EMC TEST REPORT

No. SH10091192-001

Applicant	:	Raffel Systems, LLC N112 W14600 Mequon Road, Germantown, Wisconsin, 53022, United States
Manufacturer	:	Raffel Systems, LLC N112 W14600 Mequon Road, Germantown, Wisconsin, 53022, United States
Equipment	:	VB-1000 Wireless Audio System
Type/Model	:	V-XMTR (Transmitter)

SUMMARY

The equipment complies with the requirements according to the following standard(s):

47CFR Part 15 (2009): Radio Frequency Devices

ANSI C63.4 (2003): American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

RSS-210 Issue 7 (June 2007): Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

RSS-Gen Issue 2 (June 2007): General Requirements and Information for the Certification of Radiocommunication Equipment

Date of issue: Nov 23, 2010

Prepared by:

Wakeyou Wang (*Project Engineer*)

Reviewed by:

Daniel Zhao (*Reviewer*)

Description of Test Facility

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IC Assigned Code: 2042B-1

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Content

1. General Information

1.1 Applicant Information

Applicant:	Raffel Systems, LLC N112 W14600 Mequon Road, Germantown, Wisconsin, 53022, United States
Name of contact:	Edward A. Nowak
Tel: Fax:	262-502-1011 ext 1013 262-502-1010
Manufacturer:	Raffel Systems, LLC N112 W14600 Mequon Road, Germantown, Wisconsin, 53022, United States

Sample received date	:	Oct 10, 2010
Sample Identification No	:	*0101010-18-001*
Date of test	:	Oct 10, 2010 ~ Nov 2, 2010

1.2 Identification of the EUT

Equipment:	VB-1000 Wireless Audio System
Type/model:	V-XMTR (Transmitter)
FCC ID:	YZH-VB1000XMTR
IC:	9314A-1000XX

1.3 Technical specification

Operation Frequency Band:	902MHz - 928MHz
Modulation:	FSK
Antenna Designation:	PCB antenna, non-user removable.
Gain of Antenna:	1.2dBi
Rating:	Built-in Battery: DC 2*1.5V Working frequency: 914.00MHz, 914.50MHz, 915.00MHz
Description of EUT:	There is one model only. The EUT is a transmitter to transmit wireless audio signal to the corresponding receiver.
Channel Description:	There are three channels, namely 914.00MHz, 914.50MHz and 915.00MHz.

1.4 Mode of operation during the test / Test peripherals used

Within this test report, EUT was tested with modulation and tested under its rating voltage and frequency.
The EUT is a mobile device and was tested according as its normal using condition.
While testing the EUT, an IPod (model: A1199) generating digital audio signal (1kHz) were used as a test peripheral.

2. Test Specification

2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESIB 26	R&S	EC 3045	2010-4-10	2011-4-9
Semi-anechoic chamber	-	Albatross project	EC 3048	2010-11-1	2011-10-31
A.M.N.	ESH2-Z5	R&S	EC 3119	2010-1-11	2011-1-10
Test Receiver	ESCS 30	R&S	EC 2107	2010-4-10	2011-4-9
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2010-6-2	2011-6-1
Horn antenna	HF 906	R&S	EC 3049	2010-4-10	2011-4-9
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2010-9-18	2011-9-17
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2010-2-8	2011-2-7
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2010-2-8	2011-2-7
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2010-2-8	2011-2-7
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2010-2-8	2011-2-7

2.2 Test Standard

47CFR Part 15 (2009)
ANSI C63.4: 2003
RSS-210 Issue 7 (June 2007)
RSS-Gen Issue 2 (June 2007)

2.3 Test Summary

This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Fundamental & Harmonics	15.249(a)	RSS-210 Issue 7 Annex A2.9	Pass
Spurious emission	15.249(c)	RSS-210 Issue 7 Annex A2.9	Pass
Power line conducted emission	15.207	RSS-Gen Issue 2 Clause 7.2.2	NA
Emission bandwidth	15.215(c)	-	Pass
Occupied bandwidth	-	RSS-Gen Issue 2 Clause 4.6.1	Tested

3. Fundamental & Spurious Emission & Restrict band radiated emission

Test result: **PASS**

3.1 Test limit

3.1.1 The emission shall test through the 10th harmonic or to 40GHz, whichever is lower. It must comply with the limits below:

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonics limit (dBuV/m)
☒902 – 928	94	54
☐2400 – 2483.5	94	54
☐5725 – 5875	94	54

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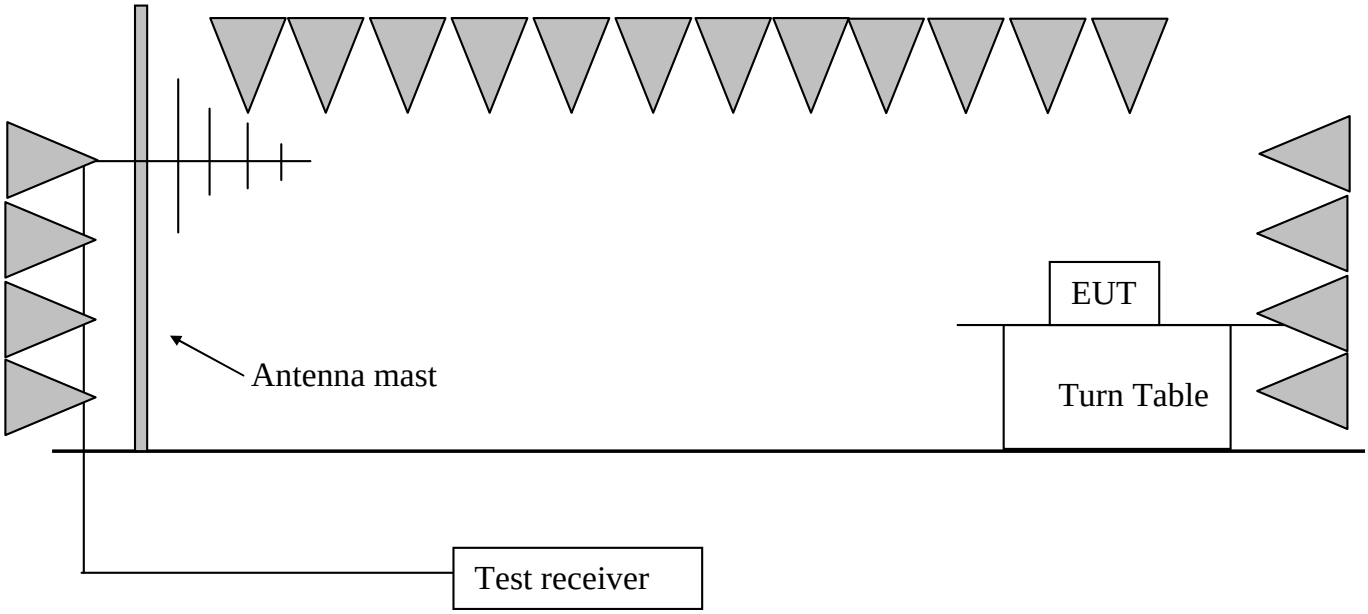
3.1.2 Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209 as showed as below, whichever is the lesser attenuation.

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

3.2 Test Configuration



3.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, the pre-amplifier and high pass filter is equipped just at the output terminal of the antenna.
The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.
The radiated emission was measured using the test receiver with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz~1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK)

3.4 Test protocol

CH	Ant	Frequency (MHz)	Correct Factor (dB/m)	Corrected Reading (dBuV/m)	Emission Type	Limit (dBuV/m)	Margin	Detector
L	H	914.26	24.20	80.60	Fundamental	94.00	13.40	PK
	H	1828.32	-8.80	40.30	Harmonics	54.00	13.70	PK
	H	2741.50	-5.20	41.40	Harmonics	54.00	12.60	PK
	H	3656.88	-2.90	40.10	Harmonics	54.00	13.90	PK
	V	591.78	21.20	38.90	Spurious	46.00	7.10	PK
	H	786.17	23.20	41.60	Spurious	46.00	4.40	PK
	H	788.12	23.20	42.20	Spurious	46.00	3.80	PK
M	H	914.46	24.20	80.40	Fundamental	94.00	13.60	PK
	H	1828.59	-8.80	40.10	Harmonics	54.00	13.90	PK
	H	2741.97	-5.20	41.30	Harmonics	54.00	12.70	PK
	H	3657.52	-2.90	40.10	Harmonics	54.00	13.90	PK
	V	591.78	21.20	38.90	Spurious	46.00	7.10	PK
	H	786.17	23.20	41.60	Spurious	46.00	4.40	PK
	H	788.12	23.20	42.20	Spurious	46.00	3.80	PK
H	H	915.83	24.20	80.50	Fundamental	94.00	13.50	PK
	H	1828.00	-8.80	40.30	Harmonics	54.00	13.70	PK
	H	2741.50	-5.20	41.20	Harmonics	54.00	12.80	PK
	H	3658.00	-2.90	40.00	Harmonics	54.00	14.00	PK
	V	591.78	21.20	38.90	Spurious	46.00	7.10	PK
	H	786.17	23.20	41.60	Spurious	46.00	4.40	PK
	H	788.12	23.20	42.20	Spurious	46.00	3.80	PK

Remark: 1.Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz)
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = limit - Corrected Reading

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB, Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV, limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m; Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m; Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

4. Deactivating time

Test result: **NA**

4.1 Test limit

☐ (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

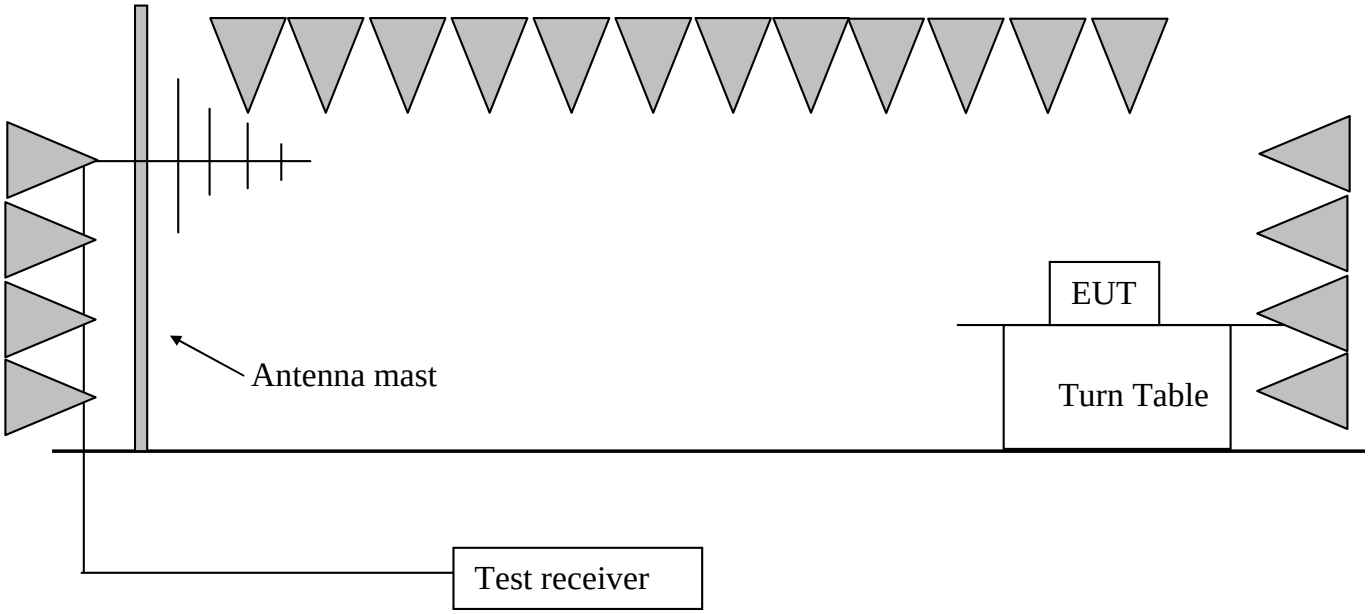
☐ (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

☐ (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

☐ (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

☐ (5) Transmission of set-up information for security systems may exceed the transmission duration limits in (1) and (2) above, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

4.2 Test Configuration



4.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber.
The central frequency of test receiver was set as the operating frequency of EUT and the Span was set as 0.
The EUT was switched once. The test receiver recorded the whole time from the triggered moment to the time of stopping radiating. For manual switching, to avoid uncertainty, the operating above would be repeated five times and the worst data is recorded.

4.4 Test protocol

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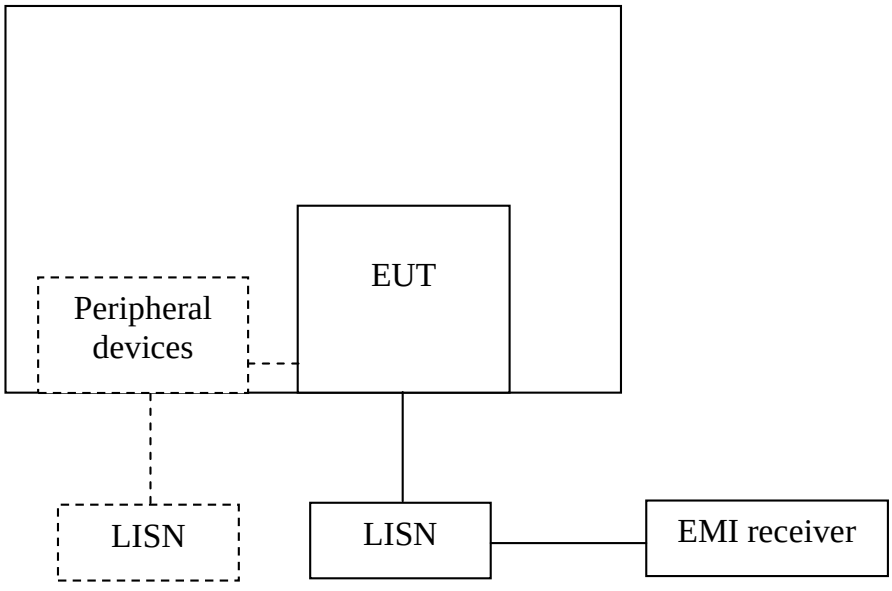
5. Power line conducted emission

Test result: **NA**

5.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

5.2 Test configuration



☐ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

5.3 Test procedure and test set up

The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.
The bandwidth of the test receiver is set at 9 kHz.

5.4 Test protocol

Power line: L

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB).
2. Margin (dB) = Limit - Corrected Reading.
3. If the margin higher than 20dB, it would be marked as *.

Power line: N

Frequency	Correct Factor (dB)	Corrected Reading (dBuV)		Limit (dBuV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

Remark: 1. Correction Factor (dB) = LISN Factor (dB) + Cable Loss (dB).
2. Margin (dB) = Limit - Corrected Reading.
3. If the margin higher than 20dB, it would be marked as *.

6. Emission Bandwidth

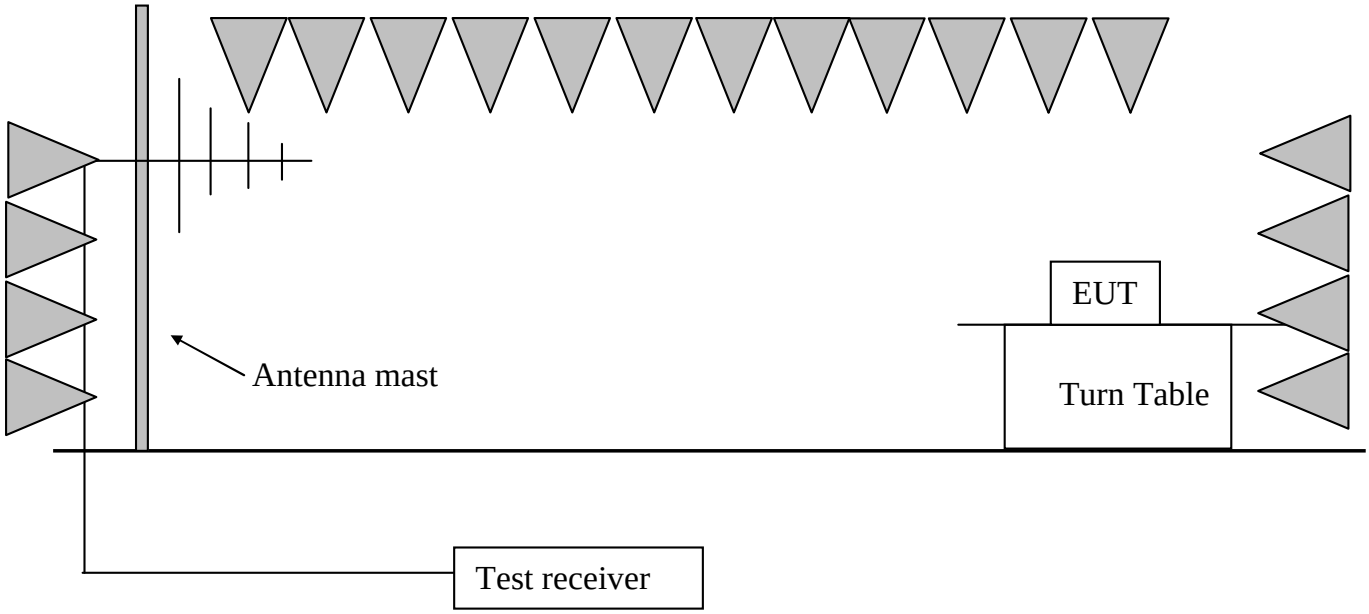
Test Status: Pass

6.1 Test limit

The 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

The frequency range for the EUT is **904.6MHz – 925.4MHz.**

6.2 Test Configuration



6.3 Test procedure and test setup

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.
The central frequency of test receiver was set near the operating frequency of EUT.
The test was conducted using the Spectrum Analyzer with the resolutions bandwidth set at 10kHz, the video bandwidth set at 30kHz.

6.4 Test protocol

Temperature : 22 °C
Relative Humidity : 43 %

Channel	Edge frequency (MHz)	Limit (MHz)	Result
L	913.95	904.60	Pass
H	915.05	925.40	

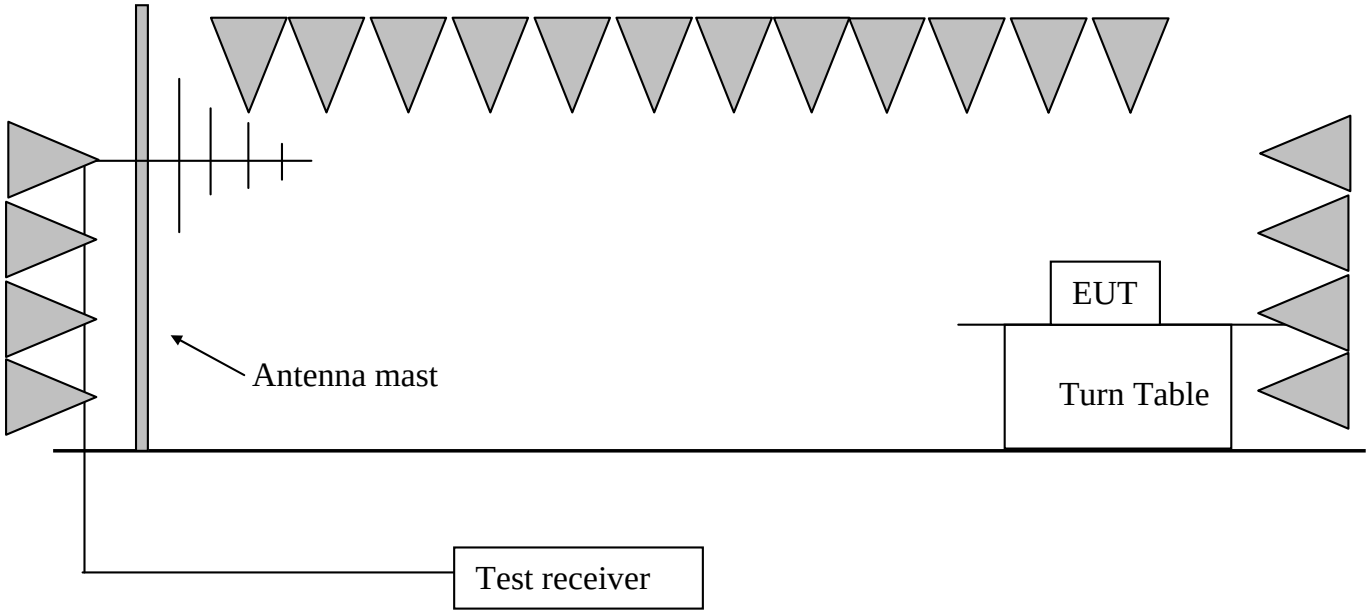
7. Occupied Bandwidth

Test Status: Tested

7.1 Test limit

None

7.2 Test Configuration



7.3 Test procedure and test setup

The occupied bandwidth per RSS-Gen Issue 2 Clause 4.6.1 was measured using the Spectrum Analyzer with the resolutions bandwidth set at 10kHz, the video bandwidth set at 30kHz.

7.4 Test protocol

Temperature : 22 °C
Relative Humidity : 43 %

Occupied Bandwidth (kHz)
84.17