



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

Per:

47 CFR: Part 22, Part 24, Part 27

RSS-130 Issue 2; RSS-132 Issue 3; RSS-133 Issue 6; RSS-139 Issue 3; RSS-199 Issue 3

REPORT #: EMC_KPTRK-011-19001_FCC_22_24_27_ISED

DATE: 2020-02-21



A2LA Accredited

IC recognized #
3462B-2

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1 Assessment

The following device as further described in section 3 of this report was evaluated for radiated spurious emissions in simultaneous transmission of cellular and unlicensed radios according to criteria specified in the Code of Federal Regulations Title 47 parts 22, 24, 27 and Industry Canada Radio Standard Specifications RSS: 130 Issue 2, 132 Issue 3, 133 Issue 6, 139 Issue 3 and 199 Issue 3.

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

No deficiencies were ascertained.

Responsible for Testing Laboratory:

2020-02-21	Compliance	Cindy Li (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2020-02-21	Compliance	Kevin Wang (Senior EMC Engineer)	
Date	Section	Name	Signature

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.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

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

2.2 Identification of the Client

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

2.3 Identification of the Manufacturer

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

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	LBB-3.55CA
Firmware Version Identification Number (FVIN):	67024
Hardware Version Identification Number (HVIN):	1.1
Product Marketing Name (PMN):	LBB-3.55CA
Antenna Information as declared:	Flexible PCB, Internal Antenna Main Antenna gain: 3.1 dBi
Other Radios included in the device:	❖ <u>WLAN, BLE</u> • Module name: LSR Sterling-LWB • Module number: LSR 450-0152 • FCC/IC ID: TFB-1003 / 5969A-1003 • Antenna Gain: 1.5 dBi ❖ GPS • Module name/number: ublox NEO-M8U-0-10
Power Supply/ Rated Operating Voltage Range:	Low 6 VDC, Nominal 14 VDC, High 30 VDC
Operating Temperature Range:	Low -40° C, Nominal 20° C, High 115° C
Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production
EUT Dimensions(mm):	11.1 x 9.7 x 2.5
Weight(grams):	250
EUT Diameter	☒ < 60 cm ☐ Other _____

Module Information	
Module Name:	Sierra Wireless HL7588
Model Number:	7588
FCC ID:	N7NHL7588
IC ID:	N/A

3.2 EUT Sample details

EUT #	IMEI number	HW Version	SW Version	Notes/Comments
1	015389000315853	1.1	67024	Radiated Measurement

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 to low channel(802.11g), and co-transmission with WCDMA Band II mid channel 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 WCDMA Band II mid channel, simultaneously transmitting with WLAN 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 evaluation conducted by CETECOM Inc. is to support a request for new equipment authorization under **FCC ID: 2AQM7-35 / IC ID: 24516-35**

The pre-certified module to be integrated (Sierra Wireless HL7588) as described in Section 3, Radiated Spurious Emissions test was performed. Results have been checked to meet limits per Code of Federal Regulations Title 47 parts 22, 24, 27 and Industry Canada Radio Standard Specifications RSS: 130 Issue 2, 132 Issue 3, 133 Issue 6, 139 Issue 3 and 199 Issue 3.

The conducted module test data that can be obtained under the **FCC Filing ID: N7NHL7588** is applicable for the host described in section 3.

4.1 Dates of Testing:

01/04/2020-01/25/2020

4.2 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 30MHz	±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)

4.3 Environmental Conditions during Testing:

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

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

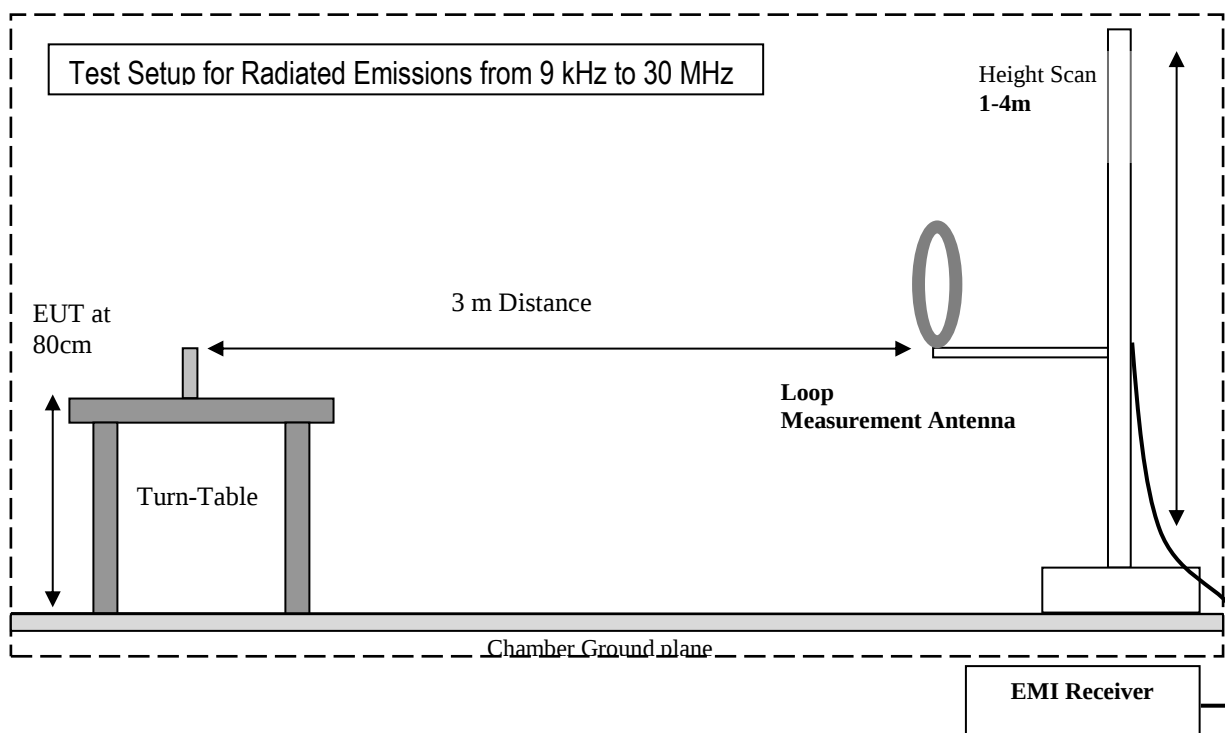
Deviating test conditions are indicated at individual test description where applicable.

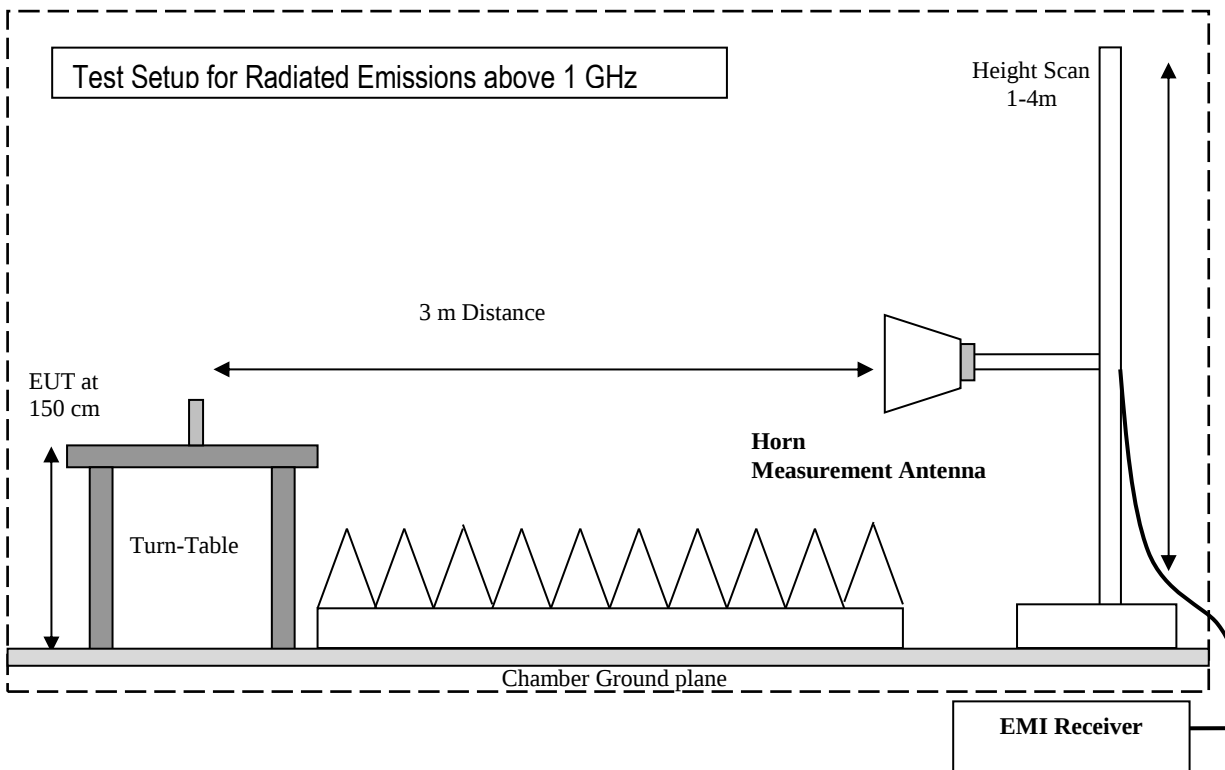
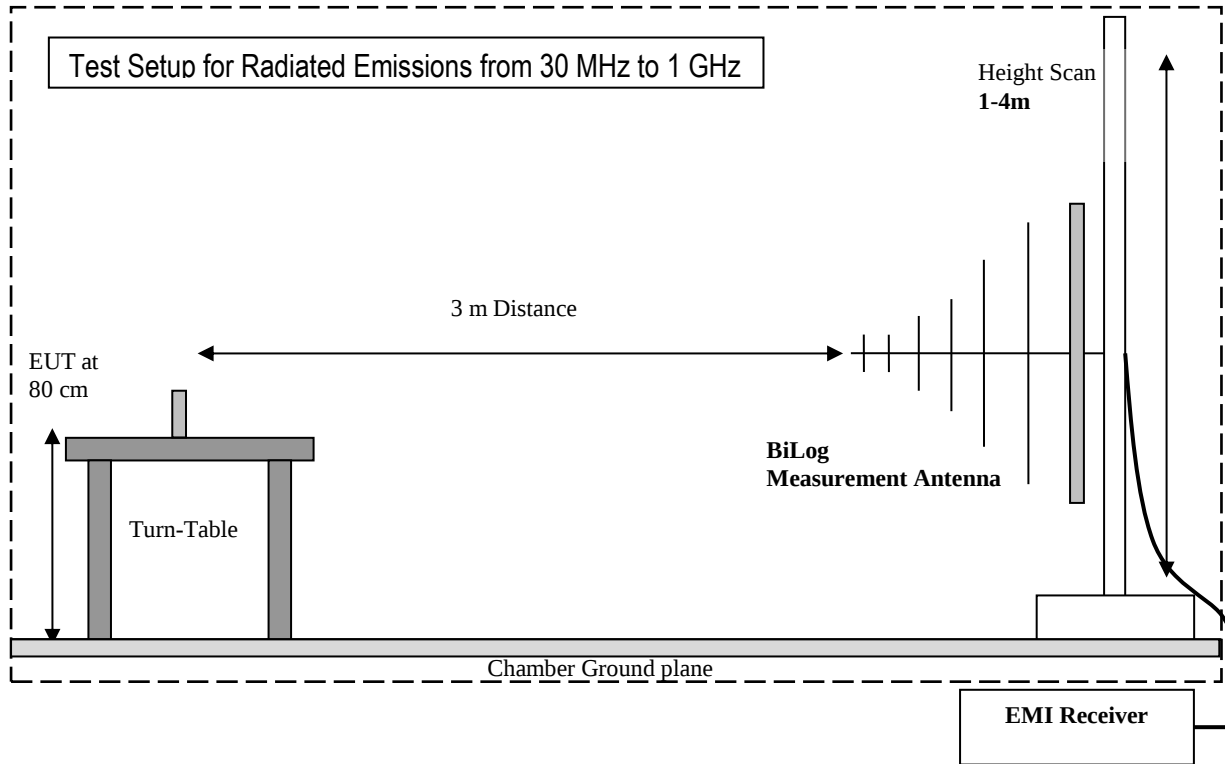
5 Measurement Procedures

Testing is performed according to the guidelines provided in FCC publication (KDB) 971168 D01 v03 – “Measurement Guidance for Certification of Licensed Digital Transmitters” and according to ANSI C63.26 as detailed below.

5.1 Radiated Measurement

- 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.





5.2 Sample Calculations for Field Strength Measurements

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

- Measured reading in dB μ V
- Cable Loss between the receiving antenna and SA in dB and
- 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 μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

6 Measurement Results Summary

6.1 FCC 22, RSS-132:

Test Specification	Test Case	Temperature and Voltage Conditions	Set up	Pass	Fail	NA	NP	Result
§2.1046; §22.913 (a)	RF Output Power	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1055; §22.355	Frequency Stability	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §22.917	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §22.917	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §22.917	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §22.917(a); RSS-132 Issue 3-5.5;	Radiated Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from module certification FCC ID: N7NHL7588

6.2 FCC 24, RSS-133:

Test Specification	Test Case	Temperature and Voltage Conditions	Set up	Pass	Fail	NA	NP	Result
§2.1046; §24.232 (a)	RF Output Power	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1055; §24.235	Frequency Stability	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §24.238	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §24.238	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §24.238	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §24.238(a); RSS-133 Issue 6-6.5.1;	Radiated Spurious Emissions	Nominal	1	■	☐	☐	☐	Complies

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from module certification FCC ID: N7NHL7588

6.3 FCC 27, RSS-130, RSS-139, RSS-199:

Test Specification	Test Case	Temperature and Voltage Conditions	Set up	Pass	Fail	NA	NP	Result
§2.1046; §27.50 (d)	RF Output Power	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1055; §27.54	Frequency Stability	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1049; §27.53	Occupied Bandwidth	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §27.53	Band Edge Compliance	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1051; §27.53	Conducted Spurious Emissions	Nominal	-	☐	☐	☐	■	Note 1 Note 2
§2.1053; §27.53(g); §27.53(h); RSS-130 Issue 2-4.6; RSS-139 Issue 3-6.6; RSS-199 Issue 3-4.6	Radiated Spurious Emissions	Nominal	Op.1	☐	☐	☐	■	Note 1 Note 2

Note 1: NA= Not Applicable; NP= Not Performed.

Note 2: Leveraged from module certification FCC ID: N7NHL7588

7 Test Result Data

7.1 ERP

Band	Frequency Range (MHz)	Power conducted (W)	Emission Designator	Antenna Gain + Cable loss (dBi)	gain linear	EIRP ¹ (W)	ERP ¹ (W)	Frequency deviation (ppm)	Limit ERP (W)
WCDMA II	1852.4 – 1907.6	0.355	4M14F9W	3.1	2.042	0.725	-	1.5	2

Note 1: ERP are calculated from maximum power in grant of cellular module Sierra Wireless HL7588 adding the maximum gain of the utilized cellular antenna per operational description.

7.2 Radiated Spurious Emissions

7.2.1 Measurement according to FCC: CFR 47 Part 2.1053; CFR Part 22.917; CFR Part 24.238, Part 27.53 utilizing KDB 971168 D01 Power Meas License Digital Systems v03, and according to ANSI C63.26 2017

Spectrum Analyzer Settings for FCC 22

Frequency Range	30 MHz – 1 GHz	1 – 1.58 GHz	1.58 – 9 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz
Video Bandwidth	100 kHz	1 MHz	1 MHz
Detector	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto

Spectrum Analyzer Settings for FCC 24 and 27

Frequency Range	30MHz – 1 GHz	1 – 2.7 GHz	2.7 – 18 GHz	18 – 19.1 GHz
Resolution Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Video Bandwidth	100 kHz	1 MHz	1 MHz	1 MHz
Detector	Peak	Peak	Peak	Peak
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold
Sweep Time	Auto	Auto	Auto	Auto

7.2.2 Limits:

- FCC Part 22.917(a) and Part 24.238(a), Part 27.53 (g), and Part 27.53 (h)
- RSS-130 Issue 2-4.6, RSS-132 Issue 3 5.5, RSS-133 Issue 6 6.5.1, RSS-139 Issue 3 6.6, RSS-199 Issue 3-4.6

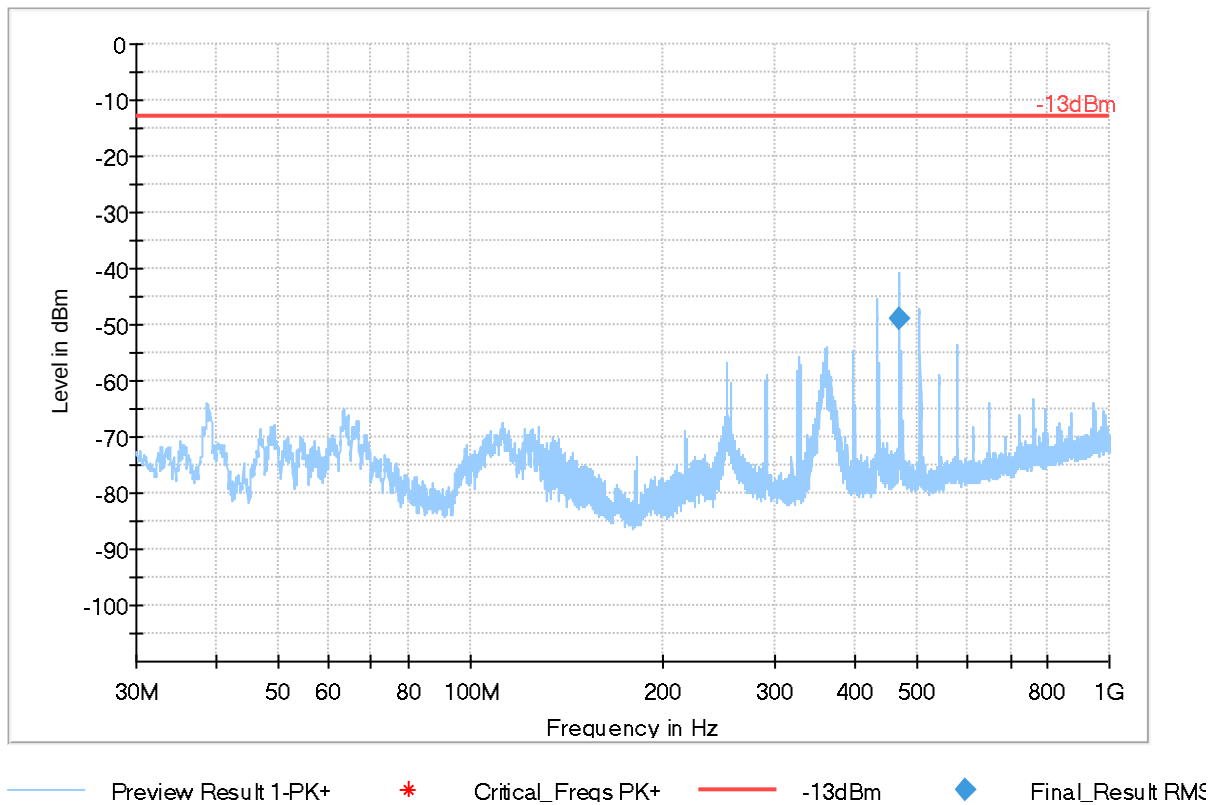
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB = (-13dBm)

7.2.3 Test conditions and setup:

Ambient Temperature (C)	EUT Set-Up #	Power Input
22	1	12 VDC

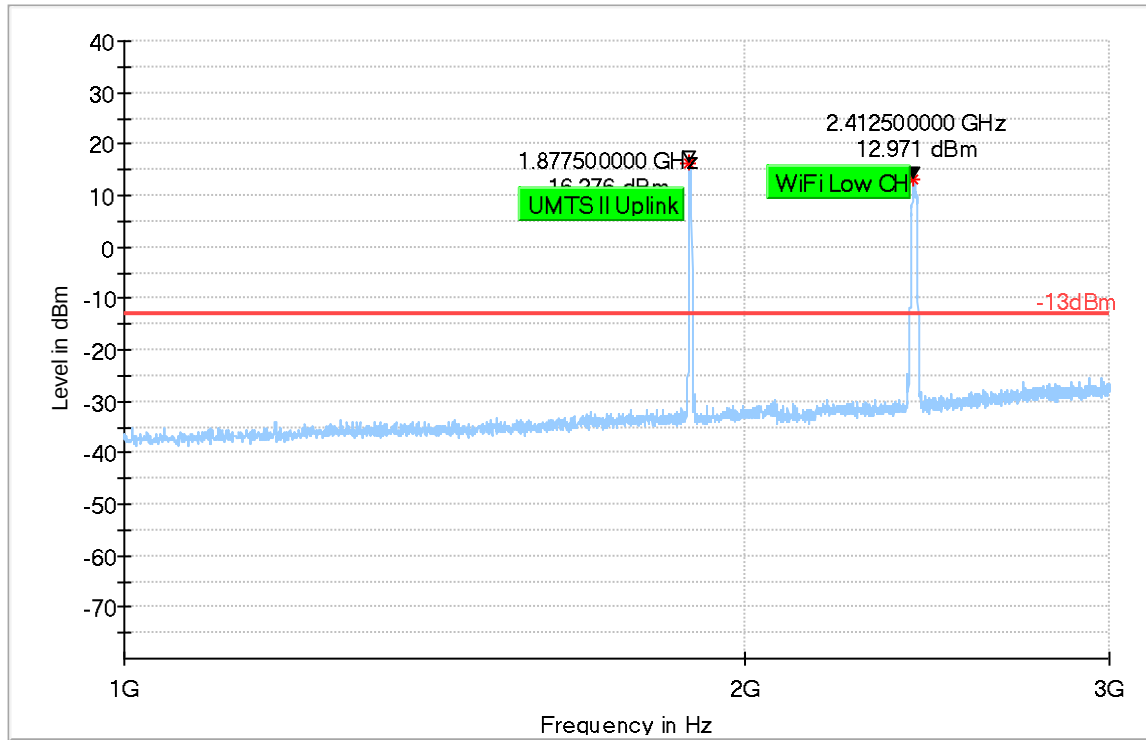
7.2.4 Measurement Plots:**WCDMA Band II****Plot # 1 Radiated Emissions: 30 MHz – 1GHz****Channel: Mid****Final_Result**

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin	Meas. Time (ms)	Bandwidth (Hz)	Height	Pol	Azimuth	Corr. (dB)	Comment
469.253	-48.846	-13.00	35.85	200.0	100.000	100.0	H	163.0	-108.2	3:23:16 PM - 1/3/2020



Plot # 2 Radiated Emissions: 1 GHz - 3 GHz

Channel: Mid



Preview Result 1-PK+



Critical_Freqs PK+

-13dBm



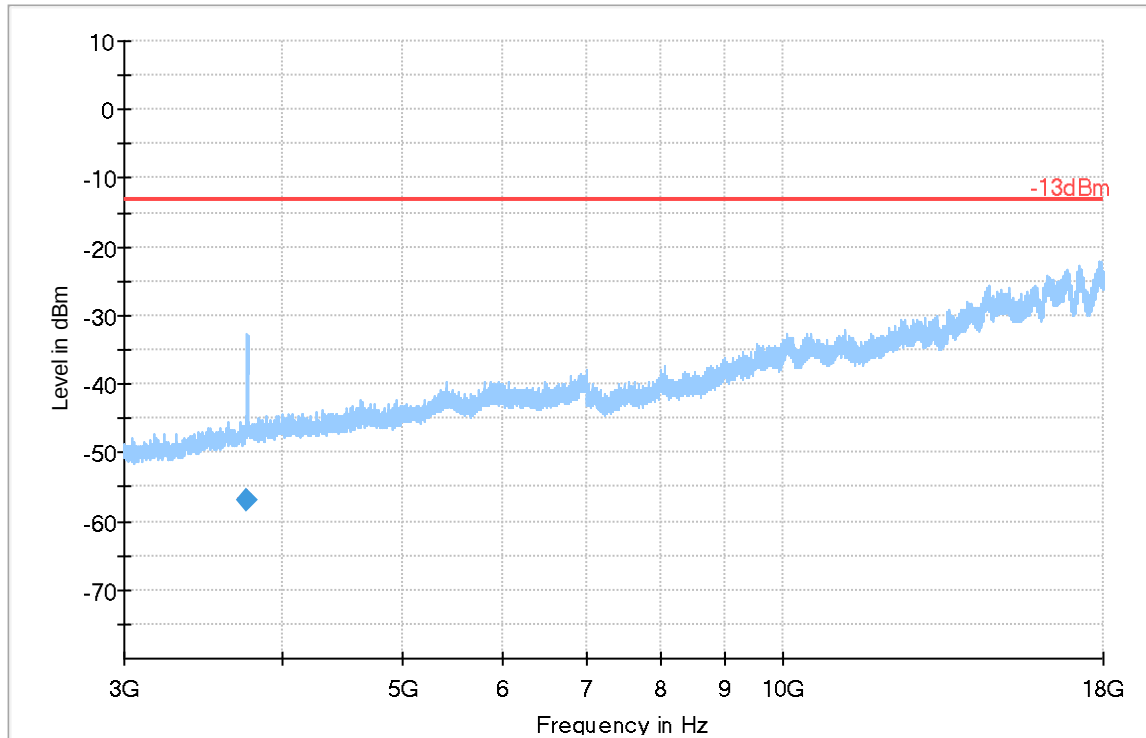
Final_Result RMS

Plot # 3 Radiated Emissions: 3 GHz – 18 GHz

Channel: Mid

Final_Result

Frequency (MHz)	RMS (dBm)	Limit (dBm)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Corr. (dB)	Comment
3757.082	-56.771	-13.00	43.77	200.0	1000.000	137.0	V	-34.0	-102.4	2:57:59 PM - 1/3/2020



Preview Result 1-PK+ * Critical_Freqs PK+ -13dBm Final_Result RMS

8 Test setup photo

Setup photos are included in supporting file name: "EMC_KPTRK-011-19001_ISED_Setup_Photos.pdf"

9 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 THERMOMETER	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. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

10 Revision History

Date	Report Name	Changes to report	Report prepared by
2020-02-21	EMC_KPTRK-011-19001_FCC_22_24_27_ISED	Initial version	Yuchan Lu

<<The End>>