

TEST REPORT

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Manufacturing Site : ZHONGSHAN DONLIM WEILI ELECTRICAL APPLIANCES CO.,LTD
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Sample Description

Product : 30" Black Electric Smoker
 40" Black Electric Smoker

FCC ID : YHXESQ-3040R3

Model No. : 20070312, 20072112, 20072212, 20072312, 20072412, 20072912
 20070512, 20072512, 20072612, 20072712, 20072812, 20073012

Electrical Rating : 30" Black Electric Smoker: 120VAC, 60Hz, 800W, 6.7A
 40" Black Electric Smoker : 120VAC, 60Hz, 1200W, 10A
 Remote controller: 2*1.5V/AAA battery

Frequency : 2.440GHz Transceiver

Date Received : 14 October 2011

Date Test Conducted : 10 Feb.,2012 – 10 Feb.,2012

Test standards : FCC Part 15: 2010

Test Result : Pass

Conclusion : The submitted samples complied with the above rules/standards.


Remark : None.

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15 Feb.,2012 **Date**

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1. General Description

1.1 Product Description

The equipment under test (EUT) is a transceiver for remote control of Black Electric Smoker at 2.440GHz. The EUT is powered by 2*1.5V/AAA battery. It send the command of temperature & time settings & lighting to the Electric Smoker, and it sends a signal to Electric Smoker to request "meat probe" temperature and receives temperature information (probe) from Electric Smoker.

Antenna Type: internal integrated antenna.

The remote controllers of the model: 20070312, 20072112, 20072212, 20072312, 20072412, 20072912 20070512, 20072512, 20072612, 20072712, 20072812, 20073012 are the same as the test model 20070312 in hardware and software aspect. The only differences are the appearance, and model number for trading purpose.

We tested the remote controllers, model: 20070312, to determine if it was in compliance with the relevant FCC standards. We found that the unit met the requirements of FCC part 15.249 when tested as received. The worst case's test data was presented in this test report.

1.2 Related Submittal (s) / Grants

The FCC ID of corresponding transceiver for this transceiver is YHXESQ-3040C3.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated emission measurement was performed in semi-anechoic chamber 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.

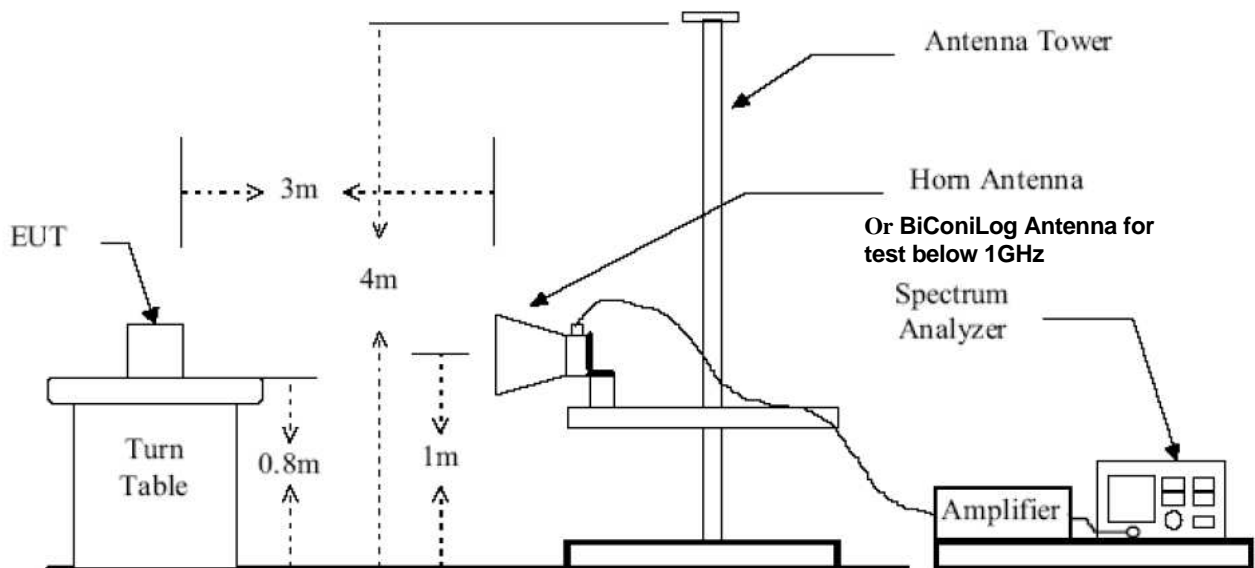
1.4 Test Facility

The Radiated Emission test is performed at:
Compliance Certification Services (Shenzhen) Inc. located at No.10-1Mingkeda Logistics Park, No.18Huanguan South RD. Guanlan Town, Baoan District Shenzhen China. This test facility and site measurement data have been fully placed on file with the FCC, test firm registration number is 441872.

Test Equipment List

Serial No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
D286	Horn Antenna	SCHWARZBECK	BBHA9120D	19-Mar-11	19-Mar-12
US4430039 9	PSA Series Spectrum Analyzer	Agilent	E4446A	19-Mar-11	19-Mar-12
5082	Bilog Antenna	SCHAFFNER	CBL6143	03-Jun-11	03-Jun-12
1411843	Amplifier	MITEQ	AM-1604-3000	18-Mar-11	18-Mar-12

Test setup figure



Test setup figure

1.5 Measurement Uncertainty

Radiated Emission: 3.79dB in the frequency range of 30MHz-200MHz, 3.62dB in the frequency range of 200MHz-1000MHz, 5.04dB in the frequency above 1GHz at a level of confidence of 95%. When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2. 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 C63.4 (2003).

The EUT was powered by 2*1.5V/AAA battery in the testing.

Type of modulation: GFSK modulation, and only the worst data was reported in this report.

The unit was operated standalone and placed in the center of the turntable.

For maximizing emissions, the unit was placed in the center of the turntable, and the turntable 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 Chapter 3.

2.2 EUT Exercising Software

There was no special software to exercise the device.

2.3 Special Accessories

No special accessories used.

2.4 Equipment Modification

Any modifications installed previous to testing by Masterbuilt Manufacturing Inc will be incorporated in each production model sold/leased in the United States. No modifications were installed by Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.

2.5 Support Equipment List and Description

N/A

3. Summary of Test Results

FCC Rules	Description of Test	Result
15.203	Antenna Requirement	Pass
15.207	Disturbance Voltage at the Mains Terminals	N/A
15.249	Radiated Emission	Pass
15.249	Band Edges Measurement	Pass

Remark: When determining the test results, measurement uncertainty of tests has been considered.

3.1 Antenna Requirement

The EUT Antenna Type: internal integrated antenna.

3.2 Conducted Emission

The EUT is battery operating device, the conducted emission is unnecessary.

3.3 Radiated Emission

Data is included 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.

3.3.1 Radiated Emission Limits

According to FCC 15.249, operating within the bands 2400-2483.5 MHz, the field strength of emissions from intentional radiators operated within this frequency bands shall comply with the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
2400 - 2483.5	50	500

3.3.2 Test Setup

Reference 1.4

3.3.3 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.

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

$$\rightarrow FS = RA + \text{Correct Factor} + AV$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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
- Correct Factor = AF + CF - AG + PD

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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 62.0 dB μ V
 AF = 7.4 dB
 CF = 1.6 dB
 AG = 29.0 dB
 PD = 0 dB
 AV = -10 dB

$$\text{Correct Factor} = 7.4 + 1.6 - 29.0 + 0 = -20 \text{ dB}$$

$$FS = 62 + (-20) + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

3.3.4 Radiated Emission Test Data

Date of test: 10 Feb.,2012

Radiated Emissions

Operation: EUT on transmitting operation

Pursuant to FCC 15.209: Emissions Requirement (30MHz-1GHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Correction Factor (dB)	Net at 3m (dBµV/m)	QP Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	30.000	19.5	-8.2	11.3	40.0	-28.7
Horizontal	654.680	20.1	-5.5	14.6	46.0	-31.4
Horizontal	798.240	22.0	-3.8	18.2	46.0	-27.8
Vertical	141.550	24.6	-18.4	6.2	43.5	-37.3
Vertical	470.380	22.7	-8.5	14.2	46.0	-31.8
Vertical	709.000	22.8	-4.3	18.5	46.0	-27.5

Pursuant to FCC 15.249: Emissions Requirement(1GHz-25GHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Correction Factor (dB)	Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2445.000	92.9	-9.8	83.1	114.0	-30.9
Horizontal	4881.667	56.4	-0.4	56.0	74.0	-18.0
Horizontal	7318.333	45.5	5.0	50.5	74.0	-23.5
Vertical	2445.000	87.9	-9.8	78.1	114.0	-35.9
Vertical	4881.667	60.3	-0.4	59.9	74.0	-14.1
Vertical	7318.333	52.5	5.3	57.8	74.0	-15.1

Polarization	Frequency (MHz)	Reading (dBµV)	Correction Factor (dB)	Average Factor (-dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2445.000	92.9	-9.8	12.4	70.7	94.0	-23.3
Horizontal	4881.667	56.4	-0.4	12.4	43.6	54.0	-10.4
Horizontal	7318.333	45.5	5.0	12.4	38.1	54.0	-15.9
Vertical	2445.000	87.9	-9.8	12.4	65.7	94.0	-28.3
Vertical	4881.667	60.3	-0.4	12.4	47.5	54.0	-6.5
Vertical	7318.333	52.5	5.3	12.4	45.4	54.0	-8.6

- Notes:
1. AT frequencies equal to or less than 1000MHz, quasi-peak detector was used, above 1000MHz, Peak detector was used.
 2. All measurements were made at 3 meter.
 3. Negative value in the margin column shows emission below limit.
 4. Horn antenna is used for the emission over 1000MHz.

3.3.5 Test Result

The data on the above test result table lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

According 15.249, the worst case radiated emission at 4881.667 MHz
Judgement: Passed by 6.5dB

3.4 Bandedges Measurement

3.4.1 Limited of the bandedges measurement

Sec15.249:

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

(e) As shown in Section 15.35(b), for frequencies above 1000 MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Sec15.215:

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20dB bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

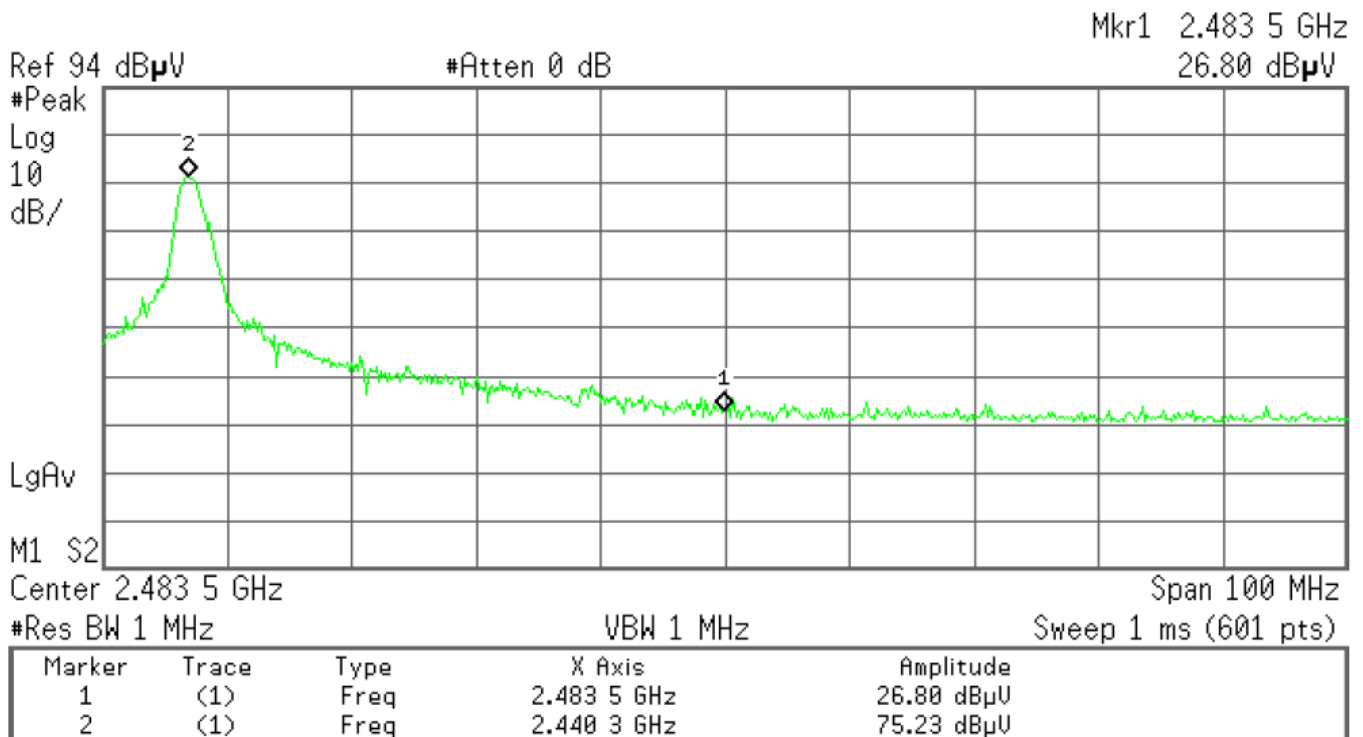
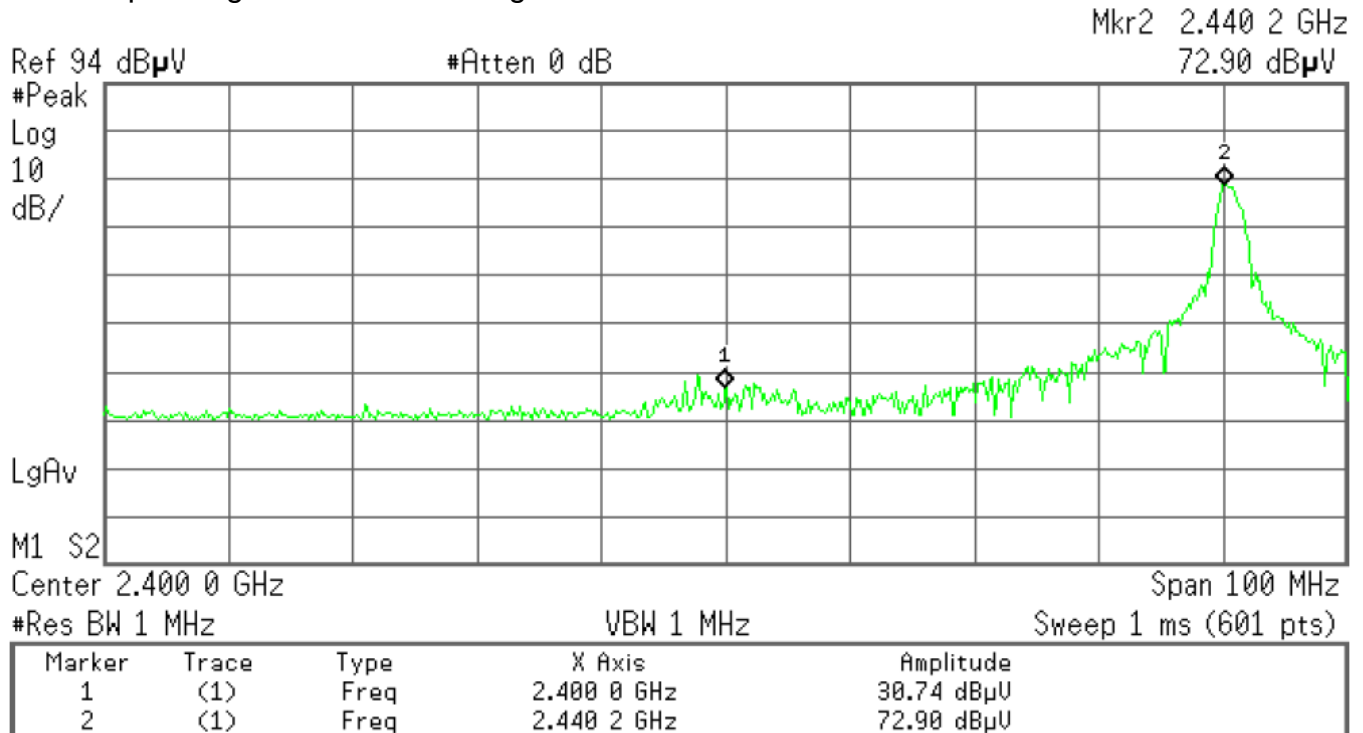
3.4.2 Test Setup

Refer to 1.4

3.4.3 Test Plot

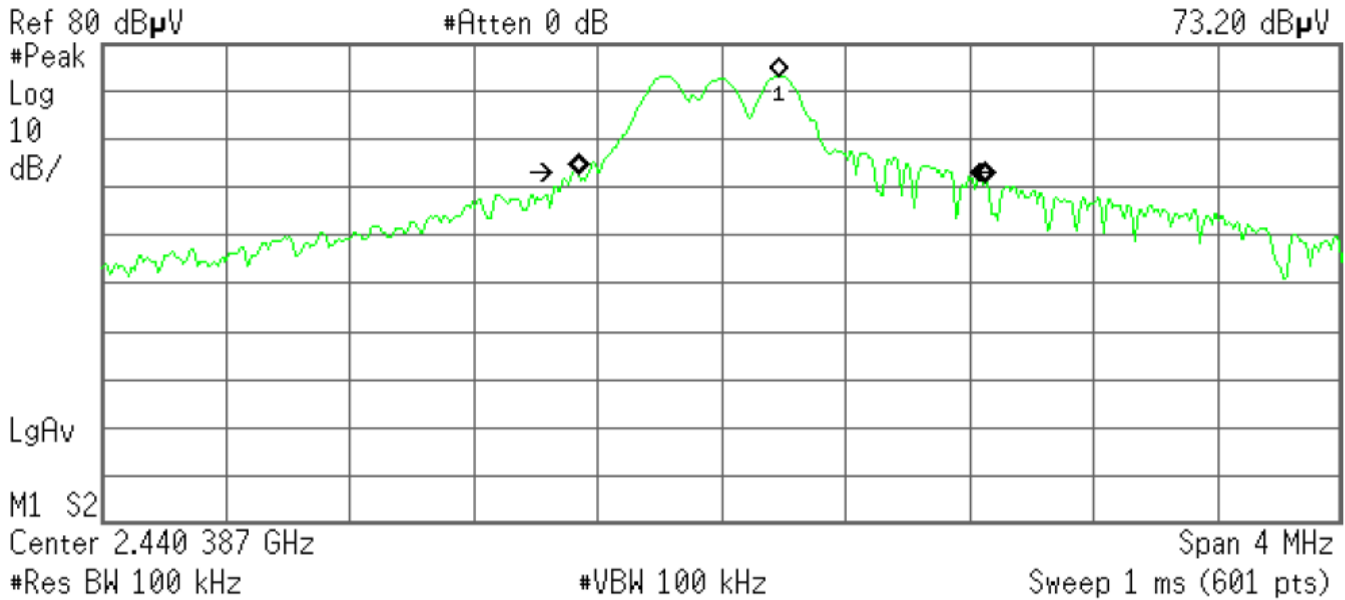
Frequency Bands

Operating mode: Transmitting



Modulation Bandwidth
 Operating mode: Transmitting

Mkr1 2.440 573 GHz
 73.20 dB μ V



Occupied Bandwidth
 1.3135 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error 196.360 kHz
x dB Bandwidth 1.209 MHz

3.4.4 Test Result

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

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

(i) Lower bandedge:

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

$$\begin{aligned} &= 83.1\text{dB}\mu\text{v}/\text{m} - 42.2\text{dB} \\ &= 40.9\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

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

$$\begin{aligned} &= 70.7\text{dB}\mu\text{v}/\text{m} - 42.2\text{dB} \\ &= 28.5\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

(ii) Upper bandedge:

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

$$\begin{aligned} &= 83.1\text{dB}\mu\text{v}/\text{m} - 48.4\text{dB} \\ &= 34.7\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

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

$$\begin{aligned} &= 70.7\text{dB}\mu\text{v}/\text{m} - 48.4\text{dB} \\ &= 22.3\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

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

3.4.5 Transmitter Duty Cycle Calculation FCC Rule 15.35(b, c)

Averaging factor in dB = $20 \log(\text{duty cycle})$

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 (1 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.

A plot of the worst-case duty cycle as detected in this manner is shown below.

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

The duration of one cycle = 3.967ms
Effective period of the cycle = 0.95ms

DC = $0.95/3.967=0.2395$ or 23.95%

Therefore, the averaging factor is found by $20\lg 0.2395=-12.4\text{dB}$

4. Appendix III - Document List

Exhibit type	File Description	Filename
Average factor	Average factor	Average factor.pdf
Bandwidth Plot	Bandwidth Plot	Bandwidth Plot.pdf
Certification Agreement	Certification Agreement	Certification Agreement.pdf
External photos	External photos	External photos.pdf
FCC-Letter-of-Agency	FCC-Letter-of-Agency	FCC-Letter-of-Agency.pdf
Form-731	Form-731	Form-731.doc
internal photos	internal photos	internal photos.pdf
Label and location	Label and location	Label and location.pdf
Test Report.doc	Test Report.doc	Test Report.doc
Test Setup Photos(Radiated Emission)	Test Setup Photos(Radiated Emission)	Test Setup Photos(Radiated Emission).pdf
User Manual	User Manual	User Manual.pdf
Technical Description	Technical Description	Technical Description.pdf
block diagram	block diagram	block diagram.pdf
circuit diagram	circuit diagram	circuit diagram.pdf

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