TEST REPORT

KOSTEC CO., Ltd. 28(175-20, Annyeong-dong) 406-gil sejaro, Hwaseong-si, Gyeonggi-do, Korea Tel:031-222-4251, Fax:031-222-4252	Report No.: KST-FCR-180005(2)	KOSTEC Co., Ltd. http://www.kostec.org

1. Applicant

- Name : SAM JIN CO., LTD.
- Address : 81, Anyangcheonseo-ro, Manan-gu Anyang-si, Gyeonggi-do, South Korea

2. Test Item

- Product Name: HUB
- Model Name: STH-ETH-300
- Brand: None
- FCC ID: 2AF4S-STH-ETH-300 • IC : 20753-STHETH300

3. Manufacturer

- Name : QINGDAO SANJIN ELECTRONIC CO.,LTD.
- Address : 81, Anyangcheonseo-ro, Manan-gu Anyang-si, Gyeonggi-do, South Korea

4. Date of Test : 2017. 12. 13. ~ 2017. 12. 14.

5. Test Method Used : FCC CFR 47, Part 15. Subpart C-15.249
ANSI C63.10:2013

6. Test Result : Compliance

7. Note: None

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 63.10-2013.

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.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

Affirmation	Tested by Name : Jung, Ho-cheol (Signature)	Technical Manager Name : Park, Gyeong-Hyeon (Signature)

2018. 04. 18.

KOSTEC Co., Ltd.

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1. GENERAL INFORMATION

1.1 Test Facility

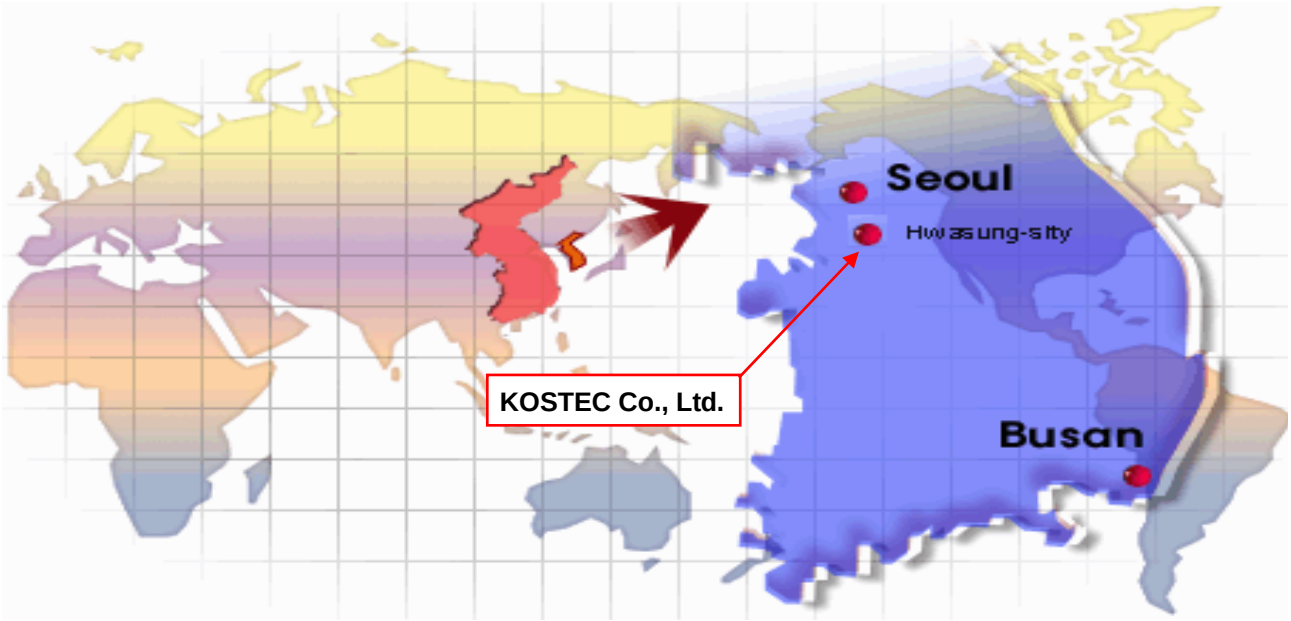
Test laboratory and address

KOSTEC Co., Ltd.
128(175-20,Annyeong-dong)406-gil sejaro, Hwaseong-si Gyeonggi-do, Korea

Registration information

KOLAS No. : 232
FCC Designation No. : KR0041
IC Registration Site No. : 8305A-1

1.2 Location



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1.3 Revision History of test report

Rev.	Revisions	Effect page	Reviewed	Date
-	Initial issue	All	Gyeong Hyeon, Park	2018. 02. 09.
1	Revised address and Product name Revised 5.2.1 and 5.3.6	1, 5, 12, 17	Gyeong Hyeon, Park	2018. 04. 16.
2	Revised Used Test Equipment List Revised 5.3.6	7~8, 17	Gyeong Hyeon, Park	2018. 04. 18.

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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.

Equipment Name	HUB
Model No	STH-ETH-300
Usage	Smart Hub
Serial Number	Proto type
Modulation type	2FSK
Emission Type	F1D
Operated Frequency	908.4 MHz ~ 916.0 MHz
Channel Number	3
Operation temperature	-10 °C ~ 55 °C
Power Source	Adapter DC 5.0 V
Antenna Description	Internal Helical antenna, gain : 3.10 dBi
Remark	1. The device was operating at its maximum output power for all measurements. 2. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case (X) is shown in the report. 3. The above DUT's information was declared by manufacturer. Please refer to the specifications or user manual for more detailed description.
FCC ID	2AF4S-STH-ETH-300
IC	20753- STHETH300

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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 Smart Hub. The detailed explanation is refer as user manual.

3.2 Used peripherals list

Description	Model No.	Serial No.	Manufacture	Remark
Notebook	LG15N54	412NZET043212	LG	
Adapter	PA-1900-14	None	LG	For notebook

3.3 Product Modification

N/A

3.4 Operating Mode

Constantly transmitting with a modulated carrier at maximum power on the low, middle and high channels.

3.5 Test Setup of EUT

The measurements were taken in continuous transmit / receive mode using the TEST MODE.

For controlling the EUT as TEST MODE, the test program and the test cables were provided by the applicant.

3.6 Table for Carrier Frequencies

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**908.40**	**2**	**908.42**
3	**916.00**		

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3.9 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	2018.09.06	1 year	☒
2	T & H Chamber	SH-641	92006831	ESPEC CORP	2018.05.31	1 year	☐
3	Spectrum Analyzer	8563E	3846A10662	Agilent Technology	2018.02.02	1 year	☐
4	Spectrum Analyzer	8593E	3710A02859	Agilent Technology	2018.02.02	1 year	☐
5	Spectrum Analyzer	FSV30	20-353063	Rohde& Schwarz	2018.02.01	1 year	☒
6	Signal Analyzer	N9010A	MY56070441	Agilent Technologies	2018.05.15	1 year	☐
7	EMI Test Receiver	ESCI7	100823	Rohde& Schwarz	2018.01.31	1 year	☐
8	EMI Test Receiver	ESI	837514/004	Rohde& Schwarz	2017.09.07	1 year	☐
9	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2018.02.03	1 year	☐
10	Network Analyzer	8753ES	US39172348	AGILENT	2017.09.06	1 year	☐
11	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2018.02.01	1 year	☐
12	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2018.02.01	1 year	☐
13	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2018.02.01	1 year	☐
14	Modulation Analyzer	8901A	3538A07071	Agilent Technology	2018.02.02	1 year	☐
15	Audio Analyzer	8903B	3514A16919	Agilent Technology	2018.01.31	1 year	☐
16	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2018.02.02	1 year	☐
17	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2017.09.06	1 year	☐
18	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2018.02.02	1 year	☐
19	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2018.02.02	1 year	☒
20	Signal Generator	SMB100A	179628	Rohde & Schwarz	2018.05.18	1 year	☒
21	Tracking Source	85645A	070521-A1	Agilent Technology	2018.02.03	1 year	☐
22	SLIDAC	None	0207-4	Myoung sung Ele.	2018.01.31	1 year	☐
23	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2018.02.01	1 year	☐
24	DC Power supply	6038A	3440A12674	Agilent Technology	2018.01.31	1 year	☐
25	DC Power supply	E3610A	KR24104505	Agilent Technology	2018.01.31	1 year	☒
26	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2018.01.31	1 year	☐
27	DC Power Supply	SM 3004-D	114701000117	DELTA ELEKTRONIKA	2018.01.31	1 year	☐
28	Dummy Load	8173	3780	Bird Electronic Co., Corp	2018.02.03	1 year	☐
29	Attenuator	50FH-030-500	140410 9433	JEW Idustries Inc.	2018.02.02	1 year	☐
30	Attenuator	24-30-34	BX5630	Aeroflex / Weinschel	2017.12.27	1 year	☐
31	Attenuator	8498A	3318A09485	HP	2018.02.01	1 year	☐
32	Step Attenuator	8494B	3308A32809	HP	2018.02.02	1 year	☐
33	Attenuator	18B50W-20F	64671	INMET	2018.02.02	1 year	☐
34	Attenuator	10 dB	1	Rohde & Schwarz	2018.05.18	1 year	☒
35	Attenuator	10 dB	2	Rohde & Schwarz	2018.05.18	1 year	☐
36	Attenuator	10 dB	3	Rohde & Schwarz	2018.05.18	1 year	☐
37	Attenuator	10 dB	4	Rohde & Schwarz	2018.05.18	1 year	☐
38	Attenuator	54A-10	74564	WEINSCHEL	2018.05.18	1 year	☐
39	Attenuator	56-10	66920	WEINSCHEL	2018.05.18	1 year	☐
40	Power divider	11636B	51212	HP	2018.02.01	1 year	☐
41	3Way Power divider	KPDSU3W	00070365	KMW	2017.09.06	1 year	☐
42	4Way Power divider	70052651	173834	KRYTAR	2018.02.01	1 year	☐
43	3Way Power divider	1580	SQ361	WEINSCHEL	2018.05.18	1 year	☐
44	OSP	OSP120	101577	Rohde & Schwarz	2018.05.19	1 year	☐
45	White noise audio filter	ST31EQ	101902	SoundTech	2017.09.07	1 year	☐
46	Dual directional coupler	778D	17693	HEWLETT PACKARD	2018.02.02	1 year	☐
47	Dual directional coupler	772D	2839A00924	HEWLETT PACKARD	2018.02.02	1 year	☐
48	Band rejection filter	3TNF-0006	26	DOVER Tech	2018.02.03	1 year	☐
49	Band rejection filter	3TNF-0008	317	DOVER Tech	2018.02.03	1 year	☐
50	Band rejection filter	3TNF-0007	311	DOVER Tech	2018.02.03	1 year	☐

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No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
51	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2018.02.02	1 year	☐
52	Band rejection filter	WRCJV12-5695-5725-5825-5855-50SS	1	Wainwright Instruments GmbH	2018.05.18	1 year	☐
53	Band rejection filter	WRCJV12-5120-5150-5350-5380-40SS	4	Wainwright Instruments GmbH	2018.05.18	1 year	☐
54	Band rejection filter	WRCGV10-2360-2400-2500-2540-50SS	2	Wainwright Instruments GmbH	2018.05.18	1 year	☐
55	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2018.02.02	1 year	☒
56	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2018.02.02	1 year	☐
57	Highpass Filter	WHNX6-5530-3000-26500-40CC	2	Wainwright Instruments GmbH	2018.05.19	1 year	☐
58	Highpass Filter	WHNX6-2370-7000-26500-40CC	4	Wainwright Instruments GmbH	2018.05.19	1 year	☐
59	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2018.02.03	1 year	☐
60	Radio Communication Tester	CMU 200	112026	Rohde & Schwarz	2018.02.03	1 year	☐
61	Bluetooth Tester	TC-3000B	3000B6A0166	TESCOM CO., LTD.	2018.02.03	1 year	☐
62	Loop Antenna	6502	9203-0493	EMCO	2019.05.29	2 year	☒
63	BiconiLog Antenna	3142B	9910-1432	EMCO	2018.04.25	2 year	☒
64	Trilog-Broadband Antenna	VULB 9168	9168-606	SCHWARZBECK	2018.09.09	2 year	☐
65	Horn Antenna	3115	2996	EMCO	2018.02.11	2 year	☒
66	Horn Antenna	BBHA9170	BBHA9170152	SCHWARZBECK	2019.04.25	2 year	☐
67	Antenna Master(3)	AT13	None	AUDIX	N/A	N/A	☐
68	Turn Table(3)	None	None	AUDIX	N/A	N/A	☐
69	PREAMPLIFIER(3)	8449B	3008A02577	Agilent	2018.02.01	1 year	☐
70	Antenna Master(10)	MA4000-EP	None	inno systems GmbH	N/A	N/A	☒
71	Turn Table(10)	None	None	inno systems GmbH	N/A	N/A	☒
72	AMPLIFIER(10)	TK-PA6S	120009	TESTEK	2018.01.31	1 year	☒
73	AMPLIFIER	8447D	2944A07881	H.P	2018.01.31	1 year	☐
74	Antenna Mast	MA2000-EP	None	inno systems GmbH	N/A	N/A	☐
75	Turn Device	DE3700-RH	None	inno systems GmbH	N/A	N/A	☐

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4. SUMMARY TEST RESULTS

Description of Test	FCC Rule	Reference Clause	Used	Test Result
20 dB Bandwidth	15.215(c)	Clause 5.1	☒	Compliance
Band edge of RF conducted emissions	15.249(d)	Clause 5.2	☒	Compliance
Spurious RF radiated emissions	15.205(a) 15.209(a) 15.249 15.35	Clause 5.3	☒	Compliance
Antenna requirement	15.203	Clause 5.4	☒	Compliance
AC Power Conducted emissions	15.207	Clause 5.5	☒	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.				

Procedure Reference

FCC CFR 47, Part 15. Subpart C-15.249
ANSI C 63.10-2013

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5. MEASUREMENT RESULTS

5.1 20 dB Bandwidth

5.1.1 Standard Applicable [FCC §15.215(c)]

The bandwidth of a frequency hopping channel is the 20 dB emission bandwidth, measured with the hopping stopped. The system RF bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset while the long-term distribution appears evenly distributed.

5.1.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.1.3 Measurement Procedure

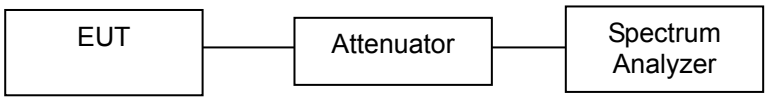
1.Place the EUT on the table and set it in transmitting mode.

2.Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

3.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz, Detector function=peak, Trace=max hold, Sweep=auto.

4.Set the measured low and high frequency and test 20dB bandwidth with spectrum analyzer.

5.1.4 Test setup



5.1.5 Measurement Result

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99 % Bandwidth [MHz]	Test Results
1	908.4	0.313	0.265	Compliance
3	916.0	0.350	0.290	Compliance

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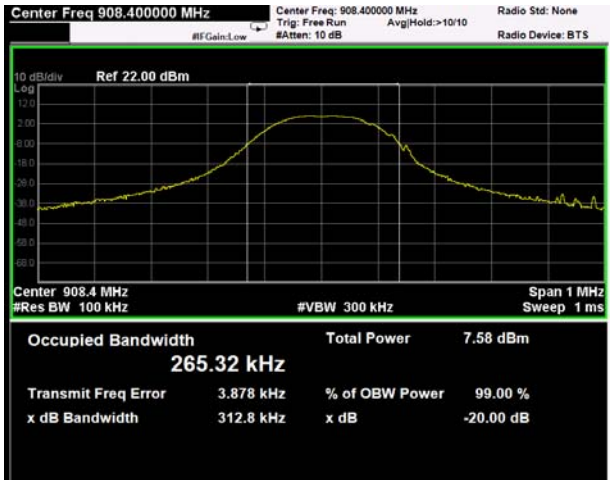
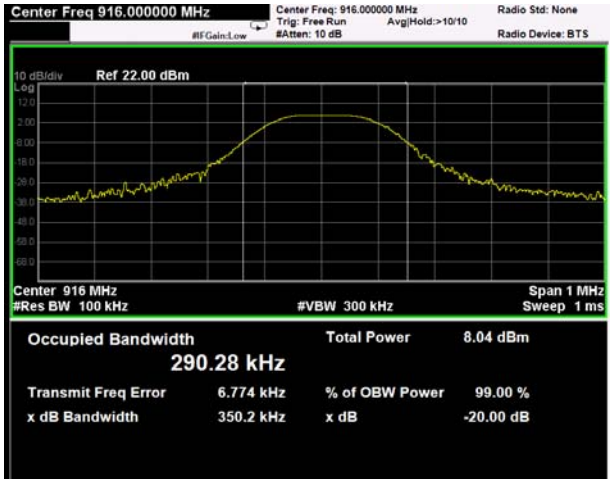
5.1.6 Test Plot

CH Low



CH High



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5.2 Band-edge Compliance of RF Conducted emissions

5.2.1 Standard Applicable [FCC §15.249(d)]

FCC and IC

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.2.3 Measurement Procedure

(1) Pre-calibration for the spectrum analyzer has to be done first through a reference CW signal from signal generator.
(2) Reference frequency generated from the signal generator is supply to spectrum analyzer input port via RF cable and attenuator, and then, it's applied to offset value on spectrum analyzer.
(3) Remove the antenna from the EUT and then, connected to spectrum analyzer via a dc Block, suitable low loss RF cable and attenuator.
(4) Place the EUT on the table and set on the emission at the band-edge,
(5) After the trace being stable, Use the marker-to-peak function to move the marker to the peak of the in-band emission.
(6) The marker-delta value now displayed must comply with the limit specified in above standard.
(7) please refer to the detailed procedure method KDB 558074 v04.

The spectrum analyzer is set to the as follows :

- Span : Wide enough to capture the peak level of the emission operating on the channel closet to the Band-edge, as well as any modulation products which fall outside of the authorized band of operation
- RBW : 100 kHz (≥ 1 % of the span)
- VBW : ≥ RBW
- Sweep : auto
- Detector function : peak
- Trace : Max hold

5.2.4 Test setup

Please refer 5.1.4

5.2.5 Measurement Result

Setting Channel		Test Results		
		Measured value [dB]	Limit [dB]	Result
CH 1	902.0 MHz	-52.50	50.00	Compliance
CH 3	928.0 MHz	-51.70		Compliance

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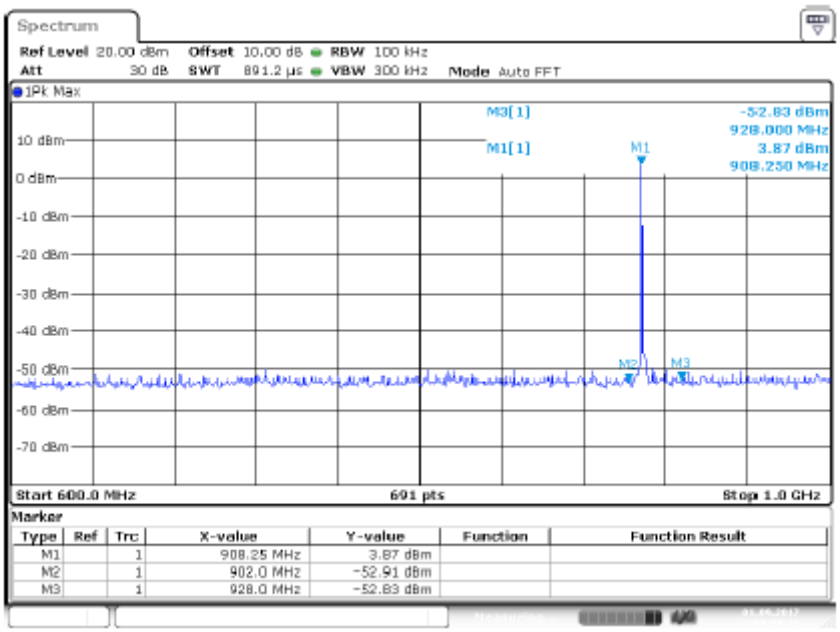
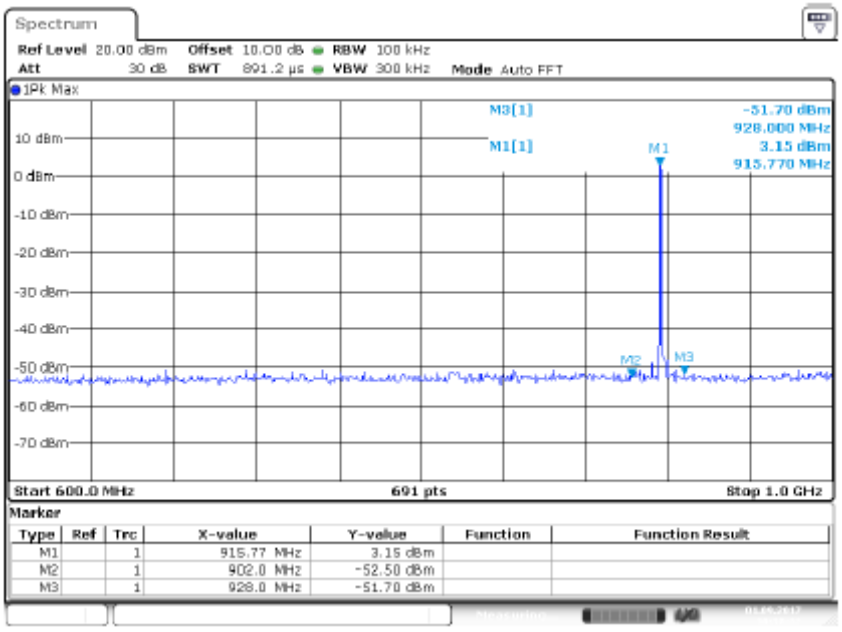
5.2.6 Test Plot (Band-edge)





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5.3 Field strength of fundamental & Spurious RF Radiated emissions

5.3.1 Standard Applicable [FCC §15.249(d) and RSS-210 5.5]

FCC

the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

IC

The field strength measured at 3 metres shall not exceed the limits shown in the following table:

Fundamental Frequencies (MHz)	Field Strength (millivolts/m)	
	Fundamental	Harmonics
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25
24075-24175	2500	25

§15.209 and RSS-Gen limits for radiated emissions measurements (distance at 3 m)

Frequency Band [MHz]	DISTANCE [Meters]	Limit [㎶/m]	Limit [dB㎶/m]	Detector
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)	Peak
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)	Peak
1.705 ~ 30.0	30	30	29.54	Peak
30 - 88	3	100 **	40.00	Quasi peak
88 - 216	3	150 **	43.52	Quasi peak
216 - 960	3	200 **	46.02	Quasi peak
Above 960	3	500	54.00	Average
Above 1000	3	74.0 dB㎶/m (Peak), 54.0 dB㎶/m (Average)		

** fundamental emissions from intentional radiators operation under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, or 470-806 MHz. However, operation within these Frequency bands is permitted under other
sections of this Part Section 15.231 and 15.241

§15.205. Restrict Band of Operation for FCC

[MHz]	[MHz]	[MHz]	[GHz]
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505**	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.
4.177 25 - 4.177 75	37.5 -38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 -1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.38 6 75	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

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

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§15.205. Restrict Band of Operation for IC

[MHz]	[MHz]	[MHz]	[GHz]
0.090 - 0.110	12.519 75 - 12.520 25	399.9 - 410	5.35 - 5.46
2.173 5 - 2.190 5	12.576 75 - 12.577 25	608 - 614	7.25 - 7.75
3.020 - 3.026	13.36 - 13.41	960 - 1 427	8.025 - 8.
4.125 - 4.128	16.42 - 16.423	1 435 - 1 626.5	9.0 - 9.2
4.177 25 - 4.177 75	16.694 75 - 16.695 25	1 645.5 - 1 646.5	9.3 - 9.5
4.207 25 - 4.207 75	16.804 25 - 16.804 75	1 660 - 1 710	10.6 - 12.7
5.677 - 5.683	25.5 - 25.67	1 718.8 -1 722.2	13.25 - 13.4
6.215 - 6.218	37.5 -38.25	2 200 - 2 300	14.47 - 14.5
6.26775–6.26825	73 - 74.6	2 310 - 2 390	15.35 - 16.2
6.31175–6.31225	74.8 - 75.2	2 655 - 2 900	17.7 - 21.4
8.291 - 8.294	108 - 138	3 260 - 3 267	22.01 - 23.12
8.362 - 8.366	156.524 75 - 156.525 25	3 332 - 3 339	23.6 - 24.0
8.376 25 - 8.38 6 75	156.7 - 156.9	3 345.8 - 3 358	31.2 - 31.8
8.414 25 - 8.414 75	240 - 285	3 500 - 4 400	36.43 - 36.5
12.29 - 12.293	322 - 335.4	4 500 - 5 150	Above 38.6

5.3.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.3.3 Measurement Procedure

The measurements procedure of the Spurious RF Radiated emissions is as following describe method.

1. The EUT was placed on the top of a rotating table (0.8 meters for below 1 ㎓ and 1.5 meters for above 1 ㎓) above the ground at a 3 meter camber. The table was rotated 360 degree to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna master.
3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both Horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotating table was turned from 0 - 360 degrees to find the maximum reading.
5. The measuring receiver was set to peak detector and specified bandwidth with max hold function.
6. Low, Middle and high channels were measured, and radiation measurements are performed in X, Y, Z axis positioning. And found the worst axis position and only the test worst case mode is recorded in the report.

• The measurement results are obtained as described below:
Result(㏈㎶/m) = Reading(㏈㎶) + Antenna factor(㏈/m)+ CL(㏈) + other applicable factor (㏈)

• The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒ and the video bandwidth is 3 ㎒ for RMS Average (Duty cycle < 98 %) for Average detection (AV) at frequency above 1 ㎓, then the measurement results was added to a correction factor (10 log(1/duty cycle)).

• The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒ and the video bandwidth is 10 ㎐ (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 ㎓.

• According to §15.33 (a)(1), Frequency range of radiated measurement is performed the tenth harmonic.

5.3.4 Measurement Uncertainty

Radiated Emission measurement: Below 1 GHz : 4.32 dB (CL: Approx 95 %, *k*=2)
Above 1 GHz : 4.14 dB (CL: Approx 95 %, *k=2*)

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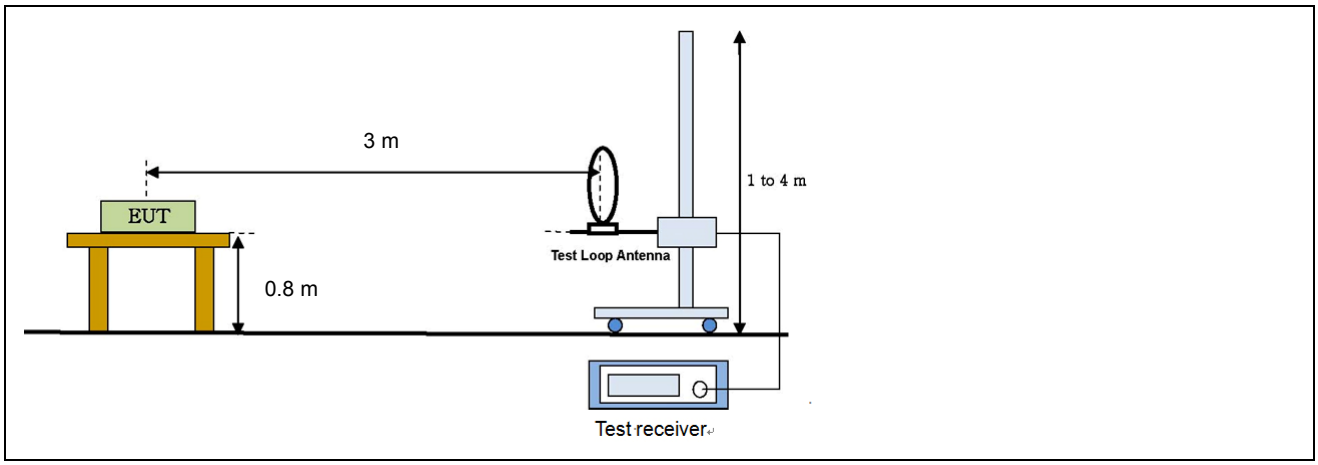
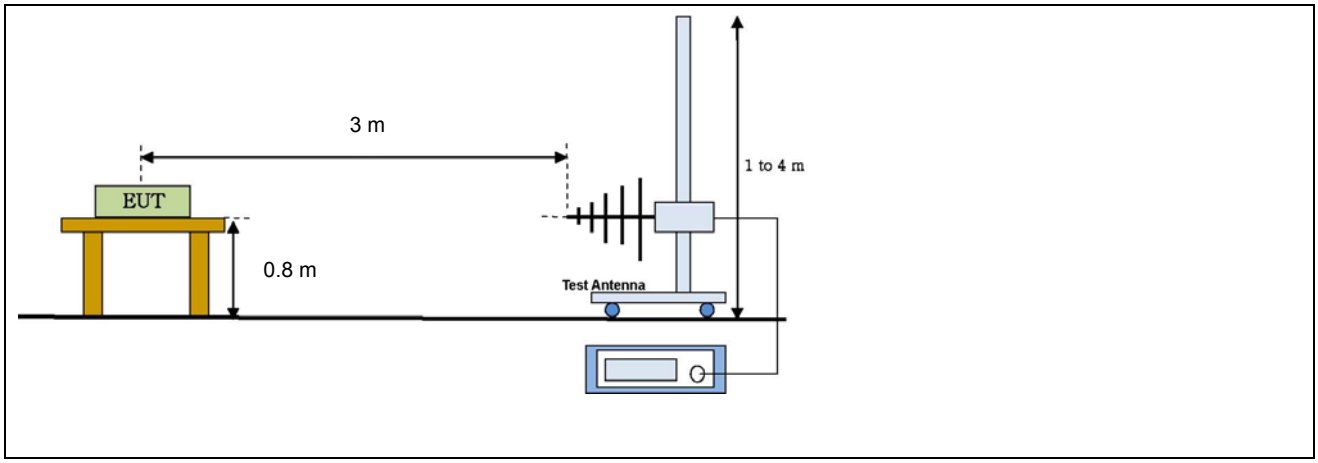
5.3.5 Test Configuration

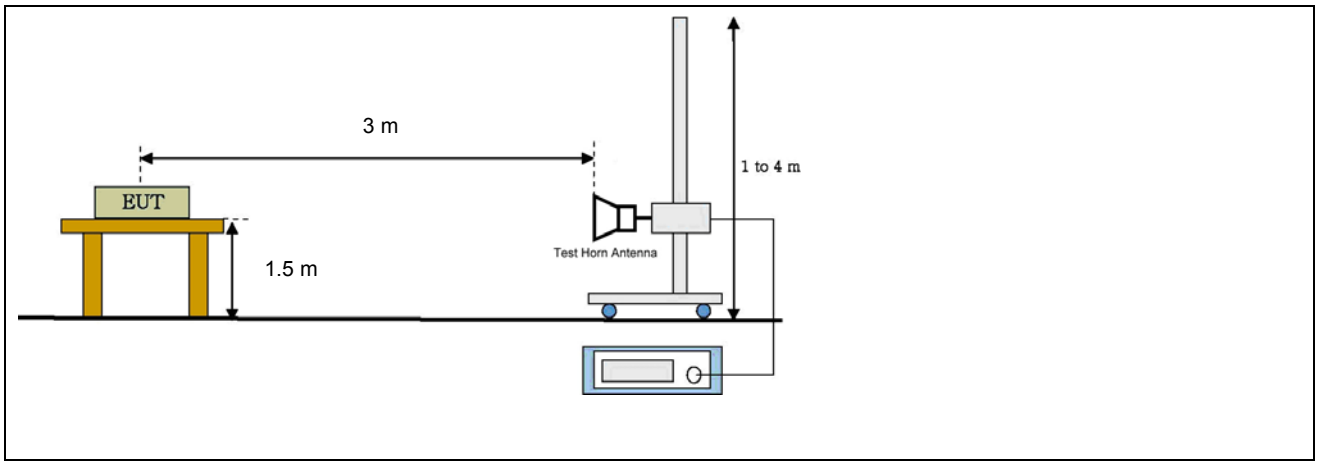
Radiated emission setup, Below 30 MHz



Radiated emission setup, Below 1 000 MHz



Radiated emission setup, Above 1 GHz



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5.3.6 Measurement Result

Field strength of fundamental

Freq. (MHz)	QP Reading (dBμV/m)	Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dBμV/m)	Limit (dBμV/m)	Mgn. (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
908.4	101.73	180	1.0	H	23.85	4.19	-38.32	91.45	94	2.55	Compliance
908.4	93.58	180	1.0	V	23.85	4.19	-38.32	83.30	94	10.70	Compliance

Freq. (MHz)	QP Reading (dBμV/m)	Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dBμV/m)	Limit (dBμV/m)	Mgn. (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
916.0	100.16	180	1.0	H	23.90	4.21	-38.32	89.95	94	4.05	Compliance
916.0	95.39	180	1.0	V	23.90	4.21	-38.32	85.18	94	8.82	Compliance

Spurious RF Radiated emissions

Below 1 GHz

Freq. (MHz)	Reading (dBμV/m)	Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dBμV/m)	Limit (dBμV/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
There are no spurious emissions.											Compliance

Above 1 GHz

Freq. (GHz)	Reading (dBμV/m)		Table (Deg)	Antenna			CL (dB)	AMP (dB)	Meas Result (dBμV/m)		Limit (dBμV/m)		Mgn. (dB)		Result
	PK	AV		Height (m)	Pol. (H/V)	Fctr. (dB/m)			PK	AV	PK	AV	PK	AV	
There are no spurious emissions.															Compliance

※Note

- It is not recorded on the report that the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to measured.
- The Reading values are already added value of the duty cycle factor and correction Factor was applied for Average Field Strength.
- For the All spurious, measured any other signal is not detected on test receiver
- The transmitter radiated spectrum was investigated from 9 kHz to 10 GHz.

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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.

5.6.2 Antenna details

Frequency Band	Antenna Type	Gain [dBi]	Results
900	Internal Helical antenna	3.10	Compliance

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5.7 AC Power Conducted emissions

5.7.1 Standard Applicable [FCC §15.207(a) and RSS-Gen 8.8]

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 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/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 (dBμV)	
	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

5.7.2 Test Environment conditions

• Ambient temperature : (24 ~ 25) ℃ • Relative Humidity : (49 ~ 55) % R.H.

5.7.3 Measurement Procedure

EUT was placed on a non- metallic table height of 0.8 m above the reference ground plane. Cables connected to EUT were fixed to cause maximum emission. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the Maximum signal strength.

5.7.4 Used equipment

Equipment	Model No.	Serial No.	Manufacturer	Next cal date	Cal interval	Used
Test receiver	ESCS30	100111	Rohde & Schwarz	2018. 01. 31	1 year	☒
LISN	ESH2-Z5	100044	R&S	2018. 01. 31	1 year	☐
	ESH3-Z5	100147	R&S	2018. 01. 31	1 year	☒

*Test Program: " ESXS-K1 V2.2"
Measurement uncertainty
Conducted Emission measurement: 4.48 dB (CL: Approx 95 %, *k*=2)

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5.7.5 Measurement Result

Freq.	Factor [dB]		POL	QP			CISPR AV		
				Limit	Reading	Result	Limit	Reading	Result
[㎒]	LISN	CABLE +P/L		[dB㎶]	[dB㎶]	[dB㎶]	[dB㎶]	[dB㎶]	[dB㎶]
0.170	0.11	9.97	N	64.98	45.03	45.14	54.98	31.90	32.01
0.396	0.12	9.98	N	57.93	52.08	52.20	47.93	40.70	40.82
0.443	0.12	9.99	N	57.01	47.96	48.08	47.01	38.80	38.92
0.505	0.12	9.99	N	56.00	45.64	45.76	46.00	36.40	36.52
14.021	0.60	10.35	L	60.00	33.99	34.59	50.00	27.50	28.10
15.291	0.66	10.38	L	60.00	41.12	41.78	50.00	32.70	33.36
15.474	0.59	10.38	N	60.00	34.89	35.48	50.00	27.40	27.99
15.705	0.66	10.38	L	60.00	39.55	40.21	50.00	31.20	31.86
16.318	0.61	10.40	N	60.00	33.81	34.42	50.00	29.10	29.71
16.552	0.68	10.40	L	60.00	38.76	39.44	50.00	33.30	33.98
18.580	0.71	10.44	L	60.00	36.70	37.41	50.00	28.90	29.61
20.302	0.74	10.48	L	60.00	31.80	32.54	50.00	26.10	26.84

* LISN: LISN insertion Loss, Cable: Cable Loss, P/L:pulse limiter factor
* L: Line. Live, N: Line. Neutral
* Reading: test receiver reading value (with cable loss & pulse limiter factor)
* Result = LISN + Reading

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Line. Live

Kostec Co.,Ltd

Conducted Emission

EUT: O-17-0260
Manuf:
Op Cond: AC 120V , 60Hz
Operator:
Test Spec: FCC
Comment: Live

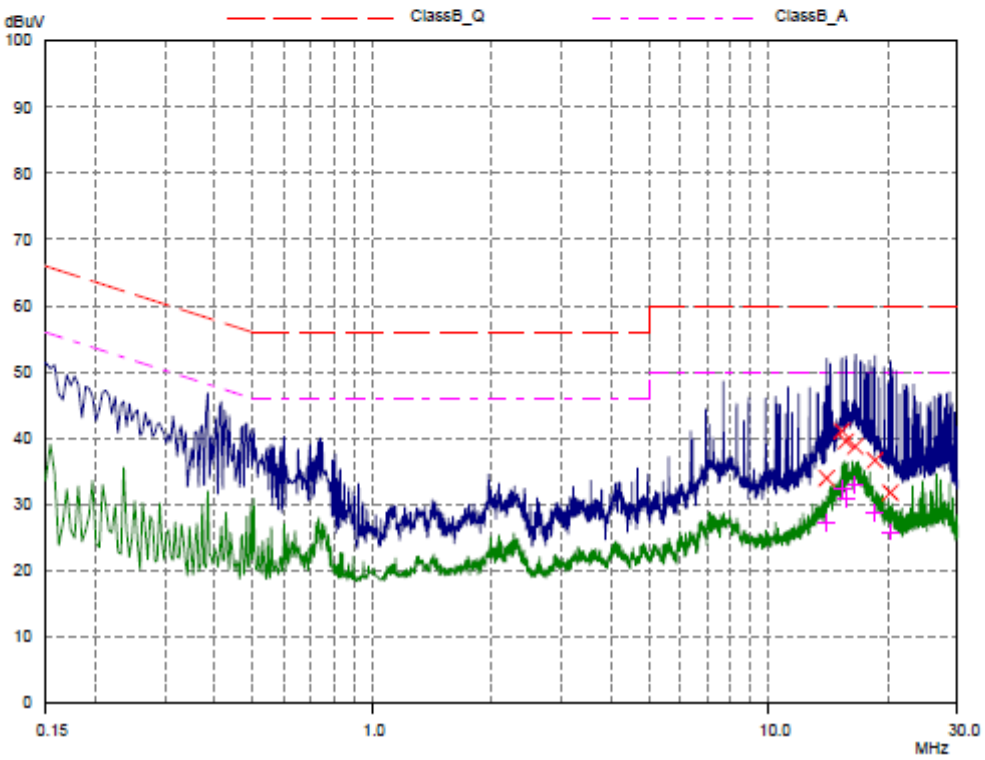
Result File: 0260_l.dat : New Measurement

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
	11	9kHz	30MHz	MAIN

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



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Line. Neutral

Kostec Co.,Ltd

Conducted Emission

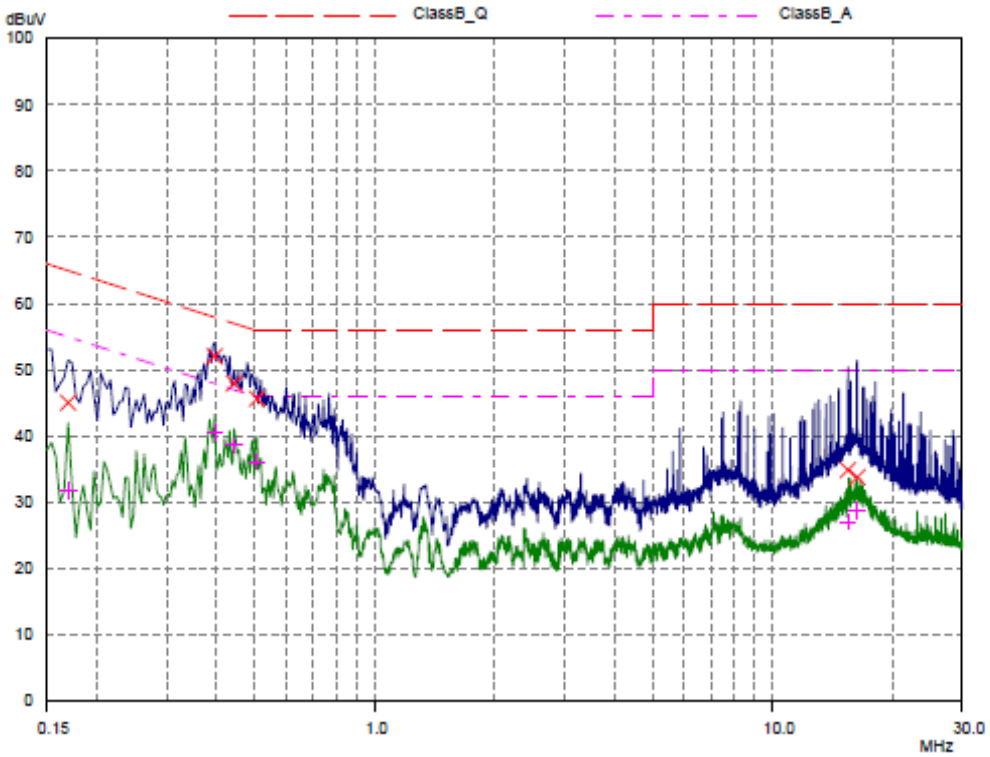
EUT:	O-17-0260
Manuf:	
Op Cond:	AC 120V , 60Hz
Operator:	
Test Spec:	FCC
Comment:	Neutral
Result File:	0260_n.dat : New Measurement

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
	11	9kHz	30MHz	MAIN

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



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