



EMI TEST REPORT

Test Report No. : 29GE0009-HO-01-A-R1

Applicant : Edmo Distributors, Inc.
Type of Equipment : VHF AM TRANSCEIVER
Model No. : FL-M1000A
Test standard : FCC Part 87: 2006
FCC ID : VOSFL-M1000A
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the client product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. Original test report number of this report is 29GE0009-HO-01-A.

Date of test:

February 19 to 28, 2009

Tested by:

Hironobu Ohnishi
EMC Services

Approved by :

Hironobu Shimoji
Assistant Manager of EMC Services

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

MF060b (09.01.08)

CONTENTS	PAGE
SECTION 1: Client information	3
SECTION 2: Equipment under test (E.U.T.)	3
SECTION 3: Test specification, procedures and results.....	4
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: RF Output power	9
SECTION 6: Audio Frequency Response.....	10
SECTION 7: Modulation Limiting	11
SECTION 8: Emission limitations.....	12
SECTION 9: Spurious emission at Antenna Terminal	13
SECTION 10: Field Strength of Spurious Emission.....	14
SECTION 11: Frequency Stability Measurement	16
SECTION 12: 99% Occupied Bandwidth	17
APPENDIX 1: Photographs of test setup	18
APPENDIX 2: Data of EMI test	20
RF Output Power (Conducted).....	20
Audio Frequency Response (Conducted).....	21
Modulation Limiting (Conducted)	25
Emission limitations (Conducted)	29
Spurious Emissions (Conducted).....	31
Spuripous Emissions (Radiated) (Transmitting)	37
Frequency Stability (Conducted).....	40
99% Occupied Bandwidth (Conducted)	41
APPENDIX 3: Test Instruments	42

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SECTION 1: Client information

Company name : Edmo Distributors, Inc.
Address : 12830 East Mirabeau Parkway, Spokane Valley, WA 99216 U.S.A.
Telephone Number : +1-509-535-8280
Facsimile Number : +1-509-535-8266
Contact Person : Jeff Christensen

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : VHF AM TRANSCEIVER
Model No. : FL-M1000A
Serial No. : 01
Rating : DC 13.8V (DC 11.7V to 16V) or DC 26.4V (DC 21V to 31V)
Country of Manufacture : JAPAN
Receipt Date of Sample : February 19, 2009
Condition of EUT : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab.

2.2 Product Description

Model: FL-M1000A (referred to as the EUT in this report) is the VHF AM TRANSCEIVER.
The VHF AM TRANSCEIVER is used for the Aeronautical utility mobile and Aviation support.

Equipment Type : Transceiver
Emission Designation : 6K00A3E
Frequency of Operation : 118.000MHz to 136.975MHz
Other Clock Frequency : IF : 38.85MHz (1st) and 450kHz (2nd)
4.194304MHz (CPU), 38.400MHz (2nd Local), 12.8MHz (TCXO)
Modulation : AM
Channel spacing : 25kHz
Method of Frequency Generation : Synthesized method
Antenna Type : 1 / 4 wave whip
Antenna Connector : SO-239 (M type)
Operating temperature range : -30 deg.C. to +60 deg.C.
(Radio part) Operating Voltage (inner) : DC 13.8V

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SECTION 3: Test specification, procedures and results

3.1 Test Specification

Test Specification : FCC Part87: 2006
Title : AVIATION SERVICES
Class of Station : Aeronautical utility mobile

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	RF Output Power	FCC Section 2.1046, TIA/EIA-603-C Section 2.2.1	Section 87.131	-	N/A	-	Complied
2	Audio Frequency Response	FCC Section 2.1047(a), TIA/EIA-603-C Section 2.2.6	-	-	N/A	-	Complied
3	Modulation Limiting	FCC Section 2.1047(b), TIA/EIA-603-C Section 2.2.3	Section 87.141(a)	-	N/A	-	Complied
4	Emission limitations	FCC Section 2.1049, TIA/EIA-603-C Section 2.2.11	Section 87.139(a)	-	N/A	-	Complied
5	Spurious Emission at Antenna Terminals	FCC Section 2.1051, TIA/EIA-603-C Section 2.2.13	Section 87.139(a)(3)	-	N/A	3.48dB 97.1MHz	Complied
6	Field Strength of Spurious Emission	Section 2.1053, TIA/EIA-603-C Section 2.2.12	Section 87.139(a)(3)	-	N/A	7.2dB 236.000MHz Vertical	Complied
7	Frequency Stability Measurement	Section 2.1055, TIA/EIA-603-C Section 2.2.2	Section 87.133(a)	-	N/A	-	Complied
8	99% Occupied Bandwidth	FCC Section 2.1049, TIA/EIA-603-C Section 2.2.11	Section 87.135, 87.137(a)	-	N/A	-	Complied

Note: UL Japan, Inc.'s EMI Work Test Procedure QPM05 and QPM48.

Refer to "OVERVIEW OF FEDERAL COMMUNICATIONS COMMISSION TELECOMMUNICATION CERTIFICATION BODY PROGRAM (September 30, 2005)"

*These tests were also referred to TIA/EIA-603-C: 2004 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

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3.3 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room	Conducted emission	Radiated emission (10m*)			Radiated emission (3m*)			Radiated emission (3m*)	
	150kHz-30MHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz	18GHz-40GHz
No.1 semi-anechoic chamber (±)	3.7dB	3.1dB	4.4dB	4.2dB	3.2dB	3.8dB	3.9dB	5.9dB	6.1dB
No.2 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.4dB	4.0dB	5.9dB	6.1dB
No.3 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	4.6dB	4.0dB	5.9dB	6.1dB
No.4 semi-anechoic chamber (±)	3.7dB	-	-	-	3.2dB	3.9dB	3.9dB	5.9dB	6.1dB

*10m/3m = Measurement distance

Spurious emissions (Radiated)

The measurement uncertainty for this test is 4.62dB(30-1000MHz) and 5.06dB(Above 1GHz).

The data listed in this test report has enough margin, more than the site margin.

RF Output Power

The measurement uncertainty for this test is 1.5dB.

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

3.4 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. Code: 200572-0

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	N/A	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.5 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX 1 to3.

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SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The sequence is used : Transmitting
- Low Channel : 118.000MHz,
- Mid Channel : 127.500MHz,
- High Channel : 136.975MHz

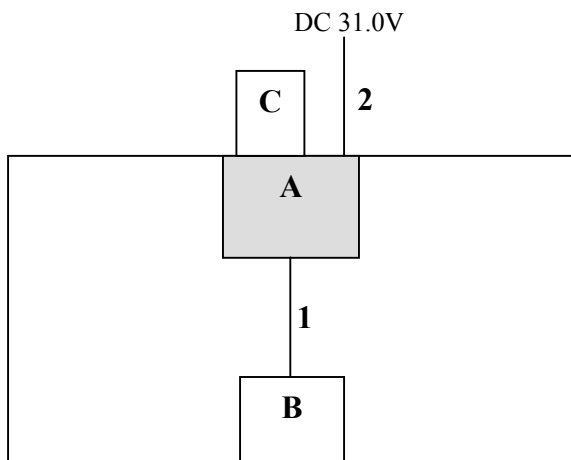
About the other setting, refer to each test section.

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

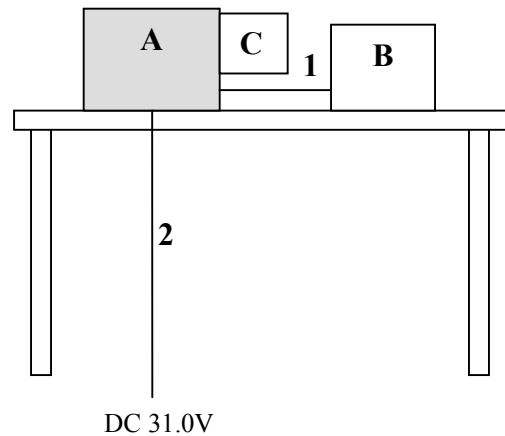
4.2. Configuration and peripherals

4.2.1 Radiated emission

<Top view>



<Side view>



- * Cabling and setup were taken into consideration and test data was taken under worst case conditions.
- * The test was carried out with the voltage that maximum output power was provided.

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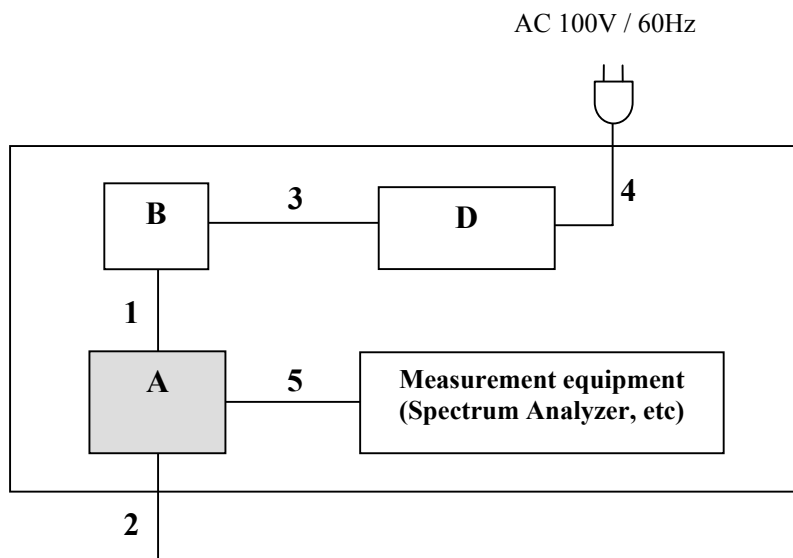
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4.2.2 Antenna Terminal Test



Frequency Stability : DC 26.4V(Vnom), 11.7V(Vmin), 31V(Vmax)
Other tests : DC 13.8V(typical voltage), 31V(maximum output power)

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	VHF AM TRANSCEIVER	FL-M1000A	01	Edmo Distributors	EUT
B	Jig	-	-	CSR	-
C	Terminator	CT-20NP	1318543E	TME	-
D	Audio Analyzer	VA-2230	5040076	KENWOOD	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	0.6	Unshielded	Unshielded	Curl cord
2	DC Cable	1.0	Unshielded	Unshielded	-
3	Audio Cable	1.6	Shielded	Shielded	-
4	AC Cable	2.0	Unshielded	Unshielded	-
5	Coaxial Cable (Measurement)	1.0	Shielded	Shielded	-

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SECTION 5: RF Output power

5.1 Test Procedure : FCC Part 2.1046, Part 87.131, TIA/EIA-603-C section 2.2.1

To achieve the maximum power output rating, measurement was taken with EUT.

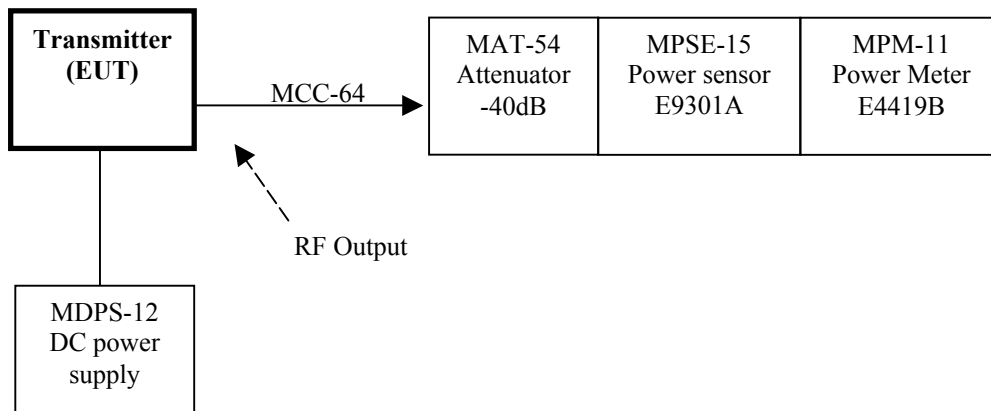
The EUT was aligned for transmitter operation on 118.000MHz (Low), 127.500MHz(Mid), 136.975MHz (High) at full rated power.

Measured items is none modulation mode.

RF output level is measured with Power Meter on RF output port.

- | | | | |
|------------|-------------------------|----------|---|
| 5.2 | Test data | : | APPENDIX 2 |
| 5.3 | Test result | : | Pass |
| 5.4 | Test instruments | : | MPM-11, MPSE-15, MAT-54, MCC-64, MDPS-12 |

5.5 Measurement Block Diagram of RF power output



< RF Power Measurement (FCC Part 2.1046, FCC87.131, TIA/EIA-603-C section 2.2.1) >

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SECTION 6: Audio Frequency Response

6.1 Test Procedure : FCC Part 2.1047, TIA/EIA-603-C section 2.2.6

It was measured based on “Constant Input Test Method” of TIA-603-C section 2.2.6.2.2.

The EUT was aligned for transmitter operation on 127.500MHz at full rated power.

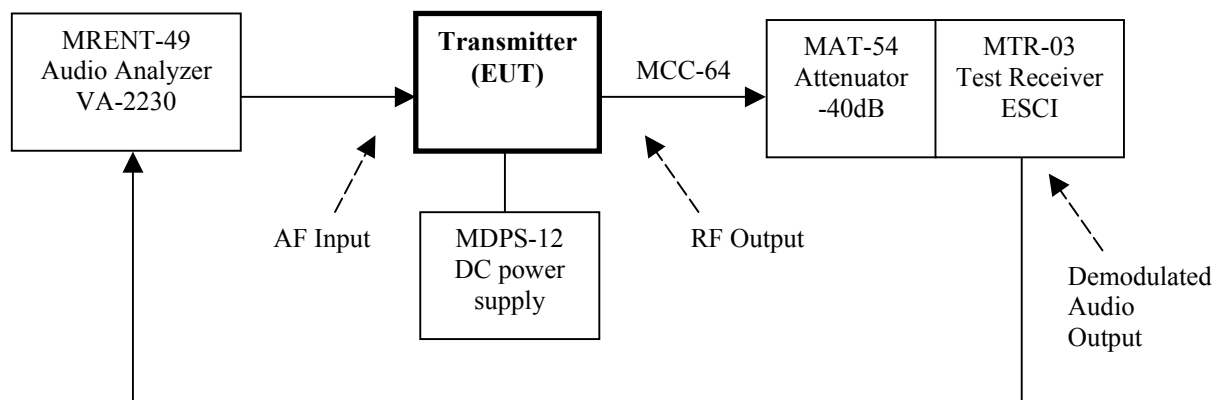
When frequency from 1kHz is applied to audio (Dynamic microphone port) input of EUT each input level that necessary to produce 20 percent modulation(1kHz).

(RF) demodulated audio level is measured with (Test Receiver and) Audio Analyzer (input audio signal frequency 300Hz to 3kHz).

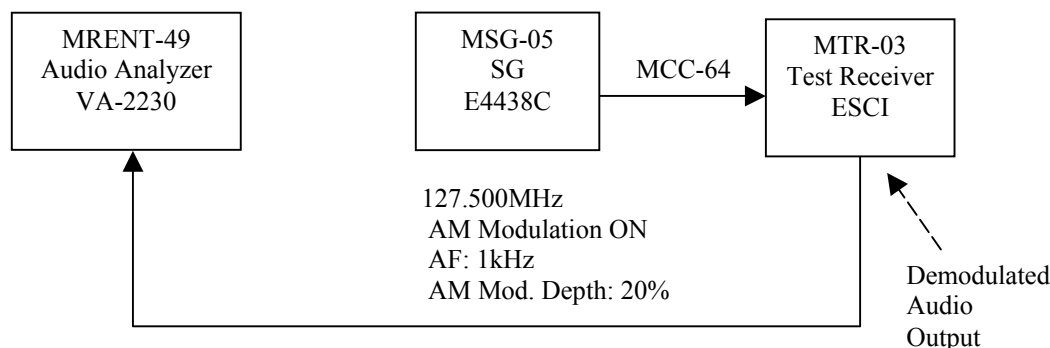
The demodulated output of the test receiver is calibrate with the signal generator. The result used it as normalization data.

- | | | | |
|-----|-----------------|---|---|
| 6.2 | Test Data | : | APPENDIX 2 |
| 6.3 | Test Result | : | Pass |
| 6.4 | Test Instrument | : | MRENT-49, MCC-64 , MAT-54 , MTR-03, MDPS-12, MSG-05 |

6.5 Measurement Block Diagram



< Audio Frequency Response (FCC part 2.1047, TIA/EIA-603-C section 2.2.6) >



< The collection method of normalization data of the test receiver >

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SECTION 7: Modulation Limiting

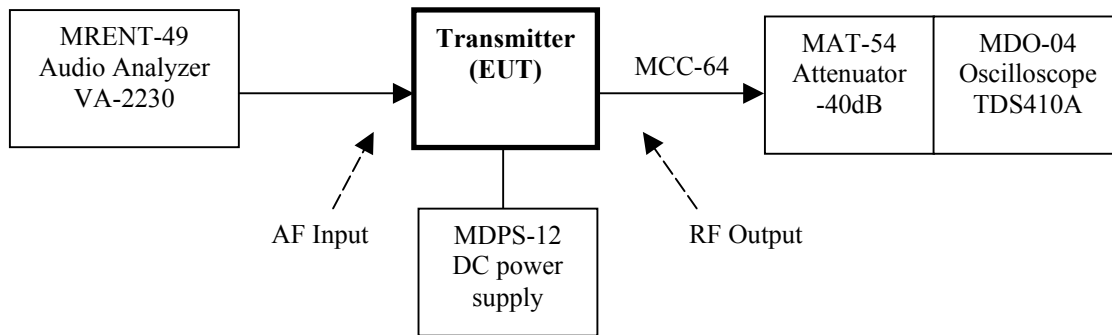
7.1 Test Procedure : FCC Part 2.1047, Part 87.141(a), TIA/EIA-603-C section 2.2.3

The EUT was aligned for transmitter operation on 127.500MHz at full rated power.

When input Level from -80dBV to -28dBV is applied to audio (Dynamic microphone port) input of EUT each modulation frequency 300Hz, 500Hz, 1kHz, 2.5kHz and 3kHz, Amplifier Modulation rate is measured by Oscilloscope.

- 7.2 Test Data : APPENDIX 2
7.3 Test Result : Pass
7.4 Test Instrument : MRENT-49, MDO-04, MAT-54, MCC-64, MDPS-12

7.5 Measurement Block Diagram



< Modulation Limiting (FCC part 2.1047, FCC part 87.141(a), TIA/EIA-603-C section

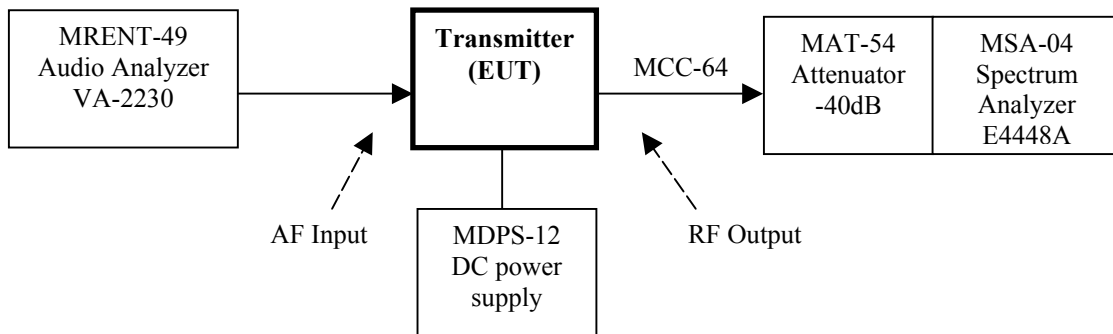
SECTION 8: Emission limitations

8.1 Test Procedure : FCC Part 2.1049 , 87.139(a) , TIA/EIA-603-C section 2.2.11

- 1) Set the reference level of the spectrum analyzer to the unmodulation carrier level of the EUT.
- 2) The Carrier is modulated by a 2.5kHz tone at an input level 16dB greater than that necessary to produce 50 percent modulation(2.5kHz). The input level shall be established at the frequency of maximum response of the audio modulation.
(EUT audio input level: -18.0dBm = 50% modulation level: -34dBm + 16dB)

8.2 Test Data : APPENDIX 2
8.3 Test Result : Pass
8.4 Test Instrument : MSA-04 , MAT-54 ,MCC-64 , MDPS-12, MRENT-49

8.5 Measurement Block Diagram



< Emission limitations (FCC Part 2.1049, 87.139(a), TIA/EIA-603-C section 2.2.11) >

SECTION 9: Spurious emission at Antenna Terminal

9.1 Test Procedure : FCC Part 2.1051, part 87.139(a), TIA/EIA-603-C section 2.2.13

The EUT was aligned for transmitter operation on 118.000MHz (Low), 127.500MHz(Mid), 136.975MHz (High) at full rated power.

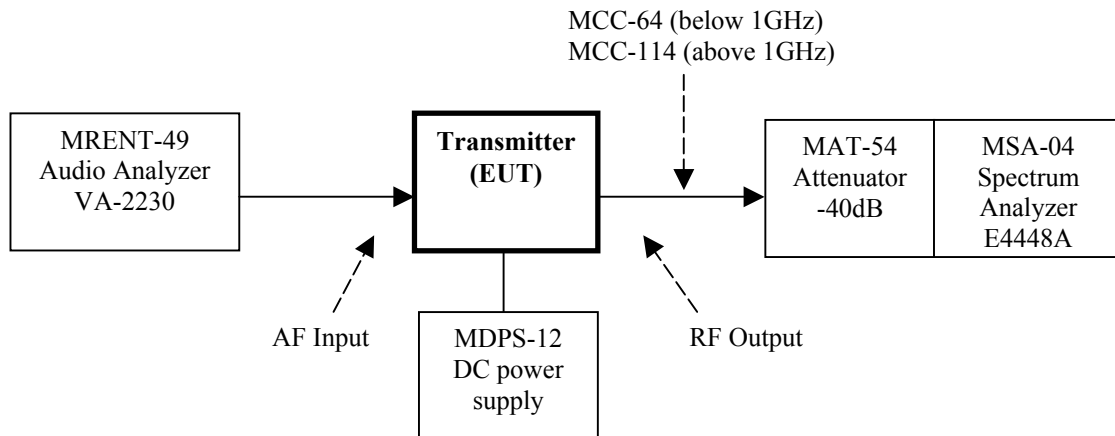
The Carrier is modulated by a 2.5kHz tone at an input level 16dB greater than that necessary to produce 50 percent modulation(2.5kHz). The input level shall be established at the frequency of maximum response of the audio modulation. (EUT audio input level: -18.0dBm = 50% modulation level: -34dBm + 16dB)

When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} pY$ dB, $< (-13 \text{ dBm})$

Frequency	Below 1GHz	Above 1GHz
Instrument used	Spectrum Analyzer	Spectrum Analyzer
IF Bandwidth	RBW: 10kHz/VBW: 30kHz Detector: Average power Sweep Speed < 2000Hz / second	RBW: 1MHz/VBW: 3MHz Detector: Average power Sweep Speed < 2000Hz / second

- 9.2 Test Data : APPENDIX 2
 9.3 Test result : Pass
 9.4 Test Instrument : MSA-04, MRENT-49, MDPS-12,
 + [below 1GHz] MAT-54, MCC-64,
 + [above 1GHz] MAT-54, MCC-114

9.5 Measurement Block Diagram



< Spurious Emission at Antenna Terminals (FCC Part 2.1051, part 87.139, TIA/EIA-603-C section 2.2.13) >

UL Japan, Inc.

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

SECTION 10: Field Strength of Spurious Emission

10.1 Test Procedure : FCC part 2.1053, part 87.139(a), TIA/EIA-603-C section 2.2.12

- 1) The EUT was aligned for transmitter operation on 118.000MHz (Low), 127.500MHz(Mid), 136.975MHz (High) at full rated power.
- 2) The RF ports was terminated with 50 ohm load and all ports was terminated with respective loads.
- 3) Tune-up the transmitter (EUT)
- 4) For each spurious measurement the receiving antenna is adjusted to the correct length for the frequency involved. These measurements are made from the lowest radio frequency generated in the EUT or 30MHz to the tenth harmonics of the carrier.
- 5) EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, raised 0.8m above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength intensity has been measured in semi anechoic chamber with a ground plane and at a distance of 3m. The measuring antenna height was varied between 1 to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Spectrum Analyzer	Spectrum Analyzer
IF Bandwidth	PK: RBW: 10kHz/VBW: 300kHz	PK: RBW: 1MHz/VBW: 3MHz

- 6) Exchanged the EUT to the Substitution Antenna, the measurement was set for the same height 0.8m as the EUT. The frequency below 1GHz of the Substitution Antenna was used as the Half wave dipole Antenna, which is harmonized with the measured frequency in 5). The frequency above 1GHz of the Substitution Antenna was used with Horn Antenna. The Substitution Antenna was connected with the Signal Generator, and the polarized electromagnetic radiation of the Substitution Antenna was matched with the one of the measuring Antenna, which was set with the Signal Generator to the measured frequency in 5). Then, we set with the Output power (CW) of the Signal Generator where the measuring electromagnetic field is equal to the measured value in 5). The measuring antenna height varied between 1 and 4m to obtain the maximum receiving level. Its Output power of Signal Generator was recorded.
- 7) Equivalent Radiated power was calculated by subtracting the cable loss and the attenuator loss connected between the Signal Generator and the Substitution Antenna from the Output power of the Signal Generator recorded in 6). For the usage of the Antenna (Horn Antenna) except for the Half wave dipole Antenna (2.15dBi) for the Substitution Antenna, the Equivalent Radiated power was calculated by compensating the finite difference in the Antenna gain of the Half wave dipole Antenna, and Substitution Antenna.

When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} pY$ dB, $< (-13 \text{ dBm})$

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

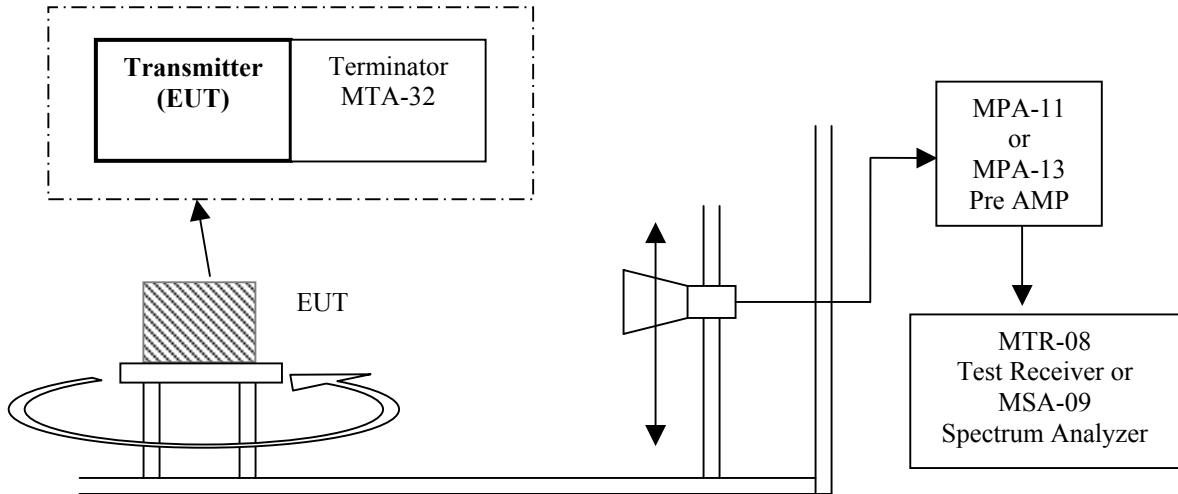
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10.2 Test Data : APPENDIX 2

10.3 Test Result : Pass

10.4 Test Instrument : MAEC-03, MTR-08, MCC-51, MPA-13, MAT-30, MBA-03, MLA-03,
MSA-09, MCC-56, MPA-11, MHA-20, MTA-32

10.5 Measurement Block Diagram



< Field Strength of Spurious Emission (FCC Part2.1053, part 87.139, TIA/EIA-603-C section 2.2.12) >

UL Japan, Inc.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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SECTION 11: Frequency Stability Measurement

11.1 Test Procedure : FCC part 2.1055, FCC 87.133(a), TIA/EIA-603-C section 2.2.2

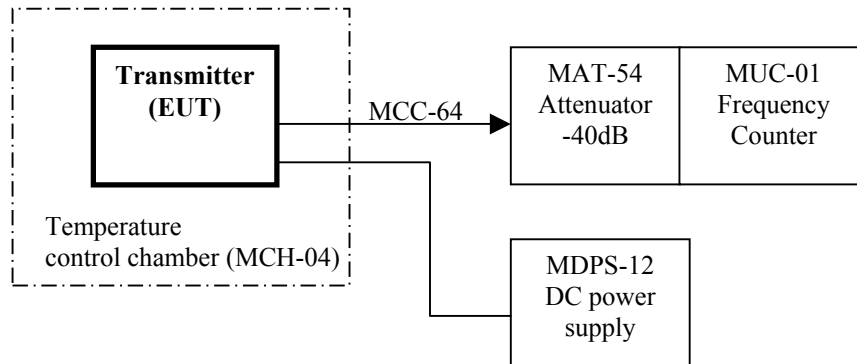
The EUT was aligned for transmitter operation on 118.000MHz (Low), 127.500MHz(Mid), 136.975MHz (High) unmodulated carrier.

11.2 Test Data : APPENDIX 2

11.3 Test Result : Pass

11.4 Test Instrument : MCH-04 , MUC-01 , MCC-64 , MAT-54 , MDPS-12

11.5 Measurement Block Diagram



< Frequency Stability(FCC Part 2.1055, part 87.133, TIA/EIA-603-C section 2.2.2) >

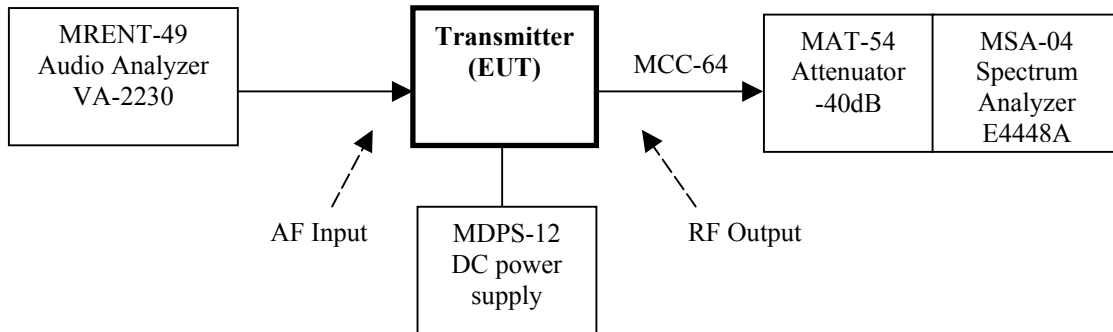
SECTION 12: 99% Occupied Bandwidth

8.1 Test Procedure : FCC Part 2.1049 , 87.135 , TIA/EIA-603-C section 2.2.11

The Carrier is modulated by a 2.5kHz tone at an input level 16dB greater than that necessary to produce 50 percent modulation(2.5kHz). The input level shall be established at the frequency of maximum response of the audio modulation. (EUT audio input level: -18.0dBm = 50% modulation level: -34dBm + 16dB)

- 8.2 Test Data : APPENDIX 2**
8.3 Test Result : Pass
8.4 Test Instrument : MSA-04 , MAT-54 ,MCC-64 , MDPS-12, MRENT-49

8.5 Measurement Block Diagram



< 99% Occupied Bandwidth (FCC Part 2.1049, 87.135, TIA/EIA-603-C section 2.2.11) >