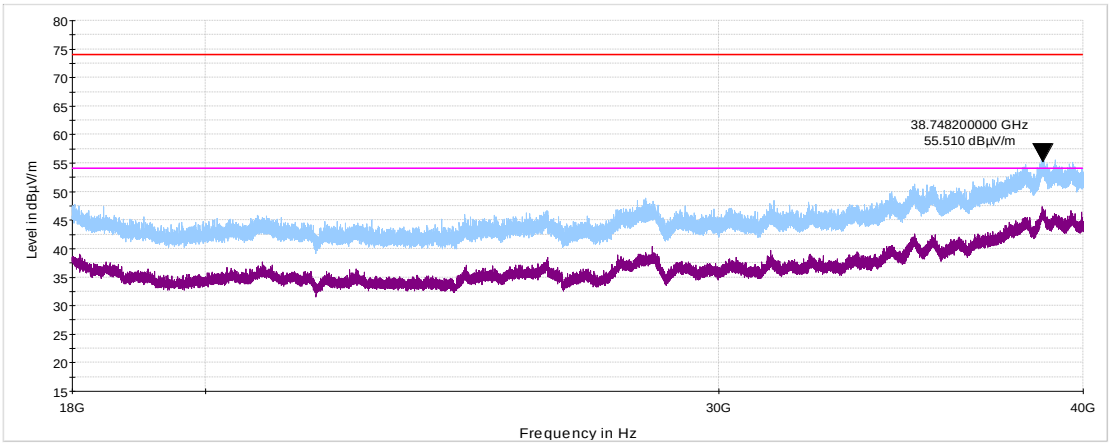
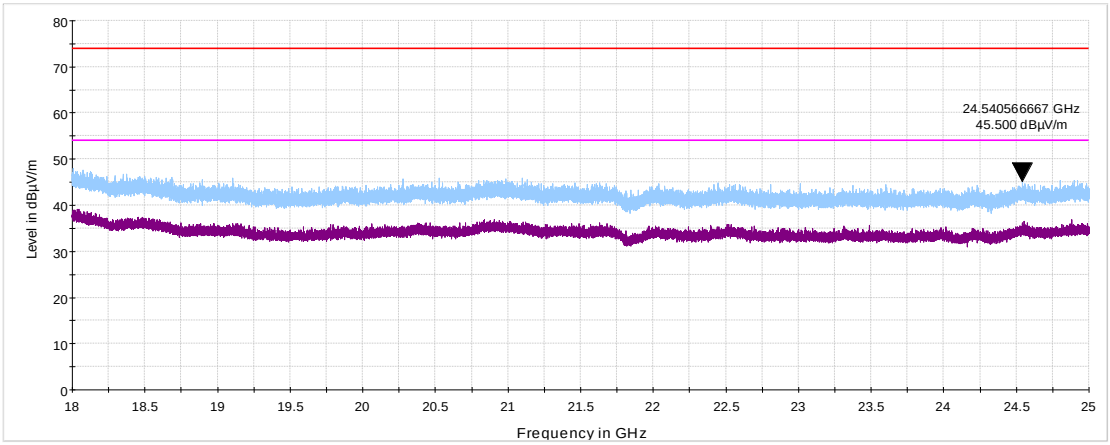
Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Nov-24 - 07-Nov-24		
Temperature: 24 ºC	Relative Humidity: 42 %	Air Pressure: 1016 hPa	Power: 120 VAC, 60 Hz
Remarks: WIFI			

Plot 7.3.20 Radiated emission measurements 18 to 40 GHz at the high carrier frequency

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



Plot 7.3.21 Radiated emission measurements 18 to 25 GHz at the high carrier frequency



Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Nov-24		
Temperature: 24 ºC	Relative Humidity: 42 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
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 Band edge emission test setup, energized normally modulated at the maximum data rate and its proper operation was checked.

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

7.4.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

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

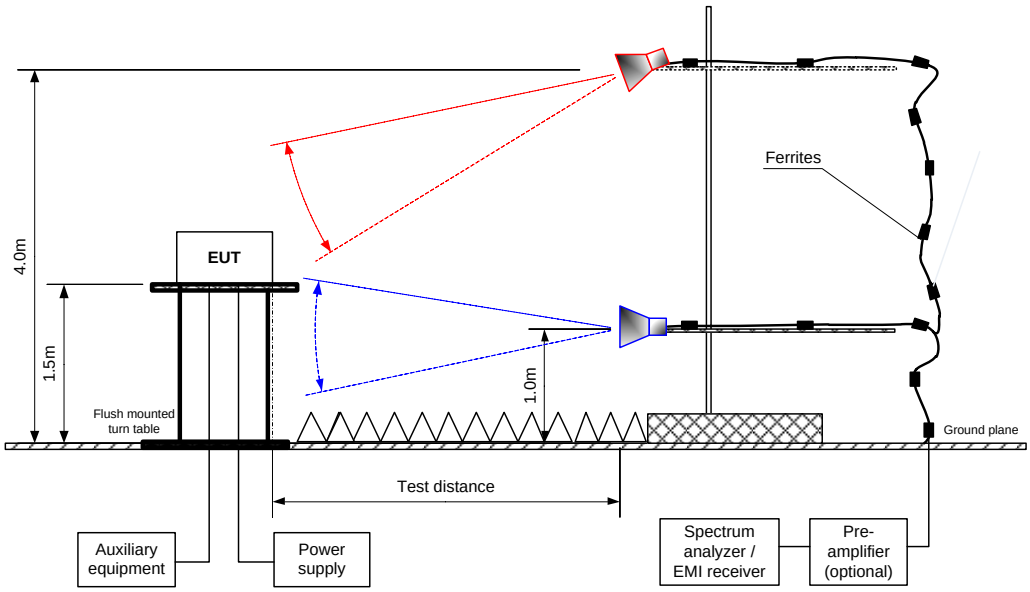
7.4.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.4.2 and Table 7.4.3 and associated plots and referenced to the highest emission level measured within the authorized band.

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

7.4.2.7 The above procedure was repeated with the frequency hopping function enabled.

Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Nov-24		
Temperature: 24 ºC	Relative Humidity: 42 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.4.1 Band edge emission test setup



Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Nov-24		
Temperature: 24 ºC	Relative Humidity: 42 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz
DETECTOR USED: Peak
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
VIDEO BANDWIDTH: ≥ RBW

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
BW=20 MHz CCK / 11Mbps						
2400.000	61.52	96.47	34.95	20.0	14.95	Pass
BW=20 MHz BPSK / 6 Mbps						
2400.000	63.48	98.42	34.94	20.0	14.94	Pass
BW=20 MHz 64QAM / 65 Mbps						
2400.000	65.05	97.48	32.43	20.0	12.43	Pass
BW=40 MHz 64QAM / 65 Mbps						
2400.000	55.11	93.82	38.71	20.0	18.71	Pass

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

Table 7.4.3 Band edge emission inside restricted bands test results

ASSIGNED FREQUENCY RANGE: 2400.0 – 2483.5 MHz
DETECTOR USED: Peak
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
VIDEO BANDWIDTH: ≥ RBW

Frequency, MHz	Peak field strength			Average field strength			Verdict
	Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	
BW=20 MHz CCK / 11Mbps							
2390.0	58.10	74	-15.9	46.71	54	-7.29	Pass
2483.5	59.66	74	-14.34	43.65	54	-10.35	Pass
BW=20 MHz BPSK / 6 Mbps							
2390.0	60.41	74	-13.59	47.58	54	-6.42	Pass
2483.5	68.27	74	-5.73	50.3	54	-3.7	Pass
BW=20 MHz 64QAM / 65 Mbps							
2390.0	59.18	74	-14.82	47.69	54	-6.31	Pass
2483.5	62.09	74	-11.91	45.49	54	-8.51	Pass
BW=40 MHz 64QAM / 65 Mbps							
2390.0	62.83	74	-11.17	47.45	54	-6.55	Pass
2483.5	57.94	74	-16.06	47.59	54	-6.41	Pass

Reference numbers of test equipment used

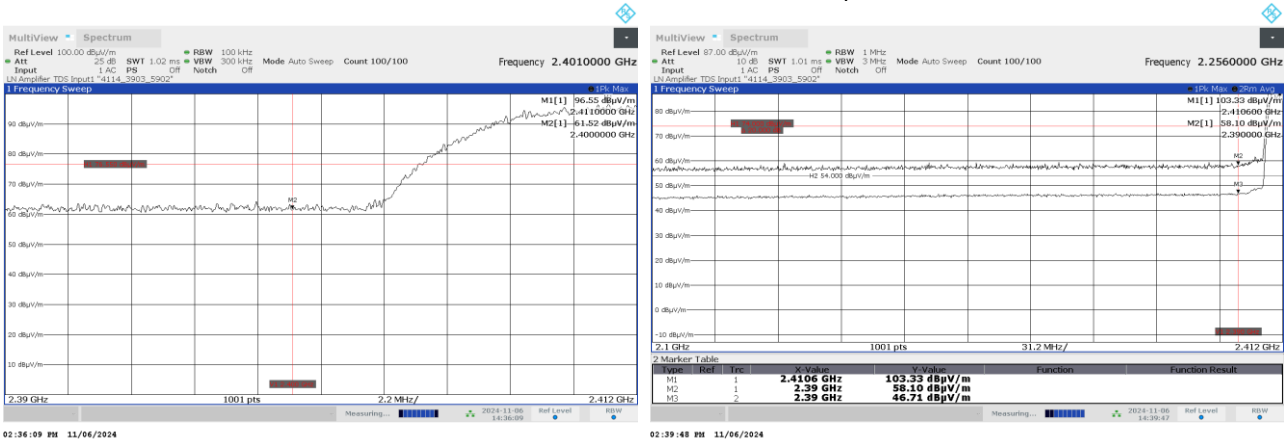
HL 3903	HL 4933	HL 5902	HL 7585	HL 3440			

Full description is given in Appendix A.

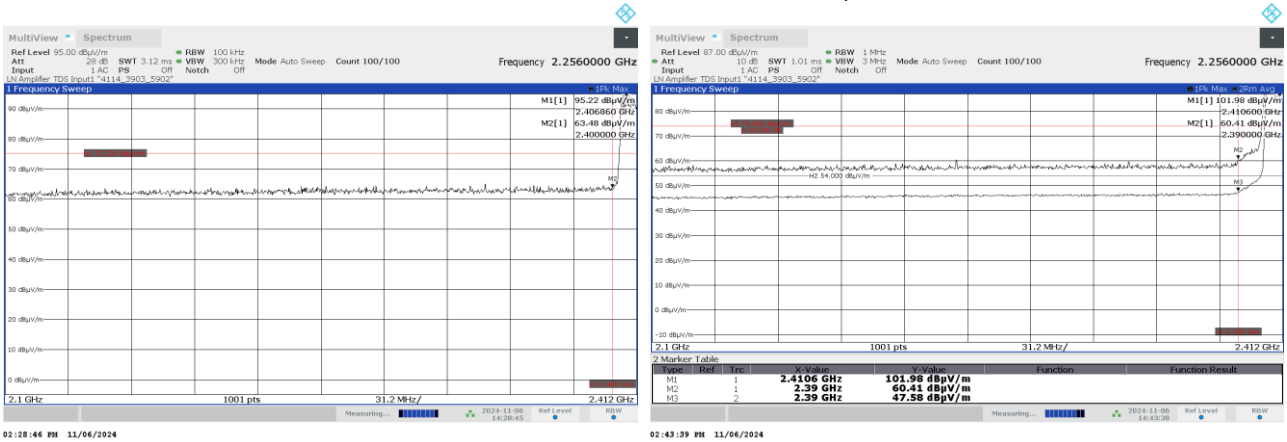
Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Band edge emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 42 %	**Air Pressure:** 1003 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

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

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

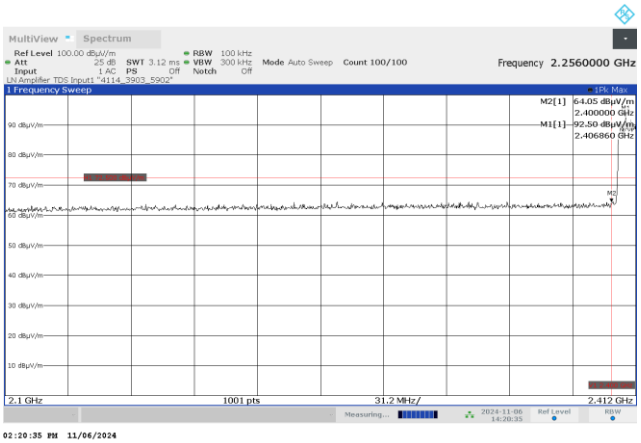


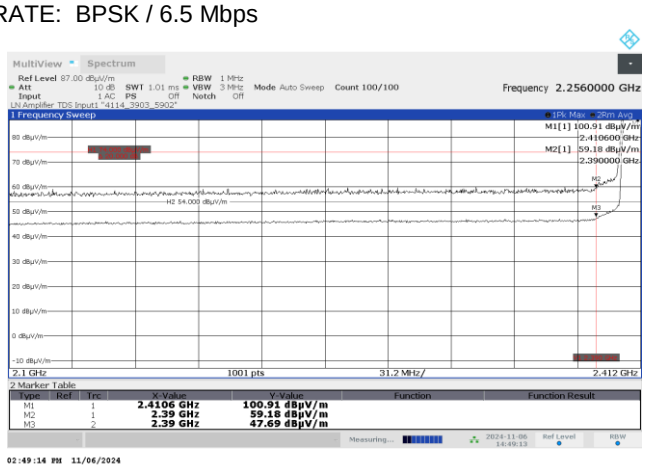
CHANNEL BANDWIDTH: 20MHz
MODULATION/BITRATE: BPSK / 6 Mbps



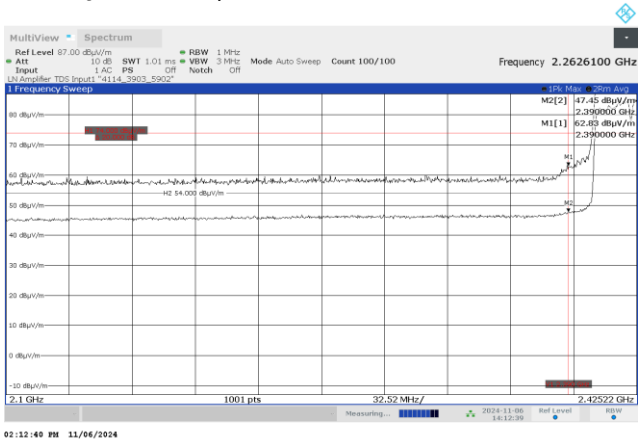
Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Band edge emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 42 %	**Air Pressure:** 1003 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

CHANNEL BANDWIDTH: 20MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps





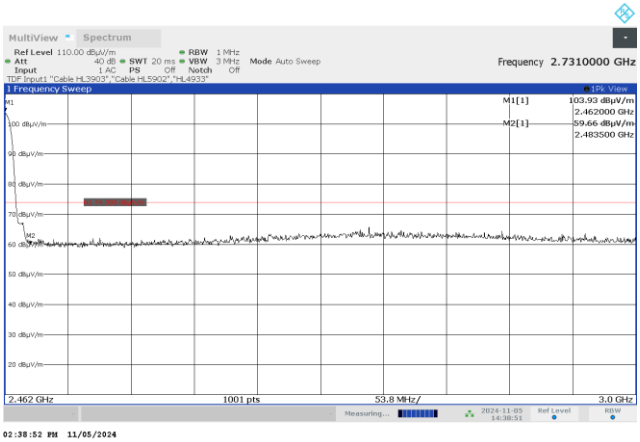
CHANNEL BANDWIDTH: 40MHz
MODULATION/BITRATE: 64-QAM / 65 Mbps



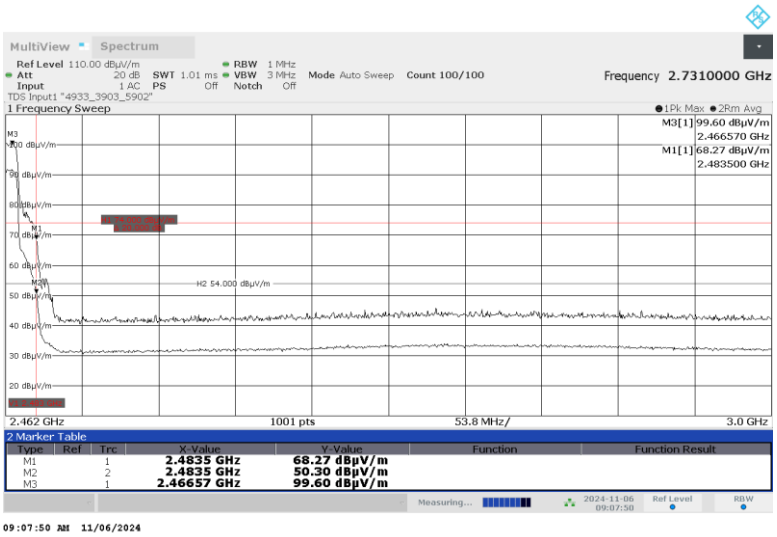
Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Nov-24		
Temperature: 24 ºC	Relative Humidity: 42 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.4.2 The highest emission level within the assigned band at high carrier frequency

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

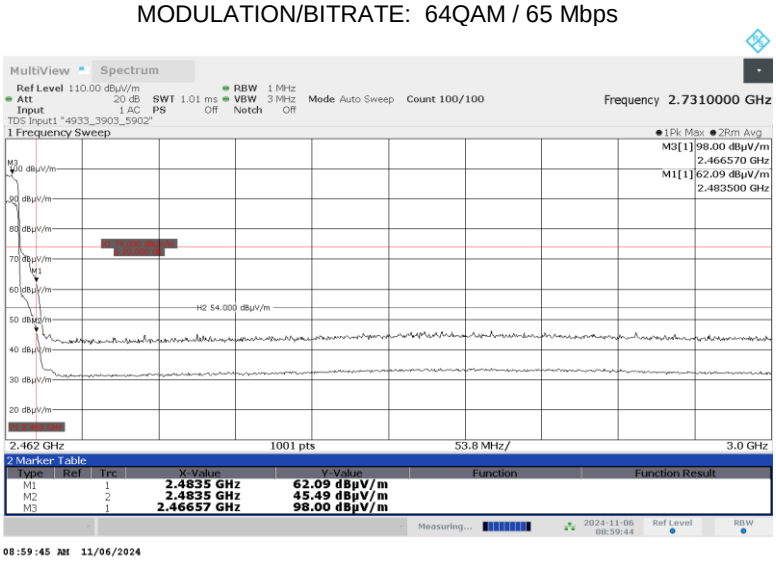


CHANNEL BANDWIDTH: 20MHz
MODULATION/BITRATE: BPSK / 6 Mbps

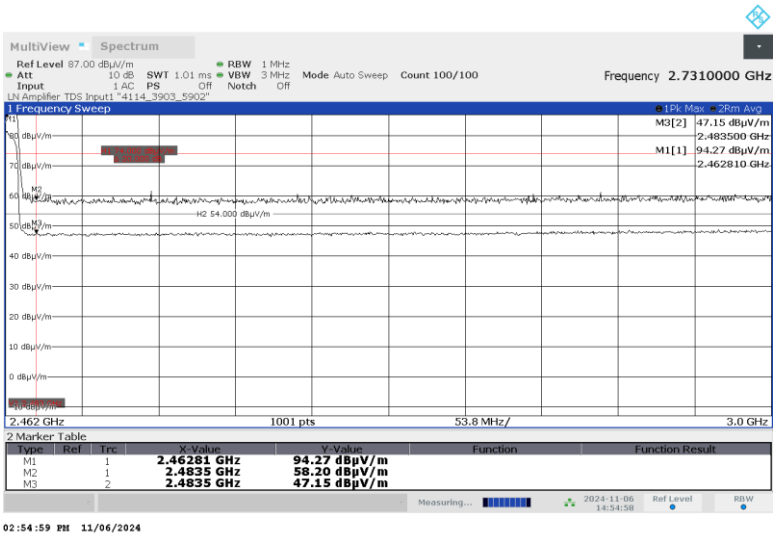


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Band edge emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Nov-24		
Temperature: 24 ºC	Relative Humidity: 42 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
Remarks:			

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



CHANNEL BANDWIDTH: 40MHz
MODULATION/BITRATE: 64-QAM / 65 Mbps



Test specification:	**Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density**		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 56 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 60 Hz
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 Peak spectral power density limit @ 3m, dB(μV/m)*
2400.0 – 2483.5	**3.0**	**8.0**	**103.2**

* - Equivalent Peak spectral power density limit was calculated from the peak spectral power density as follows: E=sqrt(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 Peak spectral power density measurements

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

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

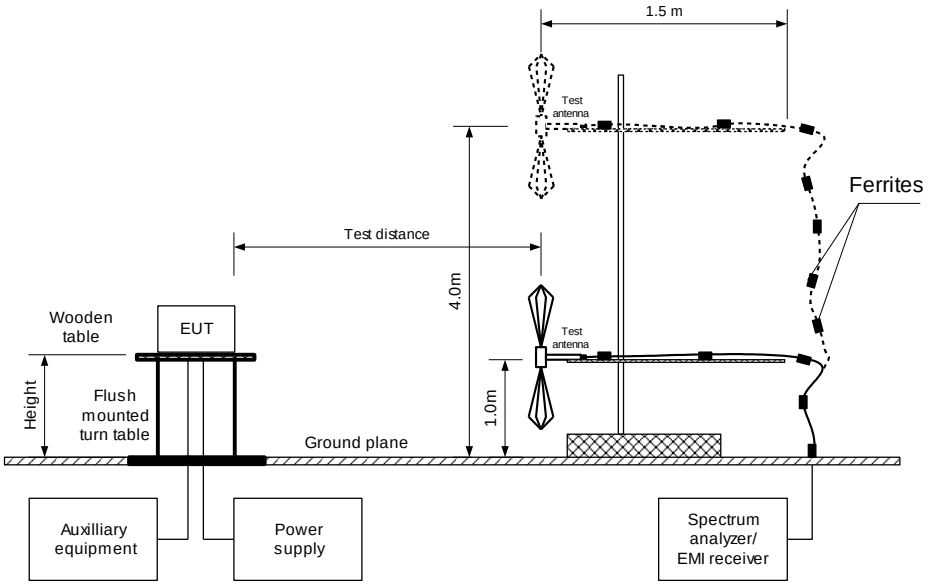
7.5.2.3 The Peak spectral power density of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

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 7.5.1 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):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.5.1 Setup for carrier Peak spectral power density 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):	10-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 56 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.5.2 Field strength measurement of peak spectral power density

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

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: DBPSK / 1 Mbps

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412	95.96	2.5	103.2	-7.24	Horizontal	1.5	-48	Pass
2437	95.36	2.5	103.2	-7.84	Horizontal	1.5	-60	Pass
2462	95.36	2.5	103.2	-7.84	Horizontal	1.5	-51	Pass

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

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412	96.47	2.5	103.2	-6.73	Horizontal	1.5	-40	Pass
2437	96.28	2.5	103.2	-6.92	Horizontal	1.5	-50	Pass
2462	97.02	2.5	103.2	-6.18	Horizontal	1.5	-50	Pass

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

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	98.42	2.5	103.2	-4.78	Horizontal	1.5	-45	Pass
2442.0	98.36	2.5	103.2	-4.84	Horizontal	1.5	-48	Pass
2462.0	93.43	2.5	103.2	-9.77	Horizontal	1.5	-50	Pass

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	98.15	2.5	103.2	-5.05	Horizontal	1.5	-50	Pass
2442.0	98.55	2.5	103.2	-4.65	Horizontal	1.5	-50	Pass
2462.0	92.89	2.5	103.2	-10.31	Horizontal	1.5	-57	Pass

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):	10-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 56 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.5.3 Field strength measurement of peak spectral power density (continuation)

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

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

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	97.84	2.5	103.2	-5.36	Horizontal	1.5	-44	Pass
2442.0	98.25	2.5	103.2	-4.95	Horizontal	1.5	-60	Pass
2462.0	92.25	2.5	103.2	-10.95	Horizontal	1.5	-56	Pass

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

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2412.0	97.48	2.5	103.2	-5.05	Horizontal	1.5	-50	Pass
2442.0	98.10	2.5	103.2	-4.65	Horizontal	1.5	-50	Pass
2462.0	92.01	2.5	103.2	-10.31	Horizontal	1.5	-57	Pass

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2422.0	95.37	2.5	103.2	-7.83	Horizontal	1.5	-40	Pass
2437.0	90.25	2.5	103.2	-12.95	Horizontal	1.5	-38	Pass
2452.0	88.26	2.5	103.2	-14.94	Horizontal	1.5	-50	Pass

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: 64-QAM 65 Mbps

Frequency, MHz	Peak spectral power density, dB(µV/m)	EUT antenna gain, dBi	Limit, dB(µV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
2422.0	93.82	2.5	103.2	-9.38	Horizontal	1.5	-40	Pass
2437.0	90.25	2.5	103.2	-12.95	Horizontal	1.5	-40	Pass
2452.0	88.44	2.5	103.2	-14.76	Horizontal	1.5	-50	Pass

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

Reference numbers of test equipment used

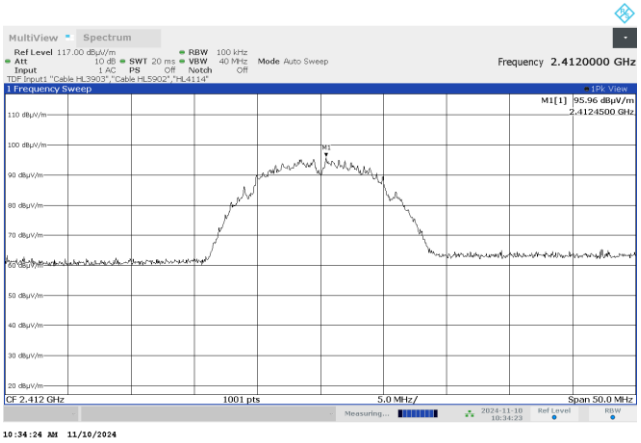
HL 3903	HL 4933	HL 3440	HL 5902	HL 7585			

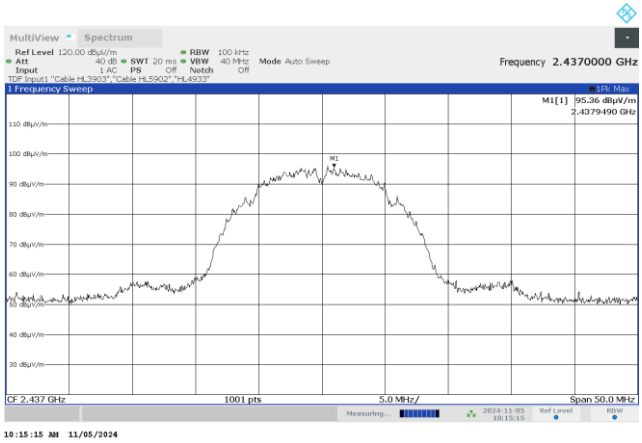
Full description is given in Appendix A.

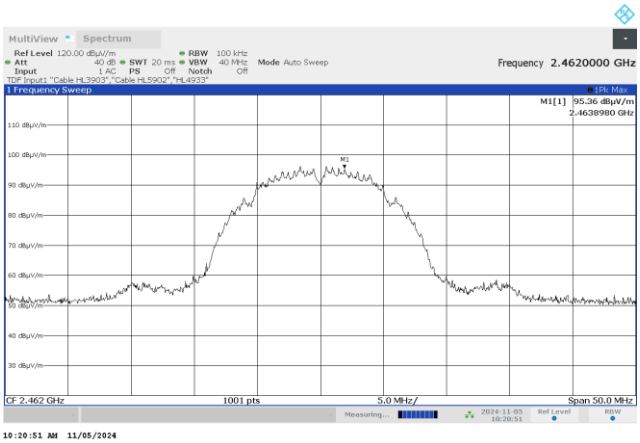
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.1 Peak spectral power density of carrier at low / mid /high frequency

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: DBPSK /1 Mbps



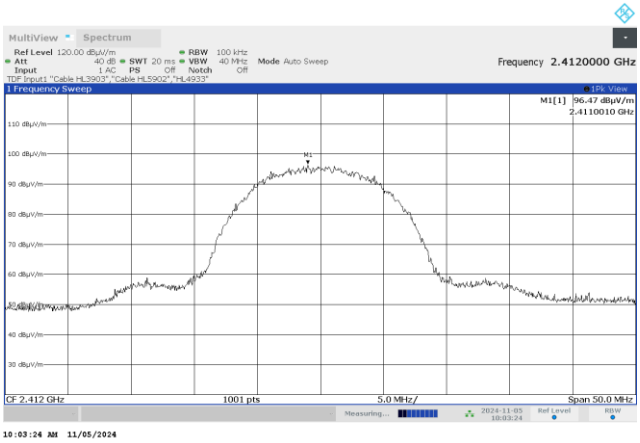


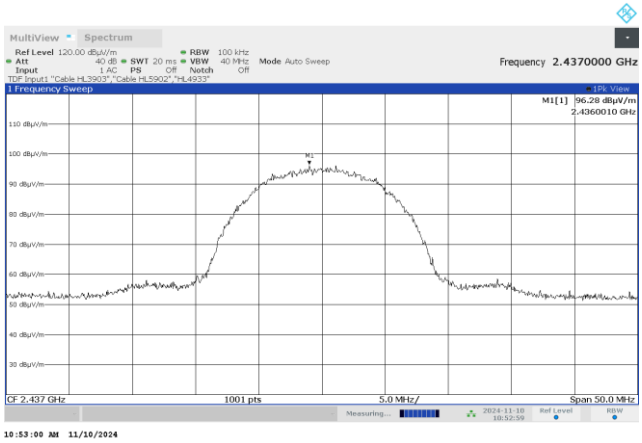


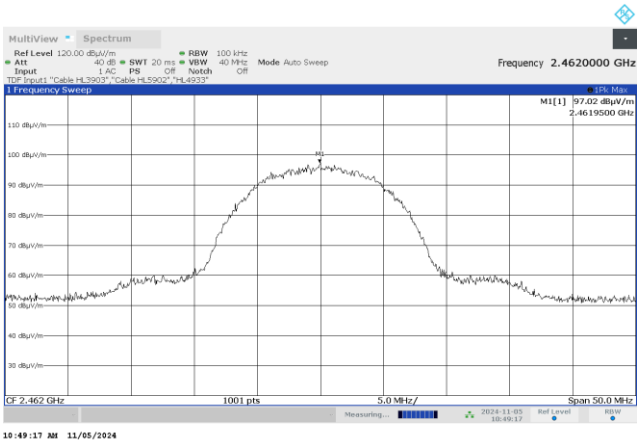
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.2 Peak spectral power density of carrier at low / mid /high frequency

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



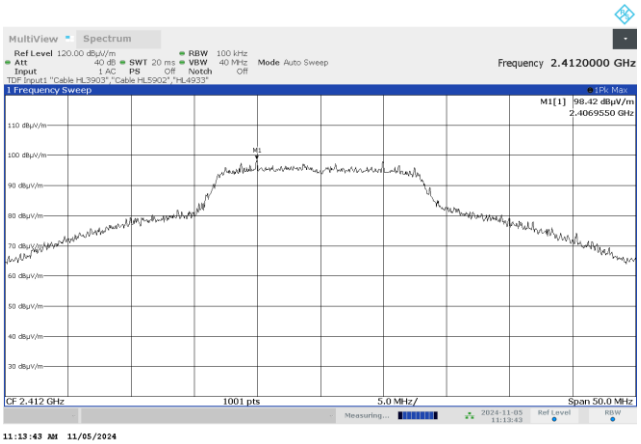


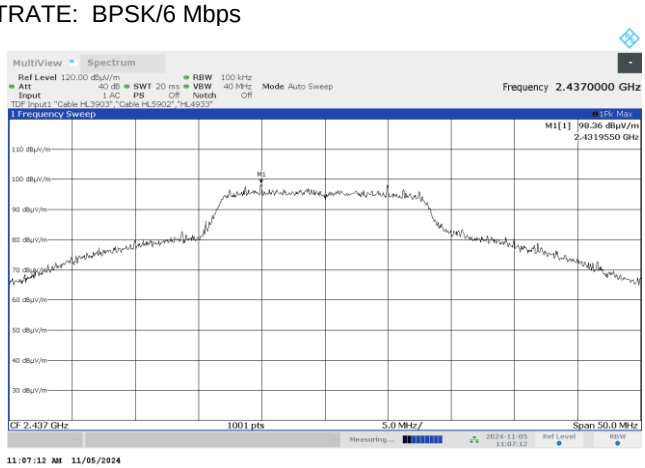


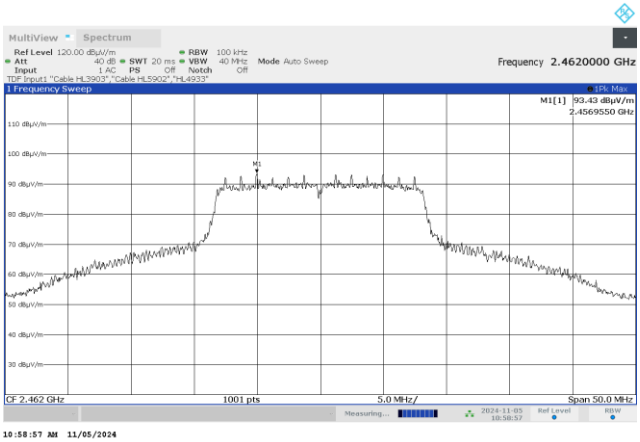
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.3 Peak spectral power density of carrier at low / mid /high frequency

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



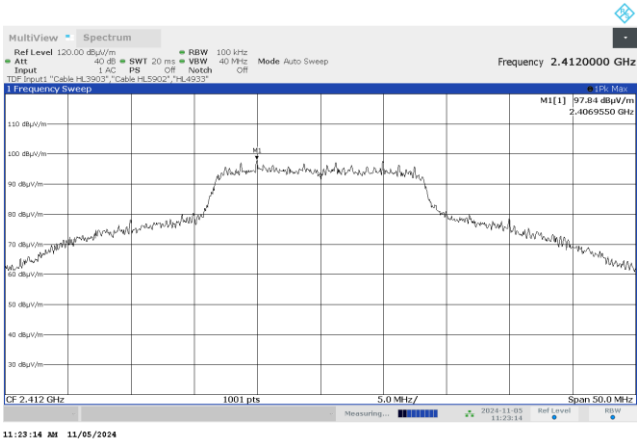


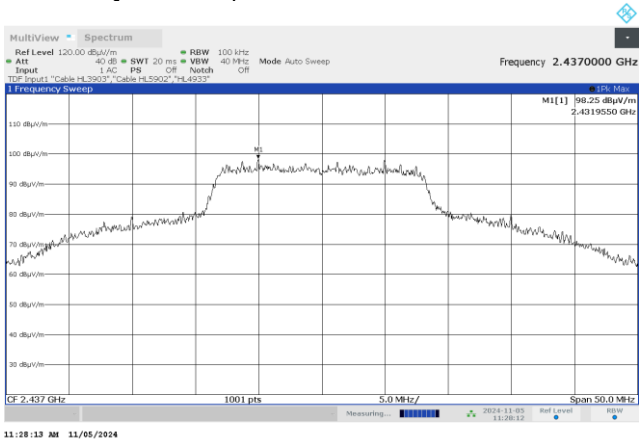


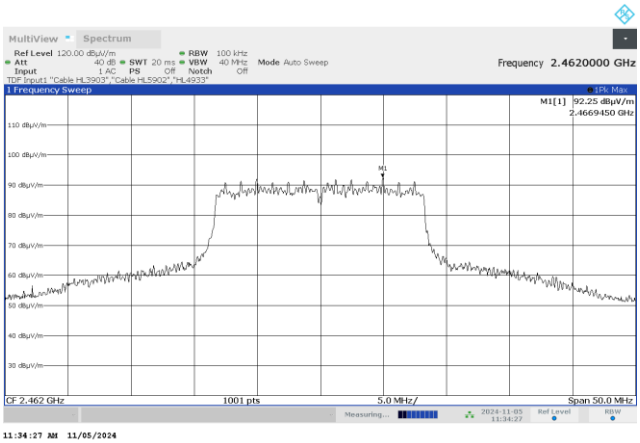
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.4 Peak spectral power density of carrier at low / mid /high frequency

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



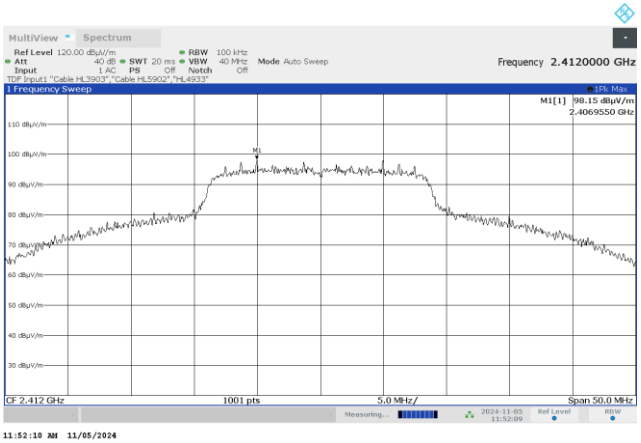


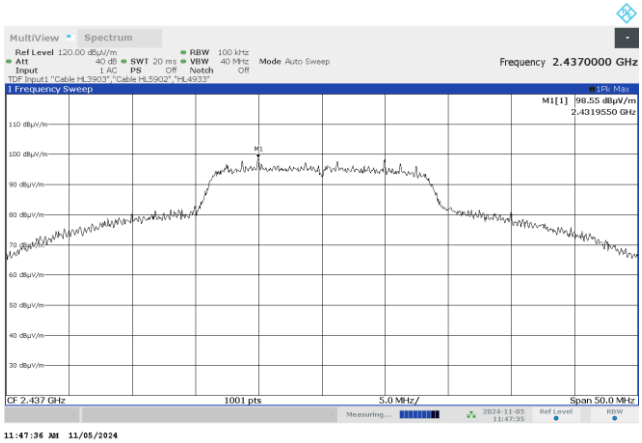


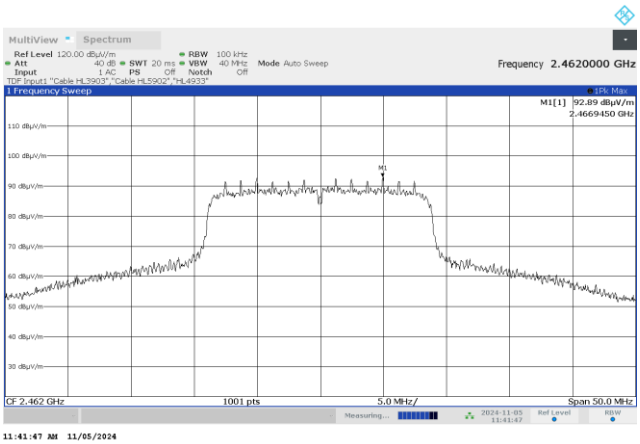
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.5 Peak spectral power density of carrier at low / mid /high frequency

CHANNEL BANDWIDTH: 20 MHz
MODULATION/BITRATE: BPSK/6.5 Mbps



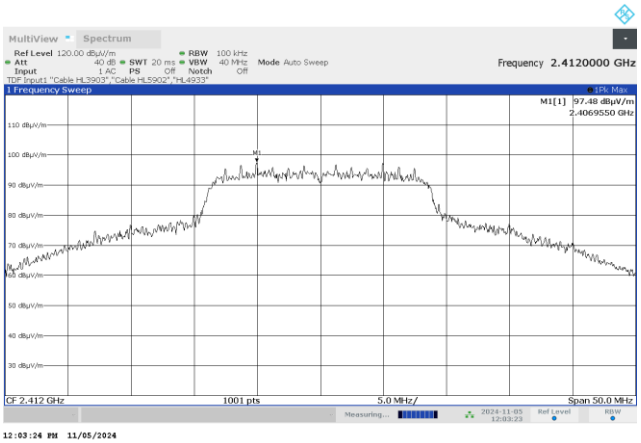


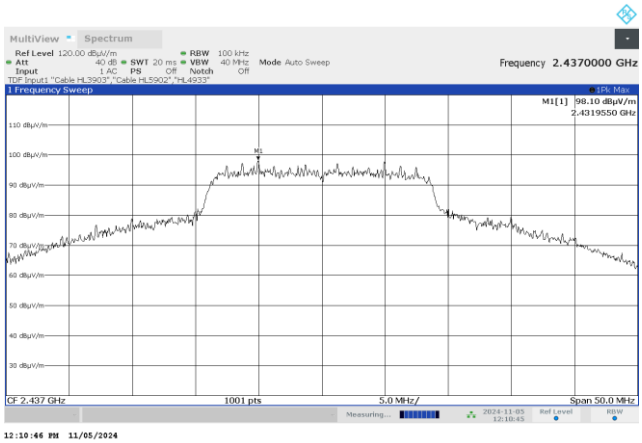


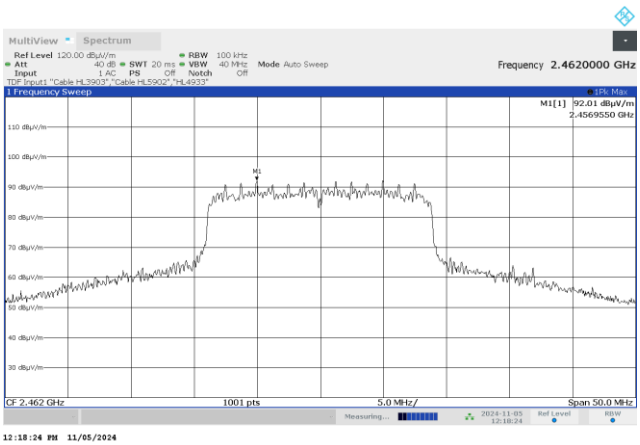
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.6 Peak spectral power density of carrier at low / mid /high frequency

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



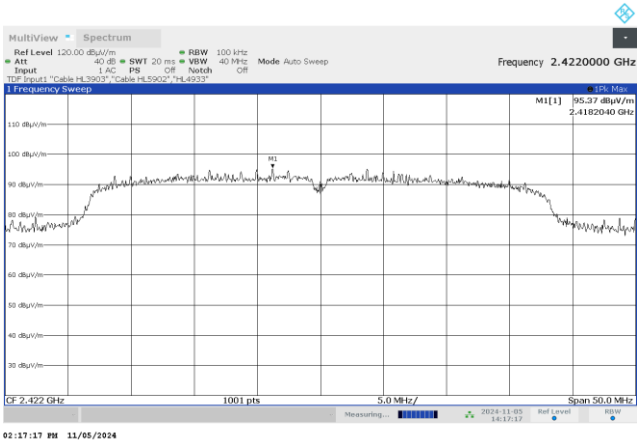


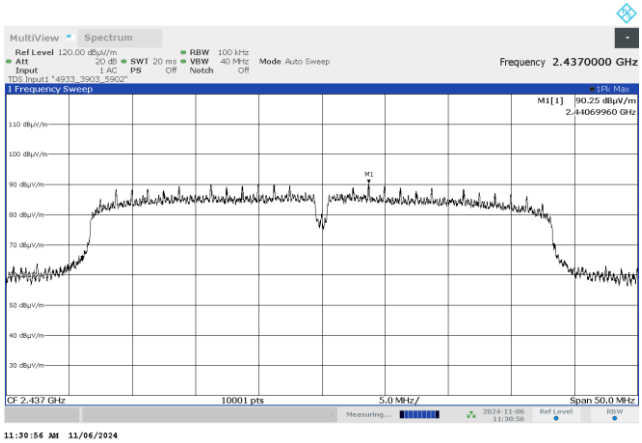


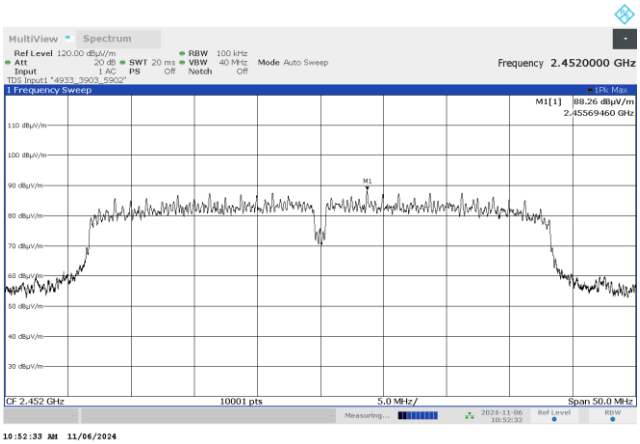
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.7 Peak spectral power density of carrier at low / mid /high frequency

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: BPSK / 6.5 Mbps



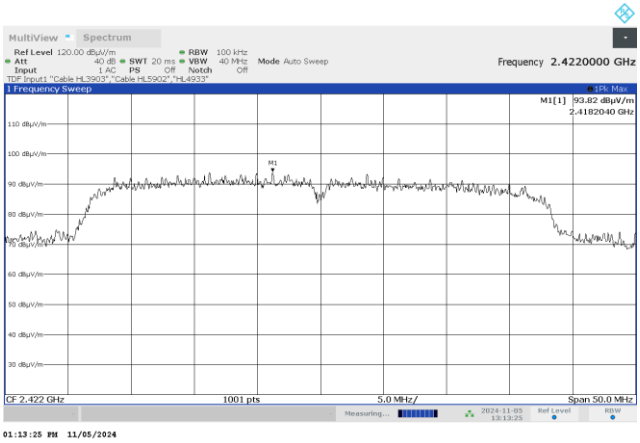


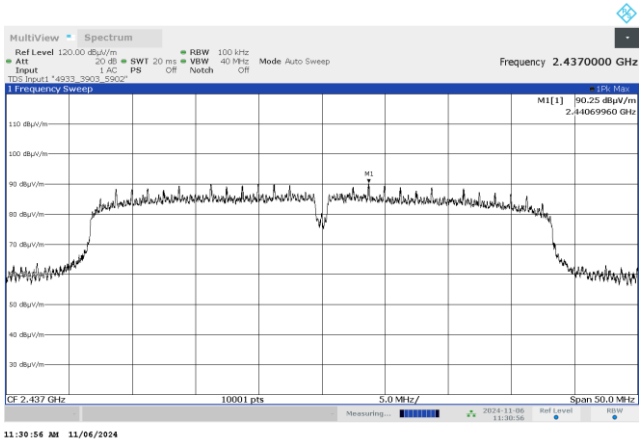


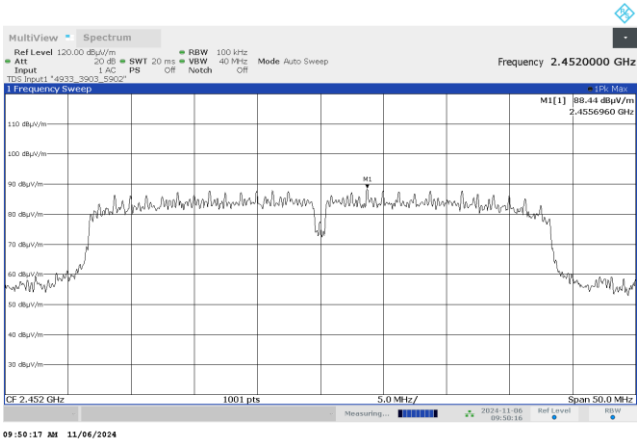
Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.8 Peak spectral power density of carrier at low / mid /high frequency

CHANNEL BANDWIDTH: 40 MHz
MODULATION/BITRATE: 64QAM / 65 Mbps







Test specification:	Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.6 Conducted emissions

7.6.1 General

This test was performed to measure the common mode conducted emissions at the EUT power port. The specification test limits are given in Table 7.6.1.

Table 7.6.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μV)		Class A limit, dB(μV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

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

7.6.2 Test procedure

7.6.2.1 The EUT was set up as shown in Figure 7.6.1 and the associated photographs, energized and the EUT performance was checked.

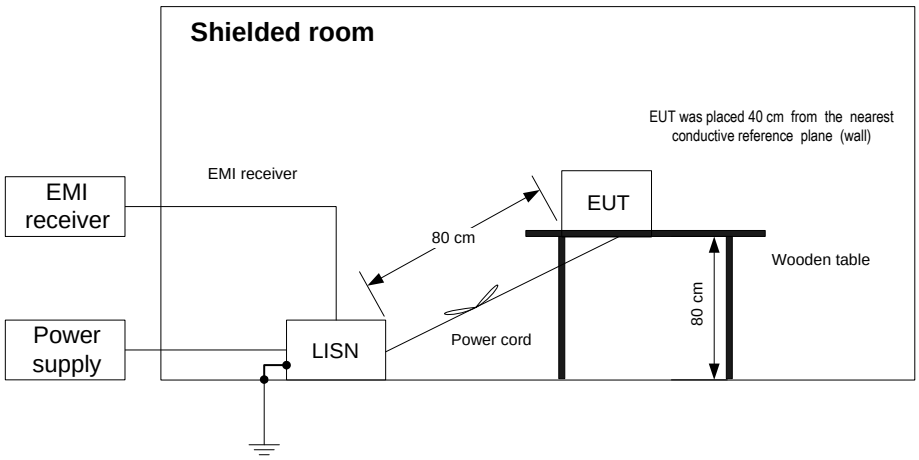
7.6.2.2 The measurements were performed at the EUT power terminals with the LISN connected to the EMI receiver in the frequency range referred to in Table 7.6.2. The unused coaxial connector of the LISN was terminated with 50 Ohm.

7.6.2.3 The position of the EUT cables was varied to find the highest emission.

7.6.2.4 The worst test results with respect to the limits were recorded in Table 7.6.2 and shown in the associated plots.

Test specification:	Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.6.1 Setup for conducted emission measurements, table-top EUT



Photograph 7.6.1 Setup for conducted emission measurements

Test specification:	**Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 56 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.6.2 Conducted emission test results

LINE: AC mains
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.444	NA	38.40	56.98	-18.58	30.46	46.98	-16.52	L1	Pass
0.446	NA	39.30	56.94	-17.64	31.42	46.94	-15.52		
0.449	NA	40.28	56.90	-16.62	32.43	46.90	-14.47		
0.451	NA	41.16	56.86	-15.70	33.34	46.86	-13.52		
0.453	NA	41.86	56.83	-14.97	34.02	46.83	-12.81		
0.455	NA	42.24	56.79	-14.55	34.40	46.79	-12.39		
0.451	NA	42.14	56.86	-14.72	34.80	46.86	-12.06	L2	Pass
0.453	NA	42.88	56.83	-13.95	35.50	46.83	-11.33		
0.455	NA	43.33	56.79	-13.46	35.88	46.79	-10.91		
0.457	NA	43.32	56.75	-13.43	35.86	46.75	-10.89		
0.459	NA	42.88	56.72	-13.84	35.41	46.72	-11.31		
0.461	NA	42.03	56.68	-14.65	34.54	46.68	-12.14		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

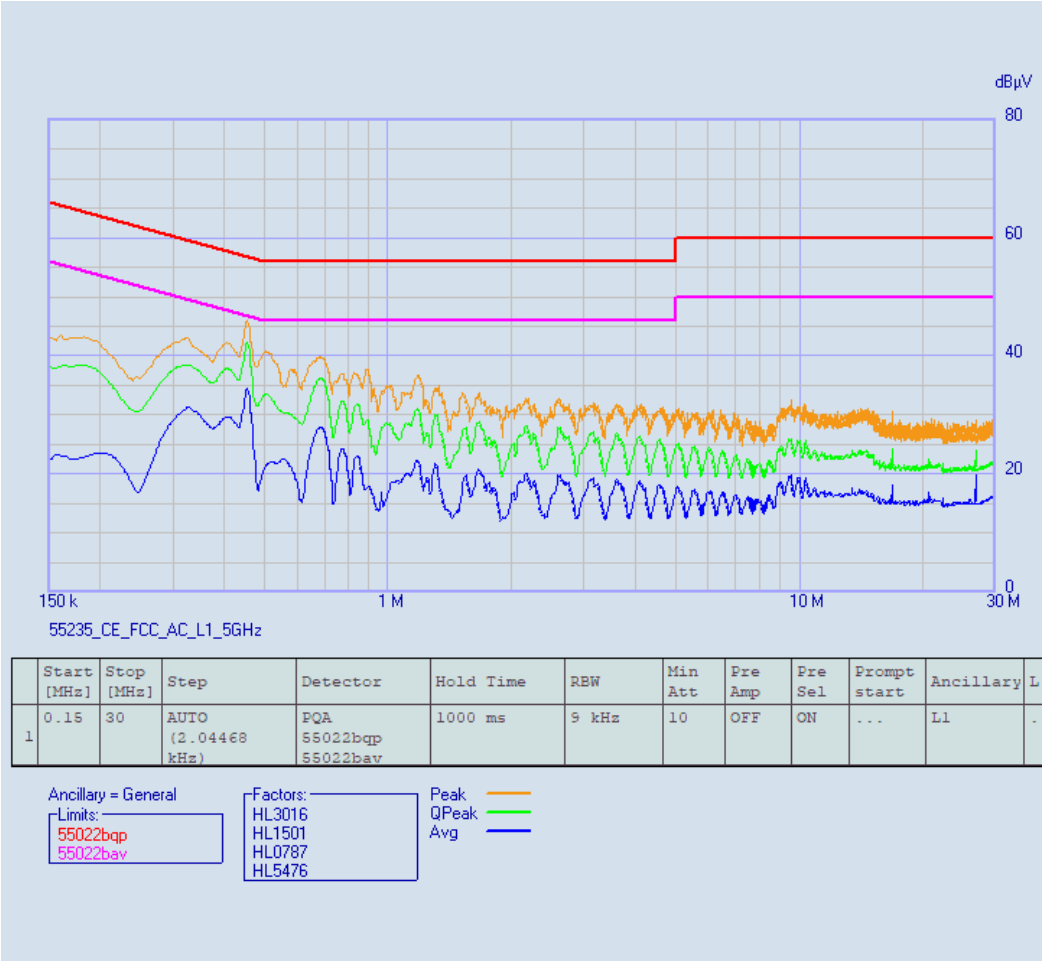
HL 0787	HL 1501	HL 3016	HL 5476	HL 5707			

Full description is given in Appendix A.

Test specification:	**Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 56 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Plot 7.6.1 Conducted emission measurements

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK

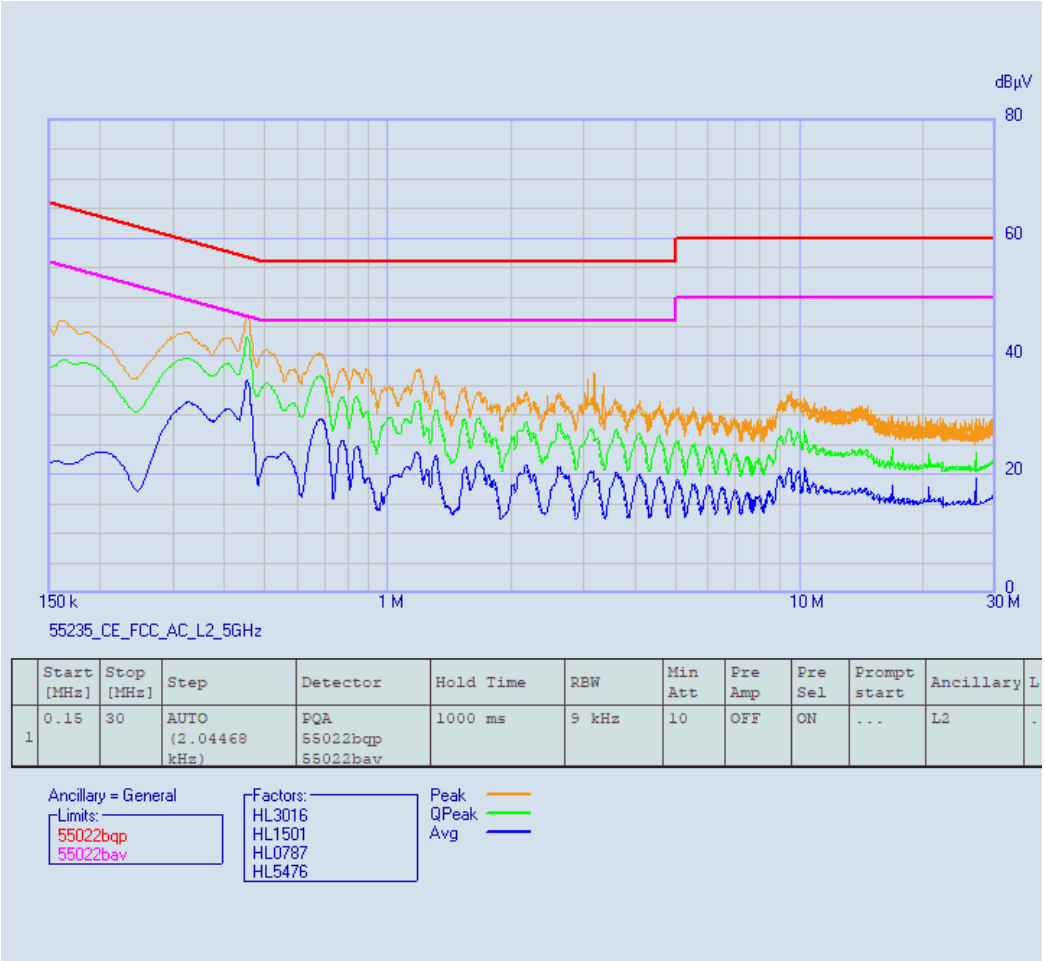


	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary	L
1	0.15	30	AUTO (2.04468 kHz)	PQA 55022bqp 55022bav	1000 ms	9 kHz	10	OFF	ON	...	L1	.

Test specification:	Section 15.207(a), RSS-Gen, Section 7.2, Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	Relative Humidity: 56 %	Air Pressure: 1012 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.6.2 Conducted emission measurements

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary	L
1	0.15	30	AUTO (2.04468 kHz)	PQA 55022bqp 55022bav	1000 ms	9 kHz	10	OFF	ON	...	L2	.

Test specification:	**Section 15.203 / RSS-Gen section 6.8, Antenna requirement**		
Test procedure:	Visual inspection		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	10-Nov-24		
Temperature: 24 ºC	**Relative Humidity:** 56 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

7.7 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 7.7.1.

Table 7.7.1 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	

8 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
3440	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	05-Aug-24	05-Aug-25
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	06-May-24	06-May-25
4114	Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz	ETS Lindgren	3117	00123515	27-Oct-24	27-Oct-25
4338	Reject Band Filter, 50 Ohm, 0 to 2170 and 3000 to 18000 MHz,SMA-FM / SMA-M	Micro-Tronics	BRM 50702-02	023	10-Jul-24	10-Jul-26
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
5112	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502494/2EA	02-Jun-24	02-Jun-25
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	24-Mar-22	24-Mar-25
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	24-Sep-24	24-Sep-25

9 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.

10 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.

11 APPENDIX D Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.
Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for relevant parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; Recognized by Innovation, Science and Economic Development Canada for wireless and terminal testing (ISED), ISED #2186A, CAB identifier is IL1001; Certified by VCCI, Japan (the registration numbers for OATS are R-10808 for RE measurements below 1 GHz, G-20112 for RE measurements above 1 GHz, R-11082 for anechoic chamber for RE measurements below 1 GHz, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site and T-11606 for conducted emissions at telecommunication ports).
The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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12 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

13 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

END OF DOCUMENT