TIMCO ENGINEERING, Inc.

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FCC PART 15.249 AND IC RSS-210
TEST REPORT

Applicant	PERCEPTIVE PIXEL INC.
Address	102 MADISON AVENUE, 12TH FLOOR
	NEW YORK NY 10016
FCC ID	ZX6014800
Model Number	014800
Product Description	MOBILE STATION
Date Sample Received	3/2/2012
Date Tested	4/5/2012
Tested By	Joe Scoglio
Approved By	Mario R. de Aranzeta
Report Number	524AUT12TestReport.doc
Test Results	☒ PASS ☐ FAIL

ACCREDITED

Testing certificate #0955-01

TABLE OF CONTENT

GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:
☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this 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: 2005 requirements.

ACCREDITED

Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, Fl 32669

Authorized Signatory Name:

Mario de Aranzeta C.E.T.
Compliance Engineer/ Lab. Supervisor

Date: April 24, 2012

GENERAL INFORMATION

DUT Specification

Applicable Standard	Part 15.249		
DUT Description	MOBILE STATION		
FCC ID	ZX6014800		
Operating Frequency	TX: 2404 – 2478	RX: Same	
DUT Power Source	☐ 110–120Vac/50– 60Hz		
	☐ DC Power		
	☒ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable
Antenna	5 dBi		
Antenna Connector	RP-SMA		
Test Facility	Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA.		
Test Conditions	Temperature: 26°C Relative humidity: 50%		
Test Exercise	The DUT was placed in continuous transmit mode of operation.		

Test Supporting Equipment

Supporting Device	Manufacturer	Model / FCC ID	Serial Number
N/A			

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 5/10/10	5/10/12
AC Voltmeter	HP	400FL	2213A14499	CAL 6/12/11	6/12/13
Antenna: Active Loop	ETS-Lindgren	6502	00062529	CAL 9/23/10	9/23/12
Frequency Counter	HP	5385A	2730A03025	CAL 8/17/11	8/17/13
Hygro-Thermometer	Extech	445703	0602	CAL 6/15/11	6/15/13
Modulation Analyzer	HP	8901A	3435A06868	CAL 7/18/11	7/18/13
Digital Multimeter	Fluke	FLUKE-77	35053830	CAL 9/9/11	9/9/13
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 10/28/11	10/28/13
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 10/28/11	10/28/13
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 10/28/11	10/28/13
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 10/28/11	10/28/13
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 4/25/10	4/25/12
Antenna	ETS	3117	41534	9/22/2010	9/22/2012
Antenna	Electro metrics	LPA-25	1122	5/04/2011	5/04/2013
Antenna	Eaton	94455-1	1096	5/4/11	5/4/13

TEST PROCEDURES

Radiation Interference: ANSI C63.4-2003 using a spectrum analyzer, a preselector, a 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 GHz and 1 MHz with a video BW of 3 MHz above 1 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 dBµV) to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. 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 dBµV	+ 10.36 dB	+ 0.5 = 30.86 dBµV/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 10 kHz 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.

Bandwidth 6.0dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=1 MHz and the video bandwidth (VBW) =3 MHz and the span set as shown on plot.

Power Output: The RF power output was measured at the antenna feed point using a peak power meter.

Antenna Conducted Emissions: The RBW=100 kHz, VBW=300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10th Harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

ANSI C63.4-2003 10.1 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 (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. Emissions attenuated more than 20 dB below the permissible value are not reported.

RADIATION INTERFERENCE

Rules Part No.: 15.249, 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) µV/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) µV/m @ 30 meters
1705 kHz to 30 MHz	29.54 dBµV/m @ 30 meters
30 – 88	40.0 dBµV/m @ 3 meters
80 – 216	43.5 dBµV/m @ 3 meters
216 – 960	46.0 dBµV/m @ 3 meters
Above 960	54.0 dBµV/m @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dBµV/m @ 3 meters
Fundamental 2.4 – 2.4835 MHz	94.0 dBµV/m @ 3 meters
Harmonics	54.0 dBµV/m @ 3 meters

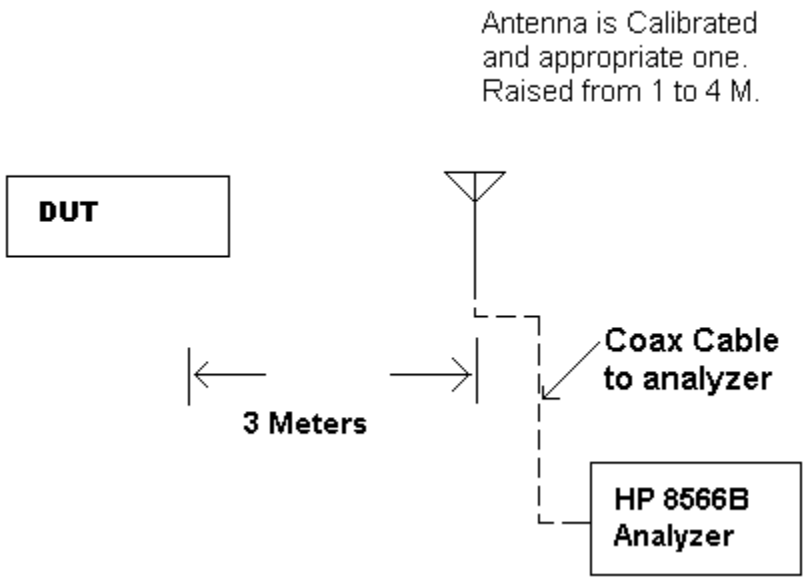
Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty cycle Correction factor dB	Field Strength dBµV/m	Margin dB
A2,404.0	2,404.00	61.8	H	3.18	32.41	29.9	67.49	26.51
A2,404.0	2,404.00	62.5	V	3.18	32.41	29.9	68.19	25.81
A2,404.0	4,808.00	27.3	V	4.90	34.38	29.9	36.68	17.32
A2,404.0	4,808.00	28.1	H	4.90	34.38	29.9	37.48	16.52
A2,404.0	7,212.00	8.8	V	5.73	36.16	29.9	20.79	33.21
A2,404.0	7,212.00	9.7	H	5.73	36.16	29.9	21.69	32.31
A2,440.0	2,440.00	61.5	H	3.21	32.48	29.9	67.29	26.71
A2,440.0	2,440.00	62.4	V	3.21	32.48	29.9	68.19	25.81
A2,440.0	4,880.00	26.6	V	4.94	34.43	29.9	36.07	17.93
A2,440.0	4,880.00	27.4	H	4.94	34.43	29.9	36.87	17.13
A2,440.0	7,320.00R	8.4	V	5.79	36.14	29.9	20.43	33.57
A2,440.0	7,320.00	9.4	H	5.79	36.14	29.9	21.43	32.57
A2,478.0	2,478.00	62.1	H	3.23	32.56	29.9	67.99	26.01
A2,478.0	2,478.00	62.7	V	3.23	32.56	29.9	68.59	25.41
A2,478.0	4,956.00R	28.4	V	4.98	34.47	29.9	37.95	16.05
A2,478.0	4,956.00	29.4	H	4.98	34.47	29.9	38.95	15.05
A2,478.0	7,434.00R	9.6	V	5.86	36.11	29.9	21.67	32.33
A2,478.0	7,434.00	10.0	H	5.86	36.11	29.9	22.07	31.93

A is Average
P is Peak

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Duty cycle Correction factor dB	Field Strength dBµV/m	Margin dB
P2,404.0	2,404.00	61.8	H	3.18	32.41		97.39	16.61
P2,404.0	2,404.00	62.5	V	3.18	32.41		98.09	15.91
P2,404.0	4,808.00	27.3	V	4.90	34.38		66.58	7.42
P2,404.0	4,808.00	28.1	H	4.90	34.38		67.38	6.62
P2,404.0	7,212.00	8.8	V	5.73	36.16		50.69	23.31
P2,404.0	7,212.00	9.7	H	5.73	36.16		51.59	22.41
P2,440.0	2,440.00	61.5	H	3.21	32.48		97.19	16.81
P2,440.0	2,440.00	62.4	V	3.21	32.48		98.09	15.91
P2,440.0	4,880.00	26.6	V	4.94	34.43		65.97	8.03
P2,440.0	4,880.00	27.4	H	4.94	34.43		66.77	7.23
P2,440.0	7,320.00R	8.4	V	5.79	36.14		50.33	23.67
P2,440.0	7,320.00	9.4	H	5.79	36.14		51.33	22.67
P2,478.0	2,478.00	62.1	H	3.23	32.56		97.89	16.11
P2,478.0	2,478.00	62.7	V	3.23	32.56		98.49	15.51
P2,478.0	4,956.00R	28.4	V	4.98	34.47		67.85	6.15
P2,478.0	4,956.00	29.4	H	4.98	34.47		68.85	5.15
P2,478.0	7,434.00R	9.6	V	5.86	36.11		51.57	22.43
P2,478.0	7,434.00	10.0	H	5.86	36.11		51.97	22.03

Method of Measuring Radiated Spurious Emissions



METHOD OF MEASUREMENT: The procedure used was ANSI standard C63.4-2003 & the FCC/OET Guidance on Measurements for Spread Spectrum Systems – KDB 558074 dated March 23, 2005.

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Part 15.207

Requirements:

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

Test Data: Not applicable.

NOTE DUT BATTERY OPERATED ONLY

OCCUPIED BANDWIDTH

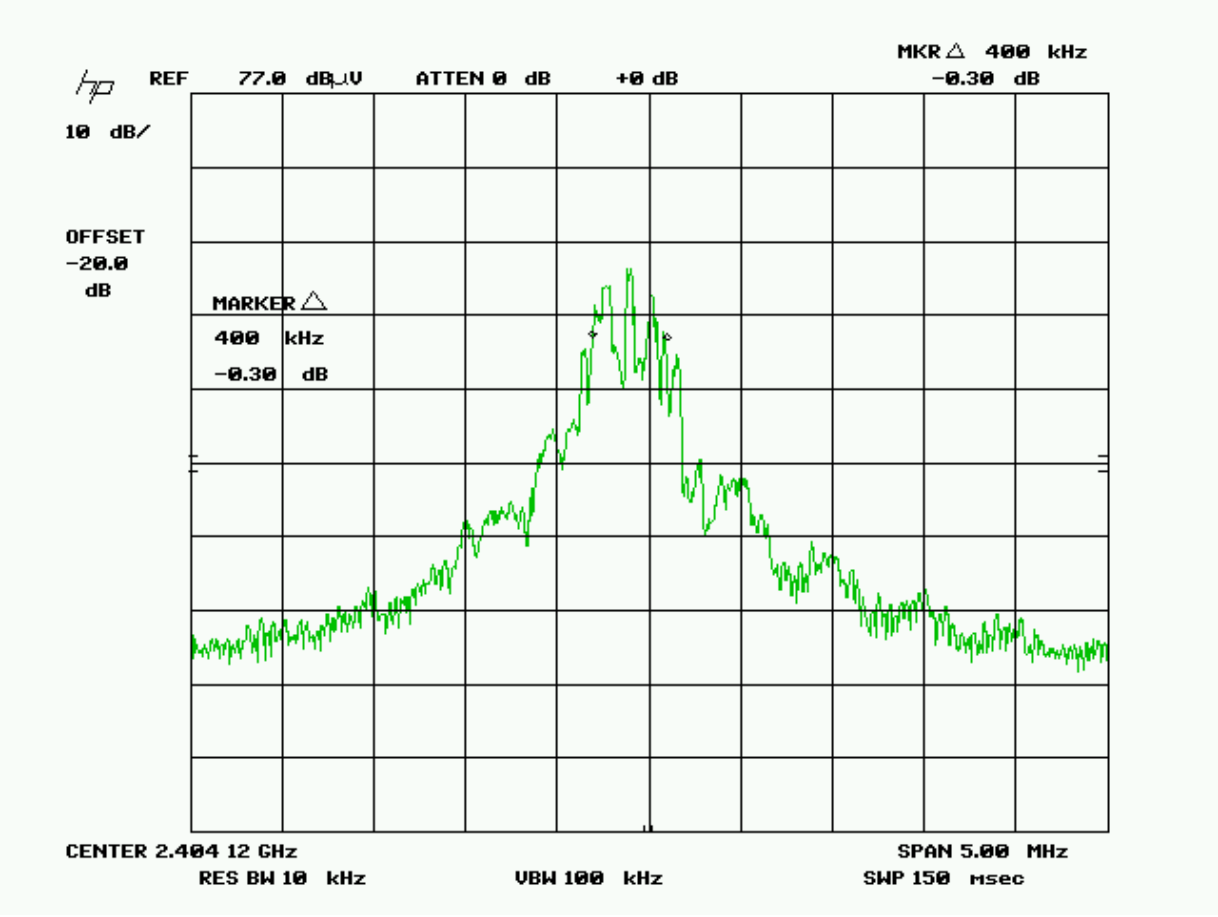
Rules Part No.: 15.249

Requirements:

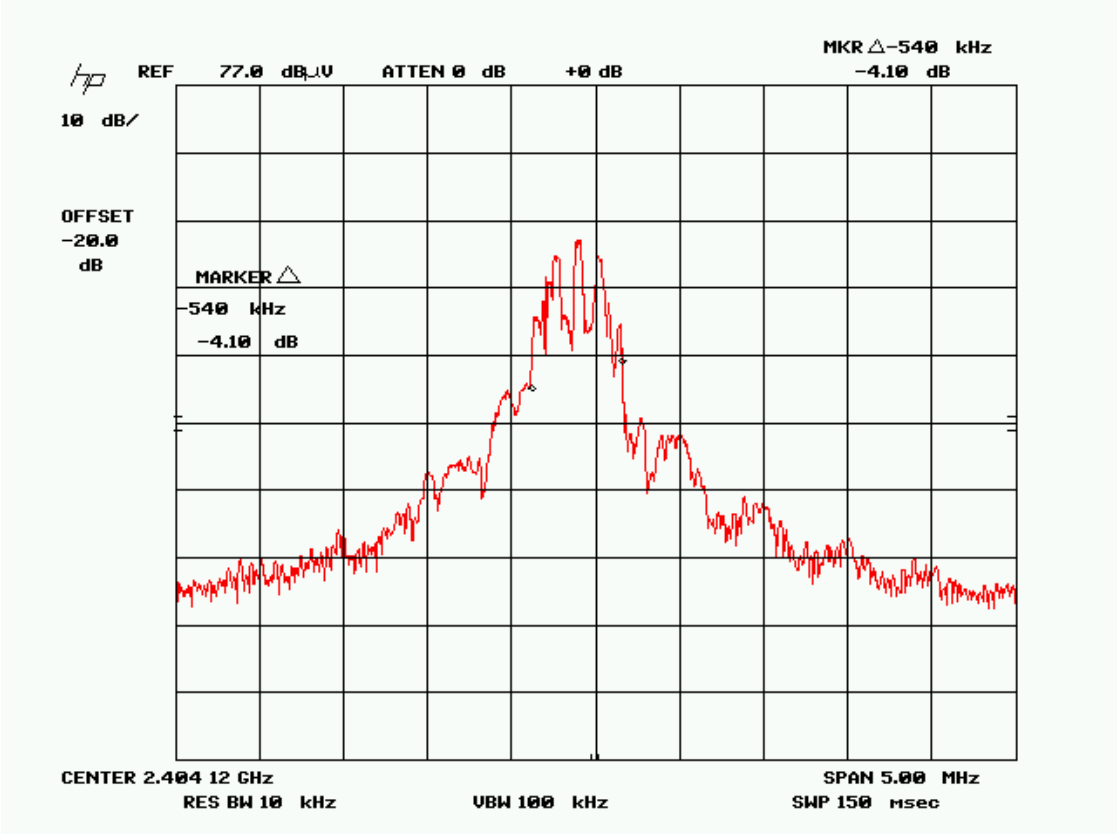
Test Data:

Three places in the band were measured and the worst case reported.

BANDWIDTH 6dB plot



BANDWIDTH 20 dB plot

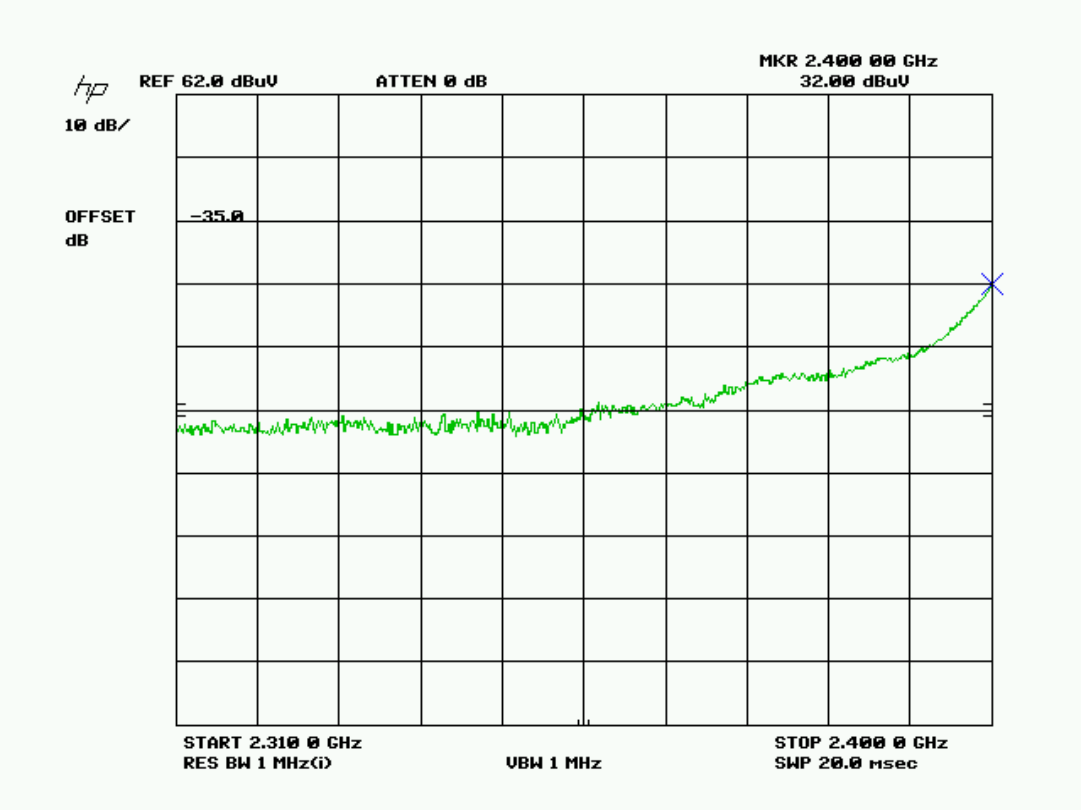


RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND

Requirements: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 µV/m (54 dBµV/m).

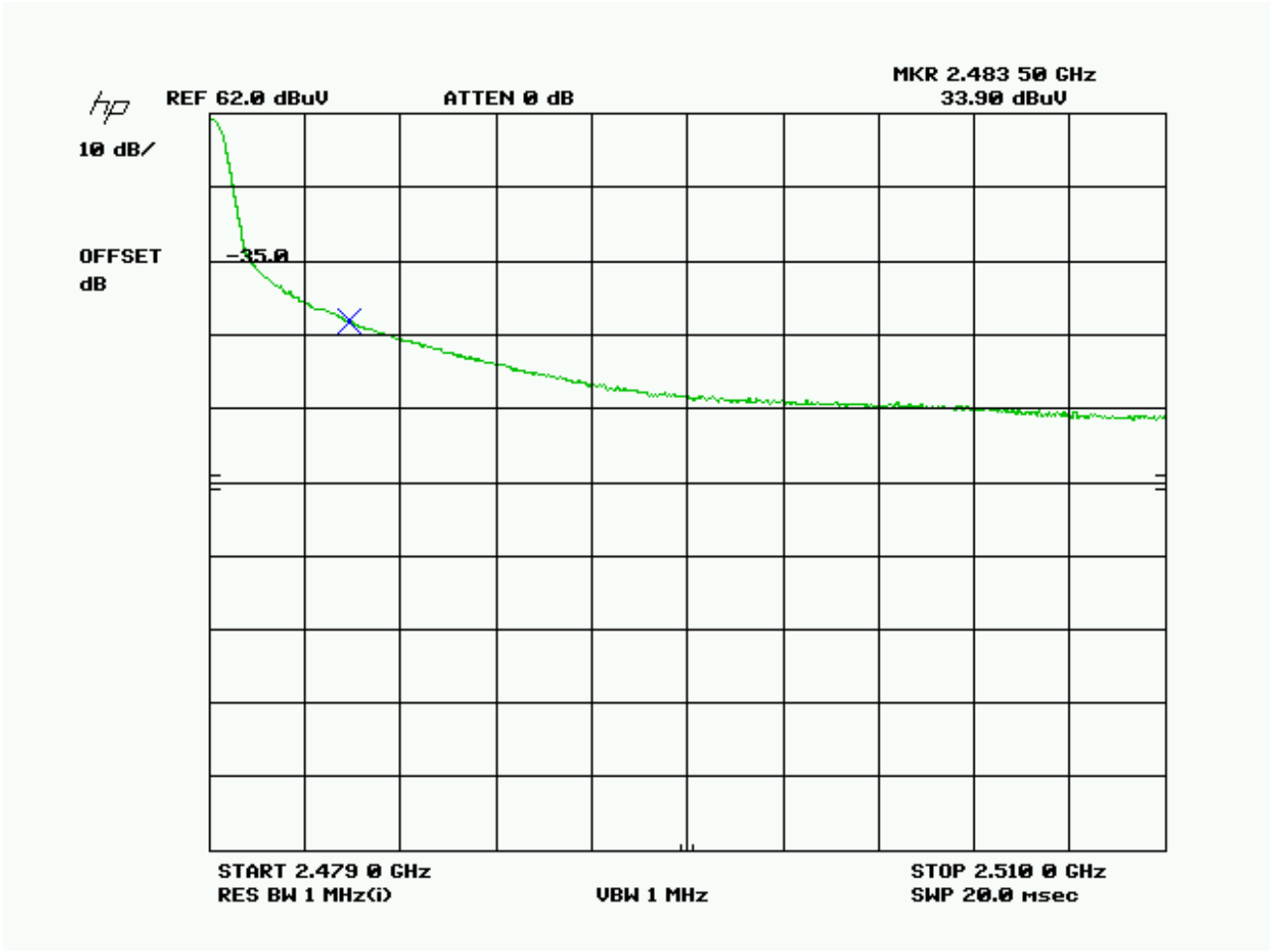
Test Procedure: An in band field strength measurement of the fundamental Emission using the RBW and detector function required by C63.4-2000 and FCC Rules. The procedure was repeated with an average detector and a plot made. The calculated field strength in the adjacent restricted band is presented below.

Lower adjacent restricted band .Peak



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Duty Cycle correction factor dB	Field Strength dBµV/m	Margin dB
A2,404.0	2,400.00	32.0	V	3.18	32.40	29.9	37.68	16.32
P2,404.0	2,400.00	32.0	V	3.18	32.40		67.58	6.42

Upper Bandedge Peak



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Pol	Coax Loss dB	Correction Factor dB/m	Duty cycle correction factor dB	Field Strength dBµV/m	Margin dB
P2,478.0	2,483.50	33.9	V	3.24	32.57	29.9	39.81	14.19
A2,478.0	2,483.50	33.9	V	3.24	32.57		69.71	4.29

DUTY CYCLE

Based on the applicants information:

At the maximum frame rate of 120 Hz, we transmit with duty cycle of (800 us)*(120 Hz), or 0.096. The duty cycle is further decreased by the hopping sequence. The period of that sequence is much longer than 100 ms, so the average power over 100 ms should be used, per 15.35 (c). At our maximum frame rate of 120 Hz, we transmit 12 or fewer packets in any 100 ms interval. If a given channel were never used twice in a 12-frame consecutive sequence, then the duty cycle would be decreased by a factor of (1/12); but in fact, a channel will in some cases be used more than once in a 12-frame sequence. By using a computer program to generate all the possible sequence of 12 consecutive channels in the hopping sequence, we can determine the frequency with which at least one channel is used multiple times.

The sequence never uses a given channel more than 4 times in any 12-frame sequence; the worst-case duty cycle on any frequency is therefore reduced by a factor of (4/12) = 0.333. The overall duty cycle is therefore 0.096*0.333 = 0.032. The allowable instantaneous transmit field strength is therefore -20*log(0.032) = 29.9 dB greater than the allowable average field strength. The peak field strength is also limited to 20 dB above the average field strength, regardless of duty cycle; in this case, that limit is tighter.