Test Report

MOVON CORPORATION
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Report No. :
MOV-15-EMC-I084
Page (1)/(18)Pages

1. Customer

- Company : DIGEN
- Address : 89, Seongseo4chacheomdan-ro, Dalseo-gu, Daegu, 704-801, Korea
- Date of receipt : 2015-10-22
- Contact Person : Jun Kim
- Telephone / Fax : +82-70-4850-3311 / +82-2-532-8811

2. Use of report : Evaluation of EMC test

3. Equipment Under Test

- Product name : Car Infotainment
- Model number : DGU-7T45-Q155SA
- FCC ID : 2AE77DGU7T45Q155SA

4. Date of test : 2015-11-04 ~ 2015-11-06

5. Applied Standards : FCC CFR 47 Part 15 Subpart B (Class B)
ANSI C63.4-2009

6. Test results

Test Items	Test Results
Conducted Emission	Complied
Radiated Emission (BELOW 1 GHz)	Complied
Radiated Emission (ABOVE 1 GHz)	Complied

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

Affirmation	Tested by Name : Choi Hong Sun	Techincal manager Name : Gi Wang Kim

2015-11-19

MOVON Corporation

Report History

Revision	Date	Description
-	2015-11-19	Initial release

Table of Contents

1 General Information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 2.2. The MOVON CORP. does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the MOVON CORP.

1.2 Testing Laboratory

Test Location :
MOVON CORPORATION.

♦Yongin Laboratory
P. O. box 449-812
Address : 498-2, Geumeo-ro, Pogok-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
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E-mail : emclab@movon.co.kr
Internet : http://www.movonlab.co.kr

2 Applicant Information

2.1 EUT Details

Product name	**Car Infotainment**
Model number	**DGU-7T45-Q155SA**
Serial number	**N/A**
Power supply	**DC 12 V**
Frequency range	**2 400 MHz ~ 2 483.5 MHz**
FCC ID	**2AE77DGU7T45Q155SA**
Manufacture	**DIGEN / Korea**

2.2 Test mode and Condition

Test mode	**Normal Operation Mode**
Test voltage	**DC 12 V**

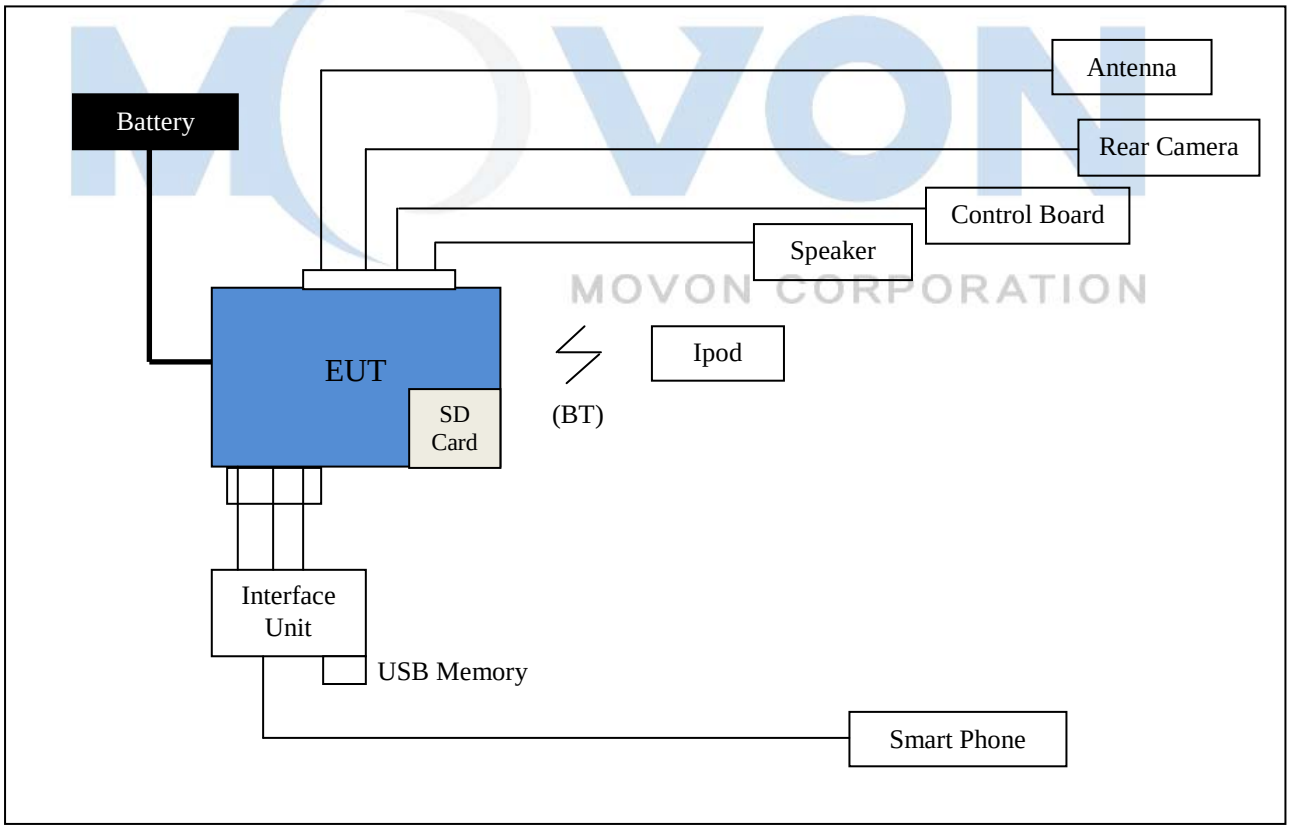
2.3 Peripheral Equipment

Description	Model	Serial No.	Manufacturer
Car Infotainment	DGU-7T45-Q155SA	N/A	DIGEN
Antenna	N/A	N/A	N/A
Speaker	N/A	N/A	N/A
Rear Camera	N/A	N/A	N/A
Control Board	N/A	N/A	DIGEN
Ipod	A1509	CCQL834UFFCJ	Apple
Smart Phone	LG-LS980	N/A	LG
Interface Unit	N/A	N/A	DIGEN
USB Memory	XTICK	N/A	LG
SD Card Memory	4GB	N/A	APRIME
Battery	BX80R	N/A	ATLAS BX

2.4 Cable list

Start		END		Cable Spec.	
Name	I/O Port	Name	I/O Port	Length(m)	Shield
EUT	Power IN	Battery	Power OUT	2.0	Unshielded
	SD Card Slot	SD Card	-	Direct	-
	Interface Port1	Interface Unit	-	1.5	Unshielded
	Interface Port2	Interface Unit	-	1.5	Unshielded
	Interface Port3	Interface Unit	-	1.5	Unshielded
	Interface Port4	Speaker	-	2.0	Unshielded
	Interface Port4	Control Board	-	2.0	Unshielded
	Wireless(BT)	Ipod	-	-	-
	Interface Port4	Rear Camera	-	2.0	Unshielded
	Interface Port4	Antenna	-	2.0	Unshielded
Interface Unit	HDMI	Smart Phone	-	1.8	Unshielded
	USB Port	USB Memory	-	Direct	-

2.5Test System Layout



Signal
Main Power

3 Description of Tests

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2009. The measurement was performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 10 KHz or for "quasi-peak" within a bandwidth of 9 KHz.
The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table which is placed 40cm away from the vertical wall and 1.5m away from the side wall of the chamber room. Two LISNs are bonded to bottom plane of the shielded room. The EUT is powered from the Com-power LISN and the support equipment is powered from the another Com-power LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the Com-power LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling (serpentine fashion) to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the Signal Analyzer Spectrum Analyzer to determine the frequency producing the max. Emission from the EUT. The frequencies are producing the max. Level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission reported was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

3.2 Radiated Emission Measurement

Preliminary measurements were made at indoors 3 meter semi EMC Anechoic Chamber using broadband antennas, broadband amplifier, and spectrum analyzer to determine the emission frequencies producing the maximum EME.

Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth with respect to the antenna was noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using bilog antenna and above 1000MHz, linearly polarized double ridge horn antennas were used. Above 1GHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies which were selected as bottom, middle and top frequency in the operating band. Emission levels from the EUT with various configurations were examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 10-meter test range using bilog antenna. The output from the antenna was connected, via a pre-selector or a preamplifier, to the input of the EMI Measuring Receiver and Spectrum analyzer(for above 1GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth on the Field strength receiver was set to at least 120kHz (1MHz for measurement above 1GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission The EUT, support equipment and interconnecting cables were configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1m x 1.5 meter table. The turntable containing the system was rotated and the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Each emission was maximized by varying the mode of operating frequencies of the EUT. The system was tested in all the three orthogonal planes and changing the polarity of the antenna. The worst case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor(20dB/decade) as per section 15.31(f).

Photographs of the worst-case emission test setup can be seen in Appendix 1.

4 Test Condition

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

Radiated Emission Test

Preliminary radiated emission tests were conducted using the procedure in ANSI C63.4/2009 Clause 8.3.1.1 to determine the worst operating condition. Final radiated emission tests were conducted at 10 meter open field test site.

5 Test summary and results

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

FCC Rule Parts	Measurement Required	Result
15.107(a)	Conducted Emission	Pa ssed by – 34.06 dB
15.109(a)	Radiated Emissions	Pa ssed by – 12.22 dB

The data collected shows that the iMK Co., Ltd. 3D ACTIVE GLASSES models : iAG-401(X) and family models comply with technical requirements of the Part 15.107 and 15.109 of the FCC Rules.

5.2 Conducted Emission

5.2.1 Test Results : **Complied**

5.2.2 Measurement equipment

Kind of Equipment	Manufacture / Model	S/N	Calibrated until
TWO LINE-V-NETWORK	Rohde & Schwarz / ESH3-Z5	100296	2015-12-11
EMI TEST RECEVER	Rohde & Schwarz / ESR3	101873	2016-01-12

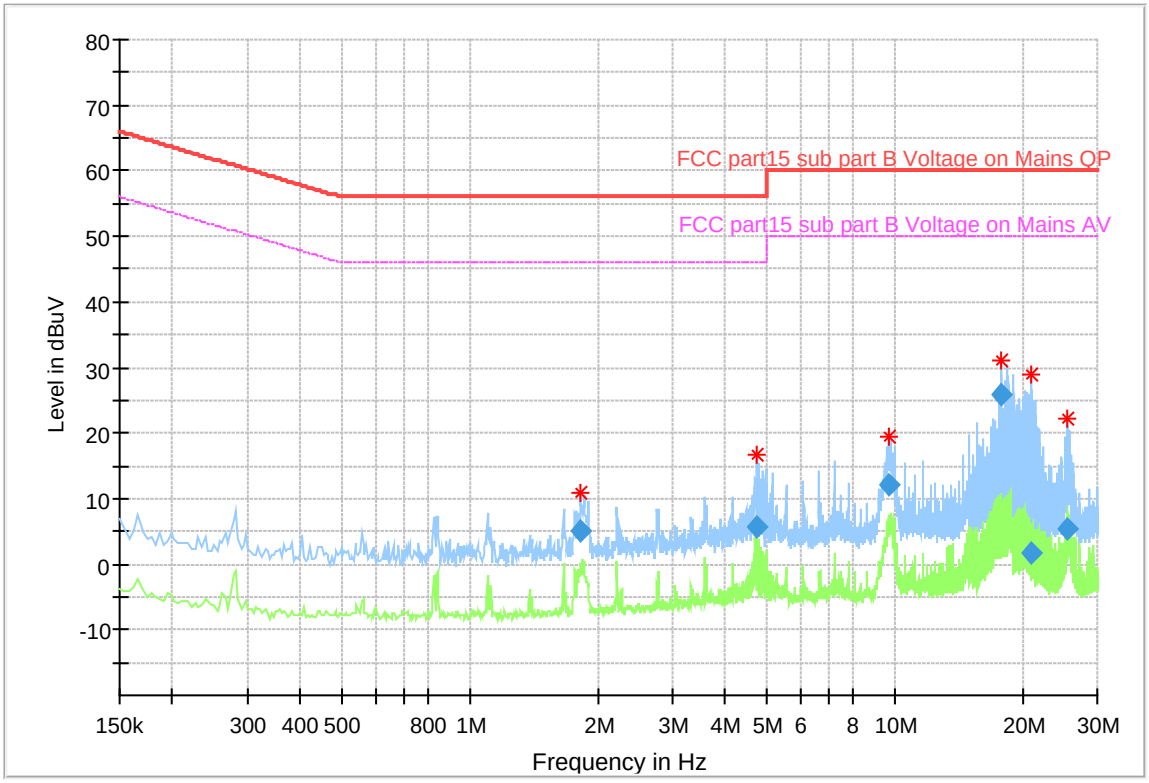
5.2.3 Testing Environment

Test Date : 2015-11-04
Temperature : 22.5 ℃
Humidity : 42 % RH

5.2.4 Test Data

Common Information

Test Description:	Conducted Emission
Test Site:	Shield Room
Test Line:	Positive
Model Name:	DGU-7T45-Q155SA
Test Mode:	Bluetooth mode

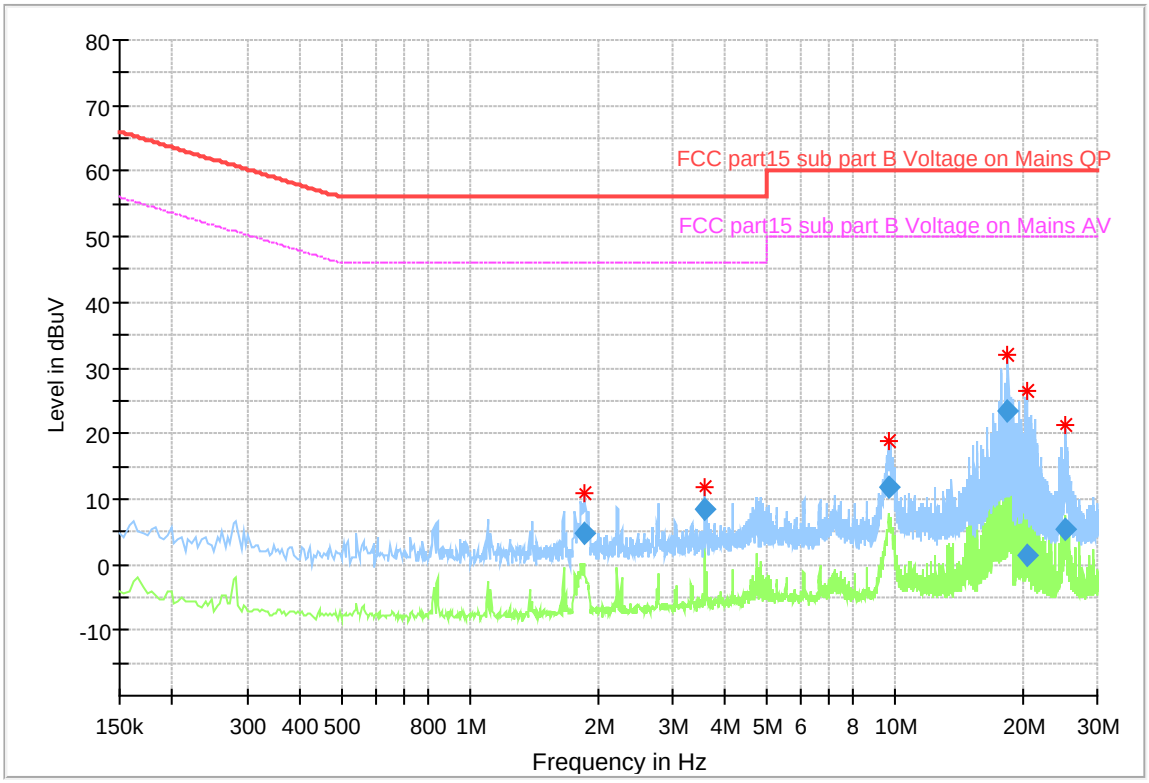


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
1.83	5.03	---	56.00	50.97	1000.0	9.000	Single Line	0.18
4.73	5.78	---	56.00	50.22	1000.0	9.000	Single Line	0.23
9.75	12.08	---	60.00	47.92	1000.0	9.000	Single Line	0.30
17.89	25.94	---	60.00	34.06	1000.0	9.000	Single Line	0.41
20.96	1.82	---	60.00	58.18	1000.0	9.000	Single Line	0.40
25.54	5.32	---	60.00	54.68	1000.0	9.000	Single Line	0.47

Common Information

Test Description:	Conducted Emission
Test Site:	Shield Room
Test Line:	Negative
Model Name:	DGU-7T45-Q155SA
Test Mode:	Bluetooth mode



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
1.86	4.63	---	56.00	51.37	1000.0	9.000	Single Line	0.19
3.58	8.34	---	56.00	47.66	1000.0	9.000	Single Line	0.21
9.74	11.71	---	60.00	48.29	1000.0	9.000	Single Line	0.32
18.50	23.53	---	60.00	36.47	1000.0	9.000	Single Line	0.43
20.49	1.47	---	60.00	58.53	1000.0	9.000	Single Line	0.43
25.17	5.34	---	60.00	54.66	1000.0	9.000	Single Line	0.50

Note.

1. H : Hot Line , N :Neutral Line
2. Emission Level = Reading + Correction Factor
3. Margin = Emission Level – Limit
4. Measurement uncertainty estimated at ±3.500 dB.
   The measurement uncertainty is given with a confidence of 95.00 % with the coverage factor, k=2.

5.3 Radiated Emissions (BELOW 1 GHz)

5.3.1 Test Results : **Complied**

5.3.2 Measurement equipment

Kind of Equipment	Manufacture / Model	S/N	Calibrated until
EMI TEST Receiver	Rohde & Schwarz / ESVS30	829673/015	2016-05-12
Antenna Mast	INNCO / MA4000-EP	MA4000/285/23880210/L	N/A
Controller	INNCO / CO2000	CO2000/561/23880210/L	N/A
Bilog-Antenna	A.H. System / SAS-521-7	128	2017-11-02

5.3.3 Testing Environment

Test Date : 2015-11-06
Temperature : 9.3 ℃
Humidity : 55 % RH

5.3.4 Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical
Measurement Distance : 3 meters

Frequency [MHz]	Reading [dBuV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBuV/m]	Emission Level [dBuV/m]	Margin [dB]
154.07	5.69	V	19.97	1.74	43.52	27.40	16.12
192.15	15.69	V	11.27	1.84	43.52	28.80	14.72
462.26	12.54	H	18.21	3.05	46.02	33.80	12.22
500.33	11.70	V	18.70	3.20	46.02	33.60	12.42
539.19	10.49	H	19.49	3.32	46.02	33.30	12.72
578.17	6.87	V	20.29	3.43	46.02	30.60	15.42

NOTES :
1. * H : Horizontal polarization , ** V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss + AMP Gain
3. Margin value = Emission Level - Limit
4. All other emissions not reported were more than 25dB below the permitted limit.
5. Measurement uncertainty estimated at ±4.728 dB.

The measurement uncertainty is given with a confidence of 95.00 % with the coverage factor, k=2.

5.4 Radiated Emissions (ABOVE 1 GHz)

5.4.1 Test Results : **Complied**

5.4.2 Measurement equipment

Kind of Equipment	Manufacture / Model	S/N	Calibrated until
EMI Receiver	Rohde & Schwarz / ESIB26	100196	2015-12-11
Antenna Master	INNCO / MA4000-EP	D-92521	N/A
Controller	INNCO / CO2000	CO2000/561/23880210/L	N/A
Horn Antenna	R&S / HF906	100236	2017-07-24
Pre amplifier	MITEQ / AFS42-00101800-25-S-42	973164	2015-12-11

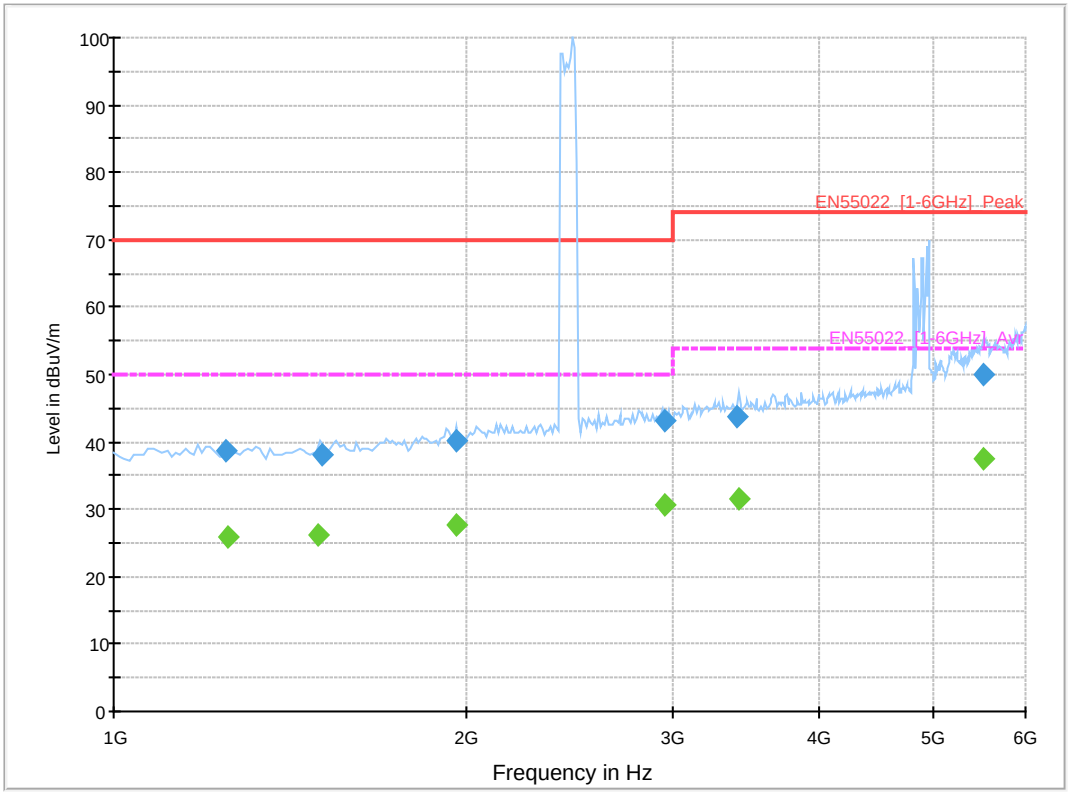
5.4.3 Testing Environment

Test Date : 2015-11-05
Temperature : 22.5 ℃
Humidity : 49 % RH

5.4.4 Test Data for above 1 GHz

Common Information

Test Description:	Radiated Emission Above 1GHz
Polarizaion:	Horizontal
Test Site:	3M Semi Anechoic Chamber
Model Name:	DGU-7T45-Q155SA
Test Mode:	Bluetooth mode



Final Result 1

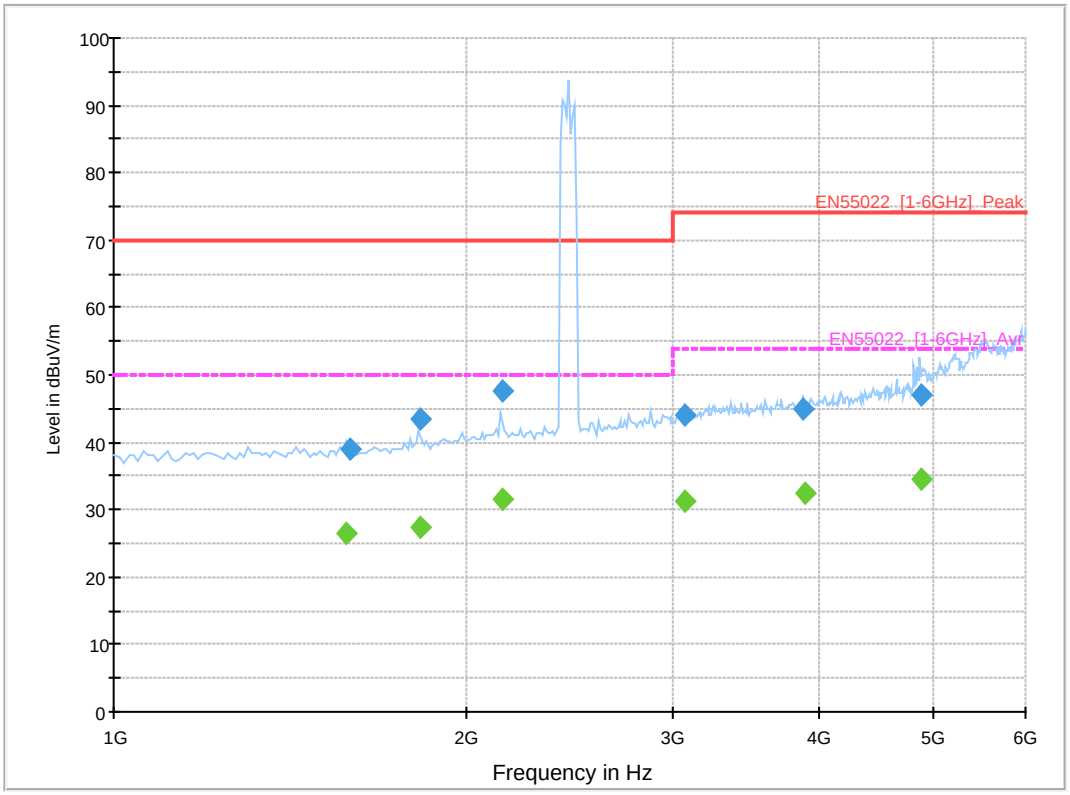
Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Limit (dBuV/m)
1248.501002	38.6	1000.0	1000.000	H	80.0	-12.7	70.00
1508.602004	38.1	1000.0	1000.000	H	74.0	-11.3	70.00
1963.923848	40.1	1000.0	1000.000	H	277.0	-9.1	70.00
2952.687776	43.1	1000.0	1000.000	H	236.0	-5.5	70.00
3407.229659	43.7	1000.0	1000.000	H	133.0	-4.2	74.00
5516.238076	50.1	1000.0	1000.000	H	70.0	3.1	74.00

Final Result 2

Frequency (MHz)	CAverage (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Limit (dBuV/m)
1250.101002	25.8	1000.0	1000.000	H	80.0	-12.7	50.00
1495.002004	26.1	1000.0	1000.000	H	74.0	-11.3	50.00
1962.323848	27.7	1000.0	1000.000	H	277.0	-9.1	50.00
2953.887776	30.6	1000.0	1000.000	H	236.0	-5.5	50.00
3421.229659	31.6	1000.0	1000.000	H	133.0	-4.2	54.00
5517.838076	37.4	1000.0	1000.000	H	70.0	3.1	54.00

Common Information

Test Description:	Radiated Emission Above 1GHz
Polarizaion:	Vertical
Test Site:	3M Semi Anechoic Chamber
Model Name:	DGU-7T45-Q155SA
Test Mode:	Bluetooth mode



Final Result 1

Frequency (MHz)	MaxPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Limit (dBuV/m)
1589.962325	39.0	1000.0	1000.000	V	0.0	-10.9	70.00
1824.443287	43.4	1000.0	1000.000	V	157.0	-9.7	70.00
2147.884569	47.5	1000.0	1000.000	V	0.0	-8.3	70.00
3070.548297	44.1	1000.0	1000.000	V	66.0	-5.1	74.00
3881.751503	44.8	1000.0	1000.000	V	0.0	-3.0	74.00
4882.155511	46.9	1000.0	1000.000	V	170.0	0.0	74.00

Final Result 2

Frequency (MHz)	CAverage (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Corr. (dB)	Limit (dBuV/m)
1579.962325	26.5	1000.0	1000.000	V	0.0	-10.9	50.00
1824.443287	27.5	1000.0	1000.000	V	157.0	-9.7	50.00
2147.484569	31.5	1000.0	1000.000	V	0.0	-8.3	50.00
3071.748297	31.1	1000.0	1000.000	V	66.0	-5.1	54.00
3885.751503	32.5	1000.0	1000.000	V	0.0	-3.0	54.00
4886.155511	34.4	1000.0	1000.000	V	170.0	0.1	54.00

Appendix . FCC ID Label and location

Product Label Sample with FCC ID Label information

Following is a sample copy of the label that will be placed on the rear cabinet of the product.
The FCC identifier is marked in the product label.
The warning statement and Information to the User are described in the user manual.

GreenChips Co., Ltd

Product Name : Car Infotainment
Model Name : DGU-7T45-Q155SA
FCC ID : 2AE77DGU7T45Q155SA

This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received,
including interference that may cause undesired operation.

Made In KOREA