TEST REPORT

Dt&C

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 : DRTFCC2008-0253
2. Customer
   - Name : BLUEBIRD INC.
   - Address : 3F, 115, Irwon-ro, Gangnam-gu, Seoul, South Korea
3. Use of Report : FCC Original Grant
4. Product Name / Model Name : Enterprise-Value Full Touch Handheld Computer / VF550
   FCC ID : SS4VF550
5. Test Method Used : KDB971168 D01v03, ANSI/TIA-603-E-2016, ANSI C63.26-2015
   Test Specification : §2, §22(H), §24(E)
6. Date of Test : 2020.06.25 ~ 2020.07.22
7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing
8. Testing Environment : See appended test report.
9. Test Result : Refer to the attached Test Result

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

Affirmation	Tested by Name : InHee Bae	(Signature)	Reviewed by Name : JaeJin Lee	(Signature)

2020 . 08 . 21 .

DT&C Co., Ltd.

Not abided by KS Q ISO / IEC 17025 and KOLAS accreditation.

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

Test Report Version

Test Report No.	Date	Description	Revised by	Reviewed by
DRTFCC2008-0253	Aug. 21, 2020	Initial issue	InHee Bae	JaeJin Lee

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1. GENERAL INFORMATION

Applicant Name : BLUEBIRD INC.

Address : 3F, 115, Irwon-ro, Gangnam-gu, Seoul, South Korea

FCC ID : SS4VF550

FCC Classification : PCS Licensed Transmitter Held to Ear(PCE)

EUT : Enterprise-Value Full Touch Handheld Computer

Model Name : VF550

Add Model Name : NA

Supplying power : DC 3.85 V

Antenna Type : Internal Antenna

Mode	Tx Frequency (MHz)	ERP (Max. Power)		EIRP (Max. Power)	
		dBm	W	dBm	W
GSM850	824.2 ~ 848.8	27.17	0.521	-	-
EDGE850	824.2 ~ 848.8	21.39	0.138	-	-
WCDMA850	826.4 ~ 846.6	18.57	0.072	-	-
GSM1900	1 850.2 ~ 1 909.8	-	-	26.09	0.406
EDGE1900	1 850.2 ~ 1 909.8	-	-	22.31	0.170
WCDMA1900	1 852.4 ~ 1 907.6	-	-	20.81	0.121

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Equipment Under Test (EUT) supports GSM/WCDMA/LTE/Bluetooth/WLAN/NFC.

2.2. EUT CAPABILITIES

This EUT contains the following capabilities:
GSM 850/1 900, WCDMA 850/1 900, Multi-band LTE, 802.11b/g/n WLAN(2.4GHz),
802.11a/n/ac WLAN(5GHz), Bluetooth(BDR, EDR, LE), NFC.

2.3. TESTING ENVIRONMENT

Ambient Condition	
▪ Temperature	+21 ℃ ~ +25 ℃
▪ Relative Humidity	39 % ~ 44 %

2.4. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.5. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of *k* = 2 to indicate a 95 % level of confidence.

Parameter	Measurement uncertainty
Radiated Disturbance (Below 1 GHz)	4.9 dB (The confidence level is about 95 %, k = 2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.1 dB (The confidence level is about 95 %, k = 2)
Radiated Disturbance (Above 18 GHz)	5.3 dB (The confidence level is about 95 %, k = 2)

2.6. TEST FACILITY

DT&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042.
The test site complies with the requirements of § 2.948 according to ANSI C63.4-2014.

- FCC MRA Accredited Test Firm No. : KR0034

www.dtnc.net

Telephone	:	+ 82-31-321-2664
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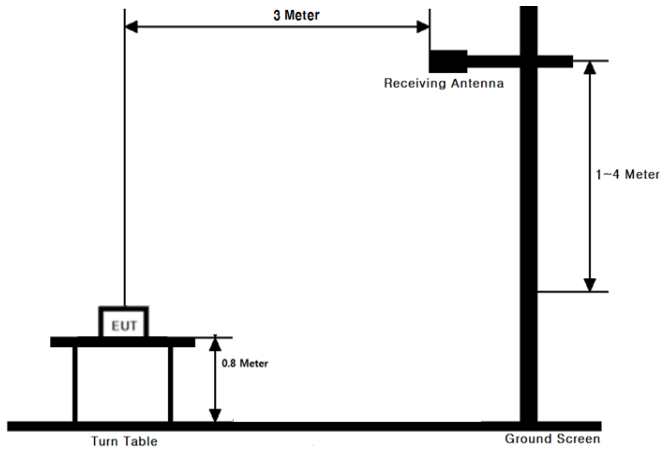
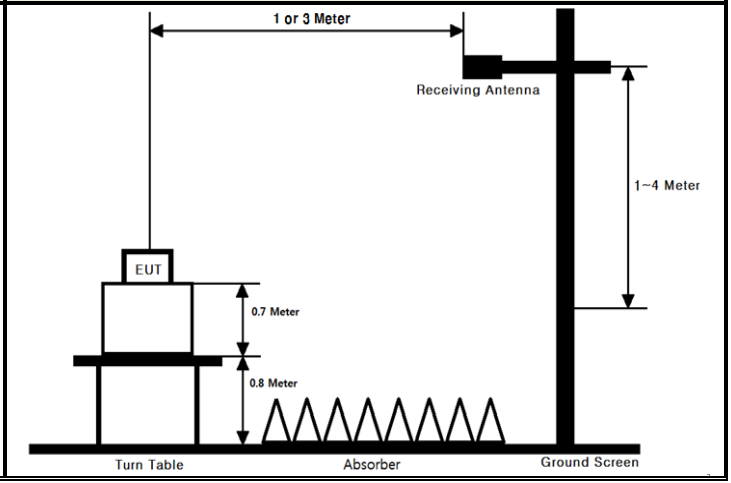
3. DESCRIPTION OF TESTS

3.1 ERP & EIRP (Effective Radiated Power & Equivalent Isotropic Radiated Power)

Test Set-up

Below 1 GHz	Above 1 GHz
	

These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 1.5 meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

Test Procedure

- **ANSI/TIA-603-E-2016 - Section 2.2.17**
- **KDB971168 D01v03 - Section 5.2.2**
- **ANSI 63.26-2015 – Section 5.2.4.4.1**

Test setting

1. Set span to 2 x to 3 x the OBW.
2. Set RBW = 1 % to 5 % of the OBW.
3. Set VBW ≥ 3 x RBW.
4. Set number of points in sweep ≥ 2 × span / RBW.
5. Sweep time:
   1) Set = auto-couple, or
   2) Set ≥ [10 × (number of points in sweep) × (transmission period)] for single sweep (automation-compatible) measurement. Transmission period is the on and off time of the transmitter.
6. Detector = power averaging (rms).
7. If the EUT can be configured to transmit continuously, then set the trigger to free run.
8. If the EUT cannot be configured to transmit continuously, then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Verify that the sweep time is less than or equal to the transmission burst duration. Time gating can also be used under similar constraints (i.e., configured such that measurement data is collected only during active full-power transmissions).
9. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple. To accurately determine the average power over multiple symbols, it can be necessary to increase the number of traces to be averaged above 100 or, if using a manually configured sweep time, increase the sweep time.

10. Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band or channel power measurement function, with the band/channel limits set equal to the OBW band edges. If the instrument does not have a band or channel power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

The receiver antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer.

A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminal of the substitute antenna is measured.

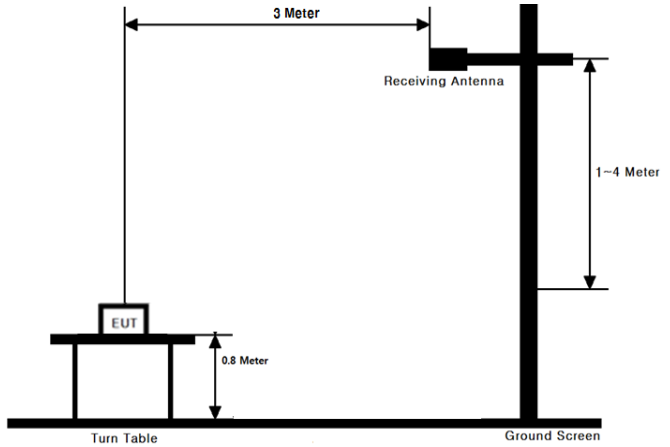
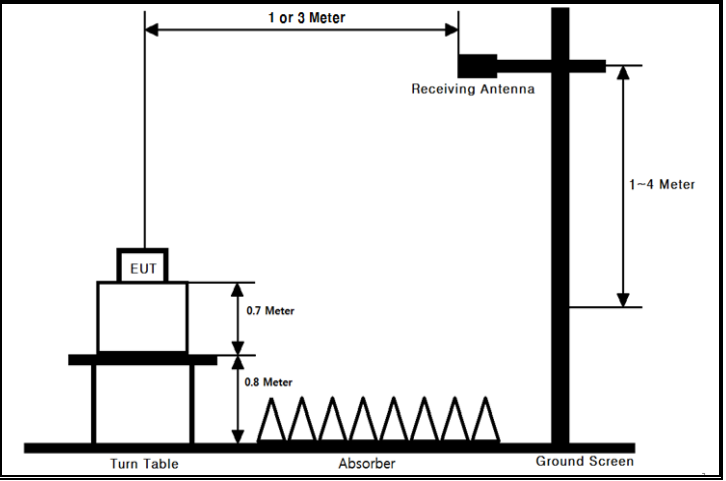
The ERP / EIRP is calculated using the following formula:

ERP / EIRP = The conducted power at the substitute antenna`s terminal [dBm] + Substitute Antenna gain [dBd for ERP, dBi for EIRP]

For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn antenna and an isotropic antenna are taken into consideration.

3.2 RADIATED SPURIOUS EMISSIONS

Test Set-up

Below 1 GHz	Above 1 GHz
	

These measurements were performed at 3 m test site. The equipment under test is placed on a non-conductive table 1.5 meters above a turntable which is flush with the ground plane and 3 meters from the receive antenna. For measurements above 1 GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.

Test Procedure

- **ANSI/TIA-603-E-2016 - Section 2.2.12**
- **KDB971168 D01v03 - Section 5.8**
- **ANSI C63.26-2015 - Section 5.5**

Test setting

1. RBW = 100 kHz for below 1 GHz and 1 MHz for above 1 GHz / VBW ≥ 3 X RBW
2. Detector = RMS & Trace mode = Max hold
3. Sweep time = Auto couple
4. Number of sweep point ≥ 2 X span / RBW
5. The trace was allowed to stabilize

The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. For radiated spurious emission measurements below 1 GHz, a half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading.
For radiated spurious emission measurements above 1 GHz, a Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. The difference between the gain of the horn and an isotropic antenna are taken into consideration.

4. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9020A	20/06/24	21/06/24	US47360812
DC power supply	Agilent Technologies	66332A	20/06/24	21/06/24	MY43000394
Multimeter	FLUKE	17B+	19/12/16	20/12/16	36390701WS
Radio Communication Analyzer	Agilent Technologies	E5515E	20/06/24	21/06/24	MY52113012
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-2
Thermohygrometer	BODYCOM	BJ5478	19/12/18	20/12/18	120612-1
Signal Generator	Rohde Schwarz	SMBV100A	19/12/16	20/12/16	255571
Signal Generator	ANRITSU	MG3695C	19/12/16	20/12/16	173501
Loop Antenna	ETS-Lindgren	6502	19/09/18	21/09/18	00226186
Bilog Antenna	Schwarzbeck	VULB 9160	19/04/23	21/04/23	9160-3362
Dipole Antenna	Schwarzbeck	UHA9105	20/04/10	22/04/10	2262
HORN ANT	ETS	3117	20/04/24	21/04/24	00140394
HORN ANT	A.H.Systems	SAS-574	20/06/24	21/06/24	155
PreAmplifier	H.P	8447D	19/12/16	20/12/16	2944A07774
PreAmplifier	Agilent	8449B	20/06/24	21/06/24	3008A02108
High-pass filter	Wainwright	WHKX12-935-1000-15000-40SS	20/06/24	21/06/24	7
High-pass filter	Wainwright	WHKX10-2838-3300-18000-60SS	20/06/24	21/06/24	2
Cable	DTNC	Cable	20/01/16	21/01/16	M-01
Cable	DTNC	Cable	20/01/16	21/01/16	M-04
Cable	Junkosha	MWX315	20/01/16	21/01/16	M-05
Cable	Junkosha	MWX221	20/01/16	21/01/16	M-06

Note1: The measurement antennas were calibrated in accordance to the requirements of ANSI C63.5-2017.
Note2: The cable is not a regular calibration item, so it has been calibrated by DT & C itself.

5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Parameter	Status Note 1
2.1046	Conducted Output Power	NA Note2
22.913(a) 24.232(c)	Effective Radiated Power Equivalent Isotropic Radiated Power	C
2.1049	Occupied Bandwidth	NA Note2
2.1051 22.917(a) 24.238(a)	Band Edge Emissions at Antenna Terminal Spurious Emissions at Antenna Terminal	NA Note2
24.232(d)	Peak to Average Ratio	NA Note2
2.1053 22.917(a) 24.238(a)	Radiated Spurious and Harmonic Emissions	C
2.1055 22.355 24.235	Frequency Stability	NA Note2

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable
Note 2: These test items were not performed because this device uses the granted module.
(FCC ID: XMR201805EC25AU)
Please refer to the test report of the granted module.

6. EMISSION DESIGNATOR AND SAMPLE CALCULATION

A. For substitution method

1) The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1 GHz respectively above ground.
2) The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
3) During the test, the turn table is rotated until the maximum signal is found.
4) Record the field strength meter's level. (ex. Spectrum reading level is -8.5 dBm)
5) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
6) Increase the signal generator output till the field strength meter's level is equal to the item (4). (ex. Signal generator level is -18.04 dBm)
7) The gain of the cable and amplifier between the signal generator and terminals of substituted antenna is 46.92 dB at test frequency.
8) Record the level at substituted antenna terminal. (ex. 28.88 dBm)
9) The result is calculated as below;

EIRP(dBm) = LEVLE@ANTENNA TERMINAL + TX Antenna Gain (dBi)
ERP(dBm) = LEVLE@ANTENNA TERMINAL + TX Antenna Gain (dBd)
Where, TX Antenna Gain (dBd) = TX Antenna Gain (dBi) - 2.15 dB

7. TEST DATA

7.1 1 EFFECTIVE RADIATED POWER

- Test Notes

This EUT was tested under all configurations and the highest power is reported in GSM mode and WCDMA mode with HSDPA inactive at 12.2 kbps RMC and TPC bits set to “1” and in GSM mode using a Power Control Level of “0” in PCS Band and “5” in the Cellular Band. This EUT was tested with the fully charged battery. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna.

The worst case data is reported.

- GSM850 data

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL@ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Note.
GSM850	128	824.2	H	27.48	-0.63	26.85	0.484	-
GSM850	190	836.6	H	27.24	-0.74	26.50	0.447	-
GSM850	***251***	***848.8***	***H***	***28.02***	***-0.85***	***27.17***	***0.521***	***-***
EDGE850	***251***	***848.8***	***H***	***22.24***	***-0.85***	***21.39***	***0.138***	***-***

- WCDMA850 data

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL@ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBd)	ERP (dBm)	ERP (W)	Note.
WCDMA850	4 132	826.4	H	18.47	-0.65	17.82	0.061	-
WCDMA850	4 183	836.6	H	18.74	-0.74	18.00	0.063	-
WCDMA850	***4 233***	***846.6***	***H***	***19.40***	***-0.83***	***18.57***	***0.072***	***-***

7.2 EQUIVALENT ISOTROPIC RADIATED POWER

- GSM1900 data

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL@ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Note.
GSM1900	512	1 850.2	H	19.58	4.90	24.48	0.281	-
GSM1900	661	1 880.0	H	20.91	4.60	25.51	0.356	-
GSM1900	***810***	***1 909.8***	***H***	***21.65***	***4.44***	***26.09***	***0.406***	***-***
EDGE1900	***810***	***1 909.8***	***H***	***17.87***	***4.44***	***22.31***	***0.170***	***-***

- WCDMA1900 data

Mode	CH	Frequency (MHz)	Ant. Pol. (H/V)	LEVEL@ TX ANTENNA TERMINAL (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	Note.
WCDMA1900	9 262	1 852.4	H	13.06	4.88	17.94	0.062	-
WCDMA1900	9 400	1 880.0	H	14.78	4.60	19.38	0.087	-
WCDMA1900	***9 538***	***1 907.6***	***H***	***16.38***	***4.43***	***20.81***	***0.121***	***-***

7.3 RADIATED SPURIOUS EMISSIONS

- Test Notes

1. This EUT was tested under all configurations and the highest power is reported in GSM mode and WCDMA mode with HSDPA inactive at 12.2 kbps RMC and TPC bits set to “1” and in GSM mode using a Power Control Level of “0” in PCS Band and “5” in the Cellular Band. This EUT was tested with the fully charged battery. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization of detecting antenna.
   The worst case data is reported.
2. Limit Calculation = 43 + 10 $\log_{10}$(P[Watts])
3. No other spurious and harmonic emissions were reported greater than listed emissions.

- GSM850 data

Channel (ERP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL@ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBd)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)	Note.
128 (0.484 W)	824.2	1 648.34	V	-51.90	4.16	-47.74	-13.00	34.74	-
		2 472.53	V	-47.42	3.59	-43.83	-13.00	30.83	-
190 (0.447 W)	836.6	1 673.27	V	-50.25	3.64	-46.61	-13.00	33.61	-
		2 509.92	V	-47.27	3.79	-43.48	-13.00	30.48	-
251 (0.521 W)	848.8	1 697.82	V	-49.04	3.10	-45.94	-13.00	32.94	-
		2 546.40	V	-47.84	3.94	-43.90	-13.00	30.90	-

- WCDMA850 data

Channel (ERP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL@ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBd)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)	Note
4 132 (0.061 W)	826.4	1 654.44	V	-54.44	4.05	-50.39	-13.00	37.39	-
4 183 (0.063 W)	836.6	1 671.98	V	-54.92	3.67	-51.25	-13.00	38.25	-
4 233 (0.072 W)	846.6	1 695.52	V	-54.17	3.15	-51.02	-13.00	38.02	-

- GSM1900 data

Channel (EIRP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL@ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)	Note
512 (0.281 W)	1 850.2	3 701.07	V	-53.90	8.30	-45.60	-13.00	32.60	-
661 (0.356 W)	1 880.0	3 760.34	V	-53.91	8.42	-45.49	-13.00	32.49	-
810 (0.406 W)	1 909.8	3 820.08	V	-53.70	8.50	-45.20	-13.00	32.20	-

- WCDMA1900 data

Channel (EIRP)	Tx Freq. (MHz)	Freq. (MHz)	POL (H/V)	LEVEL@ ANTENNA TERMINAL (dBm)	Substitute Antenna Gain (dBi)	Correct Generator Level (dBm)	Limit (dBm)	Margin (dB)	Note
9 262 (0.062 W)	1 852.4	3 702.92	V	-52.82	8.31	-44.51	-13.00	31.51	-
		5 553.89	V	-49.52	10.52	-39.00	-13.00	26.00	-
9 400 (0.087 W)	1 880.0	3 758.46	V	-52.33	8.42	-43.91	-13.00	30.91	-
		5 643.25	V	-44.62	10.71	-33.91	-13.00	20.91	-
9 538 (0.121 W)	1 907.6	3 817.15	V	-53.36	8.50	-44.86	-13.00	31.86	-
		5 720.32	V	-45.57	10.60	-34.97	-13.00	21.97	-