FCC RF Test Report

APPLICANT	:	Xiaomi Communications Co., Ltd.
EQUIPMENT	:	Mobile Phone
BRAND NAME	:	Redmi
MODEL NAME	:	A101XM
FCC ID	:	2AFZZK19KR
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	Aug. 25, 2021

We, Sporton International (Kunshan) 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 Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.

Jason Jia

Reviewed by: Jason Jia / Supervisor

Alex wang

Approved by: Alex Wang / Manager

ACCREDITED
Cert #5145.02

Sporton International (Kunshan) Inc.
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR122708-01B	Rev. 01	Initial issue of report	Sep. 22, 2021

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	1
-	15.247(b)(3)	Output Power	≤ 30dBm	Pass	1
-	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	1
-	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 30dBc	Pass	1
3.1	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 4.23 dB at 2483.500 MHz
-	15.207	AC Conducted Emission	15.207(a)	Pass	-
3.2	15.203 & 15.247(b)	Antenna Requirement	N/A	N/A	-

Remark 1: Test items are performed on original report which can be referred to Sporton report number FR122708B

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

1.2 Manufacturer

Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	Redmi
Model Name	A101XM
FCC ID	2AFZZK19KR
IMEI Code	Radiation : 860036050004491
HW Version	P0.1
SW Version	MIUI13
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/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	40
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)
Antenna Type / Gain	PIFA Antenna type with gain 0.41 dBi
Type of Modulation	Bluetooth LE : GFSK

1.5 Modification of EUT

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

1.6 Re-use of Measured Data

1.6.1 Introduction Section

This application re-uses data collected on a similar device. The subject device of this application (Model: A101XM, FCC ID: 2AFZZK19KR) is electrically identical to the reference device (Model: XIG02, FCC ID: 2AFZZK19JR) for the portions of the circuitry corresponding to the data being re-used. Based on their similarity, the FCC Part 15C (equipment class: DTS, DSS) reuse the original model's result and do spot-check, following the FCC KDB 484596 D01 v01.

The applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID: 2AFZZK19KR .

1.6.2 Difference Section

The **main** difference between FCC ID: 2AFZZK19JR and FCC ID: 2AFZZK19KR is that the two models support different WWAN bands /NFC / WIFI 5G U-NII-3.
Other differences and all the details of similarity and difference can be found in the A101XM_Operational Description of Product Equality Declaration which is exhibited separately.

1.6.3 Reference detail Section:

Rule Part	Equipment Class	Frequency Band (MHz)	Reference FCC ID(Parent)	Type Grant/ Permissive Change	Reference Title	FCC ID Filling (Variant)	Report Title/Section
15C	DSS (BR/EDR)	2400~2483.5	2AFZZK19JR	Original Grant	FR122708A	2AFZZK19KR	All sections applicable except RSE
	DTS (BLE)	2400~2483.5	2AFZZK19JR	Original Grant	FR122708B	2AFZZK19KR	All sections applicable except RSE
	DTS (WLAN)	2400~2483.5	2AFZZK19JR	Original Grant	FR122708C	2AFZZK19KR	All sections applicable except RSE

1.6.4 Spot Check Verification Data Section

Conducted power test against the variant model based on the worst-case condition from the original model was performed in this filing to demonstrate the test data from original model remains representative for the variant model

Summary for power spot check for each rule entry and technology is listed as below:

Test Item	Mode	2AFZZK19JR Worst Result	2AFZZK19KR Worst Result	Difference (dB)
Conducted Power (dBm)	Bluetooth-LE 1M	6.90	6.03	0.87
	Bluetooth-LE 2M	7.24	6.34	0.9

Conclusion:
Based on the spot check test result, the test data from the original model is representative for the variant model. The power level and RSE spot check are shown within expected level compliant to limit line.

We confirm that the test data reuse policy of FCC KDB 484596 D01 Referencing Test Data v01 has been followed and the test data as referenced from the parent model report represents compliance with new FCC ID.

1.7 Testing Location

Sporton International (Kunshan) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International (Kunshan) Inc.		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH05-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24al

1.9 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

2.2 Test Mode

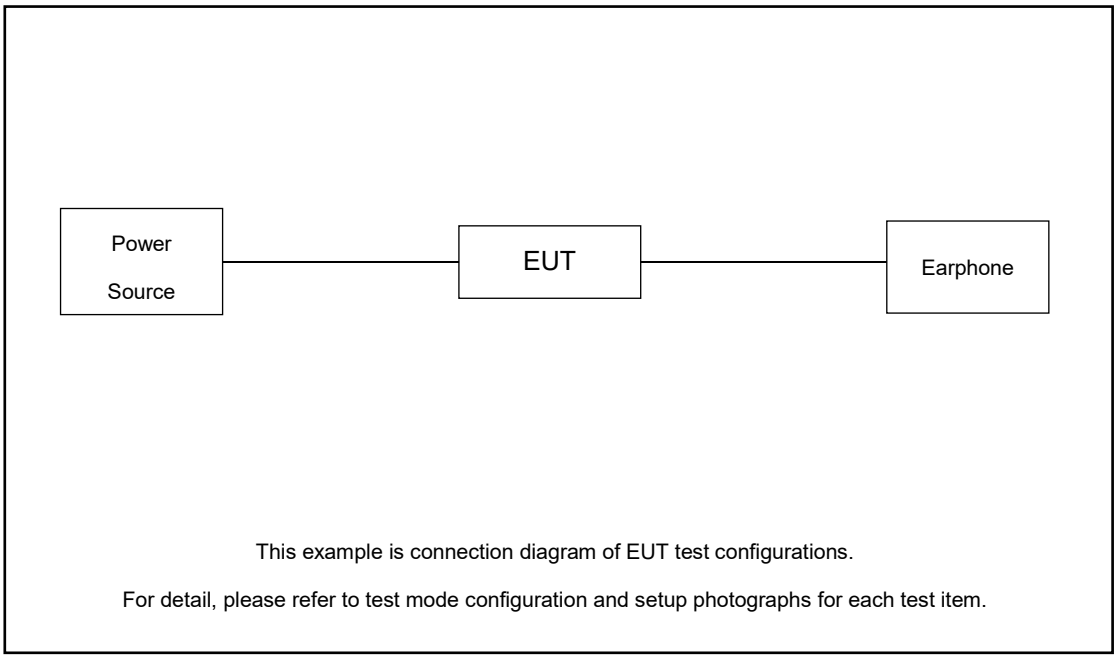
The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: adiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
	Bluetooth – LE / GFSK
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz Mode 2: Bluetooth Tx CH19_2440 MHz Mode 3: Bluetooth Tx CH39_2480 MHz
CO-Location	BLE 2M CH39 2480MHz + EDGE850 link
Remark: For Radiated Test Cases, The tests were performed with Adapter, Earphone and USB Cable.	

2.3 Connection Diagram of Test System

For Radiated Emission



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Earphone	Xiaomi	N/A	N/A	N/A	N/A
2.	Adapter	Xiaomi	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For BLE function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 Limit of Radiated Band Edges and Spurious Emission

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 limits as below.

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

3.1.2 Measuring Instruments

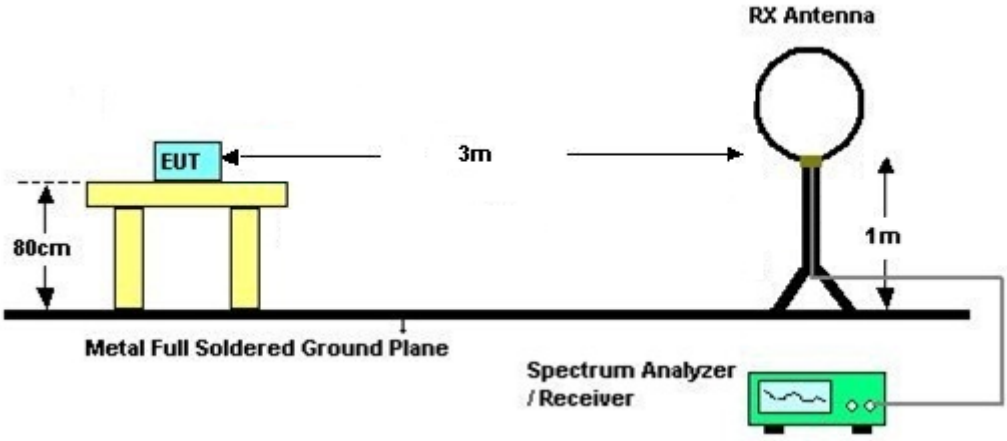
The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

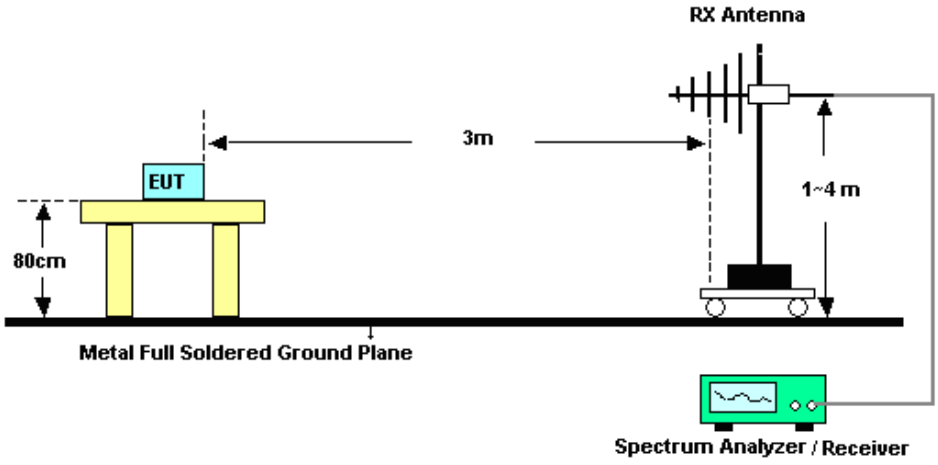
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 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.

3.1.4 Test Setup

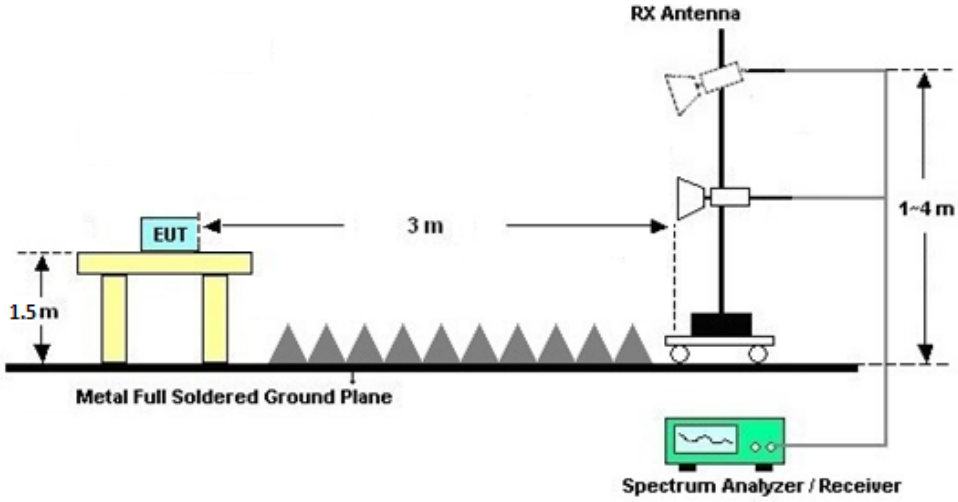
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

3.1.7 Duty Cycle

Please refer to Appendix B.

3.1.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix A.

3.2 Antenna Requirements

3.2.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 17, 2020	Aug. 25, 2021	Oct. 16, 2021	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55150244	10Hz-44G,MAX 30dB	Apr. 13, 2021	Aug. 25, 2021	Apr. 12, 2022	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 01, 2020	Aug. 25, 2021	Oct. 31, 2021	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	Jun. 04 ,2021	Aug. 25, 2021	Jun. 03, 2022	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 24, 2021	Aug. 25, 2021	Apr. 23, 2022	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101115	18GHz~40GHz	Nov. 10, 2020	Aug. 25, 2021	Nov. 09, 2021	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	187289	9KHz-1GHz	Apr. 12, 2021	Aug. 25, 2021	Apr. 11, 2022	Radiation (03CH05-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 07, 2021	Aug. 25, 2021	Jan. 06, 2022	Radiation (03CH05-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2012228	1Ghz-18Ghz	Oct. 17, 2020	Aug. 25, 2021	Oct. 16, 2021	Radiation (03CH05-KS)
Amplifier	Keysight	83017A	MY53270316	500MHz~26.5GHz	Oct. 17, 2020	Aug. 25, 2021	Oct. 16, 2021	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Aug. 25, 2021	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Aug. 25, 2021	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Aug. 25, 2021	NCR	Radiation (03CH05-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0dB**

Appendix A. Radiated Spurious Emission

For Bluetooth LE 1 Mbps:

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2368.24	54.81	-19.19	74	49.77	32.11	7.66	34.73	234	61	P	H
		2389.3	44.63	-9.37	54	39.42	32.2	7.72	34.71	234	61	A	H
	*	2402	96.24	-	-	91.03	32.2	7.72	34.71	234	61	P	H
	*	2402	95.46	-	-	90.25	32.2	7.72	34.71	234	61	A	H
		2369.15	54.38	-19.62	74	49.27	32.15	7.69	34.73	100	112	P	V
		2380.07	44.82	-9.18	54	39.71	32.15	7.69	34.73	100	112	A	V
	*	2402	97.34	-	-	92.13	32.2	7.72	34.71	100	112	P	V
	*	2402	96.69	-	-	91.48	32.2	7.72	34.71	100	112	A	V
BLE CH 39 2480MHz		2491.3	54.89	-19.11	74	49.5	32.1	7.89	34.6	201	59	P	H
		2483.5	45.78	-8.22	54	40.43	32.12	7.86	34.63	201	59	A	H
	*	2480	99.41	-	-	94.06	32.12	7.86	34.63	201	59	P	H
	*	2480	98.59	-	-	93.24	32.12	7.86	34.63	201	59	A	H
		2497.18	54.69	-19.31	74	49.3	32.1	7.89	34.6	100	120	P	V
		2483.5	46.14	-7.86	54	40.79	32.12	7.86	34.63	100	120	A	V
	*	2480	100.32	-	-	94.97	32.12	7.86	34.63	100	120	P	V
	*	2480	99.7	-	-	94.35	32.12	7.86	34.63	100	120	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 00 2402MHz		4806	41.11	-32.89	74	57.45	34.3	11.18	61.82	300	0	P	H
		4806	41.66	-32.34	74	58	34.3	11.18	61.82	300	0	P	V
BLE CH 19 2440MHz		4878	41.37	-32.63	74	57.52	34.34	11.28	61.77	300	0	P	H
		7320	42.39	-31.61	74	54.79	35.93	13.73	62.06	300	0	P	H
		4878	41.28	-32.72	74	57.43	34.34	11.28	61.77	300	0	P	V
		7320	43.12	-30.88	74	55.52	35.93	13.73	62.06	300	0	P	V
BLE CH 39 2480MHz		4962	40.34	-33.66	74	56.28	34.38	11.39	61.71	300	0	P	H
		7440	42.91	-31.09	74	55.22	35.91	13.85	62.07	300	0	P	H
		4962	43.45	-30.55	74	59.39	34.38	11.39	61.71	300	0	P	V
		7440	42.49	-31.51	74	54.8	35.91	13.85	62.07	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		101.78	23.51	-19.99	43.5	38.81	16.28	1.52	33.1	-	-	P	H
		153.19	27.3	-16.2	43.5	41.5	16.92	1.87	32.99	200	0	P	H
		315.18	29.25	-16.75	46	39.73	19.55	2.7	32.73	-	-	P	H
		380.17	23.98	-22.02	46	32.31	21.2	2.97	32.5	-	-	P	H
		718.7	26.63	-19.37	46	27.81	27.26	4.1	32.54	-	-	P	H
		945.68	29.16	-16.84	46	25.72	30.85	4.7	32.11	-	-	P	H
		44.55	25.91	-14.09	40	40.64	17.35	1.02	33.1	100	0	P	V
		198.78	26.34	-17.16	43.5	42.03	15.07	2.14	32.9	-	-	P	V
		312.27	29.41	-16.59	46	39.92	19.52	2.69	32.72	-	-	P	V
		576.11	24.47	-21.53	46	28.05	25.61	3.66	32.85	-	-	P	V
		746.83	27.13	-18.87	46	27.43	28.11	4.18	32.59	-	-	P	V
		921.43	28.77	-17.23	46	26.37	29.92	4.64	32.16	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

For Bluetooth LE 2 Mbps:

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2378.12	54.21	-19.79	74	49.1	32.15	7.69	34.73	235	55	P	H
		2383.97	45.24	-8.76	54	40.13	32.15	7.69	34.73	235	55	A	H
	*	2402	97	-	-	91.79	32.2	7.72	34.71	235	55	P	H
	*	2402	96.07	-	-	90.86	32.2	7.72	34.71	235	55	A	H
		2320.14	54.35	-19.65	74	49.51	32.02	7.6	34.78	101	111	P	V
		2363.17	45.14	-8.86	54	40.1	32.11	7.66	34.73	101	111	A	V
	*	2402	97.36	-	-	92.15	32.2	7.72	34.71	101	111	P	V
	*	2402	96.74	-	-	91.53	32.2	7.72	34.71	101	111	A	V
BLE CH 39 2480MHz		2483.5	56.48	-17.52	74	51.13	32.12	7.86	34.63	196	61	P	H
		2483.5	48.58	-5.42	54	43.23	32.12	7.86	34.63	196	61	A	H
	*	2480	98.7	-	-	93.35	32.12	7.86	34.63	196	61	P	H
	*	2480	98.24	-	-	92.89	32.12	7.86	34.63	196	61	A	H
		2483.8	55.58	-18.42	74	50.23	32.12	7.86	34.63	100	118	P	V
		2483.5	49.64	-4.36	54	44.29	32.12	7.86	34.63	100	118	A	V
	*	2480	100.19	-	-	94.84	32.12	7.86	34.63	100	118	P	V
	*	2480	99.53	-	-	94.18	32.12	7.86	34.63	100	118	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

BLE	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BLE CH 00 2402MHz		4806	41.11	-32.89	74	57.45	34.3	11.18	61.82	300	0	P	H
		4806	41.66	-32.34	74	58	34.3	11.18	61.82	300	0	P	V
BLE CH 19 2440MHz		4878	40.33	-33.67	74	56.48	34.34	11.28	61.77	300	0	P	H
		7320	42.41	-31.59	74	54.81	35.93	13.73	62.06	300	0	P	H
		4878	40.5	-33.5	74	56.65	34.34	11.28	61.77	300	0	P	V
		7320	42.91	-31.09	74	55.31	35.93	13.73	62.06	300	0	P	V
BLE CH 39 2480MHz		4962	41.44	-32.56	74	55.68	34.38	11.39	60.01	300	0	P	H
		7440	44.08	-29.92	74	54.86	35.91	13.85	60.54	300	0	P	H
		4962	41.96	-32.04	74	56.2	34.38	11.39	60.01	300	0	P	V
		7440	43.02	-30.98	74	53.8	35.91	13.85	60.54	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BLE LF		101.78	23.51	-19.99	43.5	37.68	16.28	1.75	32.2	-	-	P	H
		153.19	27.3	-16.2	43.5	40.32	16.92	2.16	32.1	100	0	P	H
		272.5	23.73	-22.27	46	33.48	19.53	2.88	32.16	-	-	P	H
		315.18	29.25	-16.75	46	38.73	19.55	3.1	32.13	-	-	P	H
		380.17	23.98	-22.02	46	31.64	21.2	3.4	32.26	-	-	P	H
		653.71	25.55	-20.45	46	26.79	26.52	4.44	32.2	-	-	P	H
		44.55	25.91	-14.09	40	39.58	17.35	1.16	32.18	100	0	P	V
		99.84	24.52	-18.98	43.5	38.89	16.1	1.73	32.2	-	-	P	V
		153.19	24.32	-19.18	43.5	37.34	16.92	2.16	32.1	-	-	P	V
		198.78	26.34	-17.16	43.5	40.91	15.07	2.46	32.1	-	-	P	V
		312.27	29.41	-16.59	46	38.92	19.52	3.09	32.12	-	-	P	V
		448.07	23.92	-22.08	46	29.37	23.05	3.7	32.2	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

For Co-location:

2.4GHz 2400~2483.5MHz

BLE 2M CH39 2480MHz &EDGE850 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH39 2480MHz		2483.5	56.48	-17.52	74	51.13	32.12	7.86	34.63	117	123	P	H
		2483.5	49.57	-4.43	54	44.22	32.12	7.86	34.63	117	123	A	H
	*	2480	99.86	-	-	94.51	32.12	7.86	34.63	117	123	P	H
	*	2480	99.17	-	-	93.82	32.12	7.86	34.63	117	123	A	H
		2483.56	57.75	-16.25	74	52.4	32.12	7.86	34.63	273	98	P	V
		2483.5	49.77	-4.23	54	44.42	32.12	7.86	34.63	273	98	A	V
	*	2480	100.46	-	-	95.11	32.12	7.86	34.63	273	98	P	V
	*	2480	99.81	-	-	94.46	32.12	7.86	34.63	273	98	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BLE 2M CH39 2480MHz & EDGE850 (Harmonic @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH39 2480MHz		4962	41.98	-32.02	74	56.22	34.38	11.39	60.01	300	0	P	H
		7440	44.19	-29.81	74	54.97	35.91	13.85	60.54	300	0	P	H
		4962	41.96	-32.04	74	56.2	34.38	11.39	60.01	300	0	P	V
		7440	43.64	-30.36	74	54.42	35.91	13.85	60.54	300	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

BLE	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

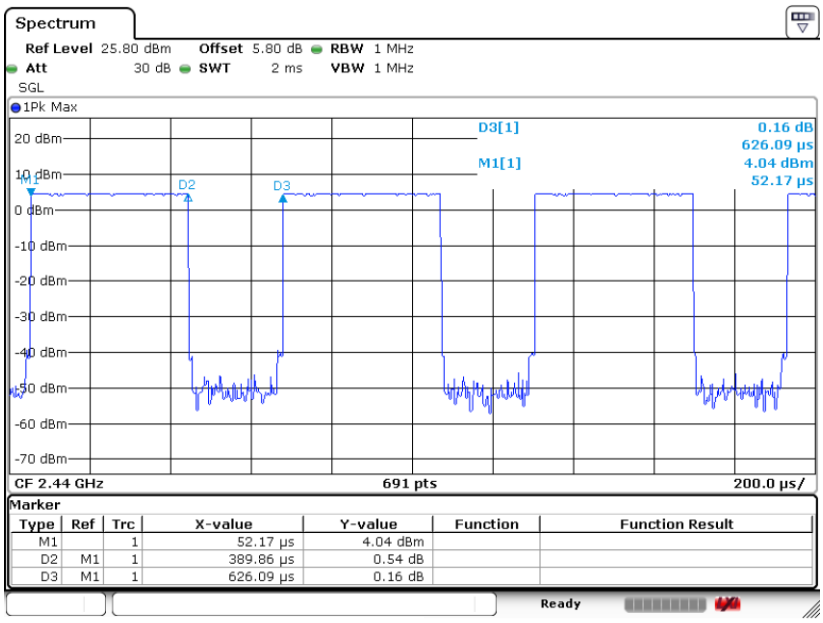
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

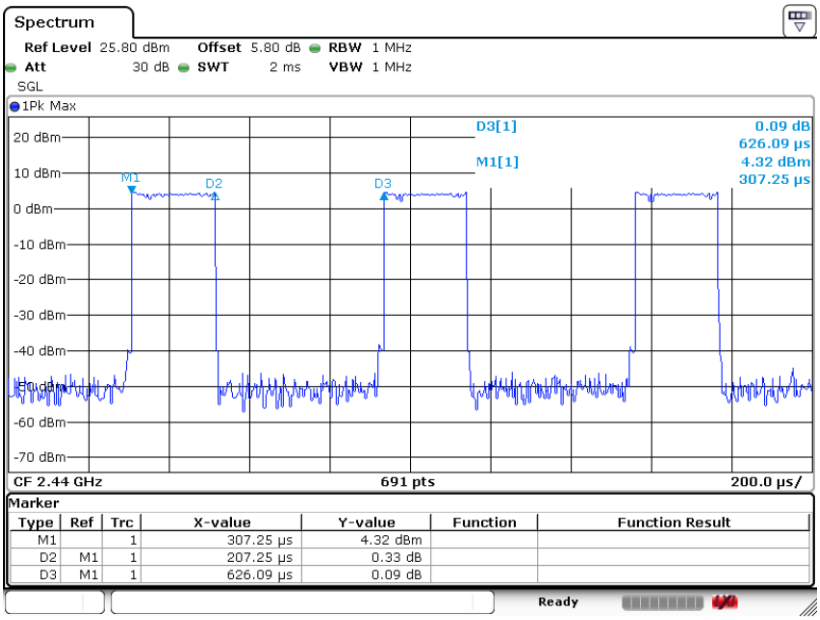
Appendix B. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth LE 1 Mbps	62.27	0.390	2.565	2.7kHz
Bluetooth LE 2 Mbps	33.10	0.207	4.825	5.1kHz

Bluetooth LE 1Mbps



Bluetooth LE 2 Mbps



Appendix D. Reference Report

Please refer to Sporton report number FR122708B which is issued separately.