

FCC RADIO TEST REPORT

FCC ID: 2AX57OV0220

Product: Set-Top Box Android

Trade Mark: Oneview

Model No.: OV0220

Family Model: OV0221,OV0222

Report No.: S21070902705004

Issue Date: Aug. 18.2021

Prepared for

Oneview Healthcare Inc

D Block 2, Blackrock Business Park Blackrock, Co. Dublin

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name : Oneview Healthcare Inc

Address : Block 2, Blackrock Business Park Blackrock, Co. Dublin

Manufacturer's Name : VIDEOSTRONG TECHNOLOGY CO.,LIMITED

Address : 604, Lushi industrial Building, 28 District, Bao'an District, Shenzhen, China

Product description

Product name : Set-Top Box Android

Model and/or type reference : OV0220

Family Model : OV0221,OV0222

Standards : FCC Part15.407Test procedure ANSI C63.10-2013 and KDB 789033 D02 General UNII Test Procedures
New Rules v02r01

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test

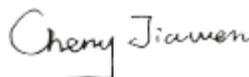
Date (s) of performance of tests 09 Jul. 2021 ~ 18Aug.2021

Date of Issue 18Aug.2021

Test Result **Pass**

Testing Engineer

:



(Cheng Jiawen)

Authorized Signatory

:



(Alex Li)

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Revision History

[illegible]

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.407) , Subpart E			
Standard Section	Test Item	Judgment	Remark
15.207	AC Power Line Conducted Emissions	PASS	
15.209(a), 15.407 (b)(1) 15.407 (b)(4) 15.407 (b)(9) 15.407 (b)(10)	Spurious Radiated Emissions	PASS	
15.407 (a)(1) 15.407 (a)(3)	26 dB and 99% Emission Bandwidth	PASS	
15.407(e)	Minimum 6 dB bandwidth	PASS	
15.407 (a)(1) 15.407 (a)(3)	Maximum Conducted Output Power	PASS	
15.407(b)(1) 15.407(b)(4)	Band Edge	PASS	
15.407 (a)(1) 15.407 (a)(3)	Power Spectral Density	PASS	
15.407(b)	Spurious Emissions at Antenna Terminals	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report
- (2) This device operates with a duty cycle greater than 99%

1.1 FACILITIES AND ACCREDITATIONS

FACILITIES

All measurement facilities used to collect the measurement data are located at
1/F, Building E, Fenda Science Park Sanwei, Xixiang, Bao'an District
Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

CNAS-Lab. : The Certificate Registration Number is L5516.

IC-Registration : The Certificate Registration Number is 9270A.
CAB identifier:CN0074

FCC- Accredited : Test Firm Registration Number: 463705.
Designation Number: CN1184

A2LA-Lab. : The Certificate Registration Number is 4298.01

Name of Firm : Shenzhen NTEK Testing Technology Co., Ltd.

Site Location : 1/F, Building E, Fenda Science Park Sanwei, Xixiang, Bao'an District
Shenzhen, Guangdong, China

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded 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	$\pm 2.80\text{dB}$
2	RF power, conducted	$\pm 0.16\text{dB}$
3	Spurious emissions, conducted	$\pm 0.21\text{dB}$
4	All emissions, radiated(30MHz~1GHz)	$\pm 2.64\text{dB}$
5	All emissions, radiated(1GHz~6GHz)	$\pm 2.40\text{dB}$
6	All emissions, radiated(> 6GHz)	$\pm 2.52\text{dB}$
7	Temperature	$\pm 0.5^\circ\text{C}$
8	Humidity	$\pm 2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Set-Top Box Android
Trade Mark	Oneview
Model Name	OV0220
Family Model	OV0221,OV0222
Model Difference	All models are the same circuit and RF module, except the Model names and appearance and packing.
FCC ID	2AX57OV0220
Product Description	Mode Supported ☒ 802.11a ☒ 802.11n(HT20) ☒ 802.11n(HT40) ☒ 802.11ac(VHT20) ☒ 802.11ac(VHT40) ☒ 802.11ac(VHT80)
	Data Rate 802.11a: 6,9,12,18,24,36,48,54Mbps; 802.11n(HT20/HT40):MCS0-MCS15; 802.11ac(VHT20): NSS1, MCS0-MCS8 802.11ac(VHT40/VHT80):NSS1, MCS0-MCS9
	Modulation OFDM with BPSK/QPSK/16QAM/64QAM
	Operating Frequency Range ☒ U-NII-1: 5150 MHz ~5250MHz ☐ U-NII-2A: 5250MHz~5350MHz ☐ U-NII-2C: 5470MHz~5725MHz ☒ U-NII-3: 5725 MHz ~5850 MHz
	Function: ☐ Outdoor AP ☐ Indoor AP ☐ Fixed P2P ☒ Client
	Smart system ☒ SISO for 802.11a/n/ac ☒ MIMO for 802.11n/ac
	Antenna Type FPC Antenna
	Antenna Gain Antenna : 2dBi
	Based on the application, features, or specification exhibited in User's Manual, More details of EUT technical specification, please refer to the User's Manual.
Ratings	DC 12V from adapter
Adapter	☒ Adapter supply: Model: KA2401A-1202000DE Input: AC 100-240V~50/60Hz 0.65A MAX Output:12.0V---2.0A 24.0W
Battery	N/A
Connecting I/O Port(s)	Please refer to the User's Manual
HW Version	S905X4 Hybrid HDMI IN_V1.3 T2+ATSC-PROIDIOM_V1.1
SW Version	Oneview_Coax-userdebug 10 QTT8.201201.002 58 dev-keys
Test Software	RF test tool
RF Power Setting	Default Value

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Frequency and Channel list for 802.11a/n/ac(20MHz) band I (5180-5240MHz):

802.11a/n/ac(20MHz) Carrier Frequency Channel							
Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)
36	5180	44	5220	-	-	-	-
40	5200	48	5240	-	-	-	-

Frequency and Channel list for 802.11n/ac(40MHz) band I (5190-5230MHz):

802.11n/ac(40MHz) Carrier Frequency Channel							
Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)
38	5190	-	-	-	-	-	-
46	5230	-	-	-	-	-	-

Frequency and Channel list for 802.11ac(80MHz) band I (5210MHz):

802.11ac(80MHz) Carrier Frequency Channel							
Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)
42	5210	-	-	-	-	-	-

Frequency and Channel list for 802.11a/n/ac(20 MHz) band IV (5745-5825MHz):

802.11a/n/ac(20 MHz) Carrier Frequency Channel							
Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)	Channel	Frequen cy (MHz)
149	5745	153	5765	157	5785	161	5805
165	5825	-	-	-	-	-	-

Frequency and Channel list for 802.11n/ac(40MHz) band IV (5755-5795MHz):

802.11n/ac(40MHz) Carrier Frequency Channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
151	5755	159	5795	-	-

Frequency and Channel list for 802.11ac(80MHz) band IV (5775MHz):

802.11ac(80MHz) Carrier Frequency Channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
155	5775			-	-

2.2 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.

Pretest Mode	Description
Mode 1	Normal Link Mode
Mode 2	802.11a/n/ac20 CH36/CH40/CH48/CH149/CH157/CH165
Mode 3	802.11n40/ac40 CH38/CH46CH151/CH159
Mode 4	802.11ac80 CH42/CH155

For Radiated Emission	
Final Test Mode	Description
Mode 1	Normal Link Mode
Mode 2	802.11a/n/ac20 CH36/CH40/CH48/CH149/CH157/CH165
Mode 3	802.11n40/ac40 CH38/CH46CH151/CH159
Mode 4	802.11ac80 CH42/CH155

For AC Conducted Emission	
Final Test Mode	Description
Mode 1	Normal Link Mode

For Conducted Test Cases	
Final Test Mode	Description
Mode 1	Normal Link Mode
Mode 2	802.11a/n/ac20 CH36/CH40/CH48/CH149/CH157/CH165
Mode 3	802.11n40/ac40 CH38/CH46CH151/CH159
Mode 4	802.11ac80 CH42/CH155

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

This EUT has two antennas, and different modes support different transmit mode what describe as following form:

Mode	Tx / Rx
802.11a / n(20MHz,40MHz) / ac(20MHz,40MHz,80MHz)	1TX, 1RX
802.11n(20MHz,40MHz) / ac(20MHz,40MHz,80MHz)	2TX, 2RX

For 5.2GHz/5.8GHz band, 802.11n(20/40)/ac(20/40/80) has MIMO mode, Antenna 1,2 are simultaneous transmissions, each with the same directional gain.

For power measurements: Directional gain= G_{ANT} + Array Gain=2dBi + 0 = 2dBi

For power spectral density (PSD) measurements: Directional gain= G_{ANT} + Array Gain=2dBi + 3.01 = 5.01dBi

Note: G_{ANT} means antenna gain for the same gain in dBi.

For power spectral density (PSD) measurements: Array Gain = $10\log(N_{ANT}/N_{SS})$ dB.

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT} ;

Array Gain = $5 \log(N_{ANT}/N_{SS})$ dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

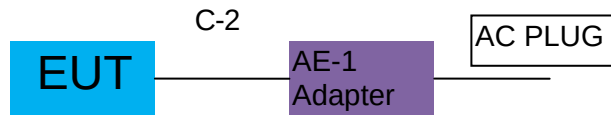
For power measurements:

N_{ANT} = number of transmit antennas and

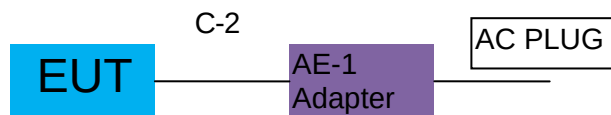
N_{SS} = number of spatial streams. (Assume $N_{SS} = 1$ unless you have specific information to the contrary.)

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

For AC Conducted Emission Test Cases



For Radiated Test Cases



For Conducted Test Cases



Note: 1. 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.

2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.	Series No.	Note
AE-1	Adapter	KEYU	KA2401A-1202000DE	N/A	Peripherals

Item	Cable Type	Shielded Type	Ferrite Core	Length
C-1	RF Cable	YES	NO	0.1m
C-2	Power cable	NO	NO	1.2m

Note:

- (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) During the battery power test, the battery is fully charged.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation& Conducted Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2021.04.27	2022.04.26	1 year
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2021.07.01	2022.06.30	1 year
3	Spectrum Analyzer	R&S	FSV40	101417	2021.07.01	2022.06.30	1 year
4	Test Receiver	R&S	ESPI7	101318	2021.04.27	2022.04.26	1 year
5	Bilog Antenna	TESEQ	CBL6111D	31216	2021.03.29	2022.03.28	1 year
6	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2020.05.11	2023.05.10	3 year
7	Horn Antenna	EM	EM-AH-10180	2011071402	2021.03.29	2022.03.28	1 year
8	Amplifier	EMC	EMC051835SE	980246	2021.07.01	2022.06.30	1 year
9	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	055	2020.11.20	2021.11.19	1 year
10	Power Meter	DARE	RPR3006W	15I00041SN084	2020.11.20	2021.11.19	1 year
11	USB RF Power Sensor	DARE	RPR3006W	15I00041SN084	2021.07.01	2022.06.30	1 year
12	Test Cable (9KHz-30MHz)	N/A	R-01	N/A	2019.08.06	2022.08.05	3 year
13	Test Cable (30MHz-1GHz)	N/A	R-02	N/A	2019.08.06	2022.08.05	3 year
14	High Test Cable(1G-40GHz)	N/A	R-03	N/A	2020.05.11	2023.05.10	3 year
15	High Test Cable(1G-40GHz)	N/A	R-04	N/A	2020.05.11	2023.05.10	3 year
16	Filter	TRILTHIC	2400MHz	29	2020.04.07	2023.04.06	3 year
17	temporary antenna connector (Note)	NTS	R001	N/A	N/A	N/A	N/A
18	Low Noise Amplifier	B&Z	BZ-P540-550850-452727	16476-11729	2021.04.01	2022.03.31	1 year
19	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	803	2020.11.19	2021.11.18	1 year
20	Thermal Chamber	Ten Billion	TTC-B3C	TBN-960502	2021.04.27	2022.04.26	1 year

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	2021.04.27	2022.04.26	1 year
2	LISN	R&S	ENV216	101313	2021.04.27	2022.04.26	1 year
3	LISN	SCHWARZBECK	NNLK 8129	8129245	2021.04.27	2022.04.26	1 year
4	50Ω Coaxial Switch	ANRITSU CORP	MP59B	6200983704	2020.05.11	2023.05.10	3 year
5	Test Cable (9KHz-30MHz)	N/A	C01	N/A	2020.05.11	2023.05.10	3 year
6	Test Cable (9KHz-30MHz)	N/A	C02	N/A	2020.05.11	2023.05.10	3 year
7	Test Cable (9KHz-30MHz)	N/A	C03	N/A	2020.05.11	2023.05.10	3 year

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

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 APPLICABLE STANDARD

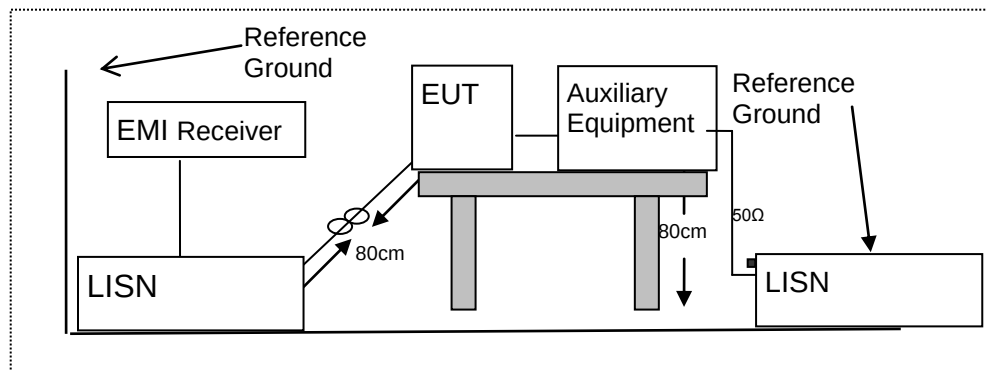
According to FCC Part 15.207(a)

3.1.2 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.

3.1.3 TEST CONFIGURATION



3.1.4 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.

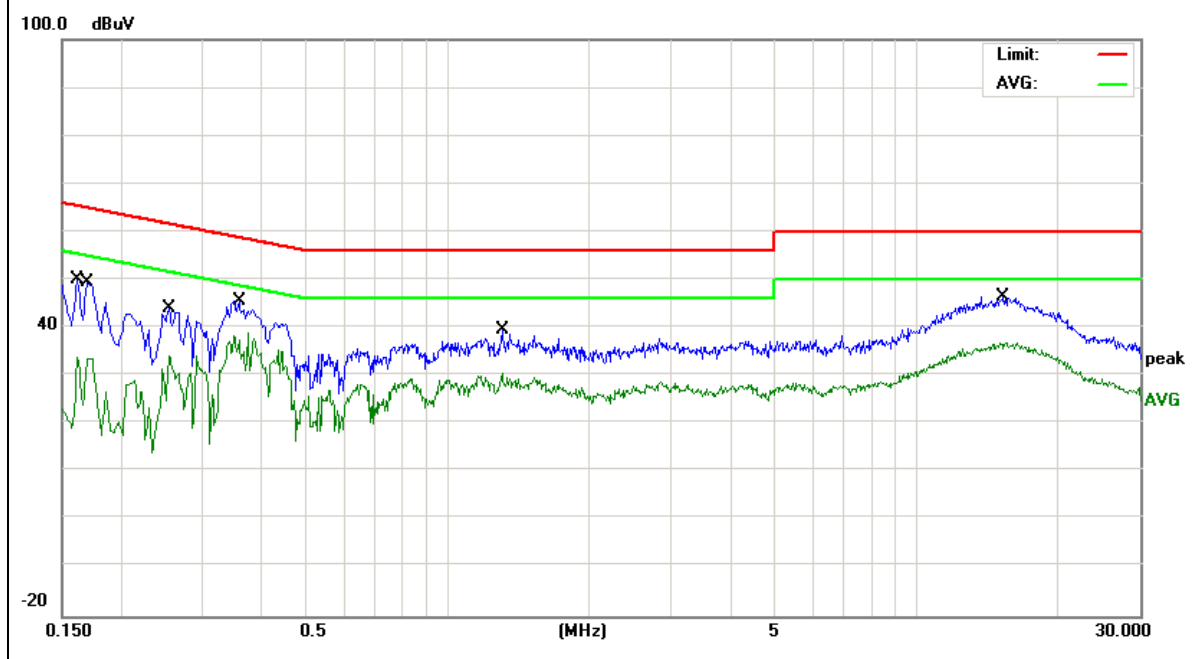
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room.
2. The EUT was placed on a table which is 0.8m above ground plane.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The 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.

EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	23.5 °C	Relative Humidity :	45%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz	Test Mode :	Mode 1(5.2G)

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1620	40.28	9.71	49.99	65.36	-15.37	QP
0.1620	24.12	9.71	33.83	55.36	-21.53	AVG
0.1700	39.65	9.69	49.34	64.96	-15.62	QP
0.1700	23.85	9.69	33.54	54.96	-21.42	AVG
0.2540	34.33	9.63	43.96	61.62	-17.66	QP
0.2540	24.60	9.63	34.23	51.62	-17.39	AVG
0.3580	35.97	9.64	45.61	58.77	-13.16	QP
0.3580	29.17	9.64	38.81	48.77	-9.96	AVG
1.3060	29.80	9.75	39.55	56.00	-16.45	QP
1.3060	20.75	9.75	30.50	46.00	-15.50	AVG
15.3779	36.59	9.83	46.42	60.00	-13.58	QP
15.3779	27.05	9.83	36.88	50.00	-13.12	AVG

Remark:

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

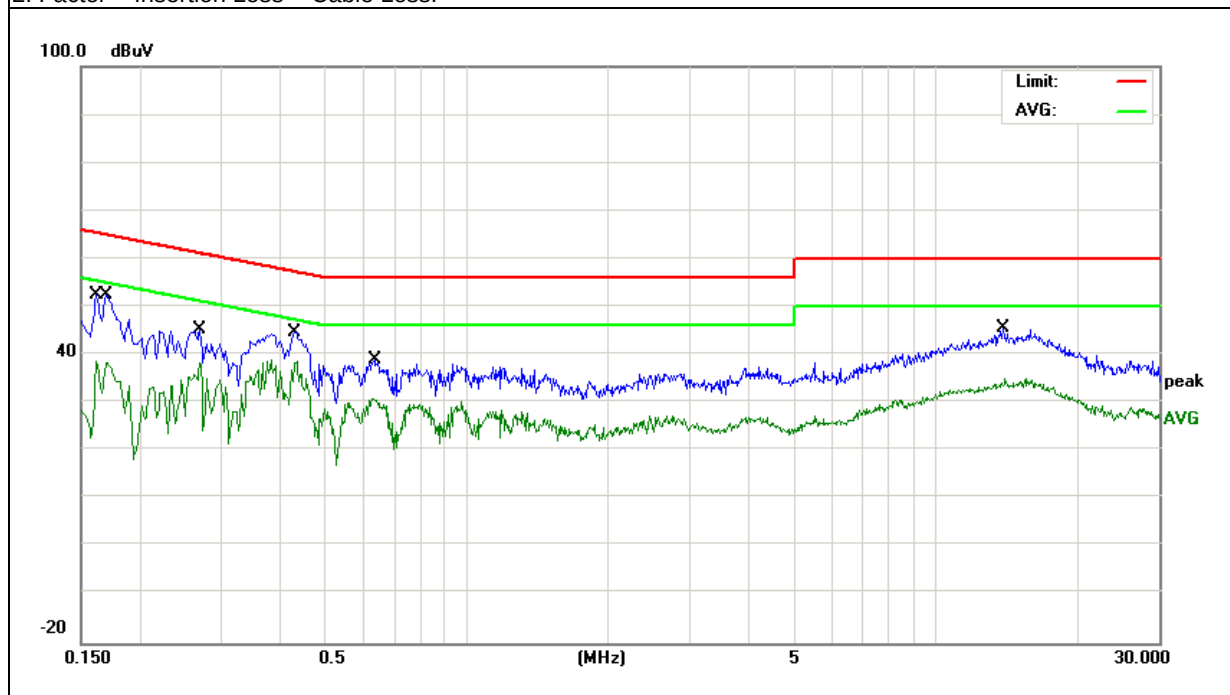


EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	23.5 °C	Relative Humidity :	45%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz	Test Mode :	Mode 1(5.2G)

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Remark
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.1620	42.87	9.63	52.50	65.36	-12.86	QP
0.1620	28.92	9.63	38.55	55.36	-16.81	AVG
0.1700	42.95	9.63	52.58	64.96	-12.38	QP
0.1700	28.74	9.63	38.37	54.96	-16.59	AVG
0.2700	35.56	9.65	45.21	61.12	-15.91	QP
0.2700	28.62	9.65	38.27	51.12	-12.85	AVG
0.4300	34.90	9.72	44.62	57.25	-12.63	QP
0.4340	28.82	9.72	38.54	47.18	-8.64	AVG
0.6340	29.40	9.67	39.07	56.00	-16.93	QP
0.6340	21.29	9.67	30.96	46.00	-15.04	AVG
13.9539	35.69	9.75	45.44	60.00	-14.56	QP
13.9539	25.39	9.75	35.14	50.00	-14.86	AVG

Remark:

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

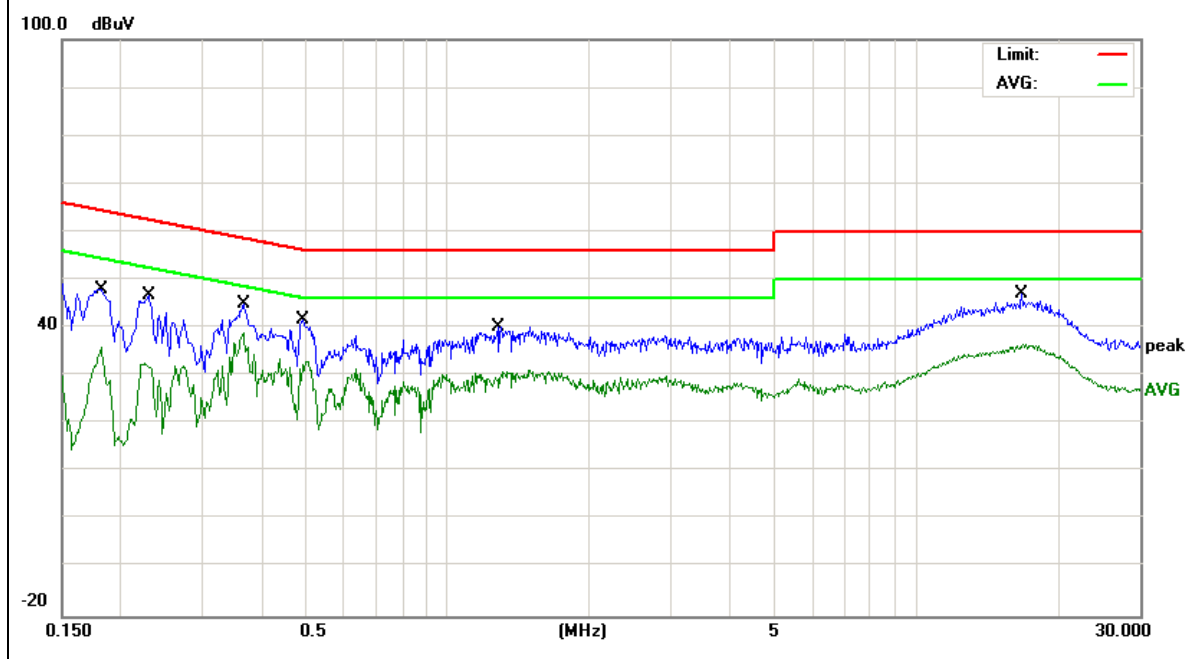


EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	23.5 °C	Relative Humidity :	45%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz	Test Mode :	Mode 1(5.8G)

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1819	38.32	9.67	47.99	64.39	-16.40	QP
0.1819	26.24	9.67	35.91	54.39	-18.48	AVG
0.2300	37.08	9.63	46.71	62.45	-15.74	QP
0.2300	22.94	9.63	32.57	52.45	-19.88	AVG
0.3660	35.26	9.64	44.90	58.59	-13.69	QP
0.3660	29.26	9.64	38.90	48.59	-9.69	AVG
0.4900	32.07	9.64	41.71	56.17	-14.46	QP
0.4900	23.44	9.64	33.08	46.17	-13.09	AVG
1.2820	30.46	9.75	40.21	56.00	-15.79	QP
1.2820	21.04	9.75	30.79	46.00	-15.21	AVG
16.8219	37.29	9.84	47.13	60.00	-12.87	QP
16.8219	26.81	9.84	36.65	50.00	-13.35	AVG

Remark:

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

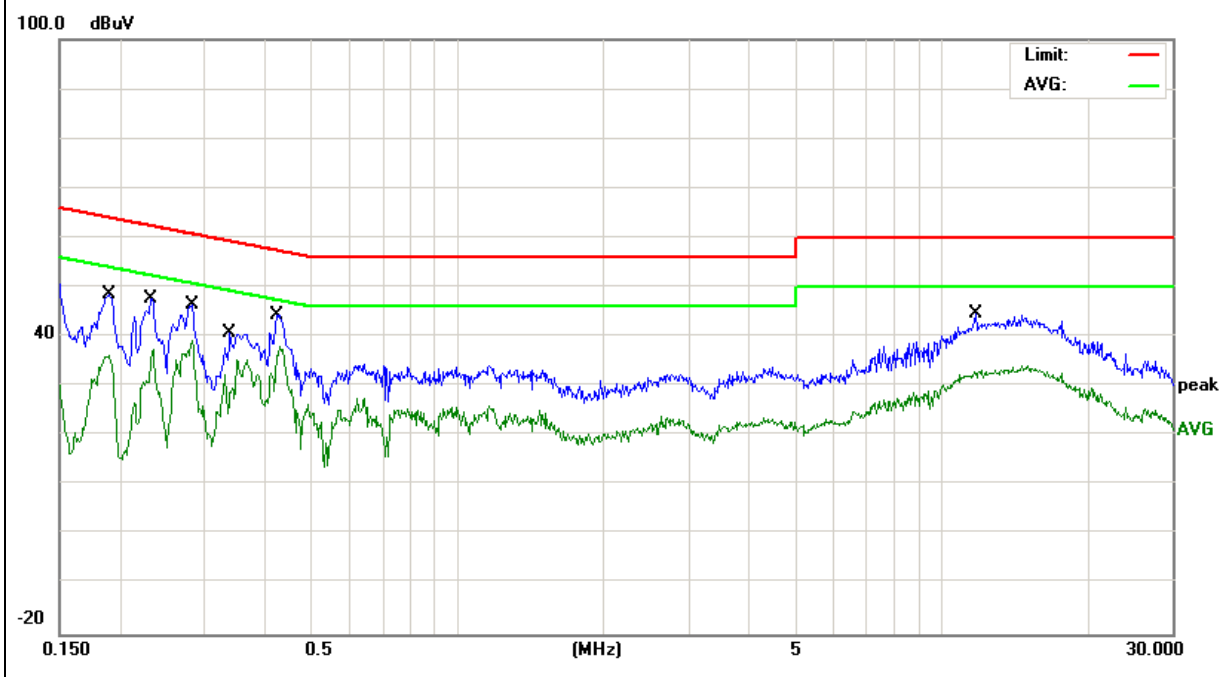


EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	23.5 °C	Relative Humidity :	45%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz	Test Mode :	Mode 1(5.8G)

Frequency (MHz)	Reading Level (dBμV)	Correct Factor (dB)	Measure-ment (dBμV)	Limits (dBμV)	Margin (dB)	Remark
0.1900	39.01	9.63	48.64	64.03	-15.39	QP
0.1900	26.49	9.63	36.12	54.03	-17.91	AVG
0.2316	38.00	9.64	47.64	62.39	-14.75	QP
0.2316	25.55	9.64	35.19	52.39	-17.20	AVG
0.2819	36.68	9.66	46.34	60.76	-14.42	QP
0.2819	29.63	9.66	39.29	50.76	-11.47	AVG
0.3379	31.10	9.68	40.78	59.25	-18.47	QP
0.3379	19.98	9.68	29.66	49.25	-19.59	AVG
0.4220	34.70	9.71	44.41	57.41	-13.00	QP
0.4220	28.29	9.71	38.00	47.41	-9.41	AVG
11.7499	34.73	9.78	44.51	60.00	-15.49	QP
11.7499	23.45	9.78	33.23	50.00	-16.77	AVG

Remark:

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



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 APPLICABLE STANDARD

According to FCC Part 15.407(b)(9) and 15.209

3.2.2 CONFORMANCE LIMIT

According to FCC Part 15.407(b) (9): 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 §15.205(c)).
According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	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			

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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	24000/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. For Frequency 9kHz~30MHz:

Distance extrapolation factor =40log(Specific distance/ test distance)(dB);

Limit line=Specific limits(dBuV) + distance extrapolation factor.

For Frequency above 30MHz:

Distance extrapolation factor =20log(Specific distance/ test distance)(dB);

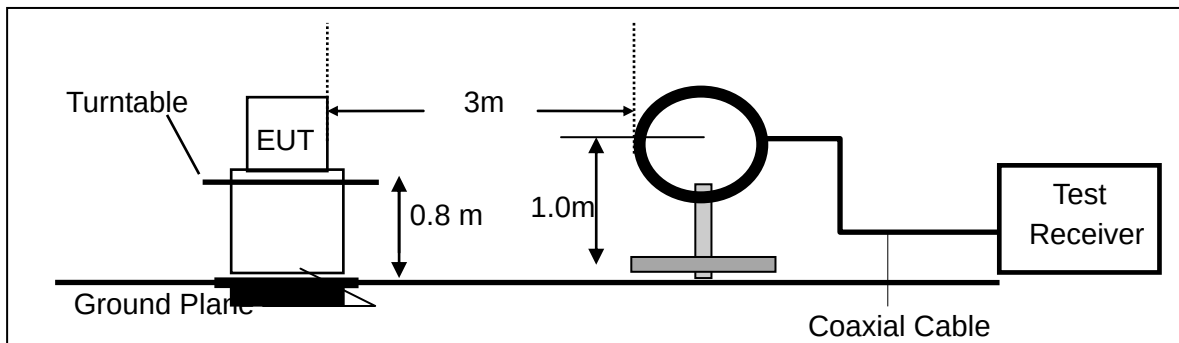
Limit line=Specific limits(dBuV) + distance extrapolation factor.

3.2.3 MEASURING INSTRUMENTS

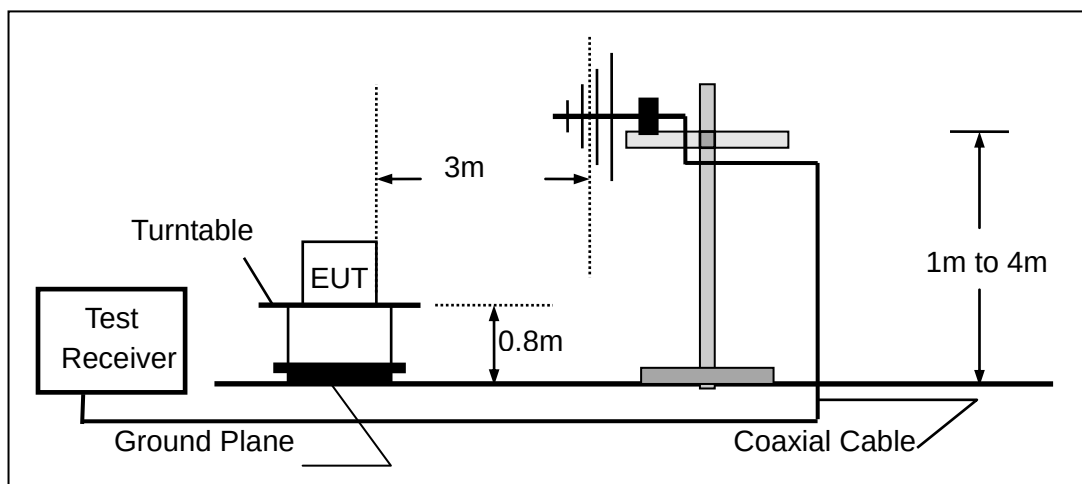
The Measuring equipment is listed in the section 6.3 of this test report.

3.2.4 TEST CONFIGURATION

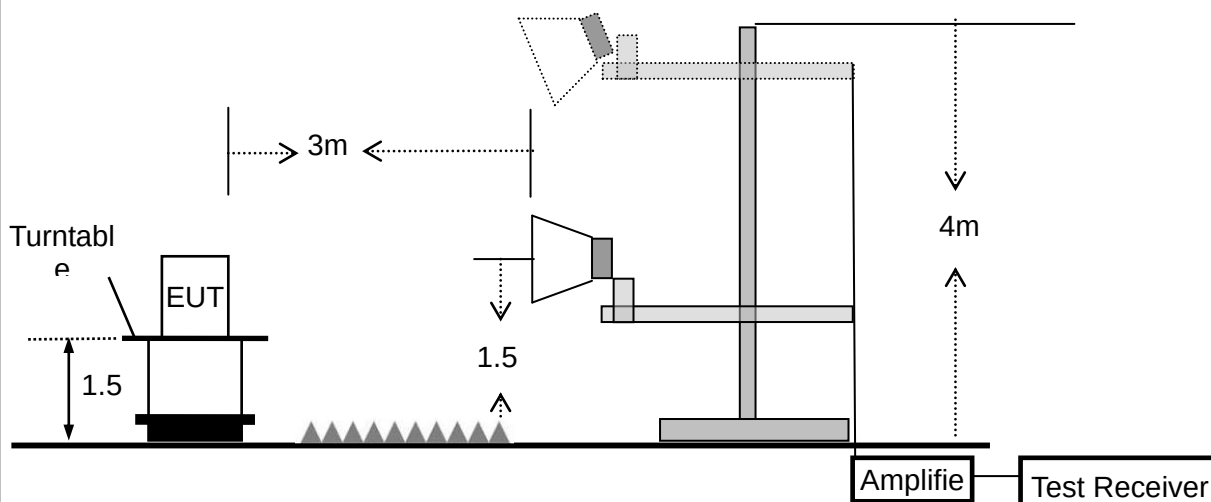
(a) For radiated emissions below 30MHz



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



(c) For radiated emissions above 1000MHz



3.2.5 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

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

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 $RBWCF [dB] = 10 \cdot \lg(100 [kHz] / \text{narrower RBW [kHz]})$. , 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.

3.2.6 TEST RESULTS (9KHZ – 30 MHZ)

EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	26 °C	Relative Humidity :	54%
Pressure:	1010 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	N/A
--	--	--	--	N/A

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

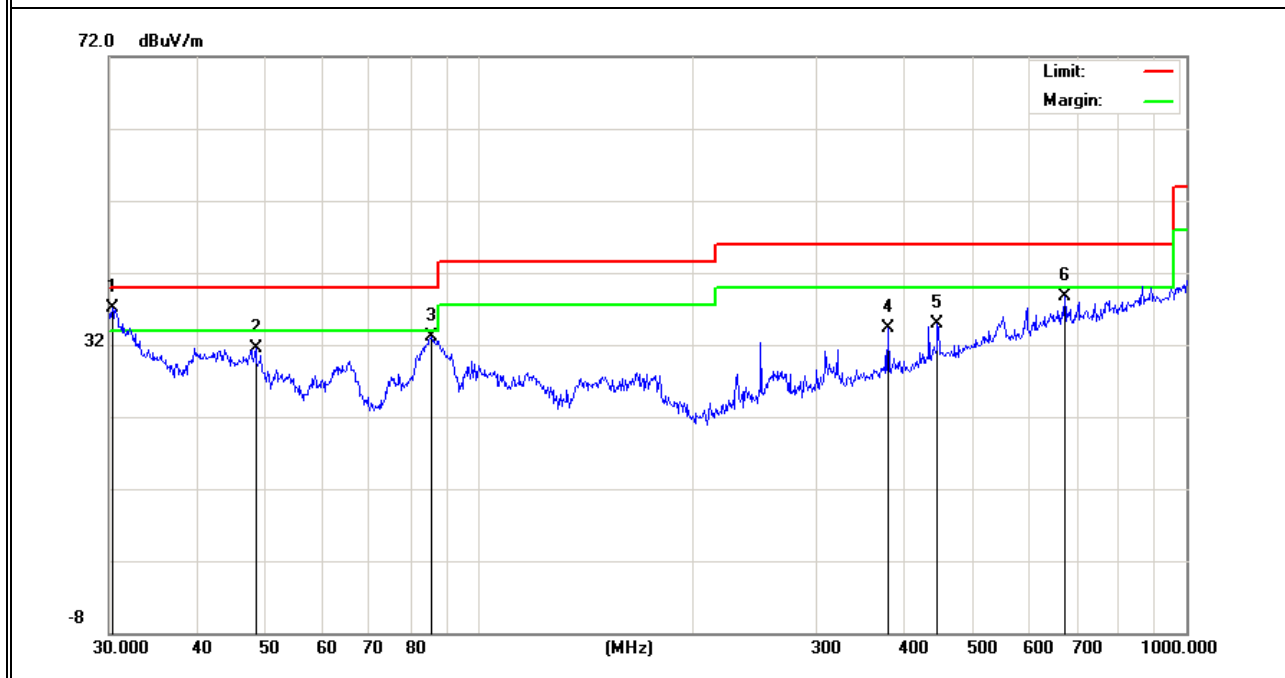
3.2.7 TEST RESULTS (30MHZ – 1GHZ)

EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	25.2	Relative Humidity :	55
Pressure :	1010 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX(5.2G)- 802.11n20 MIMO(Low CH)		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	30.3173	12.21	24.94	37.15	40.00	-2.85	QP
V	48.3318	15.96	15.62	31.58	40.00	-8.42	QP
V	85.5977	18.23	14.95	33.18	40.00	-6.82	QP
V	378.5843	10.87	23.36	34.23	46.00	-11.77	QP
V	444.8514	9.82	25.11	34.93	46.00	-11.07	QP
V	672.8444	9.02	29.70	38.72	46.00	-7.28	QP

Remark:

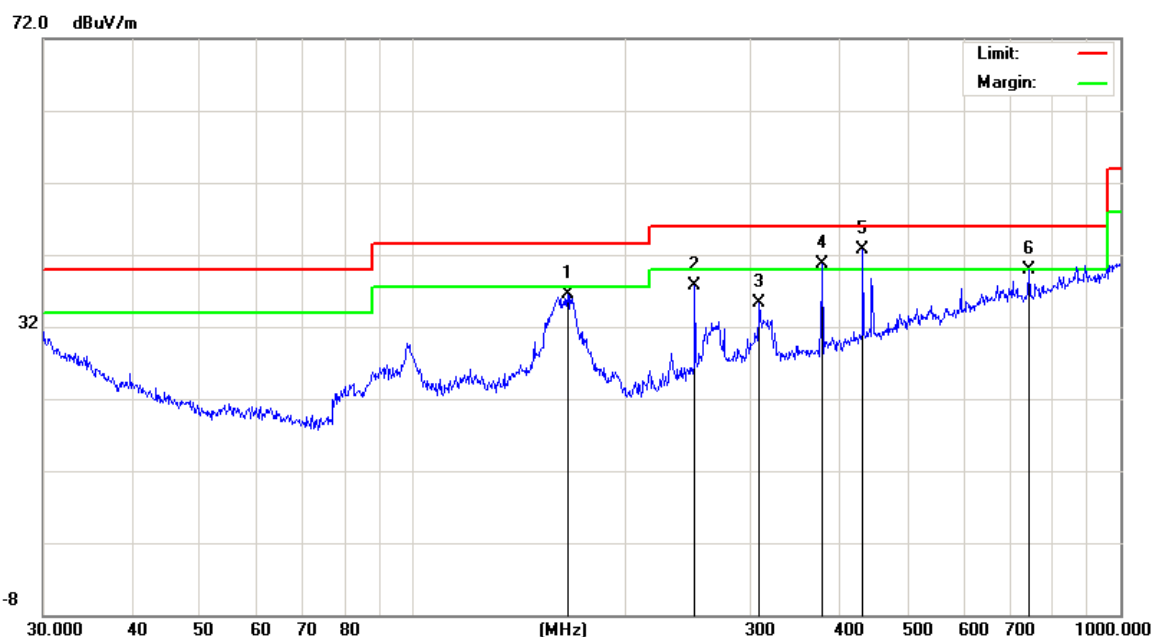
Emission Level= Meter Reading+ Factor, Margin= Emission Level - Limit



Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	165.4866	19.01	17.43	36.44	43.50	-7.06	QP
H	250.3012	17.96	19.65	37.61	46.00	-8.39	QP
H	308.9126	14.33	21.01	35.34	46.00	-10.66	QP
H	378.5843	17.30	23.36	40.66	46.00	-5.34	QP
H	432.5457	17.94	24.68	42.62	46.00	-3.38	QP
H	742.2587	9.98	30.00	39.98	46.00	-6.02	QP

Remark:

Emission Level= Meter Reading+ Factor, Margin= Emission Level - Limit

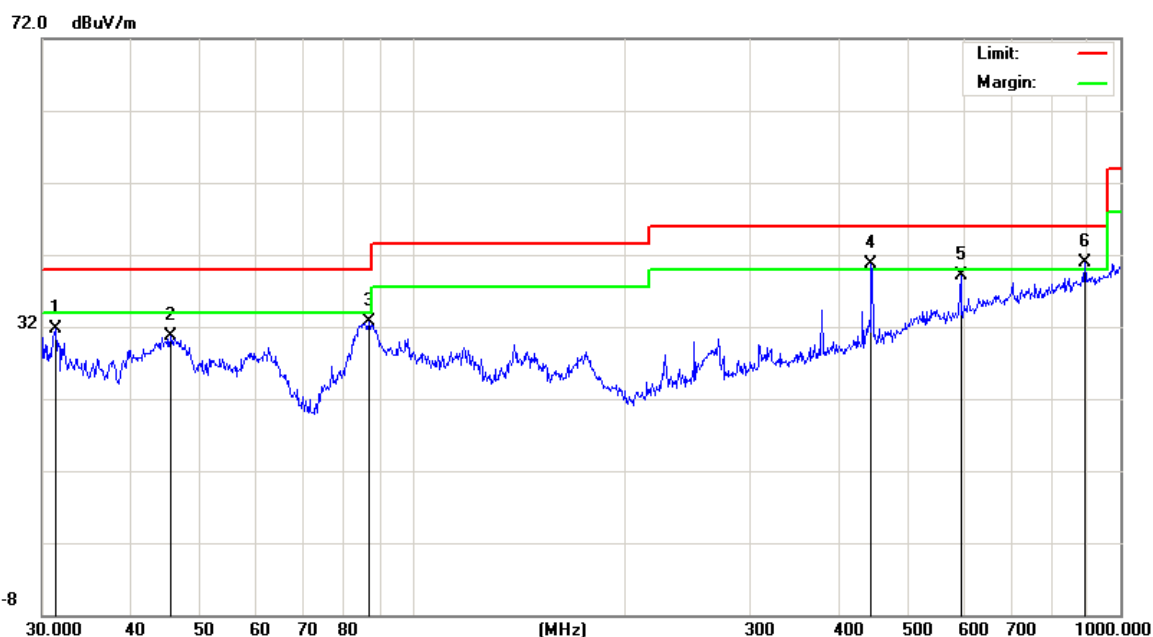


EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	25.2	Relative Humidity :	55
Pressure :	1010 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX(5.8G) - 802.11ac20 MIMO(Low CH)		

Polar (H/V)	Frequency (MHz)	Meter Reading (dBUV)	Factor (dB)	Emission Level (dBUV/m)	Limits (dBUV/m)	Margin (dB)	Remark
V	31.3992	7.86	23.77	31.63	40.00	-8.37	QP
V	45.5348	14.15	16.52	30.67	40.00	-9.33	QP
V	86.8068	17.46	15.24	32.70	40.00	-7.30	QP
V	444.8514	15.63	25.11	40.74	46.00	-5.26	QP
V	595.1329	10.74	28.32	39.06	46.00	-6.94	QP
V	890.7278	8.74	32.22	40.96	46.00	-5.04	QP

Remark:

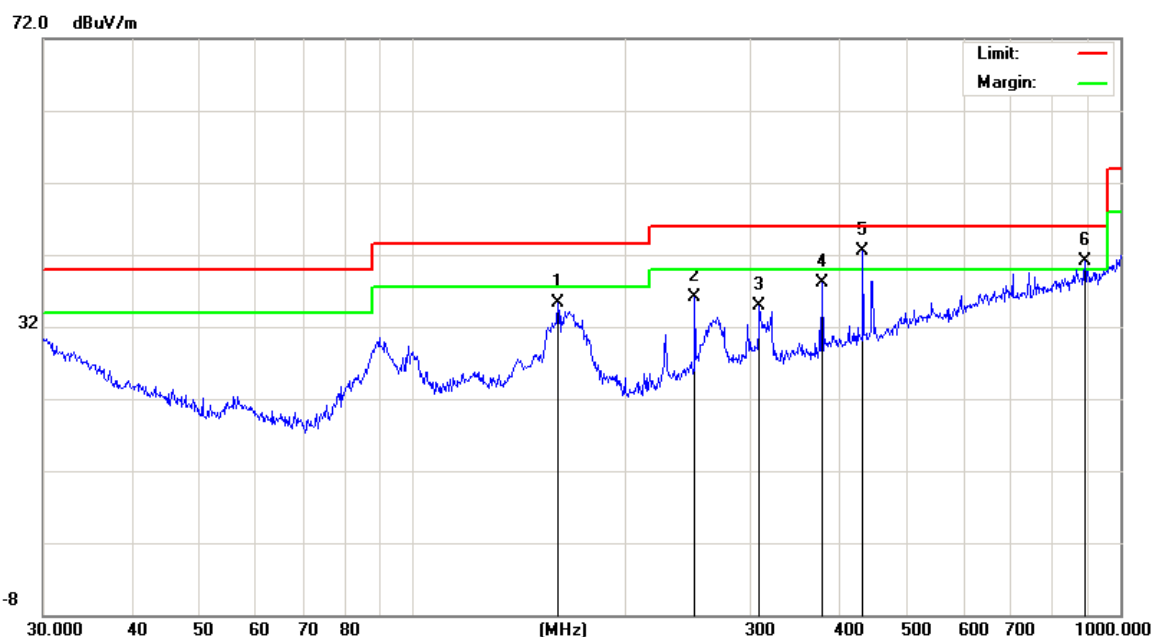
Emission Level= Meter Reading+ Factor, Margin= Emission Level - Limit



Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	160.3456	17.23	18.15	35.38	43.50	-8.12	QP
H	250.3012	16.44	19.65	36.09	46.00	-9.91	QP
H	308.9126	13.92	21.01	34.93	46.00	-11.07	QP
H	378.5843	14.73	23.36	38.09	46.00	-7.91	QP
H	432.5457	17.78	24.68	42.46	46.00	-3.54	QP
H	890.7278	8.91	32.22	41.13	46.00	-4.87	QP

Remark:

Emission Level= Meter Reading+ Factor, Margin= Emission Level - Limit



Note: All modes have been tested, just the the worst mode has been recorded in the report.

3.2.8 TEST RESULTS (1GHz-18GHz)

EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX(5.2G) - 802.11n20 MIMO mode_5180~5240MHz		

Polar	Frequency	Meter Reading	Cable loss	Antenna Factor	Preamplifier Factor	Emission Level	Limits	Margin	Detector Type
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel (5180 MHz)-Above 1G									
Vertical	3015	54.40	5.94	35.4	44	51.74	68.2	-16.46	Pk
Vertical	10360	56.64	8.46	39.75	44.5	60.35	68.2	-7.85	Pk
Vertical	15540	57.56	10.12	38.8	44.1	62.38	74	-11.62	Pk
Vertical	15540	40.41	10.12	38.8	42.7	46.63	54	-7.37	AV
Horizontal	2981	54.22	5.94	35.18	44	51.34	68.2	-16.86	Pk
Horizontal	10360	51.95	8.46	38.71	44.5	54.62	68.2	-13.58	Pk
Horizontal	15540	53.54	10.12	38.38	44.1	57.94	74	-16.06	Pk
Horizontal	15540	40.08	10.12	38.38	44.1	44.48	54	-9.52	AV
Middle Channel (5200 MHz)-Above 1G									
Vertical	3561	53.86	6.48	36.35	44.05	52.64	68.2	-15.56	Pk
Vertical	10400	56.21	8.47	37.88	44.51	58.05	68.2	-10.15	Pk
Vertical	15600	54.84	10.12	38.8	44.1	59.66	74	-14.34	Pk
Vertical	15600	35.13	10.12	38.8	42.7	41.35	54	-12.65	AV
Horizontal	3363	55.22	6.48	36.37	44.05	54.02	68.2	-14.18	Pk
Horizontal	10400	49.35	8.47	38.64	44.5	51.96	68.2	-16.24	Pk
Horizontal	15600	58.94	10.12	38.38	44.1	63.34	74	-10.66	Pk
Horizontal	15600	42.07	10.12	38.38	44.1	46.47	54	-7.53	AV
High Channel (5240 MHz)-Above 1G									
Vertical	3926	59.50	7.1	37.24	43.5	60.34	74	-13.66	Pk
Vertical	3926	40.53	7.1	37.24	43.5	41.37	54	-12.63	AV
Vertical	10480	52.47	8.46	37.68	44.5	54.11	68.2	-14.09	Pk
Vertical	15720	54.47	10.12	38.8	44.1	59.29	74	-14.71	Pk
Vertical	15720	36.02	10.12	38.8	42.7	42.24	54	-11.76	AV
Horizontal	3885	63.27	7.1	37.24	43.5	64.11	74	-9.89	Pk
Horizontal	3885	38.84	7.1	37.24	43.5	39.68	54	-14.32	AV
Horizontal	10480	49.79	8.46	38.57	44.5	52.32	68.2	-15.88	Pk
Horizontal	15720	59.32	10.12	38.38	44.1	63.72	74	-10.28	Pk
Horizontal	15720	38.02	10.12	38.38	44.1	42.42	54	-11.58	AV

Note: "802.11n20 MIMO" mode is the worst mode. PK value is lower than the Average value limit, So average didn't record.

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX (5.8G) -- 802.11ac20 MIMO_5745~5825MHz		

Polar	Frequen cy	Meter Readin g	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector Type
(H/V)	(MHz)	(dBuV)	(dB)	dB/m	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
Low Channel (5745 MHz)-Above 1G									
Vertical	2806	61.19	5.94	35.40	44.00	58.53	74.00	-15.47	Pk
Vertical	2806	44.41	5.94	35.40	44.00	41.75	54.00	-12.25	AV
Vertical	11490	58.88	8.46	39.75	44.50	62.59	74.00	-11.41	Pk
Vertical	11490	38.92	8.46	39.75	44.50	42.63	54.00	-11.37	AV
Vertical	17235	49.55	10.12	38.80	44.10	54.37	68.20	-13.83	Pk
Horizontal	2911	58.15	5.94	35.18	44.00	55.27	68.20	-12.93	Pk
Horizontal	11490	59.49	8.46	38.71	44.50	62.16	74.00	-11.84	Pk
Horizontal	11490	39.10	8.46	38.71	44.50	41.77	54.00	-12.23	AV
Horizontal	17235	52.72	10.12	38.38	44.10	57.12	68.20	-11.08	Pk
middle Channel (5785 MHz)-Above 1G									
Vertical	3763	58.89	6.48	36.35	44.05	57.67	74.00	-16.33	Pk
Vertical	3763	42.36	6.48	36.35	44.05	41.14	54.00	-12.86	AV
Vertical	11570	59.18	8.47	37.88	44.51	61.02	74.00	-12.98	Pk
Vertical	11570	44.58	8.47	37.88	44.51	46.42	54.00	-7.58	AV
Vertical	17355	55.84	10.12	38.8	44.10	60.66	68.20	-7.54	Pk
Horizontal	3561	52.39	6.48	36.37	44.05	51.19	68.20	-17.01	Pk
Horizontal	11570	57.37	8.47	38.64	44.50	59.98	74.00	-14.02	Pk
Horizontal	11570	38.92	8.47	38.64	44.50	41.53	54.00	-12.47	AV
Horizontal	17355	56.36	10.12	38.38	44.10	60.76	68.20	-7.44	Pk
High Channel (5825 MHz)-Above 1G									
Vertical	3907	60.88	7.10	37.24	43.50	61.72	74.00	-12.28	Pk
Vertical	3907	40.45	7.10	37.24	43.50	41.29	54.00	-12.71	AV
Vertical	11650	57.60	8.46	37.68	44.50	59.24	74.00	-14.76	Pk
Vertical	11650	42.68	8.46	37.68	44.50	44.32	54.00	-9.68	AV
Vertical	17475	52.72	10.12	38.8	44.10	57.54	68.20	-10.66	Pk
Horizontal	3912	58.26	7.10	37.24	43.50	59.10	74.00	-14.90	Pk
Horizontal	3912	38.18	7.10	37.24	43.50	39.02	54.00	-14.98	AV
Horizontal	11650	60.49	8.46	38.57	44.50	63.02	74.00	-10.98	Pk
Horizontal	11650	42.00	8.46	38.57	44.50	44.53	54.00	-9.47	AV
Horizontal	17475	51.52	10.12	38.38	44.10	55.92	68.20	-12.28	Pk

Note:"802.11ac20 MIMO" mode is the worst mode. PK value is lower than the Average value limit, So average didn't record.

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value

has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

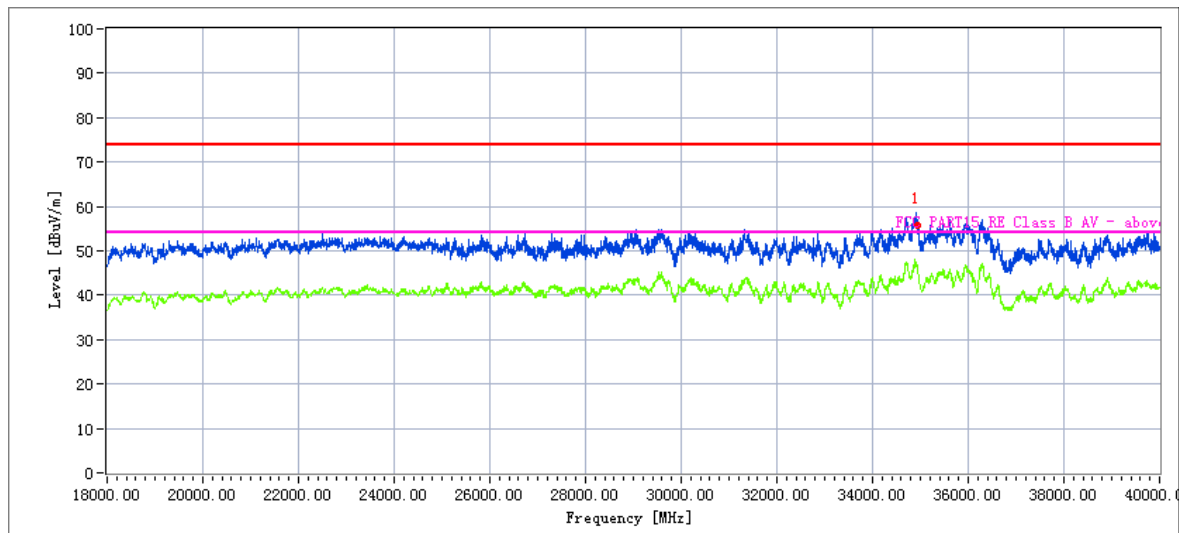
3.2.10 TEST RESULTS (18GHz-40GHz)

EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX (5.2G)-802.11ac20 MIMO 5180MHz~5240MHz; TX (5.8G)-802.11n20 MIMO 5745MHz~5825MHz		

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

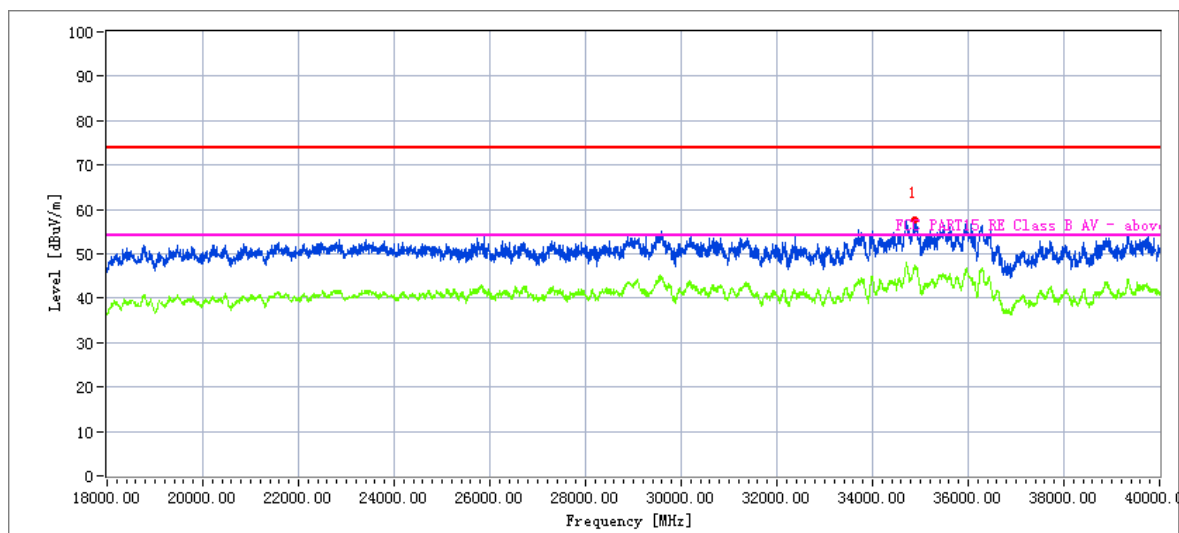
Low Channel (5180 MHz)-Above 1G

Horizontal



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
34933.428	37.69	20.09	44.07	43.48	58.37	68.20	9.83	Peak

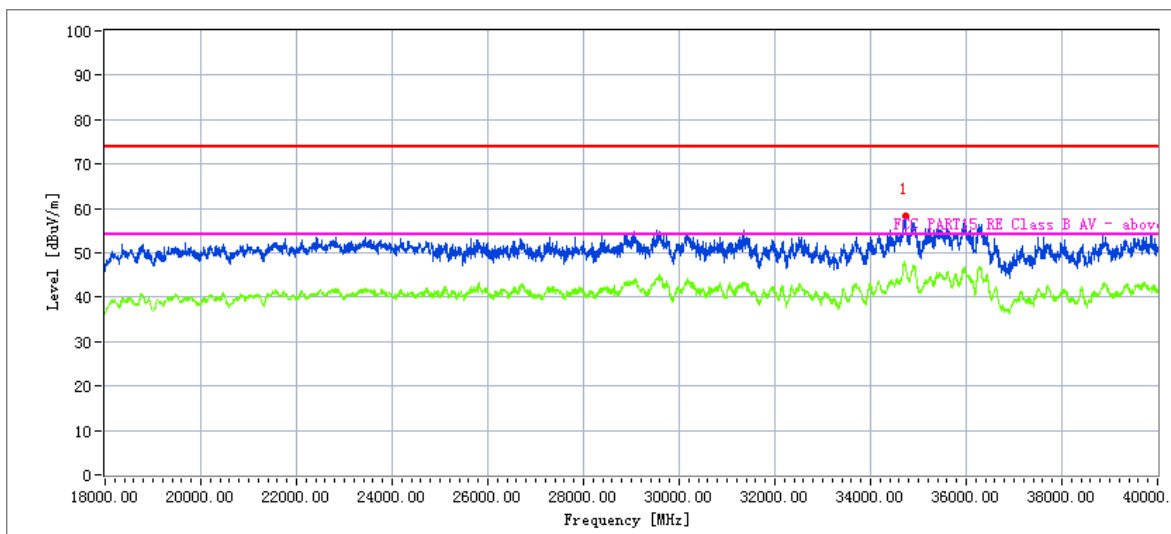
Vertical



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
34898.094	40.84	19.11	42.73	44.61	58.07	68.20	10.13	Peak

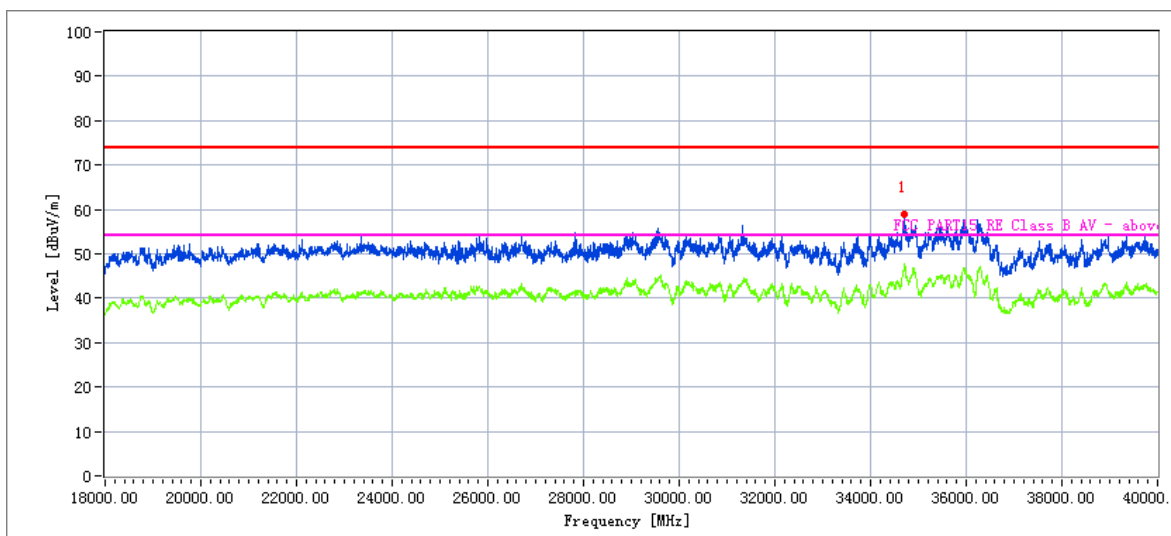
High Channel (5240 MHz)-Above 1G

Horizontal



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
34723.171	38.25	20.09	44.07	43.48	58.93	68.20	9.27	Peak

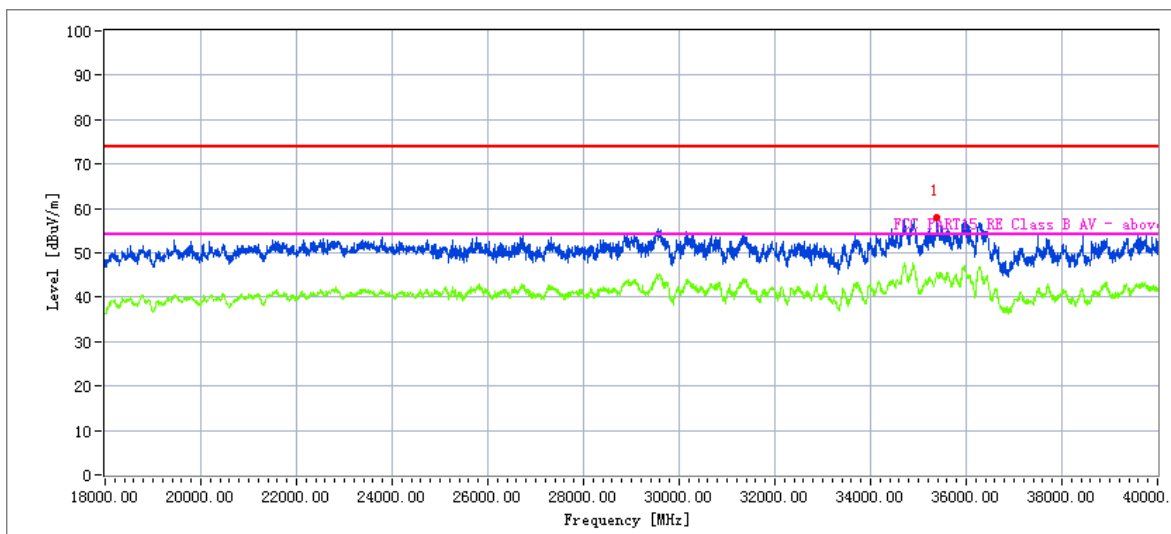
Vertical



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
34706.816	38.22	20.09	44.07	43.48	58.90	68.20	9.30	Peak

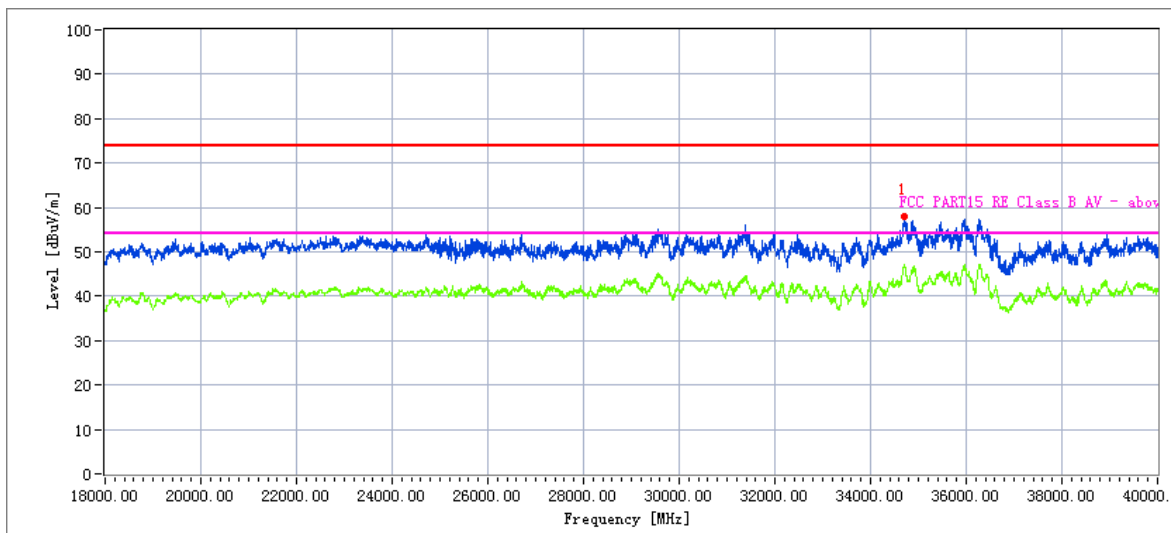
Low Channel (5745 MHz)-Above 1G

Horizontal



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
35382.191	38.71	20.09	44.16	43.48	59.48	68.20	8.72	Peak

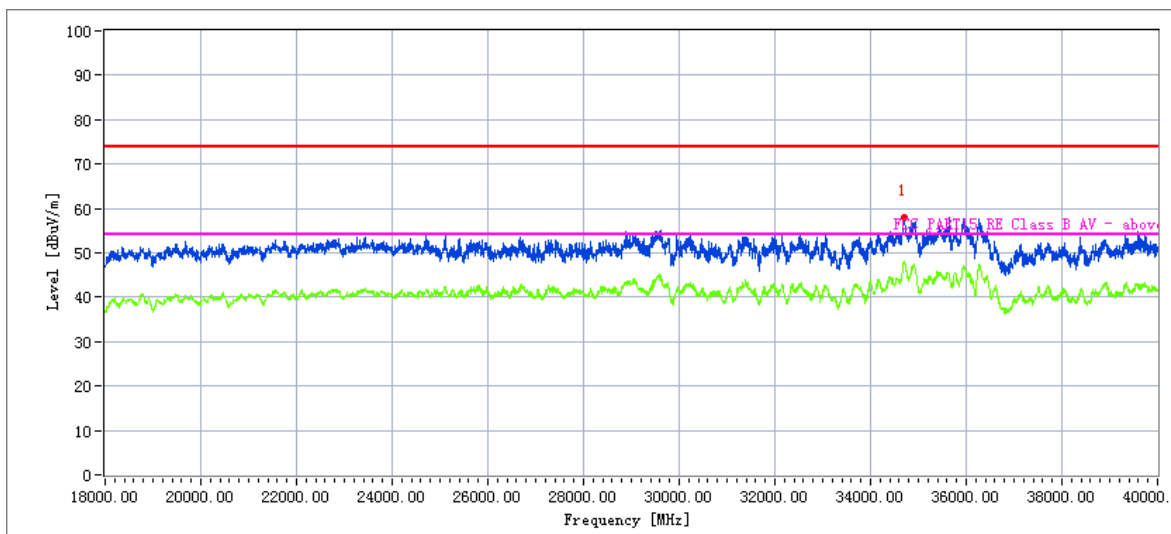
Vertical



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
34716.727	40.73	19.11	42.63	43.48	58.99	68.20	9.21	Peak

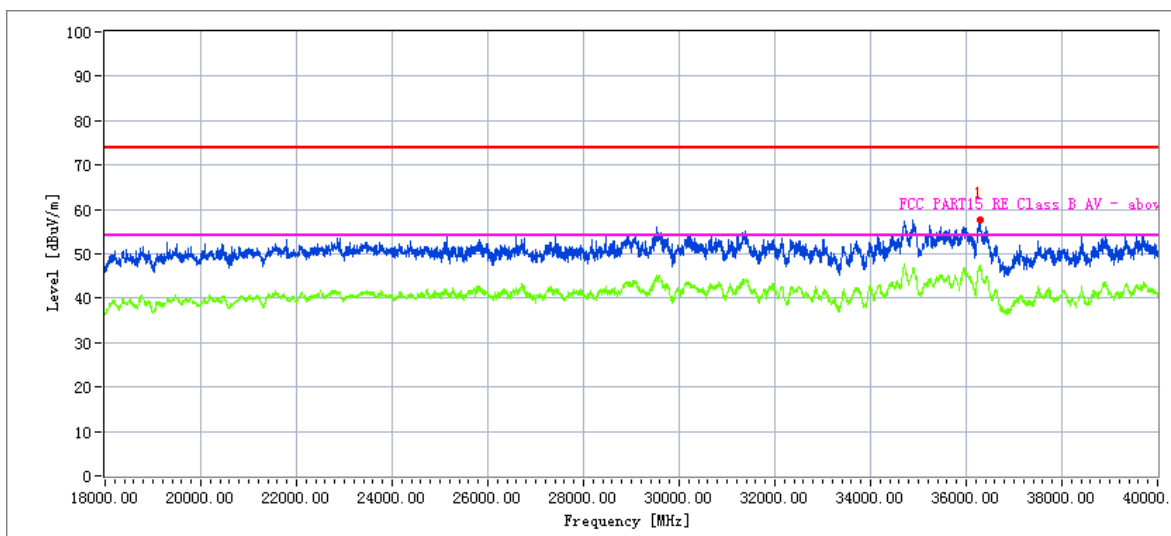
High Channel (5825 MHz)-Above 1G

Horizontal



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
34702.316	38.53	20.06	44.07	43.21	59.45	68.20	8.75	Peak

Vertical



Frequency	Meter Reading	Cable loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Remark
35977.328	37.97	20.10	44.10	43.22	58.95	68.20	9.25	Peak

3.2.11 Spurious Emission in Restricted Band 4.5GHz~5.150 GHz& 5.350GHz~5460GHz

EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX (5.2G)-802.11n20 MIMO 5150MHz~5250MHz,		

All the modulation modes have been tested, The report just record the worst data mode.

Frequency	Meter Reading	Cable Loss	Antenna Factor	Preamp Factor	Emission Level	Limits	Margin	Detector	Comment
(MHz)	(dBμV)	(dB)	dB/m	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type	
5.2G WIFI-802.11n20 MIMO Mode									
4500	58.25	5.20	35.60	44.20	54.85	74	-19.15	Pk	Horizontal
4500	44.97	5.20	35.60	44.20	41.57	54	-12.43	AV	Horizontal
4500	60.20	5.20	35.60	44.20	56.80	74	-17.20	Pk	Vertical
4500	41.74	5.20	35.60	44.20	38.34	54	-15.66	AV	Vertical
5150	60.08	5.36	35.66	44.22	56.88	74	-17.12	Pk	Horizontal
5150	38.49	5.36	35.66	44.22	35.29	54	-18.71	AV	Horizontal
5150	58.87	5.36	35.66	44.22	55.67	74	-18.33	Pk	Vertical
5150	39.33	5.36	35.66	44.22	36.13	54	-17.87	AV	Vertical
5350	58.69	5.68	35.68	44.22	55.83	74	-18.17	Pk	Horizontal
5350	37.09	5.68	35.68	44.22	34.23	54	-19.77	AV	Horizontal
5350	56.80	5.68	35.68	44.22	53.94	74	-20.06	Pk	Vertical
5350	37.61	5.68	35.68	44.22	34.75	54	-19.25	AV	Vertical

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

(2) "802.11n20 MIMO" mode is the worst mode. When PK value is lower than the Average value limit, average don't record.

4. POWER SPECTRAL DENSITY TEST

4.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(a)

For the band 5.15-5.25 GHz,

- (i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
- (ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
- (iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.
- (iv) For client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz

- (3) For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2 TEST PROCEDURE

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 KHz bandwidth, the following adjustments to the procedures apply:

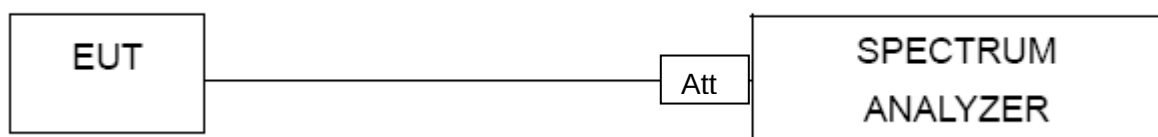
- a) Set $RBW \geq 1/T$, where T is defined in section II.B.I.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ KHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10\log(1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note: As a practical matter, it is recommended to use reduced RBW of 100 KHz for the sections 5.c) and 5.d) above, since $RBW=100 \text{ KHz}$ is available on nearly all spectrum analyzers.

4.3 DEVIATION FROM STANDARD

No deviation.

4.4 TEST SETUP



4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1015 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX Frequency Band 1 (5150-5250MHz), Band 4 (5745-5825MHz)		

Refer to section 2.2 of this report:

For 5.2G band, 802.11n/ac has MIMO mode. Directional gain=5.01 dBi
 5.01 dBi<6.0 dBi, so MIMO power spectral density limit=11dBm / 1MHz;
 For 5.8G band, 802.11n/ac has MIMO mode. Directional gain=5.01 dBi
 5.01 dBi<6.0 dBi, so MIMO power spectral density limit=30dBm / 500kHz;

Test data reference attachment.

5. 26DB & 99% EMISSION BANDWIDTH

5.1 APPLIED PROCEDURES / LIMIT

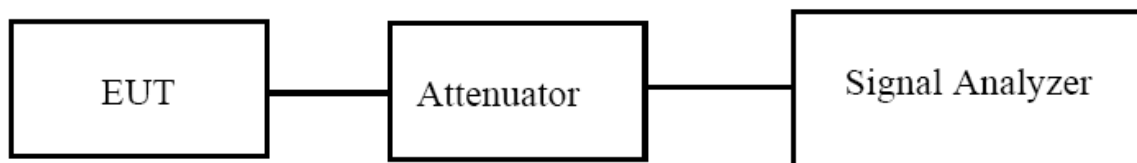
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.15-5.25 GHz, 5.25-5.35 GHz, and the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

5.2 TEST PROCEDURE

- a) Set RBW = approximately 1% of the emission bandwidth.
- b) Set the VBW > RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

The following procedure shall be used for measuring (99 %) power bandwidth:

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set $VBW \geq 3 \cdot RBW$
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.



5.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.4 TEST RESULTS

EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX Frequency Band 1 (5150-5250MHz), Band 4 (5745-5825MHz)		

Test data reference attachment.

6. MINIMUM 6 DB BANDWIDTH

6.1 APPLIED PROCEDURES / LIMIT

According to FCC §15.407(e)

(e) Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

6.2 TEST PROCEDURE

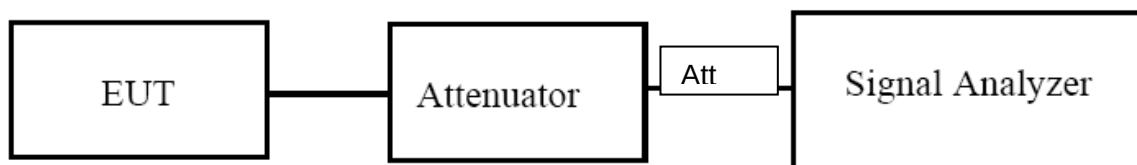
Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 KHz for the band 5.715-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX (5G) Mode Frequency Band 4 (5725-5850MHz)		

Test data reference attachment.

7. MAXIMUM CONDUCTED OUTPUT POWER

7.1 PPLIED PROCEDURES / LIMIT

According to FCC §15.407

The maximum conducted output power should not exceed:

Frequency Band(MHz)	Limit
5150~5250	1W
5725~5850	1W

7.2 TEST PROCEDURE

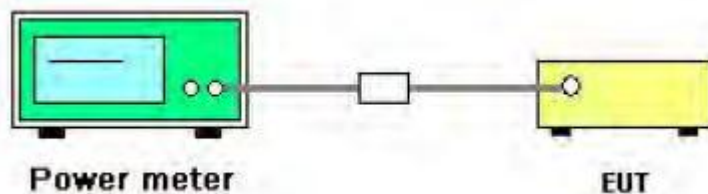
· Method PM is Measurement using an RF average power meter. The procedure for this method is as follows:

- a) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the following conditions are satisfied:
 - 1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
 - 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
 - 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- b) If the transmitter does not transmit continuously, measure the duty cycle D of the transmitter output signal as described in 12.2.
- c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
- d) Adjust the measurement in dBm by adding $[10 \log (1 / D)]$, where D is the duty cycle {e.g., $[10 \log (1 / 0.25)]$, if the duty cycle is 25%}.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.5 TEST RESULTS

EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX Frequency Band 1 (5150-5250MHz), Band 4 (5745-5825MHz)		

Refer to section 2.2 of this report:

For 5.2G band. Directional gain=2dBi; 6.0dBi > 2dBi, so conducted power limit= 23.98dBm.

For 5.8G band. Directional gain=2dBi; 6.0dBi > 2dBi, so conducted power limit= 30.00dBm.

Test data reference attachment.

8. OUT OF BAND EMISSIONS

8.1 APPLICABLE STANDARD

According to FCC §15.407(b)

Undesirable emission limits. Except as shown in paragraph (b)(9) (10) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of -27 dBm/MHz.
- (2) For transmitters operating in the 5.725-5.85 GHz band: For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

8.2 TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 1 MHz with a convenient frequency span.
4. 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.
5. Repeat above procedures until all measured frequencies were complete.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.6 TEST RESULTS

EUT :	Set-Top Box Android	Model Name :	OV0220
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1012 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz

Test data reference attachment.

9. Frequency Stability Measurement

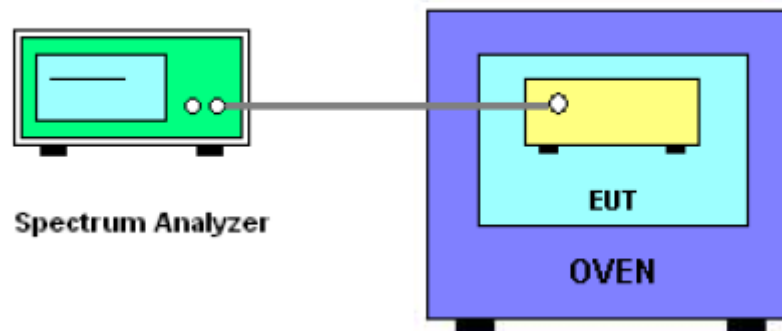
9.1 LIMIT

Manufactures of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

9.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 20 ppm (IEEE 802.11 specification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is $-20^{\circ}\text{C} \sim 70^{\circ}\text{C}$.

9.3 TEST SETUP LAYOUT



9.4 EUT OPERATION DURING TEST

1. The EUT was programmed to be in continuously un-modulation transmitting mode.
2. The has two antennas, and the worst data is Antenna 1, only shown Antenna 1 Plot.

9.5 TEST RESULTS

EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX Frequency Band I (5150-5250MHz)		

1(2) Represent the value of antenna 1 and 2, the worst data is Antenna 1 802.11a mode, only shown Antenna 1 802.11a mode data.

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5180.0540	5180	0.0540	-10.4167
		V max (V)	13.20	5180.0116	5180	0.0116	-2.2434
		V min (V)	10.80	5180.0060	5180	0.0060	-1.1521
Limits				Within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5180MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5180.0652	5180	0.0652	-12.5865
		T (°C)	-10	5180.0044	5180	0.0044	-0.8473
		T (°C)	0	5180.0640	5180	0.0640	-12.3522
		T (°C)	10	5180.0021	5180	0.0021	-0.4076
		T (°C)	20	5180.0008	5180	0.0008	-0.1591
		T (°C)	30	5180.0167	5180	0.0167	-3.2264
		T (°C)	40	5180.0598	5180	0.0598	-11.5359
		T (°C)	50	5180.0239	5180	0.0239	-4.6064
		T (°C)	60	5180.0094	5180	0.0094	-1.8058
		T (°C)	70	5180.0073	5180	0.0073	-1.4140
Limits				Within 5150-5250MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5200.0307	5200	0.0307	-5.9048
		V max (V)	13.20	5200.0623	5200	0.0623	-11.9718
		V min (V)	10.80	5200.0724	5200	0.0724	-13.9300
Limits				Within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5200MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5200.0733	5200	0.0733	-14.0880
		T (°C)	-10	5200.0124	5200	0.0124	-2.3852
		T (°C)	0	5200.0020	5200	0.0020	-0.3902
		T (°C)	10	5200.0439	5200	0.0439	-8.4443
		T (°C)	20	5200.0610	5200	0.0610	-11.7324
		T (°C)	30	5200.0507	5200	0.0507	-9.7578
		T (°C)	40	5200.0430	5200	0.0430	-8.2603
		T (°C)	50	5200.0419	5200	0.0419	-8.0669
		T (°C)	60	5200.0143	5200	0.0143	-2.7563
		T (°C)	70	5200.0721	5200	0.0721	-13.8640
Limits				Within 5150-5250MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5240.0229	5240	0.0229	-4.3710
		V max (V)	13.20	5240.0723	5240	0.0723	-13.7900
		V min (V)	10.80	5240.0622	5240	0.0622	-11.8618
Limits				Within 5150-5250MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5240MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5240.0118	5240	0.0118	-2.2612
		T (°C)	-10	5240.0067	5240	0.0067	-1.2777
		T (°C)	0	5240.0593	5240	0.0593	-11.3116
		T (°C)	10	5240.0582	5240	0.0582	-11.1025
		T (°C)	20	5240.0317	5240	0.0317	-6.0431
		T (°C)	30	5240.0554	5240	0.0554	-10.5685
		T (°C)	40	5240.0071	5240	0.0071	-1.3611
		T (°C)	50	5240.0241	5240	0.0241	-4.5913
		T (°C)	60	5240.0695	5240	0.0695	-13.2623
		T (°C)	70	5240.0697	5240	0.0697	-13.3099
Limits				Within 5150-5250MHz			
Result				Complies			

EUT :	Set-Top Box Android	Model Name. :	OV0220
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 12V powered by Adapter AC 120V/60Hz
Test Mode :	TX Frequency(5745-5850MHz)		

1(2) Represent the value of antenna 1 and 2, the worst data is Antenna 1 802.11a mode, only shown Antenna 1 802.11a mode data.

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5745.0214	5745	0.02136	-3.7172
		V max (V)	13.20	5745.0646	5745	0.06459	-11.2422
		V min (V)	10.80	5745.0003	5745	0.00026	-0.0448
Limits				Within 5745-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5745MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5745.0572	5745	0.05724	-9.9641
		T (°C)	-10	5745.0699	5745	0.06988	-12.1630
		T (°C)	0	5745.0111	5745	0.01107	-1.9264
		T (°C)	10	5745.0349	5745	0.03493	-6.0802
		T (°C)	20	5745.0768	5745	0.07678	-13.3645
		T (°C)	30	5745.0525	5745	0.05251	-9.1404
		T (°C)	40	5745.0292	5745	0.02922	-5.0865
		T (°C)	50	5745.0416	5745	0.04164	-7.2485
		T (°C)	60	5745.0019	5745	0.00195	-0.3394
		T (°C)	70	5745.0299	5745	0.02993	-5.2104
Limits				Within 5745-5850MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5785.0090	5785	0.00900	-1.5553
		V max (V)	13.20	5785.0649	5785	0.06494	-11.2249
		V min (V)	10.80	5785.0050	5785	0.00503	-0.8702
Limits				Within 5745-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5785MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5785.0659	5785	0.06591	-11.3932
		T (°C)	-10	5785.0777	5785	0.07773	-13.4358
		T (°C)	0	5785.0458	5785	0.04579	-7.9151
		T (°C)	10	5785.0676	5785	0.06763	-11.6900
		T (°C)	20	5785.0524	5785	0.05244	-9.0649
		T (°C)	30	5785.0067	5785	0.00674	-1.1652
		T (°C)	40	5785.0161	5785	0.01605	-2.7745
		T (°C)	50	5785.0775	5785	0.07753	-13.4018
		T (°C)	60	5785.0716	5785	0.07161	-12.3785
		T (°C)	70	5785.0169	5785	0.01693	-2.9269
Limits				Within 5745-5850MHz			
Result				Complies			

Voltage vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
T nom (°C)	20	V nom (V)	12.00	5825.0080	5825	0.00802	-1.3767
		V max (V)	13.20	5825.0422	5825	0.04221	-7.2469
		V min (V)	10.80	5825.0050	5825	0.00499	-0.8562
Limits				Within 5745-5850MHz			
Result				Complies			

Temperature vs. Frequency Stability

TEST CONDITIONS				Reference Frequency: 5825MHz			
				f	fc	Max. Deviation (MHz)	Max. Deviation (ppm)
V nom (V)	12	T (°C)	-20	5825.0316	5825	0.03160	-5.4243
		T (°C)	-10	5825.0361	5825	0.03611	-6.1985
		T (°C)	0	5825.0147	5825	0.01469	-2.5214
		T (°C)	10	5825.0421	5825	0.04209	-7.2259
		T (°C)	20	5825.0584	5825	0.05837	-10.0200
		T (°C)	30	5825.0661	5825	0.06606	-11.3413
		T (°C)	40	5825.0135	5825	0.01345	-2.3097
		T (°C)	50	5825.0270	5825	0.02701	-4.6361
		T (°C)	60	5825.0025	5825	0.00253	-0.4335
		T (°C)	70	5825.0460	5825	0.04602	-7.9011
Limits				Within 5745-5850MHz			
Result				Complies			

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

10.2 EUT ANTENNA

The EUT antenna is permanent attached Antenna: FPC Antenna (Gain: 2dBi),
It comply with the standard requirement.

END OF REPORT