

MFA **M. Flom Associates, Inc. - Global Compliance Center**
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C L A S S I I P E R M I S S I V E C H A N G E

of

FCC ID: ALH30643110
MODEL: TKR-840-1

to

FEDERAL COMMUNICATIONS COMMISSION

Rule Part(s) 22, 74, 90, 90.210, 95

DATE OF REPORT: July 10, 2002

ON THE BEHALF OF THE APPLICANT:

Kenwood Communications Corporation

AT THE REQUEST OF:

P.O. JBF-001

Kenwood Communications Corporation
Technology Park at Johns Creek
3975 Johns Creek Court #300
Suwanee, GA 30024

Attention of:

Joel E. Berger, Research & Development
JBerger@kenwoodusa.com
(678) 474-4722; FAX: -4731

SUPERVISED BY:


Morton Flom, P. Eng.

THE APPLICANT HAS BEEN CAUTIONED AS TO THE FOLLOWING:

15.21 INFORMATION TO USER.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) SPECIAL ACCESSORIES.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.


Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

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Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

- a) TEST REPORT
- b) Laboratory: M. Flom Associates, Inc.
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044) Chandler, AZ 85225
- c) Report Number: d0270004
- d) Client: Kenwood Communications Corporation
Technology Park at Johns Creek
3975 Johns Creek Court #300
Suwanee, GA 30024
- e) Identification: TKR-840-1
FCC ID: ALH30643110
EUT Description: UHF FM Repeater
- f) EUT Condition: Not required unless specified in individual tests.
- g) Report Date: July 10, 2002
EUT Received: July 2, 2002
- h, j, k): As indicated in individual tests.
- i) Sampling method: No sampling procedure used.
- l) Uncertainty: In accordance with MFA internal quality manual.
- m) Supervised by: 
Morton Flom, P. Eng.
- n) Results: The results presented in this report relate only to the item tested.
- o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

PAGE NO. 2 of 28.

EXPOSITORY STATEMENT
PERMISSIVE CHANGE

APPLICANT: Kenwood Communications Corporation

FCC ID: ALH30643110

The applicant has made design changes/improvements to the originally FCC approved equipment.

Data contained herein confirms that a Permissive Change to the unit has been effected and that the performance of the unit is at or better than the levels originally reported to the commission.

The following changes/improvements have been made as per attached letter of Explanation:

No circuit changes were involved. Only the addition of data transmission.

PAGE NO. 3 of 28.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

IN ACCORDANCE WITH FCC RULES AND REGULATIONS,
VOLUME II, PART 2 AND TO

22, 74, 90, 90.210, 95

Sub-part 2.1033

(c)(1): NAME AND ADDRESS OF APPLICANT:

Kenwood Communications Corporation
Technology Park at Johns Creek
3975 Johns Creek Court #300
Suwanee, GA 30024

MANUFACTURER:

Kenwood Corporation
14-6, Dogenzaka 1-Chome
Shibuya-ku, Tokyo 150, Japan

(c)(2): FCC ID: ALH30643110

MODEL NO: TKR-840-1

(c)(3): INSTRUCTION MANUAL(S):

PLEASE SEE ATTACHED EXHIBITS

(c)(4): TYPE OF EMISSION: 16K0F3E, 11K0F3E, 16K0F1D,
11K0F1D

(c)(5): FREQUENCY RANGE, MHz: 450 to 480


(c)(6): POWER RATING, Watts: 0.1 to 5
Switchable x Variable N/A

FCC GRANT NOTE: BB - Power output
continuously variable from
value listed to less than
0.5 watts.

(c)(7): MAXIMUM POWER RATING, Watts: 300

DUT RESULTS: Passes x Fails

M. Flom Associates, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA) as shown in the scope below.



THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited


M. FLOM ASSOCIATES, INC.
Chandler, AZ

for technical competence in the field of

Electrical (EMC) Testing


The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO 9001 or ISO 9002.

Presented this 2nd day of March, 2001.



Peter Abney
President
For the Accreditation Council
Certificate Number 1008.01
Valid to December 31, 2002

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical (EMC) Scope of Accreditation



American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

M. FLOM ASSOCIATES, INC.
Electronic Testing Laboratory
3356 North San Marcos Place, Suite 107
Chandler, AZ 85225
Morton Flom Phone: 480 926 3100

ELECTRICAL (EMC)

Valid to: December 31, 2002 Certificate Number: 1008-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following electromagnetic compatibility tests:

Tests	Standard(s)
RF Emissions	FCC Part 15 (Subparts B and C) using ANSI C63.4-1992, CISPR 11; CISPR 13; CISPR 14; CISPR 22; EN 55011; EN 55013; EN 55014; EN 55022; EN 50081-1; EN 50081-2; ICES-003; AS/NZS 1044; AS/NZS 1053; AS/NZS 3548; AS/NZS 4251.1; CNS 13438
Harmonic Currents	EN 61000-3-2
Fluctuation and Flicker	EN 61000-3-3
RF Immunity	EN: 50082-1, 50082-2 (both excluding "Power Frequency Magnetic Field Immunity"), 55024 (excluding Power Frequency Magnetic Field and Conducted Immunity); AS/NZS 4251.1
Electrostatic Discharge (ESD)	EN 61000-4-2
Radiated Susceptibility	EN 61000-4-3; ENV 50140; ENV 50204; IEC 1000-4-3; IEC 801-3
EFT	EN 61000-4-4; IEC 1000-4-4; IEC 801-4
Surge	EN 61000-4-5; ENV 50142; IEC 1000-4-5; IEC 801-5
Voltage Dips, Short Interruptions, and Line Voltage Variations	EN 61000-4-11
47 CFR (FCC)	Part: 2, 18, 21, 22, 23, 24, 25, 26, 27, 74, 80, 87, 90, 95, 97, 101 (excluding SAR Testing)

Russell M. Robinson

(A2LA Cert. No. 1008.01) 05/10/02 Page 1 of 1

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644 3248 • Fax: 301-662 2974

"This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this report have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report."

Should this report contain any data for tests for which we are not accredited, or which have been undertaken by a subcontractor that is not A2LA accredited, such data would not covered by this laboratory's A2LA accreditation.

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Subpart 2.1033 (continued)

(c)(8): VOLTAGES & CURRENTS IN ALL ELEMENTS IN FINAL R. F. STAGE, INCLUDING FINAL TRANSISTOR OR SOLID STATE DEVICE:

COLLECTOR CURRENT, A = per manual
 COLLECTOR VOLTAGE, Vdc = per manual
 SUPPLY VOLTAGE, Vdc = 13.8

(c)(9): TUNE-UP PROCEDURE:

PLEASE SEE ATTACHED EXHIBITS

(c)(10): CIRCUIT DIAGRAM/CIRCUIT DESCRIPTION:

Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

PLEASE SEE ATTACHED EXHIBITS

(c)(11): LABEL INFORMATION:

PLEASE SEE ATTACHED EXHIBITS

(c)(12): PHOTOGRAPHS:

PLEASE SEE ATTACHED EXHIBITS

(c)(13): DIGITAL MODULATION DESCRIPTION:

 ATTACHED EXHIBITS
 x N/A

(c)(14): TEST AND MEASUREMENT DATA:

FOLLOWS

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Sub-part
2.1033(c)(14):TEST AND MEASUREMENT DATA

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

- 21 - Domestic Public Fixed Radio Services
- 22 - Public Mobile Services
- 22 Subpart H - Cellular Radiotelephone Service
- 22.901(d) - Alternative technologies and auxiliary services
- 23 - International Fixed Public Radiocommunication services
- 24 - Personal Communications Services
- 74 Subpart H - Low Power Auxiliary Stations
- 80 - Stations in the Maritime Services
- 80 Subpart E - General Technical Standards
- 80 Subpart F - Equipment Authorization for Compulsory Ships
- 80 Subpart K - Private Coast Stations and Marine Utility Stations
- 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
- 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
- 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
- 80 Subpart V - Emergency Position Indicating Radiobeacons (EPIRB'S)
- 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
- 80 Subpart X - Voluntary Radio Installations
- 87 - Aviation Services
- 90 - Private Land Mobile Radio Services
- 94 - Private Operational-Fixed Microwave Service
- 95 Subpart A - General Mobile Radio Service (GMRS)
- 95 Subpart C - Radio Control (R/C) Radio Service
- 95 Subpart D - Citizens Band (CB) Radio Service
- 95 Subpart E - Family Radio Service
- 95 Subpart F - Interactive Video and Data Service (IVDS)
- 97 - Amateur Radio Service
- 101 - Fixed Microwave Services

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STANDARD TEST CONDITIONS
and
ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-1992/2000 Draft, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurements.

PAGE NO. 8 of 28.
NAME OF TEST: Carrier Output Power (Conducted)
SPECIFICATION: 47 CFR 2.1046(a)
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.1
TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

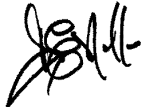
1. The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an R. F. Power Meter.
2. Measurement accuracy is $\pm 3\%$.

MEASUREMENT RESULTS
(Worst case)

FREQUENCY OF CARRIER, MHz = 465, 450, 480

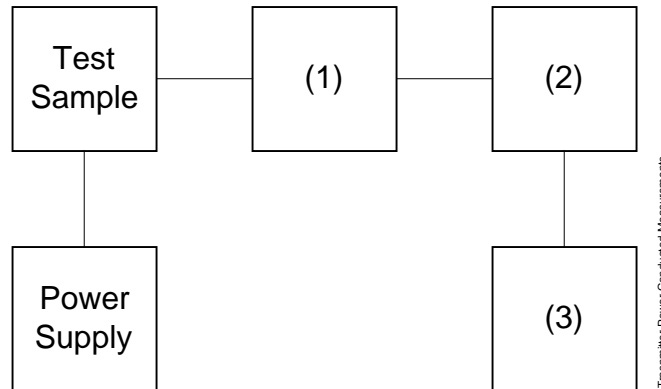
<u>POWER SETTING</u>	<u>R. F. POWER, WATTS</u>
Low	0.1
High	5

PERFORMED BY:


Doug Noble, B.A.S. E.E.T.

TRANSMITTER POWER CONDUCTED MEASUREMENTS

TEST 1: R. F. POWER OUTPUT
 TEST 2: FREQUENCY STABILITY



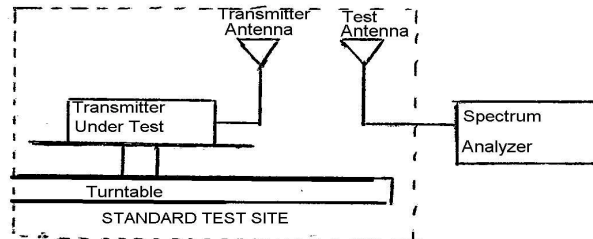
Asset	Description (as applicable)	s/n
(1)	<u>COAXIAL ATTENUATOR</u>	
i00122	Narda 766-10	7802
i00123	Narda 766-10	7802A
i00069	Bird 8329 (30 dB)	1006
i00113	Sierra 661A-3D	1059
(2)	<u>POWER METERS</u>	
i00014	HP 435A	1733A05836
i00039	HP 436A	2709A26776
i00020	HP 8901A POWER MODE	2105A01087
(3)	<u>FREQUENCY COUNTER</u>	
i00042	HP 5383A	1628A00959
i00019	HP 5334B	2704A00347
i00020	HP 8901A FREQUENCY MODE	2105A01087

PAGE NO. 10 of 28.
NAME OF TEST: ERP Carrier Power (Radiated)
SPECIFICATION: TIA/EIA 603A (Substitution Method)

2.2.17.1 Definition: The average radiated power of a licensed device is the equivalent power required, when delivered to a half-wave dipole or horn antenna, to produce at a distant point the same average received power as produced by the licensed device.

2.2.17.2 Method of Measurement:

a) Connect the equipment as illustrated. Place the transmitter to be tested on the turntable in the standard test site.



b) Raise and lower the test antenna from 1m to 6 m with the transmitter facing the antenna and record the highest received signal in dB as LVL.

c) Repeat step b) for seven additional readings at 45° interval positions of the turntable.

d) Replace the transmitter under test with a half-wave or horn vertically polarized antenna. The center of the antenna should be at the same location as the transmitter under test. Connect the antenna to a signal generator with a known output power and record the path loss in dB or LOSS.

e) Calculate the average radiated output power from the readings in step c) and d) by the following:

$$\text{average radiated power} = 10 \log_{10} \Sigma 10(\text{LVL} - \text{LOSS})/10 \text{ (dBm)}$$

	RESULTS					
	450 MHz		465 MHz		480 MHz	
	LVL, dbm	Path Loss, db	LVL, dbm	Path Loss, db	LVL, dbm	Path Loss, db
0°	31.6	1.2	31.7	1.3	36.8	1.0
45°	31.7	1.2	30.9	1.3	35.9	1.0
90°	32.0	1.2	32.0	1.3	38.9	1.0
135°	31.9	1.2	32.0	1.3	34.9	1.0
180°	30.9	1.2	32.4	1.3	35.8	1.0
225°	32.0	1.2	34.9	1.3	36.1	1.0
270°	34.6	1.2	31.5	1.3	35.2	1.0
315°	31.7	1.2	33.6	1.3	34.4	1.0

	450 MHz	465 MHz	480 MHz
Av. Radiated Power:	33.25 dbm	33.68 dbm	36.95 dbm

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NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

SPECIFICATION: 47 CFR 2.1051

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.13

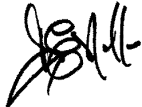
TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

1. The emissions were measured for the worst case as follows:
 - (a): within a band of frequencies defined by the carrier frequency plus and minus one channel.
 - (b): from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40 GHz, whichever is lower.
2. The magnitude of spurious emissions that are attenuated more than 20 dB below the permissible value need not be specified.
3. MEASUREMENT RESULTS: ATTACHED FOR WORST CASE

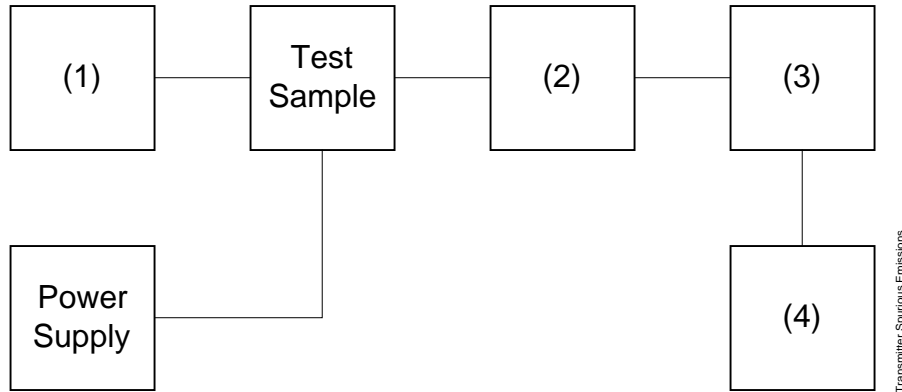
FREQUENCY OF CARRIER, MHz	=	465, 450, 480
SPECTRUM SEARCHED, GHz	=	0 to 10 x F _c
MAXIMUM RESPONSE, Hz	=	N/A (for Data)
ALL OTHER EMISSIONS	=	≥ 20 dB BELOW LIMIT

PERFORMED BY:


Doug Noble, B.A.S. E.E.T.

TRANSMITTER SPURIOUS EMISSION

TEST A. OCCUPIED BANDWIDTH (IN-BAND SPURIOUS)
 TEST B. OUT-OF-BAND SPURIOUS



Asset Description (as applicable)	s/n
(1) <u>AUDIO OSCILLATOR/GENERATOR</u>	
i00010 HP 204D	1105A04683
i00017 HP 8903A	2216A01753
i00012 HP 3312A	1432A11250
(2) <u>COAXIAL ATTENUATOR</u>	
i00122 Narda 766-10	7802
i00123 Narda 766-10	7802A
i00069 Bird 8329 (30 dB)	1006
i00113 Sierra 661A-3D	1059
(3) <u>FILTERS; NOTCH, HP, LP, BP</u>	
i00126 Eagle TNF-1	100-250
i00125 Eagle TNF-1	50-60
i00124 Eagle TNF-1	250-850
(4) <u>SPECTRUM ANALYZER</u>	
i00048 HP 8566B	2511A01467
i00029 HP 8563E	3213A00104

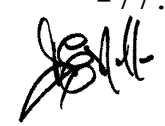
PAGE NO. 13 of 28.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

LIMIT(S), dBc $-(50+10 \times \text{LOG } P) = -40$ (0.1 Watts)
 $-(50+10 \times \text{LOG } P) = -57$ (5 Watts)

STATE: 1:Low Power g0270019: 2002-Jul-08 Mon 14:11:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
450.000000	899.995500	-52.1	-72.1	-32.1
465.000000	930.003500	-45.4	-65.4	-25.4
480.000000	959.989000	-52.3	-72.3	-32.3
450.000000	1350.011500	-46.8	-66.8	-26.8
465.000000	1394.995500	-39.1	-59.1	-19.1
480.000000	1439.991500	-42.2	-62.2	-22.2
450.000000	1800.009500	-49.7	-69.7	-29.7
465.000000	1859.997500	-43.7	-63.7	-23.7
480.000000	1919.981000	-55.2	-75.2	-35.2
450.000000	2249.991000	-60.4	-80.4	-40.4
465.000000	2324.999000	-59.9	-79.9	-39.9
480.000000	2399.886900	-60.3	-80.3	-40.3
450.000000	2700.181600	-62.8	-82.8	-42.8
465.000000	2790.248700	-63.5	-83.5	-43.5
480.000000	2879.941500	-62.4	-82.4	-42.4
450.000000	3149.989000	-63.8	-83.8	-43.8
465.000000	3254.936400	-63.9	-83.9	-43.9
480.000000	3359.771800	-63.9	-83.9	-43.9
450.000000	3600.113100	-63.6	-83.6	-43.6
465.000000	3719.999000	-62.6	-82.6	-42.6
480.000000	3840.101600	-63.8	-83.8	-43.8
450.000000	4049.979000	-63.4	-83.4	-43.4
465.000000	4185.207700	-63.3	-83.3	-43.3
480.000000	4319.904400	-61.7	-81.7	-41.7
450.000000	4499.768800	-63	-83	-43
465.000000	4650.127100	-62.7	-82.7	-42.7
480.000000	4800.122600	-62.4	-82.4	-42.4
450.000000	4949.838400	-63.7	-83.7	-43.7
465.000000	5114.984000	-63.4	-83.4	-43.4
480.000000	5280.163100	-64	-84	-44
450.000000	5399.939000	-62.4	-82.4	-42.4
465.000000	5580.246700	-62.1	-82.1	-42.1
480.000000	5760.014000	-63.3	-83.3	-43.3
450.000000	5850.007500	-57.2	-77.2	-37.2
465.000000	6045.190900	-57.1	-77.1	-37.1
480.000000	6239.829500	-56.9	-76.9	-36.9
450.000000	6300.074800	-56.8	-76.8	-36.8
465.000000	6509.869900	-57.4	-77.4	-37.4
480.000000	6720.212800	-57.3	-77.3	-37.3
450.000000	6749.907300	-56.1	-76.1	-36.1
465.000000	6975.071800	-56.6	-76.6	-36.6
480.000000	7199.867900	-57.6	-77.6	-37.6



PERFORMED BY:

Doug Noble, B.A.S. E.E.T.

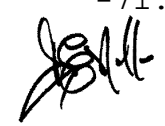
PAGE NO. 14 of 28.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

LIMIT(S), dBc $-(50+10 \times \text{LOG } P) = -40$ (0.1 Watts)
 $-(50+10 \times \text{LOG } P) = -57$ (5 Watts)

STATE: 2:High Power g0270018: 2002-Jul-08 Mon 14:08:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
450.000000	899.999500	-33.3	-70.2	-13.3
465.000000	930.005000	-30.5	-67.4	-10.5
480.000000	960.014500	-34.6	-71.5	-14.6
450.000000	1350.007500	-37.7	-74.6	-17.7
465.000000	1394.997500	-33.8	-70.7	-13.8
480.000000	1440.003000	-33.6	-70.5	-13.6
450.000000	1799.908900	-39.3	-76.2	-19.3
465.000000	1859.998000	-37	-73.9	-17
480.000000	1919.893400	-38.4	-75.3	-18.4
450.000000	2249.797800	-38.9	-75.8	-18.9
465.000000	2325.083600	-38.5	-75.4	-18.5
480.000000	2399.805800	-38.3	-75.2	-18.3
450.000000	2699.837900	-40.7	-77.6	-20.7
465.000000	2790.121600	-39.1	-76	-19.1
480.000000	2880.216700	-40.5	-77.4	-20.5
450.000000	3150.099600	-39.6	-76.5	-19.6
465.000000	3255.106600	-40.5	-77.4	-20.5
480.000000	3359.840400	-40.7	-77.6	-20.7
450.000000	3600.083600	-41.7	-78.6	-21.7
465.000000	3720.068600	-40.5	-77.4	-20.5
480.000000	3839.816400	-40.8	-77.7	-20.8
450.000000	4050.124100	-40.6	-77.5	-20.6
465.000000	4184.928400	-40.1	-77	-20.1
480.000000	4319.836400	-40.9	-77.8	-20.9
450.000000	4500.144600	-39.3	-76.2	-19.3
465.000000	4650.097600	-40.5	-77.4	-20.5
480.000000	4800.214700	-41.5	-78.4	-21.5
450.000000	4950.029500	-42.1	-79	-22.1
465.000000	5115.165600	-40.4	-77.3	-20.4
480.000000	5280.221700	-40	-76.9	-20
450.000000	5400.221700	-41.1	-78	-21.1
465.000000	5579.933400	-40.2	-77.1	-20.2
480.000000	5759.858400	-40.1	-77	-20.1
450.000000	5850.210300	-34.4	-71.3	-14.4
465.000000	6045.123600	-32.5	-69.4	-12.5
480.000000	6240.056300	-35.4	-72.3	-15.4
450.000000	6300.135100	-34.4	-71.3	-14.4
465.000000	6509.932200	-34.9	-71.8	-14.9
480.000000	6720.222800	-34.1	-71	-14.1
450.000000	6750.092700	-34.5	-71.4	-14.5
465.000000	6974.848500	-33.7	-70.6	-13.7
480.000000	7200.057300	-34.2	-71.1	-14.2



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NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: 47 CFR 2.1053(a)

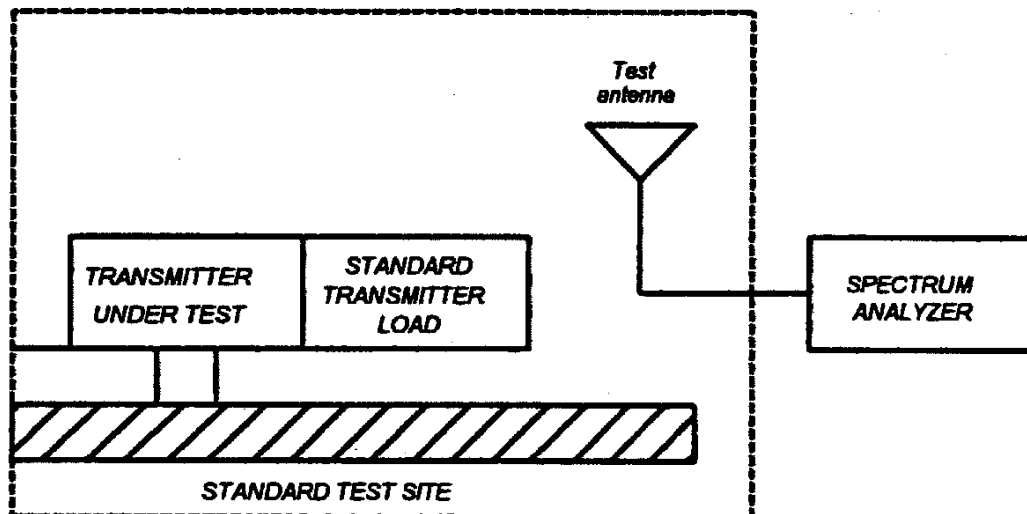
GUIDE: ANSI/TIA/EIA-603-1992/2001, Paragraph 1.2.12 and Table 16, 47 CFR 22.917

MEASUREMENT PROCEDURE

1.2.12.1 Definition: Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

1.2.12.2 Method of Measurement

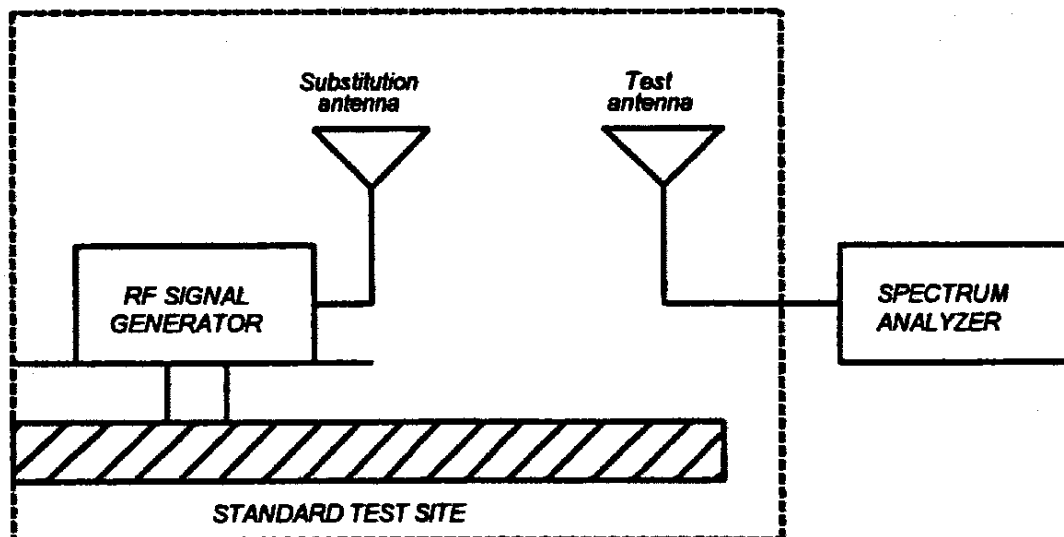
- A) Connect the equipment as illustrated
- B) Adjust the spectrum analyzer for the following settings:
- 1) Resolution Bandwidth 100 kHz (<1 GHz), 1 MHz (> 1GHz).
 - 2) Video Bandwidth ≥ 3 times Resolution Bandwidth, or 30 kHz (22.917)
 - 3) Sweep Speed ≤ 2000 Hz/second
 - 4) Detector Mode = Mean or Average Power
- C) Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load which is placed on the turntable. The RF cable to this load should be of minimum length.



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NAME OF TEST: Field Strength of Spurious Radiation (Cont.)

- D) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to \pm the test bandwidth (see section 1.3.4.4).
- E) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
- F) Repeat step E) for each spurious frequency with the test antenna polarized vertically.



- G) Reconnect the equipment as illustrated.
- H) Keep the spectrum analyzer adjusted as in step B).
- I) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

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NAME OF TEST: Field Strength of Spurious Radiation (Cont.)

- J) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
- K) Repeat step J) with both antennas vertically polarized for each spurious frequency.
- L) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps J) and K) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.
- M) The levels recorded in step L) are absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions dB =
 $10 \log_{10}(\text{TX power in watts}/0.001) - \text{the levels in step l)}$

NOTE: It is permissible that other antennas provided can be referenced to a dipole.

Test Equipment:

Asset Description (as applicable)	s/n	Cycle	Last Cal
<u>TRANSDUCER</u>			
i00088 EMCO 3109-B 25MHz-300MHz	2336	12 mo.	Sep-01
i00065 EMCO 3301-B Active Monopole	2635	12 mo.	Sep-01
i00089 Aprel 2001 200MHz-1GHz	001500	12 mo.	Sep-01
i00103 EMCO 3115 1GHz-18GHz	9208-3925	12 mo.	Sep-01
<u>AMPLIFIER</u>			
i00028 HP 8449A	2749A00121	12 mo.	Mar-02
<u>SPECTRUM ANALYZER</u>			
i00029 HP 8563E	3213A00104	12 mo.	Jan-02
i00033 HP 85462A	3625A00357	12 mo.	Jan-02
i00048 HP 8566B	2511AD1467	6 mo.	Jan-02
<u>MICROPHONE, ANTENNA PORT, AND CABELING</u>			
Microphone	<u>Yes</u>	Cable Length <u>1.0</u> Meters	
Antenna Port Terminated	<u>Yes</u>	Load <u>No</u>	Antenna Gain <u>0</u> dbd

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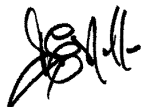
NAME OF TEST: Field Strength of Spurious Radiation

g0270011: 2002-Jul-03 Wed 09:29:00

STATE: 2:High Power

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	ERP, dBm	ERP, dbc
465.000000	929.997400	-32.4	≤ -62.9
465.000000	1395.004900	-25.9	≤ -62.9
465.000000	1859.999900	-31.4	≤ -62.9
465.000000	2324.977700	-42.6	≤ -62.9
465.000000	2790.011600	-40.4	≤ -62.9
465.000000	3255.000833	-54.8	≤ -62.9
465.000000	3719.995417	-47.4	≤ -62.9
465.000000	4185.014583	-53.3	≤ -62.9
465.000000	4650.013750	-49.3	≤ -62.9

SUPERVISED BY:


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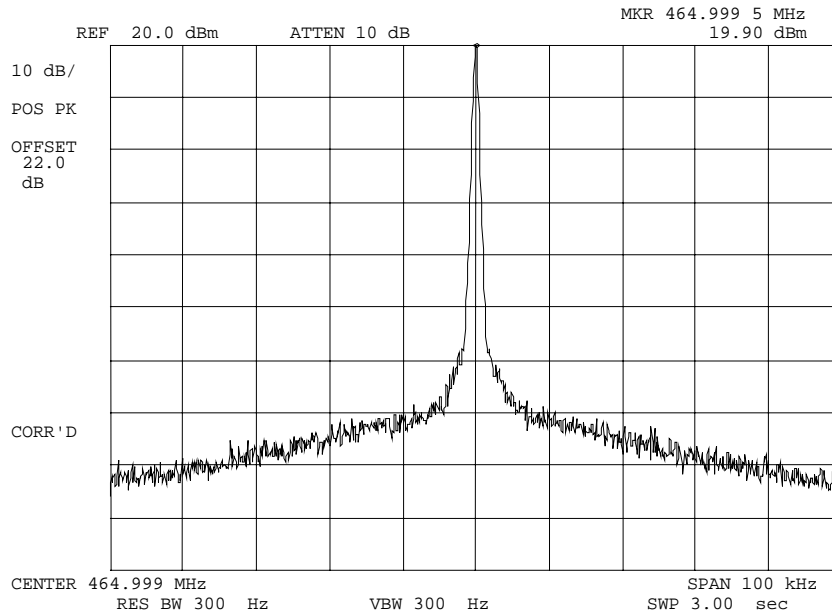
PAGE NO. 19 of 28.
NAME OF TEST: Emission Masks (Occupied Bandwidth)
SPECIFICATION: 47 CFR 2.1049(c)(1)
GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.11
TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.
2. For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for $\pm 2.5/\pm 1.25$ kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.
3. For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.
5. MEASUREMENT RESULTS: ATTACHED

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NAME OF TEST: Emission Masks (Occupied Bandwidth)
g0270013: 2002-Jul-08 Mon 13:38:00
STATE: 1:Low Power



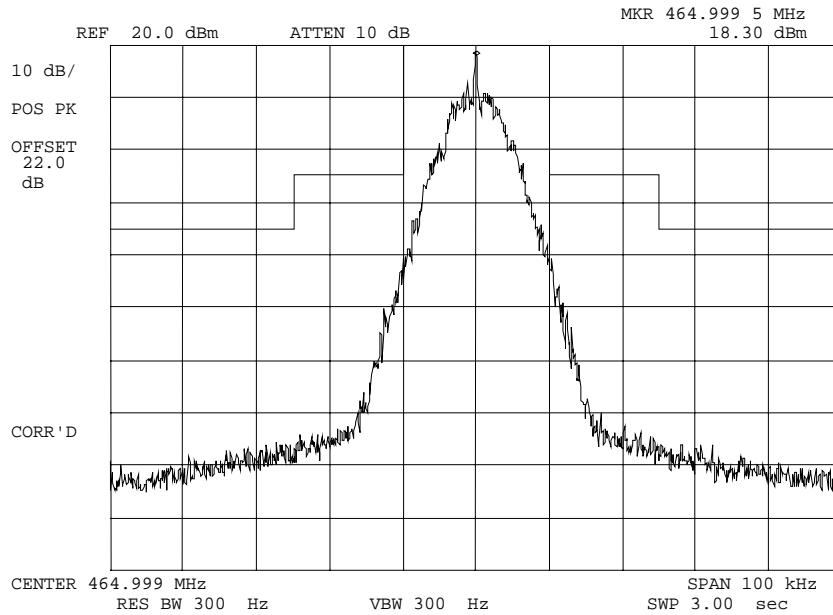
POWER: LOW
MODULATION: NONE

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NAME OF TEST: Emission Masks (Occupied Bandwidth)
g0270015: 2002-Jul-08 Mon 13:44:00
STATE: 1:Low Power



POWER:
MODULATION:

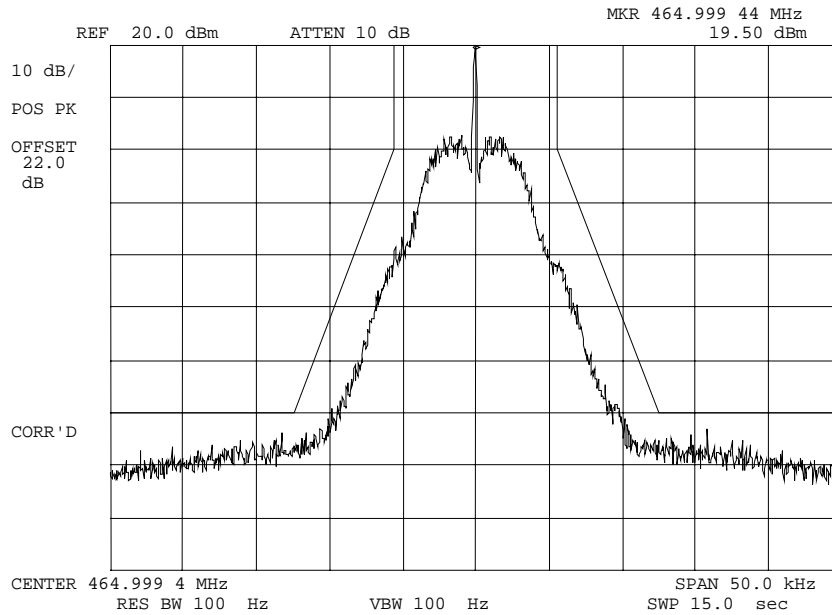
LOW
RANDOM DATA 19.2 K/BITS PER
SECOND
MASK: B, VHF/UHF 25kHz,
w/LPF

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NAME OF TEST: Emission Masks (Occupied Bandwidth)
g0270016: 2002-Jul-08 Mon 13:53:00
STATE: 1:Low Power



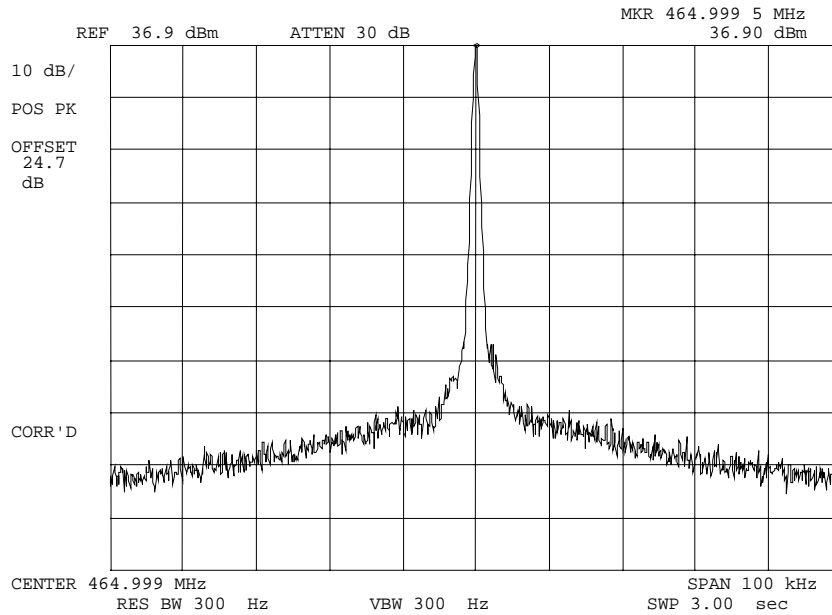
POWER: LOW
MODULATION: RANDOM DATA 19.2 K/BITS PER SECOND
MASK: D, VHF/UHF 12.5kHz BW

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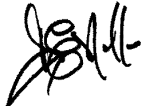
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NAME OF TEST: Emission Masks (Occupied Bandwidth)
g0270012: 2002-Jul-08 Mon 13:34:00
STATE: 2:High Power



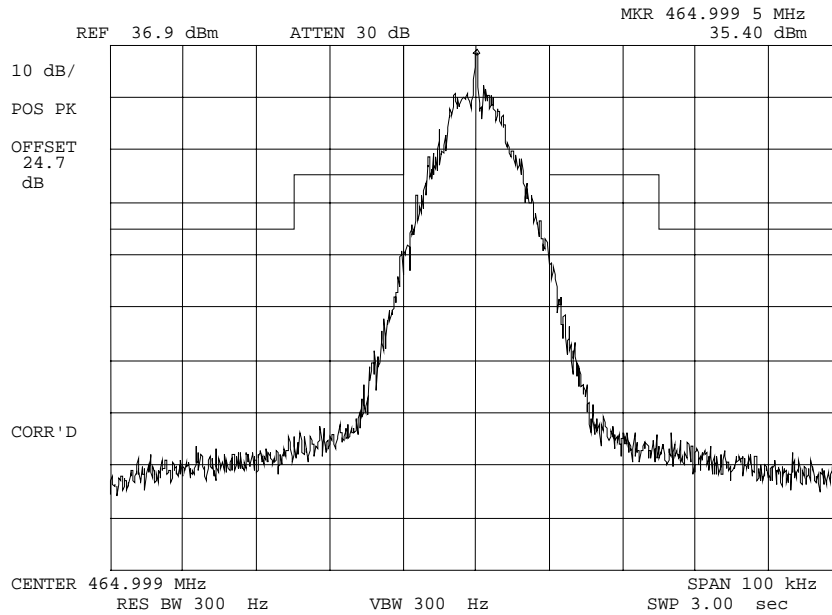
POWER: HIGH
MODULATION: NONE

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Doug Noble, B.A.S. E.E.T.

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NAME OF TEST: Emission Masks (Occupied Bandwidth)
g0270014: 2002-Jul-08 Mon 13:43:00
STATE: 2:High Power



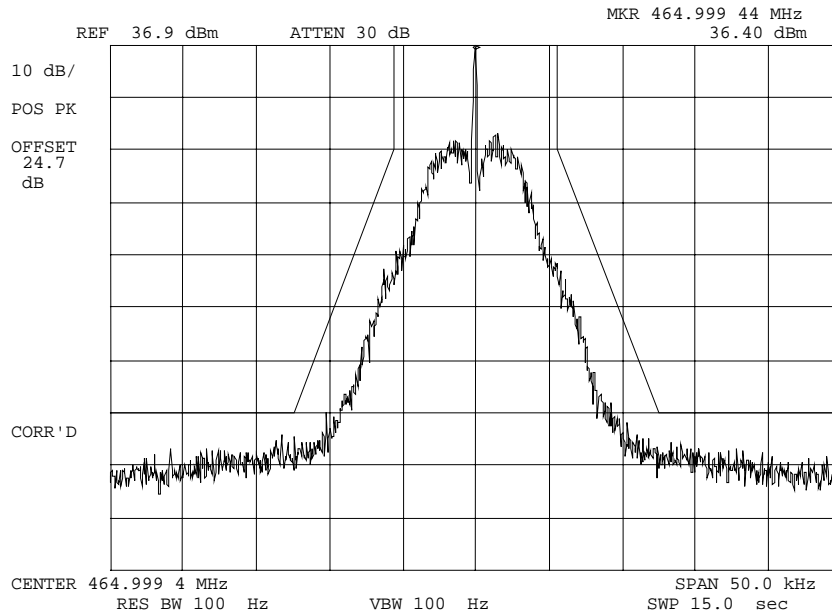
POWER:	HIGH
MODULATION:	RANDOM DATA 19.2 K/BITS PER SECOND
	MASK: B, VHF/UHF 25kHz, w/LPF

PERFORMED BY:

Doug Noble, B.A.S. E.E.T.

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NAME OF TEST: Emission Masks (Occupied Bandwidth)
g0270017: 2002-Jul-08 Mon 13:54:00
STATE: 2:High Power



POWER: HIGH
MODULATION: RANDOM DATA 19.2 K/BITS PER SECOND
MASK: D, VHF/UHF 12.5kHz BW

PERFORMED BY:

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NAME OF TEST: Transient Frequency Behavior

SPECIFICATION: 47 CFR 90.214

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.19

TEST EQUIPMENT: As per attached page

MEASUREMENT PROCEDURE

1. The EUT was setup as shown on the attached page, following TIA/EIA-603 steps a, b, and c as a *guide*.
2. The transmitter was turned on.
3. Sufficient attenuation was provided so that the transmitter carrier level measured at the output of the combiner was 40 dB below the maximum input level of the test receiver. This level was recorded as step f.
4. The transmitter was turned off.
5. An RF signal generator (1) modulated with a 1 kHz tone at either 25, 12.5, or 6.25 kHz deviation, and set to the same frequency as the assigned transmitter frequency, (2) was adjusted to a level -20 dB below the level recorded for step f, as measured at the output of the combiner. This level was then fixed for the remainder of the test and is recorded at step h.
6. The oscilloscope was setup using TIA/EIA-603 steps j and k as a guide, and to either 10 ms/div (UHF) or 5 ms/div (VHF).
7. The 30 dB attenuator was removed, the transmitter was turned on, and the level of the carrier at the output of the combiner was recorded as step l.
8. The carrier on-time as referenced in TIA/EIA-603 steps m, n, and o was captured and plotted. The carrier off-time as referenced in TIA/EIA-603 steps p, q, r, and s was captured and plotted.

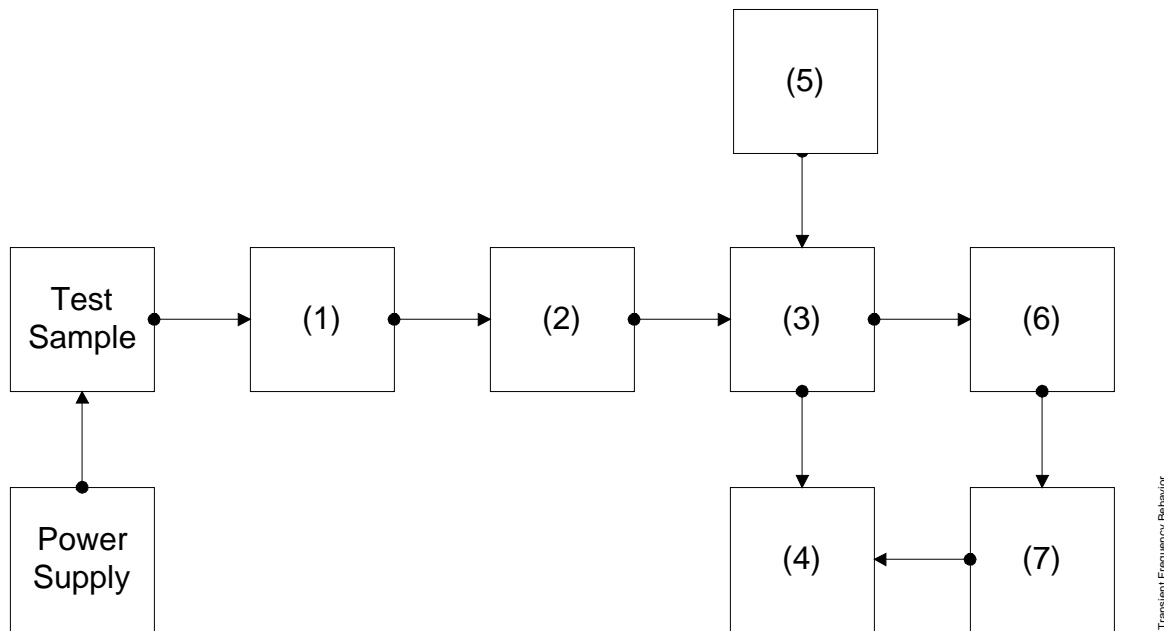
LEVELS MEASURED:

<u>step f</u> , dBm	= -14.1
<u>step h</u> , dBm	= -47.9
<u>step l</u> , dBm	= 2.1

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TRANSIENT FREQUENCY BEHAVIOR



Asset	Description (as applicable)	s/n
(1)	<u>ATTENUATOR</u> (Removed after 1st step)	
	i00112 Philco 30 dB	989
(2)	<u>ATTENUATOR</u>	
	i00112 Philco 30 dB	989
	i00172 Bird 30 dB	989
	i00122 Narda 10 dB	7802
	i00123 Narda 10 dB	7802A
	i00110 Kay Variable	145-387
(3)	<u>COMBINER</u>	
	i00154 4 x 25 Ω COMBINER	154
(4)	<u>CRYSTAL DETECTOR</u>	
	i00159 HP 8470B	1822A10054
(5)	<u>RF SIGNAL GENERATOR</u>	
	i00018 HP 8656A	2228A03472
	i00031 HP 8656A	2402A06180
	i00067 HP 8920A	3345U01242
(6)	<u>MODULATION ANALYZER</u>	
	i00020 HP 8901A	2105A01087
(7)	<u>SCOPE</u>	
	i00030 HP 54502A	2927A00209

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NAME OF TEST: Necessary Bandwidth and Emission Bandwidth
SPECIFICATION: 47 CFR 2.202(g)

MODULATION = 16K0F3E
NECESSARY BANDWIDTH CALCULATION:
 MAXIMUM MODULATION (M), kHz = 3
 MAXIMUM DEVIATION (D), kHz = 5
 CONSTANT FACTOR (K) = 1
 NECESSARY BANDWIDTH (B_N), kHz = (2xM)+(2xDxK)
 = 16.0

MODULATION = 11K0F3E
NECESSARY BANDWIDTH CALCULATION:
 MAXIMUM MODULATION (M), kHz = 3
 MAXIMUM DEVIATION (D), kHz = 2.5
 CONSTANT FACTOR (K) = 1
 NECESSARY BANDWIDTH (B_N), kHz = (2xM)+(2xDxK)
 = 11.0

MODULATION = 16K0F1D
NECESSARY BANDWIDTH CALCULATION:
 MAXIMUM MODULATION (M), kHz = 7
 MAXIMUM DEVIATION (D), kHz = 1
 CONSTANT FACTOR (K) = 1
 NECESSARY BANDWIDTH (B_N), kHz = (2xM)+(2xDxK)
 = 16

MODULATION = 11K0F1D
NECESSARY BANDWIDTH CALCULATION:
 MAXIMUM MODULATION (M), kHz = 4
 MAXIMUM DEVIATION (D), kHz = 1
 CONSTANT FACTOR (K) = 11
 NECESSARY BANDWIDTH (B_N), kHz = (2xM)+(2xDxK)
 = 10



PERFORMED BY: Doug Noble, B.A.S. E.E.T.

END OF TEST REPORT

TESTIMONIAL
AND
STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY THAT:

1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.
2. THAT the technical data supplied with the application was taken under my direction and supervision.
3. THAT the data was obtained on representative units, randomly selected.
4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

CERTIFYING ENGINEER:



Morton Flom, P. Eng.