MFA M. Flom Associates, Inc. - Global Compliance Center
3356 North San Marcos Place, Suite 107, Chandler, Arizona 85225-7176
www.mflom.com general@mflom.com (480) 926-3100, FAX: 926-3598

Date: November 1, 2001

Federal Communications Commission
Via: Electronic Filing

Attention: Authorization & Evaluation Division

Applicant: Wabtec Railway Electronics
Equipment: 15623
FCC ID: PYI-15623
FCC Rules: 90, 90.210, Confidentiality

Gentlemen:

On behalf of the Applicant, enclosed please find Application Form 731, Engineering Test Report and all pertinent documentation, the whole for approval of the referenced equipment as shown.

Filing fees are attached.

We trust the same is in order. Should you need any further information, kindly contact the writer who is authorized to act as agent.

Sincerely yours,

Morton Flom, P. Eng.

enclosure(s)
cc: Applicant
MF/cvr

LIST OF EXHIBITS
(FCC **CERTIFICATION** (TRANSMITTERS) - REVISED 9/28/98)

APPLICANT: Wabtec Railway Electronics

FCC ID: PYI-15623

BY APPLICANT:

1. LETTER OF AUTHORIZATION x

2. IDENTIFICATION DRAWINGS, 2.1033(c)(11)
   - x LABEL
   - x LOCATION OF LABEL
   - x COMPLIANCE STATEMENT
   - x LOCATION OF COMPLIANCE STATEMENT

3. PHOTOGRAPHS, 2.1033(c)(12) x

4. DOCUMENTATION: 2.1033(c)

(3)	USER MANUAL	N/A: See Statement
(9)	TUNE UP INFO	x
(10)	SCHEMATIC DIAGRAM	x
(10)	CIRCUIT DESCRIPTION	x
	BLOCK DIAGRAM	x
	PARTS LIST	x
	ACTIVE DEVICES	x

5. PART 90.203(e) & (g) ATTESTATION x

6. Confidentiality Request x

7. MPE Report x

8. Letter stating Models 15622 and 15623 are the same

9. MX.com, Inc. Mixed Signals ICS MX469 x

10. Plot showing Transmit Audio Data x

BY M.F.A. INC.

A. TESTIMONIAL & STATEMENT OF CERTIFICATION

B. STATEMENT OF QUALIFICATIONS

MFA M. Flom Associates, Inc. - Global Compliance Center
3356 North San Marcos Place, Suite 107, Chandler, Arizona 85225-7176
www.mflom.com general@mflom.com (480) 926-3100, FAX: 926-3598

T R A N S M I T T E R C E R T I F I C A T I O N

of

FCC ID: PYI-15623
MODEL: 15623

to

FEDERAL COMMUNICATIONS COMMISSION

Rule Part(s) 90, 90.210, Confidentiality

DATE OF REPORT: November 1, 2001

ON THE BEHALF OF THE APPLICANT:

Wabtec Railway Electronics

AT THE REQUEST OF: P.O. 0076L

Wabtec Railway Electronics
21200 Dorsey Mill Road
Germantown, MD 20876

Attention of: Ira L. Pollack, Program Manager
(301) 515-2000; FAX: -2100
Email: ipollack@wabtec.com
and/or Clive Wright, Principal Engineer
(301) 515-2024; FAX: -2150
Email: cwright@wabtec.com

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.

TABLE OF CONTENTS

PAGE NO. 1 of 37.

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: d01b0008

d) Client: Wabtec Railway Electronics
21200 Dorsey Mill Road
Germantown, MD 20876

e) Identification: 15623
FCC ID: PYI-15623
EUT Description: UHF FM Mobile

f) EUT Condition: Not required unless specified in individual tests.

g) Report Date: November 1, 2001
EUT Received: October 12, 2001

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 37.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

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

90, 90.210, Confidentiality

Sub-part 2.1033

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

Wabtec Railway Electronics
21200 Dorsey Mill Road
Germantown, MD 20876

MANUFACTURER:

Applicant

(c)(2): FCC ID: PYI-15623

MODEL NO: 15623

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

PLEASE SEE ATTACHED EXHIBITS

(c)(4): TYPE OF EMISSION: 25K2F1D, 12K6F1D, 4K2F1D

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

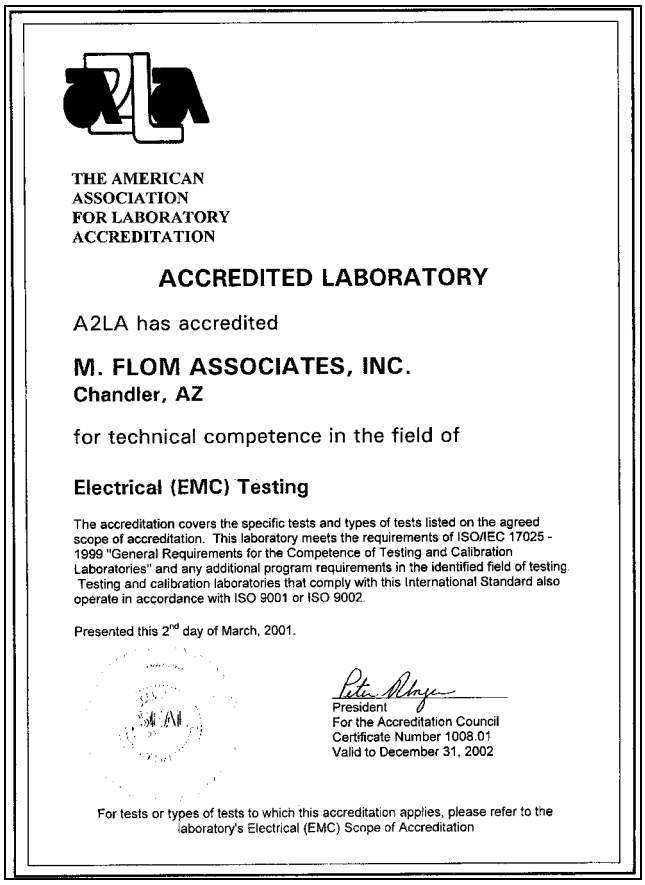
(c)(6): POWER RATING, Watts: 2 to 8
_x_ Switchable ___ Variable ___ N/A

FCC GRANT NOTE: BF - The output power is continuously variable from the value listed in this entry to 20%-25% of the value listed.

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

DUT RESULTS: Passes _x_ Fails _____

M. Flom Associates, Inc. is accredited by the American Association for Laboratory Association (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

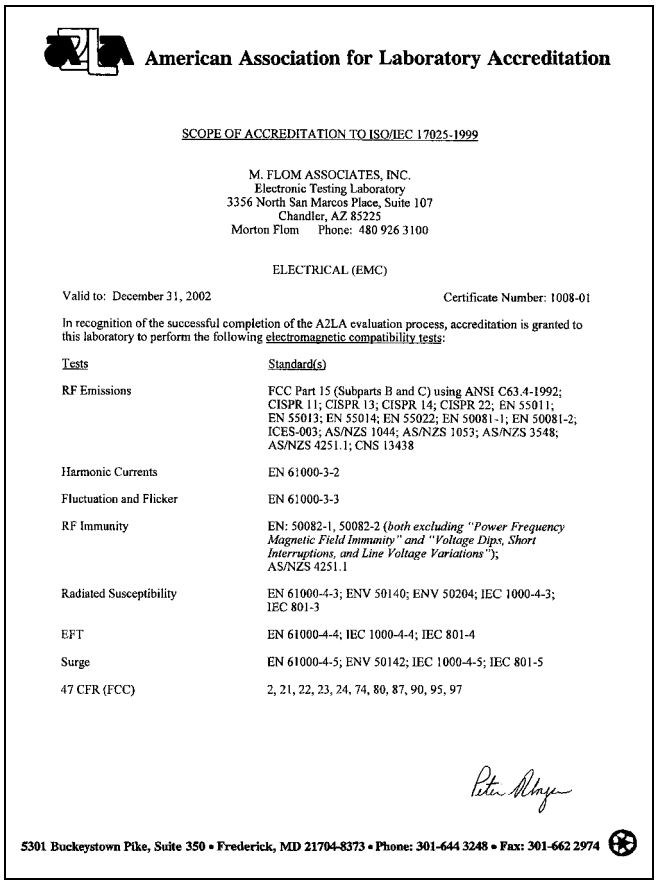
Electrical (EMC) Testing

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.

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" and "Voltage Dips, Short Interruptions, and Line Voltage Variations"*); AS/NZS 4251.1
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
47 CFR (FCC)	2, 21, 22, 23, 24, 74, 80, 87, 90, 95, 97

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.

PAGE NO. 4 of 37.

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 = 13.0 nominal

(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

PAGE NO. 5 of 37.

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
_X_ 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

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. 7 of 37.

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 ±3%.

MEASUREMENT RESULTS
(Worst case)

FREQUENCY OF CARRIER, MHz = 450.075, 479.8625

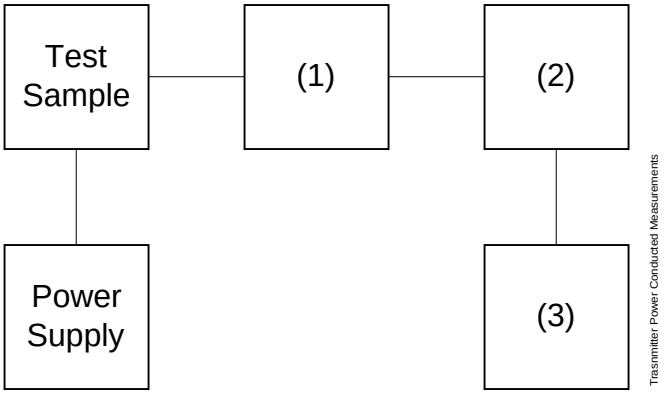
POWER SETTING	R. F. POWER, WATTS
Low	2
High	8

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

PAGE NO. 8 of 37.

TRANSMITTER POWER CONDUCTED MEASUREMENTS

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



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

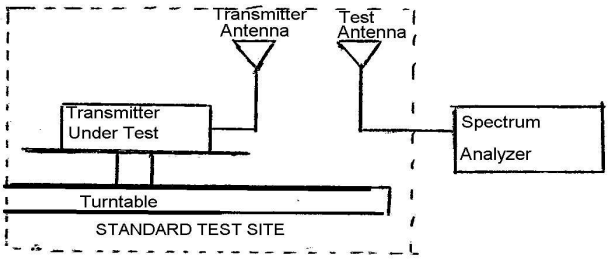
PAGE NO. 9 of 37.

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:

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

RESULTS

	450.013 MHZ LVL, dbm	465.08 MHz LVL, dbm	479.900 MHz LVL, dbm	Path Loss, db
0˚	35.2	36.9	36.9	1.8
45˚	34.3	36.4	35.5	1.8
90˚	33.9	35.8	34.0	1.8
135˚	33.8	36.0	35.1	1.8
180˚	33.8	36.5	36.1	1.8
225˚	34.4	34.8	35.8	1.8
270˚	34.2	35.4	35.6	1.8
315˚	33.9	35.1	35.5	1.8

	450.013 MHZ	465.08 MHz	479.900 MHz
Av. Radiated Power:	35.95 dbm	37.66 dbm	37.36 dbm

PAGE NO. 10 of 37.

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

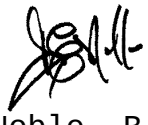
MEASUREMENT PROCEDURE

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	=	450.075, 479.8625
SPECTRUM SEARCHED, GHz	=	0 to 10 x F_C
MAXIMUM RESPONSE, Hz	=	(Data) N/A
ALL OTHER EMISSIONS	=	≥ 20 dB BELOW LIMIT



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

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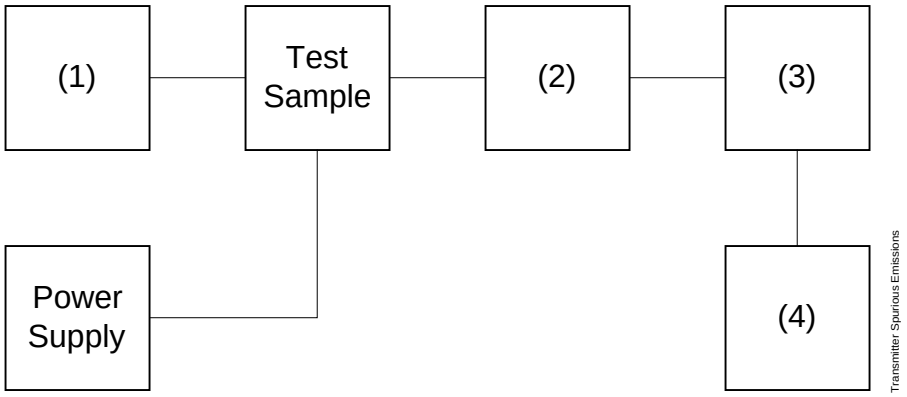
TRANSMITTER SPURIOUS EMISSION

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



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

PAGE NO. 12 of 37.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

LIMIT(S), dBc
-(50+10xLOG P) = -53 (2 Watts)
-(50+10xLOG P) = -59 (8 Watts)

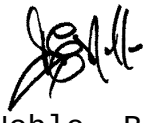
Unit #4	Type	Frequency	Modulation	Peak Dev. kHz	RF Output Watts
	F1	450.0750	MSK 1200BPS	3.0	2.0
	F1	450.0750	MSK 1200BPS	3.0	8.0

Low Power g01a0084: 2001-Oct-17 Wed 11:50:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
450.075000	900.158000	-38.3	-71.3	-18.3
450.075000	1350.396000	-42	-75	-22
450.075000	1799.820000	-42.5	-75.5	-22.5
450.075000	2250.828000	-40.6	-73.6	-20.6
450.075000	2699.951000	-43.1	-76.1	-23.1
450.075000	3150.029000	-44.3	-77.3	-24.3
450.075000	3600.737000	-44.2	-77.2	-24.2
450.075000	4050.725000	-43.7	-76.7	-23.7
450.075000	4500.575000	-43.1	-76.1	-23.1
450.075000	4950.647000	-43.8	-76.8	-23.8
450.075000	5401.106000	-44.2	-77.2	-24.2
450.075000	5851.064000	-38.4	-71.4	-18.4
450.075000	6300.663000	-37.2	-70.2	-17.2
450.075000	6751.052000	-37.5	-70.5	-17.5

High Power g01a0083: 2001-Oct-17 Wed 11:48:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
450.075000	900.156000	-29.8	-68.8	-9.8
450.075000	1350.227000	-42.4	-81.4	-22.4
450.075000	1800.074000	-41.8	-80.8	-21.8
450.075000	2250.273000	-41.2	-80.2	-21.2
450.075000	2700.683000	-43.2	-82.2	-23.2
450.075000	3150.151000	-44	-83	-24
450.075000	3600.623000	-43.4	-82.4	-23.4
450.075000	4050.296000	-44.1	-83.1	-24.1
450.075000	4500.991000	-43.4	-82.4	-23.4
450.075000	4950.456000	-44	-83	-24
450.075000	5401.327000	-43.3	-82.3	-23.3
450.075000	5850.514000	-37.9	-76.9	-17.9
450.075000	6301.296000	-39	-78	-19
450.075000	6750.951000	-37.7	-76.7	-17.7



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

PAGE NO. 13 of 37.

NAME OF TEST: Unwanted Emissions (Transmitter Conducted)

LIMIT(S), dBc
-(50+10xLOG P) = -53 (2 Watts)
-(50+10xLOG P) = -59 (8 Watts)

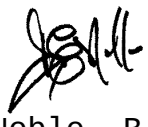
Unit #5	Type	Frequency	Modulation	Peak Dev. kHz	RF Output Watts
	F1	479.8625	MSK 1200BPS	3.0	2.0
	F1	479.8625	MSK 1200BPS	3.0	8.0

Low Power g01a0078: 2001-Oct-17 Wed 10:16:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
479.862000	959.738000	-39.7	-72.7	-19.7
479.862000	1439.158000	-41.7	-74.7	-21.7
479.862000	1919.884000	-41.3	-74.3	-21.3
479.862000	2398.815000	-40.6	-73.6	-20.6
479.862000	2879.030000	-43.6	-76.6	-23.6
479.862000	3358.812000	-42.1	-75.1	-22.1
479.862000	3839.078000	-43.6	-76.6	-23.6
479.862000	4318.986000	-43.3	-76.3	-23.3
479.862000	4799.085000	-44	-77	-24
479.862000	5278.558000	-42.2	-75.2	-22.2
479.862000	5758.218000	-43.9	-76.9	-23.9
479.862000	6237.847000	-36.5	-69.5	-16.5
479.862000	6718.101000	-37.9	-70.9	-17.9
479.862000	7197.482000	-37.2	-70.2	-17.2

High Power g01a0077: 2001-Oct-17 Wed 10:14:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	MARGIN, dB
479.862000	959.733000	-31.1	-70.1	-11.1
479.862000	1439.574000	-41.8	-80.8	-21.8
479.862000	1919.463000	-36	-75	-16
479.862000	2399.325000	-37.4	-76.4	-17.4
479.862000	2879.495000	-43.6	-82.6	-23.6
479.862000	3358.694000	-43.8	-82.8	-23.8
479.862000	3839.351000	-44.5	-83.5	-24.5
479.862000	4318.561000	-44	-83	-24
479.862000	4798.300000	-43.6	-82.6	-23.6
479.862000	5278.186000	-43.7	-82.7	-23.7
479.862000	5758.385000	-43.3	-82.3	-23.3
479.862000	6238.674000	-37.8	-76.8	-17.8
479.862000	6717.794000	-37.7	-76.7	-17.7
479.862000	7197.527000	-38.3	-77.3	-18.3



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

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NAME OF TEST: Field Strength of Spurious Radiation

SPECIFICATION: 47 CFR 2.1053(a)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 1.2.12

MEASUREMENT PROCEDURE

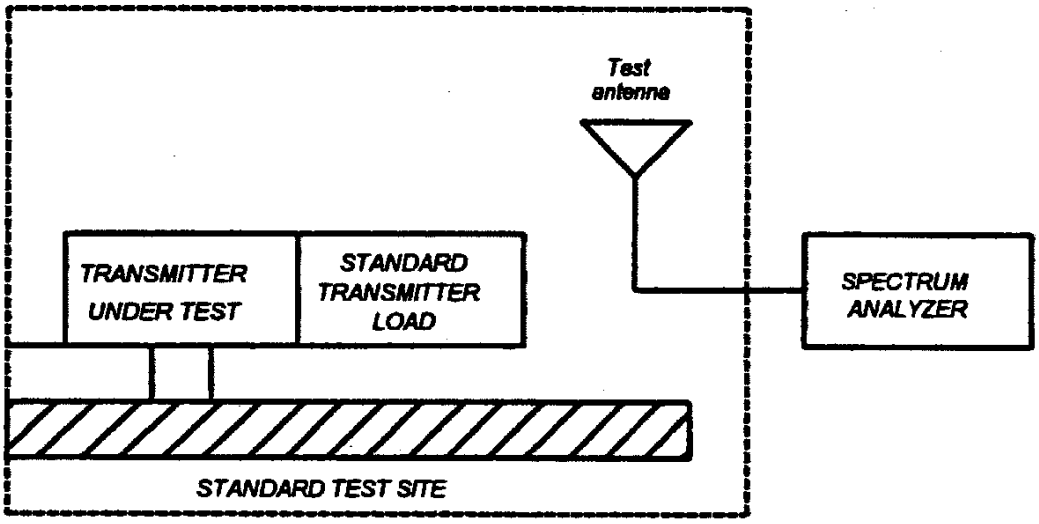
1.2.12.1 Definition: Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

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 ≤3 kHz.
2) Video Bandwidth ≥10 kHz
3) Sweep Speed ≤2000 Hz/second
4) Detector Mode = Positive Peak

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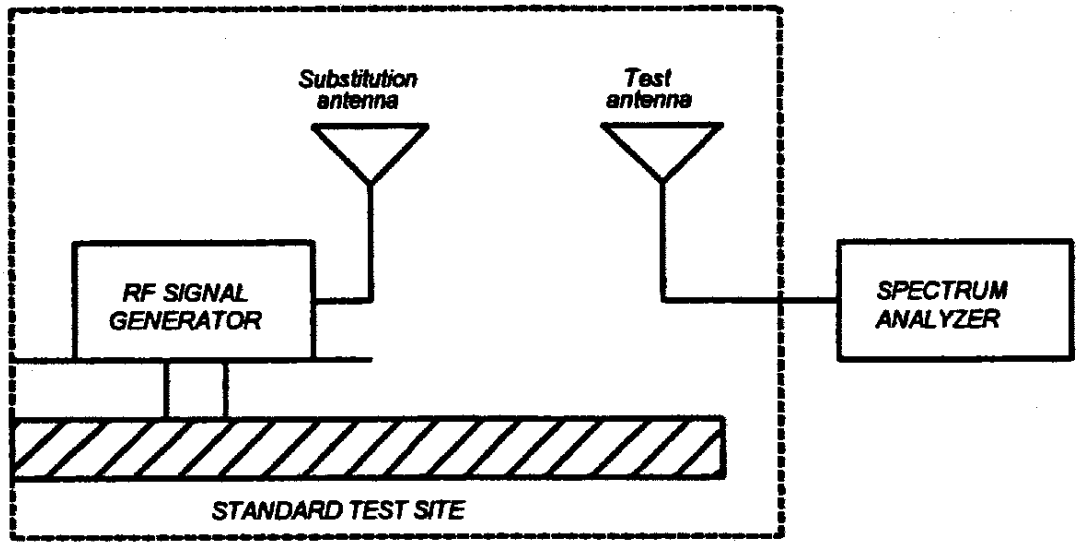
NAME OF TEST: Field Strength of Spurious Radiation (Cont.)

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 ± 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 =
$10\log_{10}$(TX power in watts/0.001) – the levels in step l)

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

Test Equipment:

Asset (as applicable)	Description	s/n	Cycle (Per ANSI C63.4-1992/2000 Draft, 10.1.4)	Last Cal
TRANSDUCER				
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
AMPLIFIER				
i00028	HP 8449A	2749A00121	12 mo.	Mar-01
SPECTRUM ANALYZER				
i00029	HP 8563E	3213A00104	12 mo.	Aug-01
i00033	HP 85462A	3625A00357	12 mo.	May-01
i00048	HP 8566B	2511AD1467	6 mo.	Nov-01

MICROPHONE, ANTENNA PORT, AND CABELING

Microphone Yes/No Y Cable Length 1 Meters
Antenna Port Terminated Yes/No Y Antenna Gain 0 dBd
All Ports Terminated by Load N

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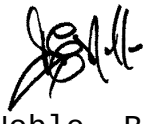
NAME OF TEST: Field Strength of Spurious Radiation

Low Powerg01a0097: 2001-Oct-23 Tue 14:20:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	ERP, dBm	ERP, dbc
450.075000	900.148800	-38.2	≤ -58
450.075000	1350.225000	-25	≤ -58
450.075000	1800.304900	-28.8	≤ -58
450.075000	2250.394900	-33.3	≤ -58
450.075000	2700.457400	-41.9	≤ -58
450.075000	3150.525584	-35.1	≤ -58
450.075000	3600.599484	-39.4	≤ -58
450.075000	4050.680984	-50.5	≤ -58
450.075000	4500.749600	-46.3	≤ -58

High Power g01a0096: 2001-Oct-23 Tue 12:45:00

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	ERP, dBm	ERP, dbc
479.862000	959.736300	-34.9	≤ -63.4
479.862000	1439.590900	-40	≤ -63.4
479.862000	1919.450400	-26.4	≤ -63.4
479.862000	1919.451700	-27.4	≤ -63.4
479.862000	2399.312700	-24.4	≤ -63.4
479.862000	2879.185282	-37.9	≤ -63.4
479.862000	3359.029449	-48.8	≤ -63.4
479.862000	3838.906116	-47.2	≤ -63.4
479.862000	4318.771449	-48.5	≤ -63.4



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

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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 ±2.5/±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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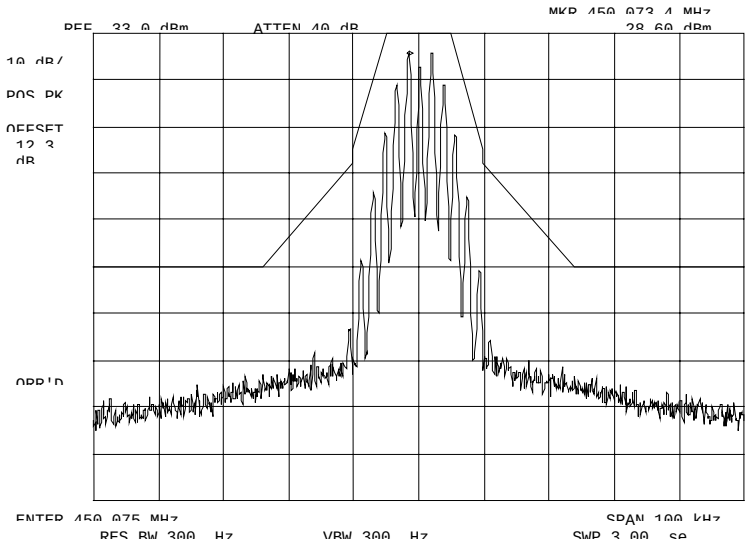
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0081: 2001-Oct-17 Wed 11:41:00
STATE: 1:Low Power Model 15623



POWER: LOW EOT #4
MODULATION: MSK @ 1200 BPS, 1.8K MARK, 450.0750 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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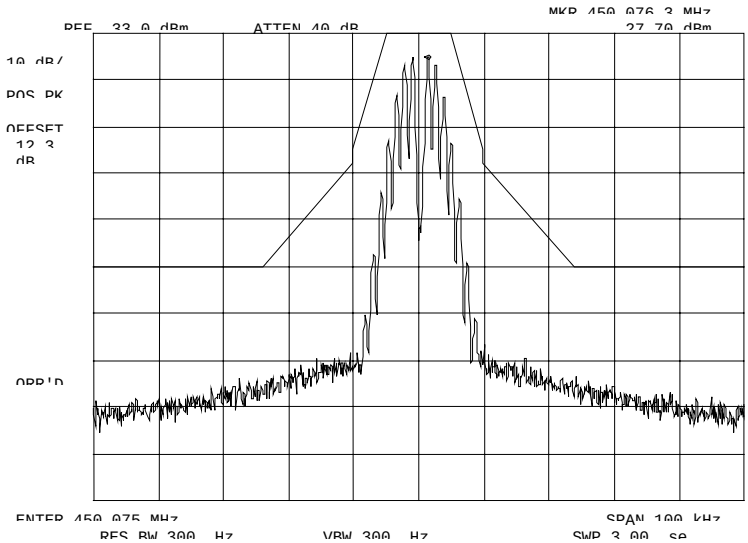
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0082: 2001-Oct-17 Wed 11:42:00
STATE: 1:Low Power Model 15623



POWER: LOW EOT #4
MODULATION: MSK @ 1200 BPS, 1.2K MARK, 450.0750 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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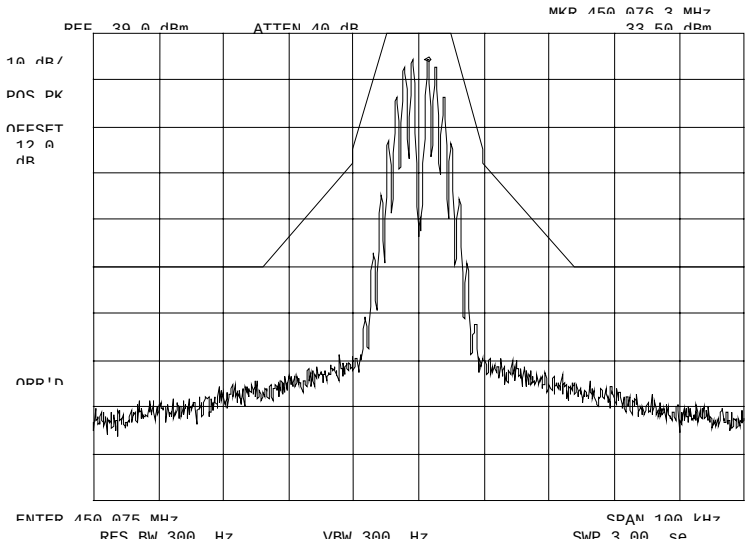
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0079: 2001-Oct-17 Wed 11:38:00
STATE: 2:High Power Model 15623



POWER: HIGH EOT #4
MODULATION: MSK @ 1200 BPS, 1.2K MARK, 450.0750 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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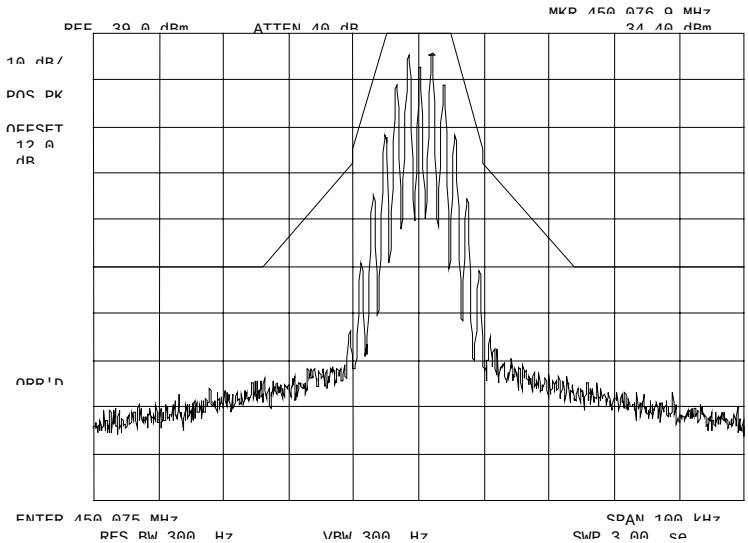
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0080: 2001-Oct-17 Wed 11:39:00
STATE: 2:High Power Model 15623



POWER: HIGH EOT #4
MODULATION: MSK @ 1200 BPS, 1.8K MARK, 450.0750 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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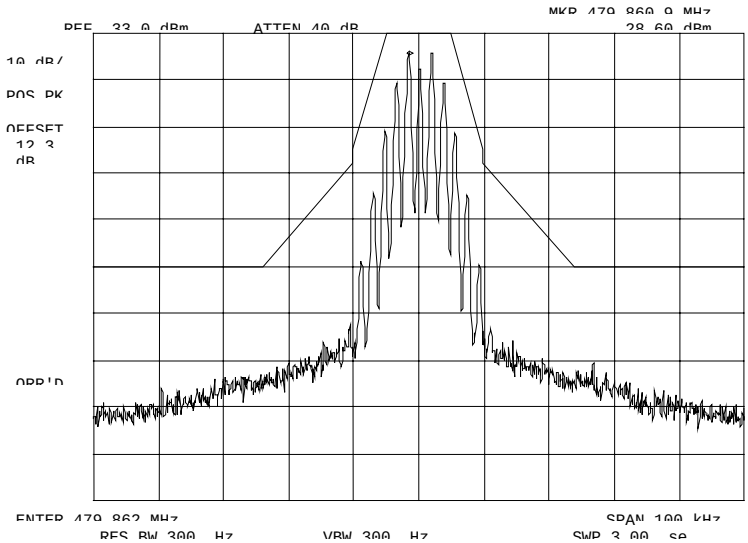
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0075: 2001-Oct-17 Wed 09:49:00
STATE: 1:Low Power Model 15623



POWER: LOW EOT #5
MODULATION: MSK @ 1200 BPS, 1.8K MARK, 479.8625 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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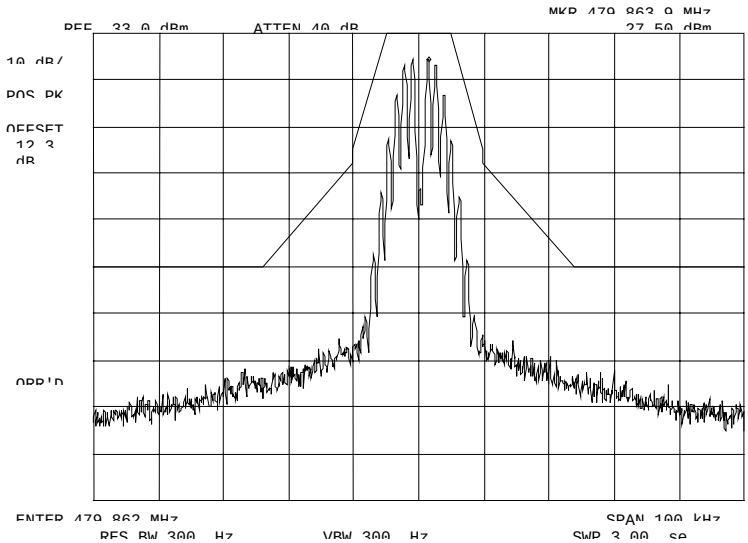
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0076: 2001-Oct-17 Wed 09:51:00
STATE: 1:Low Power Model 15623



POWER: LOW EOT #5
MODULATION: MSK @ 1200 BPS, 1.2K MARK, 479.8625 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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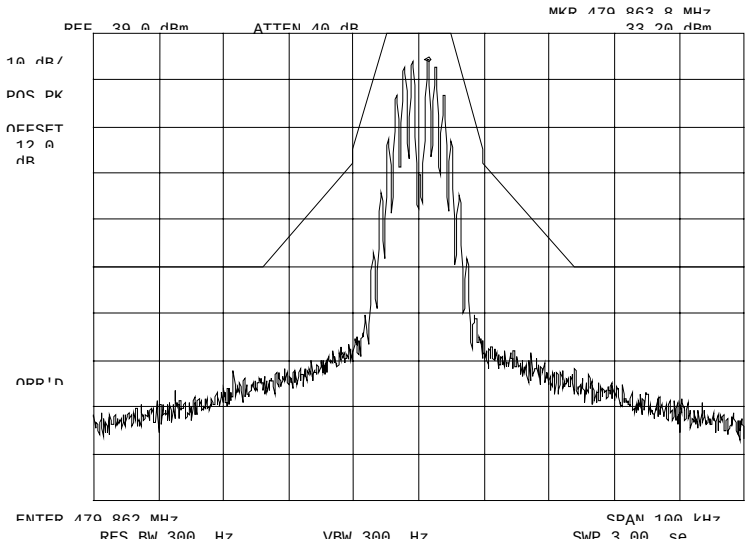
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0073: 2001-Oct-17 Wed 09:39:00
STATE: 2:High Power Model 15623



POWER: HIGH EOT #5
MODULATION: MSK @ 1200 BPS, 1.2K MARK, 479.8625 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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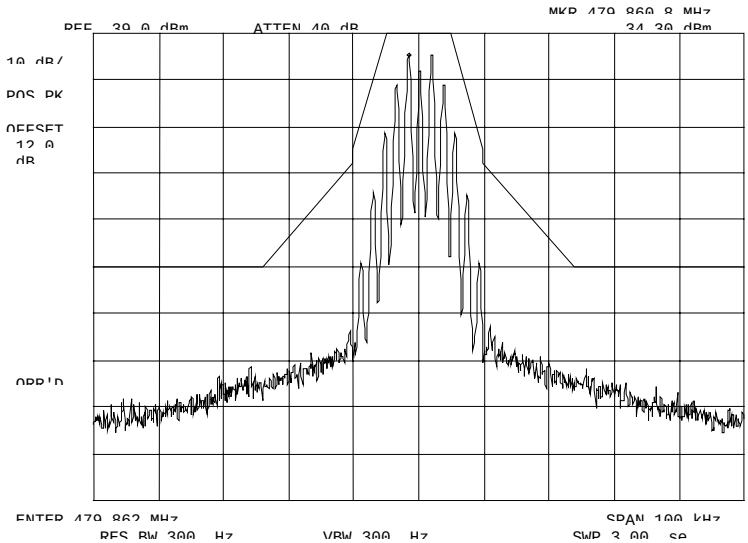
NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0074: 2001-Oct-17 Wed 09:48:00
STATE: 2:High Power Model 15623



POWER: HIGH EOT #5
MODULATION: MSK @ 1200 BPS, 1.8K MARK, 479.8625 MHZ
MASK: C, VHF/UHF 25kHz, no LPF

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

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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:

step f, dBm	=	-1.01
step h, dBm	=	-42.49
step l, dBm	=	7.67

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

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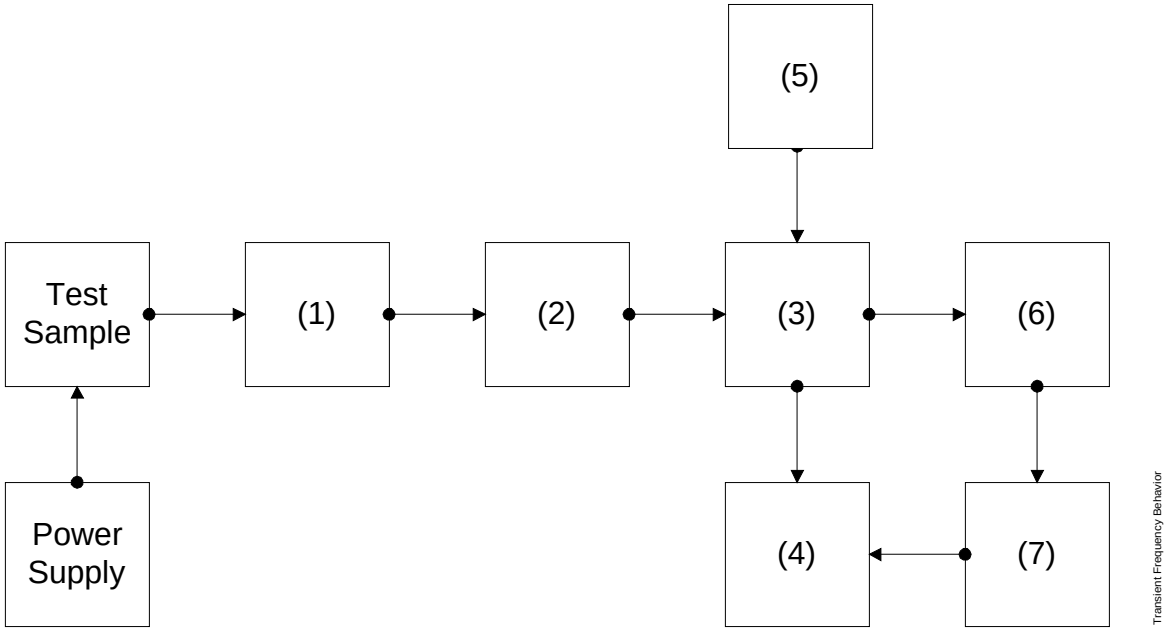
TRANSIENT FREQUENCY BEHAVIOR



Asset	Description	s/n
(as applicable)		
(1) ATTENUATOR (Removed after 1st step)		
i00112	Philco 30 dB	989
(2) ATTENUATOR		
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) COMBINER		
i00154	4 x 25 Ω COMBINER	154
(4) CRYSTAL DETECTOR		
i00159	HP 8470B	1822A10054
(5) RF SIGNAL GENERATOR		
i00018	HP 8656A	2228A03472
i00031	HP 8656A	2402A06180
i00067	HP 8920A	3345U01242
(6) MODULATION ANALYZER		
i00020	HP 8901A	2105A01087
(7) SCOPE		
i00030	HP 54502A	2927A00209

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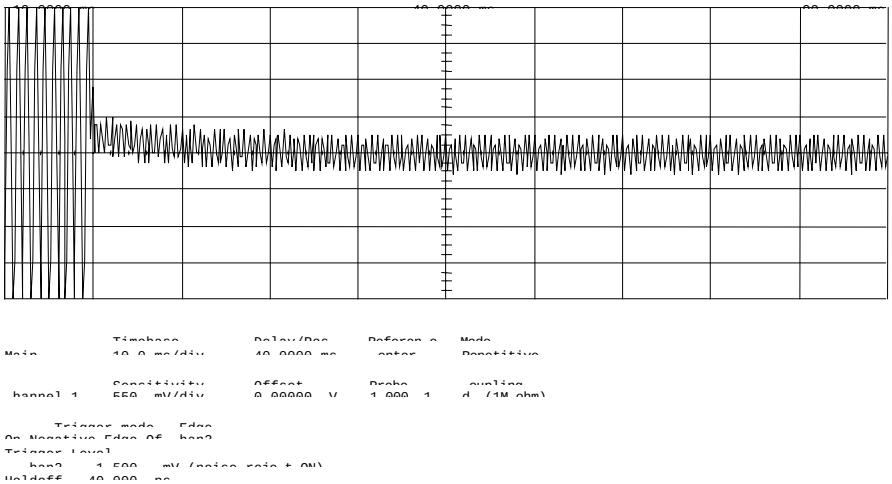
NAME OF TEST: Transient Frequency Behavior
g01a0100: 2001-Oct-30 Tue 12:27:00
STATE: 2:High Power



POWER: HIGH
MODULATION: Ref Gen=25 kHz Deviation
DESCRIPTION: CARRIER ON TIME

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

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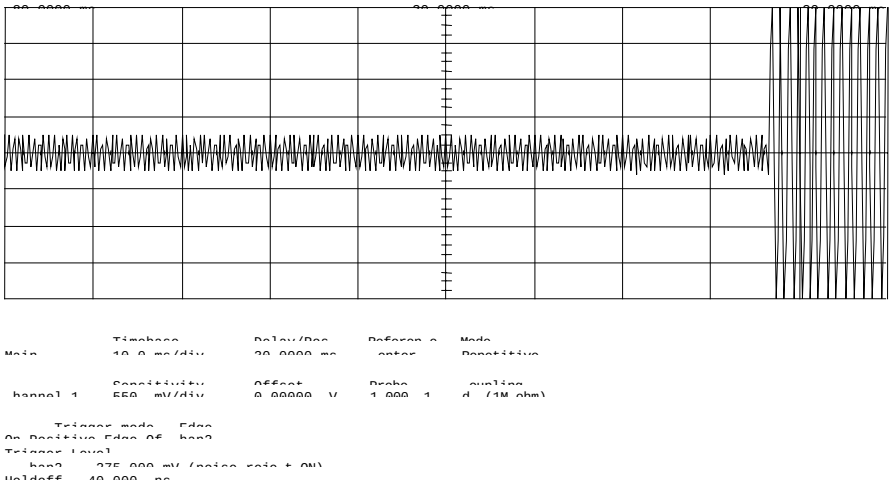
NAME OF TEST: Transient Frequency Behavior
g01a0101: 2001-Oct-30 Tue 12:29:00
STATE: 2:High Power



POWER: HIGH
MODULATION: Ref Gen=25 kHz Deviation
DESCRIPTION: CARRIER OFF TIME

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

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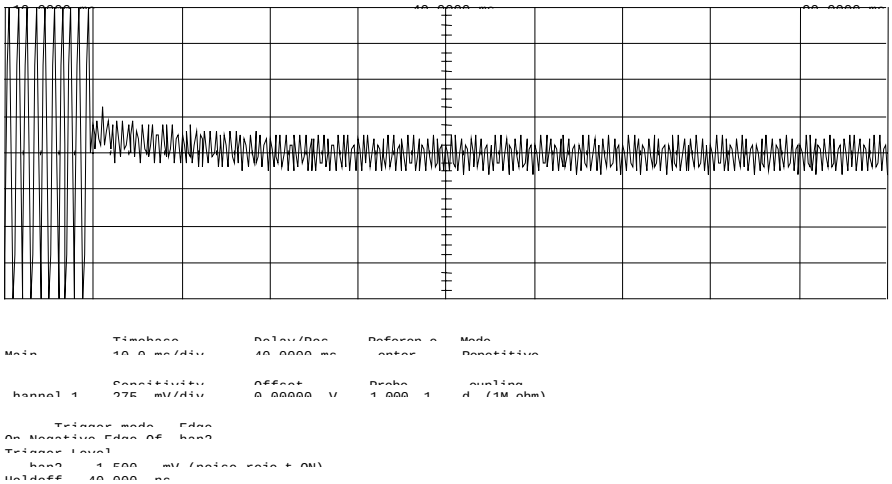
NAME OF TEST: Transient Frequency Behavior
g01a0102: 2001-Oct-30 Tue 12:57:00
STATE: 2:High Power



POWER: HIGH
MODULATION: Ref Gen=12.5 kHz Deviation
DESCRIPTION: CARRIER ON TIME

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

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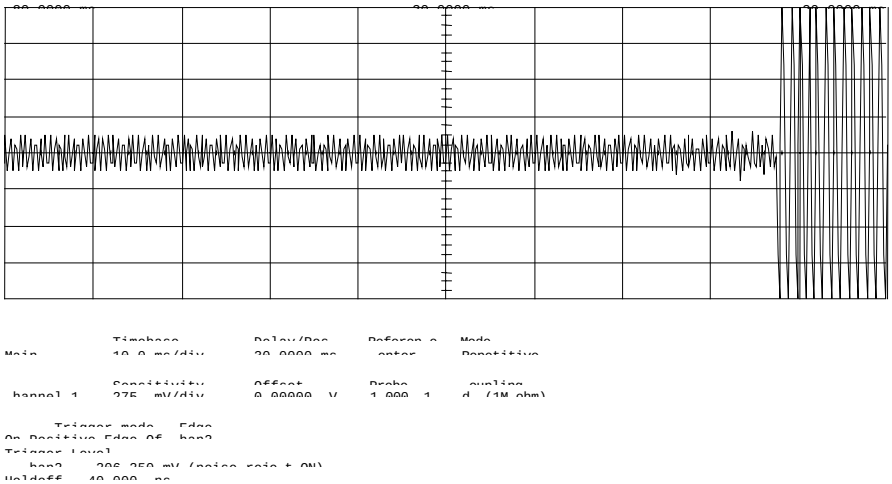
NAME OF TEST: Transient Frequency Behavior
g01a0103: 2001-Oct-30 Tue 12:59:00
STATE: 2:High Power



POWER: HIGH
MODULATION: Ref Gen=12.5 kHz Deviation
DESCRIPTION: CARRIER OFF TIME

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

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NAME OF TEST: Frequency Stability (Temperature Variation)

SPECIFICATION: 47 CFR 2.1055(a)(1)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2

TEST CONDITIONS: As Indicated

TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page.

2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.

3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

4. The temperature tests were performed for the worst case.

5. MEASUREMENT RESULTS: ATTACHED

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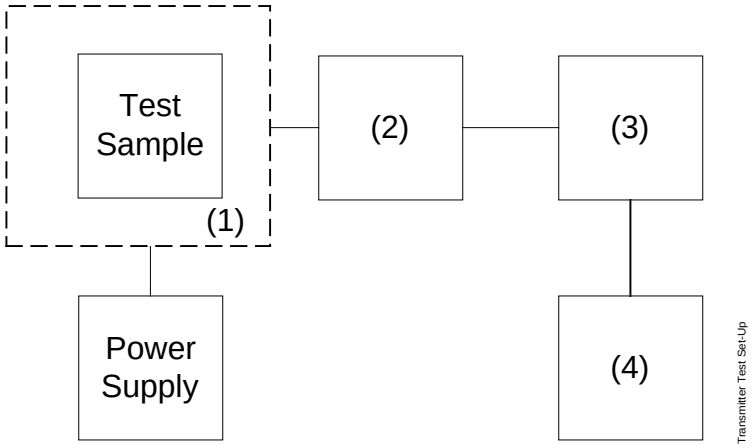
TRANSMITTER TEST SET-UP

TEST A. OPERATIONAL STABILITY
TEST B. CARRIER FREQUENCY STABILITY
TEST C. OPERATIONAL PERFORMANCE STABILITY
TEST D. HUMIDITY
TEST E. VIBRATION
TEST F. ENVIRONMENTAL TEMPERATURE
TEST G. FREQUENCY STABILITY: TEMPERATURE VARIATION
TEST H. FREQUENCY STABILITY: VOLTAGE VARIATION



Transmitter Test Set-Up

Asset	Description	s/n
(as applicable)		
(1)	TEMPERATURE, HUMIDITY, VIBRATION	
i00027	Tenney Temp. Chamber	9083-765-234
i00	Weber Humidity Chamber	
i00	L.A.B. RVH 18-100	
(2)	COAXIAL ATTENUATOR	
i00122	NARDA 766-10	7802
i00123	NARDA 766-10	7802A
i00113	SIERRA 661A-3D	1059
i00069	BIRD 8329 (30 dB)	10066
(3)	R.F. POWER	
i00014	HP 435A POWER METER	1733A05839
i00039	HP 436A POWER METER	2709A26776
i00020	HP 8901A POWER MODE	2105A01087
(4)	FREQUENCY COUNTER	
i00042	HP 5383A	1628A00959
i00019	HP 5334B	2704A00347
i00020	HP 8901A	2105A01087

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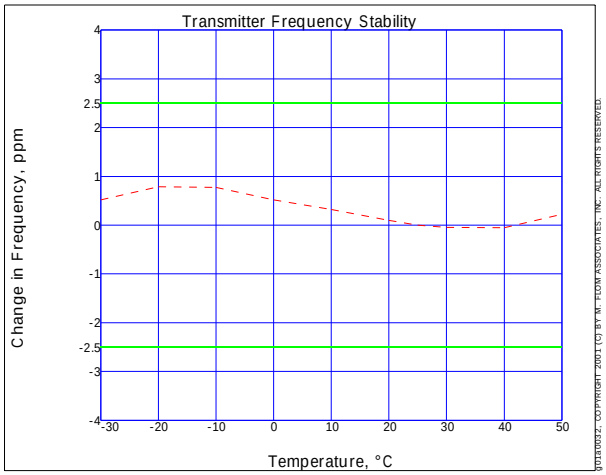
NAME OF TEST: Frequency Stability (Temperature Variation)
g01a0032: 2001-Oct-17 Wed 14:14:38
STATE: 0:General



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

PAGE NO. 36 of 37.

NAME OF TEST: Frequency Stability (Voltage Variation)

SPECIFICATION: 47 CFR 2.1055(d)(1)

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2

TEST EQUIPMENT: As per previous page

MEASUREMENT PROCEDURE

1. The EUT was placed in a temperature chamber at 25±5°C and connected as for "Frequency Stability - Temperature Variation" test.

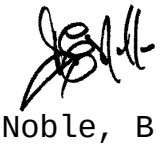
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.

3. The variation in frequency was measured for the worst case.

RESULTS: Frequency Stability (Voltage Variation)
g01a0072: 2001-Oct-17 Wed 09:13:46
STATE: 0:General

LIMIT, ppm = 2.5
LIMIT, Hz = 1163
BATTERY END POINT (Voltage) = 10.4

% of STV	Voltage	Frequency, MHz	Change, Hz	Change, ppm
85	11.05	465.087490	-10	-0.02
100	13	465.087500	0	0.00
115	14.95	465.087490	-10	-0.02
80	10.4	465.087490	-10	-0.02



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

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NAME OF TEST: Necessary Bandwidth and Emission Bandwidth

SPECIFICATION: 47 CFR 2.202(g)

MODULATION = 19.2 K BPS

NECESSARY BANDWIDTH CALCULATION:

MAXIMUM MODULATION (M), kHz	= 19.2/2
MAXIMUM DEVIATION (D), kHz	= 3.0
CONSTANT FACTOR (K)	= 1.0
NECESSARY BANDWIDTH (B_N), kHz	= (2xM)+(2xDxK)
	= 25K2F1D

MODULATION = 9.6 K BPS

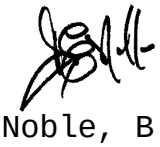
NECESSARY BANDWIDTH CALCULATION:

MAXIMUM MODULATION (M), kHz	= 9.6/2
MAXIMUM DEVIATION (D), kHz	= 1.5
CONSTANT FACTOR (K)	= 1.0
NECESSARY BANDWIDTH (B_N), kHz	= (2xM)+(2xDxK)
	= 12K6F1D

MODULATION = 1.2 K BPS

NECESSARY BANDWIDTH CALCULATION:

MAXIMUM MODULATION (M), kHz	= 1.2/2
MAXIMUM DEVIATION (D), kHz	= 1.5
CONSTANT FACTOR (K)	= 1.0
NECESSARY BANDWIDTH (B_N), kHz	= (2xM)+(2xDxK)
	= 4K2F1D



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.