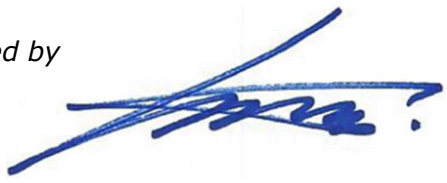
EMC TEST REPORT

Test Report No.	:	KES-E2-19T0022
Date of Issue	:	Mar. 12, 2019
Product name	:	Smart Remote Extensometer
Model/Type No.	:	QSHM-0B
Variant Mode	:	-
Applicant	:	QOOL SYSTEM Co.
Applicant Address	:	16, Yulgok-ro 13-gil, Jongno-gu, Seoul
Manufacturer	:	QOOL SYSTEM Co.
Manufacturer Address	:	16, Yulgok-ro 13-gil, Jongno-gu, Seoul
Equipment authorization	:	**Supply's Declaration of Conformity**
Date of Receipt	:	Feb. 11, 2019
Test date	:	Mar. 11, 2019
Test Results	:	☒ **In Compliance** ☐ **Not in Compliance**

Tested by

Mun Hye, Jung
EMC Test Engineer

Reviewed by



Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KOLAS.

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Mar. 12, 2019	KES-E2-19T0022	Issued

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1.0 General Product Description

Main Specifications of EUT are:

Model name	QSHM-0B
Dimension(mm)	150(W) x 445(H) x 35(D) (mm)
Weight (g)	270g
Battery Type	Li-ion Polymer Battery (3.7V 300mAh)
OS	Android 4.3 or over, iOS 7.0 or over
Power source	Li-ion Polymer Battery (3.7V 300mAh)
Interface	Bluetooth 4.0 (Bluetooth Low Energy)
Measuring method	Ultrasonic distance
Measuring area	Top body
Measuring Frequency	1 sec.
Measuring current	500uA under
Measuring items	Body height
Contents	Device, User manual
Usage range	10~40 ℃, 30~85% RH
Storage range	-10~60 ℃, 10~95% RH
TX, RX frequency	2.4GHz ISM band

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 ☐ 24 Vdc ☐ PoE

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
Smart Remote Extensometer	QSHM-0B	-	QOOL SYSTEM Co.	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
SmartPhone	A1487	-	Apple	-
Adapter	A1401	-	Flextronics Power Systems (Dongguan) Co., Ltd	-

1.6 External I/O Cabling

■ Charging MODE

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
Smart Remote Extensometer (EUT)	Micro 5 pin	Adapter	USB	1.0	U

■ Bluetooth MODE

Start		END		Cable Spec.	
Description	**I/O Port**	**Description**	**I/O Port**	**Length**	**Shield**
Smart Remote Extensometer (EUT)	Wireless	SmartPhone	Wireless	-	-

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

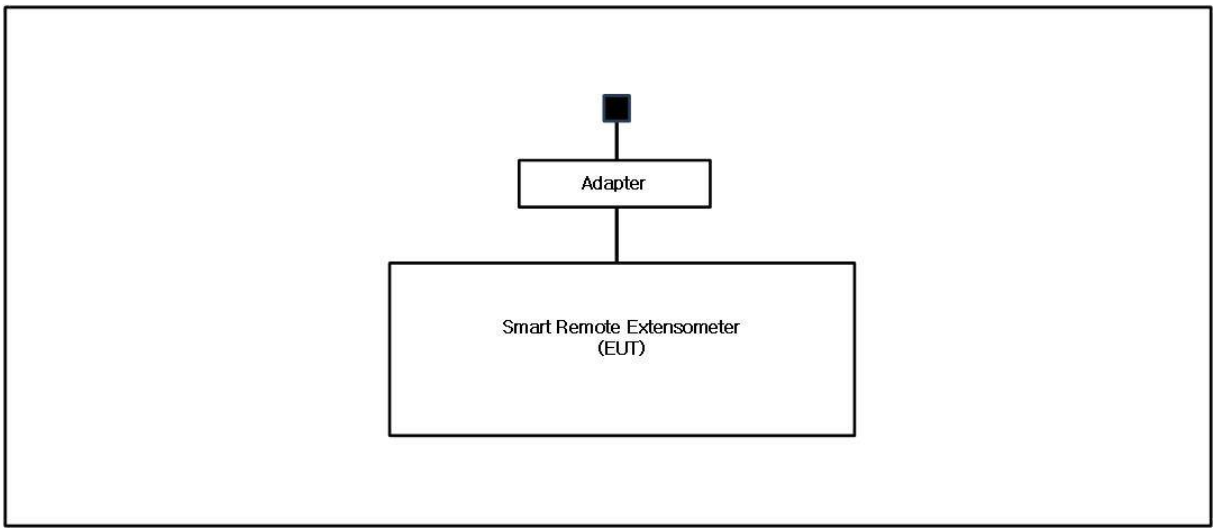
Test mode	operating
Charging	The EUT charging state checked with RED LED.
Bluetooth	1.The EUT and SmartPhone connected wirelessly. 2.Checked bluetooth(BLE) condition with app of smartphone.

EUT Test operating S/W		
Name	**Version**	**Manufacture Company**
SONA	1.5	Health G

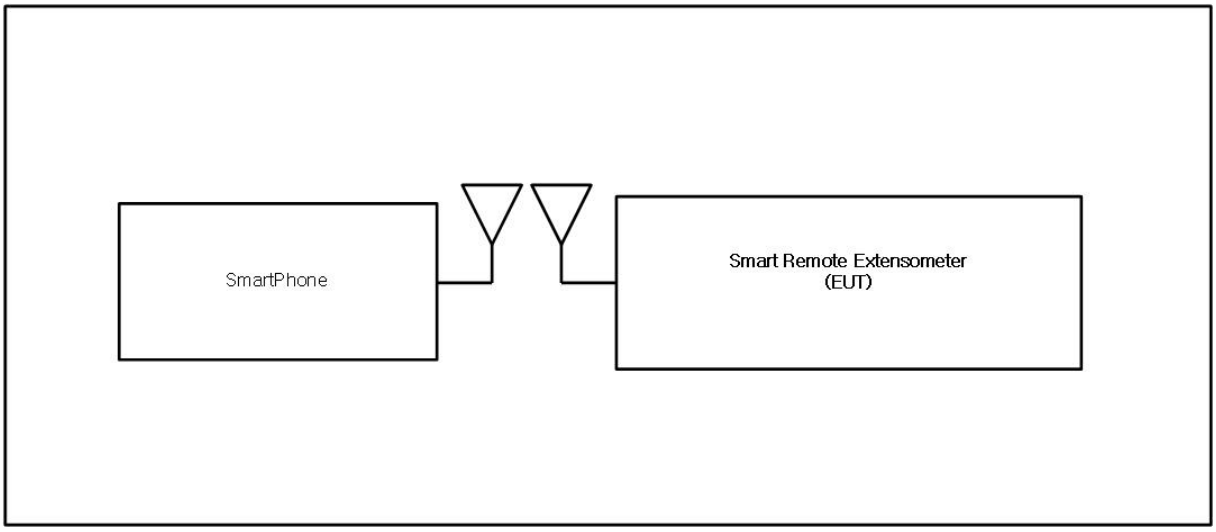
1.8 Configuration

■ AC Main
□ DC Main

■ Charging MODE



■ Bluetooth 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-4308, C-4798, T-2311, G-914
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 17 07 01633 001

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

☐ **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
Mar. 11, 2019

Test Location
Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EMC32	R & S	9.12.00	-
☒	EMI TEST RECEIVER	ESR3	R & S	101781	04, 25, 2019
☒	LISN	ENV216	R & S	101787	01, 04, 2020
☒	LISN	ESH2-Z5	R & S	100450	04, 25, 2019
☒	PULSE LIMITER	ESH3-Z2	R & S	101915	11, 26, 2019

Test Conditions
Temperature: 22.2 ℃
Relative Humidity: 41.7 % 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
Mar. 11, 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
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 11, 2019
☒	AMPLIFIER	SCU 01	R & S	100603	11, 26, 2019
☒	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	11, 29, 2020
☒	ATTENUATOR	8491A	HP	32173	03, 21, 2019

Test Conditions
Temperature: 22.4 ℃
Relative Humidity: 41.8 % 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.

2.3 Radiated Electric Field Emissions(Above 1 ㎓)

Test Date
Mar. 11, 2019

Test Location
SEMI ANECHOIC CHAMBER #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
☒	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
☒	EMI TEST RECEIVER	ESU26	R & S	100551	04, 11, 2019
☒	PREAMPLIFIER	8449B	AGILENT	3008A01742	01, 11, 2019
☒	HORN ANTENNA	BBHA 9120D	SCHWARZBECK	9120D-1802	09, 04, 2019

Test Conditions
Temperature: 22.4 ℃
Relative Humidity: 41.8 % 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.

APPENDIX A – TEST DATA

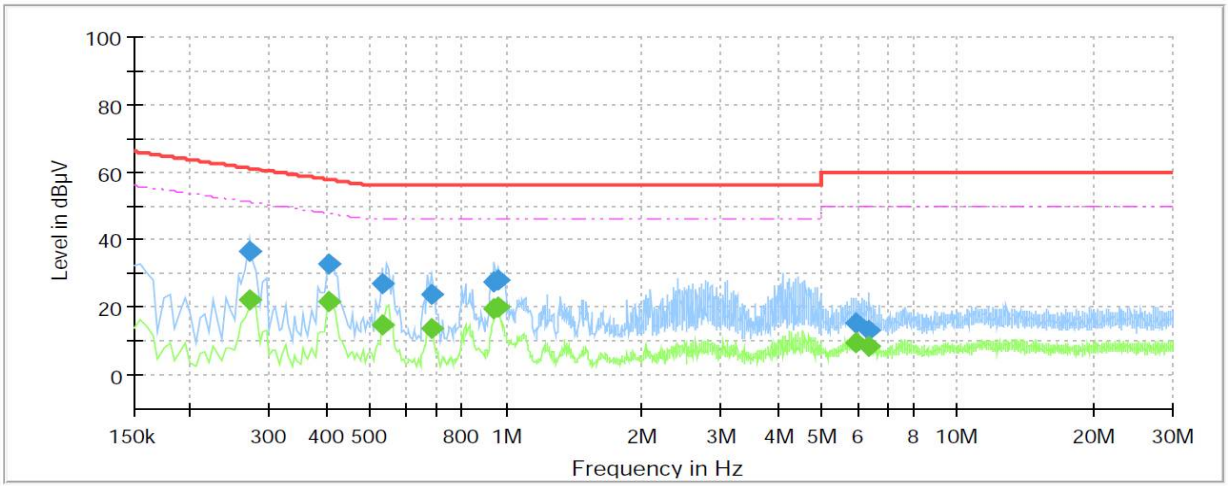
Conducted Emissions at Mains Power Ports

■ Charging MODE

HOT LINE

Common Information

Test Description:	Conducted Emission
Model No.:	QSHM-0B
Mode	Charging
Operator Name:	KES



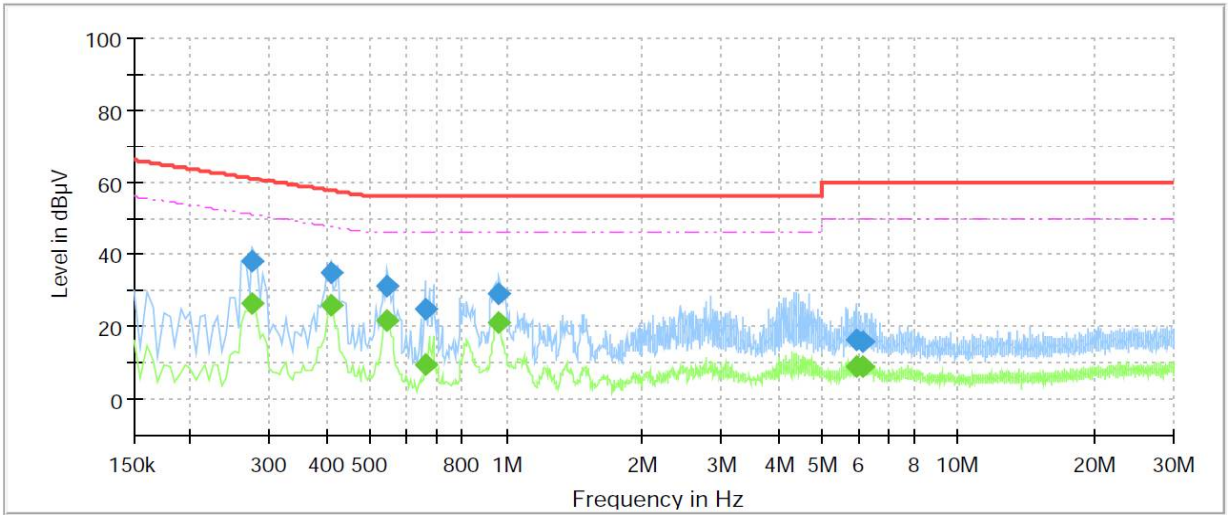
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.270000	36.44	---	61.12	24.68	1000.0	9.000	L1	19.7
0.270000	---	22.50	51.12	28.62	1000.0	9.000	L1	19.7
0.405000	32.83	---	57.75	24.92	1000.0	9.000	L1	19.7
0.405000	---	21.95	47.75	25.80	1000.0	9.000	L1	19.7
0.530000	---	14.78	46.00	31.22	1000.0	9.000	L1	19.7
0.530000	26.98	---	56.00	29.02	1000.0	9.000	L1	19.7
0.685000	24.04	---	56.00	31.96	1000.0	9.000	L1	19.7
0.685000	---	13.73	46.00	32.27	1000.0	9.000	L1	19.7
0.945000	---	19.58	46.00	26.42	1000.0	9.000	L1	19.8
0.945000	27.52	---	56.00	28.48	1000.0	9.000	L1	19.8
0.965000	27.84	---	56.00	28.16	1000.0	9.000	L1	19.8
0.965000	---	20.11	46.00	25.89	1000.0	9.000	L1	19.8
5.940000	---	9.62	50.00	40.38	1000.0	9.000	L1	20.0
5.940000	15.29	---	60.00	44.71	1000.0	9.000	L1	20.0
6.340000	---	8.50	50.00	41.50	1000.0	9.000	L1	20.1
6.340000	13.41	---	60.00	46.59	1000.0	9.000	L1	20.1

NEUTRAL LINE

Common Information

Test Description:	Conducted Emission
Model No.:	QSHM-0B
Mode	Charging
Operator Name:	KES



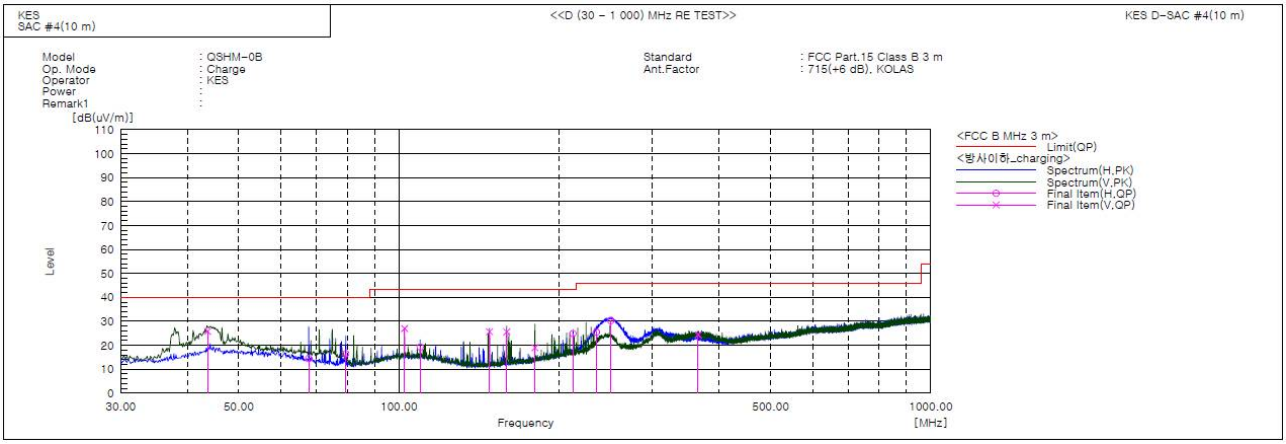
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.275000	38.37	---	60.97	22.60	1000.0	9.000	N	19.7
0.275000	---	26.59	50.97	24.38	1000.0	9.000	N	19.7
0.410000	35.11	---	57.65	22.54	1000.0	9.000	N	19.7
0.410000	---	25.83	47.65	21.82	1000.0	9.000	N	19.7
0.545000	---	21.53	46.00	24.47	1000.0	9.000	N	19.7
0.545000	31.32	---	56.00	24.68	1000.0	9.000	N	19.7
0.660000	24.85	---	56.00	31.15	1000.0	9.000	N	19.7
0.660000	---	9.70	46.00	36.30	1000.0	9.000	N	19.7
0.965000	---	21.30	46.00	24.70	1000.0	9.000	N	19.7
0.965000	28.88	---	56.00	27.12	1000.0	9.000	N	19.7
5.925000	16.49	---	60.00	43.51	1000.0	9.000	N	20.0
5.925000	---	8.97	50.00	41.03	1000.0	9.000	N	20.0
6.155000	15.67	---	60.00	44.33	1000.0	9.000	N	20.0
6.155000	---	9.17	50.00	40.83	1000.0	9.000	N	20.0

♦ 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))

Radiated Electric Field Emissions(Below 1 ㎓)

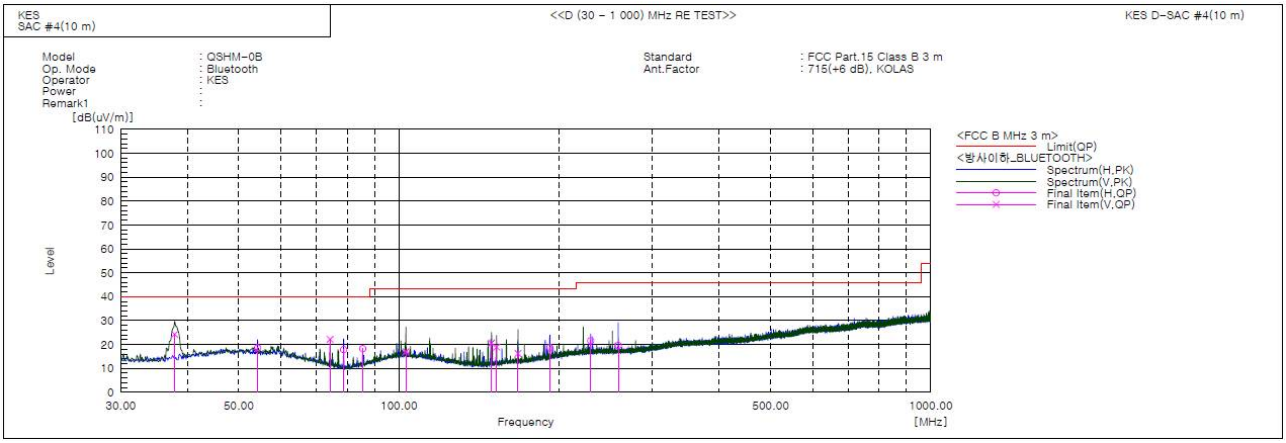
■ Charging MODE



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	43.693	V	48.4	-22.6	25.8	40.0	14.2	116.0	191.0	
2	67.709	H	39.5	-25.0	14.5	40.0	25.5	213.0	214.0	
3	79.470	H	44.8	-28.3	16.5	40.0	23.5	219.0	226.0	
4	102.508	V	50.2	-23.2	27.0	43.5	16.5	100.0	171.0	
5	109.661	H	42.7	-23.4	19.3	43.5	24.2	400.0	241.0	
6	148.098	V	52.5	-26.8	25.7	43.5	17.8	100.0	266.0	
7	159.495	V	51.6	-26.0	25.6	43.5	17.9	100.0	314.0	
8	180.229	V	43.8	-24.8	19.0	43.5	24.5	100.0	310.0	
9	212.481	H	46.9	-22.0	24.9	43.5	18.6	255.0	230.0	
10	235.276	H	46.8	-21.3	25.5	46.0	20.5	100.0	266.0	
11	250.270	H	51.4	-21.1	30.3	46.0	15.7	126.0	103.0	
12	365.378	V	41.7	-17.3	24.4	46.0	21.6	143.0	338.0	

■ Bluetooth MODE



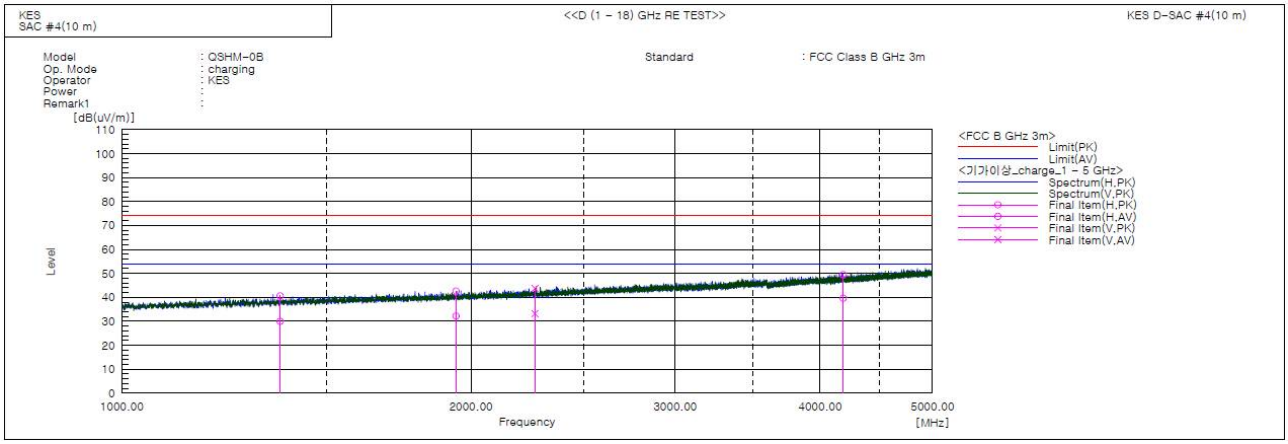
Final Result

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	37.881	V	48.8	-24.5	24.3	40.0	15.7	100.0	239.0	
2	54.250	H	40.9	-22.3	18.6	40.0	21.4	400.0	34.0	
3	74.256	V	49.5	-27.3	22.2	40.0	17.8	100.0	263.0	
4	78.743	H	46.2	-28.3	17.9	40.0	22.1	400.0	197.0	
5	85.533	H	45.1	-26.8	18.3	40.0	21.7	200.0	234.0	
6	103.114	V	40.2	-23.2	17.0	43.5	26.5	148.0	134.0	
7	149.310	V	47.4	-26.8	20.6	43.5	22.9	100.0	239.0	
8	152.705	V	45.6	-26.7	18.9	43.5	24.6	400.0	225.0	
9	167.498	V	41.8	-25.5	16.3	43.5	27.2	100.0	311.0	
10	192.233	H	42.3	-23.6	18.7	43.5	24.8	200.0	270.0	
11	229.456	H	43.0	-21.4	21.6	46.0	24.4	209.0	230.0	
12	258.556	H	40.6	-21.0	19.6	46.0	26.4	256.0	234.0	

♦ 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

Radiated Electric Field Emissions(Above 1 ㎓)

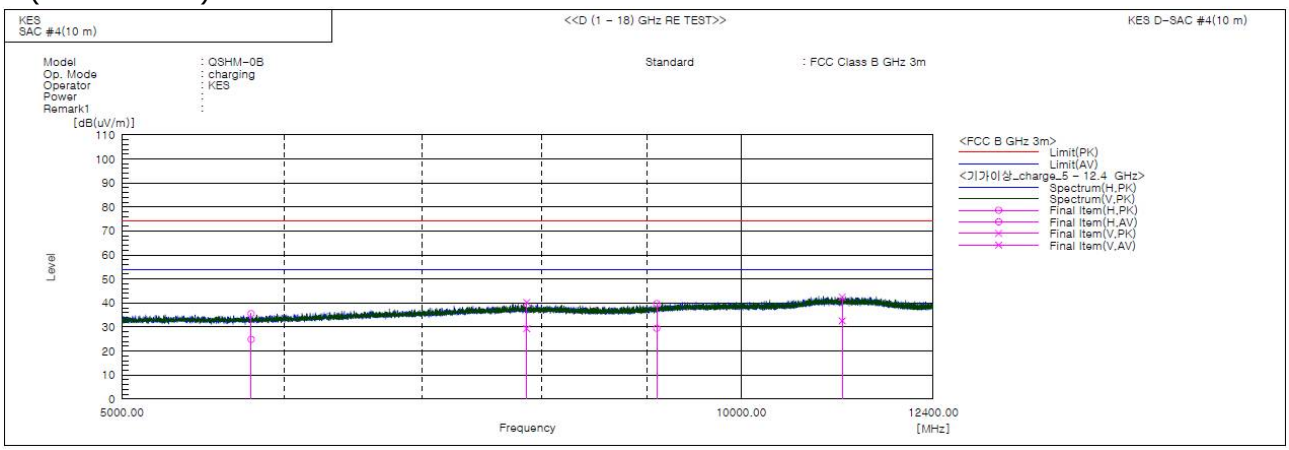
■ Charging MODE – (1 ~ 5 ㎓)



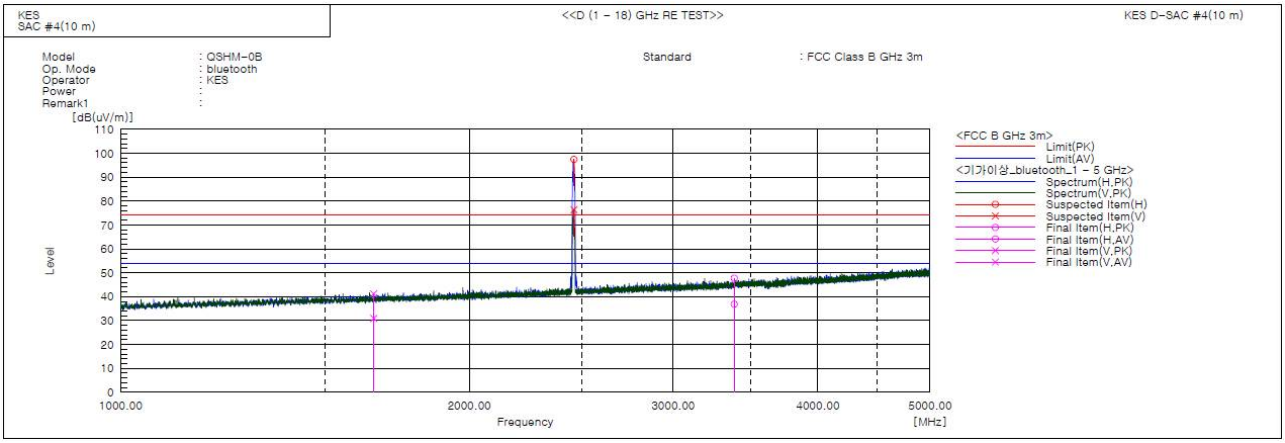
Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Height [cm]	Angle [deg]	Remark
1	1369.390	H	44.4	-3.6	40.7	74.0	54.0	33.3	100.0	183.0	
2	1941.765	H	43.3	-0.7	42.6	74.0	54.0	31.4	100.0	57.0	
3	2270.685	V	42.9	0.9	43.8	74.0	54.0	30.2	100.0	51.0	
4	4187.555	H	41.3	8.3	49.5	74.0	54.0	24.5	100.0	290.0	

– (5 ~ 12.4 ㎓)



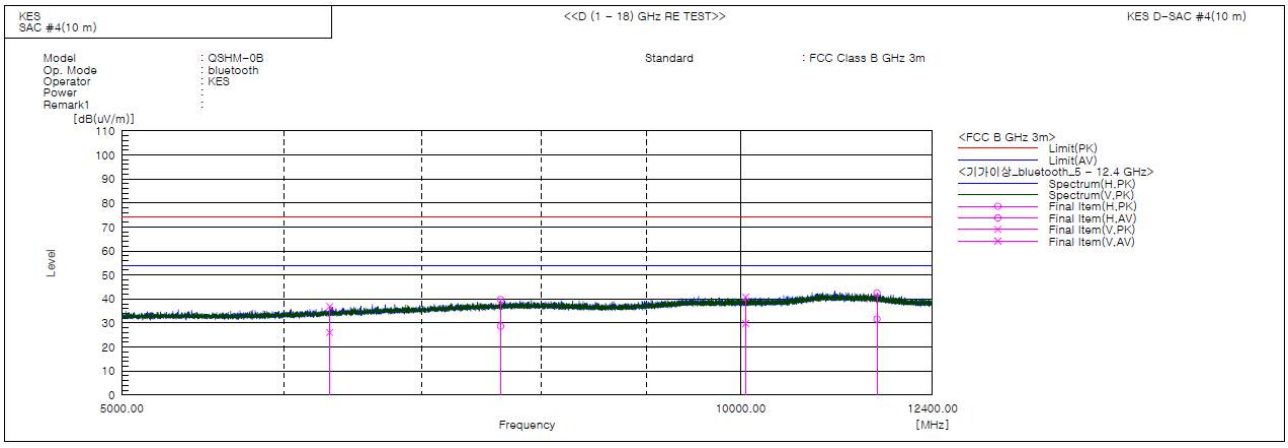
■ Bluetooth MODE – (1 ~ 5 ㎓)



Final Result

No.	Frequency [MHz]	(P)	Reading PK [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Height [cm]	Angle [deg]	Remark
1	1653.955	V	43.1	-2.0	41.2	74.0	54.0	32.8	100.0	355.0	
2	3387.830	H	42.6	5.0	47.7	74.0	54.0	26.3	100.0	213.0	
3	2463.000	H	--------	1.8	--------	74.0	54.0	--------	100.0	198.0	
4	2463.000	V	--------	1.8	--------	74.0	54.0	--------	100.0	113.0	

– (5 ~ 12.4 ㎓)



♦ 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 - Preamp Factor), Margin: Margin value

* Exclusion Band : 2.4 ㎓