EMC Test Report

Project No.	:	1604013
Equipment	:	SD Card
Model Name	:	Industrial SD R1, Industrial SDHC R1
Applicant	:	Apacer Technology Inc.
Address	:	1F., No.32, Zhongcheng Rd., Tucheng Dist. New Taipei City 236, Taiwan R.O.C

Date of Receipt	:	Mar. 04, 2016
Date of Test	:	Mar. 04, 2016 ~ Mar. 16, 2016
Issued Date	:	Apr. 13, 2016
Tested by	:	BTL Inc.

Testing Engineer : (Pike Lee)

Technical Manager : (Jeff Yang)

Authorized Signatory : (Andy Chiu)

BTL INC.

B1, No. 37, Lane 365, Yang-Guang St.,
Nei-Hu District, Taipei City 114, Taiwan.
TEL: +886-2-2657-3299 FAX: +886-2-2657-3331

Testing Laboratory
0659

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

BTL's report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and **BTL-self**, extracts from the test report shall not be reproduced except in full with **BTL**'s authorized written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Table of Contents Page

Table of Contents Page

REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-EMC-1-1603051	Original report.	Mar. 17, 2016
BTL-EMC-1-1604013	Compared with the previous report (BTL-EMC-1-1603051), model name, brand name and applicant information are changed, these changes have no effect on test result, and the rest are remained.	Apr. 13, 2016

1. CERTIFICATION

Equipment	:	SD Card
Brand Name	:	Apacer
Model Name	:	Industrial SD R1, Industrial SDHC R1
Applicant	:	Apacer Technology Inc.
Date of Test	:	Mar. 04, 2016 ~ Mar. 16, 2016
Test Sample	:	Engineering Sample
Standard(s)	:	EN 55022: 2010+AC:2011 Class B AS/NZS CISPR 22: 2009 +A1: 2010 Class B CISPR 22: 2008 Class B EN 55024: 2010 EN 61000-4-2: 2009 EN 61000-4-3: 2006+A1: 2008+A2: 2010 EN 61000-4-8: 2010

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-EMC-1-1604013) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

Emission				
Standard(s)	Test Item	Limit	Judgment	Remark
EN 55022: 2010 +AC :2011 AS/NZS CISPR 22: 2009 +A1: 2010 CISPR 22: 2008	Conducted emission	Class B	PASS	
	Conducted emission at telecommunication ports	Class B	N/A	NOTE (1)
	Radiated emission Below 1 GHz	Class B	PASS	
	Radiated emission Above 1 GHz	Class B	PASS	NOTE (2)

Standard(s)	Test Item	Limit	Judgment	Remark
EN 61000-3-2: 2014	Harmonic current emissions	Class A	N/A	NOTE (1)
EN 61000-3-3: 2013	Voltage changes, voltage fluctuations and flicker	------	N/A	NOTE (1)

Immunity EN 55024: 2010				
Section	Test Item	Performance Criterion	Judgment	Remark
EN 61000-4-2: 2009	Electrostatic discharge immunity	B	PASS	
EN 61000-4-3: 2006+A1: 2008+A2: 2010	Radiated, radio-frequency, electromagnetic field immunity	A	PASS	
EN 61000-4-4: 2012	Electrical fast transient/burst immunity	B	N/A	NOTE (1)
EN 61000-4-5: 2014	Surge immunity	B/C NOTE (4)	N/A	NOTE (1)
EN 61000-4-6: 2014	Immunity to conducted disturbances, induced by radio-frequency fields	A	N/A	NOTE (1)
EN 61000-4-8: 2010	Power frequency magnetic field immunity	A	PASS	
EN 61000-4-11: 2004	Voltage dips, short interruptions and voltage variations immunity	B / C / C NOTE(5)	N/A	NOTE (1)

NOTE:

(1) ”N/A” denotes test is not applicable in this test report.

(2) The EUT’s max operating frequency is 208MHz which exceeds 108 MHz, so the test will be performed.

(3) If the power consumption is less than 75W, there is no limit applied.

(4) Performance Criterion **C** for signal ports and telecommunication ports.
Performance Criterion **B** for input d.c. power port and a.c. power ports.

(5) Voltage Dips: ＞95% reduction – Performance Criterion **B**
Voltage Dips: 30% reduction – Performance Criterion **C**
Voltage Interruptions: ＞95% reduction – Performance Criterion **C**

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

Conducted emission Test:

C05: (VCCI RN: C-4742; FCC RN:965108; FCC DN:TW1082)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

Radiated emission Test (Below 1 GHz):

OS02: (VCCI RN: R-2669; FCC RN: 95335; FCC DN: TW1010; IC Assigned Code: 4428A-1)
No.132-1, Ln. 329, Sec. 2, Balian Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

CB11: (VCCI RN: G-868)
No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

The immunity test facilities are located at:

No. 68-1, Ln. 169, Sec.2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

2.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expanded uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95**%.
The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.
The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

A. Conducted emission test:

Test Site	Method	Measurement Frequency Range	U, (dB)
C05	CISPR	150 kHz~30MHz	2.04

B. Radiated emission test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U,(dB)
OS02 (10m)	CISPR	30MHz ~ 200MHz	V	3.08
		30MHz ~ 200MHz	H	3.40
		200MHz ~ 1,000MHz	V	3.28
		200MHz ~ 1,000MHz	H	3.72

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
CB11 (3m)	CISPR	1GHz ~ 6GHz	V	4.14
		1GHz ~ 6GHz	H	4.14
		6GHz ~ 18GHz	V	5.34
		6GHz ~ 18GHz	H	5.34

C. Immunity tests:

Test Site	Method	Test Item	U
SR03	EN 61000-4-2	Voltage (2kV/4kV/6kV/8kV/15kV/25kV/30kV)	3.0%
		Peak Current	3.7%
		30/60ns Current	3.8%
		Rise time	1.5%
CB12	EN 61000-4-3	80MHz~1GHz	2.66 dB
SR02	EN 61000-4-8	Magnetic Field Level	2 %

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.
Our calculated Measurement Instrumentation Uncertainty is shown in the tables above.
These are our U_{lab} values in CISPR 16-4-2 terminology.
Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB
Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

It can be seen that our U_{lab} values are smaller than U_{CISPR}.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	SD Card
Brand Name	Apacer
Model Name	Industrial SD R1, Industrial SDHC R1
Model Difference	Differ in market area.
Power Source	Supplied from host system.
Power Rating	EUT I/P: DC 5V

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

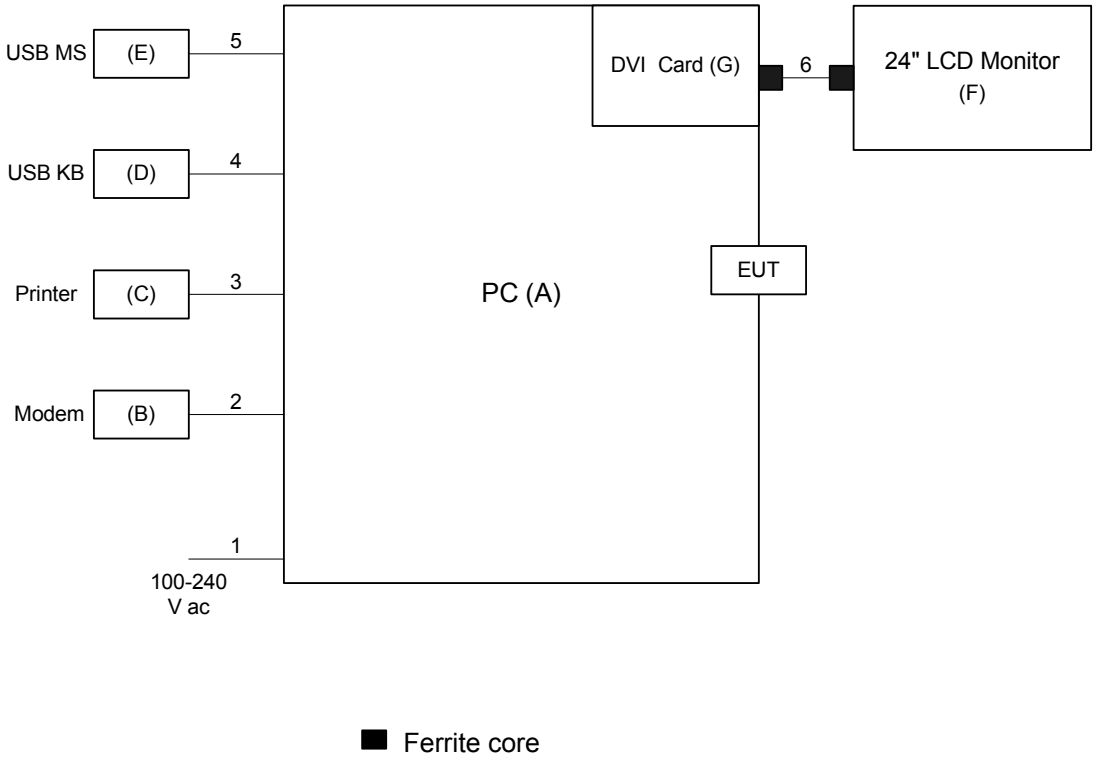
Pretest Mode	Description
Mode 1	SD CARD READ/WRITE

Conducted emission test	
Final Test Mode	Description
Mode 1	SD CARD READ/WRITE

Radiated emission test	
Final Test Mode	Description
Mode 1	SD CARD READ/WRITE

Immunity tests	
Final Test Mode	Description
Mode 1	SD CARD READ/WRITE

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	FCC ID	Series No.
A	PC	DELL	OptiPlex 790 MT	DOC	64NJVBX
B	Modem	ACEEX	DM-1414V	DOC	8041708
C	Printer	HP	SNPRB-1202-01	DOC	CN5161909P
D	USB K/B	DELL	L50U	DOC	CN-0H9F99-65890-17P-06WP-A01
E	USB Mouse	DELL	MS111-L	DOC	CN-09RRC7-44751-17J-OH1F
F	24” LCD Monitor	DELL	U2410f	DOC	CN-OJ257M-72872-09J-067L
G	DVI Card	ASUS	GTX 750 Ti	DOC	F3COYZ138369

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.7m	Power Cable
2	YES	NO	1.7m	RS232 Cable
3	YES	NO	1.7m	USB Cable
4	YES	NO	1.7m	USB Cable
5	YES	NO	1.7m	USB Cable
6	YES	YES	1.7m	DVI Cable

Note:

(1) The support equipment was authorized by Declaration of Conformity (DOC).

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION TEST

4.1.1 LIMITS (FREQUENCY RANGE 150 KHZ-30MHZ)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 - 5.0	73.00	60.00	56.00	46.00
5.0 - 30.0	73.00	60.00	60.00	50.00

NOTE:

(1) The tighter limit applies at the band edges.
(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
(3) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
Margin Level = Measurement Value – Limit Value

4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	Jan. 25, 2017
2	Test Cable	TIMES	CFD300-NL	C05	Jun. 14, 2016
3	EMI Test Receiver	R&S	ESR7	101433	Dec. 09, 2016
4	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

Remark: “N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

4.1.3 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

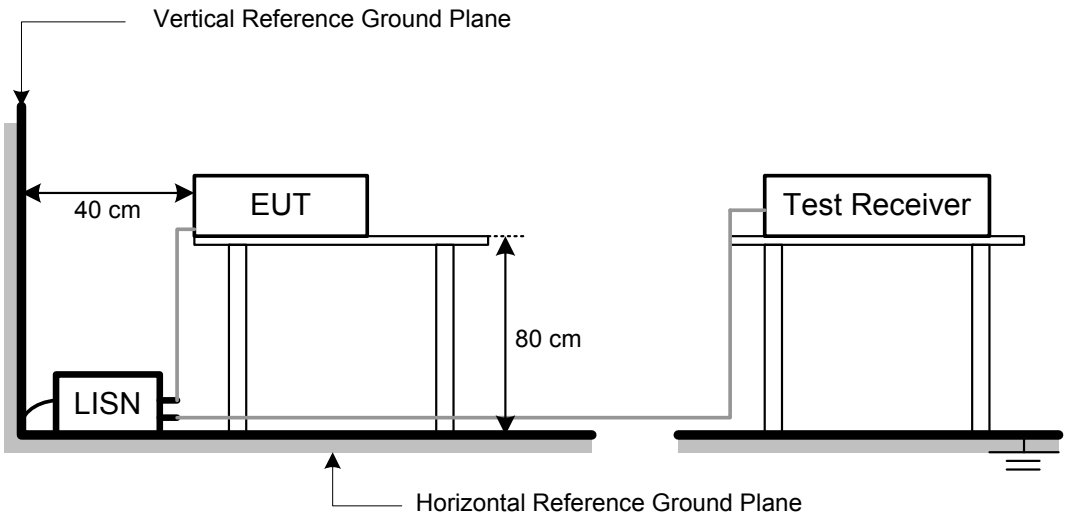
NOTE:

a. Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
b. All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only Peak or QP Mode was measured, but AVG Mode didn‘t perform.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



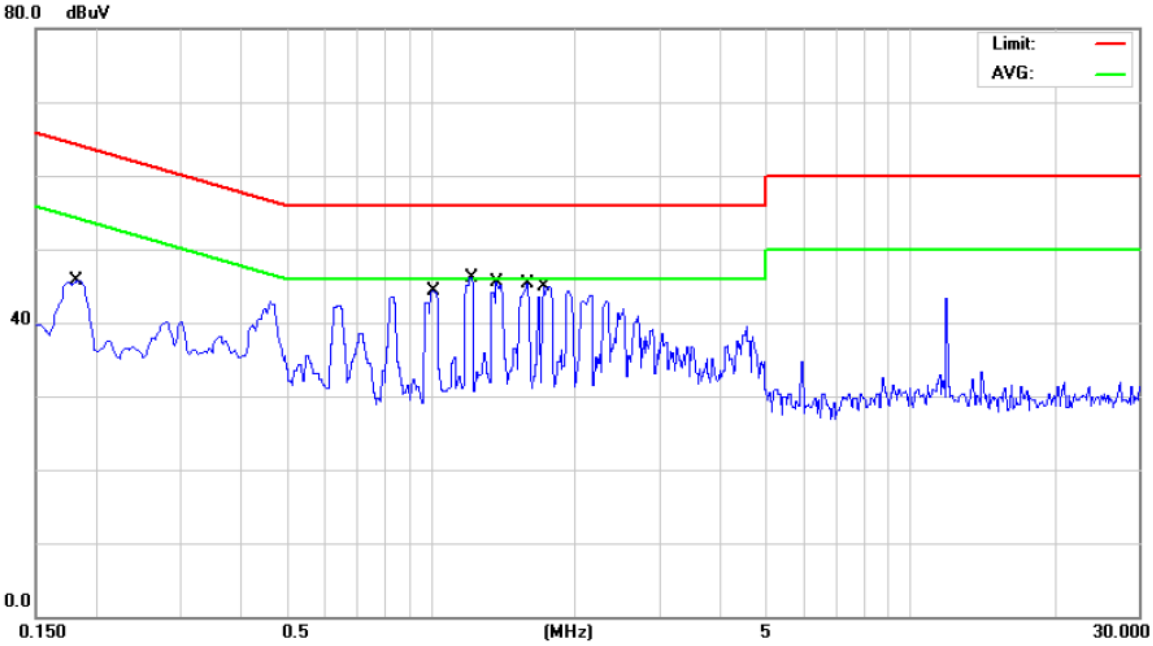
4.1.6 EUT OPERATING CONDITIONS

The PC exercise program (BurninTEST V7.1) used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use.

4.1.7 TEST RESULTS

EUT	SD Card	Model Name	Industrial SD R1
Temperature	25°C	Relative Humidity	54%
Test Voltage	AC 230V/50Hz		
Test Mode	SD CARD READ/WRITE		

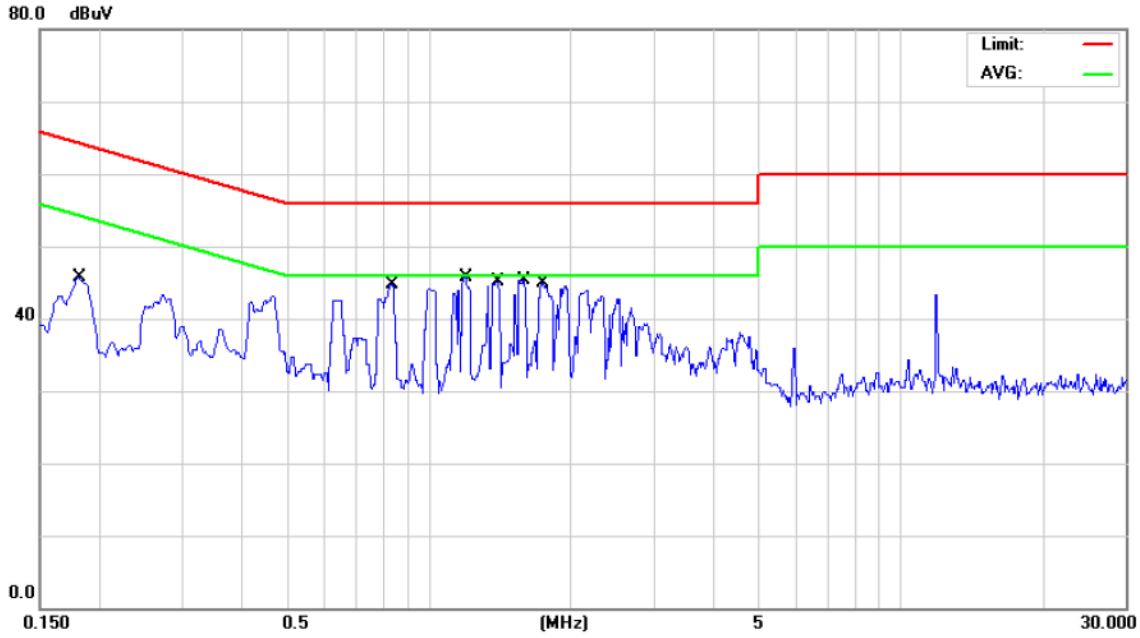
Phase: Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1822	30.00	9.66	39.66	64.38	-24.72	QP	
2		0.1822	22.80	9.66	32.46	54.38	-21.92	AVG	
3		1.0130	32.70	9.70	42.40	56.00	-13.60	QP	
4		1.0130	26.90	9.70	36.60	46.00	-9.40	AVG	
5		1.2109	33.10	9.71	42.81	56.00	-13.19	QP	
6	*	1.2109	27.40	9.71	37.11	46.00	-8.89	AVG	
7		1.3730	32.50	9.72	42.22	56.00	-13.78	QP	
8		1.3730	25.40	9.72	35.12	46.00	-10.88	AVG	
9		1.5890	33.10	9.74	42.84	56.00	-13.16	QP	
10		1.5890	24.00	9.74	33.74	46.00	-12.26	AVG	
11		1.7240	28.10	9.75	37.85	56.00	-18.15	QP	

EUT	SD Card	Model Name	Industrial SD R1
Temperature	25°C	Relative Humidity	54%
Test Voltage	AC 230V/50Hz		
Test Mode	SD CARD READ/WRITE		

Phase: Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1808	30.00	9.66	39.66	64.44	-24.78	QP	
2		0.1808	22.20	9.66	31.86	54.44	-22.58	AVG	
3		0.8330	31.40	9.69	41.09	56.00	-14.91	QP	
4	*	0.8330	28.30	9.69	37.99	46.00	-8.01	AVG	
5		1.1930	32.40	9.71	42.11	56.00	-13.89	QP	
6		1.1930	22.20	9.71	31.91	46.00	-14.09	AVG	
7		1.4000	32.90	9.72	42.62	56.00	-13.38	QP	
8		1.4000	24.50	9.72	34.22	46.00	-11.78	AVG	
9		1.5890	33.10	9.73	42.83	56.00	-13.17	QP	
10		1.5890	27.60	9.73	37.33	46.00	-8.67	AVG	
11		1.7420	32.00	9.74	41.74	56.00	-14.26	QP	
12		1.7420	21.60	9.74	31.34	46.00	-14.66	AVG	

4.2 RADIATED EMISSION TEST

4.2.1 LIMITS

Below 1 GHz

FREQUENCY (MHz)	Class A (at 10m) dBuV/m	Class B (at 10m) dBuV/m
30 - 230	40	30
230 - 1000	47	37

NOTE:

(1) The limit for radiated test was performed according to as following: CISPR 22.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m) = 20log Emission level (uV/m).
(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

Above 1 GHz

FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
1000 - 3000	76	56	70	50
3000 - 6000	80	60	74	54

NOTE:

(1) The limit for radiated test was performed according to as following: CISPR 22.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m) = 20log Emission level (uV/m).
3m Emission level = 10m Emission level + 20log(10m/3m).
(4) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)
Margin Level = Measurement Value - Limit Value

FREQUENCY RANGE OF RADIATED MEASUREMENT (FOR UNINTENTIONAL RADIATORS)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5^{th} harmonic of the highest frequency or 6 GHz, whichever is lower

4.2.2 MEASUREMENT INSTRUMENTS LIST

Below 1 GHz:

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Log-Bicon Antenna	Schwarzbeck	VULB 9160	3173	Dec. 03, 2016
2	Pre-Amplifier	Anritsu	MH648A	M98457	May 27, 2016
3	Test Cable	TIMES	LMR-400	10M-OS01	May 27, 2016
4	Test Cable	TIMES	LMR-400	OS02	May 27, 2016
5	EMI Test Receiver	R&S	ESCI	100082	N/A
6	System Controller (OS02)	CT	SC100	N/A	N/A
7	Turn Table	Chance Most	CMTB-1.5	N/A	N/A
8	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

Above 1 GHz:

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Horn Antenna	Schwarzbeck	BBHA-9120D	D 546	Nov. 04, 2016
2	Pre-Amplifier	Agilent	8449B	3008A02331	Jan. 22, 2017
3	Test Cable	EMCI	EMC104-SM-SM-5000	140302	Mar. 08, 2017
4	Test Cable	EMCI	EMC104-SM-SM-2500	150306	Mar. 08, 2017
5	Test Cable	EMCI	EMC104-SM-SM-800	150305	Mar. 08, 2017
6	EMI Test Receiver	R&S	N9038A	MY51210215	Jun. 07, 2016
7	Measurement Software	Farad	EZ_EMC (Version NB-03A)	N/A	N/A

Remark: “N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

4.2.3 TEST PROCEDURE

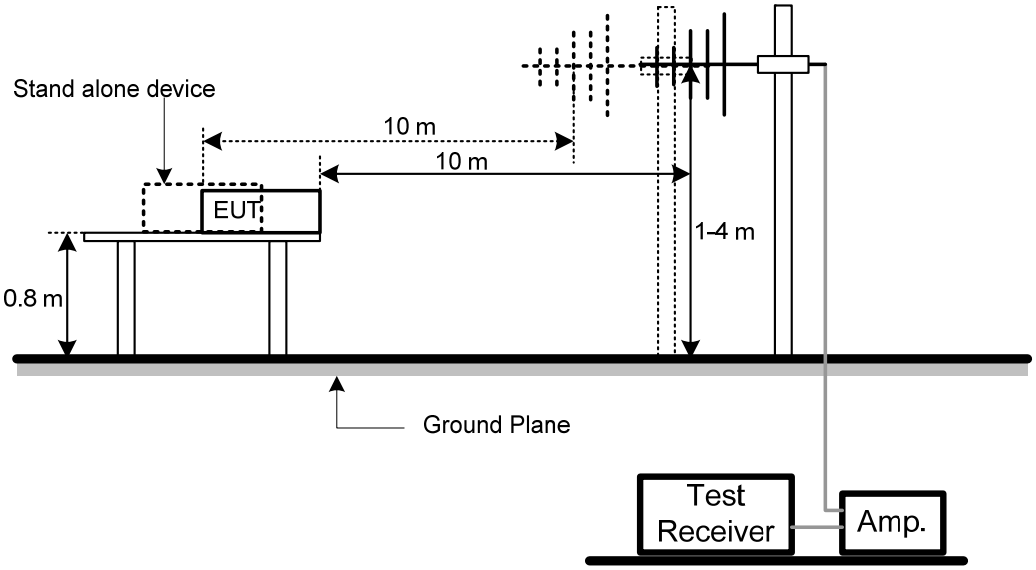
a. The measuring distance of 10 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.4 DEVIATION FROM TEST STANDARD

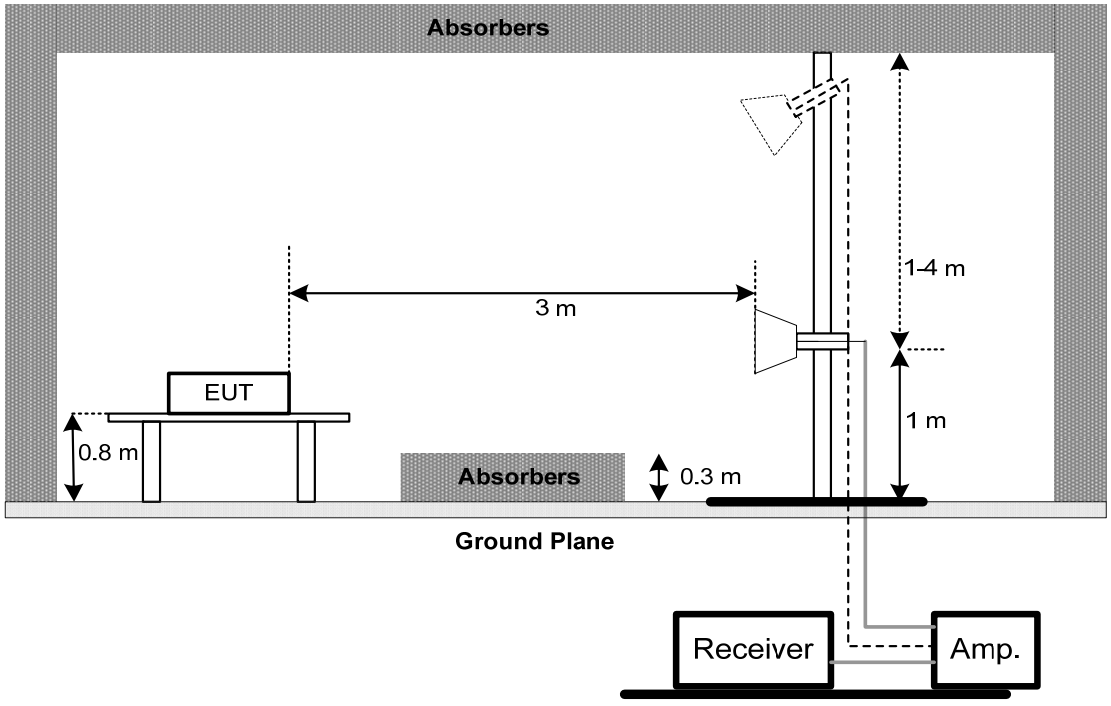
No deviation

4.2.5 TEST SETUP

Below 1 GHz



Above 1 GHz



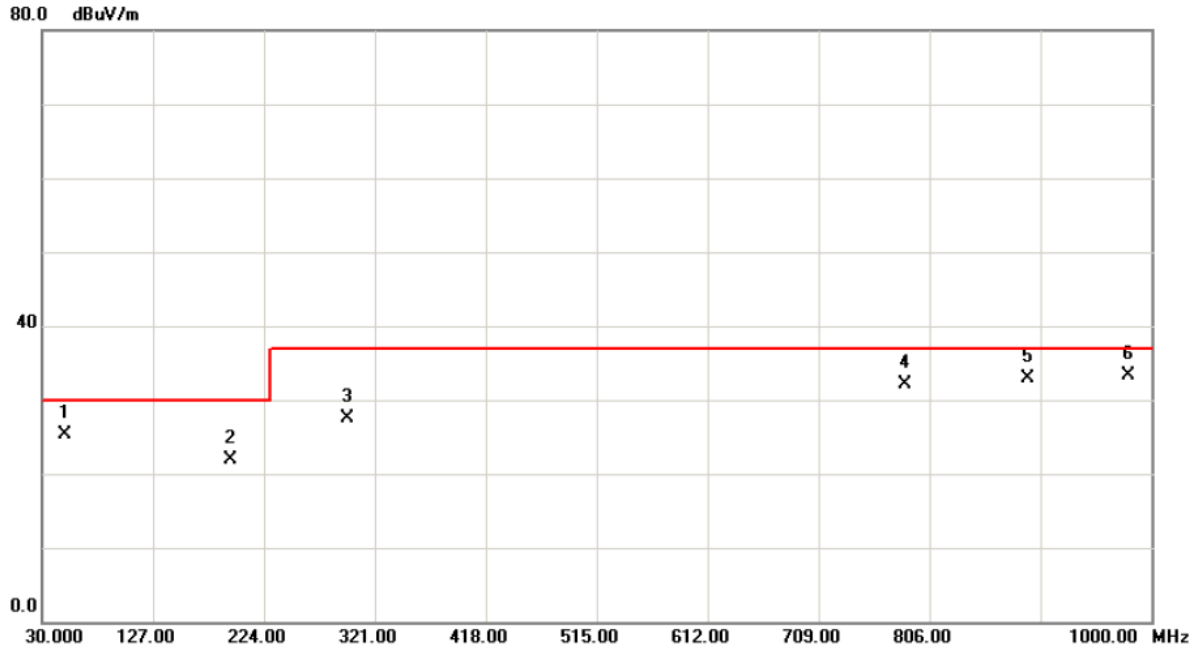
4.2.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.6** unless otherwise a special operating condition is specified in the follows during the testing.

4.2.7 TEST RESULTS-BELOW 1 GHZ

EUT	SD Card	Model Name	Industrial SD R1
Temperature	17° C	Relative Humidity	63%
Test Voltage	230V/50Hz		
Test Mode	SD CARD READ/WRITE		

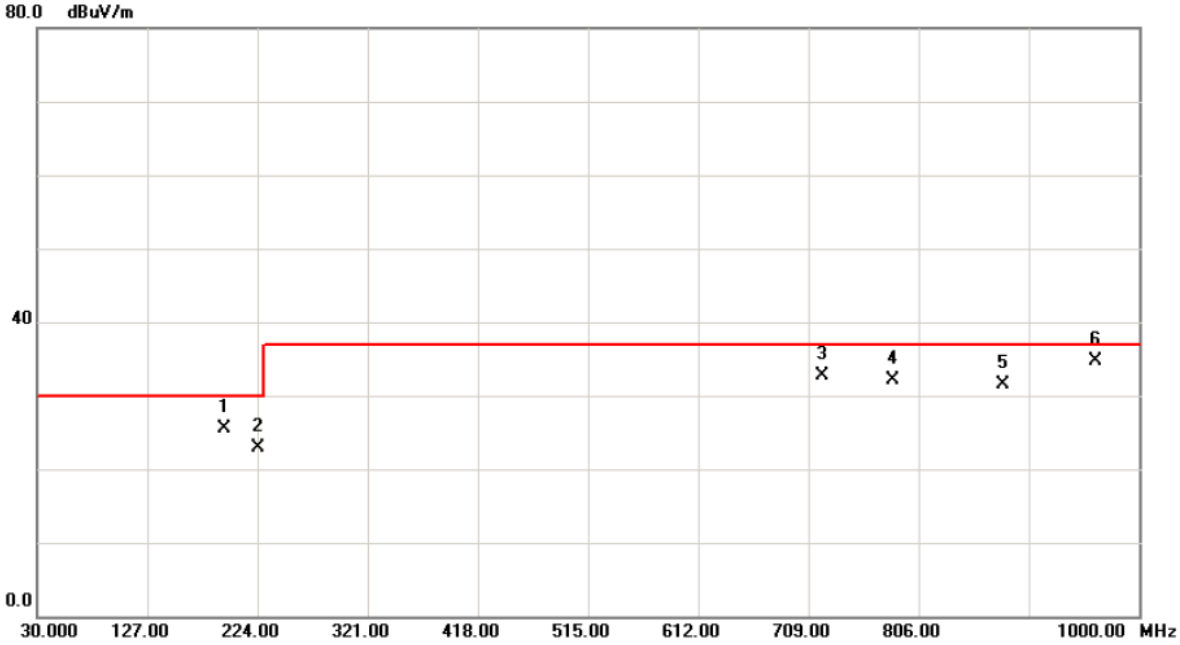
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		49.7100	31.29	-6.03	25.26	30.00	-4.74	QP	110	50	
2		194.2100	29.39	-7.55	21.84	30.00	-8.16	QP	100	80	
3		296.3600	31.46	-3.95	27.51	37.00	-9.49	QP	130	120	
4		783.7100	25.65	6.53	32.18	37.00	-4.82	QP	100	0	
5		890.8500	24.74	8.08	32.82	37.00	-4.18	QP	150	160	
6	*	979.0600	23.52	9.84	33.36	37.00	-3.64	QP	100	35	

EUT	SD Card	Model Name	Industrial SD R1
Temperature	17° C	Relative Humidity	63%
Test Voltage	230V/50Hz		
Test Mode	SD CARD READ/WRITE		

Polarization: Horizontal

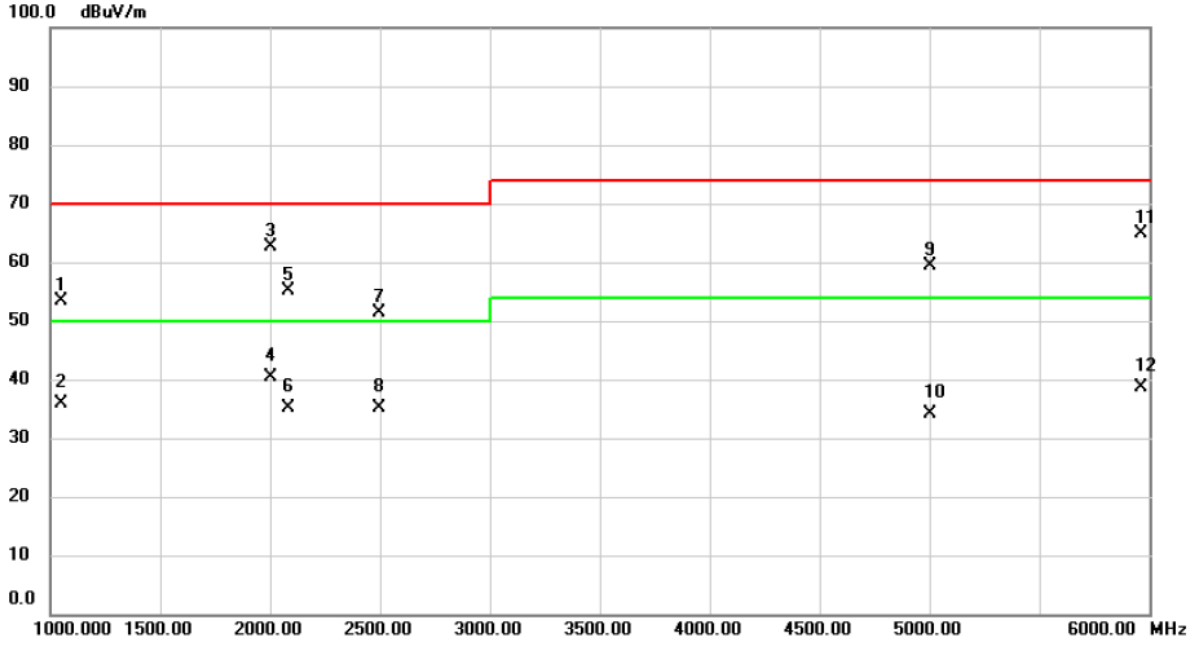


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		194.1100	33.10	-7.55	25.55	30.00	-4.45	QP	200	90	
2		224.4100	29.76	-6.88	22.88	30.00	-7.12	QP	250	45	
3		719.8700	27.64	5.05	32.69	37.00	-4.31	QP	180	275	
4		783.0400	25.53	6.52	32.05	37.00	-4.95	QP	200	186	
5		879.1200	23.65	7.88	31.53	37.00	-5.47	QP	250	96	
6	*	960.8500	25.15	9.49	34.64	37.00	-2.36	QP	200	185	

4.2.8 TEST RESULTS-ABOVE 1 GHZ

EUT	SD Card	Model Name	Industrial SD R1
Temperature	26° C	Relative Humidity	61%
Test Voltage	230V/50Hz		
Test Mode	SD CARD READ/WRITE		

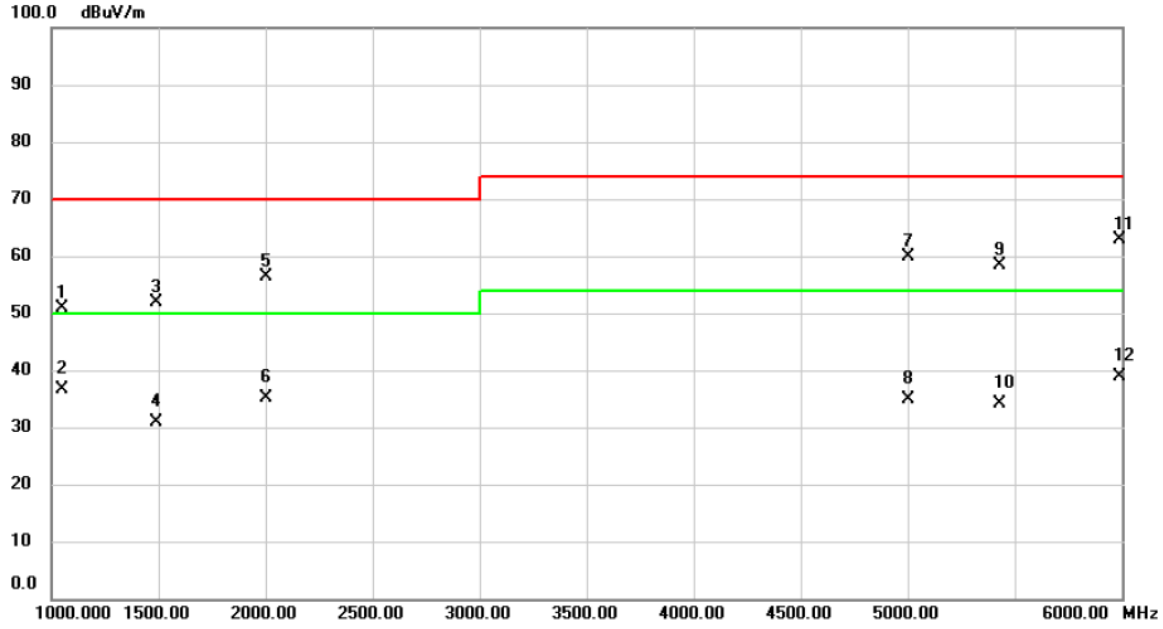
Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		1050.000	60.88	-7.58	53.30	70.00	-16.70	peak	200	10	
2		1050.000	43.35	-7.58	35.77	50.00	-14.23	AVG	200	10	
3	*	2000.000	67.38	-4.69	62.69	70.00	-7.31	peak	100	225	
4		2000.000	45.15	-4.69	40.46	50.00	-9.54	AVG	100	225	
5		2080.000	59.62	-4.40	55.22	70.00	-14.78	peak	100	167	
6		2080.000	39.47	-4.40	35.07	50.00	-14.93	AVG	100	167	
7		2495.000	54.15	-2.89	51.26	70.00	-18.74	peak	100	38	
8		2495.000	37.96	-2.89	35.07	50.00	-14.93	AVG	100	38	
9		5000.000	55.58	3.76	59.34	74.00	-14.66	peak	100	229	
10		5000.000	30.34	3.76	34.10	54.00	-19.90	AVG	100	229	
11		5960.000	59.82	5.16	64.98	74.00	-9.02	peak	100	147	
12		5960.000	33.55	5.16	38.71	54.00	-15.29	AVG	100	147	

EUT	SD Card	Model Name	Industrial SD R1
Temperature	26° C	Relative Humidity	61%
Test Voltage	230V/50Hz		
Test Mode	SD CARD READ/WRITE		

Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		1050.000	58.50	-7.58	50.92	70.00	-19.08	peak	100	57	
2		1050.000	44.27	-7.58	36.69	50.00	-13.31	AVG	100	57	
3		1490.000	57.81	-5.88	51.93	70.00	-18.07	peak	100	34	
4		1490.000	36.86	-5.88	30.98	50.00	-19.02	AVG	100	34	
5		2000.000	61.15	-4.69	56.46	70.00	-13.54	peak	200	14	
6		2000.000	39.76	-4.69	35.07	50.00	-14.93	AVG	200	14	
7		5000.000	56.12	3.76	59.88	74.00	-14.12	peak	100	16	
8		5000.000	31.23	3.76	34.99	54.00	-19.01	AVG	100	16	
9		5430.000	53.74	4.56	58.30	74.00	-15.70	peak	100	133	
10		5430.000	29.53	4.56	34.09	54.00	-19.91	AVG	100	133	
11	*	5990.000	57.58	5.18	62.76	74.00	-11.24	peak	106	0	
12		5990.000	33.78	5.18	38.96	54.00	-15.04	AVG	106	0	

5. EMC IMMUNITY TEST

5.1 STANDARD COMPLIANCE/SERVRITY LEVEL/CRITERIA

Tests Standard No.	TEST SPECIFICATION Level	Test Mode Test Ports	Criterion
Electrostatic discharge immunity EN 61000-4-2	±8 kV air discharge ±4 kV contact discharge	Direct Mode	B
	±4 kV HCP discharge ±4 kV VCP discharge	Indirect Mode	B
Radiated, radio-frequency, electromagnetic field immunity EN 61000-4-3	80 MHz to 1000 MHz 3 V/m(rms), 1 kHz, 80%, AM modulated	Enclosure	A
Electrical fast transient/burst immunity EN 61000-4-4	±1.0kV(peak) 5/50ns Tr/Th 5 kHz Repetition Freq.	Power Supply Port	B
	±0.5 kV(peak) 5/50ns Tr/Th 5 kHz Repetition Freq.	CTL/Signal Data Line Port	B
Surge immunity EN 61000-4-5	±1 kV(5P/5N) 1.2/50(8/20) Tr/Th μs	AC Power Port L-N	B
	±2 kV(5P/5N) 1.2/50(8/20) Tr/Th μs	AC Power Port L-PE/N-PE	B
	±1 kV(5P/5N) 1.2/50(8/20) Tr/Th μs	DC Power Port	B
	±1 kV(5P/5N) 10/700 or 1.2/50 Tr/Th μs	Signal/Telecommunication Ports	C
Immunity to conducted disturbances, induced by radio-frequency fields EN 61000-4-6	0.15 MHz to 80 MHz 3 V(rms), 1 kHz 80%, AM Modulated 150Ω source impedance	CTL/Signal Port	A
	0.15 MHz to 80 MHz 3 V(rms), 1 kHz 80%, AM Modulated 150Ω source impedance	AC Power Port	A
	0.15 MHz to 80 MHz 3 V(rms), 1 kHz 80%, AM Modulated 150Ω source impedance	DC Power Port	A
Power frequency magnetic field immunity EN 61000-4-8	50/60 Hz, 1 A/m	Enclosure	A
Voltage dips, short interruptions and voltage variations immunity EN 61000-4-11	Voltage Dips＞95% Voltage Dips 30% Voltage Interruptions＞95%	AC Power Port	B C C

5.2 GENERAL PERFORMANCE CRITERIA

According to **EN55024** standard, the general performance criteria as following:

Criterion A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion B	After the test, the equipment shall continue to operate as intended without operator Intervention. No degradation of performance or loss of function is allowed, after the application of the phenomenon below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state if stored data allowed to persist after the test. If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

5.3 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **4.1.6** unless otherwise a special operating condition is specified in the follows during the testing.

5.4 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

5.4.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-2
Discharge Impedance	330 ohm / 150 pF
Required Performance	B
Discharge Voltage	Air Discharge: ±2 kV, ±4 kV, ±8 kV (Direct) Contact Discharge: ±2 kV, ±4 kV (Indirect)
Polarity	Positive & Negative
Number of Discharge	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Mode	Single Discharge
Discharge Period	1 second minimum

5.4.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	ESD Simulator	TESEQ	NSG 437	429	Apr. 25, 2016

Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

5.4.3 TEST PROCEDURE

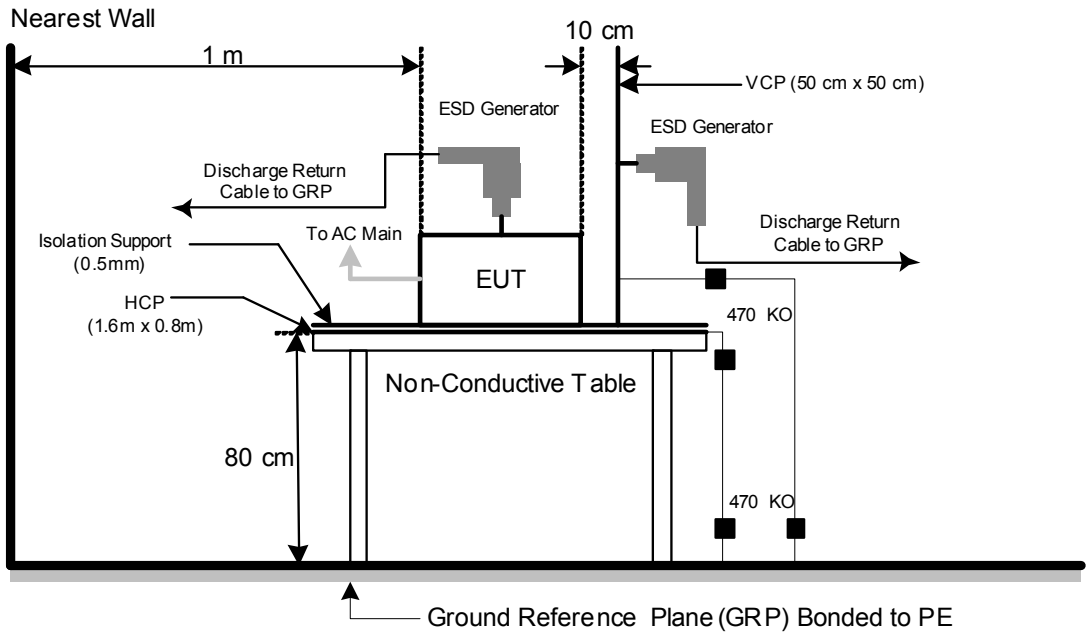
The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

a. Contact discharge was applied to conductive surfaces (Direct) and coupling planes (Indirect) of the EUT.
   During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.
   If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
   Vertical Coupling Plane (VCP):
   The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.
   The four faces of the EUT will be performed with electrostatic discharge.
   Horizontal Coupling Plane (HCP):
   The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.
   The four faces of the EUT will be performed with electrostatic discharge.
b. Air discharges at insulation surfaces of the EUT.
   It was at least ten single discharges with positive and negative at the same selected point.

5.4.4 DEVIATION FROM TEST STANDARD

No deviation

5.4.5 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test was installed in a representative system as described in EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

5.4.6 TEST RESULTS

EUT	SD Card	Model Name	Industrial SD R1
Temperature	23°C	Relative Humidity	45%
Pressure	1012 hPa	Test Voltage	AC 230V/50Hz
Test Mode	SD CARD READ/WRITE		

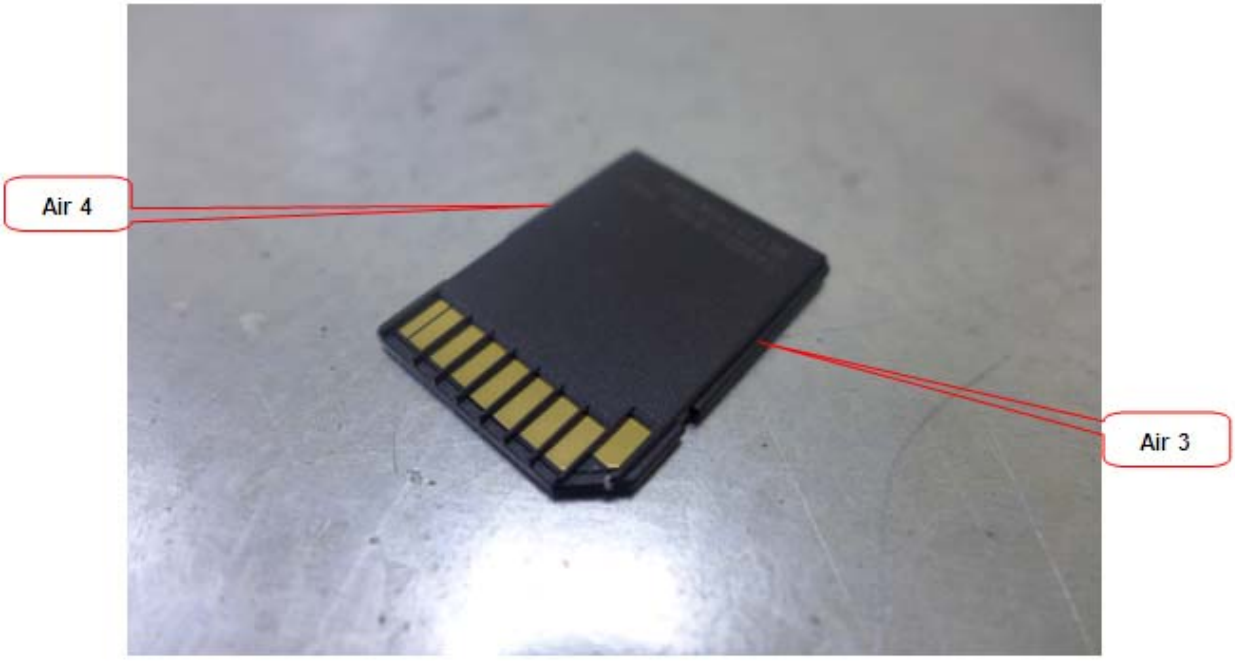
Mode	Air Discharge								Contact Discharge							
	2 kV		4 kV		8 kV		-- kV		2 kV		4 kV		-- kV		-- kV	
Location	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
1	A	A	A	A	A	A	-	-	-	-	-	-	-	-	-	-
2	A	A	A	A	A	A	-	-	-	-	-	-	-	-	-	-
3	A	A	A	A	A	A	-	-	-	-	-	-	-	-	-	-
4	A	A	A	A	A	A	-	-	-	-	-	-	-	-	-	-
5	A	A	A	A	A	A										
Criterion	**B**						-		**B**				-		-	
Result	**A**						-		**N/A**				-		-	
Judgment	**PASS**						-		**N/A**				-		-	

Mode	HCP Discharge								VCP Discharge							
	2 kV		4 kV		-- kV		-- kV		2 kV		4 kV		-- kV		-- kV	
Location	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
1	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
2	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
3	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
4	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
Criterion	**B**				-		-		**B**				-		-	
Result	**A**				-		-		**A**				-		-	
Judgment	**PASS**				-		-		**PASS**				-		-	

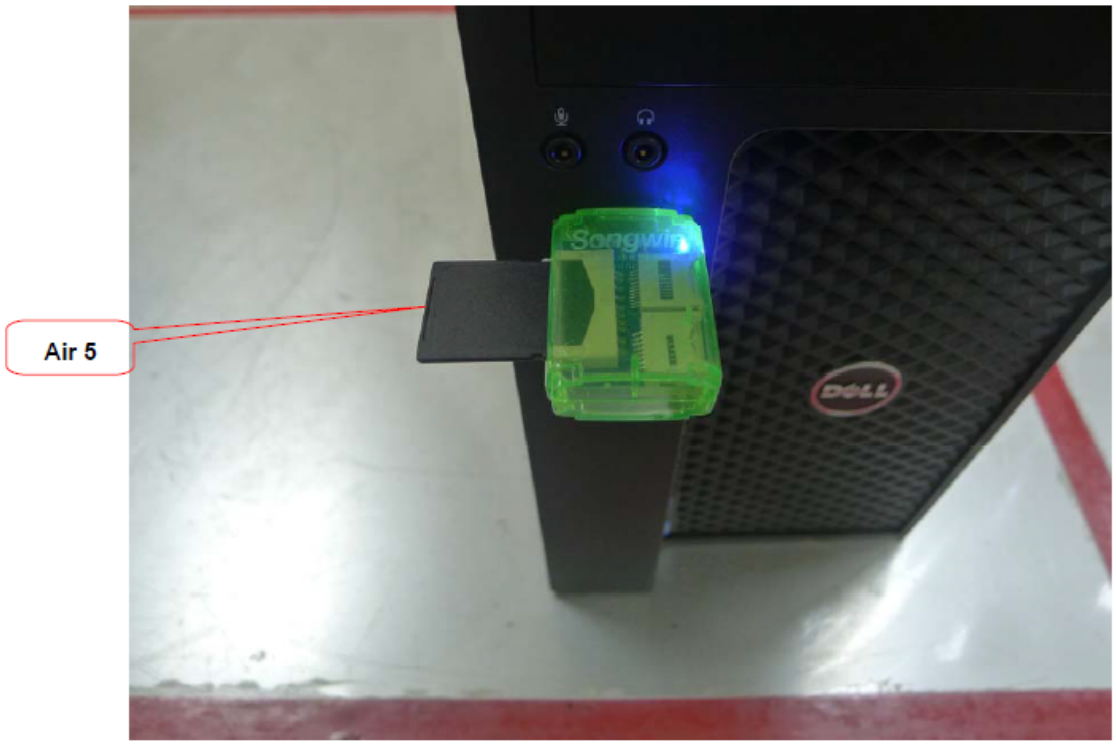
Note:

1) P/N denotes the Positive/Negative polarity of the output voltage.
2) Test condition:
   Direct/Indirect (HCP/VCP) discharges: Minimum 25 times (Positive/Negative) at each point.
   Air discharges: Minimum 10 times (Positive/Negative) at each point.
3) Test location(s) in which discharge (Air and contact discharge) to be applied illustrated by photos shown in next page(s)
4) The Indirect (HCP/VCP) discharges description of test point as following:
   1. left side; 2.right side; 3.front side; 4.rear side.
5) N/A - denotes test is not applicable in this test report
6) Criterion A: No observation of any performance degradation.
7) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
8) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.
9) Test software : Winthrax version 3.0.7
10) Test is done in operational mode.

PHOTO(S) SHOWN THE LOCATION(S) OF ESD EVALUATED



PHOTO(S) SHOWN THE LOCATION(S) OF ESD EVALUATED



5.5 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

5.5.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-3
Required Performance	A
Frequency Range	80 MHz - 1000 MHz
Field Strength	3 V/m
Modulation	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step	1% of fundamental
Polarity of Antenna	Horizontal and Vertical
Test Distance	3 m
Antenna Height	1.5 m
Dwell Time	at least 3 seconds

5.5.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Signal Generator	R&S	SMT06	832080/007	Jul. 22, 2016
2	Log-Periodic Antenna	AR	AT1080	320290	N/A
3	Power Amplifier	AR	150W1000M1	320946	N/A
4	Laser Power Field Prode	AR	FL7004	0320284/0313298	Jul. 19, 2016
5	RF Power Meter	BOONTON	4232A	10179	Aug. 29, 2016
6	Power Sensor	BOONTON	51011-EMC	34150	Aug. 29, 2016
7	Measurement Software	AR	SW1006 (Version 1.22)	321779	N/A

Remark: “N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

5.5.3 TEST PROCEDURE

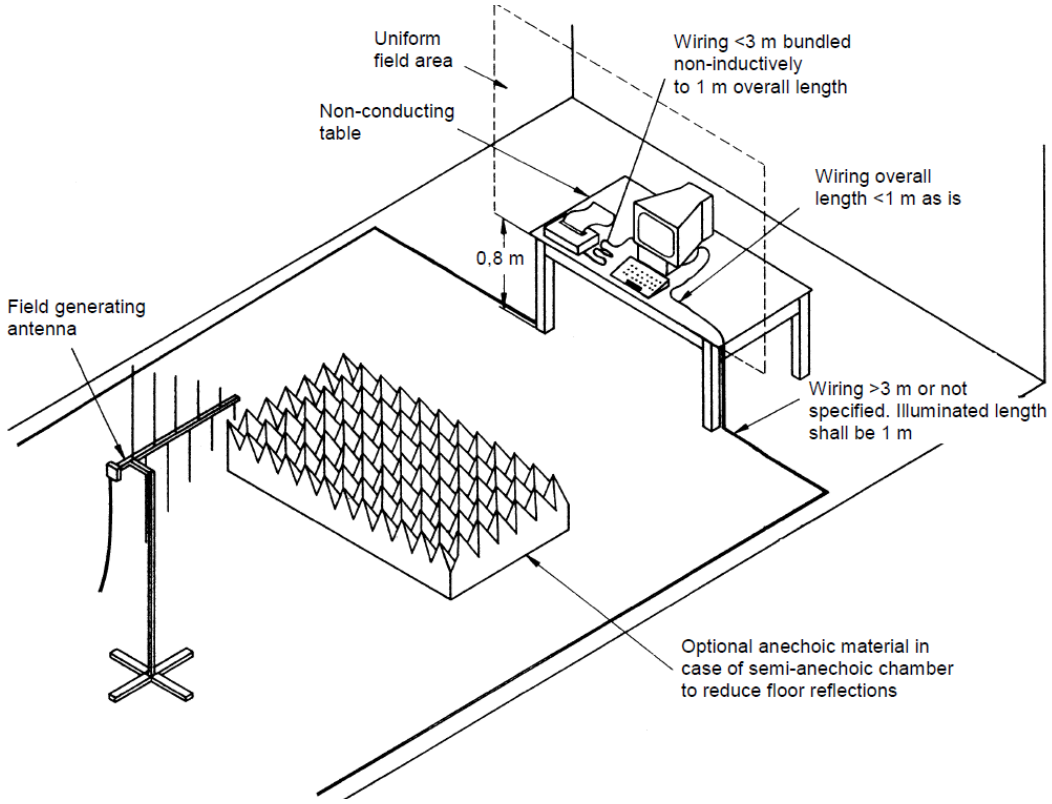
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.
The testing distance from antenna to the EUT was 3 meters.
The other condition as following manner:

a. The field strength level was 3 V/m.
b. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80%amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
d. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.5.4 DEVIATION FROM TEST STANDARD

No deviation

5.5.5 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

5.5.6 TEST RESULTS

EUT	SD Card	Model Name	Industrial SD R1
Temperature	23°C	Relative Humidity	45%
Test Voltage	AC 230V/50Hz		
Test Mode	SD CARD READ/WRITE		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Criterion	Result	Judgment
80 - 1000	H / V	3 V/m (rms) AM Modulated 1 kHz, 80%	0°	**A**	**A**	**PASS**
			90°			
			180°			
			270°			

Note:

1) P/N denotes the Positive/Negative polarity of the output voltage.
2) N/A - denotes test is not applicable in this test report.
3) Criterion A: No observation of any performance degradation.
4) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
5) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.

5.6 POWER FREQUENCY MAGNETIC FIELD IMMUNITY TEST (PFMF)

5.6.1 TEST SPECIFICATION

Basic Standard	EN 61000-4-8
Required Performance	A
Frequency Range	50/60 Hz
Field Strength	1 A/m
Observation Time	1 minute
Inductance Coil	Rectangular type, 1mx1m

5.6.2 MEASUREMENT INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Triaxial ELF Magnetic Fiedl Meter	F.W. BELL	4190	0845014	May 13, 2016
2	Magnetic Field Test Generator	FCC	F-1000-4-8-G-1 25A	04029	May 13, 2016
3	Magnetic Field Immunity Loop	FCC	F-1000-4-8/9/10 -L-1M	04018	May 13, 2016

Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

5.6.3 TEST PROCEDURE

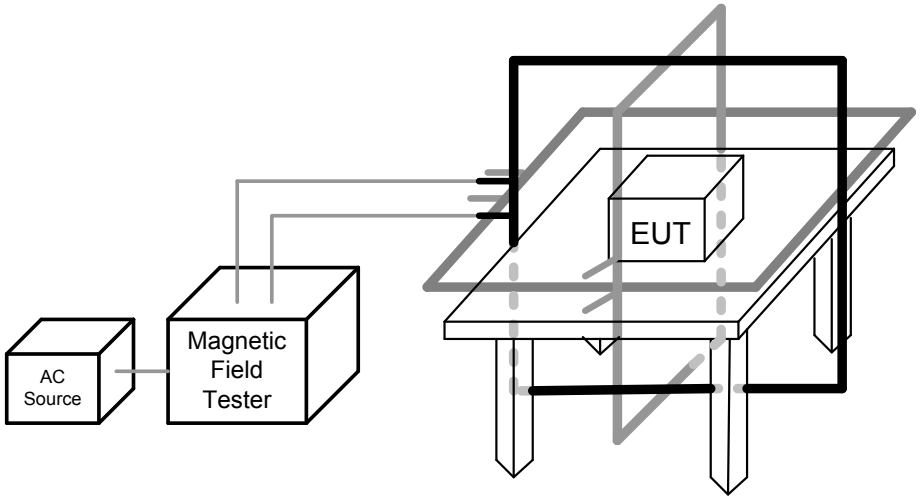
The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
The other condition as following manner:

a. The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
b. The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

5.6.4 DEVIATION FROM TEST STANDARD

No deviation

5.6.5 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50 percent of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

5.6.6 TEST RESULTS

EUT	SD Card	Model Name	Industrial SD R1
Temperature	23°C	Relative Humidity	45%
Test Voltage	AC 230V/50Hz		
Test Mode	SD CARD READ/WRITE		

Test Mode	Test Level	Antenna aspect	Duration (s)	Criterion	Result	Judgment
Enclosure	1 A/m 50/60 Hz	X	60	**A**	**A**	**PASS**
Enclosure	1 A/m 50/60 Hz	Y	60	**A**	**A**	**PASS**
Enclosure	1 A/m 50/60 Hz	Z	60	**A**	**A**	**PASS**

Note:

1) N/A - denotes test is not applicable in this test report
2) Criterion A: No observation of any performance degradation.
3) Criterion B: Some degradation of performance is observed but the equipment continues to operate as intended.
4) Criterion C: Loss of functionality, but self-recoverable by user, without loss of information or settings.

6. EUT TEST PHOTO

Conducted emission test photos

SD CARD READ/WRITE

Radiated emission below 1 GHz test photos

SD CARD READ/WRITE

Radiated emission above 1 GHz test photos

SD CARD READ/WRITE