



Canada

RF Test Report

As per

RSS-210 Issue 10:2019 & FCC Part 15 Subpart 15.249

Unlicensed Intentional Radiators

on the

Lucere Nomad

Issued by:

TÜV SÜD Canada Inc.
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Testing produced for

Prepared by:

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Project Engineer

Lucere, Inc.

See Appendix A for full client &
EUT details.

Reviewed by:

Min Xie,
Sr. Project Engineer



Registration #
6844A-3



Testing Laboratory
Certificate #2955.02



R-14023, G-20072
C-14498, T-20060



Registration #
CA6844



Client	Lucere Inc.	
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Table of Contents

Table of Contents	2
Report Scope	3
Summary	4
Test Results Summary	5
Notes, Justifications, or Deviations	6
Sample Calculation(s)	6
Applicable Standards, Specifications and Methods	7
Document Revision Status	8
Definitions and Acronyms	9
Testing Facility	10
Calibrations and Accreditations	10
Testing Environmental Conditions and Dates	11
Detailed Test Results Section	12
Maximum Output Power	13
Transmitter Spurious Radiated Emissions	16
Emission Bandwidth	28
Appendix A – EUT Summary	31
Appendix B – EUT and Test Setup Photos	33

Client	Lucere Inc.	
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Report Scope

This report addresses the EMC verification testing and test results of the **Lucere**, Model: **Nomad 012120-0C**, and is herein referred to as EUT (Equipment Under Test). The EUT was tested for compliance against the following standards:


RSS-210 Issue 10:2019

FCC Part 15 Subpart C 15.249

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc. accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc., unless otherwise stated.


Client	Lucere Inc.	
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Summary

The results contained in this report relate only to the item(s) tested.

EUT:	Lucere Nomad
FCC Certification #, FCC ID:	2AVQC-NOMAD
ISED Certification #, IC:	25878-NOMAD
EUT passed all tests performed	Yes
Tests conducted by	Amir Emami


For testing dates, see "Testing Environmental Conditions and Dates".

Client	Lucere Inc.	
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS-GEN (Table 7)	Restricted Bands for Intentional Operation	QuasiPeak Average	Pass
FCC 15.207 RSS-GEN (Table 4)	Power Line Conducted Emissions	QuasiPeak Average	N/A See Justification
FCC 15.249(a) RSS-210 F.1(a)	Maximum Output Power	< 50 mV/m	Pass
FCC 15.249(d) RSS-210 F.1(e)	Transmitter Spurious Radiated Emissions	QuasiPeak Average	Pass
FCC 15.249 RSS-GEN 6.7	Emission Bandwidth	99% BW	Pass
Overall Result			Pass

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '*'.

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Notes, Justifications, or Deviations

The following notes, justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203, the unit uses a non-removable, soldered monopole antenna 8.3cm long.

For the Restricted Bands of operation, the EUT is designed to only operate between 902 – 928 MHz.

The EUT was mounted in three orthogonal axis. Worst case results were obtained with the EUT in the Y-axis facing up. Worst case results are presented. See Appendix B for axis details.

Power line conducted emissions was not applicable since the EUT is a battery operated device. It contains an internal rechargeable battery but the EUT and transmitter do not operate when the battery is being charged. All tests were performed with the battery fully charged.

Sample Calculation(s)

Radiated Emission Test

E-Field Level = Received Signal + Antenna Factor + Cable Loss – Pre-Amp Gain


E-Field Level = 50dB μ V + 10dB/m + 2dB – 20dB

E-Field Level = 42dB μ V/m

Margin = Limit – E-Field Level


Margin = 50dB μ V/m – 42dB μ V/m

Margin = 8.0 dB (pass)

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Applicable Standards, Specifications and Methods

ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American National Standard For Testing Unlicensed Wireless Devices
CFR 47 FCC 15 Subpart C	Code of Federal Regulations – Radio Frequency Devices, Intentional Radiators
CISPR 32:2012	Electromagnetic Compatibility of Multimedia Equipment – Emission Requirements
FCC KDB 558074: 2019	FCC KDB 558074 Digital Transmission Systems, measurements and procedures
FCC KDB 447498: 2015	RF exposure procedures and equipment authorization policies for mobile and portable devices
ICES-003 Issue 6 2019	Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
RSS-GEN Issue 5 2019	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 10 2019	Licence-Exempt Radio Apparatus: Category I Equipment
ISO 17025:2017	General Requirements for the Competence of Testing and Calibration Laboratories

Client	Lucere Inc.	 Canada
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Document Revision Status

Revision	Date	Description
000	March 12, 2020	Initial Release
-	-	-

Client	Lucere Inc.	
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Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

DTS – Digital Transmission System
LISN – Line Impedance Stabilization Network
NCR – No Calibration Required
NSA – Normalized Site Attenuation
N/A – Not Applicable
RF – Radio Frequency

AE – Auxiliary Equipment. A digital accessory that feeds data into or receives data from another device (host) that in turn, controls its operation.

Antenna Port – Port, other than a broadcast receiver tuner port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.


BW – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

EMI – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

EUT – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

ITE – Information Technology Equipment. Has a primary function of entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer.


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Testing Facility

Testing for EMC on the EUT was carried out at TÜV SÜD Canada testing lab near Toronto, Ontario. The testing lab has calibrated 3m semi-anechoic chambers which allow measurements on a EUT that has a maximum width or length of up to 2m and a height of up to 3m. The testing lab also has a calibrated 10m Open Area Test Site (OATS). The chambers are equipped with a turntable that is capable of testing devices up to 5000lb in weight and are equipped with a mast that controls the polarization and height of the antenna. Control of the mast occurs in the control room adjoining the shielded chamber. This facility is capable of testing products that are rated for single phase or 3-phase AC input and DC capability is also available. Radiated emission measurements are performed using a BiLog antenna and a Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN and using the vertical ground plane if applicable.

Calibrations and Accreditations


The 3m semi-anechoic chamber is registered with Federal Communications Commission (FCC, CA6844), Innovation, Science and Economic Development Canada (ISED, 6844A-3) and Voluntary Control Council for Interference (VCCI, R-14023, G-20072, C-14498, and T-20060). This chamber was calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. The NSA data is kept on file at TÜV SÜD Canada. For radiated susceptibility testing, a 16 point field calibration has been performed on the chamber. The field uniformity data is kept on file at TÜV SÜD Canada. TÜV SÜD Canada Inc. is accredited to ISO 17025 by A2LA with Testing Certificate #2955.02. The laboratory's current scope of accreditation listing can be found as listed on the A2LA website. All measuring equipment is calibrated on an annual or biennial basis as listed for each respective test.

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Testing Environmental Conditions and Dates

Following environmental conditions were recorded in the facility during time of testing

Date	Test	Initials	Temperature (°C)	Humidity (%)	Pressure (kPa)
January 7, 2020	Radiated Emissions	AE	20.6	18.3	101.0

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Detailed Test Results Section

Client	Lucere Inc.	
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Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Maximum Output Power

Purpose

The purpose of this test is to ensure that the maximum equivalent isotropically radiated power does not exceed the limits specified.

Limits and Method

The limits are defined in FCC Part 15.249(a) and RSS-210 F.1(a). The method is given in ANSI C63.10 Section 11.9.


Fundamental Frequency	Field Strength of Fundamental	Field Strength of Harmonics
902 – 928MHz	50 mV/m (94 dBuV/m) at 3m	500 uV/m (54 dBuV/m) at 3m

Harmonic emissions falling into restricted frequency bands listed in RSS-Gen 8.10 Table 7 shall meet the general field strength limits specified in RSS-Gen 8.9 Tables 5 & 6, regardless of the limits given above. See also the Transmitter Spurious Radiated Emissions section of this test report.

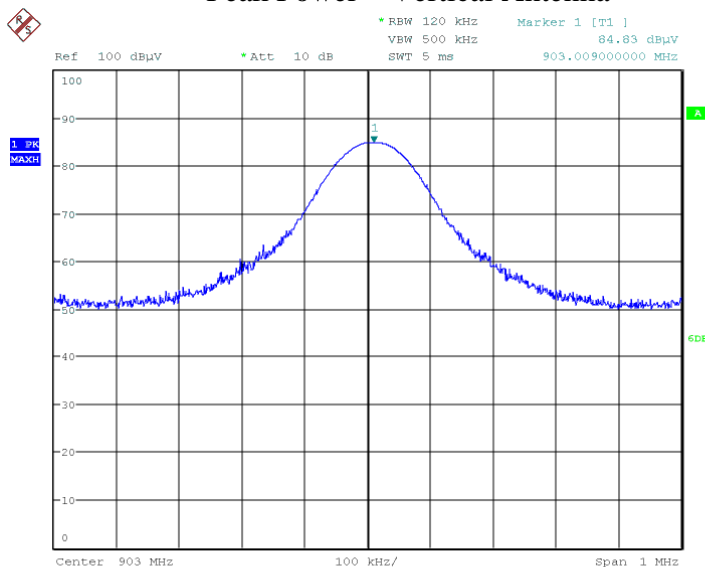
Results

The EUT passed. Maximum field strength of fundamental: 87.0 dB μ V/m

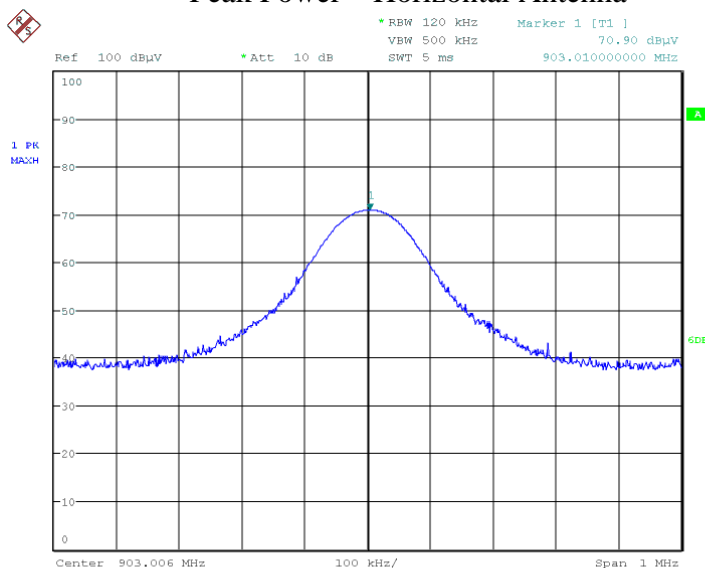
Frequency (MHz)	Antenna Polarization	EUT Axis	Detector	Received Signal (dB μ V)	Total Loss Factors (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Test Result
903.000	Vert	Y	Peak	84.8	2.2	87.0	94.0	7.0	Pass
913.667	Vert	Y	Peak	83.7	2.2	85.9	94.0	8.1	Pass
927.000	Vert	Y	Peak	84.0	2.1	86.1	94.0	7.9	Pass
903.000	Horz	Y	Peak	70.9	2.2	73.1	94.0	20.9	Pass
913.667	Horz	Y	Peak	69.7	2.2	71.9	94.0	22.1	Pass
927.000	Horz	Y	Peak	68.2	2.1	70.3	94.0	23.7	Pass

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Peak Power – Vertical Antenna



Peak Power – Horizontal Antenna



See 'Appendix B – EUT and Test Setup Photos' for photos showing the test set-up.

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Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSU 26	Rohde & Schwarz	Oct. 28, 2019	Oct. 28, 2021	GEMC 232
BiLog Antenna	3142-C	ETS	Oct. 19, 2018	Oct. 19, 2020	GEMC 8
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	NCR	NCR	GEMC 286
Pre-Amp 9 kHz – 1 GHz	LNA-1450	RF Bay Inc.	Oct. 18, 2018	Oct. 11, 2020	GEMC 221
RF Cable 10m	LMR-400-10M- 50Ω-MN-MN	LexTec	NCR	NCR	GEMC 274
RF Cable 2m	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271

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Transmitter Spurious Radiated Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limits and Method

The method is as defined in ANSI C63.10 Section 6.3.

The limits, as defined in FCC Part 15.249(d) and RSS-210 F.1(e) for unintentional radiated emissions, apply for those emissions that fall in the restricted bands defined in FCC Part 15.205(a) and RSS-GEN 8.10 Table 7. These emissions must comply with the radiated emission limits specified in FCC Part 15.209(a) and RSS-GEN 8.9 Tables 5 & 6.


Frequency	Limit
0.009 MHz – 0.490 MHz	2400/F(kHz) uV/m at 30m ¹
0.490 MHz – 1.705 MHz	24000/F(kHz) uV/m at 30m ¹
1.705 MHz – 30 MHz	30 uV/m at 30m ¹
30 MHz – 88 MHz	100 uV/m (40.0 dBuV/m ¹) at 3m
88 MHz – 216 MHz	150 uV/m (43.5 dBuV/m ¹) at 3m
216 MHz – 960 MHz	200 uV/m (46.0 dBuV/m ¹) at 3m
Above 960 MHz	500 uV/m (54.0 dBuV/m ¹) at 3m
Above 1000 MHz	500 uV/m (54 dBuV/m ²) at 3m
Above 1000 MHz	5 mV/m (74 dBuV/m ³) at 3m

¹Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1

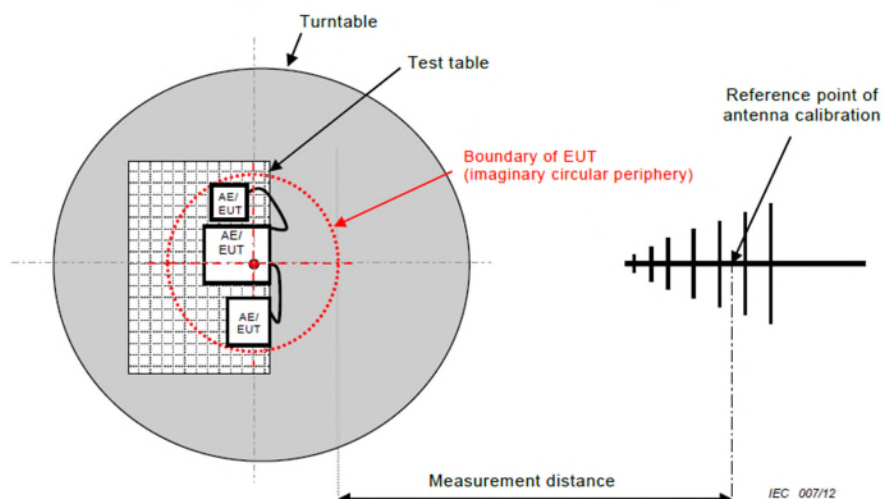
²Limit is with 1 MHz measurement bandwidth and using an Average detector

³Limit is with 1 MHz measurement bandwidth and using a Peak detector

Based on ANSI C63.4 Section 4.2, if the Peak detector measurements do not exceed the Quasi-Peak limits, where defined, then the EUT is deemed to have passed the requirements.

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Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is $\pm 5.67\text{dB}$ for 30MHz – 1GHz and $\pm 4.58\text{dB}$ for 1GHz – 18GHz with a 'k=2' coverage factor and a 95% confidence level.


Preliminary Graphs

The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

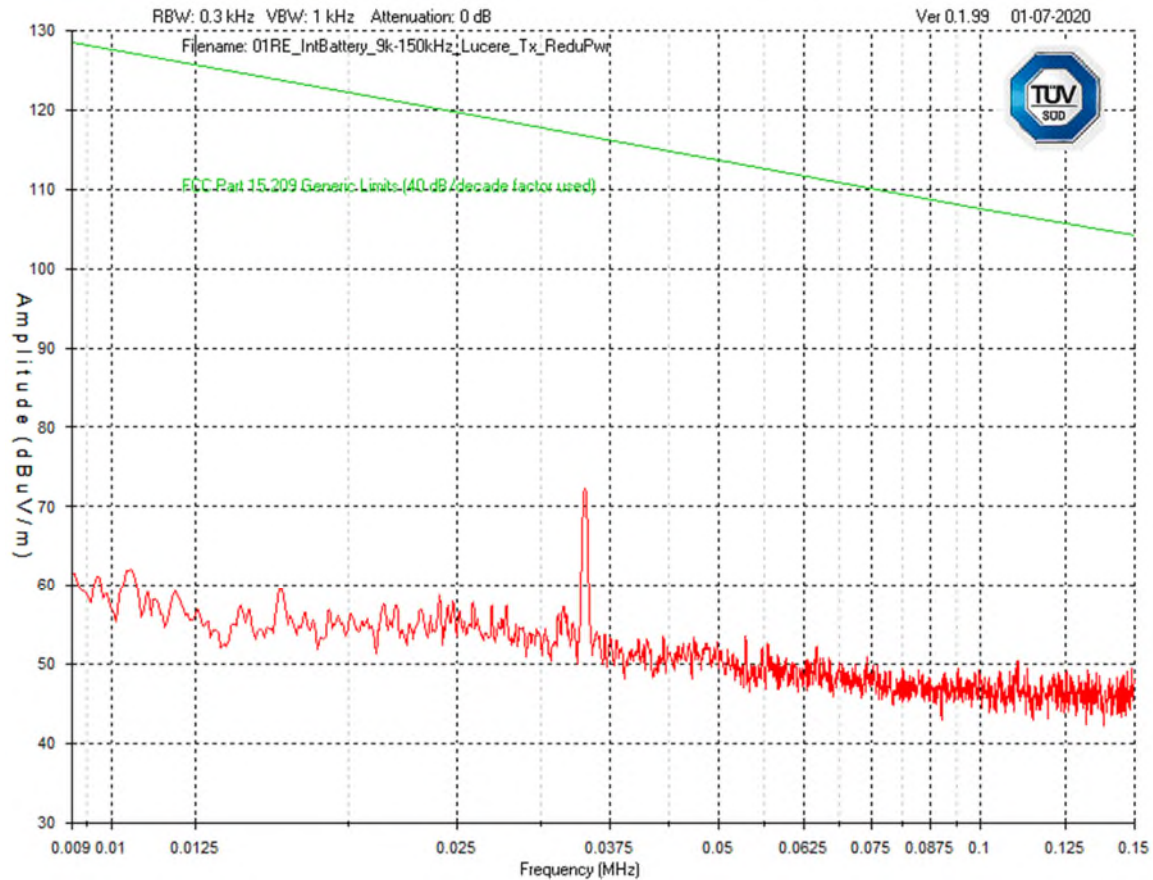
In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10th harmonic (a minimum of 9280 MHz).


Devices scanned may be scanned at alternate test distances and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m / 3m) is applied.

Low, middle and high channels, each in three orthogonal axis were checked. However, the worst case channel is presented.

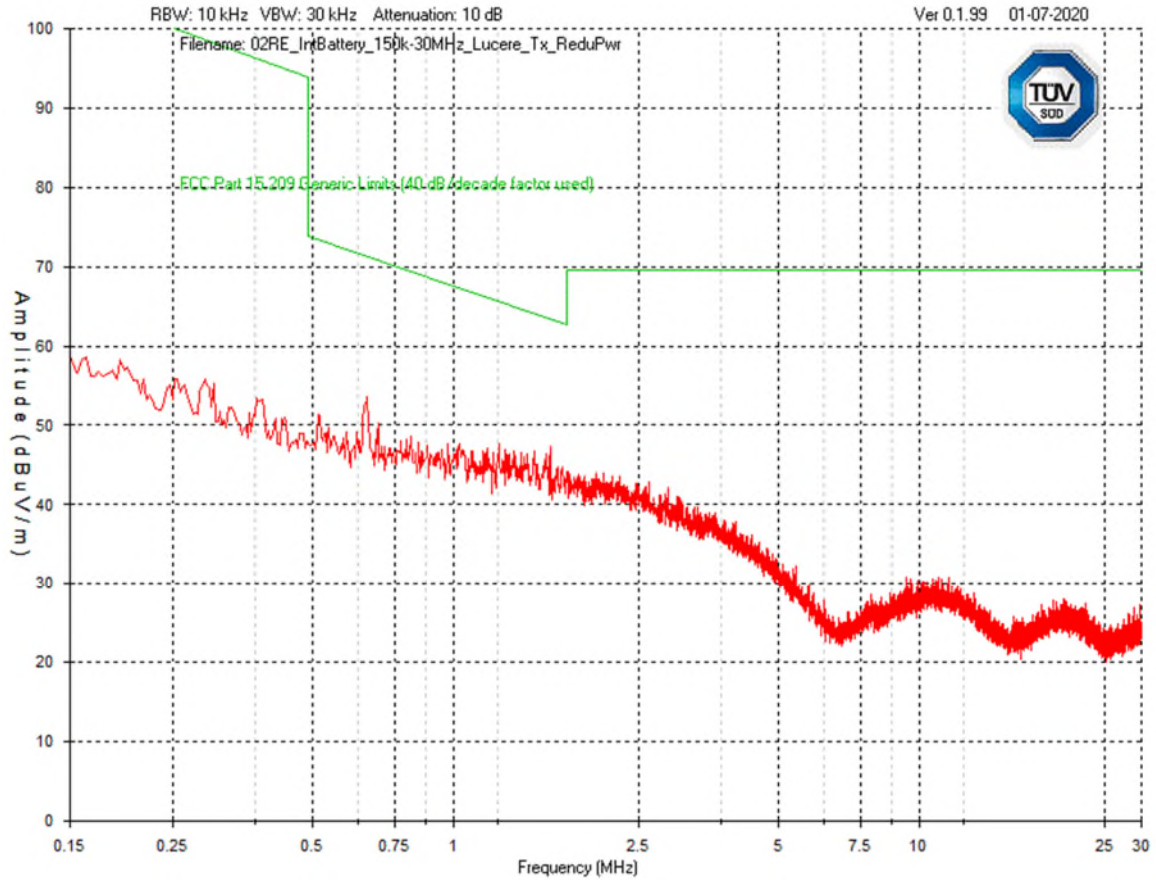
Client	Lucere Inc.	
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Low Channel
9 kHz – 150 kHz
Peak Emission Graph



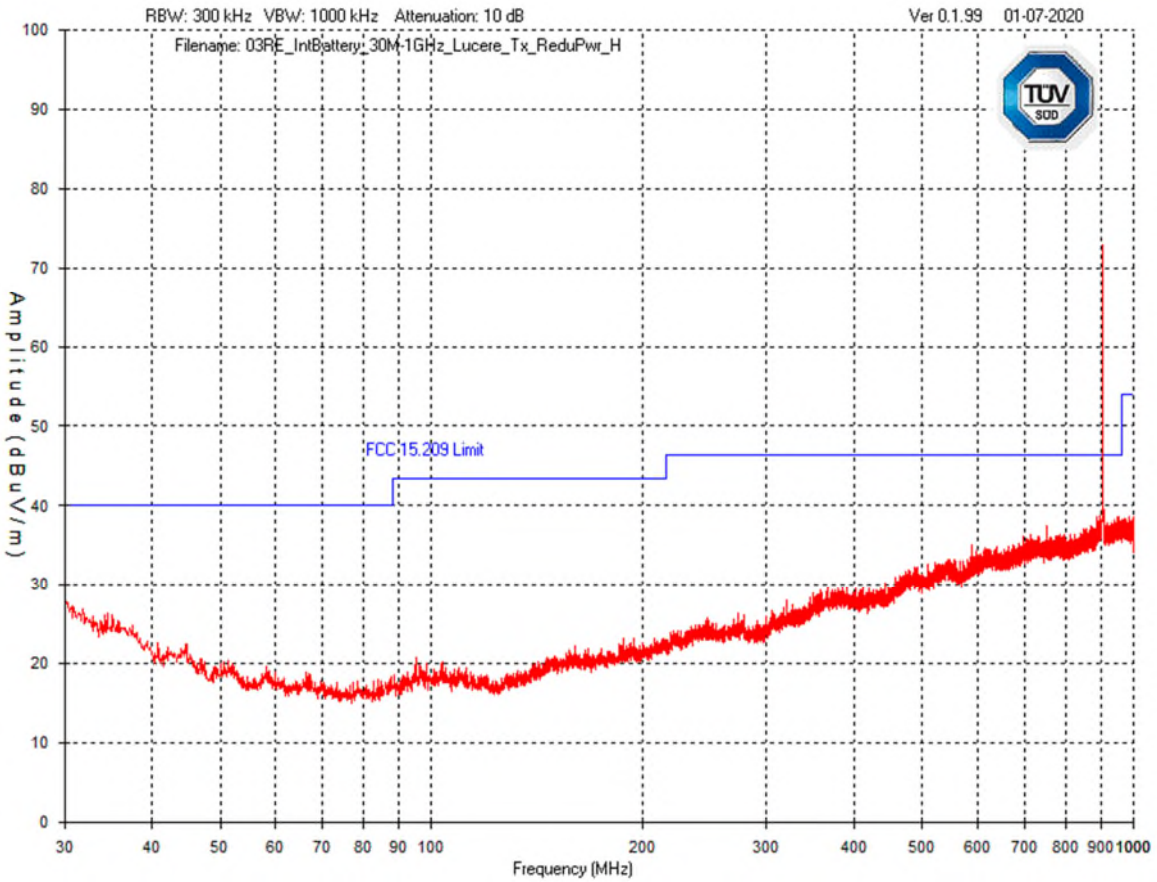
Client	Lucere Inc.	
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Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	


Low Channel
150 kHz – 30 MHz
Peak Emission Graph



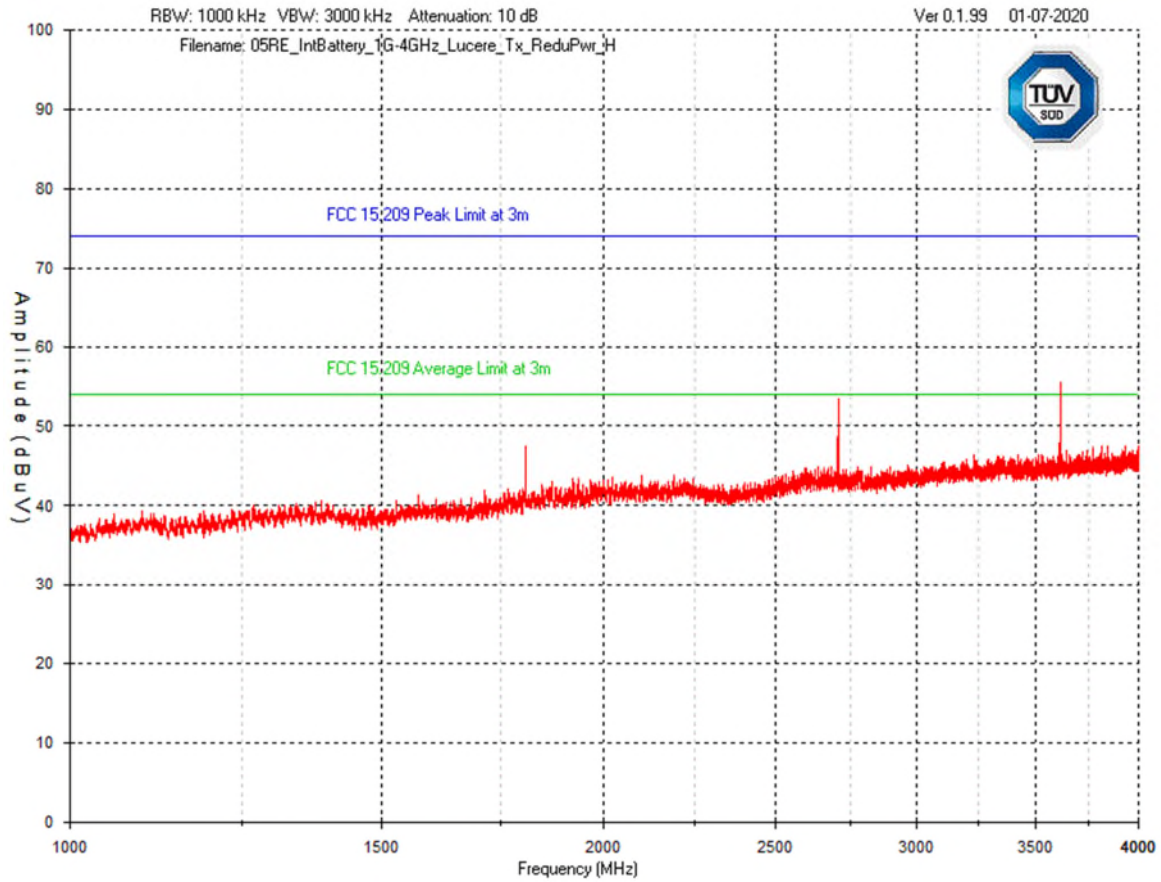
Client	Lucere Inc.	 Canada
Product	Lucere Nomad	
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Low Channel – 30 MHz – 1 GHz
Horizontal - Peak Emission Graph



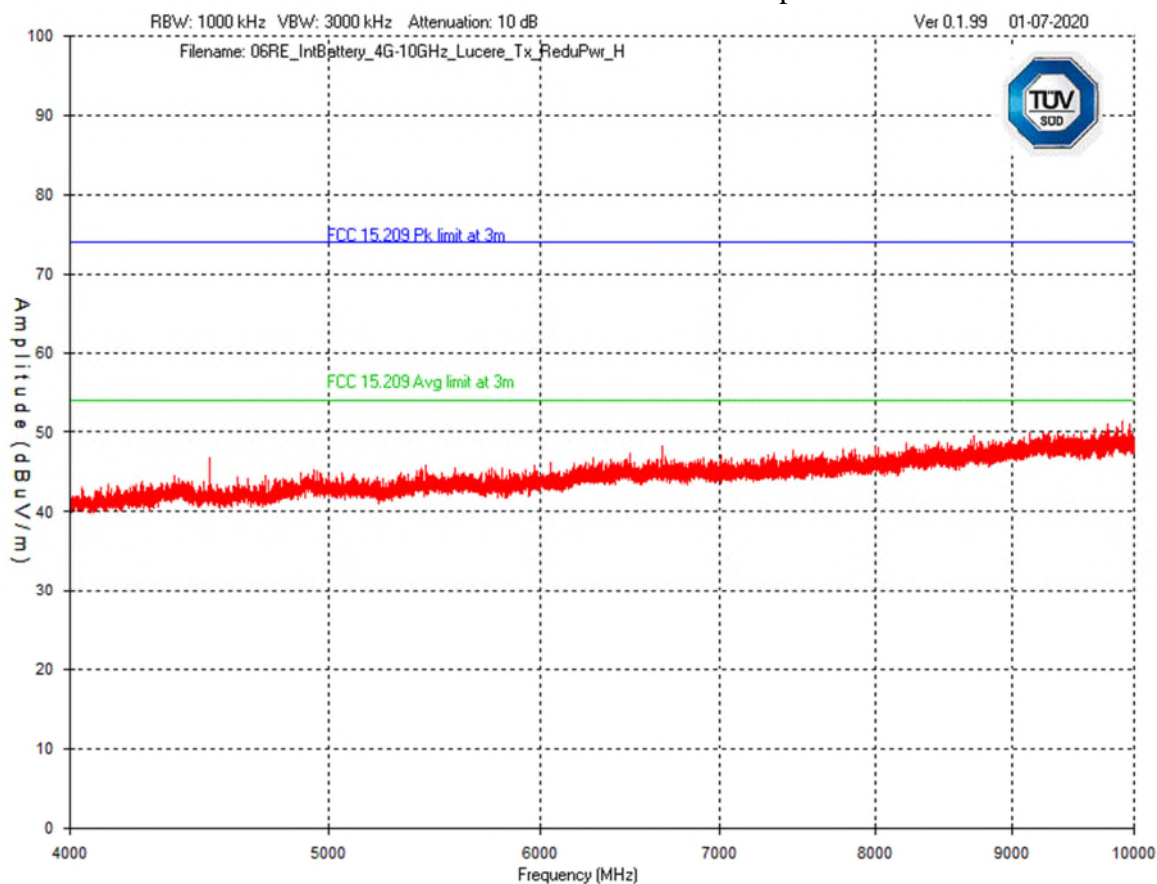
Client	Lucere Inc.	
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Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	


Low Channel – 1 GHz – 4 GHz
Horizontal - Peak Emission Graph



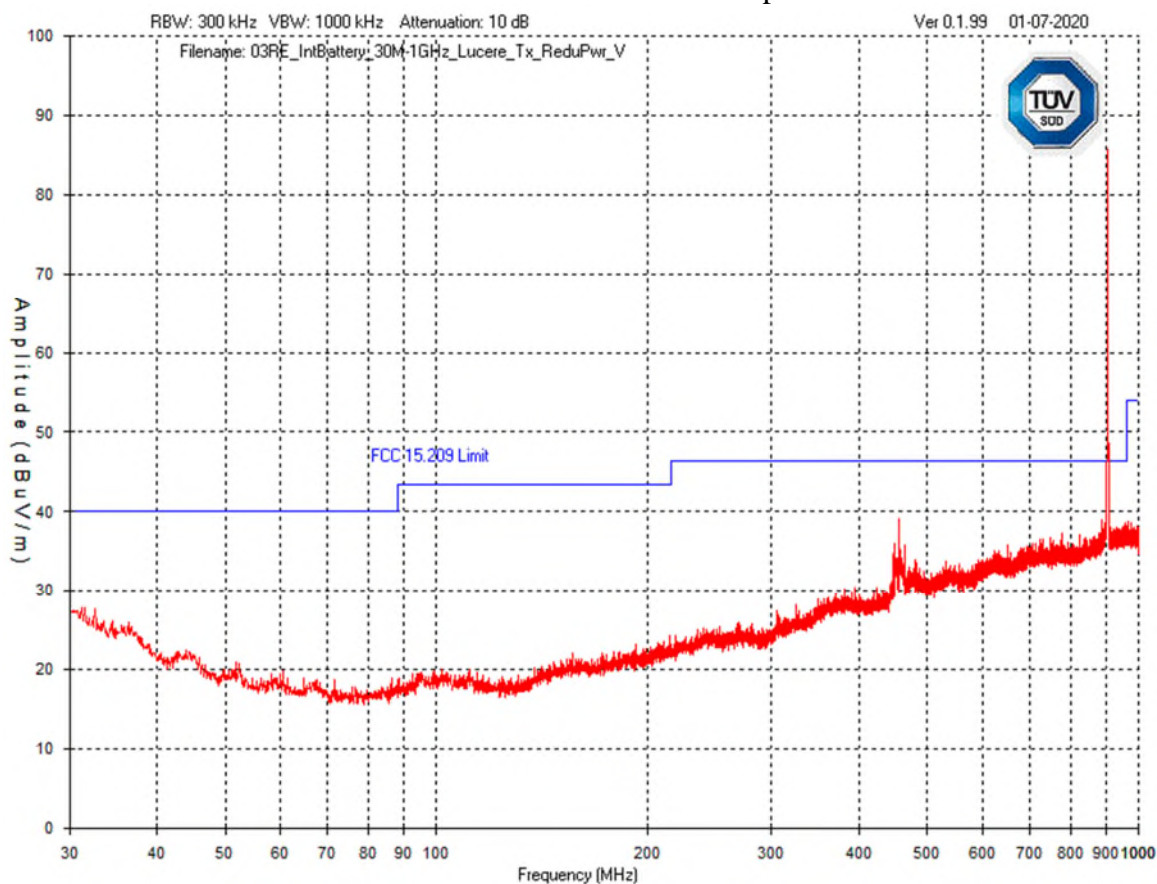
Client	Lucere Inc.	 Canada
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Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	


Low Channel – 4 GHz – 10 GHz
Horizontal - Peak Emission Graph



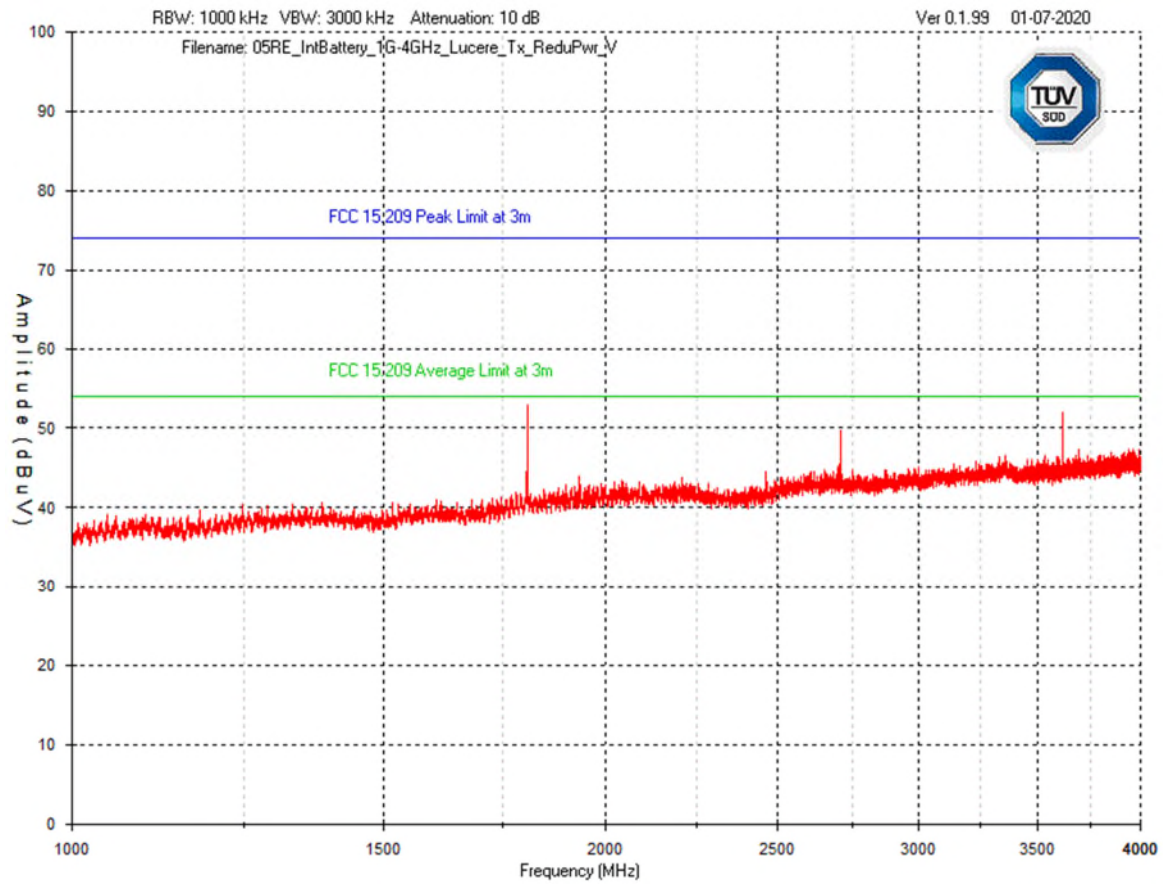
Client	Lucere Inc.	
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	


Low Channel – 30 MHz – 1 GHz
Vertical - Peak Emission Graph



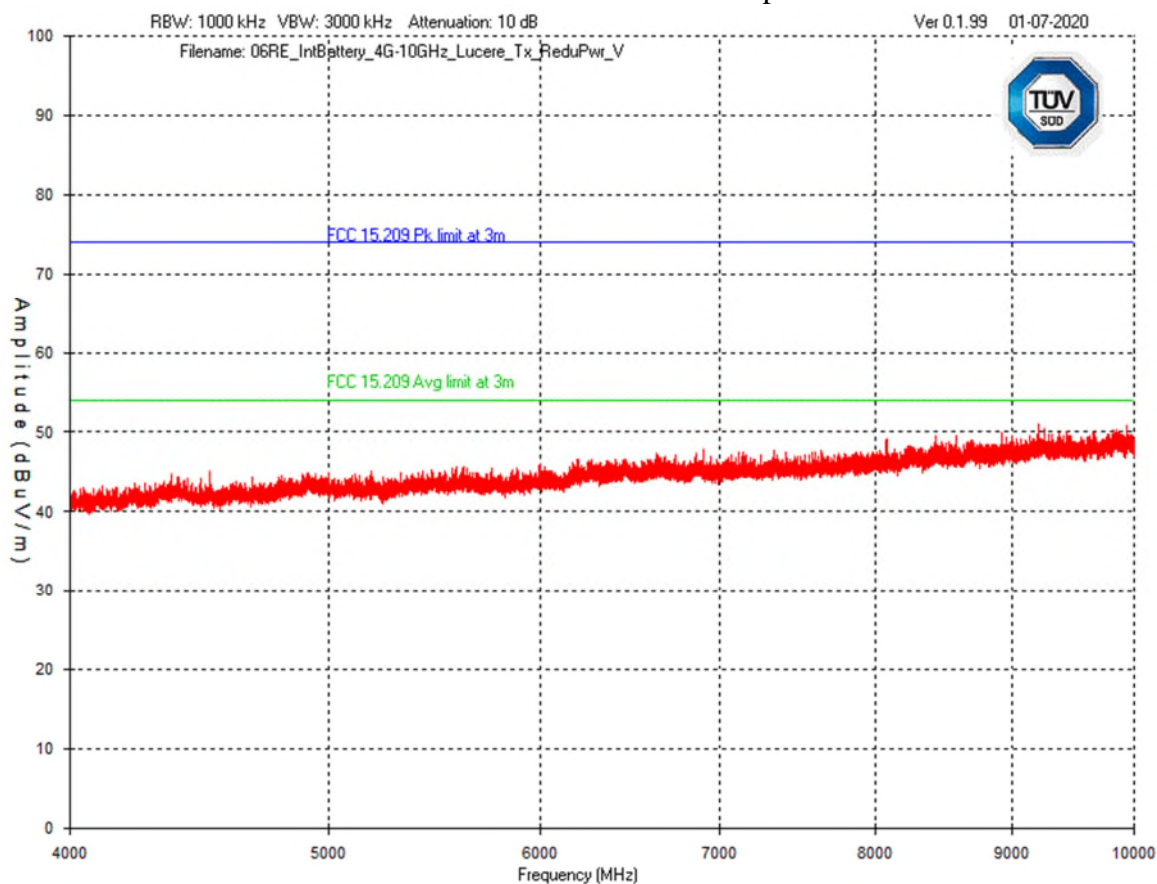
Client	Lucere Inc.	 Canada
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Low Channel – 1 GHz – 4 GHz
Vertical - Peak Emission Graph



Client	Lucere Inc.	 Canada
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Low Channel – 4 GHz – 10 GHz
Vertical - Peak Emission Graph



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Final Measurements and Results

The EUT passed.


The measurements were maximized by rotating the turn table over a full 0-360 rotation and the antenna height was varied from 1 m to 4 m.

Supply			Internal Battery						
Frequency (MHz)	Detector	Received Signal (dBμV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-Amp (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Test Result
Horizontal Antenna Polarization									
752.89	PEAK	36.6	28.0	4.2	-31.3	37.5	46.4	8.9	Pass
587.92	PEAK	37.3	25.8	3.5	-31.5	35.1	46.4	11.3	Pass
30.10	PEAK	37.0	23.1	0.5	-32.1	28.5	40.0	11.5	Pass
3612.00	AVG	51.6	30.7	6.0	-34.7	53.6	54.0	0.4	Pass
2709.00	AVG	51.7	29.6	4.9	-35.8	50.4	54.0	3.6	Pass
1806.00	AVG	48.9	26.5	4.9	-36.2	44.1	54.0	9.9	Pass
Vertical Antenna Polarization									
454.99	PEAK	45.1	23.1	2.8	-31.9	39.1	46.4	7.3	Pass
448.00	PEAK	42.6	22.5	2.8	-31.9	36.0	46.4	10.4	Pass
30.00	PEAK	36.9	23.1	0.5	-32.1	28.4	40.0	11.6	Pass
1806.00	AVG	56.3	26.5	4.9	-36.2	51.5	54.0	2.6	Pass
3612.00	AVG	46.9	30.7	6.0	-34.7	48.9	54.0	5.1	Pass
2709.00	AVG	45.9	29.6	4.9	-35.8	44.6	54.0	9.4	Pass

Note:


Peak = Peak measurement

AVG = Average measurement

Client	Lucere Inc.	 TUV SUD Canada
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Test Equipment List

Equipment	Model No.	Manufacturer	Last Calibration Date	Next Calibration Date	Asset #
Spectrum Analyzer	FSU 26	Rohde & Schwarz	Oct. 28, 2019	Oct. 28, 2021	GEMC 232
Loop Antenna	EM 6871	Electro-Metrics	Feb 15, 2019	Feb 15, 2021	GEMC 70
Loop Antenna	EM 6872	Electro-Metrics	Feb 15, 2019	Feb 15, 2021	GEMC 71
BiLog Antenna	3142-C	ETS	Oct. 19, 2018	Oct. 19, 2020	GEMC 8
Horn Antenna 2 – 18 GHz	WBH218HN	Q-par	Feb. 27, 2018	Feb. 27, 2020	GEMC 6375
Horn Antenna 1 – 18 GHz	AH-118	Com-Power Corporation	Aug. 5, 2019	Aug. 5, 2021	GEMC 214
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	Oct. 19, 2018	Oct. 19, 2020	GEMC 286
Pre-Amp 9 kHz – 1 GHz	LNA 6901	Teseq	Feb. 25, 2019	Feb. 25, 2021	GEMC 168
Pre-Amp 9 kHz – 1 GHz	CPA9230	Chase	Feb. 28, 2018	Feb. 28, 2020	GEMC 301
Pre-Amp 1 – 26.5 GHz	HP 8449B	HP	Jun. 12, 2018	Jun. 12, 2020	GEMC 312
0.98GHz HPF	8IH40-980/T3750	K & L Microwave	NCR	NCR	GEMC 4256
RF Cable 10m	LMR-400-10M-50Ω-MN-MN	LexTec	NCR	NCR	GEMC 274
RF Cable 2m	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271
Emissions Software	0.1.99	TUV SUD Canada, Inc.	NCR	NCR	GEMC 58

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Emission Bandwidth

Purpose

The purpose of this test is to ensure that the upper and lower frequency limits of the transmitter 99% emission power bandwidth remain within the operating frequency limits at all times.

Limits and Method


The method is given in ANSI C63.10 Section 6.9.3 and RSS-GEN 6.7.

The 99% bandwidth of systems using digital modulation techniques operating in the 902 – 928 MHz band shall remain within the operating frequency band at all times. This should be measured with a RBW in the range of 1% to 5% of the occupied bandwidth and a VBW of approximately three times RBW.

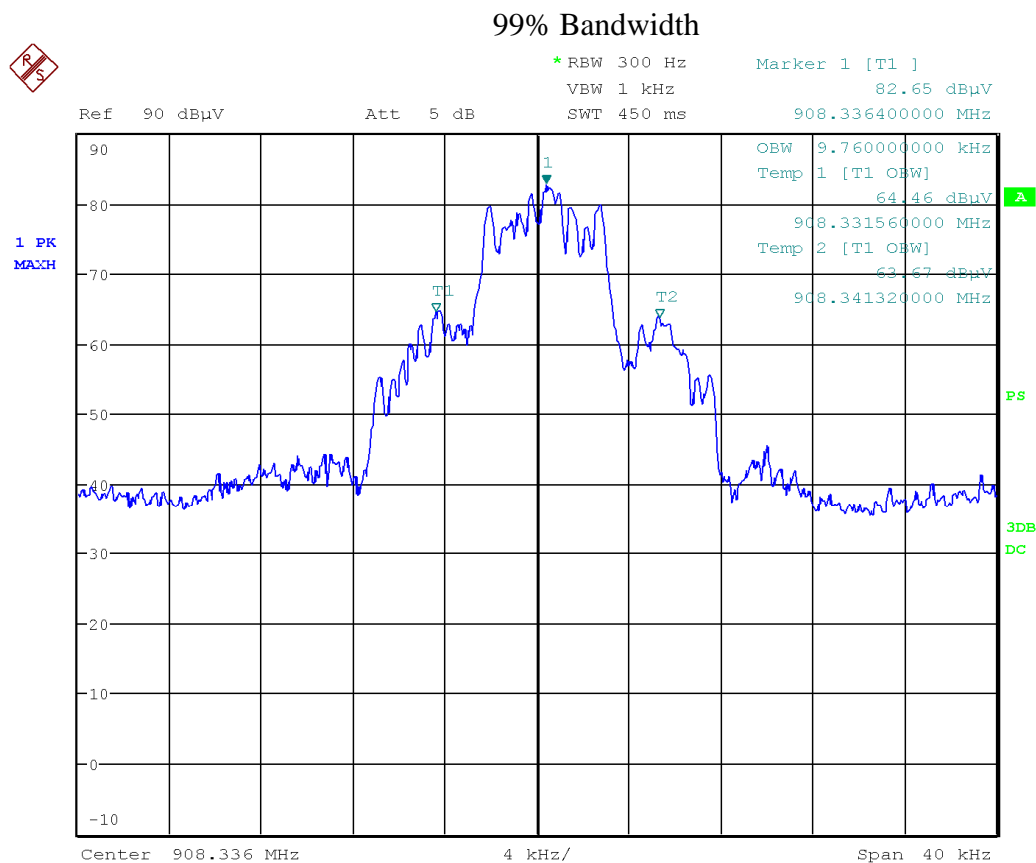
Results

The EUT passed. The 99% bandwidth was measured using the 99% bandwidth function of the spectrum analyzer.


Frequency (MHz)	99% Bandwidth			Result
	F _{LOW} (MHz)	F _{HIGH} (MHz)	Occupied Bandwidth (kHz)	
908.3364	908.33156	908.34132	9.76	Pass

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Graphs




Note: See 'Appendix B – EUT & Test Setup Photos' for photos showing the test set-up.


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BiLog Antenna	3142-C	ETS	Oct. 19, 2018	Oct. 19, 2020	GEMC 8
Attenuator 6 dB	612-6-1	Meca Electronics, Inc	Oct. 19, 2018	Oct. 19, 2020	GEMC 286
Pre-Amp 9 kHz – 1 GHz	CPA9230	Chase	Feb. 28, 2018	Feb. 28, 2020	GEMC 301
RF Cable 10m	LMR-400-10M- 50Ω-MN-MN	LexTec	NCR	NCR	GEMC 274
RF Cable 2m	Sucoflex 104A	Huber+Suhner	NCR	NCR	GEMC 271

Client	Lucere Inc.	 Canada
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Appendix A – EUT Summary


Client	Lucere Inc.	
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

For further details for filing purposes, refer to filing package.

General EUT Description

Client	
Organization / Address	Lucere Inc. Suite 400, 333 Wilson Avenue Toronto, ON M3H 1T2
Contact	Stephen Makk
Phone	416 751-7267 x114
Email	stephen@makk.com
EUT Details	
EUT Name	Lucere
EUT Model	Nomad 012120-0C
FCC ID	2AVQC-NOMAD
IC	25878-NOMAD
Equipment Category	Luminaire (Portable Lighting)
Basic EUT Functionality	Portable lamp with adjustable brightness. It is programmed such that it does not turn on while charging
EUT is powered using	Charging: AC/DC Adaptor Normal Operation: Internal Battery – 3.9V Li-Poly
Input voltage range(s) (V)	120
Frequency range(s) (Hz)	60
Rated input current (mA)	450
Nominal power consumption (W)	2 (at full brightness)
Connectors available on EUT	Micro USB B Jack (Charging Port)
Peripherals Required for Test	None
Release type	Final
Intentional Radiator Frequency	903 – 927 MHz
EUT Configuration	<ul style="list-style-type: none"> - LEDs were off during the tests. - Wireless configured to transmit continuously at 100% duty cycle - Power setting: -2dBm by writing value 0x08 to register "TXPOWERCOEFFB1"

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT and Test Setup Photos'.

Client	Lucere Inc.	 Canada
Product	Lucere Nomad	
Standard(s)	RSS 210 Issue 10:2019 FCC Part 15 Subpart 15.249	

Appendix B – EUT and Test Setup Photos

Refer to the files separate from this test report