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ELECTRICAL TESTING
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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C §15.247 (DTS), subpart B, Class B, RSS-247 Issue 3:2023, RSS-Gen Issue 5, ICES-003 Issue 7:2020

FOR:

Essence Smartcare Ltd.
Emergency Pendant
with/without Fall Detection
Models: ES700EPAJ / ES700EPPJ / ES700EPA / ES700EPP
FCC ID:2ARFP-ES700EPAJ
IC: 24417-ES700EPAJ

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

2 Equipment under test attributes

Product name:	Emergency Pendant with Fall Detection
Product type:	Transceiver
Model(s):	ES700EPAJ*
Serial number:	35200945001DA8FC
Hardware version:	2.A
Software release:	1.12
Receipt date	19-Jun-24

*According to manufacturer's declaration provided in Appendix G the ES700EPAJ and ES700EPPJ is a Super Set product that is fully identical to ES700EPA, ES700EPP, behind an exception of Fall Sensor hardware that does not exist in ES700EPA, ES700EPP. Therefore, only the model ES700EPAJ was tested.

3 Manufacturer information

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

4 Test details

Project ID:	54224
Location:	Hermon Laboratories Ltd. 66 HaTachana str., P.O. Box 23, Binyamina 3055001, Israel
Test started:	02-Jul-24
Test completed:	16-Jul-24
Test specification(s):	FCC 47CFR part 15 subpart C §15.247 (DTS), subpart B, Class B, RSS-247 Issue 3:2023, 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(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 6.8, Antenna requirement	Pass
Unintentional emissions	
FCC Part 15, Section 107 / ICES-003, Section 6.1 class B, Conducted emission at AC power port	Not required
FCC Part 15, Section 109 / RSS-Gen, Section 7.3 / ICES-003, Section 6.2 class B, Radiated emission	Pass

This Test Report was performed to support Application for Class II permissive changes certification for FCC ID: 2ARFP-ES700EPAJ and IC: 24417-ES700EPAJ, original granted on 08/06/2019. The change filed under this application are:

1. To enable BLE that was assemble but not maintained via software.
2. To add additional configuration with the same PCB, and a different top cover only.

According to manufacturer's declaration provided in Appendix H and except outlined above, certified product remain identical to original one.

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 tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mrs. N. Lenkina, test engineer, EMC & Radio	02-Jul-24 – 16-Jul-24	
Reviewed by:	Mrs. S. Peysahov Sheynin, certification specialist, EMC & Radio	22-Jul-24	
Approved by:	Mr. M. Nikishin, group leader, EMC & Radio	29-Jul-24	

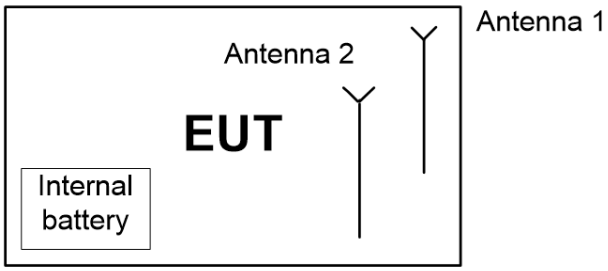
6 EUT description

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

6.1 General information

The EUT, models ES700EPAJ / ES700EPPJ / ES700EPA / ES700EPP, are jewelry version of battery powered Emergency Pendant with Fall Detection /without Fall Detection, operate at 916.5MHz.
The EUT is with BLE 2.4GHz, but we are using only the Advertising mode of BLE in this product for location.

6.2 Test configuration



6.3 Transmitter characteristics

Type of equipment		
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	2402-2480 MHz
Maximum rated output power	Peak output power 3.18 dBm

Is transmitter output power variable?	**V**	No			
		Yes		continuous variable	
				stepped variable with stepsize	dB
			minimum RF power		dBm
			maximum RF power		dBm

Antenna connection					
unique coupling	standard connector	**V**	Integral		with temporary RF connector
				V	without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Internal	Essence Security	printed	-3 dBi

Transmitter aggregate data rate/s	1 Mbps
Type of modulation	GFSK
Modulating test signal (baseband)	

Transmitter power source					
V	Battery	**Nominal rated voltage**	3.0 VDC	Battery type	Alkaline
	DC	**Nominal rated voltage**			
	AC mains	**Nominal rated voltage**		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):	15-Jul-24		
Temperature: 23 ºC	Relative Humidity: 40 %	Air Pressure: 999 hPa	Power: 3 VDC
Remarks:			

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

7.1 Minimum 6 dB and 99% 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
902.0 – 928.0	**6.0**	**500.0**
2400.0 – 2483.5		
5725.0 – 5850.0		

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

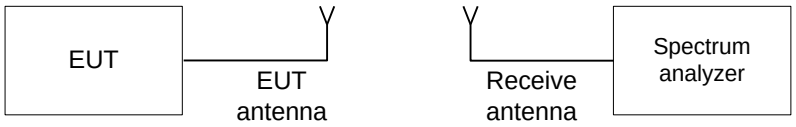
7.1.2 Test procedure

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

7.1.2.2 The EUT was set to transmit modulated carrier.

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 7.1.2 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):	15-Jul-24		
Temperature: 23 ºC	Relative Humidity: 40 %	Air Pressure: 999 hPa	Power: 3 VDC
Remarks:			

Table 7.1.2 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND:	2400-2483.5 MHz
DETECTOR USED:	Peak
SWEEP MODE:	Single
SWEEP TIME:	Auto
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
MODULATION ENVELOPE REFERENCE POINTS:	6.0 dBc
MODULATION:	GFSK
BIT RATE:	1 Mbps

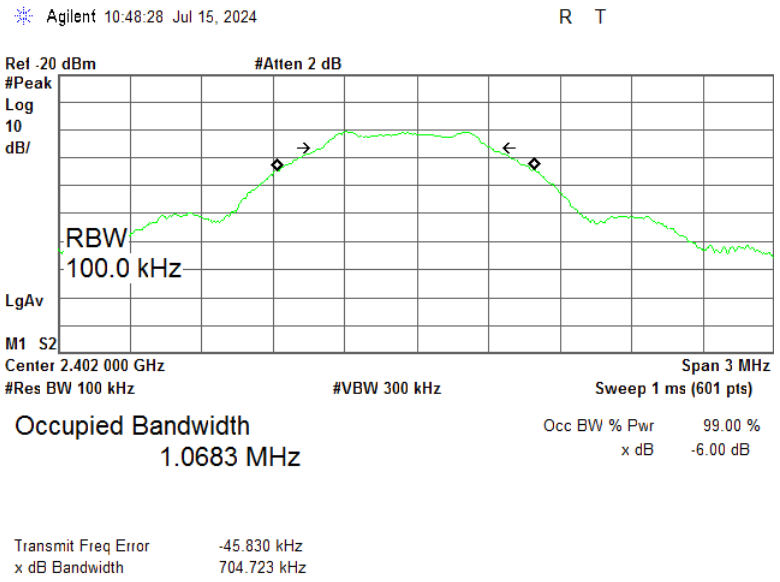
Carrier frequency, MHz	99% bandwidth, kHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402	1068.3	704.72	500	204.72	Pass
2426	1066.3	718.65	500	218.65	Pass
2480	1093.1	740.23	500	240.23	Pass

Reference numbers of test equipment used

HL 3433	HL 3818	HL 4136	HL 5838				

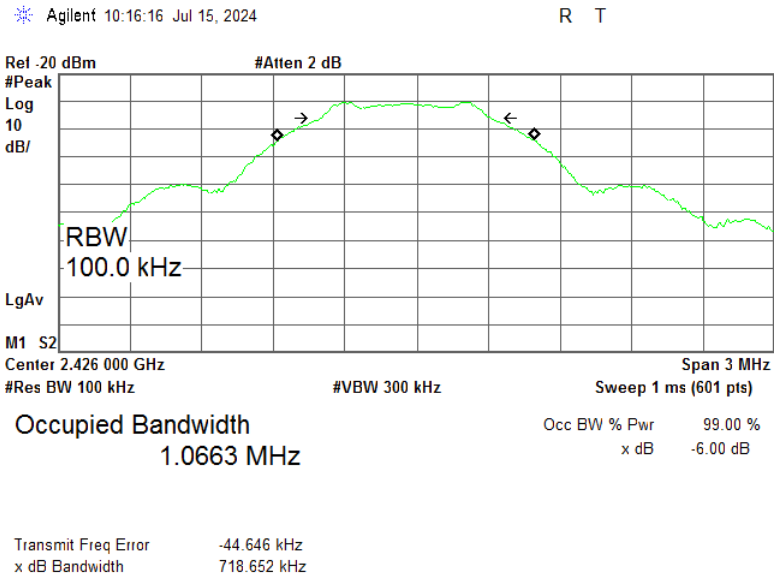
Full description is given in Appendix A.

Plot 7.1.1 6 dB bandwidth test result at low frequency

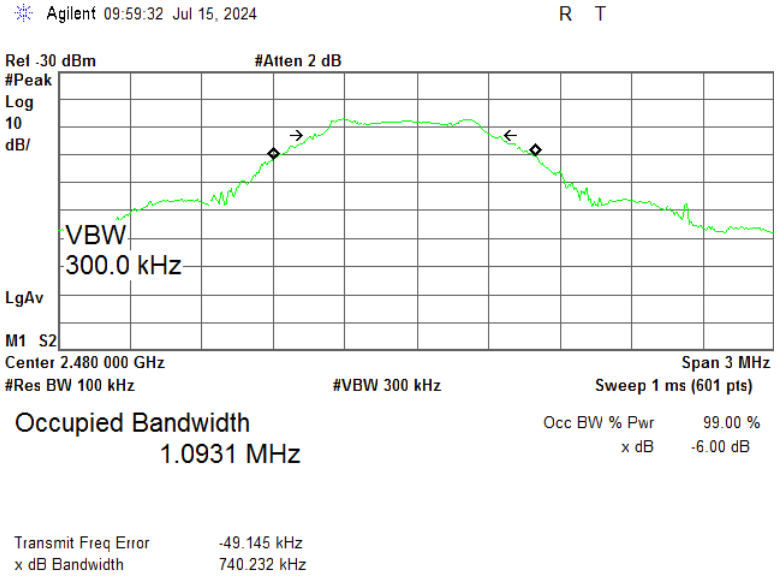


Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	15-Jul-24		
Temperature: 23 ºC	Relative Humidity: 40 %	Air Pressure: 999 hPa	Power: 3 VDC
Remarks:			

Plot 7.1.2 6 dB bandwidth test result at mid frequency



Plot 7.1.3 6 dB bandwidth test result at high frequency



Test specification:	FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

7.2 Peak output power

7.2.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)**
		W	dBm	
902.0 – 928.0	6.0	1.0	30.0	131.2
2400.0 – 2483.5				
5725.0 – 5850.0				

*- 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.

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

7.2.2.3 The resolution bandwidth of spectrum analyzer was set 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 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.2.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

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

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

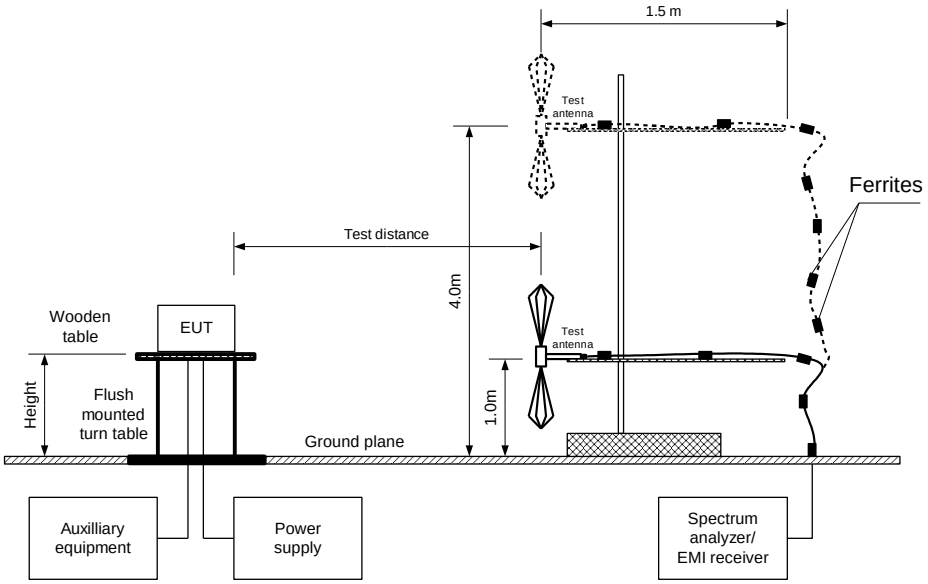
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

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

7.2.2.6 The worst test results (the lowest margins) were recorded in Table 7.2.2.

Test specification:	**FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power**		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1002 hPa	**Power:** 3 VDC
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements



Photograph 7.2.2 Setup for carrier field strength measurements, EUT orientation

X orientation	Y orientation	Z orientation
		

Test specification:	FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY:	2400-2483.5 MHz
TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT HEIGHT:	1.5 m
DETECTOR USED:	Peak
TEST ANTENNA TYPE:	Double ridged guide (above 1000 MHz)
MODULATION:	GFSK
BIT RATE:	1 Mbps
DETECTOR USED:	Peak
EUT 6 dB BANDWIDTH:	740.23 kHz
RESOLUTION BANDWIDTH:	2 MHz
VIDEO BANDWIDTH:	10 MHz

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
FREQUENCY 2402MHz									
Orientation X									
2401.70	85.61	V	1.2	-40	-3.0	-6.59	30	-36.59	Pass
2401.72	92.90	H	1.7	-30	-3.0	0.70	30	-29.30	Pass
Orientation Y									
2401.76	86.74	V	1.3	-65	-3.0	-5.46	30	-35.46	Pass
2401.79	91.87	H	1.4	180	-3.0	-0.33	30	-30.33	Pass
Orientation Z									
2401.76	95.38	V	1.5	-20	-3.0	3.18	30	-26.82	Pass
2401.74	90.43	H	1.4	180	-3.0	-1.77	30	-31.77	Pass
FREQUENCY 2406MHz									
Orientation Z									
2425.71	93.58	V	1.3	135	-3.0	1.38	30	-28.62	Pass
2425.69	81.92	H	1.4	-145	-3.0	-10.28	30	-40.28	Pass
FREQUENCY 2480MHz									
Orientation Z									
2480.10	93.72	V	1.4	140	-3.0	1.52	30	-28.48	Pass
2479.71	78.64	H	1.5	-70	-3.0	-13.56	30	-43.56	Pass

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

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

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

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

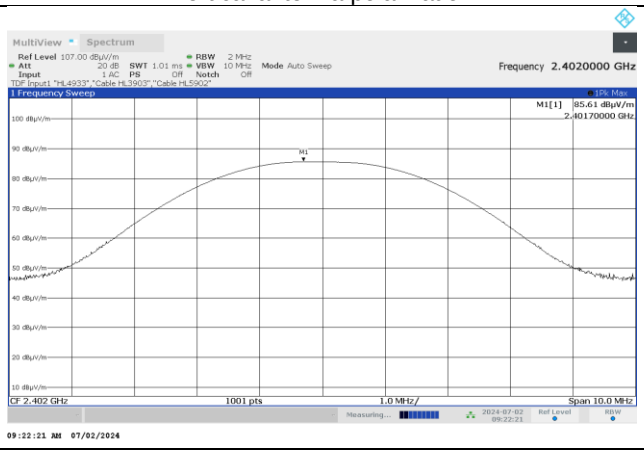
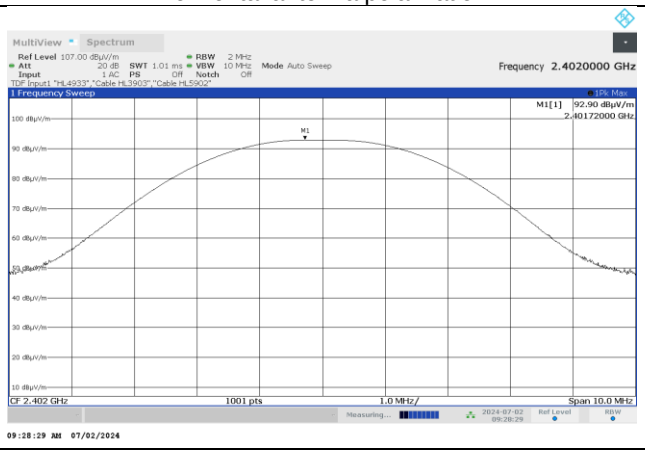
Reference numbers of test equipment used

HL 7585	HL 4933	HL 3903	HL 5902				

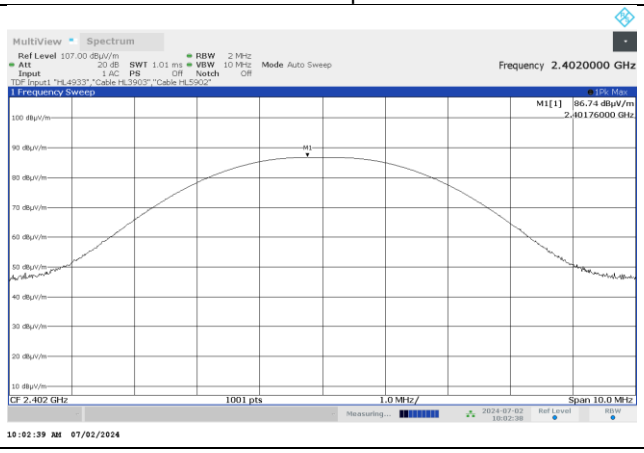
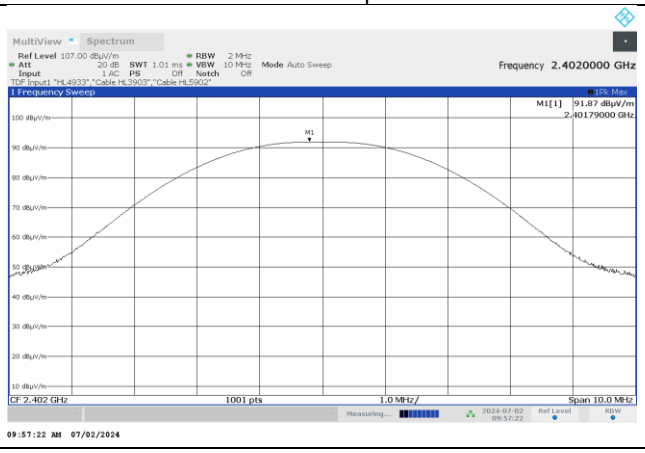
Full description is given in Appendix A.

Test specification:	**FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power**		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1002 hPa	**Power:** 3 VDC
Remarks:			

Plot 7.2.1 Field strength of carrier at low frequency, orientation X

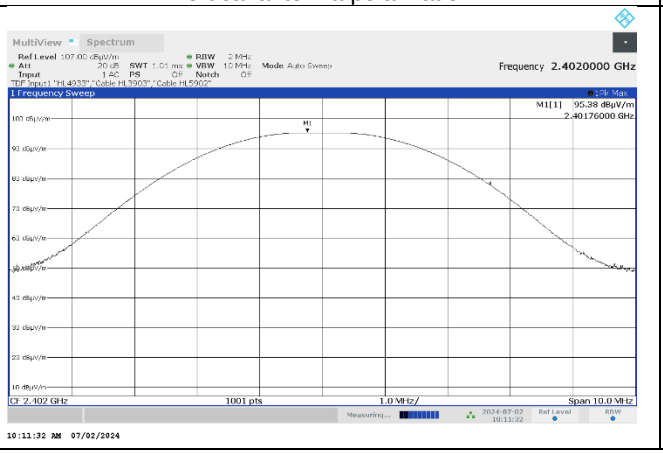
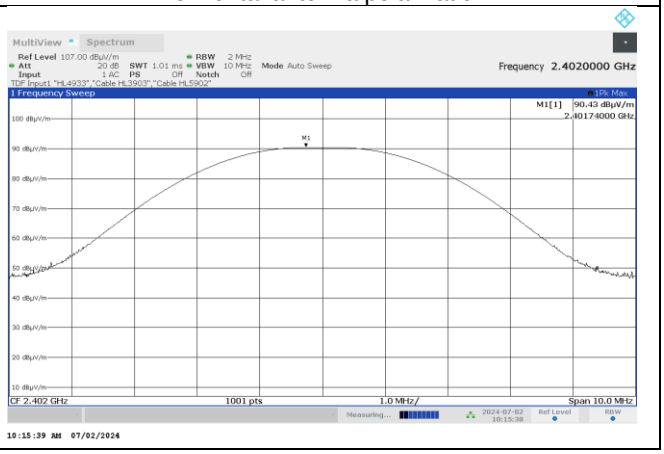
Vertical antenna polarization	Horizontal antenna polarization
	

Plot 7.2.2 Field strength of carrier at low frequency, orientation Y

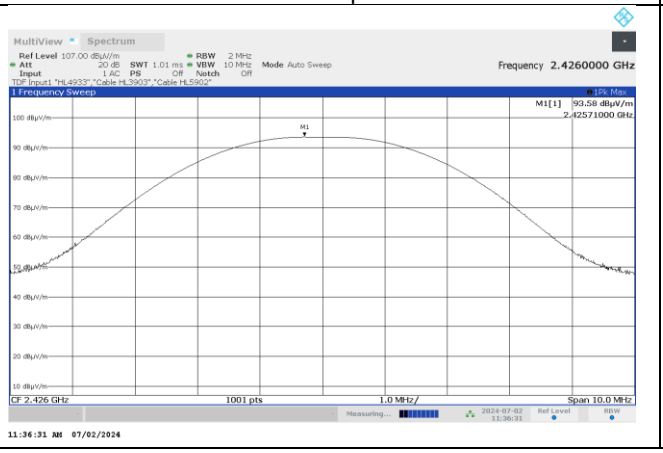
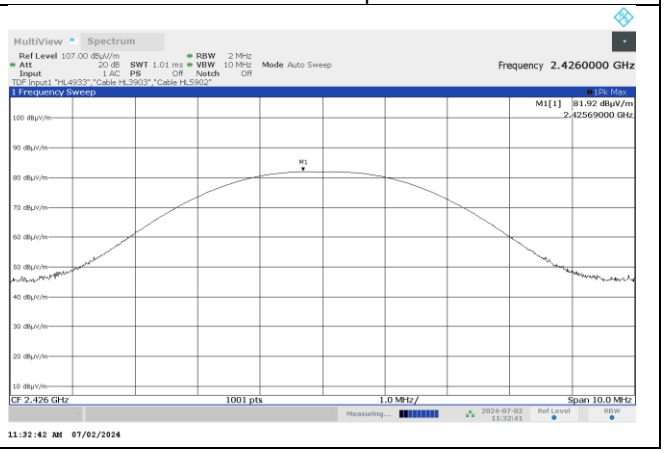
Vertical antenna polarization	Horizontal antenna polarization
	

Test specification:	FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Plot 7.2.3 Field strength of carrier at low frequency, orientation Z

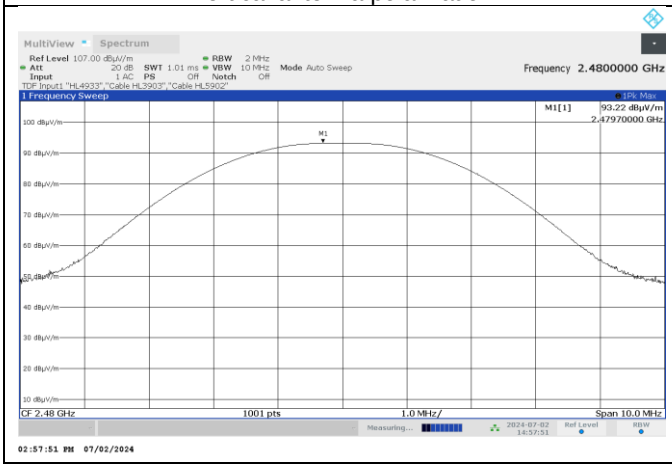
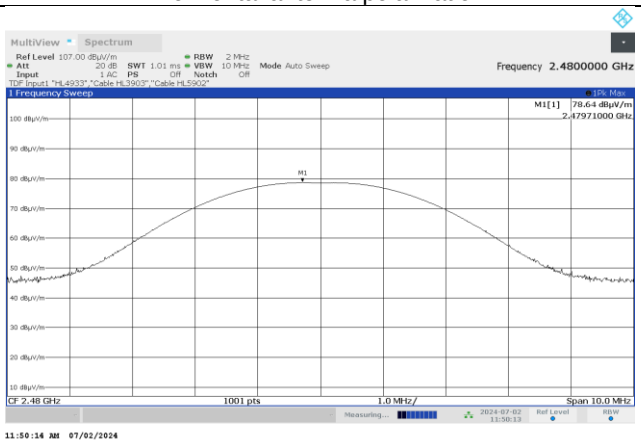
Vertical antenna polarization	Horizontal antenna polarization
	

Plot 7.2.4 Field strength of carrier at mid frequency

Vertical antenna polarization	Horizontal antenna polarization
	

Test specification:	FCC section 15.247(b)3, RSS-210 section A8.4(4) ,Peak output power		
Test procedure:	FR Vol.62, page 26243, Section 15.247(b)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Plot 7.2.5 Field strength of carrier at high frequency

Vertical antenna polarization	Horizontal antenna polarization
	

Test specification:	**Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

7.3 Field strength of spurious emissions

7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emissions limits

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

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

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

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.

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

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 specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

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

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

7.3.3.1 The EUT was set up as shown in Figure 7.3.2, Figure 1.1.3, energized and the performance check was conducted.

7.3.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

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

Test specification:	**Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz

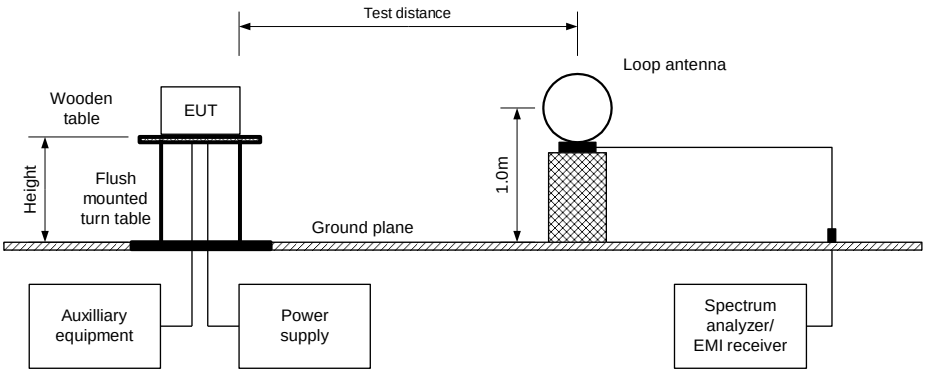
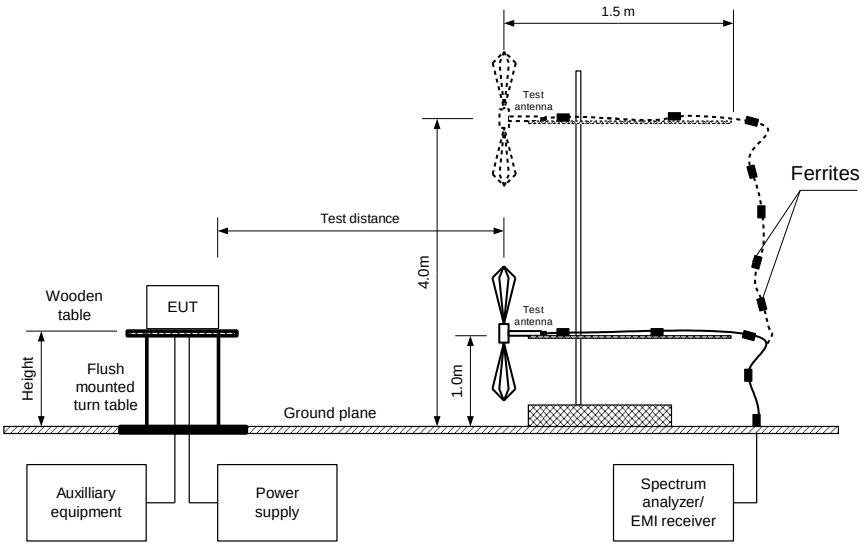
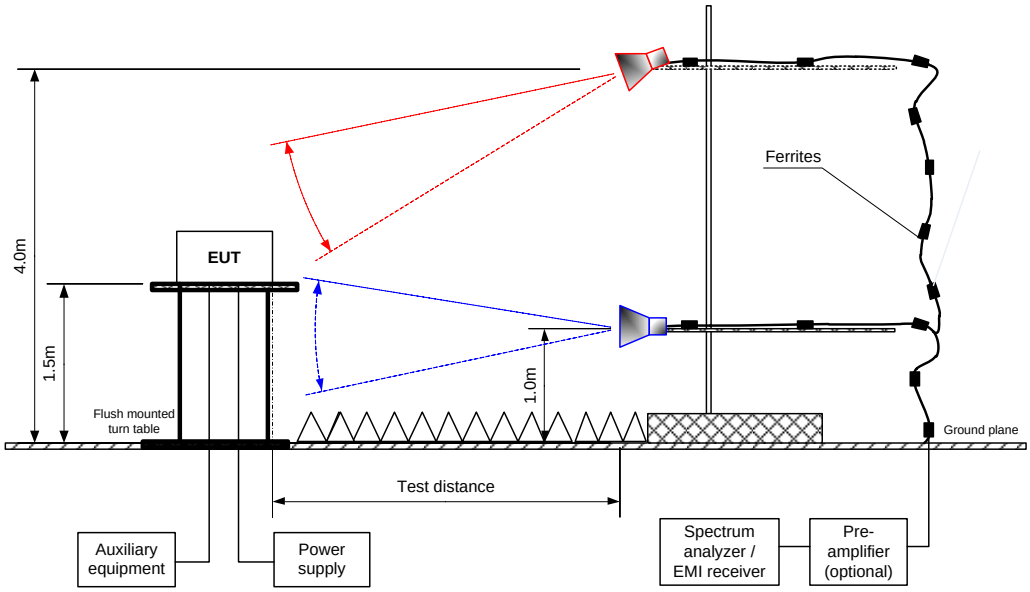


Figure 7.3.2 Setup for spurious emission field strength measurements in 30 -1000 MHz



Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

Figure 7.3.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY:	2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 - 25000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK
BIT RATE:	1 Mbps
DUTY CYCLE:	100 %
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, mid, high carrier frequency									
No emissions were found									Pass

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

Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

Table 7.3.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY:	2400 MHz
INVESTIGATED FREQUENCY RANGE:	1000 - 25000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
BIT RATE:	1 Mbps
DUTY CYCLE:	100 %
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1000 kHz
TEST ANTENNA TYPE:	Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
4804	Vertical	1.5	160	51.15	74	-22.85	45.45	NA	54	-8.55	Pass
Mid carrier frequency											
4852	Vertical	1.5	180	49.48	74	-24.52	43.46	NA	54	-10.54	Pass
High carrier frequency											
4960	Vertical	1.5	159	51.50	74	-22.50	46.38	NA	54	-7.62	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.

Table 7.3.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
NA	NA	NA	NA	NA	NA

*- Average factor was calculated as follows

for pulse train shorter than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train\right)$$

for pulse train longer than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\,ms} \times Number\ of\ bursts\ within\ 100\,ms\right)$$

Test specification:	**Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

Table 7.3.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY:	2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK
BIT RATE:	1 Mbps
DUTY CYCLE:	100 %
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	> Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	**Peak emission, dB(µV/m)**	**Quasi-peak**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
		Measured emission, dB(µV/m)	**Limit, dB(µV/m)**	**Margin, dB***				
Low, mid, high carrier frequency								
No emissions were found								Pass

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

Test specification:	**Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

Table 7.3.6 Restricted bands according to FCC section 15.205

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

Table 7.3.7 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

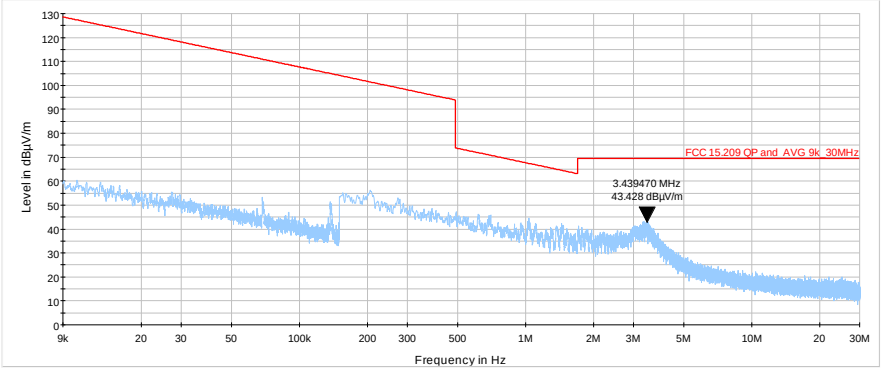
HL 7585	HL 5288	HL 4933	HL 4956	HL 446	HL 5902	HL 3903	

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, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

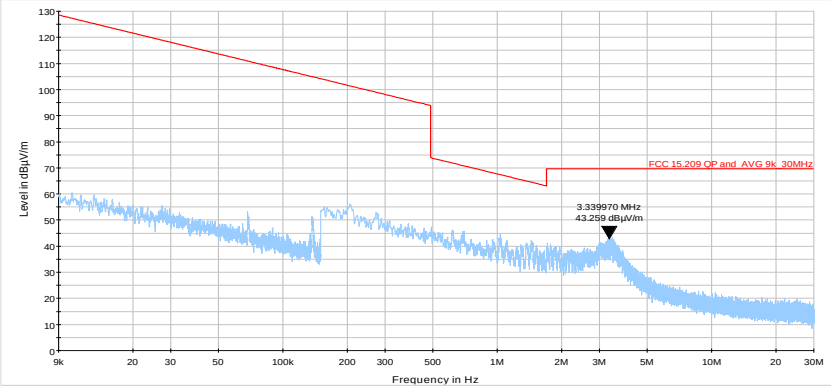
Plot 7.3.1 Radiated emission measurements from 9 kHz to 30 MHz at the low carrier frequency

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



Plot 7.3.2 Radiated emission measurements from 9 kHz to 30 MHz at the mid carrier frequency

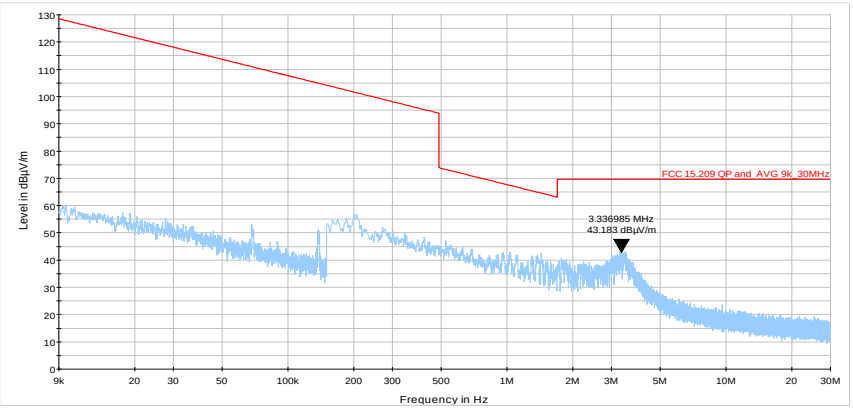
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

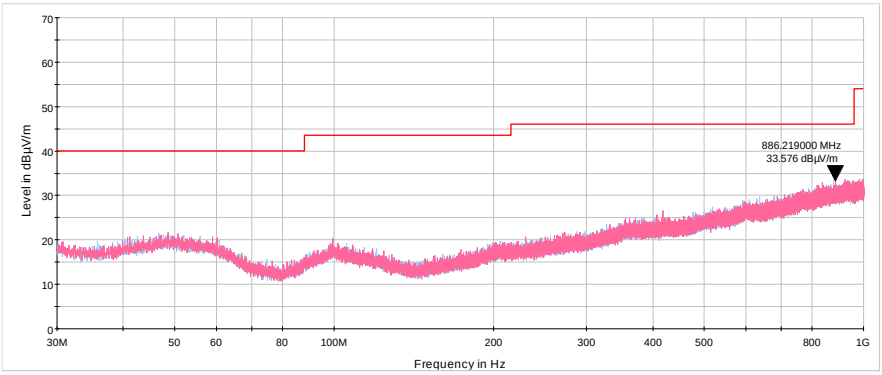
Plot 7.3.3 Radiated emission measurements from 9 kHz to 30 MHz at the high carrier frequency

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



Plot 7.3.4 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

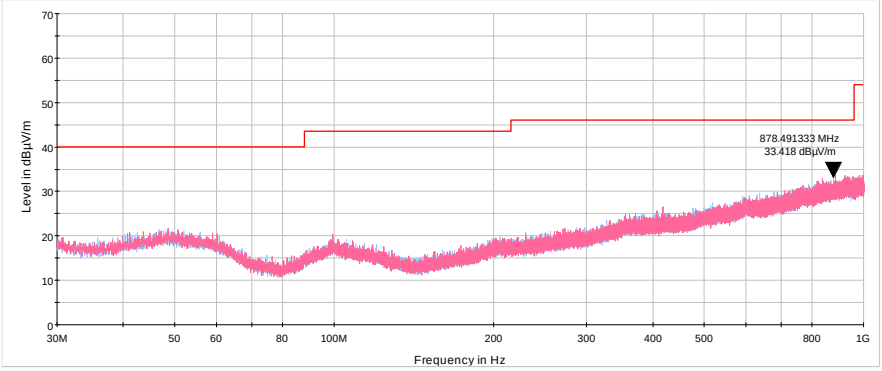
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

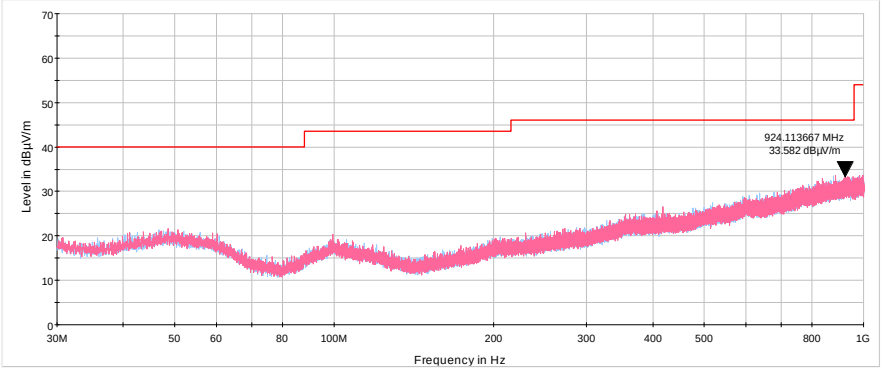
Plot 7.3.5 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

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



Plot 7.3.6 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

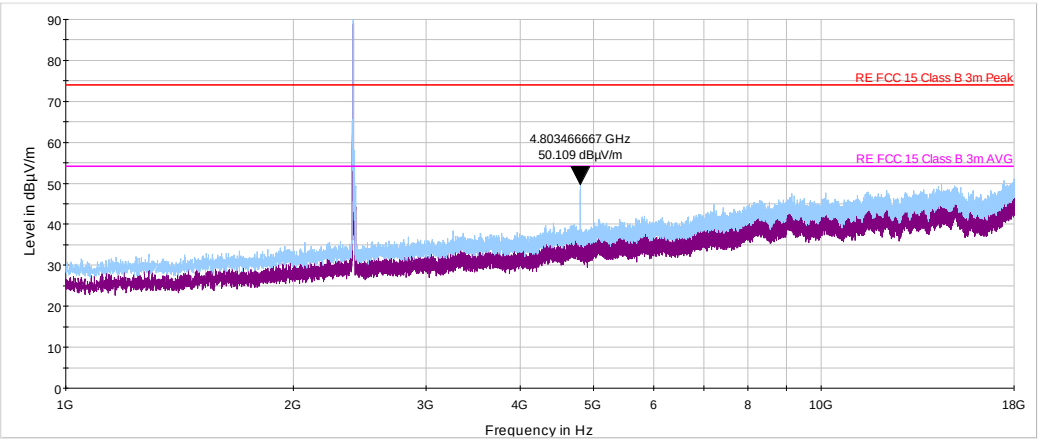
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

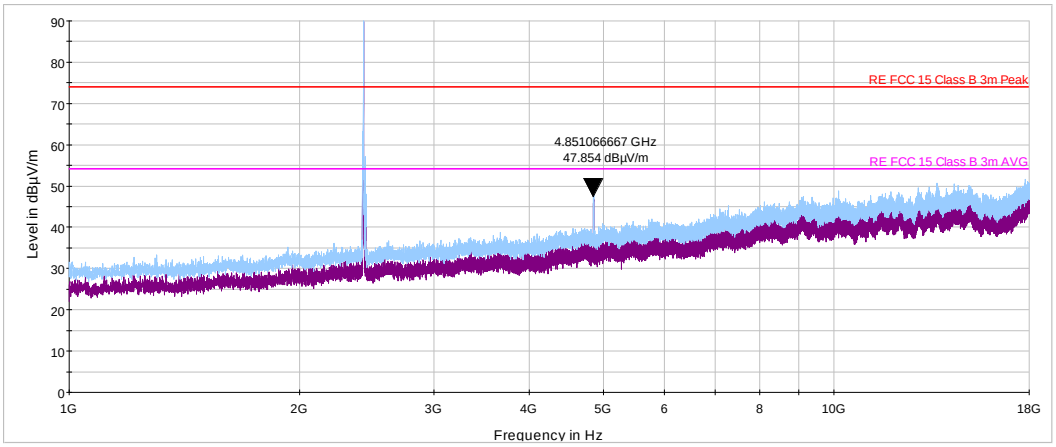
Plot 7.3.7 Radiated emission measurements from 1000 to 18000 MHz at the low carrier frequency

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



Plot 7.3.8 Radiated emission measurements from 1000 to 18000 MHz at the mid carrier frequency

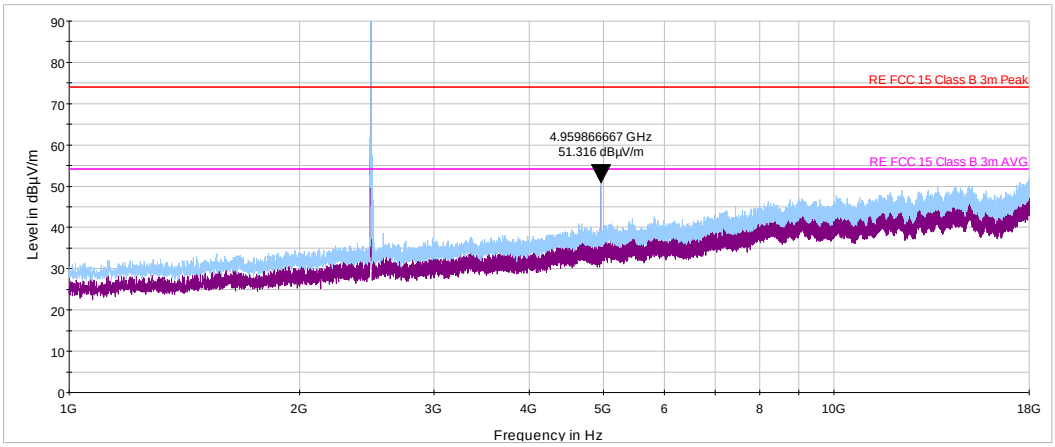
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

Plot 7.3.9 Radiated emission measurements from 1000 to 18000 MHz at the high carrier frequency

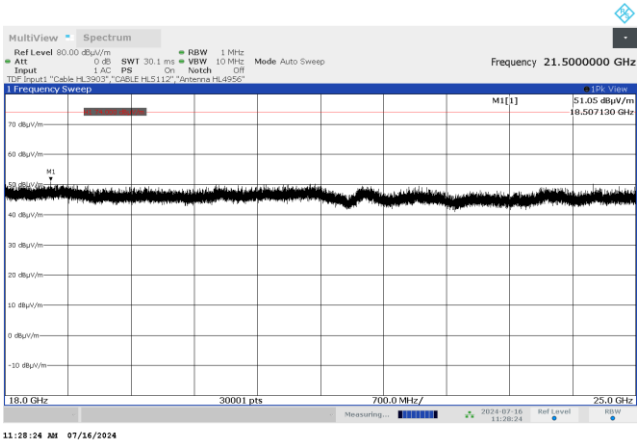
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

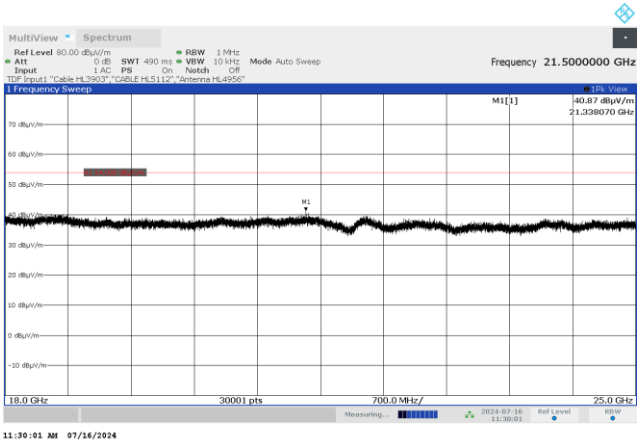


Test specification:	**Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

Plot 7.3.10 Radiated emission measurements from 18000 to 25000 MHz at the low carrier frequency

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

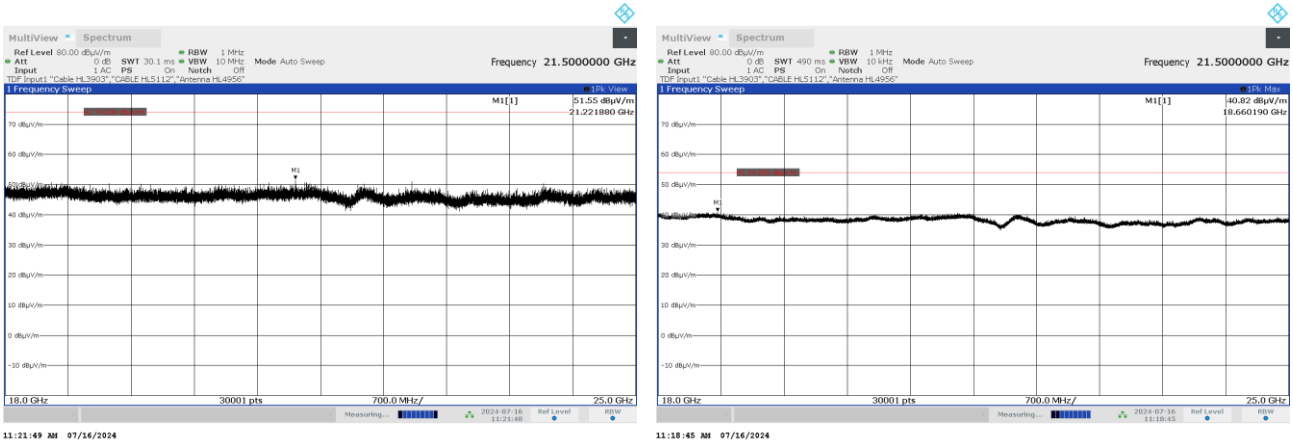




Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

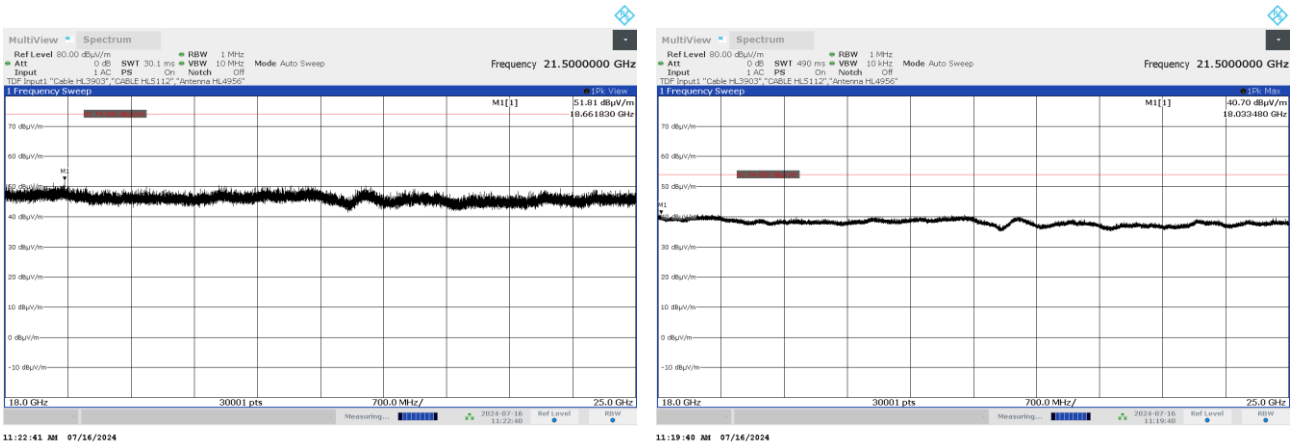
Plot 7.3.11 Radiated emission measurements from 18000 to 25000 MHz at the mid carrier frequency

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



Plot 7.3.12 Radiated emission measurements from 18000 to 25000 MHz at the high carrier frequency

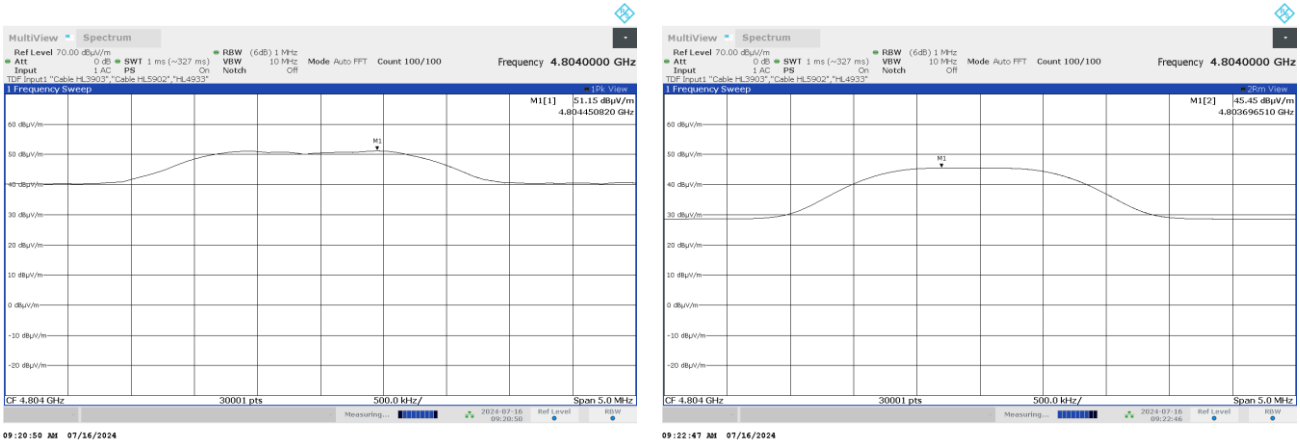
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

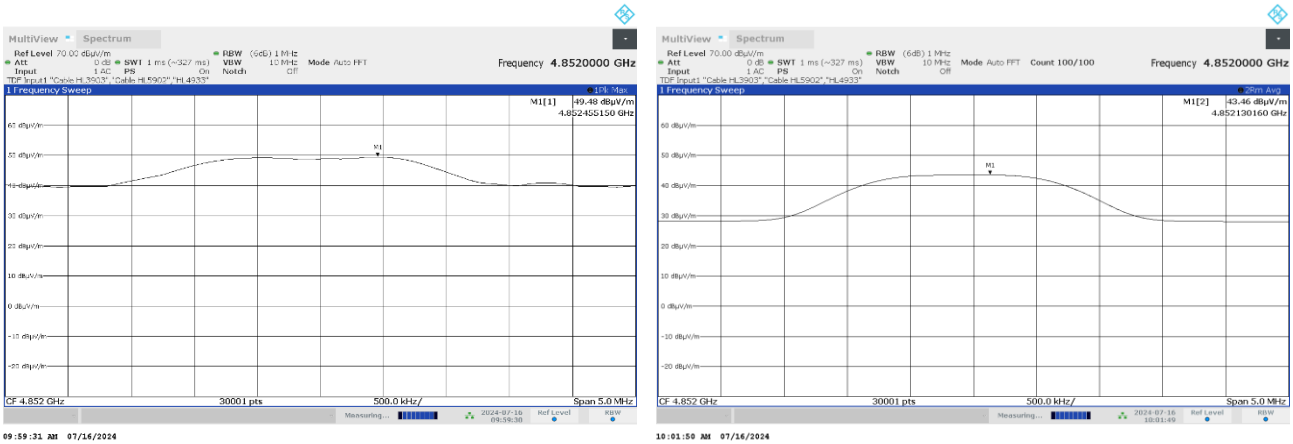
Plot 7.3.13 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.14 Radiated emission measurements at the second harmonic of mid carrier frequency

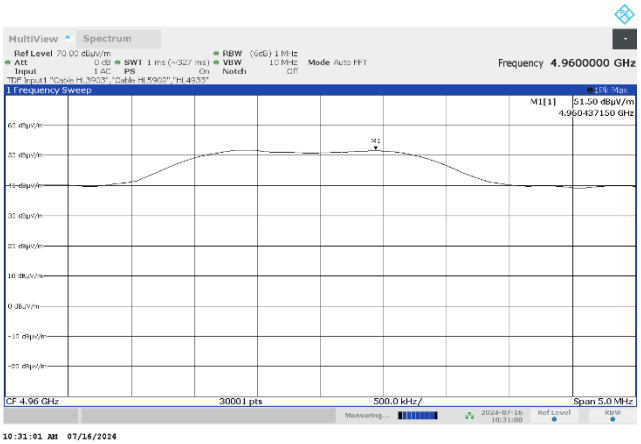
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m

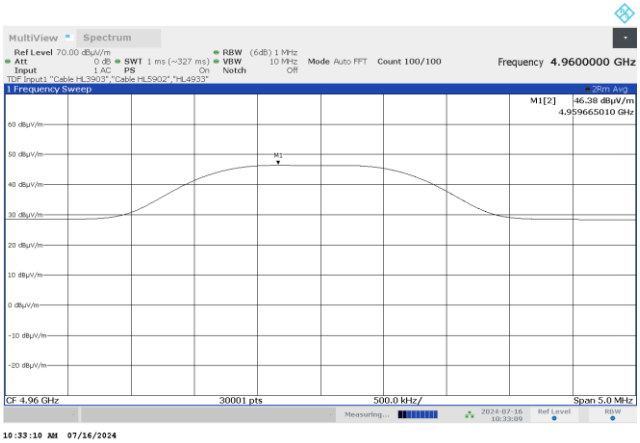


Test specification:	**Section 15.247(d), RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

Plot 7.3.15 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m





Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 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 edge emission limits

Output power	Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(µV/m)	
			Peak	Average
Peak	**2400.0 – 2483.5**	20.0	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.

The maximum band edge emission and modulation product outside of the band were measured as provided in

Test specification:	**Section 15.247(d), RSS-247 section 5.5, Emissions at band edges**		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1002 hPa	**Power:** 3 VDC
Remarks:			

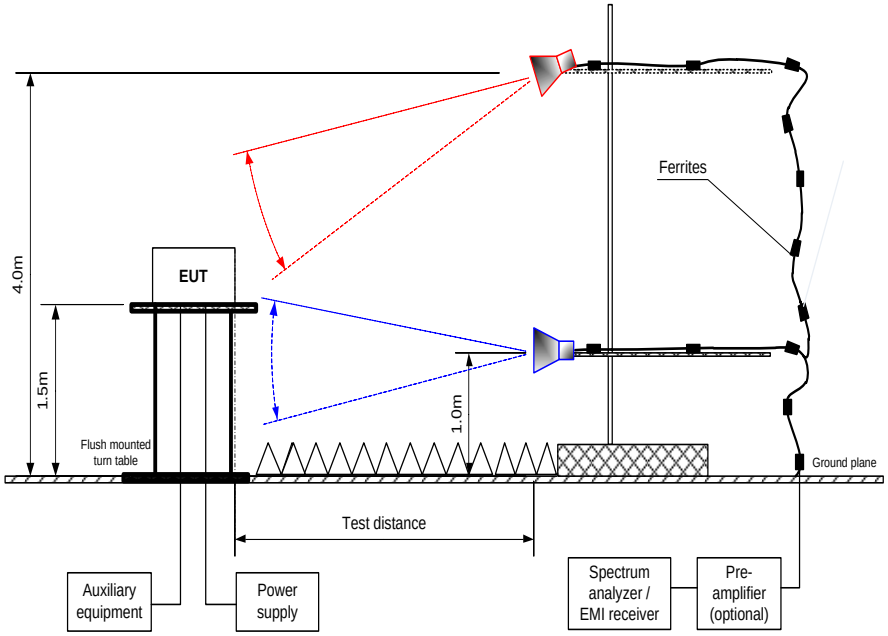
7.4.2.5 Table 7.4.2 and associated plots and referenced to the highest emission level measured within the authorized band.

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, Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Figure 7.4.1 Band edge emission test setup



Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Table 7.4.2 Band edge emission outside restricted band test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz
DETECTOR USED: Peak
MODULATION: GFSK
BIT RATE: 1 Mbps
RESOLUTION BANDWIDTH: 100kHz
VIDEO BANDWIDTH: ≥ RBW

Frequency, MHz	Band edge emission, dBuV/m	Emission at carrier, dBuV/m	Attenuation below carrier, dBc	Limit, dBc	Margin, dB	Verdict
2400.00	46.37	94.03	47.66	20.00	27.66	Pass

Table 7.4.3 Band edge emission within restricted band test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz
DETECTOR USED: Peak
MODULATION: GFSK
BIT RATE: 1 Mbps
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: ≥ RBW

Frequency, MHz	Peak field strength			Average field strength			Verdict
	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured Peak, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
2390.00	42.79	74.0	-31.21	42.79	54.0	-11.21	Pass
2483.50	45.21	74.0	-28.79	45.21	54.0	-8.79	Pass

*- Margin = Measured field strength - specification limit.
**- Margin = Calculated field strength - specification limit,
Where Calculated field strength = Measured field strength + average factor.

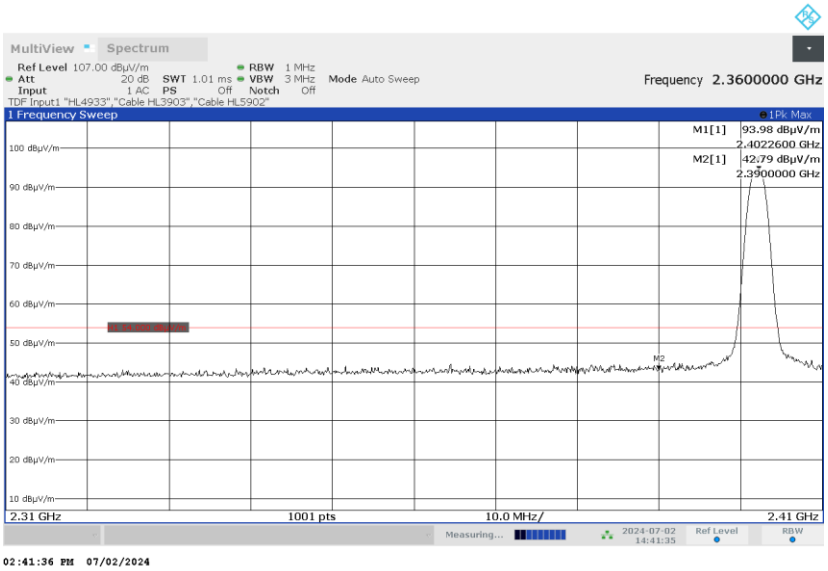
Reference numbers of test equipment used

HL 7585	HL 4933	HL 3903	HL 5902				

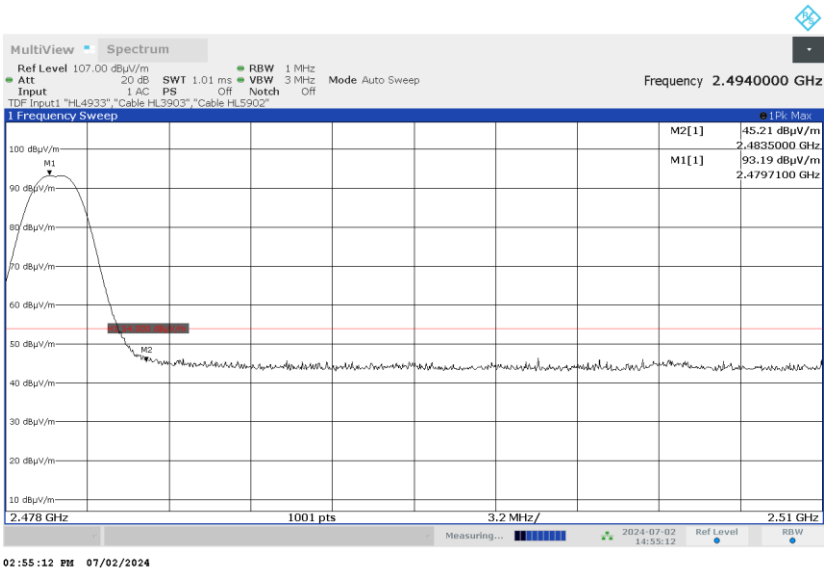
Full description is given in Appendix A.

Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Plot 7.4.1 The highest band edge emission inside restricted bands at low carrier frequency

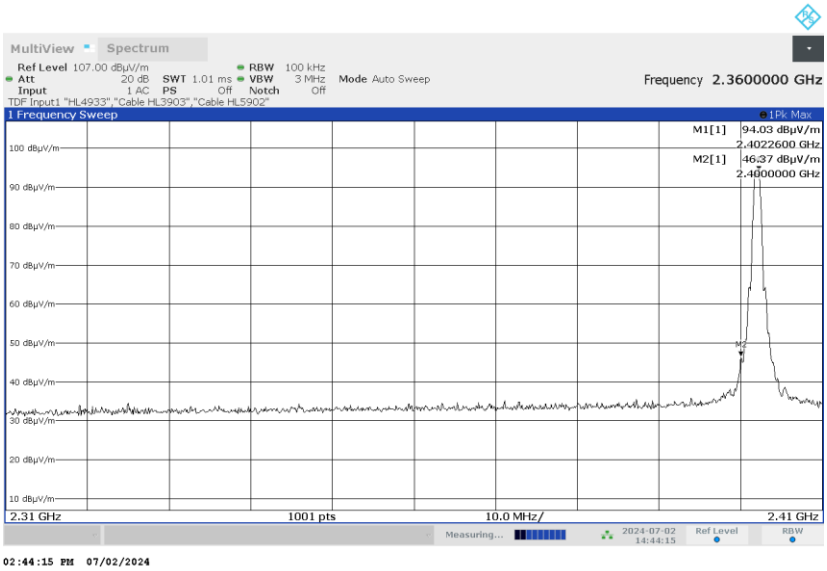


Plot 7.4.2 The highest band edge emission inside restricted bands at high carrier frequency



Test specification:	Section 15.247(d), RSS-247 section 5.5, Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Plot 7.4.3 The highest emission level outside restricted bands at low carrier frequency



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):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 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 range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm	Equivalent field strength limit @ 3m, dB(μV/m)*
902.0 – 928.0	3.0	8.0	103.2
2400.0 – 2483.5			
5725.0 – 5850.0			

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

7.5.2 Test procedure for field strength 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.

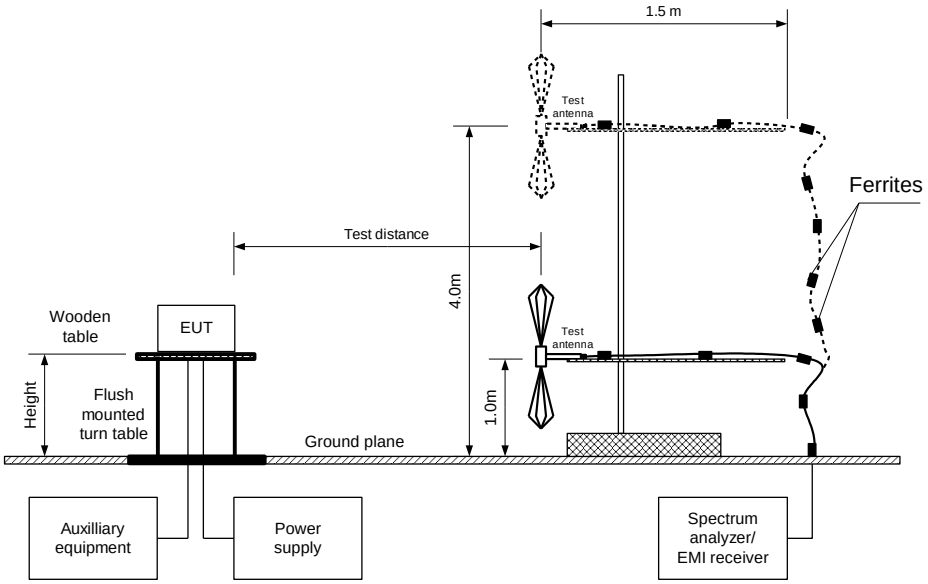
7.5.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

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 Table 7.5.2 and associated plots.

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):	02-Jul-24		
Temperature: 25 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1002 hPa	**Power:** 3 VDC
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements



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):	02-Jul-24		
Temperature: 25 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1002 hPa	**Power:** 3 VDC
Remarks:			

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY:	2400-2483.5 MHz
TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT HEIGHT:	1.5 m
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	3 kHz
VIDEO BANDWIDTH:	10 kHz
TEST ANTENNA TYPE:	Double ridged guide (above 1000 MHz)
MODULATION:	GFSK
BIT RATE:	1 Mbps
TRANSMITTER OUTPUT POWER:	Maximum

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
2402.0	85.23	-3.0	103.2	-14.97	V	1.5	-23
2426.0	83.63	-3.0	103.2	-16.57	V	1.3	139
2480.0	80.88	-3.0	103.2	-19.32	V	1.4	140

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

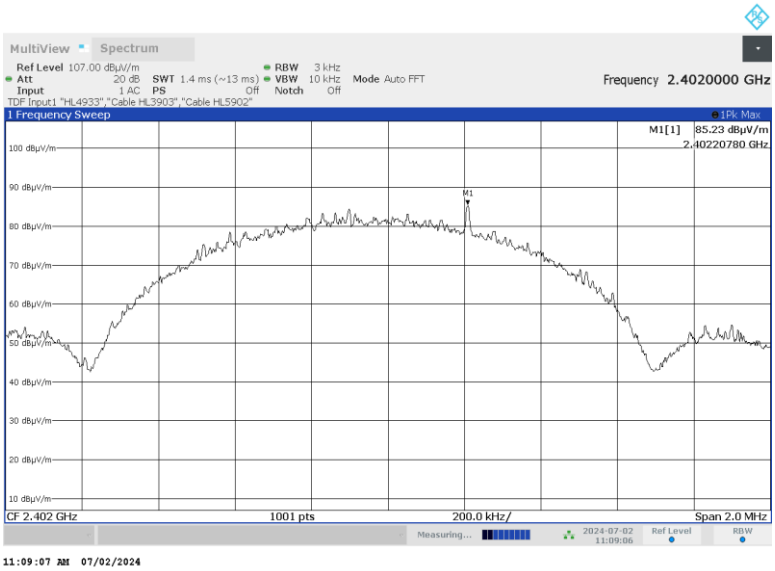
Reference numbers of test equipment used

HL 4933	HL 3903	HL 5902	HL 7585				

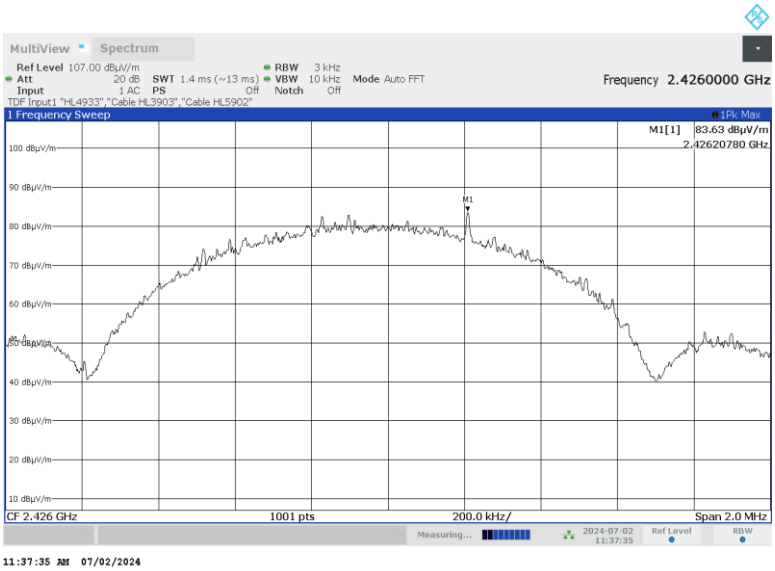
Full description is given in Appendix A.

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):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Plot 7.5.1 Peak spectral power density at low frequency

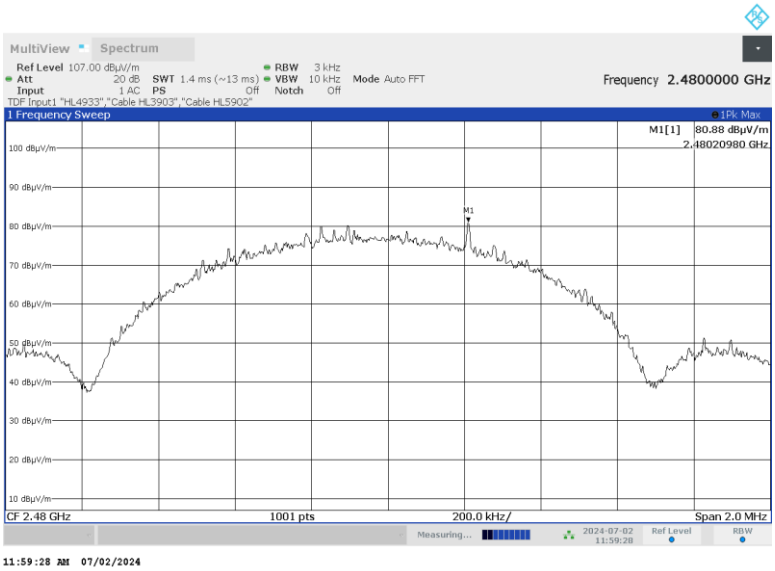


Plot 7.5.2 Peak spectral power density at mid frequency



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):	02-Jul-24		
Temperature: 25 ºC	Relative Humidity: 47 %	Air Pressure: 1002 hPa	Power: 3 VDC
Remarks:			

Plot 7.5.3 Peak spectral power density at high frequency



Test specification:	**FCC Part 15, Section 203 / RSS-Gen, Section 7.1.4, Antenna requirements**		
Test procedure:	Visual inspection		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Jul-24		
Temperature: 25 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1002 hPa	**Power:** 3 VDC
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	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

8 Emissions tests according to FCC 47CFR part 15 subpart B and ICES-003 requirements

8.1 Radiated emission measurements

8.1.1 General

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

Table 8.1.1 Radiated emission test limits

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
FCC 47 CFR, Section 15.109				
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*
ICES-003, Section 3.2.2				
30 - 88	30.0	40.0	40.0	50.0
88 - 216	33.1	43.5	43.5	54.0
216 - 230	35.6	46.0	46.4	56.9
230 - 960	37.0	47.0	47.0	57.0
960 - 1000	43.5	54.0	49.5	60.0
1000 - 40000	---	74 (Peak) / 54 (AVR)	---	80 (Peak) / 60 (AVR)

* - The limit for a test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – the standard defined and the test distance respectively in meters.

8.1.2 Test procedure for measurements in semi-anechoic chamber

8.1.2.1 **30 – 1000 MHz range.** The EUT was set up as shown in Figure 8.1.1 and the associated photograph/s, energized and the EUT performance was checked.

8.1.2.2 The measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.

8.1.2.3 **1000 – 40000 MHz range.** The EUT was set up as shown in Figure 8.1.2 and the associated photograph/s, energized and the EUT performance was checked.

8.1.2.4 The measurements were performed in the semi anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. In order to stay within the 3 dB beamwidth while keeping the antenna height scanned from 1 to 4 m, a few sweeps with different antenna angles over the entire height were performed.

8.1.2.5 The worst test results with respect to the limits were recorded in Table 8.1.2 and shown in the associated plots.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

Figure 8.1.1 Setup for radiated emission measurements in anechoic chamber in 30 – 1000 MHz range, table-top EUT

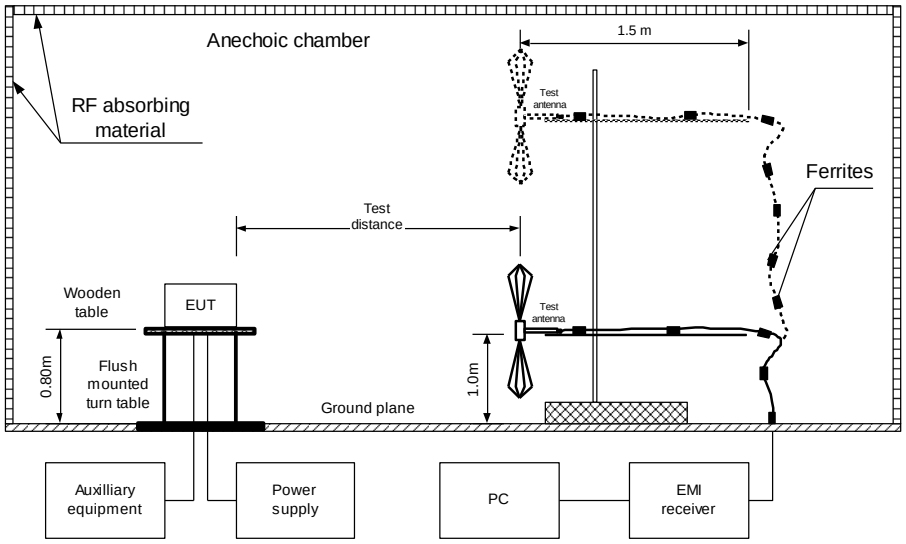
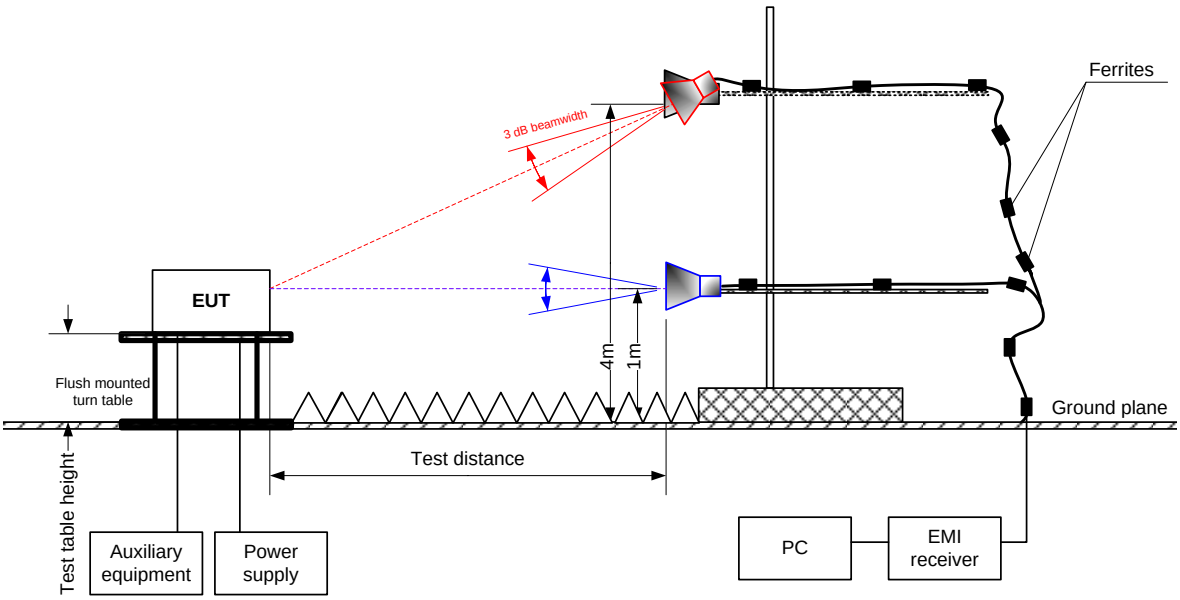


Figure 8.1.2 Setup for radiated emission measurements in 1000 – 40000 MHz range, table-top EUT



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	**Relative Humidity:** 58 %	**Air Pressure:** 1012 hPa	**Power:** 3 VDC
Remarks:			

Table 8.1.2 Radiated emission test results

EUT SET UP: TABLE-TOP
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	**Peak emission, dB(μV/m)**	**Quasi-peak**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
		Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***				
No emissions were found.								Pass

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 13000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	**Peak**			**Average**			**Antenna polarization**	**Antenna tilt, degrees**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
	Measured emission, dB(μV/m)	**Limit, dB(μV/m)**	**Margin, dB***	**Measured emission, dB(μV/m)**	**Limit, dB(μV/m)**	**Margin, dB***					
No emissions were found.											Pass

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

Reference numbers of test equipment used

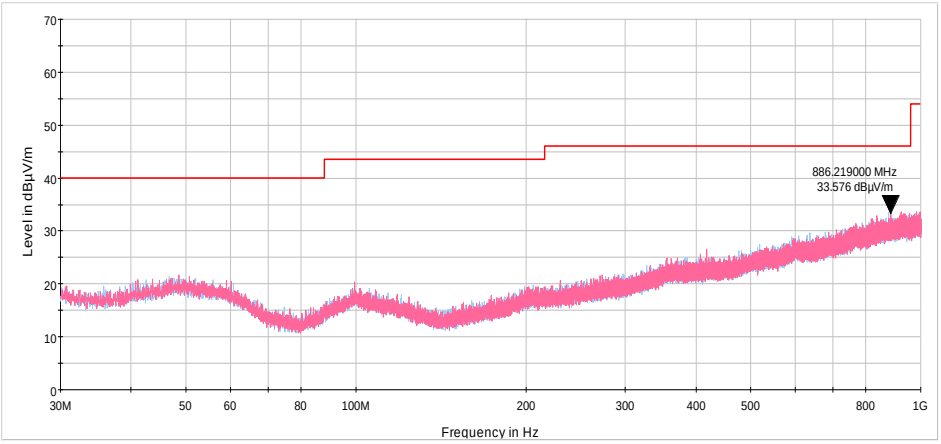
HL 7585	HL 5288	HL 4933	HL 3903	HL 5902	HL	HL	HL

Full description is given in Appendix A.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jul-24		
Temperature: 24 ºC	Relative Humidity: 58 %	Air Pressure: 1012 hPa	Power: 3 VDC
Remarks:			

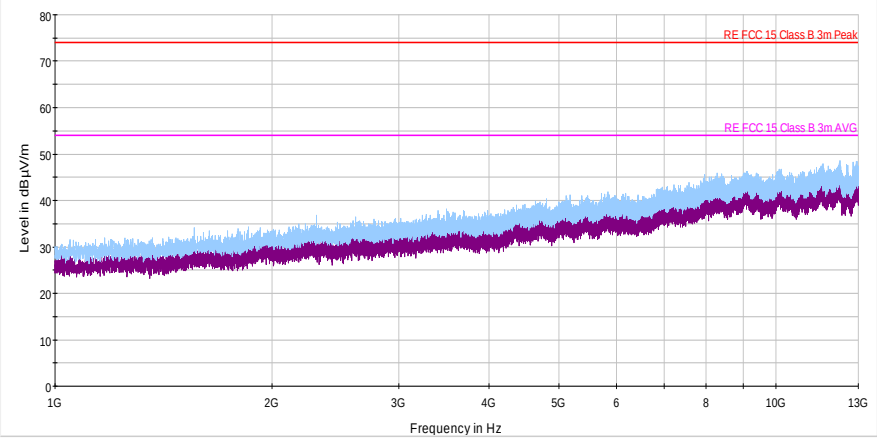
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Plot 8.1.2 Radiated emission measurements above 1000 MHz

TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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	29-Feb-24	28-Feb-25
3433	Test Cable , DC-18 GHz, 1.5 m, SMA - SMA	Mini-Circuits	CBL-5FT-SMSM+	25679	06-May-24	06-May-25
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	23-Jul-23	23-Jul-24
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	06-May-24	06-May-25
4136	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000137	20-May-24	20-May-25
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	20-Feb-24	20-Feb-25
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATION	AHA-840	105004	03-Mar-24	03-Mar-25
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	24-Mar-22	24-Mar-25
5838	Set near field probes	COM-POWER CORPORATION	PS-400	151724	05-Jul-22	05-Jul-24
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000	NA	19-Nov-23	19-Nov-24
7585	EMI Test Receiver, 1 Hz to 44 GHz	Rohde & Schwarz	ESW44	103130	21-Sep-23	21-Sep-24

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	Frequency, MHz	Antenna factor, dB/m
30	14.96	160	12.67
35	15.33	180	13.34
40	16.37	200	15.40
45	17.56	250	16.42
50	17.95	300	17.28
60	16.87	400	19.98
70	13.22	500	21.11
80	10.56	600	22.90
90	13.61	700	24.13
100	15.46	800	25.25
120	14.03	900	26.35
140	12.23	1000	27.18

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

above 1000 MHz

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
1000	26.9	3600	38.9
1100	28.1	3700	39.4
1200	28.4	3800	39.4
1300	29.6	3900	39.6
1400	29.1	4000	39.7
1500	30.4	4100	39.8
1600	30.7	4200	40.5
1700	31.5	4300	40.9
1800	32.3	4400	41.1
1900	32.6	4500	41.4
2000	32.5	4600	41.3
2100	32.9	4700	41.6
2200	33.5	4800	41.9
2300	33.2	4900	42.3
2400	33.7	5000	42.7
2500	34.6	5100	43.0
2600	34.7	5200	42.9
2700	34.6	5300	43.5
2800	35.0	5400	43.6
2900	35.5	5500	44.3
3000	36.2	5600	44.7
3100	36.8	5700	45.0
3200	36.8	5800	45.0
3300	37.0	5900	45.3
3400	37.5	6000	45.9
3500	38.2		

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

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

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB
10	-33.4	±1.0
20	-37.8	±1.0
50	-40.5	±1.0
75	-41.0	±1.0
100	-41.2	±1.0
150	-41.2	±1.0
250	-41.1	±1.0
500	-41.2	±1.0
750	-41.3	±1.0
1000	-41.3	±1.0

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB
2000	-41.4	±1.0
3000	-41.4	±1.0
4000	-41.5	±1.0
5000	-41.5	±1.0
10000	-41.7	±1.0
15000	-42.1	±1.0
20000	-42.7	±1.0
25000	-44.2	±1.0
30000	-45.8	±1.0

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

11 APPENDIX C Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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 Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 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 are R-10808 for OATS, R-1082 for anechoic chamber, 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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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

13 APPENDIX E Specification references

FCC 47CFR part 15: 2022	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-247 Issue 3: 2023	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
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.
ICES-003: 2020, Issue 7	Information Technology Equipment (Including Digital Apparatus)

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	Ohm
PM	pulse modulation
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
WB	wideband

15 APPENDIX G Manufacturer's declaration

essence
Better life made possible™

Declaration of Identity

We, the undersigned,

Company: Essence Smartcare Ltd.
Address: 12 Abba Eban Avenue, Herzliya 4672530
Country: ISRAEL
Telephone number: +972 73 2447735
Fax number: +972 9 7729962

Declare under our sole responsibility that the following equipment:

Brand/Item	Type/Model	Short Product description
Essence Smartcare	ES700EPAJ / ES700EPPJ	EPAJ / EPPJ

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Type/Model	Short Product description
Essence Smartcare	ES700EPA / ES700EPP	EPA / EPP

The reason for name change is:
All 4 devices are with the same PCB P/N ESPC05174.
ES700EPAJ and ES700EPA have the same PCBA.
ES700EPPJ and ES700EPP have the same PCBA.

The only different between EPA/EPAJ vs. EPP/EPPJ is that EPA/EPAJ include Fall Sensor, and EPP/EPPJ don't have it.
The EPA/EPP are the same devices as EPAJ/EPPJ, the only different is the top cover which make the EPAJ/EPPJ to looks like Jewel.

July-29, 2024
.....
(date)

.....
(signature)
Israel Gottesman
.....
(printed name)
Standards Engineer
.....
(position)

ESSENCE SMARTCARE LTD

.....
(company stamp)

16 APPENDIX H Manufacturer's declaration

essence
Better life made possible™

Declaration

We
Name: Essence Security International.
Address: 12 Abba Eban avenue, Ackerstein Tower Bldg. D
City: Herzliya 4612001
Country: Israel

Declare that,
When ES700EPAJ/EPPJ was FCC/IC tested and certified (project # 32531), the BLE was assemble but not tested.

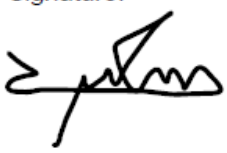
The EPA/EPP/EPAJ/EPPJ is based on the same PCB with the same Texas Instruments MCU CC1350. There is only one radio core in CC1350, therefore 916.5MHz and the BLE cannot operate simultaneously, only one at a time.

The EPA/EPP are the same devices as EPAJ/EPPJ, the only different is the top cover which make the EPAJ/EPPJ to looks like Jewel.

Date: July 29, 2024

Name: Israel Gottesman
Function: Standards Engineer

Signature:



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