

FCC Test Report

FCC ID: 2BK8UCB20RDNAR1

Product: ConBox2020RD

Trade Mark: Lear

Model Number: CB20RDNAR1

Family Model: N/A

Report No.: S24080903001004

Prepared for

Lear Corporation Engineering GmbH
Industriestrasse 48, Kronach, Germany, 96317

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name.....: Lear Corporation Engineering GmbH

Address: Industriestrasse 48, Kronach, Germany, 96317

Manufacturer's Name.....: Lear Corporation Engineering GmbH

Address: Industriestrasse 48, Kronach, Germany, 96317

Product description

Product name: ConBox2020RD

Model and/or type reference : CB20RDNAR1

Family Model: N/A

FCC Part15B

Standards.....: ANSI C63.4:2014

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with Part 15 of FCC Rules. And it is applicable only to the tested sample identified in the report.

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Test Sample Number.....: S240913043001

Date of Test:

Date (s) of performance of tests.....: Aug. 15, 2024

Date of Issue: Sept. 14, 2024

Test Result: **Pass**

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1. TEST SUMMARY

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
FCC Part15B ANSI C63.4: 2014	Conducted Emission	N/A	N/A	
	Radiated Emission	Class B	PASS	

NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report
- (2) For client's request and manual description, the test will not be executed.

1.1 TEST FACILITY

Shenzhen NTEK Testing Technology Co., Ltd

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China.

IC-Registration The Certificate Registration Number is 9270A.

CAB identifier:CN0074

FCC- Accredited Test Firm Registration Number: 463705.

Designation Number: CN1184

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95 %**.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
NTEKC01	ANSI	0.009MHz ~ 0.15MHz	3.6dB	
NTEKC01	ANSI	0.15MHz ~ 30MHz	3.1dB	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
NTEKA01	ANSI	30MHz~1000MHz	5.2dB	
NTEKA01	ANSI	1GHz~18GHz	5.1dB	

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	ConBox2020RD	
Trade Mark	Lear	
Model Name	CB20RDNAR1	
Family Model	N/A	
Model Difference	N/A	
Product Description	Operating frequency:	5 GHz by WIFI(Declaration by factory)
	Connecting I/O port:	N/A
Based on the application, features, or specification exhibited in User's Manual. More details of EUT technical specification, please refer to the User's Manual.		
Adapter	N/A	
Battery	Typical Capacity: DC 3.2V, 1.1Ah, 3.52Wh Rated Capacity: DC 3.6V, 1.05Ah, 3.36Wh	
Power supply	DC 12V	
HW Version	H04	
SW Version	0340	

2.1.1 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

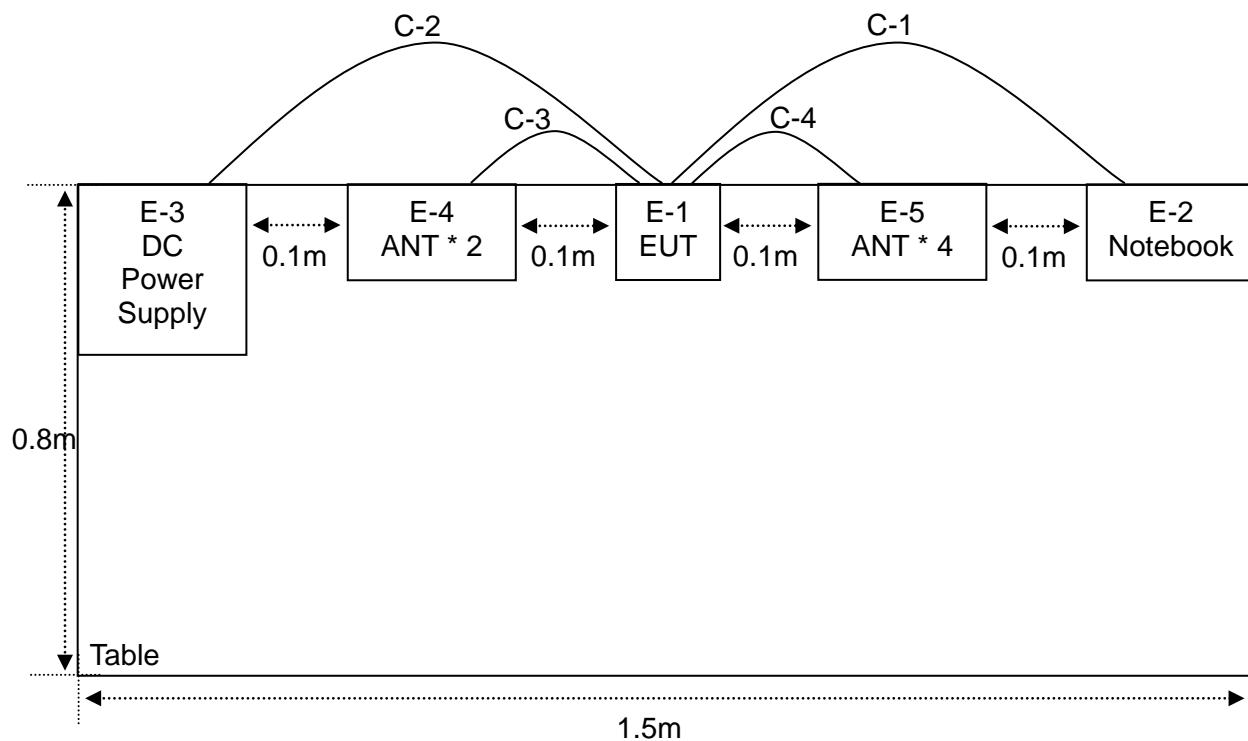
Pretest Mode	Description
Model 1	Working

For Radiated Test	
Final Test Mode	Description
Model 1	Working

Note: Final Test Mode: Through Pre-scan, find the model 1 is the worst case.
Only the worst case mode is recorded in the report.

2.2 DESCRIPTION OF TEST SETUP

Mode RE : Working



2.3 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	ConBox2020RD	Lear	CB20RDNAR1	N/A	EUT
E-2	Notebook	N/A	KLVD-WFH9	J8GPM21B02000149	
E-3	DC Power Supply	Zhaoxin	PS-6005D	20170402923	
E-4	ANT * 2	N/A	N/A	N/A	
E-5	ANT * 4	N/A	N/A	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	150cm	
C-2	NO	YES	150cm	
C-3	YES	NO	80cm	
C-4	YES	NO	80cm	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) "YES" means "shielded" "with core"; "NO" means "unshielded" "without core".

2.4 MEASUREMENT INSTRUMENTS LIST

Radiation Test equipment

Item	Name of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	3m Anechoic Chamber	N/A	9*6*6	N/A	May 14, 2021	May 13, 2025	4 years
2	3m Anechoic Chamber	N/A	9*6*6	N/A	Jul. 28, 2022	Jul. 27, 2025	3 years
3	EMI Test Receiver	R&S	ESPI7	101318	Mar. 12, 2024	Mar. 11, 2025	1 year
4	Bilog Antenna	TESEQ	CBL6111D	31216	Mar. 11, 2024	Mar. 10, 2025	1 year
5	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	May 06, 2023	May 05, 2026	3 years
6	Cable	Talent Microwave	A81-NWMS MAM-12M	21120897	Apr. 26, 2024	Apr. 25, 2027	3 years
7	Cable	Talent Microwave	A81-NMNM -10M	24012011	Jan. 23, 2024	Jan. 22, 2027	3 years
8	Cable	Talent Microwave	A81-NMNM -10M	22084896	Feb. 01, 2024	Jan. 31, 2027	3 years
9	Log-Periodic Antenna	SCHWARZB ECK	VULB 9162	675	Mar. 30, 2024	Mar. 29, 2025	1 year
10	Log-Periodic Antenna	SCHWARZB ECK	VULB 9162	584	May 25, 2024	May 24, 2025	1 year
11	Log-Periodic Antenna	SCHWARZB ECK	VULB 9162	586	May 12, 2024	May 11, 2025	1 year
12	Cable	Talent Microwave	A81-NMNM -2M	22084895	Feb. 01, 2024	Jan. 31, 2027	3 years
13	Attenuator	Eastsheep	5W-N-JK-6 G-6DB	N/A	Apr. 26, 2024	Apr. 25, 2025	1 year
14	Attenuator	Eastsheep	5W-N-JK-6 G-6DB	N/A	Apr. 26, 2024	Apr. 25, 2025	1 year
15	Broadband Horn Antenna	EM	EM-AH-101 80	2011071402	Mar. 31, 2022	Mar. 30, 2025	3 years
16	Broadband Horn Antenna	SCHWARZB ECK	BBHA 9120 D	2816	Jan. 12, 2023	Jan. 11, 2026	3 years
17	Broadband Horn Antenna	SCHWARZB ECK	BBHA 9120 D	2817	Jan. 12, 2023	Jan. 11, 2026	3 years
18	Spectrum Analyzer	Keysight	N9020A	MY532802 44	Apr. 26, 2024	Apr. 25, 2025	1 year
19	Spectrum Analyzer	Agilent	E4440A	MY410001 30	Mar. 12, 2024	Mar. 11, 2025	1 year
20	Pre-Amplifier	EMC	EMC05183 5SE	980246	Jan. 23, 2024	Jan. 22, 2025	1 year
21	Cable	Keysight	A40-2.92M 2.92M-2M	1808041	Nov. 01, 2022	Oct. 31, 2025	3 years
22	Broadband Horn Antenna	SCHWARZB ECK	BBHA 9170	803	Nov. 07, 2022	Nov. 06, 2025	3 years

Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable which is scheduled for calibration every 3 years.

RADIATED TEST		
Software name	Manufacturer	Version number
EZ-EMC_RE	Farad	AIT-03A

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

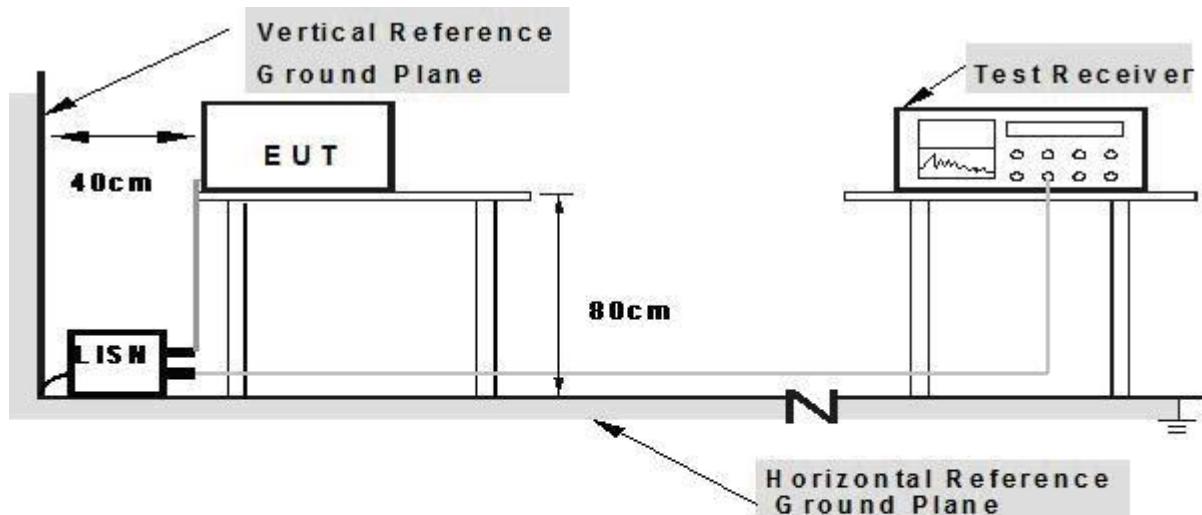
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (A and B) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

3.1.5 TEST RESULTS

EUT:	ConBox2020RD	Model Name. :	CB20RDNAR1
Temperature:	24.5 °C	Relative Humidity:	52%
Pressure:	1010hPa	Test Date:	2024-08-14
Test Mode:	Mode 1	Phase :	L
Test Voltage:	DC 5V from PC AC 120V/60Hz		

Not Applicable

EUT:	ConBox2020RD	Model Name. :	CB20RDNAR1
Temperature:	24.5 °C	Relative Humidity:	52%
Pressure:	1010hPa	Test Date:	2024-08-14
Test Mode:	Mode 1	Phase :	N
Test Voltage:	DC 5V from PC AC 120V/60Hz		

Not Applicable

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 3m)
	dB _{UV} /m	dB _{UV} /m
30 ~ 88	39.0	40.0
88 ~ 216	43.5	43.5
216 ~ 960	46.5	46.0
Above 960	49.5	54.0

Notes:

- (1) The limit for radiated test was performed according to as following:
FCC PART 15B /ICES-003.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dB_{UV}/m)=20log Emission level (uV/m).

3.2.2 TEST PROCEDURE

Test Arrangement for Radiated Emissions up to 1 GHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height 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.
- d. 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.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency below 1GHz.

Test Arrangement for Radiated Emissions above 1 GHz.

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at an accredited chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

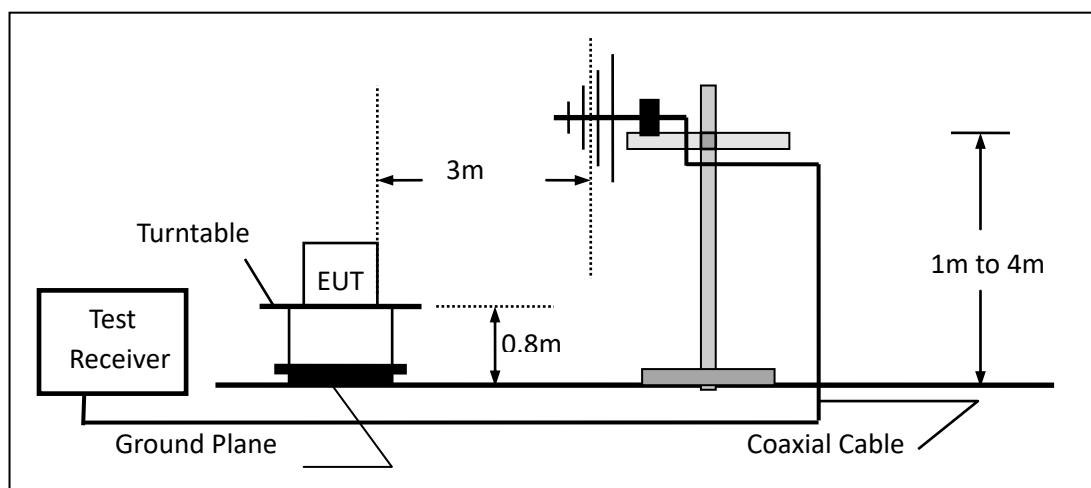
Note: For the hand-held device, the EUT should be measured for all 3 axes and only the worst case is recorded in the report

During the radiated emission test, according to ANSI C63.4-2014(4.2), the Spectrum Analyzer was set with the following configurations:

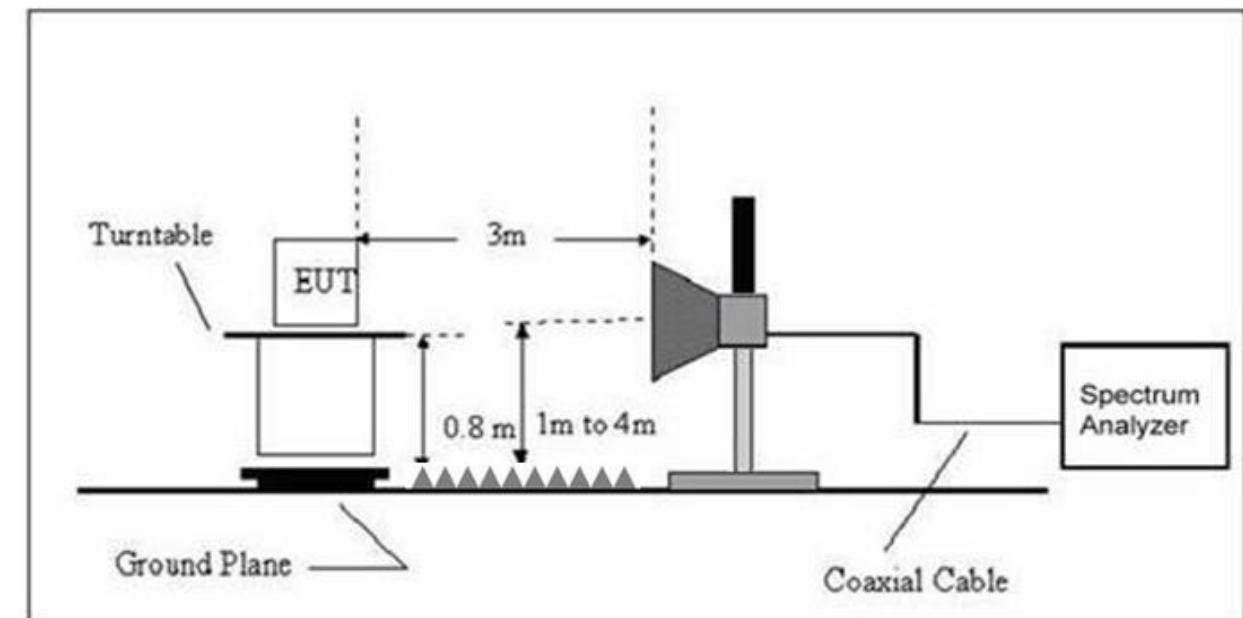
Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	3 MHz
	Avg	1 MHz	10 Hz

3.2.3 TEST SETUP

For Radiated Emission 30~1000MHz



(B) Radiated Emission Test Set-Up Frequency Above 1GHz



3.2.4 TEST RESULTS

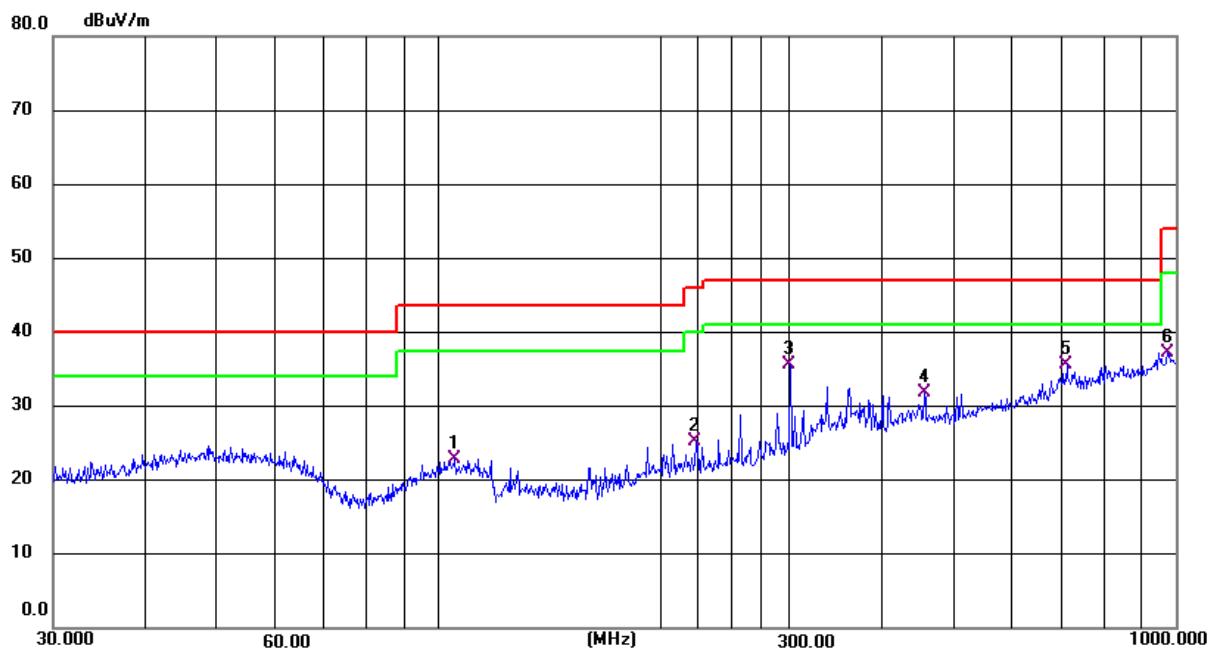
TEST RESULTS (30~1000 MHz)

EUT:	ConBox2020RD	Model Name:	CB20RDNAR1
Temperature:	26.0 °C	Relative Humidity:	54%RH
Pressure:	1010hPa	Test Date :	2024-08-15
Test Mode :	Working	Polarization :	Horizontal
Test Power :	DC 12V powered by DC Power Supply		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	105.2720	5.04	17.85	22.89	43.50	-20.61	QP
H	223.7330	7.34	17.89	25.23	46.00	-20.77	QP
H	300.3670	15.32	20.21	35.53	46.00	-10.47	QP
H	455.9060	8.24	23.50	31.74	46.00	-14.26	QP
H	711.6730	7.52	28.01	35.53	46.00	-10.47	QP
H	975.7530	6.29	30.98	37.27	54.00	-16.73	QP

Remark:

Factor = Antenna Factor + Cable Loss - Amplifier.

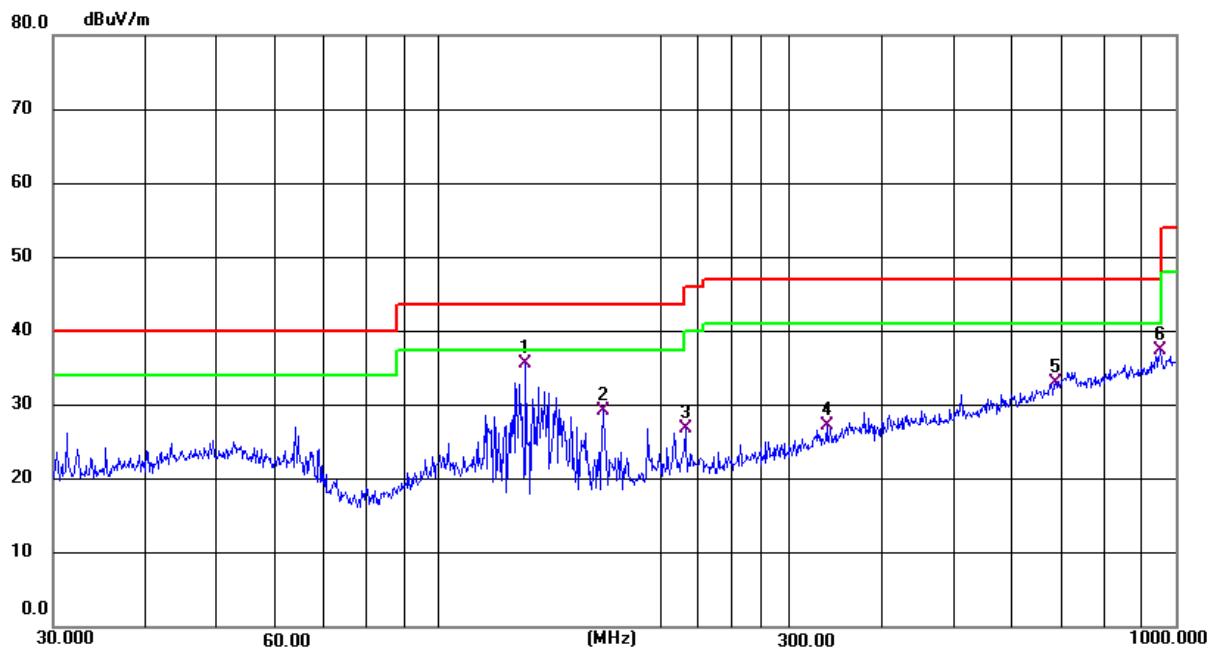


EUT:	ConBox2020RD	Model Name :	CB20RDNAR1
Temperature:	26.0 °C	Relative Humidity:	54%RH
Pressure:	1010hPa	Test Date :	2024-08-15
Test Mode :	Working	Polarization :	Vertical
Test Power :	DC 12V powered by DC Power Supply		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	131.2970	21.06	14.48	35.54	43.50	-7.96	QP
V	167.2370	14.02	15.14	29.16	43.50	-14.34	QP
V	216.0240	9.05	17.88	26.93	46.00	-19.07	QP
V	336.0350	6.12	21.18	27.30	46.00	-18.70	QP
V	687.1510	5.61	27.39	33.00	46.00	-13.00	QP
V	952.0940	6.73	30.66	37.39	46.00	-8.61	QP

Remark:

Factor = Antenna Factor + Cable Loss - Amplifier.



3.2.5 TEST RESULTS(1000~18000MHz)

EUT:	ConBox2020RD	Model Name :	CB20RDNAR1
Temperature:	24.0°C	Relative Humidity:	51%RH
Pressure:	1010hPa	Test Date :	2024-08-15
Test Mode :	Mode 1		
Test Power :	DC 12V powered by DC Power Supply		

Polar (H/V)	Frequency	Reading	Correct	Result	Limit	Over Limit	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
V	10656.000	45.75	11.78	57.53	74.00	-16.47	peak
V	10656.000	27.78	11.78	39.56	54.00	-14.44	AVG
V	13019.000	44.44	13.12	57.56	74.00	-16.44	peak
V	13019.000	27.84	13.12	40.96	54.00	-13.04	AVG
V	16283.000	45.30	13.20	58.50	74.00	-15.50	peak
V	16283.000	29.31	13.20	42.51	54.00	-11.49	AVG
H	10197.000	46.75	10.89	57.64	74.00	-16.36	peak
H	10197.000	29.67	10.89	40.56	54.00	-13.44	AVG
H	13002.000	43.72	13.09	56.81	74.00	-17.19	peak
H	13002.000	28.54	13.09	41.63	54.00	-12.37	AVG
H	16181.000	45.25	13.16	58.41	74.00	-15.59	peak
H	16181.000	29.20	13.16	42.36	54.00	-11.64	AVG

Remark:

Correct Factor = Antenna Factor + Cable Loss

Measurement Level = Reading Level + Correct Factor

Over Level = Measurement Level - Limit

END OF REPORT