TEST REPORT

Part 15 Subpart C 15.247

Equipment under test	Base station
Model name	TGBS900BA
FCC ID	2AQ9G-TGBS900BA
Applicant	Trianglecnc co., Ltd.
Manufacturer	Trianglecnc co., Ltd.
Date of test(s)	2019.01.09 ~ 2019.01.30
Date of issue	2019.04.01

Issued to
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Revision history

Revision	Date of issue	Test report No.	Description
-	2019.04.01	KES-RF-19T0033	Initial

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1. General information

Applicant:	Trianglecnc co., Ltd.
Applicant address:	B-720, Building Kumkang Penterium IT tower, 282, Hagui-ro, Dongang-gu, Anyang-si, Gyeonggi-go, Republic of Korea
Test site:	KES Co., Ltd.
Test site address:	3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Test Facility	FCC Accreditation Designation No.: KR0100, Registration No.: 444148 ISED Registration No.: 23298
FCC rule part(s):	15.247
FCC ID:	2AQ9G-TGBS900BA
Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	Base station
Frequency range	FHSS : 906.4 ㎒ ~ 923.5 ㎒
Model:	TGBS900BA
Modulation technique	FHSS
Antenna specification	Antenna type : Dipole antenna, Peak gain : 2.850 ㏈i
Power source	AC 120 V
Number of channels	FHSS : 50

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15.247(a)(1) that the rx input bandwidths shift frequencies in synchronization with the transmitted signals.
15.247(g): The system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
15.247(h): The system does not coordinate it channels selection/ hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

Pseudorandom frequency hopping sequence
The channel is represented by a pseudo-random hopping sequence hopping through the 50 RF channels.

Equal hopping frequency use
The channels of this system will be used equally over the long-term distribution of the hopsets.

Example of a 50 hopping sequence in data mode:
03, 24, 31, 20, 05, 10, 43, 36, 23, 30, 11, 06, 09, 50, 01, 40, 13, 44, 07, 08, 49, 16, 41, 34, 21, 04, 15, 12, 29, 22, 35, 18, 27, 32, 39, 46, 33, 42, 37, 38, 17, 14, 47, 26, 45, 28, 19, 48, 25, 02, 10, 35, 36, 38, 01, 06, 43, 02, 03, 48, 16, 34, 15, 25, 11, 41, 12, 42, 40, 14, 20, 13, 49, 05, 50, 45, 07, 47, 17, 18, 29, 32, 33, 08, 24, 22, 39, 37, 23, 30, 44, 09, 19, 04, 21, 28, 31, 46, 27, 26

System receiver input bandwidth
Each channel bandwidth is 1 ㎒.
The system receivers have input bandwidth that match the hopping channel bandwidth of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

1.2. Test configuration
The **Trianglecnc co., Ltd. Base station FCC ID: 2AQ9G-TGBS900BA,**
was tested per the guidance of ANSI C63.10-2013 and DA 00-705. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

1.3. Information about derivative model
N/A

1.4. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

1.5. Software and Firmware description
The software and firmware installed in the EUT is version 3.20

1.6. Measurement results explanation example
For all conducted test items :
The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Offset(㏈) = RF cable loss(㏈) + attenuator factor(㏈).
= 0.98 + 30.00 = 30.98 (㏈)

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1.7. Measurement Uncertainty

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.62 dB
Uncertainty for Radiation emission test (include Fundamental emission)	9kHz - 30MHz	4.54 dB
	30MHz - 1GHz	4.36 dB
	Above 1GHz	5.00 dB
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

1.8. Frequency/channel operations

Ch.	Frequency (MHz)
01	904.6
. .	. .
25	914.8
. .	. .
50	923.5

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2. Summary of tests

Reference	Test description	Test results
15.247(a)(1)(i)	20 dB bandwidth	Pass
15.247(b)(2)	Output power	Pass
15.247(a)(1)	Channel separation	Pass
15.247(a)(1)(i)	Number of channels	Pass
15.247(a)(1)(i)	Time of occupancy	Pass
15.205, 15.209	Radiated restricted band and emission	Pass
15.207(d)	Conducted band edge and out of band emissions	Pass
15.207(a)	AC conducted emissions	Pass

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3. Test result

3.1. 20 dB bandwidth

Test procedure

DA 00-705

Test setting

1. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
2. RBW ≥ 1% of the 20 dB bandwidth
3. VBW ≥ RBW
4. Sweep = auto
5. Detector function = peak
6. Sweep = auto couple
7. Trace mode = max hold

Limit

According to §15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if t he 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 ho pping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 s econds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or gre ater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any f requency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test results

Frequency(㎒)	20 dB bandwidth(㎒)	Limit(㎒)
906.4	0.166	0.250
914.8	0.166	
923.5	0.169	

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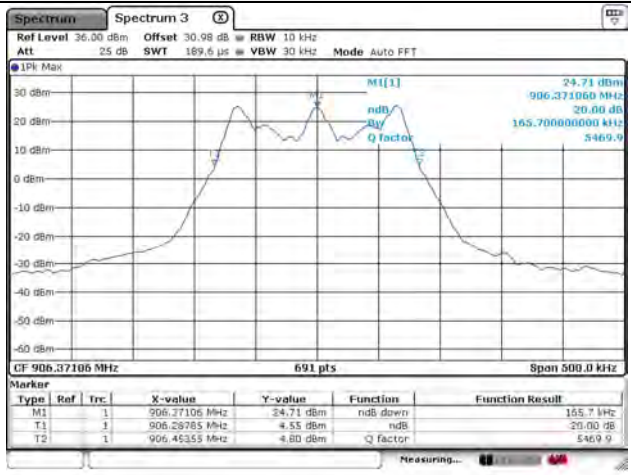
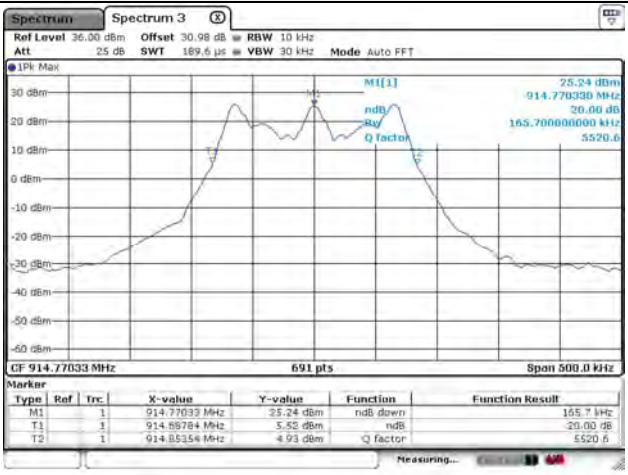
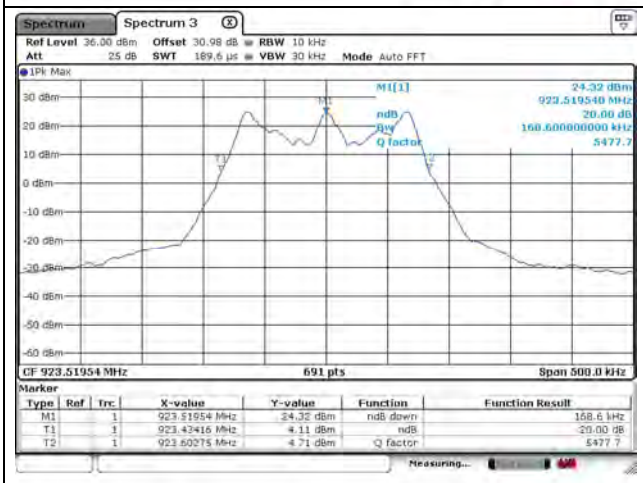
FHSS


Spectrum
Spectrum 3
Ref Level 36.00 dBm Offset 30.98 dB RBW 10 kHz
Att 25 dB SWT 189.6 µs VBW 30 kHz Mode Auto FFT
1Pk Max
M1[1] 24.71 dBm
906.371060 MHz
ndB 20.00 dB
Bw 165.700000000 kHz
Q factor 5469.9
CF 906.37106 MHz
691 pts
Span 500.0 kHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 906.37106 MHz 24.71 dBm ndB down 165.7 kHz
T1 1 906.28785 MHz 4.55 dBm ndB -20.00 dB
T2 1 906.45355 MHz 4.80 dBm Q factor 5469.9
Measuring...


Spectrum
Spectrum 3
Ref Level 36.00 dBm Offset 30.98 dB RBW 10 kHz
Att 25 dB SWT 189.6 µs VBW 30 kHz Mode Auto FFT
1Pk Max
M1[1] 25.24 dBm
914.770330 MHz
ndB 20.00 dB
Bw 165.700000000 kHz
Q factor 5520.6
CF 914.77033 MHz
691 pts
Span 500.0 kHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 914.77033 MHz 25.24 dBm ndB down 165.7 kHz
T1 1 914.68784 MHz 5.52 dBm ndB -20.00 dB
T2 1 914.85354 MHz 4.93 dBm Q factor 5520.6
Measuring...


Spectrum
Spectrum 3
Ref Level 36.00 dBm Offset 30.98 dB RBW 10 kHz
Att 25 dB SWT 189.6 µs VBW 30 kHz Mode Auto FFT
1Pk Max
M1[1] 24.32 dBm
923.519540 MHz
ndB 20.00 dB
Bw 168.600000000 kHz
Q factor 5477.7
CF 923.51954 MHz
691 pts
Span 500.0 kHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 923.51954 MHz 24.32 dBm ndB down 168.6 kHz
T1 1 923.43416 MHz 4.11 dBm ndB -20.00 dB
T2 1 923.60275 MHz 4.71 dBm Q factor 5477.7
Measuring...

N/A

3.2. Output power

Test procedure

DA 00-705

Test setting

1. Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
2. RBW > the 20 dB bandwidth of the emission being measured
3. VBW ≥ RBW
4. Sweep = Auto
5. Detector function = Peak
6. Trace = Max hold

Limit

According to §15.247(b)(2), For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels.

Test results

Frequency(㎒)	Channel no.	Measured power		Peak Power Limit	
		(dBm)	(W)	(dBm)	(W)
906.4	01	26.44	0.44	30.00	1.00
914.8	25	26.92	0.49	30.00	1.00
923.5	50	26.21	0.42	30.00	1.00

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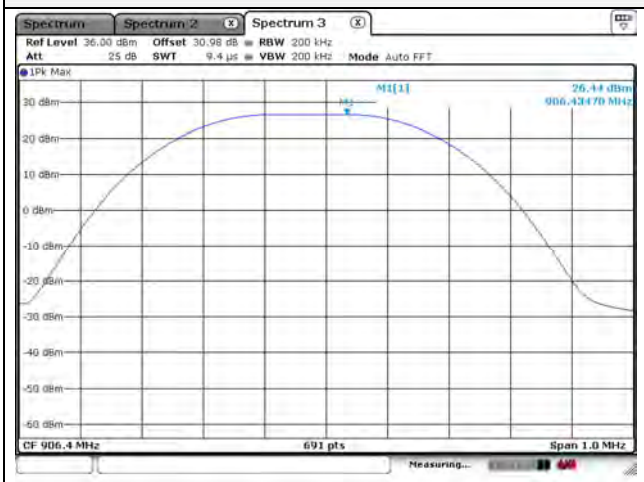
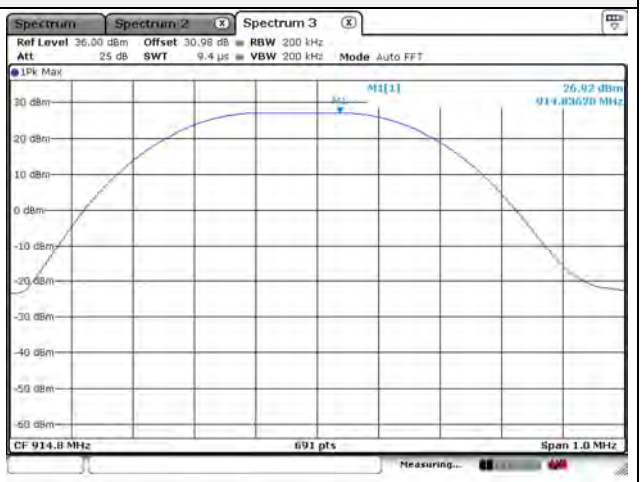
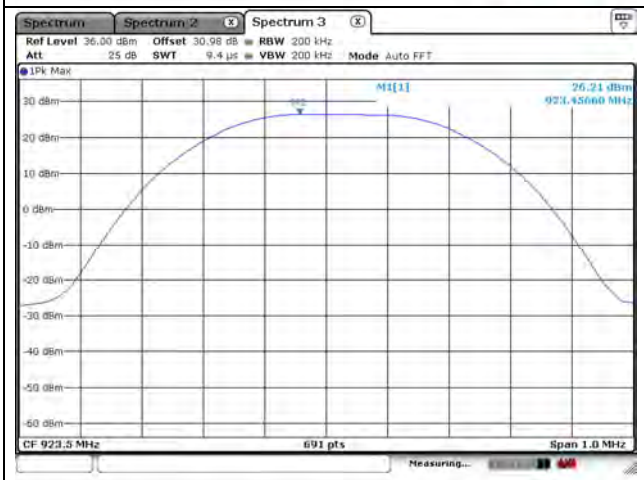
FHSS


Spectrum
Spectrum 2
Spectrum 3
Ref Level 36.00 dBm Offset 30.98 dB RBW 200 kHz
Att 25 dB SWT 9.4 µs VBW 200 kHz Mode Auto FFT
1Pk Max
M1[1]
26.44 dBm
906.43470 MHz
CF 906.4 MHz
691 pts
Span 1.0 MHz
Measuring...


Spectrum
Spectrum 2
Spectrum 3
Ref Level 36.00 dBm Offset 30.98 dB RBW 200 kHz
Att 25 dB SWT 9.4 µs VBW 200 kHz Mode Auto FFT
1Pk Max
M1[1]
26.92 dBm
914.83670 MHz
CF 914.8 MHz
691 pts
Span 1.0 MHz
Measuring...


Spectrum
Spectrum 2
Spectrum 3
Ref Level 36.00 dBm Offset 30.98 dB RBW 200 kHz
Att 25 dB SWT 9.4 µs VBW 200 kHz Mode Auto FFT
1Pk Max
M1[1]
26.21 dBm
923.45660 MHz
CF 923.5 MHz
691 pts
Span 1.0 MHz
Measuring...

N/A

3.3. Carrier frequency separation

Test procedure

DA 00-705

Test Setting

1. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
2. Span = wide enough to capture the peaks of two adjacent channels
3. Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
4. Video (or Average) Bandwidth (VBW) ≥ RBW
5. Sweep = auto
6. Detector function = peak
7. Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section. Submit this plot.

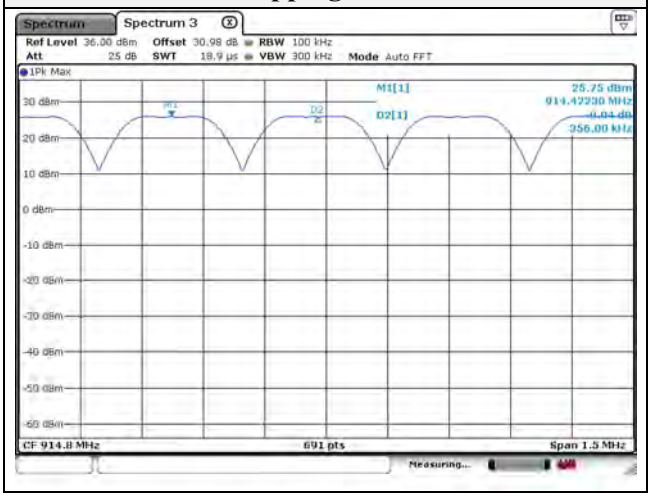
Limit

According to §15.247(a)(1)(i), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test results

Frequency(㎒)	Channel no.	Channel Separation (㎒)
914.8	25	0.356

Hopping mode



3.4. Number of hopping frequency

Test procedure

DA 00-705

Test setting

1. The EUT must have its hopping function enabled.
2. Frequency range: 905 ㎒ ~ 925 ㎒
3. Span = the frequency band of operation
4. RBW = 1 ㎒ (≥ 1% of the span)
5. VBW = 1 ㎒ (≥ RBW)
6. Sweep = auto
7. Detector function = peak
8. Trace = max hold

All the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

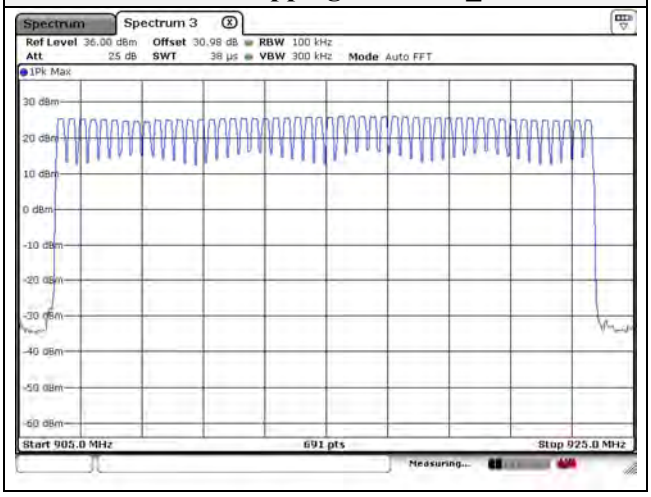
Limit

According to 15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test results

Frequency	Number of hopping frequency	Limit
906.4 ~ 923.5 ㎒	50	≥ 50

Number of Hopping Channels_GFSK



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3.5. Time of occupancy

Test procedure

DA 00-705

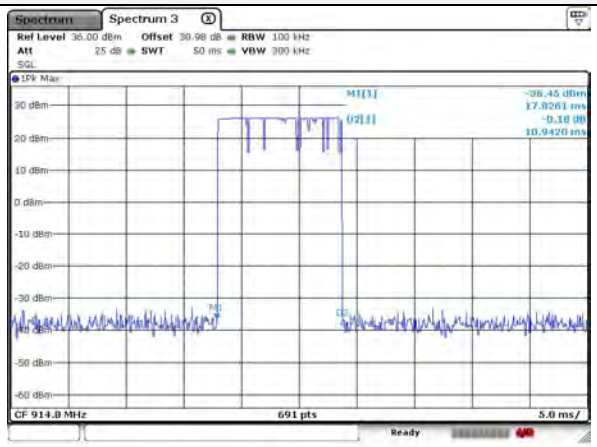
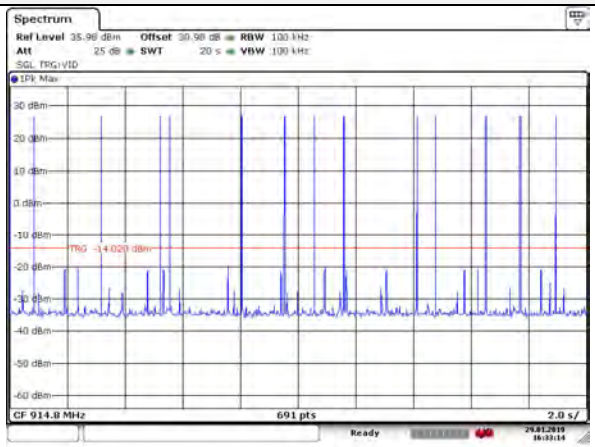
Test setting

1. The EUT must have its hopping function enabled.
2. Span = zero span, centered on a hopping channel
4. RBW = 1 ㎒
5. VBW = 1 ㎒ (≥ RBW)
6. Sweep = as necessary to capture the entire dwell time per hopping channel
7. Detector function = peak
8. Trace = max hold

Limit

According to 15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

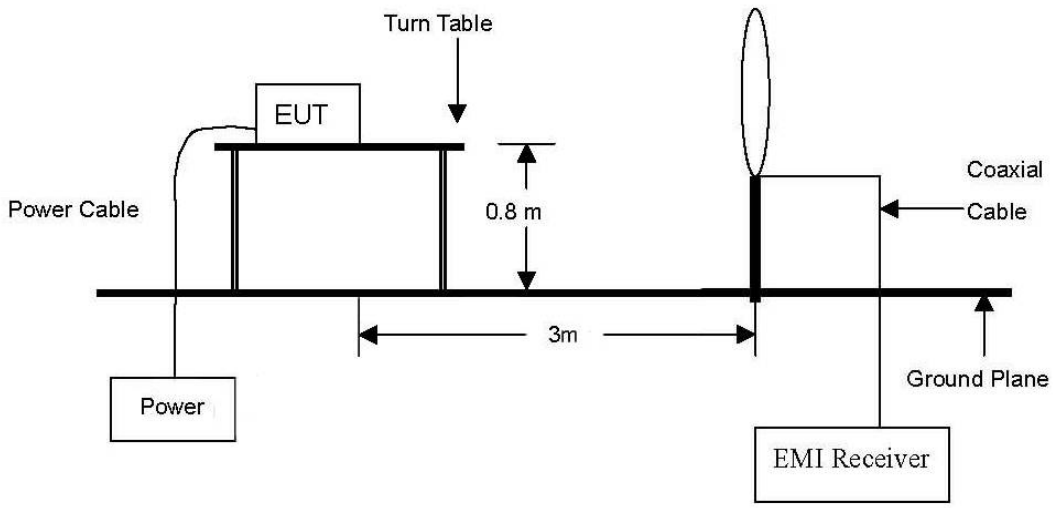
Frequency (㎒)	Burst time (ms)	Burst number	Time of occupancy (ms)	Limit (ms)
914.8	10.94	13	144.22	400.00

Burst time(㎳) = 10.94_Hopping Mode	Burst number within 20 s = 13_Hopping Mode
	

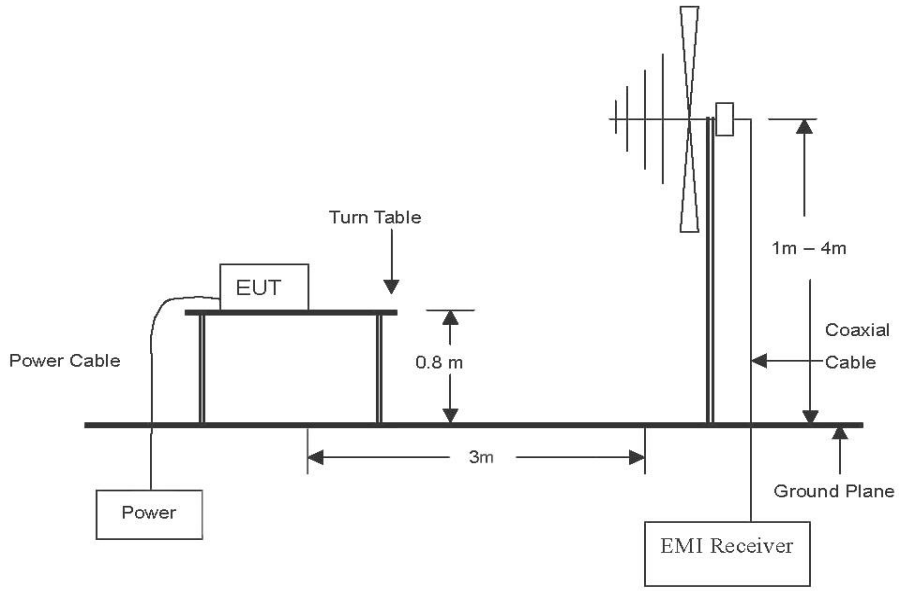
3.5. Radiated restricted band and emissions

Test setup

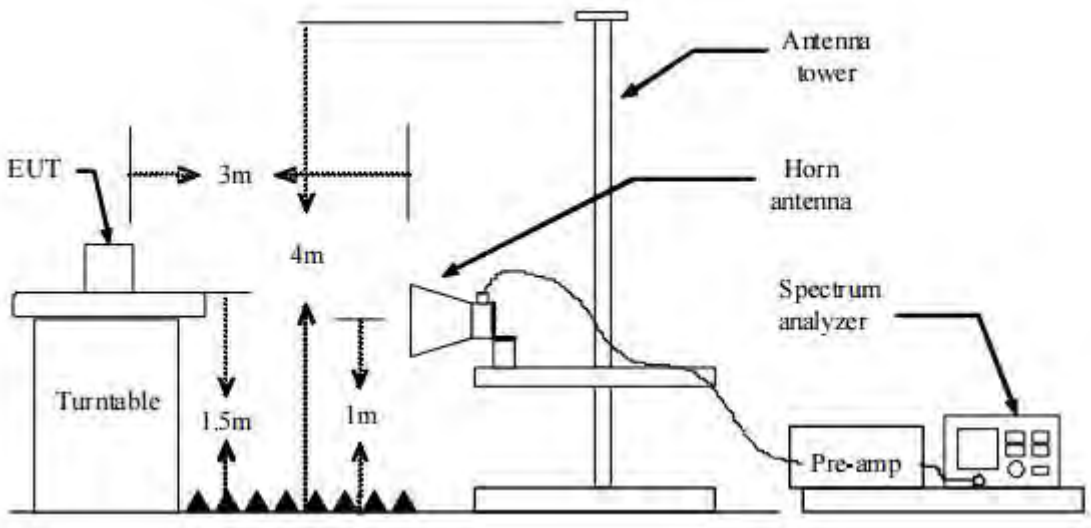
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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 (below 1 ㎓) and 1.5 m (above 1 ㎓) 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 for f < 1 ㎓:
   Span = wide enough to fully capture the emission being measured
   RBW = 100 ㎑
   VBW ≥ RBW
   Sweep = auto
   Detector function = quasi peak
   Trace = max hold
8. Spectrum analyzer settings for f ≥1 ㎓: Peak
   Span = wide enough to fully capture the emission being measured
   RBW = 1 ㎒
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
9. Spectrum analyzer settings for f ≥1 ㎓: Average
   Span = wide enough to fully capture the emission being measured
   RBW = 1 ㎒
   VBW ≥ 1/T ㎐, where T= pulse width in seconds
   Sweep = auto
   Detector function = average
   Trace = max hold
10. Duty Cycle Correction Factor (50 channel hopping)
    a. Time to cycle through all channels = Δt=τ[㎳] × 50 channels = 547 ㎳, where τ = pulse width
    b. 100 ㎳/Δt[㎳] = H → Round up to next highest integer, H '=1
    c. Worst Case Dwell Time = τ[㎳] × H' = 10.94 ㎳
    d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100㎳) ㏈ = -19.22 ㏈

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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. All channels, modes, and modulations/data rates were investigated among DSS band.
   Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.
10. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
11. 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

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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	2400/F(㎑)
0.490 ~ 1.705	30	24000/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.

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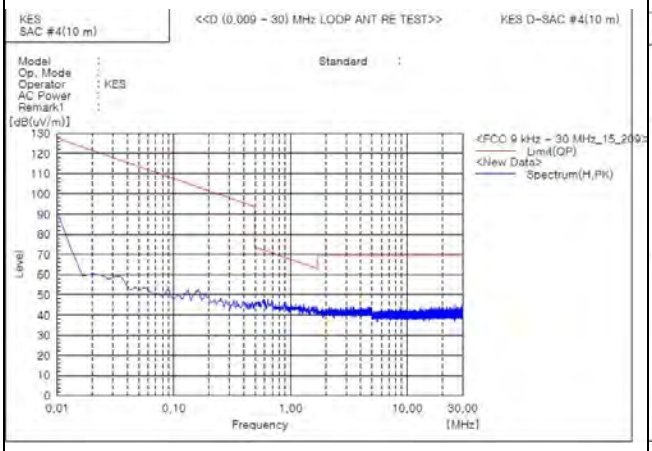
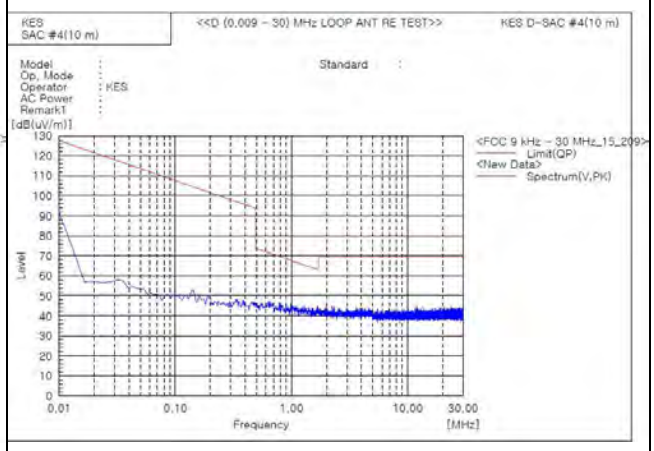
Test results (Below 30 ㎒) – Worst case

Mode:	FHSS
Distance of measurement:	3 meter
Channel:	1 (Worst case)

Horizontal	Vertical
	

- No spurious emissions were detected

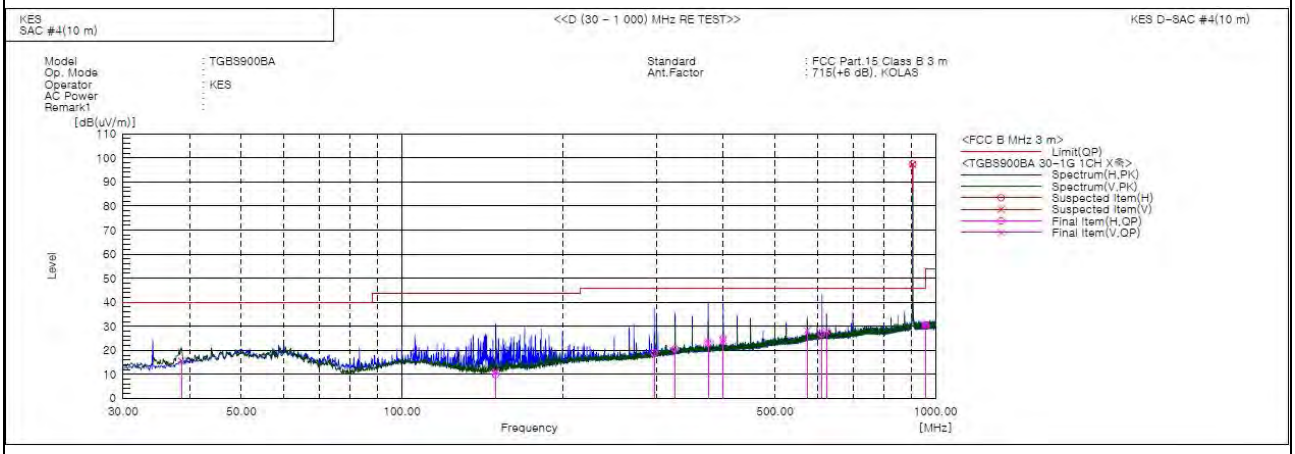
Test results (Below 1 000 ㎒) – Worst case

Mode: FHSS

Distance of measurement: 3 meter

Channel: 1 (Worst case)

Horizontal // Vertical



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	38.609	V	39.7	-24.2	15.5	40.0	24.5	132.0	22.0	
2	149.916	H	36.7	-26.9	9.8	43.5	33.7	172.0	46.0	
3	149.916	V	37.8	-26.9	10.9	43.5	32.6	219.0	134.0	
4	297.114	H	39.0	-20.1	18.9	46.0	27.1	243.0	236.0	
5	325.001	H	39.3	-18.6	20.7	46.0	25.3	380.0	220.0	
6	374.956	H	40.2	-17.2	23.0	46.0	23.0	288.0	297.0	
7	374.956	V	40.5	-17.2	23.3	46.0	22.7	146.0	189.0	
8	400.055	H	41.6	-16.7	24.9	46.0	21.1	327.0	249.0	
9	400.055	V	40.8	-16.7	24.1	46.0	21.9	394.0	134.0	
10	575.019	V	40.6	-12.4	28.2	46.0	17.8	240.0	165.0	
11	611.280	H	38.4	-11.5	26.9	46.0	19.1	103.0	258.0	
12	625.095	V	39.5	-11.4	28.1	46.0	17.9	101.0	145.0	
13	906.395	V	--------	-7.9	--------	46.0	--------	400.0	176.0	
14	906.516	H	--------	-7.9	--------	46.0	--------	400.0	118.0	
15	960.000	H	38.1	-7.6	30.5	46.0	15.5	318.0	6.0	
16	960.000	V	38.5	-7.6	30.9	46.0	15.1	135.0	202.0	

* 906.395 ㎒(Vertical) / 906.516 ㎒(Horizontal) is Fundamental.

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Test results (Above 1 000 ㎒)

Mode: FHSS

Distance of measurement: 3 meter

Channel: 01

- **Spurious**

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 814.80	30.22	Peak	H	31.64	-	61.86	74.00	12.14
1 814.80	30.22	Average	H	31.64	-19.22	42.64	54.00	11.36
2 170.80	28.93	Peak	H	33.85	-	62.78	74.00	11.22
2 170.80	28.93	Average	H	33.85	-19.22	43.56	54.00	10.44
2 816.20	29.76	Peak	H	35.73	-	65.49	74.00	8.51
2 816.20	29.76	Average	H	35.73	-19.22	46.27	54.00	7.73
1 814.80	35.35	Peak	V	31.64	-	66.99	74.00	7.01
1 814.80	35.35	Average	V	31.64	-19.22	47.77	54.00	6.23
2 147.60	29.27	Peak	V	33.76	-	63.03	74.00	10.97
2 147.60	29.27	Average	V	33.76	-19.22	43.81	54.00	10.19
2 720.70	32.42	Peak	V	35.52	-	67.94	74.00	6.06
2 720.70	32.42	Average	V	35.52	-19.22	48.72	54.00	5.28

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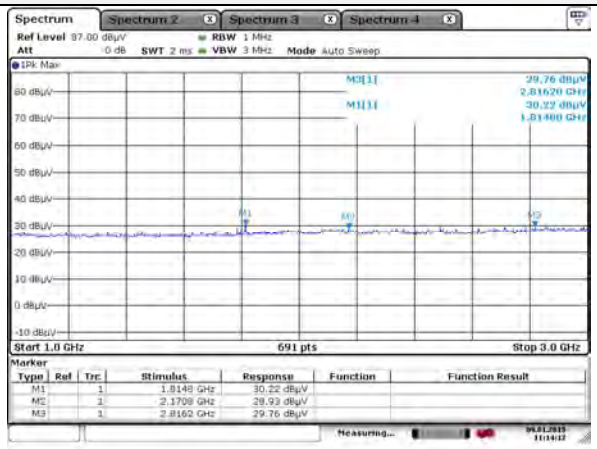
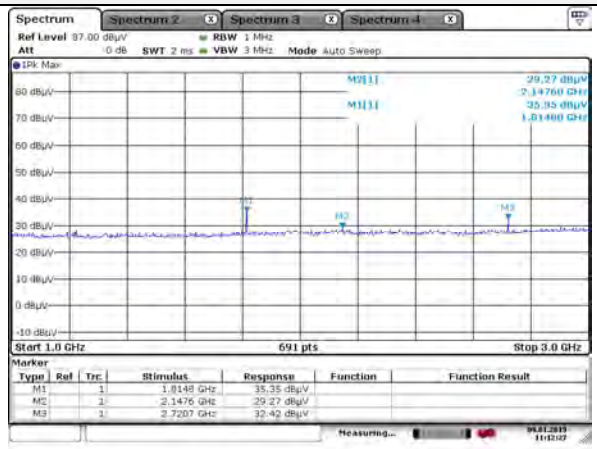
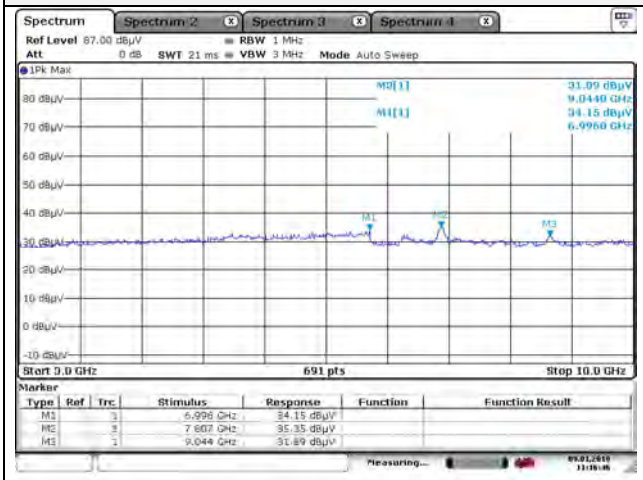
Horizontal // Peak for 1 ㎓ to 3 ㎓



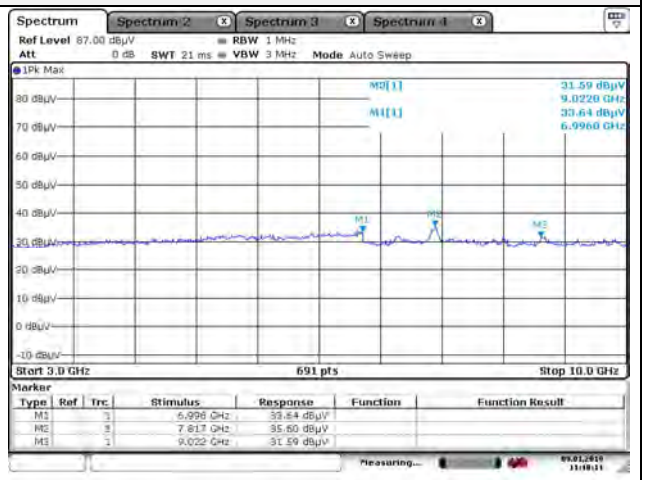
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 10 ㎓



Vertical // Peak for 3 ㎓ to 10 ㎓



Note.
1. No spurious emission were detected above 3 ㎓.

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Test results (Above 1 000 ㎒)

Mode: FHSS

Distance of measurement: 3 meter

Channel: 25

- **Spurious**

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 837.90	28.84	Peak	H	31.84	-	60.68	74.00	13.32
1 837.90	28.84	Average	H	31.84	-19.22	41.46	54.00	12.54
2 477.60	29.11	Peak	H	34.95	-	64.06	74.00	9.94
2 477.60	29.11	Average	H	34.95	-19.22	44.84	54.00	9.16
2 859.60	29.24	Peak	H	35.83	-	65.07	74.00	8.93
2 859.60	29.24	Average	H	35.83	-19.22	45.85	54.00	8.15
1 829.20	32.09	Peak	V	31.76	-	63.85	74.00	10.15
1 829.20	32.09	Average	V	31.76	-19.22	44.63	54.00	9.37
2 393.60	28.93	Peak	V	34.65	-	63.58	74.00	10.42
2 393.60	28.93	Average	V	34.65	-19.22	44.36	54.00	9.64
2 743.80	33.05	Peak	V	35.57	-	68.62	74.00	5.38
2 743.80	33.05	Average	V	35.57	-19.22	49.40	54.00	4.60

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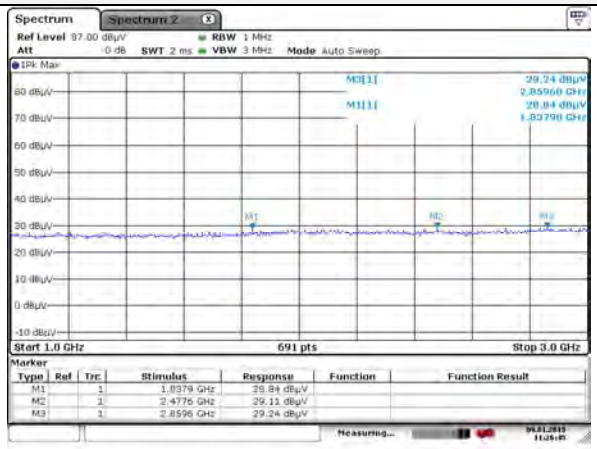
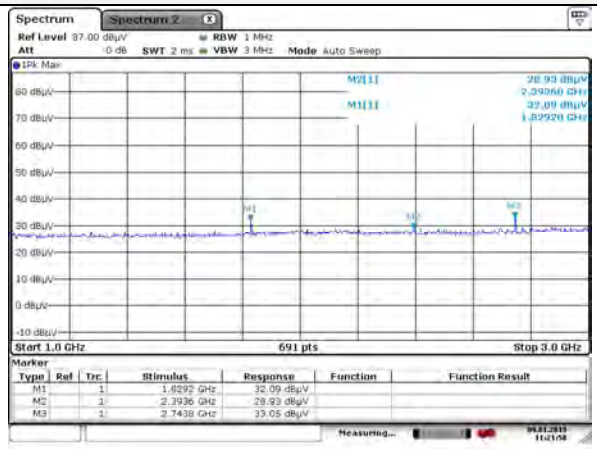
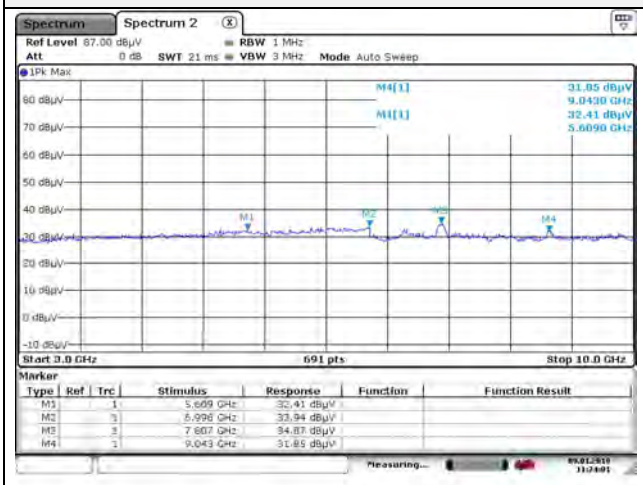
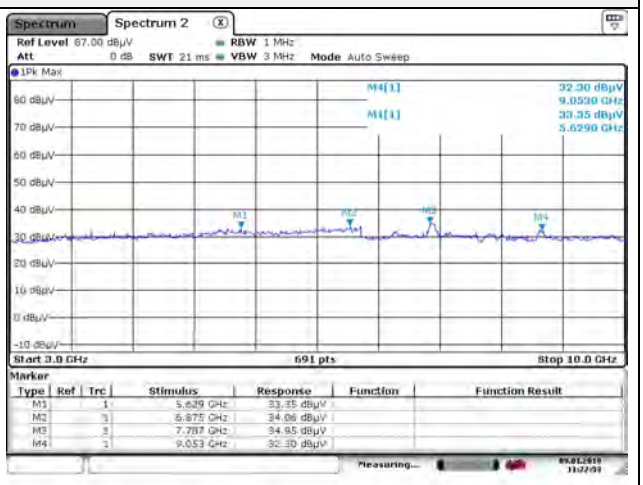
Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 10 ㎓	**Vertical // Peak for 3 ㎓ to 10 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

Test results (Above 1 000 ㎒)

Mode: FHSS

Distance of measurement: 3 meter

Channel: 50

- **Spurious**

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1 872.60	28.17	Peak	H	32.13	-	60.30	74.00	13.70
1 872.60	28.17	Average	H	32.13	-19.22	41.08	54.00	12.92
2 460.20	29.24	Peak	H	34.88	-	64.12	74.00	9.88
2 460.20	29.24	Average	H	34.88	-19.22	44.90	54.00	9.10
2 891.50	30.42	Peak	H	35.90	-	66.32	74.00	7.68
2 891.50	30.42	Average	H	35.90	-19.22	47.10	54.00	6.90
1 846.60	29.69	Peak	H	31.91	-	61.60	74.00	12.40
1 846.60	29.69	Average	H	31.91	-19.22	42.38	54.00	11.62
2 489.10	29.18	Peak	V	34.99	-	64.17	74.00	9.83
2 489.10	29.18	Average	V	34.99	-19.22	44.95	54.00	9.05
2 769.90	31.60	Peak	V	35.63	-	67.23	74.00	6.77
2 769.90	31.60	Average	V	35.63	-19.22	48.01	54.00	5.99

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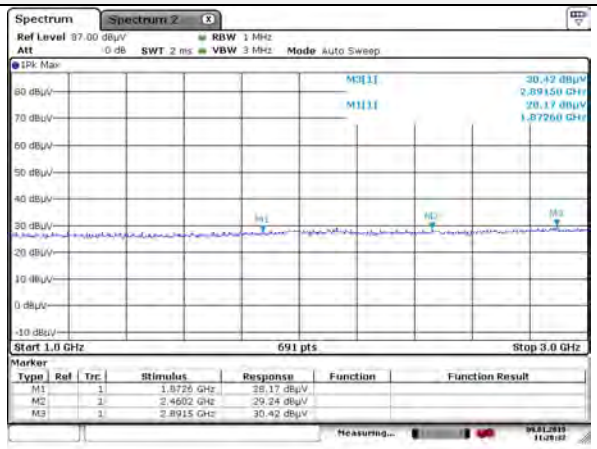
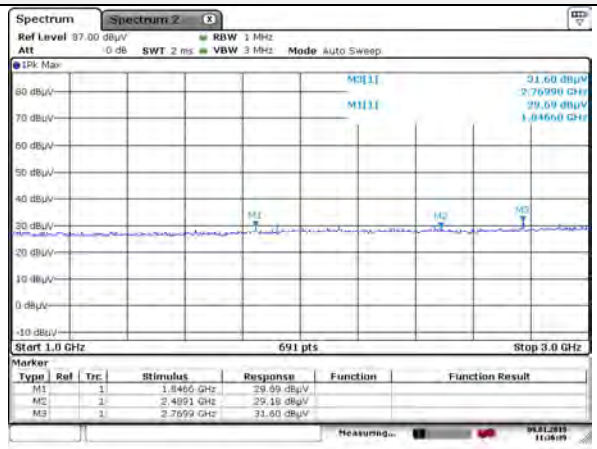
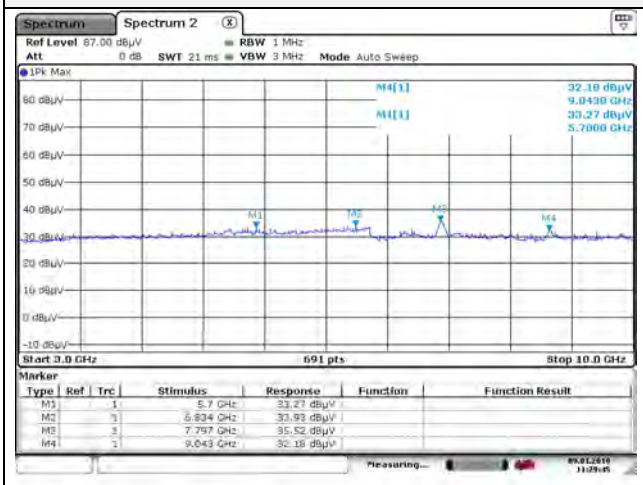
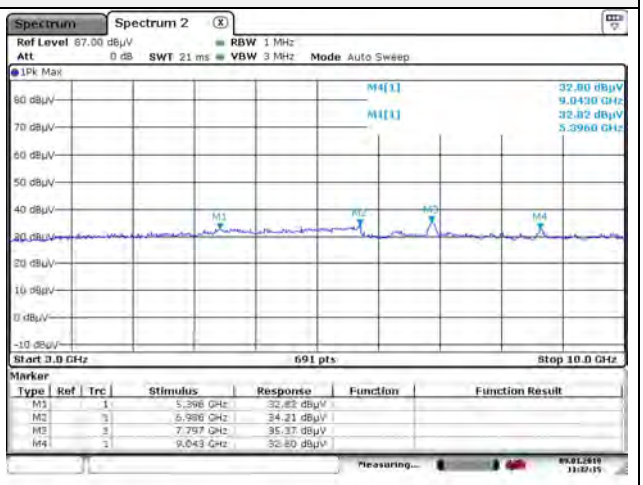
Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 10 ㎓	**Vertical // Peak for 3 ㎓ to 10 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

3.6 Conducted spurious emissions & band edge

Test procedure

DA 00-705

Test setting

1. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.
2. RBW = 100 ㎑
3. VBW ≥ 300 ㎑
4. Detector = Peak
5. Number of sweep points ≥ 2 × Span/RBW
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Limit

According to 15.247(d), in any 100 ㎑ bandwidth outside the frequency band in which the spread spe ctrum or digitally modulated intentional radiator is operating, the radio frequency power that is produc ed by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the b and that contains the highest level of the desired power, based on either an RF conducted or a radiate d measurement, provided the transmitter demonstrates compliance with the peak conducted power limit s. If the transmitter complies with the conducted power limits based on the use of RMS averaging ov er a time interval , as permitted under paragraph(b)(3) of this section , the attenuation required under this paragraph shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general limits specified in secti on 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in s ection 15.205(a), must also comply the radiated emission limits specified in section 15.209(a) (see sect ion 15.205(c))

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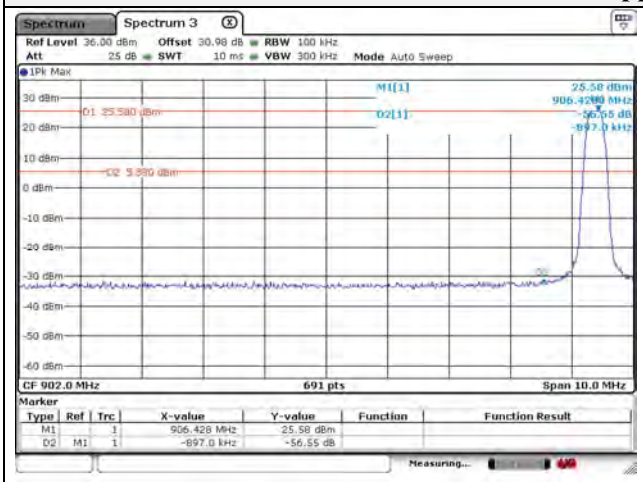
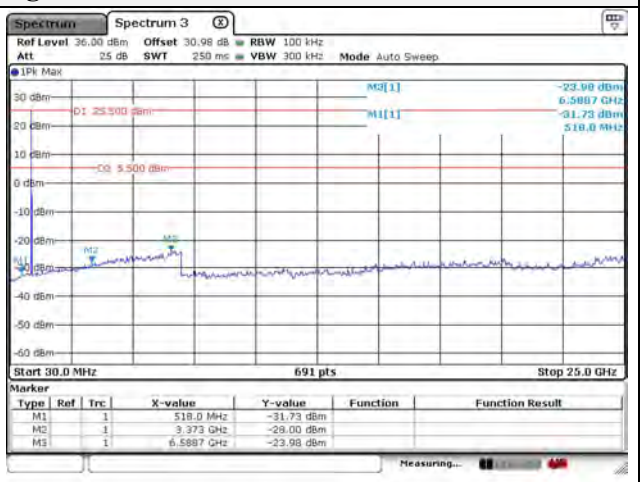
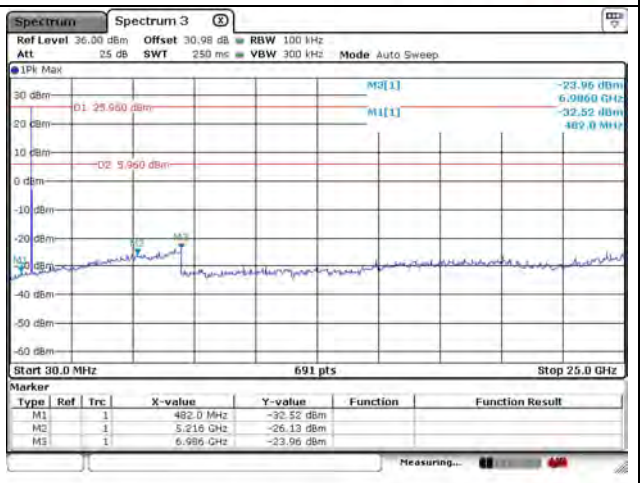
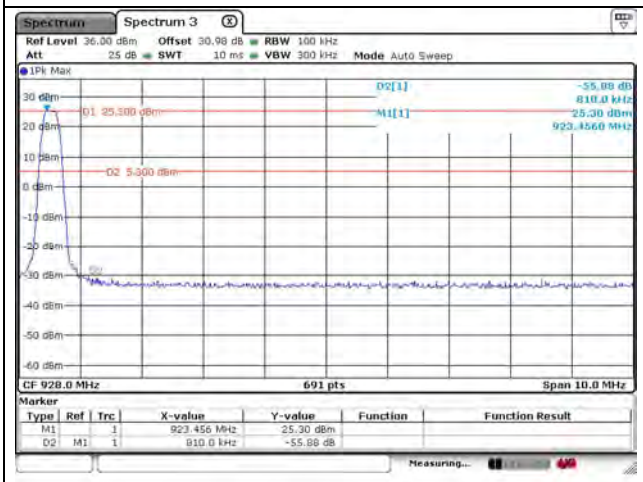
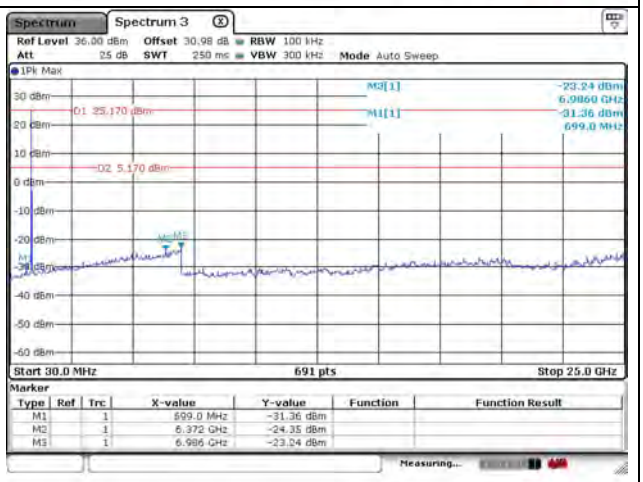
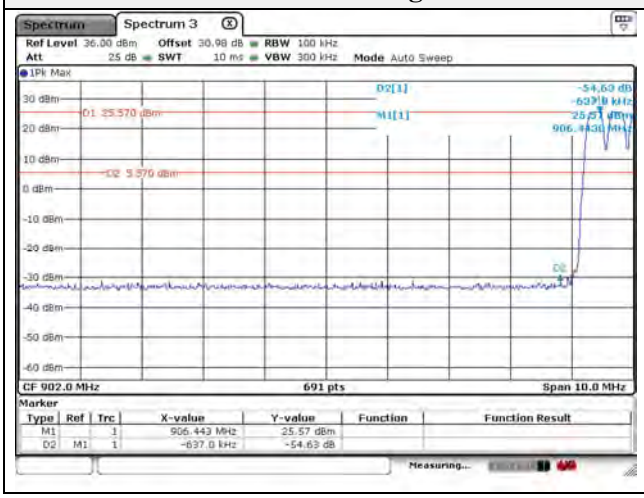
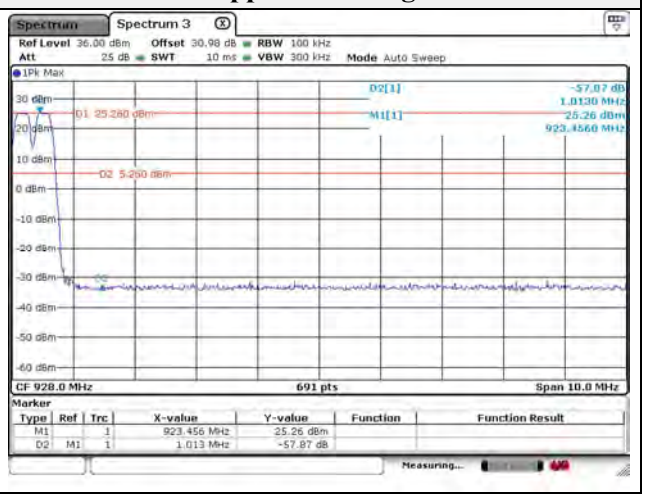
Test results

Non-Hopping Mode	
	
N/A	
	

Hopping Mode	
Lower Band-edge	**Upper Band-edge**
	

3.8. 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 (dBμV/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 AC line conducted spurious emission are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and the appropriate frequencies. All data rates and modes were investigated for conducted spurious emission. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.
2. Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level)

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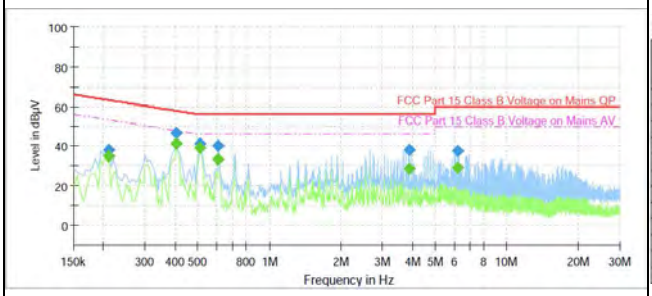
Test results

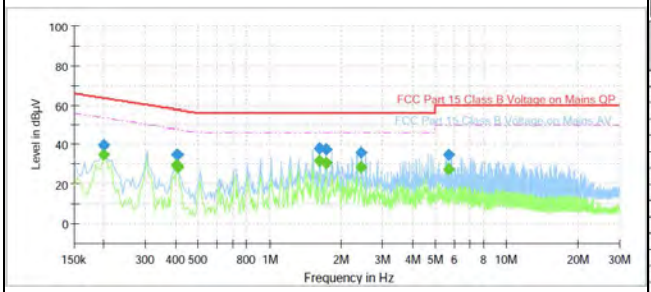
Hot Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.210000	37.98	---	63.21	25.23	1000.0	9.000	L1	19.5
0.210000	---	34.74	53.21	18.47	1000.0	9.000	L1	19.5
0.405000	---	41.50	47.75	6.25	1000.0	9.000	L1	19.7
0.405000	46.82	---	57.75	10.93	1000.0	9.000	L1	19.7
0.510000	---	39.29	46.00	6.71	1000.0	9.000	L1	19.8
0.510000	41.36	---	56.00	14.64	1000.0	9.000	L1	19.8
0.610000	---	33.30	46.00	12.70	1000.0	9.000	L1	19.9
0.610000	40.33	---	56.00	15.67	1000.0	9.000	L1	19.9
3.870000	---	28.80	46.00	17.20	1000.0	9.000	L1	20.0
3.870000	37.97	---	56.00	18.03	1000.0	9.000	L1	20.0
6.215000	---	29.38	50.00	20.62	1000.0	9.000	L1	19.7
6.215000	37.55	---	60.00	22.45	1000.0	9.000	L1	19.7

Neutral Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.200000	39.70	---	63.61	23.91	1000.0	9.000	N	19.5
0.200000	---	34.71	53.61	18.90	1000.0	9.000	N	19.5
0.405000	---	29.71	47.75	18.04	1000.0	9.000	N	19.7
0.405000	35.08	---	57.75	22.67	1000.0	9.000	N	19.7
0.410000	34.97	---	57.65	22.68	1000.0	9.000	N	19.7
0.410000	---	28.58	47.65	19.07	1000.0	9.000	N	19.7
1.630000	---	31.56	46.00	14.44	1000.0	9.000	N	20.3
1.630000	38.29	---	56.00	17.71	1000.0	9.000	N	20.3
1.730000	37.60	---	56.00	18.40	1000.0	9.000	N	20.3
1.730000	---	30.64	46.00	15.36	1000.0	9.000	N	20.3
2.445000	36.22	---	56.00	19.78	1000.0	9.000	N	20.3
2.445000	---	28.41	46.00	17.59	1000.0	9.000	N	20.3
5.705000	34.96	---	60.00	25.04	1000.0	9.000	N	19.7
5.705000	---	27.67	50.00	22.33	1000.0	9.000	N	19.7

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Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Cal. Day to Next Cal. day
Spectrum Analyzer	R&S	FSV30	100736	2018.06.28 ~ 2019.06.28 2019.01.09 ~ 2020.01.09
Spectrum Analyzer	R&S	FSV40	101002	2018.06.29 ~ 2019.06.29
8360B Series Swept Signal Generator	HP	83630B	3844A00786	2018.01.22 ~ 2019.01.22 2019.01.15 ~ 2020.01.15
Attenuator	HP	30dB ATTENUATOR ASSEMBLY	3318A05137	2018.01.18 ~ 2019.01.18 2019.01.15 ~ 2020.01.15
Attenuator	HP	8491A	35496	2018.03.21 ~ 2019.03.21 2019.03.11 ~ 2020.03.11
Loop Antenna	Schwarzbeck	FMZB1513	225	2017.05.10 ~ 2019.05.10 2019.02.05 ~ 2021.02.15
Trilog-broadband antenna	SCHWARZBECK	VULB 9163	9168-714	2018.11.26 ~ 2020.11.26
Horn Antenna	A.H	SAS-571	414	2017.02.15 ~ 2019.02.15 2019.02.11 ~ 2021.02.11
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1802	2017.09.04 ~ 2019.09.04
PREAMPLIFIER	AGILENT	8449B	3008A01967	2018.05.31 ~ 2019.05.31
Attenuator	HP	8491A	32173	2018.03.21 ~ 2019.03.21 2019.03.11 ~ 2020.03.11
Amplifier	R&S	SCU 01	100603	2018.11.26 ~ 2019.11.26
EMI Test Receiver	R&S	ESR3	101781	2018.04.25 ~ 2019.04.25 2019.04.22 ~ 2020.04.22
EMI Test Receiver	R&S	ESU26	100551	2018.04.11 ~ 2019.04.11 2019.04.09 ~ 2020.04.09
Pulse Limiter	R&S	ESH3-Z2	101915	2018.11.26 ~ 2019.11.26
LISN	R&S	ENV216	101787	2019.01.04 ~ 2020.01.04
RF Cable 1	Woken	-	# 3	2019.01.09 (Cal. date)
RF Cable 2	Woken	-	# 21	2019.01.09 (Cal. date)

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook computer	LG Electronics Inc.,	LGS53	306QCZP560949

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