FCC 47 CFR PART 15 SUBPART C

Report No.: C131128Z01-RP1

for

802.11n ADSL2+ Router Model: SR360n,SR320n

Brand: SmartRG

Test Report Number: C131128Z01-RP1

Issued Date: December 25, 2013

Issued for

SmartRG Inc.

501 SE Columbia Shores Boulevard, Suite 500 Vancouver, Washington 98661

Issued by:

Compliance Certification Services (Shenzhen) Inc.

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Revision History

Report No.: C131128Z01-RP1

Rev.	Issue No.	Revisions	Effect Page	Revised By
00	C131128Z01-RP1	Initial Issue	ALL	Sinphy Xie

Note: This report is updated base on the original report C130524Z02-RP1.

- 1.The applicant company changed the company name, the address, the brand, the model name, in addition, model of MSP-C1000IC12.0-12W-US adapter is deleted, and added two new adapters based on DA2010 model in Initial report (C130524Z02-RP1), the model's ports is the same as DA2210, Besides, there are appearance and antenna gain difference between the new model and the Initial model. After reassessment, all the items was re-tested.
- 2. The other information, please refer to the Report No.: C130524Z02-RP1 and this report.

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1 TEST CERTIFICATION

Product	802.11n ADSL2+ Router
Model	SR360n,SR320n
Brand	SmartRG
Tested	November 28~December 23, 2013
Applicant	SmartRG Inc. 501 SE Columbia Shores Boulevard, Suite 500 Vancouver, Washington 98661
Manufacturer	SmartRG Inc. 501 SE Columbia Shores Boulevard, Suite 500 Vancouver, Washington 98661

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APPLICABLE STANDARDS						
Standard Test Type Standard		Test Type				
15.207(a)	Power Line Conducted Emissions	15.247(d) 15.209(a)	Spurious EmissionsConducted MeasurementRadiated Emissions			
15.247(a)(2)	6dB Bandwidth Measurement	15.247(b)(3) 15.247(b)(4)	Peak Power Measurement			
15.247(d)	Band Edges Measurement	15.247(e)	Peak Power Spectral Density			

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in **ANSI C63.4: 2009** and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Reviewed by:

Tom Gan
Supervisor of EMC Dept.
Compliance Certification Service Inc.

Ruby Zhang Supervisor of Report Dept. Compliance Certification Service Inc.

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2 TEST RESULT SUMMARY

	APPLICABLE STANDARDS						
Standard Test Type			Remark				
15.247(a)(2)	6dB Bandwidth Measurement	Pass	Meet the requirement of limit.				
15.247(b)(3) 15.247(b)(4)	Peak Power Measurement	Pass	Meet the requirement of limit.				
15.247(d)	Band Edges Measurement	Pass	Meet the requirement of limit.				
15.247(e)	Peak Power Spectral Density	Pass	Meet the requirement of limit.				
15.247(d) 15.209(a)	Spurious EmissionsConducted MeasurementRadiated Emissions	Pass	Meet the requirement of limit.				
15.207(a)	Power line Conducted Emissions	Pass	Meet the requirement of limit.				

Note: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.

2. The information of measurement uncertainty is available upon the customer's request.

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EUT DESCRIPTION

Product	802.11n ADSL2+ Router			
Model Number	SR360n,SR320n			
Brand	SmartRG			
Model Discrepancy	They are the same as internal PCB layout except for different antenna type, antenna gain and the appearances. SR360n has external antenna, SR320n has Built-in antenna, The SR360n's antenna gain is 5dBi, and the SR320n's antenna gain is 1dBi.			
Serial Number	C130524Z02-RP1			
Received Date	November 28, 2013			
Power Supply	DC12V powered by the adapter			
Adapter Manufacturer/ Model Name	Adapter 1: Shenzhen Gongjin Electronics Co., Ltd./ S12A02-120A100-P4 I/P: 100-240Vac, 50/60Hz, max 0.5A O/P: 12Vdc, 1A, DC Output Cable: Unshielded,1.30m Adapter 2: ShenZhen RuiDe Electronics Industrial Co., Ltd./ RD1201000-C55-2MG I/P: 100-240Vac, 50/60Hz, max 0.6A O/P: 12Vdc, 1A, DC Output Cable: Shielded,1.50m Adapter 3: Shenzhen Gongjin Electronics Co., Ltd./ S12B22-120A100-04 I/P: 100-240Vac, 50/60Hz, max 0.5A O/P: 12Vdc, 1A, DC Output Cable: Unshielded,1.30m			
Transmit Power	IEEE 802.11b mode: 17.88dBm IEEE 802.11g mode: 23.60dBm(Antenna 0) IEEE 802.11g mode: 23.06dBm(Antenna 1) IEEE 802.11n HT20 MHz mode: 24.59101dBm(Combine with Antenna 0 and Antenna 1) IEEE 802.11n HT40 MHz mode: 24.15808dBm(Combine with Antenna 0 and Antenna 1)			
Modulation Technique	IEEE 802.11b mode: DSSS(CCK,QPSK, BPSK) IEEE 802.11g mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT20 MHz mode: OFDM (BPSK/QPSK/16QAM/64QAM) IEEE 802.11n HT40 MHz mode: OFDM (BPSK/QPSK/16QAM/64QAM)			
Transmit Data Rate	IEEE 802.11b: 11Mbps(CCK) with fall back rates of 5.5/2/1Mbps IEEE 802.11g: 54Mbps with fall back rates of 48/36/24/18/12/9 /6Mbps IEEE 802.11n HT20:130Mbps with fall back rates of 130/117/104/ 78/52/39/26/13Mbps IEEE 802.11nHT40:270Mbps with fall back rates of 270/243/216/ 162/108/81/54/27Mbps			
Number of Channels	IEEE 802.11b mode: 11 Channels IEEE 802.11g mode: 11 Channels IEEE 802.11n HT20 MHz mode: 11 Channels IEEE 802.11n HT40 MHz mode: 7 Channels			
Antenna Specification	Dipole Antenna with 5.0dBi gain (Max) PCB Antenna with 1.0dBi gain (Max)			
Channels Spacing	IEEE 802.11b/g ,802.11n HT20/HT40 : 5MHz			
Temperature Range	0°C ~ +40°C			

Note: 1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

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^{2.} This submittal(s) (test report) is intended for FCC ID: <u>VW7SR360N</u> filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



4 TEST METHODOLOGY

4.1. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting and receiving

mode is programmed.

Test Item	Test mode	Worse mode
	Mode 1: Normal +Adapter 1 (S12A02-120A100-P4) (SR360n)	
Conducted	Mode 2: Normal +Adapter 2	Mode 2
Emission	(RD1201000-C55-2MG) (SR360n)	Mode 3
	Mode 3:Normal +Adapter 3 (S12B22-120A100-04) (SR360n)	
Radiated Emission	Mode 1: TX	Mode 1

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After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only, and power line conducted emission below 30MHz, which worst case was in normal link mode.

IEEE802.11b mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High(2462MHz) with 1Mbps data rate were chosen for full testing.

IEEE802.11g mode: Channel Low (2412MHz), Channel Mid (2437MHz) and Channel High (2462MHz) with 6Mbps data rate were chosen for full testing.

IEEE 802.11n HT20 MHz mode: Channel Low (2412MHz), Channel Mid(2437MHz) and Channel High (2462MHz) with 13Mbps data rate were chosen for full testing.

IEEE 802.11n HT40 MHz mode: Channel Low (2422MHz), Channel Mid (2437MHz) and Channel High (2452MHz) with 27Mbps data rate were chosen for full testing.

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5 SETUP OF EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

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No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord
1	Notebook1#	B475	WB04861612	N/A	LENOVO	Shielded, 18.00m	Unshielded, 1.80m
2	Notebook2#	992F2VG	62P7043	N/A	IBM	Shielded, 18.00m	UnShielded 1.80m
3	lpod	A1285	YM908BYU3QX	N/A	iPod	Shielded, 1.80m	Unshielded, 1.50m
4	DSL Source	IES1000	S110203018444	N/A	ZYXEL	Shielded, 22.00m	Unshielded 1.80m

Note:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

5.2. CONFIGURATION OF SYSTEM UNDER TEST

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.

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6 FACILITIES AND ACCREDITATIONS

6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at No.10-1 Mingkeda Logistics park, No.18, Huanguan South Rd., Guan Lan Town, Baoan District, Shenzhen, China

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The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

USA A2LA China CNAS

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA FCC

Japan VCCI(C-3478, R-3135, T-652, G-624)

Canada INDUSTRY CANADA

Taiwan BSMI Norway Nemko

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsrf.com

6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : 966(2)	+/-3.6880dB
Radiated Emission, 200 to 1000 MHz Test Site: 966(2)	+/-3.6695dB
Radiated Emission, 1 to 8 GHz	+/-5.1782dB
Radiated Emission, 8 to 18 GHz	+/-5.2173dB
Conducted Emissions	+/-3.6836dB
Band Width	178kHz
Peak Output Power MU	+/-1.906dB
Band Edge MU	+/-0.182dB
Channel Separation MU	416.178Hz
Duty Cycle MU	0.054ms
Frequency Stability MU	226Hz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.

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7 FCC PART 15.247 REQUIREMENTS

7.1. POWER LINE CONDUCTED EMISSIONS MEASUREMENT

7.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range		nits ⊭V)
(MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

NOTE:

- (1) The lower limit shall apply at the transition frequencies.
- (2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

7.1.2. TEST INSTRUMENTS

	Conducted Emission Test Site							
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration			
ESCI EMI TEST RECEIVER.ESCI	ROHDE&SCHWARZ	ESCI	100783	03/09/2013	03/08/2014			
LISN(EUT)	ROHDE&SCHWARZ	ENV216	101543-WX	09/20/2013	09/20/2014			
LISN	EMCO	3825/2	8901-1459	03/09/2013	03/08/2014			
Temp. / Humidity Meter	VICTOR	HTC-1	N/A	03/04/2013	03/03/2014			
Test S/W	FARAD	EZ-EMC/ CCS-3A1-CE						

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. N.C.R = No Calibration Request.

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7.1.3. TEST PROCEDURES (please refer to measurement standard)

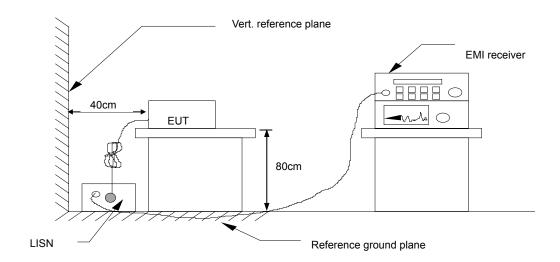
• The EUT and Support equipment, if needed, was placed on a non-conducted table, which is 0.8m above the ground plane and 0.4m away from the conducted wall.

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- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane. All support equipment power received from a second LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The frequency range from 150 kHz to 30 MHz was searched. The test data of the worst-case condition(s) was recorded. Emission levels under limit 20dB were not recorded.

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7.1.4. TEST SETUP



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For the actual test configuration, please refer to the related item - Photographs of the Test Configuration.

7.1.5. DATA SAMPLE

Frequency (MHz)	LISN Factor (dB)	Cable Loss (dB)	Meter Reading (dBuV)	Measured Level (dBuV)	Limits (dBuV)	Over Limits (dBuV)	Detector	Line (L1/L2)
X.XX	8.93	0.07	25.96	34.96	60.00	-25.04	QP	L1

Freq. = Emission frequency in MHz

LISN Factor = Insertion loss of LISN and Pulse Limiter

Cable Loss = Insertion loss of Cable (LISN to EMI Tester Receiver)

Meter Reading = Uncorrected Analyzer/Receiver reading

Measured Level = Read Level + Factor
Limit = Limit stated in standard
Over Limit = Reading in reference to limit

Peak = Peak Reading

QP = Quasi-peak Reading AV = Average Reading

Calculation Formula

1. Measured Level (dBuV) = LISN Factor (dB) + Cable Loss (dB)+ Meter Reading (dBuV)

2. Over Limit (dBuV) = Measured Level (dBuV) - Limits (dBuV)

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7.1.6. TEST RESULTS

Model No.	SR360n	RBW,VBW	9 kHz
Environmental Conditions	26°C, 60% RH	Test Mode	Mode 2
Tested by	Sun Guo	Line	L1

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(The chart below shows the highest readings taken from the final data.)

Frequency	QuasiPeak Reading	Average Reading	Correction Factor	QuasiPeak Result	Average Result	QuasiPeak Limit	Average Limit	QuasiPeak Margin	Average Margin	Remark
(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	(Pass/Fail)
0.1500	42.59	29.21	9.58	52.17	38.79	65.99	56.00	-13.82	-17.21	Pass
0.3140	28.33	16.45	9.69	38.02	26.14	59.86	49.86	-21.84	-23.72	Pass
0.4500	26.88	13.68	9.68	36.56	23.36	56.87	46.88	-20.31	-23.52	Pass
1.3300	19.27	6.30	9.72	28.99	16.02	56.00	46.00	-27.01	-29.98	Pass
2.0700	18.25	5.55	9.73	27.98	15.28	56.00	46.00	-28.02	-30.72	Pass
16.2300	15.81	9.23	9.89	25.70	19.12	60.00	50.00	-34.30	-30.88	Pass

NOTE: L1 = Line One (Live Line)

Model No.	SR360n	RBW,VBW	9 kHz
Environmental Conditions	26°C, 60% RH	Test Mode	Mode 2
Tested by	Sun Guo	Line	L2

(The chart below shows the highest readings taken from the final data.)

Frequency	QuasiPeak	Average	Correction	QuasiPeak			Average	QuasiPeak	Average	Remark
(MHz)	Reading (dBuV)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Result (dBuV)	Limit (dBuV)	Limit (dBuV)	Margin (dB)	Margin (dB)	(Pass/Fail)
0.1539	41.34	26.30	9.78	51.12	36.08	65.78	55.79	-14.66	-19.71	Pass
0.4500	26.46	15.81	9.70	36.16	25.51	56.87	46.88	-20.71	-21.37	Pass
1.4740	18.68	8.06	9.77	28.45	17.83	56.00	46.00	-27.55	-28.17	Pass
4.4740	18.83	8.26	9.77	28.60	18.03	56.00	46.00	-27.40	-27.97	Pass
8.0659	19.24	10.92	9.82	29.06	20.74	60.00	50.00	-30.94	-29.26	Pass
23.1299	15.98	9.73	9.77	25.75	19.50	60.00	50.00	-34.25	-30.50	Pass

NOTE: L2 = Line Two (Neutral Line).

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Model No.	SR360n	RBW,VBW	9 kHz
Environmental Conditions	26°C, 60% RH	Test Mode	Mode 3
Tested by	Sun Guo	Line	L1

(The chart below shows the highest readings taken from the final data.)

Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark
(MHz)	Reading (dBuV)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Result (dBuV)	Limit (dBuV)	Limit (dBuV)	Margin (dB)	Margin (dB)	(Pass/Fail)
0.1500	44.08	28.38	9.58	53.66	37.96	65.99	56.00	-12.33	-18.04	Pass
0.1780	39.32	24.86	9.65	48.97	34.51	64.57	54.58	-15.60	-20.07	Pass
0.2100	35.31	22.26	9.69	45.00	31.95	63.20	53.21	-18.20	-21.26	Pass
0.4380	29.88	21.33	9.68	39.56	31.01	57.10	47.10	-17.54	-16.09	Pass
2.6180	26.77	18.18	9.72	36.49	27.90	56.00	46.00	-19.51	-18.10	Pass
7.2300	30.77	20.81	9.79	40.56	30.60	60.00	50.00	-19.44	-19.40	Pass

NOTE: L1 = Line One (Live Line)

Model No.	SR360n	RBW,VBW	9 kHz
Environmental Conditions	26°C, 60% RH	Test Mode	Mode 3
Tested by	Sun Guo	Line	L2

(The chart below shows the highest readings taken from the final data.)

Frequency	QuasiPeak	Average		QuasiPeak			Average	QuasiPeak	Average	Remark
(MHz)	Reading (dBuV)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Result (dBuV)	Limit (dBuV)	Limit (dBuV)	Margin (dB)	Margin (dB)	(Pass/Fail)
0.1500	44.08	28.38	9.58	53.66	37.96	65.99	56.00	-12.33	-18.04	Pass
0.1780	39.32	24.86	9.65	48.97	34.51	64.57	54.58	-15.60	-20.07	Pass
0.2100	35.31	22.26	9.69	45.00	31.95	63.20	53.21	-18.20	-21.26	Pass
0.4380	29.88	21.33	9.68	39.56	31.01	57.10	47.10	-17.54	-16.09	Pass
2.6180	26.77	18.18	9.72	36.49	27.90	56.00	46.00	-19.51	-18.10	Pass
7.2300	30.77	20.81	9.79	40.56	30.60	60.00	50.00	-19.44	-19.40	Pass

NOTE: L2 = Line Two (Neutral Line).

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7.2. SPURIOUS EMISSIONS MEASUREMENT

7.2.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

§15.247(d)specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

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If the peakoutput power procedure is used to measure the fundamental emission powerto demonstrate compliance to 15.247(b)(3)requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency bandshall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

If the averageoutput power procedure is used to measure the fundamental emission powerto demonstrate compliance to 15.247(b)(3)requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

7.2.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Due Calibration	
Spectrum Analyzer	Agilent	E4446A	US44300399	03/09/2013	03/08/2014	

7.2.3. TEST PROCEDURE (please refer to measurement standard)

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

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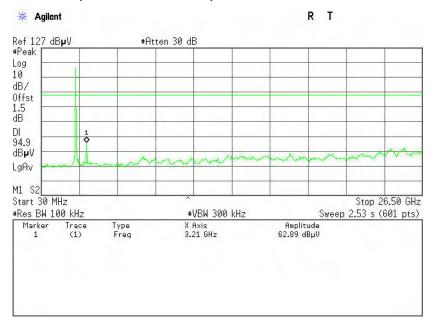
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7.2.4. TEST RESULTS

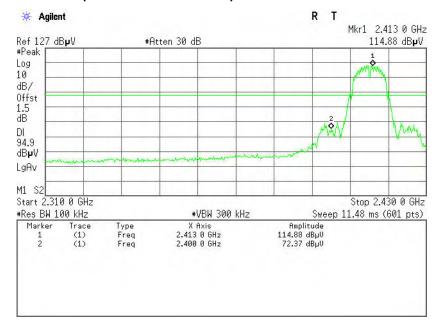
Test Plot Antenna 0

IEEE 802.11b mode

CH Low (30MHz ~26.5GHz)



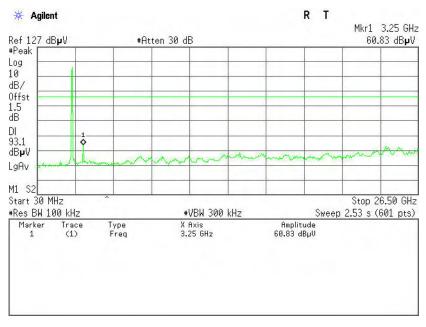
CH Low (2.31GHz ~2.43GHz)



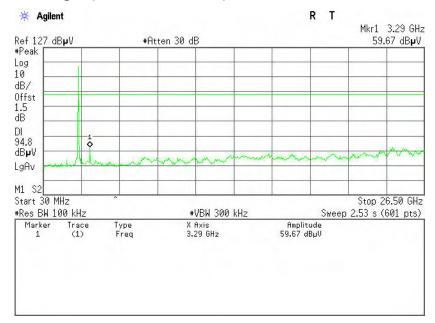
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CH Mid (30MHz ~26.5GHz)



CH High (30MHz ~26.5GHz)

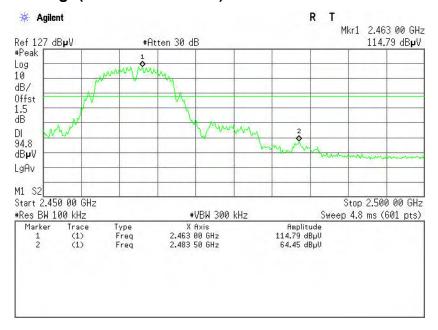


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CH High(2.45GHz ~2.5GHz)



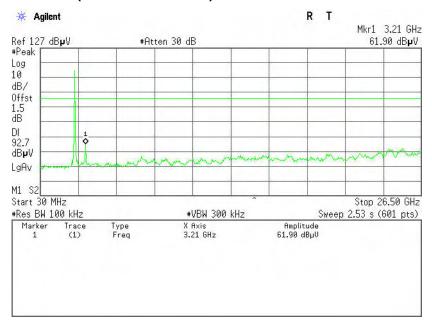
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Antenna 0

IEEE 802.11g mode

CH Low (30MHz ~26.5GHz)



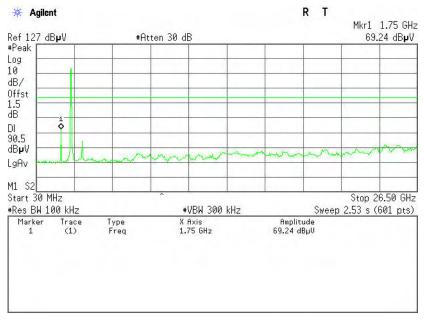
CH Low (2.31GHz ~2.43GHz)



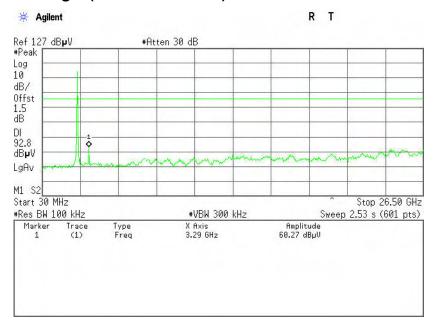
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CH Mid (30MHz ~26.5GHz)



CH High (30MHz ~26.5GHz)

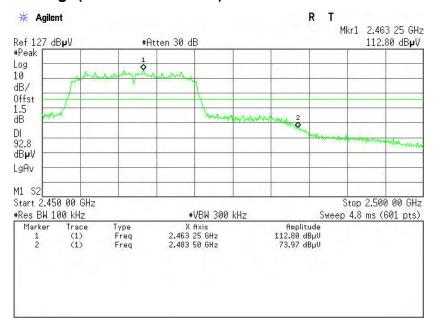


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CH High(2.45GHz ~2.5GHz)



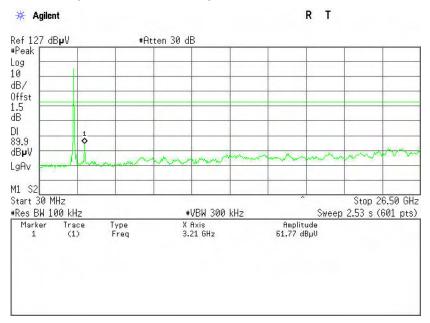
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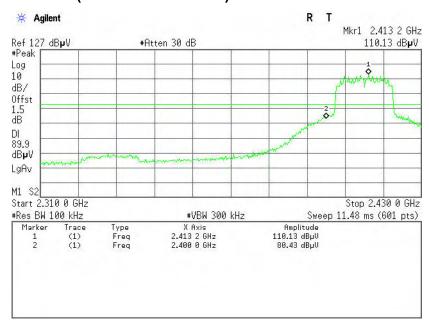
Antenna 0

IEEE 802.11n HT20 MHz mode

CH Low (30MHz ~26.5GHz)



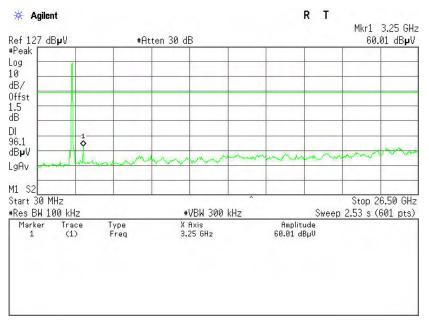
CH Low (2.31GHz ~2.43GHz)



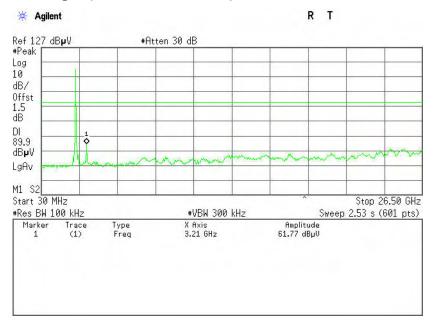
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CH Mid (30MHz ~26.5GHz)



CH High (30MHz ~26.47GHz)

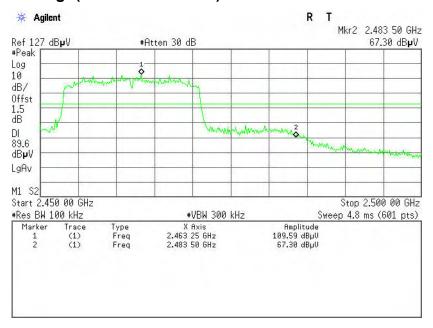


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CH High(2.45GHz ~2.5GHz)



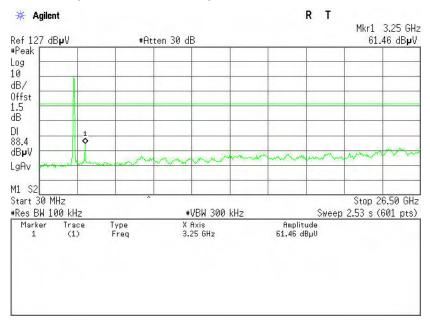
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Report No.: C131128Z01-RP1

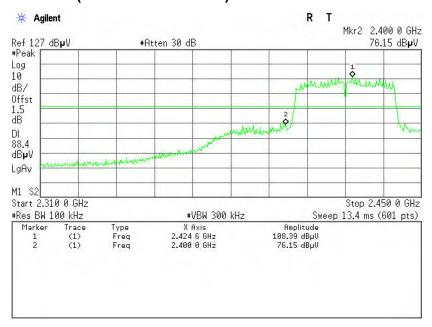
Antenna 0

IEEE 802.11n HT40 MHz mode

CH Low (30MHz ~26.5GHz)



CH Low (2.31GHz ~2.45GHz)



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