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Amended FCC/ISED Test Report

Prepared for:

Inovonics

Address:

11000 Westmoor Circle Building 10, Suite 250 Westminster, CO 80021

R20210831-20-E2C

Product:

EN2222S-60

Test Report No:

Approved by:

Mahendra Karthik Vepuri, NCE EMC Test Engineer, iNARTE Certified EMC Engineer #EMC-041453-E

DATE:

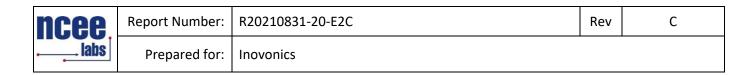
13 July 2022

Total Pages:

37

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REVISION PAGE

Rev. No.	Date	Description
0	31 December 2021	Original – NJohnson
		Prepared by KVepuri
А	14 June 2022	Section 4.0 and Appendix C were modified -KV
В	22 June 2022	Model number is updated on manufacturers request-KV
С	13 July 2022	Conducted output powers have been added to section 4.0 -KV



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1.0 SUMMARY OF TEST RESULTS

The worst-case measurements were reported in this report. Summary of test results presented in this report correspond to the following section:

FCC Part 15.247

The EUT has been tested according to the following specifications:

- (1) US Code of Federal Regulations, Title 47, Part 15
- (2) ISED RSS-Gen, Issue 5
- (3) ISED RSS-247, Issue 2

APPLIED STANDARDS AND REGULATIONS						
Standard Section	Test Type	Result				
FCC Part 15.35 RSS Gen, Issue 5, Section 6.10	Duty Cycle	Pass				
FCC Part 15.247(b)(3) RSS-247 Issue 2 Section 5.2	Peak output power	Pass				
FCC Part 15.247(a)(2) RSS-247 Issue 2 Section 5.2	Bandwidth	Pass				
FCC Part 15.209 RSS-Gen Issue 5, Section 7.1	Receiver Radiated Emissions	Pass				
FCC Part 15.209 (restricted bands), 15.247 (unrestricted) RSS-247 Issue 2 Section 5.5, RSS-Gen Issue 4, Section 8.9	Transmitter Radiated Emissions	Pass				
FCC Part 15.247(e) RSS-247 Issue 2 Section 5.2	Power Spectral Density	Pass				
FCC Part 15.209, 15.247(d) RSS-247 Issue 2 Section 5.5	Band Edge Measurement	Pass				
FCC Part 15.207 RSS-Gen Issue 5, Section 7.2	Conducted Emissions	NA-Battery powered device				

See Section 4 for details on the test methods used for each test.



2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary and Operating Condition:

EUT	EN2222S-60
EUT Received	12/1/2021
EUT Tested	12/2/2021- 12/23/2021
Serial No./ Tx ID	02905418
Operating Band	2400 – 2483.5 MHz
Device Type	 ☑ BLE BT BR □ BT EDR 2MB □ BT EDR 3MB □ 802.11x
Voltage	3V Coin Cell Battery (CR2032)

NOTE: For more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 DESCRIPTION OF TEST MODES

The operating range of the EUT is dependent on the device type found in section 2.1:

For Bluetooth Transmissions:				
Channel Frequency				
Low	2402 MHz			
Mid	2426 MHz			
High	2480 MHz			

These are the only representative channels tested in the frequency range according to FCC Part 15.31 and RSS-Gen Table A1. See the operational description for a list of all channel frequency and designations.

2.3 DESCRIPTION OF SUPPORT UNITS

None



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3.1 LABORATORY DESCRIPTION

All testing was performed at the following Facility:

The Nebraska Center for Excellence in Electronics (NCEE Labs) 4740 Discovery Drive Lincoln, NE 68521

A2LA Certificate Number:	1953.01
FCC Accredited Test Site Designation No:	US1060
Industry Canada Test Site Registration No:	4294A-1
NCC CAB Identification No:	US0177

Environmental conditions varied slightly throughout the tests:

Relative humidity of $35 \pm 4\%$ Temperature of $22 \pm 3^{\circ}$ Celsius



3.2 TEST PERSONNEL

No.	PERSONNEL TITLE F		ROLE
1	Nic Johnson	Technical Manager	Review/editing
2	Karthik Vepuri	Test Engineer	Testing and report
3	Fox Lane	Test Engineer	Testing

Notes:

All personnel are permanent staff members of NCEE Labs. No testing or review was sub-contracted or performed by sub-contracted personnel.



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3.3 TI	ECT EA	IIIDMENT	
J.J		UIPMENT	

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE	CALIBRATION DUE DATE	
Keysight MXE Signal Analyzer (44GHz)	N9038A	MY59050109	July 21, 2021	July 21, 2023	
Keysight MXE Signal Analyzer (26.5GHz)	N9038A	MY56400083	May 5, 2020	May 5, 2023	
Keysight EXA Signal Analyzer	N9010A	MY56070862	July 20, 2021	July 20, 2023	
SunAR RF Motion	JB1	A091418	July 27, 2021	July 27, 2022	
EMCO Horn Antenna	3115	6415	March 16, 2020	March 16, 2022	
EMCO Horn Antenna	3116	2576	March 9, 2020	March 9, 2022	
Com-Power LISN 50μH / 250μH - 50Ω	LI-220C	20070017	September 22, 2020	September 22, 2022	
8447F POT H64 Preamplifier*	8447F POT H64	3113AD4667	February 1, 2021	February 1, 2022	
Rohde & Schwarz Preamplifier*	TS-PR18	3545700803	April 14, 2020	April 14, 2022	
Trilithic High Pass Filter*	6HC330	23042	April 14, 2020	April 14, 2022	
ETS – Lindgren- VSWR on 10m Chamber	10m Semi- anechoic chamber- VSWR	4740 Discovery Drive	July 30, 2020	July 30, 2023	
NCEE Labs-NSA on 10m Chamber	10m Semi- anechoic chamber- NSA	NCEE-001	October 25, 2019	October 25, 2022	
TDK Emissions Lab Software	V11.25	700307	NA	NA	
RF Cable (preamplifier to antenna)*	MFR-57500	01-07-002	April 14, 2020	April 14, 2022	
RF Cable (antenna to 10m chamber bulkhead)*	FSCM 64639	01E3872	September 24, 2021	September 24, 2023	
RF Cable (10m chamber bulkhead to control room bulkhead)*	FSCM 64639	01E3864	September 24, 2021	September 24, 2023	
RF Cable (control room bulkhead to test receiver)*	FSCM 64639	01F1206	September 24, 2021	September 24, 2023	
N connector bulkhead (10m chamber)*	PE9128	NCEEBH1	September 24, 2021	September 24, 2023	
N connector bulkhead (control room)* *Internal Characterization	PE9128	NCEEBH2	September 24, 2021	September 24, 2023	

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*Internal Characterization

Notes: All equipment is owned by NCEE Labs and stored permanently at NCEE Labs facilities.



3.4 GENERAL TEST PROCEDURE AND SETUP FOR RADIO MEASUREMNTS

Measurement type presented in this report (Please see the checked box below):

Conducted \Box

The conducted measurements were performed by connecting the output of the transmitter directly into a spectrum analyzer using an impedance matched cable and connector soldered to the EUT in place of the antenna. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in the Appendix C. All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

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Figure 1 - Bandwidth Measurements Test Setup

Radiated 🛛

All the radiated measurements were taken at a distance of 3m from the EUT. The information regarding resolution bandwidth, video bandwidth, span and the detector used can be found in the graphs provided in the Appendix C. All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

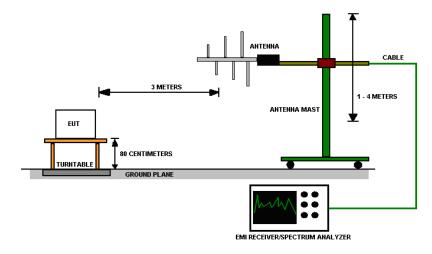
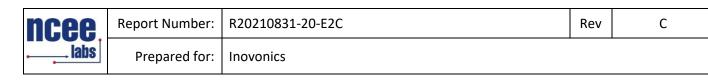


Figure 2 - Radiated Emissions Test Setup



4.0 RESULTS

	DTS Radio Measurements									
CHANNEL	Occupied Bandwidth (kHz)	6 dB Bamdwidth (kHz)	EIRP PEAK OUTPUT POWER (dBm)	PEAK OUTPUT POWER (mW)	Gain (dB)	CONDUCTED PEAK OUTPUT POWER (dBm)	PSD (dBm)	RESULT		
Low	1057.70	702.20	6.654	4.628	1.7	4.954	-9.886	PASS		
Mid	1052.90	714.30	6.302	4.268	1.7	4.602	-10.244	PASS		
High	1054.50	701.90	5.120	3.251	1.7	3.420	-11.309	PASS		
Occupied Ba	Occupied Bandwidth = N/A; 6 dB Bandwidth Limit = 500 kHz					er Limit = 30 dBm out Power =EIRP				

*EIRP Peak output power is the worst-case power. Antenna gain is declared by the manufacturer with the help of a data sheet provided to the test lab. Some of the results in this report can be affected by the declared antenna gain.

Unrestricted Band-Edge									
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Relative Highest out of band level (dBm)	Relative Fundamental (dBm)	Delta (dB)	Min Delta (dB)	Result		
Low	BLE	2400.00	17.00	66.69	49.69	20.00	PASS		
High	BLE	2483.50	15.38	58.08	42.71	20.00	PASS		

Peak Restricted Band-Edge									
CHANNELModeBand edge /Measurement Frequency (MHz)Highest out of band level (dBuV/m @ 3m)Measurement Measurement TypeLimit (dBuV/m @ 3m)Margin Res									
Low	BLE	2390.00	48.34	Peak	73.98	25.64	PASS		
High	BLE	2483.50	50.11	Peak	73.98	23.87	PASS		
Low	BLE	2390.00	39.25	Average	53.98	14.74	PASS		
High	BLE	2483.50	39.52	Average	53.98	14.46	PASS		
*Limit shown	is from FCC Pa	art 15.209							

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	_	Corre	ctions and I	Raw Values for E	IRP		
Channel	Antenna Factor (dB)	Cable Loss (dB)	dBm to dBuV	EIRP Conversion from 3m	Correction/Reference level offset		
Low 28.38 5.77 107 95.23 45.92							
Mid 28.34 6.42 107 95.23 46.53							
High 28.39 5.79 107 95.23 45.95							
EIRP (dB	EIRP (dBm) at 3 m test distance = Uncorrected Level (dBm) - 95.23 +107+Antenna Factor+ Cable Loss						



4.1

Test Method: All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

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Limits of power measurements:

For FCC Part 15.247 Device:

The maximum allowed peak output power is 30 dBm.

Test procedures:

Details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

Details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

- 1. All the output power plots can be found in the Appendix C.
- 2. All the measurements were found to be compliant.
- 3. The measurements are listed in the table under Section 4.0



4.2 **POWER SPECTRAL DENSITY**

Test Method: All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

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Limits of power measurements:

For FCC Part 15.247 Device: The maximum PSD allowed is 8 dBm.

Test procedures:

Details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

Details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

- 4. All the Power Spectral Density (PSD) plots can be found in the Appendix C.
- 5. All the measurements were found to be compliant.
- 6. The measurements are reported on the graph.



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Test Method: All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

Limits of bandwidth measurements:

For FCC Part 15.247 Device:

The 99% occupied bandwidth is for informational purpose only. The 6dB bandwidth of the signal must be greater than 500 kHz.

Test procedures:

Details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

Test setup details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

- 1. All the bandwidth plots can be found in the Appendix C.
- 2. All the measurements were found to be compliant.



4.4 DUTY CYCLE

Manufacturer declared that the maximum duty cycle possible is 30 ms in a given 100 ms period. So, Duty cycle correction factor is $20 \log 30/100 = -10.45$ dB



Test Method: ANSI C63.10-2013, Section 6.5, 6.6

Limits for radiated emissions measurements:

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

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FREQUENCIES (MHz)	FIELD STRENGTH (μV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.

2. Emission level (dBuV/m) = 20 * log * Emission level (μ V/m).

3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.



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Test procedures:

a. The EUT was placed on the top of a rotating table above the ground plane in a 10 meter semianechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The table was 0.8m high for measurements from 30MHz-1Ghz and 1.5m for measurements from 1 GHz up to 25 GHz, to include the 10th harmonic.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

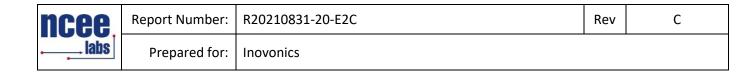
d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise, the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. The EUT was maximized in all 3 orthogonal positions. The results are presented for the axis that had the highest emissions.

h. For spurious emissions from 30MHz – 1GHz, the emissions were investigated at the lowest, middle and highest channel. The worse-case results are presented.



Test setup:

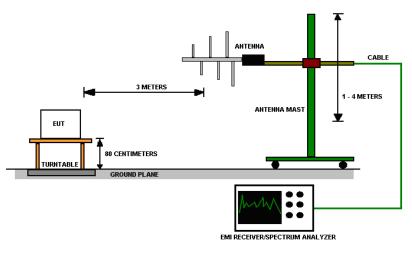


Figure 3 - Radiated Emissions Test Setup

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth 1 MHz for all measurements and at frequencies above 1GHz, A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

Deviations from test standard:

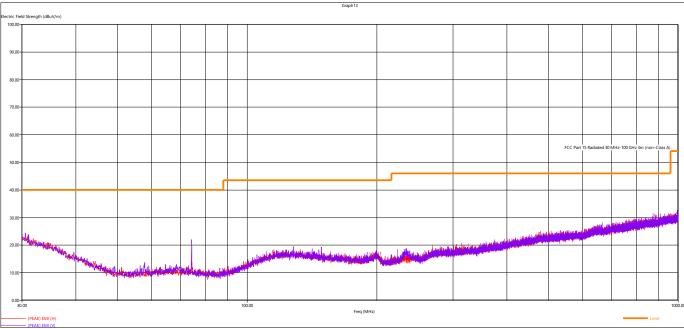
No deviation.

EUT operating conditions

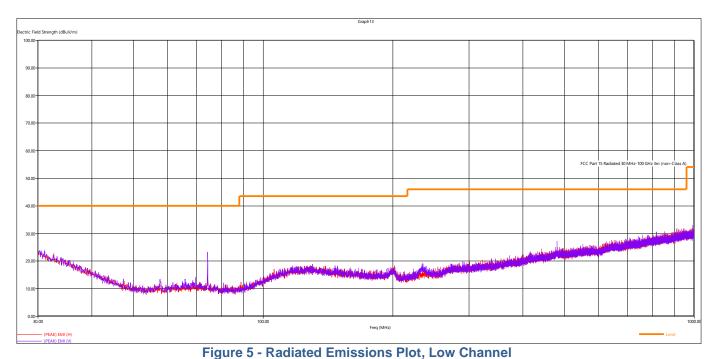
Details can be found in section 2.1 of this report.



Test results:







REMARKS:

- 1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
- 2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
- 3. The other emission levels were very low against the limit.
- 4. Margin value = Emission level Limit value

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	Peak Measurements, Bluetooth							
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation
MHz	dBµV/m	dBµV/m	dB	cm.	deg.			
2402.634	102.32	NA	NA	484	322	Н	Low	BLE
2425.746	101.91	NA	NA	413	338	Н	Mid	BLE
2479.332	101.66	NA	NA	388	350	Н	High	BLE

The EUT was maximized in all 3 orthogonal axis. The worst-case is shown in the plots and tables above. If the measurements were found to be 10 dB below the limit, they were not reported.



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4.6 BAND EDGES

Test Method: All the radio measurements were performed using the sections from ANSI C63.10, details about the section used can be found in the spectrum analyzer titles on the graph.

Limits of band-edge measurements: From FCC Part 15.247 Device:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.205(c))

Test procedures:

The highest emissions level beyond the band-edge was measured and recorded. All band edge measurements were evaluated to the general limits in Part 15.209. More details can be found in section 3.4 of this report.

Deviations from test standard:

No deviation.

Test setup:

Test setup details can be found in section 3.4 of this report.

EUT operating conditions:

Details can be found in section 2.1 of this report.

Test results:

Pass

- 1. All the band edge plots can be found in the Appendix C.
- 2. If the device falls under FCC Part 15.247 (Details can be found in summary of test results), compliance is shown in the unrestricted band edges by showing minimum delta of 20 dB between peak and the band edge.
- 3. The restricted band edge compliance is shown by comparing to the general limit defined in Part 15.209. The limit shown in the graph accounts for the antenna gain of the device.



APPENDIX A: SAMPLE CALCULATION

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Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows: FS = RA + AF - (-CF + AG) + AV

where FS = Field Strength

RA = Receiver Amplitude AF = Antenna Factor CF = Cable Attenuation Factor AG = Amplifier Gain AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dB μ V is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dB μ V/m.

 $FS = 55 + 12 - (-1.1 + 20) + 0 = 48.1 \text{ dB}\mu\text{V/m}$

The 48.1 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

Level in μ V/m = Common Antilogarithm [(48.1 dB μ V/m)/20]= 254.1 μ V/m

AV is calculated by the taking the $20^{100}(T_{on}/100)$ where T_{on} is the maximum transmission time in any 100ms window.

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EIRP Calculations

In cases where direct antenna port measurement is not possible or would be inaccurate, output power is measured in EIRP. The maximum field strength is measured at a specified distance and the EIRP is calculated using the following equation;

EIRP (Watts) = [Field Strength (V/m) x antenna distance (m)]² / 30

Power (watts) = 10^[Power (dBm)/10] / 1000

Voltage ($dB\mu V$) = Power (dBm) + 107 (for 50 Ω measurement systems)

Field Strength (V/m) = 10^{Field} Strength (dB μ V/m) / 20] / 10^{6}

Gain = 1 (numeric gain for isotropic radiator)

Conversion from 3m field strength to EIRP (d=3):

 $EIRP = [FS(V/m) \times d^2]/30 = FS[0.3]$ for d = 3

 $EIRP(dBm) = FS(dB\mu V/m) - 10(log 10^9) + 10log[0.3] = FS(dB\mu V/m) - 95.23$

10log(10^9) is the conversion from micro to milli



APPENDIX B - MEASUREMENT UNCERTAINTY

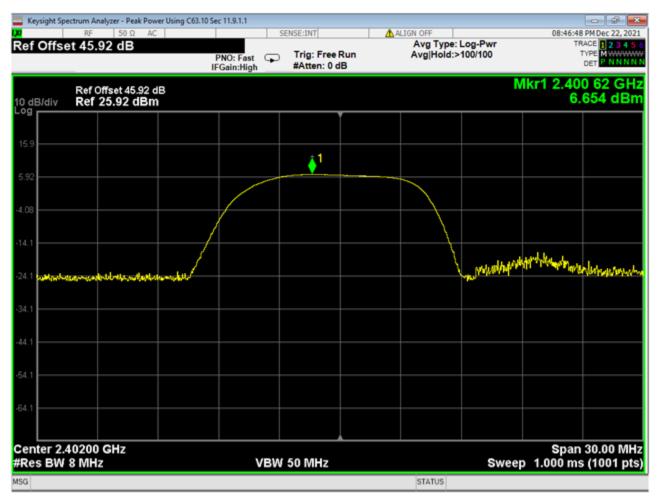
Where relevant, the following measurement uncertainty levels have been for tests performed in this test report:

Test	Frequency Range	Uncertainty Value (dB)
Radiated Emissions, 3m	30MHz - 1GHz	3.82
Radiated Emissions, 3m	1GHz - 18GHz	4.44
Emissions limits, conducted	30MHz – 18GHz	±3.30 dB

Expanded uncertainty values are calculated to a confidence level of 95%.

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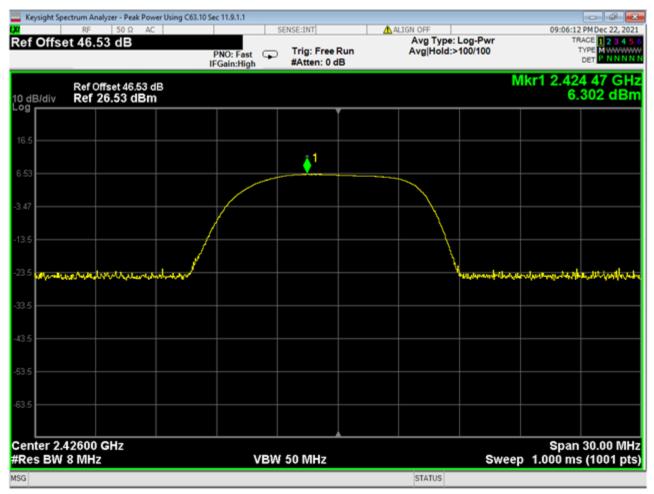
APPENDIX C – GRAPHS AND TABLES



01 EIRP Output Power Low Channel*

*Radiated Measurement, all the corrections including EIRP conversion is included as an offset. For details about the offset see section 4.0.

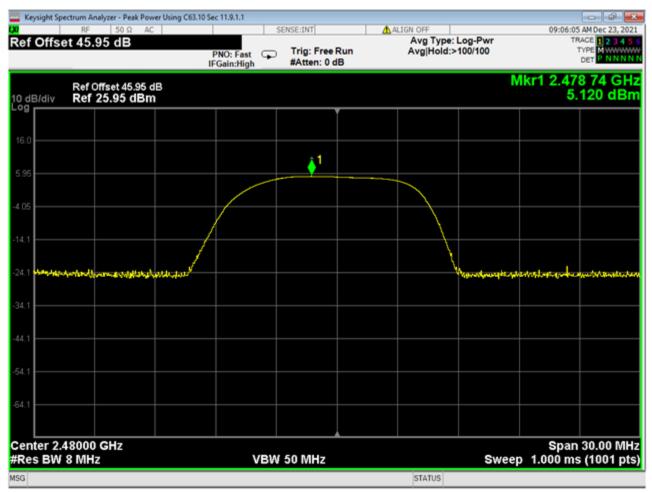
ncee.	Report Number:	R20210831-20-E2C	Rev	С
labs	Prepared for:	Inovonics		



02 EIRP Output Power Mid Channel

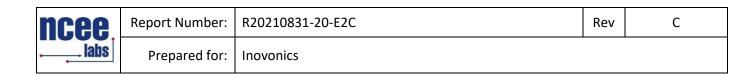
*Radiated Measurement, all the corrections including EIRP conversion is included as an offset. For details about the offset see section 4.0.

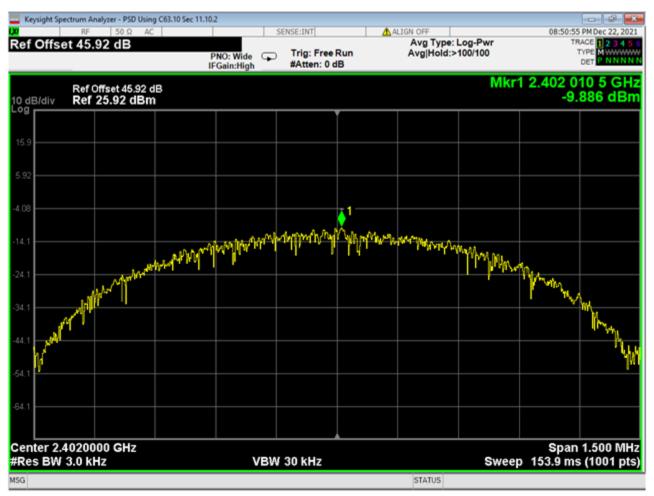
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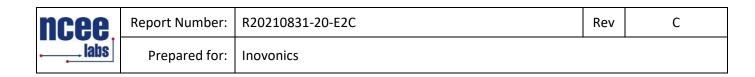
03 EIRP Output Power High Channel

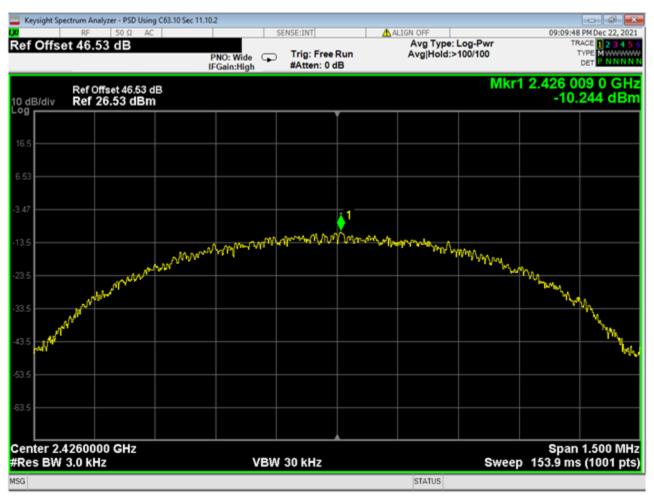
*Radiated Measurement, all the corrections including EIRP conversion is included as an offset. For details about the offset see section 4.0.



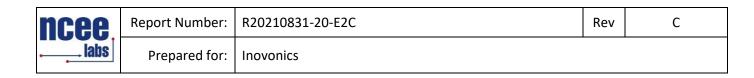


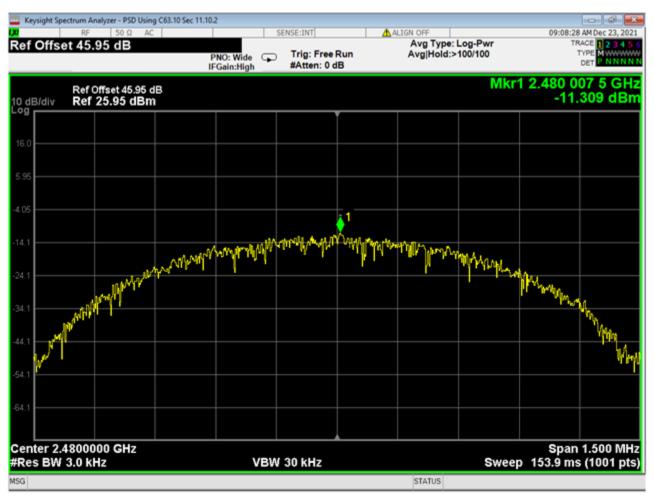
04 Power Spectral Density Low Channel



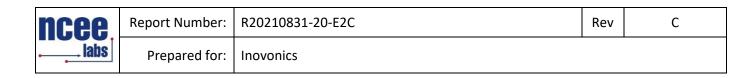


05 Power Spectral Density Mid Channel





06 Power Spectral Density High Channel



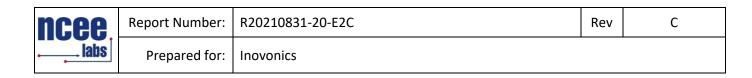
Keysight Spectrum Analyzer - BW using C63.	10 Sec 11.8.1			
ef Value 0.00 dBm		Center Freq: 2.402000000		08:52:22 PM Dec 22, 20 Radio Std: None
	#FGain:Low	Trig: Free Run #Atten: 0 dB	Avg Hold:>10/10	Radio Device: BTS
dB/div Ref 0.00 dBm				
0.0				
.0				
.0				
0		m		
.0				
.0				
.0	human		hang	
.0				
.0			m	man man
enter 2.402000 GHz				Span 5.000 Mi
tes BW 100 kHz		VBW 1 MHz		Sweep 1 n
Occupied Bandwidth	n	Total Power	-33.6 dBm	
	י 0577 MHz	Total Power	-33.6 dBm	
1.0		Total Power % of OBW Power	-33.6 dBm 99.00 %	
1.(Transmit Freq Error)577 MHz			
1.(Transmit Freq Error	-6.325 kHz	% of OBW Power	99.00 %	
1.(Transmit Freq Error	-6.325 kHz	% of OBW Power	99.00 %	
Occupied Bandwidth 1.(Transmit Freq Error x dB Bandwidth	-6.325 kHz	% of OBW Power	99.00 %	

07 Bandwidth Low Channel

ncee.	Report Number:	R20210831-20-E2C	Rev	С
labs	Prepared for:	Inovonics		

Keysight Spectrum Analyzer - BW using C63	.10 Sec 11.8.1			
RF 50Ω DC		SENSE:INT AL Center Freq: 2.426000000	IGN OFF	09:10:56 PM Dec 22, 20 Radio Std: None
ef Value 0.00 dBm		Tolor Free Dure	Avg Hold:>10/10	Radio Sta: None
	#IFGain:Low	#Atten: 0 dB		Radio Device: BTS
dB/div Ref 0.00 dBm				
pg a second seco				
0.0				
.0				
.0		Common March		
0				
	/		\	
	/			
.0	A second		m	
	w		mm -	manan
enter 2.426000 GHz				Span 5.000 Mi
tes BW 100 kHz		VBW 1 MHz		Sweep 1 n
Occupied Bandwidt	n	Total Power	-35.0 dBm	
) 529 MHz			
Transmit Freq Error	-6.029 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	714.3 kHz	x dB	-6.00 dB	
			STATUS	

08 Bandwidth Mid Channel



Keysight Spectrum Analyzer - BW using C63.	10 Sec 11.8.1			
enter Freq 2.480000000	GHz	Center Freq: 2.48000000	IGN OFF GHz Avg Hold:>10/10	09:13:10 PM Dec 22, 20 Radio Std: None Radio Device: BTS
	#IFGain:Low	#Atten. V db		Radio Device. D 13
dB/div Ref 0.00 dBm				
dB/div Ref 0.00 dBm				
.0				
0				
0				
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0 mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm	www.		- mar	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
enter 2.480000 GHz				Span 5.000 MI
es BW 100 kHz		VBW 1 MHz		Sweep 1 n
Occupied Bandwidth	1	Total Power	-41.9 dBm	
) 545 MHz	Total Power	-41.9 dBm	
1.0		Total Power % of OBW Power		
1.(Transmit Freq Error)545 MHz			
Occupied Bandwidth 1.(Transmit Freq Error x dB Bandwidth	-7.453 kHz	% of OBW Power	99.00 %	
1.(Transmit Freq Error	-7.453 kHz	% of OBW Power	99.00 %	
1.(Transmit Freq Error	-7.453 kHz	% of OBW Power	99.00 %	

09 Bandwidth High Channel

ncee.	Report Number:	R20210831-20-E2C	Rev	С
labs	Prepared for:	Inovonics		

Keysight Spectru		stricted LBE using C	53.10 Sec 11.13.2	_						
put Mech	Atten 0 d	B	PNO: Wide (IFGain:High		g: Free Run ten: 0 dB	ALIC	Avg Type: Avg Hold:>		T	5 PM Dec 22, 20 RACE 2 3 4 TYPE A NN DET ANN
dB/div	Ref 86.99 dl	ΒμV						Mkr1	2.480 2 58.0	27 5 GH)81 dBµ
9 .0 .0				. 1						
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0 0		^								
0 0	······	sen se			from	V.	man	hmhr	and the state of the state	34
19										
art 2.4780 as BW 10	00 GHz 00 kHz		V	BW 1.0	MHz			Sweep	Stop 2.4 1.000 ms	83500 GI s (1001 pt
R MODE TRC S		× 2.480 227 5 GH	Y	31 dBµV	FUNCTION	FUNCTIO	N WIDTH	FUI	CTION VALUE	
		2.483 500 0 GF 3.272 5 MF	iz 15.37	76 dBµV 2.704 dB						
										>

10 Bandedge High Channel unrestricted

ncee.	Report Number:	R20210831-20-E2C	Rev	С
labs	Prepared for:	Inovonics		

Keysight Spec		restricted LBE using CO	53.10 Sec 11.13.2						
		AC		SENSE:IN	T	ALIGN OFF	e: Log-Pwr		PM Dec 22, 20
put Mec	h Atten 0	aв	PNO: Wide G		: Free Run en: 0 dB		1:>1000/1000		
) dB/div	Ref 86.99	dBuV					Mk	r1 2.402 66.6	239 GH 92 dBµ
^{pg}					Ţ				
7.0									
7.0									
				-				_/	1
				-					m
.0				-			3∆1		
0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		man		~ ~
39									
01									
art 2.390 Res BW	0000 GHz 100 kHz		VB	N 1.0 M	ИНz		Sweep	Stop 2.4 1.333 ms	03767 GI (1001 pi
R MODE TRO	C SCL	х	Y		FUNCTION	FUNCTION WIDTH	FU	NCTION VALUE	
Ν 1 Δ1 1	f (Δ)	2.402 239 GH -2.239 MH	iz (Δ) -49.6	93 dB					
N 1	f (Δ)	2.400 000 GH	iz (Δ) 17.000	dBµV		+			
									>

10 Bandedge Low Channel unrestricted

ncee,	Report Number:	R20210831-20-E2C	Rev	С
labs	Prepared for:	Inovonics		

RF 50 Ω						
			ENSE:INT	ALIGN OFF	Type: RMS	08:56:45 PM Dec 22, 2 TRACE
2.3900000 PREAMP		PNO: Fast 😱 FGain:High	Trig: Free Run #Atten: 0 dB	Avgi	Hold:>1000/1000	
Pef 115 55	dBuV				M	lkr2 2.387 22 GI 39.248 dBj
	uopv					
2 Pass						
	to a state of the	Andreas as to deal Dealer	مهير بالعقالية له معدسات	ومعادمة معالي ويردم	Magent Area (Bacherson Marea) Pro-	and a sail and a sail and a sail
and the second						
		#VBV	v 50 MHz*		Sweep	Stop 2.3900 G 1.667 ms (1001 p
SCL	х	Y		FUNCTION WIDT	TH FL	INCTION VALUE
1						
	2.387 22 GHz	39.245 d	ВиV			
		PREAMP I Ref 115.55 dBµV 1 1 Pass 2 2 Pass 1 1 Pass 1 Pass 1	PREAMP IFGain:High Ref 115.55 dBµV 1 1 Pass 2 2 Pass 2 2 Pass 2 1 Pass 2 2 Pass 2 2 Pass 2 1 Pass 2 2 Pass	PREAMP IFGain:High #Atten: 0 dB Ref 115.55 dBµV 1 1 1 Pass 1 1 2 Pass 1 1 1 Pass 1 1 1 Pass 1 1 2 Pass 1 1 1 Pass 1 1 2 Pass 1 1 1 Pass 1 1	PREAMP IFGain:High #Atten: 0 dB Ref 115.55 dBµV 1 1 1 1 Pass 2<	PREAMP IFGain:High #Atten: 0 dB Ref 115.55 dBµV Image: Constraint of the second of the s

11 Bandedge Low Channel_Restricted_1

ncee.	Report Number:	R20210831-20-E2C	Rev	С
labs	Prepared for:	Inovonics		

	RF 50 9	Ω AC CORREC		SENSE:I	NT	ALIGN OFF		09:19:27 PM Dec 22,
w 1 SS	PREAMP		PNO: Fast C IFGain:High		g: Free Run tten: 0 dB		pe: RMS ld:>1000/1000	TRACE 2 3 TYPE MA DET P A N
dB/div	Ref 114.9	9 dBµV					Mkr	2 2.494 703 5 G 39.514 dB
	1 Pass							
0 Trace	2 Pass			_				
0								
,								
an an	and the state of the	and and a second	2 Josef randomenan		munneters	4944-497-434m-444	and an	ogeneration and
0								
0								
	3500 GHz 1.0 MHz		VE	SW 50 I	MHz*		Sweet	Stop 2.500000 0 1.000 ms (1001
MODE TRO	SCL	× 2.483 516 5 GH	Y	7 dBuV	FUNCTION	FUNCTION WIDTH	FI	UNCTION VALUE
N 2	f	2.494 703 5 GH	z 39.51	6 dBµV				

12 Bandedge High Channel_Restricted

ncee.	Report Number:	R20210831-20-E2C	Rev	С
labs	Prepared for:	Inovonics		

REPORT END