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▪ DXX NFC

TEST REPORT

Report No: KST-FCR-140009

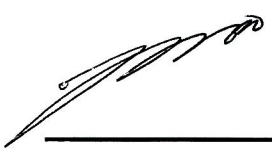
Applicant	Name	CHANG SHIN INFOTEL CO.,LTD
	Address	3F, Yonhap News Bldg, 64, Deadeok-Daero, 168beon-gil, seo-gu, Deajeon, South Korea
Manufacturer	Name	CHANG SHIN INFOTEL CO.,LTD
	Address	3F, Yonhap News Bldg, 64, Deadeok-Daero, 168beon-gil, seo-gu, Deajeon, South Korea
Equipment	Name	Access Controlled Security System with zigbee&RFID
	Model No	SG-3000
	Brand	huinu
	FCC ID	2ABZV-SG-3000
Test Standard	FCC CFR 47, Part 15. Subpart C-15.225	
Test Date(s)	2014. 12. 03 ~ 2014. 12. 04	
Issue Date	2014. 12. 05	
Test Result	Compliance	
Note	-	

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 63.10-2009.

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

Signature 

Approved by Gyeong Hyeon, Park

Signature 

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1. GENERAL INFORMATION

1.1 Test Facility

Test laboratory and address

KOSTEC Co., Ltd.

128(175-20,Annyeong-dong)406-gil sejaro, Hwaseong-si Gyeonggi-do, 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 C 63.10-2009.

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

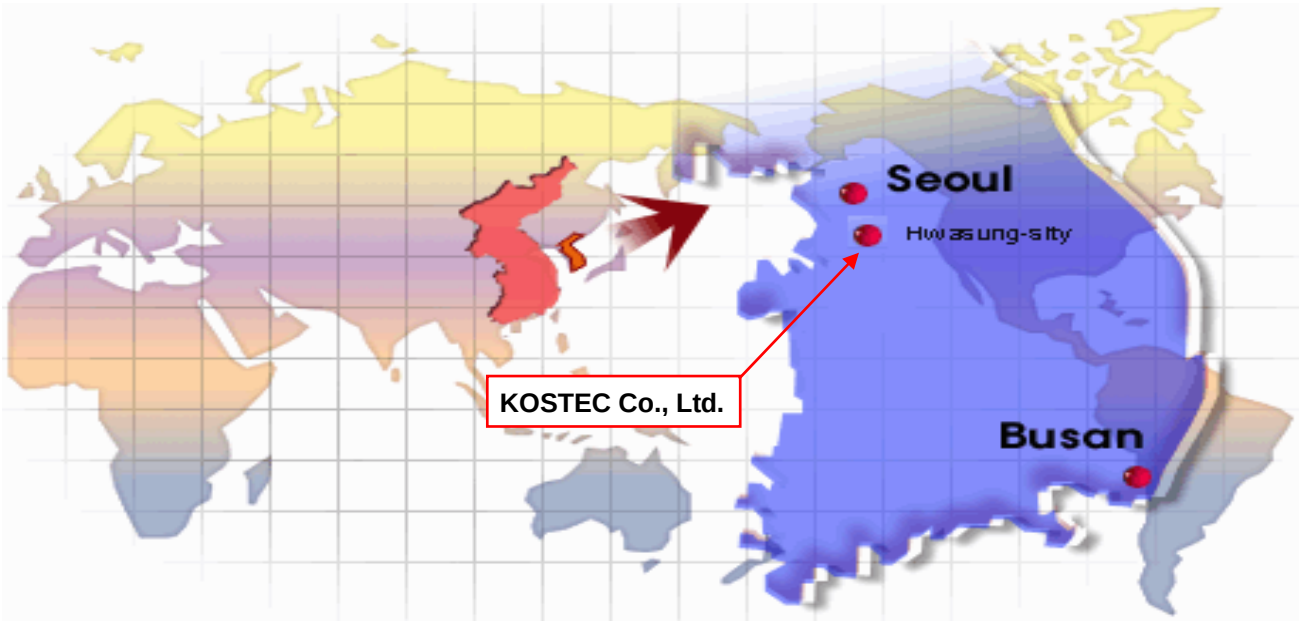
KOLAS(Korea Laboratory Accreditation Scheme) Number : 232

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	Access Controlled Security System with zigbee&RFID
2) Model No	SG-3000
3) Brand Name	huinu
4) Usage	Access Controlled Security System with zigbee&RFID
5) Serial Number	Proto type
6) ITU emission Code	Not required (because it is unlicensed devices)
7) Oscillation Type	X-tal
8) Data connection Type	RFID (Radio Frequency Identification)
9) Modulation type	ASK
10) Field Strength	7.87 dBμV/m @ 30 meter**
11) Operated Frequency	13.560 MHz
12) Channel Number	1 ea
13) Communication Type	Half duplex
15) Final Amplifier	U1201
16) Operation temperature	- 20℃~ + 55 ℃
17) Power Source	AC/DC Adaptor, output: DC 12 V
18) Antenna Description	PCB Antenna
19) FCC ID	2ABZV-SG-3000

** it is maximum peak power in band

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3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

This equipment is a wireless authentication key that you wirelessly communicate with each other in 2.4GHz zigbee. It is used as a key of access control systems as the product which satisfies users' convenience and security. As it doesn't require users' authentication behaviors like RF-ID or finer scan, but is automatically authenticated, it is the next generation access device that convenience was drastically improved.

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark

3.3 Product Modification

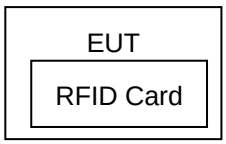
N/A

3.4 Operating Mode

* Constantly transmitting with a modulated carrier at maximum power.
* Radiated emissions tests were performed with all unused ports terminated.

3.5 Test Setup of EUT

The measurements were taken in continuous transmit / receive mode on condition that EUT was read a RFID card.



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3.6 Used Test Equipment List

No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
1	T & H Chamber	EY-101	90E14260	TABAI ESPEC	2015.09.19	1 year	☒
2	Constant switch Tester	DS-COT	None	Dong sung Ele.	N/A	N/A	☐
3	Vibration Tester	70UA	L90016	IDEX Co.,Ltd	N/A	N/A	☐
4	Vibration Meter	VM-6360	N225098	LANDTEK	2015.04.04	18 month	☐
5	Falling Tester	SWD-8000	None	Sinwoo	N/A	N/A	☐
6	Spectrum Analyzer	8563E	3846A10662	Agilent Technology	2015.02.07	1 year	☐
7	Spectrum Analyzer	8593E	3710A02859	Agilent Technology	2015.02.07	1 year	☐
8	Spectrum Analyzer	FSV30	20-353063	Rohde& Schwarz	2015.02.07	1 year	☒
9	EMI Test Receiver	ESCI7	100823	Rohde& Schwarz	2015.02.05	1 year	☒
10	EMI Test Receiver	ESI	834000/002	Rohde& Schwarz	2015.02.05	1 year	☒
11	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2015.02.07	1 year	☐
12	Network Analyzer	8753ES	US39172348	AGILENT	2015.09.18	1 year	☐
13	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2015.02.07	1 year	☐
14	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2015.02.07	1 year	☐
15	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2015.02.07	1 year	☐
16	Modulation Analyzer	8901A	3538A07071	Agilent Technology	2015.02.07	1 year	☐
17	Audio Analyzer	8903B	3514A16919	Agilent Technology	2015.02.07	1 year	☐
18	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2015.02.07	1 year	☐
19	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2015.09.17	1 year	☐
20	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2015.02.07	1 year	☐
21	ESG Vector Signal Generator	E4438C	MY42083133	Agilent Technology	2015.09.17	1 year	☐
22	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2015.01.21	1 year	☐
23	Tracking Source	85645A	070521-A1	Agilent Technology	2015.02.07	1 year	☐
24	Signal Generator	SML03	100692	Rohde& Schwarz	2015.02.07	1 year	☐
25	SLIDAC	None	0207-4	Myoung sung Ele.	2015.02.07	1 year	☐
26	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2015.02.07	1 year	☐
27	DC Power supply	6038A	3440A12674	Agilent Technology	2015.02.07	1 year	☐
28	DC Power supply	E3610A	KR24104505	Agilent Technology	2015.02.07	1 year	☒
29	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2015.02.07	1 year	☐
30	DC Power Supply	SM 3004-D	114701000117	DELTA ELEKTRONIKA	2015.02.07	1 year	☐
31	Dummy Load	8173	3780	Bird Electronic Co., Corp	2015.02.07	1 year	☐
32	Attenuator	50FH-030-500	140410 9433	JEW Idustries Inc.	2015.02.07	1 year	☐
33	Attenuator	765-20	9703	Narda	2015.09.17	1 year	☐
34	Attenuator	8498A	3318A09485	HP	2015.02.07	1 year	☐
35	Step Attenuator	8494B	3308A32809	HP	2015.02.07	1 year	☐
36	Step Attenuator	8495D	3308A01464	HP	2015.02.07	1 year	☐
37	Power divider	11636B	51212	HP	2015.09.17	1 year	☐
38	3Way Power divider	KPDSU3W	00070365	KMW	2015.02.07	1 year	☐
39	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2015.02.07	1 year	☐
40	White noise audio filter	ST31EQ	101902	SoundTech	2015.09.17	1 year	☐
41	Dual directional coupler	778D	17693	HEWLETT PACKARD	2015.02.07	1 year	☐
42	Dual directional coupler	772D	2839A00924	HEWLETT PACKARD	2015.02.07	1 year	☐
43	Band rejection filter	3TNF-0006	26	DOVER Tech	2015.02.07	1 year	☐
44	Band rejection filter	3TNF-0008	317	DOVER Tech	2015.02.07	1 year	☐
45	Band rejection filter	3TNF-0007	311	DOVER Tech	2015.02.07	1 year	☐
46	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2015.02.07	1 year	☐
47	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2015.02.07	1 year	☐
48	Radio Communication Alalyzer	MT8815A	6200429622	ANRITSU	2015.02.07	1 year	☐
49	CDMA Mobile Station Test Set	E8285A	US40081298	AGILENT	2015.02.07	1 year	☐
50	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2015.04.10	1 year	☐

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No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
51	RF Up/Down Converter	DCP-1780	980901003	CREDIX	2015.02.07	1 year	☐
52	DECT Test set	8923B	3829U00364	HP	2015.02.07	1 year	☐
53	DECT Test set	CMD60	840677/005	Rohde& Schwarz	2015.09.17	1 year	☐
54	Loop Antenna	6502	9203-0493	EMCO	2015.05.31	2 year	☒
55	Dipole Antenna	HZ-12	100005	Rohde & Schwarz	2016.07.01	2 year	☐
56	Dipole Antenna	HZ-13	100007	Rohde & Schwarz	2016.07.01	2 year	☐
57	BiconiLog Antenna	3142B	1745	EMCO	2016.06.16	2 year	☒
58	Horn Antenna	3115	9605-4834	EMCO	2016.06.16	2 year	☐
59	Horn Antenna	3115	2996	EMCO	2016.02.26	2 year	☐
60	Horn Antenna	BBHA9170	BBHA9170152	SCHWARZBECK	2015.05.27	2 year	☐
61	Signal Generator	SMT-06	100552	Rohde & Schwarz	2015.02.07	1 year	☐
62	HYGRO-Thermograph	NSII-Q	1611545	SATO	2015.09.22	1 year	☐
63	Barometer	7612	81134	SATO	2016.01.20	2 year	☐
64	Multi meter	DM-313	S60901832	LG Precision Co.,Ltd	2015.02.07	1 year	☐
65	Antenna Mast(OSA)	AT14	None	Daeil EMC	N/A	N/A	☐
66	Turn table(OSA)	None	None	Daeil EMC	N/A	N/A	☐
67	RF Amplifier(OSA)	8447D	2944A07881	AGILENT	2015.02.04	1 year	☐
68	Antenna Master(3)	AT13	None	AUDIX	N/A	N/A	☐
69	Turn Table(3)	None	None	AUDIX	N/A	N/A	☐
70	PREAMPLIFIER(3)	8449B	3008A02577	Agilent	2015.02.05	1 year	☐
71	Antenna Master(10)	MA4000-EP	None	inno systems GmbH	N/A	N/A	☒
72	Turn Table(10)	None	None	inno systems GmbH	N/A	N/A	☒
73	AMPLIFIER(10)	TK-PA6S	120009	TESTEK	2015.02.05	1 year	☒
74	Vernier Calipers	None	8280373	Mitutoyo	2015.09.18	1 year	☐

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4. SUMMARY TEST RESULTS

Description of Test	FCC Rule	Reference Clause	Used	Test Result
Carrier frequency tolerance	15.225(e)	Clause 5.1	☒	Compliance
Field strength of radiated emission	15.225(a) ~ (d)	Clause 5.2	☒	Compliance
AC Conducted emission	15.207	Clause 5.3	☒	Compliance
Antenna requirement	15.203, 15.247	Clause 5.4	☒	Compliance
20 dB bandwidth measurement	2.1049	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 Carrier Frequency tolerance

5.1.1 Standard Applicable [FCC §15.225(e)]

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency Over a temperature variation of - 20 degrees to + 50 degrees C at normal supply voltage, and for a variation In the primary supply from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

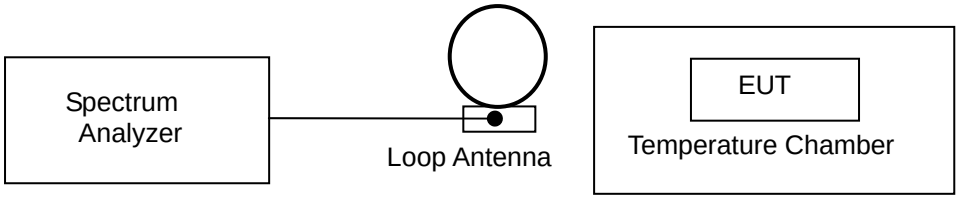
5.1.2 Test Environment conditions

- Ambient temperature : (20 – 21) ℃,
- Relative Humidity : (40 - 43) % R.H.

5.1.3 Measurement Procedure

Before measurements are made the equipment shall have reached thermal balance in the Test chamber period. and then it is normal operating for about 15 minutes after thermal balance has been reached. For tests at the extreme temperature, the equipment shall be left in the test chamber until thermal balance is attained, then the standby or receive condition for a period of a few minute after which the equipment shall meet the specified requirements. The test data sheet recorded measured value by frequency counter.

5.1.4 Test setup



5.1.5 Measurement Result

Frequency (13.56 ㎒)		Measured frequency [㎐]	Frequency Tolerance	
			%	㎐
T_{NOM} + 21 ℃	V_{NOM} 12.0 Vdc	13,560,692	0.0051	692
	V_{MIN} 10.2 Vdc	13,560,693	0.0051	693
	V_{MAX} 13.8 Vdc	13,560,690	0.0051	690
T_{MIN} - 20 ℃	V_{NOM} 12.0 Vdc	13,560,433	0.0032	433
T_{MAX} + 55 ℃	V_{NOM} 12.0 Vdc	13,560,710	0.0052	710
LIMIT		Within in (±) 0.01 % or (±) 1 356 ㎐		
Max. Tolerance		0.0052 %, (±)710㎐		
Result		Compliance		

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5.2 Field strength of radiated emissions

5.2.1 Standard Applicable [FCC §15.225 (a) ~ (d)]]

(a) The Field strength of any emissions within the band 13.553-13.567 ㎒ shall not exceed 15,848 ㎶/m at 30 meter
(b) Within the bands 13.410-13.553 ㎒ and 13.567-13.710 ㎒, the field strength of any emissions shall not exceed 334 micro volts/meter at 30 meter
(c) Within the bands 13.110-13.410 ㎒ and 13.710-14.010 ㎒, the field strength of any emissions shall not exceed 106 micro volts/meter at 30 meter
(d) The Field strength of any emissions appearing outside of the 13.110-14.010 ㎒ band shall not exceed The general radiated emission limits in §15.209
Above required standard (a ~ c) and (d) is brief describe table as follows

§ 15.225 [(a) ~(c)] : Limit for in-band field strength

Frequency Band (㎒)	Limit		Measurement distance (meter)
	(㎶/m)	(dB㎶/m)	
13.553 – 13.567	15,848	84.00	30
13.410 – 13.553 13.567 – 13.710	334	50.47	30
13.110 – 13.410 13.710 – 14.010	106	40.50	30

§15.209. limits for radiated emissions measurements

Frequency Band	Limit [㎶/m]	Limit [dB㎶/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

5.2.2 Test Environment conditions

• Ambient temperature : 21 ℃,
• Relative Humidity : (45 - 47) % R.H.

5.2.3 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 resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure(according ANSI C63.10:2009 clause 4.2.3.2.3 procedure for average measure). Both PK and AV level test, PK detector is used.

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

5.2.4 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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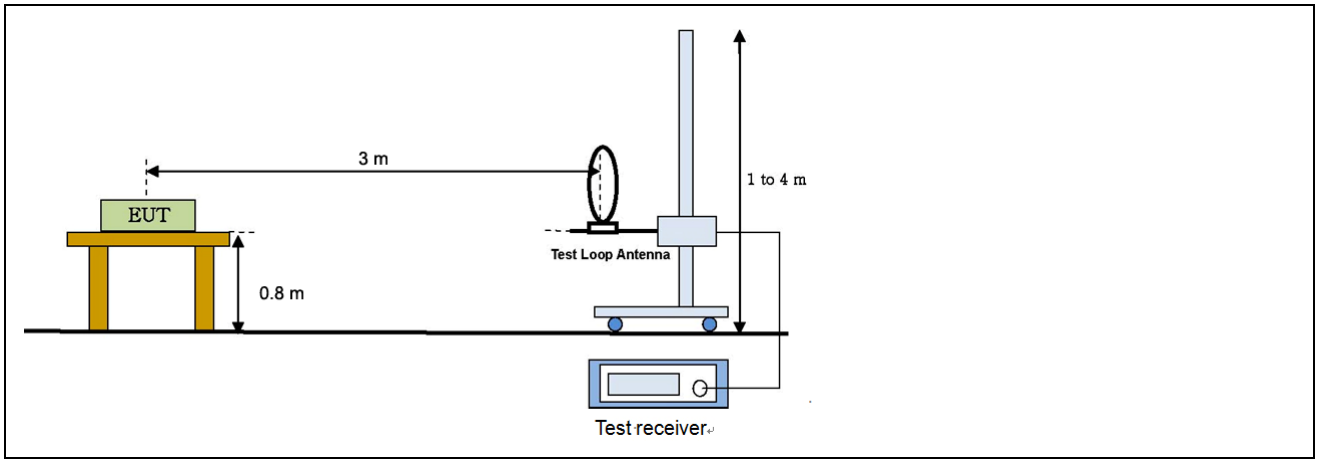
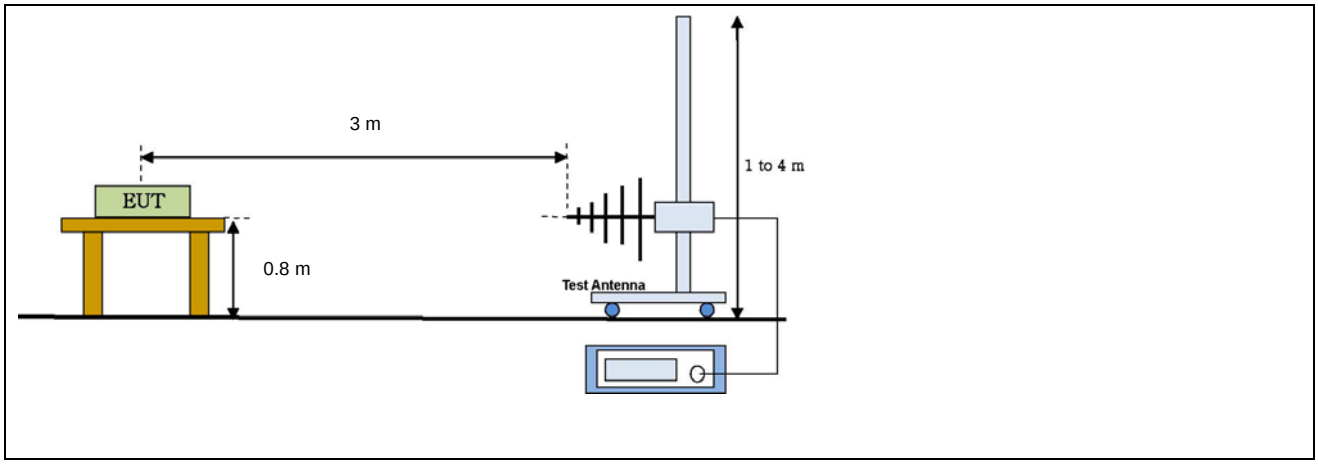
5.2.5 Test Configuration

Radiated emission setup, Below 30 MHz



Radiated emission setup, Below 1 000 MHz



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5.2.6 Measurement Result

▣ IN-BAND

Freq. (㎒)	Reading (dB㎶/m)	Table (Deg)	Pstn (axis)	Antenna			CL (dB)	Pre AMP (dB)	Distn factor (dB)	Meas Result (dB㎶/m)	Limit (dB㎶/m)	Mgn (dB)	Result
				Height (m)	Pol. (H/V)	Fctr. (dB/m)							
13.56*	38.47	130	Y	1.0	-	8.84	0.56	-	-40	7.87	84.00	76.13	Compliance
13.513	10.78	130	Y	1.0	-	8.84	0.56	-	-40	-19.82	50.47	70.29	Compliance
13.542	12.05	130	Y	1.0	-	8.84	0.56	-	-40	-18.55	50.47	69.02	Compliance
13.605	10.52	130	Y	1.0	-	8.84	0.56	-	-40	-20.08	50.47	70.55	Compliance
13.678	12.15	130	Y	1.0	-	8.84	0.56	-	-40	-18.45	50.47	68.92	Compliance

*It is fundamental frequency

Note1. above measured frequency have been done at 3 m distance and corrected according to required FCC 15.209. e)
∴Extrapolation distance factor : 40log(3/30) = -40 ㏈ If Measurement distance is 3 m and Mandatory requirement distance is 30 m at 30 ㎒ or less, extrapolation distance factor(㏈) is 40 / decade = 40 $\log_{10}^{(MRD/MD)}$
MRD is Mandatory requirement distance and MD is Measured distance

Note2. above measured frequencies is apply required standard FCC Part 15.225

Note3. All measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded.

Note4. All measurements were recorded using a quasi-peak detector.

Freq.(㎒) : Measurement frequency, Reading(dB㎶/m) : Indicated value for test receiver,
Table (Deg) : Directional degree of Turn table, Pstn(axis) : Location axis of EUT
Antenna (Height, Pol, Fctr) : Antenna Height, Polarization and Factor
Cbl(㏈) : Cable loss, Distn factor(㏈) : distance correction factor [40 ㏈/decade as per § 15.31f (2)]
Meas Result (dB㎶/m) :Reading(dB㎶/m)+ Antenna factor.(㏈/m)+ CL(㏈) + Distn factor(㏈)
Limit(dB㎶/m): Limit value specified with FCC Rule, Mgn(㏈) : FCC Limit (dB㎶/m) – Meas Result(dB㎶/m)

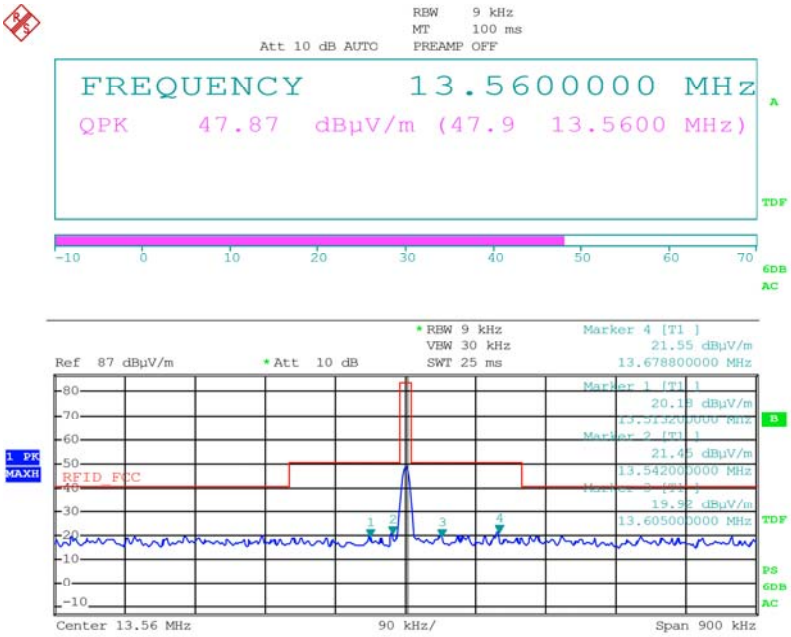
▣ OUT- BAND

Freq. (㎒)	Reading (dB㎶/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB㎶/m)	Limit (dB㎶/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
244.23	26.61	120	1.5	H	9.97	3.32	-	39.91	46.02	6.11	Compliance
289.00	24.53	130	1.5	H	11.40	3.65	-	39.58	46.02	6.44	Compliance
620.70	15.80	120	1.5	H	17.99	5.61	-	39.41	46.02	6.61	Compliance
881.40	13.97	120	1.5	H	21.33	6.86	-	42.17	46.02	3.85	Compliance

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

5.2.7 Test plot

▣ Fundamental frequency level & ≤30 ㎒ spectrum mask



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5.3 AC Power Conducted emissions

5.3.1 Standard Applicable [FCC §15.207(a)]

For intentional radiator that is designed to be connected to the public utility(AC)power line, the radio frequency. Voltage that is conducted back onto the AC power line on any frequencies hopping mode within the band 150 ㎑ to 30 ㎒ shall not exceed the limits in the following table, as measured using a 50 uH/50 ohms line Impedance stabilization network(LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

§15.207 limits for AC line conducted emissions;

Frequency of Emission(㎒)	Conducted Limit (㏈㎶)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

5.3.2 Test Environment conditions

• Ambient temperature : 22 ℃,
• Relative Humidity : (38 - 42) % R.H.

5.3.3 Measurement Procedure

The measurements were performed in a shielded room. EUT was placed on a non-metallic table Height of 0.4 m above the reference ground plane. They were folded back and forth forming a bundle 30 ㎝ to 40 ㎝ long and were hanged at a 40 ㎝ height to the ground plane.Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to Input power source.Both lines of power cord, live and neutral, were measured.

5.3.4 Used equipment

Equipment	Model No.	Serial No.	Manufacturer	Next cal date	Cal interval	Used
Test receiver	ESCS30	100111	Rohde & Schwarz	2015.02.05	1 year	●
LISN	ESH2-Z5	100044	R&S	2015.02.05	1 year	●
	ESH3-Z5	100147	R&S	2015.02.05	1 year	●

*Test Program: " ESXS-K1 V2.2"

Measurement uncertainty
Conducted Emission measurement: 3.5 ㏈ (CL: Approx 95%, *k*=2)

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5.3.5 Measurement Result

Line. Live

Kostec Co., Ltd. 3 Dec 2014 07:41

Conducted Emission

EUT: SG-3000
Manuf:
Op Cond: 120 V / 60 Hz
Operator: MIYOUNG.LEE
Test Spec: KN22
Comment: L

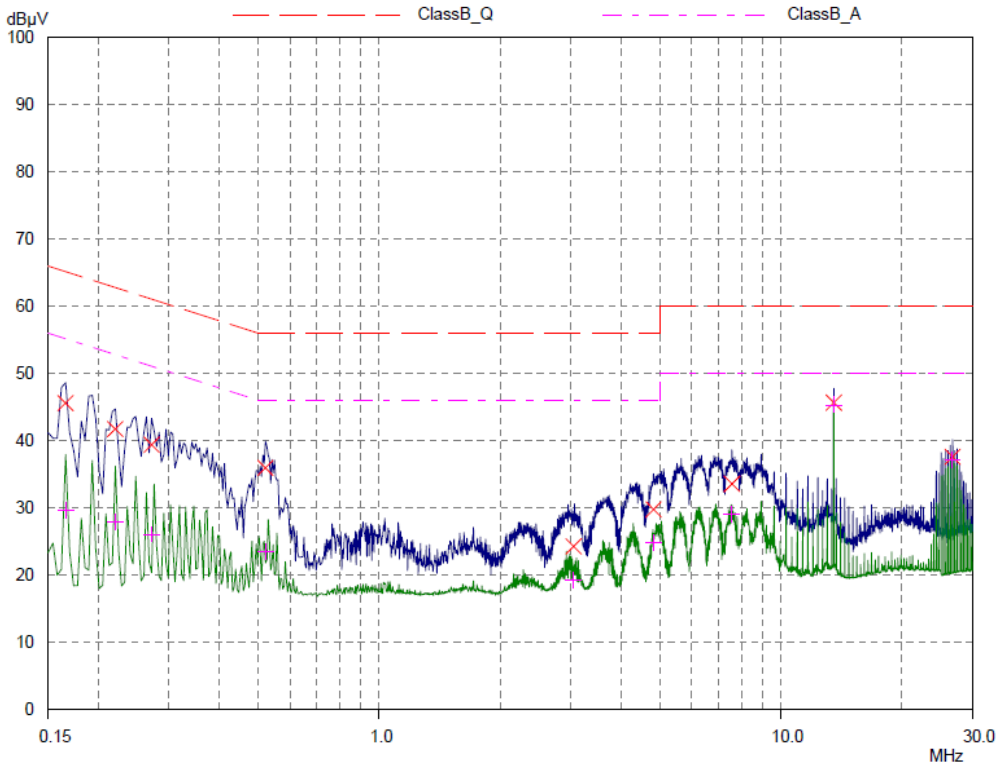
Result File: L(RFID).dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 50 dB



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Line. Live

Kostec Co., Ltd. 3 Dec 2014 07:41

Conducted Emission

EUT: SG-3000
Manuf:
Op Cond: 120 V / 60 Hz
Operator: MIYOUNG.LEE
Test Spec: KN22
Comment: L

Result File: L(RFID).dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 50 dB

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB
0.16562	45.57	65.18	19.61
0.22031	41.71	62.81	21.10
0.27109	39.38	61.08	21.70
0.52109	35.94	56.00	20.06
3.04843	24.24	56.00	31.76
4.82187	29.76	56.00	26.24
7.56015	33.55	60.00	26.45
13.56015	45.64	60.00	14.36
26.80234	37.57	60.00	22.43

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB
0.16562	29.64	55.18	25.54
0.22031	27.96	52.81	24.85
0.27109	26.04	51.08	25.04
0.52109	23.38	46.00	22.62
3.04843	19.22	46.00	26.78
4.82187	24.83	46.00	21.17
7.56015	29.10	50.00	20.90
13.56015	45.31	50.00	4.69
26.80234	37.07	50.00	12.93

* limit exceeded

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Line. Neutral

Kostec Co., Ltd. 3 Dec 2014 07:35

Conducted Emission

EUT: SG-3000
Manuf:
Op Cond: 120 V / 60 Hz
Operator: MIYOUNG.LEE
Test Spec: KN22
Comment: N

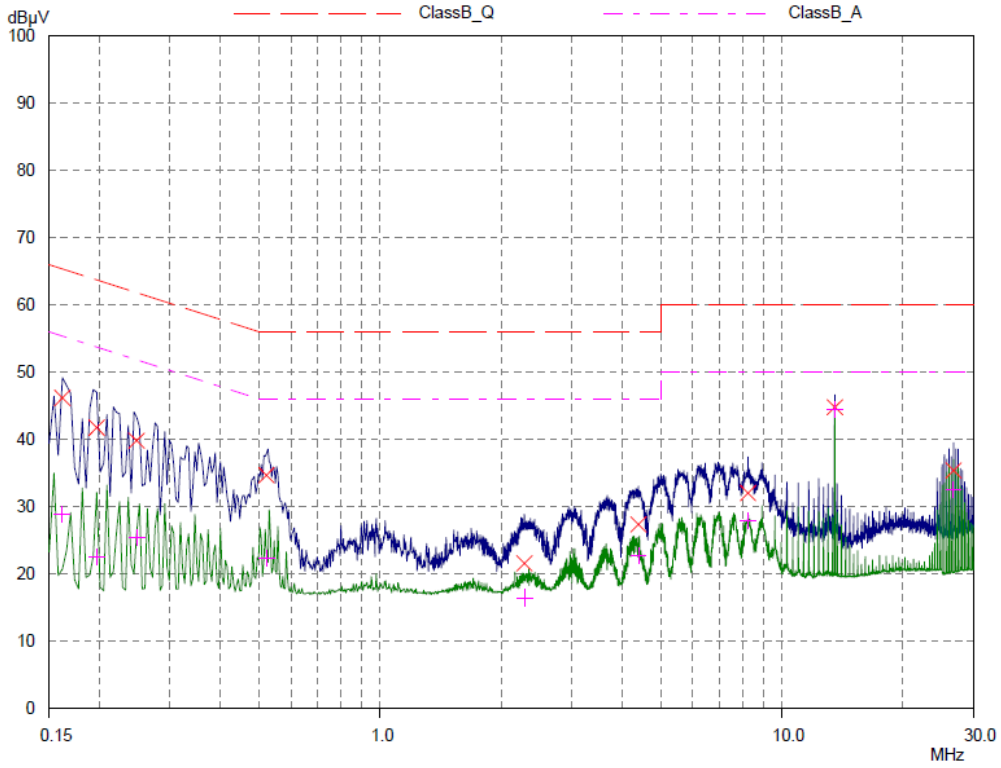
Result File: N(RFID).dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 50 dB



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Line. Neutral

Kostec Co., Ltd. 3 Dec 2014 07:35

Conducted Emission

EUT: SG-3000
Manuf:
Op Cond: 120 V / 60 Hz
Operator: MIYOUNG.LEE
Test Spec: KN22
Comment: N

Result File: N(RFID).dat : New Measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	30MHz	3.9063kHz	9kHz	PK+AV	10msec	15 dB	OFF	60dB

Transducer	No.	Start	Stop	Name
	12	9kHz	30MHz	CNEFactor

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Subranges: 25
Acc Margin: 50 dB

Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB
0.16171	46.15	65.38	19.23
0.19687	41.72	63.74	22.02
0.24765	39.81	61.84	22.03
0.52109	34.65	56.00	21.35
2.28671	21.54	56.00	34.46
4.4	27.32	56.00	28.68
8.24375	32.00	60.00	28.00
13.56015	44.78	60.00	15.22
26.79453	35.36	60.00	24.64

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB
0.16171	28.89	55.38	26.49
0.19687	22.42	53.74	31.32
0.24765	25.33	51.84	26.51
0.52109	22.37	46.00	23.63
2.28671	16.42	46.00	29.58
4.4	22.64	46.00	23.36
8.24375	27.93	50.00	22.07
13.56015	44.50	50.00	5.50
26.79453	32.54	50.00	17.46

* limit exceeded

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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 NFC antenna is built-in PCB of EUT So this product is complies with the requirement of §15.203.

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5.5 20 dB bandwidth measurement

5.5.1 Standard applicable [FCC §2.1049]

The 20 dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

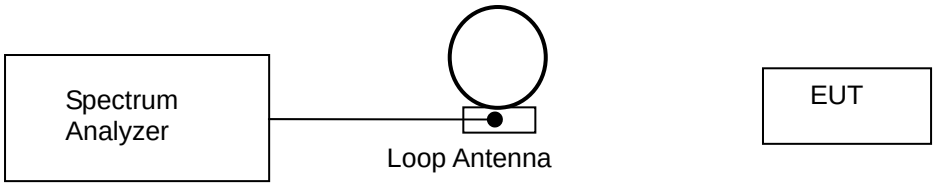
5.5.2 Test Environment conditions

• Ambient temperature : (20 – 21) ℃,
• Relative Humidity : (40 - 43) % R.H.

5.5.3 Measurement Procedure

Please refer 5.5.1

5.5.4 Test setup



5.5.5 Measurement Result

Frequency	20 dB bandwidth
13.56 ㎒	1.705 ㎑

5.5.6 Test plot