

TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C §15.247 (FHSS) and subpart B,
RSS-247 Issue 2:2017, RSS-Gen Issue 5, ICES-003 Issue 7:2020

FOR:

Essence Smartcare Ltd.

Control Panel

Model: ES8502HC_B

FCC ID: 2ARFP-ES8502HC-B

IC: 24417-ES8502HC-B

This report is in conformity with ISO/IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested.
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1 Applicant information

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Telephone: +972 732 447 735
Fax: +972 9772 9962
E-mail: israelgo@essence-grp.com
Contact name: Mr. Israel Gottesman

2 Equipment under test attributes

Product name: Control Panel
Product type: Transceiver
Model(s): ES8502HC_B
Serial number: 001
Hardware version: 2.A
Software release: 8.1
Receipt date 29-Mar-22

3 Manufacturer information

Manufacturer name: Essence Smartcare Ltd.
Address: 12 Abba Eban avenue, Ackerstein Tower Bldg. D, P.O.Box 2073, Herzliya 4612001, Israel
Telephone: +972 732 447 735
Fax: +972 9772 9962
E-Mail: israelgo@essence-grp.com
Contact name: Mr. Israel Gottesman

4 Test details

Project ID: 47160
Location: Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started: 29-Jun-22
Test completed: 21-Jul-22
Test specification(s): FCC 47CFR part 15 subpart C §15.247 (FHSS) and subpart B, RSS-247 Issue 2:2017, RSS-Gen Issue 5, ICES-003 Issue 7:2020




5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.247(a)1 / RSS-247 section 5.1(c), 20 dB bandwidth	Pass
Section 15.247(b) / RSS-247 section 5.4(a), Peak output power	Pass
Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions	Pass
Section 15.247(a)1 / RSS-247 section 5.1(b), Frequency separation	Pass
Section 15.247(a)1 / RSS-247 section 5.1(c), Number of hopping frequencies	Pass
Section 15.247(a)1 / RSS-247 section 5.1(c), Average time of occupancy	Pass
Section 15.247(i)5 / RSS-102 section 2.5, RF exposure	Pass, the exhibit to the application of certification is provided
Section 15.247(d) / RSS-247 section 5.5, Emissions at band edges	Pass
Section 15.203 / RSS-Gen section 8.3, Antenna requirements	Pass
Section 15.207(a) / RSS-Gen section 8.8, Conducted emission	Pass
Unintentional emissions	
Section 15.107/ICES-003, Section 6.1, Class B, Conducted emission at AC power port	Pass
Section 15.109/ RSS-Gen section 7.1.2 /ICES-003, Section 6.2, Class B, Radiated emission	Pass

This test report supersedes the previously issued test report identified by Doc ID: ESSRAD_FCC.47160_DSS

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.

The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer, EMC & Radio	29-Jun-22 – 21-Jul-22	
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	29-Nov-22	
Approved by:	Mr. M. Nikishin, group leader, EMC & Radio	29-Nov-22	

6 EUT description

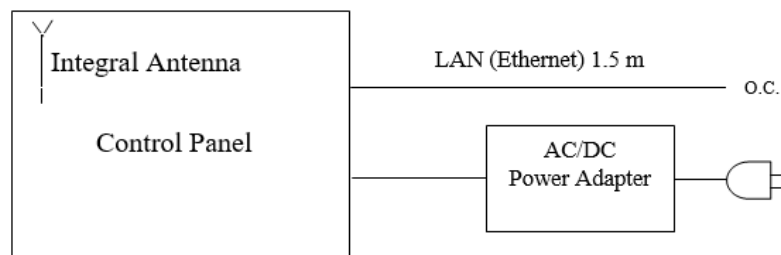
Note: The following data in this clause is provided by the customer and represents his sole responsibility

6.1 General information

The EUT is an ES8502HC_B Control Panel, powered via external AC/DC adaptor, comprises two radio modules, operating simultaneously:

- 916.5MHz, FSK modulation
- TX/Rx 2.4GHz (BLE)

6.2 Test configuration



6.3 Changes made in EUT

No changes were implemented in the EUT during testing.



6.4 Transmitter characteristics

Type of equipment				
<input checked="" type="checkbox"/>	Stand-alone (Equipment with or without its own control provisions)			
<input type="checkbox"/>	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)			
<input type="checkbox"/>	Plug-in card (Equipment intended for a variety of host systems)			
Intended use		Condition of use		
<input type="checkbox"/>	fixed	Always at a distance more than 2 m from all people		
<input checked="" type="checkbox"/>	mobile	Always at a distance more than 20 cm from all people		
<input type="checkbox"/>	portable	May operate at a distance closer than 20 cm to human body		
Assigned frequency ranges		2400-2483.5 MHz		
Operating frequencies		2402-2480 MHz		
Maximum rated output power		At transmitter 50 Ω RF output connector	dBm	
		Peak output power	18.32 dBm	
Is transmitter output power variable?		<input checked="" type="checkbox"/>	No	
		<input type="checkbox"/>	continuous variable	
		<input type="checkbox"/>	stepped variable with stepsize	dB
		<input type="checkbox"/>	minimum RF power	dBm
<input type="checkbox"/>		<input type="checkbox"/>	maximum RF power	dBm
Antenna connection				
<input type="checkbox"/>	unique coupling	<input type="checkbox"/>	standard connector	
<input checked="" type="checkbox"/>		<input type="checkbox"/>	integral	
<input checked="" type="checkbox"/>		<input type="checkbox"/>	with temporary RF connector	
<input type="checkbox"/>		<input type="checkbox"/>	without temporary RF connector	
Antenna/s technical characteristics				
Type	Manufacturer	Model number	Gain	
Printed	Essence Security	NA	3 dBi	
Transmitter aggregate data rate/s		1Mbps 2Mbps		
Type of modulation		GFSK		
Modulating test signal (baseband)		PRBS		
Transmitter power source				
<input type="checkbox"/>	Battery	Nominal rated voltage	Battery type	
<input type="checkbox"/>	DC	Nominal rated voltage		
<input checked="" type="checkbox"/>	AC mains	Nominal rated voltage	110 VAC	
		Frequency	60 Hz	
Common power source for transmitter and receiver			<input checked="" type="checkbox"/> yes <input type="checkbox"/> no	
Spread spectrum technique used		<input checked="" type="checkbox"/>	Frequency hopping (FHSS)	
		<input type="checkbox"/>	Digital transmission system (DTS)	
		<input type="checkbox"/>	Hybrid	
Spread spectrum parameters for transmitters tested per FCC 15.247 only				
FHSS	Total number of hops		40	
	Bandwidth per hop		2170 kHz	
	Max. separation of hops		2003 kHz	



Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-247 requirements

7.1 20 dB bandwidth

7.1.1 General

This test was performed to measure the 20 dB bandwidth of the transmitter hopping channel. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 20 dB bandwidth limits

Assigned frequency, MHz	Maximum bandwidth, kHz	Modulation envelope reference points*, dBc
902.0 – 928.0	250	20
2400.0 – 2483.5	NA	
5725.0 – 5850.0	1000	

* - Modulation envelope reference points provided in terms of attenuation below the peak of modulated carrier.

7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit modulated carrier at maximum data rate.

7.1.2.3 The transmitter bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and associated plot.

7.1.2.4 The test was repeated for each data rate and each modulation format.

Figure 7.1.1 The 20 dB bandwidth test setup





Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Table 7.1.2 The 20 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
DATA RATE: LE_2M_prbs9

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	99% BW, kHz	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402.0	GFSK	2.0	2041.2	2054.0	NA	NA	Pass
2440.0			2159.3	2170.0	NA	NA	Pass
2480.0			2086.0	2141.0	NA	NA	Pass

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
DATA RATE: LE_2M_1010

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	99% BW	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402.0	GFSK	2.0	2050.4	2054.0	NA	NA	Pass
2440.0			2090.1	2062.0	NA	NA	Pass
2480.0			2056.2	2059.0	NA	NA	Pass

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
DATA RATE: LE_2M_00001111

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	99% BW	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402.0	GFSK	2.0	2005.5	2053.0	NA	NA	Pass
2440.0			2100.6	2132.0	NA	NA	Pass
2480.0			2050.6	2098.0	NA	NA	Pass

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
DATA RATE: LE_1M_prbs9

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	99% BW	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402.0	GFSK	1.0	1030.4	1102.0	NA	NA	Pass
2440.0			1254.8	1280.0	NA	NA	Pass
2480.0			1087.2	1170.0	NA	NA	Pass



Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
DATA RATE: LE_1M_1010

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	99% BW	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402.0	GFSK	1.0	1040.9	1064.0	NA	NA	Pass
2440.0			1182.6	1125.0	NA	NA	Pass
2480.0			1066.0	1075.0	NA	NA	Pass

ASSIGNED FREQUENCY BAND: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
DATA RATE: LE_1M_00001111

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	99% BW	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402.0	GFSK	1.0	1010.4	1051.0	NA	NA	Pass
2440.0			1271.2	1293.0	NA	NA	Pass
2480.0			1098.5	1266.0	NA	NA	Pass

Reference numbers of test equipment used

HL 3437	HL 4136	HL 5376	HL 5397	HL 5645				
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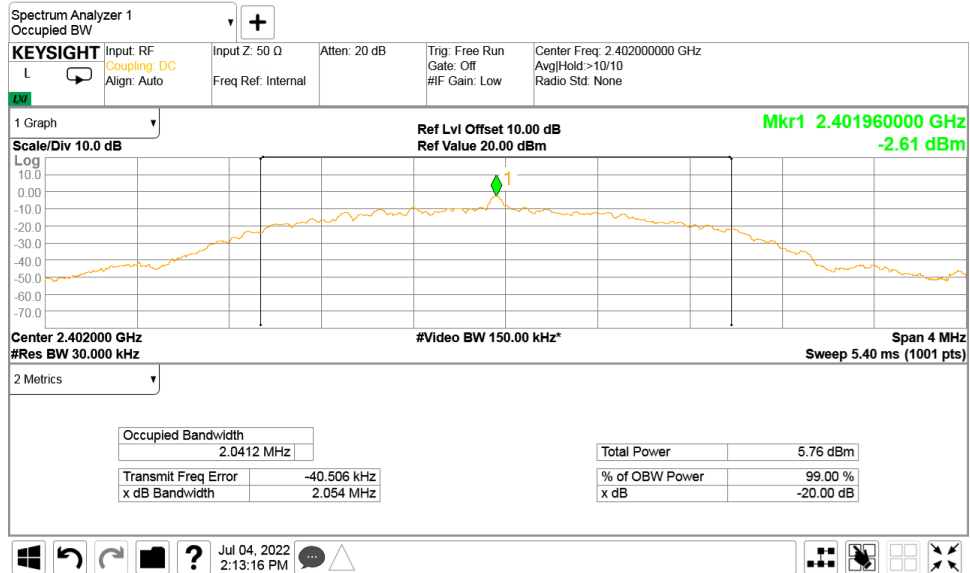
Full description is given in Appendix A.



HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.1 The 20 dB bandwidth test result at low frequency at Data Rate = LE_2M_prbs9

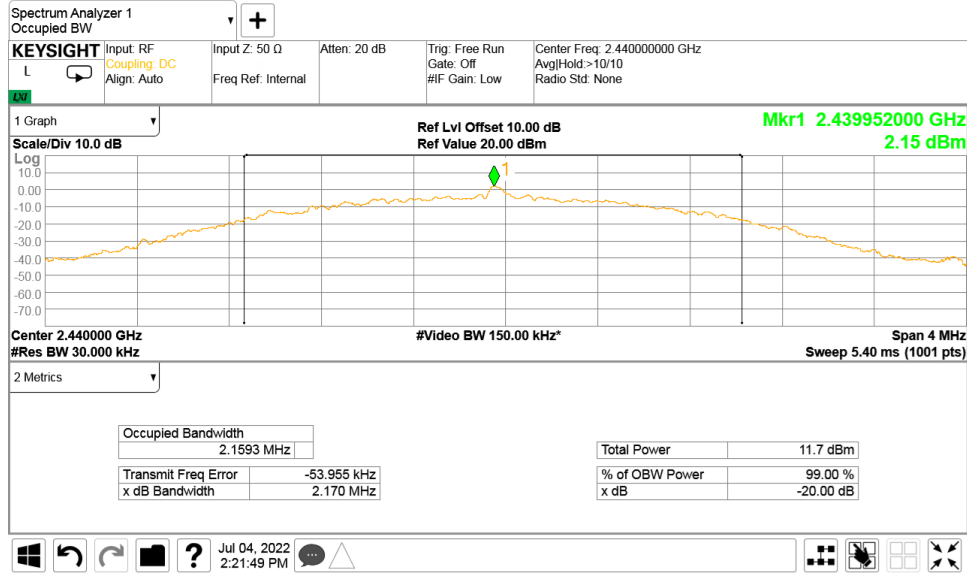




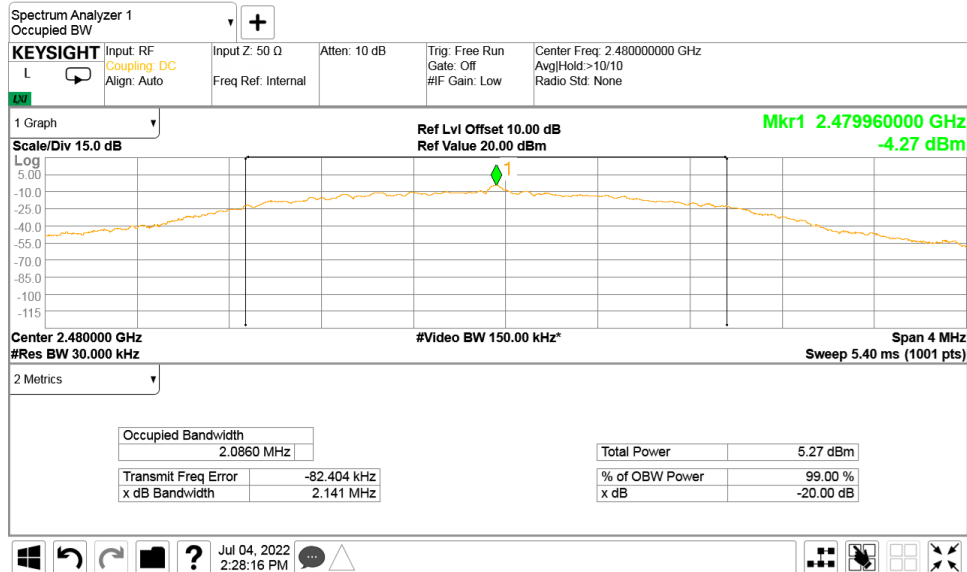
HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.2 The 20 dB bandwidth test result at mid frequency at Data Rate = LE_2M_prbs9



Plot 7.1.3 The 20 dB bandwidth test result at high frequency at Data Rate = LE_2M_prbs9

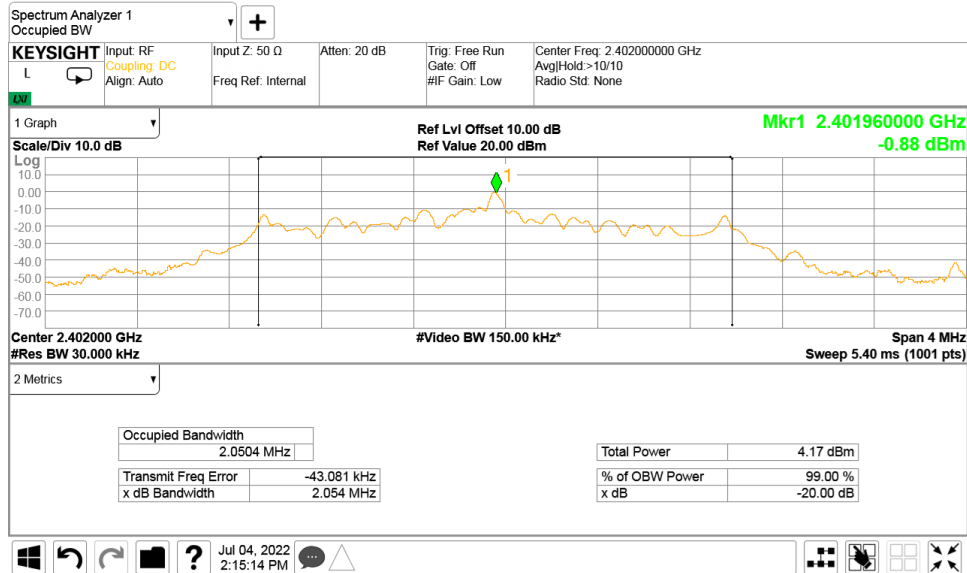




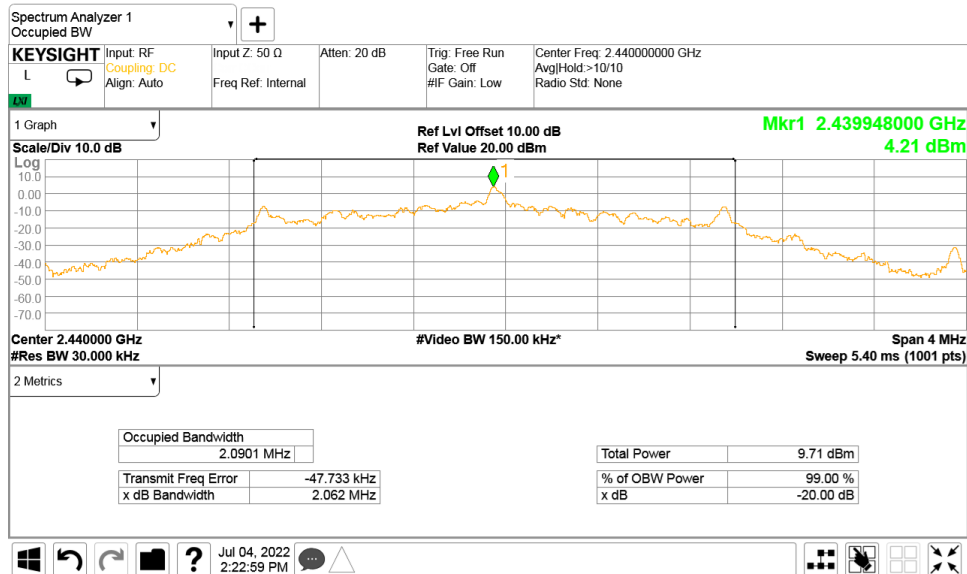
HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.4 The 20 dB bandwidth test result at low frequency at Data Rate = LE_2M_1010



Plot 7.1.5 The 20 dB bandwidth test result at mid frequency at Data Rate = LE_2M_1010

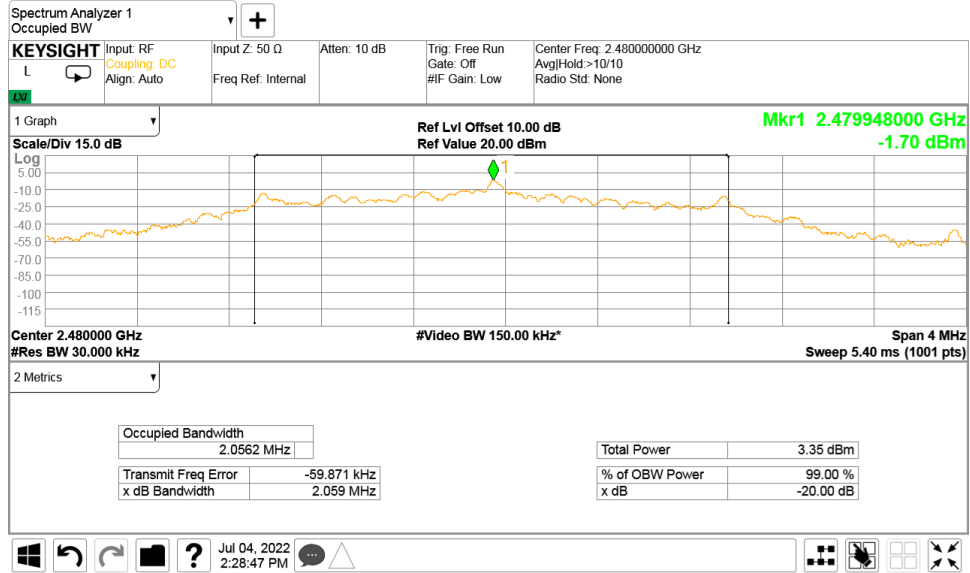




HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.6 The 20 dB bandwidth test result at high frequency at Data Rate = LE_2M_1010

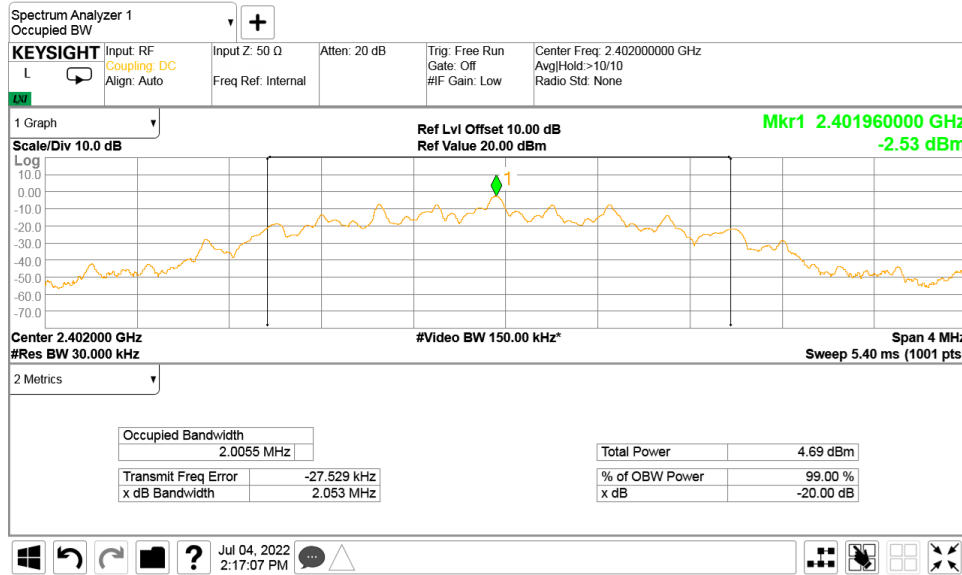




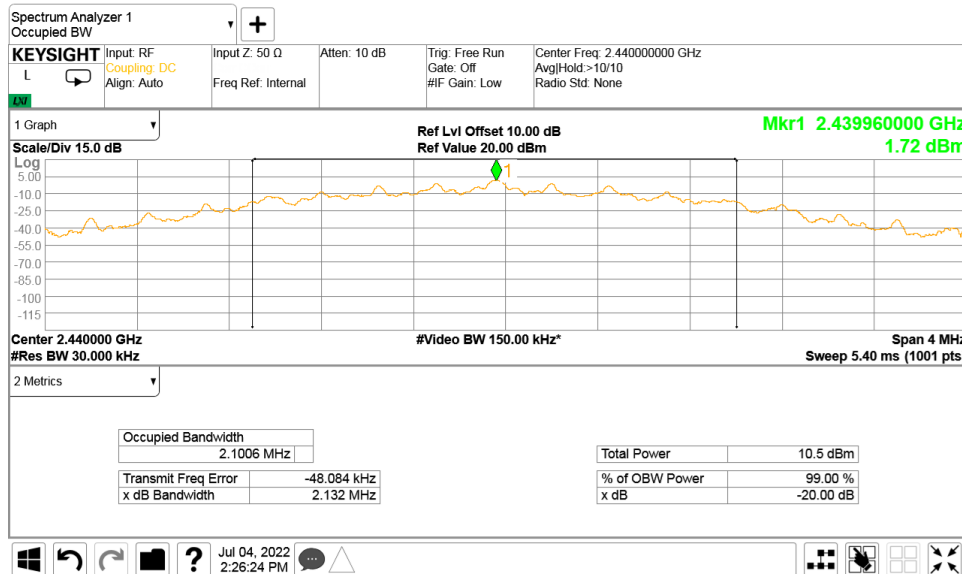
HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.7 The 20 dB bandwidth test result at low frequency at Data Rate = LE_2M_00001111



Plot 7.1.8 The 20 dB bandwidth test result at mid frequency at Data Rate = LE_2M_00001111

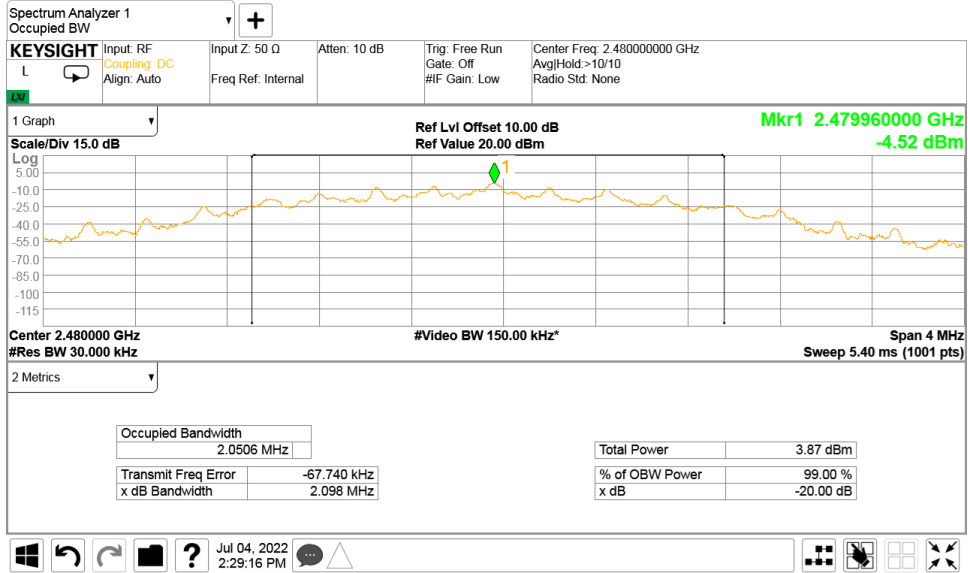




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Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.9 The 20 dB bandwidth test result at high frequency at Data Rate = LE_2M_00001111

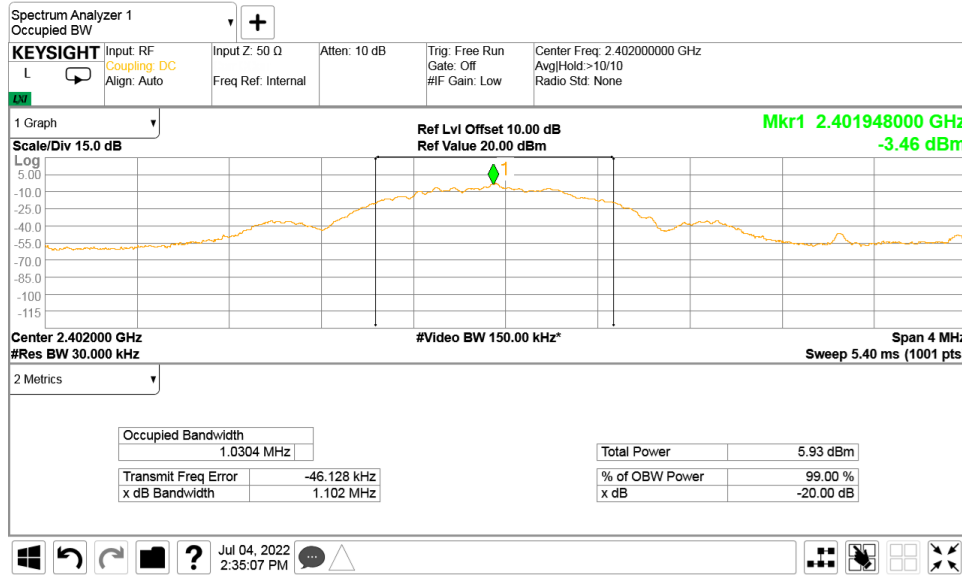




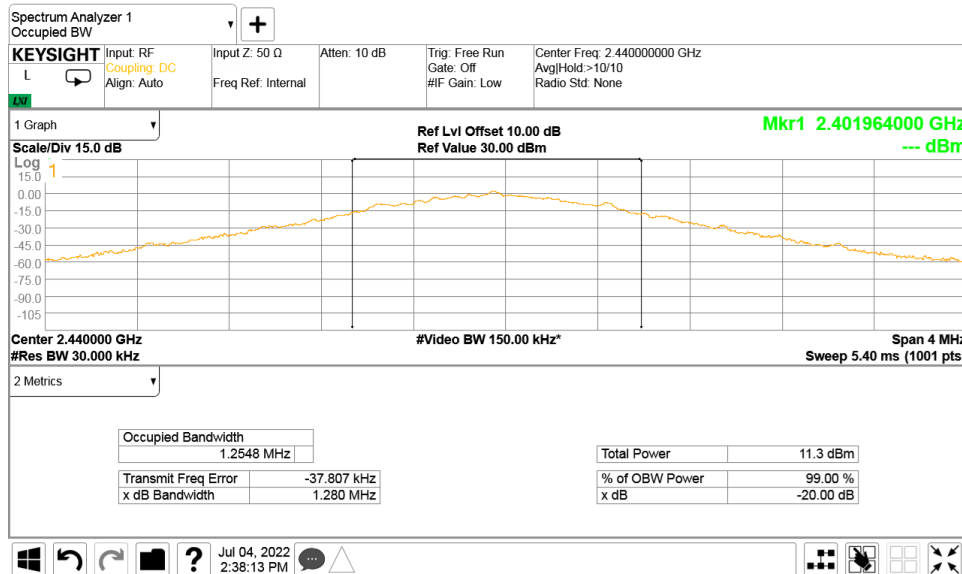
HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.10 The 20 dB bandwidth test result at low frequency at Data Rate = LE_1M_prbs9



Plot 7.1.11 The 20 dB bandwidth test result at mid frequency at Data Rate = LE_1M_prbs9

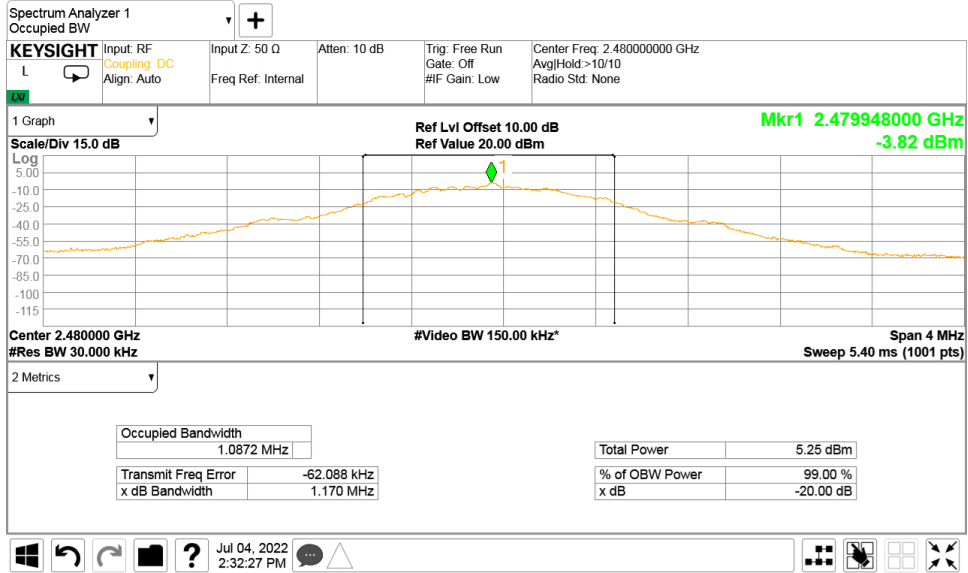




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Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.12 The 20 dB bandwidth test result at high frequency at Data Rate = LE_1M_prbs9

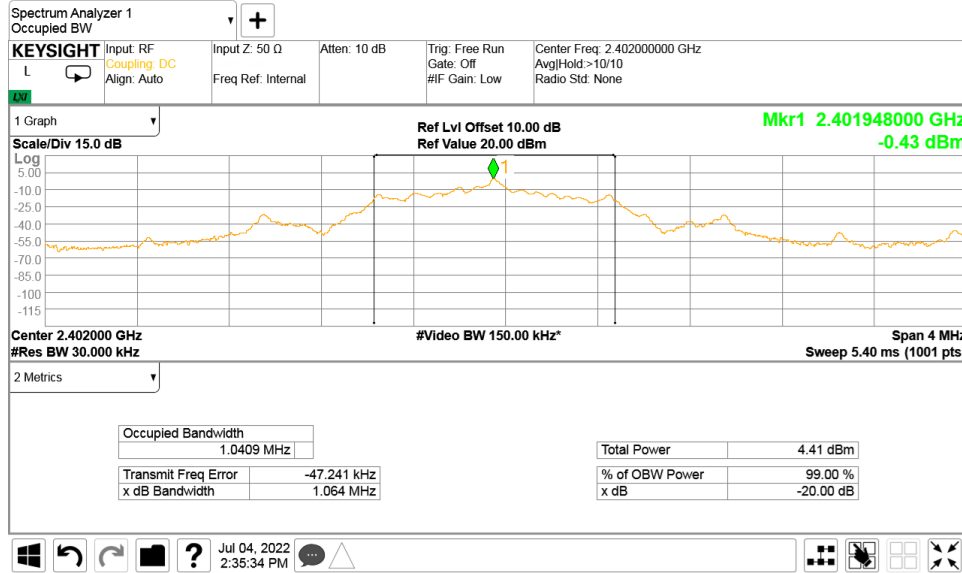




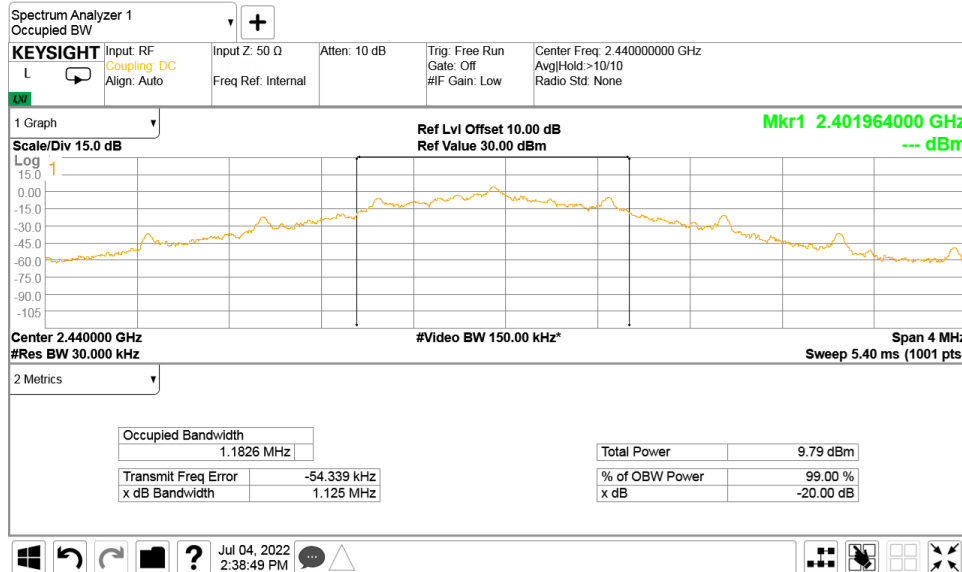
HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.13 The 20 dB bandwidth test result at low frequency at Data Rate = LE_1M_1010



Plot 7.1.14 The 20 dB bandwidth test result at mid frequency at Data Rate = LE_1M_1010

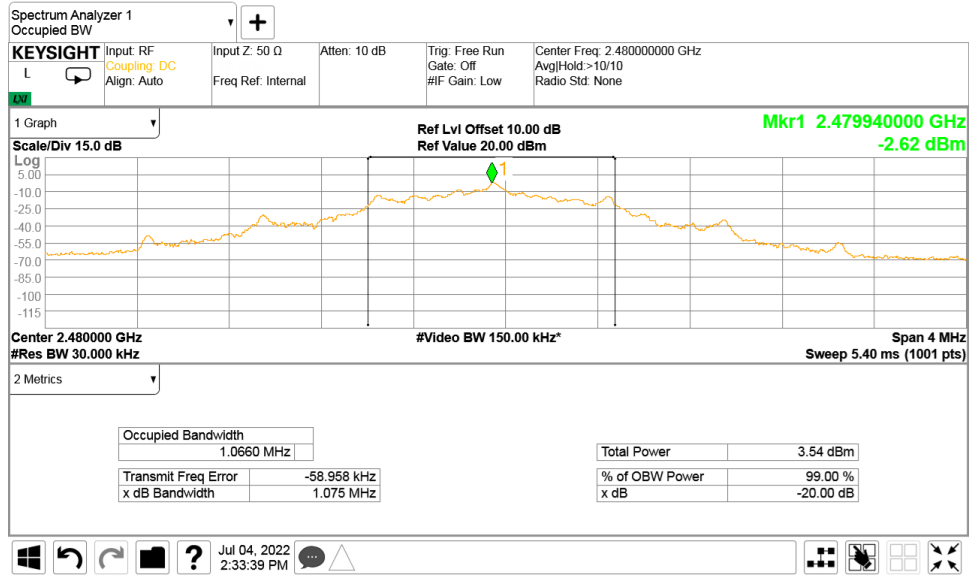




HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.15 The 20 dB bandwidth test result at high frequency at Data Rate = LE_1M_1010

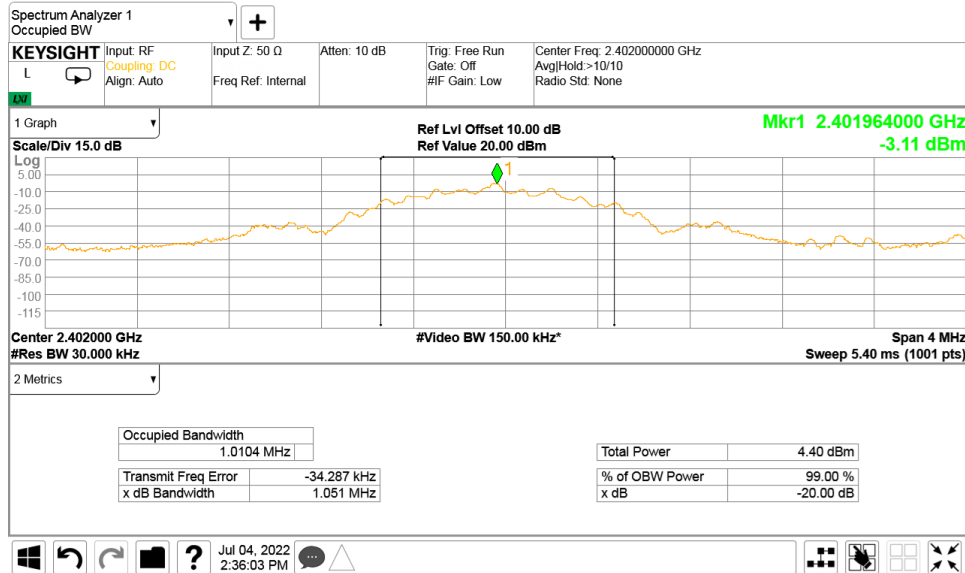




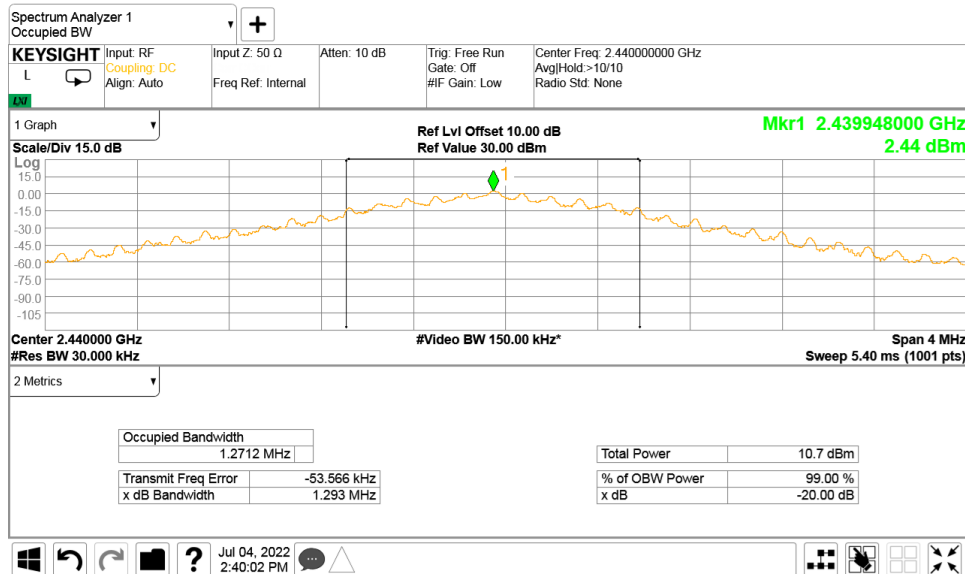
HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.16 The 20 dB bandwidth test result at low frequency at Data Rate = LE_1M_00001111



Plot 7.1.17 The 20 dB bandwidth test result at mid frequency at Data Rate = LE_1M_00001111

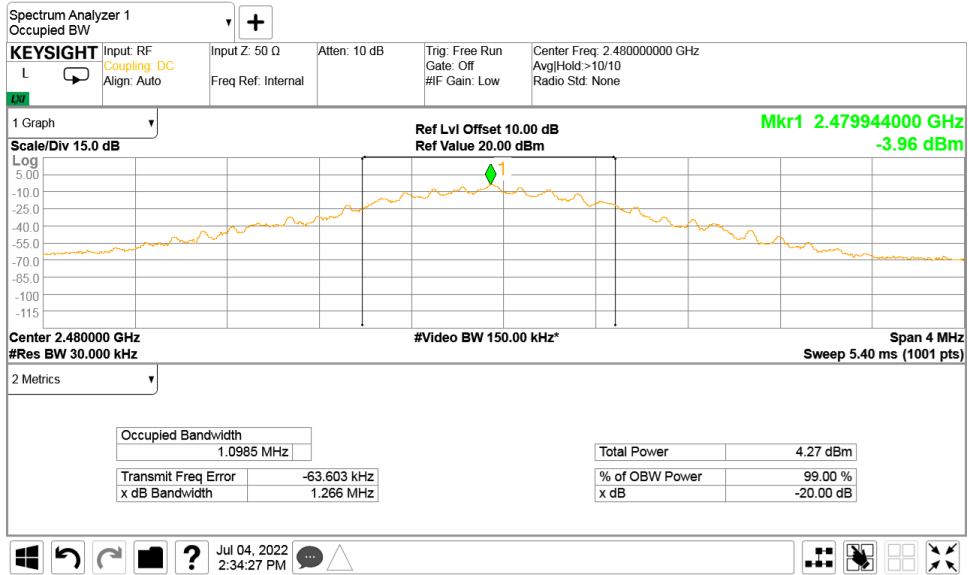




HERMON LABORATORIES

Test specification: FCC section 15.247(a)1, RSS-247 section 5.1(c), 20 dB bandwidth			
Test procedure: ANSI C63.10, section 7.8.7			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 63 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.1.18 The 20 dB bandwidth test result at high frequency at Data Rate = LE_1M_00001111





Test specification: Section 15.247(a)1, RSS-247 section 5.1(2), Frequency separation			
Test procedure: ANSI C63.10, section 7.8.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 05-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1000 hPa	Power: 110 VAC, 60 Hz
Remarks:			

7.2 Carrier frequency separation

7.2.1 General

This test was performed to measure frequency separation between the peaks of adjacent channels. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Carrier frequency separation limits

Assigned frequency range, MHz	Carrier frequency separation	
	Output power 30 dBm	Output power 21 dBm
902.0 – 928.0	25 kHz or 20 dB bandwidth of the hopping channel, whichever is greater	25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater
2400.0 – 2483.5		
5725.0 – 5850.0		

7.2.2 Test procedure

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized with frequency hopping function enabled and its proper operation was checked.
- 7.2.2.2 The spectrum analyzer span was set to capture the carrier frequency and both of adjacent channels, the lower and the higher. The resolution bandwidth was set wider than 1 % of the frequency span.
- 7.2.2.3 The spectrum analyzer was set in max hold mode and allowed trace to stabilize.
- 7.2.2.4 The frequency separation between the peaks of adjacent channels was measured as provided in Table 7.2.2 and associated plots.

Figure 7.2.1 Carrier frequency separation test setup





Test specification: Section 15.247(a)1, RSS-247 section 5.1(2), Frequency separation			
Test procedure: ANSI C63.10, section 7.8.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 05-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1000 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Table 7.2.2 Carrier frequency separation test results

ASSIGNED FREQUENCY: 2400.0 – 2483.5 MHz
 MODULATION: GFSK
 BIT RATE: 2Mbps
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: ≥ 1% of the span
 VIDEO BANDWIDTH: ≥ RBW
 FREQUENCY HOPPING: Enabled
 20 dB BANDWIDTH: 2170.0 kHz at Mid carrier frequency

Carrier frequency separation, kHz	Limit, kHz	Margin*	Verdict
2003.0	1446.67	556.33	Pass

* - Margin = Carrier frequency separation – specification limit.

Reference numbers of test equipment used

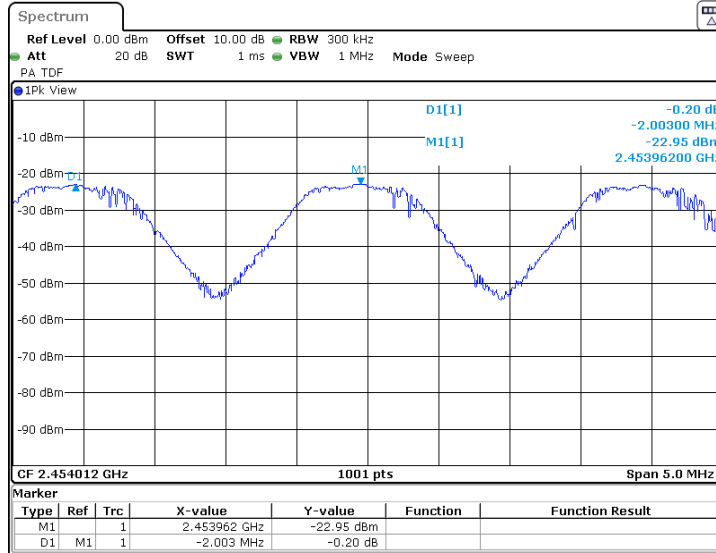
HL 4355	HL 4136	HL 5608	HL 5645	HL 337			
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Full description is given in Appendix A.



Test specification: Section 15.247(a)1, RSS-247 section 5.1(2), Frequency separation			
Test procedure: ANSI C63.10, section 7.8.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 05-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1000 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.2.1 Carrier frequency separation





Test specification: Section 15.247(a)1, RSS-247 section 5.1(c), Number of hopping frequencies			
Test procedure: ANSI C63.10, section 7.8.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 03-Jul-22 - 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 61 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

7.3 Number of hopping frequencies

7.3.1 General

This test was performed to calculate the number of hopping frequencies used by the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Minimum number of hopping frequencies

Assigned frequency range, MHz	Number of hopping frequencies
902.0 – 928.0	50 (if the 20 dB bandwidth is less than 250 kHz) 25 (if the 20 dB bandwidth is 250 kHz or greater)
2400.0 – 2483.5	15
5725.0 – 5850.0	75

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized with frequency hopping function enabled and its proper operation was checked.

7.3.2.2 Initially the spectrum analyzer span was set equal to frequency band of operation and the resolution bandwidth was set wider than 1 % of the frequency span. If the separate hopping channels were not clearly resolved the frequency band of operation was broken to sections and the resolution bandwidth was set wider than 1 % of the frequency span of each section.

7.3.2.3 The spectrum analyzer was set in max hold mode and allowed trace to stabilize.

7.3.2.4 The number of frequency hopping channels was calculated as provided in Table 7.3.2 and associated plots.

Figure 7.3.1 Hopping frequencies test setup





Test specification: Section 15.247(a)1, RSS-247 section 5.1(c), Number of hopping frequencies			
Test procedure: ANSI C63.10, section 7.8.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 03-Jul-22 - 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 61 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Table 7.3.2 Hopping frequencies test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz
 MODULATION: GFSK
 BIT RATE: 2 Mbps
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: ≥ 1% of the span
 VIDEO BANDWIDTH: ≥ RBW
 FREQUENCY HOPPING: Enabled

Number of hopping frequencies	Minimum number of hopping frequencies	Margin*	Verdict
40	15	25	Pass

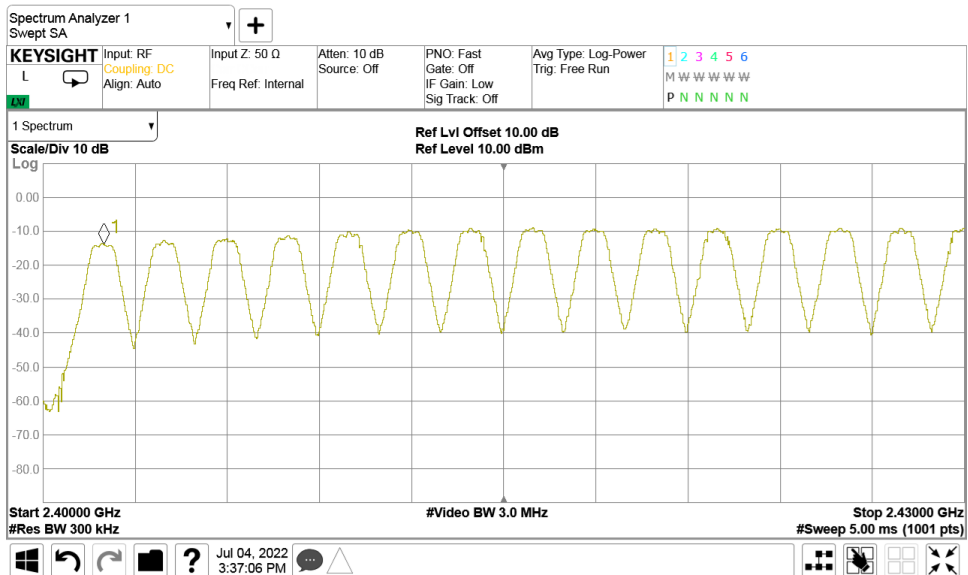
* - Margin = Number of hopping frequencies – Minimum number of hopping frequencies.

Reference numbers of test equipment used

HL 3437	HL 4136	HL 5376	HL 5397	HL 5645		
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Full description is given in Appendix A.

Plot 7.3.1 Number of hopping frequencies

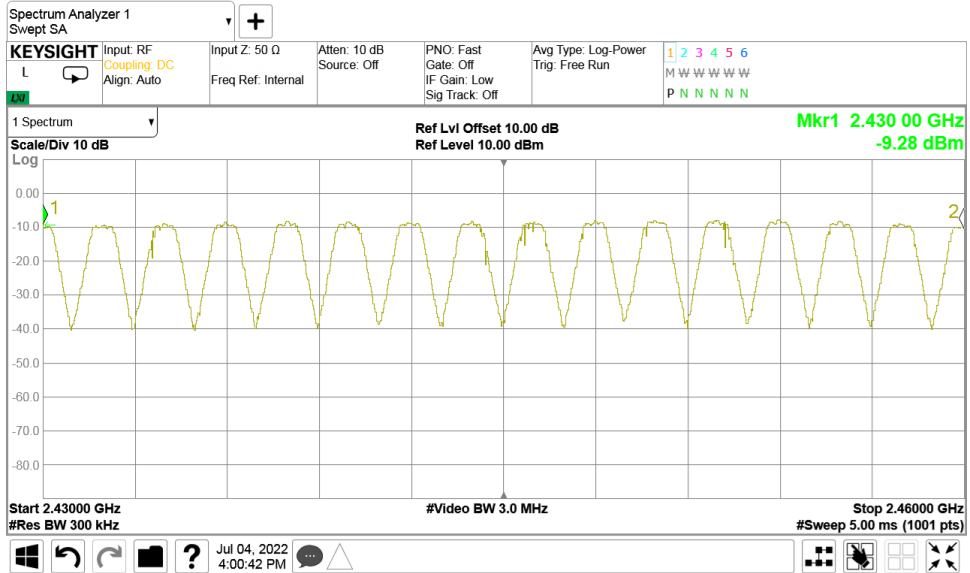




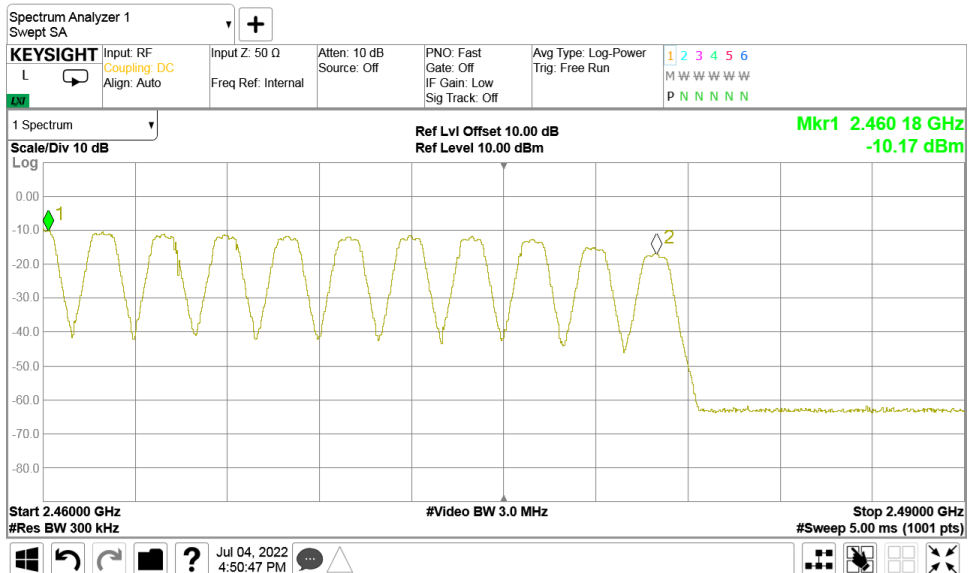
HERMON LABORATORIES

Test specification: Section 15.247(a)1, RSS-247 section 5.1(c), Number of hopping frequencies			
Test procedure: ANSI C63.10, section 7.8.3			
Test mode: Compliance		Verdict: PASS	
Date(s): 03-Jul-22 - 04-Jul-22			
Temperature: 24 °C	Relative Humidity: 61 %	Air Pressure: 1010 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.3.2 Number of hopping frequencies (continuation)



15 channels



10 channels



Test specification: Section 15.247(a)1, RSS-247 section 5.1(c), Average time of occupancy			
Test procedure: ANSI C63.10, section 7.8.4			
Test mode: Compliance		Verdict: PASS	
Date(s): 05-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1000 hPa	Power: 110 VAC, 60 Hz
Remarks:			

7.4 Average time of occupancy

7.4.1 General

This test was performed to calculate the average time of occupancy (dwell time) on any frequency channel of the EUT. Specification test limits are given in Table 7.4.1.

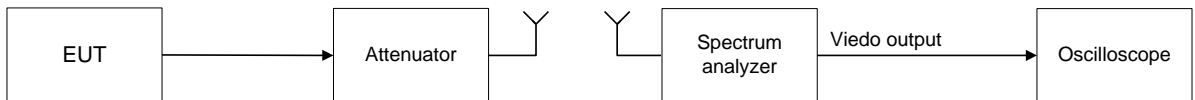
Table 7.4.1 Average time of occupancy limits

Assigned frequency range, MHz	Maximum average time of occupancy, s	Investigated period, s	Number of hopping frequencies
902.0 – 928.0	0.4	20.0	≥ 50
902.0 – 928.0	0.4	10.0	< 50
2400.0 – 2483.5	0.4	0.4 × N	N (≥ 15)
5725.0 – 5850.0	0.4	30.0	≥ 75

7.4.2 Test procedure

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized with frequency hopping function enabled and its proper operation was checked.
- 7.4.2.2 The spectrum analyzer span was set to zero centered on a hopping channel.
- 7.4.2.3 The single transmission duration and period were measured with oscilloscope.
- 7.4.2.4 The average time of occupancy was calculated as the single transmission time multiplied by the investigated period and divided by the single transmission period.
- 7.4.2.5 The test was repeated at each data rate and modulation type as provided in Table 7.4.2 and associated plots.

Figure 7.4.1 Average time of occupancy test setup





Test specification: Section 15.247(a)1, RSS-247 section 5.1(c), Average time of occupancy			
Test procedure: ANSI C63.10, section 7.8.4			
Test mode: Compliance		Verdict: PASS	
Date(s): 05-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1000 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Table 7.4.2 Average time of occupancy test results

ASSIGNED FREQUENCY: 2400.0 – 2483.5 MHz
 MODULATION: GFSK
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1 MHz
 VIDEO BANDWIDTH: 3 MHz
 NUMBER OF HOPPING FREQUENCIES: 40
 INVESTIGATED PERIOD: 16 s
 FREQUENCY HOPPING: Enabled

Carrier frequency, MHz	Single transmission duration, ms	Single transmission period, ms	Number of hops*	Average time of occupancy**, ms	Limit, s	Margin, s*	Verdict
2440.0	0.0955	1664	10	0.955	0.4	-0.399	Pass

* - Number of hops = Investigated period / Single transmission period
 * - Average time of occupancy = Single transmission duration × Number of hops
 ** - Margin = Average time of occupancy – specification limit.

Reference numbers of test equipment used

HL 4355	HL 4136	HL 5608	HL 5645	HL 337			
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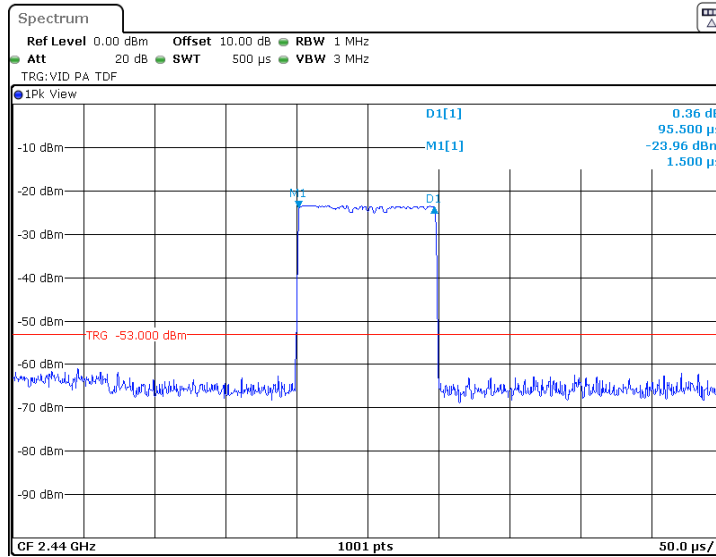
Full description is given in Appendix A.



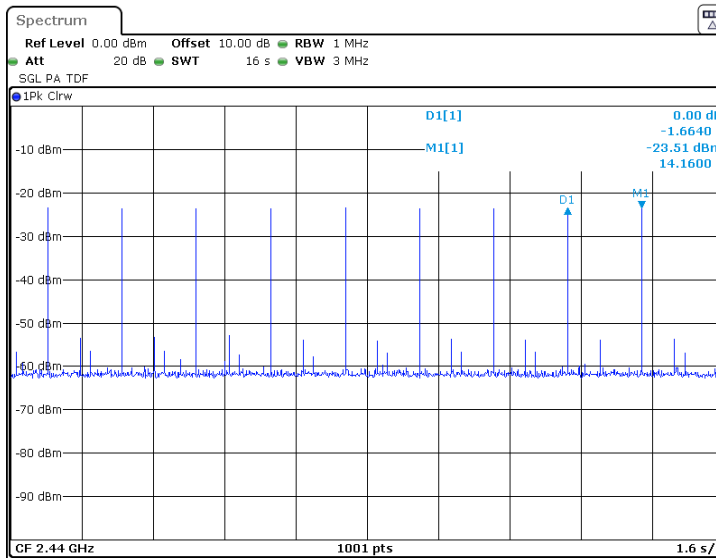
HERMON LABORATORIES

Test specification: Section 15.247(a)1, RSS-247 section 5.1(c), Average time of occupancy			
Test procedure: ANSI C63.10, section 7.8.4			
Test mode: Compliance		Verdict: PASS	
Date(s): 05-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1000 hPa	Power: 110 VAC, 60 Hz
Remarks:			

Plot 7.4.1 Single transmission duration



Plot 7.4.2 Single transmission period





Test specification: Section 15.247(b), RSS-247 section 5.4(a), Peak output power			
Test procedure: ANSI C63.10, section 7.8.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 08-Jul-22			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

7.5 Peak output power

7.5.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak output power limits

Assigned frequency range, MHz	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)*	Maximum antenna gain, dBi
	W	dBm		
902.0 – 928.0	0.25 (<50 hopping channels)	24.0(<50 hopping channels)	125.2 (<50 hopping channels)	6.0*
	1.0 (≥50 hopping channels)	30.0 (≥50 hopping channels)	131.2 (≥50 hopping channels)	
2400.0 – 2483.5	0.125 (<75 hopping channels)	21.0(<75 hopping channels)	122.2 (<75 hopping channels)	
	1.0 (≥75 hopping channels)	30.0 (≥75 hopping channels)	131.2 (≥75 hopping channels)	
5725.0 – 5850.0	1.0	30.0	131.2	

*- Equivalent field strength limit was calculated from the peak output power as follows: $E = \sqrt{30 \times P \times G} / r$, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.

** - The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

- by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
- without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
- by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

7.5.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.5.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.5.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.5.2 and associated plots.

7.5.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.

The above equation was converted in logarithmic units for 3 m test distance:

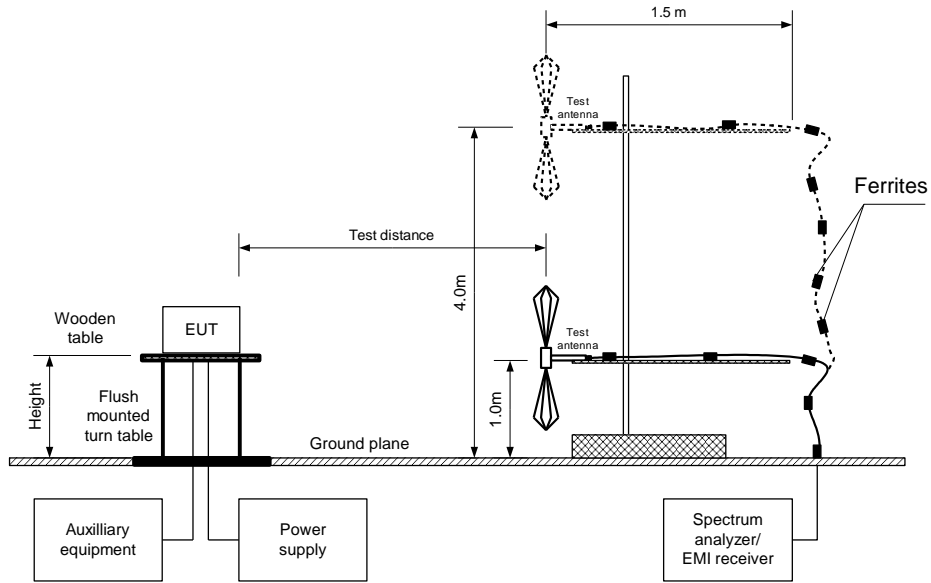
$$\text{Peak output power in dBm} = \text{Field strength in dB}(\mu\text{V/m}) - \text{Transmitter antenna gain in dBi} - 95.2 \text{ dB}$$

7.5.2.6 The worst test results (the lowest margins) were recorded in Table 7.5.2.



Test specification: Section 15.247(b), RSS-247 section 5.4(a), Peak output power			
Test procedure: ANSI C63.10, section 7.8.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 08-Jul-22			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements





Test specification: Section 15.247(b), RSS-247 section 5.4(a), Peak output power			
Test procedure: ANSI C63.10, section 7.8.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 08-Jul-22			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Table 7.5.2 Peak output power test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 1.5 m
DETECTOR USED: Peak
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
MODULATION: GFSK
DATA RATE: LE 2M Prob9
EUT 20 dB BANDWIDTH: 2170 kHz
RESOLUTION BANDWIDTH: 3 MHz
VIDEO BANDWIDTH: 50 MHz
FREQUENCY HOPPING: Disabled
NUMBER OF FREQUENCY HOPPING CHANNELS: 40

Frequency, MHz	Field strength, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2402	114.43	Vertical	1.6	20.0	3	16.23	21.0	-4.77	Pass
2440	116.52	Horizontal	1.5	25.0	3	18.32	21.0	-2.68	Pass
2480	115.81	Horizontal	1.5	35.0	3	17.61	21.0	-3.39	Pass

*- EUT front panel refer to 0 degrees position of turntable.

** - Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$, where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi - 95.2 dB*

*** - Margin = Peak output power - specification limit.

Reference numbers of test equipment used

HL 3818	HL 3903	HL 5902	HL 4114				
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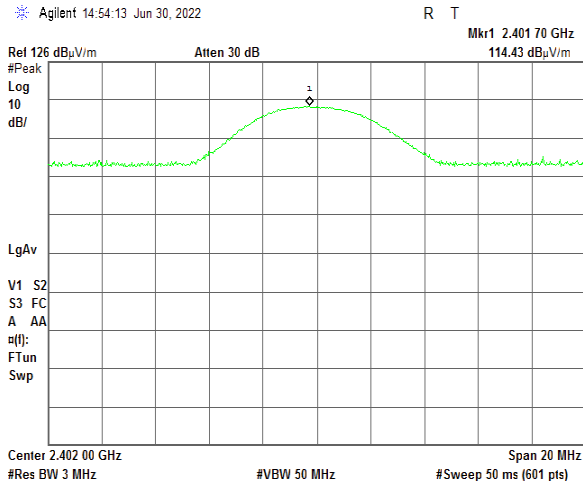
Full description is given in Appendix A.



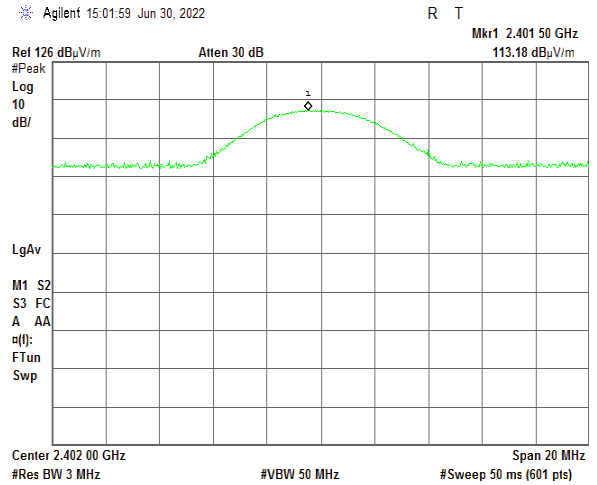
HERMON LABORATORIES

Test specification: Section 15.247(b), RSS-247 section 5.4(a), Peak output power			
Test procedure: ANSI C63.10, section 7.8.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 08-Jul-22			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.5.1 Field strength of carrier at low frequency (Vertical antenna polarization)

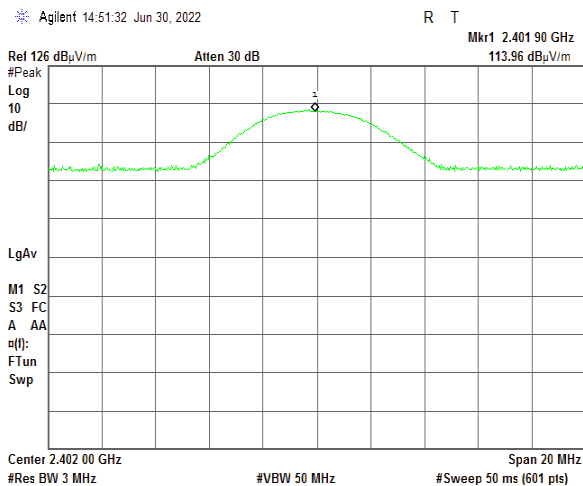


EUT Position – Horizontal

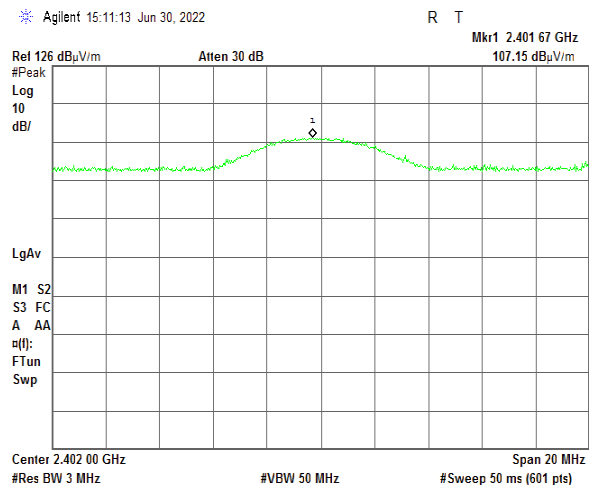


EUT Position - Vertical

Plot 7.5.2 Field strength of carrier at low frequency (Horizontal antenna polarization)



EUT Position – Horizontal



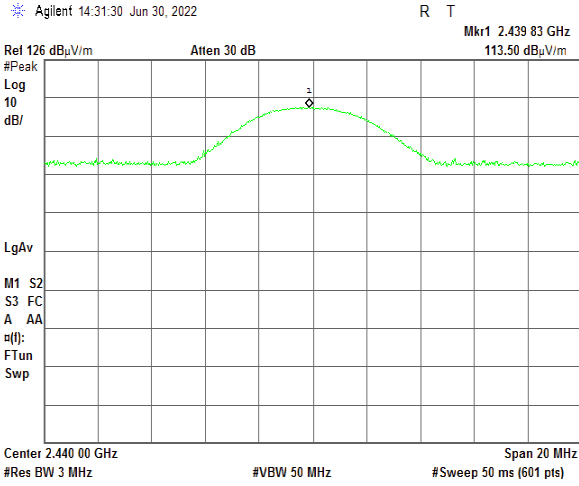
EUT Position - Vertical



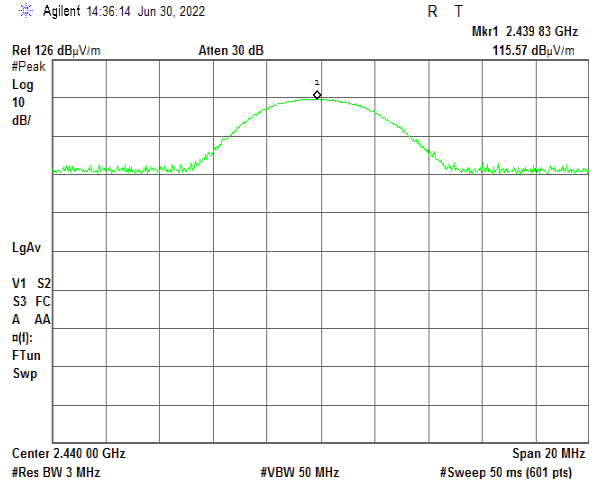
HERMON LABORATORIES

Test specification: Section 15.247(b), RSS-247 section 5.4(a), Peak output power			
Test procedure: ANSI C63.10, section 7.8.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 08-Jul-22			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.5.3 Field strength of carrier at mid frequency (Vertical antenna polarization)

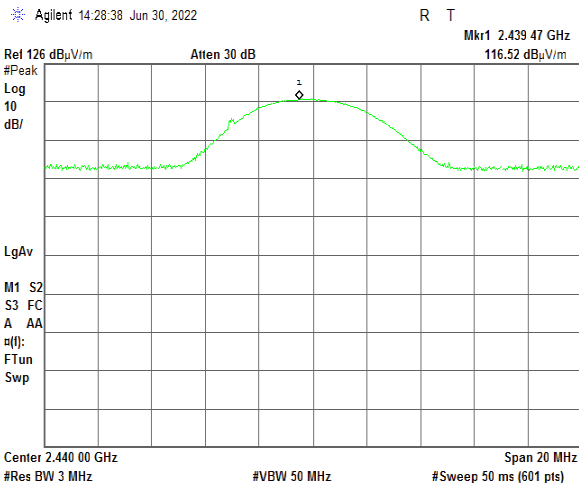


EUT Position – Horizontal

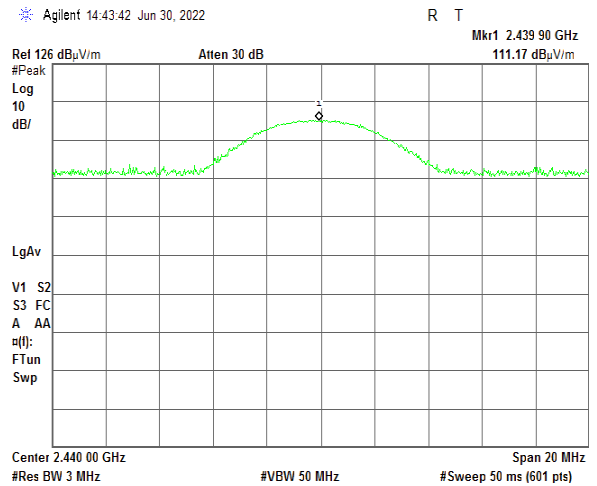


EUT Position - Vertical

Plot 7.5.4 Field strength of carrier at mid frequency (Horizontal antenna polarization)



EUT Position – Horizontal



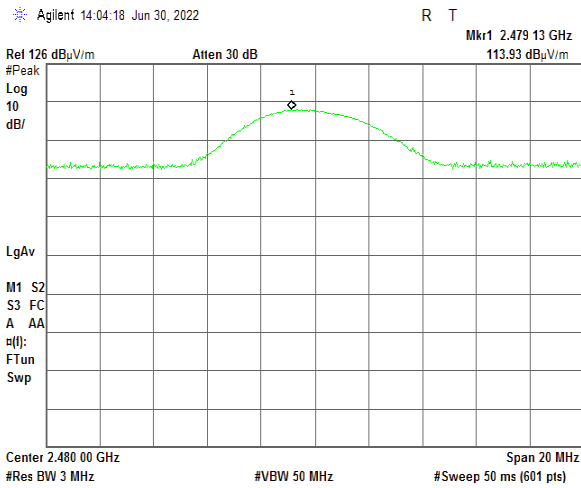
EUT Position - Vertical



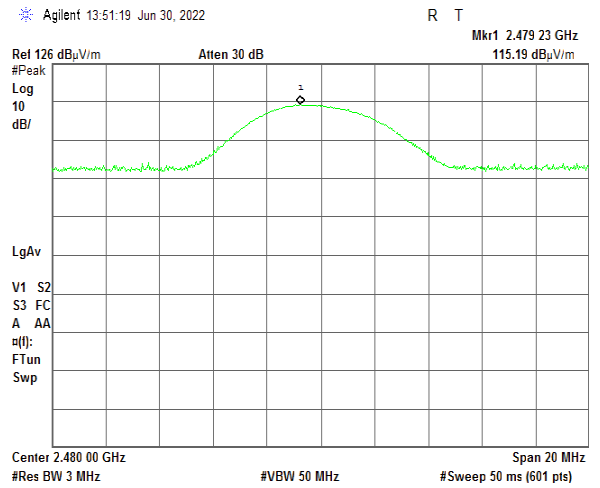
HERMON LABORATORIES

Test specification: Section 15.247(b), RSS-247 section 5.4(a), Peak output power			
Test procedure: ANSI C63.10, section 7.8.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 08-Jul-22			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Plot 7.5.5 Field strength of carrier at high frequency (Vertical antenna polarization)

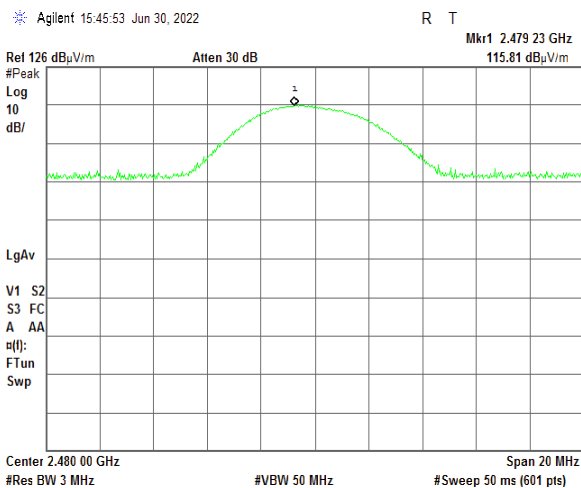


EUT Position – Horizontal

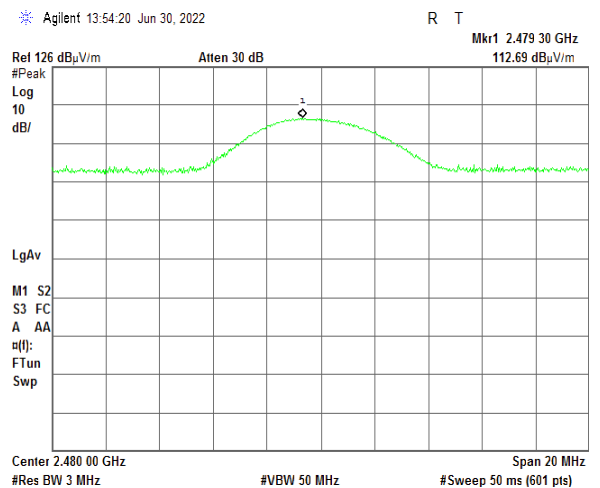


EUT Position - Vertical

Plot 7.5.6 Field strength of carrier at high frequency (Horizontal antenna polarization)



EUT Position – Horizontal



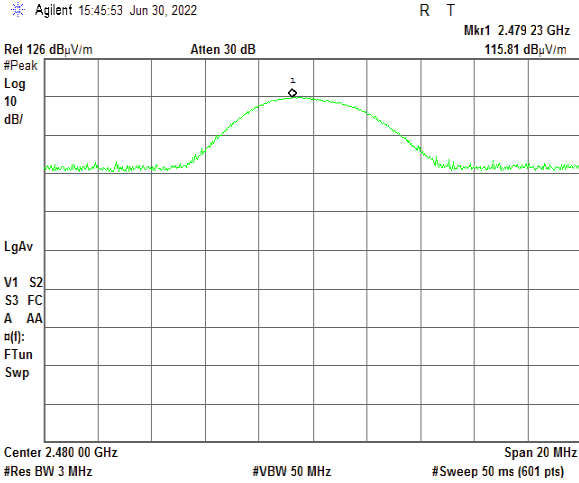
EUT Position - Vertical



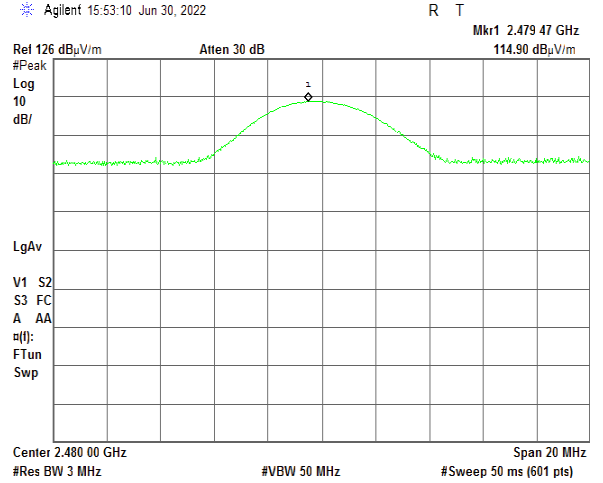
HERMON LABORATORIES

Test specification: Section 15.247(b), RSS-247 section 5.4(a), Peak output power			
Test procedure: ANSI C63.10, section 7.8.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 08-Jul-22			
Temperature: 25 °C	Relative Humidity: 52 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

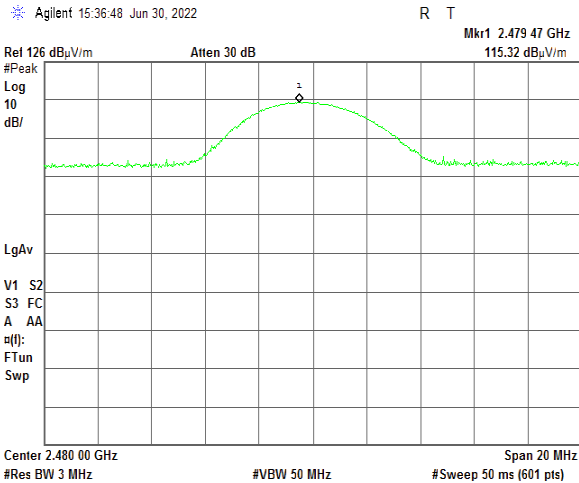
Plot 7.5.7 Field strength of carrier at high frequency depending on the data rate



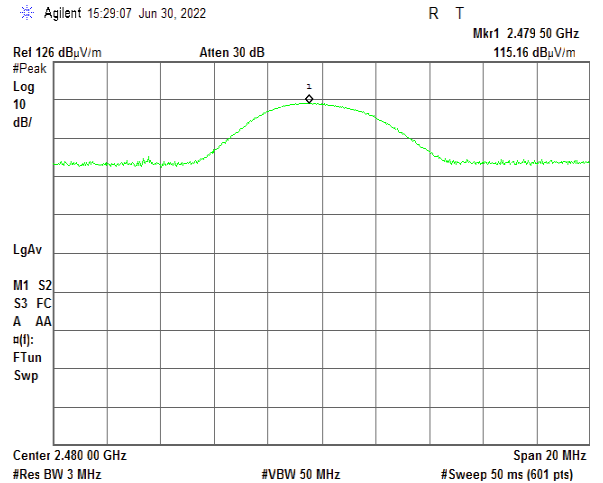
Data rate LE 2M Prob9



Data rate LE 1M Prob9



Data rate LE 2M 1010



Data rate LE 2M 00001111



Test specification: Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 01-Jul-22 - 08-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

7.6 Field strength of spurious emissions

7.6.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m) ^{***}			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc ^{***}
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5 ^{**}	20.0
0.090 – 0.110	NA	108.5 – 106.8 ^{**}	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8 ^{**}	
0.490 – 1.705	NA	73.8 – 63.0 ^{**}	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
1000 – 10 th harmonic	74.0	NA	54.0	

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log (S_1/S_2),$$

where S₁ and S₂ – standard defined and test distance respectively in meters.

** - The limit decreases linearly with the logarithm of frequency.

*** - The field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

7.6.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and the performance check was conducted.

7.6.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.6.2.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

7.6.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.6.3.1 The EUT was set up as shown in Figure 7.6.2, Figure 1.1.3, energized and the performance check was conducted.

7.6.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.6.3.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.



Test specification: Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 01-Jul-22 - 08-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Figure 7.6.1 Setup for spurious emission field strength measurements below 30 MHz

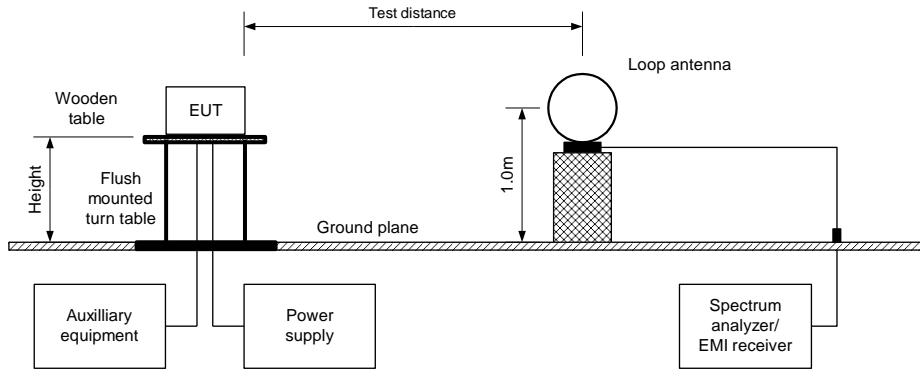
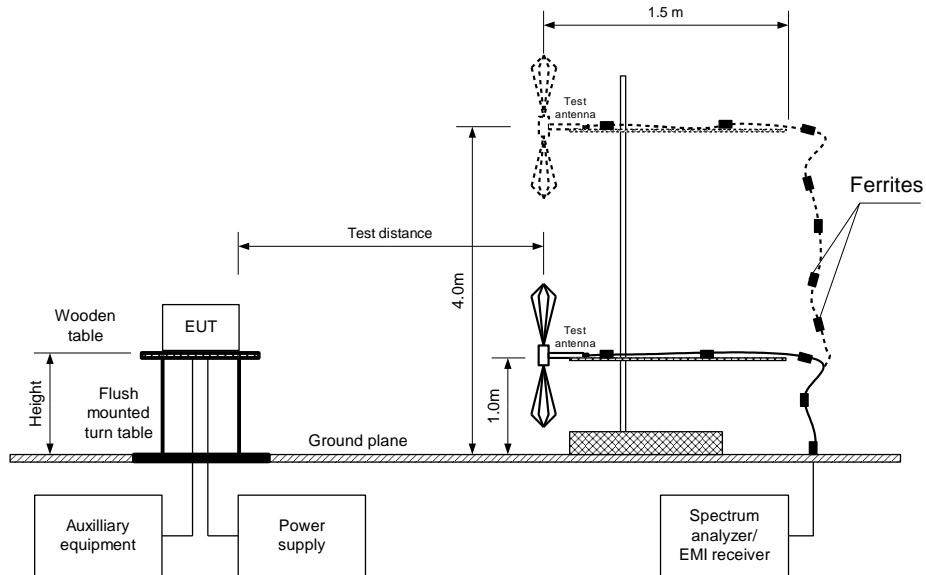


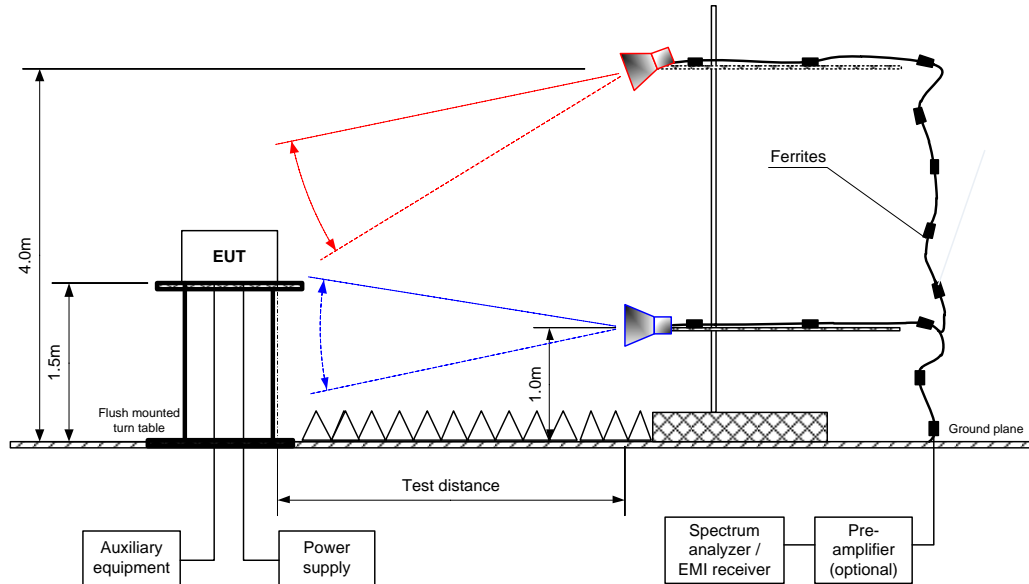
Figure 7.6.2 Setup for spurious emission field strength measurements from 30 to 1000 MHz





Test specification: Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 01-Jul-22 - 08-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Figure 7.6.3 Setup for spurious emission field strength measurements above 1000 MHz





Test specification: Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 01-Jul-22 - 08-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Table 7.6.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY: 2400-2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 -25000 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 BIT RATE: 2 Mbps
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)
 FREQUENCY HOPPING: Disabled

Frequency, MHz	Field strength of spurious, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(µV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
9608	51.63	Horizontal	1.5	34	114.07	62.44	20.0	42.44	Pass
Mid carrier frequency									
9760	58.08	Horizontal	1.5	-25	116.34	58.26	20.0	38.26	Pass
High carrier frequency									
9920	55.03	Horizontal	1.5	-18	115.70	60.67	20.0	40.67	Pass

*- EUT front panel refers to 0 degrees position of turntable.
 **- Margin = Attenuation below carrier – specification limit.

Table 7.6.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY: 2400-2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 -25000 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide
 FREQUENCY HOPPING: Disabled

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	Measured Peak, dB(µV/m)	Calculated, dB(µV/m)	Limit, Avr, dB(µV/m)	Margin, dB***	
Low carrier frequency											
4804	Vertical	1.5	80	46.2	74	-27.80	46.2	NA	54	-7.80	Pass
Mid carrier frequency											
4880	Vertical	1.5	70	49.94	74	-24.06	49.94	NA	54	-4.06	Pass
7320	Vertical	1.5	55	49.92	74	-24.08	49.92	NA	54	-4.08	
High carrier frequency											
4960	Vertical	1.5	74	48.88	74	-25.12	48.88	NA	54	-5.12	Pass
7440	Vertical	1.5	-84	51.48	74	-22.52	51.48	NA	54	-2.52	

*- EUT front panel refers to 0 degrees position of turntable.
 **- Margin = Measured field strength - specification limit.
 ***- Margin = Calculated field strength - specification limit,
 where Calculated field strength = Measured field strength + average factor.



Test specification: Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 01-Jul-22 - 08-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Table 7.6.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
0.1	1600	NA	NA	NA	-60

Table 7.6.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY: 2400-2483.5 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: GFSK
 BIT RATE: 2 Mbps
 RESOLUTION BANDWIDTH: 0.2 kHz (9 kHz – 150 kHz)
 9.0 kHz (150 kHz – 30 MHz)
 120 kHz (30 MHz – 1000 MHz)
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Log periodic (200 MHz – 1000 MHz)
 Biconilog (30 MHz – 1000 MHz)
 FREQUENCY HOPPING: Disabled

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
Low carrier frequency								
125.3	31.8	26.8	43.5	-16.7	Vertical	1.0	116	Pass
Mid carrier frequency								
124.3	32.5	27.2	43.5	-24.3	Vertical	1.0	120	Pass
High carrier frequency								
124.0	32.7	27.1	43.5	-24.4	Vertical	1.0	129	Pass

*- Margin = Measured emission - specification limit.

** - EUT front panel refer to 0 degrees position of turntable.



Test specification: Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10, sections 6.5, 6.6			
Test mode: Compliance		Verdict: PASS	
Date(s): 01-Jul-22 - 08-Jul-22			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1012 hPa	Power: 110 VAC, 50 Hz
Remarks:			

Table 7.6.6 Restricted bands according to FCC section 15.205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 - 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 - 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

Table 7.6.7 Restricted bands according to RSS-Gen

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.1905	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 - 3339	13.25 - 13.4
3.020 - 3.026	8.37625 - 8.38675	37.5 - 38.25	960 - 1427	3345.8 - 3358	14.47 - 14.5
4.125 - 4.128	8.41425 - 8.41475	73 - 74.6	1435 - 1626.5	3500 - 4400	15.35 - 16.2
4.17725 - 4.17775	12.29 - 12.293	74.8 - 75.2	1645.5 - 1646.5	4500 - 5150	17.7 - 21.4
4.20725 - 4.20775	12.51975 - 12.52025	108 - 138	1660 - 1710	5350 - 5460	22.01 - 23.12
5.677 - 5.683	12.57675 - 12.57725	156.52475 - 156.52525	1718.8 - 1722.2	7250 - 7750	23.6 - 24
6.215 - 6.218	13.36 - 13.41	156.7 - 156.9	2200 - 2300	8025 - 8500	31.2 - 31.8
6.26775 - 6.26825	16.42 - 16.423	240 - 285	2310 - 2390	9000 - 9200	36.43 - 36.5
6.31175 - 6.31225	16.69475 - 16.69525	322 - 335.4	2655 - 2900	9300 - 9500	Above 38.6

Reference numbers of test equipment used

HL 4933	HL 3818	HL 5288	HL 3903	HL 5902	HL 5112	HL 4529	HL 4372
HL 4360	HL446	HL4956					

Full description is given in Appendix A.