TEST REPORT

of

FCC Part 90 Subpart K, RSS-119 Issue 11
FCC ID / IC Certification: WDC-IQBASE-N / 7752A-IQBASEN

Equipment Under Test	:	IQ TRANSMITTER
Model Name	:	IQBASE-N
Serial No.	:	N/A
Applicant	:	HME Wireless, Inc.
Manufacturer	:	LEETEK
Date of Test(s)	:	2012.07.10 ~ 2012.08.23
Date of Issue	:	2012.09.03

In the configuration tested, the EUT complied with the standards specified above.

Tested By: Logan Lee **Date** **2012.09.03**

Approved By Feel Jeong **Date** **2012.09.03**

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1. General information

1.1. Testing laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)
- 705, Dongchun-Dong Sooji-Gu, Yongin-Shi, Kyungki-Do, South Korea.
- Wireless Div. 3FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx.

Telephone : +82 31 428 5700
FAX : +82 31 427 2371

1.2. Details of applicant

Applicant : HME Wireless, Inc.
Address : 1400 Northbrook Parkway Suite 320 Suwanee GA30024, USA
Contact Person : Sal Veni
Phone No. : +1 770-925-8630

1.3. Description of EUT

Kind of Product	IQ TRANSMITTER
Model Name	IQBASE-N
Serial Number	N/A
Power Supply	AC 100 V ~ AC 240 V
Rated Power	32 ㏈m
Frequency Range	450.025 ㎒ – 469.975 ㎒
Modulation Type	GFSK
Number of Channels	9
Channel spacing	12.5 ㎑
Antenna type and Gain	Type: External connector type(BNC) / Gain: -2.61 ㏈i

1.4. Type of Emission

According to 90.207(e), for non-voice paging operations, only A1A, A1D, A2B, A2D, F1B F1D, F2B, F2D, G1B, G1D, G2B or G2D emissions will be authorized.

Type of Emission: 11K2F1D
Bn =2M +2DK
M = 1200 bits per second
D = 5 ㎑ (Peak Deviation)
K = 1
Bn = 2(1200bps/2) + 2(5000) = 11.2k

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1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Internal	Cal Due.
Signal Generator	Agilent	8648D	3847M00534	Mar. 29, 2012	Annual	Mar. 29, 2013
Signal Generator	R&S	SMR40	100272	Mar. 29, 2012	Annual	Mar. 29, 2013
Spectrum Analyzer	R&S	FSV30	100768	Mar. 29, 2012	Annual	Mar. 29, 2013
Modulation Analyzer	H.P.	8901B	3226A04314	Jul. 20, 2012	Annual	Jul. 20, 2013
Power Sensor	R&S	NRP-Z81	100669	Apr.03, 2012	Annual	Apr. 03, 2013
Four Port Junction Pad	Anritsu	MA1612A	6200311239	Mar. 30, 2013	Annual	Mar. 30, 2013
Power Divider	Weinschel	1575	1537	Jul. 12, 2012	Annual	Jul. 12, 2013
Oscilloscope	Tektronix	DPO 3014	C020192	Apr. 25, 2012	Annual	Apr. 25, 2013
Attenuator	Mini-Circuits	BW-N20W5+	0950-1	Mar. 30, 2012	Annual	Mar. 30, 2013
AC power Supply	KIKUSUI	PCR500M	QC002962	Jan. 04, 2012	Annual	Jan. 04, 2013
Temperature Chamber	Hangil Technics	HGTP-4050	HGTP-4050-04-01	Aug. 17, 2012	Annual	Aug. 17, 2013
High Pass Filter	MICROWAVE-CIRCUITS	NHP-800	V8207600724	Mar. 30, 2012	Annual	Mar. 30, 2013
High Pass Filter	Wainwright	WHK3.0/18G-10SS	344	Jul. 12, 2012	Annual	Jul. 12, 2013
Preamplifier	H.P.	8447F	2944A03909	Jul. 03, 2012	Annual	Jul. 03, 2013
Preamplifier	R&S	SCU 18	10117	Jan. 12, 2012	Annual	Jan. 12, 2013
Test Receiver	R&S	ESU26	100109	Feb. 21, 2012	Annual	Feb. 21, 2013
Bilog Antenna	SCHWARZBECK	VULB9163	396	Apr. 27, 2012	Biennial	Apr. 27, 2013
Horn Antenna	R&S	HF 906	100326	Nov. 23, 2010	Biennial	Nov. 23, 2012
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170431	May 15. 2012	Biennial	May 15. 2014
Dipole Antenna	SCHWARZBECK	UHA9105	9105-2514	May 24. 2012	Biennial	May 24. 2014
Antenna Master	INN-CO	MM4000	N/A	N.C.R.	N/A	N.C.R.
Turn Table	INN-CO	DS 1200 S	N/A	N.C.R.	N/A	N.C.R.
Anechoic Chamber	SY Corporation	L × W × H (9.6 m×6.4 m×6.6 m)	N/A	N.C.R.	N/A	N.C.R.

▶ Support equipment

Description	Manufacturer	Model	Serial Number
N/A	-	-	-

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1.6. Summary of test results

The EUT has been tested according to the following specifications:

APPLIED STANDARD : FCC Part 90 / RSS-119 Issue 11, RSS-Gen Issue 3			
Section in		Test Item	Result
FCC part	IC RSS-119 RSS-Gen		
§90.205(h) §90.210(d)	RSS-119 §5.8.3	RF radiated output power & spurious radiated emission	Complied
§15.109(a)	RSS-Gen §6.1	Receiver radiated spurious emission	Complied
§90.209(b)	RSS-119 §5.5.7	99% occupied bandwidth	Complied
§90.210(g)	RSS-119 §5.8.3	Emission masks	Complied
§90.210(d)	RSS-119 §5.4.1 RSS-119 §5.8.3	Conducted power and transmitter spurious conducted emission	Complied
§90.213(a)	RSS-119 §5.3	Frequency stability	Complied
§90.214	RSS-119 §5.9	Transient frequency behavior	Complied
§1.1310 &1.1307(b)	RSS-Gen §5.6	RF exposure evaluation (Maximum permissible exposure)	Complied

1.7. Sample calculation

Where relevant, the following sample calculation is provided:

1.7.1. Conducted test

Offset value (㏈) = Attenuator (㏈ m) + Cable loss (㏈)

1.7.2. Radiation test

Field strength level (㏈㎶/m) = Measured level (㏈㎶) + Antenna factor (㏈) + Cable loss (㏈) - amplifier gain(㏈)
E.R.P. = [S.G level + Amp.](㏈ m) - Cable loss(㏈) + Ant. gain (㏈ d/㏈ i)

1.8. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL005715	Initial
1	F690501/RF-RTL005715-1	Add antenna worst case position of EUT. Change the MPE limit.

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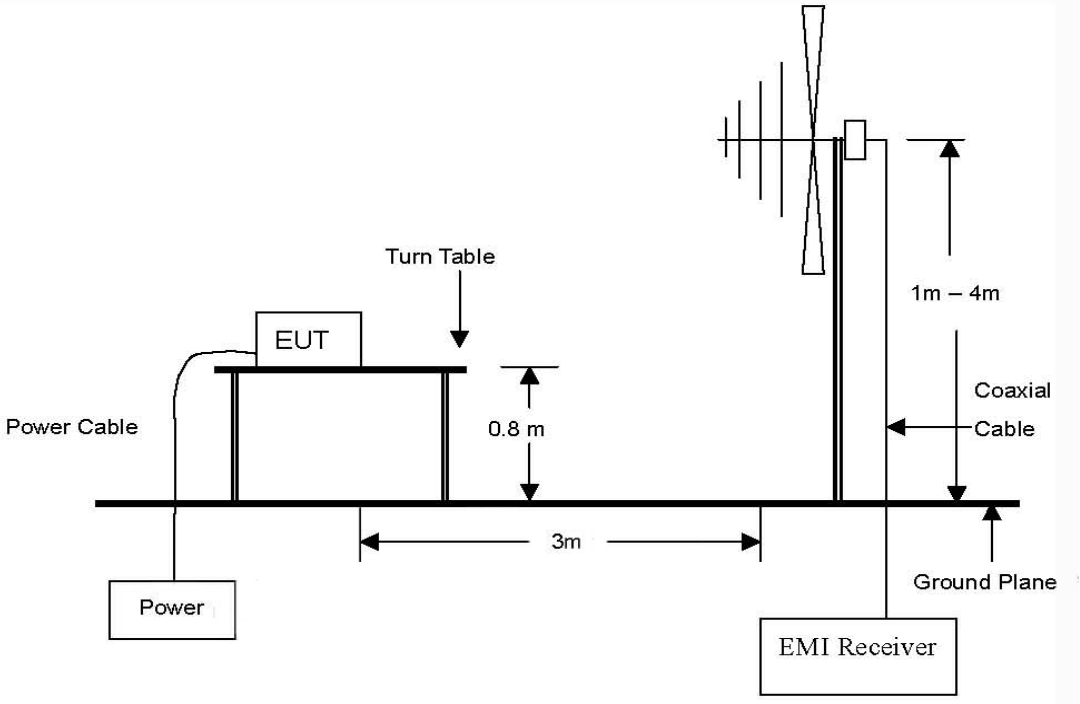
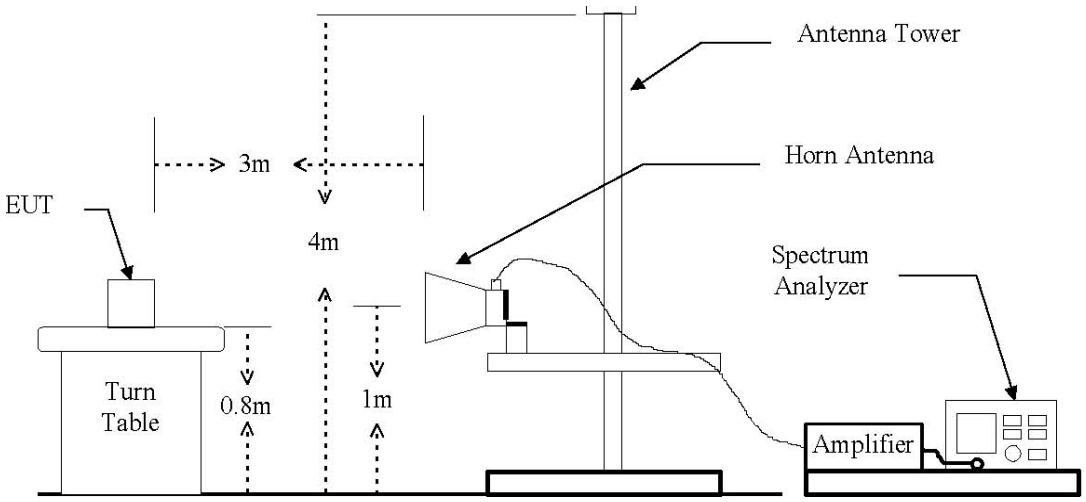
2. RF radiated output power & spurious radiated emission

2.1. 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 .The spurious emissions were investigated form 1 ㎓ to the 10th harmonic of the highest fundamental frequency or 40 ㎓, whichever is lower.



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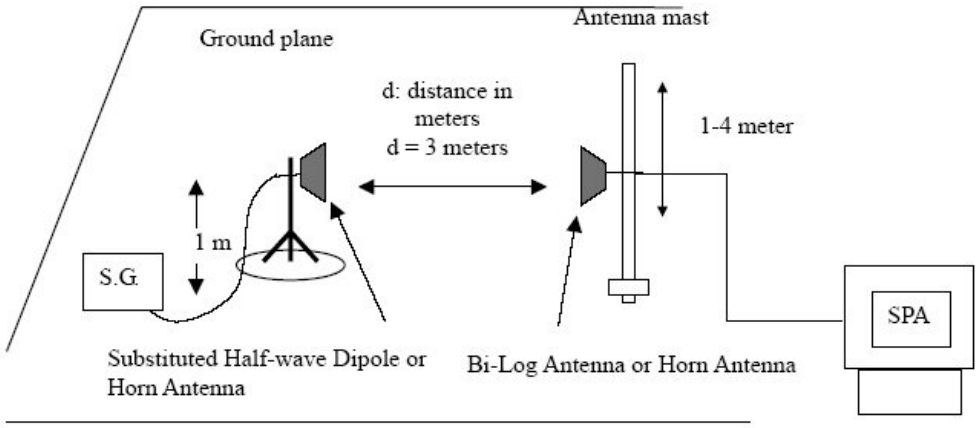
The diagram below shows the test setup for substituted method



2.2. Limit

2.2.1. Effective radiated power (E.R.P.)

According to §90.205(h) 450–470 ㎒. (1), the maximum allowable station effective radiated power (E.R.P.) 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 include 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 (㎞)									
	3	**8**	**13**	**16**	**24**	**32**	**40**	**48**[4]	**64**[4]	**80**[4]
Maximum ERP (W)[1]	**2**	28	178	[2]500	[2]500	[2]500	500	[2]500	[2]500	[2]500
Up to reference HAAT (m)[3]	**15**	15	15	15	33	65	110	160	380	670

1. Maximum ERP indicated provides for a 37 ㏈μ signal strength at the edge of the service area per FCC Report R–6602, Fig. 19 (See §73.699, Fig. 10).
2. Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 37 ㏈μ.
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 37 ㏈μ.

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2.2.2. Radiated spurious emissions

2.2.2.1. FCC Limit

According to §90.210(g)(3), On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin ㎑) of more than 12.5 ㎑: At least 50 + 10 log (P) ㏈ or 70 ㏈, whichever is the lesser attenuation.

2.2.2.2. IC Limit

According to RSS-119 §5.8.3, Emission Mask D for Transmitters Equipped with or without an Audio Low-pass Filter

The power of any emission shall be attenuated below the transmitter output power P (㏈W) as specified in Table 6.

Table 6 – Emission Mask D

Displacement Frequency, f_d (㎑)	Minimum Attenuation (㏈)	Resolution Bandwidth (㎐)
$5.625 < f_d \leq 12.5$	7.27 (f_d-2.88)	Specified in Section 4.2.2
$F_d > 12.5$	Whichever is the lesser attenuation: 70 or 50 + 10 $\log_{10}$ (P)	Specified in Section 4.2.2

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

1. On a test site, the EUT shall be placed at 80 ㎝ height on a turn table, and in the position close to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3 m 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 resolution bandwidth was to 1 ㎒ and the average bandwidth was set to 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 the maximum signal level is detected by the measuring receiver.
7. The transmitter shall 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 the 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 ㎓) or horn antenna (above 1 ㎓) connected to a signal generator.
11. In necessary, the input attenuator setting on 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.

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2.3.1. The worst case antenna position of EUT

To get a maximum emission level from the EUT, the antenna of EUT is manipulated through three orthogonal planes. The worst case antenna position is refer to the following

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2.4. Test result for RF radiated output power

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P.	
					(dB m)	(㎽)
450.025	V	35.73	2.50	-5.26	27.97	626.61
450.025	H	36.10	2.50	-5.26	28.34	682.34
457.575	V	36.60	2.53	-4.84	29.23	837.53
457.575	H	37.65	2.53	-4.84	30.28	1 066.60
469.975	V	36.66	2.57	-4.30	29.79	952.80
469.975	H	39.35	2.57	-4.30	32.48	1 770.11

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2.5. Spurious radiated emission

- Measured output Power: 32.48 ㏈m = 1.770 11 W
- Distance: 3 meters
- FCC IC Limit: 50 + 10log$_{10}$(W) = 52.48 ㏈c

Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (㏈m)	Cable loss (㏈)	Ant. gain (㏈d)	E.R.P (㏈m)	㏈c	Margin (㏈)
Low Channel (450.025 ㎒)							
900.05	H	-14.40	5.32	-3.70	-23.42	55.90	3.42
900.05	V	-15.24	5.32	-3.70	-24.26	56.74	4.26
1 350.08	H	-29.31	4.10	5.23	-25.05	57.53	5.05
1 350.08	V	-26.18	4.10	5.23	-28.18	60.66	8.18
1 800.10	H	-44.19	4.81	6.84	-42.16	74.64	22.16
1 800.10	V	-36.39	4.81	6.84	-34.36	66.84	14.36
2 250.13	H	-42.53	5.39	7.68	-40.24	72.72	20.24
2 250.13	V	-35.35	5.39	7.68	-33.06	65.54	13.06
2 700.15	H	-46.54	5.99	8.28	-44.25	76.73	24.25
2 700.15	V	-44.41	5.99	8.28	-42.12	74.60	22.12
3 150.18	H	-49.45	6.57	8.99	-47.03	79.51	27.03
3 150.18	V	-48.14	6.57	8.99	-45.72	78.20	25.72
3 600.20	H	-42.39	6.97	9.71	-39.65	72.13	19.65
3 600.20	V	-43.65	6.97	9.71	-40.91	73.39	20.91
4 050.23	H	-48.57	7.59	9.65	-46.51	78.99	26.51
4 050.23	V	-48.68	7.59	9.65	-46.62	79.10	26.62
4 500.25	H	-50.75	8.12	9.40	-49.47	81.95	29.47
4 500.25	V	-50.64	8.12	9.40	-49.36	81.84	29.36
Above 4 600 ㎒ Not detected	-	-	-	-	-	-	-

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Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P (dB m)	dB c	Margin (dB)
Middle Channel (457.575 ㎒)							
915.15	H	-16.14	5.36	-3.75	-25.25	57.73	5.25
915.15	V	-14.40	5.36	-3.75	-23.51	55.99	3.51
1 372.73	H	-29.18	4.14	5.36	-27.96	60.44	7.96
1 372.73	V	-33.60	4.14	5.36	-32.38	64.86	12.38
1 830.30	H	-46.32	4.85	6.92	-44.25	76.73	24.25
1 830.30	V	-37.52	4.85	6.92	-35.45	67.93	15.45
2 287.88	H	-44.59	5.44	7.73	-42.30	74.78	22.30
2 287.88	V	-32.98	5.44	7.73	-30.69	63.17	10.69
2 745.45	H	-45.23	6.02	8.34	-42.91	75.39	22.91
2 745.45	V	-45.46	6.02	8.34	-43.14	75.62	23.14
3 203.03	H	-52.27	6.62	9.10	-49.79	82.27	29.79
3 203.03	V	-48.84	6.62	9.10	-46.36	78.84	26.36
3 660.60	H	-39.32	7.07	9.70	-36.69	69.17	16.69
3 660.60	V	-40.60	7.07	9.70	-37.97	70.45	17.97
4 118.18	H	-50.32	7.68	9.62	-48.38	80.86	28.38
4 118.18	V	-47.73	7.68	9.62	-45.79	78.27	25.79
4 575.75	H	-51.00	8.26	9.39	-49.87	82.35	29.87
4 575.75	V	-45.08	8.26	9.39	-43.95	76.43	23.95
Above 4 600 ㎒ Not detected	-	-	-	-	-	-	-

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Frequency (㎒)	Ant. Pol. (H/V)	S.G level + Amp. (dB m)	Cable loss (dB)	Ant. gain (dB d)	E.R.P (dB m)	dB c	Margin (dB)
High Channel (469.975 ㎒)							
939.95	H	-19.29	5.42	-3.84	-28.55	61.03	8.55
939.95	V	-14.65	5.42	-3.84	-23.91	56.39	3.91
1 409.93	H	-27.83	4.20	5.56	-26.47	58.95	6.47
1 409.93	V	-35.61	4.20	5.56	-34.25	66.73	14.25
1 879.90	H	-44.29	4.91	7.05	-42.15	74.63	22.15
1 879.90	V	-36.48	4.91	7.05	-34.34	66.82	14.34
2 349.88	H	-43.44	5.52	7.81	-41.15	73.63	21.15
2 349.88	V	-38.48	5.52	7.81	-36.19	68.67	16.19
2 819.85	H	-48.32	6.09	8.44	-45.97	78.45	25.97
2 819.85	V	-44.20	6.09	8.44	-41.85	74.33	21.85
3 289.83	H	-50.83	6.70	9.28	-48.25	80.73	28.25
3 289.83	V	-44.30	6.70	9.28	-41.72	74.20	21.72
3 759.80	H	-37.25	7.23	9.70	-34.78	67.26	14.78
3 759.80	V	-32.54	7.23	9.70	-30.07	62.55	10.07
4 229.78	H	-48.90	7.80	9.55	-47.15	79.63	27.15
4 229.78	V	-48.05	7.80	9.55	-46.30	78.78	26.30
4 699.75	H	-48.12	8.34	9.36	-47.10	79.58	27.10
4 699.75	V	-49.42	8.34	9.36	-48.40	80.88	28.40
Above 4 700 ㎒ Not detected						-	-

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3. Receiver Radiated spurious emissions

3.1. Test setup - Same as clause 2.1.

3.1.1. Receiver Radiated Spurious Emissions - Same as clause 2.1.

3.2. Limit

According to §15.109(a), Except for Class A digital devices, the field strength of radiated emission from unintentional radiator at a distance of 3 m shall not exceed the following values:

Frequency (㎒)	Distance (Meters)	Radiated (dBμ V/m)	Radiated (μV/m)
30 - 88	3	40.0	100
88 – 216	3	43.5	150
216 – 960	3	46.0	200
Above 960	3	54.0	500

3.3. Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

3.3.1. Test Procedures for Radiated Spurious Emissions

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

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3.4. Test Results

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

3.4.1. Spurious Radiated Emission (Worst case configuration_ Middle channel)

The frequency spectrum from 30 ㎒ to 5 ㎓ was investigated. Emission levels are not reported much lower than the limits by over 30 ㏈. All reading values are peak values.

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (㎒)	Reading (㏈㎶)	Detect Mode	Pol.	AF (㏈/m)	AMP + CL (㏈)	Actual (㏈㎶/m)	Limit (㏈㎶/m)	Margin (㏈)
34.61	37.90	Peak	V	12.40	-26.40	23.90	40.00	16.10
50.17	44.20	Peak	V	13.90	-26.20	31.90	40.00	8.10
59.59	45.80	Peak	V	12.80	-26.20	32.40	40.00	7.60
63.51	48.00	Peak	V	11.30	-26.20	33.10	40.00	6.90
156.30	41.30	Peak	H	8.70	-25.30	24.70	43.50	18.80
316.27	37.30	Peak	H	12.80	-24.50	25.60	46.00	20.40
Above 320 ㎒ Not detected	-	-	-	-	-	-	-	-

Remark:

1. Actual = Reading + AF + AMP + CL

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4. 99 % Occupied Bandwidth

4.1. Test Setup

4.2. Limit

4.2.1. FCC Limit

According to §90.209 (b) (5), unless specified elsewhere, channel spacing and bandwidths that will be authorized in the following frequency bands are given in the following table.

Standard Channel Spacing/Bandwidth

Frequency band (㎒)	Channel spacing (㎑)	Authorized bandwidth (㎑)
Below 25[2]		
25 - 50	20	20
72 - 76	20	20
150 - 174	[1]7.	[1,3]20 / 11.25 / 6
216 - 220[5]	6.25	20 / 11.25 / 6
220 - 222	5	4
406 - 512[2]	**[1]6.25**	[1,3]20 / **11.25** / 6
806 – 809 / 851 - 854	12.5	20
809 – 824 / 854 - 869	25	20
896 – 901 / 935 - 940	12.5	13.6
902 - 928[4]		
929 - 930	25	20
1 427 – 1 432[5]	12.5	12.5
[3]2 450 – 2 483.5[2]		
Above 2 500[2]		

1. For stations authorized on or after August 18, 1995.
2. Bandwidths for radiolocation stations in the 420 – 450 ㎒ band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.
3. Operations using equipment designed to operate with a 25 ㎑ channel bandwidth will be authorized a 20 ㎑ bandwidth. Operations using equipment designed to operate with a 12.5 ㎑ channel bandwidth will be authorized a 11.25 ㎑ bandwidth. Operations using equipment designed to operate with a 6.25 ㎑ channel bandwidth will be authorized a 6 ㎑ bandwidth. All stations must operate on channels with a bandwidth of 12.5 ㎑ or less beginning January 1, 2013, unless the operations meet the efficiency standard of §90.203(j)(3).
4. The maximum authorized bandwidth shall be 12 ㎒ for non-multilateration LMS operations in the band 909.75 – 921.75 ㎒ and 2 ㎒ in the band 902.00 – 904.00 ㎒. The maximum authorized bandwidth for multilateration LMS operations shall be 5.75 ㎒ in the 904.00 – 909.75 ㎒ band; 2 ㎒ in the 919.75 – 921.75 MHz band; 5.75 ㎒ in the 921.75 – 927.25 ㎒ band and its associated 927.25 – 927.50 ㎒ narrowband forward link; and 8.00 ㎒ if the 919.75 – 921.75 ㎒ and 921.75–927.25 ㎒ bands and their associated 927.25 – 927.50 ㎒ and 927.50 – 927.75 ㎒ narrowband forward links are aggregated.
5. See §90.259.

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4.2.2. IC Limit

According to RSS-119 §5.5.7, Voice input to an FM transmitter may use the spectrum mask with audio filter if it is equipped with suitable filters to be used for the audio signal only and not for other purposes. Other modulations must comply with the masks without audio filter.

Table 3 – Channel Spacing, Authorized Bandwidths and Applicable Spectrum Masks

Frequency Band (㎒)	Related SRSP for channeling Plan and e.r.p.	Channel Spacing	Authorized Bandwidth (㎑)	Spectrum Masks with Audio Filter	Spectrum Masks Without Audio Filter
27.41 - 28.0 and 29.7 – 50.0	N/A	20	20	B	C
72 – 76	N/A	20	20	B	C
138 – 144; 148 – 149.9 and 150.5 – 174	SRSP-500	30	20	B	C
		15	11.25	D	D
		7.5	6	E	E
217 – 218 and 219 – 220	N/A	12.5	11.25	D or I	D or J
220 – 222	SRSP-512	5	4	F	F
406.1 – 430 and **450 – 470**	SRSP-501	25	20 22	B Y	C(G, Note 1) Y
		12.5	**11.25**	D	**D**
		6.25	6	E	E
764 – 776 and 794 - 806	SRSP-511	6.25 12.5 25 50	Note 2	Section 5.8.9	Section 5.8.9
806 – 821 - / 851 – 866 And 821 – 824 / 866 – 869	SRSP-502	25	20 22	B Y	G Y
		12.5	11.25	D	D
896 – 901 / 935 – 940	SRSP-506	12.5	13.6	I	J (G, Note 3)
929 – 930 and 931 – 932	SRSP-504 (for aging)	25	20	B	G
928 – 929 / 952 – 953 and 932 – 932.5 / 941 – 941.5	SRSP-505	25	20	B	G
		12.5	11.25	D	D
932.5 – 935 / 941.5 - 944	SRSP-507	25	20	B	G
		12.5	11.25	D	D

Note 1: Paging transmitters in the bands 406.1-430 MHz and 450-470 MHz are to use Mask G.
Note 2: Provided that the ACP requirements in Section 5.8.9.1 are met, any authorized bandwidth that does not exceed the channel bandwidth can be used.
Note 3: Mask G applies if two 12.5 kHz channels are aggregated. Alternatively, a mask may be used which does not produce more adjacent channel interference than narrowband (12.5 kHz) channel equipment

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

4.3. Test Procedure

The 99 % band width was measured with a spectrum analyzer connected to RF antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency of each channel.
Use the following spectrum analyzer setting:

1. SPAN = 2 or 3 times necessary bandwidth,
2. RBW = approximately 1 % of the SPAN,
3. VBW is set to 3 times RBW,
4. Detector = sampling,
5. Trace mode = max hold.
6. Measure lowest and highest frequencies are placed in a running sum until 0.5 % and 99.5 % of the total is reached and then record the SPAN between the lowest and the highest frequencies for the 99 % occupied bandwidth.
7. Repeat until all the test channels are investigated.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

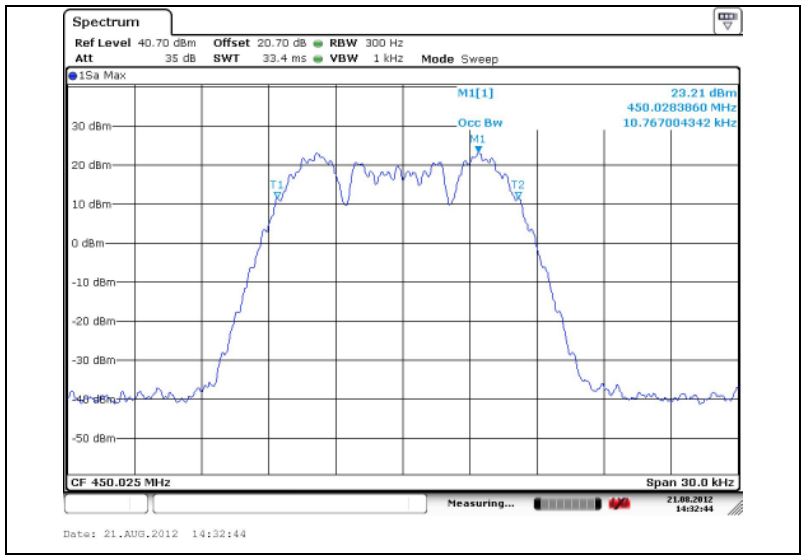
4.4. Test Results

Ambient temperature	:	(24 ± 2) ℃
Relative humidity	:	47 % R.H.

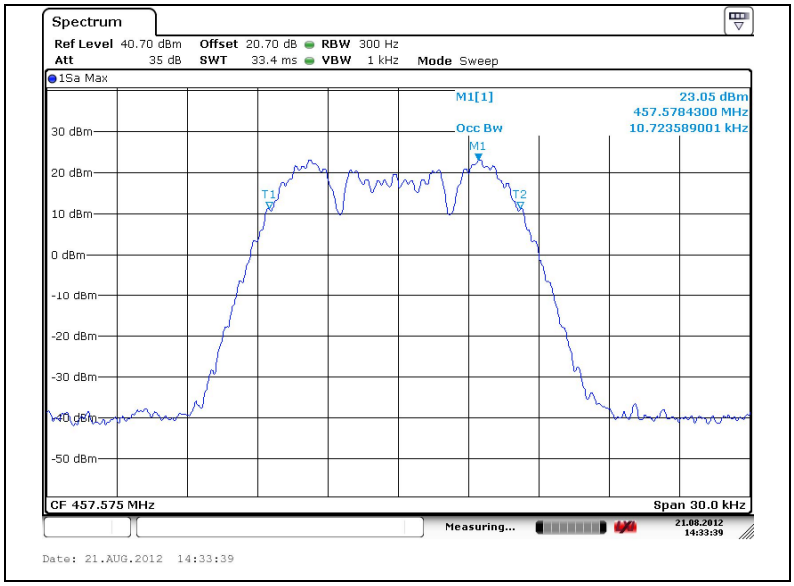
Please refer to the following plots.

99 % Occupied Bandwidth

Low Channel



Middle Channel



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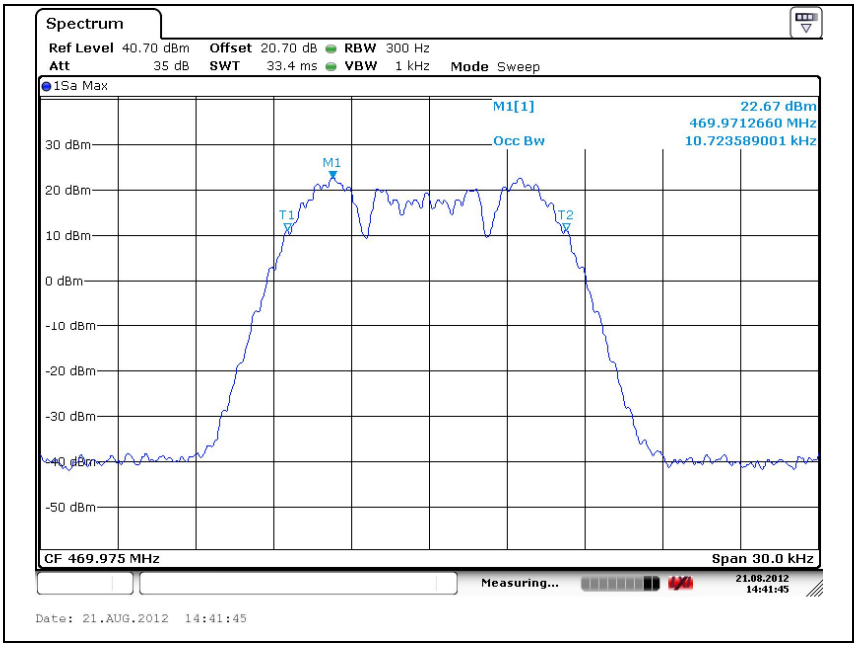
High Channel



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5. Emission Mask

5.1. Test Setup

5.2. Limit

5.2.1. FCC 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 f0 to 5.625 ㎑ removed from f0: Zero ㏈.

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fdin ㎑) of more than 5.625 ㎑ but no more than 12.5 ㎑: At least 7.27(fd−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 + 10 log (P) ㏈ or 70 ㏈, whichever is the lesser attenuation.

5.2.2. IC Limit

According to RSS-119 §5.8.3, Emission Mask D for Transmitters Equipped with or without an Audio Low-pass Filter

The power of any emission shall be attenuated below the transmitter output power P (㏈W) as specified in Table 6.

Table 6 – Emission Mask D

Displacement Frequency, f_d (㎑)	Minimum Attenuation (㏈)	Resolution Bandwidth (㎐)
5.625 < f_d ≤ 12.5	7.27 (f_d-2.88)	Specified in Section 4.2.2
F_d > 12.5	Whichever is the lesser attenuation: 70 or 50 + 10 $\log_{10}$ (P)	Specified in Section 4.2.2

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5.3. Test Procedure

The emission mask was measured with a spectrum analyzer connected to RF antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency.
Use the following spectrum analyzer setting:

1. Span = approximately 100 ㎑
2. RBW = 100 ㎐
3. VBW = equal or greater than RBW
4. Sweep = auto
5. Detector = peak
6. Trace1 & 2 = max hold
7. Mark the peak frequency with maximum peak power as the center of the display of the spectrum analyzer. And record the power spectrum analyzer and compare to the mask.

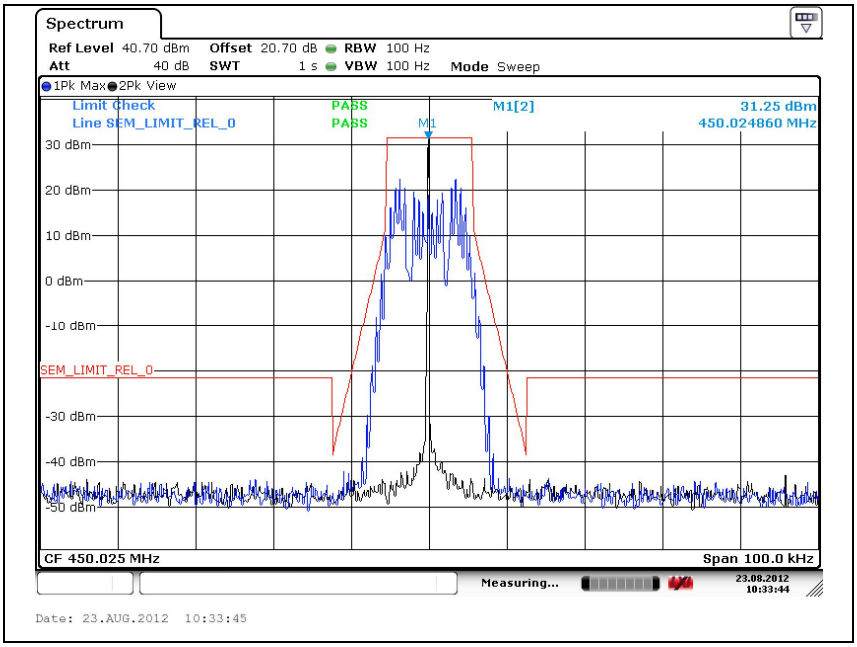
The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

5.4. Test Results

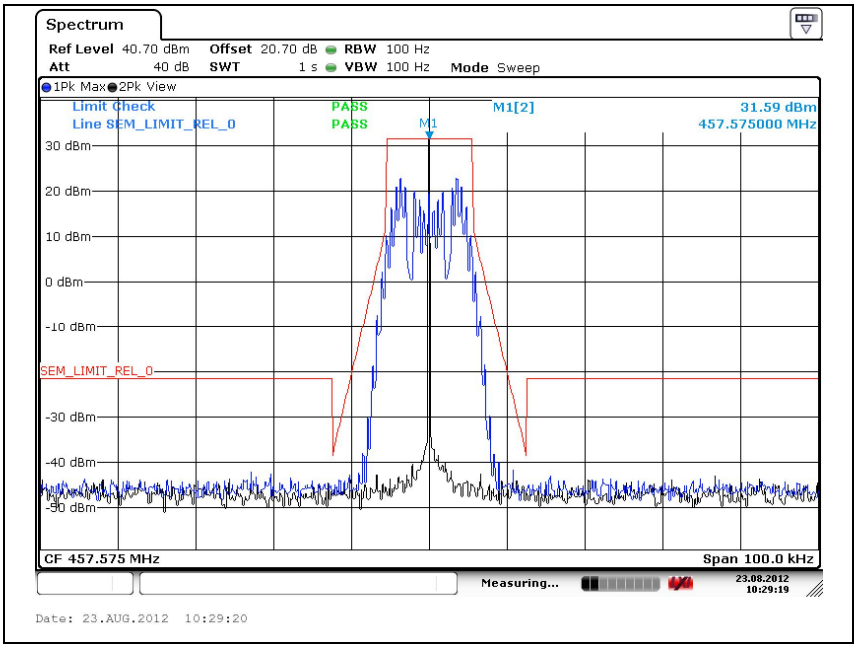
Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

Please refer to the following plots.

Low Channel

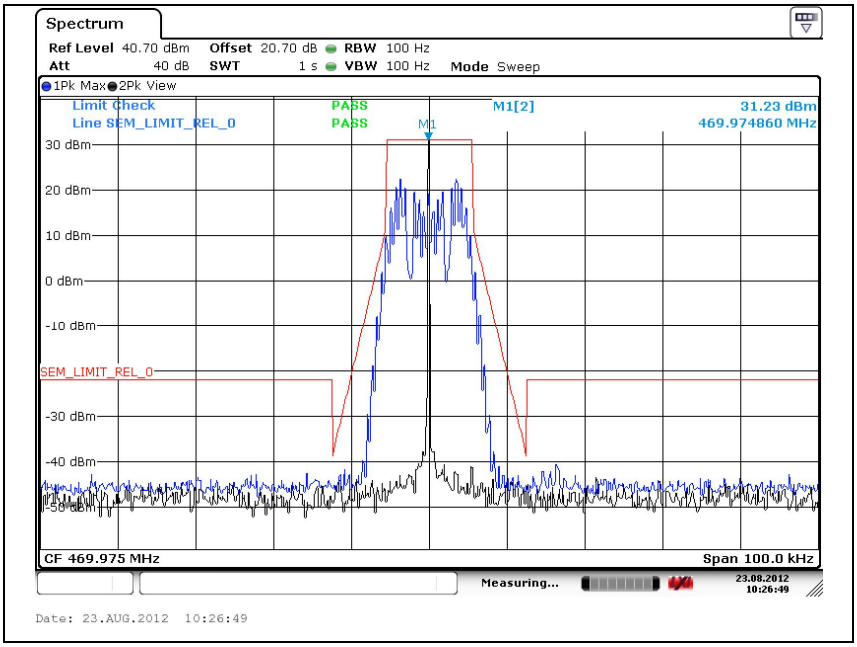


Middle Channel



The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

High Channel



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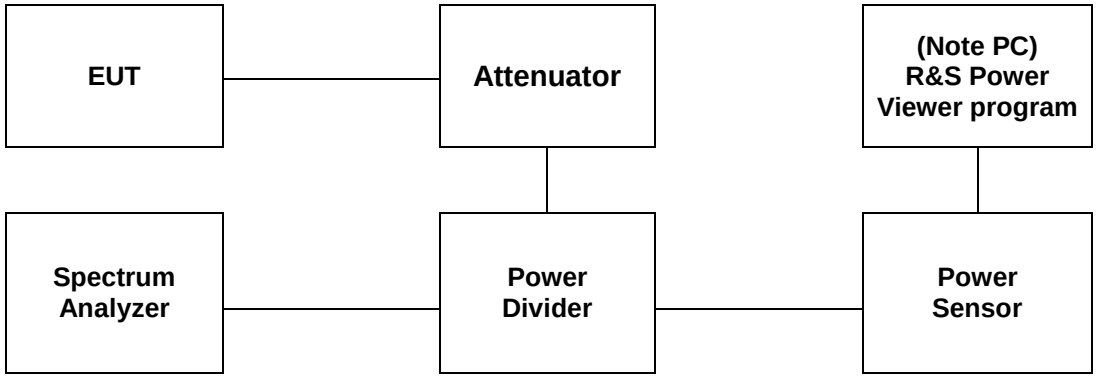
6. Conducted power and transmitter spurious conducted emission

6.1. Test Setup



6.2. Limit

6.2.1. FCC Limit

According to §90.205(h) 450–470 ㎒. (1), the maximum allowable station effective radiated power (E.R.P.) 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 include 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 (㎞)									
	3	**8**	**13**	**16**	**24**	**32**	**40**	**48**[4]	**64**[4]	**80**[4]
Maximum ERP (W)[1]	**2**	28	178	[2]500	[2]500	[2]500	500	[2]500	[2]500	[2]500
Up to reference HAAT (m)[3]	**15**	15	15	15	33	65	110	160	380	670

1. Maximum ERP indicated provides for a 37 ㏈μ signal strength at the edge of the service area per FCC Report R–6602, Fig. 19 (See §73.699, Fig. 10).
2. Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 37 ㏈μ.
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 37 ㏈μ.

According to §90.210(d)(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 + 10 log (P) ㏈ or 70 ㏈, whichever is the lesser attenuation.

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6.2.2. IC Limit

According to RSS-119 §5.4 Transmitter Output Power The output power shall be within ±1.0 dB of the manufacturer's rated power.
According to RSS-119 §5.4.1 For all Frequency Bands of Table 1 Except 72-76 MHz, 217-218 MHz, 219-220 MHz, 220-222 MHz, 764-776 MHz and 794-806 MHz Typical transmitter output powers are 110 watts for base and/or fixed stations (paging transmitters excepted), and 30 watts for mobile stations. Higher powers may be certified, but it should be noted that mobile stations are normally only licensed up to 30 watts. See the SRSP relevant to the operating frequency for equipment power limits.
According to RSS-119 §5.8.3, Emission Mask D for Transmitters Equipped with or without an Audio Low-pass Filter
The power of any emission shall be attenuated below the transmitter output power P (dB W) as specified in Table 6.

Table 6 – Emission Mask D

Displacement Frequency, f_d (kHz)	Minimum Attenuation (dB)	Resolution Bandwidth (Hz)
5.625 < f_d ≤ 12.5	7.27 (f_d-2.88)	Specified in Section 4.2.2
F_d > 12.5	Whichever is the lesser attenuation: 70 or 50 + 10 $\log_{10}$ (P)	Specified in Section 4.2.2

6.3. Test Procedure

6.3.2. Conducted output power

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.
3. Test program: (S/W name: R&S Power Viewer, Version: 3.2.0)
4. Measure peak & average power each channel.

6.3.2. Transmitter conducted spurious emissions

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.
The necessary setting of the spectrum analyzer was set as follows:

1. Span = 30 MHz to 5 GHz
2. RBW = 100 kHz
3. VBW = equal or greater than RBW
4. Sweep = Auto
5. Detector function = Peak
6. Trace = Max hold
7. Mark the peak frequency with maximum peak power as the display of the spectrum analyzer and record the peak values.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

6.4. Test Results

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

6.4.1. Conducted output power

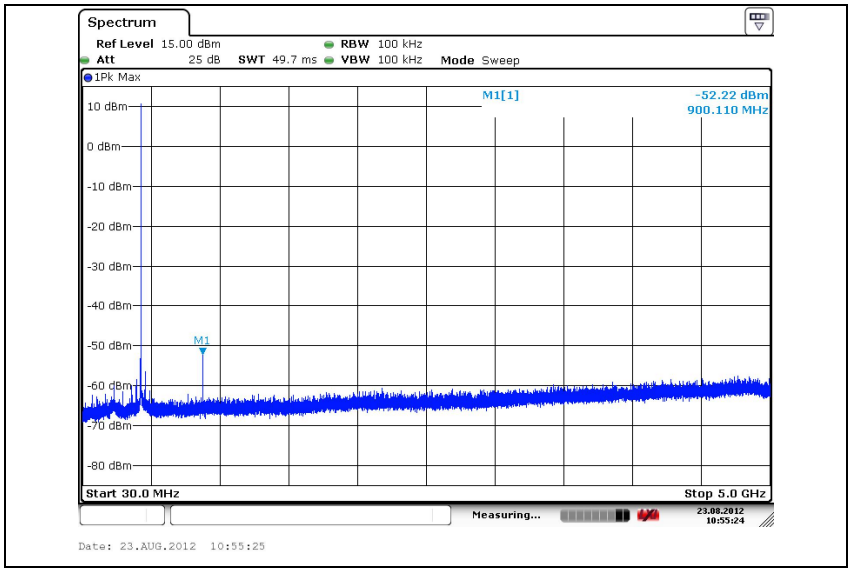
-Rated power: 32.00 ㏈m (1.58 W)

Frequency (㎒)	Average power (㏈m)	FCC Limit	IC Limit
450.025	31.33	33 ㏈m (2 W)	50.4 ㏈m (110 W) ±1.0 ㏈ of rated power
457.575	31.70	33 ㏈m (2 W)	50.4 ㏈m (110 W) ±1.0 ㏈ of rated power
469.975	31.43	33 ㏈m (2 W)	50.4 ㏈m (110 W) ±1.0 ㏈ of rated power

6.4.2. Conducted spurious emissions

Please refer to the following plots.

Low Channel



Note:
Offset (㏈) = Attenuator (㏈m) + Cable loss (㏈)
Result (㏈m) = Spurious offset (㏈) + Reading values (㏈m)

Frequency (㎒)	offset (㏈)	Reading values (㏈m)	Result (㏈m)
900.11	20.71	-52.22	-31.51

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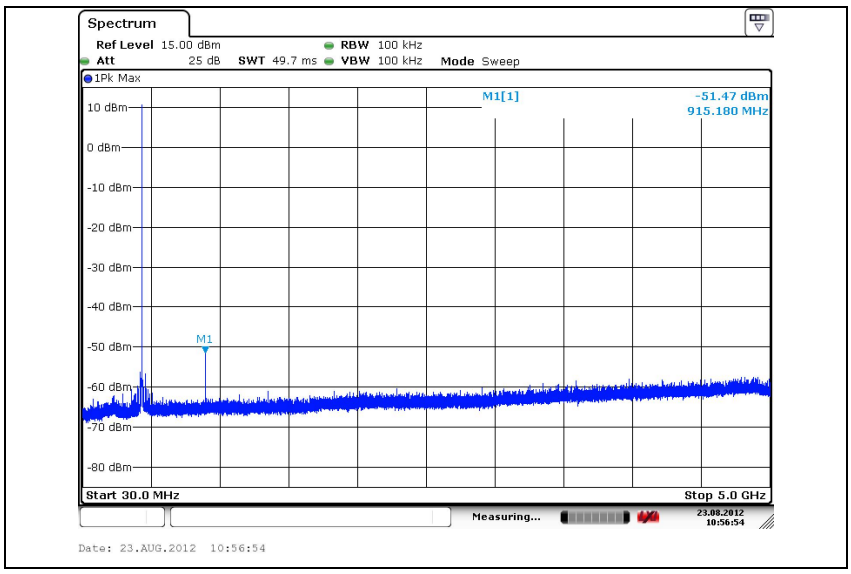
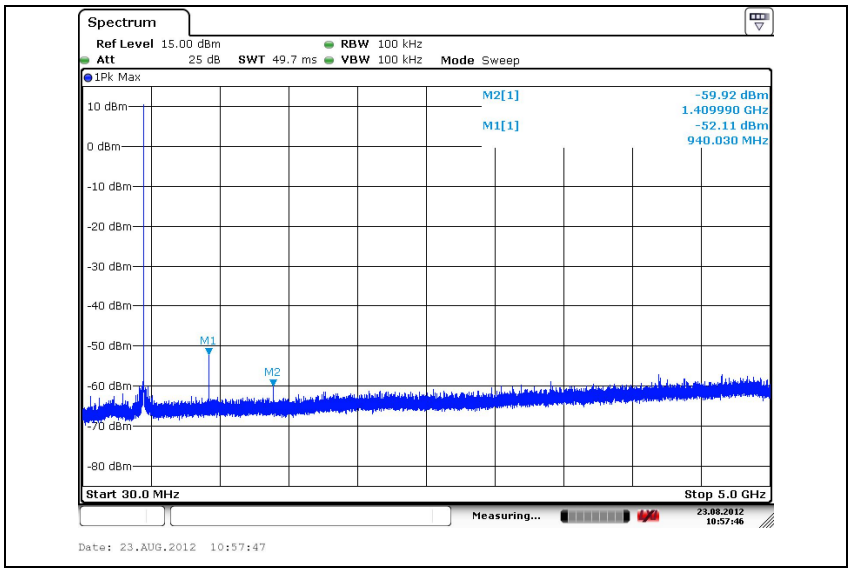
Middle Channel



Note:
Offset (dB) = Attenuator (dB m) + Cable loss (dB)
Result (dB m) = Spurious offset (dB) + Reading values (dB m)

Frequency (㎒)	offset (dB)	Reading values (dB m)	Result (dB m)
915.18	20.71	-51.47	-30.76

High Channel



Note:
Offset (dB) = Attenuator (dB m) + Cable loss (dB)
Result (dB m) = Spurious offset (dB) + Reading values (dB m)

Frequency (㎒)	offset (dB)	Reading values (dB m)	Result (dB m)
940.03	20.72	-56.88	-36.16
1 409.99	20.73	-59.92	-39.19

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7. Frequency Stability

7.1. Test Setup

7.2. Limit

7.2.1. FCC Limit

Requirements: FCC § 2.1055 (a), §2.1055 (d) & following:
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
1 427 – 1 435	[9]300	300	300
Above 2 450[10]			

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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 Hz of the authorized carrier frequency.
3. Travelers information station transmitters operating from 530–1700 ㎑ 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.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

7.2.2. IC Limit

Table 1 – Transmitter Frequency Stability

Frequency Band (㎒)	Channel Spacing (㎑)	Frequency Stability (ppm)		
		Base/Fixed	Mobile Station	
			>2 watts	≤ 2 watts
27.41 – 28 and 29.7 – 50	20	20	20	50
72 – 76	20	5	20	50
138 – 174	30	5	5	5
	15	2.5	5	5
	7.5	1	2	5
217 – 218 and 219 – 220	12.5	1	5	5
220 – 222 (Note 1)	5	0.1	1.5	1.5
406.1 – 430 and 450 – 470 (Note 6)	25(Note 2)	0.5	1	1
	25	2.5	5	5
	12.5	**1.5**	2.5	2.5
	6.25	0.5	1	1
764 – 776 and 794 – 806 (Note 3)	6.25 12.5 25	0.1	0.4 (Note 4)	0.4 (Note 4)
	50	1	1.25 (Note 5)	1.25 (Note 5)
806 – 821 / 851 – 866 and 821 – 824 / 866 – 869 (Note 6)	25 (Note 2)	0.1	0.1	0.1
	25	1.5	2.5	2.5
	12.5	1	1.5	1.5
896 – 901 / 935 – 940 (Note 6)	12.5	0.1	1.5	1.5
929 – 930 / 931 – 932	25	1.5	N/A	N/A
928 – 929 / 952 – 953 and 932 – 932.5 / 941 – 941.5	25	1.5	N/A	N/A
	12.5	1	3 (for remote station)	N/A
932.5 – 935 / 941.5 - 944	25	2.5	N/A	N/A
	12.5	2.5	N/A	N/A

Note 1: Mobile units may use synchronizing signals from associated base stations to achieve the specified carrier stability.

Note 2: This provision is for digital equipment with a channel spacing of 25 ㎑ and an occupied bandwidth greater than 20 ㎑.

Note 3: Mobile, portable and control transmitters operating in the 764 - 776 ㎒ and 794 - 806 ㎒ must normally use automatic frequency control (AFC) to lock onto the base station signal. The mobile station's frequency stability values given in Table 1 are for mobile stations operating under this condition.

Note 4: When the mobile, portable and control transmitters are operating in the 764 - 776 MHz narrowband segment and the AFC is not locked to the base station, the frequency stability must be at least 1.0 ppm for 6.25 ㎑, 1.5 ppm for 12.5 ㎑ (2-channel aggregate), and 2.5 ppm for 25 ㎑ (4-channel aggregate).

Note 5: When the mobile, portable and control transmitters are operating in the 764 - 776 ㎒ wideband segment and the AFC is not locked to the base station, the frequency stability must be at least 5 ppm or better.

Note 6: Control stations may operate with the frequency tolerance specified for associated mobile frequencies.

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7.3. Test Procedure

1. Frequency Stability vs. Temperature: The equipment under test was connected to an external AC power supply and the RF output was connected to a frequency counter via feed-through attenuators.
2. The EUT was placed inside the temperature chamber.
3. After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

7.4. Test Results

Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

Reference Frequency: 457.575 ㎒, FCC Limit: 2.5 ppm / IC Limit: 1.5 ppm			
Frequency Stability versus Temperature			
Environment Temperature (℃)	**Power Supplied (Vac)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
50	AC 120 V	457.574 855 0	-0.32
40		457.574 884 0	-0.25
30		457.574 971 0	-0.06
24		457.574 913 0	-0.19
10		457.574 971 0	-0.06
0		457.575 232 0	-0.51
-10		457.574 884 0	-0.25
-20		457.574 855 0	-0.32
-30		457.574 846 0	-0.34
Frequency Stability versus power Supply			
Environment Temperature (℃)	**Power Supplied (Vac)**	**Frequency Measure with Time Elapse**	
		Frequency Error (㎐)	**ppm**
24	AC 138 V	457.574 942 0	-0.13
	AC 102 V	457.574 913 0	-0.19

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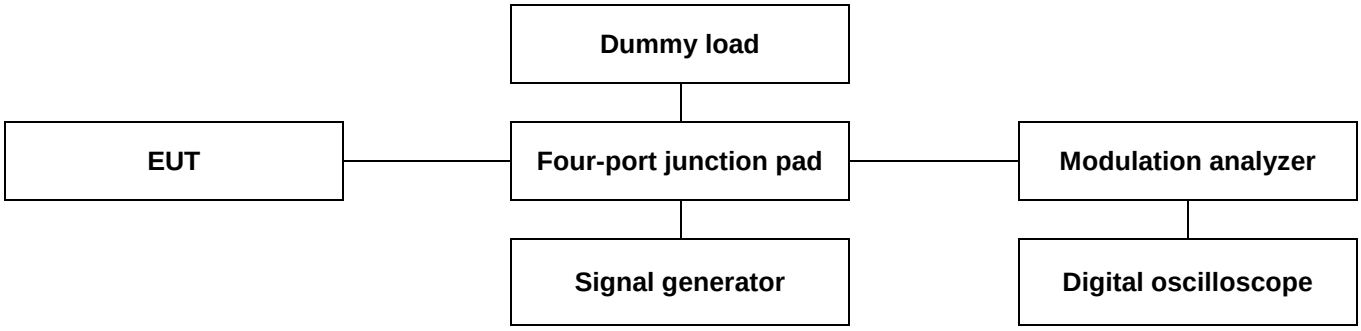
8. Transient Frequency Behavior

8.1. Test Setup



8.2. Limit

8.2.1. FCC Limit

According to FCC 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] t_{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 6watts or less, the frequency difference during this time may exceed the maximum frequency difference for this period.

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8.3. 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 -100 ㏈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.

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8.2.2. IC Limit

When a transmitter is turned on, the radio frequency may take some time to stabilize. During this initial period, the frequency error or frequency difference (i.e. between the instantaneous and the steady state frequencies) shall not exceed the limits specified in Table 17.
Any suitable method of measurement can be used provided that it is fully described in the test report. A suitable and recommended method is given in TIA Standard 603.

Table 17 - Transient Frequency Behaviour

Channel Spacing (㎑)	Time Internals[1,2]	Maximum Frequency Difference (㎑)	Transient Duration Limit (㎳)	
			138 – 174 ㎒	406.1 – 512 ㎒
25	t_1	± 25	5	10
	t_2	±12.5	20	25
	t_3	±25	5	10
12.5	t_1	±12.5	5	10
	t_2	±6.25	20	25
	t_3	±12.5	5	10
6.25	t_1	±6.25	5	10
	t_2	±3.125	20	25
	t_3	±6.25	5	10

[1] t_{on}: the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
t_1: the time period immediately following ton.
t_2: the time period immediately following t1.
t_3: the time period from the instant when the transmitter is turned off until toff.
t_{off}: the instant when the 1 kHz test signal starts to rise.
[2] If the transmitter carrier output power rating is 6 W or less, the frequency difference during the time periods t_1 and t_3 may exceed the maximum frequency difference for these time periods. The corresponding plot of frequency versus time during t_1 and t_3 shall be recorded in the test report.

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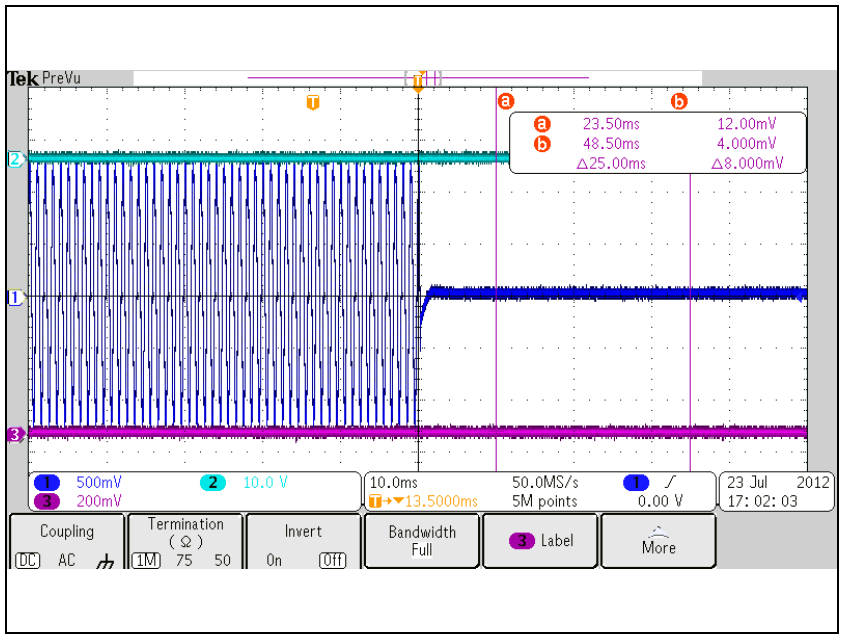
8.4. Test Results

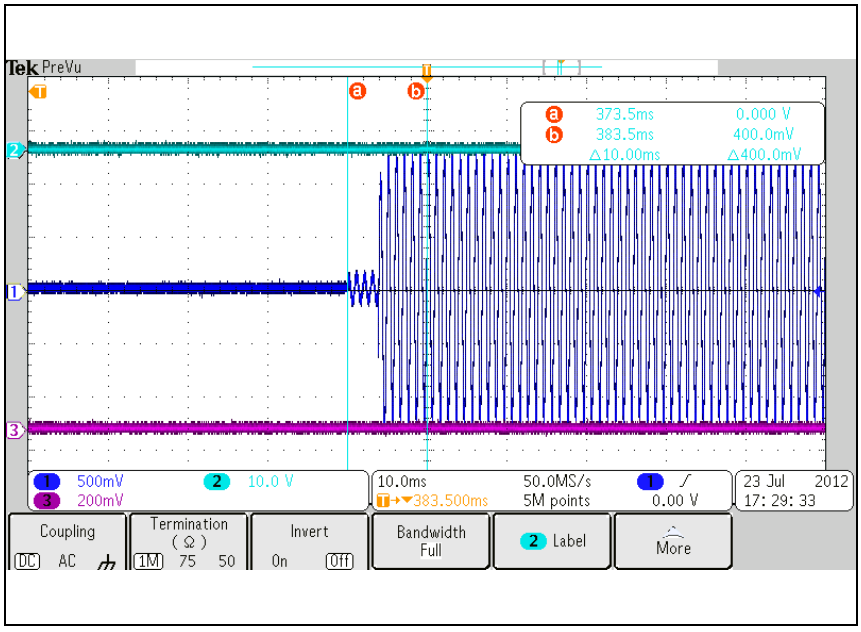
Ambient temperature : (24 ± 2) ℃
Relative humidity : 47 % R.H.

Please refer to the following plots.

Switching from off to on at Low channel



Switching from on to off at Low channel



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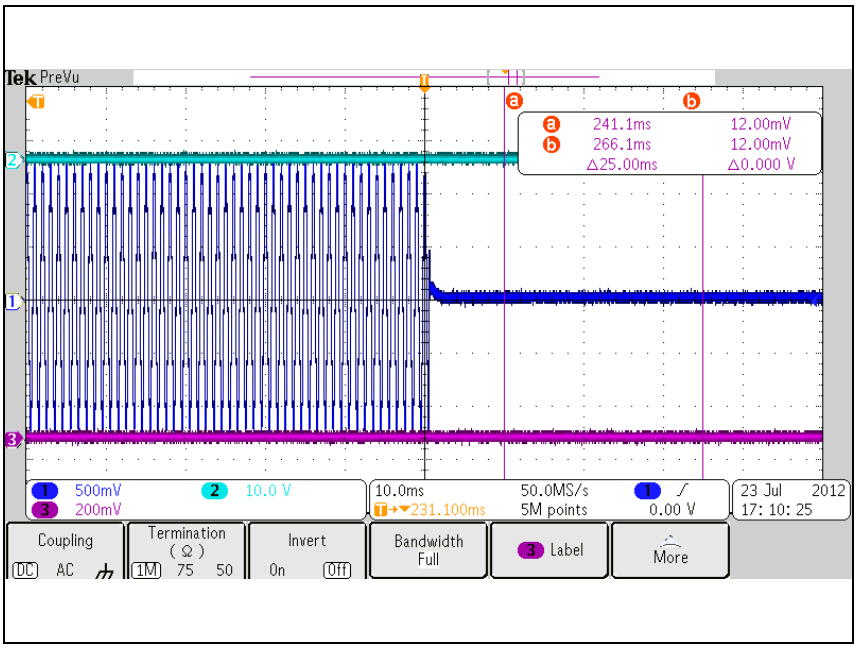
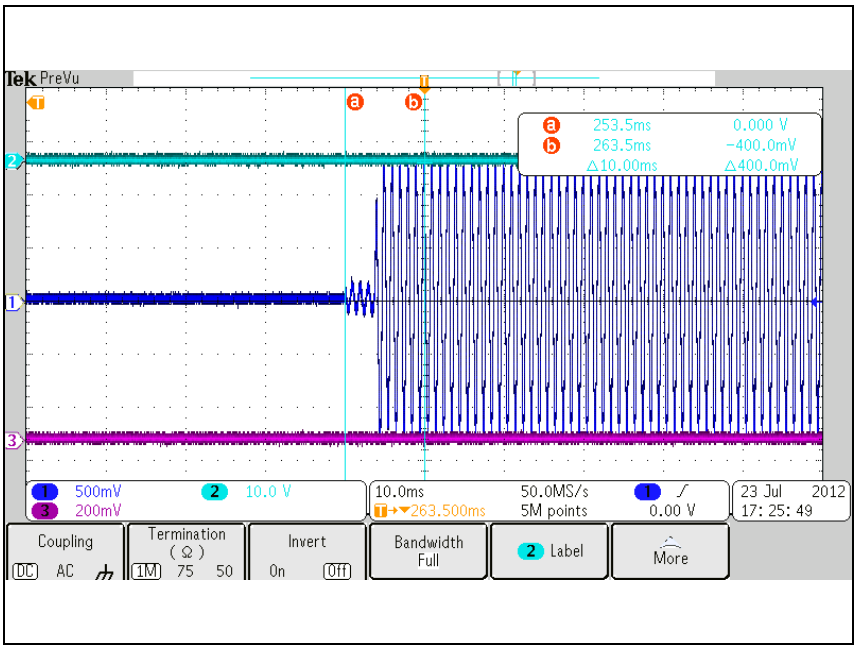
Switching from off to on at Middle channel



Switching from on to off at Middle channel



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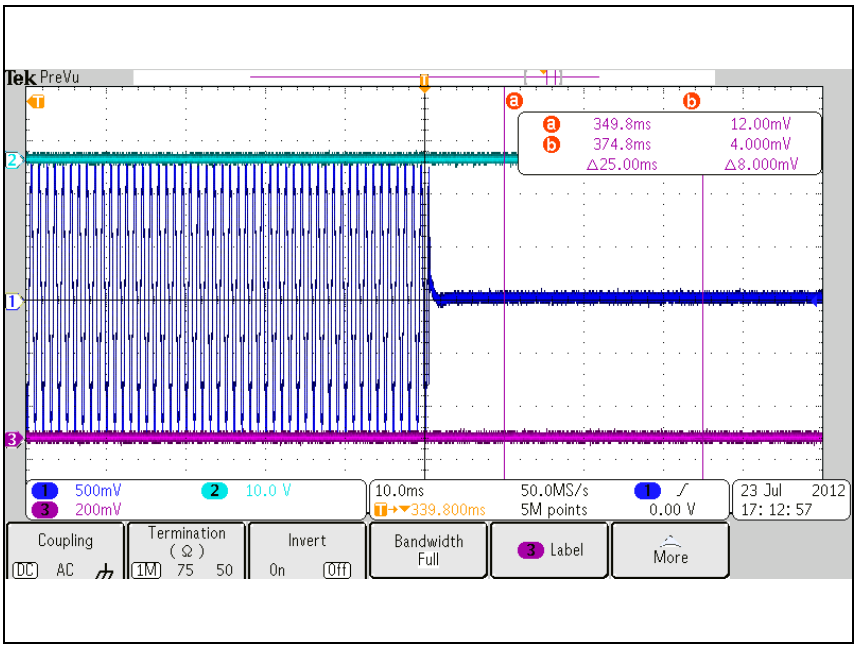
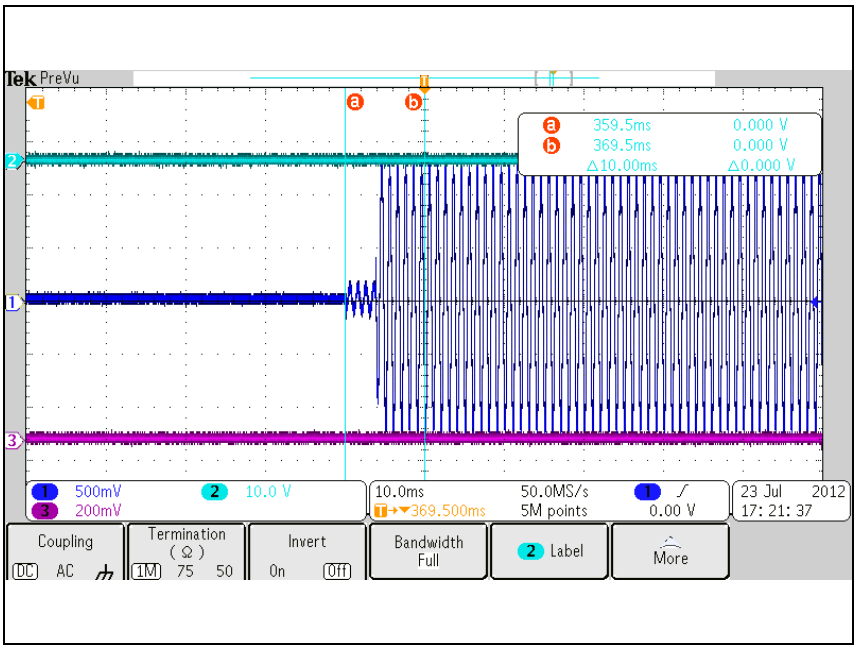
Switching from off to on at High channel



Switching from on to off at High channel



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9. RF Exposure Evaluation

9.1 Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in §1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (㎒)	Electric Field Strength(V/m)	Magnetic Field Strength (A/m)	Power Density (㎽/㎠)	Average Time
(A) Limits for Occupational /Control Exposures				
300 – 1 500	--	--	F/300	6
1 500 – 100 000	--	--	5	6
(B) Limits for General Population/Uncontrol Exposures				
300 – 1 500	**--**	**--**	**F/1500**	**30**
1 500 – 100 000	--	--	1	30

9.1.1. Friis transmission formula: Pd = (Pout*G)/(4*pi*R^2)

Where Pd = power density in ㎽/㎠

Pout = output power to antenna in ㎽

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in ㎝

Pd the limit of MPE, 1 ㎽/㎠. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

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9.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data
Test Mode : Normal Operation

9.1.3. Output Power into Antenna & RF Exposure Evaluation Distance

Channel	Channel Frequency (㎒)	Output Average Power to Antenna (dB m)	Antenna Gain (dB i)	Duty Cycle (%)	Power Density at 20 ㎝ (㎽/㎠)	LIMITS (㎽/㎠)
Low	450.025	31.33	-2.61	100	0.148 160	0.30
Middle	457.575	31.70	-2.61	100	0.161 336	0.31
High	469.975	31.43	-2.61	100	0.151 611	0.31

Note :
1. The power density Pd (5th column) at a distance of 20 ㎝ calculated from the friis transmission formula is far below the limit .

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