



EMC TEST REPORT

Test Report No. : KES-EM-21T0982
Date of Issue : Oct. 07, 2021
Product name : InBirdie IMU
Model/Type No. : InBirdie IMU
Variant Mode : -
Applicant : DMBH Co., Ltd.
Applicant Address : #401-603, Bucheon Techno-park, 655, Pyeongcheon-ro,
Wonmi-gu, Bucheon-si, Gyeonggi-do, Korea
Manufacturer : DMBH Co., Ltd.
Manufacturer Address : #401-603, Bucheon Techno-park, 655, Pyeongcheon-ro,
Wonmi-gu, Bucheon-si, Gyeonggi-do, Korea
FCC ID : 2A3CBINBIRDIEIMU
Date of Receipt : Sep. 09, 2021
Test date : Sep. 14, 2021 ~ Sep. 15, 2021
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dae Hyun, Kim
EMC Test Engineer

Reviewed by

Dong Hun, Jang
EMC Technical Manager

**KES Co., Ltd.**

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REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Oct. 07, 2021	KES-EM-21T0982	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Item	Details
Operating Frequency	Bluetooth 2.4 GHz
Power	Charge : DC 5 V (DC Adapter) Operating : DC 3.3 V (Battery)
Size	(30 x 30 x 40) mm
Weight	10 g
Port	USB C Type
Components	Main EUT 1 EA



1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

- ☒ AC 120 V , 60 Hz (DC Adapter Input power)
- ☒ DC 3.3 V (Battery operating power)

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
InBirdie IMU	InBirdie IMU	-	DMBH Co., Ltd.	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Adapter	A1401	-	Flextronics Power Systems (Dongguan) Co., Ltd	-
SmartPhone	MT9J2KH/A	-	Apple	-



1.6 External I/O Cabling

■ Charge Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
InBirdie IMU (EUT)	USB C Type	Adapter	USB	1.5	U

* Unshielded = U, Shielded = S

■ Operating Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
InBirdie IMU (EUT)	Wireless	SmartPhone	Wireless	-	-

* Unshielded = U, Shielded = S

1.7 EUT Operating Mode(s)

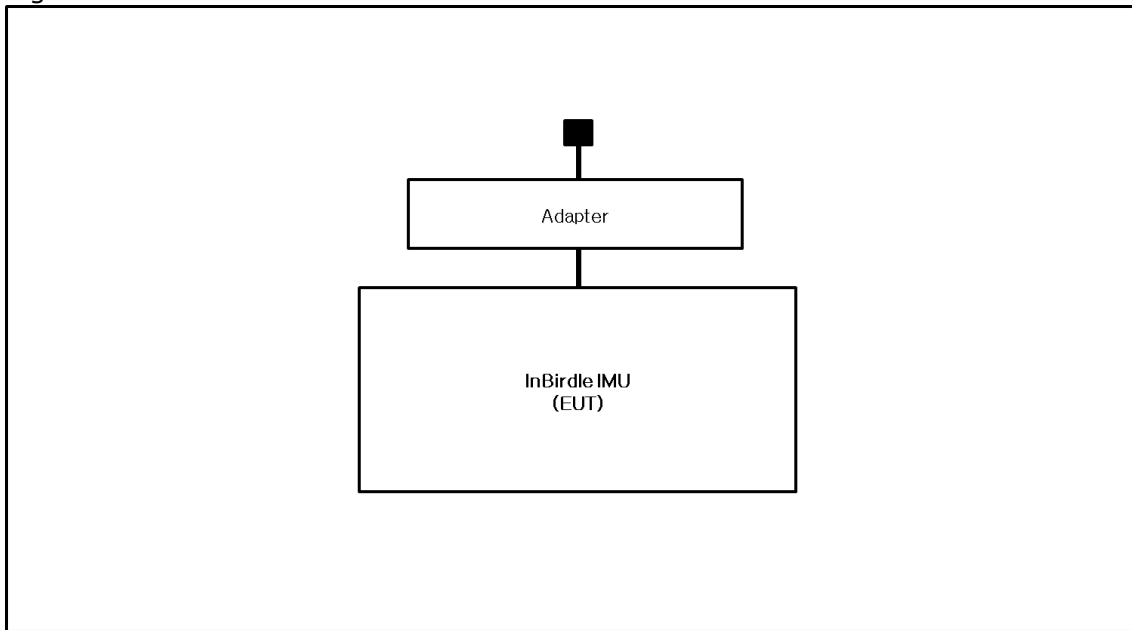
Test mode	operating
Charge	Connect EUT and Adapter. It was checked whether the EUT is normally charged.
Operating	Normal Operation was confirmed with the application of SmartPhone

EUT Test operating S/W		
Name	Version	Manufacture Company
BLE Scanner	3.0	Bluepixel Technologies

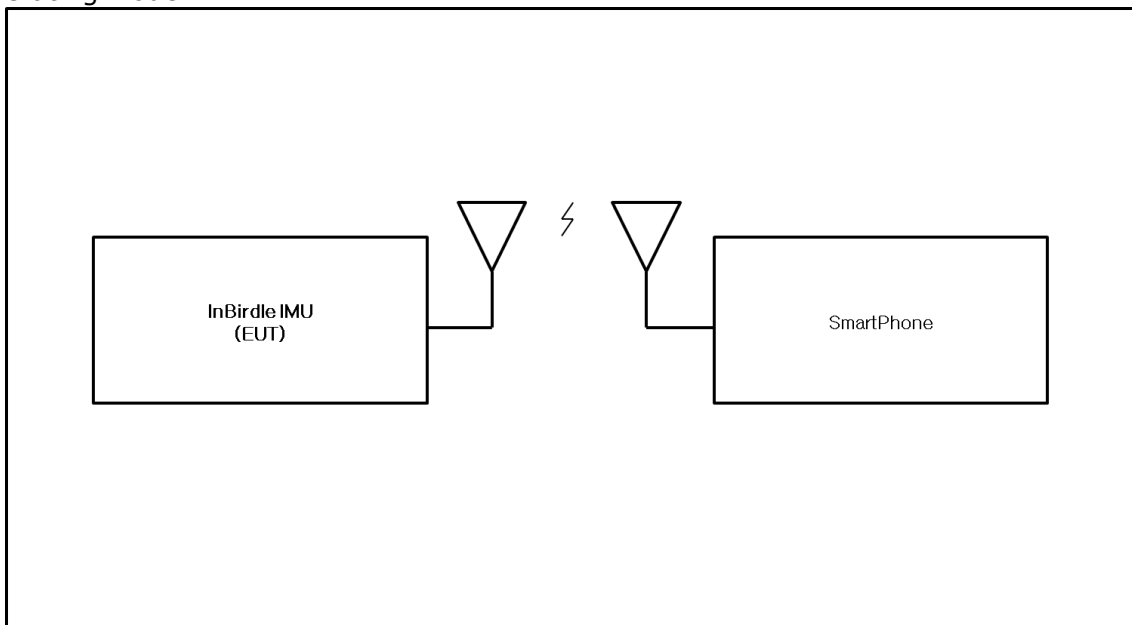
1.8 Configuration

- AC Main
- DC Main

■ Charge Mode



■ Operating Mode



1.9 Remarks when standards applied

N/A

1.10 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

1.11 Test Facility

The measurement facility is located at 473-21 Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4:2014 and CISPR 16-1-4:2019

1.12 Measurement Procedure

- Conducted Emissions







The conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emission exceed the average limit with the instrument set to the quasi-peak mode, the measurements are made in the average mode. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded. Quasi-peak readings are distinguished with a "QP".

- Radiated Electric Field Emissions

The test was done at a SEMI ANECHOIC CHAMBER with quasi-peak detector. The final test data was measured using a Quasi-Peak detector below 1 GHz at 10 m or 3 m distance and a Peak and Average detector above 1 GHz at 3 m distance. Test was proceeded worst case test mode and cable configuration. Measurements were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna height was varied from 1 m to 4 m and the EUT was rotated 360° to find the maximum emitting point for each frequency.

Measurement procedures was In accordance with ANSI C63.4-2014 7.3.3, 7.3.4, 8.3.1.1, 8.3.1.2, 8.3.2.1, 8.3.2.2

1.13 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Aechoic Chamber ,10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Aechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Aechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Aechoic Chamber and Conducted test site	 23298-1
JAPAN	VCCI	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	 R-20056, C-20036 T-20040, G-20057
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Aechoic Chamber , 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☐ **EMC – Directive 2014/30/EU**

☐ EN 61000-6-3:2011

☐ EN 61000-6-1:2007

☐ EN 61000-6-4:2007 +A1:2011

☐ EN 61000-6-2:2005

☐ EN 55011:2007 +A1:2010

☐ Group 1
☐ Class A

☐ Group 2
☐ Class B

☐ EN 55014-1:2006 +A2:2011

☐ EN 55014-2:1997 +A2:2008

☐ EN 55015:2013

☐ EN 55032:2015

☐ Class A

☐ Class B

☐ EN 55024:2010

☐ EN 50130-4:2011 +A1:2014

☐ EN 61000-3-2:2014

☐ EN 61000-3-3:2013

☐ EN 61326-1:2013



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☐ **VCCI V-3 / 2015.04**

☐ Class A

☐ Class B

☐ **AS/NZS:2013**

☐ Class A

☐ Class B

☒ **47 CFR Part 15, Subpart B**

☐ CISPR 22:2009 +A1:2010

☐ Class A

☐ Class B

☒ ANSI C63.4-2014

☐ Class A

☒ Class B

☐ **IC Regulation ICES-003 : 2016**

☐ CAN/CSA CISPR 22-10

☐ Class A

☐ Class B

☐ ANSI C63.4-2014

☐ Class A

☐ Class B

☐ **RE- Directive 2014/53/EU**

☐ EN 301 489-1 V1.9.2

- ☐ Equipment for fixed use
- ☐ Equipment for vehicular use
- ☐ Equipment for portable use

☐ EN 301 489-3 V1.6.1

☐ EN 301 489-17 V2.2.1

☐ EN 60945:2002

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2.1 Conducted Emissions at Mains Power Ports

Test Date

Sep. 14, 2021

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022	1 Year
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	12, 29, 2021	1 Year
<input type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 29, 2021	1 Year
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021	1 Year

Test Conditions

Temperature: (24,2 ± 0,1) °C
Relative Humidity: (50,6 ± 0,2) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.



2.2 Radiated Electric Field Emissions(Below 1 GHz)

Test Date

Sep. 14, 2021

Test Location

☐ OPEN AREA TEST SITE #2

☒ SEMI ANECHOIC CHAMBER #4

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESU26	R & S	100551	04, 01, 2022	1 Year
<input checked="" type="checkbox"/>	AMPLIFIER	SCU 01	R & S	100603	11, 25, 2021	1 Year
<input checked="" type="checkbox"/>	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022	2 Year
<input checked="" type="checkbox"/>	ATTENUATOR	8491A	HP	32173	03, 10, 2022	1 Year

Test Conditions

Temperature: (24,6 ± 0,1) °C

Relative Humidity: (50,1 ± 0,2) % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.



2.3 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Sep. 15, 2021

Test Location

SEMI ANECHOIC CHAMBER #5

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.120	-	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESU26	Rohde & Schwarz	100552	04, 01, 2022	1 Year
<input checked="" type="checkbox"/>	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	12, 14, 2021	1 Year
<input checked="" type="checkbox"/>	PREAMPLIFIER	8449B	HP	3008A00538	06, 21, 2022	1 Year

Test Conditions

Temperature: (24,6 ± 0,1) °C

Relative Humidity: (51,3 ± 0,2) % R.H.

Frequency Range of Measurement

1 GHz to 12,4 GHz

Instrument Settings

IF Band Width: 1 MHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

APPENDIX A – TEST DATA

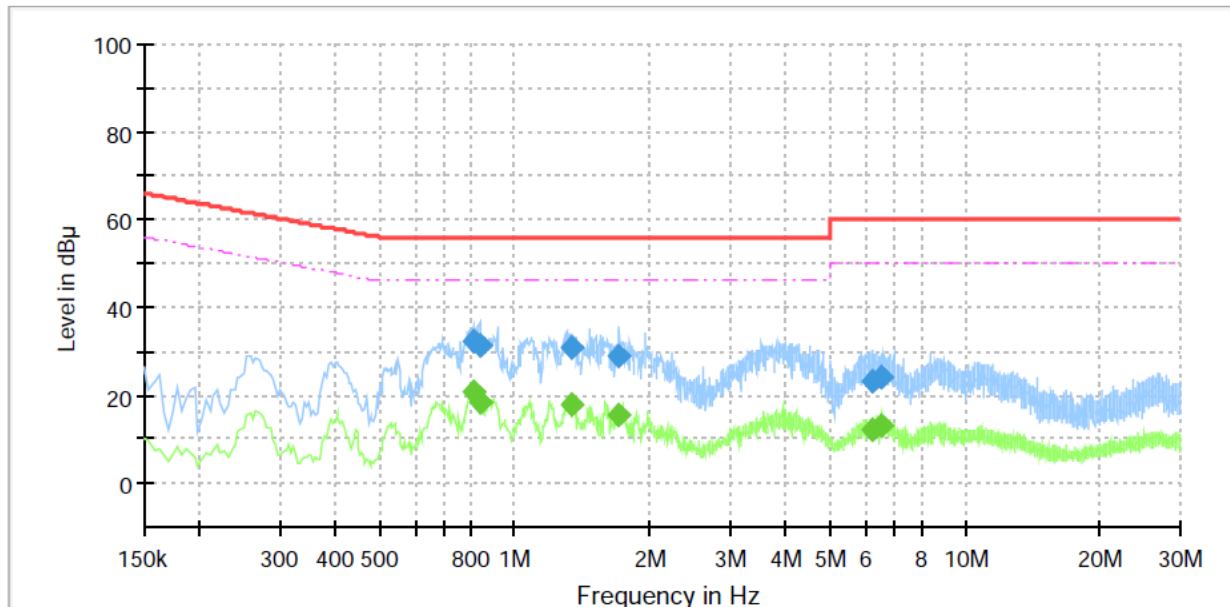
Conducted Emissions at Mains Power Ports

■ Charge Mode

HOT LINE

Common Information

Test Description: Conducted Emission
 Model No.: InBridie IMU
 Phase:
 Mode: Charge
 Operator Name: KES



Final Result

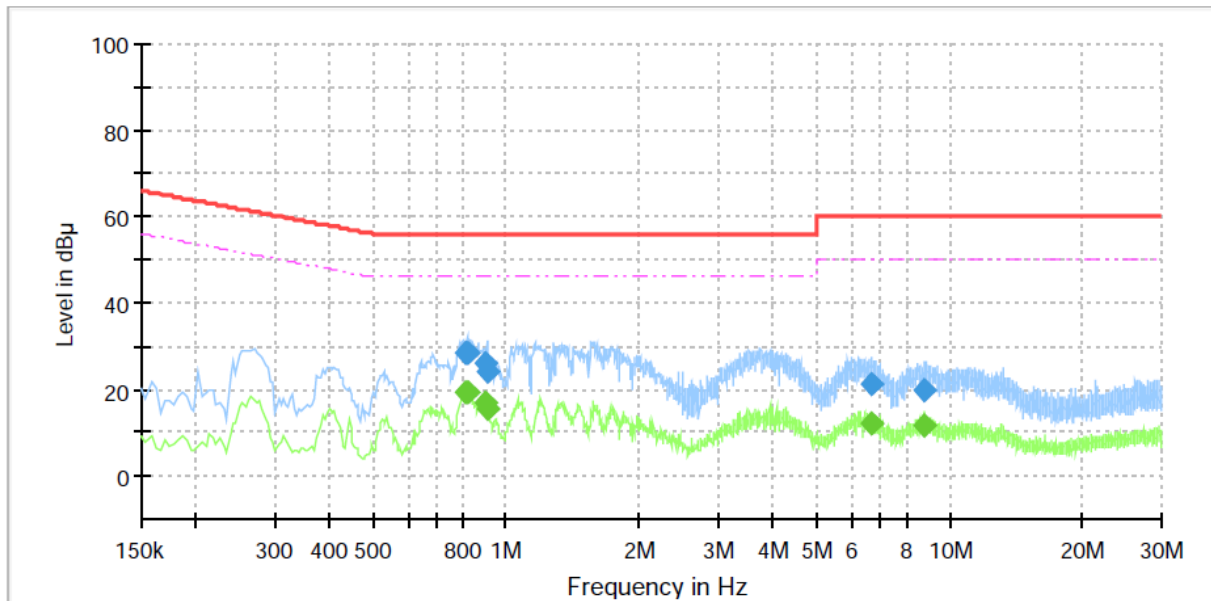
Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.810000	---	20.91	46.00	25.09	1000.0	9.000	L1	20.4
0.810000	32.45	---	56.00	23.55	1000.0	9.000	L1	20.4
0.834000	---	18.40	46.00	27.60	1000.0	9.000	L1	20.4
0.834000	31.14	---	56.00	24.86	1000.0	9.000	L1	20.4
1.330000	---	17.79	46.00	28.21	1000.0	9.000	L1	20.5
1.330000	30.71	---	56.00	25.29	1000.0	9.000	L1	20.5
1.706000	---	15.25	46.00	30.75	1000.0	9.000	L1	20.6
1.706000	28.96	---	56.00	27.04	1000.0	9.000	L1	20.6
6.198000	---	12.12	50.00	37.88	1000.0	9.000	L1	20.0
6.198000	23.09	---	60.00	36.91	1000.0	9.000	L1	20.0
6.482000	---	12.88	50.00	37.12	1000.0	9.000	L1	20.0
6.482000	24.15	---	60.00	35.85	1000.0	9.000	L1	20.0

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NEUTRAL LINE

Common Information

Test Description: Conducted Emission
 Model No.: InBridie IMU
 Phase:
 Mode: Charge
 Operator Name: KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.806000	---	19.42	46.00	26.58	1000.0	9.000	N	20.3
0.806000	28.33	---	56.00	27.67	1000.0	9.000	N	20.3
0.818000	---	19.11	46.00	26.89	1000.0	9.000	N	20.3
0.818000	28.27	---	56.00	27.73	1000.0	9.000	N	20.3
0.894000	---	16.78	46.00	29.22	1000.0	9.000	N	20.4
0.894000	25.97	---	56.00	30.03	1000.0	9.000	N	20.4
0.906000	---	15.40	46.00	30.60	1000.0	9.000	N	20.4
0.906000	24.14	---	56.00	31.86	1000.0	9.000	N	20.4
6.638000	---	11.94	50.00	38.06	1000.0	9.000	N	20.0
6.638000	20.99	---	60.00	39.01	1000.0	9.000	N	20.0
8.786000	---	11.38	50.00	38.62	1000.0	9.000	N	20.3
8.786000	19.92	---	60.00	40.08	1000.0	9.000	N	20.3

◆ Calculation

QuasiPeak [dBμV] / CAverage [dBμV] = Reading Value [dBμV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

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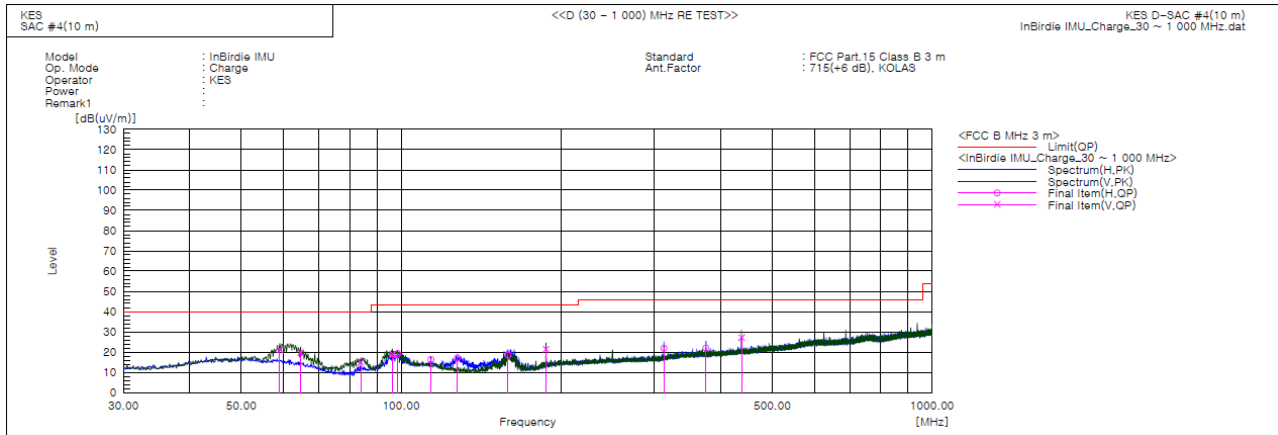
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Radiated Electric Field Emissions(Below 1 GHz)

■ Charge Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	59.100	V	43.5	-22.4	21.1	40.0	18.9	133.0	89.0	
2	64.678	V	43.5	-23.7	19.8	40.0	20.2	100.0	55.0	
3	83.956	V	42.1	-27.2	14.9	40.0	25.1	125.0	316.0	
4	96.203	V	42.8	-23.8	19.0	43.5	24.5	100.0	179.0	
5	98.506	H	42.6	-23.3	19.3	43.5	24.2	392.0	161.0	
6	113.784	H	39.7	-23.3	16.4	43.5	27.1	400.0	159.0	
7	127.606	H	42.9	-25.7	17.2	43.5	26.3	386.0	333.0	
8	159.010	H	43.9	-25.3	18.6	43.5	24.9	400.0	74.0	
9	187.504	V	44.6	-23.2	21.4	43.5	22.1	119.0	119.0	
10	312.513	H	40.2	-18.3	21.9	46.0	24.1	400.0	70.0	
11	374.956	H	38.1	-16.0	22.1	46.0	23.9	381.0	164.0	
12	437.521	V	41.9	-14.7	27.2	46.0	18.8	107.0	304.0	

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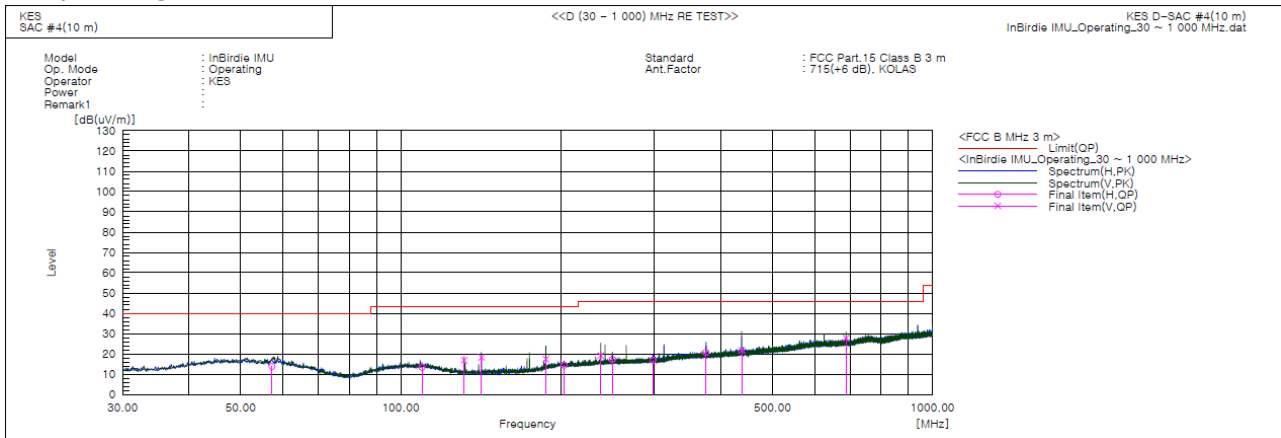
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Operating Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	57.281	H	36.0	-22.2	13.8	40.0	26.2	295.0	99.0	
2	109.661	H	36.3	-23.0	13.3	43.5	30.2	400.0	92.0	
3	131.608	V	42.8	-25.9	16.9	43.5	26.6	119.0	40.0	
4	141.793	V	44.3	-26.0	18.3	43.5	25.2	105.0	14.0	
5	187.504	V	40.7	-23.2	17.5	43.5	26.0	142.0	300.0	
6	202.781	H	35.9	-21.5	14.4	43.5	29.1	344.0	216.0	
7	237.823	V	39.6	-20.4	19.2	46.0	26.8	100.0	250.0	
8	249.948	H	37.5	-20.1	17.4	46.0	28.6	386.0	17.0	
9	298.084	H	35.9	-19.0	16.9	46.0	29.1	198.0	269.0	
10	374.956	H	36.8	-16.0	20.8	46.0	25.2	400.0	108.0	
11	437.521	V	36.5	-14.7	21.8	46.0	24.2	114.0	174.0	
12	687.539	V	36.9	-9.1	27.8	46.0	18.2	106.0	78.0	

◆ Calculation – SAC #4(10 m)

Result(QP) [dB(μV/m)] = (Reading(QP)[dB(μV)] + c.f[dB(1/m)])

Margin(QP)[dB] = Limit[dB(μV/m)] - Result(QP) [dB(μV/m)]

Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value



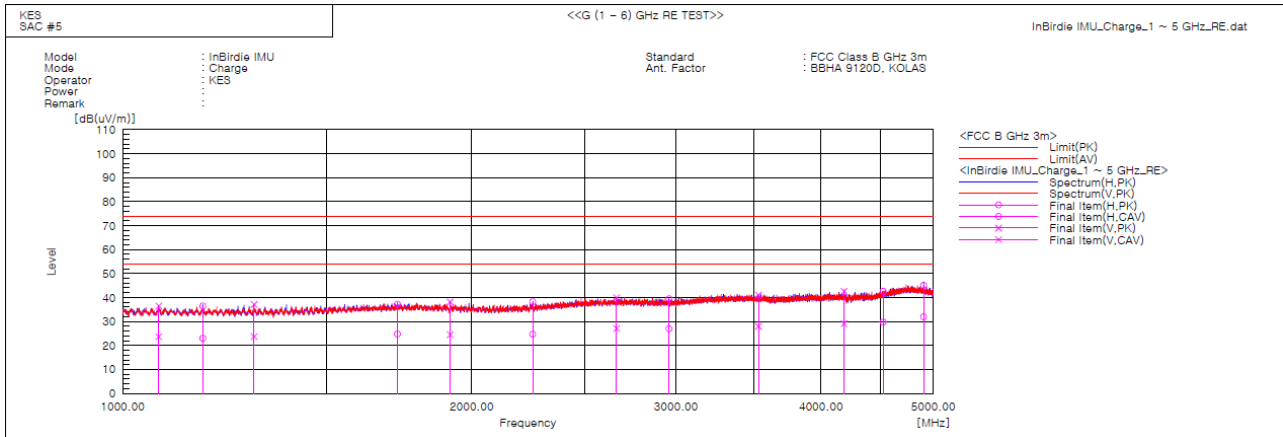
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Radiated Electric Field Emissions(Above 1 GHz)

■ Charge Mode



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1074.212	V	44.1	31.2	-7.5	36.6	23.7	74.0	54.0	37.4	30.3	144.0	311.2	
2	1172.624	H	43.5	30.0	-7.0	36.5	23.0	74.0	54.0	37.5	31.0	341.0	204.9	
3	1298.162	V	43.5	30.1	-6.4	37.1	23.7	74.0	54.0	36.9	30.3	131.0	357.9	
4	1725.175	H	41.7	29.2	-4.4	37.3	24.8	74.0	54.0	36.7	29.2	202.0	180.3	
5	1915.854	V	41.9	28.2	-3.7	38.2	24.5	74.0	54.0	35.8	29.5	100.0	16.4	
6	2256.875	H	40.9	27.3	-2.6	38.3	24.7	74.0	54.0	35.7	29.3	154.0	218.4	
7	2665.906	V	40.9	28.0	-0.9	40.0	27.1	74.0	54.0	34.0	26.9	110.0	197.2	
8	2958.758	H	39.4	26.9	0.1	39.5	27.0	74.0	54.0	34.5	27.0	221.0	93.0	
9	3533.375	V	40.1	27.1	0.9	41.0	28.0	74.0	54.0	33.0	26.0	277.0	160.9	
10	4188.650	V	39.8	26.4	2.8	42.6	29.2	74.0	54.0	31.4	24.8	134.0	103.9	
11	4526.323	H	38.3	25.5	4.3	42.6	29.8	74.0	54.0	31.4	24.2	366.0	38.4	
12	4905.099	H	39.3	26.2	5.8	45.1	32.0	74.0	54.0	28.9	22.0	400.0	141.4	

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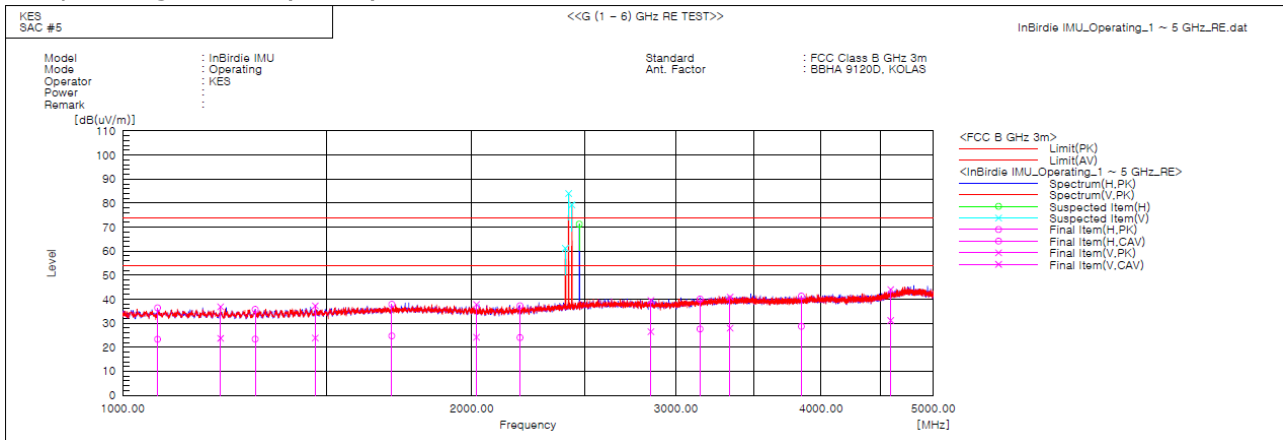
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
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Operating Mode - (1 ~ 5) GHz



Final Result

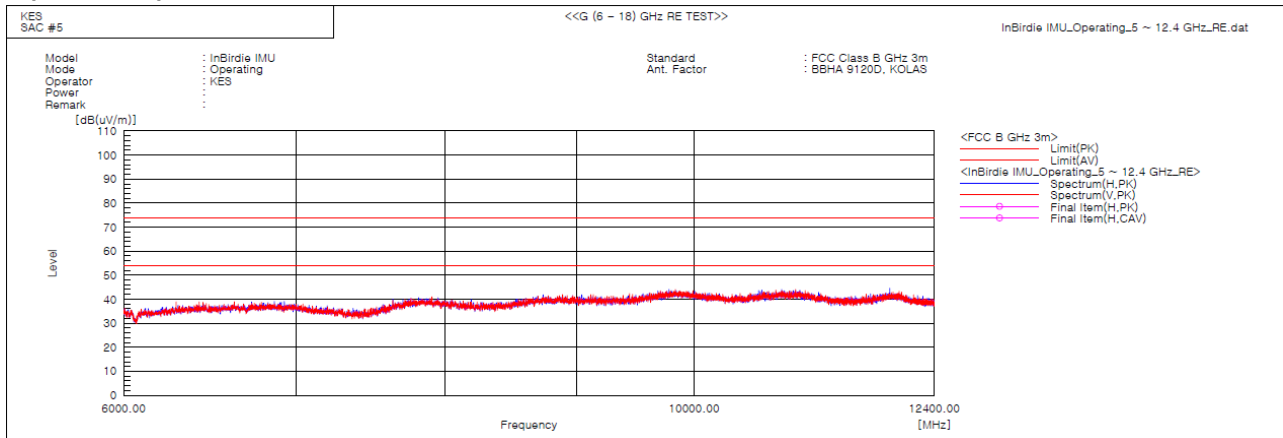
No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Result CAV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin CAV [dB]	Height [cm]	Angle [deg]	Remark
1	1071.517	H	43.9	30.8	-7.5	36.4	23.3	74.0	54.0	37.6	30.7	345.0	237.1	
2	1214.558	V	43.7	30.5	-6.8	36.9	23.7	74.0	54.0	37.1	30.3	119.0	3.6	
3	1300.944	H	42.2	29.8	-6.4	35.8	23.4	74.0	54.0	38.2	30.6	381.0	358.5	
4	1465.733	V	42.8	29.4	-5.5	37.3	23.9	74.0	54.0	36.7	30.1	102.0	60.1	
5	1706.099	H	42.3	29.1	-4.4	37.9	24.7	74.0	54.0	36.1	29.3	400.0	233.3	
6	2018.208	V	41.2	27.6	-3.4	37.8	24.2	74.0	54.0	36.2	29.8	108.0	165.3	
7	2200.498	H	40.1	26.8	-2.8	37.3	24.0	74.0	54.0	36.7	30.0	400.0	207.2	
8	2853.863	V	39.6	26.6	-0.1	39.5	26.5	74.0	54.0	34.5	27.5	144.0	34.1	
9	3146.525	H	39.5	27.0	0.6	40.1	27.6	74.0	54.0	33.9	26.4	375.0	98.5	
10	3339.591	V	40.2	27.3	0.7	40.9	28.0	74.0	54.0	33.1	26.0	120.0	7.0	
11	3847.214	H	39.7	27.1	1.6	41.3	28.7	74.0	54.0	32.7	25.3	399.0	302.5	
12	4593.942	V	39.5	26.7	4.5	44.0	31.2	74.0	54.0	30.0	22.8	139.0	354.6	
13	2408.000	V	-----	-----	-2.0	-----	-----	74.0	54.0	-----	-----	150.2	198.0	
14	2424.000	V	-----	-----	-2.0	-----	-----	74.0	54.0	-----	-----	150.2	146.0	
15	2439.500	V	-----	-----	-1.9	-----	-----	74.0	54.0	-----	-----	99.8	5.8	
16	2476.000	H	-----	-----	-1.8	-----	-----	74.0	54.0	-----	-----	200.2	55.9	

- Fundamental Frequency: 2.4 GHz

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- (6 ~ 12.4) GHz



* No spurious emission were detected above 5 GHz.

◆ Calculation

Result(PK/CAV) [dB(μV/m)] = (Reading(PK/CAV)[dB(μV)] + c.f[dB(1/m)])

Margin(PK/CAV)[dB] = Limit[dB(μV/m)] - Result(PK/CAV) [dB(μV/m)]

Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Marjin value