CTMS Ltd.
3 Cardinal Park
Godmanchester
Huntingdon
Cambridgeshire
PE29 2XN

TEST REPORT ON

TX700-148
Body-worn Portable Transmitter

FCC Authorization Procedures
Part 2 subpart J and part 74

TEST REPORT NUMBER
CTMS 2002/2273
May 2002

Prepared for:

Audio Engineering Ltd.
3 New Road
London
N8 8TA
United Kingdom

The results in this report refer to the tested unit only

CTMS Ltd.
3 Cardinal Park
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Cambridgeshire
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Certificate of Test

Cambridge Test and Measurement Services Ltd., certifies that the product listed was fully tested to the requirements of Parts 2 & 74 of the FCC Code of Regulations 47CFR, the results of which are contained in this test report No: CTMS 2002/2273

Signed on behalf of the company:

Signature :

Date : 07/05/02

Name : S. Leeding

Title : Managing Director

General Test Information

Date Test Sample Received	:	21st February 2002
Date Testing Started	:	9th April 2002
Date Testing Finished	:	4th May 2002
Equipment Serial Number	:	170202989 (low), 151101018, (mid), 170202987 170202987 (high)
CTMS Project Number	:	2002/2273
Test Engineer	:	M. Billis

Report Copy No 1

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2.1033 **Application for Certification**

For use in accordance with FCC Rules and Regulations 47 CFR parts 2 and parts 74.

2.1033 (c) (1)	Name of applicant	:	Audio Engineering Ltd.
	Address of applicant	:	3 New Road, London, N8 8TA, United Kingdom.
	Contact	:	Mr. Aldo Hakligil
2.1033 (c) (2)	FCC Identifier	:	M5H
	Model Type Number	:	TX700-148
2.1033 (c) (3)	Installation and operating instructions	:	See attachments.
2.1033 (c) (4)	Type(s) of emission	:	Frequency Modulated 200KF3E
2.1033 (c) (5)	Frequency range	:	470.000 – 746.000 MHz
2.1033 (c) (6)	Output power range	:	47 mW
2.1033 (c) (7)	Maximum power rating (part 74)	:	250 mW
2.1033 (c) (8)	dc voltage applied to power amplifier	:	See attachments.
	dc current to power amplifier	:	See attachments.
2.1033 (c) (9)	Tune-up procedure for RF power	:	See attachments.
2.1033 (c) (10)	Schematic and description of circuit	:	See attachments.
2.1033 (c) (11)	Photograph of identification plate / label	:	See attachments.
2.1033 (c) (12)	Photographs of equipment	:	See page 43
2.1033 (c) (14)	Measurement data	:	This report – 2002/2273

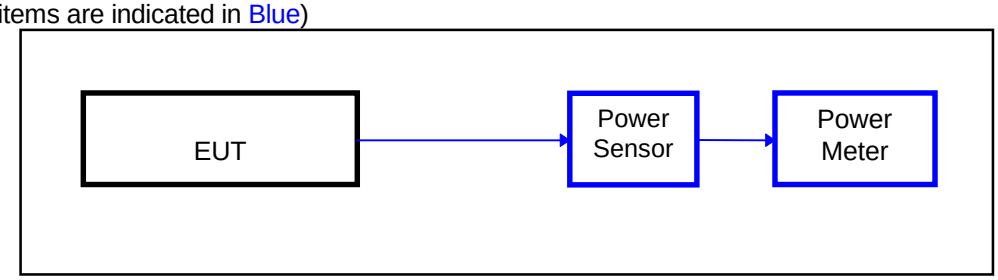
47 CFR Part 2.1033 (c) (14)

RF Power Output at terminals - 47 CFR 2.1046

The transmitter is operated under standard test conditions, using the standard test voltage from a single 9V PP3 type battery. The transmitter is coupled to the power meter by via it's antenna socket. The transmitter is tuned by the manufacturer in accordance with the stated procedure, keyed in an unmodulated condition, and the RF Power Output is observed and recorded.

The RF Power Output is measured in accordance with the following test configuration, using the test instruments listed, on the lower, mid and upper frequencies of the switching range.

(Calibrated items are indicated in Blue)



Ambient Conditions. Temperature = 21ºC Relative Humidity = 35 %

Test instruments used :

RF Power Meter : Hewlett Packard Type HP 435B, S/N 2005A03070.
RF Power Sensor : Hewlett Packard Type HP 8481B, S/N 1801A01640

Results in accordance with Part 2.1046 and 74.861. e.(1) Unmodulated Power

TRANSMITTER POWER (mWatts)		
470.000 MHz	608.000 MHz	746.000 MHz
47.0 mW	27.5 mW	30.5 mW

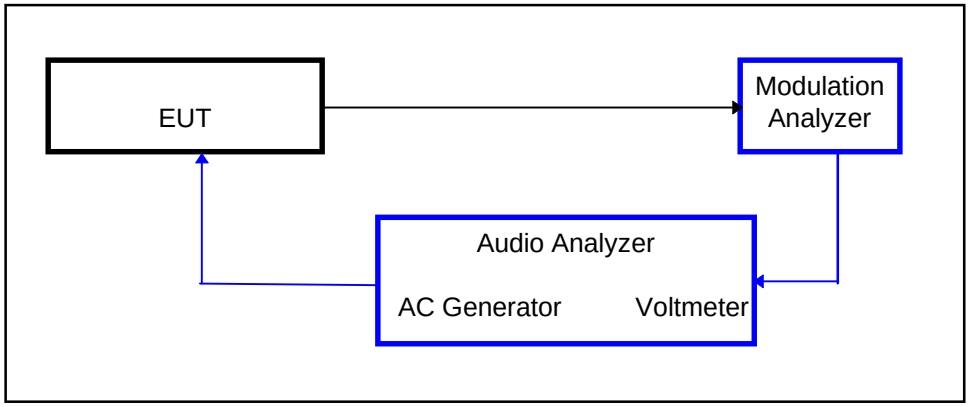
LIMIT in 74.861 (e) (1) (ii)	250 mW

Modulation Characteristic - 47 CFR 2.1047 (a)

The transmitter is operated under standard test conditions and the output monitored with a modulation analyser of normal impedance matching that of the transmitter. A test signal of 1000Hz sine wave is applied to the normal input of the modulation circuit via a dummy capsule to the audio processing circuits, the level adjusted to give ±25 kHz deviation. Ensuring the audio input level is maintained constant, the modulation frequency is varied from 50Hz to 25,000Hz. The variation in the depth of modulation is observed and recorded.

The modulation characteristic was measured in accordance with the following test configuration, using the test instruments listed.

(Calibrated items are indicated in Blue)

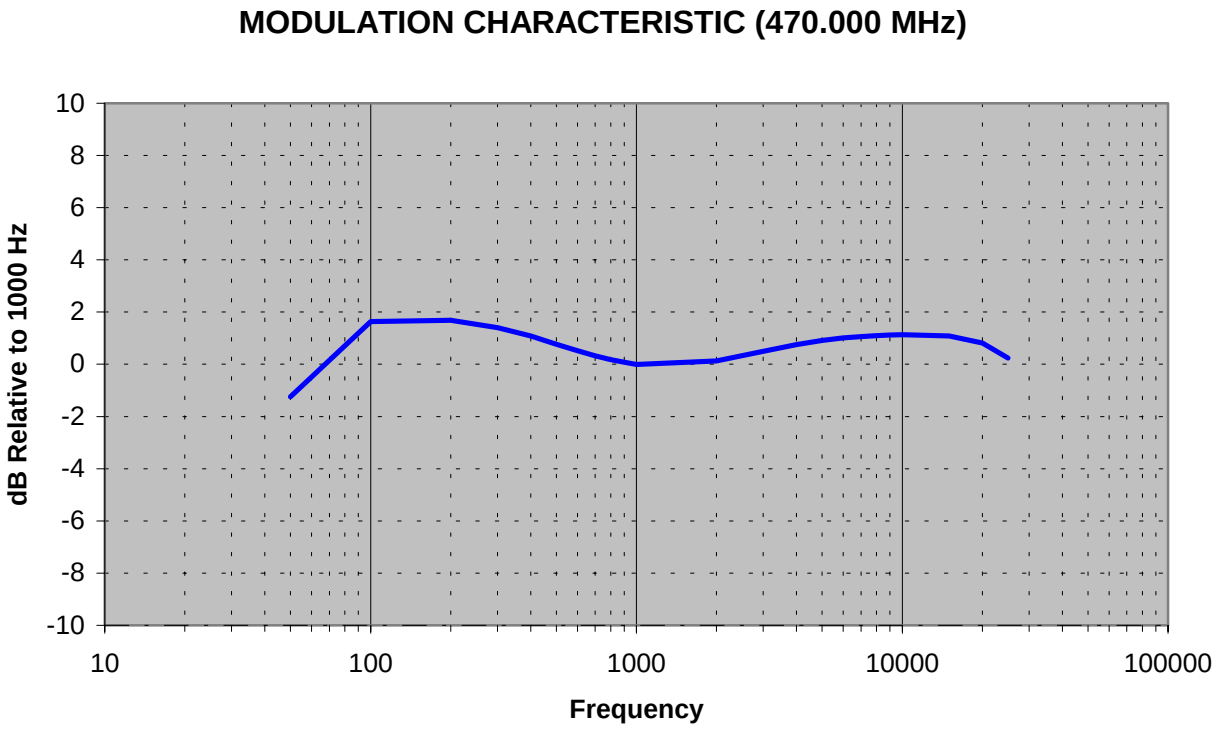


Ambient Conditions. Temperature = 22ºC Relative Humidity = 36 %

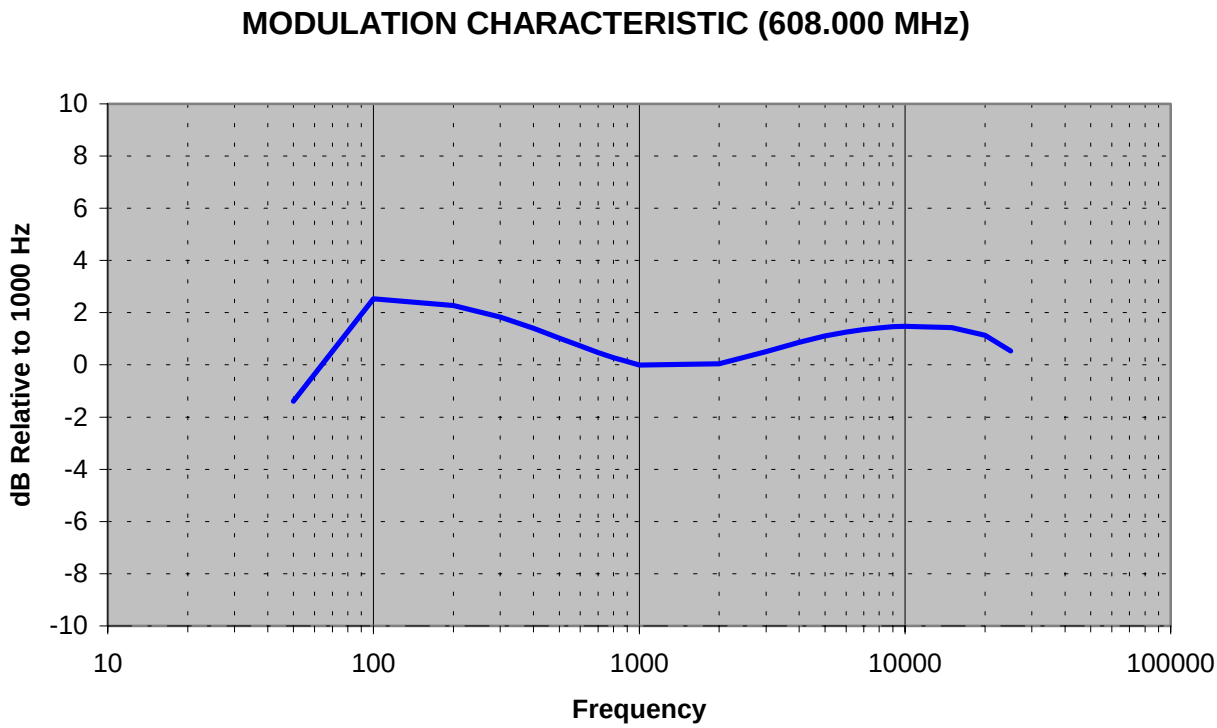
Test instruments used :

Audio Analyzer : Hewlett Packard Audio Analyzer Type HP 8903B, S/N2836A05420
Modulation Analyzer : Hewlett Packard Mod Analyzer Type HP 8901B, S/N2642A01009

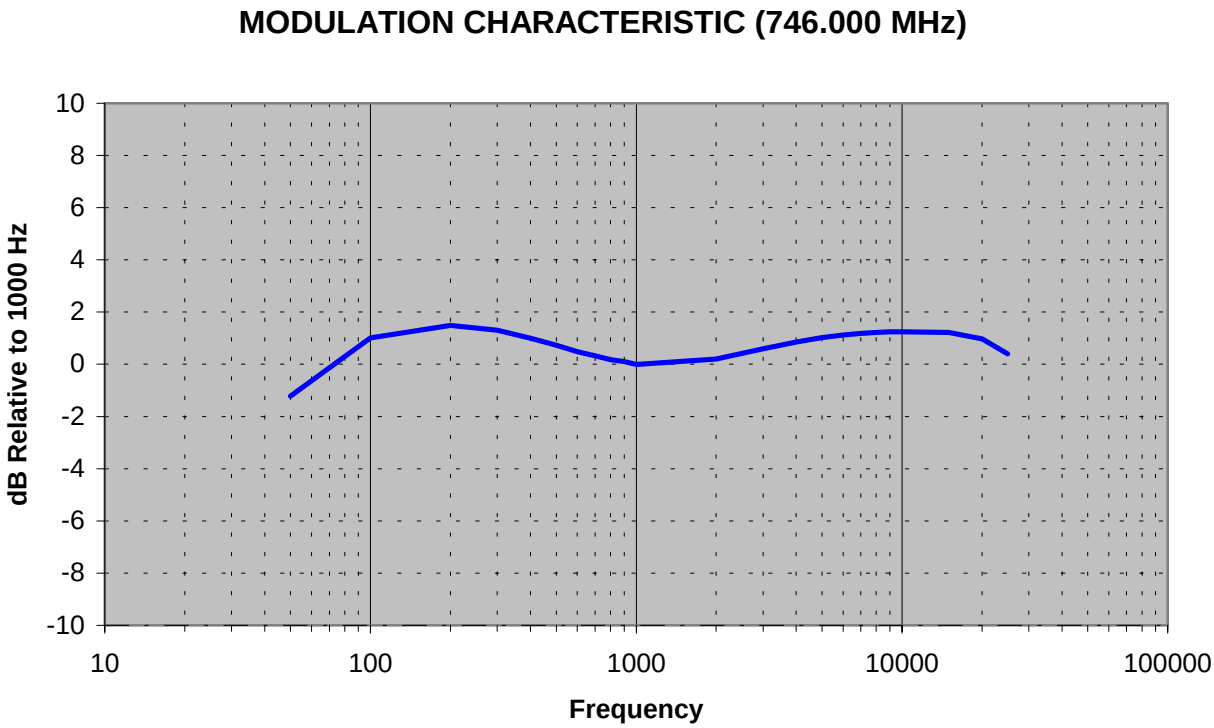
Results in accordance with Part 2.1047(a) and 74.681 (e) (3) Modulation Characteristic.



Results in accordance with Part 2.1047(a) and 74.681 (e) (3) Modulation Characteristic.



Results in accordance with Part 2.1047(a) and 74.681 (e) (3) Modulation Characteristic.



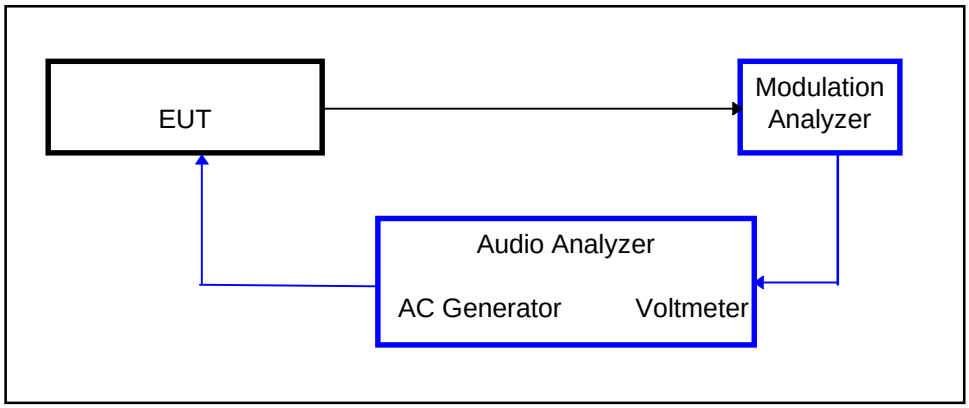
Modulation Limiting Characteristic - 47 CFR 2.1047 (b)

The transmitter is operated under standard test conditions and the output monitored with a modulation analyser of normal impedance matching that of the transmitter. A test signal of 1000Hz sine wave is applied to the normal input of the modulation circuit via a dummy capsule to the audio processing circuits, the input level is varied between -50dBm to +10dBm and the variation in the frequency deviation is observed and recorded.

The test was repeated with modulation frequencies of 100 Hz, 300 Hz and 15000 Hz.

The modulation limiting characteristic was measured in accordance with the following test configuration, using the test instruments listed.

(Calibrated items are indicated in Blue)

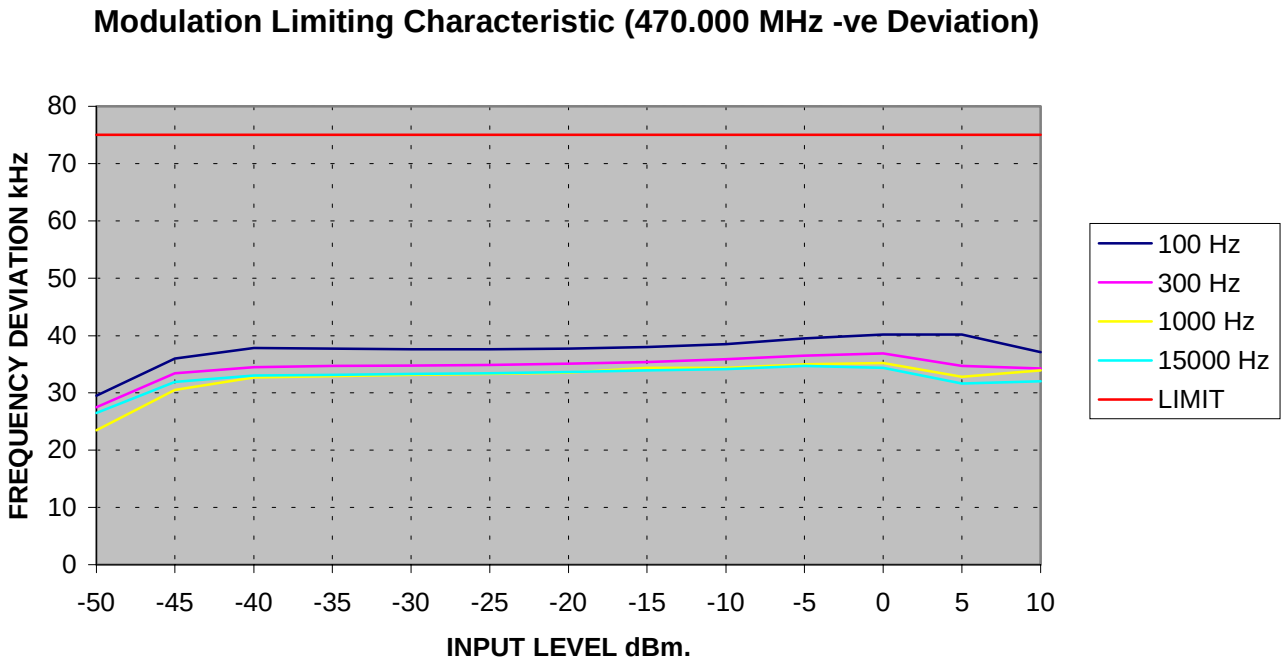


Ambient Conditions. Temperature = 22ºC Relative Humidity = 37 %

Test instruments used :

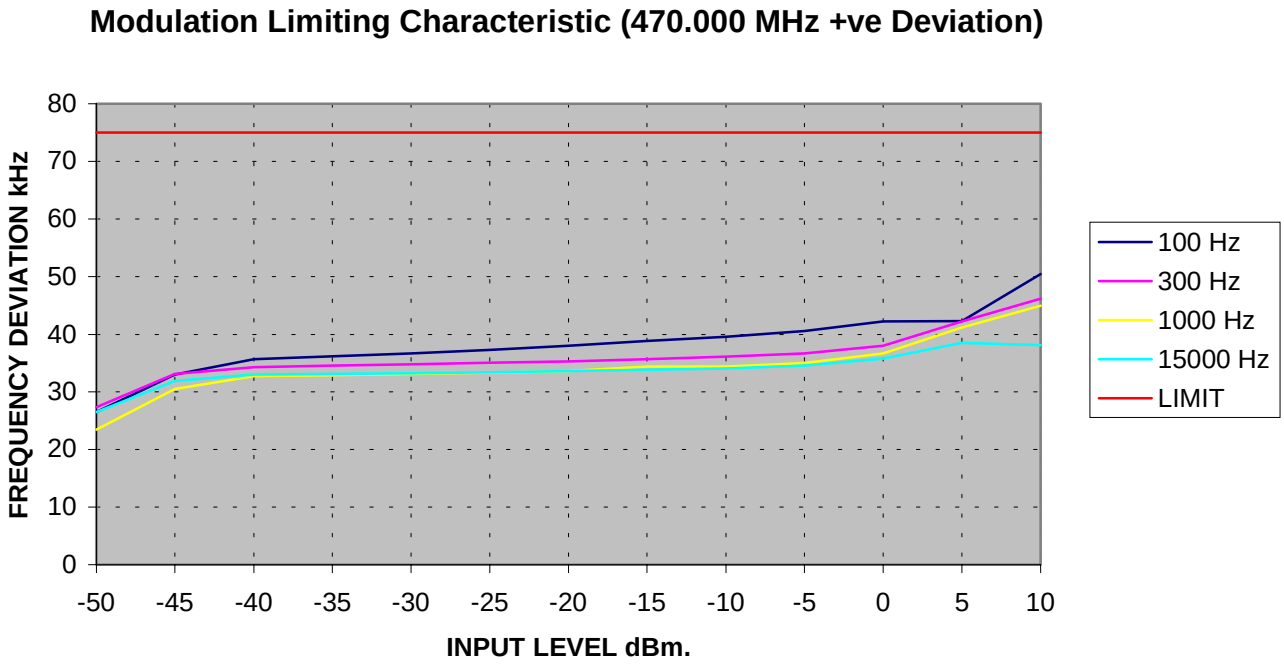
Audio Analyzer : Hewlett Packard Audio Analyzer Type HP 8903B, S/N2836A05420
Modulation Analyzer : Hewlett Packard Mod Analyzer Type HP 8901B, S/N2642A01009

Results in accordance with Part 2.1047 (b) and 74.861 (e)
Modulation Limiter Requirements.



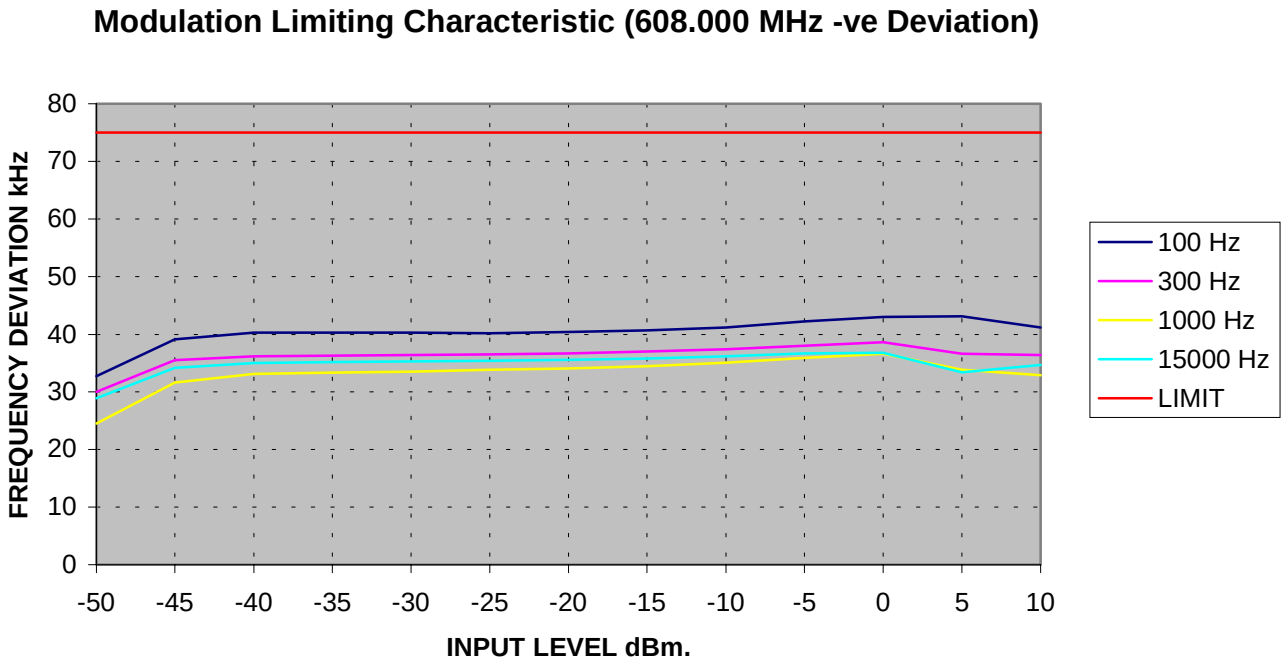
LIMIT in 74.861 (e) (3)	Maximum Deviation 75 kHz

Results in accordance with Part 2.1047 (b) and 74.861 (e)
Modulation Limiter Requirements.



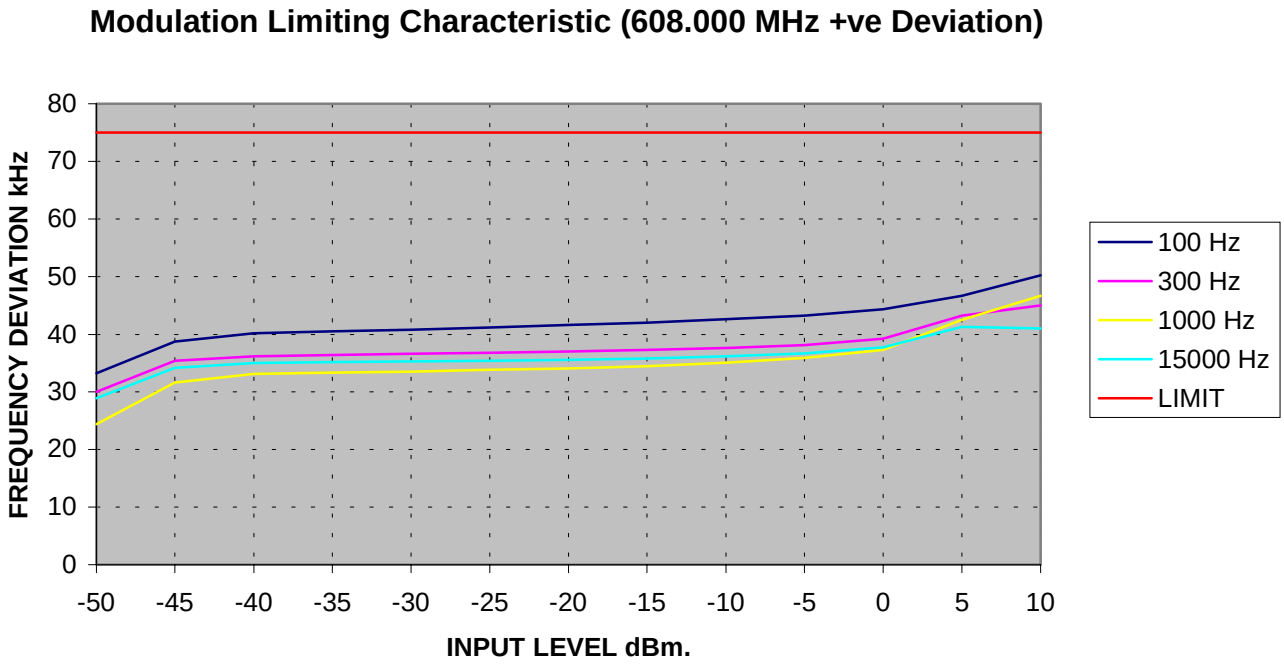
LIMIT in 74.861 (e) (3)	Maximum Deviation 75 kHz

Results in accordance with Part 2.1047 (b) and 74.861 (e)
Modulation Limiter Requirements.



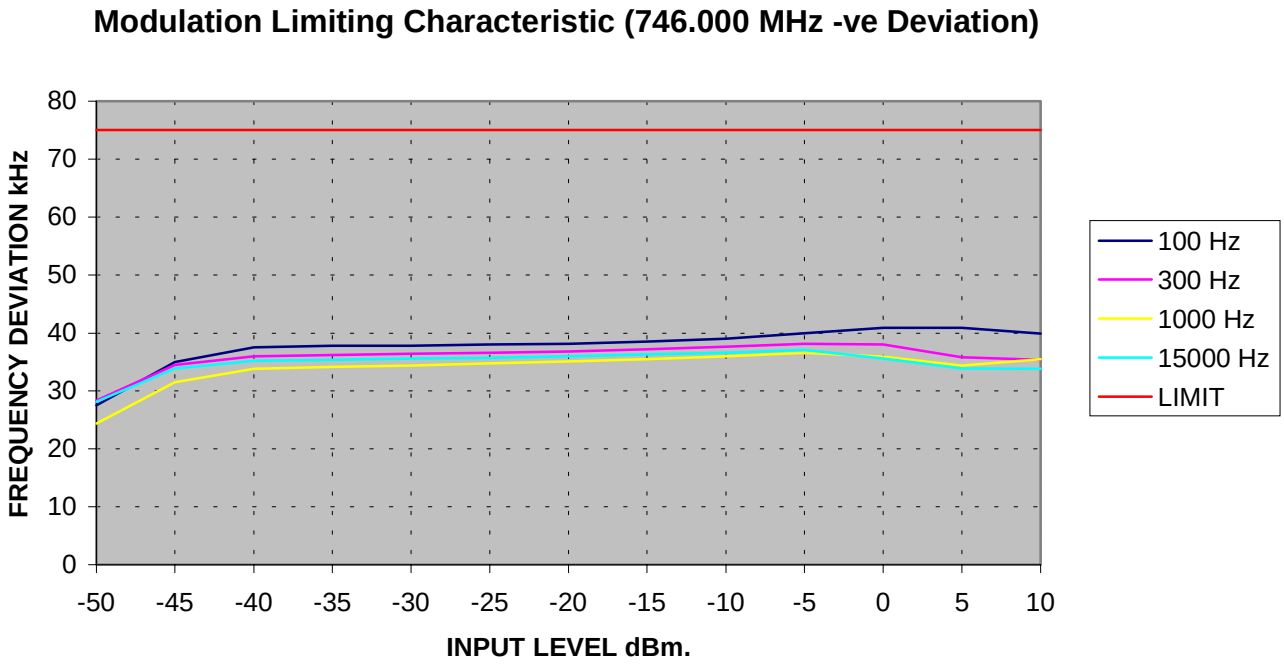
LIMIT in 74.861 (e) (3)	Maximum Deviation 75 kHz

Results in accordance with Part 2.1047 (b) and 74.861 (e)
Modulation Limiter Requirements.



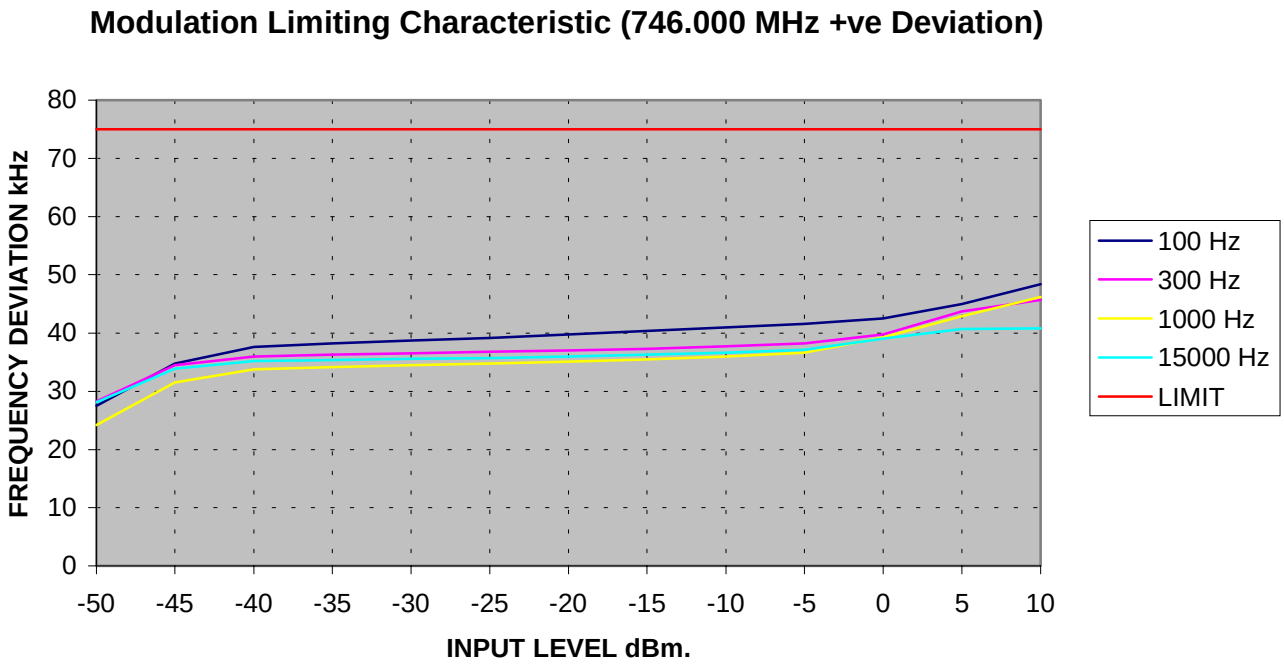
LIMIT in 74.861 (e) (3)	Maximum Deviation 75 kHz

Results in accordance with Part 2.1047 (b) and 74.861 (e)
Modulation Limiter Requirements.



LIMIT in 74.861 (e) (3)	Maximum Deviation 75 kHz

Results in accordance with Part 2.1047 (b) and 74.861 (e)
Modulation Limiter Requirements.



LIMIT in 74.861 (e) (3)	Maximum Deviation 75 kHz

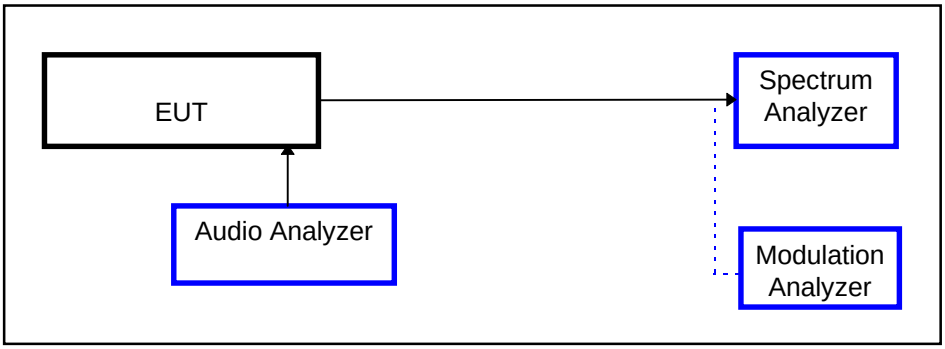
Operating Bandwidth - 47 CFR 2.1049 (c)(1)

The transmitter is operated under standard test conditions. A test signal of a 15000Hz sine wave is applied to the normal input to the modulation circuit, 15000 Hz was used as this is the highest A.F. frequency transmitted by the unit in practice, and will give a worse case result for bandwidth according to 'Carson's Rule' compared with 2500 Hz. The input level is at a level of +16dB above that which produces a modulation depth of 25 kHz deviation, at the frequency of maximum response of the audio modulating circuit.

The output of the transmitter is connected to a spectrum analyser of normal impedance matching that of the transmitter. The operating bandwidth (0.5 % mean power points) were observed and recorded.

The operating bandwidth was measured in accordance with the following test configuration, using the test instruments listed.

(Calibrated items are indicated in Blue)



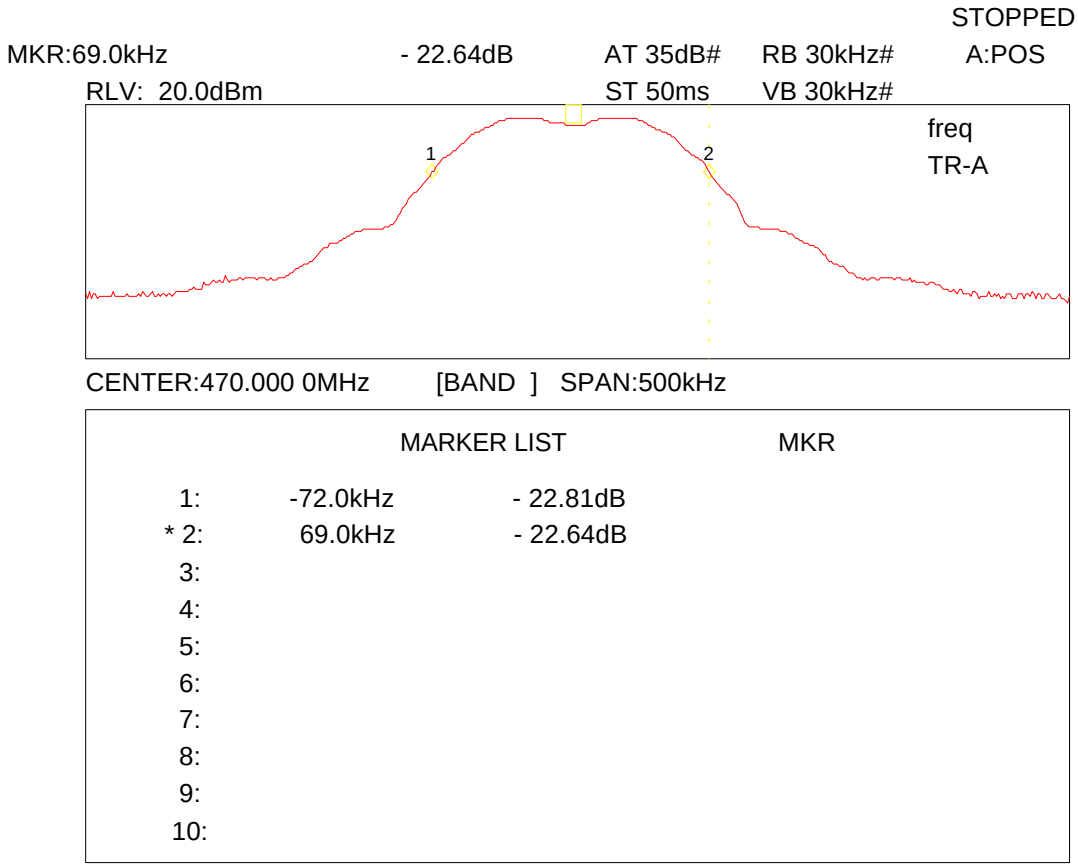
Ambient Conditions. Temperature = 22ºC Relative Humidity = 37 %

Test instruments used :

Audio Analyzer : Hewlett Packard Audio Analyzer Type HP 8903B S/N2836A05420
Modulation Analyzer : Hewlett Packard Mod Analyzer Type HP 8901B S/N2642A01009
Spectrum Analyzer : Anritsu Type MS 2602A S/N MT88057

Results in accordance with Part 2.1049 and 74.861 (e) (5).

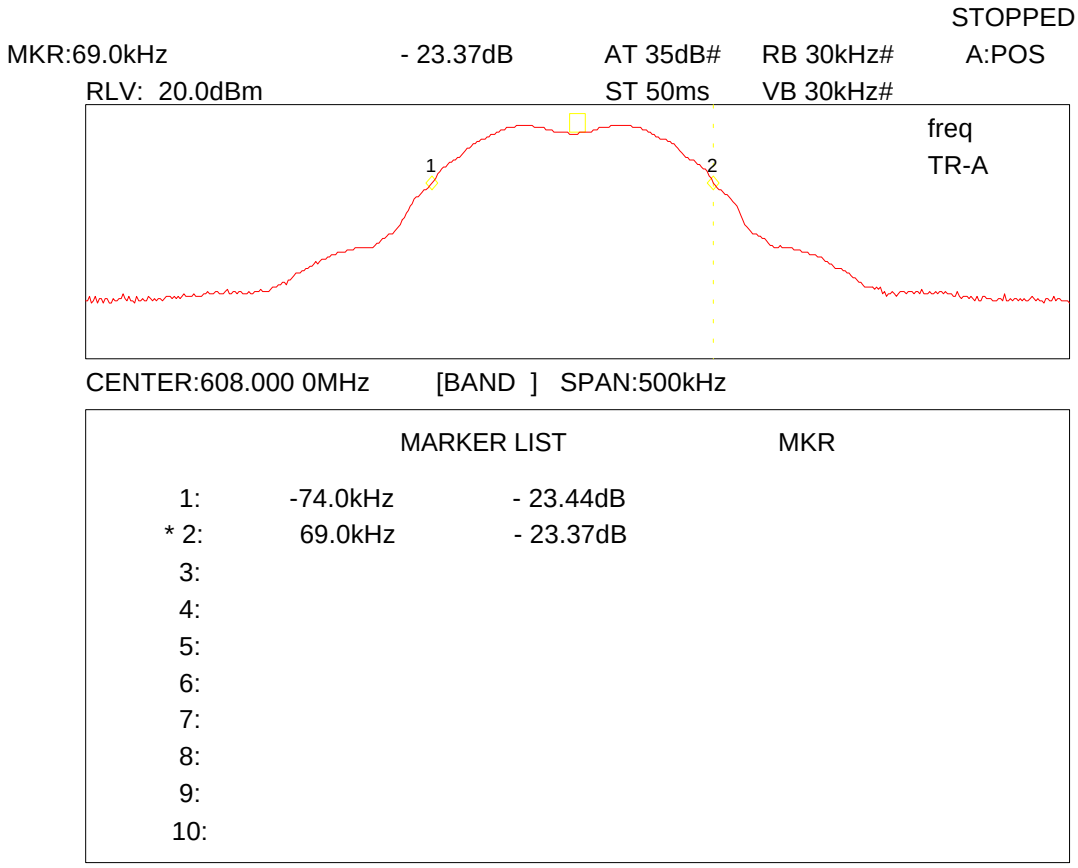
470.000 MHz



Frequency of lower -23dB point	Fc - 72.0 kHz
Frequency of higher -23dB point	Fc + 69.0 kHz
Measured Operating Bandwidth	141.0 kHz
Operating Bandwidth Limit	200 kHz

Results in accordance with Part 2.1049 and 74.861 (e) (5).

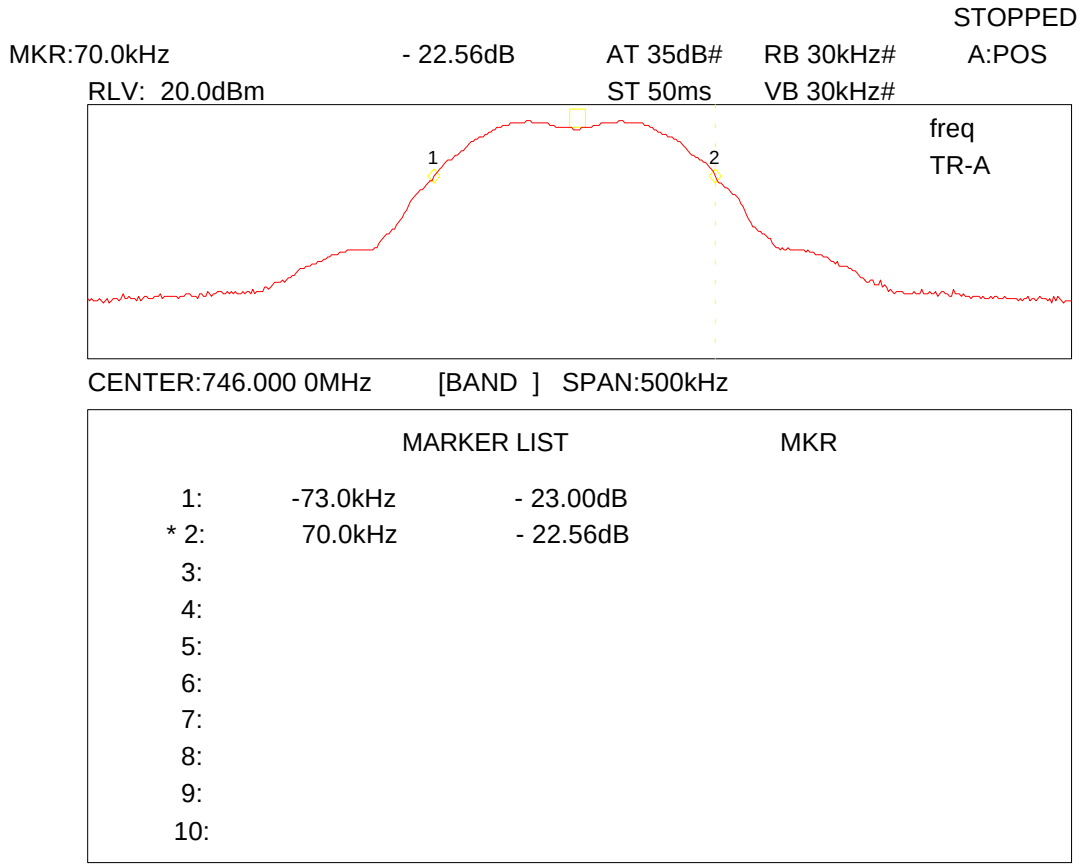
608.000 MHz



Frequency of lower -23dB point	Fc - 74.0 kHz
Frequency of higher -23dB point	Fc + 69.0 kHz
Measured Operating Bandwidth	143.0 kHz
Operating Bandwidth Limit	200 kHz

Results in accordance with Part 2.1049 and 74.861 (e) (5).

746.000 MHz



Frequency of lower -23dB point	Fc - 73.0 kHz
Frequency of higher -23dB point	Fc + 70.0 kHz
Measured Operating Bandwidth	143.0 kHz
Operating Bandwidth Limit	200 kHz

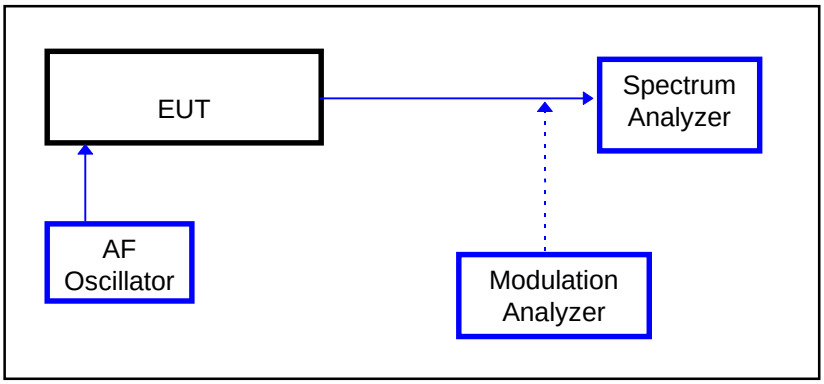
Spurious emissions at antenna terminals - 47 CFR 2.1051

The transmitter is operated under standard test conditions. The transmitter was modulated with normal test modulation being a sine wave of 2500 Hz at an A.F. input level of 16 dB above that required to produce 50% deviation, at the frequency of maximum response of the audio modulating circuit. The output of the transmitter was connected to a spectrum analyser of normal impedance matching that of the transmitter. The spurious emissions, including harmonics of the fundamental carrier frequency, were observed.

A carrier notch filter was not necessary when the attenuator of the spectrum analyser was adjusted to ensure the spectrum analyser was not overloaded and maintaining linearity. The spurious emissions, including harmonics of the fundamental carrier frequency, were measured and recorded.

The responses found on the wide band scan of the spectrum analyser were analysed in detail to determine correct power level. The level on the spectrum analyser was recorded as being the level of the spurious emission.

(Calibrated items are indicated in Blue)



Ambient Conditions. Temperature = 21ºC Relative Humidity = 34 %

Test instruments used :

Audio Analyzer : Hewlett Packard Audio Analyzer Type HP 8903B S/N2836A05420
Modulation Analyzer : Hewlett Packard Mod Analyzer Type HP 8901B S/N2642A01009
Spectrum Analyzer : Anritsu Type MS 2602A S/N MT88057

Results in accordance with Part 2.1051 and 74.861 (6) Emission Limits

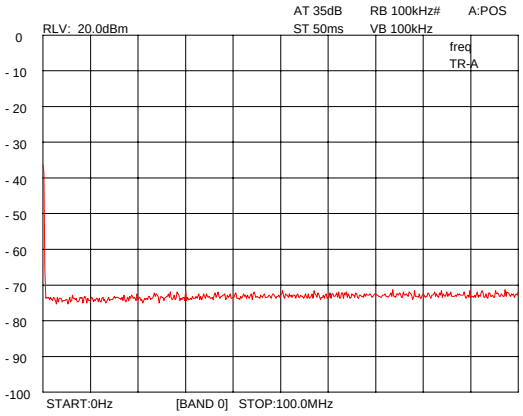
Note: Emissions 20dB below the limit are not required to be listed

Carrier Frequency (Fc): 470.000 MHz

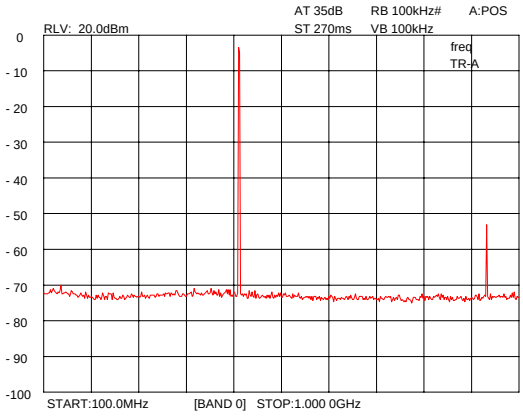
Frequency (MHz)	Identity	Absolute Level (dBm)	Absolute Limit (dBm)	Pass Margin (dB)	Measurement Bandwidth (kHz)
940.000	2Fc	-35.1	-13.0	22.1	100
1410.000	3Fc	-50.2	-13.0	37.2	1000
2350.000	5Fc	-47.5	-13.0	34.5	1000
3760.000	7Fc	-46.1	-13.0	33.1	1000
4230.000	9Fc	-40.6	-13.0	27.6	1000
4700.000	10Fc	-44.5	-13.0	31.5	1000
5170.000	11Fc	-48.3	-13.0	35.3	1000
5640.000	12Fc	-44.2	-13.0	31.2	1000
6110.000	13Fc	-38.7	-13.0	25.7	1000
6580.000	14Fc	-33.6	-13.0	20.6	1000

Note: The limit for spurious emissions and harmonics removed from the operating frequency by more than 250% of the authorised bandwidth is defined in 74.861(e)(6)(iii) as being attenuated by 43+10log(P) (dBc), this is equivalent to an absolute level of -13 dBm.

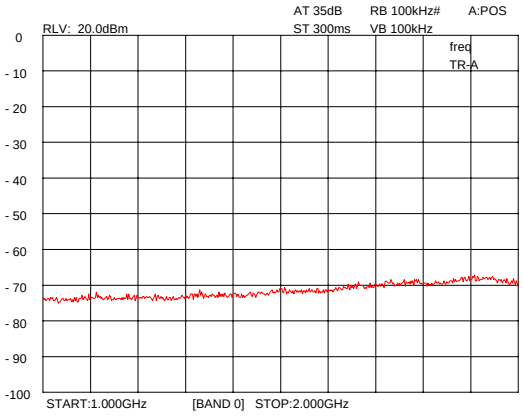
Plots of Spectrum Scans.



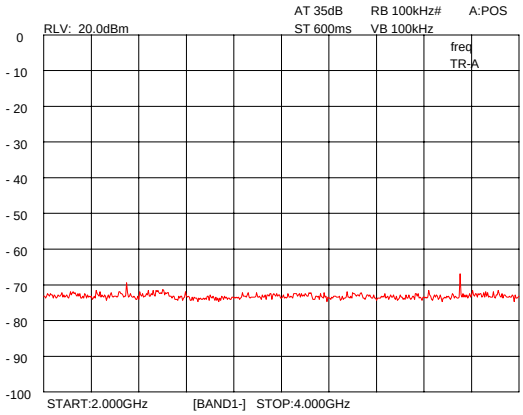
0 - 100 MHz



100 MHz - 1GHz

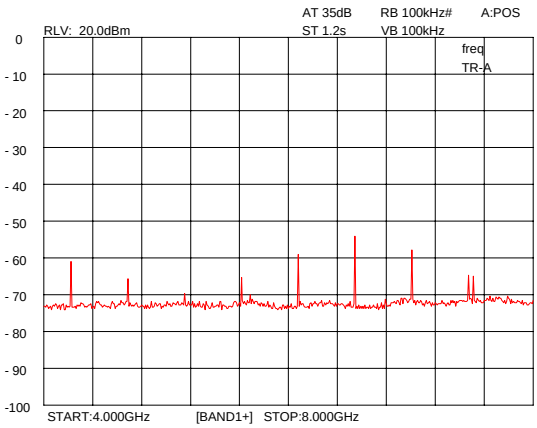


1GHz - 2 GHz

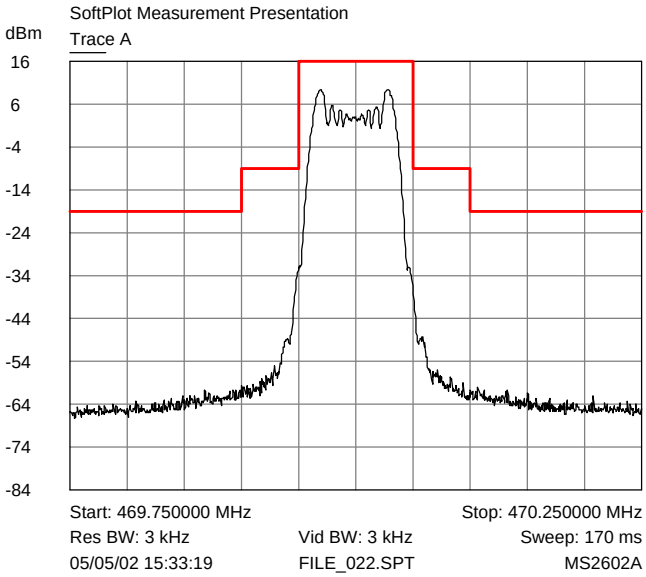


2 GHz - 4 GHz

Plots of Spectrum Scans



4 GHz - 8 GHz



Close in (around Fc)

Mask according to 74.861(e)(6)(i) and (ii). Measurement bandwidth >1% of total emission bandwidth in accordance with FCC regulations for measuring close in on Carrier.

Results in accordance with Part 2.1051 and 74.861 (6) Emission Limits

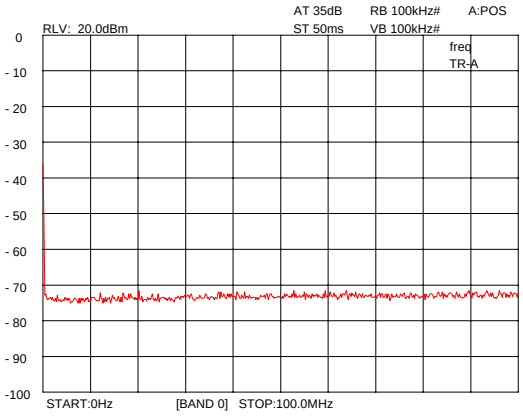
Note: Emissions 20dB below the limit are not required to be listed

Carrier Frequency (Fc): 608.000 MHz

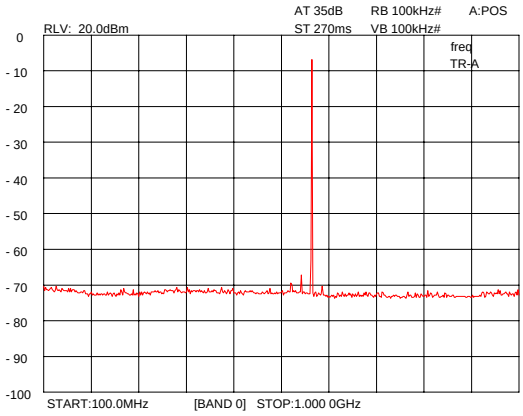
Frequency (MHz)	Identity	Absolute Level (dBm)	Absolute Limit (dBm)	Pass Margin (dB)	Measurement Bandwidth (kHz)
1216.000	2Fc	-38.1	-13.0	25.1	1000
1824.000	3Fc	-42.3	-13.0	29.3	1000
3040.000	5Fc	-47.5	-13.0	34.5	1000
3648.000	6Fc	-49.7	-13.0	36.7	1000
4256.000	7Fc	-45.7	-13.0	32.7	1000
4864.000	8Fc	-43.0	-13.0	30.0	1000
5472.000	9Fc	-48.9	-13.0	35.9	1000
6080.000	10Fc	-50.9	-13.0	37.9	1000
6688.000	11Fc	-50.0	-13.0	37.0	1000

Note: The limit for spurious emissions and harmonics removed from the operating frequency by more than 250% of the authorised bandwidth is defined in 74.861(e)(6)(iii) as being attenuated by 43+10log(P) (dBc), this is equivalent to an absolute level of -13 dBm.

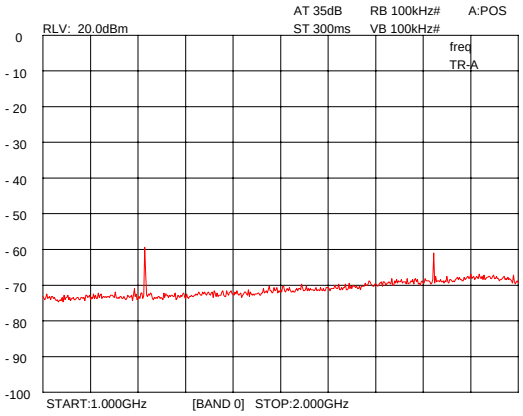
Plots of Spectrum Scans.



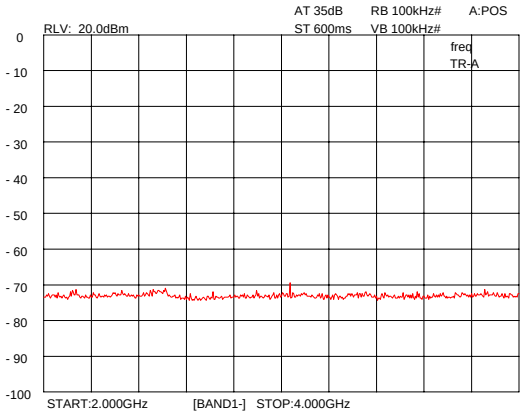
0 - 100 MHz



100 MHz - 1GHz

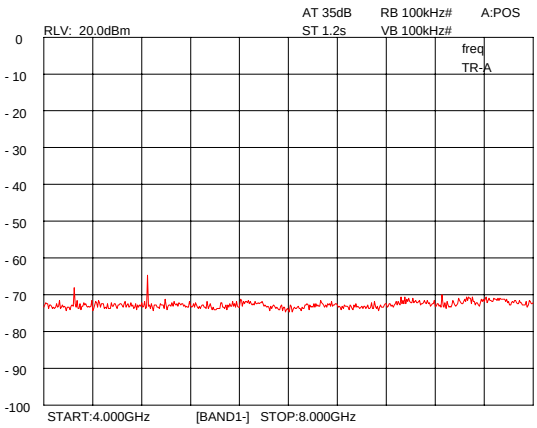


1GHz - 2 GHz

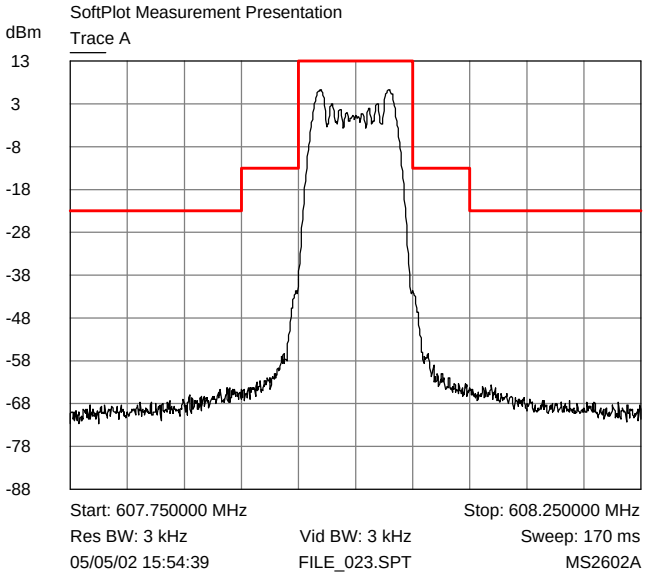


2 GHz - 4 GHz

Plots of Spectrum Scans



4 GHz - 8 GHz



Close in (around Fc)

Mask according to 74.861(e)(6)(i) and (ii). Measurement bandwidth >1% of total emission bandwidth in accordance with FCC regulations for measuring close in on Carrier.

Results in accordance with Part 2.1051 and 74.861 (6) Emission Limits

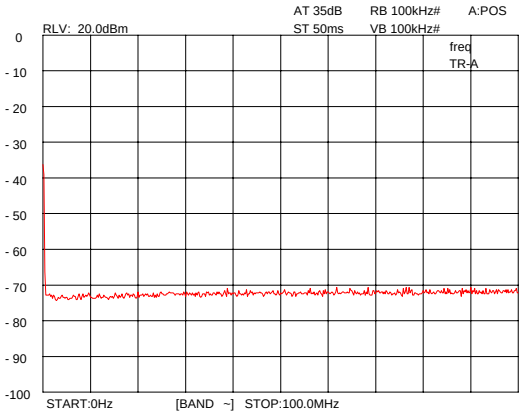
Note: Emissions 20dB below the limit are not required to be listed

Carrier Frequency (Fc): 746.000 MHz

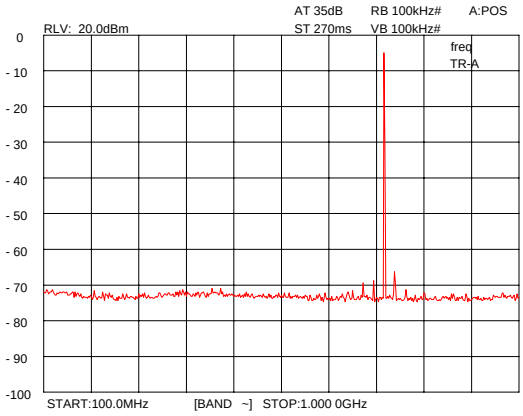
Frequency (MHz)	Identity	Absolute Level (dBm)	Absolute Limit (dBm)	Pass Margin (dB)	Measurement Bandwidth (kHz)
1492.000	2Fc	-42.6	-13.0	29.6	1000
4476.000	6Fc	-37.9	-13.0	24.9	1000
5222.000	7Fc	-39.7	-13.0	26.7	1000
5968.000	8Fc	-44.2	-13.0	31.2	1000
6714.000	9Fc	-39.9	-13.0	26.9	1000

Note: The limit for spurious emissions and harmonics removed from the operating frequency by more than 250% of the authorised bandwidth is defined in 74.861(e)(6)(iii) as being attenuated by 43+10log(P) (dBc), this is equivalent to an absolute level of -13 dBm.

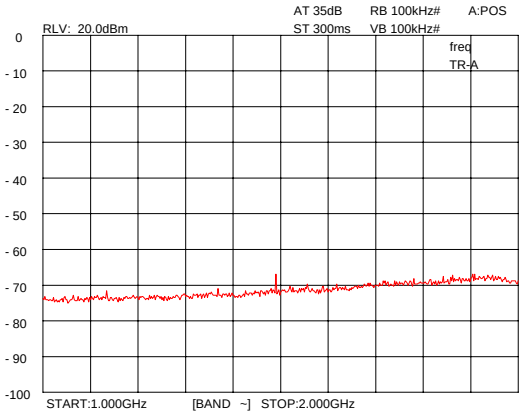
Plots of Spectrum Scans.



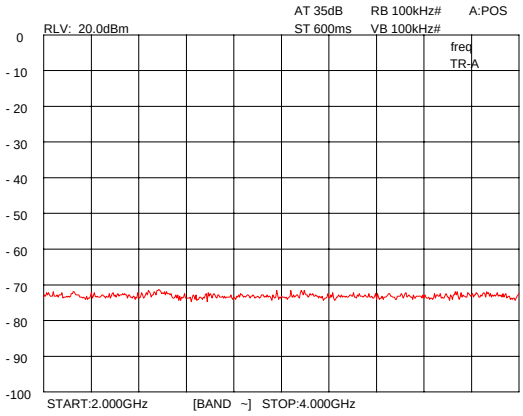
0 - 100 MHz



100 MHz - 1GHz

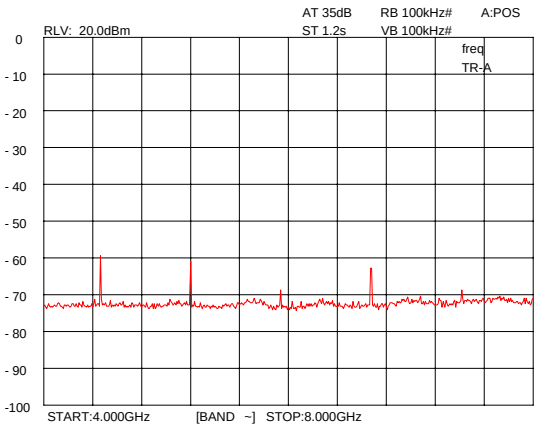


1GHz - 2 GHz

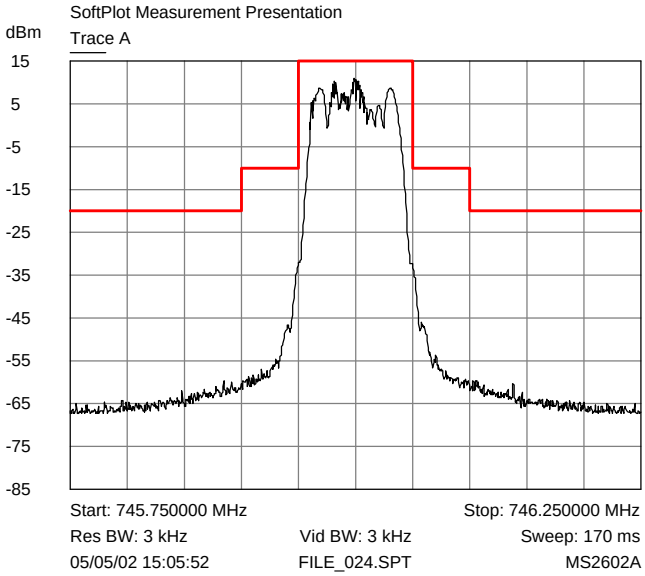


2 GHz - 4 GHz

Plots of Spectrum Scans



4 GHz - 8 GHz



Close in (around Fc)

Mask according to 74.861(e)(6)(i) and (ii). Measurement bandwidth >1% of total emission bandwidth in accordance with FCC regulations for measuring close in on Carrier.

Field Strength of Spurious radiation - 47 CFR 2.1053

The transmitter was operated under standard test conditions. Following a pre-scan in an anechoic chamber, the transmitter (the EUT) was placed on a wooden table with cables suitably dressed. The output of the EUT was connected to it's supplied antenna. At a distance of 3m from the transmitter (EUT) the radiated field for each spurious radiation, including harmonics from the carrier frequency, were detected and measured on a calibrated receiver which was fed from a calibrated log-periodic antenna, shielded loop antenna, or horn antenna, depending on the frequency range. The antenna was oriented in horizontal polarisation plane and was raised and lowered so as to ensure the maximum level of the spurious emission was detached.

The EUT was rotated through 360°, the emission levels for each spurious, including harmonics of the carrier frequency, were observed on the receiver and recorded .

The test above was repeated with the receiving antenna in the vertical polarisation plane.

The EUT was replaced by a calibrated half-wave dipole, the substitution antenna, which was fed from a calibrated signal generator. The level of the signal generator was adjusted to achieve the same level as that detected on the calibrated receiver. The level on the signal generator was recorded as being the level of the spurious emission measured by the substitution method.

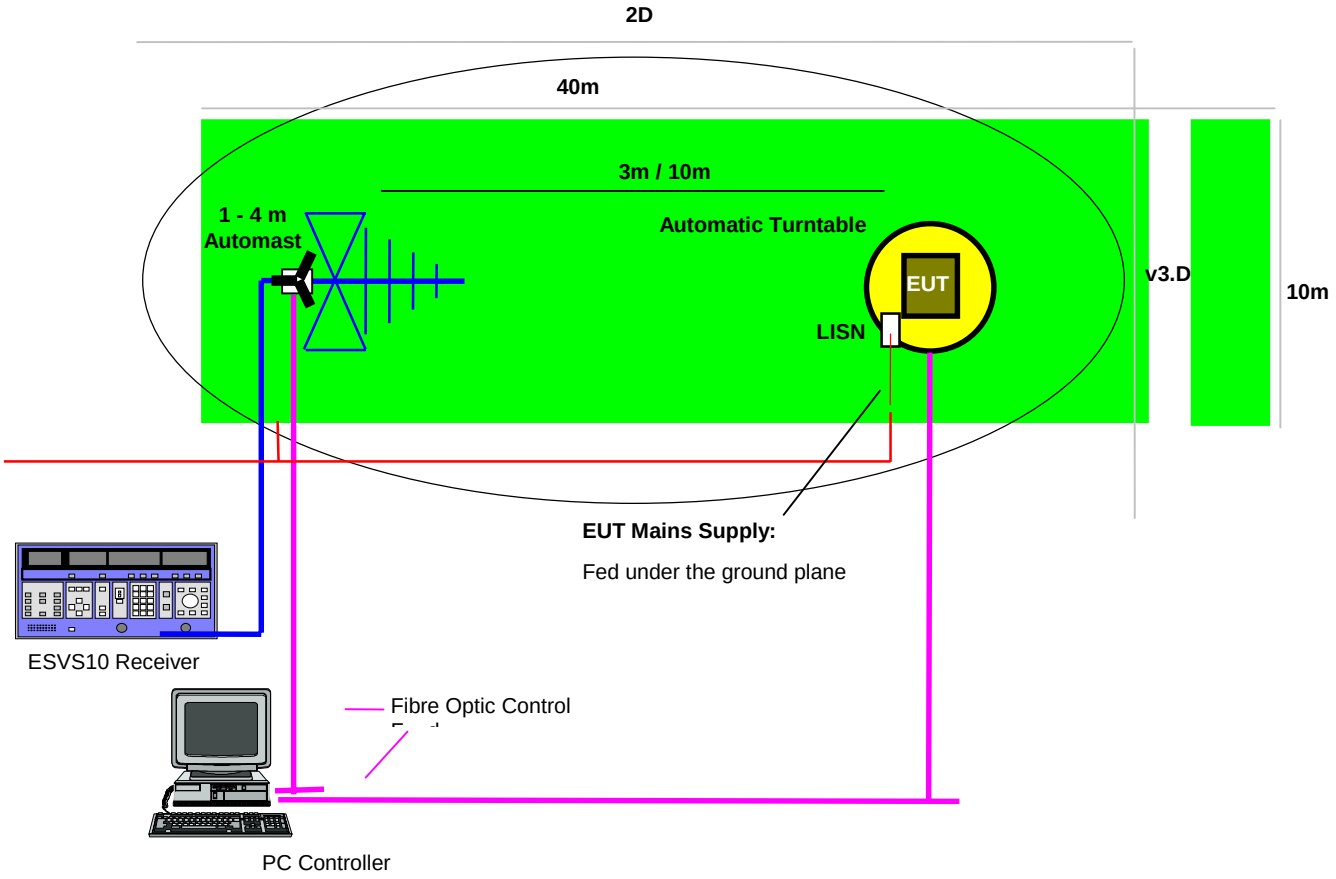
For each of the emissions detected the EUT was switched off to determine the emission was that of the EUT.

The measurement facilities at Cambridge Test and Measurement Services LTD, are in accordance with ANSI C63.4 and lodged with the FCC under rule 2.948, a letter from the FCC recognising compliance with the requirements was dated March 02,1999 with the registration number 93385.

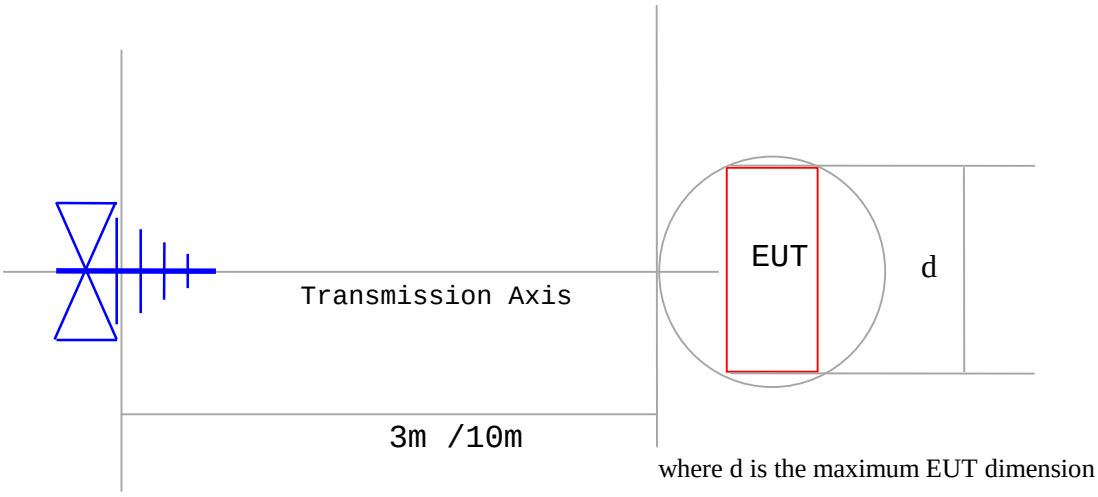
Test instruments used :

RF Signal Generator	:	Marconi Type 2032
Receiver(s)	:	Rohde & Schwarz Type(s) ESVS 10, ESHS 10, Anritsu MS2602
Antenna(s)	:	Schaffner Type CB2614A & EMCO Type 6502,
Antenna(s)	:	Rohde & Schwarz type HA226/582/50
Antenna(s)	:	Anritsu type MP627A

Open Area Test Site (OATS)



Equipment Test Set Up



Antenna to EUT Distance

Results in accordance with Part 2.1053 and 74.861 (6) Emission Limits

Note: Emissions 20dB below the limit are not required to be listed

Carrier Frequency (Fc): 470.000 MHz-Supplied antenna was fitted

Frequency (MHz)	Identity	Absolute Level (ERP) (dBm)	Absolute Limit (ERP) (dBm)	Pass Margin (dB)	Measurement Bandwidth (kHz)
No emissions were detected within 20 dB of the spec. limit.					

Note: The limit for spurious emissions and harmonics removed from the operating frequency by more than 250% of the authorised bandwidth is defined in 74.861(e)(6)(iii) as being attenuated by 43+10log(P) (dBc), this is equivalent to an absolute level of -13 dBm ERP.

Results in accordance with Part 2.1053 and 74.861 (6) Emission Limits

Note: Emissions 20dB below the limit are not required to be listed

Carrier Frequency (Fc): 608.000 MHz-Supplied antenna was fitted

Frequency (MHz)	Identity	Absolute Level (ERP) (dBm)	Absolute Limit (ERP) (dBm)	Pass Margin (dB)	Measurement Bandwidth (kHz)
No emissions were detected within 20 dB of the spec. limit.					

Note: The limit for spurious emissions and harmonics removed from the operating frequency by more than 250% of the authorised bandwidth is defined in 74.861(e)(6)(iii) as being attenuated by 43+10log(P) (dBc), this is equivalent to an absolute level of -13 dBm ERP.

Results in accordance with Part 2.1053 and 74.861 (6) Emission Limits

Note: Emissions 20dB below the limit are not required to be listed

Carrier Frequency (Fc): 746.000 MHz-Supplied antenna was fitted

Frequency (MHz)	Identity	Absolute Level (ERP) (dBm)	Absolute Limit (ERP) (dBm)	Pass Margin (dB)	Measurement Bandwidth (kHz)
No emissions were detected within 20 dB of the spec. limit.					

Note: The limit for spurious emissions and harmonics removed from the operating frequency by more than 250% of the authorised bandwidth is defined in 74.861(e)(6)(iii) as being attenuated by 43+10log(P) (dBc), this is equivalent to an absolute level of -13 dBm ERP.

Frequency Stability - 47 CFR 2.1055 (a) (1) (d) (2)

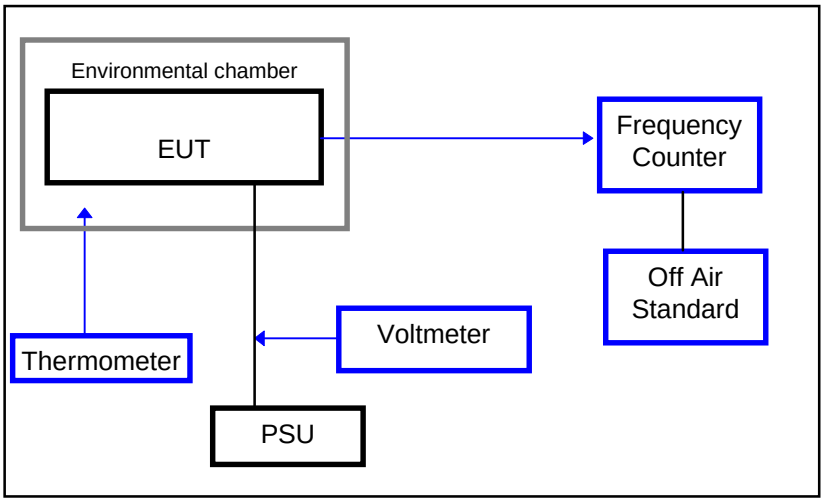
The transmitter is operated under standard test conditions, using the standard test voltage, and tuned in accordance with the procedure described in the accompanying documentation, it is keyed in an unmodulated condition and the output is connected to a RF Counter via an attenuator of normal impedance matching that of the transmitter.

The temperature was measured over the range of -30° C to + 50 ° C in steps of 10°

The Frequency drift of the EUT was observed and recorded.

The frequency drift was measured in accordance with the following test configuration, using the test instruments listed.

(Calibrated items are indicated in Blue)



The attenuator was at the nominal impedance of the transmitter.

Test instruments used :

RF Frequency Counter : H. P. Modulation Analyzer Type HP 8901B, S/N2642A01009
Off Air Standard : Quartzlock Type 2A S/N41125
Climatic Chamber : Heraeus Votsch Type VMT/04/30 S/N 24558
Thermometer : R S Type 206-3722, S/N 831016600
Voltmeter : Hewlett Packard Type HP34401A S/N US36090783.
Power Supply Unit : Kingshill Type18V10C S/N 561

Results in accordance with Part 2.1053 (a) (1) (d) (2) and 74.861 (e) (4) Frequency Stability.

Transmitter operating on 470.000 MHz

Temperature °C	Tx Frequency MHz normal Volts = 9.0 V	Tx Frequency MHz low Volts = 6.5 V
-30	469.998516	469.998499
-20	470.001296	470.000488
-10	470.001260	470.001500
0	470.002149	470.002141
+10	470.002063	470.002020
+20	470.001507	470.001468
+30	470.001020	470.000999
+40	470.000781	470.000767
+50	470.000782	470.000899

Frequency Error	kHz
Minimum	1.5
Maximum	2.1
Limit specified in 74.681.(e) (4)	< 0.005 % (± 23.5 kHz)

Results in accordance with Part 2.1053 (a) (1) (d) (2) and 74.861 (e) (4) Frequency Stability.

Transmitter operating on 608.000 MHz

Temperature °C	Tx Frequency MHz normal Volts = 9.0 V	Tx Frequency MHz low Volts = 6.5 V
-30	607.995962	607.995007
-20	607.998633	607.998851
-10	608.000909	608.000924
0	608.001996	608.001984
+10	608.002118	608.001790
+20	608.001865	608.001966
+30	608.001488	608.001443
+40	608.001228	608.000874
+50	608.001367	608.000947

Frequency Error	kHz
Minimum	5.0
Maximum	2.1
Limit specified in 74.681.(e) (4)	< 0.005 % (± 30.4 kHz)

Results in accordance with Part 2.1053 (a) (1) (d) (2) and 74.861 (e) (4) Frequency Stability.

Transmitter operating on 746.000 MHz

Temperature °C	Tx Frequency MHz normal Volts = 9.0 V	Tx Frequency MHz low Volts = 6.5 V
-30	745.995791	745.996465
-20	745.997875	745.997691
-10	746.001065	746.001376
0	746.002944	746.002939
+10	746.002956	746.003003
+20	746.002671	746.000607
+30	746.002268	746.001756
+40	746.001988	746.001150
+50	746.002143	746.002219

Frequency Error	kHz
Minimum	4.2
Maximum	3.0
Limit specified in 74.681.(e) (4)	< 0.005 % (± 37.3 kHz)

Frequency spectrum to be investigated - 47 CFR 2.1057

The level of frequency search was from the lowest radio frequency generated by the unit to the 10^{th} Harmonic of the fundamental frequency, of the highest carrier frequency.

General Information and Attachments.

Equipment Under Test (EUT).

The EUT is a body worn unit containing a battery powered transmitter designed to operate as a low powered auxiliary station in the frequency band allocated to “Auxiliary Stations”.

The FCC technical requirements for this equipment are specified in CFR 47 part 74 subpart H.

Primary Supply Voltage : 9.0 V Alkaline battery (PP3 type)

Battery end point Voltage : 6.5 V

Transmitter is switched on locally by insertion of an audio lead. Frequency selection is local by use of rotary switches.

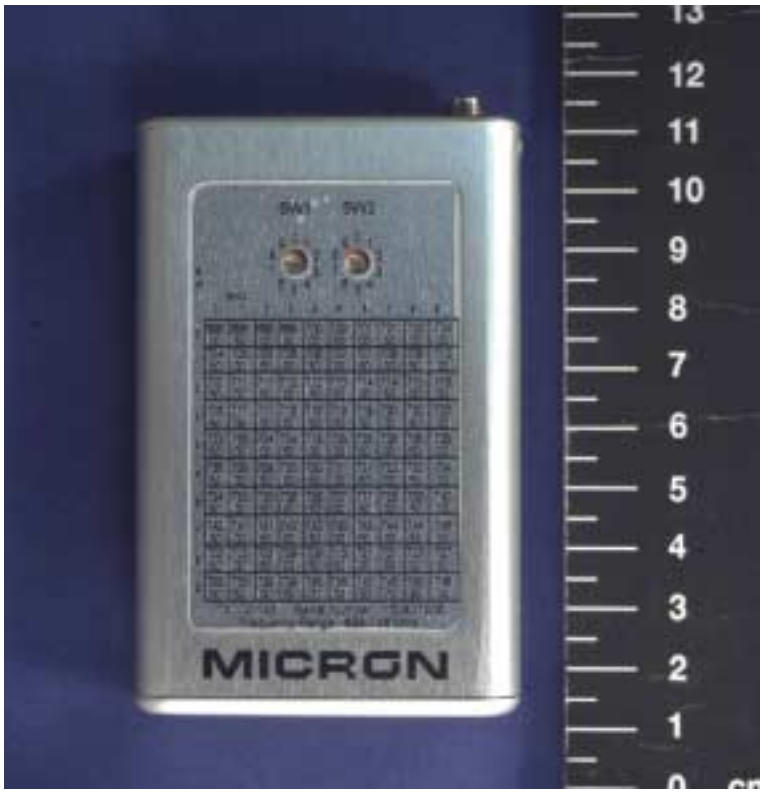
The Transmitter is capable of operating between 470.000 MHz and 746.000 MHz in 200 kHz steps.

The EUT is fitted with an SMA type socket for RF output to an antenna.

For the output power and frequency stability tests, the audio input was replaced by a dummy load.

PHOTOGRAPHS OF EQUIPMENT

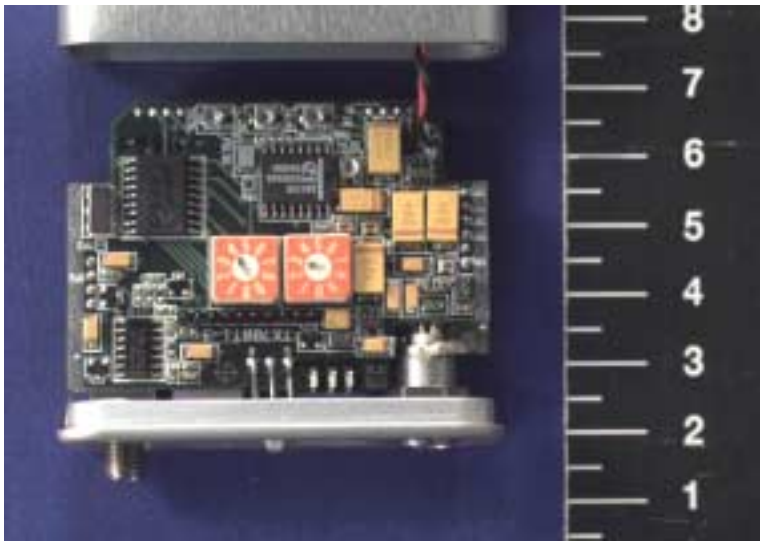
Transmitter Front View



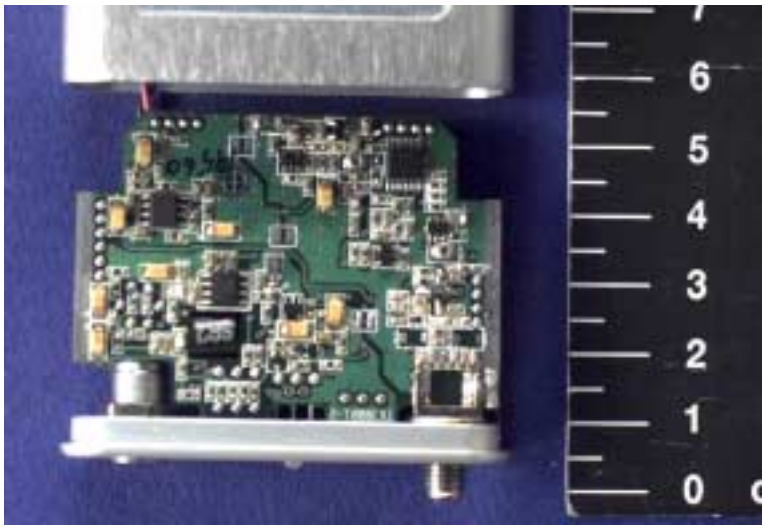
Transmitter Rear view

Transmitter Top View

Transmitter Inside View 1



Transmitter Inside View 2



Transmitter Test Position For Radiated Measurements

CTMS LTD, Company Accreditation's & Credentials

United Kingdom Accreditation Service

ACCREDITATION CERTIFICATE

TESTING LABORATORY
No. 1831

Cambridge Test and Measurement Services Ltd
PO Box 465
St Andrews Road
Cambridge
CB4 1ZJ

is accredited to undertake tests as detailed in the schedule bearing the accreditation number above. From time to time this schedule may be revised and reissued by the United Kingdom Accreditation Service.

This Accreditation shall remain in force until the expiry date printed below, subject to continuing compliance with United Kingdom Accreditation Service requirements. Accredited organisations meet the requirements of EN 45001, ISO/IEC Guide 25 and the relevant requirements of the BS EN ISO 9000 series of standards, including those of the model described in BS EN ISO 9002 when acting as suppliers producing test results.

Initial Accreditation 11 June 1997

Accreditation Manager, United Kingdom Accreditation Service

This certificate issued on 16 June 2000 **Expiry date 31 May 2001**

The Department of Trade and Industry (DTI) has entered into a memorandum of understanding with the United Kingdom Accreditation Service (UKAS) through which UKAS is recognised as the national body responsible for assessing and accrediting the competence of organisations in the fields of measurement, testing, inspection and certification of systems, products and personnel.

SGS Yarsley
International Certification Services Limited

Certificate Number

Q10171

This is to certify that the
Quality Management systems of

Cambridge Test and Measurement Services Limited

have been assessed and registered as meeting the requirements of ISO 9002

The scope of registration is detailed on the Assessment Schedule bearing this certificate number.

SGS Yarsley International Certification Services Ltd
Signed by

30 June 1997

This certificate remains valid subject to satisfactory maintenance of the system

Registered Office:
SGS Yarsley
International Certification Services Limited
SGS House, 217/221 London Road,
Camberley, Surrey GU15 3EY, United Kingdom.

NATIONAL ACCREDITATION OF CERTIFICATION BODIES

0025

United Kingdom Accreditation Service

TESTING LABORATORY
No. 1831

SCHEDULE

Testing Performed at Permanent Laboratory

Address of permanent laboratory	Laboratory contact: Mr D Fisher
Cambridge Test & Measurement Services Ltd PO Box 465 St Andrews Road Cambridge CB4 1ZJ	Telephone: +44 (0) 1223 876876 Fax: +44 (0) 1223 876851 EMail: Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
Computers and peripherals Domestic appliances Electrical/Electronic components Electrical/Electronic products Telecommunications equipment IT equipment Pager and pager devices Mobile/Portable radio - PMR PMR and ancillary equipment Fixed/Link PMR equipment Low power devices	**1 EMC TESTS**	
	1.1 Conducted Emissions 150 kHz to 30 MHz	EN 55011:1997 EN 55014:1993 Discontinuous emission EN 55022:1994 CISPR 14-1:1997 Disturbance power CISPR 22:1993 FCC Part 15:1996 ANSI C63.4:1992
	1.2 Radiated Emissions - Electric Field 30 MHz to 1 GHz	EN 55011:1997 EN 55022:1994 CISPR 22:1993 FCC Part 15:1996 ANSI C63.4:1992
	1.3 Mains Harmonics and Flicker	EN 61000-3-2:1995 EN 61000-3-3:1995
	1.4 Discontinuous Emissions (Clicks) 10 kHz to 30 MHz	EN 55014-1:1997
	1.5 Power Absorbing Emissions Measurements (Power Clamp) 30 MHz to 300 MHz	EN 55014-1:1997
	Continued on Sheet 2	

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
As listed on Sheet 1	1 **EMC TESTS** (cont'd) 1.6 Electrostatic Discharge Up to 15 kV	IEC 801-2:1991 IEC 1000-4-2:1995 EN 61000-4-2:1995
	1.7 Radiated Immunity 80 MHz to 1000 MHz, 1.4 GHz to 2.0 GHz up to 10 V/m	IEC 1000-4-3:1995 EN 61000-4-3:1996 Including Amendment 1:1998 ENV 50140:1993 ENV 50204:1995
	1.8 Fast Transient and Burst Immunity	IEC 801-4:1988 IEC 1000-4-4:1995 EN 61000-4-4:1995 ISO 7637:Part 1:1990
	1.9 Surge Immunity	IEC 1000-4-5:1995 EN 61000-4-5:1995 ENV 50142:1994
	1.10 Conducted Radio Frequency Disturbance	IEC 61000-4-6:1996 EN 61000-4-6:1996 ENV 50141:1993
	1.1 Mains Dips and Interruptions	IEC 1000-4-11:1994 EN 61000-4-11:1994
	1.12 Magnetic Field Immunity	EN 61000-4-8:1994
	Continued on Sheet 3	

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

UKAS TESTING

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
As listed on Sheet 1	**1 EMC TESTS** (cont'd) 1.13 EMC Tests These generic and product specific tests are included in this Schedule, but limited to those basic standards that are explicitly listed in Sections 1.1 to 1.10.	Generic and Product Standards EN 50081-1:1992 EN 50081-2:1994 EN 50082-1:1996 EN 50082-2:1996 EN 50130-4:1995 EN 50199:1995 EN 55024:1998 EN 60601-1-2:1993 EN 60945:1997 EN 61000-6-2:1999 EN 61326:1997 ETS 300 279:1995 ETS 300 329:1997 ETS 300 339:1994 ETS 300 340:1994 ETS 300 342-1:1997 ETS 300 445:1996 ETS 300 446:1997 ETS 300 680-1:1997 ETS 300 682:1997 ETS 300 683:1997 ETS 300 684:1997 ETS 300 717:1997 ETS 300 741:1998 ETS 300 826:1997 ETS 300 827:1998 AS/NZS 2064:1997 AS/NZS 3548:1995 AS/NZS 4251.1:1994
Fixed, Mobile, Portable radio equipment PMR and ancillary equipment Low power telemetry Low power telecommand Low power devices Maritime (VHF) Ship to shore Maritime (VHF) Shore stations	**2 RADIO TESTS** Frequency range: 9 kHz to 4 GHz Power Output up to 150 W Tests on Radio Transmitters 2.1 Frequency 2.2 RF Power, conducted and radiated 2.3 Modulation 2.4 Adjacent channel power Continued on Sheet 4	MPT 1250:1978 MPT 1251:1973 MPT 1305:1996 MPT 1308:1978 MPT 1312:1993 MPT 1314:1994 MPT 1325:1998 MPT 1328:1997 MPT 1329:1994

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
As listed on Sheet 3	**2 RADIO TESTS** (cont'd) 2.5 Spurious Emissions - conducted and radiated 2.6 Transmitter intermodulation 2.7 Transmitter transient behaviour 2.8 Audio response 2.9 Audio distortion Tests on Radio Receivers 2.10 Sensitivity - SINAD 2.11 Adjacent channel selectivity 2.12 Receiver intermodulation 2.13 Co-channel rejection 2.14 Blocking performance 2.15 Spurious emissions - conducted and radiated 2.16 Audio response 2.17 Audio distortion	 MPT 1330:1994 MPT 1335:1993 MPT 1336:1992 MPT 1338:1994 MPT 1340:1997 MPT 1344:1994 MPT 1345:1994 MPT 1350:1994 MPT 1357:1996 MPT 1360:1994 MPT 1361:1994 MPT 1365:1996 MPT 1374:1994 MPT 1382:1997 MPT 1411:1993 MPT 1601:1993 ETS 300 086:1991 ETS 300 113:1995 ETS 300 135:1991 ETS 300 162:1998 ETS 300 219:1993 I-ETS 300 220:1992 I-ETS 300 296:1994 ETS 300 328:1996 ETS 300 330:1990 ETS 300 390:1996 ETS 300 341:1995 I-ETS 300 422:1995 ETS 300 440:1999 ETS 300 454:1995 ETS 300 676:1997 ETS 300 719-1:1996 EN 300 220-1:1997 EN 300 220-2:1997 EN 300 422:V1.2.1:1999 EN 301 178:1999 EN 301 357:V1.1.1:1999 EN 301 688:1999 AS 4268.2:1995 AS 4295:1995
	Continued on Sheet 5	

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
	Facilities: Open area test sites: 3, 10 and 30 m Screened Room (Partially Lined RF Absorber) 6.4 m x 4.9 m x 2.8 m Screened Room (unlined) 3.7 m x 2.6 m x 2.5 m Screened Room (unlined) 3.0 m x 2.4 m x 2.4 m Environmental Chambers (various)	
	END	