TEST REPORT
Part 90 Subpart I

Equipment under test EV Guest Tag

Model name J1801

FCC ID WDC-J1801

Applicant JTECH an HME Company

Manufacturer Lee Technology Korea Co., Ltd.

Date of test(s) 2018.02.12 ~ 2018.02.22

Date of issue 2018.02.24

Issued to
JTECH an HME Company
1400 Northbrook Parkway Suite #320
Suwanee, GA USA
Tel: +1-678-280-2707 / Fax: +1-700-682-3459

Issued by
KES Co., Ltd.
3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si,
Gyeonggi-do, 14057, Korea
473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450

Test and report completed by :	Report approval by :
Kwon-se Kim Test engineer	Hyeon-Su, Jang Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2018.02.24	KES-RF-18T0025	Initial

TABLE OF CONTENTS

1. General information

Applicant:	JTECH an HME Company
Applicant address:	1400 Northbrook Parkway Suite #320 Suwanee, GA USA
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
FCC rule part(s):	Part 90
FCC ID:	WDC-J1801
Test device serial No.	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	EV Guest Tag
Frequency range	UHF : 450.0250 ㎒ ~ 469.9750 ㎒ NFC : 13.56 ㎒
Model:	J1801
Type of emission	5K93F1D
Channel separation	12.5 ㎑
Rated power	11 ㏈m
Antenna specification	Antenna type(UHF) : Helical antenna, Peak gain: -2.34㏈i Antenna type(NFC): Pattern antenna
Power source	DC 3.7 V (Internal Rechargeable Battery)

1.2. Test configuration

The **JTECH an HME Company EV Guest Tag FCC ID: WDC-J1801** was tested according to the specification of EUT, the EUT must comply with following standards

FCC Part 90
FCC Part 2
TIA-603-E:2016

1.3. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
AC adaptor	Zhonghan Electronics(Shenzhen)Co., Ltd.	FSP060-DIBAN2	H00000863	AC 120 V (Output : DC 12.0V/5.0A)
Tag-charger	Lee Technology Korea Co., Ltd.	Guest Paging	-	-

1.4. Software and Firmware description

The software and firmware installed in the EUT is version 1.0.

1.5. 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(㏈).
= 1.05 + 10 = 11.05 (㏈)

1.6 Measurement Uncertainty

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

1.7. Test frequency

	Low channel	Middle channel	High channel
Frequency (㎒)	450.0250	457.5750	469.9750

2. Summary of tests

Section in FCC Part 90 & 2	Parameter	Test results
90.205(h)	RF output power	Pass
90.209	Bandwidth limitations	Pass
90.210(d)	Emission mask	Pass
90.210(d)	Conducted spurious emissions	Pass
90.213(a), 2.1055(a)(1)	Frequency stability	Pass
90.214	Transient frequency behavior	Pass
90.210(d)	Radiated spurious emissions	Pass

3. Test results

3.1 RF output power

Test setup

EUT		Attenuator		Spectrum analyzer

Test procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator
2. Use the following spectrum analyzer setting

   Span = 2 ㎒
   RBW = 100 ㎑
   VBW = 100 ㎑ (≥ RBW)
   Sweep = auto
   Detector function = peak
   Trace = max hold

Limit

According to 90.205(h) 450 ~ 470 ㎒, (1) The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authoriz ed in accordance with table 2. Applicants requesting an ERP in excess of that listed in table 2 mus t submit an engineering analysis based upon generally accepted engineering practices and standards t hat includes coverage contours to demonstrate that the requested station parameters will not produce coverage in excess of that which the applicant requires.

Table 2. 450 ~ 470 ㎒—Maximum ERP/Reference HAAT for a Specific Service Area Radius

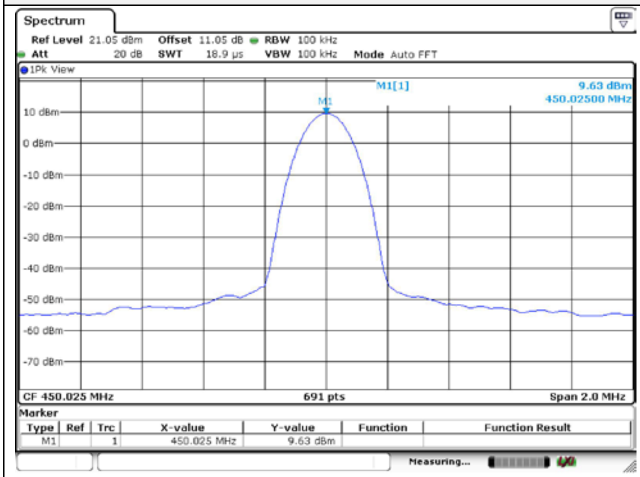
	Service area radius (km)									
	3	8	13	16	24	32	40[4]	48[4]	64[4]	80[4]
Maximum ERP (W)[1]	2	100	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500
Up to reference HAAT (m)[3]	15	15	15	27	63	125	250	410	950	2700

[1]Maximum ERP indicated provides for a 39 ㏈u signal strength at the edge of the service area per FCC Report R-6602, Fig. 29 (See §73.699, Fig. 10 b).
[2]Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 39 ㏈u.
[3]When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation: $ERP_{allow}=ERP_{max}\times (HAAT_{ref}/HAAT_{actual})^2$.
[4]Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 39 ㏈u.

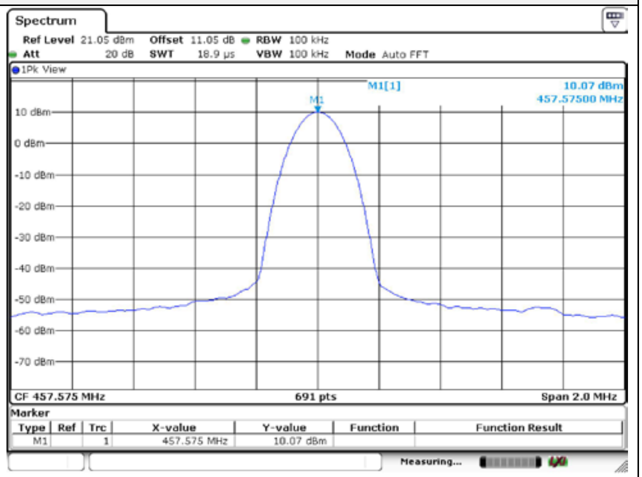
Test results

Frequency (㎒)	Output power(㏈m)	Output power(W)	Rated power(㏈m)
450.0250	9.63	0.009	11.00
457.5750	10.07	0.010	
469.9750	9.52	0.009	

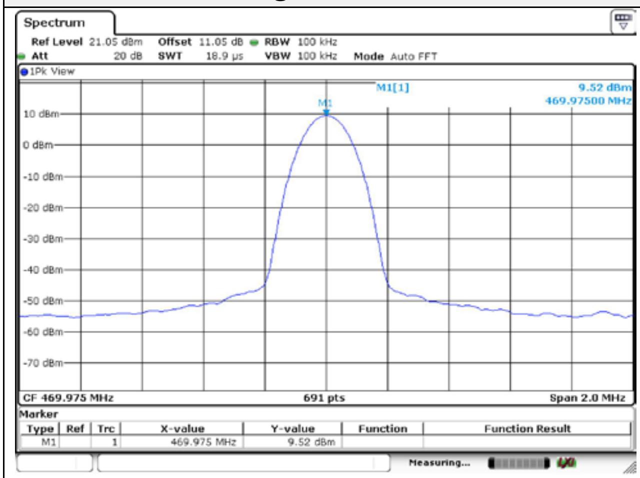
Low channel



Middle channel



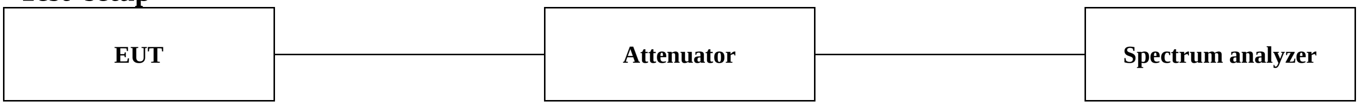
High channel



Blank

3.2 Bandwidth limitation

Test setup



Test procedure

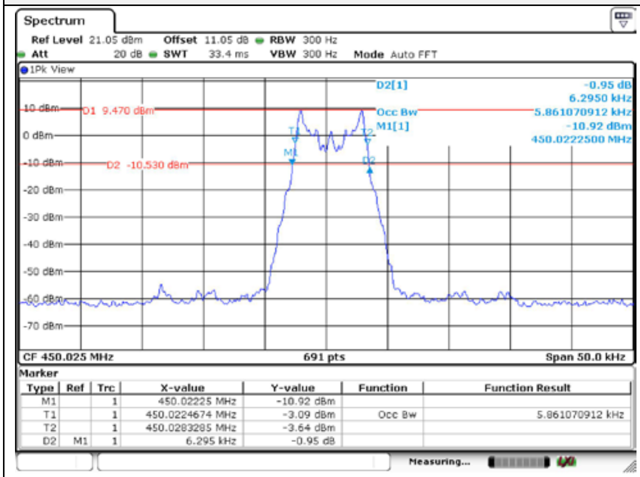
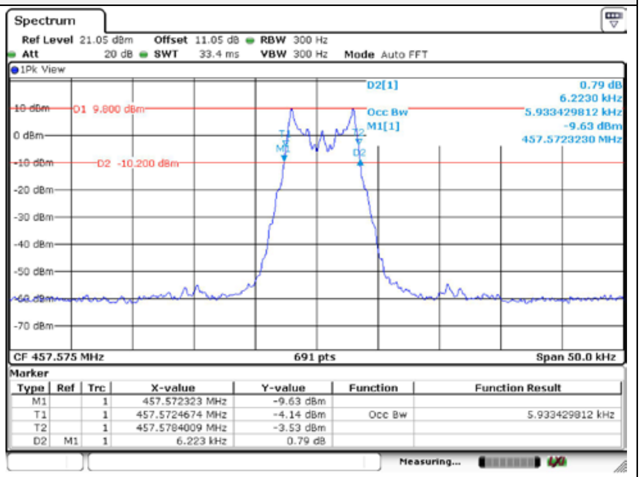
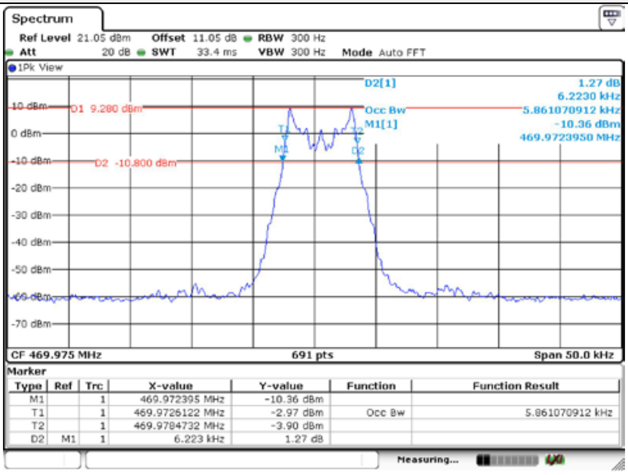
1. The transmitter output was connected to the spectrum analyzer through an attenuator
2. Use the following spectrum analyzer setting
   Span = 50 ㎑
   RBW = 300 ㎐
   VBW = 300 ㎐ (≥ RBW)
   Sweep = auto
   Detector function = peak
   Trace = max hold
3. Mark the peak frequency and -20 ㏈(Upper and lower) frequency.

Limit

N/A

Test results

Frequency(㎒)	20 ㏈ bandwidth (㎑)	OBW (㎑)
450.0250	6.30	5.86
457.5750	6.22	5.93
469.9750	6.22	5.86

Low channel	Middle channel
	
High channel	
	Blank

3.3 Emission mask

Test setup

EUT	→	Attenuator	→	Spectrum analyzer

Test procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator
2. Use the following spectrum analyzer setting
   Span = 120 ㎑
   RBW = 100 ㎐
   VBW = 100 ㎐ (≥ RBW)
   Sweep = auto
   Detector function = peak
   Trace = max hold
3. Mark the peak frequency with maximum peak power as the center of the display of the spectrum analyzer.
4. Record the power spectrum analyzer and compare to the mask.

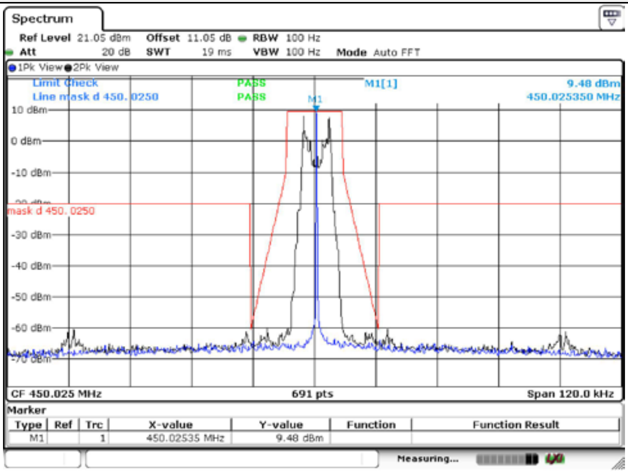
Limit

According to § 90.210(d), Emission Mask D – 12.5 ㎑ channel bandwidth equipment. For transmitters designed to operate with a 12.5 ㎑ channel bandwidth, any emission must be attenuated below the power(P) of the highest emission contained within the authorized bandwidth as follows:

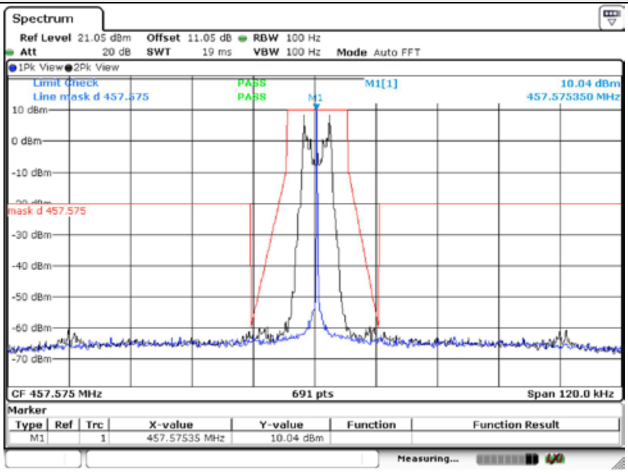
(1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 ㎑ removed from f_0: Zero ㏈.
(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in ㎑) of more than 5.625 ㎑, but no more than 12.5 ㎑: At least 7.27 (f_d-2.88 ㎑) ㏈.
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in ㎑) of more than 12.5 ㎑: At least 50 + 10log(P) ㏈ or 70 ㏈, whichever is the lesser attenuation.

Test results

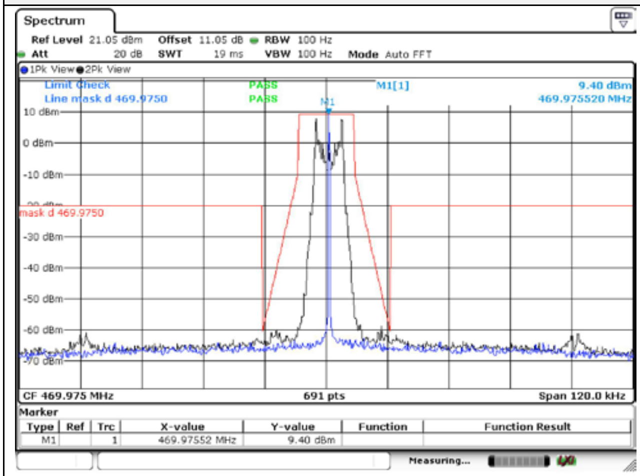
Low channel



Middle channel



High channel



Blank

3.4 Conducted spurious emissions

Test setup

EUT	**Attenuator**	**Spectrum analyzer**

Test procedure

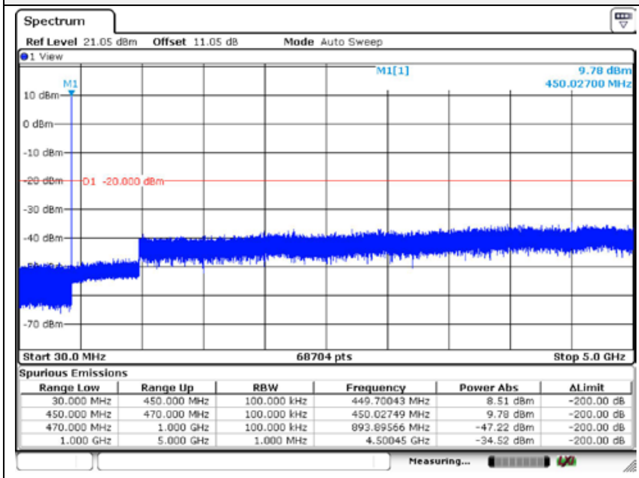
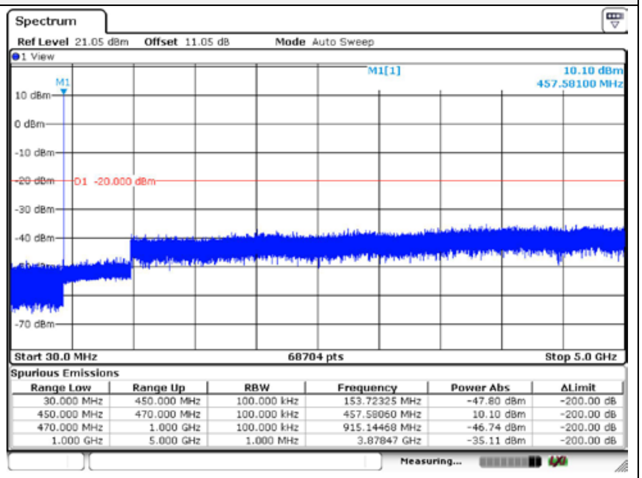
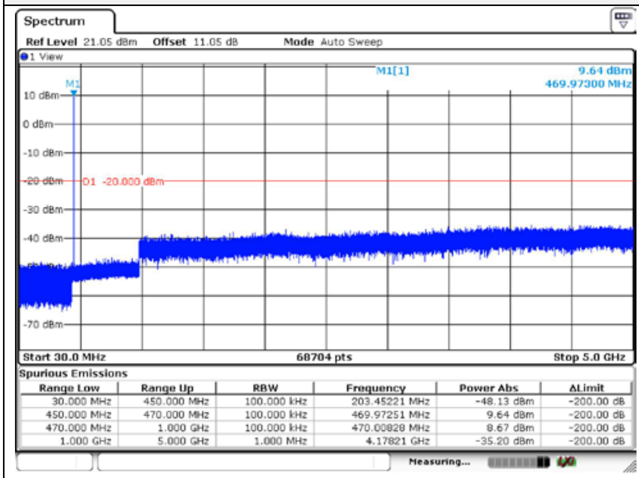
1. The transmitter output was connected to the spectrum analyzer through an attenuator
2. Use the following spectrum analyzer setting
   Span = 30 ㎒ to 5 ㎓
   RBW = 100 ㎑
   VBW = 100 ㎑ (≥ RBW)
   Sweep = auto
   Detector function = peak
   Trace = max hold

Limit

According to part 90.210(d), Emission Mask D – 12.5 ㎑ channel bandwidth equipment. For transmitters designed to operate with a 12.5 ㎑ channel bandwidth, any emission must be attenuated below the power(P) of the highest emission contained within the authorized bandwidth as follows:

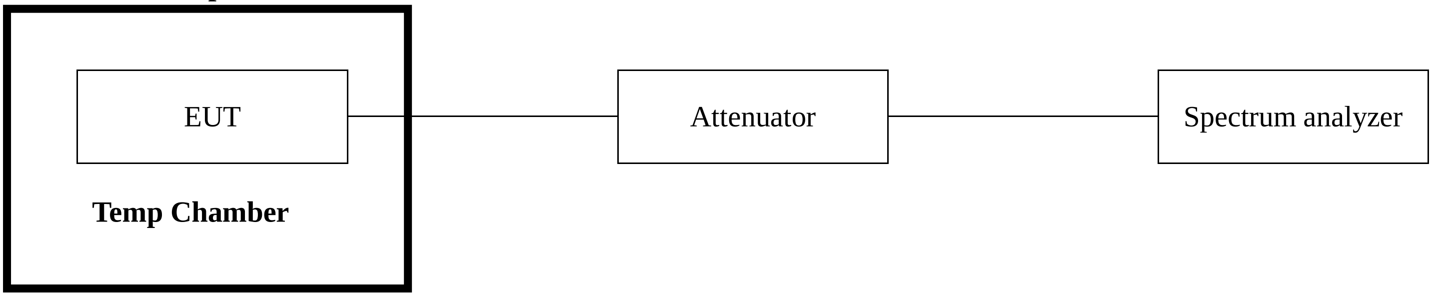
(3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in ㎑) of more than 12.5 ㎑: At least 50 + 10log(P) ㏈ or 70 ㏈, whichever is the lesser attenuation.

Test results

Low channel	Middle channel
	
High channel	
	Blank

3.5 Frequency stability

Test setup



Test procedure

TIA-603-E – Section 2.2.2, FCC Part 2.1055

TIA-603-E – Section 2.2.2

1. Connect the equipment as illustrated.
2. Operate the equipment in standby conditions for 15 minutes before proceeding.
3. Record the carrier frequency of the transmitter as $MCF_{㎒}$.
4. Calculate the ppm frequency error by the following:

$$ppm\ error = \left(\frac{MCF_{MHz}}{ACF_{MHz}} - 1\right) * 10^{6}$$

Where

$MCF_{㎒}$ is the Measured Carrier Frequency in ㎒
$ACF_{㎒}$ is the Assigned Carrier Frequency in ㎒

5. The value recorded in step 4 is the carrier frequency stability.

FCC Part 2.1055

(1) From -30° to + 50° centigrade for all equipment except that specified in paragraphs (a)(2) and (3) of this section.

Limit

1. According to §2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from -30 ℃ to +50 ℃ centigrade.
2. According to §2.1055(d)(2), for battery powered equipment the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point, which is specified by the manufacture.
3. According to §90.213, (a) Unless noted elsewhere, transmitters used in the services governed by this part must have a minimum frequency stability as specified in the following table.

Minimum Frequency Stability [Parts per million (ppm)]

Frequency range (㎒)	Fixed and base stations	Mobile stations	
		Over 2 watts output power	2 watts or less output power
Below 25	[1,2,3]100	100	200
25–50	20	20	50
72–76	5		50
150–174	[5,11]5	[6]5	[4,6]50
216–220	1.0		1.0
220–222[12]	0.1	1.5	1.5
421–512	**[7,11,14]2.5**	**[8]5**	**[8]5**
806–809	[14]1.0	1.5	1.5
809–824	[14]1.5	2.5	2.5
851–854	1.0	1.5	1.5
854–869	1.5	2.5	2.5
896–901	[14]0.1	1.5	1.5
902–928	2.5	2.5	2.5
902–928[13]	2.5	2.5	2.5
929–930	1.5		
935–940	0.1	1.5	1.5
1427–1435	[9]300	300	300
Above 2450[10]	-	-	-

[1]Fixed and base stations with over 200 watts transmitter power must have a frequency stability of 50 ppm except for equipment used in the Public Safety Pool where the frequency stability is 100 ppm.

[2]For single sideband operations below 25 ㎒, the carrier frequency must be maintained within 50 ㎐ of the authorized carrier frequency.

[3]Travelers information station transmitters operating from 530 ~ 1 700 ㎑ and transmitters exceeding 200 watts peak envelope power used for disaster communications and long distance circuit operations pursuant to §90.242 and §90.264 must maintain the carrier frequency to within 20 ㎐ of the authorized frequency.

[4]Stations operating in the 154.45 to 154.49 ㎒ or the 173.2 to 173.4 ㎒ bands must have a frequency stability of 5 ppm.

[5]In the 150 ~ 174 ㎒ band, fixed and base stations with a 12.5 ㎑ channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 ㎑ channel bandwidth must have a frequency stability of 1.0 ppm.

[6]In the 150 ~ 174 ㎒ band, mobile stations designed to operate with a 12.5 ㎑ channel bandwidth or designed to operate on a frequency specifically designated for itinerant use or designed for low-power operation of two watts or less, must have a frequency stability of 5.0 ppm. Mobile stations designed to operate with a 6.25 ㎑ channel bandwidth must have a frequency stability of 2.0 ppm.

[7]In the 421 ~ 512 ㎒ band, fixed and base stations with a 12.5 ㎑ channel bandwidth must have a frequency stability of 1.5 ppm. Fixed and base stations with a 6.25 ㎑ channel bandwidth must have a frequency stability of 0.5 ppm.

[8]In the 421 ~ 512 ㎒ band, mobile stations designed to operate with a 12.5 ㎑ channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 ㎑ channel bandwidth must have a frequency stability of 1.0 ppm.

[9]Fixed stations with output powers above 120 watts and necessary bandwidth less than 3 ㎑ must operate with a frequency stability of 100 ppm. Fixed stations with output powers less than 120 watts and using time-division multiplex, must operate with a frequency stability of 500 ppm.

[10]Except for DSRCS equipment in the 5 850 ~ 5 925 ㎒ band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5 850 ~ 5 925 ㎒ band is specified in subpart M of this part.

[11]Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150 ~ 174 ㎒ band and 2.5 ppm in the 421 ~ 512 ㎒ band.

[12]Mobile units may utilize synchronizing signals from associated base stations to achieve the specified carrier stability.

[13]Fixed non-multilateration transmitters with an authorized bandwidth that is more than 40 ㎑ from the band edge, intermittently operated hand-held readers, and mobile transponders are not subject to frequency tolerance restrictions.

[14]Control stations may operate with the frequency tolerance specified for associated mobile frequencies.

(b) For the purpose of determining the frequency stability limits, the power of a transmitter is considered to be the maximum rated output power as specified by the manufacturer.

Test results

Operating frequency: 450.0250 ㎒

Test voltage (%)	Test voltage (V)	Temperature (℃)	Measure frequency (㎒)	Frequency deviation (㎐)	Deviation (%)
100 %	DC 3.70	-30	450.025 463	463	0.000 103
		-20	450.025 445	445	0.000 099
		-10	450.025 385	385	0.000 086
		0	450.025 377	377	0.000 084
		10	450.025 374	374	0.000 083
		20	450.025 376	376	0.000 084
		30	450.025 298	298	0.000 066
		40	450.025 322	322	0.000 072
		50	450.025 355	355	0.000 079
115 %	DC 4.26	20	450.025 373	373	0.000 083
85 %	DC 3.15	20	450.025 372	372	0.000 083

Operating frequency: 457.5750 ㎒

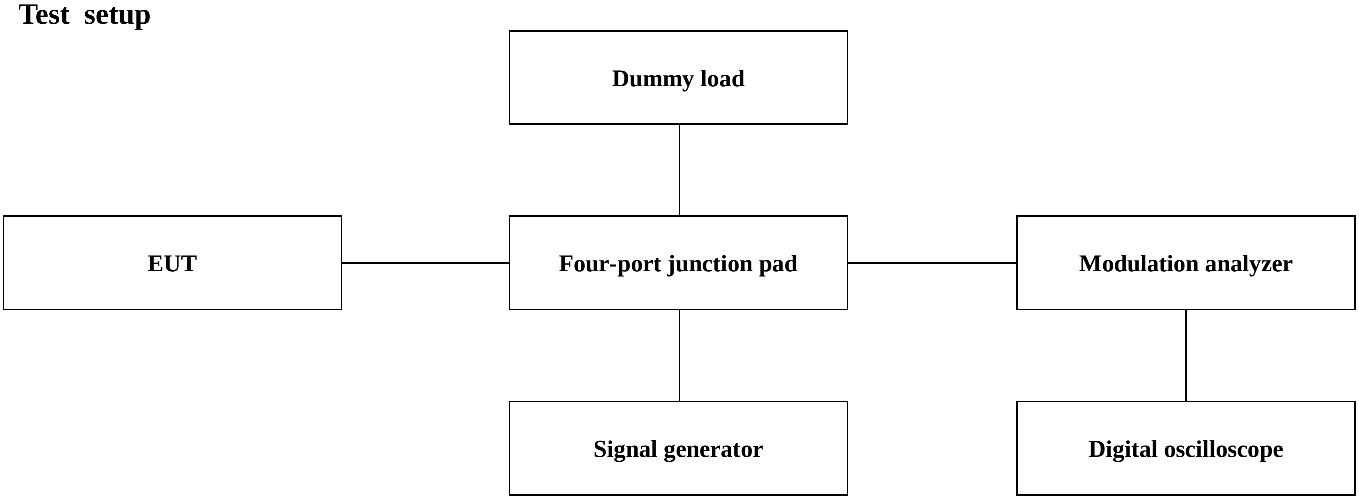
Test voltage (%)	Test voltage (V)	Temperature (℃)	Measure frequency (㎒)	Frequency deviation (㎐)	Deviation (%)
100 %	DC 3.70	-30	457.575 666	666	0.000 146
		-20	457.575 588	588	0.000 129
		-10	457.575 511	511	0.000 112
		0	457.575 434	434	0.000 095
		10	457.575 433	433	0.000 095
		20	457.575 434	434	0.000 095
		30	457.575 287	287	0.000 063
		40	457.575 293	293	0.000 064
		50	457.575 318	318	0.000 069
115 %	DC 4.26	20	457.575 429	429	0.000 094
85 %	DC 3.15	20	457.575 425	425	0.000 093

Operating frequency: 469.9750 ㎒

Test voltage (%)	Test voltage (V)	Temperature (℃)	Measure frequency (㎒)	Frequency deviation (㎐)	Deviation (%)
100 %	DC 3.70	-30	469.975 727	727	0.000 155
		-20	469.975 607	607	0.000 129
		-10	469.975 459	459	0.000 098
		0	469.975 289	289	0.000 061
		10	469.975 301	301	0.000 064
		20	469.975 463	463	0.000 099
		30	469.975 376	376	0.000 080
		40	469.975 396	396	0.000 084
		50	469.975 434	434	0.000 092
115 %	DC 4.26	20	469.975 459	459	0.000 098
85 %	DC 3.15	20	469.975 460	460	0.000 098

3.6 Transient frequency behavior of the transmitter

Test setup



Test procedure

1. Set the signal generator to the assigned transmitter frequency and modulate it with a 1 ㎑ tone at ±12.5 ㎑ deviation and set its output level to -15 ㏈m.
2. Key the transmitter.
3. Supply sufficient attenuation via the RF attenuator to provide an input level to the test receiver that is 40 ㏈ below the test receiver maximum allowed input power when the transmitter is operating at its rated power level.
4. Unkey the transmitter.
5. Adjust the RF level of the signal generator to provide RF power into the RF power meter equal to the level this signal generator RF level shall be maintained throughout the rest of the measurement.
6. Connect the output of the RF combiner network to the input of the Modulation analyzer.
7. Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjust the display to continuously view the 1 000 ㎐ tone. Adjust the vertical amplitude control of the oscilloscope to display the 1 000 ㎐ at ±4 divisions vertically centered on the display.
8. Key the transmitter and observe the stored display. once the modulation Analyzer demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the 1 ㎑ test signal is completely suppressed (including any capture time due to phasing) is considered to be t_{on}. The trace should be maintained within the allowed divisions during the period t1 and t_2. See the figure in the appropriate standards section.
9. During the time from the end of t_2 to the beginning of t_3 the frequency difference should not exceed the limits set by the FCC in 47 CFR 90.214 and outlined in 3.2.2. The allowed limit is equal to the transmitter frequency times its FCC frequency tolerance times ±4 display divisions divided by 12.5 ㎑.
10. Key the transmitter and observe the stored display. The trace should be maintained within the allowed divisions after the end of t_2 and remain within it until the end of the trace. See the figure in the appropriate standards sections.
11. To test the transient frequency behavior during the period t_3 the transmitter shall be keyed.

12. Adjust the oscilloscope trigger controls so it will trigger on a decreasing magnitude from the Modulation analyzer, at 1 division from the right side of the display, when the transmitter is turned off. Set the controls to store the display. The moment when the 1 ㎑ test signal starts to rise is considered to provide to t_{off} .
13. The transmitter shall be unkeyed.
14. Observe the display. The trace should remain within the allowed divisions during period t3. See the figures in the appropriate standards section.

Limit

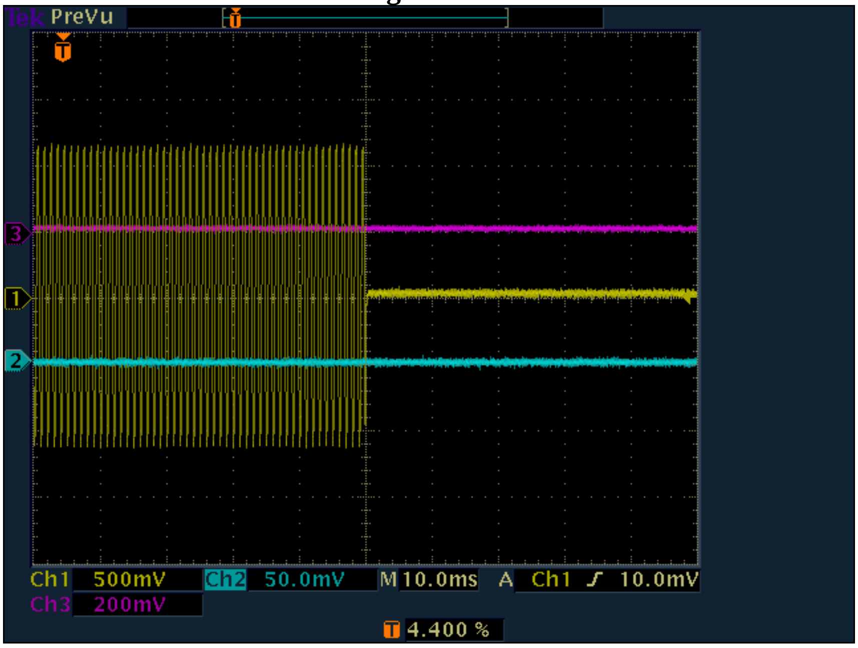
According to §90.214, Transmitters designed to operate in the 150 ~ 174 ㎒ and 421 ~ 512 ㎒ frequency bands must maintain transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time intervals [1, 2]	Maximum frequency difference [3]	All equipment	
		150 to 174 ㎒	421 to 512 ㎒
Transient frequency behaviour for equipment designed to operate on 25 ㎑ channel			
t1[4] ---------------------------	±25.0 ㎑	5.0 ㎳	10.0 ㎳
t2 ---------------------------	±12.5 ㎑	20.0 ㎳	25.0 ㎳
t3[4] ---------------------------	±25.0 ㎑	5.0 ㎳	10.0 ㎳
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 ㎑ Channel			
t1[4] ---------------------------	±12.5 ㎑	5.0 ㎳	10.0 ㎳
t2 ---------------------------	±6.25 ㎑	20.0 ㎳	25.0 ㎳
t3[4] ---------------------------	±12.5 ㎑	5.0 ㎳	10.0 ㎳
Transient Frequency Behaviour for Equipment Designed to Operate on 6.25 ㎑ Channel			
t1[4] ---------------------------	±6.25 ㎑	5.0 ㎳	10.0 ㎳
t2 ---------------------------	±3.125 ㎑	20.0 ㎳	25.0 ㎳
t3[4] ---------------------------	±6.25 ㎑	5.0 ㎳	10.0 ㎳

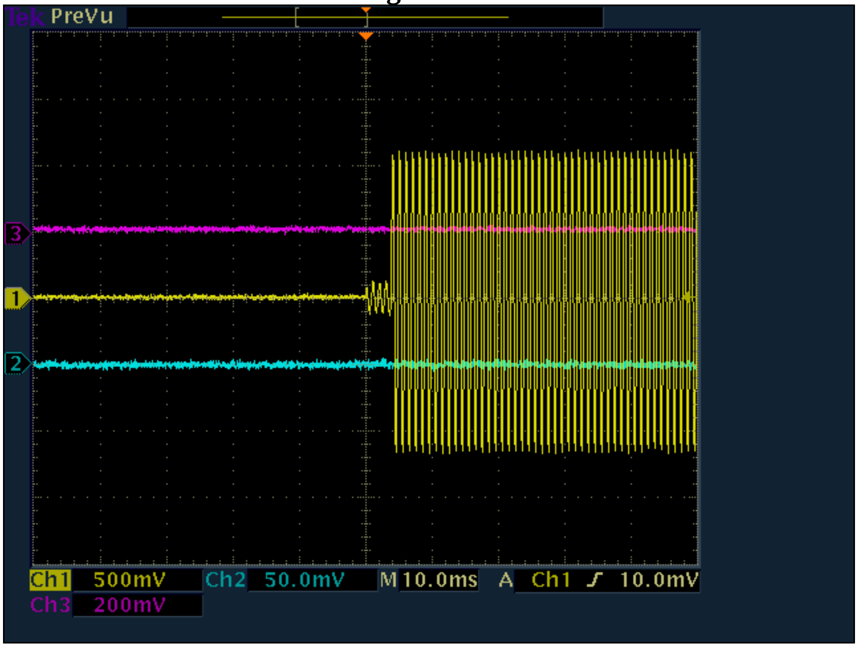
[1] on is the instant when a 1 ㎑ test signal is completely suppressed, including any capture time due to phasing.
t_1 is the time period immediately following t_{on}.
t_2 is the time period immediately following t_1.
t_3 is the time period from the instant when the transmitter is turned off until t_{off}.
t_{off} is the instant when the 1 ㎑ test signal starts to rise.
[2] During the time from the end of t_2 to the beginning of t_3, the frequency difference must not exceed the limits specified in §90.213.
[3] Difference between the actual transmitter frequency and the assigned transmitter frequency.
[4] If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time may exceed the maximum frequency difference for this period.

Test results

Switching from off to on



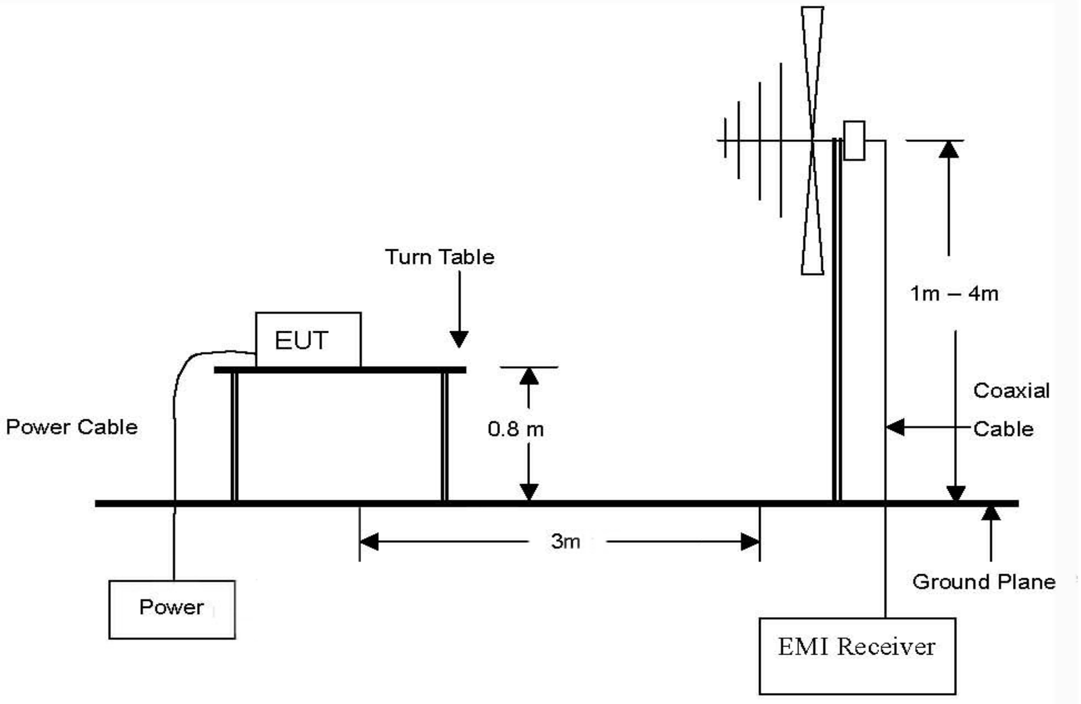
Switching from on to off



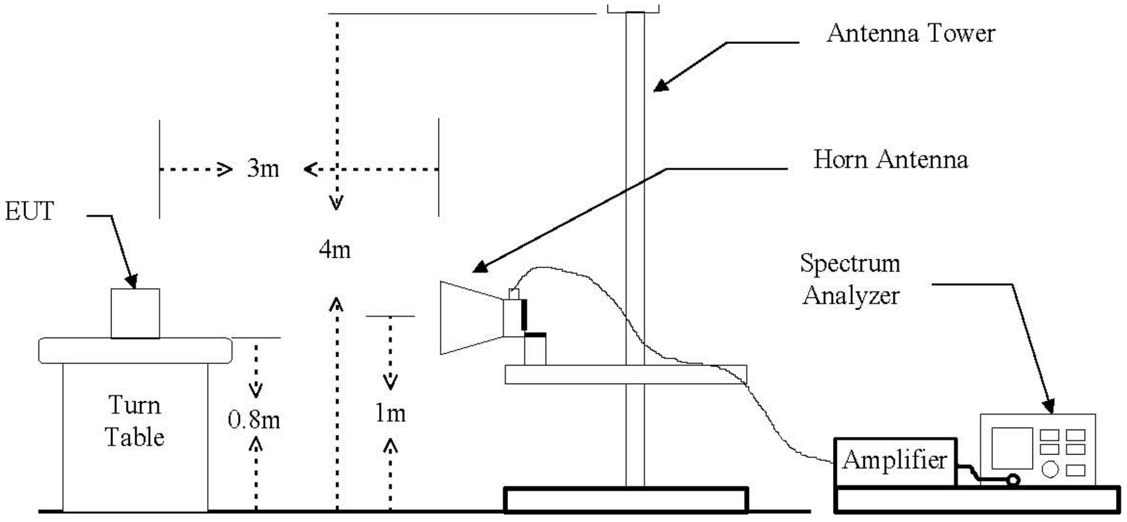
3.7 Radiation spurious emissions

Test setup

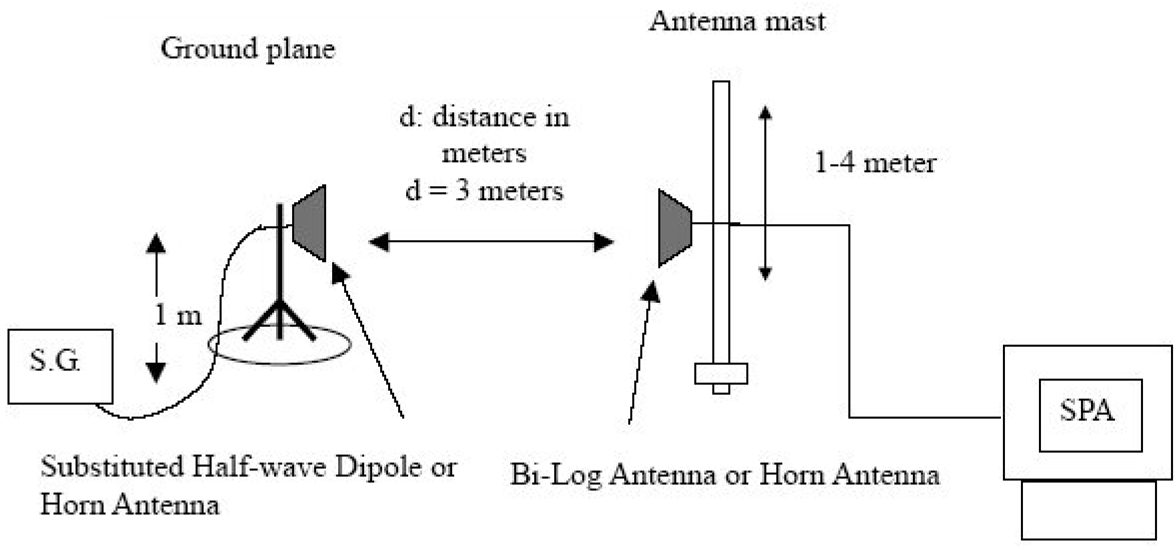
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to 5 ㎓ Emissions.



The diagram below shows the test setup for substituted method



Test procedure: Based on TIA 603E: 2016

1. On a test site, the EUT shall be placed at 80 ㎝ height on a turn table, and in the position closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3m from EUT to correspond to the fundamental frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the peak detector is used for the measurement.
4. During the measurement of the EUT, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using
   1) RBW : 100 ㎑(< 1 ㎓), 1 ㎒(> 1 ㎓).
   2) VBW : 300 ㎑(< 1 ㎓), 3 ㎒(> 1 ㎓).
5. The transmitter shall be switched on, the measuring receiver shall be tuned to the frequency of the transmitter under test.
6. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
7. The transmitter shall then the rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
8. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
9. The maximum signal level detected by the measuring receiver shall be noted.
10. The EUT was replaced by half-wave dipole(below 1 000 ㎒) or horn antenna(above 1 000 ㎒) connected to a signal generator.
11. In necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
12. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
13. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring received, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
14. The input level to the substitution antenna shall be recorded as power level in ㏈m, corrected for any change of input attenuator setting of the measuring receiver.
15. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.

Limit

According to §90.210(d), Spurious attenuated in dB = 50 + 10log(Power output in watts)

Test results (Below 1 000 ㎒)

Mode: GFSK
Distance of measurement: 3 meter
Channel: Low

Frequency (㎒)	Ant. Pol. (H/V)	E.R.P. (dBm)	E.R.P. (W)
450.0250	H	-11.64	0.000 069
450.0250	V	-24.63	0.000 003

Mode: GFSK
Distance of measurement: 3 meter
Channel: Middle

Frequency (㎒)	Ant. Pol. (H/V)	E.R.P. (dBm)	E.R.P. (W)
457.5750	H	-8.72	0.000 134
457.5750	V	-21.45	0.000 007

Mode: GFSK
Distance of measurement: 3 meter
Channel: High

Frequency (㎒)	Ant. Pol. (H/V)	E.R.P. (dBm)	E.R.P. (W)
469.9750	H	-4.39	0.000 364
469.9750	V	-17.95	0.000 016

Test results (Above 1 000 ㎒)

Mode: GFSK

Distance of measurement: 3 meter

Channel: Low

Frequency (㎒)	Ant. Pol. (H/V)	Spurious attenuation (㏈c)	Limit (㏈c)	Margin (㏈)
889.71	H	47.63	8.39	39.24
899.71	V	65.56	8.39	57.17
1 350.20	H	46.30	8.39	37.91
1 350.20	V	55.21	8.39	46.82
1 836.50	H	49.30	8.39	40.91
2 247.50	H	26.01	8.39	17.62
2 247.50	V	47.03	8.39	38.64
2 699.00	H	38.95	8.39	30.56

Note.

1. Spurious attenuation = EUT max. output power(㏈m) - absolute level
2. Spurious attenuation limit in ㏈ = 50 + 10log(power in watts)

Mode:	GFSK
Distance of measurement:	3 meter
Channel:	Middle

Frequency (㎒)	Ant. Pol. (H/V)	Spurious attenuation (dBc)	Limit (dBc)	Margin (dB)
915.34	H	48.28	11.27	37.01
915.34	V	68.57	11.27	57.30
1 373.40	H	51.83	11.27	40.56
1 373.40	V	60.07	11.27	48.80
1 830.70	H	46.65	11.27	35.38
1 830.70	V	54.53	11.27	43.26
2 288.00	H	27.16	11.27	15.89
2 288.00	V	49.59	11.27	38.32
2 745.30	H	40.01	11.27	28.74

Note.
1. Spurious attenuation = EUT max. output power(dBm) - absolute level
2. Spurious attenuation limit in dB = 50 + 10log(power in watts)

Mode:	GFSK
Distance of measurement:	3 meter
Channel:	High

Frequency (㎒)	Ant. Pol. (H/V)	Spurious attenuation (dBc)	Limit (dBm)	Margin (dB)
939.65	H	52.37	15.61	36.76
939.65	V	72.42	15.61	56.81
1 408.10	H	57.67	15.61	42.06
1 408.10	V	65.61	15.61	50.00
1 830.70	H	52.37	15.61	36.76
1 732.30	V	58.91	15.61	43.30
2 351.70	H	27.85	15.61	12.24
2 351.70	V	50.85	15.61	35.24
2 820.50	H	49.14	15.61	33.53

Note.
1. Spurious attenuation = EUT max. output power(dBm) - absolute level
2. Spurious attenuation limit in dB = 50 + 10log(power in watts)

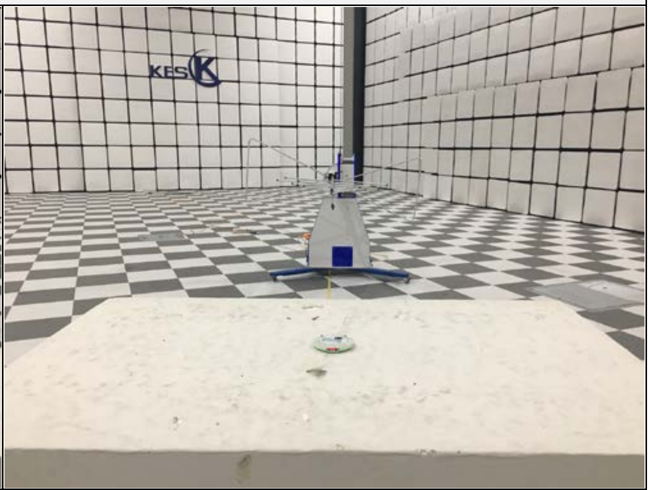
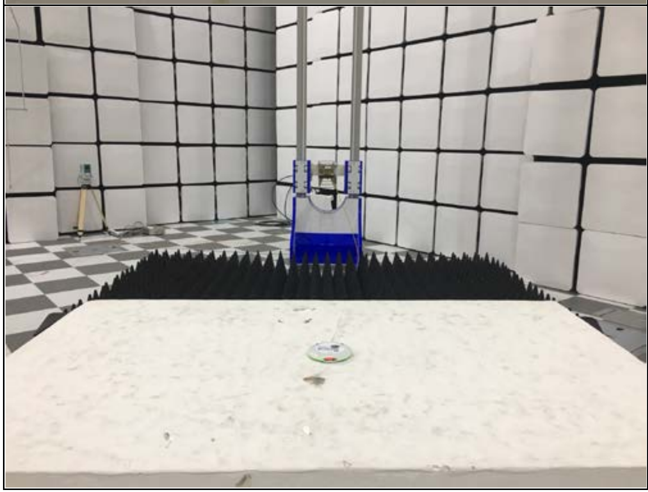
Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum Analyzer	R&S	FSV40	101002	1 year	2018.07.04
Spectrum Analyzer	R&S	FSV30	101389	1 year	2019.01.19
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2019.01.22
Power Meter	Anritsu	ML2495A	1438001	1 year	2019.01.25
Pluse Power Sensor	Anritsu	MA2411B	1339205	1 year	2019.01.25
Loop antenna	SCHWARZBECK	FMZB1513	225	2 years	2019.05.10
Trilog-broadband antenna	SCHWARZBECK	VULB 9163	9168-714	2 years	2018.11.28
Dipole antenna	SCHWARZBECK	VHA9103	3093	2 years	2019.05.19
Dipole antenna	SCHWARZBECK	UHA9105	2703	2 years	2019.05.19
Dipole antenna	SCHWARZBECK	VHA9103	3101	2 years	2019.05.19
Dipole antenna	SCHWARZBECK	UHA9105	2702	2 years	2019.05.19
Horn Antenna	A.H	SAS-571	414	2 years	2019.02.15
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170550	2 years	2019.02.15
Preamplifier	AGILENT	8449B	3008A01729	1 year	2018.05.31
Broadband Amplifier	SCHWARZBECK	BBV-9721	PS9721-003	1 year	2019.01.23
High Pass Filter	Mini-Circuits	NHP-800+	15542	1 year	2018.07.03
Attenuator	Agilent	8493C	82506	1 year	2019.01.22
EMI Test Receiver	R&S	ESR3	101781	1 year	2018.04.27
EMI Test Receiver	R&S	ESU26	100552	1 year	2018.04.19
Temperature & Humidity Chamber	Daehan Engineering	DH-1000	DH1000060628	1 year	2019.01.19
DC Power Supply	HP	6632B	MY43004130	1 year	2018.07.03
4Port Junction Pad	Anritsu	MA1612A	M14368	1 year	2018.07.08
Oscilloscope	Tektronix	TDS3014B	B014381	1 year	2018.09.20

Peripheral devices

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

Appendix B. Test setup photos

Radiated	
	
	Blank