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FCC/ISED Test Report

Prepared for: Garmin International, Inc.

Address:

1200 E. 151st Street Olathe, Kansas, 66062, USA

Product:

AB4308

Test Report No:

R20211005-21-E11A

Approved by:

Fox Lane EMC Test Engineer,

DATE:

May 13, 2022

62

Total Pages:

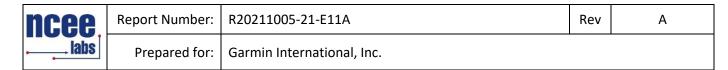
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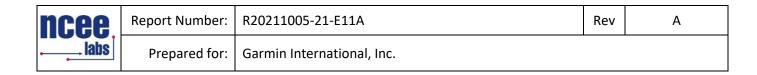
REVISION PAGE

Rev. No.	Date	Description			
0	4 March 2022	Original – KVepuri			
0	4 March 2022	Prepared by GLarsen, SProbst and FLane			
А		Added DCCF values to tabular data			
	12 May 2022	Added comments to section 4.5			
	13 May 2022	Added comments to section 4.4			
		Updated delta to fundamental			



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1.0 SUMMARY OF TEST RESULTS

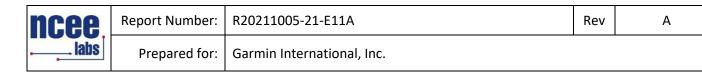
The worst-case measurements were reported in this report. Summary of test results presented in this report correspond to the following section (Please see the checked box below for the rule part used):

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 5.4(d)	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 7.3	Receiver Radiated Emissions	Pass						
FCC Part 15.209 (restricted bands), 15.247 (unrestricted) RSS-247 Issue 2 Section 5.5, RSS-Gen Issue 5, 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 8.8	Conducted Emissions	Pass						



2.0 EUT DESCRIPTION

2.1 EQUIPMENT UNDER TEST

Summary and Operating Condition:

EUT	AB4308
EUT Received	6 December 2021
EUT Tested	8 December 2021- 25 February 2022
Serial No.	3392435319 (Radiated Measurements) 3392435300 (Conducted Measurements)
Operating Band	2400 – 2483.5 MHz
Device Type	GMSK GFSK BT BR BT EDR 2MB BT EDR 3MB S02.11x
Power Supply / Voltage	Internal Battery/ 5VDC Charger: Garmin (Phi Hong) MN: PSAI10R-050Q (Representative Power Supply)

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:

GMSK TMB Transmissions:					
Channel	Frequency				
Low	2402 MHz				
Mid	2440 MHz				
High	2480 MHz				
GMSK 2MB Transmissions:					
Channel Frequency					
Low	2404 MHz				
Mid	2440 MHz				
High	2478 MHz				

GMSK 1MB Transmissions:

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



3.0 LABORATORY AND GENERAL TEST DESCRIPTION

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	ROLE						
1	Fox Lane	Test Engineer	Testing and Report						
2	Karthik Vepuri	Test Engineer	Review/Editing and Report						
3	Blake Winter	Test Engineer	Testing						
4	Grace Larsen	Test Technician	Testing and Report						
5	Samuel Probst	Test Technician	Testing and Report						
6	Matthew Emory	Test Technician	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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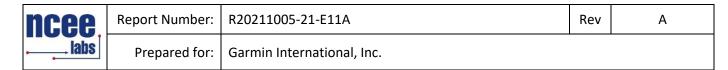
3.3 TEST EQUIPMENT

DESCRIPTION AND	MODEL NO.	SERIAL NO.	LAST CALIBRATION	CALIBRATION DUE DATE
MANUFACTURER	MODEL NO.	SERIAL NO.	DATE	DOLDATE
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, 2022
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	6416	July 28, 2021	July 28, 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, 2023
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

*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 ⊠

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.



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.

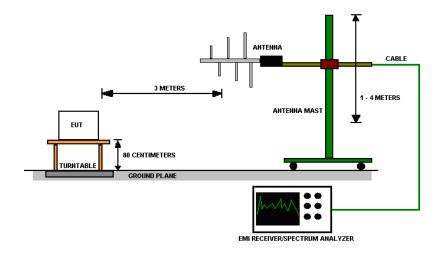


Figure 2 - Radiated Emissions Test Setup

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4.0 RESULTS

	DTS Radio Measurements								
CHANNEL	Transmitter	Occupied Bandwidth (MHz)			Bandwidth (MHz)	PSD (d	Bm)	RESULT	
Low	GMSK 1MB	1080.20			709.30	-12.98	32	PASS	
Mid	GMSK 1MB	1073.60			689.10	-13.2	71	PASS	
High	GMSK 1MB	1075.80			708.50	-13.5	13	PASS	
Low	GMSK 2Mb	2085.10			1169.00	-15.09	97	PASS	
Mid	GMSK 2Mb	2089.20			1163.00	-14.98	32	PASS	
High	GMSK 2Mb	2094.30			1175.00	-15.03	38	PASS	
Occupied Ban Limit > 500 kH	idwidth = N/A; 6 d Iz	B Bandwidth Pe	eak Output	Power Li	mit = 30 dBm; PSD	Limit = 8 dBm			
			Unrest	ricted B	and-Edge				
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Rela Highest band (dB	t out of level	Relative Fundamental (dBuV)	Delta (dB)	Min Delta (dB)	Result	
Low	GMSK 1MB	2400.00	58.	62	109.34	50.72	30.00	PASS	
Low	GMSK 2MB	2400.00	54.	33	109.69	55.36	30.00	PASS	
High	GMSK 1MB	2483.50	56.	67	108.94	52.28	30.00	PASS	
High	GMSK 2MB	2483.50	52.		109.27	56.61	30.00	PASS	
			Peak Re	stricted	Band-Edge				
CHANNEL	Mode	Band edge /Measurement Frequency (MHz)	Highest band (dBuV 3n	level //m @	Measurement Type	Limit (dBuV/m @ 3m)	Margin	Result	
Low	GMSK 1MB	2390.00	57.8	301	Peak	73.98	16.179	PASS	
Low	GMSK 2MB	2390.00	57.4	187	Peak	73.98	16.493	PASS	
High	GMSK 1MB	2483.50	64.8	399	Peak	73.98	9.081	PASS	
High	GMSK 2MB	2483.50	58.3	329	Peak	73.98	15.651	PASS	
*Limit shown i	s the peak limit ta	ken from FCC Part 1	15.209						

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СН	Transmitter	RAW AVERAGE OUTPUT POWER (dBm)	DTS Ra DCCF (For Power)	dio Measurements AVERAGE OUTPUT POWER (dBm)	AVERAGE OUTPUT POWER (mW)	RESULT
Low	GMSK 1MB	99	3.87	2.88	1.94	PASS
Mid	GMSK 1MB	-1.26	3.87	2.61	1.82	PASS
High	GMSK 1MB	-1.67	3.87	2.20	1.66	PASS
Low	GMSK 2Mb	-3.50	6.56	3.06	2.02	PASS
Mid	GMSK 2Mb	-3.58	6.56	2.98	1.99	PASS
High	GMSK 2Mb	-3.82	6.56	2.74	1.88	PASS
	Output Power Li ge Output Powe	imit = 125mW; er = (Raw Average O	utput Power) +	(DCCF For Power)		

			Avera	ge Restricted	Band-Edge				
СН	Mode	Band edge /Measurement Frequency (MHz)	Raw Average Highest out of band level (dBuV/m @ 3m)	DCCF (For Emissions)	Average Highest out of band level (dBuV/m @ 3m)**	Measurement Type	Limit (dBuV/m @ 3m)*	Margin	Result
Low	GMSK 1MB	2390.00	39.72	-7.74	47.46	Average	53.98	11.558	PASS
Low	GMSK 2MB	2390.00	44.99	-7.74	52.73	Average	53.98	11.369	PASS
High	GMSK 1MB	2483.50	36.11	-13.11	49.12	Average	53.98	7.864	PASS
High	GMSK 2MB	2483.50	39.96	-13.11	53.07	Average	53.98	7.000	PASS
**Aver	age Highest out	erage limit taken f t of band level = S information on DC	A Average Level		missions). C6	63.10 Sec. 11.12.2	2.5.2		



4.1 OUTPUT POWER

Test Method: All the radio measurements were performed using the sections from ANSI C63.10, Sec. 11.9.2.2.4

Limits of power measurements:

For FCC Part 15.247 Device:

The maximum allowed 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

Comments:

- 1. All the output power plots can be found in the Appendix C.
- 2. All the measurements were found to be compliant.
- 3. Tabulated data is listed in section 4.0.



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4.2 BANDWIDTH

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:

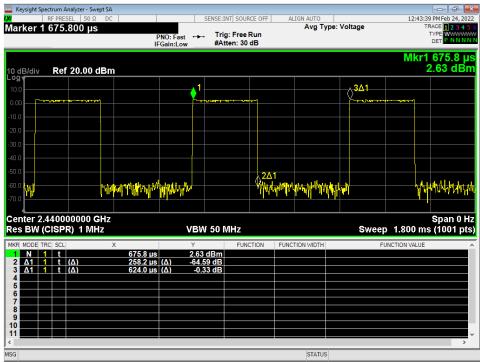
Pass

Comments:

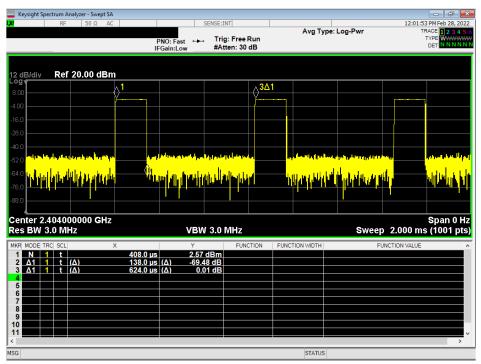
- 1. All the bandwidth plots can be found in the Appendix C.
- 2. All the measurements were found to be compliant.
- 3. Tabulated data is listed in section 4.0.



4.3 DUTY CYCLE











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GMSK 1MB

DCCF For Emissions (Duty Cycle Correction Factor) = 20 * Log(Duty Cycle) -7.74 = 20 * Log(41.4 / 100)

DCCF For Power (Duty Cycle Correction Factor) = 10 * Log(1 / (Duty Cycle)) 3.87 = 10 * Log(1 / (41.4 / 100))

GMSK 2MB

DCCF For Emissions (Duty Cycle Correction Factor) = 20 * Log(Duty Cycle) -13.11 = 20 * Log(22.1 / 100)

DCCF For Power (Duty Cycle Correction Factor) = 10 * Log(1 / (Duty Cycle)) 6.56 = 10 * Log(1 / (1 / 0.221))



4.4 RADIATED EMISSIONS

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:

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.

4. The EUT was tested for spurious emissions while running off of battery power and external USB power. The worse-case emissions were produced while running off of USB power, so results from this mode are presented.



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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 1GHz and higher.

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.

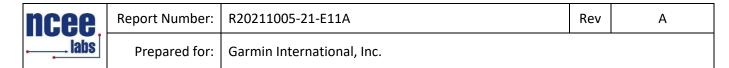
c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

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.



Test setup:

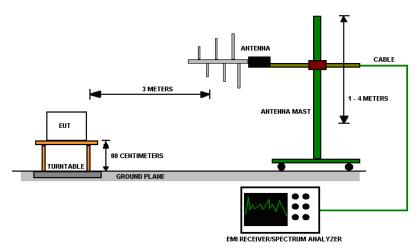


Figure 5 - Radiated Emissions Test Setup

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.

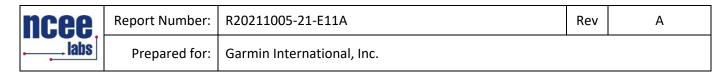
2. The resolution bandwidth 1 MHz for all measurements and at frequencies above 1GHz, A peak detector was used for all measurements above 1GHz. Measurements were made with an EMI Receiver.

Deviations from test standard:

No deviation.

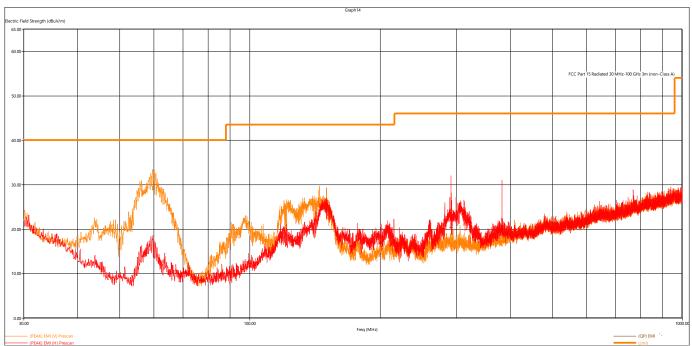
EUT operating conditions

Details can be found in section 2.1 of this report.



Test results:

EUT Was investigated for intermodulation. No intermodulation products were found and were thus not reported.





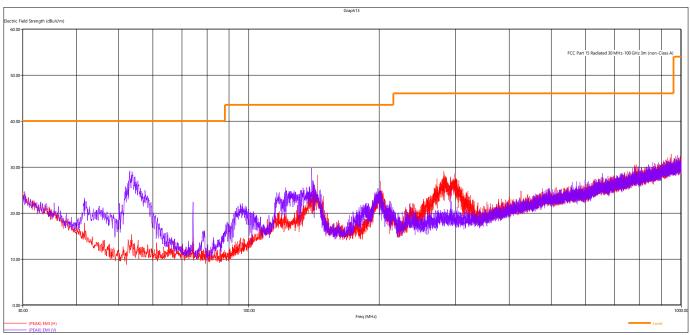
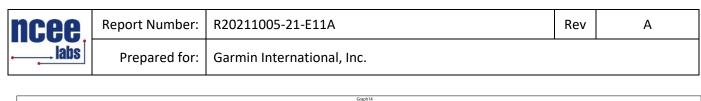


Figure 7 - Radiated Emissions Plot, GMSK 1MB



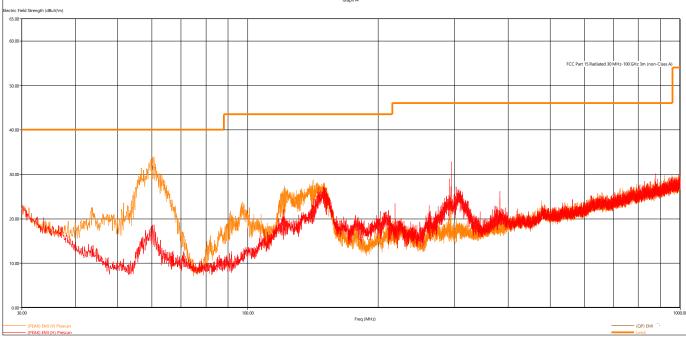


Figure 8 - Radiated Emissions Plot, GMSK 2MB

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 = Limit value Emission level

		Quas	si-Peak M	easureme	ents, GM	SK			
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation	
MHz	dBµV/m	dBµV/m	dB	cm.	deg.				
60.154320	31.39	40.00	8.61	106.00	258.00	V	Low	GMSK 2MB	
291.543120	20.33	46.02	25.69	121.00	187.00	Н	Receive		
59.587440	29.09	40.00	10.91	110.00	223.00	V	Re	eceive	

ncoo	
IILGG,	
labs	

	Peak Measurements												
Frequency	Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation					
MHz	dBµV/m	dBµV/m	dB	cm.	deg.								
2401.784000	97.11	NA	NA	454.00	112.00	Н	Low	GMSK 1MB					
2439.776000	97.96	NA	NA	127.00	115.00	Н	Mid	GMSK 1MB					
2479.590000	98.34	NA	NA	485.00	119.00	Н	High	GMSK 1MB					
2403.508000	97.64	NA	NA	110.00	115.00	Н	Low	GMSK 2MB					
2439.994000	97.97	NA	NA	128.00	114.00	Н	Mid	GMSK 2MB					
2477.476000	99.03	NA	NA	133.00	119.00	Н	High	GMSK 2MB					

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All other emissions were found to be at least 6dB below limit line

*NA means the emission was a fundamental and not subject to 15.209 limits within its band

The EUT was maximized in all 3 orthogonal axes. The worst-case is shown in the table above.

evel	DCCF	*AVG							
\//		Level	Limit	Margin	Height	Angle	Pol	Channel	Modulation
uV/m	dB	dBµV/m	dBµV/m	dB	cm.	deg.			
7.11	7.74	89.37	NA	NA	454.00	112.00	Н	Low	GMSK 1MB
7.96	7.74	90.22	NA	NA	127.00	115.00	Н	Mid	GMSK 1MB
8.34	7.74	90.60	NA	NA	485.00	119.00	Н	High	GMSK 1MB
7.64	13.11	84.53	NA	NA	110.00	115.00	Н	Low	GMSK 2MB
7.97	13.11	84.86	NA	NA	128.00	114.00	Н	Mid	GMSK 2MB
9.03	13.11	85.92	NA	NA	133.00	119.00	Н	High	GMSK 2MB
7 8 7 9 8	7.96 3.34 7.64 7.97 0.03 level + E	7.96 7.74 3.34 7.74 7.64 13.11 7.97 13.11 0.03 13.11	7.96 7.74 90.22 3.34 7.74 90.60 7.64 13.11 84.53 7.97 13.11 84.86 0.03 13.11 85.92 level + DCCF (For Emissions),	7.96 7.74 90.22 NA 3.34 7.74 90.60 NA 7.64 13.11 84.53 NA 7.97 13.11 84.86 NA 0.03 13.11 85.92 NA level + DCCF (For Emissions), Image: National State	7.967.7490.22NANA3.347.7490.60NANA7.6413.1184.53NANA7.9713.1184.86NANA0.0313.1185.92NANA	7.967.7490.22NANA127.008.347.7490.60NANA485.007.6413.1184.53NANA110.007.9713.1184.86NANA128.000.0313.1185.92NANA133.00	7.967.7490.22NANA127.00115.003.347.7490.60NANA485.00119.007.6413.1184.53NANA110.00115.007.9713.1184.86NANA128.00114.000.0313.1185.92NANA133.00119.00	7.967.7490.22NANA127.00115.00H3.347.7490.60NANA485.00119.00H7.6413.1184.53NANA110.00115.00H7.9713.1184.86NANA128.00114.00H0.0313.1185.92NANA133.00119.00H	7.967.7490.22NANA127.00115.00HMid8.347.7490.60NANA485.00119.00HHigh7.6413.1184.53NANA110.00115.00HLow7.9713.1184.86NANA128.00114.00HMid0.0313.1185.92NANA133.00119.00HHigh

See Sec 4.3 for more information on DCCF

All other emissions were found to be at least 6dB below limit line

The EUT was maximized in all 3 orthogonal axes. The worst-case is shown in the table above.



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Test Method: ANSI C63.10-2013, Section 6.7

Limits of spurious emissions:

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)).

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Test procedures:

The highest emissions level was measured and recorded. All spurious measurements were evaluated to 30dB below the fundamental. More details can be found in section 3.4 of this report. The line shown in the plots is not a limit line, it is a reference line placed at -20dBm.

Deviations from test standard:

Test was performed with 120kHz RBW

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:



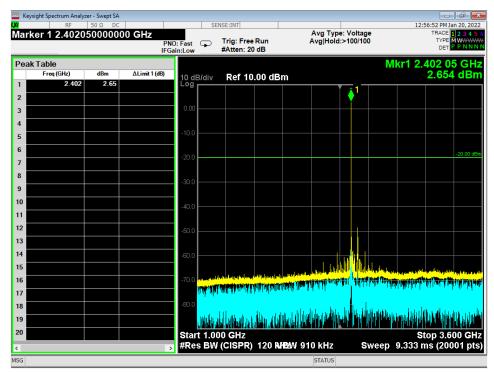
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				D:Fast 🔾	#Atten:	20 dB						DET	PPNN
eak	Table									N	Mkr1 8		
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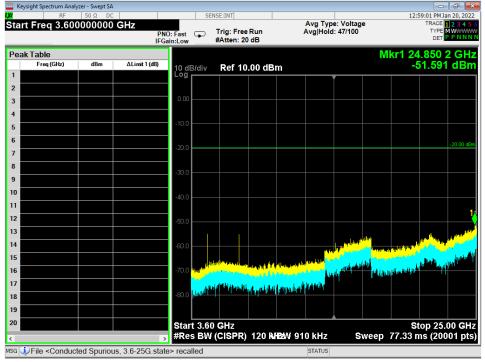


Figure 11 - Radiated Emissions Plot, GMSK 1MB, 3.6G – 25G

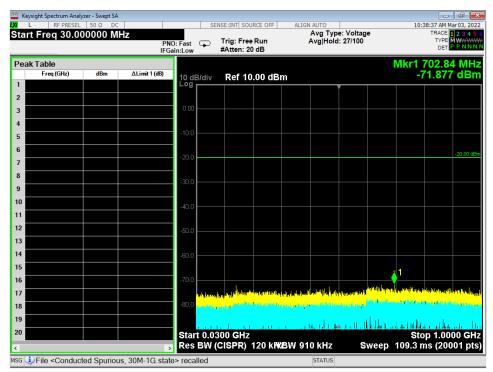


Figure 12 - Radiated Emissions Plot, GMSK 1MB, 30M – 1G



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eak]	Table									M	kr1 2	.404 0	0 GI
	Freq (GHz)	dBm	ΔLimit1(dB)	10 dB/di	v Ref	10.00 dB	m					18.299	
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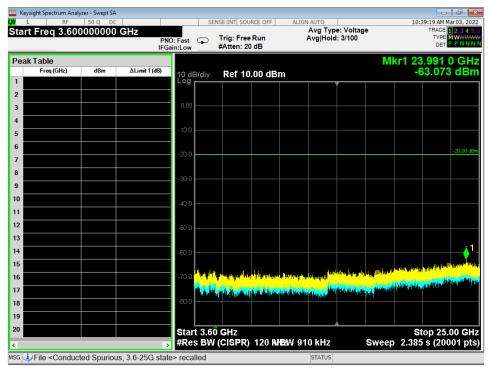


Figure 14 - Radiated Emissions Plot, GMSK 1MB, 3.6G – 25G



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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: For 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.



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Test results:

Pass

Comments:

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.



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4.7 **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.

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

Comments:

- 1. All the Power Spectral Density (PSD) plots can be found in the Appendix C.
- 2. All the measurements were found to be compliant.
- 3. Tabulated data is listed in section 4.0.



4.8 CONDUCTED AC MAINS EMISSIONS

Test Method: ANSI C63.10-2013, Section(s) 6.2

Limits for conducted emissions measurements:

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)			
	Quasi-peak	Average		
0.15-0.5	66 to 56	56 to 46		
0.5-5	56	46		
5-30	60	50		

Notes:

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

The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz
 All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

Test Procedures:

- a. The EUT was placed 0.8m above a ground reference plane and 0.4 meters from the conducting wall of a shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference as well as the ground.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels over 10dB under the prescribed limits are not reported.
- d. Results were compared to the 15.207 limits.

Deviation from the test standard:

No deviation

EUT operating conditions:

Details can be found in section 2.1 of this report.

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labs	Prepared for:	Garmin International, Inc.		

Test Results:

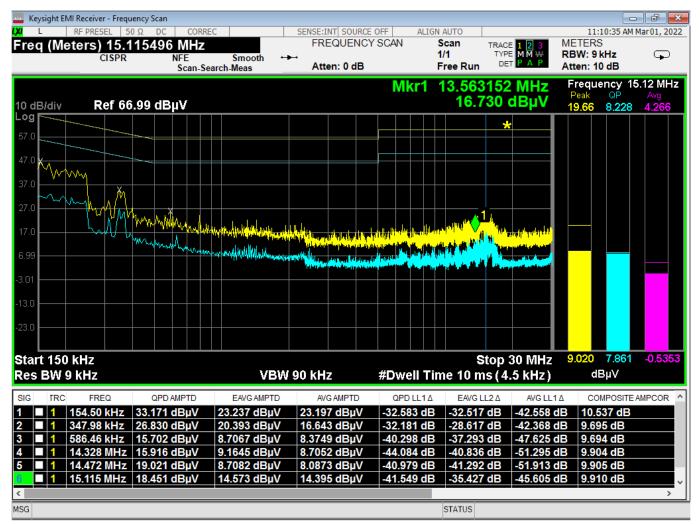


Figure 15 - Conducted Emissions Plot, Line, TX

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labs	Prepared for:	Garmin International, Inc.		

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23.0			VBW	/ 90 kHz	#Dwell Tii	Stop ne 10 ms (/	00 IIIIIE	2.62 7.691 1.0 dBµV	013
23.0 Start 150 Res BW 9	9 kHz					me 10 ms (4.5 kHz)	dBµV	
23.0 Start 150 Res BW 9	9 kHz FREQ	QPD AMPTD	EAVG AMPTD	AVG AMPTD	QPD LL1 Δ	EAVG LL2 Δ	4.5 kHz)		
23.0 Start 150 Res BW 9 BIG TRC	9 kHz FREQ 159.00 kHz	29.967 dBµV	EAVG AMPTD 25.636 dBµV	AVG AMPTD 24.733 dBμV	QPD LL1 A	me 10 ms (EAVG LL2A -29.880 dB	4.5 kHz)	dBµV сомрозіте Амрс 10.511 dB	
33.0 Start 150 Res BW 9 BIG TRC 1 1	9 kHz FREQ 159.00 kHz 358.79 kHz	29.967 dBµV 27.853 dBµV	EAVG AMPTD 25.636 dBμV 20.454 dBμV	AVG AMPTD 24.733 dBµV 20.208 dBµV	QPD LL1A -35.549 dB -30.903 dB	me 10 ms (EAVG LL2 A -29.880 dB -28.302 dB	4.5 kHz) AVG LL1A -40.783 dB -38.548 dB	dBµV COMPOSITE AMPC 10.511 dB 9.680 dB	
23.0 Start 150 Res BW 9 BIG TRC	9 kHz FREQ 159.00 kHz 358.79 kHz 401.97 kHz	29.967 dBµV 27.853 dBµV 17.687 dBµV	EAVG AMPTD 25.636 dBµV 20.454 dBµV 10.738 dBµV	AVG AMPTD 24.733 dBµV 20.208 dBµV 10.326 dBµV	QPD LL1A -35.549 dB -30.903 dB -40.125 dB	me 10 ms (EAVG LL2A -29.880 dB -28.302 dB -37.074 dB	4.5 kHz) AVG LL1Δ -40.783 dB -38.548 dB -47.487 dB	dBµV <u>COMPOSITE AMPC</u> 10.511 dB 9.680 dB 9.686 dB	
23.0 Start 150 Res BW 9 SIG TRC 1 1 2 1 1 3 1 1	9 kHz FREQ 159.00 kHz 358.79 kHz 401.97 kHz 14.513 MHz	29.967 dBµV 27.853 dBµV 17.687 dBµV 20.125 dBµV	EAVG AMPTD 25.636 dBµV 20.454 dBµV 10.738 dBµV 15.143 dBµV	AVG AMPTD 24.733 dBµV 20.208 dBµV 10.326 dBµV 14.181 dBµV	QPD LL1A -35.549 dB -30.903 dB -40.125 dB -39.875 dB	me 10 ms (EAVG LL2A -29.880 dB -28.302 dB -37.074 dB -34.857 dB	4.5 kHz) AVG LL1Δ -40.783 dB -38.548 dB -47.487 dB -45.819 dB	dBµV <u>COMPOSITE AMPC</u> 10.511 dB 9.680 dB 9.686 dB 9.905 dB	
23.0 Start 150 Res BW 9 SIG TRC 1 1 2 1 1 3 1 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9 KHZ FREQ 159.00 kHz 358.79 kHz 401.97 kHz 14.513 MHz 14.544 MHz	29.967 dBµV 27.853 dBµV 17.687 dBµV 20.125 dBµV 19.136 dBµV	ЕАУG АМРТD 25.636 dBµV 20.454 dBµV 10.738 dBµV 15.143 dBµV 14.516 dBµV	AVG AMPTD 24.733 dBµV 20.208 dBµV 10.326 dBµV 14.181 dBµV 12.690 dBµV	QPD LL1A -35.549 dB -30.903 dB -40.125 dB -39.875 dB -40.864 dB	me 10 ms (EAVG LL2A -29.880 dB -28.302 dB -37.074 dB -34.857 dB -35.484 dB	4.5 kHz) AVG LL1A -40.783 dB -38.548 dB -47.487 dB -45.819 dB -47.310 dB	dBµV COMPOSITE AMPC 10.511 dB 9.680 dB 9.686 dB 9.905 dB 9.905 dB	
23.0 Start 150 Res BW 9 BIG TRC 1 1 1 2 1 1	9 KHZ FREQ 159.00 kHz 358.79 kHz 401.97 kHz 14.513 MHz 14.544 MHz	29.967 dBµV 27.853 dBµV 17.687 dBµV 20.125 dBµV	EAVG AMPTD 25.636 dBµV 20.454 dBµV 10.738 dBµV 15.143 dBµV	AVG AMPTD 24.733 dBµV 20.208 dBµV 10.326 dBµV 14.181 dBµV	QPD LL1A -35.549 dB -30.903 dB -40.125 dB -39.875 dB -40.864 dB	me 10 ms (EAVG LL2A -29.880 dB -28.302 dB -37.074 dB -34.857 dB	4.5 kHz) AVG LL1Δ -40.783 dB -38.548 dB -47.487 dB -45.819 dB	dBµV <u>COMPOSITE AMPC</u> 10.511 dB 9.680 dB 9.686 dB 9.905 dB	
23.0 Start 150 Res BW 9 SIG TRC 1 1 2 1 1 3 1 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9 KHZ FREQ 159.00 kHz 358.79 kHz 401.97 kHz 14.513 MHz 14.544 MHz	29.967 dBµV 27.853 dBµV 17.687 dBµV 20.125 dBµV 19.136 dBµV	ЕАУG АМРТD 25.636 dBµV 20.454 dBµV 10.738 dBµV 15.143 dBµV 14.516 dBµV	AVG AMPTD 24.733 dBµV 20.208 dBµV 10.326 dBµV 14.181 dBµV 12.690 dBµV	QPD LL1A -35.549 dB -30.903 dB -40.125 dB -39.875 dB -40.864 dB	me 10 ms (EAVG LL2A -29.880 dB -28.302 dB -37.074 dB -34.857 dB -35.484 dB	4.5 kHz) AVG LL1A -40.783 dB -38.548 dB -47.487 dB -45.819 dB -47.310 dB	dBµV COMPOSITE AMPC 10.511 dB 9.680 dB 9.686 dB 9.905 dB 9.905 dB	OR

Figure 16 - Conduc	ed Emissions	Plot, Neutral, TX
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01 3.0 3.0 tart 150 es BW 9 IG TRC 1	9 kHz FREQ 150.00 kH 262.49 kH 339.35 kH	Hz 4 Hz 2 Hz 2	0.264 4.667 7.915	dBµV dBµV dBµV	1	EAVG A 2.746 d 9.584 d 2.641 d	MPTD IBµV IBµV IBµV	90 kH 32.49 18.68 22.08	Z (GAMPTC 29 dBµ 18 dBµ 15 dBµ		QPD 25.73 36.68 31.30	LL1∆ 6 dB 5 dB 4 dB	EAVC -23.20 -31.70 -26.57	ms (4 54 dB 58 dB 79 dB	.5 kHz) AVG LL -33.501 -42.664 -37.135	1A 0 dB 10 dB 10 dB 9.1	dBµV composit 0.563 dB 0.057 dB 726 dB	E AMPCOR
01 3.0 tart 150 es BW 9 G TRC 1 1	9 kHz FREQ 150.00 kH 262.49 kH 339.35 kH 13.559 M	Hz 4 Hz 2 Hz 2 Hz 3	0.264 4.667 7.915 0.642	dBµV dBµV dBµV dBµV	19 22 21	EAVG A 2.746 d 9.584 d 2.641 d 8.559 d	MPTD BµV BµV BµV BµV	90 kH 32.49 18.68 22.08 28.47	Z (G AMPTC) (9 dBµ) (8 dBµ) (5 dBµ) (7 dBµ)		Dwe QPD 25.73 36.68 31.30 29.35	LL1A 6 dB 5 dB 4 dB 8 dB	EAVC -23.20 -31.70 -26.51 -21.44	ms (4 54 dB 58 dB 79 dB 41 dB	.5 kHz) AVG LL -33.501 -42.664 -37.135 -31.523	1∆ 0 dB 10 dB 10 dB 9.1 dB 9.1	dBµV composit 0.563 dE 0.057 dE 726 dB 897 dB	E AMPCOR
01 3.0 3.0 tart 150 es BW 9 IG TRC 1	9 kHz FREQ 150.00 kł 262.49 kł 339.35 kł 13.559 M 14.490 M	Hz 4 Hz 2 Hz 2 IHz 3 IHz 1	10.264 24.667 27.915 0.642 5.606	dBµV dBµV dBµV dBµV dBµV	19 22 21 7.	EAVG A 2.746 d 9.584 d 2.641 d 8.559 d 8888 d	MPTD BµV BµV BµV BµV BµV	90 kH 32.49 18.68 22.08 28.47 6.582	Z (G AMPTE 9 dBµ 8 dBµ 8 dBµ 7 dBµ 7 dBµ 20 dBµ		QPD QPD 25.73 36.68 31.30 29.35 44.39	LL1A 6 dB 5 dB 4 dB 8 dB 4 dB	ne 10 -23.20 -31.70 -26.55 -21.44 -42.11	ms (4 54 dB 58 dB 79 dB 11 dB	AVG LL -33.501 -42.664 -37.135 -31.523 -53.418	1∆ 0 dB 10 dB 10 dB 9.1 dB 9.1 dB 9.1	dBµV COMPOSIT 0.563 dE 0.057 dE 726 dB 897 dB 905 dB	E AMPCOR
01 3.0 3.0 tart 150 es BW 9 IG TRC 1	9 kHz FREQ 150.00 kH 262.49 kH 339.35 kH 13.559 M	Hz 4 Hz 2 Hz 2 IHz 3 IHz 1	0.264 4.667 7.915 0.642	dBµV dBµV dBµV dBµV dBµV	19 22 21 7.	EAVG A 2.746 d 9.584 d 2.641 d 8.559 d	MPTD BµV BµV BµV BµV BµV	90 kH 32.49 18.68 22.08 28.47 6.582	Z (G AMPTC) (9 dBµ) (8 dBµ) (5 dBµ) (7 dBµ)		Dwe QPD 25.73 36.68 31.30 29.35	LL1A 6 dB 5 dB 4 dB 8 dB 4 dB	EAVC -23.20 -31.70 -26.51 -21.44	ms (4 54 dB 58 dB 79 dB 11 dB	.5 kHz) AVG LL -33.501 -42.664 -37.135 -31.523	1∆ 0 dB 10 dB 10 dB 9.1 dB 9.1 dB 9.1	dBµV composit 0.563 dE 0.057 dE 726 dB 897 dB	E AMPCOR
01 3.0 tart 150 es BW 9 G TRC 1 1	9 kHz FREQ 150.00 kł 262.49 kł 339.35 kł 13.559 M 14.490 M	Hz 4 Hz 2 Hz 2 IHz 3 IHz 1	10.264 24.667 27.915 0.642 5.606	dBµV dBµV dBµV dBµV dBµV	19 22 21 7.	EAVG A 2.746 d 9.584 d 2.641 d 8.559 d 8888 d	MPTD BµV BµV BµV BµV BµV	90 kH 32.49 18.68 22.08 28.47 6.582	Z (G AMPTE 9 dBµ 8 dBµ 8 dBµ 7 dBµ 7 dBµ 20 dBµ		QPD QPD 25.73 36.68 31.30 29.35 44.39	LL1A 6 dB 5 dB 4 dB 8 dB 4 dB	ne 10 -23.20 -31.70 -26.55 -21.44 -42.11	ms (4 54 dB 58 dB 79 dB 11 dB	AVG LL -33.501 -42.664 -37.135 -31.523 -53.418	1∆ 0 dB 10 dB 10 dB 9.1 dB 9.1 dB 9.1	dBµV COMPOSIT 0.563 dE 0.057 dE 726 dB 897 dB 905 dB	E AMPCOR

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Keysight El	MI Receiver - Frequ	ency Scan							
L		0Ω DC CORRE	EC	SENSE:INT SOURCE				11:00:18 AM	Mar01, 202
req (Me	eters) 14.4 CISPR	18066 MHz NFE Scan-Se	Smooth ← earch-Meas	Atten: 0 dB		Scan TRAG 1/1 TYI Free Run D	PE MM₩ RE	ETERS 3W: 9 kHz ten: 10 dB	Ŧ
0 dB/div	Ref 66	.99 dBµV			Mkr1	13.56315 29.425		requency 14 Peak QP 0.47 8.29 8	4.42 MHz ^{Avg} 5.209
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7.0						1_			
27.0 X A	Man Man	Mr. Marken M. Marken and	anast, and adding the	مالية براير	المرتب المرتبي المرتب	A selective del Constant			
7.0 - V.) .99 	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	was much mut the part	namen al priville in the second second						
.01									
3.0									
			\/B\/		#Dwoll Tir			1.61 7.646 dBuV	-0.404
tart 150 es BW 9	9 kHz			90 kHz		ne 10 ms (4	.5 kHz)	dBµV	-0.404
	9 kHz FREQ	QPD AMPTD	EAVG AMPTD	AVG AMPTD	QPD LL1 Δ	EAVG LL2 Δ	AVG LL1A	dBµV COMPOSITE	
es BW 9	9 kHz FREQ 159.00 kHz	29.307 dBµV	EAVG AMPTD 24.144 dBµV	AVG AMPTD 23.423 dBµV	QPD LL1 A	me 10 ms (2 EAVG LL2 A -31.372 dB	AVG LL1 Δ	dBμV COMPOSITE 10.511 dB	
es BW 9	9 kHz FREQ 159.00 kHz 360.61 kHz	29.307 dBµV 29.505 dBµV	EAVG AMPTD 24.144 dBμV 24.418 dBμV	AVG AMPTD 23.423 dBμV 23.838 dBμV	QPD LL1A -36.209 dB -29.209 dB	me 10 ms (2 EAVG LL2 A -31.372 dB -24.297 dB	AVG LL1∆ -42.093 dB -34.877 dB	dBµV COMPOSITE 10.511 dB 9.680 dB	
es BW 9	9 kHz FREQ 159.00 kHz 360.61 kHz 13.559 MHz	29.307 dBµV	EAVG AMPTD 24.144 dBµV	AVG AMPTD 23.423 dBµV	QPD LL1 A	me 10 ms (2 EAVG LL2 A -31.372 dB	AVG LL1 Δ	dBμV COMPOSITE 10.511 dB	
es BW 9	9 kHz FREQ 159.00 kHz 360.61 kHz 13.559 MHz 14.358 MHz	29.307 dBµV 29.505 dBµV 27.518 dBµV	EAVG AMPTD 24.144 dBμV 24.418 dBμV 25.548 dBμV	AVG AMPTD 23.423 dBµV 23.838 dBµV 25.479 dBµV	QPD LL1A -36.209 dB -29.209 dB -32.482 dB	me 10 ms (2 EAVG LL2A -31.372 dB -24.297 dB -24.452 dB	AVG LL1Δ -42.093 dB -34.877 dB -34.521 dB	dBµV COMPOSITE 10.511 dB 9.680 dB 9.897 dB	
es BW 9	9 KHZ FREQ 159.00 kHz 360.61 kHz 13.559 MHz 14.358 MHz 14.418 MHz	29.307 dBµV 29.505 dBµV 27.518 dBµV 16.324 dBµV	EAVG AMPTD 24.144 dBµV 24.418 dBµV 25.548 dBµV 6.8516 dBµV	AVG AMPTD 23.423 dBµV 23.838 dBµV 25.479 dBµV 7.0261 dBµV	QPD LL1A -36.209 dB -29.209 dB -32.482 dB -43.676 dB	me 10 ms (2 EAVG LL2A -31.372 dB -24.297 dB -24.452 dB -43.148 dB	AVG LL1Δ -42.093 dB -34.877 dB -34.521 dB -52.974 dB	dBµV <u>COMPOSITE</u> 10.511 dB 9.680 dB 9.897 dB 9.904 dB	
es BW 9	9 KHZ FREQ 159.00 kHz 360.61 kHz 13.559 MHz 14.358 MHz 14.418 MHz	29.307 dBµV 29.505 dBµV 27.518 dBµV 16.324 dBµV 21.740 dBµV	EAVG AMPTD 24.144 dBµV 24.418 dBµV 25.548 dBµV 6.8516 dBµV 16.385 dBµV	АУG АМРТD 23.423 dBµV 23.838 dBµV 25.479 dBµV 7.0261 dBµV 14.842 dBµV	QPD LL1A -36.209 dB -29.209 dB -32.482 dB -43.676 dB -38.260 dB	me 10 ms (² EAVG LL2A -31.372 dB -24.297 dB -24.452 dB -43.148 dB -33.615 dB	AVG LL1A -42.093 dB -34.877 dB -34.521 dB -52.974 dB -45.158 dB	dBµV <u>COMPOSITE</u> 10.511 dB 9.680 dB 9.897 dB 9.904 dB 9.905 dB	

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labs	Prepared for:	Garmin International, Inc.		

APPENDIX A: SAMPLE CALCULATION

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

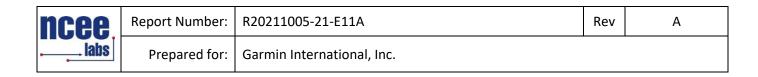
Expanded uncertainty values are calculated to a confidence level of 95%.

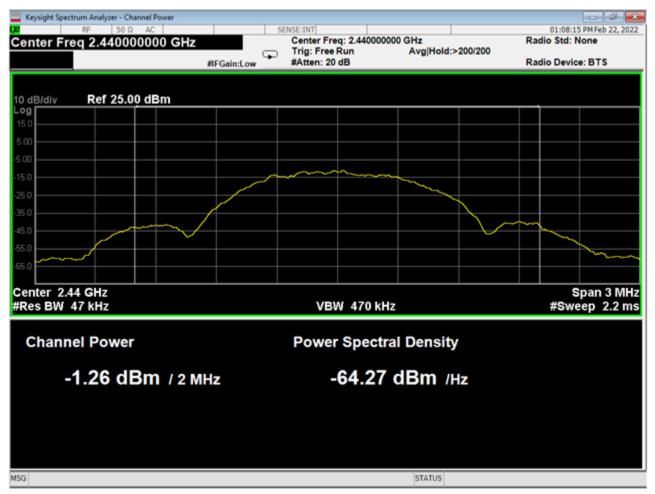
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APPENDIX C – GRAPHS AND TABLES

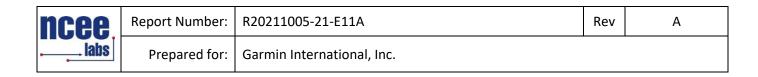


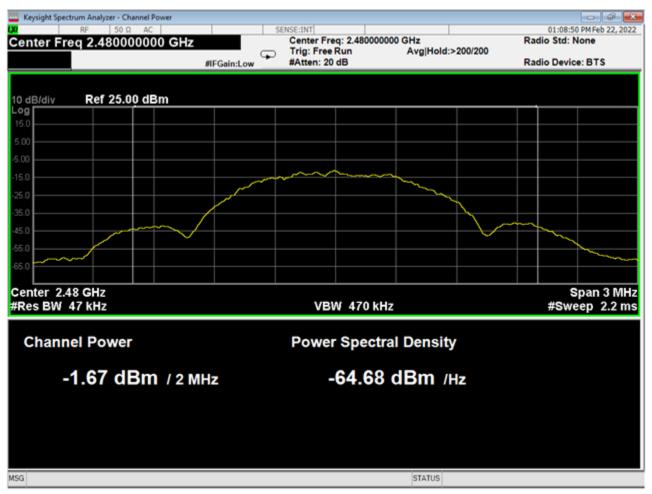
01 Average Output Power, Low Channel, GMSK 1MB





02 Average Output Power, Mid Channel, GMSK 1MB





03 Average Output Power, High Channel, GMSK 1MB

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labs	Prepared for:	Garmin International, Inc.		

Keysight Spectrum Analyzer - BW using C63.		SENSE:INT Center Freq: 2.402000000 Trig: Free Run #Atten: 20 dB	GHz Avg Hold:>10/10	11:38:44 AM Feb 28, 2022 Radio Std: None Radio Device: BTS
10 dB/div Ref 20.00 dBm				
10.0				
-10.0		\sim		
-20.0	/			
-30.0				
-40.0	~			
60.0				
-70.0				
Center 2.402 GHz #Res BW 100 kHz		VBW 1 MHz		Span 5 MHz Sweep 1 ms
Occupied Bandwidth	1	Total Power	9.45 dBm	
1.0	802 MHz			
Transmit Freq Error	6.355 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	709.3 kHz	x dB	-6.00 dB	
MSG 🧼 File <state ant_ble="" b<="" dts="" td=""><td>andwidth 11.8.1.state</td><td>> recalled</td><td>STATUS</td><td></td></state>	andwidth 11.8.1.state	> recalled	STATUS	

04 Bandwidth, Low Channel, GMSK 1MB

ncee.	Report Number:	R20211005-21-E11A	Rev	А
labs	Prepared for:	Garmin International, Inc.		

Keysight Spectrum Analyzer - BW using C63.	10 Sec 11.8.1			
enter Freq 2.440000000		Center Freq: 2.440000000 Trig: Free Run #Atten: 20 dB	0 GHz Avg Hold:>10/10	11:40:17 AM Feb 28, 202 Radio Std: None Radio Device: BTS
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enter 2.44 GHz Res BW 100 kHz		VBW 1 MHz		Span 5 MH Sweep 1 m
				oncep in
Occupied Bandwidth		Total Power	9.16 dBm	
1.0)736 MHz			
		% of OBW Power	99.00 %	
Transmit Freq Error	5.442 kHz	% OI OBW Fower	33.00 /6	
Transmit Freq Error x dB Bandwidth	5.442 kHz 689.1 kHz	x dB	-6.00 dB	

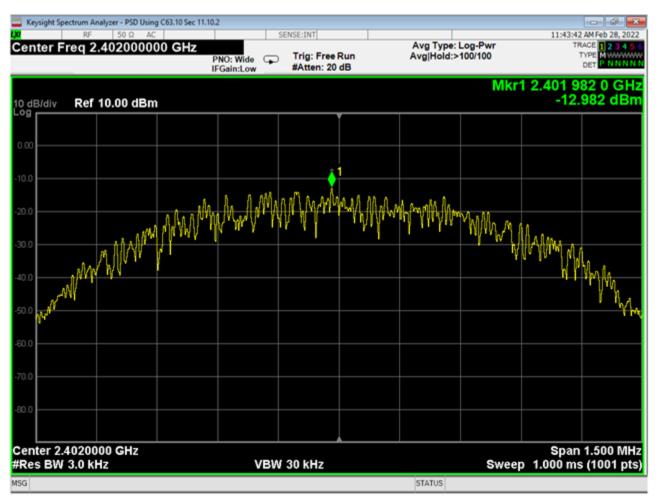
05 Bandwidth, Mid Channel, GMSK 1MB

ncee,	Report Number:	R20211005-21-E11A	Rev	А
labs	Prepared for:	Garmin International, Inc.		

Keysight Spectrum Analyzer - BW using C63	10 Sec 11.8.1			- 4
enter Freq 2.480000000	GH7	SENSE:INT Center Freq: 2.48000000) GHz	11:41:48 AM Feb 28, 202 Radio Std: None
enter Preq 2.40000000	G	Talas Free Daw	Avg Hold:>10/10	Radio Device: BTS
	#IFGain:Low	#Atten: 20 dB		Radio Device: B I S
0 dB/div Ref 20.00 dBm		· · · · · · · · · · · · · · · · · · ·	· · · · · ·	
0.0				
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.0	m		Long	
10				
	and a second			
0				
enter 2.48 GHz				Span 5 M
Res BW 100 kHz		VBW 1 MHz		Sweep 1 m
Occupied Bandwidth	•	Total Power	8.91 dBm	
1.0	0758 MHz			
Transmit Freq Error	4.537 kHz	% of OBW Power	99.00 %	
x dB Bandwidth	708.5 kHz	x dB	-6.00 dB	
	100.0 KHZ		-0.00 GB	
			STATUS	

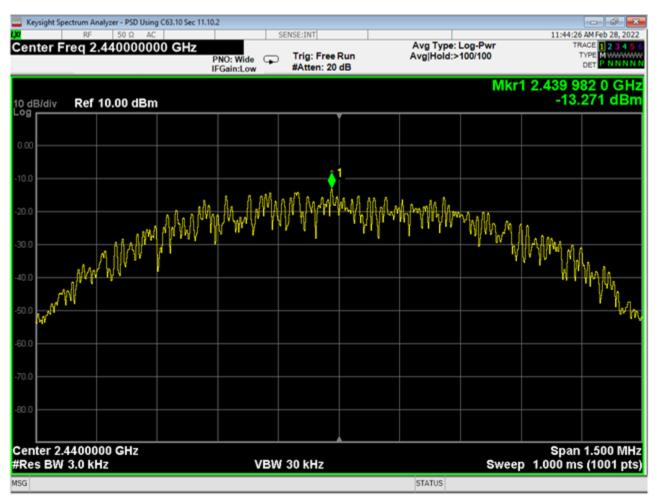
06 Bandwidth, High Channel, GMSK 1MB



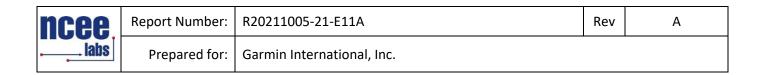


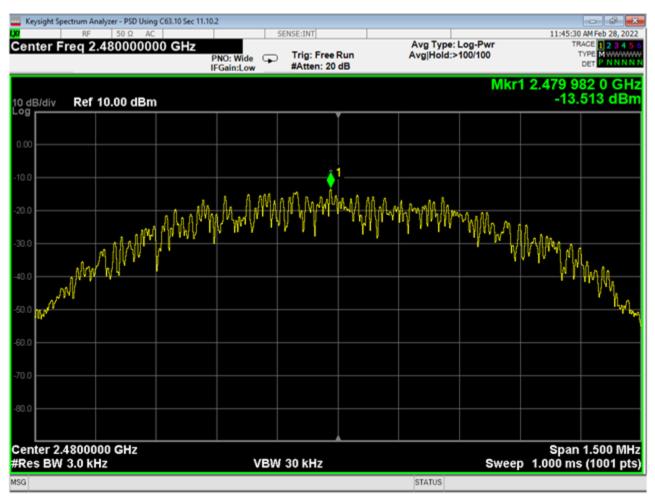
07 PSD, Low Channel, GMSK 1MB





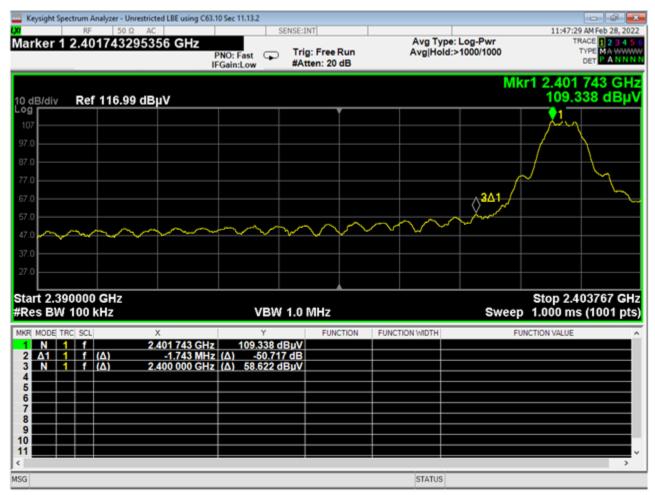
08 PSD, Mid Channel, GMSK 1MB





09 PSD, High Channel, GMSK 1MB

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10 Lower Bandedge, Unrestricted, GMSK 1MB

ncee.	Report Number:	R20211005-21-E11A	Rev	А
labs	Prepared for:	Garmin International, Inc.		



11 High Bandedge, Unrestricted, GMSK 1MB

ncee.	Report Number:	R20211005-21-E11A	Rev	А
labs	Prepared for:	Garmin International, Inc.		

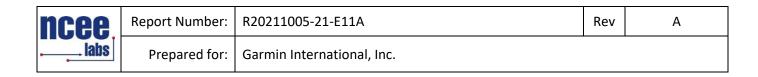
Keysight Spe	ectrum Analyzer - Res	tricted LBE using C63.1	0 Sec 6.10.5						
	RF 50 Ω	1.1.4		SENSE:INT	<u>^</u>	ALIGN OFF			AM Dec 07, 2
rker 2 SS	2.38878000 PREAMP		PNO: Fast 🖵 IFGain:High	Trig: Free F #Atten: 0 d		Avg Type Avg Hold:	: RMS >1000/1000		ACE 1 2 3 4 YPE MA WW DET P A N N
dB/div	Ref Offset 34 Ref 86.60 c						М	kr2 2.388 39.7	3 78 GI 21 dBj
G Trac	e 1 Pass e 2 Pass								
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6	and a star of the	and the second	vilade en estes			¢ ²			
.6									
6 0									
0									
	30000 GHz 1.0 MHz		#VB	W 50 MHz*			Sweep	Stop 2.3 1.000 ms	90000 G (1001 p
R MODE TR	RC SCL	× 2.389 86 GH	Y	FUNC	TION FUN	ICTION WIDTH	FUI	NCTION VALUE	
N 2	2 f	2.389 86 GH 2.388 78 GH		dBµV dBµV					

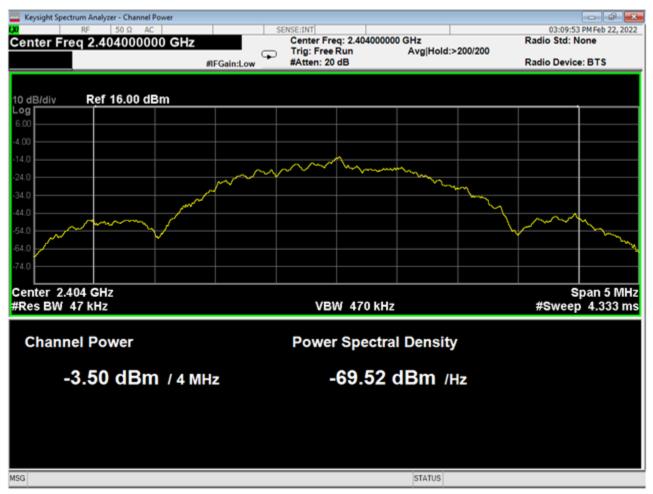
12 Lower Bandedge, Restricted, GMSK 1MB

ncee.	Report Number:	R20211005-21-E11A	Rev	А
labs	Prepared for:	Garmin International, Inc.		

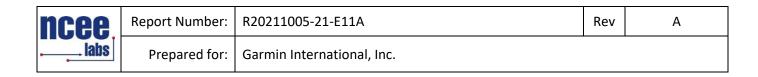
Keysight Spec	ctrum Analyzer - Restricte							9
	RF 50 Ω A		SEN	SE:INT	ALIGN OFF	DHC	10:53:06 AM Dec 0	
arker 22 ASS	2.4836155000 PREAMP	DOD GHZ PNO: F IFGain:		Trig: Free Run #Atten: 0 dB	Avg Type Avg Hold:	>1000/1000	TRACE 12 TYPE MA DET P A	
) dB/div	Ref Offset 34.77 Ref 86.76 dB	dB IV				Mkr2	2.483 615 5 0 41.378 dl	
Trace	e 1 Pass e 2 Pass							
6.8 6.8 2			**************************************		and a second	and the ball of a		Matu
5.8 5.8 5.8								
76 24								
art 2.483 Res BW	3500 GHz 1.0 MHz		VBW 5	0 MHz*		Sweep	Stop 2.500000 1.000 ms (1001	Gi I pt
		x	Y	FUNCTION	FUNCTION WIDTH	FUN	ICTION VALUE	
1 N 1 2 N 2 3	f 2.4 f 2.4	183 500 0 GHz 183 615 5 GHz	64.899 dBj 41.375 dBj					
								>

13 High Bandedge, Restricted, GMSK 1MB



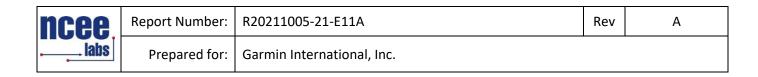


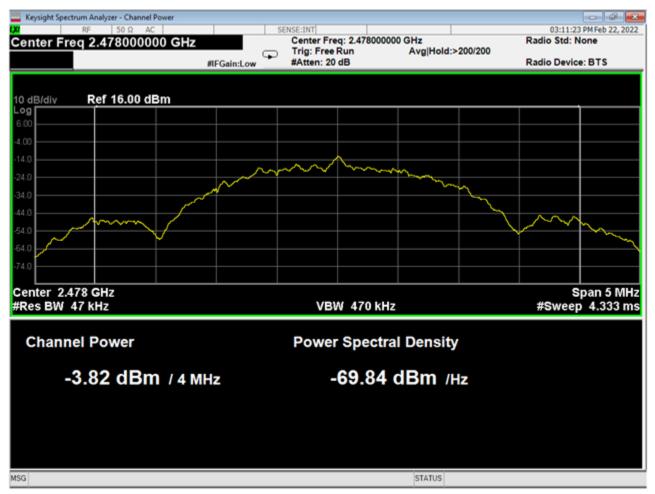
14 Average Output Power, Low Channel, GMSK 2MB



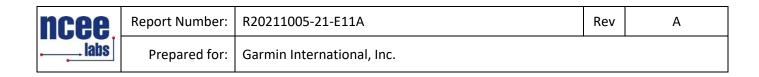


15 Average Output Power, Mid Channel, GMSK 2MB



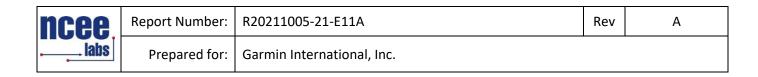


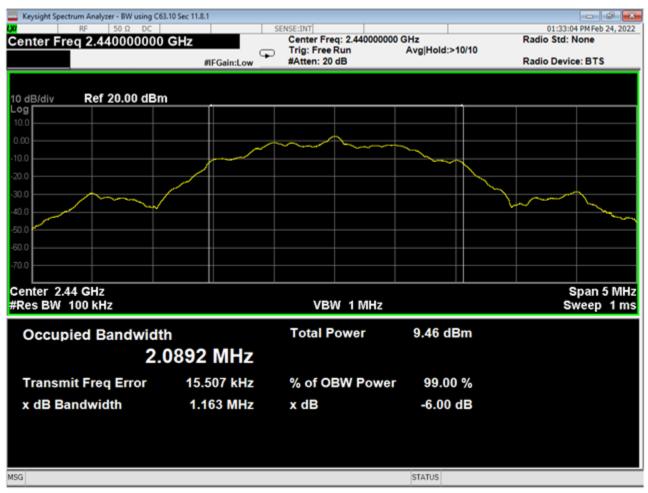
16 Average Output Power, High Channel, GMSK 2MB



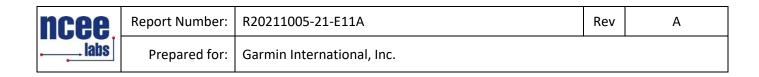


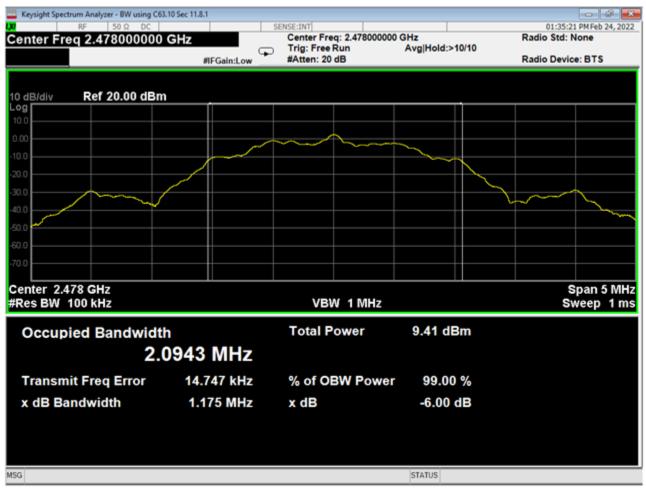
17 Bandwidth, Low Channel, GMSK 2MB



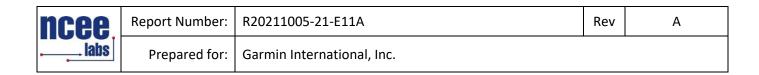


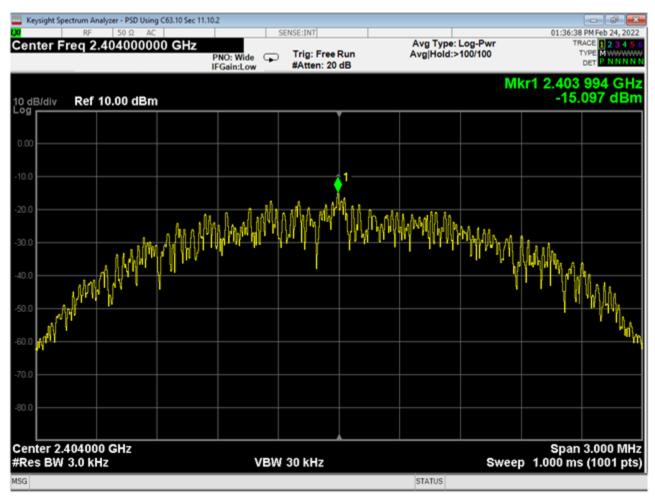
18 Bandwidth, Mid Channel, GMSK 2MB



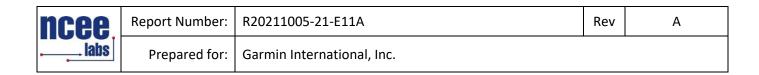


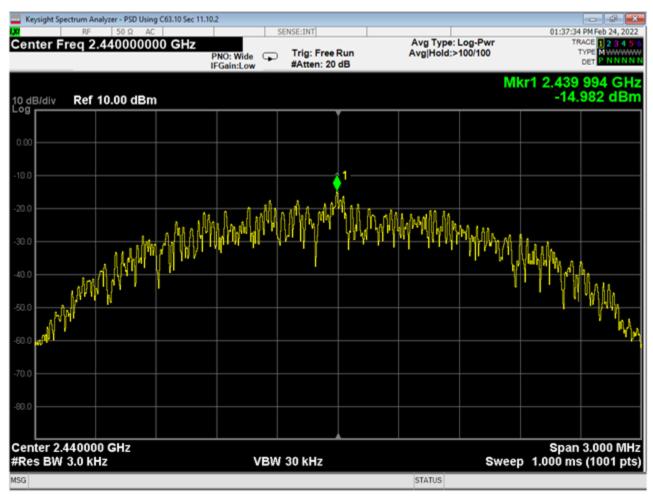
19 Bandwidth, High Channel, GMSK 2MB



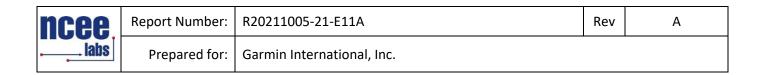


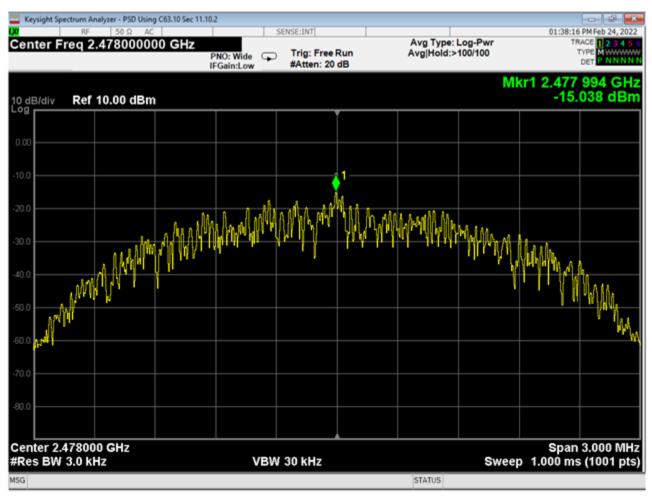
20 PSD, Low Channel, GMSK 2MB





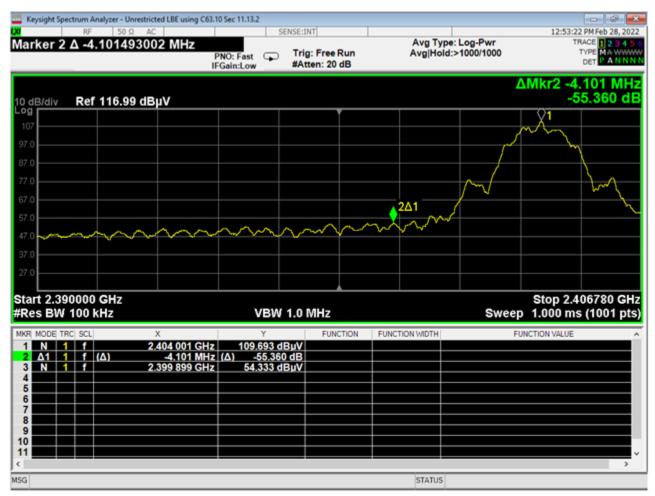
21 PSD, Mid Channel, GMSK 2MB





22 PSD, High Channel, GMSK 2MB

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labs	Prepared for:	Garmin International, Inc.		



23 Lower Bandedge, Unrestricted, GMSK 2MB

ncee.	Report Number:	R20211005-21-E11A	Rev	А
labs	Prepared for:	Garmin International, Inc.		



24 High Bandedge, Unrestricted, GMSK 2MB

ncee labs	Report Number:	R20211005-21-E11A	Rev	А
	Prepared for:	Garmin International, Inc.		

Keysight Spectrum Analyzer - Re							- F
RF 50 Ω		SENSE:I	NT	ALIGN OFF	DMS		8 PM Mar 03, 2 RACE <mark>1 2 3 4</mark>
Arker 2 2.3875200	F		g: Free Run tten: 0 dB		:>1000/1000		
dB/div Ref 115.55	σdΒμV				N	1kr2 2.38 39.6	7 52 GI 614 dBj
g Trace 1 Pass							
^{D6} Trace 2 Pass							
i.5							
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.5	Maaywaanaanaa ahaanaa ahaanaa	৵৻৵ ৽৽ৠ৻৻ ৻৻য়ঀ৻৴৻৴৻৻৽৲ঀ৲৾৾৽৵৾ঀঀ৾ঀ৻ৗ৸৵৽	Tan Marine Carlos and a state of the	در مورد المرود المراجع والمرود المرود المرود الم	an an air agus an an far la sa	الموادي والمحمد ويورك والمراجع	-
	weater and stand out of the stand of the	Ada daha bada ti a sulta a		·	<u>^</u> 2		
.5							
5.5							
art 2.380000 GHz as BW 1.0 MHz		#VBW 50	MHz*		Swee	Stop 2.3 5 1.000 ms	90000 G s (1001 p
R MODE TRC SCL	х	Y	FUNCTION	FUNCTION WIDTH	F	JNCTION VALUE	
N 1 f	2.389 89 GHz	57.487 dBµV					
N 2 f	2.387 52 GHz	39.615 dBµV					

25 Lower Bandedge, Restricted, GMSK 2MB

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Keysight Spectrum An	alyzer - Restricted I	HBE C63.10 Sec 6.1	0.5						
C RF	50 Ω AC	CORREC		NSE:INT	Â	ALIGN OFF		02:24:2	1 PM Mar 03, 202
Marker 2 2.483						Avg Type	RMS		RACE 1 2 3 4 5
	203000000		NO: Fast 😱	Trig: Free Ru	n		>1000/1000		TYPE MA WWW
PASS PR	EAMP		Gain:High	#Atten: 0 dB					DET PANN
			Junangn						
							Mkr	2 2.483 8	96 0 GH
10 dB/div Ref	114.99 dBµ	v							961 dBµ'
Trace 1 Pa	ss								
¹⁰⁵ Trace 2 Pa	SS								
95.0									
33.0									
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Start 2.483500								Stop 2.5	00000 GH
Res BW 1.0 M	Hz		VBW :	50 MHz*			Swee	p 1.000 ms	s (1001 pt
MKR MODE TRC SCL	X	1	Y	FUNCTI				UNCTION VALUE	· ·
1 N 1 f		3 797 0 GHz					T.	UNCTION VALUE	
		3 896 0 GHZ	58.329 dB						
2 N 2 f	2.48	5 896 0 GHZ	39.957 dB	νμν					
4									
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26 High Bandedge, Restricted, GMSK 2MB

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REPORT END