TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd

TEST REPORT

SCOPE OF WORK
FCC Testing – VJP_01

REPORT NUMBER
201201047SZN-002

ISSUE DATE
03 March 2021

PAGES
28

DOCUMENT CONTROL NUMBER
FCC ID 249_C

101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community GuanHu Subdistrict, LongHua District, Shenzhen, People's Republic of China
Tel: (86 755) 8601 6288
Fax: (86 755) 8601 6751
www.intertek.com

Total Quality. Assured.

Test Report

Intertek Report No.: 201201047SZN-002

TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd

Application For Certification

FCC ID: 2AYFZVJPML1

Audio effects processor

Model: VJP_01

FOMOfx

2.4GHz Transmitter

Report No.: 201201047SZN-002

We hereby certify that the sample of the above item is considered to comply with the requirements of FCC Part 15, Subpart C for Intentional Radiator, mention 47 CFR [10-1-19]

Prepared and Checked by:

Jeff Liang
Engineer

Approved by:

Kidd Yang
Technical Supervisor
Date: 03 March 2021

MEASUREMENT/TECHNICAL REPORT

This report concerns (check one:) Original Grant X Class II Change _____

Equipment Type: DXX - Part 15 Low Power Communication Device Transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No X

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No X

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-19 Edition] provision.

Report prepared by:

Jeff Liang
Intertek Testing Services Shenzhen Ltd. Longhua Branch
101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing
Community, GuanHu Subdistrict, LongHua District, Shenzhen.
Tel: (86 755) 8601 0682 Fax: (86 755) 8601 6661

Table of Contents

1.0 Summary of Test Result

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd

Address: 6 Bridge Road, North Ryde, NSW 2113 AUSTRALIA

Manufacturer: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd

Address: 6 Bridge Road, North Ryde, NSW 2113 AUSTRALIA

Model: VJP_01

FCC ID: 2AYFZVJPML1

Test Specification	Reference	Results
Transmitter Radiated Emission Bandedge	15.249 &15.209 &15.205	Pass
Conducted Emission	15.207	Pass
20dB Bandwidth	15.215(c)	Pass

Notes: The EUT uses an Integral Antenna which in accordance to Section 15.203 is considered sufficient to comply with the provisions of this section.

2.0 General Description

2.1 Product Description

The equipment under test (EUT) is an Audio effects processor with 2.4GHz transmitter function operating at 2.4G Band. The EUT is powered by DC 3.7V rechargable battery. For more detail information pls. refer to the user manual.

Antenna Type: Integral antenna
Modulation Type: GFSK
Antenna Gain: 1dBi

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

2.2 Related Submittal(s) Grants

This is an application for certification of transceiver for the Audio effects processor which has 2.4GHz Transmitter Function. Other digital functions were reported in the verification report: 201201047SZN-001.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). Radiated emission measurement was performed in Semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the 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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

The Semi-Anechoic chamber and shield room used to collect the radiated data and conducted data are **Intertek Testing Services Shenzhen Ltd. Longhua Branch** and located at 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, ShenZhen, P.R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: CN1188).

3.0 System Test Configuration

3.1 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 EUT was powered by a fully DC 3.7V rechargeable battery that charged by an adapter with AC120V, 60Hz input during the test, only the worst data was reported in this report.

For maximizing emissions below 30 MHz, the EUT was rotated through 360°, the centre of the loop antenna was placed 1 meter above the ground, and the antenna polarization was changed. 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 Section 4.

The EUT and transmitting antenna was centered on the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

3.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified testing.

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Test Software: FCC- TX Hi Duty Cycle Rev 1.0

3.3 Special Accessories

Shielded Data Cable.

3.4 Equipment Modification

Any modifications installed previous to testing by TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd Longhua Branch.

3.5 Measurement Uncertainty

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

3.6 Support Equipment List and Description

Description	Manufacturer	Model No.
Adapter (Provided by Intertek)	realme	OP52CAEH
Micro USB Cable (Provided by Intertek)	N/A	Unshielded, Length 91cm
Data Cable (Provided by Applicant)	TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd	Shielded, Length 50cm
VIRTUAL JEFF PRO (Provided by Applicant)	TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd	N/A

4.0 Emission Results

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

4.1 Radiated Test Results

A sample calculation, configuration photographs and data tables of the emissions are included.

4.1.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF - AG + PD + 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
PD = Pulse Desensitization in dB
AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF - AG + PD + AV

Assume a receiver reading of 62.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
AV = -10 dB
FS = 62 + 7.4 + 1.6 - 29 + 0 = 42 dBµV/m

Level in µV/m = Common Antilogarithm [(42 dBµV/m)/20] = 125.9 µV/m

4.1.2 Radiated Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

4.1.3 Radiated Emissions

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.

Worst Case Radiated Emission

at 37.048667 MHz

Judgement: Passed by 9.6 dB

TEST PERSONNEL:

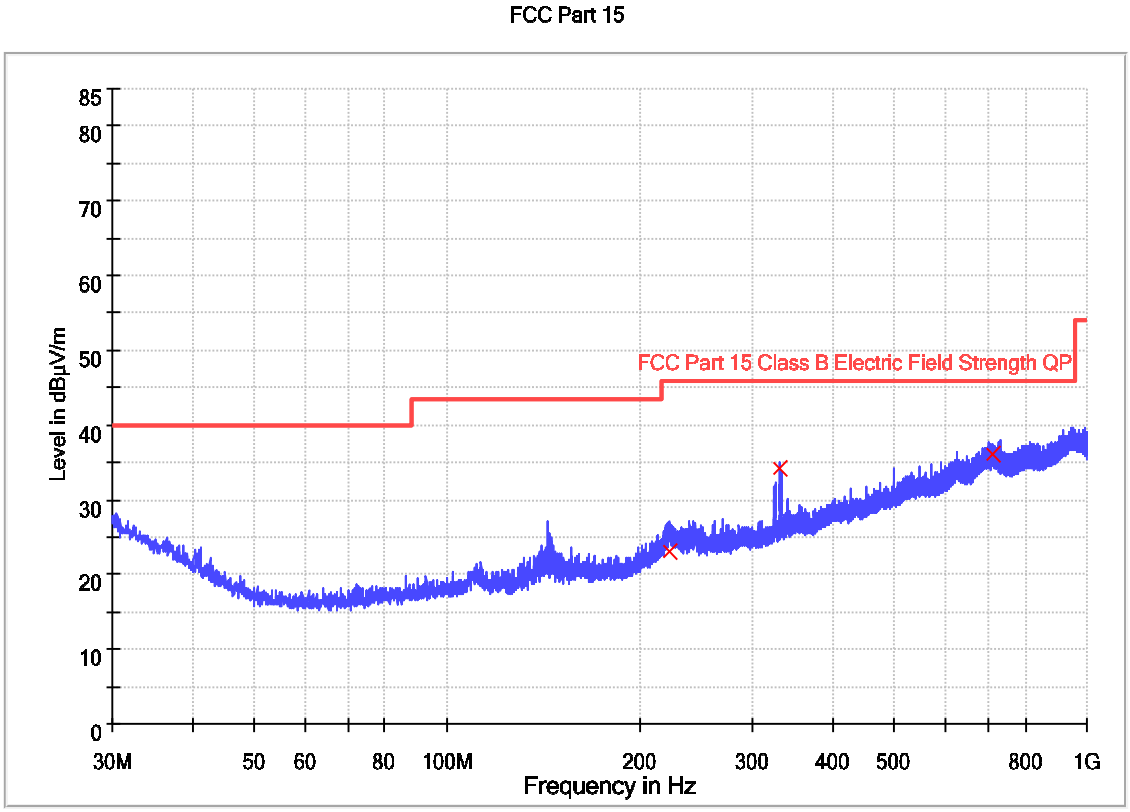
Sign on file

Jeff Liang, Engineer
Typed/Printed Name

22 February 2021
Date

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd
Date of Test: 22 February 2021 Model: VJP_01
Worst Case Operating Mode: Transmitting(2403MHz)

ANT Polarity: Horizontal

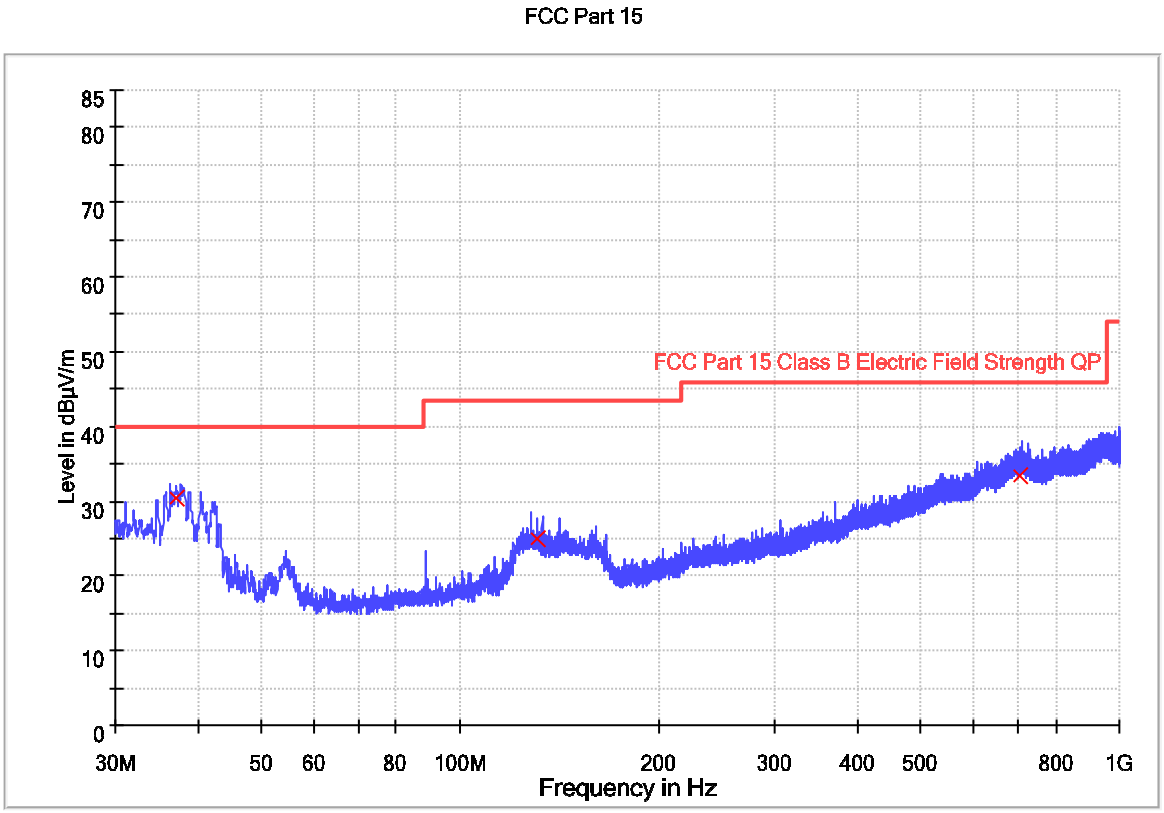


Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
223.482667	23.2	1000.0	120.000	H	13.0	22.8	46.0
331.896333	34.4	1000.0	120.000	H	16.9	11.6	46.0
710.519667	36.1	1000.0	120.000	H	25.7	9.9	46.0

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd
Date of Test: 22 February 2021 Model: VJP_01
Worst Case Operating Mode: Transmitting(2403MHz)

ANT Polarity: Vertical



Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
37.048667	30.4	1000.0	120.000	V	14.3	9.6	40.0
130.815333	24.9	1000.0	120.000	V	9.7	18.6	43.5
707.027667	33.3	1000.0	120.000	V	25.8	12.7	46.0

Remark:
1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
3. Margin (dB) = Limit Line(dBµV/m) – Level (dBµV/m)

4.1.4 Transmitter Spurious Emissions (Radiated)

Worst Case Radiated Emission
at
2400.0 MHz

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

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.

Judgement: Passed by 3.6 dB

TEST PERSONNEL:

Sign on file

Jeff Liang, Engineer
Typed/Printed Name

22 February 2021
Date

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd
Date of Test: 22 February 2021 Model: VJP_01
Worst Case Operating Mode: Transmitting

Table 1

Radiated Emissions
(2403.000 MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2403.000	97.4	36.7	28.1	88.8	114.0	-25.2
Vertical	4806.000	53.4	36.7	35.5	52.2	74.0	-21.8
Vertical	7209.000	54.9	36.8	35.6	53.7	74.0	-20.3

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2403.000	97.4	36.7	28.1	18.9	69.9	94.0	-24.1
Vertical	4806.000	53.4	36.7	35.5	18.9	33.3	54.0	-20.7
Vertical	7209.000	54.9	36.8	35.6	18.9	34.8	54.0	-19.2

Notes:
1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance 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 value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd
Date of Test: 22 February 2021 Model: VJP_01
Worst Case Operating Mode: Transmitting

Table 2

Radiated Emissions
(2432.000 MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2432.000	97.7	36.7	28.1	89.1	114.0	-24.9
Vertical	4864.000	54.3	36.7	35.5	53.1	74.0	-20.9
Vertical	7296.000	52.8	36.8	35.6	51.6	74.0	-22.4

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2432.000	97.7	36.7	28.1	18.9	70.2	94.0	-23.8
Vertical	4864.000	54.3	36.7	35.5	18.9	34.2	54.0	-19.8
Vertical	7296.000	52.8	36.8	35.6	18.9	32.7	54.0	-21.3

Notes:
1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance 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 value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd
Date of Test: 22 February 2021 Model: VJP_01
Worst Case Operating Mode: Transmitting

Table 3

Radiated Emissions
(2465.000 MHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2465.000	93.3	36.7	28.1	84.7	114.0	-29.3
Vertical	4930.000	59.6	36.7	35.5	58.4	74.0	-15.6
Vertical	7395.000	54.8	36.8	35.6	53.6	74.0	-20.4

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2465.000	93.3	36.7	28.1	18.9	65.8	94.0	-28.2
Vertical	4930.000	59.6	36.7	35.5	18.9	39.5	54.0	-14.5
Vertical	7395.000	54.8	36.8	35.6	18.9	34.7	54.0	-19.3

Notes:

1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distance 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 value in the margin column shows emission below limit.

4. Horn antenna is used for the emission over 1000MHz.

4.2 Conducted Emission Configuration Photograph

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

4.2.1 Conducted Emission

Worst Case Conducted Configuration
at
0.3165MHz

Judgement: Passed by 10.9dB margin

TEST PERSONNEL:

Sign on file

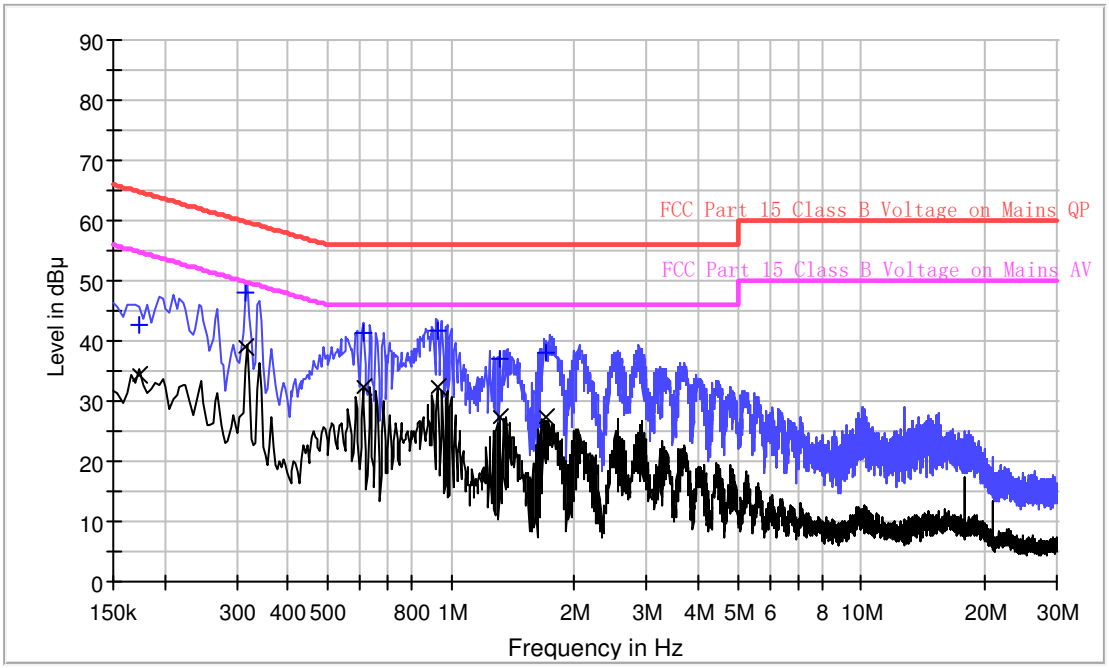
Jeff Liang, Engineer
Typed/Printed Name

22 February 2021
Date

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd
Date of Test: 22 February 2021 Model: VJP_01
Worst Case Operating Mode: Transmitting(2403MHz)
Phase: Live

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.174000	42.7	9.000	L1	9.6	22.1	64.8
0.316500	48.0	9.000	L1	9.6	11.8	59.8
0.610000	41.2	9.000	L1	9.7	14.8	56.0
0.926000	41.6	9.000	L1	9.7	14.4	56.0
1.318000	36.9	9.000	L1	9.7	19.1	56.0
1.706000	37.9	9.000	L1	9.7	18.1	56.0

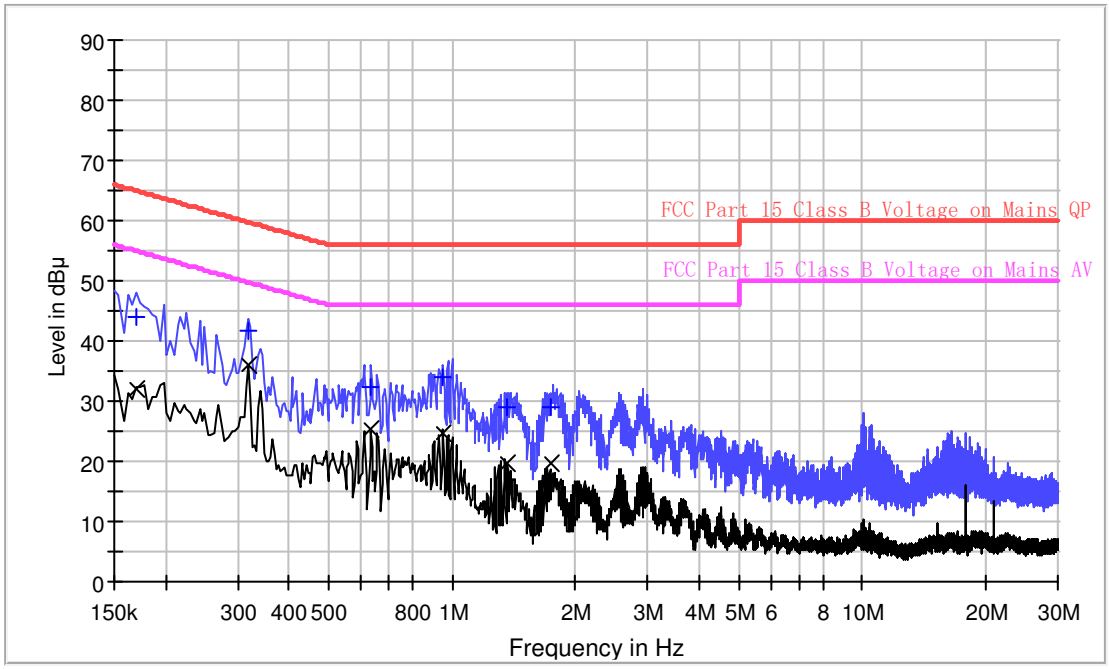
Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.174000	34.5	9.000	L1	9.6	20.3	54.8
0.316500	38.9	9.000	L1	9.6	10.9	49.8
0.610000	32.4	9.000	L1	9.7	13.6	46.0
0.926000	32.3	9.000	L1	9.7	13.7	46.0
1.318000	27.2	9.000	L1	9.7	18.8	46.0
1.706000	27.3	9.000	L1	9.7	18.7	46.0

Applicant: TECHNOLOGY CONNECTIONS INTERNATIONAL Pty Ltd
Date of Test: 22 February 2021 Model: VJP_01
Worst Case Operating Mode: Transmitting(2403MHz)
Phase: Neutral

Graphic / Data Table

Conducted Emissions
Pursuant to FCC 15.207: Emissions Requirement



Limit and Margin QP

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.170000	43.9	9.000	N	9.6	21.1	65.0
0.318000	41.8	9.000	N	9.6	18.0	59.8
0.634000	32.3	9.000	N	9.7	23.7	56.0
0.954000	33.9	9.000	N	9.7	22.1	56.0
1.366000	29.1	9.000	N	9.7	26.9	56.0
1.738000	29.1	9.000	N	9.7	26.9	56.0

Limit and Margin AV

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.170000	32.0	9.000	N	9.6	23.0	55.0
0.318000	35.9	9.000	N	9.6	13.9	49.8
0.634000	25.3	9.000	N	9.7	20.7	46.0
0.954000	24.6	9.000	N	9.7	21.4	46.0
1.366000	19.8	9.000	N	9.7	26.2	46.0
1.738000	19.7	9.000	N	9.7	26.3	46.0

5.0 Equipment Photographs

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf & internal photos.pdf.

6.0 Product Labelling

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

7.0 Technical Specifications

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

8.0 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.

9.0 Miscellaneous Information

This miscellaneous information includes details of the measured bandedge, 20dB Bandwidth, the test procedure and calculation of factor such as pulse desensitization.

9.1 Bandedge Plot

The test plots are attached as below. From the plot, the field strength of any emissions outside of the specified frequency band are attenuated to the general radiated emission limits in section 15.209. It fulfils the requirement of 15.249(d).

Peak Measurement

Restricted-band band-edge tests shall be performed as radiated measurements, i.e (Band-edge Plot).

(i) Lower channel 2403.000 MHz:

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2400.0	76.7	36.7	27.9	67.9	74.0	-6.1

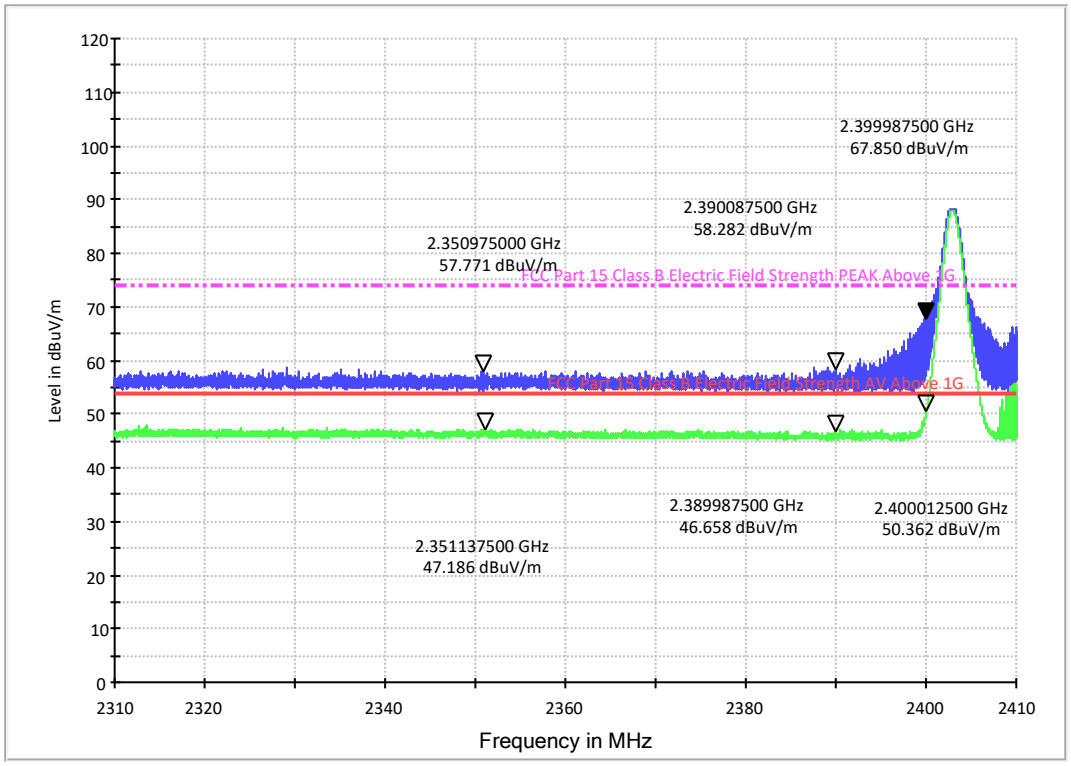
Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m	Margin (dB)
Vertical	2400.0	59.2	36.7	27.9	50.4	54.0	-3.6

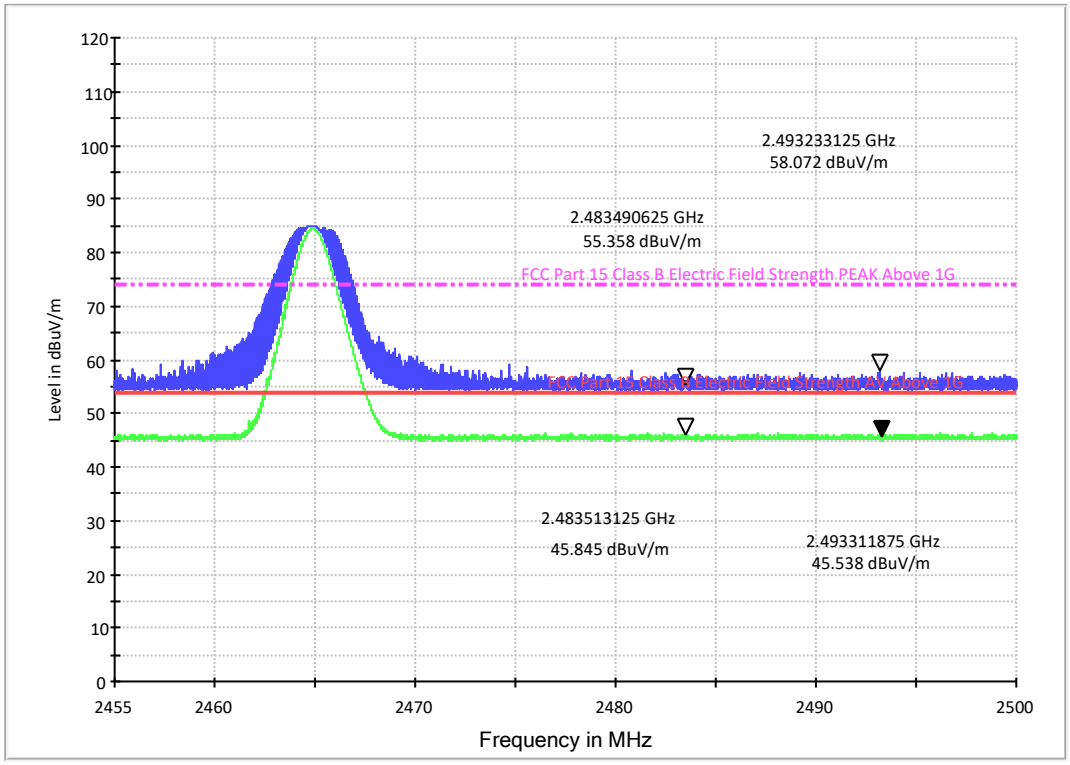
(ii) Upper channel 2465.000 MHz:

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	2493.2	65.8	36.8	29.1	58.1	74.0	-15.9

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m	Margin (dB)
Vertical	2483.5	32.6	36.8	50.0	45.8	54.0	-8.2

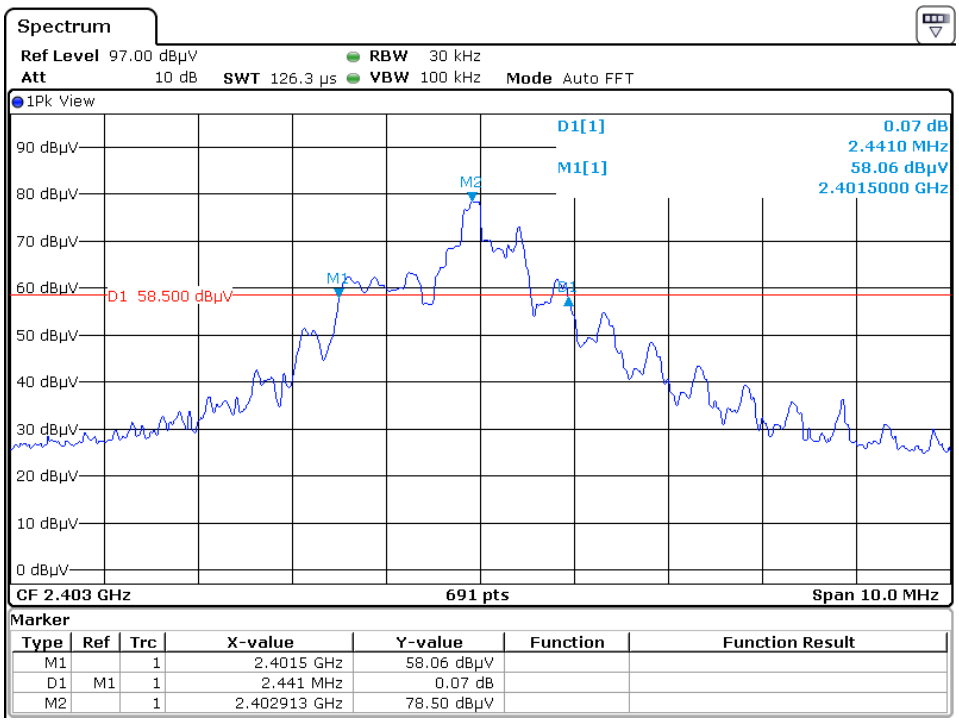
The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74dBµv/m (Peak Limit) and 54dBµv/m (Average Limit).


2.399987500 GHz
67.850 dBuV/m
2.390087500 GHz
58.282 dBuV/m
2.350975000 GHz
57.771 dBuV/m
FCC Part 15 Class B Electric Field Strength PEAK Above 1G
FCC Part 15 Class B Electric Field Strength AV Above 1G
2.389987500 GHz
46.658 dBuV/m
2.400012500 GHz
50.362 dBuV/m
2.351137500 GHz
47.186 dBuV/m
Level in dBuV/m
Frequency in MHz


2.493233125 GHz
58.072 dBuV/m
2.483490625 GHz
55.358 dBuV/m
FCC Part 15 Class B Electric Field Strength PEAK Above 1G
2.483513125 GHz
45.845 dBuV/m
2.493311875 GHz
45.538 dBuV/m
Level in dBuV/m
Frequency in MHz

9.2 20dB Bandwidth

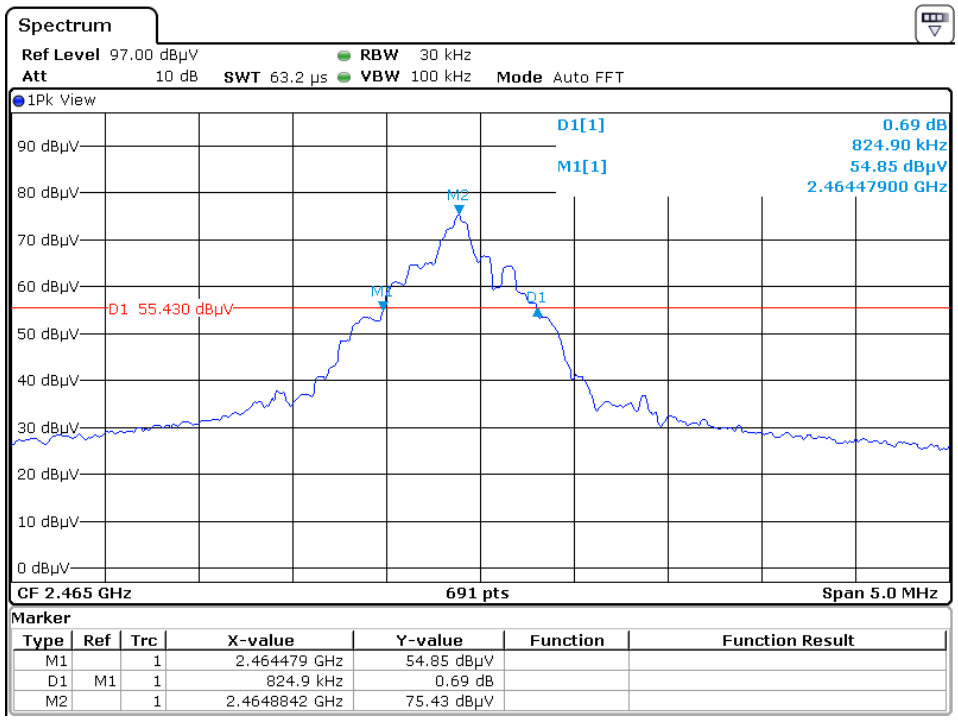
Pursuant to FCC part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered. The test plots are reported as below.



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4015 GHz	58.06 dBµV		
D1	M1	1	2.441 MHz	0.07 dB		
M2		1	2.402913 GHz	78.50 dBµV		

Date: 12.JAN.2021 16:55:33



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.464479 GHz	54.85 dBµV		
D1	M1	1	824.9 kHz	0.69 dB		
M2		1	2.4648842 GHz	75.43 dBµV		

Date: 12.JAN.2021 17:10:39

9.3 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (T_{eff}) is approximately 140.58us for a digital "1" bit, as shown in the plots of Section 9.4. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB.

9.4 Calculation of Average Factor

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

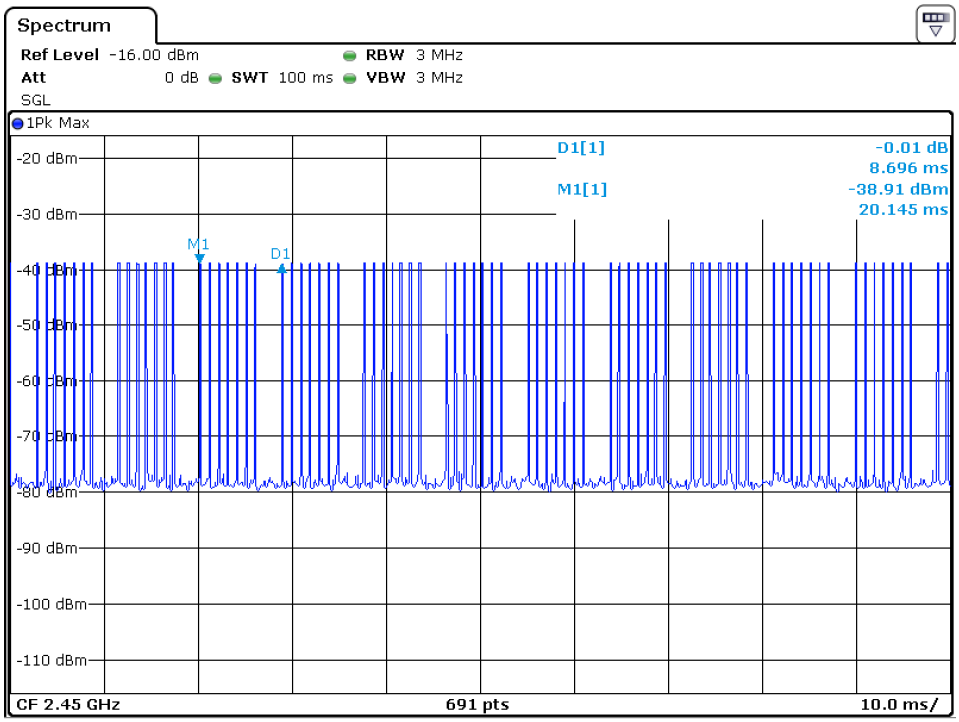
The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

The duty cycle is simply the on-time divided by the period:

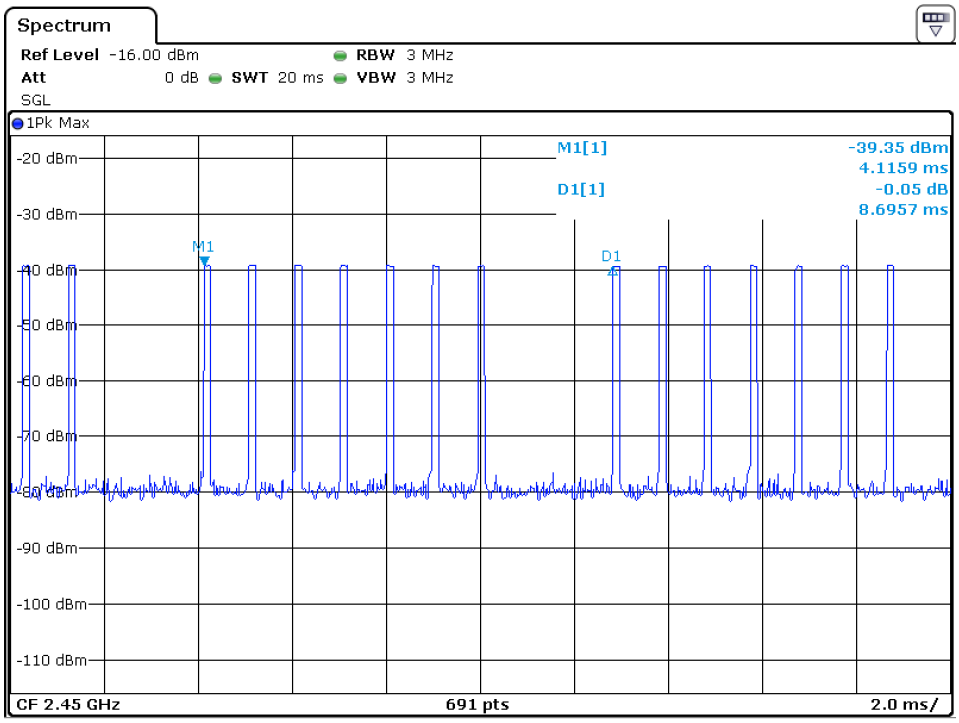
The duration of one cycle = 8.6957ms
Effective period of the cycle = 0.14058ms* 7 = 0.98406ms
DC =0.98406ms / 8.6957ms =0.1132 or 11.32%

Therefore, the averaging factor is found by $20 \log_{10}$ (0.1132) = -18.9 dB

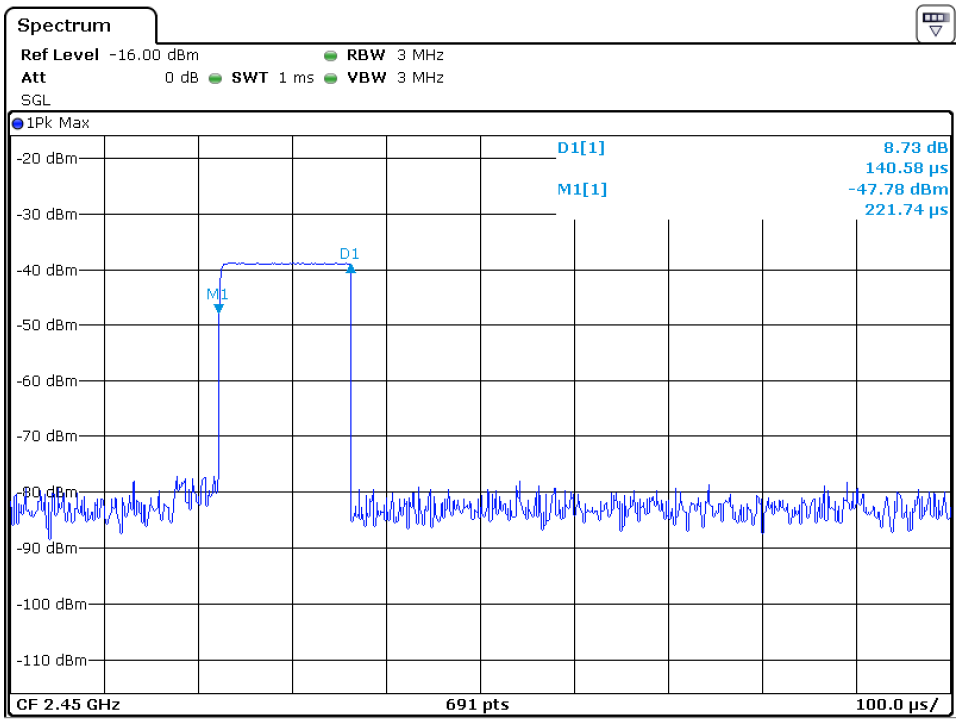
The test plots are attached as below.



Date: 29.DEC.2020 09:21:49



Date: 29.DEC.2020 09:22:57



Date: 29.DEC.2020 09:23:42

9.5 Emissions Test Procedures

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

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.10 - 2013.

The transmitting equipment under test (EUT) is placed on a styrene turntable which is four feet in diameter and approximately 0.8 meter up to 1GHz and 1.5 meter above 1GHz in height above the ground plane. 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 axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

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 Section 9.4.

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.

Detector function for conducted emissions is in QP & AV mode and IFBW setting is 9 kHz from the frequency band 150 kHz to 30MHz.

9.6 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 are made as described in ANSI C63.10 - 2013.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 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 Section 9.3). Above 1000 MHz, a resolution bandwidth of 1 MHz is used, RBW 3MHz used for fundamental emission.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted 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, but those measurements taken at a closer distance are so marked.

10.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00166158	09-Oct-2019	09-Oct-2021
SZ185-01	EMI Receiver	R&S	ESCI	100547	22-Dec-2020	22-Dec-2021
SZ061-08	Horn Antenna	ETS	3115	00092346	07-Sep-2019	07-Sep-2021
SZ061-06	Active Loop Antenna	Electro-Metrics	EM-6876	217	24-May-2019	24-May-2021
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	27-May-2020	27-May-2021
SZ056-06	Signal Analyzer	R&S	FSV 40	101101	27-May-2020	27-May-2021
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	27-May-2020	27-May-2021
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Dec-2018	15-Dec-2021
SZ062-02	RF Cable	RADIALL	RG 213U	--	24-Aug-2020	24-Feb-2021
SZ062-05	RF Cable	RADIALL	0.04-26.5GHz	--	24-Aug-2020	24-Feb-2021
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	24-Aug-2020	24-Feb-2021
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	27-May-2020	27-May-2021
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	27-Oct-2020	27-Oct-2021
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	27-Oct-2020	27-Oct-2021
SZ187-02	Two-Line V-Network	R&S	ENV216	100072	27-May-2020	27-May-2021
SZ062-16	RF Cable	HUBER+SUHNER	CBL2-BN-1m	110127-2231000	13-Nov-2020	13-Nov-2021
SZ188-03	Shielding Room	ETS	RFD-100	4100	07-Jan-2020	07-Jan-2023

********** End of Report**********