



Test report no. : 71006-4

Item tested : TA-7610 / TA-7625

Type of equipment : VHF Transceiver

**FCC ID : RA9TA-76XX (1 and 25W
Transmitter)**

Client : Jotron AS

www.nemko.com

FCC Part 87 Subpart D

Aviation Services

RSS-141

Aeronautical radiocommunication equipment in the
Frequency Range 117.975 – 137 MHz

22 June 2007

Authorized by : 

Frode Sveinsen
Technical Verificator



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1 GENERAL INFORMATION

1.1 Testhouse Info

Name : Nemko Comlab
Address : Gåsevikveien 8, Box 96
N-2027 Kjeller, NORWAY
Telephone : +47 64 84 57 00
Fax : +47 64 84 57 05
E-mail: post@comlab.no
FCC test firm registration # : 994405
IC OATS registration # : 4443
Total Number of Pages: 36

1.2 Client Information

Name : Jotron AS
Address : P.O.Box 54, Kirkestian 1, 3280 Tjodalyng
Telephone : +47 33 13 97 14
Fax : --

Contact:

Name : Eirik Storjordet
Telephone : +47 33 13 97 14
E-mail : eirik.storjordet@jotron.com

1.3 Manufacturer (if other than client)

--,"

2 Test Information

2.1 Test Item

Name :	Jotron
Model/version :	TX: TA-7610, TA-7625
Serial number :	TX: 24
Hardware identity and/or version:	TX: X84506:R0543, X82411:R0552X
Software identity and/or version :	TX: Dec 5 2006
Frequency Range :	118 – 136.975 MHz
Tunable Bands :	None
Emission designator:	6K00A3E
Number of Channels :	3
Operating Modes :	TX & RX (Simplex)
Channel separation:	25kHz
Type of Modulation :	AM & VDL *
User Frequency Adjustment :	Yes
Rated Output Power (TX) :	High power: 25 W and Low power: 1W
Rated maximum audio output:	+10 dBm at 600 ohm line
Rated maximum audio input:	+10 dBm at 600 ohm line
Type of Power Supply :	100 – 260 AC mains or 21 - 36VDC
Antenna Connector :	50 Ohm N-connector

*VHF Digital Link (VDL) modulation is not yet implemented and not tested.

Description of Test Item

The Jotron TA 7600 series VHF radios are designed for ground to air communications on air port traffic control centers. The units are rack mounted. And the transmitter and receiver are separate units and have their own built in power supplies. These radios can be operated locally as well as remotely. The remote control ports are LAN, RS-485 and RS-232.

Theory of Operation

A simple AM modulated ground to air VHF aeronautical radio.

2.2 Test Environment

2.2.1 *Normal test condition*

Temperature: 20 - 24 °C

Relative humidity: 20 - 50 %

Normal test voltage: 120 V AC

The values are the limit registered during the test period.

2.3 Test Period

Item received date: 2006-12-12

Test period : from 2007-01-03 to 2007-02-12

3 TEST REPORT SUMMARY

3.1 General

Manufacturer: Jotron AS
Model No.: TA-7610 / TA-7625
Serial No.: TA-7625: 24

All measurements are traceable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC Part 87 subpart D.


Radiated tests were conducted in accordance with ANSI C63.4-2003. The radiated tests were made in a semi-anechoic chamber at measuring distances of 3 and 10metres.

New Submission Production Unit
 Class II Permissive Change Pre-production Unit
FVH Equipment Code Family Listing

**THIS TEST REPORT RELATES ONLY TO THE ITEMS AND CONFIGURATIONS TESTED.
Deviations from, additions to, or exclusions from the test specifications are described in
"Summary of Test Data".**



TEST REPORT #: 71006/4

TESTED BY: 
G.Suhanthakumar, Test engineer

DATE: 08.05.2007

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3.2 Test Summary

Name of test	FCC part 87 paragraph	IC RSS-141 paragraph	Result
RF Power Output	87.131 / 2.1046	4.3	Complies ¹
Audio Frequency Response	2.1047	-	Complies
Audio Low-Pass Filter Response	2.1047	-	Complies
Modulation Limiting	87.141b / 2.1047	-	Complies
Occupied Bandwidth	87.139a / 2.1049	-	Complies
Spurious Emissions at Antenna Terminals (conducted)	87.139a3 / 2.1051/2.1057	4.4/6.2	Complies
Spurious Emissions radiated, Transmitter & receiver	87.139(a)(3) / 2.1053/2.1057	4.5	Complies
Frequency Stability	87.133 / 2.1055	4.2	Complies ²

¹ The output power 1 to 25 W is selected in software.

² The manufacturer specified voltage range is 80 - 260 V AC

3.3 Description of modification for Modification Filing

Not applicable.

3.4 Comments

The measurements were done with the EUT powered by 120 V AC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

All ports were populated during spurious emission measurements.

3.5 Family List Rational

Not Applicable.

4 TEST RESULTS

5 RF Power Output

Para. No.: 87.131/ 2.1046

Test Performed By: G.Suhandhakumar

Date of Test: 09.01.2007

Test Results: Complies.

The maximum RF output power is 35.16W (45.46dBm) with 90% AM modulation.

The carrier power is within 0.79 dB of the manufacturer's rating of RF power output.

Measurement Data:

TX: 118 MHz, ref 50% AM, 1000Hz – Modulated 2.5KHz with 16dB overdrive

Carrier power			Mean Power		
Rated (W)	Measured (W)	(Measured/rated) dB	Rated (W)	Measured (W)	(Measured/rated) dB
25	25.23	0.02	36	33.01	-0.37
1	1.1	0.39	1.4	1.23	-0.59

TX: 128 MHz, ref 50% AM, 1000Hz – Modulated 2.5KHz with 16dB overdrive

Carrier power			Mean Power		
Rated (W)	Measured (W)	(Measured/rated) dB	Rated (W)	Measured (W)	(Measured/rated) dB
25	23.71	-0.25	36	35.16	-0.1
1	1.17	-0.69	1.4	1.29	-0.41

TX: 136.975 MHz, ref 50% AM, 1000Hz – Modulated 2.5KHz with 16dB overdrive

Carrier power			Mean Power		
Rated (W)	Measured (W)	(Measured/rated) dB	Rated (W)	Measured (W)	(Measured/rated) dB
25	25.82	0.12	36	33.65	-0.29
1	1.2	0.79	1.4	1.32	-0.29

Note:

Mean power rating is based on the limit of 90% AM.

This is equivalent to 1.44 x carrier power.

Carrier power is the average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle taken under the condition of no modulation.

Mean power is the average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.

Requirement (87.131):

For Airport control tower equipment (A3E, GiD, G7D) VHF: $\leq 50W$

6 Audio Frequency Response

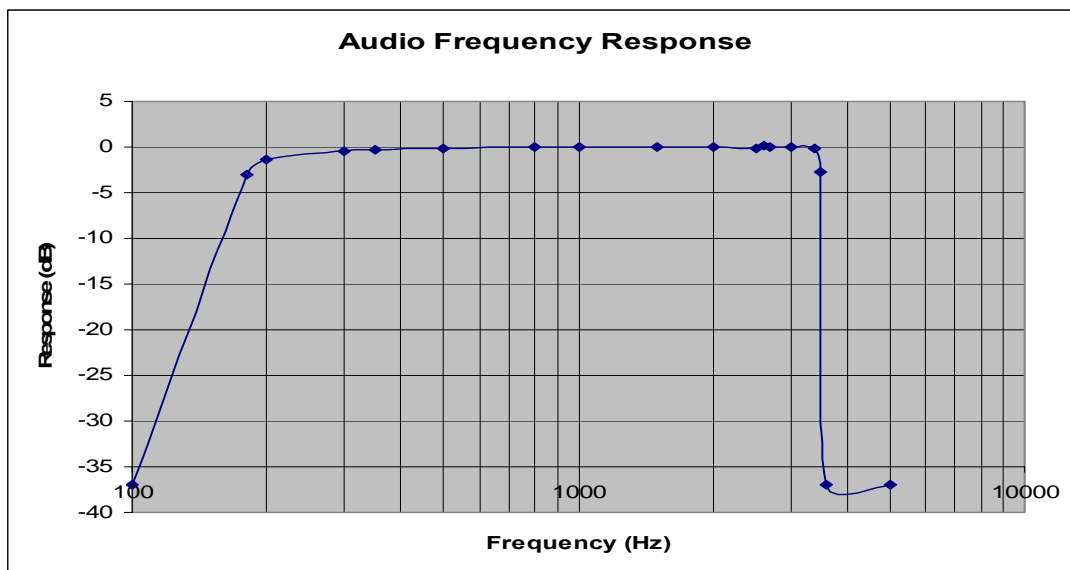
Para. No.: 2.1047

Test Performed By: G.Suwanthakumar	Date of Test: 12.02.2007
------------------------------------	--------------------------

Test Results: See attached graph.

Measurement Data:

Frequency(Hz)	Response (dB)
100	-37
180	-3
200	-1,4
300	-0,4
350	-0,3
500	-0,1
800	0
1000	0
1500	0
2000	0
2500	-0,1
2600	0,1
2700	0
3000	0
3400	-0,2
3500	-2,8
3600	-37
5000	-37



7 Audio Low-Pass Filter Response

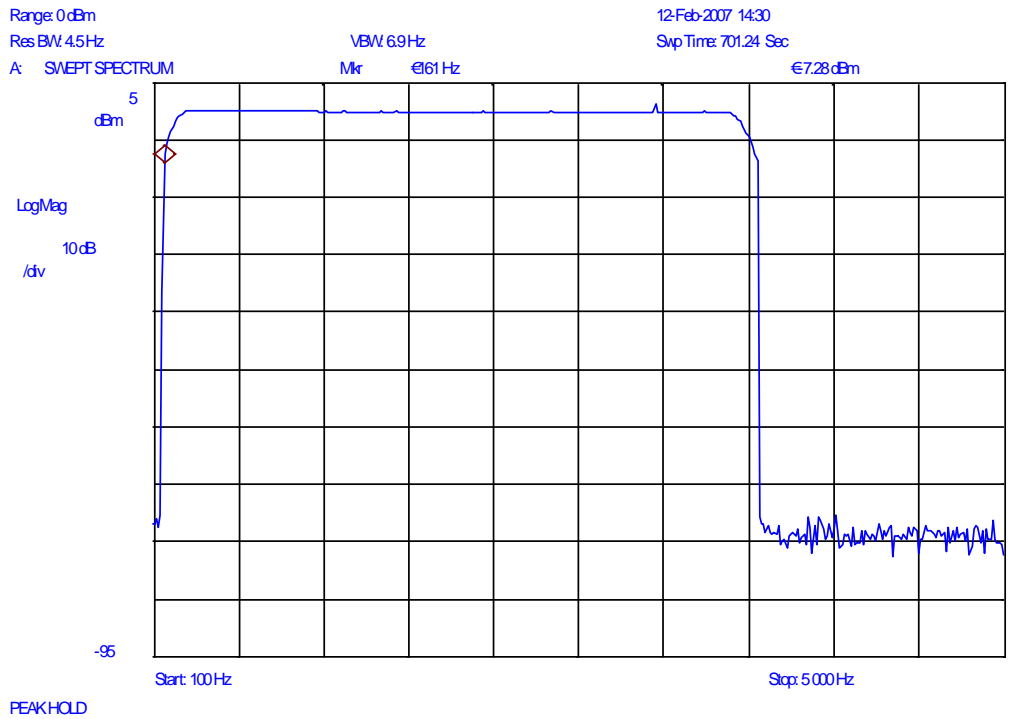
Para. No.: 2.1047

Test Performed By: G.Suwanthakumar	Date of Test: 12.02.2007
------------------------------------	--------------------------

Test Results: see attached graph

Measurement Data:

LP filter is at 3600 Hz



8 Modulation Limiting

Para. No.: 87.141(b)/ 2.1047

Test Performed By: G.Suwanthakumar	Date of Test: 11.01.2007
------------------------------------	--------------------------

Test Results: Complies.

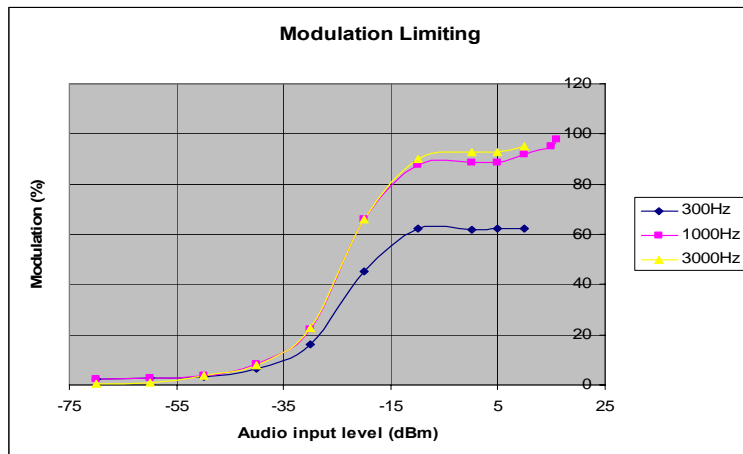
The maximum AM modulation level is 98 % @ 1000 Hz.

Measurement Data: See attached graph.

Requirement (87.141(b)):

A double sideband full carrier amplitude modulated radiotelephone transmitter with rated carrier power output exceeding 10 watts must be capable of automatically preventing modulation in excess of 100 percent.

Audio input level dBm	300HZ	1000Hz	3000Hz
	%	%	%
-70	2,4	2,5	0,6
-60	2,8	2,9	0,74
-50	3,4	3,8	3,7
-40	6,5	8,2	8
-30	16,2	22,1	22,6
-20	45,4	65,8	66
-10	62,1	87,8	90
0	62	88,4	93
5	62,1	88,4	93
10	62,3	91,7	95
15	63	95	95
16	63	98	95



9 Occupied Bandwidth

Para. No.: 87.139(a)/ 2.1049

Test Performed By: G.Suhanthakumar

Date of Test: 18.01.2007

Test Results: Complies.

Test Data: See attached graphs.

Requirement (87.139(a)):

(a) Except for ELTs and when using single sideband (R3E, H3E, J3E), or frequency modulation (F9) or digital modulation (F9Y) for telemetry or telecommand in the frequency bands 1435-1535 MHz and 2310-2390 MHz or digital modulation (G7D) for differential GPS, the mean power of any emission must be attenuated below the mean power of the transmitter (pY) as follows:

- (1) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth the attenuation must be at least 25 dB;
- (2) When the frequency is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth the attenuation must be at least 35 dB.
- (3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} pY$ dB



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* RBW 100 Hz

Marker 1 [T1]

* VBW 100 Hz

43.86 dBm

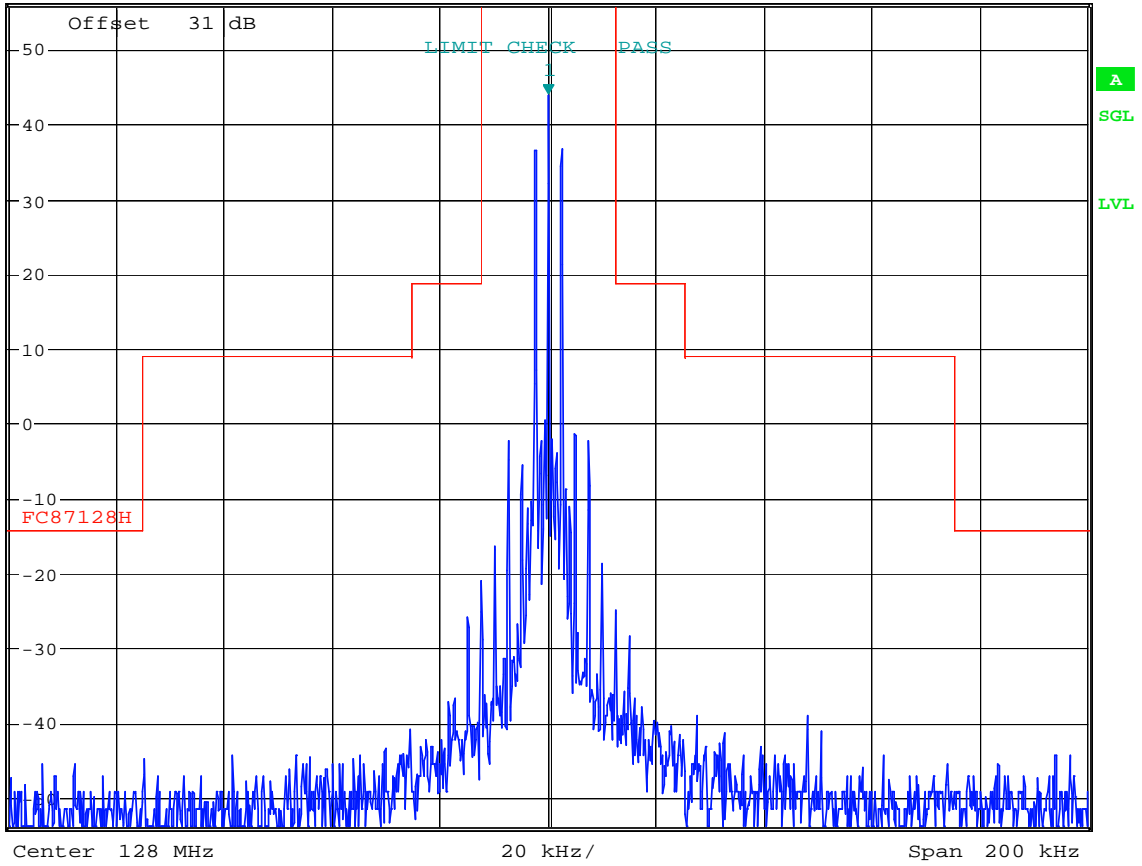
Ref 56 dBm

* Att 20 dB

SWT 20 s

128.00000000 MHz

1 AP
CLRWR



Date: 18.JAN.2007 16:50:29

6K00A3E

TX 128 MHz , High power: 25Watts

Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Authorized Bandwidth: 25 kHz, 87.137(a)

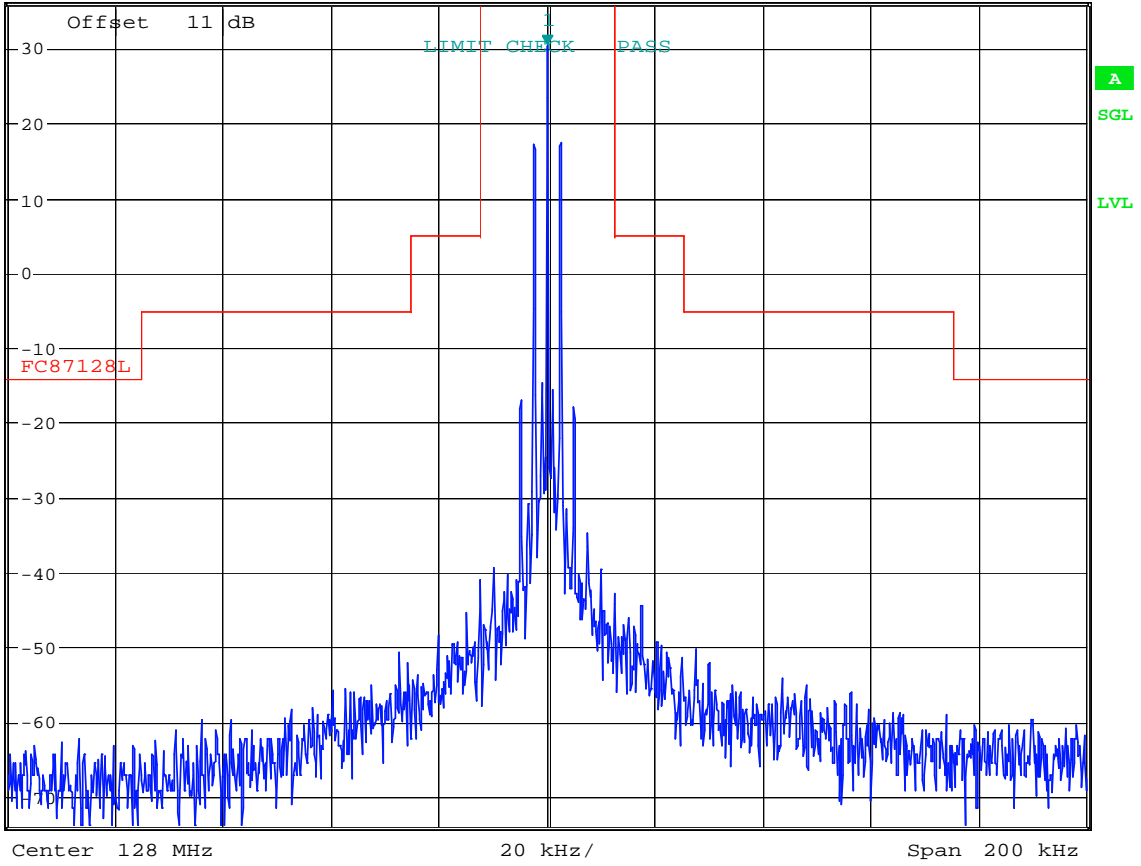
$43+10\log(25)= 56.98\text{dB}$



MARKER 1
 128 MHz

* RBW 100 Hz Marker 1 [T1]
 * VBW 100 Hz 30.37 dBm
 Ref 36 dBm * Att 20 dB SWT 20 s 128.00000000 MHz

1 AP
 CLRWR



Date: 18.JAN.2007 17:01:52

6K00A3E

TX 128 MHz, Low Power: 1Watt

Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Authorized Bandwidth: 25 kHz, 87.137(a)

$43 + 10 \log(25) = 43 \text{ dB}$



Nemko Comlab

* RBW 100 Hz
 * VBW 100 Hz

Marker 1 [T1]

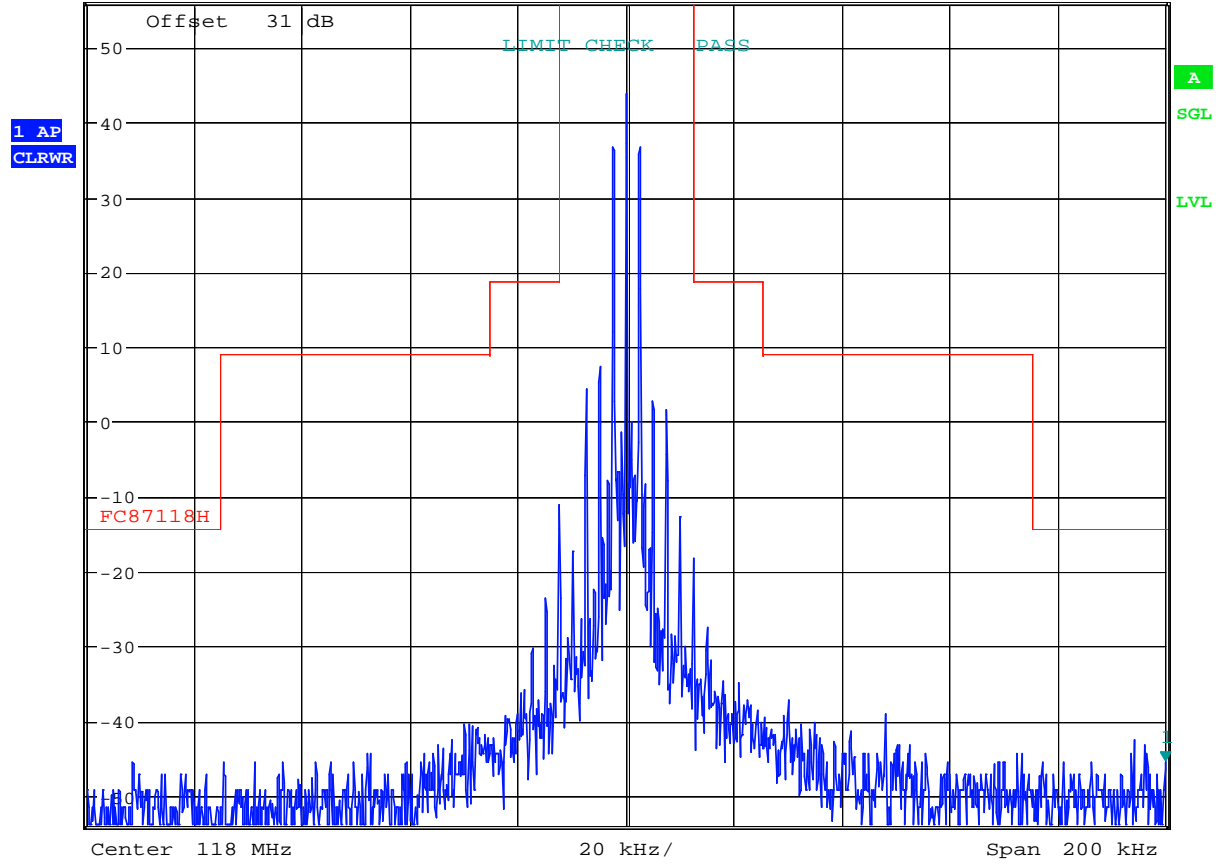
-45.66 dBm

Ref 56 dBm

* Att 20 dB

SWT 20 s

118.10000000 MHz



Date: 18.JAN.2007 16:56:52

6K00A3E

TX 118 MHz , High power: 25Watts

Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Authorized Bandwidth: 25 kHz, 87.137(a)

$43 + 10 \log(25) = 56.98\text{dB}$



Nemko Comlab

* RBW 100 Hz
 * VBW 100 Hz

Marker 1 [T1]

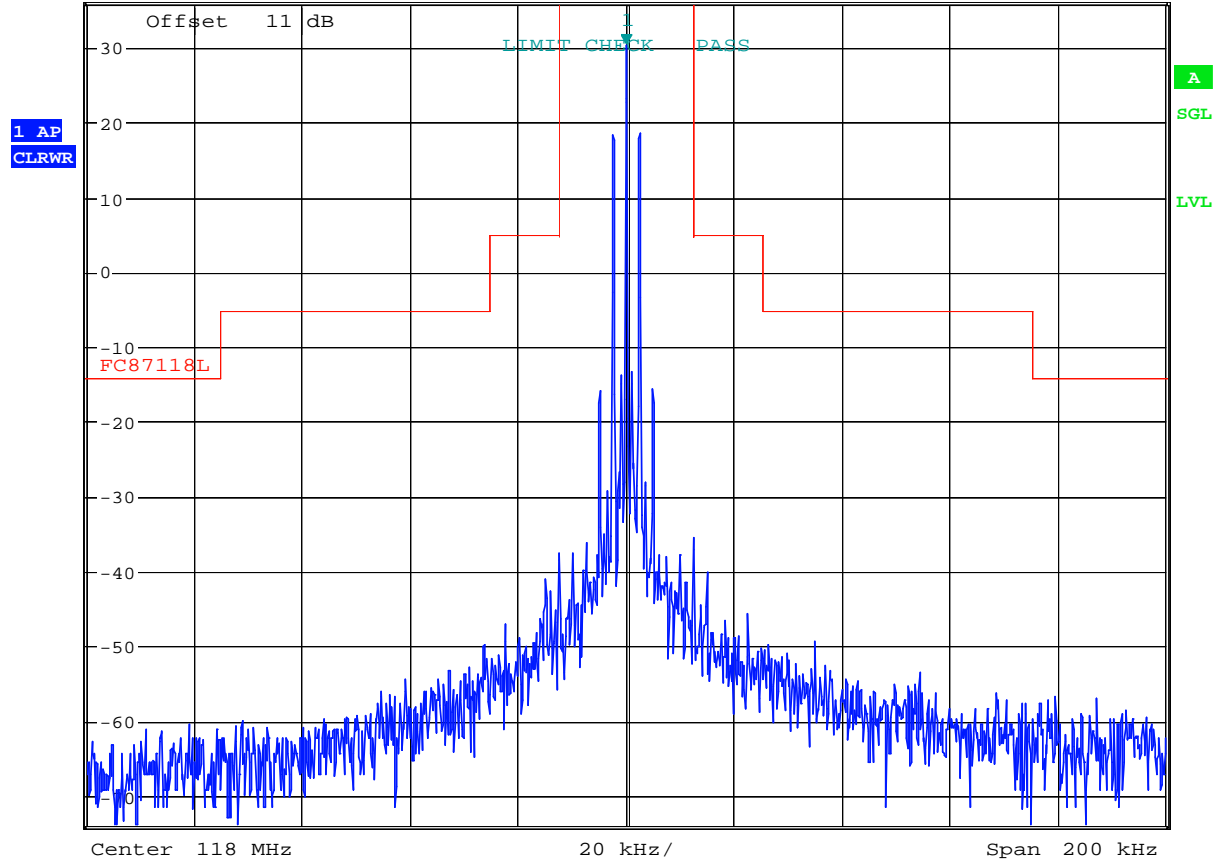
30.29 dBm

Ref 36 dBm

* Att 20 dB

SWT 20 s

118.00000000 MHz



Date: 18.JAN.2007 17:00:29

6K00A3E

TX 118 MHz, Low Power: 1Watt

Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Authorized Bandwidth: 25 kHz, 87.137(a)

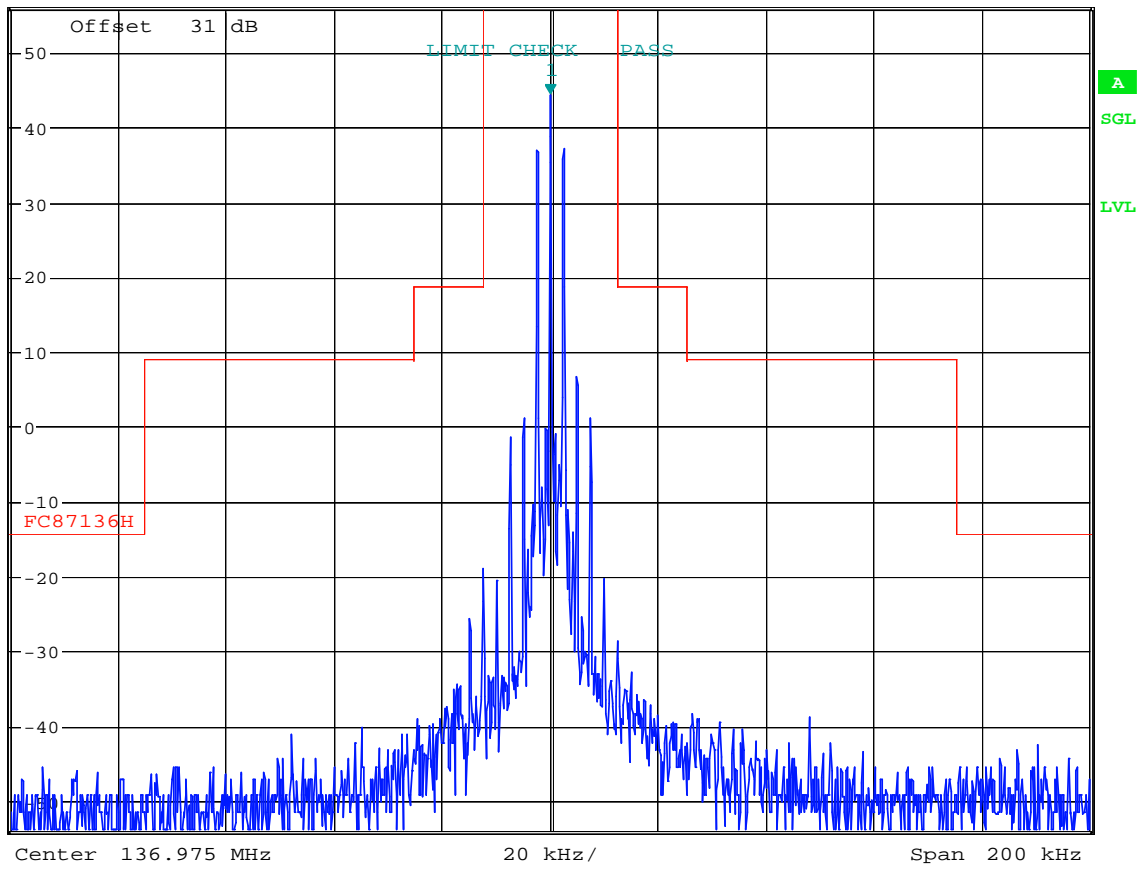
$43 + 10 \log(25) = 43\text{dB}$



MARKER 1
 136.975 MHz
 Ref 56 dBm * Att 20 dB

* RBW 100 Hz Marker 1 [T1]
 * VBW 100 Hz 44.24 dBm
 SWT 20 s 136.97500000 MHz

1 AP
 CLRWR



Date: 18.JAN.2007 16:54:16

6K00A3E

TX 136.975 MHz , High power: 25Watts

Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Authorized Bandwidth: 25 kHz, 87.137(a)

$43 + 10 \log(25) = 56.98\text{dB}$

10 Spurious Emissions at Antenna Terminals

Para. No.: 87.139(a)(3)/2.1051

Test Performed By: G.Suwanthakumar

Date of Test: 9.01.07

Test Results: Complies.

The maximum emission is -50 dBm at 256 MHz. This is 38 dB below the specification limit. The spectrum was searched from 30 to 1400 MHz using a spectrum analyzer set to positive peak detector, 1 MHz RBW/VBW. A band pass filter was used for each detected spurious to suppress the fundamental emission. Measurements were made using signal substitution method.

The measurements are done on 1118MHz, 128MHz & 136.975MHz and in High & low power. The measured spurious emissions are well below 20 dB from the limit.

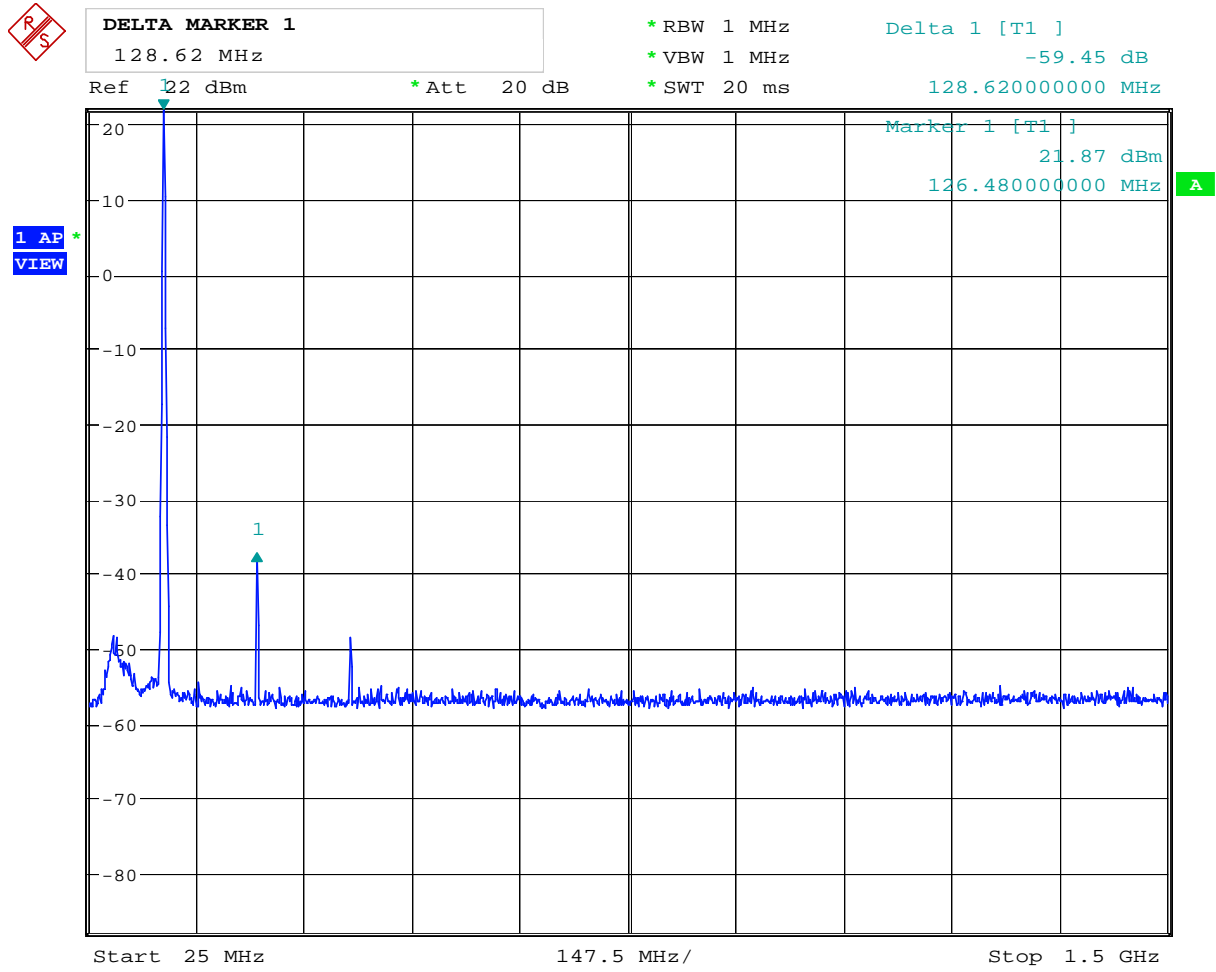
Test Data: See attached graphs.

TX 128 MHz, 25 Watts

Frequency of Emission (MHz)	Measured Emission Level (dBm)	Limit (dBm)	Margin (dB)
256	-50.50	-13	38
384	-58.68	-13	46

Requirement (87.139(a)(3):

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



Date: 9.JAN.2007 16:37:14

Above graph is only for frequency identification.

A band pass filter is used to measure the identified spurious emission.

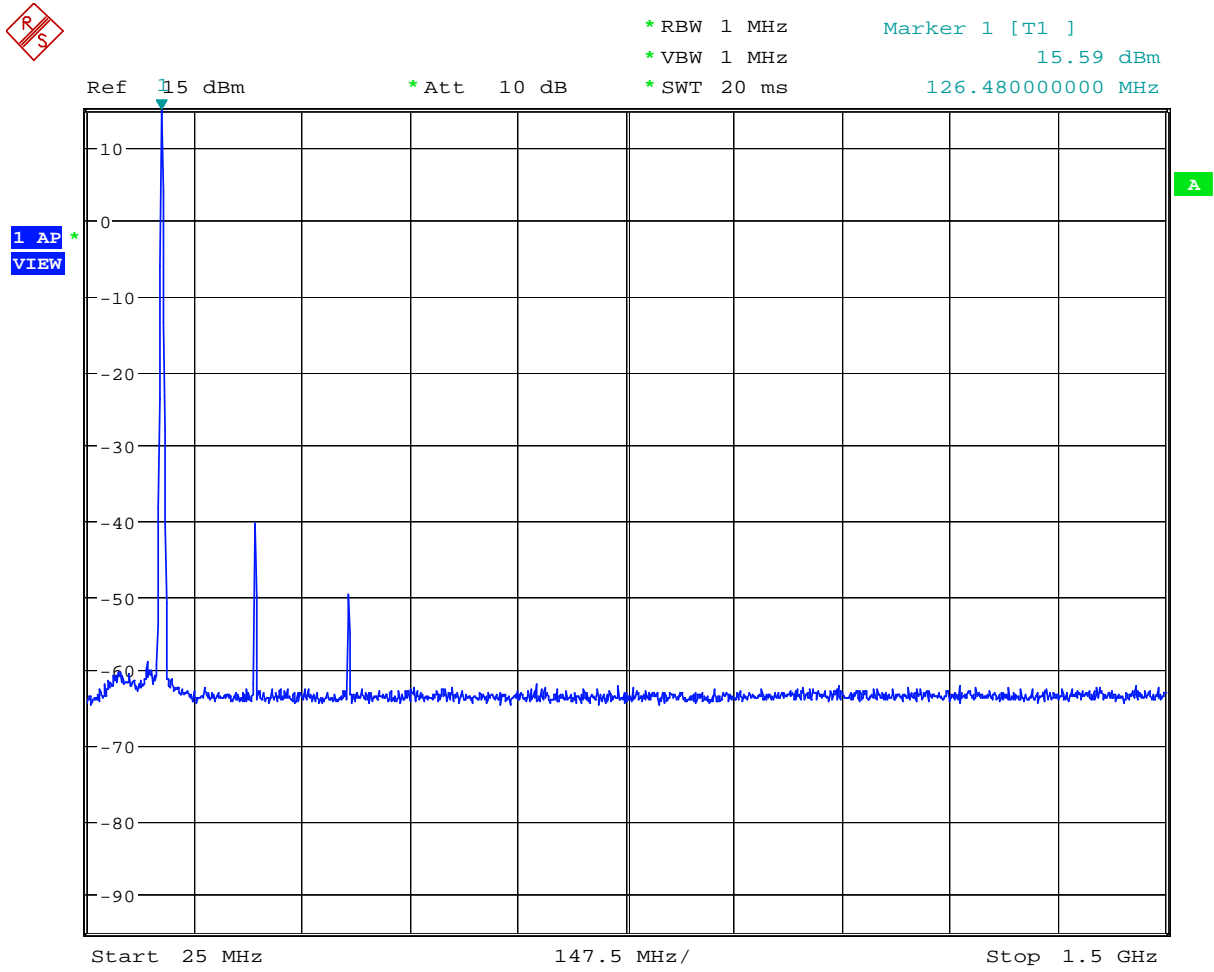
See tabulated data. Measured using signal substitution method.

6K00A3E

TX 128 MHz, HP: 25Watts

Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Authorized Bandwidth: 25 kHz, 87.137(a)



Date: 9.JAN.2007 16:35:13

Above graph is only for frequency identification

A notch filter was used to suppress the fundamental emission.

See tabulated data. Measured using signal substitution method.

6K00A3E

TX 128 MHz, LP: 1Watt

Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Authorized Bandwidth: 25 kHz, 87.137(a)

11 Field Strength of Spurious Emissions

Para. No.: 87.139(a)(3)/2.1053

Test Performed By: G.Suhandhakumar	Date of Test: 18.01.07
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Test Results: Complies.

The spectrum was searched from 30 to 1400 MHz.

The RF ports was terminated with 50 ohm load and all ports was terminated with respective loads.

Test Data:

TX 128 MHz, 25 Watts - Modulated 2500 Hz, 16 dB overdrive (ref: 50% modulation, 1000 Hz)

Frequency of Emission (MHz)	Measured Emission Level (dBm)	Limit (dBm)	Margin (dB)
51.75	-27	-13	14
128	-29	-13	16
299.55	-66	-13	53
1099	-50	-13	37

Requirement (87.139(a)(3):

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

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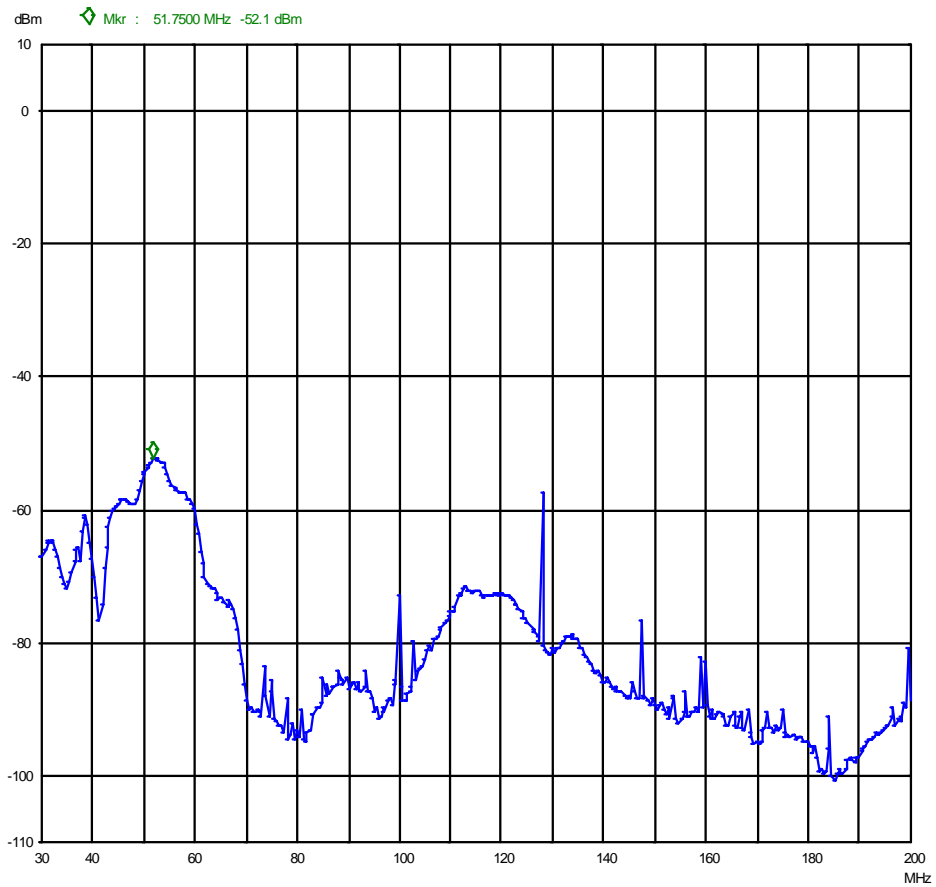
18. Jan 07 11:01

PK

EUT: Jotron
Manuf: Jotron Electronic AS
Op Cond: 1m vp
Operator: gns
Test Spec: FCC part 87
Comment: 50 ohm load

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB



Radiated spurious scan , VP 30- 200MHz

Nemko Comlab

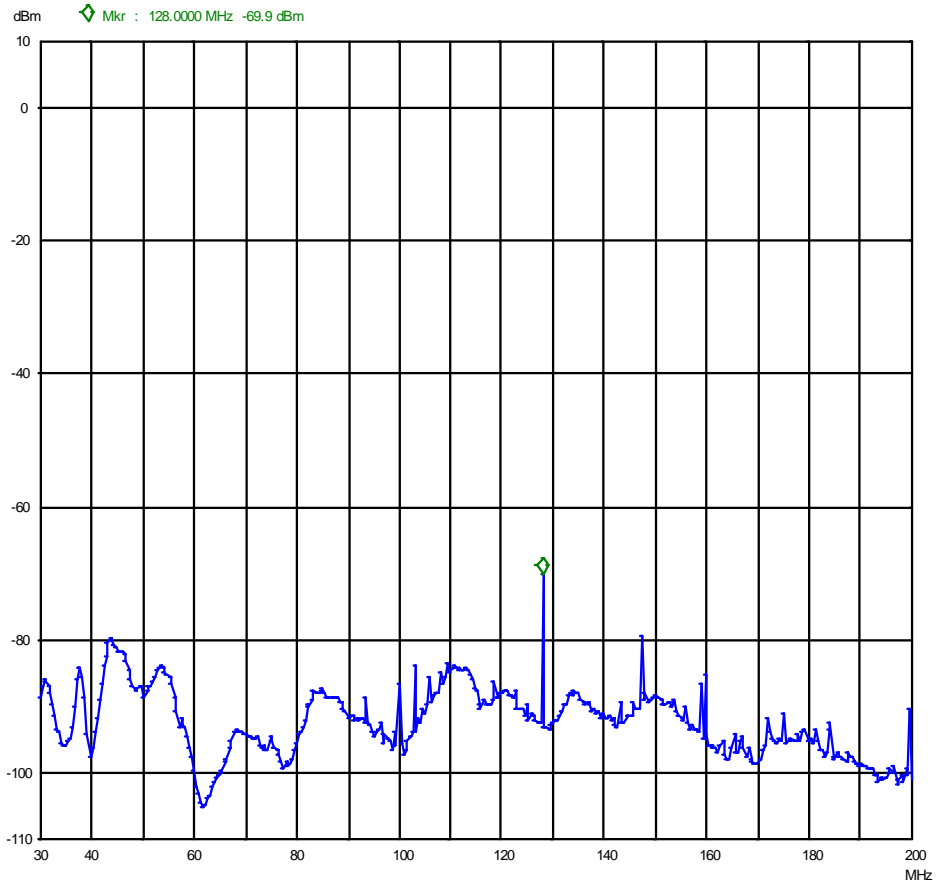
18. Jan 07 11:07

PK

EUT: Jotron
Manuf: Jotron Electronic AS
Op Cond: 4m hp
Operator: gns
Test Spec: FCC part 87
Comment: 50 ohm load

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	200M	50k	120k	PK	50ms	AUTO	LN ON	60dB

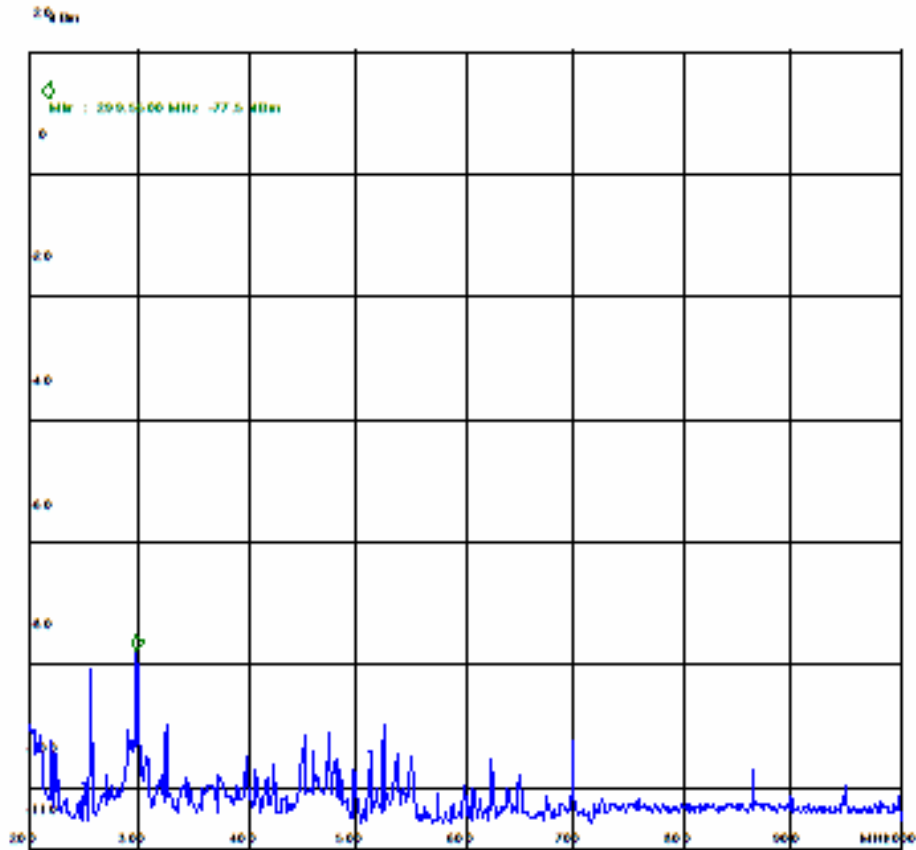


Radiated spurious scan , HP 30- 200MHz

Nemko Connect JobMax1 Jobno: Electromag Coe 4: TestOperator: glnstSpec: FCC part87Dmax1 50 ohm load

18. Jan 07 10:22

Scan Settings (1 Range) Frequencies Recorder Settings Part Stop Step IF BW Detector H-Tune Meter Pres



Radiated spurious scan , VP 200- 1000MHz

Nemko Comlab

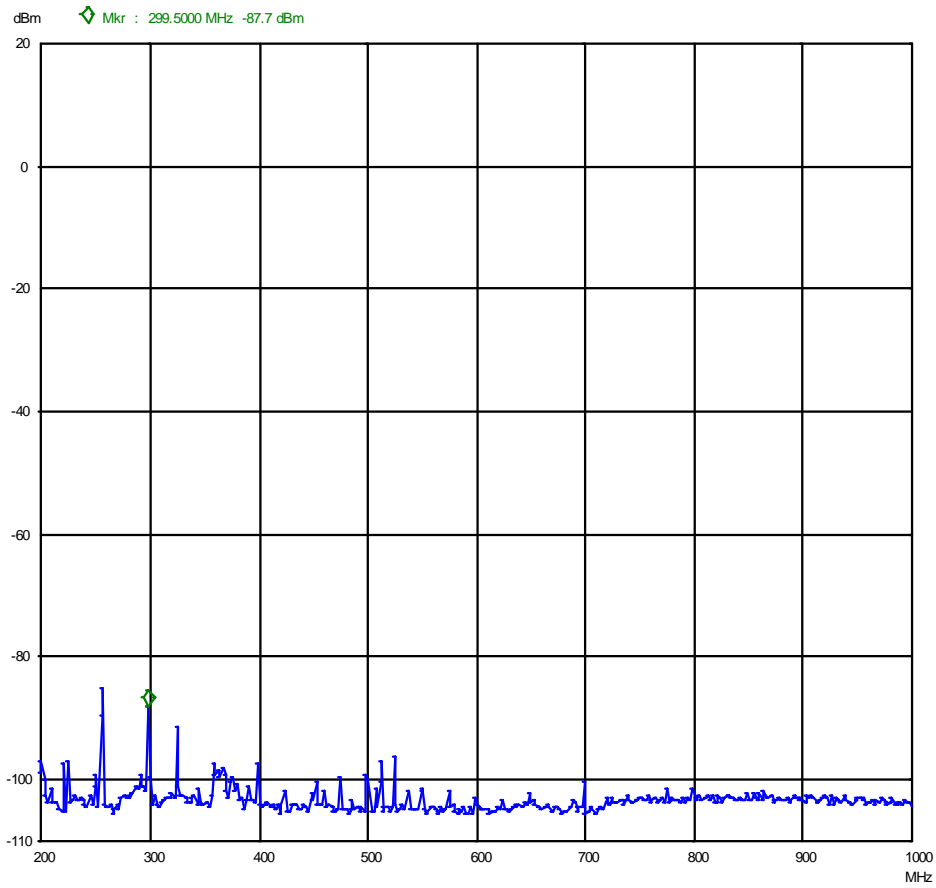
18. Jan 07 10:38

PK

EUT: Jotron
Manuf: Jotron Electronic AS
Op Cond: 4m hp
Operator: gns
Test Spec: FCC part 87
Comment: 50 ohm load

Scan Settings (1 Range)

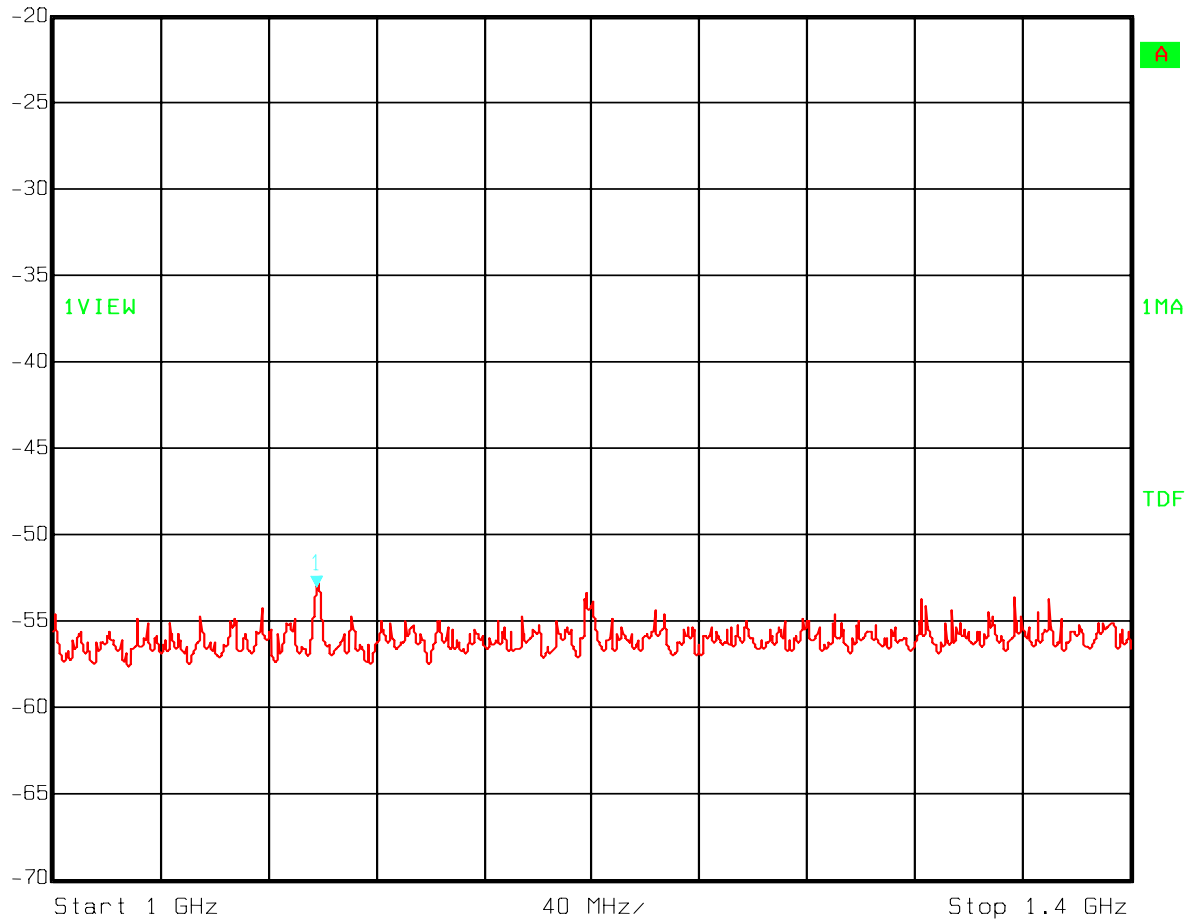
----- Frequencies -----|----- Receiver Settings -----|
Start Stop Step IF BW Detector M-Time Atten Preamp OpRge
200M 1000M 50k 120k PK 50ms AUTO LN ON 60dB



Radiated spurious scan , HP 200- 1000MHz



Ref Lvl -20 dBm
Marker 1 [T1] -53.01 dBm
1.09779559 GHz
RBW 1 MHz
RF Att 10 dB
VBW 1 MHz
SWT 5 ms
Unit dBm

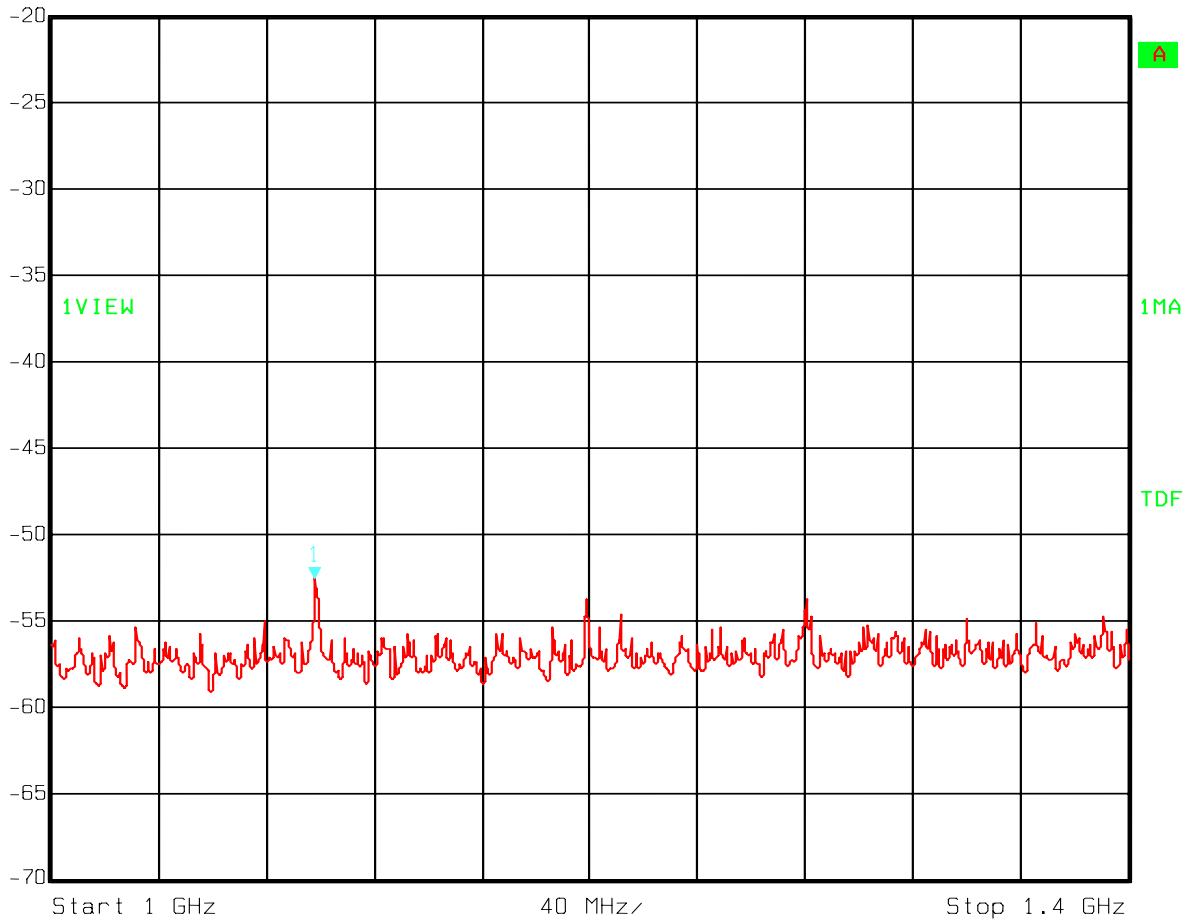


Date: 18.JAN.2007 10:17:09

Radiated spurious scan , VP 1000 - 1400MHz



Ref Lvl -20 dBm
Marker 1 [T1] -52.59 dBm
1.09779559 GHz
RBW 1 MHz
RF Att 10 dB
VBW 1 MHz
SWT 5 ms
Unit dBm



Date: 18.JAN.2007 10:18:09

Radiated spurious scan , HP 1000 - 1400MHz

12 Frequency Stability

Para. No.: 87.133(a)/2.1055

Test Performed By: G.Suwanthakumar	Date of Test: 19.01.07
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Test Results: Complies.

The maximum frequency drift is 30 Hz. This is 0.235 ppm.

Test Data:

Test Condition	Frequency (118.000MHz)	Frequency Drift (Hz)	Frequency (128.000MHz)	Frequency Drift (Hz)	Frequency (136.975MHz)	Frequency Drift (Hz)
50°C, 120 VAC	117.99997	-30	127.99997	-30	136.97499	-10
40°C, 120 VAC	117.99997	-30	127.99997	-30	136.97499	-10
30°C, 120 VAC	118.00002	20	128.00000	0	136.97499	-10
20°C, 138 VAC	118.00002	20	128.00002	20	136.97501	10
20°C, 120 VAC	118.00002	20	128.00002	20	136.97501	10
20°C, 102 VAC	118.00002	20	128.00002	20	136.97501	10
10°C, 120 VAC	118.00003	30	128.00003	30	136.97503	30
0°C, 120 VAC	118.000007	7	128.000009	9	136.97501	10
-10°C, 120 VAC	117.999999	-1	127.999998	-2	136.97499	-10
-20°C, 120 VAC	117.999982	-18	127.999996	-4	136.97499	-10
-30°C, 120 VAC	117.999985	-15	127.999996	-4	136.97499	-10
Maximum frequency drift (Hz)	30		30		30	

Requirement 87.133(a):

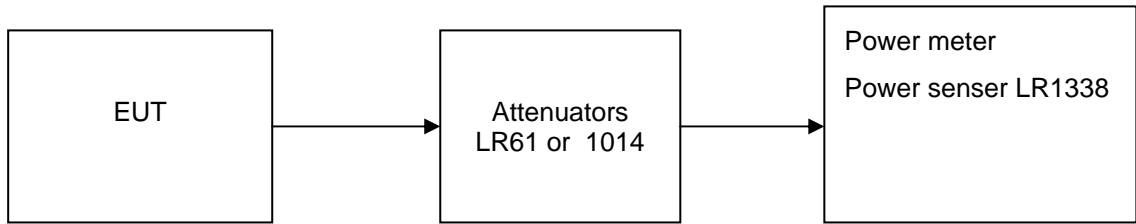
The tolerance for transmitters , and stations using offset carrier techniques is less than 20 ppm.

13 LIST OF TEST EQUIPMENT

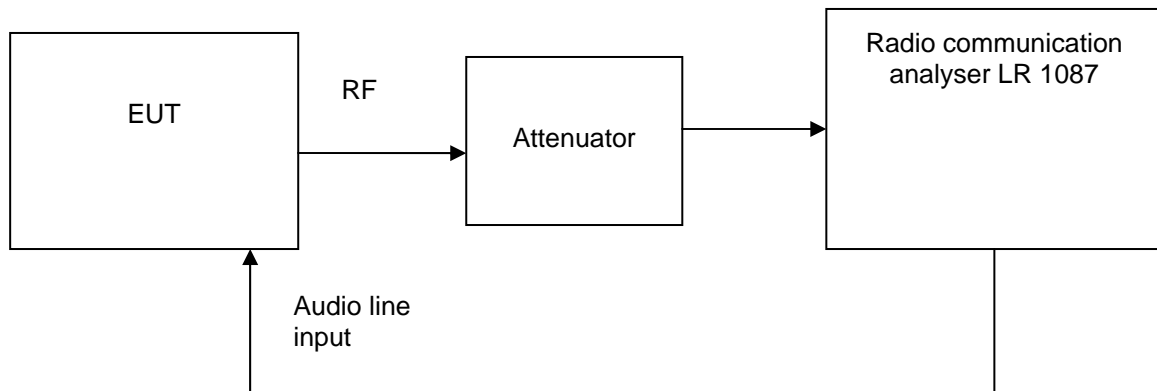
To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No	Description	Manufacturer	Type
1101	EMI-Receiver	R&S	ESVS30
1261	Antenna Log-periodic	R&S	HL 223
1410	Shielded room	ETS Euroshield	Semi-anechoic
61	Attenuator	Bird	8321
1087	Radiocomm Analyzer	R&S	CMTA 54
1079	Generator, AF../UHF	R&S	SMHU56
1337	Spektrum Analyzer	R&S	FSEK 1088,3494,30
1336	Generator, RF	R&S	SMP04 1035,5005,04
1260	Antenna, biconical	R&S	HK 116
1338	Probe, RF	HP	8481H
181	Power meter	HP	436A
1014	Counter Freq	HP	5386A
1195	Attenuator	Narda	768-30
1007	Attenuator	Narda	765-10
1020	Multimeter, Digital	Fluke	87
257	Hybrid	Anza	H-9
1504	EMI Receiver	R&S	FSU26
1167	Filter Band Pass	Trilithic	5VF95/190
46	Filter Band Pass	Texn	5VF190/375
1169	Filter Band Pass	Trilithic	5VF250/500
1173	Filter Band Pass	Trilithic	5VF24/48
1174	Filter Band Pass	Trilithic	5VF1000/2000
5099	Spektrum Analyzer	HP	3588A
1083	Climatic chamber	ACS	TY80

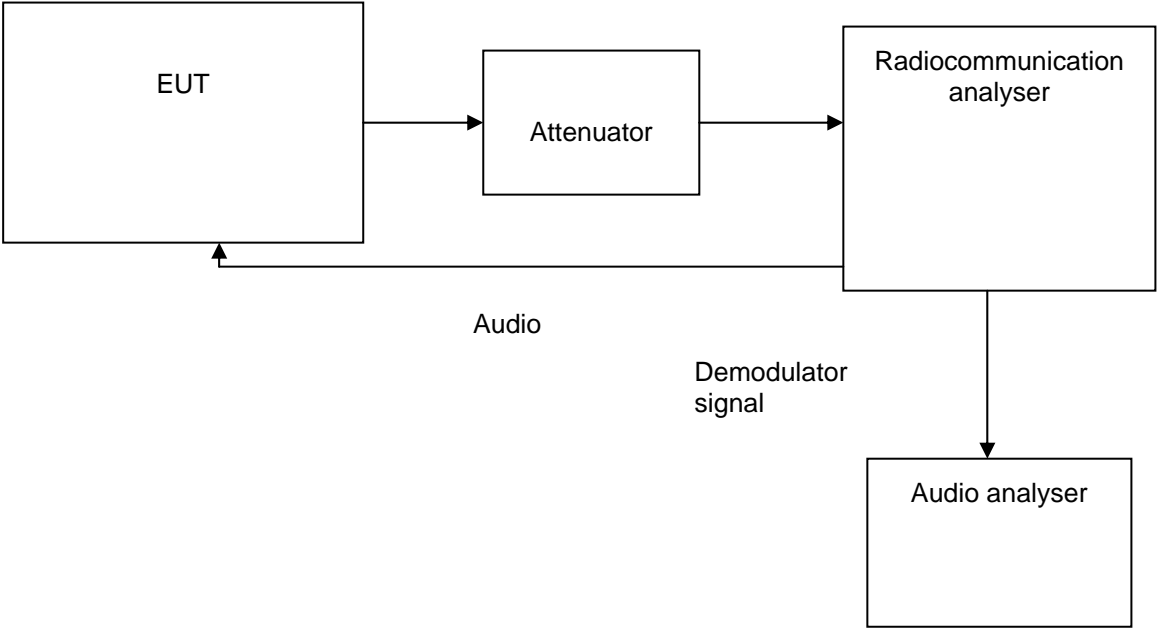
14 TEST SET-UP



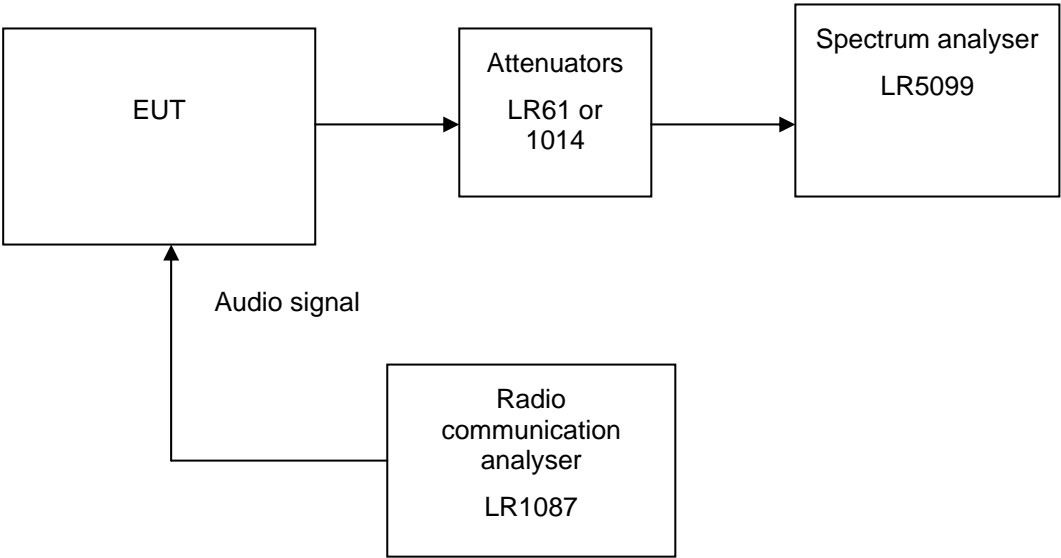
RF Output Power



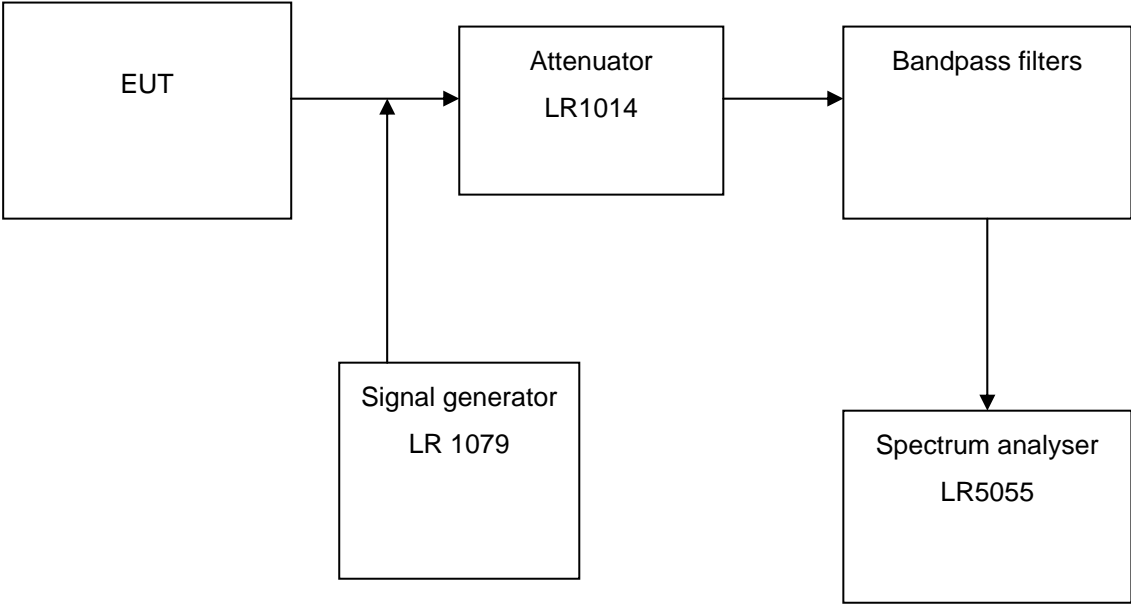
Audio Frequency Response/Modulation limiting



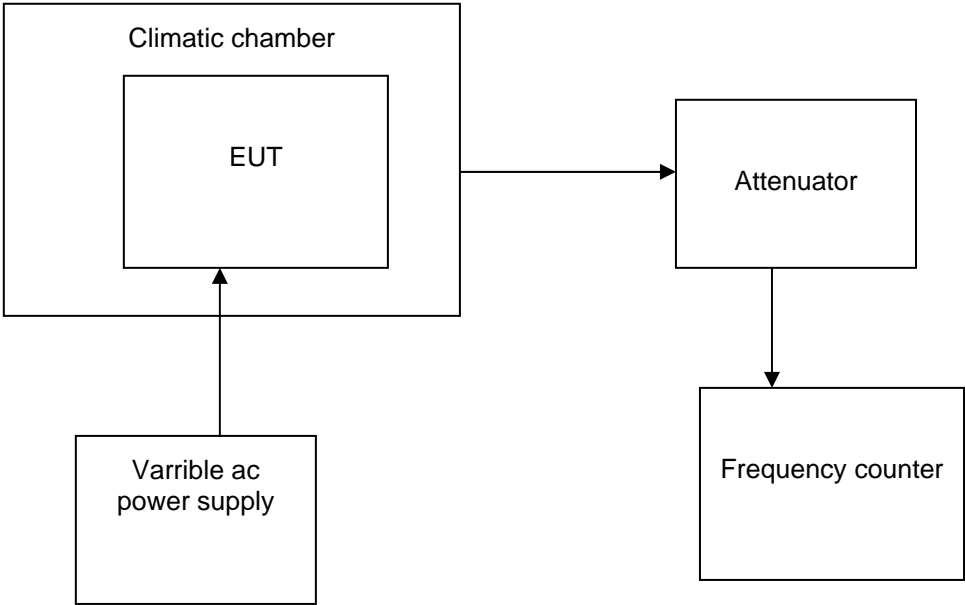
Audio low pass filter response



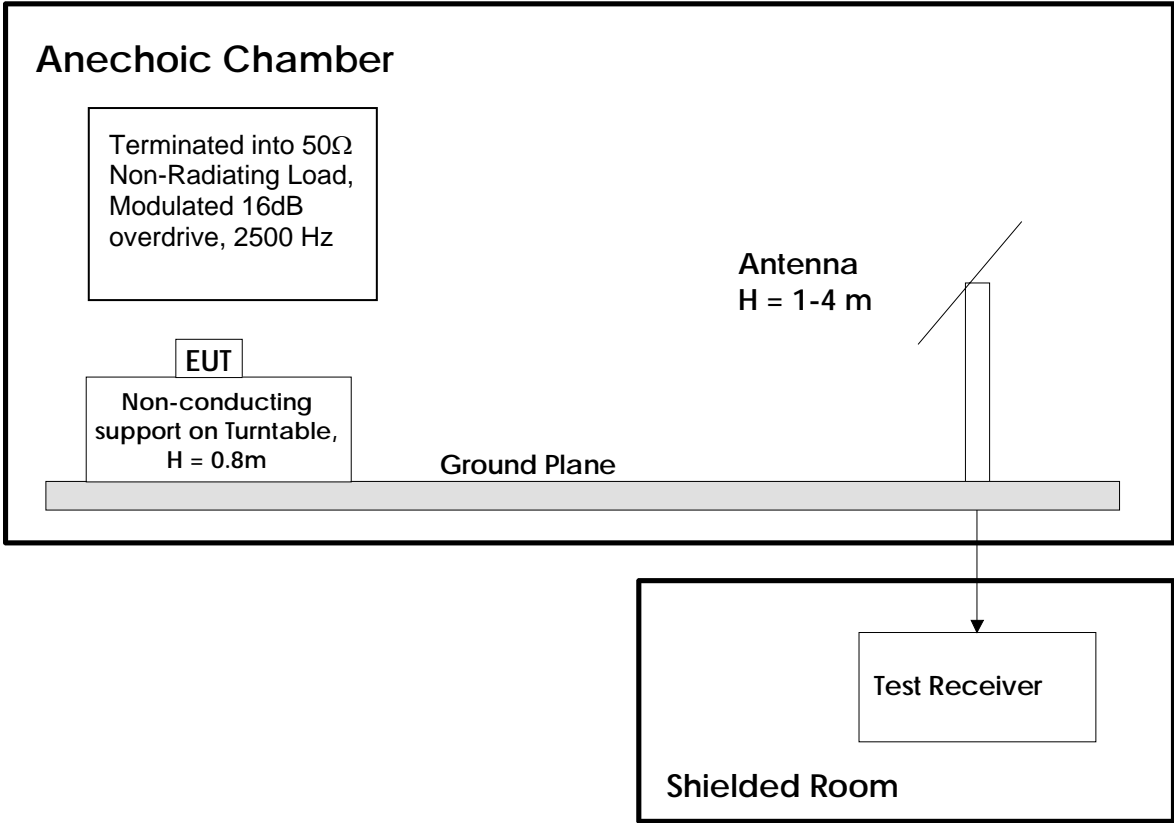
Occupied Bandwidth



Spurious Emissions at Antenna Terminals



Frequency Stability



Emission levels are measured in terms of ERP. All emissions within 20 dB of the specification limit are maximized along 360° azimuth and further maximized by raising and lowering the search antenna from 1 to 4 m. The transmitter under test is replaced with a dipole antenna and calibrated signal generator. The level and frequency of the signal generator are adjusted in order to reproduce the previously detected emission and maximized by varying the height of the search antenna. This procedure is performed both horizontal and vertical polarization of the detected signal.

Radiated spurious emissions