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 of Report: December 7, 2001
Date of Submission: January 29, 2002

Federal Communications Commission
Via Electronic Filing

Attention: Authorization & Evaluation Division

Applicant: Kelvin Hughes Limited
Equipment: CAE-A12-20
FCC ID: CICCAE-A12-20
FCC Rules: 80

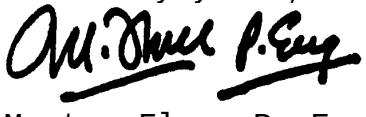
Gentlemen:

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: Kelvin Hughes Limited

FCC ID: CICCAE-A12-20

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 x
   - (9) TUNE-UP/ALIGNMENT PROCEDURE x
   - (10) SCHEMATIC DIAGRAM x
   - (10) OPERATIONAL DESCRIPTION x
   - BLOCK DIAGRAM x
   - PARTS LIST x
   - ACTIVE DEVICES x

5. PART 80.203(b) ATTESTATION x

BY M.F.A. INC.

A. TESTIMONIAL & STATEMENT OF CERTIFICATION

B. STATEMENT OF QUALIFICATIONS

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: CICCAE-A12-20
MODEL: CAE-A12-20

to

FEDERAL COMMUNICATIONS COMMISSION

Rule Part(s) 80

DATE OF REPORT: December 7, 2001

ON THE BEHALF OF THE APPLICANT:

Kelvin Hughes Limited

AT THE REQUEST OF: P.O. V139928/B5

Kelvin Hughes Limited
New North Rd.
Hainault, Ilford
Essex 1G6 2UR, England

Attention of: David A. Hannah, Chief Engineer
Dave Everson, Coordinator
dave.everson@kelvinhughes.co.uk
Phone: 011 81 500 1020 FAX: 011 44 208 559 8524

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 33.

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: d01c0010

d) Client: Kelvin Hughes Limited
New North Rd.
Hainault, Ilford
Essex 1G6 2UR, England

e) Identification: CAE-A12-20
FCC ID: CICCAE-A12-20
Description: "X" Band Radar

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

g) Report Date: December 7, 2001
EUT Received:

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 33.

LIST OF GENERAL INFORMATION REQUIRED FOR CERTIFICATION

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

80

Sub-part 2.1033

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

Kelvin Hughes Limited
New North Rd.
Hainault, Ilford
Essex 1G6 2UR, England

MANUFACTURER:

Applicant

(c)(2): FCC ID: CICCAE-A12-20

MODEL NO: CAE-A12-20

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

PLEASE SEE ATTACHED EXHIBITS

(c)(4): TYPE OF EMISSION: 82M2P0N

(c)(5): FREQUENCY RANGE, MHz: 9380 to 9440

(c)(6): POWER RATING, Watts Peak: 25000
___ Switchable ___ Variable _x_ N/A

(c)(7): MAXIMUM POWER RATING, Watts: 16.8 Average

PLEASE NOTE: This unit is identical to FCC ID: CICCTX-A8 simultaneously submitted, except this model is meant for UPMAST Installation.

PAGE NO. 3 of 33.

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, Vac = 110/220, 60 Hz

(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

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

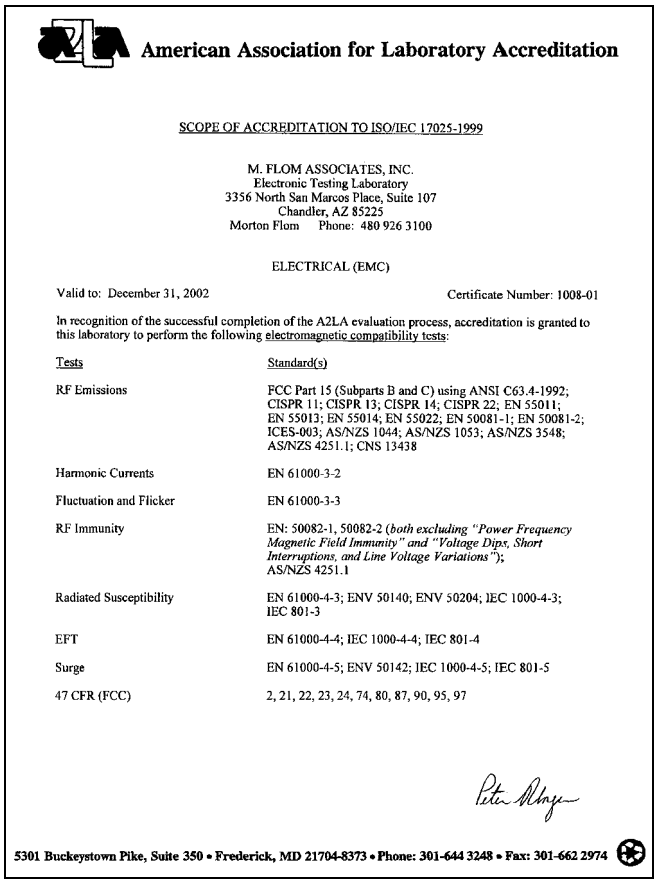
Electrical (EMC) Testing

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. 5 of 33.

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
_X_ 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

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 33.

NAME OF TEST: Summary of Calculations

TEST EQUIPMENT: As per attached page

PROCEDURE

Tests and calculations for the indicated parameters were conducted and made as follows:

(1) The average power, pulse widths, pulse rise and decay times, and the interval between successive output pulses were measured.

(2) The pulse repetition frequency (P.R.F.) was then calculated from the reciprocal of the interval.

(3) The duty cycle was calculated from the product of the P.F.R. and the pulse width.

(4) The average power was corrected for attenuation.

(5) The peak power was calculated by dividing the average power by the duty cycle.

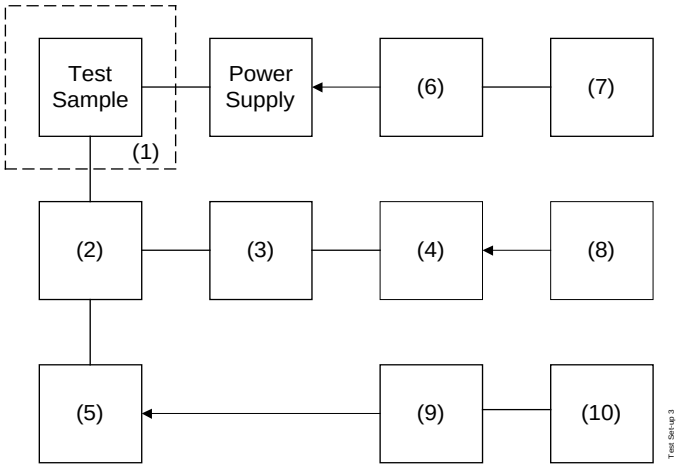
(6) The spurious and harmonic radiation characteristics, the occupied bandwidth and the receiver radiation were measured.

(7) MEASUREMENT RESULTS: ATTACHED

PAGE NO. 8 of 33.

TEST SET-UP FOR MEASUREMENT OF:

TEST A. AVERAGE POWER
TEST B. PULSE WIDTHS
TEST C. PULSE INTERVAL
TEST D. OCCUPIED BANDWIDTH
TEST E. SPURIOUS AND HARMONIC EMISSIONS
TEST F. FREQUENCY STABILITY
TEST G. SPURIOUS RADIATION FIELD STRENGTH



Asset	Description (as applicable)	s/n
(1) TEMPERATURE CHAMBER:		
i00027	Tenney Temp. Chamber	9083-765-234
(2) DIRECTIONAL COUPLER:		
i00187	Narda 1080 (S), 40 dB	50233
i00107	Narda 104 (X)	890627-001
(3) ADAPTER:		
i00185	HP S281A	16
i00188	HP X281A	17
(4) FREQUENCY METER:		
i00083	HP 536A (S)	1441A02335
i00082	HP 537A (X)	144102889
i00019	HP 5334B	2704A00347
(5) LOAD TERMINATION:		
i00186	Waveline 281 (S)	281
i00189	Narda 320B (X)	8107
(6) SENSOR:		
i00016	HP 8481A (S,X)	1926A25798
i00015	HP 8482H (S)	1545A00606
(7) POWER METER:		
i00039	HP 436A	2709A26776
(8) SPECTRUM ANALYZER:		
i00048	HP 8566B	2511A01467
i00029	HP 8563E	3213A00104
(9) CRYSTAL DETECTOR:		
i00159	HP 8472B	1822A10054
(10) OSCILLOSCOPE:		
i00030	HP 54502A	2927A00209

MEASUREMENT SUMMARY

Pulse Mode	P.R.F., Hz	Pulse Width, µS
Short	3000	0.047
Medium	1500	0.184
Long	750	0.902
Very Long	375	0.991

ITEM	SUMMARY (S-BAND)	SUMMARY (X-BAND)
1. Average Power	Measured with HP 436A with HP 8482H	Measured with HP 436A with HP 8481A
2. Corrected Power	Corrected for Attenuator	
3. P.R.F.	Measured with HP 5334B Frequency Counter	
4. Pulse Width	Measured with HP 54502A Oscilloscope	
5. Peak Power	Calculation: Avg. Power divided by P.R.F. x Pulse Width (duty cycle)	

PAGE NO. 10 of 33.

NAME OF TEST: R.F. Power Output (Measured and Calculated)

SPECIFICATION: 47 CFR 2.1046(a), 80.215

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.1

TEST EQUIPMENT: As per previous page, using:

CMI RCC284-2	HP 436A	HP 8481A(X)
HP S281A, HP X281A	NARDA 320B (X)	HP 8482H(S)
WAVELINE 281 (S)	NARDA 1080 (S)	

MEASUREMENT PROCEDURE

1. The EUT was adjusted in accordance with the manufacturer's tune-up procedure, the test sample and test equipment were set up as shown on the previously attached Test Setup.

2. The power output was measured with an accuracy of ±3%.

3. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT RESULTS: R.F. Power (Measured and Calculated)

SAMPLE CALCULATION

Pulse Mode = Short

Measured Power, µW = 412

Coupler Correction, dB = 40

Power Output, Watts, Ave. = 4.12

Pulse Mode	Coupler Attenuation, dB	Corrected Watts, Ave.
Short	40	4.12
Medium	40	7.5
Long	40	16.8
Very Long	40	9.3

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

PAGE NO. 12 of 33.

NAME OF TEST: Calculation of Peak Power

TEST EQUIPMENT: N/A

APPLICABLE FORMULAS

Duty Cycle = P.R.F. x Pulse Width

Peak Power = $\frac{\text{Average Power}}{\text{Duty Cycle}}$

SAMPLE CALCULATION

Pulse Mode = Short

Average Power, W (corrected) = 4.12

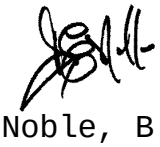
P.R.F., Hz (measured) = 3000

Pulse Width, µs (measured) = 0.047

Peak Power, kWP (calculated) = 29.2

CALCULATION SUMMARY

Pulse Mode	Corrected Ave. Power, W	P.R.F., Hz	Pulse Width, µs	Peak Power, kW
Short	4.12	3000	0.047	29.2
Medium	7.5	1500	0.184	27.17
Long	16.8	750	0.902	24.8
Very Long	9.3	375	0.991	25.02



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

PAGE NO. 13 of 33.

NAME OF TEST: Detected Pulses

TEST EQUIPMENT: As per previous page, using:

HP 54502A HP 8472B NARDA 4779

MEASUREMENT PROCEDURE

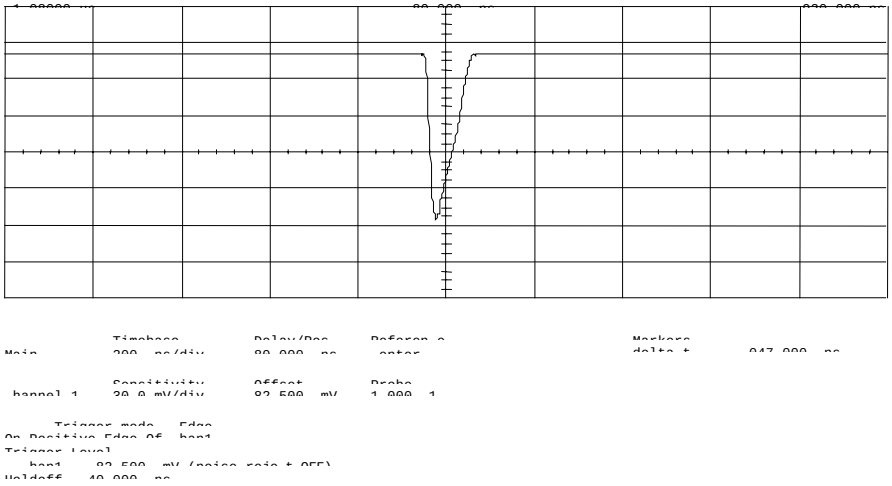
1. In order to determine some of the characteristics of the various pulses, an HP 51502A Oscilloscope Measurement System was connected, through an HP 8472B Detector and a Narda 4779 Attenuator to the Test Setup (previously attached).

2. The detected pulse shapes are shown on the plots following.

3. MEASUREMENT RESULTS: ATTACHED.

PAGE NO. 14 of 33.

NAME OF TEST: Detected Pulses
g01a0134: 2001-Oct-05 Fri 10:13:00
STATE: 2:High Power

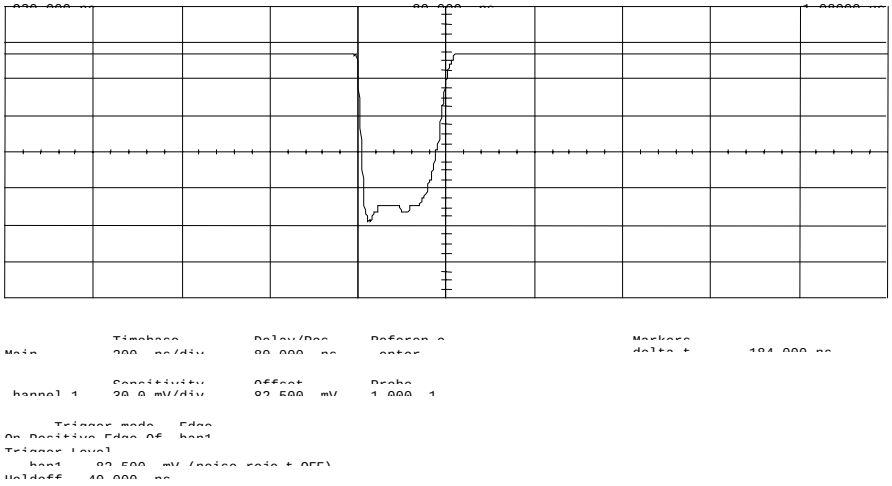


POWER:	HIGH
MODULATION:	SHORT PULSE
DESCRIPTION:	PULSE = .047 US @ 50% BELOW REFERENCE

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

PAGE NO. 15 of 33.

NAME OF TEST: Detected Pulses
g01a0135: 2001-Oct-05 Fri 10:24:00
STATE: 2:High Power

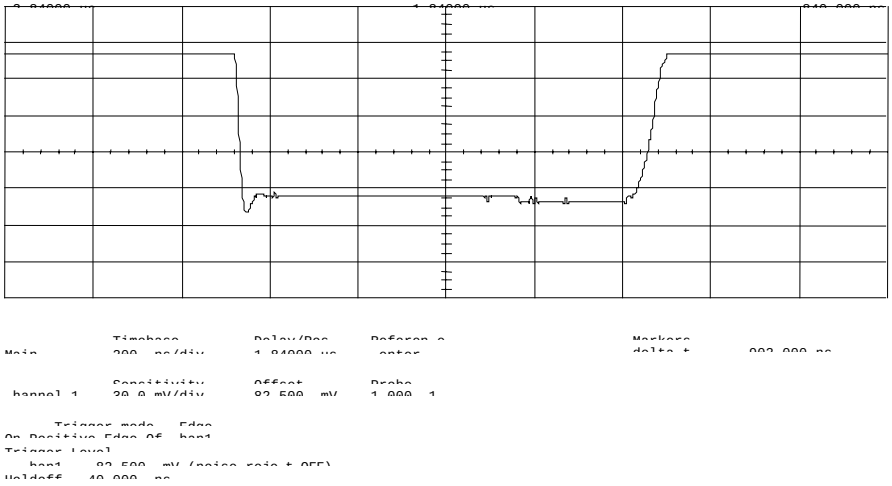


POWER: HIGH
MODULATION: MEDIUM PULSE
DESCRIPTION: PULSE = .184 US @ 50% BELOW REFERENCE

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

PAGE NO. 16 of 33.

NAME OF TEST: Detected Pulses
g01a0136: 2001-Oct-05 Fri 10:34:00
STATE: 2:High Power

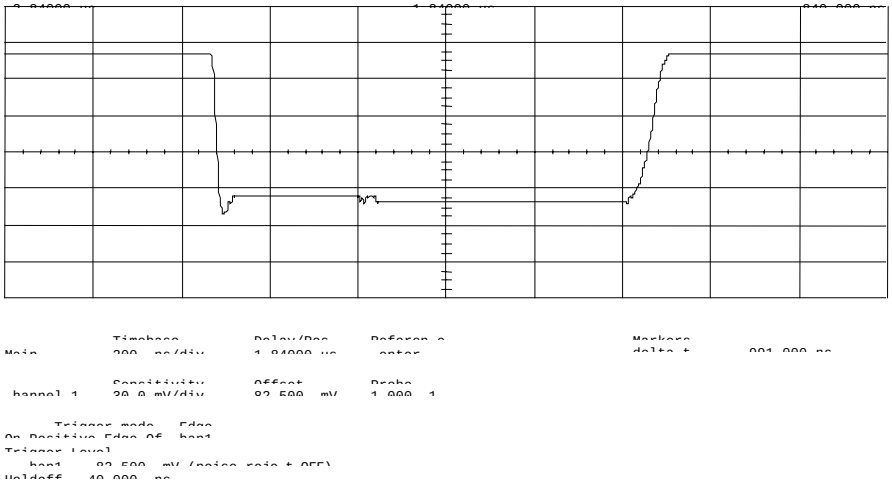


POWER:	HIGH
MODULATION:	LONG PULSE
DESCRIPTION:	PULSE = .902 US @ 50% BELOW REFERENCE

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

PAGE NO. 17 of 33.

NAME OF TEST: Detected Pulses
g01a0137: 2001-Oct-05 Fri 10:38:00
STATE: 2:High Power



POWER:	HIGH
MODULATION:	VERY LONG PULSE
DESCRIPTION:	PULSE = .991 US @ 50% BELOW REFERENCE

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

PAGE NO. 18 of 33.

NAME OF TEST: Modulation Limiting

SPECIFICATION: 47 CFR 2.1047(b)

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

TEST EQUIPMENT: N/A

PLEASE SEE TECHNICAL DESCRIPTION, ATTACHED

PAGE NO. 19 of 33.

NAME OF TEST: Emission Masks (Occupied Bandwidth)

SPECIFICATION: 47 CFR 2.1049(c)(1), 80.209(b), 80.211

GUIDE: ANSI/TIA/EIA-603-1992, Paragraph 2.2.11

TEST EQUIPMENT: As per previous page, using:

CMI RCC284-2	HP 8563E	HP 8566B
HP 5281A, HP A281A	NARDA 320B	HP X281A
WAVELINE 281	NARDA 1080	NARDA 4779

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up as shown on the following page, with the Spectrum Analyzer connected.

2. The digital storage mode of the Spectrum Analyzer does not show internal detail of the pulse. Other analyzer settings were attempted in order to obtain a more "dense" pattern. The one presented here proved to be the optimum.

3. The 99% poewr bandwidth was measured for each pulse mode using HP "Programming note (MAR 1989) for HP 8566B, HP 8568B, Models 218, 226, 236-91".

MEASUREMENT SUMMARY

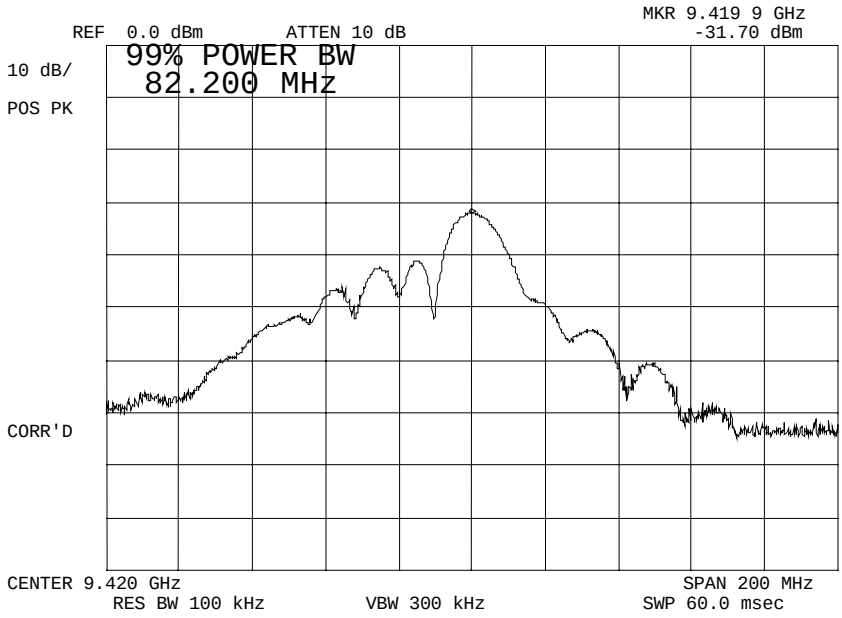
PULSE MODE	99% POWER BANDWIDTH, MHz
Short	82.2
Medium	54.2
Long	21.0
Very Long	13.8

MEASUREMENT RESULTS: ATTACHED

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

PAGE NO. 20 of 33.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0138: 2001-Oct-05 Fri 12:36:00
STATE: 2:High Power

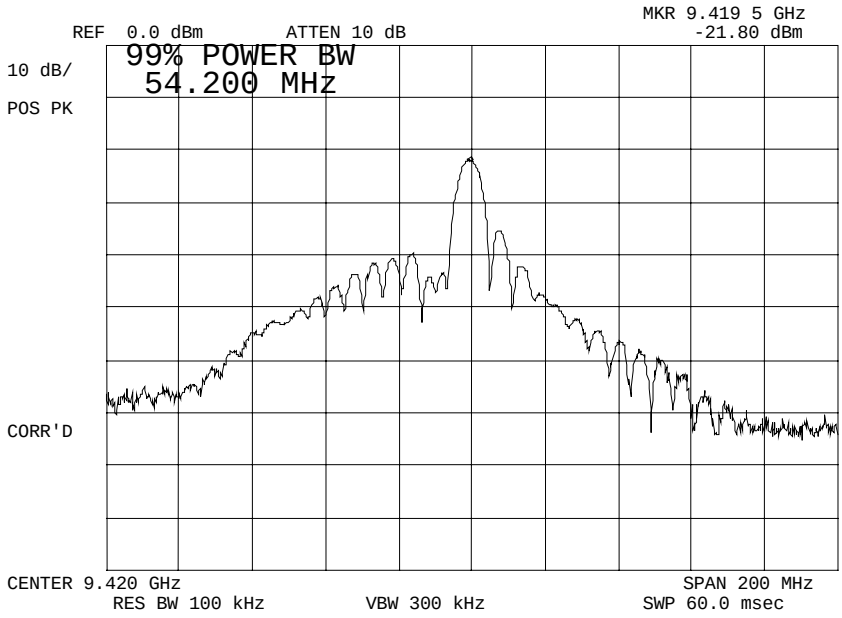


POWER: HIGH
MODULATION: SHORT PULSE
99 % POWER BANDWIDTH

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

PAGE NO. 21 of 33.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0139: 2001-Oct-05 Fri 13:16:00
STATE: 2:High Power

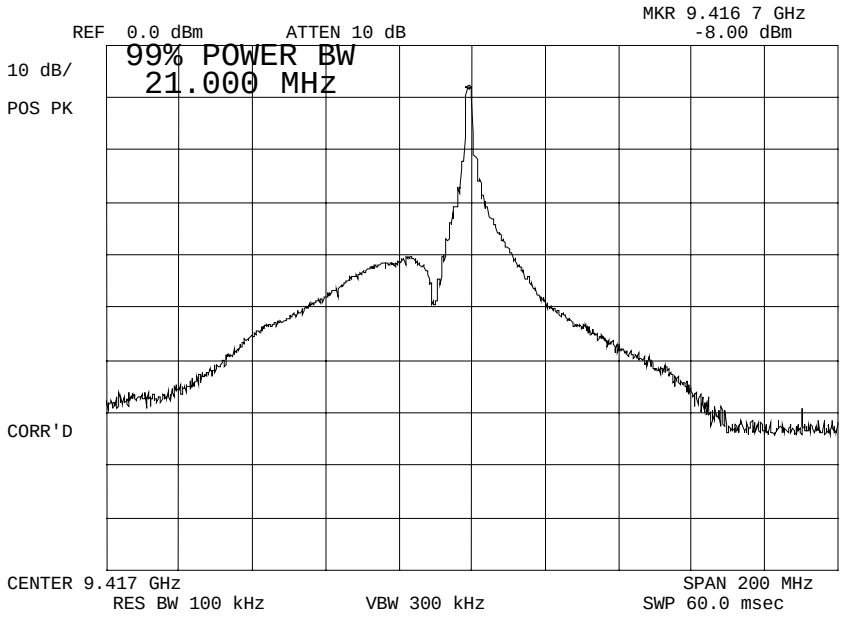


POWER: HIGH
MODULATION: MEDIUM PULSE
99 % POWER BANDWIDTH

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

PAGE NO. 22 of 33.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0140: 2001-Oct-05 Fri 13:20:00
STATE: 2:High Power

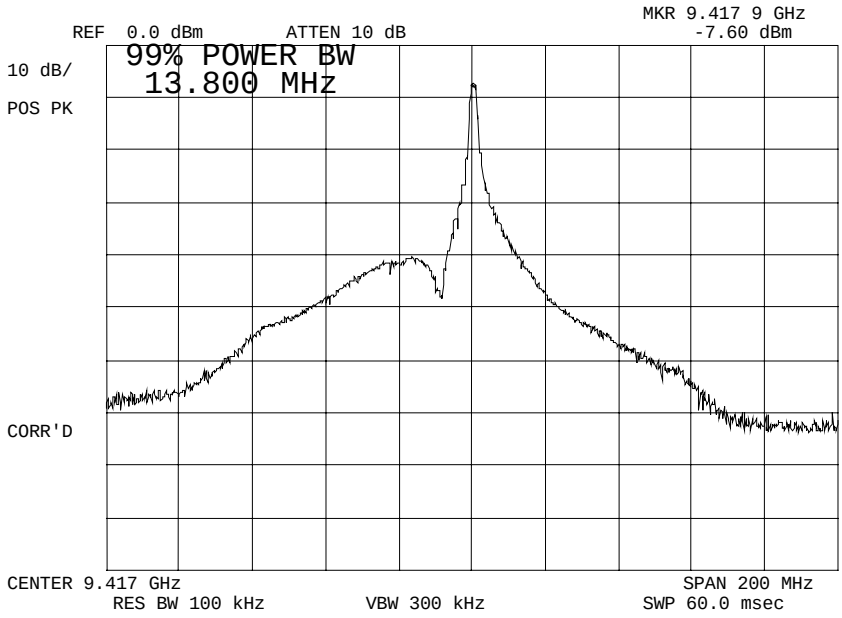


POWER: HIGH
MODULATION: LONG PULSE
99 % POWER BANDWIDTH

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

PAGE NO. 23 of 33.

NAME OF TEST: Emission Masks (Occupied Bandwidth)
g01a0141: 2001-Oct-05 Fri 13:22:00
STATE: 2:High Power



POWER: HIGH
MODULATION: VERY LONG PULSE
99 % POWER BANDWIDTH

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

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NAME OF TEST: Emissions TX1

SPECIFICATION: 47 CFR 2.1051

Fc, Tuned = 9410 MHz

Limit = -(43 + 10 LOG P_o)

= -(43 + 10 LOG 16.8)
(Worst Case, Long Pulse

= -55.25 dbc

Emission	dbm	dBc
2 x Fc	-38.1	-80.3
3 x Fc	-42.4	-84.6

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

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NAME OF TEST: Spurious Emissions at Antenna Terminals

SPECIFICATION: 47 CFR 2.1051, 80.211

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

TEST EQUIPMENT: As per previous page, using:

CMI RCC284-2	HP 8563E	HP S281A
NARDA 320B (X)	HP 8566B	NARDA 1080 / NARDA 104
WAVELINE 281 (S)	NARDA 4779	HP X281A

MEASUREMENT PROCEDURE

1. The test sample was set up as for Occupied Bandwidth.
2. At first, the 0 dB reference level for the main pulse was established
3. The spectrum was searched over the range 0 to 90 GHz, using external mixers on the HP 8556B Spectrum Analyzer.
4. MEASUREMENT RESULTS: ATTACHED

Spectrum Searched, GHZ	= 0 to 90
All Other Emissions	= ≥ 20 dB below limit
Limit, dBc: -(43 + 10 LOG P_0) (Average Power)	= -55.3 (16.8 W, Average)
Tuned Fc	= 9410 MHz

Emission, MHz/Harmonic	dbm	Spurious Level, dBc (worst case)
18820.2	-42.4	-84.6
3 x Fc	-53.9	-96.1

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

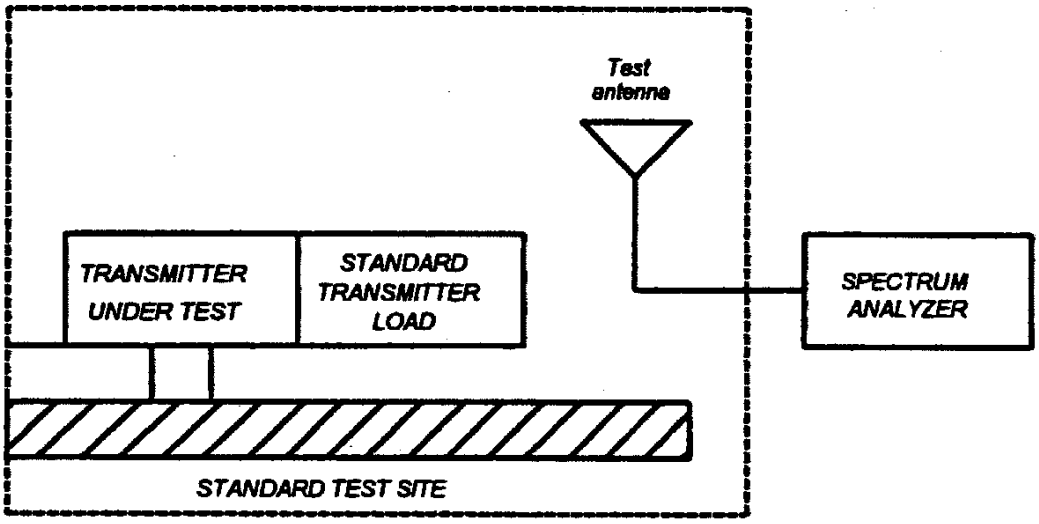
1.2.12.1 Definition: Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

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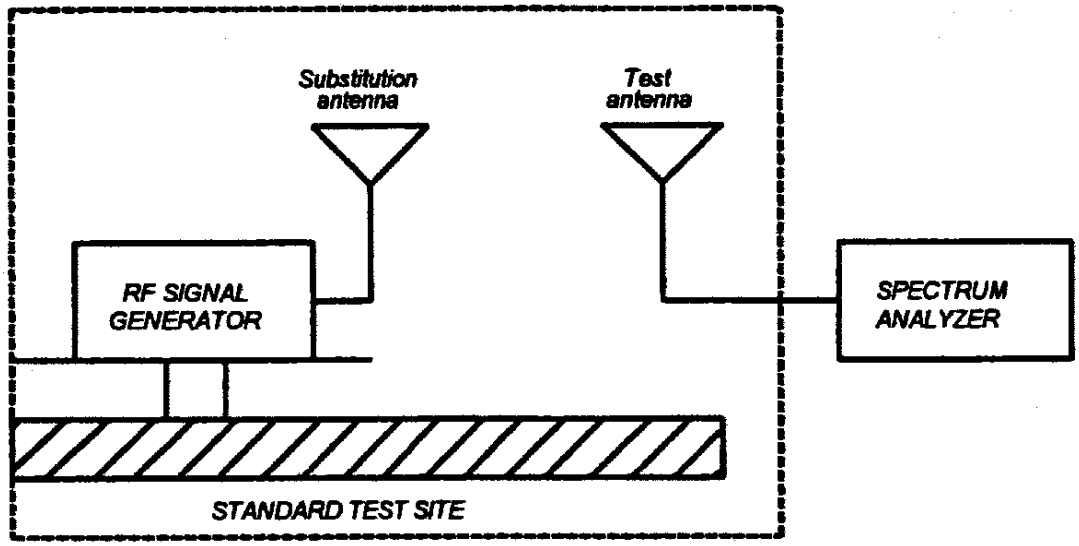
NAME OF TEST: Field Strength of Spurious Radiation (Cont.)

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.	May-01

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NAME OF TEST: Field Strength of Spurious Radiation

Spectrum Searched, GHz = 0 to 90
(Using external mixers)

All Other Emissions = ≥ 20 dB Below Limit

Limit, dBc = -55.3 dbc (16.8 W, ave)

Fc = 9410 MHz

Pulse Mode	Emission MHz	Level dbμν/m	@ m	C.F., db	Calc dbμν/m	EIRP dbm	EIRP dbc
Short	18838.2	18.8	3	14.9	32.7	-61.5	-97.6
	3 x Fc	7.2	3	30.1	37.3	-57.9	-94.04
Medium	18831.9	20.4	3	14.9	35.3	-59.9	-98.6
	3 x Fc	7.7	3	30.1	37.8	-57.4	-96.2
Long	18820.2	21.7	3	14.9	36.6	-58.6	-101
	3 x Fc	8.1	3	30.1	38.2	-57.02	-99.3
Very Long	18827.7	21.5	3	14.9	36.4	-58.8	-98.5
	3 x Fc	7.9	3	30.1	38.0	-57.2	-96.9

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(d)

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

TEST CONDITIONS: As Indicated

TEST EQUIPMENT: As per previous page, using:

CMI RCC284-2		HP 436A
HP 8424H (S)	NARDA 320B (X)	HP 8481A(S,X)
NARDA 1080 (S)	HP S281A (S)	NARDA 320B (X)
WAVELINE 281 (S)	TENNY JR.	

MEASUREMENT PROCEDURE

1. The EUT and test equipment were set up in the temperature chamber as shown on the previously attached page.

2. With all power removed, the temperature was decreased to -20°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted after waiting the period recommended by the manufacturer. Measurement accuracy is ±200 kHz.

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.

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

5. The frequency tolerance is determined by stabilization of voltages, voltage control feedback circuit, and mechanical tolerances controlled in the manufacture of the magnetron.

5. MEASUREMENT RESULTS: ATTACHED

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NAME OF TEST: Frequency Stability (Temperature Variation)

Degrees Celsius	Change in Hz
-20	≤ 590
-10	≤ 590
0	≤ 590
10	≤ 590
20	≤ 590
30	≤ 590
40	≤ 590
50	≤ 590

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

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NAME OF TEST: Frequency Stability (Voltage Variation)

SPECIFICATION: 47 CFR 2.1055(b)(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.

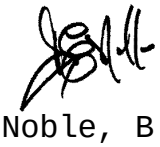
2. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.

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

RESULTS: Frequency Stability (Voltage Variation)

LIMIT, ppm = 3.2×10^{-3}
LIMIT, Hz = 30 MHz

% of STV	VAC	Change, Hz
85	102	0
100	120	0
115	138	0



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

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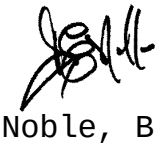
NAME OF TEST: Necessary Bandwidth and Emission Bandwidth

SPECIFICATION: 47 CFR 2.202(g)

MODULATION = UNMODULATED PULSE

NECESSARY BANDWIDTH CALCULATION:

RANGE RESOLUTION (r), m	=
VELOCITY OF LIGHT (c), m/s	= 300×10^6
CONSTANT FACTOR (K)	= 1.5
NECESSARY BANDWIDTH (B_n)	= (2 x K) / (2 x r / c)
	= 82.2 MHz (measured)



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

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.