TEST REPORT

Report No.: 15070548HKG-001R1

Source Pro Industries Ltd.

Application
For
Certification
(Original Grant)
(FCC ID: 2AFOO49314937)

Transceiver

This report supersedes previous report with report number 15070548HKG-001 dated September 14, 2015.

Prepared and Checked by:

Signed On File
Leung Sung Tak, Andy
Assistant Engineer

Approved by:

Digitally signed by Kenneth Wong
Location: Intertek Testing Services Hong Kong Ltd.

Wong Kwok Yeung, Kenneth
Lead Engineer
Date: September 15, 2015

GENERAL INFORMATION

Grantee:	Source Pro Industries Ltd.
Grantee Address:	Workshop No.18, 10/F., Metro Centre, No. 32 Lam Hing Street, Kowloon, Hong Kong
Contact Person:	Jackey Chu
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Manufacturer:	Dongguan Source Pro Electrical Mfg. Co. Ltd.
Manufacturer Address:	No. 6, Yinfeng 1st Road, Yinhu Industrial Park, Xiegang Town, Dongguan, China, 523598
Brand Name:	GLACIER BAY / Source Pro
Model:	SP4937, SP4931
Type of EUT:	Transceiver
Description of EUT:	LED Mirror with Bluetooth Speaker
Serial Number:	N/A
FCC ID:	2AFOO49314937
Date of Sample Submitted:	July 10, 2015
Date of Test:	July 10, 2015 to August 07, 2015
Report No.:	15070548HKG-001R1
Report Date:	September 15, 2015
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Radiated Emission Radiated Emission on the Bandedge	15.249, 15.209	Pass
Radiated Emission in Restricted Bands	15.205	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2014 Edition

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.
3. Please refer HA-S15-038 Letter issued on September 15, 2015 for amendment/ supersede notification.

Table of Contents

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a 2.4GHz Bluetooth 4.1 LED Mirror with Bluetooth Speaker. The EUT is powered by120VAC 60Hz. The Bluetooth 4.1 module (BLE function is disable) in the EUT is operating in the frequency range from 2402MHz to 2480MHz (79 channels with 1MHz channel spacing). The EUT can be connected with a Bluetooth Device for music playing and hand free function.

The model: SP4931 is the same as the Model: SP4937 in hardware aspect. The models are different in enclosure only.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

1.3 Test Methodology

Both AC mains line-conducted and Radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber. Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by 120VAC.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was operated standalone and placed in the center of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

As the circuitry and PCB layout of SP4931 is identical to the SP4937 except the enclosure, thus the product can be grouped in the RF portion and the RF test data of model SP4937 is shown on report only.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

2.5 Support Equipment List and Description

N/A.

3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
RR = 18.0 dBµV
LF = 9.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 120.628 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 8.1 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 9.7935 MHz

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

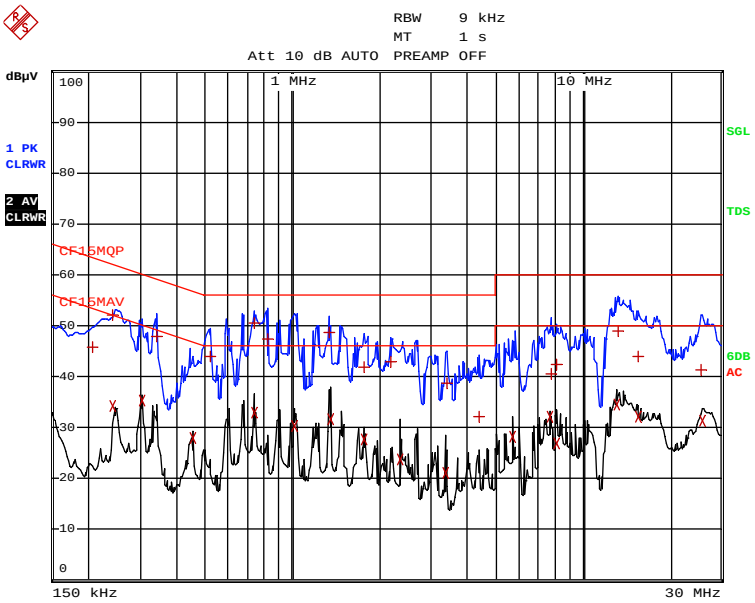
3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 4.67 dB

Model: SP4937

Worst-Case Operating Mode: Bluetooth Playing



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	208.5 kHz	45.84	N	-17.42
1	Quasi Peak	244.5 kHz	52.07	N	-9.86
2	CISPR Average	244.5 kHz	34.33	N	-17.60
2	CISPR Average	303 kHz	35.23	N	-14.92
1	Quasi Peak	339 kHz	47.94	N	-11.28
2	CISPR Average	451.5 kHz	28.08	N	-18.76
1	Quasi Peak	519 kHz	43.89	L1	-12.10
1	Quasi Peak	735 kHz	50.58	N	-5.41
2	CISPR Average	735 kHz	33.00	L1	-12.99
1	Quasi Peak	820.5 kHz	47.32	L1	-8.67
2	CISPR Average	1.014 MHz	30.38	N	-15.61
1	Quasi Peak	1.3425 MHz	48.69	L1	-7.30
2	CISPR Average	1.3515 MHz	31.50	N	-14.49
1	Quasi Peak	1.77 MHz	41.94	L1	-14.05
2	CISPR Average	1.77 MHz	27.80	N	-18.20
1	Quasi Peak	2.184 MHz	43.02	L1	-12.97
2	CISPR Average	2.3595 MHz	23.65	N	-22.34
2	CISPR Average	3.39 MHz	21.08	N	-24.91
1	Quasi Peak	3.399 MHz	38.79	L1	-17.20
1	Quasi Peak	4.416 MHz	32.12	L1	-23.87

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

Model: SP4937

Worst-Case Operating Mode: Bluetooth Playing

EDIT PEAK LIST (Final Measurement Results)

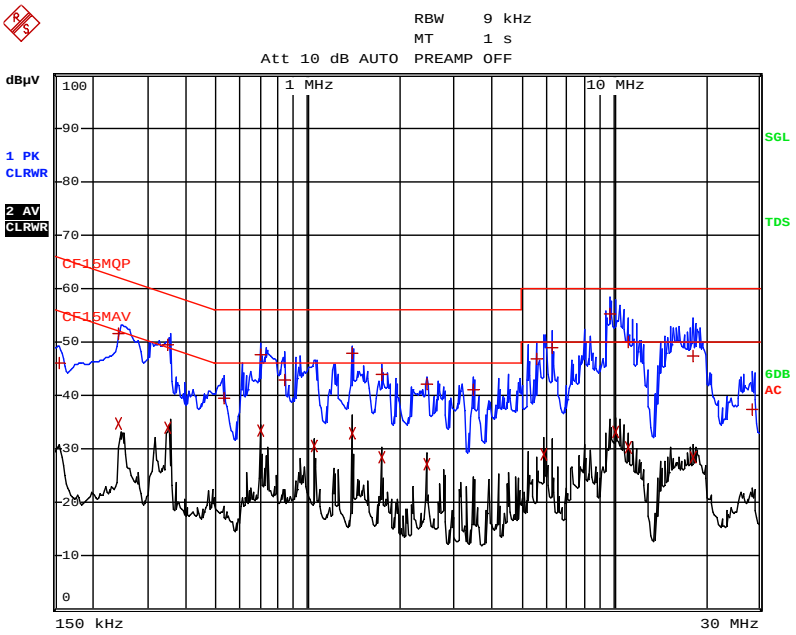
Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	5.7255 MHz	28.26	L1	-21.73
2	CISPR Average	7.755 MHz	32.03	L1	-17.96
1	Quasi Peak	7.8045 MHz	40.57	N	-19.42
2	CISPR Average	8.106 MHz	26.89	L1	-23.10
1	Quasi Peak	8.133 MHz	42.27	L1	-17.72
2	CISPR Average	13.1055 MHz	34.54	N	-15.45
1	Quasi Peak	13.2675 MHz	48.87	L1	-11.12
2	CISPR Average	15.477 MHz	32.08	L1	-17.91
1	Quasi Peak	15.612 MHz	44.04	L1	-15.95
1	Quasi Peak	25.6155 MHz	41.32	L1	-18.67
2	CISPR Average	25.899 MHz	31.25	L1	-18.74

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

Model: SP4931

Worst-Case Operating Mode: Bluetooth Playing



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	154.5 kHz	45.96	L1	-19.79
1	Quasi Peak	244.5 kHz	51.47	L1	-10.47
2	CISPR Average	244.5 kHz	34.67	L1	-17.27
1	Quasi Peak	352.5 kHz	49.42	N	-9.47
2	CISPR Average	352.5 kHz	33.93	N	-14.97
1	Quasi Peak	528 kHz	39.53	L1	-16.46
2	CISPR Average	699 kHz	33.42	N	-12.57
1	Quasi Peak	703.5 kHz	47.59	L1	-8.40
1	Quasi Peak	843 kHz	42.87	N	-13.13
2	CISPR Average	1.0545 MHz	30.55	N	-15.44
1	Quasi Peak	1.401 MHz	47.97	L1	-8.02
2	CISPR Average	1.4055 MHz	32.82	L1	-13.17
1	Quasi Peak	1.752 MHz	43.98	N	-12.01
2	CISPR Average	1.752 MHz	28.40	N	-17.60
1	Quasi Peak	2.4495 MHz	42.21	N	-13.79
2	CISPR Average	2.454 MHz	27.08	N	-18.91
1	Quasi Peak	3.5025 MHz	41.06	L1	-14.93
1	Quasi Peak	5.5995 MHz	46.93	N	-13.06
2	CISPR Average	5.955 MHz	28.98	N	-21.02
1	Quasi Peak	6.3015 MHz	48.98	L1	-11.01

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

Model: SP4931

Worst-Case Operating Mode: Bluetooth Playing

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	9.7935 MHz	55.32	N	-4.67
2	CISPR Average	10.158 MHz	33.10	L1	-16.90
1	Quasi Peak	11.1975 MHz	50.08	L1	-9.91
2	CISPR Average	11.2065 MHz	30.23	N	-19.76
2	CISPR Average	18.195 MHz	28.60	L1	-21.39
1	Quasi Peak	18.204 MHz	47.37	L1	-12.62
1	Quasi Peak	28.3335 MHz	37.35	L1	-22.64

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

Applicant: Source Pro Industries Ltd. Date of Test: August 07, 2015
Model: SP4937
Worst-Case Operating Mode: Transmitting

Table 1
Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2402.000	107.1	33	29.4	103.5	24	79.5	94.0	-14.5
V	***4804.000***	***53.1***	***33***	***34.9***	***55.0***	***24***	***31.0***	***54.0***	***-23.0***
V	7206.000	48.9	33	37.9	53.8	24	29.8	54.0	-24.2
V	9608.000	51.2	33	40.4	58.6	24	34.6	54.0	-19.4
V	***12010.000***	***52.5***	***33***	***40.5***	***60.0***	***24***	***36.0***	***54.0***	***-18.0***
V	14412.000	55.2	33	40.0	62.2	24	38.2	54.0	-15.8

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2402.000	107.1	33	29.4	103.5	114.0	-10.5
V	***4804.000***	***53.1***	***33***	***34.9***	***55.0***	***74.0***	***-19.0***
V	7206.000	48.9	33	37.9	53.8	74.0	-20.2
V	9608.000	51.2	33	40.4	58.6	74.0	-15.4
V	***12010.000***	***52.5***	***33***	***40.5***	***60.0***	***74.0***	***-14.0***
V	14412.000	55.2	33	40.0	62.2	74.0	-11.8

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

Applicant: Source Pro Industries Ltd. Date of Test: August 07, 2015
Model: SP4937
Worst-Case Operating Mode: Transmitting

Table 2
Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2440.000	106.9	33	29.4	103.3	24	79.3	94.0	-14.7
V	***4880.000***	***53.1***	***33***	***34.9***	***55.0***	***24***	***31.0***	***54.0***	***-23.0***
V	***7320.000***	***48.6***	***33***	***37.9***	***53.5***	***24***	***29.5***	***54.0***	***-24.5***
V	9760.000	50.9	33	40.4	58.3	24	34.3	54.0	-19.7
V	***12200.000***	***52.6***	***33***	***40.5***	***60.1***	***24***	***36.1***	***54.0***	***-17.9***
V	14640.000	56.9	33	38.4	62.3	24	38.3	54.0	-15.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2440.000	106.9	33	29.4	103.3	114.0	-10.7
V	***4880.000***	***53.1***	***33***	***34.9***	***55.0***	***74.0***	***-19.0***
V	***7320.000***	***48.6***	***33***	***37.9***	***53.5***	***74.0***	***-20.5***
V	9760.000	50.9	33	40.4	58.3	74.0	-15.7
V	***12200.000***	***52.6***	***33***	***40.5***	***60.1***	***74.0***	***-13.9***
V	14640.000	56.9	33	38.4	62.3	74.0	-11.7

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

Applicant: Source Pro Industries Ltd. Date of Test: August 07, 2015
Model: SP4937
Worst-Case Operating Mode: Transmitting

Table 3
Radiated Emissions
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Average Factor (dB)	Calculated at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2480.000	106.6	33	29.4	103.0	24	79.0	94.0	-15.0
V	***4960.000***	***53.1***	***33***	***34.9***	***55.0***	***24***	***31.0***	***54.0***	***-23.0***
V	***7440.000***	***48.5***	***33***	***37.9***	***53.4***	***24***	***29.4***	***54.0***	***-24.6***
V	9920.000	50.8	33	40.4	58.2	24	34.2	54.0	-19.8
V	***12400.000***	***52.7***	***33***	***40.5***	***60.2***	***24***	***36.2***	***54.0***	***-17.8***
V	14880.000	56.6	33	38.4	62.0	24	38.0	54.0	-16.0

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2480.000	106.6	33	29.4	103.0	114.0	-11.0
V	***4960.000***	***53.1***	***33***	***34.9***	***55.0***	***74.0***	***-19.0***
V	***7440.000***	***48.5***	***33***	***37.9***	***53.4***	***74.0***	***-20.6***
V	9920.000	50.8	33	40.4	58.2	74.0	-15.8
V	***12400.000***	***52.7***	***33***	***40.5***	***60.2***	***74.0***	***-13.8***
V	14880.000	56.6	33	38.4	62.0	74.0	-12.0

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

Applicant: Source Pro Industries Ltd. Date of Test: August 07, 2015
Model: SP4937
Worst-Case Operating Mode: Sound Play

Table 4
Radiated Emissions
Pursuant to FCC Part 15 Section 15.209 Requirement

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	34.606	36.7	16	10.0	30.7	40.0	-9.3
V	***120.628***	***37.4***	***16***	***14.0***	***35.4***	***43.5***	***-8.1***
H	180.992	22.7	16	20.0	26.7	43.5	-16.8
H	***250.001***	***22.8***	***16***	***20.0***	***26.8***	***46.0***	***-19.2***
H	298.100	21.8	16	22.0	27.8	46.0	-18.2
H	344.575	18.4	16	24.0	26.4	46.0	-19.6

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

Applicant: Source Pro Industries Ltd. Date of Test: August 07, 2015
Model: SP4931
Worst-Case Operating Mode: Sound Play (Circle Shape)

Table 5
Radiated Emissions
Pursuant to FCC Part 15 Section 15.209 Requirement

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	34.721	36.5	16	10.0	30.5	40.0	-9.5
V	***120.600***	***37.0***	***16***	***14.0***	***35.0***	***43.5***	***-8.5***
H	181.266	22.9	16	20.0	26.9	43.5	-16.6
H	***251.243***	***22.6***	***16***	***20.0***	***26.6***	***46.0***	***-19.4***
H	297.214	21.9	16	22.0	27.9	46.0	-18.1
H	344.575	18.2	16	24.0	26.2	46.0	-19.8

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Horn antenna is used for the emission over 1000MHz.

5. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.

6. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

4.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

8.0 Miscellaneous Information

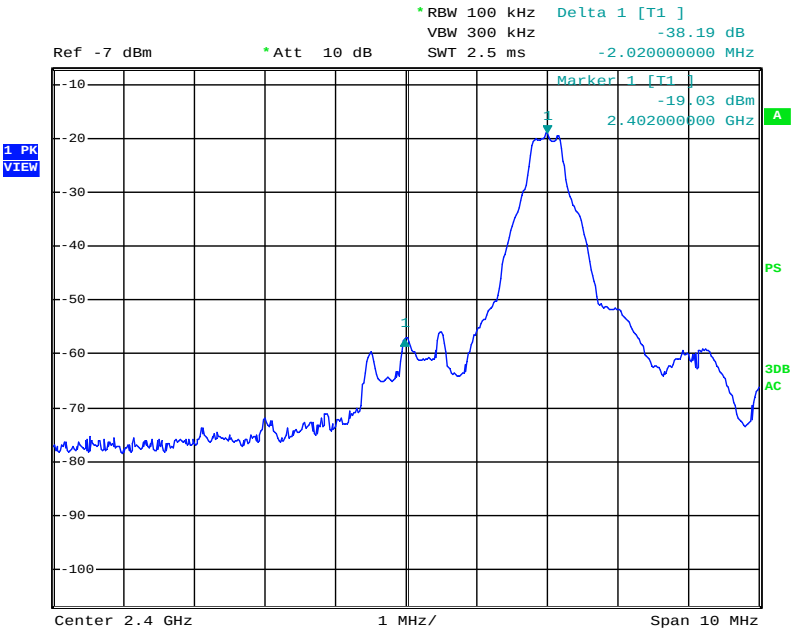
The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

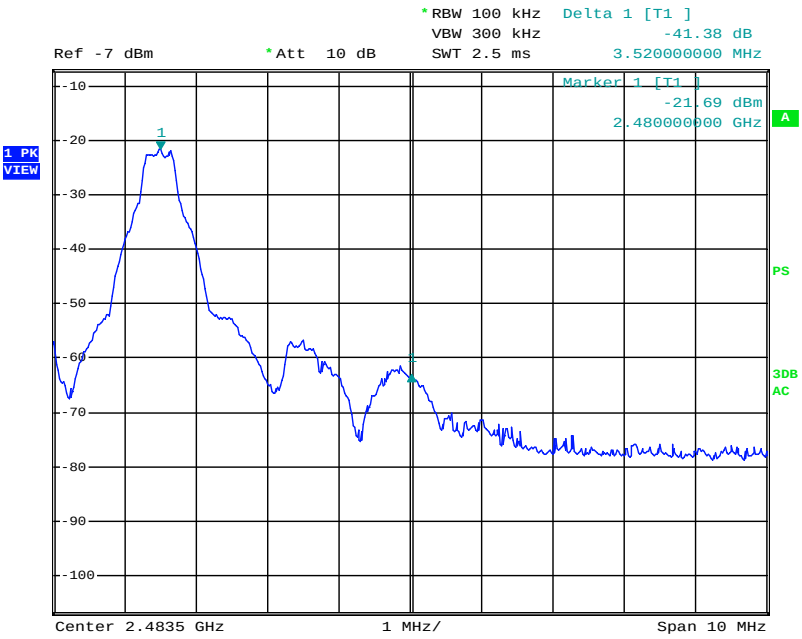
8.1 Radiated Emission on the Bandedge

From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.10 (2013) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

Peak Measurement





Peak Measurement

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=103.5 dBµV/m – 38.2 dB
=65.3 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=79.5 dBµV/m – 38.2 dB
=41.3 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=103.0 dBµV/m – 41.4 dB
=61.6 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=79.0 dBµV/m – 41.4 dB
=37.6 dBµV/m

The resultant field strength meets the general radiated emission limit in Section 15.209, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (Teff) is approximately 0.625ms for a digital "1" bit which illustrated on technical specification, with a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

8.3 Calculation of Average Factor

Based on the Bluetooth Specification Version 4.1 (Disable BLE), the transmitter ON time for each timeslot of Bluetooth is 625μs. DH5 has the maximum duty cycle, which consists of 5 continuous Tx slots and 1 Rx slot. Therefore one hopset take (5+1) x 625μs = 3.75ms. For one period for a pseudo-random hopping through at least 20 RF channels in adaptive mode (worse case), it take: 20 x 3.75ms = 75ms.

The dwell time for DH5 is 5 x 625μs = 3.125ms.

For the worst case calculation, there are two transmissions might occur in 100ms. Therefore,

Duty Cycle (DC) = Maximum On time in 100ms/100ms
= 3.125ms x 2/100ms
= 0.0625

Average Factor (AF) of Bluetooth in dB = $20 \log_{10} (0.0625)$
= -24 dB

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

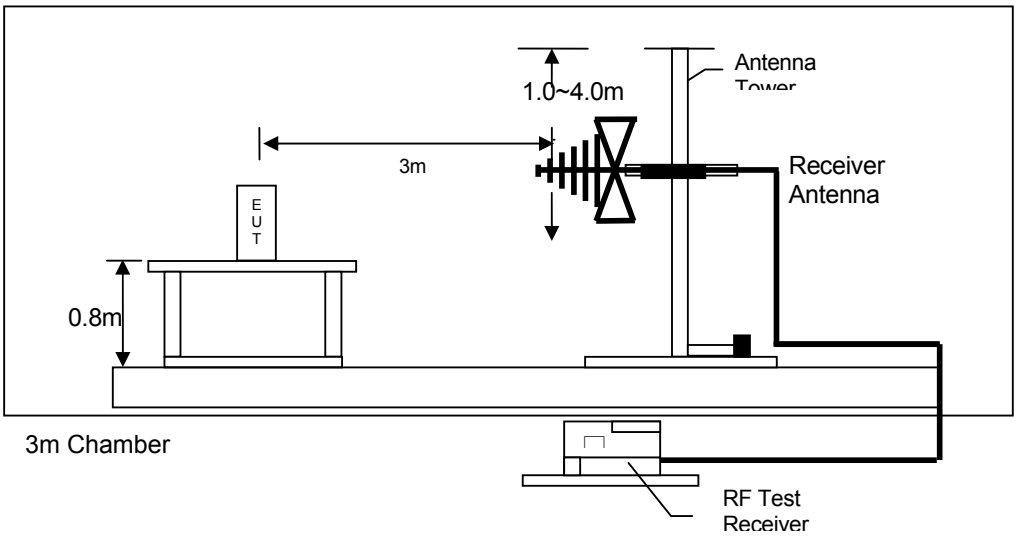
Conducted measurements were made as described in ANSI C63.10 (2013).

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 3 MHz is used.

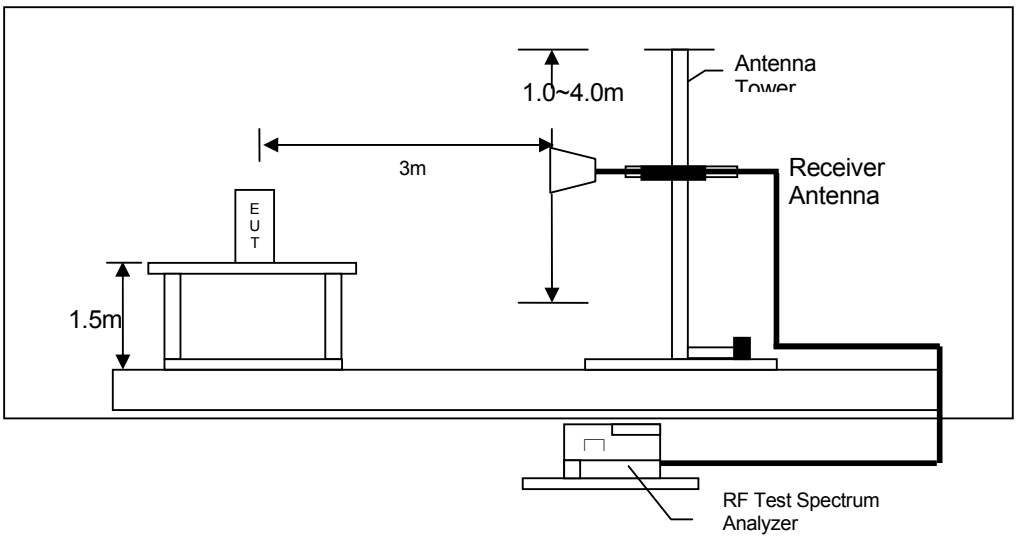
Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions upto 1GHz



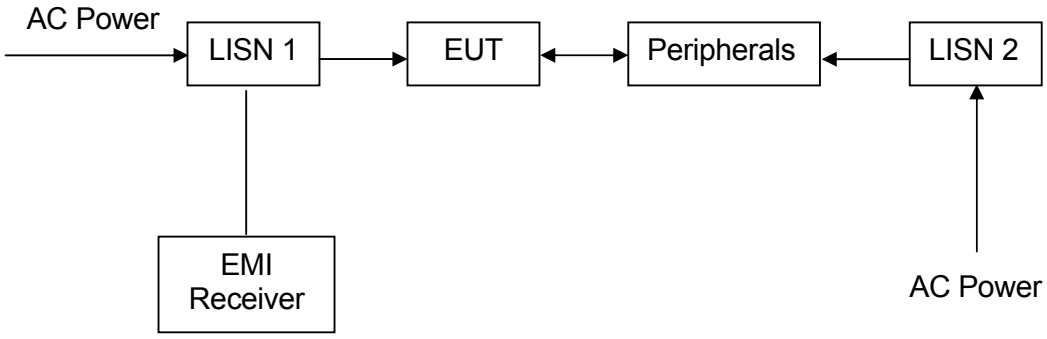
Test setup of radiated emissions above 1GHz

8.4.2 Conducted Emission Test Procedures

For tabletop equipment, the EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table. For floor-standing equipment, the EUT and all cables were insulated, if required, from the ground plane by up to 12 mm of insulating material. The EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4.3 Conducted Emission Test Setup



9.0 Confidentiality Request

For electronic filing, a preliminary copy of the confidentiality request is saved with filename: request.pdf.

10.0 Equipment List

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-3095	EW-2466	EW-2512
Manufacturer	R&S	R&S	EMCO
Model No.	ESCI	FSP30	3104C
Calibration Date	Oct. 16, 2014	Sep. 02, 2014	Jan. 22, 2015
Calibration Due Date	Oct. 16, 2015	Sep. 02, 2015	Jul. 22, 2016

Equipment	Double Ridged Guide Antenna	Log Periodic Antenna
Registration No.	EW-1133	EW-0447
Manufacturer	EMCO	EMCO
Model No.	3115	3146
Calibration Date	Apr. 30, 2014	Mar. 16, 2015
Calibration Due Date	Oct. 30, 2015	Sep. 16, 2016

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN
Registration No.	EW-2500	EW-2501
Manufacturer	R&S	R&S
Model No.	ESCI	ENV-216
Calibration Date	Nov. 06, 2014	Jan. 15, 2015
Calibration Due Date	Nov. 06, 2015	Jan. 15, 2016

3) Bandedge Measurement

Equipment	Spectrum Analyzer
Registration No.	EW-2249
Manufacturer	R&S
Model No.	FSP30
Calibration Date	Nov. 19, 2014
Calibration Due Date	Nov. 19, 2015

END OF TEST REPORT