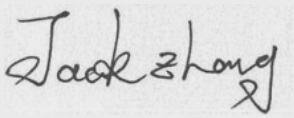
DEKRA Testing and Certification (Suzhou) Co., Ltd.
No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China
TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098

Test report No:
2120121R-RF-US-P06V01

TEST REPORT
FCC Rules&Requlations 47 CFR Chapter I - Part 15C

Product Name	Immobilizer
Trademark	Continental
Model and /or type reference	REN_X52_20_IMSY-1
FCC ID	KR5RENX5220IMSY1
Applicant's name / address	Continental Automotive GmbH Siemensstrasse 12, 93055 Regensburg, Germany
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C
Verdict Summary	IN COMPLIANCE
Documented By (name / position & signature)	Tim Cao/Project Engeneer 
Approved by (name / position & signature)	Jack Zhang/ Supervisor 
Date of issue	2021-03-27
Report Version	V1.0
Report template No	Template_FCC Part 15C-RF-V1.0

INDEX

page

COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.
In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Mar. 19, 2021
Date (start test)	Mar. 22, 2021
Date (finish test)	Mar. 27, 2021

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT : Equipment Under Test
QP : Quasi-Peak
CAV : CISPR Average
AV : Average
CDN : Coupling Decoupling Network
SAC : Semi-Anechoic Chamber
OATS : Open Area Test Site
BW : Bandwidth
AM : Amplitude Modulation
PM : Pulse Modulation
HCP : Horizontal Coupling Plane
VCP : Vertical Coupling Plane
U_N : Nominal voltage
*T*x : Transmitter
*R*x : Receiver
N/A : Not Applicable
N/M : Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2120121R-RF-US-P06V01	V1.0	Initial issue of report.	2021-03-27

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:

   - Chapter 1.1 General Description of the Item(s);
   - Chapter 1.2 Antenna information.

USED EQUIPMENT

Emission in non-restricted frequency bands / TR-8					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2020.08.15	2021.08.14
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2020.04.17	2021.04.16
MXA Signal Analyzer	Keysight	N9020A	MY56060147	2020.08.15	2021.08.14
Temperature/Humidity Meter	Zhichen	ZC1-2	TR8-TH	2020.08.19	2021.08.18
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

Radiated Emission(Below 1GHz) / AC-3					
Instrument	Manufacturer	Type No.	Serial No.	Cal. Date	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100176	2020.08.15	2021.08.14
Loop Antenna	R&S	HFH2-Z2	833799/003	2021.01.24	2022.01.23
Bilog Antenna	Teseq GmbH	CBL6112D	27613	2020.08.19	2021.08.18
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC3-C	2020.04.13	2021.04.12
Temperature/Humidity Meter	RTS	RTS-8S	AC3-TH	2020.08.19	2021.08.18
Quietek EMI V3(test software)	Quietek	N/A	N/A	N/A	N/A
Note: All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.					

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%, The Uncertainties is complice with standard required as below.

Test item	Uncertainty
AC Power Line Conducted Emission	± 2.02 dB
Peak Power Output	± 1.27 dB
Radiated Emission(30MHz~1GHz)	± 3.80 dB
RF antenna conducted test	± 1.27 dB
DTS Bandwidth	± 1kHz
Occupied Bandwidth	± 1kHz
Power Density	± 1.27 dB
Frequency Stability	± 100 Hz

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name.....:	Immobilizer
Model No.....:	REN_X52_20_IMSY-1
Trademark.....:	Continental
FCC ID.....:	KR5RENX5220IMSY1
Manufacturer.....:	Continental Automotive GmbH
Manufacturer Address .....:	Siemensstrasse 12, 93055 Regensburg, Germany
Factory.....:	Continental Automotive Corporation Changchun Co.,Ltd.
Factory Address.....:	Jingyue Branch No. 5800,Shengtai Street, CHANGCHUN, JILIN PROVINCE, 130000, P.R. China.

Wireless Specification.....:	N/A
Operating frequency range(s).....:	125 kHz
Type of modulation .....:	ASK
Number of channel .....:	1

Rated power supply.....:	Voltage and Frequency	
	☐	AC: 220 – 240 V, 50/60 Hz
	☐	AC: 100 – 240 V, 50/60 Hz
	☒	DC: 12 V
	☐	Battery:
Mounting position.....:	☐	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☒	Other: vehicle-mounted equipment

1.2 Antenna Information

Antenna model / type number .....:	N/A			
Antenna serial number.....:	N/A			
Antenna Delivery .....:	☒	1TX + 1RX		
	☐	2TX + 2RX		
	☐	Others:……		
Antenna technology.....:	☒	SISO		
	☐	MIMO	☐	CDD
			☐	Beam-forming
Antenna Type .....:	☐	External	☐	Dipole
			☐	Sectorized
	☒	Internal	☒	Coil
			☐	PCB
			☐	Metal
			☐	PIFA
			☐	Others……..
Antenna Gain.....:	N/A			

Note: The General Description of the Item and antenna information in clause 1 are provided and confirmed by the client.

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

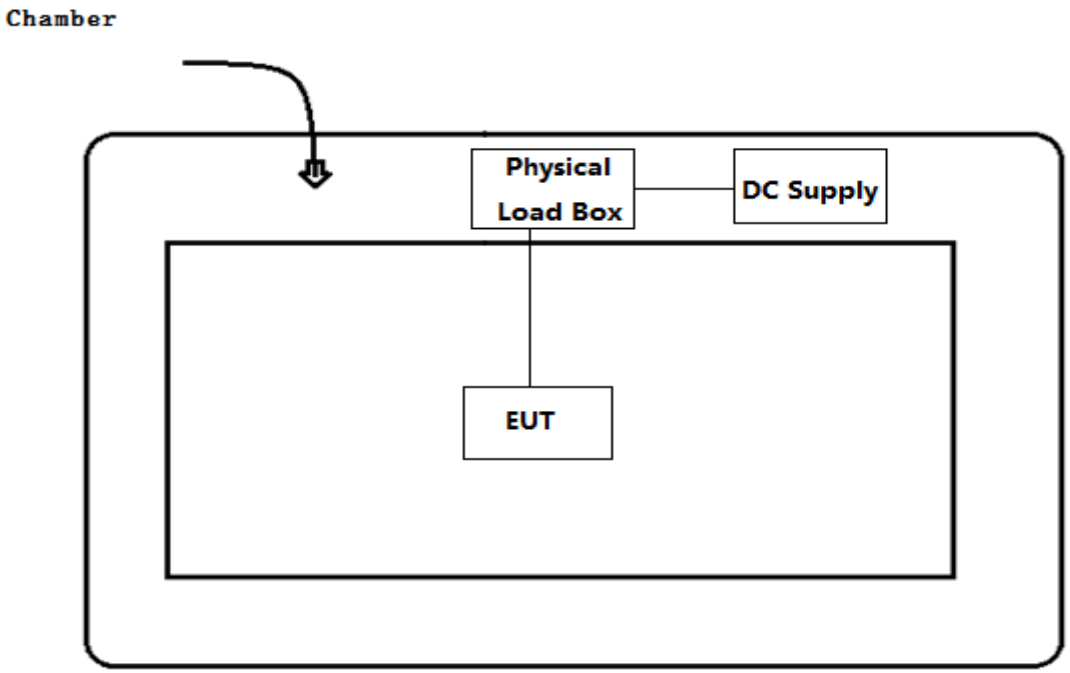
Test Mode	Mode 1: Transmit

2.2 Support / Auxiliary equipment / unit / Test software for the EUT

Auxiliary equipment	Type / Version	Manufacturer	Supplied by
N/A	N/A	N/A	N/A
software	Type / Version	Manufacturer	Supplied by
N/A	N/A	N/A	N/A

2.3 Test Configuration / Block diagram used for tests

Connection Diagram



Signal Cable Type		Signal cable Description
A	RS485 cable	Shield， > 5m

2.4 Testing process

1	Setup the EUT as shown in Section 2.3.
2	Turn on the physical load box and configure the signal.
3	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C	2020	Intentional Radiators

3.2 Overview of results

Requirement – Test case	Basic standard(s)	Verdict	Remark
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C Section 15.207	N/A	---
Field Strength of Spurious	FCC CFR Title 47 Part 15 Subpart C Section 15.209	PASS	---
Channel Bandwidth	FCC CFR Title 47 Part 15 Subpart C Section 15.215(c)	PASS	---
Antenna Requirement	FCC CFR Title 47 Part 15 Subpart C Section 15.203	PASS	---
Supplementary information:			

3.3 Test Facility

USA	**:**	**FCC Designation Number: CN1199**

4 TEST RESULTS

4.1 AC Power Line Conducted Emission	VERDICT: N/A

4.1.1 Limit

Standard	FCC Part 15 Subpart E Paragraph 15.207	
Frequency range [MHz]	Limit: QP [dB(μV)[1)]]	Limit: AV [dB(μV) [1)]]
0,15 - 0,50	66 – 56 [2)]	56 - 46 [2)]
0,50 - 5,0	56	46
5,0 - 30	60	50

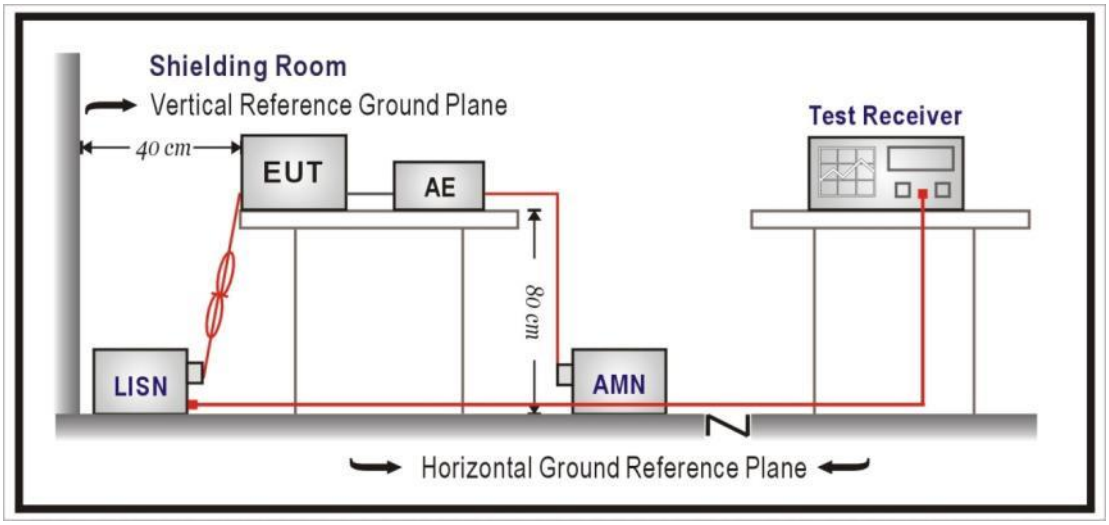
[1)] At the transition frequency, the lower limit applies.

[2)] The limit decreases linearly with the logarithm of the frequency.

NOTE 1: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz.

NOTE 2: Where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT the AC power output port need not to be tested.

4.1.2 Test Setup



4.1.3 Test Procedure

	References Rule	Chapter	Item
☒	ANSI C63.10-2013	6.2	Standard test method for ac power-line conducted emissions from unlicensed wireless devices

4.1.4 Test Data

N/A: The sample is supply by DC .

4.2 Radiated Emissions — VERDICT: PASS

4.2.1 Limit

Standard	FCC Part 15 Subpart C Paragraph 15. 209

Restricted Band Emissions Limit

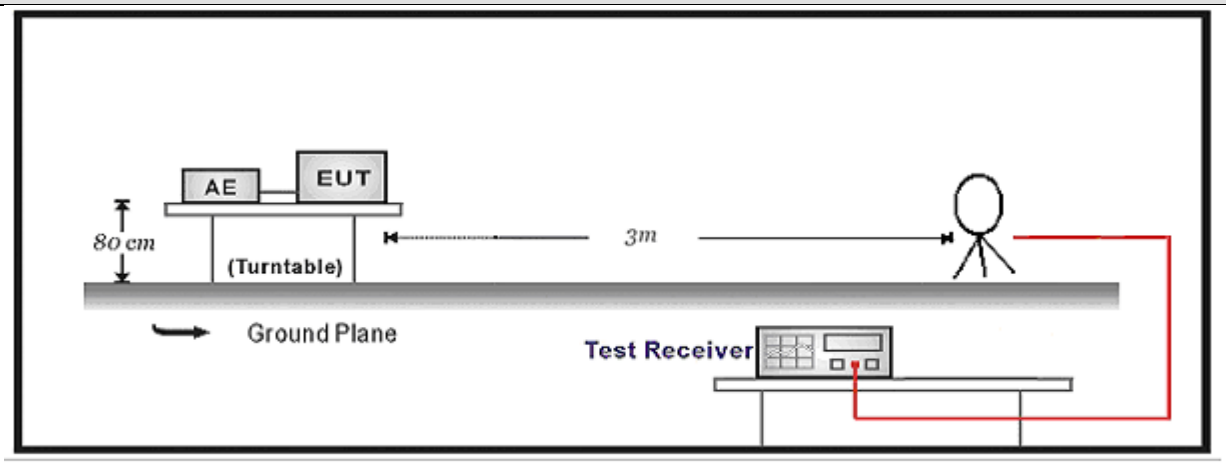
Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30(Note 1)
1.705 - 30	30	29.5	30(Note 1)
30 - 88	100	40	3(Note 2)
88 - 216	150	43.5	3(Note 2)
216 - 960	200	46	3(Note 2)
Above 960	500	54	3(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

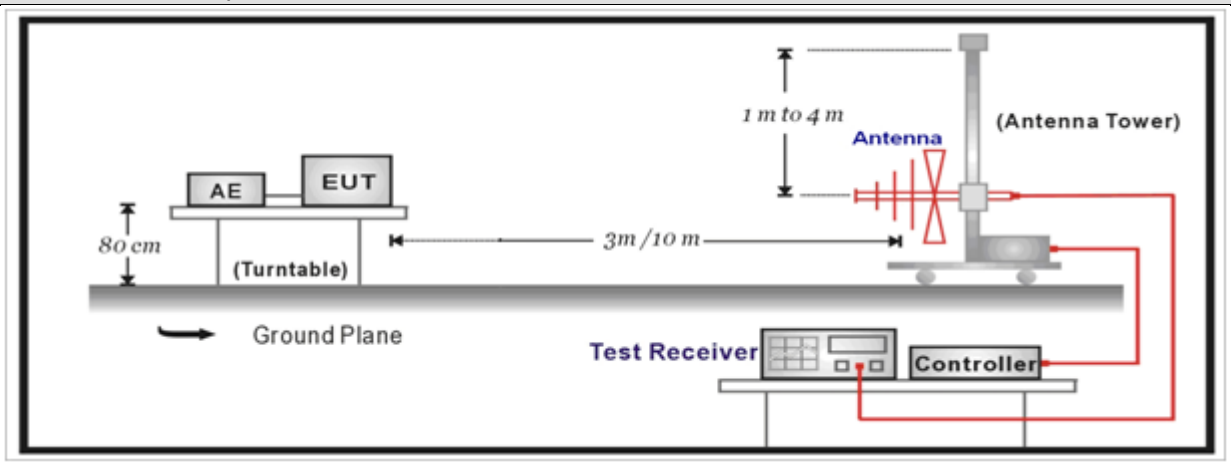
Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.2.2 Test Setup

Below 30MHz Test Setup:



30MHz-1GHz Test Setup:

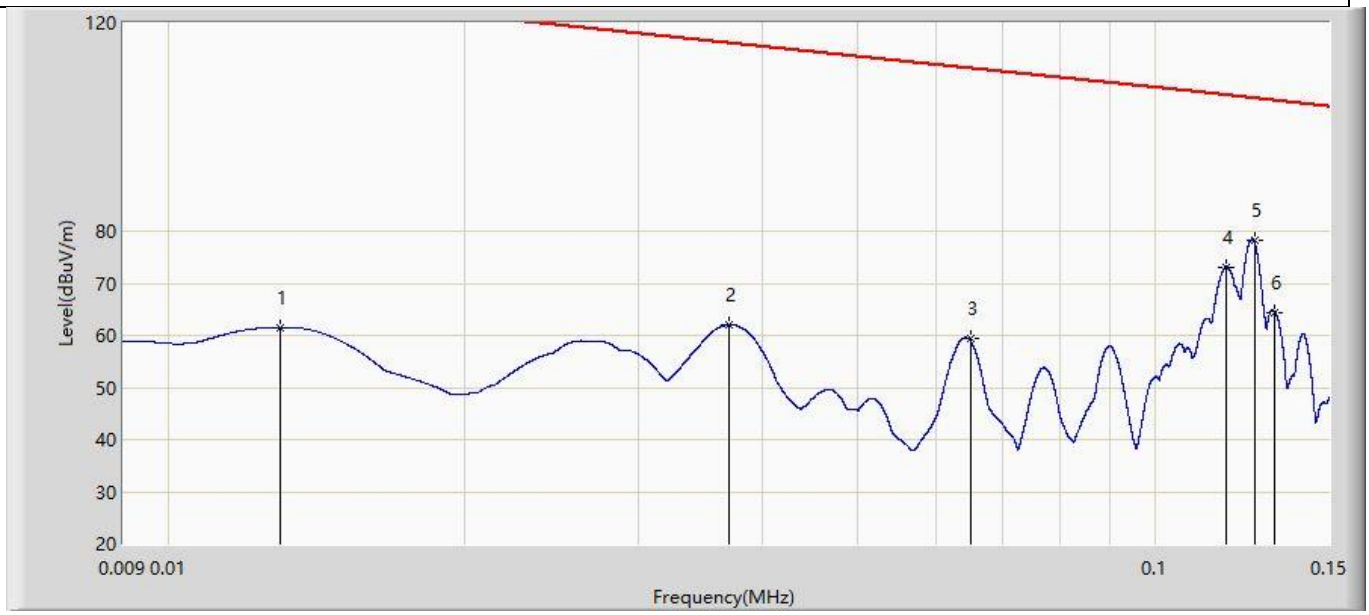


4.2.3 Test Procedure

	References Rule		Chapter	Description
	☒	ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
	☒	ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
	☐	ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

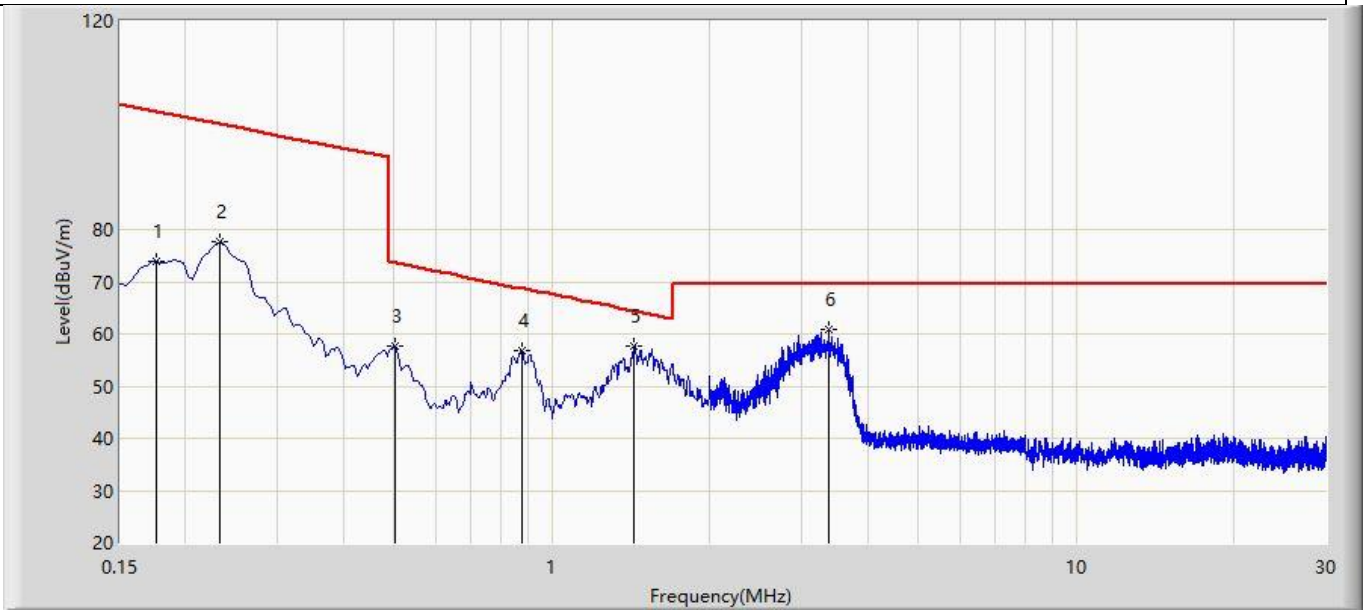
4.2.4 Test Data

Profile: 2120121R	Page No.: 95
Engineer: Tim.Cao	
Site: AC1	Time: 2021/03/26 - 18:35
Limit: FCC Part15.209	Margin: 0
Probe: HFH2-Z2_833799(0.009-30MHz)	Polarity: Parallel
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	



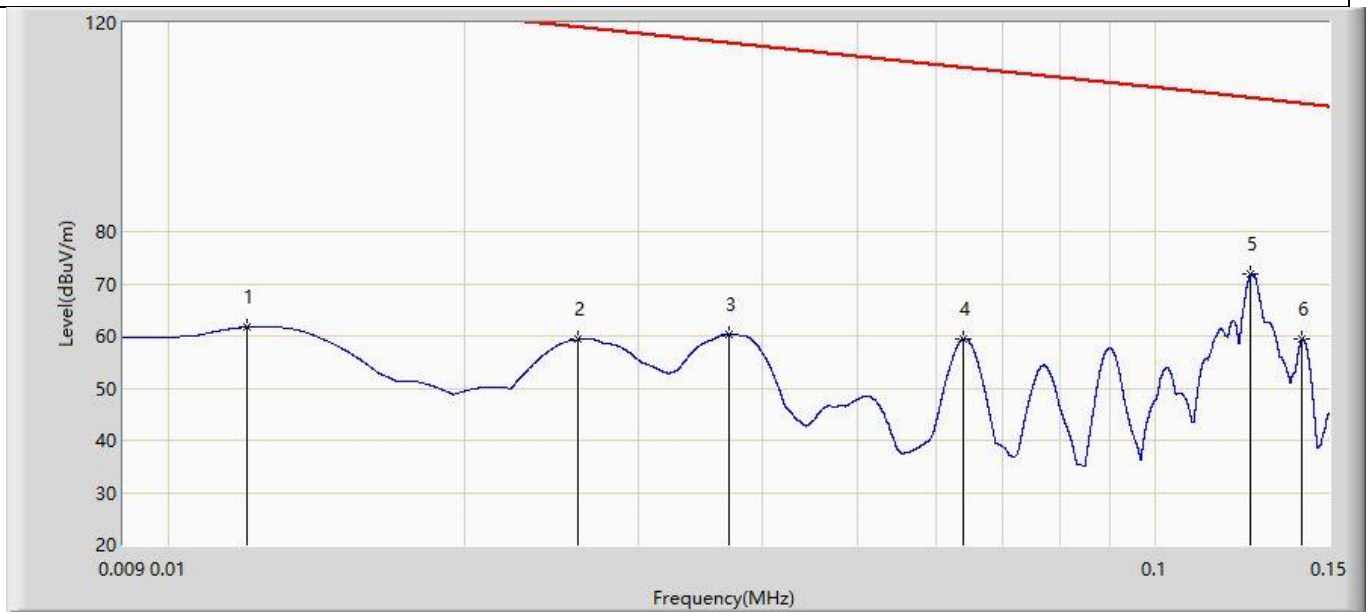
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.013	61.573	32.194	-63.754	125.326	29.379	QP
2		0.037	62.036	33.386	-54.207	116.242	28.649	QP
3		0.065	59.453	30.812	-51.896	111.349	28.641	QP
4		0.118	72.967	44.211	-33.204	106.171	28.756	QP
5	*	0.126	78.346	49.575	-27.254	105.601	28.771	PK
6		0.132	64.404	35.621	-40.792	105.197	28.783	QP

Profile: 2120121R	Page No.: 96
Engineer: Tim.Cao	
Site: AC1	Time: 2021/03/26 - 18:54
Limit: FCC Part15.209	Margin: 0
Probe: HFH2-Z2_833799(0.009-30MHz)	Polarity: Parallel
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	



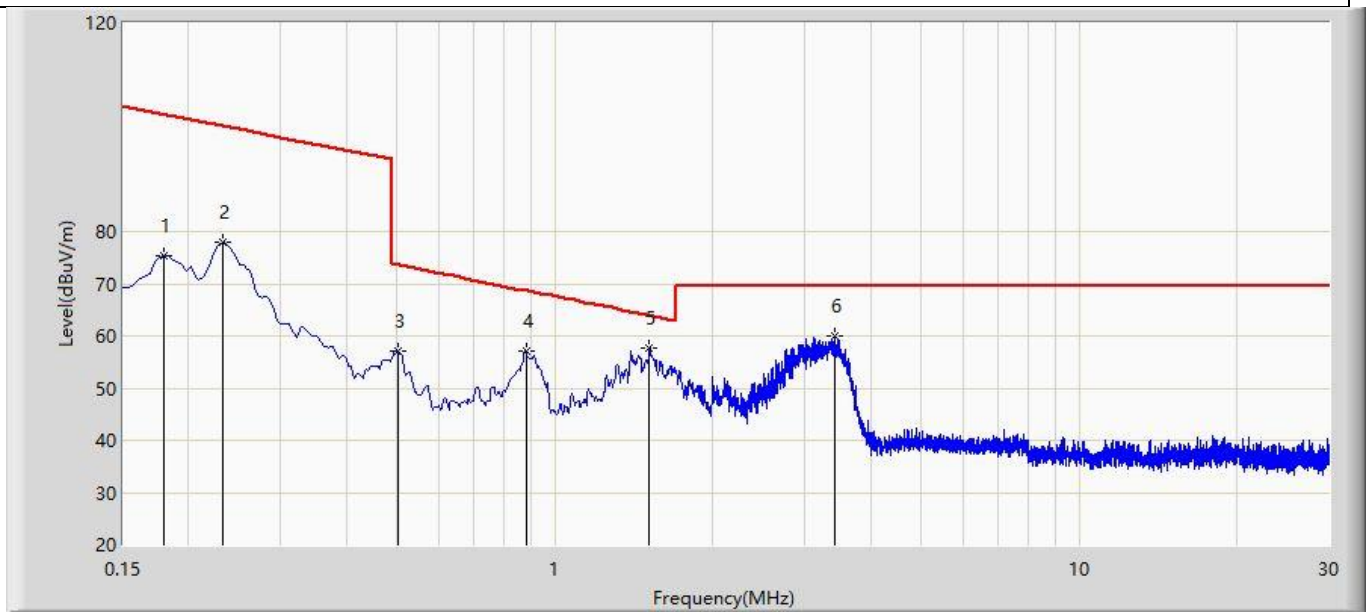
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.176	73.972	45.096	-28.724	102.696	28.876	QP
2		0.232	77.680	48.689	-22.614	100.295	28.991	QP
3		0.501	57.583	28.013	-16.026	73.608	29.569	QP
4		0.878	56.840	25.742	-11.898	68.737	31.098	QP
5	*	1.437	57.593	26.407	-6.865	64.458	31.186	QP
6		3.385	61.000	30.126	-8.540	69.540	30.874	QP

Profile: 2120121R	Page No.: 97
Engineer: Tim.Cao	
Site: AC1	Time: 2021/03/26 - 18:57
Limit: FCC Part15.209	Margin: 0
Probe: HFH2-Z2_833799(0.009-30MHz)	Polarity: Perpendicular
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	



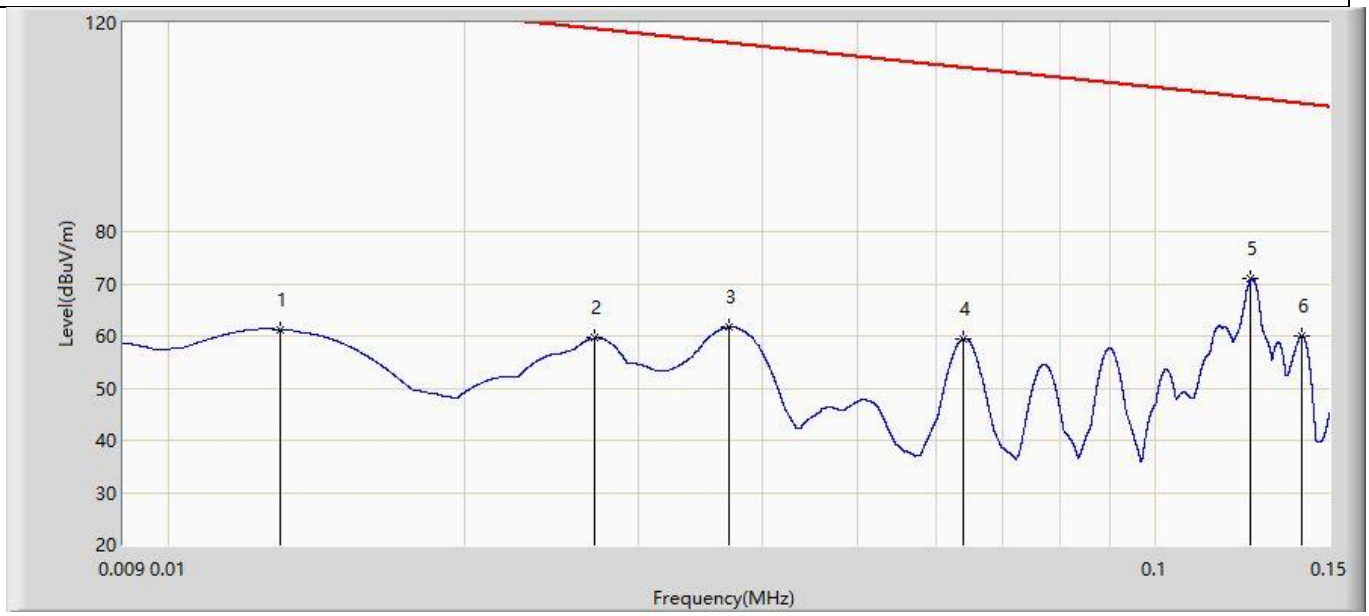
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.012	61.789	32.380	-64.233	126.022	29.409	QP
2		0.026	59.373	30.389	-59.934	119.307	28.984	QP
3		0.037	60.336	31.686	-55.907	116.242	28.649	QP
4		0.064	59.403	30.764	-52.081	111.484	28.639	QP
5	*	0.125	72.023	43.254	-33.647	105.670	28.769	PK
6		0.141	59.393	30.592	-45.231	104.624	28.801	QP

Profile: 2120121R	Page No.: 98
Engineer: Tim.Cao	
Site: AC1	Time: 2021/03/26 - 18:59
Limit: FCC Part15.209	Margin: 0
Probe: HFH2-Z2_833799(0.009-30MHz)	Polarity: Perpendicular
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	



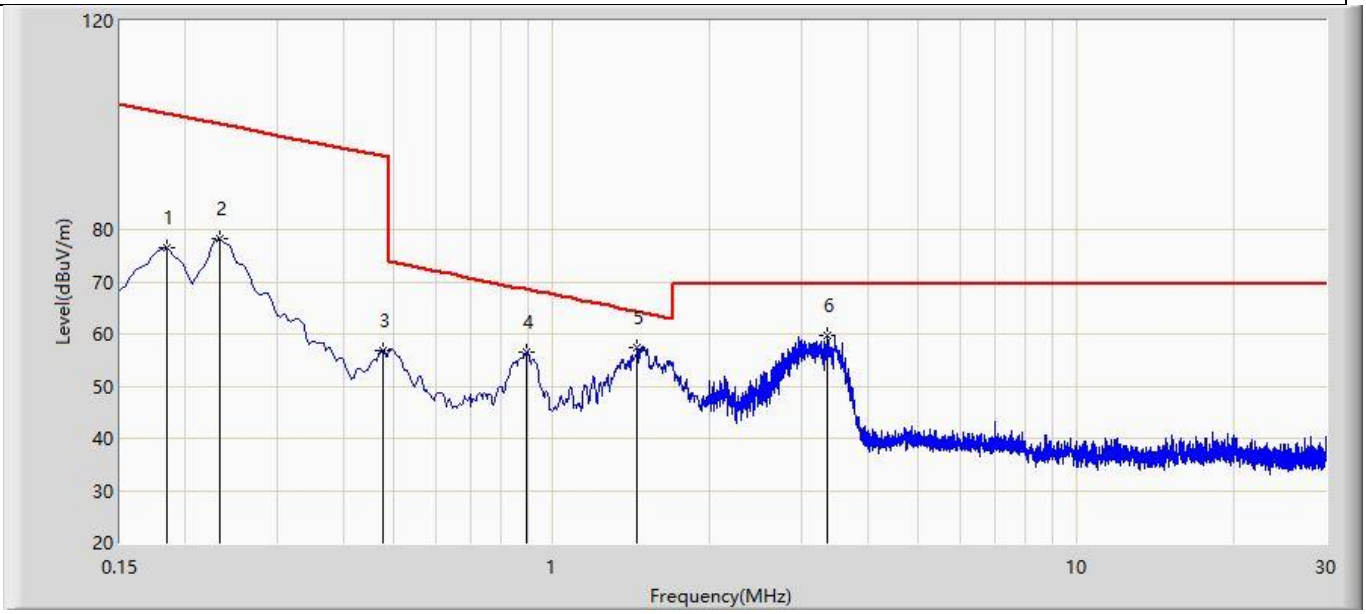
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.180	75.298	46.413	-27.202	102.500	28.885	QP
2		0.232	78.038	49.047	-22.256	100.295	28.991	QP
3		0.501	57.140	27.570	-16.469	73.608	29.569	QP
4		0.881	56.966	25.856	-11.742	68.708	31.111	QP
5	*	1.516	57.793	26.675	-6.195	63.988	31.118	QP
6		3.422	60.002	29.127	-9.538	69.540	30.875	QP

Profile: 2120121R	Page No.: 99
Engineer: Tim.Cao	
Site: AC1	Time: 2021/03/26 - 19:01
Limit: FCC Part15.209	Margin: 0
Probe: HFH2-Z2_833799(0.009-30MHz)	Polarity: Ground-parallel
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	



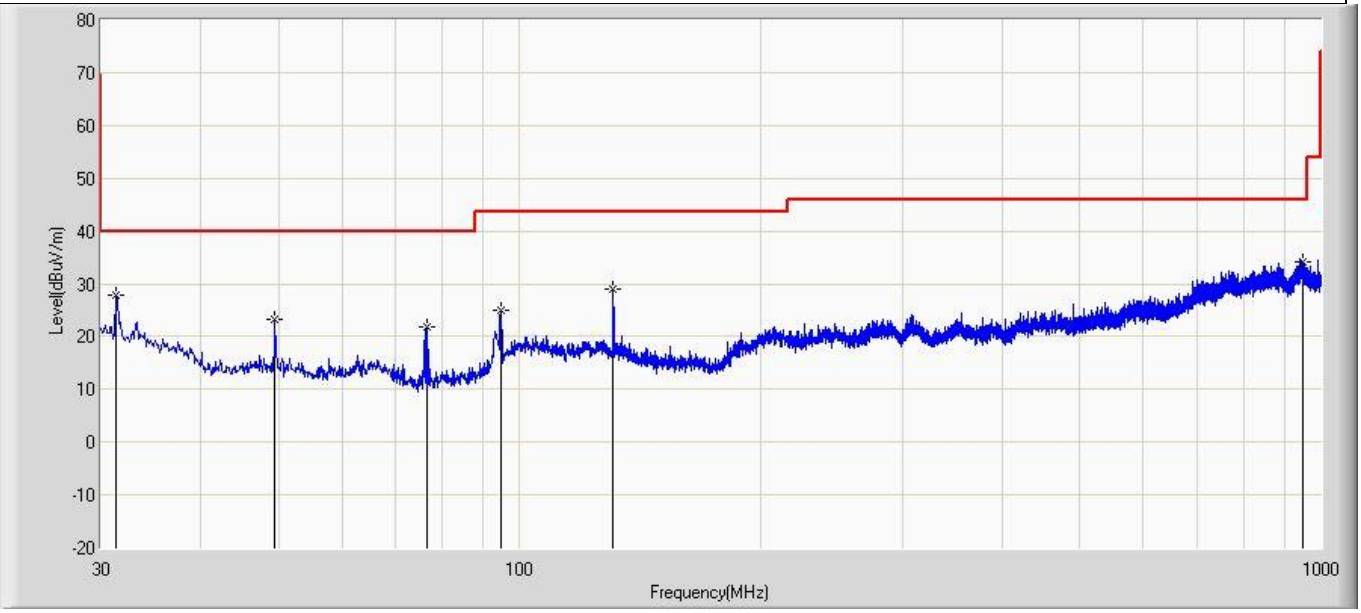
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.013	61.273	31.894	-64.054	125.326	29.379	QP
2		0.027	59.600	30.647	-59.378	118.979	28.954	QP
3		0.037	61.637	32.987	-54.606	116.242	28.649	QP
4		0.064	59.515	30.876	-51.969	111.484	28.639	QP
5	*	0.125	71.088	42.319	-34.582	105.670	28.769	PK
6		0.141	60.092	31.291	-44.532	104.624	28.801	QP

Profile: 2120121R	Page No.: 100
Engineer: Tim.Cao	
Site: AC1	Time: 2021/03/26 - 19:04
Limit: FCC Part15.209	Margin: 0
Probe: HFH2-Z2_833799(0.009-30MHz)	Polarity: Ground-parallel
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	



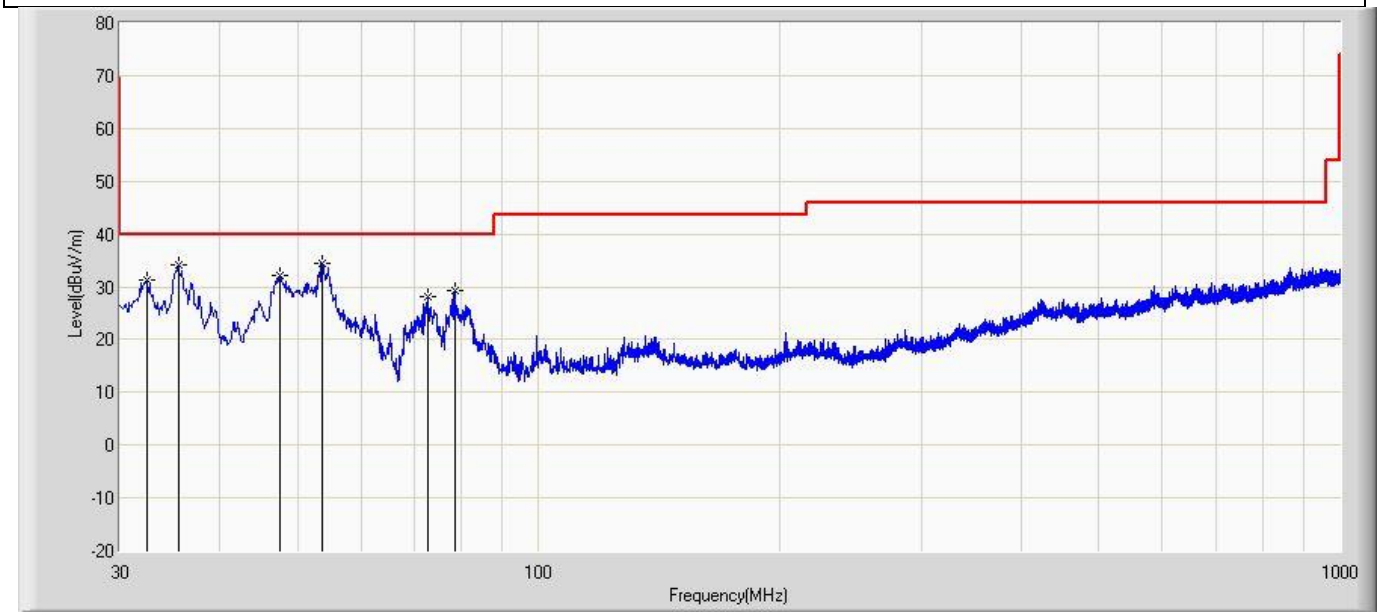
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		0.184	76.576	47.681	-25.733	102.309	28.894	QP
2		0.232	78.174	49.183	-22.120	100.295	28.991	QP
3		0.475	56.945	27.448	-37.126	94.071	29.498	QP
4		0.896	56.551	25.376	-12.010	68.561	31.175	QP
5	*	1.456	57.431	26.262	-6.912	64.343	31.169	QP
6		3.348	59.791	28.924	-9.749	69.540	30.867	QP

Profile: 2120121R	Page No.: 4
Engineer: Tim.Cao	
Site: AC3	Time: 2021/03/27 - 13:30
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Vertical
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		31.334	27.738	4.186	-12.262	40.000	23.552	QP
2		49.521	23.366	5.415	-16.634	40.000	17.951	QP
3		76.439	21.972	7.549	-18.028	40.000	14.423	QP
4		94.869	24.921	5.016	-18.579	43.500	19.905	QP
5		130.759	29.096	8.234	-14.404	43.500	20.862	QP
6	*	948.833	34.267	-0.480	-11.733	46.000	34.747	QP

Profile: 2120121R	Page No.: 6
Engineer: Tim.Cao	
Site: AC3	Time: 2021/03/27 - 13:56
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC3_3m (30-1000MHz)	Polarity: Horizontal
EUT: Immobilizer	Power: DC 12V
Note: Mode 1: Transmit at 125kHz	

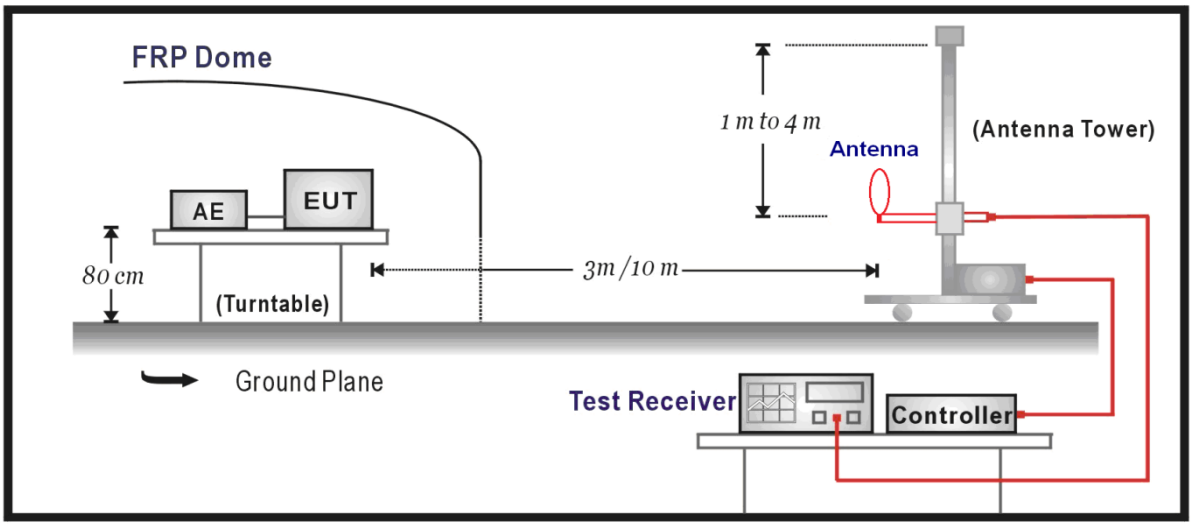


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		32.425	31.212	4.729	-8.788	40.000	26.484	QP
2		35.456	34.235	8.680	-5.765	40.000	25.555	QP
3		47.581	32.200	16.213	-7.800	40.000	15.986	QP
4	*	53.765	34.471	20.800	-5.529	40.000	13.671	QP
5		72.559	28.000	16.775	-12.000	40.000	11.224	QP
6		78.500	29.377	16.816	-10.623	40.000	12.561	QP

4.3 Emission bandwidth	VERDICT: PASS

4.3.1 Limit	
Standard	FCC Part 15 Subpart C Paragraph 15.215
Within the band.	

4.3.2 Test Setup

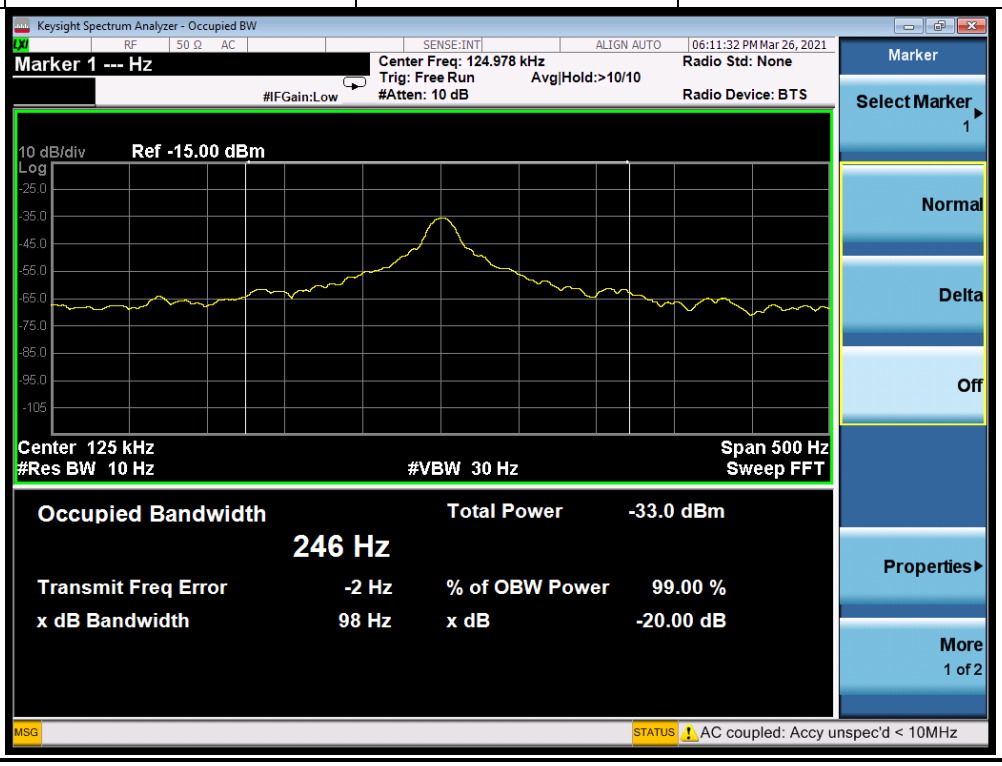


4.3.3 Test Procedure

	Reference Rule	Chapter	Description
☒	ANSI C63.10	6.9.2	Occupied bandwidth—relative measurement procedure

4.3.4 Test Data

Frequency (kHz)	20dB bandwidth (Hz)	99% bandwidth (Hz)	Result
125	98	246	Pass



4.4 Antenna Requirement	VERDICT: PASS

4.4.1 Limit:	
Standard	FCC Part 15 Subpart E Paragraph 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	

4.4.2 Antenna Connector Construction:	
☒	The use of a permanently attached antenna
☐	The antenna use of a unique coupling to the intentional radiator
☐	The use of a nonstandard antenna jack or electrical connector
Please refer to the attached document “Internal Photograph” to show the antenna connector.	

5 TEST SETUP PHOTO AND EUT PHOTO	VERDICT: PASS

Remark: The test setup photo and EUT Photo please see appendix.

The End