FCC TEST REPORT

For

Shenzhen Manka IOT Electronic Co.,Ltd

Wicom Controller RGBCW+Microphone

Test Model: SC2QCEDQ21WR

Additional Model No.: Please Refer to Page 6

Prepared for	:	Shenzhen Manka IOT Electronic Co.,Ltd
Address	:	Room 1404, Huichao Technology Building, Jinhai Road, Yantian Community, Xixiang Street, Baoan District, Shenzhen, China.
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
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Date of receipt of test sample	:	September 07, 2022
Number of tested samples	:	2
Sample No.	:	A082622155-1, A082622155-2
Serial number	:	Prototype
Date of Test	:	September 07, 2022 ~ September 23, 2022
Date of Report	:	September 26, 2022

FCC TEST REPORT
FCC CFR 47 PART 15 C(15.247)

Report Reference No.	**:**	**LCSA082622155EB**
Date of Issue	:	September 26, 2022
Testing Laboratory Name.....	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
**Applicant's Name ..... **	**:**	**Shenzhen Manka IOT Electronic Co.,Ltd**
Address	:	Room 1404, Huichao Technology Building, Jinhai Road, Yantian Community, Xixiang Street, Baoan District, Shenzhen, China.
Test Specification		
Standard.....	:	FCC CFR 47 PART 15 C(15.247)
**Test Report Form No. ..... **	**:**	LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF	:	Dated 2011-03

**EUT Description. ..... **	**:**	**Wicom Controller RGBCW+Microphone**
Trade Mark.....	:	N/A
Test Model.....	:	SC2QCEDQ21WR
Ratings	:	Input: DC 5-24V, 0.5A For Adapter Input: 100-240V~, 50/60Hz, 0.75A max For Adapter Output: 12.0V⎓2.0A, 24.0W
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Vera Deng/ Administrator	Cary Luo/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCSA082622155EB**	September 26, 2022 Date of issue

EUT.....	:	Wicom Controller RGBCW+Microphone
Test Model.....	:	SC2QCEDQ21WR
Applicant.....	**:**	**Shenzhen Manka IOT Electronic Co.,Ltd**
Address.....	:	Room 1404, Huichao Technology Building, Jinhai Road, Yantian Community, Xixiang Street, Baoan District, Shenzhen, China.
Telephone.....	:	/
Fax.....	:	/
Manufacturer.....	**:**	**Shenzhen Manka IOT Electronic Co.,Ltd**
Address.....	:	Room 1404, Huichao Technology Building, Jinhai Road, Yantian Community, Xixiang Street, Baoan District, Shenzhen, China.
Telephone.....	:	/
Fax.....	:	/
Factory.....	**:**	**Shenzhen Manka IOT Electronic Co.,Ltd**
Address.....	:	Room 1404, Huichao Technology Building, Jinhai Road, Yantian Community, Xixiang Street, Baoan District, Shenzhen, China.
Telephone.....	:	/
Fax.....	:	/

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Report Version	Issue Date	Revision Content	Revised By
000	September 26, 2022	Initial Issue	---

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1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Wicom Controller RGBCW+Microphone
Test Model	:	SC2QCEDQ21WR
Additional Model No.	:	Please see the next page
Model Declaration	:	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Power Supply	:	Input: DC 5-24V, 0.5A For Adapter Input: 100-240V~, 50/60Hz, 0.75A max For Adapter Output: 12.0V⎓2.0A, 24.0W
Hardware Version	:	V1.0
Software Version	:	1.0.60
Bluetooth		
Frequency Range	:	2402MHz ~ 2480MHz
Channel Number	:	40 channels for Bluetooth V4.2 (DTS)
Channel Spacing	:	2MHz for Bluetooth V4.2 (DTS)
Modulation Type	:	GFSK for Bluetooth V4.2 (DTS)
Bluetooth Version	:	V4.2
Antenna Description	:	Internal Antenna, -2.21dBi(Max.)
2.4G WLAN		
Frequency Range	:	2412MHz~2462MHz
Channel Spacing	:	5MHz
Channel Number	:	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Antenna Description	:	Internal Antenna, -2.21dBi(Max.)

Model list:

MKPX-WW2M24	SC1YXEDC21NW	SC2QC2DQ21WR	SC2HED2408NW	SC0SFCDN44NW
MKPX-HH2M24	SC1YXFDC213W	SC2QCCDQ21WR	SC2HEE2408NW	SC0SFDDN44NW
MKPX-WW3M24	SC1YXFDC214W	SC2QCDDQ21WR	SC2HEF2408NW	SC0SFEDN44NW
MKPX-HH3M24	SC1YX2DC41NW	SC2QCEDQ21WR	SC2HE14804NW	SC0SFFDN44NW
MKPX-WW2M36	SC1YXCDC41NW	SC2QCFDQ21W3	SC2HE24804NW	SC1GE1G2202H
MKPX-HH2M36	SC1YXDDC41NW	SC2QCFDQ21W4	SC2HEC4804NW	SC1GE2G2202H
MKPX-WW3M36	SC1YXEDC41NW	SC2FD2UQ30NB	SC2HED4804NW	SC1GELG2202H
MKPX-HH3M36	SC1YXFDC413W	SC2FDCUQ30NB	SC2HEE4804NW	SC1GE3G2202H
MKPX-WW2M48	SC1YXFDC414W	SC2FDDUQ30NB	SC2HEF4804NW	SC1GE4G2202H
MKPX-HH2M48	SC1YX2DC42NW	SC2FDEUQ30NB	SC2HE11232NW	SC1GE5G2202H
MKPX-WW3M48	SC1YXCDC42NW	SC2FDFUQ30NB	SC2HE21232NW	SC1GEFG2202H
MKPX-HH3M48	SC1YXDDC42NW	SC2FD2UQ30RB	SC2HEC1232NW	SC1GE1G2205H
MKPX-WW2M80	SC1YXEDC42NW	SC2FDCUQ30RB	SC2HED1232NW	SC1GE2G2205H
MKPX-HH2M80	SC1YXFDC423W	SC2FDDUQ30RB	SC2HEE1232NW	SC1GELG2205H
MKPX-WW3M80	SC1YXFDC424W	SC2FDEUQ30RB	SC2HEF1232NW	SC1GE3G2205H
MKPX-HH3M80	SC1TW2U521HB	SC2FDFUQ30RB	SC2HE12416NW	SC1GE4G2205H
MKPY-WW2M1018	SC1TWCU521HB	SC1XX1UQ21RW	SC2HE22416NW	SC1GE5G2205H
MKPY-WW3M1018	SC1TWDU521HB	SC1XX2UQ21RW	SC2HEC2416NW	SC1GEFG2205H
MKPY-WW2M1036	SC1TWEU521HB	SC1XX3UQ21RW	SC2HED2416NW	SC1GE1G2208H
MKPY-WW3M1036	SC1TWFU5213B	SC1XX4UQ21RW	SC2HEE2416NW	SC1GE2G2208H
MKPY-WW2M1218	SC1TWFU5214B	SC1XX5UQ21RW	SC2HEF2416NW	SC1GELG2208H
MKPY-WW3M1218	SC1TW2U541HB	SC1XX6UQ21R3	SC2HE14808NW	SC1GE3G2208H
MKPY-WW2M1236	SC1TWCU541HB	SC1XX6UQ21R4	SC2HE24808NW	SC1GE4G2208H
MKPY-WW3M1236	SC1TWDU541HB	SC1XX1DQ21RW	SC2HEC4808NW	SC1GE5G2208H
MKPY-WW2M1518	SC1TWEU541HB	SC1XX2DQ21RW	SC2HED4808NW	SC1GEFG2208H
MKPY-WW3M1518	SC1TWFU5413B	SC1XX3DQ21RW	SC2HEE4808NW	SC1ZZ1UQ21H3
MKPY-WW2M1536	SC1TWFU5414B	SC1XX4DQ21RW	SC2HEF4808NW	SC1ZZ2UQ21H3
MKPY-WW3M1536	SC1TW2U542HB	SC1XX5DQ21RW	SC1XMAUQ21RB	SC1ZZ3UQ21H3
MKPY-WW2M1818	SC1TWCU542HB	SC1XX6DQ21R3	SC1XMBUQ21RB	SC1ZZCUQ21H3
MKPY-WW3M1818	SC1TWDU542HB	SC1XX6DQ21R4	SC1XMCUQ21RB	SC1ZZ4UQ21H3
MKPY-WW2M1836	SC1TWEU542HB	SC1XY1UQ21RB	SC1XMDUQ21RB	SC1ZZDUQ21H3
MKPY-WW3M1836	SC1TWFU5423B	SC1XY2UQ21RB	SC1XMEUQ21RB	SC1ZZ5UQ21H3
MKPY-WW2M2518	SC1TWFU5424B	SC1XY3UQ21RB	SC1XMFUQ21R3	SC1ZZEUQ21H3
MKPY-WW3M2518	SC1TW2DC21HB	SC1XY4UQ21RB	SC1XMFUQ21R4	SC1ZZFUQ21H3
MKPY-WW2M2536	SC1TWCDC21HB	SC1XY5UQ21RB	SC1XMADQ21RB	SC1ZZFUQ21H4
MKPY-WW3M2536	SC1TWDDC21HB	SC1XY6UQ21R3	SC1XMBDQ21RB	SC1ZZ1DQ21H3
MKPY-WW2M3518	SC1TWEDC21HB	SC1XY6UQ21R4	SC1XMCDQ21RB	SC1ZZ2DQ21H3
MKPY-WW3M3518	SC1TWFDC213B	SC1XY1DQ21RB	SC1XMDDQ21RB	SC1ZZ3DQ21H3
MKPY-WW2M3536	SC1TWFDC214B	SC1XY2DQ21RB	SC1XMEDQ21RB	SC1ZZCDQ21H3
MKPY-WW3M3536	SC1TW2DC41HB	SC1XY3DQ21RB	SC1XMFDQ21R3	SC1ZZ4DQ21H3
SC1WQFU521NB	SC1TWCDC41HB	SC1XY4DQ21RB	SC1XMFDQ21R4	SC1ZZDDQ21H3

SC1WQFDC21NB	SC1TWDDC41HB	SC1XY5DQ21RB	SC1XNAUQ21RB	SC1ZZ5DQ21H3
SC1WQFU521SK	SC1TWEDC41HB	SC1XY6DQ21R3	SC1XNBUQ21RB	SC1ZZEDQ21H3
SC1WQFDC21SK	SC1TWFDC413B	SC1XY6DQ21R4	SC1XNCUQ21RB	SC1ZZFDQ21H3
SC1WU1U521NB	SC1TWFDC414B	SC2HE11202NW	SC1XNDUQ21RB	SC1ZZFDQ21H4
SC1WU2U521NB	SC1TW2DC42HB	SC2HE21202NW	SC1XNEUQ21RB	SC2GZ1UQ21H3
SC1WU3U521NB	SC1TWCDC42HB	SC2HEC1202NW	SC1XNFUQ21R3	SC2GZ2UQ21H3
SC1WUCU521NB	SC1TWDDC42HB	SC2HED1202NW	SC1XNFUQ21R4	SC2GZ3UQ21H3
SC1WU4U521NB	SC1TWEDC42HB	SC2HEE1202NW	SC1XNADQ21RB	SC2GZCUQ21H3
SC1WUDU521NB	SC1TWFDC423B	SC2HEF1202NW	SC1XNBDQ21RB	SC2GZ4UQ21H3
SC1WU5U521NB	SC1TWFDC424B	SC2HE12401NW	SC1XNCDQ21RB	SC2GZDUQ21H3
SC1WUEU521NB	SC2WA1UQ21WB	SC2HE22401NW	SC1XNDDQ21RB	SC2GZ5UQ21H3
SC1WUFU5213B	SC2WA2UQ21WB	SC2HEC2401NW	SC1XNEDQ21RB	SC2GZEUQ21H3
SC1WUFU5214B	SC2WA3UQ21WB	SC2HED2401NW	SC1XNFDQ21R3	SC2GZFUQ21H3
SC1WU1U541NB	SC2WACUQ21WB	SC2HEE2401NW	SC1XNFDQ21R4	SC2GZFUQ21H4
SC1WU2U541NB	SC2WA4UQ21WB	SC2HEF2401NW	SC1XSAUQ21RB	SC2GZ1DQ21H3
SC1WU3U541NB	SC2WADUQ21WB	SC2HE1480ANW	SC1XSBUQ21RB	SC2GZ2DQ21H3
SC1WUCU541NB	SC2WA5UQ21WB	SC2HE2480ANW	SC1XSCUQ21RB	SC2GZ3DQ21H3
SC1WU4U541NB	SC2WAEUQ21WB	SC2HEC480ANW	SC1XSDUQ21RB	SC2GZCDQ21H3
SC1WUDU541NB	SC2WAFUQ213B	SC2HED480ANW	SC1XSEUQ21RB	SC2GZ4DQ21H3
SC1WU5U541NB	SC2WAFUQ214B	SC2HEE480ANW	SC1XSFUQ21R3	SC2GZDDQ21H3
SC1WUEU541NB	SC2WA1DQ21WB	SC2HEF480ANW	SC1XSFUQ21R4	SC2GZ5DQ21H3
SC1WUFU5413B	SC2WA2DQ21WB	SC2HE11204NW	SC1XSADQ21RB	SC2GZEDQ21H3
SC1WUFU5414B	SC2WA3DQ21WB	SC2HE21204NW	SC1XSBDQ21RB	SC2GZFDQ21H3
SC1WU1U542NB	SC2WACDQ21WB	SC2HEC1204NW	SC1XSCDQ21RB	SC2GZFDQ21H4
SC1WU2U542NB	SC2WA4DQ21WB	SC2HED1204NW	SC1XSDDQ21RB	SC2MZ1UQ21H3
SC1WU3U542NB	SC2WADDQ21WB	SC2HEE1204NW	SC1XSEDQ21RB	SC2MZ2UQ21H3
SC1WUCU542NB	SC2WA5DQ21WB	SC2HEF1204NW	SC1XSFDQ21R3	SC2MZ3UQ21H3
SC1WU4U542NB	SC2WAEDQ21WB	SC2HE12402NW	SC1XSFDQ21R4	SC2MZCUQ21H3
SC1WUDU542NB	SC2WAFDQ213B	SC2HE22402NW	SC0SFCU521NW	SC2MZ4UQ21H3
SC1WU5U542NB	SC2WAFDQ214B	SC2HEC2402NW	SC0SFFU521NW	SC2MZDUQ21H3
SC1WUEU542NB	SC2YB2UQ21WR	SC2HED2402NW	SC0SFCU541NW	SC2MZ5UQ21H3
SC1WUFU5423B	SC2YBCUQ21WR	SC2HEE2402NW	SC0SFFU541NW	SC2MZEUQ21H3
SC1WUFU5424B	SC2YBDUQ21WR	SC2HEF2402NW	SC0SFCU542NW	SC2MZFUQ21H3
SC1WU1DC21NB	SC2YBEUQ21WR	SC2HE14801NW	SC0SFFU542NW	SC2MZFUQ21H4
SC1WU2DC21NB	SC2YBFUQ213R	SC2HE24801NW	SC0SF1DC21NW	SC2MZ1DQ21H3
SC1WU3DC21NB	SC2YBFUQ214R	SC2HEC4801NW	SC0SF2DC21NW	SC2MZ2DQ21H3
SC1WUCDC21NB	SC2YB2DQ21WR	SC2HED4801NW	SC0SFCDC21NW	SC2MZ3DQ21H3
SC1WU4DC21NB	SC2YBCDQ21WR	SC2HEE4801NW	SC0SFDDC21NW	SC2MZCDQ21H3
SC1WUDDC21NB	SC2YBDDQ21WR	SC2HEF4801NW	SC0SFEDC21NW	SC2MZ4DQ21H3
SC1WDCDC21NB	SC2YBEDQ21WR	SC2HE11206NW	SC0SFFDC21NW	SC2MZDDQ21H3
SC1WUEDC21NB	SC2YBFDQ213R	SC2HE21206NW	SC0SF1DC41NW	SC2MZ5DQ21H3
SC1WUFDC213B	SC2YBFDQ214R	SC2HEC1206NW	SC0SF2DC41NW	SC2MZEDQ21H3

SC1WUFDC214B	SC2TC2UQ21WR	SC2HED1206NW	SC0SFCDC41NW	SC2MZFDQ21H3
SC1WU1DC41NB	SC2TCCUQ21WR	SC2HEE1206NW	SC0SFDDC41NW	SC2MZFDQ21H4
SC1WU2DC41NB	SC2TCDUQ21WR	SC2HEF1206NW	SC0SFEDC41NW	SC2NZ1UQ21H3
SC1WU3DC41NB	SC2TCEUQ21WR	SC2HE12403NW	SC0SFFDC41NW	SC2NZ2UQ21H3
SC1WUCDC41NB	SC2TCFUQ213R	SC2HE22403NW	SC0SF1DC42NW	SC2NZ3UQ21H3
SC1WU4DC41NB	SC2TCFUQ214R	SC2HEC2403NW	SC0SF2DC42NW	SC2NZCUQ21H3
SC1WUDDC41NB	SC2TC2DQ21WR	SC2HED2403NW	SC0SFCDC42NW	SC2NZ4UQ21H3
SC1WDCDC41NB	SC2TCCDQ21WR	SC2HEE2403NW	SC0SFDDC42NW	SC2NZDUQ21H3
SC1WUEDC41NB	SC2TCDDQ21WR	SC2HEF2403NW	SC0SFEDC42NW	SC2NZ5UQ21H3
SC1WUFDC413B	SC2TCEDQ21WR	SC2HE1480BNW	SC0SFFDC42NW	SC2NZEUQ21H3
SC1WUFDC414B	SC2TCFDQ213R	SC2HE2480BNW	SC0SF1DN21NW	SC2NZFUQ21H3
SC1WU1DC42NB	SC2TCFDQ214R	SC2HEC480BNW	SC0SF2DN21NW	SC2NZFUQ21H4
SC1WU2DC42NB	SC2QW2UQ21HW	SC2HED480BNW	SC0SFCDN21NW	SC2NZ1DQ21H3
SC1WU3DC42NB	SC2QWCUQ21HW	SC2HEE480BNW	SC0SFDDN21NW	SC2NZ2DQ21H3
SC1WUCDC42NB	SC2QWDUQ21HW	SC2HEF480BNW	SC0SFEDN21NW	SC2NZ3DQ21H3
SC1WU4DC42NB	SC2QWEUQ21HW	SC2HE11208NW	SC0SFFDN21NW	SC2NZCDQ21H3
SC1WUDDC42NB	SC2QWFUQ21H3	SC2HE21208NW	SC0SF1DN22NW	SC2NZ4DQ21H3
SC1WDCDC42NB	SC2QWFUQ21H4	SC2HEC1208NW	SC0SF2DN22NW	SC2NZDDQ21H3
SC1WUEDC42NB	SC2QW2UQ21RW	SC2HED1208NW	SC0SFCDN22NW	SC2NZ5DQ21H3
SC1WUFDC423B	SC2QWCUQ21RW	SC2HEE1208NW	SC0SFDDN22NW	SC2NZEDQ21H3
SC1WUFDC424B	SC2QWDUQ21RW	SC2HEF1208NW	SC0SFEDN22NW	SC2NZFDQ21H3
SC1YX2U521NW	SC2QWEUQ21RW	SC2HE12404NW	SC0SFFDN22NW	SC2NZFDQ21H4
SC1YXCU521NW	SC2QWFUQ21R3	SC2HE22404NW	SC0SF1DN41NW	SC2RZ1UQ21H3
SC1YXDU521NW	SC2QWFUQ21R4	SC2HEC2404NW	SC0SF2DN41NW	SC2RZ2UQ21H3
SC1YXEU521NW	SC2QC2UQ21WR	SC2HED2404NW	SC0SFCDN41NW	SC2RZ3UQ21H3
SC1YXFU5213W	SC2QCCUQ21WR	SC2HEE2404NW	SC0SFDDN41NW	SC2RZCUQ21H3
SC1YXFU5214W	SC2QCDUQ21WR	SC2HEF2404NW	SC0SFEDN41NW	SC2RZ4UQ21H3
SC1YX2U541NW	SC2QCEUQ21WR	SC2HE14802NW	SC0SFFDN41NW	SC2RZDUQ21H3
SC1YXCU541NW	SC2QCFUQ21W3	SC2HE24802NW	SC0SF1DN42NW	SC2RZ5UQ21H3
SC1YXDU541NW	SC2QCFUQ21W4	SC2HEC4802NW	SC0SF2DN42NW	SC2RZEUQ21H3
SC1YXEU541NW	SC2QW2DQ21HW	SC2HED4802NW	SC0SFCDN42NW	SC2RZFUQ21H3
SC1YXFU5413W	SC2QWCDQ21HW	SC2HEE4802NW	SC0SFDDN42NW	SC2RZFUQ21H4
SC1YXFU5414W	SC2QWDDQ21HW	SC2HEF4802NW	SC0SFEDN42NW	SC2RZ1DQ21H3
SC1YX2U542NW	SC2QWEDQ21HW	SC2HE11216NW	SC0SFFDN42NW	SC2RZ2DQ21H3
SC1YXCU542NW	SC2QWFDQ21H3	SC2HE21216NW	SC0SF1DN43NW	SC2RZ3DQ21H3
SC1YXDU542NW	SC2QWFDQ21H4	SC2HEC1216NW	SC0SF2DN43NW	SC2RZCDQ21H3
SC1YXEU542NW	SC2QW2DQ21RW	SC2HED1216NW	SC0SFCDN43NW	SC2RZ4DQ21H3
SC1YXFU5423W	SC2QWCDQ21RW	SC2HEE1216NW	SC0SFDDN43NW	SC2RZDDQ21H3
SC1YXFU5424W	SC2QWDDQ21RW	SC2HEF1216NW	SC0SFEDN43NW	SC2RZ5DQ21H3
SC1YX2DC21NW	SC2QWEDQ21RW	SC2HE12408NW	SC0SFFDN43NW	SC2RZEDQ21H3
SC1YXCDC21NW	SC2QWFDQ21R3	SC2HE22408NW	SC0SF1DN44NW	SC2RZFDQ21H3
SC1YXDDC21NW	SC2QWFDQ21R4	SC2HEC2408NW	SC0SF2DN44NW	SC2RZFDQ21H4

SC1ZZ1UQ2123	SC1ZZ2UQ2123	SC1ZZ3UQ2123	SC1ZZCUQ2123	SC1ZZ4UQ2123
SC1ZZDUQ2123	SC1ZZ5UQ2123	SC1ZZEUQ2123	SC1ZZFUQ2123	SC1ZZFUQ2124
SC1ZZ1DQ2123	SC1ZZ2DQ2123	SC1ZZ3DQ2123	SC1ZZCDQ2123	SC1ZZ4DQ2123
SC1ZZDDQ2123	SC1ZZ5DQ2123	SC1ZZEDQ2123	SC1ZZFDQ2123	SC1ZZFDQ2124

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
SHENZHEN OLEAD TECHNOLOGY CO.,LTD	ADAPTER	OLD120200AUS5D	--	FCC

1.3. External I/O Cable

I/O Port Description	Quantity	Cable
Power Port	1	N/A

1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.
Test Firm Registration Number: 254912.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

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

1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in Y position.

AC conducted emission pre-test at both at AC 120V/60Hz and AC 240V/60Hz modes, recorded worst case;

AC conducted emission pre-test at both at power adapter and power from PC modes, recorded worst case;

Worst-case mode and channel used for 150 KHz-30 MHz power line conducted emissions was determined to be IEEE 802.11b mode (Middle Channel).

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was determined to be IEEE 802.11b mode (Middle Channel).

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

IEEE 802.11b Mode: 1 Mbps, DSSS.
IEEE 802.11g Mode: 6 Mbps, OFDM.
IEEE 802.11n Mode HT20: MCS0, OFDM.
IEEE 802.11n Mode HT40: MCS0, OFDM.

Antenna & Bandwidth

Antenna	Chain 0 (ANT0)		Chain 1 (ANT1)		Simultaneously
Bandwidth Mode	20MHz	40MHz	20MHz	40MHz	/
IEEE 802.11b	☑	☐	☑	☐	☐
IEEE 802.11g	☑	☐	☑	☐	☐
IEEE 802.11n	☑	☑	☑	☑	☑

Channel List & Frequency

IEEE 802.11b/g/n HT20

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2412~2462MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437	---	---

IEEE 802.11n HT40

Frequency Band	Channel No.	Frequency(MHz)	Channel No.	Frequency(MHz)
2422~2452MHz	---	---	7	2442
	---	---	8	2447
	3	2422	9	2452
	4	2427	10	---
	5	2432	11	---
	6	2437	---	---

2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB558074 D01 15.247 Meas Guidance v05r02 is required to be used for this kind of FCC 15.247 digital modulation device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz and 1.5 m above ground plane above 1GHz. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013.

2.4. Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1(A082622155-1)	Engineer sample – continuous transmit
Sample 2(A082622155-2)	Normal sample – Intermittent transmit

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (EspRFTestTool_v28_Manual) provided by applicant.

3.3. Special Accessories

N/A.

3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.247(a)(2)	6dB Bandwidth	Sample 1	Compliant	Appendix B.1
§15.209(a)	Radiated Spurious Emissions	Sample 1 Sample 2	Compliant	Note 1
§15.247(b)	Maximum Peak Conducted Output Power	Sample 1	Compliant	Appendix B.2
§15.247(e)	Power Spectral Density	Sample 1	Compliant	Appendix B.3
§15.247(d)	Band Edge Measurements and Conducted Spurious Emissions	Sample 1	Compliant	Appendix B.4 Appendix B.5
/	On Time and Duty Cycle	Sample 1	/	Only reported; Appendix B.6
§15.205	Emissions in Restricted Band	Sample 1	Compliant	Appendix B.7
§15.207(a)	Conducted Emissions	Sample 2	Compliant	Note 1
§15.203	Antenna Requirements	Sample 1	Compliant	Note 1
§15.247(i)§2.1091	RF Exposure	N/A	Compliant	Note 2

Remark:
1. Note 1 – Test results inside test report;
2. Note 2 – Test results in other test report (RF Exposure report);

5. TEST RESULT

5.1. 6 dB Spectrum Bandwidth Measurement

5.1.1. Standard Applicable

According to §15.247(a) (2): For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

5.1.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto Sweep

5.1.3. Test Procedures

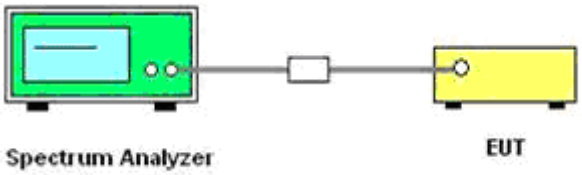
5.1.3.1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.

5.1.3.2. Set RBW/VBW = 100 KHz/300KHz (for 6dB bandwidth measurement)

Set RBW = 1%~5% OBW; VBW≥3*RBW (for occupied bandwidth measurement).

5.1.3.3. Measured the 6dB bandwidth and 99% occupied bandwidth by related function of the spectrum analyzer.

5.1.4. Test Setup Layout



5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.1.6. Test Result of 6dB Spectrum Bandwidth

PASS

Please refer to Appendix B.1
Remark:
1). Measured 6dB bandwidth at difference data rate for each mode and recorded worst case for each mode.
2). Test results including cable loss;
3). Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40;

5.2. Radiated Emissions Measurement

5.2.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 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	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	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			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 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.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

5.2.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10^{th} carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/B kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.2.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.0 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 2.5 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

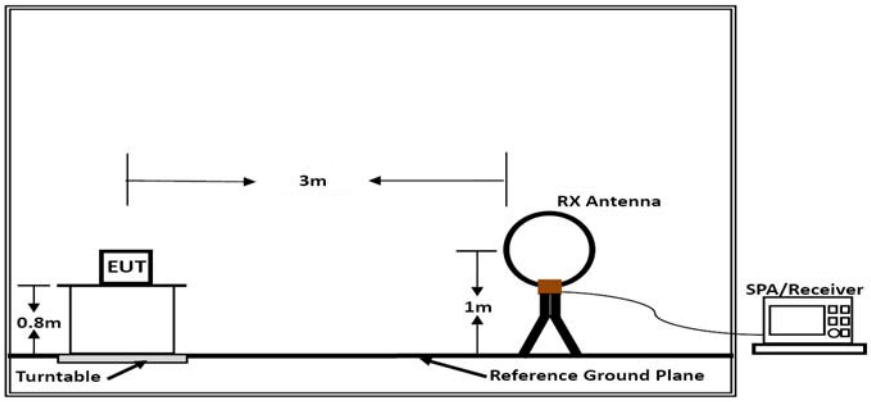
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

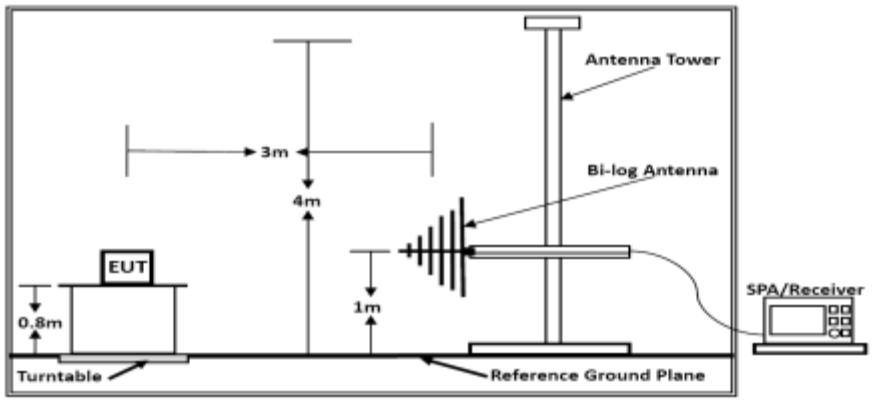
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

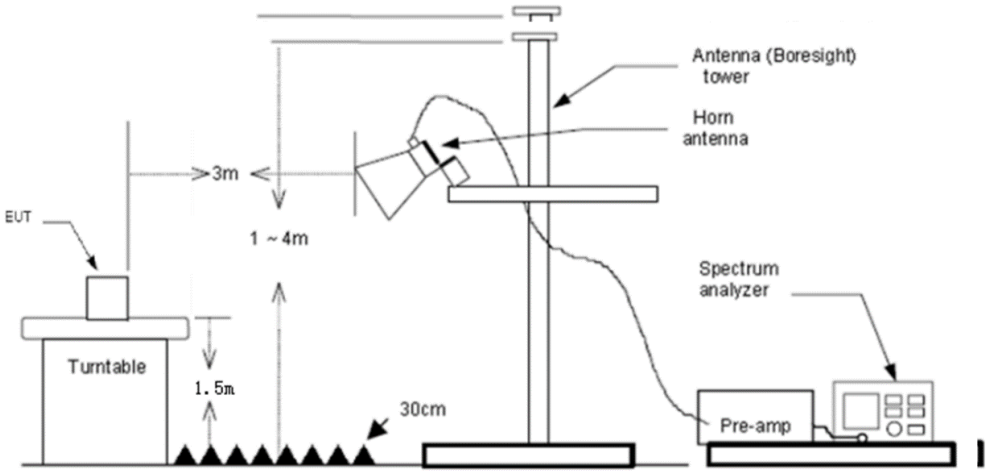
5.2.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 18 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1m.

5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.2.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Monkey Li	Configurations	IEEE 802.11b/g/n

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dB)	Remark
-	-	-	-	See Note

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

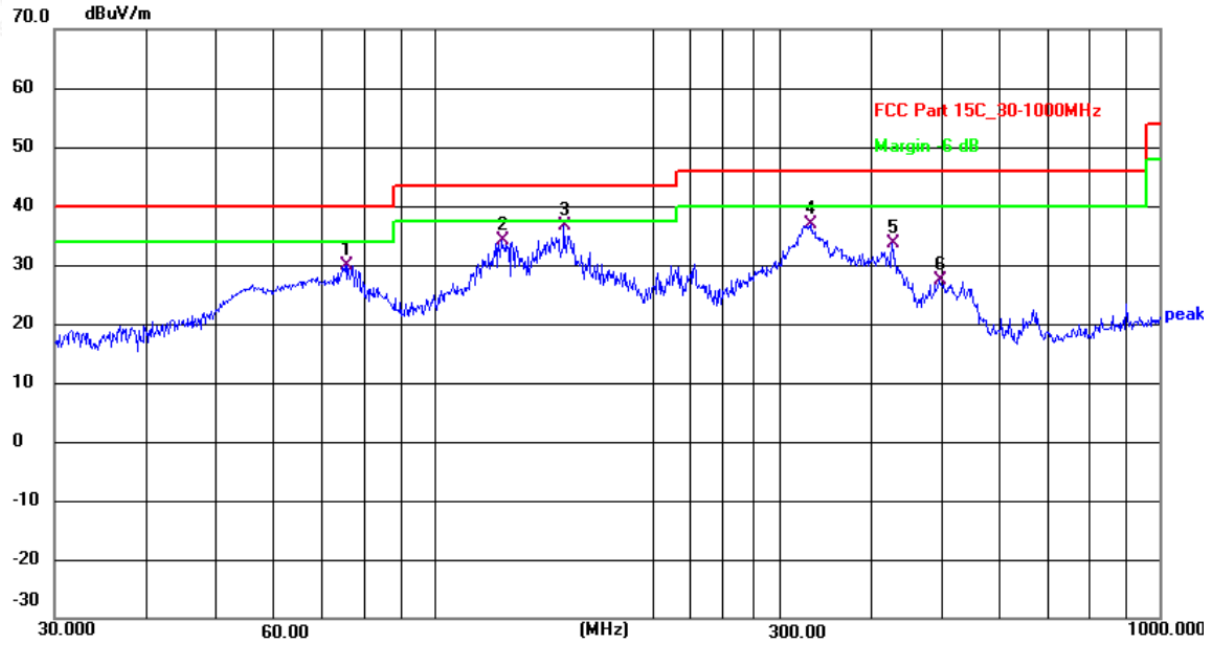
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.2.7. Results of Radiated Emissions (30MHz~1GHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Monkey Li	Configurations	IEEE 802.11b/g/n

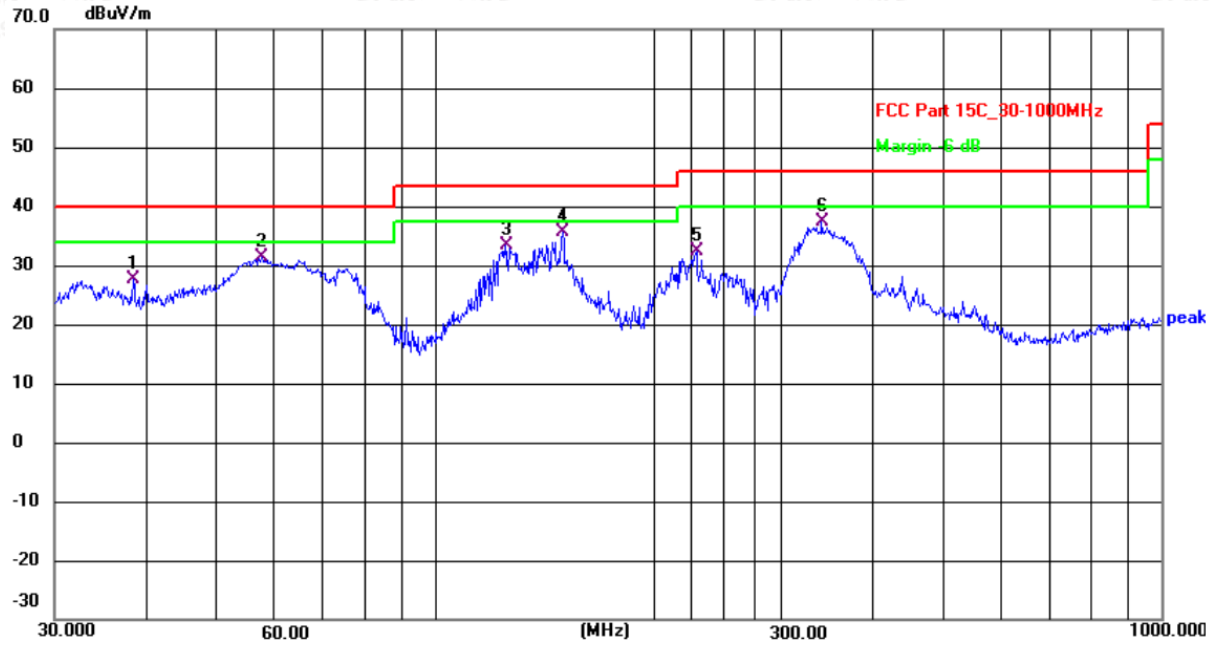
Test result for IEEE 802.11b mode (Middle Channel)

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	75.4464	49.60	-19.69	29.91	40.00	-10.09	QP
2	124.1330	54.44	-20.21	34.23	43.50	-9.27	QP
3	151.0666	56.36	-19.81	36.55	43.50	-6.95	QP
4	331.3546	51.20	-14.36	36.84	46.00	-9.16	QP
5	428.0193	47.38	-13.67	33.71	46.00	-12.29	QP
6	497.6765	40.65	-13.28	27.37	46.00	-18.63	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	38.4809	45.15	-17.62	27.53	40.00	-12.47	QP
2	57.7962	49.85	-18.45	31.40	40.00	-8.60	QP
3	125.0066	53.60	-20.26	33.34	43.50	-10.16	QP
4	150.0108	55.53	-19.82	35.71	43.50	-7.79	QP
5	229.2931	49.04	-16.55	32.49	46.00	-13.51	QP
6	340.7817	51.91	-14.61	37.30	46.00	-8.70	QP

Note:

Pre-scan all modes and recorded the worst case results in this report IEEE 802.11b mode (Middle Channel).

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

Level = Reading + Factor, Margin = Level – Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor

5.2.8. Results for Radiated Emissions (1 GHz~26 GHz)

Note: All the modes have been tested and recorded worst mode in the report.

(worst mode)

IEEE 802.11b-ant 1-the worst

Channel 1 / 2412 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4824.00	56.32	33.06	35.04	3.94	58.28	74.00	-15.72	Peak	Horizontal
4824.00	41.70	33.06	35.04	3.94	43.66	54.00	-10.34	Average	Horizontal
4824.00	54.10	33.06	35.04	3.94	56.06	74.00	-17.94	Peak	Vertical
4824.00	38.39	33.06	35.04	3.94	40.35	54.00	-13.65	Average	Vertical

Channel 6 / 2437 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4874.00	60.03	33.16	35.15	3.96	62.00	74.00	-12.00	Peak	Horizontal
4874.00	42.12	33.16	35.15	3.96	44.09	54.00	-9.91	Average	Horizontal
4874.00	55.19	33.16	35.15	3.96	57.16	74.00	-16.84	Peak	Vertical
4874.00	39.42	33.16	35.15	3.96	41.39	54.00	-12.61	Average	Vertical

Channel 11 / 2462 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4924.00	60.44	33.26	35.14	3.98	62.54	74.00	-11.46	Peak	Horizontal
4924.00	41.95	33.26	35.14	3.98	44.05	54.00	-9.95	Average	Horizontal
4924.00	53.50	33.26	35.14	3.98	55.60	74.00	-18.40	Peak	Vertical
4924.00	39.32	33.26	35.14	3.98	41.42	54.00	-12.58	Average	Vertical

IEEE 802.11g-ant 1-the worst

Channel 1 / 2412 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4824.00	56.07	33.06	35.04	3.94	58.03	74.00	-15.97	Peak	Horizontal
4824.00	41.88	33.06	35.04	3.94	43.84	54.00	-10.16	Average	Horizontal
4824.00	55.04	33.06	35.04	3.94	57.00	74.00	-17.00	Peak	Vertical
4824.00	41.98	33.06	35.04	3.94	43.94	54.00	-10.06	Average	Vertical

Channel 6 / 2437 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4874.00	C	33.16	35.15	3.96	61.21	74.00	-12.79	Peak	Horizontal
4874.00	41.94	33.16	35.15	3.96	43.91	54.00	-10.09	Average	Horizontal
4874.00	52.72	33.16	35.15	3.96	54.69	74.00	-19.31	Peak	Vertical
4874.00	41.21	33.16	35.15	3.96	43.18	54.00	-10.82	Average	Vertical

Channel 11 / 2462 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4924.00	57.71	33.26	35.14	3.98	59.81	74.00	-14.19	Peak	Horizontal
4924.00	42.87	33.26	35.14	3.98	44.97	54.00	-9.03	Average	Horizontal
4924.00	54.05	33.26	35.14	3.98	56.15	74.00	-17.85	Peak	Vertical
4924.00	41.02	33.26	35.14	3.98	43.12	54.00	-10.88	Average	Vertical

IEEE 802.11n HT20- ant 1-the worst

Channel 1 / 2412 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4824.00	53.67	33.06	35.04	3.94	55.63	74.00	-18.37	Peak	Horizontal
4824.00	40.60	33.06	35.04	3.94	42.56	54.00	-11.44	Average	Horizontal
4824.00	53.84	33.06	35.04	3.94	55.80	74.00	-18.20	Peak	Vertical
4824.00	40.13	33.06	35.04	3.94	42.09	54.00	-11.91	Average	Vertical

Channel 6 / 2437 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4874.00	59.20	33.16	35.15	3.96	61.17	74.00	-12.83	Peak	Horizontal
4874.00	43.00	33.16	35.15	3.96	44.97	54.00	-9.03	Average	Horizontal
4874.00	53.96	33.16	35.15	3.96	55.93	74.00	-18.07	Peak	Vertical
4874.00	40.62	33.16	35.15	3.96	42.59	54.00	-11.41	Average	Vertical

Channel 11 / 2462 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4924.00	56.69	33.26	35.14	3.98	58.79	74.00	-15.21	Peak	Horizontal
4924.00	41.65	33.26	35.14	3.98	43.75	54.00	-10.25	Average	Horizontal
4924.00	53.28	33.26	35.14	3.98	55.38	74.00	-18.62	Peak	Vertical
4924.00	40.42	33.26	35.14	3.98	42.52	54.00	-11.48	Average	Vertical

IEEE 802.11n HT40- ant 1-the worst

Channel 3 / 2422 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4844.00	55.57	33.06	35.04	3.94	57.53	74.00	-16.47	Peak	Horizontal
4844.00	42.65	33.06	35.04	3.94	44.61	54.00	-9.39	Average	Horizontal
4844.00	54.22	33.06	35.04	3.94	56.18	74.00	-17.82	Peak	Vertical
4844.00	38.97	33.06	35.04	3.94	40.93	54.00	-13.07	Average	Vertical

Channel 6 / 2437 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4874.00	59.32	33.16	35.15	3.96	61.29	74.00	-12.71	Peak	Horizontal
4874.00	41.51	33.16	35.15	3.96	43.48	54.00	-10.52	Average	Horizontal
4874.00	53.39	33.16	35.15	3.96	55.36	74.00	-18.64	Peak	Vertical
4874.00	40.17	33.16	35.15	3.96	42.14	54.00	-11.86	Average	Vertical

Channel 9 / 2452 MHz

Freq. MHz	Reading dBuV	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
4904.00	56.43	33.26	35.14	3.98	58.53	74.00	-15.47	Peak	Horizontal
4904.00	42.47	33.26	35.14	3.98	44.57	54.00	-9.43	Average	Horizontal
4904.00	54.11	33.26	35.14	3.98	56.21	74.00	-17.79	Peak	Vertical
4904.00	39.39	33.26	35.14	3.98	41.49	54.00	-12.51	Average	Vertical

Notes:

1). Measuring frequencies from 9 KHz - 10th harmonic or 26.5GHz (which is less), at least have 20dB margin between lowest internal used/generated frequency to 30MHz.

2). Radiated emissions measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.

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). Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13.5Mbps at IEEE 802.11n HT40.

5). Measured Level = Reading Level + Factor, Margin = Measured Level – Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor.

5.3. Maximum Peak Conducted Output Power Measurement

5.3.1. Standard Applicable

According to §15.247(b): For systems using digital modulation in the 2400-2483.5 MHz and 5725-5850 MHz band, the limit for maximum peak conducted output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceeds 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter peak output power.

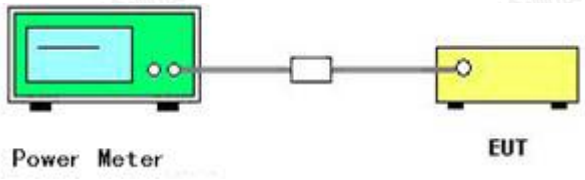
5.3.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of the power meter.

5.3.3. Test Procedures

According to KDB558074 D01 15.247 Meas Guidance v05r02 Section 9.1 Maximum peak conducted output power, 9.1.3 the maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

5.3.4. Test Setup Layout



5.3.5. EUT Operation during Test

1) The EUT is configured to transmit continuously.
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.

5.3.6. Test Result of Maximum Peak Conducted Output Power

Limits

Mode	Antenna 0 Gain (dBi)	Antenna 1 Gain (dBi)	Directional Gain (dBi)	FCC Power Limit (dBm)
IEEE 802.11b	0	0	-/-	30
IEEE 802.11g	0	0	-/-	30
IEEE 802.11n HT20	0	0	3.01	30
IEEE 802.11n HT40	0	0	3.01	30

PASS

Please refer to Appendix B.2

Remark:

1). Measured output power at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

3). Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40;

4). For power measurements on IEEE 802.11 devices;

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

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

Array Gain = 5 log (NANT/NSS) dB or 3 dB, whichever is less, for 20-MHz channel widths with NANT ≥ 5.

5.4. Power Spectral Density Measurement

5.4.1. Standard Applicable

According to §15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

5.4.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of Spectrum Analyzer.

5.4.3. Test Procedures

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.

2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.

3. Set the RBW = 3 kHz.

4. Set the VBW ≥ 3*RBW

5. Set the span to 1.5 times the DTS channel bandwidth.

6. Detector = peak.

7. Sweep time = auto couple.

8. Trace mode = max hold.

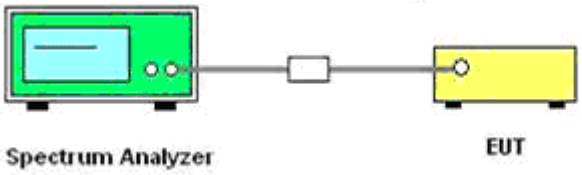
9. Allow trace to fully stabilize.

10. Use the peak marker function to determine the maximum power level.

11. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

12. The resulting peak PSD level shall not be greater than 8dBm in any 3 kHz.

5.4.4. Test Setup Layout



5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.4.6. Test Result of Power Spectral Density

Limits

Mode	Antenna 0 Gain (dBi)	Antenna 1 Gain (dBi)	Directional Gain (dBi)	FCC PSD Limit (dBm/3KHz)
IEEE 802.11b	0	0	-/-	8
IEEE 802.11g	0	0	-/-	8
IEEE 802.11n HT20	0	0	3.01	8
IEEE 802.11n HT40	0	0	3.01	8

PASS

Please refer to Appendix B.3

Remark:

1). Measured power spectrum density at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

3). Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20;

13Mbps at IEEE 802.11n HT40;

4) The PSD limits of IEEE 802.11n HT20 and IEEE 802.11 n HT40 for MIMO with CDD technology should be according to KDB662911 D01 Multiple Transmitter Output v02r01;

5). For MIMO with CCD technology device, The Directional Gain= Gain of individual transmit antennas (dBi) + Array gain;

ANTANT/NSS) dB, where ANT/NSS) dB, where NANT is the number of transmit antennas and NSS is 1.

5.5. Band Edge Measurements and Conducted Spurious Emissions Test

5.5.1. Standard Applicable

According to §15.247 (d): 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

5.5.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
RB / VB (Emission in restricted band)	100KHz/300KHz
RB / VB (Emission in non-restricted band)	100KHz/300KHz

5.5.3. Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz

The spectrum from 9 KHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

5.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 5.4.4.

5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.5.6. Test Results of Conducted Spurious Emissions

PASS

Please refer to Appendix B.4 for Band Edge Measurements;

Please refer to Appendix B.5 for Conducted Spurious Emissions.

Remark:
1). Measured RF conducted spurious emission at difference data rate for each mode and recorded worst case for each mode.
2). Test results including cable loss;
3). Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40;
4). "---"means that the fundamental frequency not for 15.209 limits requirement.
5). Not recorded emission from 9 KHz to 30 MHz as emission level at least 20dBc lower than emission limit.

5.6. On Time and Duty Cycle

5.6.1. Standard Applicable

None: for reporting purpose only.

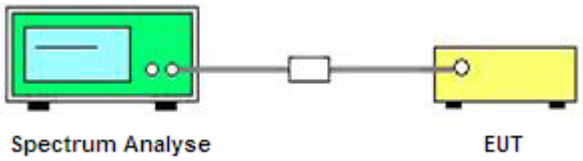
5.6.2. Measuring Instruments and Setting

Please refer to equipment's list in this report. The following table is the setting of the spectrum analyzer.

5.6.3. Test Procedures

1. Set the centre frequency of the spectrum analyzer to the transmitting frequency;
2. Set the span=0MHz, RBW=8MHz, VBW=8.0MHz, Sweep time=auto;
3. Detector = peak;
4. Trace mode = Single hold.

5.6.4. Test Setup Layout



5.6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.6.6. Test result

For reporting purpose only.

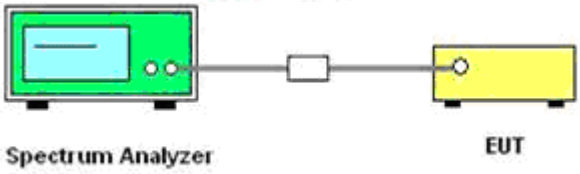
Please refer to Appendix B.6

5.7. Emissions in Restricted Band

5.7.1 Standard Applicable

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 20dB 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 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

5.7.2. Test Setup Layout



5.7.3. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of Spectrum Analyzer.

5.7.4. Test Procedures

According to KDB558074 D01 15.247 Meas Guidance v05r02 for Antenna-port conducted measurement. Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.
1). Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2). Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to an EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3). Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=1/B for AV detector.
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.
6). Measure the conducted output power (in dBm) using the detector specified by the appropriate regulatory agency (see 12.2.2, 12.2.3, and 12.2.4 for guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
7). Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see 12.2.5 for guidance on determining the applicable antenna gain)
8). Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
9). For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
10). Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$E = EIRP – 20\log D + 104.77 = EIRP + 95.23$

Where:
E = electric field strength in dBμV/m,
EIRP = equivalent isotropic radiated power in dBm
D = specified measurement distance in meters.
11). Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.
12). Compare the resultant electric field strength level to the applicable regulatory limit.
13). Perform radiated spurious emission test duress until all measured frequencies were complete.

5.7.5 Test Results

PASS

Please refer to Appendix B.7

Remark:

1). Measured Band edge measurement for radiated emission at difference data rate for each mode and recorded worst case for each mode.

2). Test results including cable loss;

3). Worst case data at 1Mbps at IEEE 802.11b; 6Mbps at IEEE 802.11g; 6.5Mbps at IEEE 802.11n HT20; 13Mbps at IEEE 802.11n HT40;

4). "---"means that the fundamental frequency not for 15.209 limits requirement.

5.8. AC Power line conducted emissions

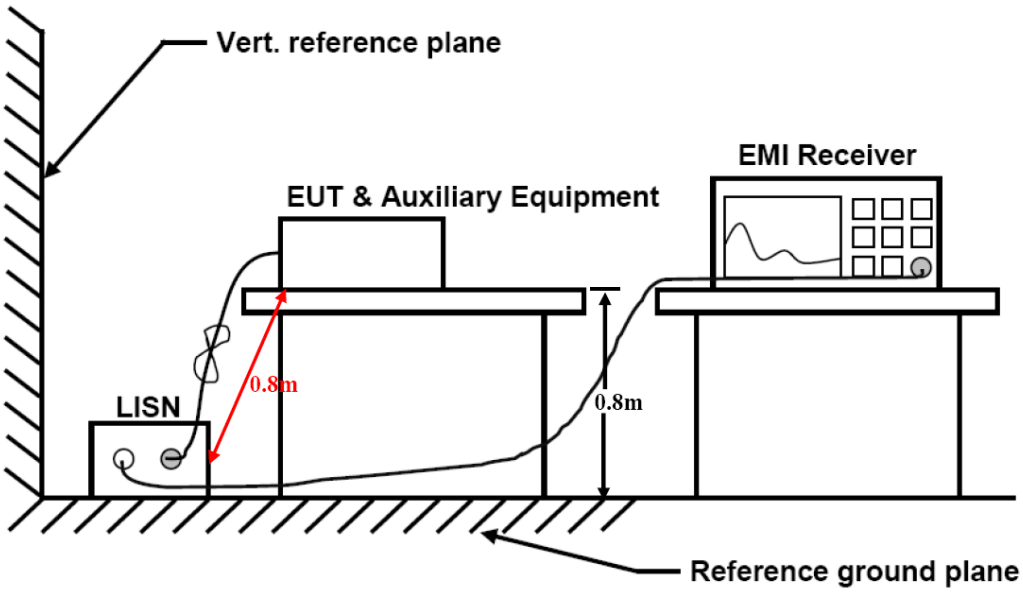
5.8.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

5.8.2 Block Diagram of Test Setup



5.8.3 Test Results

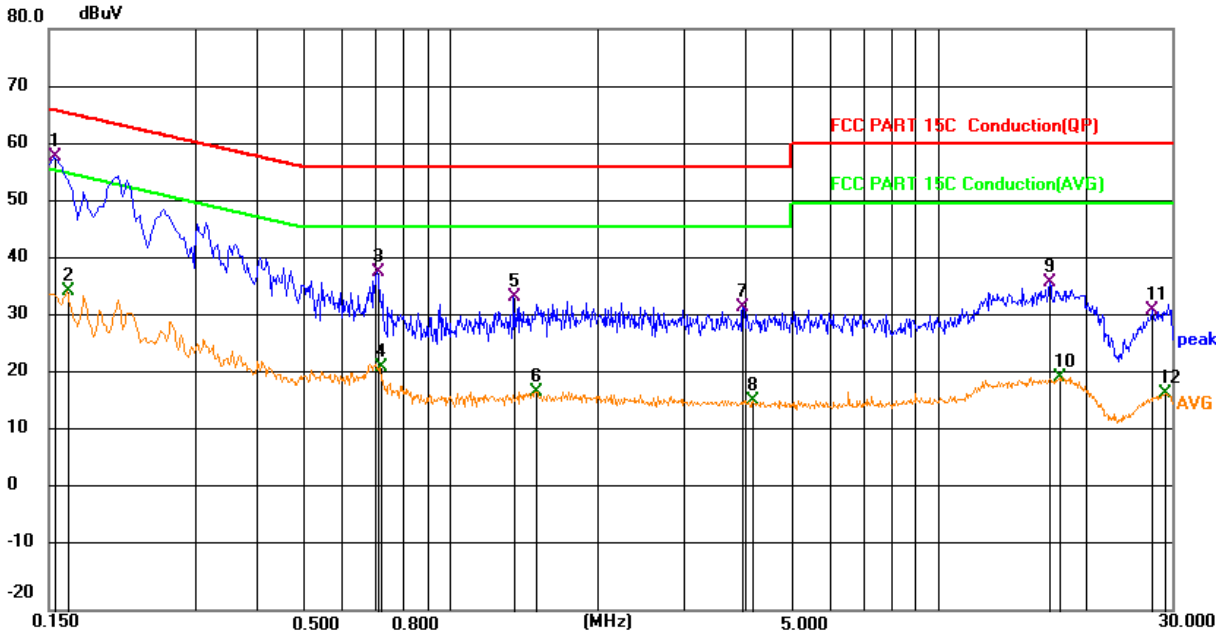
Temperature	23.2℃	Humidity	53.3%
Test Engineer	Monkey Li	Configurations	IEEE 802.11b/g/n

PASS.

The test data please refer to following page.

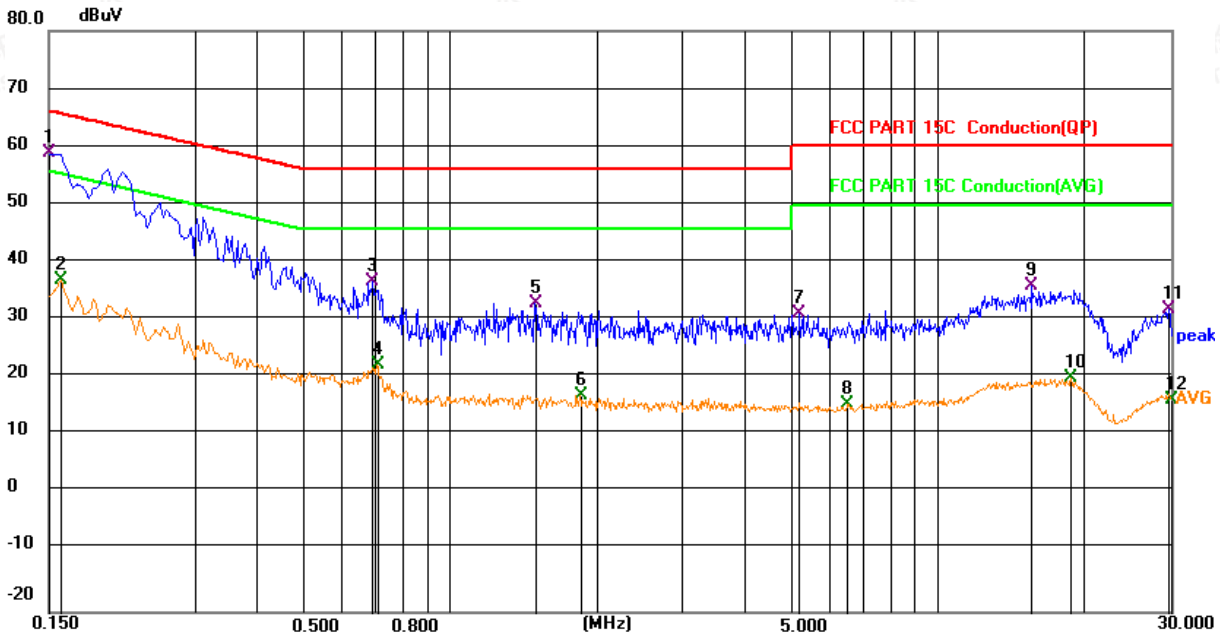
AC Conducted Emission @ AC 120V/60Hz @ IEEE 802.11b mode (Middle Channel) (worst case)

Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1546	38.46	19.63	58.09	65.75	-7.66	QP
2	0.1636	15.23	19.63	34.86	55.28	-20.42	AVG
3	0.7081	18.62	19.65	38.27	56.00	-17.73	QP
4	0.7171	2.07	19.65	21.72	46.00	-24.28	AVG
5	1.3516	14.28	19.66	33.94	56.00	-22.06	QP
6	1.4955	-1.98	19.66	17.68	46.00	-28.32	AVG
7	3.9796	12.40	19.70	32.10	56.00	-23.90	QP
8	4.1596	-3.63	19.70	16.07	46.00	-29.93	AVG
9	16.8721	16.41	20.02	36.43	60.00	-23.57	QP
10	17.6821	-0.11	20.12	20.01	50.00	-29.99	AVG
11	27.4021	11.63	20.05	31.68	60.00	-28.32	QP
12	29.1301	-2.74	20.09	17.35	50.00	-32.65	AVG

Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)	
1	0.1500	39.27	19.63	58.90	66.00	-7.10	QP
2	0.1590	17.53	19.63	37.16	55.52	-18.36	AVG
3	0.6945	17.28	19.65	36.93	56.00	-19.07	QP
4	0.7081	2.88	19.65	22.53	46.00	-23.47	AVG
5	1.4911	13.50	19.66	33.16	56.00	-22.84	QP
6	1.8466	-2.29	19.68	17.39	46.00	-28.61	AVG
7	5.2036	11.52	19.80	31.32	60.00	-28.68	QP
8	6.5536	-3.93	19.82	15.89	50.00	-34.11	AVG
9	15.5986	16.37	19.90	36.27	60.00	-23.73	QP
10	18.7306	0.10	20.17	20.27	50.00	-29.73	AVG
11	29.8051	11.98	20.10	32.08	60.00	-27.92	QP
12	30.0000	-3.66	20.11	16.45	50.00	-33.55	AVG

****Note: 1). Pre-scan all modes and recorded the worst case results in this report IEEE 802.11b mode (Middle Channel).*

2). Result = Reading + Correct, Margin = Result – Limit.
Correct Factor= Lisn Factor+Cable Factor

5.9. Antenna Requirements

5.9.1 Standard Applicable

According to antenna requirement of §15.203.

According to antenna requirement of §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

5.9.2 Antenna Connected Construction

5.9.2.1. Standard Applicable

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.

5.9.2.2. Antenna Connector Construction

The gains of antenna used for transmitting is -2.21dBi(Max.), and the antenna is Internal Antenna and no consideration of replacement. Please see EUT photo for details.

5.9.2.3. Results: Compliance.

6. LIST OF MEASURING EQUIPMENTS

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2022-06-16	2023-06-15
2	Power Sensor	R&S	NRV-Z81	100458	2022-06-16	2023-06-15
3	Power Sensor	R&S	NRV-Z32	10057	2022-06-16	2023-06-15
4	Test Software	Tonscend	JS1120-2	/	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-2	N/A	2021-11-16	2022-11-15
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2021-11-16	2022-11-15
7	DC Power Supply	Agilent	E3642A	N/A	2021-11-15	2022-11-14
8	EMI Test Software	AUDIX	E3	/	N/A	N/A
9	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2022-06-16	2023-06-15
10	Positioning Controller	Max-Full	MF7802BS	MF780208586	N/A	N/A
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2021-08-29	2024-08-28
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2021-09-12	2024-09-11
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2021-09-05	2024-09-04
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2021-08-29	2024-08-28
15	Broadband Preamplifier	SCHWARZBECK	BBV9719	9719-025	2022-06-16	2023-06-15
16	EMI Test Receiver	R&S	ESR 7	101181	2022-06-16	2023-06-15
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2021-11-16	2022-11-15
18	Broadband Preamplifier	/	BP-01M18G	P190501	2022-06-16	2023-06-15
19	6dB Attenuator	/	100W/6dB	1172040	2022-06-16	2023-06-15
20	3dB Attenuator	/	2N-3dB	/	2021-11-15	2022-11-14
21	EMI Test Receiver	R&S	ESPI	101940	2022-08-17	2023-08-16
22	Artificial Mains	R&S	ENV216	101288	2022-06-16	2023-06-15
23	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2022-06-16	2023-06-15
24	EMI Test Software	Farad	EZ	/	N/A	N/A

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF REPORT----------