HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO:

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

FOR:

ARAD TECHNOLOGIES

AT57-7

Models: AT57-7-21-5-P-1

FCC ID: 2A7AA-SON2LR30DB

IC: 28664-SON2LR30DB

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1 Applicant information

Client name:	ARAD TECHNOLOGIES
Address:	POB 537, HaMada 4, Yokneam Ind. Zone, Yokneam Ilit 20692, Israel
Telephone:	04-9935222, Ext: 271
Fax:	04-9935227
E-mail:	viorel.negreanu@aradtec.com
Contact name:	Mr. Vily Negreanu

2 Equipment under test attributes

Product name:	AT57-7
Product type:	Transceiver
Model(s):	AT57-7-21-5-P-1
Serial number:	70B3D5A9F087F344
Hardware version:	0B
Software release:	57.1.2.4
Receipt date	22-Apr-25

3 Manufacturer information

Manufacturer name:	ARAD TECHNOLOGIES
Address:	POB 537, HaMada 4, Yokneam Ind. Zone, Yokneam Ilit 20692, Israel
Telephone:	04-9935222, Ext: 271
Fax:	04-9935227
E-Mail:	viorel.negreanu@aradtec.com
Contact name:	Mr. Vily Negreanu

4 Test details

Project ID:	56698
Location:	Hermon Laboratories Ltd. 66 HaTachana str., P.O. Box 23, Binyamina 3055001, Israel
Test started:	22-Apr-25
Test completed:	14-May-25
Test specification(s):	FCC 47CFR part 15 subpart C §15.247 (FHSS), 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	
Section 15.247(a)1 / RSS-247 section 5.1(c), 20 dB bandwidth	Pass
Section 15.247(b) / RSS-247 section 5.4(a), Peak output power	Pass
Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions	Pass
Section 15.247(a)1 / RSS-247 section 5.1(b), Frequency separation	Pass
Section 15.247(a)1 / RSS-247 section 5.1(c), Number of hopping frequencies	Pass
Section 15.247(a)1 / RSS-247 section 5.1(c), Average time of occupancy	Pass
Section 15.247(i)5 / RSS-102 section 2.5, RF exposure	Pass, the exhibit to the application of certification is provided
Section 15.247(d) / RSS-247 section 5.5, Emissions at band edges	Pass
Section 15.207(a) / RSS-Gen section 8.8, Conducted emission	Not required
Section 15.203 / RSS-Gen section 8.3, Antenna requirements	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 supersedes the previously issued test report identified by Doc ID: ARARAD_FCC.56698_FHSS

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	**Date**	**Signature**
Tested by:	Mr. S. Sugatov, test engineer, EMC & Radio Mrs. N. Lenkina, test engineer, EMC & Radio	22-Apr-25 – 14-May-25	
Reviewed by:	Mrs. S. Peysahov Sheynin, certification engineer, EMC & Radio	20-May-25	
Approved by:	Mr. M. Nikishin, group leader, EMC & Radio	05-Jun-25	

6 EUT description

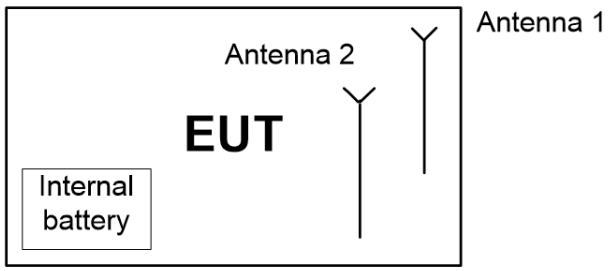
Note: The following data in this clause is provided by the customer and represents his sole responsibility

6.1 General information

The AT57-7 LoRa water meter is a fully integrated radio and antenna solution. It is a battery-operated radio transceiver designed for automated water reading. The AT57-7 provides optional online data of all kinds (water consumption, temperatire, Alerts, Tampering, back flow…) It uses LoRaWAN radio for relaying water consumprion data to the utility.

AT57-7 Intergrate Bluetooth Low energy for field maintenance.

6.2 Test configuration



6.3 Transmitter characteristics

Type of equipment	
X	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)

Intended use		**Condition of use**
X	fixed	Always at a distance more than 2 m from all people
	mobile	Always at a distance more than 20 cm from all people
	portable	May operate at a distance closer than 20 cm to human body

Assigned frequency ranges	902 – 928 MHz
Operating frequencies	902.3 – 914.9 MHz

Maximum rated output power	At transmitter 50 Ω RF output connector	dBm
	Peak output power	29.75 dBm

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

Antenna connection			
unique coupling	standard connector	X integral	with temporary RF connector
			X without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Intergrated	Inhouse design	N/A	0dBi

Transmitter aggregate data rate/s	980bps 5470bps
Type of modulation	Chirp Spread Spectrum CSS
Modulating test signal (baseband)	LoRa

Transmitter power source					
X	Battery	**Nominal rated voltage**	3.6 VDC	Battery type	Lithium Inorganic battery
	DC	**Nominal rated voltage**			
	AC mains	**Nominal rated voltage**		Frequency	

Common power source for transmitter and receiver	X yes	no

Spread spectrum technique used	X	Frequency hopping (FHSS)
		Digital transmission system (DTS)
		Hybrid

Spread spectrum parameters for transmitters tested per FCC 15.247 only		
FHSS	Total number of hops	64
	Bandwidth per hop	146.25 kHz
	Max. separation of hops	205.33 kHz

Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

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

7.1 20 dB bandwidth

7.1.1 General

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

Table 7.1.1 The 20 dB bandwidth limits

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

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

7.1.2 Test procedure

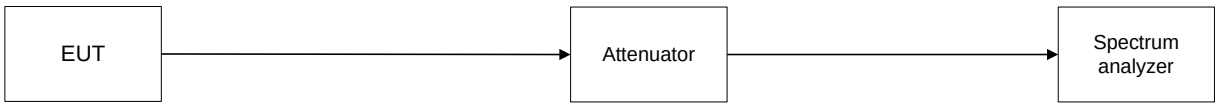
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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

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

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

Figure 7.1.1 The 20 dB bandwidth test setup



Test specification:	**Section 15.247(a)1, RSS-247 section 5.1(3), 20 dB bandwidth**		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 996 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.1.2 The 20 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 902-928 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
FREQUENCY HOPPING: Disabled

Carrier frequency, MHz	Type of modulation	Data rate, bps	99% OBW kHz	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency							
902.3	LoRa	980	125.47	139.06	250	-110.94	Pass
		5470	126.27	145.85	250	-104.15	Pass
Mid frequency							
908.7	LoRa	980	125.47	139.46	250	-110.54	Pass
		5470	126.67	146.25	250	-103.75	Pass
High frequency							
914.9	LoRa	980	125.47	138.66	250	-111.34	Pass
		5470	126.27	145.05	250	-104.95	Pass

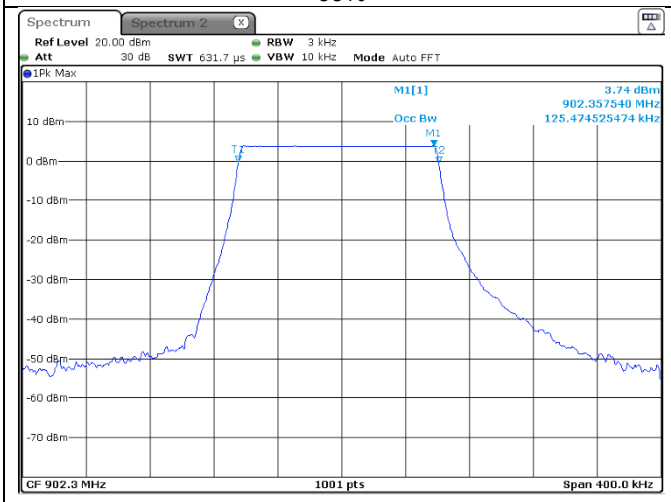
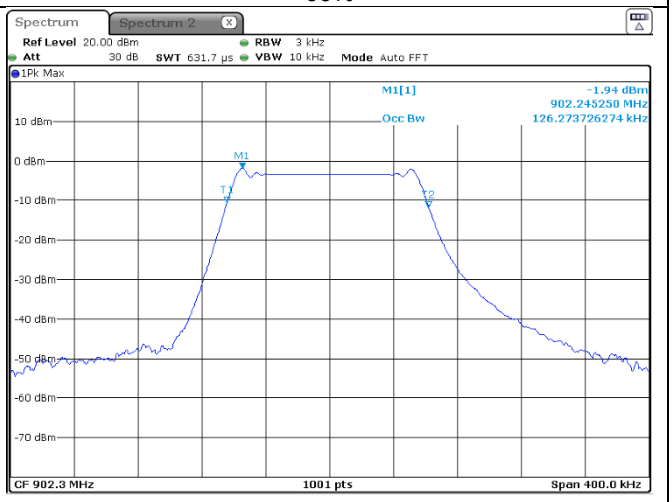
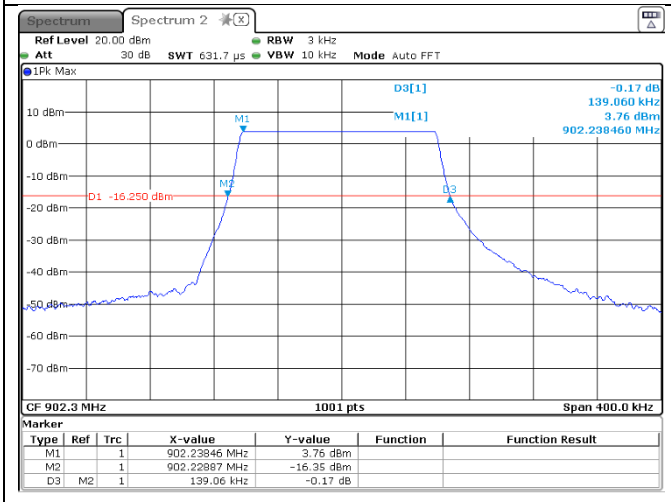
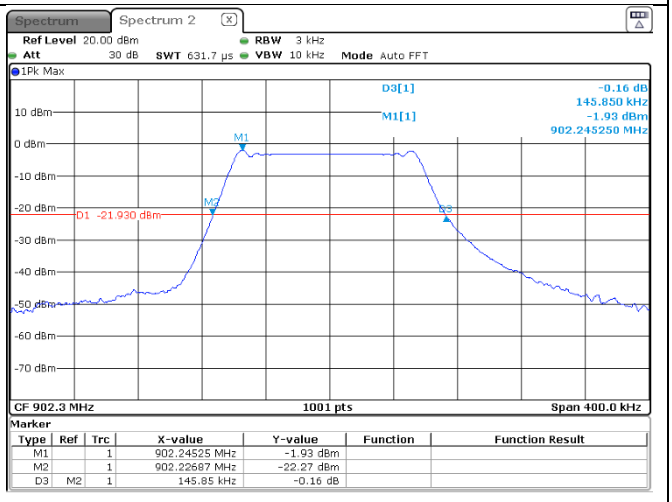
Reference numbers of test equipment used

HL 4355	HL 5594	HL 5601	HL 4135	HL 5637				

Full description is given in Appendix A.

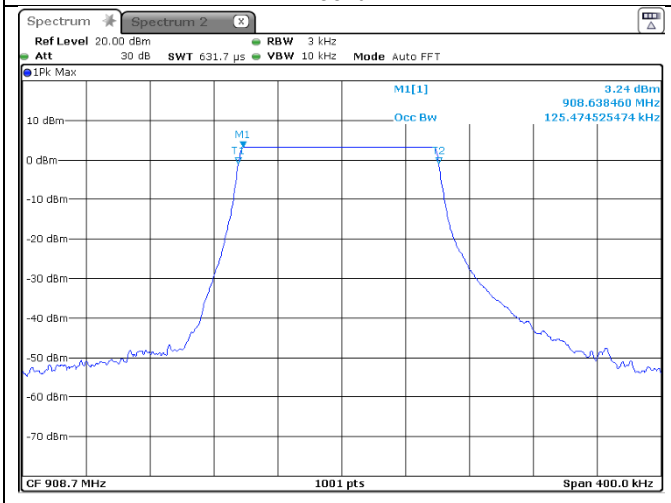
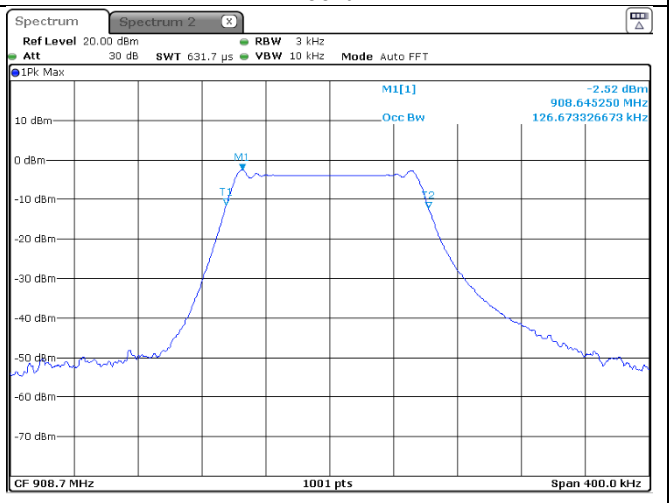
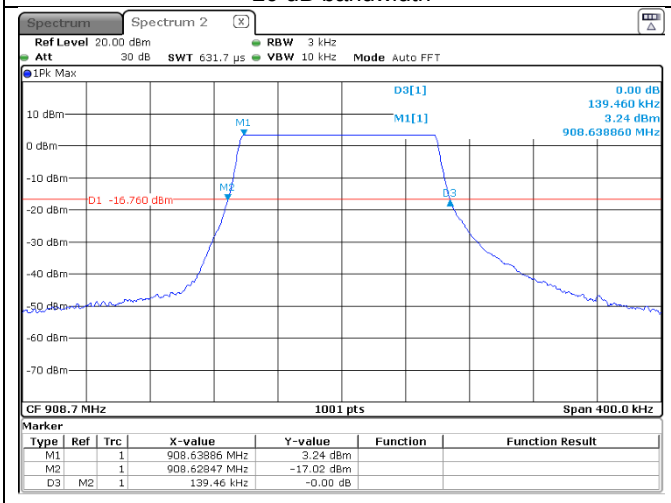
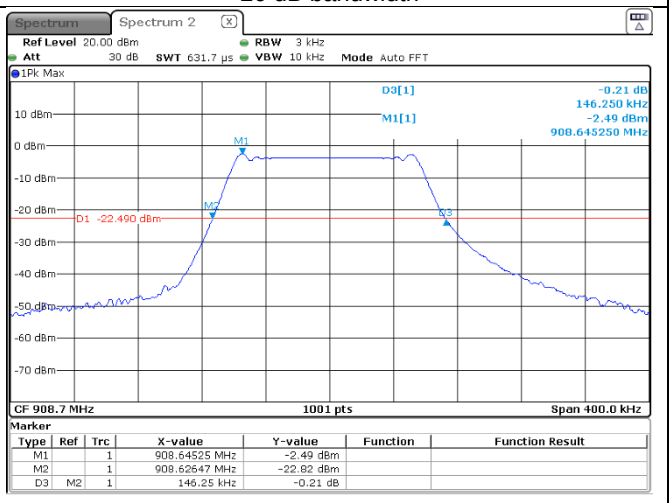
Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.1.1 The 20 dB bandwidth test result at low frequency

Low bitrate	High bitrate
99%	99%
	
20 dB bandwidth	20 dB bandwidth
	

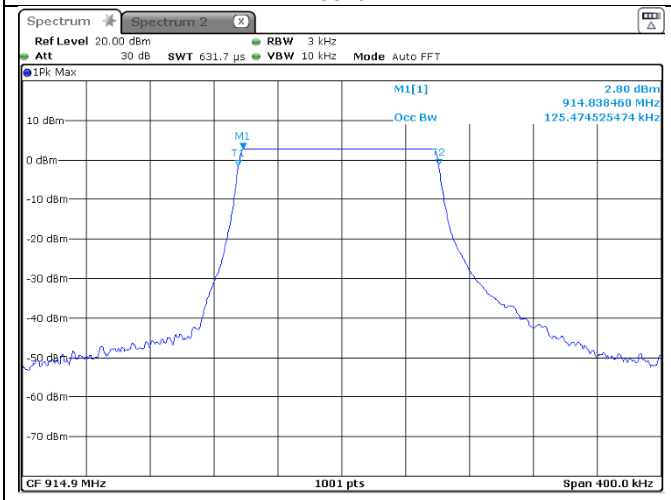
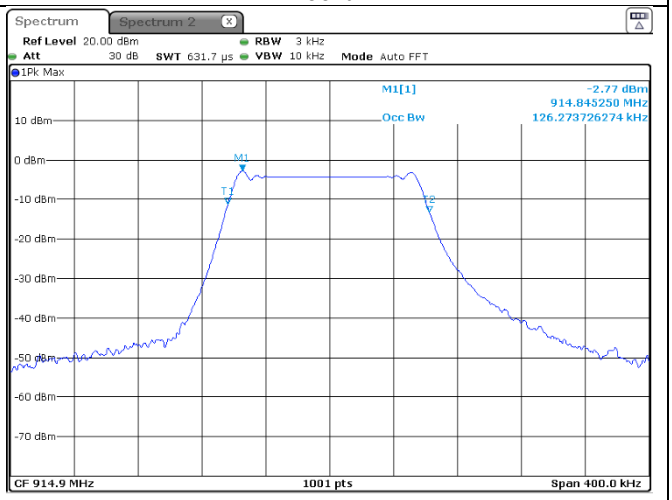
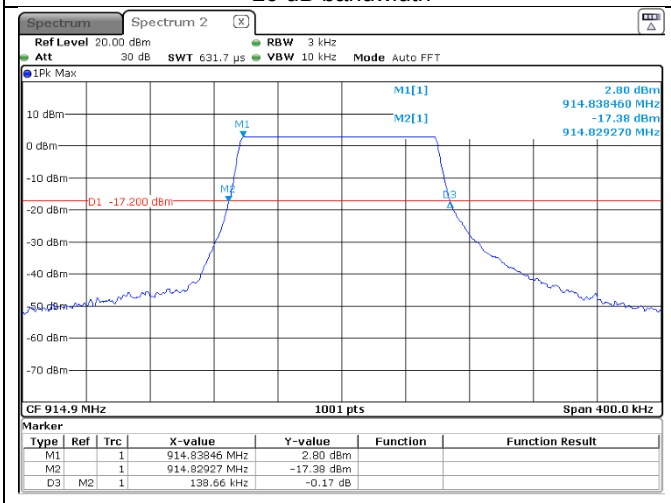
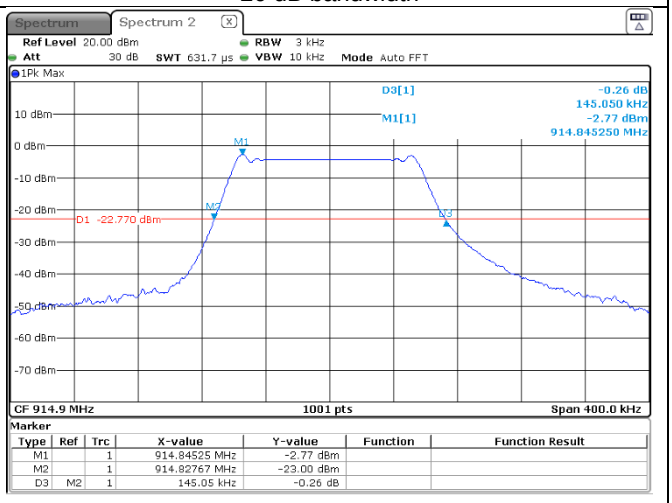
Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.1.2 The 20 dB bandwidth test result at mid frequency

Low bitrate	High bitrate
99%	99%
	
20 dB bandwidth	20 dB bandwidth
	

Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.1.3 The 20 dB bandwidth test result at high frequency

Low bitrate	High bitrate
99%	99%
	
20 dB bandwidth	20 dB bandwidth
	

Test specification:	Section 15.247(a)1, RSS-247 section 5.1(2), Frequency separation		
Test procedure:	ANSI C63.10, section 7.8.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

7.2 Carrier frequency separation

7.2.1 General

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

Table 7.2.1 Carrier frequency separation limits

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

7.2.2 Test procedure

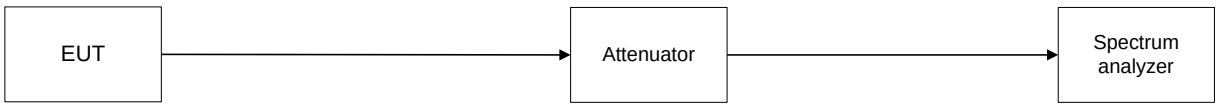
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized with frequency hopping function enabled and its proper operation was checked.

7.2.2.2 The spectrum analyzer span was set to capture the carrier frequency and both of adjacent channels, the lower and the higher. The resolution bandwidth was set wider than 1 % of the frequency span.

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

7.2.2.4 The frequency separation between the peaks of adjacent channels was measured as provided in Table 7.2.2 and associated plots.

Figure 7.2.1 Carrier frequency separation test setup



Test specification:	Section 15.247(a)1, RSS-247 section 5.1(2), Frequency separation		
Test procedure:	ANSI C63.10, section 7.8.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

Table 7.2.2 Carrier frequency separation test results

ASSIGNED FREQUENCY: 902.0 – 928.0 MHz
MODULATION: LoRa
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW
FREQUENCY HOPPING: Enabled

BIT RATE: 980 bps
20 dB BANDWIDTH: 139.46 kHz

Carrier frequency separation, kHz	Limit, kHz	Margin, kHz*	Verdict
205.33	139.46	65.87	Pass

BIT RATE: 5470 bps
20 dB BANDWIDTH: 146.25 kHz

Carrier frequency separation, kHz	Limit, kHz	Margin, kHz*	Verdict
200.20	146.25	53.95	Pass

* - Margin = Carrier frequency separation – specification limit.

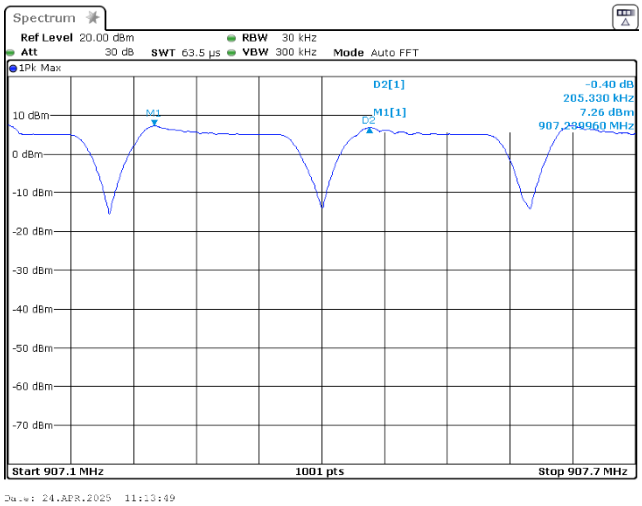
Reference numbers of test equipment used

HL 4355	HL 5673	HL 4135	HL 5601	HL 5594			

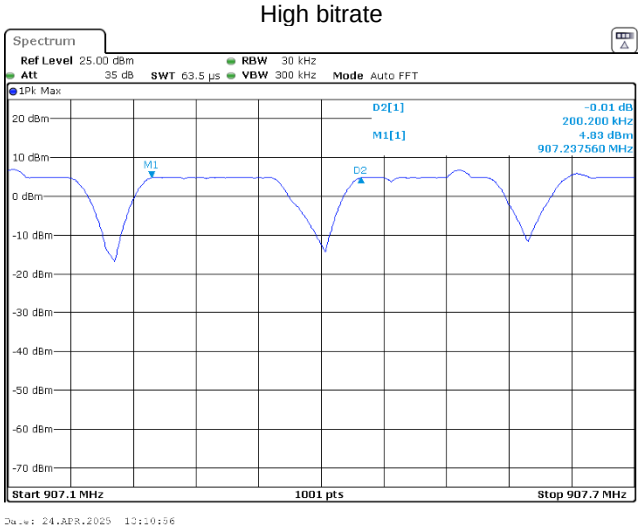
Full description is given in Appendix A.

Plot 7.2.1 Carrier frequency separation

Low bitrate



High bitrate



Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

7.3 Number of hopping frequencies

7.3.1 General

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

Table 7.3.1 Minimum number of hopping frequencies

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

7.3.2 Test procedure

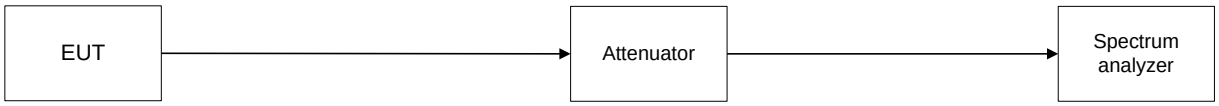
7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized with frequency hopping function enabled and its proper operation was checked.

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

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

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

Figure 7.3.1 Hopping frequencies test setup



Test specification:	**Section 15.247(a)1, RSS-247 section 5.1(3), Number of hopping frequencies**		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 996 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.3.2 Hopping frequencies test results

ASSIGNED FREQUENCY: 902.0 – 928.0 MHz
MODULATION: LoRa
DETECTOR USED: Peak
FREQUENCY HOPPING: Enabled

BIT RATE: 980 bps

Number of hopping frequencies	Minimum number of hopping frequencies	Margin*	Verdict
64	50	14	Pass

BIT RATE: 5470 bps

Number of hopping frequencies	Minimum number of hopping frequencies	Margin*	Verdict
64	50	14	Pass

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

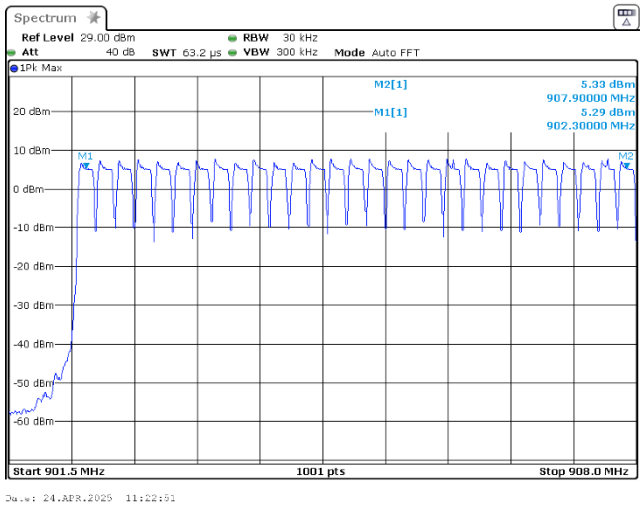
Reference numbers of test equipment used

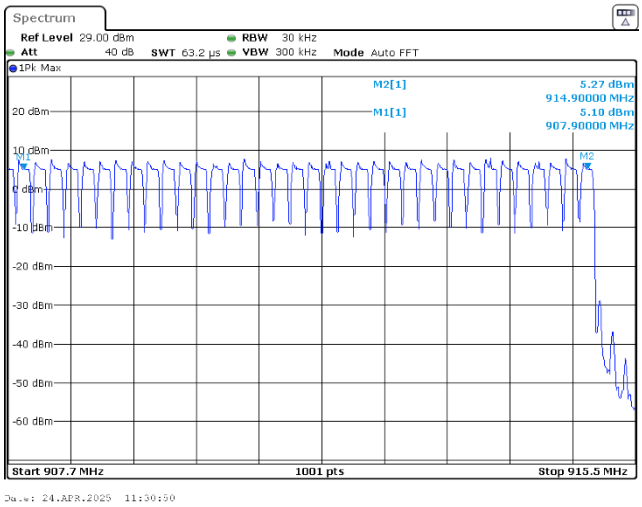
HL 4355	HL 5673	HL 4135	HL 5601	HL 5594			

Full description is given in Appendix A.

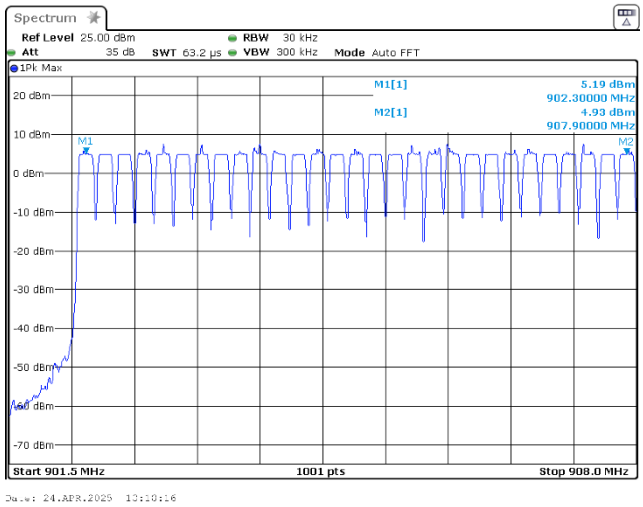
Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

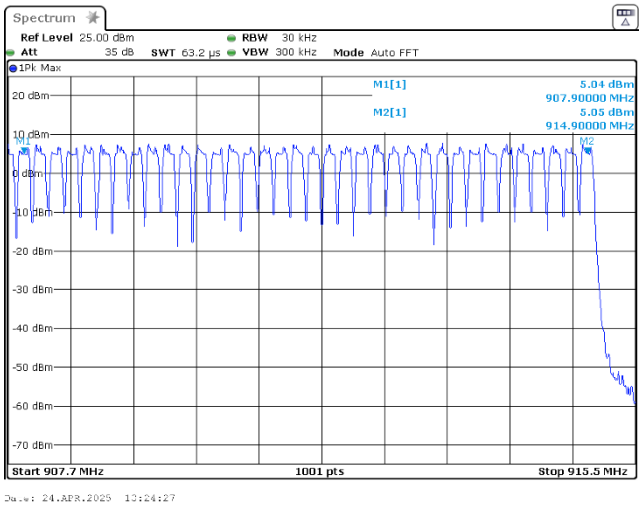
Plot 7.3.1 Number of hopping frequencies with bit rate 980 bps





Plot 7.3.2 Number of hopping frequencies with bit rate 5470 bps





Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), Average time of occupancy		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

7.4 Average time of occupancy

7.4.1 General

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

Table 7.4.1 Average time of occupancy limits

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

7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized with frequency hopping function enabled and its proper operation was checked.

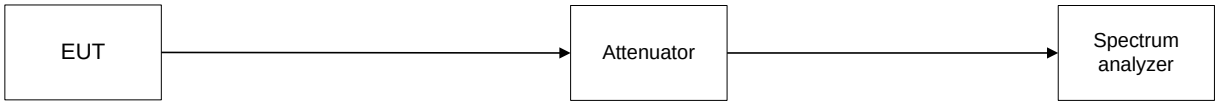
7.4.2.2 The spectrum analyzer span was set to zero centered on a hopping channel.

7.4.2.3 The single transmission duration and period were measured with oscilloscope.

7.4.2.4 The average time of occupancy was calculated as the single transmission time multiplied by the investigated period and divided by the single transmission period.

7.4.2.5 The test was repeated at each data rate and modulation type as provided in Table 7.4.2 and associated plots.

Figure 7.4.1 Average time of occupancy test setup



Test specification:	**Section 15.247(a)1, RSS-247 section 5.1(3), Average time of occupancy**		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 996 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.4.2 Average time of occupancy test results

ASSIGNED FREQUENCY: 902.0 – 928.0 MHz
MODULATION: LoRa
DETECTOR USED: Peak
NUMBER OF HOPPING FREQUENCIES: 64
INVESTIGATED PERIOD: 20 s
FREQUENCY HOPPING: Enabled

Carrier frequency, MHz	Single transmission duration, ms	Number of transmissions within investigated period	Average time of occupancy*, s	Bit rate, bps	Limit, s	Margin, s**	Verdict
908.7	371.0	1	0.37	980	0.4	-0.03	Pass
914.9	61.8	1	0.06	5470	0.4	-0.34	Pass

* - Average time of occupancy = (Single transmission duration × Investigated period) / (Single transmission period × number of hopping channels).
** - Margin = Average time of occupancy – specification limit.

Reference numbers of test equipment used

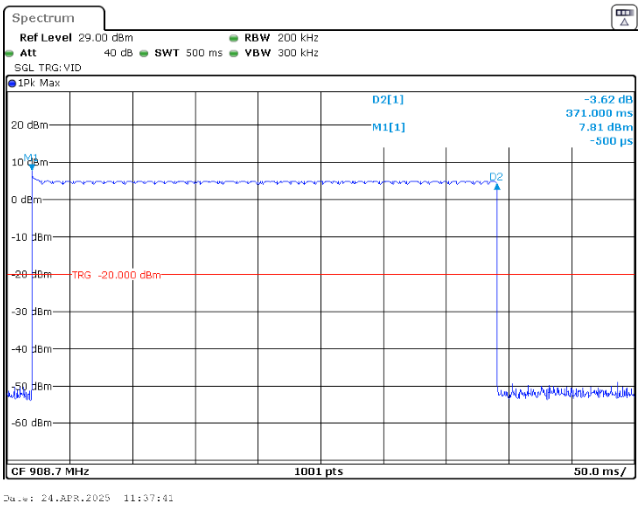
HL 4355	HL 5673	HL 4135	HL 5601	HL 5594			

Full description is given in Appendix A.

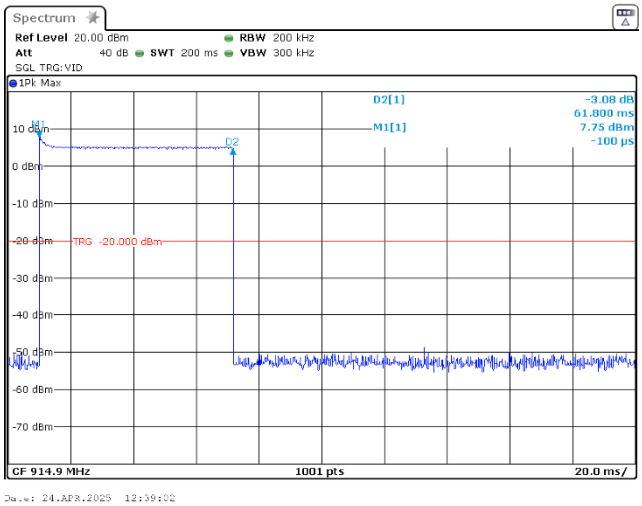
Test specification:	Section 15.247(a)1, RSS-247 section 5.1(3), Average time of occupancy		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	24-Apr-25		
Temperature: 23 ºC	Relative Humidity: 46 %	Air Pressure: 996 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.4.1 Single transmission duration

Data rate 980 bps

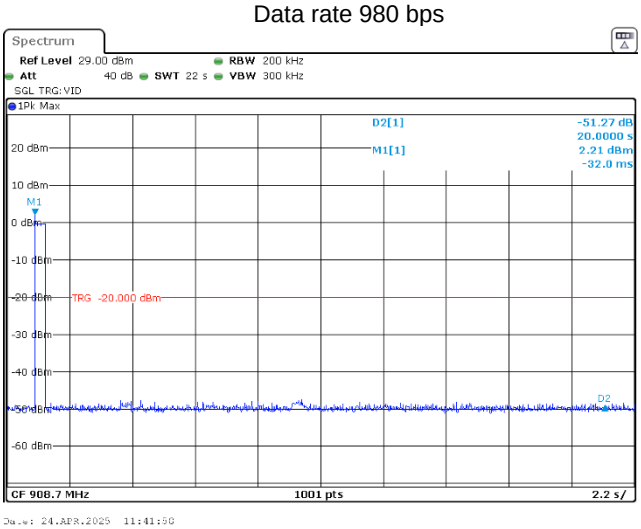


Data rate 5470 bps

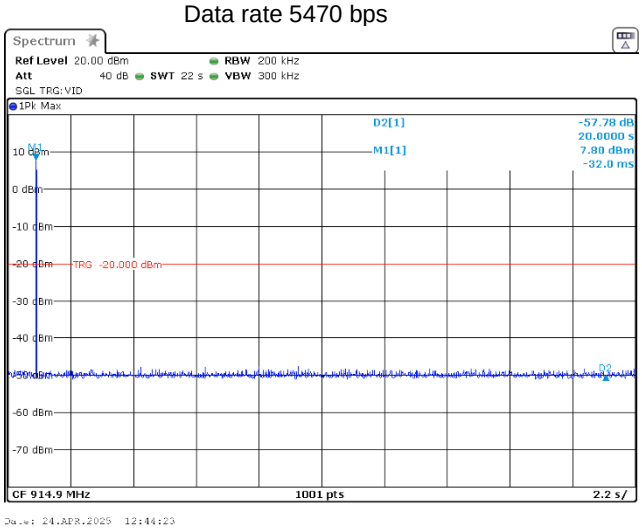


Plot 7.4.2 Single transmission period

Data rate 980 bps



Data rate 5470 bps



Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

7.5 Peak output power

7.5.1 General

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

Table 7.5.1 Peak output power limits

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

*- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×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.
**- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

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

7.5.2 Test procedure

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

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

7.5.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

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

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

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

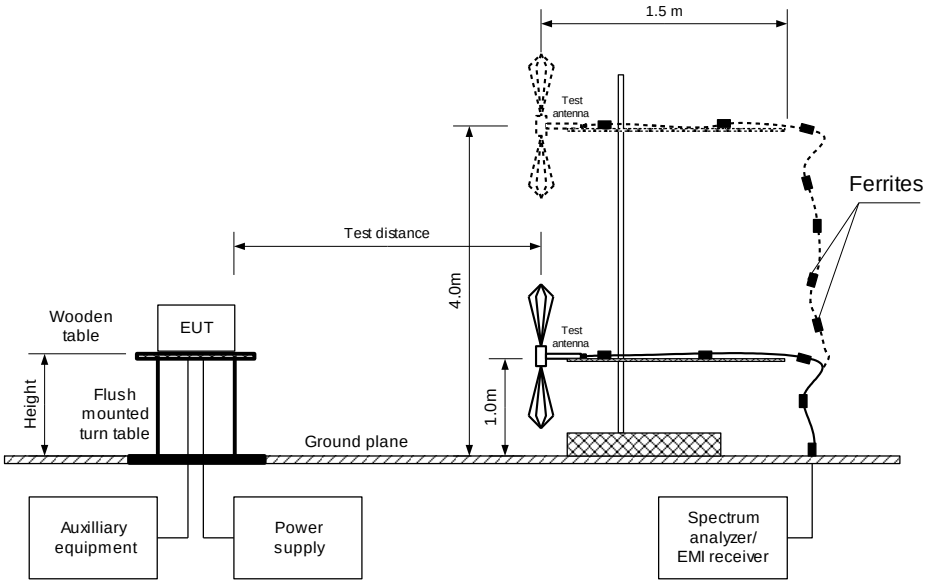
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

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

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

Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.5.2 Peak output power test results

ASSIGNED FREQUENCY:	902-928 MHz
TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT HEIGHT:	0.8 m
DETECTOR USED:	Peak
TEST ANTENNA TYPE:	Biconilog (30 MHz – 1000 MHz)
MODULATION:	LoRa
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
EUT 20 dB BANDWIDTH:	145 kHz
RESOLUTION BANDWIDTH:	300 kHz
VIDEO BANDWIDTH:	1 MHz
FREQUENCY HOPPING:	Disabled
NUMBER OF FREQUENCY HOPPING CHANNELS:	64

BIT RATE: 980 bps

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
902.3	124.95	V	1.10	125	0	29.75	30	-0.25	Pass
908.7	124.03	V	1.11	130	0	28.83	30	-1.17	Pass
914.9	124.34	V	1.1	100	0	29.14	30	-0.86	Pass

BIT RATE: 5470 bps

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
902.3	124.95	V	1.14	100	0	29.75	30	-0.25	Pass
908.7	124.72	V	1.10	80	0	29.52	30	-0.48	Pass
914.9	124.60	V	1.12	80	0	29.40	30	-0.60	Pass

*****- EUT front panel refer to 0 degrees position of turntable.
******- Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$,
where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Peak output power – specification limit.

Reference numbers of test equipment used

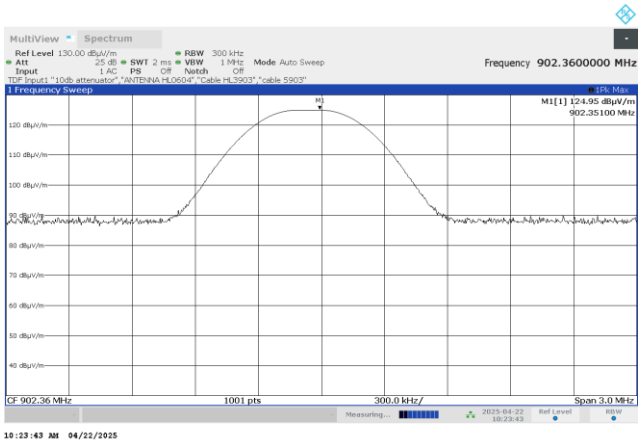
HL 7585	HL 0604	HL 3903	HL 5903	HL 5611			

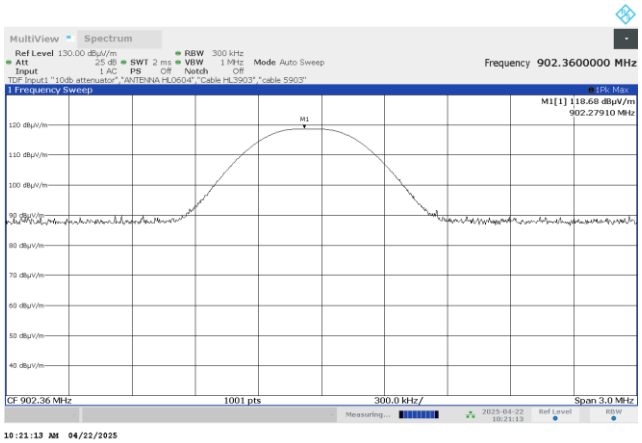
Full description is given in Appendix A.

Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

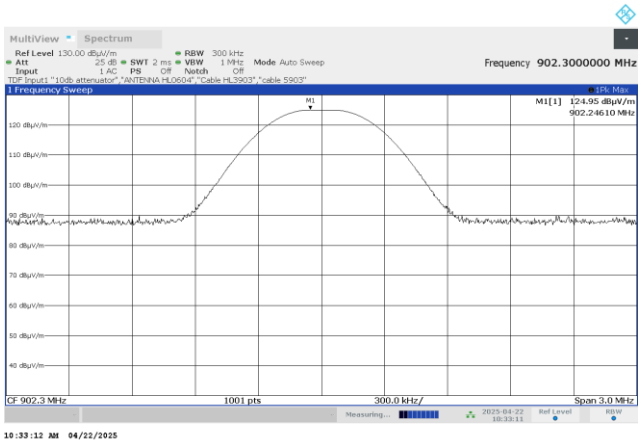
Plot 7.5.1 Field strength of carrier at low frequency

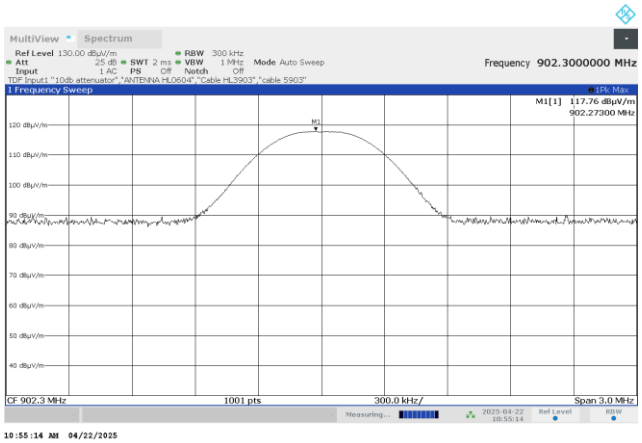
Data rate 980 bps





Data rate 5470 bps

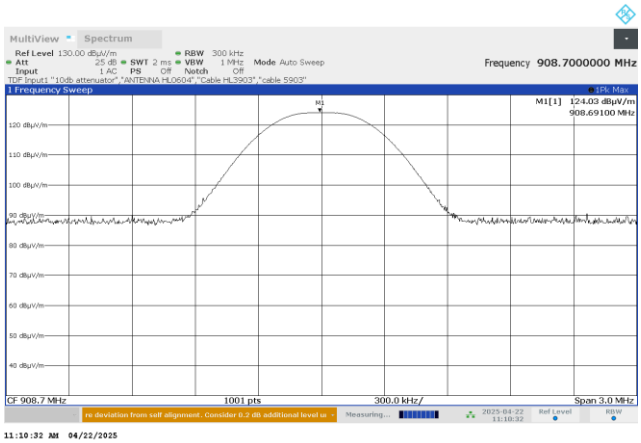


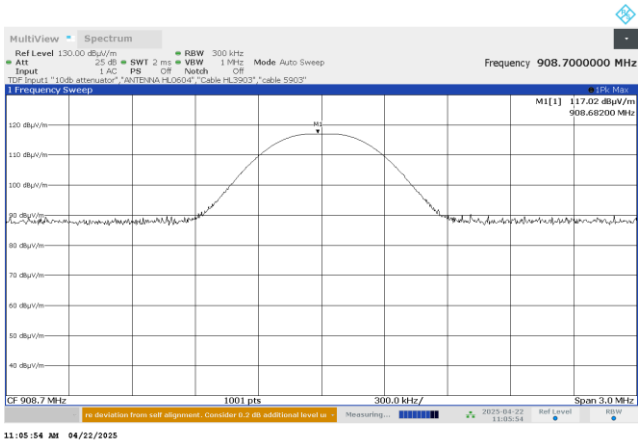


Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

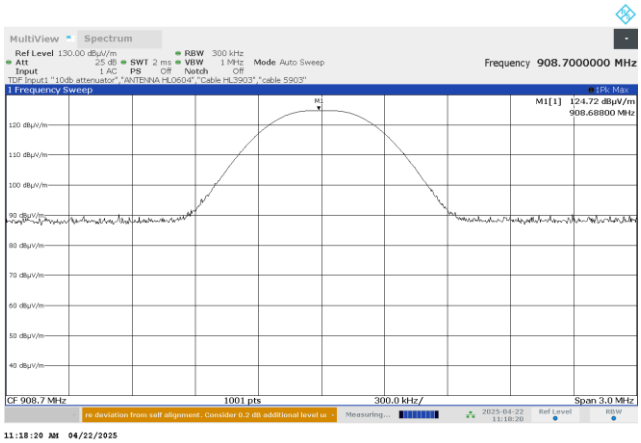
Plot 7.5.2 Field strength of carrier at mid frequency

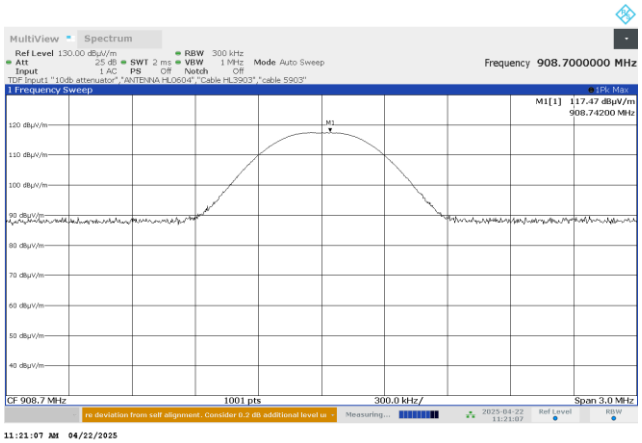
Data rate 980 bps





Data rate 5470 bps

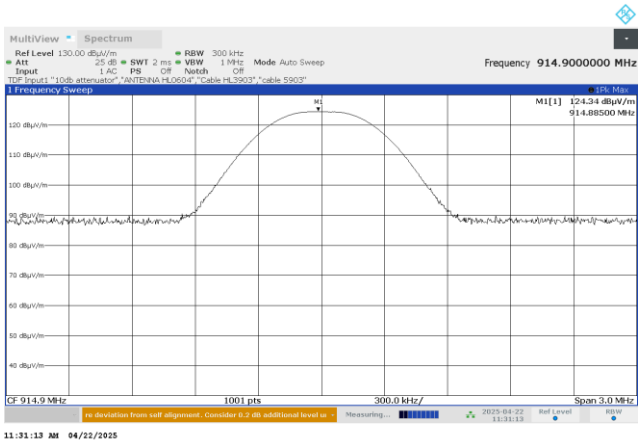


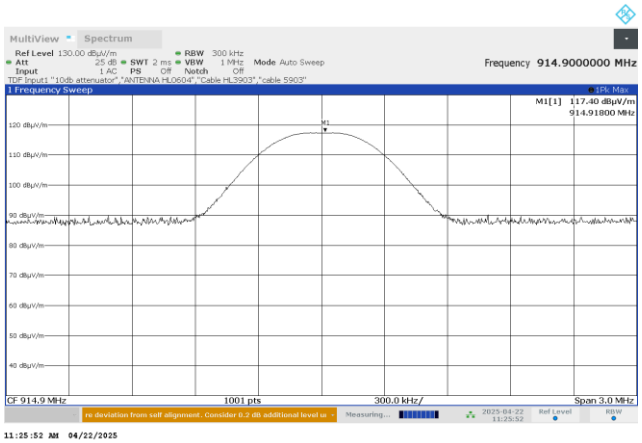


Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

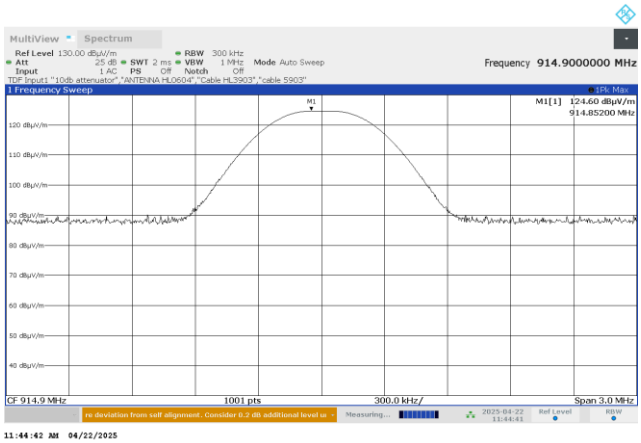
Plot 7.5.3 Field strength of carrier at high frequency

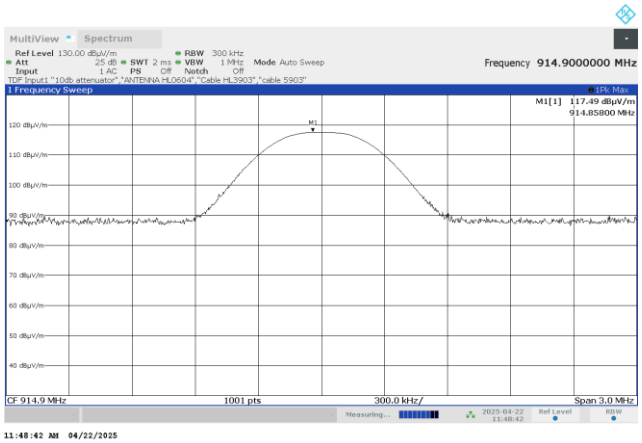
Data rate 980 bps





Data rate 5470 bps





Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

7.6 Field strength of spurious emissions

7.6.1 General

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

Table 7.6.1 Radiated spurious emissions limits

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

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

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

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

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

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

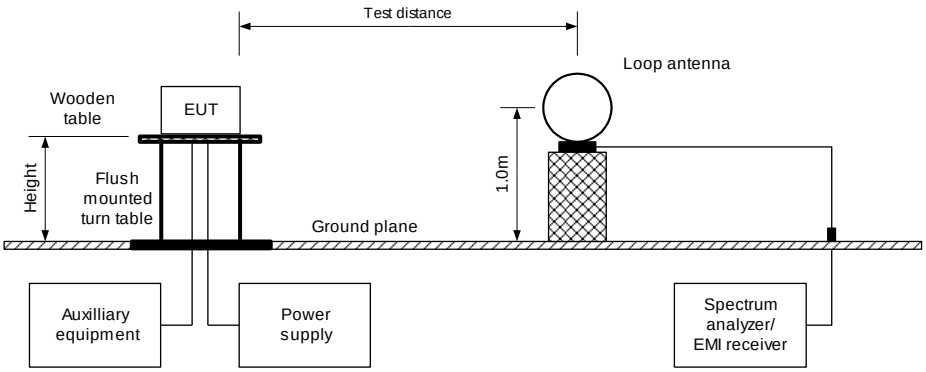
7.6.3.1 The EUT was set up as shown in Figure 7.6.2, Figure 1.1.3, energized and the performance check was conducted.

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

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

Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

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



Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

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

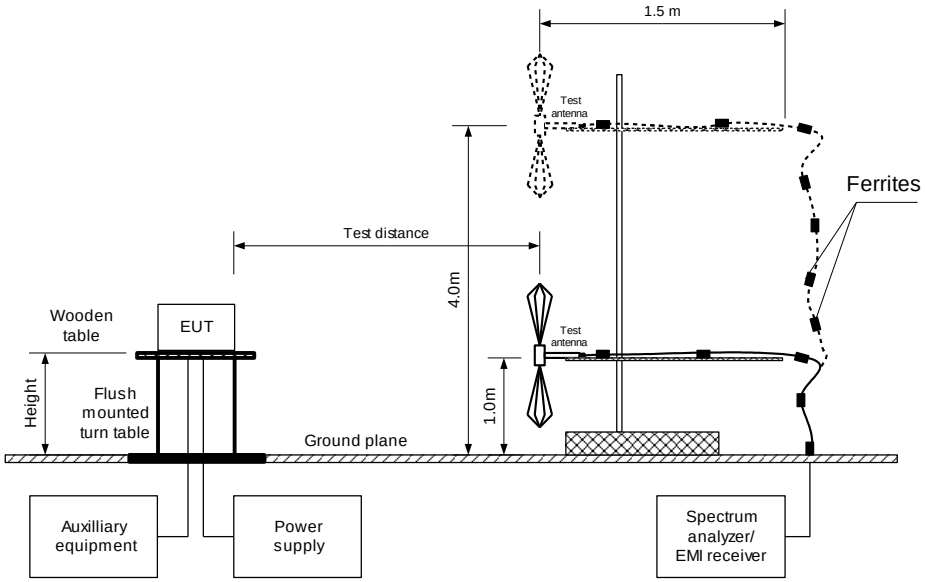
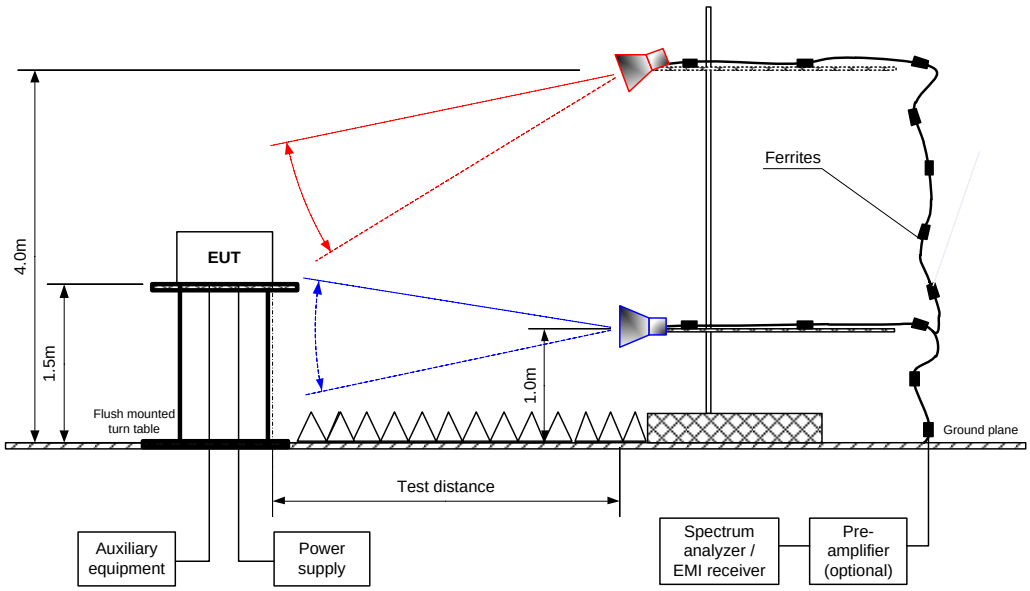


Figure 7.6.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.6.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY: 902-928 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 -9500 MHz
TEST DISTANCE: 3 m
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
FREQUENCY HOPPING: Disabled

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low, Mid, High carrier frequency									
All emissions were greater then 20dB below the limit									Pass

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

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

ASSIGNED FREQUENCY: 902-928 MHz
INVESTIGATED FREQUENCY RANGE: 1000 – 9500 MHz
TEST DISTANCE: 3 m
MODULATION: LoRa
TRANSMITTER OUTPUT POWER: 29.75 dBm at low carrier frequency
29.52 dBm at mid carrier frequency
29.40 dBm at high carrier frequency
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
TEST ANTENNA TYPE: Double ridged guide
FREQUENCY HOPPING: Disabled

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
2706.9	V	1.81	-72	54.27	74	-19.73	54.27	50.09	54	-3.91	Pass
Mid carrier frequency											
2726.1	V	1.80	-65	53.47	74	-20.53	53.47	49.29	54	-4.71	Pass
High carrier frequency											
2744.7	V	1.80	-70	53.23	74	-20.77	53.23	49.05	54	-4.95	Pass

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

Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.6.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Number of pulses within 100 ms	Duration, ms	Period, ms		
61.8	1	NA	NA	NA	-4.18

*- 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(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

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

ASSIGNED FREQUENCY: 902-928 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
TEST DISTANCE: 3 m
MODULATION: LoRa
TRANSMITTER OUTPUT POWER: 29.75 dBm at low carrier frequency
29.52 dBm at mid carrier frequency
29.40 dBm at high carrier frequency
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)
Biconical (30 MHz – 200 MHz)
Log periodic (200 MHz – 1000 MHz)
Biconilog (30 MHz – 1000 MHz)
FREQUENCY HOPPING: Disabled

Frequency, MHz	**Peak emission, dB(µV/m)**	**Quasi-peak**			**Antenna polarization**	**Antenna height, m**	**Turn-table position**, degrees**	**Verdict**
		Measured emission, dB(µV/m)	**Limit, dB(µV/m)**	**Margin, dB***				
Low carrier frequency								
All emissions were greater then 20dB below the limit								Pass
Mid carrier frequency								
38.20	39.02	25.43	40.0	-14.57	V	1.00	-180	Pass
High carrier frequency								
74.36	37.15	22.96	40.0	-17.04	V	1.02	-165	Pass

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

Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.6.6 Restricted bands according to FCC section 15.205

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

Table 7.6.7 Restricted bands according to RSS-Gen

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

Reference numbers of test equipment used

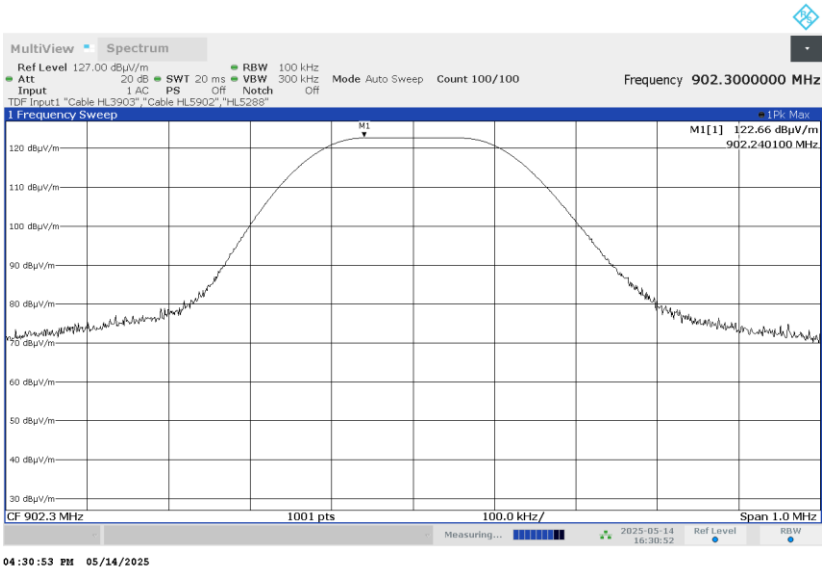
HL7585	HL0446	HL0604	HL4933	HL3903	HL5903	HL4921	HL6252
HL4339							

Full description is given in Appendix A.

Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

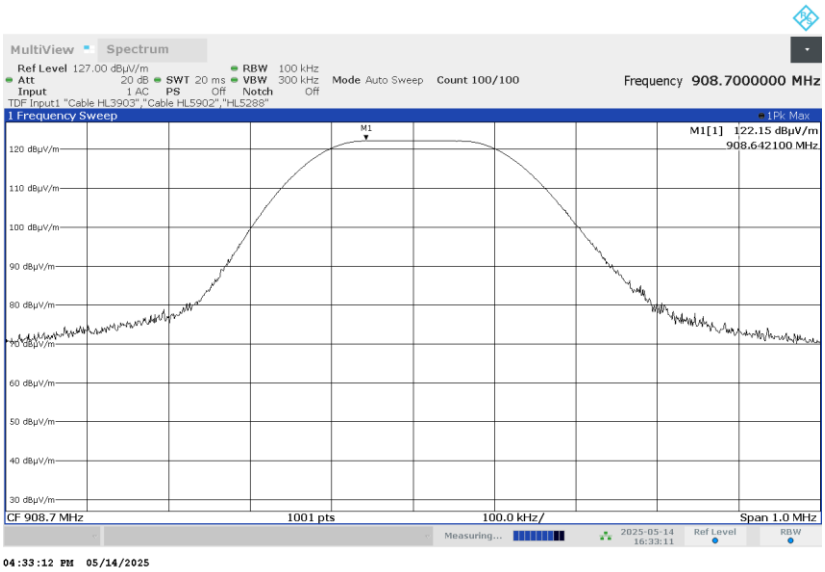
Plot 7.6.1 Radiated emission measurements at the low carrier frequency

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



Plot 7.6.2 Radiated emission measurements at the mid carrier frequency

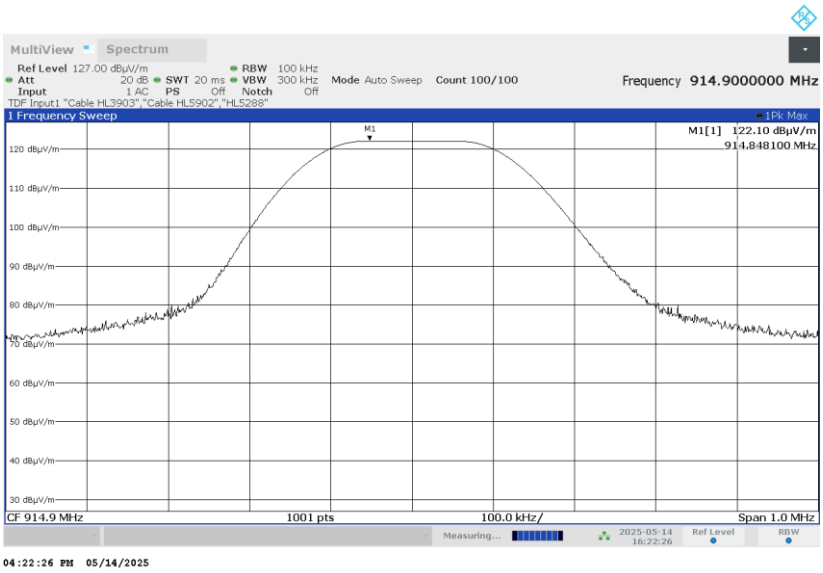
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal



Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.3 Radiated emission measurements at the high carrier frequency

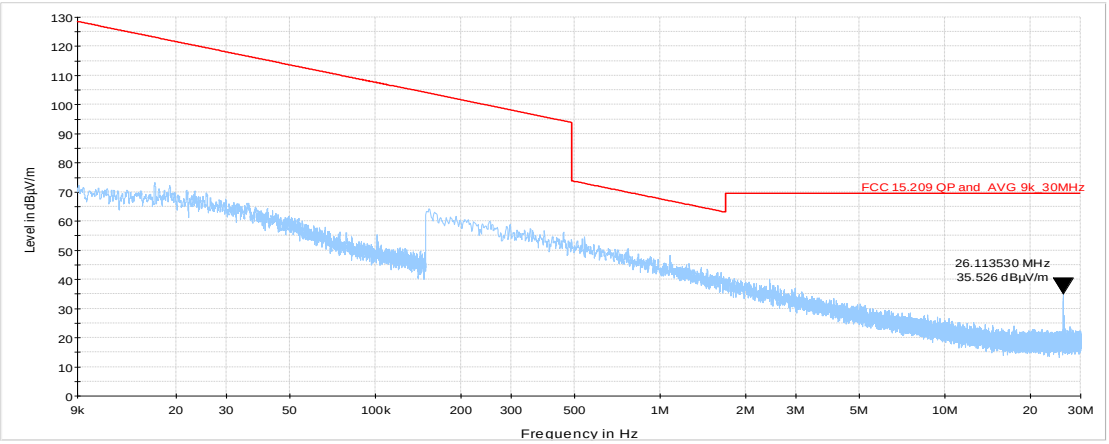
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal



Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

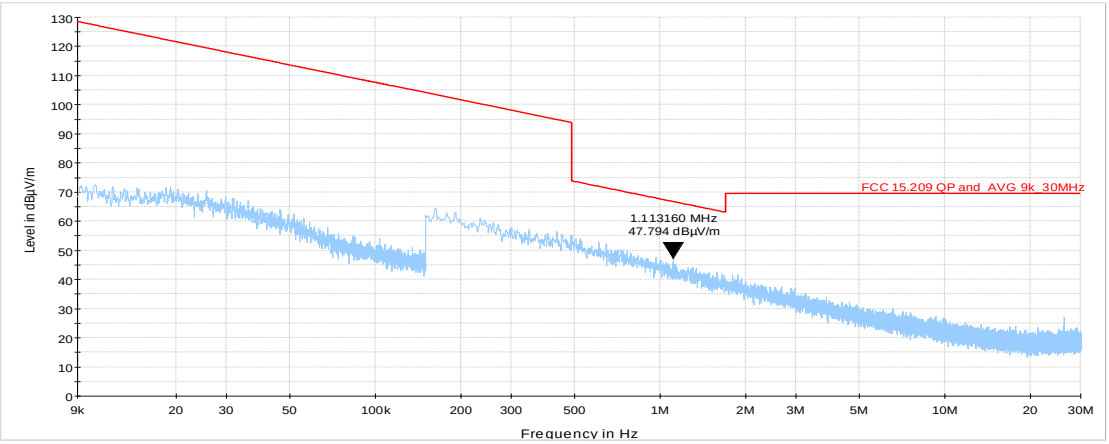
Plot 7.6.4 Radiated emission measurements from 0.009 to 30 MHz at the low carrier frequency

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



Plot 7.6.5 Radiated emission measurements from 0.009 to 30 MHz at the mid carrier frequency

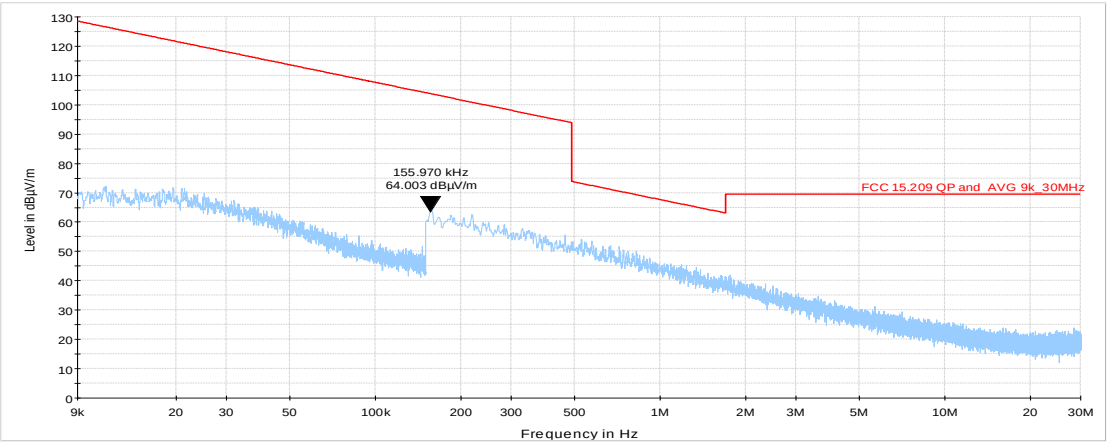
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.6 Radiated emission measurements from 0.009 to 30 MHz at the high carrier frequency

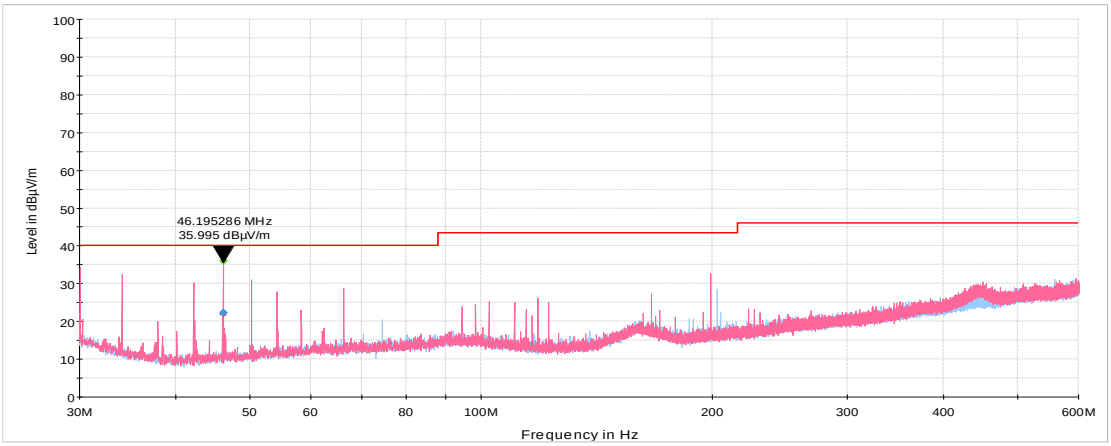
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



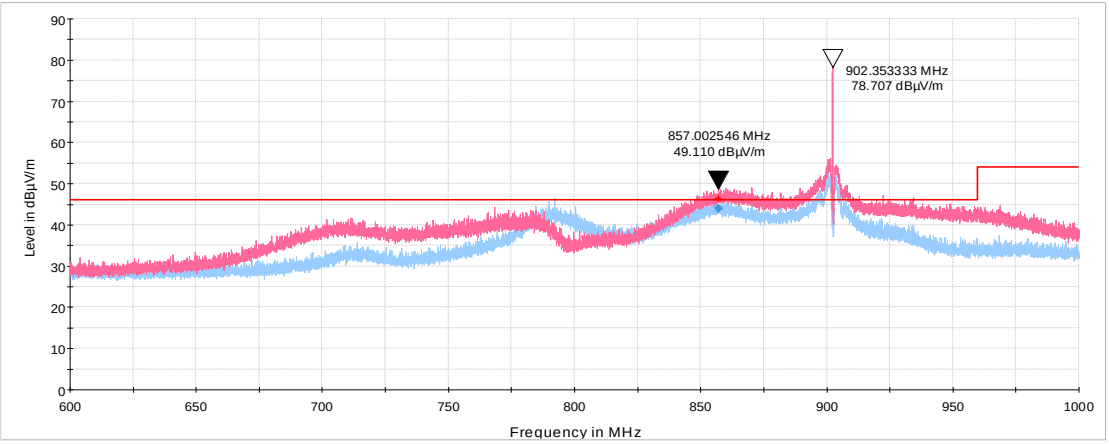
Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.7 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



With filter HL 4921

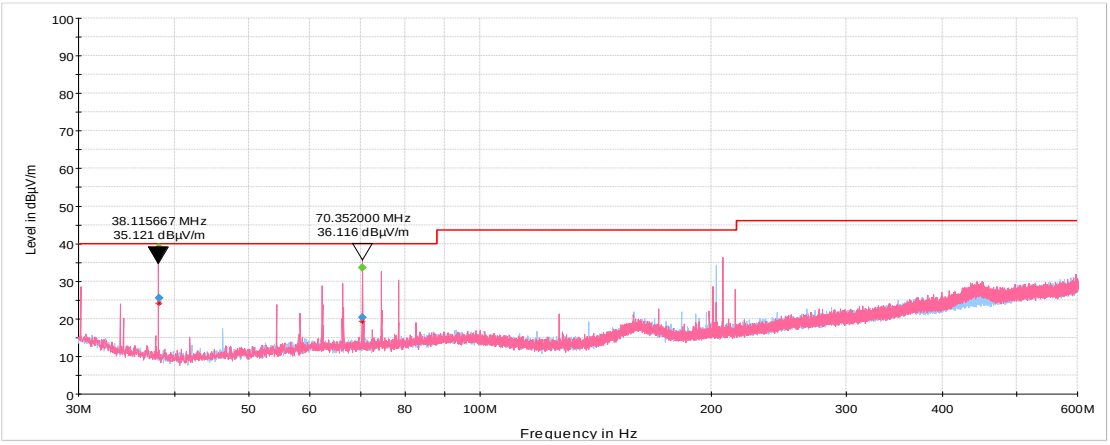


With filter HL 6252

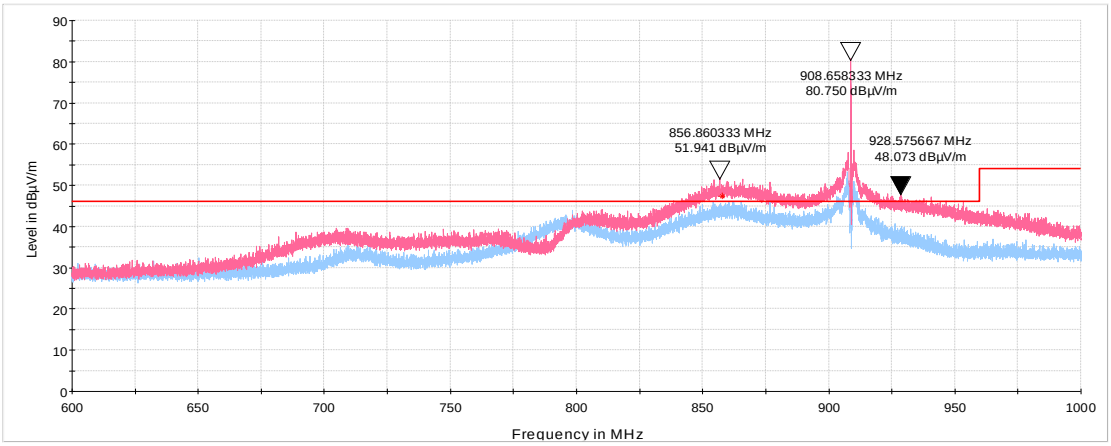
Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.8 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



With filter HL 4921

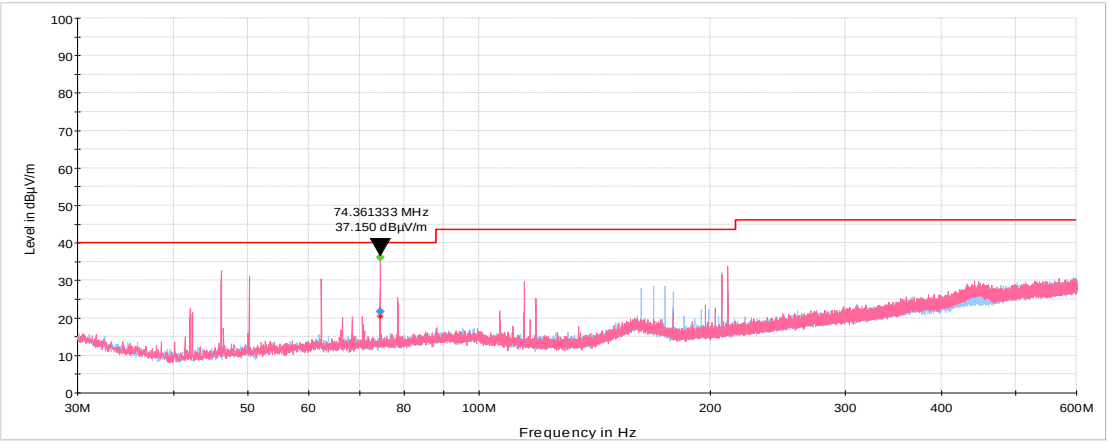


With filter HL 6252

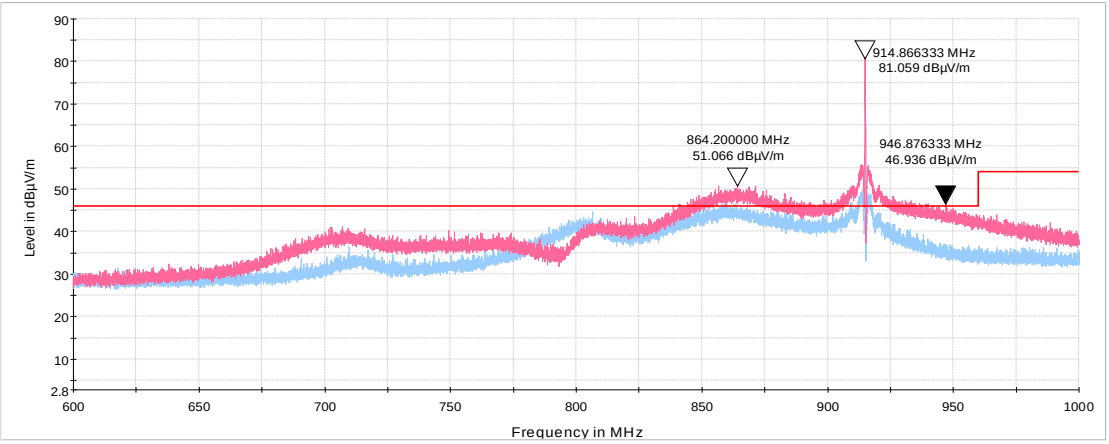
Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.9 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



With filter HL 4921

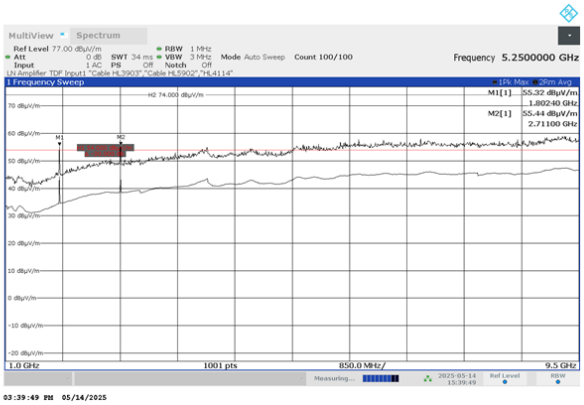


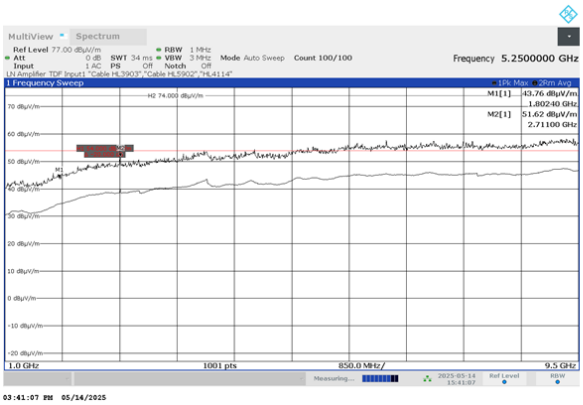
With filter HL 6252

Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

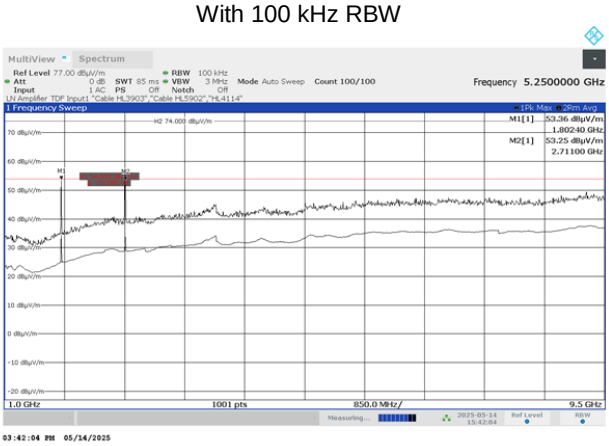
Plot 7.6.10 Radiated emission measurements from 1000 to 9500 MHz at the low carrier frequency

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





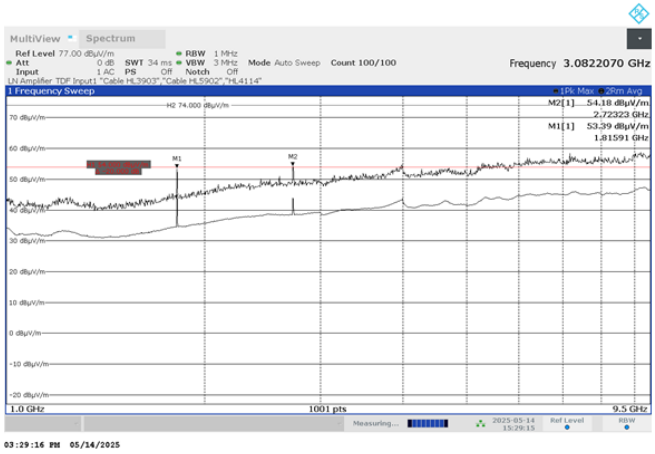
With filter HL 4339
With 100 kHz RBW



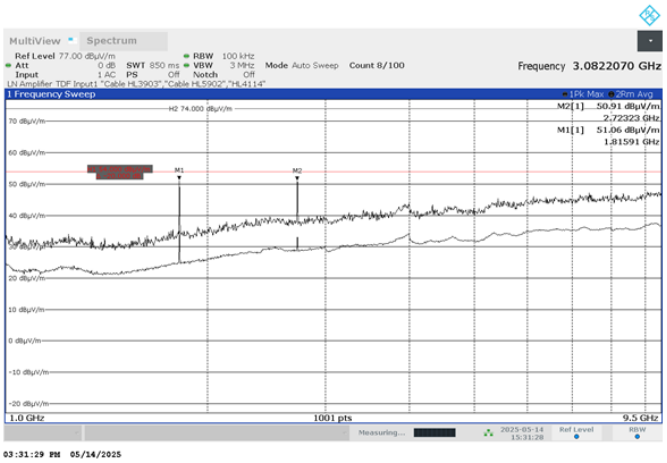
Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.11 Radiated emission measurements from 1000 to 9500 MHz at the mid carrier frequency

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



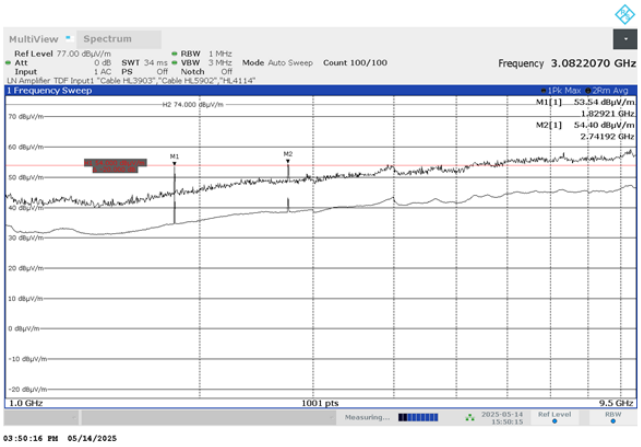
With filter HL 4339
With 100 kHz RBW



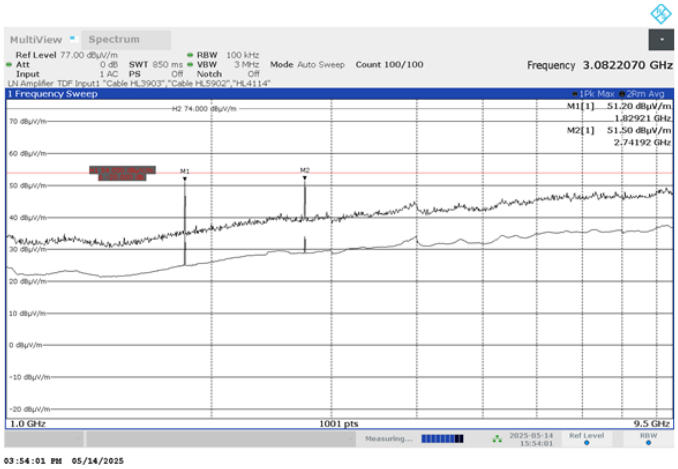
Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.12 Radiated emission measurements from 1000 to 9500 MHz at the high carrier frequency

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



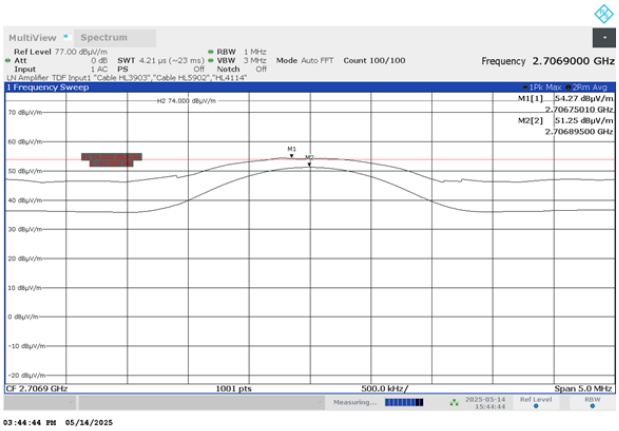
With filter HL 4339
With 100 kHz RBW



Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

Plot 7.6.13 Radiated emission measurements at the third harmonic of low carrier frequency

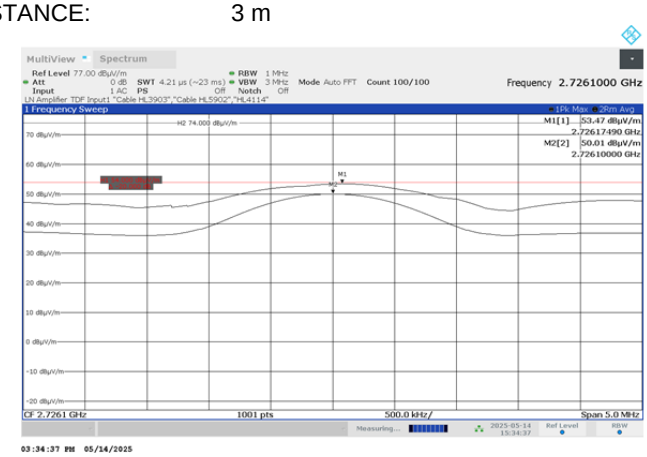
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(b), RSS-247 section 5.4(1), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1012 hPa	**Power:** 3.6 VDC
Remarks:			

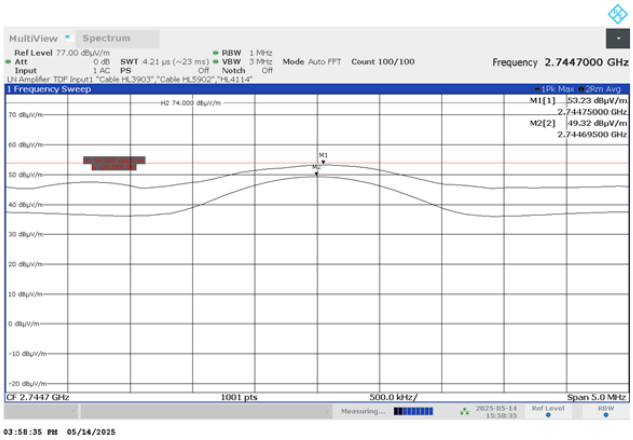
Plot 7.6.14 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



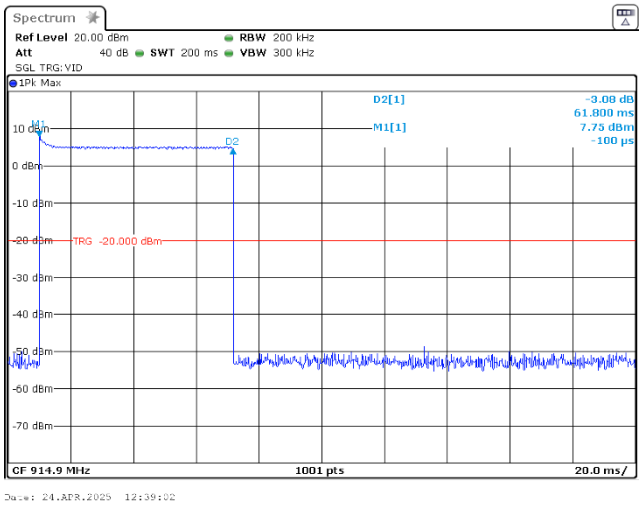
Plot 7.6.15 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(b), RSS-247 section 5.4(1), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1012 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.6.16 Transmission pulse duration



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):	22-Apr-25 - 24-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1003 hPa	Power: 3.6 VDC
Remarks:			

7.7 Band edge radiated emissions

7.7.1 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 7.7.1.

Table 7.7.1 Band edge emission limits

Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(µV/m)	
		Peak	Average
902.0 – 928.0	**20.0**	**74.0**	**54.0**
2400.0 – 2483.5			
5725.0 – 5850.0			

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

7.7.2 Test procedure

7.7.2.1 The EUT was set up as shown in **Error! Reference source not found.**, energized normally modulated at the m aximum data rate with its hopping function disabled and its proper operation was checked.

7.7.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

7.7.2.3 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.

7.7.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

7.7.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.7.2 and associated plots and referenced to the highest emission level measured within the authorized band.

7.7.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

7.7.2.7 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):	22-Apr-25 - 24-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1003 hPa	Power: 3.6 VDC
Remarks:			

Figure 7.7.1 Band edge emission test setup (hopping disables)

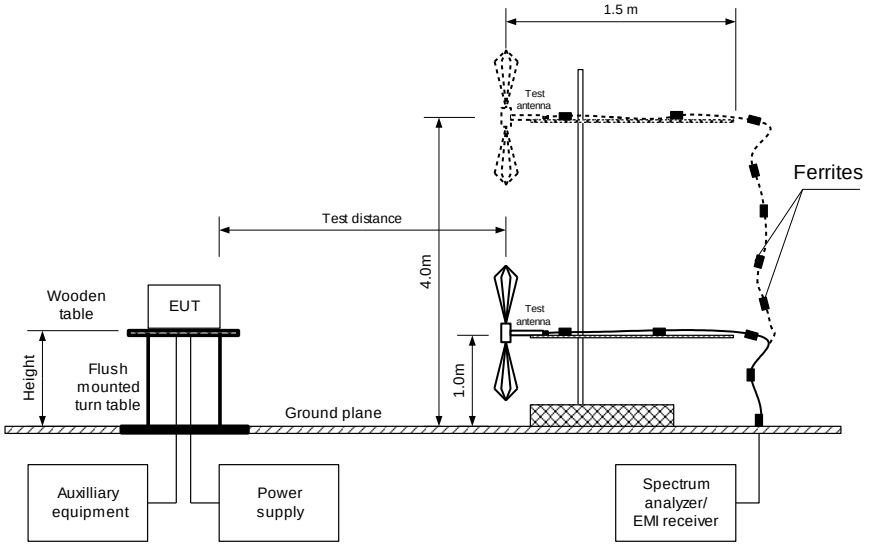
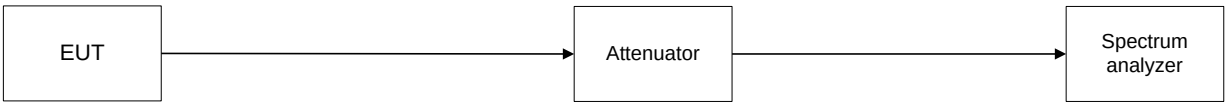


Figure 7.7.2 Band edge emission test setup (hopping enables)



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):	22-Apr-25 - 24-Apr-25		
Temperature: 24 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1003 hPa	**Power:** 3.6 VDC
Remarks:			

Table 7.7.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 902-928 MHz
DETECTOR USED: Peak
MODULATION: LoRa
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW

BIT RATE: 980 bps

Frequency, MHz	Band edge emission, dB(μV/m)	Emission at carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hopping disabled						
902.3	85.41	124.35	38.94	20.0	18.94	Pass
914.9	83.90	124.28	40.38		20.38	
Frequency, MHz	**Band edge emission, dBm**	**Emission at carrier, dBm**	**Attenuation below carrier, dBc**	**Limit, dBc**	**Margin, dB***	**Verdict**
Frequency hopping enabled						
902.3	-22.79	26.63	49.42	20.0	29.42	Pass
914.9	-31.79	26.91	58.70		38.70	

BIT RATE: 5470 bps

Frequency, MHz	Band edge emission, dB(μV/m)	Emission at carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Frequency hopping disabled						
902.3	84.97	124.91	39.94	20.0	19.94	Pass
914.9	83.56	124.55	40.99		20.99	
Frequency, MHz	**Band edge emission, dBm**	**Emission at carrier, dBm**	**Attenuation below carrier, dBc**	**Limit, dBc**	**Margin, dB***	**Verdict**
Frequency hopping enabled						
902.3	-25.42	26.82	52.24	20.0	32.24	Pass
914.9	-31.13	27.52	58.65		38.65	

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

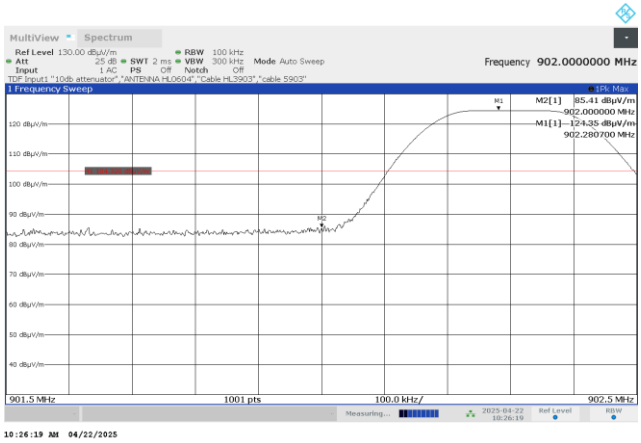
Reference numbers of test equipment used

HL 7585	HL 0604	HL 3903	HL 5903	HL 5611			

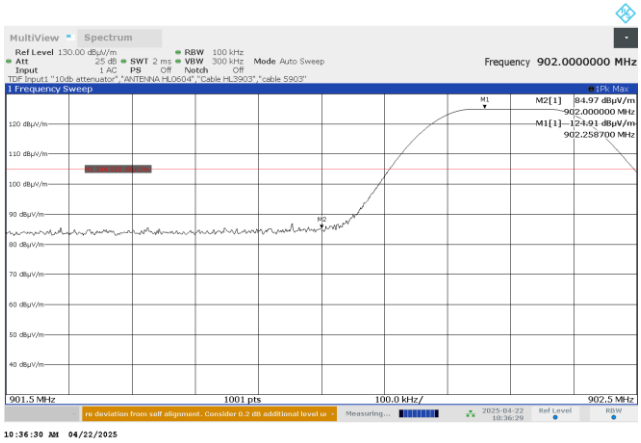
Full description is given in Appendix A.

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):	22-Apr-25 - 24-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1003 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.7.1 The highest band edge emission at low carrier frequency with hopping function disabled

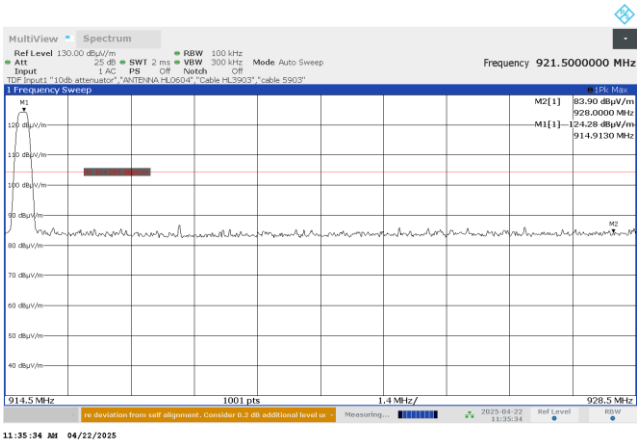


Bit rate 980 bps

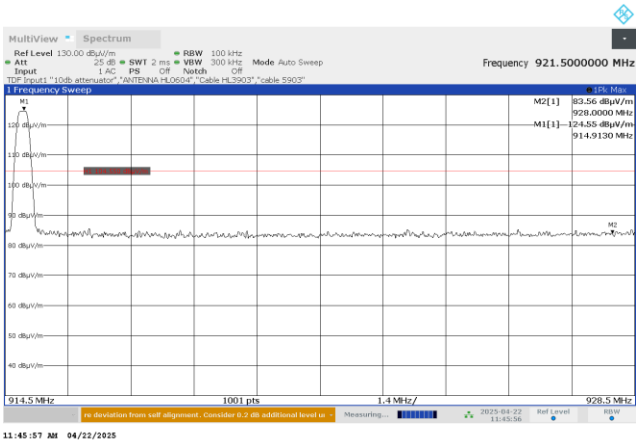


Bit rate 5470 bps

Plot 7.7.2 The highest band edge emission at high carrier frequency with hopping function disabled



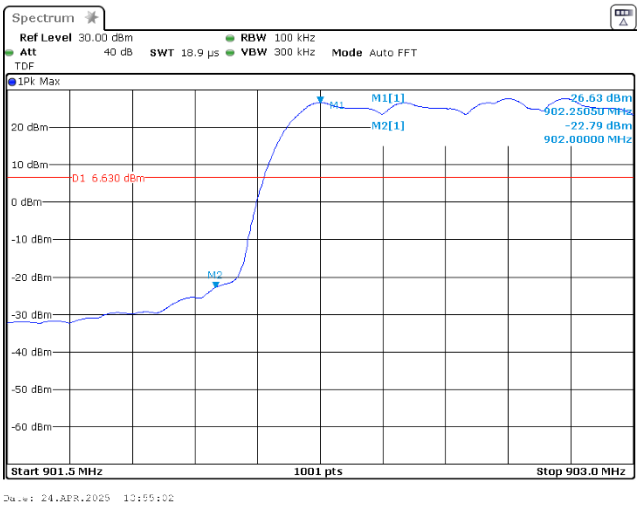
Bit rate 980bps



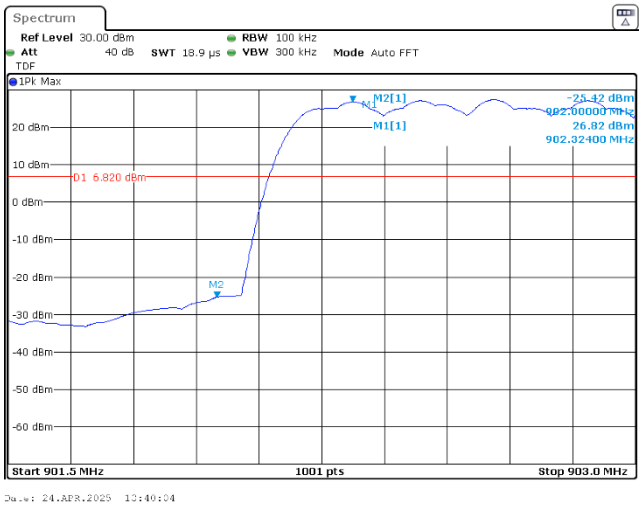
Bit rate 5470 bps

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):	22-Apr-25 - 24-Apr-25		
Temperature: 24 ºC	Relative Humidity: 51 %	Air Pressure: 1003 hPa	Power: 3.6 VDC
Remarks:			

Plot 7.7.3 The highest band edge emission at low carrier frequency with hopping function enabled

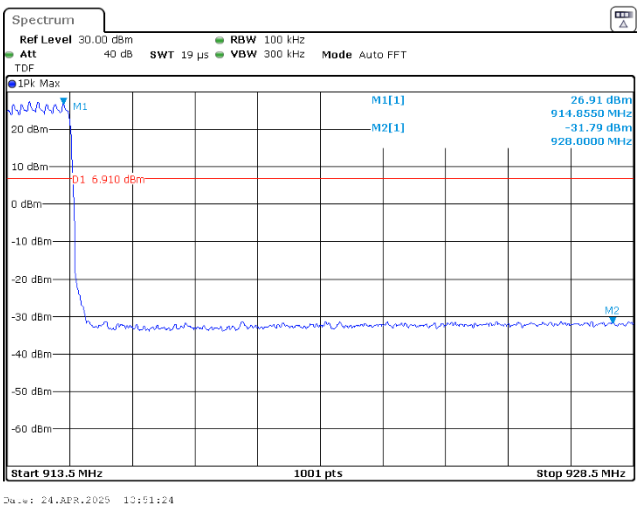


Bit rate 980bps

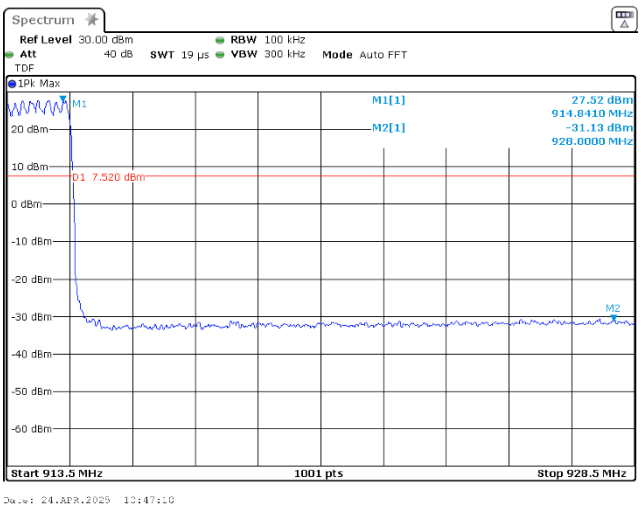


Bit rate 5470 bps

Plot 7.7.4 The highest band edge emission at high carrier frequency with hopping function enabled



Bit rate 980bps



Bit rate 5470 bps

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):	14-May-25		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1011 hPa	**Power:** 3.6 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. 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 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 – standard defined and test distance respectively in meters.

8.1.2 Test procedure

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

8.1.2.2 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. 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 photographs, 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):	14-May-25		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 1011 hPa	Power: 3.6 VDC
Remarks:			

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

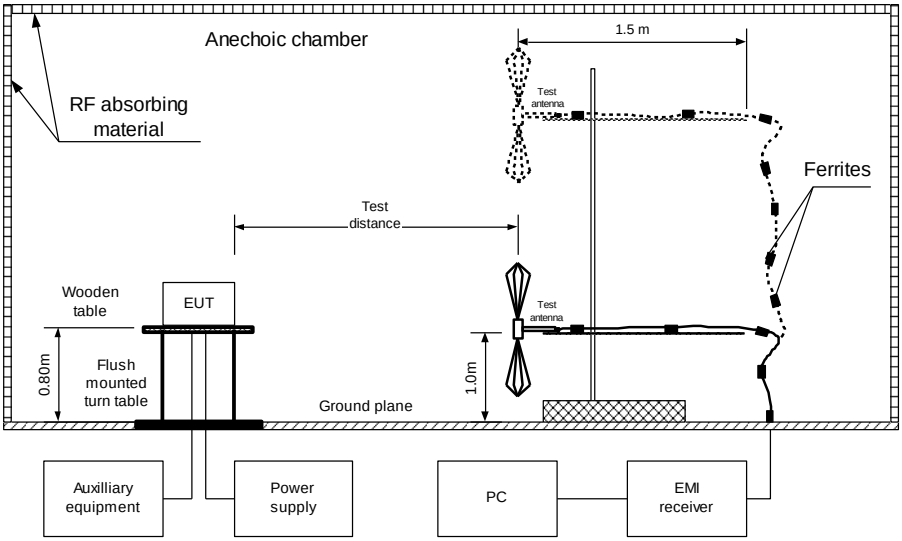
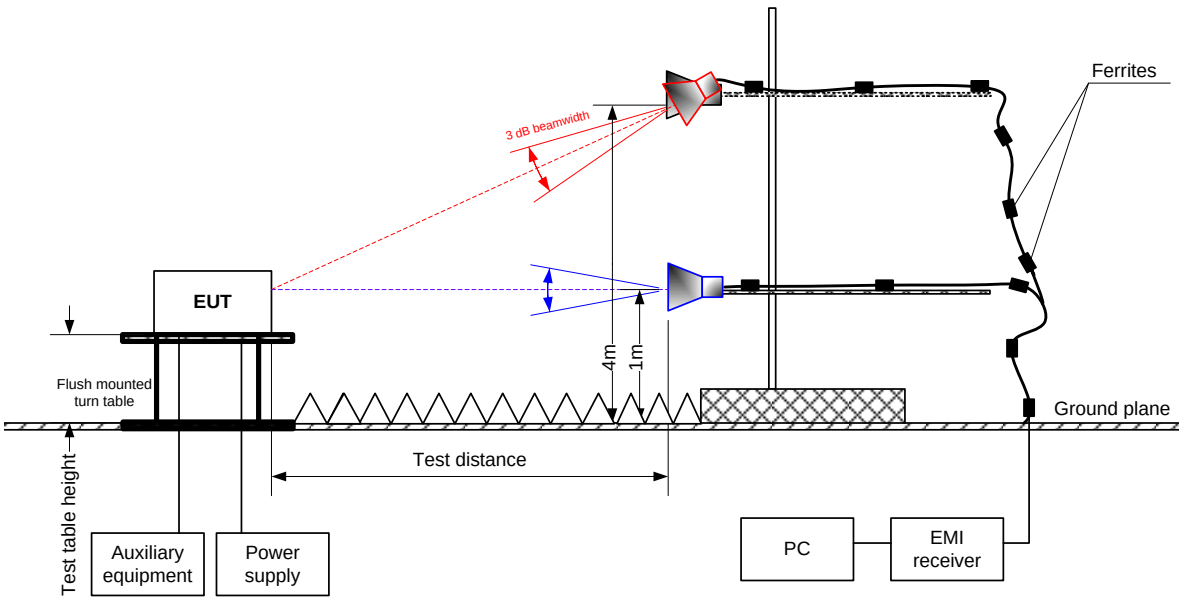


Figure 8.1.2 Setup for radiated emission measurements in semi anechoic chamber in 1000 – 40000 MHz range, table-top EUT



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):	14-May-25		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1011 hPa	**Power:** 3.6 VDC
Remarks:			

Table 8.1.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Stand-by
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*				
170.694	38.35	21.20	43.50	-22.30	Horizontal	1.22	45	Pass
180.744	39.48	22.57	43.50	-20.93	Horizontal	1.60	32	

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 12750 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polarization	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 detected										Pass

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

Reference numbers of test equipment used

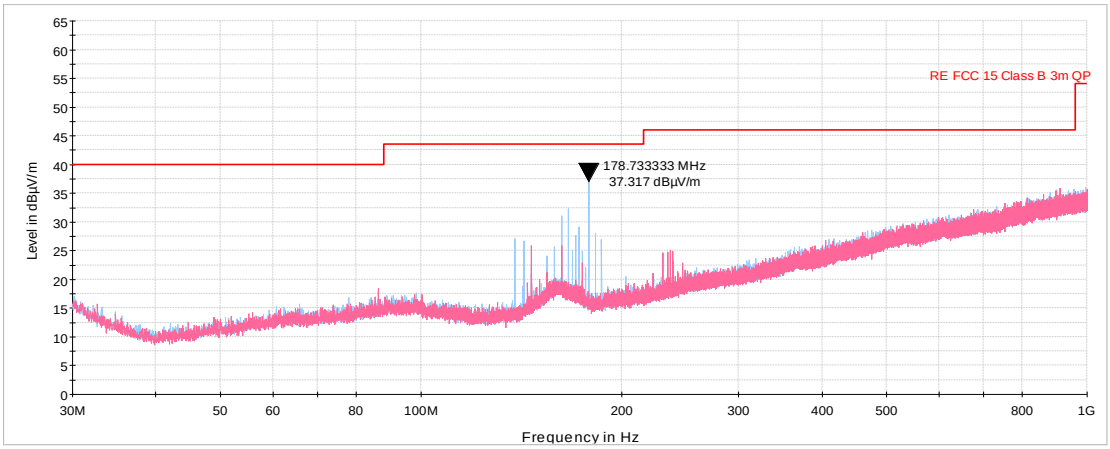
HL 3903	HL 4339	HL 4933	HL 5288	HL 5902	HL 7585		

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):	14-May-25		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 1011 hPa	Power: 3.6 VDC
Remarks:			

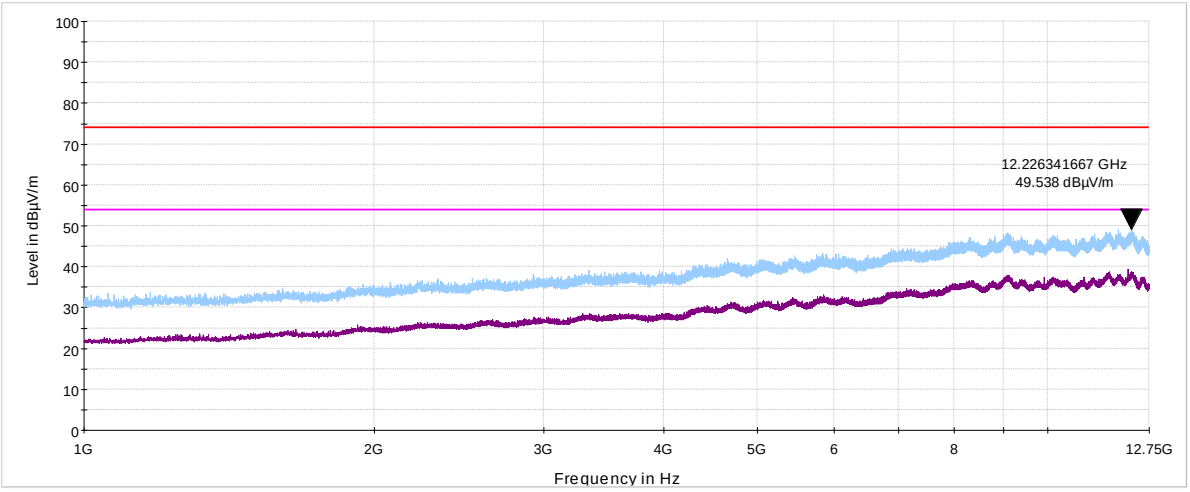
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical and horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by



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

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Stand-by



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	23-Aug-23	23-Aug-26
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	06-May-24	06-Jun-25
4135	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000136	20-May-24	20-May-25
4339	High pass Filter, 50 Ohm, 1000 to 18000 MHz, SMA-FM / SMA-M	Micro-Tronics	HPM50115-02	001	21-Jun-23	21-Jun-25
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	101630	19-Jun-24	19-Jun-25
4921	Low Pass Filter, 50 Ohm, DC to 630 MHz, SMA/M-SMA/F	Mini-Circuits	VLF-630+	NA	20-Jun-23	20-Jun-25
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	19-Feb-25	19-Feb-26
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	08-Apr-25	08-Apr-27
5601	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18000 MHz	Mini Circuits	BW-N10W5+	NA	14-Aug-24	14-Aug-25
5611	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini Circuits	BW-S10W5+	NA	06-Feb-25	06-Feb-26
5637	Cable, 50 Ohm, DC to 18 GHz, 1.8 m, SMA/SMA	Mini Circuits	CBL-6FT-SMSM+	NA	21-Apr-25	21-Apr-26
5673	Cable SF126EA/11N(x2)/2M, 18GHz	Huber-Suhner	SF126EA	506756/126EA	19-May-24	19-May-25
5902	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000	NA	17-Nov-24	17-Nov-25
5903	RF cable, 18 GHz, 6.0m, N-type	Huber-Suhner	SF126EA/11N/11N/6000	NA	06-Aug-24	06-Aug-25
6252	Tunable Bandreject Filter 800-1000 MHz	K&L Microwave Inc.	3TNF-800/1000-0.2-N/N	336	07-Nov-23	07-Jun-25
7585	EMI Test Receiver, 1 Hz to 44 GHz	Rohde & Schwarz	ESW44	103130	24-Sep-24	24-Sep-25

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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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

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