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TEST REPORT

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

FOR:

Vayyar Imaging LTD. Walabot DIY2 Models: VMPRO19EB4BAT, VMPRO19EB4WREP FCC ID: 2AHIS-VMAKERPROW IC: 21498-VMAKERPROW

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. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.



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1 Applicant information

Client name:	Vayyar Imaging LTD.
Address:	26 Shabazi street, Yehud, 5623000, Israel
Telephone:	+972 54 333 9670
E-mail:	miroslav.baryakh@vayyar.com
Contact name:	Mr. Miro Baryakh

2 Equipment under test attributes

Product name:	Walabot DIY2
Product type:	UWB handheld device with wireless communication
Model(s):	VMPRO19EB4BAT
Serial number:	DCWCFE03L219000163
Hardware version:	RevE
Software release:	ESP_RF_test_tool_v2.5
Receipt date	03-May-22

3 Manufacturer information

Manufacturer name:	Vayyar Imaging LTD.
Address:	26 Shabazi street, Yehud, 5623000, Israel
Telephone:	+972 54 333 9670
E-Mail:	miroslav.baryakh@vayyar.com
Contact name:	Mr. Miro Baryakh

4 Test details

Project ID:	46976
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	26-May-22
Test completed:	27-Jun-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	
FCC Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth	Pass
FCC Section 15.247(b)3/ RSS-247 section 5.4(4), Peak output power	Pass
FCC section 15.247(i) / RSS-102 section 2.5.1, RF exposure	Pass, the exhibit to the application of certification is provided
FCC Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions	Pass
FCC Section 15.247(d)/ RSS-247 section 5.5, Emissions at band edges	Pass
FCC Section 15.247(e) / RSS-247 section 5.2(2), Peak power density	Pass
FCC section 15.203 / RSS-Gen section 8.3, Antenna requirement	Pass
FCC section 15.207(a) / RSS-Gen section 8.8, Conducted emission	Pass
Unintentional emissions	
FCC section 15.107/ RSS-Gen section 8.8, Conducted emission at AC power port	Pass
FCC section 15.109, RSS-Gen section 7, Radiated emission at Wi-Fi mode	Pass
FCC section 15.109, RSS-Gen section 7, Radiated emission at UWB and Wi-Fi mode	Pass

The original EUT configuration was certified by FCC under FCC ID: 2AHIS-VMAKERPROW and by ISED under IC: 21498-VMAKERPROW. The new models configuration differs only by a minor layout modification in the supply network. In addition, modified USB component and updated matching network of the ESP2 IC. The models are equivalent in terms of their RF characteristics, as tuned by calibration procedure and validated by the testing, therefore the differences are minor enough to count as permissive change Class II and described in the technical description.

This test report supersedes the previously issued test report identified by Doc ID: VAYRAD_FCC_15.247.46976_WiFi_Rev1

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

The test results relate	only to the items testor	Doce/fail decision w	as based on nominal values.
	Unity to the items tested		

	Name and Title	Date	Signature
Tested by:	Mr. H.N. Abayev, test engineer, EMC & Radio	26-May-22 – 27-Jun-22	vy
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	15-Jul-22	13
Approved by: Mr. M. Nikishin, group leader, EMC & Radio		23-Aug-22	f4 b



6 EUT description

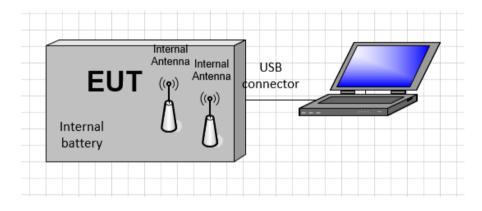
Note: The following data in this clause is provided by the customer and represents his sole responsibility

6.1 General information

The WalabotDIY2 products are using VMKAERPROUWB UWB module to characterize the environment in the vicinity of the sensor and are connected to a hosting device by WiFi/BLE communication. Utilizing the UWB module, those products are collecting and analyzing propagation information between the antennas, which is affected by the environment. The information is gathered by sequentially transmitting from the available antennas and collecting the received information at the rest of the antennas. The response information is then transmitted by WiFi to a hosting device and processed to obtain spatial information about the environment. The acquisition is controlled by the hosting device. The hosting device may ask WalabotDIY2 to acquire multiple snapshots, so as to integrate the data into information about larger spatial extent, or to detect changes in the environment.

According to manufacturer's declaration provided in Appendix G of the test report models VMPRO19CEB4BAT and VMPRO19CEB4WREP has an identical radio frequency system and differ only in that the VMPRO19CEB4BAT has an integrated battery and can be supplied by either the battery or by external power source (through USBC port). VMPRO19EB4WREP doesn't contain battery and thus can only be powered by external power source.

6.2 Test configuration



6.3 Changes made in EUT

No changes were performed in the EUT during testing.



6.4 Transmitter characteristics

V Stand-alone (Equipment with or without its own control provisions) Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) Plug-in card (Equipment intended for a variety of host systems) Assigned frequency range 2400 -2483.5 MHz Operating frequencies 2412-2462 MHz Maximum rated output power Peak output power @ CCK 10.06 dBm Peak output power @ 64-QAM 5.4 dBm Peak output power @ 64-QAM 5.4 dBm V No V No Vest continuous variable minimum RF power dBm Antenna connection V unique coupling standard connector V Type Maufacturer Model number Gain Type INPAQ ACA-3216-A2-MC-S Typ peak gain: 0 dBi Transmitter aggregate data rate/s 1/2/5.5/11/6/54/65/65 Mbps Typ peak gain: 0 dBi								
Combined equipment (Equipment where the radio part is fully integrated within another type of equipment) Plug-in card (Equipment intended for a variety of host systems) Assigned frequency range 2400 -2483.5 MHz Operating frequencies 2412-2462 MHz Maximum rated output power Peak output power @ CCK 10.06 dBm Peak output power @ BPSK 8.51 dBm Peak output power @ 64-QAM 5.4 dBm Peak output power @ 64-QAM 5.4 dBm Peak output power @ 64-QAM 5.4 dBm V No Yes Stepped variable innimum RF power dB Mattenna connection Manufacturer Mathemal connector V Type Manufacturer Manufacturer Model number Gain Type equiped data rate/s Type of modulation CCK / BPSK / 64-QAM	Type of equipment							
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Maximum rated output power Peak output power @ CCK 10.06 dBm Peak output power @ BPSK 8.51 dBm Peak output power @ 64-QAM 5.4 dBm Is transmitter output power variable? V No Yes continuous variable minimum RF power dBm maximum RF power dBm Antenna connection with temporary RF connector unique coupling standard connector V Integral Type Manufacturer Model number Gain Type of modulation 1/2/5.5/11/6/54/6.5/65 Mbps Typ peak gain: 0 dBi				12				
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V No Is transmitter output power variable? Yes		Peak of	output pow	er @ BF	PSK 8.51 dBm			
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with temporary RF connector unique coupling standard connector v with temporary RF connector Name V with temporary RF connector Antenna/s technical characteristics Type Manufacturer Model number Gain integral INPAQ ACA-3216-A2-MC-S Typ peak gain: 0 dBi Transmitter aggregate data rate/s CCK / BPSK / 64-QAM					um RF power	RF power		dBm
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integral INPAQ ACA-3216-A2-MC-S Typ peak gain: 0 dBi Transmitter aggregate data rate/s 1/2/5.5/11/6/54/6.5/65 Mbps CCK / BPSK / 64-QAM	Antenna/s technical characteristics							
Transmitter aggregate data rate/s 1/2/5.5/11/6/54/6.5/65 Mbps Type of modulation CCK / BPSK / 64-QAM	Type Manufacturer			Model number			Gain	
Type of modulation CCK / BPSK / 64-QAM	integral INPAQ				ACA-3216-A2-MC-S Typ pea		Typ peak gai	n: 0 dBi
Type of modulation CCK / BPSK / 64-QAM	Transmitter aggregate data rate/s 1/2/5.5/11/6/54/6.5/65 Mbps							
	Modulating test signal (baseband)							
Transmitter power source								
V Battery Nominal rated voltage 3.85 V Battery type		tano	3 95	X V	Batten/ tvpo			
V Dately Nominal rated voltage 5.05 V Dately type V DC Nominal rated voltage 5.0 VDC								
AC mains Nominal rated voltage Frequency Hz		<u> </u>			Frequency	Hz		



Test specification: Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth						
Test procedure: ANSI C63.10 section 11.8.1						
Test mode:	Compliance	Verdict:	PASS			
Date(s):	26-May-22	verdict:	PA35			
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC			
Remarks:						

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

7.1 Minimum 6 dB bandwidth

7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
2400.0 – 2483.5	6.0	500.0

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

Table 7.1.2 The 99% bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points	Limit, kHz
2400.0 – 2483.5	99%	NA

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.
- **7.1.2.3** The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.3 and associated plot.

Figure 7.1.1 6 dB bandwidth test setup





Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth				
Test procedure:	ANSI C63.10 section 11.8.1				
Test mode:	Compliance	Verdict:	PASS		
Date(s):	26-May-22	verdict:	PASS		
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC		
Remarks:	-				

Table 7.1.3 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND DETECTOR USED: RESOLUTION BANDWIDTH: VIDEO BANDWIDTH: MODULATION: CHANNEL BANDWIDTH: BITRATE:):	2400.0 – 2483.5 MH Peak 100 kHz 300 kHz CCK 20 MHz 1 Mbps	łz	
Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	9546.0	500.0	9046.0	Pass
2442.0	9557.0	500.0	9057.0	Pass
2462.0	9563.0	500.0	9063.0	Pass
CHANNEL BANDWIDTH: BITRATE:		20 MHz 11 Mbps		
Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	9842.0	500.0	9342.0	Pass
2442.0	9279.0	500.0	8779.0	Pass
2462.0	9735.0	500.0	9235.0	Pass
MODULATION: CHANNEL BANDWIDTH: BITRATE:		BPSK 20 MHz 6 Mbps		
Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	16320.0	500.0	15820.0	Pass
2442.0	16310.0	500.0	15810.0	Pass
2462.0	15750.0	500.0	15250.0	Pass
MODULATION: CHANNEL BANDWIDTH: BITRATE:		64-QAM 20 MHz 54 Mbps		
Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	16410.0	500.0	15910.0	Pass
2442.0	16120.0	500.0	15620.0	Pass
2462.0	15810.0	500.0	15310.0	Pass



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth				
Test procedure:	ANSI C63.10 section 11.8.1				
Test mode:	Compliance	Verdict:	PASS		
Date(s):	26-May-22	verdict:	PASS		
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC		
Remarks:					

Table 7.1.4 6 dB bandwidth test results (continuation)

ASSIGNED FREQUENCY BANE DETECTOR USED: RESOLUTION BANDWIDTH: VIDEO BANDWIDTH: MODULATION: CHANNEL BANDWIDTH: BITRATE:):	łz		
Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	17030.0	500.0	16530.0	Pass
2442.0	16900.0	500.0	16400.0	Pass
2462.0	16360.0	500.0	15860.0	Pass
MODULATION:		64-QAM		

CHANNEL BANDWIDTH:		20 MHz		
BITRATE:		65 Mbps		
Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	17680.0	500.0	17180.0	Pass
2442.0	17680.0	500.0	17180.0	Pass
2462.0	17670.0	500.0	17170.0	Pass



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth				
Test procedure:	ANSI C63.10 section 11.8.1				
Test mode:	Compliance	Verdict: PASS			
Date(s):	26-May-22	Verdict:	PA33		
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC		
Remarks:					

Table 7.1.5 99% bandwidth test results

ASSIGNED FREQUENCY BAND:	2400.0 – 2483.5 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	300 kHz
VIDEO BANDWIDTH:	1000 kHz
MODULATION:	CCK
CHANNEL BANDWIDTH:	20 MHz
MODULATION/BITRATE:	1 Mbps
MODULATION/BITRATE:	1 Mbps

Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	13610.0	NA	NA	Pass
2442.0	13619.0	NA	NA	Pass
2462.0	13521.0	NA	NA	Pass

CHANNEL BANDWIDTH: MODULATION/BITRATE:		20 MHz 11 Mbps		
Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	13332.0	NA	NA	Pass
2442.0	13322.0	NA	NA	Pass
2462.0	13264.0	NA	NA	Pass

MODULATION: CHANNEL BANDWIDTH: MODULATION/BITRATE:		BPSK 20 MHz 6 Mbps		
Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	16703.0	NA	NA	Pass
2442.0	16667.0	NA	NA	Pass
2462.0	16588.0	NA	NA	Pass

MODULATION:		64-QAM		
CHANNEL BANDWIDTH:	2	20 MHz		
MODULATION/BITRATE:	Ę	54 Mbps		
Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2412.0	16470.0	NA	NA	Pass
2442.0	16477.0	NA	NA	Pass
2462.0	16494.0	NA	NA	Pass



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth				
Test procedure:	ANSI C63.10 section 11.8.1				
Test mode:	Compliance	Verdict:	PASS		
Date(s):	26-May-22	verdict:	PA33		
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC		
Remarks:	-				

Table 7.1.6 99% bandwidth test results (continuation)

ASSIGNED FREQUENCY BAND DETECTOR USED: RESOLUTION BANDWIDTH: VIDEO BANDWIDTH: MODULATION: CHANNEL BANDWIDTH: BITRATE:		2400.0 – 2483.5 MHz Peak 300 kHz 1000 kHz BPSK 20 MHz 6.5 Mbps				
Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict		
2412.0	17831.0	NA	NA	Pass		
2442.0	17732.0	NA	NA	Pass		
2462.0	17755.0	NA	NA	Pass		
MODULATION: CHANNEL BANDWIDTH: BITRATE:		64-QAM 20 MHz 65 Mbps				
Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict		
2412.0	17701.0	NA	NA	Pass		
2442.0	17673.0	NA	NA	Pass		
2462.0	17703.0	NA	NA	Pass		

Reference numbers of test equipment used

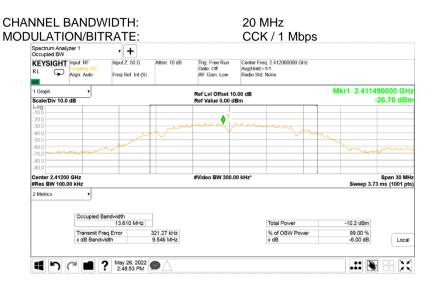
HL 3437 HL 4136 HL 5376 HL 5644	
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Full description is given in Appendix A.

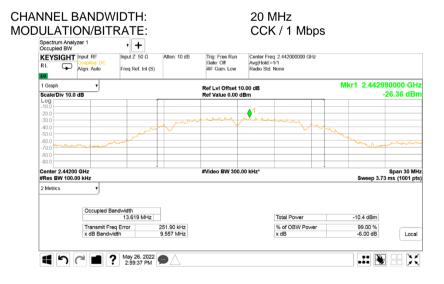


Test specification: Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth								
Test procedure:	ANSI C63.10 section 11.8.1							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	26-May-22	verdict:	PASS					
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC					
Remarks:								

Plot 7.1.1 6 dB bandwidth test result at low frequency



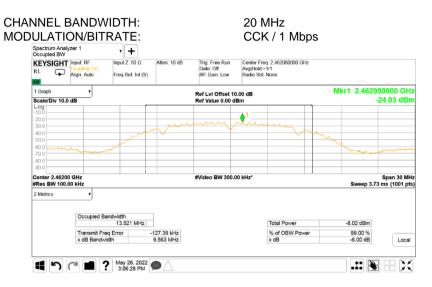
Plot 7.1.2 6 dB bandwidth test result at mid frequency





Test specification: Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth								
Test procedure:	ANSI C63.10 section 11.8.1							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	26-May-22	verdict:	PASS					
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC					
Remarks:								

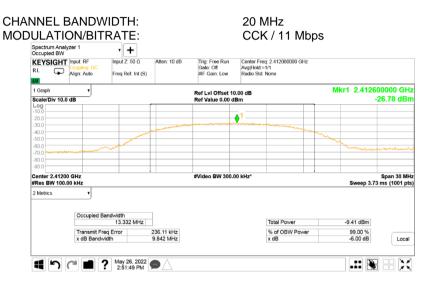
Plot 7.1.3 6 dB bandwidth test result at high frequency



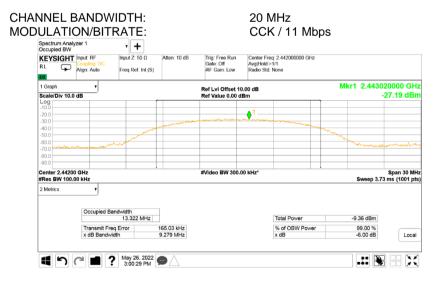


Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth						
Test procedure:	ANSI C63.10 section 11.8.1						
Test mode:	Compliance	Vardiate	PASS				
Date(s):	26-May-22	Verdict:	PASS				
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:	· · ·						

Plot 7.1.4 6 dB bandwidth test result at low frequency



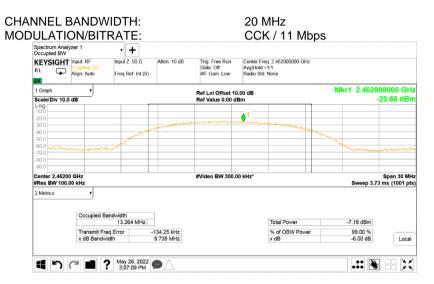
Plot 7.1.5 6 dB bandwidth test result at mid frequency





Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth							
Test procedure:	ANSI C63.10 section 11.8.1							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	26-May-22	verdict:	PA33					
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC					
Remarks:								

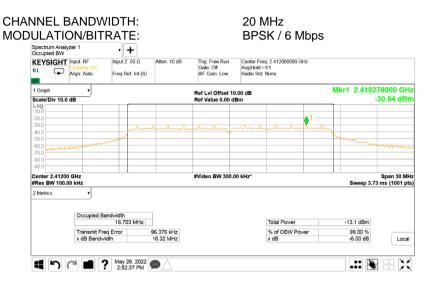
Plot 7.1.6 6 dB bandwidth test result at high frequency





Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth						
Test procedure:	ANSI C63.10 section 11.8.1						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	26-May-22	verdict:	PASS				
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.1.7 6 dB bandwidth test result at low frequency



Plot 7.1.8 6 dB bandwidth test result at mid frequency

 	BANDW DN/BIT				20 N BPS	MHz SK / 6 M	lbps			
Spectrum Analyzer 1 Occupied BW		· +			·					
	Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Freq Ref: Int (S)	Atten: 10 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Fre Avg Hold:> Radio Std:		Hz			
1 Graph	•			Ref Lvi Offset	10.00 dB			Mkr1	2.4432	60000 GHz
Scale/Div 10.0	dB			Ref Value 0.00	dBm			_		30.33 dBm
-10.0 -20.0 -30.0					↓ 1					
-40.0		pentres	mann	montray	mmm	- Maria Maria	mon	1		
-50.0 -60.0	nour	und and a second se						~~~~	-	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
-80.0										
Center 2.44200 #Res BW 100.0				#Video BW 300	.00 kHz*			•	Sweep 3.73	Span 30 MHz 3 ms (1001 pts)
2 Metrics	T								·	
	Occupied Ba	ndwidth 16.667 MHz				Total Power		-1	3.4 dBm	
	Transmit Fre x dB Bandwi		73.554 kHz 16.31 MHz			% of OBW Pov x dB	ver		99.00 % -6.00 dB	Local
1 5	┍╴ ?	May 26, 2022 3:01:16 PM	\square						.#	



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth							
Test procedure:	ANSI C63.10 section 11.8.1							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	26-May-22	verdict:	PA33					
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC					
Remarks:								

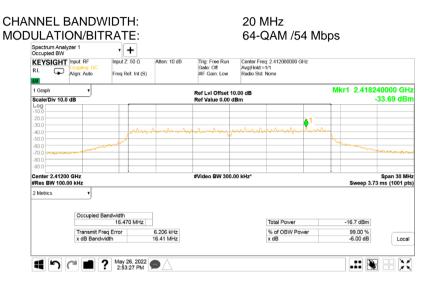
Plot 7.1.9 6 dB bandwidth test result at high frequency

ANNEL E	ON/BIT			20 MHz BPSK / 6 Mbps				
Coccupied BW KEYSIGHT RL	Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Freq Ref: Int (S)	Atten: 10 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 2.4620000 Avg Hold:>1/1 Radio Std: None	I0 GHz		
1 Graph Scale/Div 10.	v dB			Ref Lvi Offset 10. Ref Value 0.00 dE			Mkr1 2.454	500000 GHz -27.28 dBm
Log -10.0 -20.0 -30.0 -40.0 -50.0 -60.0 -70.0 -80.0 -80.0		- All	desenter to		man	AA	1	and the second
Center 2.4620 #Res BW 100				#Video BW 300.0	0 kHz*		Sweep 3.7	Span 30 MHz 3 ms (1001 pts)
2 Metrics	Occupied B	andwidth 16.588 MHz]		Total Powe	r	-11.0 dBm 99.00 %	



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth						
Test procedure:	ANSI C63.10 section 11.8.1						
Test mode:	Compliance	Vardiate	PASS				
Date(s):	26-May-22	Verdict:	PASS				
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.1.10 6 dB bandwidth test result at low frequency



Plot 7.1.11 6 dB bandwidth test result at mid frequency

		BANDW ON/BIT				20 N 64-0	//Hz Qam /54 m	bps		
	Spectrum Analyzer 1 Occupied BW		• +					•		
		Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Freq Ref: Int (Atten: 10 dB S)	Trig: Free Run Gate: Off #IF Gain: Low	Center Fre Avg Hold:> Radio Std:				
	1 Graph	•			Ref Lvi Offset 10			Mkr		50000 GHz 27.41 dBm
	Scale/Div 10.0	dB			Ref Value 0.00 d	Bm		_		27.41 060
	-10.0									
	-20.0									
	-30.0		m	mmmmm	mmm	mm	mound	my		
	-40.0		~		T T			<u> </u>		
	-50.0		man and a second						man	man m
	-60.0	alout and the								and a second second
	-80.0									
	-90.0									
	Center 2.4420 #Res BW 100.		•		#Video BW 300.0	00 kHz*			Sweep 3.73	Span 30 MHz ms (1001 pts)
ľ	2 Metrics	•								
ŀ	2 modes									
		Occupied Ba	andwidth							
		complete an	16.477 MHz	:			Total Power		10.2 dBm	
		Transmit Fre	a Error	10.544 kHz			% of OBW Power		99.00 %	
		x dB Bandwi		16.12 MHz			x dB		-6.00 dB	Local
- 1			May 26, 202	2						
	()	(***	3:02:21 PM	" 9 /						



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	26-May-22	verdict:	PASS
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Plot 7.1.12 6 dB bandwidth test result at high frequency

HANNEL B					20 N 64-0	/IHz QAM /5/	4 Mb	ps	
		T + Input Z: 50 Ω Freq Ref: Int (S)	Atten: 10 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Fre Avg Hold:> Radio Std:		Hz		
1 Graph Scale/Div 10.0 c	, B			Ref Lvi Offset 10 Ref Value 0.00 d				Mkr1 2.4545	00000 GHz -31.15 dBm
Log -10.0 -20.0 -40.0 -50.0 -70.0 -80.0 -80.0 -90.0		1	h-mhan	h		nmmn	A		
Center 2.46200 #Res BW 100.00				#Video BW 300.0	00 kHz*			Sweep 3.7	Span 30 MHz 3 ms (1001 pts)
2 Metrics	Occupied Ba Transmit Fre x dB Bandwi	16.494 MHz	56.993 kHz 15.81 MHz			Total Power % of OBW Pow x dB	ver	-14.7 dBm 99.00 % -6.00 dB	Local
	∍ ∎ ?	May 26, 2022 3:09:12 PM						.:: 🗎	



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth			
Test procedure:	ANSI C63.10 section 11.8.1			
Test mode:	Compliance	Vardiate	PASS	
Date(s):	26-May-22	Verdict:	PASS	
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC	
Remarks:				

Plot 7.1.13 6 dB bandwidth test result at low frequency

HANNEL B					20 MHz BPSK /6.5	Mbps	6	
Spectrum Analyz Occupied BW	ter 1	• +				•		
	Input: RF <mark>Coupling: DC</mark> Align: Auto	Input Z: 50 Ω Freq Ref: Int (S)	Atten: 10 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 2.412000000 Avg Hold:>1/1 Radio Std: None	3Hz		
1 Graph Scale/Div 10.0 d	TIB.			Ref Lvi Offset 1 Ref Value 0.00 d			Mkr1 2.4132	60000 GHz 29.95 dBm
Log -10.0 -20.0 -30.0 -50.0 -50.0 -70.0 -80.0 -90.0	mor walk men	prover from the second	Amaana	mmm	1- numericantes	-AA.		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Center 2.41200 #Res BW 100.00		ļ		#Video BW 300.	00 kHz*		Sweep 3.73	Span 30 MHz ms (1001 pts)
2 Metrics	Occupied Bar	ndwidth 17.831 MHz	_		Total Power		-13.0 dBm	
	Transmit Free x dB Bandwid		55.999 kHz 17.03 MHz		% of OBW Po x dB	wer	99.00 % -6.00 dB	Local
1 50	∍∎?	May 26, 2022 2:56:28 PM	\square				.:: 🖌	

Plot 7.1.14 6 dB bandwidth test result at mid frequency

HANNEL BA ODULATION Spectrum Analyzer 1 Occupied BW	I/BITRAT			20 MHz BPSK /6.5	Mbps	
	oling: DC	2:50 Ω Atten: 10 dB tef: Int (S)	Trig: Free Run Gate: Off #IF Gain: Low	Center Freq: 2.442000000 G Avg Hold:>1/1 Radio Std: None	iHz	
1 Graph Scale/Div 10.0 dB	•		Ref Lvi Offset 10. Ref Value 0.00 dE		Mkr1 2.443	260000 GHz -24.41 dBm
Log -100 -200 -300 -400 -500 -800 -700 -800 -900				1	Anna	ulu un
Center 2.44200 GHz #Res BW 100.00 kH			#Video BW 300.0) kHz*	Sweep 3.	Span 30 MHz 73 ms (1001 pts)
Т	Vccupied Bandwidth 17.7 ransmit Freq Error dB Bandwidth	32 MHz -17.721 kHz 16.90 MHz		Total Power % of OBW Por x dB	-7.43 dBm wer 99.00 % -6.00 dB	Local
	May 3:03	26, 2022				



Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	26-May-22	verdict:	PASS
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

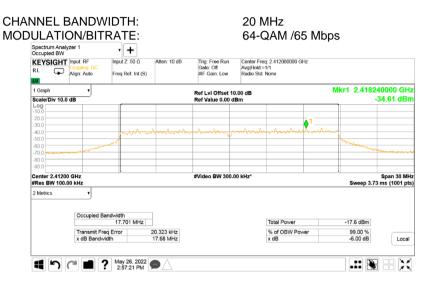
Plot 7.1.15 6 dB bandwidth test result at high frequency

IANNEL B					20 N BPS	ИНz SK /6.5 M	bps	
		r + Input Z: 50 Ω Freq Ref: Int (S)	Atten: 10 dB	Trig: Free Run Gate: Off #IF Gain: Low	Center Fre Avg Hold:> Radio Std:			
1 Graph Scale/Div 10.0 c	, IB			Ref Lvi Offset 10 Ref Value 0.00 d			Mkr1 2.4557	30000 GHz -27.34 dBm
Log -10.0 -20.0 -30.0 -40.0 -50.0 -60.0 -70.0 -80.0 -90.0			-1			or Anna Anna An	N.	
Center 2.46200 #Res BW 100.00 2 Metrics				#Video BW 300.	00 kHz*		Sweep 3.7	Span 30 MHz 3 ms (1001 pts)
	Occupied Ba Transmit Fre x dB Bandwi	17.755 MHz q Error	-71.470 kHz 16.36 MHz			Total Power % of OBW Power x dB	-11.0 dBm 99.00 % -6.00 dB	Local
4 50		May 26, 2022 3:09:57 PM	\square				.#	3 88 🔀

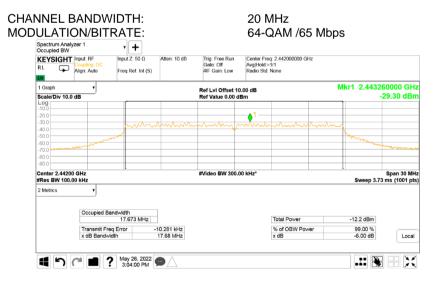


Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth			
Test procedure:	ANSI C63.10 section 11.8.1			
Test mode:	Compliance	Vardiate	PASS	
Date(s):	26-May-22	Verdict:	PASS	
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC	
Remarks:				

Plot 7.1.16 6 dB bandwidth test result at low frequency



Plot 7.1.17 6 dB bandwidth test result at mid frequency

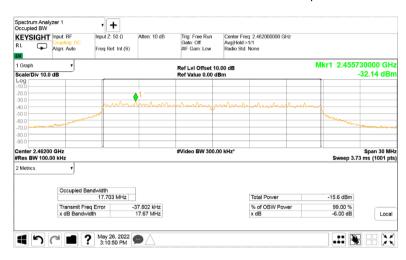




Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth			
Test procedure:	ANSI C63.10 section 11.8.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	26-May-22	verdict:	PASS	
Temperature: 24 °C	Relative Humidity: 60 %	Air Pressure: 1008 hPa	Power: 5 VDC	
Remarks:	•			

Plot 7.1.18 6 dB bandwidth test result at high frequency

CHANNEL BANDWIDTH: MODULATION/BITRATE: 20 MHz 64-QAM /65 Mbps





Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-22 - 15-Jun-22	verdict.	FA33
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

7.2 Field strength of spurious emissions

7.2.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.2.1.

Frequency, MHz	dB(μV/m)* strength d		Attenuation of field strength of spurious versus	
requeriey, wriz	Peak	Quasi Peak	Average	carrier outside restricted bands, dBc***
0.009 - 0.090	148.5 – 128.5	NA	128.5 - 108.5**	
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		73.8 - 63.0**		
1.705 – 30.0*		69.5		30.0
30 - 88	NA	40.0	NA	30.0
88 – 216	NA	43.5	NA NA	
216 - 960		46.0		
960 - 1000		54.0		
1000 – 10 th harmonic	74.0	NA	54.0	

Table 7.2.1 Radiated spurious emissions limits

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows: $\lim_{S_2} = \lim_{S_1} + 40 \log (S_1/S_2),$

where S_1 and S_2 – 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.

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

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and the performance check was conducted.
- **7.2.2.2** The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^o and the measuring antenna was rotated around its vertical axis.
- 7.2.2.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

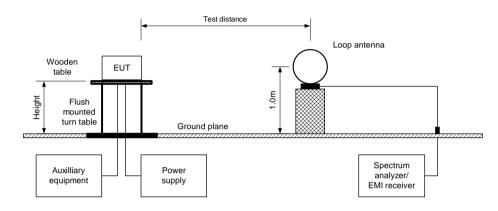
7.2.3 Test procedure for spurious emission field strength measurements above 30 MHz

- **7.2.3.1** The EUT was set up as shown in Figure 7.2.2, Figure 1.1.3, energized and the performance check was conducted.
- **7.2.3.2** The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^o, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.
- 7.2.3.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

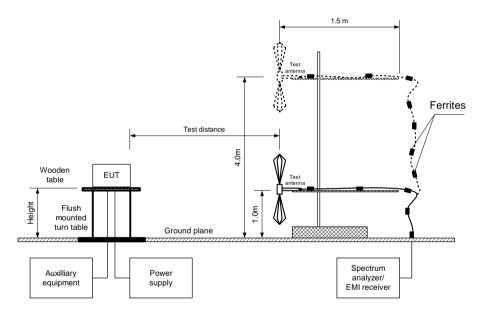


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions			
Test procedure:	ANSI C63.10 section 11.12.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PASS	
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC	
Remarks:	-			

Figure 7.2.1 Setup for spurious emission field strength measurements below 30 MHz



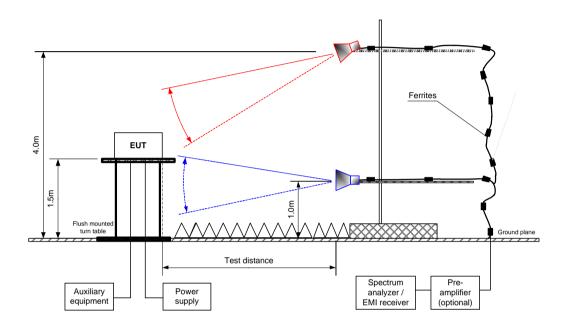






Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions				
Test procedure:	ANSI C63.10 section 11.12.1				
Test mode:	Compliance	Verdict:	PASS		
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PASS		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC		
Remarks:		· · · · · · · · · · · · · · · · · · ·			

Figure 7.2.3 Setup for spurious emission field strength measurements above1000 MHz





Test specification:	Section 15.247(d) / RSS-2	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions					
Test procedure:	ANSI C63.10 section 11.12.1						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PASS				
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC				
Remarks:							

Table 7.2.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY:	2400.0 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 - 25000 MHz
TEST DISTANCE:	3 m
MODULATION:	CCK
MODULATING SIGNAL:	PRBS
BIT RATE:	11 Mbps
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
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, 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	Low carrier frequency 2412.0 MHz								
		All emis	ssions were g	greater than 3	30 dB below the I	imit			Pass
Mid carrier f	requency 2442.	0 MHz							
		All emis	ssions were g	greater than 3	30 dB below the I	imit			Pass
High carrier	High carrier frequency 2462.0 MHz								
All emissions were greater than 30 dB below the limit								Pass	

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

**- Margin = Attenuation below carrier – specification limit.

Table 7.2.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY: INVESTIGATED FREQUENCY RANGE: TEST DISTANCE: MODULATION: MODULATING SIGNAL: BIT RATE: DUTY CYCLE: TRANSMITTER OUTPUT POWER SETTINGS: DETECTOR USED: RESOLUTION BANDWIDTH: TEST ANTENNA TYPE:				10 3 C(PI 11 10 M Pe 10	100.0 – 24 m CK RBS I Mbps 00 % aximum eak 000 kHz puble ridge	0 MHz					
Frequency,	Antenr		Azimuth,	Peak field s	<u> </u>			e field stren			
MHz	Polarization	Height, m	degrees*	Measured, dB(μV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	.,	Margin, dB***	Verdict
Low carrie	r frequency 2	412.0 MH	lz								
4823.770						-9.65	49.98	NA	54.0	-4.02	Pass
Mid carrier frequency 2442.0 MHz											
4884.114 Vertical 1.79 78 64.66 74.0 -9.34 50					50.67	NA	54.0	-3.33	Pass		
High carrie	r frequency 2	2462.0 M	Hz								
4924.010	Vertical	1.28	116	64.93	74.0	-9.07	51.42	NA	54.0	-2.58	Pass

*- 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-2	47 section 5.5, Radiated spu	urious emissions
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PA33
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:	-		

Table 7.2.4 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY: 2400.0 - 2483.5 MHz INVESTIGATED FREQUENCY RANGE: 0.009 - 1000 MHz TEST DISTANCE: 3 m MODULATION: CCK MODULATING SIGNAL: PRBS BIT RATE: 11 Mbps DUTY CYCLE: 100 % TRANSMITTER OUTPUT POWER SETTINGS: Maximum **RESOLUTION BANDWIDTH:**

VIDEO BANDWIDTH: TEST ANTENNA TYPE: 0.2 kHz (9 kHz - 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz) > Resolution bandwidth Active loop (9 kHz - 30 MHz) Biconilog (30 MHz – 1000 MHz)

				Biooninog		00 1011 12)		
Frequency,	Peak	Qu	asi-peak		Antenna	Antenna	Turn-table	
MHz	emission,	Measured emission,	Limit,	Margin, dB*		height, m	position**,	Verdict
	dB(µV/m)	dB(μV/m)	dB(µV/m)	margin, ab	polarization	neight, m	degrees	
Low carrier	frequency 24	112.0 MHz						
120.000	32.42	30.37	43.5	-13.13	Vertical	1.00	-107	Pass
400.009	40.23	36.51	46.0	-9.49	Horizontal	1.04	-21	F 855
Mid carrier	frequency 24	42.0 MHz						
120.000	29.97	28.36	43.5	-15.14	Vertical	1.02	-157	Pass
400.002	39.55	38.23	46.0	-7.77	Horizontal	1.02	-31	Pass
High carrier	frequency 2	462.0 MHz						
120.001	30.00	28.36	43.5	-15.14	Vertical	1.02	-157	Pass
400.010	39.30	37.95	46.0	-8.05	Horizontal	1.02	-31	Fass

*- Margin = Measured emission - specification limit.

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

Table 7.2.5 Average factor calculation

	Transmission pulse		Transmiss	sion burst	Transmission train	Average factor,			
	Duration, ms	ration, ms Period, ms Duration, ms Period, ms		duration, ms	dB				
	NA								
*-	- Average factor was calculated as follows								
	for pulse train	shorter than 100 ms	Average factor = $20 \times \log_1$	${}_{0}\left(\frac{Pulseduration}{Pulse period} \times \frac{Burst d}{Traind}\right)$	luration uration × Number of bursts	within pulse train			
	for pulse train	longer than 100 ms:	Average factor = $20 \times \log_1$	$_{0}\left(\frac{Pulseduration}{Pulseperiod} \times \frac{Bursta}{100}\right)$	luration Oms × Number of bursts	within 100ms)			



Test specification:	Section 15.247(d) / RSS-24	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions					
Test procedure:	ANSI C63.10 section 11.12.1						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PA33				
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC				
Remarks:							

Table 7.2.6 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	ADOVE 30.0

Table 7.2.7 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

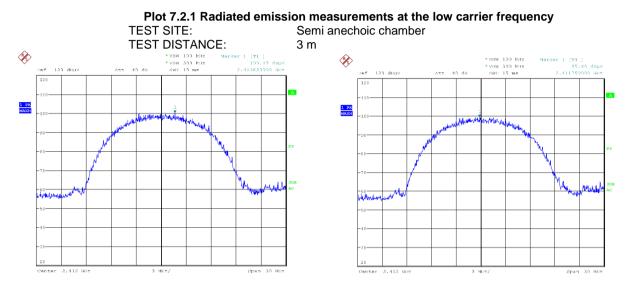
Reference numbers of test equipment used

HL 0446	HL 4360	HL 4933	HL 4956	HL 5288		

Full description is given in Appendix A.

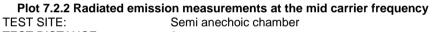


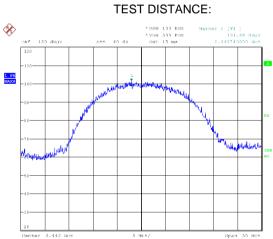
Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-22 - 15-Jun-22	verdict.	FA33
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			



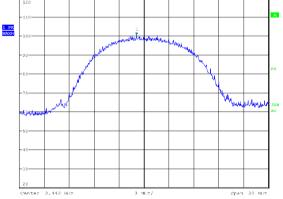
Date: 13.JUN.2022 12:40:59

Date: 13.JUN.2022 12:37:19





3 m * REM 100 kitz Market * VIW 300 kitz 120 kitz Market * VIW 300 kitz 120 kitz Market * VIW 300 kitz



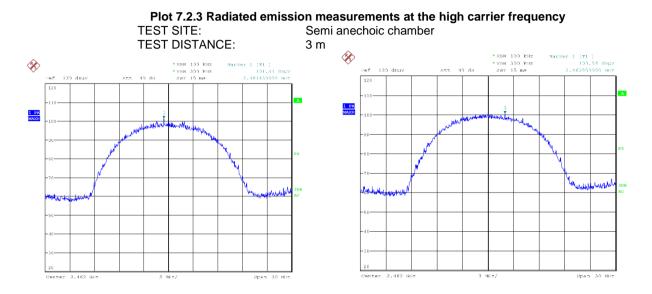
r 1 [T1] 100.40 dBp 2.441070000 GH

Date: 13.JUN.2922 12:51:12

Date: 13.JUN.2022 12:47:20



Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-22 - 15-Jun-22	verdict.	FA33
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			



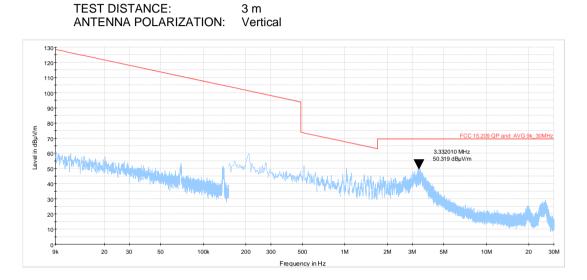
Date: 13.JUN.2022 12:57:59

Date: 13.JUN.2022 12:55:20



Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PASS
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

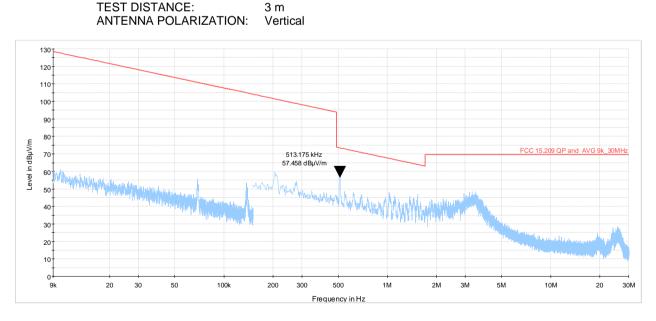
Plot 7.2.4 Radiated emission measurements from 9 kHz to 30 MHz at the low carrier frequency TEST SITE: Semi anechoic chamber



 Plot 7.2.5 Radiated emission measurements from 9 kHz to 30 MHz at the mid carrier frequency

 TEST SITE:
 Semi anechoic chamber

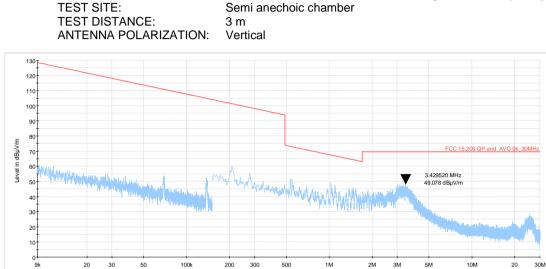
 TEST DISTANCE:
 3 m





Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	- Verdict: P	PASS
Date(s):	13-Jun-22 - 15-Jun-22		PA33
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.2.6 Radiated emission measurements from 9 kHz to 30 MHz at the high carrier frequency

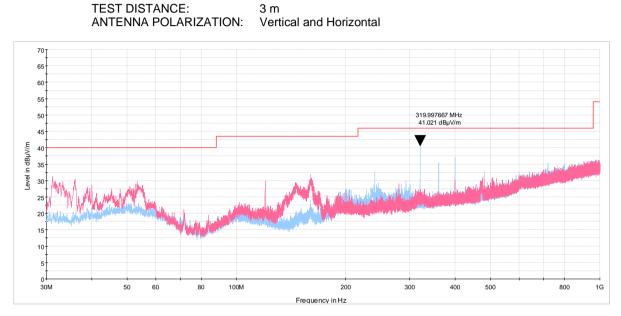


Frequency in Hz

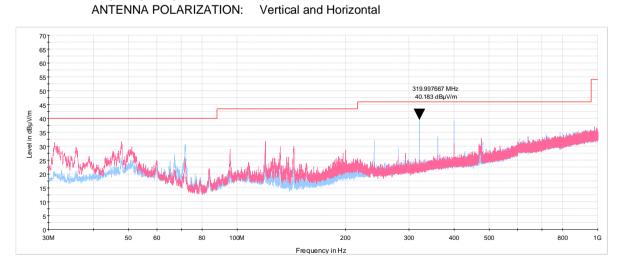


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Vardiate	PASS
Date(s):	13-Jun-22 - 15-Jun-22	Verdict:	PASS
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.2.7 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency TEST SITE: Semi anechoic chamber



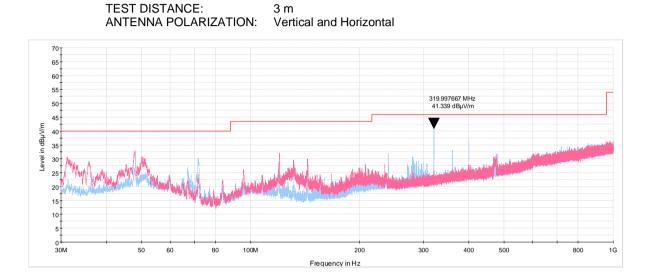
Plot 7.2.8 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency TEST SITE: Semi anechoic chamber TEST DISTANCE: 3 m





Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	- Verdict:	
Date(s):	13-Jun-22 - 15-Jun-22		PASS
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

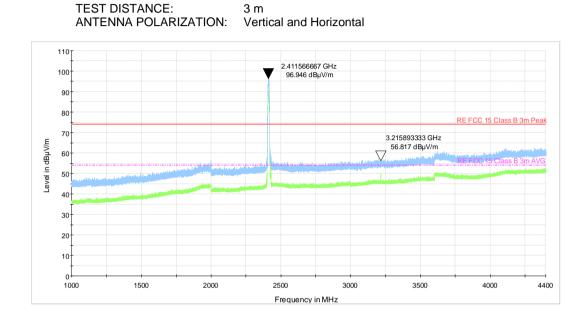
Plot 7.2.9 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency TEST SITE: Semi anechoic chamber

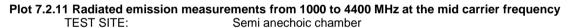


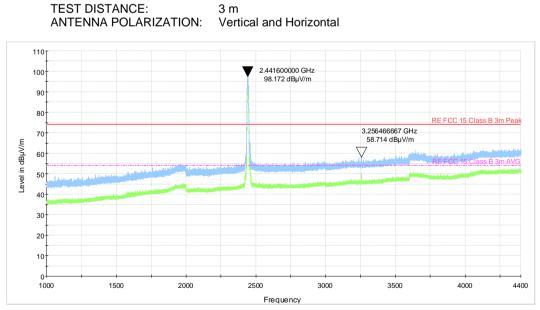


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Jun-22 - 15-Jun-22		PASS
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:	-		

Plot 7.2.10 Radiated emission measurements from 1000 to 4400 MHz at the low carrier frequency TEST SITE: Semi anechoic chamber



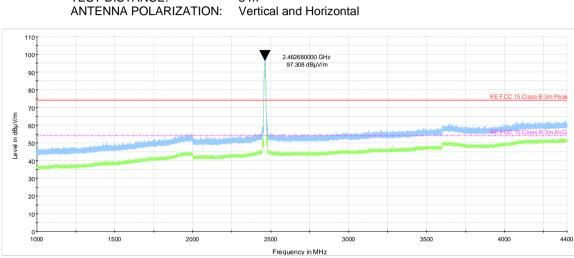






Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions					
Test procedure:	ANSI C63.10 section 11.12.1	ANSI C63.10 section 11.12.1				
Test mode:	Compliance	Verdict:	PASS			
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PASS			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC			
Remarks:						

Plot 7.2.12 Radiated emission measurements from 1000 to 4400 MHz at the high carrier frequency



TEST SITE: Semi anechoic chamber TEST DISTANCE: 3 m

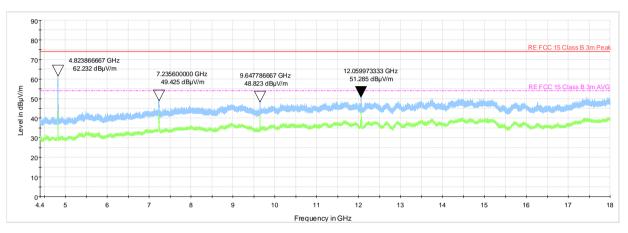


Test specification:	Section 15.247(d) / RSS-24	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions						
Test procedure:	ANSI C63.10 section 11.12.1							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PASS					
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC					
Remarks:								

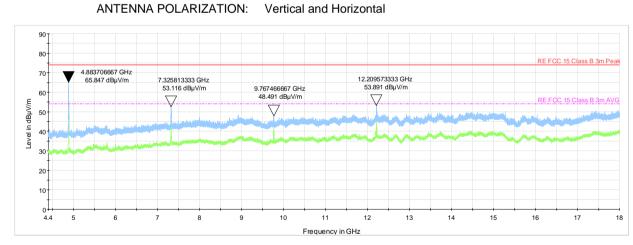
Plot 7.2.13 Radiated emission measurements from 4400 to 18000 MHz at the low carrier frequency



Semi anechoic chamber 3 m Vertical and Horizontal



Plot 7.2.14 Radiated emission measurements from 4400 to 18000 MHz at the mid carrier frequency TEST SITE: Semi anechoic chamber TEST DISTANCE: 3 m





Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions						
Test procedure:	ANSI C63.10 section 11.12.1						
Test mode:	Compliance	Vardiate	PASS				
Date(s):	13-Jun-22 - 15-Jun-22	Verdict:	PASS				
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC				
Remarks:	-						

Plot 7.2.15 Radiated emission measurements from 4400 to 18000 MHz at the high carrier frequency

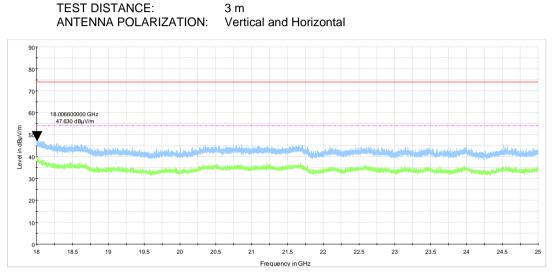
TEST SITE: TEST DISTANCE: ANTENNA POLARIZATION: Semi anechoic chamber 3 m Vertical and Horizontal



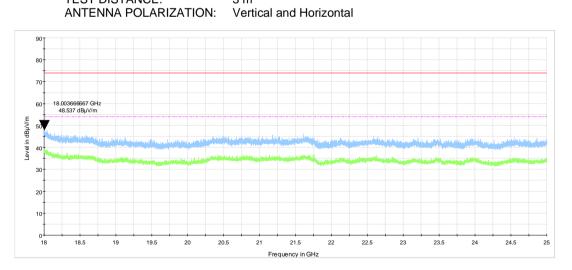


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions					
Test procedure:	ANSI C63.10 section 11.12.1					
Test mode:	Compliance	Verdict:	PASS			
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PA33			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC			
Remarks:						

Plot 7.2.16 Radiated emission measurements from 18 GHz to 25 GHz at the low carrier frequency TEST SITE: Semi anechoic chamber



Plot 7.2.17 Radiated emission measurements from 18 GHz to 25 GHz at the mid carrier frequency TEST SITE: Semi anechoic chamber TEST DISTANCE: 3 m

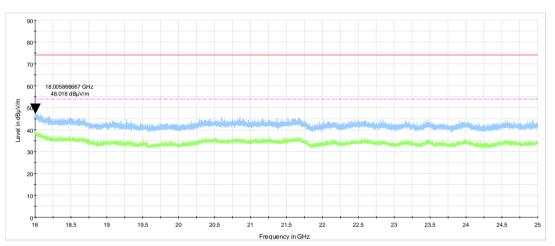




Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions					
Test procedure:	ANSI C63.10 section 11.12.1	ANSI C63.10 section 11.12.1				
Test mode:	Compliance	Verdict:	PASS			
Date(s):	13-Jun-22 - 15-Jun-22	verdict:	PASS			
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC			
Remarks:						

Plot 7.2.18 Radiated emission measurements from 18 GHz to 25 GHz at the high carrier frequency

TEST SITE: TEST DISTANCE: ANTENNA POLARIZATION: Semi anechoic chamber 3 m Vertical and Horizontal





Test specification:	Section 15.247(b)3 / RSS-2	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2.	ANSI C63.10 sections 11.9.2.2.4					
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PA33				
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC				
Remarks:							

7.3 Peak output power

7.3.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Peak output power limits

Assigned frequency	Maximum antenna	Peak outpu	It power*	Equivalent field strength		
range, MHz	gain, dBi	W	dBm	limit @ 3m, dB(µV/m)**		
2400.0 – 2483.5	6.0	1.0	30.0	131.2		

*- 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.

**- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×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.

7.3.2 Test procedure

- 7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.
- 7.3.2.2 The EUT was adjusted to produce maximum available to end user RF output power.
- **7.3.2.3** The resolution bandwidth of spectrum analyzer was set to 1 MHz with the integration BW applied to be wider than 6 dB bandwidth of the EUT and the field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.
- **7.3.2.4** The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.3.2 and associated plots.
- 7.3.2.5 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:

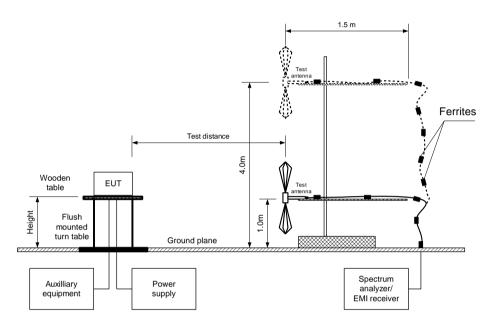
Peak output power in dBm = Field strength in dB(μ V/m) - Transmitter antenna gain in dBi – 95.2 dB

7.3.2.6 The worst test results (the lowest margins) were recorded in Table 7.3.2.



Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2.	4				
Test mode:	Compliance	Verdict:	PASS			
Date(s):	12-Jun-22 - 27-Jun-22	verdict.	PASS			
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:			·			

Figure 7.3.1 Setup for carrier field strength measurements





2412.0

2442.0 2462.0 99.34

100.35

100.60

Vertical

Vertical

Vertical

1.30

1.20

1.30

130

60

95

0

0

0

4.14

5.15 5.40 30

30 30

Test specification:	Section 15.247(b)3 / RSS-2	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power						
Test procedure:	ANSI C63.10 sections 11.9.2.2.	4						
Test mode:	Compliance	Verdict:	PASS					
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PA33					
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC					
Remarks:								

Table 7.3.2 Peak output power test results

ASSIGNED FREQUENCY:2400.0 - 2483.5 MHzTEST DISTANCE:3 mTEST SITE:Semi anechoic chamberEUT HEIGHT:1.5 mDETECTOR USED:PeakTEST ANTENNA TYPE:Double ridged guide (above 1000 MHz)TRANSMITTER OUTPUT POWER SETTINGS:MaximumDETECTOR USED:RMSRESOLUTION BANDWIDTH:1 MHzVIDEO BANDWIDTH:10 MHz									
CHANNEL BA				20 M⊦ CCK					
BITRATE: Frequency,	Field strength,	Antenna	Antenna	1 Mbp Azimuth,	S EUT antenna	Peak output	Limit,	Margin,	Vardiat
MHz	dB(µV/m)	polarization	height, m	degrees*	gain, dBi	power, dBm**	dBm	dB***	Verdict
2412.0	100.95	Vertical	1.40	120	0	5.75	30	-24.25	Pass
2442.0	101.75	Vertical	1.10	110	0	6.55	30	-23.45	Pass
2462.0	101.82	Vertical	1.20	100	0	6.62	30	-23.38	Pass
CHANNEL BA MODULATIO BITRATE: Frequency, MHz	N: Field strength,	Antenna polarization	Antenna height, m	20 MH CCK 11 Mb Azimuth, degrees*	ps EUT antenna	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2412.0	dB(μV/m) 103.99	Vertical	1.20	70	gain, dBi 0	8.79	30	-21.21	Pass
2412.0	105.10	Vertical	1.20	50	0	9.90	30	-20.10	Pass
2462.0	105.26	Vertical	1.30	100	0	10.06	30	-19.94	Pass
CHANNEL BA MODULATIO BITRATE:	N:	Andarana		20 MH BPSK 6 Mbp		Beek and the	1		
Frequency, MHz	Field strength, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2412.0	102.44	Vertical	1.30	80	0	7.24	30	-22.76	Pass
2442.0	103.57	Vertical	1.20	50	0	8.37	30	-21.63	Pass
2462.0	103.67	Vertical	1.20	100	0	8.47	30	-21.53	Pass
CHANNEL BA MODULATIO BITRATE:	N:			20 MH 64-QA 54 Mb	M ps				
Frequency, MHz	Field strength,	Antenna	Antenna	Azimuth.	EUT antenna	Peak output	Limit.	Margin,	Verdict

-25.86

-24.85 -24.60 Pass

Pass Pass



Test specification:	Section 15.247(b)3 / RSS-2	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2.	.4					
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC				
Remarks:							

CHANNEL BANDWIDTH:20 MHzMODULATION:BPSKBITRATE:6.5 Mbps									
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
2412.0	102.61	Vertical	1.30	80	0	7.41	30	-22.59	Pass
2442.0	103.50	Vertical	1.30	90	0	8.30	30	-21.70	Pass
2462.0	103.71	Vertical	1.20	105	0	8.51	30	-21.49	Pass

MODULATIC BITRATE:	ANDWIDTH: DN:			20 MF 64-QA 65 Mb	M				_
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
2412.0	98.46	Vertical	1.30	80	0	3.26	30	-26.74	Pass
2442.0	99.32	Vertical	1.50	50	0	4.12	30	-25.88	Pass
2462.0	99.77	Vertical	1.25	100	0	4.57	30	-25.43	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(\muV/m)* - *Transmitter antenna gain in dBi* – 95.2 dB *- Margin = Peak output power – specification limit.

Note: Maximum peak output power was obtained at Unom (115%Unom, 85%Unom) input power voltage.

Reference numbers of test equipment used

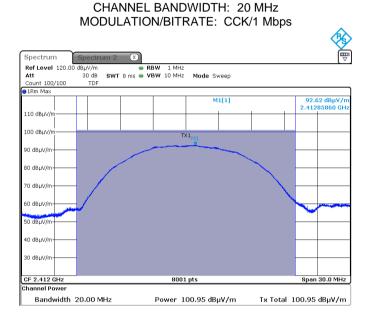
HL 4355 HL 4933 HL 5410 HL 5902

Full description is given in Appendix A.

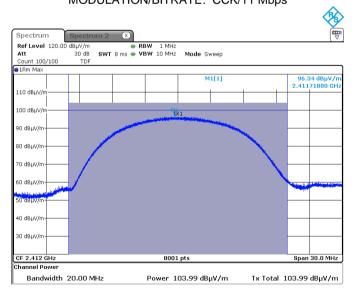


Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2.4					
Test mode:	Compliance	Vardiate	PASS			
Date(s):	12-Jun-22 - 27-Jun-22	Verdict:	PA33			
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:						

Plot 7.3.1 Field strength of carrier at low frequency



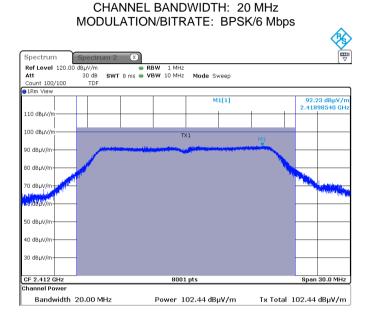
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: CCK/11 Mbps



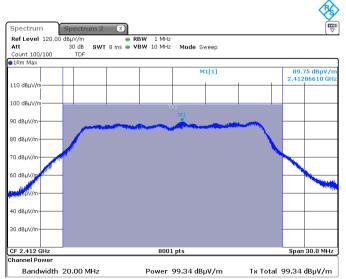


Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2.4					
Test mode:	Compliance	Verdict:	PASS			
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS			
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:						

Plot 7.3.2 Field strength of carrier at low frequency (continuation)



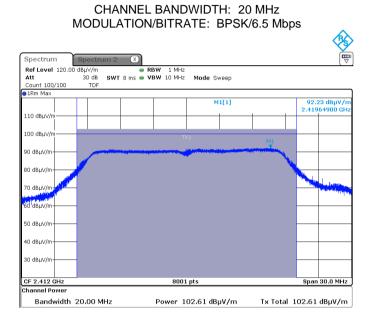
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/ 54 Mbps



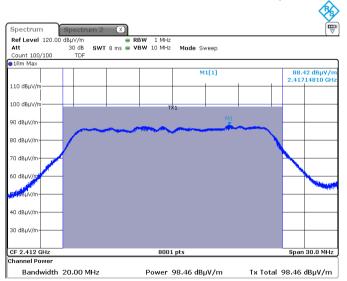


Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2.4					
Test mode:	Compliance	Verdict:	PASS			
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS			
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:						

Plot 7.3.3 Field strength of carrier at low frequency (continuation)



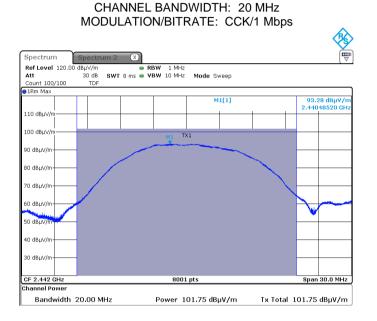
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/65 Mbps



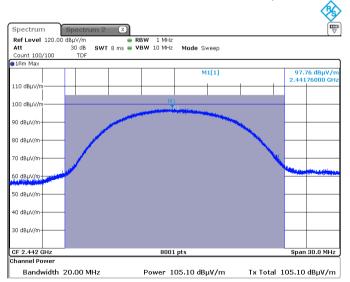


Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2	2.4				
Test mode:	Compliance	Vardiate	PASS			
Date(s):	12-Jun-22 - 27-Jun-22	Verdict:	PA33			
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:	•					

Plot 7.3.4 Field strength of carrier at mid frequency



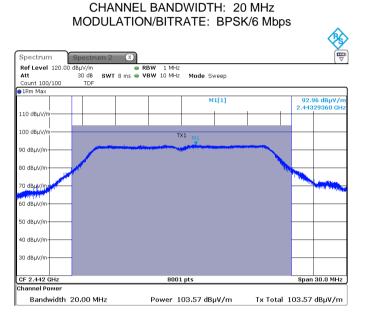
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: CCK/11 Mbps



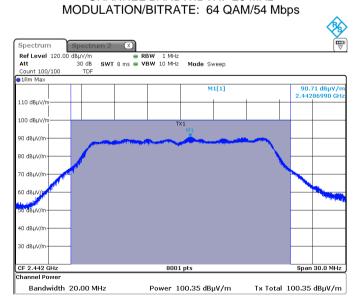


Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2	.4				
Test mode:	Compliance	Vardiate	DACC			
Date(s):	12-Jun-22 - 27-Jun-22	Verdict: PASS				
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:			·			

Plot 7.3.5 Field strength of carrier at mid frequency (continuation)



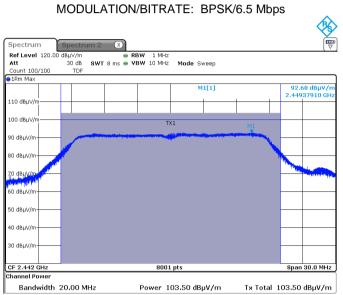
CHANNEL BANDWIDTH: 20 MHz





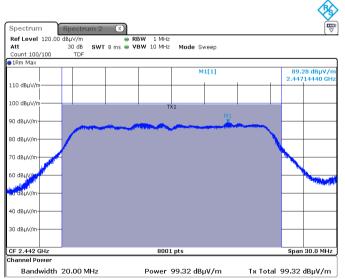
Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.	2.4				
Test mode:	Compliance	Vardiate	DACC			
Date(s):	12-Jun-22 - 27-Jun-22	- Verdict: PASS				
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:	•					

Plot 7.3.6 Field strength of carrier at mid frequency (continuation)



CHANNEL BANDWIDTH: 20 MHz

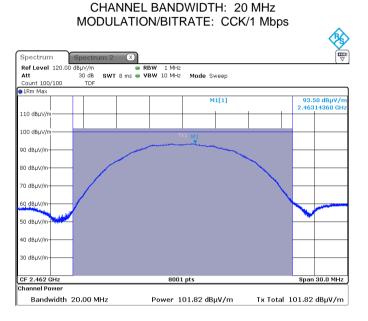
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/65 Mbps



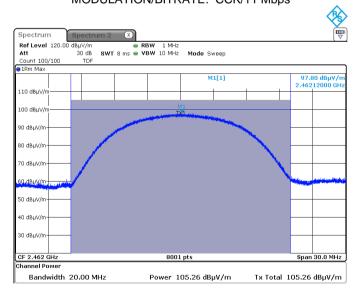


Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2	2.4				
Test mode:	Compliance	Vardiate	PASS			
Date(s):	12-Jun-22 - 27-Jun-22	Verdict:	PA33			
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:	•					

Plot 7.3.7 Field strength of carrier at high frequency



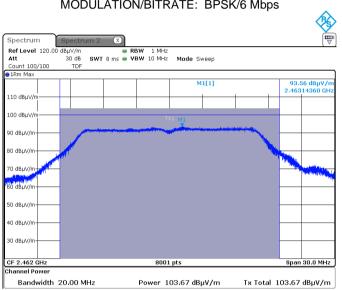
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: CCK/11 Mbps





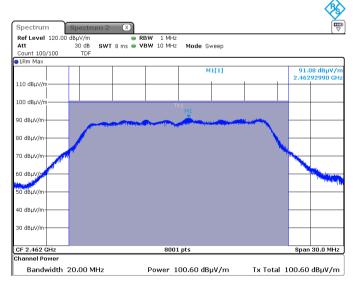
Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2	.4				
Test mode:	Compliance	Vardiate	DACC			
Date(s):	12-Jun-22 - 27-Jun-22	Verdict: PASS				
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:			·			

Plot 7.3.8 Field strength of carrier at high frequency (continuation)



CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: BPSK/6 Mbps

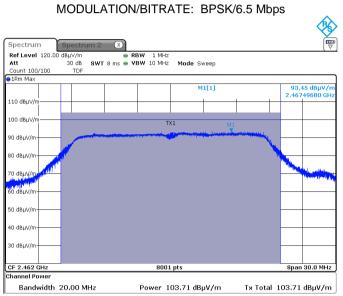
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/54 Mbps





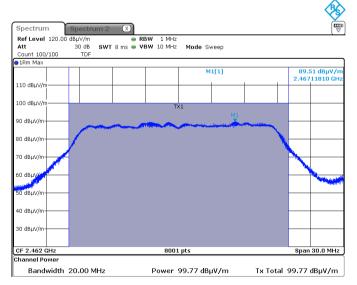
Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power					
Test procedure:	ANSI C63.10 sections 11.9.2.2	2.4				
Test mode:	Compliance	Vardiate	PASS			
Date(s):	12-Jun-22 - 27-Jun-22	Verdict:	PA33			
Temperature: 24 °C	Relative Humidity: 45 %	Air Pressure: 1005 hPa	Power: 5 VDC			
Remarks:	•					

Plot 7.3.9 Field strength of carrier at high frequency (continuation)



CHANNEL BANDWIDTH: 20 MHz

CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/65 Mbps





Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions				
Test procedure:	ANSI C63.10 section 11.12.1				
Test mode:	Compliance	Verdict: PASS			
Date(s):	13-Jun-22	verdict:	PA33		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC		
Remarks:					

7.4 Band edge radiated emissions

7.4.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.4.1.

Table 7.	4.1	Band	edae	emission	limits
1001011		Duna	ougo.	0111001011	

Output power	Assigned frequency, MHz	Attenuation below	carrier*, dBc bands, dB(µV/	
	inequency, winz		Peak	Average
Peak	2400.0 – 2483.5	30.0	74.0	54.0

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

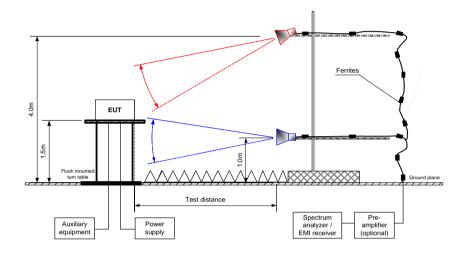
7.4.2 Test procedure

- 7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized normally modulated at the maximum data rate and its proper operation was checked.
- 7.4.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.
- **7.4.2.3** The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.
- **7.4.2.4** The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.
- **7.4.2.5** The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.4.2 and associated plots and referenced to the highest emission level measured within the authorized band.
- **7.4.2.6** The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.
- 7.4.2.7 The above procedure was repeated with the frequency hopping function enabled.



Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions				
Test procedure:	ANSI C63.10 section 11.12.1				
Test mode:	Compliance	Verdict:	PASS		
Date(s):	13-Jun-22	verdict.	FA33		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC		
Remarks:					

Figure 7.4.1 Band edge emission test setup





Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions			
Test procedure:	ANSI C63.10 section 11.12.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	13-Jun-22	verdict:	PA33	
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC	
Remarks:				

Table 7.4.2 Band edge emission outside restricted bands test results

ASSIGNED FREQUENCY RANGE:	2400.0 – 2483.5 MHz
DETECTOR USED:	Peak
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	≥ RBW
	20 MHz CCK / 11 Mbps

MODULATIC	N/BITRATE:		CCK / 11 Mbps			
Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
2400.000	43.41	91.02	47.61	30.0	-27.61	Pass

*- Margin = Attenuation below carrier - specification limit.

Table 7.4.3 Band edge emission inside restricted bands test results

ASSIGNED FREQUENCY RANGE:	24
DETECTOR USED:	Pe
TRANSMITTER OUTPUT POWER SETTINGS:	M
VIDEO BANDWIDTH:	≥

400.0 – 2483.5 MHz eak laximum RBW

CHANNEL BANDWIDTH: MODULATION/BITRATE:

20 MHz CCK / 11 Mbps

	Peak field strength(VBW=10 MHz)			Average field			
Frequency, MHz	Measured, dB(μV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(μV/m)	Limit, dB(µV/m)	Margin, dB**	Verdict
2387.02	46.61	74.0	-27.39	NA	54.0	NA	Pass
2485.01	52.10	74.0	-21.90	NA	54.0	NA	Pass

Reference numbers of test equipment used

HL 4355	HL 4933	HL 5410	HL 5902		

Full description is given in Appendix A.

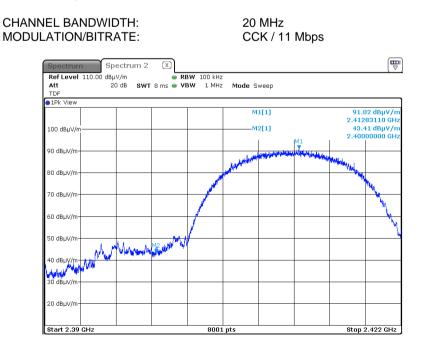


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions				
Test procedure:	ANSI C63.10 section 11.12.1				
Test mode:	Compliance	Verdict:	PASS		
Date(s):	13-Jun-22	verdict:	PASS		
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC		
Remarks:					

Plot 7.4.1 The highest emission level within restricted band at low carrier frequency

CHANNEL BA				MHz K / 11	Mbps		
Spectrum Ref Level Att TDF	110.00 dBµV/m	₩ 1 MHz ₩ 10 MHz	Mode Sv	veep			
1 Pk View							
			M	1[1]			i1 dBµ∀/m
100 dBµV/m						2.38	70820 GHz
100 000111	i l						
90 dBµV/m-							
80 dBµV/m-							
	D1 74.000 dBµV/m						
70 dBµV/m-							
60 dBµV/m-							
50 dBµV/m-							M1
							. 👗
and states a series		a na fa ta a d	historia	distantia a fa hali	الارتيانية الترسية معرفية. «ومروتي الأخر ماني الترسية التر		testa and the attraction
30 dBµV/m-							
20 dBµV/m-							
20 dBµV/m-							
Start 2.1 0	iHz	8001	pts			Stop	2.39 GHz

Plot 7.4.2 The highest emission level outside restricted band at low carrier frequency





Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions			
Test procedure:	ANSI C63.10 section 11.12.1			
Test mode:	Compliance	Verdict:	PASS	
Date(s):	13-Jun-22	verdict:	PASS	
Temperature: 24 °C	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 5 VDC	
Remarks:			·	

Plot 7.4.3 The highest emission level within restricted band at high carrier frequency

CHANNEL BANDWIDTH: MODULATION/BITRATE:		20 MHz CCK / 11 Mbps			
Spectrum Spectrum 2 Ref Level 110.00 dBµV/m Att 20 dB swT TDF TOF Sector S	X ● RBW 1 MHz 8 ms ● VBW 10 MHz Mode	Sweep			
e 1Pk View					
		M1[1]	52.10 dBµV/m 2.4850170 GHz		
100 dBµV/m			2.4000170 012		
90 dBµV/m					
80 dBµV/m-					
D1 74.000 dBµV/m-					
60 dBµV/m					
50 dBµV/m					
40 dBpV/m	nichten beiteren der ein die seinen sind eine seine die seine seine seine seine seine seine seine seine seine s Seine seine sein		tering and a filling of the state of the state		
30 dBµV/m					
20 dBµV/m					
Start 2.4835 GHz	8001 pts		Stop 3.0 GHz		



Test specification:	Section 15.247(e) / RSS-24	7 section 5.2(2), Maximum	power spectral density
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

7.5 Peak spectral power density

7.5.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak spectral power density limits

Assigned frequency	Measurement	Peak spectral power	Equivalent Peak spectral power
range, MHz	bandwidth, kHz	density, dBm	density limit @ 3m, dB(μV/m)*
2400.0 – 2483.5	3.0	8.0	103.2

* - Equivalent Peak spectral power density limit was calculated from the peak spectral power density as follows: E=sqrt(30xP)/r, where P is peak spectral power density and r is antenna to EUT distance in meters.

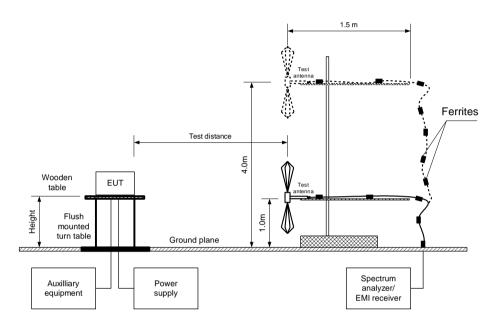
7.5.2 Test procedure for Peak spectral power density measurements

- **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 Peak spectral power density of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^o and the measuring antenna height was swept in both vertical and horizontal polarizations.
- **7.5.2.4** The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth wider than resolution bandwidth, auto sweep time and sufficient number of sweeps was allowed for trace stabilization. The spectrum lines spacing was verified to be wider than 3 kHz. Otherwise the resolution bandwidth was reduced until individual spectrum lines were resolved and the power of individual spectrum lines was integrated over 3 kHz band.
- **7.5.2.5** The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in **Error! Reference source not found.** and associated plots.



Test specification:	Section 15.247(e) / RSS-24	7 section 5.2(2), Maximum	power spectral density
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC
Remarks:			

Figure 7.5.1 Setup for carrier Peak spectral power density measurements





Test specification:	Section 15.247(e) / RSS-24	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2							
Test mode:	Compliance	Verdict:	PASS					
Date(s):	12-Jun-22 - 27-Jun-22	verdict.	FA33					
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC					
Remarks:								

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: TEST DISTANCE: TEST SITE: EUT HEIGHT: DETECTOR USED: **RESOLUTION BANDWIDTH:** VIDEO BANDWIDTH: TEST ANTENNA TYPE: TRANSMITTER OUTPUT POWER SETTINGS: 2400.0 - 2483.5 MHz 3 m Semi anechoic chamber 1.5 m RMS 100 kHz 1 MHz Double ridged guide (above 1000 MHz) Maximum

CHANNEL BANDWIDTH: MODUL ATION/BITRATE

MODULATIO	N/BITRATE:			CCK/1 Mbps					
Frequency, MHz	Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict	
2412.0	90.44	0	103.2	-12.76	Vertical	1.40	120	Pass	
2442.0	91.55	0	103.2	-11.65	Vertical	1.10	110	Pass	
2462.0	90.80	0	103.2	-12.40	Vertical	1.20	100	Pass	

CHANNEL BANDWIDTH: MODULATION/BITRATE

Ν	NODULATIO	N/BITRATE:			CCK/11 Mbps				-
	Frequency, MHz	Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	2412.0	91.25	0	103.2	-11.95	Vertical	1.20	70	Pass
	2442.0	91.28	0	103.2	-11.92	Vertical	1.30	50	Pass
	2462.0	91.45	0	103.2	-11.75	Vertical	1.25	100	Pass

CHANNEL BANDWIDTH: MODUL ATION/BITRATE

MODULA	FION/BITRATE:	BPSK/6 Mbps						
Frequence MHz	y, Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	87.39	0	103.2	87.39	Vertical	1.30	80	Pass
2442.0	87.99	0	103.2	87.99	Vertical	1.20	50	Pass
2462.0	88.33	0	103.2	88.33	Vertical	1.20	100	Pass

CHANNEL BANDWIDTH:

MODULATIC	N/BITRATE:	64 QAM/54 Mbps						
Frequency, MHz	Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	83.60	0	103.2	-19.60	Vertical	1.30	130	Pass
2442.0	84.31	0	103.2	-18.89	Vertical	1.20	60	Pass
2462.0	84.63	0	103.2	-18.57	Vertical	1.30	95	Pass

20 MHz

20 MHz

20 MHz

20 MHz

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Test specification:	Section 15.247(e) / RSS-24	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density					
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict.	FA33				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

CHANNEL BANDWIDTH:

MODULATIO	N/BITRATE:			BPSK/6.5	Mbps			
Frequency, MHz	Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	87.35	0	103.2	-12.76	Vertical	1.30	80	Pass
2442.0	87.98	0	103.2	-11.65	Vertical	1.30	90	Pass
2462.0	88.17	0	103.2	-12.40	Vertical	1.20	105	Pass

20 MHz

CHANNEL BANDWIDTH: MODULATION/BITRATE

20 MHz 64 QAM/65 Mbps

VIODULATIO	N/DITRATE.			64 QAM/65 Mbps				
Frequency, MHz	Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	82.65	0	103.2	-20.55	Vertical	1.30	80	Pass
2442.0	83.40	0	103.2	-19.80	Vertical	1.50	50	Pass
2462.0	83.75	0	103.2	-19.45	Vertical	1.25	100	Pass

*- Margin = Field strength - EUT antenna gain - calculated field strength limit. **- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

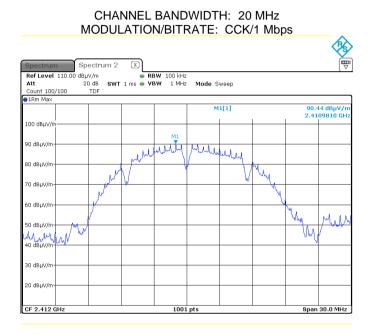
[HL 4355	HL 4933	HL 5410	HL 5902		
_						

Full description is given in Appendix A.

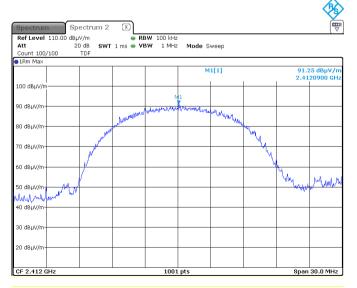


Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.1 Peak spectral power density of carrier at low frequency



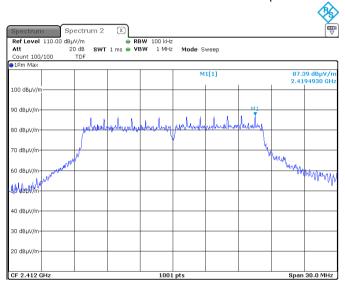
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: CCK/11 Mbps





Test specification:	: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.2 Peak spectral power density of carrier at low frequency (continuation)



CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: BPSK/6 Mbps

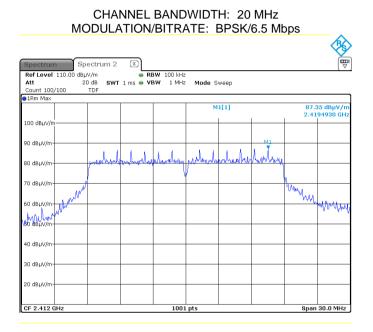
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/54 Mbps

Spectrum Spectrum 2 (×		
RefLevel 110.00 dBμV/m Att 20 dB SWT 1 m	RBW 100 kHz s VBW 1 MHz Mode Sw	(een	
Count 100/100 TDF			
	M1	[1]	83.60 dBµV/m 2.4194930 GHz
100 dBµV/m			
90 dBµV/m		M1	
80 dBµV/m MMphr.M	mutur trading publication	whenter	
70 dBµV/m	¥		
60 dBµV/m		- Yu	WWW
50 dBµV/m			Mayn
40 dBull/m			
30 dBµV/m			
20 dBµV/m			
CF 2.412 GHz	1001 pts		Span 30.0 MHz



Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.3 Peak spectral power density of carrier at low frequency (continuation)



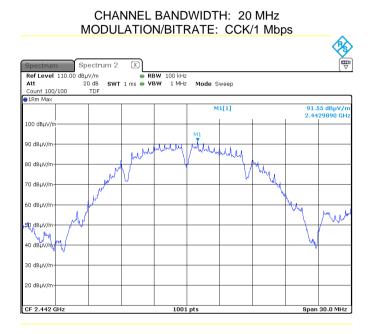
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/65 Mbps

Spectrum Ref Level 110.00	Spectrum	2 🛛	RBW 100 kHz					T
Att Count 100/100		WT 1 ms 🖷			weep			
1Rm Max	TDF							
				м	1[1]			65 dBµV/ .94930 GI
100 dBµV/m							2.41	.94930 Gr
90 dBµV/m						M1		
80 dBµV/m		1 1 1	111	l. h. t	t la	l Jako		
	MMM	wown	holomby	pannah	Var Wind	1 Martin		
70 dBµV/m				ř				
60 dBµV/m							My	
N	IN .						Molecular Contraction	
50 dBµV/m	_	_					-744	NU V
40, dBpv/m								WWW
Mar Bran								
30 dBµV/m		-						
20 dBµV/m								
20 00µV/III								1



Test specification:	n: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.4 Peak spectral power density of carrier at mid frequency



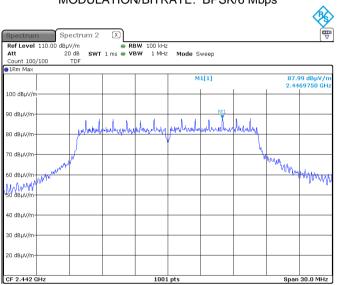
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: CCK/11 Mbps

Spectrum	Spectrum							0
Ref Level 110.0 Att		● RI VT 1 ms ● VI	BW 100 kHz BW 1 MHz		keen			
Count 100/100	TDF			mode of	,cob			
1Rm Max								
				E M	L[1]			28 dBµV/r 105910 GH
100 dBµV/m								
			M1					
90 dBµV/m			Jun Ann	with when				
		Junto 1 Martin Marting		north the start of the second s	" Mahama			
30 dBµV/m		مرين اولير				he ha		
	فهرين	'				4		
70 dBµV/m	- V					- W		
	W					X	4.	
50 dBµV/m	y .						My	Murund
10.dauV/m , lugu	pland						MAN	WV~VU WAAA
iQ,dBWY(m+ <mark>-//m</mark>								
‡0 dBμV/m								
30 dBµV/m								
50 app.,111								
20 dBµV/m								



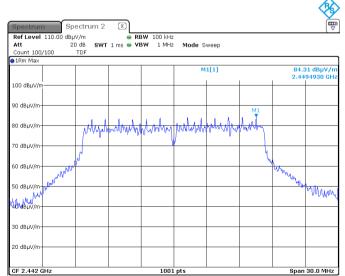
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.5 Peak spectral power density of carrier at mid frequency (continuation)



CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: BPSK/6 Mbps

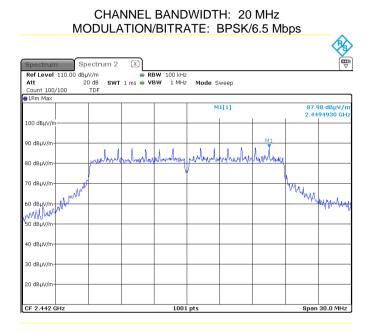






Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.6 Peak spectral power density of carrier at mid frequency (continuation)



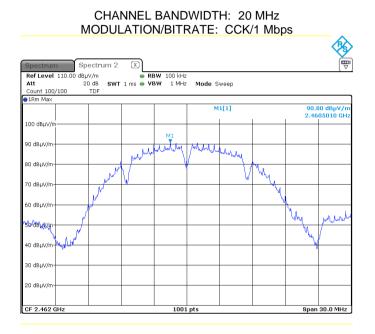
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/65 Mbps

Count 100/100		/T 1 ms 👄	/BW 1 MHz	Mode S	weep			
⊜1Rm Max	TDF							
				M	1[1]			10 dBµV∕ 94930 GI
100 dBµV/m								
90 dBµV/m								
50 abptylin						M1		
80 dBµV/m	man	Install	Murthy	mont	Mush	hours		
70 dBµV/m	1900					, in the second s		
	1						hu.	
60 dBµV/m	N	_					"Www.W	
50 dBµV/m		_					N _y	NA 1.
AO ABUV/m								way
40 ₩BµV/m								
30 dBµV/m								
20 dBµV/m								
CF 2.442 GHz			1001					30.0 MH



Test specification:	n: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PASS				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.7 Peak spectral power density of carrier at high frequency



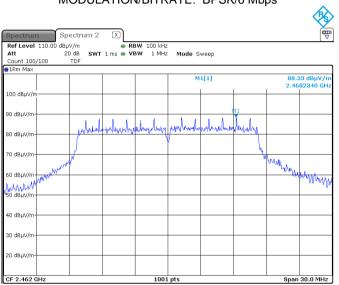
CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: CCK/11 Mbps

Ref Level 110.00 dBµV/m ● RBW 100 kHz Att 20 dB SWT 1 ms ● VBW 1 MHz Mode Sweep Count 100/100 TDF Image: SWT 1 ms ● VBW 1 MHz Mode Sweep 100 dBµV/m 00 dBµV/m M1[1] 100 dBµV/m M1[1] 100 dBµV/m M1[1] 90 dBµV/m 00 dBµV/m M1[1] M1[1] M1[1] M1[1]	91.45 dBµV/n 2.4617300 GH
Count 100/100 TDF IRm Max M1[1] 100 dBµV/m 30 dBµV/m	
100 dBµV/m M1[1] 30 dBµV/m M3 30 dBµV/m M3	
90 deuv/m	
90 dBuv/m	
white white a second of a second where where where we wanted a second se	
30 dBµV/m	
30 dBµV/m	
70 dBµV/m	
60 dBµV/m	Ν.,
who Ditable a ream in a stability of the	Mary margareter het
delidewwq	
40 dBµV/m	
30 dBµV/m	
20 dBµV/m	



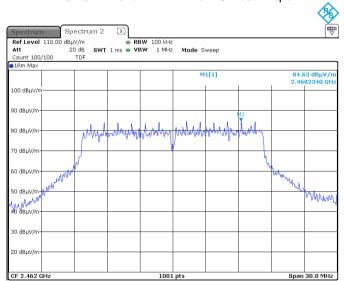
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	PA33				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:	· · ·						

Plot 7.5.8 Peak spectral power density of carrier at high frequency (continuation)



CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: BPSK/6 Mbps

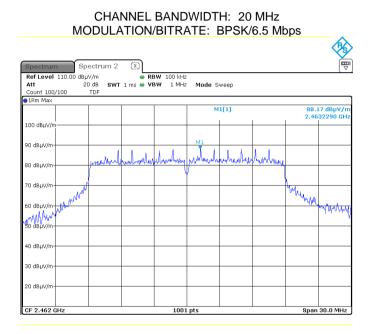






Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density						
Test procedure:	ANSI C63.10 section 11.10.2						
Test mode:	Compliance	Verdict:	PASS				
Date(s):	12-Jun-22 - 27-Jun-22	verdict:	FA22				
Temperature: 25 °C	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 5 VDC				
Remarks:							

Plot 7.5.9 Peak spectral power density of carrier at high frequency (continuation)



CHANNEL BANDWIDTH: 20 MHz MODULATION/BITRATE: 64 QAM/65 Mbps

Att Count 100/100	00 dBµV/m 20 dB S TDF	WT 1 ms 🖷 V	BW 100 kHz BW 1 MHz		weep			
1Rm Max	101				1[1]		00.7	′5 dBµV/
				191	1[1]			82340 G
100 dBµV/m								
90 dBµV/m								
						11		
80 dBµV/m	whater	ulmhutu	whenter	million	Mush	Andreas		
70 dBµV/m	1400.	doe for a se	1					
70 00pv/m							<u> </u>	
60 dBµV/m	JPA .						May Mar	
- Ward	v						Proton March	
50 dBµV/m							1	MW.
40 dBµV/m								. 14
30 dBµV/m								
20 dBµV/m					1			



Test specification:	Section 15.203 / RSS-Gen section 6.8, Antenna requirement				
Test procedure:	Visual inspection				
Test mode:	Compliance	Verdiete		PASS	
Date(s):	12-Jun-22	Verdict:		PASS	
Temperature: 24 °C	Relative Humidity: 46 %	Air Pressure: 1004 hPa	Power:		
Remarks:					

7.6 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.

The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.6.1.

Table 7.6.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	
The transmitter employs a unique antenna connector	NA	Comply
The transmitter requires professional installation	NA	



Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission				
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4			
Test mode:	Compliance	Verdict:	PASS		
Date(s):	14-Jun-22 - 15-Jun-22	verdict:	PA33		
Temperature: 26 °C	Relative Humidity: 60 %	Air Pressure: 1011 hPa	Power: 5 VDC		
Remarks: WiFi Mode					

8 Emission tests according to 47CFR part 15 subpart B requirements

8.1 Radiated emission measurements at Wi-Fi mode

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Radiated emission test limits	

Frequency,	Class B lim	it, dB(μV/m)	Class A limit, dB(µV/m)		
MHz	10 m distance	3 m distance	10 m distance	3 m distance	
30 - 88	29.5*	40.0	39.0	49.5*	
88 - 216	33.0*	43.5	43.5	54.0*	
216 - 960	35.5*	46.0	46.4	56.9*	
Above 960	43.5*	54.0	49.5	60.0*	

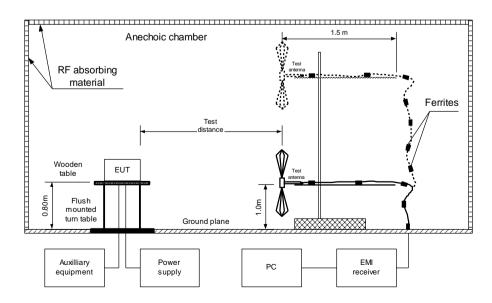
* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\lim_{S_2} = \lim_{S_1} + 20 \log (S_1/S_2)$,

where S_1 and S_2 – standard defined and test distance respectively in meters.

8.1.2 Test procedure for measurements in semi-anechoic chamber

- **8.1.2.1** The EUT was set up as shown in Figure 8.1.1 and associated photograph/s, energized and the performance check was conducted.
- **8.1.2.2** The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 3600, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.
- 8.1.2.3 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

Figure 8.1.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment





Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission				
Test procedure:	ANSI C63.4, Sections 11.6 and	12.1.4			
Test mode:	Compliance	Verdict:	PASS		
Date(s):	14-Jun-22 - 15-Jun-22	verdict:	PASS		
Temperature: 26 °C	Relative Humidity: 60 %	Air Pressure: 1011 hPa	Power: 5 VDC		
Remarks: WiFi Mode					

Table 8.1.2 Radiated emission test results

EUT SET UP: LIMIT: EUT OPERATING TEST SITE: TEST DISTANCE DETECTORS US FREQUENCY RA RESOLUTION BA	E: SED: ANGE:	SEMI ANECHOIC CHAMBER 3 m ED: PEAK / QUASI-PEAK NGE: 30 MHz – 1000 MHz						
	Peak		Quasi-peak			Antenna	Turn-table	
	emission, dB(μV/m)	Measured emission, dB(μV/m)	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	height, m	position**, degrees	Verdict
119.999	31.03	29.57	43.5	-13.93	Vertical	1.02	-145	
240.001	33.44	31.33	46.0	-14.67	Horizontal	1.20	-46	
320.000	41.96	41.16	46.0	-4.84	Horizontal	1.04	18	Pass
360.013	34.60	32.44	46.0	-13.56	Horizontal	1.02	-83	
400.002	39.37	38.01	46.0	-7.99	Horizontal	1.02	-33	
TEST SITE: TEST DISTANCE DETECTORS US FREQUENCY RA RESOLUTION BA	SED: ANGE:	SEMI ANECHOIC CHAMBER 3 m PEAK / AVERAGE E: 1000 MHz – 13000 MHz						

		11.			1000					
Fragman		Peak			Average			Antonno	Turn tabla	
Frequency,	Measured	Limit,	Margin,	Measured	Limit,	Margin,	Antenna		Turn-table position**.	
MHz	emission,			emission,			polarization		degrees	verdict
IVITIZ	dB(μV/m)	dB(μV/m)	dB*	dB(μV/m)	dB(μV/m)	dB*		m	uegrees	
No emission found 20dB below limit							Pass			

*- Margin = Measured emission - specification limit.
**- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

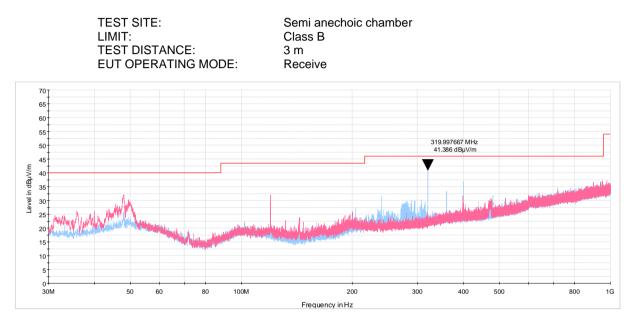
HL 4360	HL 4933	HL 5288					

Full description is given in Appendix A.

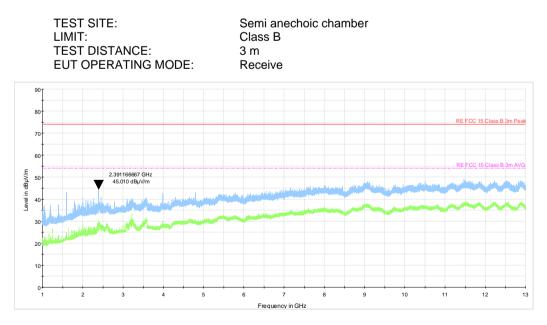


Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission				
Test procedure:	ANSI C63.4, Sections 11.6 ar	id 12.1.4			
Test mode:	Compliance	Vardiate	PASS		
Date(s):	14-Jun-22 - 15-Jun-22	Verdict:	PASS		
Temperature: 26 °C	Relative Humidity: 60 %	Air Pressure: 1011 hPa	Power: 5 VDC		
Remarks: WiFi Mode					

Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization



Plot 8.1.2 Radiated emission measurements above 1000 MHz, vertical and horizontal antenna polarization





Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission				
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4				
Test mode:	Compliance	Verdict:	PASS		
Date(s):	14-Jun-22 - 15-Jun-22	verdict.	FA33		
Temperature: 26 °C	Relative Humidity: 60 %	Air Pressure: 1011 hPa	Power: 5 VDC		
Remarks: UWB + WiFi Mode					

8.2 Radiated emission measurements at UWB and Wi-Fi mode

8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1.

Frequency, Class B limi		it, dB(μV/m)	Class A limit, dB(μV/m)	
MHz	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
Above 960	43.5*	54.0	49.5	60.0*

Table 8.2.1 Radiated emission test limits

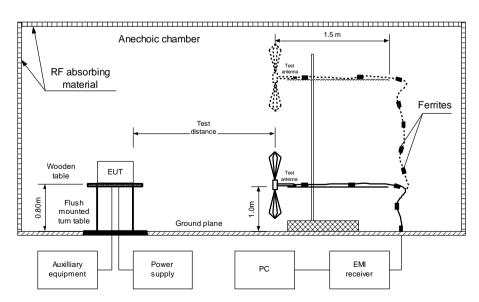
* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\lim_{s_2} \lim_{s_3} \lim_{s_4} \lim_{s_4}$

where S_1 and S_2 – standard defined and test distance respectively in meters.

8.2.2 Test procedure for measurements in semi-anechoic chamber

- **8.2.2.1** The EUT was set up as shown in Figure 8.2.1 and associated photograph/s, energized and the performance check was conducted.
- **8.2.2.2** The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360⁰, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.
- 8.2.2.3 The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.

Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment





Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission				
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4				
Test mode:	Compliance	- Verdict: PASS			
Date(s):	14-Jun-22 - 15-Jun-22	verdict.	FA33		
Temperature: 26 °C	berature: 26 °C Relative Humidity: 60 % Air Pressure: 1011 hPa Power: 5 VDC				
Remarks: UWB + WiFi Mode					

Table 8.2.2 Radiated emission test results

height	Turn-table position**, degrees	Verdict
ıl 1.03	143	Deee
l 1.02	141	Pass
2	height, m al 1.03	a height, mposition**, degreesal1.03143

	MHz	emission,	dR(u)/(m)	dR*	emission,	dP(u)/m	dB*	polarization	m m	degrees	Vertilet
	Frequency,	Measured	Limit,	Margin,	Measured	Limit,	Margin,	Antenna		Turn-table position**,	
Peak			Average			Antonno	Turn tabla				
RESOLUTION BANDWIDTH:			1000) kHz							
FREQUENCY RANGE:				1000 -40000 MHz							
DETECTORS USED:			PEA	K / AVER	AGE						
TEST DISTANCE:			3 m								
TEST SITE: SEMI				I ANECH	OIC CHAMBE	R					

54.0

dB*

-2.55

Vertical

1.00

153

Pass

dB(μV/m) dB(μV/m)

	4853.787	52.87	74.0	-21.13	51.45		
*- Margin – Measured emission - specification limit							

Margin = Measured emission - specification limit. **- EUT front panel refer to 0 degrees position of turntable.

dB(μV/m)

dB*

Reference numbers of test equipment used

dB(μV/m)

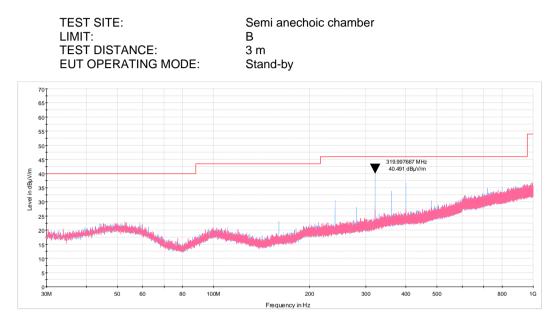
	HL 3903	HL 4360	HL 4933	HL 4956	HL 5288		
_		· · •					

Full description is given in Appendix A.

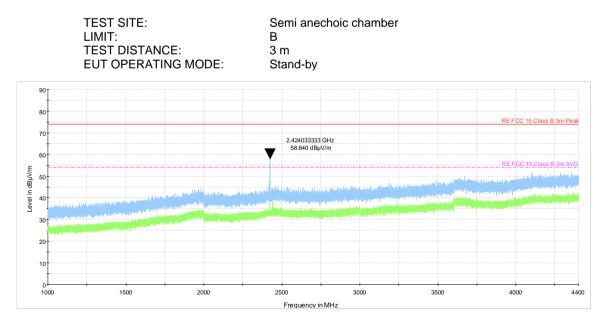


Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission			
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode:	Compliance	- Verdict: PASS		
Date(s):	14-Jun-22 - 15-Jun-22			
Temperature: 26 °C	Relative Humidity: 60 %	Air Pressure: 1011 hPa	Power: 5 VDC	
Remarks: UWB + WiFi Mode				

Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization



Plot 8.2.2 Radiated emission measurements in 1 – 4.4 GHz range, vertical and horizontal antenna polarization

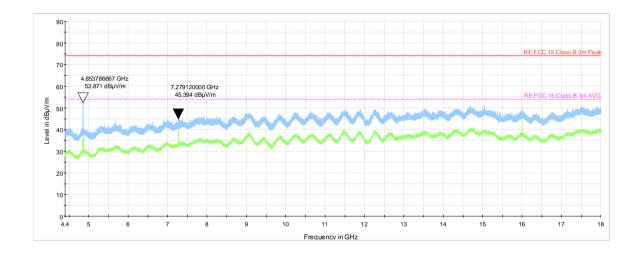




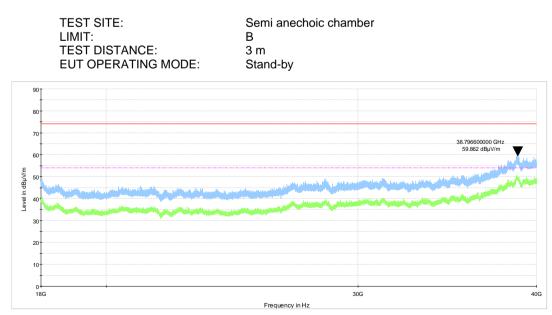
Test specification:	Section 15.109, RSS-Gen, Section 7.3, ICES-003, Radiated emission			
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode:	Compliance	Verdiet: DASS		
Date(s):	14-Jun-22 - 15-Jun-22	- Verdict: PASS		
Temperature: 26 °C	Relative Humidity: 60 %	Air Pressure: 1011 hPa	Power: 5 VDC	
Remarks: UWB + WiFi Mode				

Plot 8.2.3 Radiated emission measurements in 4.4 - 18 GHz range, vertical and horizontal antenna polarization

Semi anechoic chamber
3
3 m
Stand-by









9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 (9) kHz - 30 MHz	EMCO	6502	2857	28-Feb-22	28-Feb-23
3437	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW- S10W5+	NA	13-Sep-21	13-Sep-22
4136	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000 137	28-Apr-22	28-Apr-23
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	101630	20-Sep-21	20-Sep-22
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	13-Jan-22	13-Jan-23
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATI ON	AHA-118	701046	13-Jan-22	13-Jan-23
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATI ON	AHA-840	105004	07-Mar-22	07-Mar-23
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX- 8000E	00809	24-Mar-22	24-Apr-25
5376	EXA Signal Analyzer, 10 Hz - 32 GHz	Keysight Technologies	N9010B	MY574704 04	01-Nov-21	01-Nov-22
5410	RF cable, 40 GHz, SMA-SMA, 5.5 m	Huber-Suhner	SF102EA/ 11SK/11S K/5500M M	503974/EA	10-Aug-21	10-Aug-22
5644	Cable, 50 Ohm, DC to 18 GHz, 1.8 m, SMA/SMA	Mini Circuits	CBL-6FT- SMSM+	NA	01-Nov-21	01-Nov-22
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/ 11N/11N/ 6000	NA	16-Jan-22	16-Jan-23



10 APPENDIX B Test equipment correction factors

HL 5288: Trilog Antenna Frankonia, model: ALX-8000E, s/n: 00809 30-1000 MHz

Frequency, MHz	Antenna factor, dB/m
30	14.96
35	15.33
40	16.37
45	17.56
50	17.95
60	16.87
70	13.22
80	10.56
90	13.61
100	15.46
120	14.03
140	12.23

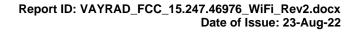
Frequency, MHz	Antenna factor, dB/m
160	12.67
180	13.34
200	15.40
250	16.42
300	17.28
400	19.98
500	21.11
600	22.90
700	24.13
800	25.25
900	26.35
1000	27.18

The antenna factor shall be added to receiver reading in $dB_{\mu}V$ to obtain field strength in $dB_{\mu}V/m$. above 1000 MHz

	above
Frequency, MHz	Antenna factor, dB/m
1000	26.9
1100	28.1
1200	28.4
1300	29.6
1400	29.1
1500	30.4
1600	30.7
1700	31.5
1800	32.3
1900	32.6
2000	32.5
2100	32.9
2200	33.5
2300	33.2
2400	33.7
2500	34.6
2600	34.7
2700	34.6
2800	35.0
2900	35.5
3000	36.2
3100	36.8
3200	36.8
3300	37.0
3400	37.5
3500	38.2

Frequency, MHz	Antenna factor, dB/m
3600	38.9
3700	39.4
3800	39.4
3900	39.6
4000	39.7
4100	39.8
4200	40.5
4300	40.9
4400	41.1
4500	41.4
4600	41.3
4700	41.6
4800	41.9
4900	42.3
5000	42.7
5100	43.0
5200	42.9
5300	43.5
5400	43.6
5500	44.3
5600	44.7
5700	45.0
5800	45.0
5900	45.3
6000	45.9

The antenna factor shall be added to receiver reading in dB_µV to obtain field strength in dB_µV/m.



 Measurement

 uncertainty, dB

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0

 ±1.0



HL 0446: Active Loop Antenna EMCO, model: 6502, s/n 2857

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB	Frequency,	Measured antenna factor, dBS/m
10	-33.4	±1.0	2000	-41.4
20	-37.8	±1.0	3000	-41.4
50	-40.5	±1.0	4000	-41.5
75	-41.0	±1.0	5000	-41.5
100	-41.2	±1.0	10000	-41.7
150	-41.2	±1.0	15000	-42.1
250	-41.1	±1.0	20000	-42.7
500	-41.2	±1.0	25000	-44.2
750	-41.3	±1.0	30000	-45.8
1000	-41.3	±1.0		

The antenna factor shall be added to receiver reading in $dB_{\mu}V$ to obtain field strength in $dB_{\mu}A/m$.



HL 4933: Active Horn Antenna COM-POWER CORPORATION, model: AHA-118, s/n 701046

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
1000	-16.1
1500	-15.1
2000	-10.9
2500	-11.9
3000	-11.1
3500	-10.6
4000	-8.6
4500	-8.3
5000	-5.9
5500	-5.7
6000	-3.3
6500	-4.0
7000	-2.2
7500	-1.7
8000	1.1
8500	-0.8
9000	-1.5
9500	-0.2

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
10000	1.8
10500	1.0
11000	0.3
11500	-0.5
12000	3.1
12500	1.4
13000	-0.3
13500	-0.4
14000	2.5
14500	2.2
15000	1.9
15500	0.5
16000	2.1
16500	1.2
17000	0.6
17500	3.1
18000	4.2

The antenna factor shall be added to receiver reading in $dB_{\mu}V$ to obtain field strength in $dB_{\mu}V/m$.



11 APPENDIX C Measurement uncertainties

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB
	12.4 GHz to 40 GHz: ± 2.3 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB
	2.9 GHz to 6.46 GHz: ± 3.5 dB
	6.46 GHz to 13.2 GHz: ± 4.3 dB
	13.2 GHz to 22.0 GHz: ± 5.0 dB
	22.0 GHz to 26.8 GHz: ± 5.5 dB
	26.8 GHz to 40.0 GHz: ± 4.8 dB
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB
	150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance	
Horizontal polarization	Biconilog antenna: ± 5.3 dB
	Biconical antenna: ± 5.0 dB
	Log periodic antenna: ± 5.3 dB
	Double ridged horn antenna: \pm 5.3 dB
Vertical polarization	Biconilog antenna: ± 6.0 dB
	Biconical antenna: ± 5.7 dB
	Log periodic antenna: ± 6.0 dB
	Double ridged horn antenna: \pm 6.0 dB

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.



12 APPENDIX D Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.

Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for relevant parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; Recognized by Innovation, Science and Economic Development Canada for wireless and terminal testing (ISED), ISED #2186A, CAB identifier is IL1001; Certified by VCCI, Japan (the registration numbers for OATS are R-10808 for RE measurements below 1 GHz, G-20112 for RE measurements above 1 GHz, R-11082 for anechoic chamber for RE measurements below 1 GHz, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site and T-11606 for conducted emissions at telecommunication ports).

The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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Person for contact: Mr. Michael Nikishin, EMC&Radio group manager



13 APPENDIX E Specification references

FCC 47CFR part 15: 2020	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
RSS-247 Issue 2: 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 5 with_amendment_1_2: 2021	General Requirements and Information for the Certification of Radiocommunication Equipment
ICES-003: 2020, Issue 7	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement



14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω PM PS	open area test site Ohm pulse modulation power supply
ppm	part per million (10 ⁻⁶)
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband



15 APPENDIX G Manufacturer's declaration



Declaration of Identity

We, the undersigned,

Company: Vayyar Imaging Ltd. Address: Shabazi 26, Yehud Country: Israel Telephone number: +972-54-42254549

declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
Vayyar Imaging LTD.	VMPRO19CB4BAT,	Handheld UWB device with
	VMPRO19EB4BAT	optional WI-FI/BLE
		communication

Has an identical RF system as the following equipment:

Brand/Item	Type/Model	Short Product description
Vayyar Imaging LTD.	VMPRO19CB4WREP	Handheld UWB device with
	VMPRO19EB4WREP	optional WI-FI/BLE
		communication

The reason for name change is: VMPRO19CB4BAT, VMPRO19EB4BAT has an integrated battery and can be supplied by either the battery or by external power source (through USBC port). VMPRO19CB4WREP, VMPRO19EB4WREP doesn't contain battery and thus can only be powered by external power source.

21/07/2022 (date)

(signature)

Naftali Chayat (printed name)

CTO (position)

END OF DOCUMENT