

	ESTECH Co., Ltd. Rm 1015, World Venture Center II, 426-5 Gasan-dong, Guncheon-gu, Seoul, 158-803, Korea	  	Electromagnetic Interference Test Report

Test Report for FCC

FCC ID:TKWFSM

Report Number		ESTF151201-006			
Applicant	Company name	Suprema Inc.			
	Address	16F Parkview Office Tower, Jeongja-dong, Bundang-gu, Seongnam, Gyeonggi, 463-863 Korea			
	Telephone	82-31-783-4505			
Product	Product name	Face-Station			
	Model No.	FSM	Manufacturer	Suprema Inc.	
	Serial No.	NONE	Country of origin	Korea	
Test date	2012-01-02~2012-01-02		Date of issue	20-Jan-12	
Testing location	ESTECH Co., Ltd. 58-1 OSan-Ri Kanam-Myon, Yeosu-Gun, KyungKi-Do, Korea				
Standard	FCC PART 15 2010 , ANSI C 63.4 2003				
Test item	☒ Conducted Emission	☐ Class A	☒ Class B	Test result	OK
	☒ Radiated Emission	☐ Class A	☒ Class B	Test result	OK
Measurement facility registration number		94696			
Tested by	Senior Engineer S.B.LEE  (Signature)				
Reviewed by	Engineering Manager J.M.Yang  (Signature)				
Abbreviation	OK, Pass = Complied, Fail = Failed, N/A = not applicable				
* Note - This test report is not permitted to copy partly without our permission - This test result is dependent on only equipment to be used - This test result based on a single evaluation of one sample of the above mentioned					

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Appendix 1. Spectral diagram

Appendix 2. Antenna Requirement

1. Laboratory Information

1.1 General

This EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards and is tested in accordance with the measurement procedures as indicated in this report. ESTECH Lab attests to accuracy of test data. All measurement reported herein were performed by ESTECH Co., Ltd.

ESTECH Lab assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

1.2 Test Lab.

Corporation Name : ESTECH Co., Ltd.

Head Office : Rm 1015, World Venture Center II, 426-5, Gasan-dong, Geumcheon-gu, Seoul, Korea
(Safety & Telecom. Test Lab)

EMC Test Lab : 58-1 Osan-Ri, GaNam-Myon, YeoJoo-Gun, KyungKi-Do, Korea
97-1 Hoiuk-Ri Majang-Myon, Icheon-city, KyungKi-Do, Korea

1.3 Official Qualification(s)

KCC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication

KOLAS : Accredited Lab By Korea Laboratory Accreditation Schema base on CENELEC requirements

FCC : Filed Laboratory at Federal Communications Commission

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE

2. Description of EUT

2.1 Summary of Equipment Under Test

Product	: Face-Station
Model Number	: FSM
Serial Number	: NONE
Manufacturer	: Suprema Inc.
Country of origin	: Korea
Operating Frequency	: 13.562 MHz
Antenna Type	: PCB Pattern Antenna
Modulation Type	: ASK
Channel Spacing	: 1
Rating	: Input : (100 – 240) Va.c., 1.0 A (50 – 60) Hz EUT input : 12 Vd.c., 2.5 A
Receipt Date	: 21-Dec-11
X-tal lists	: 12 MHz, 27 MHz, 48 MHz, 32.768kHz, 25MHz, 24.576MHz

2.2 General descriptions of EUT

System Specifications

- CPU : Main B/D CPU - ARM11 667MHz X 1ea
- DSP 1GHz X 1ea
- Memory : Main B/D - Flash : Nand SLC 512MByte, SDRAM(mDDR) : 256MByte
- DISPLAY : 4.3inch LCD X 1ea
- INPUT : 저항막 방식 Touch Screen X 1ea + 5 Keypad (F1~F4, CALL)
- CAMERA : VGA CMOS Camera X 2ea
- I/O Port : Wiegand In/Out (S/W 설정을 통해 Input 또는 Output으로 사용가능) X 1ch
Switch Input X 4ch
RS-485 X 2ch
RS-232(Share with RS-485) X 1ch
Relay(1A@30Vdc) X 2ch
Ethernet(10/100M) X 1ch
- Sound Out: System Sound용 Speaker X 2ea
- RF CARD : Mifare
- Power Input : 12Vdc Adaptor or POE Input

3. Test Standards

Test Standard : FCC PART 15 (2010)

This Standard sets out the regulations under which an intentional, unintentional, or incidental radiator may be operated without an individual license. It also contains the technical specifications, administrative requirements and other conditions relating to the marketing of Part 15 devices.

Test Method : ANSI C 63.4 (2003)

This standard sets forth uniform methods of measurement of radio-frequency (RF) signals and noise emitted from both unintentional and intentional emitters of RF energy in the frequency range 9 kHz to 40 GHz. Methods for the measurement of radiated and AC power-line conducted radio noise are covered and may be applied to any such equipment unless otherwise specified by individual equipment requirements. These methods cover measurement of certain devices that deliberately radiate energy, such as intentional emitters, but does not cover licensed transmitters. This standard is not intended for certification/approval of avionic equipment or for industrial, scientific, and medical (ISM) equipment. These methods apply to the measurement of individual units or systems comprised of multiple units.

Summary of Test Results

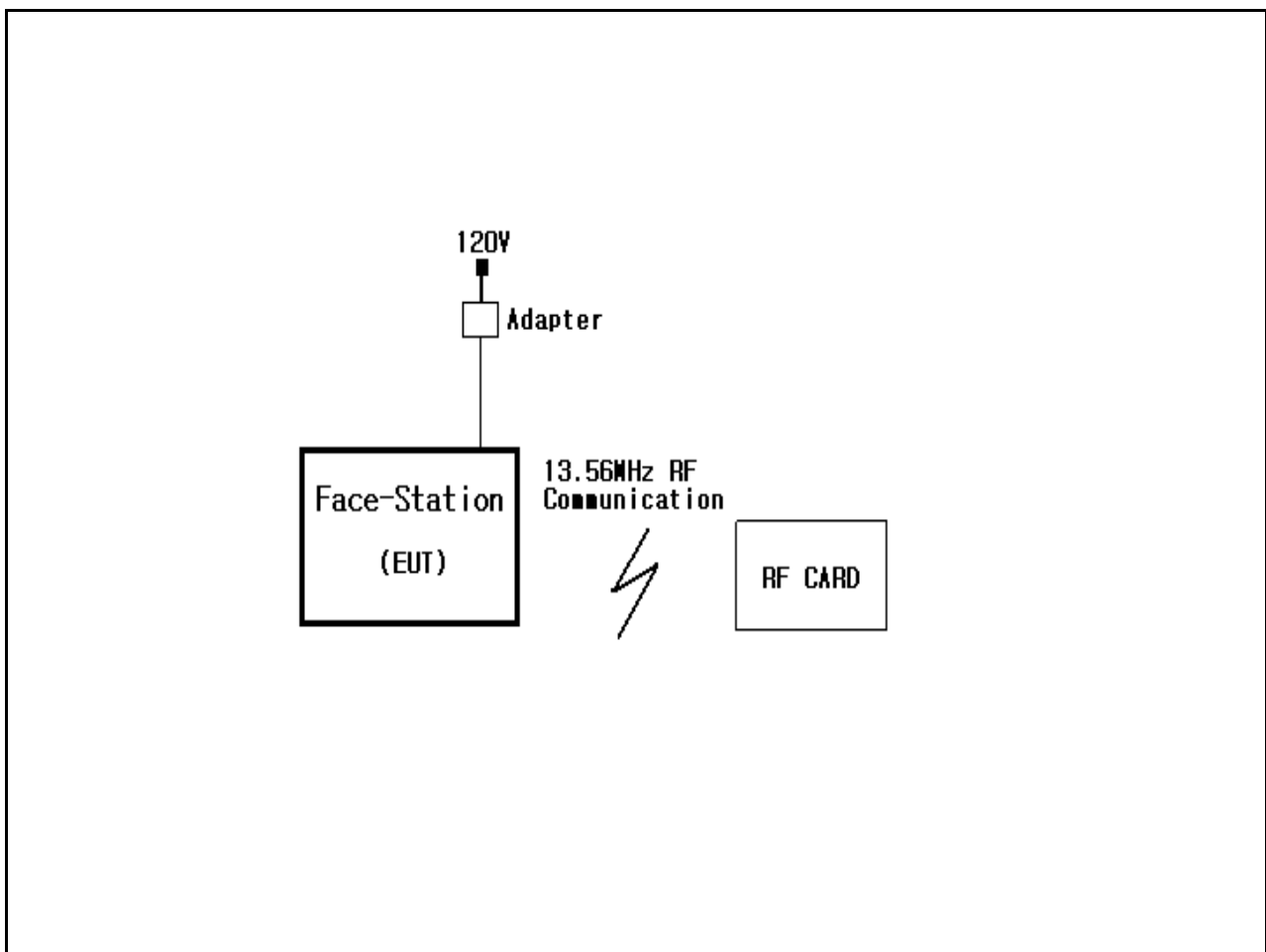
Applied Standard : 47 CFR Part 15, Subpart C				
Standard	Test Type	Result	Remark	Limit
15.207	AC Power Conducted Emission	Pass	Meet the requirement	
15.225(a)	Radiated Emission (13.553 ~13.567) MHz	Pass	Meet the requirement	15,848 uV/m at 30 m
15.225(b)	Radiated Emission (13.410 ~13.553 , 13.567 ~ 13.710) MHz	Pass	Meet the requirement	334 uV/m at 30 m
15.225(c)	Radiated Emission (13.110 ~13.410 , 13.710 ~ 14.010) MHz	Pass	Meet the requirement	106 uV/m at 30 m
15.225(d)	Apply section 15.209 (out side band of the 13.110 ~14.010) MHz	Pass	Meet the requirement	
15.225(e)	Frequency stability	Pass	Meet the requirement	
15.215(c)	20dB Bandwidth	Pass	Meet the requirement	

4. Measurement Condition

4.1 EUT Operation.

The EUT was measured by transmitter mode continuously.

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (FCC ID)
Face-Station	FSM	NONE	Suprema Inc.	EUT
Adapter	JPW128KA1200N06	NONE	BridgePower Corp.	
RF CARD	NONE	NONE	Suprema Inc.	

4.4 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
Face-Station	Power	Adapter	—	2	No	
RFID READER	13.56MHz RF Signal	RF CARD	13.56MHz RF Signal	—	—	

5. 20 dB Bandwidth

5.1 Procedure

The measurement was performed in the antenna height to gain the maximum of Electric field strength

5.2 20dB Bandwidth setup

The spectrum analyzer is set to as following

RBW:10 Hz

VBW:100 Hz

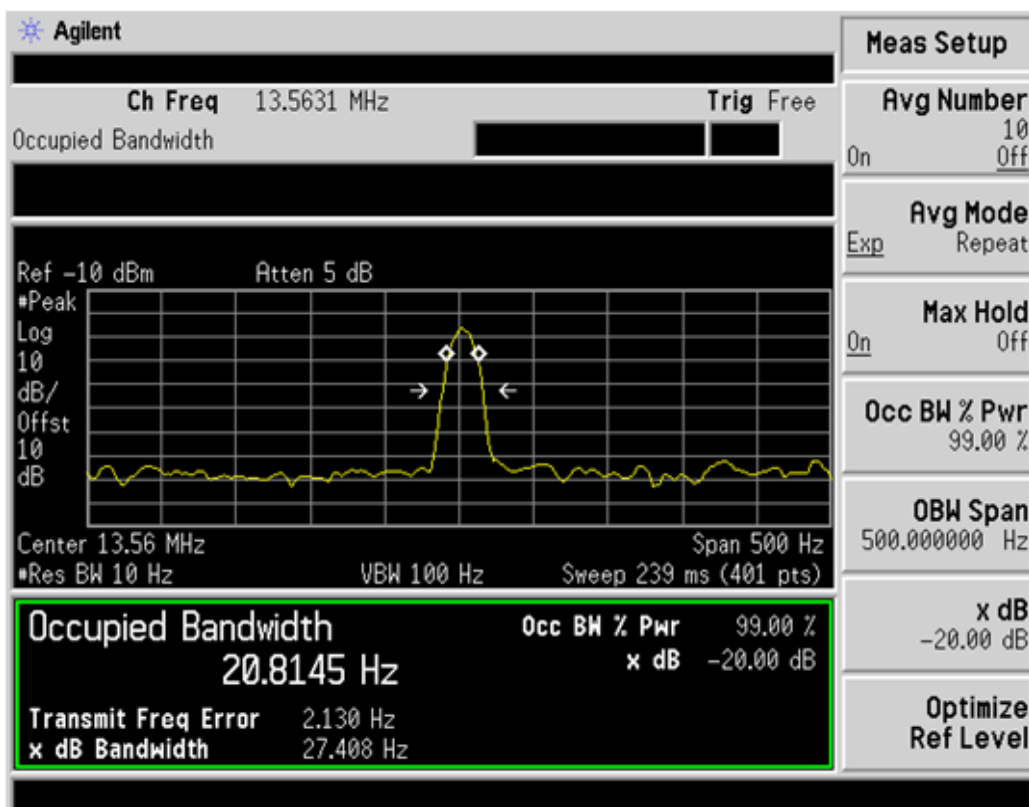
Span:500 Hz

Sweep:suitable duration based on the EUT specification

20dB Bandwidth Test Instruments

Decription	Model	Serial Number	Cal. Due Data
Spectrum Analyzer	E4440A	US41421291	2-Feb-12

5.3 Measurement Data



6. Frequency Tolerance

6 Procedure

The frequency stability of the transmitter is measured by:

- a) Temperature: The temperature is varied from $-20\text{ }^{\circ}\text{C}$ to $+50\text{ }^{\circ}\text{C}$ using an environmental chamber.
 - b) Primary Supply Voltage: The primary supply voltage is varied from 85 % to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.
- The frequency tolerance of the carrier shall be maintained within $\pm 0.01\text{ }%$ of the operating frequency.

The following test equipments are used during test

Decription	Model	Serial Number	Cal. Due Data
Spectrum Analyzer	E4440A	US41421291	2-Feb-12
DC Power Supply	AK-3010	01000106	24-Feb-12
Temp./Humidity Chamber	SM-150-2	04-TH24	7-Feb-12

6.3 Measurement Data

Operating Frequency :	13,562,000 Hz
Reference Voltage :	12.00 Vdc
Deviation Limit :	± 0.01 %

Voltage (%)	Power (Vdc)	Temperature (°C)	Frequency (Hz)	Deviation
100	12.00	+20 °C(Ref)	13,563,100	-0.008110
100		-20	13,563,050	-0.007742
100		-10	13,563,060	-0.007815
100		0	13,563,050	-0.007742
100		10	13,563,080	-0.007963
100		20	13,563,100	-0.008110
100		25	13,563,075	-0.007926
100		30	13,563,062	-0.007830
100		40	13,563,077	-0.007941
100		50	13,563,081	-0.007970
85	10.2	20	13,563,100	-0.008110
115	13.8	20	13,563,089	-0.008029

7. Measurement of radiated disturbance

The EUT was placed on the top of a rotating table 0.8 m above the ground at a 3 m Open test site. The table was rotated 360° to determine the position of the highest radiation. Then antenna is a loop antenna is fixed at 1 m above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0° to 360° to find the maximum reading. The test receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

7.1 Radiated emission limits, general requirements

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength @30 m (uV/m)	Field strength @30 m (dBuV/m)	Field strength @3m (dBuV/m)
Below 13.110	30	29.5	69.5
13.110 ~ 13.410	106	40.5	80.5
13.410 ~ 13.553	334	50.5	90.5
13.553 ~ 13.567	15,848	84	124
13.567 ~ 13.710	334	50.5	90.5
13.710 ~ 14.010	106	40.5	80.5
Above 14.010	30	29.5	69.5

* dBuV/m = 20 * log(uV/m) * Distance factor = 40dB / decade (15.31(f))

7.2 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
Test Receive	ESVS10	Rohde & Schwarz	838562/002	27-Jan-12
Test Receive	ESPI7	Rohde & Schwarz	100185	27-Jan-12
Spectrum Analyzer	R3273	ADVANTEST	110600592	27-Jan-12
Logbicon Antenna	VULB9160	Schwarzbeck	3106	14-Apr-12
Horn Antenna	BBHA 9120 D	Schwarzbeck	352	22-Mar-12
Pre Amplifier	8447F	HP	2944A03711	11-Jan-12
PREAMPLIFIER	8449B	Sonoma Instrument	300884581	27-Jan-12
Loop Antenna	HFH2-Z2	Rohde & Schwarz	100188	29-Jul-12
Turn Table	2081-1.2M	EMCO	NONE	-
Antenna Mast	Jan-70	EMCO	0005-2205	-
ANT Mast Controller	2090	EMCO	9612-1202	-
Turn Table Controller	2090	EMCO	9612-1202	-

7.3 Environmental Condition

Test Place : Open site(3 m)
 Temperature (°C) : 2 °C
 Humidity (% R.H.) : 65 % R.H.

7.4 Test data(9 kHz ~ 30 MHz)

Test Date : 2-Jan-12

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value(Quasi-Peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
Below 13.110 MHz								
Noise Floor	–	–	–	18.15	0.4	69.5	–	–
13.110 MHz to 13.410 MHz								
Noise Floor	–	–	–	18.15	0.4	80.5	–	–
13.410 MHz to 13.553 MHz								
Noise Floor	–	–	–	18.15	0.4	90.5	–	–
13.553 MHz to 13.567 MHz								
13.562	32.02	H	1.0	18.15	0.4	124.0	50.59	73.41
13.567 MHz to 13.710 MHz								
Noise Floor	–	–	–	18.15	0.4	90.5	–	–
13.710 MHz to 14.010 MHz								
Noise Floor	–	–	–	18.15	0.4	80.5	–	–
14.010 MHz to 30 MHz								
Noise Floor	–	–	–	18.15	0.4	69.5	–	–
Remark	*There was no detected Restricted bands and Radiated suprious emission below 30MHz. *The 30m limit was converted to 3m Limit using square factor(x) as it was found by measurements as follows; *3 m Limit(dBuV/m) = 20log(X)+40log(30/3)= 20log(15848)+40log(30/3) = 124dBuV							

7.5 Test data(30 MHz ~ 1 000 MHz)

Test Date : 2-Jan-12

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value(Qeasi-Peak)		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
30.35	42.00	V	1.0	10.52	-25.71	40.00	26.81	13.19
64.25	43.20	V	1.0	10.57	-24.84	40.00	28.94	11.06
108.00	42.10	V	1.0	9.65	-24.39	43.50	27.37	16.13
120.00	44.50	H	3.2	10.87	-24.19	43.50	31.18	12.32
144.20	40.50	V	1.0	12.52	-24.31	43.50	28.72	14.78
166.20	40.90	V	1.0	12.30	-23.52	43.50	29.68	13.82
232.77	39.50	V	1.0	11.31	-23.01	46.00	27.80	18.20
250.00	43.40	V	1.0	11.57	-22.95	46.00	32.02	13.98
271.06	43.40	H	1.7	13.07	-23.00	46.00	33.47	12.53
325.00	41.20	V	1.0	14.72	-23.17	46.00	32.75	13.25
375.02	44.20	H	1.2	15.48	-23.60	46.00	36.08	9.92
500.00	42.00	H	1.0	18.23	-24.05	46.00	36.18	9.82
Remark	H : Horizontal, V : Vertical *CL = Cable Loss-Amplifier Gain(In case of above1000MHz) *CL = Cable Loss(In case of below1000MHz) *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz. *The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection at frequency above 1GHz.							

8. Measurement of conducted disturbance

The continuous disturbance voltage of AC Mains in the frequency from 0.15 MHz to 30 MHz was measured in accordance to FCC Part 15 (2010) & ANSI C 63.4 (2003). The test setup was made according to FCC Part 15 (2010) & ANSI C 63.4 (2003) in a shielded Room. The EUT was placed on a non-conductive table at least 0.8 m above the ground plan. A grounded vertical reference plane was positioned in a distance of 0.4 m from the EUT. The distance from the EUT to other metal surfaces was at least 0.8 m. The EUT was only earthen by its power cord through the line impedance stabilizing network. The power cord has been bundled to a length of 1.0 m. The test receiver with Quasi Peak detector complies with CISPR 16.

8.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
LISN	ESH2-Z5	POLARAD	872461/048	11-Jan-12
TEST Receiver	ESHS 30	Rohde & Schwarz	828765/002	16-Dec-12
Pulse Limiter	ESH3-Z2	Rohde & Schwarz	NONE	21-Mar-12

8.2 Environmental Condition

Test Place : Shielded Room
 Temperature (°C) : 23 °C
 Humidity (% R.H.) : 45 % R.H.

8.3 Test data

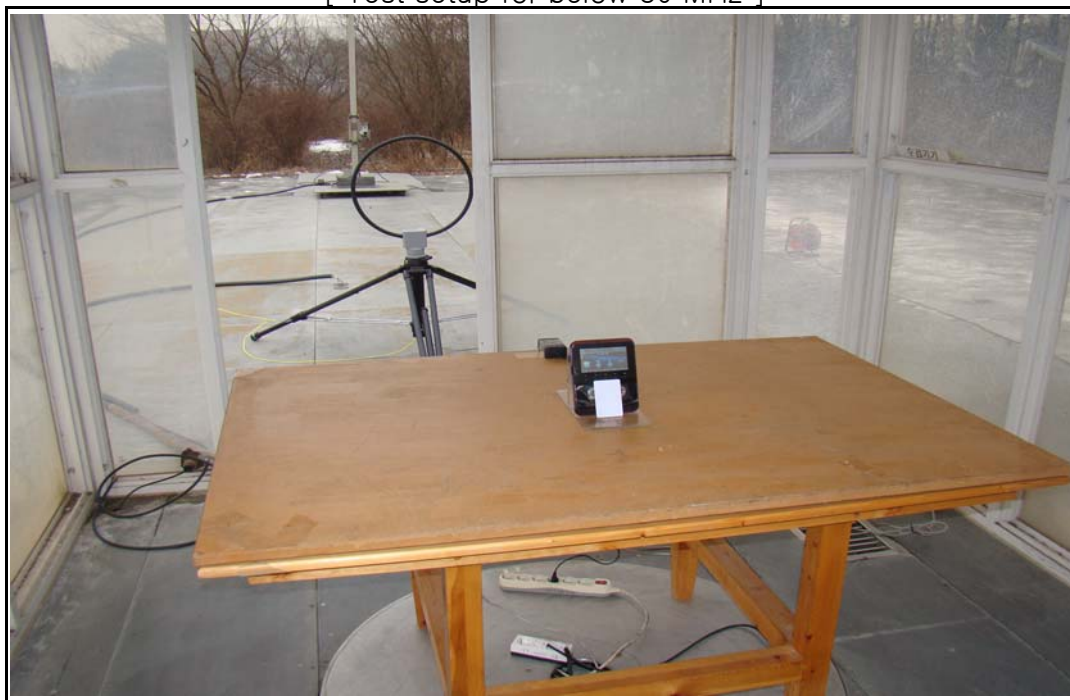
Test Date : 2-Jan-12

Frequency (MHz)	Correction Factor		Line (H/N)	Quasi-peak Value			Average Value		
	Lisn (dB)	Cable (dB)		Limit (dB μ V)	Reading (dB μ V)	Result (dB μ V)	Limit (dB μ V)	Reading (dB μ V)	Result (dB)
0.18	0.17	0.36	N	64.49	36.21	36.74	54.49	35.49	36.02
0.20	0.10	0.36	H	63.69	39.03	39.49	53.69	32.96	33.42
0.24	0.17	0.36	N	62.06	33.26	33.79	52.06	30.35	30.88
0.26	0.10	0.36	H	61.30	35.97	36.43	51.30	31.73	32.19
0.33	0.18	0.36	N	59.45	35.57	36.11	49.45	31.10	31.64
0.51	0.19	0.37	N	56.00	26.01	26.57	46.00	19.44	20.00
0.53	0.19	0.37	N	56.00	31.63	32.19	46.00	27.32	27.88
0.60	0.19	0.37	N	56.00	39.16	39.72	46.00	35.37	35.93
0.66	0.20	0.37	N	56.00	38.85	39.42	46.00	35.30	35.87
0.92	0.14	0.44	H	56.00	29.25	29.83	46.00	27.07	27.65
1.39	0.22	0.46	N	56.00	29.07	29.75	46.00	26.85	27.53
1.85	0.17	0.44	H	56.00	28.84	29.45	46.00	26.93	27.54
11.53	0.35	0.53	H	60.00	26.38	27.26	50.00	17.67	18.55
21.30	0.69	0.65	N	60.00	34.72	36.06	50.00	27.45	28.79
22.17	0.69	0.66	N	60.00	22.92	24.27	50.00	15.21	16.56
22.89	0.70	0.68	N	60.00	29.97	31.35	50.00	19.05	20.43
23.07	0.61	0.68	H	60.00	24.63	25.92	50.00	17.17	18.46
23.82	0.70	0.69	N	60.00	29.05	30.44	50.00	21.33	22.72
27.93	0.60	0.79	H	60.00	32.49	33.88	50.00	21.61	23.00
Remark	H : Hot Line, N : Neutral Line								

9. Photographs of test setup

9.1 Setup for Radiated Test

[Test setup for below 30 MHz]

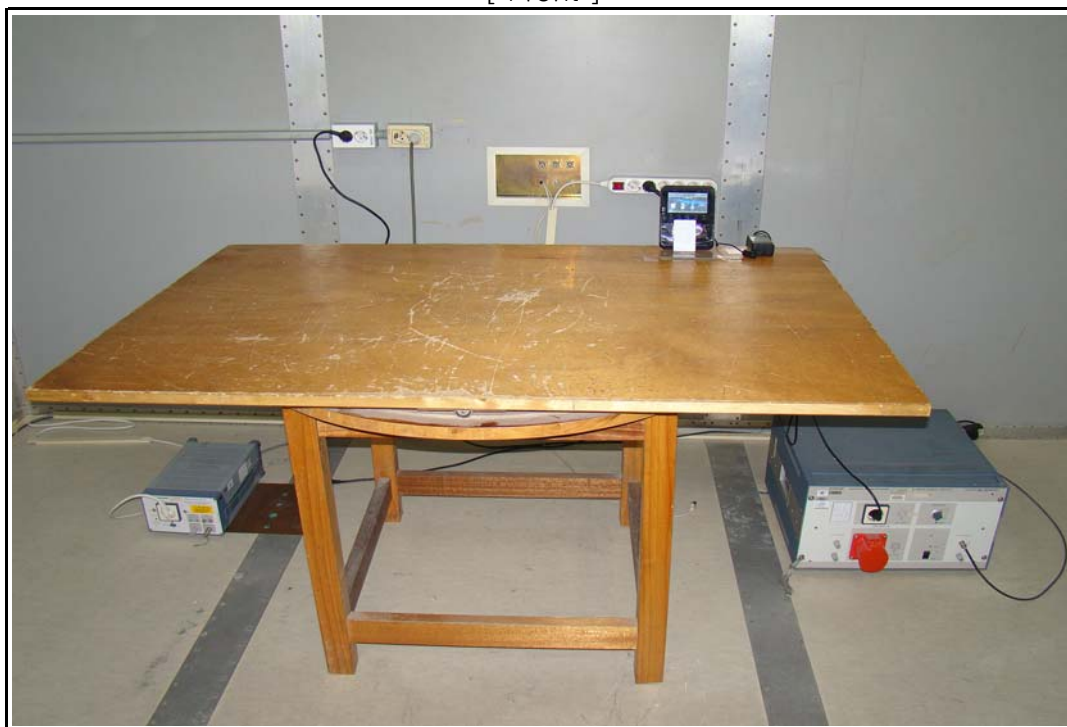


[Test setup for above 30 MHz]



9.2 Setup for Conducted Test : 0.15 MHz ~ 30 MHz

[Front]



[Rear]

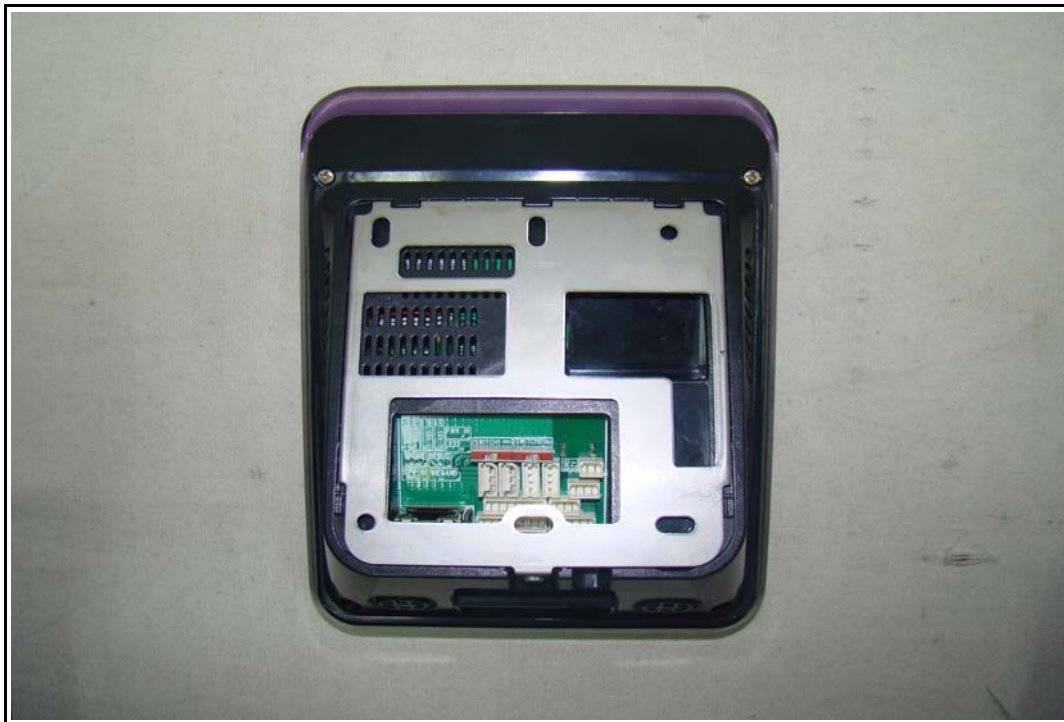


10.0 Photographs of EUT

[Front]



[Rear]



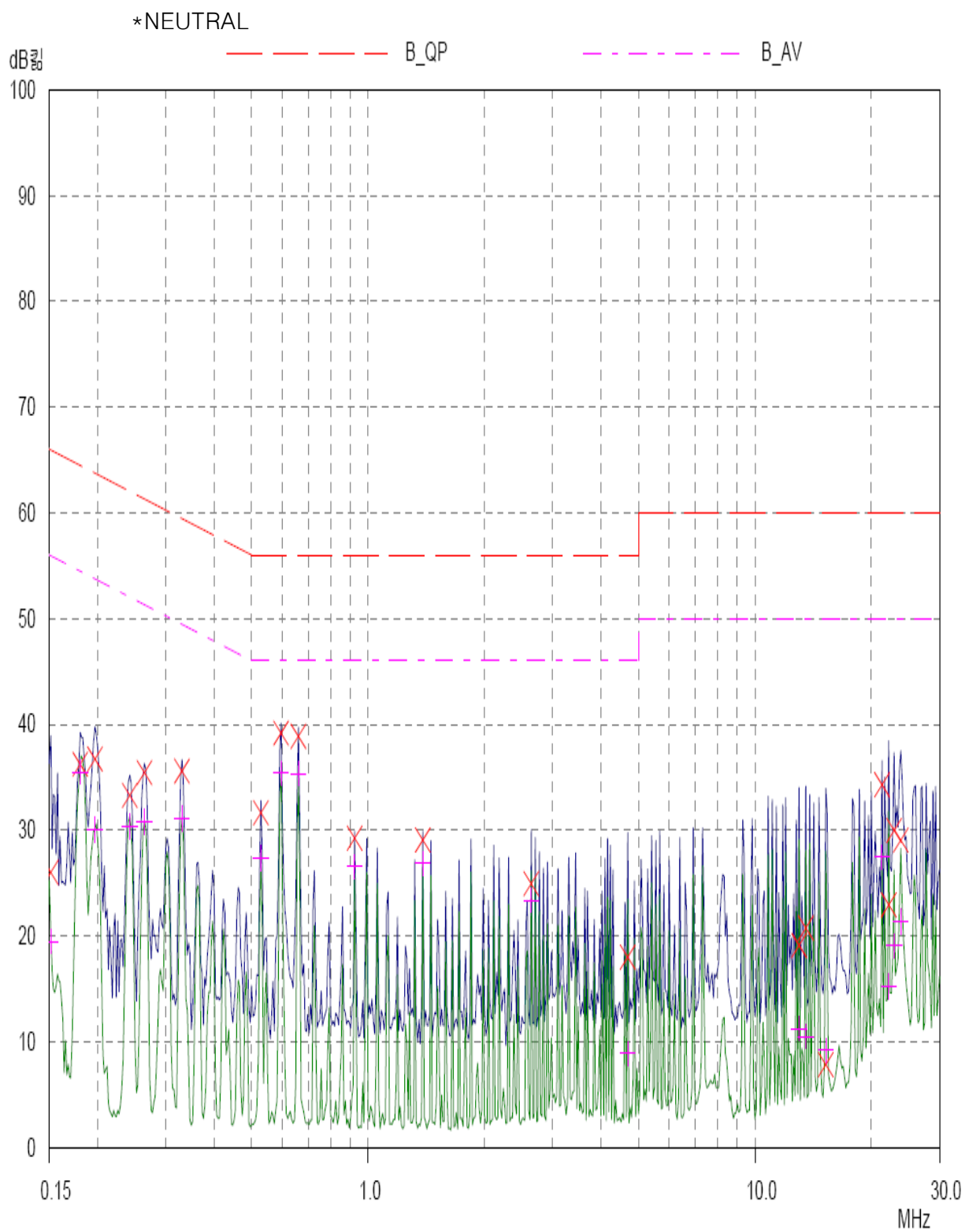
10.1 Photographs of EUT

[Front]

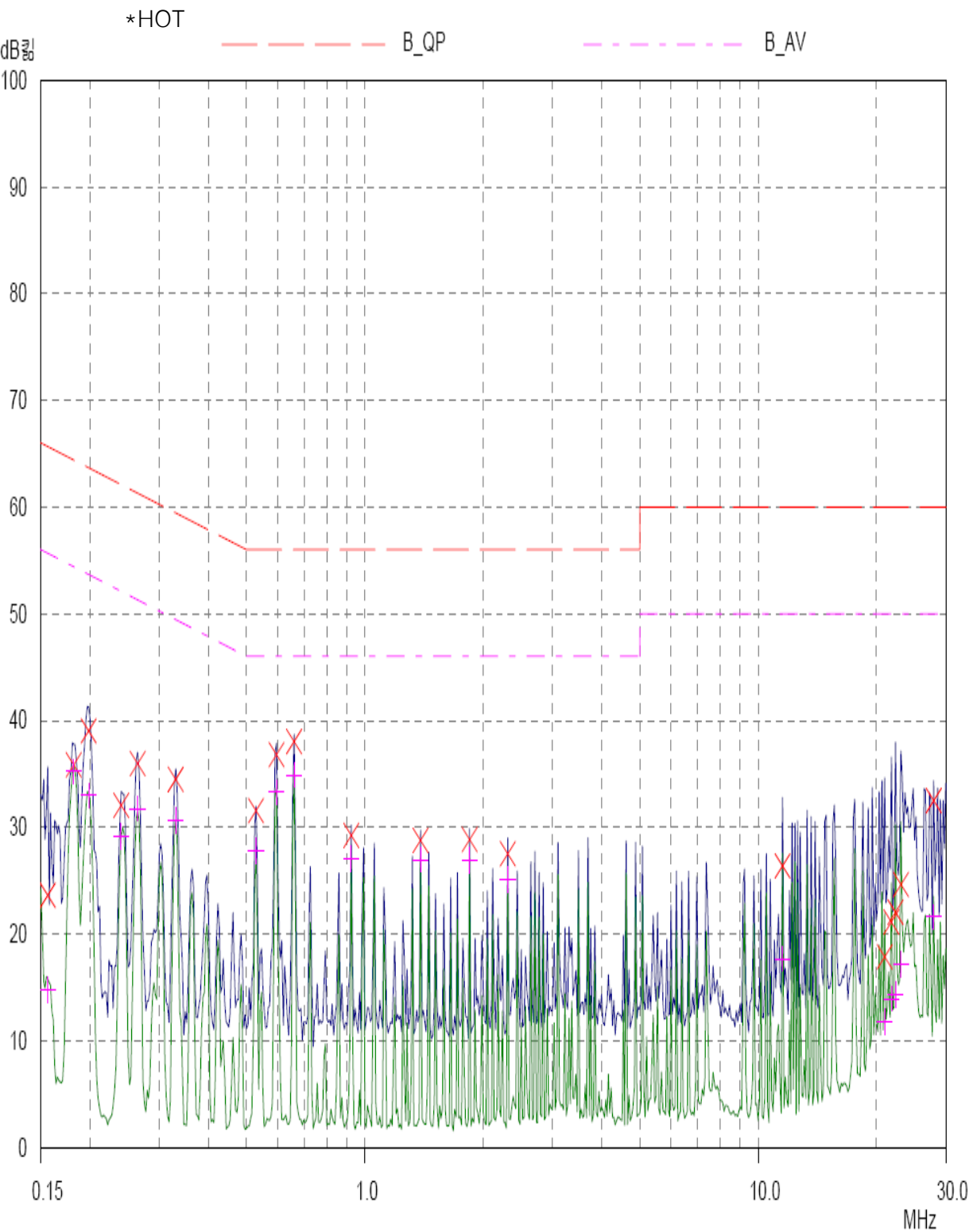


[Rear]





Appendix 1. Spectral diagram



Appendix 2. Antenna Requirement

Regulation

According to §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.

Result

–Complied

The transmitter has an integral PCB pattern antenna.