KOSTEC Co., Ltd.
Http:// www.kosteclab.com

Head office & Test Lab: 180-254, Annyeong-dong,
Hwaseong-si, Gyeonggi-do, South korea 445-380
Tel: +82-31-222-4251 / Fax: +82-31-222-4252
www.kosteclab.com kostec@kosteclab.com

TEST REPORT

Report No: KST-FCR-130004

Applicant	Name	Dogtra Co., Ltd.
	Address	#715-2(146BL-3L) Gojan-dong, Namdong-gu, Incheon, Korea
Manufacturer	Name	Dogtra Co., Ltd.
	Address	#715-2(146BL-3L) Gojan-dong, Namdong-gu, Incheon, Korea
Equipment	Name	DOG TRAINING DEVICE
	Model No	CLiQ
	Brand	None
	FCC ID	SWN-CLIQ
Test Standard	FCC CFR 47, Part 15. Subpart C-15.231	
Test Date(s)	2013. 04. 17 ~ 2013. 04. 18	
Issue Date	2013. 04. 19	
Test Result	Compliance	

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 63.4-2003.

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.

180-254, Annyeong-dong, Hwaseong-si, Gyeonggi-do, South 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 C63.4-2003.

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

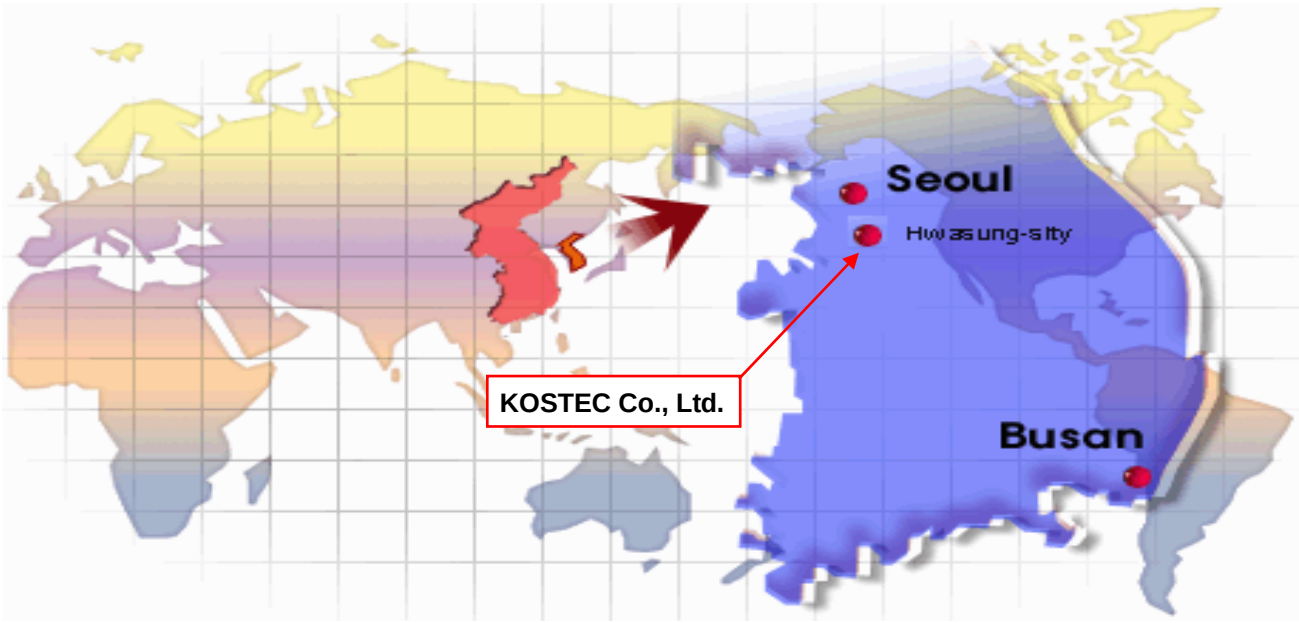
KOLAS(Korea Laboratory Accreditation Scheme) Number : 232

FCC Registration Number(FRN) : 525762

VCCI Registration Number : R-1657 / C –1763

IC Registration Site Number : 8305A-1

1.2 Location



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2. EQUIPMENT DESCRIPTION

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

1) Equipment Name	DOG TRAINING DEVICE
2) Model No	CLiQ
3) Brand Name	None
4) Usage	device for dog using 433.92 ㎒
5) Serial Number	Proto type
6) ITU emission Code	Not required (because it is unlicensed devices)
7) Oscillation Type	X-tal
8) Clock frequency	8 ㎒, 13.56 ㎒
9) Modulation type	ASK
10) Fundamental Field Strength	80.83 ㏈㎶/m @ 3 meter**
11) Operated Frequency	433.92 ㎒
12) Channel Number	1 ea
13) Communication Type	Half duplex
15) Final Amplifier	Q2
16) Operation temperature	- 20℃~ + 55 ℃
17) Power Source	Lithium cell coin (CR2032), DC 3 V x 2 EA
18) Antenna Description	Helical antenna fixed in PCB, Length: 3.6 ㎝, Max gain: 0 ㏈i
19) FCC ID	SWN-CLIQ
** it is maximum transmitter carrier out levels Field strength(detector: AV)	

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3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

The Equipment Under Test (EUT) contains the following capabilities: This equipment is Portable Remote Controlled Dog Training Collars using 433.92 ㎒. The detailed explanation is refer as user manual.

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark
-	-	-	-	-
-	-	-	-	-

3.3 Product Modification

N/A

3.4 Operating Mode

* Constantly transmitting with a modulated carrier at maximum power.

3.5 Test Setup of EUT

The measurements were taken in continuous transmit mode.

Please refer as Appendix1. Test set-up photos

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3.6 Used Test Equipment List

No.	Instrument	Model	Serial No.	Manufacturer	Due to Cal. Date	Used
1	Tem & Hum Chamber	EY-101	90E14260	TABAI ESPEC	2013.10.05	☒
2	Spectrum Analyzer	8563E	3846A10662	Agilent Technology	2014.01.11	☒
3	Spectrum Analyzer	FSP	100083	Rohde & Schwarz	2014.02.28	☒
4	Vector signal Analyzer	89441A	3416A02620	Agilent Technology	2013.05.18	☐
5	Radio communication Analyzer	MT8815A	6200429622	ANRITSU	2014.02.28	☐
6	CDMA Mobile Station Test Set	E8285A	US40081298	Agilent Technology	2014.02.28	☐
7	Test Receiver	ESPI3	100109	Rohde & Schwarz	2014.02.28	☐
8	EMI Test receiver	ESCI7	100823	Rohde & Schwarz	2014.02.15	☒
9	Modulation analyzer	8901A	3538A07071	Agilent Technology	2013.05.18	☐
10	Audio analyzer	8903B	3514A16919	Agilent Technology	2013.05.18	☐
11	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2013.05.18	☐
12	RF Power Sensor	ECP-E18A	US37181768	Agilent Technology	2013.05.18	☐
13	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2013.05.18	☐
14	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2013.10.05	☐
15	Multi meter	DM-313	S60901832	LG Precision Co.,Ltd.	2013.05.18	☐
16	Digital Signal Generator	E4436B	US39260458	H.P	2013.05.18	☐
17	Digital Signal Generator	E4438C	MY42083133	Agilent Technology	2013.10.05	☐
18	Signal Generator	SMT-06	1039.2000.06	Rohde & Schwarz	2014.02.28	☐
19	Tracking CW Signal Source	85645A	070521-A1	H.P	2013.05.18	☐
20	Ultra broadband Antenna	HL562	100075	Rohde & Schwarz	2014.04.13	☐
21	Ultra broadband Antenna	HL562	100076	Rohde & Schwarz	2014.12.10	☒
22	Dipole Antenna	HZ-12	100005	Rohde & Schwarz	2014.04.19	☐
23	Dipole Antenna	HZ-13	100007	Rohde & Schwarz	2014.04.19	☐
24	Horn Antenna	3115	2996	EMCO	2014.07.04	☒
25	Horn Antenna	3115	9605-4834	EMCO	2014.05.15	☐
26	Loop Antenna	6502	9203-0493	EMCO	2013.06.03	☒
27	AMPLIFIER	TK-PA6S	12009	TESTEK	2013.05.18	☒
28	Dummy Load	8173	3780	Bird Electronic	2013.05.18	☐
29	Attenuator	8498A	3318A09485	H.P	2013.05.18	☐
30	Attenuator	50FH-030-500	1404109433	JEW Industries Inc.	2013.05.18	☐
31	Attenuator	UFA-20NPJ-20	IF836	TAMAGAWA Electronic	2013.05.18	☐
32	Band rejection filter	3TNF-0006	26	Dover Tech	2013.05.18	☐
33	Band rejection filter	3TNF-0007	311	Dover Tech	2013.05.18	☐
34	Band rejection filter	3TNF-0008	317	Dover Tech	2013.05.18	☐
35	High pass filter	WHJS1100-10EF	1	Wainwright Instrument Gmbh.	2013.05.18	☐
36	High pass filter	WHJS3000-10EF	1	Wainwright Instrument Gmbh.	2013.05.18	☐
37	Directional coupler	779D	07271	H.P	2013.05.18	☐
38	3 Way power divider	KPDSU3W	00070365	KMW	2014.02.28	☐
39	SLIDAC	None	0207-4	Myoung-Sung Electronic Co., Ltd.	2013.05.18	☐
40	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2013.05.18	☐
41	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2013.05.18	☐
42	DC Power supply	E3610A	KR24104505	Agilent Technology	2013.05.18	☐
43	Thermo Hygrometer	PC-7800W	None	SATO	2013.10.06	☒
44	HYGRO-Thermograph	NSII-Q	1611545	SATO	2013.10.06	☒
45	Barometer	7612	81134	SATO	2014.01.15	☒

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4. SUMMARY TEST RESULTS

Description of Test	FCC Rule	Reference Clause	Used	Test Result
20 dB Bandwidth	Part15.231(c)	Clause 5.1	☒	Compliance
Deactivate	Part15.231(1)of (a)	Clause 5.2	☒	Compliance
Field strength of radiated emissions	Part15.231(b)	Clause 5.3	☒	Compliance
Antenna Requirements	Part15.203	Clause 5.4	☒	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.				

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5. MEASUREMENT RESULTS

5.1 20 dB bandwidth

5.1.1 Standard Applicable [FCC §15.231(c)]

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70 ㎒ and below 900 ㎒. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.1.2 Test Environment conditions

• Ambient temperature : 19 ℃,
• Relative Humidity : 46 % R.H.

5.1.3 Measurement Procedure

With the EUT's antenna attached, the EUT's 20 dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

The spectrum analyzer is set to the as follows :

• Span : approximately 2 or 3 times of the bandwidth
• RBW : 1 ㎑ (≥ 1% of the of the emission bandwidth)
• VBW : 3 ㎑ (≥ RBW)
• Sweep : auto
• Detector function : PEAK
• Trace : max hold

5.1.4 Test setup

Please refer as Clause 3.5

5.1.5 Measurement Result

Operating frequency (㎒)	20 dB Bandwidth (㎑)	Limit (㎒)**	Result
433.92	6.10	1.084	Compliance

** The limit value formula is as follows ;

Operating frequency x 0.25 % = 433.92 x 0.0025 = 1.084 ㎒

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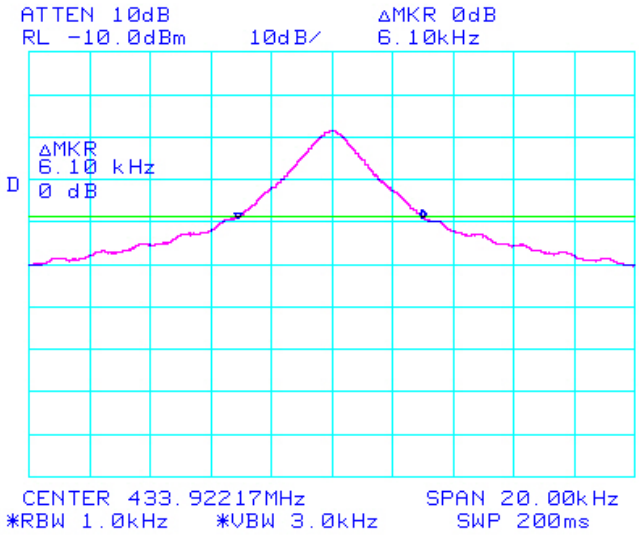
5.1.6 Test Plot



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5.2 Deactivate

5.2.1 Standard Applicable [FCC §15.231(a)(1)]

Per 15.231(a)(1), A manually operated Transmitter shall employ a switch that will automatically deactivate the Transmitter within not more than 5 seconds of being released.

5.2.2 Test Environment conditions

• Ambient temperature : 19 ℃
• Relative Humidity : 46 % R.H.

5.2.3 Measurement Procedure

With the EUT's antenna attached, the EUT's power was received by the test antenna which was connected to the spectrum analyzer with the center frequencies set to the EUT's operation frequency.

The spectrum analyzer is set to the as follows :

• Span : Zero (time domain state)
• RBW : 1 ㎒
• VBW : 1 ㎒ (≥ RBW)
• Sweep : 5 s
• Detector function : PEAK
• Trace : max hold

5.2.4 Test setup

Please refer as Clause 3.5

5.2.5 Measurement Result

Operating frequency (㎒)	Total Tx time (s)	Limit (s)**	Result
433.92	4.0083	≤ 5 s	Compliance
Note : This transmitter is activated via two buttons. Transmission packets are sent by the device upon valid activation. These packets are 56.17 ㎳ in length. After 4 s, the device goes into deactivate condition and will not transmit again even if the button on the device is being pressed.			

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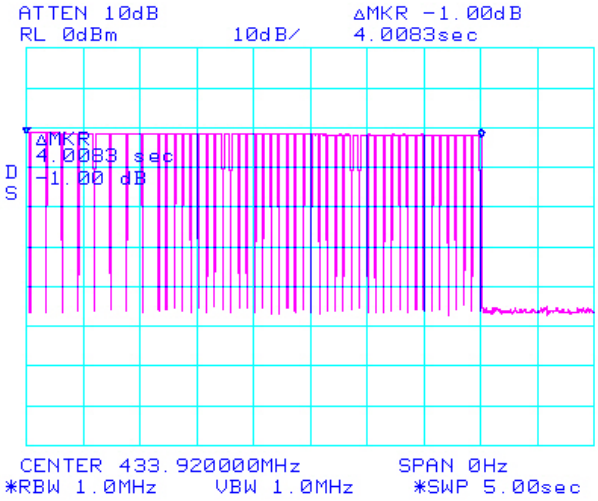
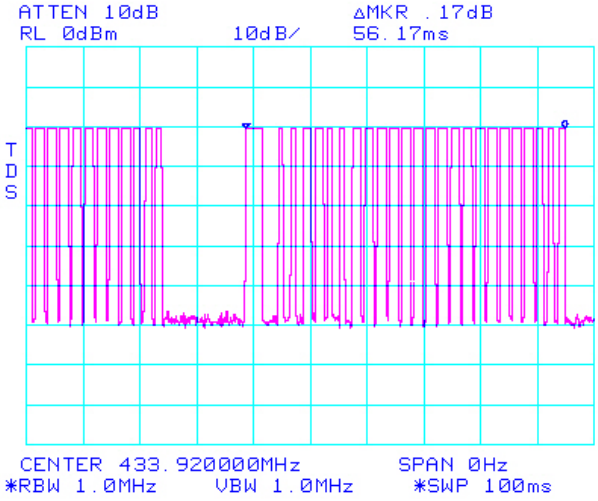
5.2.6 Test Plot

▣ Total TX time



▣ Packet Length



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5.3 Field strength of radiated emissions

5.3.1 Standard Applicable [FCC §15.231 (b)]

The field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (㎒)	Field strength of Fundamental (microvolts /m)	Field strength of spurious emissions (microvolts /m)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 **	125 to 375 **
174-260	3,750	375
260-470	3,750 to 12,500 **	375 to 1 250 **
Above 470	12,500	1 250
** Linear interpolations		

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

§15.209. limits for radiated emissions measurements

Frequency Band	Limit [㎶/m]	Limit [㏈㎶/m]	Measurement distance (meter)	Detector
0.009 – 0.490	2 400/F (㎑)	-	300	
0.490 – 1.705	2 4000/F (㎑)	-	30	
1.705 – 30.0	30	29.54	30	Quasi peak
30 - 88	100 **	40.0	3	Quasi peak
88 - 216	150 **	43.5	3	Quasi peak
216 - 960	200 **	46.0	3	Quasi peak
Above 960	500	54.0	3	Peak & Average
** fundamental emissions from intentional radiators operation under this Section shall not be located in the frequency bands 54-72 ㎒, 76-88 ㎒, 174-216 ㎒, or 470-806 ㎒. However, operation within these Frequency bands is permitted under other sections of this Part Section 15.231 and 15.241				

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§15.205. [Table 1] : Restrict Band of Operation

Only spurious emissions are permitted in any of the frequency bands listed below ;

[㎒]	[㎒]	[㎒]	[㎓]
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505**	16.69475 - 16.69525	608 -614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 -1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.
4.17725 - 4.17775	37.5 -38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 -6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 -6.26825	108 - 121.94	1718.8 -1722.2	13.25 - 13.
6.31175 -6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.4142 5 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	Above 38.6

** Until February 1, 1999, this restricted band shall be 0.490-0.510

5.3.2 Test Environment conditions

• Ambient temperature : (17 – 20) ℃,
• Relative Humidity : (47 – 48) % 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 ㏈ 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 ㎓, and if the below 1 ㎓, broad-band antenna and Loop antenna were used for below 30 ㎒ 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 measuring detector type of the measurement receiver is based on average value of measurement instrumentation employing a CISPR Quasi Peak detector according to required standard and for above 1 ㎓, set the spectrum analyzer on a average and peak detector for the provisions in §15.35 and investigated frequency range is set the spectrum analyzer according to §15.33.

⑤ The fundamental frequency at which a relevant radiated signal component is detected, the test antenna

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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:
  Result(dBμV/m) = Reading(dBμV) + Antenna factor(dB/m)+ CL(dB) + other applicable factor (dB)
- According to §15.33 (a)(1), Frequency range of radiated measurement is performed the tenth harmonic.

※ if necessary, additionally receiver is adopted high-pass filter and preamp because lower radiated signal

※ The transmitter radiated spectrum was investigated from 9 ㎑ to 10th harmonic and the worst-case emissions were reported.

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

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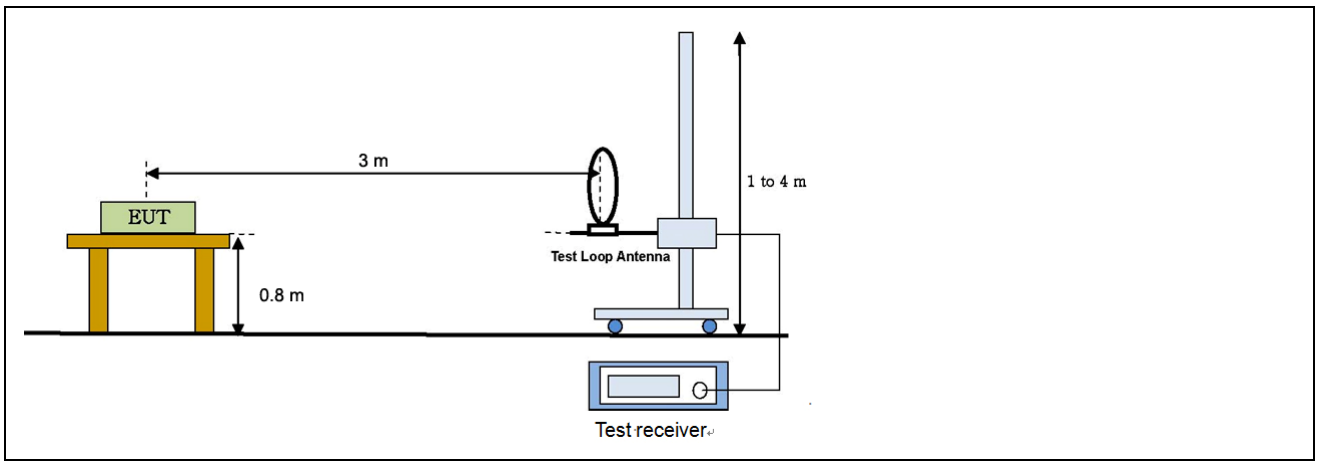
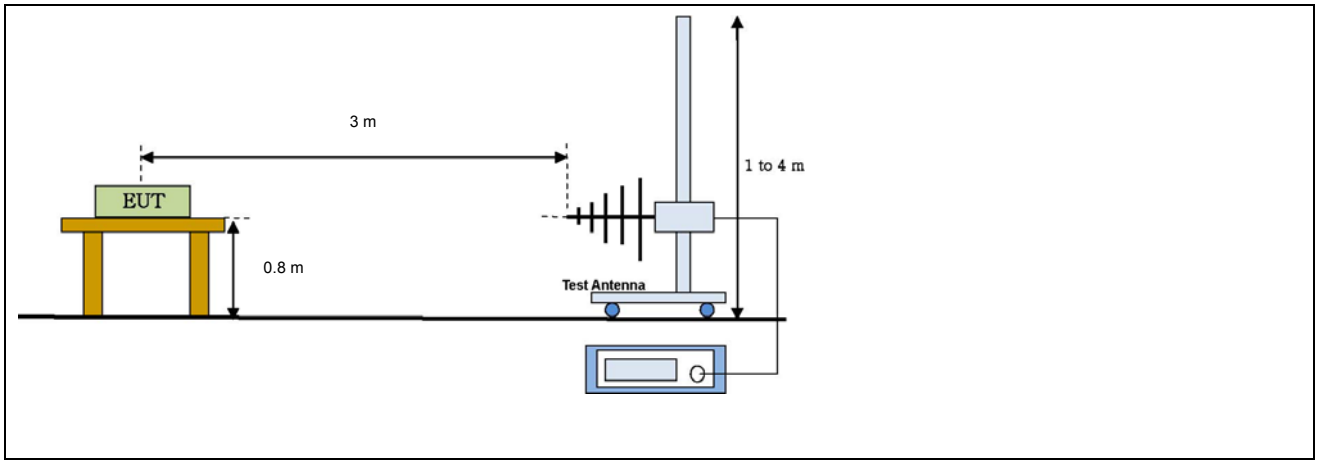
5.3.5 Test Configuration

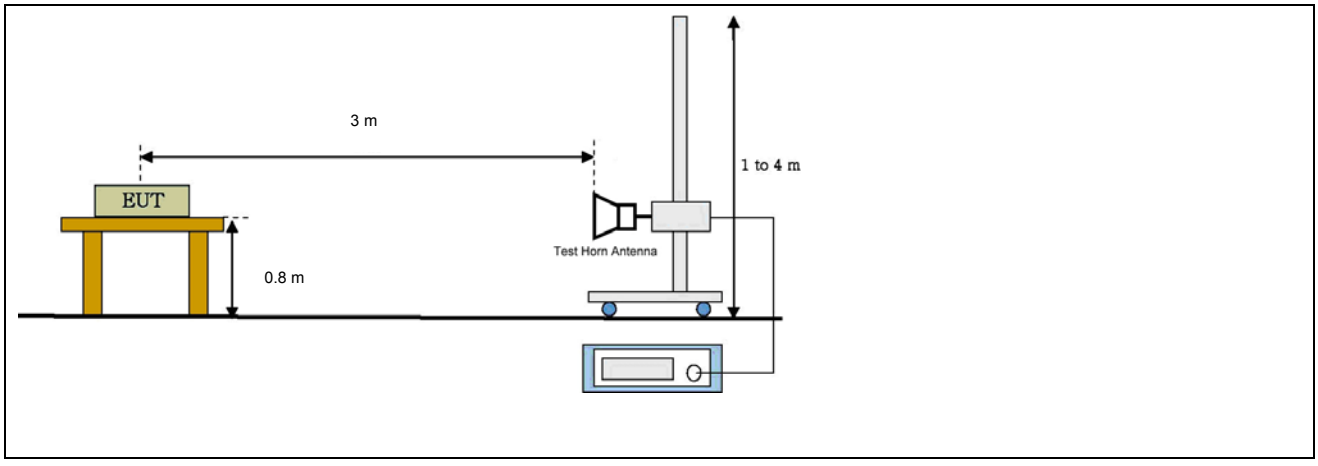
Radiated emission setup, Below 30 MHz



Radiated emission setup, 30 MHz - 1 000 MHz



Radiated emission setup, Above 1 GHz



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5.3.6 Measurement Result

▣ Field strength of fundamental emissions

Freq. (㎒)	Reading (㏈㎶/m)	Table (Deg)	Antenna			CL (㏈)	Pre AMP (㏈)	Meas Result (㏈㎶/m)	Limit* (㏈㎶/m)	Mgn (㏈)	Result	Detector
			H (m)	Pol. (H/V)	Fctr. (㏈/m)							
433.92	66.68	120	1.0	V	15.05	2.77	-	84.50	100.83	16.33	Compliance	PK
433.92	60.09	120	1.0	V	15.05	2.77	-	77.91	80.83	2.92	Compliance	AV

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

* The limit value formula is as follows ;
Linear interpolation with frequency in ㎒:
For the band 260 - 470 ㎒, ㎶/m at 3meter = 41.6667(F) – 7083.333
This device frequency is 433.92 ㎒ = 41.6667(433.92) – 7083.333 = 10996.6812 ㎶/m (80.83 ㏈㎶/m)

▣ Field strength of spurious emissions

Below 1 ㎓

Freq. (㎒)	Reading (㏈㎶/m)	Table (Deg)	Antenna			CL (㏈)	Pre AMP (㏈)	Meas Result (㏈㎶/m)	Limit (㏈㎶/m)	Mgn (㏈)	Result	Detector
			H (m)	Pol. (H/V)	Fctr. (㏈/m)							
867.84	24.84	120	1.0	V	21.18	4.09	-	50.10	80.83	30.73	Compliance	PK
867.84	14.01	120	1.0	V	21.18	4.09	-	39.27	60.83	21.55	Compliance	AV
Below 867.84 ㎒ Nil emission												

Above 1 ㎓

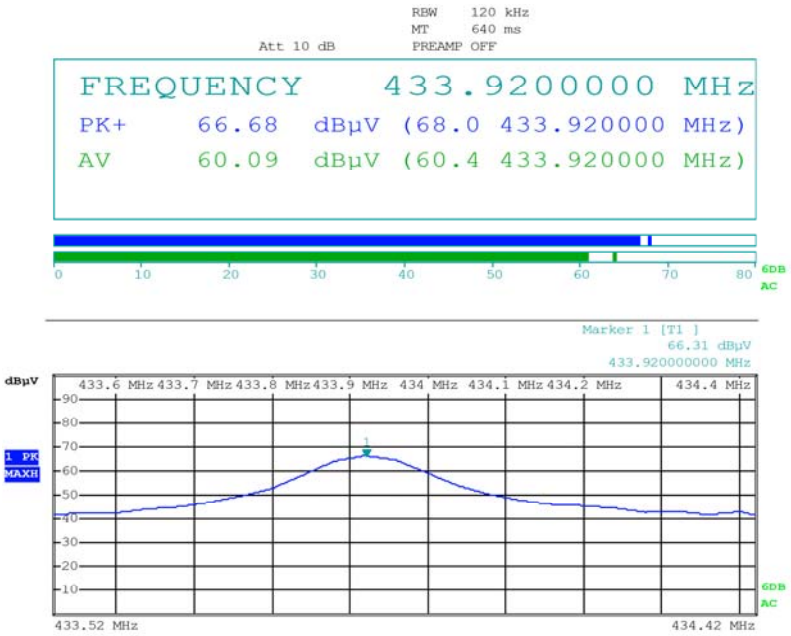
Freq. (㎒)	Reading (㏈㎶/m)	Table (Deg)	Antenna			CL+ Pre AMP (㏈)	Meas Result (㏈㎶/m)	Limit (㏈㎶/m)	Mgn (㏈)	Result	Detector
			H (m)	Pol. (H/V)	Fctr. (㏈/m)						
2440.00	16.76	180	1.0	H	27.91	2.91	47.57	80.83	33.25	Compliance	PK
2440.00	5.51	180	1.0	H	27.91	2.91	36.32	60.83	24.50	Compliance	AV
Above 2.440 ㎓ Nil emission											

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

Head office & Test Lab: 180-254, Annyeong-dong,
Hwaseong-si, Gyeonggi-do, South korea 445-380
Tel: +82-31-222-4251 / Fax: +82-31-222-4252
www.kosteclab.com kostec@kosteclab.com

5.3.7 Test plot

▣ Field strength of fundamental emissions



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Head office & Test Lab: 180-254, Annyeong-dong,
Hwaseong-si, Gyeonggi-do, South korea 445-380
Tel: +82-31-222-4251 / Fax: +82-31-222-4252
www.kosteclab.com kostec@kosteclab.com

5.4 Antenna requirement

5.4.1 Standard applicable [FCC §15.203]

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by responsible party shall be used with the device.

The use of a permanently attached antenna or of an antenna that user a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The manufacturer may design the unit So that broken antenna can be replaced by the user, but the Use of a standard antenna jack or electrical connector is prohibited.

The Helical antenna is located on PCB of EUT and fixed to the intentional radiator. So The DOG TRAINING DEVICE FCC ID: SWN-CLIQ complies with the requirement of §15.203.

5.4.2 Antenna Specification

Type	Connector type	Length	Gain	Results
Helical antenna	Fixed	3.6 ㎝	0 dBi	Compliance