Toll-free: (866) 311-3268
www.ComplianceTesting.com
info@ComplianceTesting.com

Test Report

Prepared for: Level Up Holding Co., Inc

Models: LBA-VI-10
LBA-VI-10-CELL-V

Description: Video Intercom System with 10 inch Screen

FCC ID: 2A267-LBAVI10-CV

To

FCC Part 15.209

Date of Issue: October 12, 2021

On the behalf of the applicant:	**Level UP Holding Co.** **6020 N 55th Ave** **Glendale, AZ 85301**
Attention of:	**Joseph Butler** **Ph: (602)775-5360** **E-Mail: jbulter@golittlebird.com**

Prepared by
Compliance Testing, LLC
1724 S. Nevada Way
Mesa, AZ 85204
(480) 926-3100 phone / (480) 926-3598 fax
www.compliancetesting.com
Project No: p2180004.10

Greg Corbin
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	October 12, 2021	Greg Corbin	Original Document
2.0	November 15, 2021	Greg Corbin	Added AC conducted test photos, added reference to ANSI standards on page 6

Table of Contents

ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. 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.

FCC Site Reg. #349717

IC Site Reg. #2044A-2

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 marketed 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 part 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:
ANSI C63.4-2014 was followed for testing the 125 kHz transmitter.
ANSI C63.10-2013 was followed for testing the WIFI transmitter.
ANSI C63.26-2015 was followed for testing the cellular transmitter.

In accordance with ANSI C63.4-2014, 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)**
23.5 – 25.4	38.1 – 44.1	965.1 – 967.7

EUT Description

Model: LBA-VI-10-CELL-V
Description: Video Intercom System with 10 inch screen
Software: Littlebird Test Software Rev 1.0
Serial Number: N/A

Additional Information:

The EUT is a modern version of the traditional telephone entry system for a gated community or complex. This device allows residents to access the property by swiping a physical credential such as a key fob, or their smartphone, as well as providing directory lookup and calling for property guests. The system includes a screen, keypad, card reader, speakers, microphone, cell modem (optional), and connections to interface with an access control system.

The EUT contains a 125 kHz transmitter and 2 pre-certified modules, (BLE and Cellular).
The 125 kHz transmitter was a pre-certified module with Limited Modular Approval. Full compliance testing was performed and a new FCC ID was issued.
For the pre-certified modules, the output power, band edge and radiated spurious testing was performed.
Co-location radiated spurious testing was performed with all 3 transmitters transmitting simultaneously.
The 125kHz transmitter is for an RFID Reader. The module of the transmitter is manufactured by ID-Innovations. In this configuration it has an external 455 uH wire wound antenna. It communicates to a microcontroller using a UART connection at 9600 baud.

The manufacturer produces a variant of the model tested. The variant is the same as the model tested with the cellular module removed. The model with the cellular module was tested to represent the worse cast of the 2 models.

The LBA-VI-10-CELL-V includes the Verizon cell modem and has a 10” non-touch screen.
The LBA-VI-10 does not include the Verizon cell modem and has a 10” non-touch screen.

Pre-certified Modules installed in the EUT

Module Description	Manufacturer	FCC ID	Frequency Range (MHz)
BLE	Raytac Corp.	SH6MDBT42Q	2402 – 2480
Cellular	Sierra Wireless	N7NHL7618RD	1710 – 1755 777- - 787

Model Tested and Variants

Model Tested	Description
LBA-VI-10-CELL-V	10 inch non-touch screen with Verizon Cellular Modem
Variants	
LBA-VI-10	10 inch non-touch screen without Verizon Cellular Modem

EUT Operation during Tests

The EUT was tested in normal operation.
All tests were performed radiated.
For all tests, the 125 kHz transmitter was powered on and transmitting.
For the 125 kHz transmitter test, the cellular and BLE modules were powered on with the RF output turned off.
For the BLE transmitter verification tests, the cellular module was powered on with the RF output turned off.
For the cellular transmitter verification tests, the BLE module was powered on with the RF output turned off.
For both the BLE and cellular verification tests, the output power, band edge, and radiated spurious was recorded.

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Termination
1	AC Power Cable 24 VAC, 16awg 2 conductor	2	N	N	EUT
1	Ethernet (CAT5e)	> 3	N	N	EUT to switch or pc
1	Ground wire, 16 awg	3	N	N	EUT to ground
1	Multi-conductor cable 22 AWG, 6 conductor	>3	N	N	DMP 734 to Video Intercom

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	AC to DC Power Converter 24 VAC to 12 VDC	Altronix	TP2450	N/A

Modifications: None

Test Results Summary

125 kHz Transmitter

Specification	Test Name	Pass, Fail, N/A	Comments
15.209	Output Power	Pass	
15.209	Radiated Emissions	Pass	
15.207	Conducted Powerline Emissions	Pass	
15.209	Radiated Emissions_ Co-Location	Pass	All 3 transmitters on

Bluetooth module_ pre-certified module spot check

Specification	Test Name	Pass, Fail, N/A	Comments
15.247(b)(3)	Output Power	Pass	
15.247(d)	Band Edge	Pass	
15.205	Restricted Band	Pass	

Cellular module_ pre-certified module spot check

Specification	Test Name	Pass, Fail, N/A	Comments
27.5	Output Power	Pass	
27.53(g)	Band Edge	Pass	

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

15.203: Antenna Requirement:

X	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

Field Strength

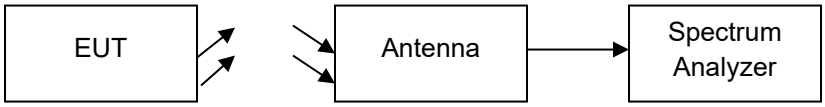
Engineer: Greg Corbin
Test Date: 9/28/2021

Test Procedure

The EUT was tested in an anechoic chamber at a 3 meter distance from the loop antenna.
The Limit is at 300 meters, so a distance correction factor was applied to the measured result.
The antenna was rotated on the X,Y,Z axis and the highest output power was recorded.
The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
The field strength was also recorded using a peak detector.

Frequency = 125 kHz
Detector = RMS Average
RBW = 200 Hz
Distance Correction Factor = 20*Log(D1/D2)
Corrected Level = measured level – (antenna correction factor – distance correction factor)

Test Setup



Field Strength

Detector	Measured Level	Antenna CF	Distance CF	Corrected Level	Limit	Margin	Result
	dBuV/m	dB	dB	dBuV/m	dBuV/m	dB	Pass
Average	53.9	13.8	-40	0.1	25.67	-25.57	Pass
Peak	54.3	13.8	-40	0.5	45.67	-45.17	Pass

Note: Cable correction factors are not included in this measurement as the low loss of the high quality coax cable at low frequencies in practically non-existent.

Radiated Spurious Emissions

Engineer: Greg Corbin

Test Date: 9/28/2021

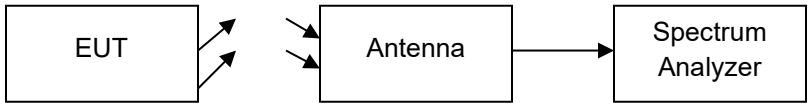
Test Procedure

The EUT was tested in an anechoic chamber at a 3 meter distance from the loop antenna.
A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions from 9 kHz to 30 MHz

The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
For QP measurements, a peak detector was used, and any emissions over the limit were measured with a QP detector. Peak and Average data was recorded as required.

Distance Correction Factor = 20*Log(D1/D2)
Corrected Level = measured level – (antenna correction factor – distance correction factor)

Test Setup



Radiated Emissions

Freq Range	Detector	Measured Frequency	Measured Level	Distance Correction Factor	Antenna Correction Factor	Corrected Level	Limit	Margin
kHz	Pk / Avg	kHz	dBuV/m	dB	dB	dBuV/m	dBuV/m	dB
9 - 150	Average	9.677	44.1	-40	15.4	-11.3	47.89	-59.19
9 - 150	Peak	9.536	53.8	-40	15.4	-1.6	48.02	-49.62
110 - 490	Average	146.56	37.5	-40	13.8	-16.3	24.28	-40.58
490 - 30000	Peak	502	35.7	-40	13.9	-18.2	13.59	-31.79

Refer to Annex A for Radiated Spurious Emissions plots.

Powerline Conducted

Engineer: Greg Corbin

Test Date: 10/4/2021

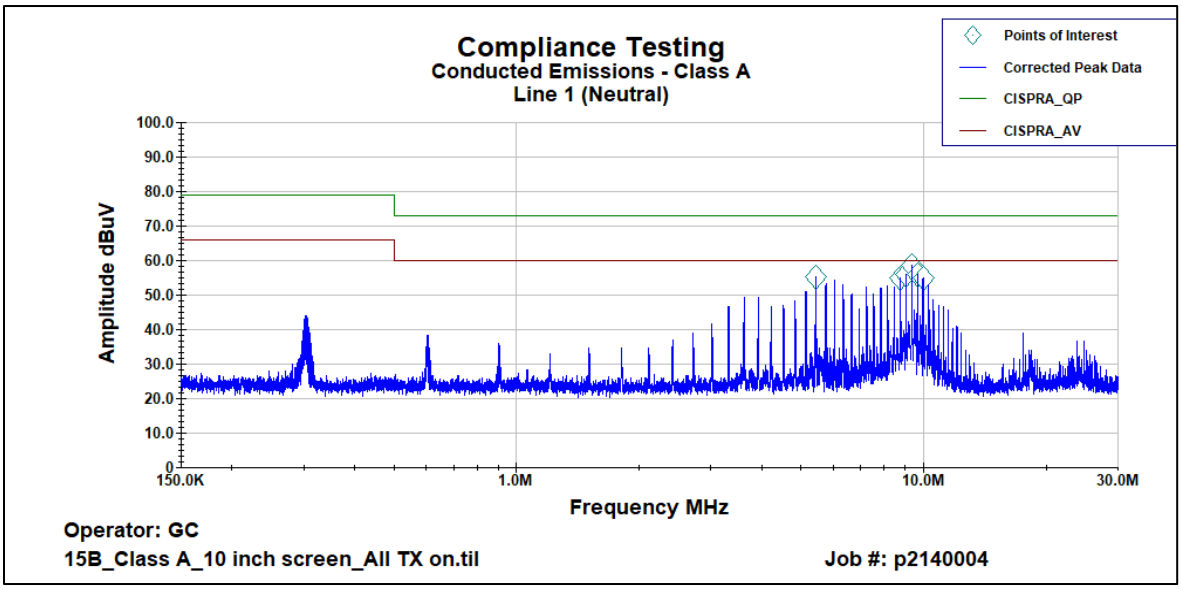
Test Procedure

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

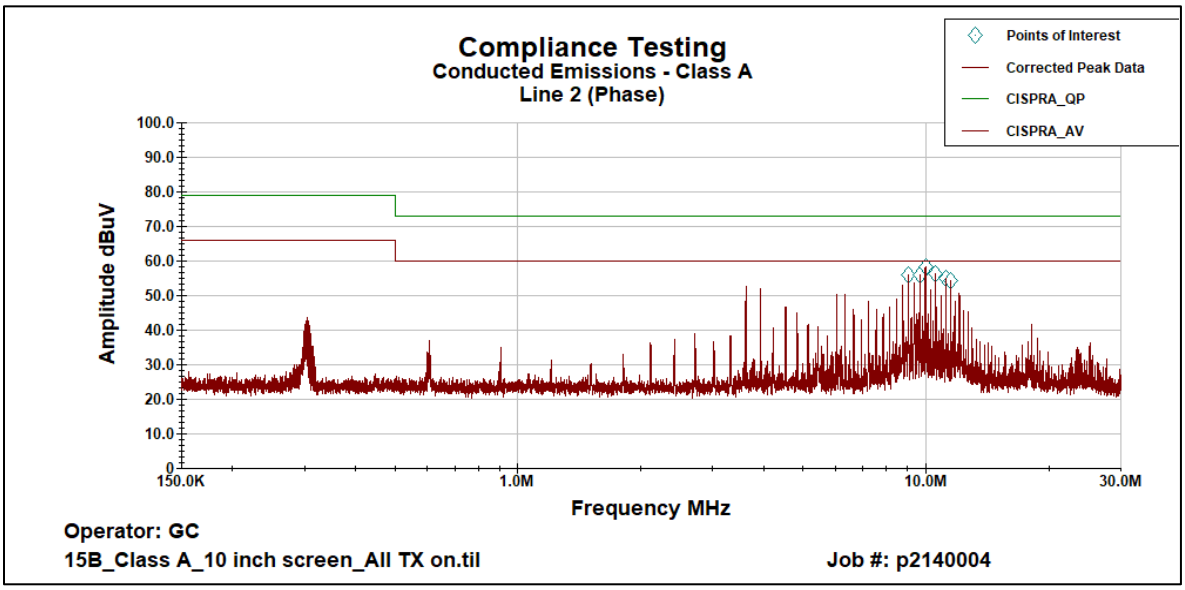
Test Setup

Test Results Summary

Line 1 Peak Plot



Line 2 Peak Plot



Test Results Summary

Line 1 Neutral Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
5.4322 MHz	27.32	0.071	0.11	10.2	37.701	60	-22.299
8.7496 MHz	34.097	0.055	0.143	10.2	44.494	60	-15.506
9.0495 MHz	33.76	0.05	0.15	10.2	44.16	60	-15.84
9.3528 MHz	35.06	0.05	0.15	10.2	45.46	60	-14.54
9.6542 MHz	36.713	0.047	0.15	10.2	47.11	60	-12.89
9.9551 MHz	31.097	0.041	0.15	10.2	41.488	60	-18.512

Line2 Phase Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
9.051 MHz	32.22	0.01	0.15	10.2	42.579	60	-17.421
9.6595 MHz	37.75	0	0.15	10.2	48.103	60	-11.897
9.9622 MHz	33.29	0	0.15	10.2	43.64	60	-16.36
10.569 MHz	31.6	0	0.16	10.2	41.957	60	-18.043
11.172 MHz	33.23	0	0.169	10.2	43.599	60	-16.401
11.467 MHz	32.81	0	0.17	10.2	43.18	60	-16.82

Line 1 Neutral QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
5.4322 MHz	44.21	0.071	0.11	10.2	54.591	73	-18.409
8.7496 MHz	44.02	0.055	0.143	10.2	54.418	73	-18.582
9.0495 MHz	44.69	0.05	0.15	10.2	55.09	73	-17.91
9.3528 MHz	46.58	0.05	0.15	10.2	56.98	73	-16.02
9.6542 MHz	49.01	0.047	0.15	10.2	59.407	73	-13.593
9.9551 MHz	44.77	0.041	0.15	10.2	55.161	73	-17.839

Line 2 Phase 2 QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Attenuator (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
9.051 MHz	43.23	0.01	0.15	10.2	53.589	73	-19.411
9.6595 MHz	49.5	0	0.15	10.2	59.85	73	-13.15
9.9622 MHz	45.9	0	0.15	10.2	56.25	73	-16.75
10.569 MHz	44.76	0	0.16	10.2	55.12	73	-17.88
11.172 MHz	42.3	0	0.169	10.2	52.669	73	-20.331
11.467 MHz	42.26	0	0.17	10.2	52.63	73	-20.37

Radiated Spurious Emissions_ Co-Location

Engineer: Greg Corbin

Test Date: 9/28/2021

Test Procedure

The EUT was tested in an anechoic chamber at a 3 meter distance from the receiving antenna.
A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions from 30 MHz to 25 GHz.

For co-location, all 3 transmitters were powered on and transmitting at the maximum power level.
The BT transmitter was set to lowest and highest available channel.
The Cellular transmitter was set to the lowest and highest frequency and the lowest and highest modulation bandwidths provided by the module.

The transmitter settings are recorded in the test summary table below.

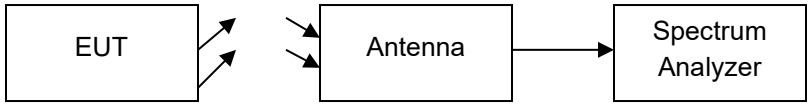
The antenna, cable and pre-amplifier correction factors were entered into the spectrum analyzer before recording the final results.

A reference level offset of 11.8 dB was included to compare the measured level to the -13 dBm limit.

A 3.4 GHz high pass filter was used to measurements from 3.4 – 25 GHz, to suppress the fundamental signal and allow a wider dynamic range on the spectrum analyzer.
The emission limits are based on measurements employing a CISPR quasi-peak detector for 30 – 1000 MHz and a average detector from 1 – 25 GHz.

A peak detector set to max hold was used for all measurements. If the spurious emissions were within 10 dB of the limit a second measurement was performed using a QP detector for frequencies below 1 GHz and an average detector for frequencies above 1 GHz.
RBW = 100 kHz (30 – 1000 MHz)
RBW = 1 MHz (1 – 25 GHz)

Test Setup



Co-Location Test Summary

Frequency Range	BT Frequency	Cellular Frequency	Cellular BW	Measured Frequency	Measured Level	Limit	Margin	Results
GHz	MHz	MHz	MHz	MHz	dBm	dBm	dB	Pass / Fail
0.030 - 1	2402	779.5	5	943.92	-23.9	-13	-10.9	Pass
0.030 - 1	2402	784.5	5	941.59	-22.6	-13	-9.6	Pass
0.030 - 1	2480	779.5	5	940.62	-22.2	-13	-9.2	Pass
0.030 - 1	2480	784.5	5	930.53	-22.4	-13	-9.4	Pass
0.030 - 1	2402	782	10	946.45	-22.7	-13	-9.7	Pass
0.030 - 1	2480	782	10	945.48	-23.2	-13	-10.2	Pass
0.030 - 1	2402	1710.7	1.4	957.51	-22.8	-13	-9.8	Pass
0.030 - 1	2402	1754.3	1.4	936.55	-22.9	-13	-9.9	Pass
0.030 - 1	2480	1710.7	1.4	993.21	-22.9	-13	-9.9	Pass
0.030 - 1	2480	1754.3	1.4	987.97	-23.4	-13	-10.4	Pass
0.030 - 1	2402	1720	20	942.18	-23.3	-13	-10.3	Pass
0.030 - 1	2402	1745	20	953.43	-23.0	-13	-10	Pass
0.030 - 1	2480	1720	20	922.19	-22.9	-13	-9.9	Pass
0.030 - 1	2480	1745	20	936.74	-23.3	-13	-10.3	Pass
1 – 18	2402	779.5	5	17547.3	-35.1	-13	-22.1	Pass
1 – 18	2402	784.5	5	17620.3	-35.9	-13	-22.9	Pass
1 – 18	2480	779.5	5	17614.5	-34.8	-13	-21.8	Pass
1 – 18	2480	784.5	5	17634.9	-36.1	-13	-23.1	Pass
1 – 18	2402	782	10	17304.9	-36.0	-13	-23	Pass
1 – 18	2480	782	10	14734.8	-36.3	-13	-23.3	Pass
1 – 18	2402	1710.7	1.4	17445.1	-35.6	-13	-22.6	Pass
1 – 18	2402	1754.3	1.4	14761.1	-35.9	-13	-22.9	Pass
1 – 18	2480	1710.7	1.4	14796.1	-35.7	-13	-22.7	Pass
1 – 18	2480	1754.3	1.4	14775.7	-36.0	-13	-23	Pass
1 – 18	2402	1720	20	1032.6	-21.8	-13	-8.8	Pass
1 – 18	2402	1745	20	1075.4	-21.9	-13	-8.9	Pass
1 – 18	2480	1720	20	1017.3	-21.9	-13	-8.9	Pass
1 – 18	2480	1745	20	1002.9	-21.6	-13	-8.6	Pass
18 - 25	2402	779.5	5	24798.1	-28.2	-13	-15.2	Pass
18 – 25	2402	1710.7	1.4	24771.8	-28.3	-13	-15.3	Pass
18 - 25	For 18 - 25 GHz, no spurious emissions were observed. Sample plots were provided for each unit to show noise floor with no spurious present. For the sample plots, each unit was tested with the BT and Cell modules set to the following: BT at 2402 MHz, cell at 779.5 MHz with 5 MHz BW and 1710.7 MHz with 1.4 MHz BW. The 125 kHz transmitter was on. A 3.4 GHz HPF was installed at the receive antenna output.							

Refer to Annex B for Co-located Radiated Spurious Emissions

Output Power_ BLE module

Engineer: Greg Corbin

Test Date: 10/1/2021

Test Procedure

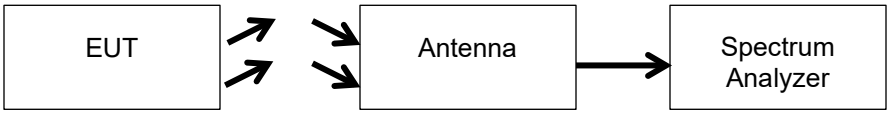
The BLE module is a pre-certified module that was installed with per the module manufacturer's instructions.
The frequency Range of the BLE module is 2402 – 2480 MHz.
The output power, band edge, and restricted band were verified to still be within the FCC limits after being installed in a new host.
The radiated spurious emissions were verified during the Radiated Spurious Emissions Co-Location test.

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 and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized.
A spectrum analyzer was used to verify that the EUT met the requirements for Output Power.

The Spectrum Analyzer was set to the following:
RBW ≥ DTS Bandwidth
VBW ≥ 3 x RBW
Span ≥ 3 x RBW
Sweep time = auto couple
Detector = peak
Trace Mode = max hold

The RF output power was measured using the spectrum analyzer's marker peak function

Test Setup



BLE Output Power Summary Table

Tuned Frequency	Measured Value	Specification Limit	Result
MHz	dBm	dBm	Pass / Fail
2402	-0.79	30	Pass
2480	1.48	30	Pass

Emissions at Band Edges_ BLE Module

Engineer: Greg Corbin

Test Date: 10/01/2021

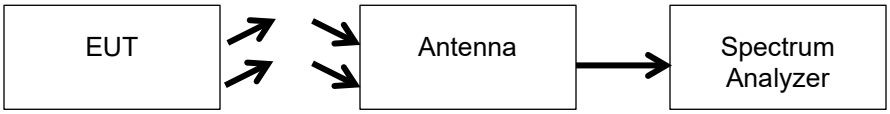
Test Procedure

The BLE module is a pre-certified module that was installed with per the module manufacturer's instructions.
The output power, band edge, and restricted band were verified to still be within the FCC limits after being installed in a new host.
The radiated spurious emissions were verified during the Radiated Spurious Emissions Co-Location test.

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 and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for band edges.

Detector = Peak, max hold

Test Setup



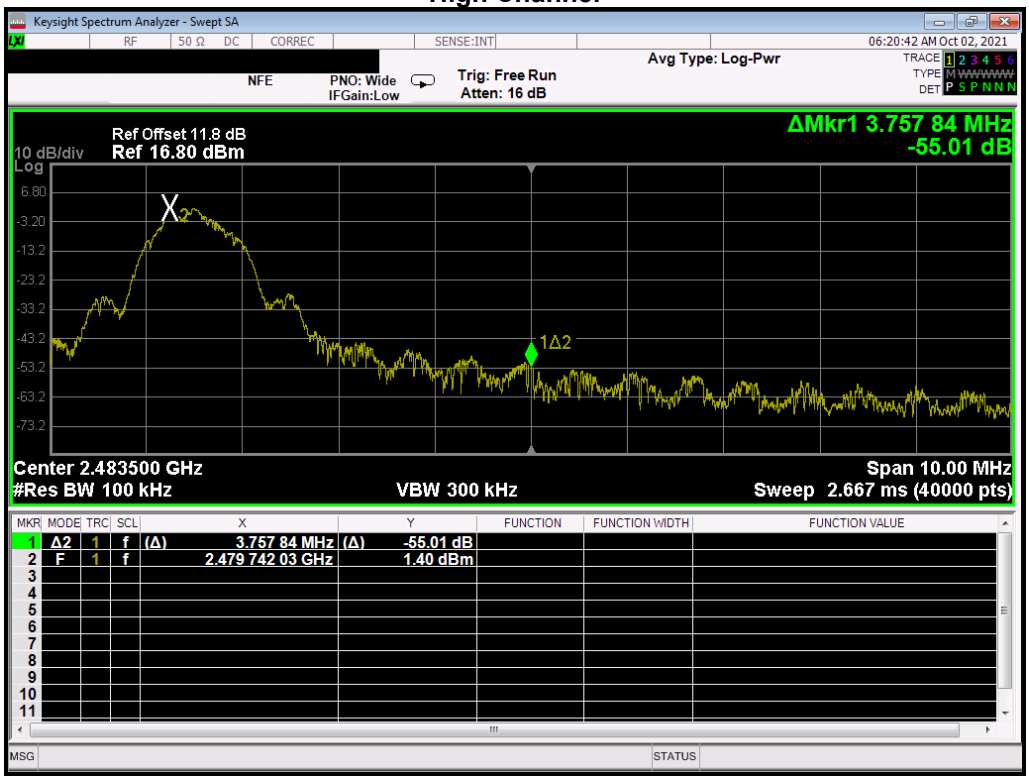
Band Edge Emissions Summary

Tuned Frequency (MHz)	Emission Frequency (MHz)	Monitored Level	Limit	Result
MHz	MHz	dBc	dBc	Pass / Fail
2402	2400	-51.8	-20	Pass
2480	2483.5	-55.0	-20	Pass

Band Edge Plots

Low Channel

High Channel



Restricted Band_ BLE module

Engineer: Greg Corbin

Test Date: 10/01/2021

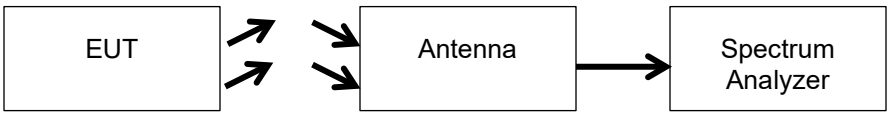
Test Procedure

The BLE module is a pre-certified module that was installed with per the module manufacturer's instructions.
The output power, band edge, and restricted band were verified to still be within the FCC limits after being installed in a new host.
The radiated spurious emissions were verified during the Radiated Spurious Emissions Co-Location test.

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 and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for the restricted bands in the frequency range of2310 – 2390 MHz and 2483.5 – 2500 MHz.

Detector = RMS Average

Test Setup

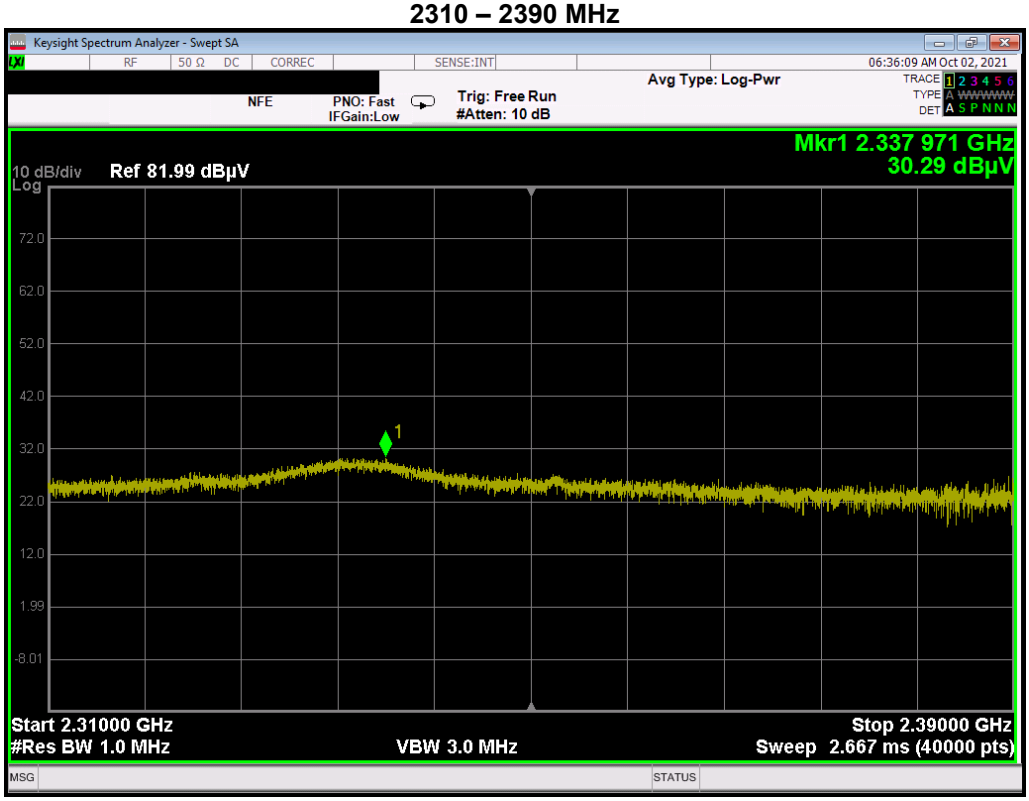


Restricted Band Emissions Summary

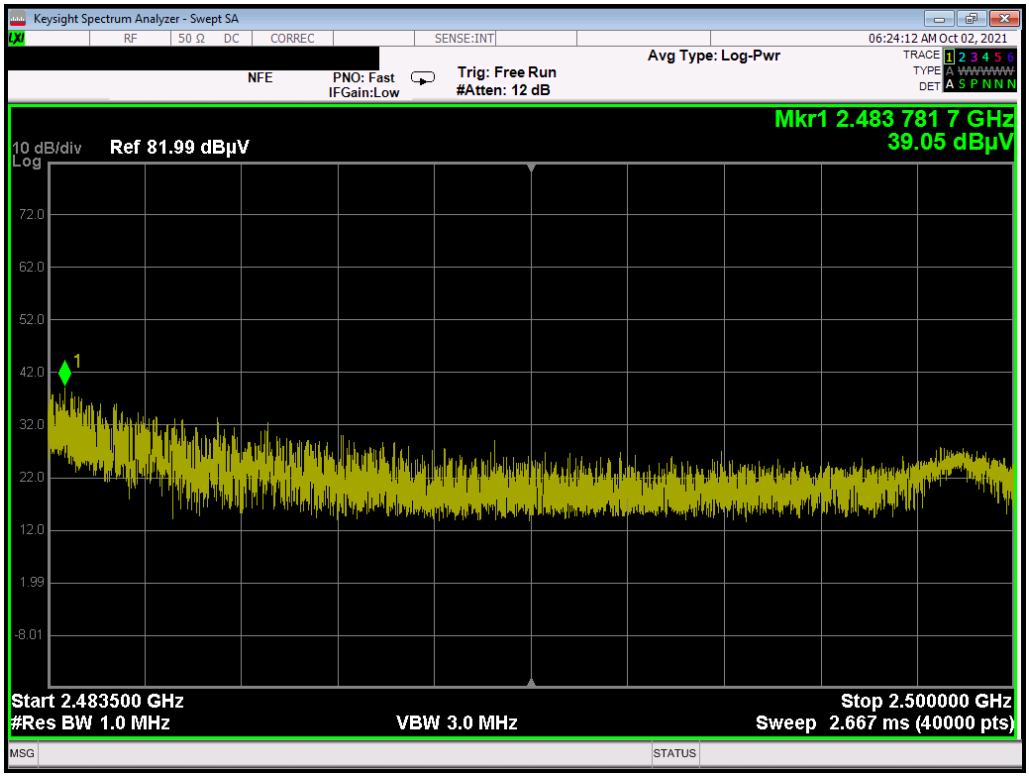
Restricted Band	Tuned Frequency (MHz)	Emission Frequency (MHz)	Monitored Level	Limit	Margin	Result
MHz	MHz	MHz	dBuV	dBuV	dB	Pass / Fail
2310 - 2390	2402	2337.971	30.3	54	-23.7	Pass
2483.5 - 2500	2480	2483.781	39.1	54	-14.9	Pass

Restricted Band Plots

2310 – 2390 MHz



2483.5 – 2500 MHz



Output Power_ Cellular module

Engineer: Greg Corbin

Test Date: 10/1/2021

Test Procedure

The Cellular module is a pre-certified module that was installed with per the module manufacturer's instructions.

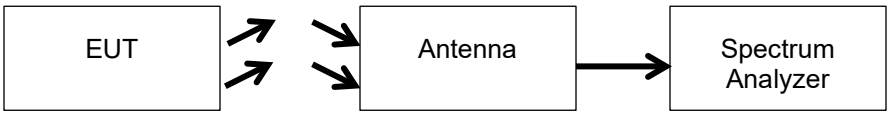
The Cellular module bands of operation are listed below.

Band	TX Frequency	RX Frequency	Bandwidth
	MHz	MHz	MHz
LTE Band 4	1710 – 1755	2110 - 2155	1.4, 3, 5, 10, 15, 20
LTE Band 13	777 – 787	746 - 756	5, 10

The output power and band edge were verified to still be within the FCC limits after being installed in a new host.
The radiated spurious emissions were verified during the Radiated Spurious Emissions Co-Location test.
The output power was verified for the lowest and highest available channel with the minimum and maximum specified bandwidths.
The RF output power was measured using the spectrum analyzer's channel power tool.

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 and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized.

Test Setup



Cellular module Output Power Summary Table

Cellular Band	Tuned Frequency	Cellular Module Bandwidth	Measured Value		Specification Limit	Result
	MHz	MHz	dBm	W	W	Pass / Fail
4	1710.7	1.4	14.4	0.028	1	Pass
4	1754.3	1.4	14.7	0.030	1	Pass
4	1720	20	14.6	0.029	1	Pass
4	1745	20	14.5	0.028	1	Pass
13	779.5	5	24.1	0.257	3	Pass
13	784.5	5	25.5	0.355	3	Pass
13	782	10	25.8	0.380	3	Pass

Emissions at Band Edges_ Cellular Module

Engineer: Greg Corbin

Test Date: 10/01/2021

Test Procedure

The Cellular module is a pre-certified module that was installed with the module manufacturer's instructions.

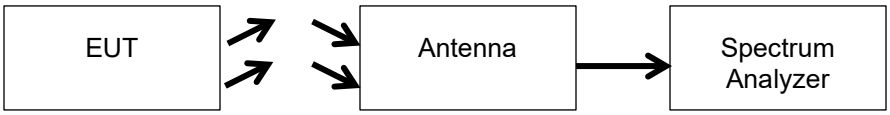
The Cellular module bands of operation are listed below.

Band	TX Frequency	RX Frequency	Bandwidth
	MHz	MHz	MHz
LTE Band 4	1710 – 1755	2110 - 2155	1.4, 3, 5, 10, 15, 20
LTE Band 13	777 – 787	746 - 756	5, 10

The output power and band edge were verified to still be within the FCC limits after being installed in a new host.
The radiated spurious emissions were verified during the Radiated Spurious Emissions Co-Location test.
The band edge was recorded for the lowest and highest channels of operation and the minimum and maximum module bandwidths.

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

Test Setup



Cellular module Band Edge Summary Table

Cellular Band	Tuned Frequency	Cellular Module Bandwidth	Measured Frequency	Measured Value	Specification Limit	Margin	Result
	MHz	MHz	MHz	dBm	dBm	dB	Pass / Fail
4	1710.7	1.4	1710	-14.2	-13	-1.2	Pass
4	1754.3	1.4	1755	-14.3	-13	-1.3	Pass
4	1720	20	1710	-23.3	-13	-10.3	Pass
4	1745	20	1755	-23.8	-13	-10.8	Pass
13	779.5	5	777	-20.8	-13	-7.8	Pass
13	784.5	5	787	-15.9	-13	-2.9	Pass
13	782	10	777	-20.5	-13	-7.5	Pass
13	782	10	787	-18.0	-13	-5	Pass

Refer to Annex C for Band Edge emissions for the cellular module

Measurement Uncertainty

Measurement Uncertainty (U_{lab}) for Compliance Testing is listed in the table below.

Measurement	U_{lab}
Radio Frequency	± 3.3 x 10^{-8}
RF Power, conducted	± 1.5 dB
RF Power Density, conducted	± 1.0 dB
Conducted Emissions	± 1.8 dB
Radiated Emissions	± 4.5 dB
Temperature	± 1.5 deg C
Humidity	± 4.3 %
DC voltage	± 0.20 VDC
AC Voltage	± 1.2 VAC

The reported expanded uncertainty +/- U_{lab}(dB) has been estimated at a 95% confidence level (k=2)

U_{lab} is less than or equal to U_{ETSI} therefore

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit

Test Equipment Utilized

Description	MFG	Model Number	CT Asset Number	Last Cal Date	Cal Due Date
EMI Receiver	HP	85462A	i00033	6/9/21	6/9/22
Horn Antenna, 18 – 40 GHz	EMCO	3116	i00085	2/22/21	2/22/22
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: 10/4/21	
Horn Antenna, 1 – 18 GHz	ARA	DRG-118/A	i00271	8/3/20	8/3/21 **
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	8/28/20	8/28/21 **
Bi-Log Antenna	Teseq	CBL 6111D	i00349	1/20/21	1/21/22
AC Power Source	Behlman	BL 6000	i00362	Verified on: 10/4/21	
EMI Analyzer	Agilent	E7405A	i00379	12/29/20	12/29/21
LISN	COM-Power	LI-125A	i00447	4/28/20	4/28/22
LISN	COM-Power	LI-125A	i00449	4/28/20	4/28/22
EMI Receiver	Keysight	N9038A	i00552	1/12/21	1/12/22
Loop Antenna	COM-Power	AL-130R	Rental S/N: 10160027	9/14/21	9/14/24

**Note: A 60 day calibration extension was approved by the lab manager.

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