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TEST REPORT PER
FCC PART 15.249 LOW POWER
UNLICENSED INTENTIONAL RADIO

Applicant	SHANGHAI HELANG ELECTRONICS CO., LTD.
Address	NO. 960, SHENGLONG RD, JIU FU ECONOMIC DEVELOPMENT ZONE JIUTING TOWN, SONGJIANG DISTRICT SHANGHAI 201615 CHINA, P.C.
FCC ID	STPHL24T2
Product Description	TOY REMOTE CONTROL
Date Sample Received	July 18, 2007
Date Tested	July 19, 2007
Tested By	Joe Scoglio
Approved By	Mario de Aranzeta
Report Number	2588AUT7TestReport.doc
Test Results	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**



Certificate # 0955-01

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ATTESTATION STATEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made by me or under my supervision, at TIMCO ENGINEERING, INC. located at 849 N.W. State Road 45, Newberry, Florida 32669.



Authorized by: Mario de Aranzeta
Signature: On file
Function: Test Lab Supervisor/ Engineer
Date: July 20, 2007

REPORT SUMMARY

Disclaimer	The test results relate only to the items tested.
Purpose of Test report	To demonstrate the DUT complies with FCC Pt 15.249 requirements to a 2.4 GHz low power intentional radio.
Applicable Standard	Pt 15.249, Pt 15.209, ANSI C63.4: 2003
Related Report(s)/Grant(s)	N/A

TEST ENVIRONMENT

Test Facility	All tests were performed by Timco Engineering Inc. which is located at 849 NW State Road 45 Newberry, FL 32669 USA
Test Condition	Normal Temperature: 23°C Relative Humidity: 55%

TEST SETUP

Deviation from the Standard(s)	N/A
Modification to the DUT	N/A
Test Exercise (e.g. software description, test signal, etc.)	The DUT was placed in continuous transmit mode of operation according to the applicant's instruction
Test Supporting Equipment	The DUT is a stand-alone device. No supporting equipment was connected to the DUT during the testing.

DUT SPECIFICATION

DUT Description	2.4 GHz Remote Toy Controller		
FCC ID	STPHL24T2		
Model Number	HL24T2		
Serial Number	N/A		
Operating Frequency	2.405 - 2.480 GHz		
Modulation	GFSK		
DUT Power Source	<input type="checkbox"/> 110-120Vac/50- 60Hz		
	<input type="checkbox"/> DC Power		
	<input checked="" type="checkbox"/> Battery Operated Exclusively		
Test Item	<input type="checkbox"/> Prototype	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Production
Type of Equipment	<input type="checkbox"/> Fixed	<input type="checkbox"/> Mobile	<input checked="" type="checkbox"/> Portable
Antenna	Integrated. Permanent attached.		
Antenna Connector	N/A		

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/20/07	3/19/10
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/06	10/11/08
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/07	4/29/09
Analyzer Blue Tower Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/13/07	4/13/09
Analyzer Blue Tower RF Preselector	HP	85685A	2926A00983	CAL 9/5/05	9/5/07
Analyzer Blue Tower Spectrum Analyzer	HP	8568B	2928A04729 2848A18049	CAL 4/13/07	4/13/09
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/07	4/28/09
Antenna: Log-Periodic	Eaton	96005	1243	CAL 12/14/05	12/14/07

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TEST PROCEDURE

Radiation Interference: The test was performed according to ANSI C63.4-2003 using a Hewlett Packard Model 8566B spectrum analyzer, a Hewlett Packard Model 85685A Pre-selector, a Hewlett Packard Model 85650A Quasi-Peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1.0 GHz and 1.0MHz with a video BW of 3.0MHz above 1.0 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

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	+ ACF	+ CL	= FS
33	20 dBuV	+ 10.36 dB	+ 0.5	= 30.86 dBuV/m @ 3m

Power Line Conducted Interference: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

ANSI C63.4-2003 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5 m. The DUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

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.: Pt 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) μ V/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) μ V/m @ 30 meters
1705 kHz to 30 MHz	29.54 dB μ V/m @ 30 meters
30 – 88	40.0 dB μ V/m @ 3 meters
80 – 216	43.5 dB μ V/m @ 3 meters
216 – 960	46.0 dB μ V/m @ 3 meters
Above 960	54.0 dB μ V/m @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB μ V/m @ 3 meters
Fundamental 2400 – 2483. 5 MHz	94.0 dB μ V/m @ 3 meters
Harmonics	54.0 dB μ V/m @ 3 meters

Test Data: The DUT appears to meet the requirements.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dB μ V	Ant. Pol. Y/N	Duty Cycle dB	Coax Loss dB	Correction Factor dB/m	Field Strength dB μ V/m	Margin dB
2,405.10	2,405.10	61.2	H	19.9	1.86	28.61	71.77	22.23
2,405.10	2,405.10	73.5	V	19.9	1.86	28.61	84.07	9.93
2,405.10	4,810.20	16.7	V	19.9	2.64	32.81	32.25	21.75
2,405.10	4,810.20	24.3	H	19.9	2.64	32.81	39.85	14.15
2,405.10	7,215.30	10.6	V	19.9	3.36	36.1	30.16	23.84
2,442.00	2,442.00	61.5	H	19.9	1.88	32.52	76.4	17.6
2,442.00	2,442.00	64.2	V	19.9	1.88	32.52	78.7	15.3
2,442.00	4,884.00	18.7	V	19.9	2.67	33.98	35.45	18.55
2,442.00	4,884.00	20.2	H	19.9	2.67	33.98	36.95	17.05
2,442.00	7,326.00	21	H	19.9	3.4	35.53	40.03	13.97
2,442.00	7,326.00	21.2	V	19.9	3.4	35.53	40.23	13.77

[Continued]

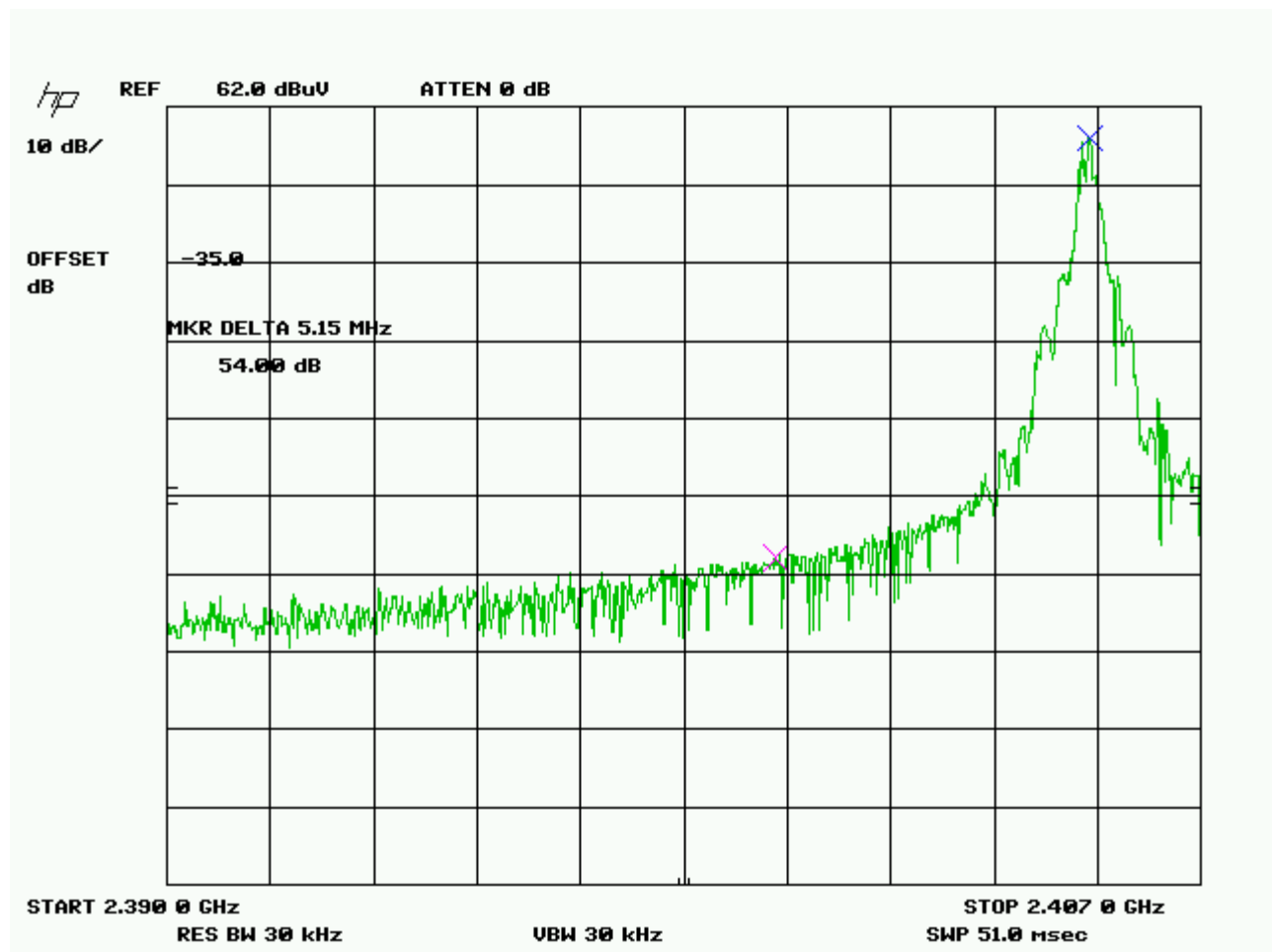
Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Pol. V/H	Duty Cycle dB	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
2,479.00	2,479.00	60.9	H	19.9	1.89	32.57	75.46	18.54
2,479.00	2,479.00	64.8	V	19.9	1.89	32.57	79.36	14.64
2,479.00	4,958.00	18.8	V	19.9	2.69	33.99	35.58	18.42
2,479.00	4,958.00	19.7	H	19.9	2.69	33.99	36.48	17.52
2,479.00	7,437.00	22.7	H	19.9	3.43	35.51	41.74	12.26
2,479.00	7,437.00	23	V	19.9	3.43	35.51	42.04	11.96

OUT OF BAND EMISSIONS

Rules Part No.: Pt 15.249 (d)

Requirements: 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 §15.209, whichever is the lesser attenuation.

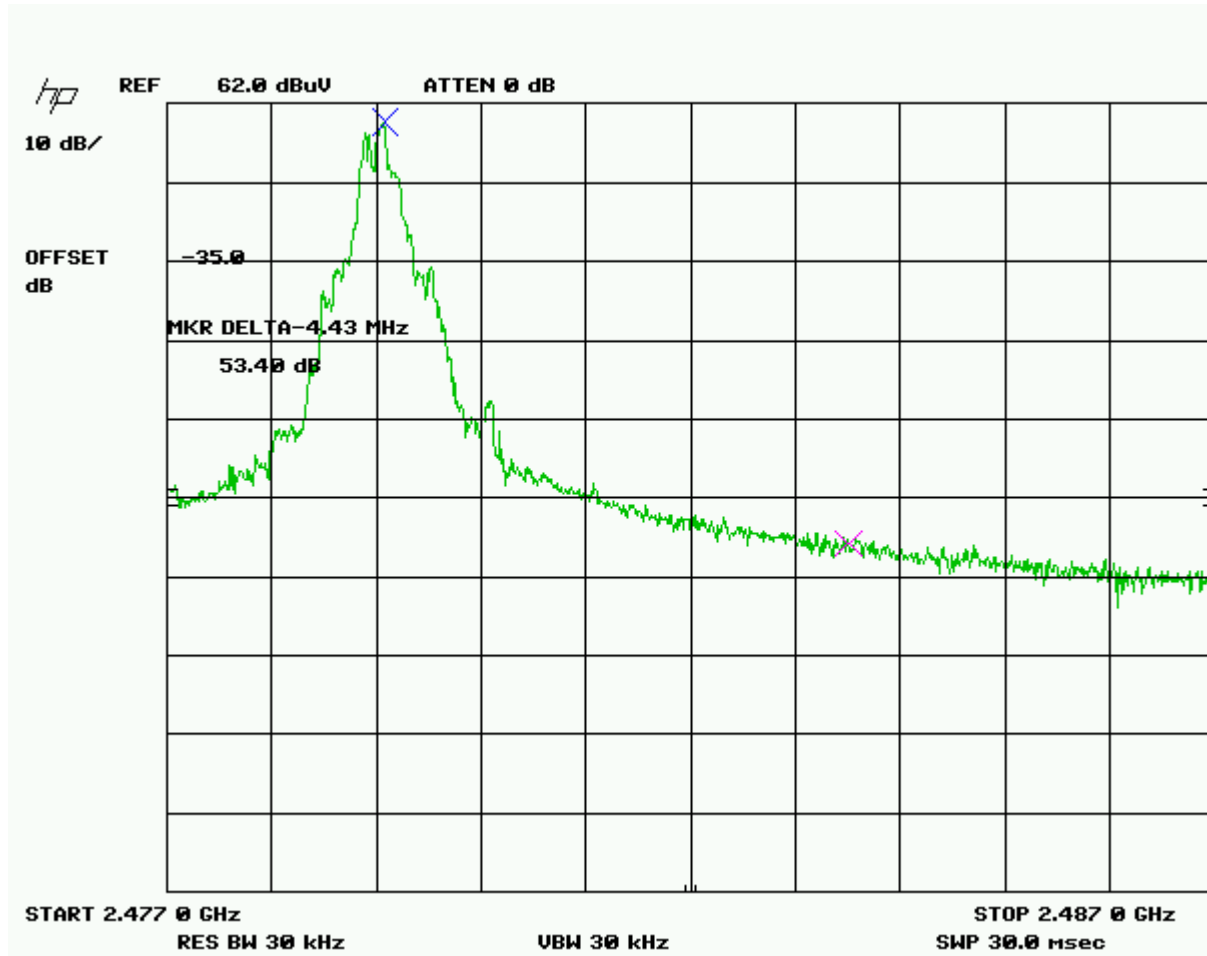
Test Data: The plot indicates the DUT met the requirements.



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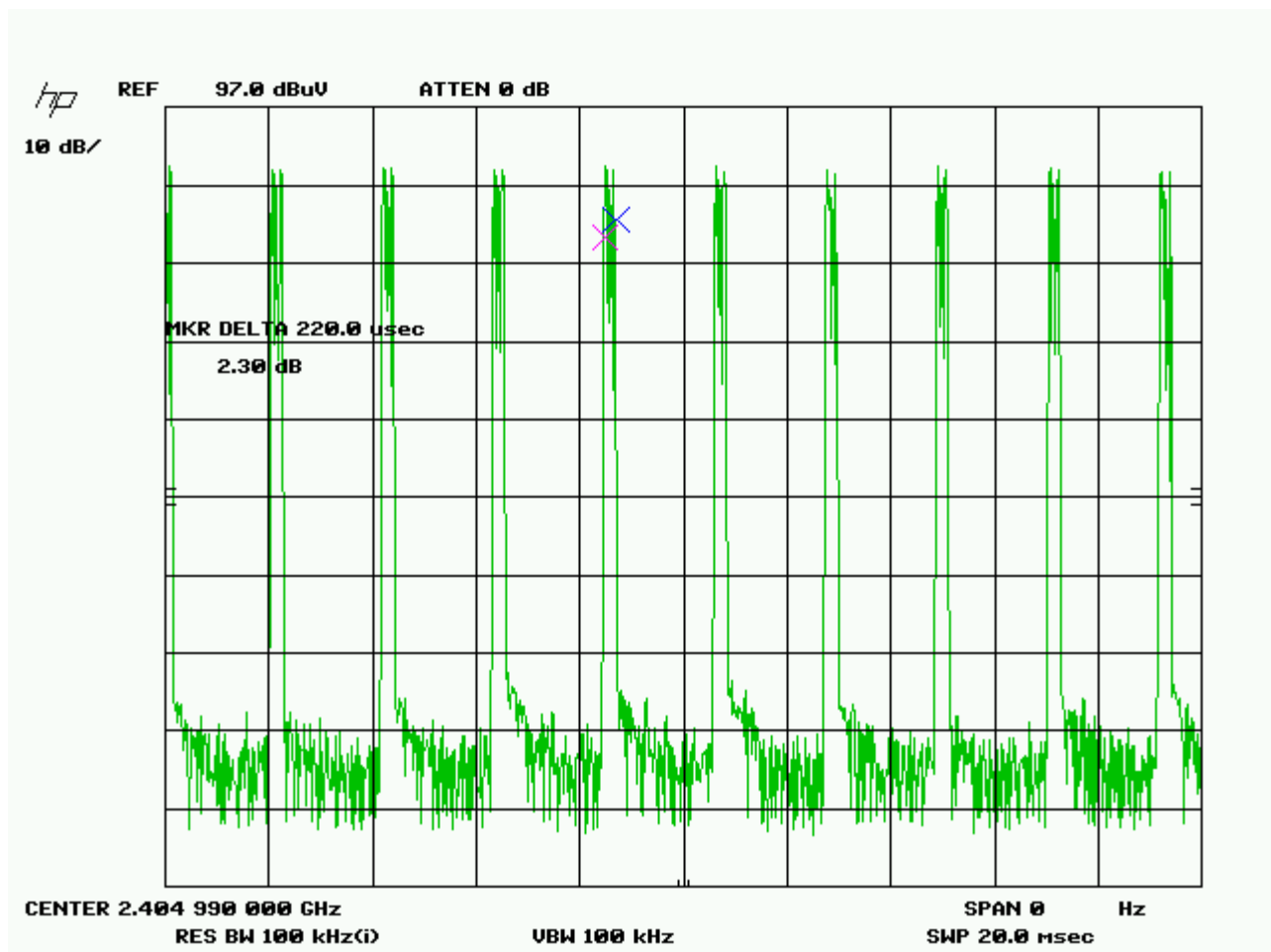
DUTY CYCLE DECLARATION

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, which in this case is millisecond. 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.

From the following 100-millisecond plot, there are 46 given type of pulse. Each pulse lasts 220 μ s, which is 0.220 milliseconds, hence,

$$\begin{aligned} \text{dB} &= 20 \cdot \log(\text{ON TIME}) / \text{PERIOD} \\ \text{dB} &= 20 \cdot \log(46 \cdot 0.220 / 100) \\ \text{dB} &= 20 \cdot \log(0.1012) \\ \text{dB} &= -19.90 \end{aligned}$$

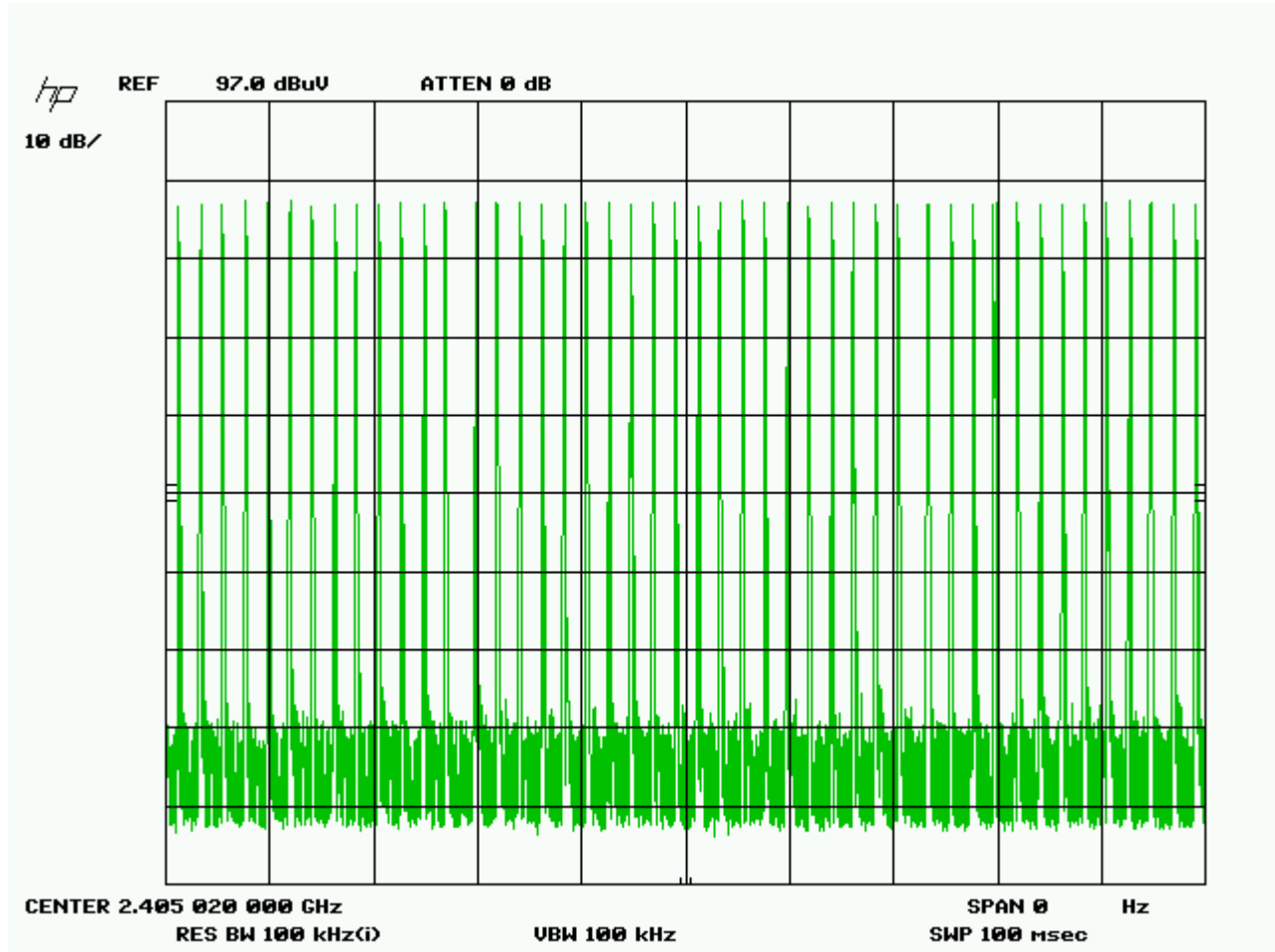
Duty Cycle plots present below.



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POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decrease with the logarithm of the frequency		

Test Data: The DUT is battery operated exclusively. The power line requirement is not applicable.