TEST REPORT

Part 15 Subpart C 15.247

Equipment under test RFID READER
Model name SNTRONC V1 RF READER
FCC ID 2AED8-SNTRN-RDV1
Applicant SENITRON CORP.
Manufacturer SENITRON CORP.
Date of test(s) 2015.05.18 ~ 2015.06.01
Date of issue 2015.06.02

Issued to

SENITRON CORP.
369 S. Doheny Drive #1236, BEVERLY HILLS,
California 90211, United States

Issued by

KES Co., Ltd.
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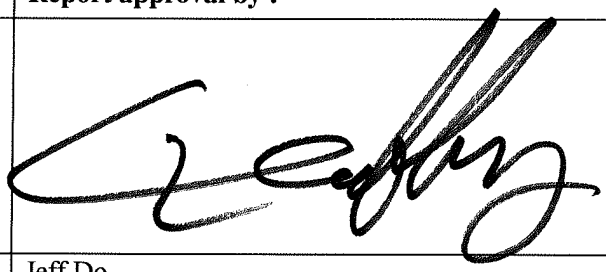
Test and report completed by :	Report approval by :
	
Hyeon-Su Jang Test engineer	Jeff Do Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2015.06.02	KES-RF-15T0044	Initial

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1. General information

Applicant:	SENITRON CORP.
Applicant address:	369 S. Doheny Drive #1236, BEVERLY HILLS,
	California 90211, United States
Test site:	KES Co., Ltd.
Test site address:	C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do,431-716, Korea
	473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
FCC rule part(s):	15.247
Model:	SNTRONC V1 RF READER
FCC ID:	2AED8-SNTRN-RDV1
Test device serial No.:	☐ Production ☒ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	RFID READER
Frequency range	902.75 ㎒ ~ 927.25 ㎒
Modulation technique	FHSS
Number of channels	50
Antenna specification	Antenna 1 : Patch Antenna // Peak gain: 1.7 dBi
	Antenna 2 : Reverse Polarized Antenna // Peak gain: 9 dBi
Power source	AC 120V Adaptor (Output : DC 5V)

15.247(a)(1) that the rx input bandwidths shift frequencies in synchronization with the transmitted

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
All channels are used equally on average.

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

System receiver input bandwidth
Receiver input bandwidth (either RF or IF) matches the bandwidth of the transmitted signal.

1.2. Frequency/channel operations

Ch.	Frequency (㎒)
01	902.75
. .	. .
26	915.25
. .	. .
50	927.25

1.3. Information about derivative model

N/A

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(b)(2)	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

Note:

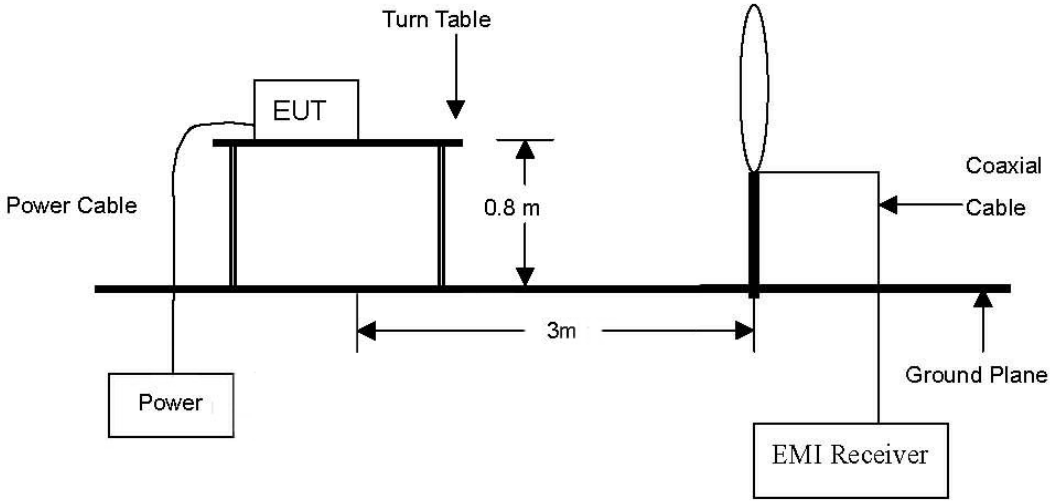
1. The EUT was tested per the guidance of DA 00-705. ANSI C63.10-2009 was used to reference the appropriate EUT setup for radiated spurious emissions testing and/or AC line conducted testing.
2. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.

3. Test results

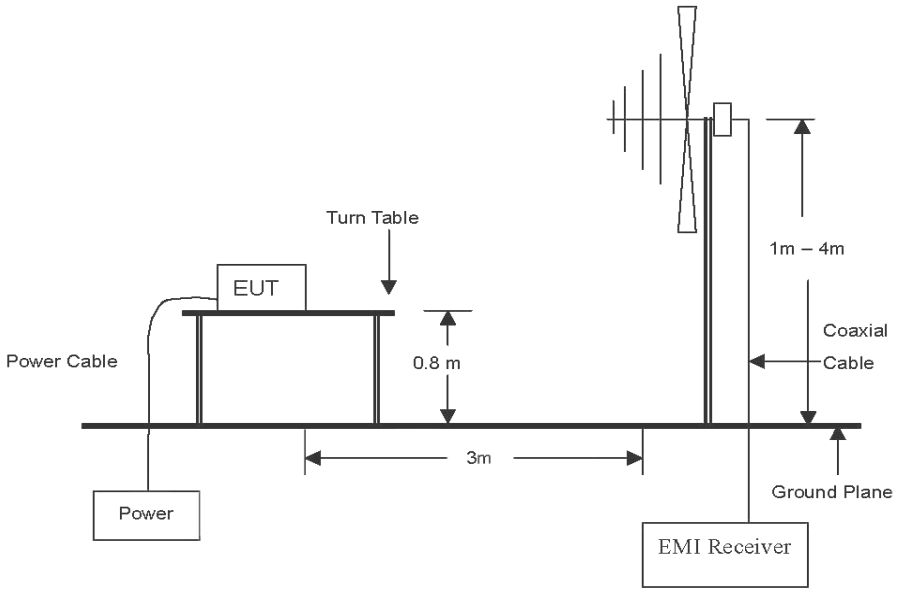
3.1. Radiated restricted band and emissions

Test setup

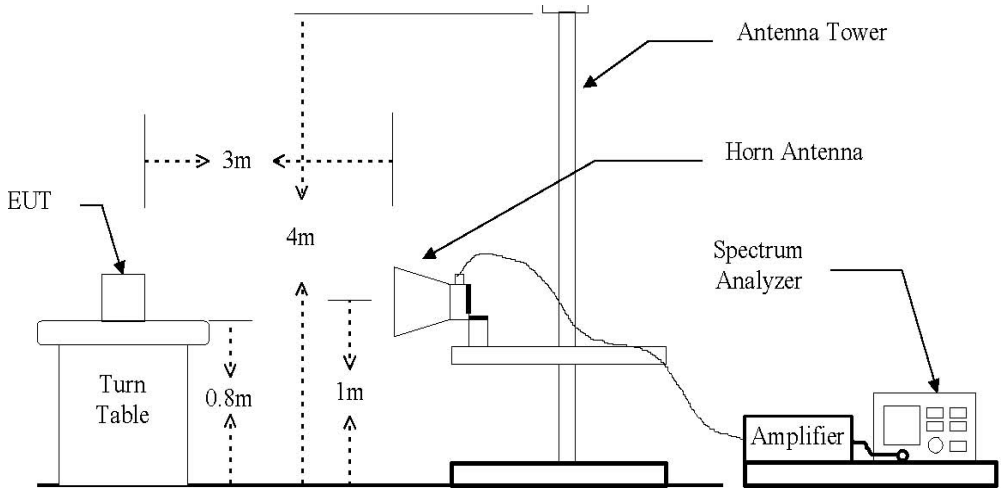
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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 24 ㎓ emissions.



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. Average measurements > 1 ㎓ using RBW = 1 ㎒ and VBW = 3 ㎑. Peak measurements > 1 ㎓ using RBW = 1 ㎒ and VBW = 3 ㎒. Both average and peak measurements were made using a peak detector.

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.
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(㏈) + F_d(㏈)
6. Correction factors(㏈/m) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈)
7. Margin(㏈) = Limit(㏈㎶/m) - Field strength(㏈㎶/m)
8. $F_d = 40\log(D_m / D_s)$

   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

- **Antenna 1 (Patch Antenna)**

Measurement frequency: Below 30 ㎒
Channel: 50
Operating frequency: 927.25 ㎒ (Worst case)
Distance of measurement: 3 meter

Frequency (㎒)	Level (dB㎶)	Ant. Pol.	Correction factors (dB/m)	F_d (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
No emission has been detected							

Measurement frequency: Below 1 000 ㎒
Channel: 50
Operating frequency: 927.25 ㎒ (Worst case)
Distance of measurement: 3 meter

Frequency (㎒)	Level (dB㎶)	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Emission levels are not reported much lower than the limits by over 20 ㏈						

Measurement frequency:	above 1 000 ㎒
Channel:	01
Operating frequency:	902.75 ㎒
Distance of measurement:	3 meter

Frequency (㎒)	Level (dB㎶)	Detector	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1805.50	61.36	Peak	H	-0.18	61.18	74.00	12.82
1805.50	43.93	Avg	H	-0.18	43.75	54.00	10.25
1805.50	60.98	Peak	V	-0.18	60.80	74.00	13.20
1805.50	44.17	Avg	V	-0.18	43.99	54.00	10.01
2708.25 *	52.16	Peak	H	5.64	57.80	74.00	16.20
2708.25 *	36.14	Avg	H	5.64	41.78	54.00	12.22
2708.25 *	54.43	Peak	V	5.64	60.07	74.00	13.93
2708.25 *	41.22	Avg	V	5.64	46.86	54.00	7.14
3611.00 *	48.46	Peak	V	7.56	56.02	74.00	17.98
3611.00 *	36.90	Avg	V	7.56	44.46	54.00	9.54

※Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.
2. "*" means restricted band.

Measurement frequency: above 1 000 ㎒
Channel: 26
Operating frequency: 915.25 ㎒
Distance of measurement: 3 meter

Frequency (㎒)	Level (dB㎶)	Detector	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1830.50	61.62	Peak	H	0.07	61.69	74.00	12.31
1830.50	42.90	Avg	H	0.07	42.97	54.00	11.03
1830.50	60.09	Peak	V	0.07	60.16	74.00	13.84
1830.50	44.83	Avg	V	0.07	44.90	54.00	9.10
2745.75 *	57.99	Peak	H	5.78	63.77	74.00	10.23
2745.75 *	38.21	Avg	H	5.78	43.99	54.00	10.01
2745.75 *	58.99	Peak	V	5.78	64.77	74.00	9.23
2745.75 *	41.09	Avg	V	5.78	46.87	54.00	7.13
3661.00 *	48.02	Peak	H	7.77	55.79	74.00	18.21
3661.00 *	36.87	Avg	H	7.77	44.64	54.00	9.36
3661.00 *	48.90	Peak	V	7.77	56.67	74.00	17.33
3661.00 *	34.34	Avg	V	7.77	42.11	54.00	11.89
4576.25 *	45.36	Peak	H	12.10	57.46	74.00	16.54
4576.25 *	28.76	Avg	H	12.10	40.86	54.00	13.14
4576.25 *	47.76	Peak	V	12.10	59.86	74.00	14.14
4576.25 *	29.71	Avg	V	12.10	41.81	54.00	12.19

※Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.
2. "*" means restricted band.

Measurement frequency:	above 1 000 ㎒
Channel:	50
Operating frequency:	927.25 ㎒
Distance of measurement:	3 meter

Frequency (㎒)	Level (dB㎶)	Detector	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1854.50	60.85	Peak	H	0.31	61.16	74.00	12.84
1854.50	44.55	Avg	H	0.31	44.86	54.00	9.14
1854.50	60.62	Peak	V	0.31	60.93	74.00	13.07
1854.50	43.90	Avg	V	0.31	44.21	54.00	9.79
2781.75 *	55.00	Peak	H	5.91	60.91	74.00	13.09
2781.75 *	42.28	Avg	H	5.91	48.19	54.00	5.81
2781.75 *	55.56	Peak	V	5.91	61.47	74.00	12.53
2781.75 *	44.15	Avg	V	5.91	50.06	54.00	3.94
3709.00 *	47.92	Peak	H	7.97	55.89	74.00	18.11
3709.00 *	35.56	Avg	H	7.97	43.53	54.00	10.47
3709.00 *	49.60	Peak	V	7.97	57.57	74.00	16.43
3709.00 *	36.12	Avg	V	7.97	44.09	54.00	9.91
4636.25 *	42.99	Peak	H	12.51	55.50	74.00	18.50
4636.25 *	29.55	Avg	H	12.51	42.06	54.00	11.94
4636.25 *	46.15	Peak	V	12.51	58.66	74.00	15.34
4636.25 *	29.08	Avg	V	12.51	41.59	54.00	12.41

※Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.
2. "*" means restricted band.

- **Antenna 2 (Reverse Polarized Antenna)**

Measurement frequency:	Below 30 ㎒
Channel:	50
Operating frequency:	927.25 ㎒ (Worst case)
Distance of measurement:	3 meter

Frequency (㎒)	Level (dB㎶)	Ant. Pol.	Correction factors (dB/m)	F_d (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
No emission has been detected							

Measurement frequency:	Below 1 000 ㎒
Channel:	50
Operating frequency:	927.25 ㎒ (Worst case)
Distance of measurement:	3 meter

Frequency (㎒)	Level (dB㎶)	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
Emission levels are not reported much lower than the limits by over 20 ㏈						

Measurement frequency:	above 1 000 ㎒
Channel:	01
Operating frequency:	902.75 ㎒
Distance of measurement:	3 meter

Frequency (㎒)	Level (dB㎶)	Detector	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1805.50	60.83	Peak	H	-0.18	60.65	74.00	13.35
1805.50	42.54	Avg	H	-0.18	42.36	54.00	11.64
1805.50	61.23	Peak	V	-0.18	61.05	74.00	12.95
1805.50	43.31	Avg	V	-0.18	43.13	54.00	10.87
2708.25 *	53.49	Peak	H	5.64	59.13	74.00	14.87
2708.25 *	36.08	Avg	H	5.64	41.72	54.00	12.28
2708.25 *	55.16	Peak	V	5.64	60.80	74.00	13.20
2708.25 *	41.08	Avg	V	5.64	46.72	54.00	7.28
3611.00 *	44.45	Peak	H	7.56	52.01	74.00	21.99
3611.00 *	29.98	Avg	H	7.56	37.54	54.00	16.46
3611.00 *	48.42	Peak	V	7.56	55.98	74.00	18.02
3611.00 *	35.30	Avg	V	7.56	42.86	54.00	11.14

※Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.
2. "*" means restricted band.

Measurement frequency:	above 1 000 ㎒
Channel:	26
Operating frequency:	915.25 ㎒
Distance of measurement:	3 meter

Frequency (㎒)	Level (dB㎶)	Detector	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1830.50	61.95	Peak	H	0.07	62.02	74.00	11.98
1830.50	43.49	Avg	H	0.07	43.56	54.00	10.44
1830.50	62.17	Peak	V	0.07	62.24	74.00	11.76
1830.50	44.43	Avg	V	0.07	44.50	54.00	9.50
2745.75 *	54.88	Peak	H	5.78	60.66	74.00	13.34
2745.75 *	37.02	Avg	H	5.78	42.80	54.00	11.20
2745.75 *	56.48	Peak	V	5.78	62.26	74.00	11.74
2745.75 *	40.52	Avg	V	5.78	46.30	54.00	7.70
3661.00 *	46.86	Peak	H	7.77	54.63	74.00	19.37
3661.00 *	35.27	Avg	H	7.77	43.04	54.00	10.96
3661.00 *	48.99	Peak	V	7.77	56.76	74.00	17.24
3661.00 *	32.64	Avg	V	7.77	40.41	54.00	13.59
4576.25 *	45.44	Peak	V	12.10	57.54	74.00	16.46
4576.25 *	25.23	Avg	V	12.10	37.33	54.00	16.67

※Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.
2. "*" means restricted band.

Measurement frequency:	above 1 000 ㎒
Channel:	50
Operating frequency:	927.25 ㎒
Distance of measurement:	3 meter

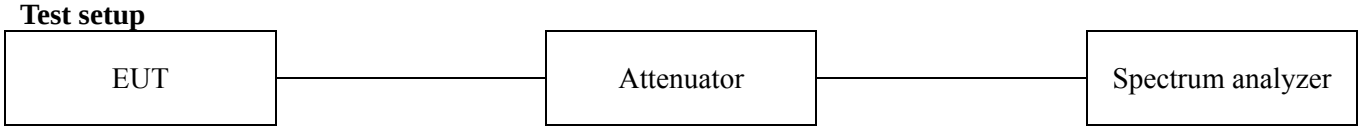
Frequency (㎒)	Level (dB㎶)	Detector	Ant. Pol.	Correction factors (dB/m)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1854.50	61.41	Peak	H	0.31	61.72	74.00	12.28
1854.50	43.55	Avg	H	0.31	43.86	54.00	10.14
1854.50	60.98	Peak	V	0.31	61.29	74.00	12.71
1854.50	41.83	Avg	V	0.31	42.14	54.00	11.86
2781.75 *	53.50	Peak	H	5.91	59.41	74.00	14.59
2781.75 *	42.28	Avg	H	5.91	48.19	54.00	5.81
2781.75 *	56.24	Peak	V	5.91	62.15	74.00	11.85
2781.75 *	36.51	Avg	V	5.91	42.42	54.00	11.58
3709.00 *	48.73	Peak	V	7.97	56.70	74.00	17.30
3709.00 *	34.13	Avg	V	7.97	42.10	54.00	11.90
4636.25 *	43.98	Peak	V	12.51	56.49	74.00	17.51
4636.25 *	26.68	Avg	V	12.51	39.19	54.00	14.81

※Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.
2. "*" means restricted band.

3.2. Conducted band edge and out of band emissions

Test setup



Test procedure

DA 00-705

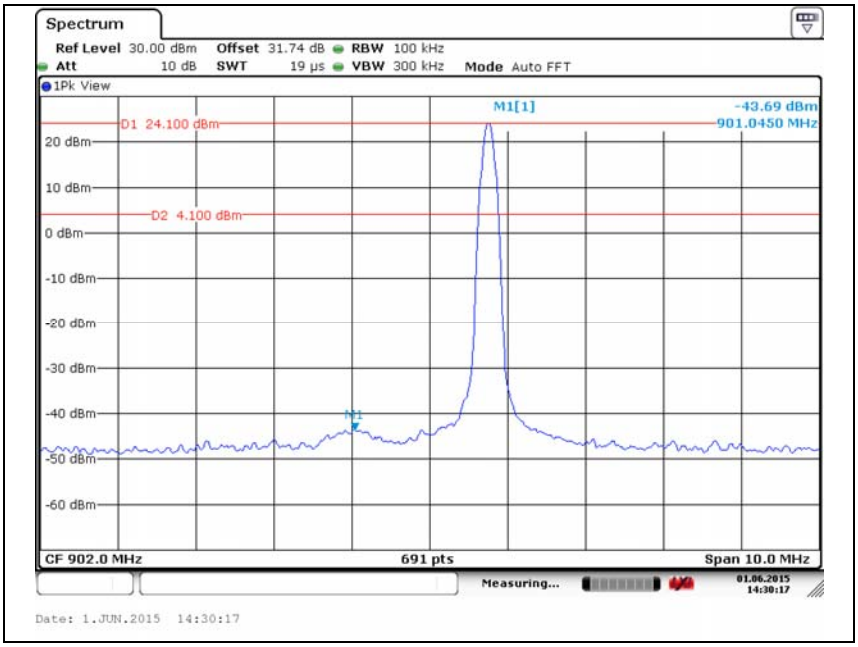
Test setting

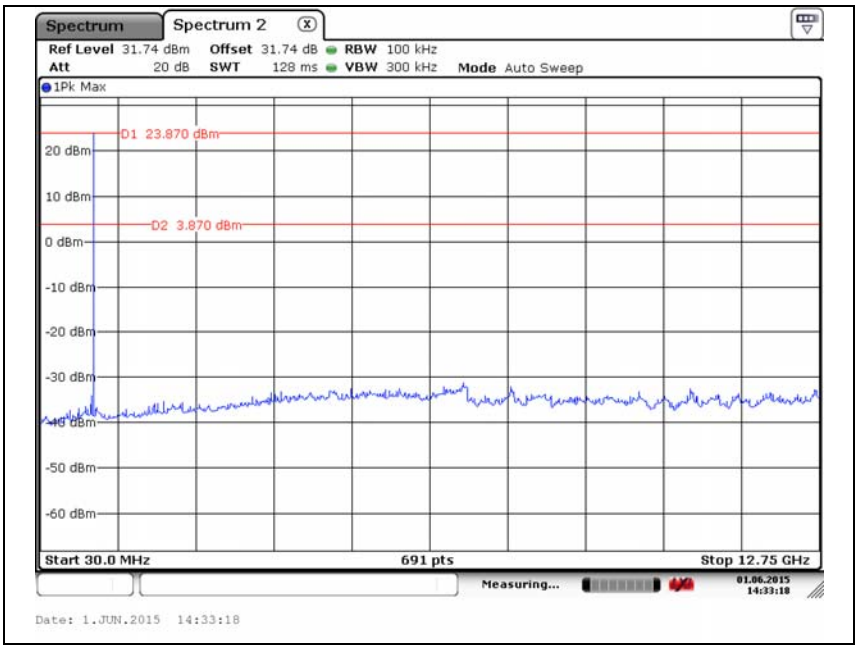
1. Span = wide enough to capture the peak level of the in-band emission and all spurious emissions(e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.
2. RBW = 100 ㎑
3. VBW ≥ 300 ㎑
4. Detector = Peak
5. Number of sweep points ≥ 2 × Span/RBW
7. Trace mode = max 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 spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over 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 section 15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section 15.205(a), must also comply the radiated emission limits specified in section 15.209(a) (see section 15.205(c))

Ch. 01





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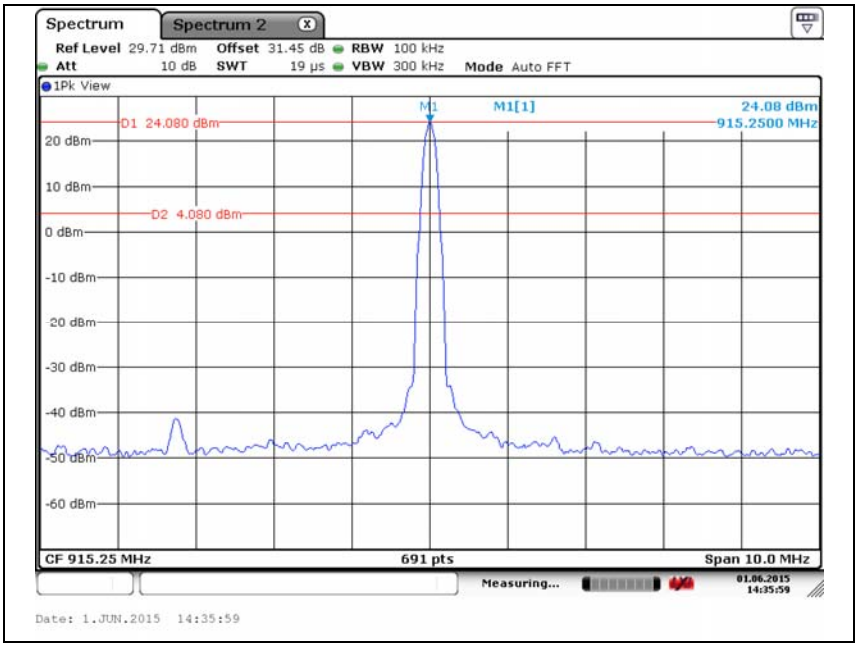
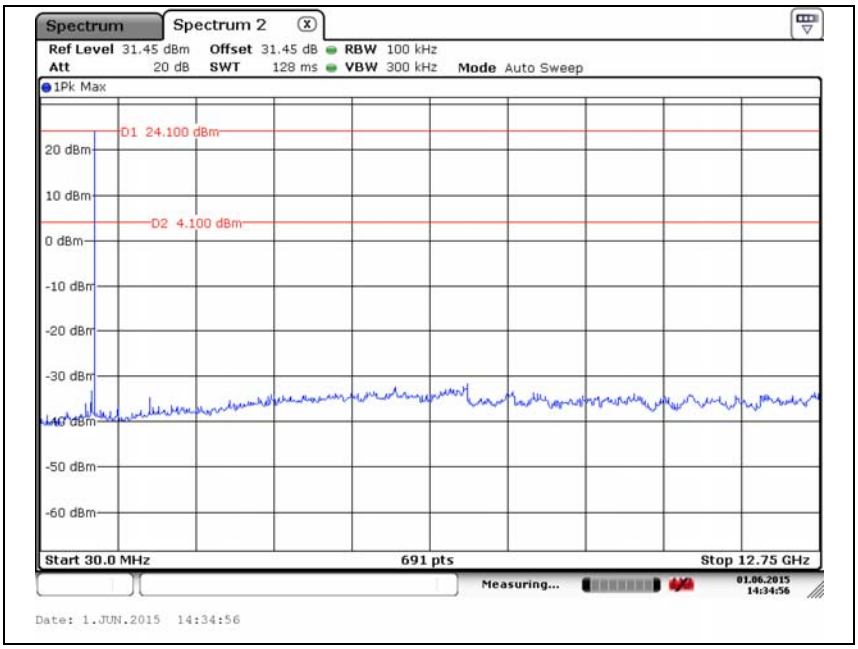
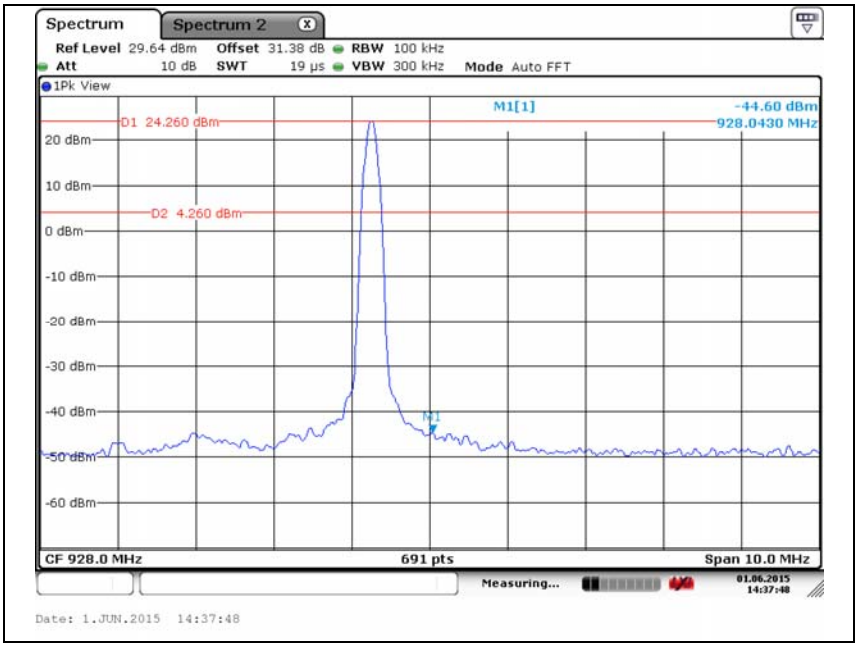
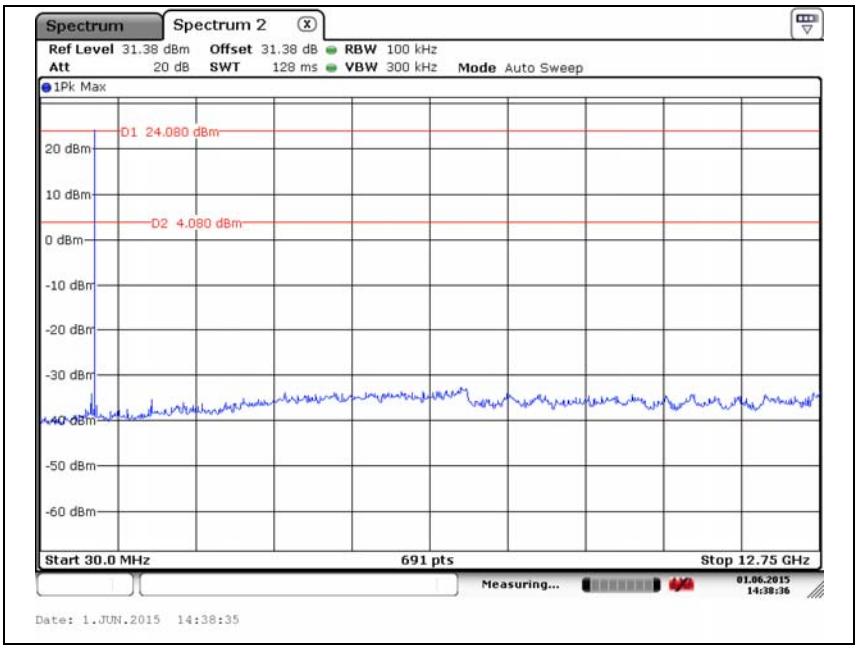


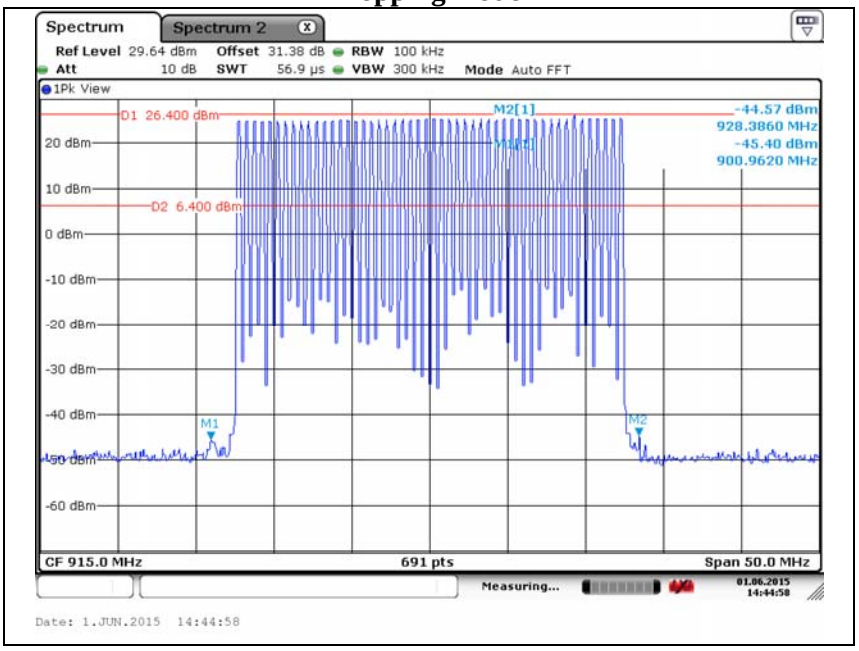


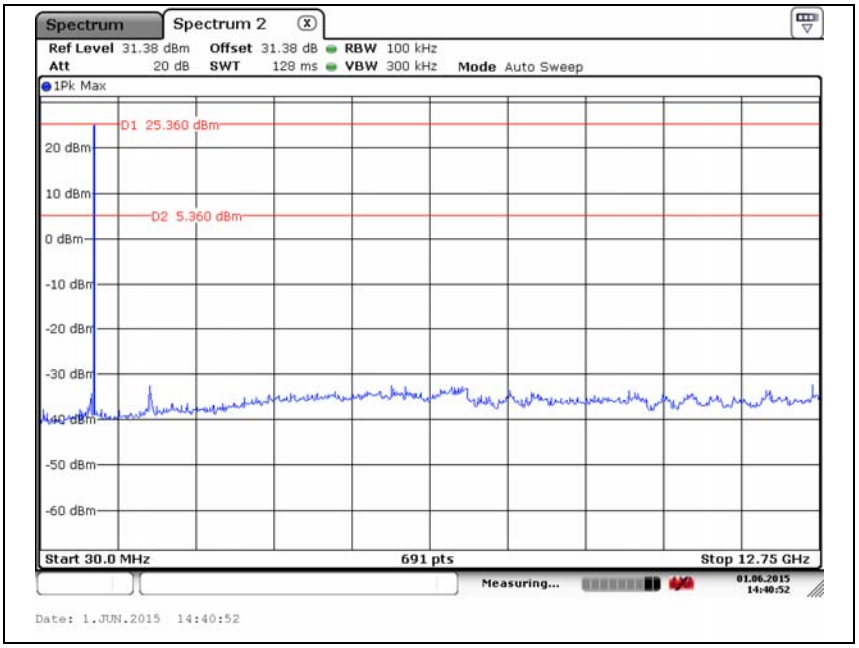
Ch. 50



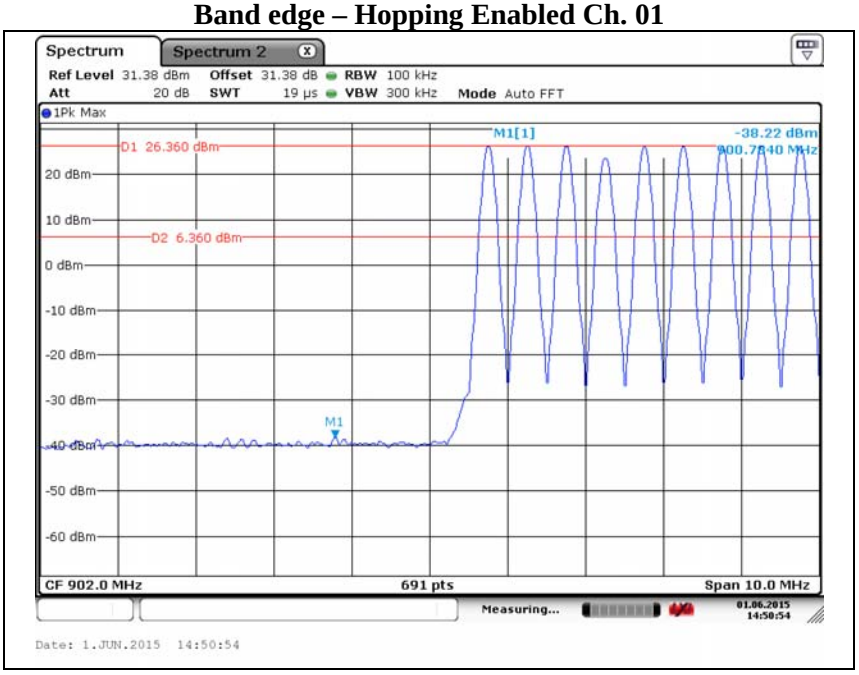


Hopping mode

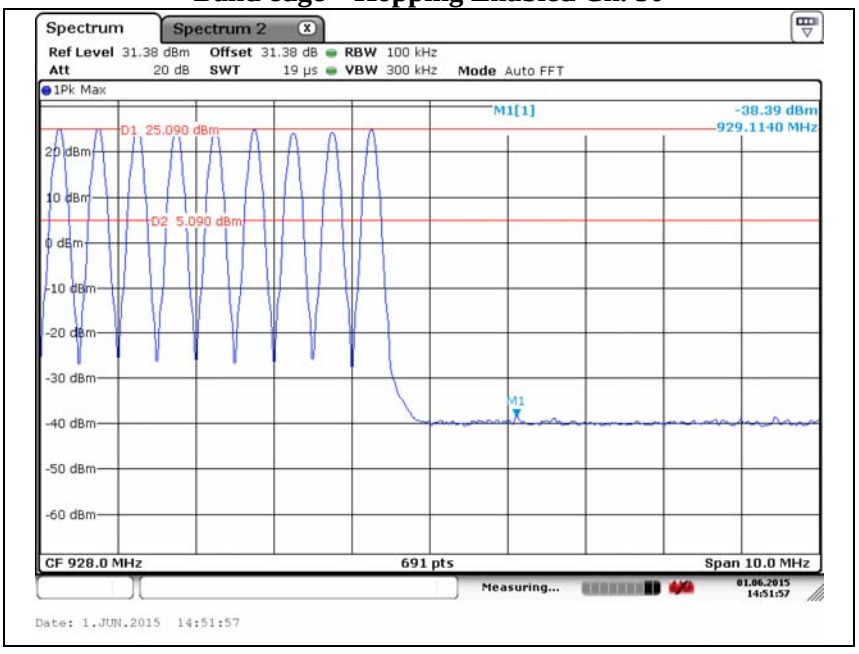




Band edge – Hopping Enabled Ch. 01

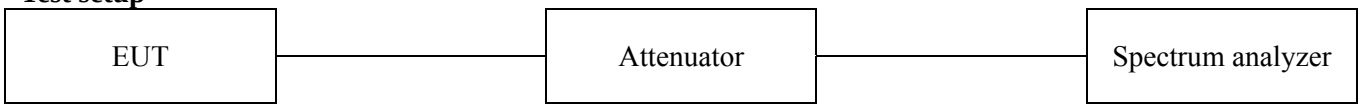


Band edge – Hopping Enabled Ch. 50



3.3. 20 dB bandwidth

Test setup



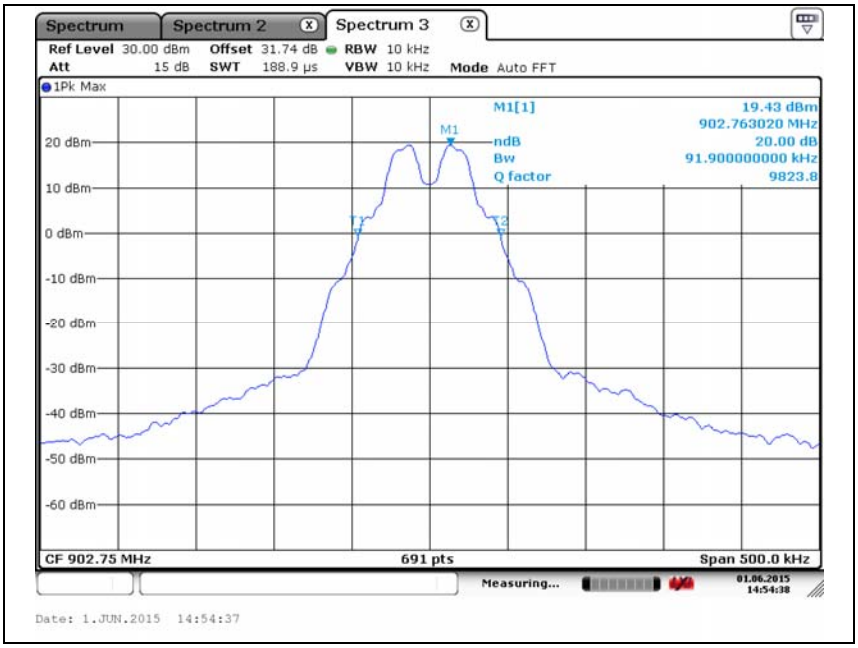
Test procedure
DA 00-075

Test setting
1. Span = 1 ㎒ (Approximately 2 to 3 times the 20 ㏈ bandwidth, centered on a hopping channel)
2. RBW ≥ 10 ㎑ (≥ 1% of the span)
3. VBW ≥ 10 ㎑ (≥ RBW)
4. Sweep = auto
5. Detector function = peak
6. Sweep = auto couple
7. Trace mode = max hold
8. The EUT should be transmitting at its maximum data rate. Allow the trance to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 ㏈ down on side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level.

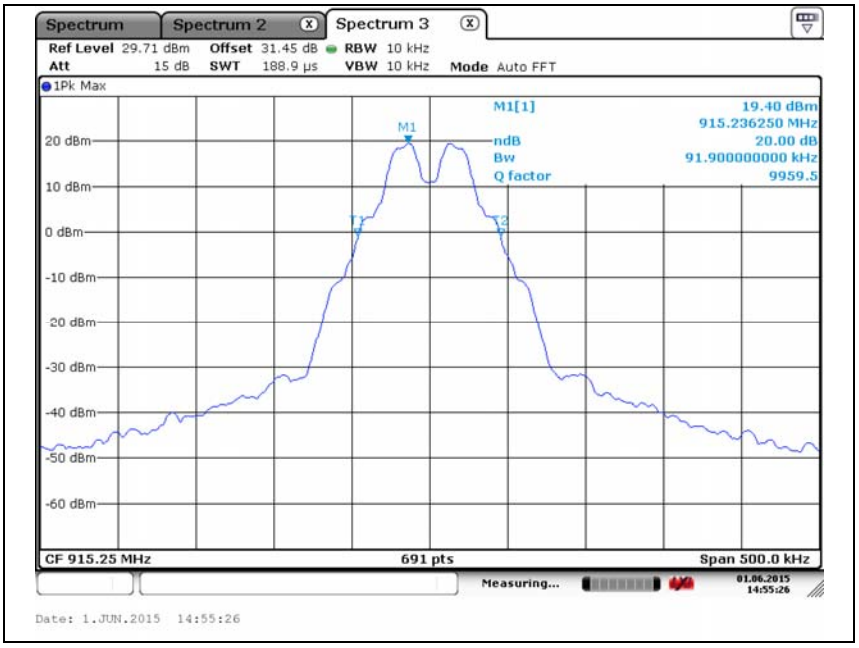
Limit
Not applicable

Frequency(㎒)	Channel no.	20 ㏈ bandwidth(㎑)
902.75	01	91.90
915.25	26	91.90
927.25	50	92.62

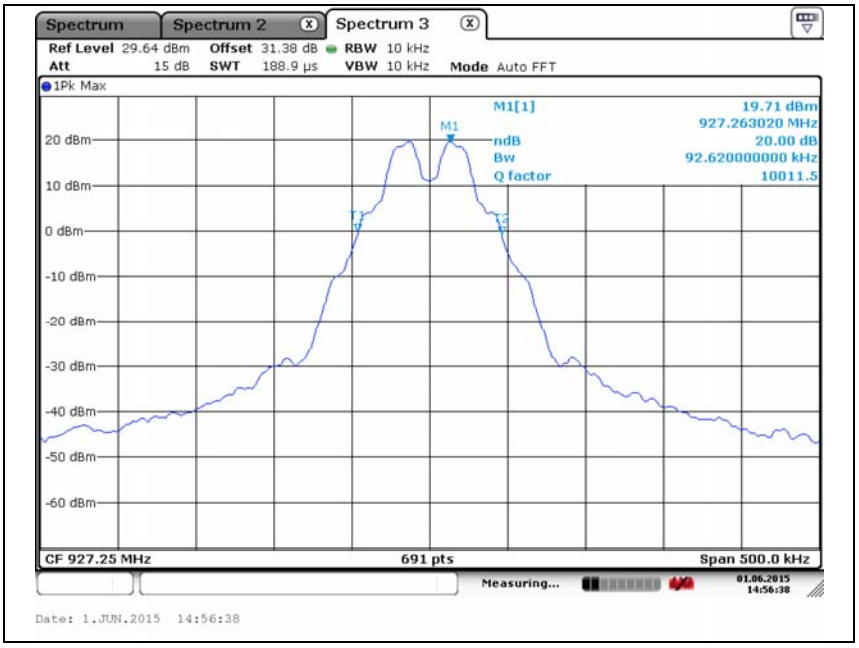
Ch. 01



Ch. 26

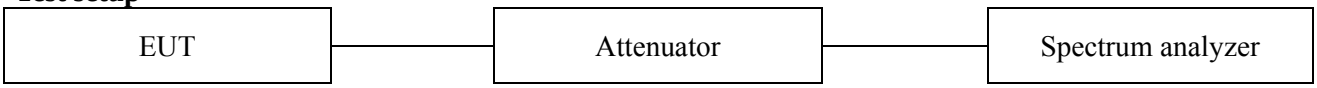


Ch. 50



3.4. Output power

Test setup



Test procedure

DA 00-075

Test setting

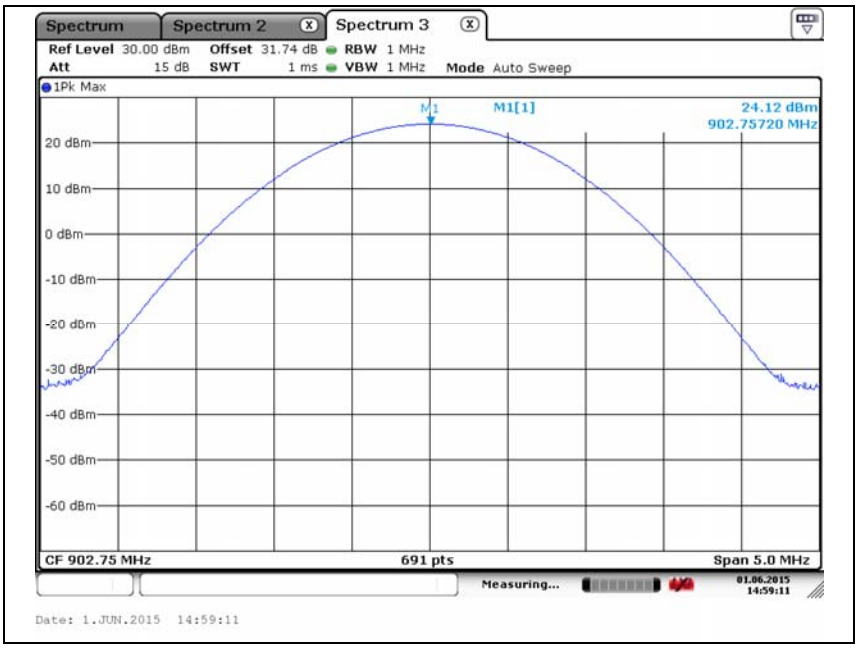
1. Span = 5 ㎒ (Approximately 5 times the 20 ㏈ bandwidth, centered on a hopping channel)
2. RBW = 1 ㎒ (the 20 ㏈ bandwidth of the emission being measured)
3. VBW = 1 ㎒ (≥ RBW)
4. Sweep = Auto
5. Detector function = Peak
6. Trace = Max hold

Limit

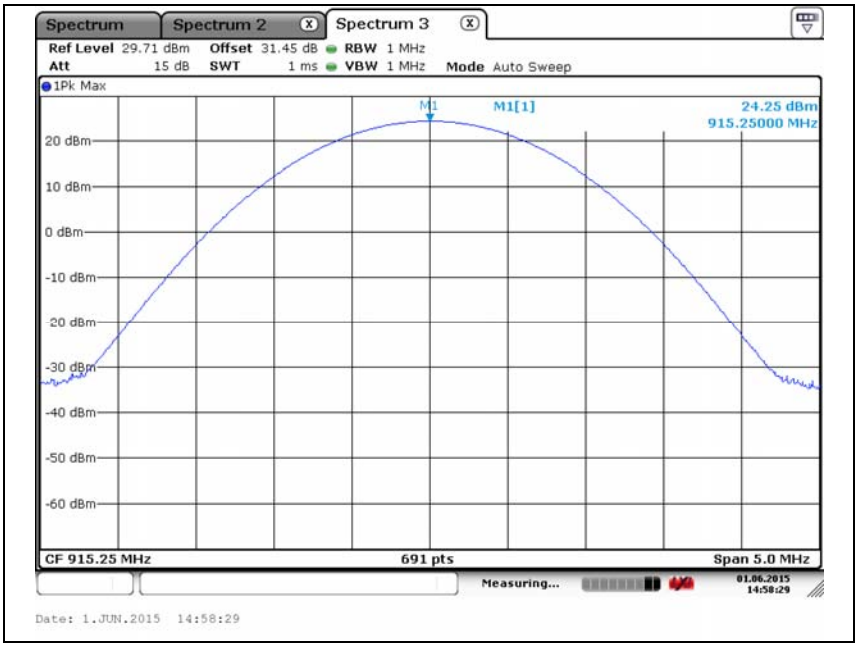
For frequency hopping systems operating in the 902 ~ 928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

Frequency(㎒)	Channel no.	Measured power(dBm)
902.75	01	24.12
915.25	26	24.25
927.25	50	24.30

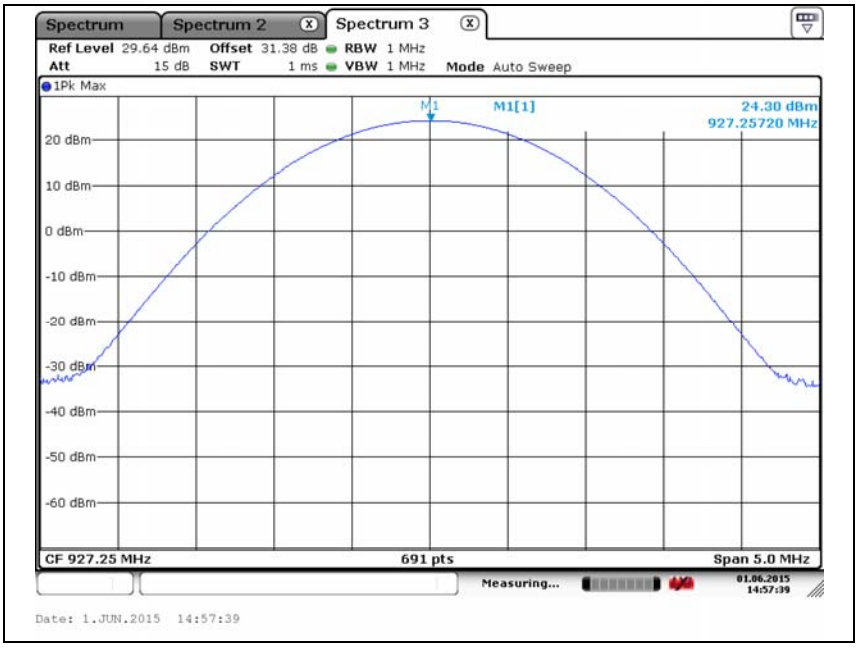
Ch. 01



Ch. 26

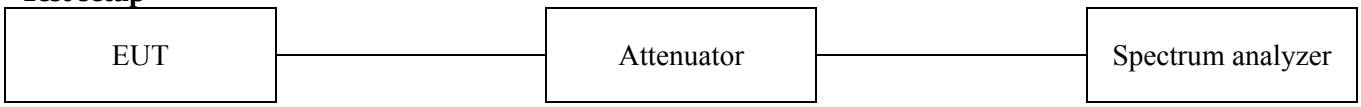


Ch. 50



3.5. Carrier frequency separation

Test setup



Test procedure

DA 00-075

Test Setting

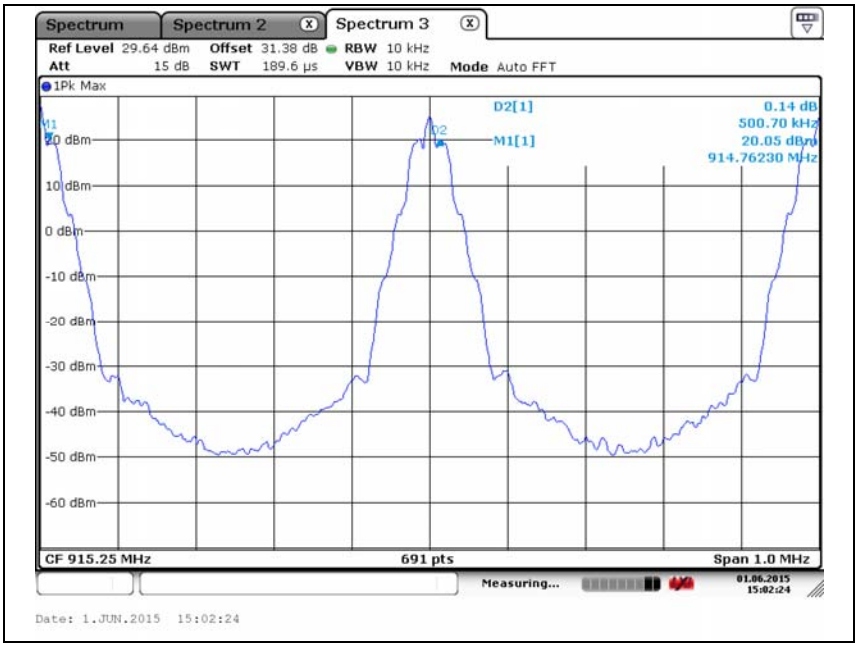
1. The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:
2. Span = 1 ㎒ (wide enough to capture the peaks of two adjacent channels)
3. RBW = 10 ㎑ (≥ 1% of the span)
4. VBW = 10 ㎑ (≥ RBW)
5. Sweep = auto
6. Detector function = peak
7. Trace = max hold

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

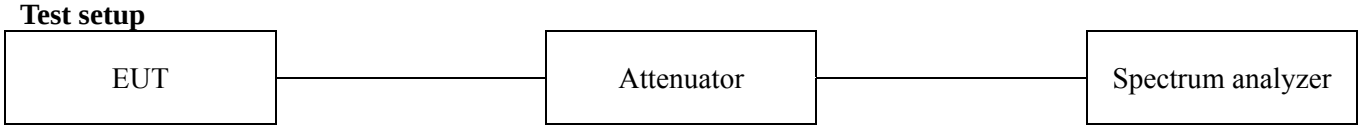
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 ㎑ or the 20 ㏈ bandwidth of the hopping channel, whichever is greater.

Operation mode	Channel separation(㎑)	Minimum bandwidth (㎑)
Hopping mode	500.7	92.6



3.6. Number of hopping frequency

Test setup

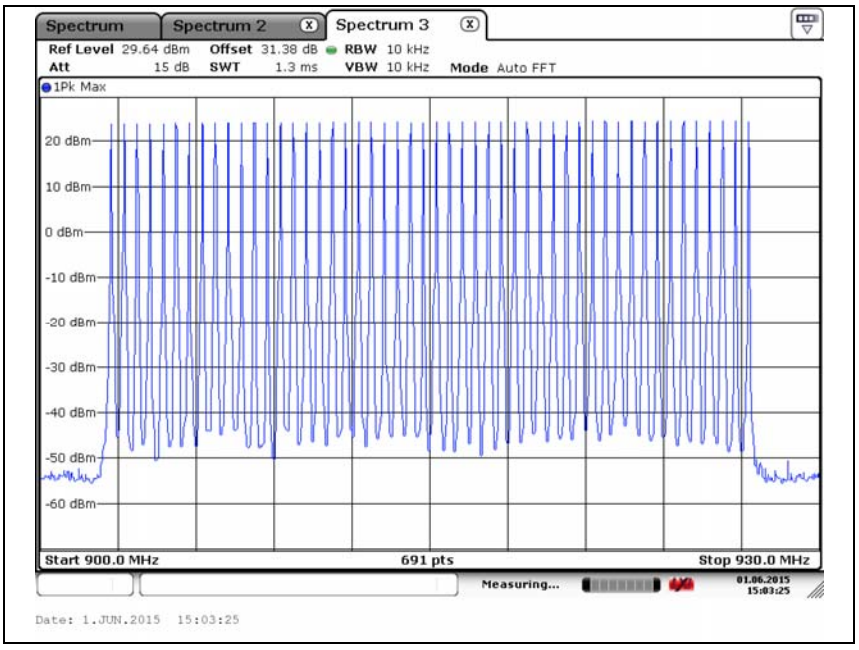


Test procedure
DA 00-075

Test setting
1. The EUT must have its hopping function enabled.
2. Frequency range: 902.75 ㎒ ~ 927.25 ㎒
3. Span = the frequency band of operation
4. RBW = 10 ㎑ (≥ 1% of the span)
5. VBW = 10 ㎑ (≥ RBW)
6. Sweep = auto
7. Detector function = peak
8. Trace = max hold

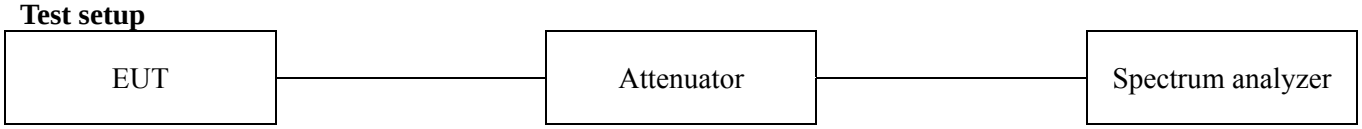
All the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Limit
For frequency hopping systems operating in the 902 ~ 928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.



3.7. Time of occupancy

Test setup



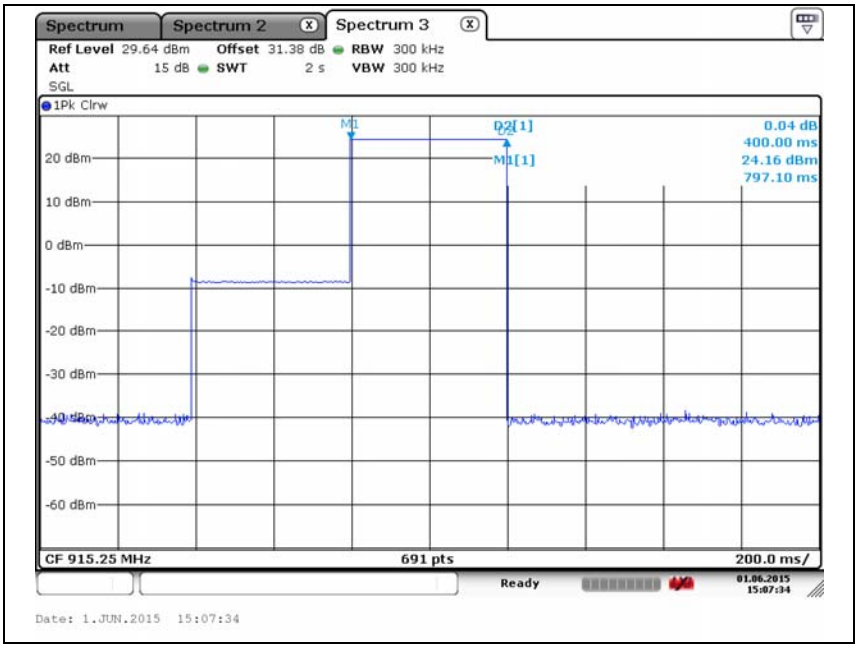
Test procedure
DA 00-075

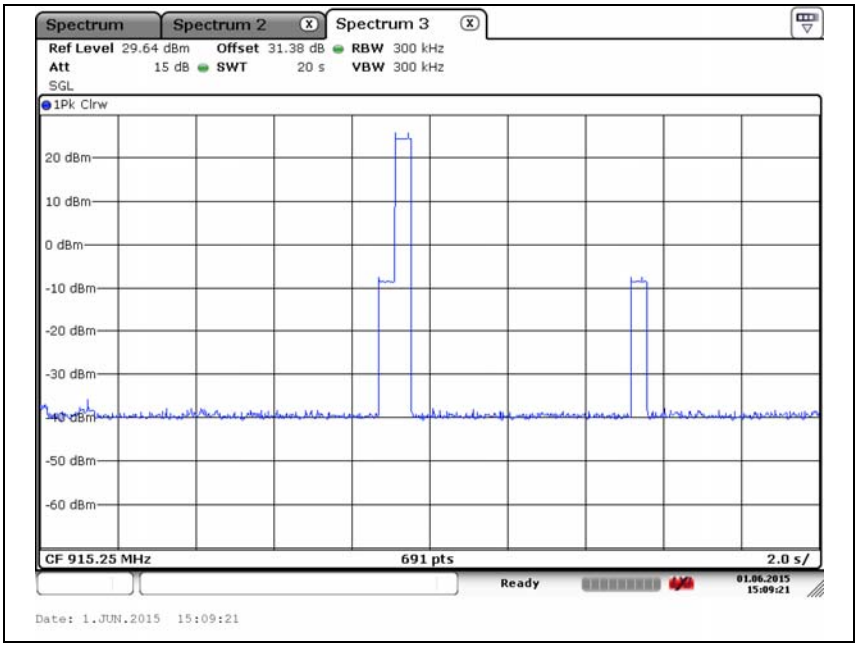
Test setting
1. The EUT must have its hopping function enabled.
2. Span = zero span, centered on a hopping channel
4. RBW = 300 ㎑
5. VBW = 300 ㎑ (≥ RBW)
6. Sweep = as necessary to capture the entire dwell time per hopping channel
7. Detector function = peak
8. Trace = max hold

Limit
For frequency hopping systems operating in the 902 ~ 928 ㎒ band: if the 20 ㏈ bandwidth of the hopping channel is less than 250 ㎑, 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 ㏈ bandwidth of the hopping channel is 250 ㎑ 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 ㏈ bandwidth of the hopping channel is 500 ㎑.

Frequency (㎒)	Dwell time (ms)	Transmission occurred	Result (㎳)	Limit (㎳)
915.25	400	1	400	400

Dwell time





3.8. AC conducted emissions

Frequency range of measurement
150 ㎑ to 30 ㎒

Instrument settings
IF Band Width: 9 ㎑

Test procedures
The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m. Amplitude measurements were performed with a quasi-peak detector and an average detector.

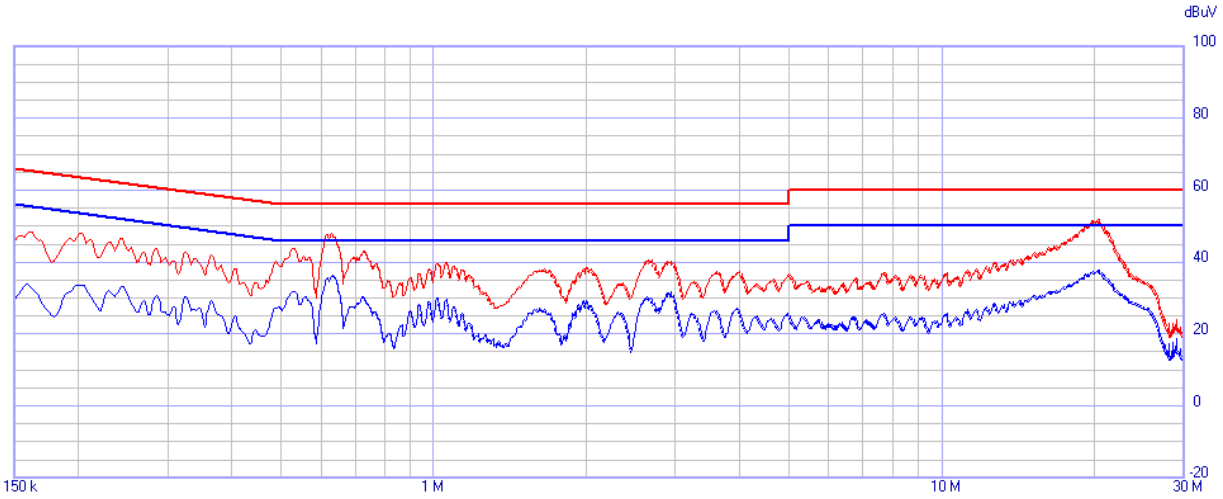
Limit
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the 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.
a) Decreases with the logarithm of the frequency.
b) All AC Conducted emission at channels are almost the same, so that high channel was chosen at representative in final test.

Test results

- **Antenna 1 (Patch Antenna)**

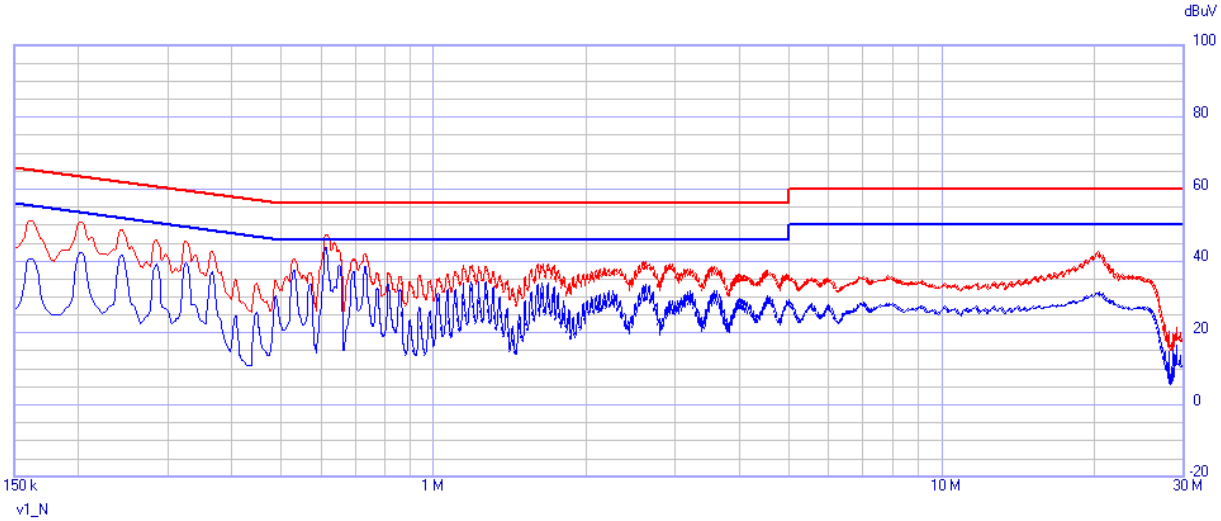


	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (2.045 kHz)	P Q C 022qp-b 022av-b	1500 ms	9 kHz	0	ON	ON	...	...

Ancillary = General
Limits:
022qp-b
022av-b
Factors:
1LISN_L1(150210)
CABLELOSS(141122)
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit 022qp-b [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit 022av-b [dBuV]	Delta [dB]	Factor 1LISN_L1(.. [dB]	Factor CABLELOSS.. [dB]
1	0.152045	47.46	65.89	-18.43	31.10	55.89	-24.79	9.65	0.02
2	0.160225	48.43	65.45	-17.02	33.45	55.45	-22.00	9.65	0.03
3	0.201125	48.11	63.56	-15.45	33.49	53.56	-20.07	9.65	0.03
4	0.242025	46.71	62.03	-15.32	32.84	52.03	-19.19	9.65	0.03
5	0.528325	43.94	56.00	-12.06	31.75	46.00	-14.25	9.65	0.03
6	0.630575	47.88	56.00	-8.12	36.13	46.00	-9.87	9.65	0.03
7	17.80244	46.73	60.00	-13.27	33.85	50.00	-16.15	9.94	0.24
8	20.217585	51.76	60.00	-8.24	37.62	50.00	-12.38	9.99	0.20

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



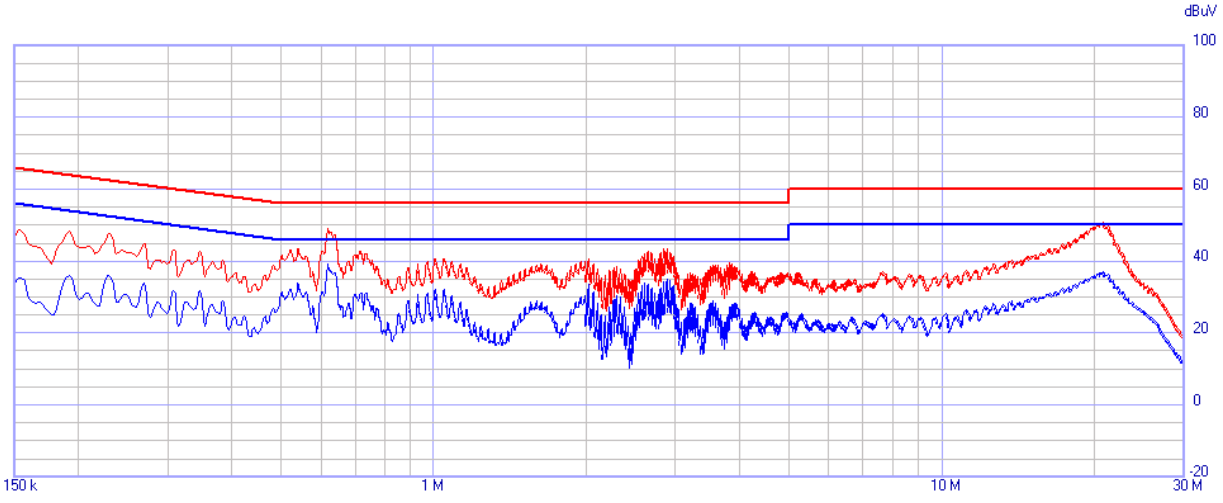
	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (2.045 kHz)	P Q C 022qp-b 022av-b	1500 ms	9 kHz	0	ON	ON	...	...

Ancillary = General
Limits:
022qp-b
022av-b
Factors:
1LISN_L2(150210)
CABLELOSS(141122)
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit 022qp-b [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit 022av-b [dBuV]	Delta [dB]	Factor 1LISN_L2(.. [dB]	Factor CABLELOSS.. [dB]
1	0.16227	51.16	65.35	-14.19	40.57	55.35	-14.78	9.63	0.03
2	0.20317	50.83	63.48	-12.65	42.34	53.48	-11.14	9.64	0.03
3	0.24407	48.80	61.96	-13.16	41.64	51.96	-10.32	9.64	0.03
4	0.28497	45.98	60.67	-14.69	39.02	50.67	-11.65	9.64	0.03
5	0.53037	40.61	56.00	-15.39	37.58	46.00	-8.42	9.65	0.03
6	0.532415	40.61	56.00	-15.39	37.58	46.00	-8.42	9.65	0.03
7	0.61626	47.47	56.00	-8.53	40.06	46.00	-5.94	9.65	0.03
8	0.732825	42.07	56.00	-13.93	38.41	46.00	-7.59	9.65	0.04
9	0.73487	42.07	56.00	-13.93	38.41	46.00	-7.59	9.65	0.04
10	20.217585	42.55	60.00	-17.45	31.37	50.00	-18.63	9.77	0.20

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

- **Antenna 2 (Reverse Polarized Antenna)**

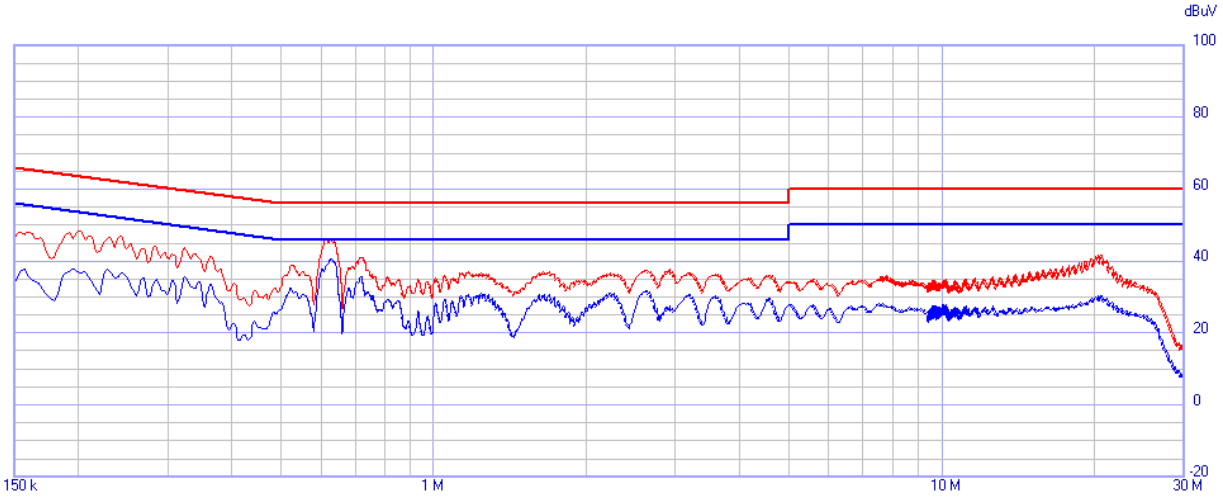


	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (2.045 kHz)	P Q C 022qp-b 022av-b	1500 ms	9 kHz	0	ON	ON	...	...

Ancillary = General
Limits:
022qp-b
022av-b
Factors:
1LISN_L1(150210)
CABLELOSS(141122)
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit 022qp-b [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit 022av-b [dBuV]	Delta [dB]	Factor 1LISN_L1(.. [dB]	Factor CABLELOSS.. [dB]
1	0.152045	48.67	65.89	-17.22	35.21	55.89	-20.68	9.65	0.02
2	0.15409	48.45	65.78	-17.33	35.36	55.78	-20.42	9.65	0.02
3	0.1909	48.37	64.00	-15.63	35.92	54.00	-18.08	9.65	0.03
4	0.229755	47.53	62.46	-14.93	36.12	52.46	-16.34	9.65	0.03
5	0.62035	49.21	56.00	-6.79	39.07	46.00	-6.93	9.65	0.03
6	2.83304	43.45	56.00	-12.55	33.68	46.00	-12.32	9.67	0.10
7	18.184855	46.28	60.00	-13.72	33.40	50.00	-16.60	9.95	0.23
8	20.64908	50.85	60.00	-9.15	37.17	50.00	-12.83	9.98	0.21

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



	Start [MHz]	Stop [MHz]	Step	Detector	Hold Time	RBW	Min Att	Pre Amp	Pre Sel	Prompt start	Ancillary
1	0.15	30	AUTO (2.045 kHz)	P Q C 022qp-b 022av-b	1500 ms	9 kHz	0	ON	ON	...	...

Ancillary = General
Limits:
022qp-b
022av-b
Factors:
1LISN_L2(150210)
CABLELOSS(141122)
QPeak
C-Avg

	Frequency [MHz]	QPeak [dBuV]	Limit 022qp-b [dBuV]	Delta [dB]	C-Avg [dBuV]	Limit 022av-b [dBuV]	Delta [dB]	Factor 1LISN_L2(.. [dB]	Factor CABLELOSS.. [dB]
1	0.152045	48.06	65.89	-17.83	36.06	55.89	-19.83	9.63	0.02
2	0.160225	48.04	65.45	-17.41	35.61	55.45	-19.84	9.63	0.03
3	0.201125	48.50	63.56	-15.06	36.56	53.56	-17.00	9.64	0.03
4	0.323825	43.70	59.61	-15.91	35.74	49.61	-13.87	9.64	0.03
5	0.528325	38.90	56.00	-17.10	31.21	46.00	-14.79	9.65	0.03
6	0.626485	46.20	56.00	-9.80	40.41	46.00	-5.59	9.65	0.03
7	0.7226	41.08	56.00	-14.92	34.92	46.00	-11.08	9.65	0.04
8	20.1092	41.70	60.00	-18.30	30.24	50.00	-19.76	9.77	0.20

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.
Spectrum analyzer	R&S	FSV30	101389	1 year	2016.01.22
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2016.01.23
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.	SAS-571	414	2 years	2017.02.09
Preamplifier	HP	8449B	3008A00538	1 year	2015.07.23
Attenuator	HP	30dB ATTENUATOR ASSEMBLY	3318A05137	1 year	2016.01.22
EMI Test Receiver	R&S	ESVS10	826008/014	1 year	2016.04.01
EMI Receiver/Signal Analyzer	Narda S.T.S / PMM	PMM 9010F	020WW31006	1 year	2016.04.01
LISN	R&S	ENV216	101137	1 year	2016.02.10

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook	Samsung	NT-R519	ZLT393BSBOOZO4H

Appendix B. Test setup photo

Radiated spurious (Patch Antenna)

Radiated spurious (Reverse Polarized Antenna)

AC conducted Emission (Patch Antenna)

AC conducted Emission (Reverse Polarized Antenna)