



EMC TEST REPORT

Test Report No. : KES-E1-19T0746
Date of Issue : Nov. 13, 2019
Product name : ALT
Model/Type No. : BAGEL-003
Variant Mode : -
Applicant : BagelLabs co.,Ltd.
Applicant Address : Suite 411, Startup Campus Bldg. 3, 289 St. Pangyo-ro,
Bundang-Gu, Seongnam-Si, Gyeonggi-do, Korea
Manufacturer : BagelLabs co.,Ltd.
Manufacturer Address : Suite 411, Startup Campus Bldg. 3, 289 St. Pangyo-ro,
Bundang-Gu, Seongnam-Si, Gyeonggi-do, Korea
FCC ID : 2AJ8I-BAGEL003
Date of Receipt : Oct. 07, 2019
Test date : Nov. 06, 2019 ~ Nov. 07, 2019
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dong Hyun, Won
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
Nov. 13, 2019	KES-E1-19T0746	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Item	Details
Operating Frequency	2.4 GHz (Bluetooth)
Power	Charge : DC 5 V (USB) Operation : Battery 3.7 V, 1.48Wh
Weight	223 g

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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.

Voltage AC 120 V / 60 Hz (Operation mode)
DC 3.7 V (Battery mode)

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
ALT	BAGEL-003	-	BagelLabsco.,Ltd.	EUT
Smart Phone	SM-J500N0	R39K3049AZ	Samsung Electronics Co.,Ltd.	-
Adaptor	Fy1201000	-	-	-

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
-	-	-	-	-



1.6 External I/O Cabling

■ Operation Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
ALT (EUT)	Wireless	Smart Phone	Wireless	-	-

■ Charge Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
ALT (EUT)	Micro 5 Pin	Adaptor	USB	0.5	U

1.7 EUT Operating Mode(s)

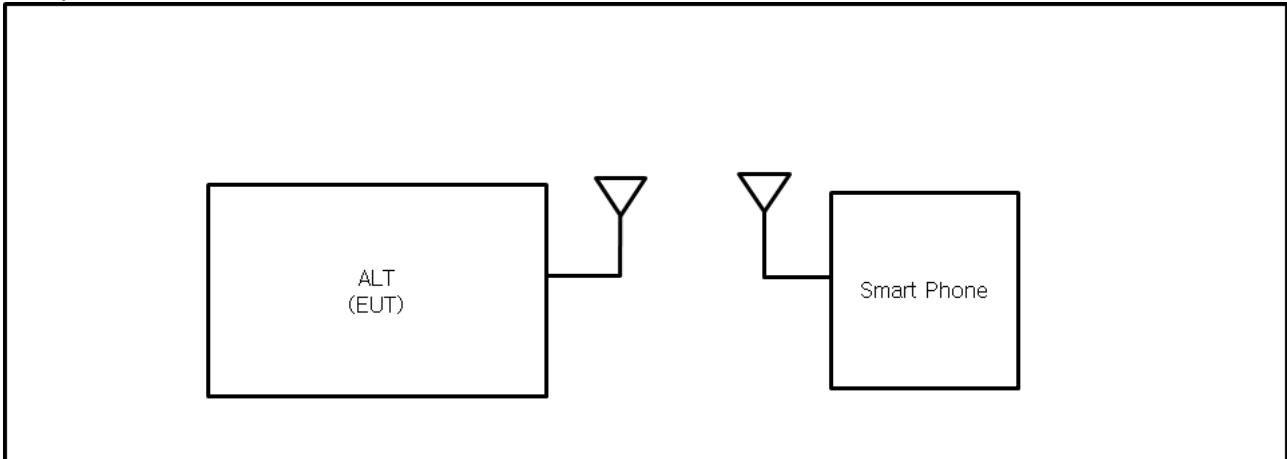
Test mode	operating
Operation	1. The EUT checked the connect bluetooth to smart phone 2. The EUT checked moved, number appeared on smart phone
Charge	The EUT checked the State of charge through LCD

EUT Test operating S/W		
Name	Version	Manufacture Company
-	-	-

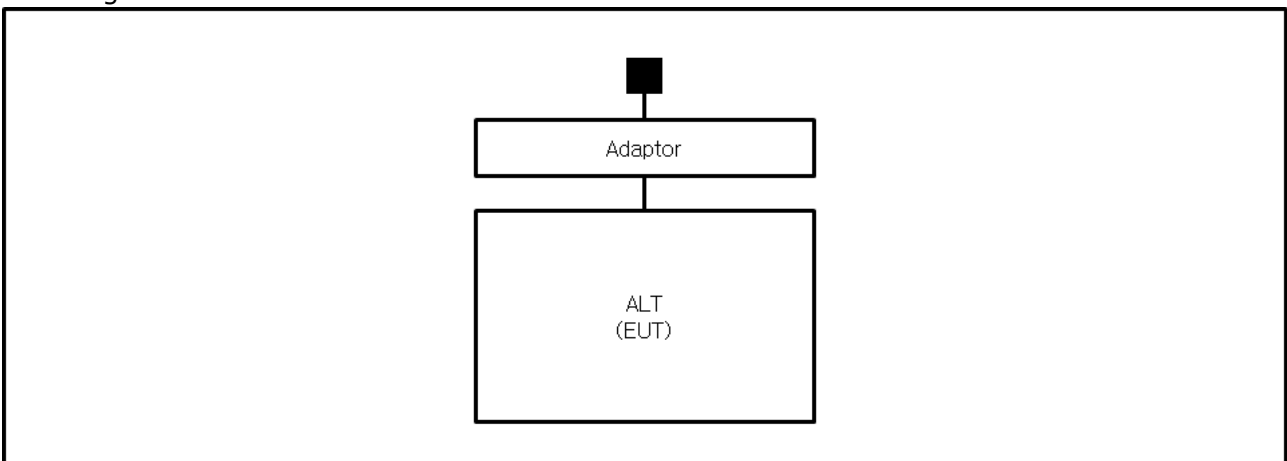
1.8 Configuration

- AC Main
- DC Main

■ Operation Mode



■ Charge 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 16-1-4:2012

1.12 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 0003

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

Nov. 06, 2019

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EMC32	R & S	9.12.00	-	-
☒	EMI TEST RECEIVER	ESR3	R & S	101781	04, 22, 2020	1 Year
☒	LISN	ENV216	R & S	101787	01, 04, 2020	1 Year
☐	LISN	ESH2-Z5	R & S	100450	04, 22, 2020	1 Year
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 26, 2019	1 Year

Test Conditions

Temperature: 22,8 °C
Relative Humidity: 52,3 % 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

Nov. 06, 2019

Test Location

☐ OPEN AREA TEST SITE #2

☒ SEMI ANECHOIC CHAMBER #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 09, 2020	1 Year
☒	AMPLIFIER	SCU 01	R & S	100603	11, 26, 2019	1 Year
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 29, 2020	2 Year
☒	ATTENUATOR	8491A	HP	32173	03, 11, 2020	1 Year

Test Conditions

Temperature: 22,5 °C

Relative Humidity: 52,3 % 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.
- The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z.



2.3 Radiated Electric Field Emissions(Above 1 GHz)

Test Date

Nov. 07, 2019

Test Location

SEMI ANECHOIC CHAMBER #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due	calibration interval
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 09, 2020	1 Year
☒	PREAMPLIFIER	8449B	AGILENT	3008A01742	01, 08, 2020	1 Year
☒	ATTENUATOR	8491A	HP	35496	03, 11, 2020	1 Year
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	03, 12, 2020	2 Year

Test Conditions

Temperature: 22,7 °C
Relative Humidity: 51,8 % 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.
- The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z.



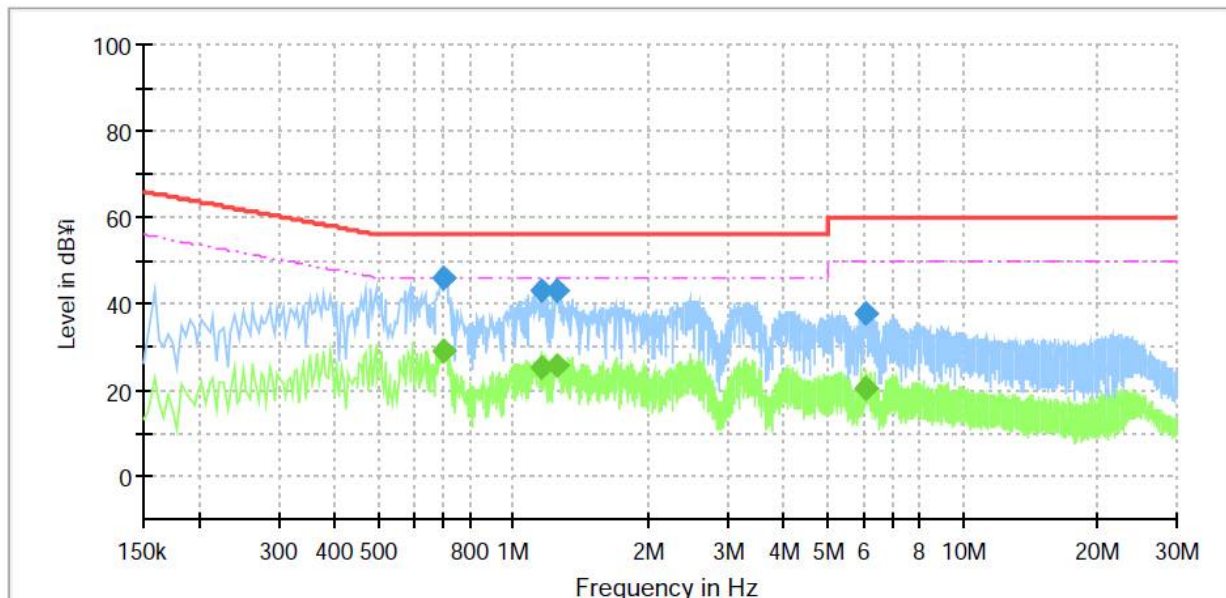
APPENDIX A – TEST DATA

Conducted Emissions at Mains Power Ports

HOT LINE

Common Information

Test Description: Conducted Emission
Model No.: BAGEL-003
Phase:
Mode: H
Operator Name: KES



Final Result

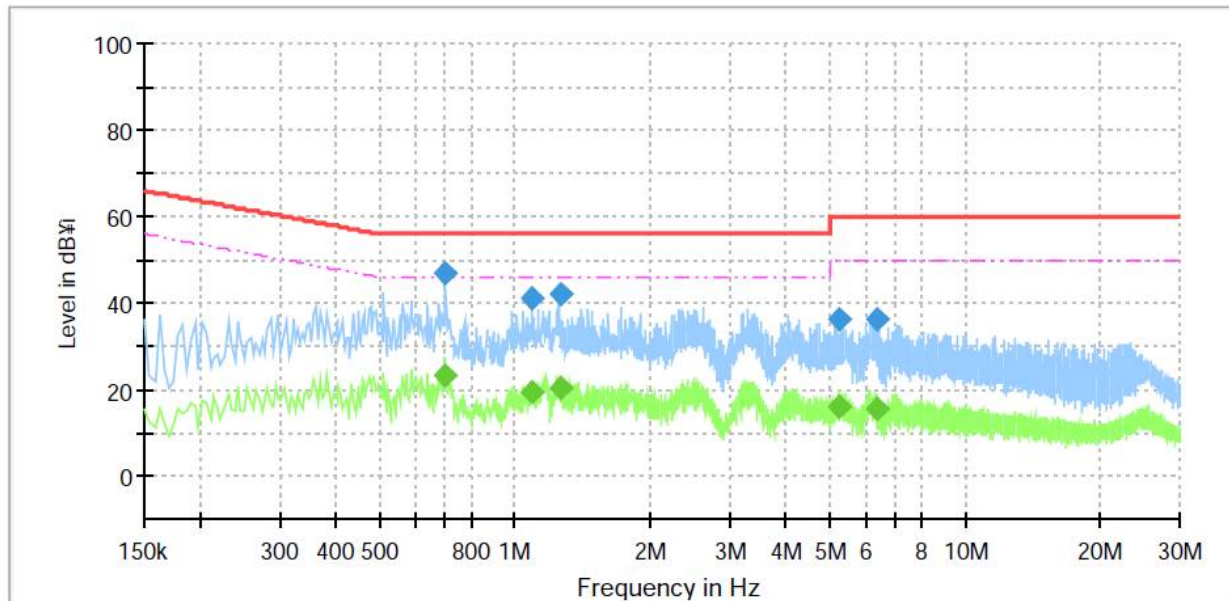
Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.698000	---	28.93	46.00	17.07	1000.0	9.000	L1	20.2
0.698000	45.84	---	56.00	10.16	1000.0	9.000	L1	20.2
0.702000	---	28.98	46.00	17.02	1000.0	9.000	L1	20.2
0.702000	46.00	---	56.00	10.00	1000.0	9.000	L1	20.2
1.158000	---	25.01	46.00	20.99	1000.0	9.000	L1	20.5
1.158000	42.85	---	56.00	13.15	1000.0	9.000	L1	20.5
1.242000	---	25.48	46.00	20.52	1000.0	9.000	L1	20.5
1.242000	43.15	---	56.00	12.85	1000.0	9.000	L1	20.5
6.082000	---	20.40	50.00	29.60	1000.0	9.000	L1	20.0
6.082000	37.56	---	60.00	22.44	1000.0	9.000	L1	20.0
6.118000	---	20.62	50.00	29.38	1000.0	9.000	L1	20.0
6.118000	37.71	---	60.00	22.29	1000.0	9.000	L1	20.0

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NEUTRAL LINE

Common Information

Test Description: Conducted Emission
 Model No.: BAGEL-003
 Phase:
 Mode: N
 Operator Name: KES



Final Result

Frequency (MHz)	MaxPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.702000	---	23.42	46.00	22.58	1000.0	9.000	N	20.2
0.702000	46.81	---	56.00	9.19	1000.0	9.000	N	20.2
1.090000	---	19.40	46.00	26.60	1000.0	9.000	N	20.4
1.090000	41.16	---	56.00	14.84	1000.0	9.000	N	20.4
1.262000	---	20.29	46.00	25.71	1000.0	9.000	N	20.5
1.262000	42.04	---	56.00	13.96	1000.0	9.000	N	20.5
5.258000	---	15.93	50.00	34.07	1000.0	9.000	N	19.9
5.258000	36.42	---	60.00	23.58	1000.0	9.000	N	19.9
6.334000	---	15.70	50.00	34.30	1000.0	9.000	N	20.1
6.334000	36.30	---	60.00	23.70	1000.0	9.000	N	20.1

◆ Calculation

QuasiPeak [dBuV] / CAverage [dBuV] = Reading Value [dBuV] + 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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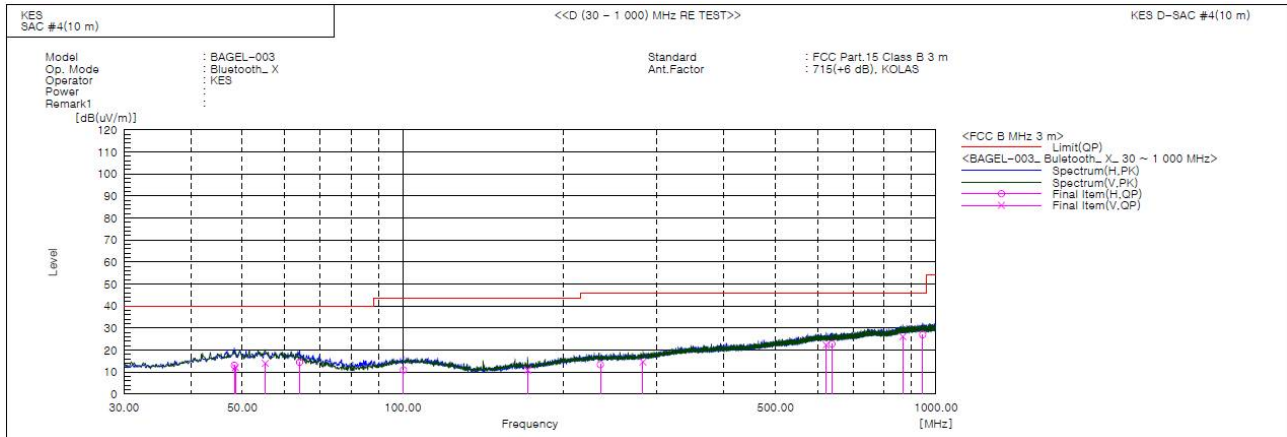
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Radiated Electric Field Emissions(Below 1 GHz)

■ Operation 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	48.309	H	35.2	-22.1	13.1	40.0	26.9	265.0	16.0	
2	48.551	V	34.1	-22.0	12.1	40.0	27.9	120.0	122.0	
3	55.220	V	36.4	-22.4	14.0	40.0	26.0	146.0	309.0	
4	64.071	H	38.5	-24.0	14.5	40.0	25.5	359.0	267.0	
5	100.325	H	34.3	-23.3	11.0	43.5	32.5	348.0	301.0	
6	171.499	V	36.4	-25.4	11.0	43.5	32.5	145.0	225.0	
7	234.791	H	34.8	-21.4	13.4	46.0	32.6	293.0	16.0	
8	282.200	V	35.2	-20.6	14.6	46.0	31.4	152.0	185.0	
9	622.791	V	33.7	-11.4	22.3	46.0	23.7	102.0	290.0	
10	638.311	H	34.0	-11.2	22.8	46.0	23.2	297.0	139.0	
11	866.625	V	34.3	-8.2	26.1	46.0	19.9	208.0	105.0	
12	944.468	H	34.7	-7.7	27.0	46.0	19.0	381.0	250.0	

it was determined that X orientation was worst-case orientation; therefore, al final radiated testing was performed with the EUT in X orientation.

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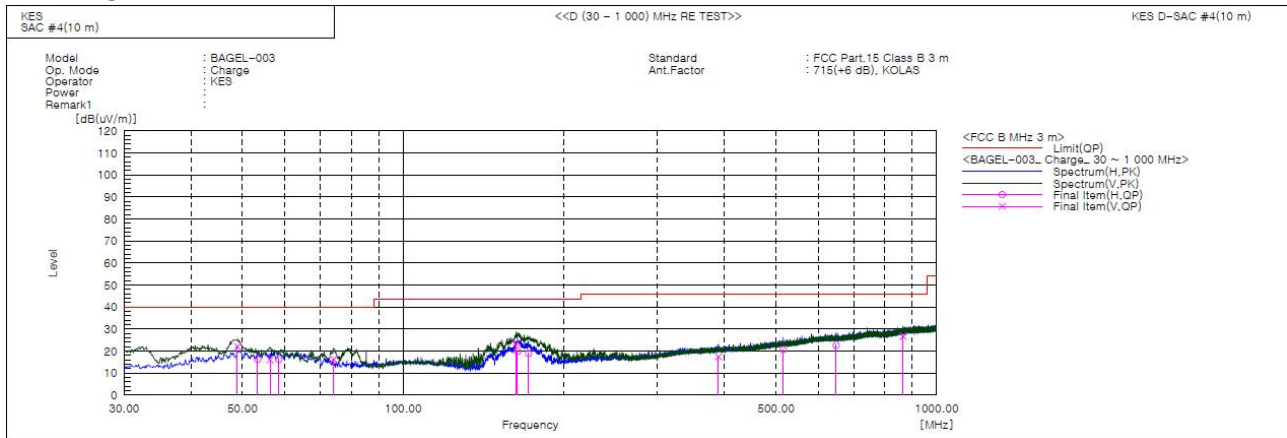
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Charge Mode



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	48.915	V	44.1	-22.0	22.1	40.0	17.9	103.0	98.0	
2	53.401	H	38.5	-22.2	16.3	40.0	23.7	358.0	357.0	
3	56.311	V	38.6	-22.6	16.0	40.0	24.0	121.0	90.0	
4	58.494	H	39.1	-22.9	16.2	40.0	23.8	326.0	257.0	
5	74.135	V	43.5	-27.2	16.3	40.0	23.7	118.0	70.0	
6	163.011	V	49.3	-25.8	23.5	43.5	20.0	134.0	178.0	
7	163.860	H	45.6	-25.7	19.9	43.5	23.6	297.0	250.0	
8	171.863	H	44.2	-25.3	18.9	43.5	24.6	210.0	278.0	
9	389.991	V	34.3	-16.9	17.4	46.0	28.6	115.0	334.0	
10	515.606	H	34.8	-14.1	20.7	46.0	25.3	392.0	355.0	
11	648.133	H	33.7	-11.1	22.6	46.0	23.4	383.0	10.0	
12	865.413	V	35.0	-8.3	26.7	46.0	19.3	150.0	316.0	

◆ Calculation - SAC #4(10 m)

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

Margin(QP)[dB] = Limit[dB(μ V/m)] - Result(QP) [dB(μ V/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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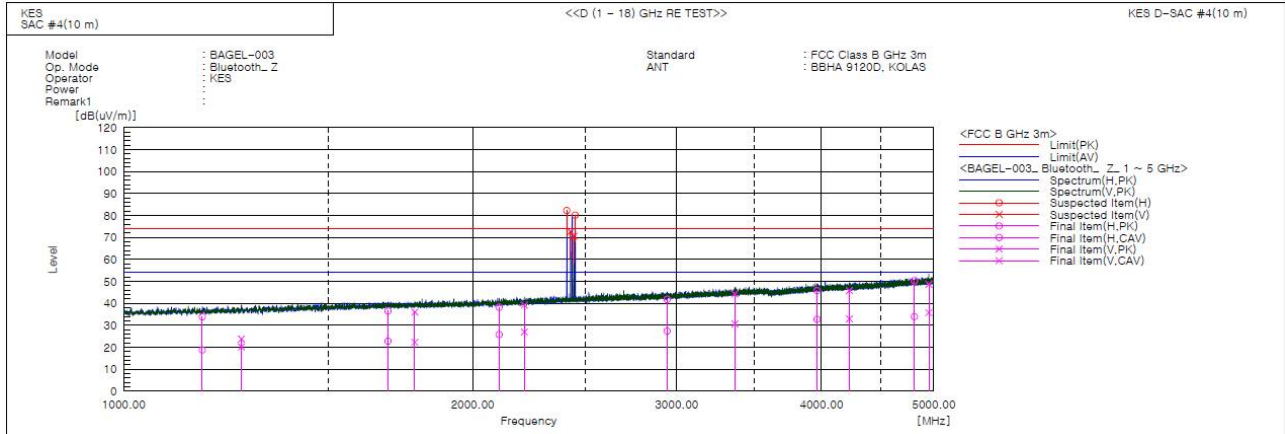
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Radiated Electric Field Emissions(Above 1 GHz)

■ Operation 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	1169.000	H	39.0	23.9	-5.1	33.9	18.8	74.0	54.0	40.1	35.2	335.0	235.0	
2	1263.500	V	28.2	24.6	-4.4	23.8	20.2	74.0	54.0	50.2	33.8	119.0	200.0	
3	1690.500	H	38.4	24.7	-1.9	36.5	22.8	74.0	54.0	37.5	31.2	320.0	158.0	
4	1783.000	V	37.6	23.8	-1.5	36.1	22.3	74.0	54.0	37.9	31.7	125.0	273.0	
5	2108.500	H	38.2	25.8	0.0	38.2	25.8	74.0	54.0	35.8	28.2	361.0	14.0	
6	2216.500	V	38.7	26.5	0.5	39.2	27.0	74.0	54.0	34.8	27.0	103.0	325.0	
7	2944.000	H	38.3	23.9	3.5	41.8	27.4	74.0	54.0	32.2	26.6	349.0	50.0	
8	3368.000	V	39.4	25.8	4.9	44.3	30.7	74.0	54.0	29.7	23.3	116.0	325.0	
9	3965.500	H	38.2	25.2	7.6	45.8	32.8	74.0	54.0	28.2	21.2	385.0	154.0	
10	4228.000	V	37.4	24.6	8.4	45.8	33.0	74.0	54.0	28.2	21.0	119.0	325.0	
11	4811.605	H	39.5	23.2	10.8	50.3	34.0	74.0	54.0	23.7	20.0	174.0	57.0	
12	4951.500	V	37.5	24.6	11.2	48.7	35.8	74.0	54.0	25.3	18.2	106.0	75.0	
13	2411.500	H	-----	-----	1.4	-----	-----	74.0	54.0	-----	-----	400.0	203.0	
14	2430.000	V	-----	-----	1.5	-----	-----	74.0	54.0	-----	-----	100.0	31.0	
15	2446.000	V	-----	-----	1.6	-----	-----	74.0	54.0	-----	-----	100.0	332.0	
16	2452.000	H	-----	-----	1.6	-----	-----	74.0	54.0	-----	-----	400.0	70.0	

* Operation Mode Exclusion Band
- Fundamental Frequency: 2.4 GHz

it was determined that Z orientation was worst-case orientation; therefore, al final radiated testing was performed with the EUT in Z orientation.

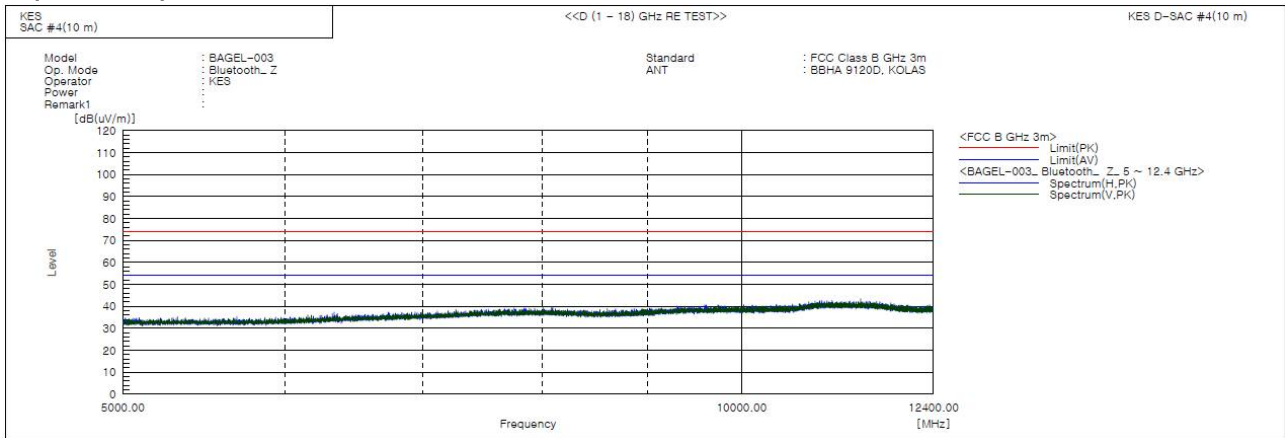


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– (5 ~ 12.4) GHz



* No spurious emission were detected above 5 GHz.

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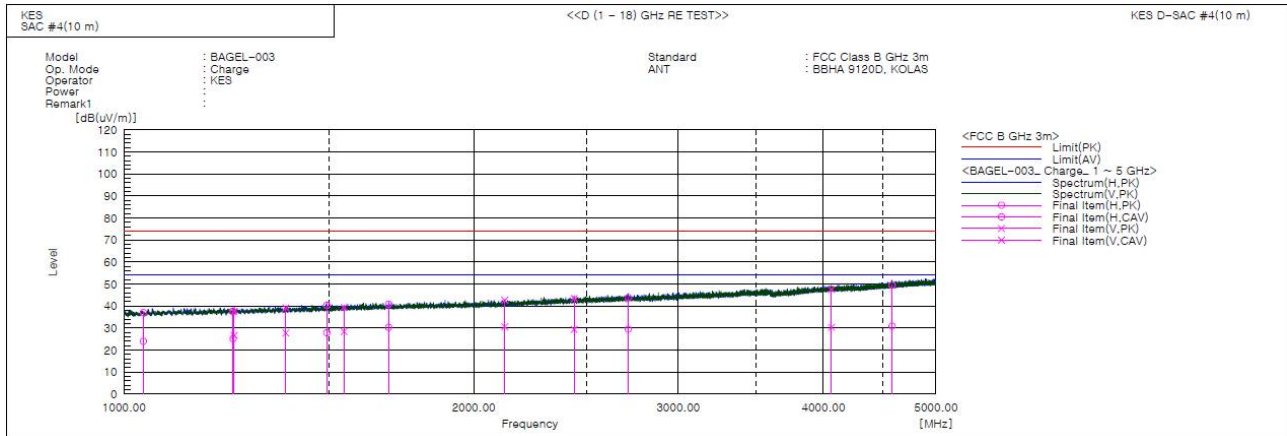


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Charge Mode



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	1039.205	H	43.1	30.1	-6.1	37.0	24.0	74.0	54.0	37.0	30.0	154.0	91.0	
2	1241.500	H	42.2	29.8	-4.6	37.6	25.2	74.0	54.0	36.4	28.8	238.0	346.0	
3	1244.000	V	42.1	31.2	-4.5	37.6	26.7	74.0	54.0	36.4	27.3	110.0	334.0	
4	1378.000	V	42.8	31.4	-3.6	39.2	27.8	74.0	54.0	34.8	26.2	152.0	135.0	
5	1495.000	H	43.3	30.8	-2.9	40.4	27.9	74.0	54.0	33.6	26.1	145.0	352.0	
6	1546.500	V	41.9	31.0	-2.6	39.3	28.4	74.0	54.0	34.7	25.6	139.0	163.0	
7	1690.000	H	42.8	32.2	-1.9	40.9	30.3	74.0	54.0	33.1	23.7	324.0	198.0	
8	2127.500	V	42.6	30.5	0.1	42.7	30.6	74.0	54.0	31.3	23.4	106.0	106.0	
9	2441.000	V	41.9	27.8	1.6	43.5	29.4	74.0	54.0	30.5	24.6	117.0	143.0	
10	2717.500	H	41.2	26.8	2.7	43.9	29.5	74.0	54.0	30.1	24.5	268.0	28.0	
11	4064.500	V	39.5	22.3	8.0	47.5	30.3	74.0	54.0	26.5	23.7	113.0	346.0	
12	4583.500	H	39.6	21.0	9.9	49.5	30.9	74.0	54.0	24.5	23.1	265.0	100.0	

Calculation

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

Margin(PK/CAV)[dB] = Limit[dB(uV/m)] - Result(PK/CAV) [dB(uV/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: Margin value

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