



FCC ID - TEST REPORT

Report Number : **709502405404-00A** Date of Issue: August 12, 2024

Model : ZCD1311A

Product Type : ZCUD

Applicant : Continental Automotive Technologies GmbH

Address : Siemensstrasse 12 Regensburg 93055 Germany

Manufacturer : Continental Automotive Technologies GmbH

Address : Siemensstrasse 12 Regensburg 93055 Germany

Production Facility : Continental Automotive Changchun Co., Ltd. Jingyue Branch

Address : 5800, Shengtai Street, Changchun, Jilin Province, P.R.China

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

Total pages including
Appendices : 24



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2 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
No.16 Lane, 1951 Du Hui Road,
Shanghai 201108,
P.R. China

Telephone: +86 21 6141 0123

Fax: +86 21 6140 8600

FCC Registration No.: 820234

FCC Designation Number: CN1183



3 Description of the Equipment Under Test

Product:	ZCUD
Model no.:	ZCD1311A
FCC ID:	KR5ZCD1311A
Options and accessories:	N/A
Supply voltage:	12V DC
Operation Voltage:	9V~16V DC
RF Transmission Frequency:	125kHz
Modulation:	ASK
Antenna Type:	LF Antenna
Antenna Number:	6
Description of the EUT:	ZCUD can transmit 125kHz low frequency signal
Test sample no.:	SHA-818594-2

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.



4 Summary of Test Standards

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

All the test methods were according to ANSI C63.10-2013.



5 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	NA	NA	☐	☐	☒
§15.205, §15.209 Field strength of emissions and Restricted bands	9~17	1	☒	☐	☐
§15.215(c) 20dB bandwidth	18~19	1	☒	☐	☐

Note 1: N/A=Not Applicable. Conducted emission is not apply for battery operated device.

Note 2: The EUT uses six Loop Antenna. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.



6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: KR5ZCD1311A, complies with section 15.205,15.207,15.209,15.215 of the FCC Part 15, Subpart C rules.
TX range is 125KHz.

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: July 30, 2024

Testing Start Date: July 30, 2024

Testing End Date: July 30, 2024

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

Reviewed by:

Prepared by:

Tested by:



Hui TONG
Review EMC Manager

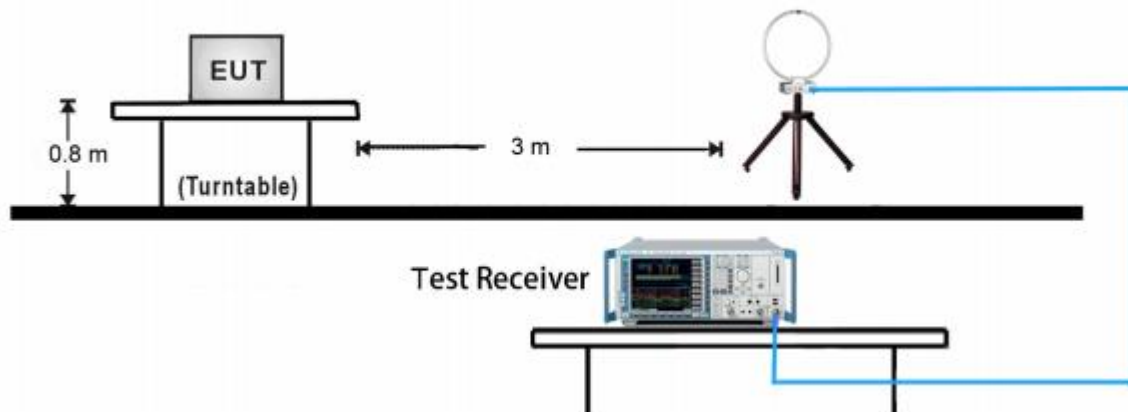
Jiaxi XU
Project Manager

Tianji XU
Test Engineer

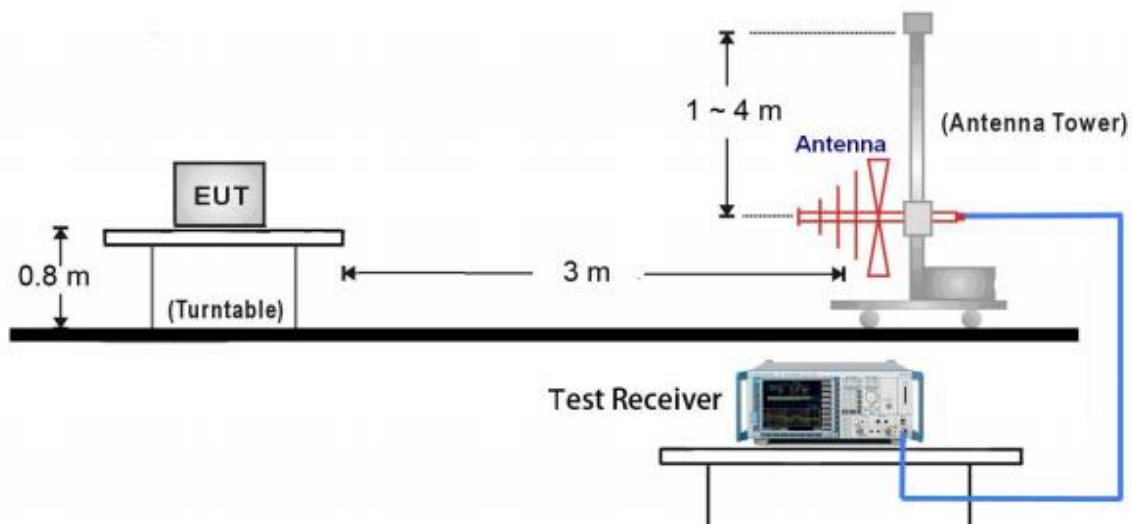
7 Test Setups

7.1 Radiated test setups

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



8 Test Methodology

8.1 Radiated Emission

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 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 $\geq$ 3RBW for peak 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 $\geq$ 3RBW 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 $\geq$ 98%) for peak detection at frequency above 1GHz
- 4: If the emission is pulsed (duty cycle $<$ 98%), modify the unit for continuous operation: use the settings shown above, then correct the reading by subcontracting the peak to average duty cycle correction factor $20\log(\text{duty cycle})$, derived from the appropriate duty cycle calculation.

Limits for 15.209 Radiated emission limits; general requirements

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Limit

Frequency	Limit at 3m (dBuV/m)
0.009 MHz – 0.490 MHz	128.5 to 93.8 ¹
0.490 MHz – 1.705 MHz	73.8 to 63 ¹
1.705 MHz – 30 MHz	69.5 ¹
30 MHz – 88 MHz	40.0 ¹
88 MHz – 216 MHz	43.5 ¹
216 MHz – 960 MHz	46.0 ¹
Above 960 MHz	54.0 ¹
Above 1000 MHz	54.0 ²
Above 1000 MHz	74.0 ³

¹Limit is with detector with bandwidths as defined in CISPR-16-1-1 except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz where an Average detector is used.

²Limit is with 1 MHz measurement bandwidth and using an Average detector

³Limit is with 1 MHz measurement bandwidth and using a Peak detector

Remark: Only the worst data listed in this report.

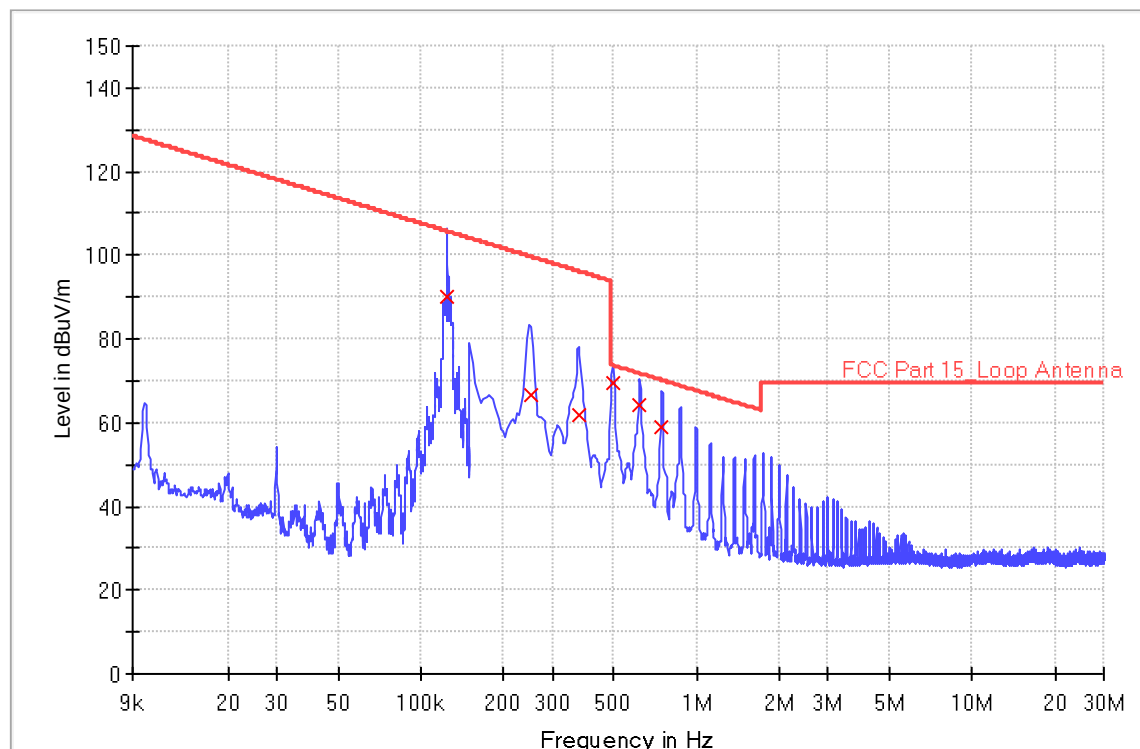
Radiated emissions for transmitter

0.009-30MHz Radiated Emission

EUT Information

EUT Name: ZCUD
 Model: ZCD1311A
 Client: Continental Automotive Technologies GmbH
 Op Cond: Power on, 125kHz continues transmit
 Operator: Tianji XU
 Test Spec: FCC Part 15C
 Comment: X
 Sample No: SHA-818594-2

RE_Loop E_pre



Limit and Margin

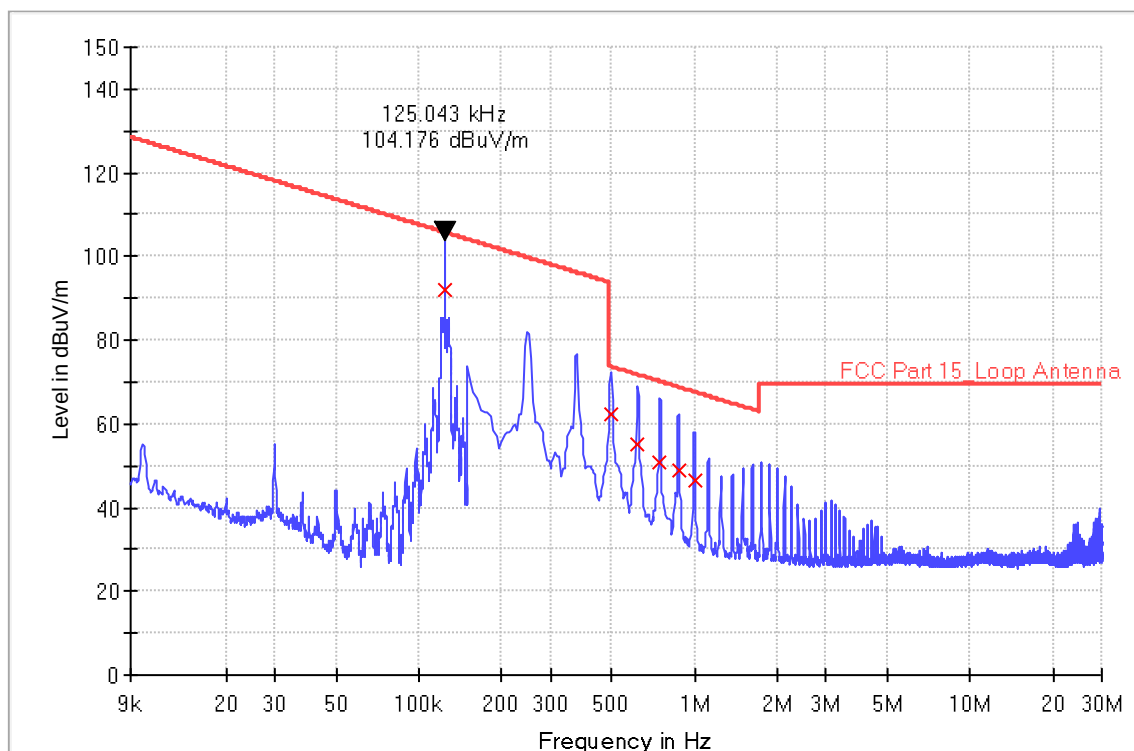
Frequency (MHz)	QuasiPeak (dBuV/m)	Average (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - (dB)	Limit - (dBuV/m)
0.125080	--	90.1	1000.0	0.200	100.0	X	13.0	18.8	15.56	105.66
0.250000	--	66.5	1000.0	9.000	100.0	X	23.0	18.8	33.145	99.645
0.374000	--	61.8	1000.0	9.000	100.0	X	225.0	18.7	34.346	96.146
0.498000	69.4	--	1000.0	9.000	100.0	X	172.0	18.8	4.259	73.659
0.622000	64.3	--	1000.0	9.000	100.0	X	25.0	18.8	7.428	71.728
0.746000	58.8	--	1000.0	9.000	100.0	X	325.0	18.8	11.349	70.149

0.009-30MHz Radiated Emission

EUT Information

EUT Name: ZCUD
 Model: ZCD1311A
 Client: Continental Automotive Technologies GmbH
 Op Cond: Power on, 125kHz continues transmit
 Operator: Tianji XU
 Test Spec: FCC Part 15C
 Comment: Y
 Sample No: SHA-818594-2

RE_Loop E_pre



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Average (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - (dB)	Limit - (dBuV/m)
0.125000	--	91.8	1000.0	0.200	100.0	Y	145.0	18.8	13.866	105.66
0.502000	62.1	--	1000.0	9.000	100.0	Y	255.0	18.8	11.49	73.590
0.618000	55.0	--	1000.0	9.000	100.0	Y	293.0	18.8	16.784	71.784
0.746000	50.6	--	1000.0	9.000	100.0	Y	326.0	18.8	19.549	70.149
0.874000	48.7	--	1000.0	9.000	100.0	Y	0.0	18.8	20.074	68.774
0.998000	46.3	--	1000.0	9.000	100.0	Y	0.0	18.8	21.322	67.622



0.009-30MHz Radiated Emission

EUT Information

EUT Name:

Model:

Client:

Op Cond:

Operator:

Test Spec:

Comment:

Sample No:

ZCUD

ZCD1311A

Continental Automotive Technologies GmbH

Power on, 125kHz continues transmit

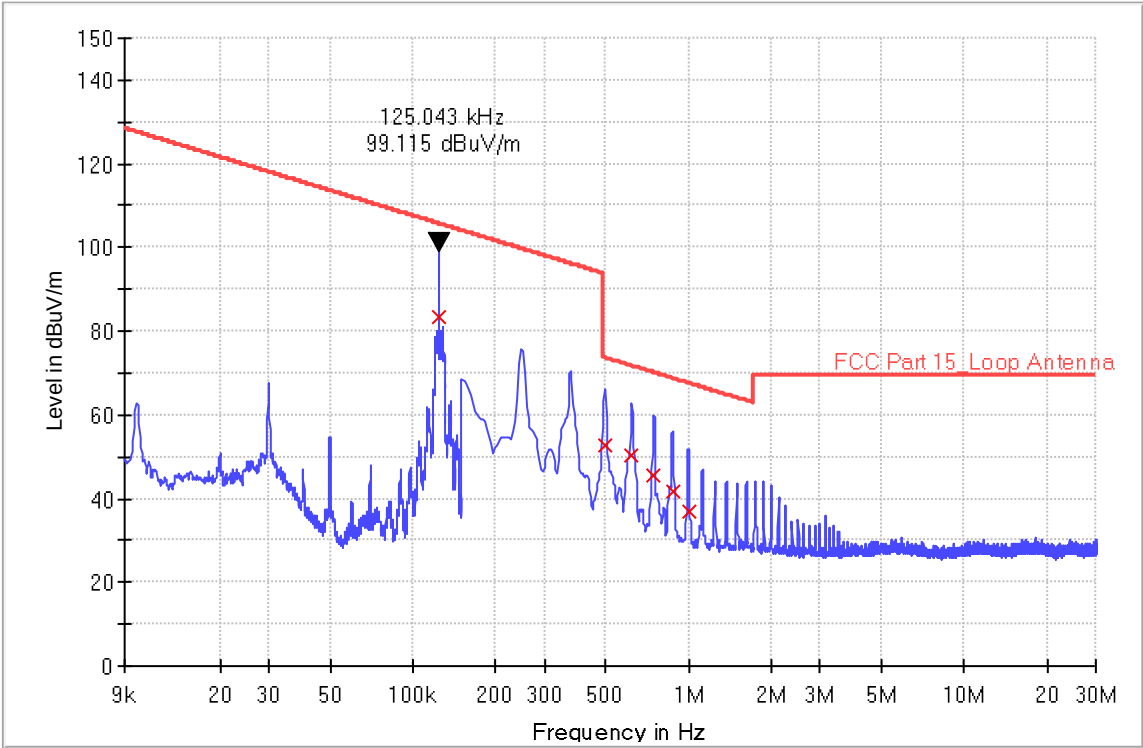
Tianji XU

FCC Part 15C

Z

SHA-818594-2

RE_Loop E_pre



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Average (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - (dB)	Limit - (dBuV/m)
0.125080	--	83.2	1000.0	0.200	100.0	Z	187.0	18.8	22.46	105.66
0.498000	52.5	--	1000.0	9.000	100.0	Z	226.0	18.8	21.159	73.659
0.622000	50.2	--	1000.0	9.000	100.0	Z	320.0	18.8	21.528	71.728
0.746000	45.5	--	1000.0	9.000	100.0	Z	359.0	18.8	24.649	70.149
0.874000	41.6	--	1000.0	9.000	100.0	Z	359.0	18.8	27.174	68.774
0.998000	36.8	--	1000.0	9.000	100.0	Z	359.0	18.8	30.822	67.622

30-1000MHz Radiated Emission

EUT Information

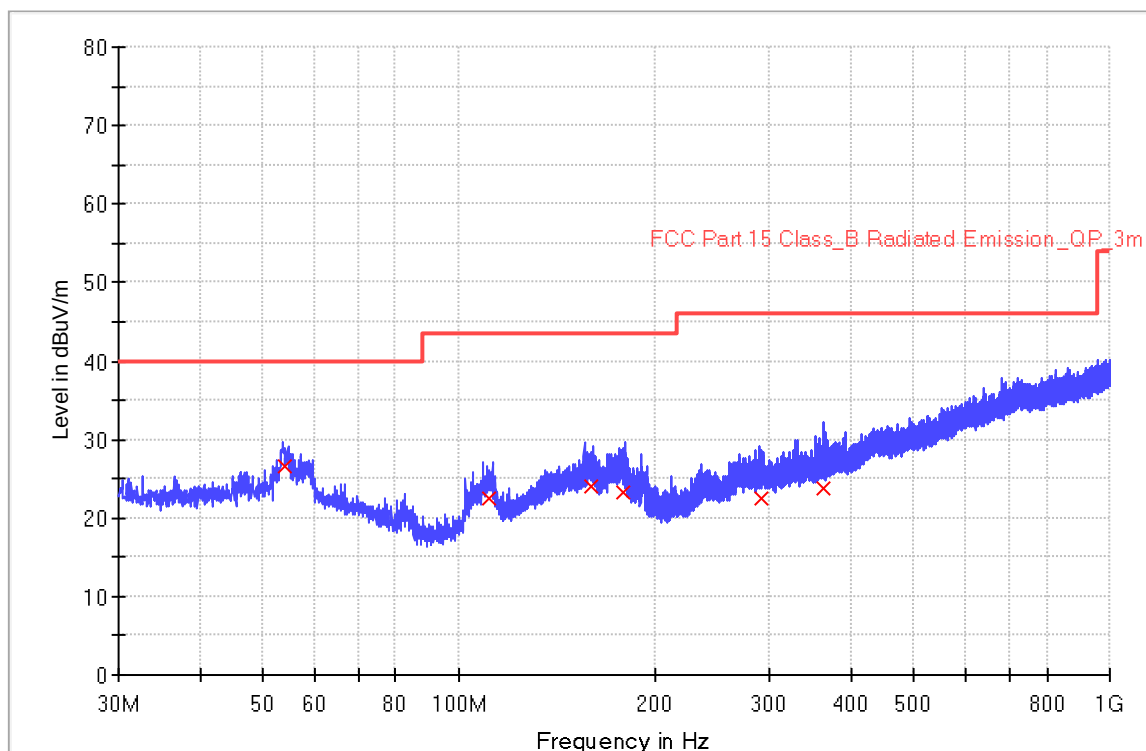
EUT Name: ZCUD
Model: ZCD1311A
Client: Continental Automotive Technologies GmbH
Op Cond: Power on, 125kHz continues transmit
Operator: Tianji XU
Test Spec: FCC Part 15C
Comment: Horizontal
Sample No: SHA-818594-2

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup: RE_VULB9168
Receiver: [ESR 3]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.2 s	20 dB

RE_VULB9168_pre_Cont_30-1000





Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
53.960000	26.7	1000.0	120.000	100.0	H	258.0	20.4	13.3	40.0
111.080000	22.4	1000.0	120.000	115.0	H	138.0	17.5	21.1	43.5
160.120000	24.1	1000.0	120.000	100.0	H	113.0	20.9	19.4	43.5
178.480000	23.2	1000.0	120.000	202.0	H	24.0	19.4	20.3	43.5
290.960000	22.6	1000.0	120.000	180.0	H	302.0	21.3	23.4	46.0
363.000000	23.8	1000.0	120.000	150.0	H	287.0	23.1	22.2	46.0

30-1000MHz Radiated Emission

EUT Information

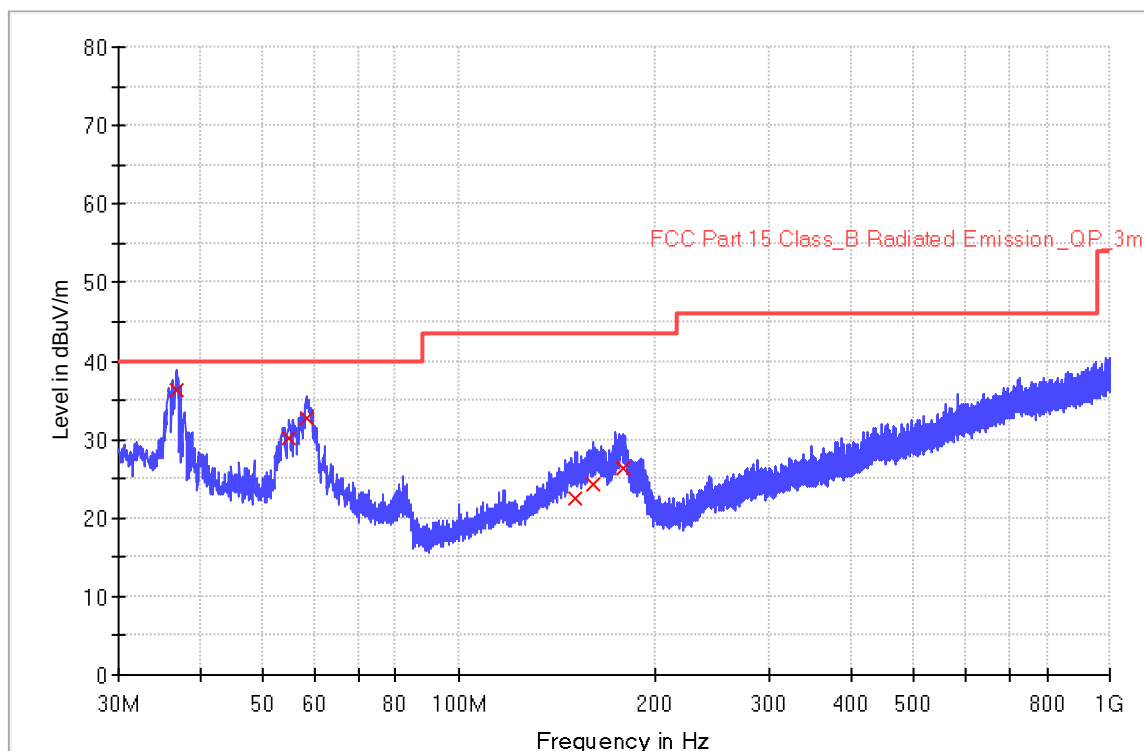
EUT Name: ZCUD
Model: ZCD1311A
Client: Continental Automotive Technologies GmbH
Op Cond: Power on, 125kHz continues transmit
Operator: Tianji XU
Test Spec: FCC Part 15C
Comment: Vertical
Sample No: SHA-818594-2

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup: RE_VULB9168
Receiver: [ESR 3]
Level Unit: dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.2 s	20 dB

RE_VULB9168_pre_Cont_30-1000





Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
36.800000	36.2	1000.0	120.000	100.0	V	239.0	19.8	3.8	40.0
54.720000	30.1	1000.0	120.000	100.0	V	133.0	20.4	9.9	40.0
58.320000	32.7	1000.0	120.000	200.0	V	48.0	20.3	7.3	40.0
151.040000	22.5	1000.0	120.000	125.0	V	258.0	20.9	21.0	43.5
161.280000	24.4	1000.0	120.000	100.0	V	331.0	20.8	19.1	43.5
178.640000	26.2	1000.0	120.000	200.0	V	136.0	19.4	17.3	43.5

8.2 Bandwidth Measurement

Test Method

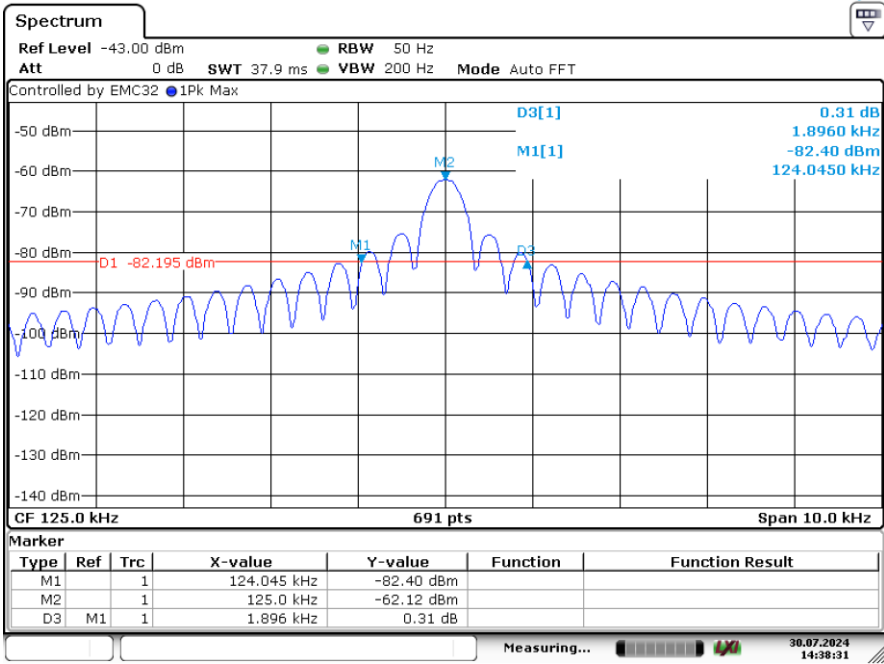
1. The EUT was placed on 0.8m height table, the RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
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. Measure the frequency difference of two frequencies that were attenuated 20 dB 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

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Result

Frequency kHz	20dB Bandwidth kHz	Result
125.0	1.896	Pass



Date: 30 JUL 2024 14:38:31



9 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
--	--	--	--



10 Test Equipment List

List of Test Instruments
Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
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	2021-9-23	2024-9-22
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2023-6-15	2024-6-14
	3m Semi-anechoic chamber	TDK	9X6X6	----	2025-4-15	2027-5-7
Measurement Software Information						
Test Item	Software	Manufacturer	Version			
RE	EMC 32	Rohde & Schwarz	V10.50.40			



11 System Measurement Uncertainty

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

System Measurement Uncertainty

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, 3.16dB
Radiated Disturbance	30MHz to 1GHz, 5.03dB (Horizontal) 5.12dB (Vertical) 1GHz to 18GHz, 5.49dB 18GHz to 40GHz, 5.63dB
Carrier power conducted measurement	50MHz~18GHz, 1.238dB
Spurious Emission Conducted Measurement	9kHz ~40GHz, 1.224dB

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2023, clause 4.3.3.



12 Photographs of Test Set-ups

Refer to the < Test Setup photos >.



13 Photographs of EUT

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

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