KES Co., Ltd.
C-3701, Simin-daero 365-40,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

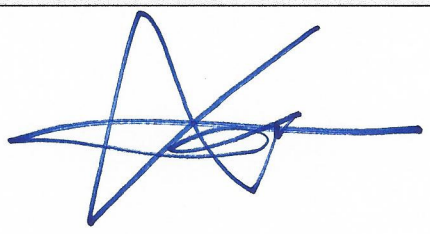
CLASS II PERMISSIVE CHANGE

TEST REPORT

Equipment under test	Wireless Baby Camera
Model name	SEP-1002RW
FCC ID	NLMSEP1001RW
Applicant	Hanwha Techwin Co., Ltd.
Manufacturer	Tianjin Samsung Techwin Opto-Electronic Co., Ltd.
Date of test(s)	2016.01.13 ~ 2016.01.15
Date of issue	2016.02.12

Issued to
Hanwha Techwin Co., Ltd.
1204, Changwon-daero, Seongsan-gu, Changwon-si,
Gyeongsangnam-do, South Korea
Tel: +82-70-7147-8361 / Fax: +82-31-8108-3717

Issued by
KES Co., Ltd.
C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, 12658, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450

Test and report completed by :	**Report approval by :**
	
Kwon-se Kim Test engineer	Jeff Do Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2016.02.12	KES-RF-16T0017	Initial

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1. General information

Applicant:	Hanwha Techwin Co., Ltd.
Applicant address:	1204, Changwon-daero, Seongsan-gu, Changwon-si Gyeongsangnam-do, South Korea
Test site:	KES Co., Ltd.
Test site address:	C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do,14057, Korea 473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, 12658, Korea
FCC rule part(s):	15.247
Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering
Application purpose:	☐ Original grant ☐ Class I permissive change ☒ Class II permissive change

1.1. EUT description

Equipment under test	Wireless Baby Camera
Frequency range	2410.875 ㎒ ~ 2471.625 ㎒
Model	SEP-1002RW
Modulation technique	FHSS
Type of Modulation	GFSK
Number of channels	19
Antenna specification	Antenna type: Wire, Peak gain: 2.0 ㏈i
Power source	AC 120V Adaptor (Output : DC 5.9V)

1.2. Test configuration

The Wireless Baby Camera FCC ID: NLMSEB1019RW was tested per the guidance of ANSI C63.10-2009 and DA 00-705. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

1.3. Frequency/channel operations

Ch.	Frequency (㎒)
01	2410.875
. .	. .
10	2441.250
. .	. .
19	2471.625

1.4. Information about Class II Permissive change

The product is no hardware modifications. Added to the product is AC adapter

Original AC Adapter	Added AC Adapter
	

2. Summary of tests

Section in FCC Part 15	Test description	Test results
15.205, 15.209	Radiated restricted band and emission	Pass
15.207	AC conducted emissions	Pass

Note:

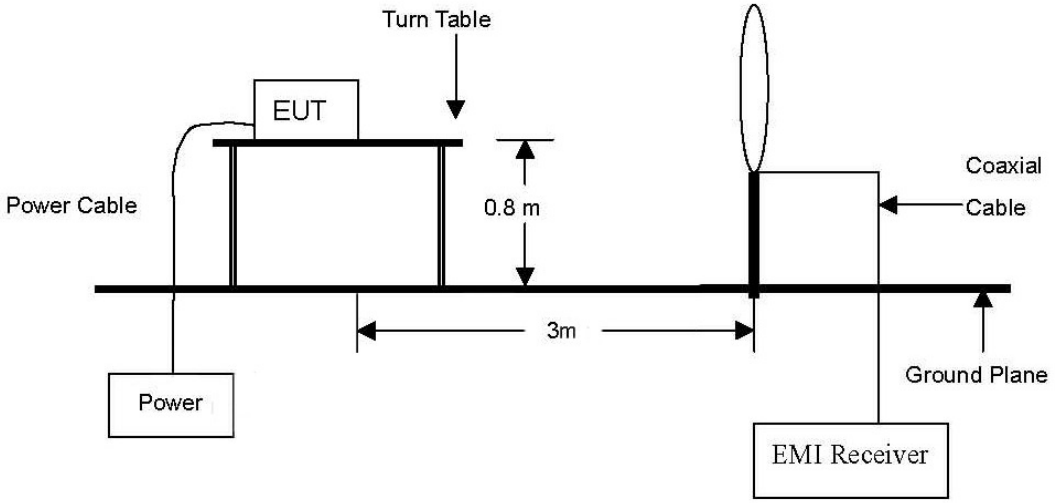
1. The EUT was tested per the guidance of DA 00-705. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

3. Test results

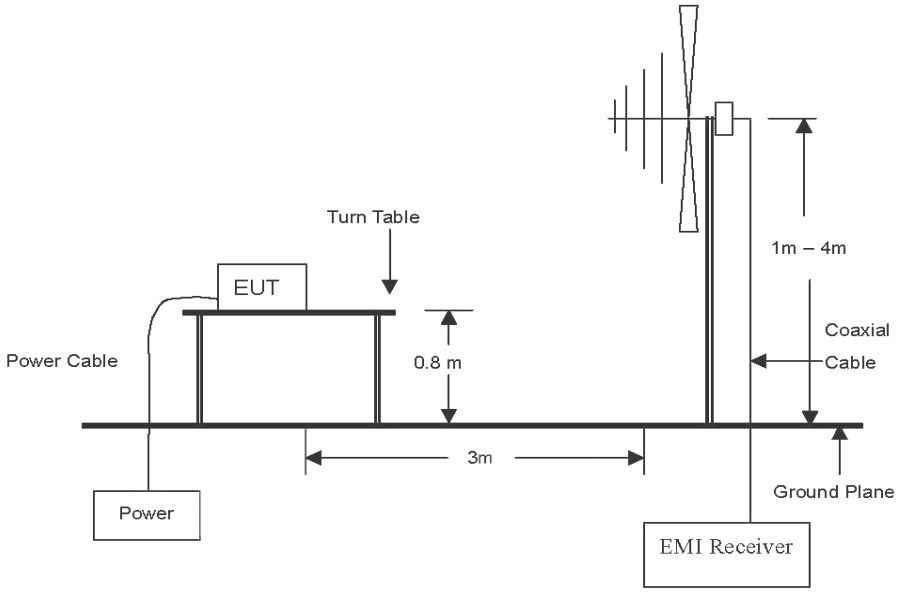
3.1. Radiated restricted band and emissions

Test setup

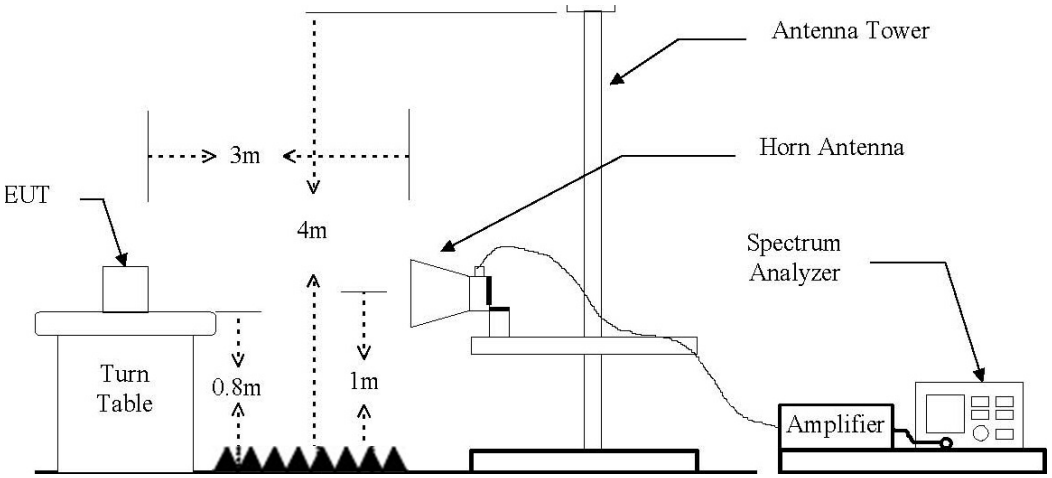
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



Test procedure

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. Spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured
   RBW = 1 ㎒ for $f \geq 1$ ㎓, 100 ㎑ for $f < 1$ ㎓
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak and/or average for $f \geq 1$ ㎓, quasi peak for $f < 1$ ㎓
   Trace = max hold
8. Now set the VBW to 10 ㎐ while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 ㎐ VBW may be further adjusted by a "duty cycle correction factor", derived from 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Note:

1. The spectrum is measured from 9 ㎑ to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1 ㎓. Above 1 ㎓, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20 ㏈ of the respective limits were not reported.
2. When Average result is different from peak result over 20 ㏈ (over-averaging), according to 15.35 (c), as a "duty cycle correction factor", pulse averaging with 20 log(duty cycle) has to be used.
   Duty cycle correction factor = 20log(dwell time/100 ㎳)
3. Emissions below 18 ㎓ were measured at a 3 meter test distance while emissions above 18 ㎓ were measured at a 1 meter test distance with the application of a distance correction factor.
4. Average test would be performed if the peak result were greater than the average limit.
5. Field strength(㏈㎶/m) = Level(㏈㎶) + Correction factors(㏈/m) + Cable loss(㏈) + or F_d(㏈)
6. Correction factors(㏈/m) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈)
7. Margin(㏈) = Limit(㏈㎶/m) - Field strength(㏈㎶/m)
8. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.
9. $f < 30$ ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m / Ds)$
   $f \geq 30$ ㎒, extrapolation factor of 20 ㏈/decade of distance. $F_d = 20\log(D_m / Ds)$

Where:

F_d = Distance factor in ㏈
D_m = Measurement distance in meters
D_s = Specification distance in meters

Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (㎒)	Distance (Meters)	Radiated (㎶/m)
0.009 ~ 0.490	300	2 400 / F(㎑)
0.490 ~ 1.705	30	24 000 / F(㎑)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating 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, e.g., Sections 15.231 and 15.241.

Test results (Below 30 ㎒)

Mode: GFSK

Distance of measurement: 3 meter

Operating frequency: 2 410.875 ㎒ (Worst case)

Channel: 01

Frequency (㎒)	Level (dB㎶)	Ant. Pol. (H/V)	Correction factors (dB/m)	F_d (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
No signal detected							

Test results (Below 1 000 ㎒)

Mode: GFSK

Distance of measurement: 3 meter

Operating frequency: 2 410.875 ㎒ (Worst case)

Channel: 01

Frequency (㎒)	Level (dB㎶)	Ant. Pol (H/V)	Correction factors		Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
			Ant. factor (dB/m)	Cable loss (dB)			
199.75	15.13	V	10.15	1.30	26.58	43.50	16.92
216.24	13.14	V	10.74	1.33	25.21	46.00	20.79
240.49	20.43	H	11.63	1.37	33.43	46.00	12.57
288.02	14.99	V	13.38	1.57	29.94	46.00	16.06
288.99	22.65	H	13.41	1.57	37.63	46.00	8.37
312.27	15.97	H	14.10	1.63	31.70	46.00	14.30
336.52	17.82	H	14.65	1.64	34.11	46.00	11.89
360.77	21.18	H	15.19	1.69	38.06	46.00	7.94
384.05	16.28	H	15.72	1.78	33.78	46.00	12.22
432.55	16.41	H	16.80	1.94	35.15	46.00	10.85
576.11	15.19	V	19.88	2.40	37.47	46.00	8.53

Note.

1. All spurious emission at channels are almost the same below 1 ㎓, so that low channel was chosen at representative in final test.

Test results (Above 1 000 ㎒)

Mode: GFSK
Distance of measurement: 3 meter
Operating frequency: 2 410.875 ㎒
Channel: 01

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	Correction factors		Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
				AFCL(dB)	DCF(dB)			
2388.67	49.94	Peak	H	-0.95	-	48.99	74.00	25.01
2389.99	56.03	Peak	V	-0.95	-	55.08	74.00	18.92
2389.95	44.72	Average	V	-0.95	-	43.77	54.00	10.23
4819.00	40.89	Peak	H	8.18	-	49.07	74.00	24.93
4819.00	43.73	Peak	V	8.18	-	51.91	74.00	22.09

Mode: GFSK
Distance of measurement: 3 meter
Operating frequency: 2 441.25 ㎒
Channel: 10

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	Correction factors		Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
				AFCL(dB)	DCF(dB)			
4889.00	39.63	Peak	H	8.68	-	48.31	74.00	25.69
4889.00	37.39	Peak	V	8.68	-	46.07	74.00	27.93

Mode:	GFSK
Distance of measurement:	3 meter
Operating frequency:	2 471.625 ㎒
Channel:	19

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	Correction factors		Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
				AFCL(dB)	DCF(dB)			
2483.76	56.95	Peak	H	-0.45	-	56.50	74.00	17.50
2383.55	43.83	Average	H	-0.98	-	42.85	54.00	11.15
2483.72	63.57	Peak	V	-0.45	-	63.12	74.00	10.88
2383.67	52.78	Average	V	-0.98	-	51.80	54.00	2.20
4946.00	39.25	Peak	H	9.08	-	48.33	74.00	25.67
4946.00	38.10	Peak	V	9.08	-	47.18	74.00	26.82

3.2. AC conducted emissions

Limit

According to 15.207(a), for an 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 frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (㎒)	Conducted limit (dB㎶/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Note:

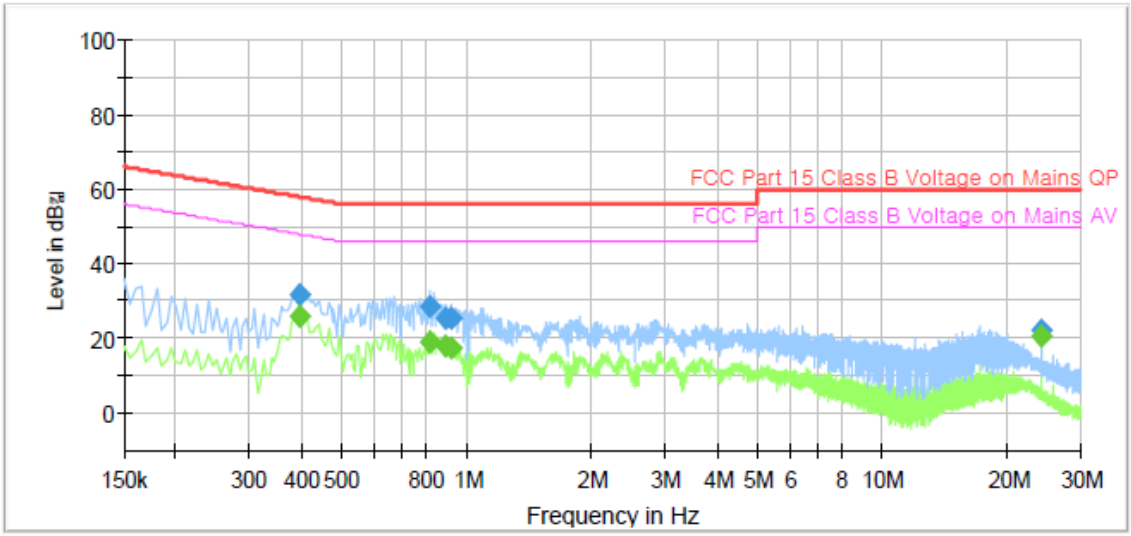
1. All modes of operation, data rates, and test channels were investigated and the worst-case emissions are reported in GFSK mode Channel 01. The emissions found were not affected by the choice of channel used during testing.
2. The limit for Class B device(s) from 150 ㎑ to 30 ㎒ are specified in Section 15.207 of the Title 47 CFR.
3. Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).
4. Deviations to the Specifications: None.

Test results

Test Report

Common Information

Test Description:	Conducted Emission
Model No.:	SEP-1002RW
Mode	TX
Operator Name:	KES



Final_Result

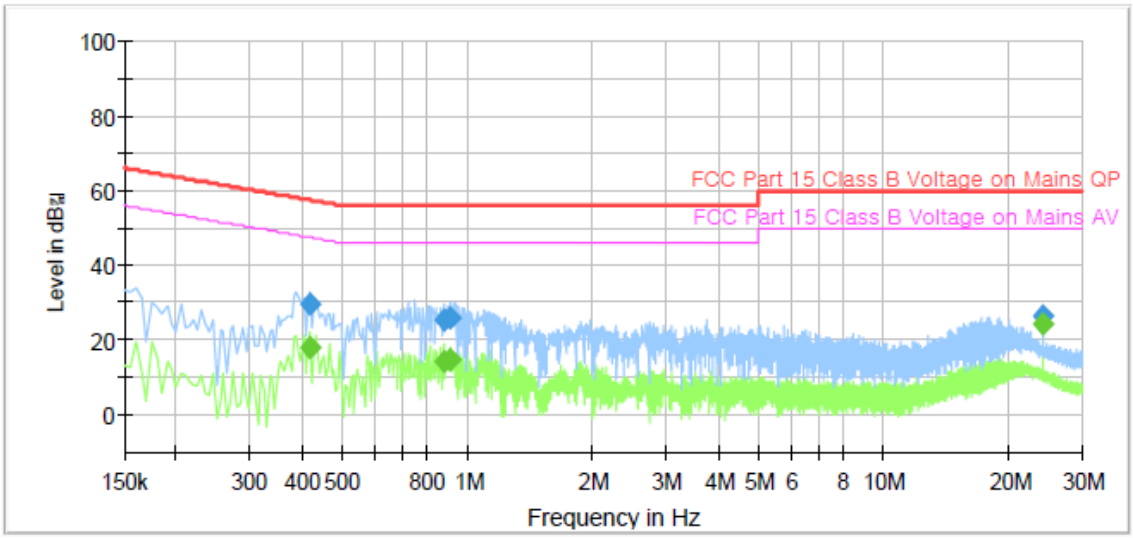
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.395000	---	26.18	47.96	21.78	1000.0	9.000	L1	9.7
0.395000	31.58	---	57.96	26.38	1000.0	9.000	L1	9.7
0.820000	---	18.95	46.00	27.05	1000.0	9.000	L1	9.7
0.820000	28.87	---	56.00	27.13	1000.0	9.000	L1	9.7
0.890000	---	17.81	46.00	28.19	1000.0	9.000	L1	9.7
0.890000	25.54	---	56.00	30.46	1000.0	9.000	L1	9.7
0.915000	---	17.47	46.00	28.53	1000.0	9.000	L1	9.7
0.915000	25.26	---	56.00	30.74	1000.0	9.000	L1	9.7
24.000000	---	20.61	50.00	29.39	1000.0	9.000	L1	10.1
24.000000	22.32	---	60.00	37.68	1000.0	9.000	L1	10.1

Note; Hot Line
Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).

Test Report

Common Information

Test Description:	Conducted Emission
Model No.:	SEP-1002RW
Mode	TX
Operator Name:	KES



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.420000	---	18.15	47.45	29.30	1000.0	9.000	N	9.7
0.420000	29.52	---	57.45	27.93	1000.0	9.000	N	9.7
0.880000	---	14.43	46.00	31.57	1000.0	9.000	N	9.7
0.880000	25.32	---	56.00	30.68	1000.0	9.000	N	9.7
0.910000	---	14.78	46.00	31.22	1000.0	9.000	N	9.7
0.910000	26.10	---	56.00	29.90	1000.0	9.000	N	9.7
24.000000	---	24.46	50.00	25.54	1000.0	9.000	N	10.0
24.000000	26.51	---	60.00	33.49	1000.0	9.000	N	10.0

Note; Neutral Line
Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).

Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due date
Spectrum Analyzer	R&S	FSV40	101002	1 year	2016.07.25
Loop Antenna	R&S	HFH2-Z2.335.4711.52	826532	2 years	2017.03.03
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-461	2 years	2017.04.03
Horn Antenna	A.H. System	SAS-571	414	2 years	2017.02.09
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170550	2 years	2017.04.30
Low Pass Filter	Wainwright Instrument	WLK1.0/18G-10TT	1	1 year	2016.07.24
High Pass Filter	Wainwright Instrument	WHJS3000-10TT	1	1 year	2016.07.24
Preamplifier	SCHWARZBECK	BBV-9718	9718-246	1 year	2016.10.23
Broadband Amplifier	SCHWARZBECK	BBV-9721	PS9721-003	1 year	2017.01.25
EMI Test Receiver	R & S	ESR3	101781	1 year	2016.05.06
EMI Test Receiver	R & S	ESR3	101783	1 year	2016.05.06
LISN	R & S	ENV216	101137	1 year	2017.02.04

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
-	-	-	-