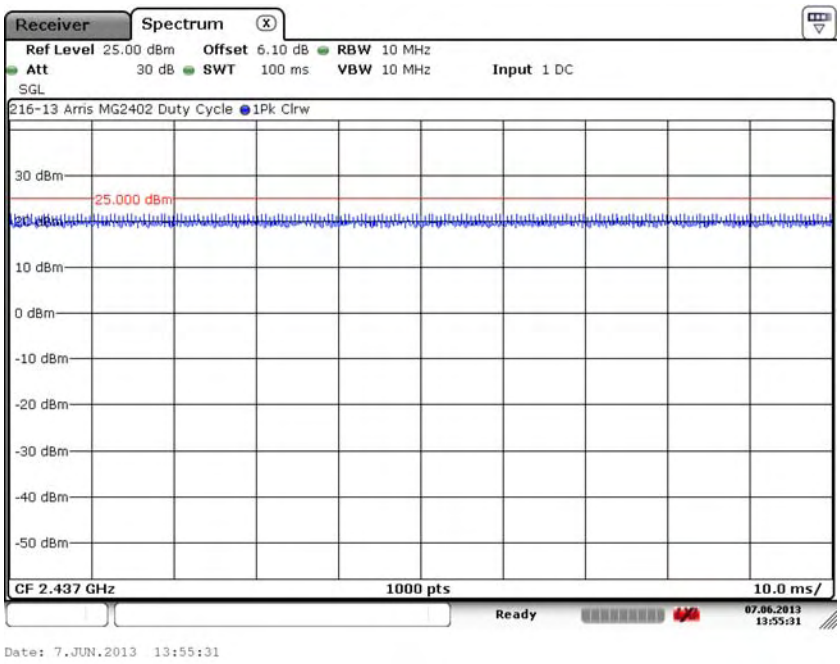
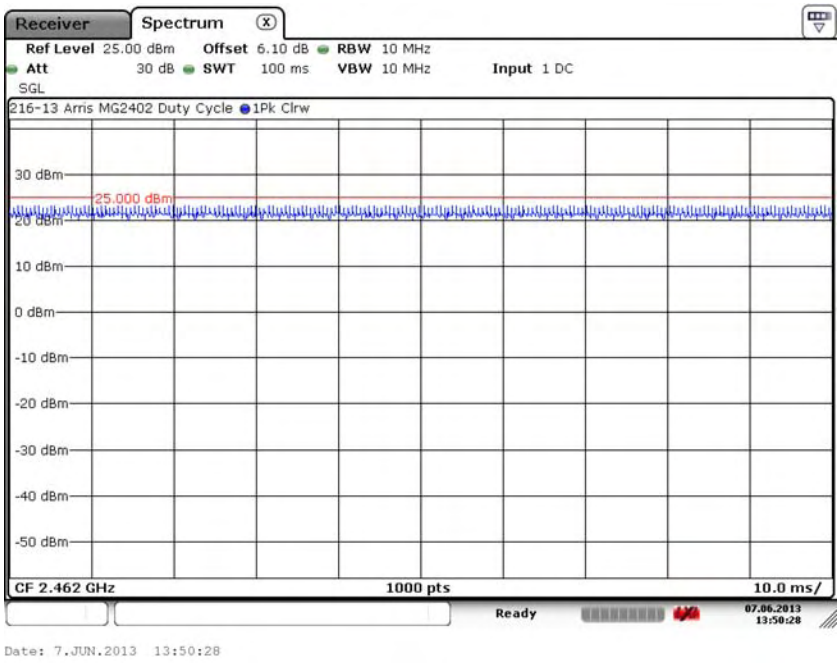
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.24. 2.4 GHz HT20: Middle Channel – 6, J2402



7.10.25. 2.4 GHz HT20: High Channel – 11, J2400



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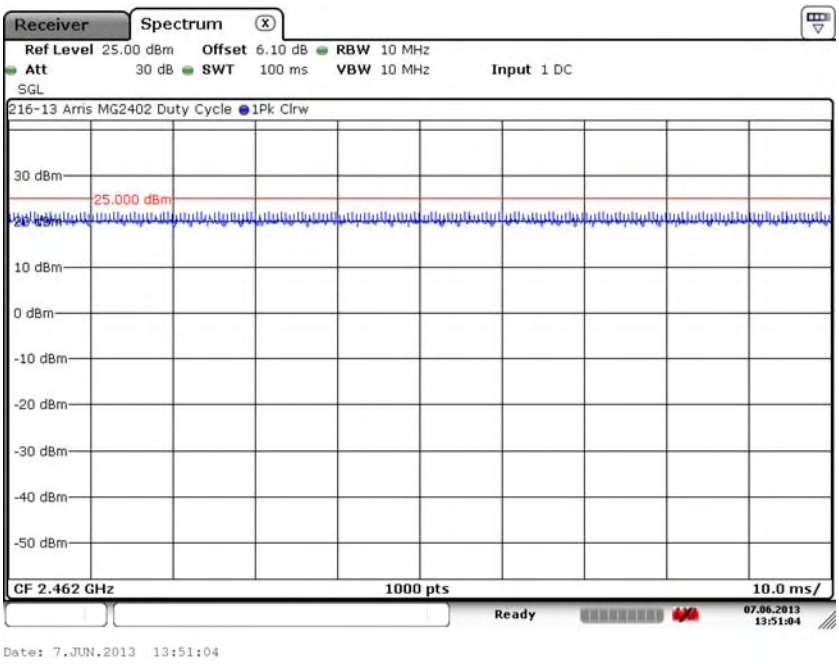
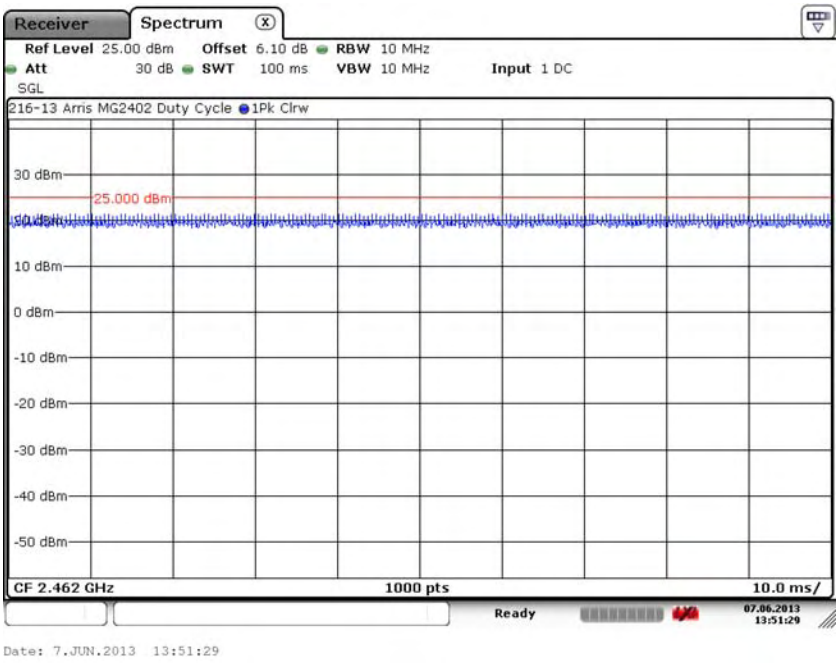
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.26. 2.4 GHz HT20: High Channel – 11, J2401



7.10.27. 2.4 GHz HT20: High Channel – 11, J2402



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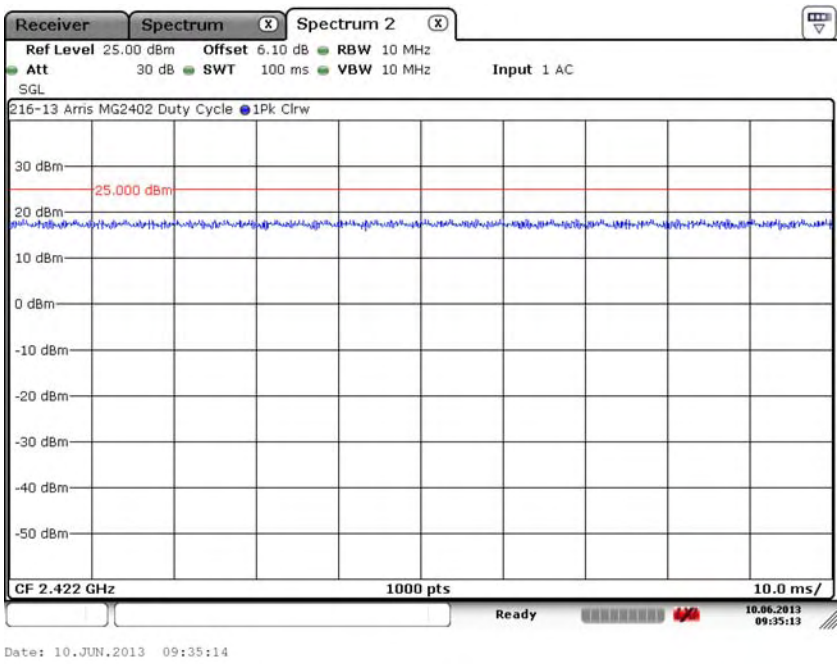
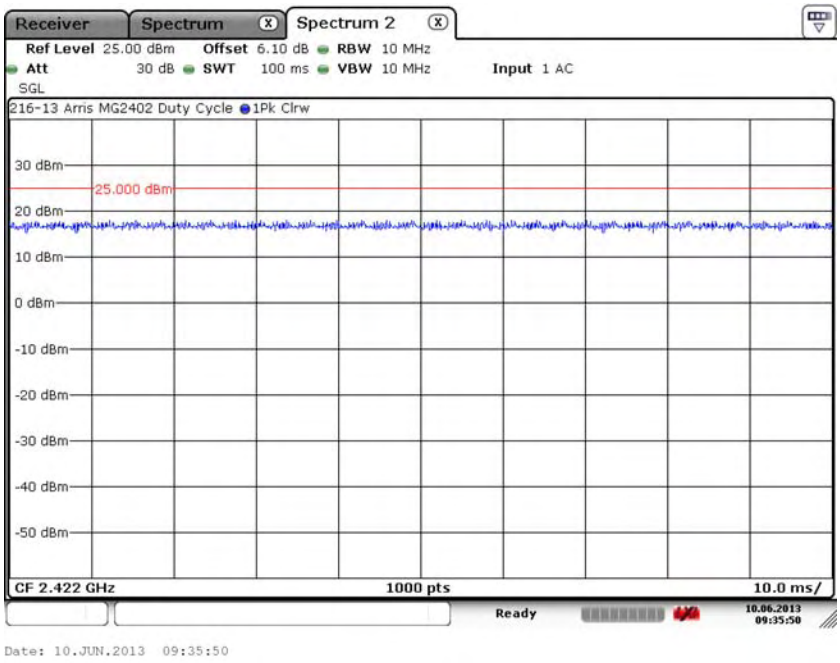
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.28. 2.4 GHz HT40: Low Channel – 3, J2400



7.10.29. 2.4 GHz HT40: Low Channel – 3, J2401



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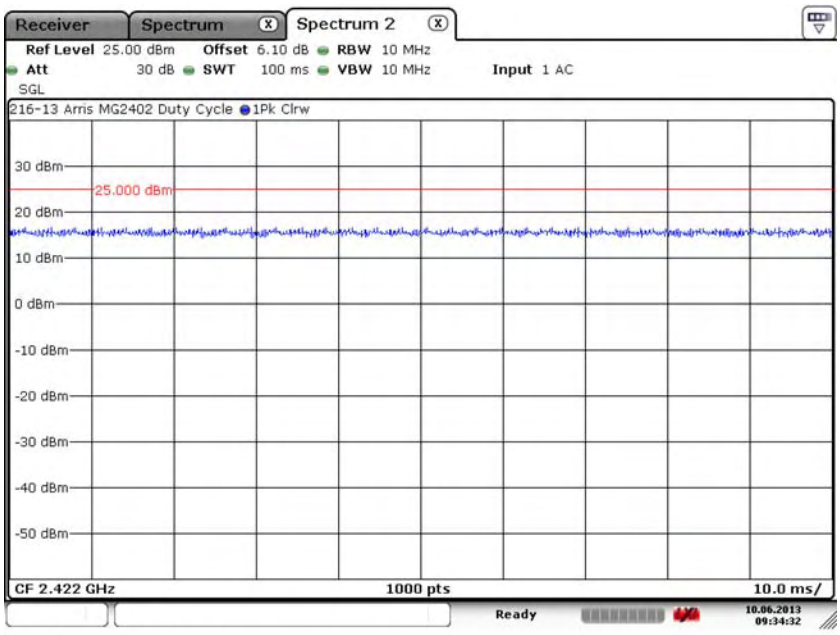
7. Measurement Data (continued)

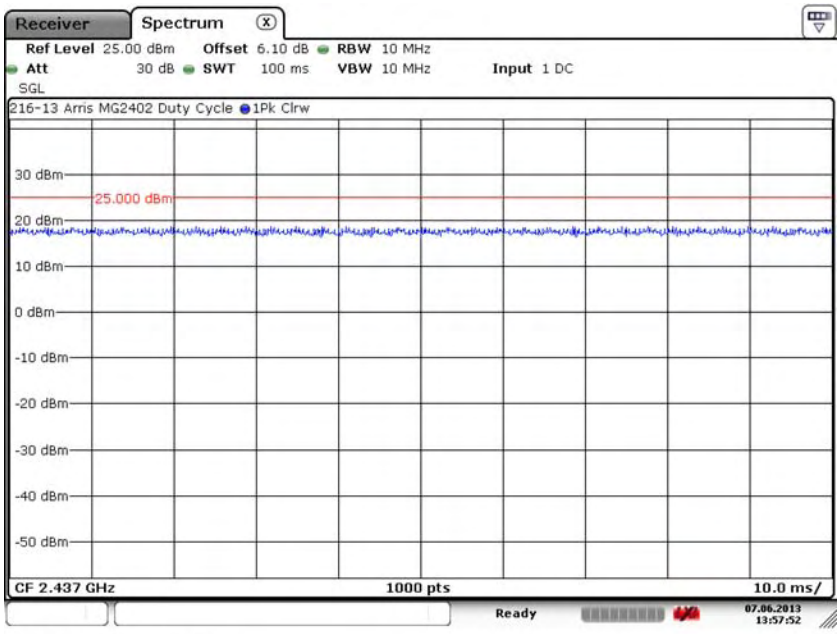
7.10. Duty Cycle

7.10.30. HT40: Low Channel – 3, J2402



Date: 10.JUN.2013 09:34:32

7.10.31. HT40: Middle Channel – 6, J2400



Date: 7.JUN.2013 13:57:52

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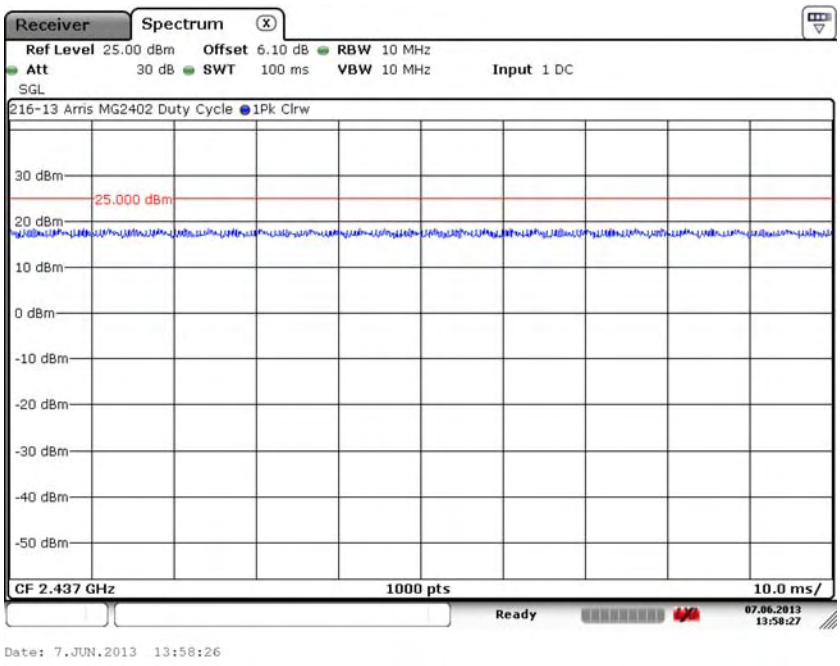
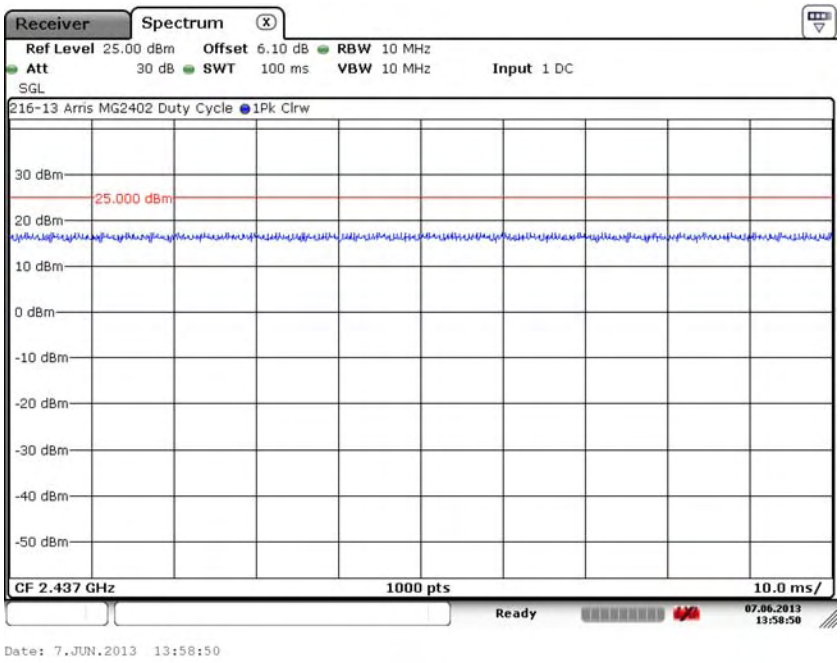
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.32. 2.4 GHz HT40: Middle Channel – 6, J2401



7.10.33. 2.4 GHz HT40: Middle Channel – 6, J2402



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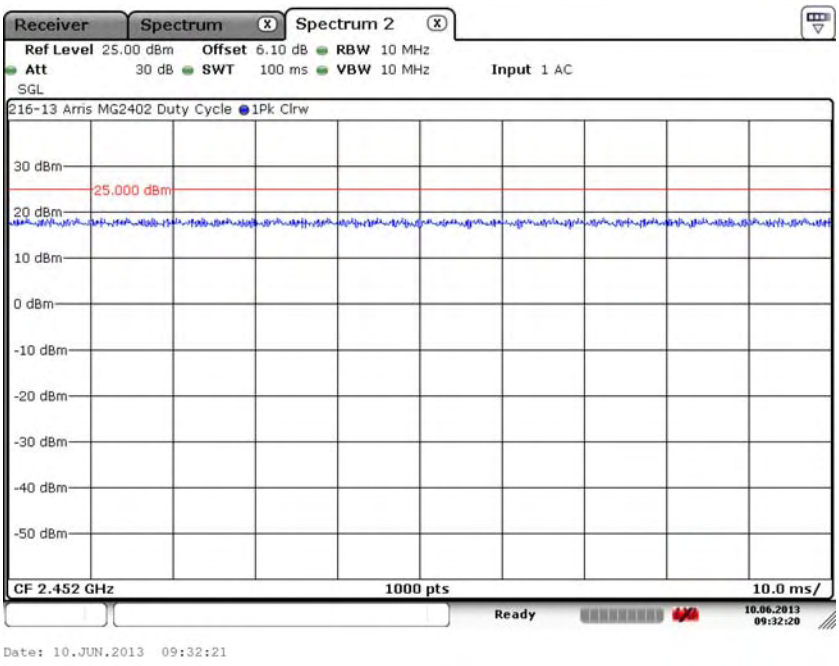
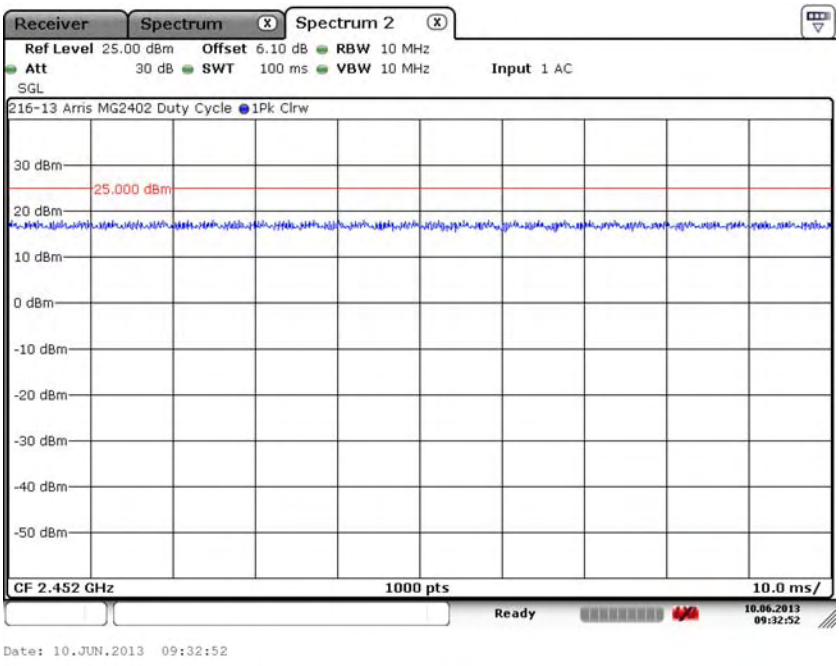
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.34. 2.4 GHz HT40: High Channel – 9, J2400



7.10.35. 2.4 GHz HT40: High Channel – 9, J2401



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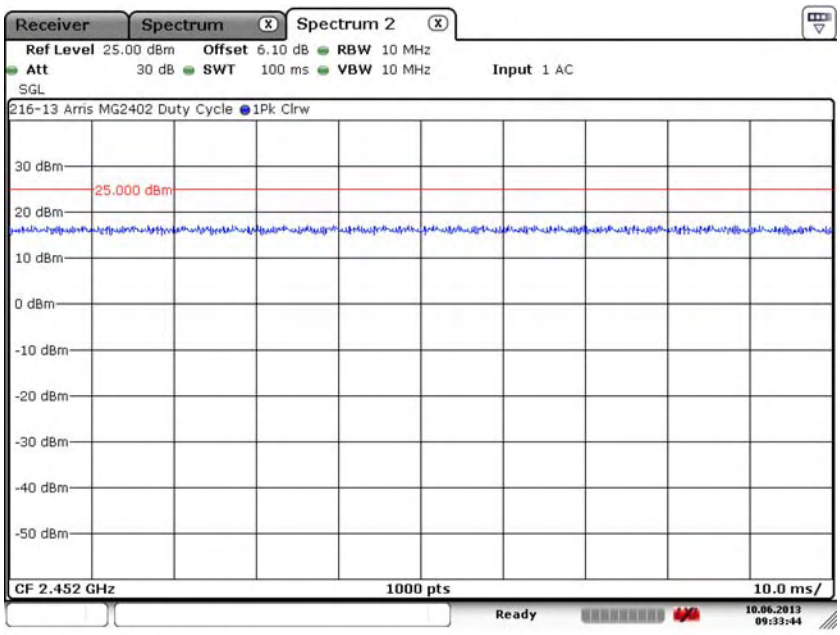
7. Measurement Data (continued)

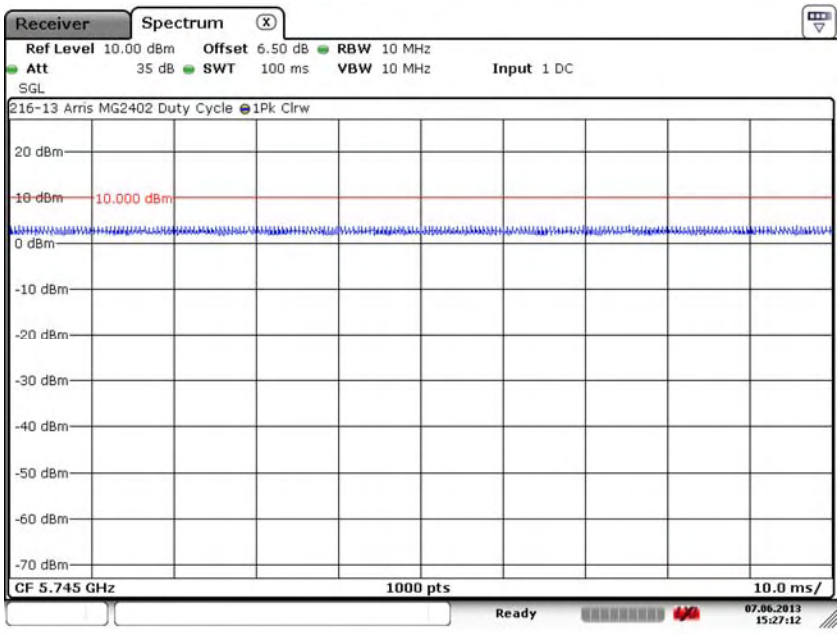
7.10. Duty Cycle

7.10.36. 2.4 GHz HT40: High Channel – 9, J2402



Date: 10.JUN.2013 09:33:44

7.10.37. 5 GHz 802.11a: Low Channel – 149, J5000



Date: 7.JUN.2013 15:27:12

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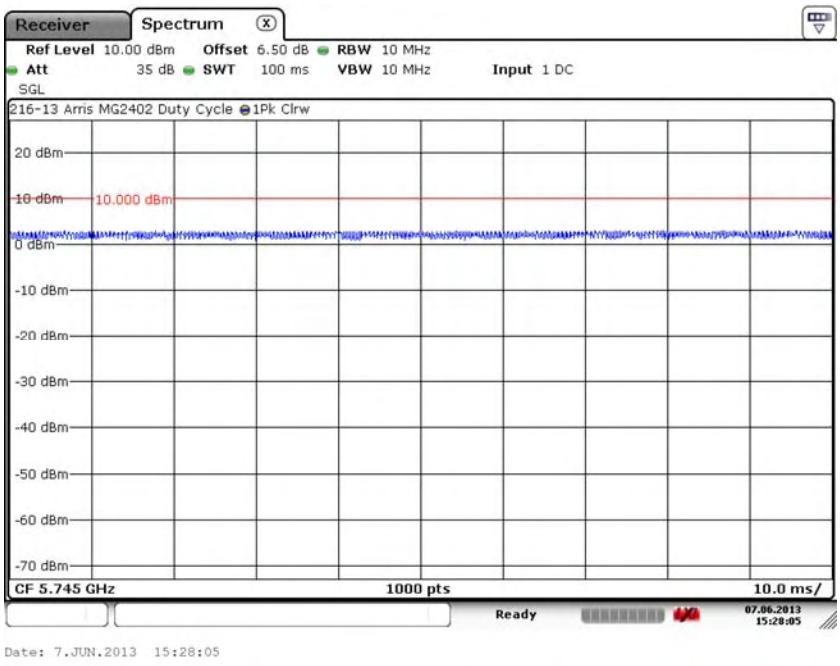
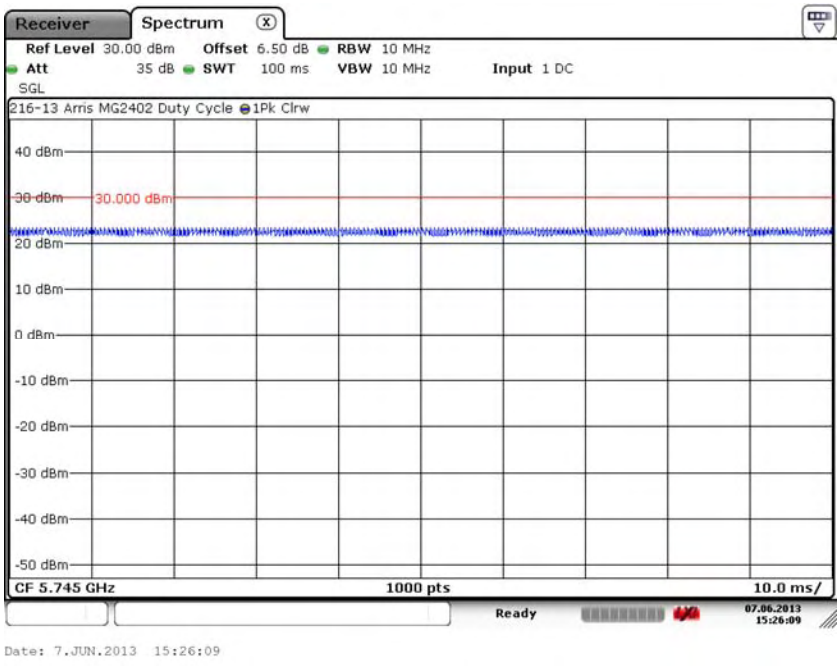
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.38. 5 GHz 802.11a: Low Channel – 149, J5001



7.10.39. 5 GHz 802.11a: Low Channel – 149, J5002



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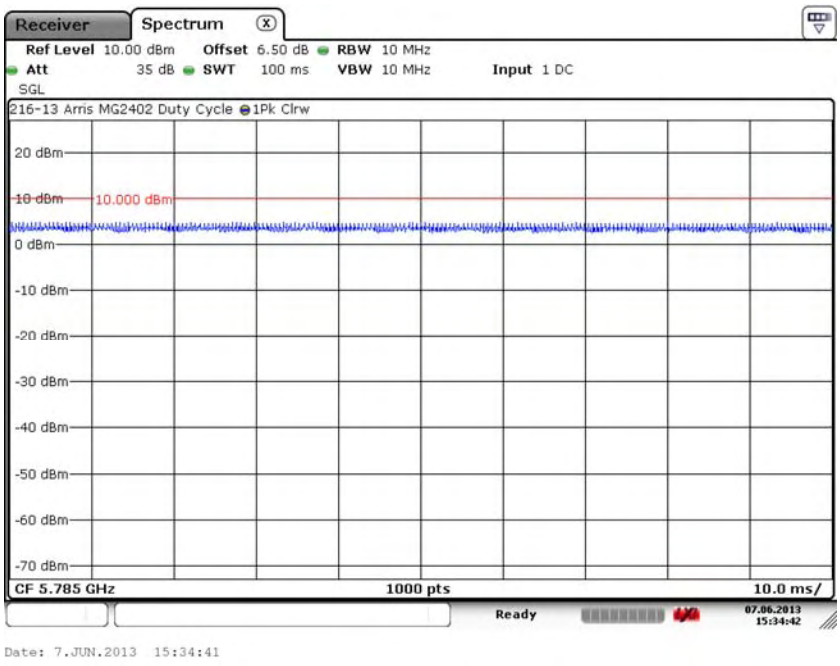
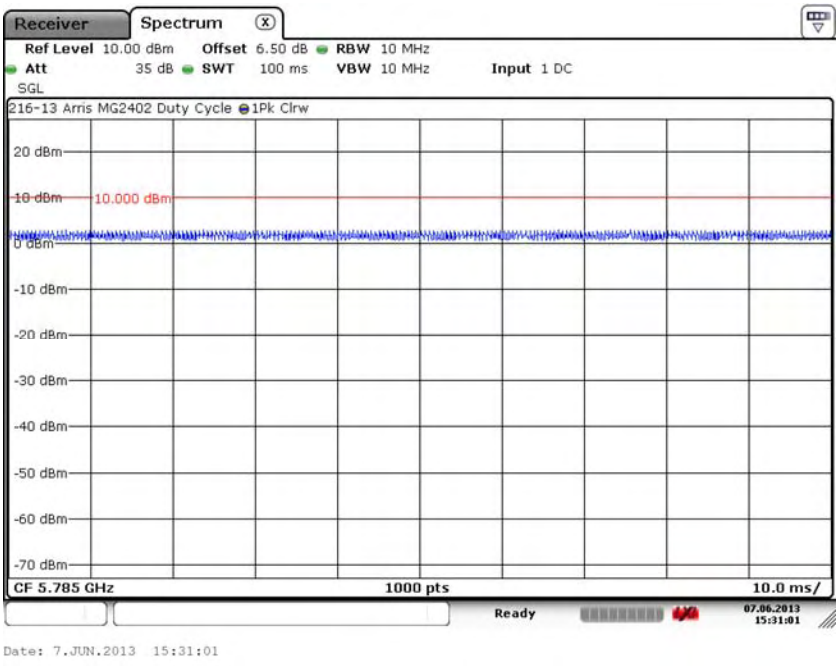
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.40. 5 GHz 802.11a: Middle Channel – 157, J5000



7.10.41. 5 GHz 802.11a: Middle Channel – 157, J5001



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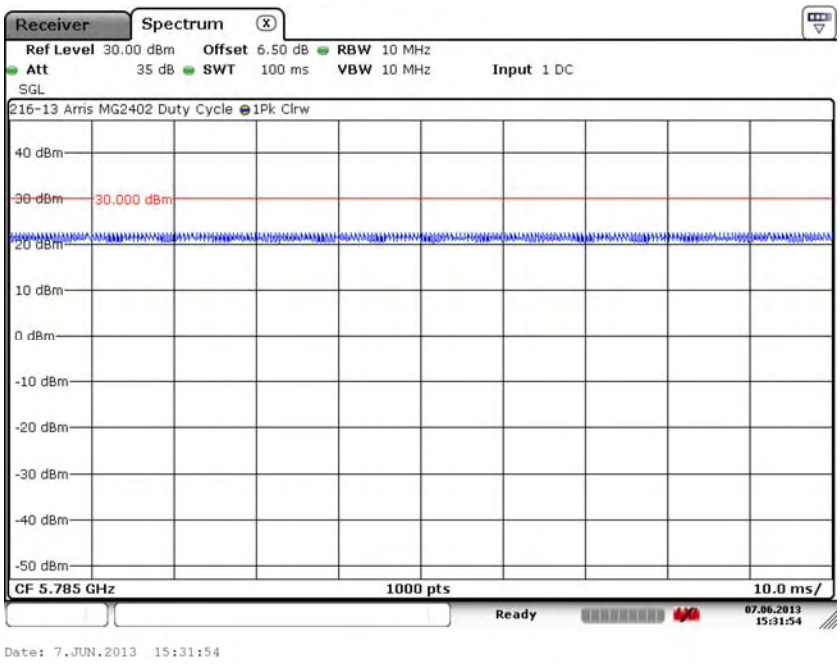
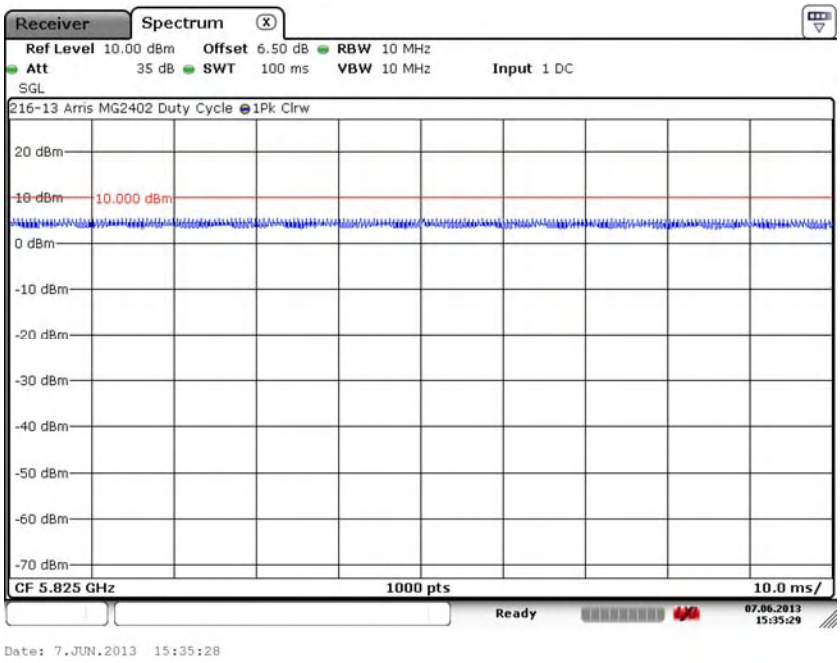
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.42. 5 GHz 802.11a: Middle Channel – 157, J5002



7.10.43. 5 GHz 802.11a: High Channel – 165, J5000



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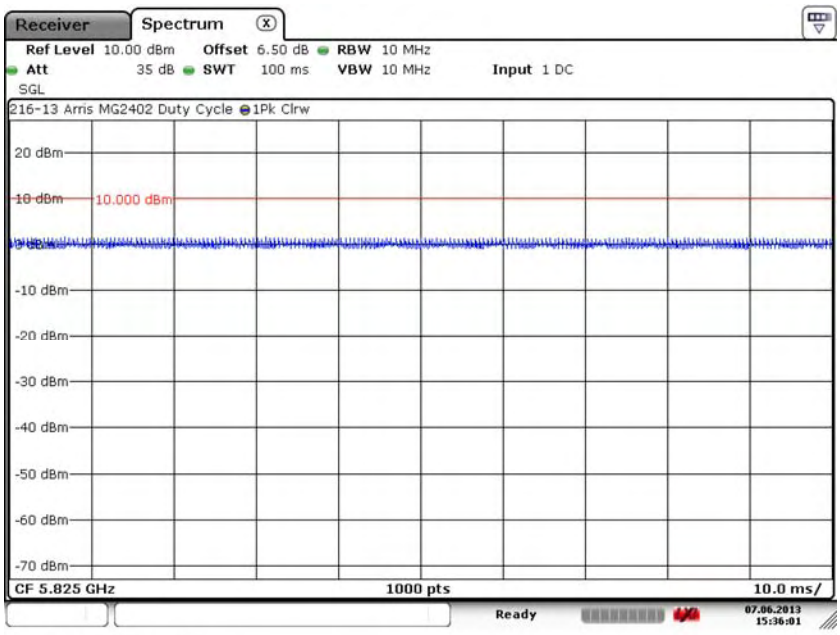
7. Measurement Data (continued)

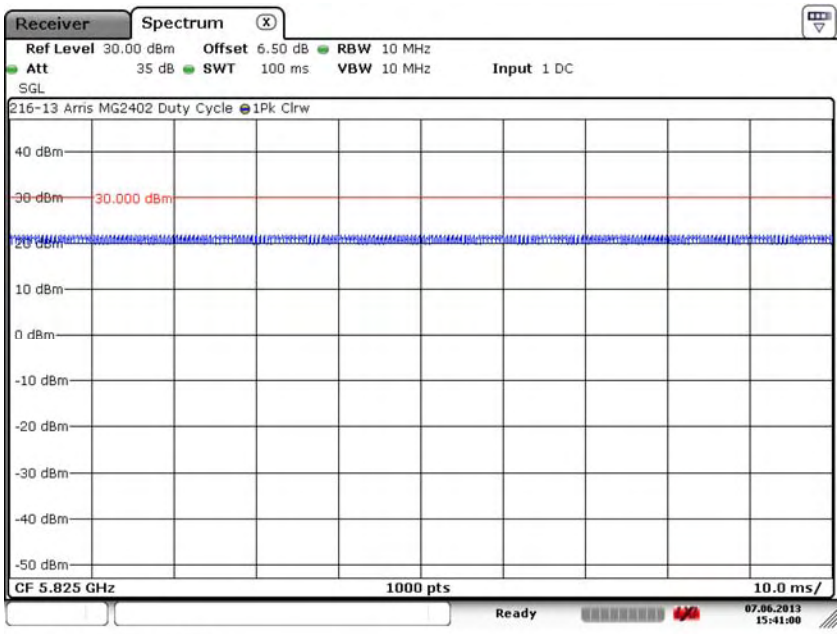
7.10. Duty Cycle

7.10.44. 5 GHz 802.11a: High Channel – 165, J5001



Date: 7.JUN.2013 15:36:01

7.10.45. 5 GHz 802.11a: High Channel – 165, J5002



Date: 7.JUN.2013 15:40:59

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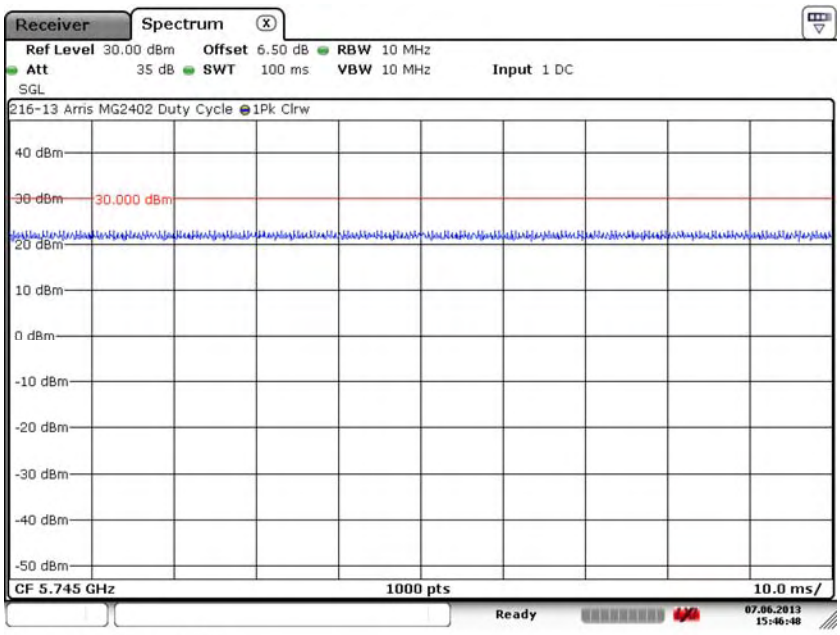
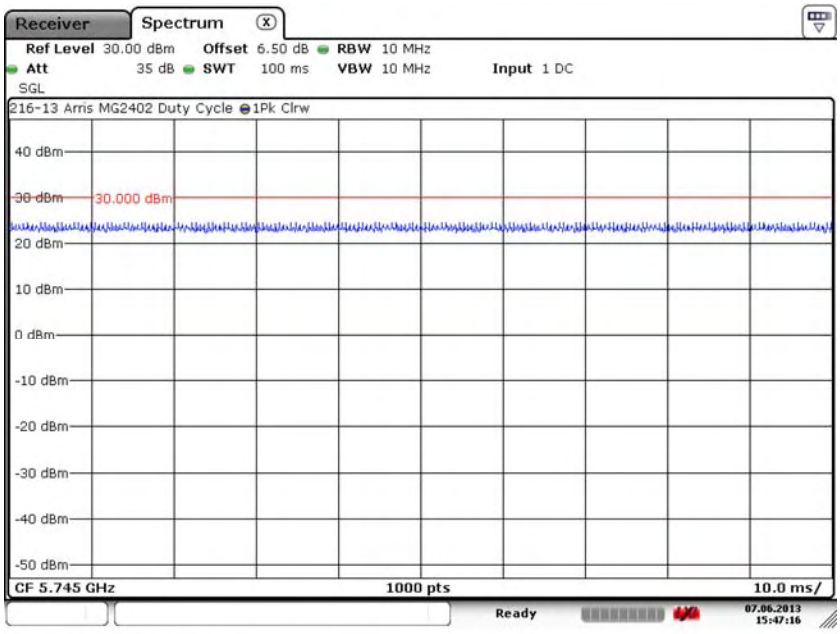
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.46. 5 GHz HT20: Low Channel – 149, J5000



7.10.47. 5 GHz HT20: Low Channel – 149, J5001



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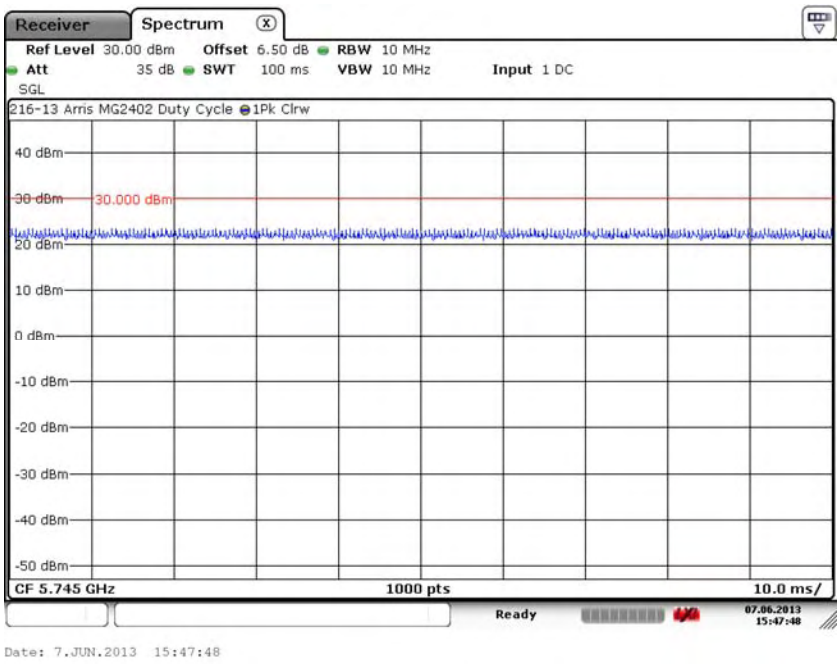
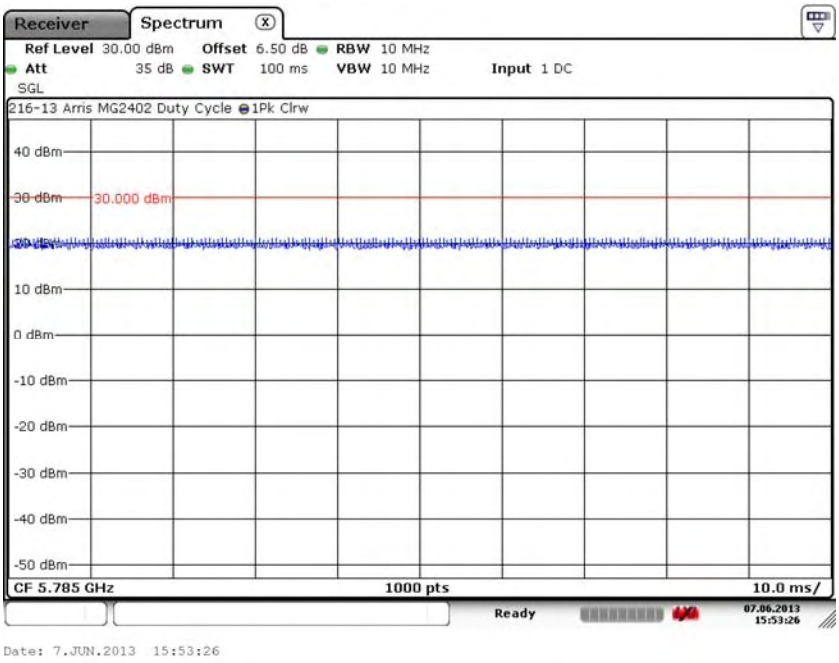
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.48. 5 GHz HT20: Low Channel – 149, J5002



7.10.49. 5 GHz HT20: Middle Channel – 157, J5000



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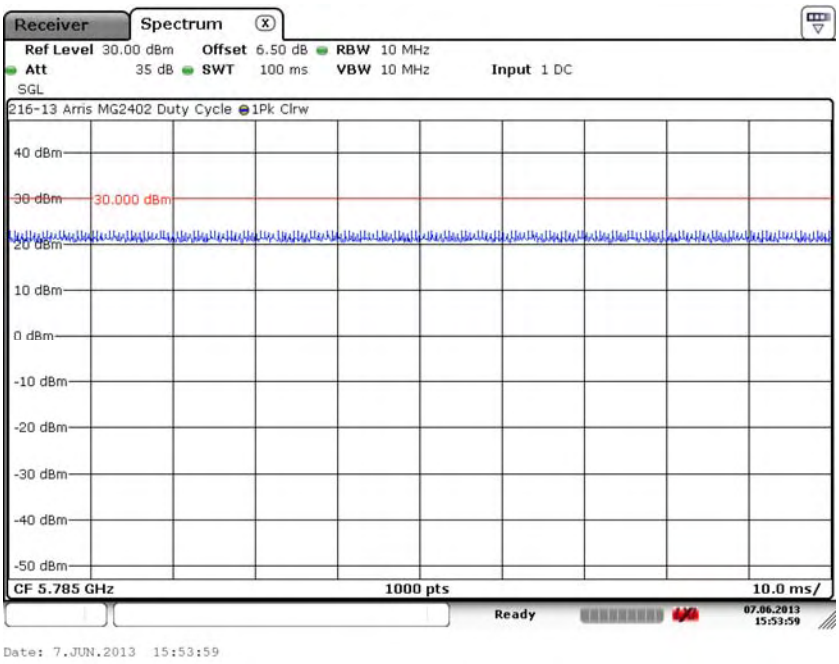
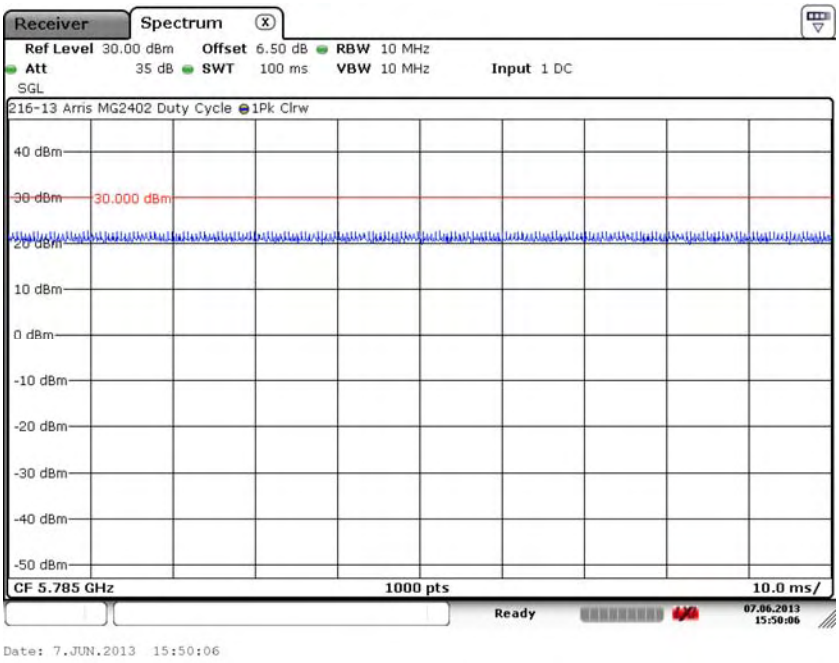
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.50. 5 GHz HT20: Middle Channel – 157, J5001



7.10.51. 5 GHz HT20: Middle Channel – 157, J5002



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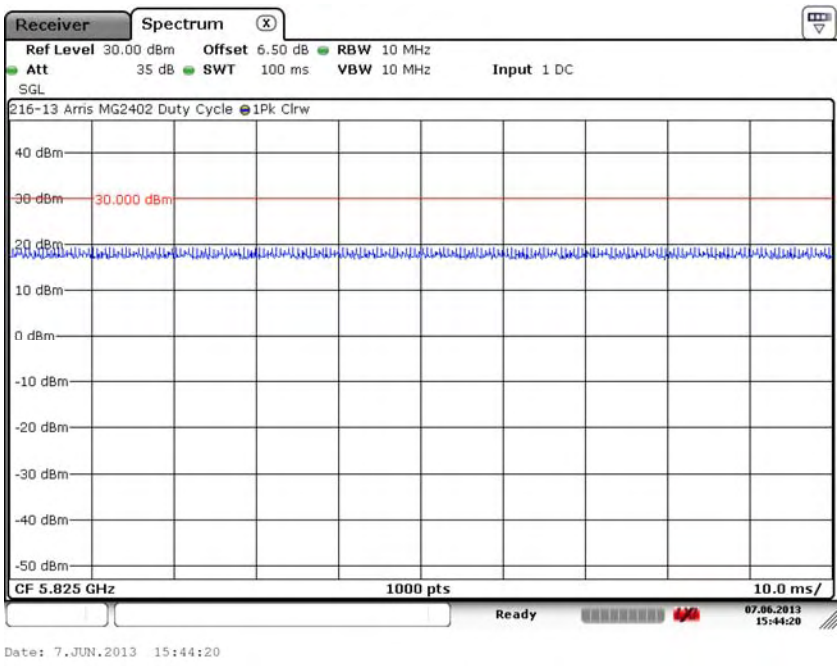
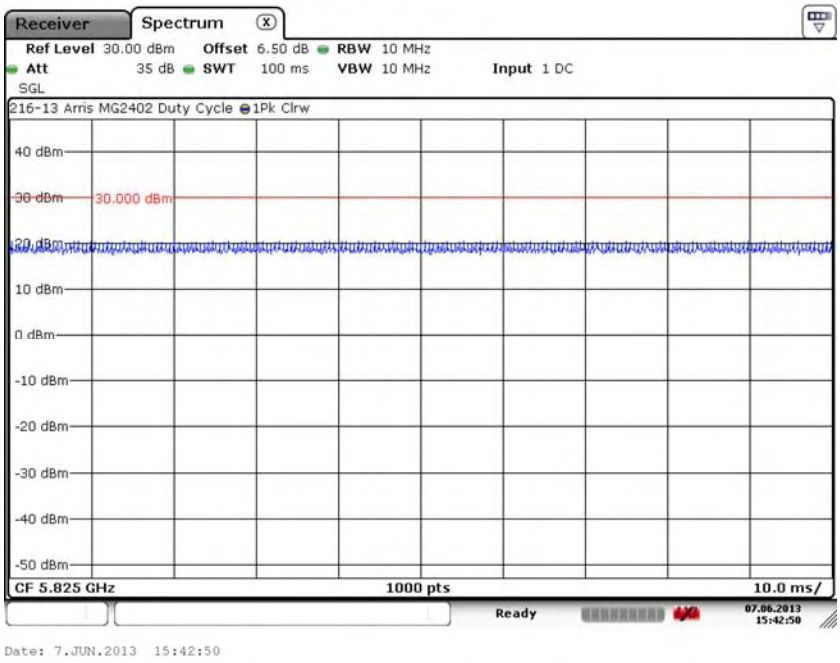
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.52. 5 GHz HT20: High Channel – 165, J5000



7.10.53. 5 GHz HT20: High Channel – 165, J5001



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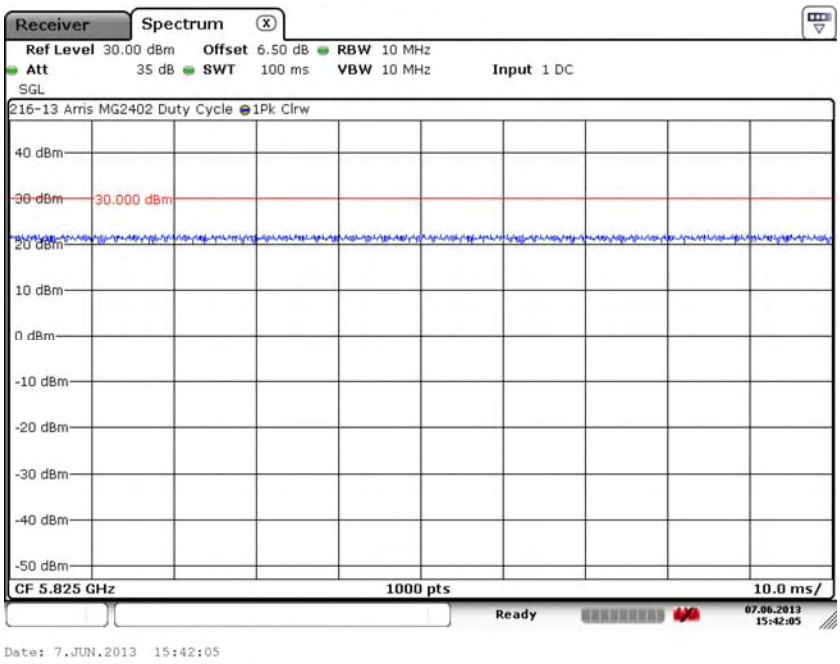
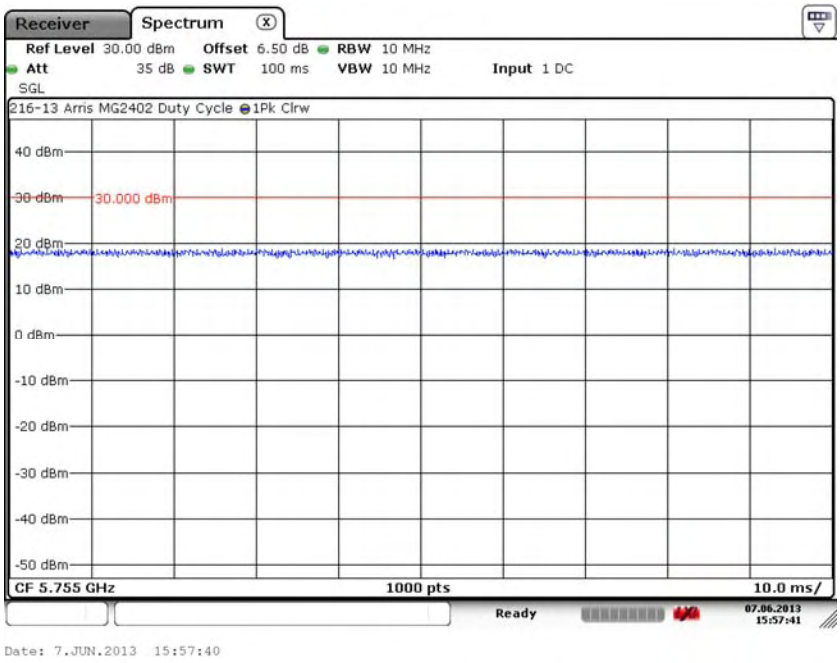
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.54. 5 GHz HT20: High Channel – 165, J5002



7.10.55. 5 GHz HT40: Low Channel – 151, J5000



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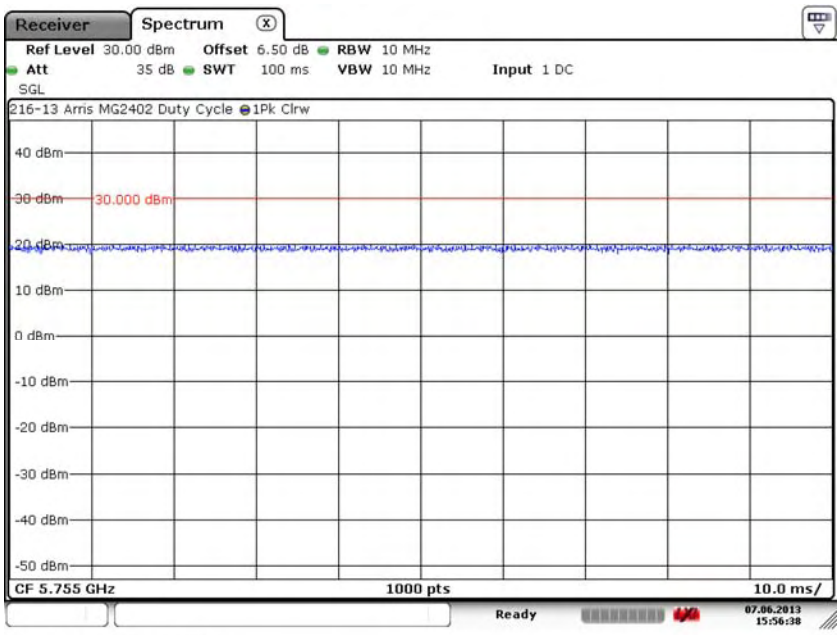
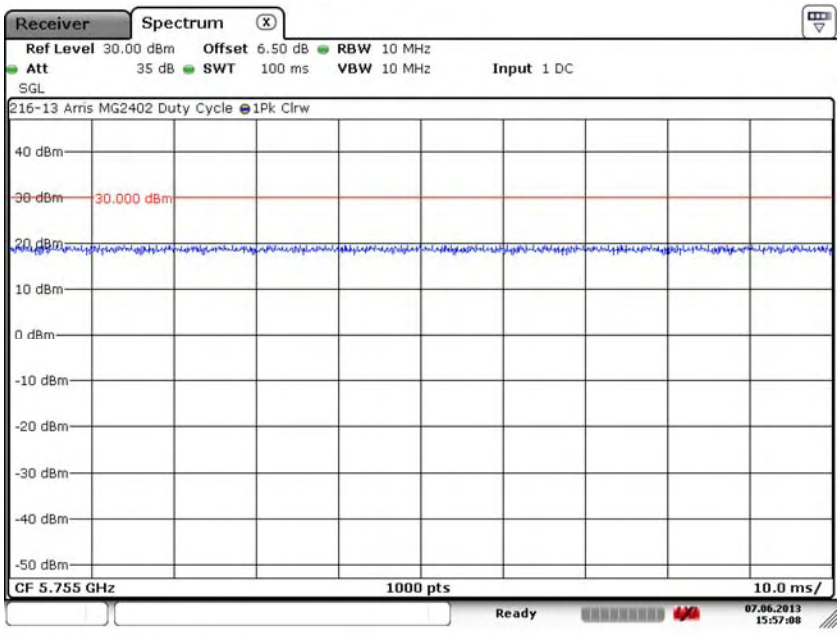
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.56. 5 GHz HT40: Low Channel – 151, J5001



7.10.57. 5 GHz HT40: Low Channel – 151, J5002



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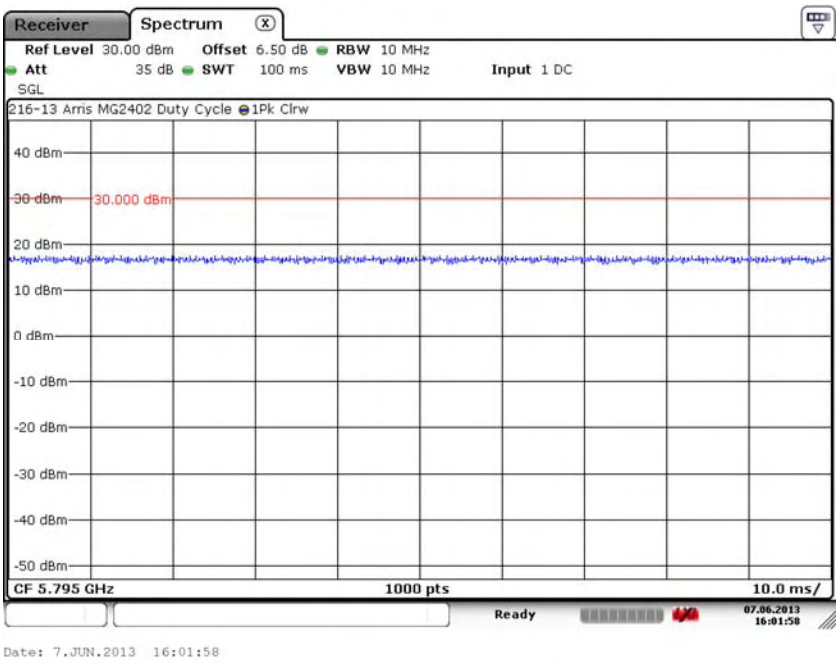
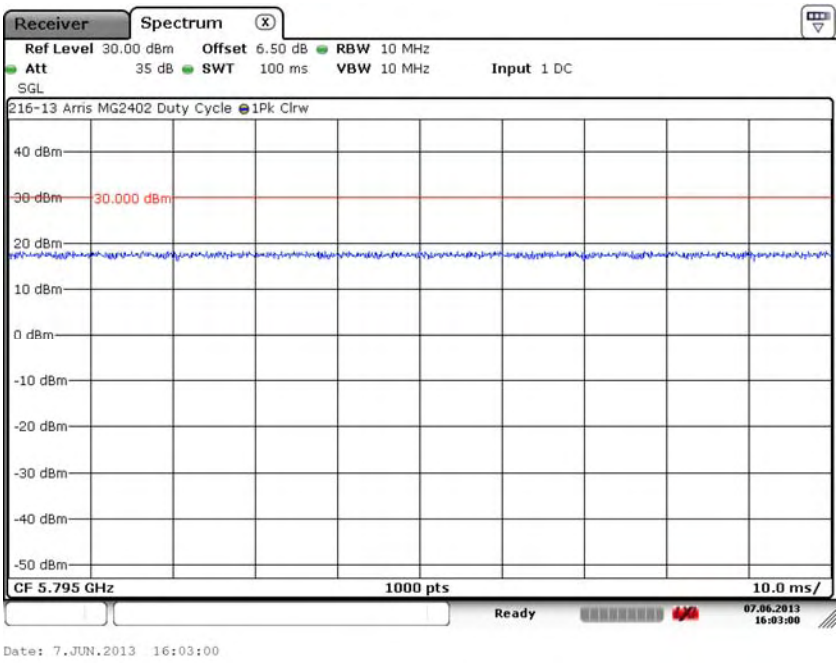
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.58. 5 GHz HT40: High Channel – 159, J5000



7.10.59. 5 GHz HT40: High Channel – 159, J5001



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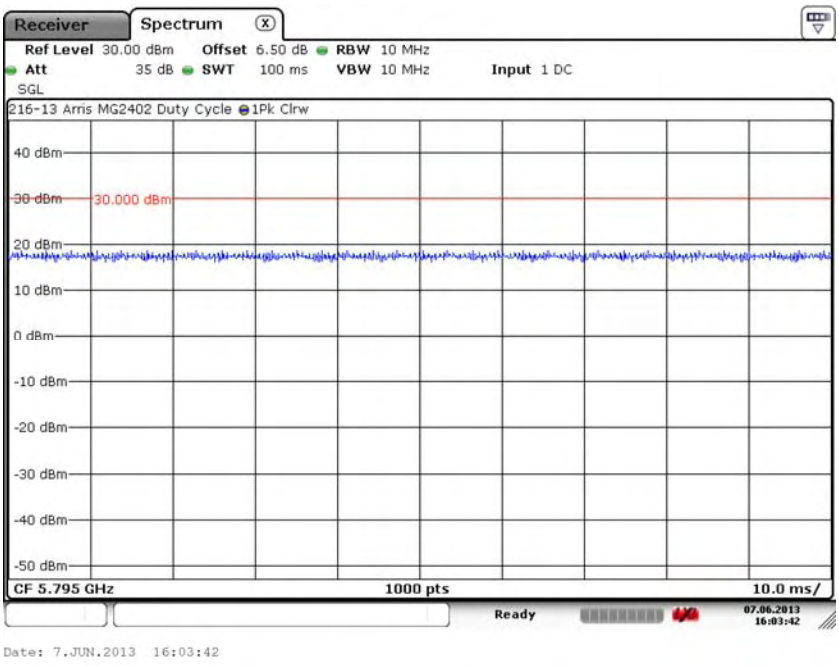
7. Measurement Data (continued)

7.10. Duty Cycle

7.10.60. 5 GHz HT40: High Channel – 159, J5002



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7. Measurement Data (continued)

7.11. Public Exposure to Radio Frequency Energy Levels (15.247(i) (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102

Requirement: (15.247(i))

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. Devices are subject to the radio frequency radiation exposure requirements specified in 47CFR 1.1307(b), FCC 47 CFR 2.1091 and 47 CFR 2.1093, as appropriate. All equipment shall be considered to operate in a ''general population/uncontrolled'' environment.

Conclusion: The device under test is meets radio frequency radiation exposure requirements specified in 47CFR 1.1307(b), § 2.1091 and § 2.1093.

Measurement Results – 2.4 GHz

802.11b Mode Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
				(mW/cm2)	(W/m2)		
	(1)	(2)	(3)	(4)		(5)	
2412	20.0	23.32	2.5	0.0759549	0.7595488	1	Compliant
2437	20.0	23.59	2.5	0.0808848	0.8088484	1	Compliant
2462	20.0	23.81	2.5	0.0851003	0.8510035	1	Compliant

802.11g Mode Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
				(mW/cm2)	(W/m2)		
	(1)	(2)	(3)	(4)		(5)	
2412	20.0	21.08	2.5	0.0453828	0.4538285	1	Compliant
2437	20.0	20.34	2.5	0.0382544	0.3825438	1	Compliant
2462	20.0	20.43	2.5	0.0390385	0.3903849	1	Compliant

HT20 Mode Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
				(mW/cm2)	(W/m2)		
	(1)	(2)	(3)	(4)		(5)	
2412	20.0	21.73	2.5	0.0526749	0.5267491	1	Compliant
2437	20.0	20.34	2.5	0.0382288	0.3822885	1	Compliant
2462	20.0	20.31	2.5	0.0379630	0.3796296	1	Compliant

HT40 Mode Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
				(mW/cm2)	(W/m2)		
	(1)	(2)	(3)	(4)		(5)	
2422	20.0	20.01	2.5	0.0354355	0.3543550	1	Compliant
2437	20.0	19.60	2.5	0.0322836	0.3228365	1	Compliant
2452	20.0	19.57	2.5	0.0320604	0.3206043	1	Compliant

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7. Measurement Data (continued)

7.11. Public Exposure to Radio Frequency Energy Levels (15.247(i) (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102

Measurement Results – 5 GHz

802.11a Mode Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
				(mW/cm2)	(W/m2)		
	(1)	(2)	(3)	(4)		(5)	
5745	20.0	23.09	2.5	0.0720211	0.7202112	1	Compliant
5785	20.0	21.49	2.5	0.0498657	0.4986566	1	Compliant
5825	20.0	19.14	2.5	0.0289926	0.2899262	1	Compliant

HT20 Mode Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
				(mW/cm2)	(W/m2)		
	(1)	(2)	(3)	(4)		(5)	
5745	20.0	23.59	2.5	0.0809225	0.8092253	1	Compliant
5785	20.0	21.81	2.5	0.0537027	0.5370272	1	Compliant
5825	20.0	19.90	2.5	0.0345362	0.3453618	1	Compliant

HT40 Mode Channel Frequency	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
				(mW/cm2)	(W/m2)		
	(1)	(2)	(3)	(4)		(5)	
5745	20.0	23.54	2.5	0.0799325	0.7993247	1	Compliant
5785	20.0	22.37	2.5	0.0610970	0.6109701	1	Compliant

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

PD = Power Density
OP = DUT Output Power (dBm)
AG = Antenna Gain (dBi)
D = MPE Distance

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the installer. All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§ 1.1307(c) and 1.1307(d) of this chapter.
2. Section 7.4 of this test report.
3. Data supplied by the client.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

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7. Measurement Data (continued)

7.11. Public Exposure to Radio Frequency Energy Levels (15.247(i), (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102 (cont.)

Simultaneous Transmission of 2.4 GHz and 5.8 GHz WiFi Radios. The highest levels for each of the modes of operation are summed in the following table.

Worse Case Mode of Operation		MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
					(mW/cm2)	(W/m2)		
Mode	MHz	(1)	(2)	(3)	(4)		(5)	
802.11b	2462	20.0	23.81	2.50	0.0851003	0.8510035	1	Compliant
802.11a HT20	5745	20.0	23.59	2.50	0.0809225	0.8092253	1	Compliant
DECT	1921.536	20.0	19.83	0.50	0.0214650	0.2146496	1	Compliant
Zigbee	2405	20.0	0.68	3.00	0.0004642	0.0046423	1	Compliant
SUM		20.0	N/A	N/A	0.1879521	1.8795207	1	Compliant

Using Directional Gain = Gant + 10 * Log10 (Nant / Nss) dBi where Nant is the number of MIMO Antennas, and Nss is the number of spatial streams (1). A consideration for Antenna Array Gain is also calculated in the following table.

Worse Case Mode of Operation		MPE Distance (cm)	DUT Output Power (dBm)	DUT Array Antenna Gain (dBi)	Power Density		Limit (mW/cm2)	Result
					(mW/cm2)	(W/m2)		
Mode	MHz	(1)	(2)	(3)	(4)		(5)	
802.11b	2462	20.0	23.81	7.3	0.2553010	2.5530105	1	Compliant
802.11a HT20	5745	20.0	23.59	7.3	0.2427676	2.4276758	1	Compliant
DECT	1921.536	20.0	19.83	0.5	0.0214650	0.2146496	1	Compliant
Zigbee	2405	20.0	0.68	3.0	0.0004642	0.0046423	1	Compliant
SUM		20.0	N/A	N/A	0.5199978	5.1999782	1	Compliant

However, based upon a recent study by the FCC and KDB 662911 D01 published 5-28-2013, Array Gain for IEEE 802.11 device with antenna arrays less than 4 or channel widths greater then 40 MHz, the value for Array Gain is 0 dB.

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8. Test Setup Photographs

8.1. Spurious Radiated Emissions - Front

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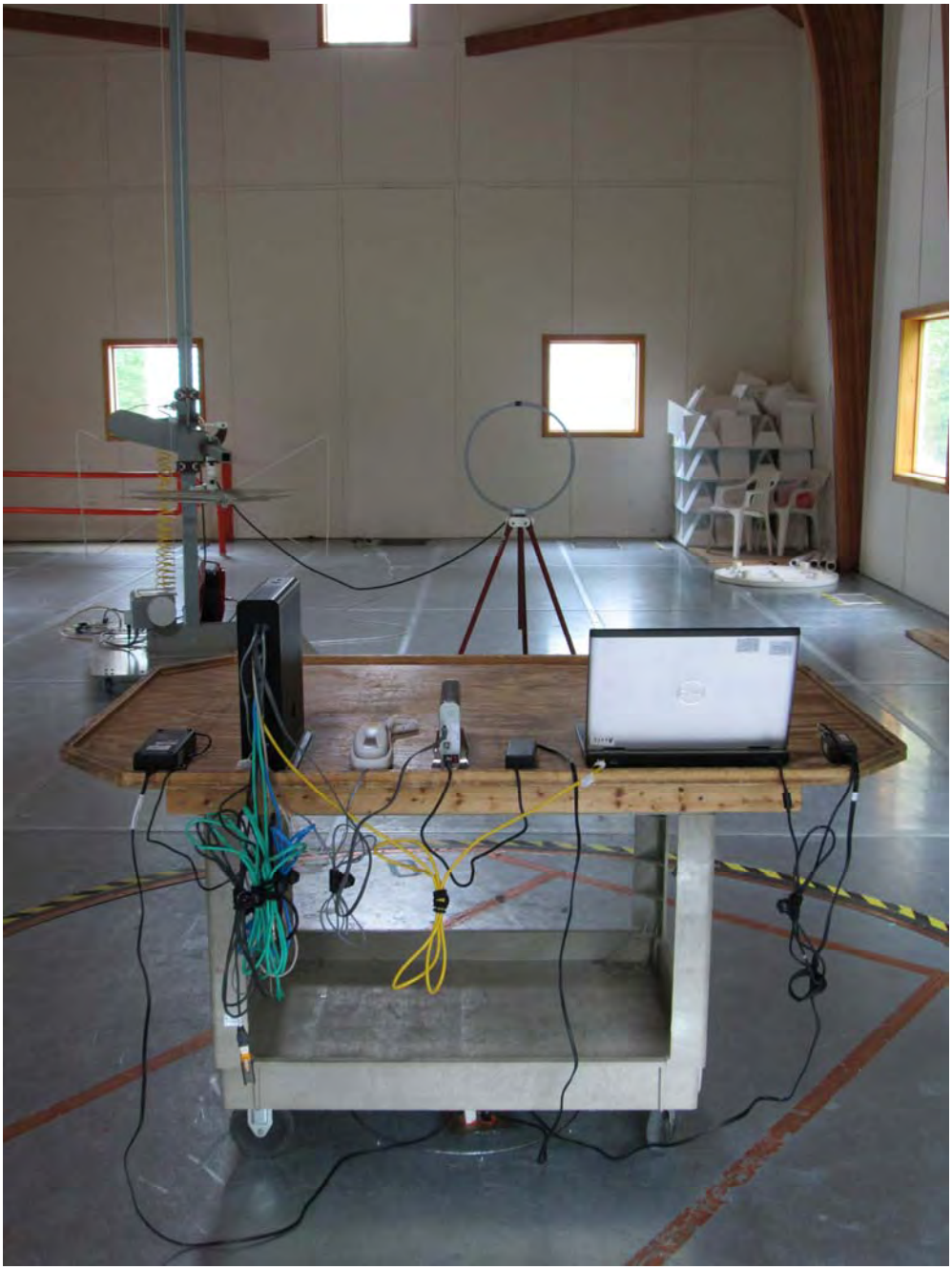
8. Test Setup Photographs

8.2. Spurious Radiated Emissions below 30 MHz - Rear



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8. Test Setup Photographs

8.3. Spurious Radiated Emissions 30 MHz to 1 GHz - Rear

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8. Test Setup Photographs

8.4. Harmonic Radiated Emissions above 1 GHz – Front

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8. Test Setup Photographs

8.5. Harmonic Radiated Emissions 1 to 18 GHz – Rear

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8. Test Setup Photographs

8.6. Harmonic Radiated Emissions 18 to 40 GHz – Rear

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8. Test Setup Photographs

8.7. Conducted Emissions Front

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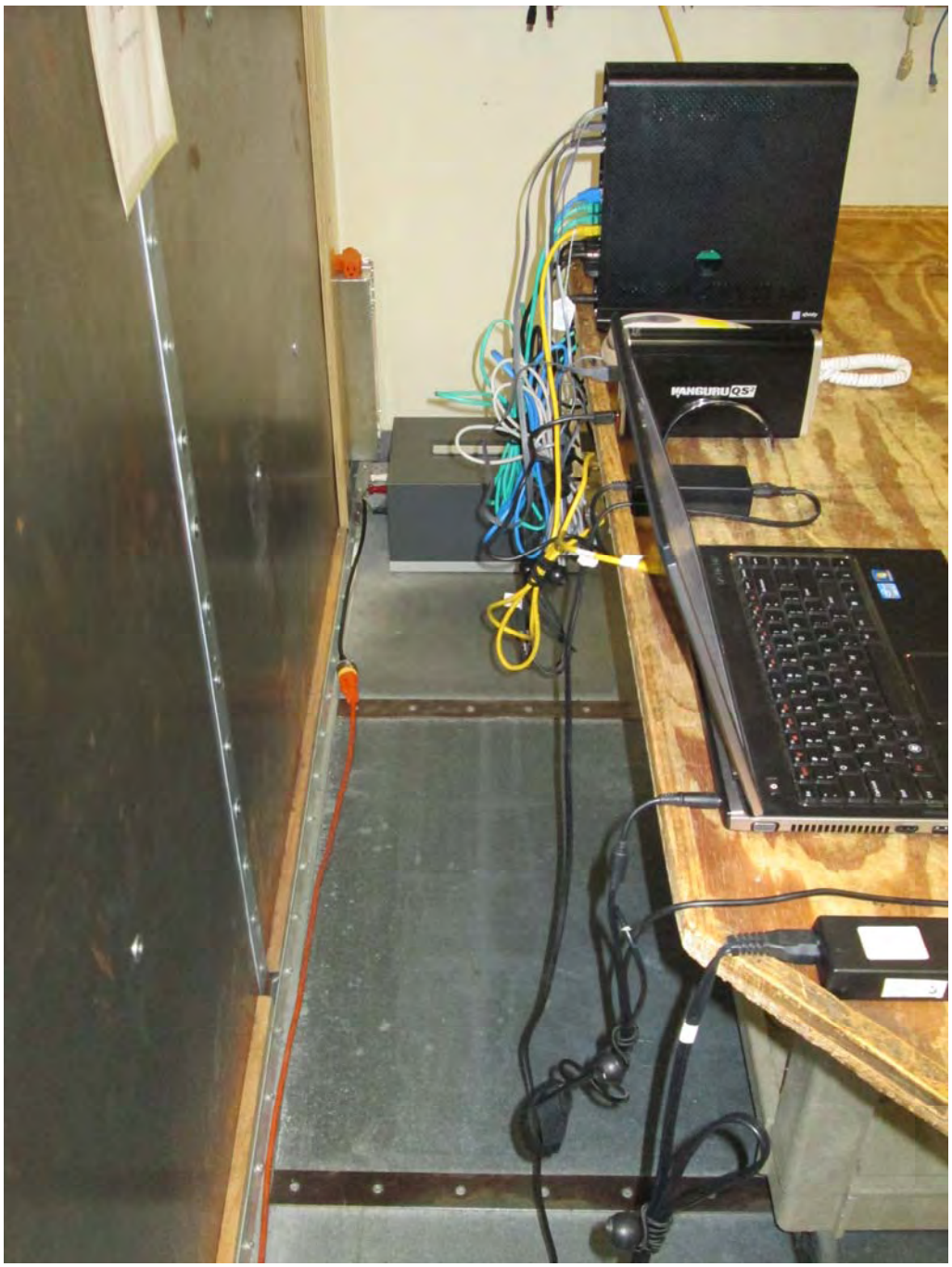
8. Test Setup Photographs

8.8. Conducted Emissions Rear



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9. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023A-1)**.

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.

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