



Report No: 140414100GZU-001
Issued: 16 June 2014

TEST REPORT

Applicant Name & Address : Masterbuilt Manufacturing Inc.
1 Masterbuilt Court Columbus, Georgia, 31907, USA

Sample Description

Product : 30" Black Electric Smoker
40" Black Electric Smoker
FCC ID : YHXESQ-3040R6
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 April 2014
Date Test Conducted : 15 April 2014 – 08 May 2014
Test standards : FCC Part 15: 2013

Test Result : Pass

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

Remark : None.

*****End of Page*****

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CONTENT

TEST REPORT 1
CONTENT 2

- 1. General Description 3
 - 1.1 Product Description 3
 - 1.2 Related Submittal (s) / Grants 3
 - 1.3 Test Methodology 3
 - 1.4 Test Facility 3
 - 1.5 Measurement Uncertainty 4
- 2. System Test Configuration 5
 - 2.1 Justification 5
 - 2.2 EUT Exercising Software 5
 - 2.3 Special Accessories 5
 - 2.4 Equipment Modification 5
 - 2.5 Support Equipment List and Description 5
- 3. Summary of Test Results 6
 - 3.1 Antenna Requirement 6
 - 3.2 Conducted Emission 6
 - 3.3 Radiated Emission 7
 - 3.4 Bandedges Measurement 12
- 4. Equipment List 19

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 sends 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-3040C6.

1.3 Test Methodology

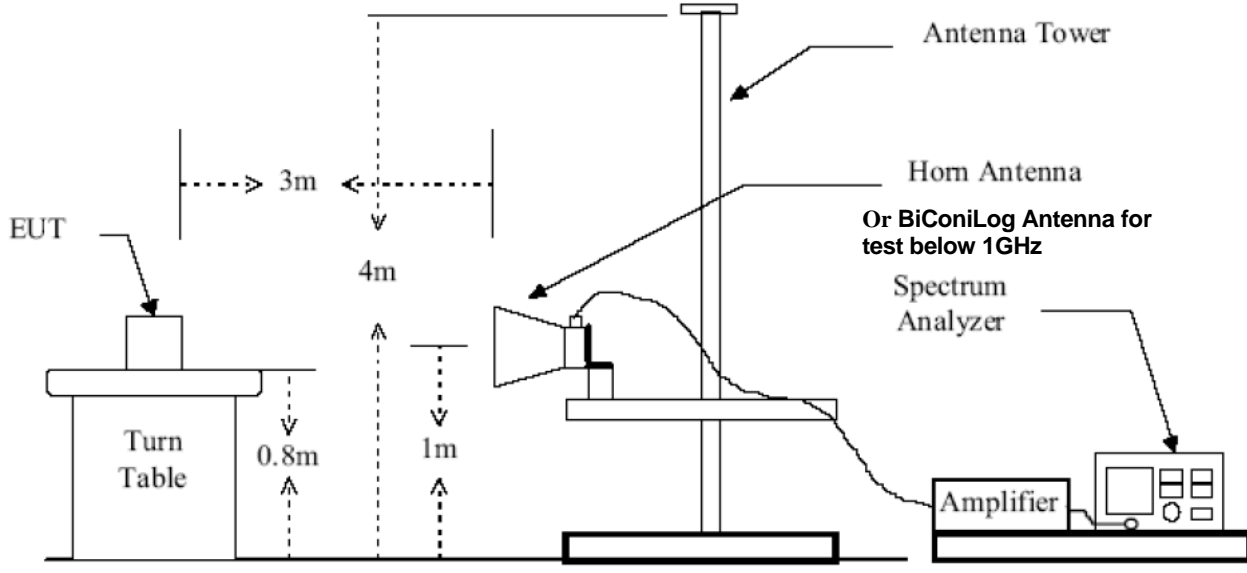
Radiated emission measurements were performed according to the procedures in ANSI C63.10:2009 Radiated emission measurement was performed in semi-anechoic chamber room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. 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

All of the tests are performed at:
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.
Block E, No.7-2 Guang Dong Software Science Park, Caipin Road, Guangzhou Science City, GETDD Guangzhou, China 510663.

This test facility and site measurement data have been fully placed on file with the FCC, test firm registration number is 549654.

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 C63.10:2009

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.

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

→ $FS = RA + \text{Correct Factor}$

Where

- FS = Peak 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
- Correct Factor = AF + CF – AG + PD

Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the average value of field strength shall be determined by:

$$\text{Average value} = \text{Peak value} + \text{Average factor}$$

3.3.4 Radiated Emission Test Data

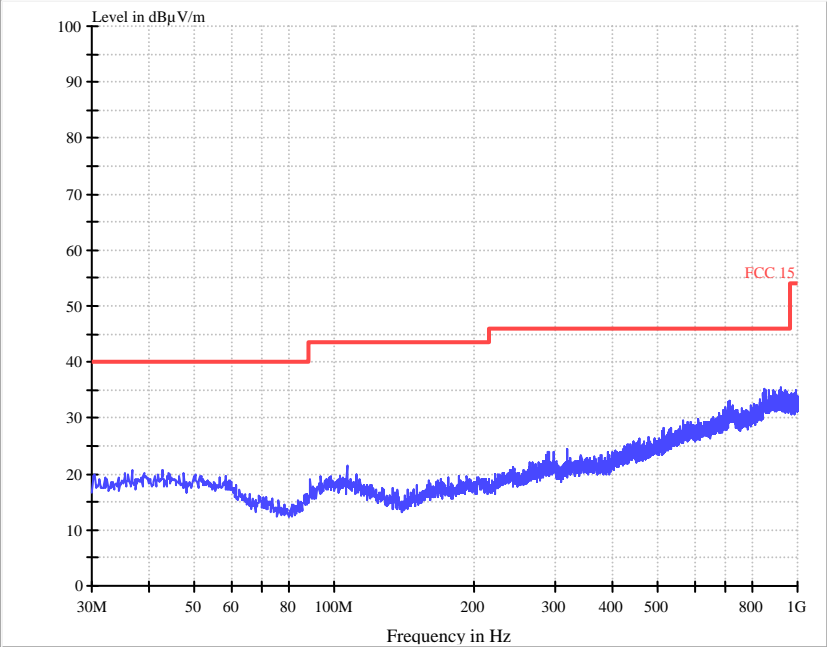
Radiated Emissions (Below 1GHz)

Operation: EUT on transmitting operation

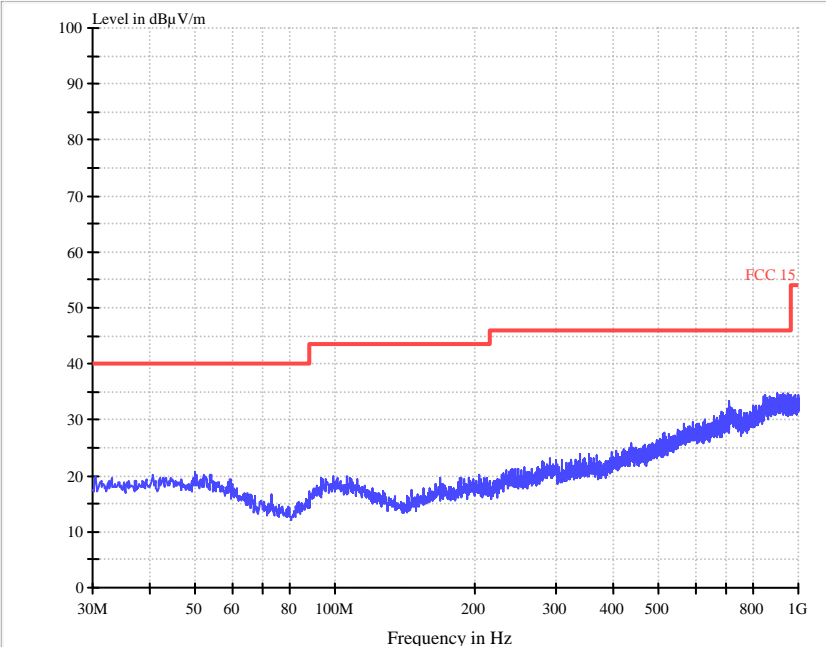
Pursuant to FCC 15.209: Emissions Requirement (30MHz-1GHz)

Antenna Polarization	Frequency [MHz]	Measured Net at 3m [dB(μV/m)]	Limit at 3m [dB(μV/m)]
Horizontal	40.0	<30	40.0
Horizontal	400.0	<36	46.0
Horizontal	961.0	<44	54.0
Vertical	200.0	<33.5	43.5
Vertical	400.0	<36	46.0
Vertical	980.0	<44	54.0

3.3.5 Test Curve Horizontal



Vertical



Radiated Emissions (Above 1GHz)

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

Polarization	Frequency (MHz)	Reading (dB μ V)	Correction Factor (dB)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2440.800	100.3	-7.7	92.6	114.0	-21.4
Horizontal	4880.800	66.1	-0.7	65.4	74.0	-8.6
Horizontal	9761.200	48.1	7.4	55.5	74.0	-18.5
Vertical	2440.400	101.5	-7.7	93.8	114.0	-20.2
Vertical	4881.200	66.0	-0.7	65.3	74.0	-8.7
Vertical	9762.000	52.3	7.4	59.7	74.0	-14.3

Polarization	Frequency (MHz)	Peak Value (dB μ V)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	2440.800	92.6	-14.0	78.6	94.0	-15.4
Horizontal	4880.800	65.4	-14.0	51.4	54.0	-2.6
Horizontal	9761.200	55.5	-14.0	41.5	54.0	-12.5
Vertical	2440.400	93.8	-14.0	79.8	94.0	-14.2
Vertical	4881.200	65.3	-14.0	51.3	54.0	-2.7
Vertical	9762.000	59.7	-14.0	45.7	54.0	-8.3

- 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.

3.4 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.

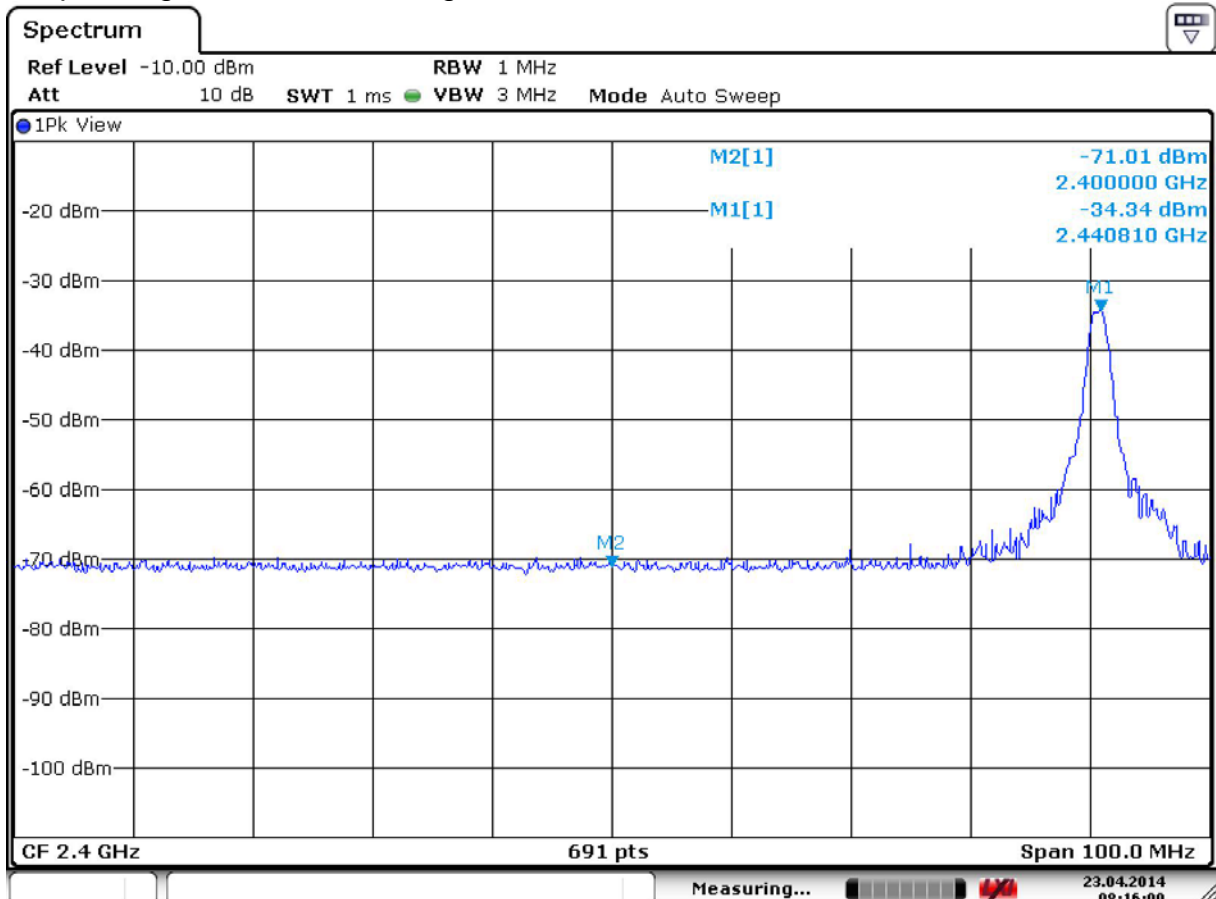
Sec15.215:

(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.

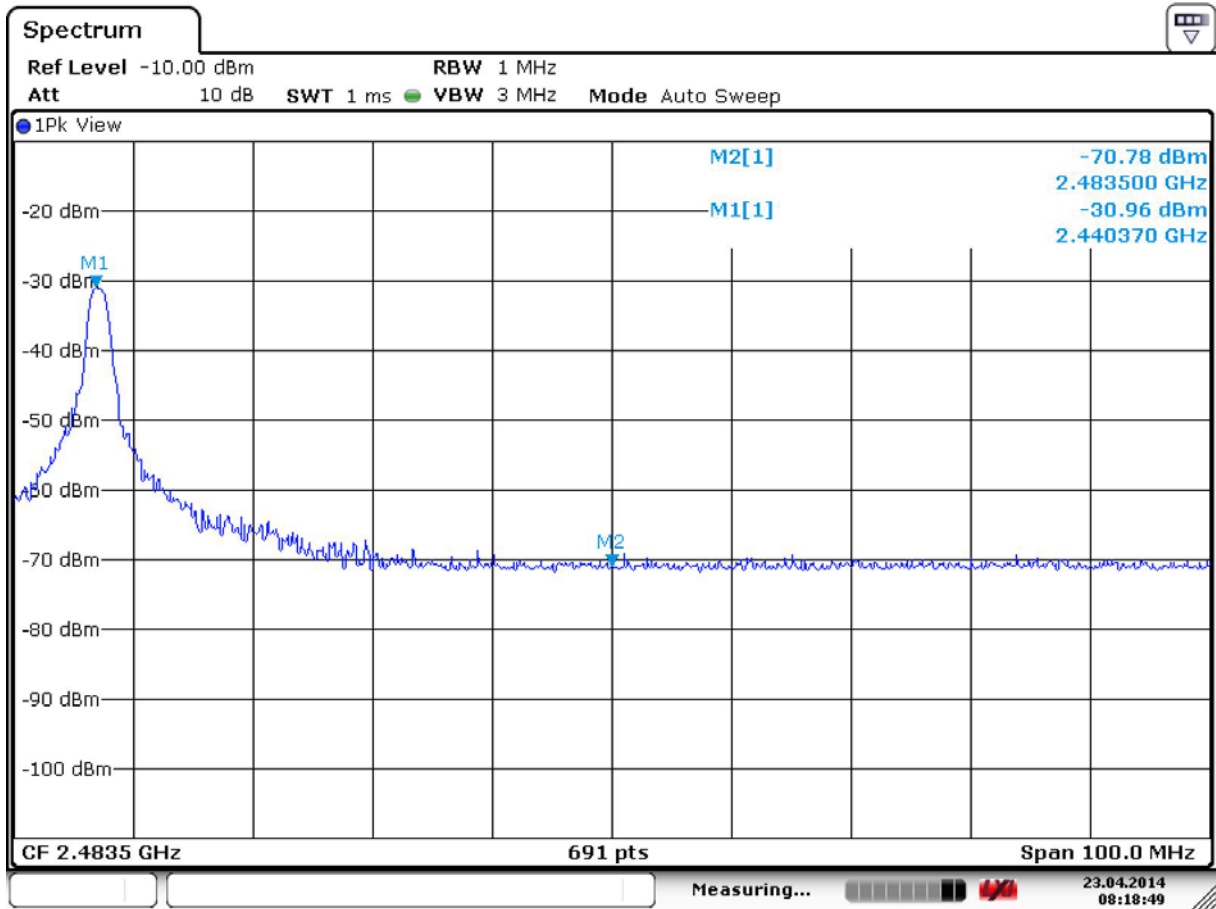
3.4.2 Test Setup

Refer to 1.4

3.4.3 Test Plot
Frequency Bands
Operating mode: Transmitting

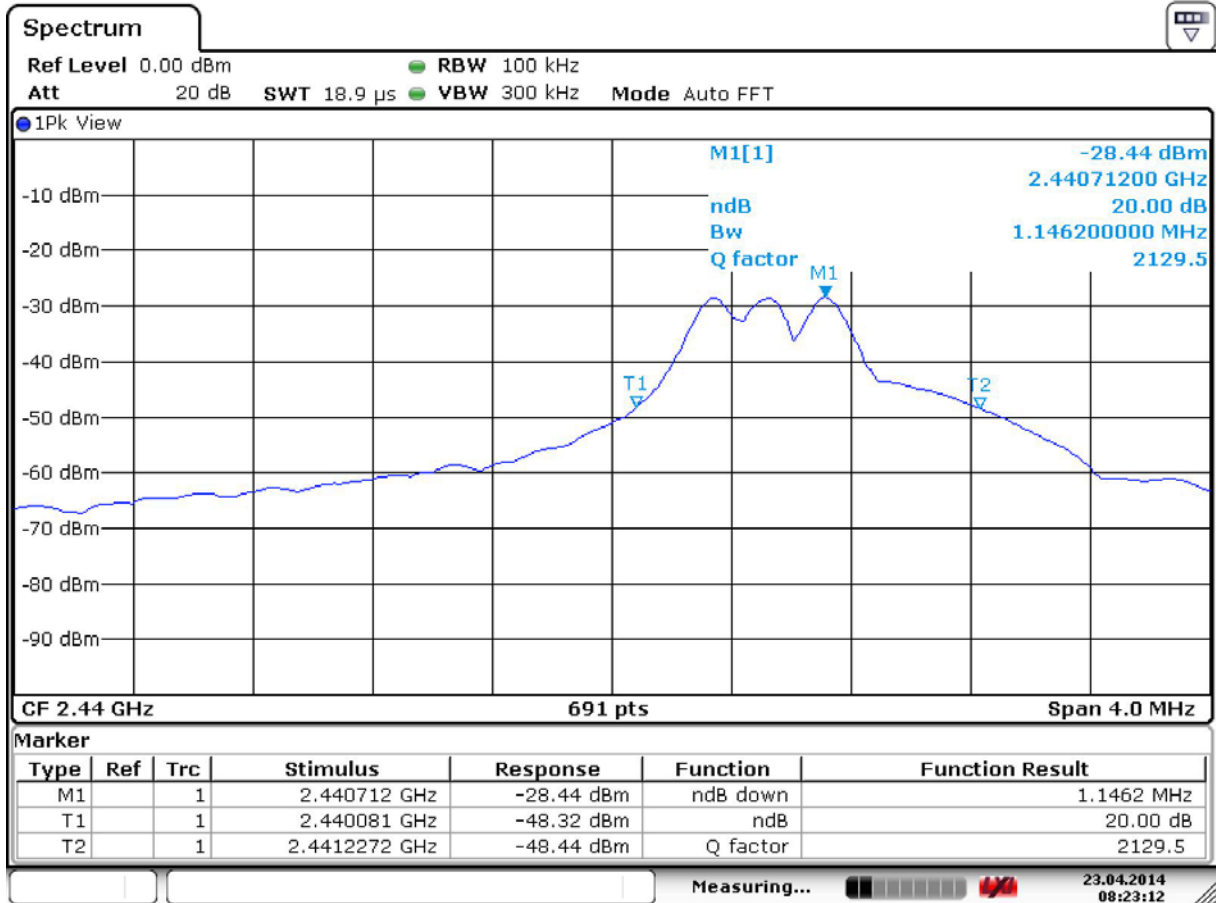


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Modulation Bandwidth
 Operating mode: Transmitting



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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

$$\begin{aligned} &= 93.8\text{dB}\mu\text{v}/\text{m} - 36.7\text{dB} \\ &= 57.1\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

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

$$\begin{aligned} &= 79.8\text{dB}\mu\text{v}/\text{m} - 36.7\text{dB} \\ &= 43.1\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

(ii) Upper bandedge:

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

$$\begin{aligned} &= 93.8\text{dB}\mu\text{v}/\text{m} - 40.0\text{dB} \\ &= 53.8\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

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

$$\begin{aligned} &= 79.8\text{dB}\mu\text{v}/\text{m} - 40.0\text{dB} \\ &= 39.8\text{dB}\mu\text{v}/\text{m} \end{aligned}$$

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).

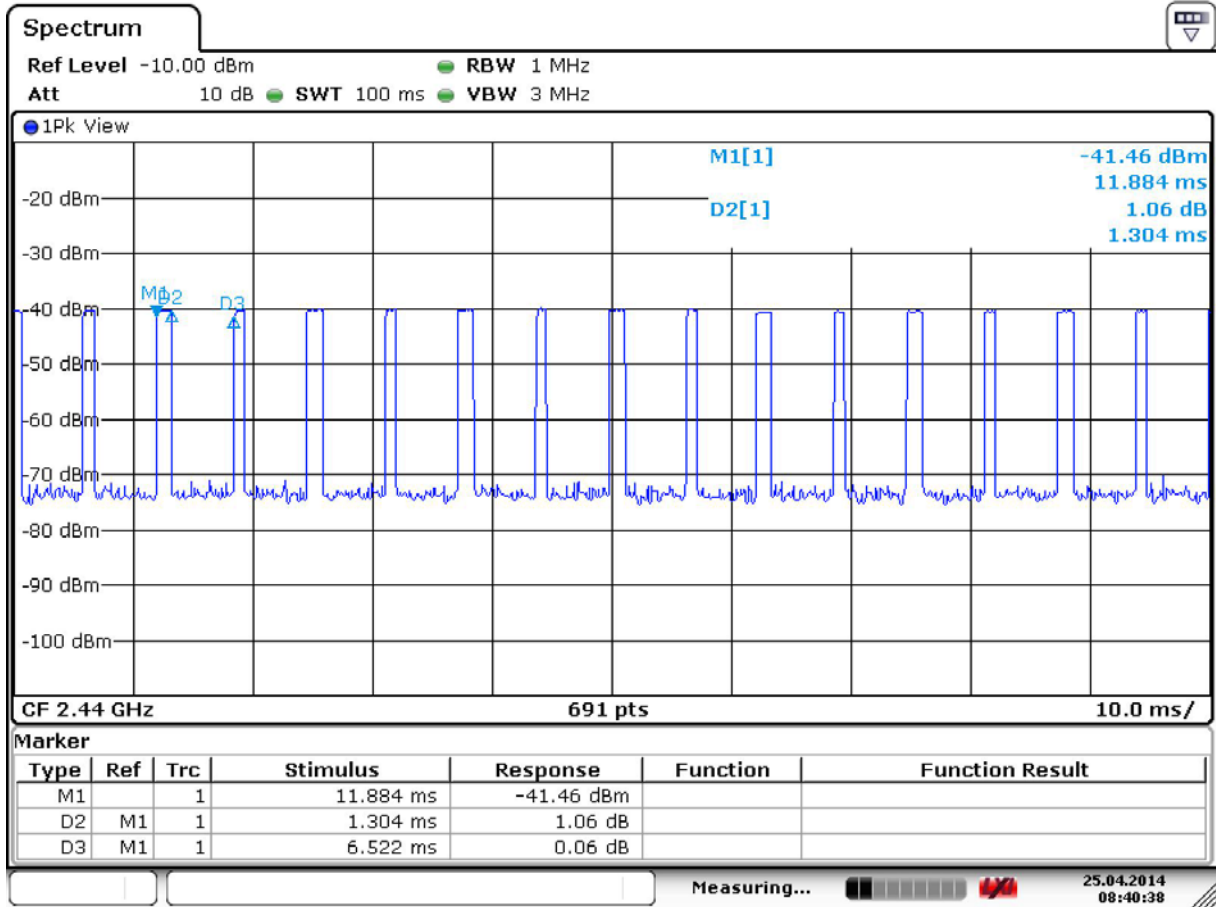
3.4.5 Transmitter Duty Cycle Calculation FCC Rule 15.35(b, c)

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.



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

The duration of one cycle = 6.522ms
 Effective period of the cycle = 1.304ms

$$DC = 1.304/6.522 = 0.1999 \text{ or } 19.99\%$$

Therefore, the averaging factor is found by $20\lg 0.1999 = -14\text{dB}$

4. Equipment List

Equipment No.	Equipment	Model	Manufacturer	Cal. Due date (YYYY-MM-DD)	Calibration Interval
EM030-01	3m Semi-Anechoic Chamber	9×6×6 m ³	ETS•LINDGR EN	2015-04-02	1Y
EM030-02	Control room for 3m Semi-Anechoic Chamber	4×4×3 m ³	ETS•LINDGR EN		
EM031-02	EMI Test Receiver (9 kHz~7 GHz)	R&S ESR7	R&S	2015-06-03	1Y
EM031-03	Signal and Spectrum Analyzer (10 Hz~40 GHz)	R&S FSV40	R&S	2015-06-03	1Y
EM011-04	Loop antenna (9 kHz-30 MHz)	HFH2-Z2	R&S	2015-05-25	1Y
EM061-03	TRILOG Super Broadband test Antenna (30 MHz-1.5 GHz)	VULB 9161	SCHWARZBE CK	2015-05-25	1Y
EM033-02	Bouble-Ridged Waveguide Horn Antenna (800 MHz-18 GHz)	R&S HF907	R&S	2015-05-25	1Y
EM031-02-01	Coaxial cable	/	R&S	2015-06-03	1Y

----- End of Report -----