EMC TEST REPORT

Test Report No.	:	KES-E1-19T0708
Date of Issue	:	Oct. 30, 2019
Product name	:	Wearable Translator
Model/Type No.	:	TalkBox
Variant Mode	:	-
Applicant	:	Soundbridge Co., Ltd.
Applicant Address	:	4th Fl., Daegu Center for Creative Economy & Innovation, 51, Hoam-ro, Buk-gu, Daegu, 41585, Korea
Manufacturer	:	Soundbridge Co., Ltd.
Manufacturer Address	:	4th Fl., Daegu Center for Creative Economy & Innovation, 51, Hoam-ro, Buk-gu, Daegu, 41585, Korea
FCC ID	:	2AG88-TALKBOX
Date of Receipt	:	Sep. 04, 2019
Test date	:	Oct. 16, 2019 ~ Oct. 17, 2019
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Dae Hyun, Kim
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Oct. 30, 2019	KES-E1-19T0708	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Item	spec
Operating Frequency	Bluetooth
Power	DC 5 V (USB) DC 3.7 V (Battery)
Size	(80 x 30 x 15) ㎜

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 ☐ 230 Vac ☒ 120 Vac ☐ 12 Vdc ☒ DC 3.7 V (Battery)

Frequency ☐ 50 Hz ☒ 60 Hz ☐ Hz

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
Wearable Translator	TalkBox	-	Soundbridge Co., Ltd.	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
AC/DC Aadapter	MCS-04KD	-	Dongdo Electroncs(Yantal) Co., Ltd	-
SmartPhone	A1429	-	Apple	-

1.6 External I/O Cabling

■ Charge Mode

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
Wearable Translator (EUT)	Micro 5 Pin	SmartPhone	USB	0.8	U

■ Operating Mode

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
Wearable Translator (EUT)	Micro 5 Pin	SmartPhone	USB	0.8	U

1.7 EUT Charge Mode(s)

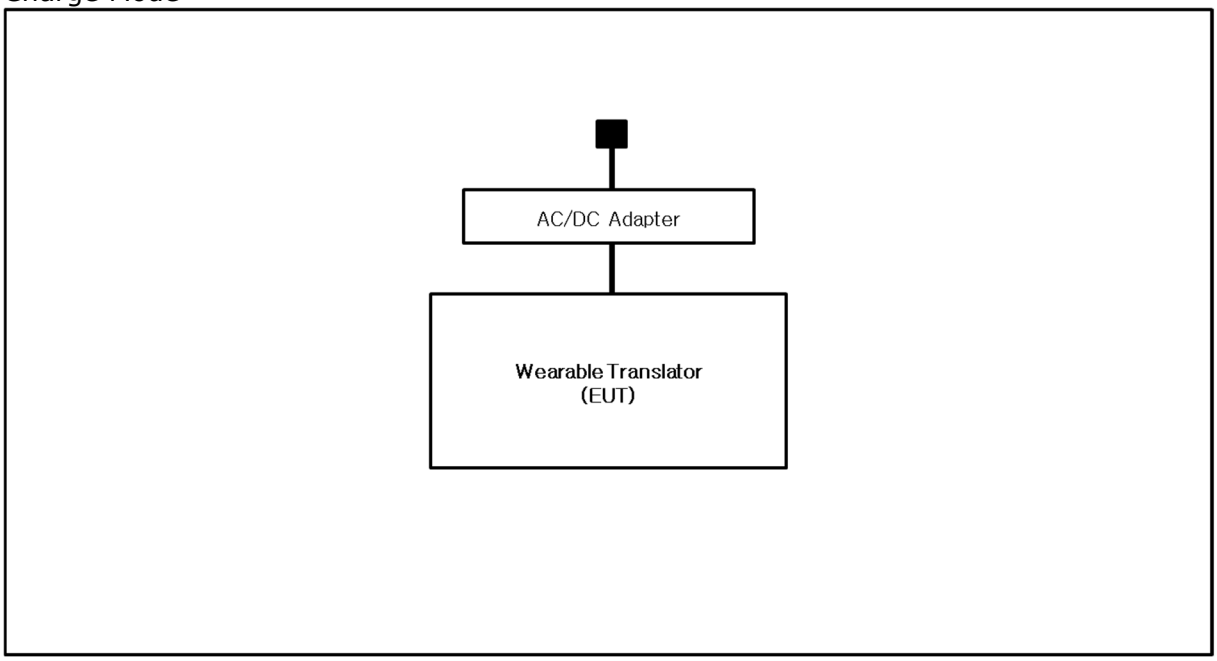
Test mode	operating
Charge	Confirmed the charge of EUT through LED of the EUT
Operating	EUT and SmartPhone to Bluetooth pairing. Normal operation was confirmed by playing 1 kHz Tone built in SmartPhone

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

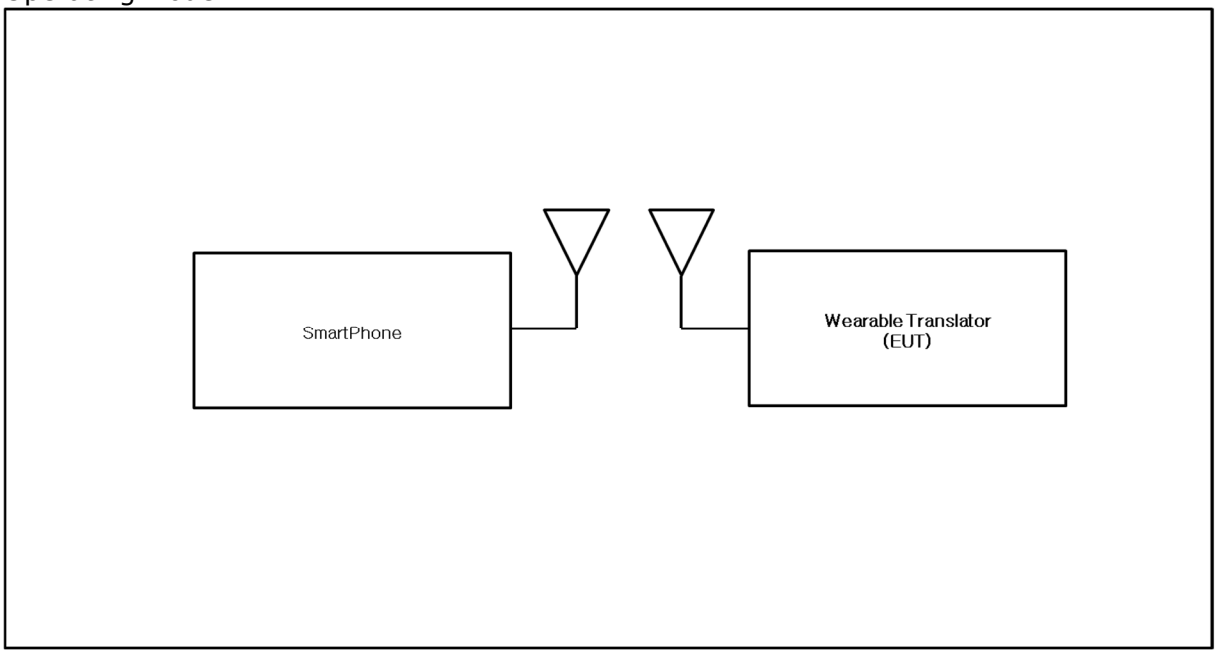
1.8 Configuration

■ 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, Yeoju-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 ☐ Group 2
☐ Class A ☐ 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

☐ **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

2.1 Conducted Emissions at Mains Power Ports

Test Date
Oct. 17, 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: 24.0 ℃
Relative Humidity: 52.9 % R.H.

Frequency Range of Measurement
150 ㎑ to 30 ㎒

Instrument Settings
IF Band Width: 9 ㎑

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 ㎓)

Test Date
Oct. 17, 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
☒	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: 24.9 ℃
Relative Humidity: 53.8 % R.H.

Frequency Range of Measurement
30 ㎒ to 1 ㎓

Instrument Settings
IF Band Width: 120 ㎑

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 thre orthogonal orientations X, Y and Z, it was determined that X orientation was worst-case orientation; therefore, al final radiated testing was performed with the EUT in X orientation.

2.3 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Oct. 16, 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: 25.2 ℃
Relative Humidity: 53.7 % R.H.

Frequency Range of Measurement
1 ㎓ to 12.4 ㎓

Instrument Settings
IF Band Width: 1 ㎒

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 thre orthogonal orientations X, Y and Z, it was determined that X orientation was worst-case orientation; therefore, al final radiated testing was performed with the EUT in X orientation.

APPENDIX A – TEST DATA

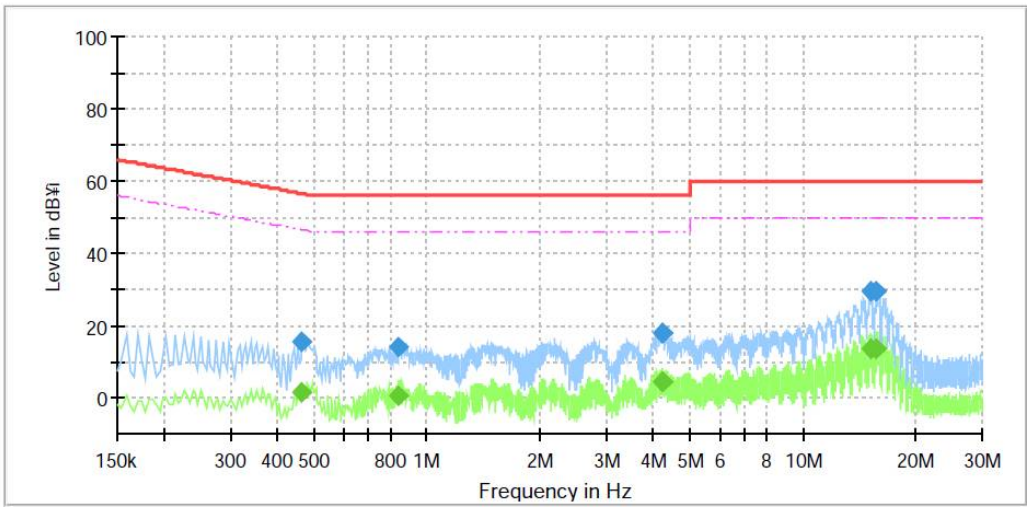
Conducted Emissions at Mains Power Ports

■ Operating Mode

HOT LINE

Common Information

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



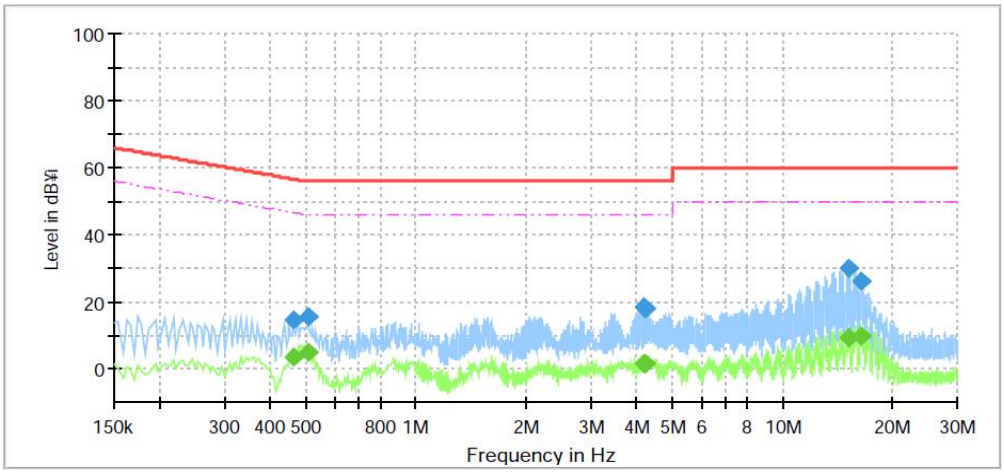
Final_Result

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.466000	---	1.39	46.58	45.19	1000.0	9.000	L1	9.7
0.466000	15.33	---	56.58	41.25	1000.0	9.000	L1	9.7
0.838000	---	0.78	46.00	45.22	1000.0	9.000	L1	9.7
0.838000	14.36	---	56.00	41.64	1000.0	9.000	L1	9.7
4.210000	---	4.55	46.00	41.45	1000.0	9.000	L1	9.8
4.210000	18.10	---	56.00	37.90	1000.0	9.000	L1	9.8
4.234000	---	4.51	46.00	41.49	1000.0	9.000	L1	9.8
4.234000	18.13	---	56.00	37.87	1000.0	9.000	L1	9.8
15.114000	---	13.83	50.00	36.17	1000.0	9.000	L1	10.1
15.114000	29.47	---	60.00	30.53	1000.0	9.000	L1	10.1
15.750000	---	13.73	50.00	36.27	1000.0	9.000	L1	10.2
15.750000	29.35	---	60.00	30.65	1000.0	9.000	L1	10.2

NEUTRAL LINE

Common Information

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



Final_Result

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.462000	---	3.65	46.66	43.01	1000.0	9.000	N	9.6
0.462000	14.61	---	56.66	42.05	1000.0	9.000	N	9.6
0.510000	---	4.83	46.00	41.17	1000.0	9.000	N	9.6
0.510000	15.59	---	56.00	40.41	1000.0	9.000	N	9.6
4.202000	---	1.52	46.00	44.48	1000.0	9.000	N	9.8
4.202000	18.45	---	56.00	37.55	1000.0	9.000	N	9.8
4.222000	---	1.50	46.00	44.50	1000.0	9.000	N	9.8
4.222000	18.11	---	56.00	37.89	1000.0	9.000	N	9.8
15.134000	---	9.10	50.00	40.90	1000.0	9.000	N	10.2
15.134000	30.23	---	60.00	29.77	1000.0	9.000	N	10.2
16.482000	---	9.81	50.00	40.19	1000.0	9.000	N	10.3
16.482000	26.28	---	60.00	33.72	1000.0	9.000	N	10.3

♦ 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))

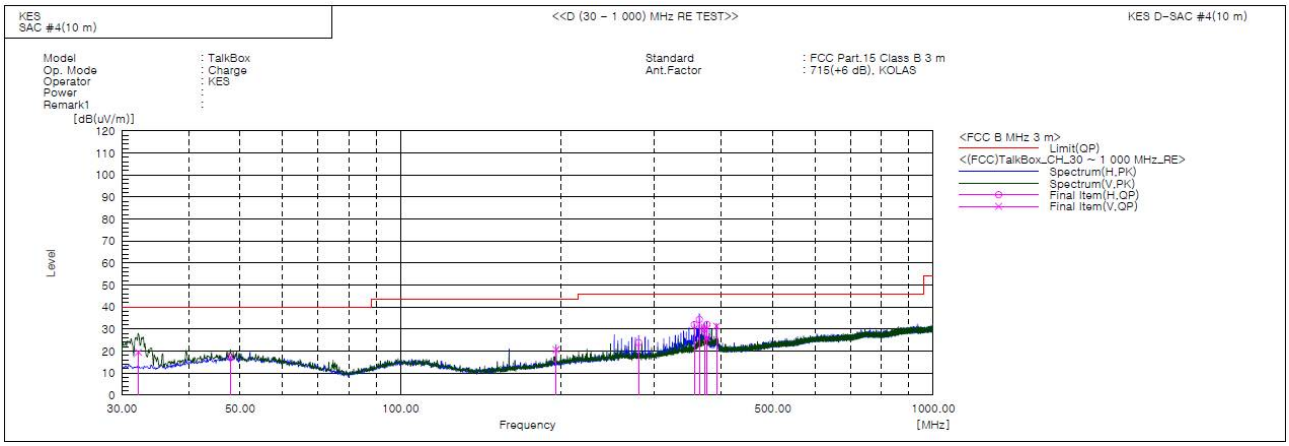
Uncertainty of measurement

HOT Line : Uncertainty of measurement 2.38 dB
(Confidence level: Approx. 95 %, *k*=2)

Neutral Line : Uncertainty of measurement 2.38 dB
(Confidence level: Approx. 95 %, *k*=2)

Radiated Electric Field Emissions(Below 1 ㎓)

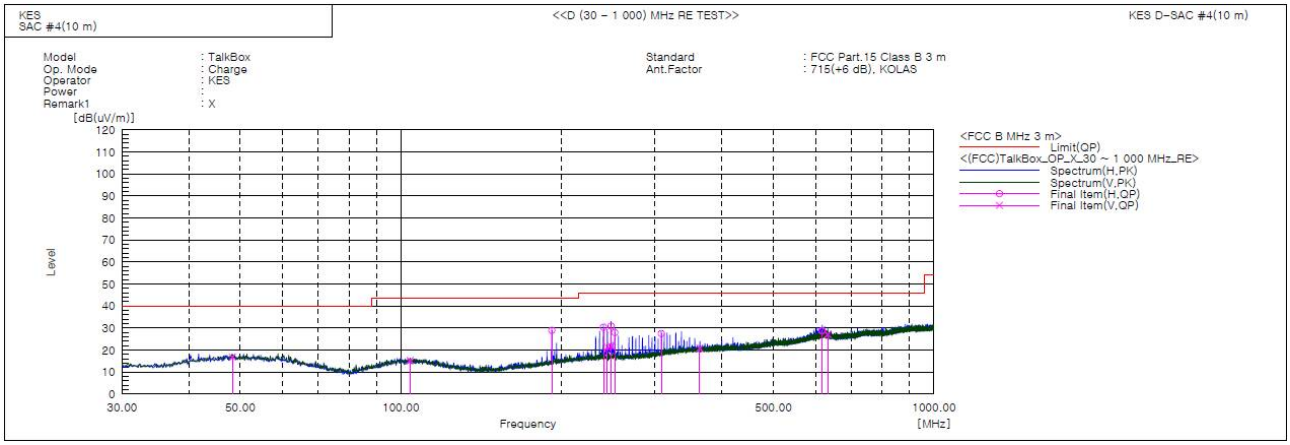
■ Charge Mode



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	32.222	V	45.1	-25.6	19.5	40.0	20.5	133.0	124.0	
2	47.975	V	39.5	-22.1	17.4	40.0	22.6	100.0	338.0	
3	195.991	V	44.0	-23.3	20.7	43.5	22.8	106.0	266.0	
4	280.042	H	44.6	-20.7	23.9	46.0	22.1	227.0	90.0	
5	356.004	H	49.5	-17.5	32.0	46.0	14.0	314.0	265.0	
6	363.942	H	51.8	-17.4	34.4	46.0	11.6	322.0	257.0	
7	367.942	H	14.2	-17.3	-3.1	46.0	49.1	351.0	261.0	
8	371.939	H	47.3	-17.2	30.1	46.0	15.9	299.0	265.0	
9	372.046	V	47.3	-17.2	30.1	46.0	15.9	135.0	108.0	
10	376.048	H	49.3	-17.2	32.1	46.0	13.9	319.0	261.0	
11	376.050	V	43.3	-17.2	26.1	46.0	19.9	154.0	87.0	
12	392.053	V	48.2	-16.8	31.4	46.0	14.6	184.0	100.0	

■ 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	48.309	V	38.9	-22.1	16.8	40.0	23.2	100.0	294.0	
2	104.070	V	38.6	-23.3	15.3	43.5	28.2	105.0	111.0	
3	191.984	H	52.7	-23.7	29.0	43.5	14.5	136.0	271.0	
4	239.999	H	51.7	-21.3	30.4	46.0	15.6	251.0	191.0	
5	244.009	V	42.7	-21.3	21.4	46.0	24.6	135.0	139.0	
6	248.010	H	52.1	-21.2	30.9	46.0	15.1	322.0	179.0	
7	248.020	V	43.0	-21.2	21.8	46.0	24.2	106.0	115.0	
8	252.009	H	49.2	-21.2	28.0	46.0	18.0	133.0	242.0	
9	308.026	H	47.0	-19.5	27.5	46.0	18.5	249.0	115.0	
10	363.679	V	38.2	-17.4	20.8	46.0	25.2	110.0	278.0	
11	617.093	H	40.2	-11.4	28.8	46.0	17.2	305.0	147.0	
12	632.011	V	38.4	-11.3	27.1	46.0	18.9	354.0	210.0	

♦ Calculation – SAC #4(10 m)
Result(QP) [dB(㎶/m)] = (Reading(QP)[dB(㎶)] + c.f[dB(1/m)]
Margin(QP)[dB] = Limit[dB(㎶/m)] - Result(QP) [dB(㎶/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

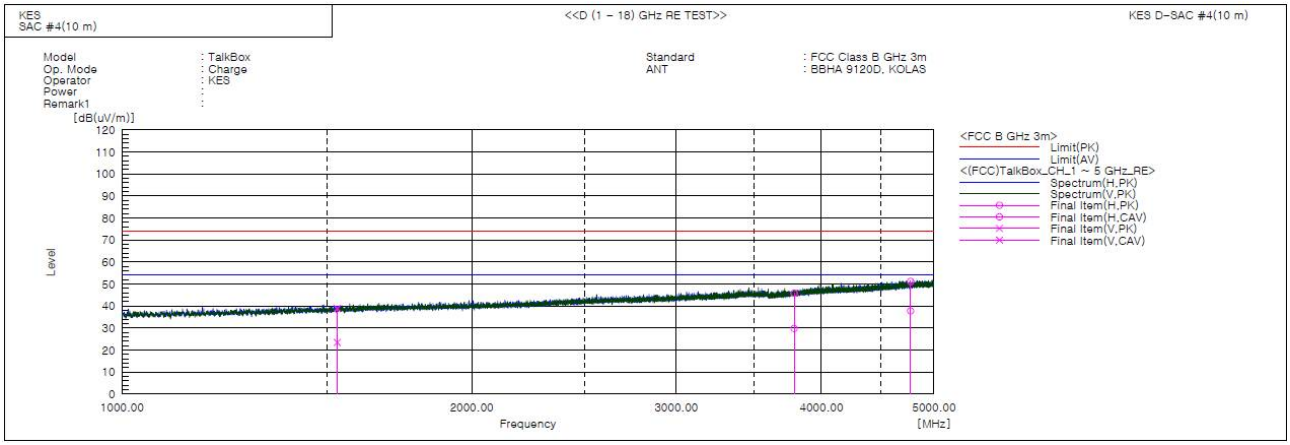
Uncertainty of measurement

Horizontal : Uncertainty of measurement 4.16 dB
(Confidence level: Approx. 95 %, *k*=2)

Vertical : Uncertainty of measurement 4.24 dB
(Confidence level: Approx. 95 %, *k*=2)

Radiated Electric Field Emissions(Above 1 GHz)

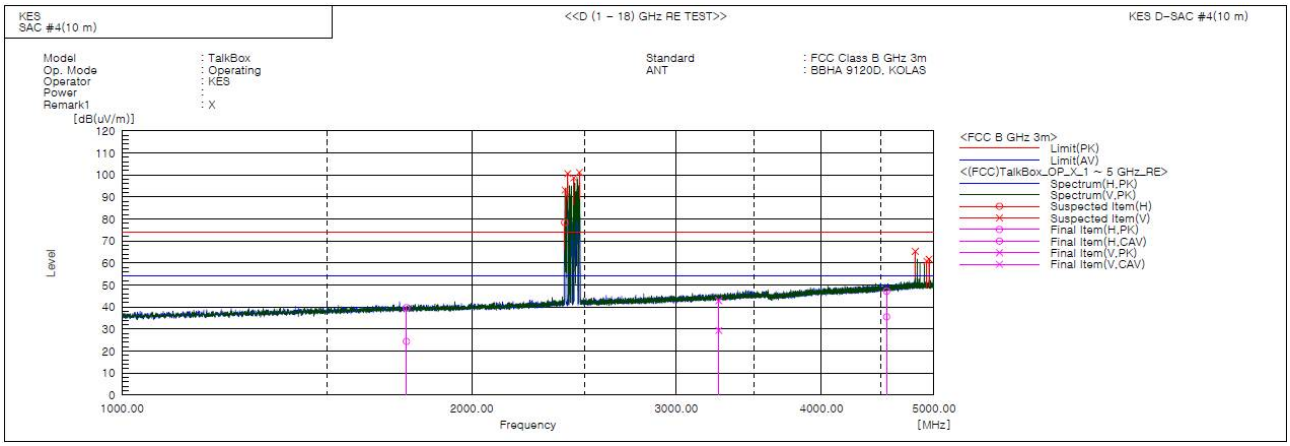
■ Charge Mode



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	1532.231	V	41.6	26.2	-2.7	38.9	23.5	74.0	54.0	35.1	30.5	155.0	207.0	
2	3789.541	H	39.2	23.2	6.6	45.8	29.8	74.0	54.0	28.2	24.2	319.0	47.0	
3	4774.046	H	40.6	27.2	10.6	51.2	37.8	74.0	54.0	22.8	16.2	224.0	275.0	

■ Operating Mode – (1 ~ 5) GHz

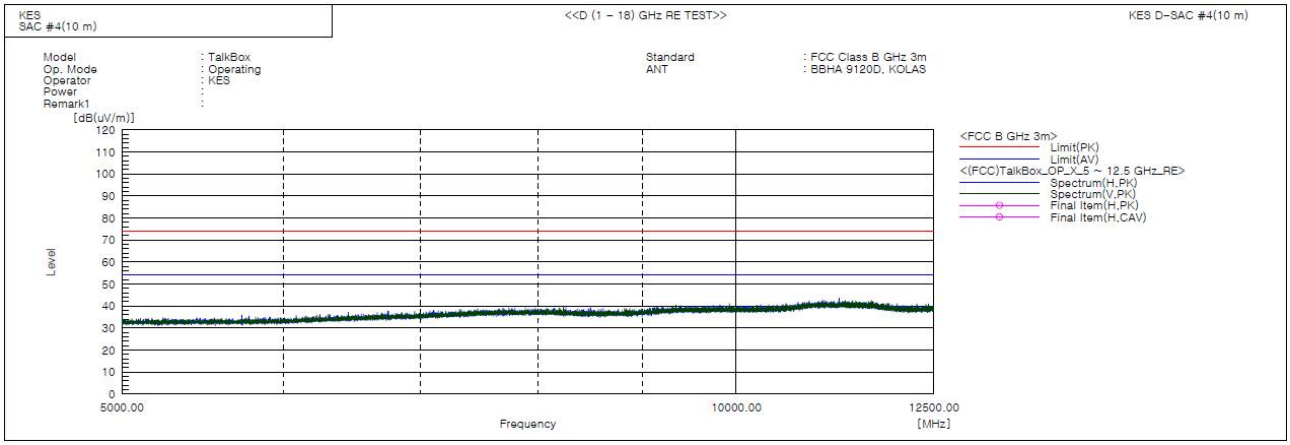


Final Result

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	1757.337	H	41.3	26.0	-1.6	39.7	24.4	74.0	54.0	34.3	29.6	270.0	331.0	
2	3264.133	V	38.3	24.8	4.6	42.9	29.4	74.0	54.0	31.1	24.6	109.0	237.0	
3	4552.429	H	37.4	25.8	9.8	47.2	35.6	74.0	54.0	26.8	18.4	229.0	158.0	
4	2404.500	H	--------	--------	1.4	--------	--------	74.0	54.0	--------	--------	100.0	243.0	
5	2406.500	V	--------	--------	1.4	--------	--------	74.0	54.0	--------	--------	100.0	185.0	
6	2419.000	V	--------	--------	1.5	--------	--------	74.0	54.0	--------	--------	100.0	345.0	
7	2448.500	V	--------	--------	1.6	--------	--------	74.0	54.0	--------	--------	100.0	273.0	
8	2476.500	V	--------	--------	1.7	--------	--------	74.0	54.0	--------	--------	100.0	321.0	
9	4818.000	V	--------	--------	10.8	--------	--------	74.0	54.0	--------	--------	100.0	325.0	
10	4928.000	V	--------	--------	11.1	--------	--------	74.0	54.0	--------	--------	100.0	345.0	
11	4951.500	V	--------	--------	11.2	--------	--------	74.0	54.0	--------	--------	100.0	337.0	

* Operating Mode Exclusion Bands
- Fundamental Frequency: 2.4 GHz
- Harmonics Frequency: 4.8 GHz, 4.9 GHz

– (5 ~ 12.5) GHz



* No spurious emission were detected above 5 GHz.

♦ Calculation

Result(PK/CAV) [dB(㎶/m)] = (Reading(PK/CAV)[dB(㎶)] + c.f[dB(1/m)]
Margin(PK/CAV)[dB] = Limit[dB(㎶/m)] - Result(PK/CAV) [dB(㎶/m)]
Reading(PK/CAV) : Reading value, Result(PK/CAV) : Reading value + Factor value
Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss + ATT Factor - Preamp Factor), Margin: Marjin value

Uncertainty of measurement

Uncertainty of measurement 5.76 dB
(Confidence level: Approx. 95 %, *k*=2)