



SK TECH CO., LTD.

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Certificate of Compliance

Test Report No.:	SKTFCE-050412-024		
NVLAP CODE :	200220-0		
Applicant:	INTO-TECH Inc.		
Applicant Address:	3F, Seojin Bldg., 1-17, Cheongdam-Dong, Gangnam-Gu, Seoul, 135-100, KOREA		
Manufacturer:	INTO-TECH Inc.		
Manufacture Address:	3F, Seojin Bldg., 1-17, Cheongdam-Dong, Gangnam-Gu, Seoul, 135-100, KOREA		
Product:	DVR BOARD		
FCC ID:	S2MSPLUS	Model No.:	SPLUS
Receipt No.:	SKTEU05-0013	Date of receipt:	Jan. 12, 2005
Date of Issue:	Apr. 12, 2005		
Testing location:	SK TECH CO., LTD. 820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea		
Test Standards:	ANSI C63.4 / 2003		
Rule Parts:	FCC part 15 Subpart B		
Equipment Class :	Class B Digital Device Peripheral		
Test Result:	The above mentioned product has been tested and passed.		

Prepared by: S.Y.Ye

Tested by: S.H.Yoon/Engineer

Approved by: C.H.Jeong
/Manager & Chief Engineer

Signature	Date	Signature	Date	Signature	Date
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Other Aspects :

Abbreviations :	- OK, Pass = passed	- Fail = failed	- N/A = not applicable
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- ☒ • 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 is based on a single evaluation of one sample of the above mentioned.
- ☒ • This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S Government.
- ☒ • We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.

NVLAP Lab. Code: 200220-0


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1. General

This equipment has been shown to be capable of compliance with the applicable technical standards and was tested in accordance with the measurement procedures as indicated in this report.

We attest to the accuracy of data. All measurements reported herein were performed by SK Tech Co., Ltd. and were made under Chief Engineer's supervision.

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

2. Test Site

SK TECH Co., Ltd.

2.1 Location

820-2, Wolmoon Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

The test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

This laboratory is accredited by NVLAP for NVLAP Lab. Code : 200220-0 and DATech for DAR-Registration No.:DAT-P-076/97-01



2.2 List of Test and Measurement Instruments

Table 1 : List of Test and Measurement Equipment

- Conducted Disturbance

Kind of Equipment	Type	S/N	Calibrated until
EMI Receiver	ESHS10	862970/019	10.2005
Artificial Mains Network	ESH2-Z5	834549/011	08.2005
EMI Receiver	ESHS10	835871/002	11.2005
Artificial Mains Network	ESH3-Z5	836679/018	08.2005

- Radiated Disturbance

Kind of Equipment	Type	S/N	Calibrated until
EMI Receiver	ESVS 10	825120/013	10.2005
EMI Receiver	ESVS 10	834468/008	11.2005
Spectrum Analyzer	R3361A	11730187	10.2005
Amplifier	8447F	3113A05153	08.2005
Log Periodic Antenna	UHALP9107	1819	04.2005
Biconical Antenna	BBA9106	91031626	04.2005
Open Site Cable	N/A	N/A	N/A
Antenna Turntable Driver	5907	N/A	N/A
Antenna Turntable controller	5906	N/A	N/A
Amp & Receiver connection cable	N/A	N/A	N/A
Amp & Spectrum connection cable	N/A	N/A	N/A
50Ω Switcher	MP59B	6100214538	N/A

2.3 Test Date

Date of Application : Jan. 12, 2005

Date of Test : Jan. 14, 2005 ~ Jan. 18, 2005

2.4 Test Environment

See each test item's description.



3. Description of the tested samples

The EUT is the DVR BOARD built in computer.

3.1 Rating and Physical Characteristics

1. Board Spec.

Category	Specification	
Video Input	Max 16 Ch	
Rated input voltage	+3.3V/ 5.0Vd.c.	
Rated input current	0.06A / 0.64A	
TV Output	1 Ch Switching	
Audio Input	Digital Audio Board 4 Ch (Option Board) Analog Audio Max 2 Ch	
Display FPS	NTSC	PAL
	60 FPS	50 FPS
Record FPS	60 FPS	50 FPS
Resolution Support	640 * 480 / 320 * 240	720* 576 / 360 * 288
Compression	2-3KB/fps	
Codec	Formula (Modified H.263)	
Digital I/O	Digital IO Board(Option Board) MAX 16 Ch/16 Ch (In/Out)	
Camera Control	P/T/Z Focus Preset	

2. Minimum System Requirements.

Category	Specification
CPU	Celeron Processor 1.7
Main Board	Intel 845G Chipset
RAM	256Mbyte
OS	Windows 2000 / XP
VGA	16Bit Color & YUY2 Directx Mode, Graphic Card (Over 32MB RAM)

3.2 Submitted Documents

N/A



4. Measurement Conditions

The operating voltage of EUT is supplied by PCI slot of Personal Computer.

(AC Adapter Input Voltage : AC 120V, 60Hz)

4.1 Modes of Operation

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

After the EUT has received the video signal from the video camera,

the signal was displayed in the CRT Monitor and PC monitor through the EUT.

4.2 List of Peripherals

Description	Manufacturer	Model Name	Serial No.	FCC ID
Keyboard(PS2)	Jing Mold Enterprise Co., Ltd.	LKB-0107	20103462	-
Mouse(USB)	LG	LMULBGS01I	04CU000259	-
Printer(Parallel)	EPSON PRECISION (PHILIPPINES), INC.	EPSON STYLUS PHOTO 830	ELTK014619	-
Personal Computer	LG Electronics	W8S	203KI12463	-
Camera(x2)	Sunkwang	-	N/A	-
Adaptor (x2) (for camera)	DREAM ELEC.	DRL-12500	N/A	-
CRT Monitor	HITRON SYSTEMS INC.	CVM0954	M3010002	-

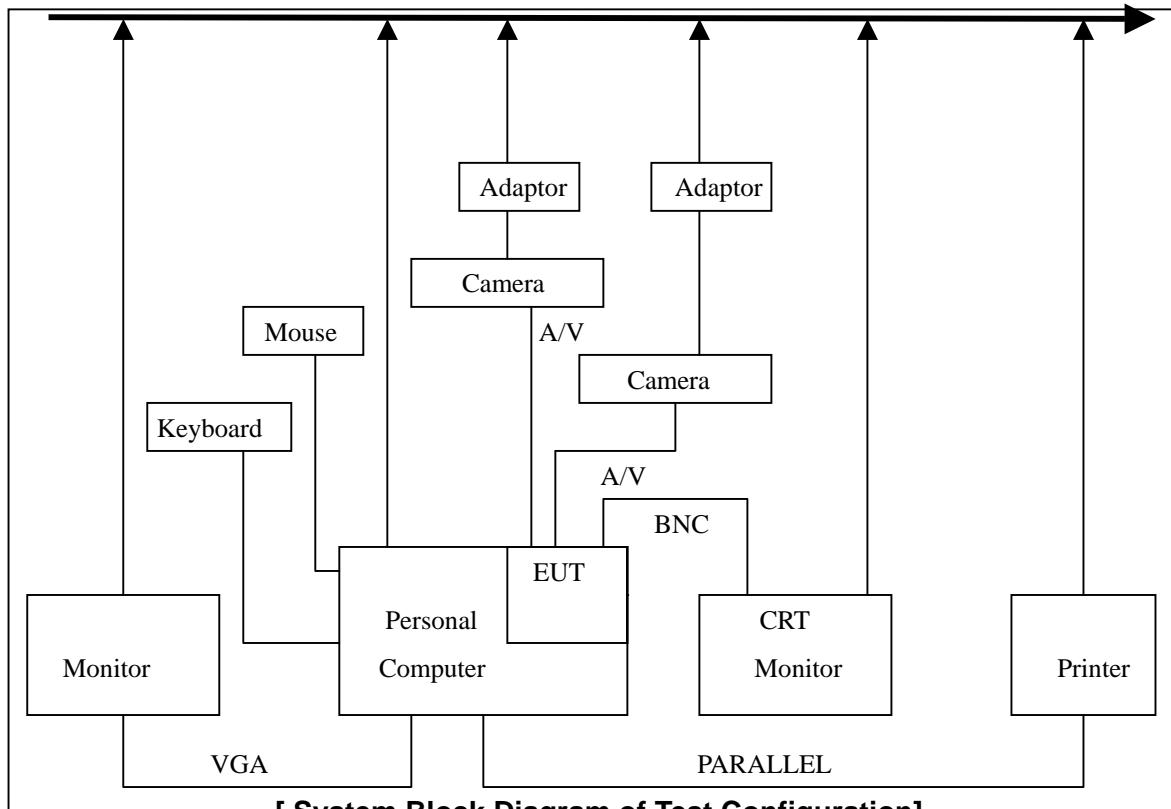


4.3 Type of Used Cables

Description	Length	Type of shield	Manufacturer	Remark
Power Cable	1.2m	Non-Shield	None	For PC
PS2 Cable	0.8m	Non-Shield	None	For Keyboard
USB Cable	1.1m	Non-Shield	None	For Mouse
VGA Cable	1.2m	Shield	None	For Monitor
Power Cable	1.2m	Non-Shield	None	For Monitor
Parallel Cable	1.2m	Shield	None	For Printer
Power Cable	1.2m	Non-Shield	None	For Printer
BNC Cable	0.8m	Shield	None	For CRT Monitor
Power Cable	1.2m	Non-Shield	None	For CRT Monitor
A/V Cable	1.1m	Non-Shield	None	For Camera
Adapter Cable	1.2m	Non-Shield	None	For Camera Adaptor

4.4 Test Setup

The test setup photographs showed the external supply connections and interfaces.





4.5 Uncertainty

1) Radiated disturbance

◎ Horizontally polarized radiated disturbances from 30MHz to 1000MHz at a distance of 10m

Input quantity	Uncertainty of Xi		U(Xi) dB	Ci	Ci _u (xi)	CISPR 16-4
	dB	Probability distribution function				
1) Receiver reading	±0.1	K=1	0.1	1	0.1	0.10
2) Attenuation: antenna-receiver	±0.18	K=2	0.09	1	0.09	0.05
3) Antenna factor	±1.5	K=2	0.75	1	0.75	1.00
RECEIVER CORRECTIONS:						
4) Sine wave voltage	±0.56	K=2	0.28	1	0.50	0.50
5) Pulse amplitude response	±1.5	Rectangular (1/3)	0.87	1	0.87	0.87
6) Pulse repetition rate response	±1.5	Rectangular (1/3)	0.87	1	0.87	0.87
7) Noise floor proximity	±0.5	K=2	0.25	1	0.25	0.25
8) AF frequency interpolation	±0.3	Rectangular (1/3)	0.17	1	0.17	0.17
9) Balance	±0.3	Rectangular (1/3)	0.17	1	0.17	0.53
10) AF height deviations	±0.5	Rectangular (1/3)	0.29	1	0.29	0.29
11) Phase center location	±0.3	Rectangular (1/3)	0.17	1	0.17	0.17
12) Directive difference	+1.0	Rectangular (1/3)	0.29	1	0.29	0.29
13) Cross polarization	±0.9	Rectangular (1/3)	0.52	1	0.52	0.52
14) Site corrections	±2.6	Rectangular (1/3)	1.5	1	1.5	1.63
15) Mismatch (ant-receiver)	±1.06	U-shaped (1/2)	0.75	1	0.75	0.67

Combined Uncertainty

$$U_c(x_i) = \sqrt{(1)^2 + (2)^2 + (3)^2 + (4)^2 + (5)^2 + (6)^2 + (7)^2 + (8)^2 + (9)^2 + (10)^2 + (11)^2 + (12)^2 + (13)^2 + (14)^2 + (15)^2} = 2.37$$

Expanded Uncertainty

$$U = k * U_c(x_i) = 2 * 2.37 = 4.74 \text{dB} \quad (\text{The coverage factor } k = 2 \text{ yields approximately a 95% level of confidence})$$


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◎ Vertically polarized radiated disturbances from 30MHz to 1000MHz at a distance of 10m

Input quantity	Uncertainty of Xi		U(Xi) dB	Ci	Ciu(xi)	CISPR 16-4
	dB	Probability distribution function				
1) Receiver reading	±0.1	K =1	0.1	1	0.1	0.10
2) Attenuation: antenna-receiver	±0.18	K=2	0.09	1	0.09	0.05
3) Antenna factor	±1.5	K=2	0.75	1	0.75	1.00
RECEIVER CORRECTIONS:						
4) Sine wave voltage	±0.56	K=2	0.28	1	0.50	0.50
5) Pulse amplitude response	±1.5	Rectangular (√3)	0.87	1	0.87	0.87
6) Pulse repetition rate response	±1.5	Rectangular (√3)	0.87	1	0.87	0.87
7) Noise floor proximity	±0.5	K=2	0.25	1	0.25	0.25
8) AF frequency interpolation	±0.3	Rectangular (√3)	0.17	1	0.17	0.17
9) Balance	±0.9	Rectangular (√3)	0.52	1	0.52	0.52
10) AF height deviations	±0.3	Rectangular (√3)	0.17	1	0.17	0.17
11) phase center location	±0.3	Rectangular (√3)	0.17	1	0.17	0.17
12) directive difference	+1.0	Rectangular (√3)	0.29	1	0.29	0.29
13) cross polarization	±0.9	Rectangular (√3)	0.52	1	0.52	0.52
14) site corrections	±2.6	Rectangular (√3)	1.5	1	1.5	1.63
15) Mismatch (ant-receiver)	±1.06	U-shaped (√2)	0.75	1	0.75	0.67

Combined Uncertainty

$$Uc(xi) = \sqrt{(1)^2 + (2)^2 + (3)^2 + (4)^2 + (5)^2 + (6)^2 + (7)^2 + (8)^2 + (9)^2 + (10)^2 + (11)^2 + (12)^2 + (13)^2 + (14)^2 + (15)^2} = 2.43$$

Expanded Uncertainty

$$U = k * Uc(xi) = 2 * 2.43 = 4.86 \text{dB}$$

(The coverage factor k =2 yields approximately a 95% level of confidence)


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2) Conducted disturbance
◎ Conducted disturbance from 150KHz to 30MHz using a 50Ω/50uH AMN

input quantity	Uncertainty of Xi		U(Xi) dB	Ci	Ciu(xi)	CISPR 16-4
	dB	Probability distribution function				
1) Receiver Readeing	±0.1	K=1	0.1	1	0.1	0.10
2) Attenuation:AMN-receiver	±0.36	Triangular ($\sqrt{6}$)	0.15	1	0.15	0.05
RECEIVER CORRECTIONS:						
3) Sine wave voltage	±0.5	K=2	0.25	1	0.25	0.50
4) Pulse amplitude response	±1.5	Rectangular ($\sqrt{3}$)	0.87	1	0.87	0.87
5) Pulse repetition rate response	±1.5	Rectangular ($\sqrt{3}$)	0.87	1	0.87	0.87
6) AMN voltage division factor	±0.07	K=2	0.04	1	0.04	0.1
7) Mismatch : AMN-receiver	±0.55	U-shaped ($\sqrt{2}$)	0.39	1	0.39	0.53
8) AMN impedance	±1.52	Triangular ($\sqrt{6}$)	0.62	1	0.62	1.08

- 1)~8) For numbered comments, refer to following articles

Combined Uncertainty

$$U_c(x_i) = \sqrt{(1)^2 + (2)^2 + (3)^2 + (4)^2 + (5)^2 + (6)^2 + (7)^2 + (8)^2} = 1.47$$

Expanded uncertainty

$$U = k * U_c(x_i) = 2 * 1.47 = 2.94 \text{dB}$$

The coverage factor $k = 2$ yields approximately a 95% level of confidence

◎ Refer

- 1) receiver's resolution capacity
- 2) refer to the sub clause 11. of a calibration report
- 3) quoted from CISPR 16-4
- 4) refer to a calibration report
- 5) refer to CISPR 16-4 article 5. 7)
- 6) refer to a calibration report and a measured AMN impedance data



5. EMISSION Test

5.1 Conducted Emissions

Result:**PASS**

The line-conducted facility is located inside a 2.0M x 3.6M x 7.2M shielded enclosure.

The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 604-05.

A 1m x 1.5m wooden table 80cm high is placed 40cm. away from the vertical wall and 1.5m away from the side wall of the shielded room. ROHDE & SCHWARZ Model ESH3-Z5 (10kHz-30MHz) 50ohm/50 uH Line-Impedance Stabilization Networks(LISNs) are bonded to the shielded room.

The EUT is powered from the ROHDE & SCHWARZ LISN and the support equipment is powered from the ROHDE & SCHWARZ LISN. Power to the LISNs are filtered by a high-current high-insertion loss Lindgren enclosures power line filters (100dB 14kHz-10GHz).

The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure.

All electrical cables are shielded by braided tinned copper zipper tubing with inner diameter of 1/2".

If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the ROHDE & SCHWARZ LISN.

All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1-meter 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 spectrum analyzer to determine the frequency producing the maximum EME from the EUT.

The spectrum was scanned from 150kHz to 30MHz with 100msec. sweep time.

The frequency producing the maximum level was reexamined using EMI/field Intensity Meter (ESHS 10) and Quasi-Peak adapter. The detector function was set to CISPR quasi-peak mode.

The bandwidth of the receiver was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME 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.

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

Each EME reported was calibrated using self-calibrating mode.

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Figure 1 : Spectral Diagram, LINE - PE

17 Jan 2005 11:51

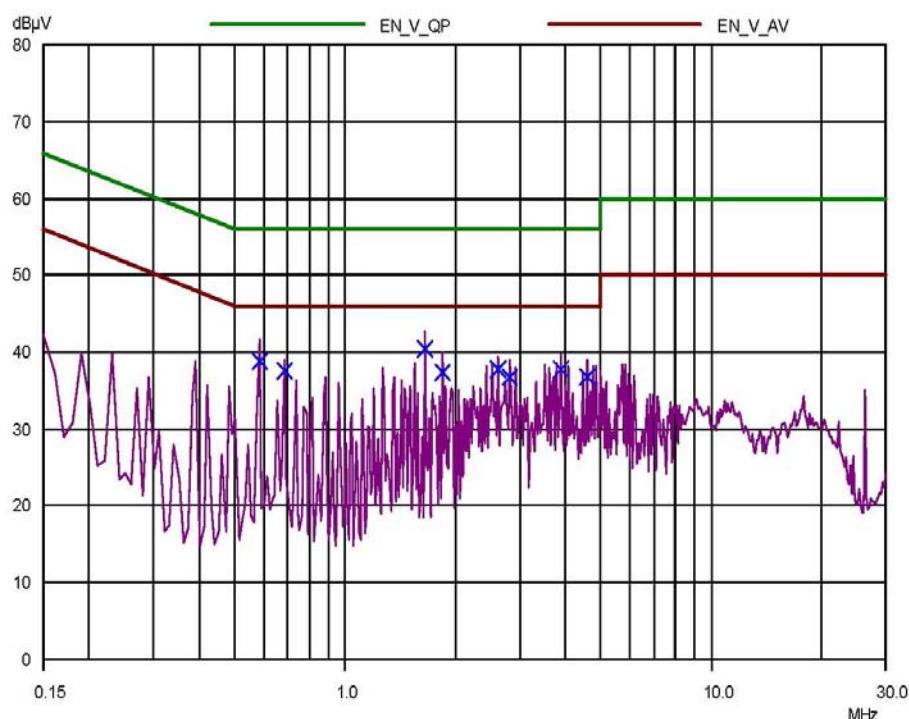
CONDUCTED DISTURBANCE

EUT: SPLUS
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: LINE-PE
Result File: SPLUS_L.dat : DVR Board

Scan Settings (1 Range)

Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	10kHz	10kHz	PK	100msec	Auto	OFF	60dB

Final Measurement: Detector: X_QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 35 dB



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Figure 2 : Spectral Diagram, NEUTRAL – PE

17 Jan 2005 10:53

CONDUCTED DISTURBANCE

EUT: SPLUS

Manuf:

Op Cond:

Operator:

Test Spec:

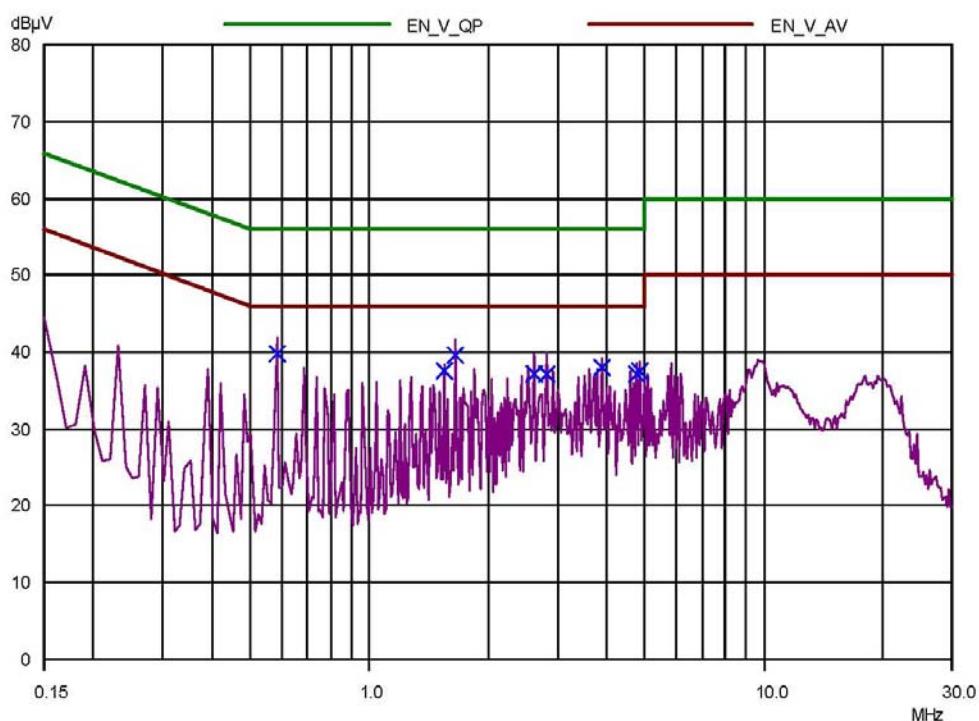
Comment: NEUTRAL-PE

Result File: SPLUS_N.dat : DVR Board

Scan Settings (1 Range)

Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	10kHz	10kHz	PK	100msec	Auto	OFF	60dB

Final Measurement: Detector: X QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 35 dB




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Table 2: Test Data, Conducted Emissions
► LINE-PE

Frequency (MHz)	Reading (dB μ V)	C/F (dB)	CL (dB)	Limit (dB μ V)	Margin (dB)
0.58	38.80	0.09	0.1	56.00	17.01
0.68	37.47	0.09	0.1	56.00	18.34
1.65	40.35	0.10	0.1	56.00	15.45
1.84	37.45	0.10	0.1	56.00	18.35
2.62	37.82	0.13	0.3	56.00	17.75
3.88	37.74	0.13	0.3	56.00	17.83

► NEUTRAL-PE

Frequency (MHz)	Reading (dB μ V)	C/F (dB)	CL (dB)	Limit (dB μ V)	Margin (dB)
0.58	39.88	0.15	0.1	56.00	15.87
1.55	37.49	0.15	0.1	56.00	18.26
1.65	39.54	0.15	0.1	56.00	16.21
2.81	37.14	0.17	0.3	56.00	18.39
3.88	38.00	0.17	0.3	56.00	17.53
4.85	37.61	0.17	0.3	56.00	17.92

NOTES:

1. All modes of operation were investigated and the worst-case emission are reported.
2. All other emissions are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. C/F = Correction Factor
6. C/L = Cable Loss

♦ Margin Calculation

$$(6) \text{Margin} = (5)\text{Limit} - (4)\text{Actual}$$

$$[(4)\text{Actual} = (1)\text{Reading} + (2)\text{C/F} + (3)\text{C/L}]$$



5.2 Radiated Emissions

Result :**PASS**

Preliminary measurements were made indoors at 3 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME.

Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found.

The spectrum was scanned from 30 to 300 MHz using biconical antenna and from 300 to 1000 MHz using log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using SCHWARZBECK dipole antennas. The test equipment was placed on a wooden table situated on a 4x4 meter area adjacent to the measurement area. Turntable was to protect from weather in the dome that made with FRP.

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 pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter(ESVS 10) and Quasi-Peak Adapter. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100kHz or 1MHz depending on the frequency or type of signal.

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-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 1 x 1.5 meter table.

The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; 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 operation or resolution; clock or data exchange speed, and/or support equipment, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in photograph of radiated emission test.

Each EME reported was calibrated using self-calibrating mode.


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Table 3 : Test Data, Radiated Emissions

Frequency (MHz)	Pol.	Height [m]	(1) Reading (dB μ V)	(2) AFCL (dB/m)	(3) Actual (dB μ V/m)	(4) Limit (dB μ V/m)	(5) Margin (dB)
168.02	H	4.0	0.5	17.5	18.0	30.0	12.0
458.18	H	1.7	13.4	21.8	35.2	37.0	1.8
572.73	H	1.3	10.1	25.0	35.1	37.0	1.9
801.82	H	1.2	7.0	28.0	35.0	37.0	2.0

Table. Radiated Measurements at 3-meters

NOTES:

1. All modes of operation were investigated and the worst-case emission are reported.
2. All other emission are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. AFCL = Antenna factor and cable loss
6. H = Horizontal, V = Vertical Polarization

◆ Margin Calculation

$$\begin{aligned}
 (5) \text{Margin} &= (4) \text{Limit} - (3) \text{Actual} \\
 (3) \text{Actual} &= (1) \text{Reading} + (2) \text{AFCL}
 \end{aligned}$$