



▪ PCB (GSM / WCDMA)

TEST REPORT

Report No: KST-FCR-140005

Applicant	Name	Bluebird Inc.
	Address	(Dogok-dong, SEI Tower 13,14) 39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
Manufacturer	Name	Bluebird Inc.
	Address	(Dogok-dong, SEI Tower 13,14) 39, Eonjuro30-gil, Gangnam-gu, Seoul, South Korea
Equipment	Name	Handheld Mobile Computer
	Model No	BM180
	Brand	None
	FCC ID	SS4BM180M
Test Standard	FCC CFR 47, Subpart 22H & 24E	
Test Date(s)	2014. 07. 28 ~ 2014. 08. 12	
Issue Date	2014. 08. 13	
Test Result	Compliance	
Note	This equipment contained the certified module for GSM850/1900, WCDMA Band II/V and not certified modules for WLAN 802.11abgn, Bluetooth 4.0, NFC.	

Supplementary Information

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with measurement procedures specified in ANSI C 63.10-2009.

We attest to the accuracy of data and all measurements reported herein were performed by KOSTEC Co., Ltd. and were made under Chief Engineer's supervision. We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by Mi Young, Lee

Approved by Gyeong Hyeon, Park

Signature

Signature

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1. GENERAL INFORMATION

1.1 Test Facility

Test laboratory and address

KOSTEC Co., Ltd.

128(175-20,Annyeong-dong)406-gil sejaro, Hwaseong-si Gyeonggi-do, Korea

The open area field test site and conducted measurement facility are used for these testing. This site at was fully described in a reports submitted to the Federal Communications Commission (FCC).

The details of these reports have been found to be in complies with the requirements of Section 2.948 of the FCC Rules on November 14, 2002. The facility also complies with the radiated and conducted test site criteria set forth in ANSI C 63.10-2009.

The Federal Communications Commission (FCC) has the reports on file and KOSTEC Co., Ltd. is listed under FCC Registration No.525762. The test site has been approved by the FCC for public use and is List in the FCC Public Access Link CORES (Commission Registration System)

Registration information

KCC (Korea Communications Commission) Number : KR0041

KOLAS(Korea Laboratory Accreditation Scheme) Number : 232

FCC Registration Number(FRN) : 525762

VCCI Registration Number : R-1657 / C -1763

IC Registration Site Number : 8305A-1

1.2 Location



2. EQUIPMENT DESCRIPTION

The product specification described herein was declared by manufacturer. And refer to user's manual for the details.

Equipment Name	Handheld Mobile Computer
Model No	BM180
Usage	Voice and data transmission
Serial Number	Proto type
Radio access Type	TDMA & CDMA
Modulation type	GSM: GMSK, GPRS: 8PSK WCDMA: QPSK
Operating Mode	Maximum continuous output power using Radio Communication Analyzer
Max. Output power (P_{erp} , P_{eirp})	GSM 850: 29.48 dBm _{erp} / GPRS 850: 29.47 dBm _{erp} GSM1900: 29.65 dBm _{erp} / GPRS 1900: 29.63 dBm _{erp} WCDMA Band II: 23.15 dBm _{erp} WCDMA Band V: 23.22 dBm _{erp}
Operated Frequency (UP Link)	GSM 850: 824.2 MHz - 848.8 MHz GSM1900: 1850.2 MHz - 1909.8 MHz WCDMA Band II: 1852.4 MHz - 1907.6 MHz WCDMA Band V: 826.4 MHz - 846.6 MHz
Tx/Rx Channel Separation	850 MHz Band : 45 MHz, 1900 MHz Band : 80 MHz
Communication Type	Full duplex
GPRS/EGPRS Multi-slot Class	Class12(Max number of timeslots in uplink & downlink: 4, Max total timeslots: 5)
Power Class	GSM/GPRS 850: Class 4 GSM/GPRS1900: Class 1 WCDMA Band II: Class 3 WCDMA Band V: Class 3
Operation temperature	- 20 °C ~ + 55 °C
Power Source	AC/DC adapter Input : AC 100-240 V, 0.3 A, 50 - 60 Hz Output : DC 5 V, 1.0 A Battery : Li-ion DC 3.7 V
Antenna Gain	Type : Internal PCB Antenna GSM/GPRS 850: Max.gain: 0.52 dBi GSM/GPRS1900:Max.gain: 1.15 dBi WCDMA Band II: Max.gain: 1.15 dBi WCDMA Band V: Max.gain: 0.52 dBi
FCC ID	SS4BM180M
Remark	1. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test. 2. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report. 3. GSM/GPRS operation was evaluated at 48kbps Max. data rate both GMSK and 8PSK modulation. WCDMA operation was evaluated at 384 kbps Max. data rate with modulation QPSK 4. The above DUT's information was declared by manufacturer. Please refer to the specifications or user manual for more detailed description.

3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

Equipment Under Test (EUT) contains the following capabilities:

The certified module for GSM/GPRS 850,1900 & WCDMA Band II/V and WLAN 802.11abgn, Bluetooth 4.0, NFC. GSM/GPRS & WCDMA frequency are UP Link (824.2 MHz to 848.8 MHz and 1 850.2 MHz to 1 909.8 MHz), Down Link (869.2 MHz to 893.8 MHz and 1 930.2 MHz to 1 989.8 MHz) and GSM/GPRS channel Number is 124ch, WCDMA channel Number is Band II(1 900 MHz) /127ch, Band V(850 MHz)/102ch.

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark
Battery	EG-520	-	Egen	Li-ion 3.7 V
AC/DC adapter	PSAI05R-050Q CH	-	Phihong (Dongguan) Electronics Co.,Ltd	Output: 5.0 V
Radio Communication Analyzer	MT8815A	6200429622	Anritsu Corporation	Due cal date: 2015.02.07

3.3 Product Modification

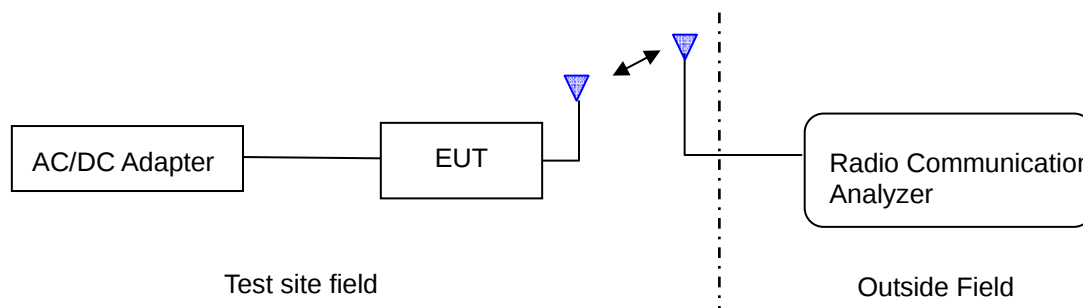
N/A

3.4 Operating Mode

All measurements were intended to emit maximum signal (Max.data rate and mod.)from EUT continuously.

3.5 Test Setup of EUT

The measurements were taken in continuous transmit / receive mode using the Radio communication Analyzer. Communication between the device and the Radio communication Analyzer was established by air link



※ This configuration is Radiated emission measurement

3.6 Test Item and channel

During testing, for channel & mode and modulation setting is controlled using the Radio communication Analyzer.

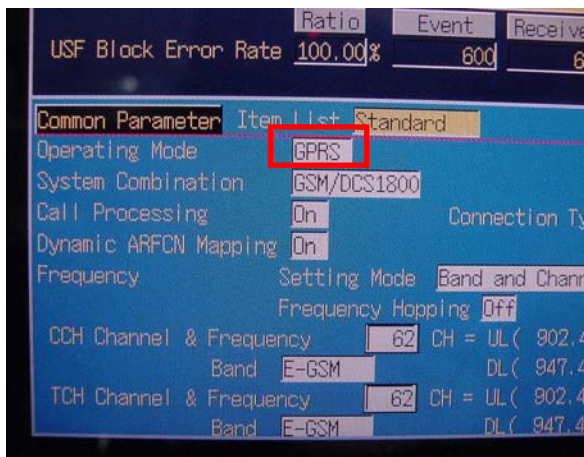
Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report

Test Items	Mode	Mode (Max.Data Rate)	Channel (UP Link)	Remark
Radiated emissions (Fundamental & Spurious etc.)	GSM/GPRS	GMSK/8PSK (48 kbps)	128, 190, 251	850 MHz Band
			512, 661, 810	1 900 MHz Band
	WCDMA	QPSK (384kbps)	4 132, 4 182, 4 233	850 MHz (Band V)
			9 262, 9 400, 9 538	1 900 MHz (Band II)

※ GSM use only voice transmission and GPRS is data, SMS and video image

3.7 Parameters of Test Software Setting

The H/W version is 1.0 and S/W version is PS:05.03.00/ AL:07.01.002-B001-GE864 in GPRS Module declared by the manufacturer.



<Test parameter selection>



<Radio Communication Analyzer>

3.8 Used Test Equipment List

No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
1	T & H Chamber	EY-101	90E14260	TABAI ESPEC	2014.10.05	1 year	☐
2	Constant switch Tester	DS-COT	None	Dong sung Ele.	N/A	N/A	☐
3	Vibration Tester	70UA	L90016	IDEX Co.,Ltd	N/A	N/A	☐
4	Vibration Meter	VM-6360	N225098	LANDTEK	2015.04.04	18 month	☐
5	Falling Tester	SWD-8000	None	Sinwoo	N/A	N/A	☐
6	Spectrum Analyzer	8563E	3846A10662	Agilent Technology	2015.02.07	1 year	☐
7	Spectrum Analyzer	8593E	3710A02859	Agilent Technology	2015.02.07	1 year	☐
8	Spectrum Analyzer	FSV30	20-353063	Rohde& Schwarz	2015.02.07	1 year	☒
9	EMI Test Receiver	ESCI7	100823	Rohde& Schwarz	2015.02.05	1 year	☒
10	EMI Test Receiver	ESI	834000/002	Rohde& Schwarz	2015.02.05	1 year	☒
11	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2015.02.07	1 year	☐
12	Network Analyzer	8753ES	US39172348	AGILENT	2014.10.05	1 year	☐
13	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2015.02.07	1 year	☐
14	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2015.02.07	1 year	☐
15	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2015.02.07	1 year	☐
16	Modulation Analyzer	8901A	3538A07071	Agilent Technology	2015.02.07	1 year	☐
17	Audio Analyzer	8903B	3514A16919	Agilent Technology	2015.02.07	1 year	☐
18	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2015.02.07	1 year	☐
19	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2014.10.05	1 year	☐
20	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2015.02.07	1 year	☐
21	ESG Vector Signal Generator	E4438C	MY42083133	Agilent Technology	2014.10.05	1 year	☐
22	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2015.01.21	1 year	☐
23	Tracking Source	85645A	070521-A1	Agilent Technology	2015.02.07	1 year	☒
24	Signal Generator	SML03	100692	Rohde& Schwarz	2015.02.07	1 year	☐
25	SLIDAC	None	0207-4	Myoung sung Ele.	2015.02.07	1 year	☐
26	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2015.02.07	1 year	☐
27	DC Power supply	6038A	3440A12674	Agilent Technology	2015.02.07	1 year	☐
28	DC Power supply	E3610A	KR24104505	Agilent Technology	2015.02.07	1 year	☐
29	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2015.02.07	1 year	☐
30	DC Power Supply	SM 3004-D	114701000117	DELTAELEKTRONIKA	2015.02.07	1 year	☐
31	Dummy Load	8173	3780	Bird Electronic Co., Corp	2015.02.07	1 year	☐
32	Attenuator	50FH-030-500	140410 9433	JEW Industries Inc.	2015.02.07	1 year	☐
33	Attenuator	765-20	9703	Narda	2014.10.05	1 year	☐
34	Attenuator	8498A	3318A09485	HP	2015.02.07	1 year	☐
35	Step Attenuator	8494B	3308A32809	HP	2015.02.07	1 year	☐
36	Step Attenuator	8495D	3308A01464	HP	2015.02.07	1 year	☐
37	Power divider	11636B	51212	HP	2014.10.05	1 year	☐
38	3Way Power divider	KPDSU3W	00070365	KMW	2015.02.07	1 year	☐
39	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2015.02.07	1 year	☐
40	White noise audio filter	ST31EQ	101902	SoundTech	2014.10.05	1 year	☐
41	Dual directional coupler	778D	17693	HEWLETT PACKARD	2015.02.07	1 year	☐
42	Dual directional coupler	772D	2839A00924	HEWLETT PACKARD	2015.02.07	1 year	☐
43	Band rejection filter	3TNF-0006	26	DOVER Tech	2015.02.07	1 year	☐
44	Band rejection filter	3TNF-0008	317	DOVER Tech	2015.02.07	1 year	☐
45	Band rejection filter	3TNF-0007	311	DOVER Tech	2015.02.07	1 year	☐
46	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2015.02.07	1 year	☐
47	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2015.02.07	1 year	☐
48	Radio Communication Alalyzer	MT8815A	6200429622	ANRITSU	2015.02.07	1 year	☒
49	CDMA Mobile Station Test Set	E8285A	US40081298	AGILENT	2015.02.07	1 year	☐
50	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2015.04.10	1 year	☐

No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
51	RF Up/Down Converter	DCP-1780	980901003	CREDIX	2015.02.07	1 year	☐
52	DECT Test set	8923B	3829U00364	HP	2015.02.07	1 year	☐
53	DECT Test set	CMD60	840677/005	Rohde & Schwarz	2014.12.04	1 year	☐
54	Loop Antenna	6502	9203-0493	EMCO	2015.05.31	2 year	☐
55	Dipole Antenna	HZ-12	100005	Rohde & Schwarz	2016.07.01	2 year	☒
56	Dipole Antenna	HZ-13	100007	Rohde & Schwarz	2016.07.01	2 year	☒
57	BiconiLog Antenna	HL562	100076	Rohde & Schwarz	2014.12.10	2 year	☒
58	Horn Antenna	3115	9605-4834	EMCO	2016.06.16	2 year	☒
59	Horn Antenna	3115	2996	EMCO	2016.02.26	2 year	☐
60	Horn Antenna	BBHA9170	BBHA9170152	SCHWARZBECK	2015.05.27	2 year	☒
61	Signal Generator	SMT-06	100552	Rohde & Schwarz	2015.02.07	1 year	☐
62	HYGRO-Thermograph	NSII-Q	1611545	SATO	2014.10.05	1 year	☐
63	Barometer	7612	81134	SATO	2016.01.20	2 year	☐
64	Multi meter	DM-313	S60901832	LG Precision Co.,Ltd	2015.02.07	1 year	☐
65	Antenna Mast(OSA)	AT14	None	Daeil EMC	N/A	N/A	☐
66	Turn table(OSA)	None	None	Daeil EMC	N/A	N/A	☐
67	RF Amplifier(OSA)	8447D	2944A07881	AGILENT	2015.02.04	1 year	☐
68	Antenna Master(3)	AT13	None	AUDIX	N/A	N/A	☒
69	Turn Table(3)	None	None	AUDIX	N/A	N/A	☒
70	PREAMPLIFIER(3)	8449B	3008A02577	Agilent	2015.02.05	1 year	☒
71	Antenna Master(10)	MA4000-EP	None	inno systems GmbH	N/A	N/A	☒
72	Turn Table(10)	None	None	inno systems GmbH	N/A	N/A	☒
73	AMPLIFIER(10)	TK-PA6S	120009	TESTEK	2015.02.05	1 year	☐
74	Vernier Calipers	None	8280373	Mitutoyo	2014.10.05	1 year	☐

4. SUMMARY TEST RESULTS

Description of Test	Standard Applicable	Reference Clause	Used	Test Result
Radiated output power (Equivalent radiated power)	22.913(2), 24.232(c)	Clause 5.1	☒	Compliance
Out of band radiated emission	22.917(a), 24.238(a)	Clause 5.2	☒	Compliance
Receive spurious emission	15.109(a)	Clause 5.3	☒	Compliance
AC Conducted emission	15.207	Clause 5.4	☒	Compliance
AC Conducted emission	15.207	Clause 5.5	☒	Compliance
Compliance/pass : The EUT complies with the essential requirements in the standard. Not Compliance : The EUT does not comply with the essential requirements in the standard. N/A : The test was not applicable in the standard.				

※ Above standard applicable accordance with FCC CFR47, Subpart 22H, 24E standard

5. MEASUREMENT RESULTS

5.1 Radiated output power

5.1.1 Standard Applicable

[FCC §22.913 Effective radiated power limits]

The effective radiated power(ERP)of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(2) The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7Watts.

[FCC §24.232 Power and antenna height limits]

(c)Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

5.1.2 Test Environment conditions

- Ambient temperature : (22 - 23) °C
- Relative Humidity : (58 - 67) % R.H.

5.1.3 Measurement Procedure

[Test configuration and Method; ANSI/TIA/EIA603Clause2.2.17,KDB971168D01&KDB412172D01]

The average radiated power of a licensed device is the equivalent power required. When delivered to a half-wave dipole antenna, to produce at a distant point the same average received power as produced by the licensed device. The other method, procedure and configuration of measurement performed in accordance with above Standard and Guidance.

5.1.4 Measurement Result

■ GSM 850MHz

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
824.2	-4.12	H	33.6	29.48	38.5	-9.02	Compliance
836.6	-3.72	V	33.0	29.28	38.5	-9.22	Compliance
848.8	-4.57	V	33.7	29.13	38.5	-9.37	Compliance

■ GSM 1900MHz

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
1 850.2	-12.55	V	42.2	29.65	33	-3.35	Compliance
1 880.0	-12.98	H	42.0	29.02	33	-3.98	Compliance
1 909.8	-12.98	V	41.9	28.92	33	-4.08	Compliance

■ GPRS 850MHz

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
824.2	-4.13	H	33.6	29.47	38.5	-9.03	Compliance
836.6	-3.63	H	33.0	29.37	38.5	-9.13	Compliance
848.8	-4.57	V	33.7	29.13	38.5	-9.37	Compliance

■ GPRS 1900MHz

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
1 850.2	-12.57	H	42.2	29.63	33	-3.37	Compliance
1 880.0	-12.38	H	42.0	29.62	33	-3.38	Compliance
1 909.8	-13.31	H	41.9	28.59	33	-4.41	Compliance

■ WCDMA 850MHz(Band V)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
824.2	-10.50	V	33.6	23.10	38.5	-15.4	Compliance
836.6	-9.78	H	33.0	23.22	38.5	-15.28	Compliance
848.8	-10.72	V	33.7	22.98	38.5	-15.52	Compliance

■ WCDMA 1900MHz(Band II)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
1 850.2	-19.05	H	42.2	23.15	33	-9.85	Compliance
1 880.0	-19.00	H	42.0	23.00	33	-10.0	Compliance
1 909.8	-18.93	V	41.9	22.97	33	-10.03	Compliance

※ EIRP(or ERP)= $P_R + L_p$

where;

- EIRP=equivalent(or effective)isotropically radiated power (in same units as P_R)
- P_R =adjusted received power level, in dBm
- L_p =basic free space propagation path loss, in dB(basic free space is KOSTEC test site propagation path loss)

5.2 Out of band radiated

5.2.1 Standard Applicable [FCC §22.917 Emission limitation for cellular equipment]

The rules in this section govern the spectral characteristic of emissions in the Cellular Radiotelephone Service.

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43+10\log(P)$ dB

[FCC §24.238 Emission limitation for Broadband PCS equipment]

The rules in this section govern the spectral characteristic of emissions in the Broadband Personal Communications Service.

(a) *Out of band emissions*. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43+10\log(P)$ dB

5.2.3 Test Environment conditions

- Ambient temperature : (22 - 23) °C ,
- Relative Humidity : (58 - 67) % R.H.

5.2.4 Measurement Procedure

[Test configuration and Method; ANSI/TIA/EIA603 Clause 3.2.12, KDB971168D01 & KDB412172D01]

Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired. The other method, procedure and configuration of measurement performed in accordance with above Standard and Guidance.

5.2.5 Measurement Result

■ GSM/GPRS 850 MHz

Low frequency(824.2 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
1.648	-57.40	H	40.0	30.8	-48.2	-13	-35.2	Compliance
2.473	-60.10	V	40.9	31.0	-50.2	-13	-37.2	Compliance
3.297	-63.20	V	41.0	31.2	-53.4	-13	-40.4	Compliance
Above 3 297	Nil emission							

Middle frequency(836.6 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
1.673	-58.70	H	40.0	30.8	-49.5	-13	-36.5	Compliance
2.509	-60.70	H	40.9	31.0	-50.8	-13	-37.8	Compliance
3.346	-62.70	V	41.0	31.2	-52.9	-13	-39.9	Compliance
Above 3 346	Nil emission							

High frequency(848.8 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
1.698	-59.20	V	40.0	30.8	-50.0	-13	-37.0	Compliance
2.546	-60.50	V	40.9	31.0	-50.6	-13	-37.6	Compliance
3.395	-60.90	V	41.0	31.2	-51.1	-13	-38.1	Compliance
Above 3 395	Nil emission							

■ GSM/GPRS 1900MHz

Low frequency(1 850.2MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
3 700	-61.0	V	41.1	31.3	-51.2	-13	-38.2	Compliance
Above 3 700	Nil emission							

Middle frequency(1 880 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
3 760	-61.6	H	41.1	31.3	-51.8	-13	-38.8	Compliance
Above 3 760	Nil emission							

High frequency(1 909.8 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
3 819	-61.9	V	41.1	31.3	-52.1	-13	-39.1	Compliance
Above 3 819	Nil emission							

■ WCDMA 850 MHz

Low frequency(824.2MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
1.648	-58.20	H	40.0	30.8	-49.0	-13	-36.0	Compliance
2.473	-60.30	H	40.9	31.0	-50.4	-13	-37.4	Compliance
Above 2 473	Nil emission							

Middle frequency(836.6 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preamp (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
1.673	-57.60	V	40.0	30.8	-48.4	-13	-35.4	Compliance
2.509	-58.80	V	40.9	31.0	-48.9	-13	-35.9	Compliance
Above 2 509	Nil emission							

High frequency(848.8 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preampl (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
1.698	-57.80	V	40.0	30.8	-48.6	-13	-35.6	Compliance
2.546	-59.10	V	40.9	31.0	-49.2	-13	-36.2	Compliance
Above 2 546	Nil emission							

■ WCDMA 1900MHz

Low frequency(1 850.2MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preampl (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
Nil emission								

Middle frequency(1 880 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preampl (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
Nil emission								

High frequency(1 909.8 MHz)

Freq.(MHz)	SA reading (dBm)	Ant. Pol. (H/V)	Path Loss (dBm)	Preampl (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Result
Nil emission								

5.3 Receiver spurious emission

5.3.1 Standard Applicable [FCC §15.109(a)]

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

§15.109. [Table 1] limits for radiated emissions measurements (distance at 3m)

Frequency Band [MHz]	Distance(m)	Limit [$\mu V/m$]	Limit [dB $\mu V/m$]	Detector
30 - 88	3	100 **	40.00	Quasi peak
88 - 216	3	150 **	43.52	Quasi peak
216 - 960	3	200 **	46.02	Quasi peak
Above 960	3	500	54.00	Average

5.3.2 Test Environment conditions

- Ambient temperature : (22 - 23) °C • Relative Humidity : (58 - 67) % R.H.

5.3.3 Measurement Procedure

The measurements procedure of the transmitter radiated E-field is as following describe method.
The test is performed in a Shield chamber to determine the accurate frequencies, after maximum emissions level will be checked on a test chamber and measuring distance is 3 m from EUT to test antenna.
(The chamber is ensured that comply with at least 6 dB above the ambient noise level)

- ① The EUT was powered ON with continuously operating mode and placed on a 0.8 meter high non-conductive table on the reference ground plane.
- ② The test antenna was used on Horn antenna for above 1 GHz, and if the below 1 GHz, broad-band antenna and it's antenna positioned in both the horizontal and vertical plane was location at EUT during the test for maximized the emission measurement.
- ③ The output of the test antenna will be connected to a measuring receiver, and it is set to tuned over the frequency range according to required standard
- ④ The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure(according ANSI C63.10:2009 clause 4.2.3.2.3 procedure for average measure). Both PK and AV level test, PK detector is used.
- ⑤ The fundamental frequency at which a relevant radiated signal component is detected, the test antenna will be raised and lowered through the specified range of heights in horizontal and vertical polarized orientation, until an maximum signal level is detected on the measuring receiver.
- ⑥ The transmitter is position x,y,z axis on rotating through 360 degrees, until the maximum signal level is detected by the measuring receiver.
- ⑦ The receiver is scanned from requested measuring frequency band and then the maximum meter reading is recorded. The radiated emissions were measured with required standard.

- The measurement results are obtained as described below:

$$\text{Result(dB } \mu V/m) = \text{Reading(dB } \mu V) + \text{Antenna factor(dB/m)} + \text{CL(dB)} + \text{other applicable factor (dB)}$$

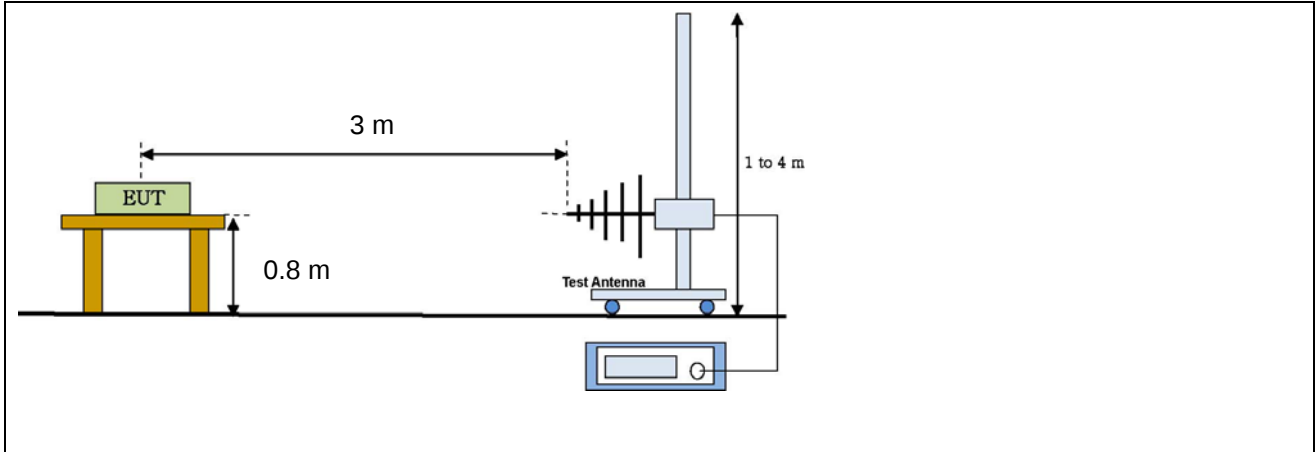
- According to §15.33 (a)(1), Frequency range of radiated measurement is performed the tenth harmonic.

5.3.4 Measurement Uncertainty

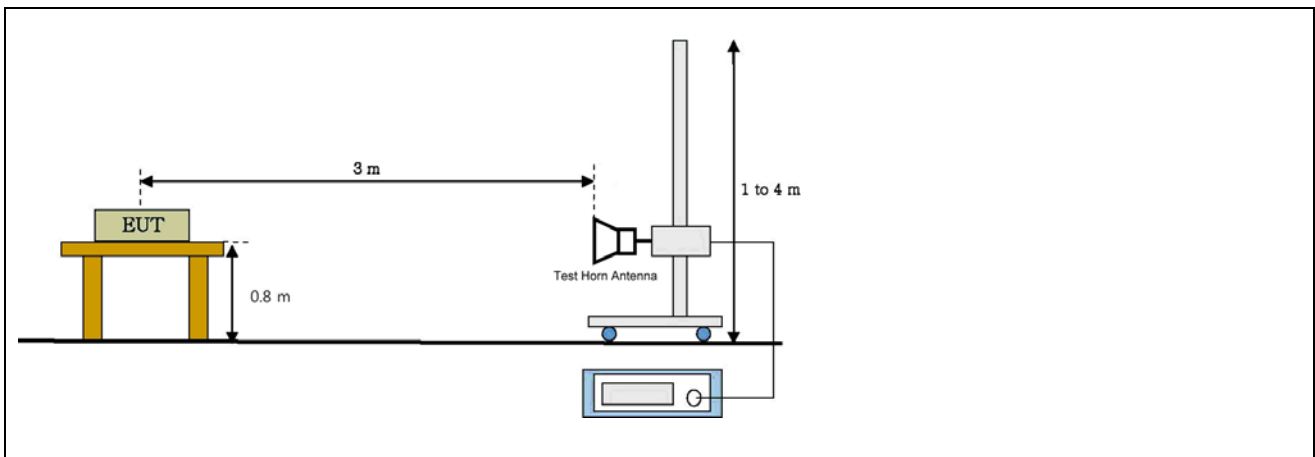
All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are test receiver, Cable loss, Antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, Antenna frequency interpolation, measurement distance variation, Site imperfection, mismatch, and system repeatability based on NIS 80,81, The measurement uncertainty level with a 95 % confidence level were apply to Uncertainty of a radiation emissions measurement at Chamber of KOSTEC is ± 6.0 dB

5.3.5 Test Configuration

Radiated emission setup, Above 30 MHz, Below 1 GHz



Radiated emission setup, Above 1 GHz



5.3.6 Measurement Result

■ GSM/GPRS 850 MHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
Nil emission or 20 dB location under limit											

■ GSM/GPRS 1 900 MHz

Freq. (MHz)	Reading (dBμV/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dBμV/m)	Limit (dBμV/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
Nil emission or 20 dB location under limit											

■ WCDMA 850 MHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
Nil emission or 20 dB location under limit											

■ WCDMA 1 900 MHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
Nil emission or 20 dB location under limit											

Freq.(MHz) : Measurement frequency, Reading(dB μ V/m) : Indicated value for test receiver,
 Table (Deg) : Directional degree of Turn table,
 Antenna (Height, Pol, Fctr) : Antenna Height, Polarization and Factor
 Cbl(dB) : Cable loss, Pre AMP(dB) : Preamplifier gain(dB)
 Meas Result (dB μ V/m) : Reading(dB μ V/m)+ Antenna factor.(dB/m) + CL(dB) - Pre AMP(dB)
 Limit(dB μ V/m): Limit value specified with FCC Rule, Mgn(dB) : FCC Limit (dB μ V/m) – Meas Result(dB μ V/m)

5.4 AC Power Conducted emissions

5.4.1 Standard Applicable [FCC §15.207(a)]

For intentional radiator that is designed to be connected to the public utility(AC)power line, the radio frequency. Voltage that is conducted back onto the AC power line on any frequencies hopping mode within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line Impedance stabilization network(LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

§15.207 limits for AC line conducted emissions;

Frequency of Emission(MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

5.4.2 Test Environment conditions

- Ambient temperature : (22 - 23) °C
- Relative Humidity : (58 - 67) % R.H.

5.4.3 Measurement Procedure

The measurements were performed in a shielded room. EUT was placed on a non-metallic table Height of 0.4 m above the reference ground plane. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plan. Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to Input power source. Both lines of power cord, live and neutral, were measured.

Measurement uncertainty

Conducted Emission measurement: 3.5 dB (CL: Approx 95%, $k=2$)

5.4.4 Measurement Result

5.4.5 Test plotst

Line. Live

Kostec Co., Ltd.

01 Aug 2014 15:24

Conducted Emission

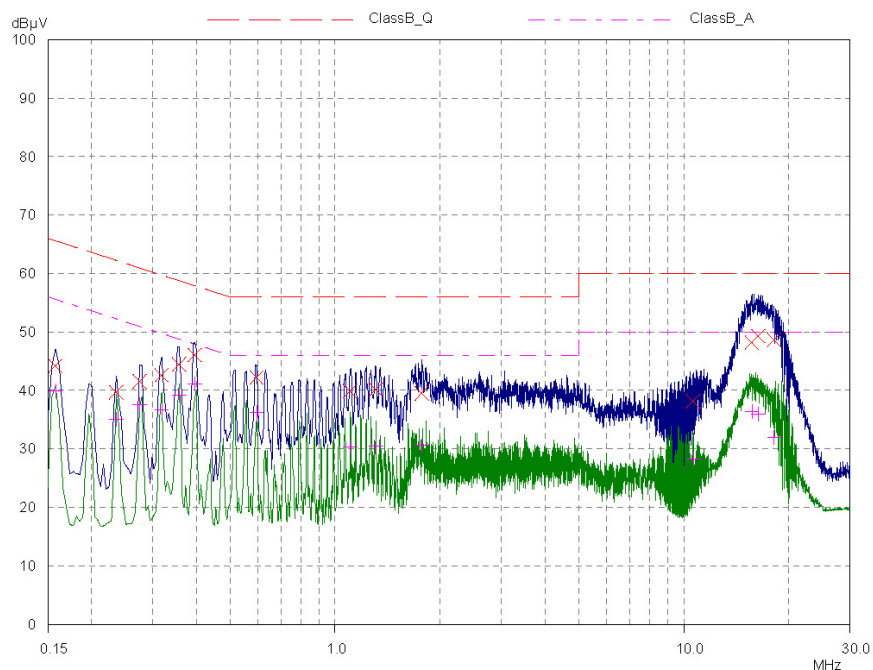
EUT: Handheld Mobile Computer
 Manuf: Bluebird Inc.
 Op Cond: a.c. 120 V, 60 Hz
 Operator:
 Test Spec: FCC
 Comment: Live
 PCB
 Result File: 0114_I2.dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings						
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge	
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB	

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 50 dB



PAGE 1

Line. Live

Kostec Co., Ltd.

01 Aug 2014 15:24

Conducted Emission

EUT: Handheld Mobile Computer
Manuf: Bluebird Inc.
Op Cond: a.c. 120 V, 60 Hz
Operator:
Test Spec: FCC
Comment: Live
PCB
Result File: 0114_I2.dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 50 dB

Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB
0.15781	44.15	65.58	21.43
0.23593	39.65	62.24	22.59
0.275	41.54	60.97	19.43
0.31796	42.64	59.76	17.12
0.35703	44.47	58.80	14.33
0.39609	46.04	57.93	11.89
0.59531	42.22	56.00	13.78
1.10312	39.89	56.00	16.11
1.31015	40.15	56.00	15.85
1.775	39.51	56.00	16.49
10.63828	38.17	60.00	21.83
15.68515	48.16	60.00	11.84
16.34921	49.32	60.00	10.68
18.15781	48.64	60.00	11.36

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.15781	39.93	55.58	15.65
0.23593	35.05	52.24	17.19
0.275	37.55	50.97	13.42
0.31796	36.61	49.76	13.15
0.35703	39.13	48.80	9.67
0.39609	41.11	47.93	6.82
0.59531	36.23	46.00	9.77
1.10312	30.31	46.00	15.69
1.31015	30.52	46.00	15.48
1.775	30.58	46.00	15.42
10.63828	28.34	50.00	21.66
15.68515	36.35	50.00	13.65
16.34921	35.90	50.00	14.10
18.15781	31.93	50.00	18.07

* limit exceeded

PAGE 2

Line. Neutral

Kostec Co., Ltd.

01 Aug 2014 15:38

Conducted Emission

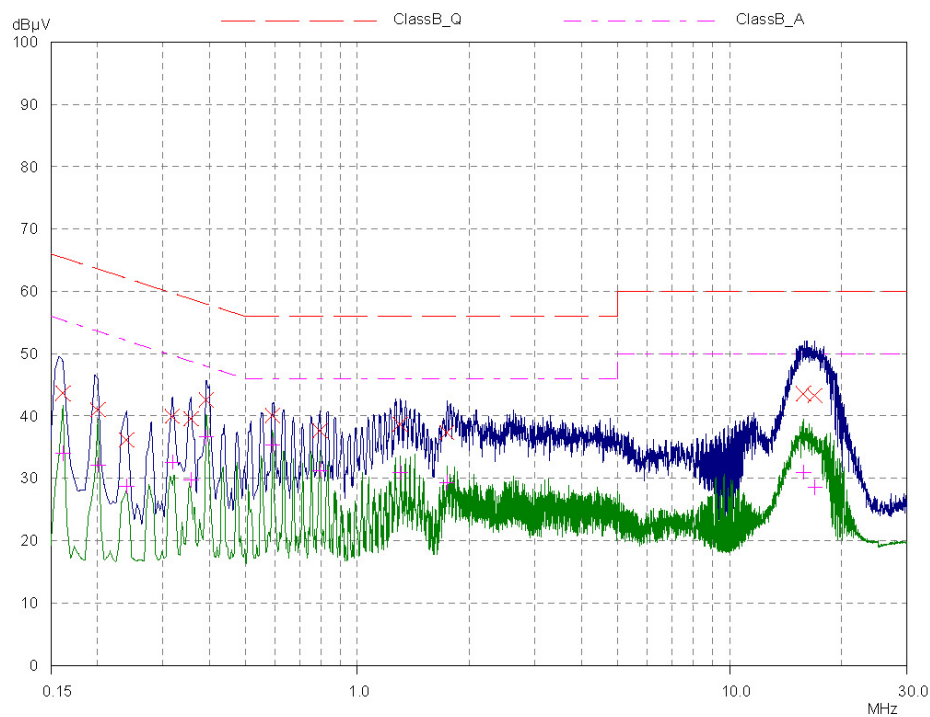
EUT: Handheld Mobile Computer
 Manuf: Bluebird Inc.
 Op Cond: a.c. 120 V, 60 Hz
 Operator:
 Test Spec: FCC
 Comment: Neutral
 PCB
 Result File: 0114_n2.dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
 Meas Time: 1sec
 Subranges: 25
 Acc Margin: 50 dB



Line. Neutral

Kostec Co., Ltd.

01 Aug 2014 15:38

Conducted Emission

EUT: Handheld Mobile Computer
Manuf: Bluebird Inc.
Op Cond: a.c. 120 V, 60 Hz
Operator:
Test Spec: FCC
Comment: Neutral
PCB
Result File: 0114_n2.dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 50 dB

Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB
0.16171	43.65	65.38	21.73
0.20078	41.02	63.58	22.56
0.23984	36.17	62.10	25.93
0.31796	39.98	59.76	19.78
0.35703	39.55	58.80	19.25
0.39218	42.61	58.02	15.41
0.5914	40.10	56.00	15.90
0.79453	37.66	56.00	18.34
1.30234	38.69	56.00	17.31
1.73984	37.33	56.00	18.67
15.78281	43.57	60.00	16.43
16.95859	43.26	60.00	16.74

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
0.16171	34.03	55.38	21.35
0.20078	32.17	53.58	21.41
0.23984	28.67	52.10	23.43
0.31796	32.61	49.76	17.15
0.35703	29.74	48.80	19.06
0.39218	36.62	48.02	11.40
0.5914	35.32	46.00	10.68
0.79453	31.29	46.00	14.71
1.30234	30.93	46.00	15.07
1.73984	29.28	46.00	16.72
15.78281	30.98	50.00	19.02
16.95859	28.57	50.00	21.43

* limit exceeded

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