2/F., Garment Centre,
576 Castle Peak Road, Kowloon,
Hong Kong.

Telephone: (852) 2173 8888
Facsimile: (852) 2785 5487
www.intertek.com

TEST REPORT

Report No.: 17101161HKG-001

BBPOS International Limited

Application For Certification
(Original Grant)

FCC ID: 2AB7X-QB21

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 Ltd. Wong Kwok Yeung, Kenneth Senior Lead Engineer Date: November 08, 2017

TEST REPORT

GENERAL INFORMATION

Grantee:	BBPOS International Limited
Grantee Address:	Suite 1602, 16/F, Tower 2, Nina Tower, No. 8 Yeung Uk Road, Tsuen Wan, N.T. Hong Kong.
Contact Person:	Adrian Kwan
Tel:	3907 0311
Fax:	3158 2586
e-mail:	Adrian.kwan@bbpos.com
Manufacturer:	BBPOS International Limited
Manufacturer Address:	Suite 1602, 16/F, Tower 2, Nina Tower, No. 8 Yeung Uk Road, Tsuen Wan, N.T. Hong Kong.
Brand Name:	Intuit
Model:	QB21
Additional Model:	N/A
Type of EUT:	Transceiver
Description of EUT:	Chip & Swipe Reader
Serial Number:	N/A
FCC ID:	**2AB7X-QB21**
Date of Sample Submitted:	October 30, 2017
Date of Test:	October 30, 2017 to November 05, 2017
Report No.:	17101161HKG-001
Report Date:	November 08, 2017
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

TEST REPORT

SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Transmitter Power Line Conducted Emissions	15.207	Pass
Radiated Emission Radiated Emission on the Bandedge	15.249, 15.209	Pass
Radiated Emission in Restricted Bands	15.205	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2016 Edition

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.

TEST REPORT

TABLE OF CONTENTS

TEST REPORT

1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT) is a Chip & Swipe Reader which is a Bluetooth controlled mobile POS device (point of sale device). It supports reading magnetic stripe credit card and EMV smart credit card (Europay, MasterCard, and Visa Card). It can be paired with smartphone or tablet and operated by mobile APP. A MSR module (magnetic stripe reader) and EMV smart card interface are used for reading magnetic stripe credit card and EMV smart credit card data respectively. The EUT can support Bluetooth 3.0 and Bluetooth 4.0 BLE. For Bluetooth 3.0 the EUT occupies a frequency range of 2402MHz to 2480MHz (79 channels with channel spacing of 1MHz). While Bluetooth 4.0 BLE, the EUT occupies a frequency range of 2402MHz to 2480MHz (40 channels with channel spacing of 2MHz). The EUT is powered by 3.7V internal rechargeable battery and/or USB port (5VDC). The USB port in EUT is for 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 transmitter.

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. This test facility and site measurement data have been placed on file with the FCC.

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 new 3.7V rechargeable battery and/or USB port (5VDC).

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.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.5 Support Equipment List and Description

1. HP notebook computer (Adaptor Model: HSTNN-CA15) (Provided by Intertek)
2. 1 X USB cable of 1m long (Provided by Intertek)
3. 1 X LAN cable of 1m long (Provided by Intertek)
4. EMV card (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 32 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 168.150 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 15.0 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 0.168 MHz

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

3.5 Conducted Emission Data

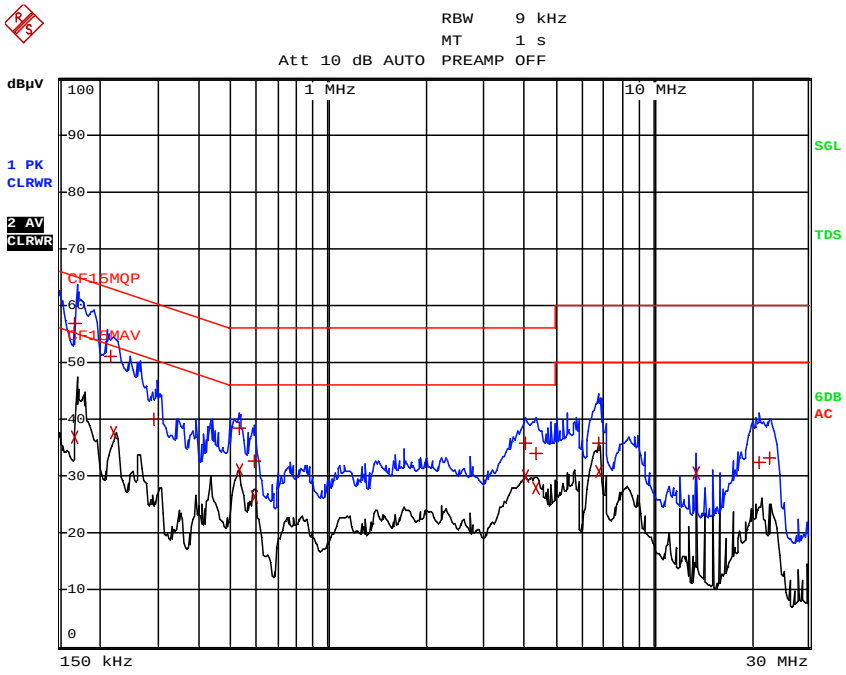
For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 8.25 dB

TEST REPORT

CONDUCTED EMISSION

Model: QB21
Date of Test: November 05, 2017
Worst-Case Operating Mode: PC Charging + Bluetooth Operating



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	168 kHz	56.80	N	-8.25
2	CISPR Average	168 kHz	36.86	N	-18.19
1	Quasi Peak	217.5 kHz	51.02	L1	-11.88
2	CISPR Average	222 kHz	37.55	N	-15.18
1	Quasi Peak	294 kHz	40.07	L1	-20.33
1	Quasi Peak	528 kHz	38.41	L1	-17.58
2	CISPR Average	528 kHz	31.22	N	-14.78
1	Quasi Peak	591 kHz	32.72	L1	-23.27
2	CISPR Average	591 kHz	26.45	L1	-19.54
2	CISPR Average	4.0605 MHz	30.08	N	-15.91
1	Quasi Peak	4.065 MHz	35.73	N	-20.26
2	CISPR Average	4.371 MHz	27.94	N	-18.06
1	Quasi Peak	4.3755 MHz	33.86	N	-22.13
2	CISPR Average	6.828 MHz	30.75	N	-19.24
1	Quasi Peak	6.8325 MHz	35.87	N	-24.12
2	CISPR Average	13.596 MHz	30.47	N	-19.52
1	Quasi Peak	21.1425 MHz	32.34	N	-27.65
1	Quasi Peak	22.7985 MHz	33.22	L1	-26.77

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

TEST REPORT

RADIATED EMISSIONS

Model: QB21
Date of Test: November 05, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 1
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	99.8	33	29.4	96.2	41.5	54.7	94.0	-39.3
H	***4804.000***	***44.4***	***33***	***34.9***	***46.3***	***41.5***	***4.8***	***54.0***	***-49.2***
H	7206.000	48.9	33	37.9	53.8	41.5	12.3	54.0	-41.7
H	9608.000	41.1	33	40.4	48.5	41.5	7.0	54.0	-47.0
H	***12010.000***	***43.9***	***33***	***40.5***	***51.4***	***41.5***	***9.9***	***54.0***	***-44.1***
H	14412.000	45.6	33	40.0	52.6	41.5	11.1	54.0	-42.9

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	99.8	33	29.4	96.2	114.0	-17.8
H	***4804.000***	***44.4***	***33***	***34.9***	***46.3***	***74.0***	***-27.7***
H	7206.000	48.9	33	37.9	53.8	74.0	-20.2
H	9608.000	41.1	33	40.4	48.5	74.0	-25.5
H	***12010.000***	***43.9***	***33***	***40.5***	***51.4***	***74.0***	***-22.6***
H	14412.000	45.6	33	40.0	52.6	74.0	-21.4

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: QB21
Date of Test: November 05, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 2
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	99.1	33	29.4	95.5	41.5	54.0	94.0	-40.0
H	***4884.000***	***43.8***	***33***	***34.9***	***45.7***	***41.5***	***4.2***	***54.0***	***-49.8***
H	***7326.000***	***48.3***	***33***	***37.9***	***53.2***	***41.5***	***11.7***	***54.0***	***-42.3***
H	9768.000	40.9	33	40.4	48.3	41.5	6.8	54.0	-47.2
H	***12210.000***	***44.3***	***33***	***40.5***	***51.8***	***41.5***	***10.3***	***54.0***	***-43.7***
H	14652.000	47.0	33	38.4	52.4	41.5	10.9	54.0	-43.1

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	2442.000	99.1	33	29.4	95.5	114.0	-18.5
H	***4884.000***	***43.8***	***33***	***34.9***	***45.7***	***74.0***	***-28.3***
H	***7326.000***	***48.3***	***33***	***37.9***	***53.2***	***74.0***	***-20.8***
H	9768.000	40.9	33	40.4	48.3	74.0	-25.7
H	***12210.000***	***44.3***	***33***	***40.5***	***51.8***	***74.0***	***-22.2***
H	14652.000	47.0	33	38.4	52.4	74.0	-21.6

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: QB21
Date of Test: November 05, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 4.0 BLE)

Table 3
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	99.0	33	29.4	95.4	41.5	53.9	94.0	-40.1
H	***4960.000***	***43.9***	***33***	***34.9***	***45.8***	***41.5***	***4.3***	***54.0***	***-49.7***
H	***7440.000***	***48.8***	***33***	***37.9***	***53.7***	***41.5***	***12.2***	***54.0***	***-41.8***
H	9920.000	41.4	33	40.4	48.8	41.5	7.3	54.0	-46.7
H	***12400.000***	***43.7***	***33***	***40.5***	***51.2***	***41.5***	***9.7***	***54.0***	***-44.3***
H	14880.000	47.1	33	38.4	52.5	41.5	11.0	54.0	-43.0

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	2480.000	99.0	33	29.4	95.4	114.0	-18.6
H	***4960.000***	***43.9***	***33***	***34.9***	***45.8***	***74.0***	***-28.2***
H	***7440.000***	***48.8***	***33***	***37.9***	***53.7***	***74.0***	***-20.3***
H	9920.000	41.4	33	40.4	48.8	74.0	-25.2
H	***12400.000***	***43.7***	***33***	***40.5***	***51.2***	***74.0***	***-22.8***
H	14880.000	47.1	33	38.4	52.5	74.0	-21.5

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: QB21
Date of Test: November 05, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 4
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	93.8	33	29.4	90.2	24	66.2	94.0	-27.8
H	***4804.000***	***44.1***	***33***	***34.9***	***46.0***	***24***	***22.0***	***54.0***	***-32.0***
H	7206.000	48.0	33	37.9	52.9	24	28.9	54.0	-25.1
H	9608.000	41.3	33	40.4	48.7	24	24.7	54.0	-29.3
H	***12010.000***	***44.1***	***33***	***40.5***	***51.6***	***24***	***27.6***	***54.0***	***-26.4***
H	14412.000	45.5	33	40.0	52.5	24	28.5	54.0	-25.5

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	93.8	33	29.4	90.2	114.0	-23.8
H	***4804.000***	***44.1***	***33***	***34.9***	***46.0***	***74.0***	***-28.0***
H	7206.000	48.0	33	37.9	52.9	74.0	-21.1
H	9608.000	41.3	33	40.4	48.7	74.0	-25.3
H	***12010.000***	***44.1***	***33***	***40.5***	***51.6***	***74.0***	***-22.4***
H	14412.000	45.5	33	40.0	52.5	74.0	-21.5

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model:
Date of Test: November 05, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 5
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	94.4	33	29.4	90.8	24	66.8	94.0	-27.2
H	***4884.000***	***44.2***	***33***	***34.9***	***46.1***	***24***	***22.1***	***54.0***	***-31.9***
H	***7326.000***	***48.7***	***33***	***37.9***	***53.6***	***24***	***29.6***	***54.0***	***-24.4***
H	9768.000	41.1	33	40.4	48.5	24	24.5	54.0	-29.5
H	***12210.000***	***43.8***	***33***	***40.5***	***51.3***	***24***	***27.3***	***54.0***	***-26.7***
H	14652.000	46.8	33	38.4	52.2	24	28.2	54.0	-25.8

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	2442.000	94.4	33	29.4	90.8	114.0	-23.2
H	***4884.000***	***44.2***	***33***	***34.9***	***46.1***	***74.0***	***-27.9***
H	***7326.000***	***48.7***	***33***	***37.9***	***53.6***	***74.0***	***-20.4***
H	9768.000	41.1	33	40.4	48.5	74.0	-25.5
H	***12210.000***	***43.8***	***33***	***40.5***	***51.3***	***74.0***	***-22.7***
H	14652.000	46.8	33	38.4	52.2	74.0	-21.8

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model:
Date of Test: November 05, 2017
Worst-Case Operating Mode: Transmitting (Bluetooth 3.0)

Table 6
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	94.0	33	29.4	90.4	24	66.4	94.0	-27.6
H	***4960.000***	***43.6***	***33***	***34.9***	***45.5***	***24***	***21.5***	***54.0***	***-32.5***
H	***7440.000***	***48.5***	***33***	***37.9***	***53.4***	***24***	***29.4***	***54.0***	***-24.6***
H	9920.000	41.0	33	40.4	48.4	24	24.4	54.0	-29.6
H	***12400.000***	***43.7***	***33***	***40.5***	***51.2***	***24***	***27.2***	***54.0***	***-26.8***
H	14880.000	47.0	33	38.4	52.4	24	28.4	54.0	-25.6

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	2480.000	94.0	33	29.4	90.4	114.0	-23.6
H	***4960.000***	***43.6***	***33***	***34.9***	***45.5***	***74.0***	***-28.5***
H	***7440.000***	***48.5***	***33***	***37.9***	***53.4***	***74.0***	***-20.6***
H	9920.000	41.0	33	40.4	48.4	74.0	-25.6
H	***12400.000***	***43.7***	***33***	***40.5***	***51.2***	***74.0***	***-22.8***
H	14880.000	47.0	33	38.4	52.4	74.0	-21.6

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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.
6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: QB21
Date of Test: November 05, 2017
Worst-Case Operating Mode: PC Charging + Bluetooth Operating

Table 7
Pursuant to FCC Part 15 Section 15.209 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	***112.850***	***23.2***	***16***	***14.0***	***21.2***	***43.5***	***-22.3***
V	***119.150***	***25.5***	***16***	***14.0***	***23.5***	***43.5***	***-20.0***
V	***168.150***	***26.5***	***16***	***18.0***	***28.5***	***43.5***	***-15.0***
H	559.424	9.5	16	28.0	21.5	46.0	-24.5
H	683.227	10.6	16	29.0	23.6	46.0	-22.4
H	845.407	10.5	16	31.0	25.5	46.0	-20.5
H	940.672	10.2	16	33.0	27.2	46.0	-18.8

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
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.
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.

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).

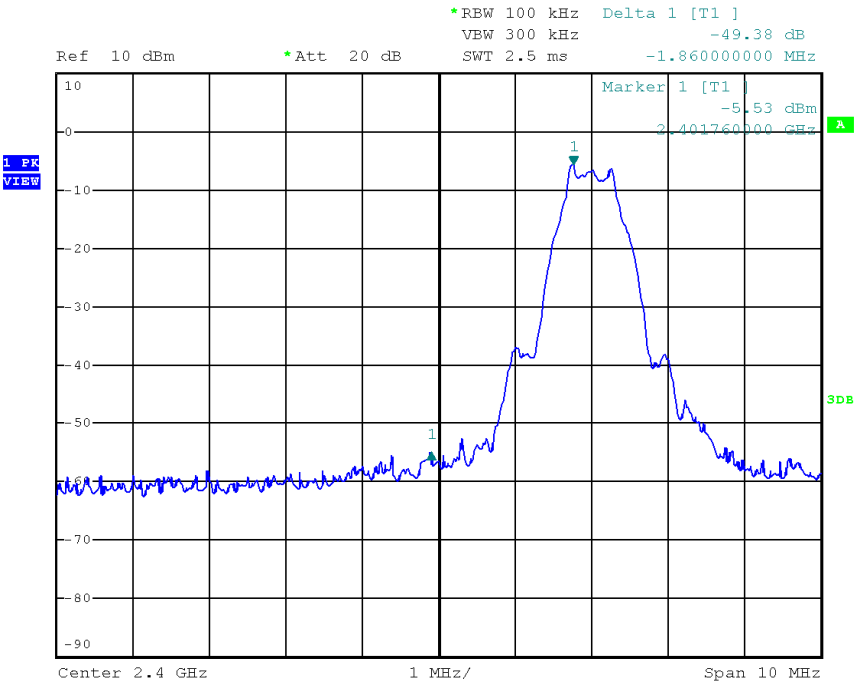
8.1 Radiated Emission on the Bandedge

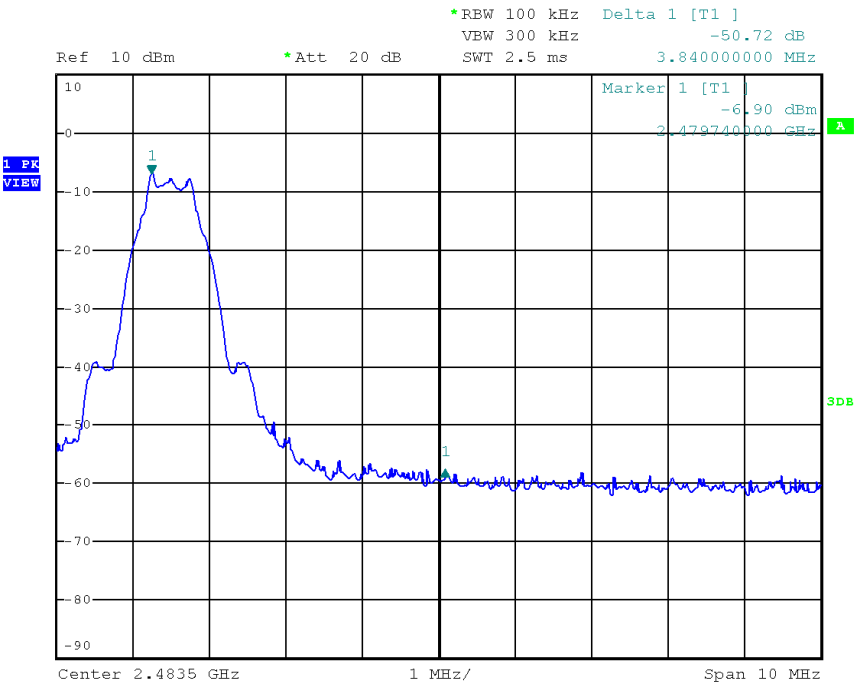
From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard 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 , whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

TEST REPORT

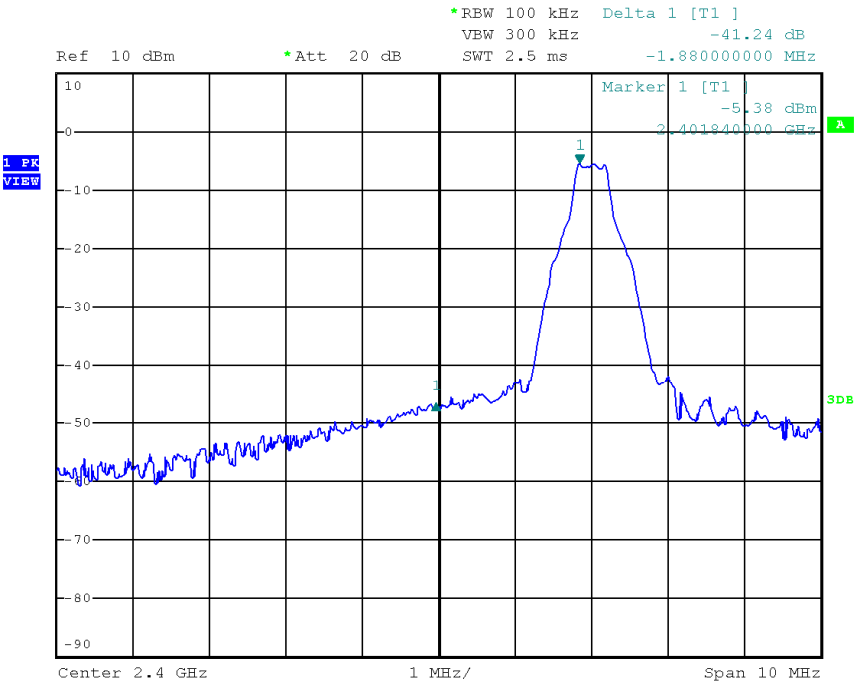
Peak Measurement (Bluetooth 4.0 BLE)

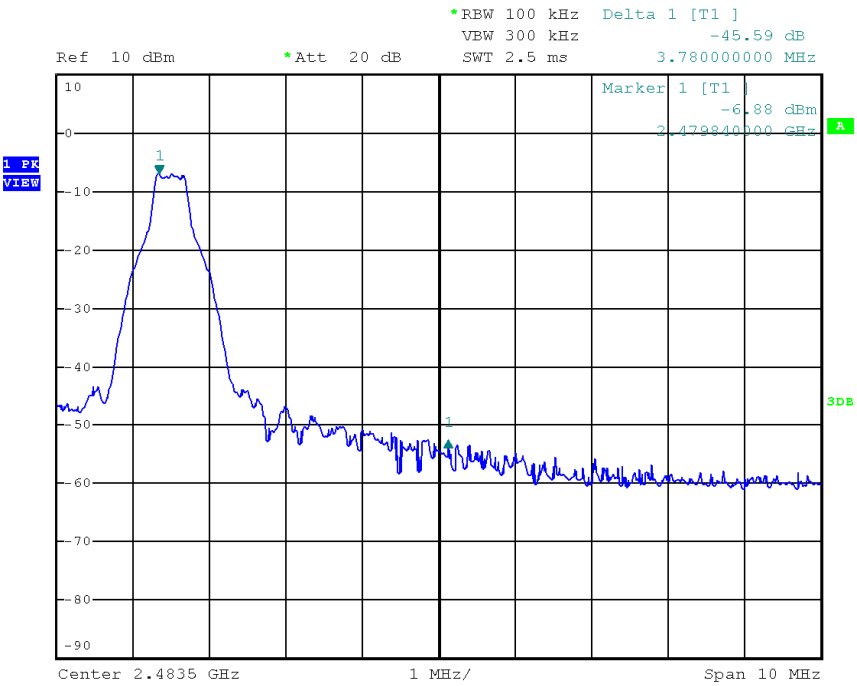




TEST REPORT

Peak Measurement (Bluetooth 3.0)





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

= 96.2 dBµV/m - 49.4 dB
= 46.8 dBµV/m

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

=54.7 dBµV/m - 49.4 dB
=5.3 dBµV/m

Upper bandedge

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

=95.4 dBµV/m - 50.7 dB
=44.7 dBµV/m

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

=53.9 dBµV/m - 50.7 dB
=3.2 dBµV/m

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

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

=90.2 dBµV/m - 41.2 dB
=49.0 dBµV/m

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

=66.2 dBµV/m - 41.2 dB
=25.0 dBµV/m

Upper bandedge

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

=90.4 dBµV/m - 45.6 dB
=44.8 dBµV/m

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

=66.4 dBµV/m - 45.6 dB
=20.8 dBµV/m

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

8.2 Discussion of Pulse Desensitization

For Bluetooth 4.0 BLE, pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 420μs for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 3MHz, so the pulse desensitivity factor is 0dB.

For Bluetooth 3.0, pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 625μs 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

(Bluetooth 4.0 BLE)
The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 100ms

Effective period of the cycle = 2 x 420μs

DC = 840μs / 100ms = 0.0084

Therefore, the averaging factor is found by 20log 0.0084 = -41.5 dB.

(Bluetooth 3.0)
Based on the Bluetooth Specification Version 3.0 + EDR, the transmitter ON time for each timeslot of Bluetooth is 625μs. DH5 has the maximum duty cycle, which consists of 5 continuous Tx slots and 1 Rx slot. Therefore one hopset take (5+1) x 625μs = 3.75ms. For one period for a pseudo-random hopping through at least 20 RF channels in adaptive mode (worse case), it take: 20 x 3.75ms = 75ms.

The dwell time for DH5 is 5 x 625μs = 3.125ms.

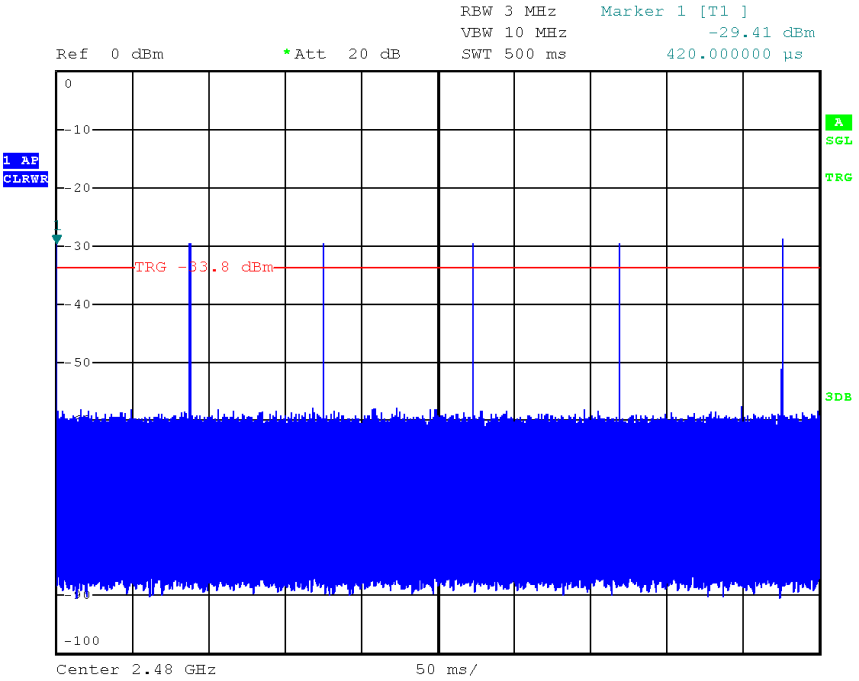
For the worst case calculation, there are two transmissions might occur in 100ms. Therefore,

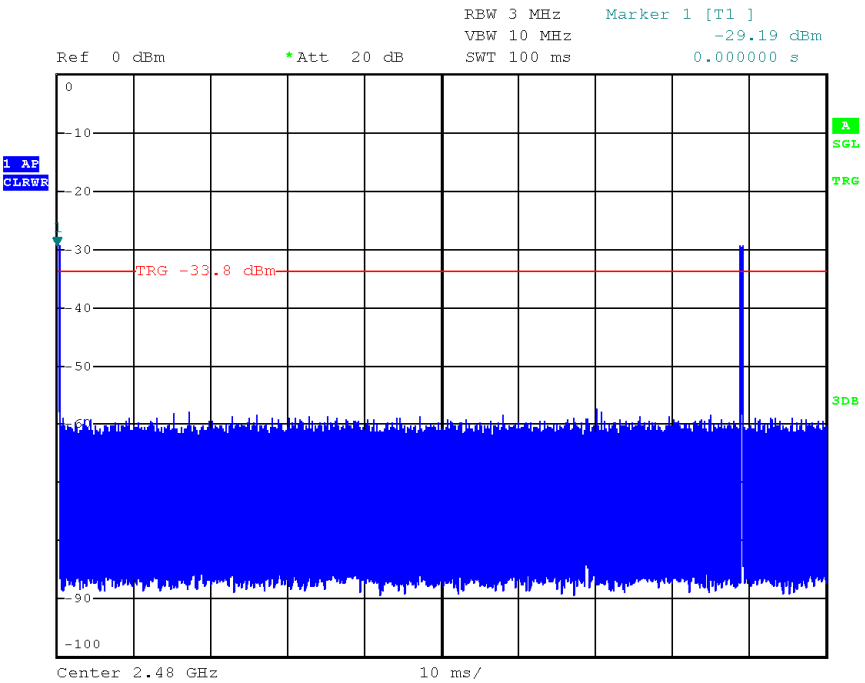
Duty Cycle (DC) = Maximum On time in 100ms/100ms
= 3.125ms x 2/100ms
= 0.0625

Average Factor (AF) of Bluetooth in dB = $20 \log_{10} (0.0625)$
= -24 dB

TEST REPORT

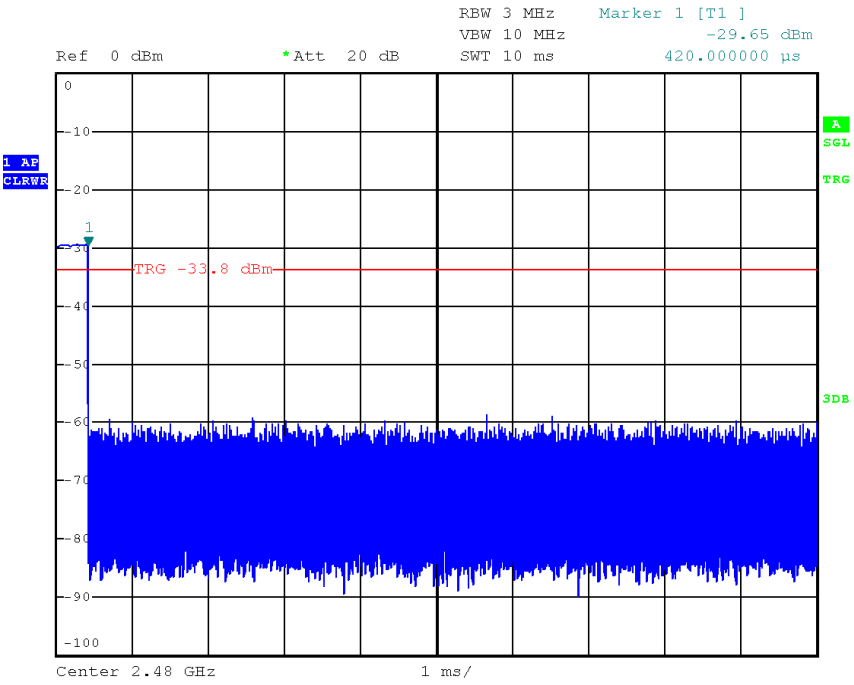
Average Factor (Bluetooth 4.0 BLE)





TEST REPORT

Average Factor (Bluetooth 4.0 BLE)



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).

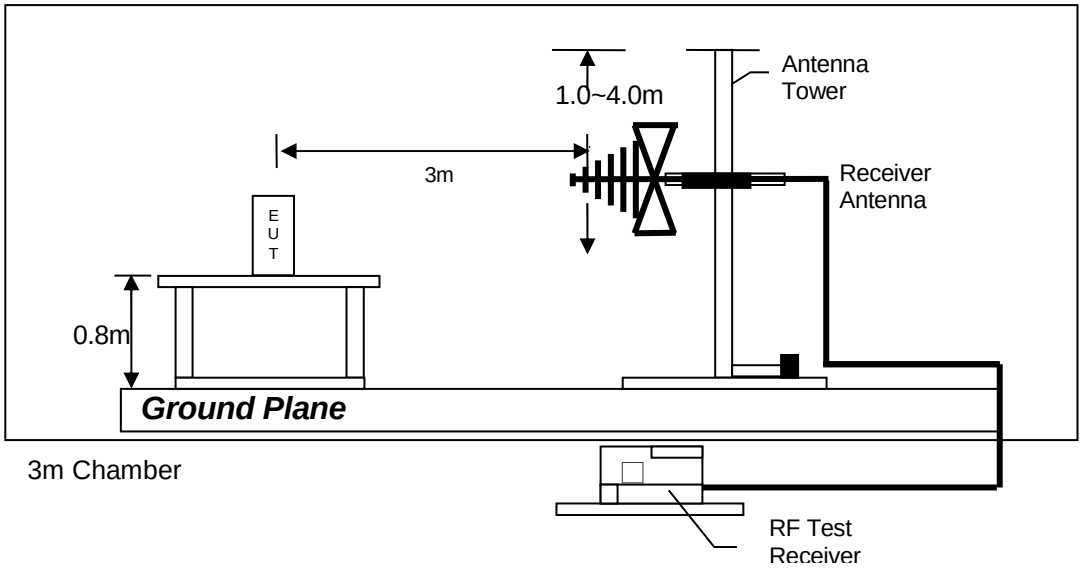
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion 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.

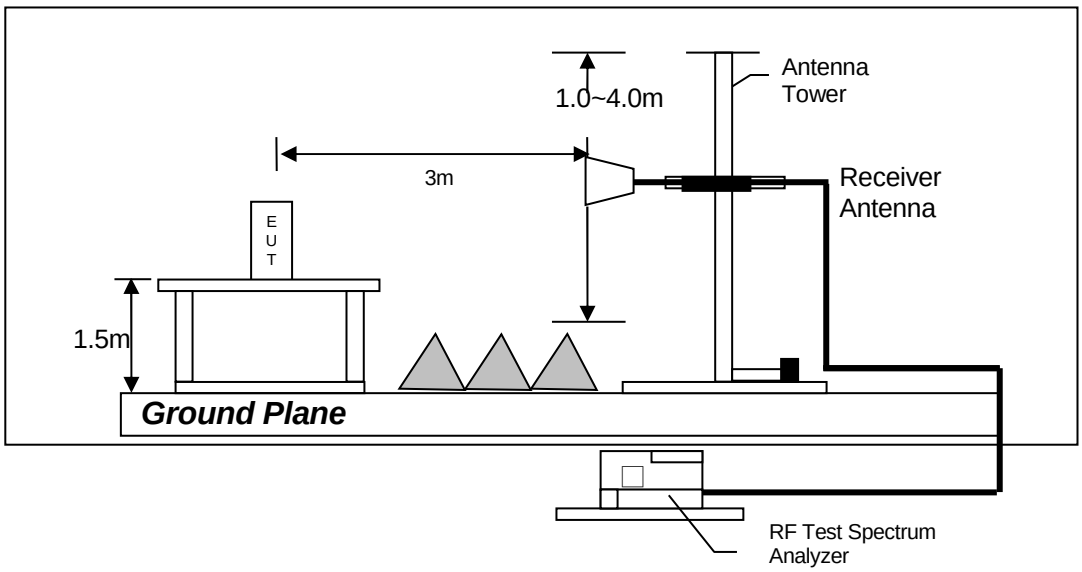
TEST REPORT

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

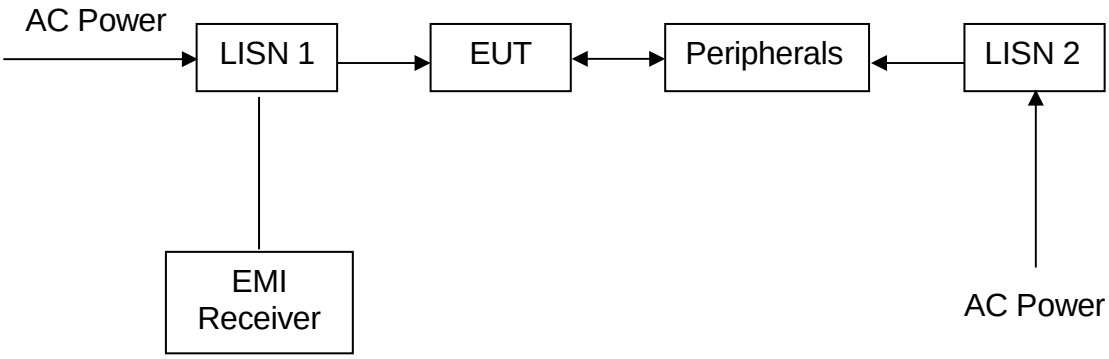
TEST REPORT

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



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	Biconical Antenna
Registration No.	EW-2500	EW-3281	EW-0571
Manufacturer	ROHDESCHWARZ	ROHDESCHWARZ	EMCO
Model No.	ESCI	FSV40	3104C
Calibration Date	Nov. 17, 2016	Dec. 19, 2016	May 18, 2016
Calibration Due Date	Nov. 17, 2017	Dec. 19, 2017	Nov. 18, 2017

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna	RF Cable (up to 40GHz)
Registration No.	EW-0572	EW-0194	EW-3155
Manufacturer	EMCO	EMCO	N/A
Model No.	3146	3115	1-40 GHz
Calibration Date	Aug. 04, 2016	Aug. 10, 2016	Dec. 05, 2016
Calibration Due Date	Feb. 04, 2018	Feb. 10, 2018	Dec. 05, 2017

Equipment	14m Double Shield RF Cable	RF Cable 14m (1GHz to 26.5GHz	RF Pre-amplifier 3 pcs (9kHz to 40GHz)
Registration No.	EW-2074	EW-2781	EW-3006c
Manufacturer	RADIALL	GREATBILLION	SCHWARZBECK
Model No.	N(m)-RG142-BNC(m) L=14M	SMA m/SHF5MPU /SMA m ra14m,26G	BBV 9718
Calibration Date	Jan 26, 2017	Sep 25, 2017	23-Mar-2017
Calibration Due Date	Dec 07, 2017	Sep 25, 2018	23-Mar-2018

Equipment	High Pass Filter 3GHz to 12GHz (2 Pieces)	Notch Filter (cutoff frequency 2.4GHz to 2.5GHz) 2 pieces
Registration No.	EW-1835	EW-2213
Manufacturer	KLMICROWAVE	MICROTRONICS
Model No.	11SH10-3000/T12000-0/OP	BRM50701-02
Calibration Date	Mar. 22, 2017	May 26, 2017
Calibration Due Date	Mar. 22, 2018	May 26, 2018

TEST REPORT

2) Conducted Emissions Test

EQUIPMENT	EMI TEST RECEIVER	LISN	RF Cable 9kHz to 1000MHz
Registration No.	EW-2251	EW-2874	EW-3170
Manufacturer	R&S	R&S	N/A
Model No.	ESCI	ENV-216	9kHz to 1000MHz
Calibration Date	Mar. 03, 2017	Mar. 16, 2017	Mar. 20, 2017
Calibration Due Date	Mar. 03, 2018	Mar. 16, 2018	Mar. 20, 2018

3) Bandedge Measurement

EQUIPMENT	RF Cable 9kHz to 1000MHz	SPECTRUM ANALYZER
Registration No.	EW-3170	EW-2249
Manufacturer	N/A	R&S
Model No.	9kHz to 1000MHz	FSP30
Calibration Date	Mar. 20, 2017	Dec. 23, 2016
Calibration Due Date	Mar. 20, 2018	Nov. 27, 2017

END OF TEST REPORT