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FCC PART 15.249 AND IC RSS-210 (issue 8)

TEST REPORT

UNLICENSED INTENTIONAL RADIATOR

Applicant	VALENTINE RESEARCH INC.
Address	10280 ALLIANCE ROAD
	CINCINNATI OHIO 45242-4710 USA
FCC ID	QJABTLE
IC	10919A-BTLE
Model Number	15-3701
Product Description	BLUETOOTH MODULE
Date Sample Received	4/22/2013
Date Tested	4/25/2013
Tested By	Joe Scoglio
Approved By	Joe Scoglio
Report Number	424AUT13TestReport.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.

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 requirements.

ACCREDITED

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:

Joe Scoglio
Testing Tech/Project Manager

Date: 4/25/2013

GENERAL INFORMATION

DUT Specification

The test results relate only to the items tested.			
Applicable Standard	Part 15.249 RSS-210 (issue 8) RSS-GEN (issue 3)		
DUT Description	BLUETOOTH MODULE		
FCC ID	QJABTLE		
IC	10919A-BTLE		
Model Number	15-3701		
Operating Frequency	TX: 2402 to 2480	RX: Same	
No. of Channels	40		
Modulations			
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 Connector	FCC Rules require that the antenna connector be unique.		
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.		
Modifications			

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
Antenna: Passive Loop	EMC Test Systems	EMCO 6512	9706-1211	06/14/12	06/14/14
Frequency Counter	HP	5385A	2730A03025	08/17/11	08/17/13
Frequency Counter	HP	5352B	2632A00165	06/22/11	06/22/13
Digital Multimeter	Fluke	FLUKE-77-3	79510405	06/13/11	06/13/13
Frequency Counter	HP	5385A	3242A07460	06/22/11	06/22/13
Antenna: Active Loop	ETS-Lindgren	6502	00062529	09/23/10	09/23/13
Antenna: Double-Ridged Horn	Electro-Metrics	RGA-180	2319	06/19/12	06/19/14
LISN	Electro-Metrics	ANS-25/2	2604	10/28/11	10/28/13
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/11	12/31/13
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	06/13/12	06/13/14
Antenna: Log-Periodic	Electro-Metrics	LPA-25	1122	05/04/11	05/04/13
Digital Multimeter	Fluke	77	35053830	09/09/11	09/09/13
Antenna: Biconnical	Eaton	94455-1	1096	05/04/11	05/04/13
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	10/28/11	10/28/13
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	10/28/11	10/28/13
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	10/28/11	10/28/13
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	10/28/11	10/28/13
Antenna: Biconnical	Eaton	94455-1	1057	05/31/11	05/31/13
Antenna: Log-Periodic	Eaton	96005	1243	05/31/11	05/31/13

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. 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 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 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, RSS-210

Requirements:

Frequency	Limits
Part 15.209, RSS-210	
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, RSS-210	
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: Radiated emissions were measured from the lowest frequency generated or 9 kHz to the 10th harmonic intentional emission. Measurements in the table are peak unless noted otherwise.

All frequencies measured at 3 meters.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m
2,402.0	2,402.00	44.3	V	3.18	32.40	79.88
2,402.0	2,402.00	44.4	H	3.18	32.40	79.98
2,402.0	4,804.00	7.7	V	4.90	34.38	46.98
2,402.0	4,804.00	7.8	H	4.90	34.38	47.08
2,442.0	2,442.00	45.1	V	3.21	32.48	80.79
2,442.0	2,442.00	46.1	H	3.21	32.48	81.79
2,442.0	4,884.00	7.6	V	4.94	34.43	46.97
2,442.0	4,884.00	7.8	H	4.94	34.43	47.17
2,480.0	2,480.00	46.0	V	3.24	32.56	81.80
2,480.0	2,480.00	46.1	H	3.24	32.56	81.90
2,480.0	4,960.00	7.8	V	4.98	34.48	47.26
2,480.0	4,960.00	7.9	H	4.98	34.48	47.36

OCCUPIED BANDWIDTH

Rules Part No.: 15.249 (d), RSS-210, RSS-GEN

Requirements: The field strength of any emissions appearing outside the specified frequency bands, except harmonics shall be attenuated at least 50 dB below the level of the carrier or to the general limits of 15.209 whichever is the lesser.

Test Data:

BAND EDGE COMPLIANCE

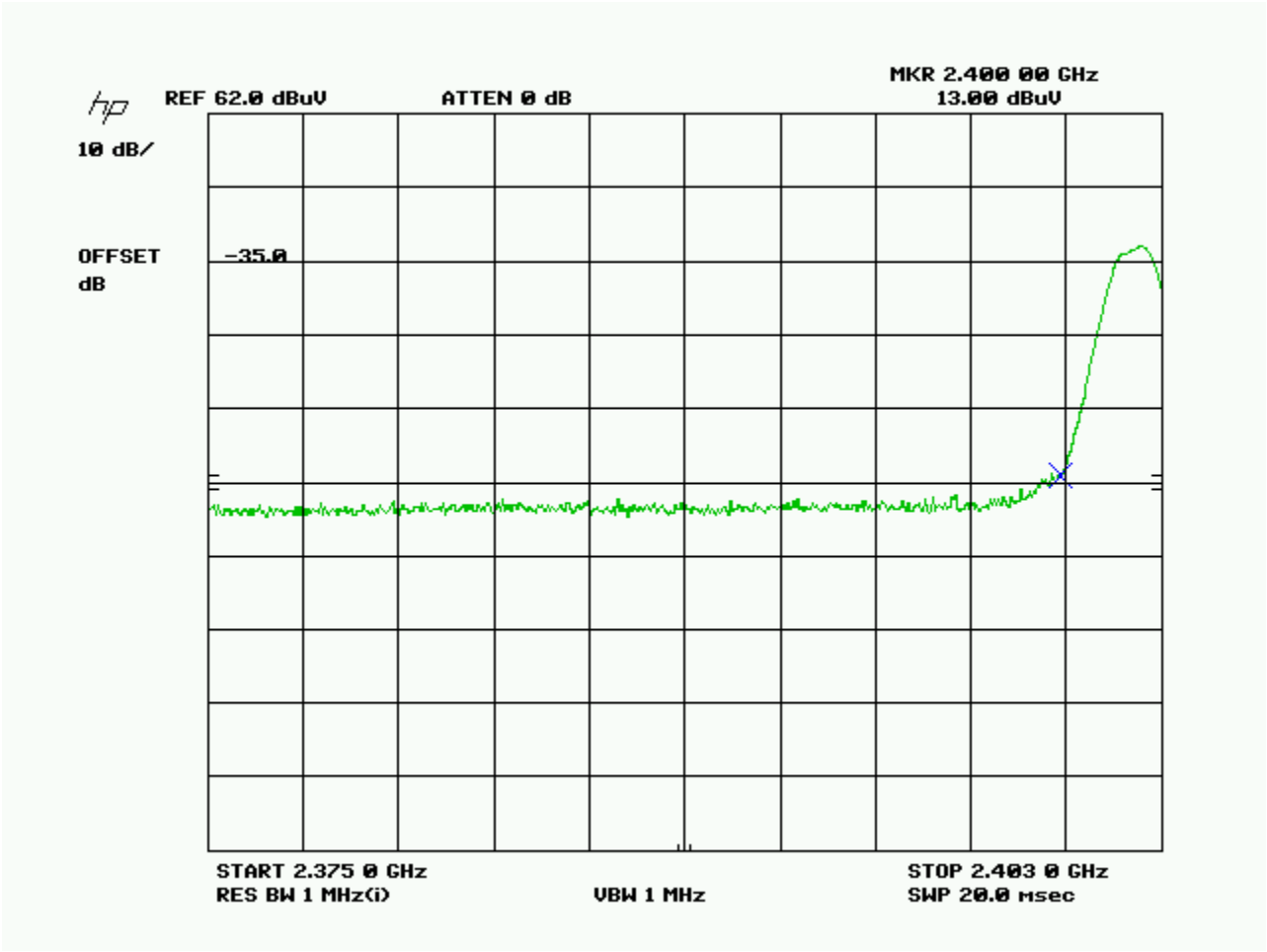
Rules Part No.: 15.249 (d), RSS-210, RSS-GEN

Requirements: 40 dBc or in the case of restricted bands 54 dBµV/m.

Test Data:

Lower bandedge

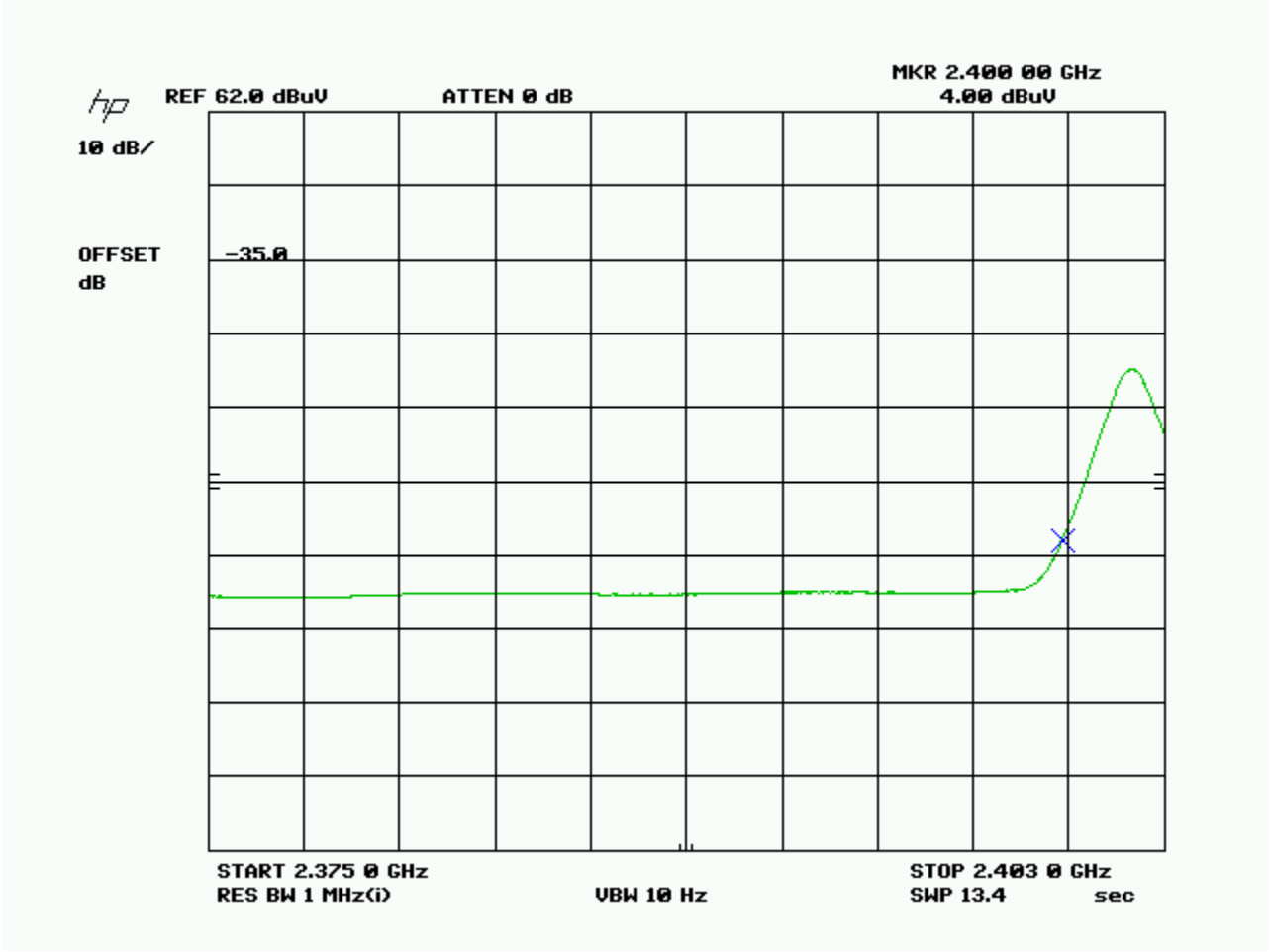
Peak Plot



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
2,402.0	2,400.00	13.0	H	3.18	32.40	48.58	5.42

Lower bandedge

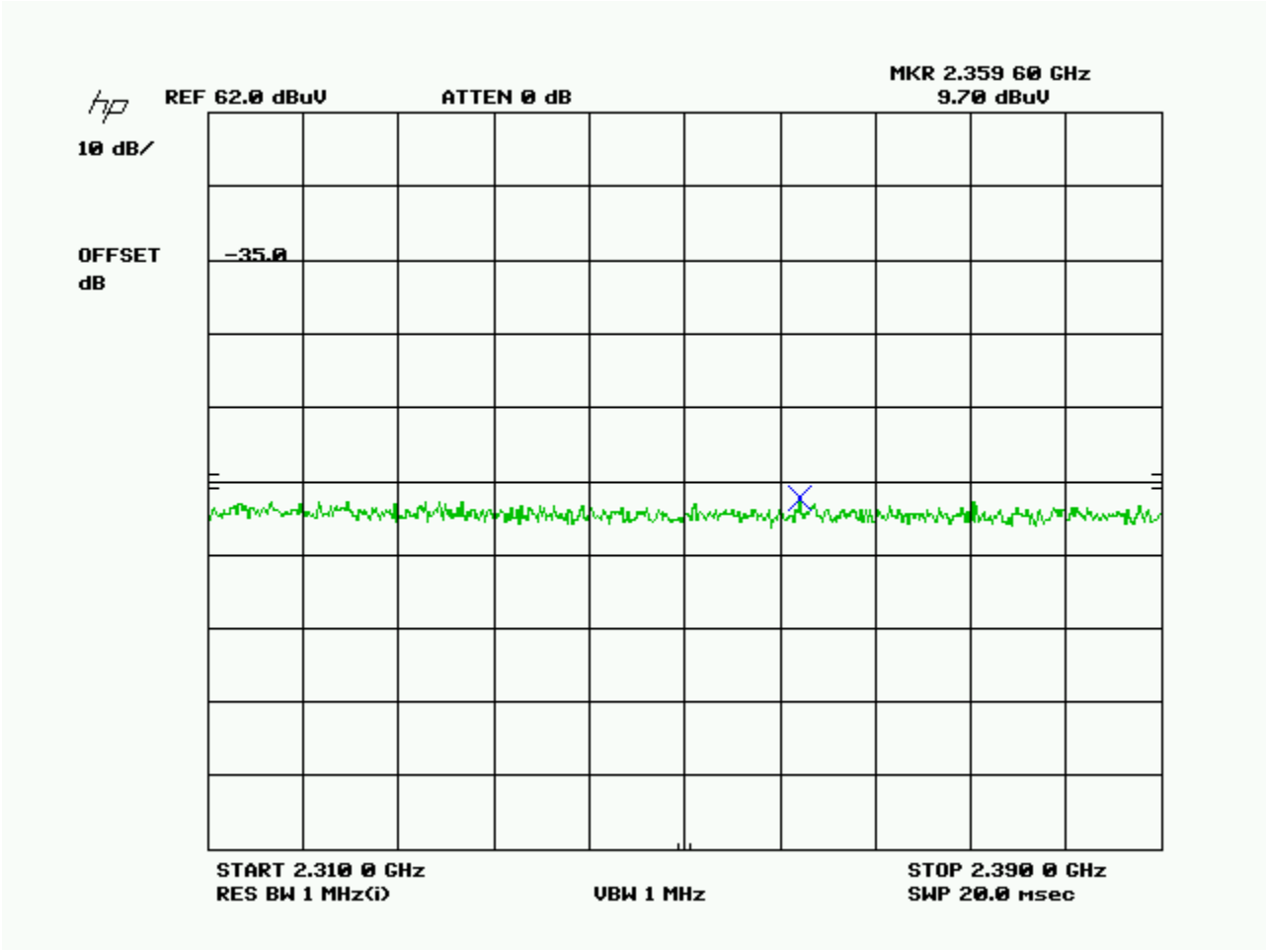
Average Plot



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
2,402.0	2,400.00	4.0	H	3.18	32.40	39.58	14.42

Lower non-adjacent restricted band

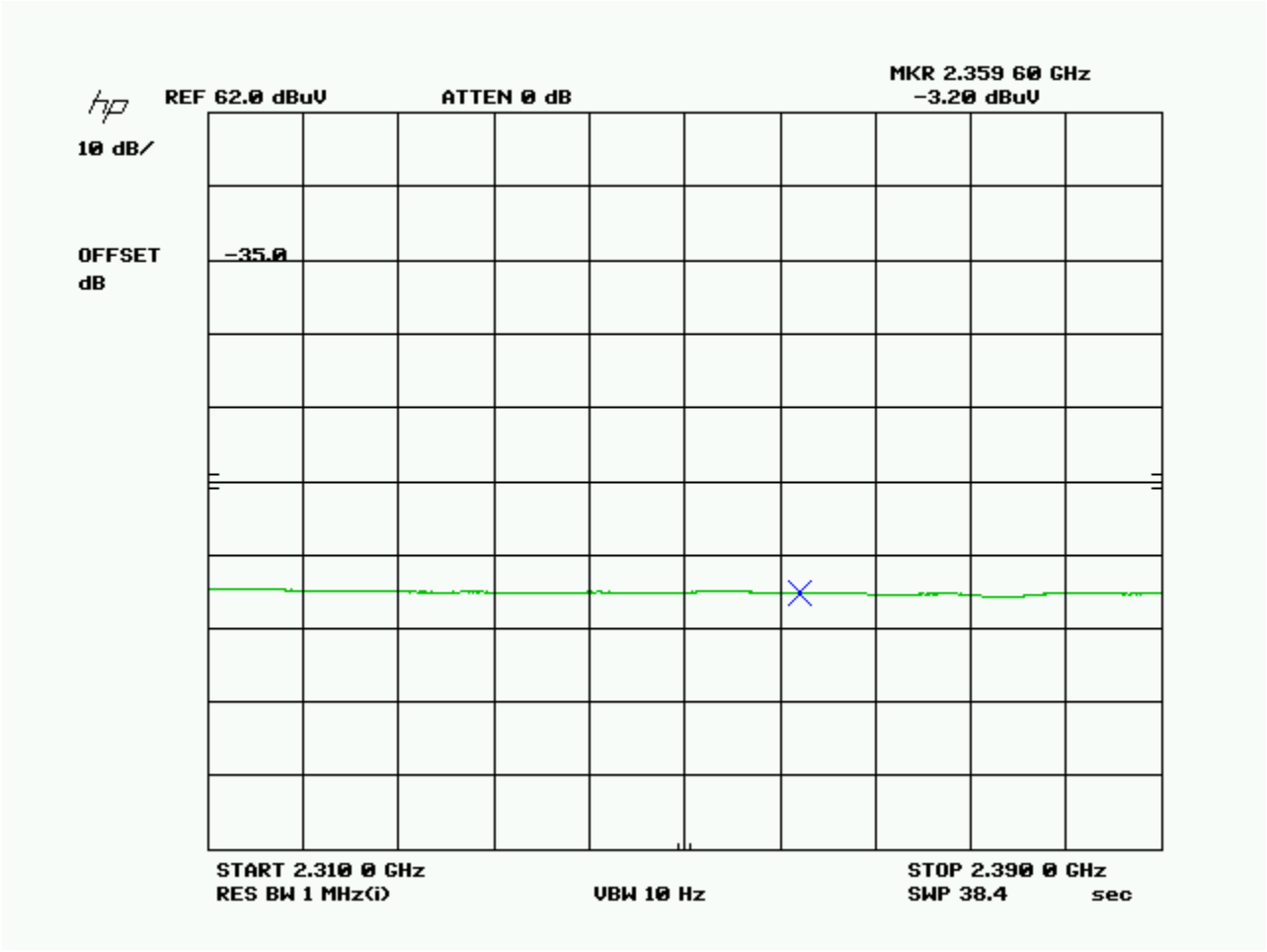
Peak Plot



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
2,402.0	2,359.60	9.7	H	3.15	32.32	45.17	8.83

Lower non-adjacent restricted band

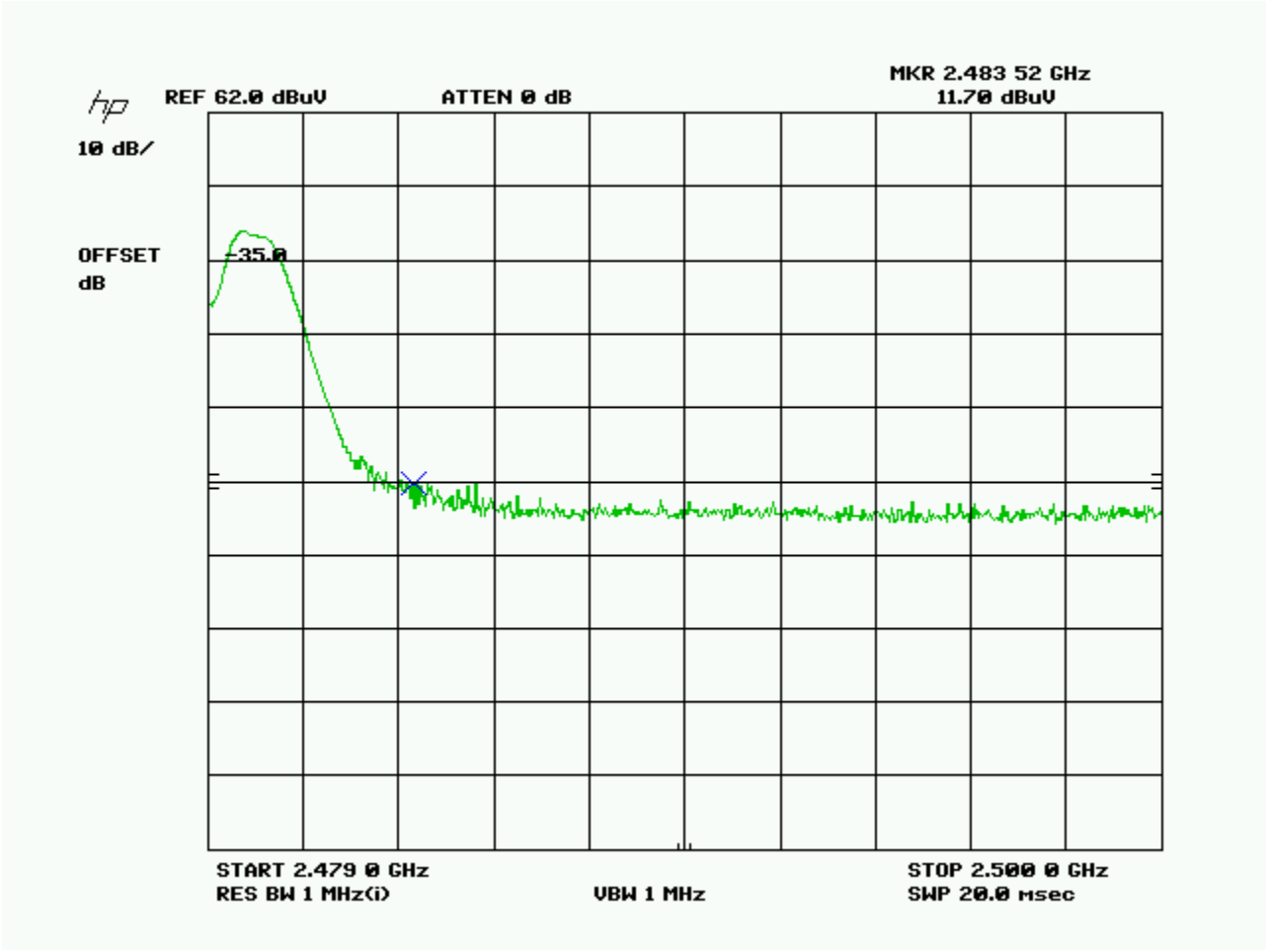
Average Plot



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
2,402.0	2,359.60	-3.2	H	3.15	32.32	32.27	21.73

Upper bandedge

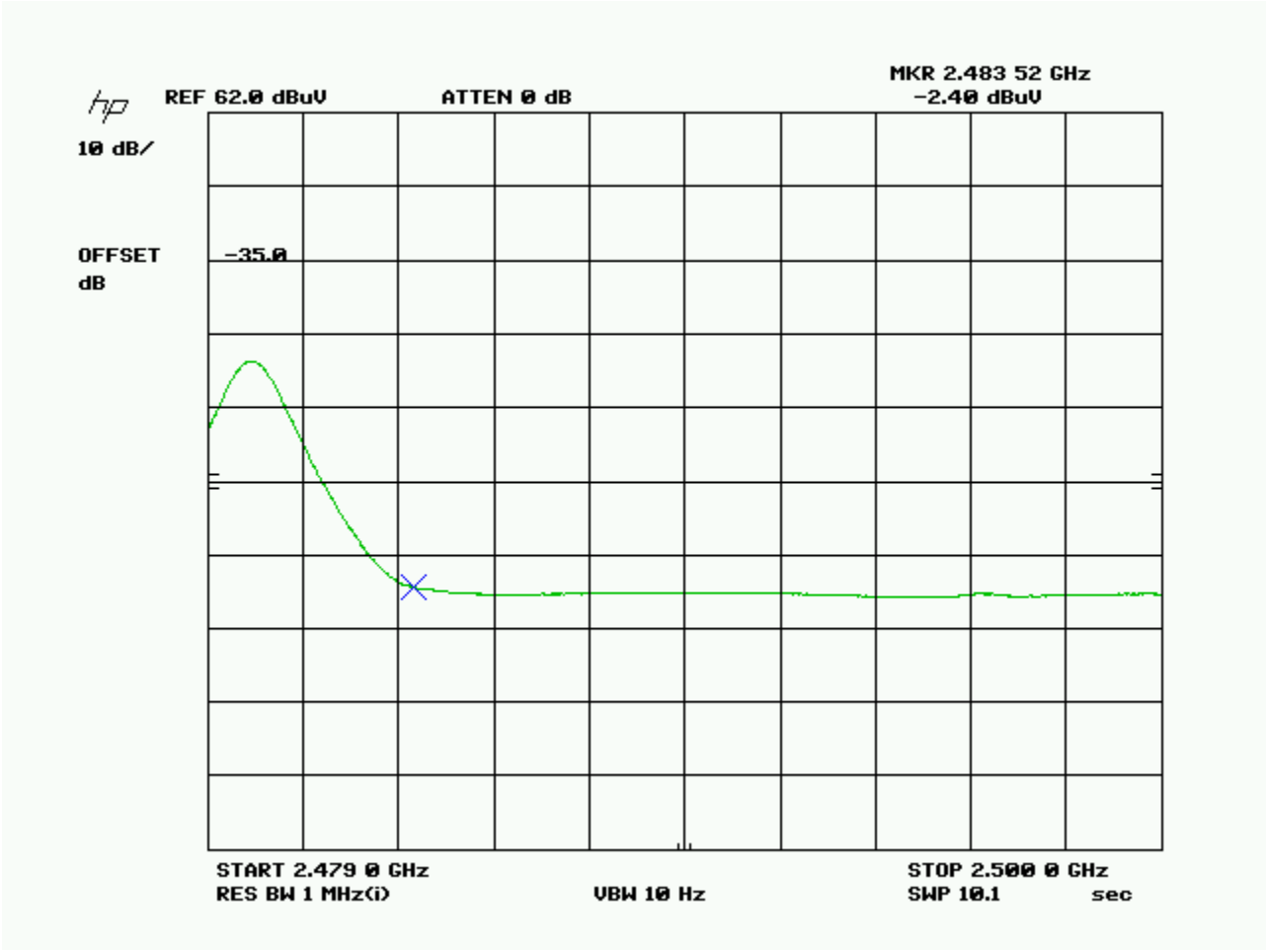
Peak Plot



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
2,480.0	2,483.50	11.7	H	3.24	32.57	47.51	6.49

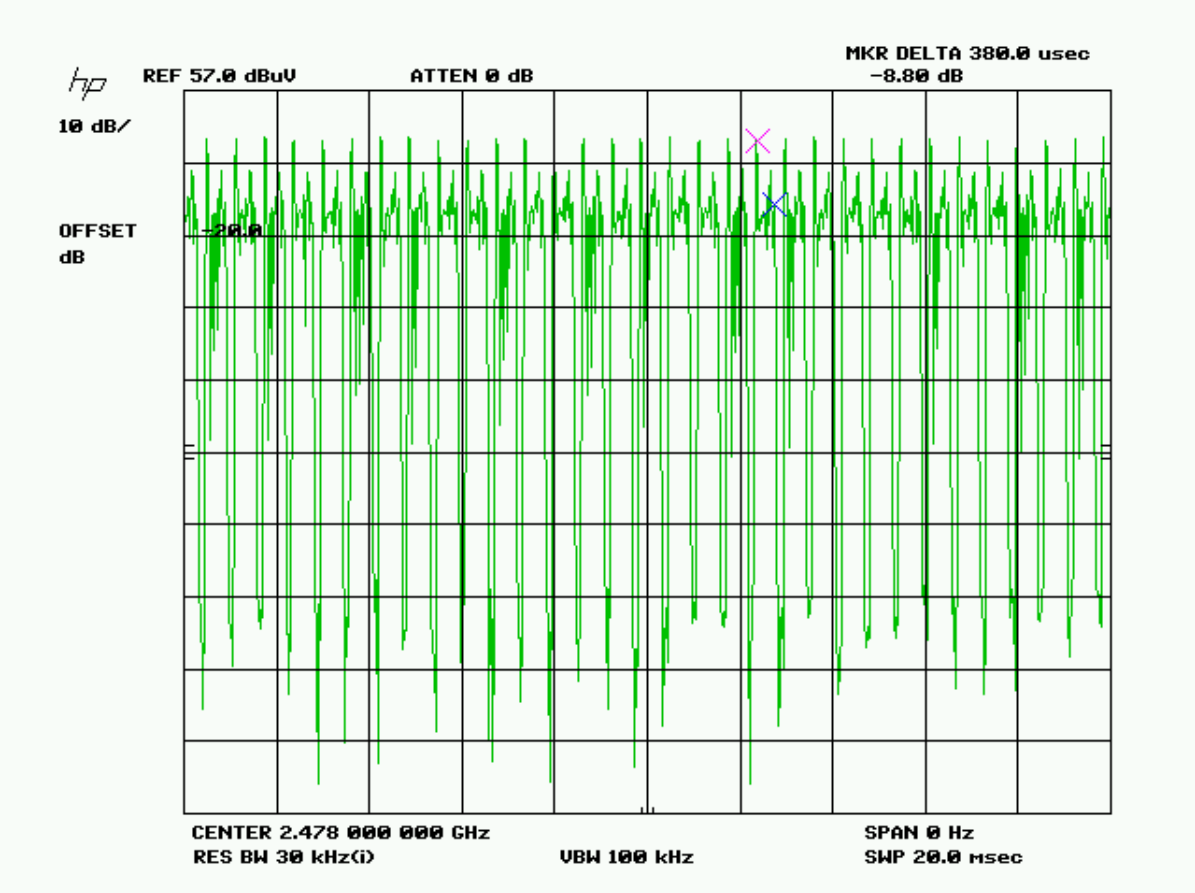
Upper bandedge

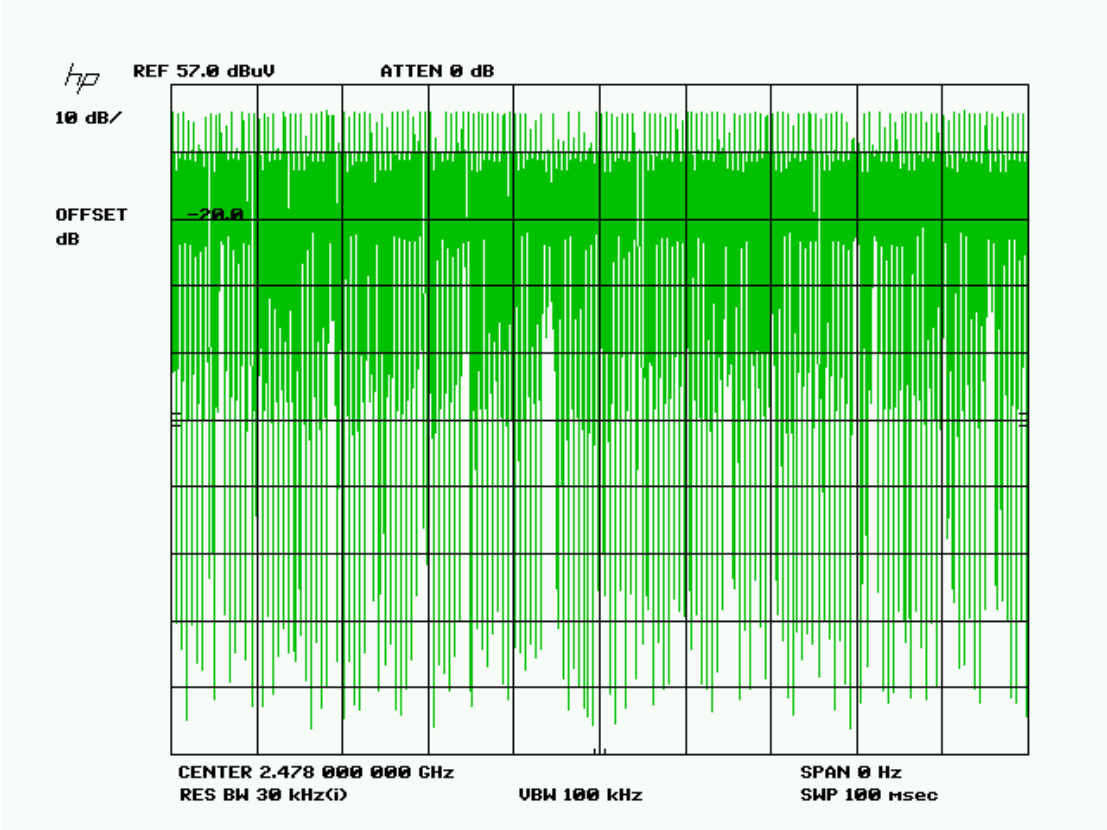
Average Plot



Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBµV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBµV/m	Margin dB
2,480.0	2,483.50	-2.4	H	3.24	32.57	33.41	20.59

DUTY CYCLE


REF 57.0 dBuV
ATTEN 0 dB
MKR DELTA 380.0 usec
-8.80 dB
10 dB/
OFFSET
dB
CENTER 2.478 000 000 GHz
RES BW 30 kHz(i)
VBW 100 kHz
SPAN 0 Hz
SWP 20.0 msec



Total # of pulses: 170 in 100 ms
Duration of pulse: .38 ms maximum duration of pulse according to manufacturer.
20*log ((170*.38)/100)=20*log (64.6)=**3.8dB**

POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: 15.207, RSS-GEN

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

Test Data: The attached graphs represent the emissions read for power line conducted for this device. Both lines were observed.

N/A
Battery or vehicle powered DUT.