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TEST REPORT

Report No.: 21031508HKG-002

BBPOS International Limited

Application For Certification
(Original Grant)

FCC ID: 2AB7X-CHB2X
IC: 24228-CHB2X

Transceiver

Prepared and Checked by:	**Approved by:**
Signed On File Wong Cheuk Ho, Herbert Lead Engineer	Digitally signed by Kenneth Wong Location: Intertek Testing Services Hong Kong Limited Wong Kwok Yeung, Kenneth Senior Lead Engineer Date: April 26, 2021

TEST REPORT

GENERAL INFORMATION

Grantee:	BBPOS International Limited
Grantee Address:	Suite 1903-04, Tower 2, Nina Tower, 8 Yeung Uk Road, Tsuen Wan, N.T., Hong Kong
Contact Person:	Adrian Kwan
Tel:	+ 852 3158 2585
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e-mail:	Adrian.kwan@bbpos.com
Manufacturer:	BBPOS International Limited
Manufacturer Address:	Suite 1903-04, Tower 2, Nina Tower, 8 Yeung Uk Road, Tsuen Wan, N.T., Hong Kong
Brand Name:	BBPOS
Model / HVIN:	CHB29
PMN:	Chipper 2X BT
Type of EUT:	Transceiver
Description of EUT:	Chipper 2X BT
Serial Number:	N/A
FCC ID / IC:	2AB7X-CHB2X / 24228-CHB2X
Date of Sample Submitted:	March 29, 2021
Date of Test:	March 29, 2021 to April 22, 2021
Report No.:	21031508HKG-002
Report Date:	April 26, 2021
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 / RSS-210 Issue 10 Certification.

TEST REPORT

SUMMARY OF TEST RESULT

Test Specification	Reference	Results
Transmitter Power Line Conducted Emissions	15.207 / RSS-Gen 8.8	Pass
Radiated Emission Radiated Emission on the Bandedge	15.249, 15.209 / RSS-210 B.10, RSS-210 4.4	Pass
Radiated Emission in Restricted Bands	15.205 / RSS-210 4.1	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2019 Edition
RSS-210 Issue 10, December 2019
RSS-Gen Issue 5 Amendment 1, March 2019

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

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TEST REPORT

1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT) is a Bluetooth controlled mobile POS device. It supports reading EMV smart credit card, tape credit card and NFC credit card. It can be paired with smartphone and operated by mobile APP through Bluetooth link. The EMV smart card interface is for reading EMV smart credit card data. The magnetic tape head is for reading tape credit card. The 13.56MHz NFC reader is for reading NFC credit card. The EUT is powered by 3.7V internal rechargeable battery. The internal battery can be charged by USB socket (5VDC). The USB port in EUT is for this charging purpose and does not contain PC connectivity.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber . Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been placed on file with the FCC and IC No. 2042H.

TEST REPORT

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by USB Port (5VDC) during test.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

The EUT exercise program (if any) used during radiated testing was designed to exercise the various system components in a manner similar to a typical use.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

TEST REPORT

2.4 Measurement Uncertainty

Decision Rule for compliance: For FCC/IC standard, the measured value must be within the limits of applicable standard without accounting for the measurement uncertainty. For EN/IEC/HKTA/HKTC standard, conformity rules will be used as per standard directly excepted EN/IEC 61000-3-2, EN/IEC 61000-3-3, HKTA1004, HKCA1008, HKTA1019, HKTA1020, HKTA1041 and HKTA1044. For these excepted or not mentioned standards, Cl 4.2.2 of ILAC-G8:09/2019 decision rules will be reference and guard band will be equal to our measurement uncertainty with 95% confidence level (k=2). In case, the measured value is within guard band region, undetermined decision will be used.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

2.5 Support Equipment List and Description

1. HP notebook computer (Adaptor Model: HSTNN-CA15)
2. LAN cable of 2m long
   (Provided by Intertek)
3. USB cable of 30cm long
   (Provided by Applicant)

TEST REPORT

3.0 EMISSION RESULTS

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

TEST REPORT

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 67.804 MHz

For electronic filing, the worst-case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 0.2 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 0.735 MHz

For electronic filing, the worst-case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

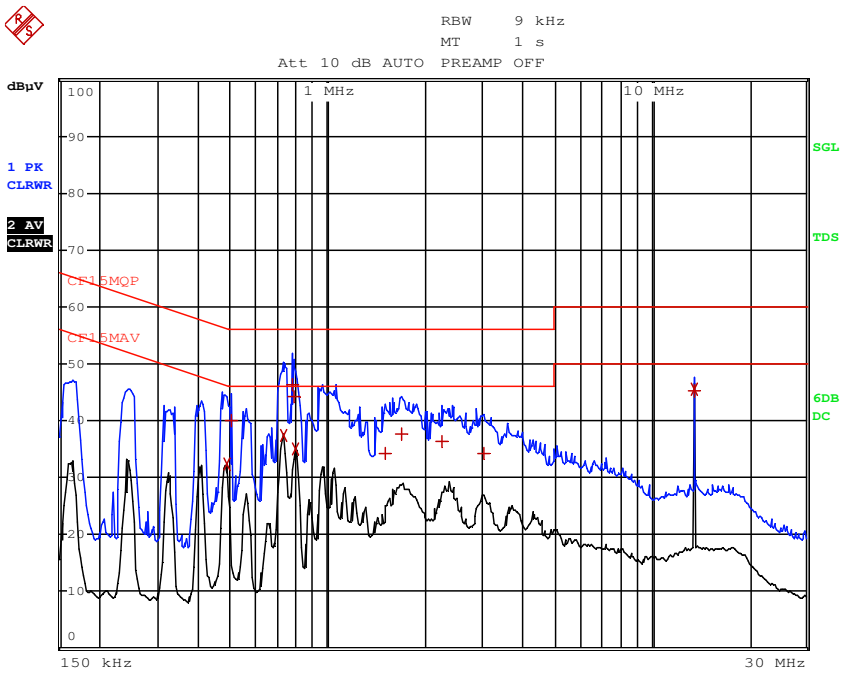
For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 3.2 dB

TEST REPORT

CONDUCTED EMISSION

Model: CHB29
Date of Test: April 15, 2021
Worst-Case Operating Mode: Bluetooth + NFC + charging (Live)



EDIT PEAK LIST (Final Measurement Results)

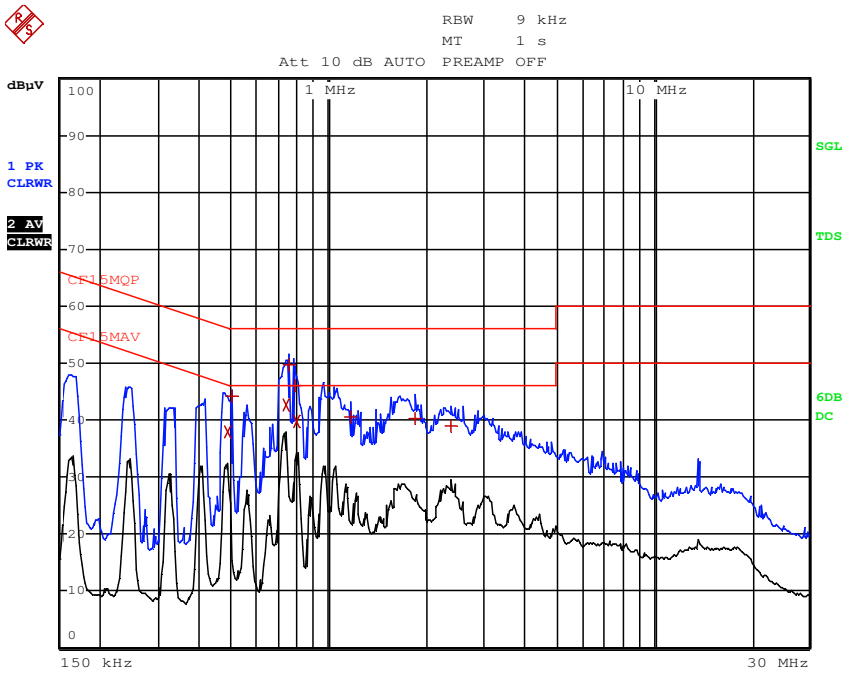
Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	487.5 kHz	32.45	L1	-13.75
1	Quasi Peak	501 kHz	39.98	L1	-16.02
2	CISPR Average	730.5 kHz	37.44	L1	-8.55
1	Quasi Peak	780 kHz	46.27	L1	-9.72
1	Quasi Peak	789 kHz	44.15	L1	-11.84
2	CISPR Average	798 kHz	34.95	L1	-11.04
1	Quasi Peak	1.5045 MHz	34.15	L1	-21.84
1	Quasi Peak	1.6935 MHz	37.65	L1	-18.34
1	Quasi Peak	2.2605 MHz	36.47	L1	-19.52
1	Quasi Peak	3.0255 MHz	34.37	L1	-21.62
1	Quasi Peak	13.56 MHz	45.34	L1	-14.65
2	CISPR Average	13.56 MHz	45.66	L1	-4.33

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

TEST REPORT

Model: CHB29
Date of Test: April 15, 2021
Worst-Case Operating Mode: Bluetooth + NFC + charging (Neutral)



EDIT PEAK LIST (Final Measurement Results)

Trace1:	CF15MQP
Trace2:	CF15MAV
Trace3:	---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	487.5 kHz	37.95	N	-8.25
1	Quasi Peak	501 kHz	44.24	N	-11.75
2	CISPR Average	735 kHz	42.75	N	-3.24
1	Quasi Peak	753 kHz	49.71	N	-6.28
1	Quasi Peak	789 kHz	45.98	N	-10.01
2	CISPR Average	798 kHz	39.68	N	-6.31
1	Quasi Peak	1.1715 MHz	40.61	N	-15.38
1	Quasi Peak	1.842 MHz	40.25	N	-15.74
1	Quasi Peak	2.382 MHz	38.94	N	-17.05

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSIONS

Model: CHB29
Date of Test: April 22, 2021
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 1
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	79.8	33	29.4	76.2	94.0	-17.8
H	3202.638	53.3	33	31.9	52.2	54.0	-1.8
V	4804.000	34.5	33	34.9	36.4	54.0	-17.6
H	7206.000	29.7	33	37.9	34.6	54.0	-19.4
V	9608.000	27.0	33	40.4	34.4	54.0	-19.6
H	12010.000	31.3	33	40.5	38.8	54.0	-15.2
V	14412.000	46.6	33	40.0	53.6	54.0	-0.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	94.8	33	29.4	91.2	114.0	-22.8
H	3202.638	57.3	33	31.9	56.2	74.0	-17.8
V	4804.000	46.9	33	34.9	48.8	74.0	-25.2
H	7206.000	40.3	33	37.9	45.2	74.0	-28.8
V	9608.000	37.0	33	40.4	44.4	74.0	-29.6
H	12010.000	40.7	33	40.5	48.2	74.0	-25.8
V	14412.000	49.6	33	40.0	56.6	74.0	-17.4

NOTES:
1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CHB29
Date of Test: April 22, 2021
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 2
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2440.000	79.6	33	29.4	76.0	94.0	-18.0
H	3253.302	51.3	33	31.9	50.2	54.0	-3.8
H	4880.000	34.9	33	34.9	36.8	54.0	-17.2
V	7320.000	30.9	33	37.9	35.8	54.0	-18.2
H	9760.000	27.2	33	40.4	34.6	54.0	-19.4
V	12200.000	31.3	33	40.5	38.8	54.0	-15.2
V	14640.000	47.2	33	38.4	52.6	54.0	-1.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2440.000	94.6	33	29.4	91.0	114.0	-23.0
H	3253.302	57.3	33	31.9	56.2	74.0	-17.8
H	4880.000	45.9	33	34.9	47.8	74.0	-26.2
V	7320.000	40.3	33	37.9	45.2	74.0	-28.8
H	9760.000	37.0	33	40.4	44.4	74.0	-29.6
V	12200.000	41.0	33	40.5	48.5	74.0	-25.5
V	14640.000	50.8	33	38.4	56.2	74.0	-17.8

NOTES:
1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CHB29
Date of Test: April 22, 2021
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 3
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2480.000	78.8	33	29.4	75.2	94.0	-18.8
H	3306.636	53.9	33	31.9	52.8	54.0	-1.2
V	4960.000	34.5	33	34.9	36.4	54.0	-17.6
H	7440.000	29.9	33	37.9	34.8	54.0	-19.2
H	9920.000	27.4	33	40.4	34.8	54.0	-19.2
V	12400.000	29.3	33	40.5	36.8	54.0	-17.2
V	14880.000	47.2	33	38.4	52.6	54.0	-1.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2480.000	93.8	33	29.4	90.2	114.0	-23.8
H	3306.636	58.9	33	31.9	57.8	74.0	-16.2
V	4960.000	45.6	33	34.9	47.5	74.0	-26.5
H	7440.000	40.5	33	37.9	45.4	74.0	-28.6
H	9920.000	37.1	33	40.4	44.5	74.0	-29.5
V	12400.000	41.3	33	40.5	48.8	74.0	-25.2
V	14880.000	51.2	33	38.4	56.6	74.0	-17.4

NOTES:
1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CHB29
Date of Test: April 22, 2021
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 4
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	90.8	33	29.4	87.2	94.0	-6.8
H	3202.636	54.3	33	31.9	53.2	54.0	-0.8
V	4804.000	34.6	33	34.9	36.5	54.0	-17.5
H	7206.000	29.9	33	37.9	34.8	54.0	-19.2
V	9608.000	26.8	33	40.4	34.2	54.0	-19.8
H	12010.000	31.0	33	40.5	38.5	54.0	-15.5
V	14412.000	45.4	33	40.0	52.4	54.0	-1.6

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	94.8	33	29.4	91.2	114.0	-22.8
H	3202.636	57.5	33	31.9	56.4	74.0	-17.6
V	4804.000	46.7	33	34.9	48.6	74.0	-25.4
H	7206.000	41.3	33	37.9	46.2	74.0	-27.8
V	9608.000	38.0	33	40.4	45.4	74.0	-28.6
H	12010.000	40.9	33	40.5	48.4	74.0	-25.6
V	14412.000	49.2	33	40.0	56.2	74.0	-17.8

NOTES:
1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CHB29
Date of Test: April 22, 2021
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 5
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2440.000	89.8	33	29.4	86.2	94.0	-7.8
H	3253.304	53.9	33	31.9	52.8	54.0	-1.2
H	4880.000	34.9	33	34.9	36.8	54.0	-17.2
V	7320.000	30.9	33	37.9	35.8	54.0	-18.2
H	9760.000	27.2	33	40.4	34.6	54.0	-19.4
V	12200.000	31.3	33	40.5	38.8	54.0	-15.2
V	14640.000	48.0	33	38.4	53.4	54.0	-0.6

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2440.000	95.2	33	29.4	91.6	114.0	-22.4
H	3253.304	57.7	33	31.9	56.6	74.0	-17.4
H	4880.000	45.7	33	34.9	47.6	74.0	-26.4
V	7320.000	42.3	33	37.9	47.2	74.0	-26.8
H	9760.000	38.0	33	40.4	45.4	74.0	-28.6
V	12200.000	41.3	33	40.5	48.8	74.0	-25.2
V	14640.000	51.4	33	38.4	56.8	74.0	-17.2

NOTES:
1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CHB29
Date of Test: April 22, 2021
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 6
Pursuant to FCC Part 15 Section 15.249 / RSS-210 B10.0 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2480.000	90.4	33	29.4	86.8	94.0	-7.2
H	3306.635	53.5	33	31.9	52.4	54.0	-1.6
V	4960.000	34.5	33	34.9	36.4	54.0	-17.6
H	7440.000	29.9	33	37.9	34.8	54.0	-19.2
H	9920.000	27.4	33	40.4	34.8	54.0	-19.2
V	12400.000	32.3	33	40.5	39.8	54.0	-14.2
V	14880.000	48.2	33	38.4	53.6	54.0	-0.4

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2480.000	95.6	33	29.4	92.0	114.0	-22.0
H	3306.635	58.3	33	31.9	57.2	74.0	-16.8
V	4960.000	45.9	33	34.9	47.8	74.0	-26.2
H	7440.000	41.5	33	37.9	46.4	74.0	-27.6
H	9920.000	38.4	33	40.4	45.8	74.0	-28.2
V	12400.000	42.3	33	40.5	49.8	74.0	-24.2
V	14880.000	51.0	33	38.4	56.4	74.0	-17.6

NOTES:
1. Peak Detector Data unless otherwise stated.
2. Average detector is applied according to ANSI C63.10.
3. All measurements were made at 3 meters.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: CHB29
Date of Test: April 22, 2021
Worst-Case Operating Mode: Bluetooth + NFC + charging

Table 7
Pursuant to FCC Part 15 Section 15.209 / RSS-210 4.4 Requirement

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	40.722	41.0	16	10.0	35.0	40.0	-5.0
H	67.804	47.8	16	8.0	39.8	40.0	-0.2
V	94.956	33.2	16	11.0	28.2	43.5	-15.3
V	366.128	26.8	16	24.0	34.8	46.0	-11.2
H	461.068	24.9	16	26.0	34.9	46.0	-11.1
V	488.240	25.8	16	26.0	35.8	46.0	-10.2

NOTES:
1. Quasi-Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Negative sign in the column shows value below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205 / RSS-210 4.1.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

4.0 EQUIPMENT PHOTOGRAPHS

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 PRODUCT LABELLING

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 TECHNICAL SPECIFICATIONS

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 INSTRUCTION MANUAL

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States and Canada.

TEST REPORT

8.0 MISCELLANEOUS INFORMATION

The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

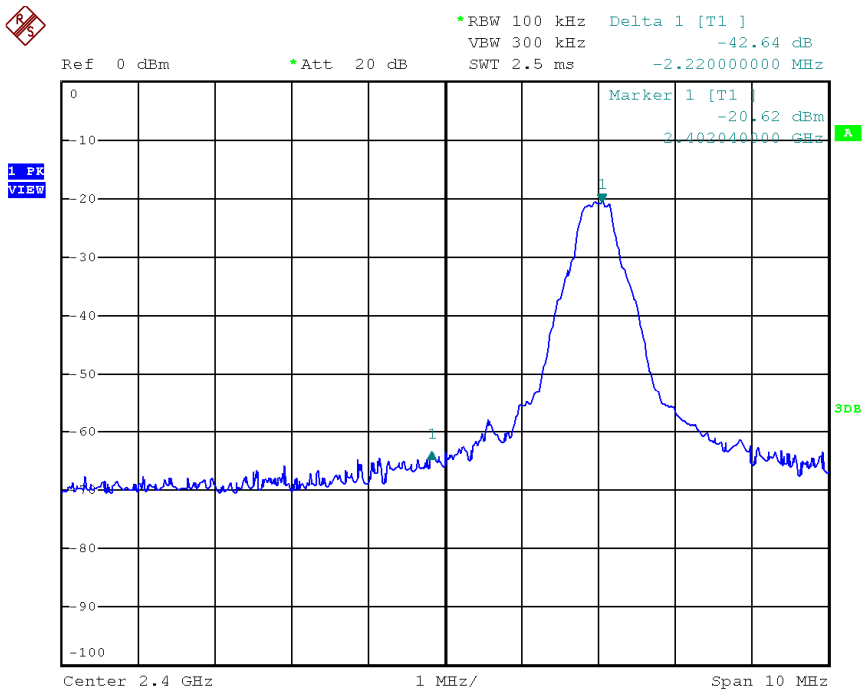
8.1 Radiated Emission on the Bandedge

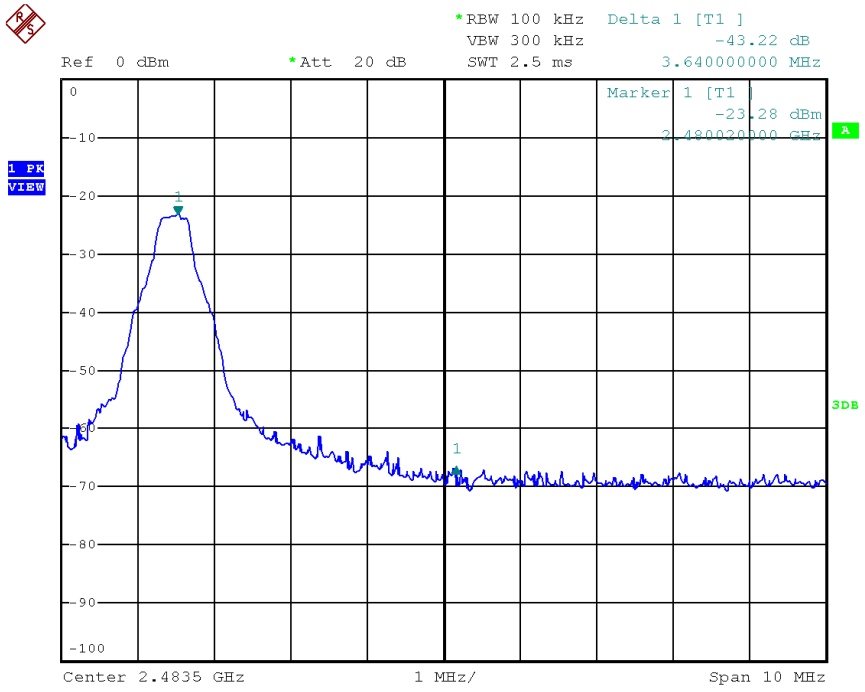
From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.10 (2013) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209 / RSS-210 4.4, whichever is the lesser attenuation, which meet the requirement of part 15.249(d) / RSS-210 B.10.

TEST REPORT

PEAK MEASUREMENT (Bluetooth 3.0)





TEST REPORT

PEAK MEASUREMENT (Bluetooth 3.0)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=91.2 dBµV/m - 42.6 dB
=48.6 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=76.2 dBµV/m - 42.6 dB
=33.6 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=90.2 dBµV/m - 43.2dB
=47.0 dBµV/m

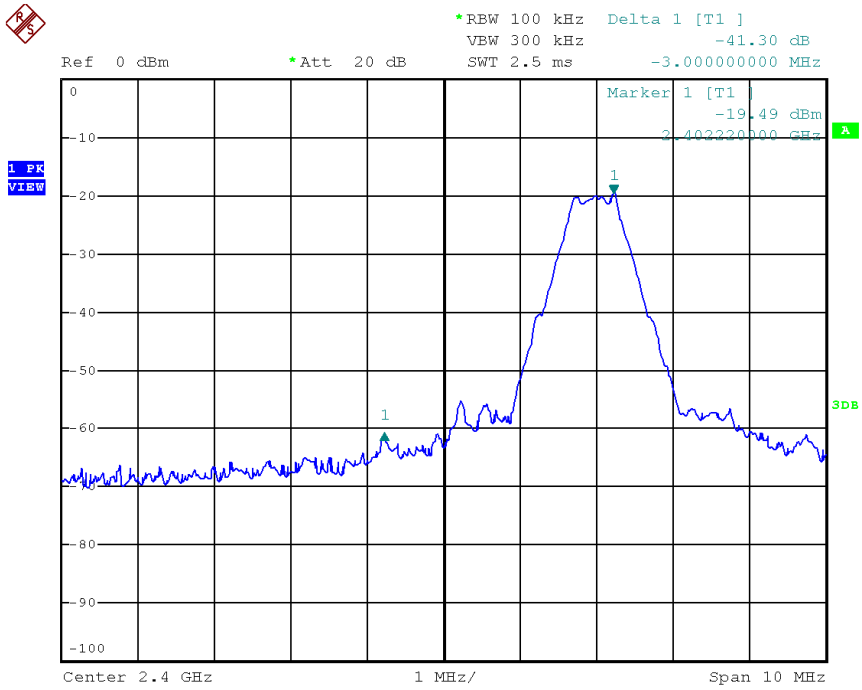
Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

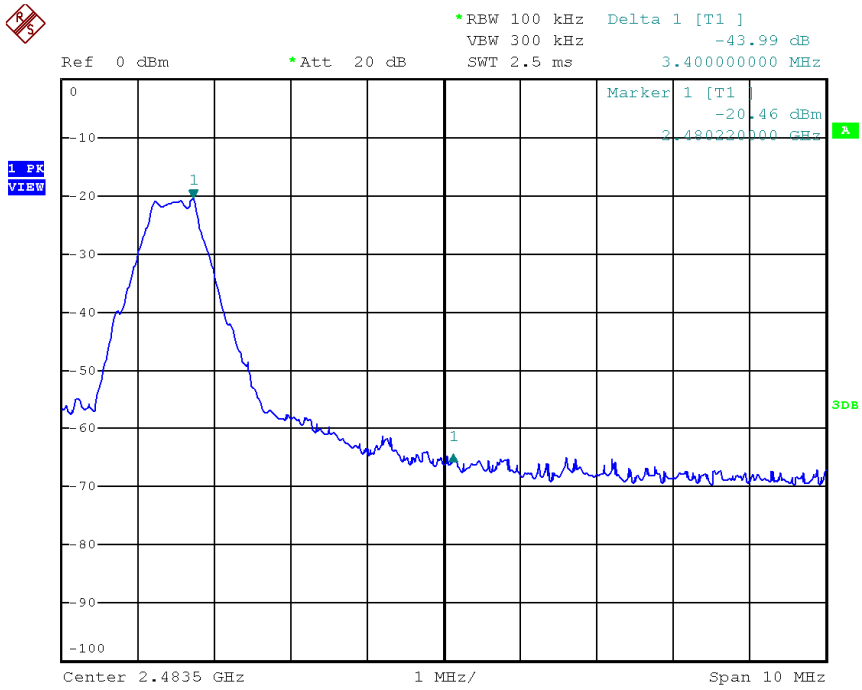
=75.2 dBµV/m - 43.2 dB
=32.0 dBµV/m

The resultant field strength meets the general radiated emission limit in Section 15.209 / RSS-210 4.4, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

TEST REPORT

PEAK MEASUREMENT (Bluetooth 4.0 BLE)





TEST REPORT

PEAK MEASUREMENT (Bluetooth 4.0 BLE)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=91.2 dBµV/m - 41.3 dB
=49.9 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=87.2 dBµV/m - 41.3 dB
=45.9 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=92.0 dBµV/m - 44.0 dB
=48.0 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=86.8 dBµV/m - 44.0 dB
=42.8 dBµV/m

The resultant field strength meets the general radiated emission limit in Section 15.209 / RSS-210 4.4, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

TEST REPORT

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 320μs for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 3MHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

N/A.

TEST REPORT

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

TEST REPORT

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.10 (2013).

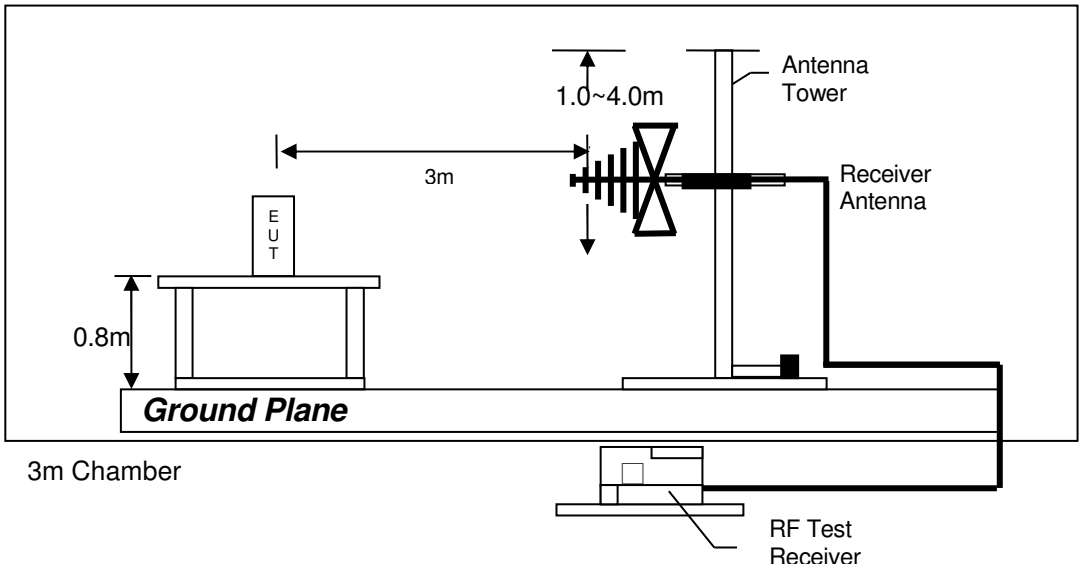
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 3 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

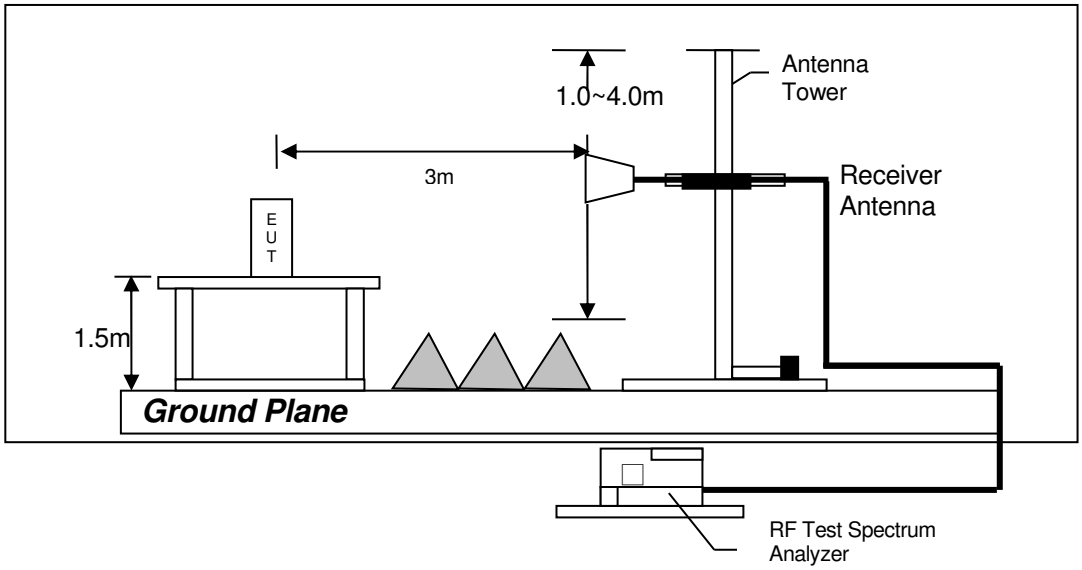
TEST REPORT

8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

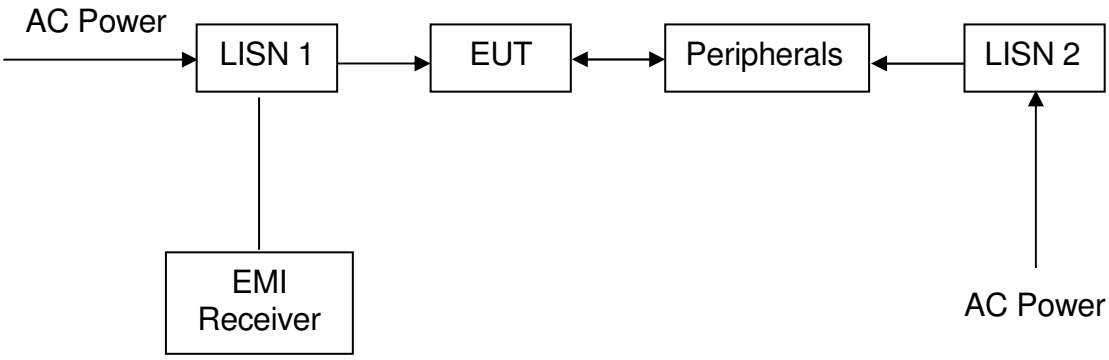
TEST REPORT

8.4.2 Conducted Emission Test Procedures

For tabletop equipment, the EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table. For floor-standing equipment, the EUT and all cables were insulated, if required, from the ground plane by up to 12 mm of insulating material. The EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4.3 Conducted Emission Test Setup



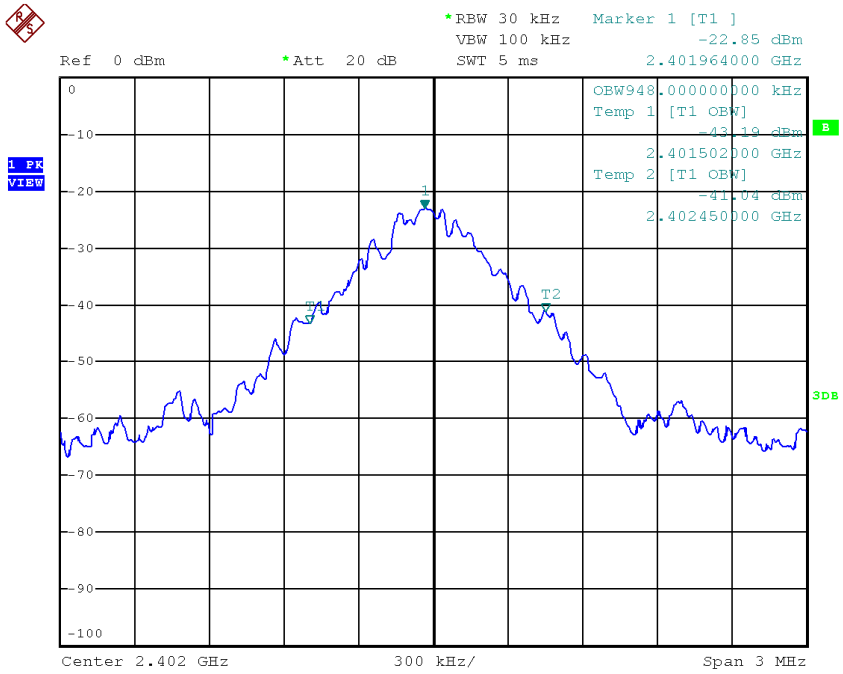
TEST REPORT

8.5 Occupied Bandwidth

Occupied Bandwidth Results: (Bluetooth 3.0)

Bluetooth (MHz)	Occupied Bandwidth (kHz)
Low Channel: 2402	948
Middle Channel: 2440	924
High Channel: 2480	924

The worst case is shown as below

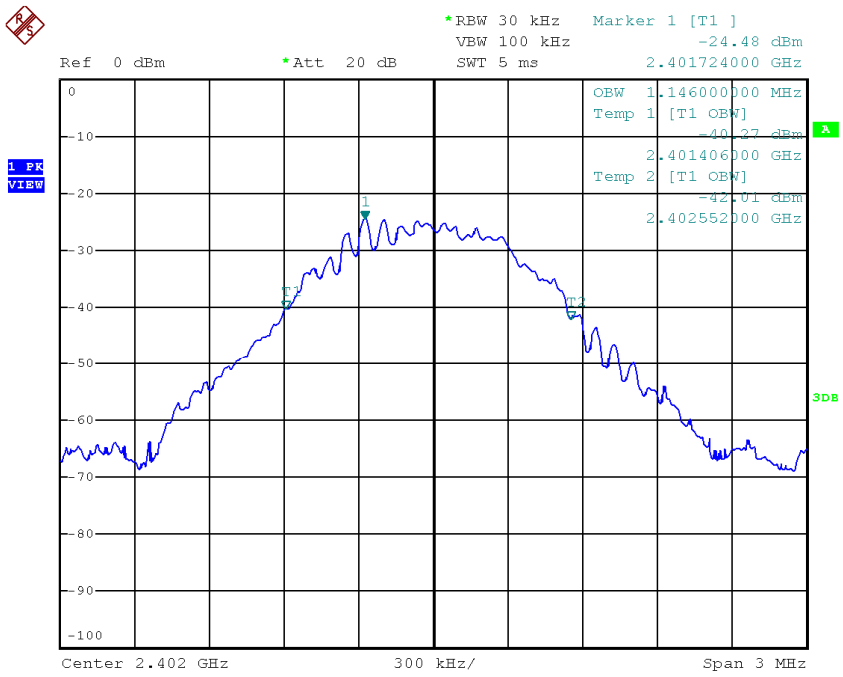


TEST REPORT

Occupied Bandwidth Results: (Bluetooth 4.0 BLE)

Bluetooth (MHz)	Occupied Bandwidth (MHz)
Low Channel: 2402	1.146
Middle Channel: 2440	1.140
High Channel: 2480	1.140

The worst case is shown as below



TEST REPORT

9.0 CONFIDENTIALITY REQUEST

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

10.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer (9kHz to 26.5GHz)	Biconical Antenna (20MHz to 200MHz)
Registration No.	EW-2500	EW-3156	EW-2512
Manufacturer	ROHDESCHWARZ	ROHDESCHWARZ	EMCO
Model No.	ESCI	ESR26	3104C
Calibration Date	March 29, 2021	January 25, 2021	June 03, 2020
Calibration Due Date	March 29, 2022	January 25, 2022	December 03, 2021

Equipment	Double Ridged Guide Antenna	RF Cable 14m (1GHz to 26.5GHz)
Registration No.	EW-1133	EW-2781
Manufacturer	EMCO	GREATBILLION
Model No.	3115	SMA m/SHF5MPU /SMA m ra14m,26G
Calibration Date	November 29, 2018	November 24, 2020
Calibration Due Date	November 29, 2020	November 24, 2021

Equipment	14m Double Shield RF Cable (20MHz to 6GHz)	14m RF High Frequency Cable (1 - 18)GHz	Solid State Low Noise Preamplifier Assembly (1 - 18)GHz
Registration No.	EW-2074	EW-2552	EW-3431
Manufacturer	RADIALL	RADIALL	BONN ELEKTRO
Model No.	N(m)-RG142-BNC(m) L= 14M	SHF5M sma m - sma m ra	BBV 9718 BBV9744 BBV 9721
Calibration Date	August 29, 2020	September 08, 2020	November 18, 2020
Calibration Due Date	August 29, 2021	September 08, 2021	November 18, 2021

Equipment	12 metre RF Cable 40GHz	Active Loop H-field (9kHz to 30MHz)
Registration No.	EW-2774	EW-2313
Manufacturer	GREATBILLION	ELECTROMETRI
Model No.	SMA m-m ra 12m 40G outdoor	EM-6876
Calibration Date	September 12, 2020	December 17, 2019
Calibration Due Date	September 12, 2021	June 17, 2021

TEST REPORT

2) Conducted Emissions Test

Equipment	RF Cable 240cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver
Registration No.	EW-2454	EW-2501	EW-3481
Manufacturer	RADIALL	ROHDESCHWARZ	ROHDESCHWARZ
Model No.	bnc m st / 142 /bnc m ra 240cm	ENV-216	ESR7
Calibration Date	November 10, 2020	September 11, 2020	November 09, 2020
Calibration Due Date	November 10, 2021	September 11, 2021	November 09, 2021

TEST REPORT

3) Bandedge/Bandwidth Measurement

Equipment	RF Cable (up to 40GHz) 1.5m length	Spectrum Analyzer
Registration No.	EW-2774	EW-2466
Manufacturer	N/A	ROHDESCHWARZ
Model No.	SMA-M to SMA-M	FSP30
Calibration Date	September 12, 2020	September 05, 2020
Calibration Due Date	September 12, 2021	September 05, 2021

END OF TEST REPORT