

FCC Part 74 Subpart H
EMI TEST REPORT
of

E.U.T. : Wireless Microphone

FCC ID. : L3XYMV-2

MODEL : YMV-2

Working Frequency : 210.638MHz

for

APPLICANT : YOGA ELECTRONICS CO., LTD.

ADDRESS : 4F, NO.23, ALLEY 10, LANE 321, SIN MIN
ROAD, NEIHU, TAIPEI, TAIWAN, R.O.C.

Test Performed by

ELECTRONICS TESTING CENTER, TAIWAN

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Report Number : ET93R-04-048-01

TEST REPORT CERTIFICATION

Applicant : YOGA ELECTRONICS CO., LTD.
4F, NO.23, ALLEY 10, LANE 321, SIN MIN ROAD, NEIHU,
TAIPEI, TAIWAN, R.O.C.

Manufacturer : YOGA ELECTRONICS CO., LTD.
4F, NO.23, ALLEY 10, LANE 321, SIN MIN ROAD, NEIHU,
TAIPEI, TAIWAN, R.O.C.

Description of EUT :

a) Type of EUT : Wireless Microphone
b) Trade Name : YOGA
c) Model No. : YMV-2
d) FCC ID : L3XYMV-2
e) Working Frequency : 210.638MHz
f) Power Supply : DC 3V Batteries

Regulation Applied : FCC Rules and Regulations Part 74 Subpart H (2001)

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Issued Date : May. 21, 2004

Test Engineer : 
(Falcon Shi)

Approve & Authorized Signer : 
Will Yauo, Manager
EMC Dept. II of ELECTRONICS
TESTING CENTER, TAIWAN

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1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	: Wireless Microphone
b) Trade Name	: YOGA
c) Model No.	: YMV-2
d) FCC ID	: L3XYMV-2
e) Working Frequency	: 210.638MHz
f) Power Supply	: DC 3V Batteries

1.2 Characteristics of Device:

1. Operating Frequency: 210.638MHz
2. Transmitting Power: -27dBm
3. Modulation: FM
4. Microphone:Frequency Response: 100Hz~12KHz
5. Operation temperature: 50°C ~0°C
6. The emission designation is 74K8F3E. The calculation is $(2M+2DK)$, $K=1$ and $(2*12.0+2*25.4)=78.4\text{KHz}$, so the emission designation is 74K8F3E.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in chapter 13 of ANSI C63.4. and section 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, and 2.1055 of Part 2 of CFR 47

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the roof top of Building at No. 34, Lin 5, Ding Fu Tsun, Linkou Hsiang, Taipei Hsien, Taiwan, R.O.C.

This site has been fully described in a report submitted to your office, and accepted in a letter dated Feb. 10, 2000.

2. REQUIREMENTS OF PROVISIONS

2.1 Definition

Intentional radiator:

A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Frequencies Available

According to sec. 74.802 of Part 74, the following frequencies are available for low power auxiliary station :

Frequencies (MHz)

26.100-26.480	455.000-456.000
54.000-72.000	470.000-488.000
76.000-88.000	488.000-494.000
161.625-161.775	614.000-806.000
174.000-216.000	450.000-451.000
944.000-952.000	

2.3 Requirements for Radio Equipment on Certification

(1) RF Output Power

For transmitters, the power output shall be measured at the RF output terminals.

(2) Modulation Characteristics

For Voice Modulated Communication Equipment, a curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted.

(3) Occupied Bandwidth

For radiotelephone transmitter, other than single sideband or independent sideband transmitter, when modulated by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

(4) Spurious Emissions at Antenna Terminals

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminal when properly loaded with a suitable artificial antenna.

(5) Field Strength of Spurious Emissions

Measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation.

(6) Frequencies Tolerance

- a) The frequency stability shall be measured with variation of ambient temperature.
- b) The frequency stability shall be measured with variation of primary supply voltage.

2.4 Labeling Requirement

Each equipment for which a type acceptance application is filed on or after May 1,1981, shall bear an identification plate or label pursuant to §2.925 (Identification of equipment) and § 2.926 (FCC identifier) .

3. OUTPUT POWER MEASUREMENT

3.1 Provision Applicable

According to §4.861(e)(1)(i), the output power shall not exceed 50 milliwatts.

3.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power as measured in chapter 3.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° , and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.
7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

Figure 1 : Frequencies measured below 1 GHz configuration

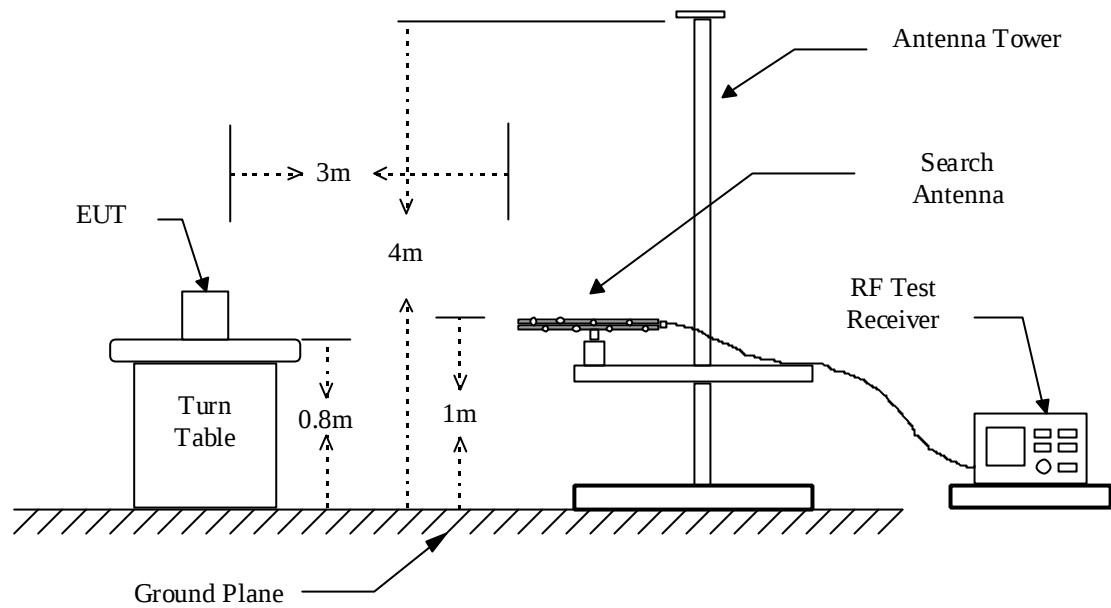
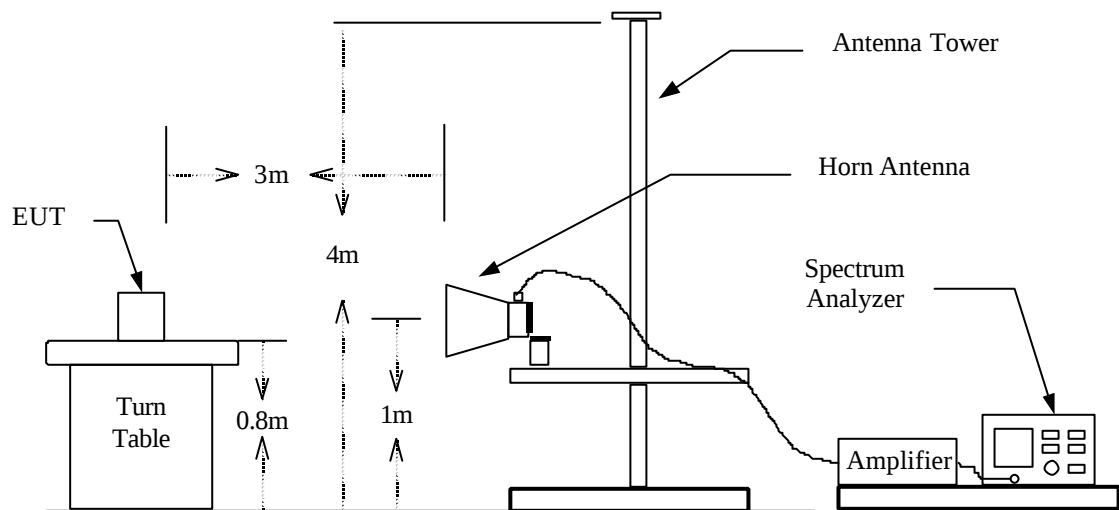


Figure 2 : Frequencies measured above 1 GHz configuration



3.3 Test Data

ERP

Operated mode : Tx
Temperature : 23 °C

Test Date : May. 18, 2004
Humidity : 63 %

Frequency (MHz)	Meter Reading (dB μ V/m)	SG Reading (dBm)	Cable Loss (dB)	Antenna Gain	Result (dBm)	Output Power (mW)	Limit (dBm)
210.638	73.5	-8.1	1.1	---	-26.7	0.002	-13

Note: For measured frequency below 1GHz, a tuned dipole antenna is used.

3.4 Result Calculation

Result calculation is as following :

Result = SG Reading + Cable Loss + Antenna Gain Corrected

Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.

$$\text{mW} = \log^{-1} \left[\frac{\text{Result(dBm)}}{10} \right]$$

3.5 Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
EMI Test Receiver	R&S	ESBI	05/25/2004
Plotter	HP	7440A	N/A

4. MODULATION CHARACTERISTICS

4.1 Provisions Applicable

According to §2.1047 (a), for Voice Modulated Communication Equipment, the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be measured.

4.2 Measurement Method

A) Frequency response of audio circuits

1. Position the EUT as shown in figure 3.
2. Vary the modulating frequency from 100 Hz to 5000 Hz with varying the input voltage from 0V to maximum permitted input voltage, and observe the change in output.

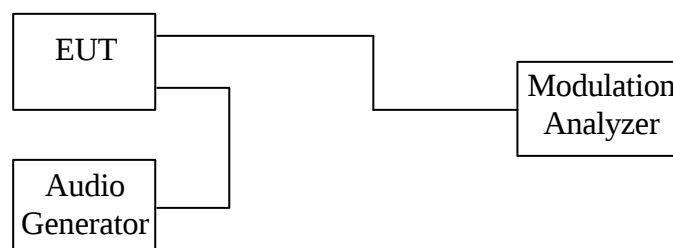
B) Modulation Limit

1. Position the EUT as shown in figure 3, adjust the audio input frequency to 100 Hz and the input level from 0V to maximum permitted input voltage with recording each carrier frequency deviation responding to respective input level.
2. Repeat step 1 with changing the input frequency for 200, 500, 1000, 3000, and 5000 Hz in sequence.

C) Frequency response of all circuits

1. Position the EUT as shown in figure 3.
2. Vary the modulating frequency from 100 Hz to 15000 Hz with constant input voltage (derived from 5.4(a) of this test report), and observe the change in output.

Figure 3 : Modulation characteristic measurement configuration

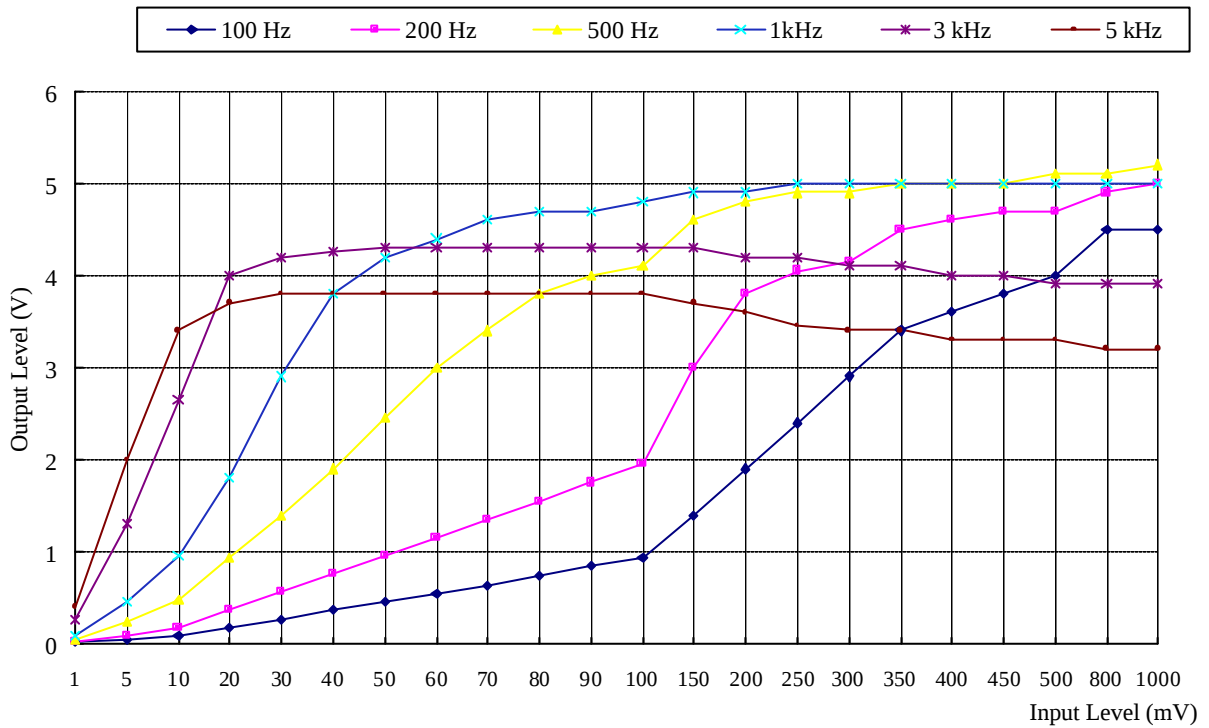


4.3 Measurement Instrument

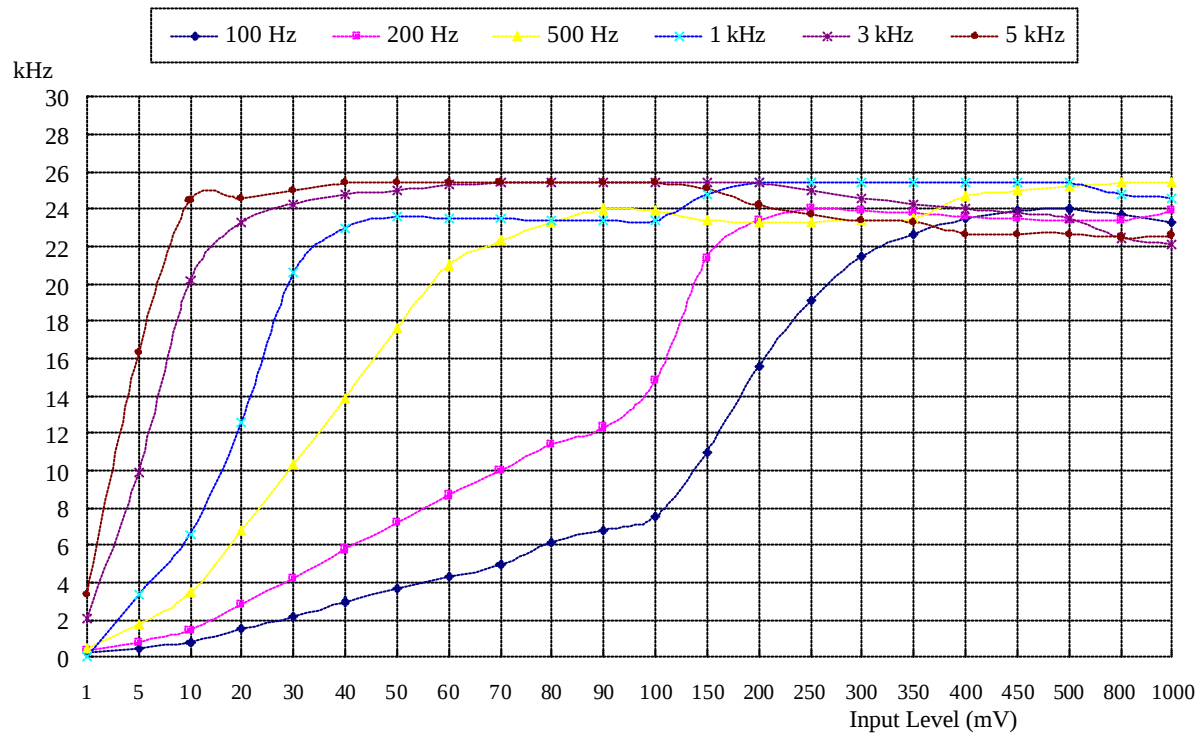
Equipment	Manufacturer	Model No.	Next Cal. Date
Modulation Analyzer	Hewlett-Packard	8901A	12/01/2004
Multifunction Synthesizer	Hewlett-Packard	8904A	12/11/2004
Oscilloscope	Lecroy	9350A	05/26/2004

4.4 Measurement Result

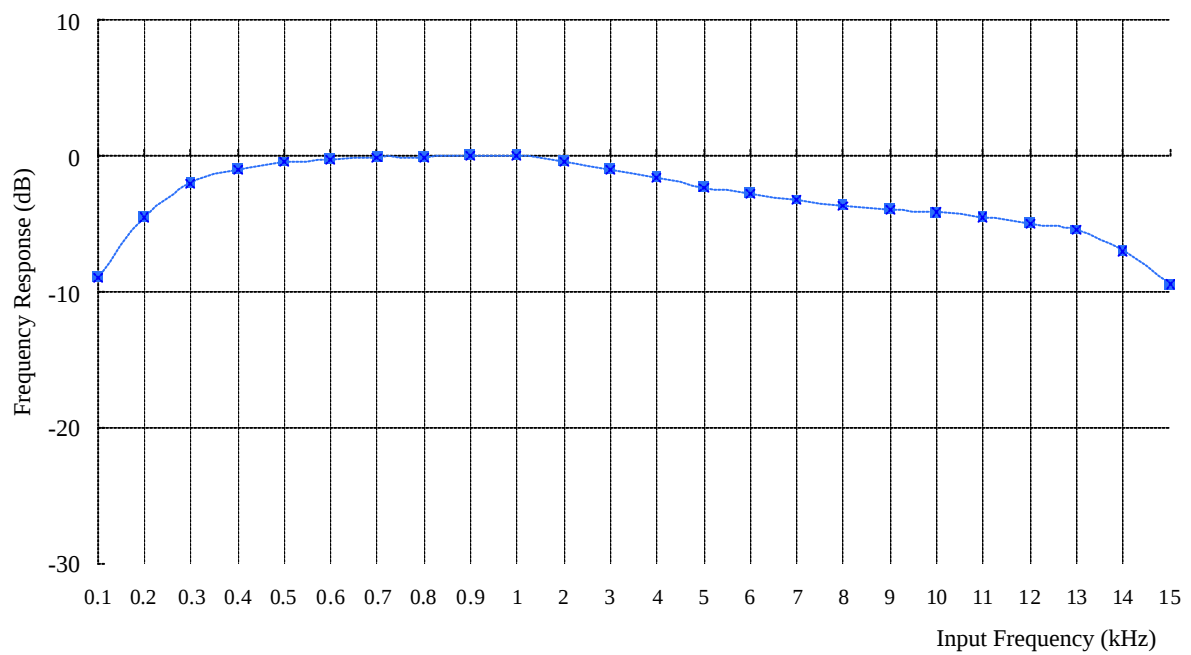
A). Frequency response



B). Modulation Limit



C). Frequency response of all circuits



5. OCCUPIED BANDWIDTH OF EMISSION

5.1 Provisions Applicable

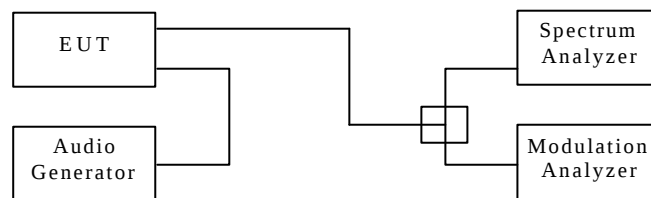
According to §2.1049 (c)(1), For radiotelephone transmitter, other than single sideband or independent sideband transmitter, when modulated by a 2.5kHz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

According to §4.861(e)(5), the frequency emission bandwidth shall not exceed 200 kHz.

5.2 Measurement Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 4, and Install new batteries in the EUT. Turn on the EUT and set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Apply a 2.5 kHz modulation signal to EUT and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB below the reference level set in step 2. This is the occupied bandwidth specified.

Figure 4 : Occupied bandwidth measurement configuration

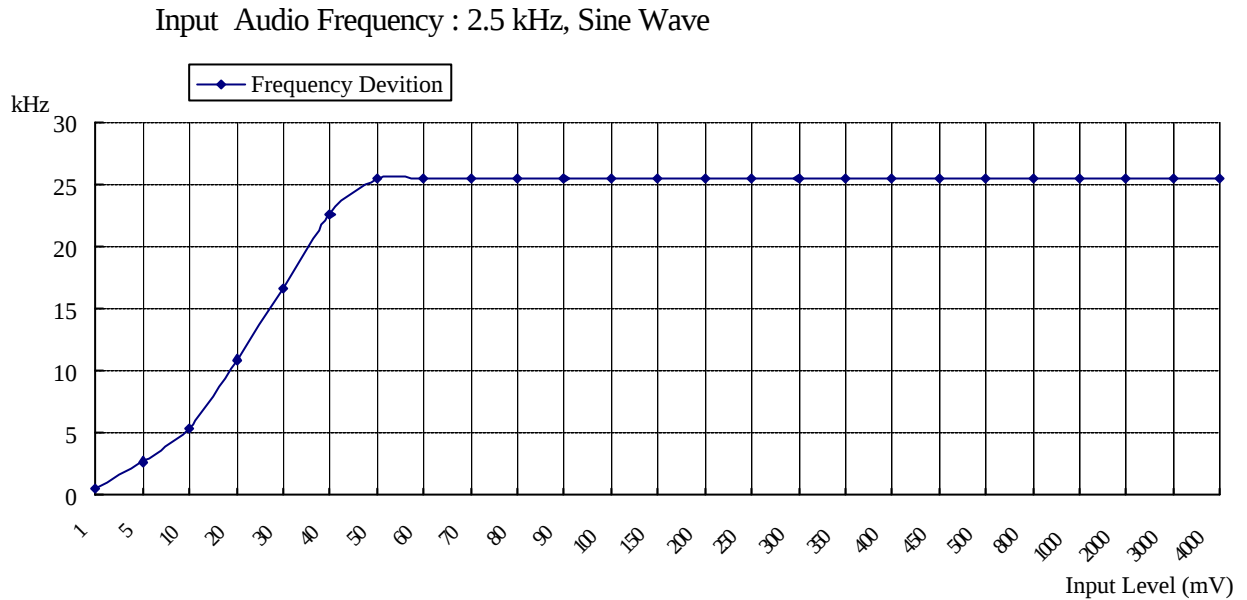


5.3 Occupied Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	R&S	ESBI	05/25/2004
Modulation Analyzer	Hewlett-Packard	8901A	12/01/2004
Multifunction Synthesizer	Hewlett-Packard	8904A	12/11/2004
Plotter	Hewlett-Packard	7440A	N/A

5.4 Bandwidth Measured

5.4.1 Input Level Derived



The Level input to produce 50 % modulation is 21 mV, therefore the magnitude 16 dB greater than it is 132.5 mV.

5.4.2 Occupied Bandwidth Plotted

The Channel down 26 dB Bandwidth is 83.5KHz.

Please see appendix 1 for plotted data.

6. FIELD STRENGTH OF EMISSION

6.1 Provisions Applicable

According to §2.1053, measurements shall be made to detect spurious emission that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal condition of installation and operation. Information submitted shall include the relative radiated power of spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from a halfwave dipole antenna.

According to §4.861(e)(6), the mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (i) on any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.
- (ii) on any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.
- (iii) on any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth shall be attenuated below the unmodulated carrier by at least 43 plus 10 Log(output power in watts) dB.

6.2 Measurement Procedure

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively, adjusting the input voltage to produce the maximum power as measured in chapter 3.
2. Adjust the analyzer for each frequency measured in chapter 6 on a 1 MHz frequency span and 1MHz resolution bandwidth.
3. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° , and record the highest value indicated on spectrum analyzer as reference value.
4. Repeat step 3 until all frequencies need to be measured were complete.
5. Repeat step 4 with search antenna in vertical polarized orientations.
6. Replace the EUT with a tuned dipole antenna (horn antenna for above 1 GHz) relative to each frequency in horizontally polarized orientation and as the same polarized orientation with search antenna. Connect the tuned dipole antenna to a standard signal generator (SG) via a low loss cable. Power on the SG and tune the right frequency in measuring as well as set SG at a appreciated output level. Rise and lower the search antenna to get the highest value on spectrum analyzer, and then hold this position. Adjust the SG output to get a identical value derived from step 3 on spectrum analyzer. Record this value for result calculated.

7. Repeat step 6 until all frequencies need to be measured were complete.
8. Repeat step 7 with both dipole antenna (horn antenna for above 1 GHz) and search antenna in vertical polarized orientations.

6.3 Measuring Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Test Receiver	Rohde & Schware	ESVS30	08/09/2004
Spectrum Analyzer	Hewlett-Packard	8564E	07/21/2004
Horn Antenna	EMCO	3115	08/12/2004
Log periodic Antenna	EMCO	3146	12/22/2004
Biconical Antenna	EMCO	3110B	12/22/2004
Preamplifier	Hewlett-Packard	8449B	06/30/2004
Preamplifier	Hewlett-Packard	8447D	02/18/2005
Diple Antenna	EMCO	3121C	12/22/2004

Measuring instrument setup in frequency band measured is as following :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz

6.4 Measuring Data

A. ERP

Operated mode : TX
Temperature : 23°C

Test Date : May. 18, 2004
Humidity : 63%

Unmodulated carrier output power is -26.7 dBm , or 0.002 mW (ERP).

The limit of spurious or harmonics is calculated as following :

$$-26.7 - [43 + 10 \log(\text{carrier output power in W})], \text{ or } -13 \text{ dBm}$$

Frequency (MHz)	Meter Reading (dBuV)		SG Reading (dBm)		Antenna Gain	Cable Loss (dB)	Result (dBm)		Limit (dBm)	Margin (dB)
	H	V	H	V			H	V		
71.580	35.8	46.6	-37.7	-22.0	---	0.5	-64.2	-48.5	-13.0	-35.5
282.720	38.0	48.0	-36.5	-24.1	---	1.4	-59.5	-47.1	-13.0	-34.1
344.800	25.0	31.2	-50.5	-40.8	---	1.6	-70.8	-61.1	-13.0	-48.1
414.800	29.6	36.0	-46.5	-37.2	---	1.7	-68.8	-59.5	-13.0	-46.5
485.500	30.8	38.0	-47.3	-36.2	---	1.9	-71.6	-60.5	-13.0	-47.5

Note :

1. Remark “---” means that the emission level is too weak to be detected.
2. For measured frequency below 1GHz, a tuned dipole antenna is used.
3. Result calculation is as following :

$$\text{Result} = \text{SG Reading} + \text{Antenna Gain} + \text{Antenna Gain Corrected} + \text{Cable Loss}$$
 Antenna Gain Corrected : is used for antenna other than dipole to convert radiated power to ERP.
4. Spurious or harmonics above 1 GHz is too low to be detected or attenuated more than 60 dB from limit value.

B. Emission mask plots

Please see appendix 2 for plotted data

6.5 Radiated Measurement Photos

Please see Exhibit-F-Setup_Photos

7. FREQUENCY STABILITY MEASUREMENT

7.1 Provisions Applicable

According to §2.1055 (a)(1), the frequency stability shall be measured with variation of ambient temperature from -30°C to +50°C centigrade, and according to §2.1055 (d)(2), the frequency stability shall be measured with reducing primary supply voltage to the battery operating end point which is specified by the manufacturer.

According to §4.861(e)(4), the frequency tolerance of the transmitter shall be 0.005 percent.

7.2 Measurement Procedure

A) Frequency stability versus environmental temperature

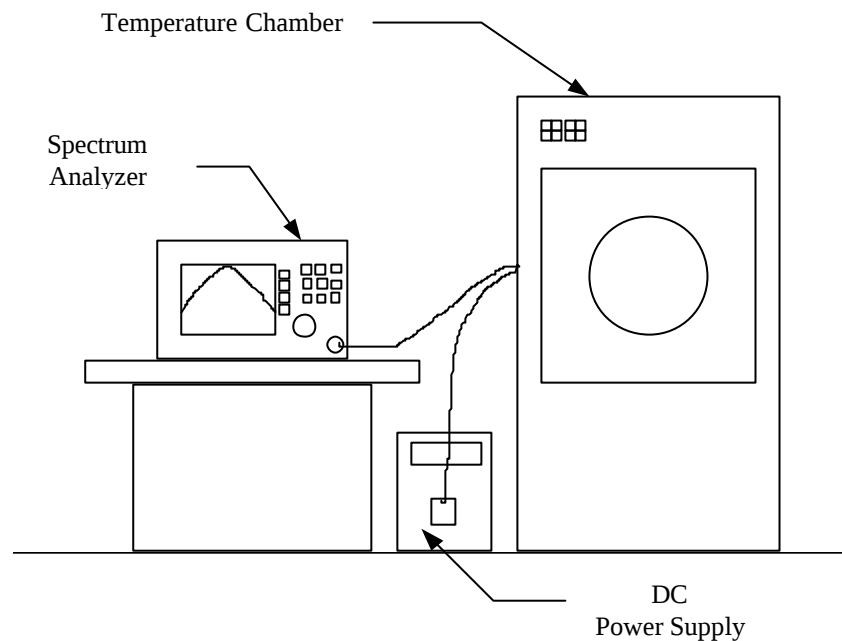
1. Setup the configuration per figure 5 for frequencies measured at ambient temperature if it is within 15°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C shall be used. Install new batteries in the EUT.
2. Turn on EUT and set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. Set the temperature of chamber to 50°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 lowest temperature -30°C is measured, record all measurement frequencies.

B) Frequency stability versus input voltage

1. Setup the configuration per figure 7 for frequencies measured at ambient temperature if it is within 15°C to 25°C. Otherwise, an environmental chamber set for a temperature of 20°C shall be used. Install new batteries in the EUT.

2. Set SA center frequency to the right frequency needs to be measured. Then set SA RBW to 30 kHz, VBW to 100kHz and frequency span to 500 kHz. Record this frequency to be a reference.
3. For battery operated only device, supply the EUT primary voltage at the battery operating end point which is specified by the manufacturer and record the frequency.

Figure 5 : Frequency stability measurement configuration



7.3 Measurement Instrument

Equipment	Manufacturer	Model No.	Next Cal. Date
Spectrum Analyzer	HP	8564E	07/21/2004
Temperature Test Chamber	MALLIER	MCT-2X-M	10/22/2004

7.4 Measurement Data

A1.Frequency stability versus enviroment tempture

Reference Frequency : 210.639 MHz Limit : 0.005%							
Enviroment Tempture (° C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
50	New Batt.	210.6423	0.00155	210.6465	0.00356	210.6463	0.00348
40		210.6320	-0.00334	210.6456	0.00312	210.6351	-0.00185
30		210.6431	0.00192	210.6432	0.00198	210.6318	-0.00342
20		210.6362	-0.00132	210.6376	-0.00065	210.6321	-0.00328
10		210.6370	-0.00097	210.6380	-0.00046	210.6438	0.00228
0		210.6380	-0.00047	210.6347	-0.00205	210.6460	0.00333
-10		210.6339	-0.00244	210.6407	0.00082	210.6350	-0.00192
-20		210.6441	0.00241	210.6421	0.00148	210.6368	-0.00105
-30		210.6382	-0.00039	210.6421	0.00147	210.6429	0.00184

A2. Frequency stability versus end-point supplied voltage (2Vdc)

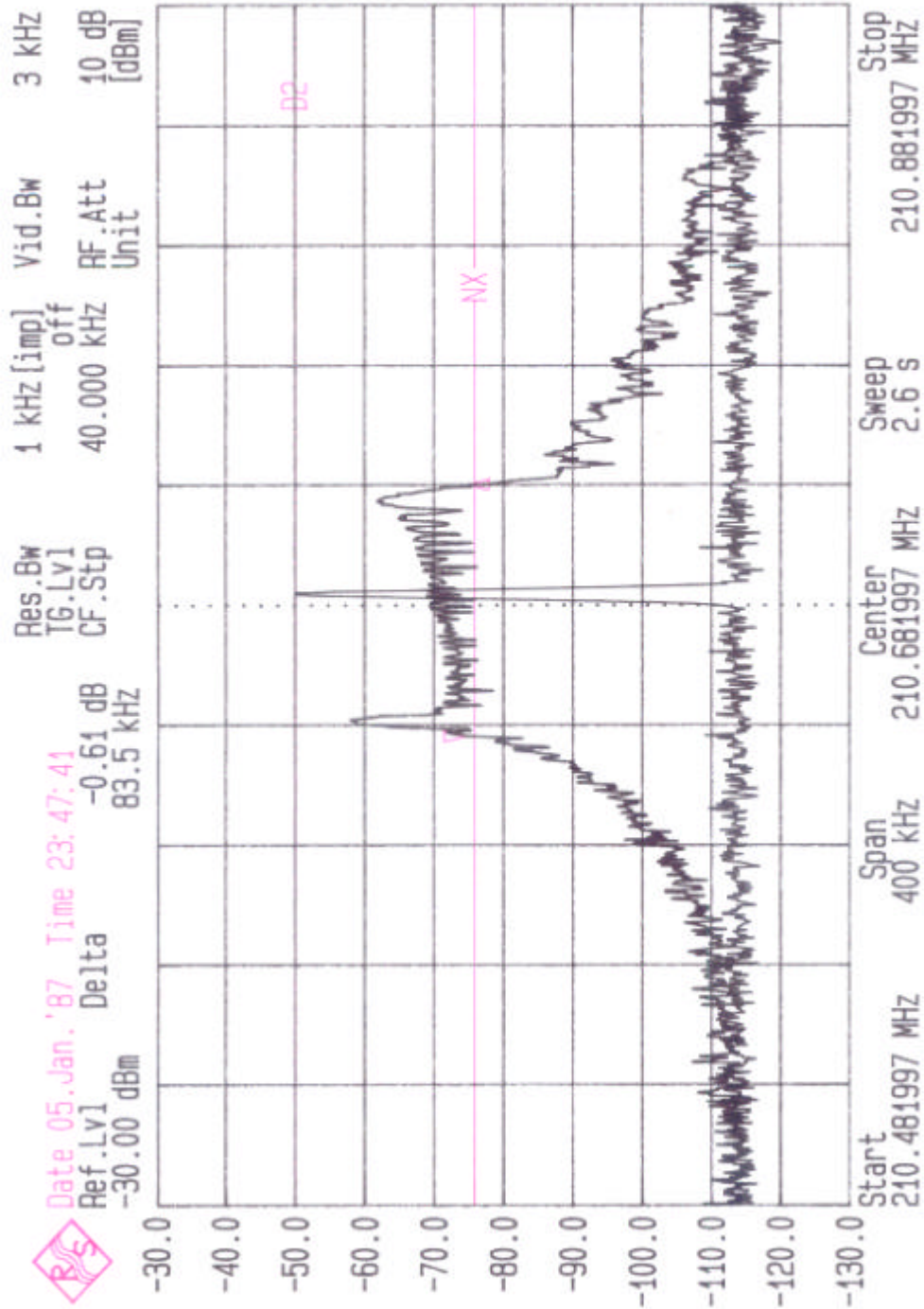
Reference Frequency : 210.639 MHz Limit : 0.005%							
Enviroment Tempture (° C)	Power Supplied (Vdc)	Frequency measured with time elapsed					
		2 minute		5 minute		10 minute	
		(MHz)	(%)	(MHz)	(%)	(MHz)	(%)
25	End-Point	210.6368	-0.00107	210.6372	-0.00083	210.6454	0.00302

8 CONDUCTED EMISSION MEASUREMENT

8.1 Description

This EUT is excused from investigation of conducted emission, for it is powered by DC 3V battery only. According to §15.207 (d), measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

Appendix 1 : Occupied Emission Bandwidth Plotted Data



Appendix 2 : Emission Mask Plotted Data

