

FCC EVALUATION REPORT FOR CERTIFICATION

Test Report No.	E13WD-191		
Date of test	Oct. 18, 2013	Date of Issuing	Oct. 18, 2013

Applicant	Samsung SDS Co., Ltd.		
Address	707-19, Youksam 2-dong, Kangnam-gu, Seoul, 135-918, Korea		
Manufacturer	Samsung SDS Co., Ltd.		
Address	707-19, Youksam 2-dong, Kangnam-gu, Seoul, 135-918, Korea		
Telephone No.	+82-2-6484-0557	Fax No.	+82-2-6484-0688

Type of Equipment	MiBUS (BUS Management System)		
Model Name	SMT-500P	Serial Number	N/A
Multi Model Name	N/A	Brand Name	N/A

The device bearing the brand name and FCC is specified about has been shown to comply with the applicable, Technical standard as indicated in the measurement report and was tested in accordance with measurement procedures specified in **ANSI (C63.4: 2003)**

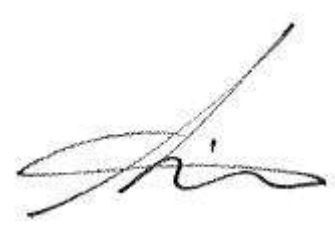
The equipment complies with the regulation; **FCC Part 15 Subpart B (Class B Unintentional Radiators)**

This test report contains only the results of a single test of the sample supplied for the examination.

Tested by: 

Seon-Mi, Mun / Engineer

StandardBank / EMC Testing Team

Reviewed by: 

Chang-Woo, Kim / Assistan Manager

StandardBank / EMC Testing Team

CONTENTS

	PAGE
1. CERTIFICATION OF COMPLIANCE	3
2. GENERAL INFORMATION	4
2.1 PRODUCT DESCRIPTION	4
2.2 FAMILY MODEL DESCRIPTIONS	4
2.3 RELATED SUBMITTAL(S) / GRANT(S)	4
2.4 TEST SYSTEM DETAILS	5
2.5 TEST METHODOLOGY	5
2.6 TEST FACILITY	5
3. SYSTEM TEST CONFIGURATION	6
3.1 MODE OF OPERATION DURING THE TEST	6
3. 2 CABLE DESCRIPTION	6
3.3 TEST SET-UP CONFIGURATION FOR EUT	7
3.4 EQUIPMENT MODIFICATIONS	8
3.5 CONFIGURATION OF TEST SYSTEM	8
4. PRELIMINARY TEST	9
4.1 CONDUCTED EMISSION TEST	9
4.2 RADIATED EMISSION TEST	9
5. FINAL RESULT OF MEASUREMENT	10
5.1 CONDUCTED EMISSION TEST	10
5.2 RADIATED EMISSION TEST [30 MHz ~ 1 000 MHz]	12
5.3 RADIATED EMISSION TEST [1 000 MHz ~ 6 000 MHz]	18
6. FIELD STRENGTH CALCULATION	20
7. LIST OF TEST EQUIPMENT	21
8. TEST SET-UP PHOTOS (CONDUCTED EMISSION)	22
9. TEST SET-UP PHOTOS (RADIATED EMISSION)	23
10. PHOTOGRAPHS OF EUT	34

1. Certification OF COMPLIANCE

DEVICE TYPE	CLASS B Digital devices
EUT DESCRIPTION	MiBUS (BUS Management System)
MEASUREMENT PROCEDURES	ANSI C63.4: 2003
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15, Subpart B SECTION 15.109
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	3 m Semi-Anechoic Chamber

The above equipment was tested by StandardBank Co., LTD. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

Samsung SDS Co., Ltd. Model SMT-500P (referred to as the EUT in this report) is a MiBUS (BUS Management System).

Product specification described herein was obtained from product data sheet or user's manual.

Chassis Type	Plastic
LIST OF EACH OSC. Or CRY. FREQ.(FREQ.>=1 MHz	-
Number of Layer	-
Power Requirement	DC 24 V
Exteranal Connector	MAIN CABLE, USB, MIC, LAN(RJ-45)

2.2 Family model descriptions

-None.

2.3 Related Submittal(s) / Grant(s)

- Original submittal only

2.4 Test System Details

The model numbers for all the equipments that were used in the tested system is:

DESCRIPTION	MODEL NAME	MANUFACTURE NO.	MANUFACTURE	Remark
MiBUS (BUS Management System)	SMT-500P	N/A	Samsung SDS Co., Ltd.	EUT
Breakout Box	N/A	N/A	Samsung SDS Co., Ltd.	EUT
Battery Pack	N/A	N/A	Samsung SDS Co., Ltd.	EUT
Microphone	N/A	N/A	Samsung SDS Co., Ltd.	AE
GPS	KGM-610G	N/A	KND Global, INC	AE
USB Memory	ZetFlash 300 (2 GB)	N/A	TRACEND INFORMATION INC.	AE

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at a distance of meters from EUT to the antenna.

2.6 Test Facility

The Electromagnetic compatibility measurement facilities are located on at Gun-Po Lab #507,508, Dongyoung Central Tower, 847-2 Kumjung-Dong, Gunpo-Si, Kyunggi-Do, Korea and Yong-In Lab 390 Bora-dong, Giheung-gu, Yongin-si, Gyeonggi-do, Korea. Description details of test facilities were submitted to the Federal Communications Commission on **FCC** and approved by **VCCI** and **TUV-SUD CARAT** and **KOLAS** (Korea Laboratory Accreditation Scheme) and **KCC** (Korea Communications Commission) according to the requirement of ISO 17025.

KOLAS Accreditation No. : **558** (Mar. 27, 2013)

FCC registration number is **323115** (Jun. 22, 2012)

TUV-SUD CARAT Recognition of Agent's Testing (Jul. 13, 2012), Certificate ID-No. : **ROK1209C**

KCC Designation No. : **KR0144** (Sep. 17, 2009)

VCCI member No. : **3096**

- Resistration No : **C-3479** (Mains Ports Conducted Interference Measurement): (Jun. 10, 2012)
- T-1374** (Telecommunication Ports Conducted Disturbance Measurement): (Sep. 11, 2012)
- R-3136** (Radiation 10 meter site): (Jun. 10, 2012)
- G-603** (Facility for measuring radiated disturbance above 1 GHz): (Sep. 11, 2012)

3. SYSTEM TEST CONFIGURATION

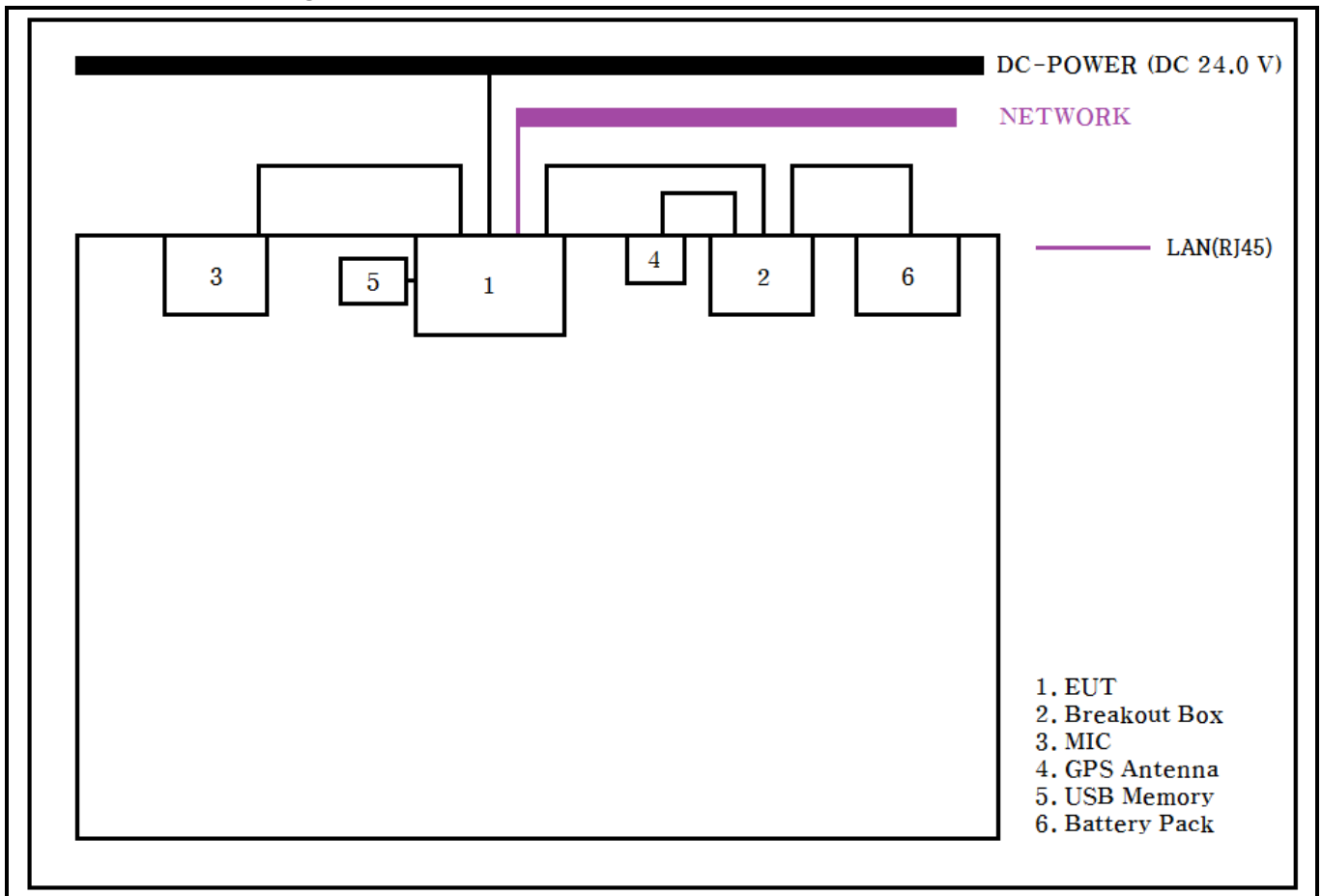
3.1 Mode of operation during the test

- After connecting the DC power supply to EUT, EUT was displayed image and was operated DEMO, KEY CHECK, PING TEST, GPS and Video play.
- EUT is connected to the laptop as LAN(RJ45) Cable. EUT LAN interface is the call ip address.(PING TEST)
- USB memory is inserted into the EUT. EUT USB Host Port is Files the copy and delete from USB Memory.

3.2 Cable Description

Ports Name	Shielded	Ferrite Bead	Metal Shell	Length (m)	Connected to
MAIN CABLE	N	N	N	1.2	EUT
MIC	N	N	N	1.5	
LAN	N	N	N	3.5	
USB	-	-	-	-	
DC-OUT	N	N	N	0.5	Breakout Box
GPS	N	N	N	2.9	

3.3 Test set-up configuration for EUT



3.4 Equipment Modifications

- None

3.5 Configuration of Test System

Line Conducted Test : The power of EUT was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power lines Conducted Emission test was performed by using the procedure in ANSI C63.4: 2003 7.2.3 to determine the worse operating conditions.

Radiated Emission Test : Preliminary radiated emission test was conducted using the procedure in ANSI C63.4: 2003 8.3.1.1 to determine the worse operating conditions. Final radiated emission test was conducted at 3 m Semi-Anechoic Chamber

4. PRELIMINARY TEST

4.1 Conducted Emission Test

During Preliminary Test, the following operating mode was investigated

Operation Mode	The worse operating condition (Please check one only)
DEMO	N/A
GPS	N/A
KEY CHECK	N/A
PING TEST	N/A
Video Play	N/A

- Because EUT was used Direct Current, Test was not proceed with Conducted Emission.

4.2 Radiated Emission Test

During Preliminary Test, the following operating mode was investigated

Operation Mode	The worse operating condition (Please check one only)
DEMO	X
GPS	O
KEY CHECK	X
PING TEST	X
Video Play	X

- The EUT is supported DEMO, GPS, KEY CHECK, PING TEST and Video play. GPS is worst case.

5. FINAL RESULT OF MEASUREMENT

Preliminary test was done on the data transfer mode. And the final measurement was selected for the maximized emission level.

5.1 Conducted Emission Test

EUT		Test Date	
Humidity Level		Temperature	

Type of Test	
Limits apply to	
Detector	
Result	

Frequency (MHz)	Line	Quasi Peak (dBμV)		Margin (dB)	Average (dBμV)		Margin (dB)
		Emission level	Q.P Limits		Emission level	A.V. Limits	

Emission Level = Correct factor + Reading level

Correct Factor = Cable loss + LISN Insertion loss + Transient Limiter Factor

Because EUT was used Direct Current, Test was not proceed with Conducted Emission.

N/A

LIVE LINE

N/A

NEUTRAL LINE

5.2 Radiated Emission Test [30 MHz ~ 1 000 MHz]

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

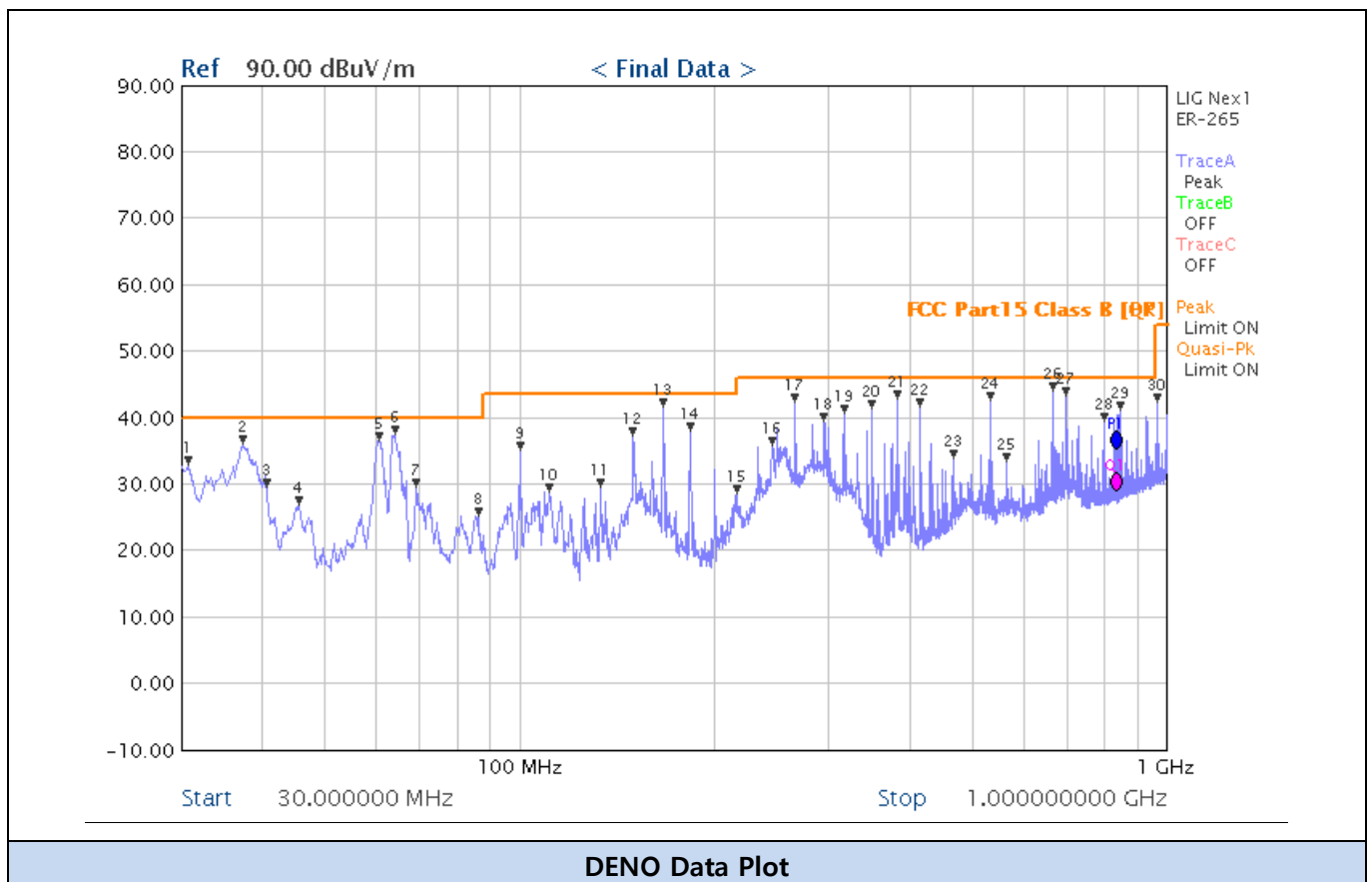
EUT	MiBUS (BUS Management System)	Test Date	Oct. 18, 2013
Humidity Level	42.4 % R.H.	Temperature	21.2 °C

Type of Test	Class B
Distance	3 m
Limits apply to	FCC CFR 47, PART 15, SUBPART B, SECTION 15.109
Detector	CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)
Result	PASS

Emission level = Reading level + Ant. factor + Cable Loss

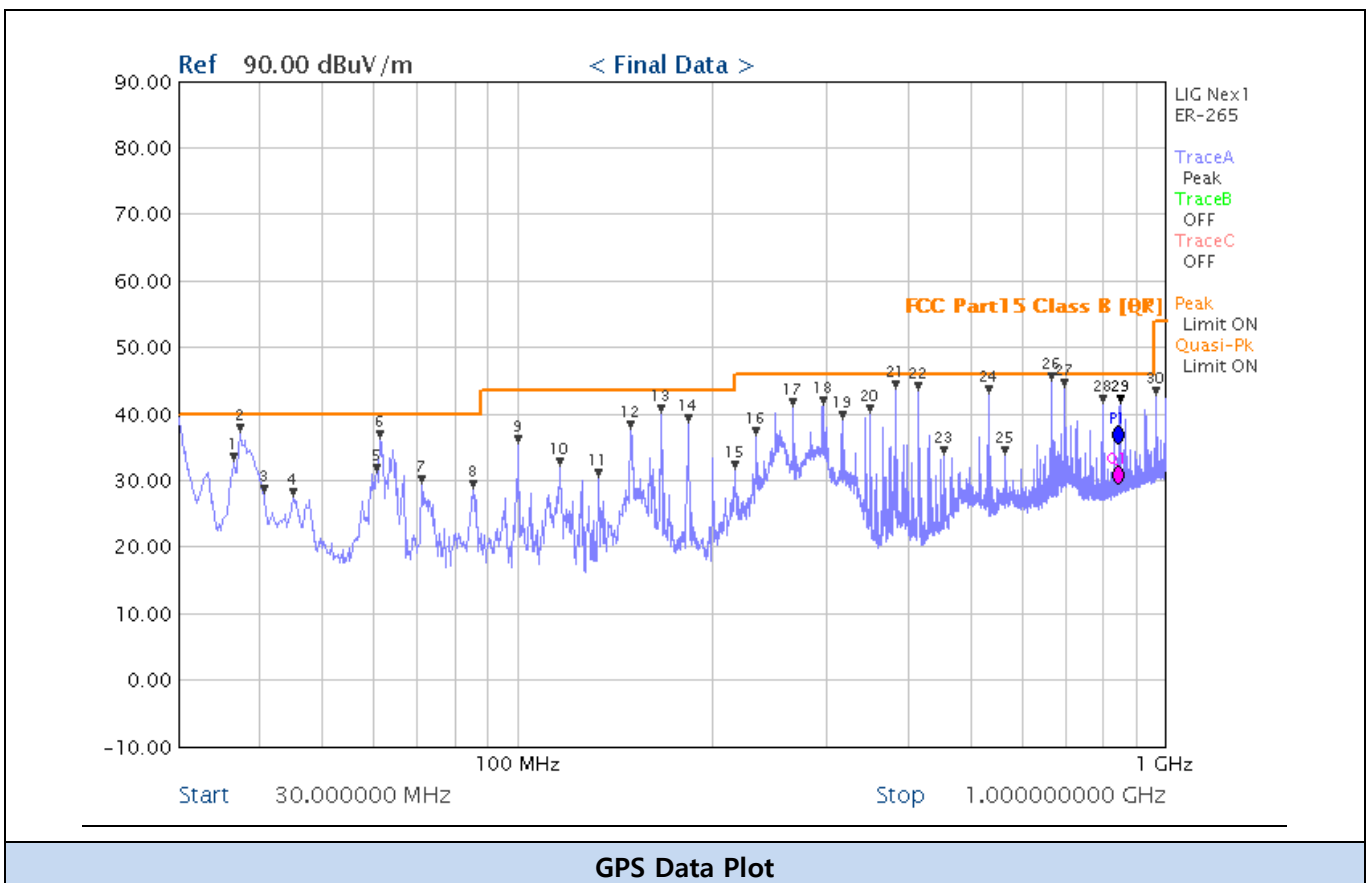
[DEMO]

Frequency (MHz)	Reading (dB μ V/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
37.23	23.58	V	11.33	1.08	35.99	40.00	-4.01
60.55	21.01	V	12.09	1.46	34.56	40.00	-5.44
63.98	23.50	V	10.46	1.44	35.40	40.00	-4.60
382.78	20.30	V	17.75	3.60	41.65	46.00	-4.35
532.47	18.40	V	18.79	4.37	41.56	46.00	-4.44
665.34	16.40	H	20.46	5.05	41.91	46.00	-4.09
698.62	15.20	H	20.66	5.14	41.00	46.00	-5.00



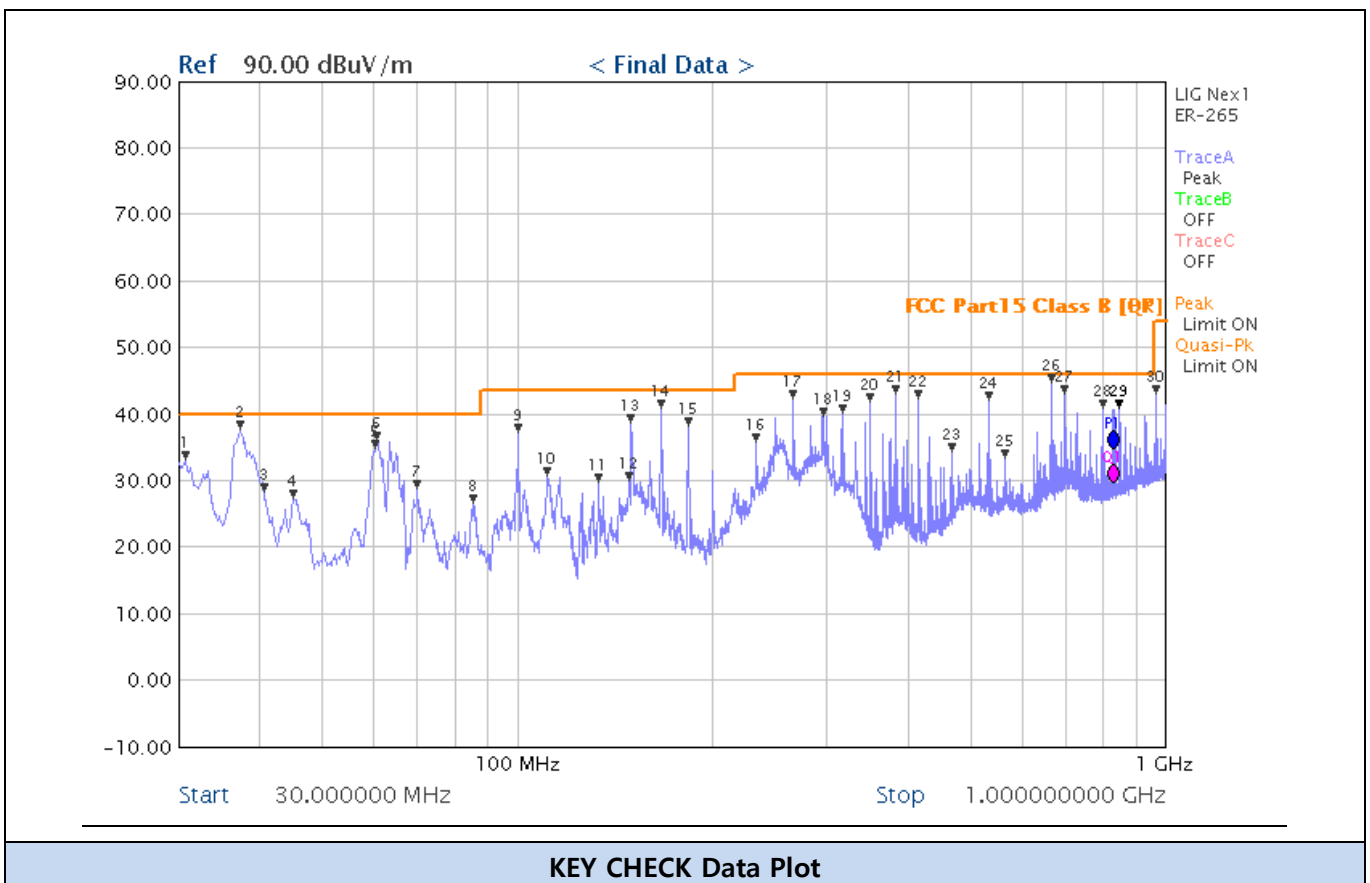
[GPS]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
37.23	22.85	V	11.33	1.08	35.26	40.00	-4.74
166.67	26.42	H	8.87	2.34	37.63	43.50	-5.87
382.75	20.15	V	17.75	3.59	41.49	46.00	-4.51
415.93	19.25	V	18.09	3.79	41.13	46.00	-4.87
532.47	17.26	H	18.79	4.37	40.42	46.00	-5.58
665.35	17.52	H	20.46	5.05	43.03	46.00	-2.97
698.63	15.89	H	20.66	5.14	41.69	46.00	-4.31



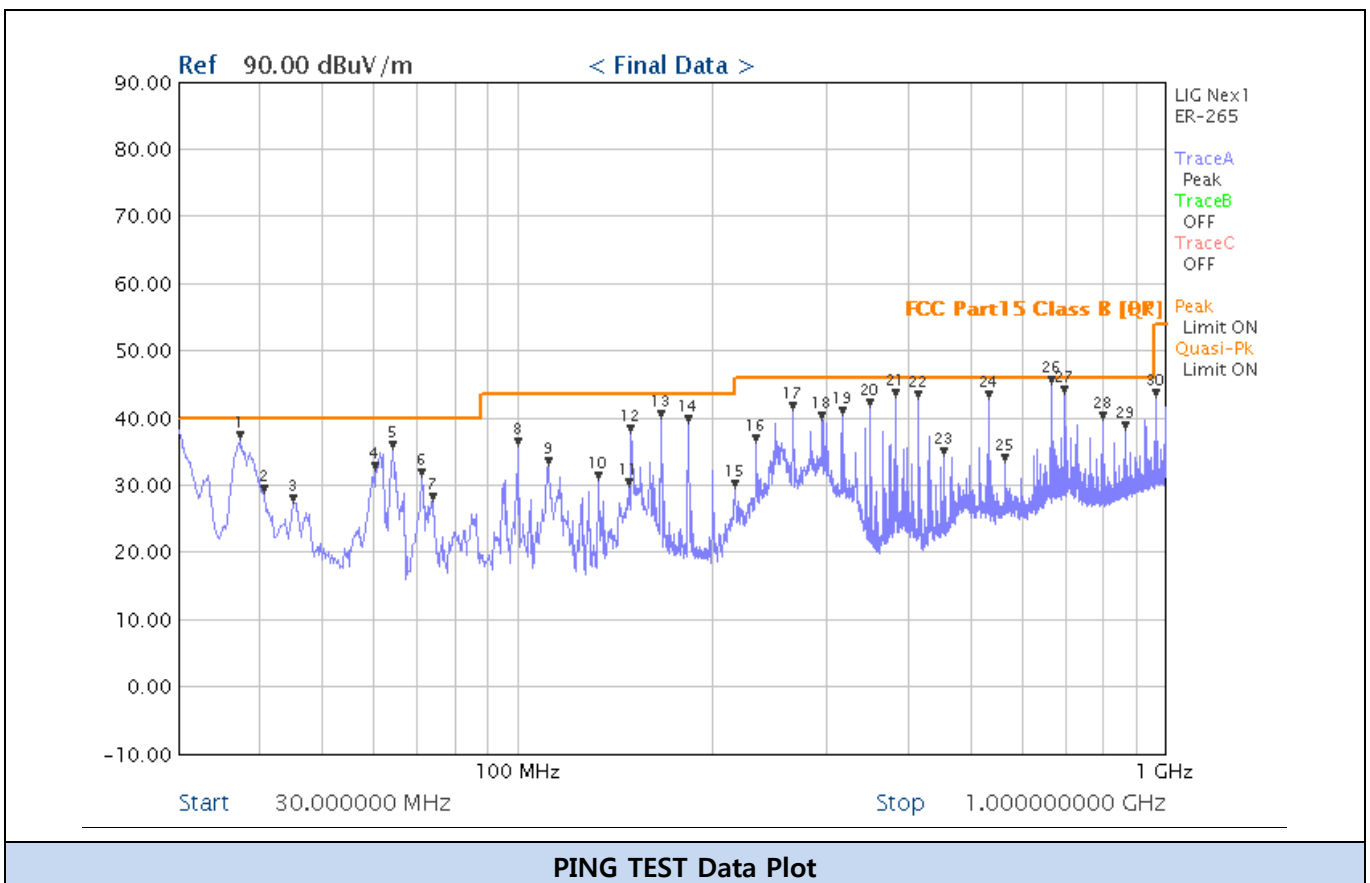
[KEY CHECK]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
37.22	23.35	V	11.33	1.08	35.76	40.00	-4.24
60.67	21.52	V	12.03	1.46	35.01	40.00	-4.99
166.65	27.53	H	8.87	2.34	38.74	43.50	-4.76
266.25	24.56	H	12.76	2.97	40.29	46.00	-5.71
382.77	19.54	V	17.75	3.59	40.88	46.00	-5.12
665.33	16.54	H	20.46	5.05	42.05	46.00	-3.95
698.61	16.84	H	20.66	5.14	42.64	46.00	-3.36



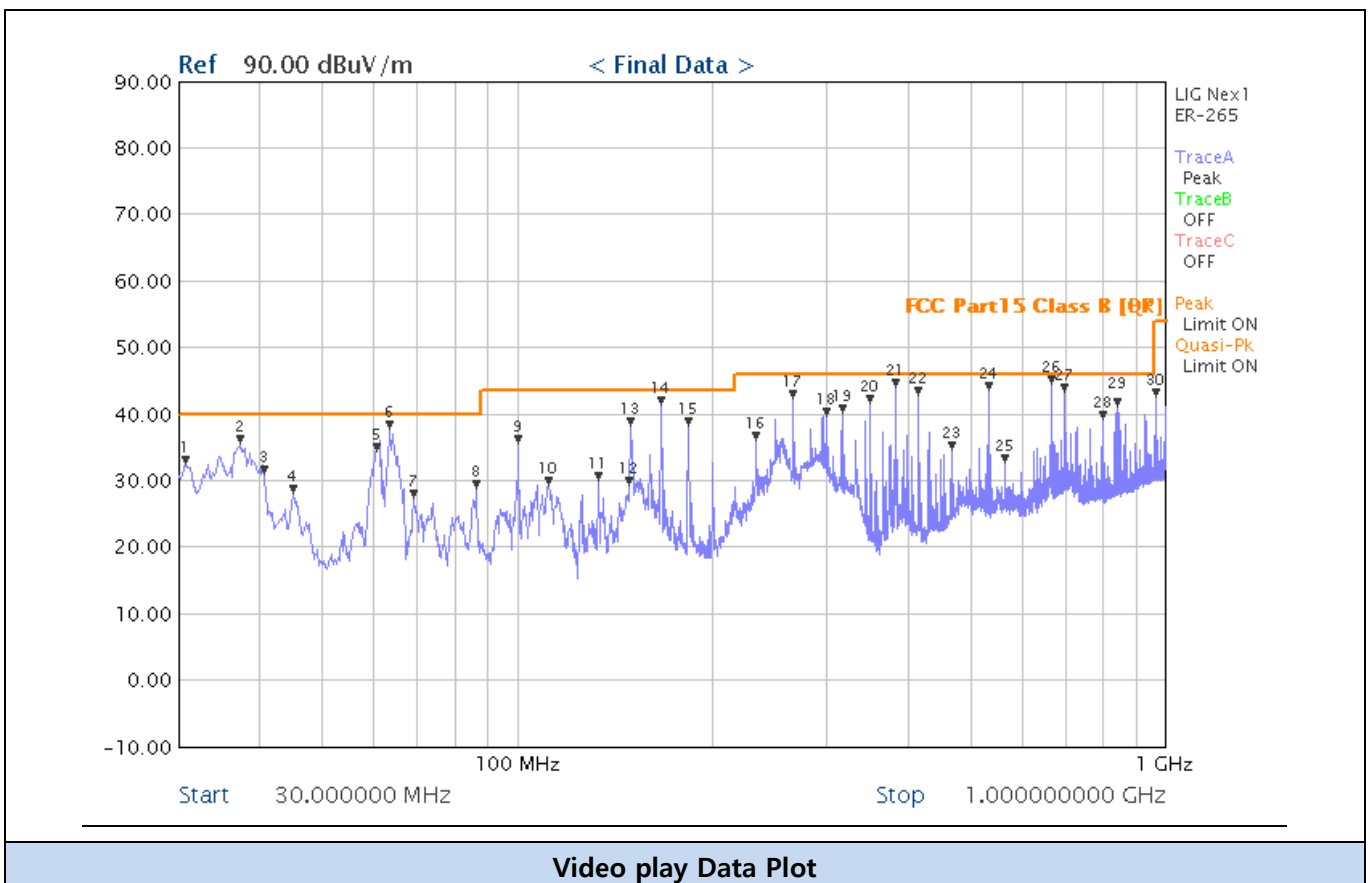
[PING TEST]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
32.21	24.25	V	10.37	1.03	35.65	40.00	-4.35
166.63	26.58	H	8.87	2.34	37.79	43.50	-5.71
382.76	20.48	V	17.75	3.59	41.82	46.00	-4.18
415.93	19.58	V	18.09	3.79	41.46	46.00	-4.54
532.45	18.41	V	18.79	4.37	41.57	46.00	-4.43
665.32	16.54	H	20.46	5.05	42.05	46.00	-3.95
698.60	15.56	H	20.66	5.14	41.36	46.00	-4.64



[Video play]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
63.39	23.48	V	10.74	1.44	35.66	40.00	-4.34
166.64	28.49	H	8.87	2.34	39.70	43.50	-3.80
266.25	25.48	H	12.76	2.97	41.21	46.00	-4.79
382.78	20.24	V	17.75	3.60	41.59	46.00	-4.41
415.93	19.54	V	18.09	3.79	41.42	46.00	-4.58
532.44	19.54	V	18.79	4.37	42.70	46.00	-3.30
698.59	16.58	H	20.66	5.14	42.38	46.00	-3.62



5.3 Radiated Emission Test [1 000 MHz ~ 6 000 MHz]

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

EUT	MiBUS (BUS Management System)	Test Date	Oct. 18, 2013
Humidity Level	42.3 % R.H.	Temperature	21.3 °C

Type of Test	Class B
Distance	3 m
Limits apply to	FCC CFR 47, PART 15, SUBPART B, SECTION 15.109
Detector	Peak (6 dB Bandwidth: 1 MHz)
Result	PASS

Emission level = Reading level + Ant. factor + Cable Loss

[DEMO]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
1342.49	1.48	V	24.74	7.51	33.73	54.00	-20.27
2021.83	4.28	V	26.49	9.34	40.11	54.00	-13.89
2124.02	4.04	H	26.79	9.57	40.40	54.00	-13.60
2429.48	7.01	H	27.69	10.33	45.03	54.00	-8.97

[GPS]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2174.95	4.85	H	26.94	9.70	41.49	54.00	-12.51
2621.28	7.40	V	28.26	10.76	46.42	54.00	-7.58
2960.97	7.42	V	29.26	11.46	48.14	54.00	-5.86

[KEY CHECK]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2213.90	4.35	V	27.06	9.80	41.21	54.00	-12.79
2375.12	6.48	V	27.53	10.20	44.21	54.00	-9.79
2566.59	7.11	H	28.10	10.64	45.85	54.00	-8.15
2853.84	7.40	H	28.94	11.28	47.62	54.00	-6.38
2961.93	7.46	V	29.26	11.46	48.18	54.00	-5.82

[PING TEST]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2127.20	4.02	H	26.80	9.58	40.40	54.00	-13.60
2263.81	5.30	V	27.21	9.93	42.44	54.00	-11.56
2335.58	5.82	V	27.42	10.11	43.35	54.00	-10.65
2547.68	7.04	H	28.04	10.59	45.67	54.00	-8.33

[Video play]

Frequency (MHz)	Reading (dBμV/m)	Ant. Pol. (H/V)	Ant. Factor (dB/m)	Cable Loss	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2193.22	5.16	H	27.00	9.74	41.90	54.00	-12.10
2352.61	6.04	H	27.47	10.15	43.66	54.00	-10.34
2700.66	8.67	V	28.49	10.96	48.12	54.00	-5.88

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

+	Meter reading	(dB μ V)
+	Cable Loss	(dB)
+	Antenna Factor (Loss)	(dB/meter)

=	Corrected Reading	(dB μ V/meter)
-	Specification Limit	(dB μ V/meter)
=	dB Relative to Spec	(+/- dB)

7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MODEL	MFR.	SER. NO.	Last Cal.	USE
1	EMI Test Receiver	ER-30	LIG NEX1	L0908A007	Jun. 25, 2013	☐
2	LISN	LN2-16	EMCIS	LN10032	Jun. 25, 2013	☐
3	LISN	LN2-16	EMCIS	LN10033	Jun. 25, 2013	☐
4	Transient Limiter	TL-B930M	EMCIS	A-008	Jan. 30, 2013	☐
5	ISN	ENY41	ROHDE&SCHWARZ	100026	Jun. 25, 2013	☐
6	ISN	NTFM 8158	SCHWARZBECK	8158-0052	Jan. 08, 2013	☐
7	EMI Test Receiver	ESVS10	ROHDE&SCHWARZ	825120-006	Jun. 25, 2013	■
8	Spectrum Analyzer	NS-30	LIG NEX1	N6052036	Jan. 30, 2013	☐
9	AMPLIFIER	8447E	H.P	1644A00609	Jan. 30, 2013	☐
10	EMI Test Receiver	ER-265	LIG NEX1	L0811B009	Apr. 09, 2013	☐
11	TRILOG ANTENNA	VULB 9160	SCHWARZBECK	9163-3292	Apr. 28, 2013	☐
12	TRILOG ANTENNA	VULB 9163	SCHWARZBECK	9163-417	Apr. 11, 2013	■
13	Horn-ANT.	SAS-571	A.H System, Inc.	1559	May. 08, 2012	■
15	DC POWER SUPPLY	DRP-303D	DIGITAL ELECTRONICS	5070395	Jan. 09, 2013	■

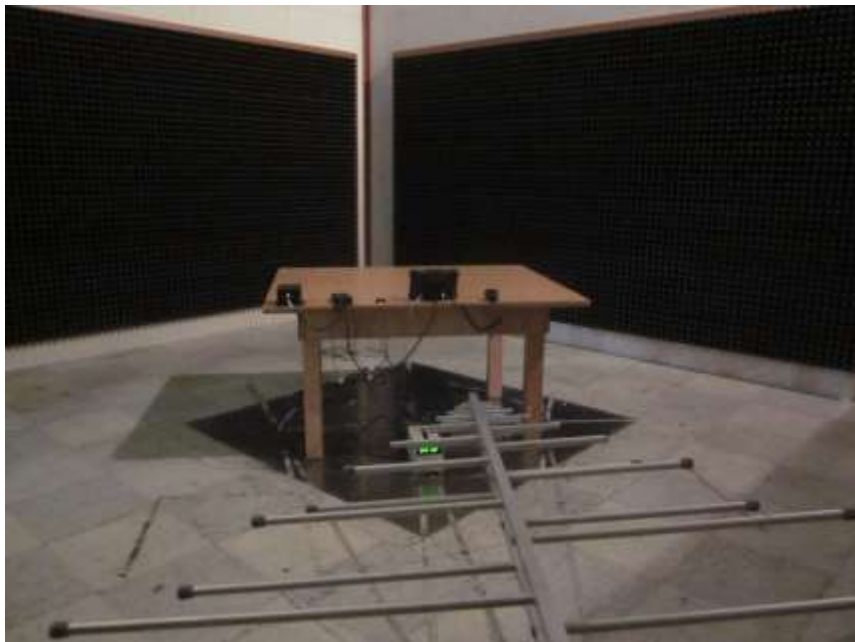
8. TEST SET-UP PHOTOS (CONDUCTED EMISSION)

N/A
Front
N/A
Rear

9. TEST SET-UP PHOTOS (RADIATED EMISSION)



DEMO [30 MHz ~ 1 000 MHz] _Front



DEMO [30 MHz ~ 1 000 MHz] _Rear



GPS [30 MHz ~ 1 000 MHz] _Front



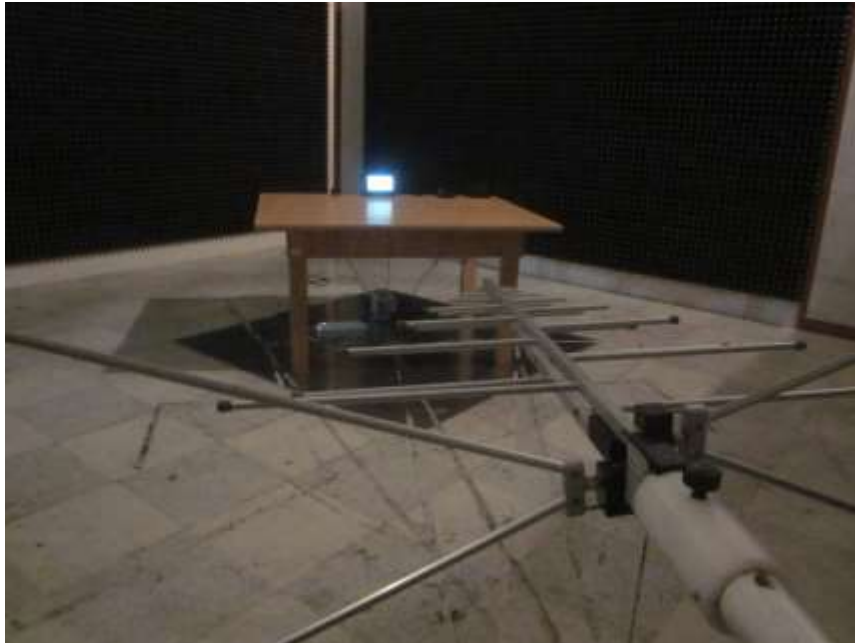
GPS [30 MHz ~ 1 000 MHz] _Rear



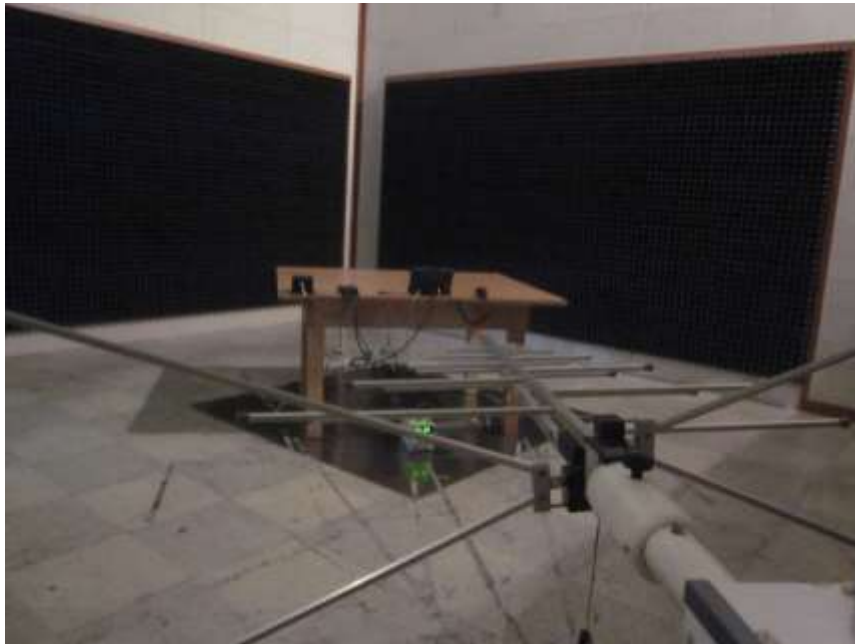
Key Check [30 MHz ~ 1 000 MHz] _Front



Key Check [30 MHz ~ 1 000 MHz] _Rear



Ping [30 MHz ~ 1 000 MHz] _Front



Ping [30 MHz ~ 1 000 MHz] _Rear



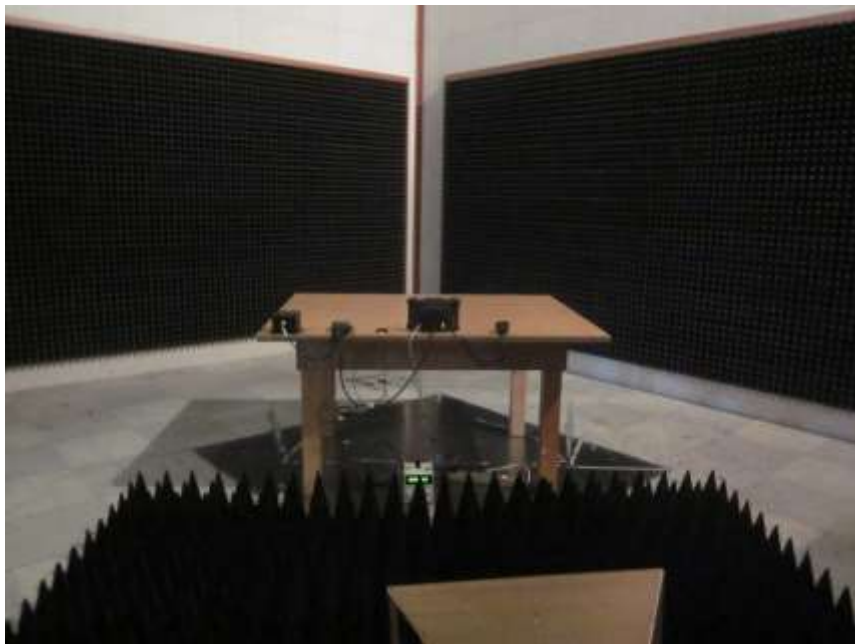
Video Play [30 MHz ~ 1 000 MHz] _Front



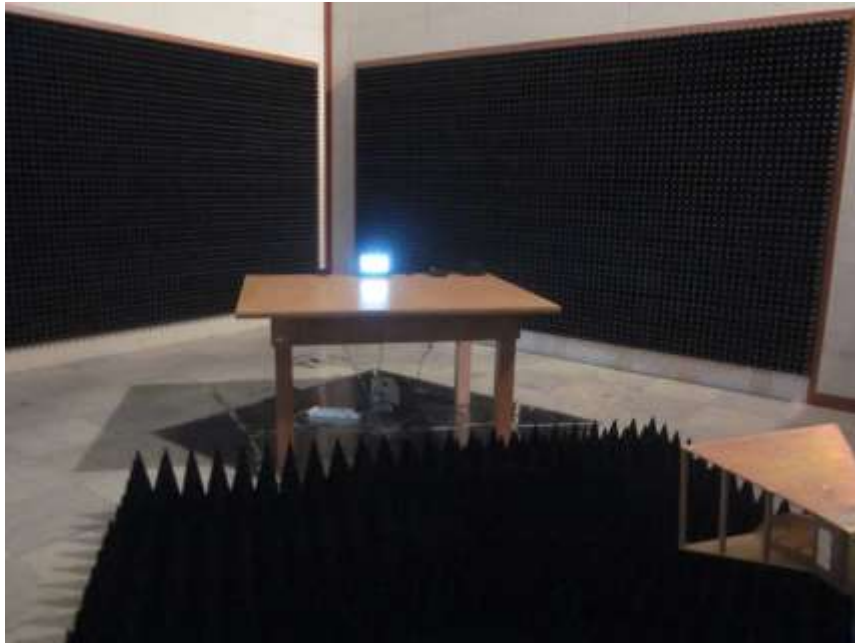
Video Play [30 MHz ~ 1 000 MHz] _Rear



DEMO [1 000 MHz ~ 6 000 MHz]_Front



DEMO [1 000 MHz ~ 6 000 MHz]_Rear



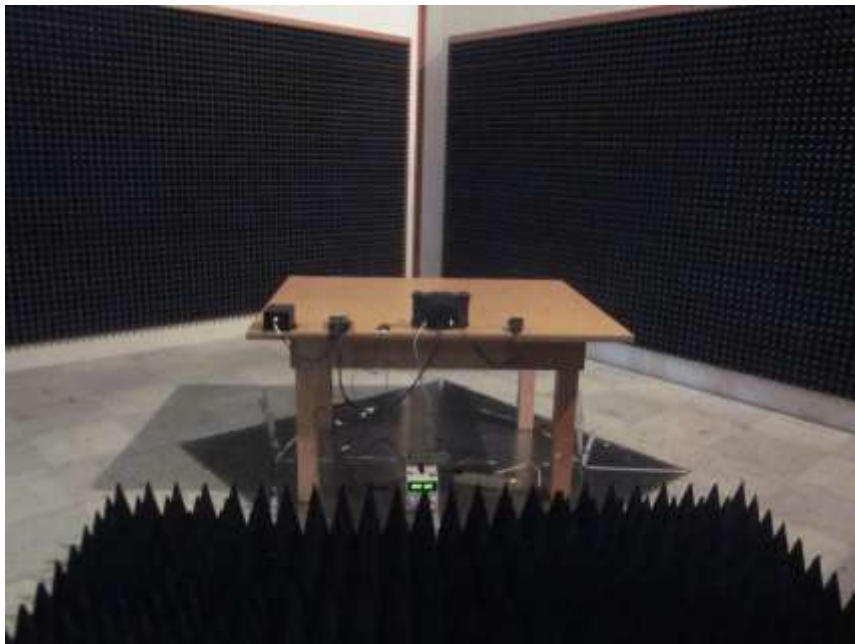
GPS [1 000 MHz ~ 6 000 MHz]_Front



GPS [1 000 MHz ~ 6 000 MHz]_Rear



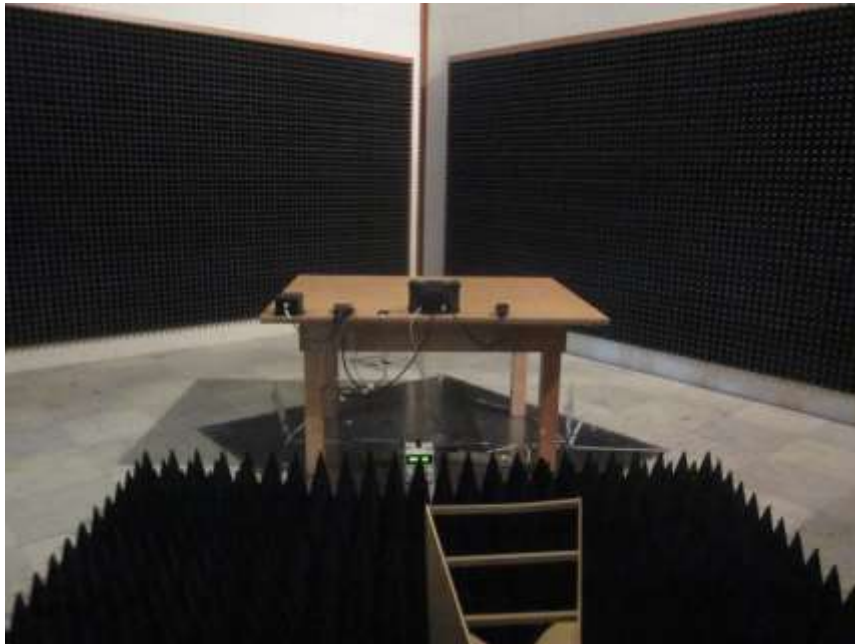
Key Check [1 000 MHz ~ 6 000 MHz]_Front



Key Check [1 000 MHz ~ 6 000 MHz]_Rear



Ping [1 000 MHz ~ 6 000 MHz]_Front



Ping [1 000 MHz ~ 6 000 MHz]_Rear



Ping [1 000 MHz ~ 6 000 MHz]_Front



Ping [1 000 MHz ~ 6 000 MHz]_Rear



Rear Detail View

10. PHOTOGRAPHS OF EUT



Front



Rear



Internal