

# REGULATORY COMPLIANCE TEST REPORT

FCC Part 15 Subpart F 15.519 Hand-Held UWB Device

Report No.: ALER03-U2 Rev C

Company: Alereon Inc.

Model Name: AL5350B Based UWB Modules



# REGULATORY COMPLIANCE TEST REPORT

Company Name: Alereon Inc.

Model Name: AL5350B Based UWB Modules

To: FCC CFR 47 Part 15 Subpart F 15.519

Test Report Serial No.: ALER03-U2 Rev C

This report supersedes: NONE

Applicant: Alereon Inc.

10800 Pecan Park Blvd, STE 100

Austin, Texas 78750

**USA** 

Issue Date: 20th April 2021

# This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.

575 Boulder Court Pleasanton California 94566 USA

Phone: +1 (925) 462-0304 Fax: +1 (925) 462-0306 www.micomlabs.com



MiCOM Labs is an ISO 17025 Accredited Testing Laboratory



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# **Table of Contents**

1. ACCREDITATION, LISTINGS & RECOGNITION	4
1.1. TESTING ACCREDITATION	4
1.2. RECOGNITION	5
1.3. PRODUCT CERTIFICATION	
2. DOCUMENT HISTORY	7
3. TEST RESULT CERTIFICATE	8
4. REFERENCES AND MEASUREMENT UNCERTAINTY	
4.1. Normative References	9
4.2. Test and Uncertainty Procedure	10
5. PRODUCT DETAILS AND TEST CONFIGURATIONS	
5.1. Technical Details	
5.2. Scope Of Test Program	
5.3. Equipment Model(s) and Serial Number(s)	
5.4. Antenna Details	
5.5. Cabling and I/O Ports	
5.6. Test Configurations	
5.7. Equipment Modifications	
5.8. Deviations from the Test Standard	
6. TEST SUMMARY	
7. TEST EQUIPMENT CONFIGURATION(S)	
7.1. Conducted Test Setup	
7.2. Radiated Emissions - 3m Chamber	18
8. MEASUREMENT AND PRESENTATION OF TEST DATA	
9. TEST RESULTS	
9.1. UWB Bandwidth	
9.2. Average Transmit Power	
9.3. Peak Power Density	
9.4. Transmitter Spurious Band Emissions	
9.4.1. Transmitter Spurious Emissions	
9.4.3. Band 2	
9.4.4. Band 3 & 6 9.4.5. Band 6	
9.4.6. GPS Band Emissions	
9.4.6.0.1. 3432 MHz	
9.4.6.0.2. 3960 MHz	
9.4.6.0.3. 4488 MHz	
9.4.6.0.4. 6600 MHz	
9.4.6.0.5. 7128 MHz	
9.4.6.0.6. 7656 MHz (Covers Band Group 3 TFC 7 and Band Group 6 TFC 5	
9.4.6.0.7. 8184 MHz	
9.4.6.0.8. 8712 MHz	
9.4. Shutoff Timing Requirements	
A. APPENDIX - GRAPHICAL IMAGES	
A.1 Transmitter Spurious Emissions	
A.1.1 Band 1	
A.1.2 Band 3	
A.1.3 Band 3 & 6	
A.1.4 Band 6	
B. APPENDIX - Manufacturer Declaration on Similarity of Models	
•	



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## 1. ACCREDITATION, LISTINGS & RECOGNITION

## 1.1. TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2017. The company is accredited by the American Association for Laboratory Accreditation (A2LA) <a href="https://www.a2la.org">www.a2la.org</a> test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <a href="https://www.a2la.org/scopepdf/2381-01.pdf">https://www.a2la.org/scopepdf/2381-01.pdf</a>



# **Accredited Laboratory**

A2LA has accredited

#### MICOM LABS

Pleasanton, CA

for technical competence in the field of

## **Electrical Testing**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017

General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 24th day of February 2020.

Vice President, Accreditation Services For the Accreditation Council Certificate Number 2381.01 Valid to November 30, 2021

Page:

4 of 172

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

Issue Date: 20<sup>th</sup> April 2021



To: FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

### 1.2. RECOGNITION

MiCOM Labs, Inc is widely recognized for its wireless testing and certification capabilities. In addition to being recognized for Testing and Certification under Phase 2 Mutual Recognition Agreements (MRA) with Canada, Europe, United Kingdom and Japan, our international recognition includes Conformity Assessment Body (CAB) designation status under agreements with Asia Pacific (APEC) MRA Phase 1 countries giving acceptance of MiCOM Labs test reports. MiCOM Labs test reports are accepted globally.

Serial #:

Country	Recognition Body	Status	MRA Phase	Identification No.
USA	Federal Communications Commission (FCC)	ТСВ	-	US0159 Test Firm Designation#: US1084
Canada	Industry Canada (ISED)	FCB	APEC MRA 2	US0159 ISED#: 4143A
Japan	MIC (Ministry of Internal Affairs and Communication) Japan Approvals Institute for Telecommunication Equipment (JATE)	CAB	Japan MRA 2	RCB 210
	VCCI			A-0012
Europe	European Commission	NB	EU MRA 2	NB 2280
United Kingdom	Department for Business, Energy & Industrial Strategy (BEIS)	AB	UK MRA 2	AB 2280
Mexico	Instituto Federal de Telecomunicaciones (IFT)	CAB	Mexico MRA 1	US0159
Australia	Australian Communications and Media Authority (ACMA)			
Hong Kong	Office of the Telecommunication Authority (OFTA)			
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	LICOAFO
Singapore	Infocomm Development Authority (IDA)	CAB	APEC WIRA I	US0159
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)			
Vietnam	Ministry of Communication (MIC)			

TCB – Telecommunications Certification Bodies (TCB)

FCB - Foreign Certification Body

CAB - Conformity Assessment Body

NB - Notified Body

AB – Approved Body

MRA - Mutual Recognition Agreement

MRA PhasePhase I - recognition for product testing

Phase II – recognition for both product testing and certification

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 5 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### 1.3. PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) <a href="https://www.a2la.org/scopepdf/2381-02.pdf">www.a2la.org/scopepdf/2381-02.pdf</a>





# Accredited Product Certification Body

A2LA has accredited

## MICOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 Requirements for bodies certifying products, processes and services. This product certification body also meets the A2LA R322 – Specific Requirements – Notified Body Accreditation Requirements and A2LA R308 - Specific Requirements - ISO-IEC 17065 - Telecommunication Certification Body Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.



Presented this 24th day of February 2020

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2021

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB) Industry Canada – Certification Body, CAB Identifier – US0159 Europe – Notified Body (NB), NB Identifier - 2280 UK – Approved Body (AB), AB Identifier - 2280 Japan – Recognized Certification Body (RCB), RCB Identifier - 210

Issue Date: 20<sup>th</sup> April 2021

**Page:** 6 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 2. DOCUMENT HISTORY

	Document History					
Revision	Date	Comments				
Draft	16 <sup>th</sup> March 2021	Draft for review				
Draft #2	22 <sup>nd</sup> March 2021					
Draft #3	23 <sup>rd</sup> March 2021					
Rev A	24 <sup>th</sup> March 2021	Initial Release				
Rev B	12 <sup>th</sup> April 2021	Updated the results table on Section 6 Test Summary to break out the results for each module tested				
Rev C	20 <sup>th</sup> April 2021	Modified title of Section 9.1 to UWB Bandwidth				

In the above table the latest report revision will replace all earlier versions.

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 7 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Tested By: MiCOM Labs, Inc.

USA

Fax: +1 925 462 0306

575 Boulder Court

Pleasanton, California 94566

Serial #: ALER03-U2 Rev C

# 3. TEST RESULT CERTIFICATE

Manufacturer: Alereon Inc.

10800 Pecan Park Blvd, STE 100

Austin, Texas 78750

USA

Model: AL5350B Based UWB Modules Telephone: +1 925 462 0304

**Equipment Type:** Mobile & Portable Client Device

**S/N's:** AL5804 Impact: 21062294

AL5808 Octal: 21030754

AL5830 Commander 256: 20510133 AL5833 Destroyer 256: 1037463-101 AL5834 Combat 256: 20510161 AL5835 Camouflage 256: 20510302

**Test Date(s):** 5<sup>th</sup> – 12<sup>th</sup> March 2021 **Website:** www.micomlabs.com

STANDARD(S)

FCC CFR 47 Part 15 Subpart F 15.519

**TEST RESULTS** 

**EQUIPMENT COMPLIES** 

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

#### Notes:

- 1. This document reports conditions under which testing was conducted and the results of testing performed.
- 2. Details of test methods used have been recorded and kept on file by the laboratory.
- 3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:

Gordon Hurst

President & CEO MiCOM Labs, Inc.

Graeme Grieve

Quality Manager MiCOM Labs, Inc.

Issue Date: 20th April 2021

Page: 8 of 172

TESTING CERT #2381.01



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 4. REFERENCES AND MEASUREMENT UNCERTAINTY

# 4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	FCC 47 CFR Part F	2018	Radio Frequency Devices; Subpart F –Ultra Wide Band Devices
II	A2LA	August 2018	R105 - Requirement's When Making Reference to A2LA Accreditation Status
III	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
IV	ANSI C63.4	2014	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
V	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
VI	M 3003	Edition 3 Nov.2012	Expression of Uncertainty and Confidence in Measurements
VII	FCC 47 CFR Part 2.1033	2016	FCC requirements and rules regarding photographs and test setup diagrams.
VIII	KDB 393764 D01 UWB FAQ v02	January 29, 2018	Ultra-Wideband (UWB) Devices frequently asked questions

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 9 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## 4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 10 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 5. PRODUCT DETAILS AND TEST CONFIGURATIONS

## 5.1. Technical Details

Purpose: Test of the Alereon AL5350B Based UWB Modules to FCC CFR 47 Part 15 Subpart F 15.519 Ultra-Wideband (UWB); Hand-Held Device  Applicant: Alereon Inc. 10800 Pecan Park Blvd, STE 100 Austin, TX 78750 USA  Manufacturer: As applicant  Laboratory performing the MicCoM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA  Test report reference number: ALER03-U2  Date EUT received: 5th March 2021  Standard(s) applied: FCC Part 15 Subpart F 15.519  Dates of test (from - to): 8th - 12th March 2021  No of Units Tested: 1  Product Name: AL5350B Based UWB Modules  Model(s): AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006  AL5808 Octal: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006  AL5803 Commander 256: 2.8g, L1.040" x W0.565", Rev 1, SW Rev 30006  AL5834 Combat 256: 5.2g, L1.690" x W1.252", Rev 1, SW Rev 30006  AL5835 Camouflage 256: 5.2g, L1.790" x W0.710", Rev 1, SW Rev 30006  AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006  AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006  AL5835 Camouflage 256: 3.3 VDC, 180mA  Current: AL5808 Octal: 3.3 VDC, 180mA  AL5808 Octal: 3.3 VDC, 180mA  AL5830 Destroyer 256: 3.3 VDC, 180mA  AL5830 Destroyer 256: 5.0 VDC, 180mA  AL5830 Destroyer 256: 5.0 VDC, 180mA  AL5830 Destroyer 256: 3.3 VDC, 180mA  AL5830 Commander 256: 5.0 VDC, 180mA	Details	Description
Applicant: Alereon Inc. Applicant: Alereon Inc. 1800 Pecan Park Blvd, STE 100 Austin, TX 78750 USA  Manufacturer: As applicant Laboratory performing the tests: 575 Boulder Court Pleasanton California 94566 USA  Test report reference number: ALER03-U2 Date EUT received: 5th March 2021 Standard(s) applied: FCC Part 15 Subpart F 15.519 Dates of test (from - to): 8th - 12th March 2021 No of Units Tested: 1 Product Name: AL5350B Based UWB Modules Model(s): AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006 AL5803 Corda: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006 AL5803 Commander 256: 2.8g, L1.040" x W0.710", Rev 1, SW Rev 30006 AL5834 Combat 256: 5.2g, L1.790" x W0.710", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5836 Combat 256: 5.2g, L1.980" x W0.710", Rev 1, SW Rev 30006 AL5836 Combat 256: 5.2g, L1.980" x W0.710", Rev 1, SW Rev 30006 AL5837 Commander 256: 2.8g, L1.980" x W0.710", Rev 1, SW Rev 30006 AL5836 Combat 256: 5.2g, L1.980" x W0.710", Rev 1, SW Rev 30006 AL5836 Combat 256: 5.2g, L1.980" x W0.710", Rev 1, SW Rev 30006 AL5837 Commander 256: 2.33 x VDC, 180mA AL5830 Commander 256: 3.3 x VDC, 180mA AL5833 Commander 256: 3.3 x VDC, 180mA AL5833 Commander 256: 5.0 v VDC, 180mA AL5833 Commander 256: 5.0 v VDC, 180mA AL5833 Commander 256: 5.0 v VDC, 180mA AL5835 Camouflage 256: 5.0 v VDC, 180mA		•
Applicant:	Fuipose.	
10800 Pecan Park Blvd, STE 100   Austin, TX 78750   USA     Manufacturer:   As applicant     Laboratory performing the tests:   575 Boulder Court     Pleasanton California 94566 USA     Test report reference number:   ALER03-U2     Date EUT received:   5th March 2021     Dates of test (from - to):   3th - 12th March 2021     No of Units Tested:   1     Product Name:   AL5350B Based UWB Modules     Model(s):   AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006     AL5808 Octal: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006     AL5830 Commander 256: 2.8g, L1.040" x W0.565", Rev 1, SW Rev 30006     AL5831 Commander 256: 5.2g, L1.790" x W0.710", Rev 1, SW Rev 30006     AL5832 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006     AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006     AL5836 Camouflage 256: 3.3 VDC, 180mA     Current:   Declared Nominal Output Power (dBm):     Power (dBm):   Rated Input Voltage and   AL5808 Octal: 3.3 VDC, 180mA     AL5833 Commander 256: 3.3 VDC, 180mA     AL5834 Combat 256: 5.0 VDC, 180mA     AL5835 Camouflage 256: 5.0 VDC, 180mA     AL5834 Combat 256: 5.0 VDC, 180mA     AL5835 Camouflage 256: 5.0 VDC, 180mA     AL5836 Camouflage 256: 5.0 VDC, 180mA     AL5837 Camouflage 256: 5.0 VDC, 180mA     AL5838 Camouflage 256: 5.0 VDC, 180mA     AL5835 Camouflage 256: 5.0 VDC, 180mA     AL5836 Camouflage 256: 5.0 VDC, 180mA     AL5837 Camouflage 256: 5.0 VDC, 180mA     AL5838 Camouflage 256: 5.0 VDC, 180mA     AL5836 Camouflage 256: 5.0 VDC, 180mA     AL5837 Camouflage 256: 5.0 VDC, 180mA     AL5838 Camouflage 256: 5.0 VDC, 180mA     AL5839 Camouflage 256: 5.0 VDC, 180mA     AL5831 Camouflage 256: 5.0 VDC, 180mA     AL5835 Camouflage 256: 5.0 VDC, 180mA     AL5836 Camouflage 256: 5.0 VDC, 180mA     AL5837 Camouflage 256: 5.0 VDC, 180mA     AL5838 Camouflage 256: 5.0 VDC, 180mA     AL5839 Ca	Applicant:	\ /'
Austin, TX 78750 USA  Manufacturer: As applicant  Laboratory performing the tests:  MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA  Test report reference number: ALER03-U2  Date EUT received: 5" March 2021  Standard(s) applied: FCC Part 15 Subpart F 15.519  Dates of test (from - to): 8" - 12" March 2021  No of Units Tested: 1  Product Name: AL5350B Based UWB Modules  Model(s): AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006  AL5808 Octal: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006  AL5830 Commander 256: 5.2g, L1.040" x W0.565", Rev 1, SW Rev 30006  AL5833 Commander 256: 5.2g, L1.090" x W0.550", Rev 1, SW Rev 30006  AL5834 Combat 256: 5.2g, L1.090" x W0.710", Rev 1, SW Rev 30006  AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006  AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006  AL5835 Camouflage 256: 4.3g, L1.090" x W0.860", Rev 1, SW Rev 30006  AL5836 Camouflage 256: 5.2g, L1.690" x W0.565"  Bell Modulation: BPM/BPSK  EUT Modes of Operation: UWB  Declared Nominal Output Power (dBm):  Rated Input Voltage and Current: AL5804 Impact: 5.0 VDC, 180mA  AL5830 Commander 256: 3.3 VDC, 180mA  AL5833 Destroyer 256: 3.3 VDC, 180mA  AL5834 Combat 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  AL5834 Combat 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  AL5836 Camouflage 256: 5.0 VDC, 180mA  AL5837 Commander 256: 5.0 VDC, 180mA  AL5838 Camouflage 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  AL5836 Camouflage 256: 5.0 VDC, 180mA  AL5837 Commander 256: 5.0 VDC, 180mA  AL5838 Camouflage 256: 5.0 VDC, 180mA	/ Applicant.	
USA		
Laboratory performing the tests:    MiCOM Labs, Inc.   575 Boulder Court   Pleasanton California 94566 USA     Test report reference number: ALER03-U2     Date EUT received: 5th March 2021     Standard(s) applied: FCC Part 15 Subpart F 15.519     Dates of test (from - to): 8th - 12th March 2021     No of Units Tested: 1     Product Name: Model(s): AL5350B Based UWB Modules     Model(s): AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006     AL5808 Octal: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006     AL5830 Commander 256: 2.8g, L1.040" x W0.565", Rev 1, SW Rev 30006     AL5834 Combat 256: 5.2g, L1.790" x W0.710", Rev 1, SW Rev 30006     AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006     AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006     AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006     AL5836 Combat 256: 5.2g, L1.790" x W0.860", Rev 1, SW Rev 30006     AL5808 Octal: 3.3 VDC, 180mA     AL5808 Octal: 3.3		
Test report reference number: ALER03-U2  Date EUT received: 5th March 2021  Standard(s) applied: PCC Part 15 Subpart F 15.519  Dates of test (from - to): No of Units Tested: 1  Product Name: AL5350B Based UWB Modules  Model(s): AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006 AL5808 Octal: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006 AL5830 Commander 256: 2.8g, L1.040" x W0.565", Rev 1, SW Rev 30006 AL5831 Destroyer 256: 5.2g, L1.690" x W1.252", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA	Manufacturer:	As applicant
Test report reference number: ALER03-U2  Date EUT received: 5th March 2021  Standard(s) applied: PCC Part 15 Subpart F 15.519  Dates of test (from - to): No of Units Tested: 1  Product Name: AL5350B Based UWB Modules  Model(s): AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006 AL5808 Octal: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006 AL5830 Commander 256: 2.8g, L1.040" x W0.565", Rev 1, SW Rev 30006 AL5831 Destroyer 256: 5.2g, L1.690" x W1.252", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA	Laboratory performing the	MiCOM Labs, Inc.
Test report reference number:   ALER03-U2		
Date EUT received:   Sth March 2021   FCC Part 15 Subpart F 15.519   Dates of test (from - to):   8th - 12h March 2021   No of Units Tested:   1		Pleasanton California 94566 USA
Standard(s) applied:   FCC Part 15 Subpart F 15.519	Test report reference number:	ALER03-U2
Dates of test (from - to): 8th - 12h March 2021	Date EUT received:	5 <sup>th</sup> March 2021
No of Units Tested: 1		
Product Name:   AL5350B Based UWB Modules	Dates of test (from - to):	8 <sup>th</sup> – 12 <sup>h</sup> March 2021
Model(s): AL5804 Impact: 1.7g, L1.215" x W0.565", Rev 1, SW Rev 30006	No of Units Tested:	1
AL5808 Octal: 1.5g, L1.040" x W0.565", Rev 1, SW Rev 30006 AL5830 Commander 256: 2.8g, L1.040" x W0.565", Rev 1, SW Rev 30006 AL5833 Destroyer 256: 5.2g, L1.690" x W1.252", Rev 1, SW Rev 30006 AL5834 Combat 256: 5.2g, L1.790" x W0.710", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5836 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5836 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5836 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 AL5836 Camouflage 256: 5.0 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA	Product Name:	AL5350B Based UWB Modules
AL5830 Commander 256: 2.8g, L1.040" x W0.565", Rev 1, SW Rev 30006	Model(s):	
AL5833 Destroyer 256: 5.2g, L1.690" x W1.252", Rev 1, SW Rev 30006		
AL5834 Combat 256: 5.2g, L1.790" x W0.710", Rev 1, SW Rev 30006 AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006 Indoors and Outdoors  Declared Frequency Range(s): 3100-10600 MHz  Type of Modulation: BPM/BPSK  EUT Modes of Operation: UWB  Declared Nominal Output Power (dBm):  Rated Input Voltage and Current: AL5804 Impact: 5.0 VDC, 180mA AL5808 Octal: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA		
AL5835 Camouflage 256: 4.1g, L1.980" x W0.860", Rev 1, SW Rev 30006  Location for use: Indoors and Outdoors  Declared Frequency Range(s): 3100-10600 MHz  Type of Modulation: BPM/BPSK  EUT Modes of Operation: UWB  Declared Nominal Output Power (dBm):  Rated Input Voltage and Current: AL5804 Impact: 5.0 VDC, 180mA  AL5808 Octal: 3.3 VDC, 180mA  AL5803 Commander 256: 3.3 VDC, 180mA  AL5830 Commander 256: 3.3 VDC, 180mA  AL5834 Combat 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  Operating Temp Range: (manufacturers declaration)		
Location for use: Indoors and Outdoors  Declared Frequency Range(s): 3100-10600 MHz  Type of Modulation: BPM/BPSK  EUT Modes of Operation: UWB  Declared Nominal Output Power (dBm):  Rated Input Voltage and Current: AL5804 Impact: 5.0 VDC, 180mA  AL5808 Octal: 3.3 VDC, 180mA  AL5830 Commander 256: 3.3 VDC, 180mA  AL5833 Destroyer 256: 3.3 VDC, 180mA  AL5834 Combat 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  Operating Temp Range: (manufacturers declaration)		
Declared Frequency Range(s): 3100-10600 MHz  Type of Modulation: BPM/BPSK  EUT Modes of Operation: UWB  Declared Nominal Output Power (dBm): AL5804 Impact: 5.0 VDC, 180mA  Current: AL5808 Octal: 3.3 VDC, 180mA  AL5830 Commander 256: 3.3 VDC, 180mA  AL5833 Destroyer 256: 3.3 VDC, 180mA  AL5834 Combat 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  Operating Temp Range: (manufacturers declaration)	Landing for the same	
Type of Modulation:  BPM/BPSK  EUT Modes of Operation:  Declared Nominal Output Power (dBm):  Rated Input Voltage and Current:  AL5804 Impact: 5.0 VDC, 180mA  AL5808 Octal: 3.3 VDC, 180mA  AL5830 Commander 256: 3.3 VDC, 180mA  AL5833 Destroyer 256: 3.3 VDC, 180mA  AL5834 Combat 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  Operating Temp Range: (manufacturers declaration)		
EUT Modes of Operation:  Declared Nominal Output Power (dBm):  Rated Input Voltage and Current:  AL5804 Impact: 5.0 VDC, 180mA AL5808 Octal: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA Operating Temp Range: (manufacturers declaration)		
Declared Nominal Output Power (dBm):  Rated Input Voltage and Current:  AL5804 Impact: 5.0 VDC, 180mA AL5808 Octal: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA Operating Temp Range: (manufacturers declaration)		
Power (dBm):  Rated Input Voltage and Current:  AL5804 Impact: 5.0 VDC, 180mA AL5808 Octal: 3.3 VDC, 180mA AL5830 Commander 256: 3.3 VDC, 180mA AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA Operating Temp Range: (manufacturers declaration)		
Rated Input Voltage and Current:  AL5804 Impact: 5.0 VDC, 180mA  AL5808 Octal: 3.3 VDC, 180mA  AL5830 Commander 256: 3.3 VDC, 180mA  AL5833 Destroyer 256: 3.3 VDC, 180mA  AL5834 Combat 256: 5.0 VDC, 180mA  AL5835 Camouflage 256: 5.0 VDC, 180mA  Operating Temp Range: (manufacturers declaration)		
Current: AL5808 Octal: 3.3 VDC, 180mA		
AL5830 Commander 256: 3.3 VDC, 180mA AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA Operating Temp Range: (manufacturers declaration)		
AL5833 Destroyer 256: 3.3 VDC, 180mA AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA Operating Temp Range: (manufacturers declaration)	Current:	
AL5834 Combat 256: 5.0 VDC, 180mA AL5835 Camouflage 256: 5.0 VDC, 180mA Operating Temp Range: (manufacturers declaration)		· · · · · · · · · · · · · · · · · · ·
AL5835 Camouflage 256: 5.0 VDC, 180mA  Operating Temp Range: -40 to +85°C  (manufacturers declaration)		
Operating Temp Range: -40 to +85°C (manufacturers declaration)		
(manufacturers declaration)	Operating Temp Range:	
	1	Mobile & Portable Client Devices

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 11 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## 5.2. Scope Of Test Program

Alereon Inc. Company: AL5350B Based UWB Modules

The scope of the test program was to test the Alereon Inc. Company AL5350B Based UWB Modules configurations in the frequency ranges 3100 - 10600 MHz for compliance against the following specification:

#### FCC CFR 47 Part 15 Subpart F - 15.519

Compliance Measurement Procedures for Unlicensed National Information Infrastructure devices operating in the 3100 - 10600 MHz bands.

## **Model Differences**

AL5804 Impact – USB Interface
AL5808 Octal – Serial Interface
AL5830 Commander 256 – Serial Interface
AL5833 Destroyer 256 – Serial Interface
AL5834 Combat 256 – USB Interface
AL5835 Camouflage 256 – Serial Interface

The manufacturer declares that all 6 Models use the same RF chipset, see Appendix B Manufacturers Declaration on Similarities. Conducted testing was performed on the AL5834 Combat 256 model with USB Interface.

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 12 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 5.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr.	Model No.	Serial No.
	Combat 256	Alereon Inc	AL5834	20510161
	Impact	Alereon Inc	AL5804	21062294
EUT	Commander 256	Alereon Inc	AL5830	20510133
	Camouflage 256	Alereon Inc	AL5835	20510302
	Octal	Alereon Inc	AL5808	21030754
	Destroyer 256	Alereon Inc	AL5833	1037463-101
Support	Host Board	Alereon Inc	N/A	N/A
Support	Laptop	Lenovo	N/A	N/A

## 5.4. Antenna Details

Туре	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X- Pol	Frequency Band (MHz)
Chip	Taiyo Yuden	AH086M555003	Patch	1.0/0.2/0.2	N/A		No	3168-3696
Chip	Taiyo Yuden	AH086M555003	Patch	0.2/-0.2/0.1	N/A		No	6600-7656
Chip	Taiyo Yuden	AH086M555003	Patch	0.1/-1.8/-1.8	N/A		No	7656-8712

BF Gain - Beamforming Gain

Dir BW - Directional BeamWidth

X-Pol - Cross Polarization

## 5.5. Cabling and I/O Ports

Custom 60 pin interface to Host Board/ USB

- a. USB Type A Port
- b. Custom USB Port
- c. Serial Port
- d. Parallel Interface

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 13 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

## 5.6. Test Configurations

Results for the following configurations are provided in this report:

Band(s)	Transmission Rate	Channel Frequency (MHz)  Low Mid High			
Dana(o)					
1	Max	3432	3960	4488	
3	Max	6600	7128	7656*	
6	Max	7656*	8184	8712	

Serial #:

## 5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

## 5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 14 of 172

<sup>\*</sup>These frequencies are the same for Band 3 and Band 6. As a result, radiated testing only presents a single set of results.



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 6. TEST SUMMARY

List of Measurements

Test Header	Result	Data Link	
UWB Bandwidth	Complies	View Data	
Peak Power	Complies	View Data	
Peak Power Density	Complies	View Data	
Spurious Radiated Emissions	Complies	View Data	
Spurious Radiated Emissions in GPS Bands	Complies	View Data	
Shutdown Timing Requirements	Complies	View Data	
Emissions below 1 GHz	Complies		
- AL5804 Impact	Complies		
- AL5808 Octal	Complies		
- AL5830 Commander 256	Complies	See MiCOM Labs test report	
- AL5833 Destroyer 256	Complies	ALER03-U4	
- AL5834 Combat 256	Complies		
- AL5835 Camouflage 256	Complies		
AC Wireline Emissions	*Not Applicable	Vdc Modules	
Comments: None			

\*Modules are dc powered



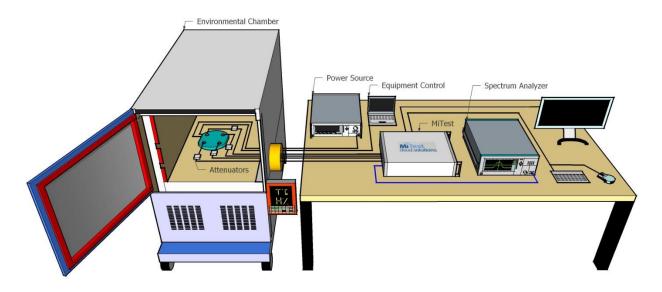
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 7. TEST EQUIPMENT CONFIGURATION(S)

# 7.1. Conducted Test Setup

### MiTest Automated Test System



A full system calibration was performed on the test station and any resulting system losses (or gains) were considered in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
#3 SA	MiTest Box to SA	Fairview Microwave	SCA1814-0101-72	#3 SA	4 Jun 2021
#3P1	EUT to MiTest box port 1	Fairview Microwave	SCA1814-0101-72	#3P1	4 Jun 2021
#3P2	EUT to MiTest box port 2	Fairview Microwave	SCA1814-0101-72	#3P2	4 Jun 2021
#3P3	EUT to MiTest box port 3	Fairview Microwave	SCA1814-0101-72	#3P3	4 Jun 2021
#3P4	EUT to MiTest box port 4	Fairview Microwave	SCA1812-0101-72	#3P4	4 Jun 2021
249	Thermocouple; Resistance Thermometer	Thermotronics	GR2105-02	9340 #2	30 Oct 2021
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2021
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/0 40	12 Jun 2021
398	MiTest RF Conducted Test Software	MiCOM	MiTest ATS	Version 4.2.3.0	Not Required
405	DC Power Supply 0-60V	Agilent	6654A	MY40018 26	Cal when used

Issue Date: 20<sup>th</sup> April 2021

**Page:** 16 of 172



**Title:** Alereon Inc. AL5350B Based UWB Modules **To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

408	USB to GPIB interface	National Instruments	GPIB-USB HS	14C0DE9	Not Required
440	USB Wideband Power Sensor	Boonton	55006	9178	22 Jun 2021
441	USB Wideband Power Sensor	Boonton	55006	9179	20 Jun 2021
442	USB Wideband Power Sensor	Boonton	55006	9181	19 Jun 2021
445	PoE Injector	D-Link	DPE-101GL	QTAH1E 2000625	Not Required
461	Spectrum Analyzer	Agilent	E4440A	MY46185 537	20 Jun 2021
510	Barometer/Thermometer	Control Company	68000-49	1708713 75	20 Dec 2021
515	MiTest Cloud Solutions RF Test Box	MiCOM	2nd Gen with DFS	515	4 Jun 2021
534	Power Sensor 50 GHz - 70dBm to +20dBm	R&S	NRP50SN	1419.009 3K02- 100888- SB	26 Feb 2022
75	Environmental Chamber	Thermatron	SE-300-2-2	27946	20 Feb 2022

Issue Date: 20th April 2021 Page: 17 of 172



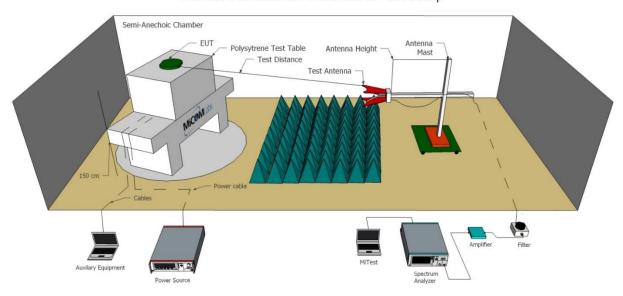
**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

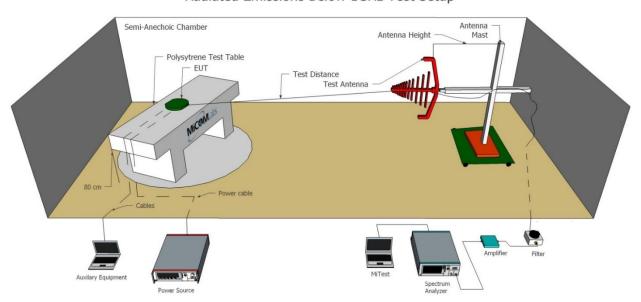
## 7.2. Radiated Emissions - 3m Chamber

The following tests were performed using the radiated test set-up shown in the diagram below. Radiated emissions above and below 1GHz.

### Radiated Emissions Above 1GHz Test Setup



### Radiated Emissions Below 1GHz Test Setup



**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 18 of 172



FCC CFR 47 Part 15 Subpart F 15.519 Serial #:

ALER03-U2 Rev C

A full system calibration was performed on the test station and any resulting system losses (or gains) were considered in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CU101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	8 Oct 2021
298	3M Radiated Emissions Chamber Maintenance Check	MiCOM	3M Chamber	298	26 Apr 2021
330	Variac 0-280 Vac	Staco Energy Co	3PN1020B	0546	Cal when used
336	Active loop Ant 10kHz to 30 MHz	EMCO	EMCO 6502	00060498	29 Nov 2021
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	4 Apr 2021
341	900MHz Notch Filter	EWT	EWT-14-0199	H1	4 May 2021
342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1	4 May 2021
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	4 May 2021
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	21 Jun 2021
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	12 Jun 2021
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	9 May 2021
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	12 May 2021
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	9 May 2021
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	MiTest Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	4 May 2021

20<sup>th</sup> April 2021 Issue Date:

Page: 19 of 172



**b:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	4 May 2021
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	4 May 2021
466	Low Pass Filter DC- 1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	4 May 2021
480	Cable - Bulkhead to Amp	SRC Haverhill	157-3050360	480	4 May 2021
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-3050787	481	4 May 2021
510	Barometer/Thermometer	Control Company	68000-49	170871375	20 Dec 2021
518	Cable - Amp to Antenna	SRC Haverhill	157-3051574	518	4 May 2021
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 20 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by <u>MiTest</u>. <u>MiTest</u> is an automated test system developed by MiCOM Labs. <u>MiTest</u> is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.





The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

Issue Date: 20th April 2021 Page: 21 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9. TEST RESULTS

## 9.1. UWB Bandwidth

Conducted Test Conditions for UWB Bandwidth							
Standard:	andard: FCC CFR 47:15.519 Ambient Temp. (°C): 24.0 - 27.5						
Test Heading:	UWB Bandwidth	WB Bandwidth Rel. Humidity (%): 32 - 45					
Standard Section(s):	ANSI C63.10 Section 10.1						
Reference Document(s):	See Normative References						

### **Test Procedure for UWB Bandwidth Measurement**

The UWB Bandwidth is measured radiated, at a 3-meter distance, while EUT is operating in transmission mode at the appropriate center frequency. The Resolution Bandwidth was set to 1MHz RBW IAW ANSI C63.10.

Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Conducted Test Set-up section specified in this document.

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 22 of 172



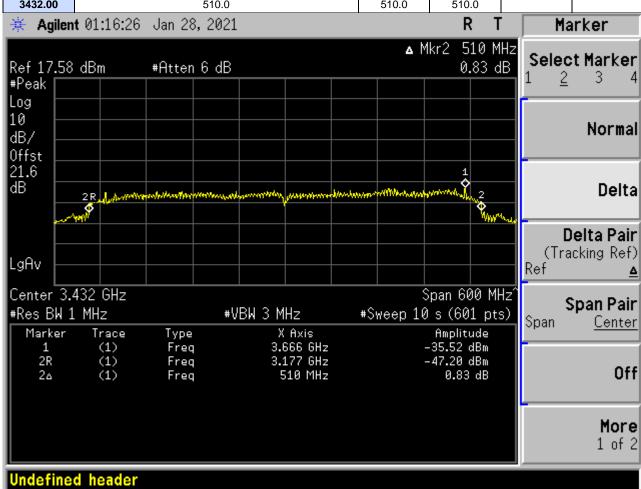
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 1	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	1.0/0.2/0.2
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test	Measured Bandwidth (MHz)	Bandwidth (MHz)		
Frequency	Measured Bandwidth (Miliz)			
MHz	Port A	Highest	Lowest	
3432.00	510.0	510.0	510.0	



Traceability to Industry Recognized Test Methodologies					
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK				
Measurement Uncertainty:	±2.81 dB				

The above values are representative of the worst-case value between polarities and based on the power measurements.

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 23 of 172



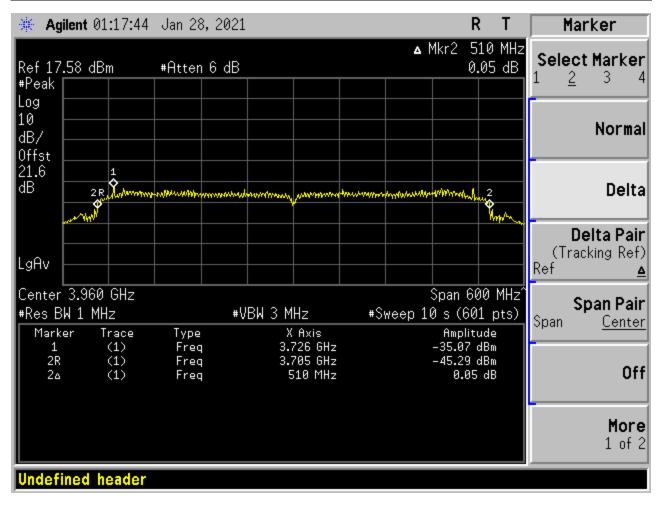
**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 1	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	1.0/0.2/0.2
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest	Lowest	
3960.00	510.0	510.0	510.0	



Traceability to Industry Recognized Test Methodologies					
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK				
Measurement Uncertainty:	±2.81 dB				

The above values are representative of the worst-case value between polarities and based on the power measurements.

Issue Date: 20th April 2021 Page: 24 of 172



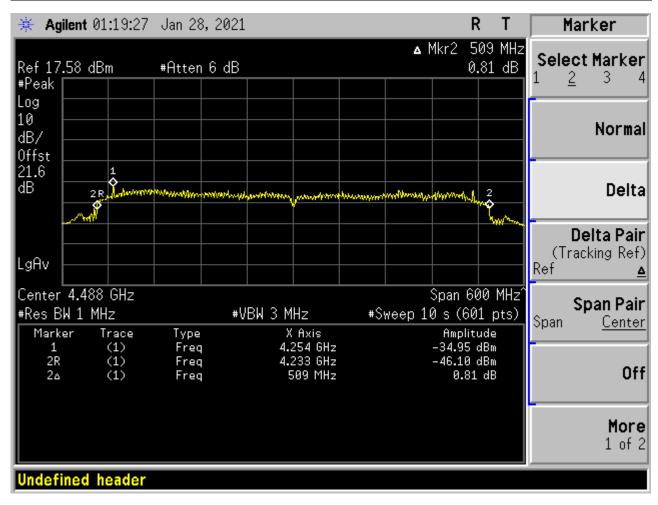
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 1	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	1.0/0.2/0.2
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest	Lowest	
4488.00	509.00	509.00	509.00	



Traceability to Industry Recognized Test Methodologies					
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK				
Measurement Uncertainty:	±2.81 dB				

The above values are representative of the worst-case value between polarities and based on the power measurements.

Issue Date: 20th April 2021 Page: 25 of 172



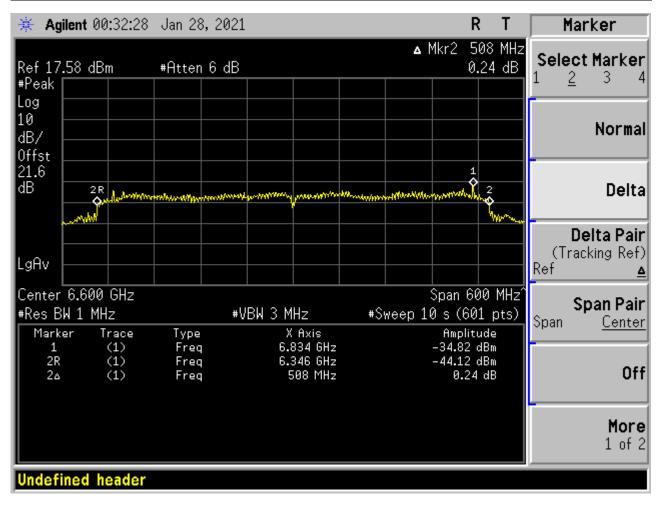
**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 3	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest	Lowest	
6600.00	508.00	508.00	508.00	



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK			
Measurement Uncertainty:	±2.81 dB			

The above values are representative of the worst-case value between polarities and based on the power measurements.

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 26 of 172



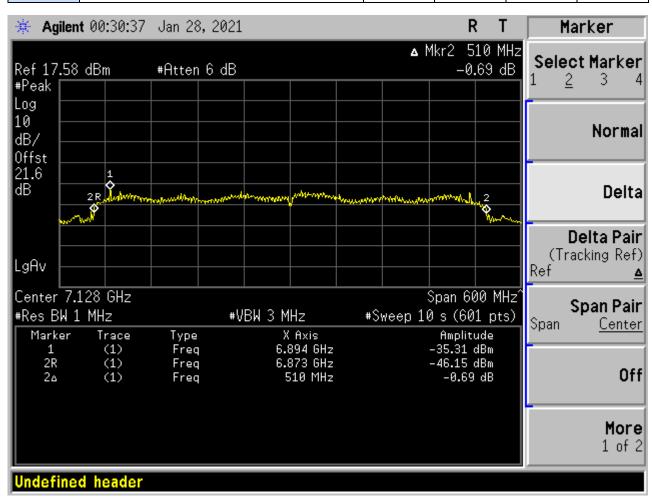
**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 3	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest	Lowest	
7128.00	510.00	510.00	510.00	



Traceability to Industry Recognized Test Methodologies					
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK				
Measurement Uncertainty:	±2.81 dB				

The above values are representative of the worst-case value between polarities and based on the power measurements.

Issue Date: 20th April 2021



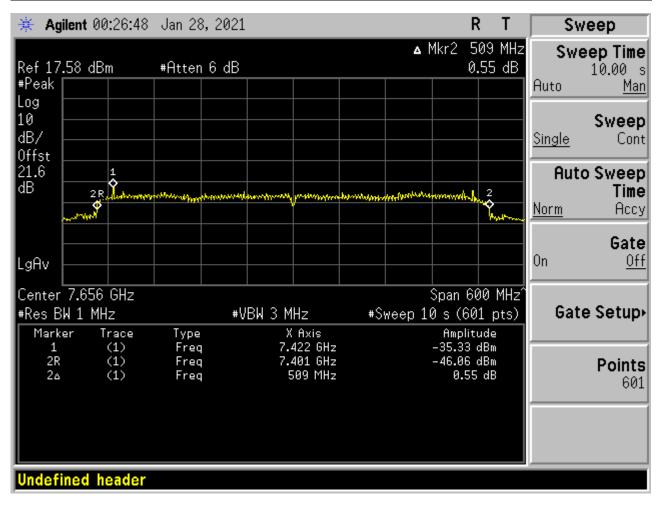
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 3	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest	Lowest	
7656.00	509.00	509.00	509.00	



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK			
Measurement Uncertainty:	±2.81 dB			

The above values are representative of the worst-case value between polarities and based on the power measurements.

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 28 of 172



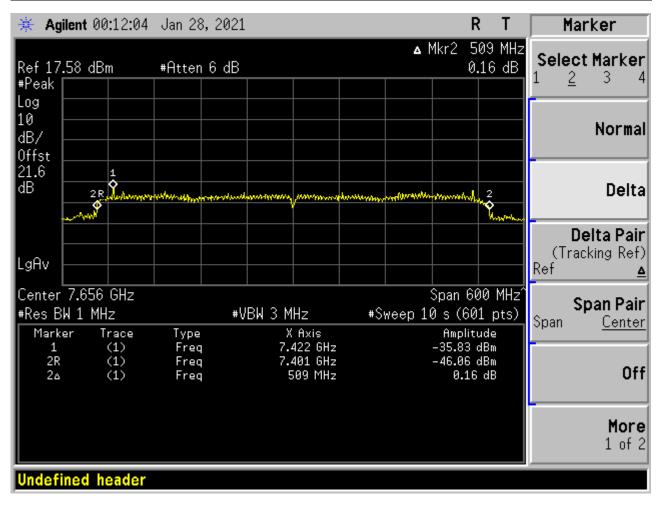
**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 3	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest	Lowest	
7656.00	509.00	509.00	509.00	



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK			
Measurement Uncertainty:	±2.81 dB			

The above values are representative of the worst-case value between polarities and based on the power measurements.

Issue Date: 20th April 2021 Page: 29 of 172



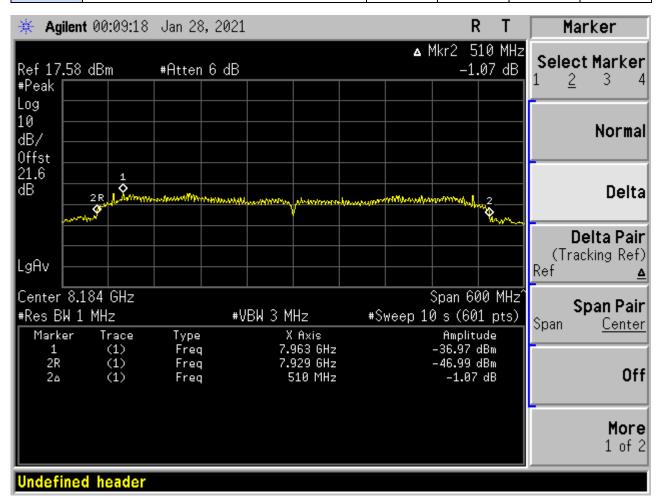
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for UWB Bandwidth**

Variant:	Band Group 3	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.1/-1.8/-1.8
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest Lowest		
8184.00	510.00	510.00	510.00	



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK			
Measurement Uncertainty:	±2.81 dB			

The above values are representative of the worst-case value between polarities and based on the power measurements.

Issue Date: 20th April 2021

Page: 30 of 172



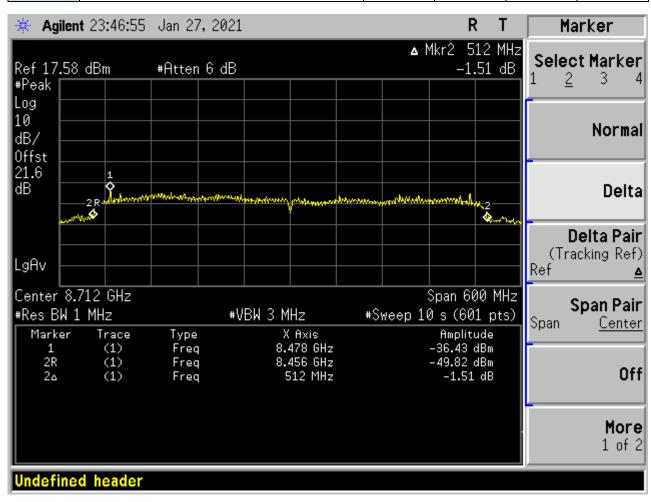
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### **Equipment Configuration for UWB Bandwidth**

Variant:	UWB	Duty Cycle (%):	100
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.1/-1.8/-1.8
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

Test Frequency	Measured Bandwidth (MHz)	Bandwidth (MHz)		
MHz	Port A	Highest Lowest		
8712.00	512.00	512.00	512.00	



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK			
Measurement Uncertainty:	±2.81 dB			

The above values are representative of the worst-case value between polarities and based on the power measurements.

Issue Date: 20th April 2021



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.2. Average Transmit Power

Conducted Test Conditions for Average Output Power					
Standard:         FCC CFR 47:15.519         Ambient Temp. (°C):         24.0 - 2					
Test Heading:	Radiated Emissions UWB Transmission	Rel. Humidity (%):	32 - 45		
Standard Section(s):	15.519 ( c )	Pressure (mBars):	999 - 1001		
Reference Document(s):	None				

#### **Test Procedure for UWB Transmission**

Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Conducted Test Set-up section specified in this document. Supporting KDB's referenced below.

#### **Operating Frequency Band:**

3100-10600 MHz

#### Limits Maximum EIRP (dBm)

Frequency	EIRP Limit
(MHz)	(dBm)
3100 - 10600	-41.3

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 32 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for Average RF Output Power**

Variant:	Band Group 1	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	1.0/0.2/0.2
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

#### **Test Measurement Results**

Test Frequency MHz	Measured Output Power(dBm)	Calculated EIRP	EIRP Limit	Margin	EUT Power Setting
2	Port A	dBm	dBm	dB	Numeric
3432.00	-45.67	-44.67	-41.3	-3.37	Max
3960.00	-44.93	-43.93	-41.3	-2.63	Max
4488.00	-45.30	-44.30	-41.3	-3.00	Max

Traceability to Industry Recognized Test Methodologies					
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER				
Uncertainty:	±1.33 dB				

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 33 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for RF Output Power**

Variant:	Band Group 3	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

#### **Test Measurement Results**

Test Frequency MHz	Measured Output Power(dBm)	Calculated EIRP	EIRP Limit	Margin	EUT Power Setting
	Port A	dBm	dBm	dB	Numeric
6600.00	-46.35	-46.15	-41.3	-4.85	Max
7128.00	-46.23	-46.03	-41.3	-4.73	Max
7656.00	-47.17	-46.97	-41.3	-5.67	Max

Traceability to Industry Recognized Test Methodologies		
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER	
Uncertainty:	±1.33 dB	

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 34 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for RF Output Power**

Variant:	Band Group 6	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.1/-1.8/-1.8
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

#### **Test Measurement Results**

Test Frequency MHz	Measured Output Power(dBm)	Calculated EIRP	EIRP Limit	Margin	EUT Power Setting
	Port A	dBm	dBm	dB	Numeric
7656.00	-47.09	-46.89	-41.3	-5.59	Max
8184.00	-47.27	-47.07	-41.3	-5.77	Max
8712.00	-47.41	-47.21	-41.3	-5.91	Max

Traceability to Industry Recognized Test Methodologies		
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER	
Uncertainty:	±1.33 dB	

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 35 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### 9.3. Peak Power Density

Test Conditions for Maximum Peak Power Density			
Standard:	FCC CFR 47:15.519 (e)	Ambient Temp. (°C):	24.0 - 27.5
Test Heading:	Peak Power Density	Rel. Humidity (%):	32 - 45
Standard Section(s):	ANSI C63.10 Section 10.3.6	Pressure (mBars):	999 - 1001
Reference Document(s):	None		

#### **Test Procedure for UWB Transmission**

Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document. Supporting KDB's referenced below.

Measurements were gathered with a RBW of 1MHz and converted to 50MHz using the following formula:

$$EIRP_{1 MHz} = EIRP_{50 MHz} + 20log(1MHz/50MHz) = 0dBm + (-34dBm) = -34dBm$$

$$(dBuV/m) = P(e.i.r.p.(dBm)) + 95.2$$

#### **Operating Frequency Band:**

3100-10600 MHz

#### Limits Maximum EIRP (dBm)

Frequency	EIRP Limit	EIRP Limit
(MHz)	(dBm/50MHz)	(dBm/1MHz)
3100 - 10600	0	-34.0

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 36 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

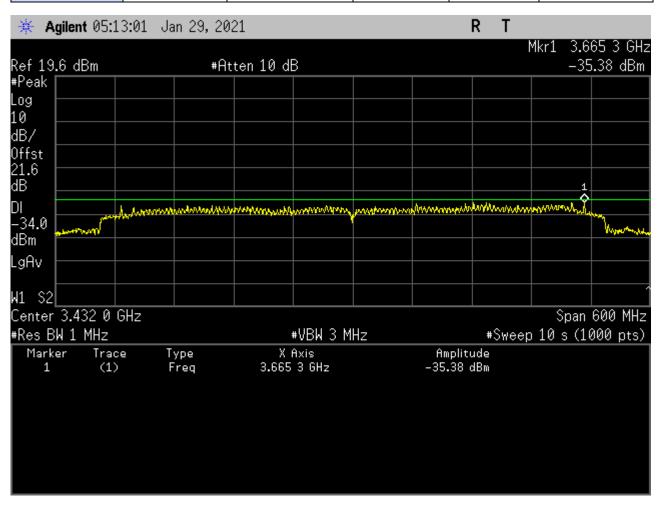
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 1	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	1.0/0.2/0.2
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequency MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
3432.00	-35.38	-34.38	-34.00	-0.38	Max



1	Traceability to Industry Recognized Test Methodologies			
	Work Instruction:	WI-01 MEASURING RF OUTPUT POWER		
	Uncertainty:	±1.33 dB		

Issue Date: 20th April 2021

**Page:** 37 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

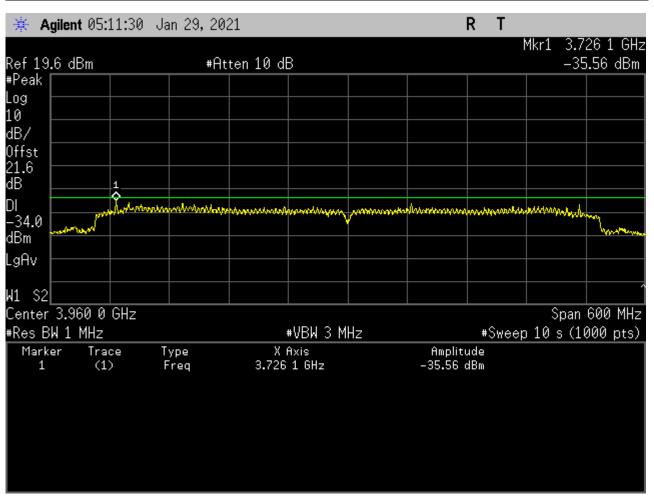
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 1	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	1.0/0.2/0.2
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequency MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
3960.00	-35.56	-34.56	-34.00	-0.56	Max



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER			
Uncertainty:	±1.33 dB			

Issue Date: 20th April 2021

**Page:** 38 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

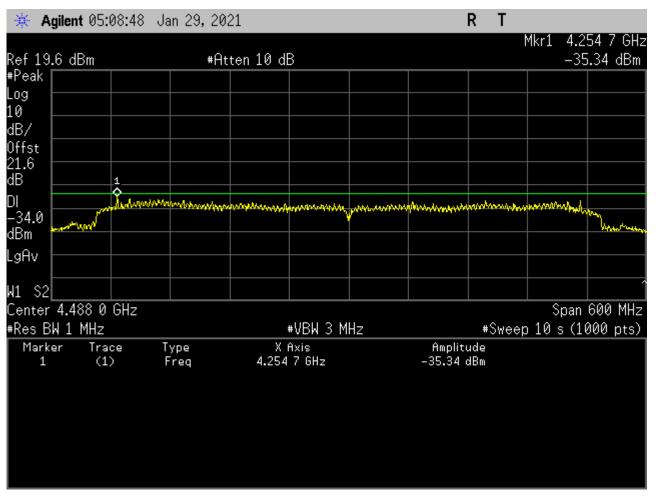
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 1	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	1.0/0.2/0.2
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequency MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
4488.00	-35.34	-34.34	-34.00	-0.34	Max



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER			
Uncertainty:	±1.33 dB			

Issue Date: 20th April 2021

**Page:** 39 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

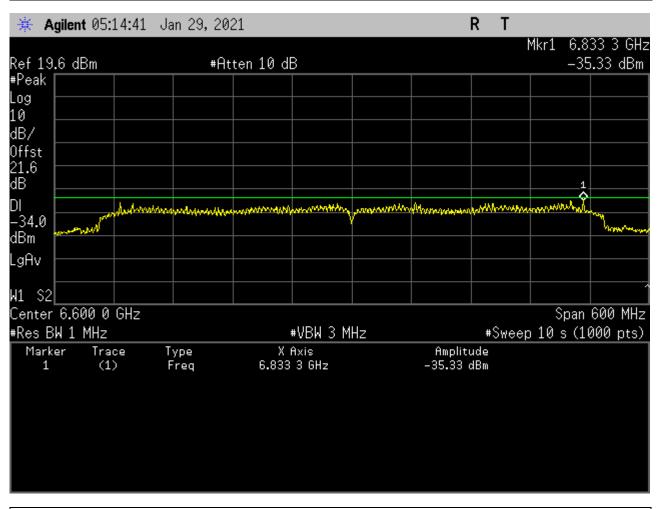
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 3	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequency MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
6600.00	-35.33	-35.13	-34.00	-1.13	Max



1	Traceability to Industry Recognized Test Methodologies			
	Work Instruction:	WI-01 MEASURING RF OUTPUT POWER		
	Uncertainty:	±1.33 dB		

Issue Date: 20th April 2021

**Page:** 40 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

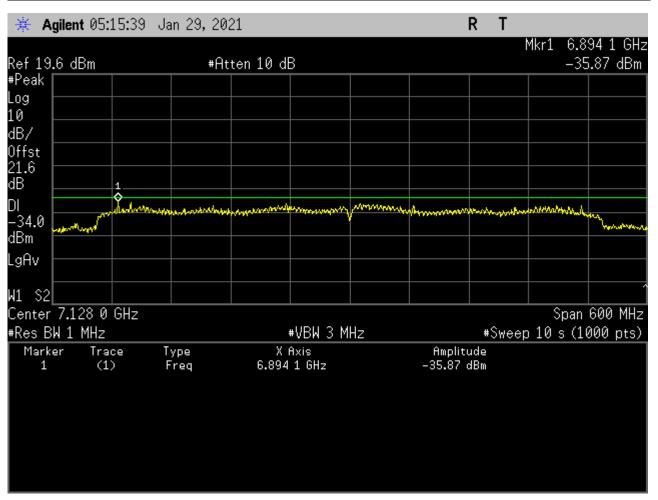
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 3	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequenc MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
7128.00	-35.87	-35.67	-34.00	-1.67	Max



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER			
Uncertainty:	±1.33 dB			

Issue Date: 20th April 2021



To: FCC CFR 47 Part 15 Subpart F 15.519

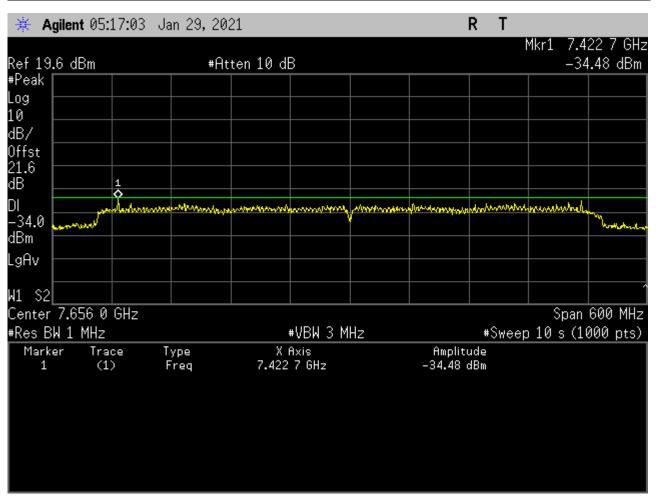
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 3	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.2/-0.2/0.1
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequency MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
7656.00	-34.48	-34.28	-34.00	-0.28	Max



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER			
Uncertainty:	±1.33 dB			

Issue Date: 20th April 2021



To: FCC CFR 47 Part 15 Subpart F 15.519

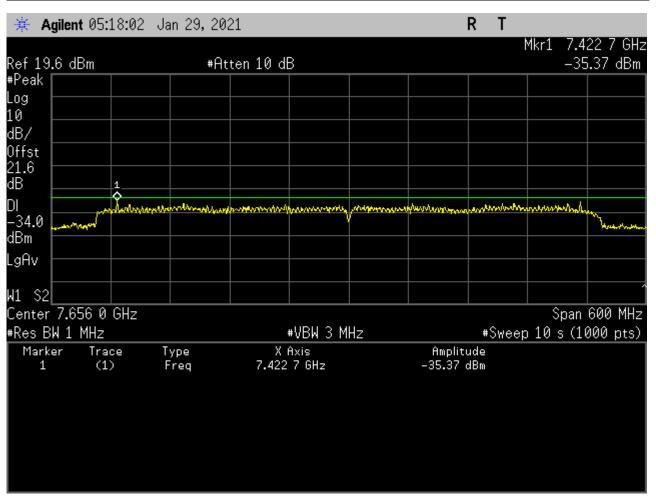
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 6	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.1/-1.8/-1.8
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequency MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
7656.00	-35.37	-35.17	-34.00	-1.17	Max



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER			
Uncertainty:	±1.33 dB			

Issue Date: 20th April 2021

**Page:** 43 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

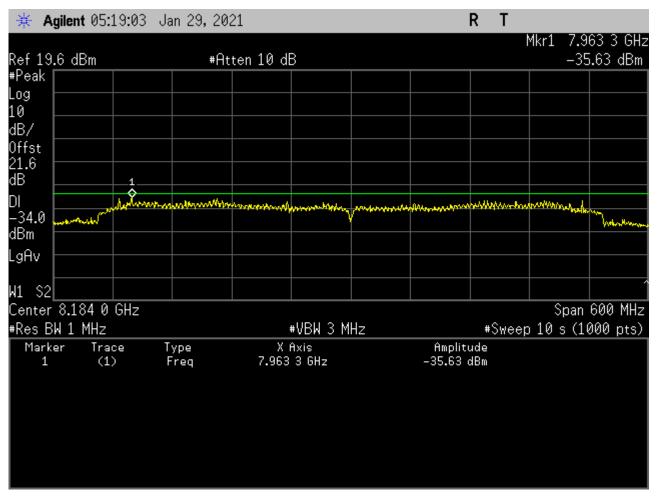
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 6	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.1/-1.8/-1.8
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test Frequer MHz	псу	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
8184.00		-35.63	-35.43	-34.00	-1.43	Max



Traceability to Industry Recognized Test Methodologies			
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER		
Uncertainty:	±1.33 dB		

Issue Date: 20th April 2021

Page: 44 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

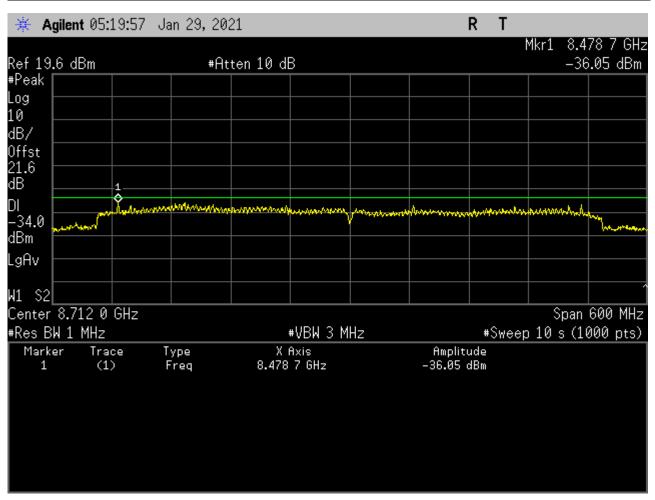
Serial #: ALER03-U2 Rev C

# **Equipment Configuration for Peak Power Density**

Variant:	Band 6	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.1/-1.8/-1.8
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

### **Test Measurement Results**

Test	Frequency MHz	Measured Peak Power Density (dBm)	Calculated EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)	EUT Power Setting
8	3712.00	-36.05	-35.85	-34.00	-1.85	Max



Traceability to Industry Recognized Test Methodologies				
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER			
Uncertainty:	±1.33 dB			

Issue Date: 20th April 2021

Page: 45 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4. Transmitter Spurious Band Emissions

Radiated Test Conditions for Radiated Spurious and Band-Edge Emissions							
	FCC CFR 47 15.519	Ambient Temp. (°C):	20.0 - 24.5				
Test Heading:	Radiated Spurious and Band-Edge Emissions	Rel. Humidity (%):	32 - 45				
Standard Section(s):	ANSI C63.10 Section 10.2 + 10.3	Pressure (mBars):	999 - 1001				
Reference Document(s):	See Normative References	ee Normative References					

## Test Procedure for Radiated Spurious and Band-Edge Emissions

Radiated emissions for restricted bands above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in max hold mode. Depending on the frequency band spanned a notch filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

Measurements on any restricted band frequency or frequencies above 1 GHz are based on the use of measurement instrumentation employing peak and average detectors. All measurements were performed using a resolution bandwidth of 1 MHz.

## Limits for Restricted Bands (15.205, 15.209)

Peak emission: 68.23 dBuV/m Average emission: 54 dBuV/m

#### **Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

#### where:

FS = Field Strength

R = Measured Spectrum analyzer Input Amplitude

AF = Antenna Factor

CORR = Correction Factor = CL - AG + NFL

CL = Cable Loss

AG = Amplifier Gain

FO = Distance Falloff Factor

NFL = Notch Filter Loss

# Measurements made at 1 meter to meet noise floor to limit requirements

Frequ	ency Range	Average Limit			
MHz	MHz	EIRP EIRP at 1 Meter (dBm) (dBuV/m)			
960	1610	-75.3	29.4		
1610	1990	-63.3	41.4		
1990	3100	-61.3	43.4		
3100	10600	-41.3	63.4		
10600	18000	-61.3	43.4		

Radiated Spurious Emissions in the GPS Bands 15.519 (d)

Issue Date: 20th April 2021

**Page:** 46 of 172



o: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

Frequenc	cy Range	Average Limit			
MHz	MHz MHz		EIRP at 1 Meters (dBuV/m)		
1164	1240	-85.3	19.47		
1559	1559 1610		19.47		

50 MHz Peak Emissions 15.519 (e)

Within 50 MHz bandwidth centered on highest radiated emissions f<sub>M</sub>, Limit is 0.0 dBm EIRP. At 1-meter distance the equivalent level is 104.77 dBuV/m

Issue Date: 20<sup>th</sup> April 2021 Page: 47 of 172



FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.1. Transmitter Spurious Emissions

# 9.4.2. Band 1

### **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 1
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	3432.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

	1000.00– 1610.00 MHz								
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1597.77	28.98	Average	Vertical	150	0	29.40	<u>-0.42</u>	Pass
2	1597.77	28.98	Average	Horizontal	150	0	29.40	<u>-0.42</u>	Pass

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz									
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
1	1920.70	29.55	Average	Vertical	150	0	41.40	<u>-11.85</u>	Pass	
2	1920.70	28.76	Average	Horizontal	150	0	41.40	<u>-12.64</u>	Pass	
Toct No	toe: ELIT nov	vorod by I	ISB or 2 2\/ Mos	ocuromont d	ictanco 1	motor				

**Test Notes:** EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz								
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	2655.11	29.32	Average	Vertical	150	0	43.40	<u>-14.08</u>	Pass
2	3100.00	30.03	Average	Horizontal	150	0	43.40	<u>-13.37</u>	Pass

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	3100-10600 MHz									
Num   1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						Pass /Fail				
1	3460.72	50.78	Average	Vertical	150	0	63.40	<u>-12.62</u>	Pass	
2	3641.08	59.72	Average	Horizontal	150	0	63.40	<u>-3.68</u>	Pass	
Test No	tes: FUT nov	vered by I	ISB or 3 3V/ Mea	surement d	istance 1	meter				

**est Notes:** EUT powered by USB or 3.3V, Measurement distance 1 meter

	10600-18000 MHz									
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail	
1	15701.40	40.22	Average	Vertical	150	0	43.4	<u>-3.18</u>	Pass	
2	15671.74	40.36	Average	Horizontal	150	0	43.4	<u>-3.04</u>	Pass	

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

Issue Date: 20<sup>th</sup> April 2021 Page: 48 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 1
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	3960.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

	1000.00- 1610.00 MHz										
Num	VIIM   VIII   VIII   POI   S   I I I I I I I I I I I I I I I I							Pass /Fail			
1	1443.74	27.23	Average	Vertical	150	0	29.4	<u>-2.17</u>	Pass		
2	2 1597.77 29.18 Average Horizontal 150 0 29.4 <u>-0.22</u> Pass										

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz										
Num	Num										
1	1920.07	29.90	Average	Vertical	150	0	41.40	<u>-11.50</u>	Pass		
2	1631.32	30.77	Average	Horizontal	150	0	41.40	<u>-10.63</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz										
Num	m   1   1   1   1   1   1   1   1   1						Pass /Fail				
1	2655.11	29.36	Average	Vertical	150	0	43.40	<u>-14.04</u>	Pass		
2	2657.33	30.52	Average	Horizontal	150	0	43.40	<u>-12.88</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	3100-10600 MHz										
Num	Frequency   Level   Measurement   Pol   Hgt   Azt   Limit   Margin   Pass   MHz   dBμV/m   Type   Pol   Cm   Deg   dBμV/m   dB   /Fail										
1	3926.65	52.94	Average	Vertical	150	0	63.40	<u>-10.46</u>	Pass		
2	2 3761.32 59.48 Average Horizontal 150 0 63.40 -3.92 Pass										

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	10600-18000 MHz										
Num	m Frequency Level Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol cm Deg dBμV/m dB /Fail										
1	1567.17	40.23	Average	Vertical	150	0	43.4	<u>-3.17</u>	Pass		
2	2 1567.17 40.11 Average Horizontal 150 0 43.4 3.20 Pass										

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 49 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 1
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	4488.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

	1000.00- 1610.00 MHz										
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail		
1	1413.18	28.72	Average	Vertical	150	0	29.4	<u>-0.68</u>	Pass		
2	1299.49	28.00	Average	Horizontal	150	0	29.4	<u>-1.40</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz										
Num	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										
1	1920.70	29.67	Average	Vertical	150	0	41.40	<u>-11.73</u>	Pass		
2	1830.84	30.67	Average	Horizontal	150	0	41.40	<u>-10.73</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz										
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail		
1	2655.11	29.15	Average	Vertical	150	0	43.40	<u>-14.25</u>	Pass		
2	1996.67	30.88	Average	Horizontal	150	0	43.40	<u>-12.52</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	3100-10600 MHz										
Num							Pass /Fail				
1	4678.15	54.41	Average	Vertical	150	0	63.40	<u>-8.99</u>	Pass		
2	4678.15	60.50	Average	Horizontal	150	0	63.40	<u>-2.90</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	10600-18000 MHz										
Num	Num   Frequency   Level   Measurement   Pol   Hgt   Azt   Limit   Margin   Pass   Pass   Hgt   MHz   Hgt   Hgt										
1	15671.74	40.30	Average	Vertical	150	0	43.4	<u>-3.10</u>	Pass		
2	2 15671.74 40.23 Average Horizontal 150 0 43.4 -3.17 Pass										

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 50 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.3. Band 2

### **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 3
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	6600.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

	1000.00– 1610.00 MHz										
Num	Im Frequency Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol Cm Deg dBμV/m dB /Fail										
1	1243.26	26.92	Average	Vertical	150	0	29.4	<u>-2.48</u>	Pass		
2	1410.74	28.20	Average	Horizontal	150	0	29.4	<u>-1.20</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz										
Num	Ium     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt cm     Azt Deg     Limit dBμV/m     Margin dB     Pass /Fail										
1	1887.95	30.17	Average	Vertical	150	0	41.40	<u>-11.23</u>	Pass		
2	1859.01	29.96	Average	Horizontal	150	0	41.40	<u>-11.44</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz											
Num	Num Frequency Level Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol cm Deg dBμV/m dB //Fail											
1	2801.92	30.17	Average	Vertical	150	0	43.40	<u>-13.23</u>	Pass			
2	2659.55	29.76	Average	Horizontal	150	0	43.40	<u>-13.64</u>	Pass			
Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter												

	3100-10600 MHz											
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt cm     Azt cm     Limit dBμV/m     Margin dBμV/m     Pass /Fail											
1	6376.55	51.20	Average	Vertical	150	0	63.40	<u>-12.20</u>	Pass			
2	2 6376.55 61.08 Average Horizontal 150 0 63.40 <u>-2.32</u> Pass											
Test No	Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter											

	10600-18000 MHz										
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Limit dBμV/m     Margin dBμV/m     Pass dBμV/m										
1	15671.74	40.55	Average	Vertical	150	0	43.4	<u>-2.85</u>	Pass		
2	15671.74	40.55	Average	Horizontal	150	0	43.4	-2.85	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 51 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 3
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	7128.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

			1000.00- 1610.00 MHz										
Num	Ium     Frequency     Level dBμV/m     Measurement Type     Pol cm     Hgt cm     Azt Deg     Limit dBμV/m     Margin dB     Pass /Fail												
1	1272.60	27.99	Average	Vertical	150	0	29.4	<u>-1.41</u>	Pass				
2	1602.66	28.00	Average	Horizontal	150	0	29.4	<u>-1.40</u>	Pass				

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz										
Num	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										
1	1920.70	31.85	Average	Vertical	150	0	41.40	<u>-9.55</u>	Pass		
2	2 1920.70 33.46 Average Horizontal 150 0 41.40 -7.94 Pass										

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz										
Num	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$								Pass /Fail		
1	2655.11	32.60	Average	Vertical	150	0	43.40	<u>-10.80</u>	Pass		
2	1996.67	31.81	Average	Horizontal	150	0	43.40	<u>-11.59</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	3100-10600 MHz										
Num	Frequency   Level   Measurement   Pol   Hgt   Azt   Limit   Margin   Pass   Hgt   Azt   Limit   Margin   Pass   Hgt   Azt   Limit   Margin   Pass   Hgt   Hgt										
1	6917.63	51.01	Average	Vertical	150	0	63.40	<u>-12.39</u>	Pass		
2	2 7338.47 60.36 Average Horizontal 150 0 63.40 -3.04 Pass										

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	10600-18000 MHz										
Num	Frequency Level Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol cm Deg dBμV/m dB //Fail										
1	15671.74	40.55	Average	Vertical	150	0	43.4	<u>-2.85</u>	Pass		
2											

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 52 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.4. Band 3 & 6

### **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 3/6
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	7656.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

				1000	0.00- 1610	.00 MHz			
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail
1	1270.16	27.03	Average	Vertical	150	0	29.4	<u>-2.37</u>	Pass
2	1594.10	28.57	Average	Horizontal	150	0	29.4	<u>-0.83</u>	Pass

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz										
Niim   Ni							Pass /Fail				
1	1920.70	31.77	Average	Vertical	150	0	41.40	<u>-9.63</u>	Pass		
2	1920.70	34.68	Average	Horizontal	150	0	41.40	<u>-6.72</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz											
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail			
1	2655.11	29.19	Average	Vertical	150	0	43.40	<u>-14.21</u>	Pass			
2	1996.67	30.05	Average	Horizontal	150	0	43.40	<u>-13.35</u>	Pass			
Test No	Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter											

	3100-10600 MHz										
Num	um Frequency Level Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol cm Deg dBμV/m dB //Fail										
1	7819.43	52.36	Average	Vertical	150	0	63.40	<u>-11.04</u>	Pass		
2	7864.52	60.79	Average	Horizontal	150	0	63.40	<u>-2.61</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	10600-18000 MHz										
Num	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										
1	15671.74	40.55	Average	Vertical	150	0	43.4	<u>-2.85</u>	Pass		
2	2 15671.74 40.55 Average Horizontal 150 0 43.4 <u>-2.85</u> Pass										
Test No	Test Notes: EUT powered by USB or 3.3V. Measurement distance 1 meter										

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 53 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.5. Band 6

### **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 6
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	8184.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

	1000.00- 1610.00 MHz										
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail		
1	1270.01	27.84	Average	Vertical	150	0	29.4	<u>-1.56</u>	Pass		
2	1597.77	28.17	Average	Horizontal	150	0	29.4	<u>-1.23</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz											
Nim   Nim							Pass /Fail					
1	1920.70	30.79	Average	Vertical	150	0	41.40	<u>-10.61</u>	Pass			
2	1920.70	34.08	Average	Horizontal	150	0	41.40	<u>-7.32</u>	Pass			

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz											
Num	Frequency MHz	Level dBµV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBµV/m	Margin dB	Pass /Fail			
1	3017.69	28.78	Average	Vertical	150	0	43.40	<u>-14.62</u>	Pass			
2	2 2659.55 29.84 Average Horizontal 150 0 43.40 <u>-13.56</u> Pass											
Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter												

	3100-10600 MHz										
Num	Num Frequency Level Measurement Pol Hgt Azt Limit Margin MHz dBμV/m Type Pol cm Deg dBμV/m dB						Pass /Fail				
1	8029.85	50.88	Average	Vertical	150	0	63.40	<u>-12.52</u>	Pass		
2	7969.73	61.75	Average	Horizontal	150	0	63.40	<u>-1.65</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	10600-18000 MHz										
Num	Num Frequency Level Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol cm Deg dBμV/m dB //Fail										
1	15671.74	40.48	Average	Vertical	150	0	43.4	<u>-2.92</u>	Pass		
2	2 15671.74 40.48 Average Horizontal 150 0 43.4 <u>-2.92</u> Pass										
Test No	Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter										

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 54 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## **Equipment Configuration for Spurious Emissions**

Antenna:	Chip	Variant:	Band Group 6
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	8712.00	Data Rate:	200Mbp/s
Power Setting:	Max	Tested By:	JMH

# **Test Measurement Results**

	1000.00– 1610.00 MHz										
Num	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$										
1	1271.38	26.68	Average	Vertical	150	0	29.4	<u>-2.72</u>	Pass		
2	2 1594.10 28.70 Average Horizontal 150 0 29.4 <u>-0.70</u> Pass										

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1610-1990 MHz										
Num	Num Frequency Level Measurement Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol cm Deg dBμV/m dB //Fail										
1	1920.70	30.05	Average	Vertical	150	0	41.40	<u>-11.35</u>	Pass		
2	1920.70	35.82	Average	Horizontal	150	0	41.40	<u>-5.58</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	1990-3100 MHz										
Num	Num     Frequency     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Limit dBμV/m     Margin dBμV/m     Pass dBμV/m										
1	2655.11	29.36	Average	Vertical	150	0	43.40	<u>-14.04</u>	Pass		
2	2657.33	30.19	Average	Horizontal	150	0	43.40	<u>-13.21</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	3100-10600 MHz										
Num	Num Frequency Level Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type cm Deg dBμV/m dB //Fail										
1	8570.94	51.56	Average	Vertical	150	0	63.40	<u>-11.84</u>	Pass		
2	8915.53	60.15	Average	Horizontal	150	0	63.40	<u>-3.25</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

	10600-18000 MHz										
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Deg     Limit dBμV/m     Margin dB     Pass /Fail										
1	15671.74	40.48	Average	Vertical	150	0	43.4	<u>-2.92</u>	Pass		
2	15671.74	40.42	Average	Horizontal	150	0	43.4	<u>-2.98</u>	Pass		

Test Notes: EUT powered by USB or 3.3V, Measurement distance 1 meter

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 55 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.6. GPS Band Emissions

9.4.6.0.1. 3432 MHz

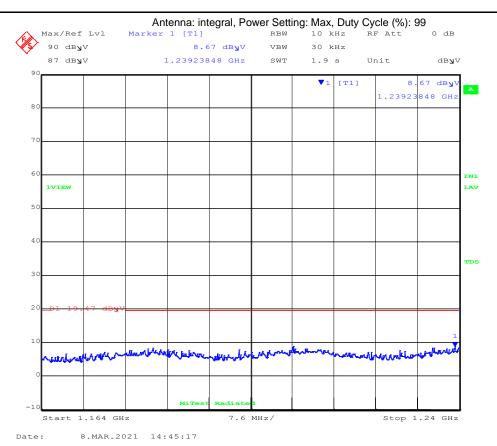
### Equipment Configuration for Spurious Emissions 1.164 – 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	3432.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

# **Test Measurement Results**

# **MiTest**

### RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



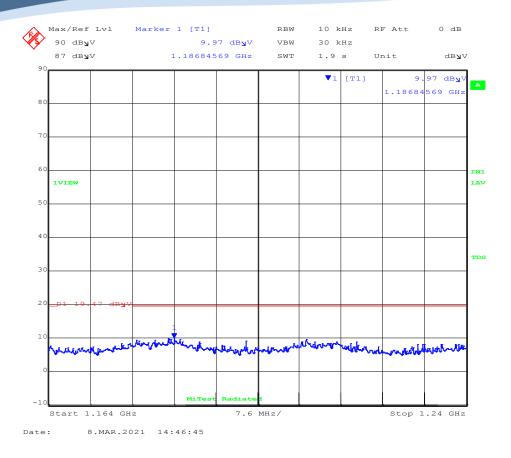
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 56 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

	1164.00 – 1240.00 MHz											
Num	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$											
1	1239.23	8.67	Average	Vertical	150	0	19.47	-10.8	Pass			
2	2 1186.84 9.97 Average Horizontal 150 0 19.47 -9.5 Pass											
Test No	tes FUT nov	vered by L	ISB or 3.3V Mea	asurement d	istance 1 i	meter						

Issue Date: 20<sup>th</sup> April 2021

Page:

57 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

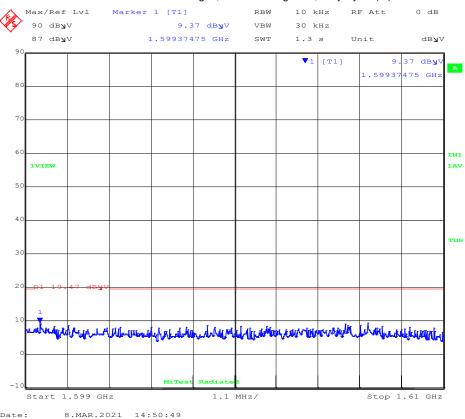
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	3432.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

### **Test Measurement Results**



### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





Antenna Polarity: Vertical

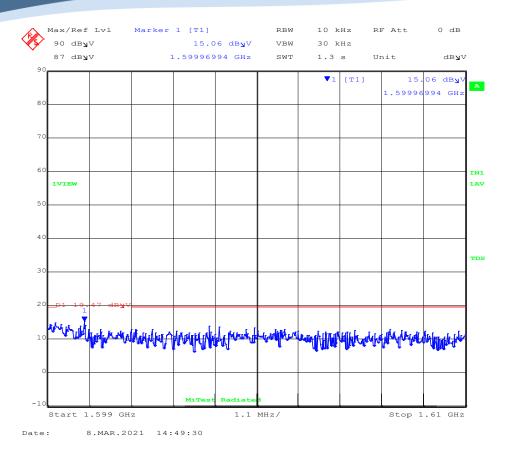
Issue Date: 20<sup>th</sup> April 2021 Page:

58 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

	1559 - 1610 MHz											
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Deg     Limit dBμV/m     Margin dBμV/m     Pass /Fail											
1	1599.37	9.37	Average	Vertical	150	0	19.47	-10.1	Pass			
2	2 1599.96 15.06 Average Horizontal 150 0 19.47 -4.41 Pass											
Test No	tes: EUT pov	vered by L	JSB or 3.3V, Mea	asurement d	listance 1 i	meter						

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 59 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.6.0.2. 3960 MHz

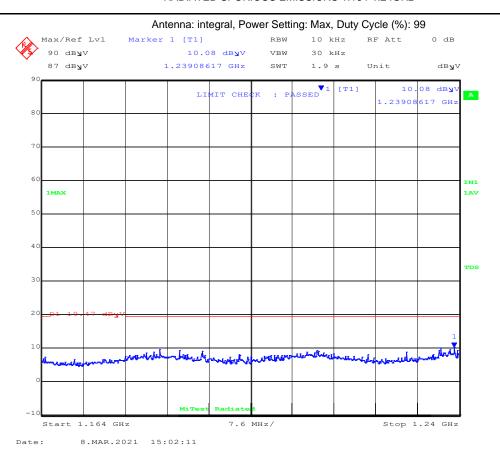
#### Equipment Configuration for Spurious Emissions 1.164 - 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	3960.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

# **Test Measurement Results**

# MiTest.

# RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



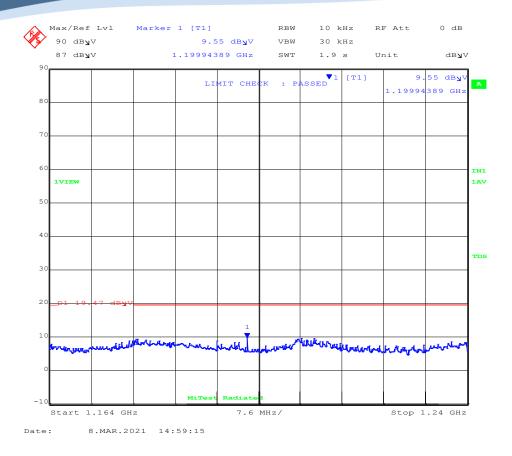
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 60 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



# Antenna Polarity: Horizontal

	1164.00 – 1240.00 MHz											
Num	Num											
1	1239.08	10.08	Average	Vertical	150	0	19.47	-9.39	Pass			
2	2 1199.94 9.55 Average Horizontal 150 0 19.47 -9.92 Pass											
Test No	tes: FUT pov	vered by l	JSB or 3.3V. Mea	asurement d	istance 1	meter						

Issue Date: 20<sup>th</sup> April 2021

Page:

61 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

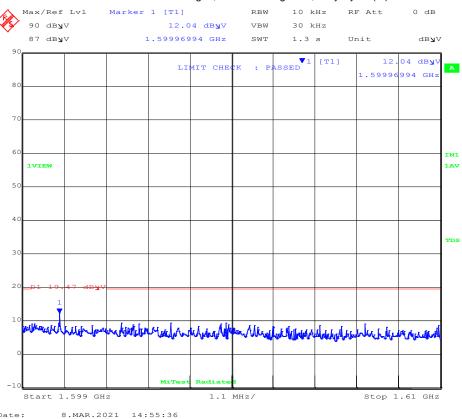
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	3960.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

### **Test Measurement Results**



### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





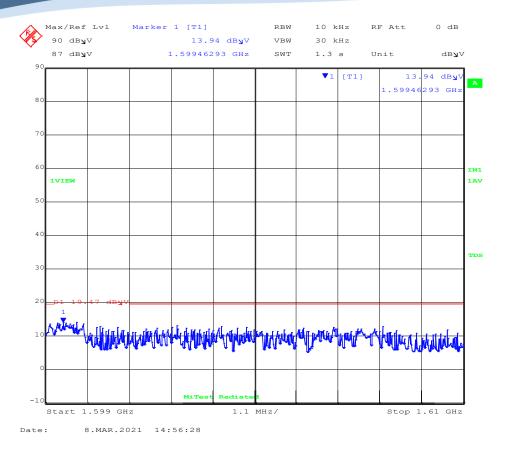
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 62 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

	1559 - 1610 MHz									
Num	Num         Frequency         Level dBμV/m         Measurement Type         Pol cm         Hgt Deg         Azt Limit dBμV/m         Margin dBμV/m         Pass Pail									
1	1599.96	12.04	Average	Vertical	150	0	19.47	-7.43	Pass	
2	1599.46	13.94	Average	Horizontal	150	0	19.47	-5.53	Pass	
Test No	tes: EUT pov	vered by L	JSB or 3.3V. Mea	asurement d	istance 1	meter				

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 63 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.6.0.3. 4488 MHz

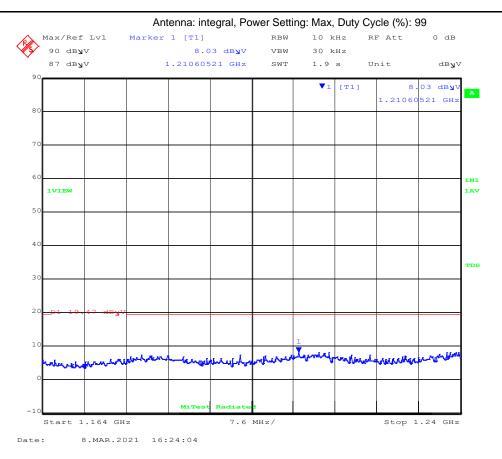
## Equipment Configuration for Spurious Emissions 1.164 – 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	4488.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

# **Test Measurement Results**

# **MiTest**

# RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



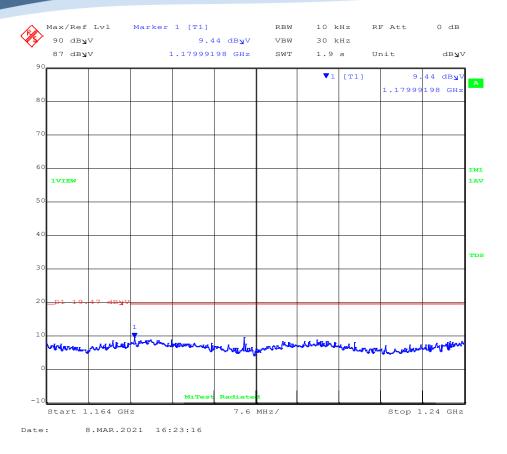
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 64 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



# Antenna Polarity: Horizontal

	1164.00 – 1240.00 MHz									
Num	Num         Frequency         Level dBμV/m         Measurement Type         Pol cm         Hgt Deg         Azt Limit dBμV/m         Margin dBμV/m         Pass Pail									
1	1210.60	8.03	Average	Vertical	150	0	19.47	-11.44	Pass	
2	1179.99	9.44	Average	Horizontal	150	0	19.47	-10.03	Pass	
Test No	tes: FUT pov	vered by l	ISB or 3.3V. Mea	asurement d	istance 1 i	meter				

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 65 of 172



**FCC CFR 47 Part 15 Subpart F 15.519** 

Serial #: ALER03-U2 Rev C

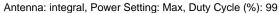
# Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

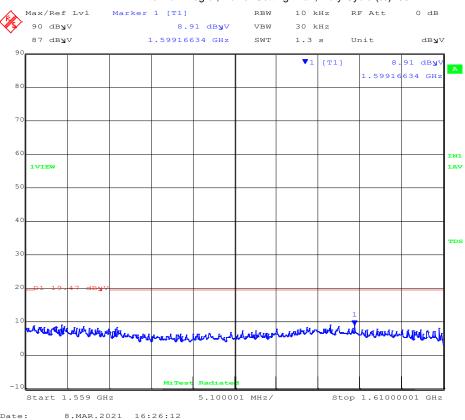
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	1.0/0.2/0.2	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	4488.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

### **Test Measurement Results**



### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





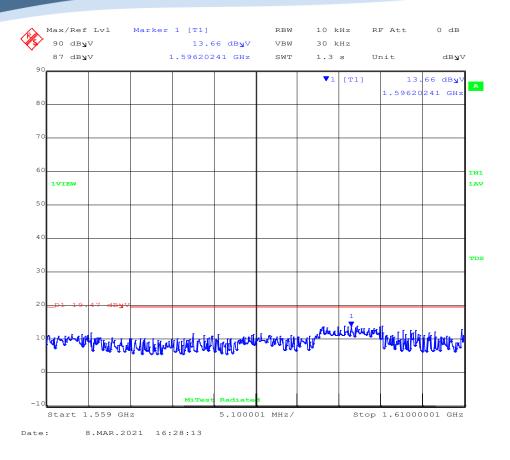
Antenna Polarity: Vertical

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 66 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



# Antenna Polarity: Horizontal

	1559 - 1610 MHz									
Num	Num         Frequency         Level dBμV/m         Measurement Type         Pol cm         Hgt Deg         Azt Limit dBμV/m         Margin dBμV/m         Pass Pass Pail									
1	1599.16	8.91	Average	Vertical	150	0	19.47	-10.56	Pass	
2	1596.20	13.66	Average	Horizontal	150	0	19.47	-5.81	Pass	
Test No	tes: FUT nov	vered by I	ISB or 3.3V Mea	asurement d	istance 1	meter				

Issue Date: 20th April 2021

**Page:** 67 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.6.0.4. 6600 MHz

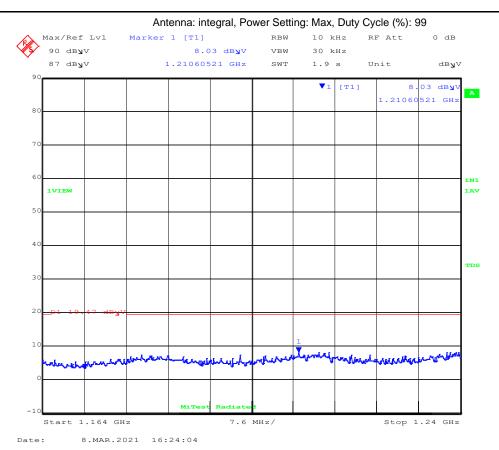
## Equipment Configuration for Spurious Emissions 1.164 – 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.2/-0.2/0.1	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	6600.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

# **Test Measurement Results**

# MiTest

# RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



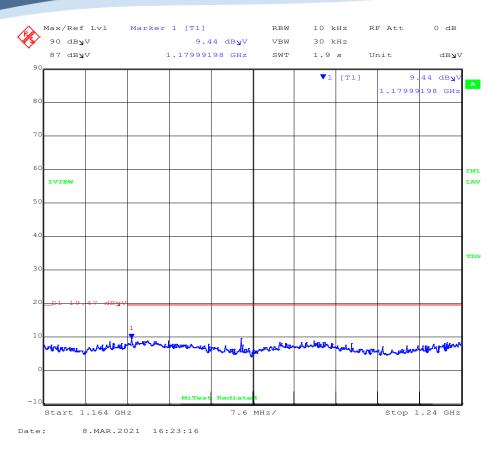
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 68 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



# Antenna Polarity: Horizontal

	1164.00 – 1240.00 MHz									
Num	Num         Frequency         Level dBμV/m         Measurement Type         Pol cm         Hgt Deg         Azt Limit dBμV/m         Margin dB Margin									
1	1210.60	8.03	Average	Vertical	150	0	19.47	-11.44	Pass	
2 1179.99 9.44 Average Horizontal 150 0 19.47 -10.03 Pass										
Test No	otes: EUT pov	vered by L	ISB or 3.3V. Mea	asurement d	istance 1 i	meter				

Issue Date: 20<sup>th</sup> April 2021 Page:

69 of 172



o: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

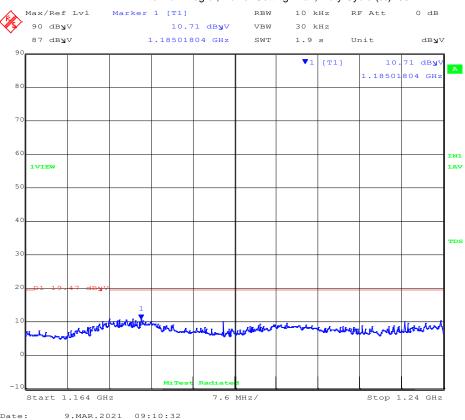
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.2/-0.2/0.1	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	6600.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

### **Test Measurement Results**



### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





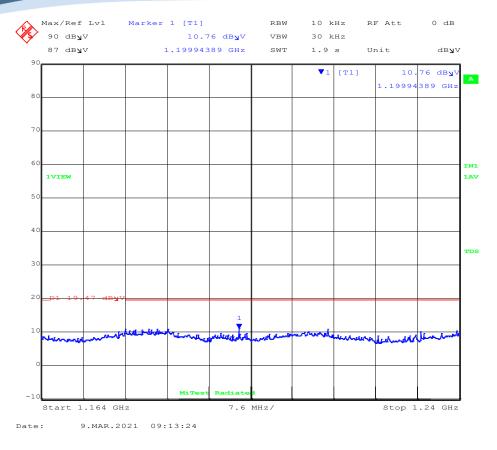
Antenna Polarity: Vertical

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 70 of 172



FCC CFR 47 Part 15 Subpart F 15.519 To:

ALER03-U2 Rev C Serial #:



# Antenna Polarity: Horizontal

	1559 - 1610 MHz									
Num	Num     Frequency     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Limit dBμV/m     Margin dBμV/m     Pass dBμV/m									
1	1185.01	10.71	Average	Vertical	150	0	19.47	-8.76	Pass	
2	1199.94	10.76	Average	Horizontal	150	0	19.47	-8.71	Pass	
Test No	tes: FUT pov	vered by l	ISB or 3.3V. Mea	asurement d	istance 1 i	meter				

20th April 2021 Issue Date:

Page: 71 of 172 This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report. MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4.6.0.5. 7128 MHz

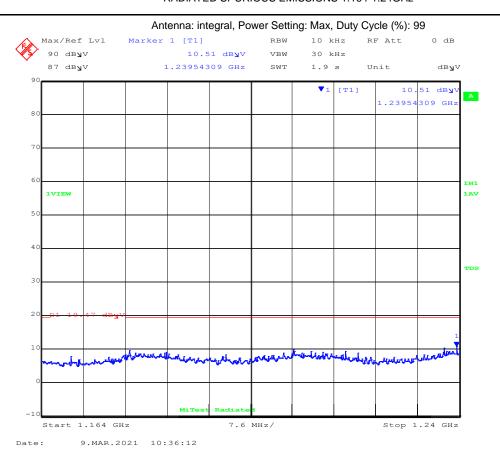
#### Equipment Configuration for Spurious Emissions 1.164 – 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.2/-0.2/0.1	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	7128.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

# **Test Measurement Results**

# MiTest.

# RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



Antenna Polarity: Vertical

Issue Date: 20<sup>th</sup> April 2021

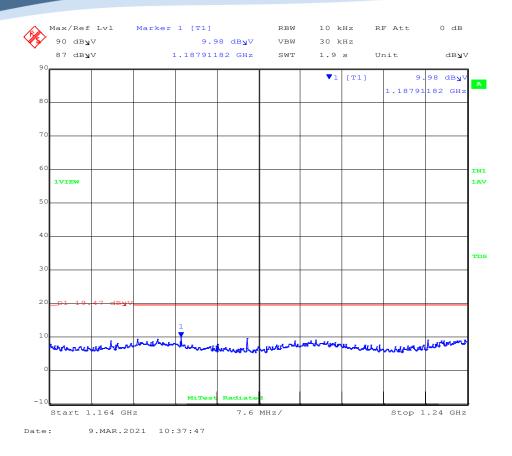
Page:

72 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



# Antenna Polarity: Horizontal

	1164.00 – 1240.00 MHz									
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Limit dBμV/m     Margin Margin dBμV/m     Pass dBμV/m									
1	1239.54	10.51	Average	Vertical	150	0	19.47	-8.96	Pass	
2	1187.11	9.98	Average	Horizontal	150	0	19.47	-9.49	Pass	
Test No	tes: FUT nov	vered by l	ISB or 3.3V. Mea	asurement d	istance 1 i	meter				

Issue Date: 20<sup>th</sup> April 2021

Page:

73 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

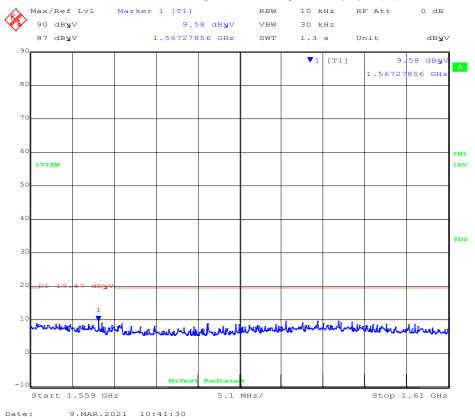
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.2/-0.2/0.1	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	7128.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

#### **Test Measurement Results**



#### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





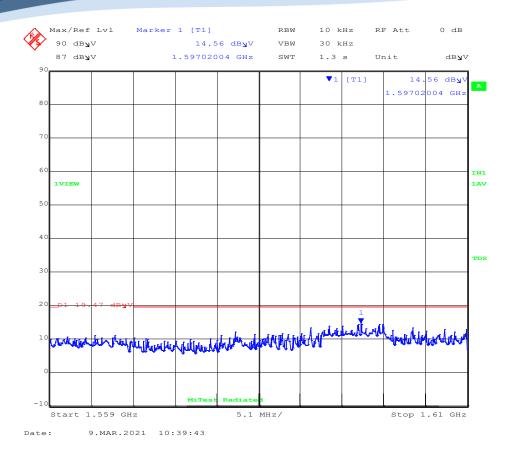
Antenna Polarity: Vertical

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 74 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

	1559 - 1610 MHz									
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Limit dBμV/m     Margin Margin dBμV/m     Pass dBμV/m									
1	1567.27	9.58	Average	Vertical	150	0	19.47	-9.89	Pass	
2	1597.02	14.56	Average	Horizontal	150	0	19.47	-4.91	Pass	
Test No	tes: FUT nov	vered by L	ISB or 3.3V Mea	asurement d	istance 1	meter				

Issue Date: 20<sup>th</sup> April 2021

**Page:** 75 of 172



FCC CFR 47 Part 15 Subpart F 15.519 To: Serial #:

ALER03-U2 Rev C

# 9.4.6.0.6. 7656 MHz (Covers Band Group 3 TFC 7 and Band Group 6 TFC 5

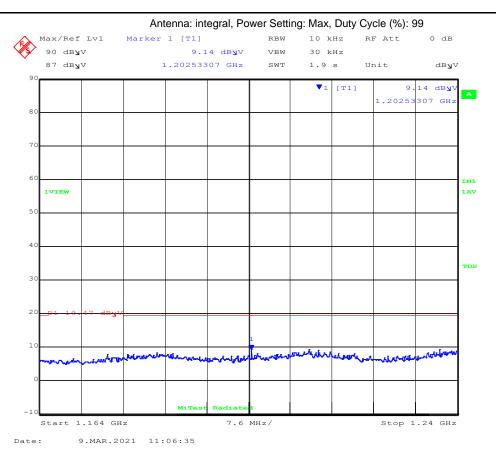
#### Equipment Configuration for Spurious Emissions 1.164 - 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.2/-0.2/0.1	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	7656.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

#### **Test Measurement Results**

# MiTest

#### RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



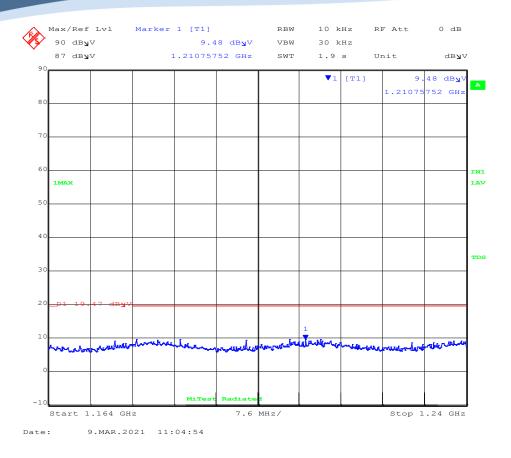
Antenna Polarity: Vertical

Issue Date: 20th April 2021 Page: 76 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

	1164.00 – 1240.00 MHz									
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Limit dBμV/m     Margin dB Margin									
1	1202.53	9.14	Average	Vertical	150	0	19.47	-10.33	Pass	
2	1210.75	9.48	Average	Horizontal	150	0	19.47	-9.99	Pass	
Test No	tes: FUT nov	vered by L	ISB or 3.3V Mea	asurement d	istance 1	meter				

Issue Date: 20<sup>th</sup> April 2021

**Page:** 77 of 172



FCC CFR 47 Part 15 Subpart F 15.519 Serial #:

ALER03-U2 Rev C

### Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

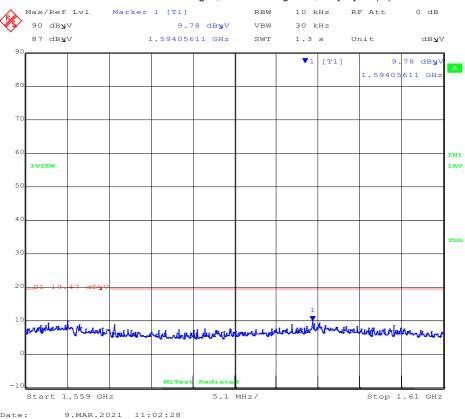
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.2/-0.2/0.1	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	7656.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

#### **Test Measurement Results**



#### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





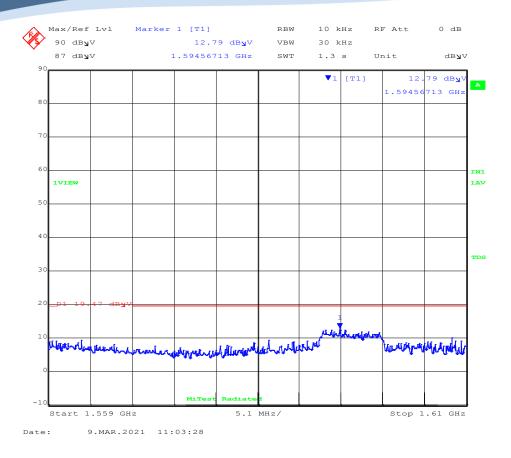
Antenna Polarity: Vertical

20th April 2021 Issue Date: Page: 78 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

	1559 - 1610 MHz									
Num	Num     Frequency MHz     Level Level dBμV/m     Measurement Type     Pol cm     Hgt Deg Deg     Azt Limit dBμV/m     Margin Margin Margin dB Margin dB Margin Margin dB Margin									
1	1594.05	9.78	Average	Vertical	150	0	19.47	-9.69	Pass	
2	1594.56	12.79	Average	Horizontal	150	0	19.47	-6.68	Pass	
Test No	tes: FUT nov	vered by L	ISB or 3.3V Mea	asurement d	istance 1 i	meter				

Issue Date: 20<sup>th</sup> April 2021

**Page:** 79 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### 9.4.6.0.7. 8184 MHz

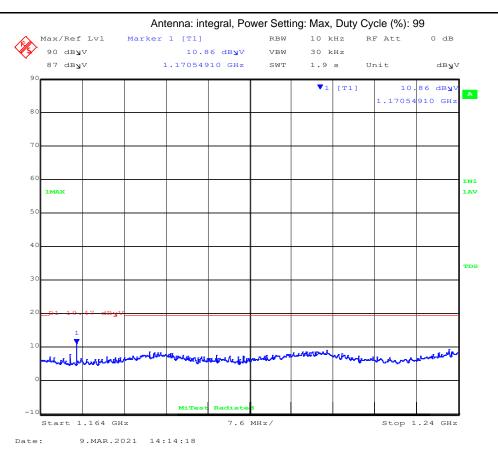
#### Equipment Configuration for Spurious Emissions 1.164 - 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.1/-1.8/-1.8	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	8184.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

#### **Test Measurement Results**

# MiTest.

#### RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



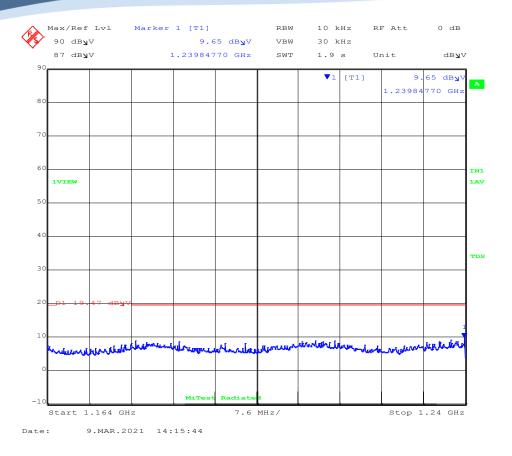
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 80 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

	1164.00 – 1240.00 MHz									
Num	Num     Frequency MHz     Level dBμV/m     Measurement Type     Pol cm     Hgt Deg     Azt Limit dBμV/m     Margin dB Margin									
1	1170.54	10.86	Average	Vertical	150	0	19.47	-8.61	Pass	
2	1239.84	9.65	Average	Horizontal	150	0	19.47	-9.82	Pass	
Test No	tes: FUT nov	vered by L	ISB or 3.3V Mea	asurement d	istance 1	meter				

Issue Date: 20<sup>th</sup> April 2021

**Page:** 81 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

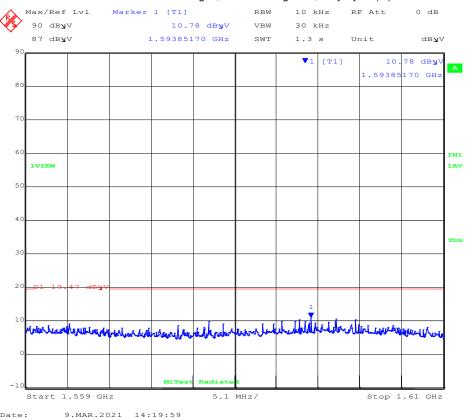
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.1/-1.8/-1.8	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	8184.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

#### **Test Measurement Results**



#### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





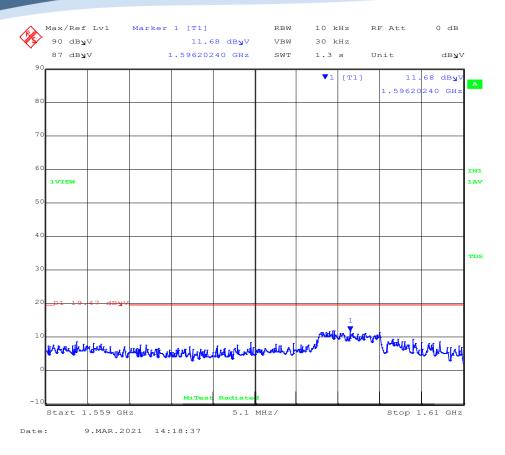
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 82 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



# Antenna Polarity: Horizontal

	1559 - 1610 MHz									
Num	Num     Frequency MHz     Level Level Level Bull Measurement Bull Measurement Deg     Hgt Azt Deg     Limit Margin Bull Measurement Bull Measurement Bull Measurement Combon Deg     Pass Bull Measurement Bull Measurement Combon Deg									
1	1593.85	10.78	Average	Vertical	150	0	19.47	-8.69	Pass	
2	1596.20	11.68	Average	Horizontal	150	0	19.47	-7.79	Pass	
Test No	tes: EUT pov	vered by L	JSB or 3.3V. Mea	asurement d	istance 1	meter				

Issue Date: 20<sup>th</sup> April 2021 Page:

83 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### 9.4.6.0.8. 8712 MHz

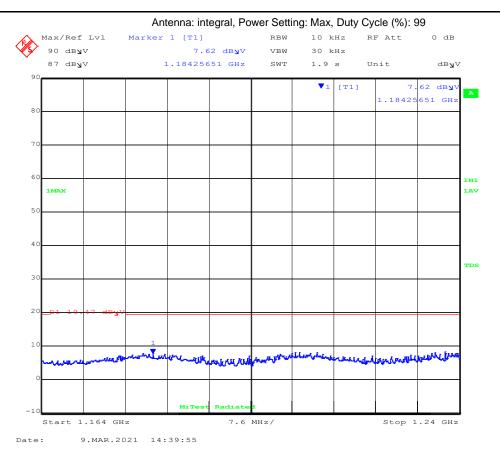
#### Equipment Configuration for Spurious Emissions 1.164 – 1.24 GHz

Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.1/-1.8/-1.8	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	8712.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

#### **Test Measurement Results**

# MiTest.

#### RADIATED SPURIOUS EMISSIONS 1.164-1.24GHz



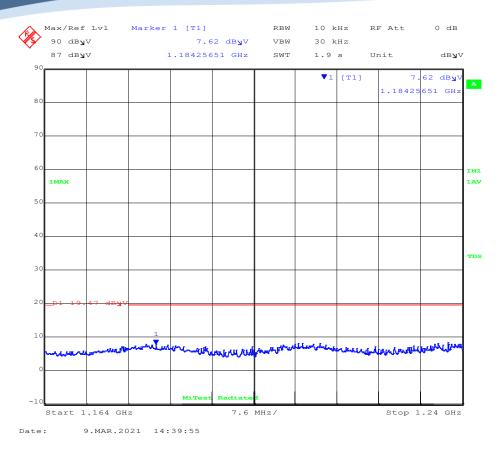
Antenna Polarity: Vertical

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 84 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

1164.00 – 1240.00 MHz									
Num	Num         Frequency         Level dBμV/m         Measurement Type         Pol cm         Hgt cm         Azt Limit Deg         Margin dB μV/m         Pass Pass Pass Pass Pass Pass Pass Pass								
1	1184.25	7.62	Average	Vertical	150	0	19.47	-11.85	Pass
2	1184.25	7.62	Average	Horizontal	150	0	19.47	-11.85	Pass
Test Notes: EUT powered by USB or 3.3V. Measurement distance 1 meter									

Issue Date: 20<sup>th</sup> April 2021 Page:

85 of 172



FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### Equipment Configuration for Spurious Emissions 1.559 - 1.610 GHz

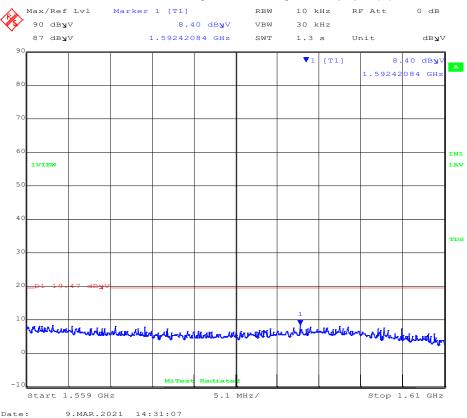
Antenna:	Chip	Variant:	500 MHz Bandwidth
Antenna Gain (dBi):	0.1/-1.8/-1.8	Modulation:	BPM/BPSK
Beam Forming Gain (Y):	Not Applicable	Duty Cycle (%):	99%
Channel Frequency (MHz):	8712.00	Data Rate:	
Power Setting:	Max	Tested By:	SB

#### **Test Measurement Results**



#### RADIATED SPURIOUS EMISSIONS 1.559-1.610GHz





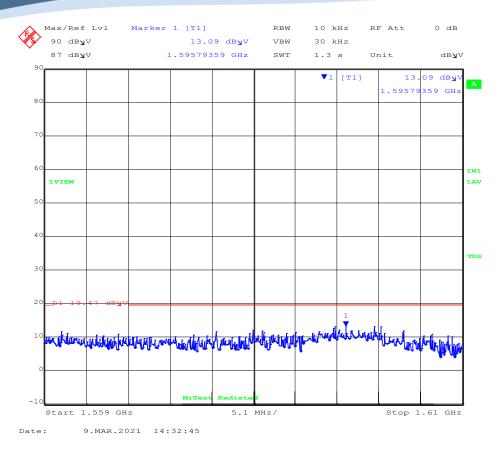
Antenna Polarity: Vertical

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 86 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Antenna Polarity: Horizontal

1559 - 1610 MHz									
Num	Num Frequency Level Measurement Pol Hgt Azt Limit Margin Pass MHz dBμV/m Type Pol cm Deg dBμV/m dB /Fail								
1	1592.42	8.40	Average	Vertical	150	0	19.47	-11.07	Pass
2	1595.79	13.09	Average	Horizontal	150	0	19.47	-6.38	Pass
Test Notes: FUT powered by USB or 3.3V. Measurement distance 1 meter									

Issue Date: 20<sup>th</sup> April 2021

Page:

87 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# 9.4. Shutoff Timing Requirements

Radiated Test Conditions for Shutoff Timing Requirements						
Standard:         FCC CFR 47:15.519 (a)(1)         Ambient Temp. (°C):         24.0 - 27.5						
Test Heading:	Shutoff Timing Requirements	Rel. Humidity (%):	32 - 45			
Standard Section(s):	ANSI C63.10 Section 10.3.6 Pressure (mBars):		999 - 1001			
Reference Document(s):	None					

#### **Test Procedure for UWB Transmission**

Testing was performed under ambient conditions at nominal voltage.

Test configuration and setup used for the measurement was per the Radiated Test Set-up section specified in this document.

#### **Operating Frequency Band:**

3100-10600 MHz

#### Limits

The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received.

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 88 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

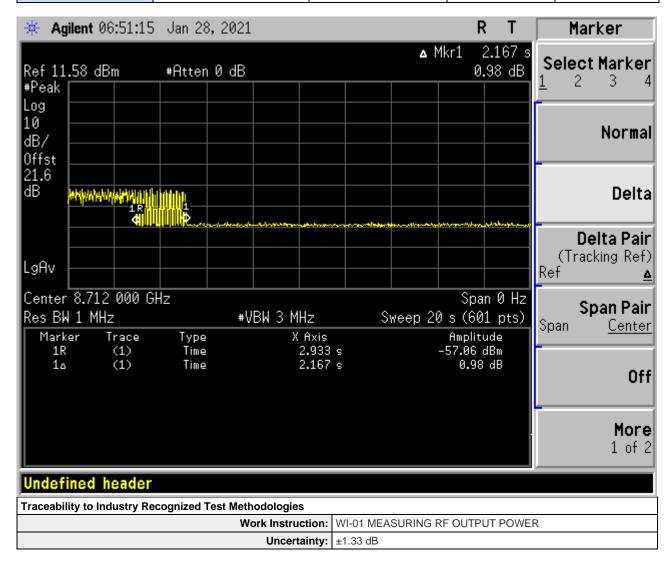
Serial #: ALER03-U2 Rev C

#### **Equipment Configuration for Shutdown Timing Requirements**

Variant:	Band 6	Duty Cycle (%):	99
Data Rate:	200Mbp/s	Antenna Gain (dBi):	0.1/-1.8/-1.8
Modulation:	BPM/BPSK	Beam Forming Gain (Y)(dB):	Not Applicable
TPC:	Not Applicable	Tested By:	SB
Engineering Test Notes:			

#### **Test Measurement Results**

Frequency	Shutdown Time	Limit	Margin	EUT Power Setting
(MHz)	(s)	(s)	(s)	Numeric
8712.00	2.167	10	-7.83	Max



Issue Date: 20<sup>th</sup> April 2021

Page:

89 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# A. APPENDIX - GRAPHICAL IMAGES

Issue Date: 20th April 2021 Page: 90 of 172



FCC CFR 47 Part 15 Subpart F 15.519 To:

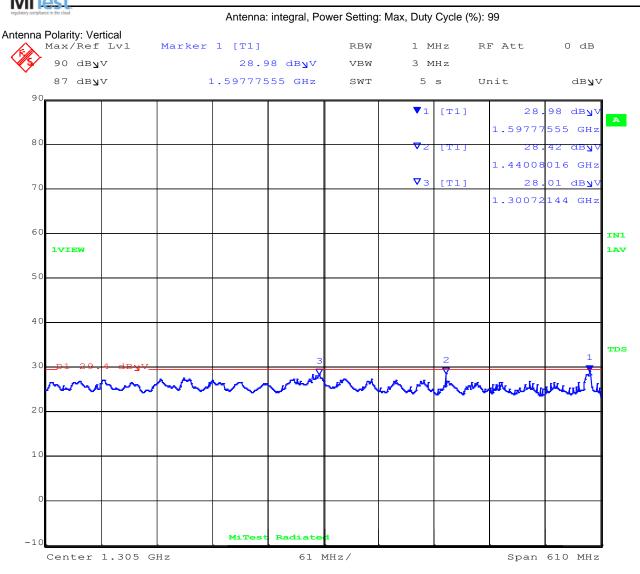
ALER03-U2 Rev C Serial #:

# A.1 Transmitter Spurious Emissions

## A.1.1 Band 1



### RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz



8.MAR.2021 14:12:42 Date:

## **Back to Matrix**

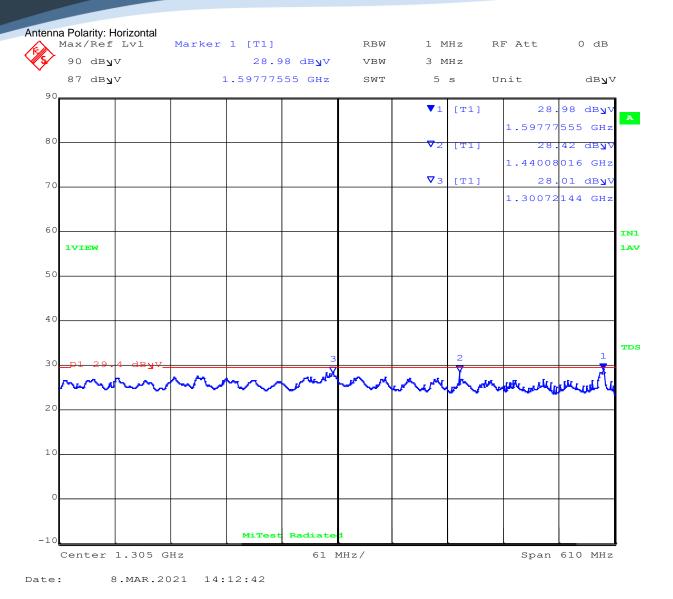
Issue Date:

20th April 2021 Page: 91 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 92 of 172



MiTes

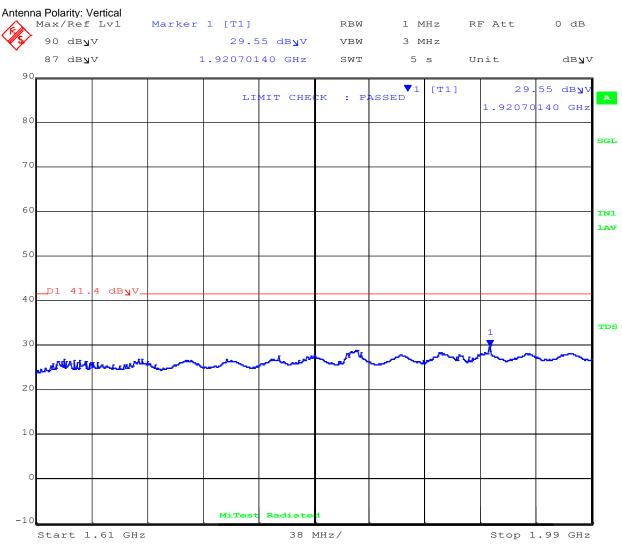
itle: Alereon Inc. AL5350B Based UWB Modules

To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 8.MAR.2021 14:15:54

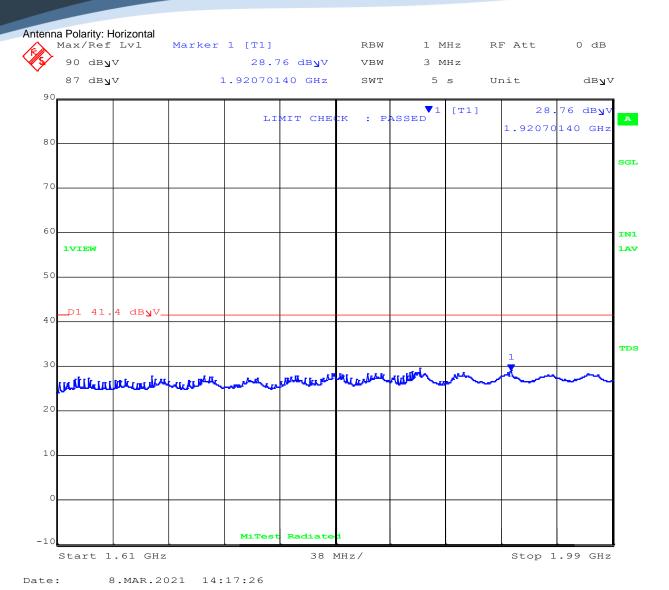
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 93 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 94 of 172



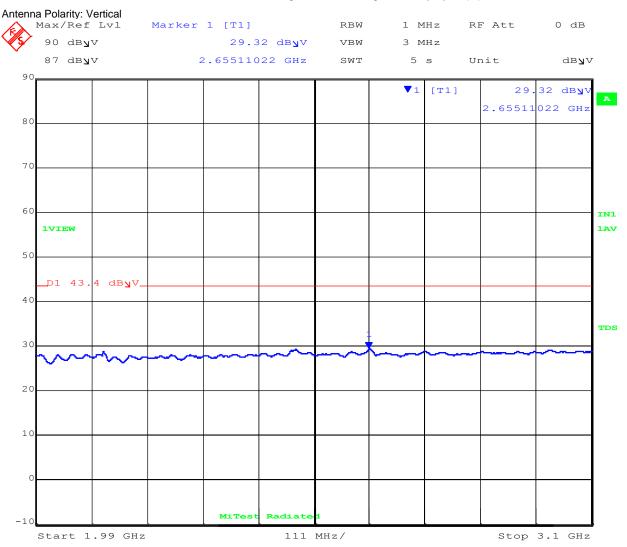
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# MiTest.

#### RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

#### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 8.MAR.2021 14:26:50

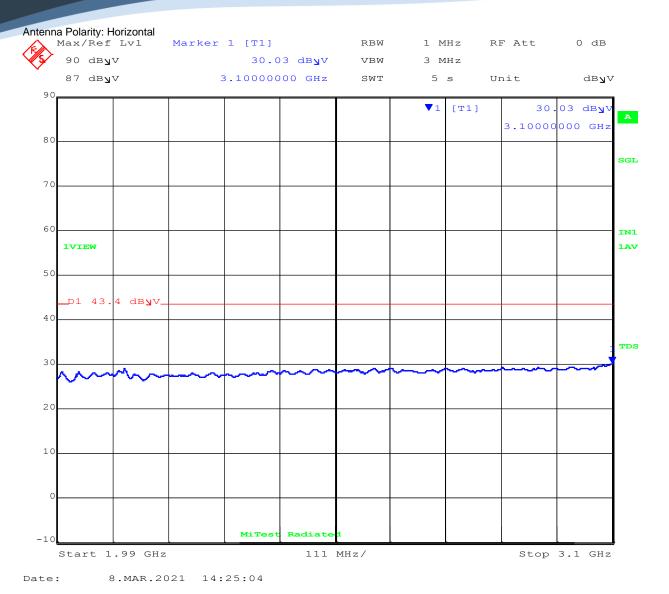
# **Back to Matrix**

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 95 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

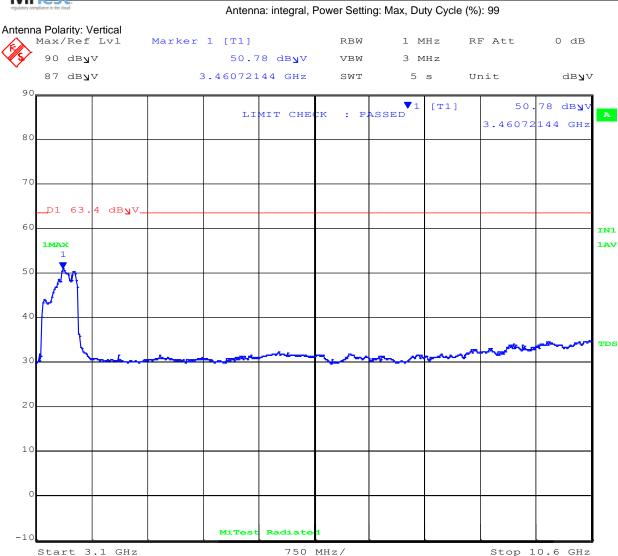
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 96 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz



Date: 8.MAR.2021 14:32:40

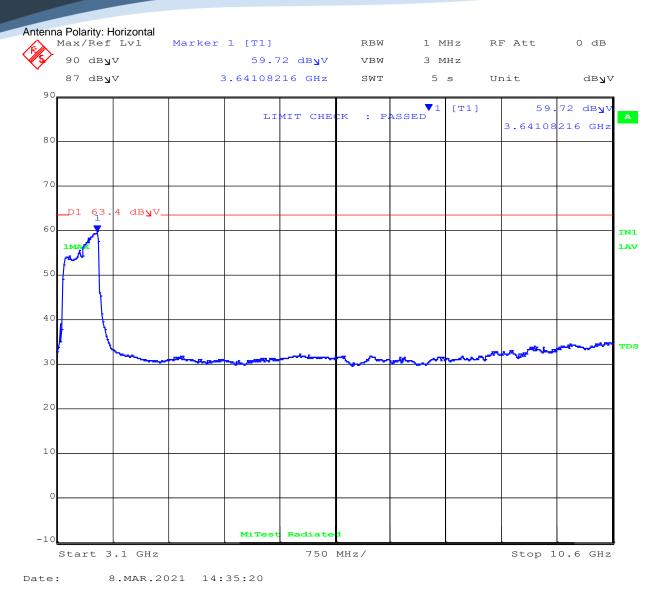
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 97 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 98 of 172



Antenna Polarity: Vertical

Title: Alereon Inc. AL5350B Based UWB Modules

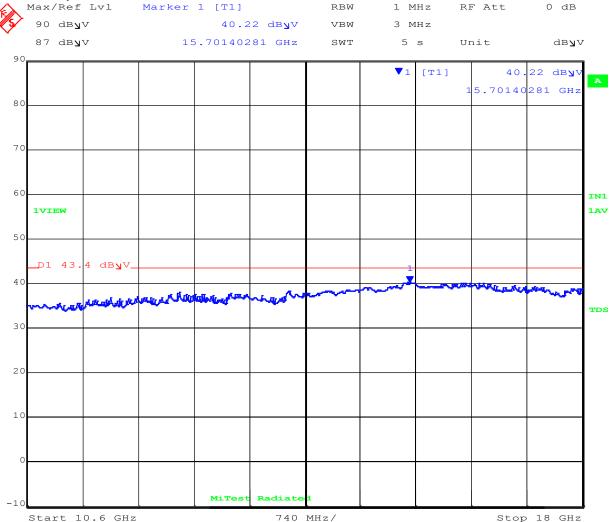
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 10.6-16GHz

Marker 1 [T1] RBW 1 MHz RF Att 0 dB

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 8.MAR.2021 14:40:43

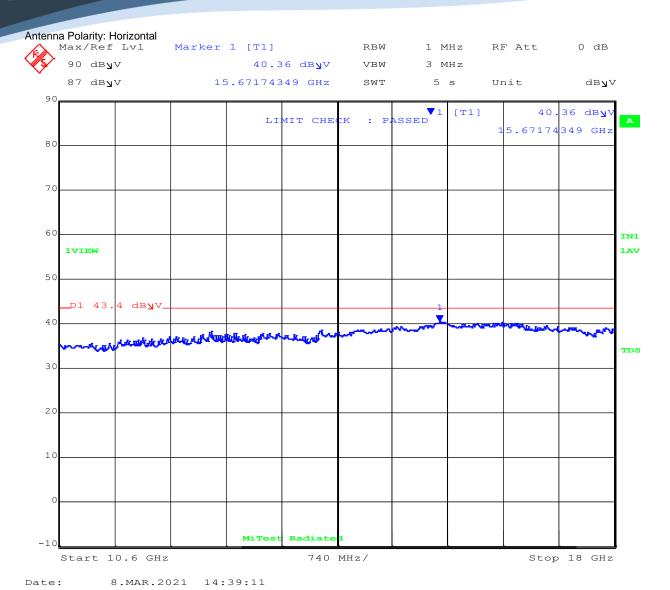
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 99 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 100 of 172



Stop 1.61 GHz

To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz

Miles Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 27.23 dByV VBW 3 MHz 87 dB**y**V 1.44374749 GHz SWT 5 s Unit dByV 23 dB**y** [T1] 1.44374749 GHz 80 1.41563126 GHz [T1] 26. 65 dB**y**7 70 1.21392786 GHz 60 IN1 1VIEW 1AV 5.0 40 TDS 20 10 MiTest Radiat

Date: 8.MAR.2021 15:05:30

Start 1 GHz

**Back to Matrix** 

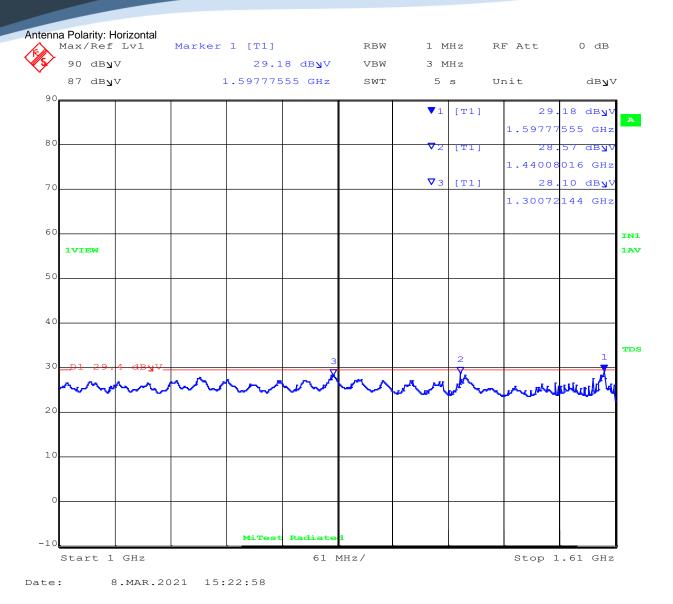
**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 101 of 172

61 MHz/



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 102 of 172



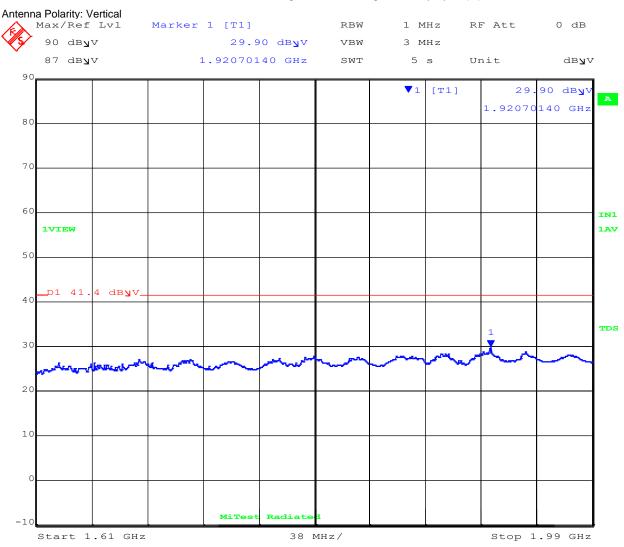
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# MiTest.

#### RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

## Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 8.MAR.2021 15:25:58

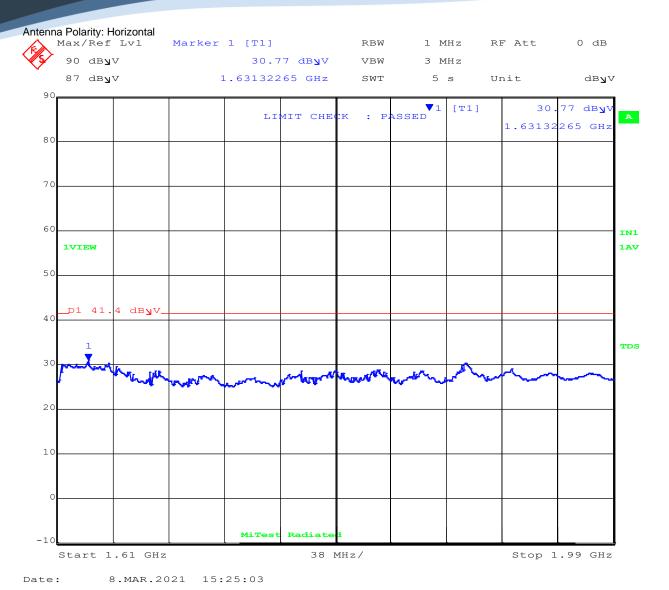
# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 103 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 104 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

MiTes Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 29.36 dByV VBW 3 MHz 87 dB**y**V 2.65511022 GHz SWT 5 s Unit dByV [T1] 36 dB**y**7 022 GHz 2.65511 80 70 60 IN1 1VIEW 1AV 5.0 D1 43.4 dB**y**V. TDS 30 20 10 MiTest Radiat Start 1.99 GHz 111 MHz/ Stop 3.1 GHz

Date: 8.MAR.2021 15:27:27

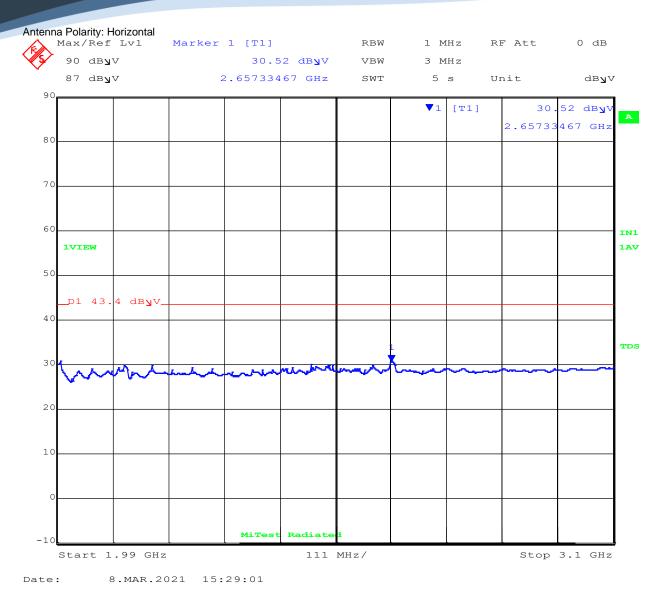
# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 105 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 106 of 172



Stop 10.6 GHz

**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz

MiTes Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 52.94 dByV VBW 3 MHz 87 dB**y**V 3.92665331 GHz SWT 5 s Unit dByV 94 dB**y**7 [T1] 3.92665331 GHz 80 D1 63.4 db**y**V. IN1 1VIEW 1AV 5.0 40 TDS 20 10 MiTest Radiat

Date: 8.MAR.2021 15:35:57

Start 3.1 GHz

# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 107 of 172

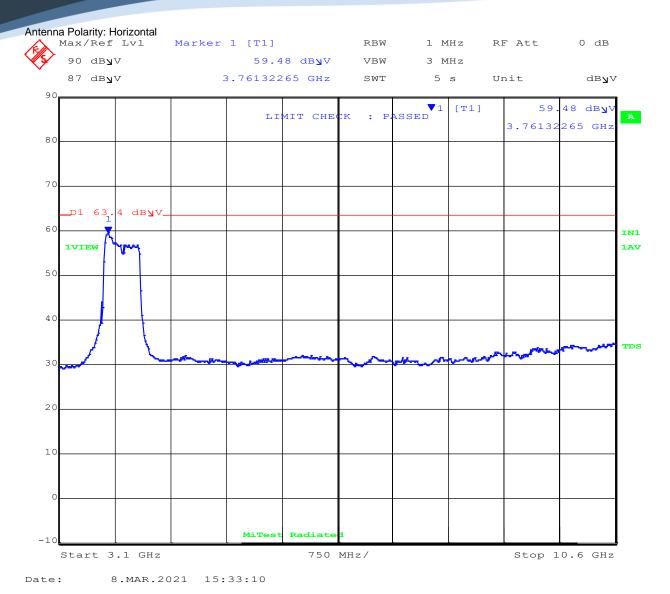
750 MHz/



**To:** FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

Serial #:



# Back to Matrix

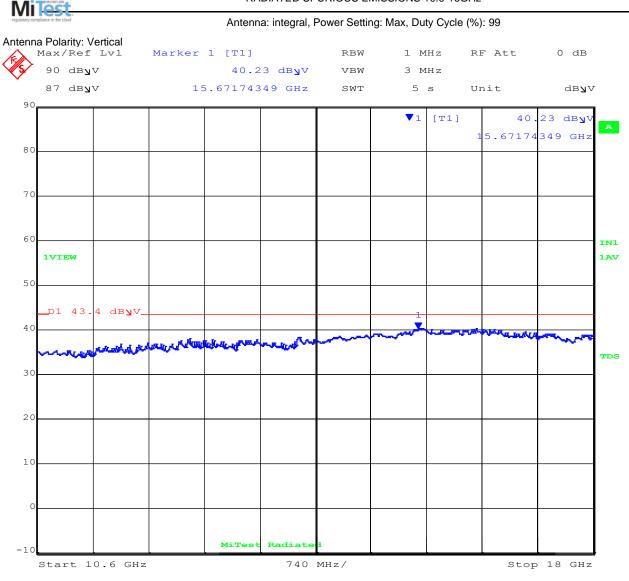
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 108 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## RADIATED SPURIOUS EMISSIONS 10.6-16GHz



Date: 8.MAR.2021 15:37:44

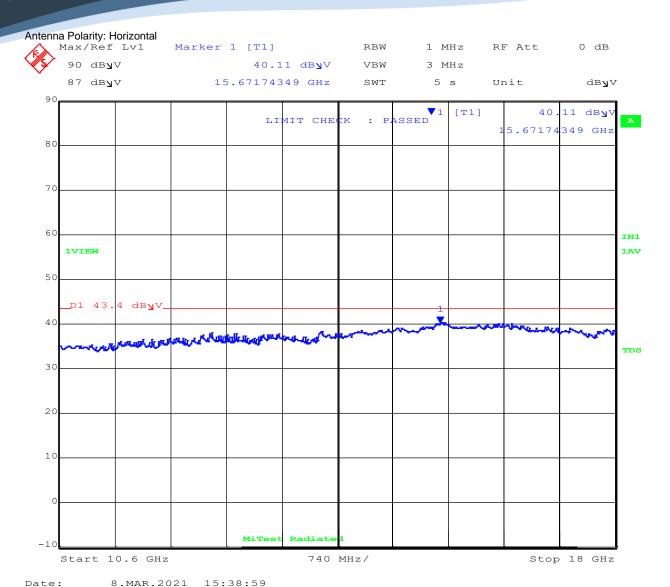
## **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 109 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 110 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

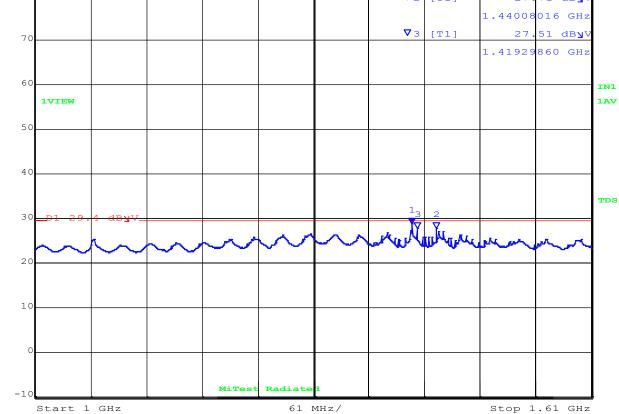
Serial #: ALER03-U2 Rev C

#### RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99

MiTest.

#### Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 28.72 dByV VBW 3 MHz 87 db**y**V 1.41318637 GHz SWT 5 s Unit dByV 72 dB**y**' [T1] 28 1.41318 637 GH<sub>2</sub> 80 1.44008016 GHz [T1] 51 dB**y**



Date: 8.MAR.2021 16:18:20

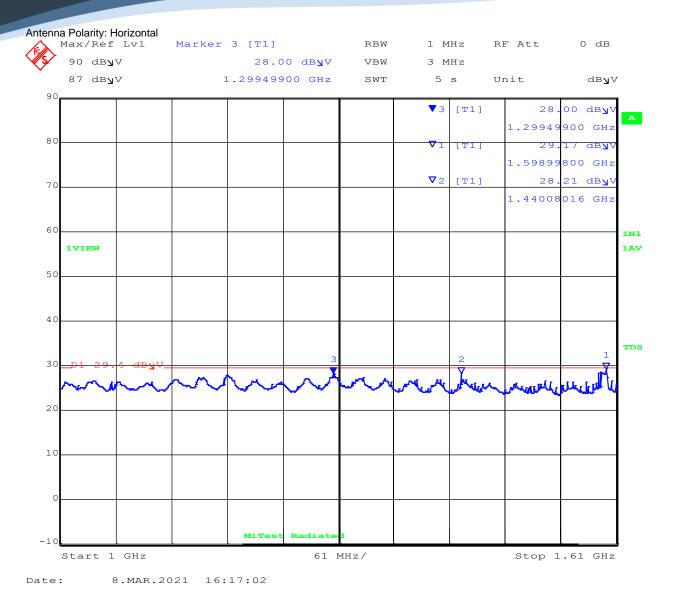
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 111 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 112 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 29.67 dByV VBW 3 MHz 87 db**y**V 1.92070140 GHz Unit dByV 90 67 dB**y** [T1] LIMIT CHE PASSED 1.92070 140 GHz 80 70 60 IN1 1VIEW 1AV 5.0 dB**y**V. TDS 20 10 MiTest Radiat Start 1.61 GHz 38 MHz/ Stop 1.99 GHz

Date: 8.MAR.2021 16:12:54

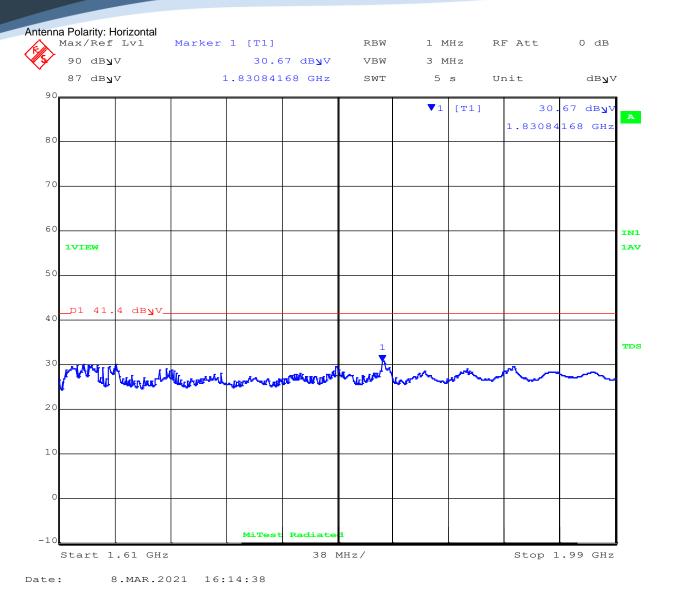
## **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 113 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix



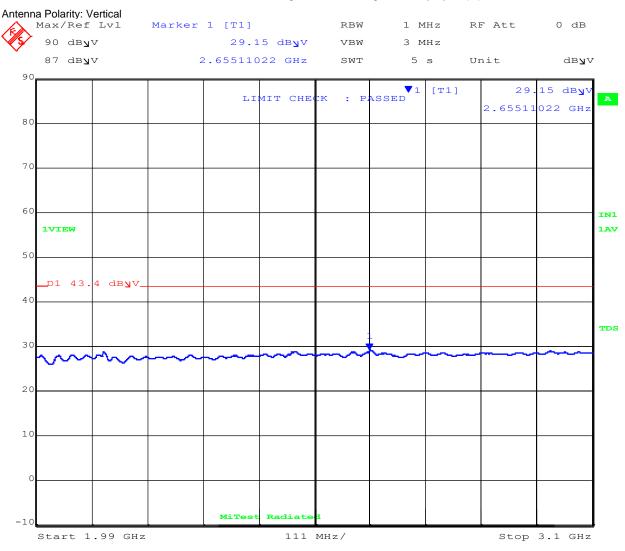
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



#### RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

#### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 8.MAR.2021 16:10:53

**Back to Matrix** 

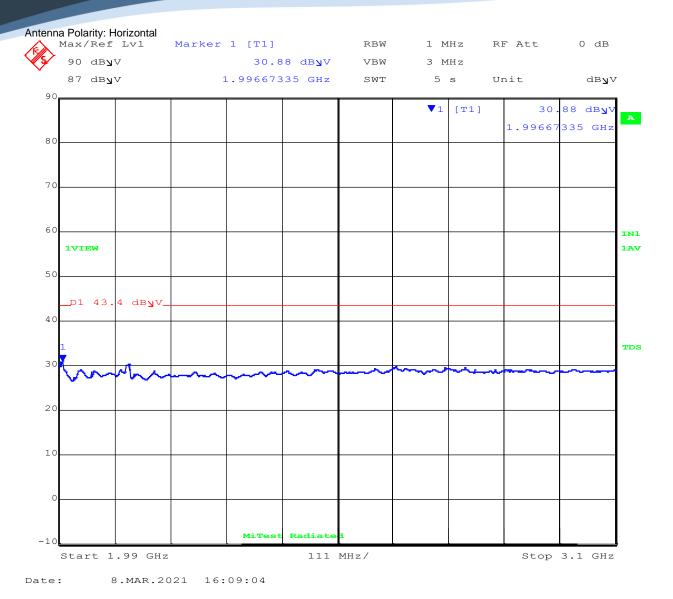
**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 115 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

Serial #:



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 116 of 172

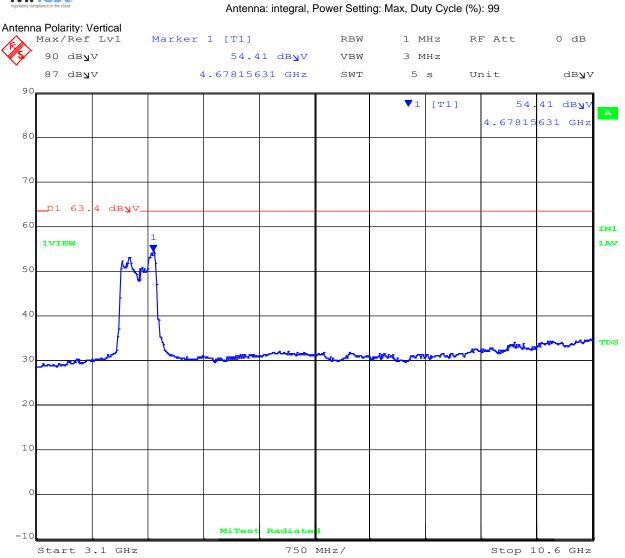


To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



#### RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz



**Back to Matrix** 

Date:

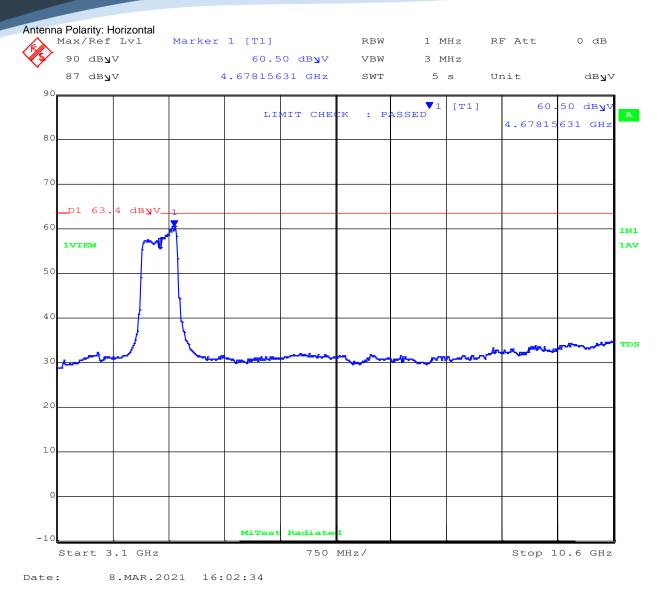
8.MAR.2021 16:01:18

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 117 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix



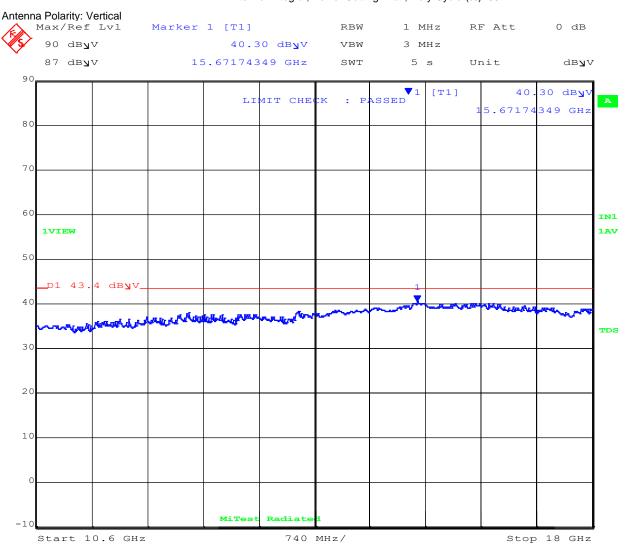
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



#### RADIATED SPURIOUS EMISSIONS 10.6-16GHz

#### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 8.MAR.2021 15:58:48

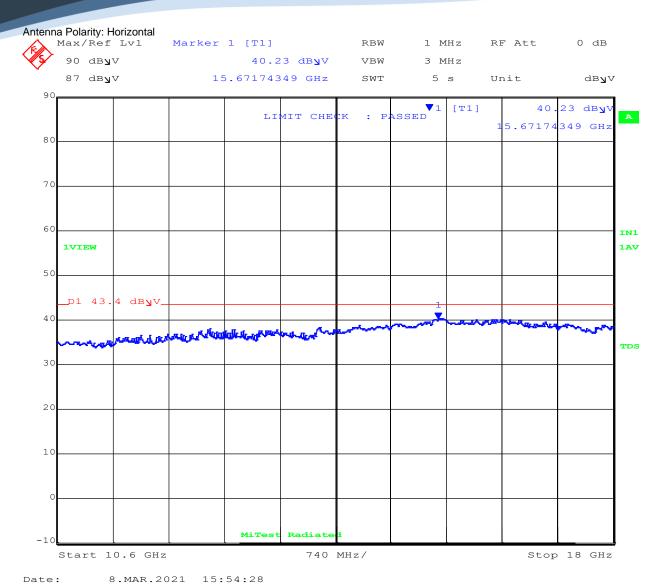
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 119 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 120 of 172



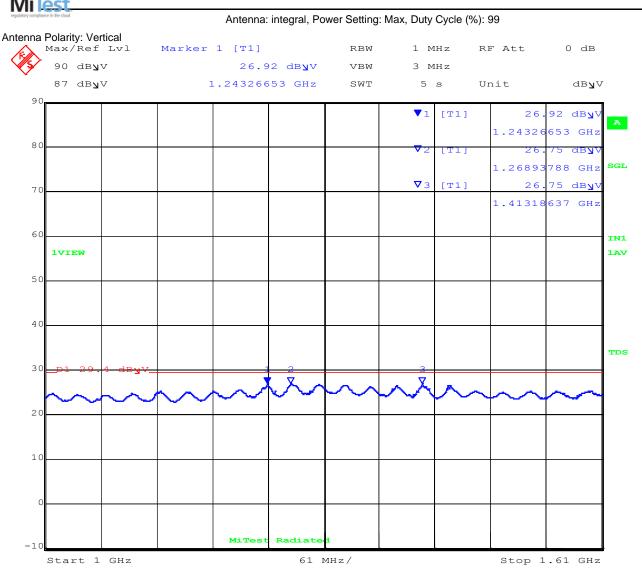
To: FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C Serial #:

## A.1.2 Band 3



#### RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz



**Back to Matrix** 

Date:

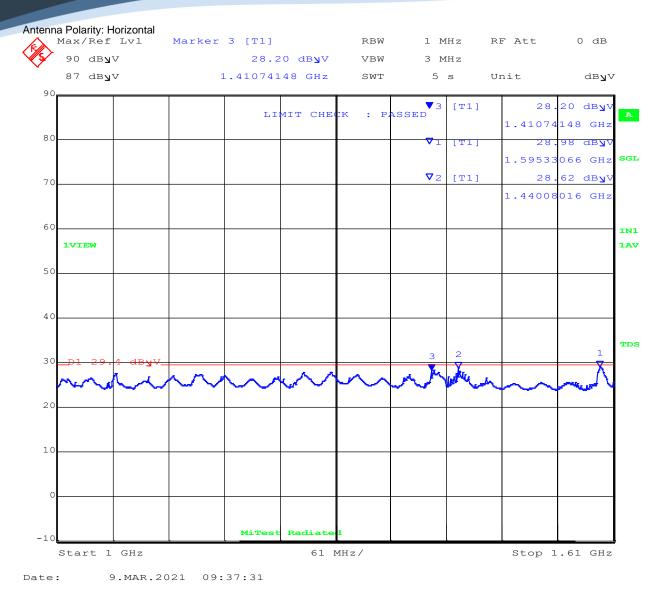
9.MAR.2021 09:39:03

20th April 2021 Issue Date: Page: 121 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 122 of 172



MiTes

itle: Alereon Inc. AL5350B Based UWB Modules

Stop 1.99 GHz

To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 30.17 dByV VBW 3 MHz 87 db**y**V 1.88795591 GHz SWT 5 s Unit dByV 17 dBy [T1] 1.88795591 GHz 80 70 60 IN1 1VIEW 1AV 5.0 41 dByV. TDS 30 20 10 MiTest Radiat

Date: 9.MAR.2021 09:44:52

Start 1.61 GHz

## **Back to Matrix**

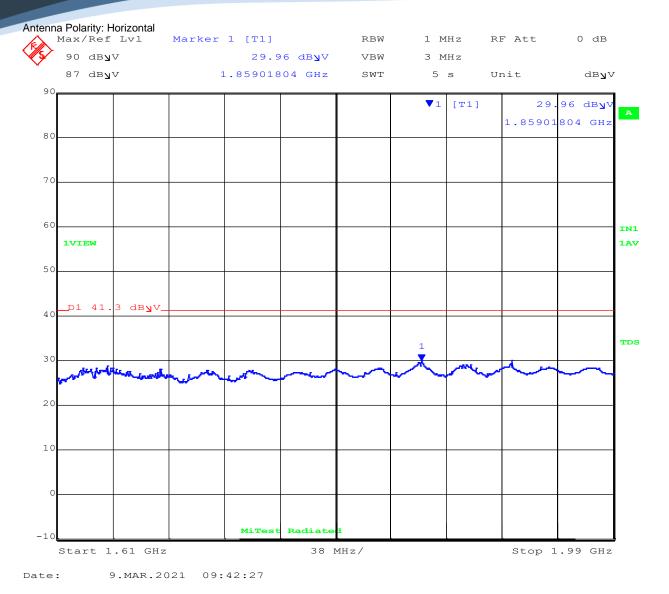
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 123 of 172

38 MHz/



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 



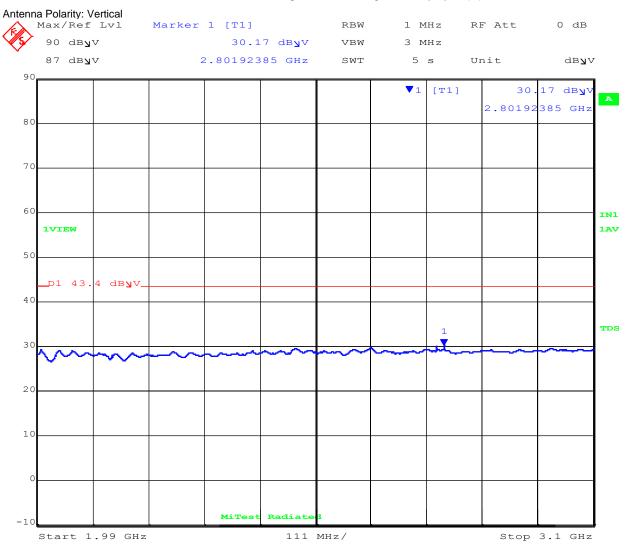
FCC CFR 47 Part 15 Subpart F 15.519 To:

ALER03-U2 Rev C Serial #:



#### RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

#### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 9.MAR.2021 09:51:52

**Back to Matrix** 

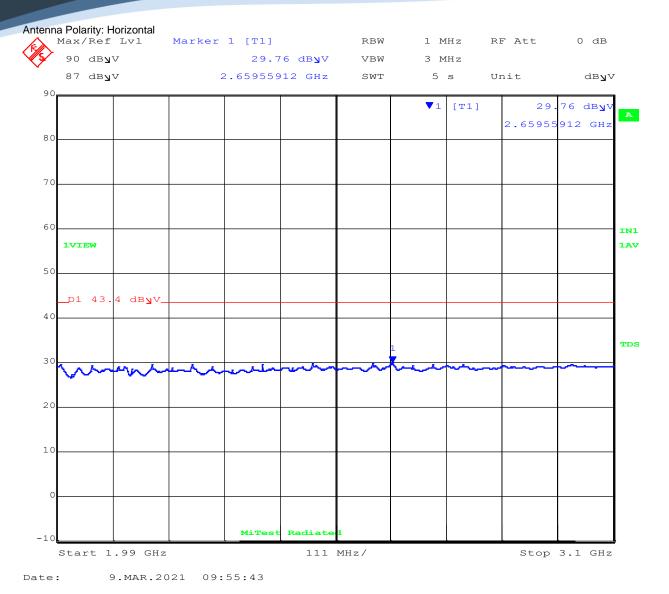
20th April 2021 Issue Date:

Page: 125 of 172 This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. All changes will be noted in the Document History section of the report. MiCOM Labs, 575 Boulder Court, Pleasanton, California 94566 USA, Phone: +1 (925) 462 0304, Fax: +1 (925) 462 0306, www.micomlabs.com



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 126 of 172



MiTes

Title: Alereon Inc. AL5350B Based UWB Modules

To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz

#### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 51.20 dByV VBW 3 MHz 87 db**y**V 6.37655311 GHz SWT 5 s Unit dByV 20 dB**y** [T1] 6.37655311 GHz 80 \_D1 63.4 db**y**V\_ IN1 1VIEW 1AV 5.0 40 TDS

Start 3.1 GHz 750 MHz/ Stop 10.6 GHz

Radiat

MiTest

9.MAR.2021 10:02:18

## **Back to Matrix**

Date:

20

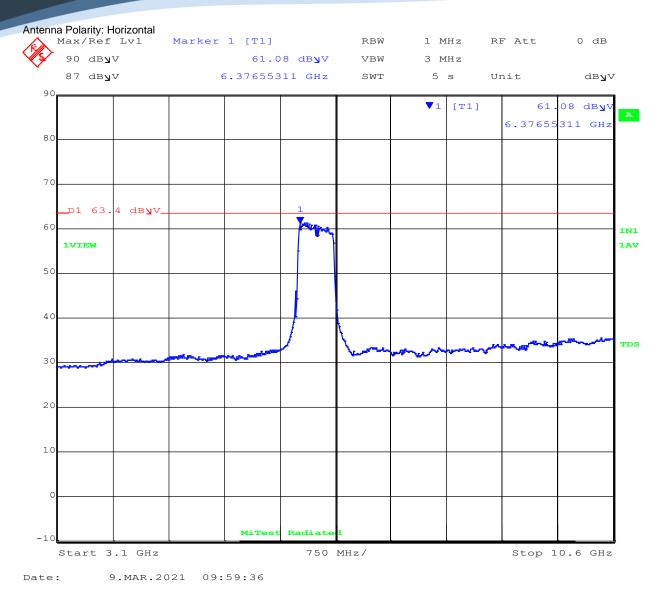
10

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 127 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 128 of 172



Stop 18 GHz

To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## RADIATED SPURIOUS EMISSIONS 10.6-16GHz

MiTes Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 40.55 dByV VBW 3 MHz 87 db**y**V 15.67174349 GHz SWT 5 s Unit dByV 55 dB**y**<sup>v</sup> [T1] 5.67174349 GHz 80 70 60 IN1 1VIEW 1AV 5.0 D1 43. 4 dByV 40 TDS 30 20 10 MiTest Radiat

Date: 9.MAR.2021 10:03:24

Start 10.6 GHz

## **Back to Matrix**

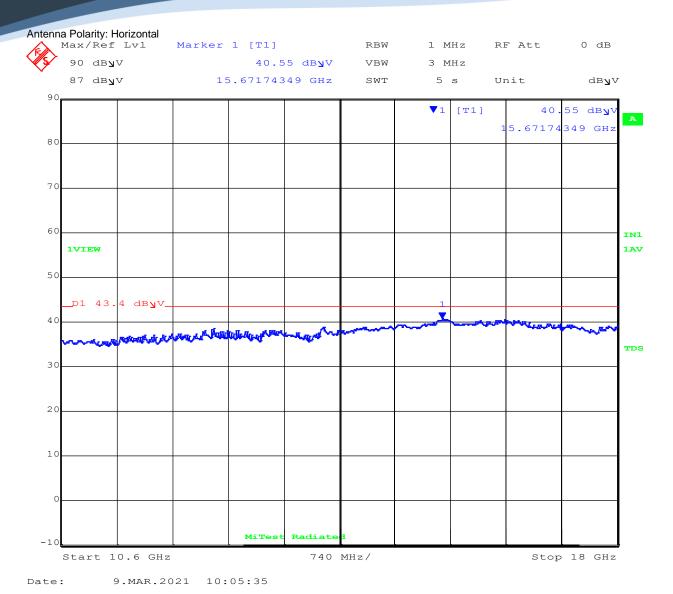
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 129 of 172

740 MHz/



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 130 of 172



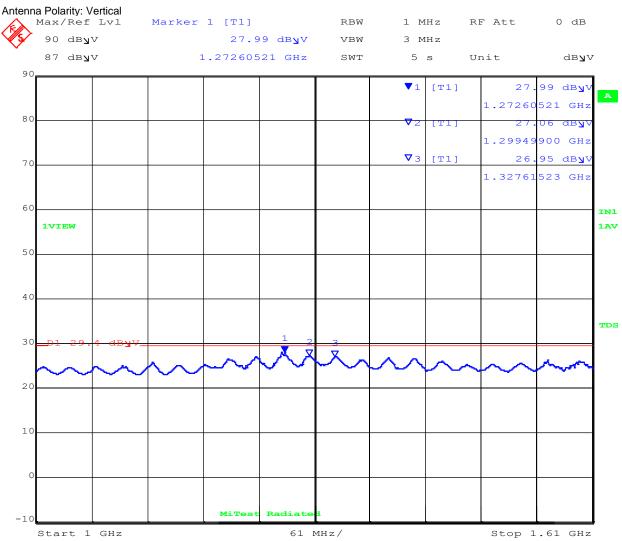
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz

MiTest.
regulatory compliance in the cloud

### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 9.MAR.2021 10:33:06

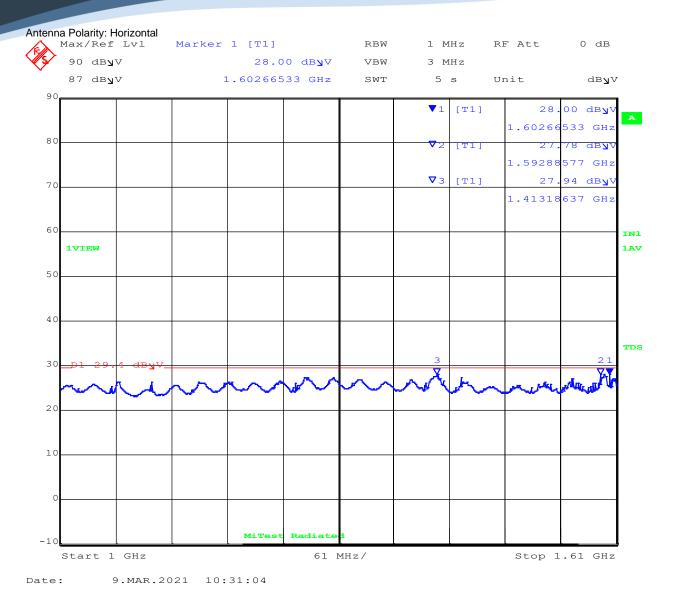
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 131 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 132 of 172



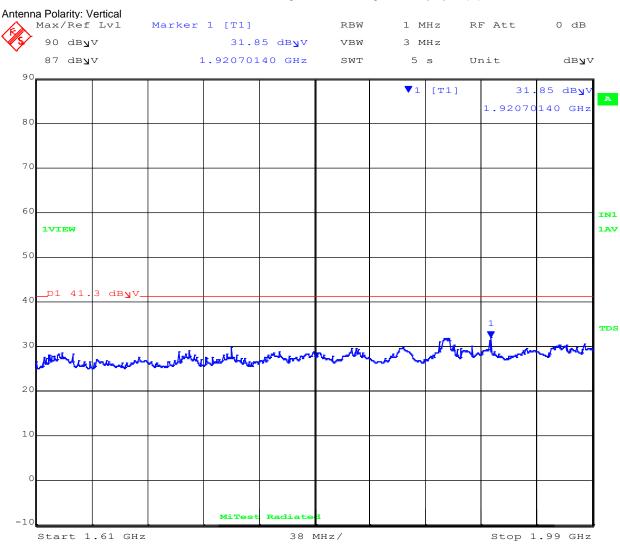
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



#### RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

#### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 9.MAR.2021 10:24:18

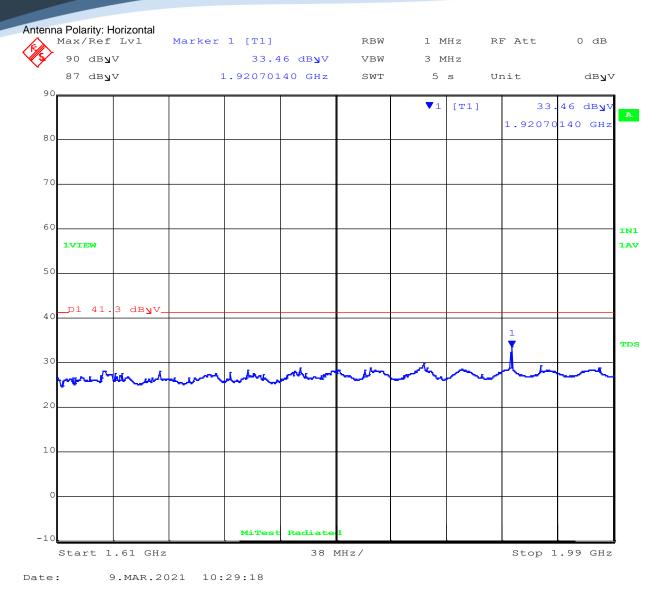
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 133 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 134 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

MiTes Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 32.60 dByV VBW 3 MHz 87 db**y**V 2.65511022 GHz SWT 5 s Unit dByV 60 dB**y**7 [T1] 022 GHz 2.65511 80 70 60 IN1 1VIEW 1AV 5.0 D1 43.4 dB**y**V. TDS 20 10 MiTest Radiat Start 1.99 GHz 111 MHz/ Stop 3.1 GHz

Date: 9.MAR.2021 10:22:24

## **Back to Matrix**

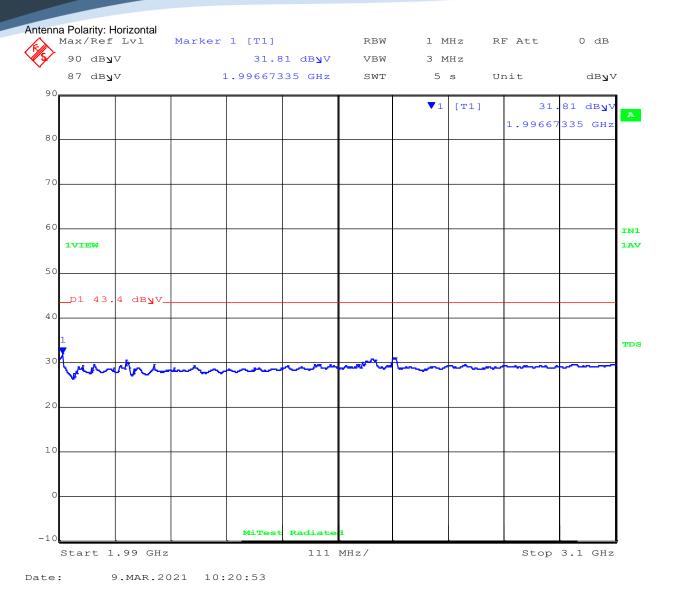
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 135 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

Serial #:



**Back to Matrix** 

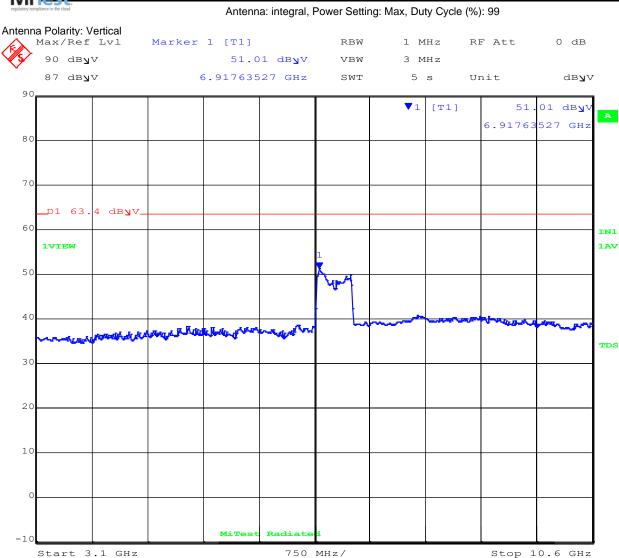
**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 136 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz



Date: 9.MAR.2021 10:16:40

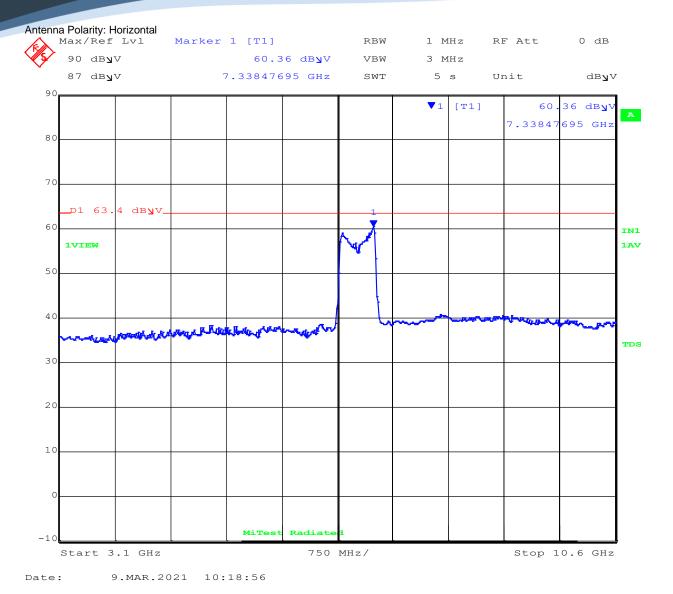
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 137 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 138 of 172

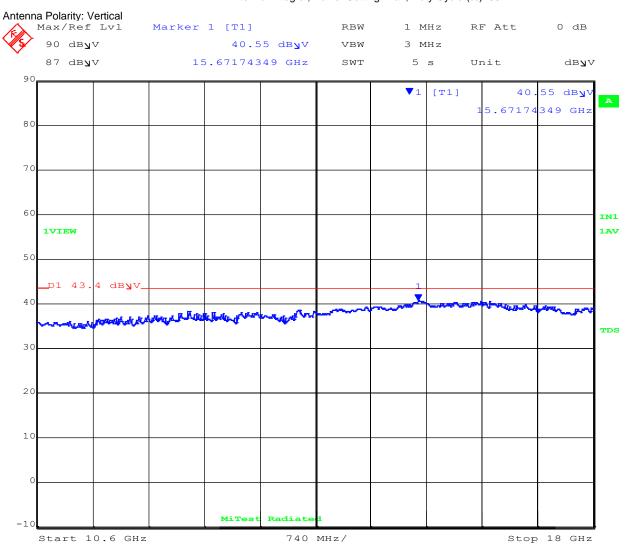


To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 10.6-16GHz

## Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 9.MAR.2021 10:13:27

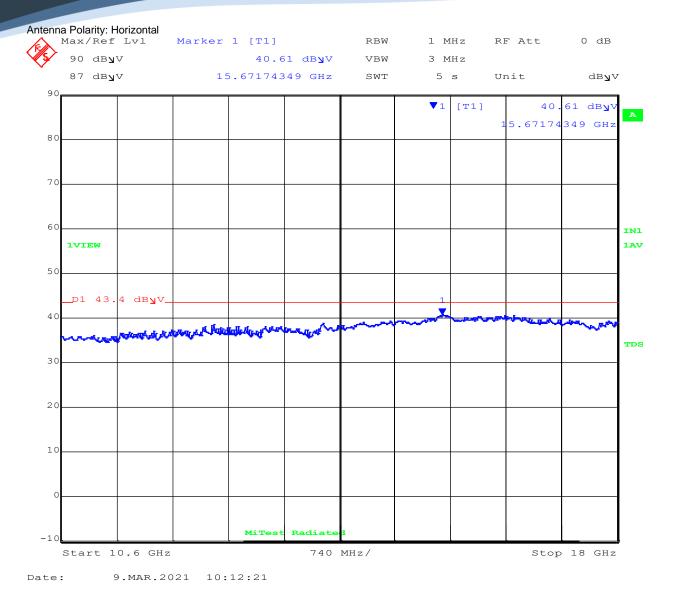
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 139 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 140 of 172



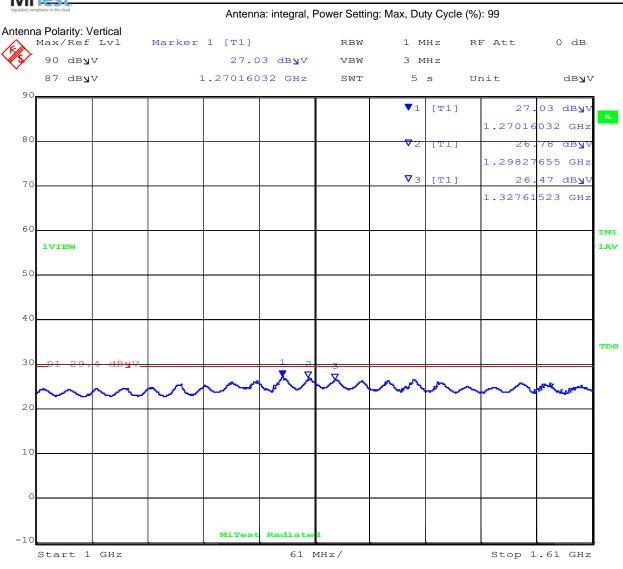
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

## A.1.3 Band 3 & 6



#### RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz



Date: 9.MAR.2021 11:10:53

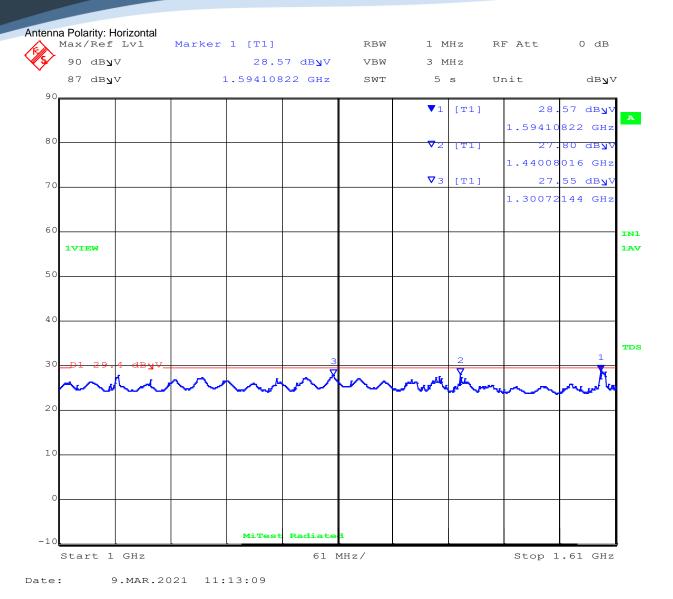
### **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 141 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 142 of 172



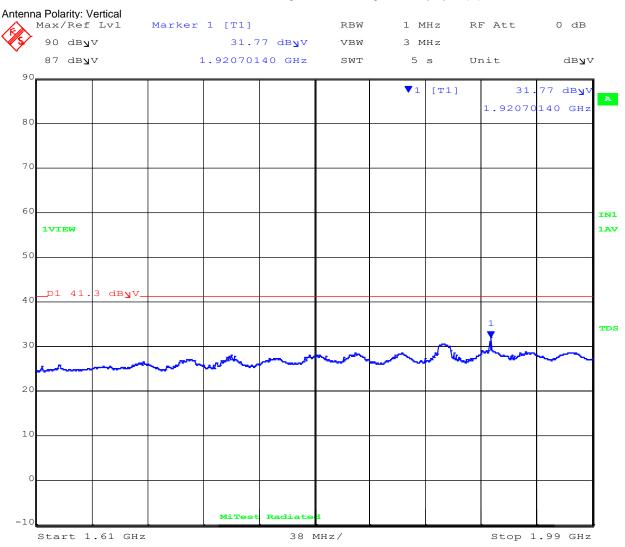
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



#### RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

## Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 9.MAR.2021 11:29:14

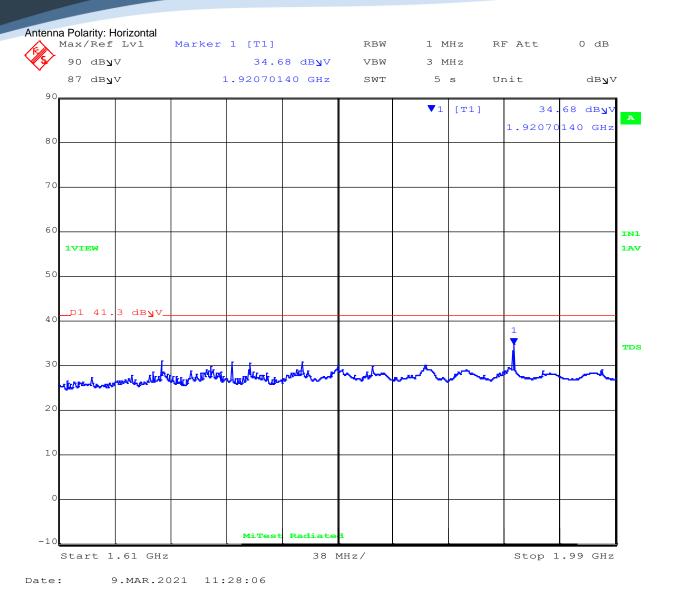
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 143 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 144 of 172



MiTes

itle: Alereon Inc. AL5350B Based UWB Modules

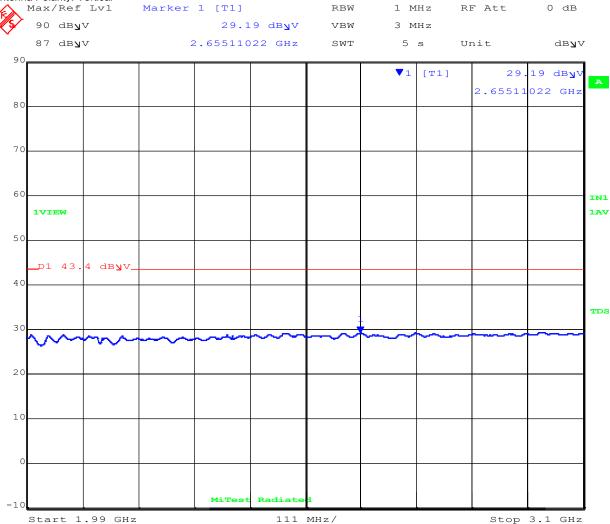
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99

Antenna Polarity: Vertical



Date: 9.MAR.2021 11:31:39

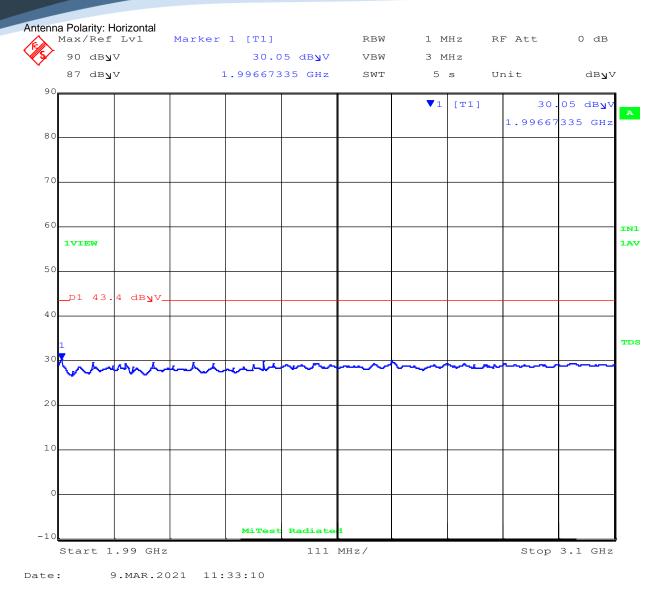
# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 145 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 146 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz

MiTes Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 52.36 dByV VBW 3 MHz 87 db**y**V 7.81943888 GHz SWT 5 s Unit dByV 36 dB**y**7 [T1] 7.81943888 GHz 80 \_D1 63.4 db**y**V\_ IN1 1VIEW 1AV 5.0 40 TDS 20 10 MiTest Radiat Start 3.1 GHz 750 MHz/ Stop 10.6 GHz

Date: 9.MAR.2021 11:37:51

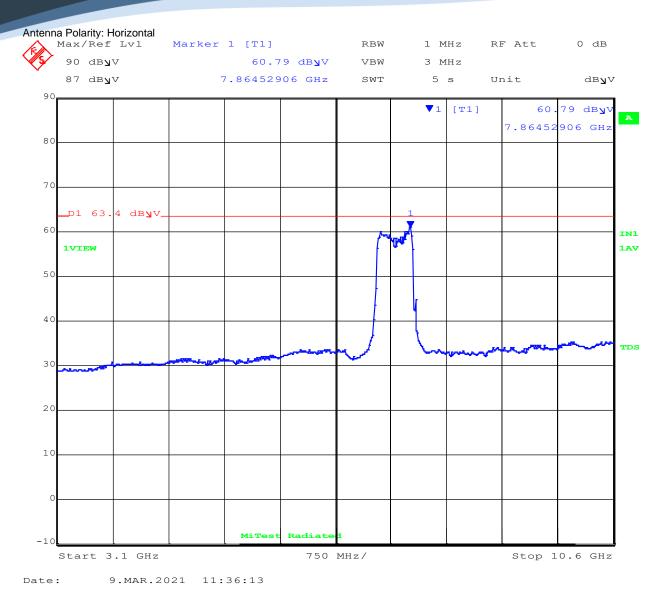
# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 147 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 148 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 10.6-16GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 40.55 dByV VBW 3 MHz 87 db**y**V 15.67174349 GHz SWT 5 s Unit dByV 55 dB**y**<sup>v</sup> [T1] 5.67174349 GHz 80 70 60 IN1 1VIEW 1AV 5.0 D1 43. 4 dByV 40 TDS 30 20 10 MiTest Radiat Start 10.6 GHz 740 MHz/ Stop 18 GHz

Date: 9.MAR.2021 11:39:07

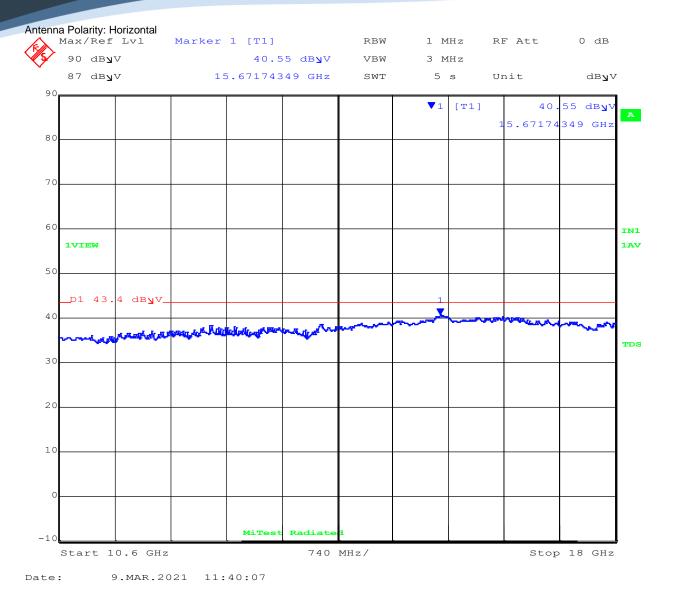
# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 149 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 150 of 172



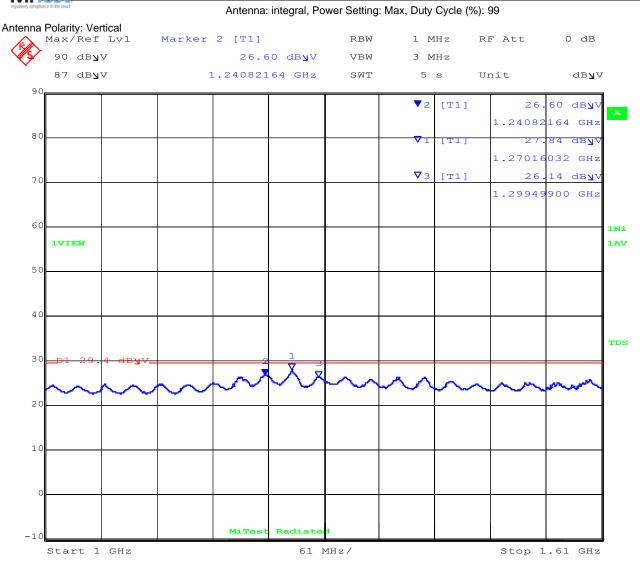
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# A.1.4 Band 6



# RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz



**Back to Matrix** 

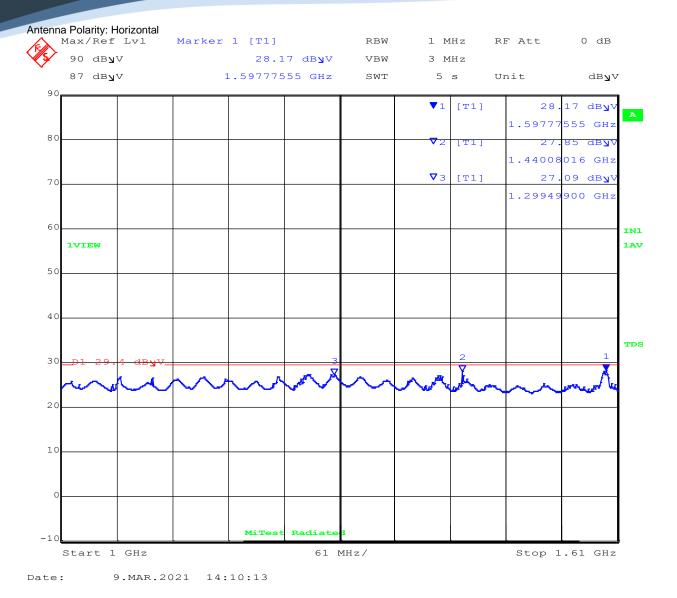
9.MAR.2021 14:11:56

**Issue Date**: 20<sup>th</sup> April 2021 **Page**: 151 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 152 of 172



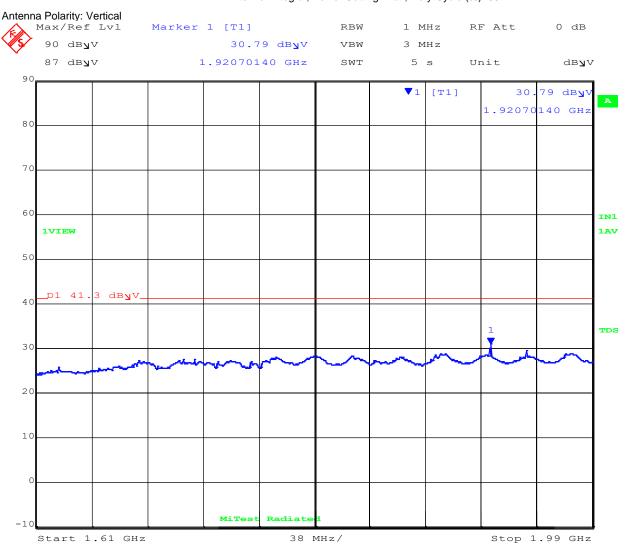
To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# MiTest.

#### RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

#### Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 9.MAR.2021 14:04:06

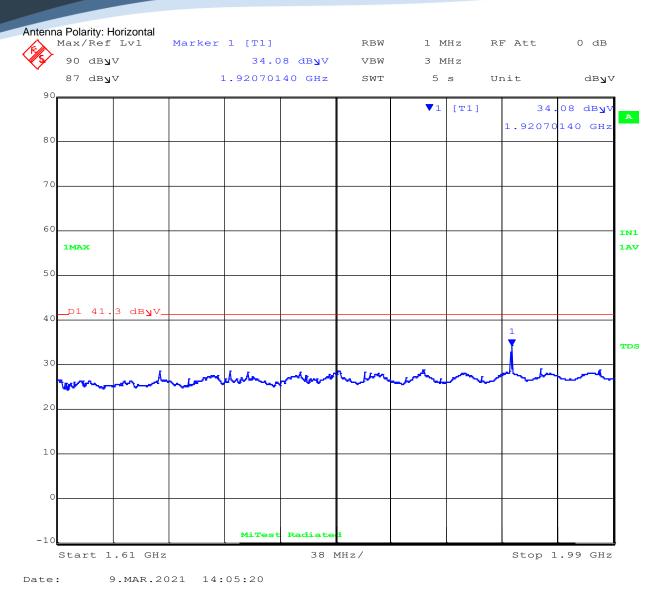
# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 153 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 154 of 172

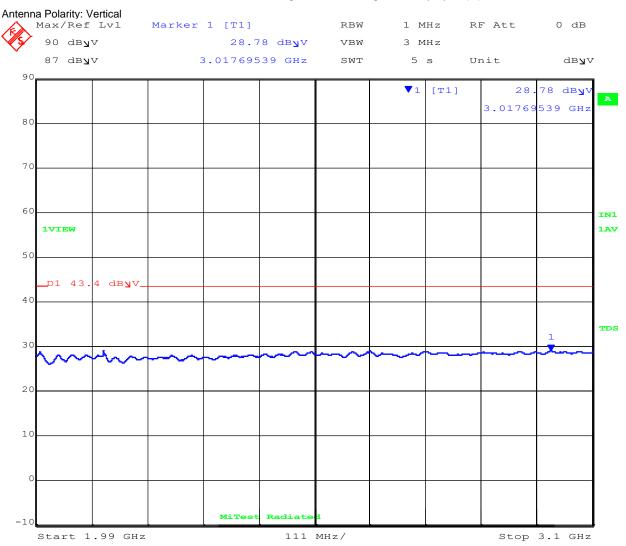


**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

#### RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99



Date: 9.MAR.2021 14:01:44

**Back to Matrix** 

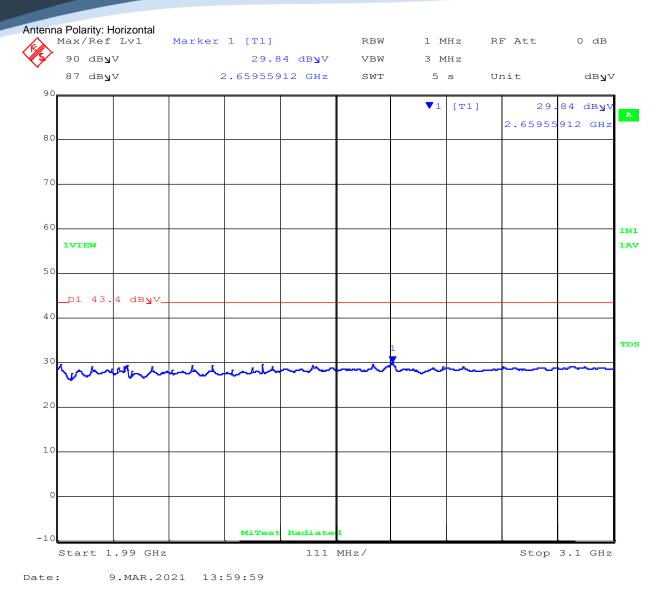
**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 155 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

Serial #:



Back to Matrix

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 156 of 172



Stop 10.6 GHz

To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



#### RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz

# Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 50.88 dByV VBW 3 MHz 87 db**y**V 8.02985972 GHz SWT 5 s Unit dByV 88 dB**y**7 [T1] 972 GHz 8.02985 80 \_D1 63.4 db**y**V\_ IN1 1VIEW 1AV 5.0 40 TDS 30 20 10

Date: 9.MAR.2021 13:55:07

Start 3.1 GHz

# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 157 of 172

MiTest

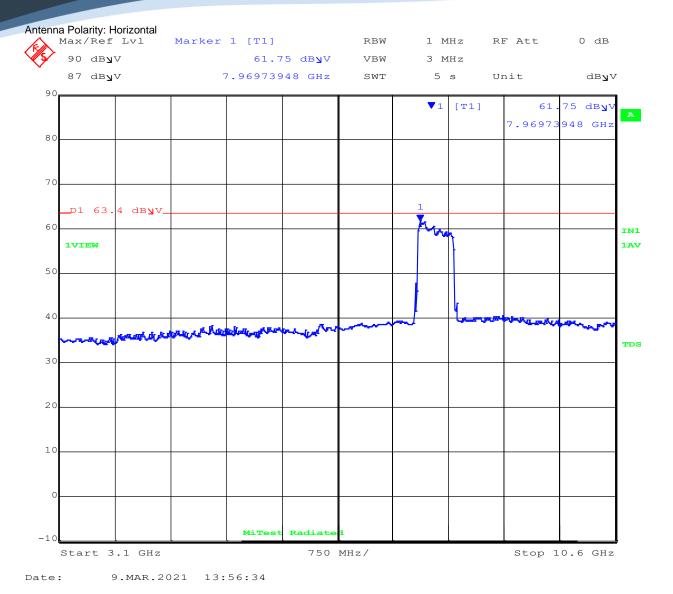
Radiat

750 MHz/



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

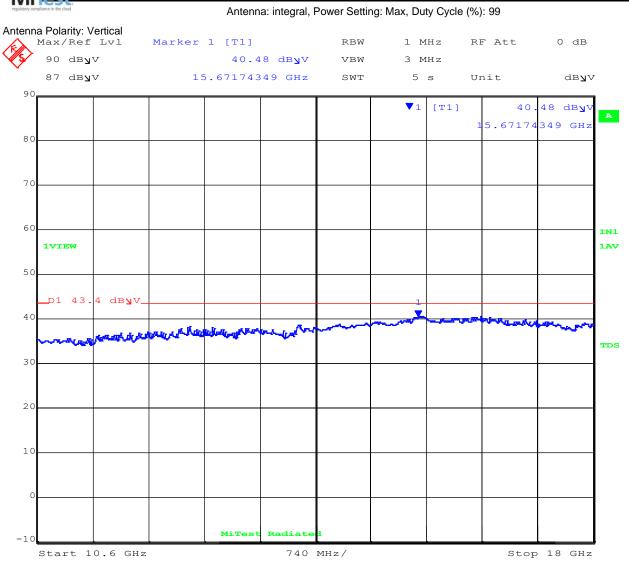
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 158 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 10.6-16GHz



Date: 9.MAR.2021 13:52:55

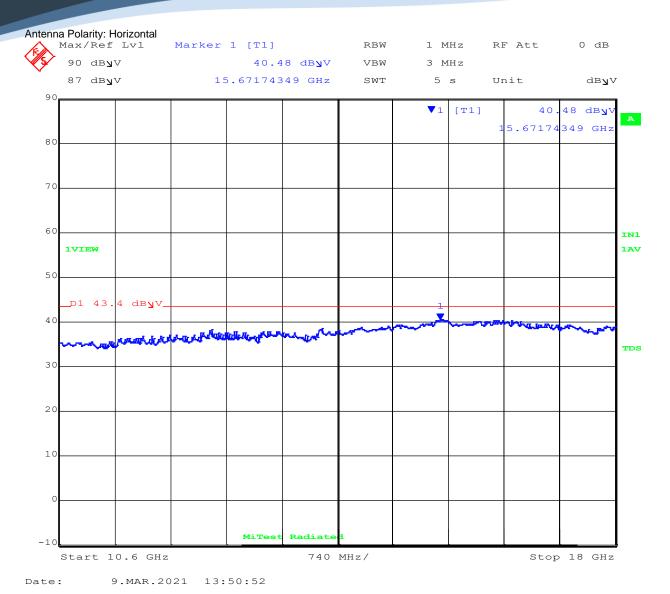
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 159 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 160 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

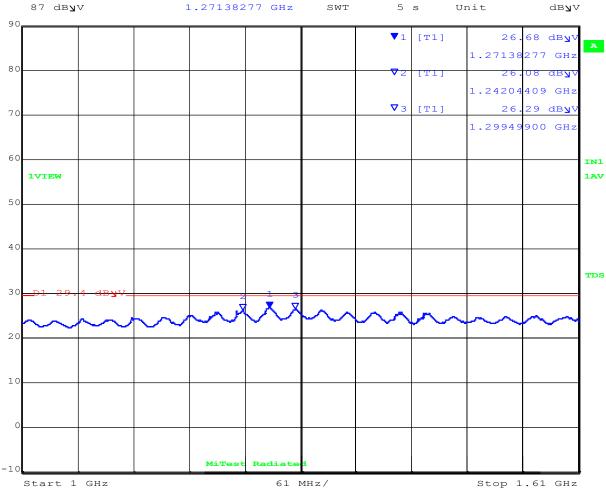
Serial #: ALER03-U2 Rev C

#### RADIATED SPURIOUS EMISSIONS 1.0-1.61GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99

MiTest.

#### Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 26.68 dByV VBW 3 MHz 87 db**y**V 1.27138277 GHz SWT 5 s Unit



Date: 9.MAR.2021 14:42:21

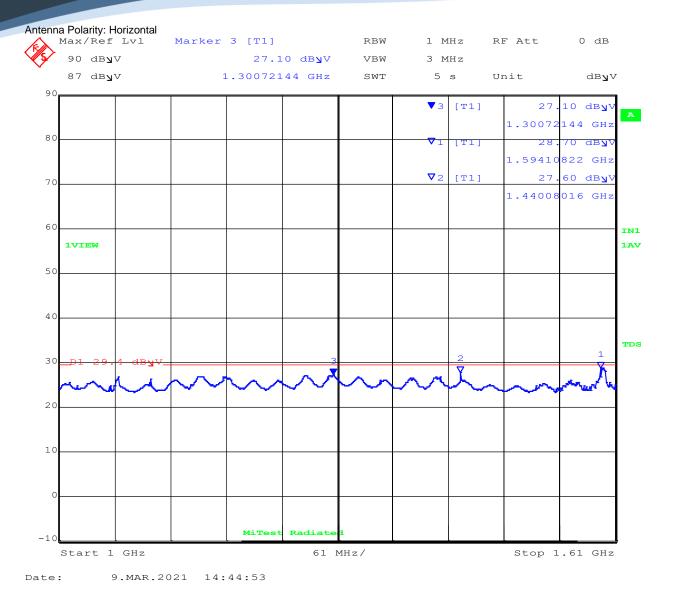
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 161 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 162 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### RADIATED SPURIOUS EMISSIONS 1.61-1.99GHz

MiTes Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 30.05 dByV VBW 3 MHz 87 db**y**V 1.92070140 GHz SWT 5 s Unit dByV 05 dB**y**<sup>7</sup> [T1] 140 GHz 1.92070 80 70 60 IN1 1MAX 1AV 5.0 41 dByV. TDS 30 20 10 MiTest Radiat Stop 1.99 GHz Start 1.61 GHz 38 MHz/

Date: 9.MAR.2021 14:54:54

# **Back to Matrix**

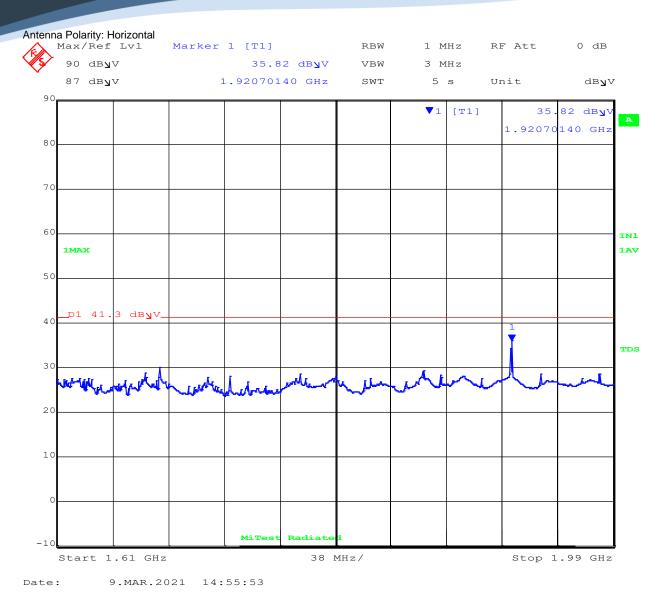
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 163 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

Serial #:



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 164 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# RADIATED SPURIOUS EMISSIONS 1.99-3.1GHz

Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 29.36 dByV VBW 3 MHz 87 db**y**V 2.65511022 GHz SWT 5 s Unit dByV [T1] 36 dB**y**7 022 GHz 2.65511 80 70 60 IN1 1VIEW 1AV 5.0 D1 43.4 dB**y**V. TDS 30 20 10 MiTest Radiat Start 1.99 GHz 111 MHz/ Stop 3.1 GHz

Date: 9.MAR.2021 15:00:05

# **Back to Matrix**

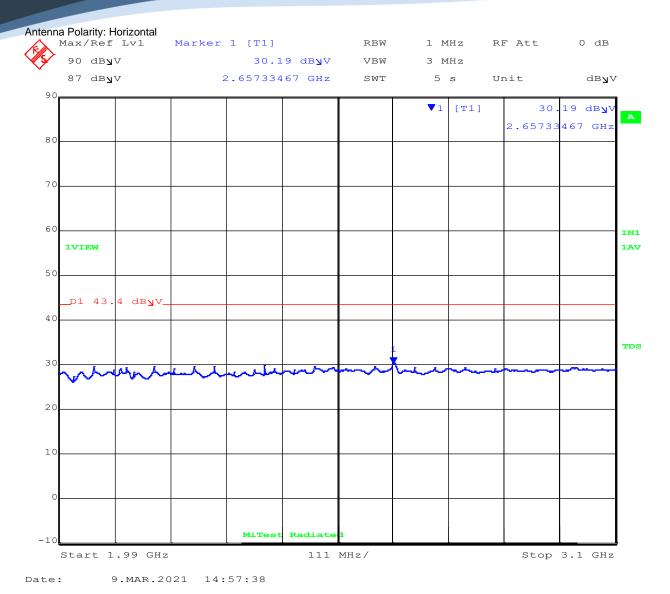
**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 165 of 172



**To:** FCC CFR 47 Part 15 Subpart F 15.519

ALER03-U2 Rev C

Serial #:



**Back to Matrix** 



Stop 10.6 GHz

To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

### RADIATED SPURIOUS EMISSIONS 3.1-10.6GHz

# MiTes Antenna: integral, Power Setting: Max, Duty Cycle (%): 99 Antenna Polarity: Vertical Max/Ref Lvl Marker 1 [T1] RBW 1 MHz RF Att 0 dB 90 db**y**V 51.56 dByV VBW 3 MHz 87 db**y**V 8.57094188 GHz SWT 5 s Unit dByV 56 dB**y**7 [T1] 8.57094188 GHz 80 \_D1 63.4 db**y**V\_ IN1 1VIEW 1AV 5.0 40 TDS 20 10

MiTest

Radiat

750 MHz/

Date: 9.MAR.2021 15:02:34

Start 3.1 GHz

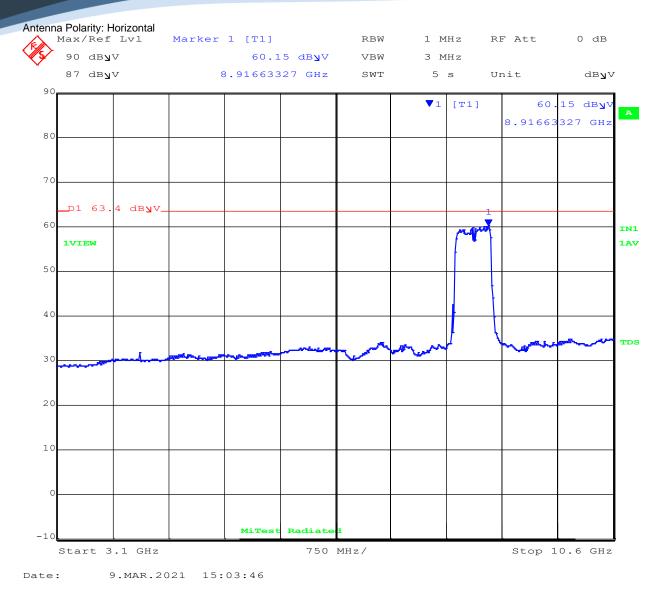
# **Back to Matrix**

**Issue Date:** 20<sup>th</sup> April 2021 **Page:** 167 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 168 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

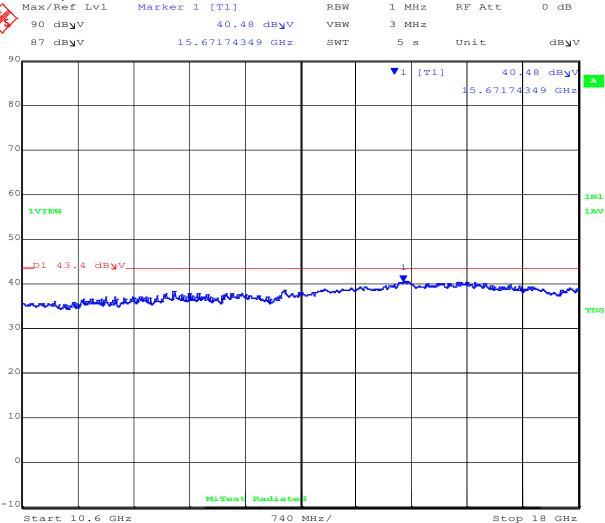
Serial #: ALER03-U2 Rev C

# MiTest.

Antenna Polarity: Vertical

# RADIATED SPURIOUS EMISSIONS 10.6-16GHz Antenna: integral, Power Setting: Max, Duty Cycle (%): 99

# Marker 1 [T1] RBW 1 MHz RF Att 0 dB



Date: 9.MAR.2021 15:07:47

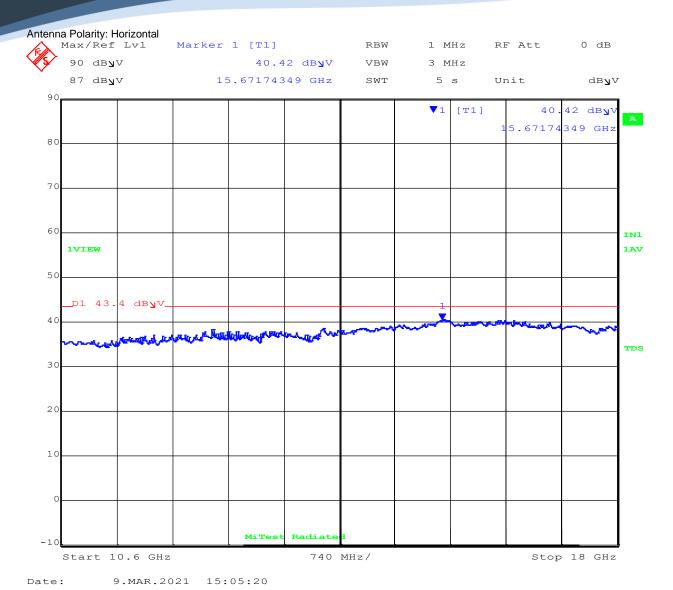
**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 169 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



**Back to Matrix** 

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 170 of 172



To: FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C

# B. APPENDIX - Manufacturer Declaration on Similarity of Models



www.alereon.com | 10800 Pecan Park Blvd. | Suite 100 | Austin,Tx 78750 | 512.345.4200 | 512.345.4201

To whom it may concern,

This is to inform you that the boards listed below all use the exact same Alereon chipset AL5350B/AL5100 and therefore the same radio. We are transmitting UWB that operates in frequencies of: 3168~MHz-4752~MHz & 6336~MHz-8968~MHz

- 1. AL5804 Impact uses USB interface
- 2. AL5834\_Combat256 uses USB interface
- 3. AL5830 Commander256 uses compact flash interface (parallel port)
- 4. AL5833\_Destroyer256 uses compact flash interface (parallel port)
- 5. AL5835 Camouflage256 uses I2C UART interface
- 6. AL5808 Octal uses Octal SPI interface

All these boards have the same radio design/layout except for the external connector (USB, parallel port or serial) and form factor, therefore for the conducted tests, testing just the AL5834\_Combat256 is perfectly adequate.

Sincerely,

David Shoemaker

CEO

Alereon, Inc.

03/23/2021

3/23/2021 CONFIDENTIAL 1 of 1

Issue Date: 20<sup>th</sup> April 2021 Page: 171 of 172



**Title:** Alereon Inc. AL5350B Based UWB Modules **To:** FCC CFR 47 Part 15 Subpart F 15.519

Serial #: ALER03-U2 Rev C



575 Boulder Court
Pleasanton, California 94566, USA
Tel: +1 (925) 462 0304
Fax: +1 (925) 462 0306
www.micomlabs.com

**Issue Date:** 20<sup>th</sup> April 2021 **Page**: 172 of 172