

EUROFINS ELECTRICAL TESTING SERVICE (SHENZHEN) CO., LTD.

RADIO TEST - REPORT

FCC Compliance Test Report for

Product name: LED lamp (SolaBulb)

Model name: AST-BLBSL-E26

FCC ID: X55AST-BLBSL-E26

Test Report Number: EFGX25070590-IE-01-E09

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1 General Information

1.1 Notes

The results of this test report relate exclusively to the item tested as specified in chapter "Description of test item" and are not transferable to any other test items.

Eurofins Electrical Testing Service (Shenzhen) Co., Ltd. is not responsible for any generalisations and conclusions drawn from this report. Any modification of the test item can lead to invalidity of test results and this test report may therefore be not applicable to the modified test item.

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Operator:

2025-10-17

Bruce Zheng / Project Engineer



Date

Eurofins-Lab.

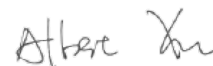
Name / Title

Signature

Technical responsibility for area of testing:

2025-10-17

Albert Xu / Lab Manager



Date

Eurofins-Lab.

Name / Title

Signature

1.2 Testing laboratory

Eurofins Electrical Testing Service (Shenzhen) Co., Ltd.

Room 20 of 2/F., 1/F., Building 2, Spring Block & Room 102, Building 8, Autumn Block, Meishenghuigu Innovation Park, No.83, Dabao Road, Bao'an District, Shenzhen, Guangdong, China

Telephone : +86-755-82911867

Fax : +86-755-82910749

The Laboratory has passed the Accreditation by the American Association for Laboratory Accreditation (A2LA). The Accreditation number is 5376.01

The Laboratory has been listed by industry Canada to perform electromagnetic emission measurements, The CAB identifier is CN0088

1.3 Details of applicant

Name	: Astera LED Technology GmbH
Address	: Schatzbogen 60 81829 Munich Germany
Telephone	: ./.
Fax	: ./.

1.4 Details of manufacturer

Name	: Astera Manufacturing Limited
Address	: 101, 201, 301, 401, 501, Bldg.3, CLT Science & Technology Park, No.7, GanLiliu Road, Jihua subdistrict, Longgang District, Shenzhen, Guangdong Province, P.R. China
Telephone	: ./.
Fax	: ./.

1.5 Application details

Date of receipt of application	: 2025-08-01
Date of receipt of test item	: 2025-08-01
Date of test	: 2025-08-01 to 2025-10-17
Date of issue	: 2025-10-17

1.6 Test item

Product type	: LED lamp (SolaBulb)
Test Model	: AST-BLBSL-E26
Sample ID	: 250729-13-001
Brand	: ./.
Serial number	: ./.
Hardware Version	: V1
Software / Firmware Version	: Android: V13.13-767 rel .NET 9.0.4 MAUI9.0.51
Ratings	: AC Input: 100-120V~, 50/60Hz, 16.5W
Test voltage	: 120V

RadioTechnical data

Frequency range	: 917MHz – 922.2MHz
Radio Tech.	: SRD
Frequency channel	: 53 Channels
Modulation	: GFSK
Antenna type	: Internal antenna
Maximum antenna gain	: -15.22dBi
Additional information	:

The above sample(s) and sample information was/were submitted and identified on behalf of the applicant.
Eurofins assures objectivity and impartiality of the test, and fulfills the obligation of confidentiality for applicant's commercial information and technical documents.

1.7 Test standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

Test Method

- 1: 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.
- 2: ANSI C63.10-2020, American National Standard for Testing Unlicensed Wireless Devices.
- 3: KDB558074 D01 15.247 Meas Guidance v05r02

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed.



or

The deviations as specified were ascertained in the course of the tests performed.



2.2 Test environment

Ac line conducted

Environment Parameter	Temperature	Relative Humidity
101.2kPa	23.7 °C	61.3%

RF conducted

Environment Parameter	Temperature	Relative Humidity
101.2kPa	24.7 °C	43.1%

Radiated

Environment Parameter	Temperature	Relative Humidity
101.2kPa	24.3 °C	51.6%

2.3 Measurement uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty in conducted measurements	1.96dB
Uncertainty for Conducted RF test	RF Power Conducted: 1.16dB Frequency test involved: 1.05×10 ⁻⁷ or 1%
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.46dB; Vertical: 4.54dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.42dB; Vertical: 4.41dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.63dB; Vertical: 4.62dB;

2.4 Test mode

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	917	28	919.7
2	917.1	29	919.8
...	...	...	...
...	...	...	...
...	...	52	922.1
26	919.5	53	922.2
27	919.6	/	/

The EUT was set at continuously transmitting mode during the test.

The Lowest Channel 1, Middle 27 and Highest 53 were selected for test in the report.

2.5 Test equipment utilized

EQUIPMENT ID	EQUIPMENT NAME	MODEL NO.	CAL. DUE DATE
23-2-13-05	EMI Test Receiver	ESR3	2026-03-25
23-2-13-06	LISN	NNLK 8127 RC	2026-03-25
23-2-10-16	Attenuator	VTSD 9561-F	2026-03-25
23-2-10-63	Temperature & Humidity Meter	COS-03	2026-03-25
23-2-10-65	Barometer	Baro	2026-03-25
23-2-13-12	Signal Analyzer	N9010B-544	2026-03-25
23-2-13-13	BT/WLAN Tester	CMW270	2026-03-25
23-2-13-14	Signal Generator	N5183B-520	2026-03-25
23-2-13-15	Vector Signal Generator	N5182B-506	2026-03-25
23-2-10-43	Switch and Control Unit	ERIT-E-JS0806-2	2026-03-25
23-2-10-44	DC power supply	E3642A	2026-03-25
23-2-10-45	Temperature test chamber	SG-80-CC-2	2026-03-25
23-2-10-50	Temperature & Humidity Meter	COS-03	2026-03-25
23-2-10-66	Barometer	Baro	2026-03-25
23-2-13-01	EMI Test Receiver	ESR7	2026-03-25
23-2-13-02	Signal Analyzer	N9020B-544	2026-03-25
23-2-12-01	Active Loop Antenna	FMZB 1519B	2026-05-29
23-2-12-02	TRILOG Broadband Antenna	VULB9168	2026-05-29
23-2-12-03	Horn Antenna	3117	2026-05-29
23-2-12-04	Horn Antenna	BBHA 9170	2026-05-29
23-2-10-01	Preamplifier	BBV9745	2026-03-25
23-2-10-02	Preamplifier	TAP01018048	2026-03-25
23-2-10-03	Preamplifier	TAP18040048	2026-03-25
23-2-10-62	Temperature & Humidity Meter	COS-03	2026-03-25
23-2-10-64	Barometer	Baro	2026-03-25
23-2-10-14	Switch and Control Unit	ERIT-E-JS0806-SF1	N/A
23-2-13-03	EMI Test Receiver	ESR7	2026-03-25
23-2-13-04	Signal Analyzer	N9020B-526	2026-03-25
23-2-12-06	Active Loop Antenna	FMZB 1519B	2026-03-25
23-2-10-46	Preamplifier	BBV9745	2026-03-25
23-2-10-47	Preamplifier	TAP01018048	2026-03-25
23-2-10-61	Temperature & Humidity Meter	COS-03	2026-03-25
23-2-10-52	Barometer	Baro	2026-03-25
23-2-10-15	Switch and Control Unit	ERIT-E-JS0806-SF1	N/A

2.6 Auxiliary equipment used during test

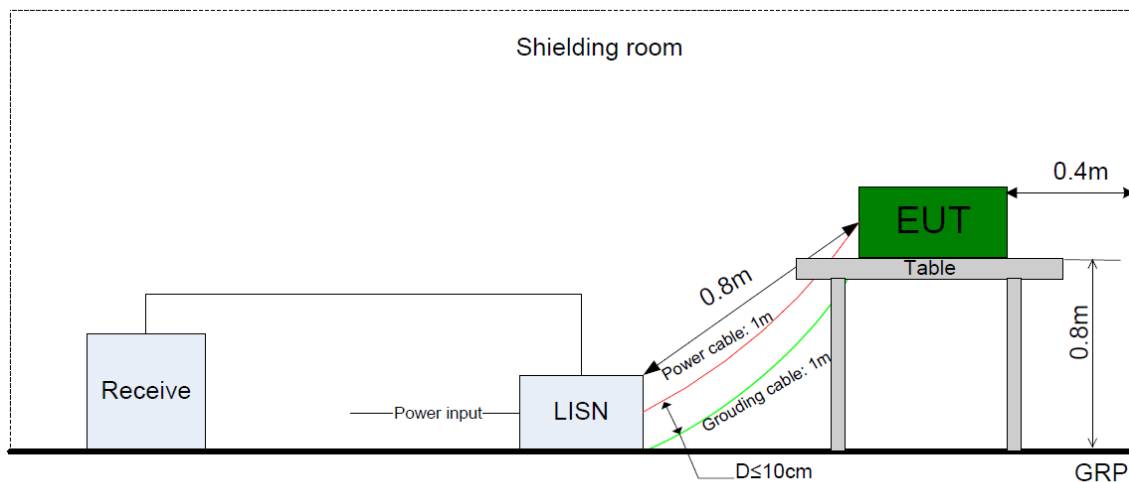
DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Laptop	LENOVO	TP00096A	PF-1QH0LV

2.7 Test software information

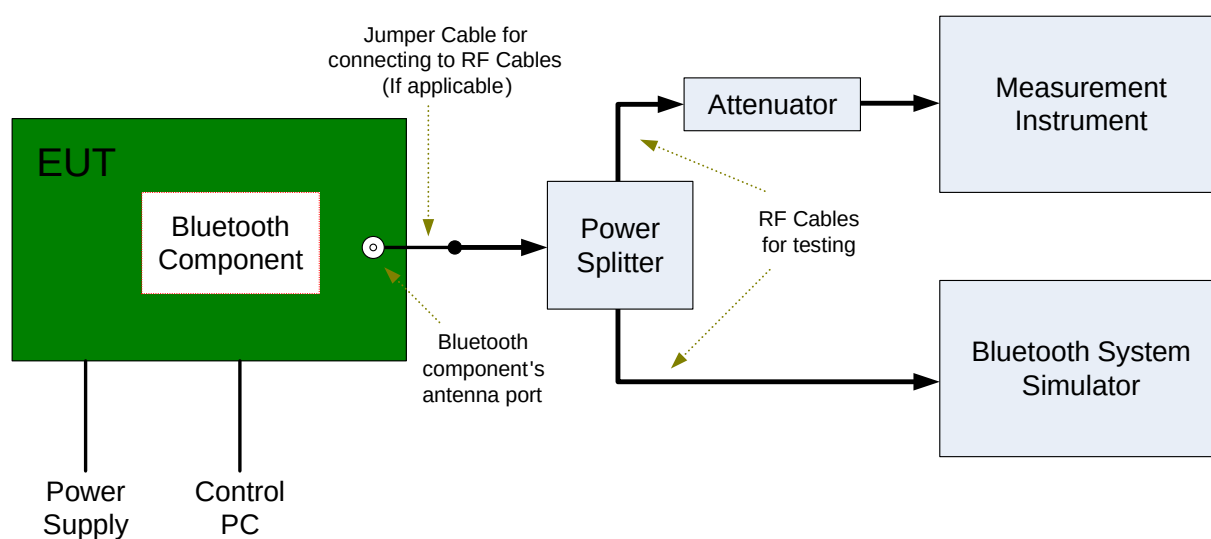
Test Software&Version	Asteras Serial Log			
Mode	Power setting			Modulation Type
GFSK	CH1	CH27	CH53	GFSK
	DEF	DEF	DEF	

2.8 Test setup

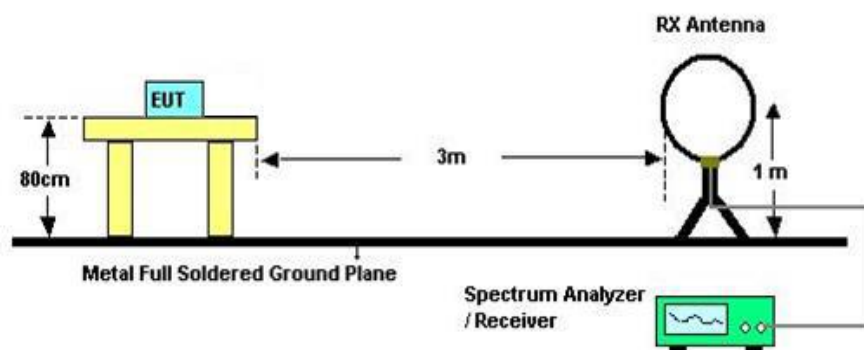
Ac line conducted



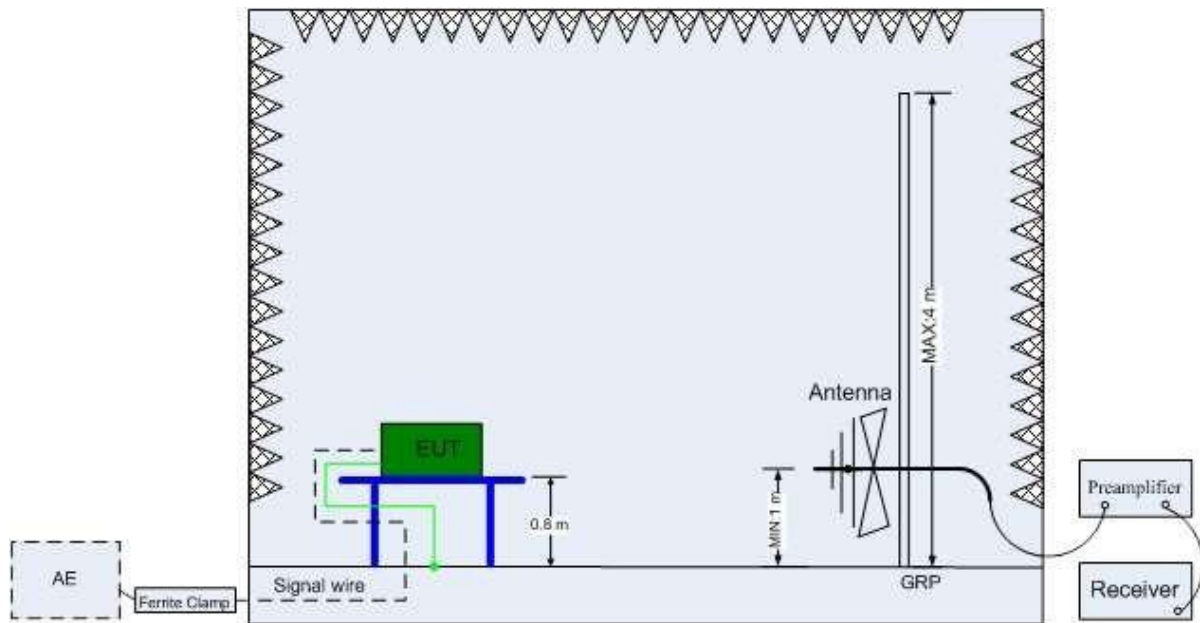
RF Conducted tests



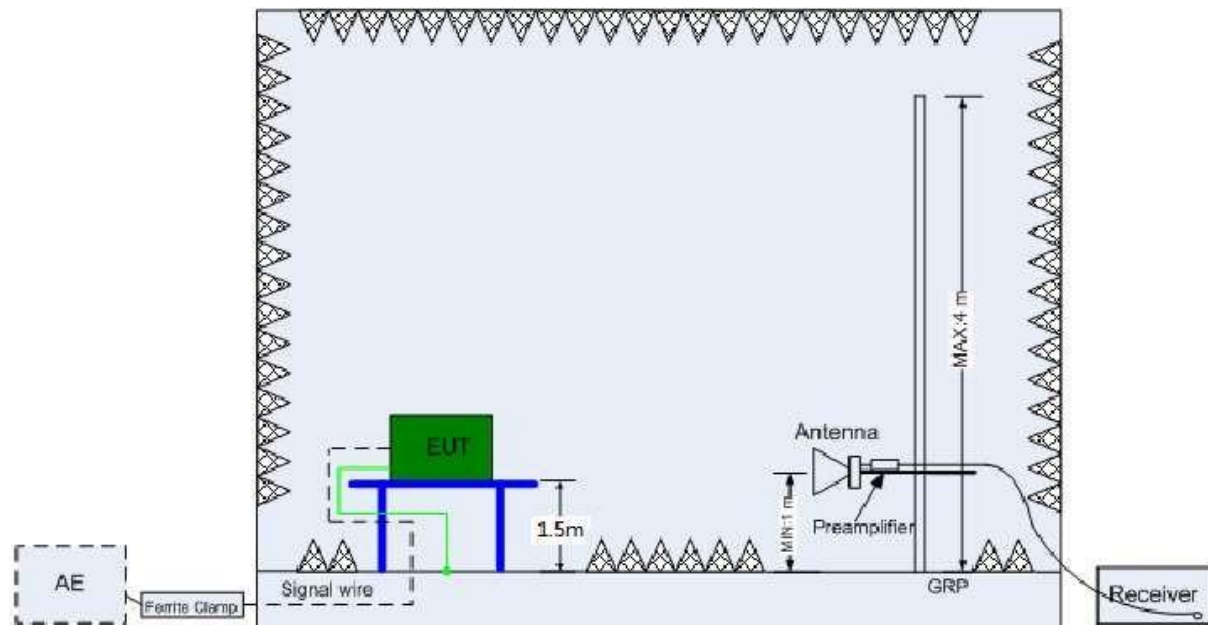
Radiated tests below 30MHz



Radiated tests below 1GHz



Radiated tests above 1GHz



2.9 Test results

☒ 1st test

☐ test after modification

☐ production test

Technical Requirements			
FCC Part 15 Subpart C			
Test Condition		Verdict	Test Site
§15.207	Conducted emission AC power port	Pass	Site 1
§15.247(b)	Conducted output power	Pass	Site 1
§15.247(a)(1)	20dB Occupied bandwidth	Pass	Site 1
§15.247(a)(1)	Carrier frequency separation	Pass	Site 1
§15.247(a)(1)(iii)	Number of hopping frequencies	Pass	Site 1
§15.247(a)(1)(iii)	Dwell Time	Pass	Site 1
§15.247(d)	Band Edge and CSE	Pass	Site 1
§15.209 & §15.205	Spurious emissions	Pass	Site 1
--	Duty cycle	Pass	Site 1
§15.203	Antenna requirement	Pass	--

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses internal antenna. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

3 Technical Requirement

3.1 Conducted emission AC power port

Test Method:

The test method was referred to the subclause 6.2 of ANSI C63.10-2020.

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both Neutral and Live lines.

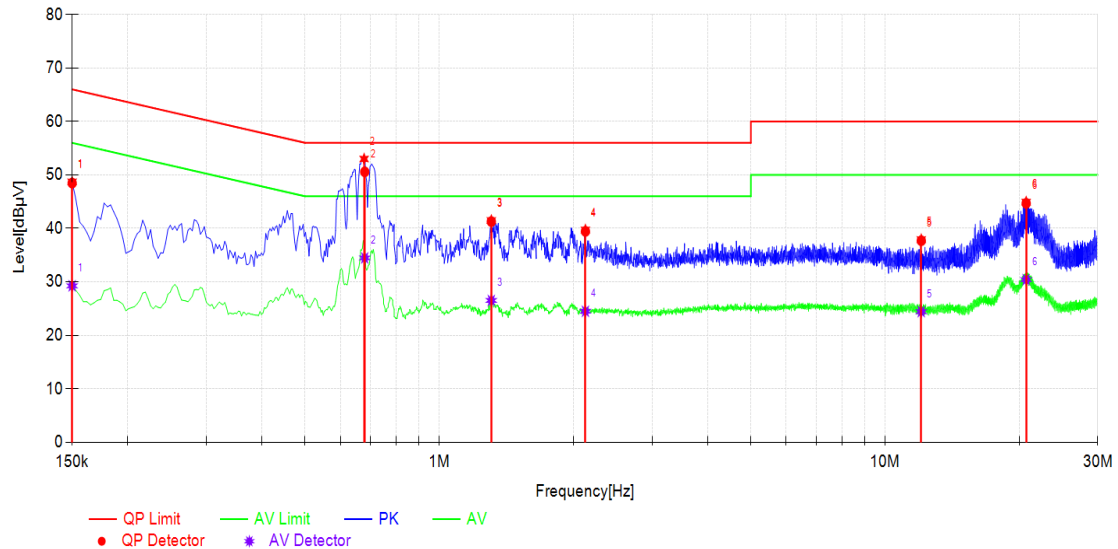
Limit:

FCC §15.207 (a)

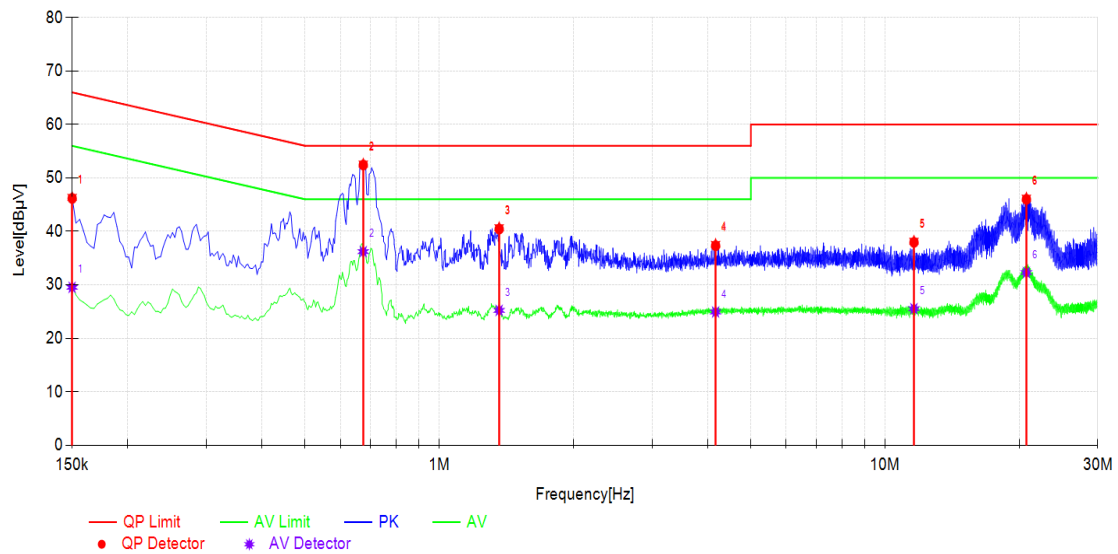
Frequency	QP Limit	AV Limit
MHz	dBμV	dBμV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linear.

Result:



Final Data List										
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type	Verdict
1	0.15	10.25	48.47	66.00	17.53	29.26	56.00	26.74	L1	PASS
2	0.6801	10.26	50.58	56.00	5.42	34.48	46.00	11.52	L1	PASS
3	1.308	10.34	41.28	56.00	14.72	26.53	46.00	19.47	L1	PASS
4	2.127	10.28	39.44	56.00	16.56	24.50	46.00	21.50	L1	PASS
5	12.058	10.49	37.70	60.00	22.30	24.44	50.00	25.56	L1	PASS
6	20.731	10.69	44.69	60.00	15.31	30.42	50.00	19.58	L1	PASS



Final Data List										
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type	Verdict
1	0.15	10.35	46.17	66.00	19.83	29.54	56.00	26.46	N	PASS
2	0.675	10.26	52.42	56.00	3.58	36.22	46.00	9.78	N	PASS
3	1.362	10.30	40.44	56.00	15.56	25.23	46.00	20.77	N	PASS
4	4.167	10.40	37.32	56.00	18.68	24.93	46.00	21.07	N	PASS
5	11.611	10.51	37.95	60.00	22.05	25.55	50.00	24.45	N	PASS
6	20.755	10.69	45.99	60.00	14.01	32.31	50.00	17.69	N	PASS

3.2 20dB Occupied bandwidth

Test Method:

The test method was referred to the subclause 6.9.2 of ANSI C63.10-2013.

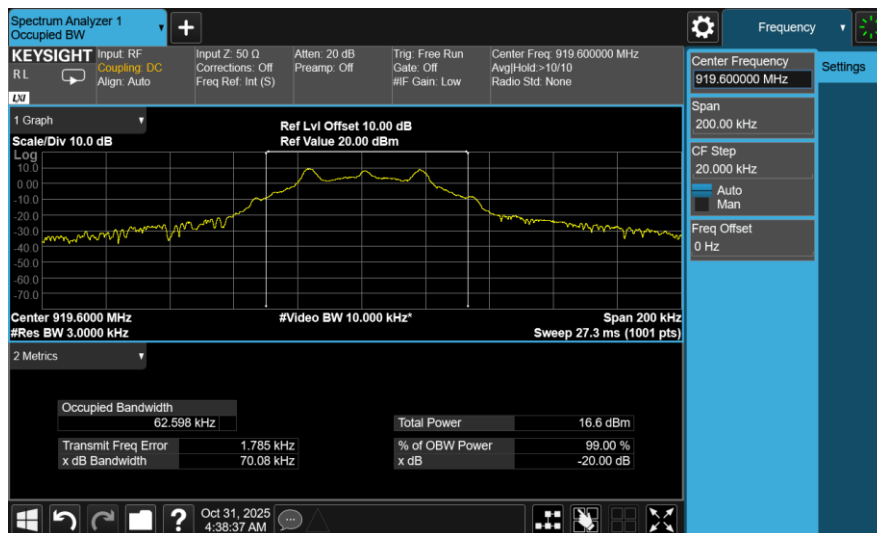
The occupied bandwidth is measured as the width of the spectral envelope of the modulated signal, at an amplitude level reduced from a reference value by a specified ratio (or in decibels, a specified number of dB down from the reference value). Typical ratios, expressed in dB, are -6 dB, -20 dB, and -26 dB, corresponding to 6 dB BW, 20 dB BW, and 26 dB BW, respectively. In this subclause, the ratio is designated by “-xx dB.” The reference value is either the level of the unmodulated carrier or the highest level of the spectral envelope of the modulated signal, as stated by the applicable requirement. Some requirements might specify a specific maximum or minimum value for the “-xx dB” bandwidth; other requirements might specify that the “-xx dB” bandwidth be entirely contained within the authorized or designated frequency band.

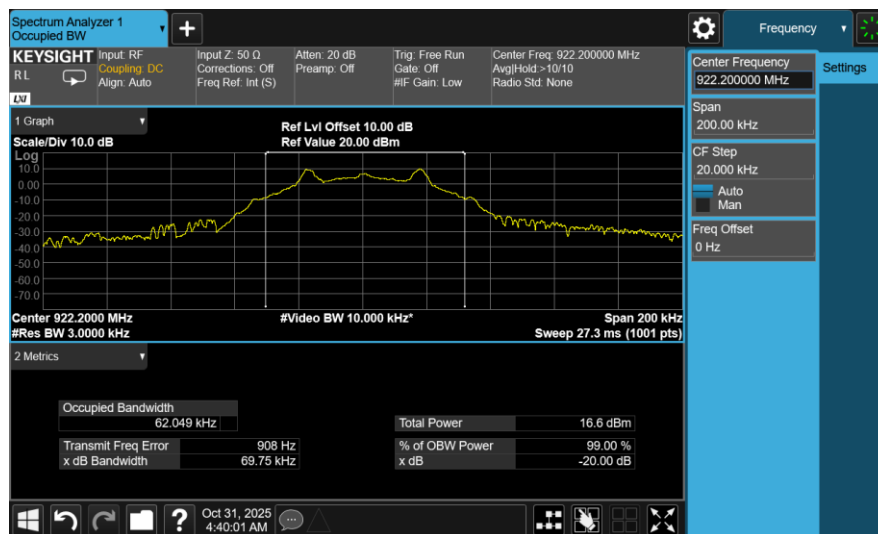
- a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW.
- b) The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW, unless otherwise specified by the applicable requirement.
- c) Set the reference level of the instrument as required, keeping the signal from exceeding the maximum input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than $[10 \log (OBW/RBW)]$ below the reference level. Specific guidance is given in 4.1.5.2.
- d) Steps a) through c) might require iteration to adjust within the specified tolerances.
- e) The dynamic range of the instrument at the selected RBW shall be more than 10 dB below the target “-xx dB down” requirement; that is, if the requirement calls for measuring the -20 dB OBW, the instrument noise floor at the selected RBW shall be at least 30 dB below the reference value.
- f) Set detection mode to peak and trace mode to max hold.
- g) Determine the reference value: Set the EUT to transmit an unmodulated carrier or modulated signal, as applicable. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
- h) Determine the “-xx dB down amplitude” using $[(\text{reference value}) - xx]$. Alternatively, this calculation may be made by using the marker-delta function of the instrument.
- i) If the reference value is determined by an unmodulated carrier, then turn the EUT modulation ON, and either clear the existing trace or start a new trace on the spectrum analyzer and allow the new trace to stabilize. Otherwise, the trace from step g) shall be used for step j).
- j) Place two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “ixx dB down amplitude” determined in step h). If a marker is below this “-xx dB down amplitude” value, then it shall be as close as possible to this value. The occupied bandwidth is the frequency difference between the two markers. Alternatively, set a marker at the lowest frequency of the envelope of the spectral display, such that the marker is at or slightly below the “ixx dB down amplitude” determined in step h). Reset the marker-delta function and move the marker to the other side of the emission until the delta marker amplitude is at the same level as the reference marker amplitude. The marker-delta frequency reading at this point is the specified emission bandwidth.
- k) The occupied bandwidth shall be reported by providing plot(s) of the measuring instrument display; the plot axes and the scale units per division shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

Limit:

None; for reporting purposes only.

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]
GFSK	Ant1	917	0.0701
		919.6	0.0701
		922.2	0.0697





3.3 Duty cycle

Test Method:

The test method was referred to the subclause 11.6 of ANSI C63.10-2020.

Measurements of duty cycle and transmission duration shall be performed using one of the following techniques:

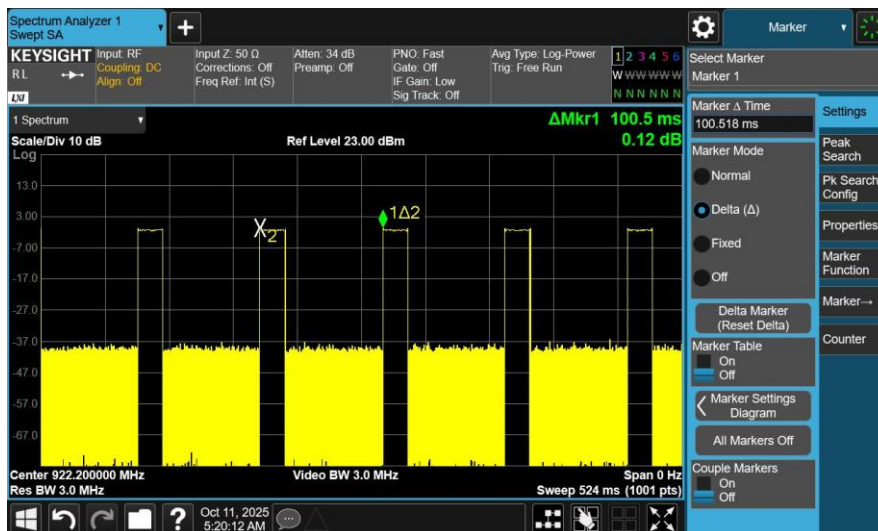
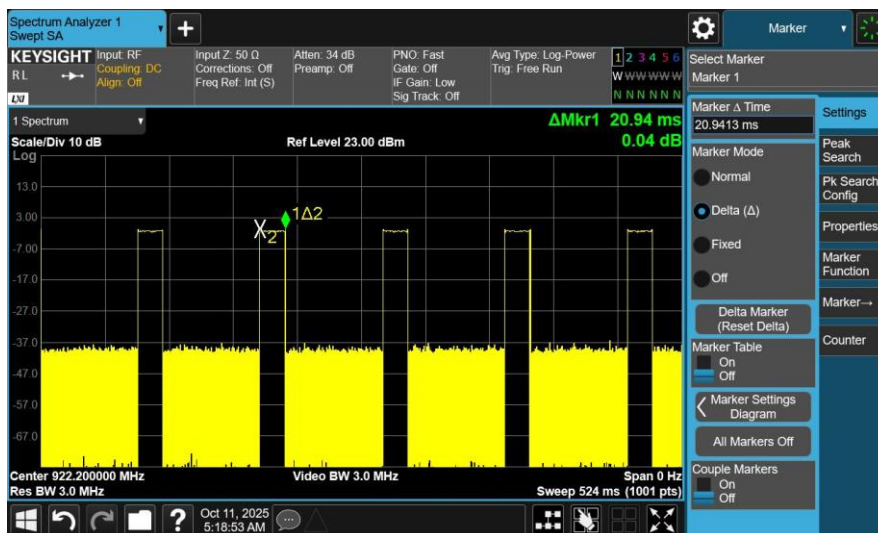
- a) A diode detector and an oscilloscope that together have a sufficiently short response time to permit accurate measurements of the ON and OFF times of the transmitted signal.
- b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:
 - 1) Set the center frequency of the instrument to the center frequency of the transmission.
 - 2) Set $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value.
 - 3) Set $VBW \geq RBW$. Set detector = peak or average.
 - 4) The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring the duty cycle shall not be used if $T \leq 16.7 \mu s$.)

Limit:

None; for reporting purposes only.

Result

TestMode	Antenna	Duty Cycle [%]
GFSK	Ant1	29.79



3.4 Conducted Peak output power

Test Method

The test method was referred to the subclause 11.9.1.1 of ANSI C63.10-2020.

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

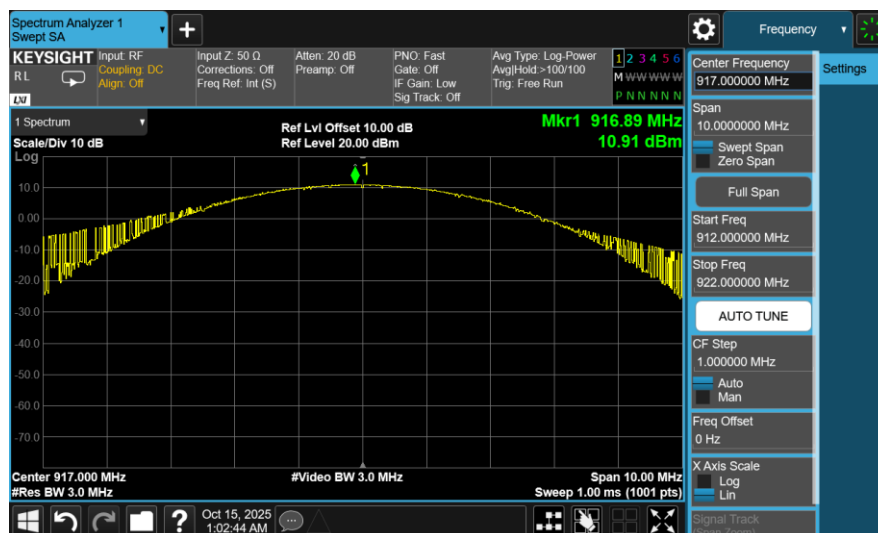
- a) Set the RBW $\geq$ DTS bandwidth.
- b) Set VBW $\geq$ $[3 \times \text{RBW}]$.
- c) Set span $\geq$ $[3 \times \text{RBW}]$.
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

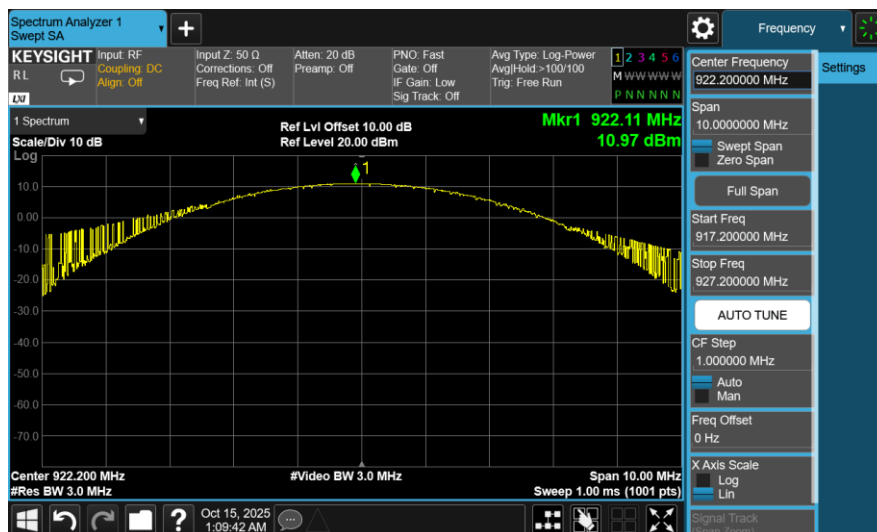
Limits:

FCC §15.247 (b) (3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands:
1 Watt.

TestMode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
GFSK	Ant1	917	10.91	≤30	PASS
		919.6	10.95	≤30	PASS
		922.2	10.97	≤30	PASS





3.5 Conducted Spurious Emissions

Test Method:

The test method was referred to the subclause 11.11/11.12 of ANSI C63.10-2020.

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to ≥ 1.5 times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW $\geq [3 \times \text{RBW}]$.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Establish an emission level by using the following procedure:

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW $\geq [3 \times \text{RBW}]$.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

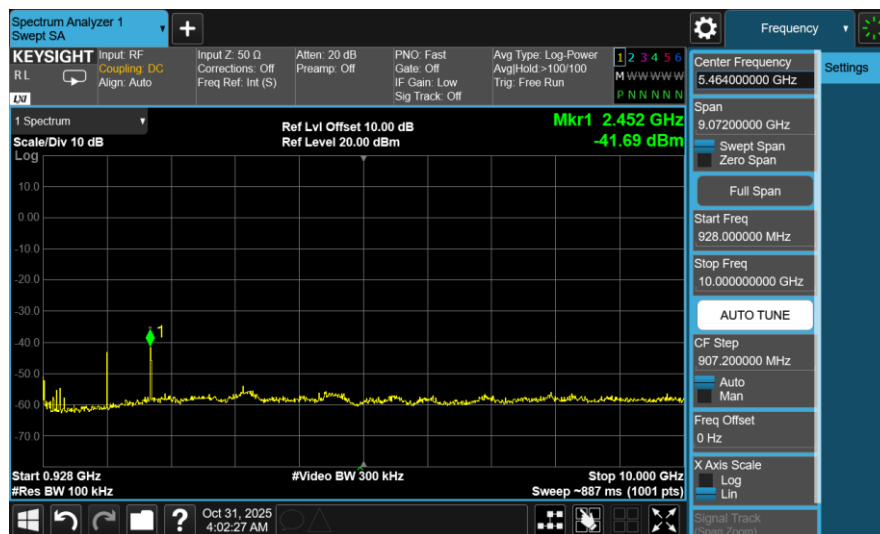
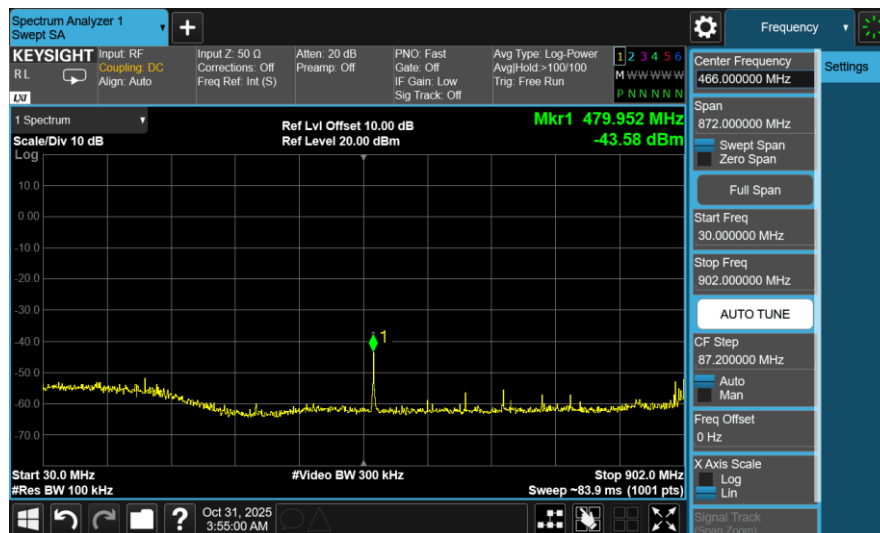
Limit:

FCC §15.247 (d)

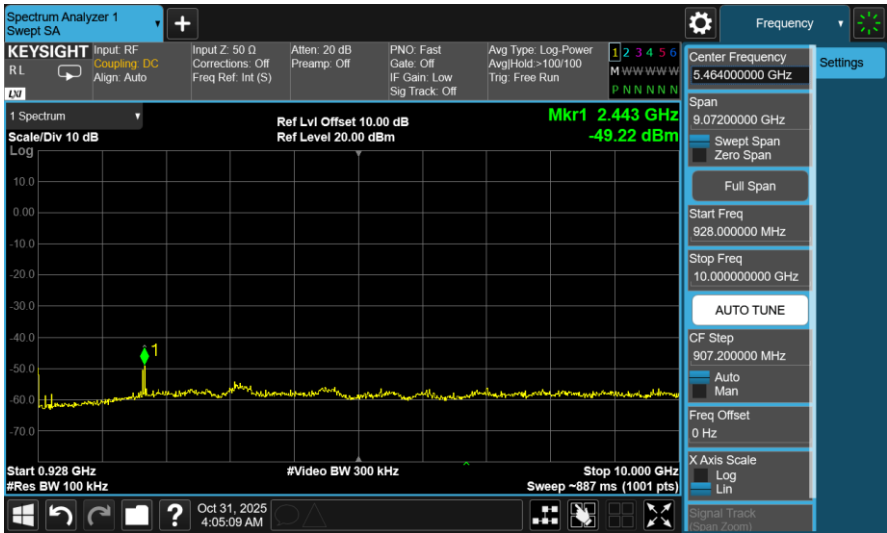
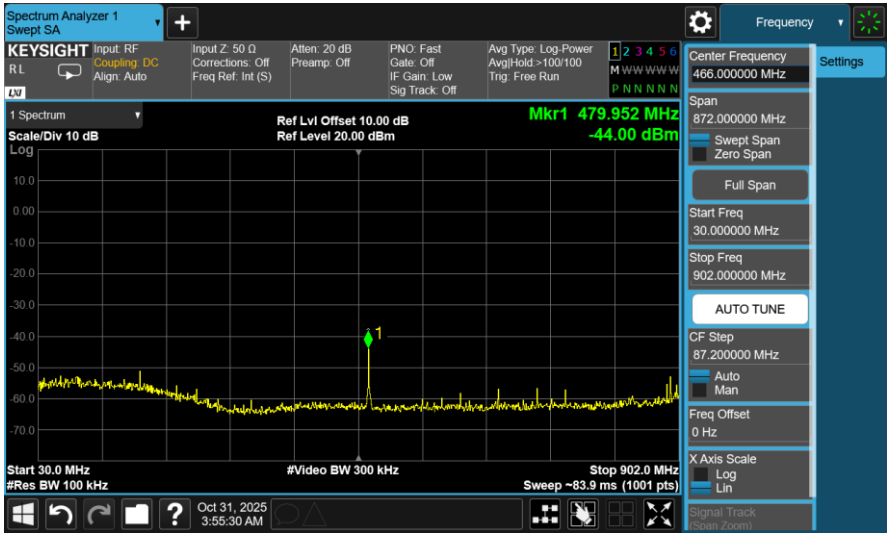
Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

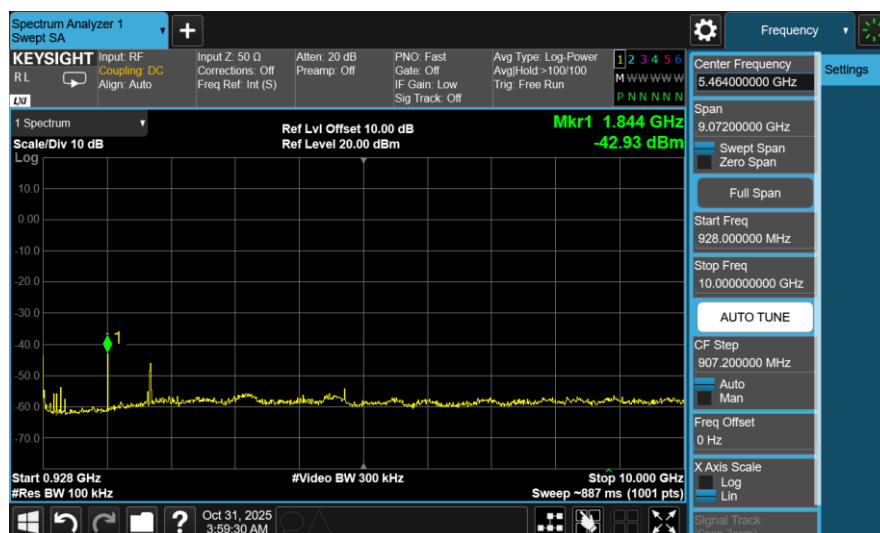
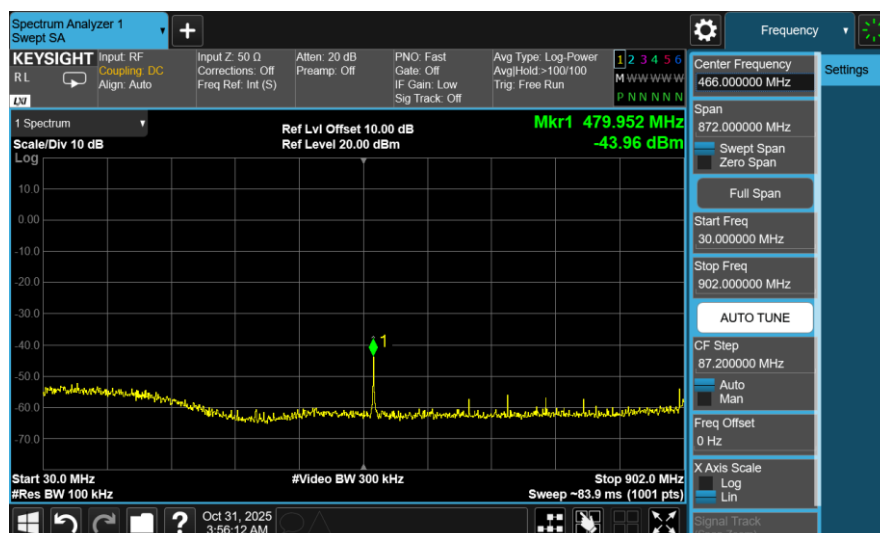
TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
GFSK	Ant1	917	Reference	10.91	10.91	---	PASS
			30~1000	10.91	-43.58	≤-9.09	PASS
			1000~1000	10.91	-41.69	≤-9.09	PASS



TestMode	Antenna	Fre- quency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
GFSK	Ant1	919.6	Reference	10.95	10.95	---	PASS
			30~1000	10.95	-44.00	≤-9.05	PASS
			1000~1000	10.95	-49.22	≤-9.05	PASS



TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
GFSK	Ant1	922.2	Reference	10.97	10.97	---	PASS
			30~1000	10.97	-43.96	≤-9.07	PASS
			1000~1000	10.97	-42.93	≤-9.07	PASS



3.6 Band edge

Test Method:

The test method was referred to the subclause 11.13.3 of ANSI C63.10-2020.

Peak detection

When using a peak detector to measure unwanted emissions at or near the band edge (within 2 MHz of the authorized band), the following integration procedure can be used:

- a) Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).
- b) Set span to 2 MHz.
- c) RBW = 100 kHz.
- d) $VBW \geq [3 \times RBW]$.
- e) Detector = peak.
- f) Sweep time = auto.
- g) Trace mode = max hold.
- h) Allow sweep to continue until the trace stabilizes (required measurement time may increase for low-duty-cycle applications).
- i) Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency ($f_{\text{emission}} \pm 0.5$ MHz). If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by $f_{\text{emission}} \pm 0.5$ MHz.

Trace averaging with continuous EUT transmission at full power

If the EUT can be configured or modified to transmit continuously ($D \geq 98\%$), then the average emission levels within 2 MHz of the authorized band edge may be measured using the following method (with EUT transmitting continuously):

- a) Set instrument center frequency to the frequency of the emission to be measured (must be within 2 MHz of the authorized band edge).
- b) Set span to 2 MHz.
- c) RBW = 100 kHz.
- d) $VBW \geq [3 \times RBW]$.
- e) Detector = RMS (power averaging), if $[\text{span} / (\# \text{ of points in sweep})] \leq (RBW / 2)$.
- f) Averaging type = power (i.e., rms):
 - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
 - 2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
- g) Sweep time = auto.
- h) Perform a trace average of at least 100 traces.
- i) Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency ($f_{\text{emission}} \pm 0.5$ MHz). If the instrument does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by $f_{\text{emission}} \pm 0.5$ MHz.

Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and the duty cycle is constant (duty cycle variations are less $\pm 2\%$), then the following procedure may be used to measure the average power of unwanted emissions within 2 MHz of the authorized band edge:

- a) The EUT shall be configured to operate at the maximum achievable duty cycle.
- b) Measure the duty cycle D of the transmitter output signal as described in 11.6.
- c) Set instrument center frequency to the frequency of the emission to be measured.
- d) Set span to 2 MHz.
- e) RBW = 100 kHz.
- f) $VBW \geq 3 \times RBW$.
- g) Detector = RMS (power averaging), if $[\text{span} / (\# \text{ of points in sweep})] \leq (RBW / 2)$. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
- h) Averaging type = power (i.e., rms):
 - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
 - 2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
- i) Sweep time = auto.
- j) Perform a trace average of at least 100 traces.
- k) Compute the power by integrating the spectrum over 1 MHz using the instrument's band power measurement function with band limits set equal to the emission frequency ($f_{\text{emission}} \pm 0.5 \text{ MHz}$). If the spectrum analyzer does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by $f_{\text{emission}} \pm 0.5 \text{ MHz}$.
- l) A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (rms) mode was used in step f), then the applicable correction factor is $[10 \log (1 / D)]$, where D is the duty cycle.
 - 2) If linear voltage averaging mode was used in step f), then the applicable correction factor is $[20 \log (1 / D)]$, where D is the duty cycle.
 - 3) If a specific emission is demonstrated to be continuous ($D \geq 98\%$) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Reduction of the measured emission amplitude levels to account for operational duty cycle is not permitted. Determining compliance is based on emission levels occurring during transmission—it is not based on an average across ON and OFF times of the transmitter.

Reduced VBW averaging across ON and OFF times of the EUT transmissions with max hold

If continuous transmission of the EUT ($D \geq 98\%$) cannot be achieved and the duty cycle is not constant (duty cycle variations equal or exceed $\pm 2\%$), then the following procedure may be used to measure unwanted emissions within 2 MHz of the authorized band edge:

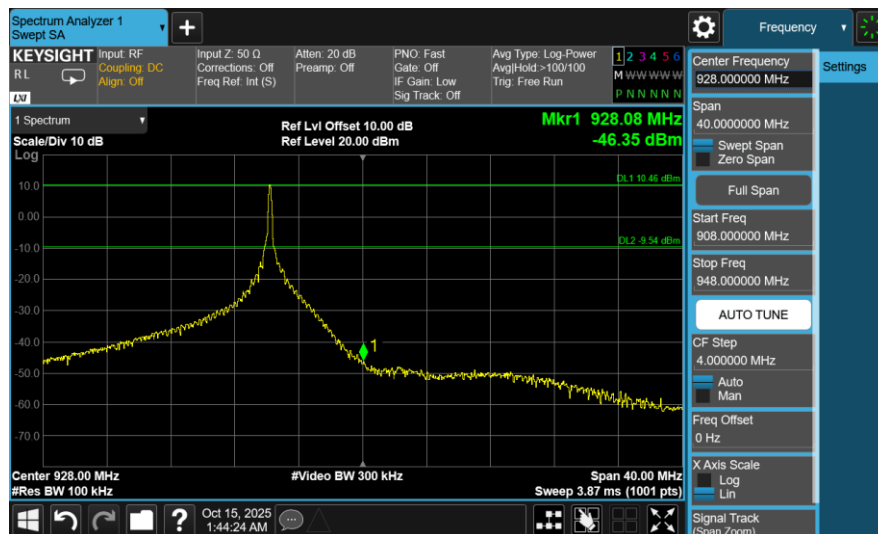
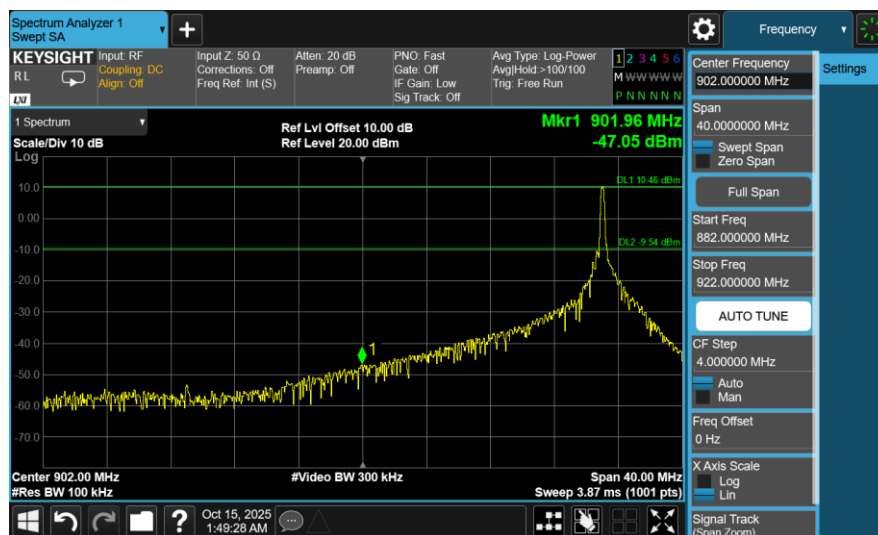
- a) Set analyzer center frequency to the frequency of the emission to be measured.
- b) Set span to 2 MHz.
- c) RBW = 100 kHz.
- d) $VBW \geq 1 / T$.
- e) Video bandwidth mode or display mode:
 - 1) The analyzer shall be set to ensure that video filtering is applied in the power domain. Typically, this requires setting the detector mode to RMS (power averaging) and setting the average-VBW type to power (rms).
 - 2) As an alternative, the analyzer may be set to linear detector mode. Ensure that video filtering is applied in linear voltage domain (rather than in a log or dB domain). Some analyzers require linear display mode to accomplish this. Others have a setting for average-VBW type, which can be set to "voltage" regardless of the display mode.
- f) Detector = peak.
- g) Sweep time = auto.
- h) Trace mode = max hold.
- i) Allow max hold to run for at least $[50 \times (1 / D)]$ traces.
- j) Compute the power by integrating the spectrum over 1 MHz using the analyzer's band power measurement function with band limits set equal to the emission frequency ($f_{\text{emission}} \pm 0.5$ MHz). If the spectrum analyzer does not have a band power function, then sum the amplitude levels (in power units) at 100 kHz intervals extending across the 1 MHz spectrum defined by $f_{\text{emission}} \pm 0.5$ MHz.

Limit:

FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required at-tenation is 20 dB.

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
GFSK	Ant1	Low	917	10.46	-47.05	≤-9.54	PASS
		High	922.2	10.46	-46.35	≤-9.54	PASS
		Low	Hop_917	5.54	-48.26	≤-9.54	PASS
		High	Hop_922.2	4.76	-48.16	≤-9.54	PASS





3.7 Carrier frequency separation

Test Method:

The test method was referred to the subclause 7.8.2 of ANSI C63.10-2013.

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: Wide enough to capture the peaks of two adjacent channels.
- b) RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
- c) Video (or average) bandwidth (VBW) $\geq$ RBW.
- d) Sweep: Auto.
- e) Detector function: Peak.
- f) Trace: Max hold.
- g) Allow the trace to stabilize.

Limit:

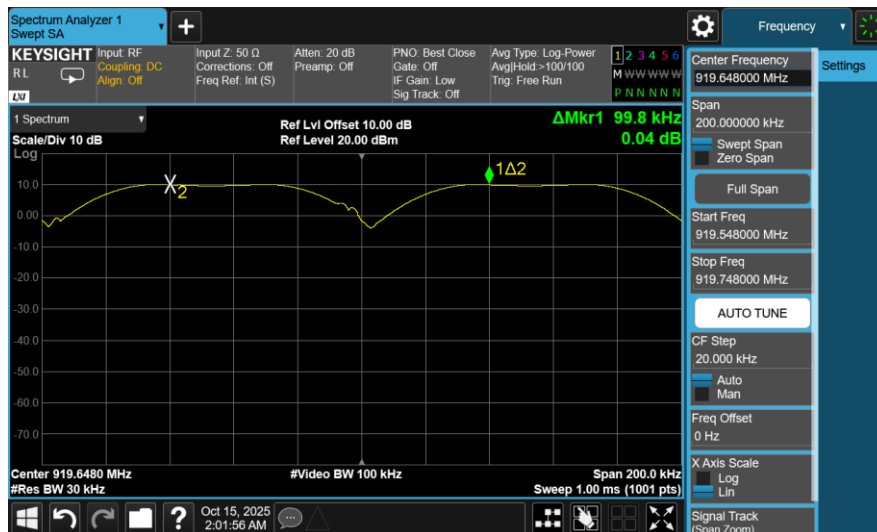
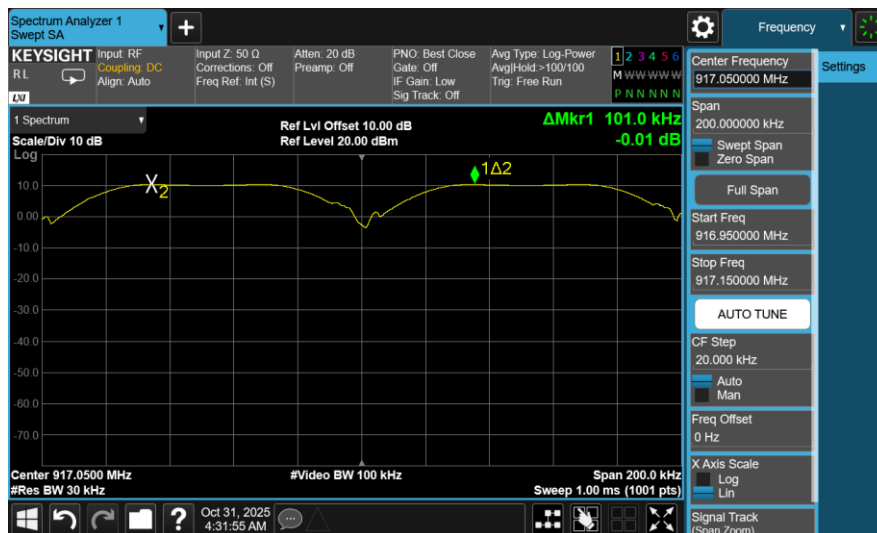
FCC §15.247 (a) (1)

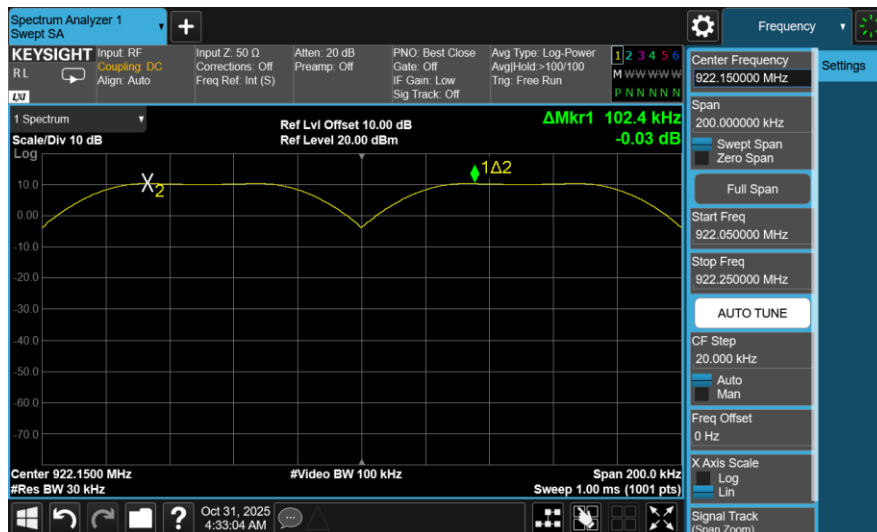
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Result: Pass

Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
Ant1	Hop	0.101	≥ 0.0701	PASS
Ant1	Hop	0.099	≥ 0.0701	PASS
Ant1	Hop	0.102	≥ 0.0697	PASS





3.8 Number of hopping frequencies

Test Method:

The test method was referred to the subclause 7.8.3 of ANSI C63.10-2013.

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- VBW $\geq$ RBW.
- Sweep: Auto.
- Detector function: Peak.
- Trace: Max hold.
- Allow the trace to stabilize.

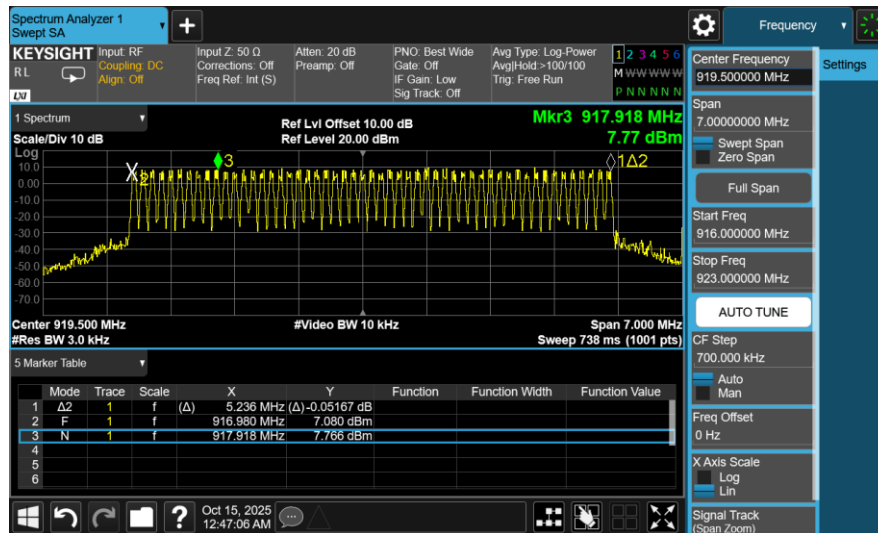
Limit:

FCC §15.247 (a) (1) (iii)

Frequency hopping systems in the 902-928 MHz band shall use at least 15 channels.

Test Result: Pass

TestMode	Antenna	Frequency [MHz]	Result[Num]	Limit[Num]	Verdict
GFSK	Ant1	Hop	53	≥15	PASS



3.9 Time of occupancy (dwell time)

Test Method:

The test method was referred to the subclause 7.8.4 of ANSI C63.10-2013.

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

- a) Span: Zero span, centered on a hopping channel.
- b) RBW shall be $\leq$ channel spacing and where possible RBW should be set $\gg 1 / T$, where T is the expected dwell time per channel.
- c) Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
- d) Detector function: Peak.
- e) Trace: Max hold.

Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:

$$\begin{aligned} & \text{(Number of hops in the period specified in the requirements)} = \\ & \text{(number of hops on spectrum analyzer)} \times (\text{period specified in the requirements} / \text{analyzer sweep time}) \end{aligned}$$

The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements. If the number of hops in a specific time varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation.

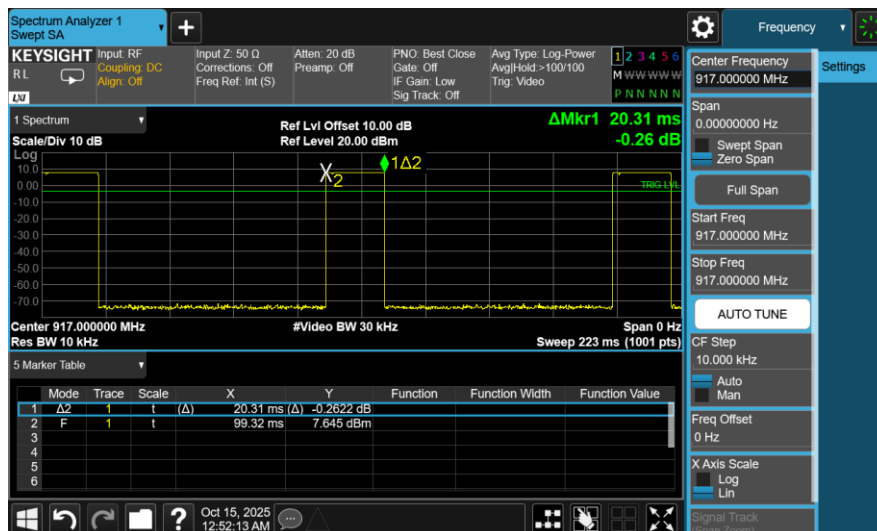
Limit:

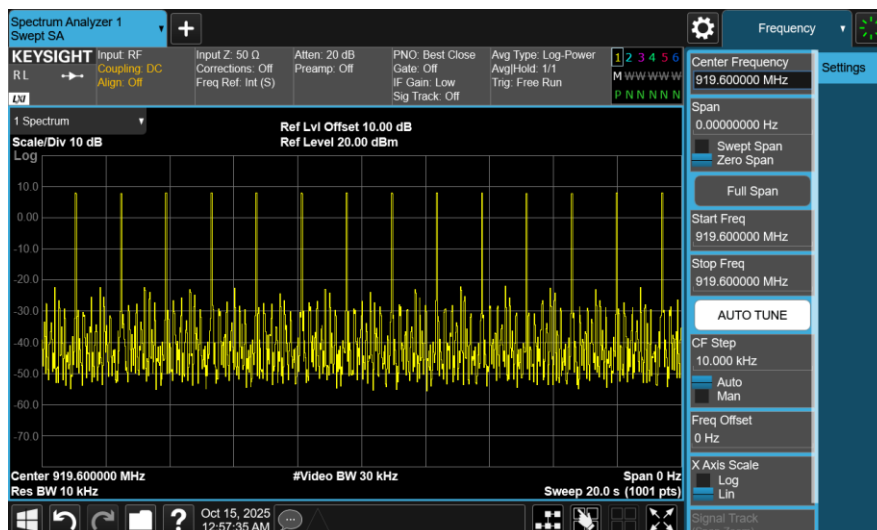
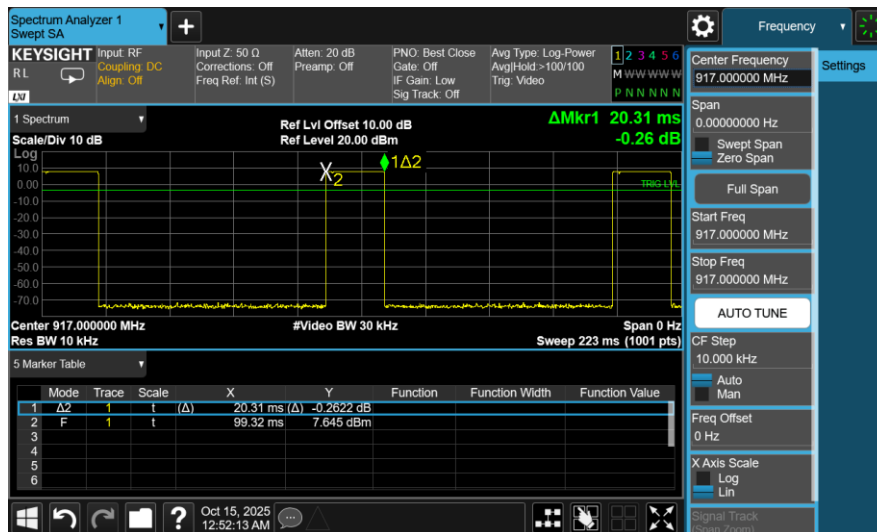
FCC §15.247 (a) (1) (iii)

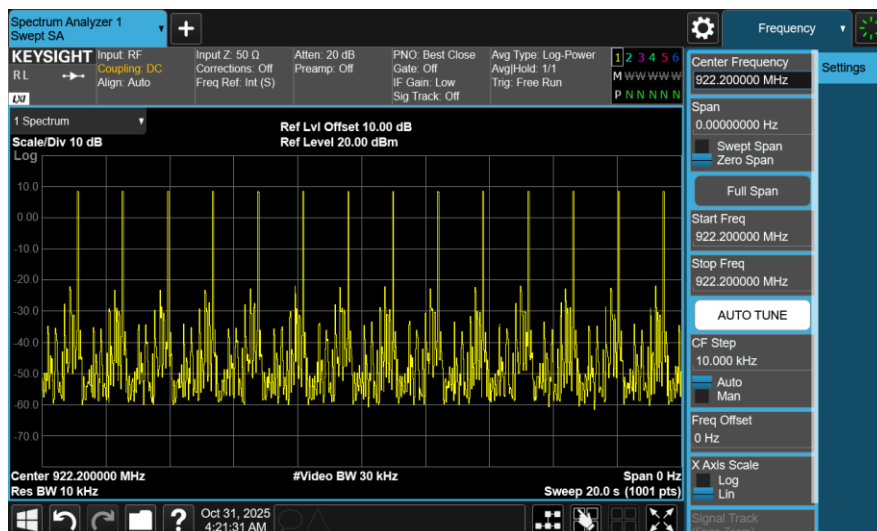
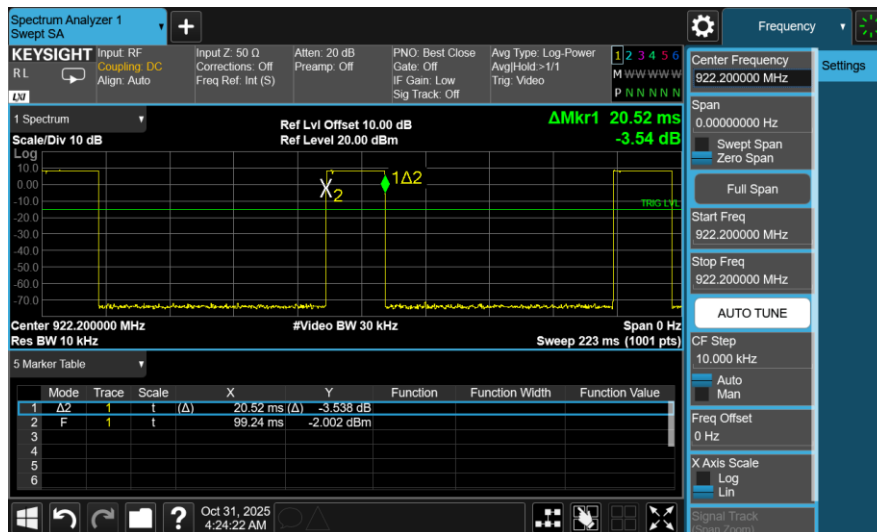
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Result: Pass

Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
Hop	20.31	14	0.284	≤0.4	PASS
Hop	20.31	14	0.284	≤0.4	PASS
Hop	20.31	14	0.284	≤0.4	PASS







3.10 Spurious radiated emissions for transmitter

Test Method:

The test method was referred to the subclause 11.11/11.12 of ANSI C63.10-2020.

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:
 For Above 1GHz
 Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 1MHz, VBW ≥ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
 For Below 1GHz
 Use the following spectrum analyzer settings:
 Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 100 KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
 For Below 30MHz
 Use the following spectrum analyzer settings:
 Span = wide enough to capture the peak level of the in-band emission and all spurious
 RBW = 200 Hz, VBW ≥ RBW from 9KHz to 0.15MHz, RBW 9KHz VBW ≥ RBW from 0.15MHz to 30MHz for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($20\log(1/\text{duty cycle})$).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
- 5: When duty cycle < 98%, The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\text{VBW} \geq 1 / T$, the T is transmission duration (T).

Limit:

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

§15.205 Restricted bands of operation

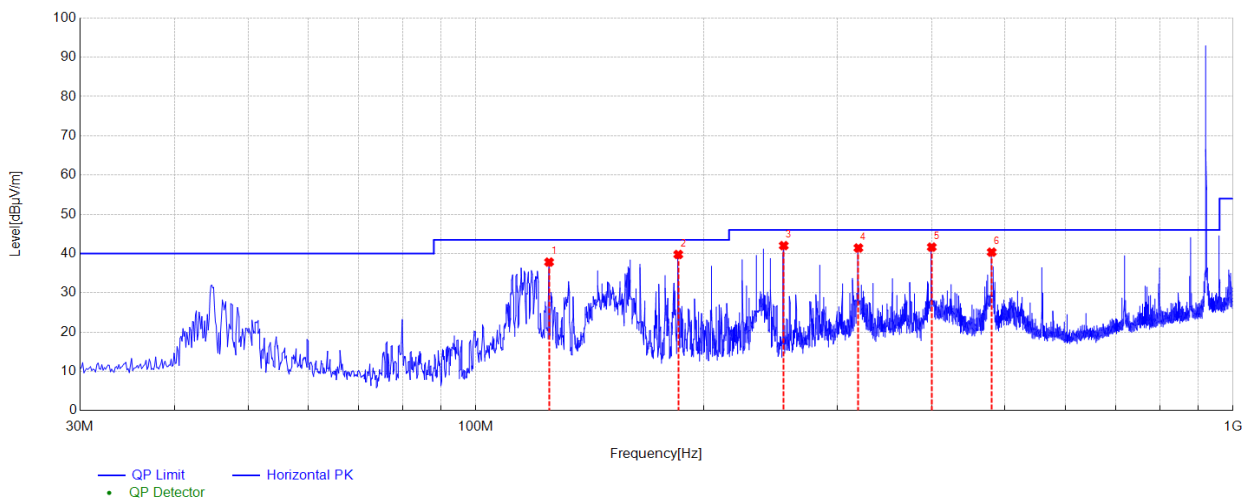
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	
13.36-13.41			

Test Result: Pass

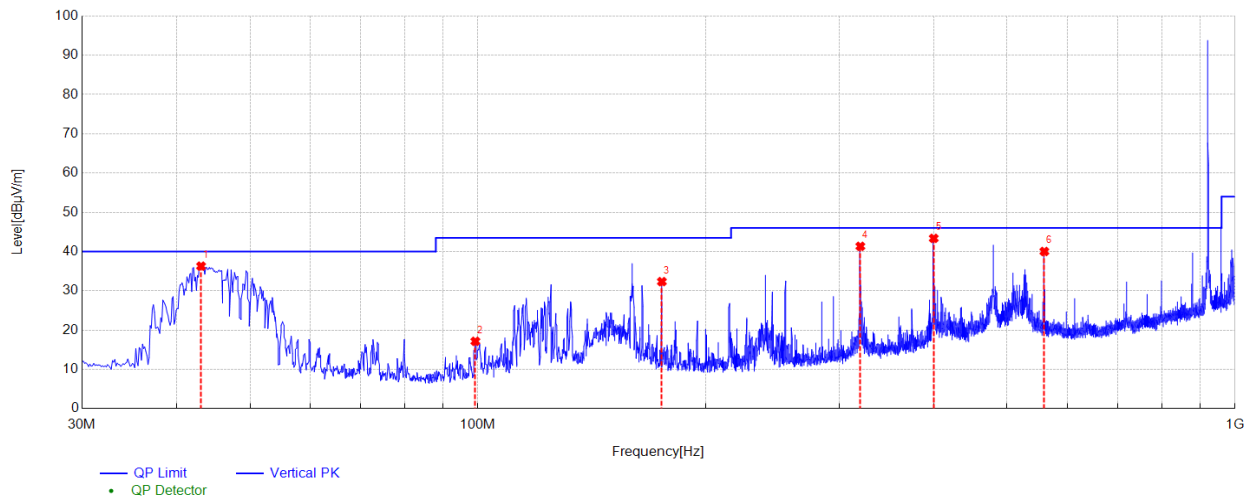
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the Emissions in the frequency band 9K-30MHz are more than 20dB below the limit are not reported. During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, the test data of the worst-case condition was recorded in this report.

Mode:	922.2MHz
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Test Graph



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	124.938	37.84	-17.51	43.50	5.66	100	154	Horizontal	PASS
2	185.078	39.78	-18.45	43.50	3.72	100	48	Horizontal	PASS
3	255.040	42.03	-17.85	46.00	3.97	100	338	Horizontal	PASS
4	320.030	41.44	-15.45	46.00	4.56	100	0	Horizontal	PASS
5	400.055	41.66	-13.60	46.00	4.34	100	2	Horizontal	PASS
6	480.080	40.37	-11.97	46.00	5.63	100	327	Horizontal	PASS



NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	43.0950	36.30	-16.13	40.00	3.70	100	87	Vertical	PASS
2	99.2338	17.16	-20.03	43.50	26.34	100	182	Vertical	PASS
3	175.015	32.36	-17.32	43.50	11.14	100	216	Vertical	PASS
4	320.030	41.35	-15.45	46.00	4.65	100	10	Vertical	PASS
5	400.055	43.38	-13.60	46.00	2.62	100	95	Vertical	PASS
6	559.983	40.04	-9.95	46.00	5.96	100	327	Vertical	PASS

Mode:	919.6MHz
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Final Data List												
NO.	Freq. [MHz]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1039.9177	-24.82	68.63	74.00	5.37	42.35	54.00	11.65	150	226.9	Horizontal	PASS
2	1360.072	-24.68	48.07	74.00	25.93	30.05	54.00	23.95	150	111	Horizontal	PASS
3	1838.9678	-21.42	55.74	74.00	18.26	41.94	54.00	12.06	150	96	Horizontal	PASS
4	2758.9518	-18.92	46.53	74.00	27.47	32.98	54.00	21.02	150	55	Horizontal	PASS
5	3678.9358	-16.51	59.79	74.00	14.21	35.52	54.00	18.48	150	49	Horizontal	PASS
6	5517.1034	-12.19	45.78	74.00	28.22	32.71	54.00	21.29	150	69	Horizontal	PASS

Final Data List												
NO.	Freq. [MHz]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1039.6079	-24.82	58.52	74.00	15.48	37.14	54.00	16.86	150	192	Vertical	PASS
2	1838.9678	-21.42	58.56	74.00	15.44	41.62	54.00	12.38	150	58	Vertical	PASS
3	2442.0884	-20.00	44.31	74.00	29.69	31.27	54.00	22.73	150	4	Vertical	PASS
4	3678.9358	-16.51	59.04	74.00	14.96	37.72	54.00	16.28	150	94	Vertical	PASS
5	5252.4505	-12.40	46.21	74.00	27.79	32.13	54.00	21.87	150	264	Vertical	PASS
6	6570.3141	-11.26	48.02	74.00	25.98	32.44	54.00	21.56	150	109	Vertical	PASS

Mode:	917MHz
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Final Data List												
NO.	Freq. [MHz]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1039.951	-24.82	68.77	74.00	5.23	43.39	54.00	10.61	150	270	Horizontal	PASS
2	1833.5667	-21.64	55.35	74.00	18.65	28.69	54.00	25.31	150	87	Horizontal	PASS
3	2751.7503	-18.96	47.20	74.00	26.80	32.66	54.00	21.34	150	46	Horizontal	PASS
4	3668.1336	-16.57	57.89	74.00	16.11	32.59	54.00	21.41	150	37	Horizontal	PASS
5	4584.5169	-14.76	47.09	74.00	26.91	31.37	54.00	22.63	150	11	Horizontal	PASS
6	7951.1902	-9.52	46.10	74.00	27.90	33.50	54.00	20.50	150	84	Horizontal	PASS

Final Data List												
NO.	Freq. [MHz]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1039.6079	-24.82	58.61	74.00	15.39	35.50	54.00	18.50	150	282	Vertical	PASS
2	1360.072	-24.68	42.40	74.00	31.60	27.12	54.00	26.88	150	240	Vertical	PASS
3	1833.5667	-21.64	57.96	74.00	16.04	29.94	54.00	24.06	150	67	Vertical	PASS
4	3668.1336	-16.57	60.04	74.00	13.96	36.71	54.00	17.29	150	86	Vertical	PASS
5	5265.053	-12.56	48.04	74.00	25.96	32.03	54.00	21.97	150	266	Vertical	PASS
6	8185.237	-9.41	45.78	74.00	28.22	33.09	54.00	20.91	150	145	Vertical	PASS

Mode:	922.2MHz
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Final Data List												
NO.	Freq. [MHz]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1040.0144	-24.82	68.59	74.00	5.41	45.47	54.00	8.53	150	262.2	Horizontal	PASS
2	1120.6241	-24.83	44.43	74.00	29.57	26.31	54.00	27.69	150	231	Horizontal	PASS
3	1844.3689	-21.46	53.07	74.00	20.93	45.14	54.00	8.86	150	97	Horizontal	PASS
4	2767.9536	-19.20	43.18	74.00	30.82	26.97	54.00	27.03	150	55	Horizontal	PASS
5	3689.7379	-16.97	56.81	74.00	17.19	45.30	54.00	8.70	150	38	Horizontal	PASS
6	4611.5223	-14.96	42.19	74.00	31.81	28.12	54.00	25.88	150	0	Horizontal	PASS

Final Data List												
NO.	Freq. [MHz]	Factor [dB/m]	PK Value [dBμV/m]	PK Limit [dBμV/m]	PK Margin [dB]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Height [cm]	Angle [°]	Polarity	Verdict
1	1039.6079	-24.82	58.60	74.00	15.40	37.11	54.00	16.89	150	186	Vertical	PASS
2	1070.214	-24.96	44.92	74.00	29.08	24.77	54.00	29.23	150	319	Vertical	PASS
3	1844.3689	-21.46	56.43	74.00	17.57	39.23	54.00	14.77	150	61	Vertical	PASS
4	3687.9376	-16.89	55.68	74.00	18.32	38.06	54.00	15.94	150	78	Vertical	PASS
5	3945.3891	-15.98	47.45	74.00	26.55	28.31	54.00	25.69	150	160	Vertical	PASS
6	7924.1848	-9.72	43.89	74.00	30.11	30.10	54.00	23.90	150	319	Vertical	PASS

4 Test Setup Photos

Ref "EFGX25070590-IE-01-E08_Setup_Photos.pdf"

5 External Photo

Ref "EFGX25070590-IE-01-E08_External_Photos.pdf"

6 Internal Photos

Ref "EFGX25070590-IE-01-E08_Internal_Photos.pdf"

-End of report-