



■ **Report No.:** DDT-RE23060511-1E01

■ **Issued Date:** Jul 02, 2023

# FCC CERTIFICATION TEST REPORT

## FOR

|                             |   |                                                                                                                                                          |
|-----------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Lorenz High Definition LLC                                                                                                                               |
| <b>Address</b>              | : | 230 Rt 206 STE 401, Flanders, New Jersey, United States                                                                                                  |
| <b>Equipment under Test</b> | : | Double Relay                                                                                                                                             |
| <b>Model No.</b>            | : | ZEN52 LR                                                                                                                                                 |
| <b>Trade Mark</b>           | : | <b>zooz</b> ™                                                                                                                                            |
| <b>FCC ID</b>               | : | 2AZ2V-091821-ZEN52                                                                                                                                       |
| <b>Manufacturer</b>         | : | Shenzhen ZVIDAR Technologies CO.,Ltd.                                                                                                                    |
| <b>Address</b>              | : | Room 468, Building F1, TCL Technologies Park,<br>1001, Zhongshanyuan Road, Shuguang<br>Community, Xili Street Office, Nanshan District,<br>Shenzhen City |

**Issued By: Dongguan Dongdian Testing Service Co., Ltd.**

**Add.:** No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park,  
Dongguan City, Guangdong Province, China, 523808

**Tel.:** +86-0769-38826678, **E-mail:** ddt@dgddt.com, <http://www.dgddt.com>

# REPORT

## Table of Contents

|      |                                                   |    |
|------|---------------------------------------------------|----|
|      | Test report declares.....                         | 3  |
| 1.   | Summary of Test Results.....                      | 5  |
| 2.   | General Test Information .....                    | 6  |
| 2.1. | Description of EUT .....                          | 6  |
| 2.2. | Accessories of EUT.....                           | 6  |
| 2.3. | Assistant equipment used for test.....            | 6  |
| 2.4. | Block diagram of EUT configuration for test ..... | 6  |
| 2.5. | Test environment conditions .....                 | 7  |
| 2.6. | Deviations of test standard.....                  | 7  |
| 2.7. | Test laboratory .....                             | 7  |
| 2.8. | Measurement uncertainty.....                      | 8  |
| 3.   | Equipment Used During Test.....                   | 9  |
| 4.   | 20 dB Bandwidth .....                             | 10 |
| 4.1. | Block diagram of test setup.....                  | 10 |
| 4.2. | Limits .....                                      | 10 |
| 4.3. | Test procedure .....                              | 10 |
| 4.4. | Test result.....                                  | 10 |
| 4.5. | Original test data .....                          | 11 |
| 5.   | Duty cycle .....                                  | 12 |
| 5.1. | Block diagram of test setup.....                  | 12 |
| 5.2. | Limit.....                                        | 12 |
| 5.3. | Test procedure .....                              | 12 |
| 5.4. | Test result.....                                  | 13 |
| 6.   | Radiated Emission .....                           | 14 |
| 6.1. | Block diagram of test setup.....                  | 14 |
| 6.2. | Limit.....                                        | 15 |
| 6.3. | Test procedure .....                              | 16 |
| 6.4. | Test result.....                                  | 17 |
| 7.   | Power Line Conducted Emission .....               | 43 |
| 7.1. | Block diagram of test setup.....                  | 43 |
| 7.2. | Power line conducted emission limits .....        | 43 |
| 7.3. | Test procedure .....                              | 43 |
| 7.4. | Test result.....                                  | 44 |
| 8.   | Antenna Requirements .....                        | 47 |
| 8.1. | Limit.....                                        | 47 |
| 8.2. | Result .....                                      | 47 |
| 9.   | Test Setup Photograph .....                       | 48 |
| 10.  | Photos of the EUT .....                           | 50 |

## Test Report Declare

|                             |   |                                                                                                                                                 |
|-----------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>            | : | Lorenz High Definition LLC                                                                                                                      |
| <b>Address</b>              | : | 230 Rt 206 STE 401, Flanders, New Jersey, United States                                                                                         |
| <b>Equipment under Test</b> | : | Double Relay                                                                                                                                    |
| <b>Model No.</b>            | : | ZEN52 LR                                                                                                                                        |
| <b>Trade mark</b>           | : | <b>ZOOZ</b> <sup>TM</sup>                                                                                                                       |
| <b>Manufacturer</b>         | : | Shenzhen ZVIDAR Technologies CO.,Ltd.                                                                                                           |
| <b>Address</b>              | : | Room 468, Building F1, TCL Technologies Park, 1001, Zhongshanyuan Road, Shuguang Community, Xili Street Office, Nanshan District, Shenzhen City |

**Test Standard Used:**

FCC Rules and Regulations Part 15 Subpart C.

**Test procedure used:**

ANSI C63.10:2013.

**We Declare:**

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

|                         |                     |                      |                               |
|-------------------------|---------------------|----------------------|-------------------------------|
| <b>Report No.:</b>      | DDT-RE23060511-1E01 |                      |                               |
| <b>Date of Receipt:</b> | Jun. 05, 2023       | <b>Date of Test:</b> | Jun. 07, 2023 ~ Jul. 01, 2023 |

**Prepared By:****Jacky Huang/Engineer****Approved By:****Damon Hu/EMC Manager**

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

## Revision History

| Rev. | Revisions     | Issue Date    | Revised By |
|------|---------------|---------------|------------|
| ---  | Initial issue | Jul. 02, 2023 |            |
|      |               |               |            |

## 1. Summary of Test Results

| The EUT have been tested according to the applicable standards as referenced below. |                                                                                       |         |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------|
| Description of Test Item                                                            | Standard                                                                              | Results |
| 20 dB Bandwidth                                                                     | FCC Part 15: 15.215<br>ANSI C63.10:2013                                               | Pass    |
| Radiated Emission                                                                   | FCC Part 15: 15.205<br>FCC Part 15: 15.209<br>FCC Part 15: 15.249<br>ANSI C63.10:2013 | Pass    |
| Power Line Conducted Emission                                                       | FCC Part 15: 15.207<br>ANSI C63.10:2013                                               | Pass    |
| Antenna requirement                                                                 | FCC Part 15: 15.203                                                                   | Pass    |

## 2. General Test Information

### 2.1. Description of EUT

|                          |                                                         |
|--------------------------|---------------------------------------------------------|
| EUT Name                 | : Double Relay                                          |
| Model Number             | : ZEN52 LR                                              |
| EUT function description | : Please reference user manual of this device           |
| Power supply             | : AC 100-240V, 50/60Hz                                  |
| Operation frequency      | : 908.40 MHz, 908.42 MHz, 916.00 MHz                    |
| Modulation               | : 2FSK, 2GFSK                                           |
| Antenna Gain             | : -2.8 dBi                                              |
| Sample Number            | : S23060511-01 for radiated, S23060511-01 for conducted |

Note: EUT is the abbreviation of equipment under test.

| Data rate<br>(kbps) | Frequency<br>(MHz) |
|---------------------|--------------------|
| 40                  | 908.40             |
| 9.6                 | 908.42             |
| 100                 | 916.00             |

### 2.2. Accessories of EUT

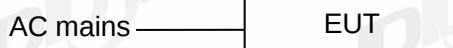
| Description of Accessories | Manufacturer | Model number | Serial No. | Other |
|----------------------------|--------------|--------------|------------|-------|
| N/A                        | N/A          | N/A          | N/A        | N/A   |

### 2.3. Assistant equipment used for test

| Assistant equipment | Manufacturer | Model number | Serial No. | Other |
|---------------------|--------------|--------------|------------|-------|
| Laptop              | Lenovo       | X201         | N/A        | N/A   |

### 2.4. Block diagram of EUT configuration for test

Tx Mode:



Test software: xshell.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

The pathloss of external cable: 0.3dB (According to the manufacturer's claims).

| Tested mode, channel, information |                  |                  |                 |
|-----------------------------------|------------------|------------------|-----------------|
| Mode                              | Setting Tx Power | Data rate (kbps) | Frequency (MHz) |
| 2FSK Tx mode                      | 100              | 40               | 908.40          |
| 2FSK Tx mode                      | 100              | 9.6              | 908.42          |
| 2GFSK Tx mode                     | 100              | 100              | 916.00          |

## 2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

|                    |            |
|--------------------|------------|
| Temperature range: | 21-25 °C   |
| Humidity range:    | 40-75%     |
| Pressure range:    | 86-106 kPa |

## 2.6. Deviations of test standard

No deviation.

## 2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: [ddt@dgddt.com](mailto:ddt@dgddt.com).

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118



## 2.8. Measurement uncertainty

| Test Item                                                                                                                                     | Uncertainty                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Bandwidth                                                                                                                                     | 1.1%                                                   |
| Peak Output Power (Conducted) (Spectrum Analyzer)                                                                                             | 0.86 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ ); |
|                                                                                                                                               | 1.38 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )   |
| Peak Output Power (Conducted) (Power Sensor)                                                                                                  | 0.74 dB                                                |
| Power Spectral Density                                                                                                                        | 0.74 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ ); |
|                                                                                                                                               | 1.38 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )   |
| Frequencies Stability                                                                                                                         | $6.7 \times 10^{-8}$ (Antenna couple method)           |
|                                                                                                                                               | $5.5 \times 10^{-8}$ (Conducted method)                |
| Conducted Spurious Emissions                                                                                                                  | 0.86 dB ( $10 \text{ MHz} \leq f < 3.6 \text{ GHz}$ ); |
|                                                                                                                                               | 1.40 dB ( $3.6 \text{ GHz} \leq f < 8 \text{ GHz}$ )   |
|                                                                                                                                               | 1.66 dB ( $8 \text{ GHz} \leq f < 22 \text{ GHz}$ )    |
| Uncertainty for Radio Frequency (RBW < 20 kHz)                                                                                                | $3 \times 10^{-8}$                                     |
| Temperature                                                                                                                                   | 0.4 °C                                                 |
| Humidity                                                                                                                                      | 2 %                                                    |
| Uncertainty for Radiation Emission Test<br>(9 kHz – 30 MHz)                                                                                   | 3.44 dB                                                |
| Uncertainty for Radiation Emission Test<br>(30 MHz - 1 GHz)                                                                                   | 4.70 dB (Antenna Polarize: V)                          |
|                                                                                                                                               | 4.84 dB (Antenna Polarize: H)                          |
| Uncertainty for Radiation Emission Test<br>(1 GHz - 40 GHz)                                                                                   | 4.10 dB (1 - 6 GHz)                                    |
|                                                                                                                                               | 4.40 dB (6 GHz - 18 GHz)                               |
|                                                                                                                                               | 3.54 dB (18 GHz - 26 GHz)                              |
|                                                                                                                                               | 4.30 dB (26 GHz - 40 GHz)                              |
| Uncertainty for Power Line Conduction Emission Test                                                                                           | 3.32 dB (150 kHz - 30 MHz)                             |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. |                                                        |

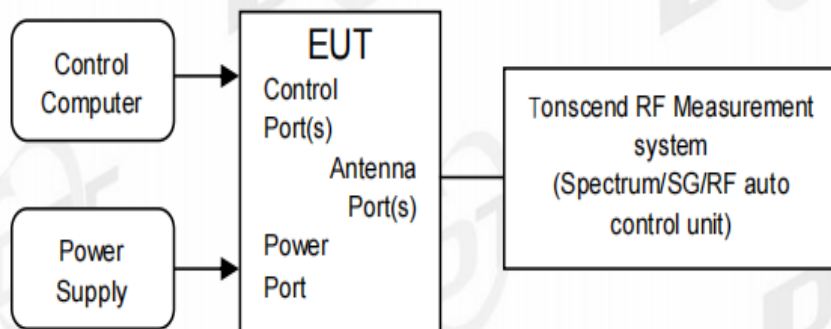


### 3. Equipment Used During Test

| Equipment                                                     | Manufacturer    | Model No.                                        | Serial No.   | Last Cal.     | Cal. Interval |
|---------------------------------------------------------------|-----------------|--------------------------------------------------|--------------|---------------|---------------|
| <b>☑RF Connected Test (Tonscend RF Measurement System 4#)</b> |                 |                                                  |              |               |               |
| Signal & Spectrum analyzer                                    | R&S             | FSV3044                                          | 101173       | Apr. 23, 2023 | 1 Year        |
| Signal & Spectrum analyzer                                    | R&S             | FSV40                                            | 101407       | Jul. 21, 2022 | 1 Year        |
| Wideband Radio Communication tester                           | R&S             | CMW500                                           | 168801       | Apr. 27, 2023 | 1 Year        |
| Vector Signal Generator                                       | Agilent         | N5182A                                           | MY48180737   | Apr. 27, 2023 | 1 Year        |
| Vector Signal Generator                                       | Agilent         | E8267D                                           | US49060192   | Sep. 28, 2022 | 1 Year        |
| RF Control Unit                                               | Tonsend         | JS0806-2                                         | 21I8060485   | Apr. 27, 2023 | 1 Year        |
| Test Software                                                 | JS Tonscend     | JS1120-3                                         | Ver.3.2.22   | N/A           | N/A           |
| <b>☑Radiation 3#chamber</b>                                   |                 |                                                  |              |               |               |
| EMI Test Receiver                                             | R&S             | ESU26                                            | 100472       | Apr. 23, 2023 | 1 Year        |
| Spectrum analyzer                                             | Agilent         | E4447A                                           | MY50180031   | Apr. 23, 2023 | 1 Year        |
| Active Loop antenna                                           | Schwarzbeck     | FMZB-1519                                        | 1519-038     | Sep. 29, 2022 | 1 Year        |
| Trilog Broadband Antenna                                      | Schwarzbeck     | VULB 9163                                        | 01429        | Jul. 22, 2022 | 1 Year        |
| Double Ridged Horn Antenna                                    | Schwarzbeck     | BBHA9120 D                                       | 02468        | Sep. 29, 2022 | 1 Year        |
| Broad Band Horn Antenna                                       | Schwarzbeck     | BBHA 9170                                        | 790          | Apr. 26, 2023 | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-118A                                         | 18040084     | Aug.17, 2022  | 1 Year        |
| Pre-amplifier                                                 | COM-POWER       | PAM-840A                                         | 461369       | Apr. 27, 2023 | 1 Year        |
| RE Cable                                                      | N/A             | W23.02 CP1-X2 + W23.09 AP1-X8+ JCT26S-NJ-NJ-1.5M | 4.5M+8M+1.5M | Apr. 21, 2023 | 1 Year        |
| RF Cable                                                      | Yuhu Technology | JCTB810-NJ-NJ -9M+ ZT26S-SMAJ-S MAJ-1M           | 21123964     | Apr. 23, 2023 | 1 Year        |
| Micro-Tronics filters                                         | REBES           | BRM50702                                         | G555         | N/A           | N/A           |
| Micro-Tronics filters                                         | REBES           | BRM50716                                         | G392         | N/A           | N/A           |
| High Pass filter                                              | XB              | XBLBQ-GTA67                                      | 210820-2-3   | N/A           | N/A           |
| Test software                                                 | Tonscend        | JS32-RE                                          | V 5.0.0.1    | N/A           | N/A           |
| <b>☑Power Line Conducted Emissions Test 1#</b>                |                 |                                                  |              |               |               |
| Test Receiver                                                 | R&S             | ESCI                                             | 100551       | Aug. 26, 2022 | 1 Year        |
| LISN 1                                                        | R&S             | ENV216                                           | 101109       | Aug. 26, 2022 | 1 Year        |
| LISN 2                                                        | R&S             | ESH2-Z5                                          | 100309       | Aug. 26, 2022 | 1 Year        |
| Pulse Limiter                                                 | R&S             | ESH3-Z2                                          | 101242       | Aug. 26, 2022 | 1 Year        |
| CE Cable 1                                                    | HUBSER          | N/A                                              | W10.01       | Aug. 26, 2022 | 1 Year        |
| Test software                                                 | Audix           | E3                                               | V 6.11111b   | N/A           | N/A           |
| Test Receiver                                                 | R&S             | ESCI                                             | 100551       | Aug. 26, 2022 | 1 Year        |

## 4. 20 dB Bandwidth

### 4.1. Block diagram of test setup



### 4.2. Limits

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.

### 4.3. Test procedure

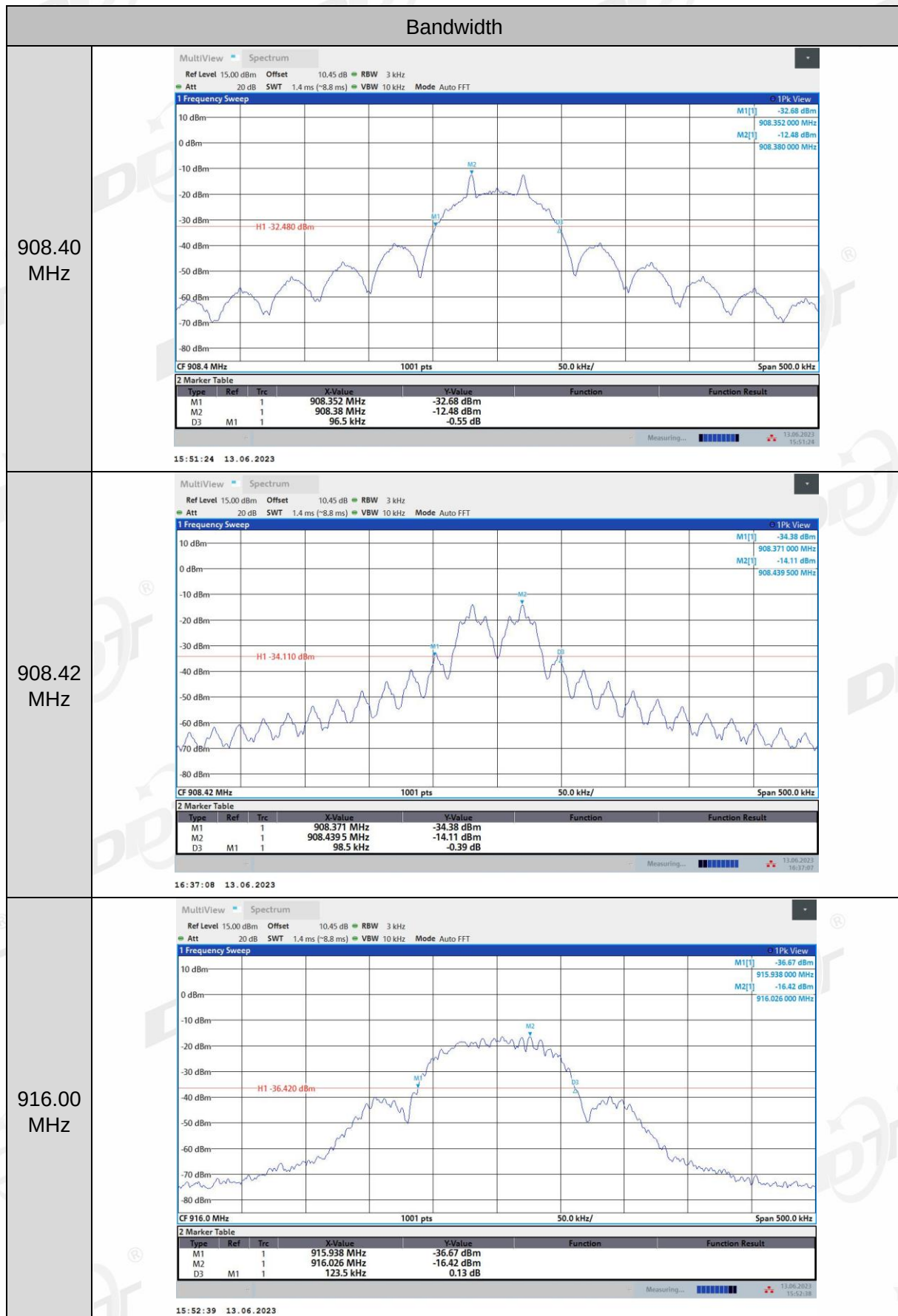
- (1) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (2) Set the spectrum analyzer as follows:
 

|                |          |
|----------------|----------|
| RBW:           | 3 kHz    |
| VBW:           | 10 kHz   |
| Detector Mode: | Peak     |
| Sweep time:    | auto     |
| Trace mode     | Max hold |
- (3) Allow the trace to stabilize, measure the 20 dB bandwidth of signal.

### 4.4. Test result

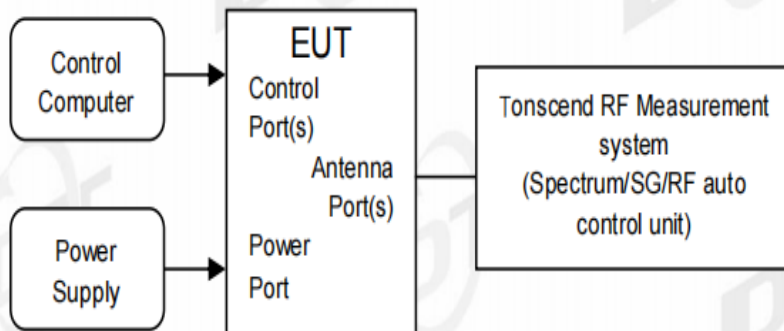
| Mode  | Frequency (MHz) | 20 dB bandwidth Result (kHz) | Limit (kHz) | Conclusion |
|-------|-----------------|------------------------------|-------------|------------|
| 2FSK  | 908.40          | 96.5                         | /           | Pass       |
| 2FSK  | 908.42          | 98.5                         | /           | Pass       |
| 2GFSK | 916.00          | 123.5                        | /           | Pass       |

## 4.5. Original test data



## 5. Duty cycle

### 5.1. Block diagram of test setup



### 5.2. Limit

Just for Report and determining the average value of pulsed emissions.

### 5.3. Test procedure

(1) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, The cable loss and attenuator loss have been put into spectrum analyzer as amplitude offset.

set the Spectrum Analyzer as below:

Centre Frequency: The centre frequency of the middle hopping channel.

Resolution BW: 1 MHz.

Video BW: 1 MHz.

Span: Zero span.

Detector: Peak.

Trace Mode: Max Hold.

Sweep: Video Trigger

Sweep time: 100 ms

(2) When the trace is complete, measure the sending time of 1 burst and the duty cycle of 1 burst cycle.

(3) Calculate dwell time follow below formula:

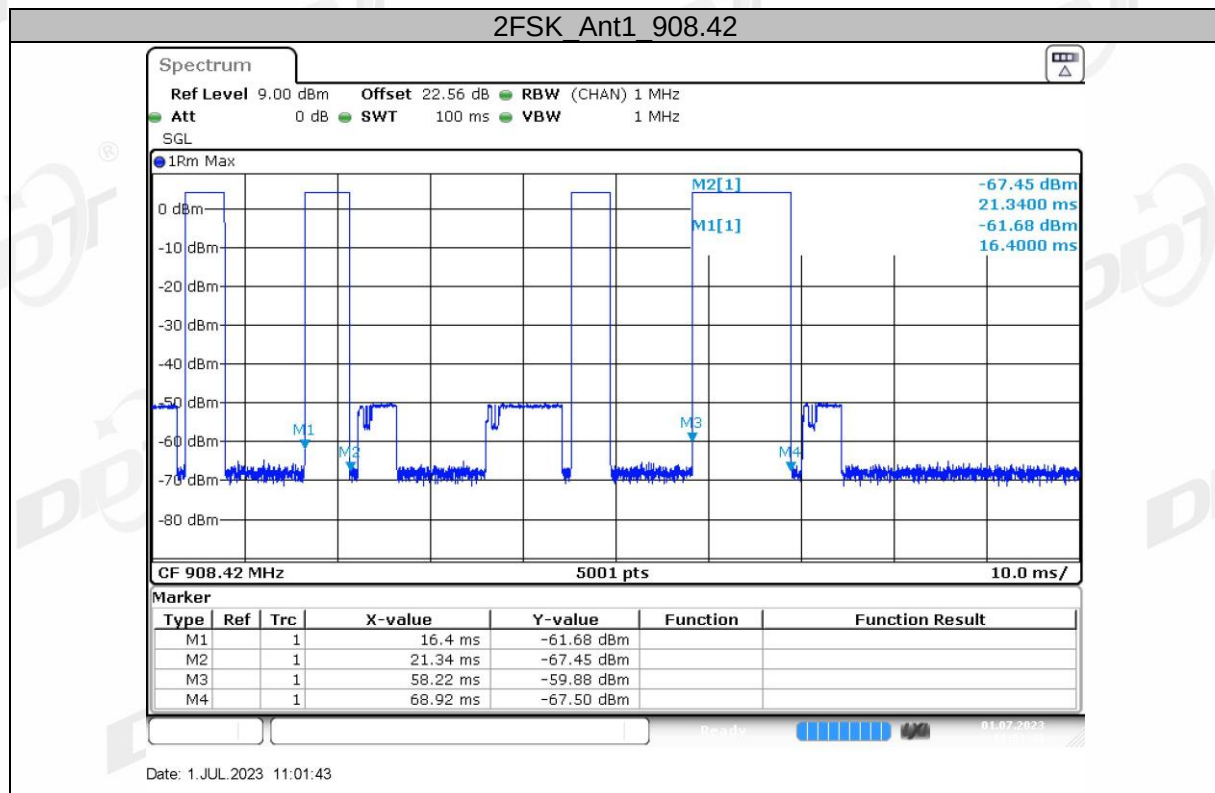
Duty cycle= Pulse's on time / Burst cycle

#### 5.4. Test result

| Test Mode | Antenna | Frequency [MHz] | ON Time [ms] | Period [ms] | Duty Cycle [%] | Duty Cycle Factor [dB] |
|-----------|---------|-----------------|--------------|-------------|----------------|------------------------|
| 2FSK      | Ant1    | 908.42          | 25.52        | 100         | 25.52          | -11.86                 |

Note 1: Different frequencies have the same duty cycle.

Note 2: On time=(21.34-16.40)\*3+(68.92-59.88)=25.52

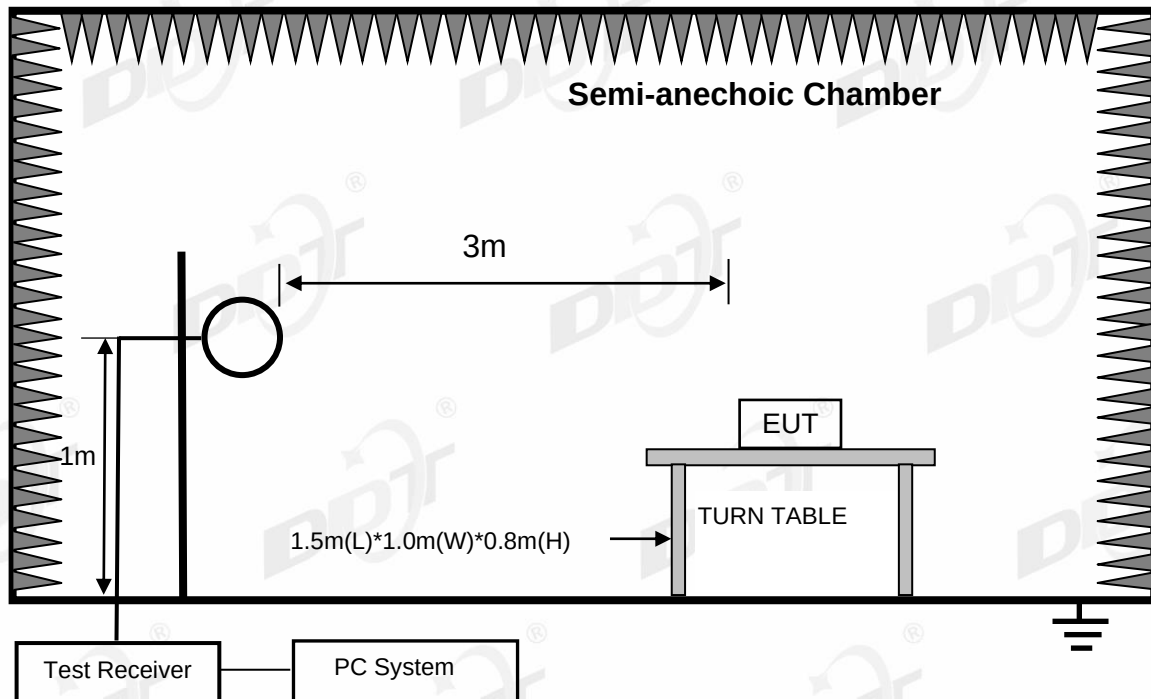




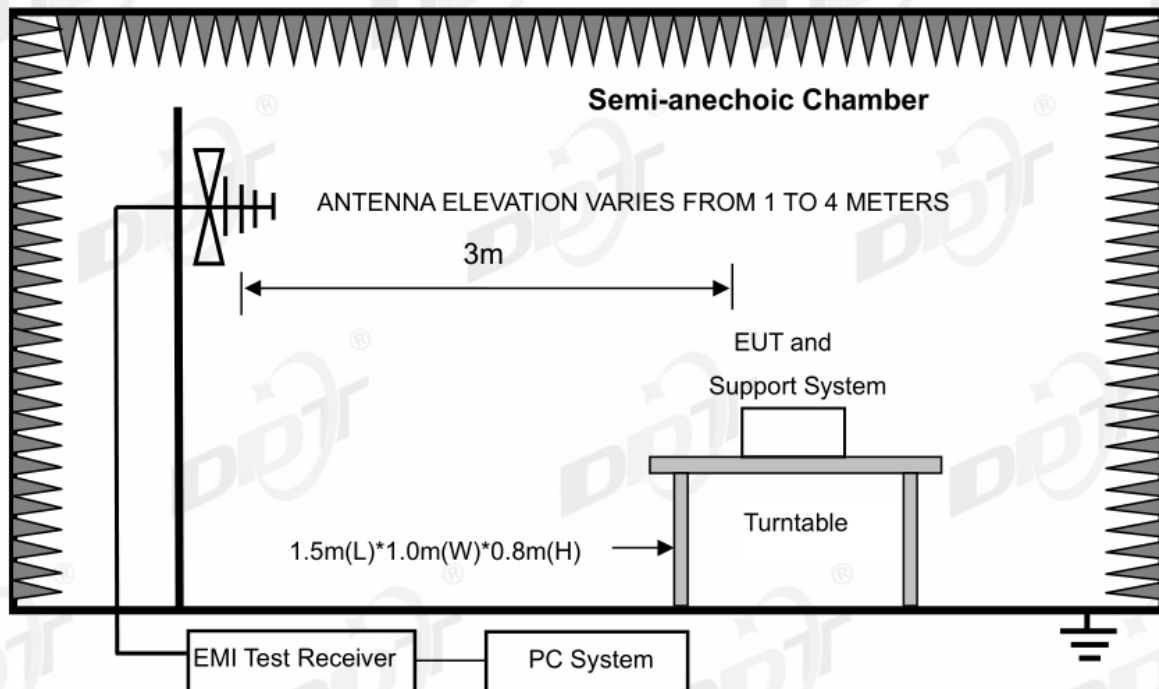
## 6. Radiated Emission

### 6.1. Block diagram of test setup

In 3 m Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:

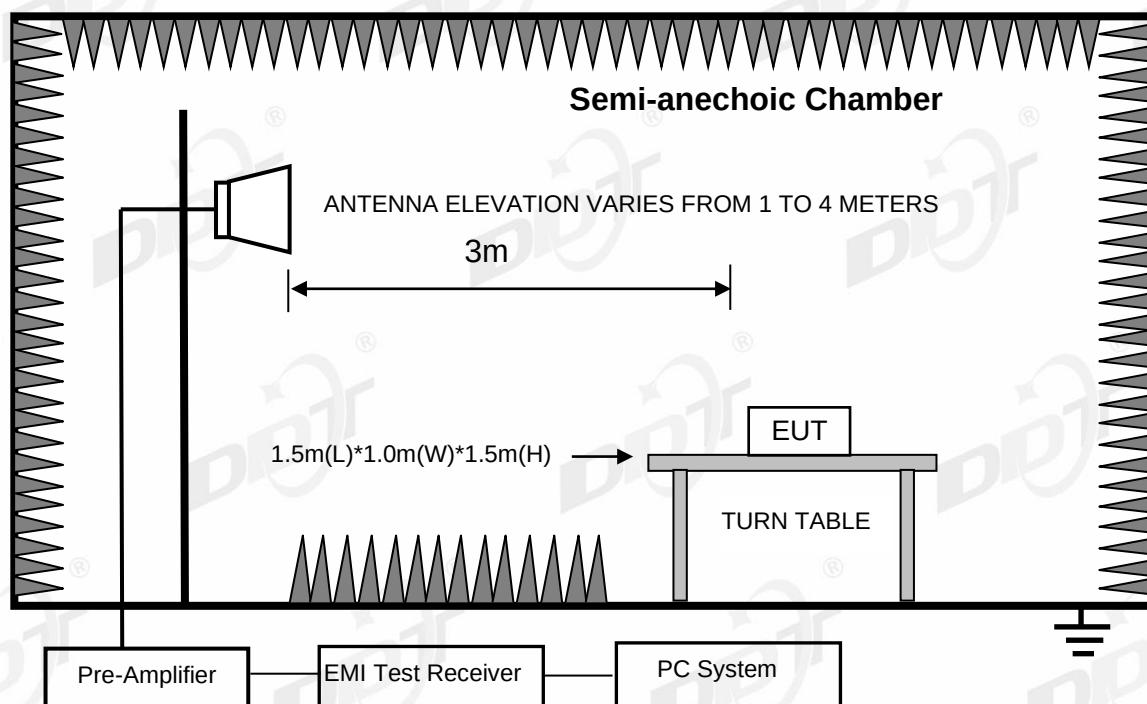


In 3 m Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:





In 3 m Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

## 6.2. Limit

(1) FCC 15.205 Restricted frequency band

| MHz                      | MHz                 | MHz           | GHz              |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| <sup>1</sup> 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        |
| 4.1772&4.17775           | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.2072&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     | ( <sup>2</sup> ) |
| 13.36-13.41              |                     |               |                  |

<sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup>Above 38.6

## (2) FCC 15.209 Limit.

| Frequency<br>(MHz)                                                 | Distance<br>(Meters) | Field strengths limit                                                     |                                   |
|--------------------------------------------------------------------|----------------------|---------------------------------------------------------------------------|-----------------------------------|
|                                                                    |                      | $\mu\text{V/m}$                                                           | $\text{dB}(\mu\text{V})/\text{m}$ |
| 0.009 ~ 0.490                                                      | 300                  | 2400/F(kHz)                                                               | 67.6-20log(F)                     |
| 0.490 ~ 1.705                                                      | 30                   | 24000/F(kHz)                                                              | 87.6-20log(F)                     |
| 1.705 ~ 30.0                                                       | 30                   | 30                                                                        | 29.54                             |
| 30 ~ 88                                                            | 3                    | 100                                                                       | 40.0                              |
| 88 ~ 216                                                           | 3                    | 150                                                                       | 43.5                              |
| 216 ~ 960                                                          | 3                    | 200                                                                       | 46.0                              |
| 960 ~ 1000                                                         | 3                    | 500                                                                       | 54.0                              |
| Above 1000 MHz                                                     | 3                    | 74.0 dB( $\mu\text{V}$ )/m (Peak)<br>54.0 dB( $\mu\text{V}$ )/m (Average) |                                   |
| Field Strength of<br>Fundamental emission for<br>902 MHz - 928 MHz | 3                    | 94.0 dB( $\mu\text{V}$ )/m (QP)                                           |                                   |
| Field Strength of<br>Harmonics                                     | 3                    | 74.0 dB( $\mu\text{V}$ )/m (Peak)<br>54.0 dB( $\mu\text{V}$ )/m (Average) |                                   |

## Remark:

- (1) Emission level  $\text{dB}\mu\text{V} = 20 \log \text{Emission level } \mu\text{V/m}$
- (2) The smaller limit shall apply at the cross point between two frequency bands.
- (3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.
- (4) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz, radiated emission limits in these three bands are based on measurements employing an average detector.

**6.3. Test procedure**

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4
- (3) Test antenna was located 3 m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
  - (a) Change work frequency or channel of device if practicable.
  - (b) Change modulation type of device if practicable.
  - (c) Change power supply range from 85% to 115% of the rated supply voltage
  - (d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) Spectrum frequency from 9 kHz to 10 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9 kHz to 30 MHz, so below final test was performed with frequency range from 30 MHz to 10 GHz.

- (5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.
- (6) For emissions from 30 MHz to 1 GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 kHz.
- (7) For emissions above 1 GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; according ANSI C63.10:2013 clause 4.1.4.2 procedure for average measure.
- (8) For fundamental frequency test, set spectrum analyzer's RBW = 100 kHz, VBW = 300 kHz. Peak detector for pre-test, then read the QP Level in spectrum analyzer and record.

#### 6.4. Test result

##### **Pass. (See below detailed test result)**

All the emissions except fundamental emission from 9 kHz to 10 GHz were comply with 15.209 limit.

Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz, so the final test was performed with frequency range from 30 MHz to 10 GHz and recorded in below.

Note2: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

**Field Strength of the Fundamental Signal**

| Freq. [MHz] | Reading [dBμV/m] | Antenna Factor [dB] | Cable loss [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-------------|------------------|---------------------|-----------------|----------------|----------------|-------------|----------|------------|
| 908.40      | 72.06            | 8.37                | 22.47           | 102.90         | 114.00         | 11.10       | PK       | Horizontal |
| 908.40      | \                | \                   | \               | 91.04          | 94.00          | 2.96        | AV       | Horizontal |
| 908.40      | 65.01            | 8.37                | 22.47           | 95.85          | 114.00         | 18.15       | PK       | Vertical   |
| 908.40      | \                | \                   | \               | 83.99          | 94.00          | 10.01       | AV       | Vertical   |
| 908.42      | 73.11            | 8.37                | 22.47           | 103.95         | 114.00         | 10.05       | PK       | Horizontal |
| 908.42      | \                | \                   | \               | 92.09          | 94.00          | 1.91        | AV       | Horizontal |
| 908.42      | 65.04            | 8.37                | 22.47           | 95.88          | 114.00         | 18.12       | PK       | Vertical   |
| 908.42      | \                | \                   | \               | 84.02          | 94.00          | 9.98        | AV       | Vertical   |
| 916.00      | 70.93            | 8.40                | 22.50           | 101.83         | 114.00         | 12.17       | PK       | Horizontal |
| 916.00      | \                | \                   | \               | 89.97          | 94.00          | 4.03        | AV       | Horizontal |
| 916.00      | 63.88            | 8.40                | 22.50           | 94.78          | 114.00         | 19.22       | PK       | Vertical   |
| 916.00      | \                | \                   | \               | 82.92          | 94.00          | 11.08       | AV       | Vertical   |

Note:

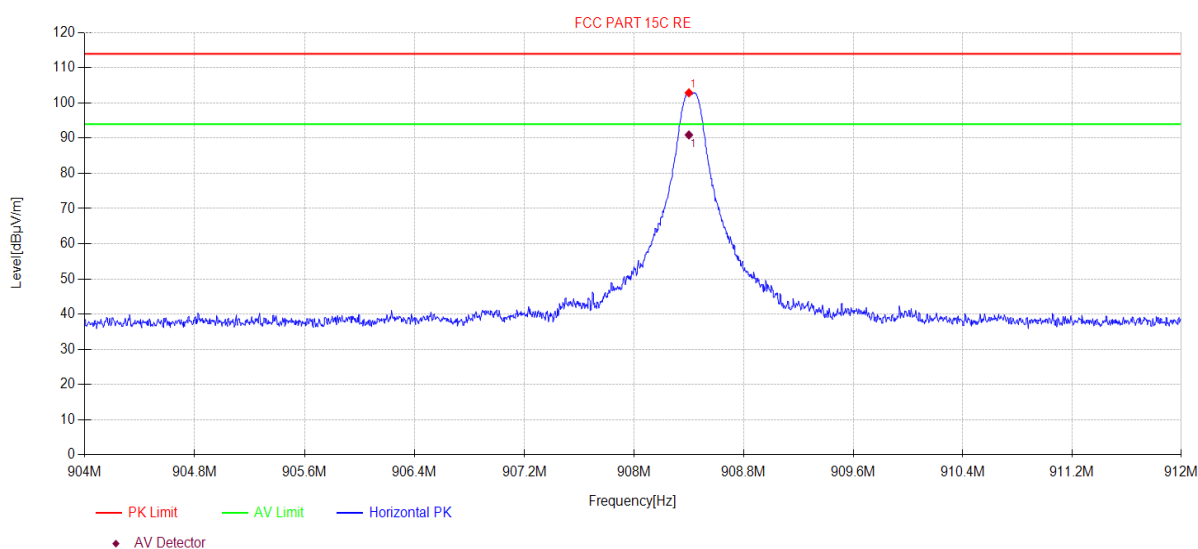
1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. The duty cycle of test signal is 25.52%, duty cycle factor is -11.86, refer to section 5.4.

## Field Strength of the Fundamental Signal

## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30 Tested By: Bairong  
EUT: Double Relay Model Number: ZEN52 LR  
Test Mode: TX Mode Power Supply: AC 120V/60Hz  
Condition: Temp:23.4°C;Humi:64.5% Test Site: DDT 3# Chamber  
File Path: d:\ts\2023 report data\Q23060511-1E ZEN52\FCC BELOW 1G\43  
Memo: 908.4MHz POWER100

## Test Graph



| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|------------|
| 1   | 908.40      | 72.06            | 8.37            | 22.47               | 102.90         | 114.00         | 11.10       | PK       | Horizontal |

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|------------|
| 1   | 908.40      | \                | \               | \                   | 91.04          | 94.00          | 2.96        | AV       | Horizontal |

## Note:

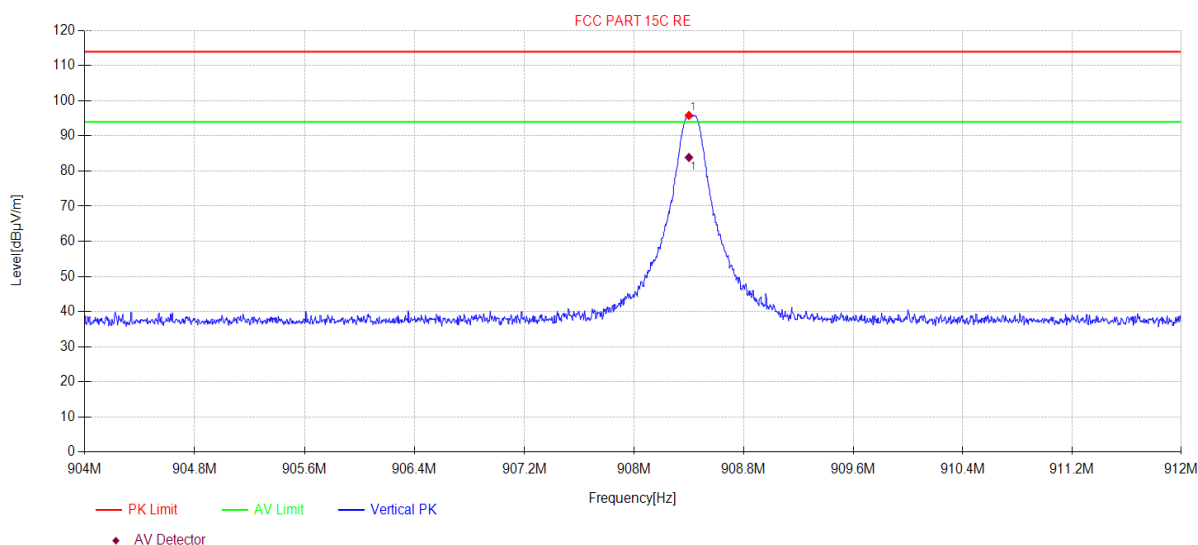
- Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- The duty cycle of test signal is 25.52%, duty cycle factor is -11.86, refer to section 5.4.



## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC BELOW 1G\44  
**Memo:** 908.4MHz POWER100

### Test Graph



| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|----------|
| 1   | 908.40      | 65.01            | 8.37            | 22.47               | 95.85          | 114.00         | 18.15       | PK       | Vertical |

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|----------|
| 1   | 908.40      | \                | \               | \                   | 83.99          | 94.00          | 10.01       | AV       | Vertical |

### Note:

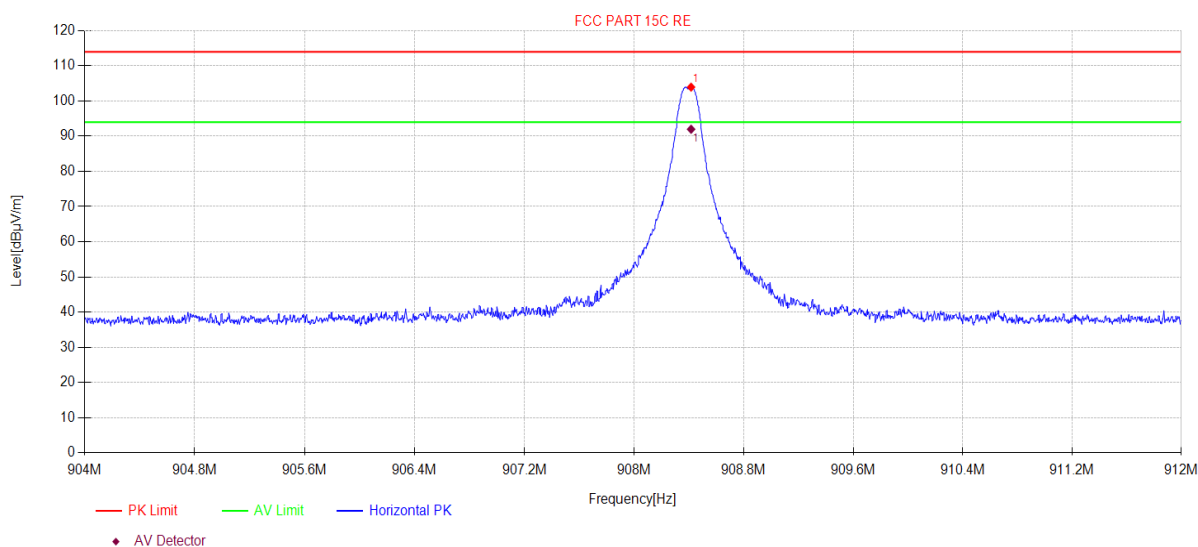
- Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
- The duty cycle of test signal is 25.52%, duty cycle factor is -11.86, refer to section 5.4.



## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30  
**Tested By:** Bairong  
**EUT:** Double Relay  
**Model Number:** ZEN52 LR  
**Test Mode:** TX Mode  
**Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5%  
**Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC BELOW 1G\45  
**Memo:** 908.42MHz POWER100

### Test Graph



| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|------------|
| 1   | 908.42      | 73.11            | 8.37            | 22.47               | 103.95         | 114.00         | 10.05       | PK       | Horizontal |

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|------------|
| 1   | 908.42      | \                | \               | \                   | 92.09          | 94.00          | 1.91        | AV       | Horizontal |

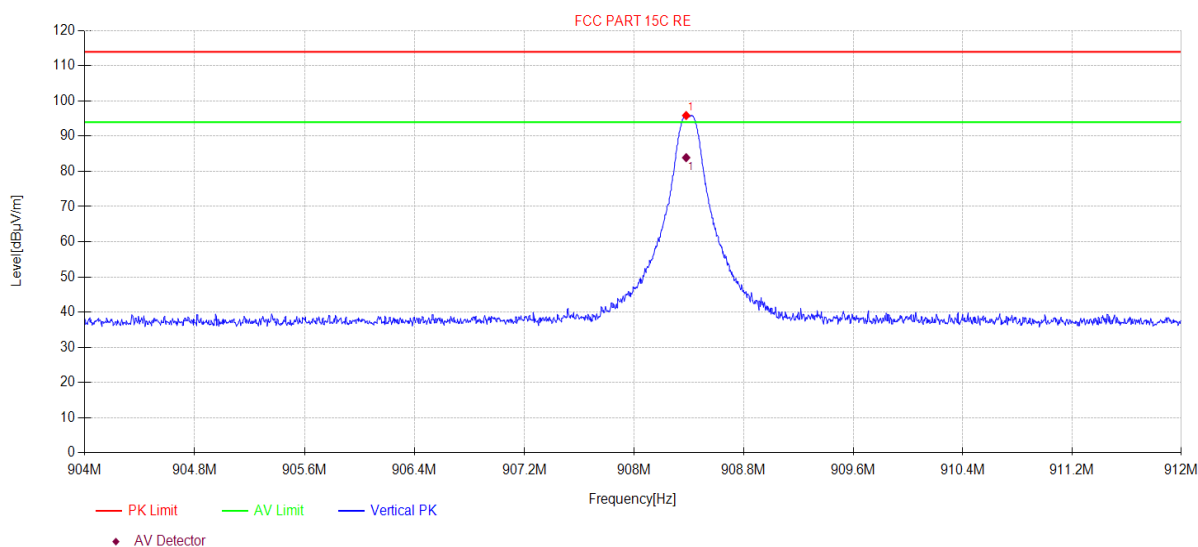
### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. The duty cycle of test signal is 25.52%, duty cycle factor is -11.86, refer to section 5.4.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC BELOW 1G\46  
**Memo:** 908.42MHz POWER100

### Test Graph



| NO. | Freq.<br>[MHz] | Reading<br>[dBμV/m] | Cable<br>loss<br>[dB] | Antenna<br>Factor<br>[dB] | Level<br>[dBμV/m] | Limit<br>[dBμV/m] | Margin<br>[dB] | Detector | Polarity |
|-----|----------------|---------------------|-----------------------|---------------------------|-------------------|-------------------|----------------|----------|----------|
| 1   | 908.38         | 65.04               | 8.37                  | 22.47                     | 95.88             | 114.00            | 18.12          | PK       | Vertical |

| NO. | Freq.<br>[MHz] | Reading<br>[dBμV/m] | Cable<br>loss<br>[dB] | Antenna<br>Factor<br>[dB] | Level<br>[dBμV/m] | Limit<br>[dBμV/m] | Margin<br>[dB] | Detector | Polarity |
|-----|----------------|---------------------|-----------------------|---------------------------|-------------------|-------------------|----------------|----------|----------|
| 1   | 908.38         | \                   | \                     | \                         | 84.02             | 94.00             | 9.98           | AV       | Vertical |

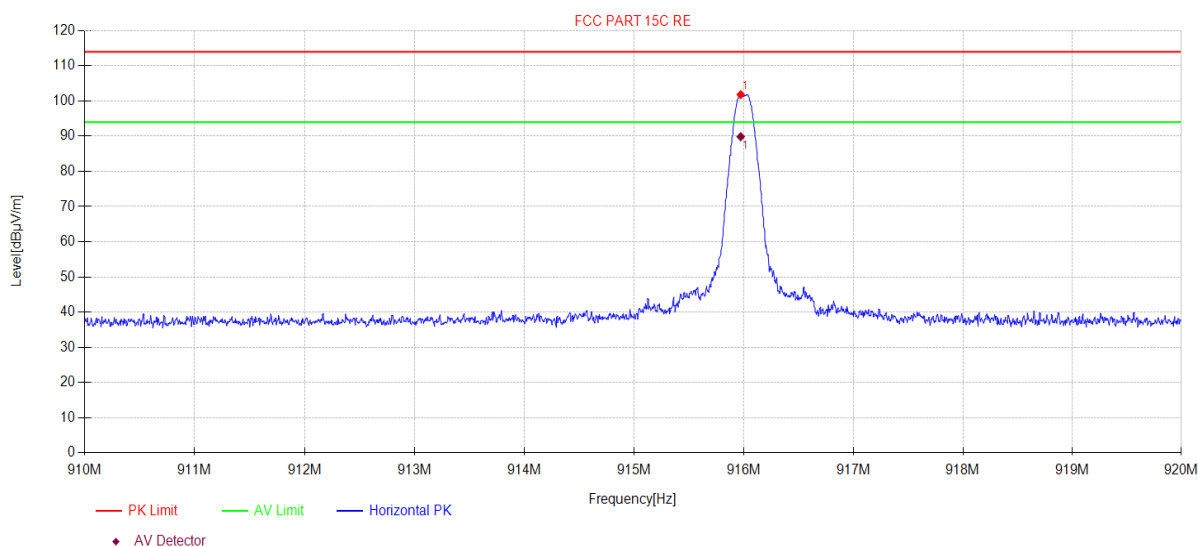
### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. The duty cycle of test signal is 25.52%, duty cycle factor is -11.86, refer to section 5.4.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC BELOW 1G\47  
**Memo:** 916MHz POWER100

### Test Graph



| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|------------|
| 1   | 915.97      | 70.93            | 8.40            | 22.50               | 101.83         | 114.00         | 12.17       | PK       | Horizontal |

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|------------|
| 1   | 915.97      | \                | \               | \                   | 89.97          | 94.00          | 4.03        | AV       | Horizontal |

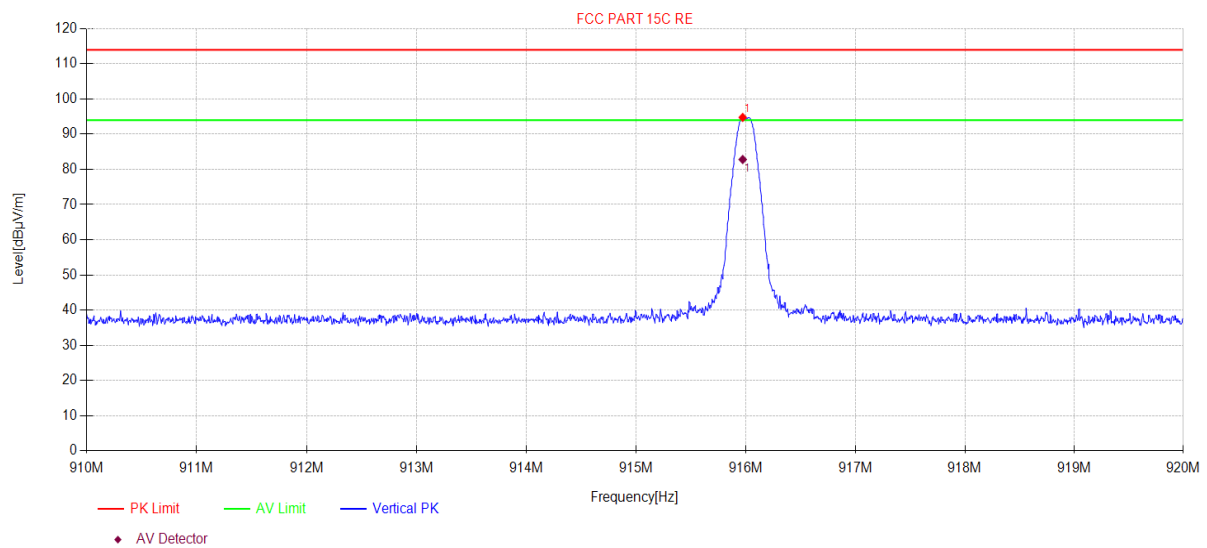
Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. The duty cycle of test signal is 25.52%, duty cycle factor is -11.86, refer to section 5.4.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30      **Tested By:** Bairong  
**EUT:** Double Relay      **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode      **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5%      **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC BELOW 1G\48  
**Memo:** 916MHz POWER100

### Test Graph



| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|----------|
| 1   | 915.97      | 63.88            | 8.40            | 22.50               | 94.78          | 114.00         | 19.22       | PK       | Vertical |

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
|-----|-------------|------------------|-----------------|---------------------|----------------|----------------|-------------|----------|----------|
| 1   | 915.97      | \                | \               | \                   | 82.92          | 94.00          | 11.08       | AV       | Vertical |

### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.
4. The duty cycle of test signal is 25.52%, duty cycle factor is -11.86, refer to section 5.4.

## Radiated Emission test (below 1 GHz)

## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30

Tested By: Bairong

EUT: Double Relay

Model Number: ZEN52 LR

Test Mode: TX Mode

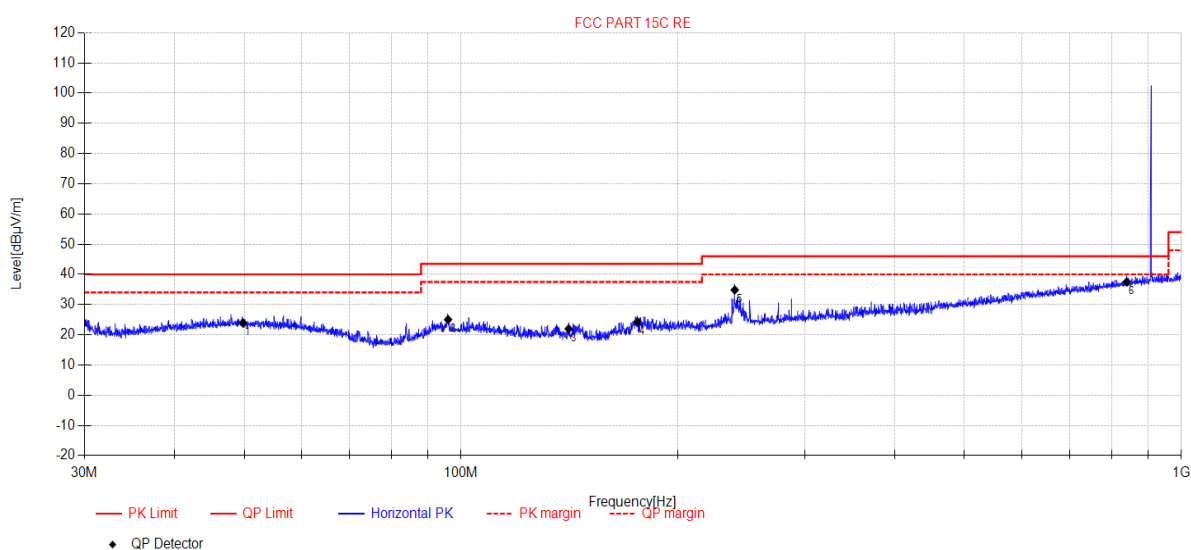
Power Supply: AC 120V/60Hz

Condition: Temp:23.4°C;Humi:64.5%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\20230630-201249\_H

Memo: 908.4MHz POWER100



| Final Data List |             |                  |                     |                 |          |                 |                |             |          |            |
|-----------------|-------------|------------------|---------------------|-----------------|----------|-----------------|----------------|-------------|----------|------------|
| NO.             | Freq. [MHz] | Reading [dBμV/m] | Antenna Factor [dB] | Cable Loss [dB] | AMP [dB] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
| 1               | 49.81       | 6.04             | 13.12               | 4.73            | 0.00     | 23.89           | 40.00          | 16.11       | QP       | Horizontal |
| 2               | 95.94       | 9.51             | 10.49               | 5.02            | 0.00     | 25.02           | 43.50          | 18.48       | QP       | Horizontal |
| 3               | 141.09      | 9.28             | 7.40                | 5.28            | 0.00     | 21.96           | 43.50          | 21.54       | QP       | Horizontal |
| 4               | 175.84      | 9.88             | 8.90                | 5.53            | 0.00     | 24.31           | 43.50          | 19.19       | QP       | Horizontal |
| 5               | 239.89      | 16.93            | 12.00               | 5.90            | 0.00     | 34.83           | 46.00          | 11.17       | QP       | Horizontal |
| 6               | 839.80      | 7.56             | 21.80               | 8.12            | 0.00     | 37.48           | 46.00          | 8.52        | QP       | Horizontal |

Note:

- Result Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
- Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30

Tested By: Bairong

EUT: Double Relay

Model: ZEN52 LR

Test Mode: TX Mode

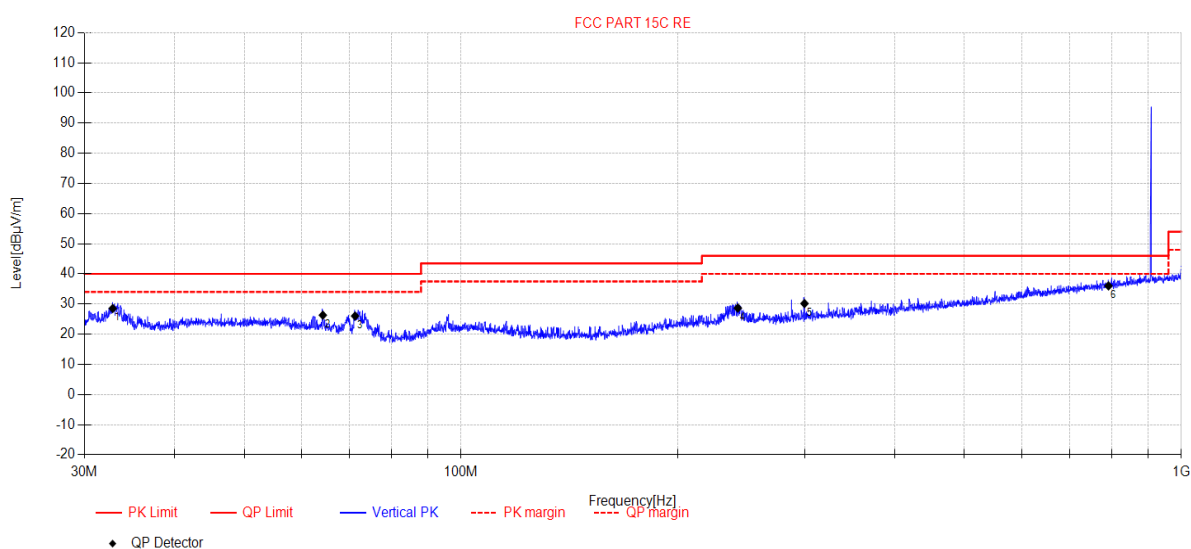
Number: ZEN52 LR  
Power: AC 120V/60Hz  
Supply:

Condition: Temp:23.4°C;Humi:64.5%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\20230630-201337\_V

Memo: 908.4MHz POWER100



| Final Data List |             |                  |                     |                 |          |                 |                |             |          |          |
|-----------------|-------------|------------------|---------------------|-----------------|----------|-----------------|----------------|-------------|----------|----------|
| NO.             | Freq. [MHz] | Reading [dBμV/m] | Antenna Factor [dB] | Cable Loss [dB] | AMP [dB] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1               | 32.84       | 13.62            | 10.40               | 4.51            | 0.00     | 28.53           | 40.00          | 11.47       | QP       | Vertical |
| 2               | 64.29       | 10.73            | 10.81               | 4.77            | 0.00     | 26.31           | 40.00          | 13.69       | QP       | Vertical |
| 3               | 71.27       | 13.12            | 8.12                | 4.79            | 0.00     | 26.03           | 40.00          | 13.97       | QP       | Vertical |
| 4               | 242.25      | 10.66            | 12.09               | 5.91            | 0.00     | 28.66           | 46.00          | 17.34       | QP       | Vertical |
| 5               | 299.81      | 10.73            | 13.29               | 6.15            | 0.00     | 30.17           | 46.00          | 15.83       | QP       | Vertical |
| 6               | 792.32      | 6.91             | 21.15               | 7.96            | 0.00     | 36.02           | 46.00          | 9.98        | QP       | Vertical |

Note:

- Result Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
- Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.



## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30

Tested By: Bairong

EUT: Double Relay

Model: ZEN52 LR

Test Mode: TX Mode

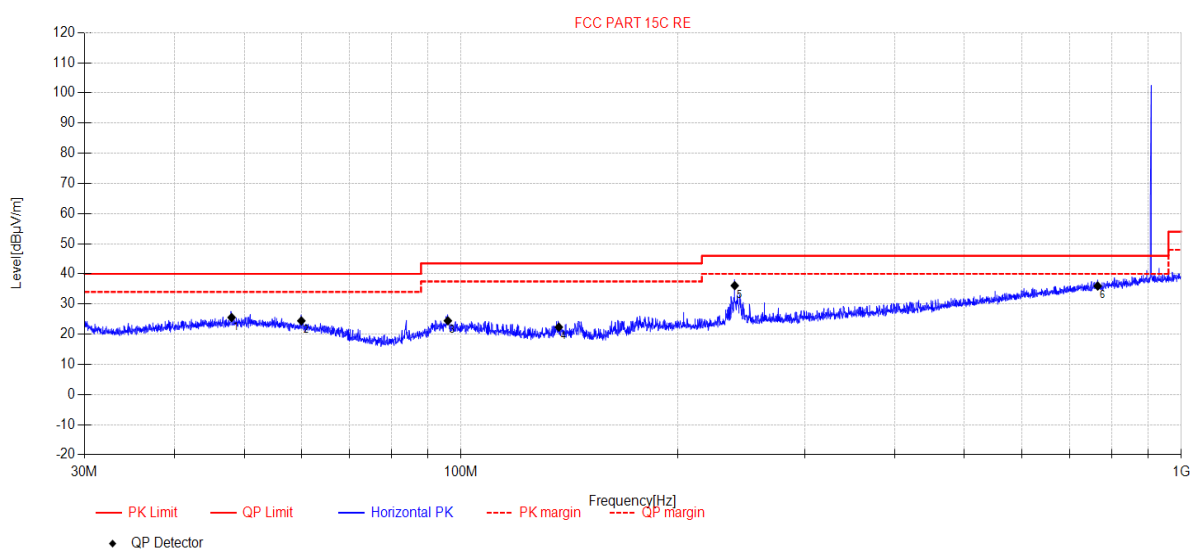
Number: ZEN52 LR  
Power: AC 120V/60Hz  
Supply:

Condition: Temp:23.4°C;Humi:64.5%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\20230630-201504\_H

Memo: 908.42MHz POWER100



| Final Data List |             |                  |                     |                 |          |                 |                |             |          |            |
|-----------------|-------------|------------------|---------------------|-----------------|----------|-----------------|----------------|-------------|----------|------------|
| NO.             | Freq. [MHz] | Reading [dBμV/m] | Antenna Factor [dB] | Cable Loss [dB] | AMP [dB] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
| 1               | 48.02       | 7.64             | 13.20               | 4.70            | 0.00     | 25.54           | 40.00          | 14.46       | QP       | Horizontal |
| 2               | 60.02       | 7.77             | 11.89               | 4.76            | 0.00     | 24.42           | 40.00          | 15.58       | QP       | Horizontal |
| 3               | 95.87       | 8.96             | 10.47               | 5.02            | 0.00     | 24.45           | 43.50          | 19.05       | QP       | Horizontal |
| 4               | 136.71      | 9.57             | 7.50                | 5.25            | 0.00     | 22.32           | 43.50          | 21.18       | QP       | Horizontal |
| 5               | 239.89      | 18.2             | 12.00               | 5.90            | 0.00     | 36.10           | 46.00          | 9.90        | QP       | Horizontal |
| 6               | 765.56      | 7.16             | 20.90               | 7.90            | 0.00     | 35.96           | 46.00          | 10.04       | QP       | Horizontal |

Note:

- Result Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
- Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30

Tested By: Bairong

EUT: Double Relay

Model: ZEN52 LR

Test Mode: TX Mode

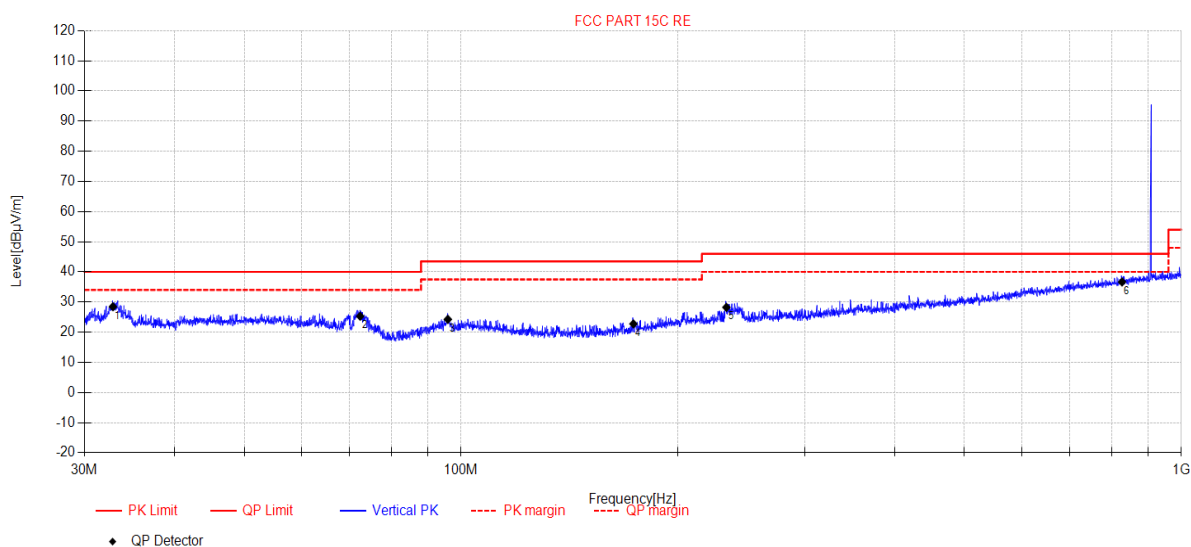
Number: ZEN52 LR  
Power: AC 120V/60Hz  
Supply:

Condition: Temp:23.4°C;Humi:64.5%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\20230630-201552\_V

Memo: 908.42MHz POWER100



| Final Data List |             |                  |                     |                 |          |                 |                |             |          |          |
|-----------------|-------------|------------------|---------------------|-----------------|----------|-----------------|----------------|-------------|----------|----------|
| NO.             | Freq. [MHz] | Reading [dBμV/m] | Antenna Factor [dB] | Cable Loss [dB] | AMP [dB] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1               | 32.86       | 13.54            | 10.40               | 4.51            | 0.00     | 28.45           | 40.00          | 11.55       | QP       | Vertical |
| 2               | 72.43       | 12.72            | 7.77                | 4.80            | 0.00     | 25.29           | 40.00          | 14.71       | QP       | Vertical |
| 3               | 95.87       | 8.76             | 10.47               | 5.02            | 0.00     | 24.25           | 43.50          | 19.25       | QP       | Vertical |
| 4               | 173.51      | 8.49             | 8.75                | 5.51            | 0.00     | 22.75           | 43.50          | 20.75       | QP       | Vertical |
| 5               | 233.58      | 10.52            | 11.84               | 5.87            | 0.00     | 28.23           | 46.00          | 17.77       | QP       | Vertical |
| 6               | 827.52      | 6.98             | 21.60               | 8.08            | 0.00     | 36.66           | 46.00          | 9.34        | QP       | Vertical |

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30

Tested By: Bairong

EUT: Double Relay

Model: ZEN52 LR

Test Mode: TX Mode

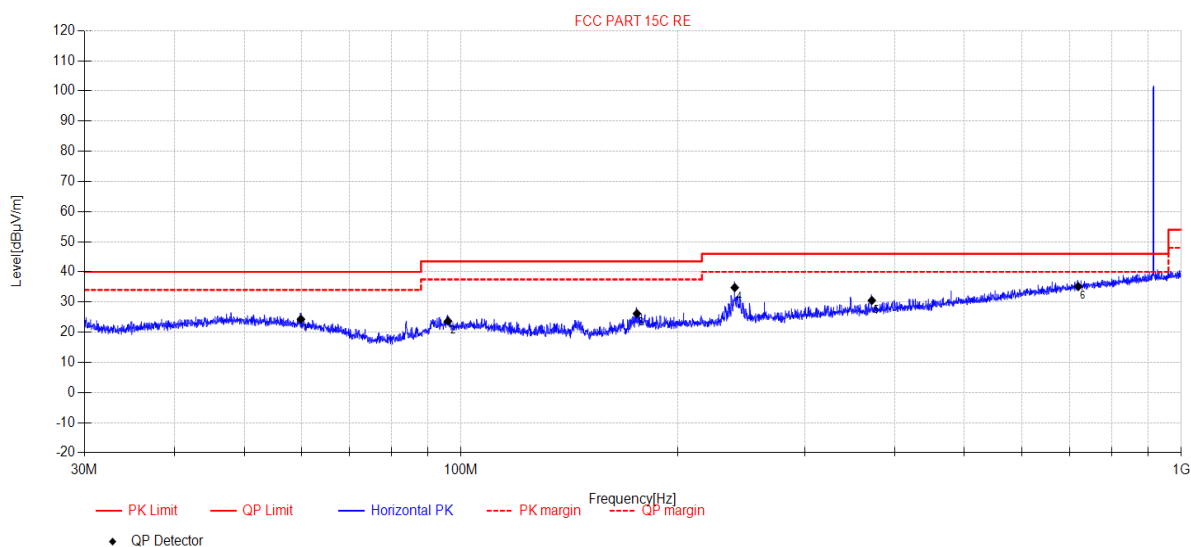
Number: ZEN52 LR  
Power: AC 120V/60Hz  
Supply:

Condition: Temp:23.4°C;Humi:64.5%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\20230630-201709\_H

Memo: 916MHz POWER100



| Final Data List |             |                  |                     |                 |          |                 |                |             |          |            |
|-----------------|-------------|------------------|---------------------|-----------------|----------|-----------------|----------------|-------------|----------|------------|
| NO.             | Freq. [MHz] | Reading [dBμV/m] | Antenna Factor [dB] | Cable Loss [dB] | AMP [dB] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
| 1               | 59.93       | 7.64             | 11.91               | 4.76            | 0.00     | 24.31           | 40.00          | 15.69       | QP       | Horizontal |
| 2               | 95.94       | 8.15             | 10.49               | 5.02            | 0.00     | 23.66           | 43.50          | 19.84       | QP       | Horizontal |
| 3               | 175.47      | 11.73            | 8.90                | 5.53            | 0.00     | 26.16           | 43.50          | 17.34       | QP       | Horizontal |
| 4               | 239.89      | 16.89            | 12.00               | 5.90            | 0.00     | 34.79           | 46.00          | 11.21       | QP       | Horizontal |
| 5               | 371.82      | 9.02             | 14.94               | 6.54            | 0.00     | 30.50           | 46.00          | 15.50       | QP       | Horizontal |
| 6               | 719.25      | 7.06             | 20.28               | 7.80            | 0.00     | 35.14           | 46.00          | 10.86       | QP       | Horizontal |

Note:

1. Result Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30

Tested By: Bairong

EUT: Double Relay

Model: ZEN52 LR

Test Mode: TX Mode

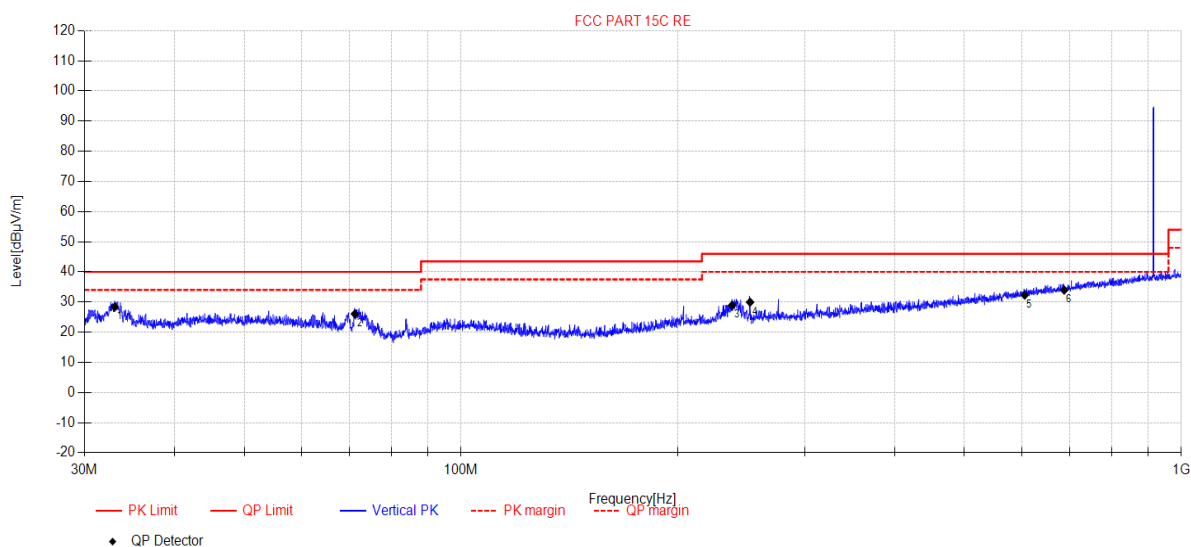
Number: ZEN52 LR  
Power: AC 120V/60Hz  
Supply:

Condition: Temp:23.4°C;Humi:64.5%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\20230630-201757\_V

Memo: 916MHz POWER100



| Final Data List |             |                  |                     |                 |          |                 |                |             |          |          |
|-----------------|-------------|------------------|---------------------|-----------------|----------|-----------------|----------------|-------------|----------|----------|
| NO.             | Freq. [MHz] | Reading [dBμV/m] | Antenna Factor [dB] | Cable Loss [dB] | AMP [dB] | Result [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1               | 33.05       | 13.43            | 10.41               | 4.51            | 0.00     | 28.35           | 40.00          | 11.65       | QP       | Vertical |
| 2               | 71.22       | 13.15            | 8.13                | 4.79            | 0.00     | 26.07           | 40.00          | 13.93       | QP       | Vertical |
| 3               | 237.88      | 11.08            | 11.96               | 5.89            | 0.00     | 28.93           | 46.00          | 17.07       | QP       | Vertical |
| 4               | 251.96      | 11.67            | 12.34               | 5.95            | 0.00     | 29.96           | 46.00          | 16.04       | QP       | Vertical |
| 5               | 606.14      | 6.2              | 18.72               | 7.36            | 0.00     | 32.28           | 46.00          | 13.72       | QP       | Vertical |
| 6               | 687.68      | 6.39             | 19.85               | 7.71            | 0.00     | 33.95           | 46.00          | 12.05       | QP       | Vertical |

Note:

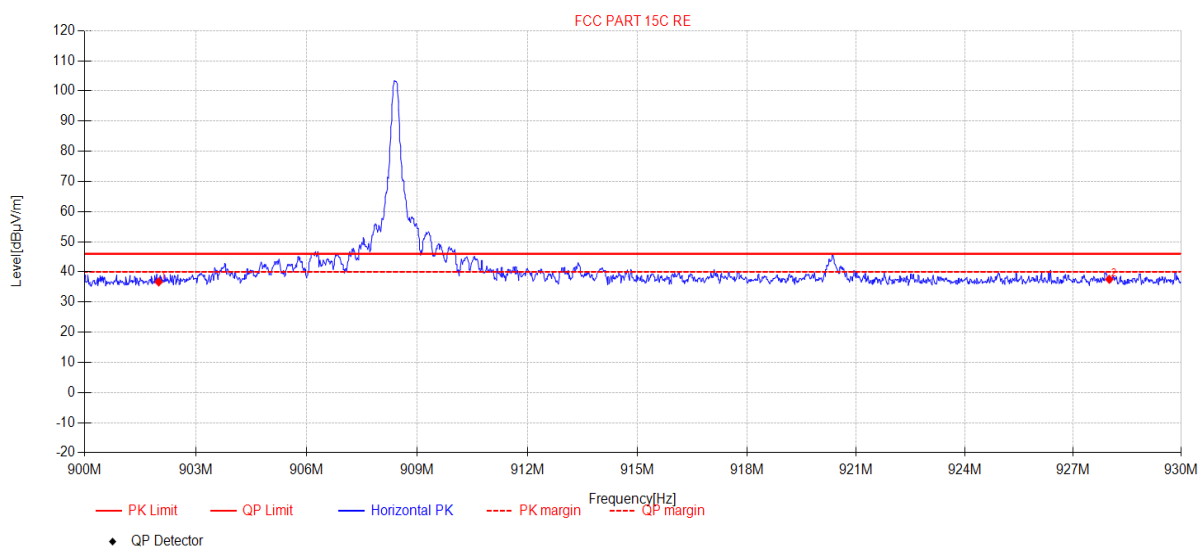
- Result Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
- Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-07-10  
**EUT:** Double Relay  
**Test Mode:** TX Mode  
**Condition:** Temp:23.4°C;Humi:64.5%  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\49  
**Memo:** 908.4MHz POWER100

**Tested By:** Bairong  
**Model Number:** ZEN52 LR  
**Power Supply:** AC 120V/60Hz  
**Test Site:** DDT 3# Chamber

### Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |            |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|------------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
| 1                   | 902.00      | 5.92             | 8.35            | 22.40               | 0.00     | 36.67          | 46.00          | 9.33        | PK       | Horizontal |
| 2                   | 928.00      | 6.60             | 8.44            | 22.50               | 0.00     | 37.54          | 46.00          | 8.46        | PK       | Horizontal |

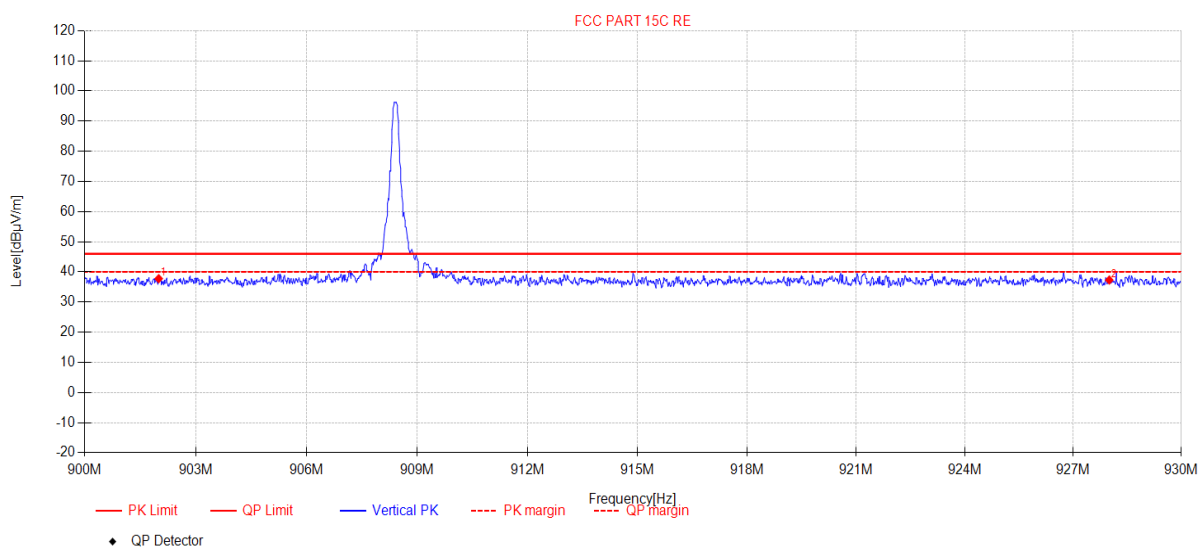
### Note:

- Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-07-10 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\50  
**Memo:** 908.4MHz POWER100

### Test Graph



### Suspected Data List

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
|-----|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|----------|
| 1   | 902.00      | 7.01             | 8.35            | 22.40               | 0.00     | 37.76          | 46.00          | 8.24        | PK       | Vertical |
| 2   | 928.00      | 6.36             | 8.44            | 22.50               | 0.00     | 37.30          | 46.00          | 8.70        | PK       | Vertical |

### Note:

- Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

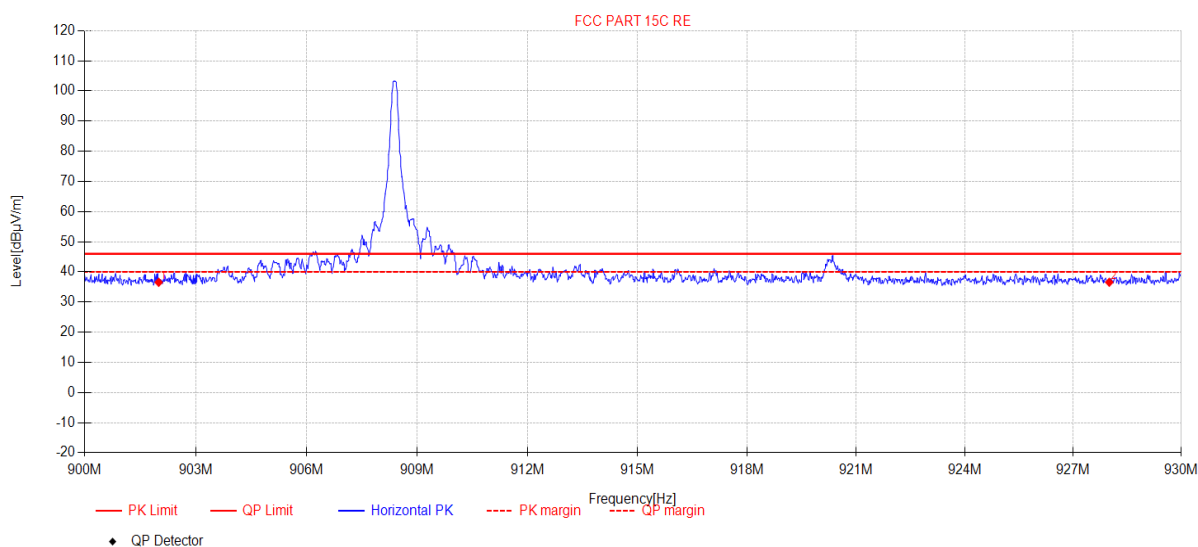


## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-07-10  
**EUT:** Double Relay  
**Test Mode:** TX Mode  
**Condition:** Temp:23.4°C;Humi:64.5%  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\51  
**Memo:** 908.42MHz POWER100

**Tested By:** Bairong  
**Model Number:** ZEN52 LR  
**Power Supply:** AC 120V/60Hz  
**Test Site:** DDT 3# Chamber

### Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |            |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|------------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
| 1                   | 902.00      | 5.79             | 8.35            | 22.40               | 0.00     | 36.54          | 46.00          | 9.46        | PK       | Horizontal |
| 2                   | 928.00      | 5.62             | 8.44            | 22.50               | 0.00     | 36.56          | 46.00          | 9.44        | PK       | Horizontal |

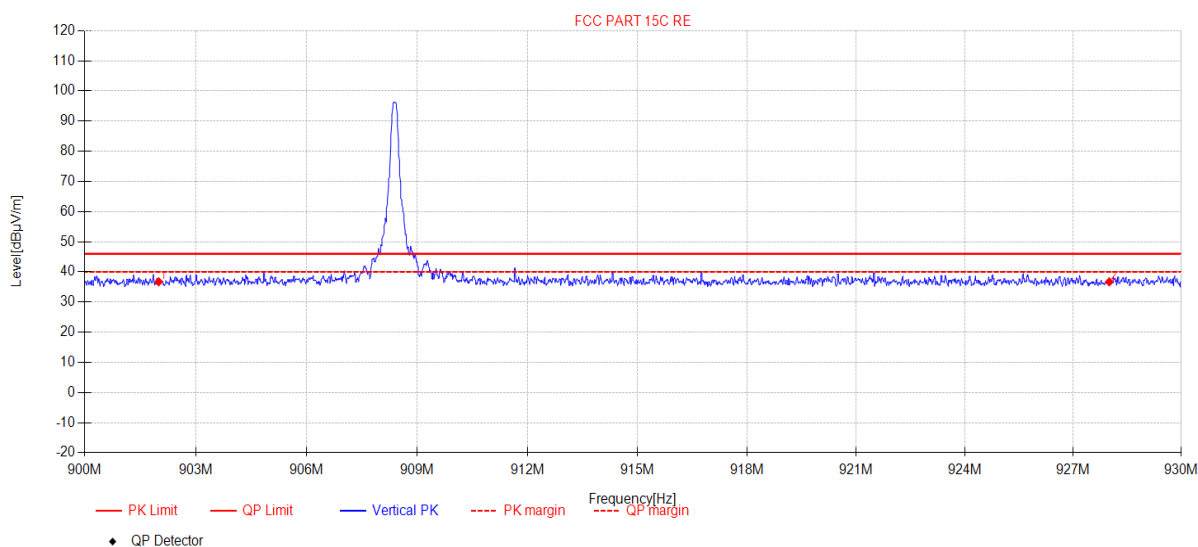
### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-07-10 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\52  
**Memo:** 908.42MHz POWER100

### Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |          |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|----------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1                   | 902.00      | 5.98             | 8.35            | 22.40               | 0.00     | 36.73          | 46.00          | 9.27        | PK       | Vertical |
| 2                   | 928.00      | 5.77             | 8.44            | 22.50               | 0.00     | 36.71          | 46.00          | 9.29        | PK       | Vertical |

### Note:

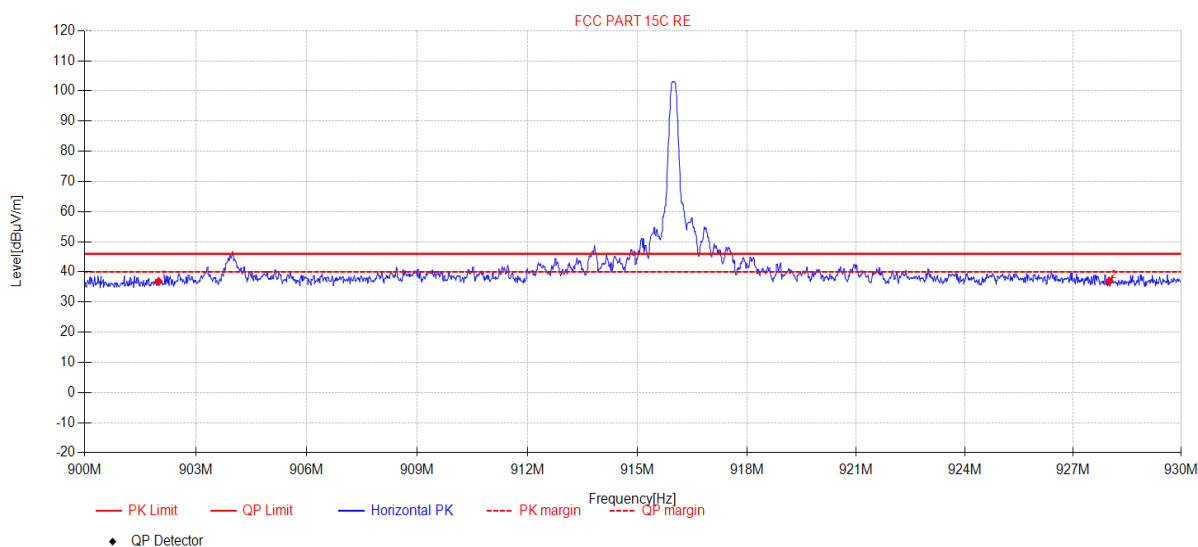
1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-07-10  
**EUT:** Double Relay  
**Test Mode:** TX Mode  
**Condition:** Temp:23.4°C;Humi:64.5%  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\53  
**Memo:** 916MHz POWER100

**Tested By:** Bairong  
**Model Number:** ZEN52 LR  
**Power Supply:** AC 120V/60Hz  
**Test Site:** DDT 3# Chamber

### Test Graph



### Suspected Data List

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|------------|
| 1   | 902.00      | 6.07             | 8.35            | 22.40               | 0.00     | 36.82          | 46.00          | 9.18        | PK       | Horizontal |
| 2   | 928.00      | 6.03             | 8.44            | 22.50               | 0.00     | 36.97          | 46.00          | 9.03        | PK       | Horizontal |

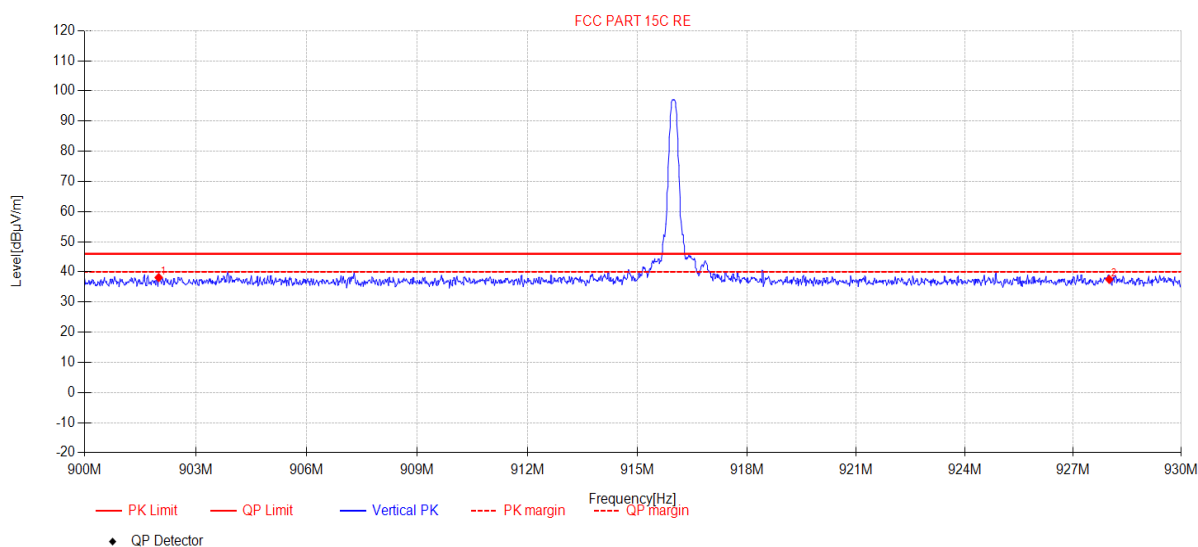
### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-07-10 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52 LR\FCC BELOW 1G\54  
**Memo:** 916MHz POWER100

### Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |          |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|----------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1                   | 902.00      | 7.37             | 8.35            | 22.40               | 0.00     | 38.12          | 46.00          | 7.88        | PK       | Vertical |
| 2                   | 928.00      | 6.56             | 8.44            | 22.50               | 0.00     | 37.50          | 46.00          | 8.50        | PK       | Vertical |

### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## Radiated Emission test (above 1 GHz)

## TR-4-E-009 Radiated Emission Test Result

Test Date: 2023-06-30

Tested By: Bairong

EUT: Double Relay

Model Number: ZEN52 LR

Test Mode: TX Mode

Power Supply: AC 120V/60Hz

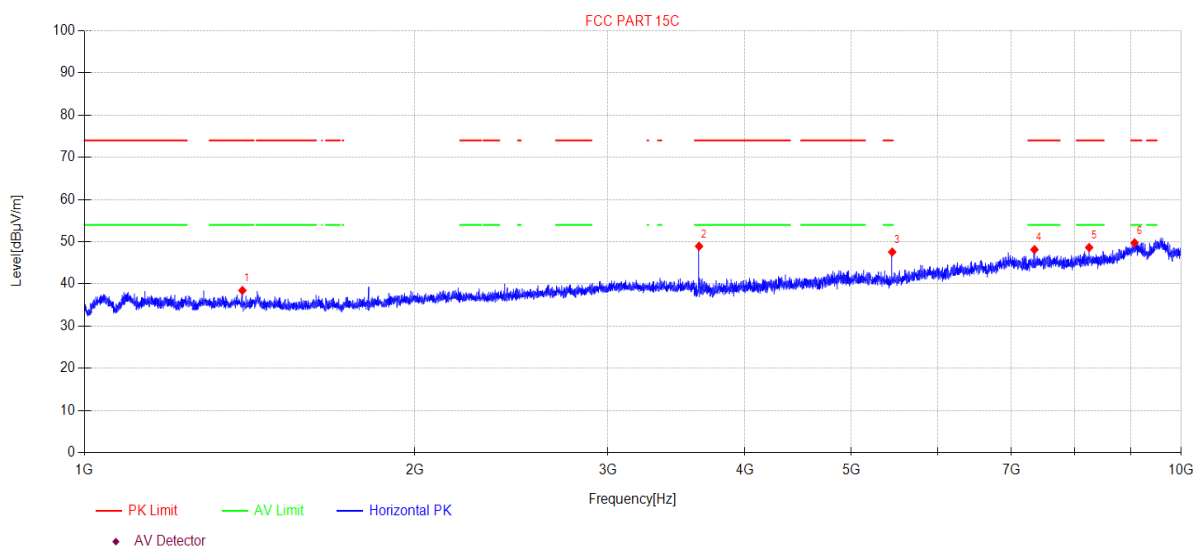
Condition: Temp:23.4°C;Humi:64.5%

Test Site: DDT 3# Chamber

File Path: d:\ts\2023 report data\Q23060511-1E ZEN52\FCC ABOVE 1G\15

Memo: 908.4MHz POWER100

## Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |            |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|------------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
| 1                   | 1393.11     | 48.69            | 2.96            | 25.60               | -38.79   | 38.46          | 74.00          | 35.54       | PK       | Horizontal |
| 2                   | 3633.66     | 55.56            | 4.78            | 29.77               | -41.18   | 48.93          | 74.00          | 25.07       | PK       | Horizontal |
| 3                   | 5450.37     | 49.84            | 5.74            | 32.90               | -40.92   | 47.56          | 74.00          | 26.44       | PK       | Horizontal |
| 4                   | 7347.06     | 46.01            | 6.63            | 36.50               | -41.00   | 48.14          | 74.00          | 25.86       | PK       | Horizontal |
| 5                   | 8241.54     | 45.26            | 6.89            | 37.10               | -40.61   | 48.64          | 74.00          | 25.36       | PK       | Horizontal |
| 6                   | 9065.76     | 43.49            | 7.54            | 38.20               | -39.48   | 49.75          | 74.00          | 24.25       | PK       | Horizontal |

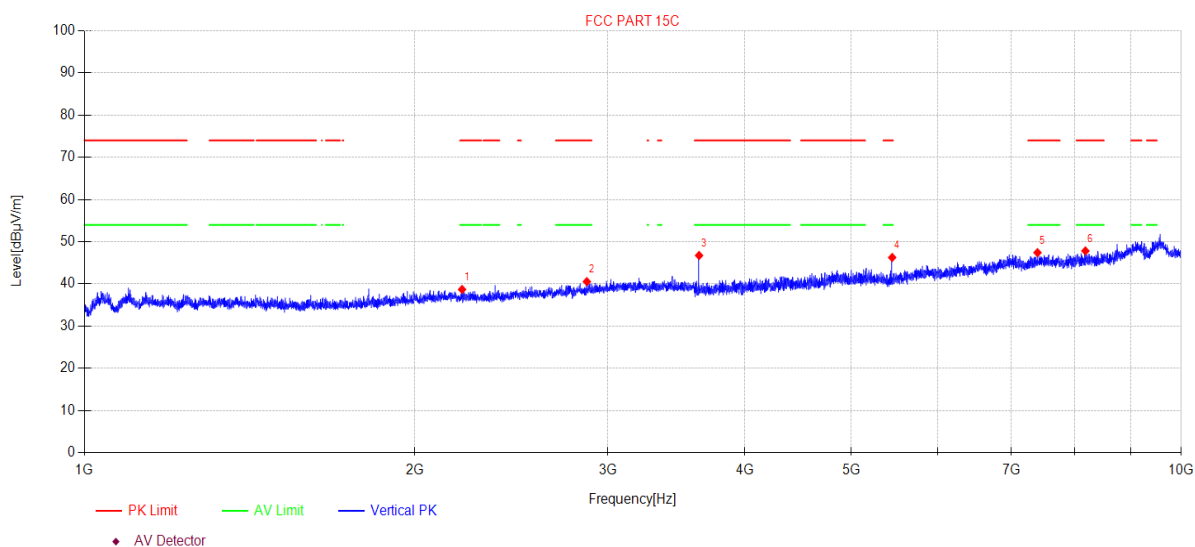
## Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC ABOVE 1G\16  
**Memo:** 908.4MHz POWER100

### Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |          |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|----------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1                   | 2209.36     | 47.67            | 3.73            | 27.22               | -39.93   | 38.69          | 74.00          | 35.31       | PK       | Vertical |
| 2                   | 2871.14     | 48.20            | 4.23            | 28.78               | -40.66   | 40.55          | 74.00          | 33.45       | PK       | Vertical |
| 3                   | 3633.66     | 53.37            | 4.78            | 29.77               | -41.18   | 46.74          | 74.00          | 27.26       | PK       | Vertical |
| 4                   | 5450.37     | 48.55            | 5.74            | 32.90               | -40.92   | 46.27          | 74.00          | 27.73       | PK       | Vertical |
| 5                   | 7394.57     | 45.28            | 6.64            | 36.50               | -41.00   | 47.42          | 74.00          | 26.58       | PK       | Vertical |
| 6                   | 8177.28     | 44.65            | 6.84            | 37.05               | -40.72   | 47.82          | 74.00          | 26.18       | PK       | Vertical |

### Note:

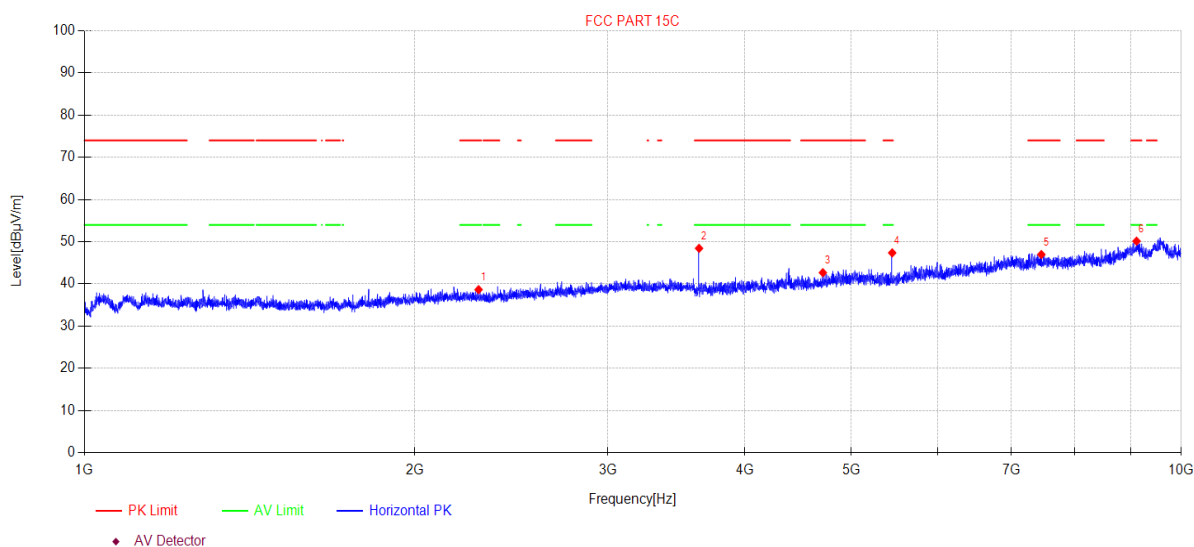
1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.



## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30 **Tested By:** Bairong  
**EUT:** Double Relay **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5% **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC ABOVE 1G\17  
**Memo:** 908.42MHz POWER100

### Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |            |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|------------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
| 1                   | 2287.52     | 47.58            | 3.79            | 27.30               | -40.02   | 38.65          | 74.00          | 35.35       | PK       | Horizontal |
| 2                   | 3633.66     | 55.06            | 4.78            | 29.77               | -41.18   | 48.43          | 74.00          | 25.57       | PK       | Horizontal |
| 3                   | 4712.30     | 46.47            | 5.37            | 32.02               | -41.19   | 42.67          | 74.00          | 31.33       | PK       | Horizontal |
| 4                   | 5450.37     | 49.65            | 5.74            | 32.90               | -40.92   | 47.37          | 74.00          | 26.63       | PK       | Horizontal |
| 5                   | 7454.40     | 44.83            | 6.65            | 36.49               | -41.00   | 46.97          | 74.00          | 27.03       | PK       | Horizontal |
| 6                   | 9103.41     | 43.87            | 7.57            | 38.21               | -39.52   | 50.13          | 74.00          | 23.87       | PK       | Horizontal |

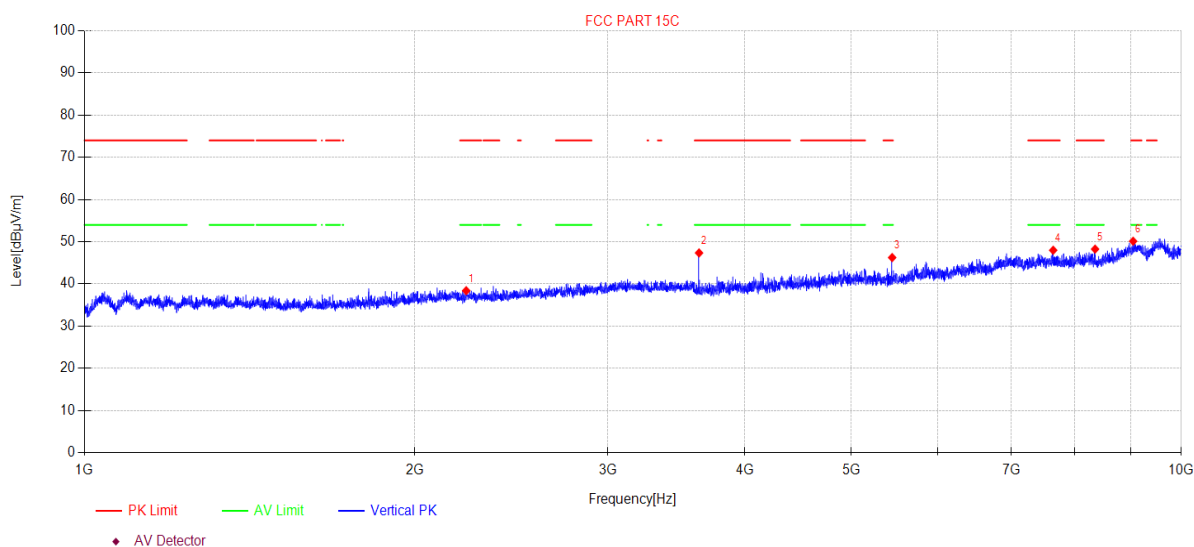
### Note:

- Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30  
**Tested By:** Bairong  
**EUT:** Double Relay  
**Model Number:** ZEN52 LR  
**Test Mode:** TX Mode  
**Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5%  
**Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC ABOVE 1G\18  
**Memo:** 908.42MHz POWER100

### Test Graph



| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |          |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|----------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1                   | 2228.77     | 47.35            | 3.74            | 27.26               | -39.95   | 38.40          | 74.00          | 35.60       | PK       | Vertical |
| 2                   | 3633.66     | 53.98            | 4.78            | 29.77               | -41.18   | 47.35          | 74.00          | 26.65       | PK       | Vertical |
| 3                   | 5450.37     | 48.53            | 5.74            | 32.90               | -40.92   | 46.25          | 74.00          | 27.75       | PK       | Vertical |
| 4                   | 7642.08     | 45.84            | 6.66            | 36.48               | -41.00   | 47.98          | 74.00          | 26.02       | PK       | Vertical |
| 5                   | 8344.64     | 44.53            | 6.97            | 37.20               | -40.45   | 48.25          | 74.00          | 25.75       | PK       | Vertical |
| 6                   | 9038.67     | 43.85            | 7.52            | 38.20               | -39.45   | 50.12          | 74.00          | 23.88       | PK       | Vertical |

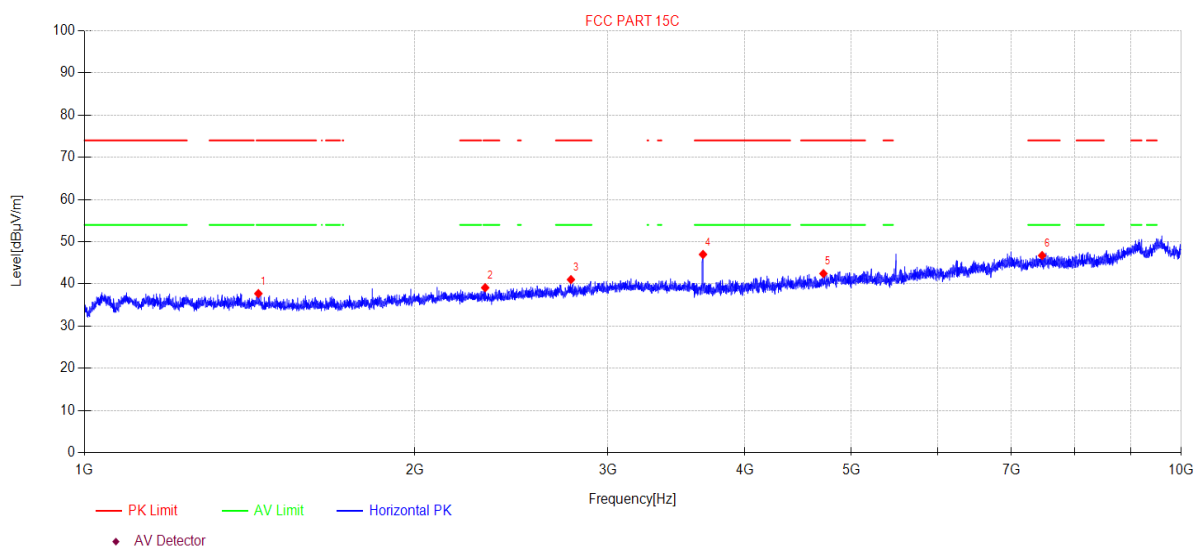
### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30      **Tested By:** Bairong  
**EUT:** Double Relay      **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode      **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5%      **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC ABOVE 1G\19  
**Memo:** 916MHz POWER100

### Test Graph



### Suspected Data List

| NO. | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity   |
|-----|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|------------|
| 1   | 1440.74     | 47.96            | 3.01            | 25.60               | -38.86   | 37.71          | 74.00          | 36.29       | PK       | Horizontal |
| 2   | 2319.33     | 48.01            | 3.81            | 27.34               | -40.05   | 39.11          | 74.00          | 34.89       | PK       | Horizontal |
| 3   | 2776.87     | 48.97            | 4.16            | 28.45               | -40.55   | 41.03          | 74.00          | 32.97       | PK       | Horizontal |
| 4   | 3663.90     | 53.53            | 4.80            | 29.86               | -41.20   | 46.99          | 74.00          | 27.01       | PK       | Horizontal |
| 5   | 4717.73     | 46.22            | 5.38            | 32.04               | -41.18   | 42.46          | 74.00          | 31.54       | PK       | Horizontal |
| 6   | 7466.42     | 44.61            | 6.65            | 36.47               | -41.00   | 46.73          | 74.00          | 27.27       | PK       | Horizontal |

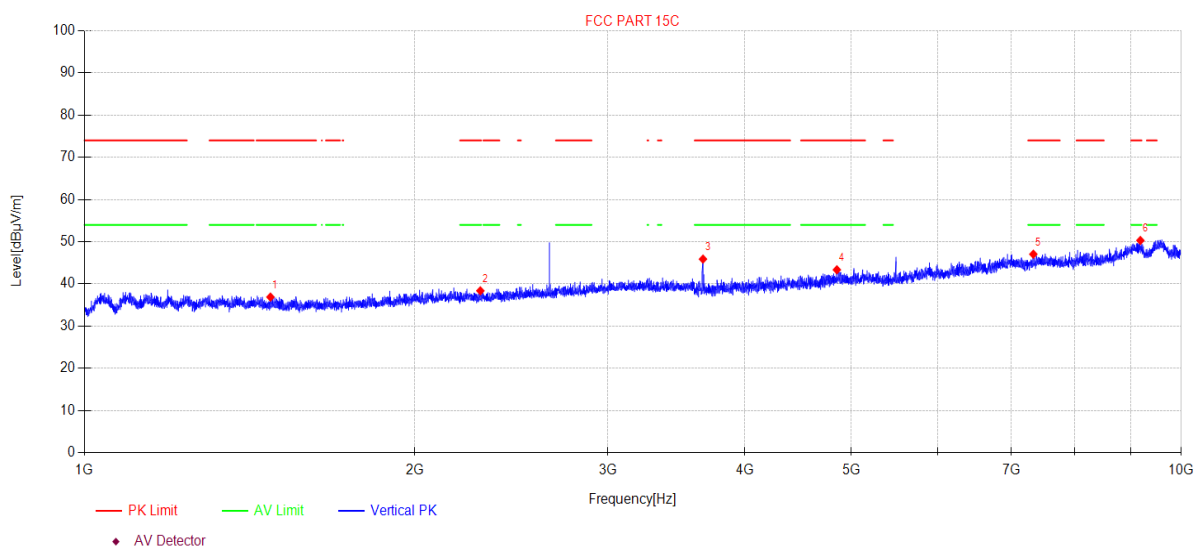
### Note:

- Level = Reading + Cable loss + Antenna Factor + AMP
- If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
- Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## TR-4-E-009 Radiated Emission Test Result

**Test Date:** 2023-06-30      **Tested By:** Bairong  
**EUT:** Double Relay      **Model Number:** ZEN52 LR  
**Test Mode:** TX Mode      **Power Supply:** AC 120V/60Hz  
**Condition:** Temp:23.4°C;Humi:64.5%      **Test Site:** DDT 3# Chamber  
**File Path:** d:\ts\2023 report data\Q23060511-1E ZEN52\FCC ABOVE 1G\20  
**Memo:** 916MHz POWER100

### Test Graph



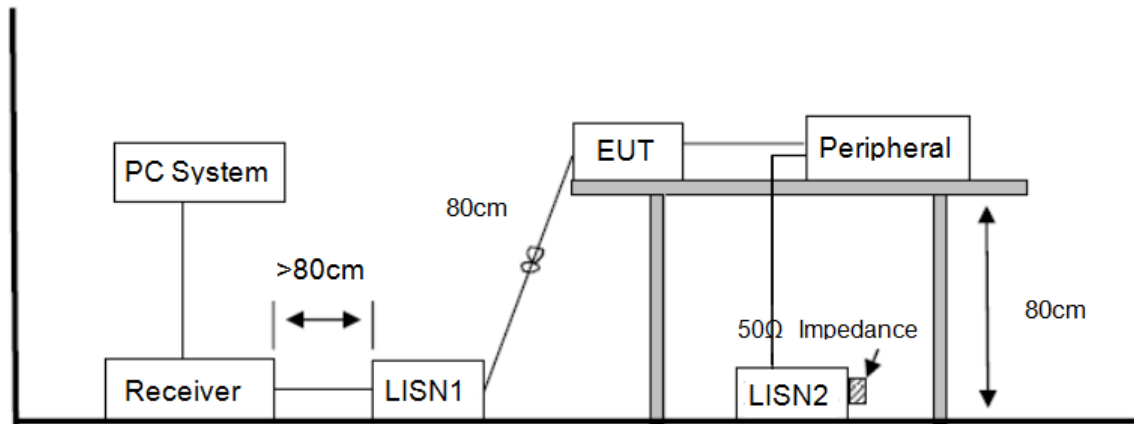
| Suspected Data List |             |                  |                 |                     |          |                |                |             |          |          |
|---------------------|-------------|------------------|-----------------|---------------------|----------|----------------|----------------|-------------|----------|----------|
| NO.                 | Freq. [MHz] | Reading [dBμV/m] | Cable loss [dB] | Antenna Factor [dB] | AMP [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Detector | Polarity |
| 1                   | 1477.69     | 47.23            | 3.04            | 25.54               | -38.92   | 36.89          | 74.00          | 37.11       | PK       | Vertical |
| 2                   | 2295.96     | 47.32            | 3.79            | 27.30               | -40.03   | 38.38          | 74.00          | 35.62       | PK       | Vertical |
| 3                   | 3663.90     | 52.43            | 4.80            | 29.86               | -41.20   | 45.89          | 74.00          | 28.11       | PK       | Vertical |
| 4                   | 4853.24     | 46.54            | 5.44            | 32.51               | -41.14   | 43.35          | 74.00          | 30.65       | PK       | Vertical |
| 5                   | 7330.16     | 44.92            | 6.63            | 36.50               | -41.00   | 47.05          | 74.00          | 26.95       | PK       | Vertical |
| 6                   | 9177.06     | 43.98            | 7.63            | 38.30               | -39.61   | 50.30          | 74.00          | 23.70       | PK       | Vertical |

#### Note:

1. Level = Reading + Cable loss + Antenna Factor + AMP
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

## 7. Power Line Conducted Emission

### 7.1. Block diagram of test setup



### 7.2. Power line conducted emission limits

| Frequency         | Quasi-Peak Level<br>dB( $\mu$ V) | Average Level<br>dB( $\mu$ V) |
|-------------------|----------------------------------|-------------------------------|
| 150 kHz ~ 500 kHz | 66 ~ 56*                         | 56 ~ 46*                      |
| 500 kHz ~ 5 MHz   | 56                               | 46                            |
| 5 MHz ~ 30 MHz    | 60                               | 50                            |

Note 1: \* Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

### 7.3. Test procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30 MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 kHz.

#### **7.4. Test result**

**Pass. (See below detailed test result)**

Note1: All emissions not reported below are too low against the prescribed limits.

Note2: “----” means Peak detection; “----” means Average detection.

Note3: Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/50Hz, recorded worse case.



## TR-4-E-010 Conducted Emission Test Result

Test Site : DDT 1# Shield Room

D:\2023 CE report data\Q23060511-1E ZEN55\FCC.EM6

Test Date : 2023-06-13

Tested By : Bairong

EUT : Double Relay

Model Number : ZEN52 LR

Power Supply : AC 120V/60Hz

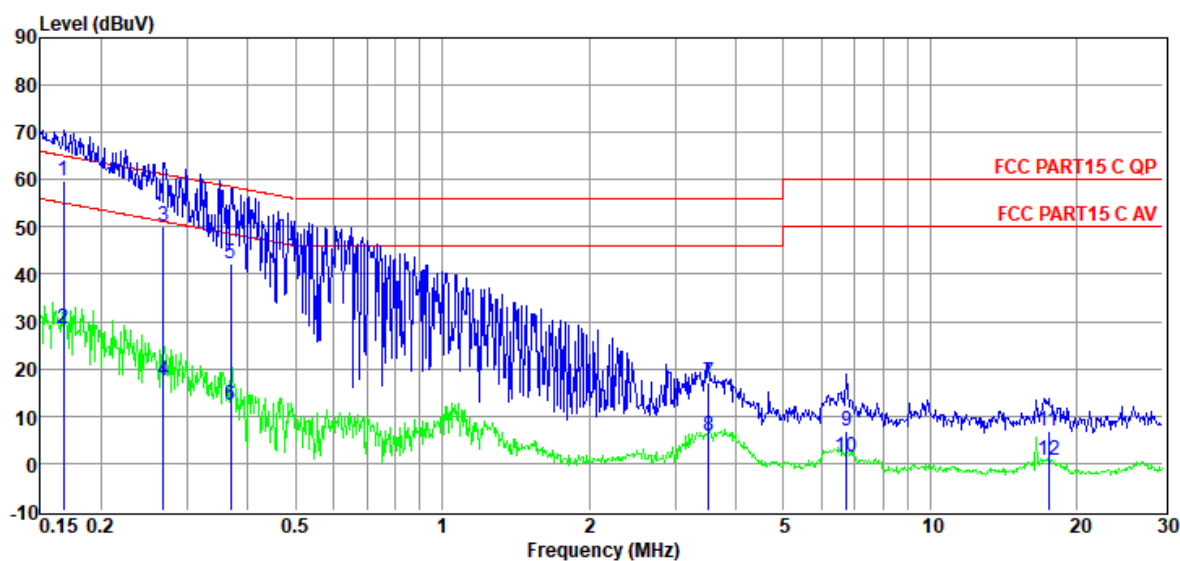
Test Mode : TX

Condition : TEMP:24.1°C, RH:62.1%

LISN : 2022 1# ENV216/LINE

Memo :

Data: 2



| Item   | Freq. | Read Level | LISN Factor | Cable Loss | Pulse Limiter Factor | Result Level | Limit Line | Over Limit | Detector | Phase |
|--------|-------|------------|-------------|------------|----------------------|--------------|------------|------------|----------|-------|
| (Mark) | (MHz) | (dBμV)     | (dB)        | (dB)       | (dB)                 | (dBμV)       | (dBμV)     | (dB)       |          |       |
| 1      | 0.17  | 40.17      | 9.68        | 0.01       | 9.92                 | 59.78        | 65.08      | -5.30      | QP       | LINE  |
| 2      | 0.17  | 8.91       | 9.68        | 0.01       | 9.92                 | 28.52        | 55.08      | -26.56     | Average  | LINE  |
| 3      | 0.27  | 30.36      | 9.77        | 0.01       | 9.91                 | 50.05        | 61.16      | -11.11     | QP       | LINE  |
| 4      | 0.27  | -2.04      | 9.77        | 0.01       | 9.91                 | 17.65        | 51.16      | -33.51     | Average  | LINE  |
| 5      | 0.37  | 22.48      | 9.73        | 0.01       | 9.91                 | 42.13        | 58.52      | -16.39     | QP       | LINE  |
| 6      | 0.37  | -7.20      | 9.73        | 0.01       | 9.91                 | 12.45        | 48.52      | -36.07     | Average  | LINE  |
| 7      | 3.51  | -2.38      | 9.52        | 0.04       | 9.91                 | 17.09        | 56.00      | -38.91     | QP       | LINE  |
| 8      | 3.51  | -13.62     | 9.52        | 0.04       | 9.91                 | 5.85         | 46.00      | -40.15     | Average  | LINE  |
| 9      | 6.73  | -12.72     | 9.59        | 0.07       | 9.92                 | 6.86         | 60.00      | -53.14     | QP       | LINE  |
| 10     | 6.73  | -18.13     | 9.59        | 0.07       | 9.92                 | 1.45         | 50.00      | -48.55     | Average  | LINE  |
| 11     | 17.48 | -12.94     | 9.64        | 0.13       | 9.94                 | 6.77         | 60.00      | -53.23     | QP       | LINE  |
| 12     | 17.48 | -19.00     | 9.64        | 0.13       | 9.94                 | 0.71         | 50.00      | -49.29     | Average  | LINE  |

Note:

1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

## TR-4-E-010 Conducted Emission Test Result

Test Site : DDT 1# Shield Room

D:\2023 CE report data\Q23060511-1E ZEN55\FCC.EM6

Test Date : 2023-06-13

Tested By : Bairong

EUT : Double Relay

Model Number : ZEN52 LR

Power Supply : AC 120V/60Hz

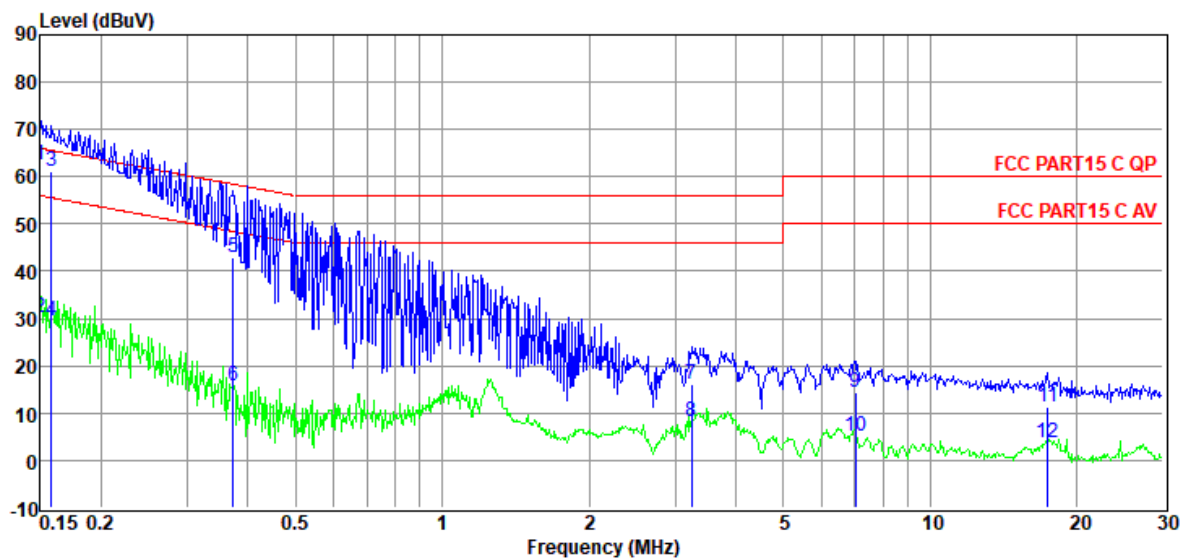
Test Mode : TX

Condition : TEMP:24.1°C, RH:62.1%

LISN : 2022 1# ENV216/NEUTRAL

Memo :

Data: 4



| Item   | Freq. | Read Level | LISN Factor | Cable Loss | Pulse Limiter Factor | Result Level | Limit Line | Over Limit | Detector | Phase   |
|--------|-------|------------|-------------|------------|----------------------|--------------|------------|------------|----------|---------|
| (Mark) | (MHz) | (dBμV)     | (dB)        | (dB)       | (dB)                 | (dBμV)       | (dBμV)     | (dB)       |          |         |
| 1      | 0.15  | 42.75      | 9.80        | 0.01       | 9.94                 | 62.50        | 66.00      | -3.50      | QP       | NEUTRAL |
| 2      | 0.15  | 10.54      | 9.80        | 0.01       | 9.94                 | 30.29        | 56.00      | -25.71     | Average  | NEUTRAL |
| 3      | 0.16  | 41.52      | 9.82        | 0.01       | 9.93                 | 61.28        | 65.56      | -4.28      | QP       | NEUTRAL |
| 4      | 0.16  | 9.68       | 9.82        | 0.01       | 9.93                 | 29.44        | 55.56      | -26.12     | Average  | NEUTRAL |
| 5      | 0.37  | 23.36      | 9.70        | 0.01       | 9.91                 | 42.98        | 58.43      | -15.45     | QP       | NEUTRAL |
| 6      | 0.37  | -4.01      | 9.70        | 0.01       | 9.91                 | 15.61        | 48.43      | -32.82     | Average  | NEUTRAL |
| 7      | 3.24  | -3.50      | 9.70        | 0.04       | 9.91                 | 16.15        | 56.00      | -39.85     | QP       | NEUTRAL |
| 8      | 3.24  | -11.39     | 9.70        | 0.04       | 9.91                 | 8.26         | 46.00      | -37.74     | Average  | NEUTRAL |
| 9      | 7.03  | -5.30      | 9.60        | 0.07       | 9.92                 | 14.29        | 60.00      | -45.71     | QP       | NEUTRAL |
| 10     | 7.03  | -14.58     | 9.60        | 0.07       | 9.92                 | 5.01         | 50.00      | -44.99     | Average  | NEUTRAL |
| 11     | 17.38 | -8.56      | 9.75        | 0.13       | 9.94                 | 11.26        | 60.00      | -48.74     | QP       | NEUTRAL |
| 12     | 17.38 | -15.92     | 9.75        | 0.13       | 9.94                 | 3.90         | 50.00      | -46.10     | Average  | NEUTRAL |

Note:

1. Result Level = Read Level + LISN Factor + Pulse Limiter Factor + Cable loss.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.

## **8. Antenna Requirements**

### **8.1. Limit**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **8.2. Result**

The antenna used for this product and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain is -2.8 dBi.

## 10. Photos of the EUT

Please refer to Appendix I: Photos of the EUT.

**END OF REPORT**