



Certificate No.: 3745.01



FCC - TEST REPORT

Report Number : **709502402016-00B** Date of Issue: June 25, 2024

Model : CNR1

Product Type : UHF-RFID

Applicant : Zhejiang Cainiao Supply Chain Management Co., Ltd.

Address : No.168 Wuchang Avenue, Wuchang Street, Yuhang District
Hangzhou China

Manufacturer : Zhejiang Cainiao Supply Chain Management Co., Ltd.

Address : No.168 Wuchang Avenue, Wuchang Street, Yuhang District
Hangzhou China

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices : 44



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2 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
-00B	First Issue	06/25/2024

3 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
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Shanghai 201108,
P.R. China

Telephone: +86 21 6141 0123

Fax: +86 21 6140 8600

FCC Registration No.: 820234

FCC Designation Number: CN1183

ISED CAB identifier: CN0101

IC Registration No.: 31668

4 Description of the Equipment Under Test

Product: UHF-RFID

Model no.: CNR1

FCC ID: 2BGGH-CNR1

Options and accessories: NA

Rating: DC 24V for UHF-RFID
100-240V~, 50/60Hz for adapter

RF Transmission Frequency: 902-928MHz

No. of Operated Channel: 50 channels

Ch	Fre (MH)	Ch	Fre (MH)	Ch	Fre (MH)	Ch	Fre (MH)	Ch	Fre (MHz)
1	902.75	11	907.75	21	912.75	31	917.75	41	922.75
2	903.25	12	908.25	22	913.25	32	918.25	42	923.25
3	903.75	13	908.75	23	913.75	33	918.75	43	923.75
4	904.25	14	909.25	24	914.25	34	919.25	44	924.25
5	904.75	15	909.75	25	914.75	35	919.75	45	924.75
6	905.25	16	910.25	26	915.25	36	920.25	46	925.25
7	905.75	17	910.75	27	915.75	37	920.75	47	925.75
8	906.25	18	911.25	28	916.25	38	921.25	48	926.25
9	906.75	19	911.75	29	916.75	39	921.75	49	926.75
10	907.25	20	912.25	30	917.25	40	922.25	50	927.25

Modulation: FHSS(ASK)

Hardware Version: CAINIAO_H92_V1.3

Software Version: V1.2.34

Antenna Type: Mini RFID Panel Antenna

Antenna Gain: 5.5dBi

Description of the EUT: The Equipment Under Test (EUT) is an UHF-RFID which operated at 902-928MHz. Only ANT1 is available, and the others ANT ports are disabled by software and will not be used by end-user.

Test sample no.: SHA-799059-1(RF Conducted /RF Radiated);

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment, antenna gain or any information supplied.



5 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2023 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 Measurement Guidance and ANSI C63.10-2013.

6 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	12-16	Site 1	☒	☐	☐
§15.247 (b) (2)	Conducted peak output power	17-18	Site 1	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	19-20	Site 1	☒	☐	☐
§15.247(a)(1)	Carrier frequency separation	21	Site 1	☒	☐	☐
§15.247(a)(1)(i)	Number of hopping frequencies	22-23	Site 1	☒	☐	☐
§15.247(a)(1)(i)	Dwell Time - Average Time of Occupancy	24-26	Site 1	☒	☐	☐
§15.247(a)(2)	6dB bandwidth	---	---	☐	☐	☒
§15.247(e)	Power spectral density	---	---	☐	☐	☒
§15.247(e)	Spurious RF conducted emissions	27-31	Site 1	☒	☐	☐
§15.247(d)	Band edge	32-36	Site 1	☒	☐	☐
§15.247(d) & §15.209 & §15.205	Spurious radiated emissions for transmitter	37-40	Site 1	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a Mini RFID Panel Antenna which use unique (non-standard) antenna connector, the gain is 5.5dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

7 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2BGGH-CNR1 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: March 18, 2024

Testing Start Date: March 20, 2024

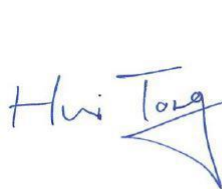
Testing End Date: May 6, 2024

-TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:

Prepared by:

Tested by:



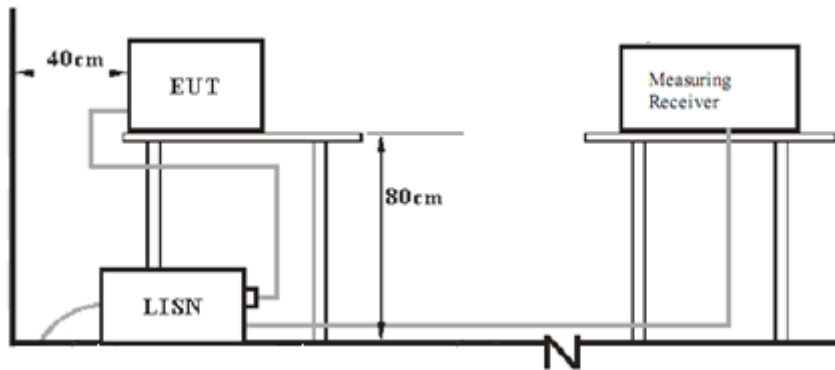
Hui TONG
Review Engineer

Jiaxi XU
Project Engineer

Cheng Huali
Test Engineer

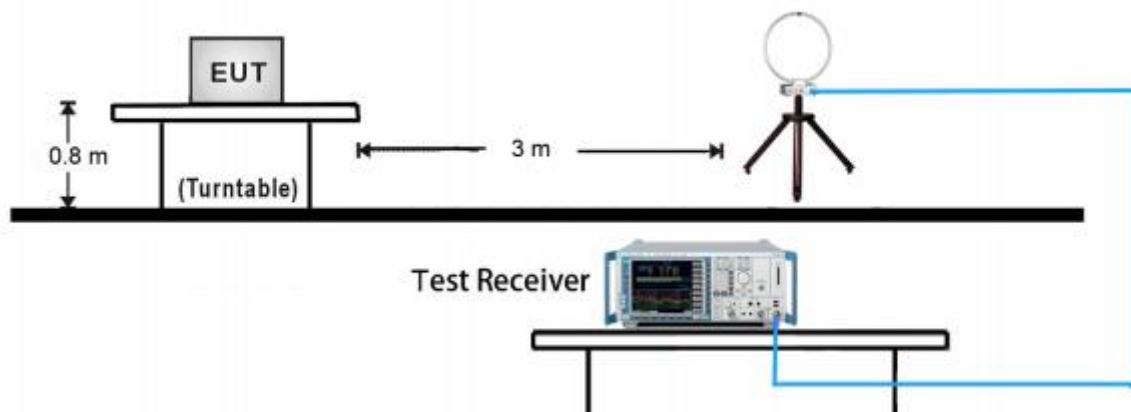
8 Test Setups

7.1 AC Power Line Conducted Emission test setups

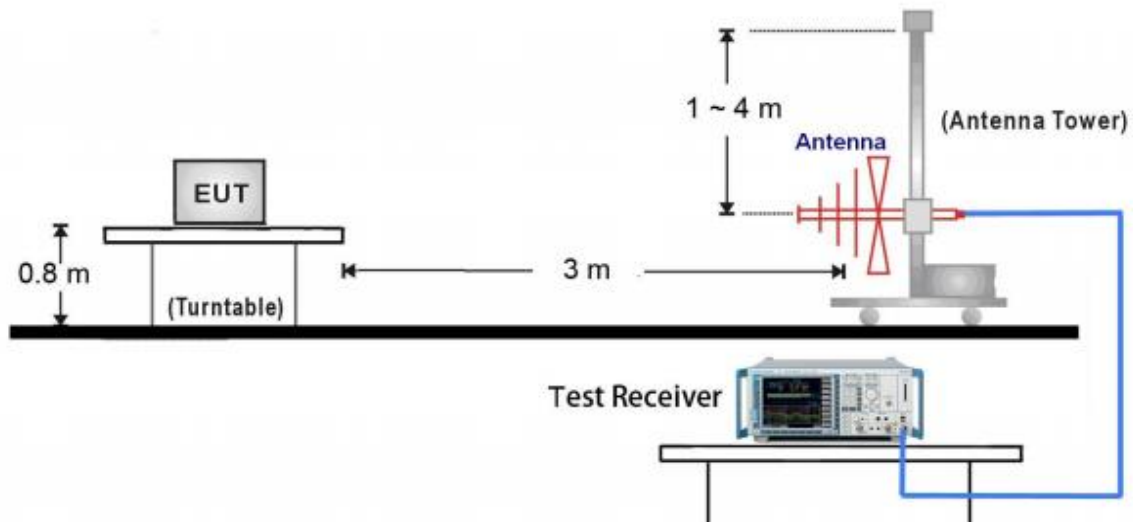


7.2 Radiated test setups

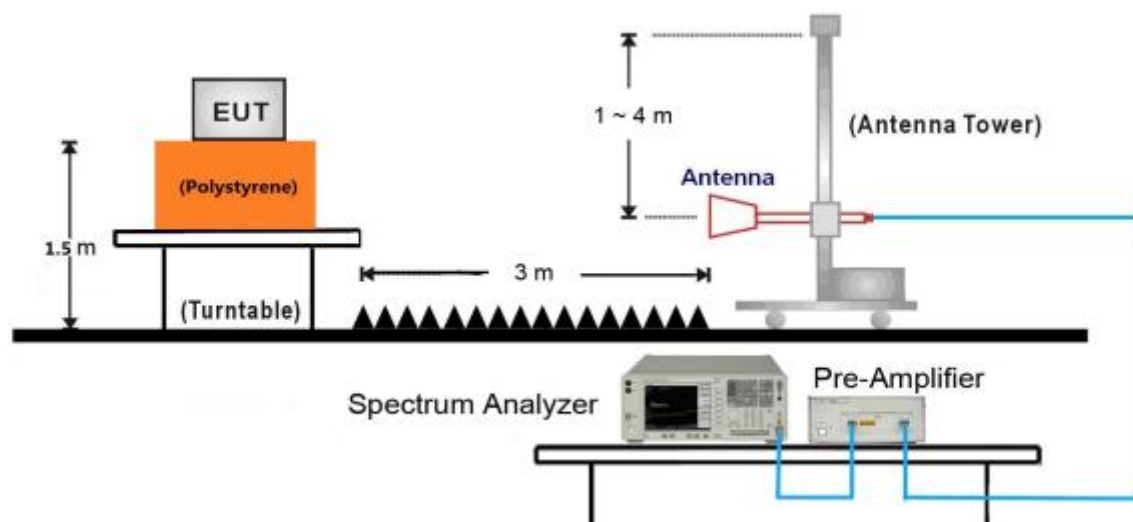
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:

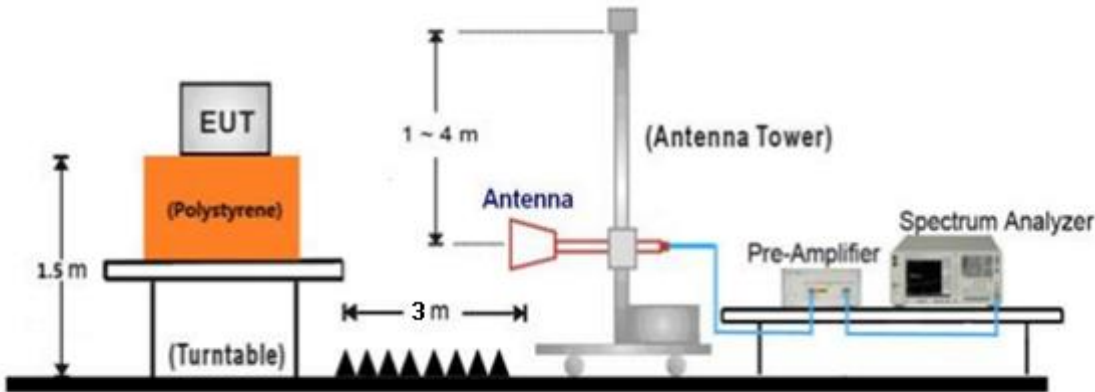


1GHz ~ 18GHz Test Setup:

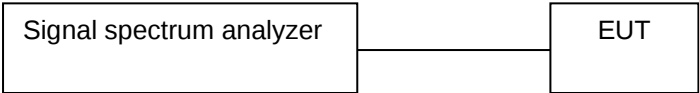




18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups



9 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenovo	E470	PF-OU5TS7 17/09

Test software: Rfid reader Console, which used to control the EUT in continues transmitting or hopping mode

The system was configured to hopping mode and non-hopping mode.

Mode	Tested Channel	Modulation	Power level setting
ASK	1	ASK	27
	26	ASK	27
	40	ASK	27
	50	ASK	27

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

10 Technical Requirement

10.1 Conducted Emission

Test Method

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. Both sides of AC line were checked for maximum conducted interference.
6. The frequency range from 150 kHz to 30 MHz was searched.
7. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

Limit

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

*Decreases with the logarithm of the frequency.

Conducted Emission

150k-30MHz Conducted Emission Test

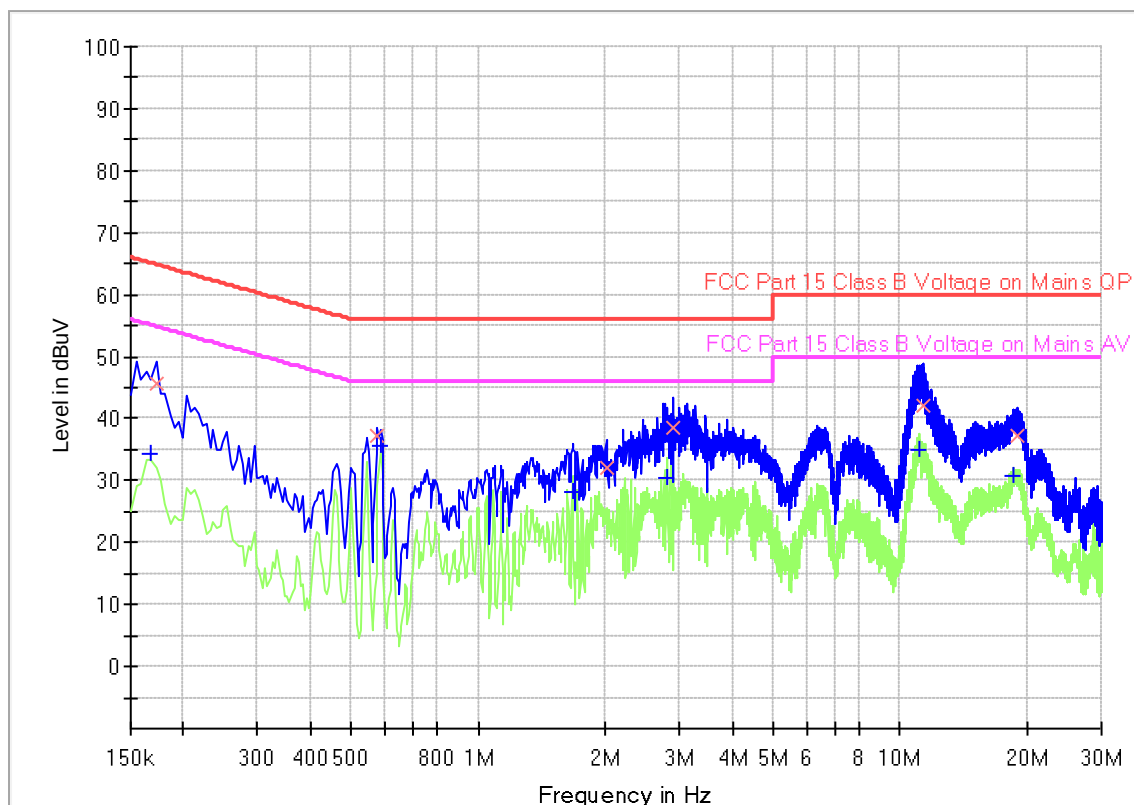
EUT Information

EUT Name: UHF-RFID
 Model: CNR1
 Client: Zhejiang Cainiao Supply Chain Management Co., Ltd.
 Op Cond: Power on, AC 120V/60Hz, TX _922.25MHz
 Operator: Huali CHENG
 Standard: FCC Part 15.207(a)
 Comment: Phase L
 Sample No.: SHA-799059-1

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
 Receiver: [ESR 3]
 Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamplifier
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.168000	---	34.29	55.06	20.77	1000.0	9.000	L1	19.4
0.172500	45.64	---	64.84	19.20	1000.0	9.000	L1	19.4
0.577500	37.32	---	56.00	18.68	1000.0	9.000	L1	19.4
0.586500	---	35.49	46.00	10.51	1000.0	9.000	L1	19.4
1.671000	---	28.05	46.00	17.95	1000.0	9.000	L1	19.5
2.013000	32.07	---	56.00	23.93	1000.0	9.000	L1	19.5
2.805000	---	30.46	46.00	15.54	1000.0	9.000	L1	19.5
2.899500	38.43	---	56.00	17.57	1000.0	9.000	L1	19.5
11.067000	---	35.02	50.00	14.98	1000.0	9.000	L1	19.9
11.314500	42.10	---	60.00	17.90	1000.0	9.000	L1	19.9
18.636000	---	30.80	50.00	19.20	1000.0	9.000	L1	20.3
19.027500	37.31	---	60.00	22.69	1000.0	9.000	L1	20.3

Remark:

*Level=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

150k-30MHz Conducted Emission Test

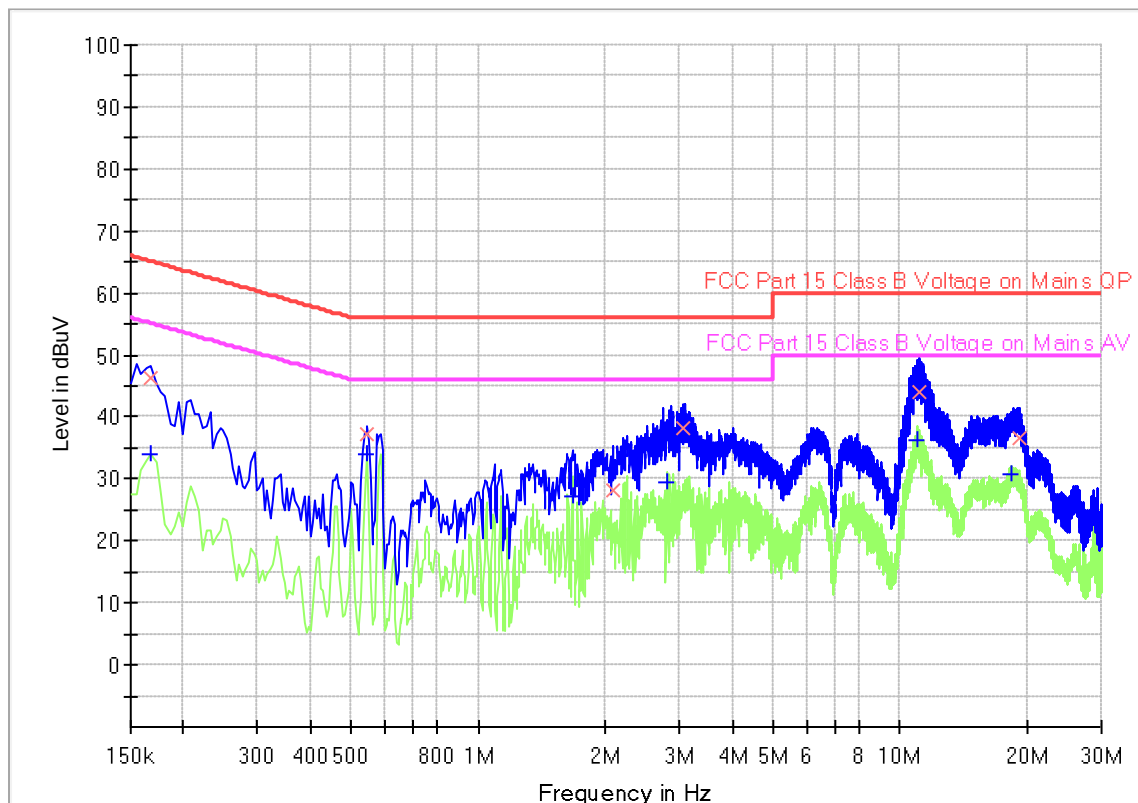
EUT Information

EUT Name: UHF-RFID
 Model: CNR1
 Client: Zhejiang Cainiao Supply Chain Management Co., Ltd.
 Op Cond: Power on, AC 120V/60Hz, TX_922.25MHz
 Operator: Huali CHENG
 Standard: FCC Part 15.207(a)
 Comment: Phase N
 Sample No.: SHA-799059-1

Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN
 Receiver: [ESR 3]
 Level Unit: dBuV

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	100 Hz	PK+	200 Hz	0.02 s	0 dB
150 kHz - 30 MHz	4.5 kHz	PK+; AVG	9 kHz	0.01 s	0 dB





Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.168000	---	33.92	55.06	21.14	1000.0	9.000	N	19.4
0.168000	46.26	---	65.06	18.80	1000.0	9.000	N	19.4
0.546000	---	33.97	46.00	12.03	1000.0	9.000	N	19.5
0.546000	37.24	---	56.00	18.76	1000.0	9.000	N	19.5
1.671000	---	27.34	46.00	18.66	1000.0	9.000	N	19.5
2.089500	28.10	---	56.00	27.90	1000.0	9.000	N	19.5
2.800500	---	29.56	46.00	16.44	1000.0	9.000	N	19.5
3.075000	38.36	---	56.00	17.64	1000.0	9.000	N	19.5
11.035500	---	36.25	50.00	13.75	1000.0	9.000	N	19.7
11.076000	44.12	---	60.00	15.88	1000.0	9.000	N	19.7
18.424500	---	30.76	50.00	19.24	1000.0	9.000	N	20.1
19.081500	36.52	---	60.00	23.48	1000.0	9.000	N	20.1

Remark:

*Level=Reading Level + Correction Factor

**Correction Factor=Cable Loss + LISN Factor

(The Reading Level is recorded by software which is not shown in the sheet)

10.2 Conducted Peak Output Power

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following test receiver settings:
Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
RBW > the 20dB bandwidth of the emission being measured, VBW ≥ RBW,
Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power and record the results in the test report.
5. Repeat above procedures until all frequencies measured were complete.

Limits

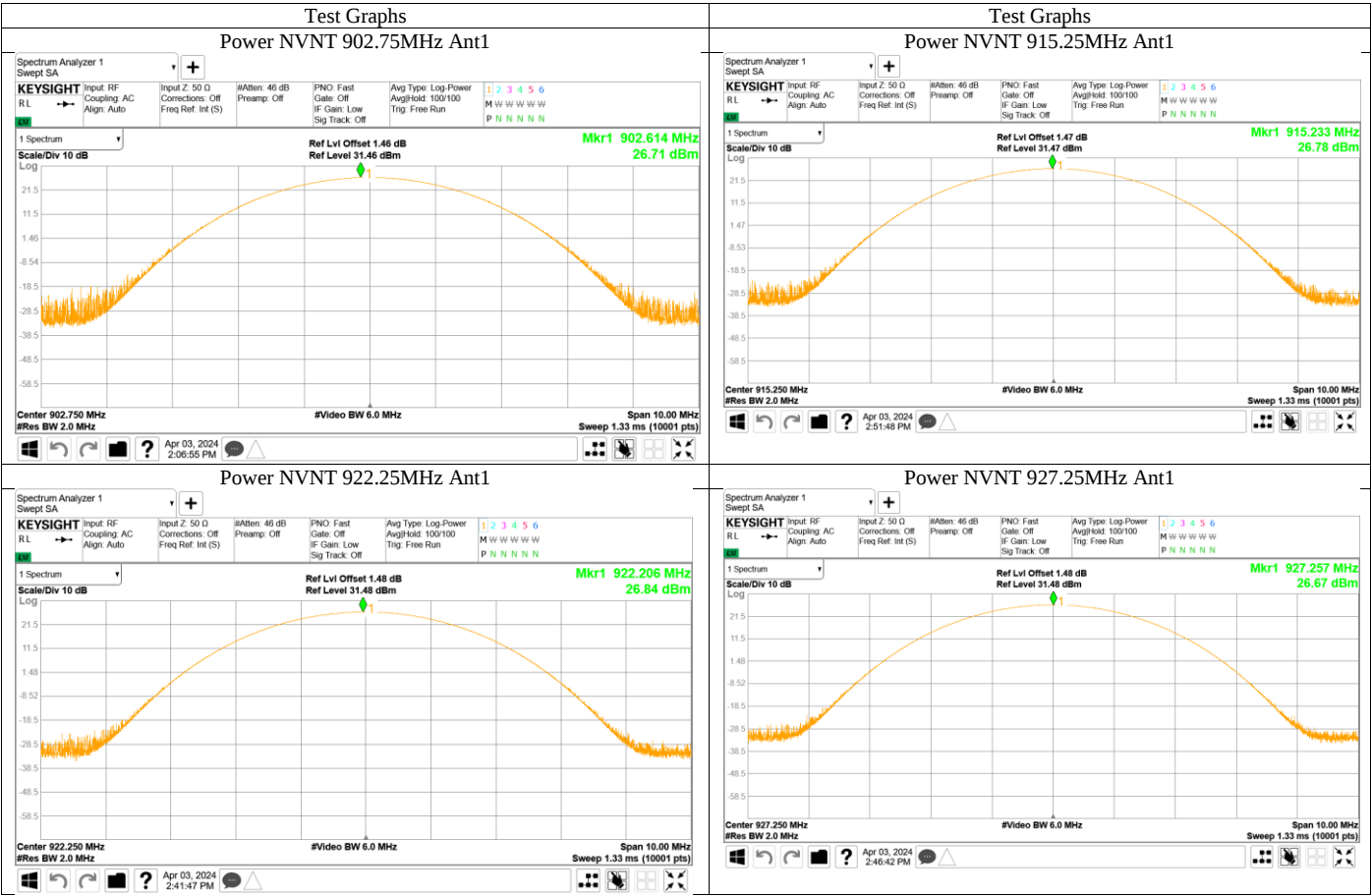
According to §15.247 (b) (2), conducted peak output power limit as below:

	Frequency Range	Limit	Limit
	MHz	W	dBm
Conducted peak output power	902-928	≤1	≤30
e.i.r.p.	902-928	≤4	≤36



Test result as below table

Antenna Gain:5.5dBi						
Frequency (MHz)	Total Power (dBm) §15.247 (b) (2)	Limit (dBm)	Result	e.i.r.p. (dBm)	Limit (dBm)	Result
902.75MHz	26.71	30	Pass	32.21	36	Pass
915.25MHz	26.78	30	Pass	32.28	36	Pass
922.25MHz	26.84	30	Pass	32.34	36	Pass
927.25MHz	26.67	30	Pass	32.17	36	Pass



10.3 20 dB bandwidth

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
RBW $\geq$ 1% to 5% of the 20 dB bandwidth/99% OBW, VBW $\geq$ 3RBW,
Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Measure the frequency difference of two frequencies that were attenuated 20 dB/99% OBW from the reference level. Record the frequency difference as the emission bandwidth. Record the results.
5. Repeat above procedures until all frequencies measured were complete.

Limit

Limit [MHz]

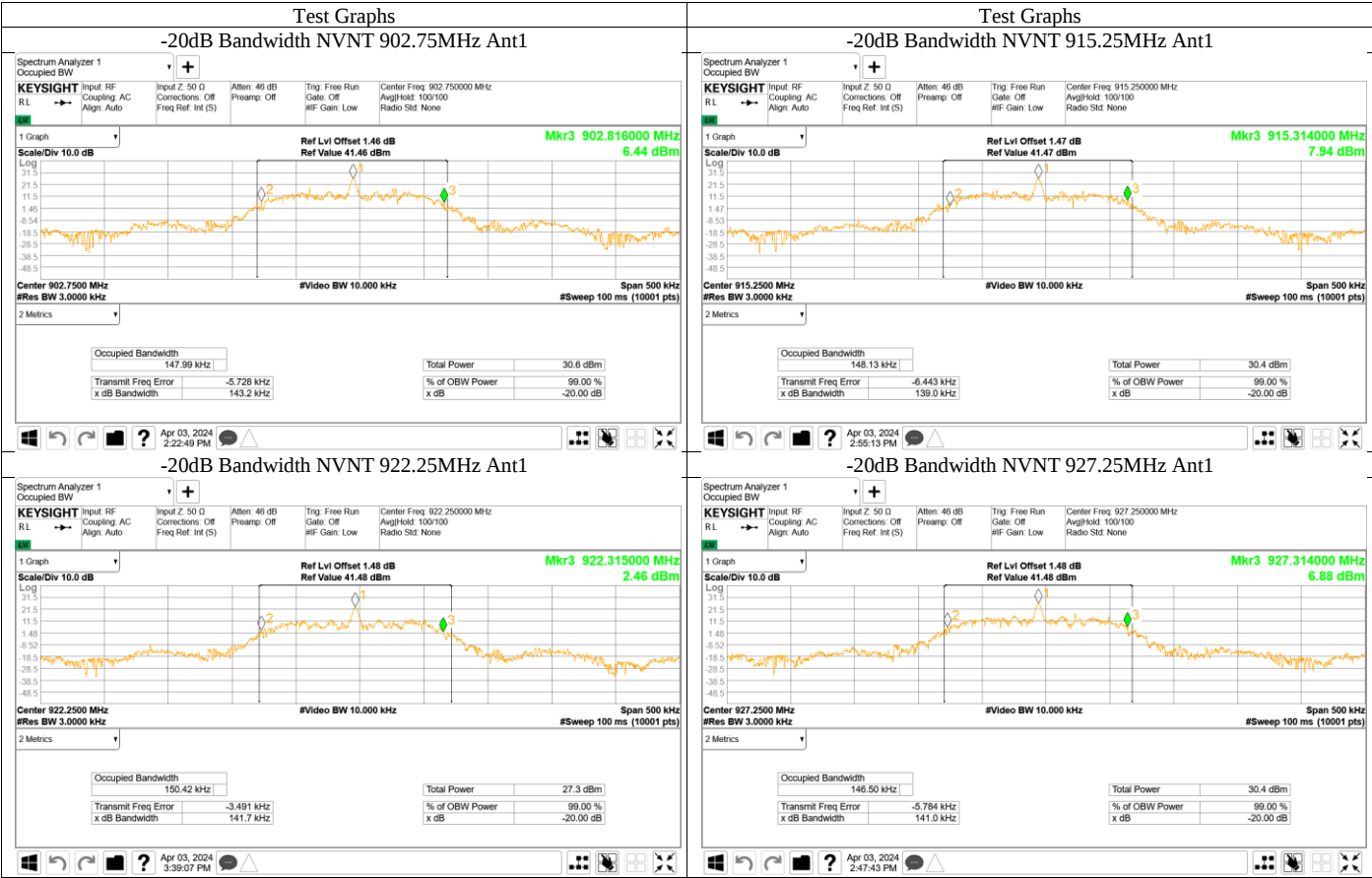
N/A



20 dB bandwidth

Test result as below

Frequency MHz	20 dB Bandwidth MHz	Result
902.75MHz	0.143	Pass
915.25MHz	0.139	Pass
922.25MHz	0.142	Pass
927.25MHz	0.141	Pass



10.4 Carrier Frequency Separation

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels, 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. VBW $\geq$ RBW, Sweep = auto, Detector function = peak.
4. By using the Max-Hold function record the separation of two adjacent channels.
5. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function. Record the results.
6. Repeat above procedures until all frequencies measured were complete.

Limit

Limit kHz
$\geq 25\text{kHz}$ or 20 dB bandwidth which is greater

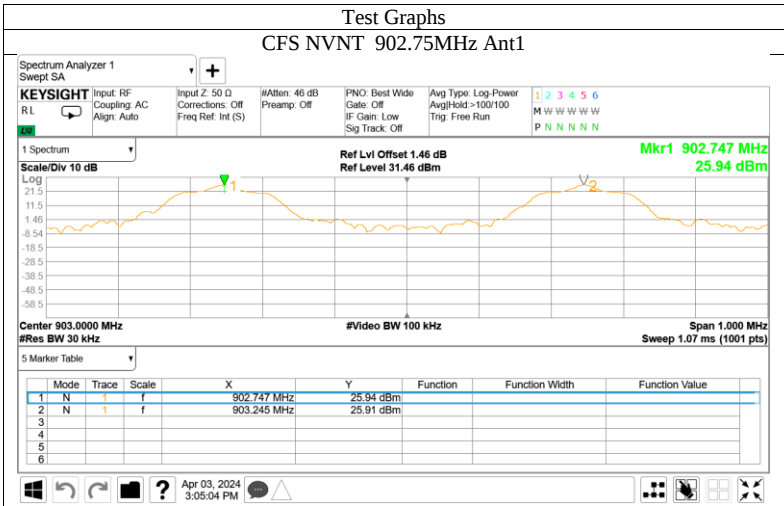
Limit

Modulation	20 dB Bandwidth kHz
ASK	143(worst case)

Test result: The measurement was performed with the typical configuration (normal hopping status), here (low channel) was used to show compliance.

test result

Modulation	Frequency MHz	Carrier Frequency Separation kHz	Result
GFSK	902.75	498	Pass



10.5 Number of hopping frequencies

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Use the following spectrum analyzer settings:
Span = the frequency band of operation, 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.
4. Allow the trace to stabilize. It may prove necessary to break the span up to sections, in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

Limit

Limit
number

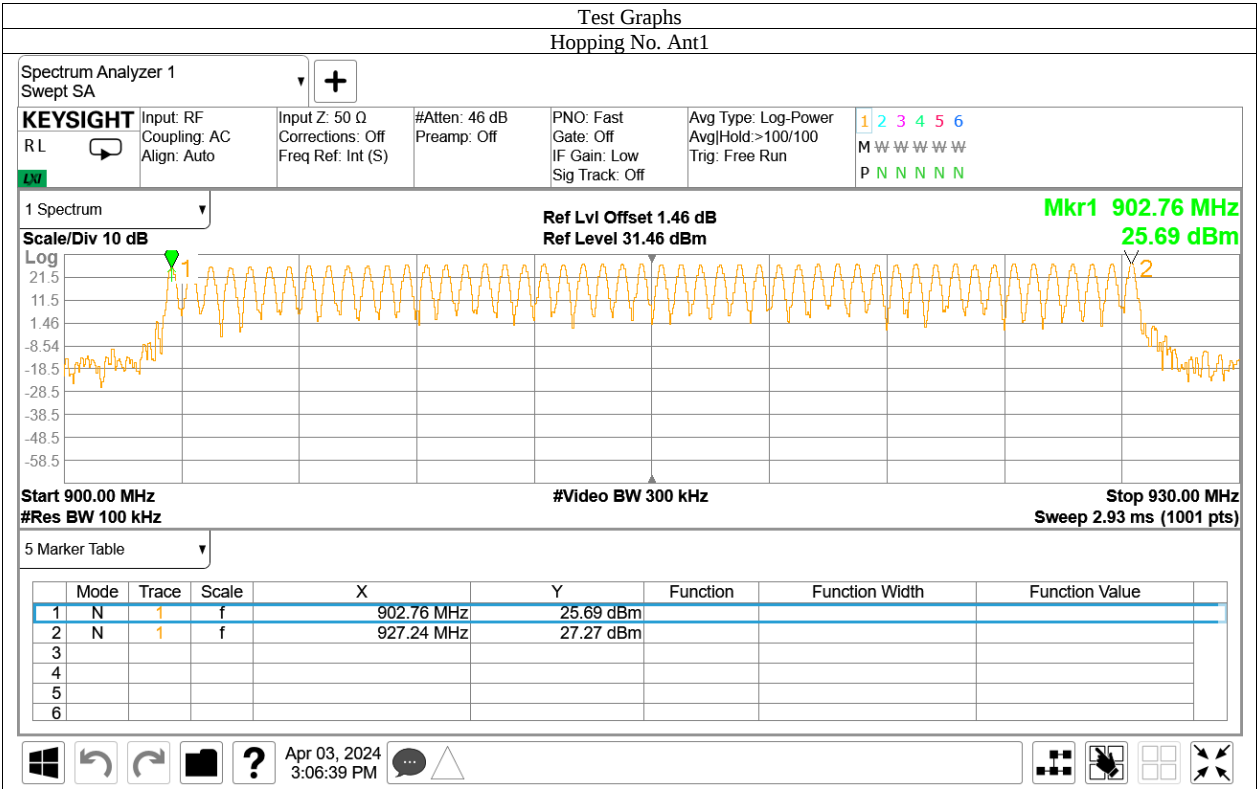
 ≥ 50



Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the modulation mode. Here ASK modulation mode was used to show compliance.

Number of hopping frequencies	Result
50	Pass



10.6 Dwell Time

Test Method

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
3. Span: Zero span, centered on a hopping channel.
4. 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.
5. 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.
6. Detector function: Peak.
7. 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.

Limit

The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period for 50 hopping frequencies



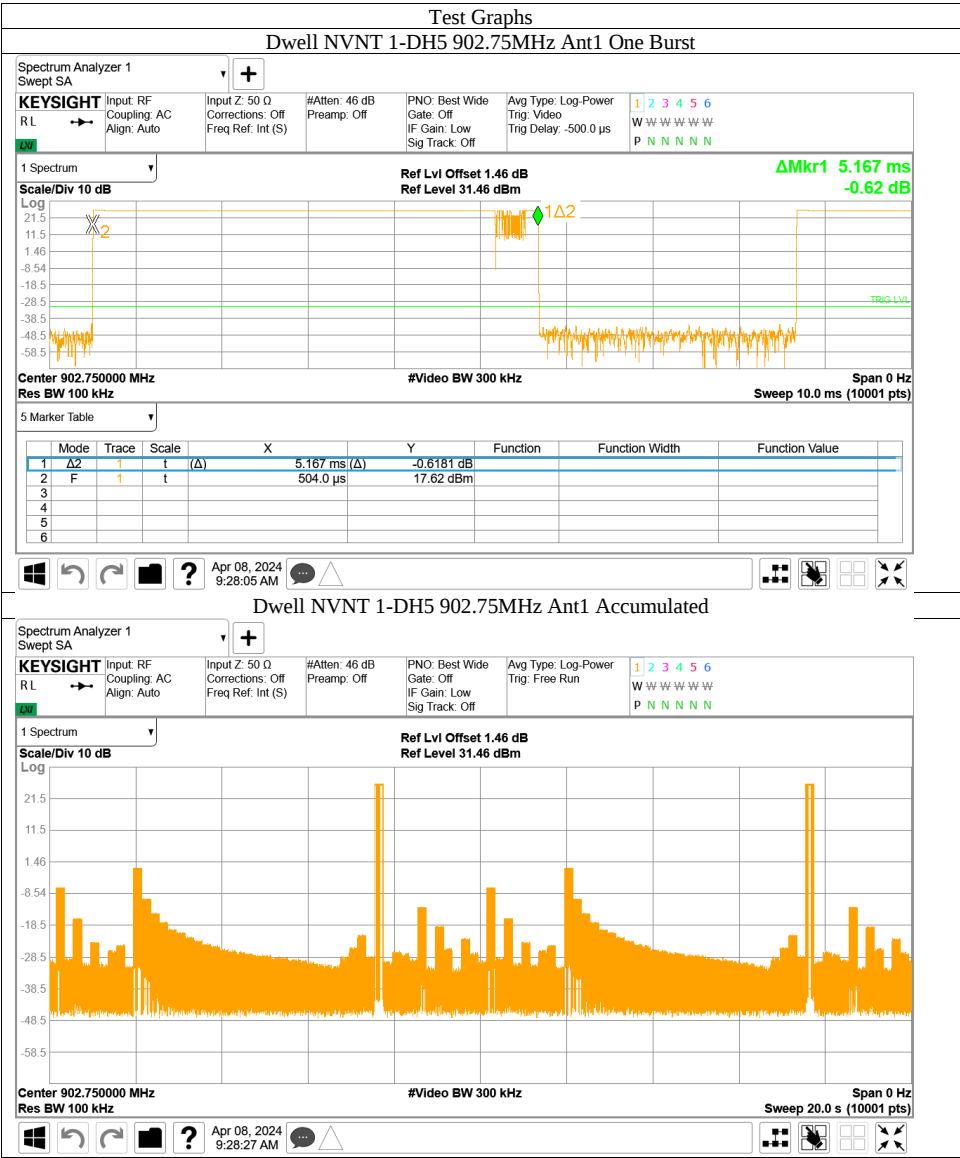
Dwell Time

Dwell time

The maximum dwell time shall be 0,4 s.
The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 50 [ch] = 20 [s*ch];
The burst width, which is directly measured, refers to the duration on one channel hop.

Test Result

Modulation	Frequency (MHz)	Reading (ms)	Total Hops	Test Result (ms)	Limit (ms)	Result
ASK	902.75	5.167	24*2	248.016	< 400	Pass





10.7 Spurious RF conducted emissions

Test Method

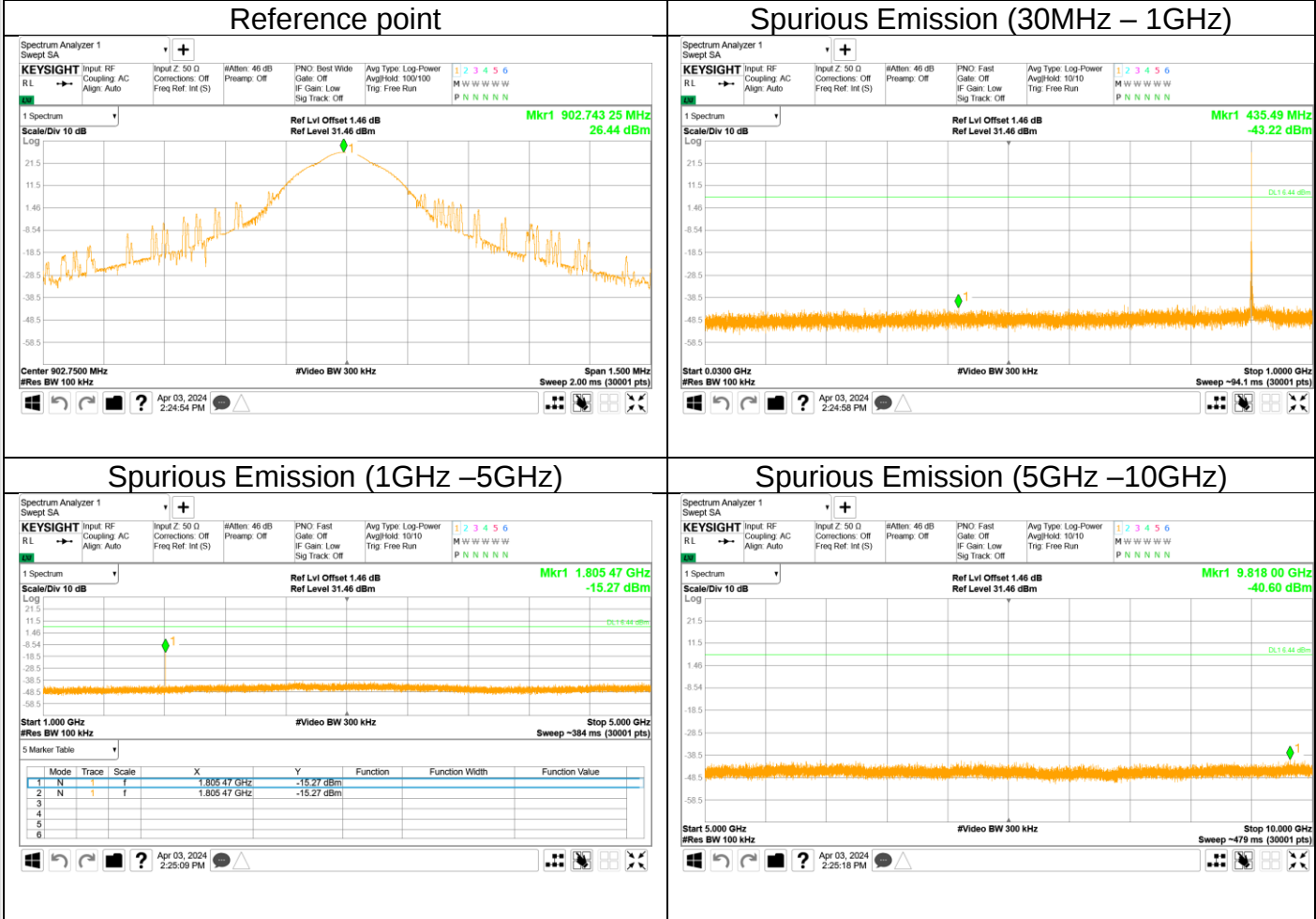
1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector, Sweep = auto, Span = wide enough to capture the peak level of the in-band emission and all spurious emissions, Trace = max hold. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section.
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency

Limit

Frequency Range MHz	Limit (dBc)
30-10000	-20

Spurious RF conducted emissions

Out-of-Band Emissions
Channel 1 (902.75MHz)

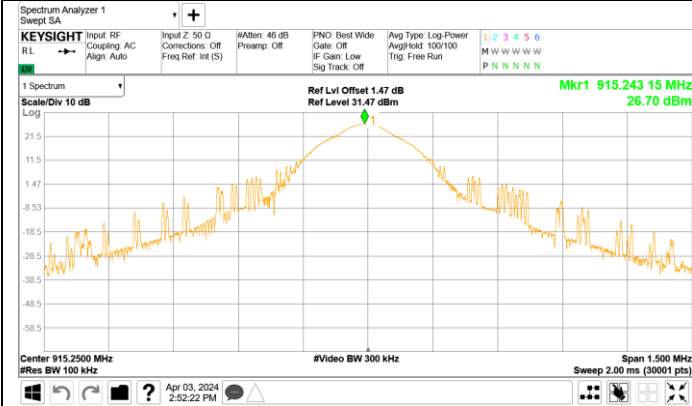


Remark: The signal that exceeds the limit is the fundamental frequency(30-1GHz).

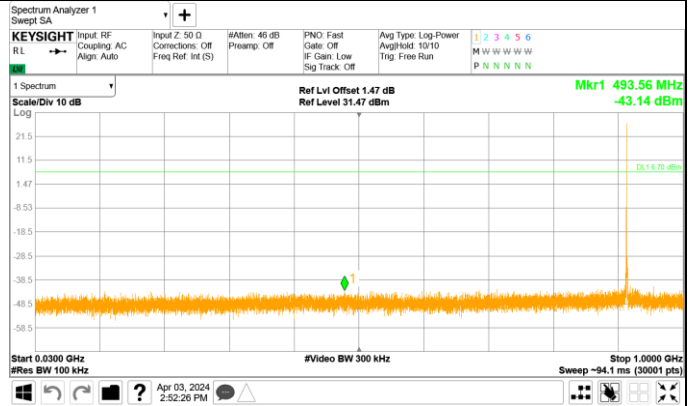


Out-of-Band Emissions
Channel 16 (915.25MHz)

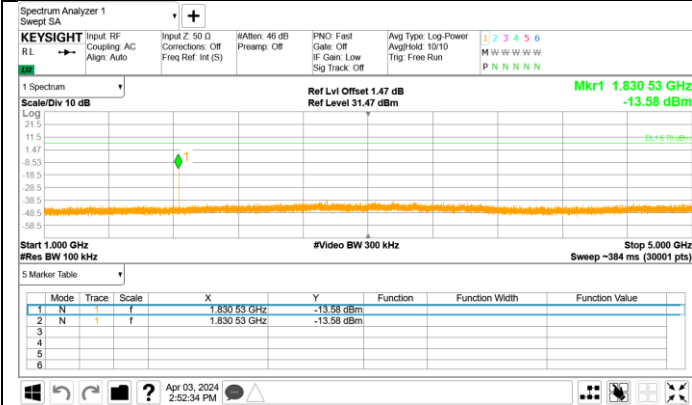
Reference point



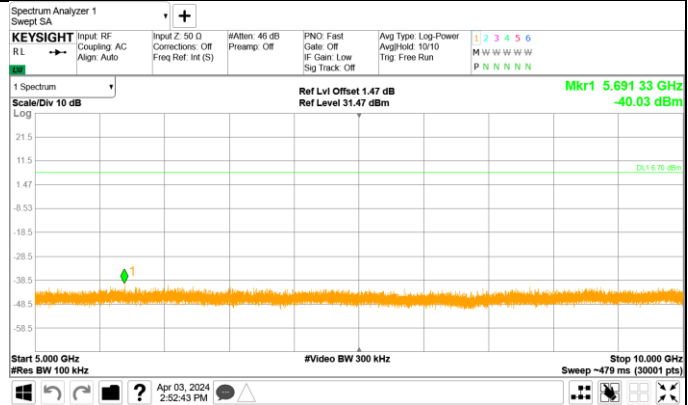
Spurious Emission (30MHz – 1GHz)



Spurious Emission (1GHz –5GHz)



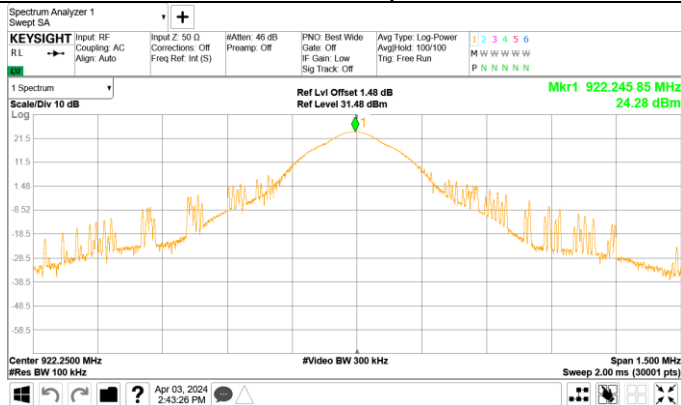
Spurious Emission (5GHz –10GHz)



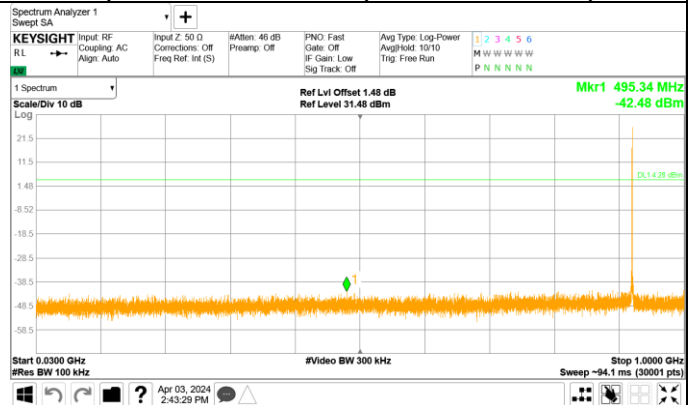
Remark: The signal that exceeds the limit is the fundamental frequency(30-1GHz).

Out-of-Band Emissions Channel 40(922.25MHz)

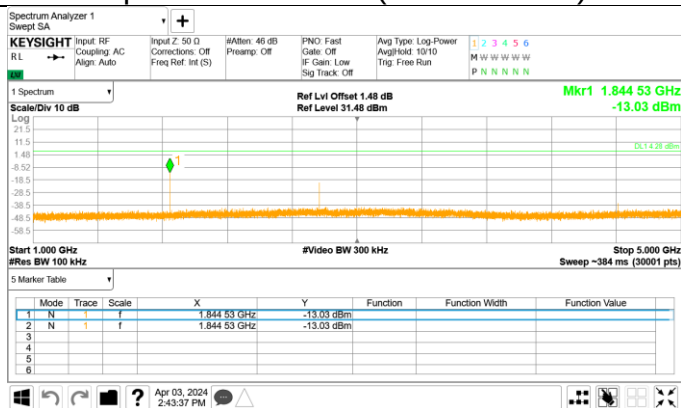
Reference point



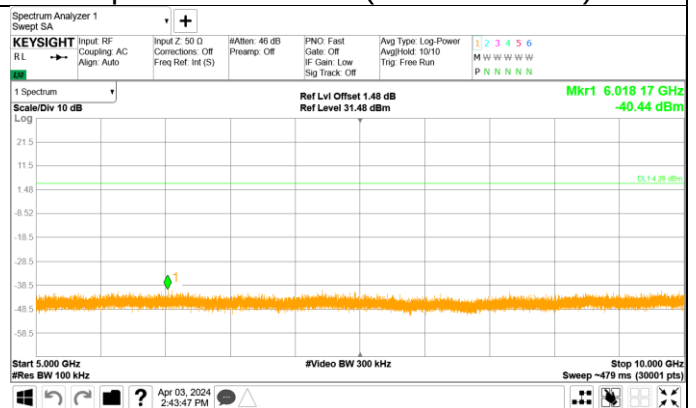
Spurious Emission (30MHz – 1GHz)



Spurious Emission (1GHz –5GHz)



Spurious Emission (5GHz –10GHz)



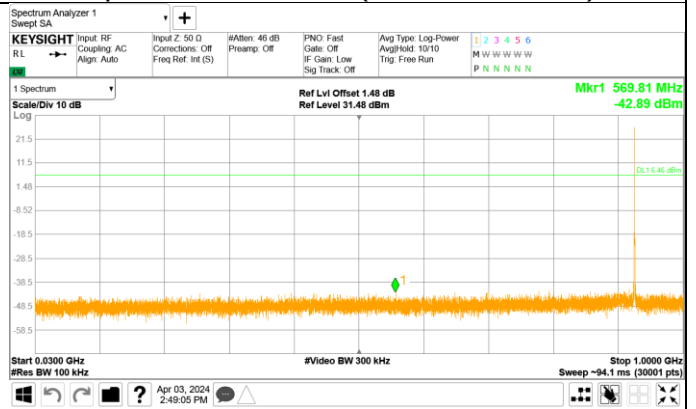
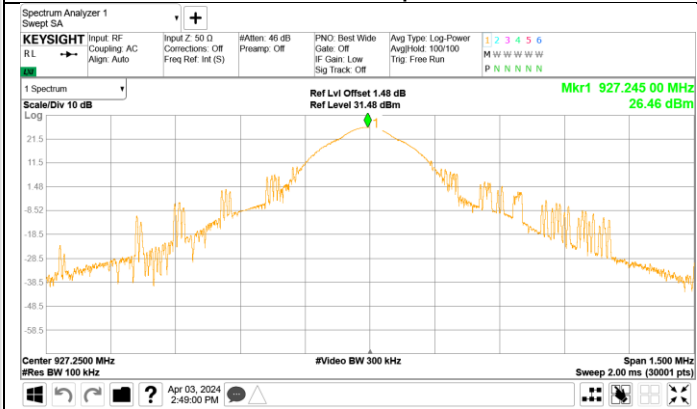
Remark: The signal that exceeds the limit is the fundamental frequency(30-1GHz).



Out-of-Band Emissions
Channel 50(927.25MHz)

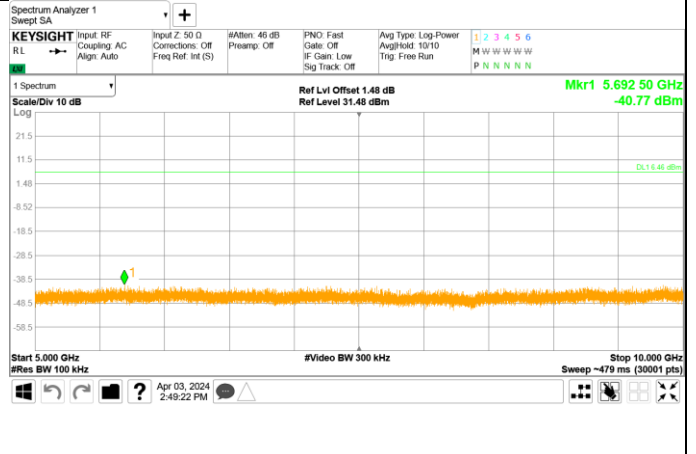
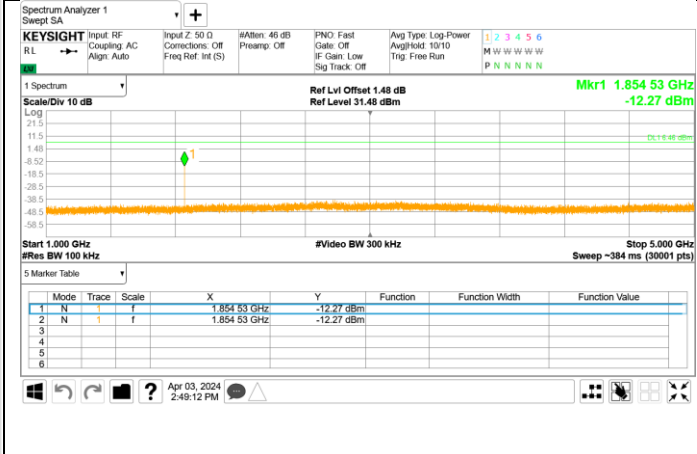
Reference point

Spurious Emission (30MHz – 1GHz)



Spurious Emission (1GHz –5GHz)

Spurious Emission (5GHz –10GHz)



Remark: The signal that exceeds the limit is the fundamental frequency(30-1GHz).

10.8 Band edge testing

Test Method

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously. Set the EUT to the lowest frequency channel.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector, Trace: Max hold, Sweep time: Coupled, Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation. Allow the trace to stabilize.
4. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge. Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.
5. Set the EUT to the highest frequency channel and repeat step 2) to 4)
6. Enable the EUT hopping mode, repeat the test.

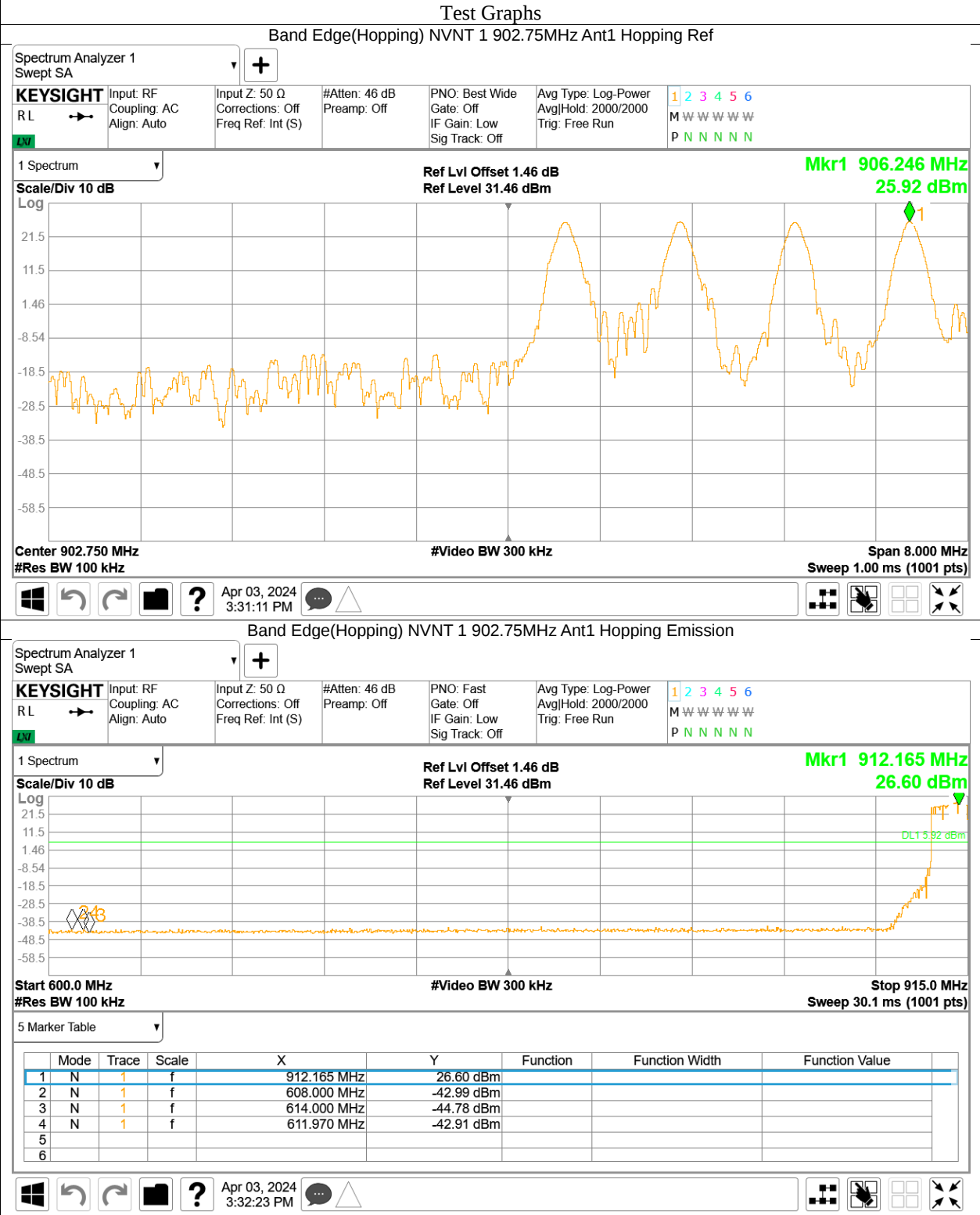
Limit:

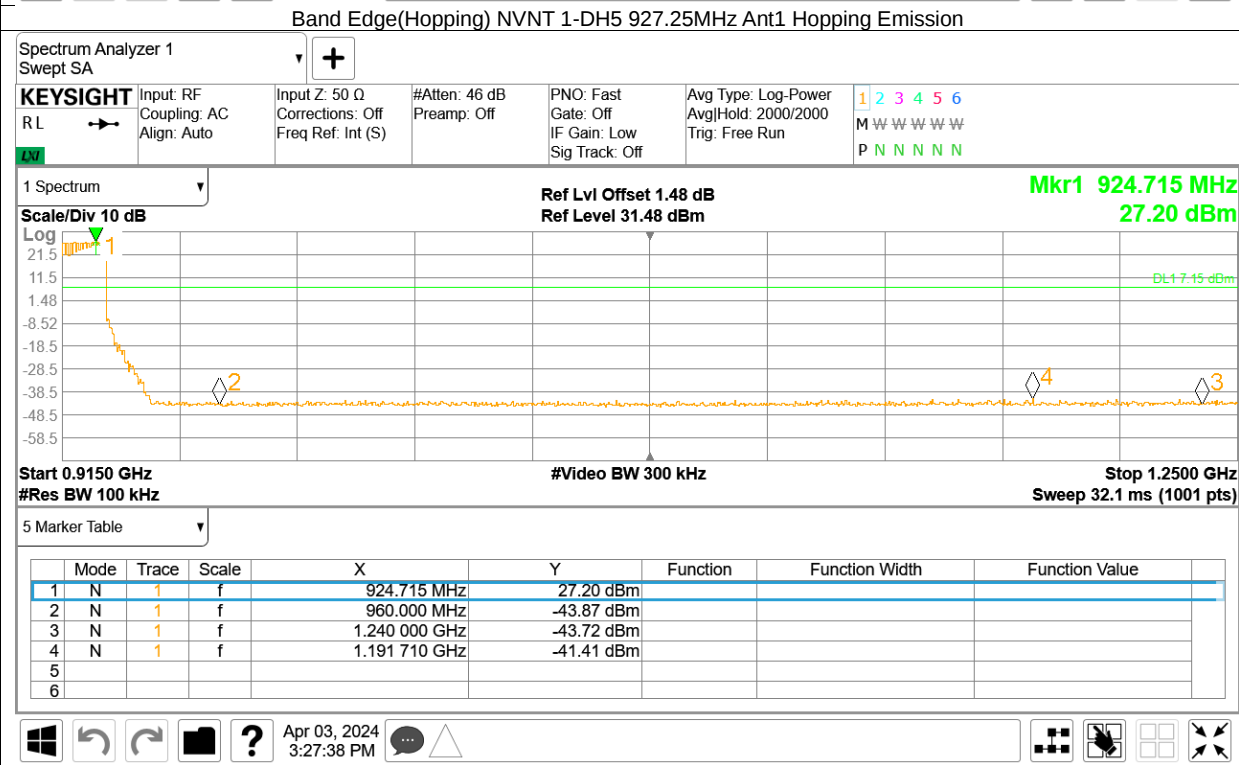
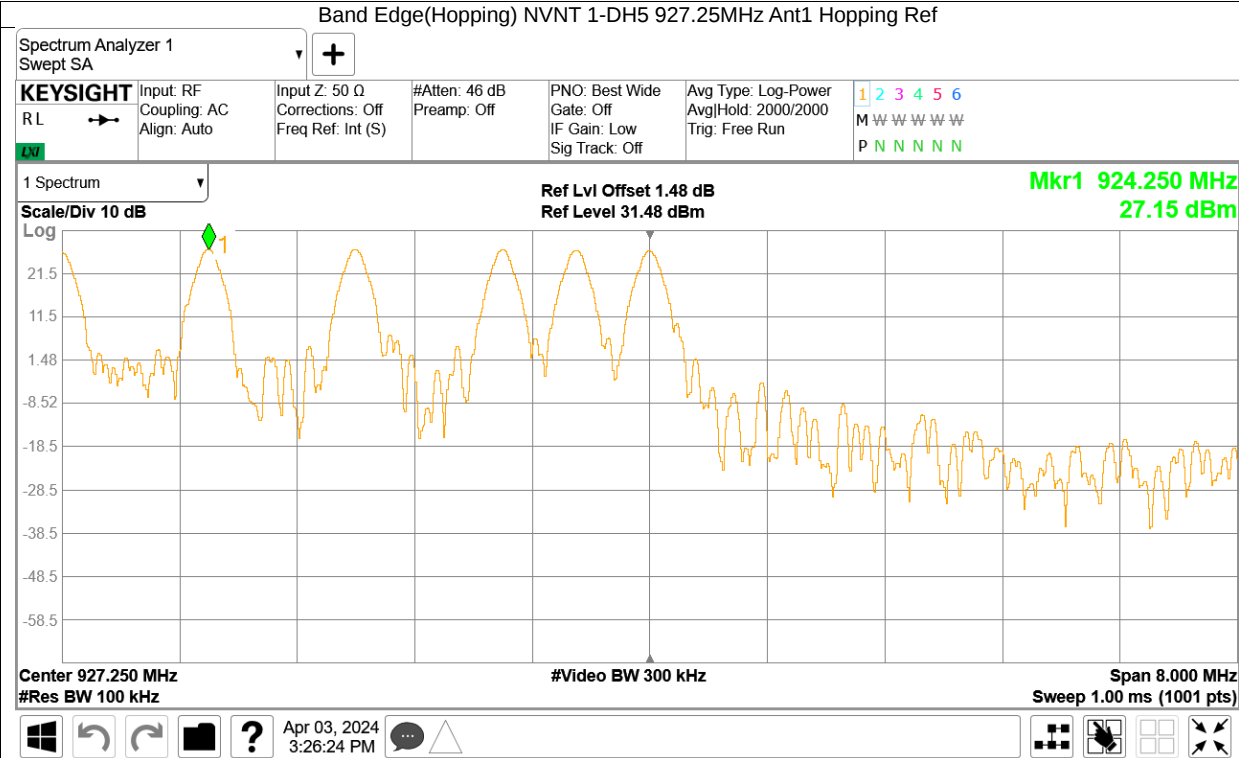
In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.



Band edge testing

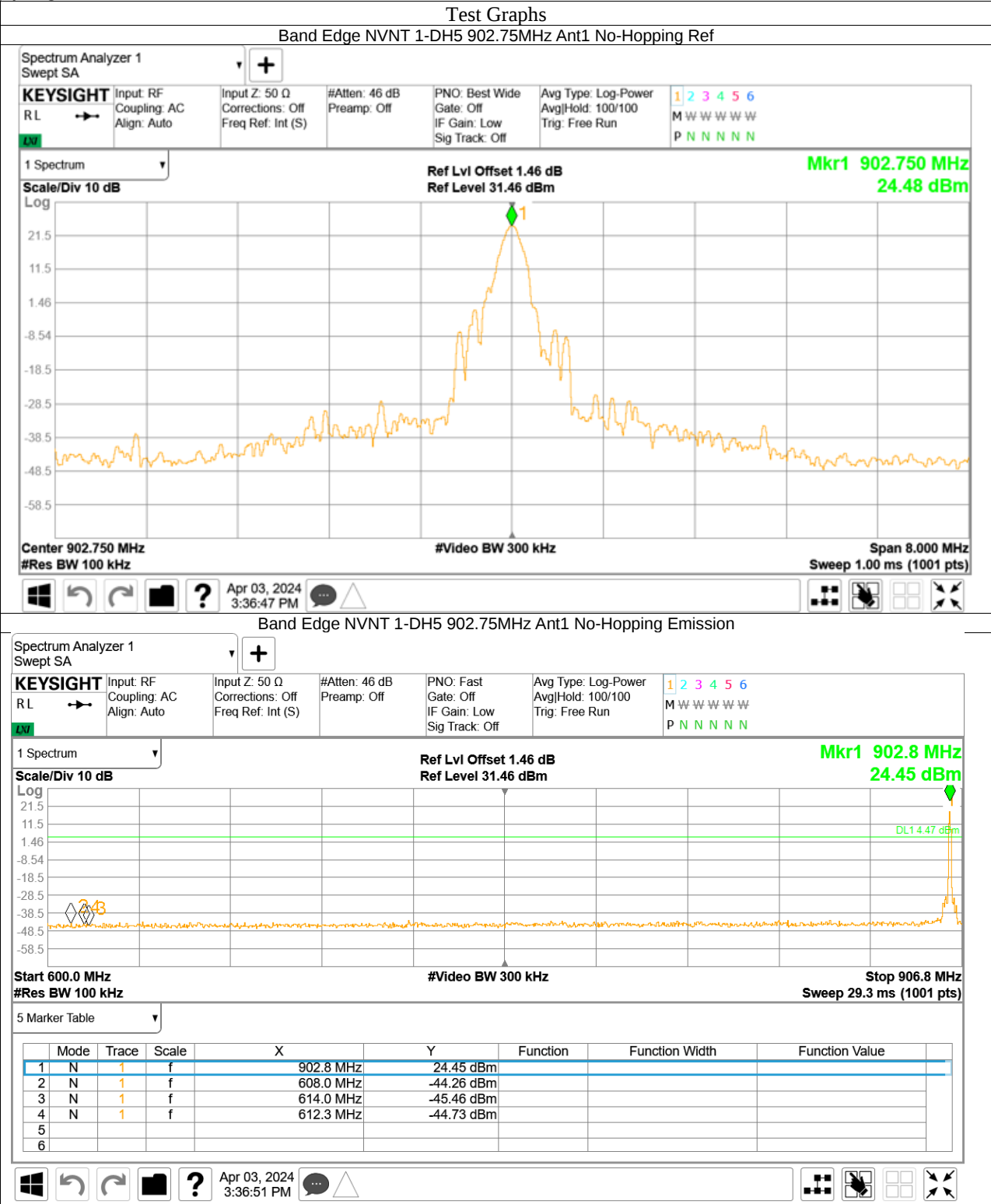
ASK Modulation Test Result:
Hopping on mode:

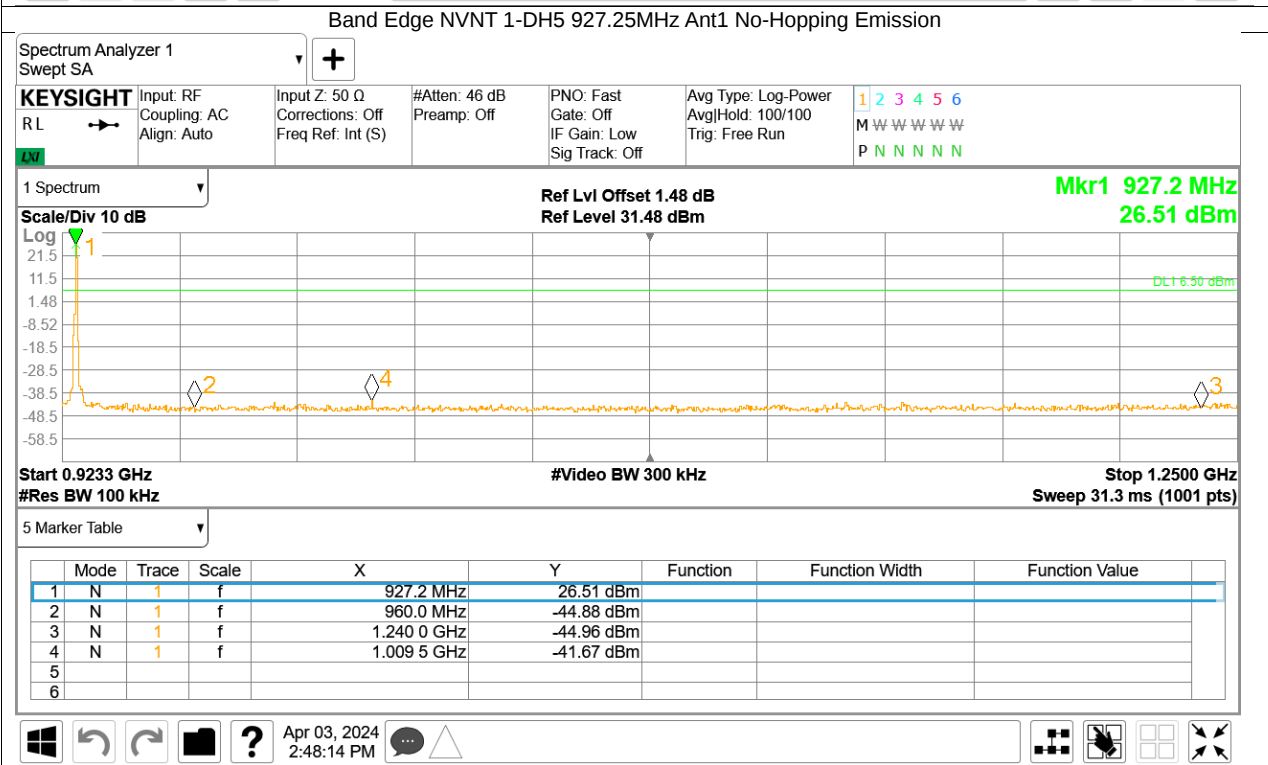
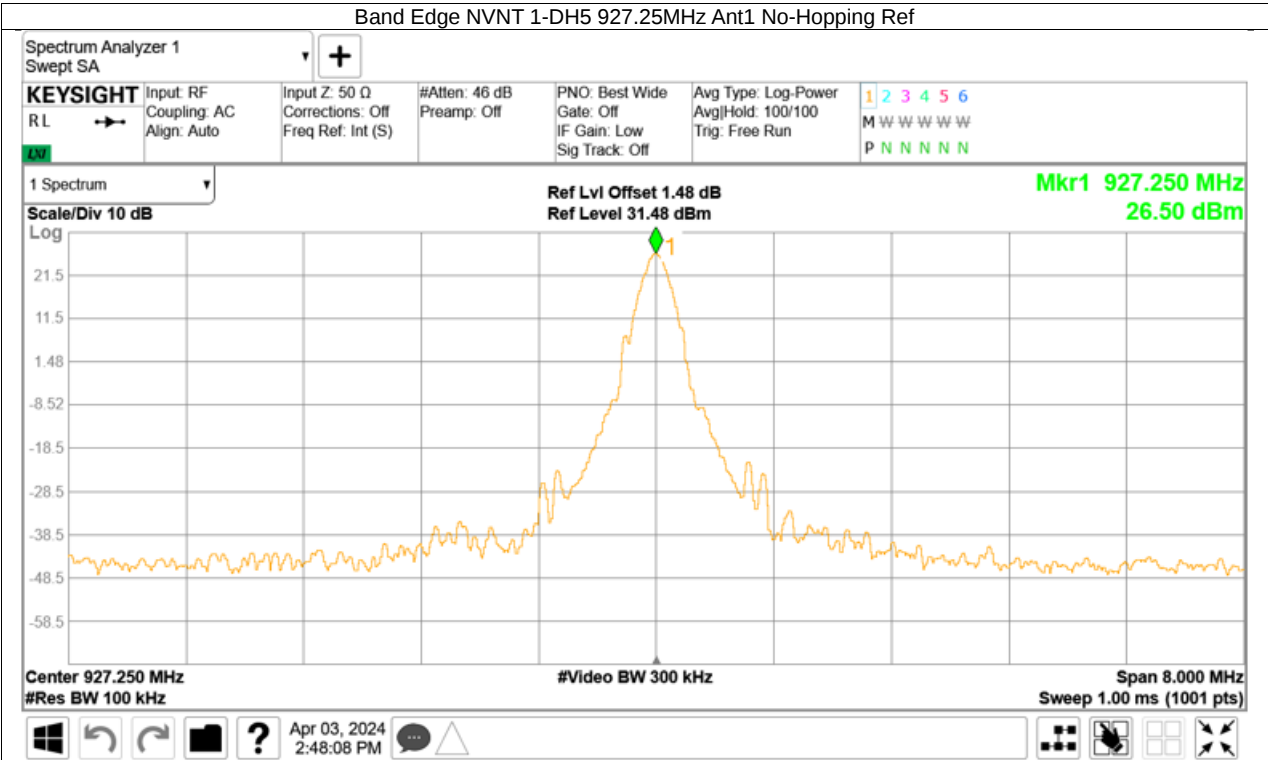






ASK Modulation Test Result:
Hopping off mode:





10.9 Spurious radiated emissions for transmitter and receiver

Test Method

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 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
4. 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.
5. 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.
6. Use the following test receiver settings According to C63.10:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz to 120KHz for $f < 1$ GHz; VBW $\geq$ RBW; Sweep = auto; Detector function = QP; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.For average measurement:

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 ($20\log(1/\text{duty cycle})$).

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.
7. Repeat above procedures until all frequencies measured were complete.

Spurious Radiated Emissions for Transmitter

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section 15.205 & RSS-GEN 8.10, must comply with the radiated emission limits specified in section 15.209 & RSS-Gen 6.13.

Frequency MHz	Field Strength $\mu\text{V/m}$	Field Strength $\text{dB}\mu\text{V/m}$	Detector	Measurement distance meters
0.009-0.490	2400/F(kHz)	48.5-13.8	AV	300
0.490-1.705	24000/F(kHz)	33.8-23.0	QP	30
1.705-30	30	29.5	QP	30
30-88	100	40	QP	3
88-216	150	43.5	QP	3
216-960	200	46	QP	3
960-1000	500	54	QP	3
Above 1000	500	54	AV	3
Above 1000	5000	74	PK	3

Note 1: Limit $3\text{m}(\text{dB}\mu\text{V/m}) = \text{Limit } 300\text{m}(\text{dB}\mu\text{V/m}) + 40\text{Log}(300\text{m}/3\text{m})$ (Below 30MHz)

Note 2: Limit $3\text{m}(\text{dB}\mu\text{V/m}) = \text{Limit } 30\text{m}(\text{dB}\mu\text{V/m}) + 40\text{Log}(30\text{m}/3\text{m})$ (Below 30MHz)

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Data of measurement within frequency range 9kHz-30MHz is the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report. The only worse case test result is listed in the report.

Transmitting spurious emission test result as below:**ASK Modulation 902.75MHz, hopping off**

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Emission type	Result
MHz	dBuV/m		dBuV/m		dBuV/m		
109.21	36.19	Horizontal	43.50	PK	7.31	Restrict band	Pass
608.79	39.42	Horizontal	46.00	PK	6.58	Restrict band	Pass
902.75	123.77	Horizontal	/	PK	/	Fundamental	Pass
1805.21	63.86	Horizontal	103.77	PK	39.91	Harmonic	Pass
2707.77	39.98	Horizontal	74.00	PK	34.02	Restrict band	Pass
608.31	39.67	Vertical	46.00	PK	6.33	Restrict band	Pass
902.75	122.71	Vertical	/	PK	/	Fundamental	Pass
1805.52	73.15	Vertical	102.71	PK	29.56	Harmonic	Pass
2654.31	50.13	Vertical	102.71	PK	52.58	Harmonic	Pass

ASK Modulation 915.25MHz, hopping off

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Emission type	Result
MHz	dBuV/m		dBuV/m		dBuV/m		
915.25	124.89	Horizontal	/	PK	/	Fundamental	Pass
1830.25	61.57	Horizontal	104.89	PK	43.32	Harmonic	Pass
2745.43	36.65	Horizontal	74.00	PK	37.35	Restrict band	Pass
915.25	124.80	Vertical	/	PK	/	Fundamental	Pass
1830.25	73.35	Vertical	104.80	PK	31.45	Harmonic	Pass
2657.68	50.08	Vertical	104.80	PK	54.72	Harmonic	Pass

ASK Modulation 922.25MHz, hopping off

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Emission type	Result
MHz	dBuV/m		dBuV/m		dBuV/m		
922.25	125.43	Horizontal	/	PK	/	Fundamental	Pass
1844.31	61.71	Horizontal	105.43	PK	43.72	Harmonic	Pass
2766.81	37.83	Horizontal	74.00	PK	36.17	Restrict band	Pass
922.25	125.88	Vertical	/	PK	/	Fundamental	Pass
1844.31	73.12	Vertical	105.88	PK	32.76	Harmonic	Pass
2661.06	47.29	Vertical	105.88	PK	58.59	Harmonic	Pass

ASK Modulation 927.25MHz, hopping off

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Emission type	Result
MHz	dBuV/m		dBuV/m		dBuV/m		
927.25	125.24	Horizontal	/	PK	/	Fundamental	Pass
990.59	50.74	Horizontal	54.00	PK	3.26	Restrict band	Pass
1854.43	66.93	Horizontal	105.24	PK	38.31	Harmonic	Pass
2781.71	37.99	Horizontal	74.00	PK	36.01	Restrict band	Pass
927.25	125.84	Vertical	/	PK	/	Fundamental	Pass
993.74	49.84	Vertical	54.00	PK	4.16	Restrict band	Pass
1854.43	72.53	Vertical	105.84	PK	33.31	Harmonic	Pass
2656.28	49.64	Vertical	105.84	PK	56.20	Harmonic	Pass

ASK Modulation, hopping on

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Emission type	Result
MHz	dBuV/m		dBuV/m		dBuV/m		
611.85	44.66	Horizontal	46.00	PK	1.34	Restrict band	Pass
965.71	50.29	Horizontal	54.00	PK	3.71	Restrict band	Pass
613.50	44.28	Vertical	46.00	PK	1.72	Restrict band	Pass
999.32	51.14	Vertical	54.00	PK	2.86	Restrict band	Pass

Remark:

Below 1GHz:

- (1) Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
- (2) Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)

Above 1GHz:

- (1) Emission level= Original Receiver Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss -Amplifier gain
- (3) Margin = limit – Corrected Reading

11 Test Equipment List

List of Test Instruments
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Signal spectrum analyzer	Agilent	N9020B	MY59050168	2024-2-19	2025-2-18
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2023-8-1	2024-7-31
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2023-8-1	2024-7-31
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2019-9-23	2024-9-22
	Horn Antenna	Rohde & Schwarz	HF907	102393	2024-4-14	2027-4-13
	Pre-amplifier	Shenzhen HzEMC	HPA-081843	HYP A23026	2024-4-16	2025-4-15
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2023-6-15	2024-6-14
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C	00246076	2023-7-7	2026-7-6
	3m Semi-anechoic chamber	TDK	9X6X6	----	2024-5-8	2027-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2023-8-1	2024-7-31
	LISN	Rohde & Schwarz	ENV216	101924	2023-8-1	2024-7-31

Measurement Software Information			
Test Item	Software	Manufacturer	Version
C	MTS 8310	MWRFTtest	3.0.0.0
RE	EMC 32	Rohde & Schwarz	V10.50.40
CE	EMC 32	Rohde & Schwarz	V9.15.03

C - Conducted RF tests

- Conducted peak output power
- 20dB bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time - Average Time of Occupancy
- Power spectral density
- Spurious RF conducted emissions
- Band edge

12 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, 3.16dB
Radiated Disturbance	9kHz to 30MHz, 3.52dB 30MHz to 1GHz, 5.03dB (Horizontal) 5.12dB (Vertical) 1GHz to 18GHz, 5.49dB 18GHz to 40GHz, 5.63dB
RF Conducted Measurement	Power related: 1.16dB Frequency related: 6.00×10^{-8}

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1.



13 Photographs of Test Set-ups

Refer to the < Test Setup photos >.



14 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

-----End of Test Report-----