

# TEST REPORT

ACCORDING TO: FCC 47 CFR PART 15 subpart C, section 15.249;  
RSS-210 issue 10 Annex 2

FOR:

**SCR Engineers Ltd.**

**AMUT03 – Cow Neck TAG**

**Model 1: HR-TAG-LDn**

**Model 2: cSense Flex**

**Model 3: Monitoring Neck Tag Flex**

**FCC ID: AMUT03**

**IC: 26436-AMUT03**

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

**Client name:** SCR Engineers Ltd.  
**Address:** 18 Hamelacha street, Netanya, POB 13564, Israel  
**Telephone:** +972 73 240 6053  
**Fax:** +972 9865 0703  
**E-mail:** [zeev.kapelnik@merck.com](mailto:zeev.kapelnik@merck.com)  
**Contact name:** Mr. Zeev Kapelnik

## 2 Equipment under test attributes

**Product name:** AMUT03 – Cow Neck TAG  
**Product type:** Transceiver  
**Model(s):** Monitoring Neck Tag Flex\*  
**Serial number:** VL10305586  
**Hardware version:** 15.00.0  
**Software release:** 05.200.44.46  
**Receipt date** 13-Jan-22

\*According to manufacturer's declaration provided in Appendix F and Appendix G the Monitoring Neck Tag Flex is full identical to HR-TAG-LDn and cSense Flex and the reason for name change is only difference SW and enclosure color. Therefore, only the model Monitoring Neck Tag Flex was tested.

## 3 Manufacturer information

**Manufacturer name:** SCR Engineers Ltd.  
**Address:** 18 Hamelacha street, Netanya, POB 13564, Israel  
**Telephone:** +972 73 240 6053  
**Fax:** +972 9865 0703  
**E-Mail:** [zeev.kapelnik@merck.com](mailto:zeev.kapelnik@merck.com)  
**Contact name:** Mr. Zeev Kapelnik

## 4 Test details

**Project ID:** 46346  
**Location:** Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel  
**Test started:** 14-Jan-22  
**Test completed:** 18-Apr-22  
**Test specification(s):** FCC 47 CFR PART 15 subpart C, section 15.249;  
RSS-210 issue 10 Annex 2



## 5 Tests summary

Test	Status
<b>Transmitter characteristics</b>	
Section 15.249(a)(d) / RSS-210, section A2.9, Field strength of emissions	Pass
Section 15.215(c) / RSS-Gen, section 6.6, Occupied bandwidth	Pass
Section 15.249(d) / RSS-210, section A2.9, Band edge emissions	Pass
Section 15.207(a) / RSS-Gen, section 8.8, Conducted emission	Not required
Section 15.203 / RSS-Gen, section 8.3, Antenna requirement	Pass

This test report supersedes the previously issued test report identified by Doc ID: SCRRAD\_FCC.46346\_45693

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

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

	Name and Title	Date	Signature
<b>Tested by:</b>	Mrs. E. Pitt, test engineer, EMC & Radio	14-Jan-22 – 18-Apr-22	
<b>Reviewed by:</b>	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	12-May-22	
<b>Approved by:</b>	Mr. M. Nikishin, group leader, EMC & Radio	12-May-22	



## 6 EUT description

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

### 6.1 General information

The EUT, Monitoring Neck Tag Flex, is an activity based tag, including the RF transceiver operating in 2.4 GHz band for outdoor installation. The tag is mounted on a collar on the animal neck, used for the following:

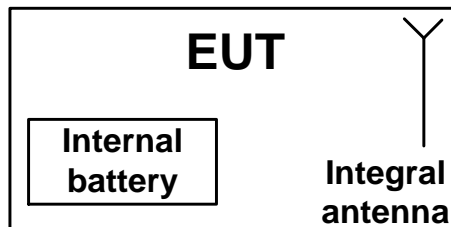
- 1) an identification of animal using the 2.4 GHz RF unit;
- 2) to measure various animal parameters, to process and transmit them via RF.

The tag initiates transmission of few messages each 20 minutes by itself or upon request from IDU or BU units.

The EUT is equipped with an integral printed on PCB antenna and is powered by 3.6 V internal battery.

The original EUT configuration was certified by FCC under FCC ID: AMUT03. The present test report was revised to reflect the HW redesign of Controller and power circuitry changes that was made in all existing models Monitoring Neck Tag Flex, HR-TAG-LDn and cSense Flex, as stated in manufacturer's declarations (refer to Appendix G of the test report).

### 6.2 Test configuration



### 6.3 Changes made in EUT

No changes were performed in the EUT.



### 6.4 Transmitter characteristics

<b>Type of equipment</b>						
<b>V</b>	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)					
<b>Assigned frequency range</b>		2400 – 2483.5 MHz				
<b>Operating frequency range</b>		2405 – 2480 MHz				
<b>RF channel spacing</b>		5 MHz				
<b>Maximum field strength of carrier at 3 m distance</b>		102.95 dBµV/m (peak), 69.14 dBµV/m (average)				
<b>Is transmitter output power variable?</b>		<b>V</b>		No		
		<b>Yes</b>			continuous variable	
					stepped variable with stepsize	dB
					minimum RF power	dBm
				maximum RF power	dBm	
<b>Antenna connection</b>						
unique coupling		standard connector		<b>V</b>	Integral	
				<b>V</b>	with temporary RF connector without temporary RF connector	
<b>Antenna/s technical characteristics</b>						
<b>Type</b>		<b>Manufacturer</b>		<b>Model number</b>		
Integral		SCR Engineers Ltd		Printed		
				<b>Gain</b>		
				0 dBi		
<b>Transmitter aggregate data rate/s</b>		250 kbps				
<b>Type of modulation</b>		QPSK				
<b>Modulating test signal (baseband)</b>		PRBS				
<b>Transmitter power source</b>						
<b>V</b>	Battery	<b>Nominal rated voltage</b>	3.6 V	<b>Battery type</b>		
	DC	<b>Nominal rated voltage</b>				
	AC mains	<b>Nominal rated voltage</b>		<b>Frequency</b>	Hz	



<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

## 7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 requirements

### 7.1 Field strength of emissions

#### 7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.1.1, Table 7.1.2 and Table 7.1.3.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)		
	Peak	Average	Quasi-Peak
2400 – 2483.5	114.0	94.0	NA

Table 7.1.2 Harmonics limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
2400 – 2483.5	74.0	54.0

Table 7.1.3 Radiated spurious emissions limits (other than harmonics)

Frequency, MHz	Field strength at 3 m, dB(μV/m)*			Attenuation below carrier
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	50 dBc (whichever is the less stringent)
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
Above 1000	74.0	NA	54.0	

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

$$Lims_2 = Lims_1 + 40 \log (S_1/S_2),$$

where S<sub>1</sub> and S<sub>2</sub> – standard defined and test distance respectively in meters.

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

Note: The above 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 but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.



<b>Test specification: Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions</b>			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

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

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

7.1.2.2 The measurements were performed in three EUT orthogonal positions.

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

7.1.2.4 The worst test results (the lowest margins) were found in the EUT vertical (X, Y, Z-axis) position, recorded in the associated tables and shown in the associated plots.

**7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz**

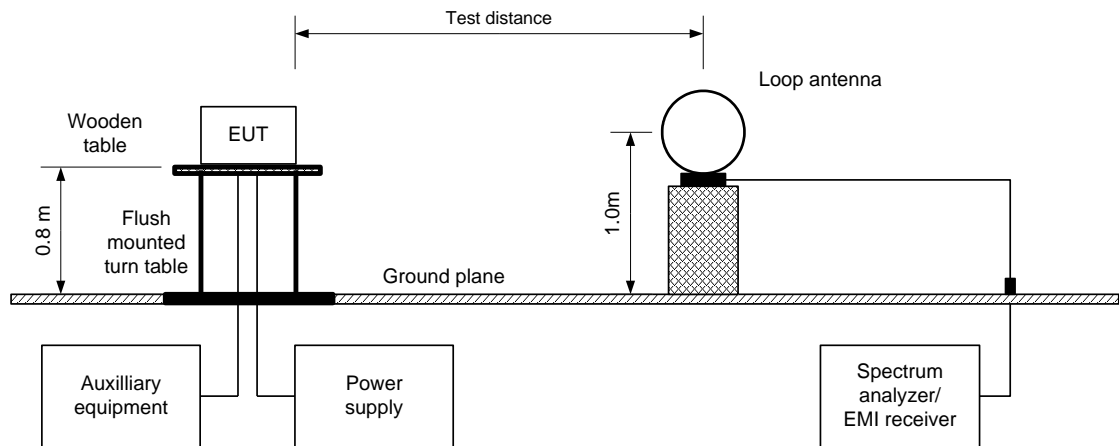
7.1.3.1 The EUT was set up as shown in Figure 7.1.2, Figure 7.1.3, energized and the performance check was conducted.

7.1.3.2 The measurements were performed in three EUT orthogonal positions.

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

7.1.3.4 The worst test results (the lowest margins) were found in the EUT vertical (X, Y, Z-axis) position, recorded in the associated tables and shown in the associated plots

**Figure 7.1.1 Setup for spurious emission field strength measurements below 30 MHz**







<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Figure 7.1.2 Setup for spurious emission field strength measurements in 30 -1000 MHz

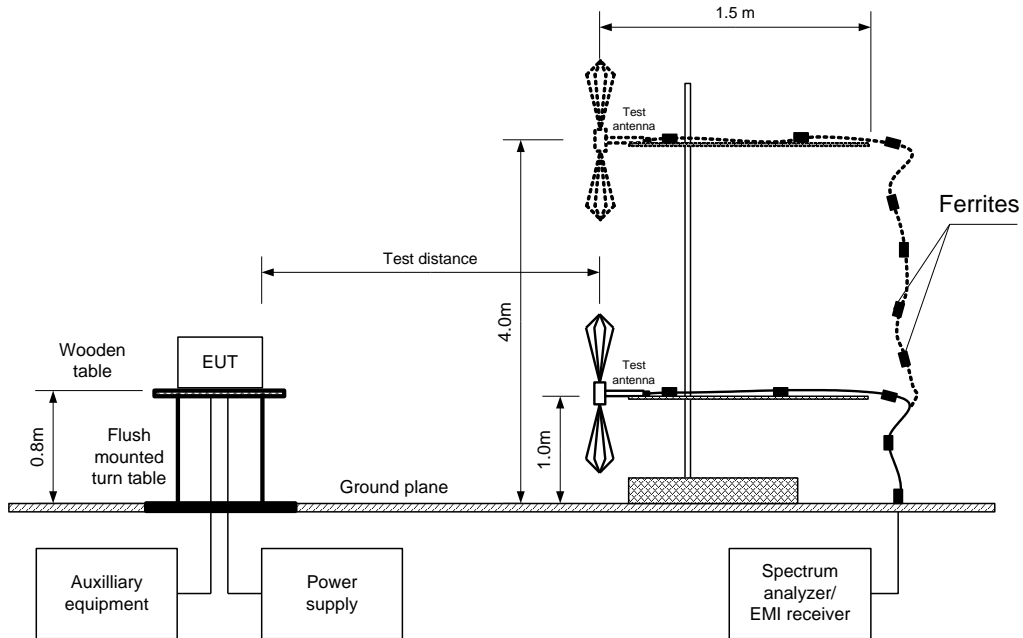
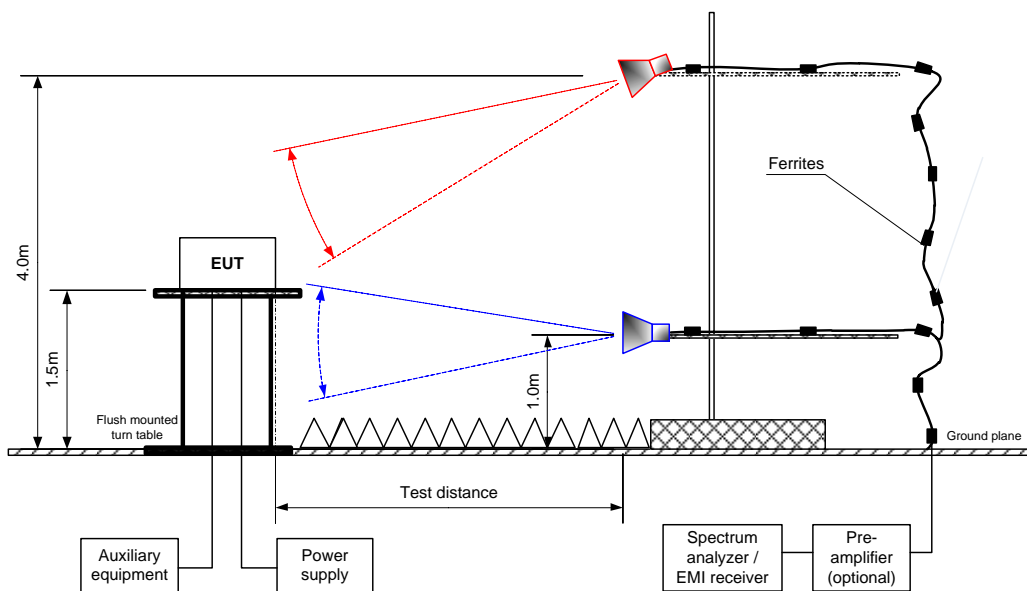


Figure 7.1.3 Setup for spurious emission field strength measurements above 1000 MHz





<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

**Table 7.1.4 Field strength of fundamental emission and spurious emissions**

TEST DISTANCE: 3 m  
 EUT POSITION: 3 orthogonal X / Y / Z,  
 MODULATION: QPSK  
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum  
 INVESTIGATED FREQUENCY RANGE: 0.009 – 25000 MHz  
 DETECTOR USED: Peak  
 RESOLUTION BANDWIDTH: 1.0 kHz (9 kHz – 150 kHz)  
 9.0 kHz (150 kHz – 30 MHz)  
 120 kHz (30 MHz – 1000 MHz)  
 1.0 MHz (above 1000 MHz)  
 VIDEO BANDWIDTH: ≥ Resolution bandwidth  
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)  
 Biconilog (30 MHz – 1000 MHz)  
 Double ridged guide (above 1000 MHz)

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Avr factor, dB	Average field strength			Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
<b>Fundamental emission***</b>											
2405	Hor	1.50	0	102.95	114	-11.05	-33.81	69.14	94	-24.86	Pass
2445	Hor	1.50	0	102.39	114	-11.61	-33.81	68.58	94	-25.42	Pass
2480	Hor	1.50	0	101.36	114	-12.64	-33.81	67.55	94	-26.45	Pass
<b>Spurious emissions at fundamental frequency 2405 MHz</b>											
4810.83	Hor	1.00	45	50.70	74	-23.30	-33.81	16.89	54	-37.11	Pass
<b>Spurious emissions at fundamental frequency 2445 MHz</b>											
4890.73	Hor	1.00	149	51.42	74	-22.58	-33.81	17.61	54	-36.39	Pass
<b>Spurious emissions at fundamental frequency 2480 MHz</b>											
4961.00	Hor	1.00	146	49.61	74	-24.39	-33.81	15.80	54	-38.20	Pass

\*- EUT front panel refers to 0 degrees position of turntable.  
 \*\*- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m).  
 \*\*\* Max value was obtained in X (Y, Z)-axis orthogonal position

**Table 7.1.5 Average factor calculation**

Transmission pulse			Average factor, dB
Duration, ms	Period, ms	Number of pulses within 100 ms	
1.02	80.60	2	-33.81

\*- Average factor was calculated as follows  
 for pulse train shorter than 100 ms: 20\*log ((Pulse duration\*Number of pulses within 100 ms) / 100)

**Reference numbers of test equipment used**

HL 0446	HL 1840	HL 3903	HL 4360	HL 4956	HL 4933	HL 5902	
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Full description is given in Appendix A.



HERMON LABORATORIES

<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

**Plot 7.1.1 Radiated emission measurements at the fundamental low frequency**

TEST SITE:

Semi anechoic chamber

TEST DISTANCE:

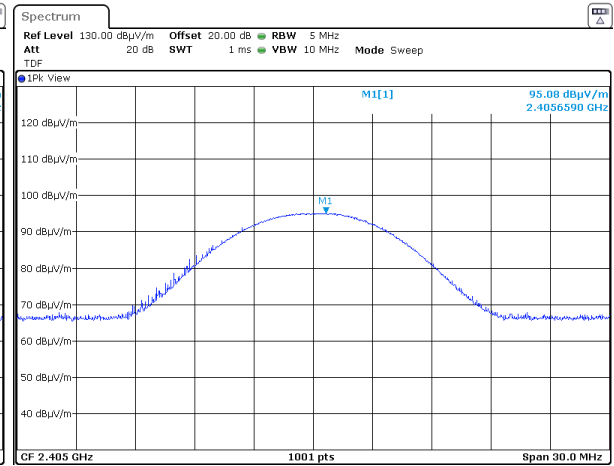
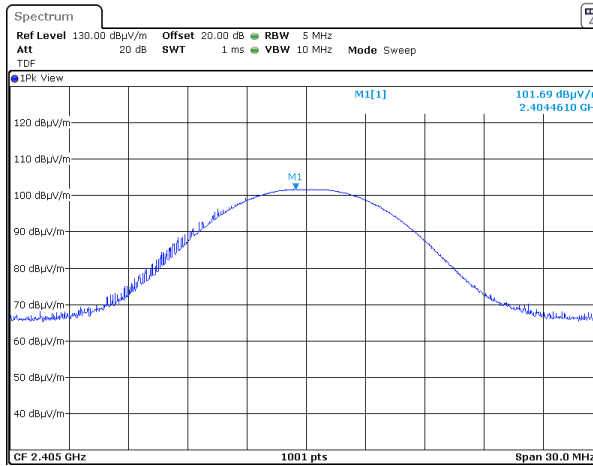
3 m

ANTENNA POLARIZATION:

Vertical and Horizontal

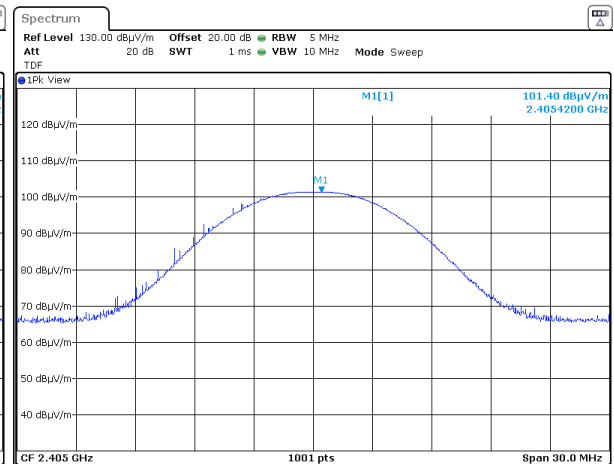
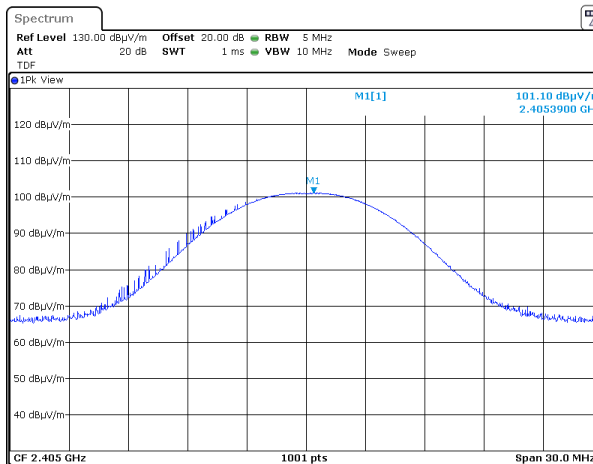
EUT POSITION:

X



EUT POSITION:

Y





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<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

**Plot 7.1.2 Radiated emission measurements at the fundamental low frequency (continued)**

TEST SITE:

Semi anechoic chamber

TEST DISTANCE:

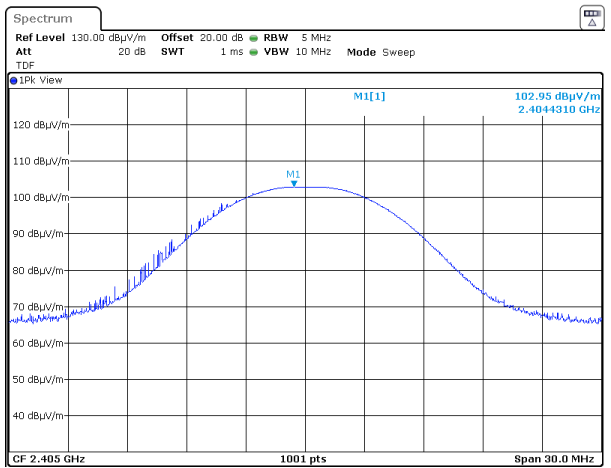
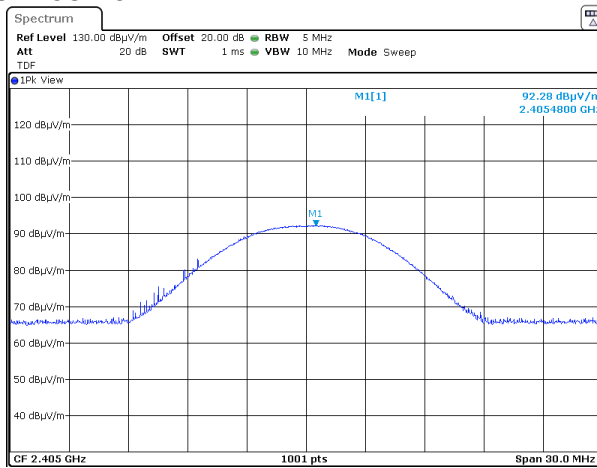
3 m

ANTENNA POLARIZATION:

Vertical and Horizontal

EUT POSITION:

Z



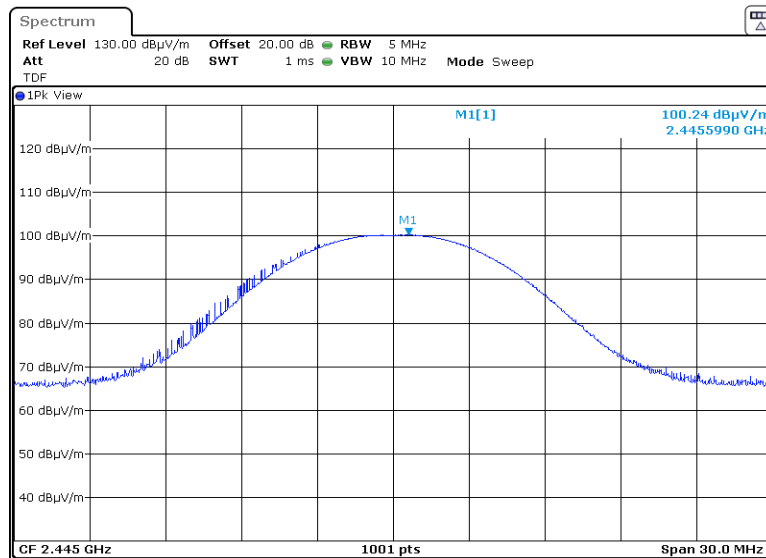


HERMON LABORATORIES

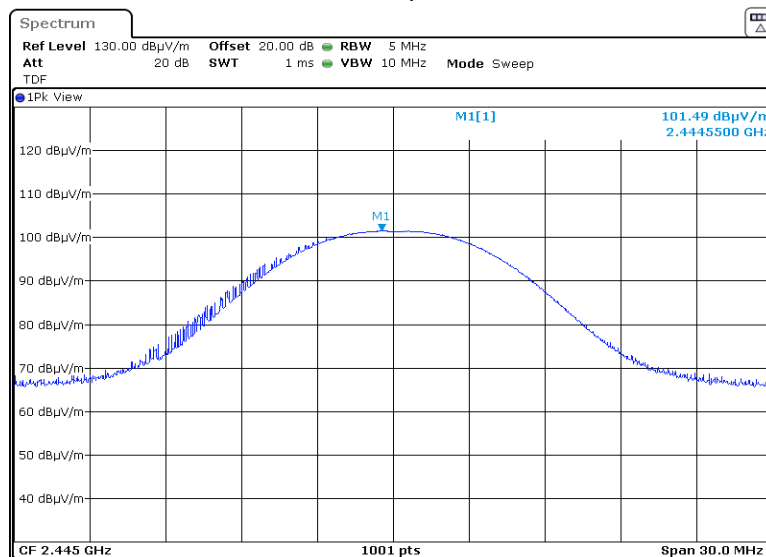
<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Plot 7.1.3 Radiated emission measurements at the fundamental mid frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
EUT POSITION:	X



EUT POSITION: Y



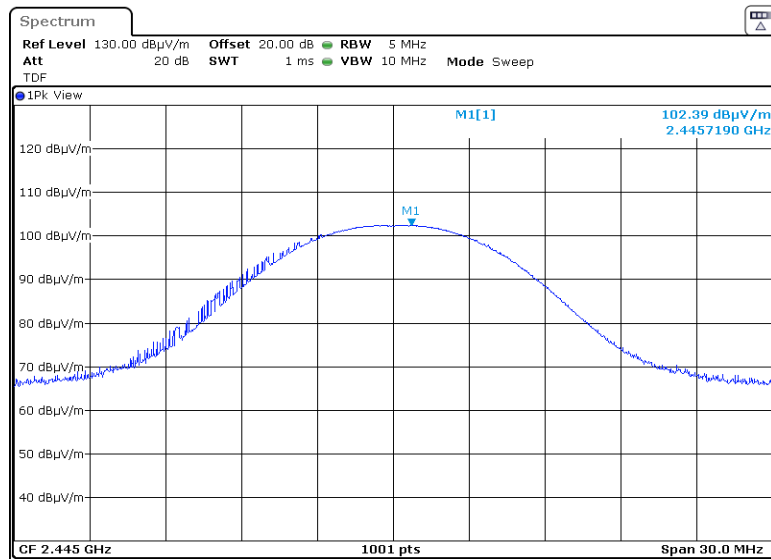


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<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

**Plot 7.1.2 Radiated emission measurements at the mid fundamental frequency (continued)**

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
EUT POSITION:	Z



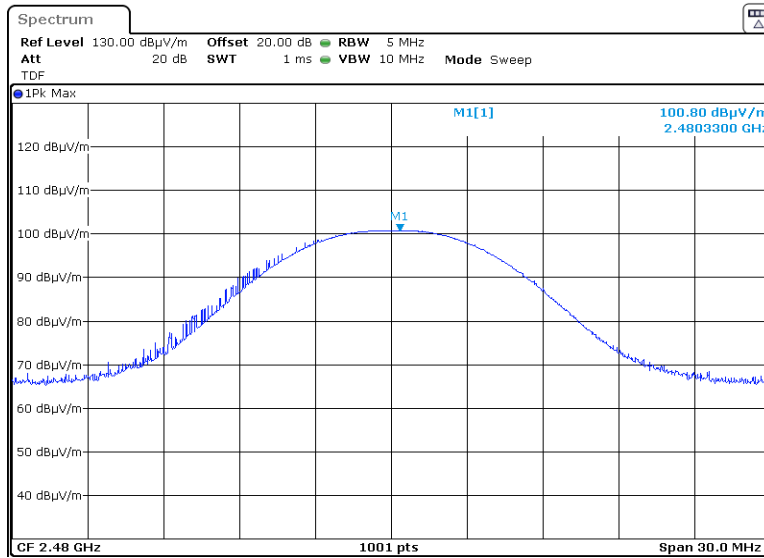


HERMON LABORATORIES

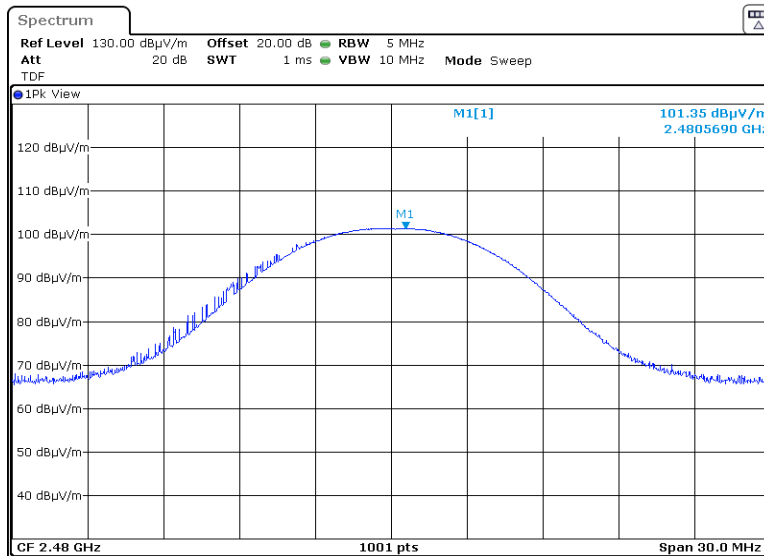
<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

**Plot 7.1.4 Radiated emission measurements at the fundamental high frequency**

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
EUT POSITION:	X



EUT POSITION: Y



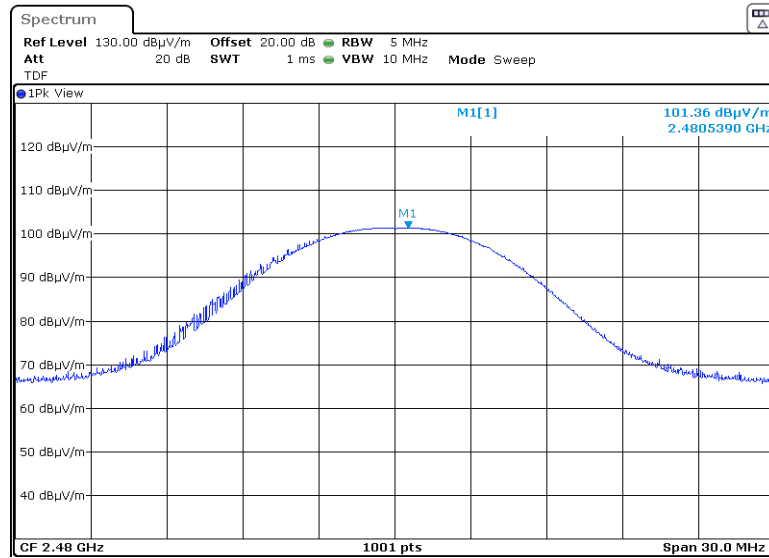


HERMON LABORATORIES

<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Plot 7.1.5 Radiated emission measurements at the fundamental high frequency (continued)

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
EUT POSITION:	Z



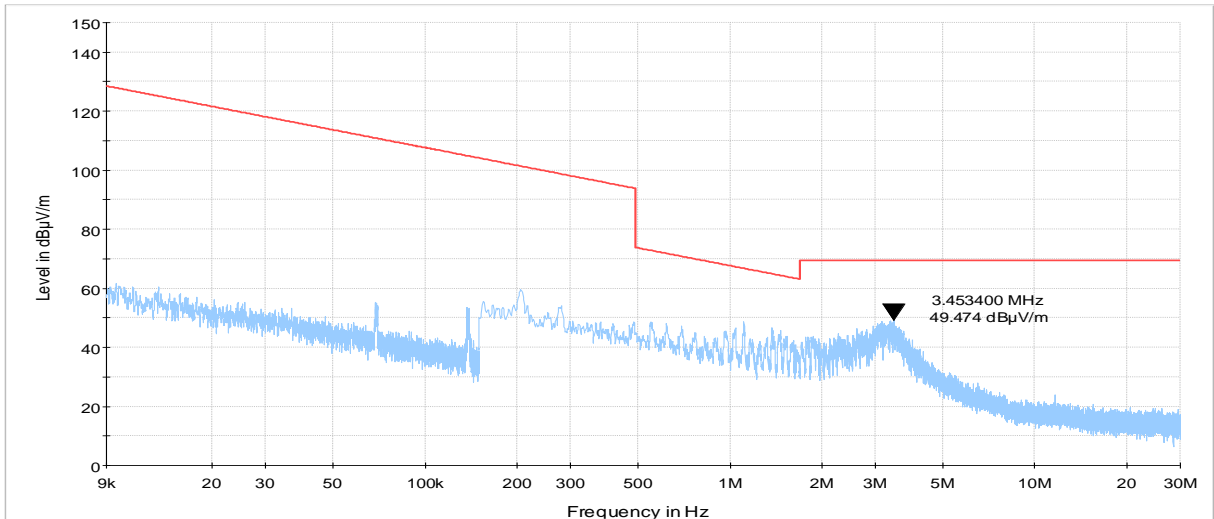




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

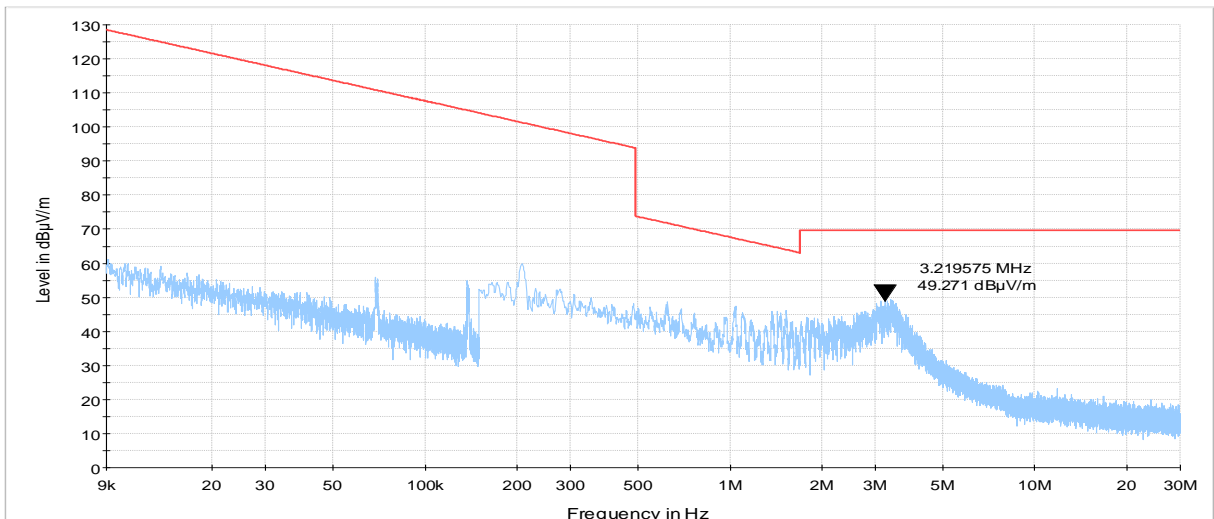
**Plot 7.1.6 Radiated emission measurements from 9 kHz to 30 MHz at low carrier frequency**

TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical  
 EUT POSITION: X



**Plot 7.1.7 Radiated emission measurements from 9 kHz to 30 MHz at mid carrier frequency**

TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical  
 EUT POSITION: X

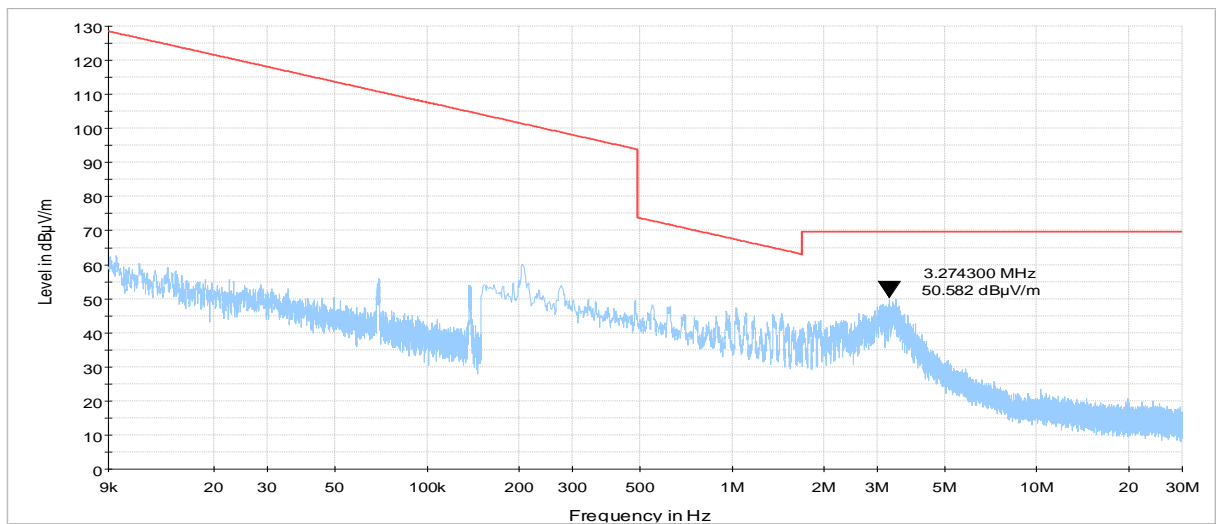




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

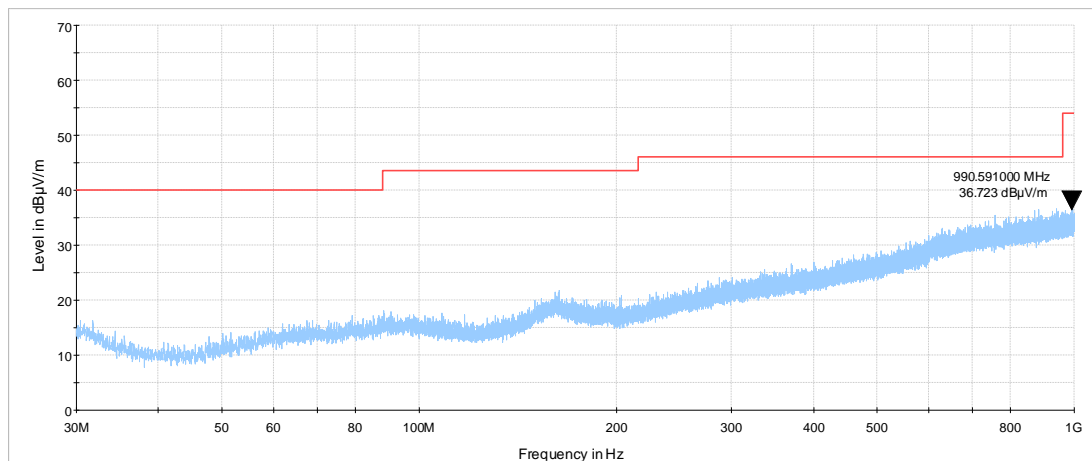
**Plot 7.1.8 Radiated emission measurements from 9 kHz to 30 MHz at high carrier frequency**

TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical  
 EUT POSITION: X



**Plot 7.1.9 Radiated emission measurements from 30 to 1000 MHz at low carrier frequency**

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

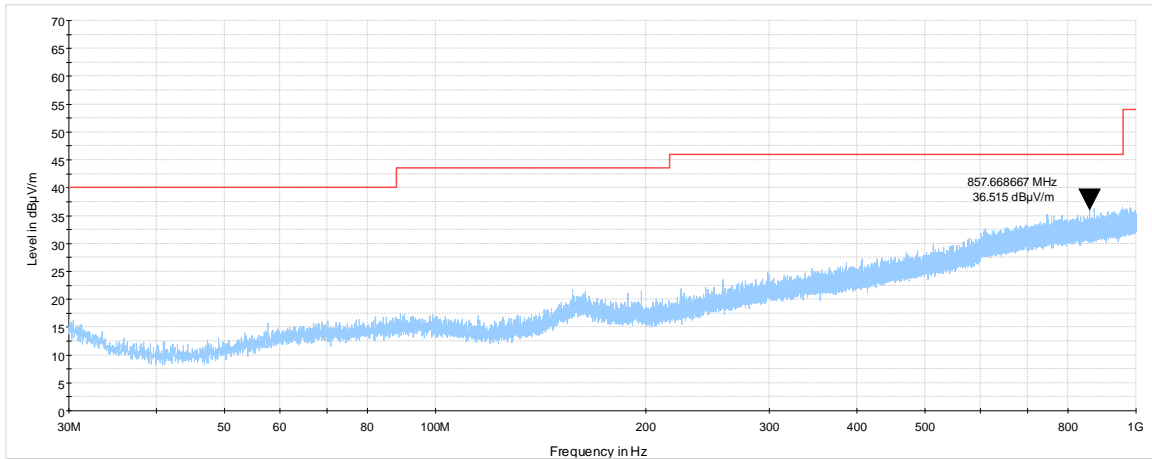




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

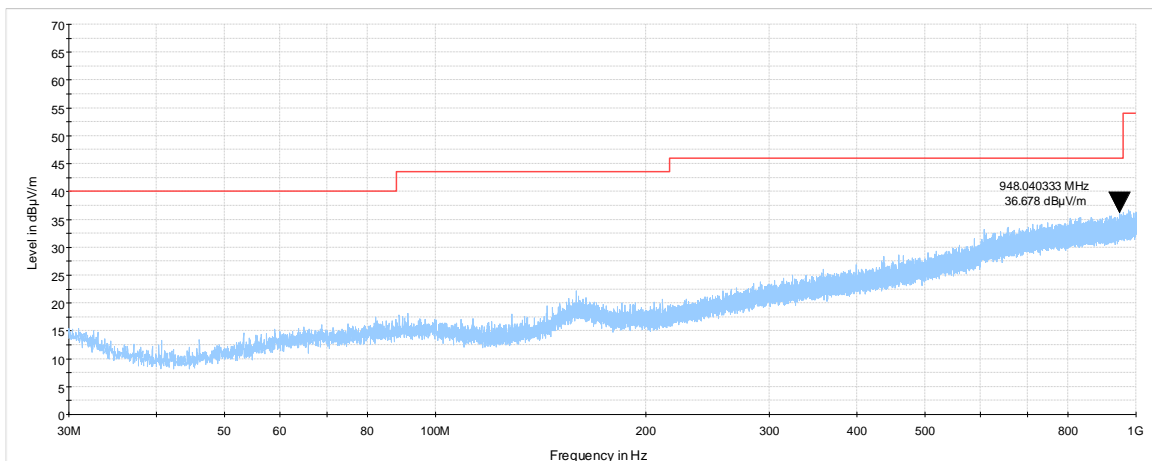
**Plot 7.1.10 Radiated emission measurements from 30 to 1000 MHz at mid carrier frequency**

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



**Plot 7.1.11 Radiated emission measurements from 30 to 1000 MHz at high carrier frequency**

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

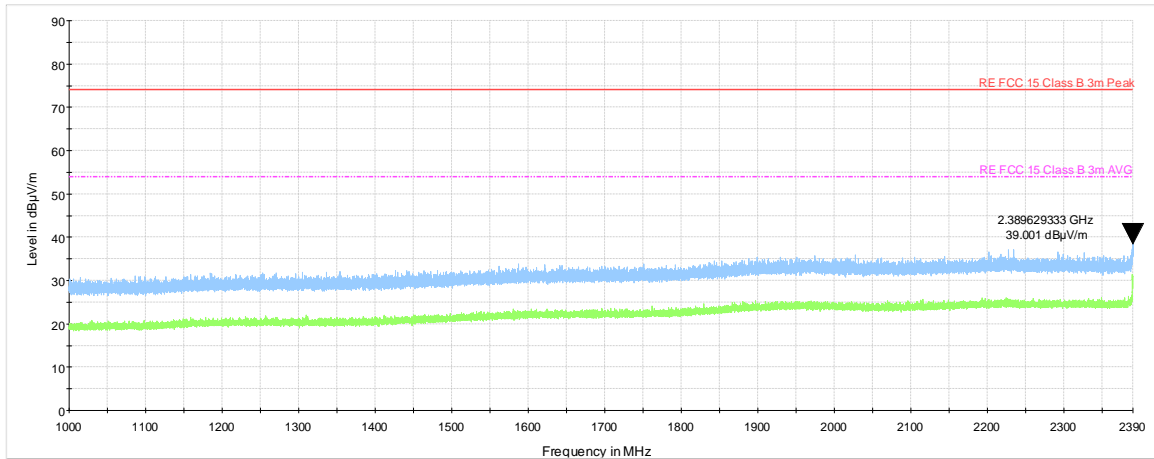




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

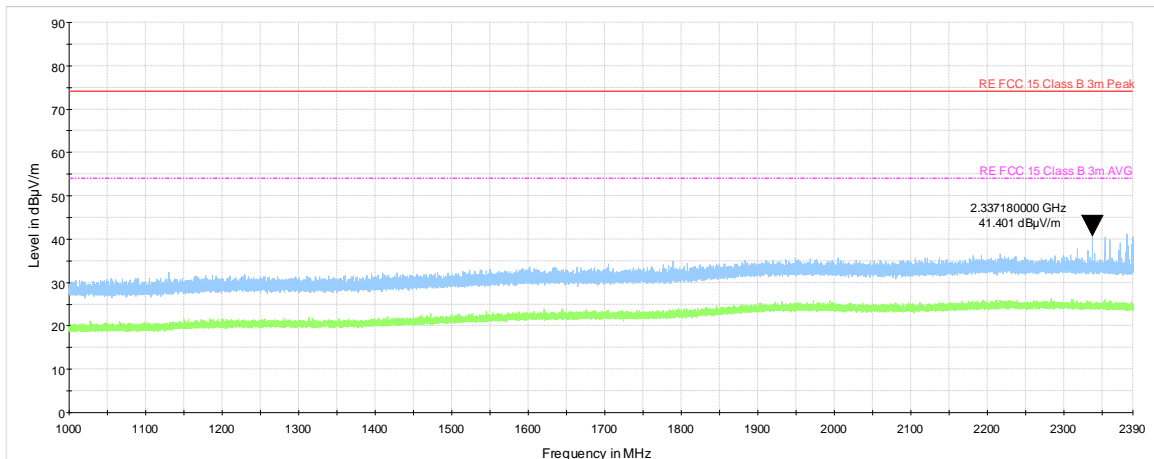
**Plot 7.1.12 Radiated emission measurements from 1.0 to 2.39 GHz at low carrier frequency**

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



**Plot 7.1.13 Radiated emission measurements from 1.0 to 2.39 GHz at mid carrier frequency**

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

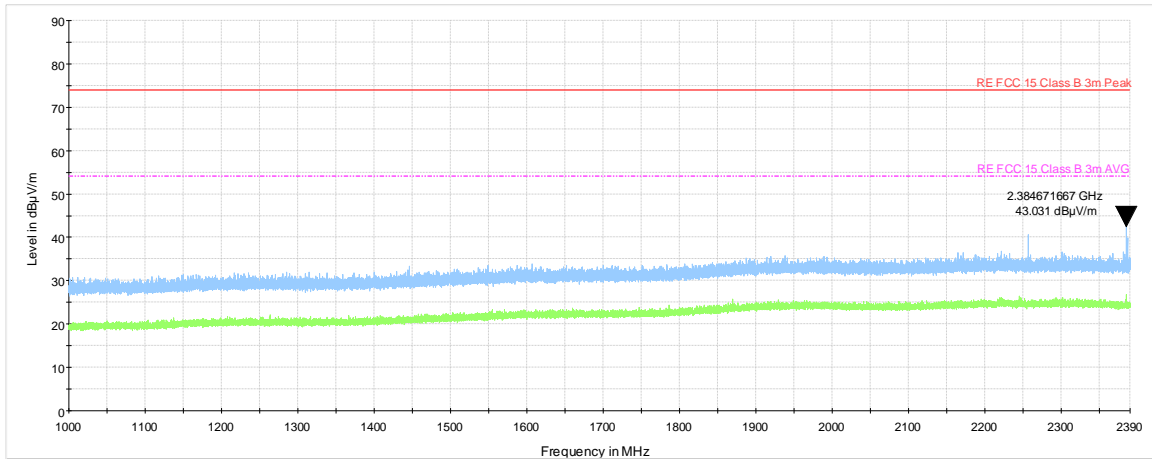




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

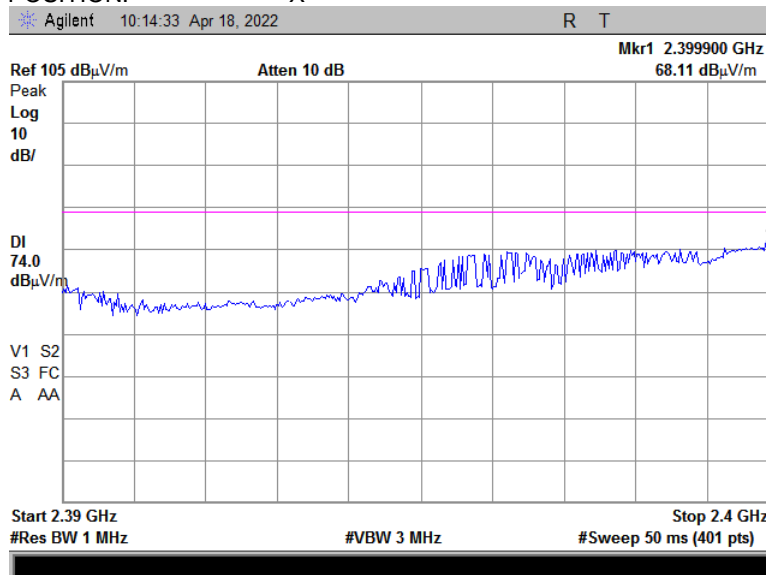
Plot 7.1.14 Radiated emission measurements from 1.0 to 2.39 GHz at high carrier frequency

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



Plot 7.1.15 Radiated emission measurements from 2390 to 2400 MHz at low carrier frequency

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



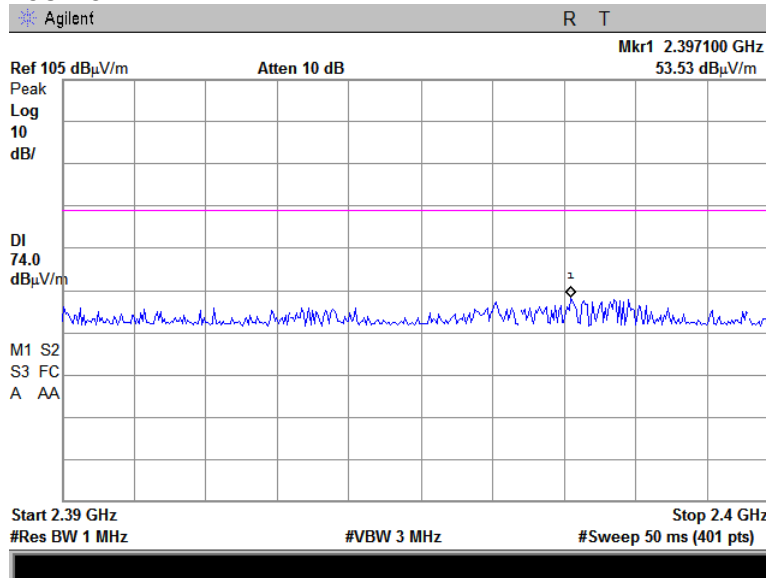


HERMON LABORATORIES

<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

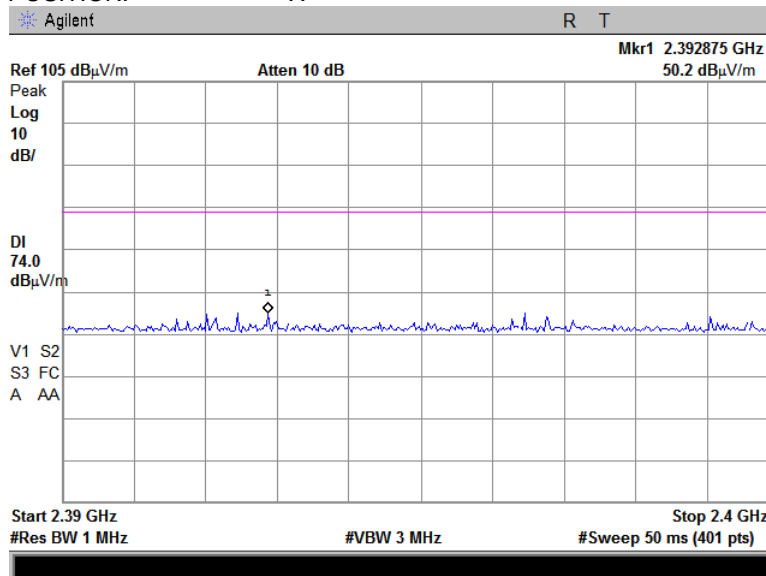
Plot 7.1.16 Radiated emission measurements from 2390 to 2400 MHz at mid carrier frequency

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



Plot 7.1.17 Radiated emission measurements from 2390 to 2400 MHz at high carrier frequency

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

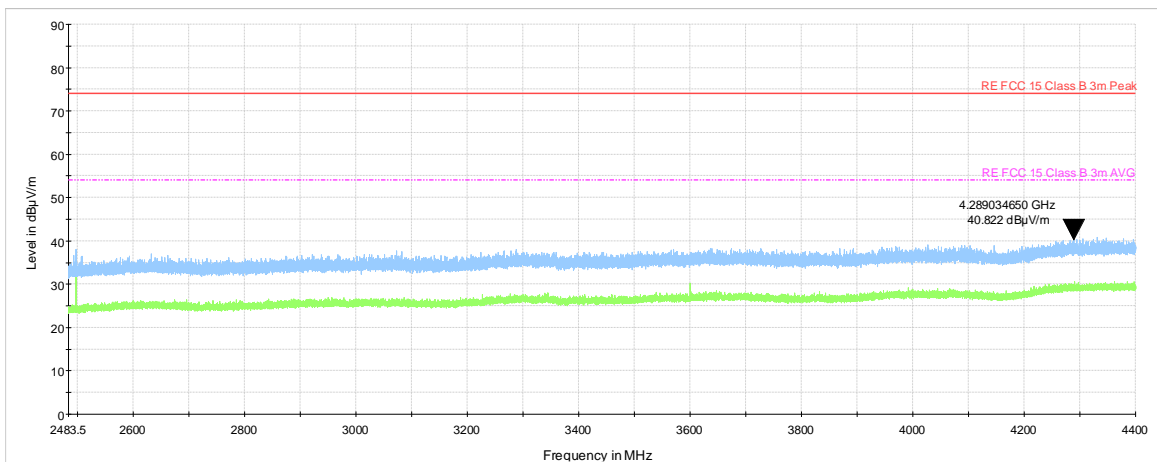




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

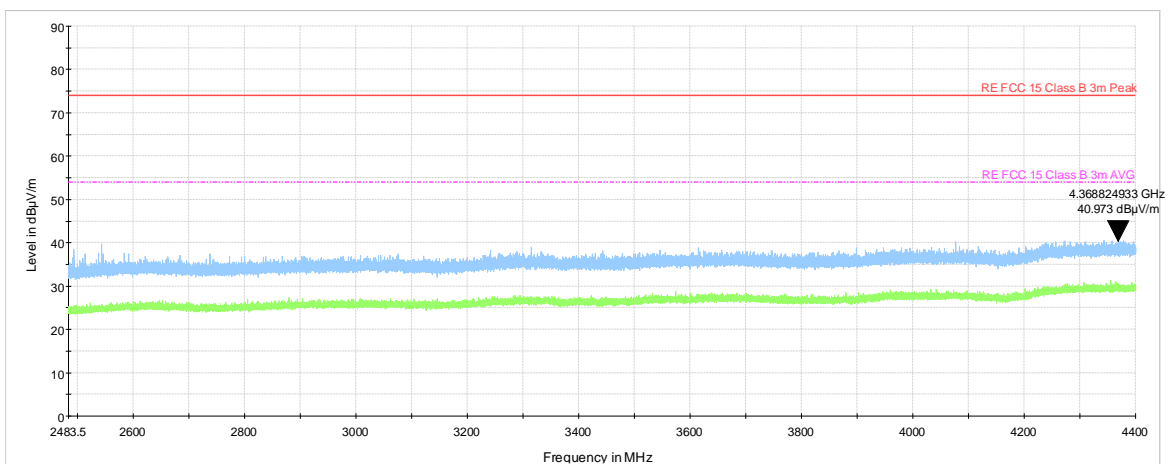
**Plot 7.1.18 Radiated emission measurements from 2483.5 to 4400 MHz at low carrier frequency**

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



**Plot 7.1.19 Radiated emission measurements from 2483.5 to 4400 MHz at mid carrier frequency**

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

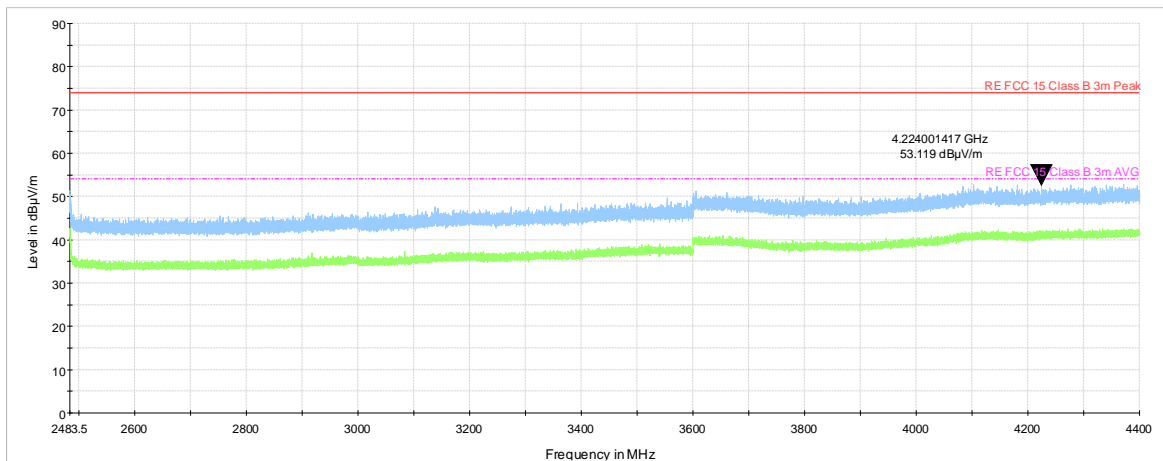




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

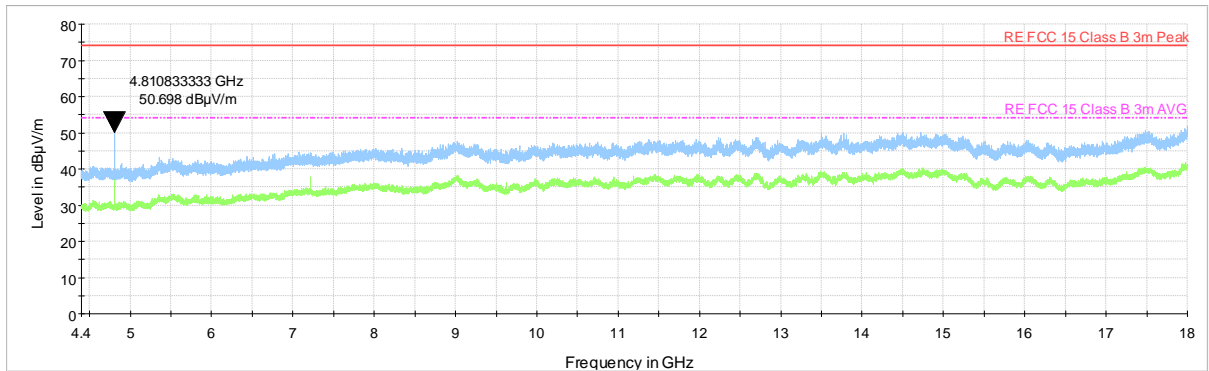
**Plot 7.1.20 Radiated emission measurements from 2486.5 to 4400 MHz at high carrier frequency**

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



**Plot 7.1.21 Radiated emission measurements from 4.4 to 18.0 GHz at low carrier frequency**

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



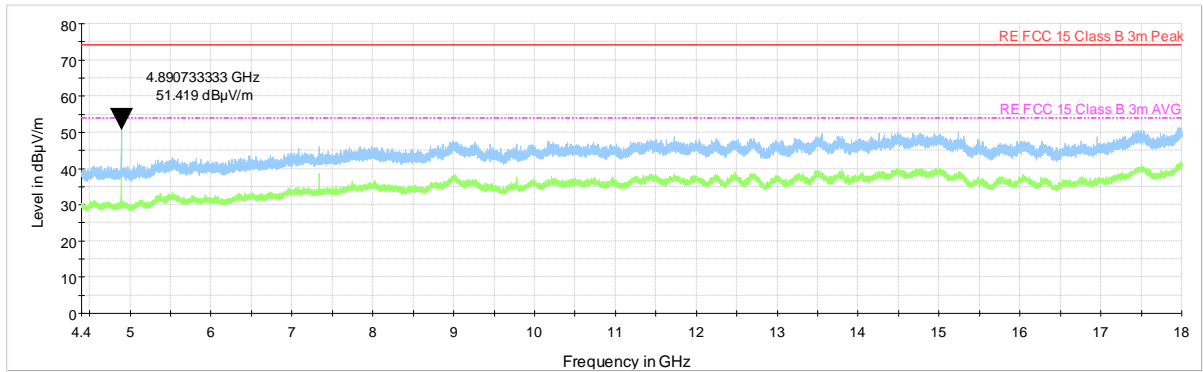




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

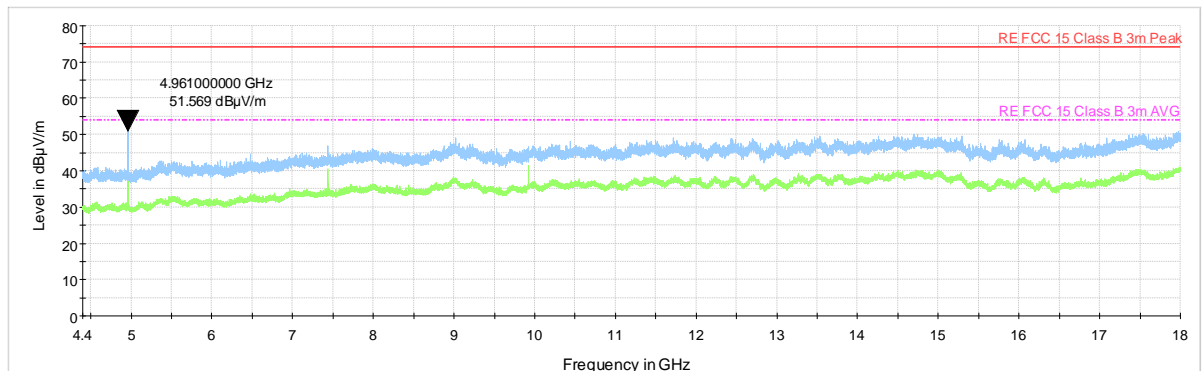
Plot 7.1.22 Radiated emission measurements from 4.4 to 18.0 GHz at mid carrier frequency

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



Plot 7.1.23 Radiated emission measurements from 4.4 to 18.0 GHz at high carrier frequency

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

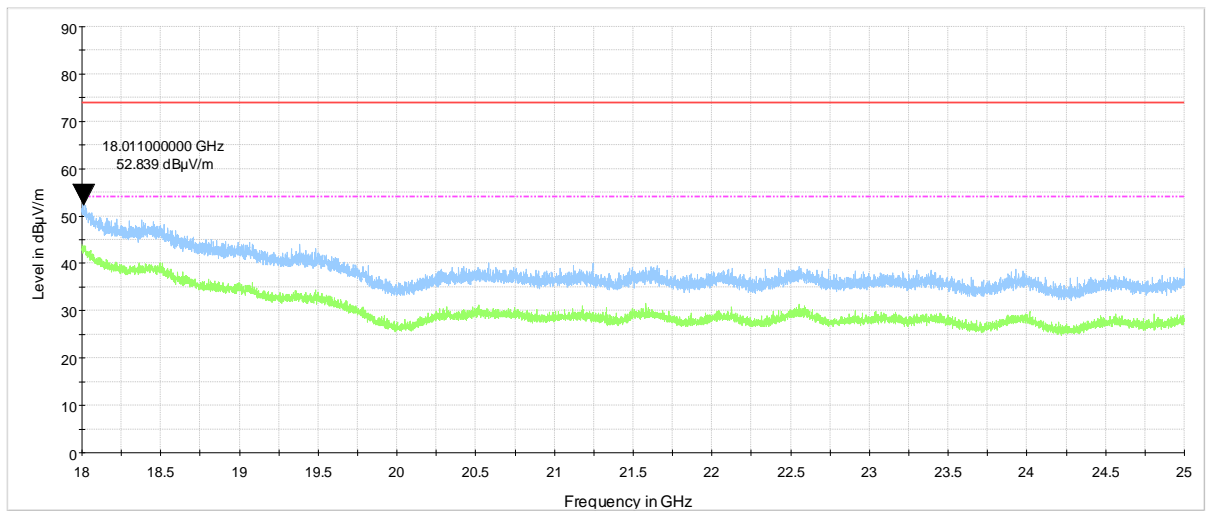




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

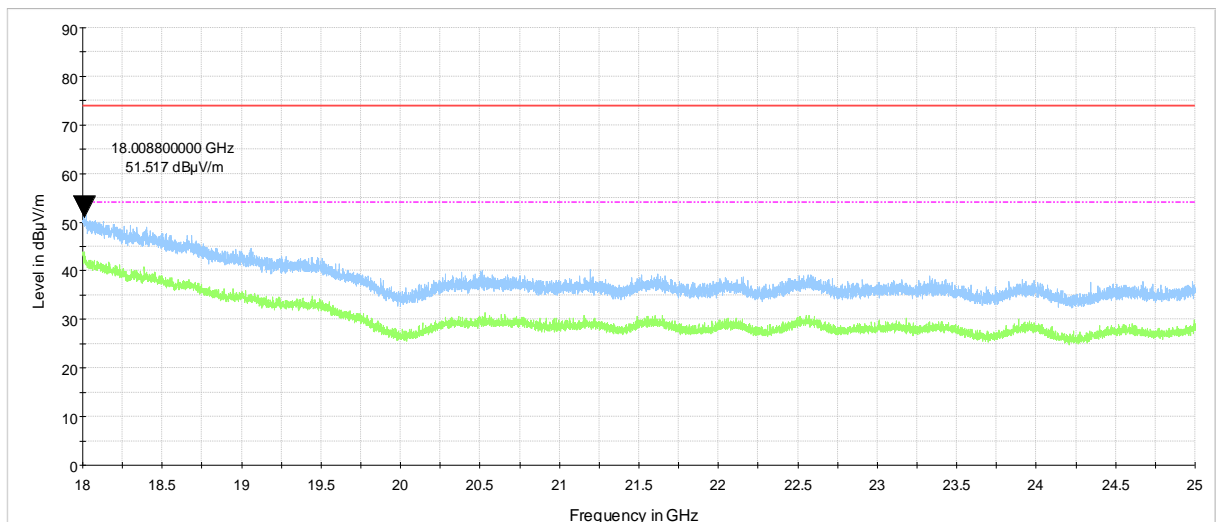
**Plot 7.1.24 Radiated emission measurements from 18.0 to 25.0 GHz at low carrier frequency**

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



**Plot 7.1.25 Radiated emission measurements from 18.0 to 25.0 GHz at mid carrier frequency**

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

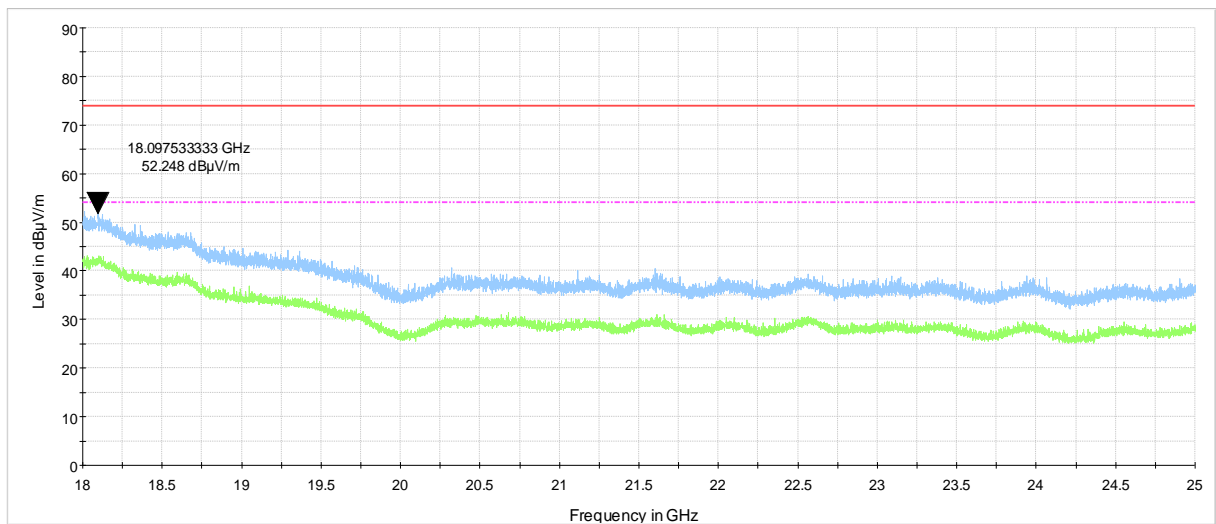




<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Plot 7.1.26 Radiated emission measurements from 18.0 to 25.0 GHz at high carrier frequency

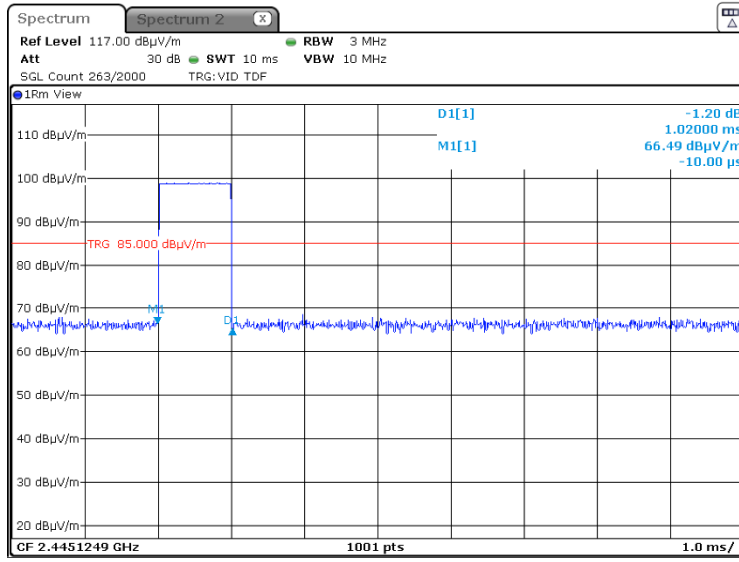
TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Vertical and Horizontal  
 EUT POSITION: X



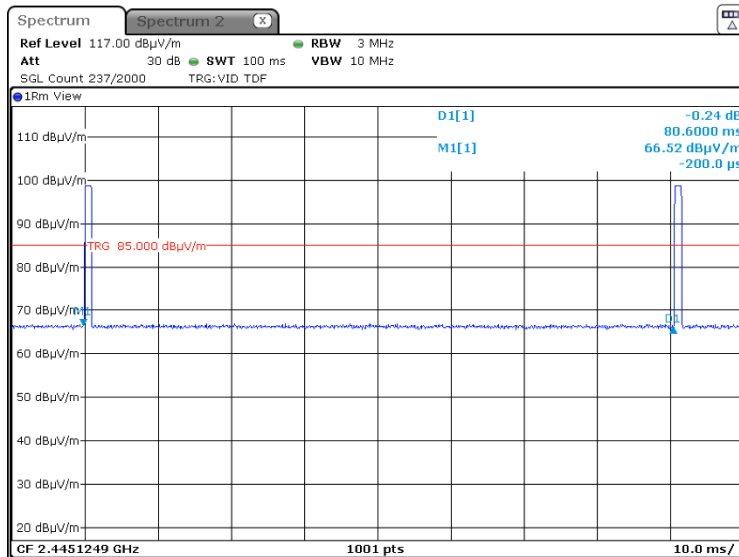


<b>Test specification:</b> Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions			
<b>Test procedure:</b> ANSI C63.10 sections 6.5, 6.6			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 21 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Plot 7.1.27 Transmission pulse duration



Plot 7.1.28 Transmission pulse period





<b>Test specification:</b> Section 15.215(c)/ RSS-Gen, section 6.6, Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.10 section 6.9.2			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 16-Jan-22			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1010 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

## 7.2 Occupied bandwidth test

### 7.2.1 General

This test was performed to verify that the 20 dB bandwidth of the emissions was contained within the standard specified frequency band according to FCC §15.215 requirements. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc
902 - 928	20.0
<b>2400 – 2483.5</b>	
5725 – 5875	
24000 – 24250	

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

Table 7.2.2 Occupied bandwidth limits RSS-210

Assigned frequency, MHz	Modulation envelope reference points*, %
902 - 928	99
<b>2400 – 2483.5</b>	
5725 – 5875	
24000 – 24250	

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

### 7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.2.2.3 The peak of emission was measured. The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.2.3 and associated plot.

Figure 7.2.1 Occupied bandwidth test setup





<b>Test specification:</b> Section 15.215(c)/ RSS-Gen, section 6.6, Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.10 section 6.9.2			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 16-Jan-22			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1010 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Table 7.2.3 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND: 2400 – 2483.5 MHz  
 DETECTOR USED: Peak hold  
 RESOLUTION BANDWIDTH: 100 kHz  
 VIDEO BANDWIDTH: 300 kHz  
 MODULATION ENVELOPE REFERENCE POINTS: 20 dBc  
 MODULATION: QPSK  
 MODULATING SIGNAL: enable

Frequency, MHz	OBW, kHz		Limit	Verdict
	20 dBc	99%		
2405	2934.0	2687.3	NA	Pass
2445	3217.0	2897.1	NA	Pass
2480	3167.0	2997.0	NA	Pass

Reference numbers of test equipment used

HL 4136	HL 4355							
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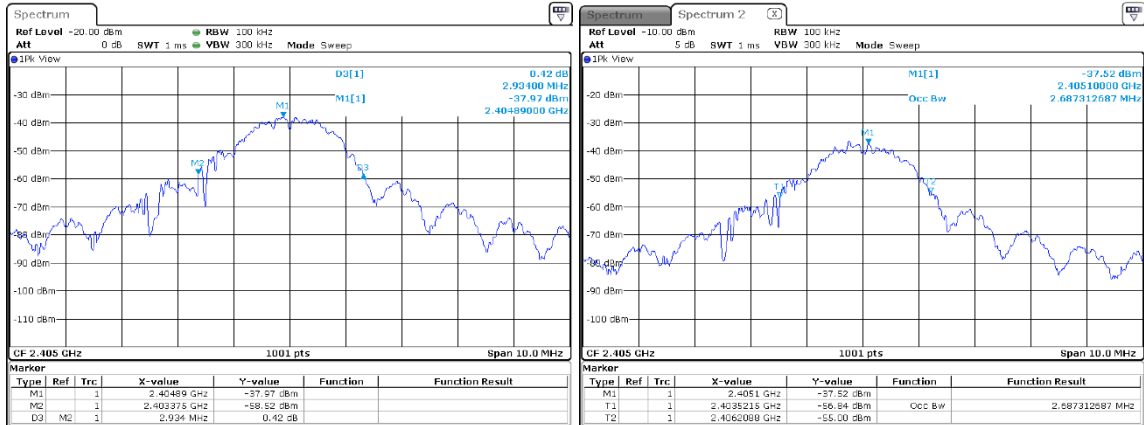
Full description is given in Appendix A.



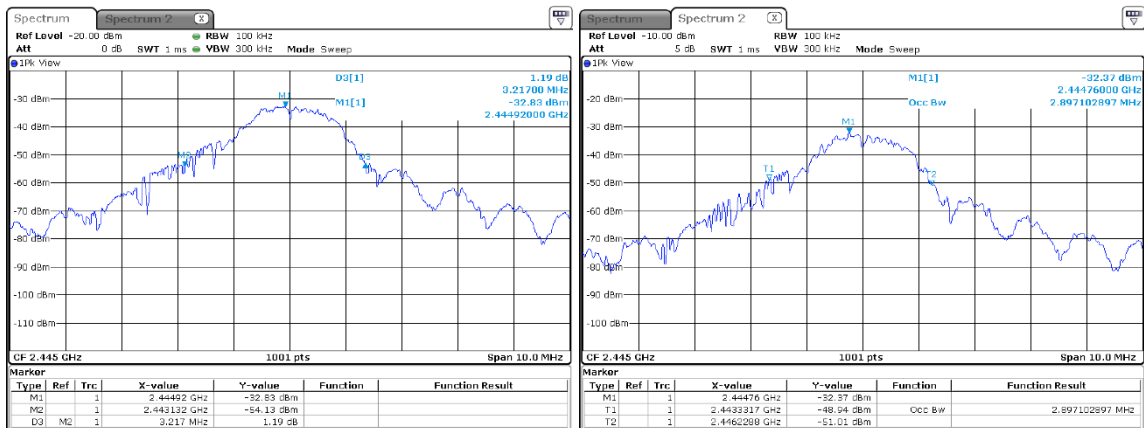
HERMON LABORATORIES

<b>Test specification:</b> Section 15.215(c)/ RSS-Gen, section 6.6, Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.10 section 6.9.2			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 16-Jan-22			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1010 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Plot 7.2.1 Occupied bandwidth 20 dBc and 99% at low carrier frequency test result



Plot 7.2.2 Occupied bandwidth 20 dBc and 99% at mid carrier frequency test result

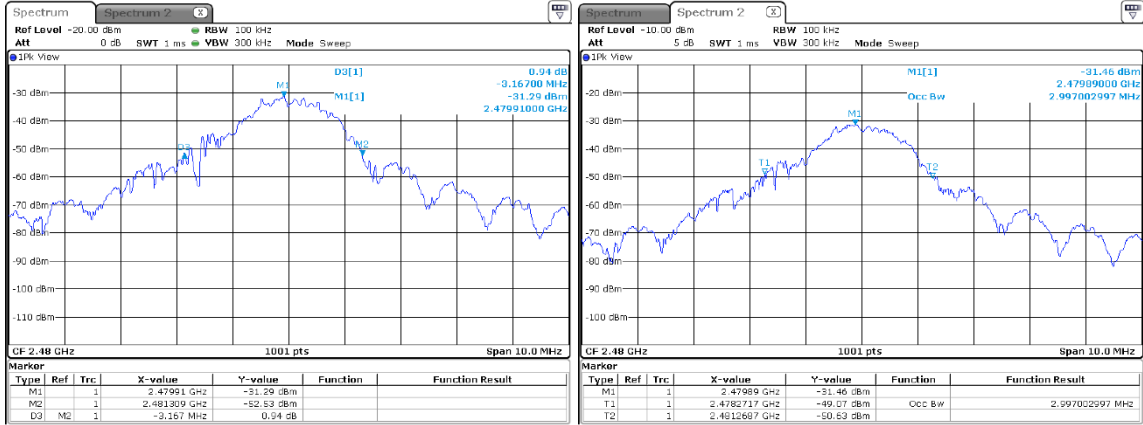




HERMON LABORATORIES

<b>Test specification:</b> Section 15.215(c)/ RSS-Gen, section 6.6, Occupied bandwidth			
<b>Test procedure:</b> ANSI C63.10 section 6.9.2			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 16-Jan-22			
<b>Temperature:</b> 23 °C	<b>Relative Humidity:</b> 49 %	<b>Air Pressure:</b> 1010 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Plot 7.2.3 Occupied bandwidth 20 dBc and 99% at high carrier frequency test result







<b>Test specification: Section 15.249(d)/RSS-210, section A2.9, Band edge emissions</b>			
<b>Test procedure:</b> ANSI C63.10 section 6.10			
<b>Test mode:</b> Compliance		<b>Verdict: PASS</b>	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

### 7.3 Band edge emission

#### 7.3.1 General

This test was performed to verify the EUT band edge emission including all associated side bands was attenuated at least 50 dB below the unmodulated carrier level or below the general spurious emission limit. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Band edge emission limits

Frequency band, MHz	Field strength limit at 3 m, dBμV/m		Attenuation below carrier, dBc
	Peak	Average	
2400.0 – 2483.5	74.0	54.0	50

#### 7.3.2 Test procedure

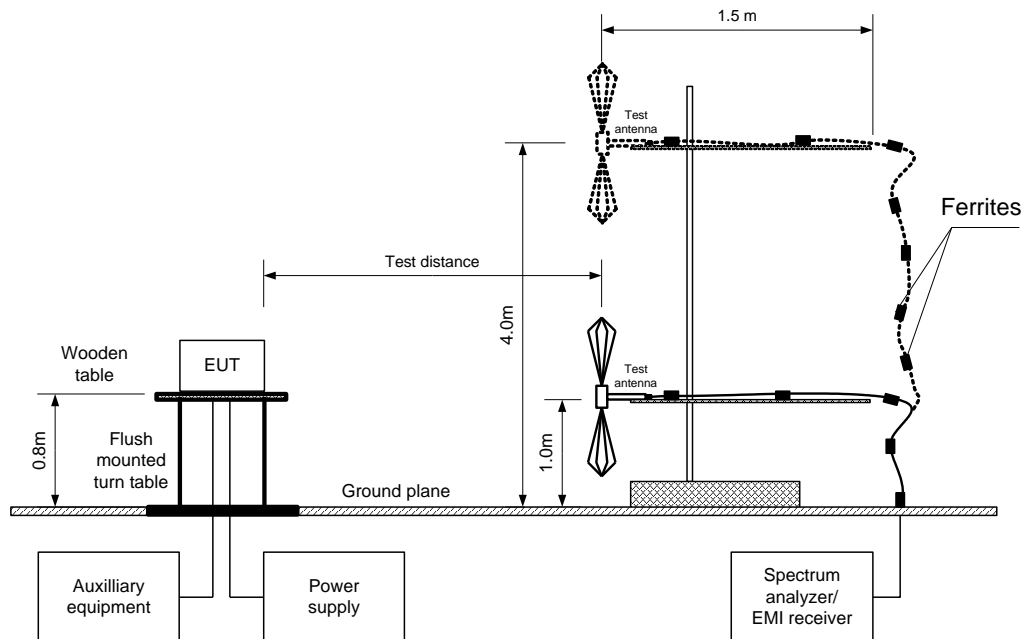
7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.

7.3.2.2 The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.3.2.3 The frequency of modulation envelope points beyond which power level drops below the band edge emission limit was measured.

7.3.2.4 The test results were recorded in Table 7.3.2 and shown in the associated plots.

Figure 7.3.1 Band edge emission measurement set up





<b>Test specification:</b> Section 15.249(d)/RSS-210, section A2.9, Band edge emissions			
<b>Test procedure:</b> ANSI C63.10 section 6.10			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

Table 7.3.2 Band edge emission test results

OPERATING FREQUENCY RANGE: 2400.0 – 2483.5 MHz  
DETECTOR USED: Peak hold  
RESOLUTION BANDWIDTH: 1 MHz  
VIDEO BANDWIDTH: 3 MHz  
MODULATION: QPSK  
MODULATING SIGNAL: PRBS  
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Edge	Frequency, MHz	Peak field strength			Avr factor, dB	Average field strength			Verdict
		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*		Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	
Low	2400.0	68.18	74.0	-5.82	-33.81	34.37	54.0	-19.63	Pass
High	2483.5	72.93	74.0	-1.07	-33.81	39.12	54.0	-14.88	Pass

\*- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m).

Reference numbers of test equipment used

HL 3903	HL 5902	HL 4933	HL 2909				
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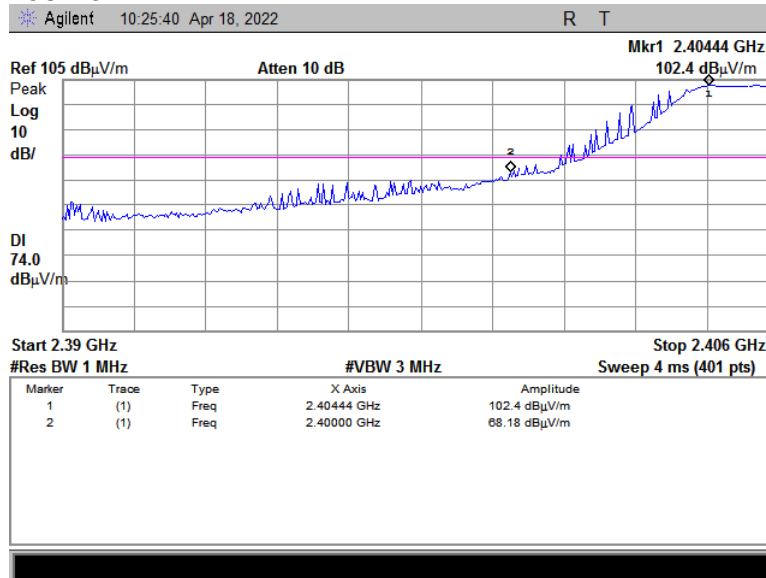
Full description is given in Appendix A.



<b>Test specification:</b> Section 15.249(d)/RSS-210, section A2.9, Band edge emissions			
<b>Test procedure:</b> ANSI C63.10 section 6.10			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 18-Apr-22			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

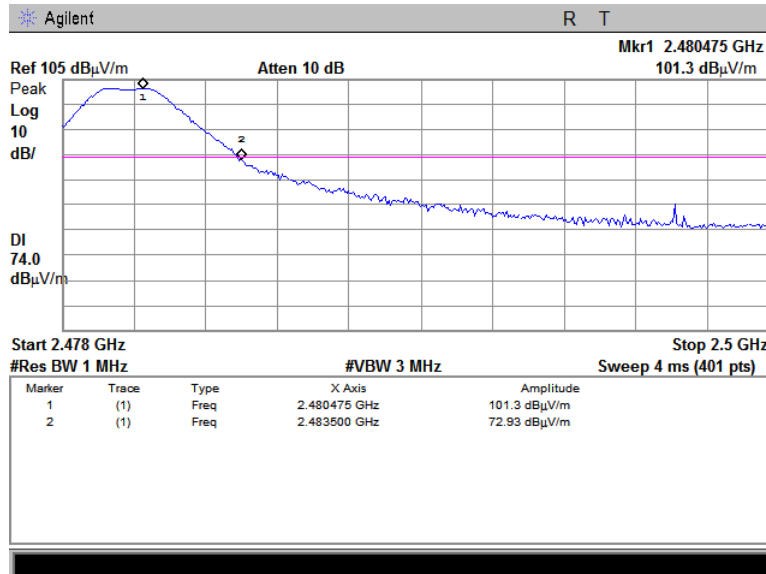
Plot 7.3.1 Low band edge emission test result

TEST SITE: Semi anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Horizontal  
 EUT POSITION: Z



Plot 7.3.2 High band edge emission test result

TEST SITE: Semi Anechoic chamber  
 TEST DISTANCE: 3 m  
 ANTENNA POLARIZATION: Horizontal  
 EUT POSITION: Z





<b>Test specification:</b> Section 15.203 / RSS-Gen, Section 8.3, Antenna requirement			
<b>Test procedure:</b> Visual inspection / supplier declaration			
<b>Test mode:</b> Compliance		<b>Verdict:</b> PASS	
<b>Date(s):</b> 17-Jan-22			
<b>Temperature:</b> 24 °C	<b>Relative Humidity:</b> 44 %	<b>Air Pressure:</b> 1012 hPa	<b>Power:</b> 3.6 VDC
<b>Remarks:</b>			

### 7.4 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 7.4.1.

Table 7.4.1 Antenna requirements

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

Photograph 7.4.1 Antenna assembly



**8 APPENDIX A Test equipment and ancillaries used for tests**

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFL EX 102A	1226/2A	06-Apr-21	06-Apr-22
4136	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000 137	25-Apr-21	25-Apr-22
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 CORPORATION	AHA-118	701046	13-Jan-22	13-Jan-23
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATION	AHA-840	105004	26-Jan-21	26-Jan-22
5085	Attenuator, 4 dB, DC - 6 GHz, 1 W	Mini-Circuits	UNAT-4+	NA	11-May-21	11-May-22
5112	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502494/2EA	19-Apr-21	19-Apr-22
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	08-Feb-19	08-Mar-22
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000	NA	16-Jan-22	16-Jan-23
5905	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000		16-Jan-22	16-Jan-23



### 9 APPENDIX B Test equipment correction factors

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.



HL 5112, RF cable, 40 GHz, 5.5 m, K-type,  
Huber-Suhner, SF102EA/11SK/11SK/5500MM, s/n 502494/2EA, HL 5112

Set / Applied, MHz	Measured, dB	Uncertainty, dB
100	0.70	±0.07
200	0.99	±0.08
300	1.21	±0.08
500	1.55	±0.08
1000	2.18	±0.08
1500	2.67	±0.08
2000	3.09	±0.08
2500	3.46	±0.10
3000	3.80	±0.10
3500	4.12	±0.10
4000	4.41	±0.10
4500	4.69	±0.10
5000	4.95	±0.10
5500	5.20	±0.10
6000	5.45	±0.10
6500	5.68	±0.10
7000	5.91	±0.10
7500	6.13	±0.10
8000	6.34	±0.10
8500	6.56	±0.10
9000	6.76	±0.10
9500	6.95	±0.10
10000	7.16	±0.10
10500	7.33	±0.10
11000	7.51	±0.10
11500	7.68	±0.10
12000	7.85	±0.10
12500	8.02	±0.13
13000	8.17	±0.13
13500	8.31	±0.13
14000	8.46	±0.13
14500	8.61	±0.18
15000	8.76	±0.18
15500	8.91	±0.18
16000	9.07	±0.18
16500	9.22	±0.18
17000	9.36	±0.18
17500	9.51	±0.18
18000	9.66	±0.18
18500	9.81	±0.23
19000	9.95	±0.23
19500	10.10	±0.23

Set / Applied, MHz	Measured, dB	Uncertainty, dB
20000	10.25	±0.23
20500	10.38	±0.23
21000	10.52	±0.23
21500	10.67	±0.23
22000	10.84	±0.23
22500	11.00	±0.29
23000	11.10	±0.29
23500	11.20	±0.29
24000	11.32	±0.29
24500	11.42	±0.29
25000	11.59	±0.23
25500	11.70	±0.23
26000	11.85	±0.23
26500	11.97	±0.23
27000	12.07	±0.33
27500	12.17	±0.33
28000	12.26	±0.40
28500	12.38	±0.40
29000	12.50	±0.40
29500	12.63	±0.40
30000	12.75	±0.40
30500	12.82	±0.33
31000	12.93	±0.33
31500	13.09	±0.33
32000	13.22	±0.33
32500	13.35	±0.33
33000	13.48	±0.33
33500	13.60	±0.33
34000	13.72	±0.33
34500	13.80	±0.40
35000	13.92	±0.40
35500	14.01	±0.40
36000	14.12	±0.40
36500	14.23	±0.40
37000	14.34	±0.33
37500	14.44	±0.33
38000	14.57	±0.33
38500	14.72	±0.33
39000	14.82	±0.33
39500	14.94	±0.33
40000	15.08	±0.47



**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**

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 $\mu$ V to obtain field strength in dB $\mu$ V/m.



**10 APPENDIX C Measurement uncertainties****Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements**

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: $\pm 3.9$ dB 150 kHz to 30 MHz: $\pm 3.8$ dB
Radiated emissions at 10 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.0$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.1$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 5.5$ dB Biconical antenna: $\pm 5.5$ dB Log periodic antenna: $\pm 5.6$ dB Double ridged horn antenna: $\pm 5.8$ dB
Radiated emissions at 3 m measuring distance Horizontal polarization  Vertical polarization	Biconilog antenna: $\pm 5.3$ dB Biconical antenna: $\pm 5.0$ dB Log periodic antenna: $\pm 5.3$ dB Double ridged horn antenna: $\pm 5.3$ dB Biconilog antenna: $\pm 6.0$ dB Biconical antenna: $\pm 5.7$ dB Log periodic antenna: $\pm 6.0$ dB Double ridged horn antenna: $\pm 6.0$ dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: $\pm 2.6$ dB 2.9 GHz to 6.46 GHz: $\pm 3.5$ dB 6.46 GHz to 13.2 GHz: $\pm 4.3$ dB 13.2 GHz to 22.0 GHz: $\pm 5.0$ dB 22.0 GHz to 26.8 GHz: $\pm 5.5$ dB 26.8 GHz to 40.0 GHz: $\pm 4.8$ dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	$\pm 1.0$ %
Occupied bandwidth	$\pm 8.0$ %

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.



## 11 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).

Address: P.O. Box 23, Binyamina 3055001, Israel.  
Telephone: +972 4628 8001  
Fax: +972 4628 8277  
e-mail: mail@hermonlabs.com  
website: www.hermonlabs.com

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

## 12 APPENDIX E Specification references

47CFR part 15: 2020	Radio Frequency Devices.
RSS-210 Issue 10: 2019	Low Power Licence- Exempt Radiocommunication Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-Gen Issue 5, April 2018	General Requirements for Compliance of Radio Apparatus



13 APPENDIX F Manufacturer's declaration

**Declaration of Applicant data and product names change**

We, the undersigned, declare under our sole responsibility full identity to product tested under HL26956

**1. Updated Applicant & Manufacturer info**

<b>Applicant &amp; Manufacturer Name</b>		<b>ALLFLEX EUROPE</b>
<b>Address</b>		BP 90219 Route des Eaux, FR-35502 Vitré Cedex, France
<b>Company Representative's Information</b>	<b>Name</b>	<b>Eli Kamhine</b>
	<b>Position</b>	<b>Chief Technology Officer, Allflex Holding</b>
	<b>E-mail Address</b>	<a href="mailto:Eli.Kamhine@Antelliq.com">Eli.Kamhine@Antelliq.com</a>
<b>Responsible Person's Information</b>	<b>Name</b>	<b>Zeev Kapelnik</b>
	<b>Position</b>	<b>Engineering</b>
	<b>Phone Number</b>	<b>Tel :+972 (0)52 5537773</b>
	<b>E-mail Address</b>	<a href="mailto:zeevk@sordairy.com">zeevk@sordairy.com</a>
<b>Company Website URL</b>		<a href="http://www.antelliq.com">www.antelliq.com</a>

**2. Product Model/Name update**

add product model to

**AMUT03 – Cow Neck TAG**

Model 1 – HR-TAG-LDn

Model 2 – cSense Flex TAG

New model (Model 2) added in aim to introduce SenseHub system with new, flexible, business model (SW addition ONLY) that allow different sales options from minimum to maximum functionality with optional upgrade in future

The different between models are SW and enclosure color ONLY.



Declare that: -

**Model cSense Flex TAG is a fully HW compatible to HR-TAG-LDn**

No SW changes associated with:

**For EMC**

- clock frequencies and multipliers;
- data rate;
- duty cycle;
- signal levels;
- threshold levels;
- power settings and options;
- enabling/disabling of HW features.

**For Radio**

- Carrier frequency and frequency stabilization algorithm (if any);
- Output power settings and options;
- BW and modulation formats/types;
- data rate;
- duty cycle;
- sensitivity levels;
- enabling/disabling of HW features.

**Enclosure** – same enclosure Only color is different



### **3. Technical Data**

The Cow Tag enables farmers to monitor the cow health condition and the readiness of the cow for insemination.

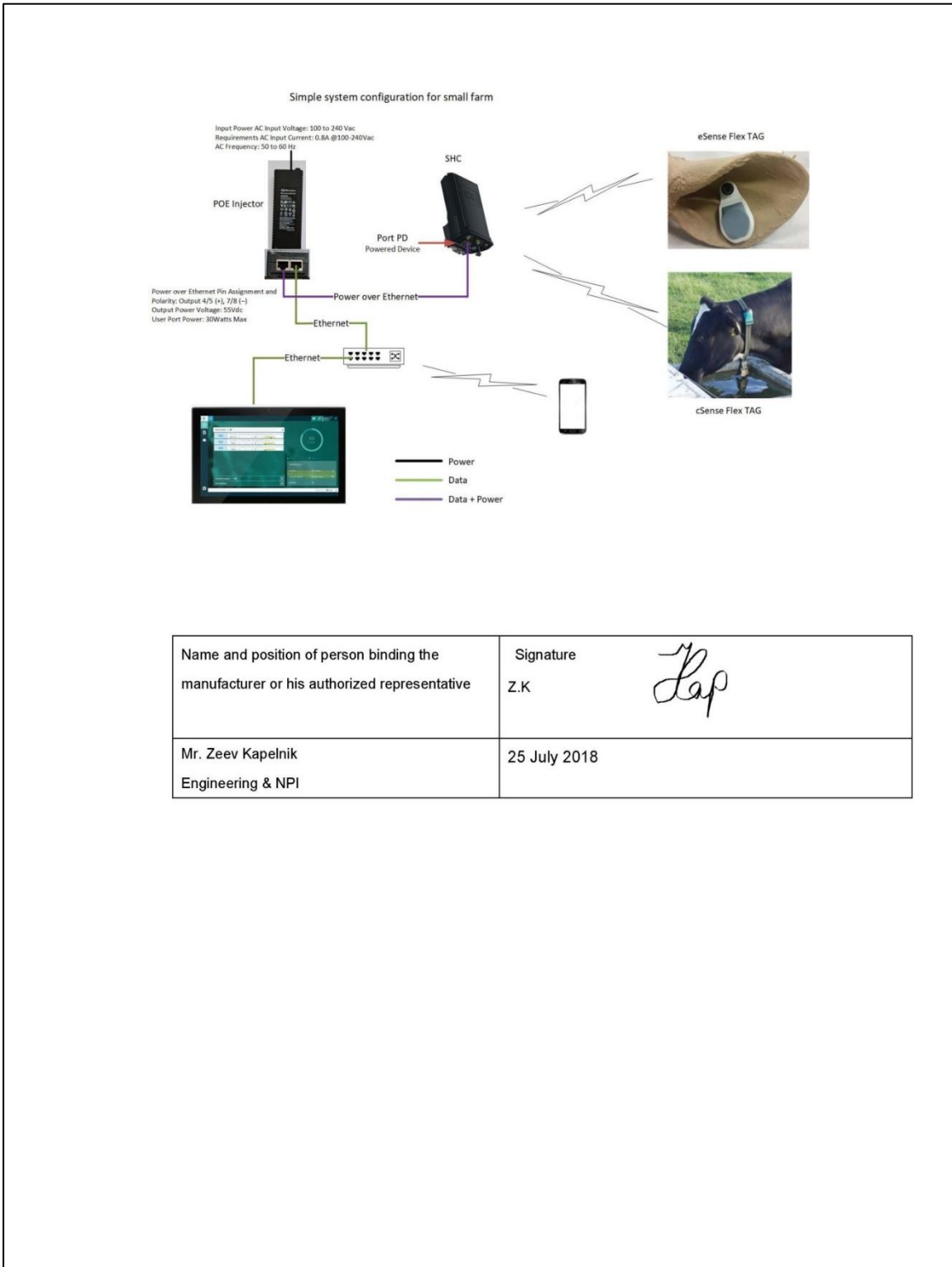
The Cow TAG is part of SenseHub system.

Each tag is mounted on a collar that is placed around the cow's neck

Measure the activity and rumination of the cow, process the data and transmit the information to the SenseHub via RF communication autonomously every 20 minutes or upon request from the control system.

Product Name	:	AMUT03
Model 1	:	HR-TAG-LDn
Model 2	:	cSense Flex TAG
Frequency Range	:	2.405 GHz – 2.480GHz
Modulation	:	QPSK
Transmission mode	:	G1D
Channel spacing	:	5 MHz
Power Output	:	5.6mW Maximum





Name and position of person binding the manufacturer or his authorized representative	Signature Z.K	
Mr. Zeev Kapelnik Engineering & NPI	25 July 2018	



## 14 APPENDIX G Manufacturer's declaration



### Declaration of product similarity

We, the undersigned, declare under our sole responsibility full identity to the product

#### New artwork and Product Model adding

add product model to

**AMUT03 – Cow Neck TAG**

Model 1 – HR-TAG-LDn

Model 2 – cSense Flex TAG

**Model 3 - Monitoring Neck Tag Flex**

The new Model name was added per marketing requirements to better present the monitoring system with unique naming.

The new artwork, HW redesign, was done because of component shortage and partial EOL.

The functionality of the new artwork identifies to existing product AMUT03 (for all 3 Models).

The RF part (Front End and Antenna) doesn't change

The difference between Old to New HW :-

1. New artwork design
2. Main controller and DC2DC
3. SW – adaptation to the new controller.

Declare that -

**New Artwork** functionally compatible to old artwork

**Model names** are functionally identical and are **ONLY** marketing names:

No SW or HW changes associated with:

#### **For EMC**

- clock frequencies and multipliers;
- data rate;
- duty cycle;
- signal levels;
- threshold levels;

SCR Engineers Ltd.  
18 Hamelacha St, Poleg Industrial Park,  
4237782, Netanya, Israel






- power settings and options;
- enabling/disabling of HW features

**For Radio**

- Carrier frequency and frequency stabilization algorithm (if any);
- Output power settings and options;
- BW and modulation formats/types;
- data rate;
- duty cycle;
- sensitivity levels;
- enabling/disabling of HW features

**Enclosure** – same enclosure – different colors per model

Name and position of person binding the manufacturer or his authorized representative	Signature Z.K. 
Mr. Zeev Kapelink Product & Regulation Engineer	12 May 2022



## 15 APPENDIX H Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB( $\mu$ V)	decibel referred to one microvolt
dB( $\mu$ V/m)	decibel referred to one microvolt per meter
dB( $\mu$ A)	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
$\mu$ s	microsecond
NA	not applicable
OATS	open area test site
$\Omega$	Ohm
PS	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

END OF DOCUMENT