



## FCC / ISED C2PC Test Report

**FOR:**

Keep Truckin

**Model Name:**

LBB-3.55CA

**Product Description:**

Uses BT to synchronize log data to companion app running on smartphone or tablet (there are iOS and Android versions of the app). Can use LTE to sync with cloud directly when companion device is not connected.

**FCC ID:** 2AQM7-35

**IC ID:** 24516-35

**Applied Rules and Standards:**

47 CFR Part 15.247 (DTS)

RSS-247 Issue 2 (DTS) & RSS-Gen Issue 5

**REPORT #:** EMC\_KPTRK\_011\_19001\_15.247\_WLAN

**DATE:** 2020-02-21



A2LA Accredited

IC recognized #  
3462B-2

**CETECOM Inc.**

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**TABLE OF CONTENTS**

<b>1</b>	<b>ASSESSMENT .....</b>	<b>3</b>
<b>2</b>	<b>ADMINISTRATIVE DATA.....</b>	<b>4</b>
2.1	IDENTIFICATION OF THE TESTING LABORATORY ISSUING THE EMC TEST REPORT.....	4
2.2	IDENTIFICATION OF THE CLIENT .....	4
2.3	IDENTIFICATION OF THE MANUFACTURER .....	4
<b>3</b>	<b>EQUIPMENT UNDER TEST (EUT) .....</b>	<b>5</b>
3.1	EUT SPECIFICATIONS .....	5
3.2	EUT SAMPLE DETAILS .....	7
3.3	SUPPORT EQUIPMENT .....	7
3.4	TEST SAMPLE CONFIGURATION.....	7
3.5	JUSTIFICATION FOR WORST CASE MODE OF OPERATION.....	8
<b>4</b>	<b>SUBJECT OF INVESTIGATION .....</b>	<b>8</b>
<b>5</b>	<b>MEASUREMENT RESULTS SUMMARY.....</b>	<b>8</b>
<b>6</b>	<b>MEASUREMENT UNCERTAINTY .....</b>	<b>9</b>
6.1	ENVIRONMENTAL CONDITIONS DURING TESTING: .....	9
6.2	DATES OF TESTING: .....	9
<b>7</b>	<b>MEASUREMENT PROCEDURES.....</b>	<b>10</b>
7.1	RADIATED MEASUREMENT .....	10
7.2	RF CONDUCTED MEASUREMENT PROCEDURE .....	12
<b>8</b>	<b>TEST RESULT DATA.....</b>	<b>13</b>
8.1	RADIATED TRANSMITTER SPURIOUS EMISSIONS AND RESTRICTED BANDS.....	13
<b>9</b>	<b>TEST SETUP PHOTOS.....</b>	<b>19</b>
<b>10</b>	<b>TEST EQUIPMENT AND ANCILLARIES USED FOR TESTING .....</b>	<b>19</b>
<b>11</b>	<b>REVISION HISTORY .....</b>	<b>20</b>

Test Report #: EMC\_KPTRK-011-19001\_15.247\_WLAN  
Date of Report 2020-02-21

FCC ID: 2AQM7-35  
IC ID: 24516-35

## 1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

Company	Description	Model #
Keep Truckin	Uses BT to synchronize log data to companion app running on smartphone or tablet (there are iOS and Android versions of the app). Can use LTE to sync with cloud directly when companion device is not connected.	LBB-3.55CA

### Responsible for Testing Laboratory:

2020-02-21      Compliance      Cindy Li  
(EMC Lab Manager)

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Date	Section	Name	Signature
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### Responsible for the Report:

2020-02-21      Compliance      Kevin Wang  
(Senior EMC Engineer)

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Date	Section	Name	Signature
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The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

Test Report #: EMC\_KPTRK-011-19001\_15.247\_WLAN  
Date of Report 2020-02-21

FCC ID: 2AQM7-35  
IC ID: 24516-35

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Street Address:</b>	411 Dixon Landing Road
<b>City/Zip Code</b>	Milpitas, CA 95035
<b>Country</b>	USA
<b>Telephone:</b>	+1 (408) 586 6200
<b>Fax:</b>	+1 (408) 586 6299
<b>EMC Lab Manager:</b>	Cindy Li
<b>Responsible Project Leader:</b>	Trina Noor

### 2.2 Identification of the Client

<b>Client's Name:</b>	Keep Truckin
<b>Street Address:</b>	370 Townsend St.
<b>City/Zip Code:</b>	San Francisco, CA 94107
<b>Country:</b>	USA

### 2.3 Identification of the Manufacturer

<b>Manufacturer's Name:</b>	Same as Client
<b>Manufacturers Address:</b>	
<b>City/Zip Code</b>	
<b>Country</b>	

### 3 Equipment under Test (EUT)

#### 3.1 EUT Specifications

<b>Model No:</b>	LBB-3.55CA
<b>HW Version :</b>	1.1
<b>SW Version :</b>	67024
<b>FCC-ID:</b>	2AQM7-35
<b>IC-ID:</b>	24516-35
<b>HVIN:</b>	LBB-3.55CA
<b>PMN:</b>	LBB-3.55CA
<b>Product Description:</b>	Uses BT to synchronize log data to companion app running on smartphone or tablet (there are iOS and Android versions of the app). Can use LTE to sync with cloud directly when companion device is not connected.
<b>Frequency Range / number of channels:</b>	Module name: LSR Sterling-LWB Module number: LSR 450-0152 FCC/IC ID: TFB-1003 / 5969A-1003 Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels
<b>Type(s) of Modulation:</b>	BPSK, QPSK, 16-QAM, 64QAM
<b>Modes of Operation:</b>	802.11b/g/n, 20MHz
<b>Antenna Information as declared:</b>	1.5 dBi
<b>Max. Peak Output Power:</b>	24 dBm
<b>Power Supply/ Rated Operating Voltage Range:</b>	Vmin: 6 VDC/ Vnom: 14 VDC / Vmax: 30 VDC
<b>Operating Temperature Range:</b>	-40 °C to 115 °C
<b>Other Radios included in the device:</b>	❖ <u>BLE</u> <ul style="list-style-type: none"><li>• Module name: LSR Sterling-LWB</li><li>• Module number: LSR 450-0152</li><li>• FCC/IC ID: TFB-1003 / 5969A-1003</li><li>• Antenna Gain: 1.5 dBi</li></ul>

Test Report #: EMC\_KPTRK-011-19001\_15.247\_WLAN  
Date of Report 2020-02-21

FCC ID: 2AQM7-35  
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	<ul style="list-style-type: none"><li>❖ WCDMA, LTE<ul style="list-style-type: none"><li>• Module name: Sierra Wireless HL7588</li><li>• Module number: 7588</li><li>• FCC/IC ID: N7NHL7588</li></ul></li><li>❖ GPS<ul style="list-style-type: none"><li>• Module name/number: ublox NEO-M8U-0-10</li></ul></li></ul>
<b>Sample Revision:</b>	<input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production

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Date of Report 2020-02-21

FCC ID: 2AQM7-35  
IC ID: 24516-35

### 3.2 EUT Sample details

EUT #	IMEI Number	HW Version	SW Version	Notes/Comments
1	015389000315853	1.1	67024	Radiated Emissions

### 3.3 Support Equipment

SE #	Type	Model	Manufacturer	Serial Number
1	AC/DC Adapter	DM5133	Dura Micro	DN2081215008176

### 3.4 Test Sample Configuration

EUT Set-up #	Combination of SE used for test set up	Comments
1	EUT#1+ SE#1	Special commands through command window used to configure the WLAN radio to low channel at maximum output power(802.11g) provided by the client that will not be available to the end user.  For radiated measurements, the internal antenna was connected.

### 3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low channel with the maximum output power (802.11g Ch1) and the customer declared highest possible duty cycle. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

## 4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 of ISED Canada.

Testing procedures are based on 558074 D01 DTS Meas Guidance v04 – “GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247” - April 5, 2017, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.

## 5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(1) RSS-247 5.2(1)	Emission Bandwidth	Nominal	802.11 b/g/n	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1 Note2
§15.247(e) RSS-247 5.2(2)	Power Spectral Density	Nominal	802.11 b/g/n	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1 Note2
§15.247(b)(1) RSS-247 5.4(4)	Maximum Conducted Output Power and EIRP	Nominal	802.11 b/g/n	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1 Note2
§15.247(d) RSS-247 5.5	Band edge compliance Unrestricted Band Edges	Nominal	802.11 b/g/n	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1 Note2
§15.247; 15.209; 15.205 RSS-Gen 8.9; 8.10	Band edge compliance Restricted Band Edges	Nominal	802.11 b/g/n	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Note1 Note2
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions- Radiated	Nominal	802.11n_ HT20 MIMO	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	N/A	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Note1 Note3

**Note1:** NA= Not Applicable; NP= Not Performed.

**Note2:** Leveraged from module certification FCC ID: TFB-1003

**Note3:** EUT is powered by 12VDC



## 6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

### Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

### Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)
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RF conducted measurement	±0.5 dB
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According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error. Also used: <http://physics.nist.gov/cuu/Uncertainty/typeb.html>. The above calculated uncertainties apply to direct application of the Substitution method. The Substitution method is always used when the EUT comes closer than 3 dB to the limit.

### 6.1 Environmental Conditions during Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25°C
- Relative humidity: 40-60%

### 6.2 Dates of Testing:

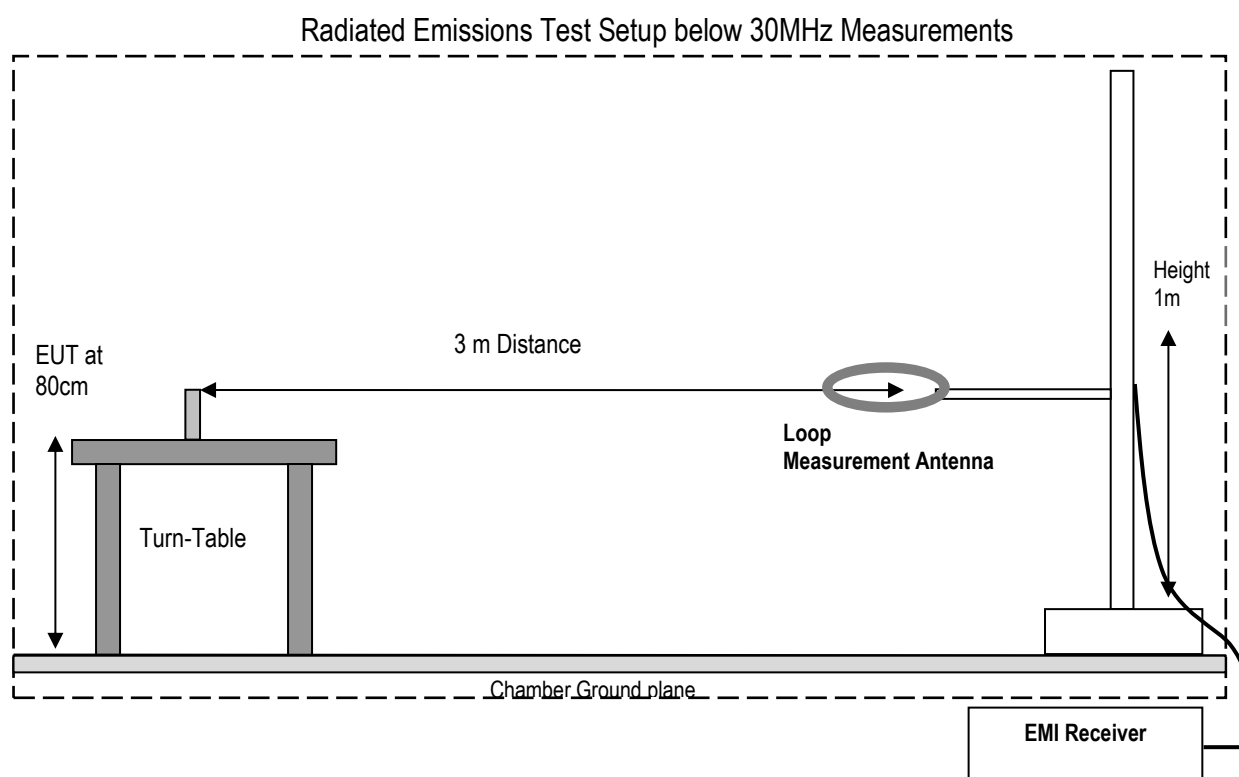
01/04/2020-01/25/2020

## 7 Measurement Procedures

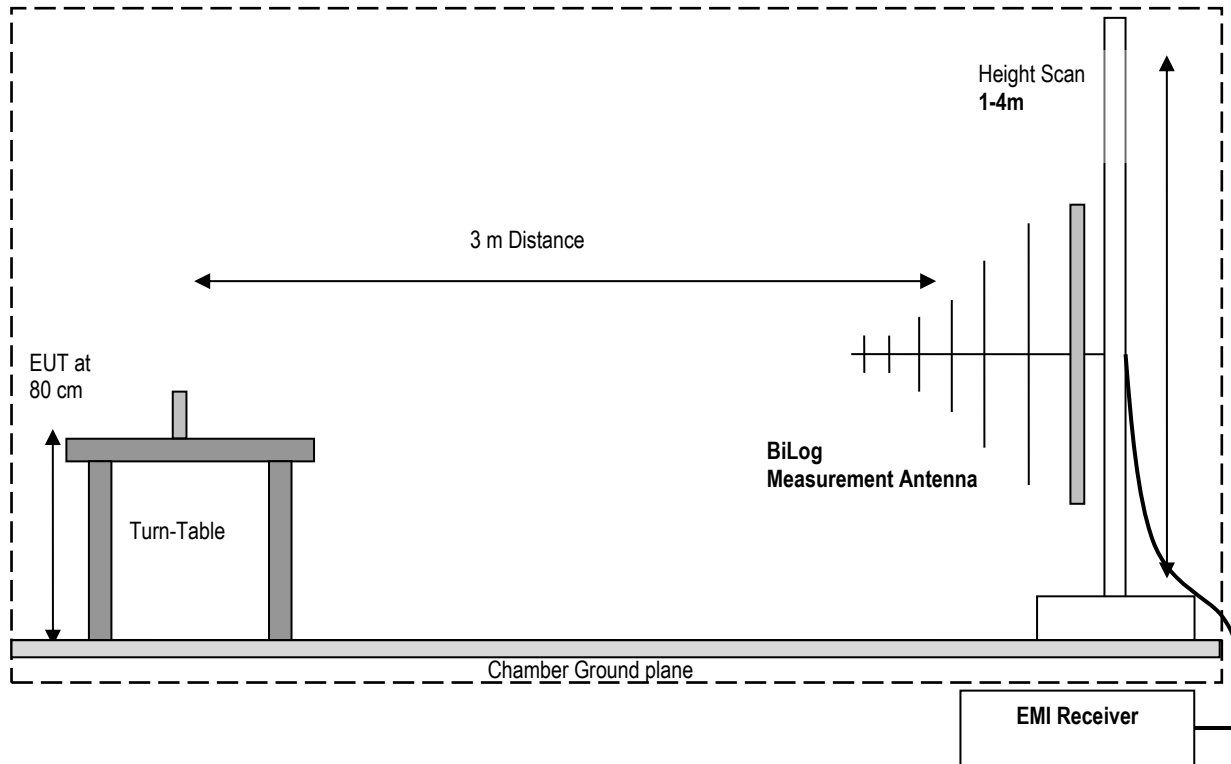
### 7.1 Radiated Measurement

The radiated measurement is performed according to ANSI C63.10 (2013)

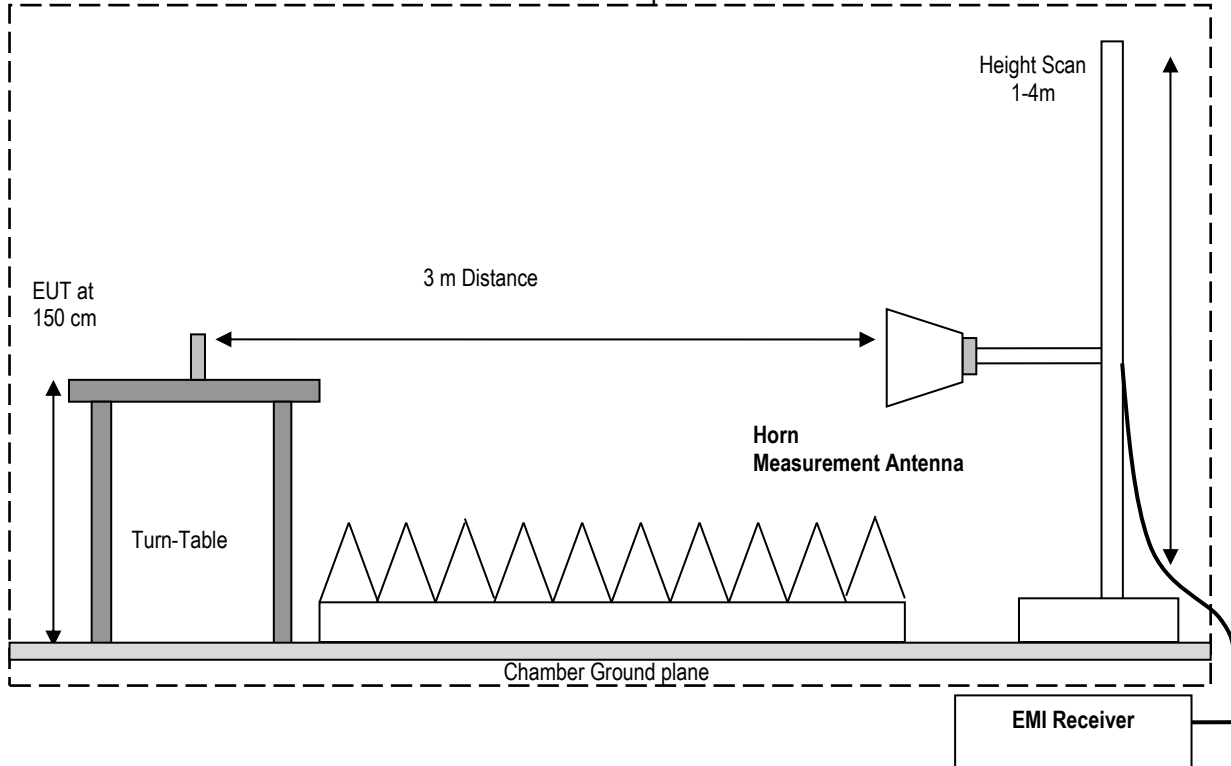
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



**Radiated Emissions Test Setup 30MHz-1GHz Measurements**



**Radiated Emissions Test Setup above 1GHz Measurements**



### 7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dB $\mu$ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$FS \text{ (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} - \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

Frequency (MHz)	Measured SA (dB $\mu$ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB $\mu$ V/m)
1000	80.5	3.5	14	98.0

### 7.2 RF Conducted Measurement Procedure

Testing procedures are based on 558074 D01 DTS Meas Guidance v04 – “GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER SECTION 15.247” - April 5, 2017, by the Federal Communications Commission, Office of Engineering and Technology, Laboratory Division.



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.
- Calculate the conducted power by taking into account attenuation of the cable and the attenuator

## 8 Test Result Data

### 8.1 Radiated Transmitter Spurious Emissions and Restricted Bands

#### 8.1.1 Measurement according to ANSI C63.10 (2013)

##### Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak
  
- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)
  
- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz
  
- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) =  $40 \log (D/d) = 40 \log (300m / 3m) = 80dB$

#### 8.1.2 Limits:

##### FCC §15.247

- 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. 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(a) (see §15.205(c)).

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength @ 3m (dBµV/m)
0.009–0.490	2400/F(kHz) / -----	300	-
0.490–1.705	24000/F(kHz) / -----	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBµV/m
88–216	150	3	43.5 dBµV/m
216–960	200	3	46 dBµV/m
Above 960	500	3	54 dBµV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

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	Above 38.6
13.36-13.41			

- 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(a) (see §15.205(c)).  
 \*PEAK LIMIT= 74 dBµV/m  
 \*AVG. LIMIT= 54 dBµV/m

Test Report #: EMC\_KPTRK-011-19001\_15.247\_WLAN  
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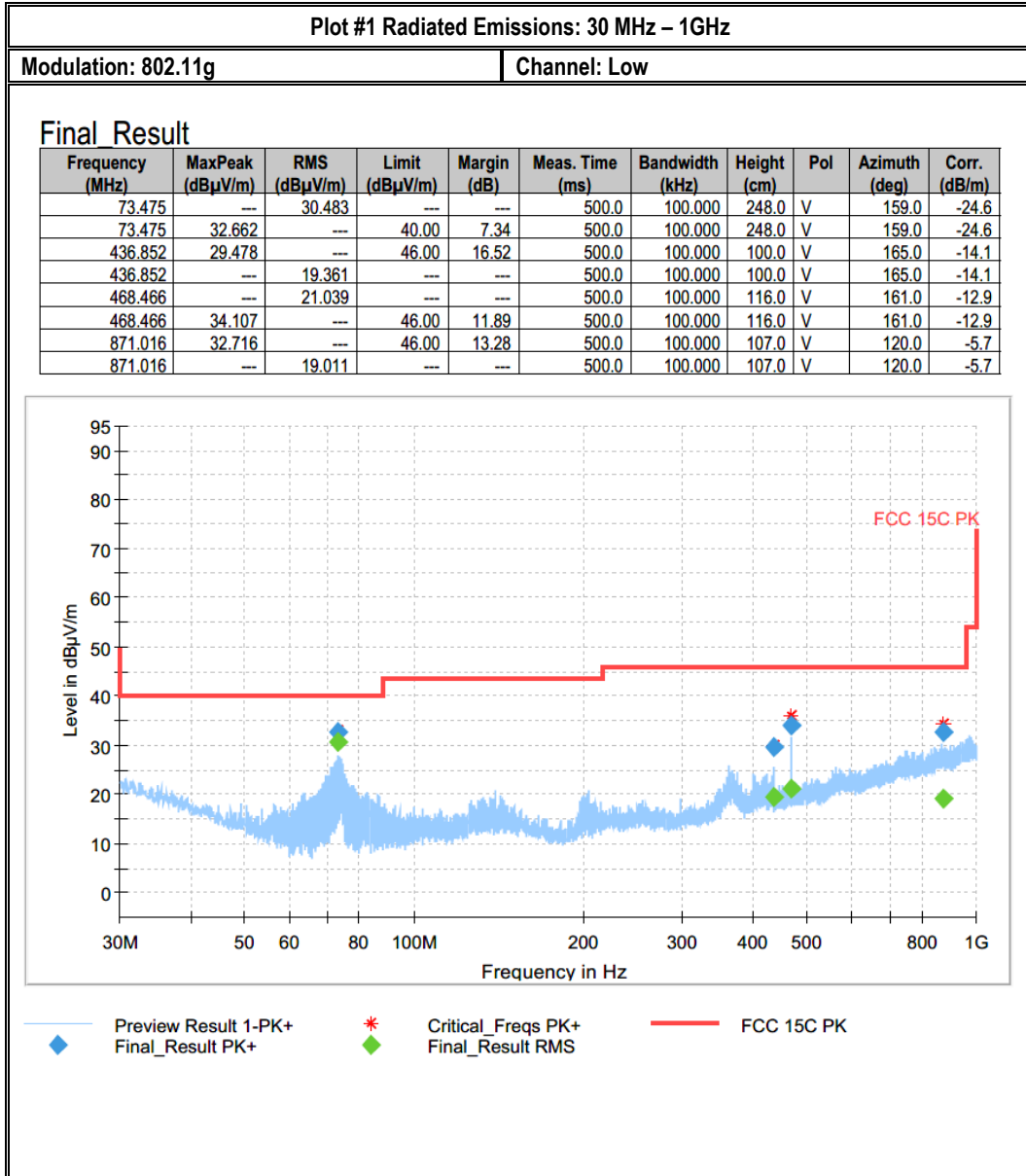
### 8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	802.11g	12 VDC

### 8.1.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
1-3	Low	30 MHz – 18 GHz	See section 8.1.2	Pass

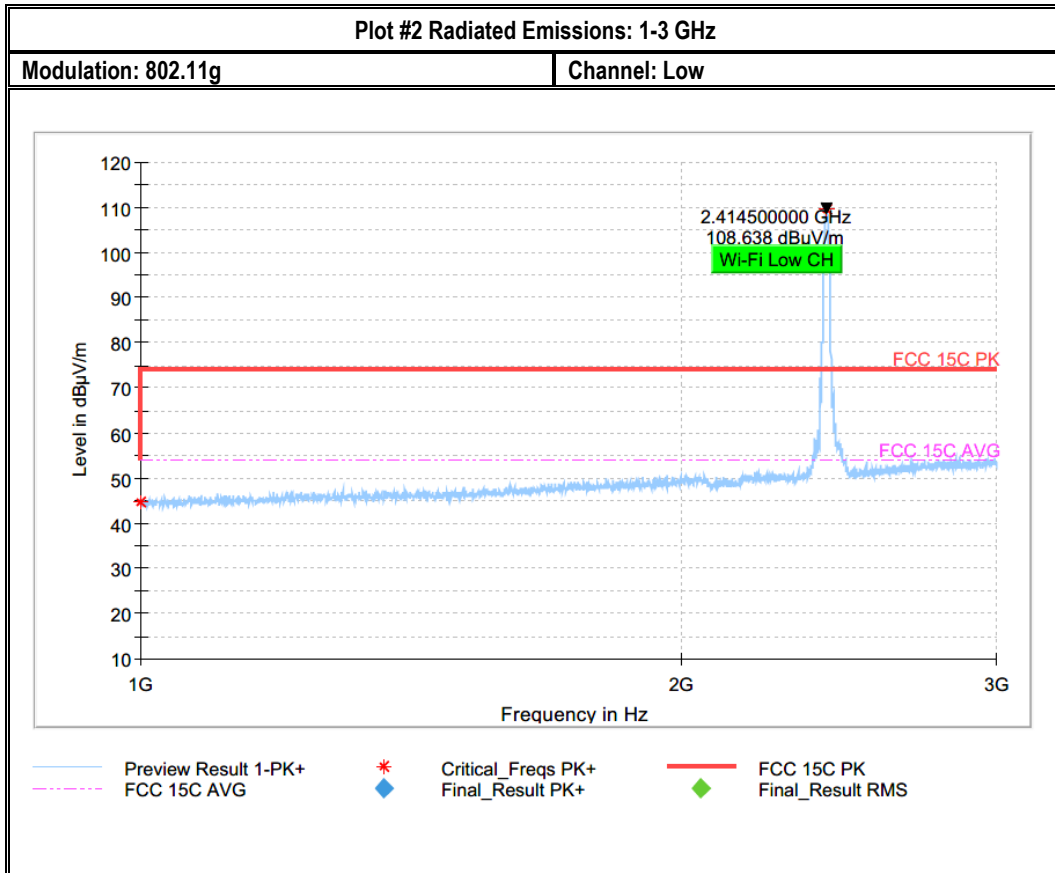
### 8.1.5 Measurement Plots:

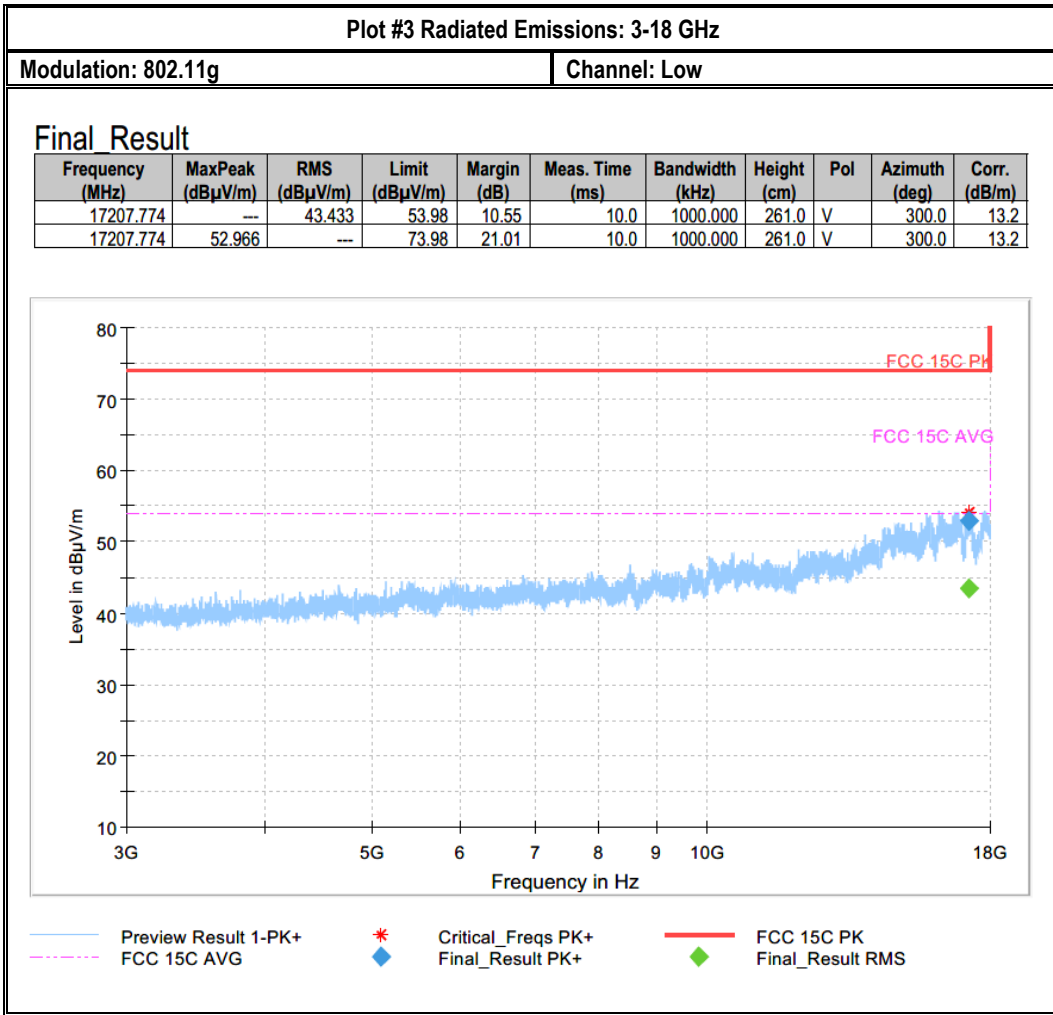




Test Report #: EMC\_KPTRK-011-19001\_15.247\_WLAN  
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Date of Report 2020-02-21

FCC ID: 2AQM7-35  
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## 9 Test setup photos

Setup photos are included in supporting file name: "EMC\_KPTRK\_011\_19001\_15.247\_Setup\_Photos.pdf"

## 10 Test Equipment and Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
PASSIVE LOOP ANTENNA	ETS LINDGREN	6507	00161344	3 YEARS	10/26/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	EMCO	3115	00035114	3 YEARS	07/31/2017
HORN ANTENNA	ETS LINDGREN	3117	00169547	3 YEARS	08/08/2017
HORN ANTENNA	ETS LINDGREN	3116C	00169535	3 YEARS	09/24/2017
UNIVERSAL RADIO COMMUNICATION TESTER	R&S	CMU 200	101821	3 YEARS	07/06/2017
WIDEBAND RADIO COMMUNICATION	R&S	CMW500	127068	3 YEARS	07/01/2017
SIGNAL ANALYZER	R&S	FSV 40	101022	2 YEARS	07/15/2019
COMPACT DIGITAL BAROMETER	CONTROL COMPANY	35519-055	91119547	3 YEARS	06/20/2017
DIGITAL THRMOMETER	CONTROL COMPANY	36934-164	191871994	2 YEARS	01/10/2019

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month.

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## 11 Revision History

<b>Date</b>	<b>Report Name</b>	<b>Changes to report</b>	<b>Report prepared by</b>
2020-02-21	EMC_KPTRK_011_19001_15.247_WLAN	Initial version	Yuchan Lu

<<The End>>