



FCC Test Report

APPLICANT : Starry, Inc.
EQUIPMENT : Starry Wing
BRAND NAME : Starry
MODEL NAME : S00211
FCC ID : 2AGZ3S00211
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Certification

The product was completed on Dec. 06, 2016. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

Prepared by: James Huang / Manager

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL (KUNSHAN) INC.
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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC690802	Rev. 01	Initial issue of report	Jan. 25, 2017



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.107	AC Conducted Emission	< 15.107 limits	PASS	Under limit 3.30 dB at 0.387 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 3.10 dB at 499.480 MHz for Quasi-Peak



1. General Description

1.1. Applicant

Starry, Inc.
PO Box 52226, Boston, MA 02205

1.2. Manufacturer

Flextronics Manufacturing (Zhuhai) Co.Ltd
Xin Qing Science & Technology Industrial Park, Doumen County, Zhuhai

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	Starry Wing
Brand Name	Starry
Model Name	S00211
FCC ID	2AGZ3S00211
EUT supports Radios application	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0 + EDR/Bluetooth v4.0 LE/Bluetooth v4.2 LE
HW Version	Wing Ver1.2
SW Version	uboot version:1.0.9 Kernel version:W00002
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4. Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Rx Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz 802.11a/n/ac: 5180 MHz ~ 5240 MHz; 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Antenna Type	WLAN Antenna 1: FPC Antenna WLAN Antenna 2: FPC Antenna Bluetooth : Chip Ceramic Antenna
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11a/g/n/ac : OFDM (BPSK / QPSK / 16QAM / 64QAM) Bluetooth LE : GFSK Bluetooth (1Mbps) : GFSK Bluetooth (2Mbps) : $\pi/4$ -DQPSK Bluetooth (3Mbps) : 8-DPSK

1.5. Modification of EUT

No modifications are made to the EUT during all test items.

1.6. Test Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958		
Test Site No.	Sporton Site No.		FCC Registration No.
	CO01-KS	03CH02-KS	418269

1.7. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC 47 CFR FCC Part 15 Subpart B
- ♦ ANSI C63.4-2014

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.



2. Test Configuration of Equipment Under Test

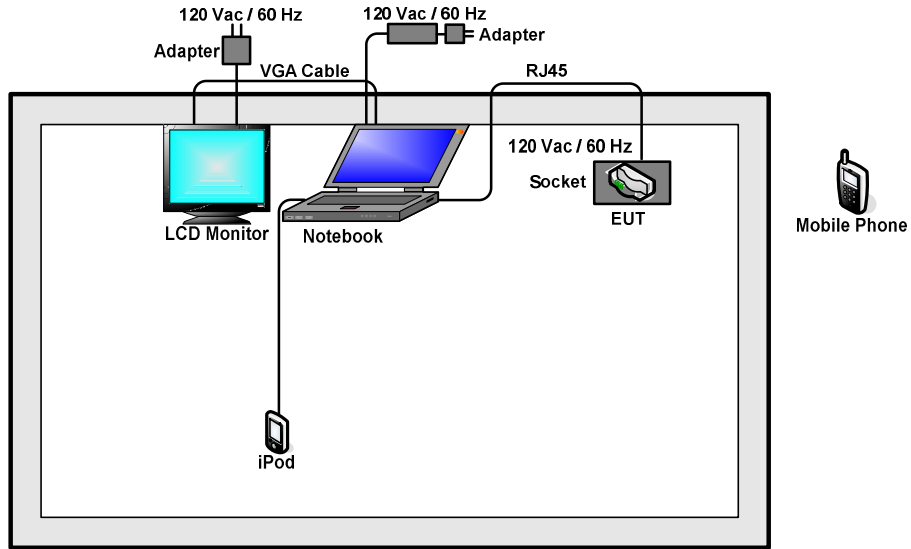
2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Test Items	Function Type
AC Conducted Emission	Mode 1 : Bluetooth Idle + WLAN (2.4G) Idle + LAN Link <Fig.1> Mode 2 : Bluetooth Idle + WLAN (5G) Idle + LAN Link <Fig.1>
Radiated Emissions < 1GHz	Mode 1 : Bluetooth Idle + WLAN (2.4G) Idle + LAN Link <Fig.1> Mode 2 : Bluetooth Idle + WLAN (5G) Idle + LAN Link <Fig.1>
Radiated Emissions ≥ 1GHz	Mode 1 : Bluetooth Idle + WLAN (2.4G) Idle + LAN Link <Fig.1>
Remark: <ol style="list-style-type: none">1. The worst case of AC is mode 1; only the test data of this mode was reported.2. The worst case of RE < 1G is mode 1; only the test data of this mode was reported.	

2.2. Connection Diagram of Test System



<Fig.1>



2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	E49	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
2.	Notebook	DELL	Latitude3440	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	LCD Monitor	DELL	IN1940MWb	FCC DoC	N/A	Unshielded, 1.8 m
4.	iPod	Apple	A1199	FCC DoC	Shielded, 1.2 m	N/A
5.	Mobile Phone	ZTE	A1	N/A	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was performing these functions during test:

1. LAN link with Notebook via RJ45 cable and execute ping.
2. Use a mobile phone to attach BT & WLAN function.



3. Test Result

3.1. Test of AC Conducted Emission Measurement

3.1.1 Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

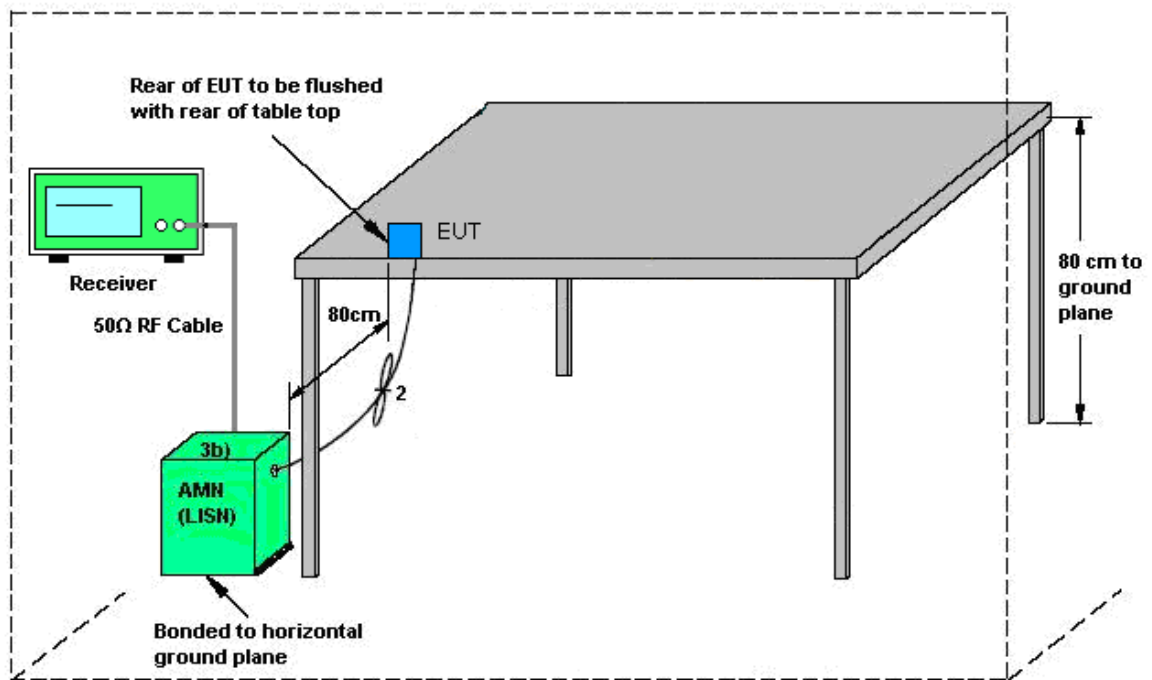
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.1.4 Test Setup

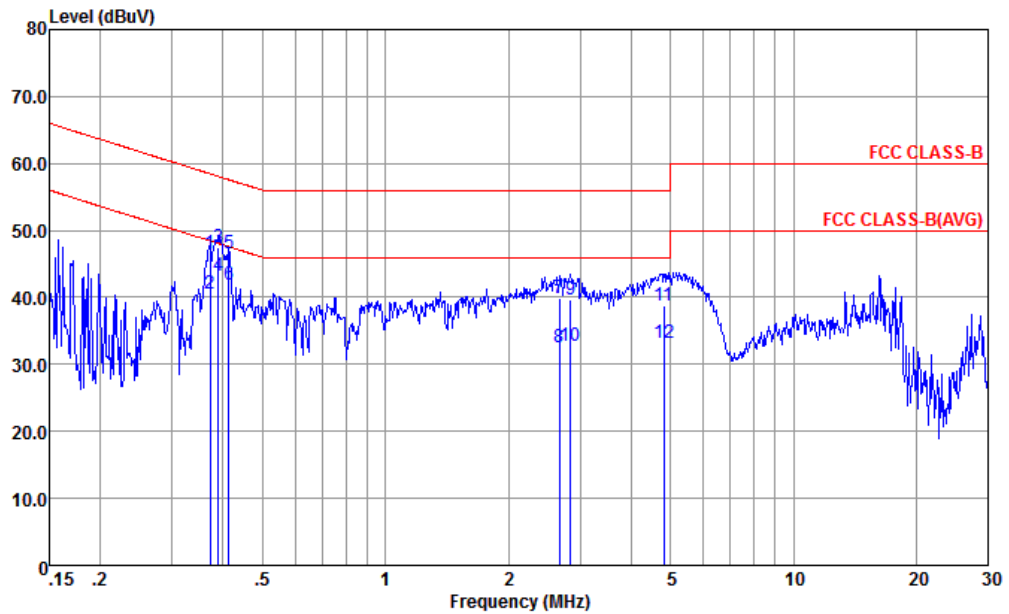


AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network



3.1.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Peter Wei	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	Bluetooth Idle + WLAN (2.4G) Idle + LAN Link		

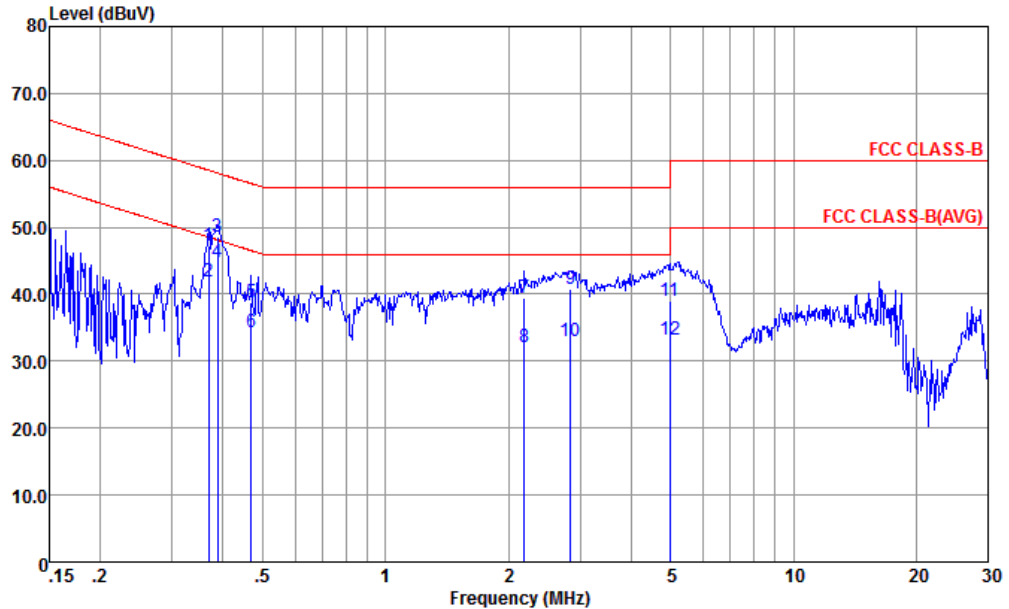


Site : CO01-KS
 Condition : FCC CLASS-B LISN-L-20151024 LINE
 Project : (FC) 690802
 mode : Mode 1
 IMEI : #2

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.371	46.64	-11.83	58.47	36.20	0.23	10.21	QP
2	0.371	40.54	-7.93	48.47	30.10	0.23	10.21	Average
3	0.389	47.53	-10.55	58.08	37.10	0.23	10.20	QP
4 *	0.389	43.33	-4.75	48.08	32.90	0.23	10.20	Average
5	0.413	46.53	-11.06	57.59	36.10	0.23	10.20	QP
6	0.413	41.83	-5.76	47.59	31.40	0.23	10.20	Average
7	2.664	39.79	-16.21	56.00	29.40	0.18	10.21	QP
8	2.664	32.59	-13.41	46.00	22.20	0.18	10.21	Average
9	2.839	39.70	-16.30	56.00	29.31	0.18	10.21	QP
10	2.839	32.80	-13.20	46.00	22.41	0.18	10.21	Average
11	4.822	38.73	-17.27	56.00	28.30	0.19	10.24	QP
12	4.822	33.13	-12.87	46.00	22.70	0.19	10.24	Average



Test Mode :	Mode 1	Temperature :	20~22°C
Test Engineer :	Peter Wei	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Idle + WLAN (2.4G) Idle + LAN Link		



Site : CO01-KS
 Condition : FCC CLASS-B LISN-N-20151024 NEUTRAL
 Project : (FC) 690802
 mode : Mode 1
 IMEI : #2

	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1	0.369	47.33	-11.19	58.52	36.80	0.32	10.21	QP
2	0.369	41.93	-6.59	48.52	31.40	0.32	10.21	Average
3	0.387	48.62	-9.50	58.12	38.09	0.32	10.21	QP
4 *	0.387	44.82	-3.30	48.12	34.29	0.32	10.21	Average
5	0.469	38.81	-17.73	56.54	28.30	0.32	10.19	QP
6	0.469	34.41	-12.13	46.54	23.90	0.32	10.19	Average
7	2.190	39.47	-16.53	56.00	28.90	0.38	10.19	QP
8	2.190	32.17	-13.83	46.00	21.60	0.38	10.19	Average
9	2.839	40.69	-15.31	56.00	30.11	0.37	10.21	QP
10	2.839	32.89	-13.11	46.00	22.31	0.37	10.21	Average
11	4.978	39.10	-16.90	56.00	28.50	0.36	10.24	QP
12	4.978	33.30	-12.70	46.00	22.70	0.36	10.24	Average



3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

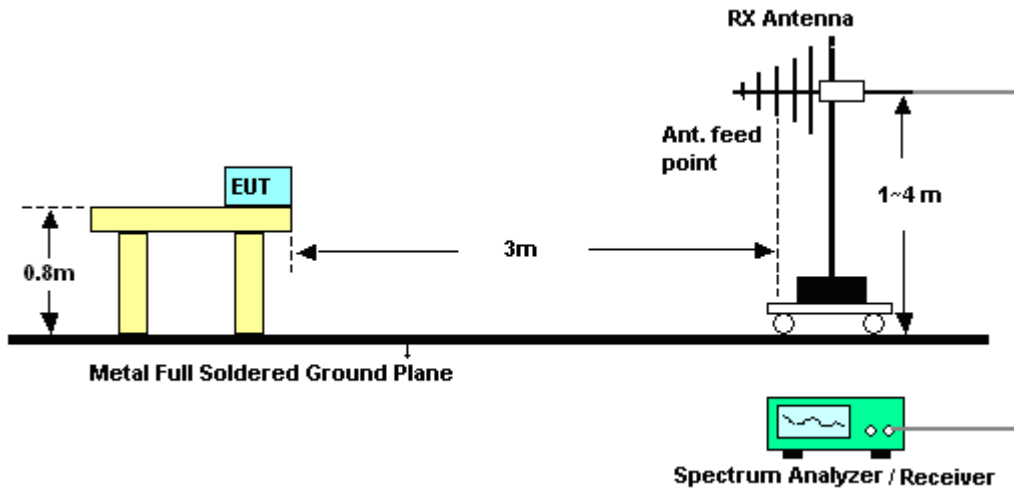
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

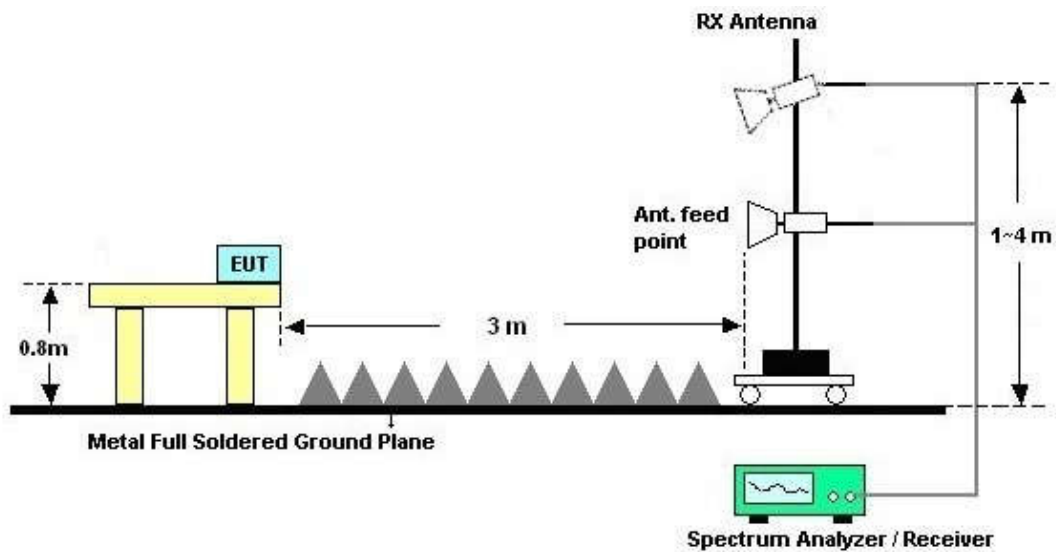
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBµV/m) = 20 log Emission level (µV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz



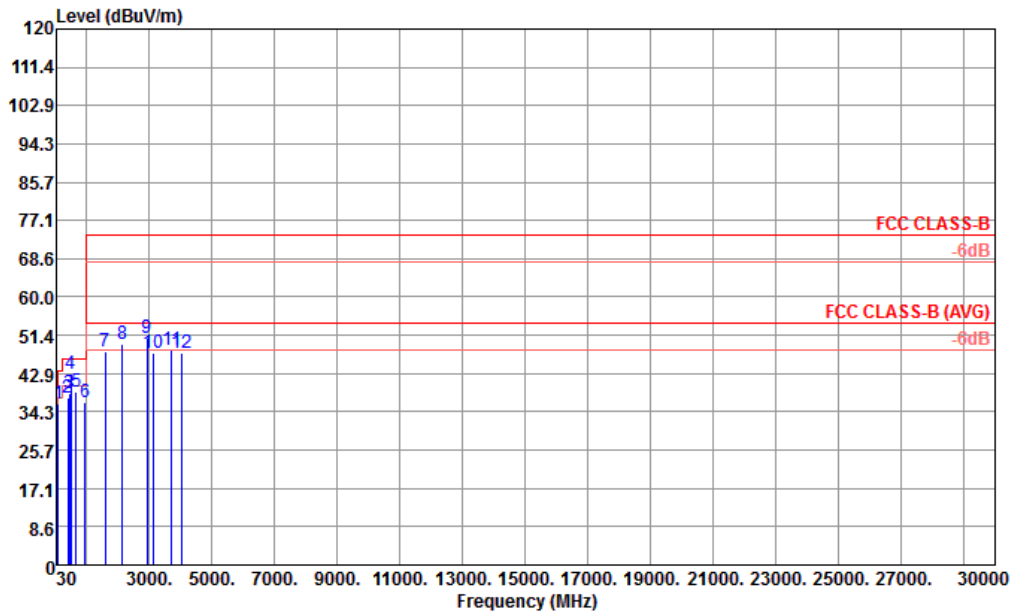
For radiated emissions above 1GHz





3.2.5. Test Result of Radiated Emission

Test Mode :	Mode 1	Temperature :	21~22°C
Test Engineer :	Carl Ni	Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	Bluetooth Idle + WLAN (2.4G) Idle + LAN Link		

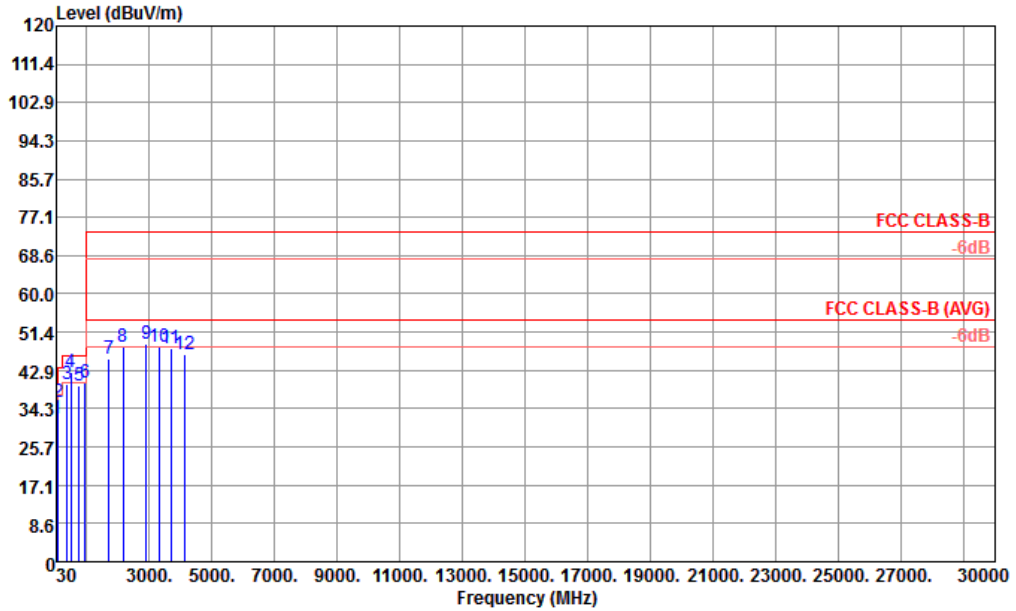


Site : 03CH02-KS
 Condition : FCC CLASS-B 3m 966-02 LF ANT HORIZONTAL
 Project : (FC) 690802
 Mode : 1
 IMEI : #2

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	95.96	36.09	-7.41	43.50	49.84	17.63	0.23	31.61	---	---	Peak
2	399.57	37.38	-8.62	46.00	41.81	25.20	0.92	30.55	---	---	Peak
3	450.01	38.59	-7.41	46.00	43.24	24.46	0.91	30.02	---	---	Peak
4	499.48	42.90	-3.10	46.00	49.00	22.64	0.99	29.73	100	150	QP
5	649.83	38.69	-7.31	46.00	41.14	25.19	1.02	28.66	---	---	Peak
6	949.56	36.40	-9.60	46.00	32.79	28.39	1.71	26.49	---	---	Peak
7	1598.00	47.68	-26.32	74.00	50.84	28.94	4.13	36.23	---	---	Peak
8	2128.00	49.47	-24.53	74.00	47.67	30.91	5.35	34.46	---	---	Peak
9	2928.00	50.91	-23.09	74.00	43.96	32.39	3.00	28.44	---	---	Peak
10	3126.00	47.62	-26.38	74.00	40.03	33.11	4.76	30.28	---	---	Peak
11	3720.00	47.99	-26.01	74.00	38.70	34.37	6.34	31.42	---	---	Peak
12	4020.00	47.56	-26.44	74.00	38.32	34.88	6.10	31.74	---	---	Peak



Test Mode :	Mode 1	Temperature :	21~22°C
Test Engineer :	Carl Ni	Relative Humidity :	41~42%
Test Distance :	3m	Polarization :	Vertical
Function Type :	Bluetooth Idle + WLAN (2.4G) Idle + LAN Link		



Site : 03CH02-KS
 Condition : FCC CLASS-B 3m 966-02 LF ANT VERTICAL
 Project : (FC) 690802
 Mode : 1
 IMEI : #2

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark	
	MHz	dBUV/m	Limit	Line	Level	Factor	Loss	Factor	cm	deg	
			dB	dBUV/m	dBuV	dB/m	dB	dB			
1	71.71	32.06	-7.94	40.00	50.11	13.50	0.18	31.73	---	---	Peak
2	95.96	35.76	-7.74	43.50	49.51	17.63	0.23	31.61	---	---	Peak
3	375.32	39.86	-6.14	46.00	46.68	22.80	0.83	30.45	---	---	Peak
4 !	499.48	42.40	-3.60	46.00	48.50	22.64	0.99	29.73	100	0	QP
5	749.74	39.43	-6.57	46.00	39.89	26.20	1.36	28.02	---	---	Peak
6 !	949.56	40.04	-5.96	46.00	36.43	28.39	1.71	26.49	---	---	Peak
7	1710.00	45.30	-28.70	74.00	47.82	29.17	4.38	36.07	---	---	Peak
8	2160.00	48.18	-25.82	74.00	46.06	31.03	5.50	34.41	---	---	Peak
9	2906.00	48.96	-25.04	74.00	41.94	32.35	2.95	28.28	---	---	Peak
10	3294.00	48.26	-25.74	74.00	39.75	33.53	5.99	31.01	---	---	Peak
11	3681.00	47.78	-26.22	74.00	38.52	34.23	6.29	31.26	---	---	Peak
12	4116.00	46.51	-27.49	74.00	36.96	35.00	6.39	31.84	---	---	Peak



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz	Apr. 29, 2016	Dec. 06, 2016	Apr. 28, 2017	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2016	Dec. 06, 2016	Oct. 12, 2017	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2016	Dec. 06, 2016	Oct. 12, 2017	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 13, 2016	Dec. 06, 2016	Oct. 12, 2017	Conduction (CO01-KS)
RF Cable	WOKEN	Y5T	00100N1Q3N1	150kHz~30MHz	Aug. 26, 2016	Dec. 06, 2016	Aug. 25, 2017	Conduction (CO01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Aug. 09, 2016	Dec. 02, 2016	Aug. 08, 2017	Radiation (03CH02-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150208	10Hz~44GHz, MAX 30dB	Apr. 22, 2016	Dec. 02, 2016	Apr. 21, 2017	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6112D	37879	30MHz~2GHz	Aug. 20, 2016	Dec. 02, 2016	Aug. 19, 2017	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Oct. 22, 2016	Dec. 02, 2016	Oct. 21, 2017	Radiation (03CH02-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz~40GHz	Mar. 03, 2016	Dec. 02, 2016	Mar. 02, 2017	Radiation (03CH02-KS)
Amplifier	com-power	PA-103A	161069	1kHz~1000MHz / 32 dB	Apr. 22, 2016	Dec. 02, 2016	Apr. 21, 2017	Radiation (03CH02-KS)
Amplifier	Agilent	8449B	3008A02384	1~26.5GHz Gain 30dB	Oct. 13, 2016	Dec. 02, 2016	Oct. 12, 2017	Radiation (03CH02-KS)
Amplifier	MITEQ	TTA1840-35-HG	1887435	18~40GHz	Jan. 20, 2016	Dec. 02, 2016	Jan. 19, 2017	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Dec. 02, 2016	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Dec. 02, 2016	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Dec. 02, 2016	NCR	Radiation (03CH02-KS)
RF Cable	Rosnol	KIK50	K1K50-7.5M-001	30MHz~40GHz	Jun. 22, 2016	Dec. 02, 2016	Jun. 21, 2017	Radiation (03CH02-KS)
RF Cable	Rosnol	KIK50	K1K50-4M-002	30MHz~40GHz	Jun. 22, 2016	Dec. 02, 2016	Jun. 21, 2017	Radiation (03CH02-KS)
High Pass Filter	Wainwright Instruments GmbH	WHKX12-2805-3000-18000-40ST	2	3G High Pass	Jun. 22, 2016	Dec. 02, 2016	Jun. 21, 2017	Radiation (03CH02-KS)



5. Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.3dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1dB
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Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$)	4.5dB
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Uncertainty of Radiated Emission Measurement (18GMHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$)	5.1dB
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