

 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 : TKWBRM-10

Report Number		ESTF151211-001			
Applicant	Company name	Suprema Inc.			
	Address	16F Parkview Tower, Jeongja-dong, Bundang-gu, Seongnam, Gyeonggi, 463-863 Korea			
	Telephone	+82-31-710-2492			
Product	Product name	BioEntry Plus Dummy Reader			
	Model No.	BRM-10	Manufacturer	Suprema Inc.	
	Serial No.	NONE	Country of origin	KOREA	
Test date	15-Sep-12		Date of issue	1-Nov-12	
Testing location	ESTECH Co., Ltd. 58-1 OSan-Ri Kanam-Myon, Yeosu-Gun, KyungKi-Do, Korea 97-1 Hoiuk-Ri Majang-Myon, Icheon-Si, 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		915135			
Tested by	Senior Engineer S.S.An		(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					

Contents

1. Laboratory Information	3
2. Description of EUT	4
3. Test Standards	5
4. Measurement condition	6
5. Measurement of radiated emission	8
5.1 Measurement equipment	8
5.2 Environmental conditions	8
5.3 Test data	9
6. Measurement of conducted emission	10
6.1 Measurement equipment	10
6.2 Environmental conditions	10
6.3 Test data	11
7. Photographs of test setup	12
8. Photographs of EUT	14

Appendix 1. Special diagram

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 : 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 : BioEntry Plus Dummy Reader
 Model Number : BRM-10
 Serial Number : NONE
 Manufacturer : Suprema Inc.
 Country of origin : KOREA
 Power Rating : 12 V d.c., 1.5 A
 Receipt Date : 3-Sep-12
 X-tal list(s) or Frequencies generated : The highest operating frequency is 400 MHz in the CPU.

2.2 General descriptions of EUT

Item	Specification
CPU	400MHz DSP
Fingerprint Sensor	OC Model : Optical Sensor
IN/OUT	Switch Input x 2, Wiegand In/Out x 1, RS-485 x 1
Power Input Rate	DC12V, Max 250mA
Support Cards	BioEntry Plus Dummy Mifare OC Model (BRM-10) - 13.56MHz Mifare Card Read/Write - 13.56MHz ISO14443A Card CSN Read
Size	50 x 160 x 38 (Width x Height x Depth)
Certified	KCC, CE, FCC

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.

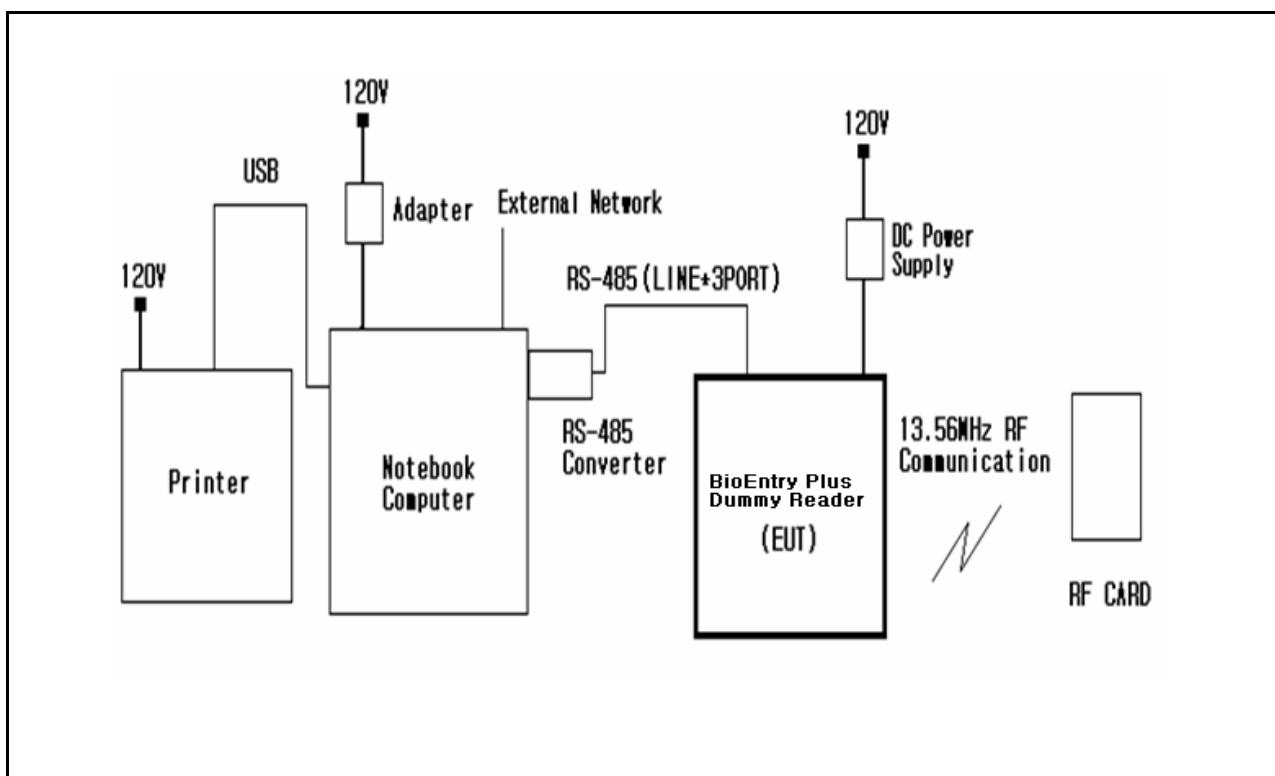
4. Measurement Condition

4.1 EUT Operation.

- The EUT was in the following operation mode during all testing

1. Connect the EUT with Notebook Computer.
2. Excute a provided program to operate RS-485 and RF card.
3. Check communcation status between the EUT and RF tag
4. The operational conditions of the EUT was determined by the manufacturer according to the typical use of the EUT with respect to the expected highest level of emission.

4.2 Configuration and Peripherals



4.3 EUT and Support equipment

Equipment Name	Model Name	S/N	Manufacturer	Remark (ECC ID)
BioEntry Plus Dummy Reader	BRM-10	NONE	Suprema Inc.	EUT
DC Power Supply	NONE	8015005	DIGITAL ELECTRONICS CO., LTD.	
Notebook Computer	GW687AV	CNU0295RBD	HEWLETT-PACKARD COMPANY	
Adapter	PPP009D	WBGSV0ADDZ306N	DELTA ELECTRONICS (JIANG SU), LTD.	
RS-485 Converter	TCC-80	TAZE01060460	MOXA	
RF CARD	NONE	NONE	Suprema Inc.	
Printer	K10229	NONE	CANON VIETNAM CO., LTD.	

4.4 Cable Connecting

Start Equipment		End Equipment		Cable Standard		Remark
Name	I/O port	Name	I/O port	Length	Shielded	
BioEntry Plus Dummy Reader	Power	DC Power Supply	-	2	Unshielded	
BioEntry Plus Dummy Reader	RS-485	RS-485 Converter	RS-485	3	Unshielded	
BioEntry Plus Dummy Reader	13.56 MHz Signal	RF CARD	13.56 MHz Signal	-	-	
BioEntry Plus Dummy Reader	LINE (Relay)	-	-	3	Unshielded	
BioEntry Plus Dummy Reader	Line (Switch)	-	-	3	Unshielded	
BioEntry Plus Dummy Reader	Line (Wiegand)	-	-	3	Unshielded	
Notebook Computer	Serial	RS-485 Converter	Serial	-	-	
Notebook Computer	Power	Adapter	-	2	Shielded	
Notebook Computer	USB	Printer	USB	2	Shielded	
Notebook Computer	LAN	External Network	LAN	20	Unshielded	

5. Measurement of radiated disturbance

Above 30 MHz Electric Field strength was measured in accordance with FCC PART 15 (2010). The test setup was made according to ANSI C 63.4 (2003) on an open test site, which allows a 3 m distance measurement. The EUT was placed in the center of wooden turntable. The height of this table was 0.8 m. The measurement was conducted with both horizontal and vertical antenna polarization. The turntable has fully rotated. For further description of the configuration refer to the picture of the test setup.

5.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESCI7	ROHDE & SCHWARZ	1166.5950.07	28-Mar-13
Logbicon Antenna	VULB 9168	SCHWARZBECK	237	20-Jan-13
Turn Table	DT3000-2t	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/641 /28051111/L	-
TEST Receiver	ESPI7	ROHDE & SCHWARZ	100185	25-Jan-13
PREAMPLIFIER	8449B	AGILENT	3008A00595	25-Jan-13
Horn Antenna	BBHA9120D	SCHWARZBECK	352	15-May-13
Turn Table	DT1500-S	Innco System GmbH	N/A	-
Antenna Mast	MA4000-EP	Innco System GmbH	N/A	-
Antenna Master & Turn table controller	CO2000-P	Innco System GmbH	CO2000/642 /28051111/L	-

5.2 Environmental Condition

Test Place : 10 m Semi-anechoic chamber

Below 1 GHz

Temperature (°C) : 25 °C

Humidity (% R.H.) : 46 % R.H.

Test Place : 3 m Semi-anechoic chamber(3 m)

Above 1 GHz

Temperature (°C) : 24 °C

Humidity (% R.H.) : 45 % R.H.

5.3 Test data (Below 1 GHz)

Test Date : 15-Sep-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)
53.70	21.73	V	1.0	12.44	1.10	40.00	35.27	4.73
70.50	22.27	H	2.4	10.94	1.21	40.00	34.42	5.58
72.20	22.50	V	1.0	10.63	1.24	40.00	34.37	5.63
104.20	24.94	V	1.0	8.48	1.60	43.50	35.02	8.48
207.50	23.38	V	1.0	9.41	2.18	43.50	34.96	8.54
276.50	18.37	H	1.8	12.23	2.50	46.00	33.10	12.90
325.10	19.13	H	1.5	13.71	2.73	46.00	35.57	10.43
341.70	21.34	H	1.2	14.08	2.82	46.00	38.24	7.76
345.80	19.44	V	1.0	14.17	2.86	46.00	36.47	9.53
413.50	20.26	V	1.0	15.69	3.17	46.00	39.12	6.88
Remark	H : Horizontal, V : Vertical *Result Value = Reading + Antenna + Cable loss *Correction Factor = Ant Factor + Cable *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection							

5.3 Test data (Above 1 GHz)

Test Date : 15-Sep-12

Measurement Distance : 3 m

Frequency (MHz)	Reading (dB μ V)	Position (V/H)	Height (m)	Correction Factor		Result Value		
				Ant Factor (dB)	Cable (dB)	Limit (dB μ V/m)	Result (dB μ V/m)	Margin (dB)
Peak(RBW:1 MHz VBW:1 MHz)								
1383.00	48.66	V	1.0	25.09	-30.75	74.00	42.99	31.01
1865.00	50.24	V	1.0	25.39	-29.36	74.00	46.28	27.72
1973.00	51.67	H	1.0	25.46	-29.15	74.00	47.98	26.02
Average(RBW:1 MHz VBW:10 Hz)								
1383.00	43.37	V	1.0	25.09	-30.75	54.00	37.70	16.30
1865.00	42.03	V	1.0	25.39	-29.36	54.00	38.07	15.93
1973.00	41.15	H	1.0	25.46	-29.15	54.00	37.46	16.54
Remark	H : Horizontal, V : Vertical							
	*Reading = receiver reading + Amplifier Gain							
	*CL = Cable Loss-Amplifier Gain							
	*The resolution bandwidth and video bandwidth of spectrum analyzer is 1 MHz and 10 Hz for average detection at frequency above 1 GHz.							
	*Application method of the highest frequency is in the following							
	*Highest frequency of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.							
	*Highest frequency of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.							
	*Highest frequency of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.							
	*Highest frequency of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 40 GHz,							

6. 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). The test setup was made according to 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.

6.1 Measurement equipments

Equipment Name	Type	Manufacturer	Serial No.	Next Calibration date
TEST Receiver	ESHS 30	Rohde & Schwarz	828765/002	16-Dec-12
LISN	ENV216	Rohde & Schwarz	101231	19-Sep-13
LISN	ESH3-Z5	Rohde & Schwarz	838979/010	26-Jan-13
Pulse Limiter	ESH3Z2	Rohde & Schwarz	NONE	25-Jan-13

6.2 Environmental Condition

Test Place : Shielded Room

Temperature (°C) : 24 °C

Humidity (% R.H.) : 47 % R.H.

6.3 Test data

Test Date : 15-Sep-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	0.06	0.28	H	64.49	34.80	35.14	54.49		
0.93	0.07	0.46	H	56.00	20.82	21.35	46.00		
1.13	0.08	0.48	N	56.00	19.37	19.94	46.00		
1.70	0.09	0.46	N	56.00	14.87	15.42	46.00		
17.59	0.66	0.68	H	60.00	25.01	26.35	50.00		
20.80	0.75	0.79	H	60.00	24.05	25.59	50.00		
Remark	H : Hot Line, N : Neutral Line *Correction Factor = Lisn + Cable *Result = Correction Factor + Reading								



ESTECH Co., Ltd.

Rm 1015, World Venture Center II,
426-5 Gasan-dong, Guncheon-gu,
Seoul, 158-803, Korea



**Electromagnetic
Interference
Test Report**

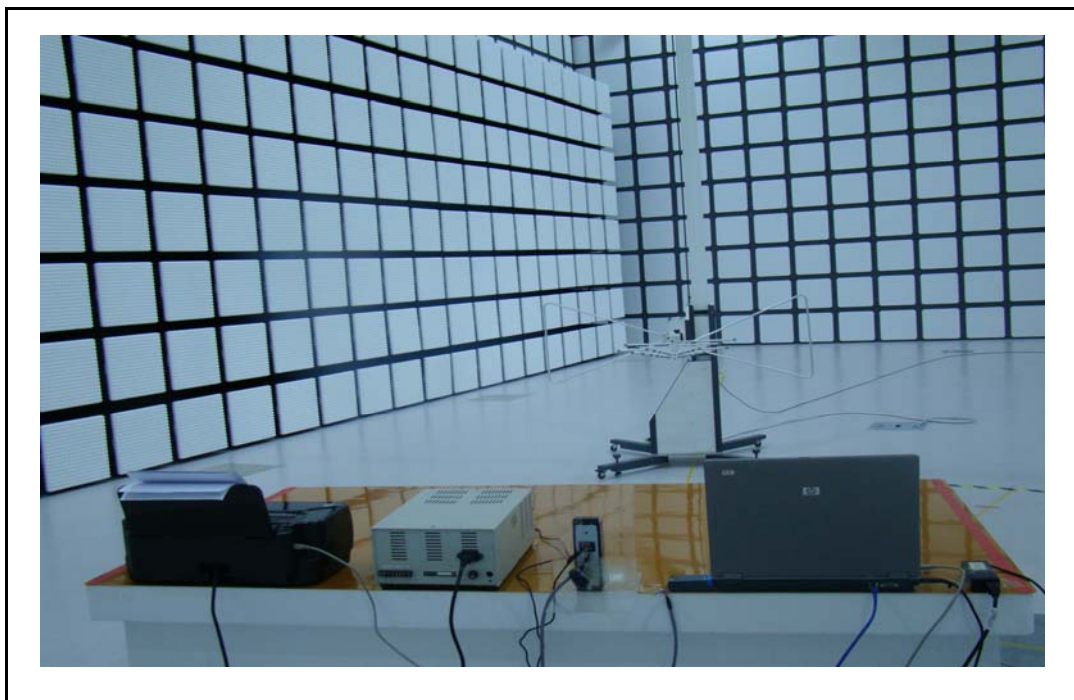
7. Photographs of test setup

7.1 Setup for Radiated Test : 30 MHz ~ 1000 MHz

[Front]



[Rear]





ESTECH Co., Ltd.

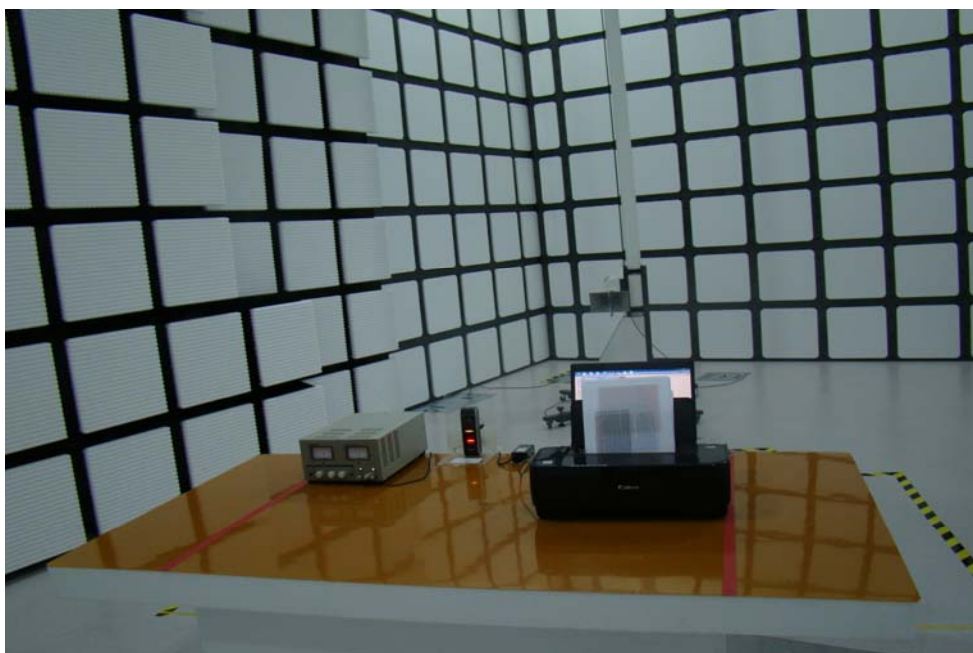
Rm 1015, World Venture Center II,
426-5 Gasan-dong, Guncheon-gu,
Seoul, 158-803, Korea



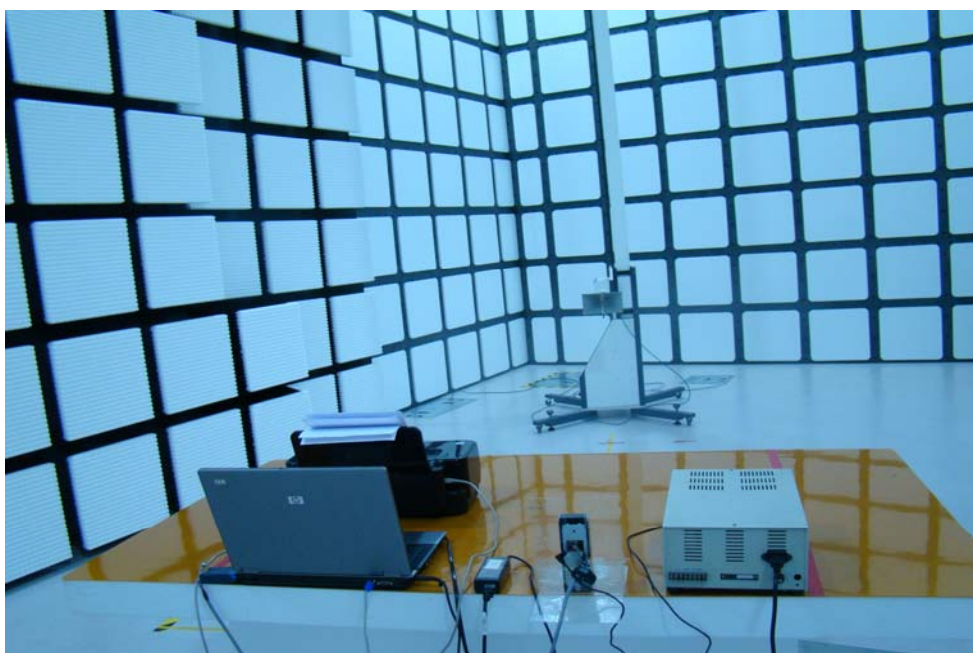
**Electromagnetic
Interference
Test Report**

7.2 Setup for Radiated Test : Above 1 GHz

[Front]



[Rear]



7.3 Setup for Conducted Test : 0.15 MHz ~ 30 MHz

[Front]



[Rear]



8. Photographs of EUT

[Front]



[Rear]



Appendix 1. Special diagram

*HOT

ES TECH
HOT LINE

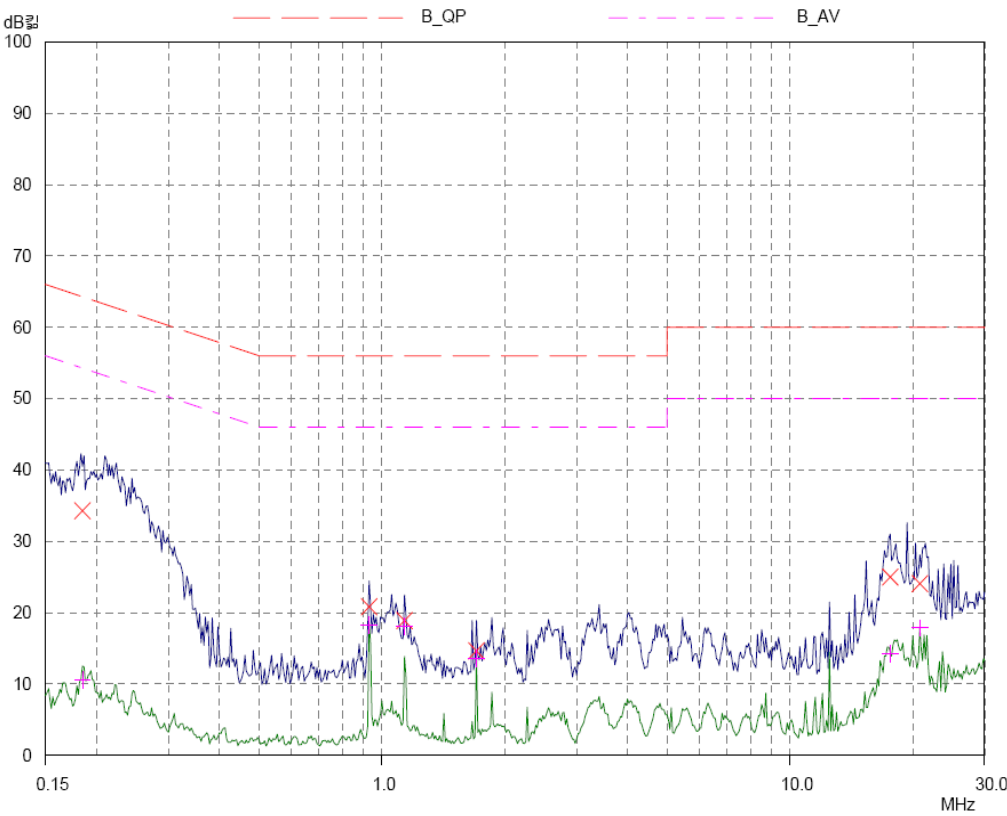
15 Sep 2012 16:42

EUT: BRM-10
Manuf:
Op Cond: 120 V
Operator: S.S. An
Test Spec: CLASS B
Comment:

Result File: 121101_h.dat :

Scan Settings			Receiver Settings						
(1 Range)									
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	0.8%	10kHz	PK+AV	10msec	Auto	OFF	60dB	

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 0 dB



*NEUTRAL

ES TECH
NEUTRAL LINE

15 Sep 2012 16:38

EUT: BRM-10
Manuf:
Op Cond: 120 V
Operator: S.S. An
Test Spec: CLASS B
Comment:

Result File: 121101_n.dat :

Scan Settings (1 Range)

Frequencies			Receiver Settings						
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	0.8%	10kHz	PK+AV	10msec	Auto	OFF	60dB	

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 0 dB

