



MEASUREMENT AND TEST REPORT

VERSION 1.01


Report Prepared for: Blackline GPS Corp.
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Calgary, AB
Canada
T2G 3J4

Equipment Under Test (EUT): Loner FDU
Bluetooth/GPS Fall Safety Device

FCC ID: W77-FDU
IC Certification number: 8255A-FDU

FCC Rule Part(s): Part 15C
Industry Canada Rule Part(s) RSS-210

Tested by: Island Compliance Services Inc.
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Authorized By	
Andrew Eadie (Manager)	

Note: This test report has been prepared for the Applicant and device described herein. It may not be duplicated or used in part without prior written consent from Island Compliance Services Inc.

FCC OATS registration number: 386117
Industry Canada OATS registration number: 9578B-1

Revision History

Version	Date	Author	Comment
1.00	29/2/2012	A. Eadie	Original Release
1.01	22/3/2012	A. Eadie	Updated Band Edge section (Page 16)

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2 SUMMARY OF TEST RESULTS

The equipment under test was found to comply with the test standards and criteria outlined herein.

Test Description	Reference Specification	Result	Comment
RF Peak Power Output	15.247(b) A8.4	Complies	
Hopping Freq. Separation	15.247(a) A8.1	Complies	
No. Hopping Channels	15.247(a)(1)(iii) A8.1	Complies	
Avg. Time of Occupancy	15.247(a)(1)(iii) A8.1	Complies	
Occupied (20dB) Bandwidth	15.247(a) A8.1	Complies	
Conducted Spurious Emissions	15.247(c) A8.5	Complies	
Radiated Spurious Emissions	15.209(a) 15.205(a) A8.5	Complies	

2.1 ENVIRONMENTAL CONDITIONS

Description	Reading
Indoor Temperature	17-20 °C
Indoor Humidity	35% – 48%
Outdoor Temperature	5-10 °C
Outdoor Humidity	45% - 75%

2.2 STANDARD TEST CONDITIONS AND ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

CFR 47, FCC rules Part 15 subpart C, ANSI C63.4 (2003), Public Notice DA 00-705, DTS procedures KDB 558074, IC standards RSS-GEN and RSS0210. Deviations, modification or clarifications (if any) to above mentioned documents are described herein.

Measurement results, unless otherwise noted, are worst-case measurements.

3 GENERAL EQUIPMENT SPECIFICATIONS

Item	Description
Manufacturer	Blackline GPS Corp.
Model Number	FDU
Function	Fall Detection device
Power Supply Input	DC Wall adaptor (Charging only)
Power Output	3mW (Max)
Antenna Gain/Type	3 dBi, Inverted F PCB antenna
Channel Spacing	1 MHz
Frequency Range	2402 – 2480 MHz
Modulation	GFSK

3.1 AUXILIARY EQUIPMENT

Equipment	Description
Blackberry mobile phone	

3.2 ENGINEERING CHANGES TO PRODUCTION UNIT

N/A

4 RF POWER OUTPUT

Test Name	Reference Specification	Result	Notes
RF Power Output	15.247(b) A8.4	Complies	

4.1 DATA

Tuned Frequency (MHz)	Peak Power (dBm)	Cable attn (dB)	Limit	Margin (dB)
2402.00	-3.0	0.5	30.0	-26.5
2441.00	-2.3	0.5	30.0	-28.2
2480.00	-3.0	0.5	30.0	-26.5

4.2 PLOT(S)

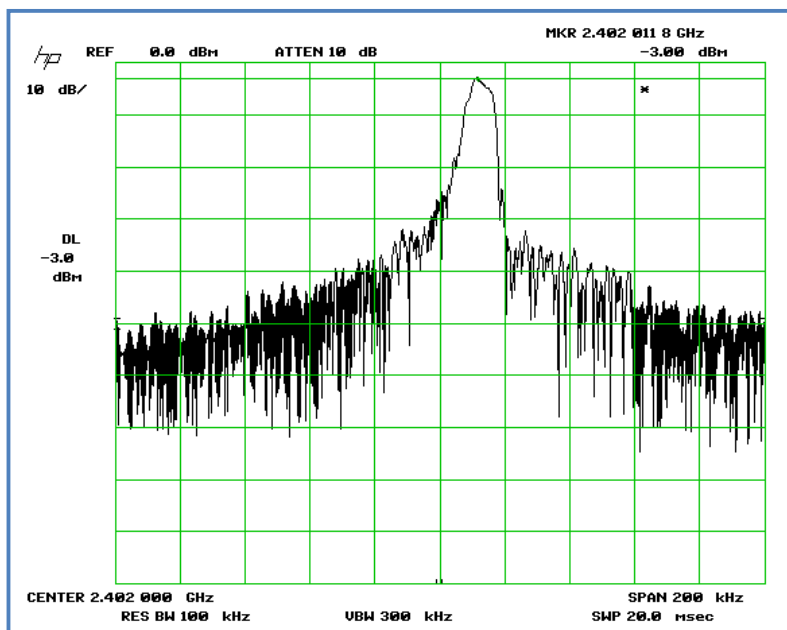


FIGURE 1 - PEAK OUTPUT POWER, LOW CHANNEL

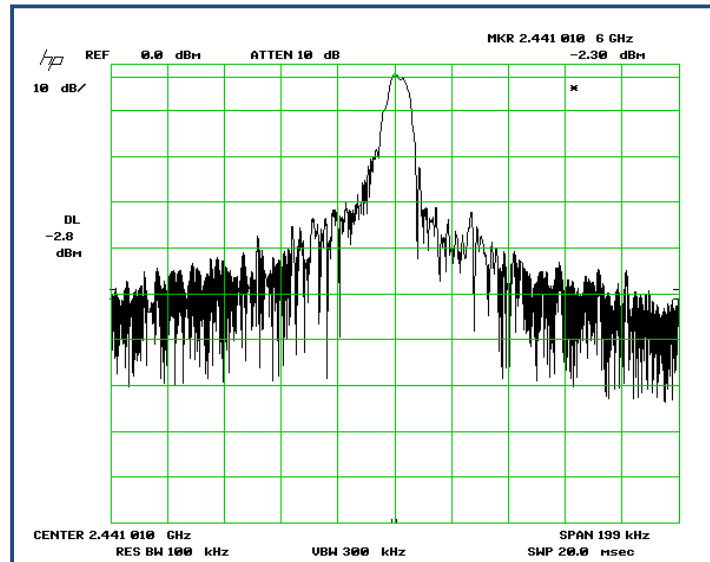


FIGURE 2 - PEAK POWER, MID CHANNEL

4.3 ADDITIONAL INFORMATION

Description	Comment
Test Engineer	A. Eadie
Test Date	13 th Feb 2012

5 HOPPING FREQUENCY SEPARATION

Test Description	Reference Specification	Result	Notes
Hopping frequency separation	15.247(a) A8.1	Complies	

5.1 DATA

Test Description	Limit	Observed (Mhz)	Result
Hopping frequency separation	>25kHz or >20dB BW	1.0	Complies

5.2 PLOT

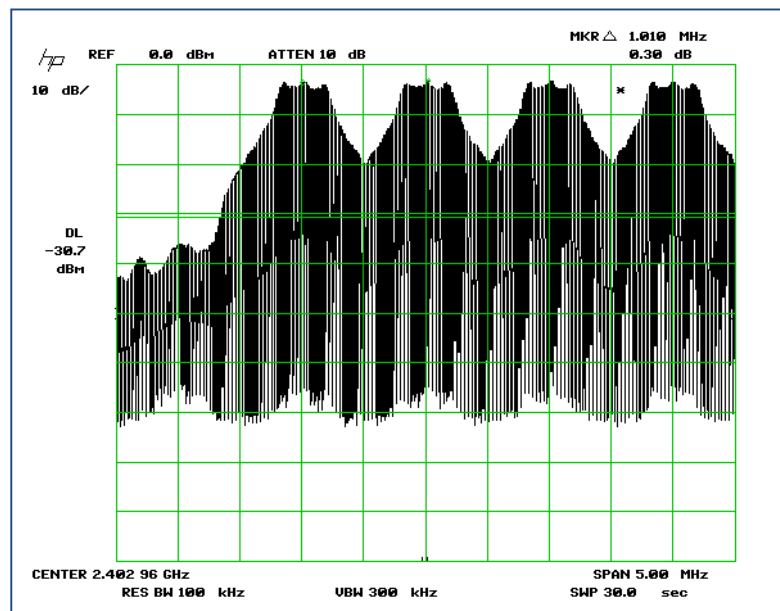


FIGURE 3 - CHANNEL SEPARATION - 1MHZ

5.3 ADDITIONAL INFORMATION

Description	Comment
Test Engineer	A. Eadie
Test Date	13 th Feb 2012

6 NUMBER OF HOPPING CHANNELS

Test Description	Reference Specification	Result	Notes
Number of hopping channels	15.247(a)(1)(iii) A8.1	Complies	

6.1 DATA

Test Description	Limit	Observed	Result
Number of hopping channels	>15 channels	79 Channels	Complies

6.2 PLOT

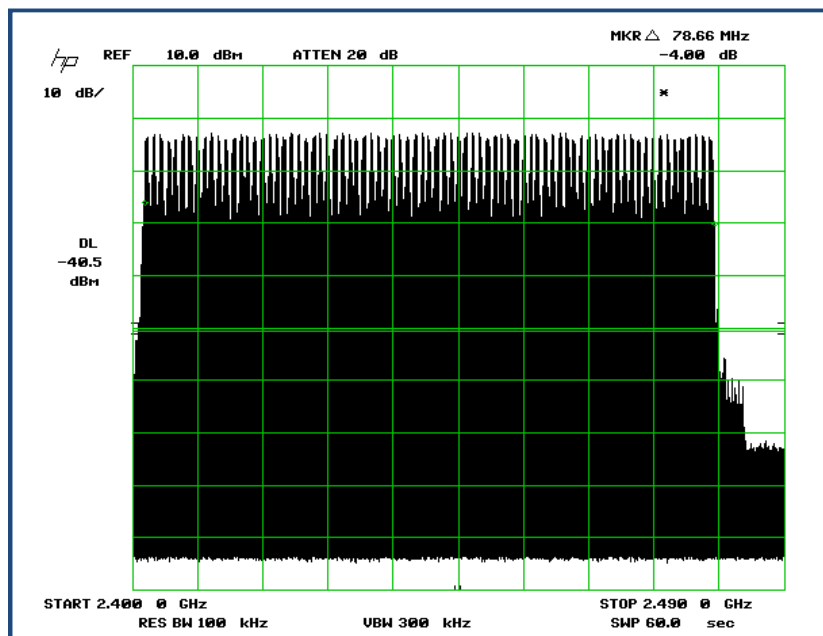


FIGURE 4

6.3 ADDITIONAL INFORMATION

Description	Comment
Test Engineer	A. Eadie
Test Date	14 th Feb 2012

7 AVERAGE TIME OF OCCUPANCY

7.1 LIMIT

15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

7.2 TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measure in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10^* (# of pulses in 3.16s) * pulse width.

7.3 TEST DATA

DH Packet	Pulse Width (ms)	Number of pulses in 3.16s	Avg Time of Occupancy (s)	Limit (s)	Margin (s)
DH1	0.52	34	0.17	0.4	0.23
DH3	1.54	17	0.26	0.4	0.14
DH5	2.7	12	0.32	0.4	0.08

8 OCCUPIED BANDWIDTH

Test Description	Reference Specification	Result	Notes
Occupied (20dB) Bandwidth	15.247(a) A8.1	Complies	

8.1 DATA

Channel	Frequency (MHz)	20dB Bandwidth (kHz)
Low	2402	835
Mid	2441	919
High	2480	880

8.2 PLOTS

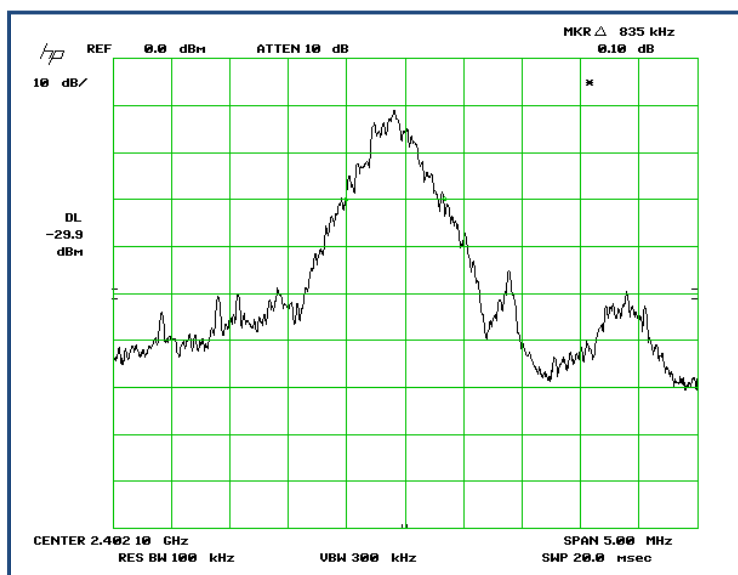


FIGURE 5 - LOW CHANNEL OCCUPIED BANDWIDTH

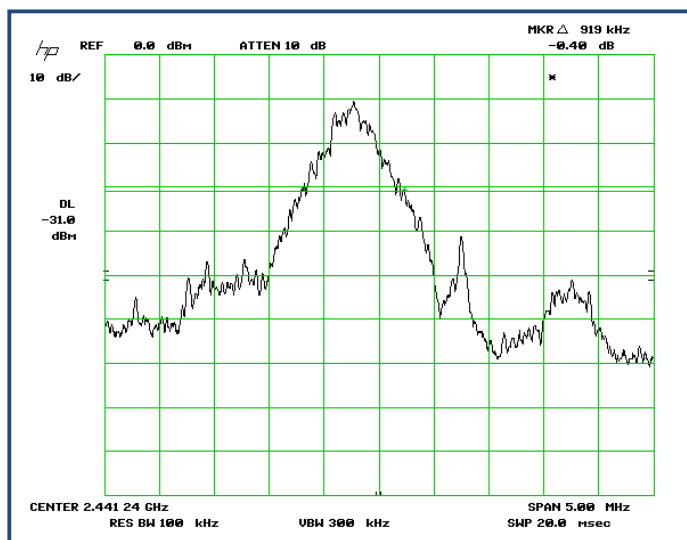


FIGURE 6 – MID CHANNEL OCCUPIED BANDWIDTH

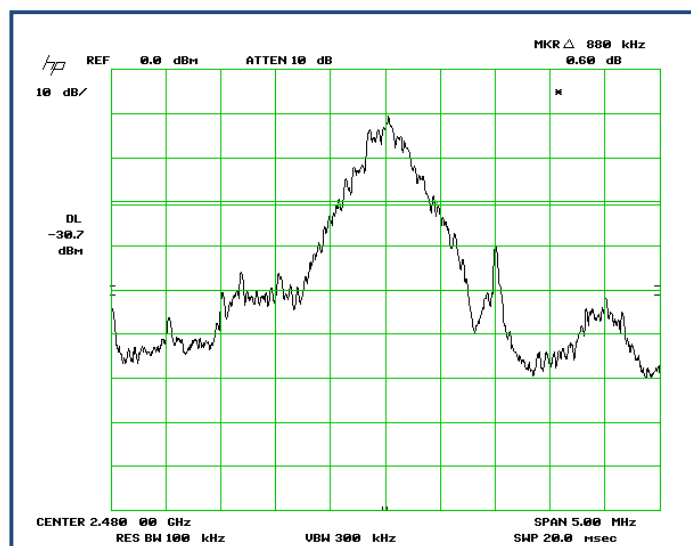


FIGURE 7 - HIGH CHANNEL OCCUPIED BANDWIDTH

8.3 ADDITIONAL INFORMATION

Description	Comment
Test Engineer	A. Eadie
Test Date	13 th Feb 2012

9 CONDUCTED SPURIOUS EMISSIONS

Test Description	Reference Specification	Result	Notes
Conducted Spurious Emissions	15.247(c) A8.5	Complies	

9.1 LIMITS

15.247(c) In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(1) (see 15.205(c)).

9.2 DATA

Channel	Fundamental Freq	Worst Case Harmonic Amplitude (dBc)	Limit (dBc)	Result
Low	2402	-48	-20	Complies
Mid	2441	-51	-20	Complies
High	2480	-54	-20	Complies

9.3 PLOTS

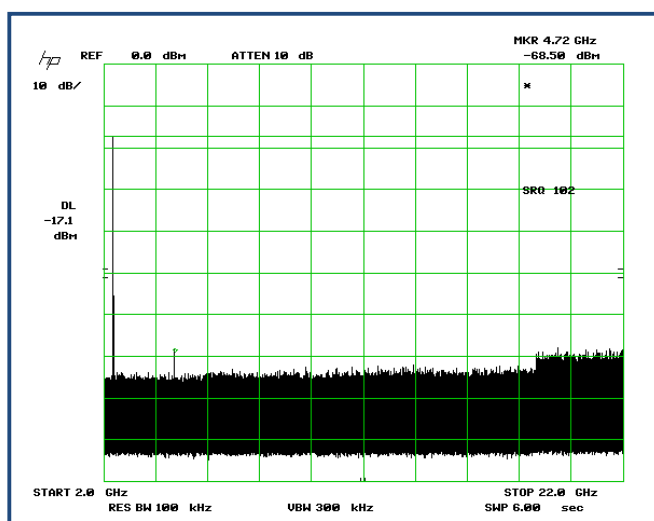


FIGURE 8 - LOW CHANNEL SPURIOUS, 2-22GHZ

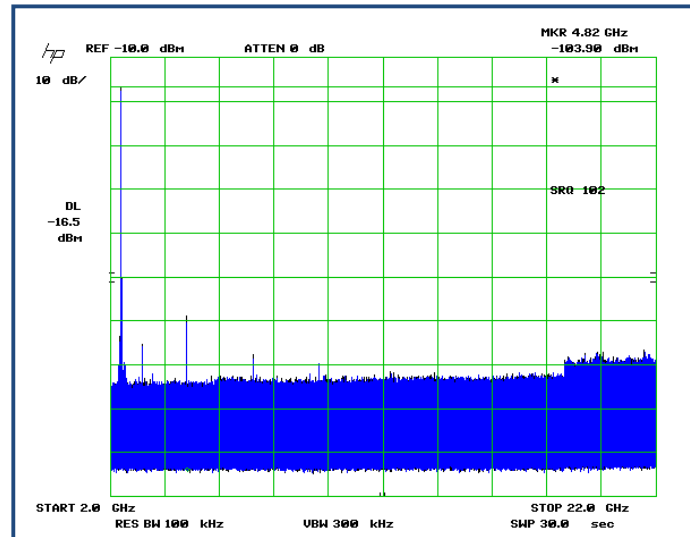


FIGURE 9 – MID CHANNEL 2-22GHZ

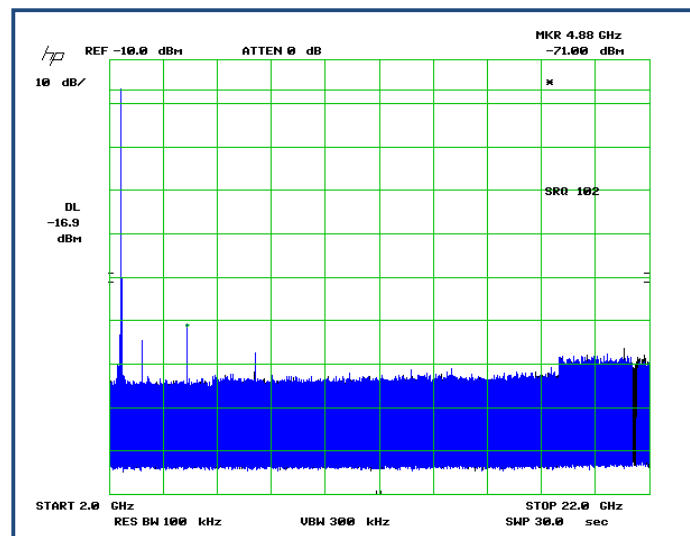


FIGURE 10 – HIGH CHANNEL 2-22GHZ

10 BANDEDGE

Test Description	Reference Specification	Limit	Result	Notes
Band Edge Compliance	15.247(d) A8.1	>20dBc, 74dBuV/m pk	Complies	

10.1 LIMITS

15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

10.1 DATA

An in-band field strength measurement of the fundamental emission was taken at 3m, with RBW = 1MHz, VBW = 1MHz and peak detection mode.

Corrected measurement = 70.8 dBuV/m

Using the marker-delta method outlined in DA 00-705, band edge emissions were well below the 74dBuV/m peak limits for restricted bands.

10.2 PLOTS

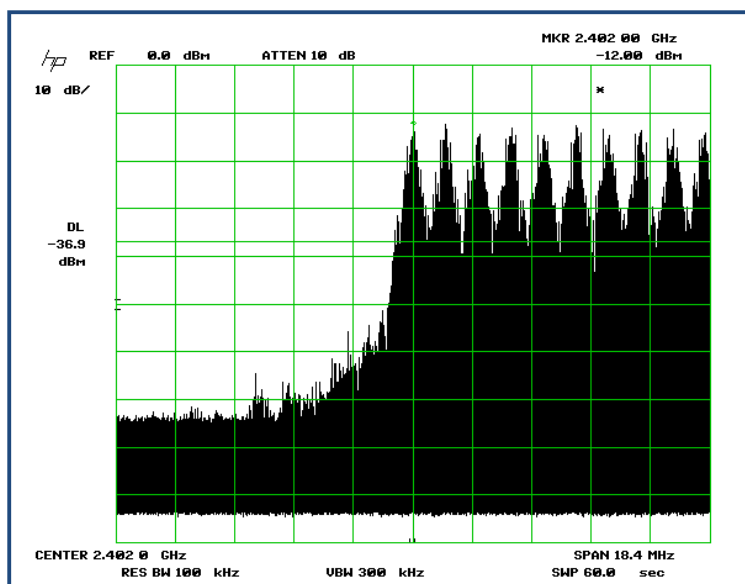


FIGURE 11 – LOWER BANDEDGE, FREQUENCY HOPPING ON

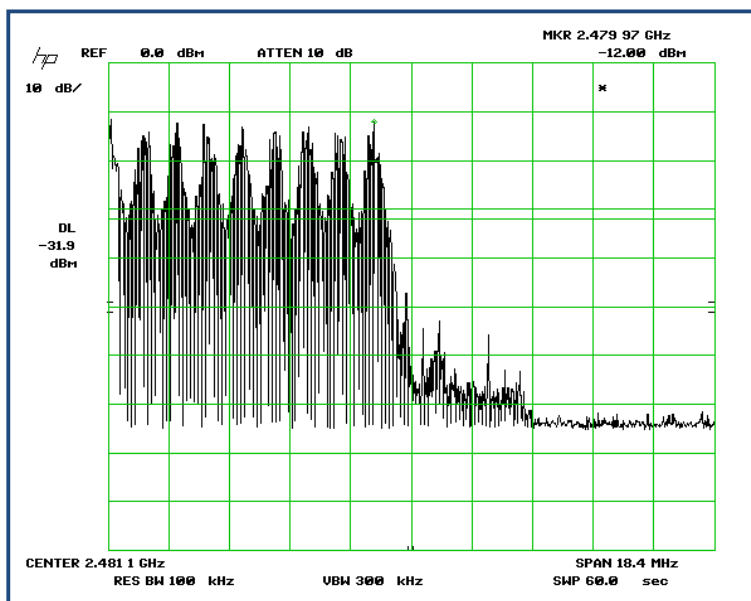


FIGURE 12 – UPPER BANDEDGE, FREQUENCY HOPPING ON

10.1 ADDITIONAL INFORMATION

Description	Comment
Test Engineer	A. Eadie
Test Date	13 th Feb 2012

11 RADIATED SPURIOUS EMISSIONS

11.1 TEST PROCEDURE

The EUT is placed on a non-conductive turntable on the 3m OATS. Exploratory measurements are made using a suitable antenna positioned within 1m of the EUT. Notable emissions are maximized and final measurements are taken if the initial results are within 20 dB of the permissible limit. The EUT is placed at nonconductive plate at the turntable center. For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations. The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E [\mu V/m] = URX + ATOT$$

Where URX is receiver reading and ATOT is total correction factor including cable loss, antenna factor and preamplifier gain (ATOT = LCABLES + AF - GPREAMP).

11.2 DATA

There were no discernible emissions within 20dB of the limit in the 1 GHz – 22GHz range.

11.3 SUMMARY OF TEST RESULTS

Test Description	Reference Specification	Result	Notes
Radiated Spurious Emissions	15.209(a) 15.205(a) A8.5	Complies	

11.3.1 SUMMARY OF 15.205 LIMITS

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
10.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(2)
13.36–13.41			

FIGURE 13 - RESTRICTED BANDS

11.3.2 SUMMARY OF 15.209 LIMITS

Limits below detailed for 3m measurement distance.

Frequency Range (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Limit dBuV/m	Detector
30-88	100	40.0	QP
88-216	150	43.5	QP
216-960	200	46.0	QP
960 – 1000	500	54.0	QP
Above 1000	500	54.0	Avg
Above 1000	5000	74.0	Peak

12 SPURIOUS RADIATED EMISSIONS (BELOW 1GHz)

12.1 TEST PROCEDURE

Maximizing procedure was performed on the six (6) highest emissions readings between the lowest RF frequency generated on the device (without going below 9 kHz) and the 10th harmonic of the highest fundamental frequency. Where applicable, a hybrid antenna, horn antenna and loop antenna were used to cover the relevant frequency bands.

All data was recorded in the peak detection mode. Quasi-peak readings were performed only when an emission was found to be marginal (within -4 dB of specification limits).

All other measurements were lower than 20dB below the limit.

12.2 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:

$$\text{Corrected Amplitude} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

12.3 MEASUREMENT DATA

No.	Freq (MHz)	Rdng (dBuV)	Corrected (dBuV/m)	Spec (dBuV/m)	Margin (dB)	Polarity	Antenna Height
1	38.57	25.9	34.2	40.0	-5.8	Vt	105
2	162.53	21.4	31.8	43.5	-11.7	Vt	273
3	31.32	14.6	25.9	40.0	-14.1	Hz	100
4	162.53	17.5	27.9	43.5	-15.6	Hz	268
5	73.76	12.7	21.3	40.0	-18.7	Vt	105
6	296.55	10.4	26.7	46.0	-19.3	Hz	268

TABLE 1 - EMISSION MEASUREMENTS

12.4 EMISSIONS PLOT

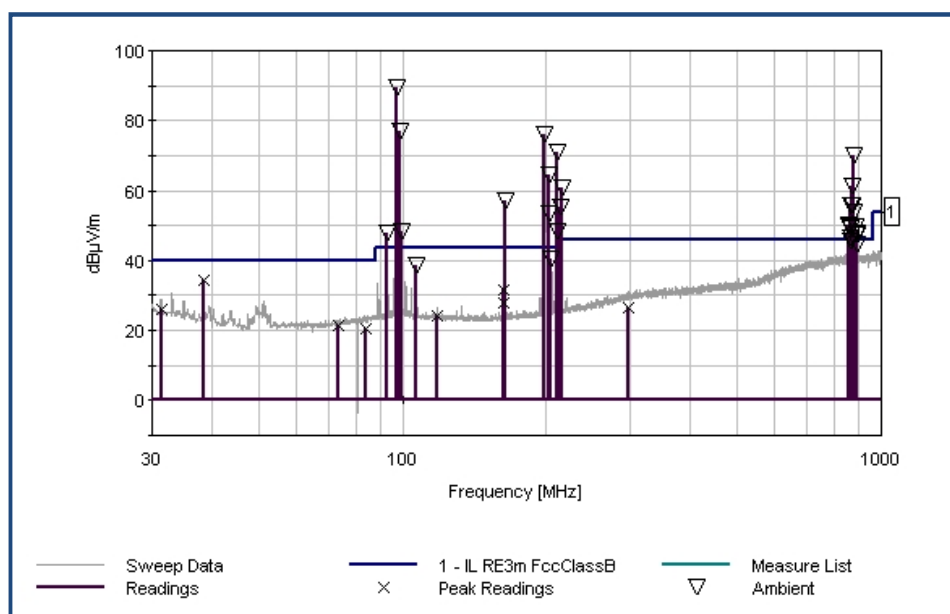


FIGURE 14 - EMISSIONS PLOT

13 AC POWER LINE CONDUCTED EMISSIONS

13.1 TEST PROCEDURE

The EUT is battery powered and is not designed to be operated as normal while connected to AC mains power. Provision (c) of §15.207 (below) states that the prescribed conducted emission limits are therefore not applicable. Worst case measurements are provided below for reference.

§15.207 (c) “Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.”

13.2 LIMITS AS PER 15.207

Frequency of emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66-56*	56-46*
0.5-5	56	46
5-30	60	50

TABLE 2 – CONDUCTED EMISSION LIMITS

13.3 TEST PROCEDURE

For the duration of the conducted emissions test, the power cord of the EUT was connected to the main power outlet of the LISN. The LISN in turn is connected to an AC power source. Exploratory tests of the EUT are performed by varying modes and cable positioning. Maximizing procedures are performed on the highest emission readings from the EUT.

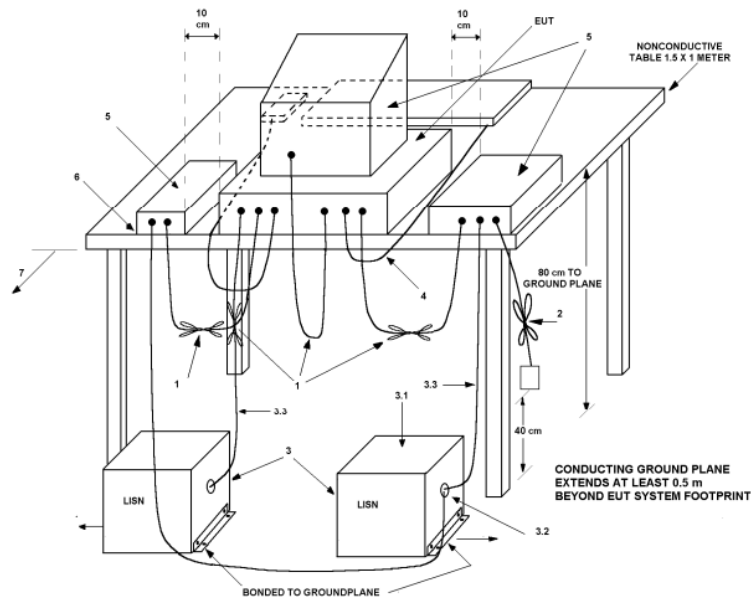


TABLE 3 - TEST ARRANGEMENT FOR CONDUCTED EMISSIONS OF TABLETOP EQUIPMENT

13.4 LINE RESULTS PLOT

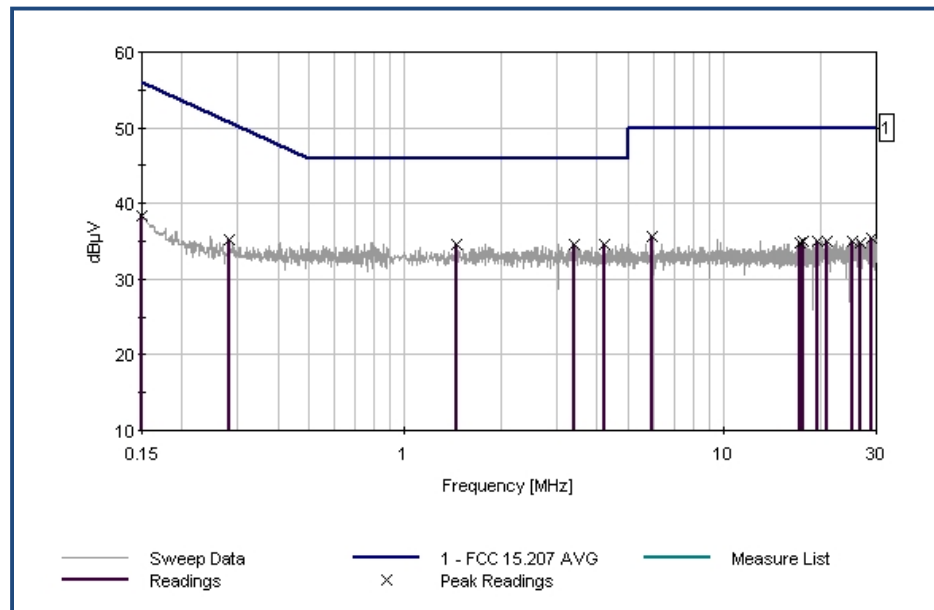


FIGURE 15 - CONDUCTED EMISSIONS PLOT - LINE

13.5 MEASUREMENT DATA, LINE

No.	Freq (MHz)	Rdng (dBuV)	Corrected (dBuV)	Spec (dBuV)	Margin (dB)	Polarity
1	5.95	35.5	35.6	50	-14.4	Line
2	29.14	34.9	35.5	50	-14.5	Line
3	21.06	34.5	35.0	50	-15.0	Line
4	17.70	34.8	34.9	50	-15.1	Line
5	19.54	34.8	34.9	50	-15.1	Line
6	25.15	34.3	34.9	50	-15.1	Line

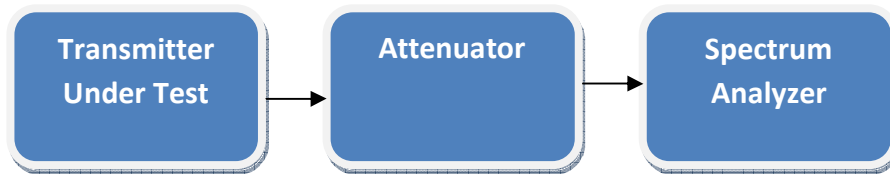
14 TEST EQUIPMENT

All applicable test equipment will be calibrated in accordance with ANSI Standard NCSL Z540-1 or other NIST traceable calibration standard. Equipment is calibrated on a 2 year cycle or according to the manufacturer's recommendations.

Manufacturer	Description	Model	Serial Number	Cal/Char Due Date D/M/Y
HP	Spectrum Analyzer	8566B	1327A00106/ 2648A14332	7/12/2012
HP	Pre-selector	85685A	2648A00463	7/12/2012
HP	Quasi Peak Detector	85650A	2521A00704	14/10/2012
Electro Metrics	Hybrid Antenna	EM-3141	9902-1141	18/11/2012
AH Systems	Horn Antenna	SAS-571	1242	18/11/2012
HP	Signal Generator	8657A	2521A00704	15/11/2012
HP	Signal Generator	8673E	2704A00420	7/2/2013
Rohde & Schwarz	Power analyzer	NVRS	844352/043	15/5/2013
Rohde & Schwarz	Power probe	NRV-Z5	8429721029	15/5/2013

15 TEST DIAGRAMS

15.1 CONDUCTED RF TEST SETUP



15.2 AC POWER LINE CONDUCTED EMISSIONS TEST SETUP



15.3 RADIATED EMISSIONS TEST SETUP

