



# FCC PART 15.231 EMI MEASUREMENT AND TEST REPORT

# For **K&J Electronics**

#103-603, Buchun Techno-Park, Buchin-city, Kyunggi-do, Korea 421-809

FCC ID: UNYEWPP202

Model: EWPP-202

This Report Concerns: **Product Type:** Original Report Wireless Push Button **Test Engineer:** Oscar Au **Report No.:** R0609217 **Report Date:** 2006-09-25 James Mu **Reviewed By:** Test Engineer: James Ma **Prepared By:** Bay Area Compliance Laboratory Corp. 1274 Anvilwood Ave. Sunnyvale, CA 94089, U.S.A. Tel: (408) 732-9162 Fax: (408) 732-9164

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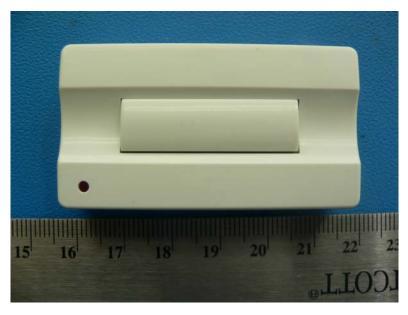
#### **GENERAL INFORMATION**

# **Product Description for Equipment Under Test (EUT)**

The *K&J Electronics* product, *FCCID: UNYEWPP202*, model *EWPP-202* or the "EUT" as referred to in this report is a Wireless Push Button which measures approximately 55mm L x 30mm W x 15mm H. The EUT is designed to operate at 315 MHz frequency.

\* The test data gathered are from production sample, serial number: KJ0002, provided by the manufacturer.

#### **EUT Photo**



Additional Photos in Exhibit C

### **Objective**

This report is prepared on behalf of *K&J Electronics* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine compliance with FCC rules, Part 15.231 for radiated emission, 20dB Bandwidth, and Deactivation.

### **Related Submittal(s)/Grant(s)**

No Related Submittals

# **Test Methodology**

All measurements contained in this report were conducted with ANSI C63.4 –2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurements were performed at BACL.

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# **Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from  $\pm 2.0$  for Conducted Emissions tests and  $\pm 4.0$  dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

# **Test Facility**

The Test site used by BACL to collect radiated and conducted emission measurement data is located at 1274 Anvilwood Ave, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at <a href="http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm">http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm</a>

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# **SYSTEM TEST CONFIGURATION**

#### **Justification**

The EUT was tested in accordance with ANSI C63.4-2003.

### **EUT Exercise Software**

None, the EUT was exercised in normal operating mode as detailed in the *K&J Electronics* provided instructions.

# **Special Accessories**

None

# **Schematics / Block Diagram**

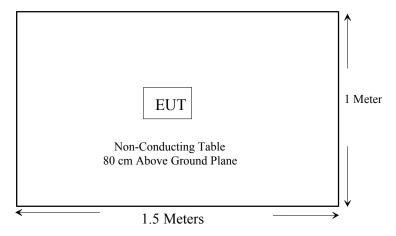
Exhibit A contains a copy of the EUT's schematics diagram as reference.

# **Equipment Modifications**

No modifications were made to the EUT.

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# **Test Setup Block Diagram**



# **SUMMARY OF TEST RESULTS**

FCC Rules	REQUIREMENTS	RESULT
§15.203	Antenna Requirement	Compliant
§15.205	Restricted Bands of Operation	Compliant
§15.207	Conducted Emissions	N/A
§15.209	Radiated Emissions, General Requirements	Compliant
§15.231 (a) (1)	5 second manual deactivation	Compliant
§15.231 (a) (2)	5 second automatic deactivation	N/A
§15.231 (a) (3)	Non predetermined transmission intervals. Aggregate Tx <2s/hr.	N/A
§15.231 (a) (4)	Transmissions during an emergency	N/A
§15.231 (a) (5)	15.211 (a)(1) & (a)(2) may be up to 10 seconds during professional installation	
§15.231 (b)	Field strength of emissions	Compliant
§15.231 (b) (1)	Field strength limits at 3 meters	Compliant
§15.231 (b) (2)	Field strength; average or QP, 15.35 for averaging pulsed emissions and for limiting peak emissions) or QP detector	Compliant
§15.231 (b) (3)	F/S Limits of spurious emissions	Compliant
§15.231 (c)	Emission B/W	Compliant
§15.231 (d)	40.66–40.70 MHz; Frequency and Voltage Tolerance	N/A
§15.231 (e)	Relaxed restrictions with reduced F/S limits	N/A

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# §15.203 - ANTENNA REQUIREMENT

# **Applicable Standard**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Refer to statement below for compliance.

"The antenna for this device is an integral antenna that the end user cannot access. Furthermore the device is for indoor/outdoor use as detailed in the Users Manual and Operational Description".

### **Antenna Connected Construction**

This product has a built-in onboard antenna, fulfilling the requirement of this section.

**◯** Compliant

N/A

# §15.207 – CONDUCTED EMISSIONS

# **Applicable Standard**

(a) Except as shown in paragraphs (b) and (c) of this section, 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 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

the boundary between the frequencies ranges.	
This test is Not Applicable (N/A) to the EUT. The EUT is designed to be connected to the public utility (AC) power	
☐ Compliant	⊠ N/A

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# §15.205, §15.209, & §15.231(a1-a5) – RESTRICTED BAND AND RADIATED EMISSION DATA

# Applicable Standard: FCC §15.205 Restricted bands of operation

(a) Except as shown in 15.205 paragraphs (d), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.090 - 0.110	8.291 – 8.294	16.69475 – 16.69525	156.7 – 156.9	1435 – 1626.5	3. 332 – 3. 339	10.6 - 12.7
0.495 - 0.505	8.362 - 8.366	25.5 – 25.67	162.0125 -167.17	1645.5 – 1646.5	3. 3458 – 3 .358	13.25 – 13.4
2.1735 - 2.1905	8.37625 - 8.38675	37.5 – 38.25	167.72 – 173.2	1660 – 1710	3.600 – 4.400	14.47 – 14.5
4.125 – 4.128	8.41425 - 8.41475	73 - 74.6	240 – 285	1718.8 – 1722.2	4. 5 – 5. 15	15.35 – 16.2
4.17725 – 4.17775	12.29 – 12.293	74.8 - 75.2	322 – 335.4	2200 - 2300	5. 35 – 5. 46	17.7 – 21.4
4.20725 - 4.20775	12.51975 - 12.52025	108 – 121.94	399.9 – 410	2310 - 2390	7.25 - 7.75	22.01 – 23.12
6.215 - 6.218	12.57675 – 12.57725	123 – 138	608 - 614	2483.5 – 2500	8.025 - 8.5	23.6 – 24.0
6.26775 - 6.26825	13.36 – 13.41	149.9 - 150.05	960 – 1240	2690 – 2900	9.0 - 9.2	31.2 – 31.8
6.31175 - 6.31225	16.42 – 16.423	156.52475 – 156.52525	1300 - 1427	3260 - 3267	9.3 - 9.5	36.43 – 36.5
						Above 38.6

(b) Except as provided in 15.205 paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(c) Except as provided in paragraphs (		
in this Subpart, the provisions of this	Section apply to emissions from a	ny intentional radiator.

Compliant	N/A

### Applicable Standard: FCC §15.209 Radiated emission limits, general requirements.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

<sup>\*\*</sup> Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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(h) In the emission table of	dhe dishder limit emplis eddhe hend ede				
(b) In the emission table above, the tighter limit applies at the band edges.					
	☑ Compliant	∐N/A			
Applicable Standard: F above 70 MHz.	CC §15.231 Periodic operation in the l	oand 40.66 - 40.70 MHz and			
40.70 MHz and above 70 M restricted to the transmission remote switches, etc. Continuous	Section are restricted to periodic operation w MHz. Except as shown in paragraph (e) of this on of a control signal such as those used with nuous transmissions, voice, video and the rad to be sent with a control signal. The follows for this periodic operation:	s Section, the intentional radiator is alarm systems, door openers, dio control of toys are not			
	<b>∑</b> Compliant	□N/A			
	transmitter shall employ a switch that will a than 5 seconds of being released.	utomatically deactivate the			
	<b>⊠</b> Compliant	□N/A			
a(2): A transmitter activate	d automatically shall cease transmission with	nin 5 seconds after activation.			
	Compliant	⊠N/A			
However, polling or superv transmitters used in security not exceed more than two s	<b>a(3):</b> Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.				
	<b>∑</b> Compliant	□N/A			
<b>a(4):</b> Intentional radiators v fire, security, and safety of alarm condition.	which are employed for radio control purpose life, when activated to signal an alarm, may	es during emergencies involving operate during the pendency of the			
	Compliant	⊠N/A			
in paragraphs (a)(1) and (a) professional installer and de	p information for security systems may exce (2) of this section, provided such transmission not exceed ten seconds after a manually operatically. Such set-up information may incl	on are under the control of a erated switch is released or a			
	Compliant Compliant	⊠N/A			

FCC ID: UNYEWPP202

K&J Electronics

# §15.231(a) – PERIODIC OPERATION IN THE BAND 40.66 – 40.70 MHz AND ABOVE 70 MHz

# **Applicable Standard Requirement**

(a) The provisions of this Section are restricted to periodic operation within the band 40.66 - 40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this Section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

<sup>\*</sup> **Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

# **Test Setup Diagram**



#### **Environmental Conditions**

Temperature:	21 ° C
Relative Humidity:	56%
ATM Pressure:	1008mbar

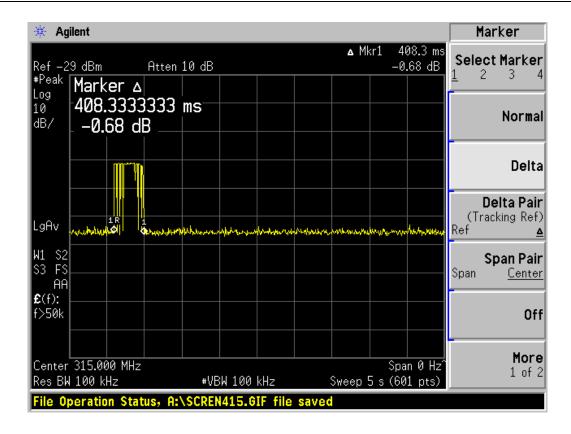
The testing was performed by Oscar Au on 2006-09-24.

#### **Test Result**

Frequency (MHz)	Transmission Time Measurement (Sec)	Time Limit Line (Sec)	Pass/Fail
315	0.408	5	PASS

Please see the following plots:

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# §15.231(b) – FIELD STRENGTH OF EMISSIONS

# **Applicable Standard Requirement**

**(b):** In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency	Field strength of fundamental	Field strength of spurious emissions
(MHz)	(microvolts/meter)	(microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750**	125 to 375**
174-260	3,750	375
260-470	3,750 to 12,500**	375 to 1,250**
Above 470	12,500	1,250

**Linear interpolations						
	<b>⊠</b> Compliant	□N/A				
<b>b(1):</b> The above field str band edges.	ength limits are specified at a dis	stance of 3 meters. The tighter limit	ts apply at the			
	<b>⊠</b> Compliant	□N/A				
the limits on the field streemeasured emissions. As a use of measurement instruent measurement employed semission measurements a limiting peak emissions a	<b>b(2):</b> Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.					
	Compliant	N/A				

# **Radiated Emissions EUT Setup**

The radiated emission tests were performed in the closed chamber 3-meter test site, using the setup in accordance with ANSI C63.4 - 2003. The specification used was the FCC Subpart C limits.

The spacing between the peripherals was 10 centimeters.

The EUT was placed on the center of the back edge on the test table.

### **Spectrum Analyzer Setup**

According to FCC CFR 47, Section 15.33, the EUT was tested to 5GHz.

During the radiated emission test, the CISPR quasi-peak detection was employed:

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#### **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Cal Date
Sonoma Instruments	Pre amplifier	317	260408	2006-02-03
Agilent	Pre amplifier	8449B	3008A01978	2005-10-10
Sunol Science Corp	Combination Antenna	JB3 Antenna	A020106-3	2006-02-14
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.595 0K03	20-174821	2006-02-24
Sunol Science Corp	System Controller	SC99V	113005-1	N/R

<sup>\*</sup> Statement of Traceability: BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

#### **Test Procedure**

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

According to §15.231, Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emission, based on the average value of the measured emissions. As an alternative, compliance with the limits may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

# **Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corrected Amplitude = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corrected Amplitude – FCC Limit

#### **Environmental Conditions**

Temperature:	21 ° C
Relative Humidity:	55%
ATM Pressure:	1008mbar

The testing was performed by Oscar on 2006-09-24.

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#### **Summary of Test Results**

According to the data in the following table, the EUT <u>complied with the FCC 15.231(b)</u> standards and these test results are deemed satisfactory evidence of compliance with ICES-003 of the Canadian Interference-Causing Equipment Regulations, and had the worst margin reading of:

-14.2 dB at 315 MHz in the Horizontal polarization.

### Radiated Emissions Test Data, 3 meters

Frequency	Meter Reading	Detector	Direction	Height	Polar	Correction factor	Corrected reading	FCC Par	t 15.231
		PK/QP/AV	Degree	Meter	H / V	dB	dBuV/m	Limit dBuV/m	Margin (dB)
315	83.8	AV	250	1.5	Н	22.4	61.4	75.6	-14.2
315	97.5	PK	250	1.5	Н	22.4	75.1	95.6	-20.5
315	76.5	AV	160	1.6	V	22.4	54.1	75.6	-21.5
945	45.4	AV	300	1.5	Н	12.9	32.5	55.6	-23.1
630	48.8	AV	200	1.3	Н	16.7	32.1	55.6	-23.5
945	44.6	AV	180	1.3	V	12.9	31.7	55.6	-23.9
315	93.4	PK	160	1.6	V	22.4	71	95.6	-24.6
630	45.6	AV	180	1.2	V	16.7	28.9	55.6	-26.7
945	51.3	PK	300	1.5	Н	12.9	38.4	75.6	-37.2
630	54.3	PK	200	1.3	Н	16.7	37.6	75.6	-38
945	50.1	PK	180	1.3	V	12.9	37.2	75.6	-38.4
630	52.5	PK	180	1.2	V	16.7	35.8	75.6	-39.8

# Applicable Standard Requirement Continued: 15.231 b(3) F/S Limits of Spurious Emissions

Fundamental frequency	Field strength of fundamental	Field strength of spurious emissions
(MHz)	(microvolts/meter)	(microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750**	125 to 375**
174-260	3,750	375
260-470	3,750 to 12,500**	375 to 1,250**
Above 470	12,500	1,250

<sup>\*\*</sup>Linear interpolations

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

<b>◯</b> Compliant	N/A
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# §15.231(c) – EMISSIONS BANDWIDTH

## **Applicable Standard Requirement**

(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

**Compliant** 

N/A

# **Test Equipment List and Details**

Manufacturer	Description	Model	Serial Number	Cal. Date
Agilent	Analyzer, Spectrum	E4446A	US44300386	2006-03-06

<sup>\*</sup> Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

# **Test Setup Diagram**



#### **Environmental Conditions**

Temperature:	21 ° C
Relative Humidity:	55%
ATM Pressure:	1008mbar

The testing was performed by Oscar Au on 2006-09-24.

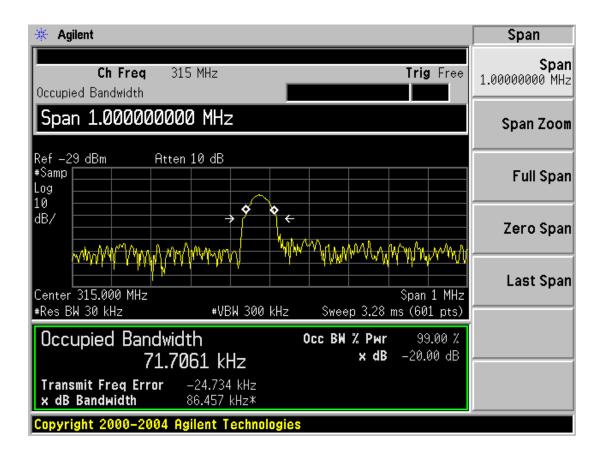
#### **Test Result**

Limit = Frequency X  $0.25\% = 314.96 \times 0.25\% = 787.4 \text{ kHz}$ 

Fund. Frequency (MHz)	20dB Bandwidth Emission (KHz)	Limit (KHz)	Result
315	86.46	787.4	PASS

Please refer to the following plot.

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# §15.231(d), (e) – FREQUENCY AND VOLTAGE TOLERANCE, RELAXED RESRICTIONS WITH REDUCED F/S LIMITS

# **Applicable Standards**

(d) For devices operating within the frequency band 40.66-40.70 MHz, the bandwidth of the emission shall be confined within the band edges and the frequency tolerance of the carrier shall be  $\pm 0.01\%$ . This frequency tolerance shall be maintained for a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

☐ Compliant ☐ N/A

(e) Intentional radiators may operate at a periodic rate exceeding that specified in § (a) of this section and may be employed for any type of operation, including operation prohibited in § (a) of this section, provided the intentional radiator complies with the provisions of §s (b) through (d) of this section, except the field strength table in § (b) of this section is replaced by the following:

Fundamental frequency	Field strength of fundamental	Field strength of spurious emissions
(MHz)	(microvolts/meter)	(microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500**	50 to 150**
174-260	1,500	150
260-470	1,500 to 5,000**	150 to 500**
Above 470	5,000	500

<sup>\*\*</sup>Linear interpolations.

In addition, devices operated under the provisions of this § shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

☐ Compliant ☐ N/A

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