

BCDMA Spurious Test Report

Equipment : Binary-CDMA Wireless Network

Model No : SKYBRIDGE SB-200

Applicant : Globalbridge Co., Ltd.
#1710, 17F, Songdo Smart valley-A, Songdomirae-ro
30 beon-gil, Yeonsu-gu, Incheon, South Korea

Date of test : July 08, 2019 to October 08, 2019

FCC Rule Part(s) : FCC Part 15 Subpart C §15.247

Report Type : Original Report

The product was received on June 04, 2019 and testing was completed on October 08, 2019. We, BWS TECH Inc. would like to declare that the tested sample has been evaluated in accordance with the test procedures 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 BWS TECH Inc. the test report shall not be reproduced except in full.

(Date) 10/08/2019



Tested by **Hyeong-Bae, Lee**

(Date) 10/08/2019



Reviewed by **Seung-Min, Mun**

BWS TECH INC.

#23, Gokhyeon-ro 480beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si,
Gyeonggi-do 17031, Republic of Korea
TEL: +82-31-333-5997, FAX: +82-31-333-0017
<http://www.bws.co.kr>

*This test report is not related to KS Q ISO/IEC 17025 and KOLAS accreditation.

*The authenticity of this test report can be confirmed in the Android app "DOCUQR" or www.docuqr.com

Report Revision

TEST REPORT NO.	DATE	DESCRIPTION
BWS-19-RF-0004	October 08, 2019	- First Approval Report

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1. General Information

Scope – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

1.1 Applicant

● Company Name	: Globalbridge Co., Ltd.
● Company Address	: #1710, 17F, Songdo Smart valley-A, Songdomirae-ro 30 beon-gil, Yeonsu-gu, Incheon, South Korea
● Phone/Fax	: Tel No. : +82-10-3158-8991 Fax No. : N/A

1.2 Manufacturer

● Company Name	: Globalbridge Co., Ltd.
● Company Address	: #1710, 17F, Songdo Smart valley-A, Songdomirae-ro 30 beon-gil, Yeonsu-gu, Incheon, South Korea
● Phone/Fax	: Tel No. : +82-10-3158-8991 Fax No. : N/A

1.3 EUT Description

● Equipment	: Binary-CDMA Wireless Network
● Model(s)	: SKYBRIDGE SB-200
● Operation Frequency	TX : 2410 ~ 2474 MHz (5 Channel) 5733 ~ 5813 MHz (6 Channel)
	RX : 2410 ~ 2474 MHz 5733 ~ 5813 MHz
● Modulation Method	: BPSK, QPSK
● Input Voltage	: DC 3.3 V Battery
● Antenna Peak Gain	: 2GHz : 2.50 dBi 5GHz : 4.00 dBi

1.4 Other Information

● FCC Rule Part(s)	: FCC Part 15 Subpart C §15.247
● FCC ID	: 2AOJBSKYBRIDGESB200
● Test Procedure	: ANSI C63.10-2013 KDB 558074 D01 DTS Meas Guidance v05
● Date of Test	: July 08, 2019 to October 08, 2019
● Place of Test	: BWS TECH Inc. (FCC Registration Number : 287786) #23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17031, South Korea TEL: +82 31 333 5997 FAX: +82 31 333 0017

2. Description of Test Facility

Site Description

Test Lab.	:	 NRRA Designation Number is KR0017.
		 The Certificate Designation Number is KR0017.
		 The Certificate Accreditation Number is KT174.
Name of Firm	:	BWS TECH Inc.
Site Location	:	#23, Gokhyeon-ro 480 Beon-gil, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do 17031, South Korea

3. Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and the requirements of FCC Rules Part 15.207, 15.209 and 15.247.

Radio testing was performed according to KDB 558074 D01 DTS Meas Guidance v05.

3.1 EUT Configuration

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

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

3.3 FCC Part 15.205 Restricted Bands of Operations

(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
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

(b) Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

4. Summary of Test Result

Clause	TEST Description	Standard Section	Requirements	Result
6.7	Radiated Spurious Emission	§15.247(d), §15.209(a), §15.35(b)	§15.209(a), §15.247(d)	Pass

5. Test Equipment

Equipment	Model	Manufacturer	Serial number	Calibration Due date (year/month/date)
Signal Analyzer (9 kHz ~ 30 GHz)	FSV30	R&S	100757	2020/09/06
EMI Test Receiver (~7 GHz)	ESCI7	R&S	100722	2020/09/06
RF Amplifier (~1.3 GHz)	8447D OPT 010	HP	2944A07684	2020/09/06
RF Amplifier (1~26.5 GHz)	8449B	HP	3008A02126	2020/03/16
Horn Antenna (1~18 GHz)	3115	ETS	00114105	2020/08/04
DRG Horn (Small)	3116B	ETS-Lindgren	133350	2020/05/03
TRILOG Antenna	VULB 9160	SCHWARZBECK	9160-3237	2021/03/16
DC Power Supply	6674A	Agilent	3637A01657	-
Power Meter	EPM-441A	HP	GB32481702	2020/03/16
Power Sensor	8481A	HP	3318A94972	2020/09/06
LISN	KNW-407	Kyoritsu	8-1430-1	2020/09/06
Signal Generator (100 kHz ~ 40 GHz)	SMB100A	R&S	177621	2020/03/16
RF Cable	SUCOFLEX	Huber+suhner	-	-

6. Test Data

6.1 Radiated Spurious Emission

6.1.1 Test Limit

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Note: Wireless charger configuration was evaluated.

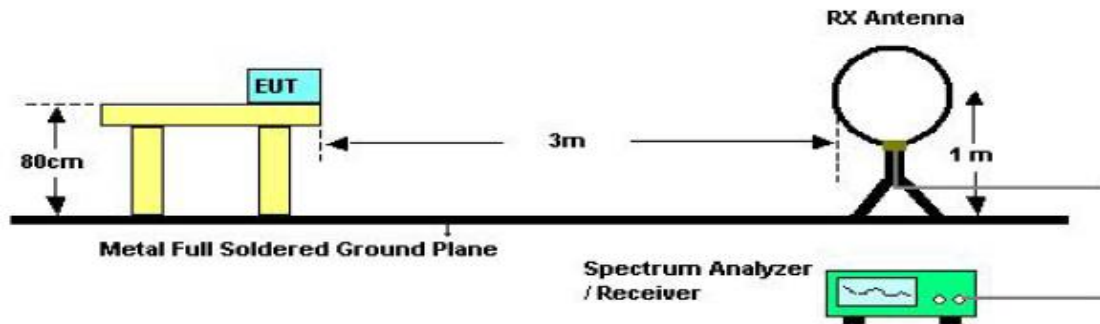
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

6.1.2 Test Procedure

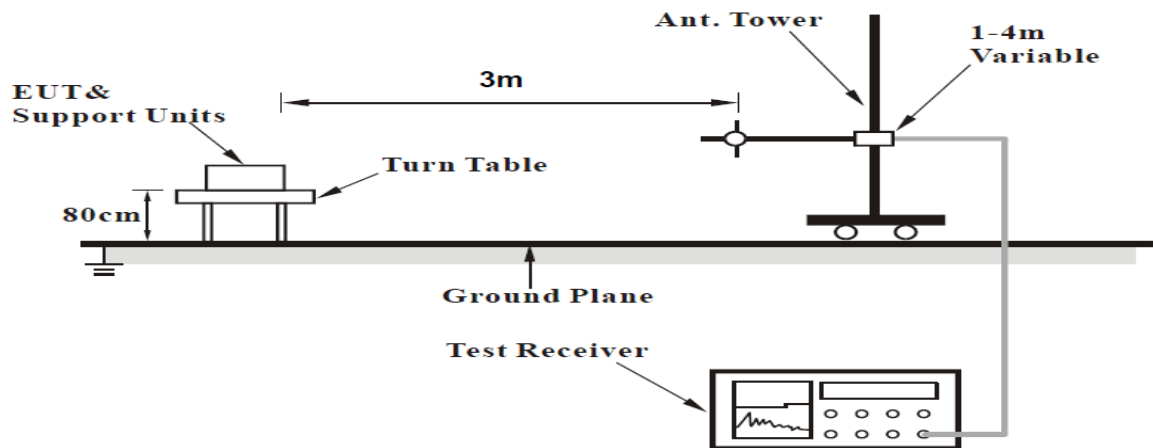
- The testing follows FCC KDB Publication No. 558074 D01 15.247 Meas. Guidance v05.
- The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
- The EUT was placed on a turntable. For emissions testing at or below 1 GHz, the table height was 80cm above the reference ground plane. For emission measurements above 1 GHz, the table height was 1.5m.
- The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- For measurement below 1 GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- Use the following spectrum analyzer settings and peak emission levels are measured :
 - Span shall wide enough to fully capture the emission being measured;
 - Set RBW (9-150 kHz: 200 Hz, 0.15-30MHz: 9kHz, 30-1000 MHz: 120 kHz, above 1GHz: 1 MHz).
 - VBW $\geq 3 \times$ RBW ; Sweep = auto; Detector function = peak; Trace = max hold
 For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
- Measure and record the results in the test report.

6.1.3 Test SET-UP (Block Diagram of Configuration)

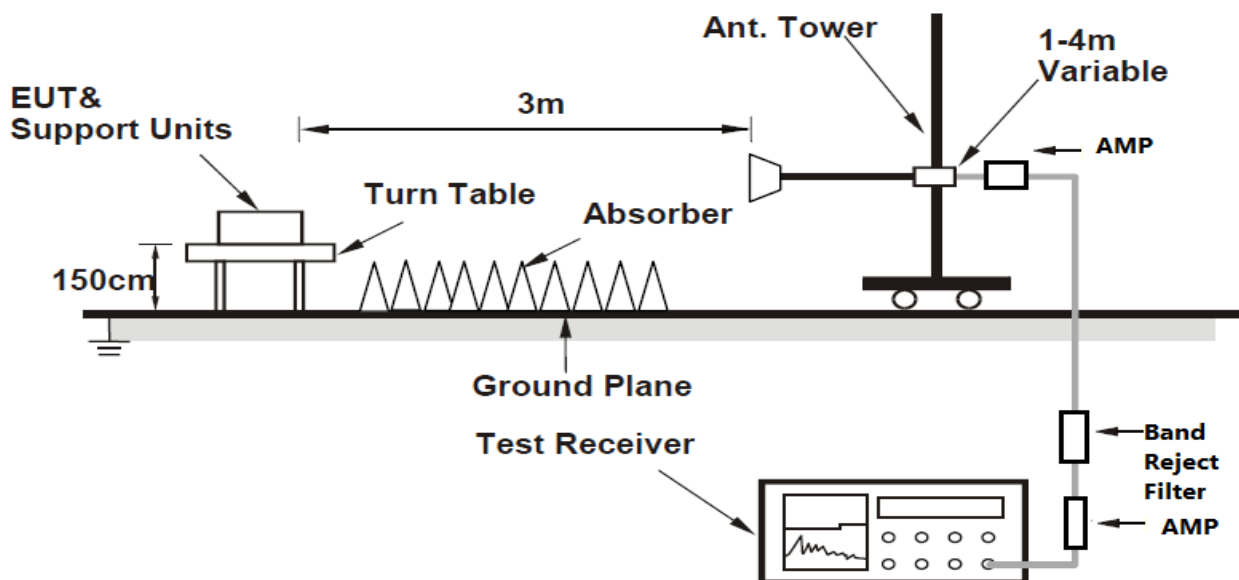
1. Radiated Emission Test Set-Up, Frequency Below 30 MHz



2. Radiated Emission Test Set-Up, Frequency Below 1000 MHz



3. Radiated Emission Test Set-Up, Frequency Above 1000 MHz.



6.1.4 Test Results

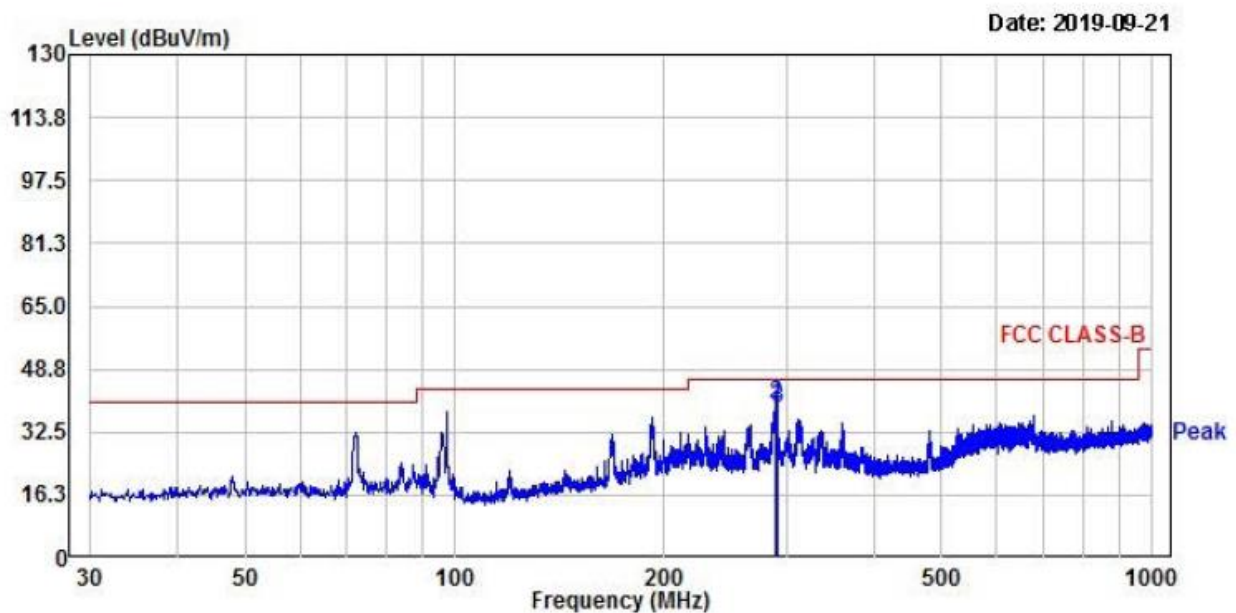
[Below 30MHz]

Frequency [MHz]	Reading [dB μ V]	Antenna Factor [dB]	Cable Loss [dB]	Preamp Factor [dB]	Level [dBuV/m]	Pol/Phase
No other emissions were detected at a level greater than 20 dB below limit.						

Remark: §15.31(o) The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

[Below 1 GHz – 30 MHz ~ 1 GHz]

Test Mode : 2 GHz BCDMA (Worst case : Horizontal)



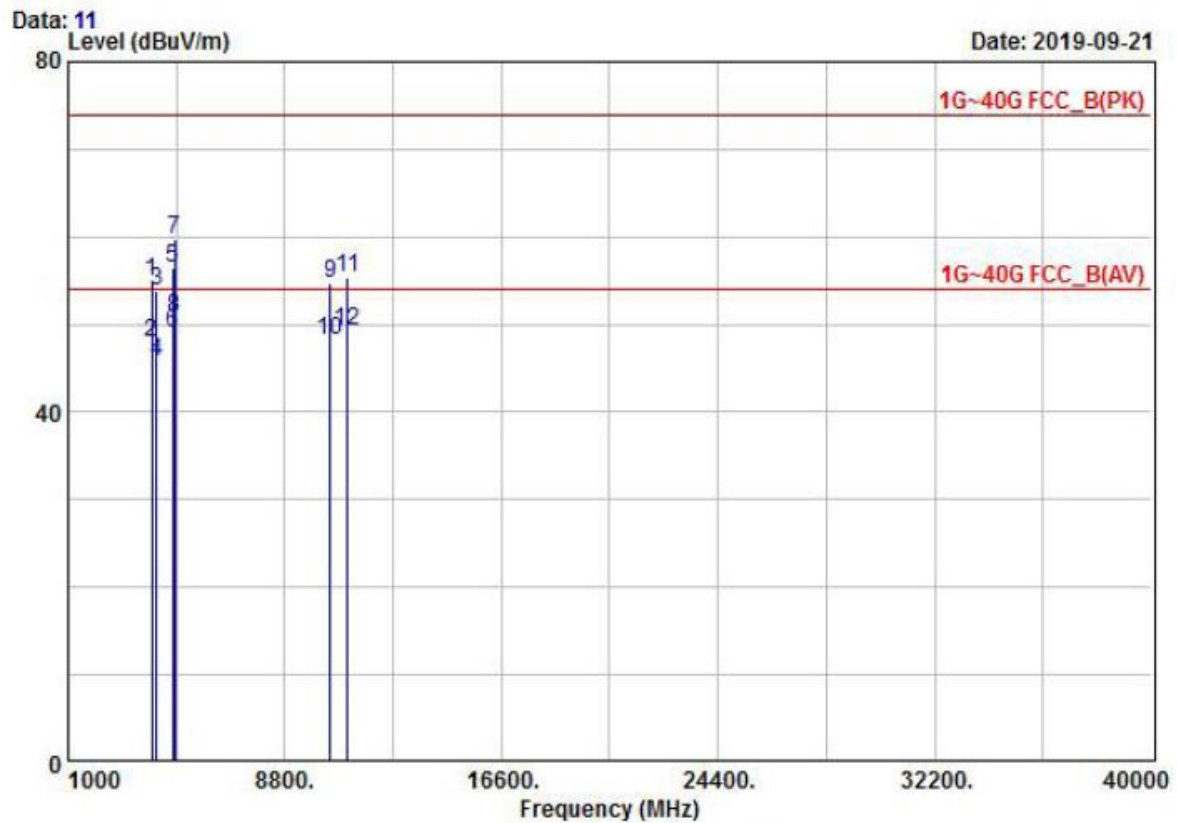
Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP dBuV/m	dBuV/m	dB	cm	deg	
288.14	50.71	-11.32	39.39	46.00	6.61	100	154	horizontal
288.38	50.96	-11.31	39.65	46.00	6.35	100	154	horizontal
290.08	49.97	-11.27	38.70	46.00	7.30	100	23	horizontal

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

Note : Only the worst case plots for Radiated Spurious Emissions.

[Above 1 GHz – 1 GHz ~ 40 GHz]

Test Mode : 2 GHz BCDMA (Worst case : Vertical & Horizontal)



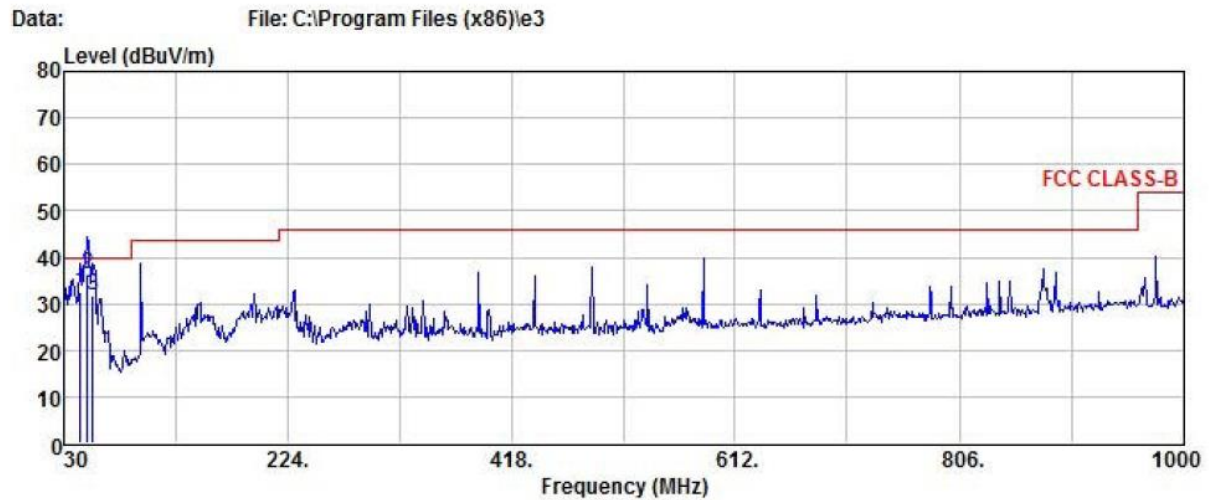
Freq	Reading	C.F	Result	Limit	Margin	Polarity
MHz	dBuV	dB	PK dBuV/m	dBuV/m	dB	
1 3994.60	72.60	-17.71	54.89	74.00	19.11	HORIZONTAL
2 3994.60	65.70	-17.71	47.99	54.00	6.01	HORIZONTAL
3 4186.50	70.50	-16.76	53.74	74.00	20.26	HORIZONTAL
4 4186.50	62.60	-16.76	45.84	54.00	8.16	HORIZONTAL
5 4768.60	71.50	-15.06	56.44	74.00	17.56	VERTICAL
6 4768.60	64.10	-15.06	49.04	54.00	4.96	VERTICAL
7 4821.30	74.80	-15.05	59.75	74.00	14.25	VERTICAL
8 4821.30	65.90	-15.05	50.85	54.00	3.15	VERTICAL
9 10436.20	61.40	-6.76	54.64	74.00	19.36	HORIZONTAL
10 10436.20	54.90	-6.76	48.14	54.00	5.86	HORIZONTAL
11 11057.80	60.80	-5.48	55.32	74.00	18.68	VERTICAL
12 11057.80	54.70	-5.48	49.22	54.00	4.78	VERTICAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Blue : Vertical Black : Horizontal

Note : Only the worst case plots for Radiated Spurious Emissions.

[Below 1 GHz – 30 MHz ~ 1 GHz]

Test Mode : 5 GHz BCDMA (Worst case : Vertical)



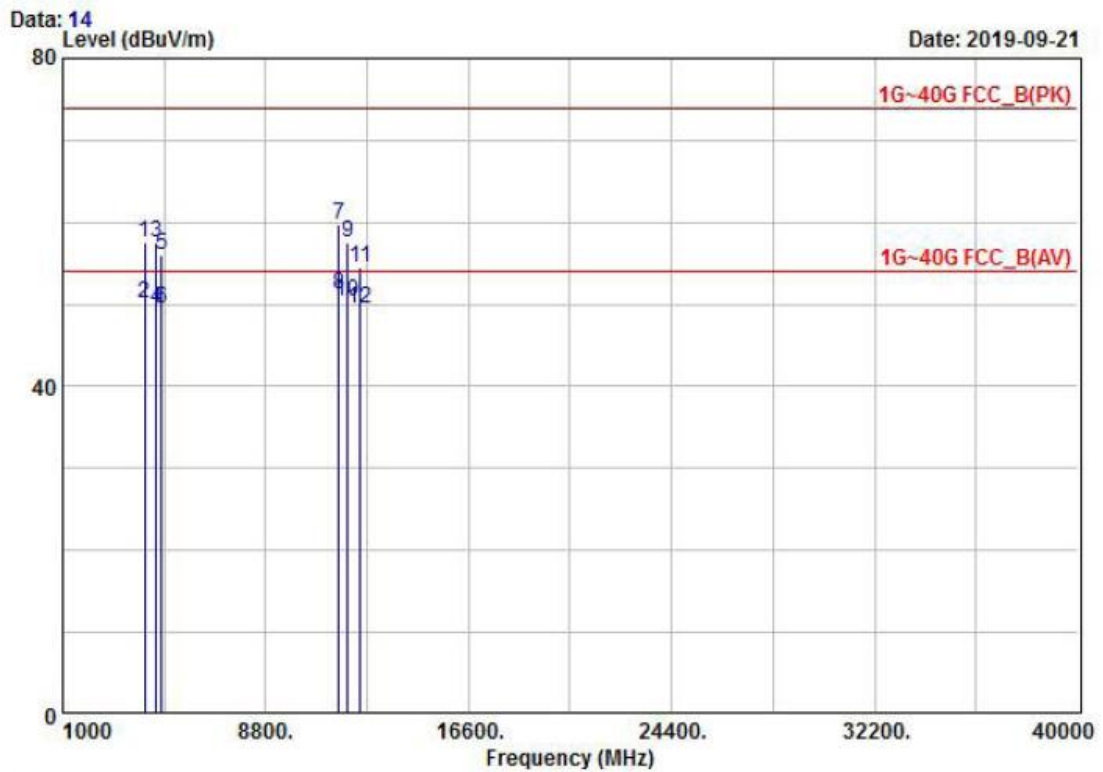
Freq	Reading	C.F	Result	Limit	Margin	Height	Angle	Polarity
MHz	dBuV	dB	QP dBuV/m	dBuV/m	dB	cm	deg	
44.55	46.59	-13.99	32.60	40.00	7.40	176	224	VERTICAL
50.37	50.17	-13.92	36.25	40.00	3.75	331	195	VERTICAL
55.22	45.89	-14.07	31.82	40.00	8.18	198	224	VERTICAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

Note : Only the worst case plots for Radiated Spurious Emissions.

[Above 1 GHz – 1 GHz ~ 40 GHz]

Test Mode : 5 GHz BCDMA (Worst case : Vertical & Horizontal)



Freq	Reading	C.F	Result	Limit	Margin	Polarity
MHz	dBuV	dB	PK dBuV/m	dBuV/m	dB	
1 4152.00	74.50	-16.93	57.57	74.00	16.43	VERTICAL
2 4152.00	67.10	-16.93	50.17	54.00	3.83	VERTICAL
3 4586.90	72.70	-15.12	57.58	74.00	16.42	VERTICAL
4 4586.90	64.70	-15.12	49.58	54.00	4.42	VERTICAL
5 4790.10	71.00	-15.06	55.94	74.00	18.06	HORIZONTAL
6 4790.10	64.50	-15.06	49.44	54.00	4.56	HORIZONTAL
7 11626.50	63.80	-4.02	59.78	74.00	14.22	VERTICAL
8 11626.50	55.30	-4.02	51.28	54.00	2.72	VERTICAL
9 11955.20	59.20	-1.64	57.56	74.00	16.44	VERTICAL
10 11955.20	51.90	-1.64	50.26	54.00	3.74	VERTICAL
11 12429.60	52.10	2.31	54.41	74.00	19.59	HORIZONTAL
12 12429.60	47.10	2.31	49.41	54.00	4.59	HORIZONTAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
Blue : Vertical Black : Horizontal

Note : Only the worst case plots for Radiated Spurious Emissions.