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FCC TEST REPORT

PART 15.231

APPLICANT	ENTERPRISE ELECTRONICS, L.L.C.
ADDRESS	2120 AUSTIN DRIVE ROCHESTER HILLS MI 48309 USA
FCC ID	QV4-LRL0006
PRODUCT DESCRIPTION	KEYPAD TRANSMITTER
DATE SAMPLE RECEIVED	5/28/2007
DATE TESTED	5/30/2007
TESTED BY	Joseph Scoglio
APPROVED BY	Mario de Aranzeta
TIMCO REPORT NO.	E\ENTERPRISE_QV4\830AZUT7\830AZUT7TestReport.doc
TEST RESULTS	☒ PASS ☐ FAIL
TOTAL PAGES	13

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GENERAL INFORMATION

DUT Specification

The test results relate only to the items tested.		
FCC ID	QV4-LRL0006	
Product Description	KEYPAD TRANSMITTER	
Operating Frequency	315 MHz	
DUT Power	*Primary Power*	3 volts dc
	Secondary Power	N/A
Test Item	☐ Prototype	
	☒ Pre-Production	
	☐ Production	
Type of Equipment	☒ Fixed	
	☐ Mobile	
	☐ Portable	
Test standards	FCC Part 15, Subparts C ANSI C63.4 – 2003	
Modification to the DUT	Changed R8, currently 120 ohms to 150 ohms	
Test exercise	The DUT was set in continuous transmit mode of operation.	
Test Facility	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669.	

COMPLIANCE WITH PART 15.231(a)

Part 15.231(a):

- Continuous operation: Yes☐ No☒
- Control signal only: Yes☒ No☐
- Data transmission with a control signal Yes☒ No☐ N/A☐
  Description of control signal: a command to unlock the door, unlock the truck and lock the door *(notes: indicate whether such info is included in supporting exhibit such as operation description page xx)*

Part 15.231(a)(1):

- Manually operated device: Yes☒ No☐
- Does it meet the 5s deactivation requirement after the switch is being released: Yes☒ No☐

Description: It stops within 100msec *(notes: a plot showing the pulse train does not necessarily constitute an objective evidence of compliance with the deactivation requirement. A plot should be accompanied by an explanation and/or statement of compliance, if not otherwise clearly stated in supporting documentation e.g. operation description page xx)*

Part 15.231(a)(2):

- Automatically operated device: Yes☐ No☒
- Does it meet the 5s deactivation requirement after being activated: Yes☐ No☐

Description: _____*(notes: a plot showing the pulse train does not necessarily constitute an objective evidence of compliance with the deactivation requirement. A plot should be accompanied by an explanation and/or statement of compliance, if not otherwise clearly stated in supporting documentation e.g. operation description page xx)*

Part 15.231(a)(3):

- Periodic transmission at regular predetermined intervals: Yes☐ No☒ N/A☐

Description: _____

- Polling or supervision transmissions, including data, to check system integrity check requires a total transmission time not exceeding 2s per hour: Yes☐ No☐ N/A☒

Part 15.231(a)(4):

Operation involving fire, security, or safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

Does the transmitter meet the condition? Yes☐ No☐ N/A☒

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/20/07	3/19/10
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/11/07	5/10/10
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
Analyzer Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 5/17/07	5/17/09
Analyzer Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 5/17/07	5/17/09
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 5/17/07	5/17/09
Analyzer Silver Tower Spectrum Analyzer	HP	8566B Opt 462	3552A22064 3638A08608	CAL 10/30/06	10/30/08
Analyzer Silver Tower RF Preselector	HP	85685A	2620A00294	CAL 3/6/07	3/6/09
Analyzer Silver Tower Quasi-Peak Adapter	HP	85650A	3303A01844	CAL 10/30/06	10/30/08
Analyzer Open-Frame Tower Preamplifier	HP	8449B	3008A01075	CAL 8/8/05	8/8/07
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/06	10/11/08
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	CAL 12/1/06	12/1/08

TEST PROCEDURE

RADIATION INTERFERENCE: The test procedure used was ANSI C63.4-2003 using a spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz. The ambient temperature of the DUT was 98.3°F with a humidity of 40%.

FORMULA OF CONVERSION FACTORS: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

Freq (MHz)	METER READING	+ CL	+ ACF	= FS
33	20 dBuV	+ 1.02	+ 10.36 dB	= 31.38 dBuV/m @ 3m

ANSI STANDARD C63.4-2003 10.1.7 MEASUREMENT PROCEDURES: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings were converted to average readings based on the duration of "ON" time.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

RADIATION INTERFERENCE

RULES PART NO.: 15.231

REQUIREMENTS:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBµV)	Field Strength of Harmonics and Spurious Emissions (dBµV/m @ 3m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	71.48 to 81.94	51.48 to 61.94
470 and above	81.94	61.94

The limit for average field strength dBuV/m for the fundamental frequency = 75.63 dBµV/m. No fundamental is allowed in the restricted bands.

The limit for average field strength dBuV/m for the harmonics and spurious frequencies = 55.63 dBµV/m. Spurious in the restricted bands must be less than 54 dBµV/m or 15.209.

TEST DATA:

Emission Frequency MHz	*	Meter Reading dBuV	Ant. Pol.	Coax Loss dB	Correction Factor dB/m	Duty Cycle Factor dB	Field Strength dBuV/m	Margin dB
315.00		49.2	V	2.68	15.30	13.00	54.18	21.45
315.00		58.6	H	2.68	14.80	13.00	63.08	12.55
630.00		35.8	V	3.98	19.40	13.00	46.18	9.44
630.00		43.1	H	3.98	19.80	13.00	53.88	1.74
945.00		20.0	V	3.24	24.70	13.00	34.94	20.69
945.00		31.1	H	3.24	24.30	13.00	45.64	9.99
1,890.0		27.6	H	1.65	31.02	13.00	47.27	8.36
3,150.0		23.1	V	2.15	32.89	13.00	45.14	10.49
3,150.0		27.3	H	2.15	32.89	13.00	49.34	6.29

** -DENOTES RESTRICTED BANDS.

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows:
1) for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F)-6136.3636;
2) for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F)-7083.3333.

Emissions attenuated more than 20 dB below the permissible value are not reported.

Sample Calculation of Limit @ 315 MHz:

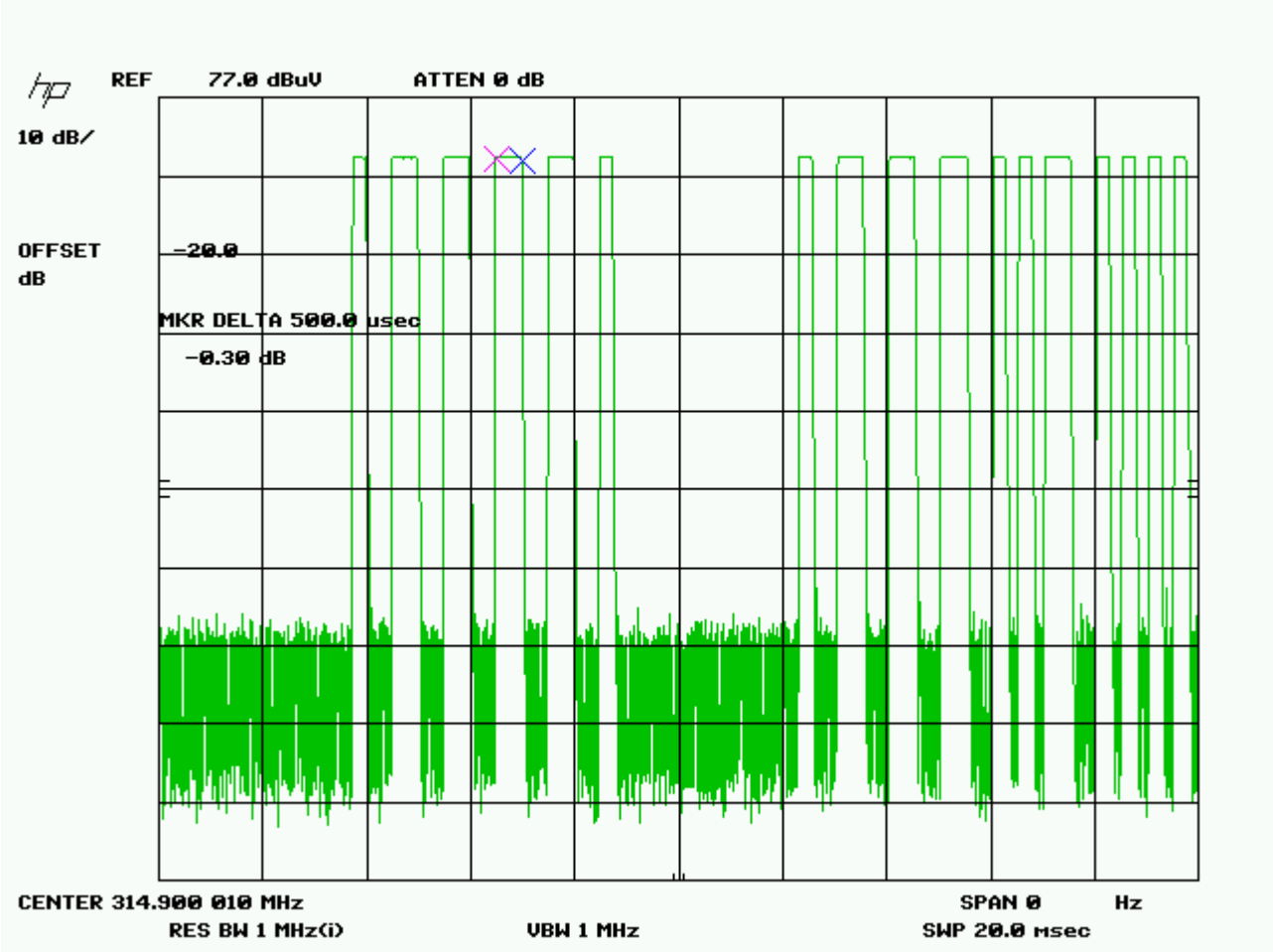
41.6667 (315)-7083.3333 = 6041.68 uV/m
20log(6048.68) = 75.63 dBuV/m limit @ 315 MHz

CALCULATION OF DUTY CYCLE

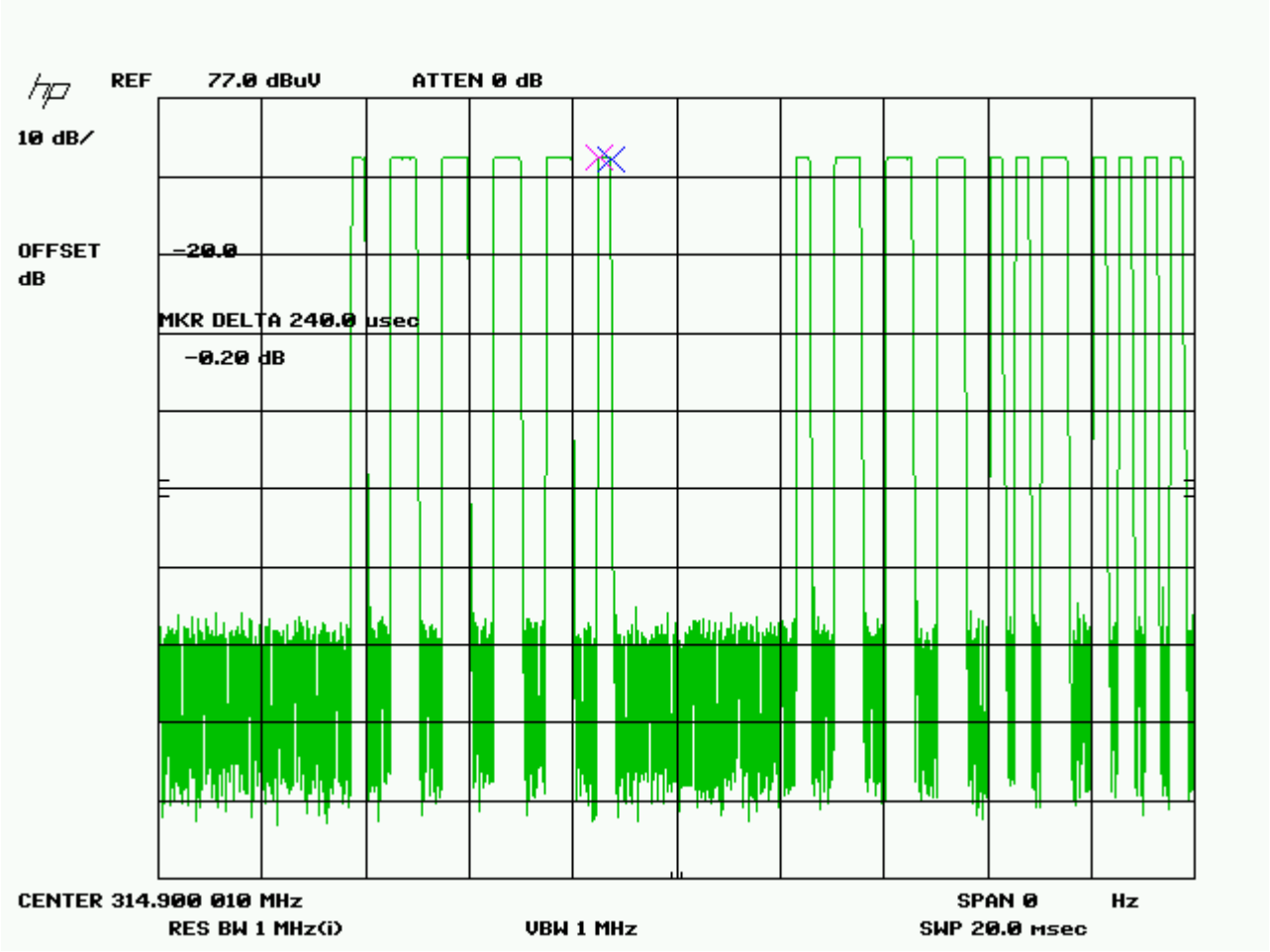
The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100 milliseconds. This sweep determines the duration of the pulse train. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100 millisecond Plot, the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the DUT is on within 100 ms. If the pulse train is longer than 100 ms then this number is multiplied by 100 to determine the percentage ON TIME. If the pulse train is less than 100 ms the total on time is divided by the length of the pulse train and then multiplied by 100 to determine the percentage ON TIME. In this case there were 28 short pulses .240 mS long and 31 long pulses .500 ms long for a total of 22.22 ms ON TIME within a 100 ms pulse train. The average field strength is determined by multiplying the peak field strength by the percent on time.

dB = 20*log(ON TIME)/PERIOD
dB = 20*log(22.22/100)
dB = 20*log(0.2222)
dB = -13.065

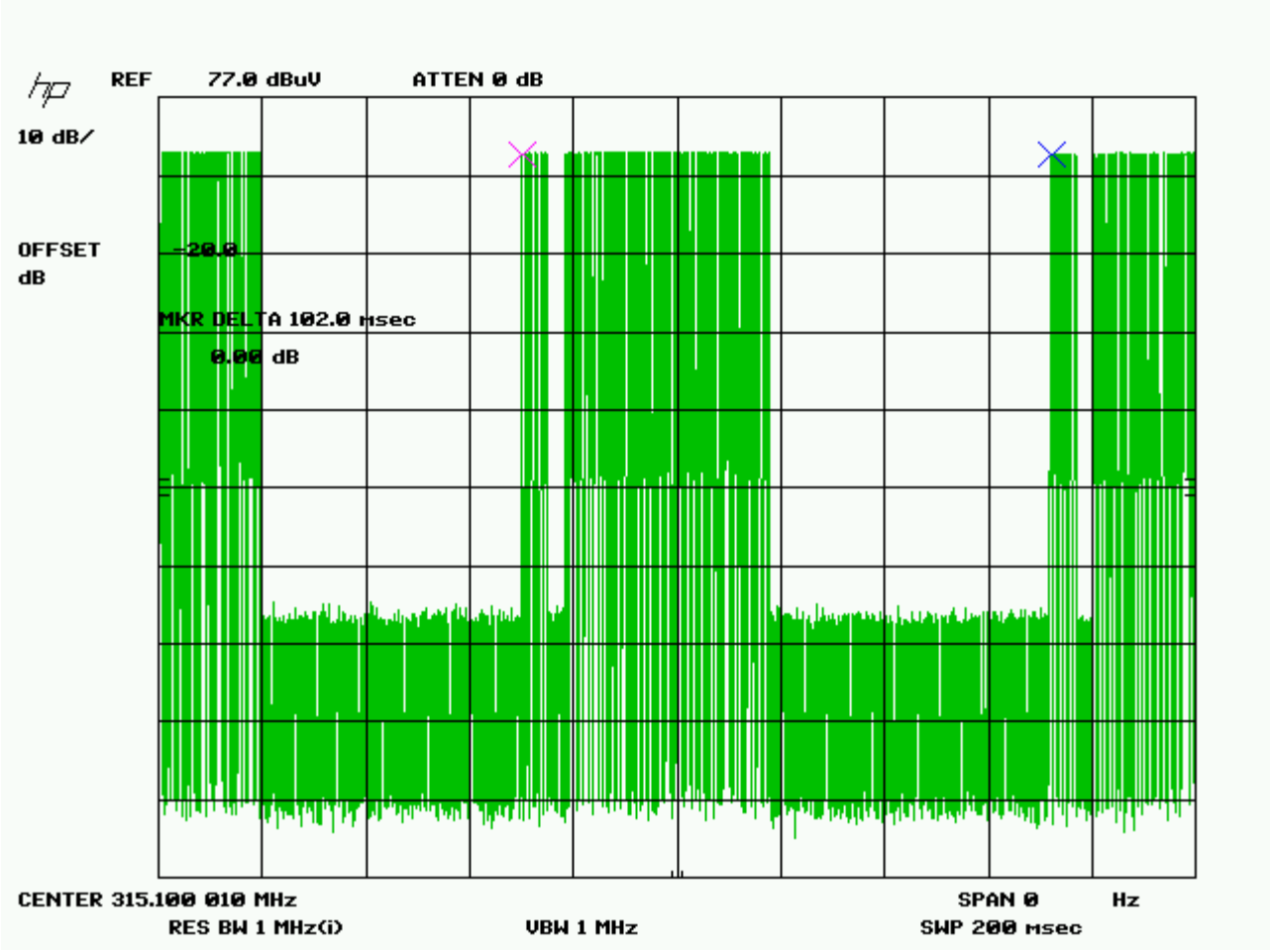
DUTY CYCLE PLOT – LONG PULSES



DUTY CYCLE PLOT – SHORT PULSES



DUTY CYCLE PLOT



OCCUPIED BANDWIDTH

Rules Part No.: 15.231(C)

Requirements: The bandwidth of the emission shall be no wider than .25% of the center frequency for devices operating between 70 and 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Method Of Measurement: A small sample of the transmitter output was fed into the spectrum analyzer and the following plot was generated. The vertical scale is set to 10 dB per division.

Test Data: The following plot represents the emissions taken for the device.

315 MHz * .0025 = .7875 MHz
.7875 MHz/2 = +/- 393.750 kHz

OCCUPIED BANDWIDTH PLOT