



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Zedly, Inc.

Model: Trakkit

Description: Wireless Tracking Device

Serial Number: N/A

FCC ID: 2AK2G-TK-GS1

IC: 22949-TKGS1

To

FCC Part 15.247 DTS

And

IC RSS-247

Date of Issue: August 25, 2017

On the behalf of the applicant:

Zedly, Inc.
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Park City, UT 84098

Attention of:

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Poona Saber
Project Test Engineer

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All results contained herein relate only to the sample tested.



Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	July 11, 2017	Poona Saber	Original Document
2.0	August 24, 2017	Poona Saber	-Updated test procedure on page 9, -Added note on page 6 regarding CW signal, -Changed naming convention for high pass filter on some plots of annex A -Added a Note on Page 11



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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The applicant has been cautioned as to the following

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marked to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.



Standard Test Conditions Engineering Practices

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

In accordance with ANSI C63.10-2013 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

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

Environmental Conditions		
Temperature (°C)	Humidity (%)	Pressure (mbar)
23.3	28.9	967

EUT Description

Model: Trakkit

Description: Wireless Tracking Device

Firmware: N/A

Software: N/A

Serial Number: N/A

Additional Information: EUT is wireless access point with an 802.11 b, g and n radio incorporated.

EUT Operation during Tests

For testing purposes EUT was put on continuous modulated b, g and n mode. CW mode was utilized for testing spurious emission for emissions in restricted band based on 15.209 limit.



Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Ti development Kit	Texas instruments	CC3220x-LAUNCHXL	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Ferrite Y/N
1	USB to mini USB	0.5	N	N	N

Modifications: None

15.203: Antenna Requirement:

- ☒ The antenna is permanently attached to the EUT
- ☐ The antenna uses a unique coupling
- ☐ The EUT must be professionally installed
- ☐ The antenna requirement does not apply



Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.247(b)	Peak Output Power	Pass	
15.247(b)	Conducted Spurious Emissions	N/A	Device has no conducted port
15.247(d), 15.209(a), 15.205	Radiated Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Emissions At Band Edges	Pass	
15.247(a)(2)	Occupied Bandwidth	Pass	
15.247(e)	Transmitter Power Spectral Density	Pass	
15.207	A/C Powerline Conducted Emissions	Pass	
RSS-Gen §7	Receiver Spurious Emission Limits	Pass	



Peak Output Power

Engineer: Poona Saber

Test Date: 7/10/17

Test Procedure

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequencies at the maximum power level. A spectrum analyzer was used to verify that the EUT met the requirements for Output Power. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

The Spectrum Analyzer was set to the following:

RBW = 1 MHz

VBW = 3 MHz

Peak Detector

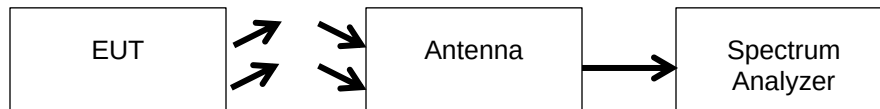
Trace mode = max hold

Sweep = auto

Span $\geq 3 \times$ RBW

The EUT was set to continuous transmit on the lowest, middle and highest frequencies at the maximum power level. The RF output power was measured using the spectrum analyzer's channel power function

Test Setup



Transmitter Peak Output Power

Tuned Frequency (MHz)	Mode	Measured Value (dBm)	Specification Limit	Result
2412	b	13.95	1 W (30 dBm)	Pass
2437	b	13.74	1 W (30 dBm)	Pass
2462	b	14.04	1 W (30 dBm)	Pass
2412	g	11.33	1 W (30 dBm)	Pass
2437	g	12.96	1 W (30 dBm)	Pass
2462	g	9.75	1 W (30 dBm)	Pass
2412	n	10.17	1 W (30 dBm)	Pass
2437	n	12.74	1 W (30 dBm)	Pass
2462	n	9.41	1 W (30 dBm)	Pass



Radiated Spurious Emissions

Engineer: Poona Saber

Test Date: 7/10/2017

Test Procedure Radiated Spurious Emissions: 30 – 1000 MHz

The EUT was tested in a semi-anechoic test chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

All emissions from 30 MHz to 1 GHz were examined.

Measured Level includes antenna and receiver cable correction factors.

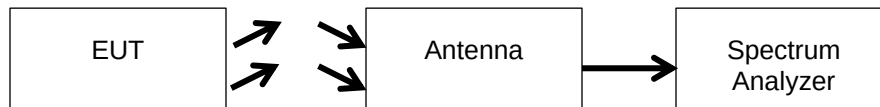
Correction factors were input into the spectrum analyzer before recording “Measured Level”.

RBW = 100 KHz

VBW = 300 KHz

Detector – Quasi Peak

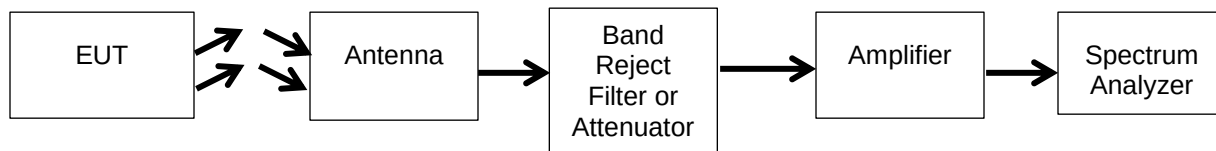
Test Setup



Test Procedure for Radiated Spurious Emissions above 1 GHz

The EUT was tested in a semi anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions. The antenna, band reject filter, amplifier and cable correction factors were input into the spectrum analyzer before recording the Measured Level to ensure accurate readings. The spectrum for each tuned frequency was examined to the 10th harmonic.

Test Setup



No other emissions were detectable. All emissions were more than -20 dBc.

See Annex A for test data



Emissions at Band Edges

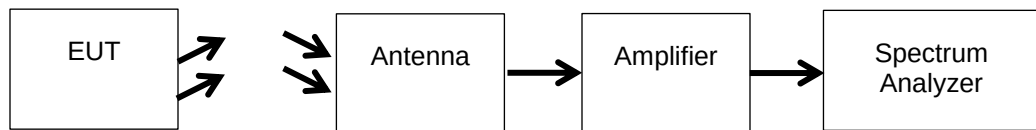
Engineer: Poona Saber

Test Date: 7/7/17

Test Procedure

The EUT was tested in a semi-anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for band edge and restricted band for both peak and average measurements. The cable and antenna correction factors were input into the analyzer as a reference level offset to ensure accurate readings. For the restricted band the amplifier and band reject filter correction factors were also input to the spectrum analyzer.

Band Edge Test Setup



Note: Band edge emission based on Restricted Band versus 15.209 limit was measured at 1 meters without the pre Amplifier being utilized

See Annex B for test data



DTS Bandwidth

Engineer: Poona Saber

Test Date: 7/10/2017

Test Procedure

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequencies at the maximum power level. A spectrum analyzer was used to verify that the EUT met the requirements for DTS Bandwidth. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

The Spectrum Analyzer was set to the following:

RBW = 100 kHz

VBW $\geq 3 \times$ RBW

Peak Detector

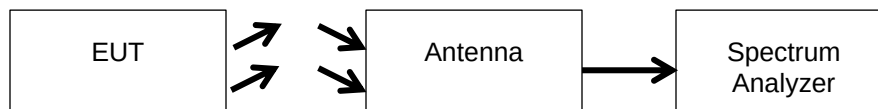
Trace mode = max hold

Sweep = auto couple

Span = $1.5 \times$ EBW

The EUT was set to transmit at the lowest, middle and highest channels of the band at the maximum power levels. The maximum width of the emission that was determined by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that were attenuated by 6db and this value was used to determine the width of the carrier. Alternatively, the spectrum analyzer's automatic bandwidth capability was used.

Test Setup



6 dB Occupied Bandwidth Summary

Frequency (MHz)	Mode	Measured Bandwidth (MHz)	Specification Limit (kHz)	Result
2412	b	9.134	≥ 500	Pass
2437	b	9.587	≥ 500	Pass
2462	b	9.124	≥ 500	Pass
2412	g	15.156	≥ 500	Pass
2437	g	15.159	≥ 500	Pass
2462	g	15.133	≥ 500	Pass
2412	n	15.159	≥ 500	Pass
2437	n	15.131	≥ 500	Pass
2462	n	15.143	≥ 500	Pass



99% Bandwidth Summary

Frequency (MHz)	Mode	Measured Bandwidth (MHz)	Result
2412	b	14.62	Pass
2437	b	14.53	Pass
2462	b	14.34	Pass
2412	g	16.85	Pass
2437	g	16.50	Pass
2462	g	16.49	Pass
2412	n	17.75	Pass
2437	n	17.57	Pass
2462	n	17.62	Pass

See Annex C for test data



Transmitter Power Spectral Density (PSD)

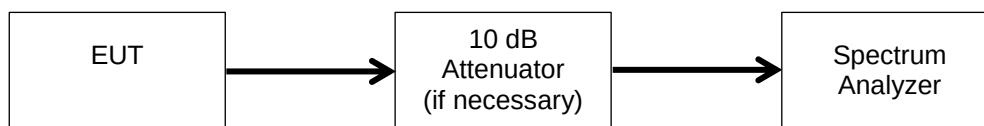
Engineer: Poona Saber

Test Date: 7/11/2017

Test Procedure

The EUT was connected directly to a spectrum analyzer. The test was performed per section 11.10 of C63.10:2013 "Procedure for determining PSD for DTS devices".

Test Setup



PSD Summary

Frequency (MHz)	Mode	Measured Data (dBm)	Specification Limit (dBm)	Result
2412	b	2.981	8	Pass
2437	b	2.668	8	Pass
2462	b	2.143	8	Pass
2412	g	0.229	8	Pass
2437	g	2.737	8	Pass
2462	g	0.166	8	Pass
2412	n	2.221	8	Pass
2437	n	2.328	8	Pass
2462	n	-1.305	8	Pass

See Annex D for test data



A/C Powerline Conducted Emission

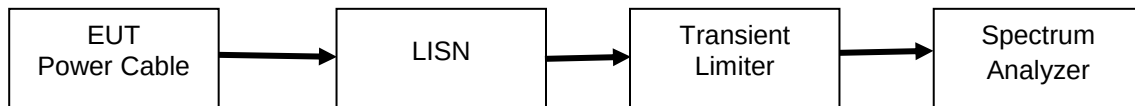
Engineer: Poona Saber

Test Date: 7/11/17

Test Procedure

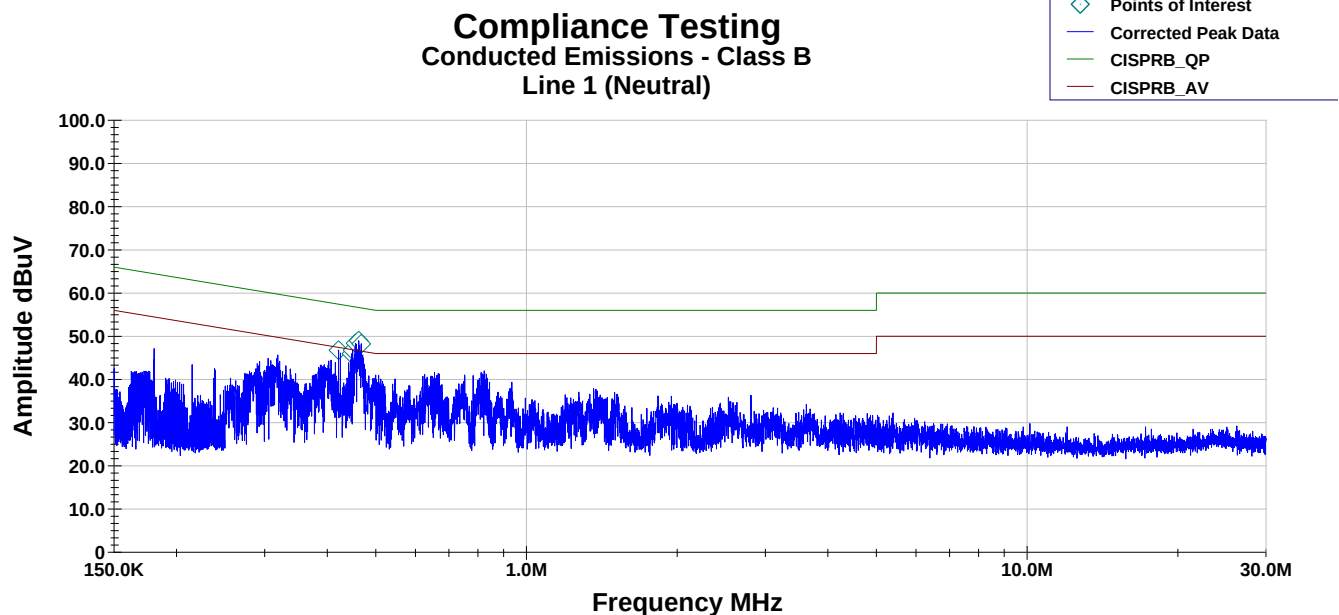
The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Test Setup



Conducted Emission Test Results

Line 1 Peak Plot



Operator: PS

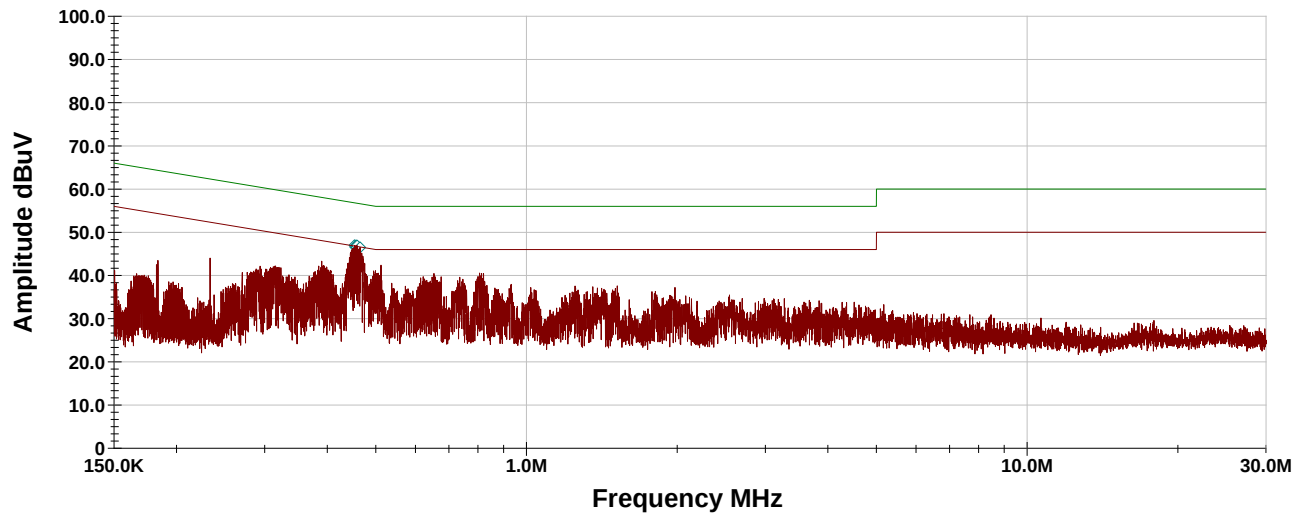
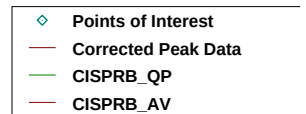
EN55022 Class B_85462 EMI Rec_V7_ACTIVE.til

Job #:



Line 2 Peak Plot

Compliance Testing
Conducted Emissions - Class B
Line 2 (Phase)



Operator: PS

EN55022 Class B_85462 EMI Rec_V7_ACTIVE.til

Job #:



Line 1 Neutral Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
428.64 KHz	7.57	0.1	0.03	10.1	17.797	48.039	-30.242
455.62 KHz	14.68	0.1	0.03	10.1	24.907	47.268	-22.361
458.18 KHz	15.26	0.1	0.03	10.1	25.49	47.195	-21.705
458.81 KHz	15.22	0.1	0.03	10.1	25.453	47.177	-21.724
460.45 KHz	15.46	0.1	0.03	10.1	25.687	47.13	-21.443
452.33 KHz	13.72	0.1	0.03	10.1	23.953	47.362	-23.409

Line 2 Phase Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
453.51 KHz	14.46	0.1	0.03	10.1	24.687	47.328	-22.642
455.08 KHz	14.68	0.1	0.03	10.1	24.91	47.283	-22.373
456.2 KHz	14.74	0.1	0.03	10.1	24.973	47.251	-22.278
457.86 KHz	15.11	0.1	0.03	10.1	25.34	47.204	-21.864
458.49 KHz	15.01	0.1	0.03	10.1	25.243	47.186	-21.943
456.45 KHz	14.64	0.1	0.03	10.1	24.873	47.244	-22.371

Line 1 Neutral QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
428.64 KHz	25.16	0.1	0.03	10.1	35.39	58.039	-22.649
455.62 KHz	33.32	0.1	0.03	10.1	43.55	57.268	-13.718
458.18 KHz	33.43	0.1	0.03	10.1	43.66	57.195	-13.535
458.81 KHz	33.41	0.1	0.03	10.1	43.64	57.177	-13.537
460.45 KHz	33.87	0.1	0.03	10.1	44.1	57.13	-13.03
452.33 KHz	32.85	0.1	0.03	10.1	43.08	57.362	-14.282

Line 2 Phase QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
453.51 KHz	33.05	0.1	0.03	10.1	43.28	57.328	-14.048
455.08 KHz	33.59	0.1	0.03	10.1	43.82	57.283	-13.463
456.2 KHz	33.55	0.1	0.03	10.1	43.78	57.251	-13.471
457.86 KHz	33.31	0.1	0.03	10.1	43.54	57.204	-13.664
458.49 KHz	33.56	0.1	0.03	10.1	43.79	57.186	-13.396
456.45 KHz	33.19	0.1	0.03	10.1	43.42	57.244	-13.824



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	ARA	DRG-118/A	i00271	6/16/16	6/16/18
Horn Antenna, Amplified	ARA	MWH-1826/B	i00273	4/22/15	4/22/18
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	6/9/17	6/9/18
Spectrum Analyzer	Agilent	E4407B	i00331	10/19/16	10/19/17
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	8/3/16	8/3/18
EMI Analyzer	Agilent	E7405A	i00379	2/22/17	2/22/18
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19
PSA Spectrum Analyzer	Agilent	E4445A	i00471	8/30/16	8/30/17
Preamplifier	Miteq	AFS44 00101 400 23-10P-44	i00509	N/A	N/A
LISN	COM-Power	LI-125A	i00446	4/29/16	4/29/18
LISN	COM-Power	LI-125A	i00448	4/29/16	4/29/18
EMI Receiver	HP	8546A	i00033	3/28/17	3/28/18
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: 7/6/2017	

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT