EMC TEST REPORT

REGULATORY MODEL NUMBER: 25152
REPORT NUMBER: TAO09045
ISSUED DATE: April 03, 2009

Applicant: LSI Corp
6145-D NORTHBELT PKY, NOR CROSS, GA 30071, USA

Manufacturer: LSI Corp
6145-D NORTHBELT PKY, NOR CROSS, GA 30071, USA

Has been tested by Inventec Corp. (Taoyuan) EMC Labs
and was found to comply with the EMC requirement on the basis of

Technical Standard
AS/NZS CISPR 22 : 2006 RFI

Receipt date of EUT: March 11, 2009
Date of testing: March 11, 2009~ March 25, 2009

Approved By

Jane Lin / EMC Lab Manager
Inventec Corp. (Taoyuan) EMC Labs

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1. PRODUCT INFORMATION

1.1. PRODUCT DESCRIPTION

Trade Name: LSI

Regulatory Model Number: 25152

Part Number: N/A

Serial Number: N/A

Equipment Type: ITE

Equipment Category: PCI-E SAS Raid Card

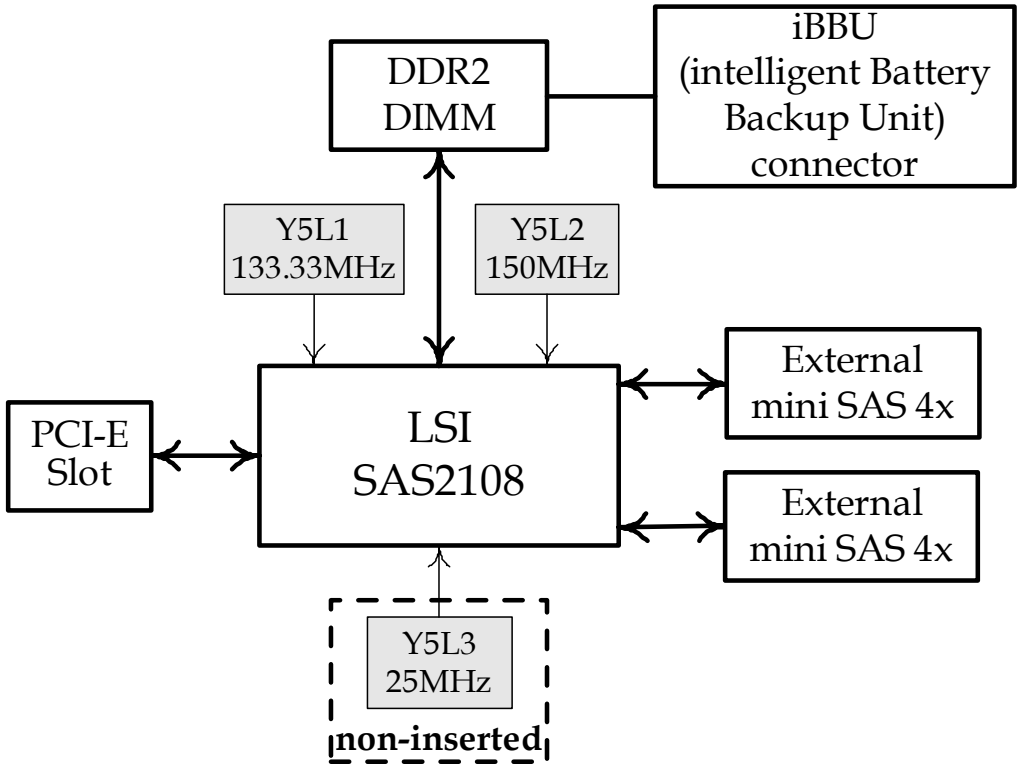
EUT Condition: DVT

1.2. PRODUCT FEATURE

A summary of features as follows:

- PCI-E 2.0 compliant for x8 lane slots
- Two external mini SAS 4x connectors
- 512MB on-board DDR2 800 cache
- PCI low profile form factor compliant
- Connection to attached iBBU (intelligent Battery Backup Unit)

1.3. CIRCUIT BLOCK DIAGRAM



2. TEST INFORMATION

2.1. SUMMARY OF TEST RESULTS

The worst data was found as following:

Standard	Test Item	Test Result	Remarks
AS/NZS CISPR22: 2006	Conduction Emission (Mode 1)	PASS	The worst emission frequency is 0.93MHz And minimum passing margin is –6.72dB at Line2, Average
	Radiation Emission (Mode 1)	PASS	The worst emission frequency is 42.93MHz at Vertical And minimum passing margin is –3.32dB, Quasi-Peak Height of antenna is 1.0m Angle of turntable is 0deg.

2.2. TEST MODES & EUT COMPONEMTS DESCRIPTION

EUT (25152) in HOST (HSTNS-2116)

Test Mode	Mode 1
EUT, PCI-E SAS Raid Card	LSI, P/N: L3-25152-30A, ID: 25152
HOST, Server System	HP, ID: HSTNS-2116
- System Board	HP, P/N: 1395T2100202
- CPU (Single)	Intel Xeon processor 2.5GHz/1333MHz
- DIMM 512MB *2	SAMSUNG, P/N: MT395T6553EZ4-CE65
- SATA2 HDD 500GB *1	Seagate, P/N: ST3500320NS
- Power Supply (660W)	DELTA, M/N: HSTNS-PD05

2.2.1. EUT OPERATING CONDITIONS

The EUT should exercise software the same as below during test.

- Run the program〝H〞pattern on host server. This program is used to exercise the EUT writing and reading data to all of disk drivers.
- Run the smasher.exe on host server. This program is used to exercise the EUT with providing data access as will as writing/reading data to all of disk drivers.

2.3. TEST SETUP

2.3.1. CABLING CONFIGURATION

Qty	From	To	Model/Part Number	Description	Connector
1	HOST (HSTNS-2116)	DM-1414	N/A	1.3m, shielded (Braid)	Shielded
4	HOST (HSTNS-2116)	F12-UF	E177865-F	1.8m, shielded (Braid)	Shielded
1	HOST (HSTNS-2116)	HSTND-2101-G	E193793	1.8m, shielded (Braid)	Shielded
1	HOST (HSTNS-2116)	AC source	E90165	1.8m, unshielded	Unshielded
2	HOST (HSTNS-2116)	DGS-1024D (HUB)	1074E	4.575m, unshielded, twisted pair	Unshielded
2	EUT (25152) in HOST	0834 (HDD Storage)	74547-0306	6.0m, shielded (Braid)	Shielded

2.3.2. TEST METHODOLOGY

A. Both conducted and radiated tests were performed according to the following methods and procedures:

- ANSI C63.4: 2003
  Methods of Measurement of Radio-Noise Emissions for Low Voltage Electrical and Electronic Equipment in the range of 9kHz to 40GHz.

- AS/NZS CISPR 22: 2006
  Limits and Methods of Measurements of Radio Interference Characteristics of Australian / New Zealand Standard.

B. Description of departing from standard test method & any other specific: NONE

2.3.3. MODIFICATIONS IMPLEMENTED FOR COMPLIANCE

No modifications were made to the equipment under test by Test Laboratory.

2.3.4. TECHNICAL BASIS FOR COMPLIANCE

The measurements shown in this test report were made in accordance with the Standard AS/NZS CISPR 22(2006).

2.3.5. RELATED SUBMITTAL(S) NOTES

A. The results relate only to the items tested.
B. The report must not be used by the client to claim product certification, approval or endorsement by NVLAP or any agency of the federal government.
C. There are no related submittals to this file.

2.3.6. TEST CONDITION

2.3.6.1 Test of Radiation Emission

Radiated emissions from 30MHz to 1000MHz were measured with a resolution bandwidth of 120kHz, 1GHz to 6GHz were measured with a resolution bandwidth of 1MHz according to the methods defines in Standard AS/NZS CISPR 22, Clause 10. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 4.5.

The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

2.3.6.2 Test of Conducted Emission

Conducted emissions were measured from 0.15MHz to 30MHz with a resolution bandwidth of 9kHz and return leads of the EUT according to the methods defines in Standard AS/NZS CISPR 22, Clause 9. The EUT was placed on a nonmetallic stand in a shielded room, 0.8 meter above the ground plane, as shown in section 3.5. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum conducted emissions.

2.4. TEST FACILITY

The Inventec Corp. (Taoyuan) EMC labs' open area test site located at: 14, 5 Lin, Hsin-feng Li, Tachi, Taoyuan, Taiwan, Republic of China. The Lab has a turntable with a diameter at maximum 2 meters and can measure ITE products at the 3 and 10 meters of antenna distance.

A site description and calibration report to ANSI C63.4 is available upon request.
It is authorized for testing ITE devices by NVLAP, NEMKO, TAF (BSMI) and VCCI.

EMC Laboratory Accreditation:

BSMI EMI Testing Lab: SL2-IN-E-0009
NVLAP Lab Code: 200140-0
Nemko ELA No. 127
VCCI Registration No. R-349, C-362, T185 (TAO Test Site)
R-350, C-363, T320 (TA2 Test Site)
TAF Accreditation No. 1119

3. CONDUCTION EMISSIO N MEASUREMENT

3.1. TEST LIMIT, AS/NZS CISPR 22 Class B

Frequency (MHz)	Limit [dB(μV)]	
	Quasi-Peak	Average
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5	56	46
5 ~ 30	60	50

Note: 1. * Decreases with the logarithm of the frequency.
2. The lower limit shall apply at the transition frequency.
3. The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

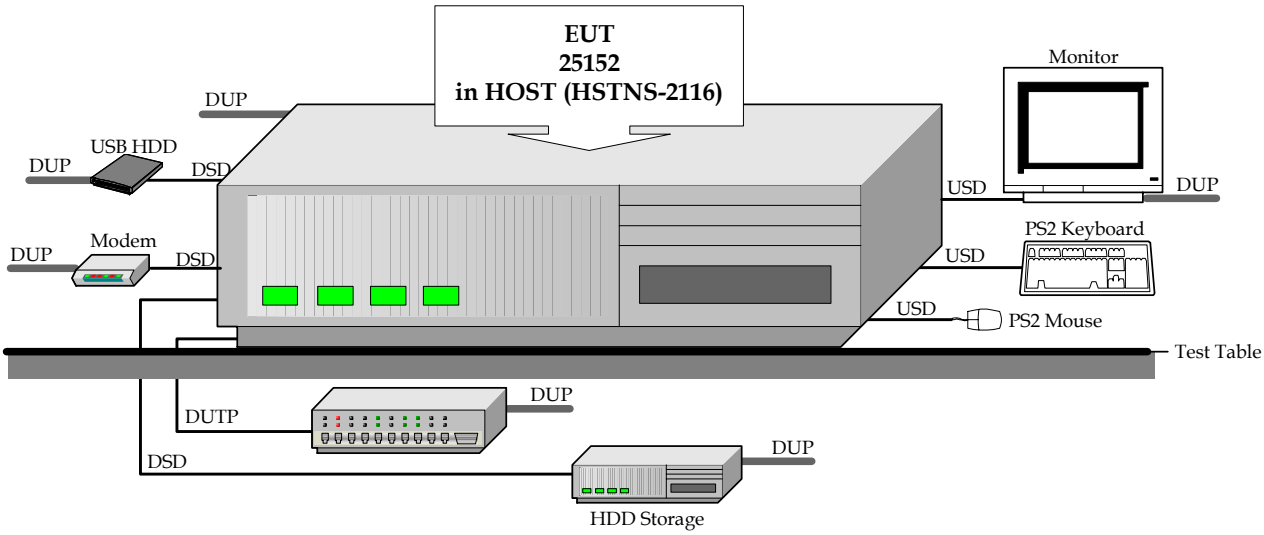
3.2. TEST INSTRUMENTS

Name	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Receiver	Rohde & Schwarz	ESIB 40	100108	18-Jun-2008	09-Jun-2009
LISN (for EUT)	EMCO	3825/2	9405-2196	10-Mar-2009	04-Mar-2010
LISN (for Peripheral)	EMCO	3825/2	1416	10-Mar-2009	04-Mar-2010
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54	18-Nov-2008	16-Nov-2009
Terminator x 3 (50 ohms)	---	N/A	N/A	10-Mar-2009	04-Mar-2010
RF Cable	---	N/A	N/A	05-Mar-2009	04-Mar-2010
EMI Test Program	---	EMI 3 (Ver. D)	N/A	N/A	N/A

3.3. SUPPORT TEST PERIPHERALS

Name	Manufacturer	Model/Part Number	Serial Number	ID or DoC
HOST	HP	HSTNS-2116	CN784600G5	DoC
Monitor	COMPAQ	MV900	904GA19EC186	DoC
PS2 Mouse	Logitech	M-S34	LC84650159	DZL211029
PS2 Keyboard	COMPAQ	KB-9965	B0A090NGAM10VC	DoC
Modem	ACEEX	DM-1414	0202003559	IFAXDM1414
USB HDD	TeraSys	F12-UF	A0100215-2A10036	DoC
USB HDD	TeraSys	F12-UF	A0100215-2CJ0008	DoC
USB HDD	TeraSys	F12-UF	A0100215-2CJ0009	DoC
USB HDD	TeraSys	F12-UF	A0100215-2CJ0001	DoC
HUB	D-link	DGS-1024D	DRC5368000357	DoC
HDD Storage	LSI	0834	0826FG000098	DoC
HDD Storage	LSI	0834	0805FG0029	DoC

3.4. BLOCK DIAGRAM OF CONDUCTION BETWEEN EUT AND TEST PERIPHERAL



Legend:

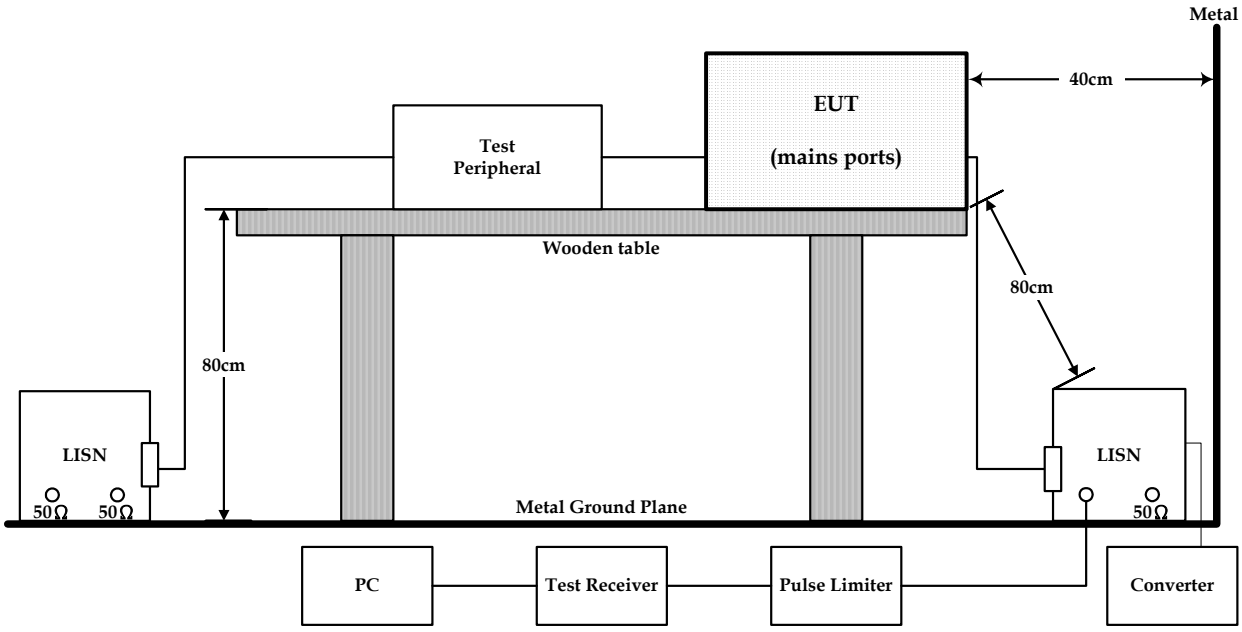
USD = Undetachable Shielded Data cable

DSD = Detachable Shielded Data cable

DUP = Detachable Unshielded Power cord

DUTP = Detachable Unshielded Twisted Pair cable

3.5. BLOCK DIAGRAM OF TEST SETUP



3.6. TEST DATA

Data of Test	: O3903165	Tested By	: GF Sheu
EUT	: 25152	Test Mode	: Mode 1
Frequency Range	: 0.15MHz ~ 30MHz	Main	: 230V/50Hz
Temperature (°C)	: 24	Humidity (%)	: 60

Freq. (MHz)	Reading Level dBμV	Correction Factor dB	Conducted Emission dBμV	Ave. Limit dB(μV)	Ave. Delta dB	QP Limit dB(μV)	QP Delta dB	Phase	PK/ QP/ AV
0.207	33.69	9.93	43.62	53.32	-9.7	63.32	N/A	L1	AV
0.275	23.49	9.94	33.43	50.96	-17.53	60.96	N/A	L1	AV
0.343	21.2	9.97	31.17	49.13	-17.96	59.13	N/A	L2	AV
0.413	24.35	9.97	34.32	47.58	-13.26	57.58	N/A	L2	AV
0.483	22.11	9.95	32.06	46.28	-14.22	56.28	N/A	L2	AV
0.553	18.11	9.94	28.05	46	-17.95	56	N/A	L2	AV
0.692	14.31	9.92	24.23	46	-21.77	56	N/A	L2	AV
0.761	12.68	9.9	22.58	46	-23.42	56	N/A	L2	AV
0.93	37.84	9.88	47.72	46	1.72	56	N/A	L2	PK
0.93	29.4	9.88	39.28	46	-6.72	56	N/A	L2	AV
1.548	32.51	9.99	42.5	46	-3.5	56	N/A	L1	PK
16.384	36.17	10.36	46.53	50	-3.47	60	N/A	L1	PK

Remark:

1. Peak, Ave. and QP signifies the measurement detector used for performing measurements.
2. Negative number in the margin column indicates the amount (in dB) that the recorded emission is below the limit.
3. L1 indicates the live of phase line, L2 denotes the neutral line.

3.7. CALCULATION

1. Freq. (MHz), means Conducted Emission frequency.
2. Reading Level (dBμV), means the reading of Analyzer or Test Receiver.
3. Correction Factor (dB), means the value of LISN Loss add Cable Loss.
4. Conducted Emission (dBμV), means the values of Reading Level add CF added.
   CE=RL+CF
5. Ave. Limit (dBμV), means Limit stated in Standard.
6. Ave. Delta (dB), Reading in reference to Limit.
   AD=CE – AL

4. RADIATION EMISSION MEASUREMENT

4.1. TEST LIMIT, AS/NZS CISPR 22 Class B

Frequency range (MHz)	Distance (Meter)	Quasi-peak limits dB(μV/m)
30 ~ 230	10	30
230 ~ 1000	10	37

Note: 1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

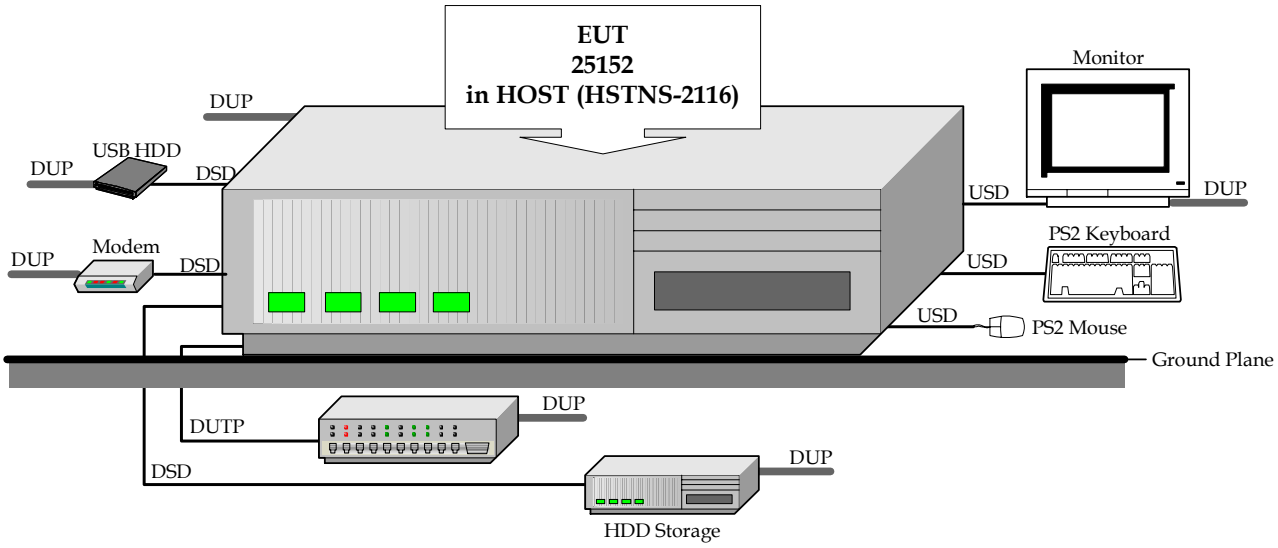
4.2. TEST INSTRUMENTS

Name	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Receiver	Rohde & Schwarz	ESIB 40	100108	18-Jun-2008	09-Jun-2009
Bilog Antenna	Schaffner	CBL6112B	2675	20-May-2008	12-May-2009
Horn Antenna	EMCO	3115	9311-4178	08-Jul-2008	30-Jun-2009
Amplifier (under 1G)	Hewlett Packard	8447D	2443A04003	08-Jul-2008	30-Jun-2009
Amplifier (above 1G)	Agilent	8449B	3008A01833	01-Sep-2008	04-Sep-2009
OATS	Inventec (Taoyuan)	TAO Site	N/A	24-Apr-2007	23-Apr-2009
RF Cable x 2	SUCOFLEX	104	N/A	08-Jul-2008	30-Jun-2009
RF Cable	---	N/A	N/A	05-Mar-2009	04-Mar-2010
EMI Test Program	---	EMI 3 (Ver. D)	N/A	N/A	N/A

4.3. SUPPORT TEST PERIPHERALS

Name	Manufacturer	Model/Part Number	Serial Number	ID or DoC
HOST	HP	HSTNS-2116	CN784600G5	DoC
Monitor	HP	HSTND-2101-G	CNG82107DC	BEJLH2065H
PS2 Mouse	Logitech	M-S34	LC84650159	DZL211029
PS2 Keyboard	COMPAQ	KB-9965	B0A090NGAM10VC	DoC
Modem	ACEEX	DM-1414	0202003559	IFAXDM1414
USB HDD	TeraSys	F12-UF	A0100215-2A10036	DoC
USB HDD	TeraSys	F12-UF	A0100215-2CJ0008	DoC
USB HDD	TeraSys	F12-UF	A0100215-2CJ0009	DoC
USB HDD	TeraSys	F12-UF	A0100215-2CJ0001	DoC
HUB	D-link	DGS-1024D	DRC5368000357	DoC
HDD Storage	LSI	0834	0826FG000098	DoC
HDD Storage	LSI	0834	0805FG0029	DoC

4.4. BLOCK DIAGRAM OF RADIATION BETWEEN EUT AND TEST PERIPHERAL



Legend:

USD = Undetachable Shielded Data cable

DSD = Detachable Shielded Data cable

DUP = Detachable Unshielded Power cord

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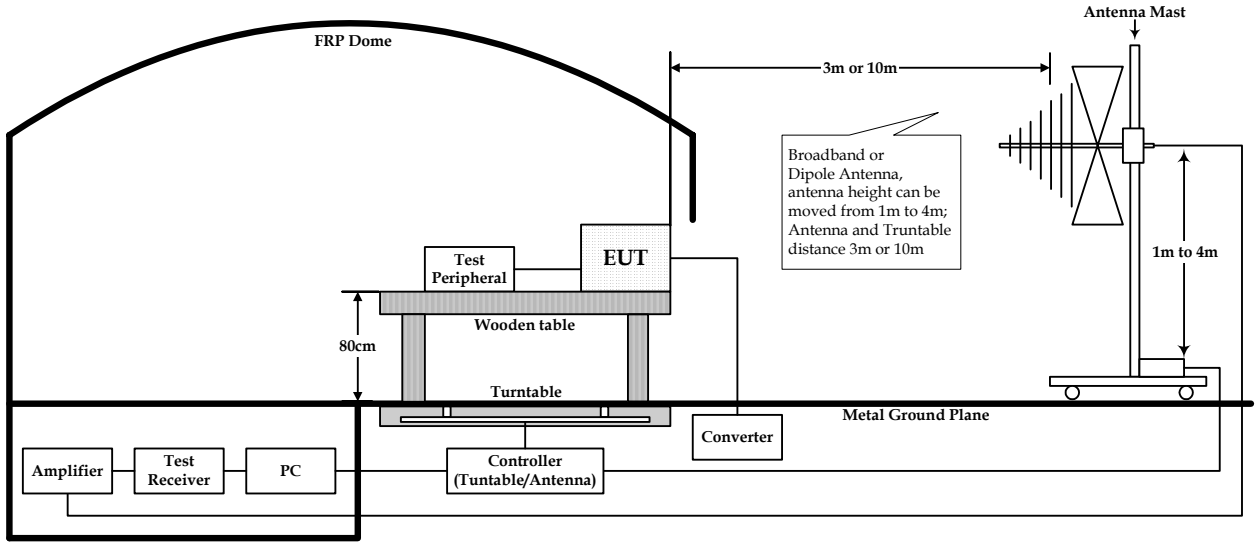
4.5. BLOCK DIAGRAM OF TEST SETUP



4.6. TEST DATA

Data of Test	: O2903161	Tested By	: GF Sheu
EUT	: 25152	Test Mode	: Mode 1
Frequency Range	: 30MHz ~ 1000MHz	Main	: 110V/60Hz
Temperature (°C)	: 26	Humidity (%)	: 45

Freq. (MHz)	Reading dBμV	Total Factor (dB/m)	Field Strength dBμV/m	Limit dB(μV/m)	Delta dB	Ant. Pol.	Antenna Height (cm)	Table Ang. (deg)	PK/ QP
42.93	41.42	-14.74	26.68	30	-3.32	V	100	0	QP
66.2	37.46	-20.19	17.27	30	-12.73	V	100	360	QP
124.99	40.05	-13.84	26.21	30	-3.79	V	131	75	QP
233.3	46.98	-14.31	32.67	37	-4.33	H	400	157	QP
240	46.24	-13.55	32.69	37	-4.31	V	102	360	QP
366.13	40.57	-8.8	31.77	37	-5.23	V	100	0	QP
480.02	38.9	-5.84	33.06	37	-3.94	H	184	294	QP
499.73	38.02	-5.63	32.39	37	-4.61	H	154	0	QP
551.24	30.62	-4.14	26.48	37	-10.52	H	100	87	QP
600.04	28.73	-3	25.73	37	-11.27	H	119	296	QP
834.12	28.49	0.27	28.76	37	-8.24	H	329	312	QP
999.99	28.18	1.94	30.12	37	-6.88	H	100	275	QP

Remark:

1. Negative number in the margin column indicates the amount (in dB) that the recorded emission is below the limit.
2. V means in Vertical Antenna Polarization, H means in Horizontal, and PK means in Peak, QP means in Quasi-Peak.
3. Radiated emissions for this type of product do not change with the AC power operating voltage. The above data represents the worse case for 110V/60Hz as well as 230V/50Hz operation.

4.7. CALCULATION

The field strength is calculated by adding the Total Factor to the receiver or analyzer reading to determine the resultant field strength.
The Total Factor is determined by adding the antenna factor and the loss of the cables connection the antenna to the receiver.
Front-end amplifier gain – if any – is accounted for in the receiver reading.
The basic equation with a sample calculation is as follows:

FS (dBμV/m) = RA (dBμV) + TF (dB/m)
The sum of Total Factor is measured mean Antenna Factor, Cable Loss Factor and Amplifier Gain
TF = AF + CL - AG

FS = Field Strength
AF = Antenna Factor
CL = Cable Loss Factor
RA = Receiver Amplitude
AG = Amplifier Gain

The difference between Field Strength and Test Limit, Delta (dB) = FS - Limit [dB(μV/m)]

Assume a receiver reading of 22dBμV is obtained.
The Antenna factor of 7.4dB and a cable loss factor of 1.1dB are added to yield 8.5dB Total Factor.
The Calculated Field Strength is the sum of 22 + 8.5 = 30.5dBμV/m.
All values are listed as dB, either referenced to 1μV or 1μV/m.

5. UNCERTAINTY OF EMI TEST SITE

Conducted Disturbances (mains ports) from 150kHz to 30MHz

Source of Uncertainty	Value (dB)	Probability distribution	ui(y)
Receiver reading	0.1	normal k=1	0.100
Attenuation: AMN-Receiver	0.5	normal k=2	0.250
AMN voltage division factor	1.2	normal k=2	0.600
Receiver corrections:			
Sine wave voltage	1.0	normal k=2	0.500
Pulse amplitude response	1.5	Rectangular	0.866
Pulse repetition rate response	1.5	Rectangular	0.866
Noise floor proximity	0.0	Rectangular	0.000
Mismatch(-): AMN-Receiver	-0.036	U-shaped	-0.026
Receiver VRC	0.091	-	
AMN VRC	0.046	-	
AMN impedance	-2.7	Triangular	-1.102
Measurement System Repeatability (previous assessment of $S(q_k)$ from 15 repeats)	0.009	normal k=1	0.009
Combined Standard Uncertainty		normal k=1	1.843
Expanded Uncertainty (Total Uncertainty @95% min. Confidence level)		**normal k=2**	**3.69**

Conducted Disturbances (telecommunication ports) from 150kHz to 30MHz

Source of Uncertainty	Value (dB)	Probability distribution	$u_i(y)$
Receiver reading	0.1	normal k=1	0.100
Attenuation: ISN-Receiver	0.5	normal k=2	0.250
ISN voltage division factor	0.35	normal k=2	0.175
ISN longitudinal conversion loss	0.75	normal k=2	0.375
Receiver corrections:			
Sine wave voltage	1.0	normal k=2	0.500
Pulse amplitude response	1.5	Rectangular	0.866
Pulse repetition rate response	1.5	Rectangular	0.866
Noise floor proximity	0.0	Rectangular	0.000
Mismatch(-): ISN-Receiver	-0.407	U-shaped	-0.288
Receiver VRC	0.091	-	
ISN VRC	0.504	-	
ISN impedance	-2.7	Triangular	-1.102
Measurement System Repeatability (previous assessment of $S(q_k)$ from 15 repeats)	0.033	normal k=1	0.033
Combined Standard Uncertainty		normal k=1	1.815
Expanded Uncertainty (Total Uncertainty @95% min. Confidence level)		**normal k=2**	**3.63**

Radiated Measurement (Bi-Log Antenna) frequency range 30MHz to 1000MHz

Source of Uncertainty	Value (dB)	Probability distribution	$u_i(y)$
Receiver reading	0.1	normal k=1	0.100
Attenuation: Antenna-Receiver	0.5	normal k=2	0.250
Bi-Log antenna factor	1.5	normal k=2	0.750
Receiver corrections:			
Sine wave voltage	1.0	normal k=2	0.500
Pulse amplitude response	1.5	Rectangular	0.866
Pulse repetition rate response	1.5	Rectangular	0.866
Noise floor proximity	0.5	normal k=2	0.250
Mismatch(-): Antenna-Receiver	-0.267	U-shaped	-0.189
Receiver VRC	0.091	-	
Antenna VRC	0.333	-	
Bi-Log antenna corrections:			
AF frequency interpolation	0.3	Rectangular	0.173
AF height deviations	0.3	Rectangular	0.173
Directivity difference at 10m	1.0	Rectangular	0.577
Phase center location at 10m	0.3	Rectangular	0.173
Cross-polarization	0.9	Rectangular	0.520
Balance	0.0	Rectangular	0.000
Site corrections:			
Site imperfections	4.0	Triangular	1.633
Separation distance at 10m	0.1	Rectangular	0.058
Table height at 10m	0.1	normal k=2	0.050
Measurement System Repeatability (previous assessment of $S(q_k)$ from 15 repeats)	0.009	normal k=1	0.009
Combined Standard Uncertainty 10m		normal k=1	2.418
Expanded Uncertainty 10m (Total Uncertainty @95% min. Confidence level)		**normal k=2**	**4.84**

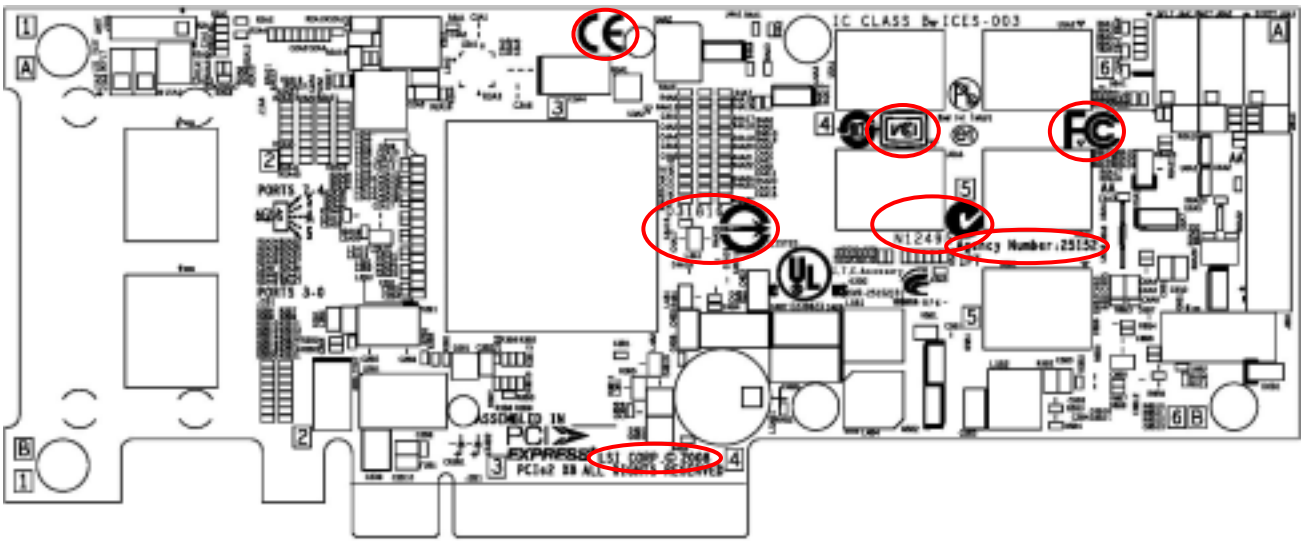
Measurement uncertainty result and comparison with the test method standards:
U_{lab} is less than or equal to U_{cispr} as defined in CISPR 16-4-2 table 1.

Therefore compliance is deemed to occur as no measured disturbance exceeds the disturbance limit and the uncertainty of Inventec lab (U_{lab}) is less than the allowed industry standard value (U_{CISPR}).

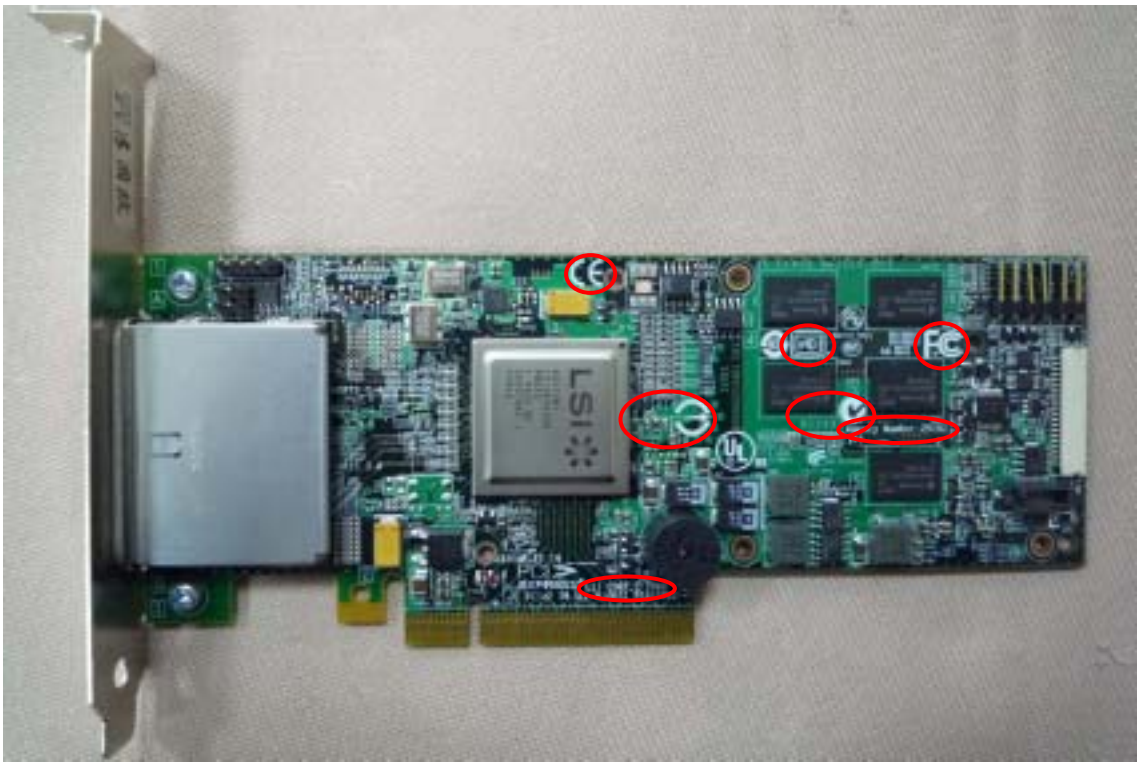
Review of our Uncertainty U_{lab} indicates it is well below that allowed in the CISPR standards (CISPR 22 and CISPR 16-4-2) demonstrating our laboratory good control.

6. PRODUCT LABELING

6.1. ID LABEL SPECIFICATION



6.2. LOCATION OF THE LABEL ON EUT



7. PHOTOGRAPHS

Front View of Radiated Test

Rear View of Radiated Test

Front View of Conducted Test

Side View of Conducted Test

EUT (PCI-E SAS Raid Card, 25152) in HOST (HSTNS-2116)

Component Side of EUT

Bottom Side of EUT