



KES Co., Ltd.
C-3701, Simin-daero 365-401,
Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Test report No.:
KES-RF-15T0041
Page (1) of (31)

TEST REPORT

Part 90

Equipment under test Restroom Valet

Model name RESTTX

FCC ID WDC-RESTTX

Applicant HME Wireless, Inc.

Manufacturer Lee Technology Korea Co., Ltd.

Date of test(s) 2015.04.16 ~ 2015.04.22

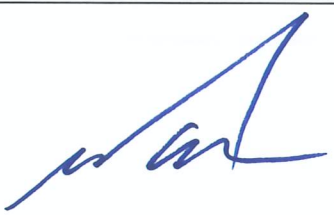
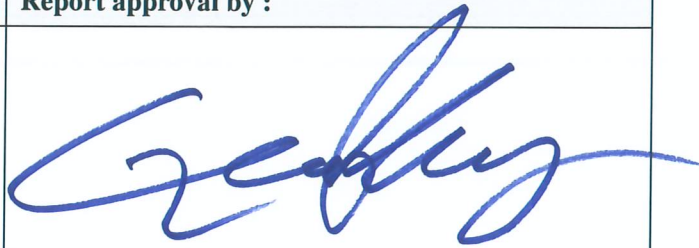
Date of issue 2015.05.08

Issued to

HME Wireless, Inc.
1400 Northbrook Parkway Suite 320
Suwanee GA 30024

Issued by

KES Co., Ltd.
C-3701, Simin-daero 365-40, Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
473-29, 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 :
	
Kwang-yeol Choo Test engineer	Jeff Do Technical manager

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.



Revision history

Revision	Date of issue	Test report No.	Description
-	2015.05.08	KES-RF-15T0041	Initial



TABLE OF CONTENTS

1.	General information	4
1.1.	EUT description	4
1.2.	Test frequency	4
1.3.	Information about derivative model	4
1.4.	Device modifications	4
2.	Summary of tests	5
3.	Test results	6
3.1	RF output power	6
3.2	Bandwidth limitation	9
3.3	Emission mask	11
3.4	Conducted spurious emissions	14
3.5	Frequency stability	17
3.6	Transient frequency behavior of the transmitter	21
3.7	Radiation spurious emissions	24
Appendix A.	Test equipment used for test	30
Appendix B.	Test setup photo	31



1. General information

Applicant HME Wireless, Inc.
Applicant address 1400 Northbrook Parkway Suite 320 Suwanee GA 30024
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, Yeosu-si, Gyeonggi-do, Korea
Rule part(s) Part 90
Test device serial No. ☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test Restroom Valet
Frequency range 450.025 MHz ~ 469.975 MHz
Model: RESTTX
Type of emission 10K2F1D
Channel separation 12.5 kHz
Rated power 0.04 W
Antenna specification Helical antenna(-18.55 dBi)
Power source 3.6 V dc // Lithium battery(Size AA, 2ea)

1.2. Test frequency

	Low channel	Middle channel	High channel
Frequency (MHz)	450.025	457.575	469.975

1.3. Information about derivative model

N/A

1.4. Device modifications

N/A



2. Summary of tests

Reference	Parameter	Test results
90.205	RF output power	Pass
90.209	Bandwidth limitation	Pass
90.210(d)	Emission mask	Pass
90.210(d)	Conducted spurious emissions	Pass
90.213	Frequency stability	Pass
90.214	Transient frequency behavior	Pass
90.210(d)	Radiated spurious emissions	Pass

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

3. Test results

3.1 RF output power

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

Limit

According to FCC 90.205(h) 450 ~ 470 MHz. (1) The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. Applicants requesting an ERP in excess of that listed in table 2 must submit an engineering analysis based upon generally accepted engineering practices and standards that 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 MHz—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

¹Maximum ERP indicated provides for a 39 dBu signal strength at the edge of the service area per FCC Report R-6602, Fig. 29 (See §73.699, Fig. 10 b).

²Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 39 dBu.

- ³When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation: $ERP_{allow} = ERP_{max} \times (HAAT_{ref}/HAAT_{actual})^2$.
- ⁴Applications 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 dBu.



KES Co., Ltd.

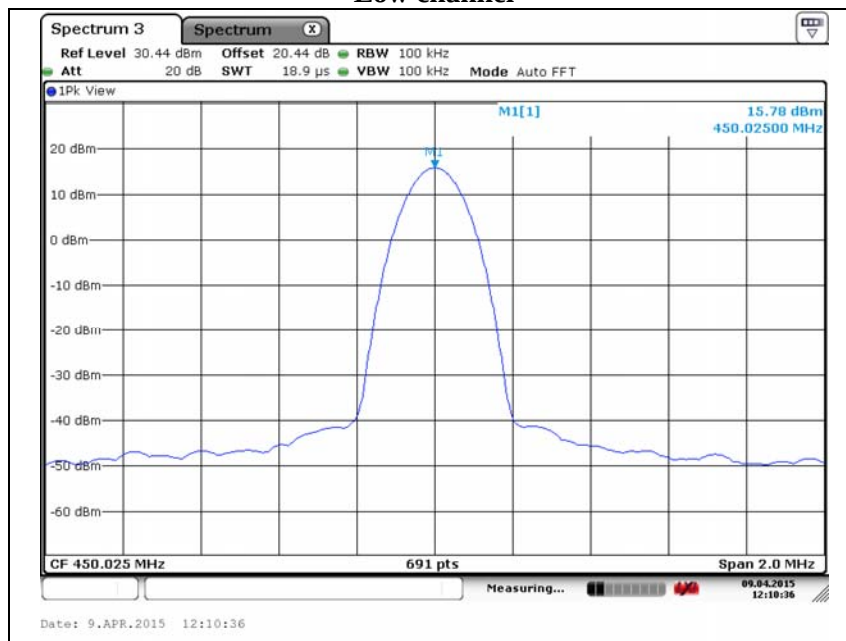
C-3701, Simin-daero 365-401,
Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Test report No.:
KES-RF-15T0041
Page (7) of (31)

Test results

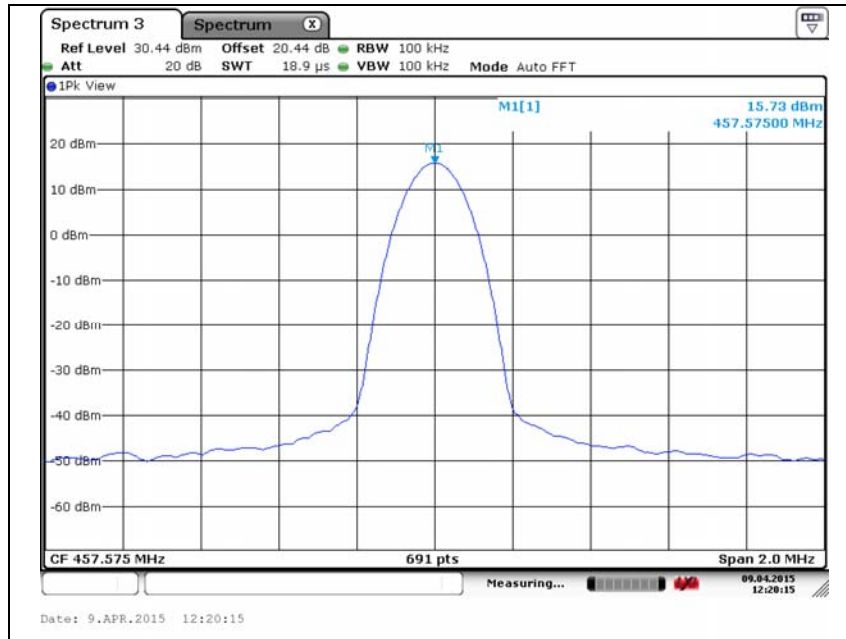
Frequency (MHz)	Output power(dBm)	Output power(W)	Rated power(dBm)
450.025	15.78	0.04	16
457.575	15.73	0.04	
469.975	15.51	0.04	

Low channel

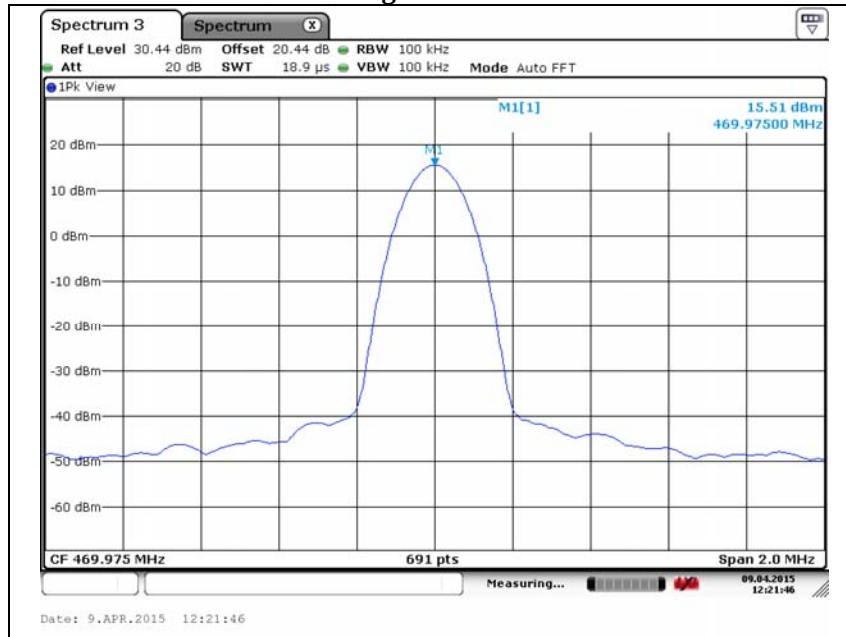


This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

Middle channel



High channel



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

3.2 Bandwidth limitation

Test setup



Test procedure

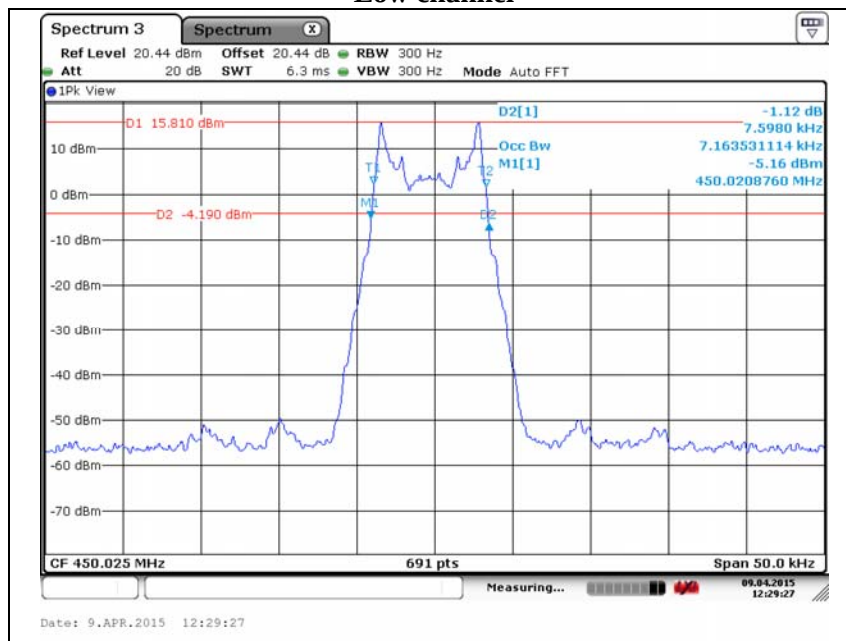
1. The transmitter output was connected to the spectrum analyzer through an attenuator
2. Use the following spectrum analyzer setting
Span = 50 kHz
RBW = 300 Hz
VBW = 300 Hz ($\geq$ RBW)
Sweep = auto
Detector function = peak
Trace = max hold
3. Mark the peak frequency and -20 dB(Upper and lower) frequency.

Limit

N/A

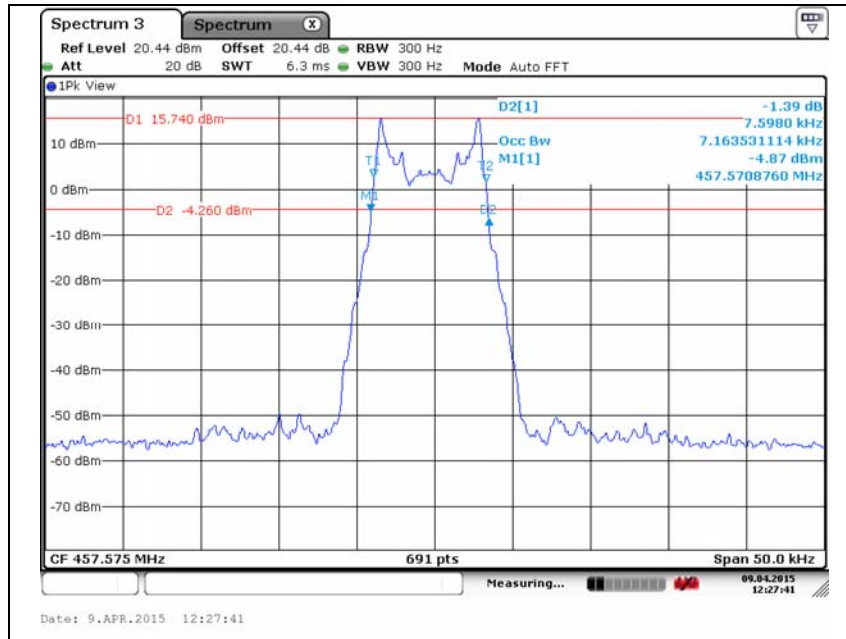
Test results

Low channel

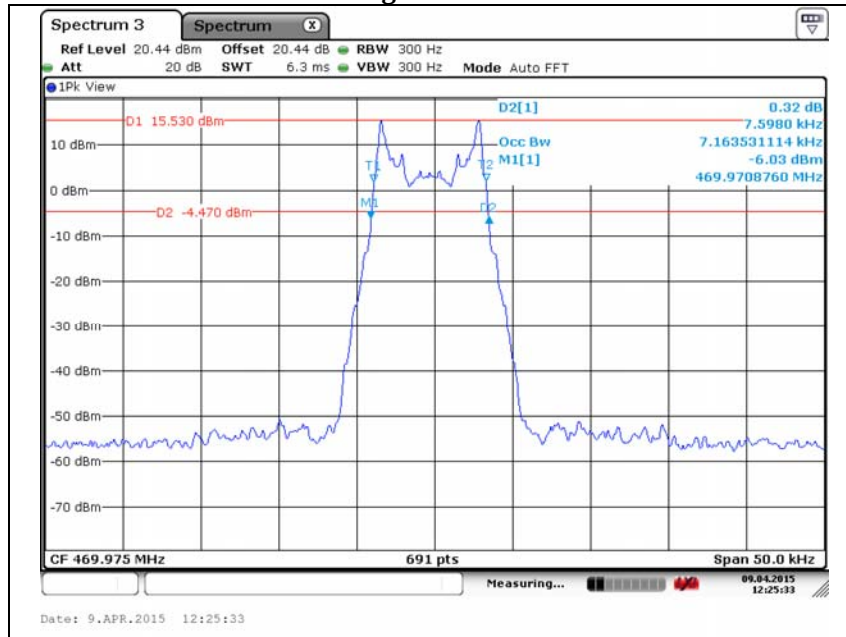




Middle channel



High channel



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

3.3 Emission mask

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 = 120 kHz
RBW = 100 Hz
VBW = 100 Hz ($\geq$ 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.

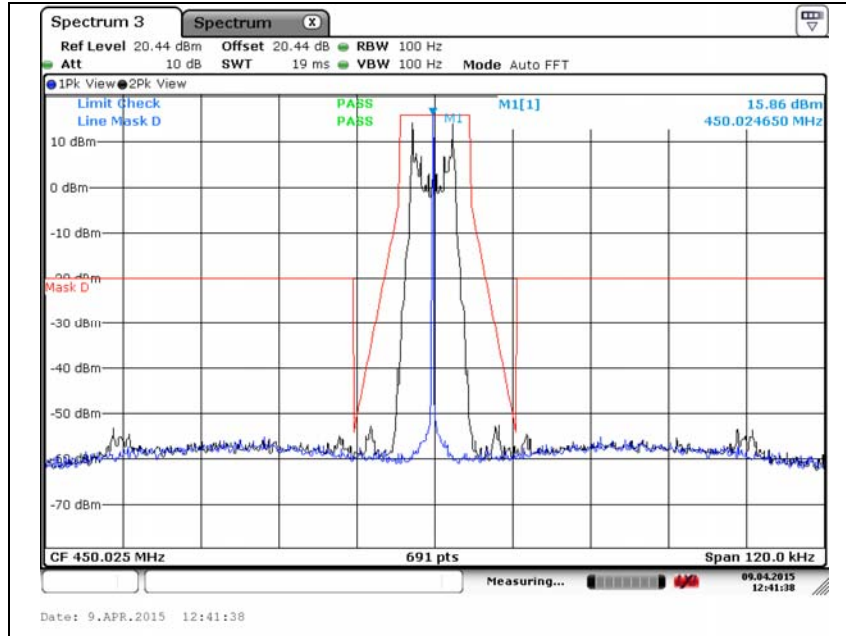
Limit

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

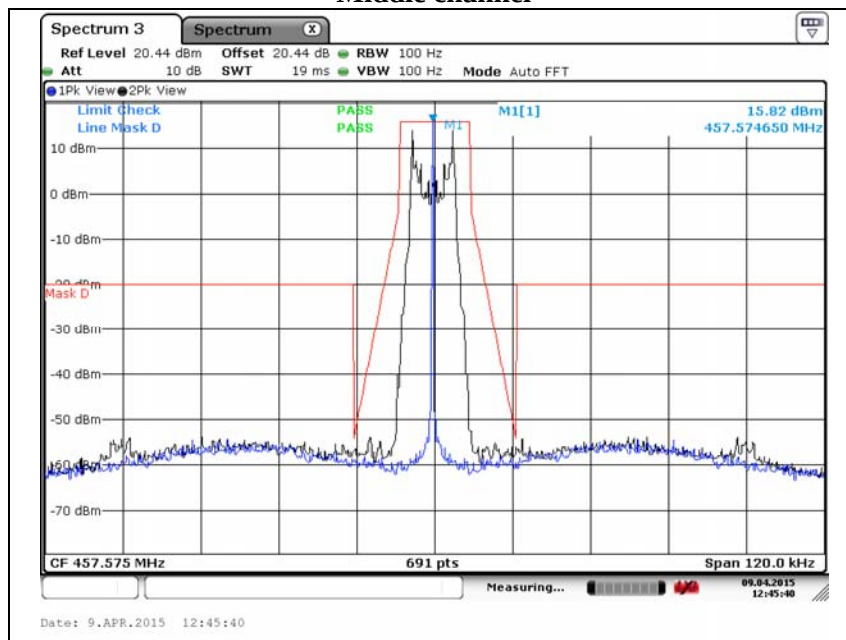
- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0 : Zero dB.
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz, but no more than 12.5 kHz: At least 7.27 ($f_d -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

Test results

Low channel



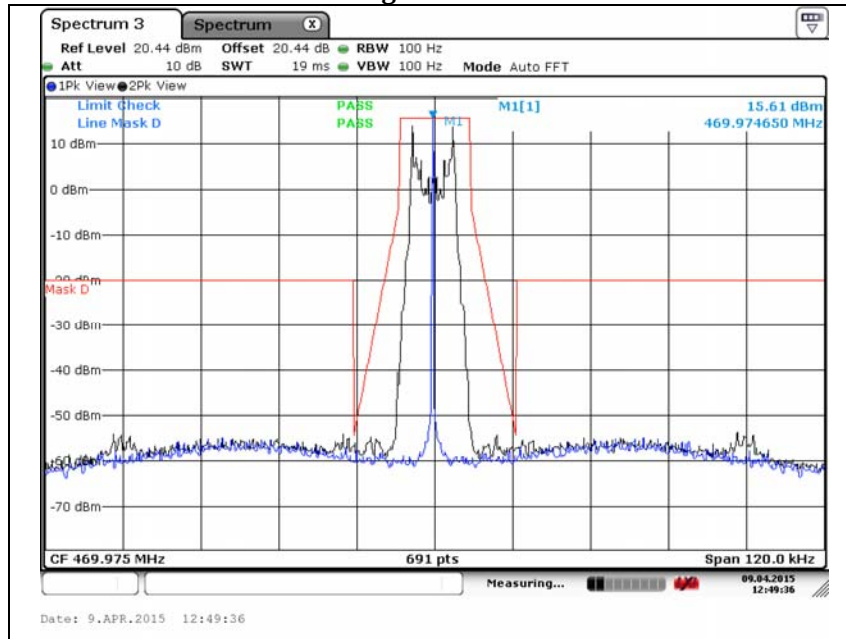
Middle channel



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.



High channel



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

3.4 Conducted spurious emissions

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 = 30 MHz to 5 GHz
 - RBW = 100 kHz
 - VBW = 100 kHz ($\geq$ RBW)
 - Sweep = auto
 - Detector function = peak
 - Trace = max hold

Limit

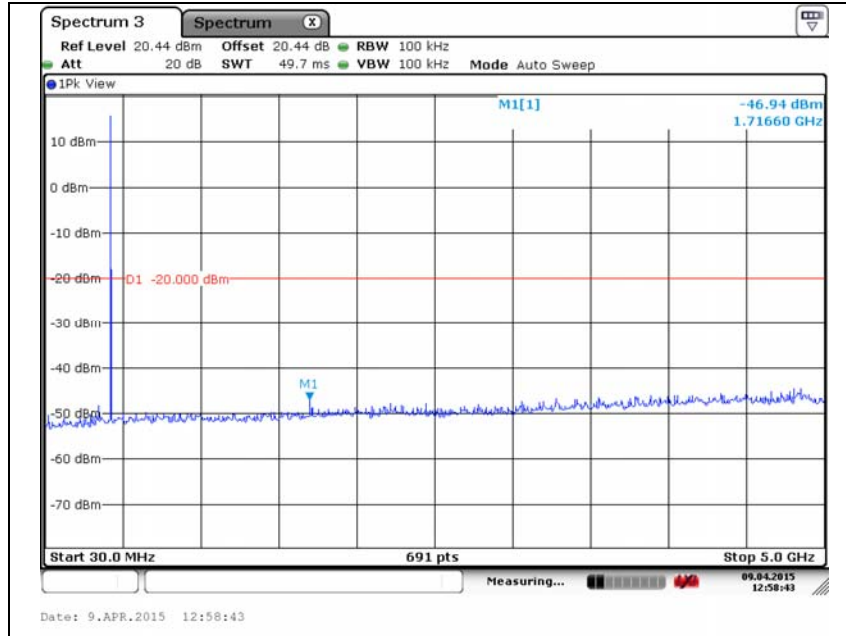
According to FCC part 90.210(d) Emission Mask D – 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power(P) of the highest emission contained within the authorized bandwidth as follows:

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

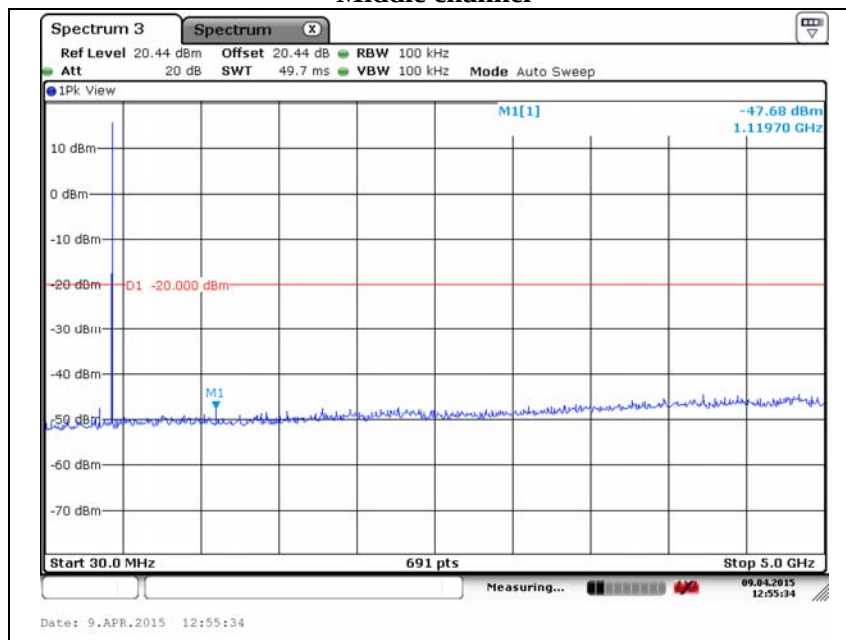


Test results

Low channel



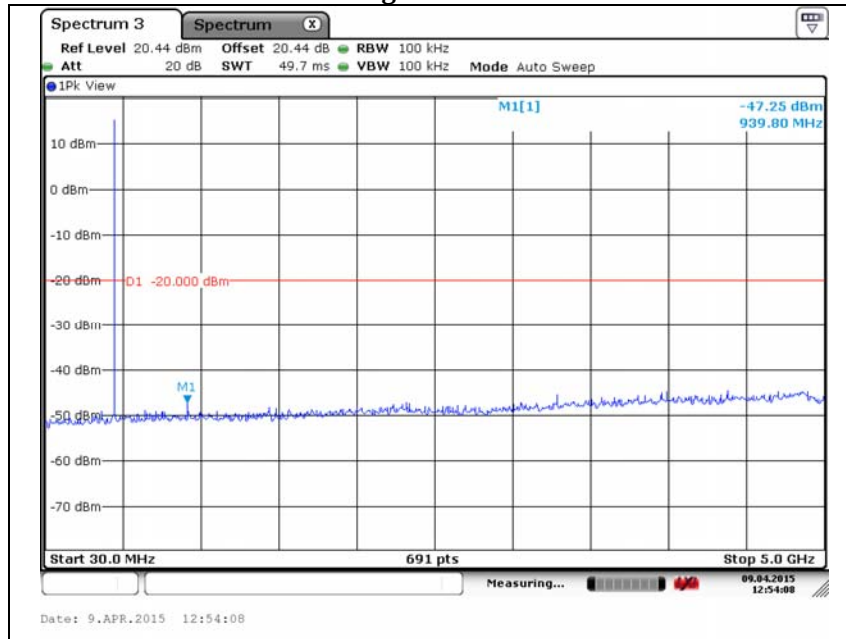
Middle channel



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.



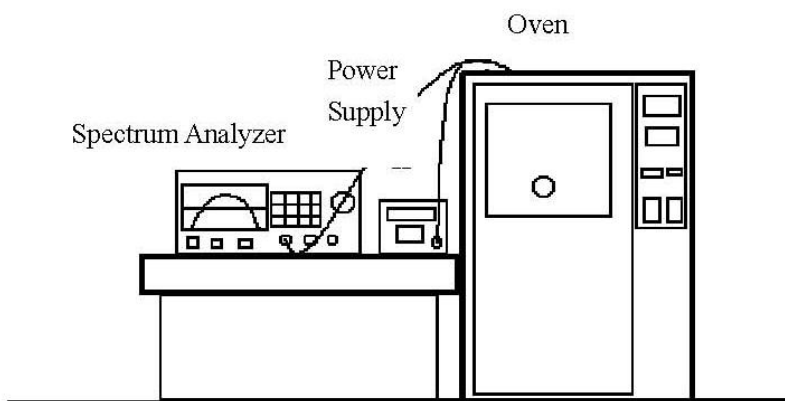
High channel



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

3.5 Frequency stability

Test setup



Test procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The transmission time was measured with the spectrum analyzer using RBW=1 kHz, VBW=1 kHz.
3. Set the temperature of chamber to -30 °C. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10 °C decreased per stage until the highest temperature 50 °C is measured, record all measured frequencies on each temperature step.

Limit

1. According to FCC part 2 section 2.1055(a)(1), the frequency stability shall be measured with variation of ambient temperature from -30 °C to +50 °C centigrade.
2. According to FCC part section 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 FCC part 90 section 90.213, (a) Unless noted elsewhere, transmitters used in the services overned by this part must have a minimum frequency stability as specified in the following table.

Minimum Frequency Stability [Parts per million (ppm)]

Frequency range (MHz)	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			

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

-
- ¹Fixed 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.
- ²For single sideband operations below 25 MHz, the carrier frequency must be maintained within 50 Hz of the authorized carrier frequency.
- ³Travelers information station transmitters operating from 530 ~ 1 700 kHz 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 Hz of the authorized frequency.
- ⁴Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
- ⁵In the 150 ~ 174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.
- ⁶In the 150 ~ 174 MHz band, mobile stations designed to operate with a 12.5 kHz 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 kHz channel bandwidth must have a frequency stability of 2.0 ppm.
- ⁷In the 421 ~ 512 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 1.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 0.5 ppm.
- ⁸In the 421 ~ 512 MHz band, mobile stations designed to operate with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Mobile stations designed to operate with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.
- ⁹Fixed stations with output powers above 120 watts and necessary bandwidth less than 3 kHz 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.
- ¹⁰Except for DSRCS equipment in the 5 850 ~ 5 925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5 850 ~ 5 925 MHz band is specified in subpart M of this part.
- ¹¹Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150 ~ 174 MHz band and 2.5 ppm in the 421 ~ 512 MHz band.
- ¹²Mobile units may utilize synchronizing signals from associated base stations to achieve the specified carrier stability.
- ¹³Fixed non-multilateration transmitters with an authorized bandwidth that is more than 40 kHz from the band edge, intermittently operated hand-held readers, and mobile transponders are not subject to frequency tolerance restrictions.
- ¹⁴Control 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

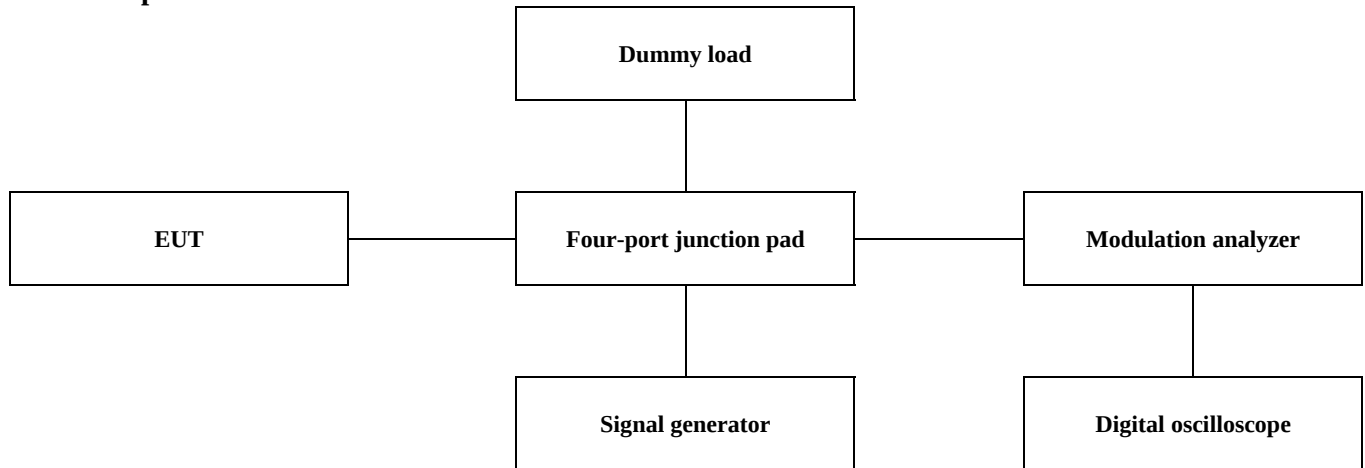
Assigned frequency (MHz): 450.025

Test voltage (%)	Test voltage (V)	Temperature (°C)	Measure frequency (MHz)	Frequency deviation (Hz)	Frequency deviation (ppm)	Limit (ppm)
100 %	3.6	-30	450.024 605	-395	-0.88	2.5
		-20	450.024 610	-390	-0.87	
		-10	450.024 622	-378	-0.84	
		0	450.024 640	-360	-0.80	
		10	450.024 651	-349	-0.78	
		20	450.024 667	-333	-0.74	
		30	450.024 675	-325	-0.72	
		40	450.024 679	-321	-0.71	
		50	450.024 684	-316	-0.70	
115 %	4.14	20	450.024 652	-348	-0.77	2.5
Battery end point	2.0	20	450.024 681	-319	-0.71	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

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 kHz tone at ± 12.5 kHz deviation and set its output level to -15 dBm.
2. Key the transmitter.
3. Supply sufficient attenuation via the RF attenuator to provide an input level to the test receiver that is 40 dB 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 Hz tone. Adjust the vertical amplitude control of the oscilloscope to display the 1 000 Hz 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 kHz 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 t_1 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 kHz.
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 kHz 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 t_3 . See the figures in the appropriate standards section.

Limit

According to FCC 90.214, Transmitters designed to operate in the 150 ~ 174 MHz and 421 ~ 512 MHz 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 MHz	421 to 512 MHz
Transient frequency behaviour for equipment designed to operate on 25 kHz channel			
t1 ⁴ -----	±25.0 kHz	5.0 ms	10.0 ms
t2 -----	±12.5 kHz	20.0 ms	25.0 ms
t3 ⁴ -----	±25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channel			
t1 ⁴ -----	±12.5 kHz	5.0 ms	10.0 ms
t2 -----	±6.25 kHz	20.0 ms	25.0 ms
t3 ⁴ -----	±12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 6.25 kHz Channel			
t1 ⁴ -----	±6.25 kHz	5.0 ms	10.0 ms
t2 -----	±3.125 kHz	20.0 ms	25.0 ms
t3 ⁴ -----	±6.25 kHz	5.0 ms	10.0 ms

¹ t_{on} is the instant when a 1 kHz 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 kHz test signal starts to rise.

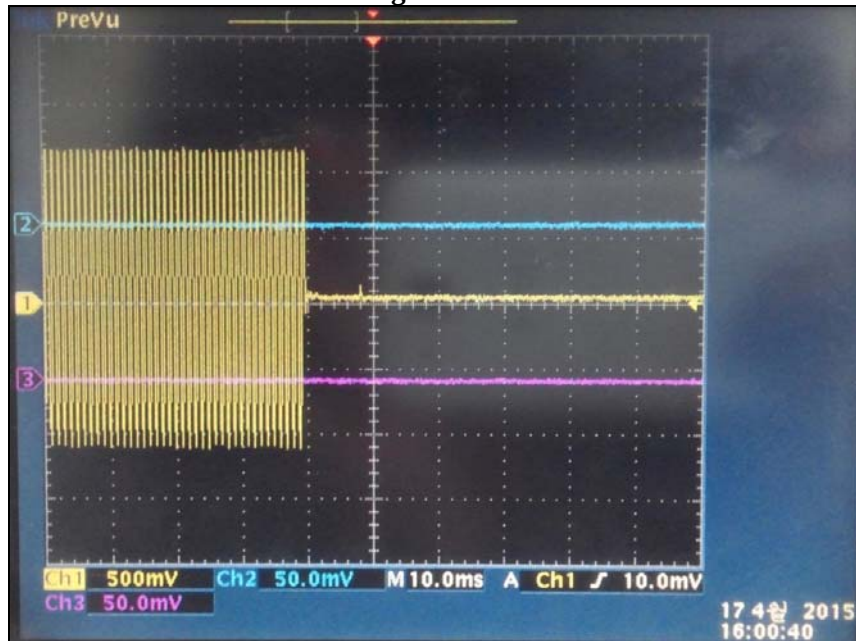
² During the time from the end of t_2 to the beginning of t_3 , the frequency difference must not exceed the limits specified in §90.213.

³ Difference between the actual transmitter frequency and the assigned transmitter frequency.

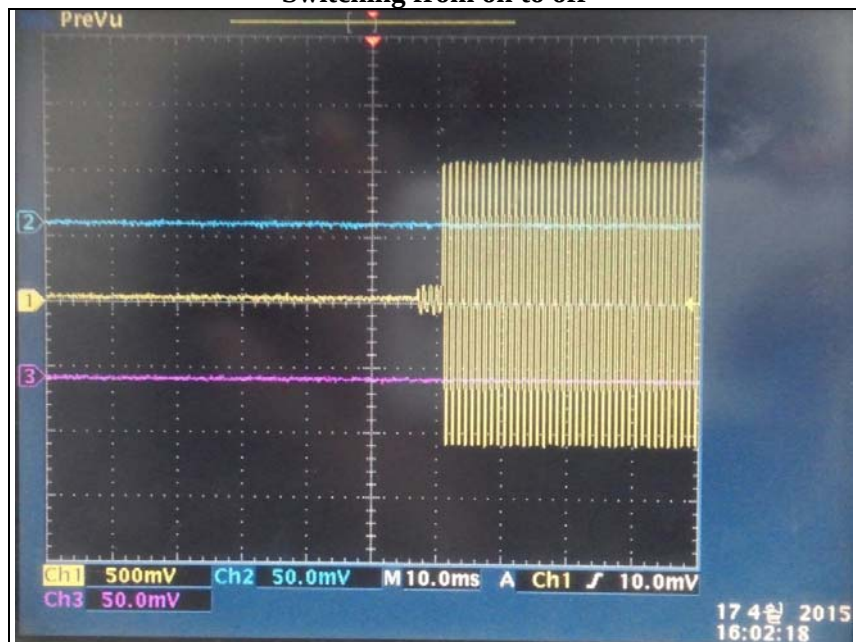
⁴ If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time may exceed the maximum frequency difference for this period.

Test results

Switching from off to on



Switching from on to off

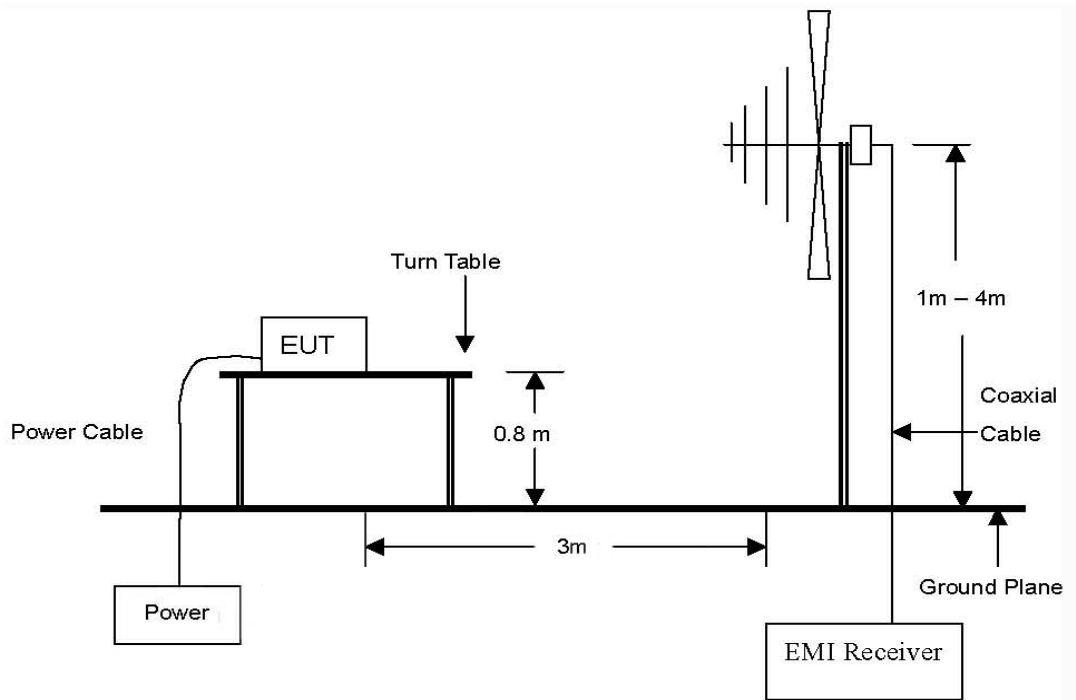


This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.

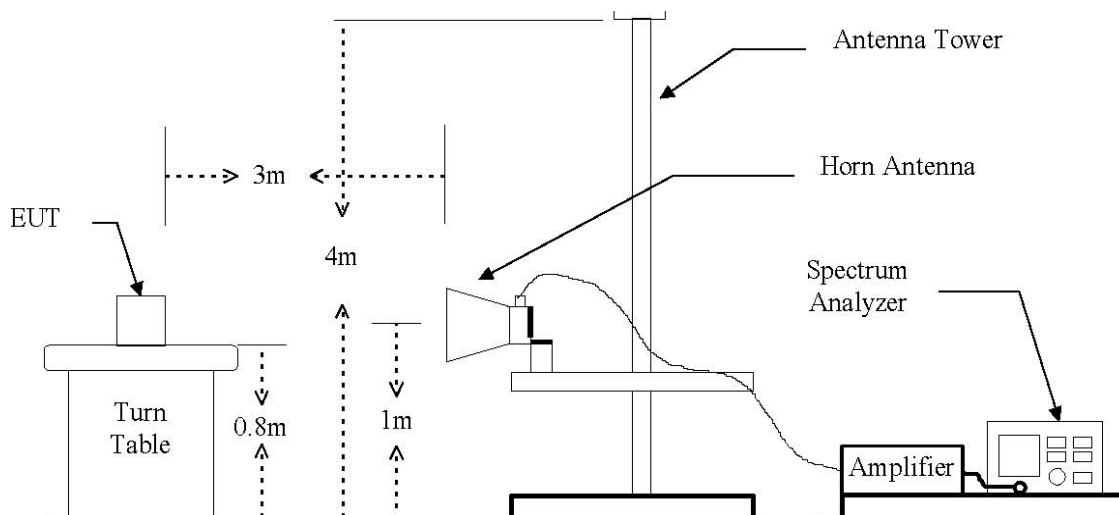
3.7 Radiation spurious emissions

Test setup

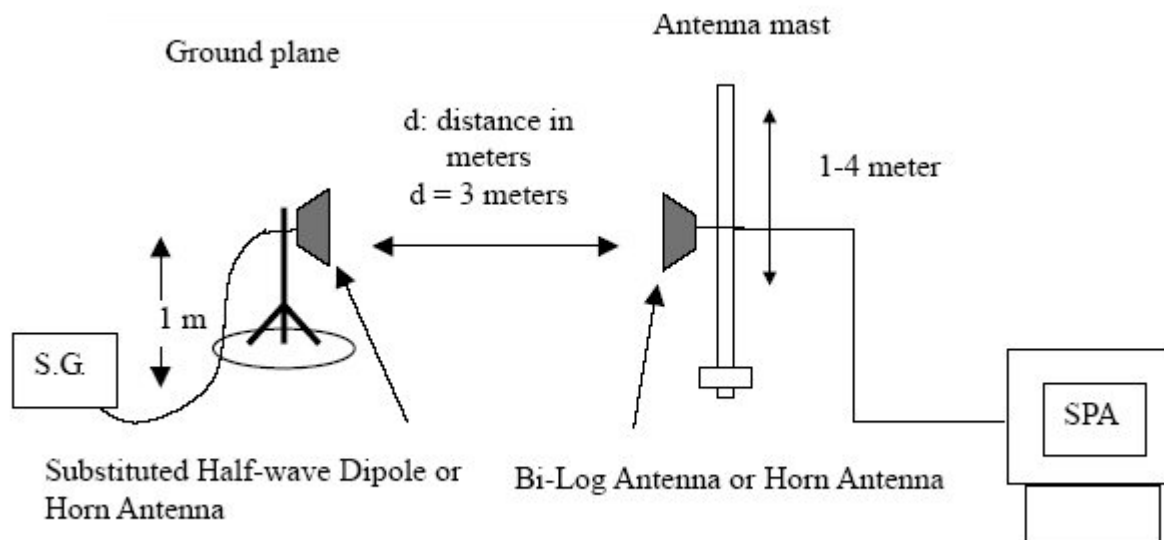
The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



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



The diagram below shows the test setup for substituted method



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The test results in the report only apply to the tested sample.

Test procedure: Based on ANSI/TIA 603C: 2004

1. On a test site, the EUT shall be placed at 80 cm 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 kHz(< 1 GHz), 1 MHz(> 1 GHz).
 - 2) VBW : 100 kHz(< 1 GHz), 1 MHz(> 1 GHz).
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 be 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 MHz) or horn antenna(above 1 000 MHz) 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 receiver, 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 dBm, 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

Measurement Condition

Ambient temperature : 18 °C

Relative humidity : 36 % R.H.

Fundamental output power

Frequency (MHz)	Ant. Pol.(H/V)	Output power(dBm)	Output power(W)
450.025	H	-1.07	0.000 782
	V	-6.13	0.000 244
457.575	H	-5.11	0.000 308
	V	-5.80	0.000 263
469.975	H	1.00	0.001 259
	V	1.36	0.001 368

Low channel

Frequency (MHz)	Ant. Pol. (H/V)	S.G. Level (dBm)	Correction factor (dB)	Absolute level (dBm)	Spurious attenuation (dBc)	Limit (dBc)	Margin (dB)
900.050	H	-66.00	3.02	-62.98	61.91	18.93	42.98
900.050	V	-59.00	3.13	-55.87	54.80	18.93	35.87
1350.075	H	-48.00	1.30	-46.70	45.63	18.93	26.70
1350.075	V	-53.00	1.19	-51.81	50.74	18.93	31.81
2250.125	H	-51.00	1.30	-49.70	48.63	18.93	29.70
2250.125	V	-54.00	1.00	-53.00	51.93	18.93	33.00
2700.150	H	-57.00	2.30	-54.70	53.63	18.93	34.70
2700.150	V	-61.00	1.36	-59.64	58.57	18.93	39.64
3150.175	H	-46.00	3.07	-42.93	41.86	18.93	22.93
3150.175	V	-43.00	2.68	-40.32	39.25	18.93	20.32
3600.200	H	-46.00	3.90	-42.10	41.03	18.93	22.10
3600.200	V	-42.00	4.47	-37.53	36.46	18.93	17.53
4050.225	H	-42.00	5.00	-37.00	35.93	18.93	17.00
4050.225	V	-40.00	4.51	-35.49	34.42	18.93	15.49
4500.250	H	-54.00	4.61	-49.39	48.32	18.93	29.39
4500.250	V	-51.00	4.63	-46.37	45.30	18.93	26.37

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.



Middle channel

Frequency (MHz)	Ant. Pol. (H/V)	S.G. Level (dBm)	Correction factor (dB)	Absolute level (dBm)	Spurious attenuation (dBc)	Limit (dBc)	Margin (dB)
915.150	H	-63.00	3.47	-59.53	54.42	14.89	39.53
915.150	V	-56.00	2.94	-53.06	47.95	14.89	33.06
1372.725	H	-46.00	1.00	-45.00	39.89	14.89	25.00
1372.725	V	-52.00	0.95	-51.05	45.94	14.89	31.05
2287.875	H	-51.00	1.17	-49.83	44.72	14.89	29.83
2287.875	V	-55.00	0.92	-54.08	48.97	14.89	34.08
2745.450	H	-55.00	1.86	-53.14	48.03	14.89	33.14
2745.450	V	-61.00	1.97	-59.03	53.92	14.89	39.03
3203.025	H	-45.00	2.94	-42.06	36.95	14.89	22.06
3203.025	V	-43.00	3.79	-39.21	34.10	14.89	19.21
3660.600	H	-47.00	3.65	-43.35	38.24	14.89	23.35
3660.600	V	-43.00	3.35	-39.65	34.54	14.89	19.65
4118.175	H	-44.00	4.45	-39.55	34.44	14.89	19.55
4118.175	V	-43.00	4.06	-38.94	33.83	14.89	18.94
4575.750	H	-54.00	4.27	-49.73	44.62	14.89	29.73
4575.750	V	-50.00	4.28	-45.72	40.61	14.89	25.72

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.



High channel

Frequency (MHz)	Ant. Pol. (H/V)	S.G. Level (dBm)	Correction factor (dB)	Absolute level (dBm)	Spurious attenuation (dBc)	Limit (dBc)	Margin (dB)
939.950	H	-51.00	6.23	-44.77	46.13	21.36	24.77
939.950	V	-45.00	5.47	-39.53	40.89	21.36	19.53
1409.925	H	-52.00	4.65	-47.35	48.71	21.36	27.35
1409.925	V	-57.00	4.84	-52.16	53.52	21.36	32.16
1879.900	H	-58.00	4.07	-53.93	55.29	21.36	33.93
1879.900	V	-65.00	4.42	-60.58	61.94	21.36	40.58
2349.875	H	-45.00	4.89	-40.11	41.47	21.36	20.11
2349.875	V	-52.00	4.58	-47.42	48.78	21.36	27.42
2819.850	H	-48.00	5.52	-42.48	43.84	21.36	22.48
2819.850	V	-55.00	5.63	-49.37	50.73	21.36	29.37
3289.825	H	-43.00	8.13	-34.87	36.23	21.36	14.87
3289.825	V	-39.00	7.86	-31.14	32.50	21.36	11.14
3759.800	H	-52.00	7.91	-44.09	45.45	21.36	24.09
3759.800	V	-50.00	8.59	-41.41	42.77	21.36	21.41
4229.775	H	-45.00	9.41	-35.59	36.95	21.36	15.59
4229.775	V	-45.00	8.53	-36.47	37.83	21.36	16.47
4699.750	H	-59.00	8.60	-50.40	51.76	21.36	30.40
4699.750	V	-56.00	8.81	-47.19	48.55	21.36	27.19

※Remark;

1. Correction factor: Substitution antenna gain - Tx cable loss
2. E.R.P. or E.I.R.P = S.G. Level + correction factor



Appendix A. Test equipment used for test

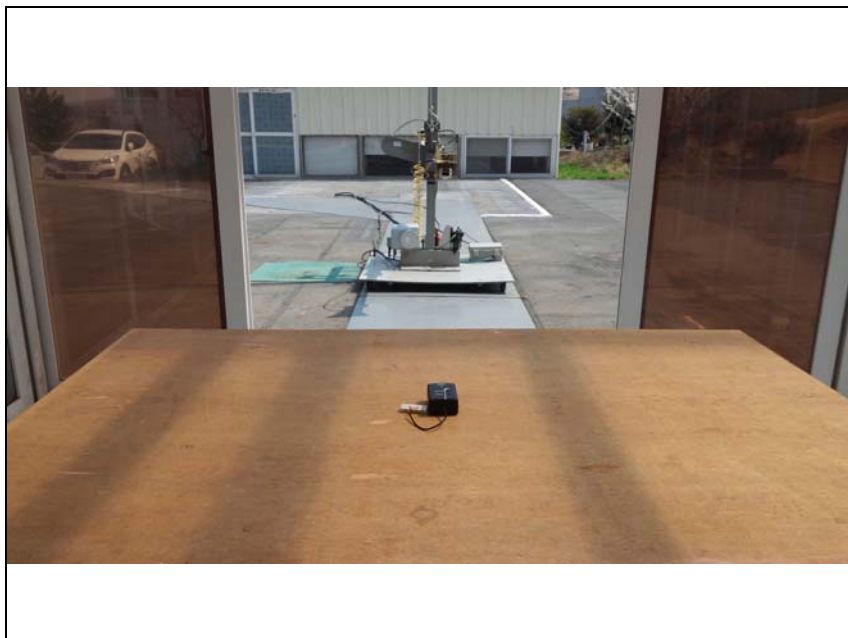
Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum analyzer	R&S	FSV30	101389	1 year	2016.01.22
Vector signal generator	R&S	SMBV100A	1407.6004K02	1 year	2015.07.24
Preamplifier	HP	8447F	2805A02570	1 year	2016.01.23
Preamplifier	HP	8449B	3008A00538	1 year	2015.07.23
Preamplifier	Schwarzbeck	BBV 9721	9721-003	1 year	2015.09.04
Attenuator	HP	8495B	110504721	1 year	2016.01.22
Trilog-broadband antenna	Schwarzbeck	VULB 9168	9168-385	2 years	2015.05.09
Horn antenna	A.H.	SAS-571	414	2 years	2017.02.09
Horn antenna	ETS-LINDGREN	3117	00135889	2 years	2016.07.24
Dipole antenna	R&S	VHAP	574	2 years	2015.05.09
Dipole antenna	R&S	VHAP	575	2 years	2015.05.09
Dipole antenna	R&S	UHAP	545	2 years	2015.05.09
Dipole antenna	R&S	UHAP	546	2 years	2015.05.09
High pass filter	Mini-circuits	NHP-800+	15542	1 year	2015.07.23
High pass filter	Weinschel	WHKX1.2/15G-6TT	1	1 year	2015.07.23
Oscilloscope	Tektronix	TDS3014B	B014381	1 year	2015.09.26
Four-port junction pad	ANRITSU	6502	MA1612A	1 year	2015.07.23
DC power supply	HP	6813A	3729A00754	1 year	2016.01.22

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
N/A			

Appendix B. Test setup photo

Radiated field emissions



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The test results in the report only apply to the tested sample.