

NCC RADIO TEST REPORT

Test Standard	NCC LP0002 (2018-01-10)
Product name	Digital instrument cluster with immobilizer
Trade name	BOSCH
Model No.	Audi FPK Gen2
Frequency Band	125kHz
Test Result	Pass

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc.(Wugu Laboratory)



Approved by:

A handwritten signature in black ink, appearing to read "Sam Chuang".

Sam Chuang
Manager
Compliance Certification Services Inc.

Tested by:

A handwritten signature in black ink, appearing to read "Jerry Chuang".

Jerry Chuang
Assistant Engineer
Compliance Certification Services Inc.

Revision History

Rev.	Issue Date	Revisions	Revised By
00	April 18, 2018	Initial Issue	Doris Chu

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Robert Bosch Car Multimedia GmbH Robert-Bosch-Strasse 200, 31139 Hildesheim, Germany
Manufacturer	Robert Bosch Car Multimedia GmbH Robert-Bosch-Strasse 200, 31139 Hildesheim, Germany
Equipment	Digital instrument cluster with immobilizer
Trade name	BOSCH
Model Name	Audi FPK Gen2
Model Discrepancy	N/A
EUT Functions	125kHz
Received Date	March 27, 2018
Date of Test	April 12, 2018
Output Power	85.72 dBuV/m
Power Operation	☐ AC ☐ Adapter : 120V/60Hz ☒ DC Type : ☒ Battery: 12.9Vdc ☐ DC Power Supply ☐ External DC adapter

1.2 EUT CHANNEL INFORMATION

Frequency Range	125kHz
Modulation Type	ASK
Number of channel	1

Remark:

Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 and NCC LP0002 section 5.1.2 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	Number of frequencies	Location in frequency range of operation
☒ 1 MHz or less	1	Middle
☐ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☐ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Type	External Loop Antenna
Antenna Gain	0 dBi
Antenna Brand	BOSCH
Antenna Model	Audi FPK Gen2

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 1.4003
RF output power, conducted	+/- 1.1372
Power density, conducted	+/- 1.4003
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1G~8G	+/- 2.5975
3M Semi Anechoic Chamber / 8G~18G	+/- 2.6112
3M Semi Anechoic Chamber / 18G~26G	+/- 2.7389
3M Semi Anechoic Chamber / 26G~40G	+/- 2.9683
3M Semi Anechoic Chamber / 40G~60G	+/- 1.8509
3M Semi Anechoic Chamber / 60G~75G	+/- 1.9869
3M Semi Anechoic Chamber / 75G~110G	+/- 2.9651
3M Semi Anechoic Chamber / 110G~170G	+/- 2.7807
3M Semi Anechoic Chamber / 170G~220G	+/- 3.6437
3M Semi Anechoic Chamber / 220G~325G	+/- 4.2982

Remark:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	-	-
Radiation	Jerry Chuang	-
RF Conducted	Jerry Chuang	-

Remark: The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Spectrum Analyzer	R&S	FSV 40	101073	10/02/2017	10/01/2018
Directional Coupler	Agilent	87301D	MY44350252	07/25/2017	07/24/2018
SUCOFLEX Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	07/31/2017	07/30/2018
Divider	Solvang Technology	2-18GHz 4Way	STI08-0015	07/26/2017	07/25/2018

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Spectrum Analyzer	Agilent	E4446A	US42510252	11/27/2017	11/26/2018
Loop Ant	COM-POWER	AL-130	121051	03/21/2018	03/20/2019
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	07/31/2017	07/30/2018

Remark: Each piece of equipment is scheduled for calibration once a year.

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

Support Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
1	DC Power Source	GWINSTEK	SPS-3610	N/A	N/A

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with NCC LP0002 (2016-08-23), ANSI C63.10:2013.

1.9 LP0002 SECTION 2.7 RESTRICTED BANDS OF OPERATIONS

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
0.090 ~ 0.110	240.00 ~ 285.00	3332.0 ~ 3339.0
0.490 ~ 0.510	322.00 ~ 335.40	3345.8 ~ 3358.0
2.172 ~ 2.198	399.90 ~ 410.00	3500.0 ~ 4400.0
3.013 ~ 3.033	485.00 ~ 510.00	4500.0 ~ 5250.0
4.115 ~ 4.198	608.00 ~ 614.00	5350.0 ~ 5460.0
5.670 ~ 5.690	703.00 ~ 748.0	7250.0 ~ 7750.0
6.200 ~ 6.300	758.00 ~ 803.00	8025.0 ~ 8500.0
8.230 ~ 8.400	825.00 ~ 915.00	9000.0 ~ 9200.0
12.265 ~ 12.600	930.00 ~ 1240.0	9300.0 ~ 9500.0
13.340 ~ 13.430	1300.0 ~ 1427.0	10600 ~ 12700
14.965 ~ 15.020	1435.0 ~ 1626.5	13250 ~ 13400
16.700 ~ 16.755	1660.0 ~ 1785.0	14470 ~ 14500
19.965 ~ 20.020	1805.0 ~ 1880.0	15350 ~ 16200
25.500 ~ 25.700	1885.0 ~ 1900.0	17700 ~ 21400
37.475 ~ 38.275	1905.0 ~ 1985.0	22010 ~ 23120
73.500 ~ 75.400	2010.0 ~ 2025.0	23600 ~ 24000
108.00 ~ 138.00	2110.0 ~ 2170.0	31200 ~ 31800
149.90 ~ 150.05	2200.0 ~ 2300.0	36430 ~ 36500
156.70 ~ 156.90	2310.0 ~ 2390.0	38600 以上
162.01 ~ 167.17	2483.5 ~ 2900.0	---
167.72 ~ 173.20	3260.0 ~ 3267.0	---

2. TEST SUMMERY

NCC Standard Section	Report Section	Test Item	Result
2.2	1.3	Antenna Requirement	Pass
-	4.1	26 dB Bandwidth	Pass
-	4.1	Occupied Bandwidth (99%)	Pass
2.8	4.2	Radiated Spurious Emission	Pass
2.8	4.2	Receiver	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	125kHz
Test Channel Frequencies	125kHz

3.2 THE WORST MODE OF MEASUREMENT

AC Power Line Conducted Emission	
Test Condition	AC Power line conducted emission for line and neutral
Voltage/Hz	DC 12.9V
Test Mode	Mode 1:EUT power by power supply.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
Voltage/Hz	DC 12.9V
Test Mode	Mode 1:EUT power by power supply.
Worst Mode	☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4

Remark:

1. The worst mode was record in this test report.
2. For below 1G, AC power line conducted emission and radiation emission were performed the EUT transmit at the highest output power channel as worse case.

4. TEST RESULT

4.1 26DB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

4.1.1 Test Limit

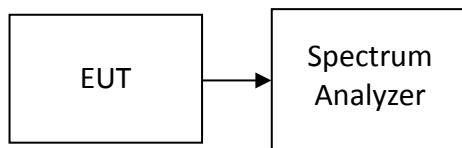
For Reporting purpose only.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.9,

1. Place the EUT on the table and set it in the transmitting mode
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer
3. Set the spectrum analyzer as RBW=10KHz, VBW=30KHz, Span=100KHz, Sweep = Auto.
4. Record the max. reading

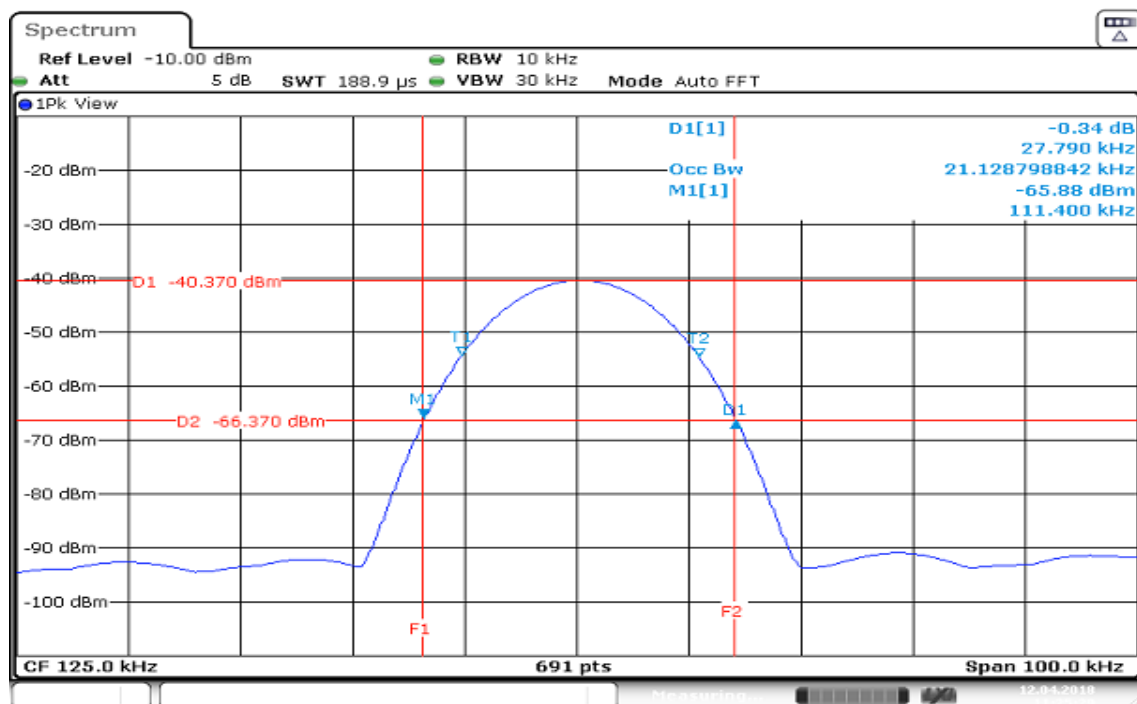
4.1.3 Test Setup



4.1.4 Test Result

Frequency(kHz)	Occupied Bandwidth 99% (kHz)	26 dB Bandwidth (kHz)
125	21.1287	27.7900

Test Data



Date: 12.APR.2018 11:25:29

4.2 RADIATION SPURIOUS EMISSION AND RECEIVER EMISSION

4.2.1 Test Limit

According to LP0002 section 2.8,

Below 30 MHz

Frequency	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Above 30 MHz

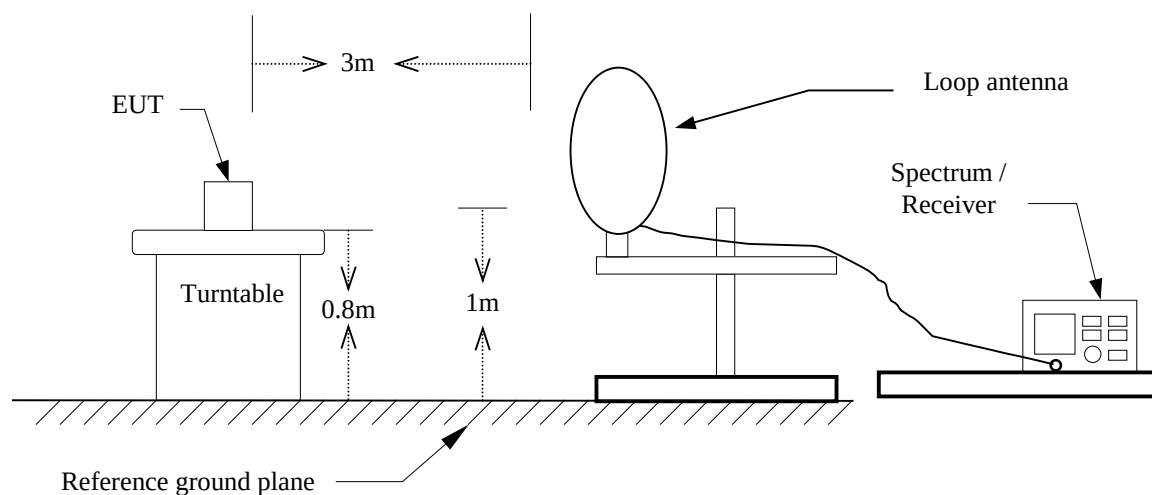
Frequency (MHz)	Field strength (uV/m)	Measurement distance
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

4.2.2 Test Procedure

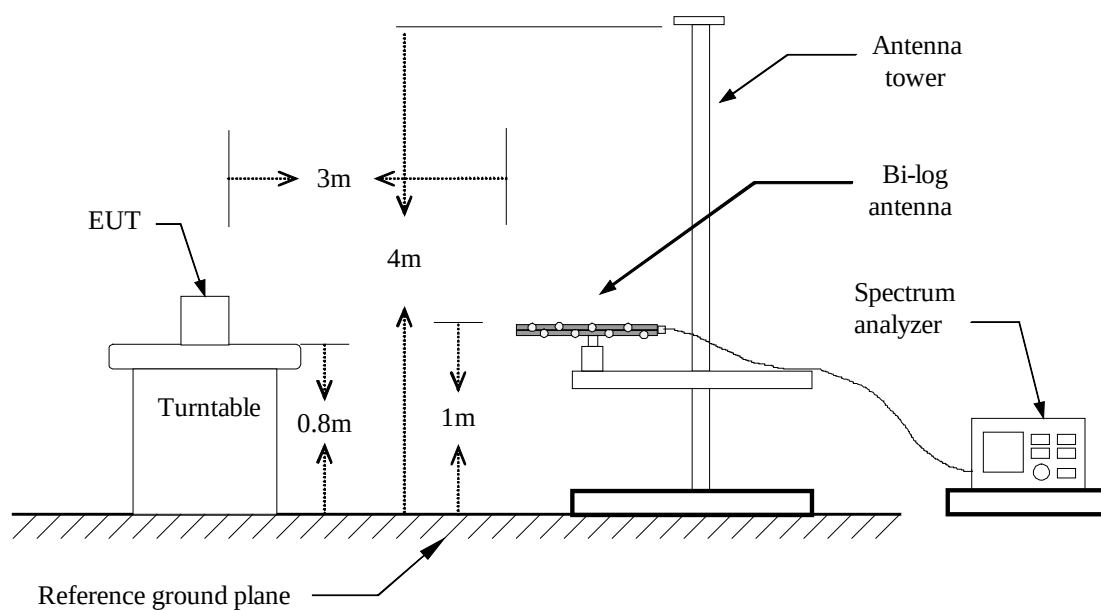
1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10, and the EUT set in a continuous mode.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.
3. Span shall wide enough to full capture the emission measured. The SA from 30MHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.
4. The SA setting following :
 - (1) Below 1G : RBW = 100kHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.
 - (2) Above 1G : RBW = 1MHz, VBW $\geq$ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

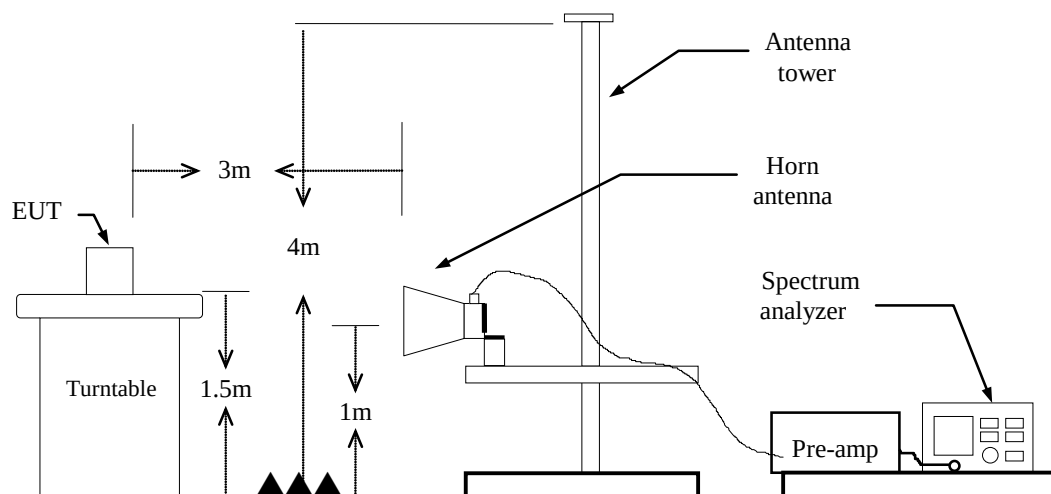
4.2.3 Test Setup

9kHz ~ 30MHz



30MHz ~ 1GHz

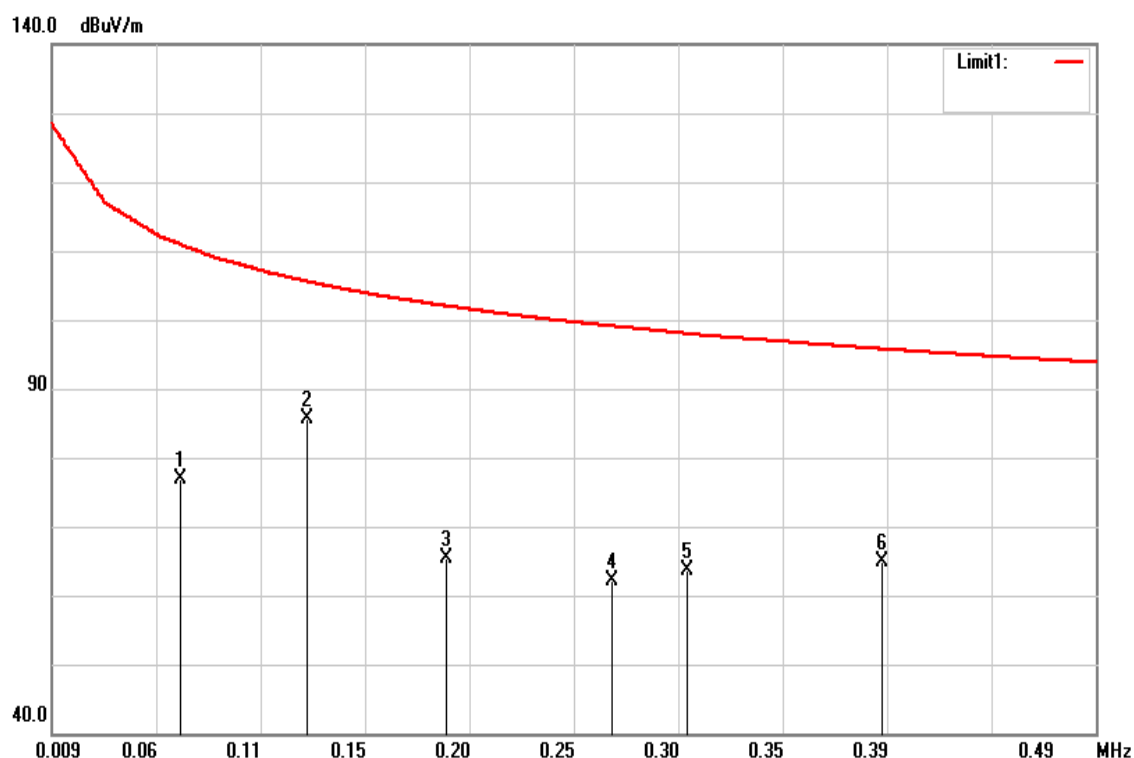


Above 1 GHz

4.2.4 Test Result

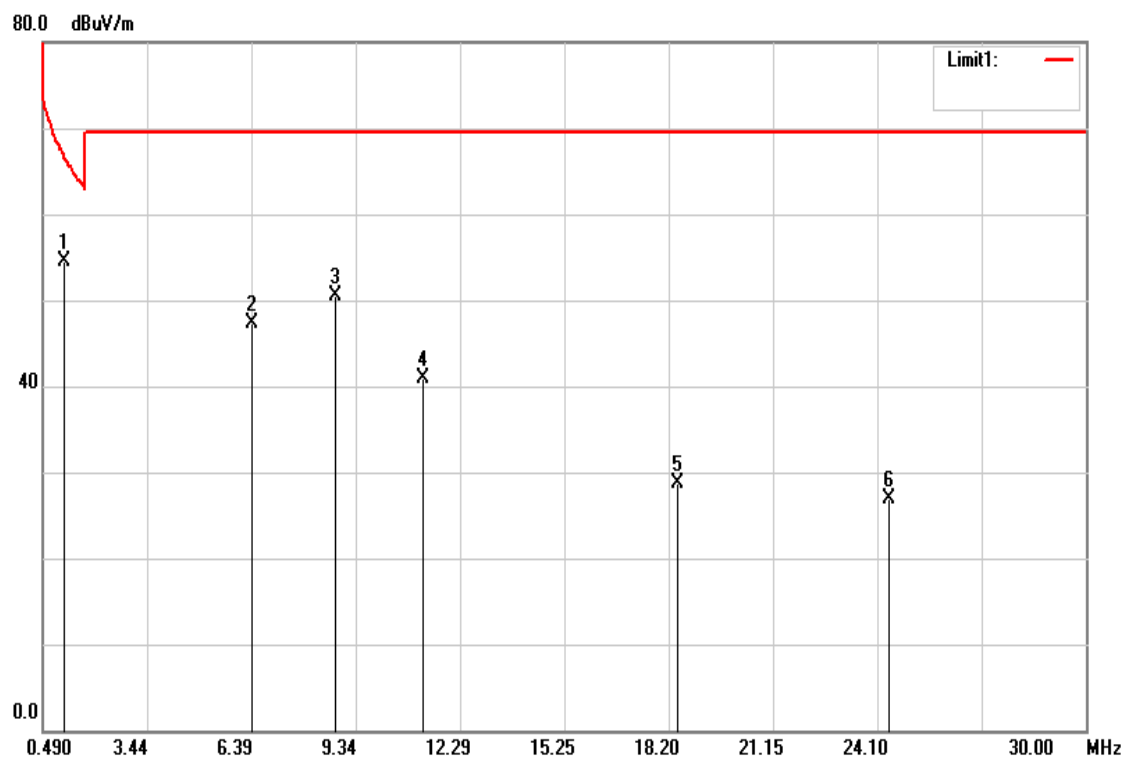
Radiated Spurious Emission

Test Mode:	TX mode	Temp/Hum	22(°C)/ 34%RH
Test Item	9kHz-490kHz	Test Date	April 12, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Qusai-peak	Test Voltage:	DC 12.9Vdc



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
0.0682	62.88	13.97	76.85	110.96	-34.11	peak
0.1264	72.26	13.45	85.71	105.58	-19.87	peak
0.1908	51.79	13.59	65.38	101.99	-36.61	peak
0.2668	48.48	13.75	62.23	99.08	-36.85	peak
0.3014	49.91	13.82	63.73	97.97	-34.24	peak
0.3914	51.04	13.86	64.90	95.74	-30.84	peak

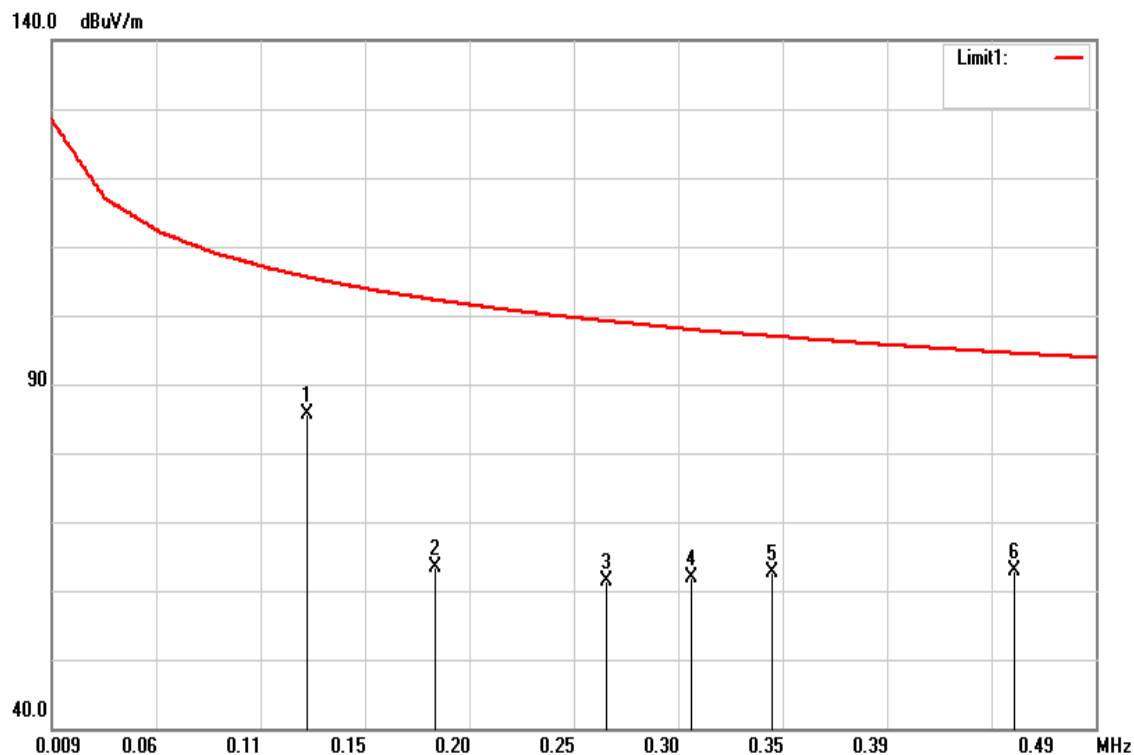
Test Mode:	TX Mode	Temp/Hum	22(°C)/ 34%RH
Test Item	490kHz-30MHz	Test Date	April 12, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Qusai-peak	Test Voltage:	DC 12.9Vdc



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1.0802	40.31	14.21	54.52	66.94	-12.42	peak
6.3920	32.48	14.73	47.21	69.54	-22.33	peak
8.7823	35.45	15.14	50.59	69.54	-18.95	peak
11.2612	25.70	15.28	40.98	69.54	-28.56	peak
18.4616	13.78	14.92	28.70	69.54	-40.84	peak
24.4226	12.94	13.89	26.83	69.54	-42.71	peak

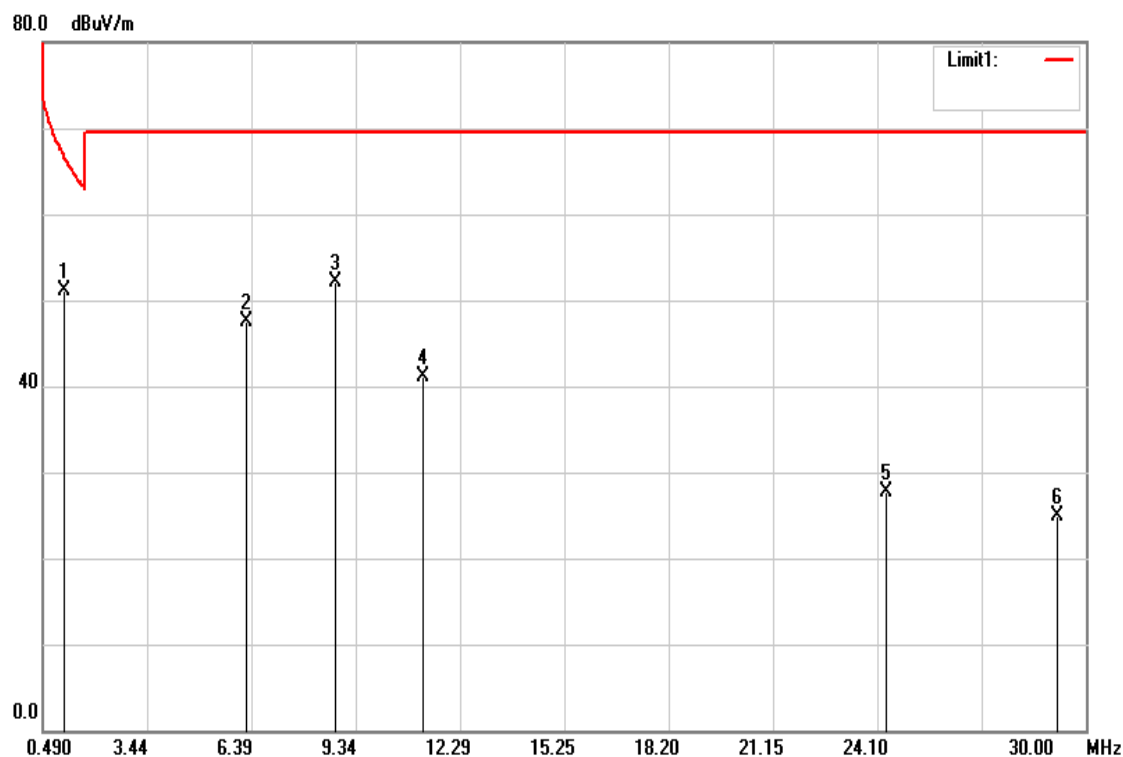
Receiver Emission

Test Mode:	RX mode	Temp/Hum	22(°C)/ 34%RH
Test Item	9kHz-490kHz	Test Date	April 12, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Qusai-peak	Test Voltage:	DC 12.9Vdc



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
0.1264	72.27	13.45	85.72	105.58	-19.86	peak
0.1855	49.73	13.58	63.31	102.22	-38.91	peak
0.2644	47.75	13.75	61.50	99.15	-37.65	peak
0.3034	48.06	13.82	61.88	97.90	-36.02	peak
0.3409	48.91	13.84	62.75	96.95	-34.20	peak
0.4525	49.12	13.88	63.00	94.48	-31.48	peak

Test Mode:	RX Mode	Temp/Hum	22(°C)/ 34%RH
Test Item	490kHz-30MHz	Test Date	April 12, 2018
Polarize	Horizontal	Test Engineer	Jerry Chuang
Detector	Peak and Qusai-peak	Test Voltage:	DC 12.9Vdc



Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1.0802	36.93	14.21	51.14	66.94	-15.80	peak
6.2444	32.86	14.70	47.56	69.54	-21.98	peak
8.7823	37.01	15.14	52.15	69.54	-17.39	peak
11.2612	25.81	15.28	41.09	69.54	-28.45	peak
24.3341	13.80	13.91	27.71	69.54	-41.83	peak
29.2032	12.12	12.86	24.98	69.54	-44.56	peak