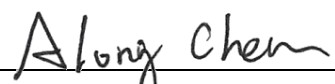


NCC Test Report

Equipment : Smart Key Fob
Model No. : SVI-MQ4FGE06
Brand Name : KIA
Applicant : Continental Automotive Systems Corporation
Address : 45-29, Saeum-ro, Icheon-si, Gyeonggi-do,
17308 Republic of Korea
Standard : LP0002 Section 3.4.2 (2018-01-10)
Received Date : Oct. 16, 2019
Tested Date : Oct. 22 ~ Oct. 24, 2019

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:


Along Chen / Assistant Manager

Approved by:

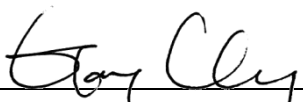

Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
TR9O1602	Rev. 01	Initial issue	Oct. 31, 2019

Summary of Test Results

NCC Rules	Test Items	Measured	Result
2.3	AC Power Line Conducted Emissions	Note ¹	N/A
3.4.2.5 (1)	Field Strength of Fundamental emissions	Meet the requirement of limit	Pass
3.4.2.5 (1) 2.8	Unwanted Emissions	Meet the requirement of limit	Pass
3.4.2.4(1)(A)	Transmission and Deactivation Time	Meet the requirement of limit	Pass
3.4.2.2	20dB bandwidth	Meet the requirement of limit	Pass
2.2	Antenna Requirement	Meet the requirement of limit	Pass
N/A means Not Applicable. Note¹: The EUT consumes DC power, so the test is not required.			

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information			
Modulation	Ch. Frequency	Channel Number	TX / RX
FSK	433.92 MHz	1	TX
FSK	125 kHz	1	RX

1.1.2 Antenna Details

Type	Connector	Gain (dBi)	Remark
PCB pattern Antenna	No	-20.35	For TX
Chip Antenna (L101); 3D Antenna	No	---	For RX

1.1.3 EUT Operational Condition

Power Supply Type	3Vdc from battery
-------------------	-------------------

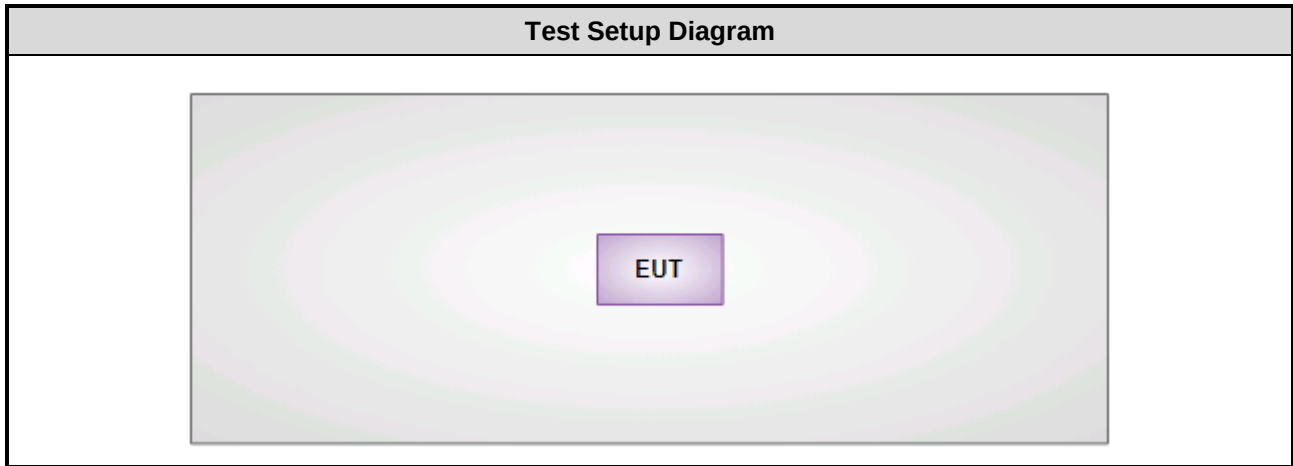
1.1.4 Accessories

N/A

1.2 Local Support Equipment List

N/A

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Jan. 07, 2019	Jan. 06, 2020
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 17, 2019	Apr. 16, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Jan. 07, 2019	Jan. 06, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2018	Nov. 14, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 09, 2018	Nov. 08, 2019
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 07, 2019	Oct. 06, 2020
Preamplifier	EMC	EMC02325	980187	Aug. 14, 2019	Aug. 13, 2020
Preamplifier	Agilent	83017A	MY53270014	Aug. 07, 2019	Aug. 06, 2020
Preamplifier	EMC	EMC184045B	980192	Aug. 01, 2019	Jul. 31, 2020
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 27, 2019	Sep. 26, 2020
RF cable-8M	EMC	EMC104-SM-SM-80 00	181107	Sep. 27, 2019	Sep. 26, 2020
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Sep. 27, 2019	Sep. 26, 2020
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800 -001	Sep. 27, 2019	Sep. 26, 2020
LF cable-3M	EMC	EMC8D-NM-NM-300 0	131103	Sep. 27, 2019	Sep. 26, 2020
LF cable-13M	EMC	EMC8D-NM-NM-130 00	131104	Sep. 27, 2019	Sep. 26, 2020
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

LP0002 Section 3.4.2 (2018-01-10)

ANSI C63.10-2013

ANSI C63.4-2014

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	±34.130 Hz
Radiated emission ≤ 1GHz	±3.41 dB
Radiated emission > 1GHz	±4.59 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH03-WS	24-25°C / 61-65%	Roger Lu
RF Conducted	TH01-WS	23°C / 61%	Aska Huang

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISSED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Mode
Field Strength of Fundamental emissions	FSK	432.92	TX
Unwanted Emissions	FSK	432.92	TX
Deactivation Time	FSK	432.92	TX
20dB bandwidth	FSK	432.92	TX
Note: 1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The Z-plane results were found as the worst case and were shown in this report.			

Test item	Mode	Test Frequency (kHz)	Mode
Field Strength of Fundamental emissions	FSK	125	RX
Note: 1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The Z-plane results were found as the worst case and were shown in this report.			

3 Transmitter Test Results

3.1 Radiated Emission

This section includes field strength of fundamental, field strength of harmonics and emissions radiated outside of the operating frequency bands.

3.1.1 Limit of field strength of fundamental and field strength of harmonics

Fundamental Frequency (MHz)	Field strength of fundamental (uV/m)	Field strength of harmonics (uV/m)
40.66~40.70	2250	225
70~130 (included)	1250	125
130 (excluded)~174 (included)	1250~3750 ^(note)	125~375 ^(note)
174 (excluded)~260 (included)	3750	375
260 (excluded)~470 (included)	3750~12500 ^(note)	375~1250 ^(note)
above 470 (excluded)	12500	1250

Note:
With linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:
 (1.1) 130-174MHz(MHz) == >56.81818×((frequency bands, MHz) – 6136.3636
 (1.2) 260-470MHz(MHz) == >41.6667×((frequency bands, MHz) - 7083.3333

3.1.2 Limit of Unwanted Emissions

The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level, or meets the requirement of Section 2.8, whichever is less. If the field strength is based on measurement instrumentation employing an average detector, it must meet the peak emissions of Section 5.15.2 °

Radiated emission limits in Section 2.8			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9~90 kHz, 110~490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.3 Test Procedures

1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

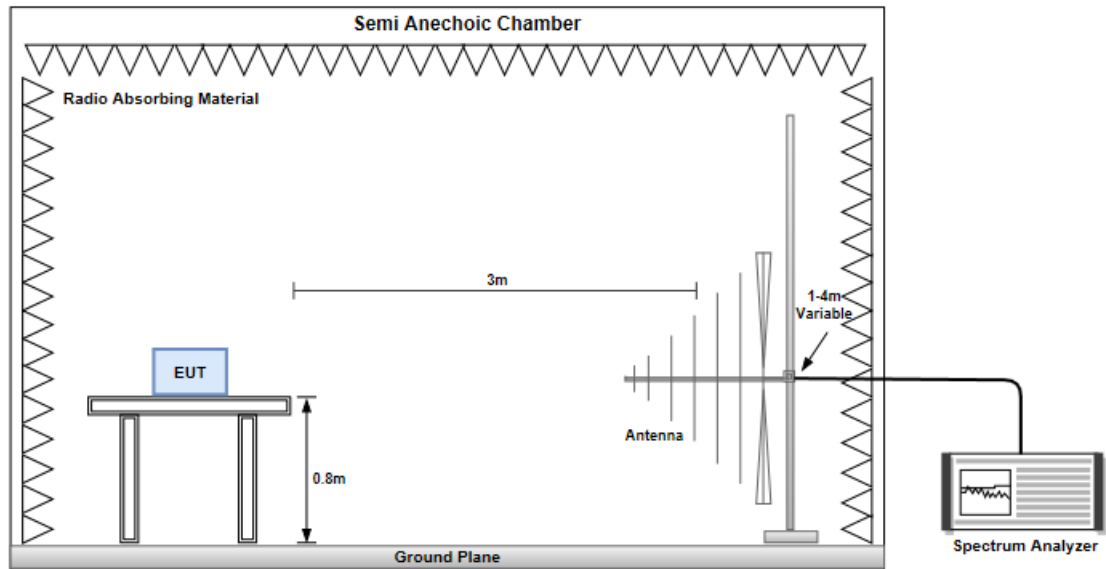
1. Radiated emission below 1GHz
120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission
 2. Radiated emission above 1GHz / Average value for other emissions
RBW=1MHz, VBW=1/T and Peak detector
 3. Radiated emission Peak value for fundamental
RBW=1MHz, VBW=3MHz and Peak detector
- Radiated emission above 1GHz / Average value for field strength of fundamental and harmonics
The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

4.
$$20\log(\text{Duty cycle}) = 20\log \frac{33.188 \text{ ms}}{100 \text{ ms}} = -9.58\text{dB}$$

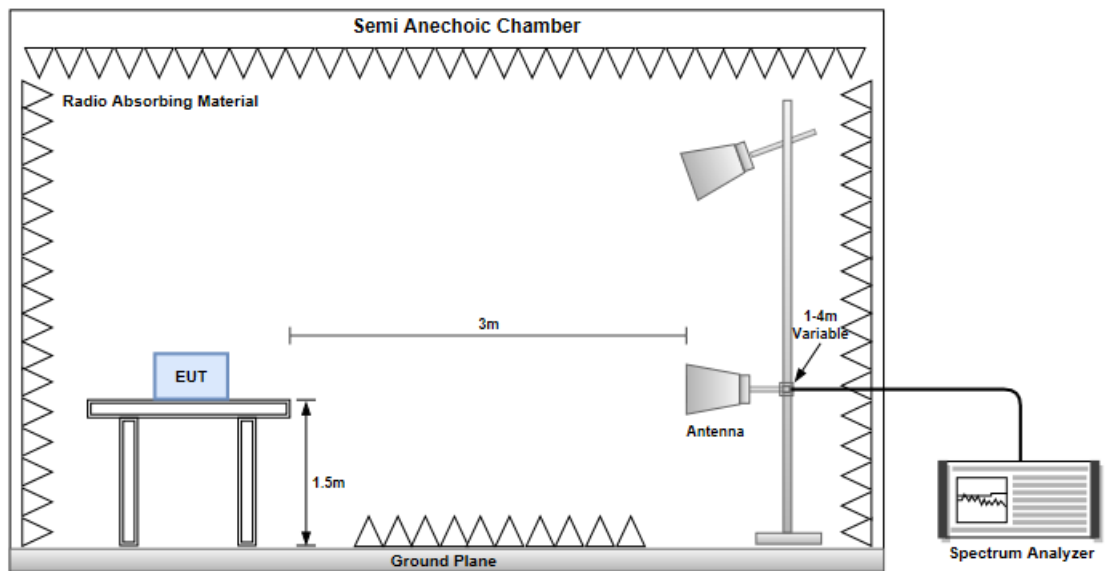
Please see page 19 for plotted duty

3.1.4 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.1.5 Transmitter Field strength of fundamental emissions and harmonics

Modulation	FSK		Test Freq. (MHz)		432.92				
Polarization	Horizontal								
Level (dBuV/m) <									

Modulation	FSK	Test Freq. (MHz)	432.92						
Polarization	Vertical								
Level (dBuV/m)									

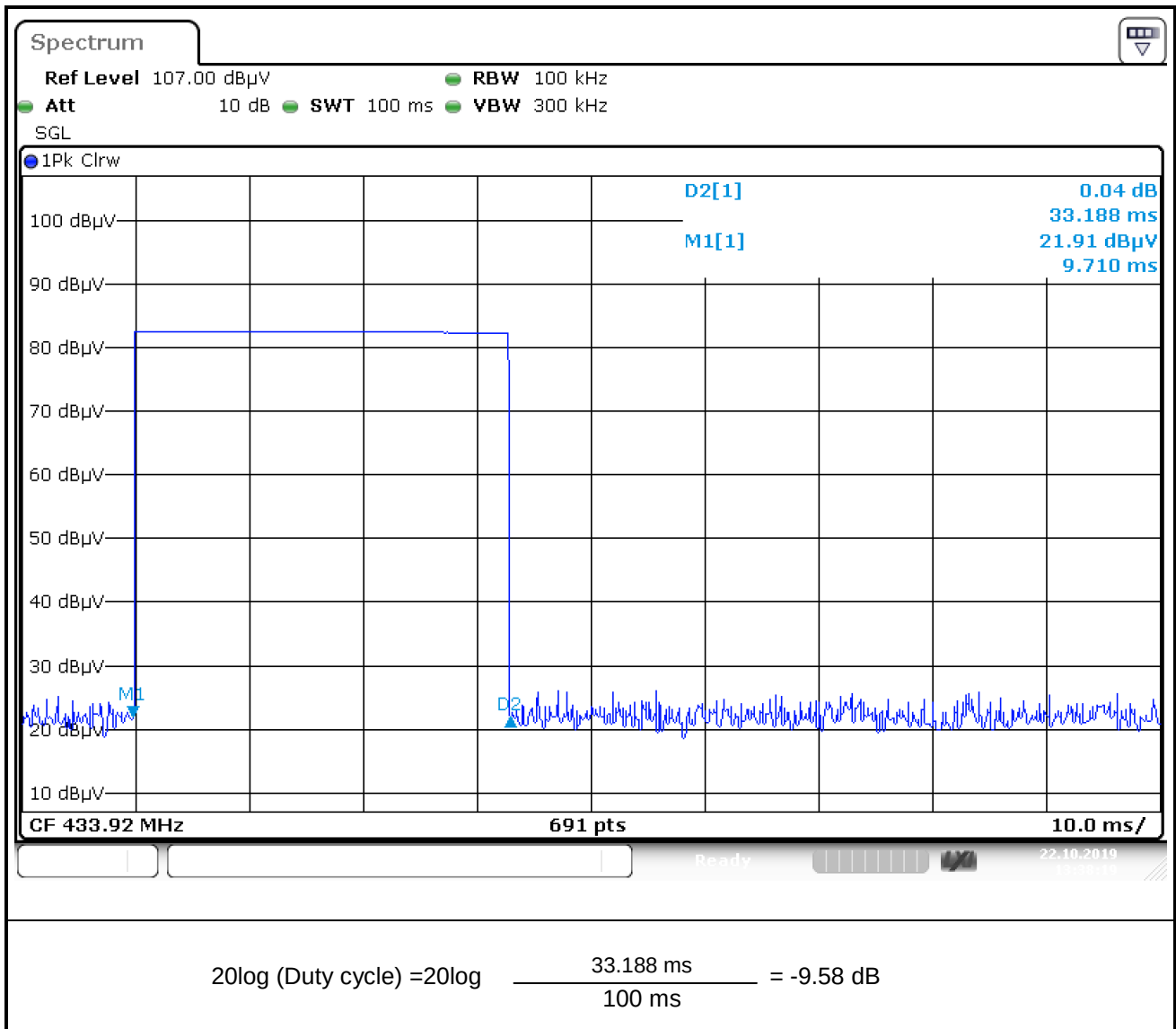
3.1.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	FSK			Test Freq. (MHz)		432.92			
Polarization	Horizontal								
Level (dBuV/m) <									

Modulation	FSK	Test Freq. (MHz)	432.92
Polarization	Vertical		
Level (dBUV/m)			

3.1.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	FSK	Test Freq. (MHz)	432.92
Polarization	Horizontal		
Level (dBuV/m)			



3.2 Transmission and Deactivation Time

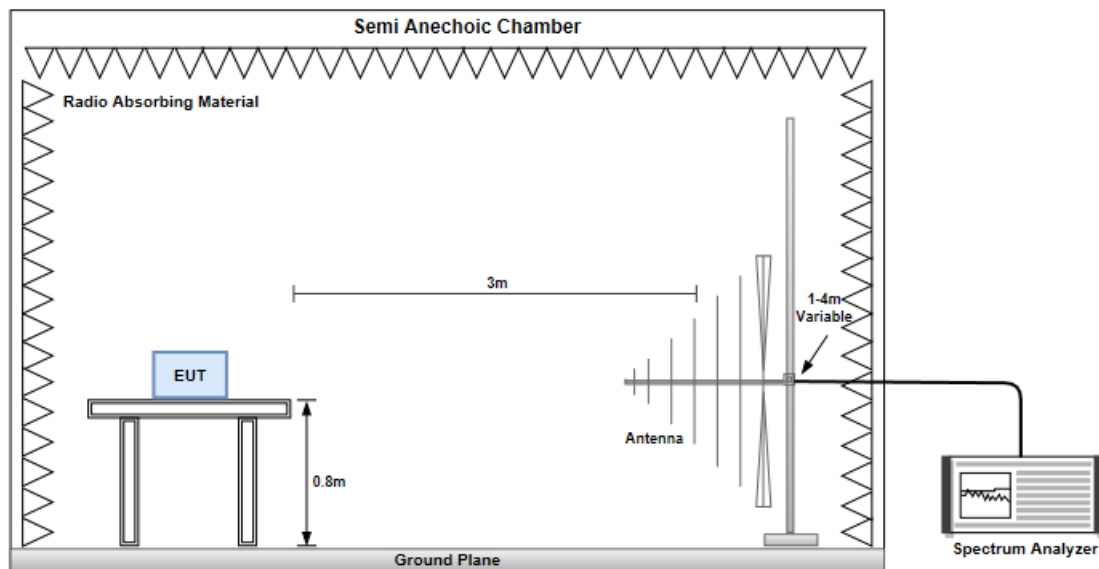
3.2.1 Limit of Transmission and Deactivation Time

For operation in 314 MHz ~ 316 MHz and 433 MHz ~ 435 MHz: A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds being released.

3.2.2 Test Procedures

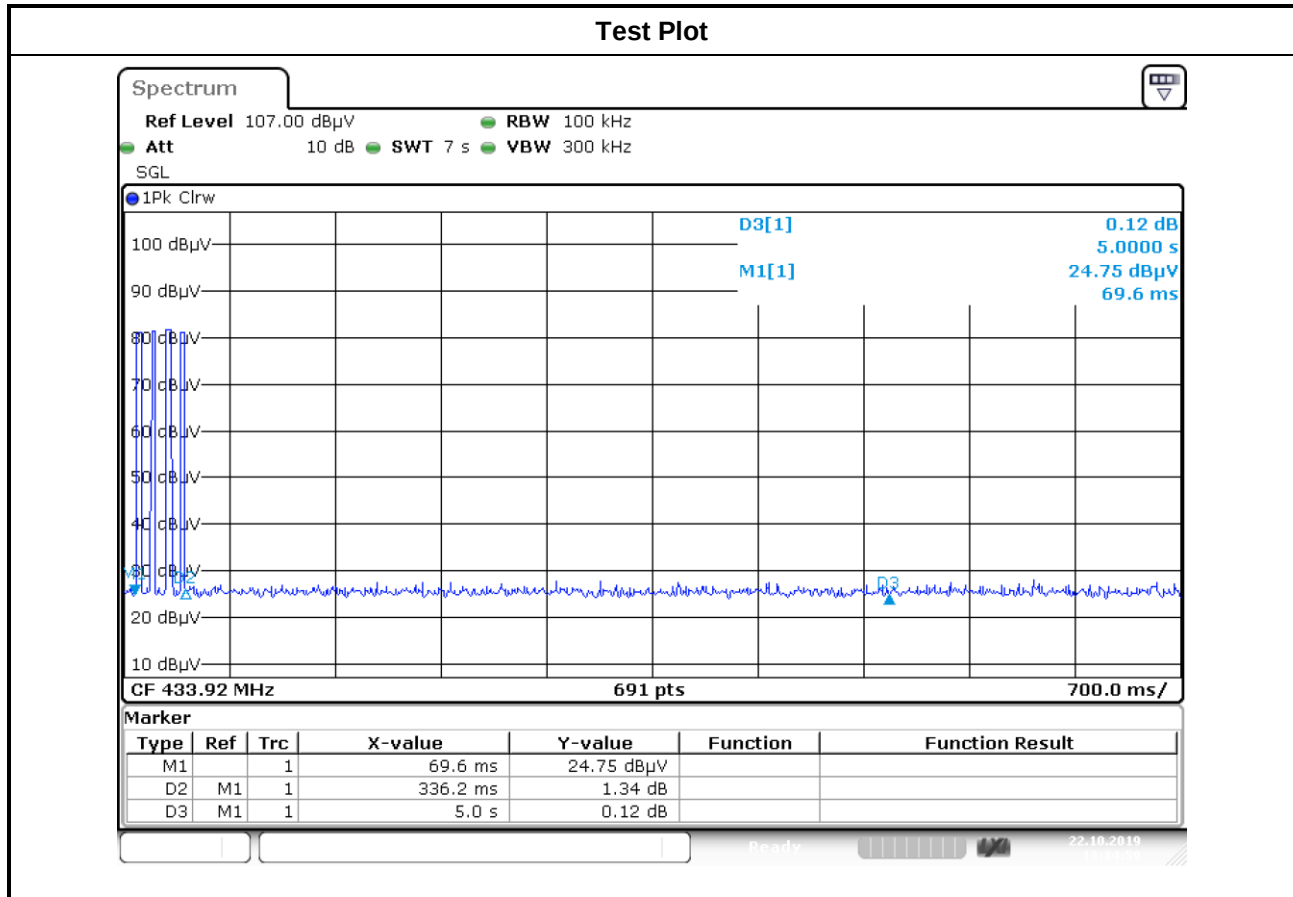
1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Set Sweep = fitting time as shown on plots of next pages, Allow the trace to stabilize.
4. Set the EUT to operates at operation modes then record the transmission and deactivation time.

3.2.3 Test Setup



3.2.4 Test Result

Transmission Time			
Frequency(MHz)	Transmission time (s)	Limit (s)	Pass/Fail
433.92	0.336200	5.00	PASS



3.3 20dB and Occupied Bandwidth

3.3.1 Limit of 20 dB Bandwidth

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz ~ 900 MHz.

3.3.2 Test Procedures

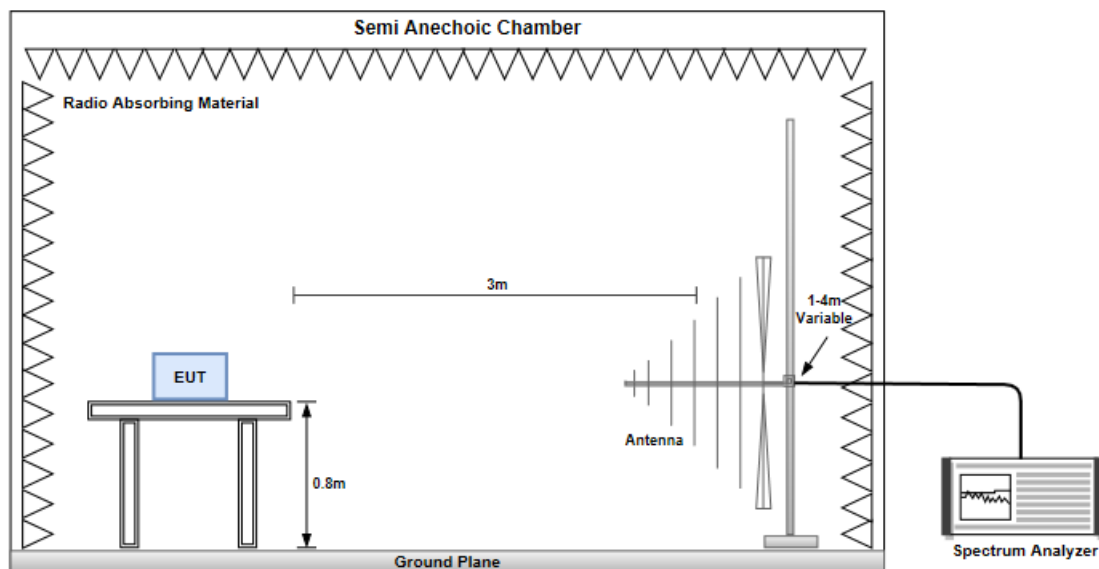
For 20dB bandwidth

1. Set resolution bandwidth (RBW) = 3 kHz, Video bandwidth = 10 kHz
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.

For Occupied bandwidth

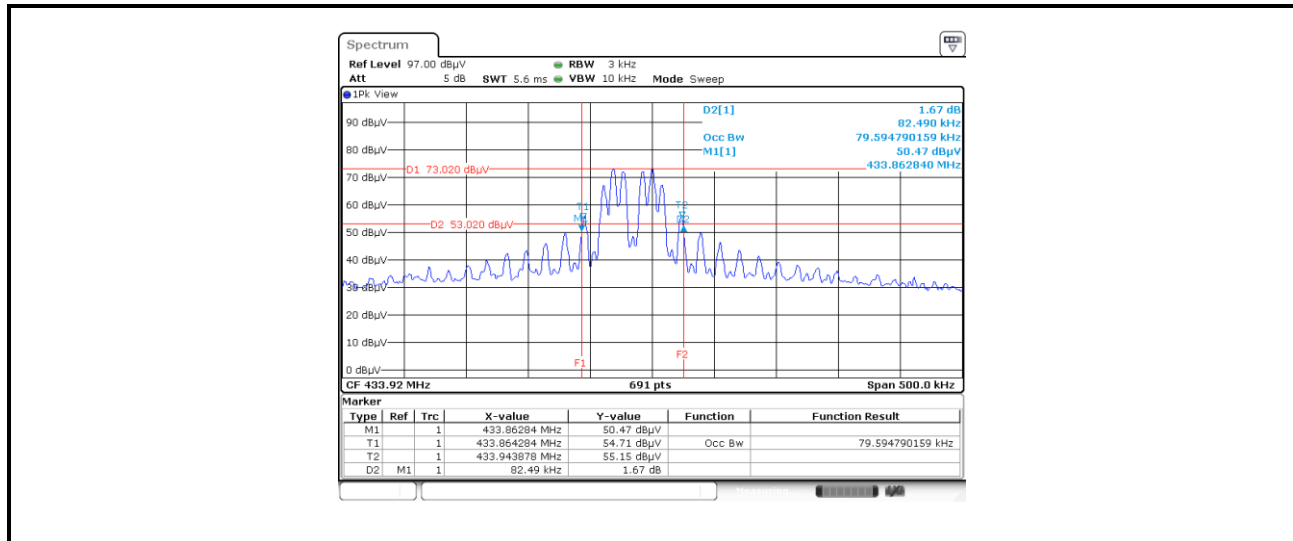
1. Set resolution bandwidth (RBW) = 3 kHz, Video bandwidth = 10 kHz
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the occupied measurement function of spectrum analyzer to measure 99% occupied bandwidth

3.3.3 Test Setup



3.3.4 20dB and Occupied Bandwidth

20dB and Occupied Bandwidth				
Frequency (MHz)	20dB Bandwidth (MHz)	20dB Bandwidth Limit (MHz)	99% Bandwidth (MHz)	Pass/Fail
433.92	0.08249	1.0848	0.0796	Pass



4 Receiver Test Results

4.1 Radiated Emissions

4.1.1 Limit of Radiated Emissions

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9~90 kHz, 110~490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

4.1.2 Test Procedures

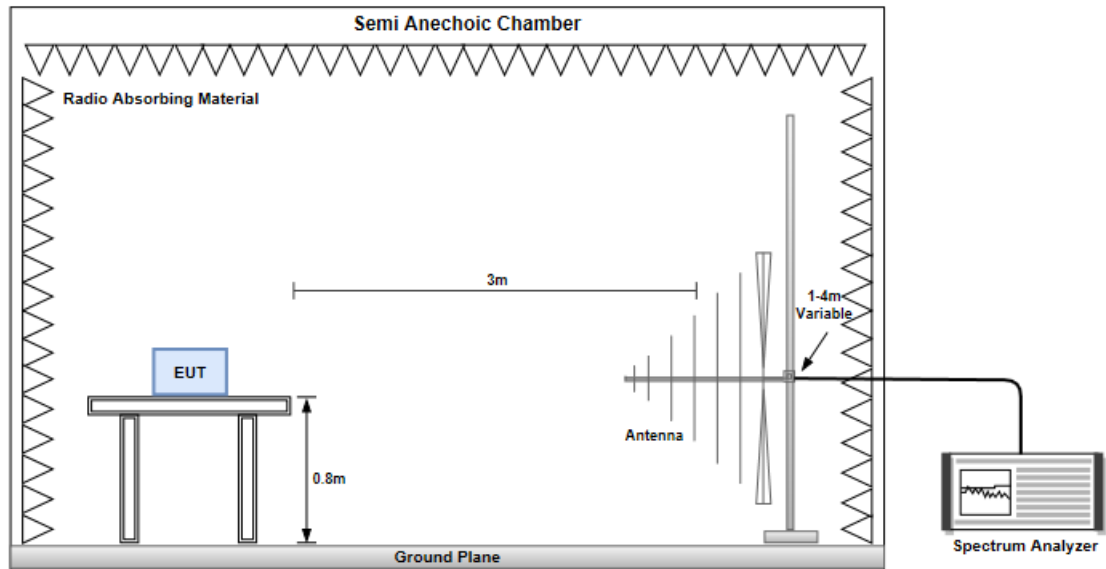
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.

4.1.3 Test Setup

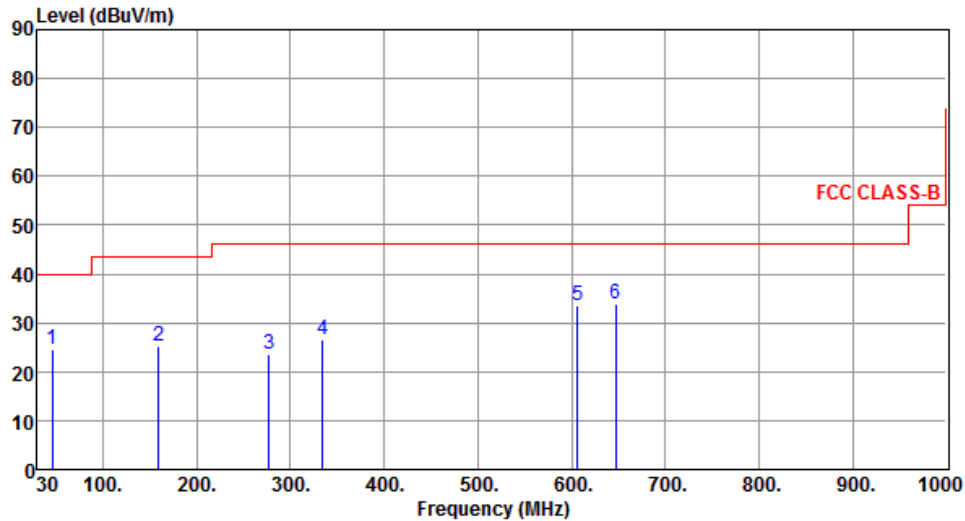
Radiated Emissions below 1 GHz



4.1.4 Receiver Emissions (Below 1GHz)

Modulation	FSK	Test Freq. (kHz)	125
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	FSK	Test Freq. (kHz)	125
Polarization	Vertical		



	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	45.49	24.58	40.00	-15.42	33.24	-8.66	Peak	---	---
2	159.12	25.37	43.50	-18.13	33.90	-8.53	Peak	---	---
3	277.42	23.64	46.00	-22.36	32.57	-8.93	Peak	---	---
4	334.62	26.47	46.00	-19.53	33.61	-7.14	Peak	---	---
5	606.22	33.68	46.00	-12.32	34.02	-0.34	Peak	---	---
6	646.92	33.86	46.00	-12.14	33.56	0.30	Peak	---	---

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

5 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

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Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd
St., Kwei Shan District, Tao Yuan
City 333, Taiwan, R.O.C.

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==