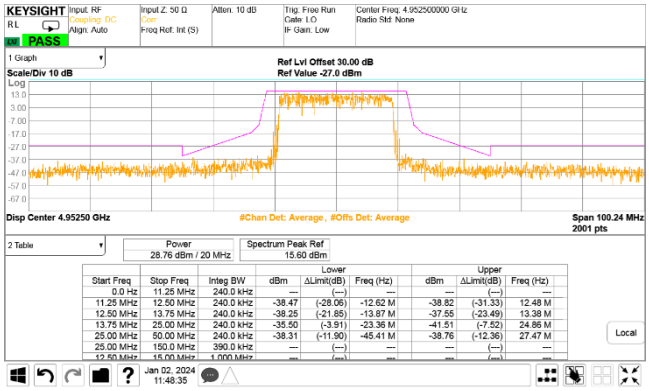
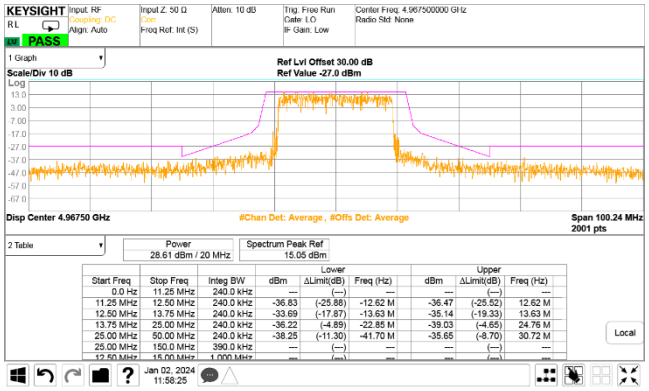
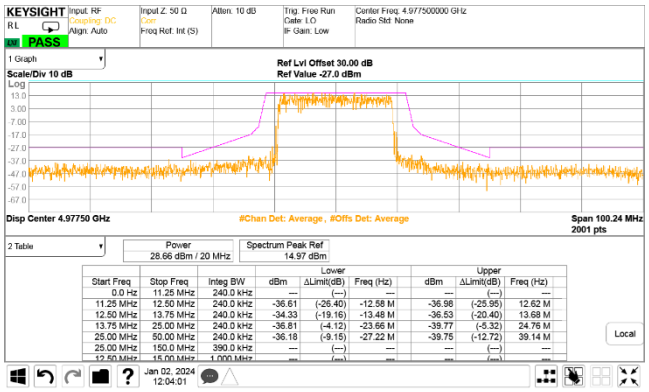
Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1014 hPa	**Power:** 48 VDC
Remarks:			

Plot 7.3.13 Emission mask test results at low, mid, high carrier frequency, 25 MHz CBW

OPERATING FREQUENCY RANGE:	4945.0 – 4985.0 MHz
DETECTOR USED:	Peak
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



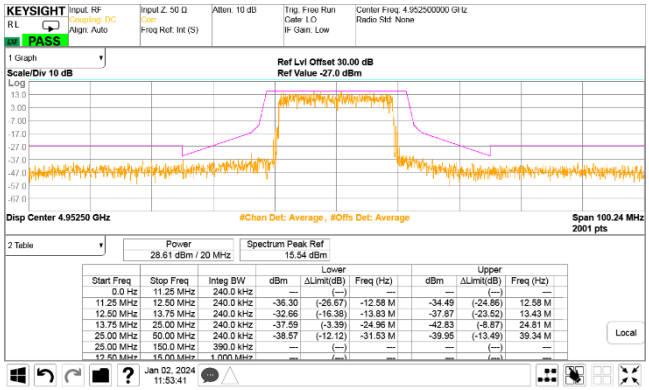


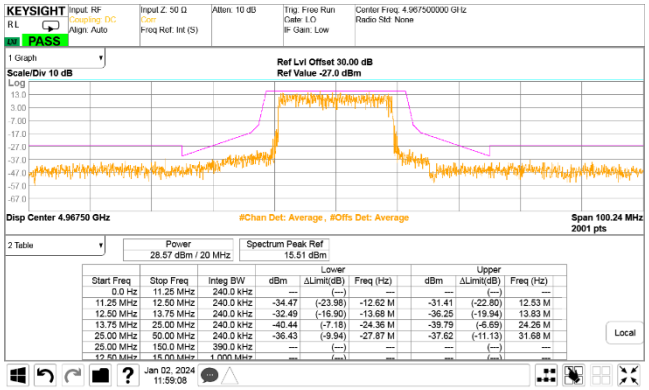


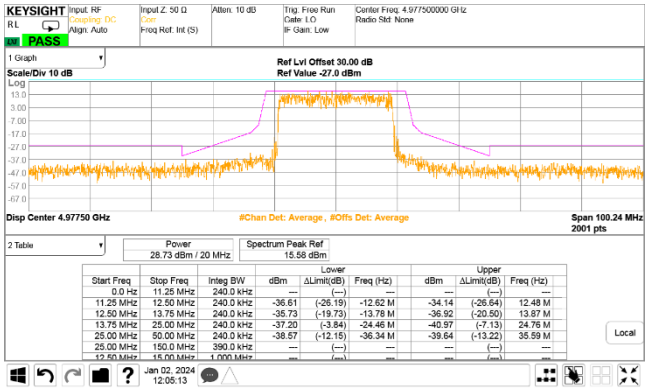
Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC
Remarks:			

Plot 7.3.14 Emission mask test results at low, mid, high carrier frequency, 25 MHz CBW

OPERATING FREQUENCY RANGE:	4945.0 – 4985.0 MHz
DETECTOR USED:	Peak
MODULATION:	16QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



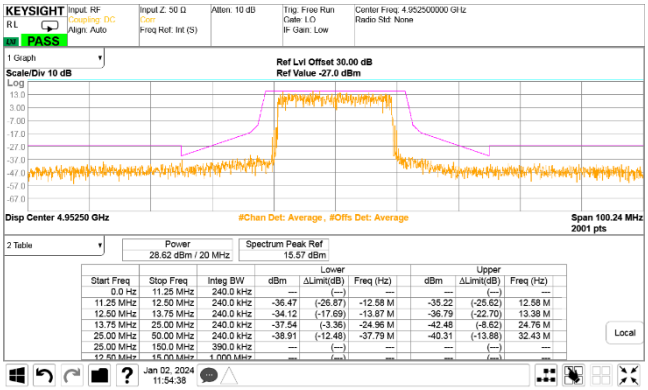


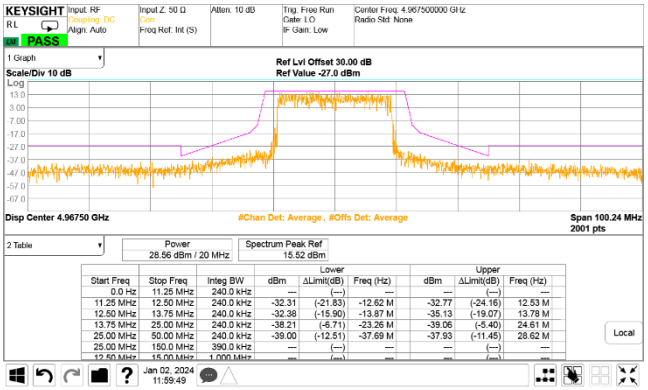


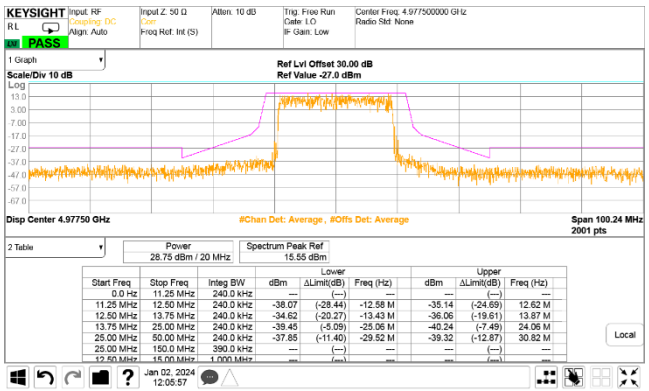
Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC
Remarks:			

Plot 7.3.15 Emission mask test results at low, mid, high carrier frequency, 25 MHz CBW

OPERATING FREQUENCY RANGE:	4945.0 – 4985.0 MHz
DETECTOR USED:	Peak
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



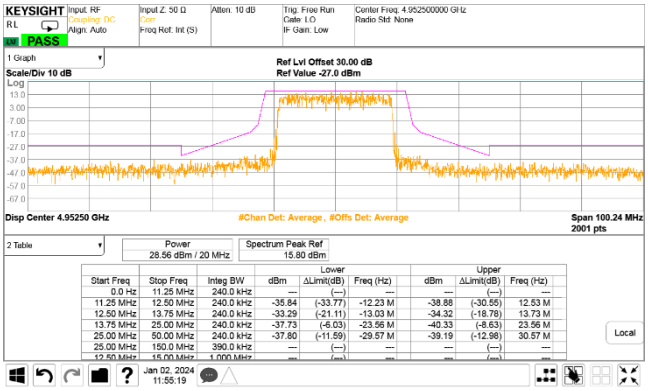


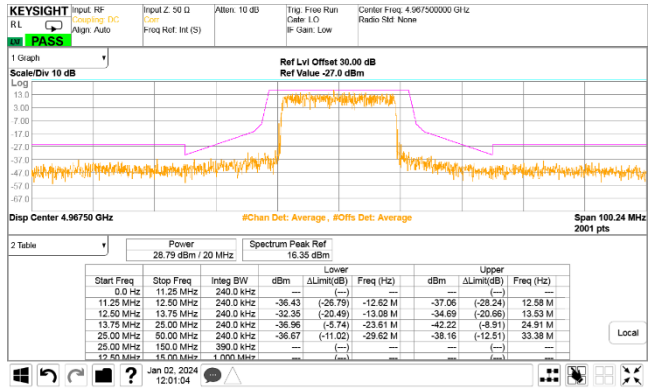


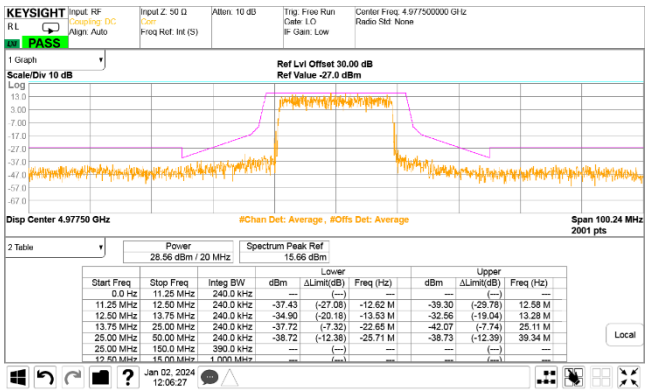
Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC
Remarks:			

Plot 7.3.16 Emission mask test results at low, mid, high carrier frequency, 25 MHz CBW

OPERATING FREQUENCY RANGE:	4945.0 – 4985.0 MHz
DETECTOR USED:	Peak
MODULATION:	256QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



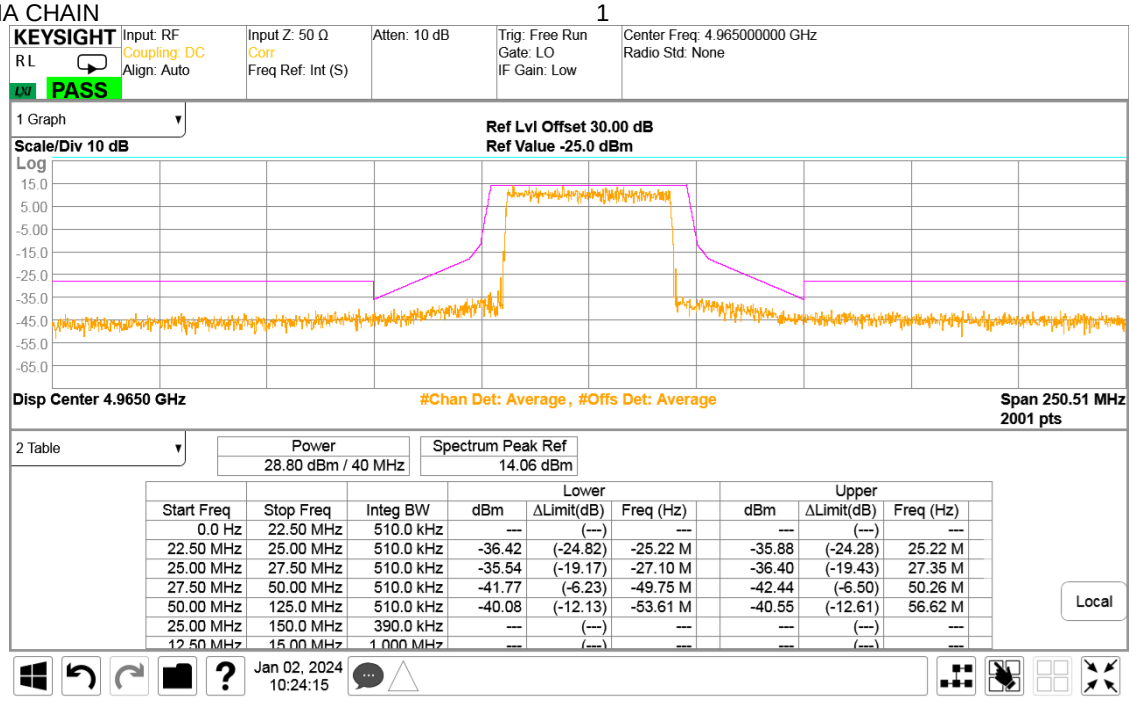




Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC
Remarks:			

Plot 7.3.17 Emission mask test results at mid carrier frequency, 50 MHz CBW

OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	1

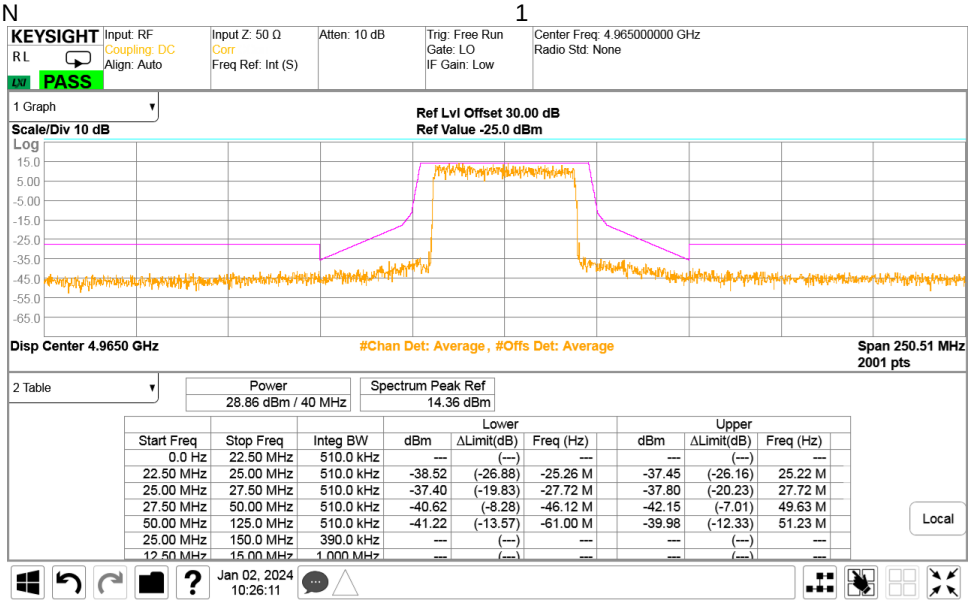


			Lower			Upper		
Start Freq	Stop Freq	Integ BW	dBm	ΔLimit(dB)	Freq (Hz)	dBm	ΔLimit(dB)	Freq (Hz)
0.0 Hz	22.50 MHz	510.0 kHz	---	(---)	---	---	(---)	---
22.50 MHz	25.00 MHz	510.0 kHz	-36.42	(-24.82)	-25.22 M	-35.88	(-24.28)	25.22 M
25.00 MHz	27.50 MHz	510.0 kHz	-35.54	(-19.17)	-27.10 M	-36.40	(-19.43)	27.35 M
27.50 MHz	50.00 MHz	510.0 kHz	-41.77	(-6.23)	-49.75 M	-42.44	(-6.50)	50.26 M
50.00 MHz	125.0 MHz	510.0 kHz	-40.08	(-12.13)	-53.61 M	-40.55	(-12.61)	56.62 M
25.00 MHz	150.0 MHz	390.0 kHz	---	(---)	---	---	(---)	---
12.50 MHz	15.00 MHz	1.000 MHz	---	(---)	---	---	(---)	---

Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1014 hPa	**Power:** 48 VDC
Remarks:			

Plot 7.3.18 Emission mask test results at mid carrier frequency, 50 MHz CBW

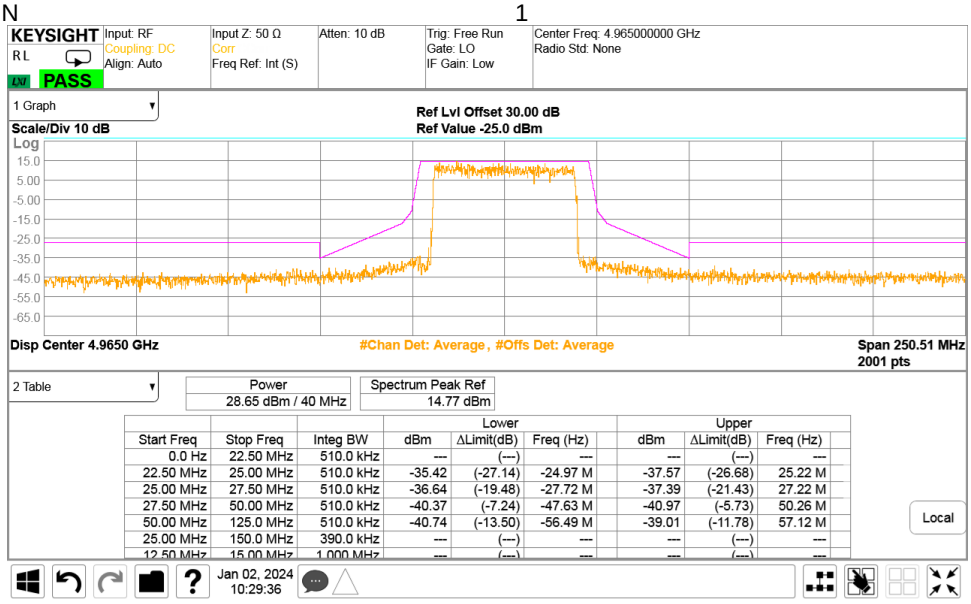
OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	16QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	1



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	Relative Humidity: 47 %	Air Pressure: 1014 hPa	Power: 48 VDC
Remarks:			

Plot 7.3.19 Emission mask test results at mid carrier frequency, 50 MHz CBW

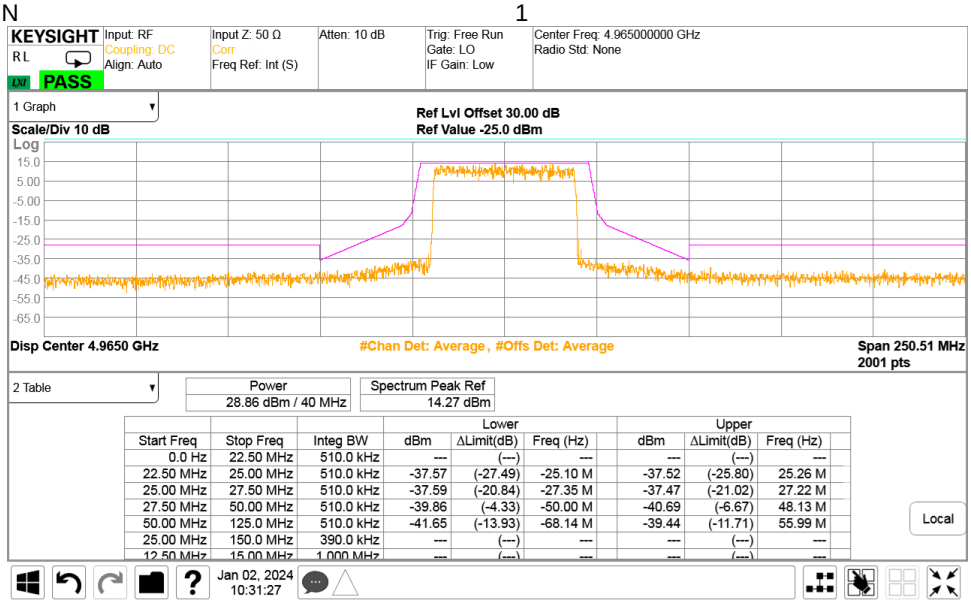
OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	1



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1014 hPa	**Power:** 48 VDC
Remarks:			

Plot 7.3.20 Emission mask test results at mid carrier frequency, 50 MHz CBW

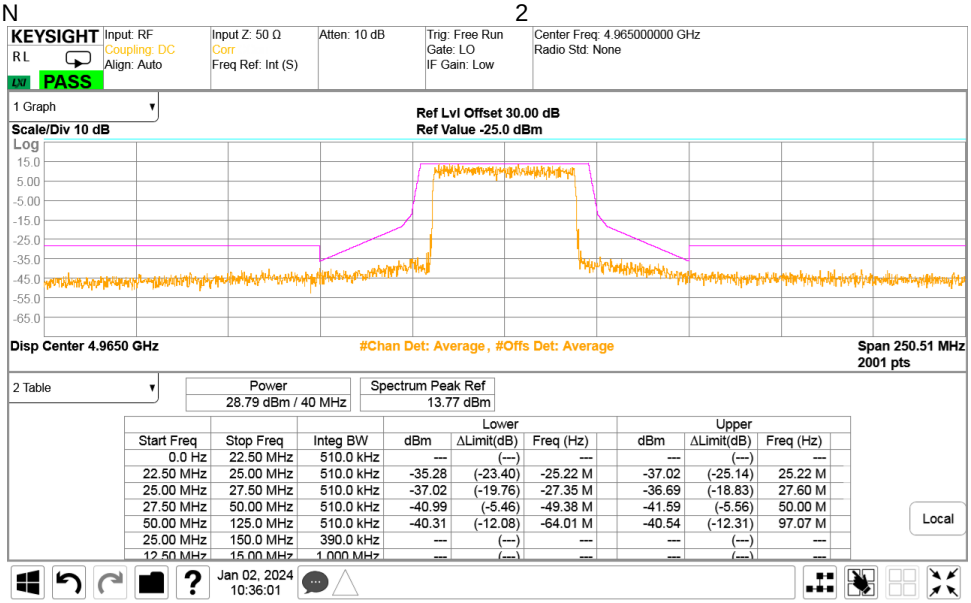
OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	256QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	1



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1014 hPa	**Power:** 48 VDC
Remarks:			

Plot 7.3.21 Emission mask test results at mid carrier frequency, 50 MHz CBW

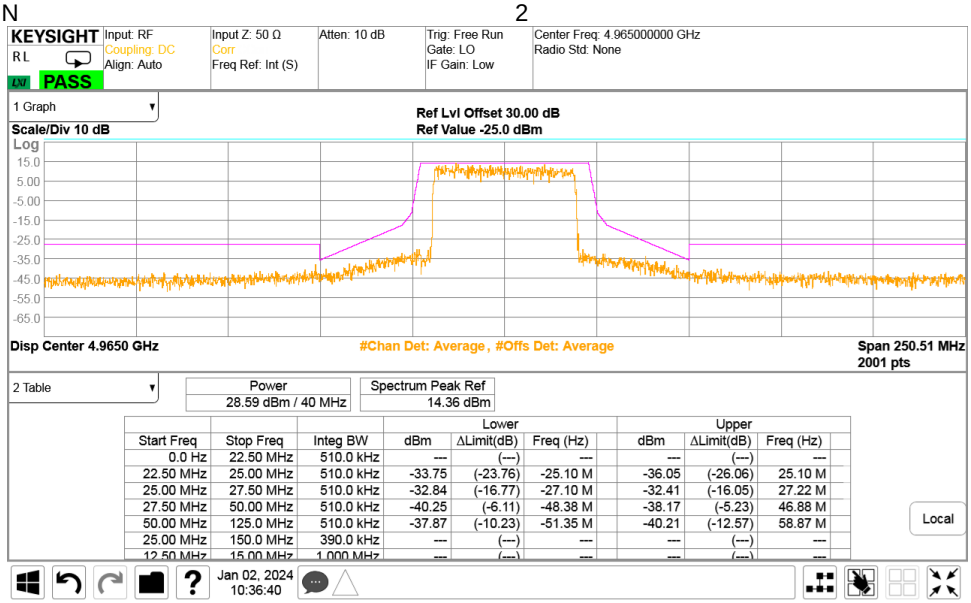
OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1014 hPa	**Power:** 48 VDC
Remarks:			

Plot 7.3.22 Emission mask test results at mid carrier frequency, 50 MHz CBW

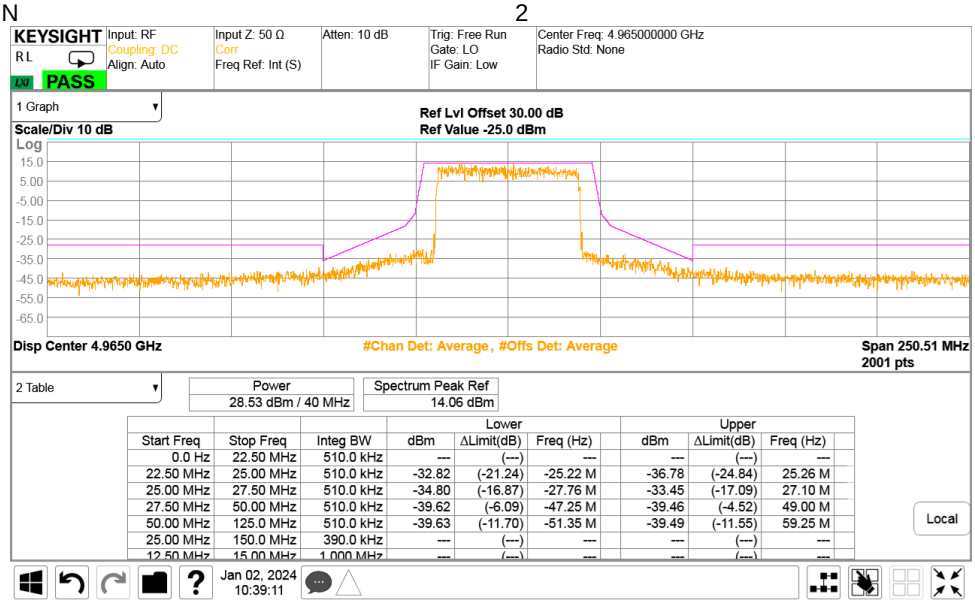
OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	16QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1014 hPa	**Power:** 48 VDC
Remarks:			

Plot 7.3.23 Emission mask test results at mid carrier frequency, 50 MHz CBW

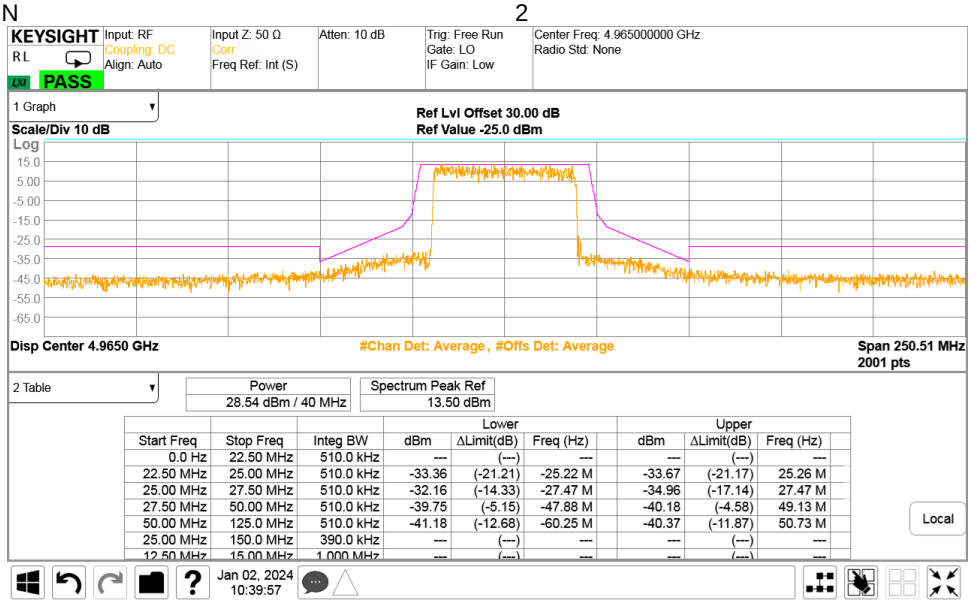
OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	27-Dec-23		
Temperature: 23 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1014 hPa	**Power:** 48 VDC
Remarks:			

Plot 7.3.24 Emission mask test results at mid carrier frequency, 50 MHz CBW

OPERATING FREQUENCY RANGE:	4952.5– 4977.5 MHz
DETECTOR USED:	Peak
MODULATION:	256QAM
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
ANTENA CHAIN	2



Test specification:	**Section 90.210, Radiated spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	04-Jan-24		
Temperature: 24 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1018 hPa	**Power:** 48 VDC
Remarks:			

7.4 Radiated spurious emission measurements

7.4.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emission test limits

Frequency, MHz	EIRP of spurious, dBm	Equivalent field strength limit @ 3m, dB(μV/m)**
0.09 – 10th harmonic*	-25	72.4

* - Excluding the in band emission within ± 150 % of the authorized bandwidth from the carrier. The high frequency is the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower

** - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows: E=sqrt(30×P×1.64)/r, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

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

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

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

7.4.2.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

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

7.4.3.1 The EUT was set up as shown in Figure 7.4.2, energized and the performance check was conducted.

7.4.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

7.4.3.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date(s):	04-Jan-24		
Temperature: 24 ºC	Relative Humidity: 47 %	Air Pressure: 1018 hPa	Power: 48 VDC
Remarks:			

Figure 7.4.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

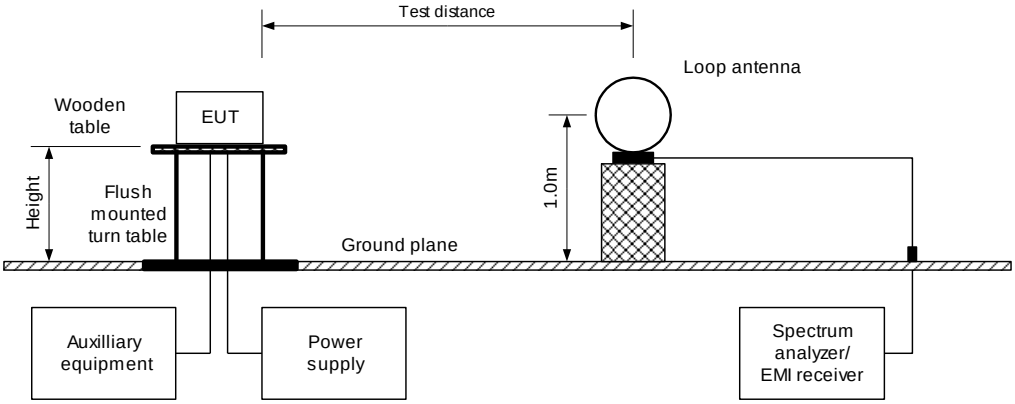
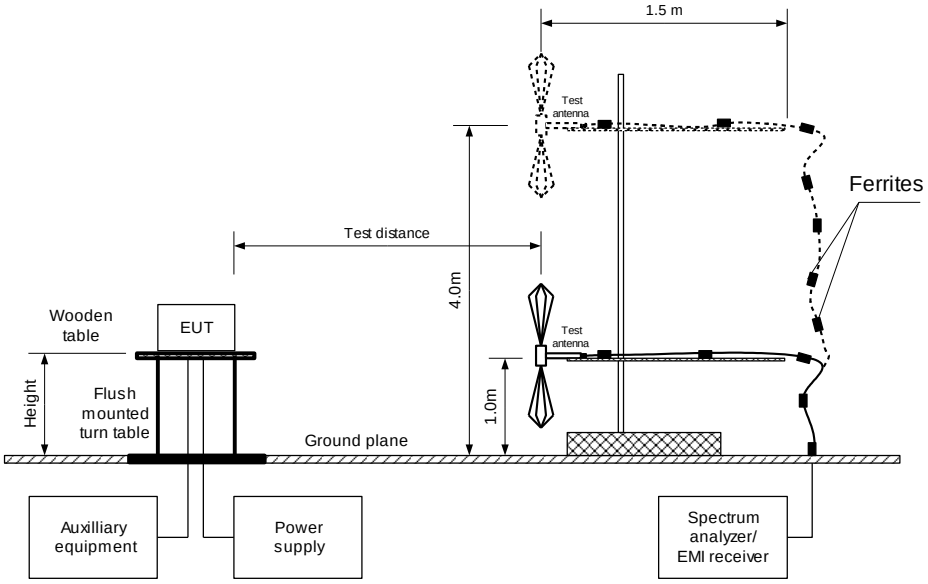


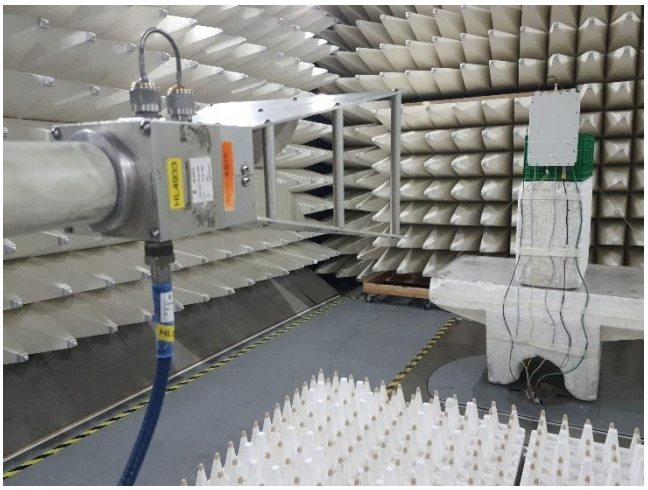
Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz

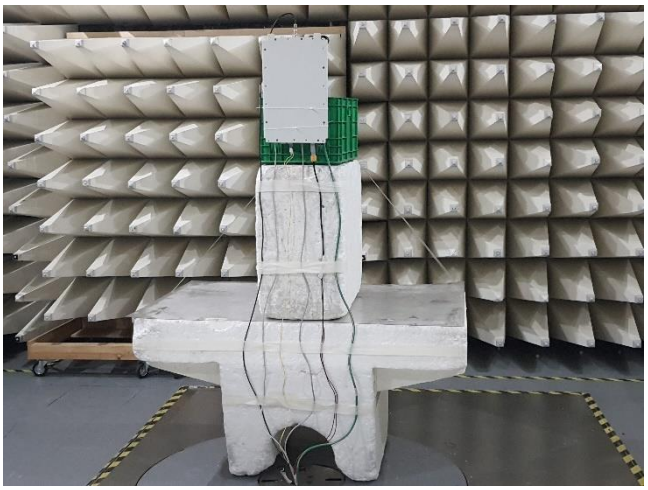
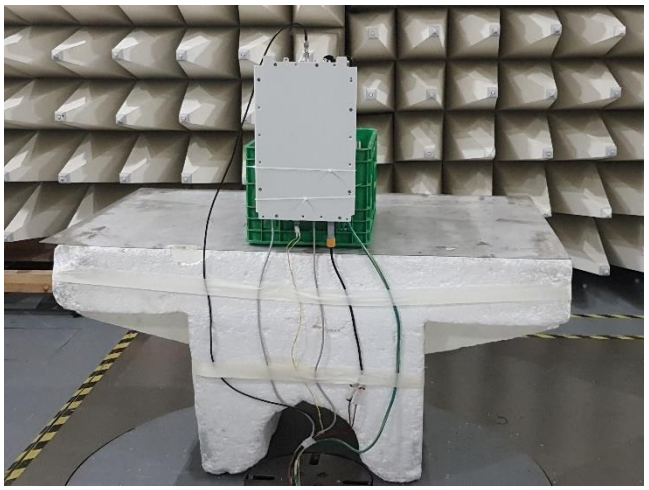


Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date(s):	04-Jan-24		
Temperature: 24 ºC	Relative Humidity: 47 %	Air Pressure: 1018 hPa	Power: 48 VDC
Remarks:			

Photograph 7.4.1 Setup for radiated emission measurements





Test specification:	**Section 90.210, Radiated spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	04-Jan-24		
Temperature: 24 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1018 hPa	**Power:** 48 VDC
Remarks:			

Test specification:	**Section 90.210, Radiated spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90.210(m); TIA/EIA-603-A, Section 2.2.12		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	04-Jan-24		
Temperature: 24 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1018 hPa	**Power:** 48 VDC
Remarks:			

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 4940.0 – 4990.0 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
DETECTOR USED: Peak
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Horn antenna (above 1000MHz)
MODULATION: QPSK (worst case variant)
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
CHANNEL BANDWIDTH: 10 MHz***

Frequency, MHz	Field strength, dB(µV/m)	Limit****, dB(µV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
No emissions were found							

*****- Margin = Field strength of spurious – calculated field strength limit.
******- EUT front panel refers to 0 degrees position of turntable.

*** - The 10 MHz channel bandwidth is configuration with the greatest aggregate power.

Reference numbers of test equipment used

HL 0446	HL 3230	HL 3903	HL 4015	HL 4933	HL 4956	HL 5112	HL 5288
HL 5902	HL 7585						

Full description is given in Appendix A.