TEST REPORT

DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No. : DREFCC1903-0110
2. Client / Applicant
   - Name : Bluebird Inc.
   - Address : (Dogok-dong, SEI Tower 13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
3. Use of Report : FCC Certification of Conformity Marking
4. Product Name / Model Name : Handheld RFID Reader / RFR900S
5. Test Standard : ANSI C 63.4 : 2014
   FCC Part 15 Subpart B
   (Other Class B digital devices)
6. Date of Test : Mar. 13. 2019 ~ Mar. 14. 2019
7. Testing Environment : Temperature (19 ~ 20) °C , Humidity (39 ~ 42) % R.H.
8. Test Result : Refer to the attached Test Result

Affirmation	Tested by Name : YongKi Kim (Signature)	Reviewed by Name : HyungJun Kim (Signature)

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose.
This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

Mar. 27. 2019

DT&C Co., Ltd.

If this report is required to confirmation of authenticity, please contact to report@dtnc.net

CONTENTS

1. General Remarks

This report contains the result of tests performed by :

DT&C Co., Ltd.
42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042
http://www.dtnc.net
Tel: +82-31-321-2664 Fax: +82-31-321-1664

2. Test Laboratory

DT&C Co., Ltd. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Remark
Accreditation	Korea	KOLAS	393	ISO/IEC 17025
	South Africa	SABS	0006	ISO/IEC 17025
	Ghana	NCA	NCA agreement 23rd,Oct,2018	-
Site Filing	USA	FCC	KR0034 101842 678747, 596748, 804488, 165783	Accredited 2.948 Listed
	Canada	IC	5740A-3 5740A-4	Registered
	Japan	VCCI	C-1427 R-1364, R-3385, R-4076, R-4180, R-4496, T-1442, G-10338, G-754, G-10815	Registered
Certification	Korea	KC	KR0034	Designation
	Germany	TUV	CARAT 089112 0006 Rev.00	ISO/IEC 17025
	Russia	RMRS	17.10189.296	ISO/IEC 17025

Quality control in the testing laboratory is implemented as per ISO/IEC 17025
which is the “General requirements for the competent of calibration and testing laboratory”.

3. General Information of EUT

Applicant	Bluebird Inc. (Dogok-dong, SEI Tower 13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
Manufacturer	Bluebird Inc. (Dogok-dong, SEI Tower 13,14)39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
Factory	Bluebird Inc. (SSang-young IT Twin tower-B 7~8F), 531, Dunchon-daero, Jungwon-gu, Seongnam-si, Gyeonggi-do, Korea
Product Name	Handheld RFID Reader
Model Name	RFR900S
Add Model Name	None
FCC ID	SS4RFR900S
Rated Power	DC 5 V
Operation Frequency	Bluetooth : (2,402 ~ 2,480) MHz RFID : (902 ~ 928) MHz
Remarks	- Adapter Info Model : KSA29B0500200D5 Input : 100 – 240 V, 50/60 Hz 0.5 A Ouput : 5.0 V, 2.0 A Manufacture : I.T.E POWER SUPPLY - Battery Info Model : BAT-RFR900_S Rated Voltage : 3.64 V Manufacturer : GSP

Related Submittal(s) / Grant(s)
Original submittal only

4. EUT Operations and Test Configurations

4.1 Principle of Configuration Selection

Emission :
The equipment under test (EUT) was configured to measure its highest possible radiation level.
The test modes were adapted accordingly in reference to the instructions for use.
For each testing mode different configurations were used,
Refer to the individual tests.

4.2 EUT Operation Mode

No.	Mode	Description
1	Charging	Check of LED lamp. (Charging lamp on)

4.3 Test Configuration Mode

No.	Mode	Description
1	Charging	Connected Adapter.

4.4 Supported Equipment

Used*	Product Type	Manufacturer	Model	Remarks
-	-	-	-	-

*Abbreviations:
AE - Auxiliary/Associated Equipment, or
SIM - Simulator

4.5 EUT In/Output Port

Name	Type*	Cable Max. >3 m	Cable Shielded	Cable Back shell	Remarks
Power In	DC	1.0	Non Shield	Plastic	EUT
Power Out	DC	1.0	Non Shield	Plastic	EUT(Adapter)
Power In	AC	1.8	Non Shield	Plastic	EUT(Adapter)

*Abbreviations:
AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port
TP = Telecommunication Ports

4.6 Test Voltage and Frequency

Case	Voltage (V)	Frequency (Hz)	Phases	Remarks
1	AC 120	60 Hz	Single	None

5. Test Summary

Test Items	Applied Standards	Results
Conducted Disturbance	ANSI C63.4 : 2014	**C**
Radiated Disturbance	ANSI C63.4 : 2014	**C**
C=Comply N/C=Not Comply N/T=Not Tested N/A=Not Applicable		

The data in this test report are traceable to the national or international standards.

-Conducted Disturbance

Frequency [MHz]	Phase	Result [dBµV]	Detector	Limit [dBµV]	Margin [dB]
0.53688	N	32.01	CAV	46.00	13.99

-Radiated Disturbance

Frequency [MHz]	Pol.	Result [dBµV/m]	Detector	Limit [dBµV/m]	Margin [dB]
878.883	H	37.25	QP	46.00	8.75

6. Test Environment

Test Items	Test date (YYYY-MM-DD)	Temp. (℃)	Humidity (% R.H.)	Pressure (kPa)
Conducted Disturbance	2019-03-14	19	42	100.6
Radiated Disturbance	2019-03-13	20	39	-

7. Test Results : Emission

7.1 Conducted Disturbance

ANSI C63.4	Mains terminal disturbance voltage	Result
Method: The AMN placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment were at least 0,8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN. The measuring port of the LISN for EUT was connected to spectrum analyzer. Using conducted emission test software, the emissions were scanned with peak detector mode. After scanning over the frequency range, suspected emissions were selected to perform final measurement. When performing final measurement, the receiver was used which has Quasi-Peak detector and CISPR Average detector. For (0.15 ~ 30) MHz frequency range, Quasi-Peak detector with 10 kHz RBW and 30 kHz VBW was used. By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission.		**Comply**

Fully configured sample scanned over the following frequency range	**Frequency range on each side of line**	**Measurement Point**
	150 kHz to 30 MHz	**Mains**
EUT mode (Refer to clauses 4)	**Test configuration mode**	**1**
	EUT Operation mode	**1**

Limits – Class A

Frequency (MHz)	**Limit dBµV**	
	Quasi-Peak	**Average**
0.15 to 0.50	79	66
0.50 to 30	73	60

Limits – Class B

Frequency (MHz)	**Limit dBµV**	
	Quasi-Peak	**Average**
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Measurement Instrument					
Description	**Model**	**Manufacturer**	**Identifier**	**Cal. Date**	**Cal. Due**
MEASUREMENT SOFTWARE	EMI-C VER. 2.00.0171	TSJ	N/A	N/A	N/A
EMI TEST RECEIVER	ESR7	ROHDE&SCHWARZ	101109	2018.10.29	2019.10.29
LISN	ENV216	ROHDE&SCHWARZ	101979	2018.12.06	2019.12.06
TRANSIENT LIMITER	TL-B0930A	EMCIS	11002	2018.09.05	2019.09.05

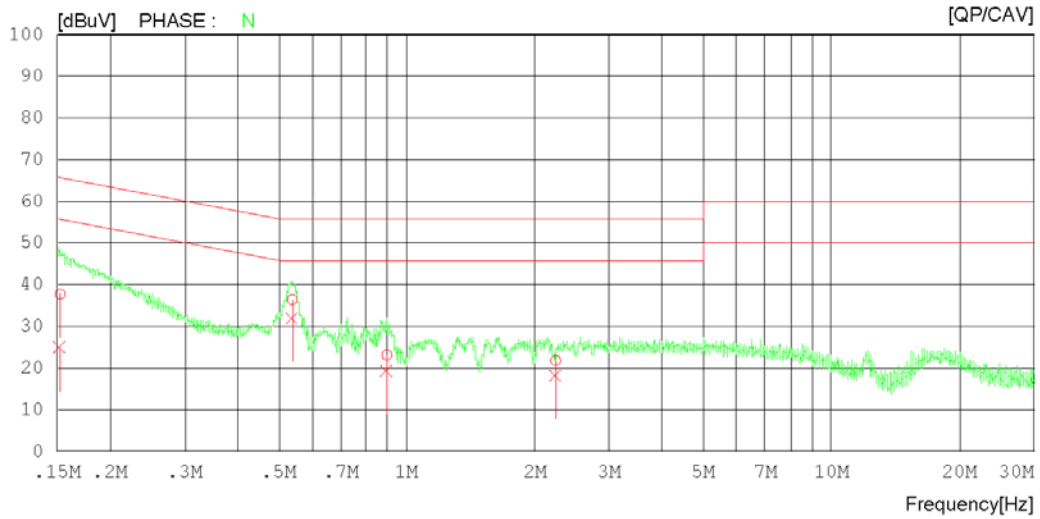
Mains terminal disturbance voltage _Measurement data			
Test configuration mode	**1**	**EUT Operation mode**	**1**
Test voltage (V)	**120**	**Test Frequency (Hz)**	**60**

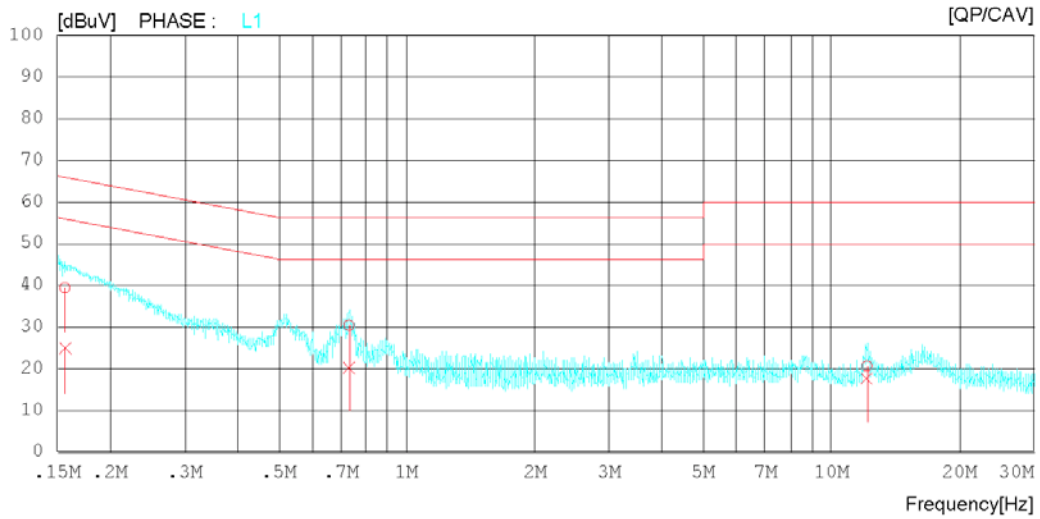
Results of Conducted Emission

DT&C
Date 2019-03-14

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi/Atm 19 'C 42 % R.H. 100.6 kPa
Test Condition Charging

LIMIT : CISPR32_B QP
CISPR32_B AV





Results of Conducted Emission

DT&C
Date 2019-03-14

Order No.	DTNC1902-01494
Power Supply	120 V 60 Hz
Temp/Humi/Atm	19 'C 42 % R.H. 100.6 kPa
Test Condition	Charging

LIMIT : CISPR32_B QP
CISPR32_B AV

NO	FREQ	READING QP	READING CAV	C.FACTOR	RESULT QP	RESULT CAV	LIMIT QP	LIMIT CAV	MARGIN QP	MARGIN CAV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15250	17.80	5.04	19.94	37.74	24.98	65.86	55.86	28.12	30.88	N
2	0.53688	16.45	11.96	20.05	36.50	32.01	56.00	46.00	19.50	13.99	N
3	0.89750	3.26	-0.56	19.92	23.18	19.36	56.00	46.00	32.82	26.64	N
4	2.24265	1.99	-1.63	19.87	21.86	18.24	56.00	46.00	34.14	27.76	N
5	0.15650	19.23	4.72	20.03	39.26	24.75	65.65	55.65	26.39	30.90	L1
6	0.73089	10.25	0.13	20.02	30.27	20.15	56.00	46.00	25.73	25.85	L1
7	12.13845	-0.36	-3.38	20.83	20.47	17.45	60.00	50.00	39.53	32.55	L1

Calculation

N : Neutral phase, L1 : Live phase
C.FACTOR(dB) : Pulse Limiter(dB) + Cable loss(dB) + Insertion loss of LISN(dB)
Result(dBμV) : Reading Value(dBμV) + C.FACTOR(dB)
Margin(dB) : Limit(dBμV) - Result(dBμV)

7.2 Radiated Disturbance

ANSI C63.4	Radiated disturbance 30 MHz – 13 GHz	Result
Method: Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 or 3 meter below 1GHz and 3 meter above 1GHz. The EUT was rotated 360° about its azimuth with the receive antenna located at various heights in horizontal and vertical polarities. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable. For final measurement below 1 GHz frequency range, Quasi-Peak detector with (RBW = 120 kHz Bandwidth) was used. For final measurement above 1 GHz frequency range, Peak detector with (RBW = 1 MHz Bandwidth) and CISPR Average detector with (RBW = 1 MHz Bandwidth) were used.		**Comply**

EUT mode (Refer to clauses 4)	**Test configuration mode**	**1**
	EUT Operation mode	**1**

Radiated Disturbance below 1 000 MHz

Frequency range (MHz)	**Quasi-peak limit dBµV/m**	
	Class A (10 m distance)	**Class B (3 m distance)**
30 to 88	39.1	40
88 to 216	43.5	43.5
216 to 960	46.4	46
960 to 1 000	49.5	54

According to 15.109(g), as an alternative to the radiated emission limit shown above, digital devices may be shown to comply with the standards contained in Third Edition of the International Special Committee on Radio Interference (CISPR), Pub. 22 shown.

Frequency range (MHz)	**Quasi-peak limit dBµV/m**	
	Class A (10 m distance)	**Class B (10 m distance)**
30 to 230	40	30
230 to 1 000	47	37

Radiated Disturbance for above 1 000 MHz at a measurement distance of 3 m

Frequency range (GHz)	**Peak limit dBµV/m**		**Average limit dBµV/m**	
	Class A	**Class B**	**Class A**	**Class B**
1 to 40	80	74	60	54

The test frequency range of Radiated Disturbance measurements are listed below.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	**Upper frequency of measurement range (MHz)**
Below 108	1 000
108 – 500	2 000
500 – 1 000	5 000
Above 1 000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Measurement Instrument					
Description	**Model**	**Manufacturer**	**Identifier**	**Cal. Date**	**Cal. Due**
EMI TEST RECEIVER	ESU	ROHDE&SCHWARZ	100469	2018.06.28	2019.06.28
TRILOG BROAD BAND ANTENNA	VULB9160	SCHWARZBECK	9160-3339	2018.10.22	2020.10.22
6DB ATTENUATOR	8491B	HP	18403	2018.10.22	2020.10.22
LOW NOISE PRE AMPLIFIER	MLA-100K01-B01-26	TSJ	1252741	2019.02.18	2020.02.18
HORN ANTENNA	3117	ETS-LINDGREN	00152093	2018.03.26	2020.03.26
PRE AMPLIFIER	8449B	H.P	3008A00887	2018.08.31	2019.08.31
HORN ANTENNA WITH PREAMPLIFIER	EM-6969	ELECTRO-METRICS	156	2019.02.13	2021.02.13
	MLA-0618-B03-34	TSJ	1785642	2019.01.02	2020.01.02
(NOTE : THE MEASUREMENT ANTENNAS WERE CALIBRATED IN ACCORDANCE TO THE REQUIREMENTS OF C63.5-2017.)					

Radiated disturbance at (30 ~ 1000) MHz _Measurement data			
Test configuration mode	**1**	**EUT Operation mode**	**1**
Test voltage (V)	**120**	**Test Frequency (Hz)**	**60**

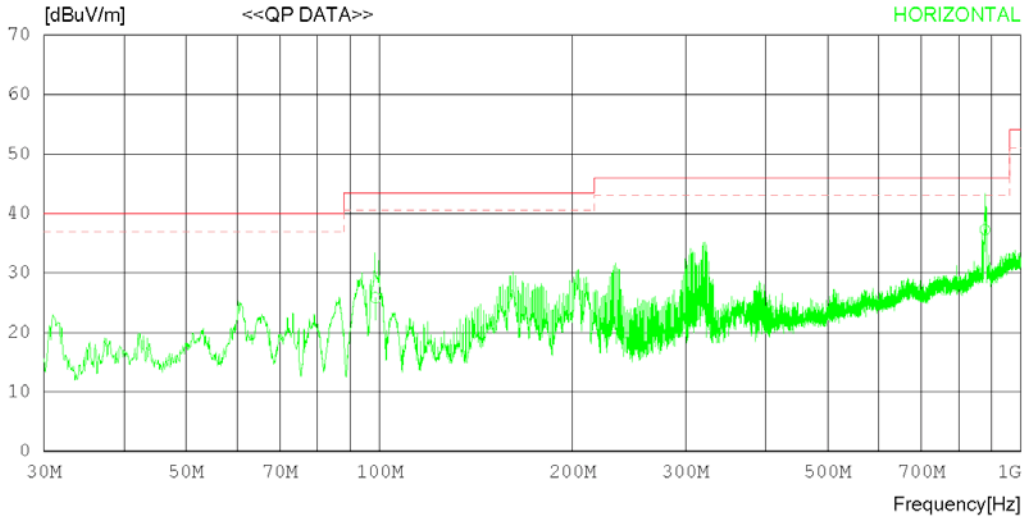
RADIATED EMISSION

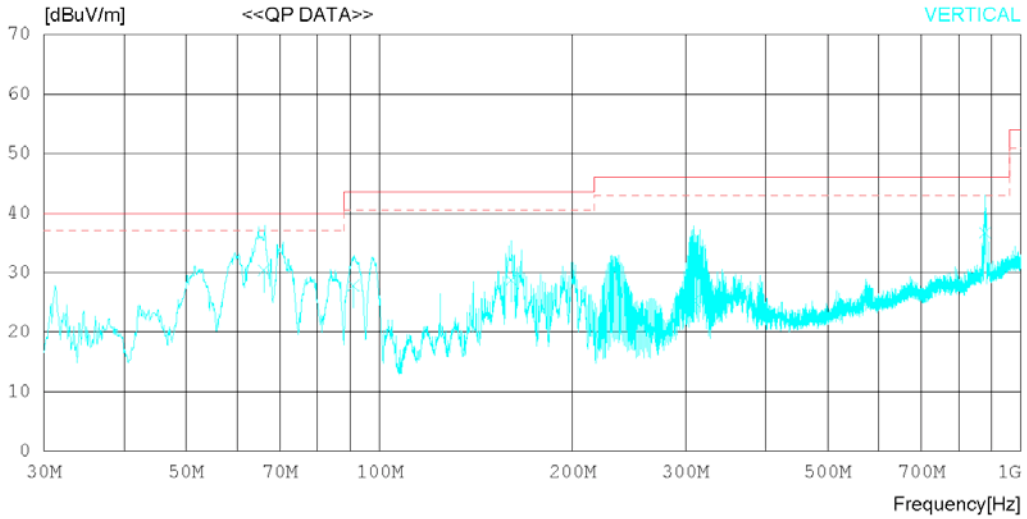
Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB





RADIATED EMISSION

Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	98.544	33.93	15.01	2.58	25.70	25.82	43.50	17.68	204	163
2	878.883	27.63	29.11	6.31	25.80	37.25	46.00	8.75	396	302
----- Vertical ------										
3	66.019	36.70	17.20	2.27	25.77	30.40	40.00	9.60	116	360
4	91.044	37.66	13.41	2.51	25.72	27.86	43.50	15.64	105	288
5	160.542	32.59	18.86	3.01	25.66	28.80	43.50	14.70	101	42
6	309.102	27.65	19.50	3.97	25.85	25.27	46.00	20.73	189	229
7	879.010	27.09	29.11	6.31	25.80	36.71	46.00	9.29	303	360

Radiated disturbance at (1 ~ 6) GHz _Peak measurement data			
Test configuration mode	**1**	**EUT Operation mode**	**1**
Test voltage (V)	**120**	**Test Frequency (Hz)**	**60**

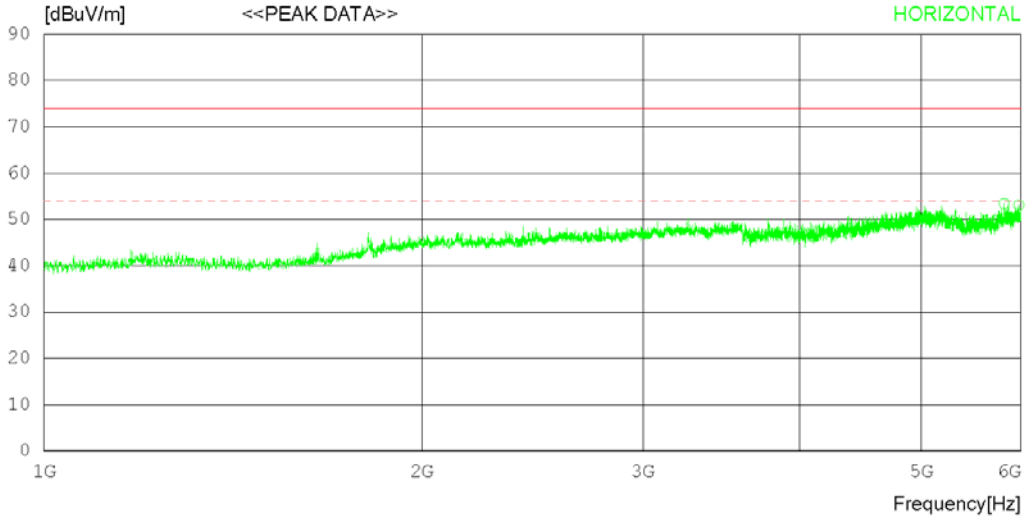
RADIATED EMISSION

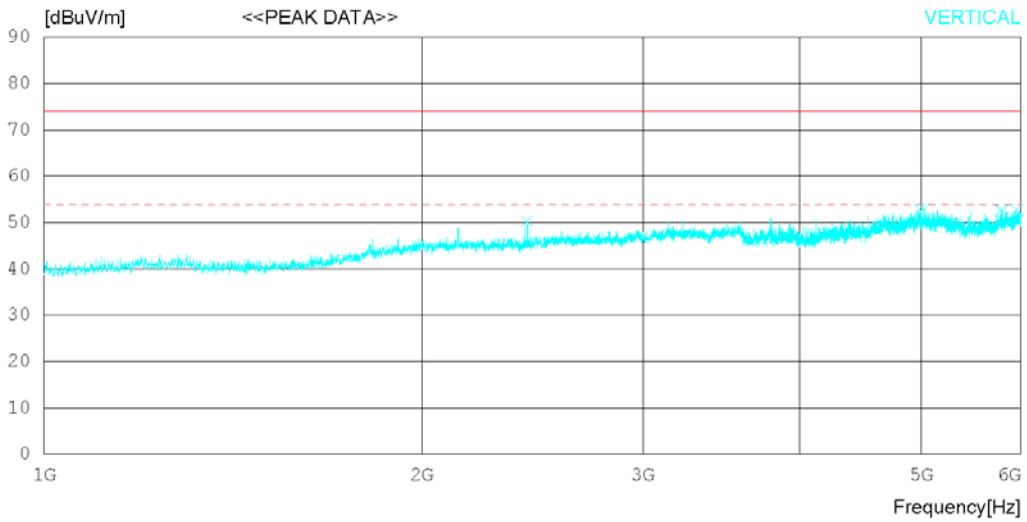
Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)
FCC Part15 Subpart.B Class B (3m) - GHz(Average)





RADIATED EMISSION

Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)
FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	5818.750	41.90	34.78	11.52	34.74	53.46	74.0	20.54	312	0
2	5977.500	41.20	35.10	11.53	34.76	53.07	74.0	20.93	395	0
----- Vertical ------										
3	2426.875	46.10	31.96	7.03	34.83	50.26	74.0	23.74	110	358
4	4985.000	42.40	34.13	11.05	34.64	52.94	74.0	21.06	143	358
5	5028.750	42.40	34.16	11.07	34.64	52.99	74.0	21.01	150	252
6	5782.500	41.20	34.70	11.49	34.73	52.66	74.0	21.34	199	358
7	5802.500	41.10	34.71	11.52	34.74	52.59	74.0	21.41	128	358
8	5960.625	40.90	35.10	11.53	34.76	52.77	74.0	21.23	109	354

Radiated disturbance at (1 ~ 6) GHz _Average measurement data			
Test configuration mode	**1**	**EUT Operation mode**	**1**
Test voltage (V)	**120**	**Test Frequency (Hz)**	**60**

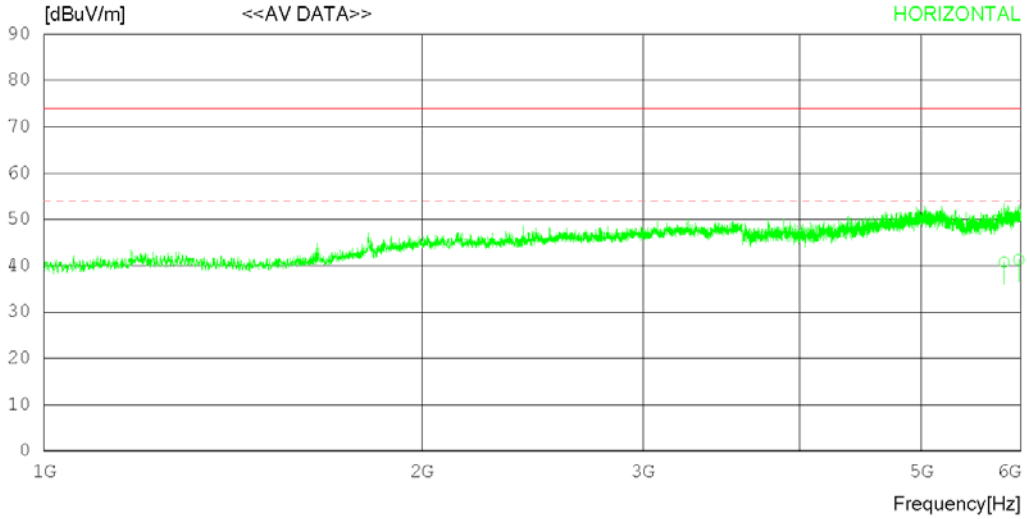
RADIATED EMISSION

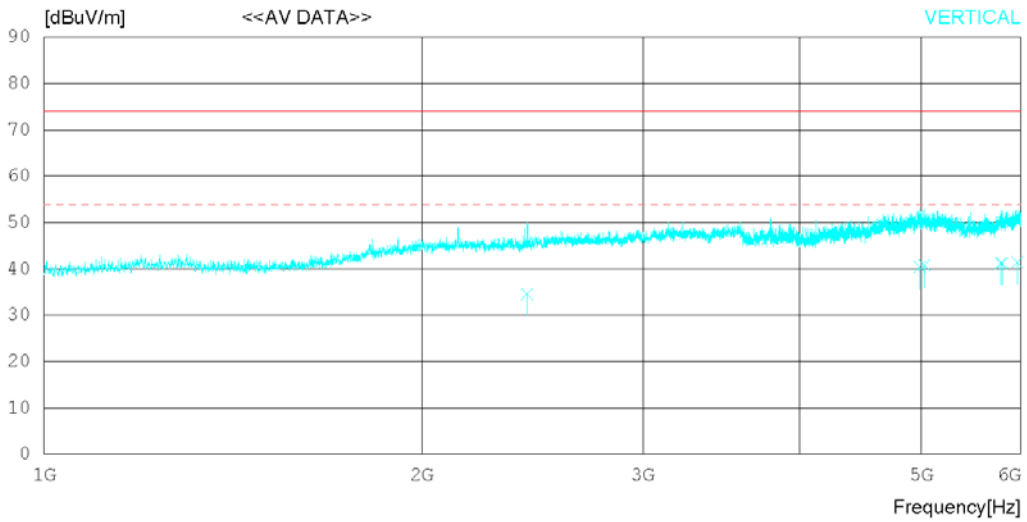
Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)
FCC Part15 Subpart.B Class B (3m) - GHz(Peak)





RADIATED EMISSION

Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)
FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	5818.187	29.24	34.77	11.52	34.74	40.79	54.00	13.21	320	284
2	5977.426	29.45	35.10	11.53	34.76	41.32	54.00	12.68	400	101
----- Vertical ------										
3	2426.011	30.40	31.96	7.03	34.83	34.56	54.00	19.44	108	212
4	4985.281	29.90	34.13	11.05	34.64	40.44	54.00	13.56	151	190
5	5028.380	30.21	34.16	11.07	34.64	40.80	54.00	13.20	148	67
6	5782.208	29.74	34.70	11.49	34.73	41.20	54.00	12.80	207	0
7	5801.991	29.75	34.71	11.52	34.74	41.24	54.00	12.76	135	349
8	5960.175	29.56	35.10	11.53	34.76	41.43	54.00	12.57	113	360

Radiated disturbance at (6 ~ 13) GHz _Peak measurement data			
Test configuration mode	**1**	**EUT Operation mode**	**1**
Test voltage (V)	**120**	**Test Frequency (Hz)**	**60**

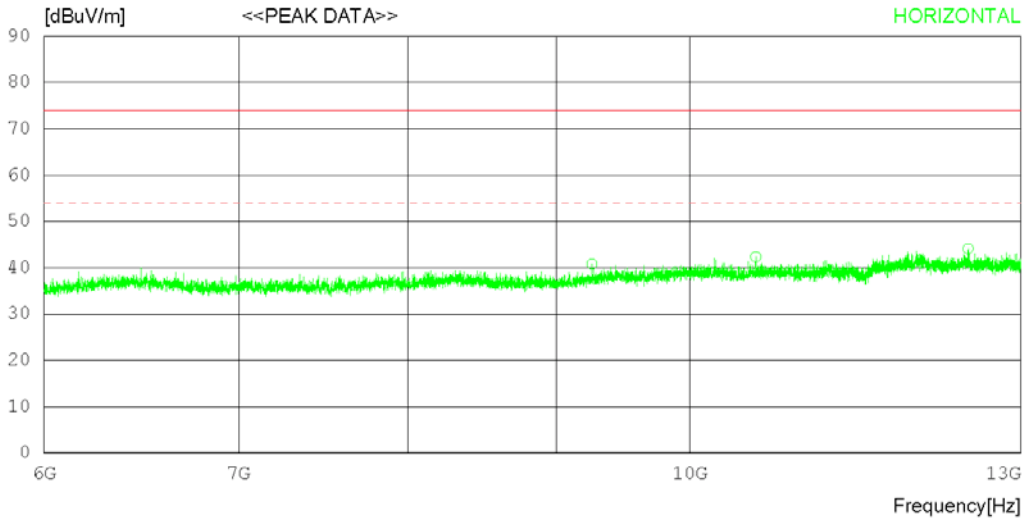
RADIATED EMISSION

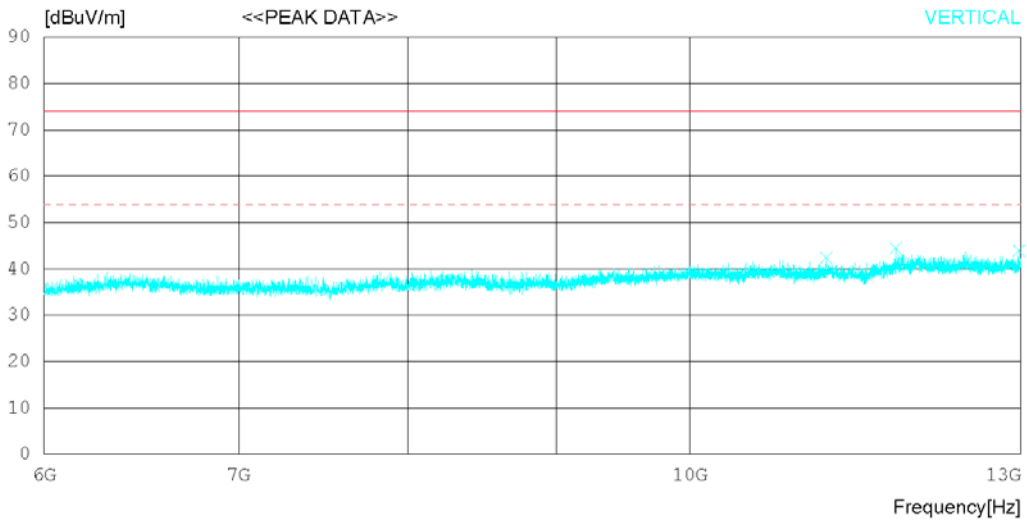
Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)
FCC Part15 Subpart.B Class B (3m) - GHz(Average)





RADIATED EMISSION

Date 2019-03-13

Order No.	DTNC1902-01494
Power Supply	120 V 60 Hz
Temp/Humi	20 'C 39 % R.H.
Test Condition	Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Peak)
FCC Part15 Subpart.B Class B (3m) - GHz(Average)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	9257.250	33.80	32.22	13.87	39.08	40.81	74.0	33.19	387	21
2	10539.000	33.30	32.47	14.70	38.13	42.34	74.0	31.66	295	189
3	12468.000	33.10	33.50	16.00	38.49	44.11	74.0	29.89	400	358
----- Vertical ------										
4	11145.750	33.20	32.56	14.87	38.22	42.41	74.0	31.59	112	0
5	11777.250	34.00	33.23	15.30	38.04	44.49	74.0	29.51	105	0
6	12981.750	32.30	33.55	16.32	38.25	43.92	74.0	30.08	161	358

Radiated disturbance at (6 ~ 13) GHz _Average measurement data			
Test configuration mode	**1**	**EUT Operation mode**	**1**
Test voltage (V)	**120**	**Test Frequency (Hz)**	**60**

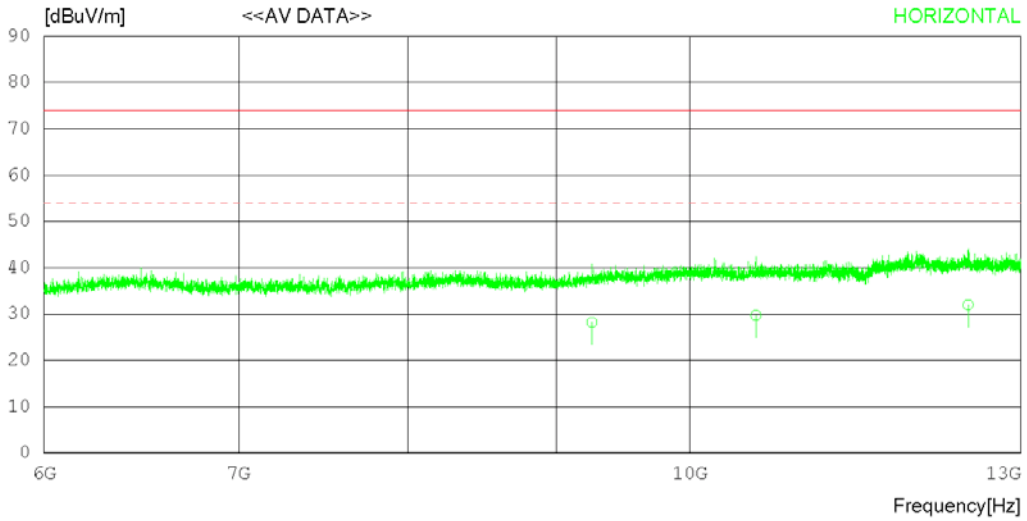
RADIATED EMISSION

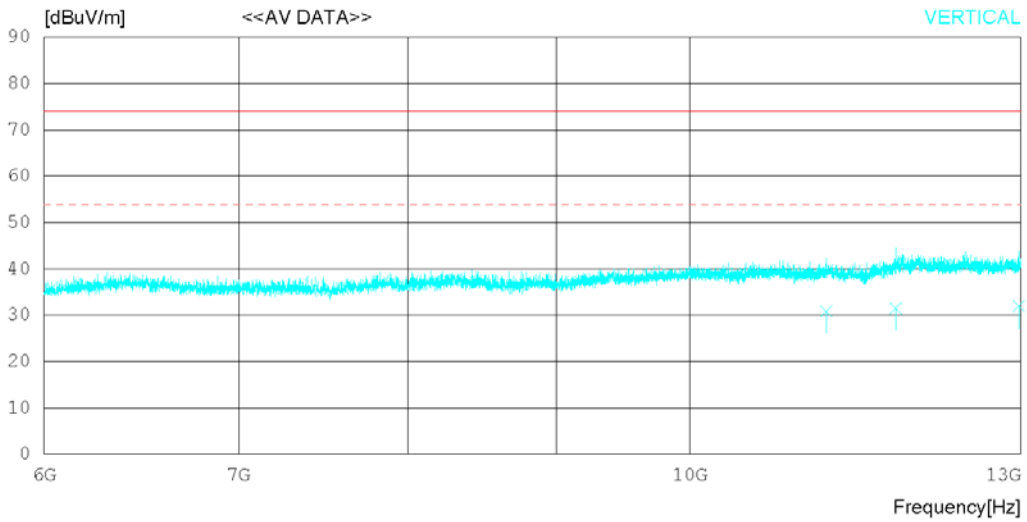
Date 2019-03-13

Order No. DTNC1902-01494
Power Supply 120 V 60 Hz
Temp/Humi 20 'C 39 % R.H.
Test Condition Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)
FCC Part15 Subpart.B Class B (3m) - GHz(Peak)





RADIATED EMISSION

Date 2019-03-13

Order No.	DTNC1902-01494
Power Supply	120 V 60 Hz
Temp/Humi	20 'C 39 % R.H.
Test Condition	Charging

Memo

LIMIT : FCC Part15 Subpart.B Class B (3m) - GHz(Average)
FCC Part15 Subpart.B Class B (3m) - GHz(Peak)

No.	FREQ [MHz]	READING CAV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	9257.260	21.20	32.22	13.87	39.08	28.21	54.00	25.79	394	219
2	10539.370	20.69	32.47	14.70	38.13	29.73	54.00	24.27	312	203
3	12467.890	20.99	33.50	16.00	38.49	32.00	54.00	22.00	391	0
----- Vertical ------										
4	11145.140	21.68	32.56	14.87	38.22	30.89	54.00	23.11	120	360
5	11777.130	20.98	33.23	15.30	38.04	31.47	54.00	22.53	118	341
6	12981.230	20.35	33.55	16.32	38.25	31.97	54.00	22.03	170	75

Calculation

N : Neutral phase, L1 : Live phase
C.FACTOR(dB) : Pulse Limiter(dB) + Cable loss(dB) + Insertion loss of LISN(dB)
Result(dBμV) : Reading Value(dBμV) + C.FACTOR(dB)
Margin(dB) : Limit(dBμV) - Result(dBμV)

8. Revision History

Date	Description	Revised By	Reviewed By
Mar. 27. 2019	Initial report	YongKi Kim	HyungJun Kim

-End of test report-