

TEST REPORT

Applicant Name & : BRK Brands Inc
Address : 3901 Liberty Street Road Aurora Illinois United States 60504-8122

Sample Description

Product : Power Controller
FCC ID : M7U-FAL-POW
Model No. : OLPOWER
Electrical Rating : 120V, 60Hz
Frequency : 908 – 919 MHz

Date Received : 18 Oct.,2012

Date Test Conducted : 22 Oct.,2012 – 15 Nov.,2012

Test standards : FCC Part 15: 2011

Test Result : Pass

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


Remark : None.

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

Prepared and Checked By:

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14 Dec.,2012 **Date**

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1. General Description

1.1 Product Description

The equipment under test (EUT) is a transceiver at 908-919MHz, it can allow the PC to power on and off any device that operates at up to 8 amps, and it can report to the Wireless System Gateway.

The EUT is powered by 120V, 60Hz.

We test the sample 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.

Frequency table as below:

Channel	Frequency (MHz)
0	908.449982
1	908.824493
2	909.199005
3	909.573517
4	909.948029
5	910.322540
6	910.697052
7	911.071564
8	911.446075
9	911.820587
10	912.195099
11	912.569611
12	912.944122
13	913.318634
14	913.693146
15	914.067657
16	914.442169
17	914.816681
18	915.191193
19	915.565704
20	915.940216
21	916.314728
22	916.689240
23	917.063751
24	917.438263
25	917.812775
26	918.187286
27	918.561798
28	918.936310
29	919.310822
30	919.685333

1.2 Related Submittal (s) / Grants

N/A.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 :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. During test, three orthogonal axes of device had been tested, the worst case data was presented in the report.

Conducted emission test was performed according to ANSI C63.4: 2009. The EUT was set to achieve the maximum emission level. The mains terminal disturbance voltage was measured with the EUT in a shielded room. The EUT was connected to AC power source through an Artificial Mains Network which provides a 50Ω linear impedance Artificial hand is used if appropriate (for handheld apparatus). The load/control terminal disturbance voltage was measured with passive voltage probe if appropriate.

The vertical conducting plane or wall of a screened room shall be located 40 cm to the rear of the EUT. All other surfaces of tabletop EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs The table-top EUT was placed on a 0.8m high non-metallic table above earthed ground plane(Ground Reference Plane).And for floor standing EUT, was placed on a 0.1m high non-metallic supported on GRP. The Artificial Mains Network is situated at a distance of 0.8m from the EUT.

During the test, mains lead of EUT excess 0.8m was folded back and forth parallel to the lead so as to form a horizontal bundle with a length between 0.3m and 0.4m.

The bandwidth of test receiver was set at 9 kHz. The frequency range from 150 kHz to 30MHz was checked.

1.4 Test Facility

The Semi-Anechoic chamber and shield room used to collect the radiated data and conducted data is Keyway Technology Co.,Ltd. located at Baishun Industrial Zone, Zhangmotou Town, Dongguan, Guangdong, China 523638. This test facility and site measurement data have been fully placed on file with the FCC, test firm registration number is 370994

Test Equipment List

Equip No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
101156	EMI Test Receiver	Rohde&Schwarz	ESCI	07 Jul 2012	07 Jul 2013
101315	Artificial Mains Network	Rohde&Schwarz	ENV216	02 Jul 2012	02 Jul 2013
101156	EMI Test Receiver	Rohde&Schwarz	ESCI	07 Jul.2012	07 Jul.2013
00135452	Bilog Antenna	ETS-LINDGREN	3142D	28 Jun.2012	28 Jun.2013
3911A04271	Spectrum Analyzer	Agilent	8593E	28 Nov.2011	28 Nov.2012
KW01	3m Semi-anechoic Chamber	ETS-LINDGREN	966	07 Jul.2012	07 Jul.2013
187303	Signal Amplifier	SONOMA	310	07 Jul.2012	07 Jul.2013
966 Cable 1#	RF Cable	IMRO	IMRO-400	07 Jul.2012	07 Jul.2013
11003	Horn Antenna	DAZE	ZN30701	11 Jul.2012	11 Jul.2013
11001	Signal Amplifier	DAZE	ZN3380C	07 Jul.2012	07 Jul.2013
966 Cable 1#	RF Cable	IMRO	IMRO-400	07 Jul.2012	07 Jul.2013

1.5 Measurement Uncertainty

Conducted Emission: 2.5 dB in the frequency range of 150kHz-30MHz at a level of confidence of 95%.

Radiated Emission: 3.2dB in the frequency range of 30MHz-10GHz 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 (2009).

The EUT was powered by 120V/60Hz in the testing.

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

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

A variable resistor load was used during test.

2.4 Equipment Modification

Any modifications installed previous to testing by BRK Brands 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	Pass
15.215	20 dB bandwidth	Pass
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: Wire antenna.

3.2 Conducted Emission

The data on the following page lists the significant emission frequencies, emission level and the limit of compliance. Judgement: Passed by 38.59 dB at 0.62 MHz

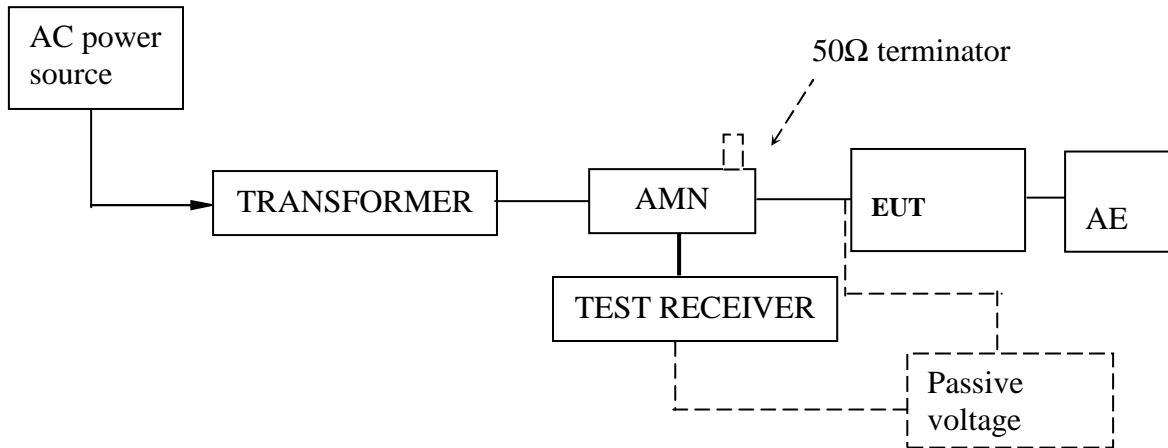
3.2.1 Conducted Emission Limits

According to FCC 15.207, for an intentional radiator that is designed to be connected to the public utility(AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150kHz to 30MHz, shall not exceed the limits in the following table:

Frequency of emission(MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

3.2.2 Block Diagram of Test Setup



3.2.3 Conducted Emission Test Data

Test was performed on the low, middle and high frequencies: 908MHz, 914MHz, 919MHz, only the data of 908MHz was presented in this report since it's the worst case.

Conducted Emissions

Pursuant to FCC 15.207: Conducted Emissions Requirement

	Frequency [MHz]	Quasi-Peak		Average	
		Disturbance level [dB(uV)]	Permitted limit [dB(uV)]	Disturbance level [dB(uV)]	Permitted limit [dB(uV)]
L	0.310	12.5	60.0	10.6	50.0
	0.620	12.8	56.0	7.4	46.0
	1.310	12.7	56.0	7.1	46.0
N	1.330	14.7	56.0	6.9	46.0
	4.480	14.4	56.0	5.8	46.0
	12.990	13.9	60.0	7.8	50.0

3.3 Radiated Emission

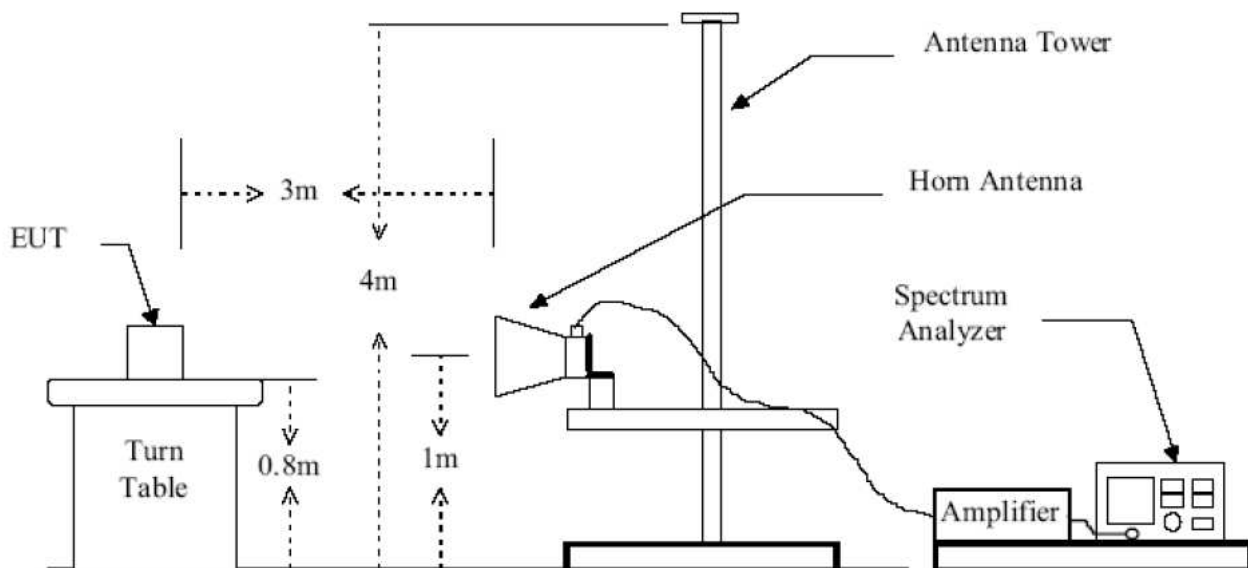
Data is included worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.3.1 Radiated Emission Limits

According to FCC 15.249, operating within the bands 902-928 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)
902-928	50	500

3.3.2 Test Setup



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.

$$\begin{aligned} \text{FS} &= \text{RA} + \text{AF} + \text{CF} - \text{AG} + \text{PD} + \text{AV} \\ \rightarrow \text{FS} &= \text{RA} + \text{Correct Factor} + \text{AV} \end{aligned}$$

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:

$$\text{FS} = \text{RA} + \text{AF} + \text{CF} - \text{AG} + \text{PD} + \text{AV}$$

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

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

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

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

3.3.4 Radiated Emission Test Data

Operation: EUT on transmitting

Radiated Emissions

908MHz

Emissions Requirement (below 1GHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Correction Factor (dB)	Net at 3m (dBμV/m)	QP Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	30.970	27.5	-12.6	14.9	40.0	-25.1
Horizontal	212.360	35.3	-17.9	17.4	43.5	-26.1
Horizontal	908.000	50.6	-0.9	49.7	94.0	-44.3
Vertical	107.600	33.6	-20.9	12.7	43.5	-30.8
Vertical	212.360	35.7	-17.9	17.8	43.5	-25.7
Vertical	908.000	52.8	-0.9	51.9	94.0	-42.1

Emissions Requirement(above 1GHz)

Polarization	Frequency (MHz)	PK Reading (dBμV)	Correction Factor (dB)	PK Net at 3m (dBμV/m)	AV Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	1816.000	34.8	7.1	41.9	54.0	-12.1
Horizontal	2724.000	41.5	11.5	53.0	54.0	-1.0
Horizontal	6852.000	24.4	25.5	49.9	54.0	-4.1
Vertical	1816.000	35.5	7.1	42.6	54.0	-11.4
Vertical	2724.000	37.4	11.5	48.9	54.0	-5.1
Vertical	6929.000	25.1	25.7	50.8	54.0	-3.2

- 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.

914MHz

Emissions Requirement (below 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	26.0	-12.0	14.0	40.0	-26.0
Horizontal	212.360	35.0	-17.9	17.1	43.5	-26.4
Horizontal	914.000	50.0	-0.7	49.3	94.0	44.7
Vertical	107.600	36.0	-20.9	15.1	43.5	-28.4
Vertical	224.000	33.0	-17.3	15.7	46.0	-30.3
Vertical	914.000	53.0	-0.7	52.3	94.0	-41.7

Emissions Requirement(above 1GHz)

Polarization	Frequency (MHz)	PK Reading (dBμV)	Correction Factor (dB)	PK Net at 3m (dBμV/m)	AV Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	1828.000	34.4	7.3	41.7	54.0	-12.3
Horizontal	2742.000	38.6	11.6	50.2	54.0	-3.8
Horizontal	5884.000	25.0	23.1	48.1	54.0	-5.9
Vertical	1828.000	33.0	7.0	40.0	54.0	-14.0
Vertical	2742.000	39.0	-11.6	50.6	54.0	-3.4
Vertical	7490.000	25.0	-26.0	51.0	54.0	-3.0

- 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.

919MHz

Emissions Requirement (below 1GHz)

Polarization	Frequency (MHz)	Reading (dBμV)	Correction Factor (dB)	Net at 3m (dBμV/m)	QP Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	212.360	38.8	-17.9	20.9	43.5	-22.6
Horizontal	418.000	32.8	-11.3	21.5	46.0	-24.5
Horizontal	919.000	53.2	-0.5	52.7	94.0	-41.3
Vertical	107.600	38.5	-20.9	17.6	43.5	-25.9
Vertical	468.400	35.6	-9.8	25.8	46.0	-20.2
Vertical	919.000	52.6	-0.5	52.1	94.0	-41.9

Emissions Requirement(above 1GHz)

Polarization	Frequency (MHz)	PK Reading (dBμV)	Correction Factor (dB)	PK Net at 3m (dBμV/m)	AV Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	1838.000	34.2	7.3	41.5	54.0	-12.5
Horizontal	2757.000	37.6	11.7	49.3	54.0	-4.7
Horizontal	7237.000	24.6	26.0	50.6	54.0	-3.4
Vertical	1838.000	35.1	7.3	42.4	54.0	-11.6
Vertical	2757.000	39.0	11.7	50.7	54.0	-3.3
Vertical	7105.000	25.7	25.9	51.6	54.0	-2.4

- 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 2724.000 MHz
Judgement: Passed by 1.0dB

3.4 Band Edges Measurement

3.4.1 Limited of the band edges measurement

Sec15.249:

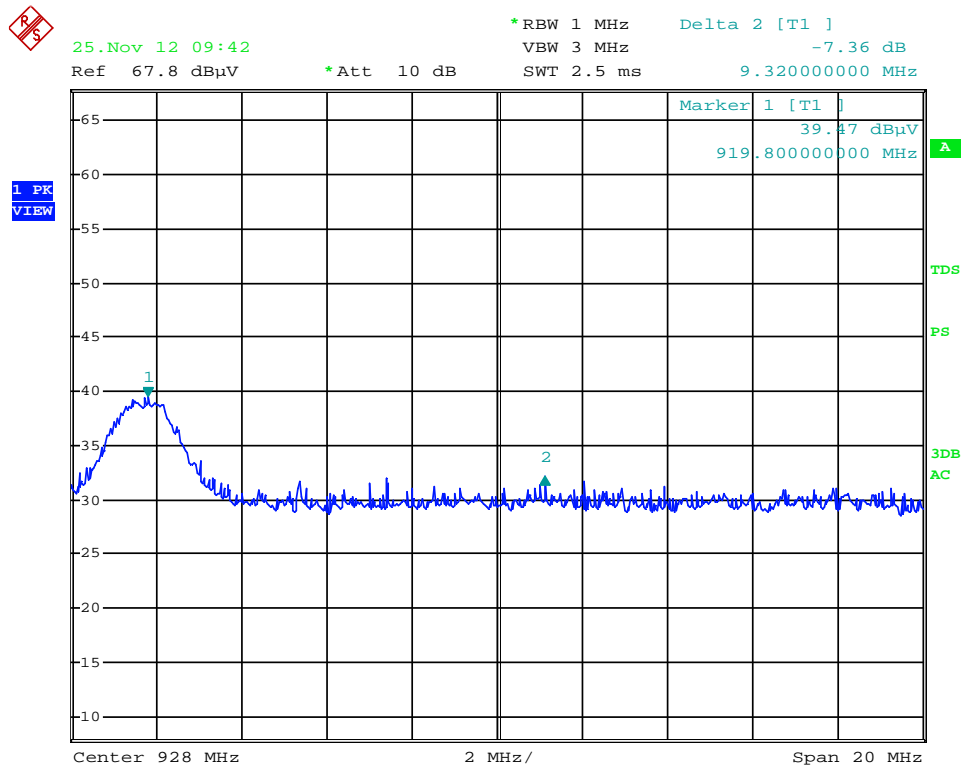
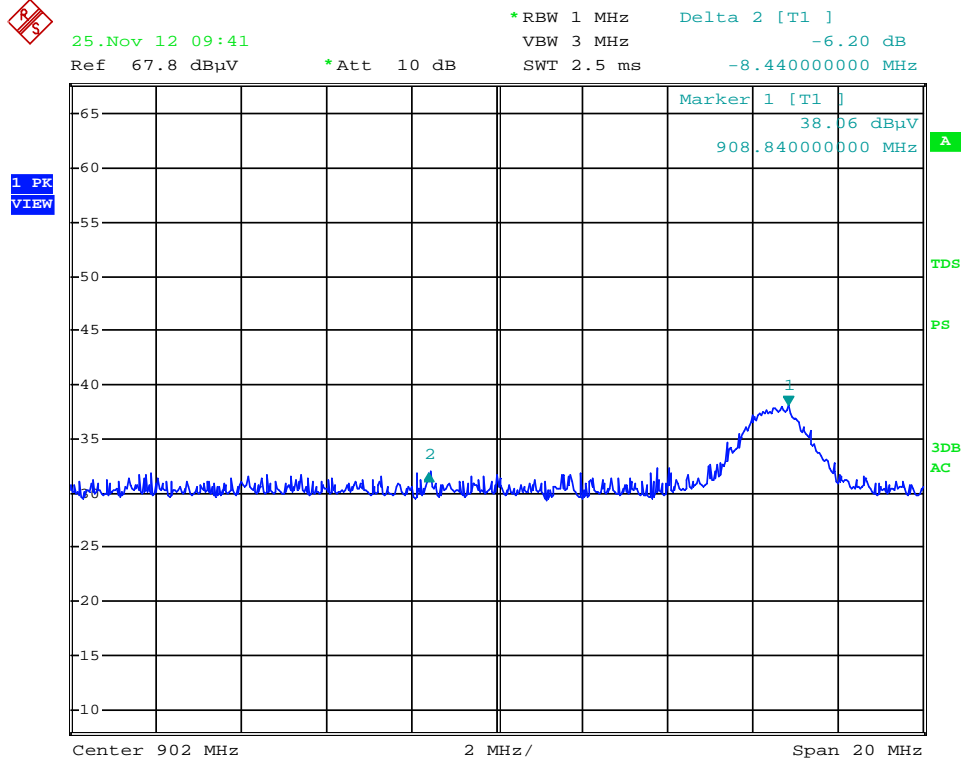
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Sec15.215:

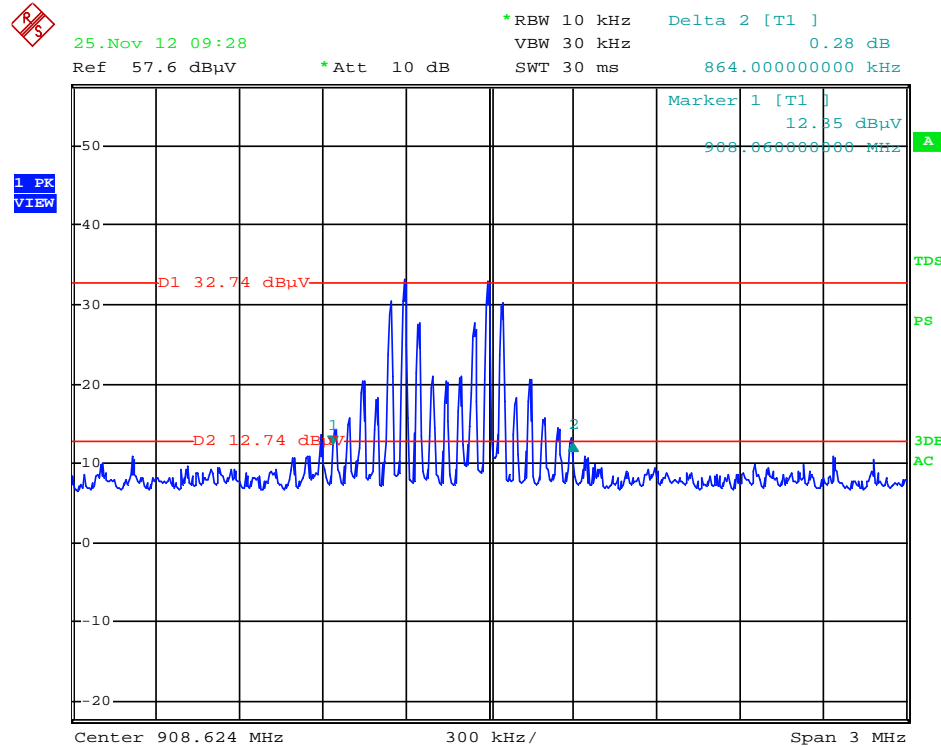
(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20dB bandwidth may otherwise be specified in the specific rule section under which the equipment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

3.4.2 Test Plot

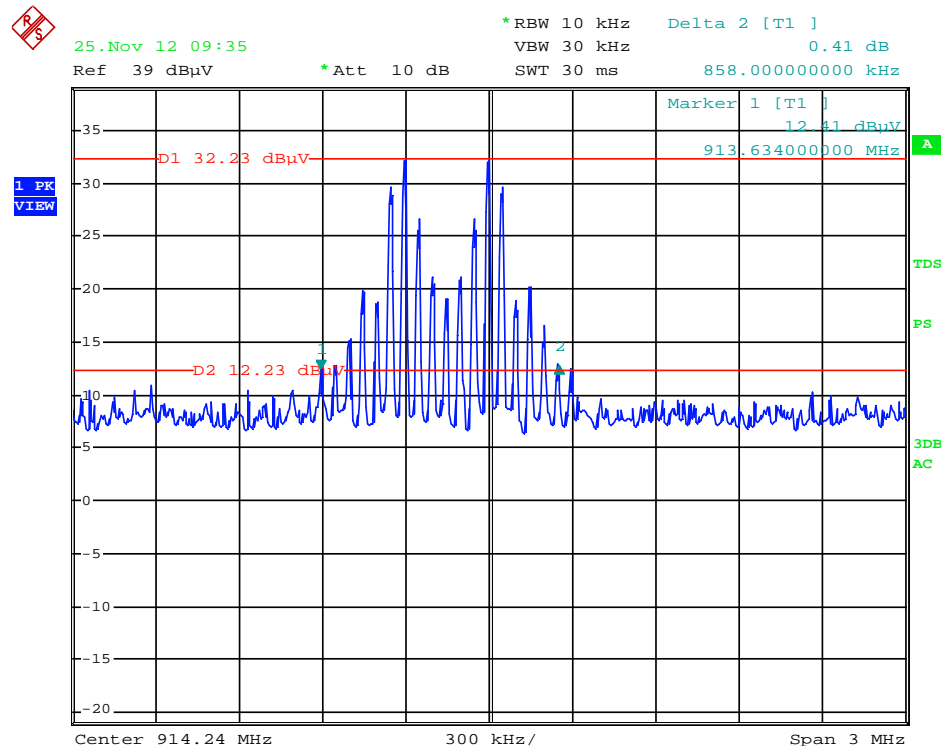
Band edges
Operating mode: Transmitting



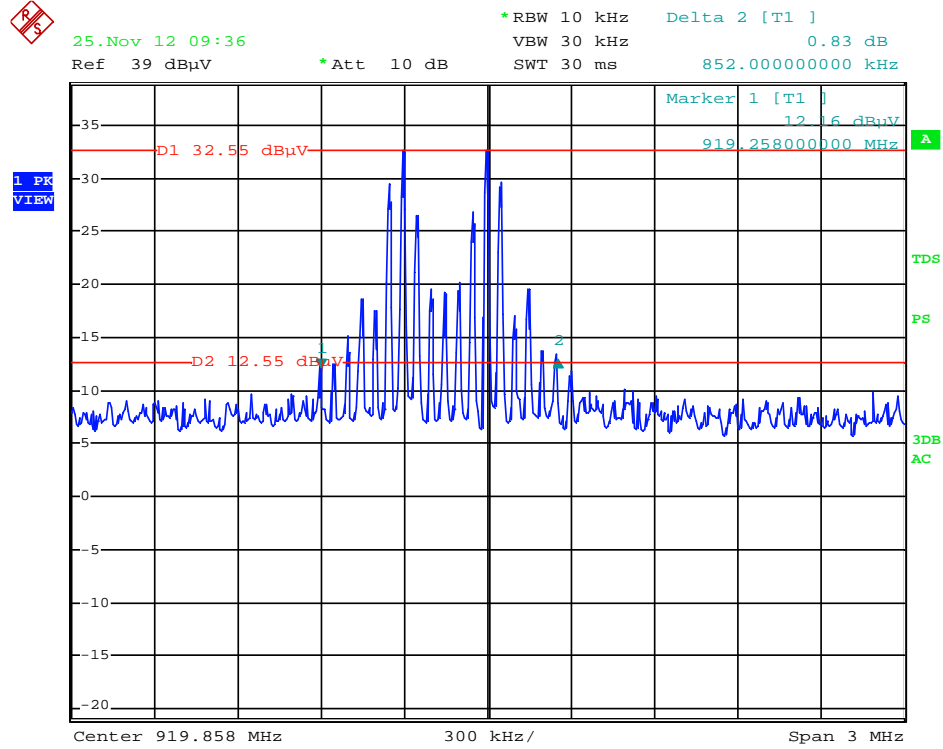
20dB Bandwidth
Operating mode: Transmitting
908MHz



914MHz:



919MHz:



3.4.3 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).

Quasi-Peak Measurement

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

(i) Lower bandedge:

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

$$\begin{aligned} &= 51.90\text{dB}\mu\text{v/m} - 6.20\text{dB} \\ &= 45.70\text{dB}\mu\text{v/m} \end{aligned}$$

(ii) Upper bandedge:

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

$$\begin{aligned} &= 52.7\text{dB}\mu\text{v/m} - 7.36\text{dB} \\ &= 45.34\text{dB}\mu\text{v/m} \end{aligned}$$

The QP resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 46 dB μ v/m (QP Limit).

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

The product has 100% duty cycle.

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