China

# FCC - TEST REPORT

| | | | | |
|---|---|---|---|---|
| Report Number | : | **708881852206-00** | Date of Issue: | May 10, 2019 |
| Model | : | I79M0 | | |
| Product Type | : | Immobilizer | | |
| Applicant | : | APTIV (China) Technology Company Limited. | | |
| Address | : | No. 118, Delin Road Pudong Shanghai China. | | |
| Manufacturer | : | APTIV COMPONENTS INDIA PVT LTD | | |
| Address | : | A-22, SIPCOT Industrial Growth Centre, Oragadam, Sriperumbudur Taluk, Kanchipuram District, India PIN CODE: 602 105. | | |
| Test Result | : | **n Positive o Negative** | | |
| Total pages including Appendices | : | 17 | | |

*TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.*

*TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch issued reports.*

China

# 1 Table of Contents





TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

# 2 Details about the Test Laboratory

**Details about the Test Laboratory**
Test Site 1

| | |
|---|---|
| Company name: | TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch<br>No.16 Lane, 1951 Du Hui Road,<br>Shanghai 201108,<br>P.R. China |
| FCC Registration Number | 820234 |
| Telephone: | +86 21 6141 0123 |
| Fax: | +86 21 6140 8600 |

# 3 Description of the Equipment Under Test

| | |
|---|---|
| Product: | Immobilizer |
| Model no.: | I79M0 |
| Rating: | 12V DC |
| Description of the EUT: | Immobilizer can transmit 125kHz low frequency signal. |
| Test Setup Configration: | Continous transmit |
| FCC ID: | 2AQ94002 |

China

# 4 Summary of Test Standards

| Test Standards | |
|---|---|
| CFR 47 Part 15<br>Subpart C | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators |



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

# 5 Summary of Test Results

| Technical Requirements | | | | | |
|---|---|---|---|---|---|
| **FCC Part 15 Subpart C** | | | | | |
| Test Condition | Pages | Test Site | Test Result | | |
| | | | Pass | Fail | N/A |
| §15.207 Conducted emission AC power port | NA | NA | ☐ | ☐ | ☒ |
| §15.205, §15.209<br>Field strength of emissions and Restricted bands | 7~13 | 1 | ☒ | ☐ | ☐ |
| §15.215(c) 20dB bandwidth | 14~15 | 1 | ☒ | ☐ | ☐ |

Note 1: N/A=Not Applicable. Conducted emission is not apply for battery operated device.
Note 2: The EUT uses an PCB Antenna, which gain is -60.0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

# 6 General Remarks

**Remarks**

This submittal(s) (test report) is intended for FCC ID:2AQ94002, complies with Section 15.205,15.207,15.209,15.215 of the FCC Part 15, Subpart C rules.
TX and RX range is 125KHz.

**SUMMARY:**

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment Under Test

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

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

| | |
|---|---|
| Sample Received Date: | April 19, 2018 |
| Testing Start Date: | April 19, 2018 |
| Testing End Date: | April 19, 2018 |

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

| Reviewed by: | Prepared by: | Tested by: |
|---|---|---|
| Hui TONG | Jiaxi XU | Wenqiang LU |
| EMC Section Manager | EMC Project Engineer | EMC Test Engineer |

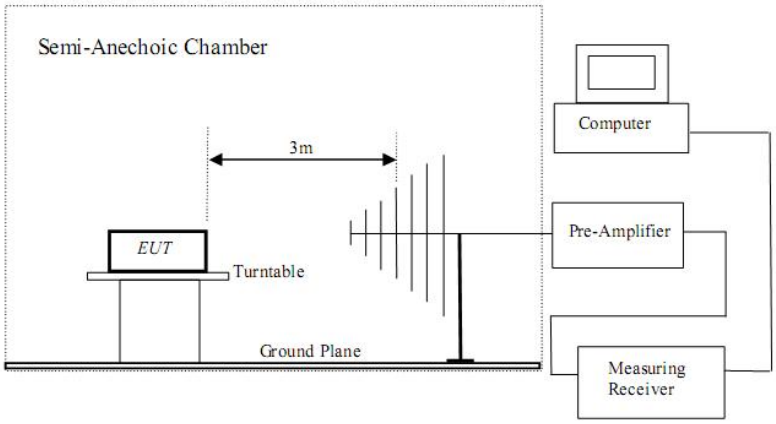


TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

# 7 Test setups

## 7.1 Radiated test setups






TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

# 8 Technical Requirement

## 8.1 Field strength of emissions and Restricted bands

**Test Method**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for 30MHz< f< 1 GHz, 9kHz for 150kHz<f< 30MHz, 200Hz for 9kHz<f<150kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4 and ANSI C63.10 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
   The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.


TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

## Limits for 15.209 Radiated emission limits; general requirements

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

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

[1]Limit is with detector with bandwidths as defined in CISPR-16-1-1 except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz where an Average detector is used.
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector
[3]Limit is with 1 MHz measurement bandwidth and using a Peak detector

*Remark: Only the worst data listed in this report.*


TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

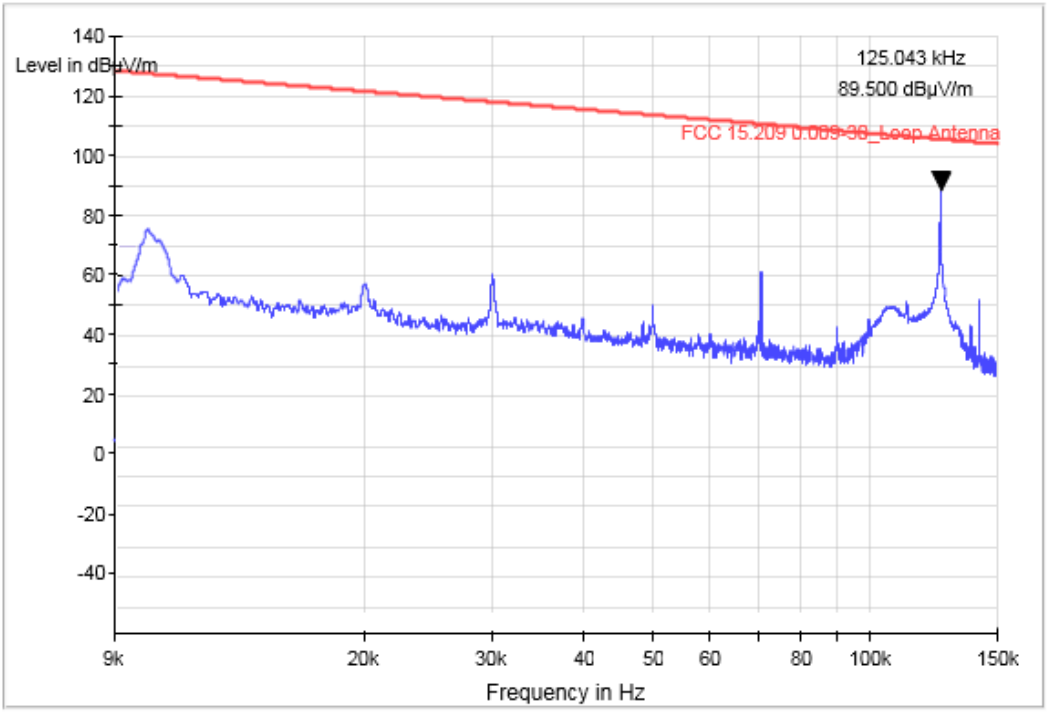
## Field strength of emissions and Restricted bands

# 9k-150kHz Radiated Emission

## EUT Information

| | |
|---|---|
| EUT Name: | Immobilizer |
| Model: | I79M0 |
| Manufacturer: | APTIV (China) Technology Company Limited. |
| Op Cond: | Continue communication,<br>DC12V,T22.3, H52.4%, P103.2kPa |
| Operator: | Jiaxi Xu |
| Test Spec: | FCC Part 15.209 |
| Comment: | H(Antenna 0 deg) |
| Sample No: | SHA-416400-1 |

FCC 15.209 RE_Loop_9kHz-150kHz_pre




## Result Table_Single

| Frequency (MHz) | MaxPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) | Limit (dBµV/m) | Margin dB |
|---|---|---|---|---|---|---|---|---|---|
| 0.125043 | 89.50 | 1000.0 | 0.200 | 100.0 | H | 270 | 19.5 | 105.66 | 16.16 |



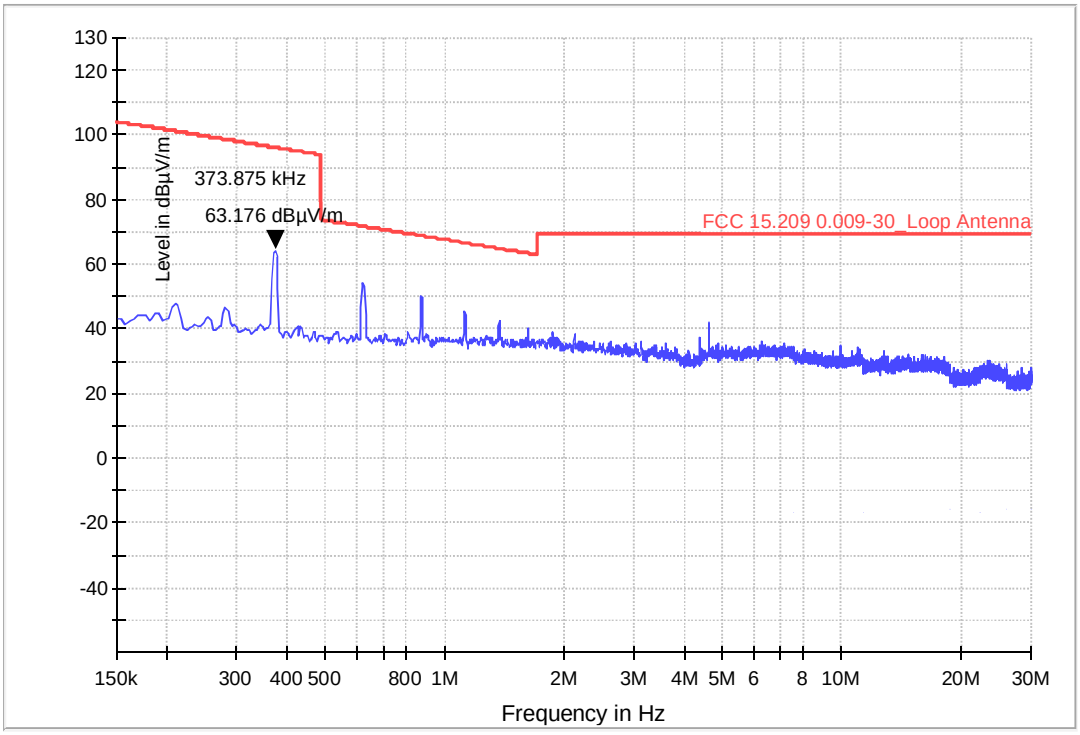
TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

# 150k-30MHz Radiated Emission

## EUT Information

| | |
|---|---|
| EUT Name: | Immobilizer |
| Model: | I79M0 |
| Manufacturer: | APTIV (China) Technology Company Limited. |
| Op Cond: | Continue communication,<br>DC12V,T22.3, H52.4%, P103.2kPa |
| Operator: | Jiaxi Xu |
| Test Spec: | FCC Part 15.209 |
| Comment: | H(Antenna 0 deg) |
| Sample No: | SHA-416400-1 |




## Result Table_Single

| Frequency (MHz) | MaxPeak (dBµV/m) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB) | Limit (dBµV/m) | Margin dB |
|---|---|---|---|---|---|---|---|---|---|
| 0.373875 | 63.176 | 1000.0 | 9.000 | 100.0 | H | 3.6 | 19.5 | 95.43 | 32.254 |



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

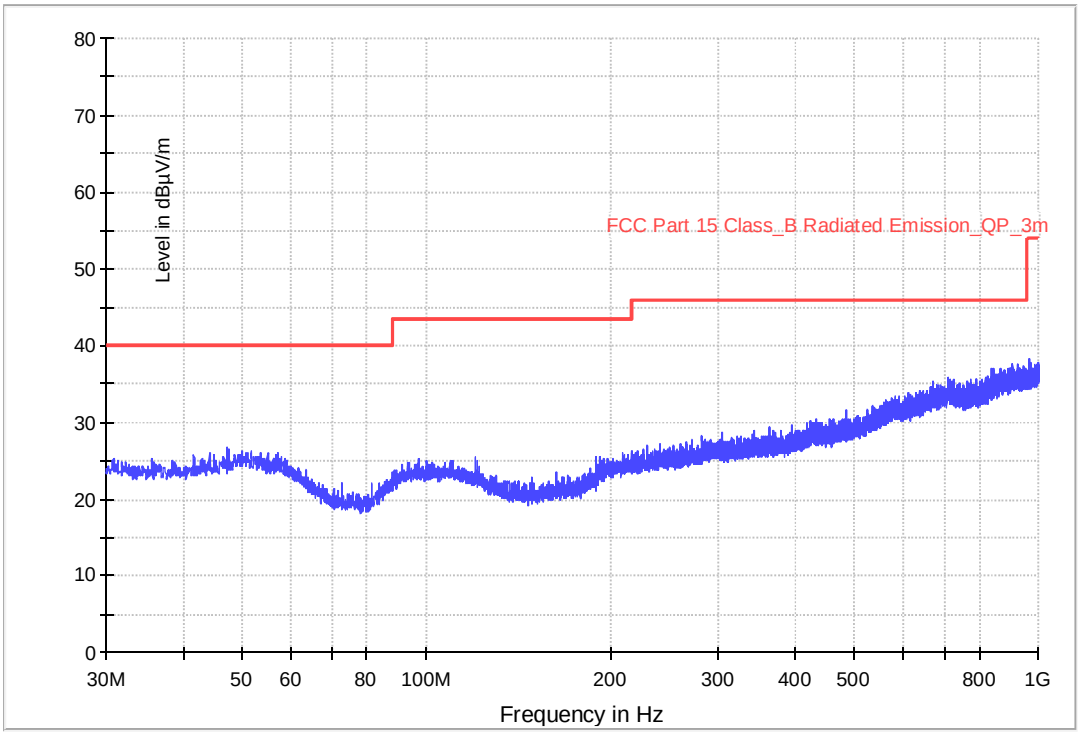
China

# 30-1000MHz Radiated Emission

## EUT Information

| | |
|---|---|
| EUT Name: | Immobilizer |
| Model: | I79M0 |
| Manufacturer: | APTIV (China) Technology Company Limited. |
| Op Cond: | Continue communication,<br>DC12V,T22.3, H52.4%, P103.2kPa |
| Operator: | Jiaxi Xu |
| Test Spec: | FCC Part 15.209 |
| Comment: | Horizontal |
| Sample No: | SHA-416400-1 |

RE_VULB9163_pre_Cont_30-1000






TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

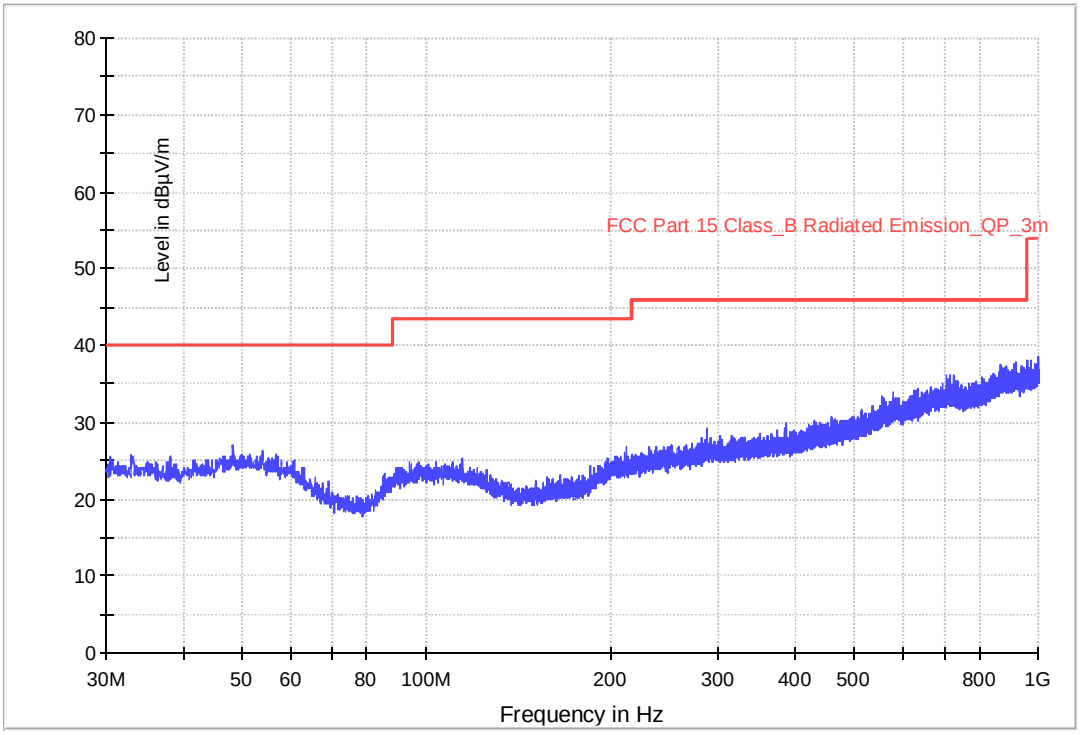
China

# 30-1000MHz Radiated Emission

## EUT Information

| | |
|---|---|
| EUT Name: | Immobilizer |
| Model: | I79M0 |
| Manufacturer: | APTIV (China) Technology Company Limited. |
| Op Cond: | Continue communication,<br>DC12V,T22.3, H52.4%, P103.2kPa |
| Operator: | Jiaxi Xu |
| Test Spec: | FCC Part 15.209 |
| Comment: | Vertical |
| Sample No: | SHA-416400-1 |

RE_VULB9163_pre_Cont_30-1000






TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

## 8.2 20dB Bandwidth

**Test Method**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

**Limits:**

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

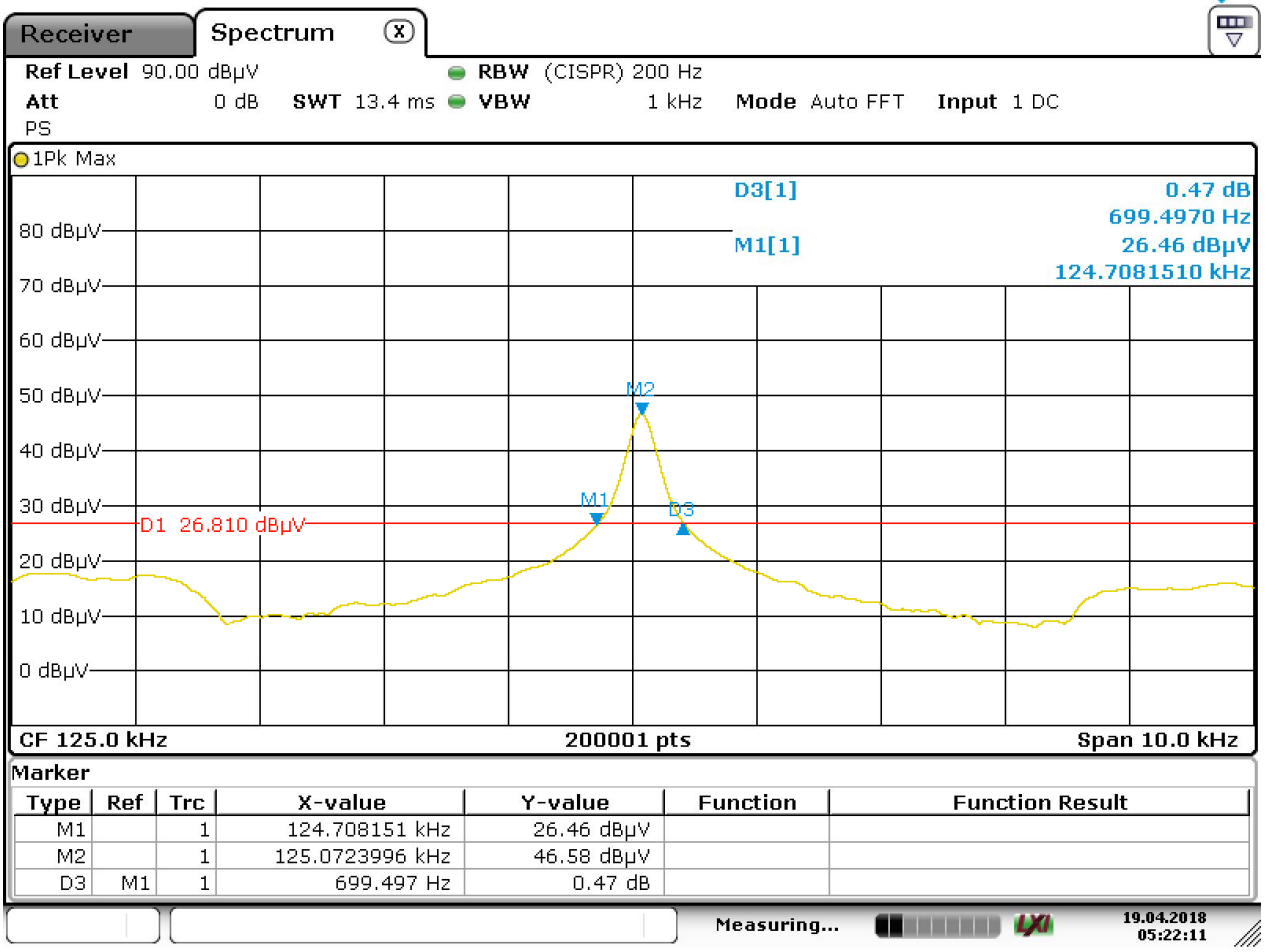


TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

## 20dB Bandwidth

| Frequency kHz | 20dB Bandwidth kHz | Result |
|---|---|---|
| 124.7081 | 0.699 | Pass |




Date: 19.APR.2018 05:22:10



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

# 9 Test equipment list

## List of Test Instruments

### RF Test

| Description | Manufacturer | Model no. | Serial no. | Cal. due date |
|---|---|---|---|---|
| Signal and spectrum analyzer | R&S | FSV40 | S1503003-YQ-EMC | 2019-8-06 |

### Radiated Emission Test

| USED | Equipment Name | Model | Manufacturer | Equipment ID. | Calibration Due Date |
|---|---|---|---|---|---|
| ☒ | EMI test receiver | ESR3 | R&S | S1503109-YQ-EMC | 2019-8-06 |
| ☒ | Trilog super broadband test antenna | SCHWARZBECK | VULB9168 | S1808296-YQ-EMC | 2022-3-15 |
| ☒ | Double-ridged waveguide horn antenna | HF907 | R&S | S1503009-YQ-EMC | 2021-4-1 |
| ☒ | Loop antenna | HFH2-Z2 | R&S | S1503013-YQ-EMC | 2019-7-8 |


TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
3-13, No.151, Heng Tong Road, Shanghai, 200070, P.R. China
Phone: +86 21 61410123, Fax:+86 21 61408600

China

# 10 System Measurement Uncertainty

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

| Items | Extended Uncertainty |
|---|---|
| Radiated Disturbance | 30MHz to 1GHz, ±5.03dB (Horizontal)<br>±5.11dB (Vertical)<br>1GHz to 18GHz, ±5.15dB (Horizontal)<br>±5.12dB (Vertical) |