RADIO TEST REPORT
IC: 23494-SP012

Product: IP Camera

Trade Mark: Sricam

Model No.: SP012

Serial Model: SP007, SP008, SP015, SP017, SP018, SP019, SP020, SP023

Report No.: SER171225623001E

Issue Date: 09 Mar. 2018

Prepared for

Shenzhen Sricctv Technology Co., Ltd
The 4th Floor of Building46, 5th Industrial Park of Huaide Cuigang Fuyong Street, Bao'an, Shenzhen, China

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant's name ..... :	Shenzhen Sricctv Technology Co., Ltd
Address ..... :	The 4th Floor of Building46, 5th Industrial Park of Huaide Cuigang, Fuyong Street, Bao'an, Shenzhen, China
Manufacturer's Name ..... :	Shenzhen Sricctv Technology Co., Ltd
Address ..... :	The 4th Floor of Building46, 5th Industrial Park of Huaide Cuigang, Fuyong Street, Bao'an, Shenzhen, China
Product description	
Product name ..... :	IP Camera
Model and/or type reference ..... :	SP012
Serial Model ..... :	SP007, SP008, SP015, SP017, SP018, SP019, SP020, SP023.

Measurement Procedure Used:

APPLICABLE STANDARDS	
APPLICABLE STANDARD/ TEST PROCEDURE	TEST RESULT
RSS-247, Issue 2 Feb 2017 RSS GEN: Issue 4 Nov 2014 ANSI C63.10-2013	Complied

This device described above has been tested by NTEK Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the IC requirements. And it is applicable only to the tested sample identified in the report.
This report shall not be reproduced except in full, without the written approval of NTEK Testing Technology Co., Ltd., this document may be altered or revised by NTEK Testing Technology Co., Ltd., personnel only, and shall be noted in the revision of the document.
The test results of this report relate only to the tested sample identified in this report.

Date of Test : 26 Dec. 2017 ~09 Mar. 2018

Testing Engineer : Lake.Xie
(Lake Xie)

Technical Manager : Jason Chen
(Jason Chen)

Authorized Signatory : Sam . Chen
(Sam Chen)

2 SUMMARY OF TEST RESULTS

RSS 247			
Standard Section	**Test Item**	**Verdict**	**Remark**
RSS-Gen 6.12	Conducted Emission	PASS	
RSS-247.5.2(1)	6dB Bandwidth	PASS	
RSS-Gen 6.6	99% OCCUPIED BANDWIDTH	PASS	
RSS-247.5.4(4)	Maximum Output Power	PASS	
RSS-247.5.4(4)	Equivalent Isotropically Radiated Power	PASS	
RSS-Gen.6.13	Radiated Spurious Emission	PASS	
RSS-247.5.2(2)	Power Spectral Density	PASS	
RSS-247.5.5	Unwanted Spurious Emissions /Band Edge Emission	PASS	
RSS-Gen.6.7	Antenna Requirement	PASS	

Remark:
1. “N/A” denotes test is not applicable in this Test Report.
2. All test items were verified and recorded according to the standards and without any deviation during the test.

3 FACILITIES AND ACCREDITATIONS

3.1 FACILITIES

All measurement facilities used to collect the measurement data are located at 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

3.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

CNAS-Lab.	:	Accredited by CNAS, 2014.09.04 The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005) The Certificate Registration Number is L5516.
IC-Registration		Accredited by Industry Canada, August 29, 2012 The Certificate Registration Number is 9270A-1.
FCC- Accredited		Test Firm Registration Number: 463705. Designation Number: CN1184
A2LA-Lab.		The Certificate Registration Number is 4298.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).
Name of Firm	:	Shenzhen NTEK Testing Technology Co., Ltd.
Site Location	:	1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

3.3 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power, conducted	±0.16dB
3	Spurious emissions, conducted	±0.21dB
4	All emissions, radiated(<1G)	±4.68dB
5	All emissions, radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

4 GENERAL DESCRIPTION OF EUT

Product Feature and Specification	
Equipment	IP Camera
Trade Mark	Sricam
IC	23494-SP012
Model No.	SP012
Serial Model	SP007, SP008, SP015, SP017, SP018, SP019, SP020, SP023.
Model Difference	All the model are the same circuit and RF module, except the appearance.
Operating Frequency	2412-2462MHz for 802.11b/g/11n(HT20); 2422-2452MHz for 802.11n(HT40);
Modulation	DSSS with DBPSK/DQPSK/CCK for 802.11b; OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n;
Number of Channels	11 channels for 802.11b/g/11n(HT20); 7 channels for 802.11n(HT40);
Antenna Type	External Antenna
Antenna Gain	2 dBi
Power supply	☒DC supply: DC 5V from Adapter ☐AC supply:
	☒Adapter supply: Model:KA1503-0502000USS Input: 100-240V~50/60Hz 0.35A Output: 5V⎓2000mA
HW Version	V3.0
SW Version	21.0.0.30
Test Software	EngineerMode
RF Power Setting	802.11b:19; 802.11g:17; 802.11n HT20/HT40:17
Radio Software Version	N/A
Radio Hardware Version	N/A

Note: Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.

Revision History

Report No.	Version	Description	Issued Date
SER171225623001E	Rev.01	Initial issue of report	Mar 09, 2018

5 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.
The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Those data rates (802.11b: 1 Mbps; 802.11g: 6 Mbps; 802.11n (HT20): MCS0; 802.11n (HT40): MCS0) were used for all test.
The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The Y-plane results were found as the worst case and were shown in this report.

Frequency and Channel list for 802.11b/g/n (HT20):

Channel	Frequency(MHz)
1	2412
2	2417
…	…
5	2432
6	2437
…	…
10	2457
11	2462

Note: fc=2412MHz+(k-1)×5MHz k=1 to 11

EUT built-in battery-powered, fully-charged battery use of the test battery

Test Mode:

Test Items	Mode	Data Rate	Channel	Ant
AC Power Line Conducted Emissions	Normal Link	-	-	-
Maximum Conducted Output Power	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11n HT20	MCS0	1/6/11	1
	11n HT40	MCS0	3/6/9	1
Power Spectral Density				
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11n HT20	MCS0	1/6/11	1
	11n HT40	MCS0	3/6/9	1
6dB Spectrum Bandwidth				
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11n HT20	MCS0	1/6/11	1
	11n HT40	MCS0	3/6/9	1
Radiated Emissions Below 1GHz				
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11n HT20	MCS0	1/6/11	1
	11n HT40	MCS0	3/6/9	1
Radiated Emissions Above 1GHz				
	11b/CCK	1 Mbps	1/6/11	1
	11g/BPSK	6 Mbps	1/6/11	1
	11n HT20	MCS0	1/6/11	1
	11n HT40	MCS0	3/6/9	1
Band Edge Emissions				
	11b/CCK	1 Mbps	1/11	1
	11g/BPSK	6 Mbps	1/11	1
	11n HT20	MCS0	1/11	1
	11n HT40	MCS0	3/9	1

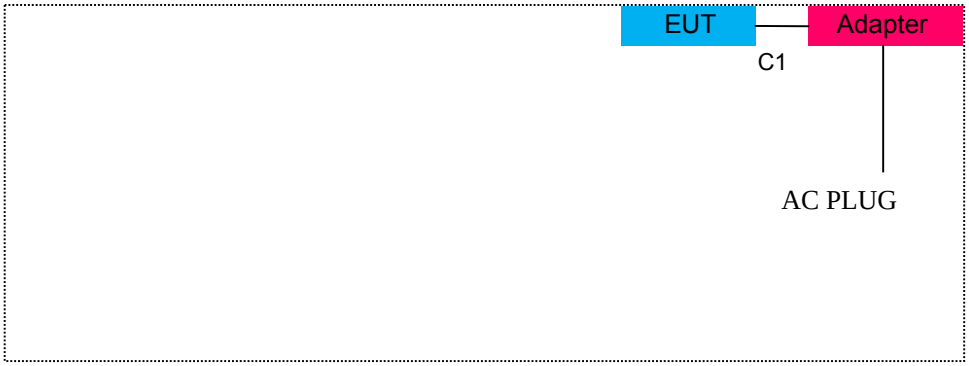
Note:

1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.
2. AC power line Conducted Emission was tested under maximum output power.
3. For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission.
4. EUT built-in battery-powered, fully-charged battery use of the test battery
5. EUT is set to continuous transmission mode. duty cycle greater than 98%.

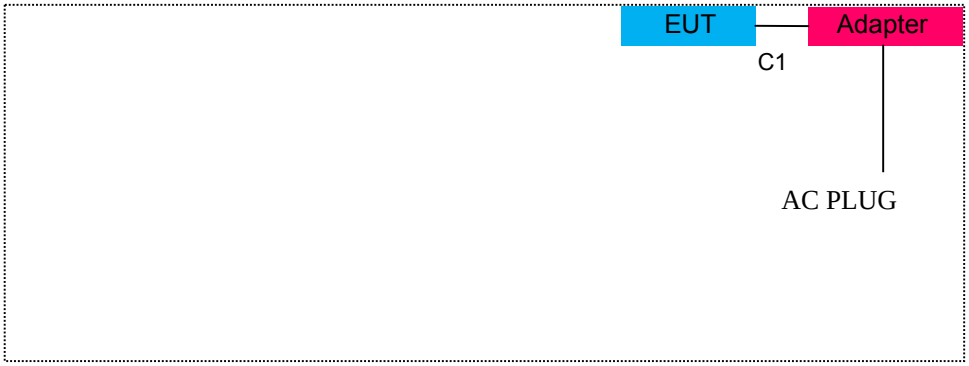
6 SETUP OF EQUIPMENT UNDER TEST

6.1 BLOCK DIAGRAM CONFIGURATION OF TEST SYSTEM

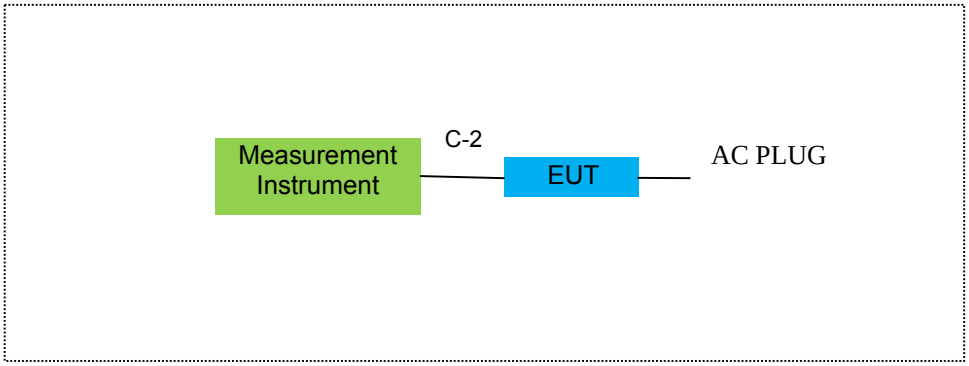
For AC Conducted Emission Mode



For Radiated Test Cases



For Conducted Test Cases



Note:The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list

6.2 SUPPORT EQUIPMENT

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.

Item	Equipment	Mfr/Brand	Model/Type No.	IC	Note
1.	IP Camera	Sricam	SP012	23494-SP012	EUT
2.	Adapter	N/A	KA1503-0502000USS	N/A	Peripherals

Item	Cable Type	Shielded Type	Ferrite Core	Length
C-1	Power Cable	NO	NO	1.2m
C-2	RF Cable	NO	NO	0.5m

Notes:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in『Length』column.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

6.3 EQUIPMENTS LIST FOR ALL TEST ITEMS

RF test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2017.07.06	2018.07.05	1 year
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2017.07.06	2018.07.05	1 year
3	EMI Test Receiver	Agilent	N9038A	MY53227146	2017.06.06	2018.06.05	1 year
4	Test Receiver	R&S	ESPI	101318	2017.06.06	2018.06.05	1 year
5	Bilog Antenna	TESEQ	CBL6111D	31216	2017.07.06	2018.07.05	1 year
6	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2017.06.06	2018.06.05	1 year
7	Horn Antenna	EM	EM-AH-10180	2011071402	2017.07.06	2018.07.05	1 year
8	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2017.07.06	2018.07.05	1 year
9	Amplifier	EM	EM-30180	060538	2017.12.22	2018.12.21	1 year
10	Amplifier	MITEQ	TTA1840-35-HG	177156	2017.06.06	2018.06.05	1 year
11	Loop Antenna	ARA	PLA-1030/B	1029	2017.06.06	2018.06.05	1 year
12	Power Meter	DARE	RPR3006W	100696	2017.07.06	2018.07.05	1 year
13	Test Cable (9KHz-30MHz)	N/A	R-01	N/A	2017.04.21	2020.04.20	3 year
14	Test Cable (30MHz-1GHz)	N/A	R-02	N/A	2017.04.21	2020.04.20	3 year
15	Test Cable (1-18GHz)	N/A	R-02	N/A	2017.04.21	2020.04.20	3 year
16	High Test Cable(1G-40GHz)	N/A	R-04	N/A	2017.04.21	2020.04.20	3 year
17	temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A

Note:

We will use the temporary antenna connector (soldered on the PCB board) When conducted test
And this temporary antenna connector is listed within the instrument list

AC Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Test Receiver	R&S	ESCI	101160	2017.06.06	2018.06.05	1 year
2	LISN	R&S	ENV216	101313	2017.08.24	2018.08.23	1 year
3	LISN	EMCO	3816/2	00042990	2017.08.24	2018.08.23	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2017.06.07	2018.06.06	1 year
5	Test Cable (9KHz-30MHz)	N/A	C01	N/A	2017.04.21	2020.04.20	3 year
6	Test Cable (9KHz-30MHz)	N/A	C02	N/A	2017.04.21	2020.04.20	3 year
7	Test Cable (9KHz-30MHz)	N/A	C03	N/A	2017.04.21	2020.04.20	3 year

Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable which is scheduled for calibration every 3 years.

7 TEST REQUIREMENTS

7.1 CONDUCTED EMISSIONS TEST

7.1.1 Applicable Standard

According to RSS-Gen 6.12

7.1.2 Conformance Limit

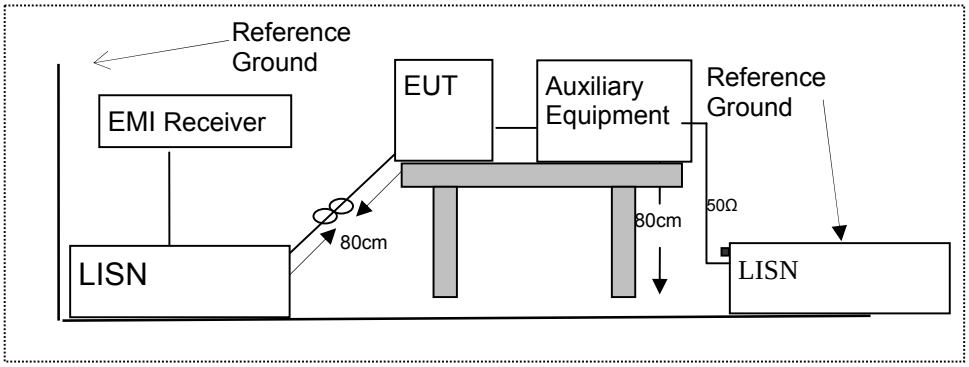
Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56*	56-46*
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. *Decreases with the logarithm of the frequency
2. The lower limit shall apply at the transition frequencies
3. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

7.1.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.1.4 Test Configuration



7.1.5 Test Procedure

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room.
2. The EUT was placed on a table which is 0.8m above ground plane.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
4. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40cm long.
5. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
6. LISN at least 80 cm from nearest part of EUT chassis.
7. The frequency range from 150KHz to 30MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth(IF bandwidth=9KHz) with Maximum Hold Mode
9. For the actual test configuration, please refer to the related Item –EUT Test Photos.

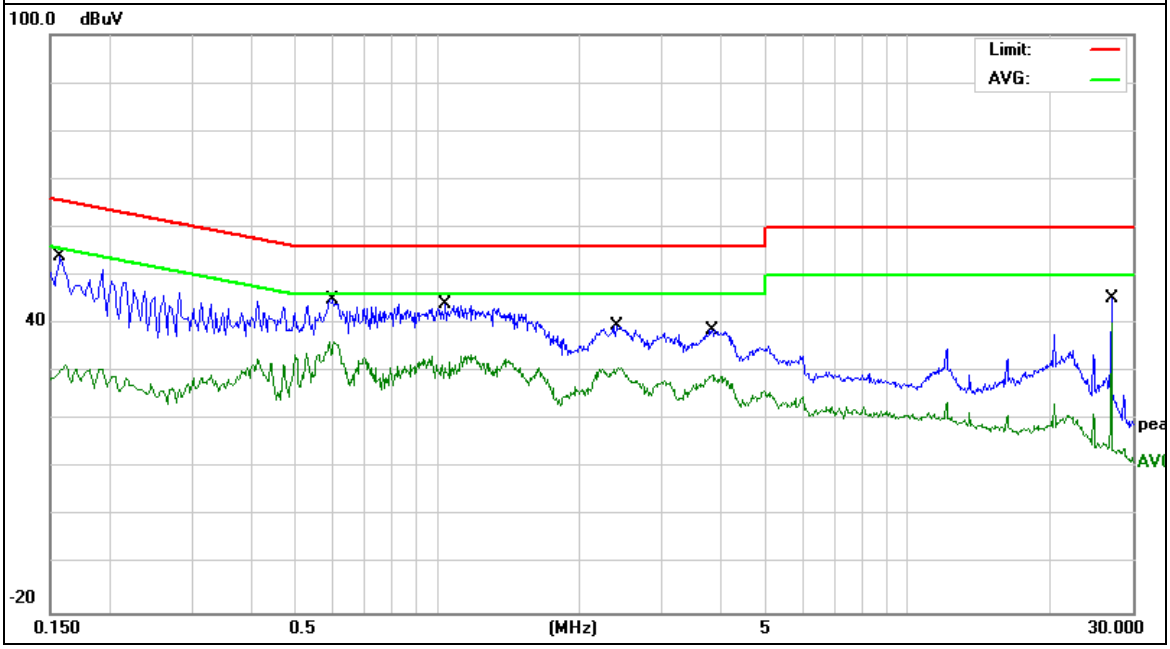
7.1.6 Test Results

EUT：	IP Camera	Model Name. ：	SP012
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase :	L
Test Voltage ：	DC 5V from adapter AC120V/60Hz	Test Mode：	Normal Link

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1580	44.12	9.82	53.94	65.56	-11.62	QP
0.1580	21.59	9.82	31.41	55.56	-24.15	AVG
0.5980	35.13	9.83	44.96	56.00	-11.04	QP
0.5980	26.46	9.83	36.29	46.00	-9.71	AVG
1.0380	34.16	9.93	44.09	56.00	-11.91	QP
1.0380	20.12	9.93	30.05	46.00	-15.95	AVG
2.4020	29.67	9.92	39.59	56.00	-16.41	QP
2.4020	19.60	9.92	29.52	46.00	-16.48	AVG
3.8380	28.57	10.05	38.62	56.00	-17.38	QP
3.8380	19.10	10.05	29.15	46.00	-16.85	AVG
26.9980	34.91	10.32	45.23	60.00	-14.77	QP
26.9980	29.75	10.32	40.07	50.00	-9.93	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

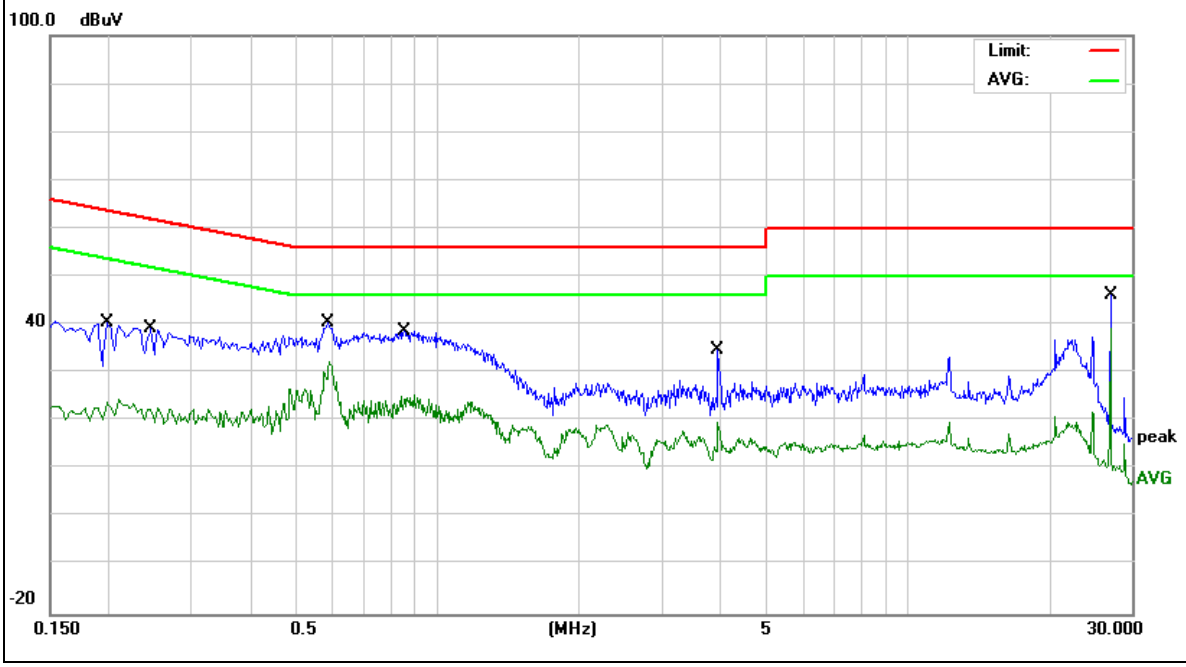


EUT：	IP Camera	Model Name. ：	SP012
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase :	N
Test Voltage ：	DC 5V from adapter AC120V/60Hz	Test Mode：	Normal Link

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1980	30.52	9.92	40.44	63.69	-23.25	QP
0.1980	13.49	9.92	23.41	53.69	-30.28	AVG
0.2459	29.37	9.92	39.29	61.89	-22.60	QP
0.2459	12.56	9.92	22.48	51.89	-29.41	AVG
0.5860	30.63	9.93	40.56	56.00	-15.44	QP
0.5860	22.52	9.93	32.45	46.00	-13.55	AVG
0.8499	28.67	9.93	38.60	56.00	-17.40	QP
0.8499	14.56	9.93	24.49	46.00	-21.51	AVG
3.9620	24.91	9.95	34.86	56.00	-21.14	QP
3.9620	7.97	9.95	17.92	46.00	-28.08	AVG
26.9980	35.69	10.40	46.09	60.00	-13.91	QP
26.9980	28.74	10.40	39.14	50.00	-10.86	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

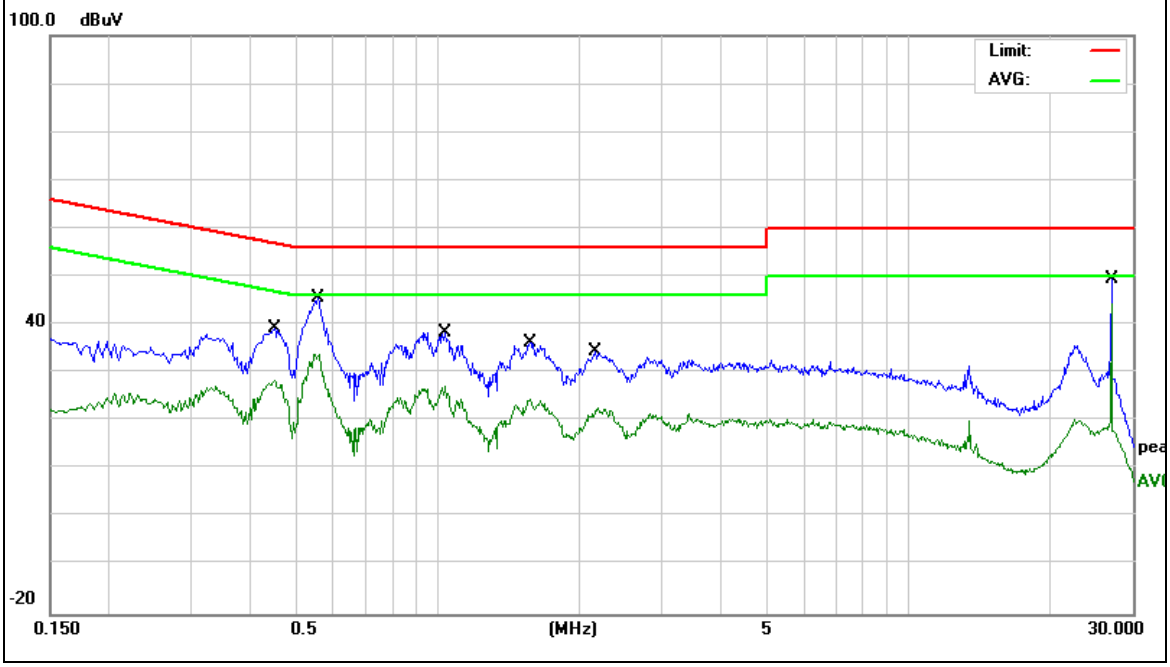


EUT：	IP Camera	Model Name. ：	SP012
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase :	L
Test Voltage ：	DC 5V from adapter AC240V/60Hz	Test Mode：	Normal Link

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.4500	29.51	9.83	39.34	56.87	-17.53	QP
0.4500	18.21	9.83	28.04	46.87	-18.83	AVG
0.5580	35.70	9.83	45.53	56.00	-10.47	QP
0.5580	24.04	9.83	33.87	46.00	-12.13	AVG
1.0420	28.33	9.93	38.26	56.00	-17.74	QP
1.0420	17.28	9.93	27.21	46.00	-18.79	AVG
1.5700	26.38	9.88	36.26	56.00	-19.74	QP
1.5700	14.33	9.88	24.21	46.00	-21.79	AVG
2.1620	24.60	9.87	34.47	56.00	-21.53	QP
2.1620	11.89	9.87	21.76	46.00	-24.24	AVG
26.9980	39.20	10.32	49.52	60.00	-10.48	QP
26.9980	33.93	10.32	44.25	50.00	-5.75	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

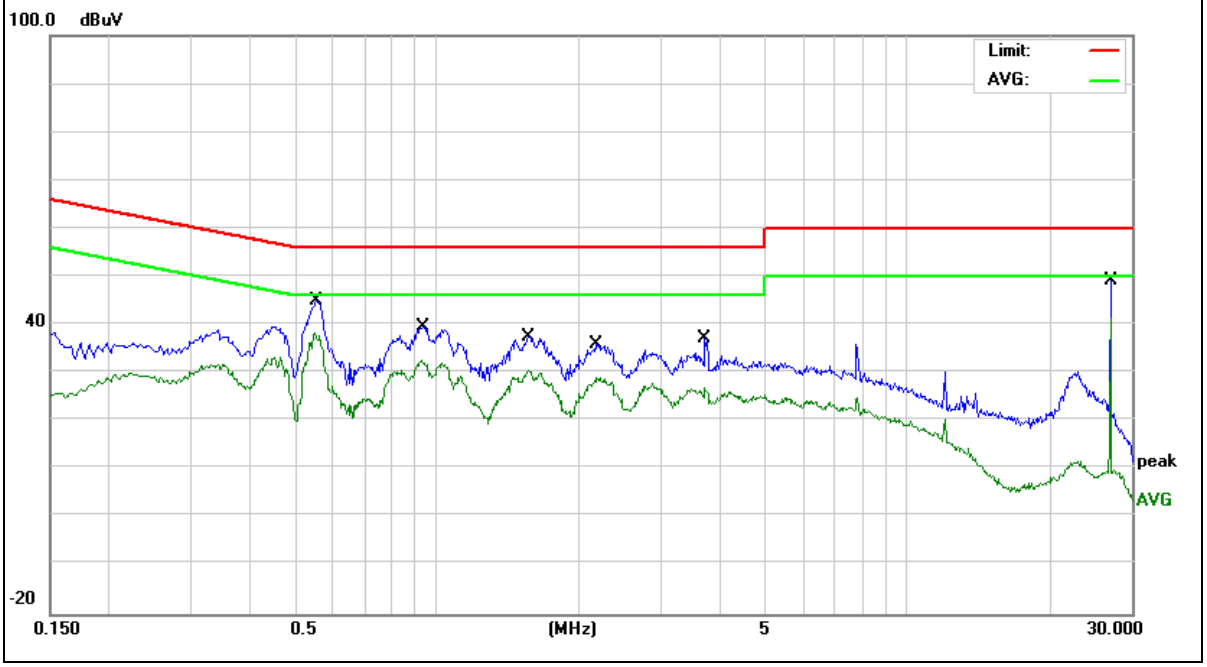


EUT：	IP Camera	Model Name. ：	SP012
Temperature：	26 ℃	Relative Humidity：	56%
Pressure：	1010hPa	Phase :	N
Test Voltage ：	DC 5V from adapter AC240V/60Hz	Test Mode：	Normal Link

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Remark
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.5540	35.16	9.93	45.09	56.00	-10.91	QP
0.5540	28.45	9.93	38.38	46.00	-7.62	AVG
0.9380	29.77	9.93	39.70	56.00	-16.30	QP
0.9380	22.82	9.93	32.75	46.00	-13.25	AVG
1.5620	27.63	9.94	37.57	56.00	-18.43	QP
1.5620	20.48	9.94	30.42	46.00	-15.58	AVG
2.1779	26.14	9.94	36.08	56.00	-19.92	QP
2.1779	18.26	9.94	28.20	46.00	-17.80	AVG
3.7139	27.13	9.95	37.08	56.00	-18.92	QP
3.7139	16.90	9.95	26.85	46.00	-19.15	AVG
26.9980	38.66	10.40	49.06	60.00	-10.94	QP
26.9980	31.05	10.40	41.45	50.00	-8.55	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



7.2 RADIATED SPURIOUS EMISSION

7.2.1 Applicable Standard

According to RSS-Gen 6.13

7.2.2 Conformance Limit

According to IC RSS-Gen 6.13: radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits. According to IC RSS-Gen, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(2)
13.36-13.41			

According to IC RSS-Gen 4.9, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009~0.490	2400/F(KHz)	20 log (uV/m)	300
0.490~1.705	2400/F(KHz)	20 log (uV/m)	30
1.705~30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Limits of Radiated Emission Measurement(Above 1000MHz)

Frequency(MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

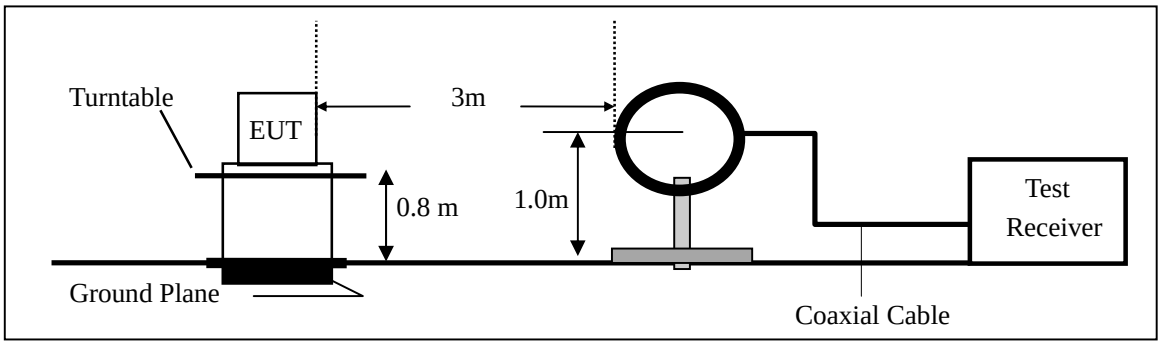
Remark :1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

7.2.3 Measuring Instruments

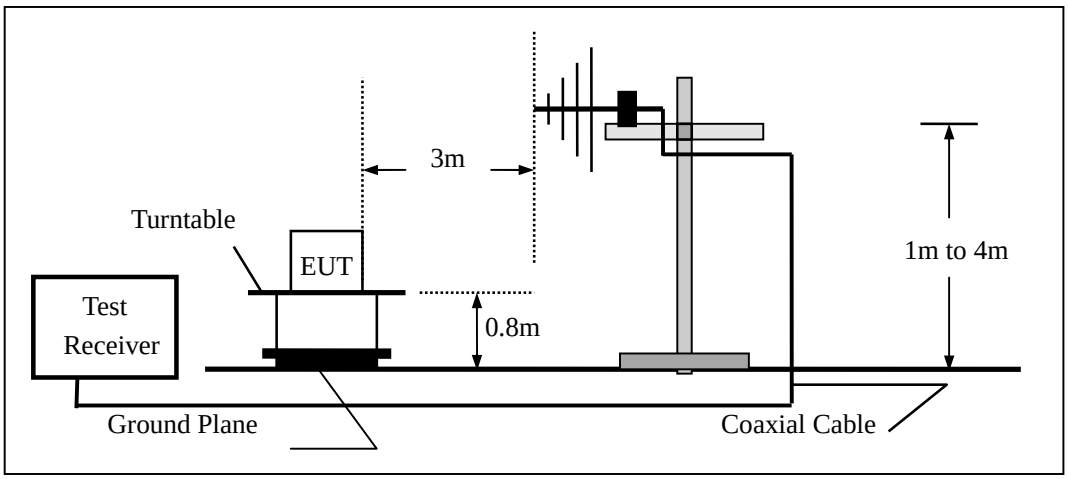
The Measuring equipment is listed in the section 6.3 of this test report.

7.2.4 Test Configuration

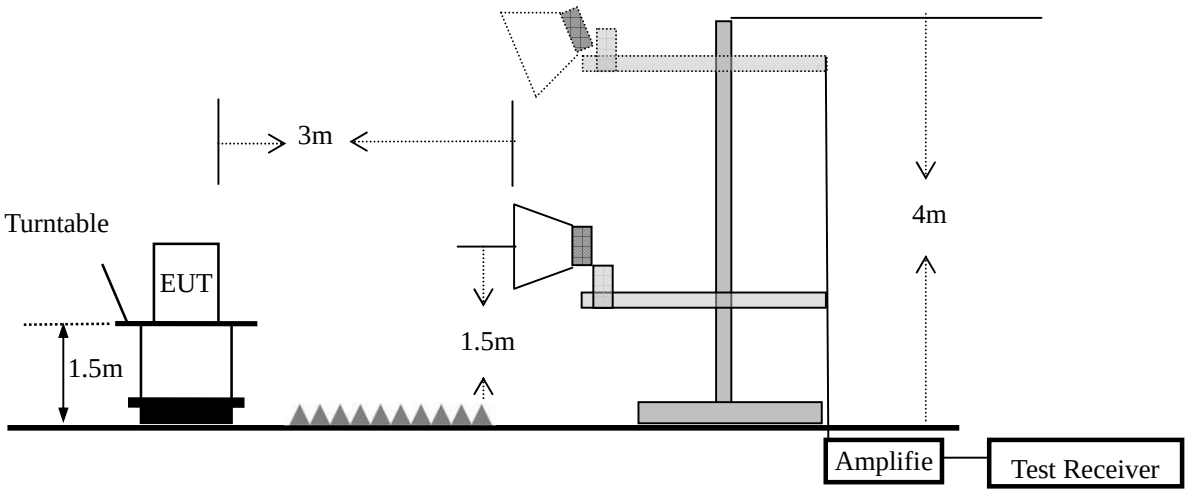
(a) For radiated emissions below 30MHz



(b) For radiated emissions from 30MHz to 1000MHz



(c) For radiated emissions above 1000MHz



7.2.5 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10-2013. The test distance is 3m.The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.
This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT.
Use the following spectrum analyzer settings:

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

Measurements shall be taken, using the following steps, at a test site that has been validated using the procedures of ANSI C63.4 or the latest CISPR 16-1-4 for measurements above 1 GHz, so as to simulate a near free-space environment (see RSS-Gen for applicable versions of ANSI and CISPR standards).
(1) Line the ground plane with absorbers between the transmitter and the receive antenna to minimize reflections. The absorbers used should have a minimum-rated attenuation of 20 dB through the measurement frequency range of interest. The absorbers shall be positioned to replicate the layout used when compliance with the applicable acceptability criterion was achieved, as set forth in the aforementioned standards on site validation.
(2) Set the height of the receive antenna to 1.5 m. The receive antenna must be one that was designed and fabricated to operate over the entire frequency range of interest, for example, an appropriate standard gain horn.
(3) The distance between the receive antenna and the radiating source shall be sufficient in order to ensure far-field conditions.
(4) Mount the transmitter at a height of 1.5 m.
(5) Configure the device under test (DUT) to produce the maximum power spectral density as measured while assessing compliance with Section 6.2.2 (i.e. channel frequency, modulation type and data rate). If the DUT is equipped with a detachable antenna and the antenna is intended for remote installation (i.e. tower-mounted), the DUT may be substituted with a suitable signal generator. The level and frequency settings on the generator shall be set so as to reproduce the maximum power spectral density, measured within a 1 MHz bandwidth, obtained while assessing compliance to Section 6.2.2.
(6) Position the transmitter or the radiating antenna so that elevation pattern measurements can be taken.
(7) Find the 0° reference point in the horizontal plane.
(8) Care should be taken when positioning the receive antenna to avoid cross-polarization. Antennas of known mounting polarization should be assessed with the receive antenna oriented in the same polarity. If the polarization of the transmit antenna is unknown or the transmit antenna can be mounted in either polarization, e.i.r.p. measurements should be performed to find which
mounting polarity provides the highest e.i.r.p. value. Testing shall be carried out with the receive antenna and the DUT mounted in each polarity.
(9) The emission shall be centred on the display of the spectrum analyzer with the following settings:
i. If the power spectral density of the DUT was assessed with a peak detector and the antenna cannot be detached from the DUT, the spectrum analyzer shall be set to a peak detector with a resolution bandwidth and video bandwidth of 1 MHz.
ii. If the power spectral density of the DUT was assessed using a sample detector with power averaging and the antenna cannot be detached from the DUT, the spectrum analyzer shall be set to a sample detector, configured to produce 100 power averages and set with a resolution bandwidth, as well as a video bandwidth of 1 MHz.
iii. If the antenna can be detached from the DUT, a continuous wave (CW) signal equal to that of the power

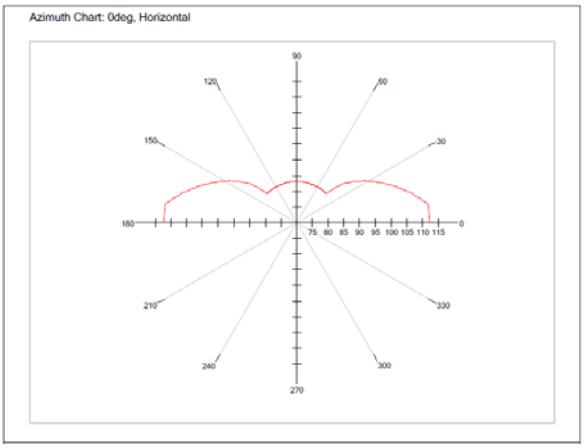
spectral density measurement may be used, the spectrum analyzer shall be set to peak detector with a resolution bandwidth and video bandwidth of 1 MHz.

(10) Rotate the turntable 360° recording the field strength at each step. Throughout the main beam of the antenna, the step size shall be kept to a maximum of 1°.
Once outside the main beam of the antenna, the maximum step size shall be as follows, when compared to the requirements of Section 6.2.2:
i. Between 0° and 8°, maximum step size of 2°;
ii. Between 8° and 40°, maximum step size of 4°;
iii. Between 40° and 45°, maximum step size of 1°;
iv. Between 45° and 90°, maximum step size of 5°.
Once the mask reaches 90°, the mask will be inverted and the step size will follow in the same manner as above.
For the purpose of this procedure, the main beam of the antenna is defined as the 3 dB beamwidth.
(11) Convert the measured field strength values in terms of e.i.r.p. density (dBW/1 MHz) using the following equation:

$$\text{e.i.r.p density(dBW/MHz)} = 10\log((E*r)^2/30)$$

E = field strength in V/m
r = measurement distance in metres

(12) Plot the results against the emission mask with reference to the horizontal plane.
(13) Using the plot, the 0° can be rotated to determine the worst-case installation tilt angle.
(14) Testing shall be performed using the highest gain antenna for every antenna type, if applicable.
(15) Antenna type(s), antenna model number(s), and worst-case tilt angle(s) necessary to remain compliant with the elevation mask requirement set forth in Section 6.2.2(3) of RSS-247 shall be clearly indicated in the user manual.
The following figure is an example of a polar elevation mask measured using the Method 1 reference to dBµV/m at 3 m.



During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Note: for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*lg(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

7.2.6 Test Results

■ Spurious Emission below 30MHz (9KHz to 30MHz)

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity：	48%
Test Mode:	802.11b/g/n(20/40 MHz)	Test By:	Lake Xie

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
Distance extrapolation factor =20log(Specific distance/ test distance)(dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor

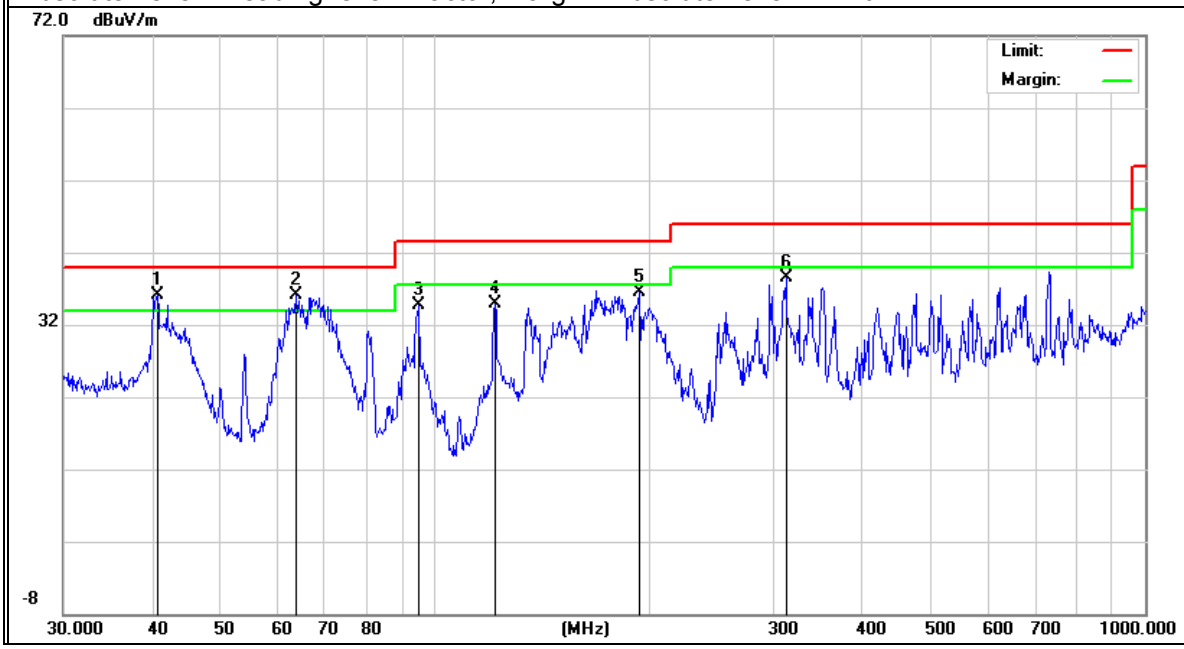
■ Spurious Emission below 1GHz (30MHz to 1GHz)

EUT：	IP Camera	Model Name ：	SP012
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 5V
Test Mode ：	TX (802.11b)		

All the modulation modes have been tested, and the worst result was report as below:

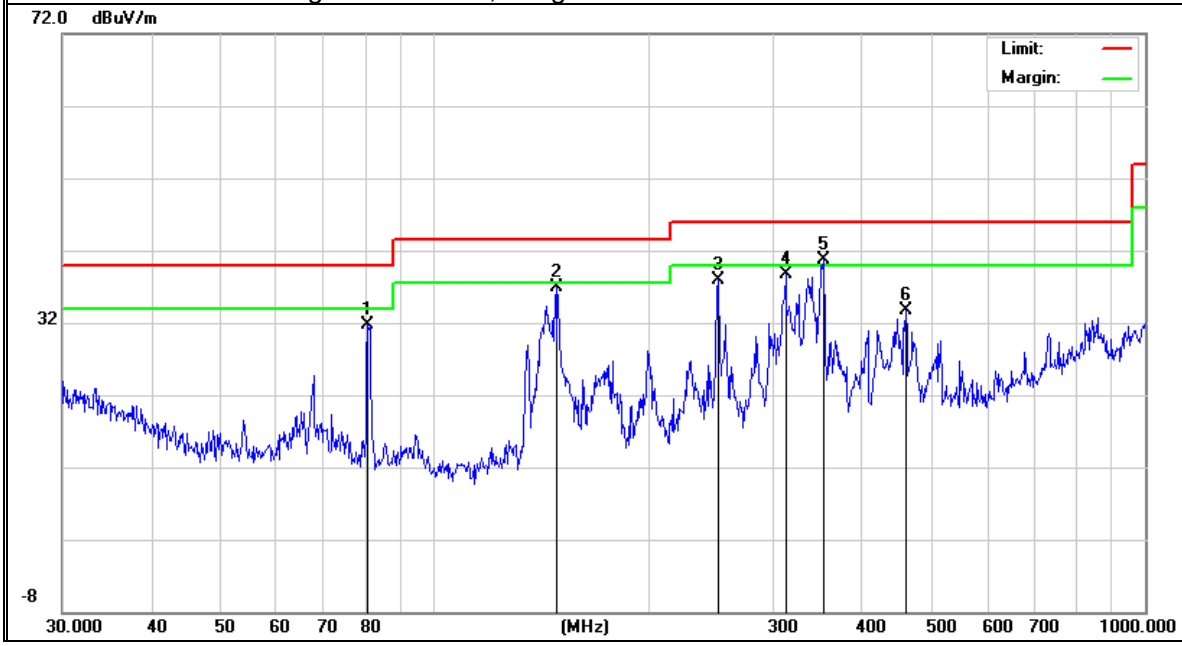
Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
V	40.7016	20.10	16.00	36.10	40.00	-3.90	QP
V	63.7588	27.13	8.89	36.02	40.00	-3.98	QP
V	94.7600	22.71	12.06	34.77	43.50	-8.73	QP
V	121.5485	24.27	10.60	34.87	43.50	-8.63	QP
V	194.4533	22.87	13.63	36.50	43.50	-7.00	QP
V	312.1792	25.28	13.29	38.57	46.00	-7.43	QP

Remark:
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
H	80.6442	20.43	11.34	31.77	40.00	-8.23	QP
H	148.9625	25.66	11.29	36.95	43.50	-6.55	QP
H	251.1803	25.65	12.20	37.85	46.00	-8.15	QP
H	312.1794	25.41	13.29	38.70	46.00	-7.30	QP
H	352.9433	26.33	14.39	40.72	46.00	-5.28	QP
H	460.7271	17.14	16.49	33.63	46.00	-12.37	QP

Remark:
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Spurious Emission Above 1GHz (1GHz to 25GHz)

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	802.11b/g/n(HT20, HT40)	Test By:	Lake Xie

All the modulation modes have been tested, and the worst result was report as below:

Frequency	Read Level	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark	Comment
(MHz)	(dBμV)	(dB)	dB/m	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
Low Channel (2412 MHz)(802.11b)--Above 1G									
4824.34	53.20	5.21	35.59	44.30	49.70	74	-24.30	Pk	Vertical
4824.34	43.77	5.21	35.59	44.30	40.27	54	-13.73	AV	Vertical
7236.05	50.69	6.48	36.27	44.60	48.84	74	-25.16	Pk	Vertical
7236.05	42.70	6.48	36.27	44.60	40.85	54	-13.15	AV	Vertical
4824.49	51.61	5.21	35.55	44.30	48.07	74	-25.93	Pk	Horizontal
4824.49	41.18	5.21	35.55	44.30	37.64	54	-16.36	AV	Horizontal
7236.59	49.78	6.48	36.27	44.52	48.01	74	-25.99	Pk	Horizontal
7236.59	43.56	6.48	36.27	44.52	41.79	54	-12.21	AV	Horizontal
Mid Channel (2437 MHz)(802.11b)--Above 1G									
4874.17	53.86	5.21	35.66	44.2	50.53	74	-23.47	Pk	Vertical
4874.17	43.70	5.21	35.66	44.2	40.37	54	-13.63	AV	Vertical
7311.18	54.68	7.10	36.50	44.43	53.85	74	-20.15	Pk	Vertical
7311.18	43.52	7.10	36.50	44.43	42.69	54	-11.31	AV	Vertical
4874.82	50.86	5.21	35.66	44.20	47.53	74	-26.47	Pk	Horizontal
4874.82	40.62	5.21	35.66	44.20	37.29	54	-16.71	AV	Horizontal
7311.03	49.74	7.10	36.50	44.43	48.91	74	-25.09	Pk	Horizontal
7311.03	42.23	7.10	36.50	44.43	41.40	54	-12.60	AV	Horizontal
High Channel (2462 MHz)(802.11b)--Above 1G									
4924.30	57.80	5.21	35.52	44.21	54.32	74	-19.68	Pk	Vertical
4924.30	43.47	5.21	35.52	44.21	39.99	54	-14.01	AV	Vertical
7386.97	54.83	7.10	36.53	44.60	53.86	74	-20.14	Pk	Vertical
7386.97	42.93	7.10	36.53	44.60	41.96	54	-12.04	AV	Vertical
4924.65	53.15	5.21	35.52	44.21	49.67	74	-24.33	Pk	Horizontal
4924.65	43.37	5.21	35.52	44.21	39.89	54	-14.11	AV	Horizontal
7386.73	49.09	7.10	36.53	44.60	48.12	74	-25.88	Pk	Horizontal
7386.73	43.16	7.10	36.53	44.60	42.19	54	-11.81	AV	Horizontal

Note: (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
(2) Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor
(3) Data of measurement within this frequency range shown " -- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(4)"802.11b" mode is the worst mode. When PK value is lower than the Average value limit, average didn't record.

■ Spurious Emission in Restricted Band 2310MHz-18000MHz the worst result was report as below:

Frequency (MHz)	Meter Reading (dBμV)	Cable Loss (dB)	Antenna Factor dB/m	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
802.11b									
2310.00	50.98	2.97	27.80	43.80	37.95	74	-36.05	Pk	Horizontal
2310.00	43.23	2.97	27.80	43.80	30.20	54	-23.80	AV	Horizontal
2310.00	50.20	2.97	27.80	43.80	37.17	74	-36.83	Pk	Vertical
2310.00	41.51	2.97	27.80	43.80	28.48	54	-25.52	AV	Vertical
2390.00	53.05	3.14	27.21	43.80	39.60	74	-34.40	Pk	Vertical
2390.00	44.46	3.14	27.21	43.80	31.01	54	-22.99	AV	Vertical
2390.00	52.30	3.14	27.21	43.80	38.85	74	-35.15	Pk	Horizontal
2390.00	41.20	3.14	27.21	43.80	27.75	54	-26.25	AV	Horizontal
2483.50	52.57	3.58	27.70	44.00	39.85	74	-34.15	Pk	Vertical
2483.50	41.32	3.58	27.70	44.00	28.60	54	-25.40	AV	Vertical
2483.50	51.75	3.58	27.70	44.00	39.03	74	-34.97	Pk	Horizontal
2483.50	40.11	3.58	27.70	44.00	27.39	54	-26.61	AV	Horizontal
802.11g									
2310.00	51.82	2.97	27.80	43.80	38.79	74	-35.21	Pk	Horizontal
2310.00	40.38	2.97	27.80	43.80	27.35	54	-26.65	AV	Horizontal
2310.00	52.32	2.97	27.80	43.80	39.29	74	-34.71	Pk	Vertical
2310.00	43.60	2.97	27.80	43.80	30.57	54	-23.43	AV	Vertical
2390.00	50.51	3.14	27.21	43.80	37.06	74	-36.94	Pk	Vertical
2390.00	40.79	3.14	27.21	43.80	27.34	54	-26.66	AV	Vertical
2390.00	52.89	3.14	27.21	43.80	39.44	74	-34.56	Pk	Horizontal
2390.00	42.93	3.14	27.21	43.80	29.48	54	-24.52	AV	Horizontal
2483.50	51.59	3.58	27.70	44.00	38.87	74	-35.13	Pk	Vertical
2483.50	42.00	3.58	27.70	44.00	29.28	54	-24.72	AV	Vertical
2483.50	51.28	3.58	27.70	44.00	38.56	74	-35.44	Pk	Horizontal
2483.50	44.33	3.58	27.70	44.00	31.61	54	-22.39	AV	Horizontal
802.11n20									
2310.00	51.06	2.97	27.80	43.80	38.03	74	-35.97	Pk	Horizontal
2310.00	42.38	2.97	27.80	43.80	29.35	54	-24.65	AV	Horizontal
2310.00	50.79	2.97	27.80	43.80	37.76	74	-36.24	Pk	Vertical
2310.00	40.42	2.97	27.80	43.80	27.39	54	-26.61	AV	Vertical
2390.00	54.09	3.14	27.21	43.80	40.64	74	-33.36	Pk	Vertical
2390.00	43.35	3.14	27.21	43.80	29.90	54	-24.10	AV	Vertical
2390.00	52.28	3.14	27.21	43.80	38.83	74	-35.17	Pk	Horizontal
2390.00	41.17	3.14	27.21	43.80	27.72	54	-26.28	AV	Horizontal
2483.50	52.08	3.58	27.70	44.00	39.36	74	-34.64	Pk	Vertical
2483.50	42.67	3.58	27.70	44.00	29.95	54	-24.05	AV	Vertical
2483.50	50.46	3.58	27.70	44.00	37.74	74	-36.26	Pk	Horizontal
2483.50	42.18	3.58	27.70	44.00	29.46	54	-24.54	AV	Horizontal
802.11n40									
2310.00	53.15	2.97	27.80	43.80	40.12	74	-33.88	Pk	Horizontal
2310.00	43.59	2.97	27.80	43.80	30.56	54	-23.44	AV	Horizontal
2310.00	50.17	2.97	27.80	43.80	37.14	74	-36.86	Pk	Vertical
2310.00	42.10	2.97	27.80	43.80	29.07	54	-24.93	AV	Vertical
2390.00	54.83	3.14	27.21	43.80	41.38	74	-32.62	Pk	Vertical
2390.00	42.00	3.14	27.21	43.80	28.55	54	-25.45	AV	Vertical
2390.00	52.28	3.14	27.21	43.80	38.83	74	-35.17	Pk	Horizontal
2390.00	44.88	3.14	27.21	43.80	31.43	54	-22.57	AV	Horizontal
2483.50	51.83	3.58	27.70	44.00	39.11	74	-34.89	Pk	Vertical
2483.50	40.13	3.58	27.70	44.00	27.41	54	-26.59	AV	Vertical
2483.50	53.70	3.58	27.70	44.00	40.98	74	-33.02	Pk	Horizontal
2483.50	40.65	3.58	27.70	44.00	27.93	54	-26.07	AV	Horizontal

(1) Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor

Spurious Emission in Restricted Bands 3260MMHz- 18000MHz

All the modulation modes have been tested, the worst result was report as below:

Frequency (MHz)	Reading Level (dBμV)	Cable Loss (dB)	Antenna Factor dB/m	Preamp Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
3260	61.44	4.04	29.57	44.70	50.35	74	-23.65	Pk	Vertical
3260	53.78	4.04	29.57	44.70	42.69	54	-11.31	AV	Vertical
3260	61.57	4.04	29.57	44.70	50.48	74	-23.52	Pk	Horizontal
3260	53.58	4.04	29.57	44.70	42.49	54	-11.51	AV	Horizontal
3332	64.67	4.26	29.87	44.40	54.40	74	-19.60	Pk	Vertical
3332	53.37	4.26	29.87	44.40	43.10	54	-10.90	AV	Vertical
3332	64.37	4.26	29.87	44.40	54.10	74	-19.90	Pk	Horizontal
3332	55.29	4.26	29.87	44.40	45.02	54	-8.98	AV	Horizontal
17789	46.58	10.99	43.95	43.50	58.02	74	-15.98	Pk	Vertical
17789	32.17	10.99	43.95	43.50	43.61	54	-10.39	AV	Vertical
17957	46.92	11.81	43.69	44.60	57.82	74	-16.18	Pk	Horizontal
17957	36.16	11.81	43.69	44.60	47.06	54	-6.94	AV	Horizontal

802.11b" mode is the worst mode. When PK value is lower than the Average value limit, average didn't record.

7.3 6DB BANDWIDTH

7.3.1 Applicable Standard

According to RSS-247 5.2(1)

7.3.2 Conformance Limit

The minimum -6 dB bandwidth shall be at least 500 kHz.

7.3.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.3.4 Test Setup

Please refer to Section 6.1 of this test report.

7.3.5 Test Procedure

The testing follows RSS-247 5.2(1)
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = the frequency band of operation
RBW = 100KHz
VBW ≥ 3*RBW
Sweep = auto
Detector function = peak
Trace = max hold

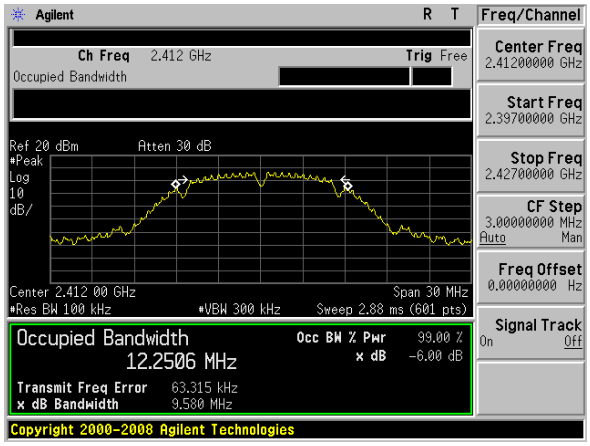
7.3.6 Test Results

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	802.11b/g/n(20/40MHz)	Test By:	Lake Xie

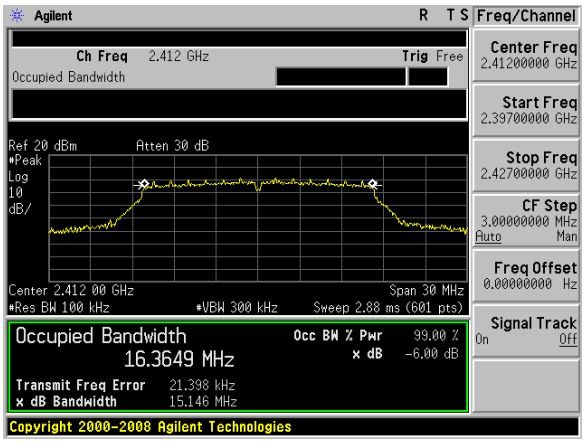
Mode	Channel	Frequency (MHz)	6dB bandwidth (MHz)	Limit (kHz)	Result
802.11b	Low	2412	9.580	500	Pass
	Middle	2437	9.133	500	Pass
	High	2462	9.137	500	Pass
802.11g	Low	2412	15.146	500	Pass
	Middle	2437	15.167	500	Pass
	High	2462	15.182	500	Pass
802.11n20	Low	2412	15.964	500	Pass
	Middle	2437	16.024	500	Pass
	High	2462	16.380	500	Pass
802.11n40	Low	2422	35.906	500	Pass
	Middle	2437	36.005	500	Pass
	High	2452	35.936	500	Pass

Test plot

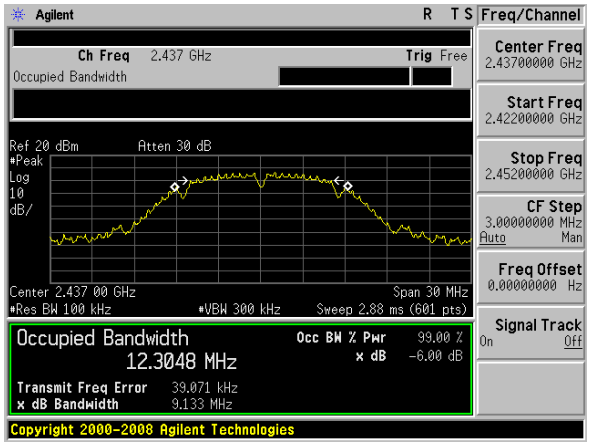
(802.11b) 6dB Bandwidth plot on channel 1



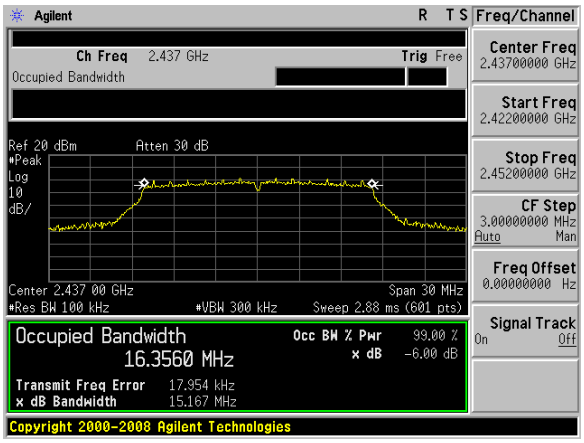
(802.11g) 6dB Bandwidth plot on channel 1



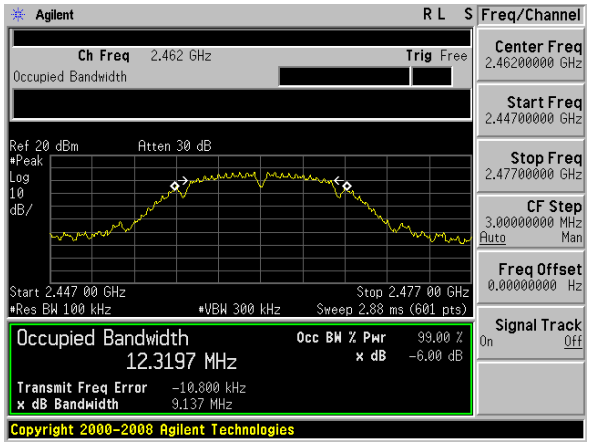
(802.11b) 6dB Bandwidth plot on channel 6



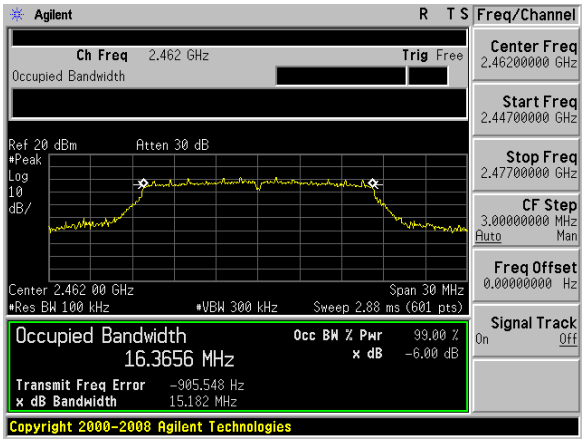
(802.11g) 6dB Bandwidth plot on channel 6



(802.11b) 6dB Bandwidth plot on channel 11

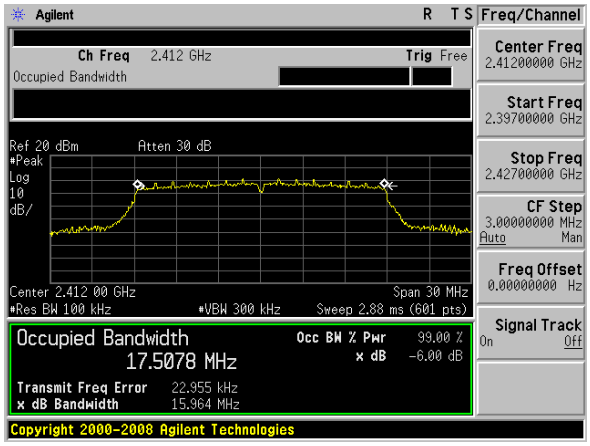


(802.11g) 6dB Bandwidth plot on channel 11

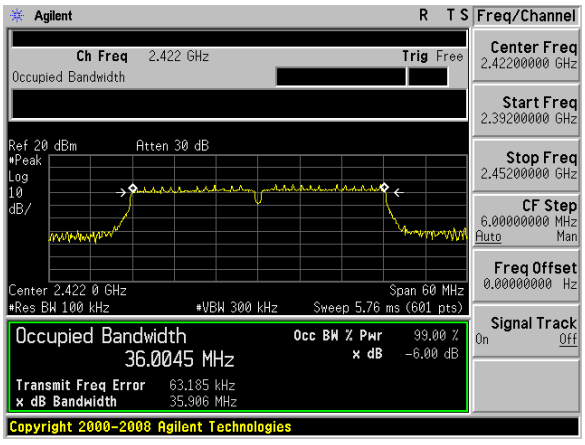


Test plot

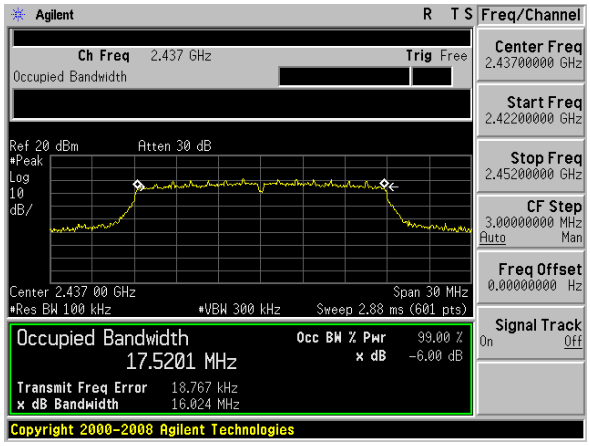
(802.11n20) 6dB Bandwidth plot on channel 1



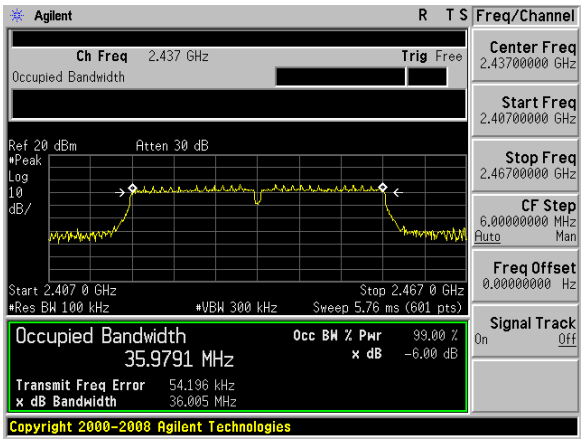
(802.11n40) 6dB Bandwidth plot on channel 3



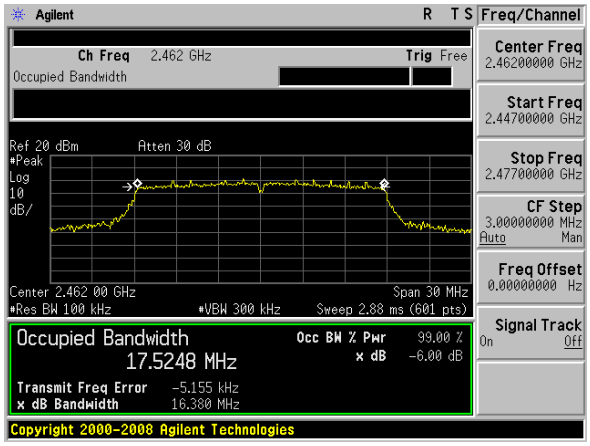
(802.11n20) 6dB Bandwidth plot on channel 6



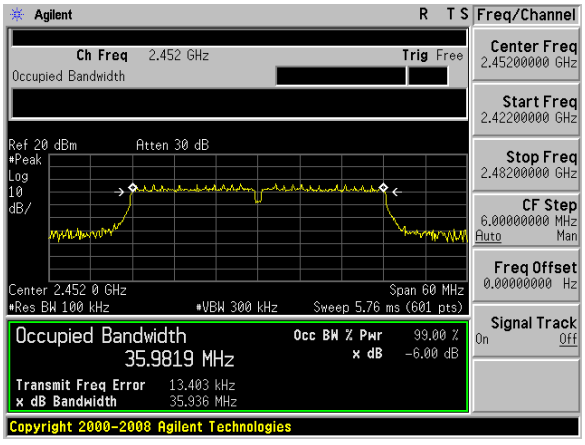
(802.11n40) 6dB Bandwidth plot on channel 6



(802.11n20) 6dB Bandwidth plot on channel 11



(802.11n40) 6dB Bandwidth plot on channel 9



7.4 99% OCCUPIED BANDWIDTH

7.4.1 Applicable Standard

According to RSS-Gen 6.6

7.4.2 Conformance Limit

No limit requirement.

7.4.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.4.4 Test Setup

Please refer to Section 6.1 of this test report.

7.4.5 Test Procedure

The testing follows RSS-Gen 6.6
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Set RBW = 1-5% of occupied bandwidth.
Set the video bandwidth (VBW) = approximately three times the RBW.
Set Span= approximately 2 times OBW
Set Detector = Peak.
Set Trace mode = max hold.
Set Sweep = auto couple.

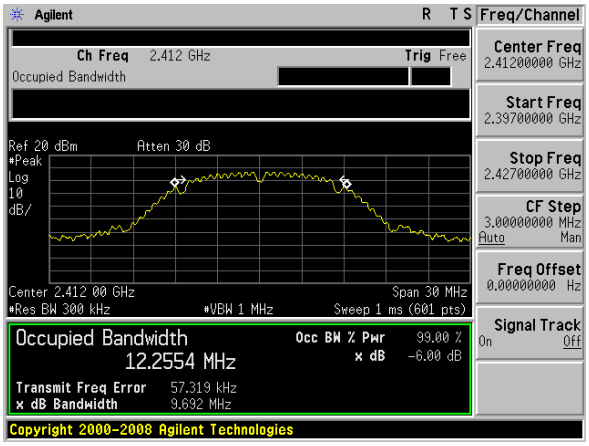
7.4.6 Test Results

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	802.11b/g/n(20/40 MHz)	Test By:	Lake Xie

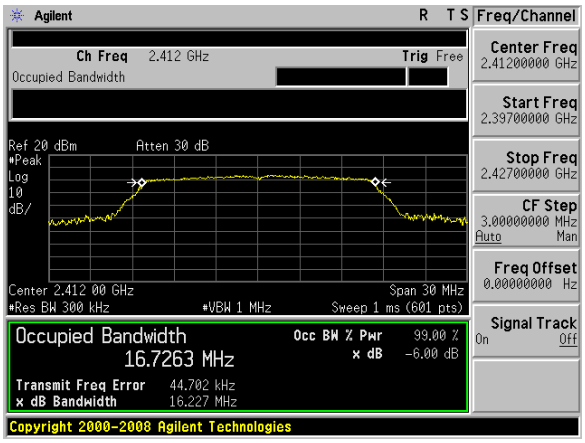
Mode	Channel	Frequency (MHz)	99% OCCUPIED BANDWIDTH (MHz)	Result
802.11b	Low	2412	12.255	Pass
	Middle	2437	12.282	Pass
	High	2462	12.343	Pass
802.11g	Low	2412	16.726	Pass
	Middle	2437	16.630	Pass
	High	2462	16.671	Pass
802.11n20	Low	2412	17.629	Pass
	Middle	2437	17.647	Pass
	High	2462	17.648	Pass
802.11n40	Low	2422	36.073	Pass
	Middle	2437	36.040	Pass
	High	2452	36.044	Pass

Test plot

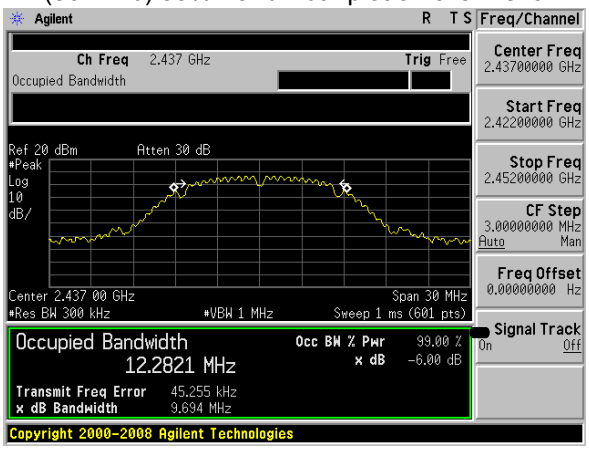
(802.11b) 99% Bandwidth plot on channel 1



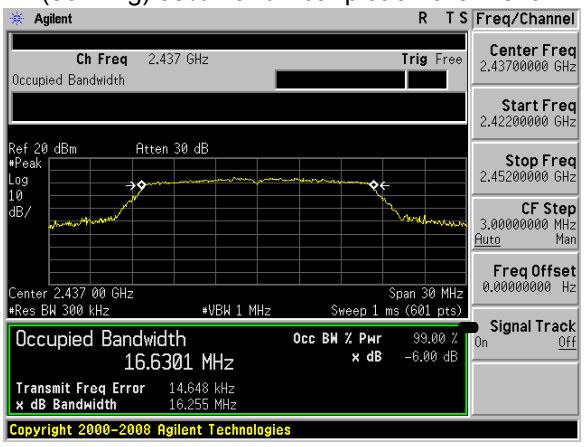
(802.11g) 99%dB Bandwidth plot on channel 1



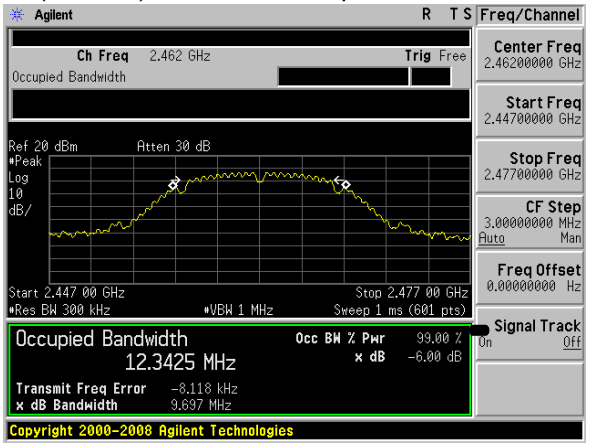
(802.11b) 99% Bandwidth plot on channel 6



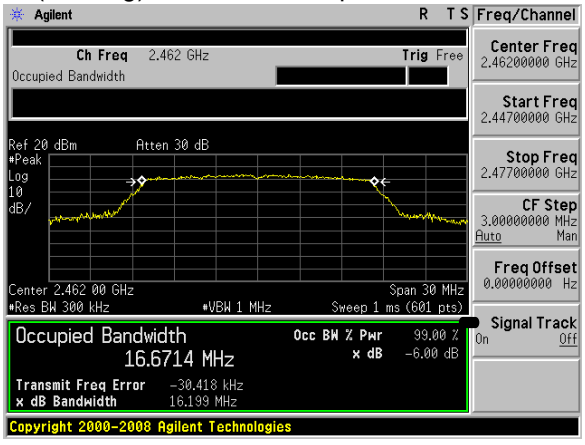
(802.11g) 99% Bandwidth plot on channel 6



(802.11b) 99% Bandwidth plot on channel 11

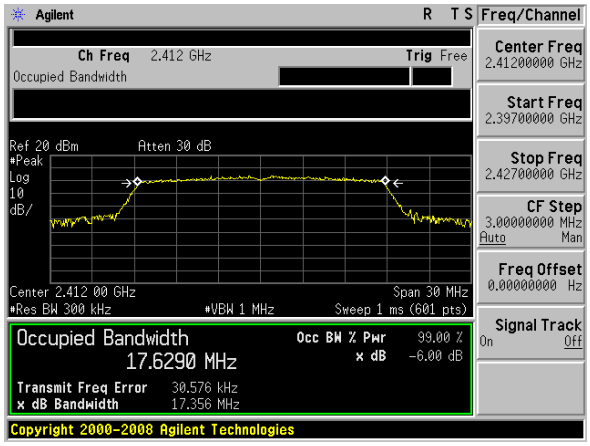


(802.11g) 99% Bandwidth plot on channel 11

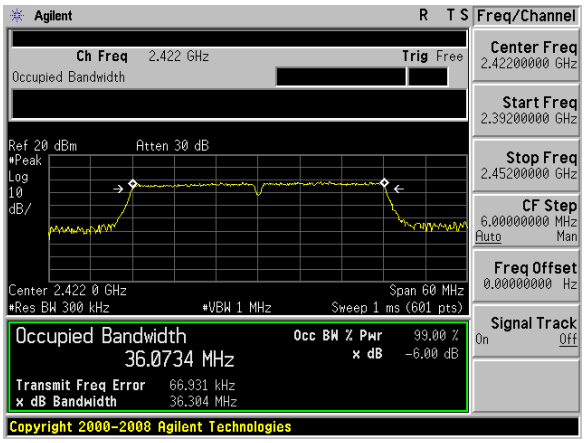


Test plot

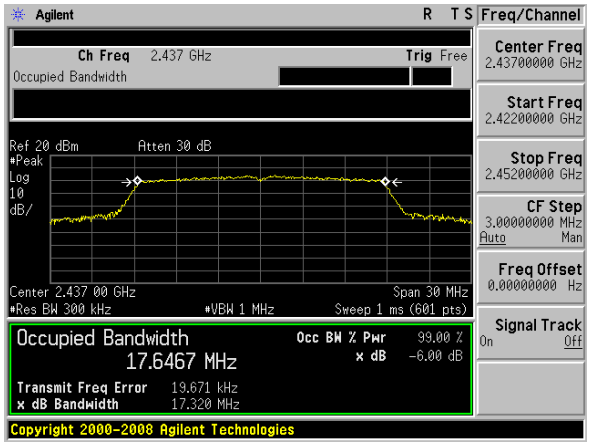
(802.11n20) 99% Bandwidth plot on channel 1



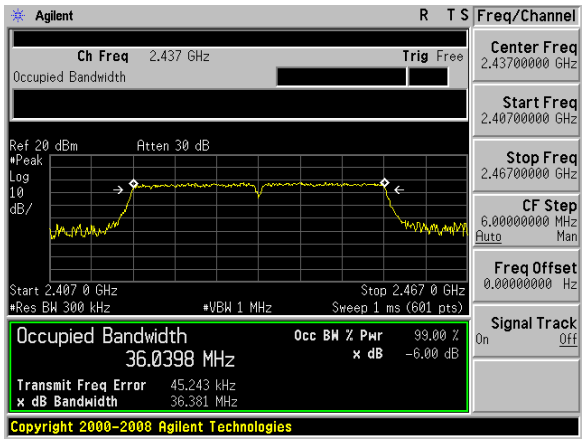
(802.11n40) 99% Bandwidth plot on channel 3



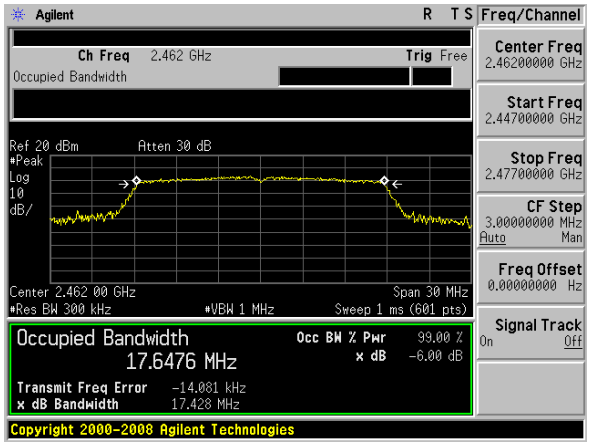
(802.11n20) 99% Bandwidth plot on channel 6



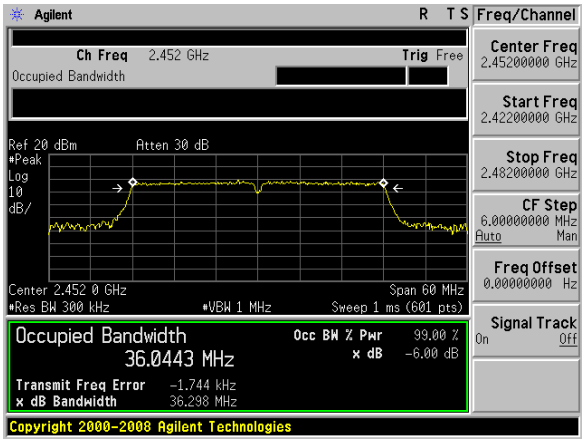
(802.11n40) 99% Bandwidth plot on channel 6



(802.11n20) 99% Bandwidth plot on channel 11



(802.11n40) 99% Bandwidth plot on channel 9



7.5 DUTY CYCLE

7.5.1 Applicable Standard

According to RSS-247 5.4(4)

7.5.2 Conformance Limit

No limit requirement.

7.5.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.5.4 Test Setup

Please refer to Section 6.1 of this test report.

7.5.5 Test Procedure

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW $\geqslant$ OBW if possible; otherwise, set RBW to the largest available value. Set VBW $\geqslant$ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T $\leqslant$ 16.7 microseconds.)

The transmitter output is connected to the Spectrum Analyzer. We tested accroding to the zero-span measurement method, 6.0)b) in RSS-247 5.4(4)

The largest availble value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if T $\leqslant$ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/T.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Use the following spectrum analyzer settings:
Span = Zero Span
RBW = 8MHz(the largest available value)
VBW = 8MHz ($\geq$ RBW)
Number of points in Sweep >100
Detector function = peak
Trace = Clear write
Measure T_{total} and T_{on}
Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor=10*log(1/Duty Cycle)

7.5.6 Test Results

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	TX 802.11b/g/n(20/40 MHz)	Test By:	Lake Xie

Mode	Data rate	Channel	T_{on}	T_{total}	Duty Cycle %	Duty Cycle Factor (dB)	1/T Minimum VBW (kHz)
802.11b	1Mbps	6	10	10	100	0.00	0.01
802.11g	6Mbps	6	10	10	100	0.00	0.01
802.11n HT20	MCS0	6	10	10	100	0.00	0.01
802.11n HT40	MCS0	6	10	10	100	0.00	0.01

7.6 MAXIMUM OUTPUT POWER

7.6.1 Applicable Standard

According to RSS-247 5.4(4)

7.6.2 Conformance Limit

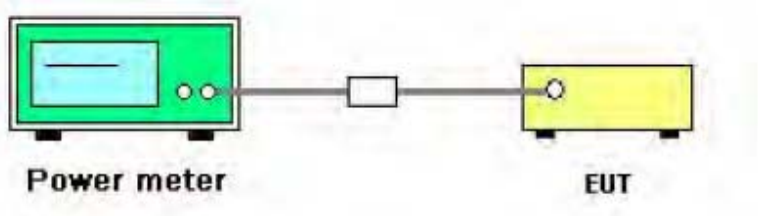
For employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W.

7.6.3 Measuring Instruments

The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	Average

7.6.4 Test Setup



7.6.5 Test Procedure

1. Test procedures refer KDB 558074 D01 v03r05 section 9.2.3.2 Measurement using a power meter (PM).
2. Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

7.6.6 EUT opration during Test

The EUT was programmed to be in continuously transmitting mode.

7.6.7 Test Results

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	TX 802.11b/g/n(20/40 MHz)	Test By:	Lake Xie

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Result
802.11b	Low	2412	14.2	30.00	Pass
	Middle	2437	14.5	30.00	Pass
	High	2462	14.4	30.00	Pass
802.11g	Low	2412	9.0	30.00	Pass
	Middle	2437	9.4	30.00	Pass
	High	2462	9.2	30.00	Pass
802.11n20	Low	2412	9.7	30.00	Pass
	Middle	2437	9.0	30.00	Pass
	High	2462	9.9	30.00	Pass
802.11n40	Low	2422	9.1	30.00	Pass
	Middle	2437	9.6	30.00	Pass
	High	2452	9.4	30.00	Pass

7.7 EQUIVALENT ISOTROPICALLY RADIATED POWER

7.7.1 Applicable Standard

According to RSS-247 5.4(4)

7.7.2 Conformance Limit

For employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the e.i.r.p. shall not exceed 4 W.

7.7.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.7.4 Test Setup

Please refer to Section 6.1 of this test report.

7.7.5 Test Procedure

The testing follows RSS-247 5.4(4)
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW = 1-5% of the OBW, not to exceed 1MHz.
d) Set VBW ≥3 x RBW.
e) Number of points in sweep ≥ 2x span / RBW.
(This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
f) Sweep time = auto.
g) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
h) If transmit duty cycle < 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle ≥ 98 %, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “free run”.
i) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
j) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

7.7.6 Test Results

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	TX 802.11b/g/n(20/40 MHz)	Test By:	Lake Xie

Mode	Channel	Frequency (MHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	E.I.R.P Measurement (dBm)	Limit (dBm)	Result
802.11b	Low	2412	14.2	2	16.2	36.02	Pass
	Middle	2437	14.5	2	16.5	36.02	Pass
	High	2462	14.4	2	16.4	36.02	Pass
802.11g	Low	2412	9.0	2	11.0	36.02	Pass
	Middle	2437	9.4	2	11.4	36.02	Pass
	High	2462	9.2	2	11.2	36.02	Pass
802.11n20	Low	2412	9.7	2	11.7	36.02	Pass
	Middle	2437	9.0	2	11.0	36.02	Pass
	High	2462	9.9	2	11.9	36.02	Pass
802.11n40	Low	2422	9.1	2	11.1	36.02	Pass
	Middle	2437	9.6	2	11.6	36.02	Pass
	High	2452	9.4	2	11.4	36.02	Pass

Note: EIRP= Output Power+ ANT Gain

7.8 POWER SPECTRAL DENSITY

7.8.1 Applicable Standard

According to RSS-247 5.4(4)

7.8.2 Conformance Limit

The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.8.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.8.4 Test Setup

Please refer to Section 6.1 of this test report.

7.8.5 Test Procedure

The testing follows RSS-247 5.4(4)

This procedure may be used when the maximum (average) conducted output power was used to demonstrate compliance to the output power limit. This is the baseline method for determining the maximum (average) conducted PSD level. If the instrument has an RMS power averaging detector, it must be used; otherwise, use the sample detector. The EUT must be configured to transmit continuously (duty cycle ≥ 98%); otherwise sweep triggering/signal gating must be implemented to ensure that measurements are made only when the EUT is transmitting at its maximum power control level (no transmitter off time is to be considered).

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 times the OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz. .
d) Set VBW ≥3 x RBW.
e) Detector = power averaging (RMS) or sample detector (when RMS not available).
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducin

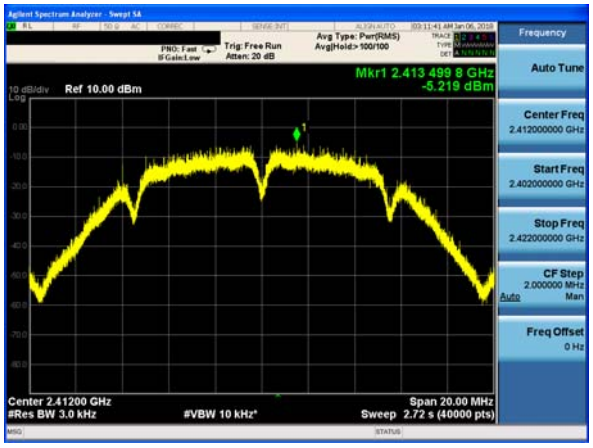
7.8.6 Test Results

EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	TX 802.11b/g/n(20/40 MHz)	Test By:	Lake Xie

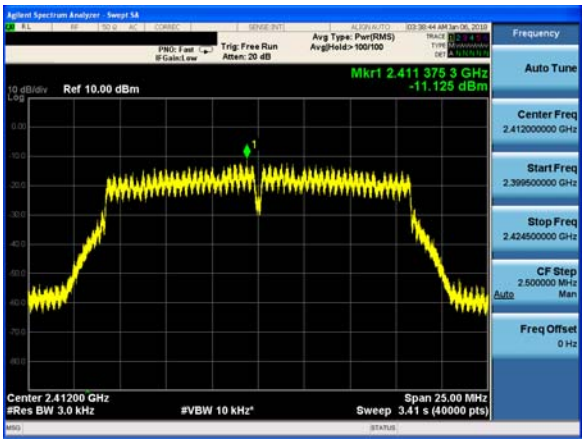
Mode	Channel	Frequency (MHz)	Power Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
802.11b	Low	2412	-5.219	8.00	Pass
	Middle	2437	-6.741	8.00	Pass
	High	2462	-7.209	8.00	Pass
802.11g	Low	2412	-11.125	8.00	Pass
	Middle	2437	-12.307	8.00	Pass
	High	2462	-10.832	8.00	Pass
802.11n20	Low	2412	-12.217	8.00	Pass
	Middle	2437	-11.135	8.00	Pass
	High	2462	-12.625	8.00	Pass
802.11n40	Low	2422	-18.502	8.00	Pass
	Middle	2437	-20.469	8.00	Pass
	High	2452	-18.931	8.00	Pass

Test plot

(802.11b) PSD plot on channel 1

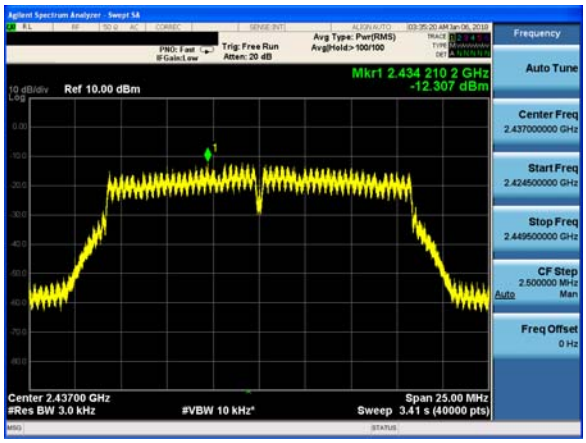


(802.11g) PSD plot on channel 1

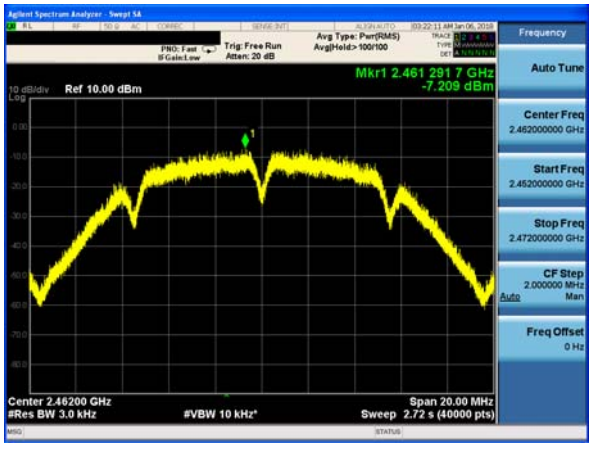


(802.11b) PSD plot on channel 6

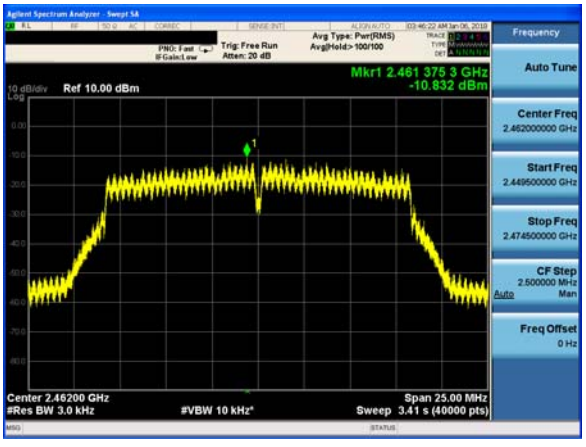
(802.11g) PSD plot on channel 6



(802.11b) PSD plot on channel 11

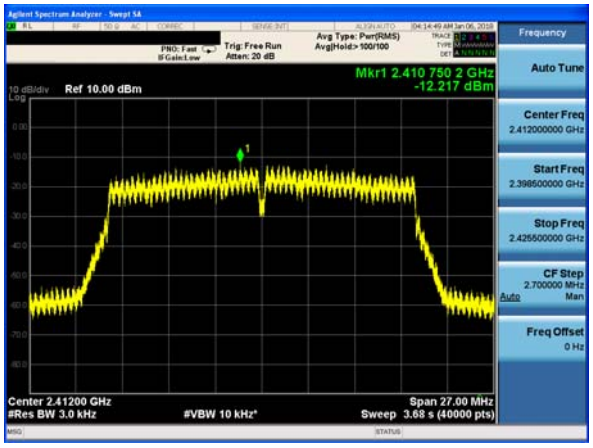


(802.11g) PSD plot on channel 11

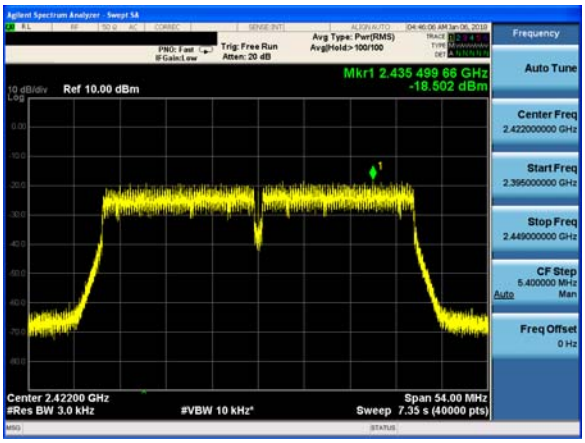


Test plot

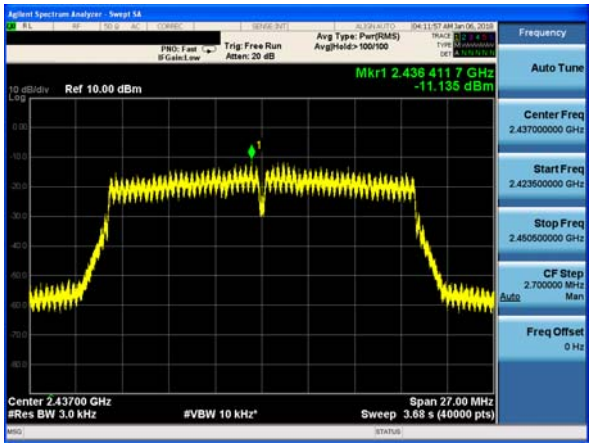
(802.11n20) PSD plot on channel 1



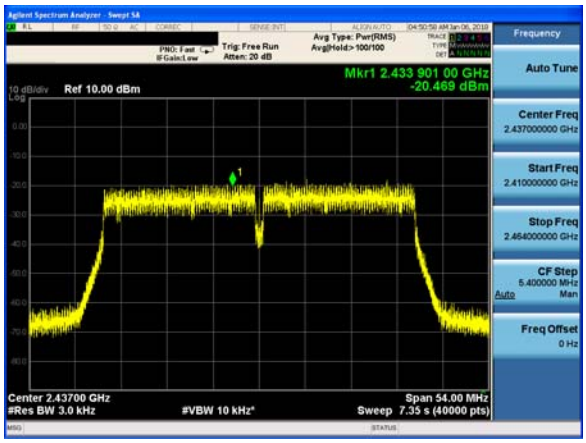
(802.11n40) PSD plot on channel 3



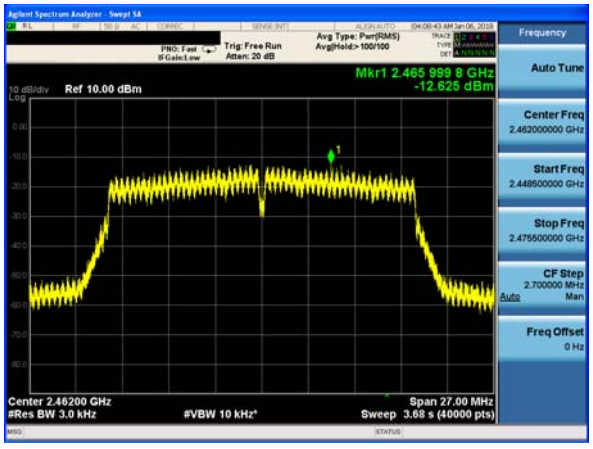
(802.11n20) PSD plot on channel 6



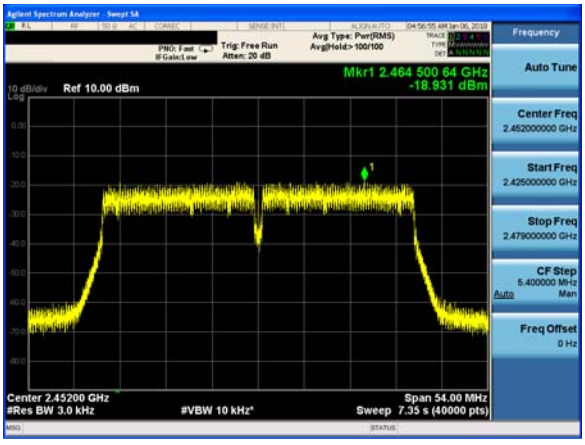
(802.11n40) PSD plot on channel 6



(802.11n20) PSD plot on channel 11



(802.11n40) PSD plot on channel 9



7.9 CONDUCTED BAND EDGE MEASUREMENT

7.9.1 Applicable Standard

According to RSS-247 5.5

7.9.2 Conformance Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

7.9.3 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.9.4 Test Setup

Please refer to Section 6.1 of this test report.

7.9.5 Test Procedure

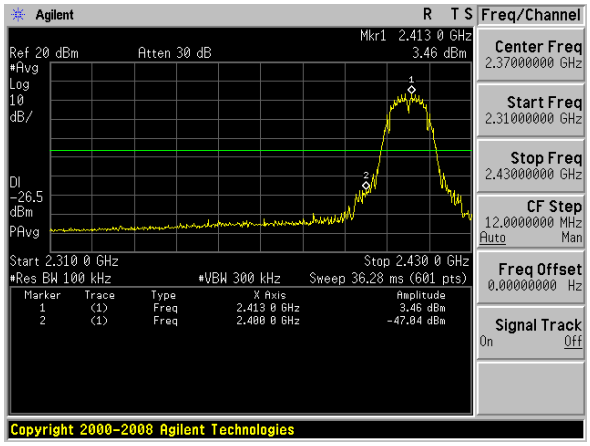
The testing follows RSS-247 5.5.
The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator.
The path loss was compensated to the results for each measurement.
Set to the maximum power setting and enable the EUT transmit continuously.
The EUT was operating in controlled its channel.
Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
Repeat above procedures until all measured frequencies were complete.

7.9.6 Test Results

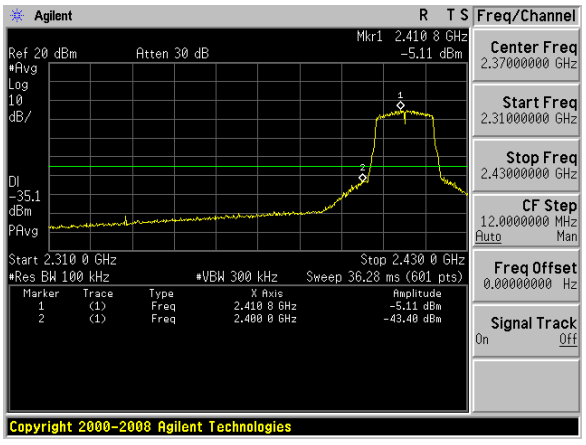
EUT:	IP Camera	Model No.:	SP012
Temperature:	20 ℃	Relative Humidity:	48%
Test Mode:	TX 802.11b/g/n(20/40 MHz)	Test By:	Lake Xie

Test plot For

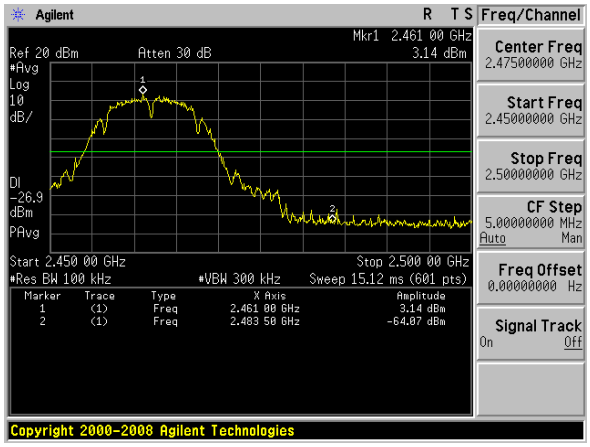
802.11b: Band Edge-Low Channel



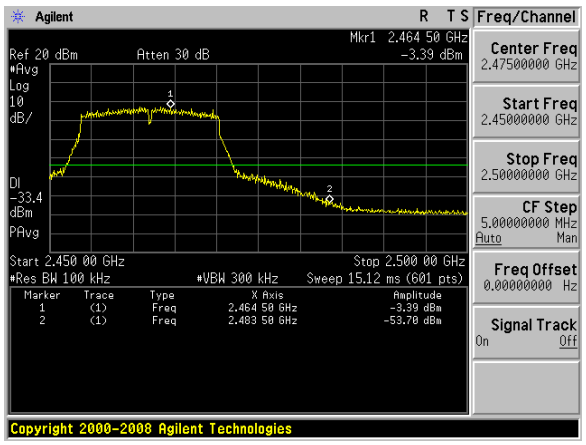
802.11g: Band Edge-Low Channel



802.11b: Band Edge-High Channel

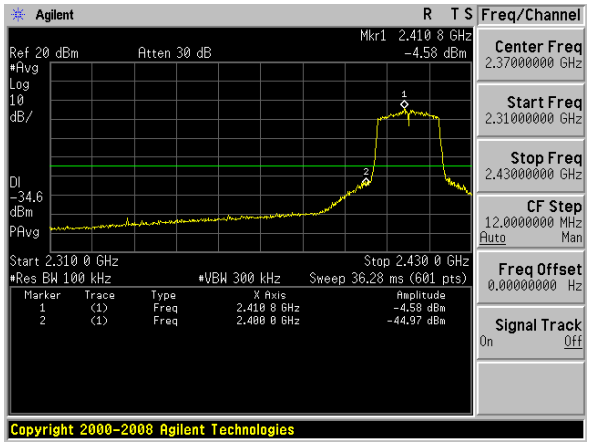


802.11g: Band Edge-High Channel

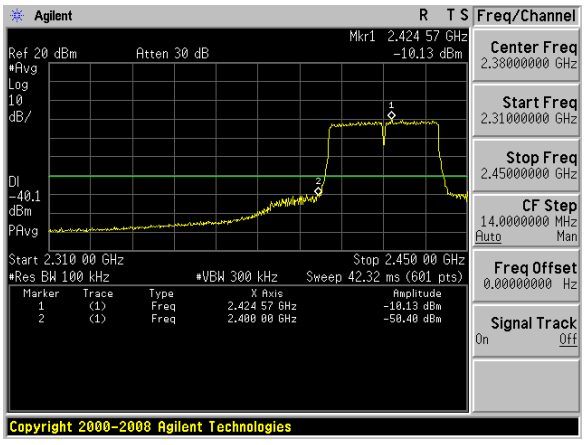


Test plot For

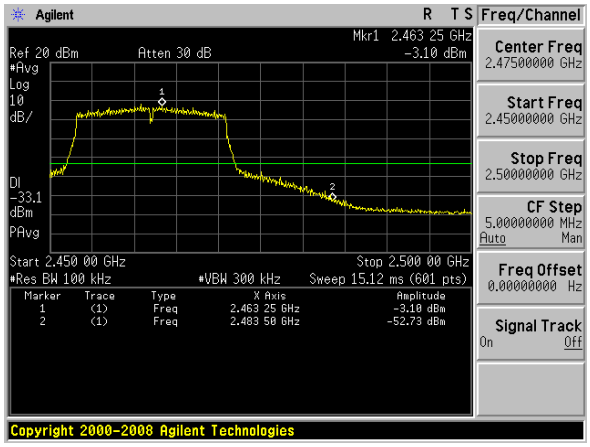
802.11n20: Band Edge-Low Channel



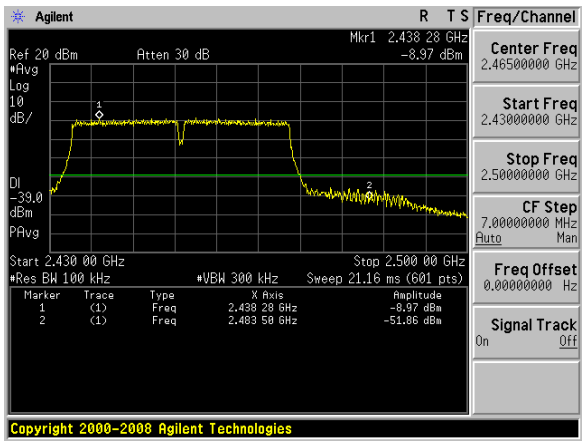
802.11n40: Band Edge-Low Channel



802.11n20: Band Edge-High Channel



802.11n40: Band Edge-High Channel



7.10 SPURIOUS RF CONDUCTED EMISSIONS

7.10.1 Conformance Limit

1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in RSS-gen-i4 8.10. The maximum permitted average field strength is listed in RSS-gen-i4 8.9.

7.10.2 Measuring Instruments

The Measuring equipment is listed in the section 6.3 of this test report.

7.10.3 Test Setup

Please refer to Section 6.1 of this test report.

7.10.4 Test Procedure

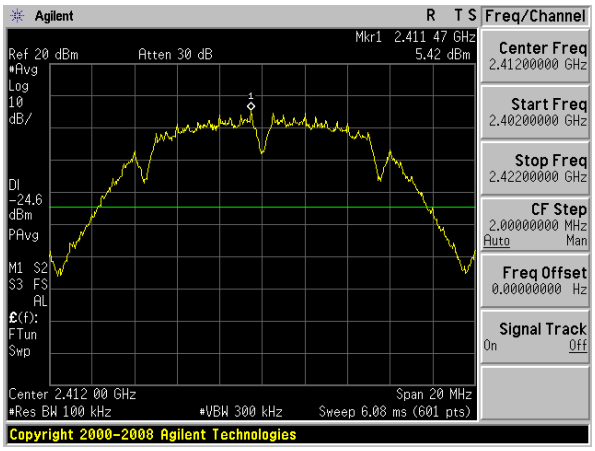
The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300KHz to measure the peak field strength , and mwasure frequeny range from 9KHz to 26.5GHz.

7.10.5 Test Results

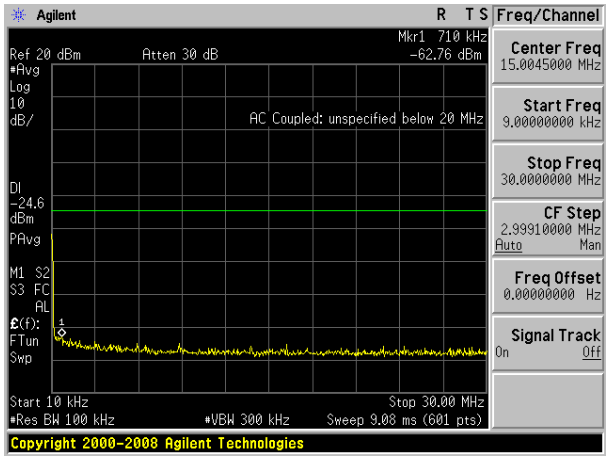
Remark: The measurement frequency range is from 9KHz to the 10th harmonic of the fundamental frequency. The lowest, Middle and highest channels are tested to verify the spurious emissions and bandege measurement data.

Test Plot

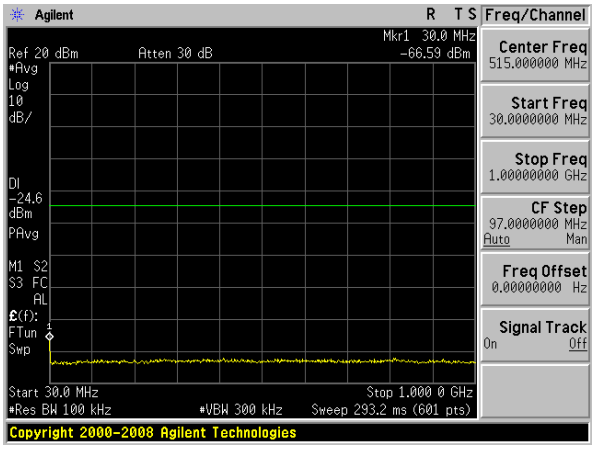
802.11b on channel 01



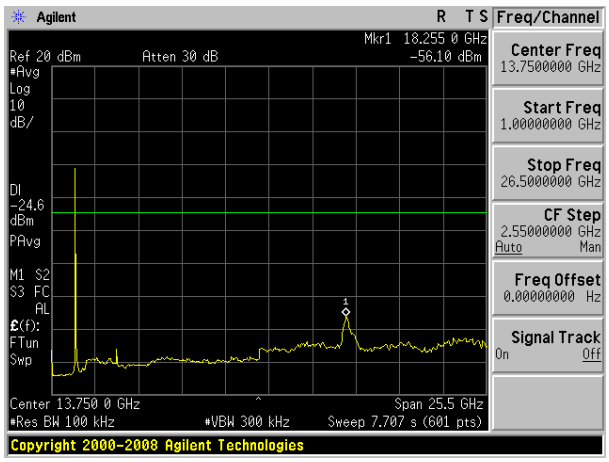
802.11b on channel 01



802.11b on channel 01

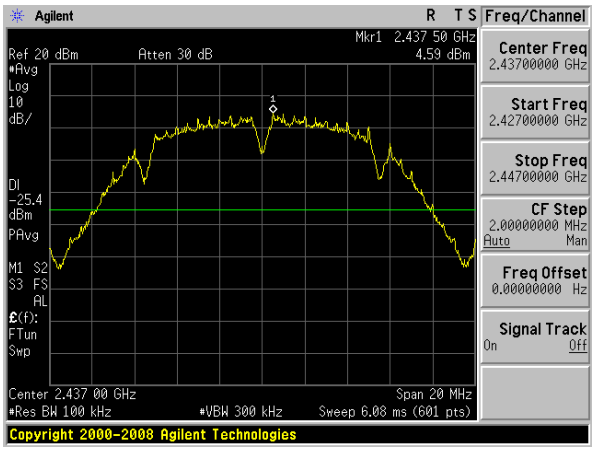


802.11b on channel 01

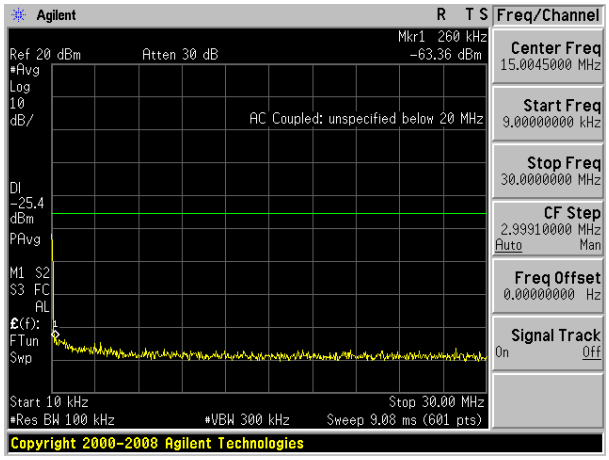


Test Plot

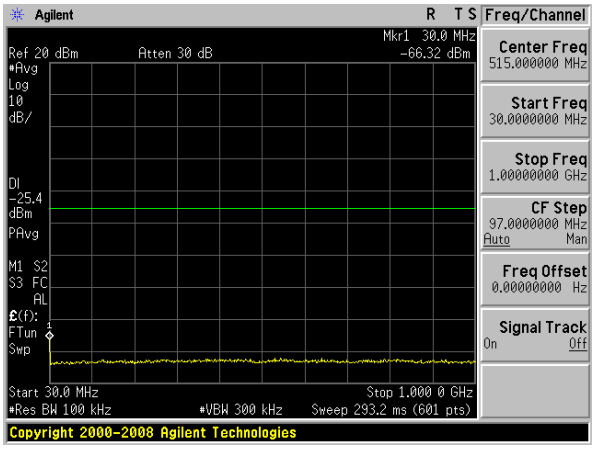
802.11b on channel 06



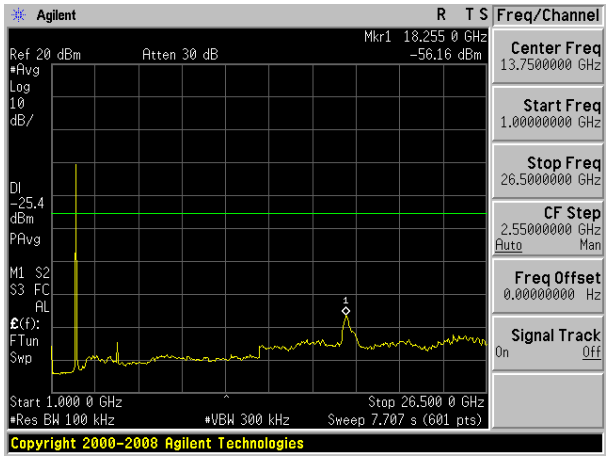
802.11b on channel 06



802.11b on channel 06

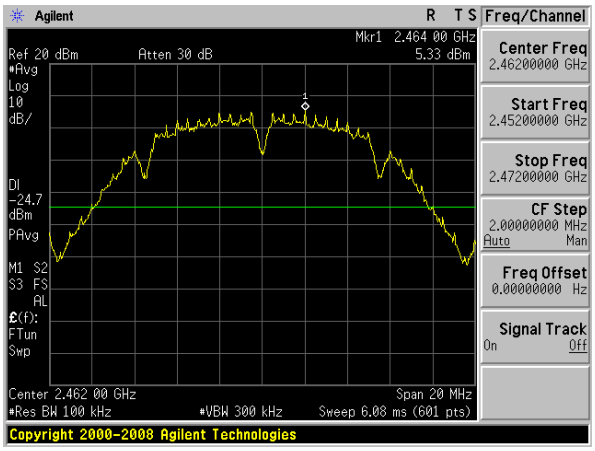


802.11b on channel 06

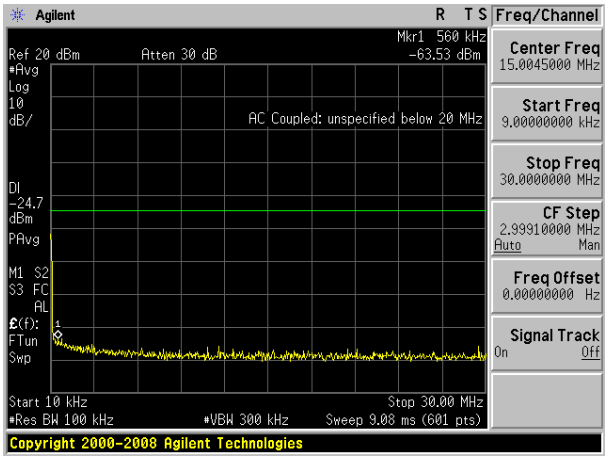


Test Plot

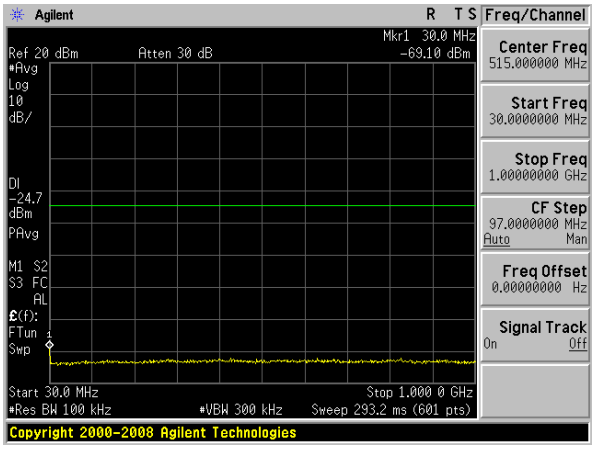
802.11b on channel 11



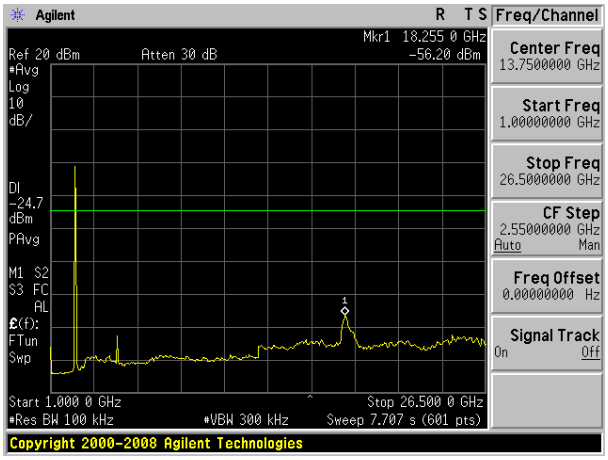
802.11b on channel 11



802.11b on channel 11

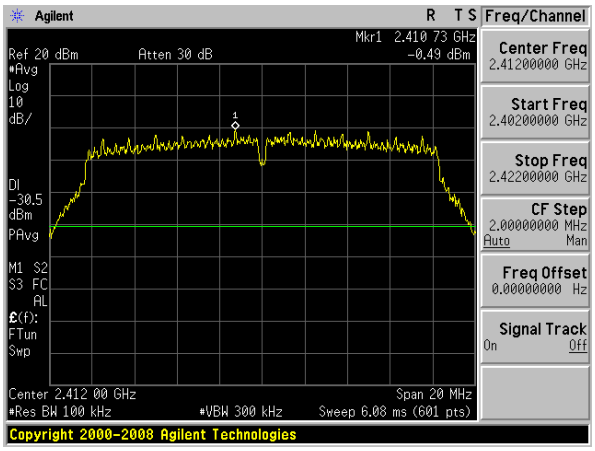


802.11b on channel 11

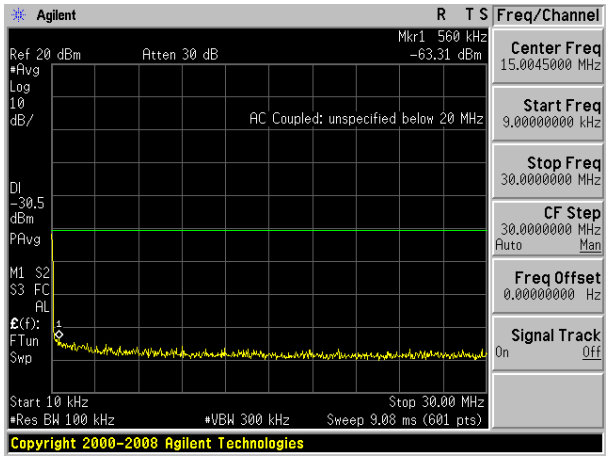


Test Plot

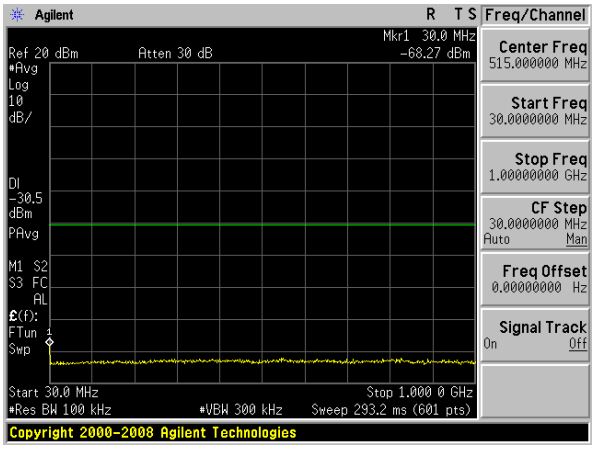
802.11g on channel 01



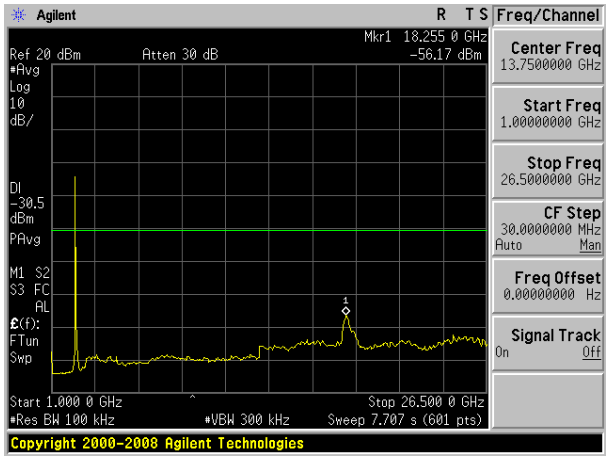
802.11g on channel 01



802.11g on channel 01

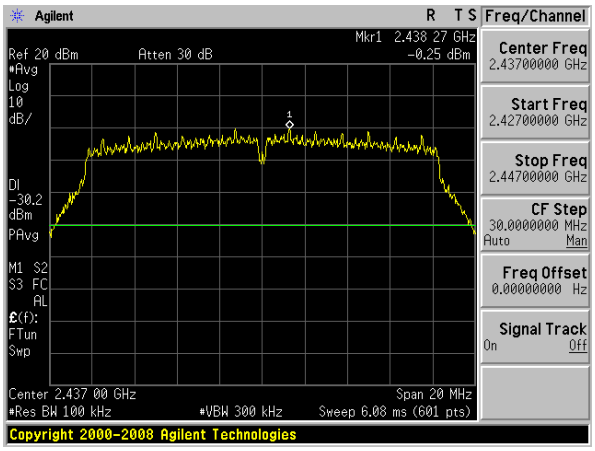


802.11g on channel 01

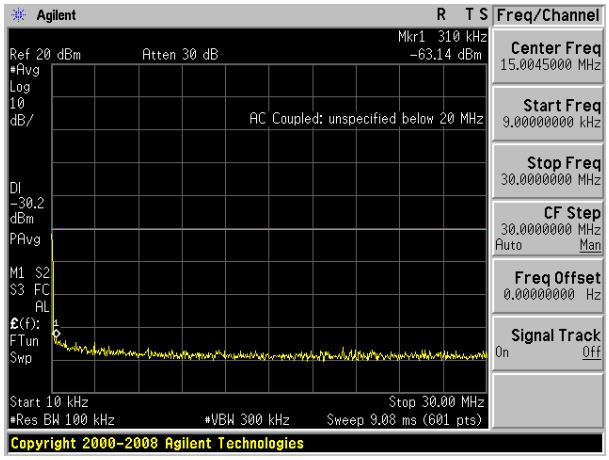


Test Plot

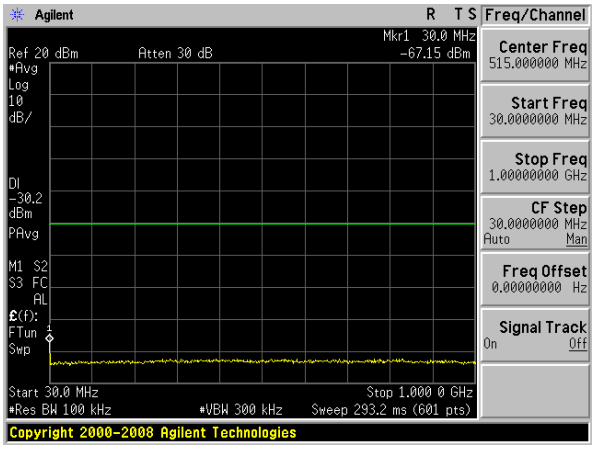
802.11g on channel 06



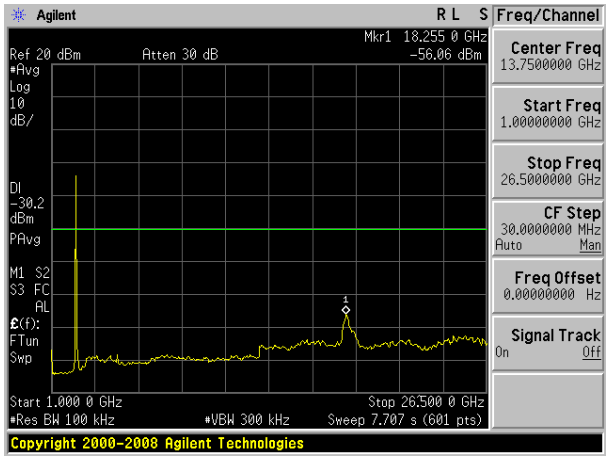
802.11g on channel 06



802.11g on channel 06

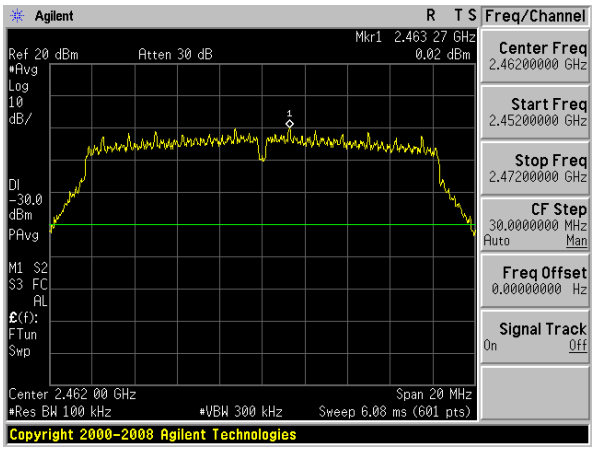


802.11g on channel 06

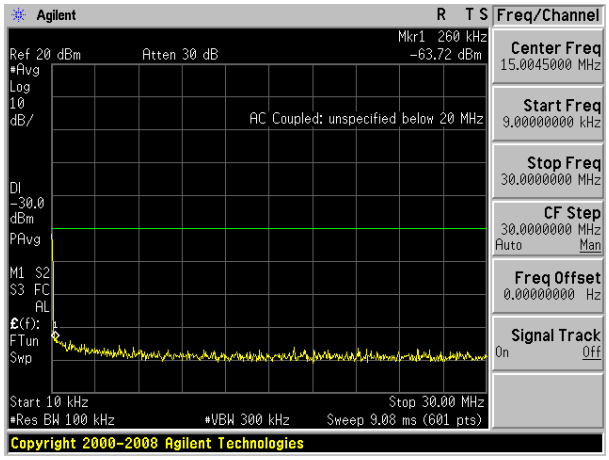


Test Plot

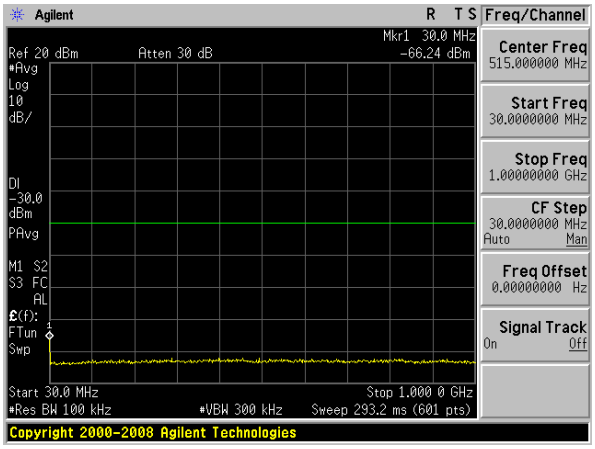
802.11g on channel 11



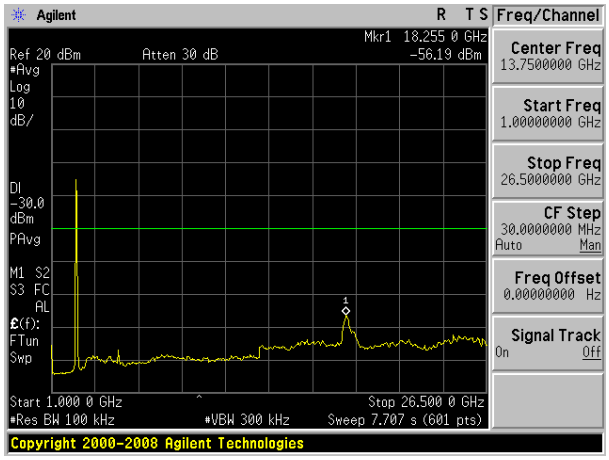
802.11g on channel 11



802.11g on channel 11

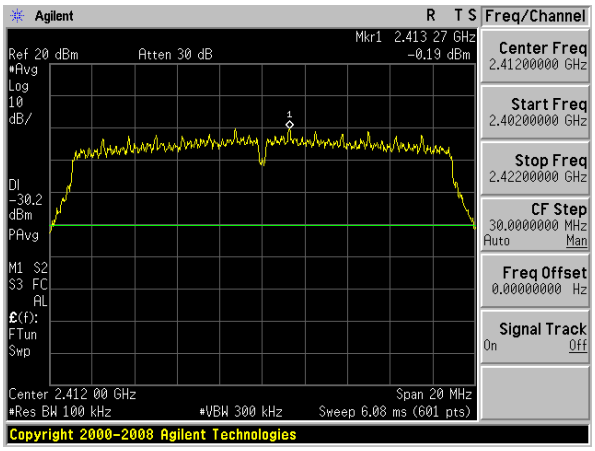


802.11g on channel 11

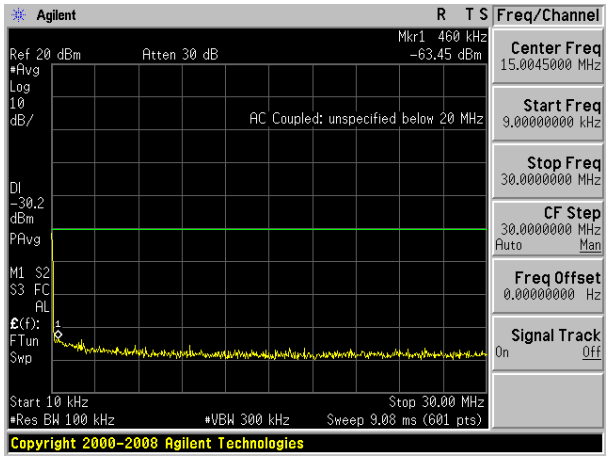


Test Plot

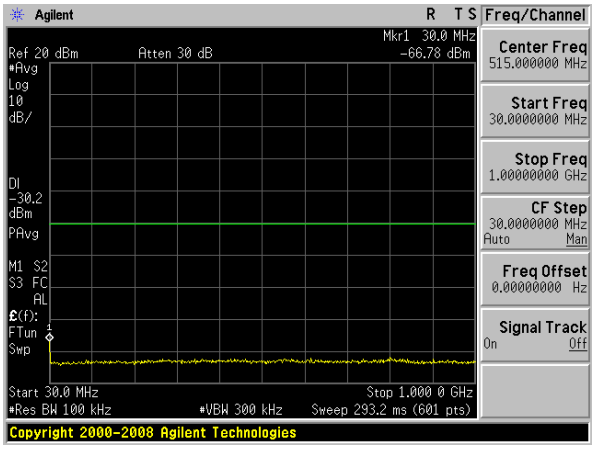
802.11n20 on channel 01



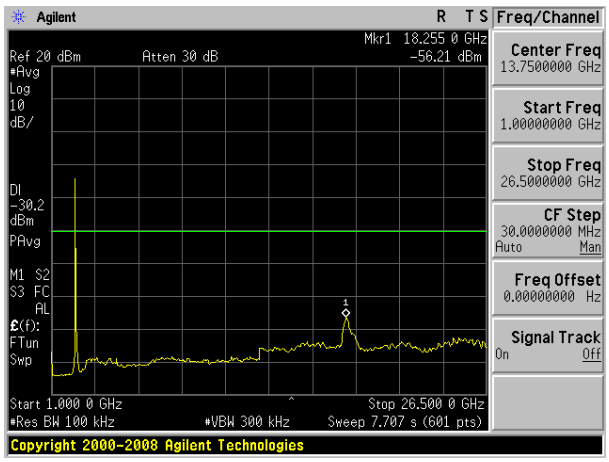
802.11n20 on channel 01



802.11 n20 on channel 01

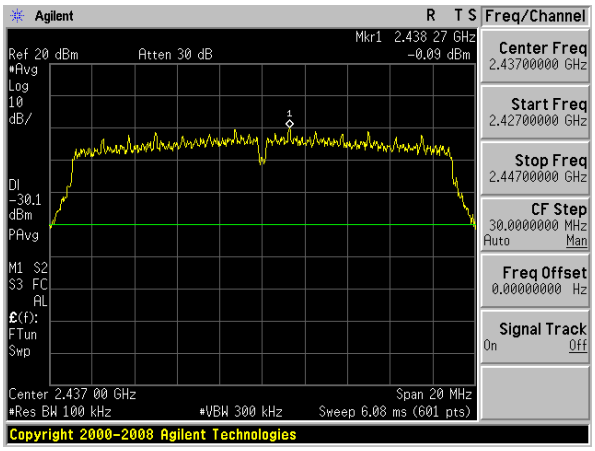


802.11 n20 on channel 01

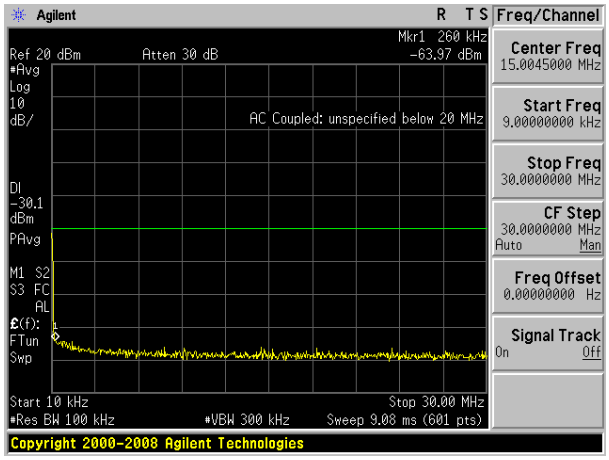


Test Plot

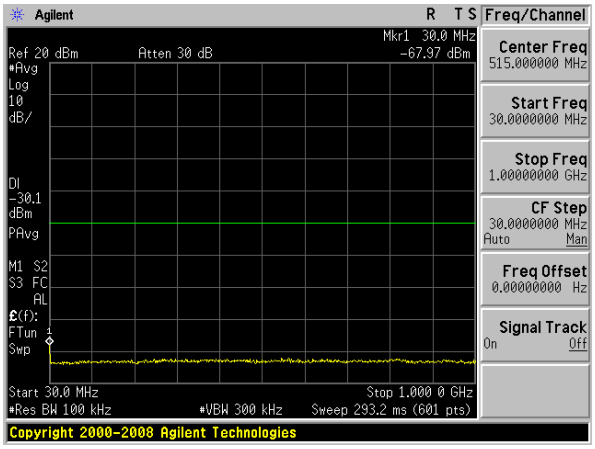
802.11 n20 on channel 06



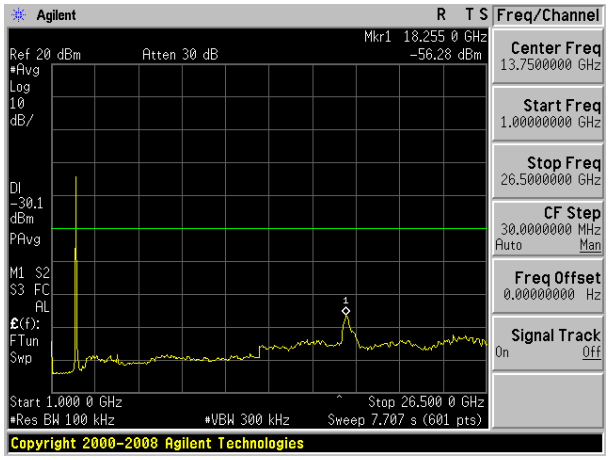
802.11 n20 on channel 06



802.11 n20 on channel 06

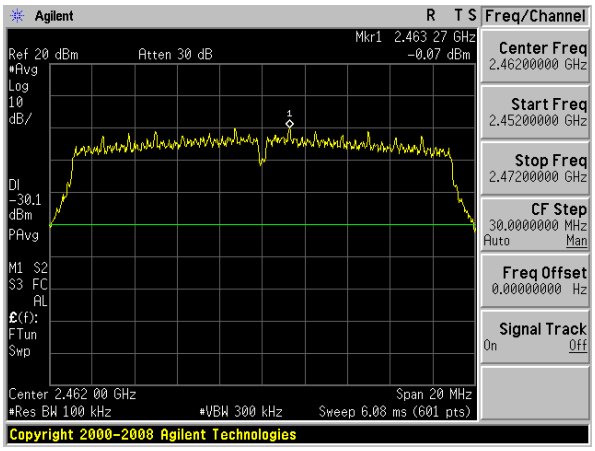


802.11 n20 on channel 06

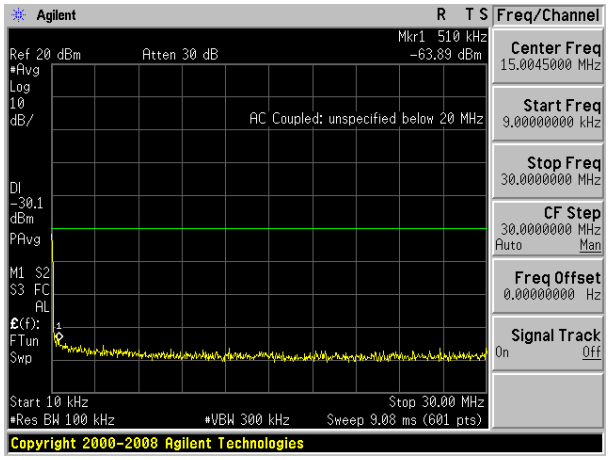


Test Plot

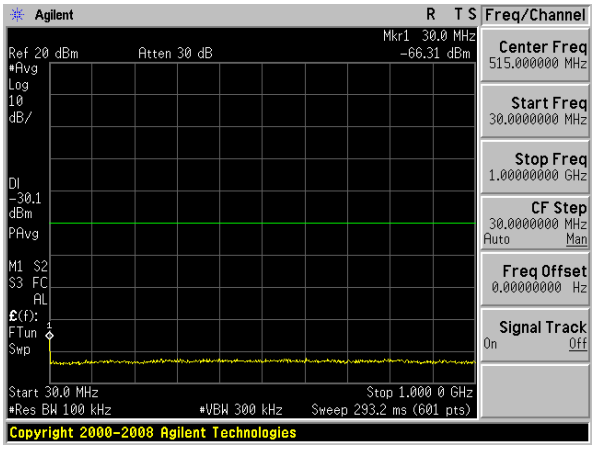
802.11 n20 on channel 11



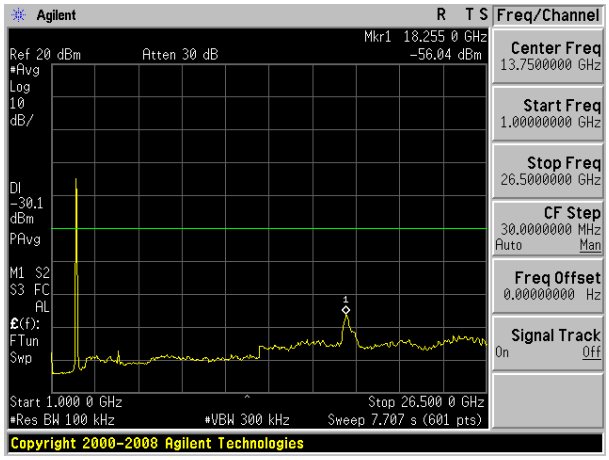
802.11 n20 on channel 11



802.11 n20 on channel 11

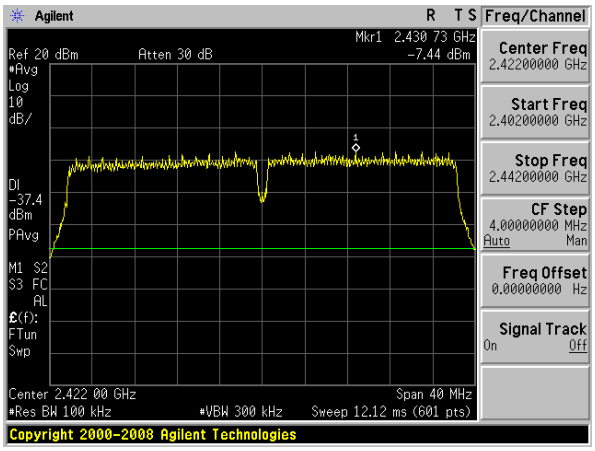


802.11 n20 on channel 11

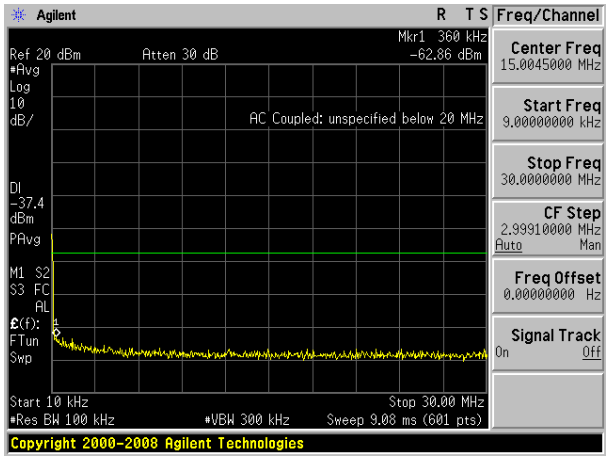


Test Plot

802.11n40 on channel 03



802.11n40 on channel 03



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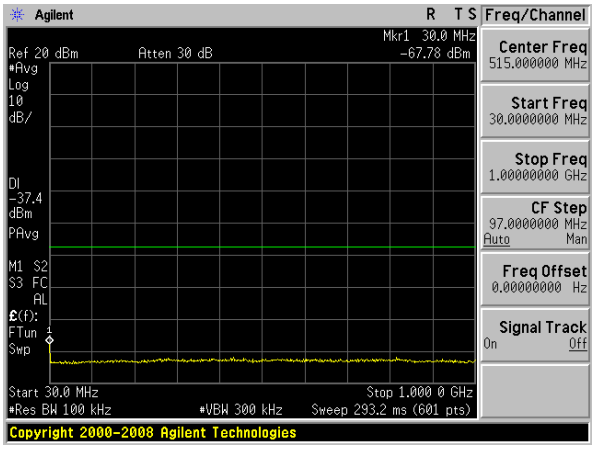
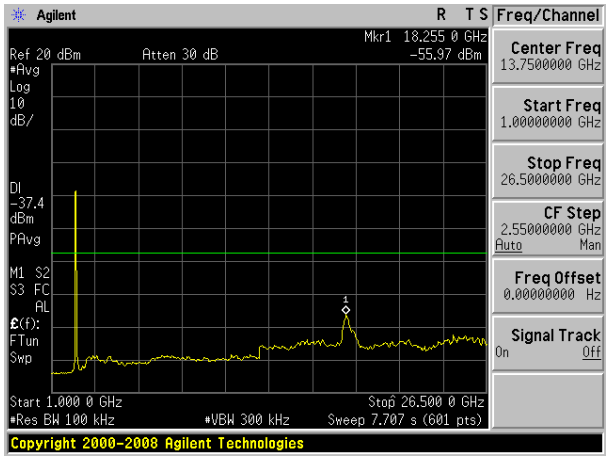
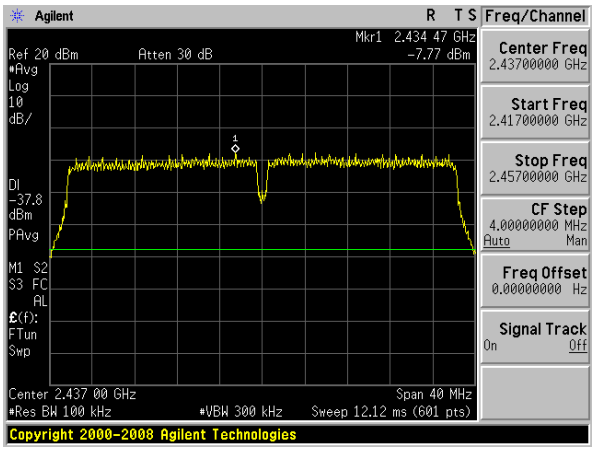


802.11n40 on channel 03



Test Plot

802.11n40 on channel 06



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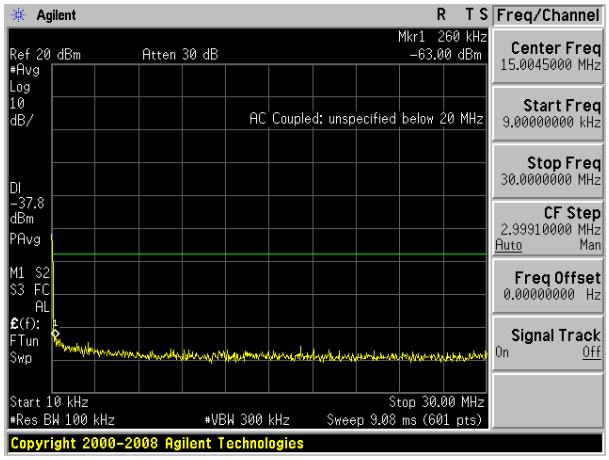
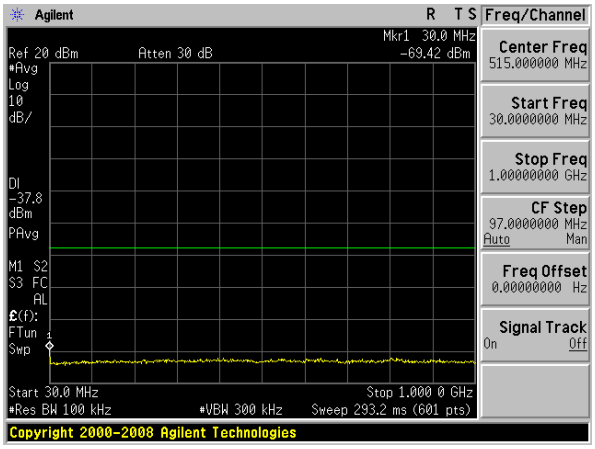
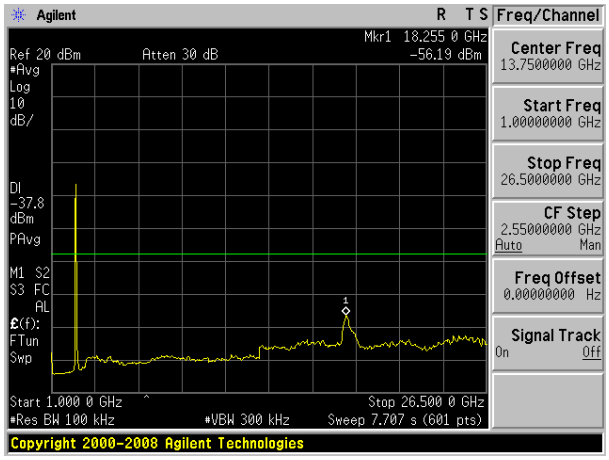


802.11 n40 on channel 06

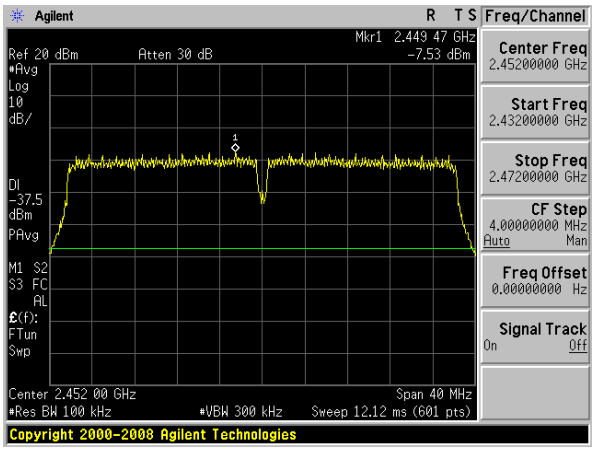


802.11 n40 on channel 06

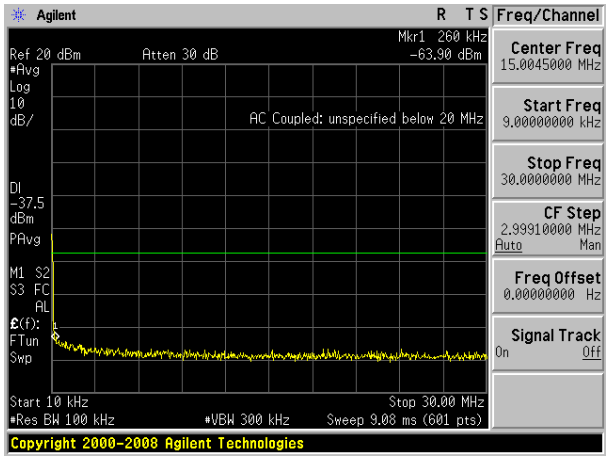


Test Plot

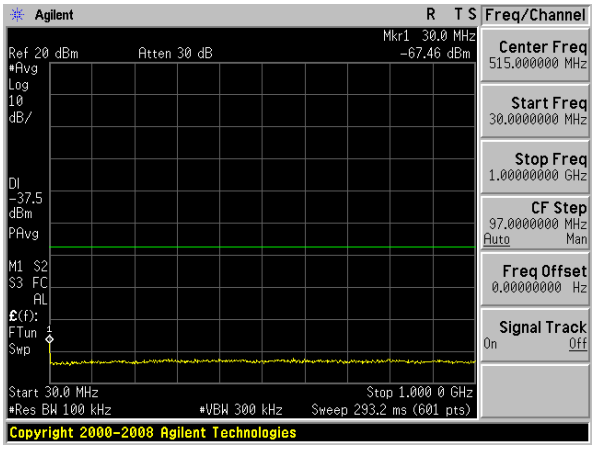
802.11 n40 on channel 9



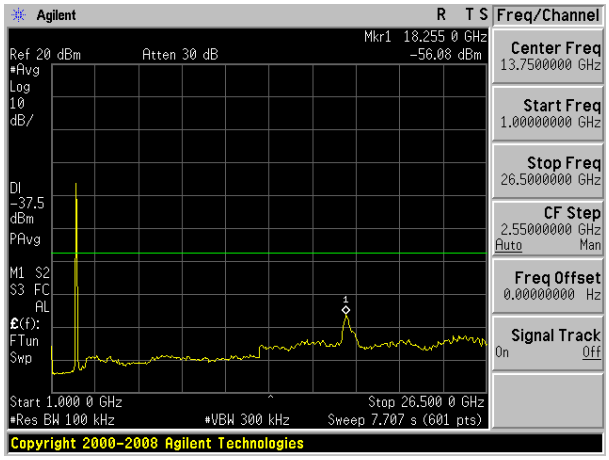
802.11 n40 on channel 9



802.11 n40 on channel 9



802.11 n40 on channel 9



7.11 ANTENNA APPLICATION

7.11.1 Standard Requirement

As per RSP-100, each applicant for equipment certification must provide a list of all antenna types that may be used with the transmitter, indicating the maximum permissible antenna gain (in dBi).
When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements, including the antenna type used.
In addition, applicants shall perform RF power and spurious emission measurements with each antenna type supplied or specified by the manufacturer for use with the transmitter.

7.11.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

7.11.3 Antenna Gain

The antenna peak gain of EUT is External (2 dBi). Therefore, it is not necessary to reduce maximum peak output power limit.

END OF REPORT