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-180018	KOSTEC Co., Ltd. http://www.kostec.org

1. Applicant

- Name : PROBO CO., LTD.
- Address : #303, 311, Nowon-ro, Nowon-gu, Seoul, Korea

2. Test Item

- Product Name: PROBO RF RECEIVER
- Model Name: PROBO-RFRC
- Brand: None
- FCC ID: 2AQU3-PROBORFRC

3. Manufacturer

- Name : PROBO CO., LTD.
- Address : #303, 311, Nowon-ro, Nowon-gu, Seoul, Korea

4. Date of Test : 2018. 10. 12. ~ 2018. 10. 15.

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 : Lee, Mi-Young (Signature)	Technical Manager Name : Park, Gyeong-Hyeon (Signature)

2018. 10. 20.

KOSTEC Co., Ltd.

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1. GENERAL INFORMATION

1.1 Test Facility

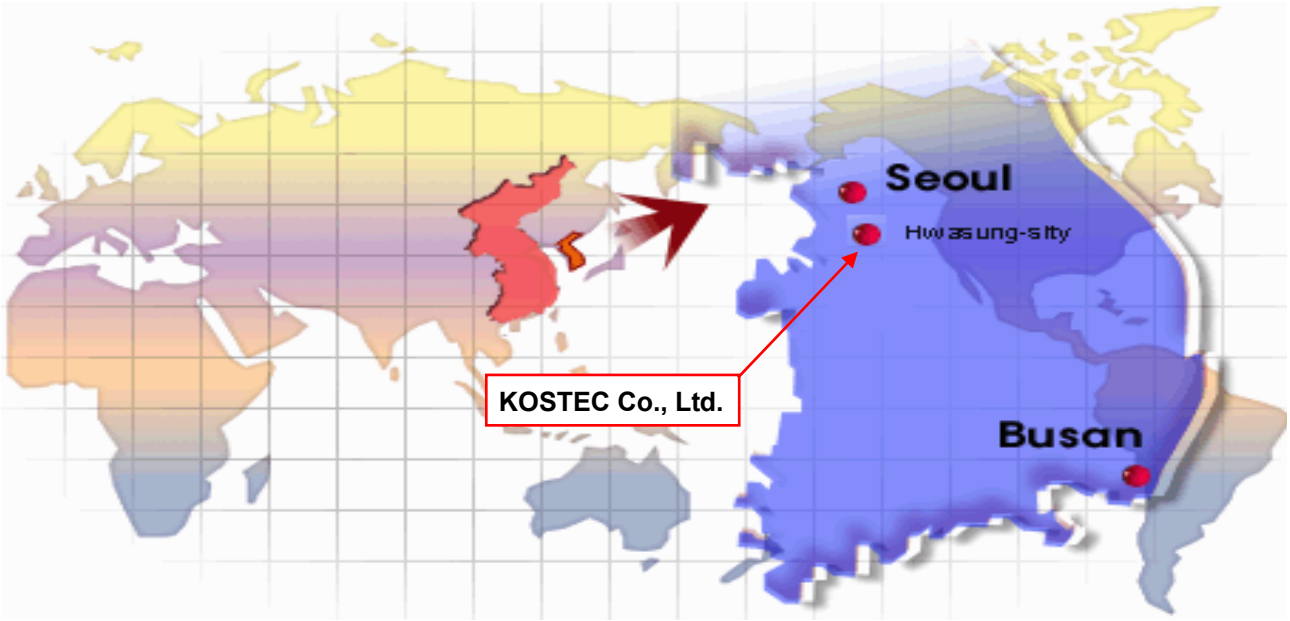
Test laboratory and address

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. 10. 20.

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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	PROBO RF RECEIVER
Model No	PROBO-RFRC
Usage	Receiver of the robot controller.
Serial Number	Proto type
Modulation type	GFSK
Emission Type	F1D
Operated Frequency	2 410 MHz ~ 2 470 MHz
Max fundamental field strength	93.26 dBμV /m
Channel Number	61
Operation temperature	-20 °C ~ 55 °C
Power Source	AA 1.5 V alkaline battery x 4ea
Antenna Description	Internal Chip antenna, Max gain : 2 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 (Y) 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	2AQU3-PROBORFRC

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3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

The EUT is receiver of the robot controller which is used for assembly toys for children.

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

EUT
(Standalone)

3.6 Table for Carrier Frequencies

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**2 410**	21	2 430
2	2 411	22	2 431
…	…	…	…
9	2 418	30	2 439
10	2 419	**31**	**2 440**
…	…	…	…
19	2 428	60	2 469
20	2 429	**61**	**2 470**

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3.7 Used Test Equipment List

No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
1	T & H Chamber	RCT-V-THC-403-1(H)	20030210	R.C.T	2019.09.03	1 year	☐
2	T & H Chamber	SH-641	92006831	ESPEC CORP	2019.02.14	1 year	☐
3	Spectrum Analyzer	8593E	3710A02859	Agilent Technology	2019.02.01	1 year	☐
4	Spectrum Analyzer	8563EC	3046A00527	Agilent Technology	2019.02.01	1 year	☐
5	Signal Analyzer	FSV13	101247	Rohde & Schwarz	2019.02.01	1 year	☐
6	Spectrum Analyzer	FSV30	20-353063	Rohde& Schwarz	2019.02.01	1 year	☐
7	Signal Analyzer	N9010A	MY56070441	Agilent Technologies	2019.05.25	1 year	☒
8	EMI Test Receiver	ESCI7	100823	Rohde& Schwarz	2019.01.29	1 year	☒
9	EMI Test Receiver	ESI	837514/004	Rohde& Schwarz	2019.09.03	1 year	☒
10	Vector Signal Analyzer	89441A	3416A02620	Agilent Technology	2019.02.01	1 year	☐
11	Network Analyzer	8753ES	US39172348	AGILENT	2019.09.03	1 year	☐
12	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2019.01.31	1 year	☐
13	RF Power Sensor	E9300A	MY41496631	Agilent Technology	2019.01.31	1 year	☐
14	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2019.01.30	1 year	☐
15	Audio Analyzer	8903B	3514A16919	Agilent Technology	2019.01.30	1 year	☐
16	Audio Telephone Analyzer	DD-5601CID	520010281	CREDIX	2019.01.30	1 year	☐
17	Modulation Analyzer	8901A	3041A0576	H.P	2019.01.31	1 year	☐
18	Digital storage Oscilloscope	TDS3052	B015962	Tektronix	2019.09.04	1 year	☐
19	ESG-D Series Signal Generator	E4436B	US39260458	Agilent Technology	2019.01.31	1 year	☐
20	Vector Signal Generator	SMBV100A	257557	Rohde & Schwarz	2019.01.31	1 year	☐
21	GNSS Signal Generator	TC-2800A	2800A000494	TESCOM CO., LTD.	2019.02.01	1 year	☐
22	Signal Generator	SMB100A	179628	Rohde & Schwarz	2019.05.09	1 year	☐
23	Tracking Source	85645A	070521-A1	Agilent Technology	2019.02.01	1 year	☐
24	SLIDAC	None	0207-4	Myoung sung Ele.	2019.01.29	1 year	☐
25	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2019.01.29	1 year	☐
26	DC Power supply	6038A	3440A12674	Agilent Technology	2019.01.29	1 year	☐
27	DC Power supply	E3610A	KR24104505	Agilent Technology	2019.01.29	1 year	☐
28	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2019.01.29	1 year	☐
29	DC Power Supply	SM 3400-D	114701000117	DELTA ELEKTRONIKA	2019.01.29	1 year	☐
30	DC Power supply	6632B	MY43004005	Agilent Technology	2019.01.31	1 year	☐
31	DC Power Supply	6632B	MY43004137	Agilent Technology	2019.01.31	1 year	☐
32	Termination	1433-3	LM718	WEINSCHEL	2019.07.09	1 year	☐
33	Termination	1432-3	QR946	AEROFLEX/WEINSCHEL	2019.07.09	1 year	☐
34	Attenuator	24-30-34	BX5630	Aeroflex / Weinschel	2018.12.15	1 year	☐
35	Attenuator	8498A	3318A09485	HP	2019.01.31	1 year	☐
36	Step Attenuator	8494B	3308A32809	HP	2019.01.31	1 year	☐
37	Attenuator	18B50W-20F	64671	INMET	2019.01.31	1 year	☐
38	Attenuator	10 dB	1	Rohde & Schwarz	2019.05.04	1 year	☐
39	Attenuator	10 dB	2	Rohde & Schwarz	2019.05.04	1 year	☐
40	Attenuator	10 dB	3	Rohde & Schwarz	2019.05.04	1 year	☐
41	Attenuator	10 dB	4	Rohde & Schwarz	2019.05.04	1 year	☐
42	Attenuator	54A-10	74564	WEINSCHEL	2019.09.04	1 year	☐
43	Attenuator	56-10	66920	WEINSCHEL	2019.05.09	1 year	☐
44	Attenuator	48-20-11	BV2658	Aeroflex/Weinschel	2019.08.06	1 year	☐
45	Attenuator	48-30-33-LIM	BL5350	Weinschel Corp.	2019.07.09	1 year	☐
46	Power divider	11636B	51212	HP	2019.02.01	1 year	☐
47	3Way Power divider	KPDSU3W	00070365	KMW	2019.09.03	1 year	☐
48	4Way Power divider	70052651	173834	KRYTAR	2019.02.01	1 year	☐
49	3Way Power divider	1580	SQ361	WEINSCHEL	2019.05.09	1 year	☐

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No.	Instrument	Model	S/N	Manufacturer	Due to cal date	Cal interval	used
50	OSP	OSP120	101577	Rohde & Schwarz	2019.05.04	1 year	☐
51	White noise audio filter	ST31EQ	101902	SoundTech	2019.09.04	1 year	☐
52	Dual directional coupler	778D	17693	HEWLETT PACKARD	2019.01.31	1 year	☐
53	Dual directional coupler	772D	2839A00924	HEWLETT PACKARD	2019.01.31	1 year	☐
54	Band rejection filter	3TNF-0006	26	DOVER Tech	2019.02.01	1 year	☐
55	Band rejection filter	3TNF-0007	311	DOVER Tech	2019.02.01	1 year	☐
56	Band rejection filter	WTR-BRF2442-84NN	09020001	WAVE TECH Co.,LTD	2019.01.31	1 year	☐
57	Band rejection filter	WRCJV12-5695-5725-5825-5855-50SS	1	Wainwright Instruments GmbH	2019.05.04	1 year	☐
58	Band rejection filter	WRCJV12-5120-5150-5350-5380-40SS	4	Wainwright Instruments GmbH	2019.05.04	1 year	☐
59	Band rejection filter	WRCGV10-2360-2400-2500-2540-50SS	2	Wainwright Instruments GmbH	2019.05.04	1 year	☐
60	Band rejection filter	CTF-155M-S1	001	RF One Electronics	2019.09.06	1 year	☐
61	Band rejection filter	CTF-435M-S1	001	RF One Electronics	2019.09.06	1 year	☐
62	Highpass Filter	WHJS1100-10EF	1	WAINWRIGHT	2019.01.31	1 year	☐
63	Highpass Filter	WHJS3000-10EF	1	WAINWRIGHT	2019.01.31	1 year	☐
64	Highpass Filter	WHNX6-5530-7000-26500-40CC	2	Wainwright Instruments GmbH	2019.05.09	1 year	☐
65	Highpass Filter	WHNX6-2370-3000-26500-40CC	4	Wainwright Instruments GmbH	2019.05.09	1 year	☐
66	WideBand Radio Communication Tester	CMW500	102276	Rohde & Schwarz	2019.02.01	1 year	☐
67	Radio Communication Tester	CMU 200	112026	Rohde & Schwarz	2019.01.31	1 year	☐
68	Bluetooth Tester	TC-3000B	3000B6A0166	TESCOM CO., LTD.	2019.01.31	1 year	☐
69	Loop Antenna	6502	9203-0493	EMCO	2019.05.29	2 year	☒
70	BiconiLog Antenna	3142B	1745	EMCO	2020.05.10	2 year	☒
71	Biconical Antenna	VUBA9117	9117-342	Schwarz beck	2020.03.12	2 year	☐
72	Trilog-Broadband Antenna	VULB 9168	9168-606	SCHWARZBECK	2020.09.14	2 year	☐
73	Horn Antenna	3115	2996	EMCO	2020.02.14	2 year	☒
74	Horn Antenna	3115	9605-4834	EMCO	2020.03.12	2 year	☐
75	Horn Antenna	BBHA9170	743	SCHWARZBECK	2019.04.25	2 year	☒
76	Antenna Master(3)	AT13	None	AUDIX	N/A	N/A	☐
77	Turn Table(3)	None	None	AUDIX	N/A	N/A	☐
78	PREAMPLIFIER(3)	8449B	3008A02577	Agilent	2019.02.02	1 year	☐
79	Antenna Master(10)	MA4000-EP	None	innco systems GmbH	N/A	N/A	☒
80	Turn Table(10)	None	None	innco systems GmbH	N/A	N/A	☒
81	AMPLIFIER(10)	TK-PA6S	120009	TESTEK	2019.01.29	1 year	☒
82	AMPLIFIER	TK-PA18	150003	TESTEK	2019.05.04	1 year	☒
83	AMPLIFIER	TK-PA1840H	160010-L	TESTEK	2019.04.27	1 year	☒
84	AMPLIFIER	8447D	2944A07881	H.P	2019.01.29	1 year	☒
85	Antenna Mast	MA2000-EP	None	innco systems GmbH	N/A	N/A	☐
86	Turn Device	DE3700-RH	None	innco 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
Spurious RF radiated emissions & Field strength of fundamental	15.205(a) & 15.209(a) & 15.249(a)	Clause 5.2	☒	Compliance
Antenna requirement	15.203	Clause 5.3	☒	Compliance
AC Power Conducted emissions	15.207	Clause 5.4	☐	N/A : This EUT uses alkaline batteries.
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)]

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

5.1.2 Test Environment conditions

- Ambient temperature : (20 ~ 21) °C
- Relative Humidity : (49 ~ 51) % R.H.

5.1.3 Measurement Procedure

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.

The spectrum analyzer is set to the as follows :

• Set RBW = 10 kHz.
• Set the video bandwidth (VBW) ≥ 3 x RBW.
• Detector = Peak.
• Trace mode = max hold.
• Sweep = auto couple.
• Allow the trace to stabilize.
• Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

5.1.4 Measurement Result

Channel	Frequency [MHz]	20 dB Bandwidth [MHz]	99 % Bandwidth [MHz]	Test Results
1	2 410	1.127	1.430	No limit (for information only)
31	2 440	1.319	1.428	
61	2 470	1.402	1.555	

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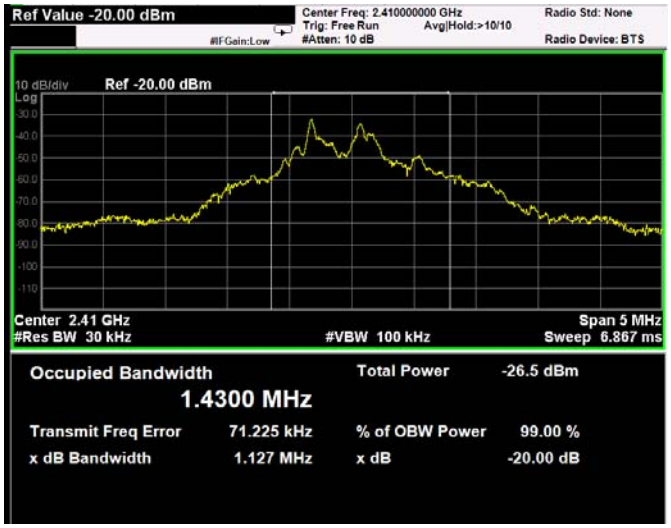
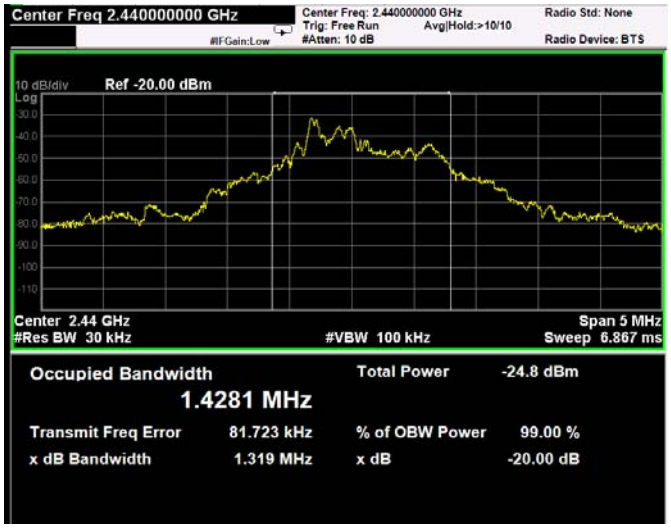
5.1.5 Test Plot





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5.2 Spurious RF Radiated emissions & Field strength of fundamental

5.2.1 Standard Applicable [FCC §15.249(a)]

(a) Except as provided in paragraph (b) of this section, 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

§15.209 limits for radiated emissions measurements (distance at 3 m)

Frequency Band [MHz]	DISTANCE [Meters]	Limit [μV/m]	Limit [dBμV/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 dBμV/m (Peak), 54.0 dBμV/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

[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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5.2.2 Test Environment conditions

- Ambient temperature : (20 ~ 21) °C
- Relative Humidity : (49 ~ 51) % R.H.

5.2.3 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 GHz and 1.5 meters for above 1 GHz) 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(dBμV/m) = Reading(dBμV) + Antenna factor(dB/m)+ CL(dB) + other applicable factor (dB)
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for RMS
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
- According to §15.33 (a)(1), Frequency range of radiated measurement is performed the tenth harmonic.

5.2.4 Measurement Uncertainty

Radiated Emission measurement: Below 1 GHz: 3.66 dB (CL: Approx 95 %, k=2)
Above 1 GHz: 4.04 dB (CL: Approx 95 %, k=2)

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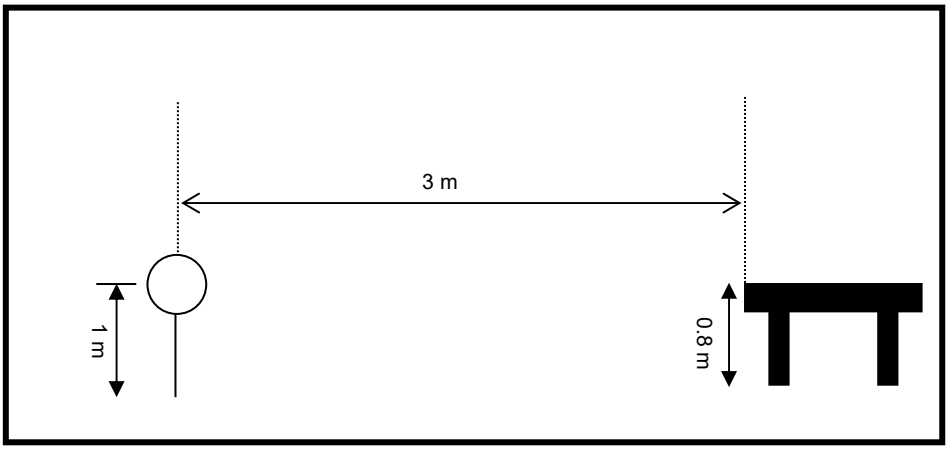
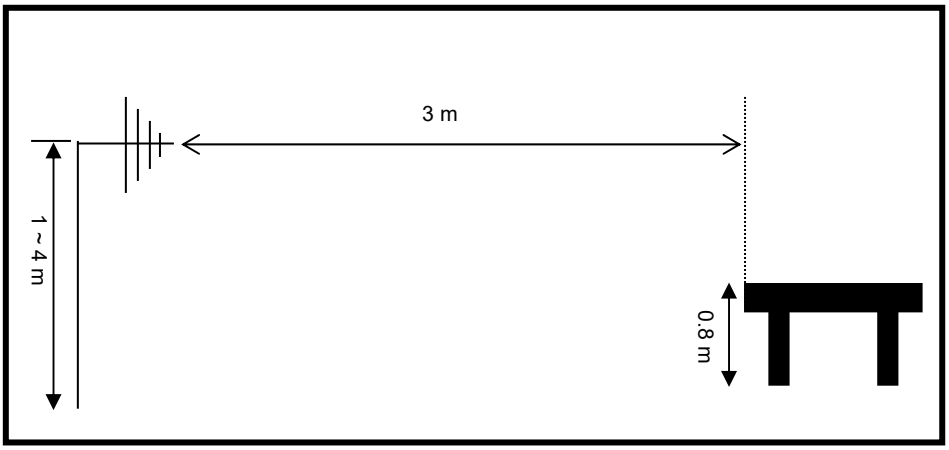
5.2.5 Test Configuration

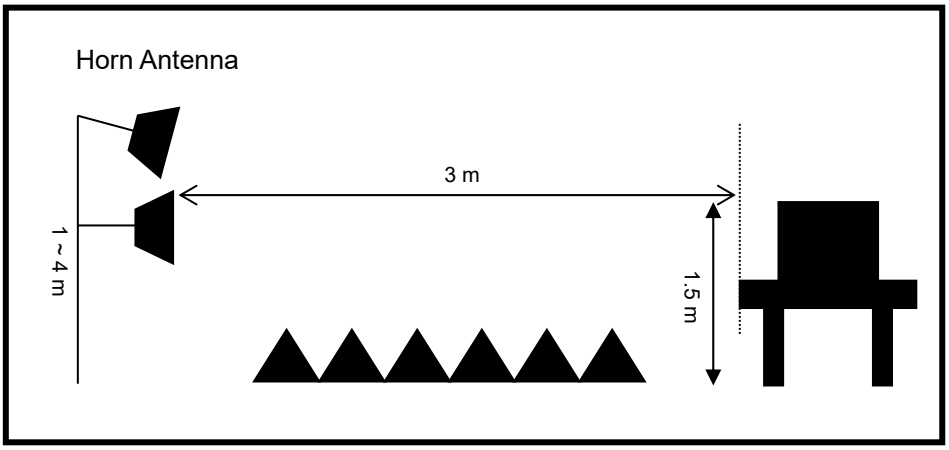
Radiated emission setup, below 30 MHz



Radiated emission setup, below 1 000 MHz



Radiated emission setup, above 1 GHz



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5.2.6 Measurement Result

Field strength of fundamental

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	
2.410	90.98	90.27	180	1.2	H	28.42	6.86	-42.05	84.21	83.50	114	94	29.79	10.50	Compliance
2.410	95.47	94.45	170	1.0	V	28.42	6.86	-42.05	88.70	87.68	114	94	25.30	6.32	Compliance
2.440	91.46	90.64	180	1.2	H	28.48	6.89	-42.13	84.69	83.87	114	94	29.31	10.13	Compliance
2.440	96.41	94.51	180	1.0	V	28.48	6.89	-42.13	89.64	87.74	114	94	24.36	6.26	Compliance
2.470	96.50	95.45	160	1.2	H	28.54	6.91	-42.22	89.74	88.69	114	94	24.26	5.31	Compliance
2.470	100.02	99.03	180	1.0	V	28.54	6.91	-42.22	93.26	92.27	114	94	20.74	1.73	Compliance

Band Edge & Restrict band

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	
2.399	60.58	44.38	160	1.2	H	28.40	6.85	-42.02	53.81	37.61	74	54	20.19	16.39	Compliance
2.399	57.10	40.64	170	1.0	V	28.40	6.85	-42.02	50.33	33.87	74	54	23.67	20.13	Compliance
2.484	54.55	41.42	180	1.2	H	28.57	6.93	-42.26	47.79	34.66	74	54	26.21	19.34	Compliance
2.484	51.62	37.34	180	1.0	V	28.57	6.93	-42.26	44.86	30.58	74	54	29.14	23.42	Compliance

Harmonic

▪ 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)						
144.14	57.67	160	1.0	V	8.60	1.67	-41.82	26.12	43.5	17.38	Compliance
144.14	58.72	170	1.2	H	8.60	1.67	-41.82	27.17	43.5	16.33	Compliance

Note: quasi-peak was used.
There is no spurious emission.

▪ 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	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Compliance
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Compliance

There is no spurious emission.

※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.
• For the below 30 MHz and above 2.484 GHz, measured any other signal is not detected on test receiver.
• The transmitter radiated spectrum was investigated from 9 kHz to 26.5 GHz.

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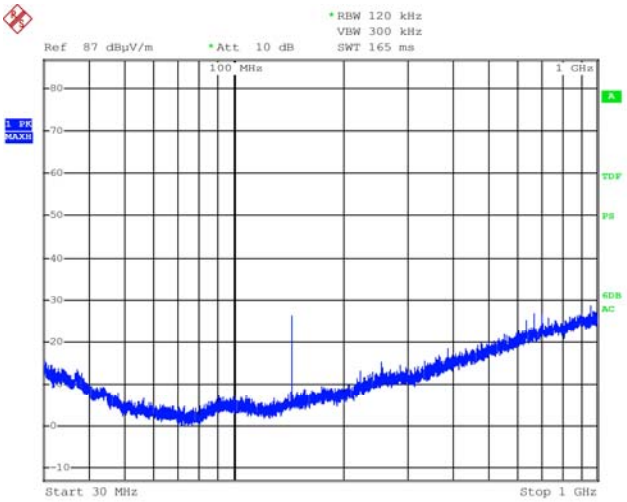
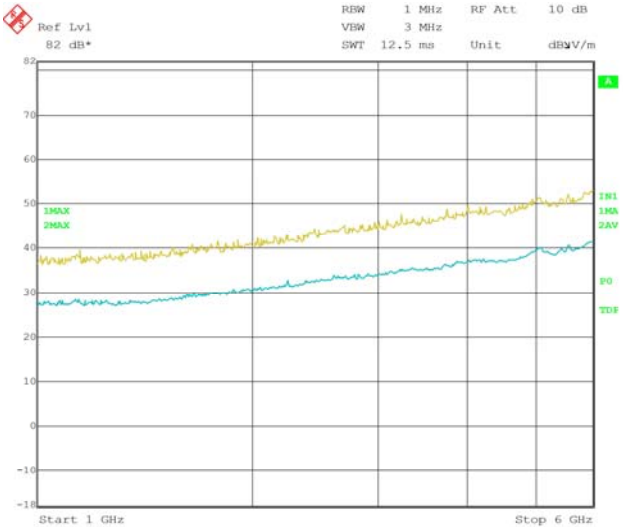
5.2.7 Plots

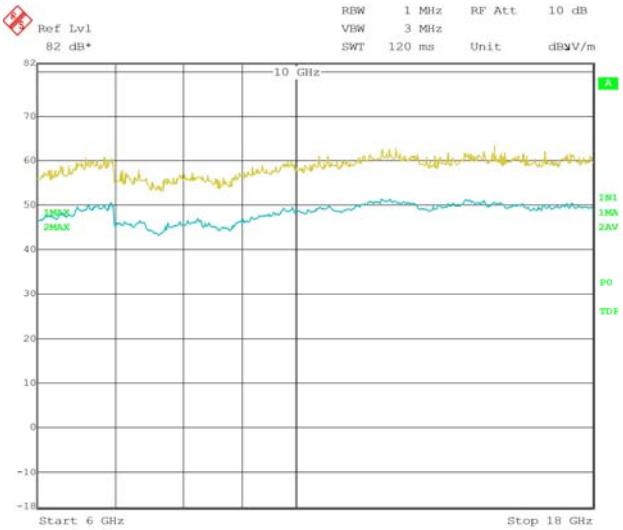
* The worst case only.

▪ Below 1 GHz



▪ Above 1 GHz





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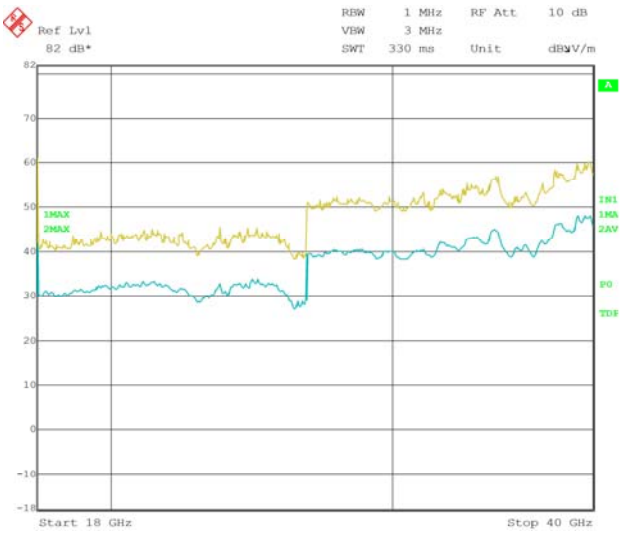

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5.3 Antenna requirement

5.3.1 Standard applicable [FCC §15.203]

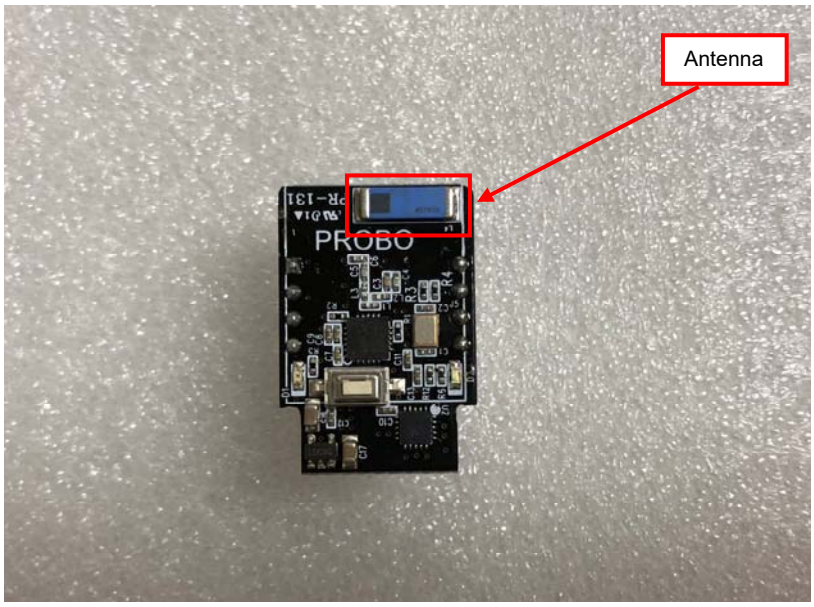
For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by responsible party shall be used with the device.

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.

5.3.2 Antenna details

Frequency Band	Antenna Type	Gain	Results
2.4 GHz	Internal Chip antenna	Max 2 dBi	Compliance



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5.4 AC Power Conducted emissions

5.4.1 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 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

5.4.2 Test Environment conditions

• Ambient temperature : - • Relative Humidity : -

5.4.3 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.

5.4.4 Used equipment

Equipment	Model No.	Serial No.	Manufacturer	Next cal date	Cal interval	Used
Test receiver	ESCS30	100111	Rohde & Schwarz	2019. 01. 29	1 year	☐
LISN	ESH2-Z5	100044	R&S	2019. 01. 29	1 year	☐
	ESH3-Z5	100147	R&S	2019. 01. 29	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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5.4.5 Measurement Result

- N/A

Freq.	Factor [dB]		POL	QP			CISPR AV		
				Limit	Reading	Result	Limit	Reading	Result
[MHz]	LISN	CABLE +P/L		[dBμV]	[dBμV]	[dBμV]	[dBμV]	[dBμV]	[dBμV]

* 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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