

FCC Test Report

Product Name	CAN Immobilizer 125kHz
Model No.	CANIMMO0216
FCC ID.	QLXCANIMMO0216

Applicant	TeraTron GmbH
Address	Martin-Siebert Str. 5, 51647 Gummersbach, Germany

Date of Receipt	Mar. 08, 2018
Issued Date	Apr. 09, 2018
Report No.	1830126R-RFUSP20V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Test Report

Issued Date: Apr. 09, 2018

Report No.: 1830126R-RFUSP20V00



Product Name	CAN Immobilizer 125kHz
Applicant	TeraTron GmbH
Address	Martin-Siebert Str. 5, 51647 Gummersbach, Germany
Manufacturer	TeraTron GmbH
Model No.	CANIMMO0216
FCC ID.	QLXCANIMMO0216
EUT Rated Voltage	DC 12-24V
EUT Test Voltage	DC 12V
Trade Name	TeraTron
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

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(Senior Adm. Specialist / Jinn Chen)

Tested By : Steven Tsai
(Engineer / Steven Tsai)

Approved By : Vincent Lin
(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	CAN Immobilizer 125kHz
Trade Name	TeraTron
Model No.	CANIMMO0216
FCC ID.	QLXCANIMMO0216
Frequency Range	125 kHz
Type of Modulation	AM
Type of antenna	coil antenna
Number of Channel	1
Power Cable	Non-shielded, 1.8m
Vehicle key	1 set

Frequency of Each Channel:

Channel	Frequency
1	125 kHz

Note:

1. The EUT is a CAN Immobilizer 125kHz with a built-in 125 kHz RFID transceiver.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.209.
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit
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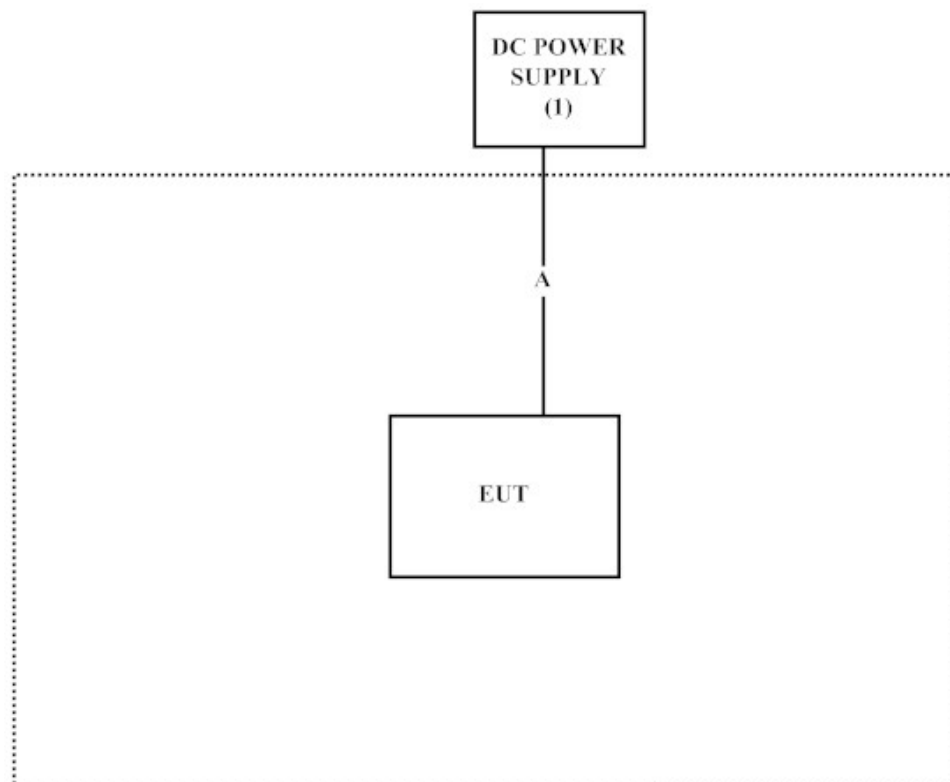
1.3. Test System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
(1) DC POWER SUPPLY	GWInstek	SPD-3606	N/A	Non-shielded, 1.8m

Signal Cable Type	Signal cable Description
A Power Cable	Non-shielded, 1.8m

1.4. Configuration of Test System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4
- (2) Provide DC power to the EUT.
- (3) Start the continuous transmitter.
- (4) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en

Site Description: Accredited by TAF
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,
New Taipei City 24457, Taiwan.
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286
E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

1.7. List of Test Equipment

For Radiated measurements /ACB1

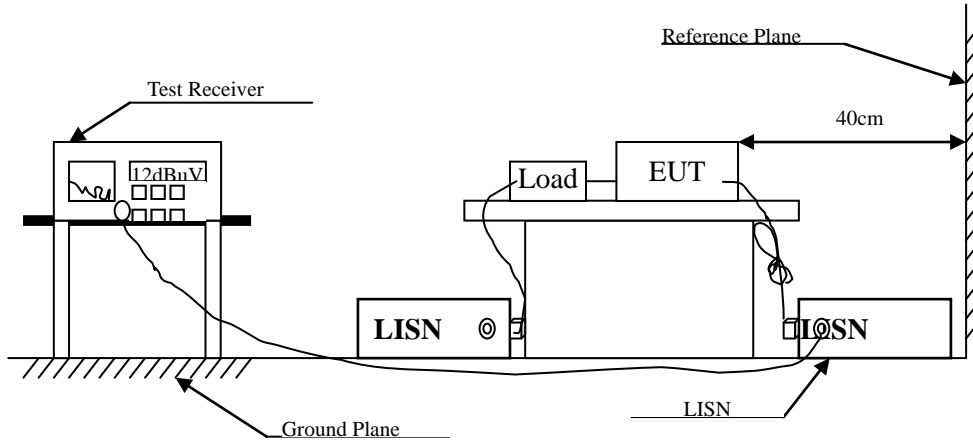
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2018.01.26	2019.01.25
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2018.04.02	2019.04.01
	Horn Antenna	ETS-Lindgren	3117	00203800	2017.11.10	2018.11.09
	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	2018.05.23
X	Pre-Amplifier	EMCI	EMC001330	980316	2017.05.16	2018.05.15
	Pre-Amplifier	EMCI	EMC051835SE	980311	2017.05.17	2018.05.16
	Pre-Amplifier	EMCI	EMC05820SE	980310	2017.05.17	2018.05.16
	Pre-Amplifier	EMCI	EMC184045SE	980314	2017.05.17	2018.05.16
	Filter	MICRO TRONICS	BRM50702	G251	2017.08.30	2018.08.29
	Filter	MICRO TRONICS	BRM50716	G188	2017.08.30	2018.08.29
X	EMI Test Receiver	R&S	ESR7	101602	2017.12.11	2018.12.10
X	Spectrum Analyzer	R&S	FSV40	101148	2018.02.08	2019.02.07
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2017.05.25	2018.05.24
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2017.08.11	2018.08.10

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB μ V) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56 ^(註)	56-46 ^(註)
0.50-5.0	56	46
5.0 - 30	60	50

2.3. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.4. Uncertainty

± 2.35 dB

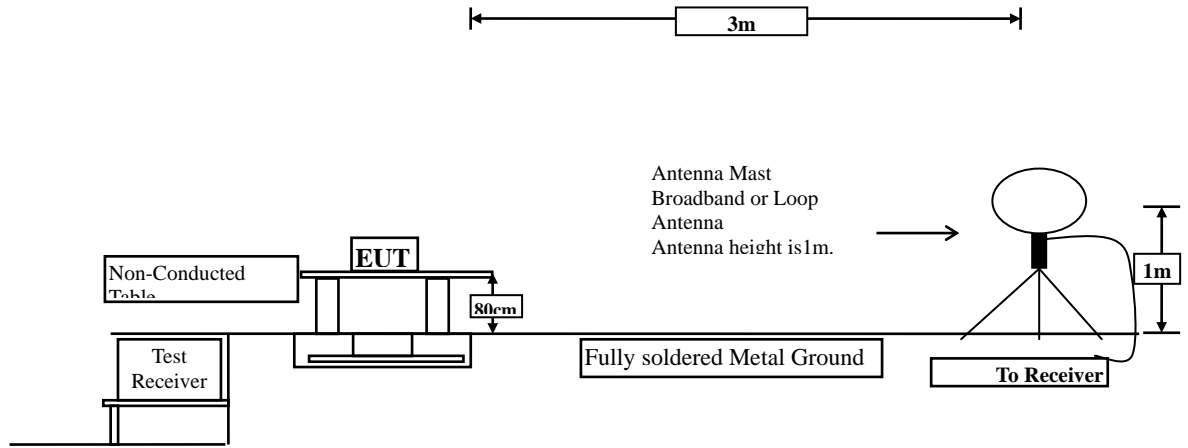
2.5. Test Result of Conducted Emission

Owing to the DC operation of EUT, this test item is not performed.

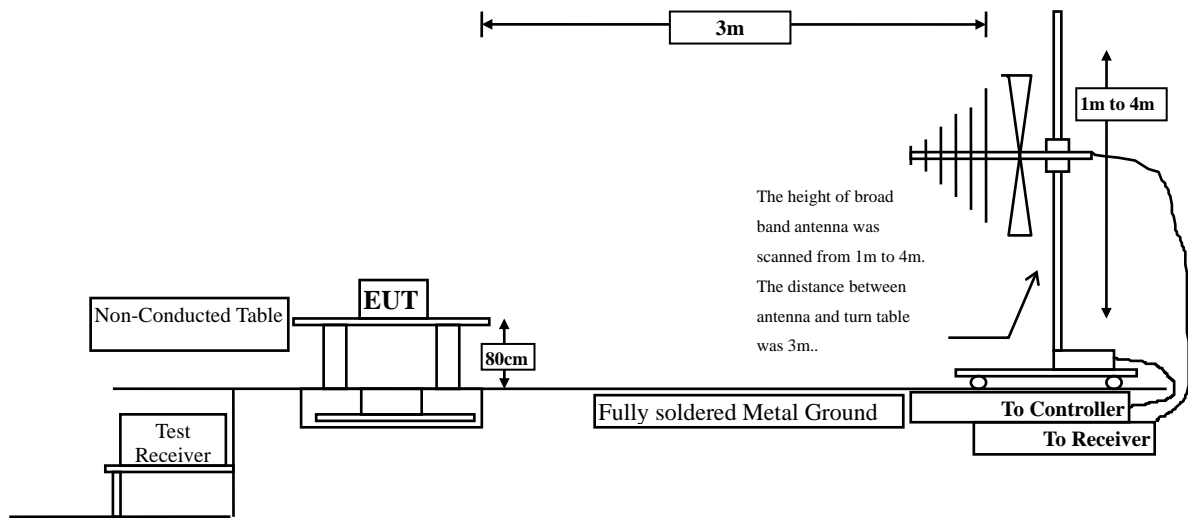
3. Radiated Emission

3.1. Test Setup

Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



3.2. Limits

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks :
1. RF Voltage (dB μ V) = 20 log RF Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.209 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz. Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

3.4. Uncertainty

Horizontal :

30-300MHz: $\pm 4.08\text{dB}$; 300M-1GHz: $\pm 3.86\text{dB}$ ◦

Vertical :

30-300MHz: $\pm 4.81\text{dB}$; 300M-1GHz: $\pm 3.87\text{dB}$ ◦

3.5. Test Result of Radiated Emission

Product : CAN Immobilizer 125kHz
 Test Item : Radiated Emission
 Test date : 2018/03/16
 Test Mode : Mode 1: Transmit

Fundamental

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Peak					
X-axis					
Horizontal					
0.125	20.343	71.420	91.763	-33.903	125.666
Vertical					
0.125	20.343	66.420	86.763	-38.903	125.666
Y-axis					
Horizontal					
0.125	20.343	61.320	81.663	-44.003	125.666
Vertical					
0.125	20.343	46.710	67.053	-58.613	125.666
Z-axis					
Horizontal					
0.125	20.343	71.530	91.873	-33.793	125.666
Vertical					
0.125	20.343	66.520	86.863	-38.803	125.666

Note:

1. The reading levels are peak values.
2. Measurement Level = Reading Level + Correct Factor.

Product : CAN Immobilizer 125kHz
 Test Item : Radiated Emission
 Test date : 2018/03/16
 Test Mode : Mode 1: Transmit

Fundamental

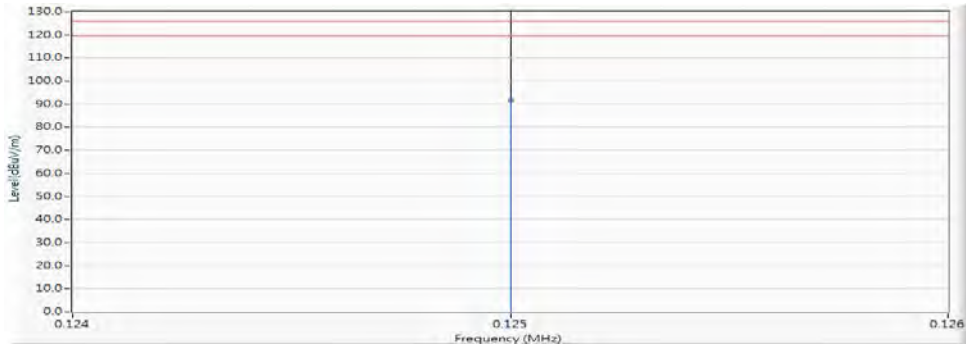
Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Average					
X-axis					
Horizontal					
0.125	20.343	69.930	90.273	-15.393	105.666
Vertical					
0.125	20.343	64.930	85.273	-20.393	105.666
Y-axis					
Horizontal					
0.125	20.343	60.140	80.483	-25.183	105.666
Vertical					
0.125	20.343	44.830	65.173	-40.493	105.666
Z-axis					
Horizontal					
0.125	20.343	70.220	90.563	-15.103	105.666
Vertical					
0.125	20.343	65.110	85.453	-20.213	105.666

Note:

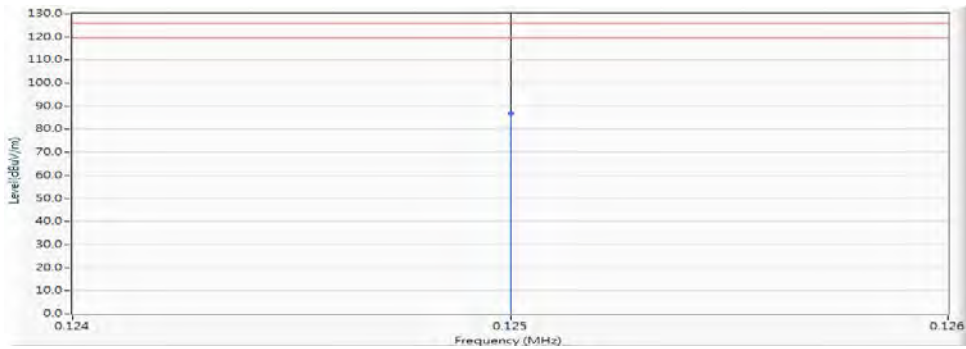
1. The reading levels are average values.
2. Measurement Level = Reading Level + Correct Factor.

X-axis
PEAK

Horizontal

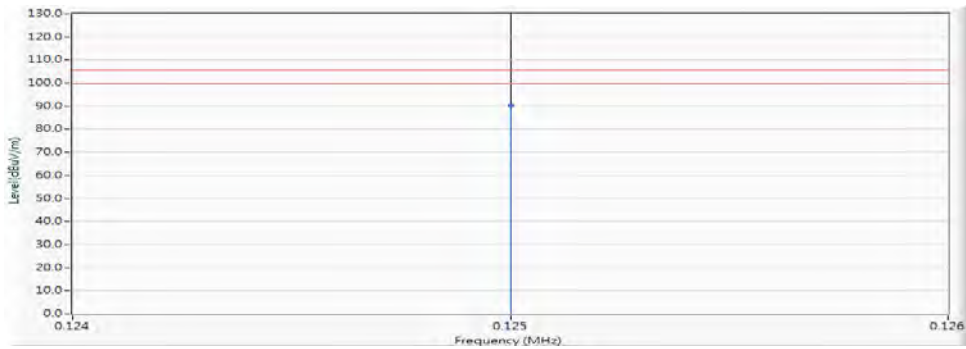


Vertical

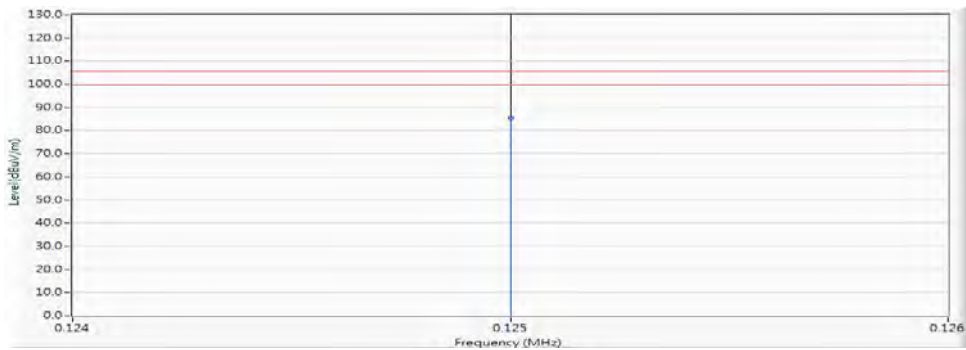


Average

Horizontal

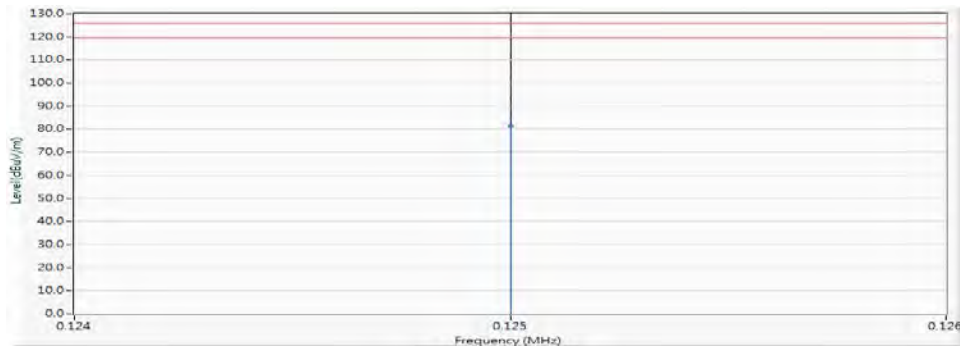


Vertical

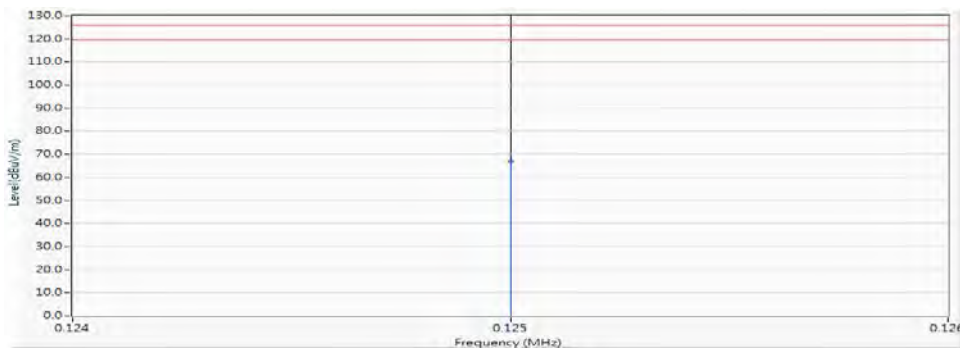


Y-axis
PEAK

Horizontal

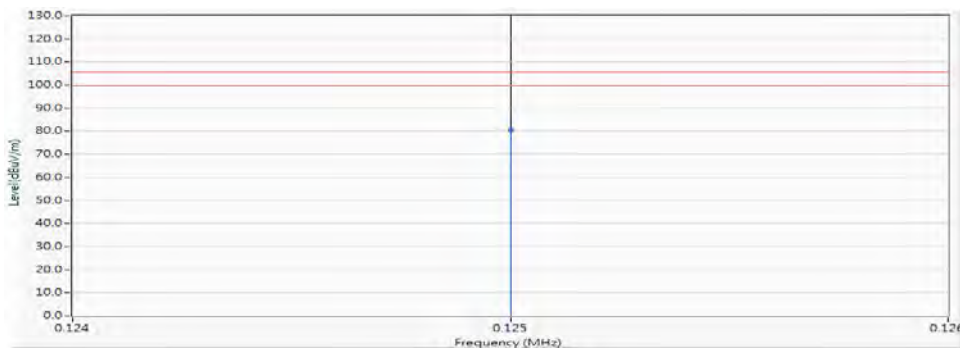


Vertical

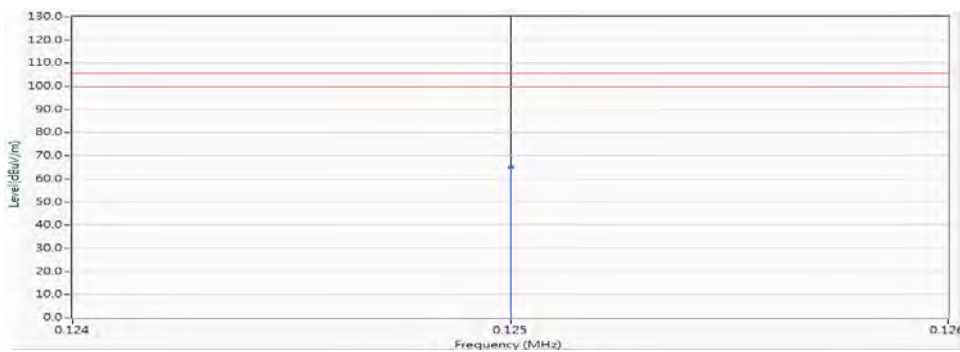


Average

Horizontal

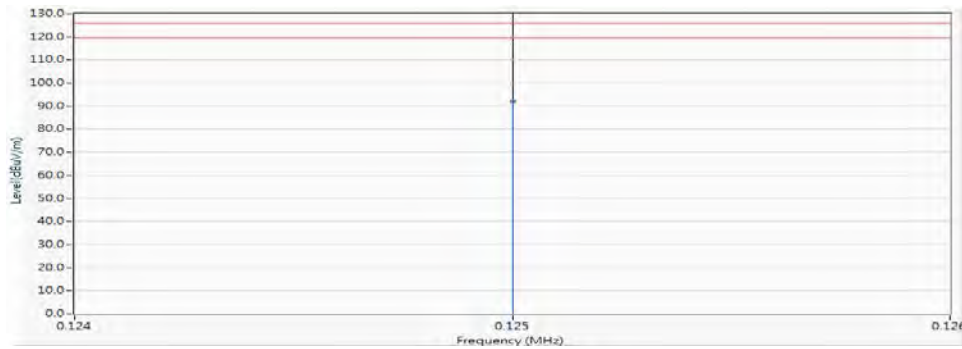


Vertical

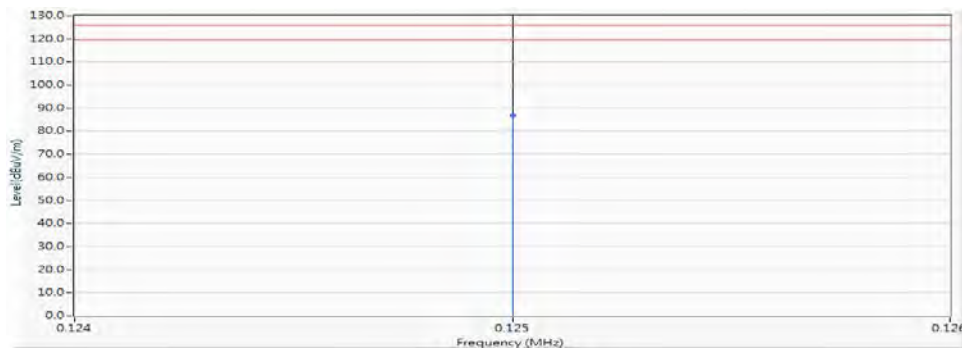


Z-axis
PEAK

Horizontal

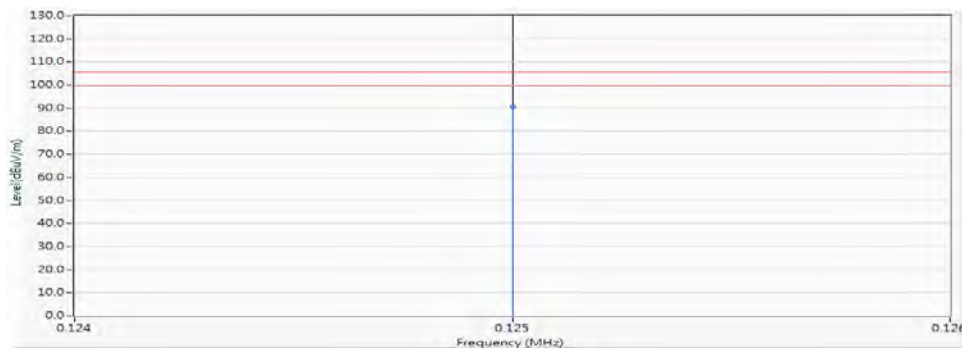


Vertical

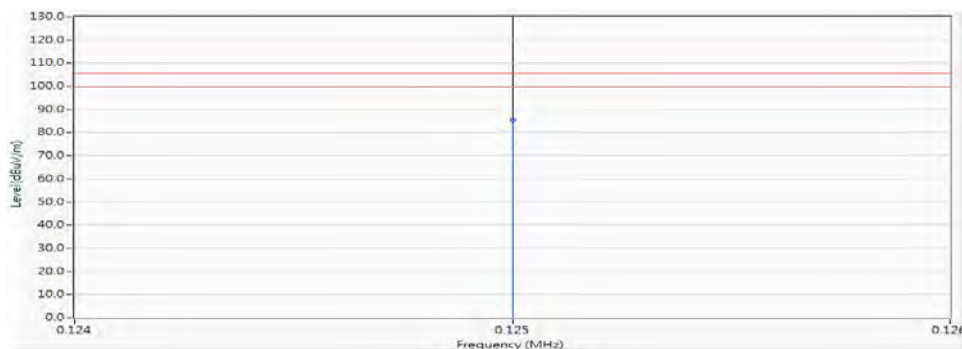


Average

Horizontal

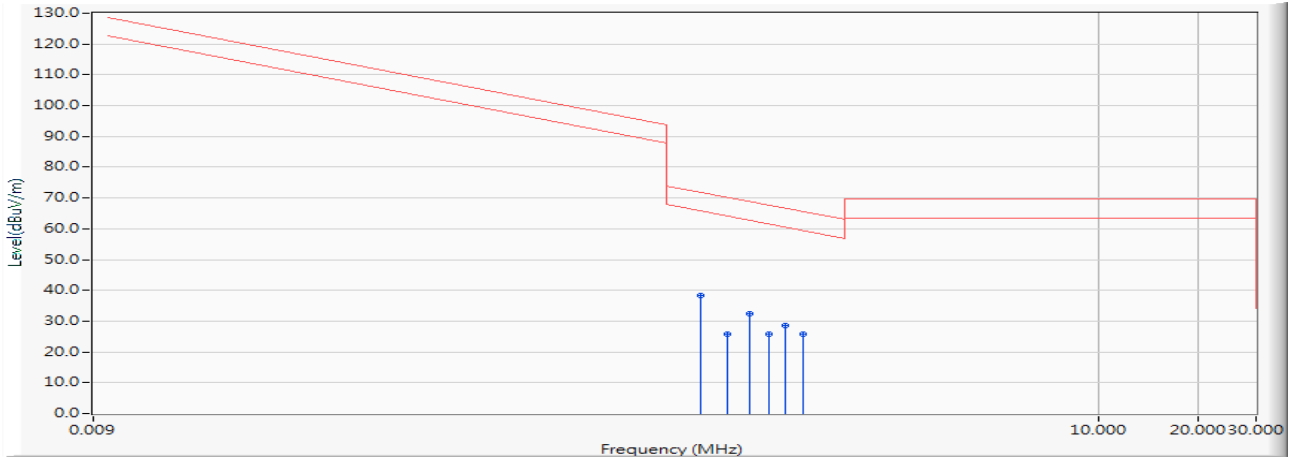


Vertical



Product : CAN Immobilizer 125kHz
 Test Item : Radiated Emission
 Test date : 2018/04/03
 Test Mode : Mode 1: Transmit

9kHz~30MHz



Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
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Quasi-Peak

Horizontal

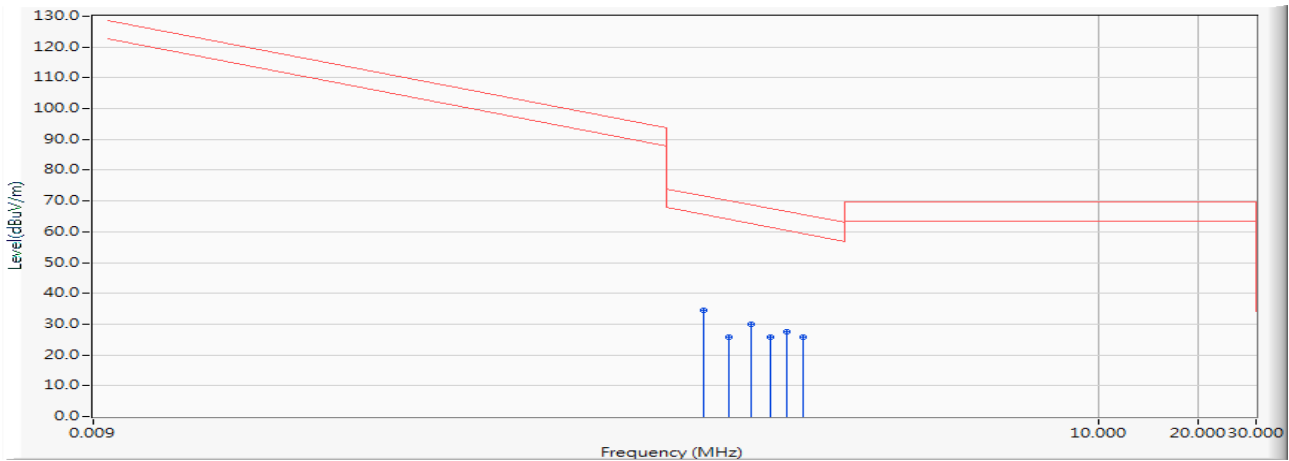
0.623	20.260	17.980	38.240	-33.474	71.714
0.753	20.255	5.590	25.845	-44.223	70.068
0.879	20.258	12.260	32.518	-36.206	68.724
1.004	20.260	5.420	25.680	-41.890	67.570
1.127	20.266	8.310	28.576	-37.990	66.566
1.276	20.273	5.660	25.933	-39.554	65.487

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “█” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : CAN Immobilizer 125kHz
 Test Item : Radiated Emission
 Test date : 2018/04/03
 Test Mode : Mode 1: Transmit

9kHz~30MHz



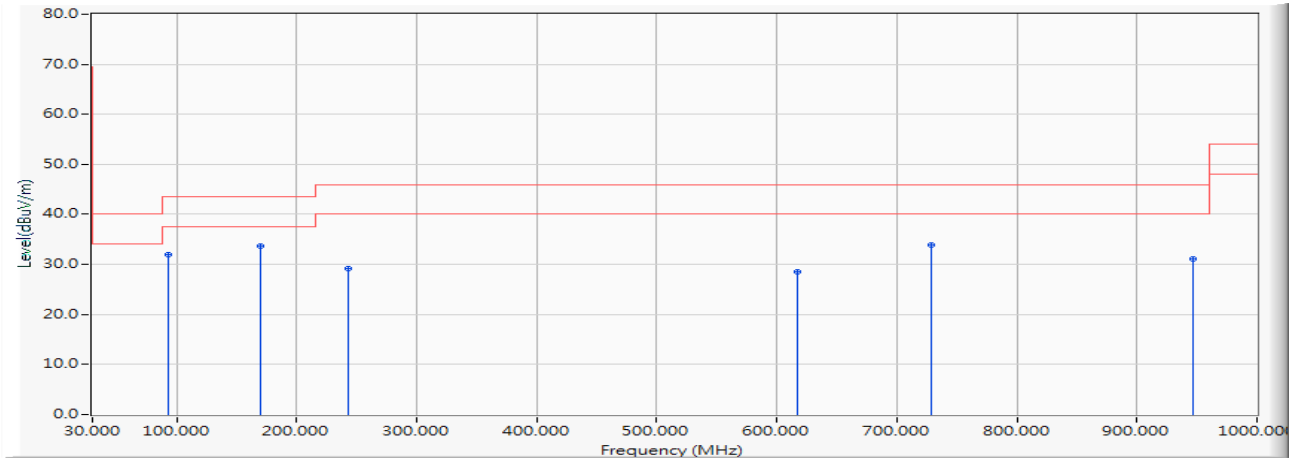
Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
Quasi-Peak					
Vertical					
0.639	20.260	14.130	34.390	-37.104	71.494
0.758	20.254	5.530	25.784	-44.227	70.011
0.884	20.258	9.840	30.098	-38.577	68.675
1.009	20.260	5.610	25.870	-41.656	67.526
1.131	20.266	7.210	27.476	-39.059	66.535
1.268	20.273	5.410	25.683	-39.859	65.542

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “█” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : CAN Immobilizer 125kHz
 Test Item : General Radiated Emission
 Test date : 2018/03/23
 Test Mode : Mode 1: Transmit

30MHz~1GHz



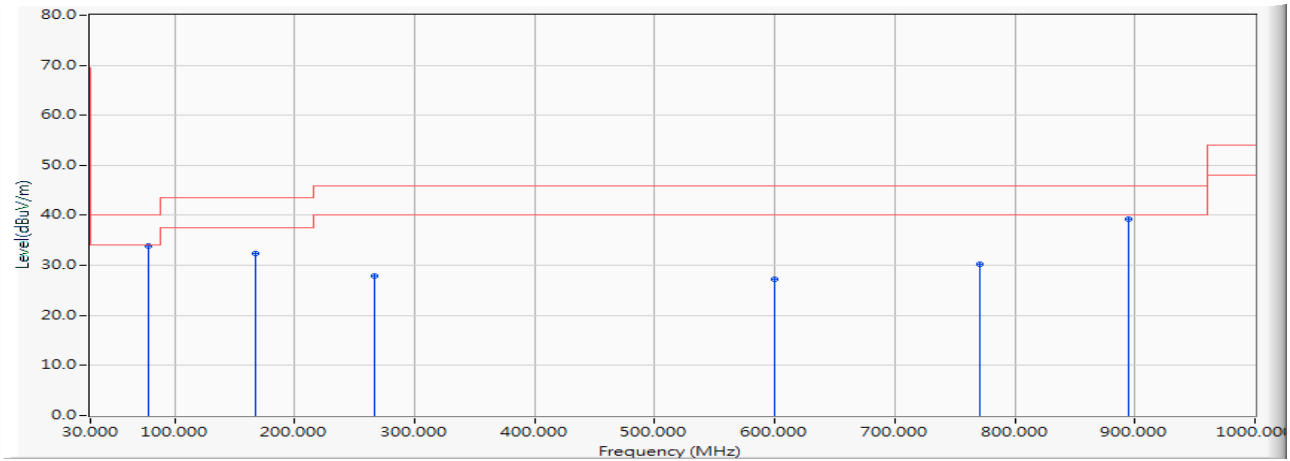
Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
Quasi-Peak					
Horizontal					
93.261	-16.796	48.674	31.878	-11.622	43.500
170.580	-10.941	44.543	33.601	-9.899	43.500
243.681	-11.782	40.855	29.072	-16.928	46.000
617.623	-2.917	31.405	28.487	-17.513	46.000
728.681	-1.202	35.190	33.988	-12.012	46.000
946.580	1.402	29.782	31.184	-14.816	46.000

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “█” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : CAN Immobilizer 125kHz
 Test Item : General Radiated Emission
 Test date : 2018/03/23
 Test Mode : Mode 1: Transmit

30MHz~1GHz



Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

Quasi-Peak

Vertical

77.797	-14.879	48.750	33.871	-6.129	40.000
167.768	-10.766	43.102	32.336	-11.164	43.500
266.174	-11.074	38.999	27.925	-18.075	46.000
599.348	-3.083	30.267	27.184	-18.816	46.000
770.855	-0.656	30.933	30.276	-15.724	46.000
894.565	0.866	38.478	39.343	-6.657	46.000

Note:

1. The reading levels below 1GHz are quasi-peak values.
2. “█” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.

4. EMI Reduction Method During Compliance Testing

No modification was made during testing.