ELECTROMAGNETIC EMISSIONS TEST REPORT

ACCORDING TO FCC Part 15 subpart C and subpart B

for

INNOWAVE TADIRAN TELECOMMUNICATIONS, WIRELESS SYSTEMS LTD.

EQUIPMENT UNDER TEST:

FIXED ACCESS UNIT

Types FAU-1, FAU-2, FAU-4

FCC ID: M2KFAU4

Prepared by: ____________
Mrs. M. Cherniavsky, Certif. Engineer
Hermon Labs

Approved by: ____________
Mr. A. Usoskin, QA Manager
Hermon Labs

Approved by: ____________ 18 June 1998
Dr. E. Usoskin, C.E.O.
Hermon Labs

Approved by: ____________
Mr. Amnon Beer, Engineering Manager
InnoWave Wireless Systems Ltd.

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ACCREDITED
839.01

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Description of equipment under test

Test items	Fixed Access Unit (hopping transceiver) with power supply unit (PCU) FCC ID:M2KFAU4
Manufacturer	InnoWave Tadiran Telecommunications, Wireless Systems Ltd.
Brand Mark	InnoWave Wireless Systems
Type (Model)	FAU-1, FAU-2, FAU-4

Applicant information

Applicant	InnoWave Tadiran Telecommunications, Wireless Systems Ltd.
Address	4 Hashiloach St.
P.O. Box	500
Postal code	49104
City	Petach-Tikva
Country	Israel
Telephone number	+972-(0)3-9263507
Telefax number	+972-(0)3-9263678
Applicant's responsible person	Mr. Amnon Beer, Engineering Manager

Test performance

Location of the test	Hermon Laboratories, Binyamina, Israel
Test started	May 11, 1998
Test completed	May 18, 1998
Purpose of test	Certification
Test specification(s)	FCC part 15 subpart C §15.247, § 15.205, § 15.207, §15.209, and Subpart B § 15.107, § 15.109

Through this report a point is used as the decimal separator and the thousands are counted with a comma.
This report is in conformity with EN 45001 and ISO GUIDE 25.
The test results relate only to the items tested.

Table of Contents

1 General Information

1.1 Abbreviations and Acronyms

The following abbreviations and acronyms are applicable to this test report:

AC	alternating current
AVRG	average (detector)
BW	bandwidth
CE	Conducted Emissions
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μA)	decibel referred to one microampere
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
DC	direct current
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
GHz	gigahertz
FSK	frequency shift keying
H	height
HL	Hermon Laboratories
HP	Hewlett Packard
Hz	hertz
IF	Intermediate frequency
kHz	kilohertz
L	length
LISN	Line Impedance Stabilization Network
m	meter
mm	millimeter
MHz	megahertz
msec	millisecond
NA	not applicable
NARTE	National Association of Radio and Telecommunications Engineers, Inc.
nF	nanofarad
Ohm	Ohms
pF	picofarad
QP	quasi-peak (detector)
RBW	resolution bandwidth
RF	Radio Frequency
RE	Radiated Emission
RMS	Root-Mean-Square
sec	second
V	volt
V/m	volt per meter
W	watt

1.2 Specification References

CFR 47 part 15: 10/1997	Radio Frequency Devices.
ANSI C63.2:1996	American National Standard for Instrumantation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4:1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

1.3 EUT Description

The EUT, Fixed Access Unit, is a frequency hopping transceiver, which links subscribers on the customer premises to a base station, which in turn is connected to a local exchange. The EUT serves as the subscriber radio providing up to 4 telephone lines and is outdoor mounted unit.
The EUT uses radio waves in 2.4 - 2.4835 GHz frequency range. A Frequency Hopping Spread Spectrum (FHSS) type of modulation, TDMA, TDD with 875 Kbps Aggregate Bit Rate is used to transport data. The frequency order is pseudorandom. The integral antenna with 13.5 dBi gain is available. The lowest and the highest channel frequencies of the hopping sequence are 2.401 GHz and 2.480 GHz correspondingly.
The FAU is supplied by 57 V DC from Power Supply and Charge Unit (PCU), which is connected via AC adapter to the mains.

1.4 EUT Test Configuration

Full tests were performed on a testsample of FAU-4 type with all four subscriber interfaces (S/N 241000F1). This configuration is the most complex version and the test results obtained are also valid for the types FAU-1 and FAU-2, which are stripped down versions of the FAU-4. Throughout the testing the COMPAQ PC, series 2880A, FCC ID:DGIP5872 was used to activate radio mode.

1.5 Statement of Manufacturer

I, Amnon Beer, Engineering Manager of InnoWave Tadiran Telecommunications, Wireless Systems Ltd., declare that the Fixed Access Unit hopping transceiver, FCC ID:M2KFAU4, S/N 241000F1, was tested on May 11 to 18, 1998 by Hermon Laboratories and which this test report applies to, is identical of the equipment that will be marketed.

The term identical means identical within the variations that can be expected to arise as a result of quantity production technique.

Amnon Beer, Engineering Manager
InnoWave Tadiran Telecommunications, Wireless Systems Ltd.

Signature: A. Beer

Date: June 17, 1998

2 Test Facility Description

2.1 General

Tests were performed at Hermon Laboratories, which is a fully independent, private EMC, Safety and Telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), recognized by VDE (Germany) for witness test, certified by VCCI (Japan), assessed by NMi Certin B.V. (Netherlands) for a number of EMC, Telecommunications and Safety standards, recognized by TUV Sudwest (Germany) for Safety testing, and assessed by AMTAC (UK) for safety of Medical Devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO GUIDE 25/EN 45001 for EMC, Telecommunications and Product Safety Information Technology Equipment (Certificate No. 839.01).

Address:	PO Box 23, Binyamina 30550, Israel.
Telephone:	+972-6-628-8001
Fax:	+972-6-628-8277

Person for contact: Mr. Alex Usoskin, Testing and QA Manager.

2.2 Equipment Calibration

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of MIL-STD-45662A.
The laboratory standards are calibrated by the third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements.

Reference numbers of test equipment used according to §15.247:

HL 0025	HL 0056	HL 0483	HL 0521	HL 0522	HL 0523	

Full description is given in Appendix A.

2.2.1 Uncertainty in Hermon Labs Measurements.

Conducted Emissions (95% Confidence)	9 KHz to 150 KHz : ± 2.18 dB Expanded uncertainty : ± 1.09 dB Combined standard uncertainty 150 KHz to 30 MHz : ± 2.42 dB Expanded uncertainty : ± 1.21 dB Combined standard uncertainty
Radiated Emissions (95% Confidence)	Biconical Antenna: 3m measuring distance : + 4.06 dB Expanded uncertainty : - 3.98 dB Expanded uncertainty : + 2.032 dB Combined standard uncertainty : - 1.99 dB Combined standard uncertainty 10m measuring distance : + 3.98 dB Expanded uncertainty : - 4.08 dB Expanded uncertainty : + 1.99 dB Combined standard uncertainty : - 2.04 dB Combined standard uncertainty Log periodic Antenna: 3m measuring distance : + 4.74 dB Expanded uncertainty : - 3.26 dB Expanded uncertainty : + 2.37 dB Combined standard uncertainty : - 1.63 dB Combined standard uncertainty 10m measuring distance : + 3.06 dB Expanded uncertainty : - 3.00 dB Expanded uncertainty

2.3 Laboratory Personnel

The four people of Hermon Laboratories that have participated in measurements and documentation preparation are: Dr. Edward Usoskin - Laboratory C.E.O., Mr. Michael Feldman - technician, Mrs. Eleonora Pitt - test engineer, and Mrs. Marina Cherniavsky-certification engineer. Dr. E. Usoskin is an EMC Specialist and M. Cherniavsky is a Telecommunication Engineer, certified by the National Association of Radio and Telecommunications Engineers (NARTE, USA.).
The Hermon Laboratories' personnel that participated in this project have more than 100 years combined experience time in EMC measurements and electronic products design.

2.4 Statement of Qualification

The test measurement data supplied in this test measurement report having been received by me, is hereby duly certified. The following is a statement of my qualifications. I am a technician, have obtained 29 years experience in electronics and have been with Hermon Laboratories since 1995.

Name: Mr. Michael Feldman
Position: technician

Signature:
Date: June 11, 1998

The test measurement data supplied in this test measurement report having been received by me, is hereby duly certified. The following is a statement of my qualifications: I am an engineer, graduated from the University in 1974 with an MScEE degree, have obtained 25 years experience in EMC measurements and have been with Hermon Laboratories since 1991.

Name: Mrs. Eleonora Pitt
Position: Test Engineer

Signature:
Date: June 11, 1998

I hereby certify that this test measurement report was prepared by me and is hereby duly certified. The following is a statement of my qualifications.
I am an engineer, graduated from University in 1971, with an MScEE degree, have obtained 25 years experience in electronic products design and development and have been with Hermon Labs since 1991. Also, I am a Telecommunication Class II engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA.), the certificate no. is E2-03410.

Name: Mrs. Marina Cherniavsky
Position: Certification Engineer

Signature:
Date: June 11, 1998

I hereby certify that this test measurement report was prepared under my direction and that to the best of my knowledge and belief, the facts set in the report and accompanying technical data are true and correct.
The following is a statement of my qualifications.
I have a Ph.D. degree in electronics, have obtained more than 41 years of experience in EMC measurements and electronic product design and have been with Hermon Laboratories since 1986.
Also, I am an EMC engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA). The certificate no. is EMC-000623-NE, Senior Member.

Name: Dr. Edward Usoskin
Position: C.E.O.

Signature:
Date: June 11, 1998

3 Emission Measurements

3.1 Frequency hopping channels separation and hopping frequency usage test according to § 15.247 (a)(1)(ii)

3.1.1 Definition of the test

This test was performed to prove that:
The EUT frequency hopping system uses at least 75 hopping frequencies
The EUT has hopping channel carrier frequencies separation by a minimum of 25 kHz or by the 20 dB bandwidth of the hopping channel.

3.1.2 The test set-up configuration

The EUT RF output was connected to the spectrum analyzer through 30 dB attenuator as shown in Photograph 3.1.
The EUT was connected to the computer and the radio transmission was activated.
All the spectrum analyzer settings are shown in the plots.

3.1.3 Test results

Four Plots 3.1.1 to 3.1.4 (attached to the test report) show 80 channels and the 1 MHz spacings between carriers which are greater than 75 channels, 25 kHz and 20 dB bandwidth spacing required by the standard. The EUT successfully passed this test.

3.2 Occupied bandwidth test according to § 15.247 (a)(1)(ii)

3.2.1 Definition of the test

This test was performed to prove that the maximum 20 dB bandwidth of the hopping channel is less than 1 MHz.

3.2.2 The test set-up configuration

The test setup was the same as in Test 3.1.

3.2.3 Test results

The measurements were performed with 875 kbits per second data rate. The occupied bandwidth measurement was performed for carrier (channel) frequency at low and high edges and at the middle of the 2.4 - 2.4835 GHz frequency. The three Plots 3.2.1 to 3.2.3 (attached to the test report) demonstrate test results of the occupied bandwidth measurements.
The spectrum analyzer settings are shown in plots.

Table 3.2
Occupied bandwidth test results

Carrier Frequency (MHz)	Measured 20 dB BW (MHz)	Limit (MHz)	Result
2401	0.990	1	Pass
2440	0.980	1	Pass
2480	0.960	1	Pass

3.3 Average time of occupancy definition according to § 15.247 (a)(1)(ii)

3.3.1 Definition

This parameter should be checked to prove that the average time of occupancy on any frequency is not greater than 0.4 seconds within any 30 second period.

3.3.2 The test set-up configuration

The test setup was the same like in 3.1 test with additionally connected oscilloscope to the spectrum analyzer video output.

3.3.3 Test results

Average time of occupancy is equal measured repetition rate (RR) multiplied by measured pulse duration (PD) in 30 second period. Plot 3.3.1 shows the time between two pulses (delta t = 150 msec). Thus the repetition rate is: 1 pulse/150 msec.
The Plot 3.3.2 shows the pulse duration which is equal 0.44 msec.
Average time of occupancy is calculated as follows:

$$0.44 \text{ msec} \times (1 \text{ pulse} : 150 \text{ msec}) \times 30\,000 \text{ msec} = 88 \text{ msec} < 400 \text{ msec},$$

as required.

3.4 Maximum peak output power test according to § 15.247 (b)

3.4.1 Definition of the test

This test was performed to demonstrate that the maximum RF peak output power of the transmitter does not exceed one watt (30 dBm) reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

ONLY for point to point!

3.4.2 The test set-up configuration

The test setup was the same as in Test 3.1.

3.4.3 Test results

The three Plots 3.4.1 to 3.4.3 show the maximum RF output power measured at 3 carrier (channel) frequencies (low, middle, high) with the 30 dB external to the spectrum analyzer attenuator, therefore 30 dB should be added to the plotted results. The allowed output power for the maximum 13.5 dBi antenna gain is:

$$30 \text{ dBm} - (13.5 \text{ dBi} - 6 \text{ dBi}):3 = 27.5 \text{ dBm}.$$

The Table 3.4 below gives measured output power in dBm.

Table 3.4
Transmitter output RF power test results

Frequency (MHz)	Measured power (dBm)	Output power (dBm)	Limit dBm	Margin dB	Criteria
2401	-9.6	20.4	27.5	7.1	Pass
2440	-9.2	20.8	27.5	6.7	Pass
2480	-9.8	20.2	27.5	7.3	Pass

3.4.4 Exposure limit according to part 1, §1.1310

Limit for power density for general population/uncontrolled exposure is:

1 mW/cm^2

The power density $P\ (mW/cm^2) = \dfrac{P_T}{4\pi r^2}$

The transmitter output power is 20.8 dBm, antenna gain is 13.5 dBi, thus the maximum output transmitter power P_T equals to 34.3 dBm = 2692 mW.

The allowed distance "r", where RF exposure limits may not be exceeded, is 14.6 cm.
The EUT, FAU-4, is an outdoor mounted unit, therefore the public cannot be exposed to dangerous RF level.

3.5 Out of band antenna conducted emissions test according to §15.247(c)

3.5.1 Definition of the test

This test was performed to prove that the EUT out-of-band emissions in any 100 kHz bandwidth outside 2.4 to 2.4835 GHz are at least 20 dB below maximum power content as measured in any 100 kHz bandwidth within the band that contains the highest level of the desired power.

3.5.2 The test set-up configuration

The test setup was the same as in Test 3.1.

3.5.3 Test results

The test was performed with transmitter operating at 3 carrier (channels) frequencies 2401, 2440 and 2480 MHz. The measurements were performed from 30 MHz to the 10^{th} harmonic. The twelve Plots 3.5.1 to 3.5.12 show that all out-of-band measured signals were more than 20 dBc. The two Plots 3.5.13 and 3.5.14 show in-band signal (2.4 and 2.4835 GHz).

Notes:

On Plot 3.5.2 recorded marker frequency 2.4000 GHz reading is inaccurate (due to large spectrum analyzer span) and corresponds to 2.401 GHz carrier frequency.

On Plot 3.5.6 recorded marker frequency 2.4320 GHz reading is inaccurate (due to large spectrum analyzer span) and corresponds to 2.440 GHz carrier frequency.

On Plot 3.5.10 recorded marker frequency 2.4720 GHz reading is inaccurate (due to large spectrum analyzer span) and corresponds to 2.480 GHz carrier frequency.

3.6 Radiated emissions test according to §§ 15.205, 15.209(a), 15.247(c)

3.6.1 Definition of the test

This test was performed to measure radiated emissions except carriers generated by the transmitter.

3.6.2 The test set-up configuration

The radiated emissions measurements were performed with the Biconilog and Double Ridged Guide antennas, installed on the variable height antenna mast in the anechoic chamber at 1 meter measuring distance, because the signal levels were not detected by the measurement equipment at 3 m specified distance. The results were extrapolated using linear-distance extrapolating factor.

The frequency range from 30 MHz to 10th harmonic was investigated. The EUT was installed on the 0.8 m high wooden table which was on the top of the metal turntable flush mounted with the ground plane. To find the maximum radiation measuring antenna height was changed from 1 to 4 m, the turntable was rotated 360° and the antennas polarization was changed from vertical to horizontal. To improve measurement sensitivity external preamplifiers were used in 6 - 18 GHz range.

3.6.3 Test measurements results

The test was performed with transmitter operating with modulation at 3 carrier (channels) frequencies 2.401, 2.440 and 2.480 GHz with integral antenna (13.5 dBi gain).
The results of measurements are brought in Table 3.6.1 and shown in Plots 3.6.1 to 3.6.4.
Emissions found in 30 - 1000 MHz range were due to the incorporated digital device and are brought in section 3.7 of this test report.

Reference numbers of test equipment used

HL 0025	HL 0041	HL 0275	HL 0465	HL 0522	HL 0547	HL 0593
HL 0594	HL 0604					

Full description is given in Appendix A.

Table 3.6.1
Radiated Emission Measurements Test Results
modulated carrier
with 13.5 dBi gain integral antenna

TEST SPECIFICATION:	FCC part 15 subpart C § 15.209(a)
COMPANY:	InnoWave Wireless Systems Ltd.
EUT:	FAU-4
DATE:	May 11, 1998
Relative Humidity:	57%
Ambient Temperature:	22°C

MEASUREMENTS PERFORMED AT 1 METRES DISTANCE

Freq. GHz	Detector Type	RBW	VBW	Measured Result dB (μV)	Correction Factor dB (1/m)	Amplifier Gain dB	Radiated Emissions dB (μV/m)	Calculated Limit dB (μV/m)	Spec. Margin dB	Pass/ Fail
7.320	Peak	1 MHz	1 MHz	68.4	37.5	35.0	70.9	~~83.5~~ 74	12.6	Pass
7.320	AVRG	1 MHz	10 Hz	43.1	37.5	35.0	45.6	~~63.5~~ 54	17.9	Pass
7.440	Peak	1 MHz	1 MHz	65.3	37.3	35.0	67.8	~~83.5~~ 74	15.7	Pass
7.440	AVRG	1 MHz	10 Hz	43.3	37.3	35.0	45.8	~~63.5~~ 54	17.7	Pass

RESTR. BAND

Notes to Table:

Antenna Type = Double Ridged Guide
Antenna polarization =vertical
Radiated Emission dB(μV/m) = Measured Results dB(μV) + Correction Factor dB(1/m)- Amplifier Gain (During the measurements the received emissions were amplified)
Correction Factor = Antenna Factor + Cable Loss (for Antenna Factor and Cable Loss refer to Appendix B).

Table Abbreviations:

RBW	= Resolution Bandwidth
VBW	= Video Bandwidth
Spec. Margin	= Specification Margins = dB below (negative if above) specification limit.

Test Performed by:
Mrs. Eleonora Pitt, test engineer

Hermon Labs

Customer Representative Person:
Mr. Yuri Kirpichnikov, test engineer

InnoWave Wireless Systems Ltd.

3.7 Unintentional Radiated emissions (class B digital device) test according to §15.109

3.7.1 Definition of the test

This test was performed to measure radiated emissions from the incorporated digital schematic of the EUT and also to verify the EUT full compliance with §15.109.

3.7.2 The test set-up configuration

The radiated emissions measurements of the EUT incorporated digital schematic in the frequency range from 30 MHz to 1 GHz were performed in the anechoic chamber at 3 meters measuring distance. The EUT was placed on the wooden table as shown in Figure 3.7.1 and Photograph 3.7.1.
The Biconilog antenna was used. To find maximum radiation the turntable was rotated 360°, the cables position was varied, the measuring antenna height changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal. The EMI receiver settings were: RBW=120 kHz, quasi-peak detector.

The receiver radiated emissions measurements were performed in the anechoic chamber at 3 meters measuring distance as shown in Photograph 3.7.2 (with Biconilog and Double Ridged antennas). The measurements were performed from 30 MHz to 6.5 GHz.

The results of measurements were recorded into Table 3.7.1 and are shown in Plots 3.7.1 to 3.7.3.

Reference numbers of test equipment used

HL 0041	HL 0275	HL 0465	HL 0521	HL 0593	HL 0594	HL 0604

Full description is given in Appendix A.

Table 3.7.1

Radiated Emission Measurements Test Results
frequency range 30 MHz - 1 GHz

TEST SPECIFICATION:	FCC part 15 subpart B § 15.109
COMPANY:	InnoWave Wireless Systems Ltd.
EUT:	FAU-4
DATE:	May 11, 1998
Relative Humidity:	57%
Ambient Temperature:	22°C

MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

Frequency (MHz)	Ant. Type	Ant. Pol.	Radiated Emissions dB (µV/m)	Spec. Limit dB (µV/m)	Spec. Margin dB	Pass/ Fail
42.400	BL	V	20.22	40.0	19.78	Pass
55.285	BL	V	21.96	40.0	18.04	Pass
59.785	BL	V	21.62	40.0	18.38	Pass
118.782	BL	H	24.72	43.5	18.78	Pass
160.012	BL	H	37.05	43.5	6.45	Pass

Notes to Table Calculations:

Measurements were performed with quasi-peak detector
Resolution bandwidth = 120 kHz
Ant. Type = Antenna Type (BL-biconilog)
Ant. Pol. = Antenna polarization (V-vertical, H-horizontal)
Spec. Margin = Specification Margins = dB below (negative if above) specification limit.

Test Performed by:
Mrs. Eleonora Pitt, test engineer

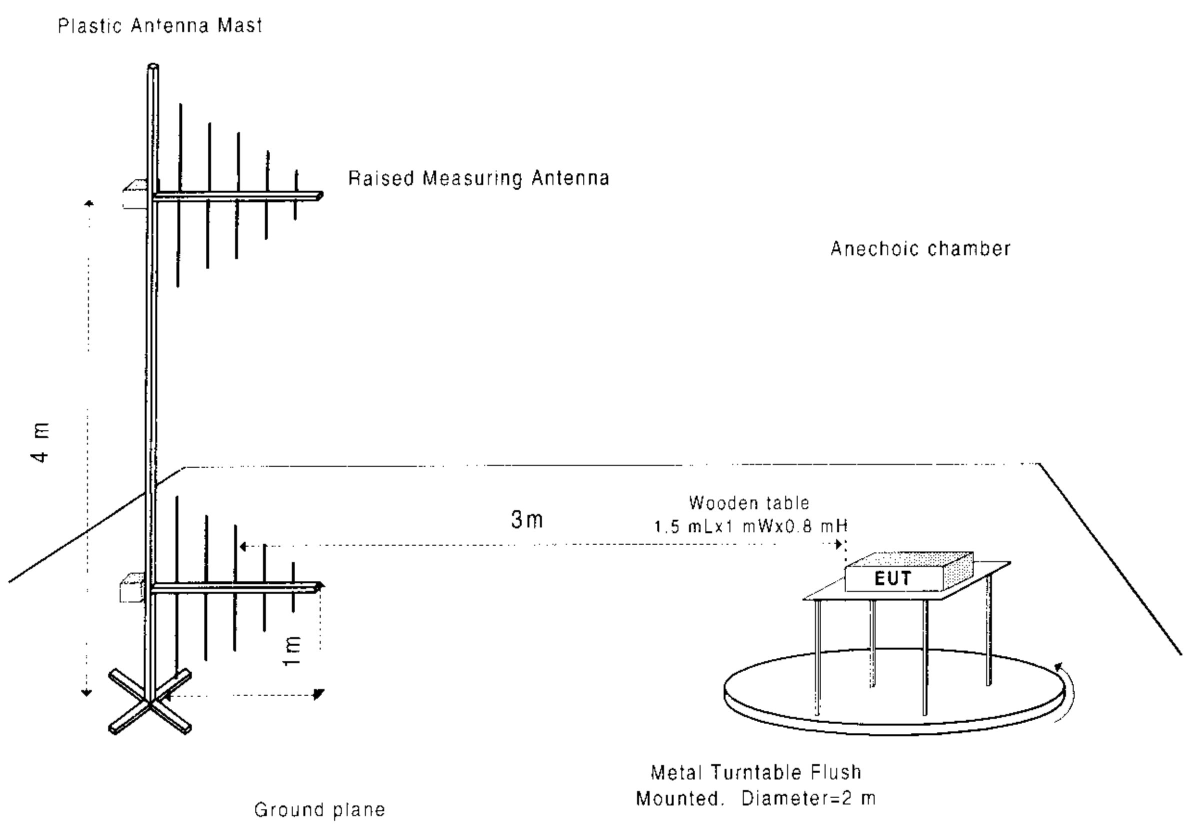
Pitt
Hermon Labs

Customer Representative Person:
Mr. Yuri Kirpichnikov, test engineer

Y. Kirpichnikov
InnoWave Wireless Systems Ltd.

Figure 3.7.1

Radiated Emission Test Setup



3.8 Conducted Emission Measurements according to §15.107, §15.207

3.8.1 Definition of the test

This test was performed to measure conducted emissions.

3.8.2 The test set-up configuration

The test was performed in the shielded room. The EUT was setup as shown in Figure 3.8.1 and Photographs 3.8.1, 3.8.2.

The frequency range from 450 kHz to 30 MHz was investigated.

The measurements were performed on the 120 V AC power lines (both neutral and phase) by means of the LISN, connected to the spectrum analyzer. The unused 50 Ω connector of the LISN was resistively terminated in 50 Ω when not connected to the measuring instrument. The position of the EUT cables was varied to determine maximum emission level. The peak detector (resolution bandwidth = 9 kHz) was used. The test results are shown in Table 3.8.1 and Plots 3.8.1 and 3.8.2.

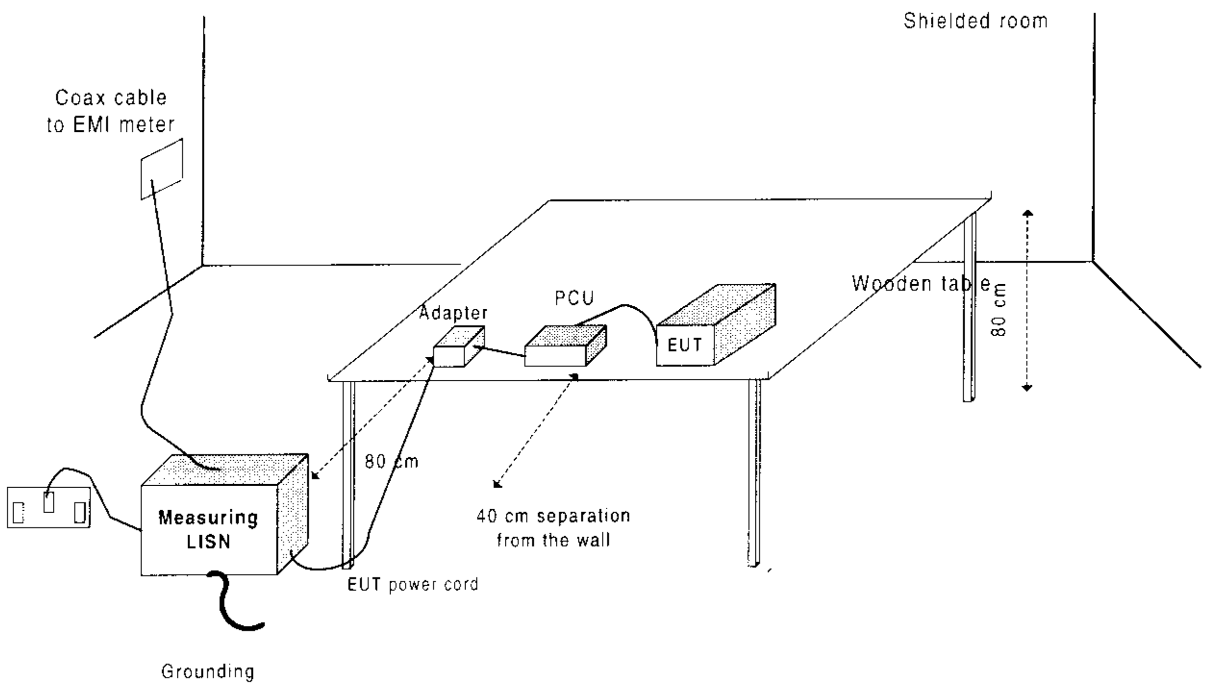
Reference numbers of test equipment used

HL 0026	HL 0163	HL 0185	HL 0447	HL 0672		

Full description is given in Appendix A.

Figure 3.8.1

Conducted Emission Test Setup



4 Summary and Signatures

The EUT was found to be in compliance with the requirements of FCC part 15 subpart C § 15.205, § 15.207, § 15.209 (a), § 15.247 and Subpart B § 15.107, § 15.109.

Test performed by:

Mr. Michael Feldman, technician

Mrs. Eleonora Pitt, test engineer

Approved by:

Dr. Edward Usoskin, C.E.O.

Responsible Person from
InnoWave Tadiran Telecommunications, Wireless Systems Ltd.

Mr. Amnon Beer, engineering manager

APPENDIX A - Test equipment and ancillaries used for tests

HL Serial No.	Serial No.	Description	Manufacturer	Model No.	Due Calibr.
0025	5837	Spectrum Analyzer, 10 kHz-23 GHz	Anritsu	MS-710A	10/98
0026	3460	Spectrum Analyzer, 100 Hz-2.2 GHz	Anritsu	MS 2601A	8/99
0041	2811	Double Ridged Guide Antenna, 1 - 18 GHz	Electro-Metrics	RGA 50/60	8/98
0056	2627	Attenuator, 50 Ohm, 2 W, 0 -18 GHz, 30 dB	Hewlett Packard	8492A	4/99
0163	1314	LISN, 9kHz-100MHz	Electro-Metrics	ANS-25/2	11/98
0185	1765	Graphics Plotter	Hewlett Packard	7475A	NA
0275	0275	Wooden Table, 1.5 x 1.0 x 0.8	Hermon Labs	NA	NA
0447	447	LISN, 16/2, 300 V RMS	Hermon Labs	NA	2/99
0465	0465	Anechoic Chamber 9 mL x 6.5 mW x 5.5 mH	Hermon Labs	NA	10/99
0483	1325	Oscilloscope Digitizing, 100 MHz	Hewlett Packard	54501A	3/99
0521	3617A 00319	Analyzer, Spectrum with RF filter section - HP EMI Receiver 9 kHz - 8 GHz	Hewlett Packard	HP 8546A	7/98
0522	4300	Amplifier, 2-8 GHz LNA	MITEQ	AFDY020180 -85-WP	12/98
0523	0523	Amplifier, 6-18 GHz LNA	MITEQ	AMT12407M	12/98
0547	400	Amplifier, GaAs FET, RF-6-18 GHz, W30 dB, 12 V/1.2 A, N.F4.5 dB	Avantek	AMT-12407	12/98
0593	593	Antenna Mast, 1-4/1-6 m Pneumatic	Hermon Laboratories	HL AM-F1	4/99
0594	594	Turn Table for Anechoic Chamber	Hermon Laboratories	HL TT-EDC1	11/98
0604	1011	Antenna Log-Periodic/T Bow-Tie 26-2000 MHz	Emco	3141 BICONILOG ANTENNA	7/98
0672	672	Shielded room 4.6 mL x 4.2 mW x 2.4mH	Hermon Labs	NA	10/99

APPENDIX B-Test Equipment Correction Factors

Correction Factor
Line Impedance Stabilization Network
Electro-Metrics, Model ANS-25/2

Frequency, kHz	Correction Factor
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

This correction factor (in dB) is to be added to the meter readings of the interference analyzer or spectrum analyzer in dB(μV).

Antenna Factor
Double Ridged Guide Antenna
Electro-Metrics, Model RGA-50/60
Ser.No.2811

Frequency, MHz	Antenna Factor, dB(1/m)
1000	24.3
1500	25.4
2000	28.4
2500	29.2
3000	30.5
3500	31.6
4000	33.7
4500	32.2
5000	34.5
5500	34.5
6000	34.6
6500	35.3
7000	35.5
7500	35.9
8000	36.6
8500	37.3
9000	37.7
9500	37.7
10,000	38.2
10,500	38.5
11,000	39.0
11,500	40.1
12,000	40.2
12,500	39.3
13,000	39.9
13,500	40.6
14,000	41.1
14,500	40.5
15,000	39.9
15,500	37.8
16,000	39.1
16,500	41.1
17,000	41.7
17,500	45.1
18,000	44.3

Antenna factor dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/meter).

Antenna Factor
Biconilog Antenna EMCO Model 3141
Ser.No.1011

Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8
28	7.8
30	7.8
40	7.2
60	7.1
70	8.5
80	9.4
90	9.8
100	9.7
110	9.3
120	8.8
130	8.7
140	9.2
150	9.8
160	10.2
170	10.4
180	10.4
190	10.3
200	10.6
220	11.6
240	12.4
260	12.8
280	13.7
300	14.7
320	15.2
340	15.4
360	16.1
380	16.4
400	16.6
420	16.7
440	17.0
460	17.7
480	18.1
500	18.5
520	19.1
540	19.5
560	19.8
580	20.6
600	21.3
620	21.5
640	21.2
660	21.4
680	21.9
700	22.2
720	22.2
740	22.1
760	22.3
780	22.6
800	22.7
820	22.9

Antenna Factor
Biconilog Antenna EMCO Model 3141
Ser.No.1011

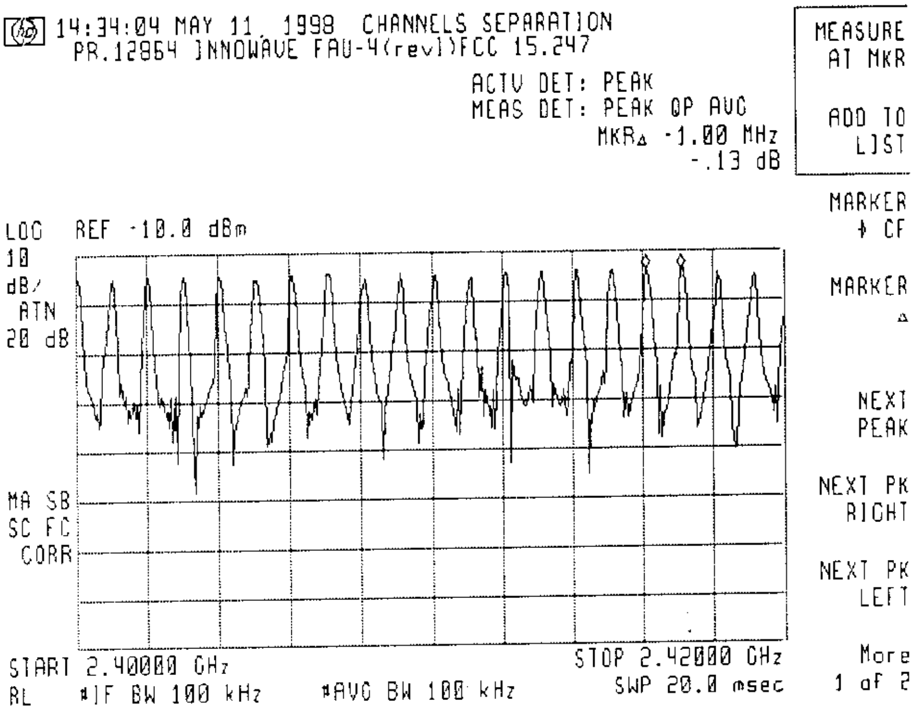
Frequency, MHz	Antenna Factor, dB(1/m)
840	23.1
860	23.4
880	23.8
900	24.1
920	24.1
940	24.0
960	24.1
980	24.5
1000	24.9
1040	25.2
1060	25.4
1080	25.6
1100	25.7
1120	26.0
1160	27.0
1180	27.0
1200	26.7
1220	26.5
1240	26.5
1260	26.5
1300	27.0
1340	28.3
1360	28.2
1380	27.9
1400	27.9
1420	27.9
1440	27.8
1460	27.8
1480	28.0
1500	28.5
1520	28.9
1560	29.8
1580	29.6
1600	29.5
1640	29.2
1660	29.4
1680	29.6
1700	29.8
1720	30.3
1760	31.1
1800	30.9
1820	30.7
1860	30.6
1900	30.6
1960	31.2
1980	31.6
2000	32.0

Antenna factor is to be added to receiver meter reading in dB(μV) to convert to field intensity in dB(μV/meter).

Attachment 1

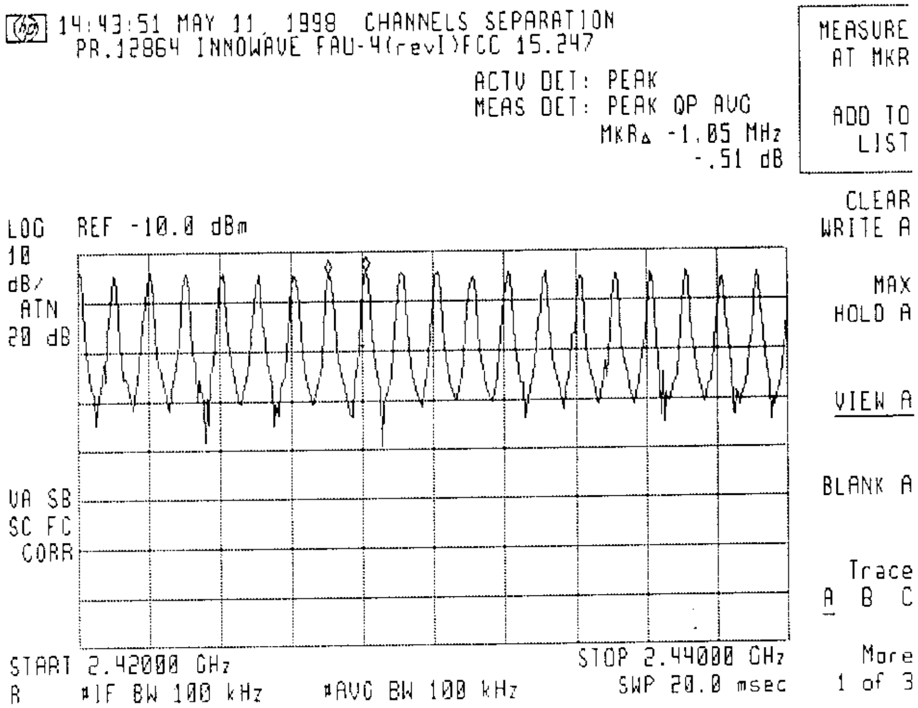
Plots of test results – 35 pages

Screen Capture - captured on 5/11/98 2:34:04 PM



Plot 3.1.1

Screen Capture - captured on 5/11/98 2:43:50 PM



Plot 3.1.2

Table 3.8.1 Conducted emission measurements on EUT power lines

Frequency range : 450 kHz - 30 MHz
Detector : quasi peak

TEST SPECIFICATION:	FCC part 15 subpart B Class B
COMPANY:	InnoWave Wireless Systems Ltd.
EUT:	FAU-4
DATE:	May 18, 1998
RELATIVE HUMIDITY:	60%
AMBIENT TEMPERATURE:	22°C

Frequency MHz	Line ID	Measured Conducted Emissions dB (μV)	Spec. Limit dB (μV)	Spec. Limit Margins dB	Pass / Fail
5.026	N	35.63	48	12.37	Pass
4.945	N	35.16	48	12.84	Pass
12.905	Ph	32.40	48	15.60	Pass
14.260	Ph	31.97	48	16.03	Pass
14.501	Ph	31.88	48	16.12	Pass
15.059	Ph	31.41	48	16.59	Pass
12.588	Ph	31.40	48	16.60	Pass

Test parameters:
Detector type = QP (quasi peak).
Resolution bandwidth = 9 kHz.

Table calculations and abbreviations:
Conducted emission = EMI meter reading (dBμV) + Cable Loss (dB) + LISN correction factor (dB). (For LISN correction factor refer to Appendix B).
Spec. limit = specification limit.
Spec. margin = dB below (negative if above) specification limit.
Line ID = Line Identification (Ph - phase, N - neutral).

Test performed by:
Mr. Michael Feldman, test technician

Hermon Labs

Customer representative person:
Mr. Yuri Kirpichnikov, test engineer

Innowave Wireless Systems

18.05.98
Pr.12864

TADIRAN

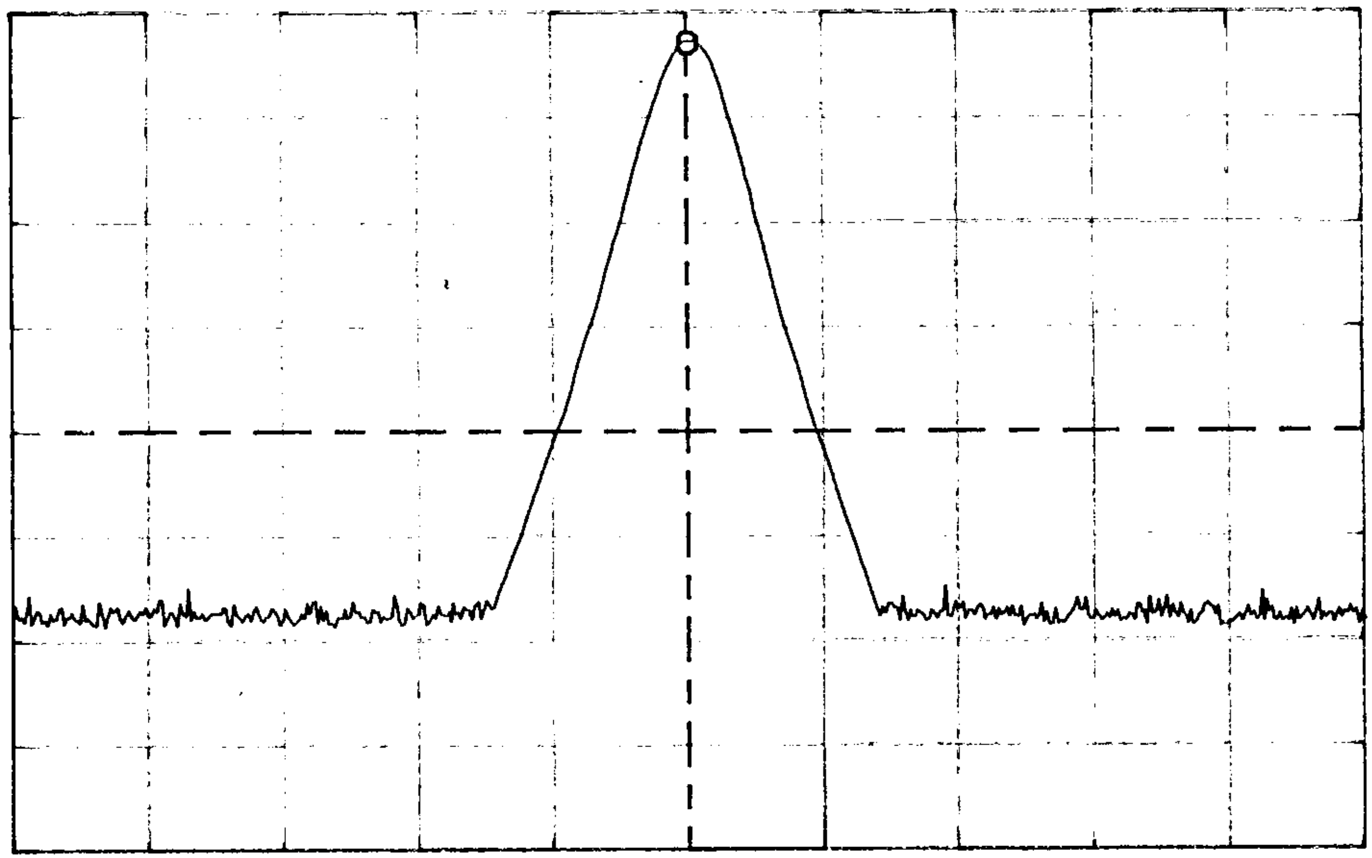
Peak Output power test

with att-
Output power

№ 12864

MK: 2.480000GHz - 9.8dBm

F: 2.48000GHz SP: 2.00MHz/ RL: - 7 dBm 10dB/ 1-

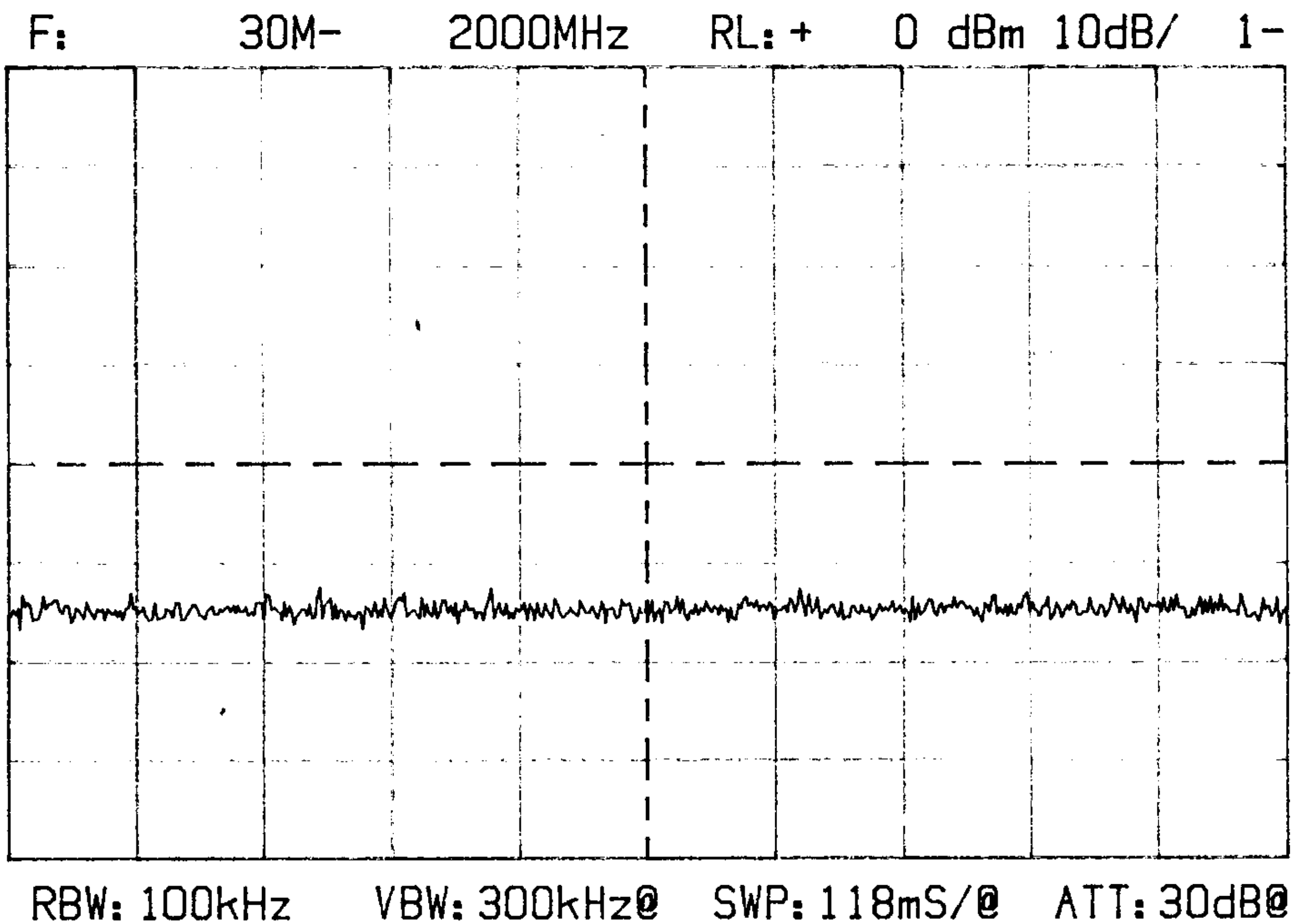


RBW: 1MHz VBW: 1MHz SWP: 10mS/@ ATT: 10dB@

plot 3.4.3

18.05.98 TADIRAN Out of band test
Pr. 12864
f - 2.401 GHz

№ 12864



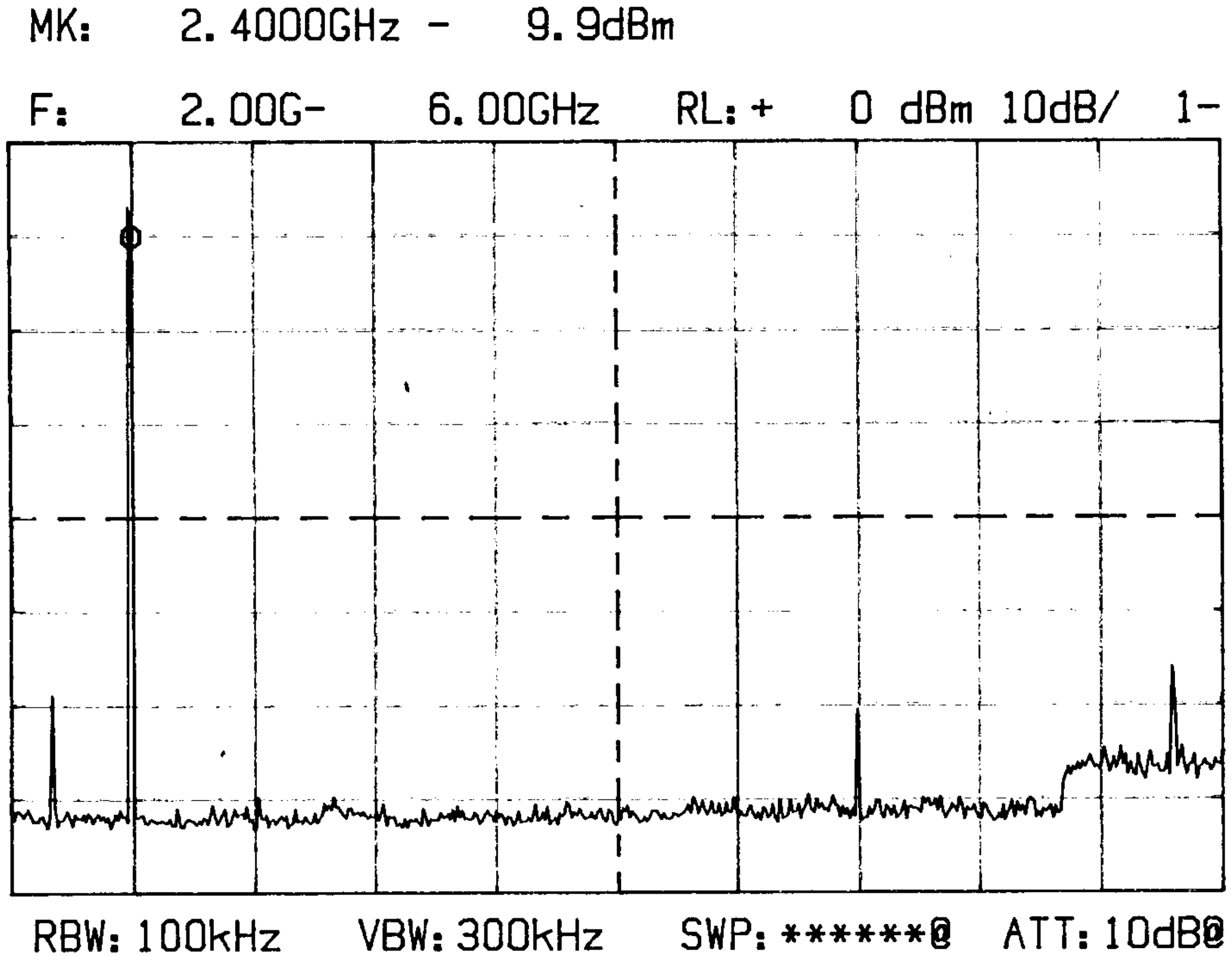
Plot 3.5.1

TADIRAN Out of band test

Pr. 12864

f - 2401.6 Hz

№ 12864

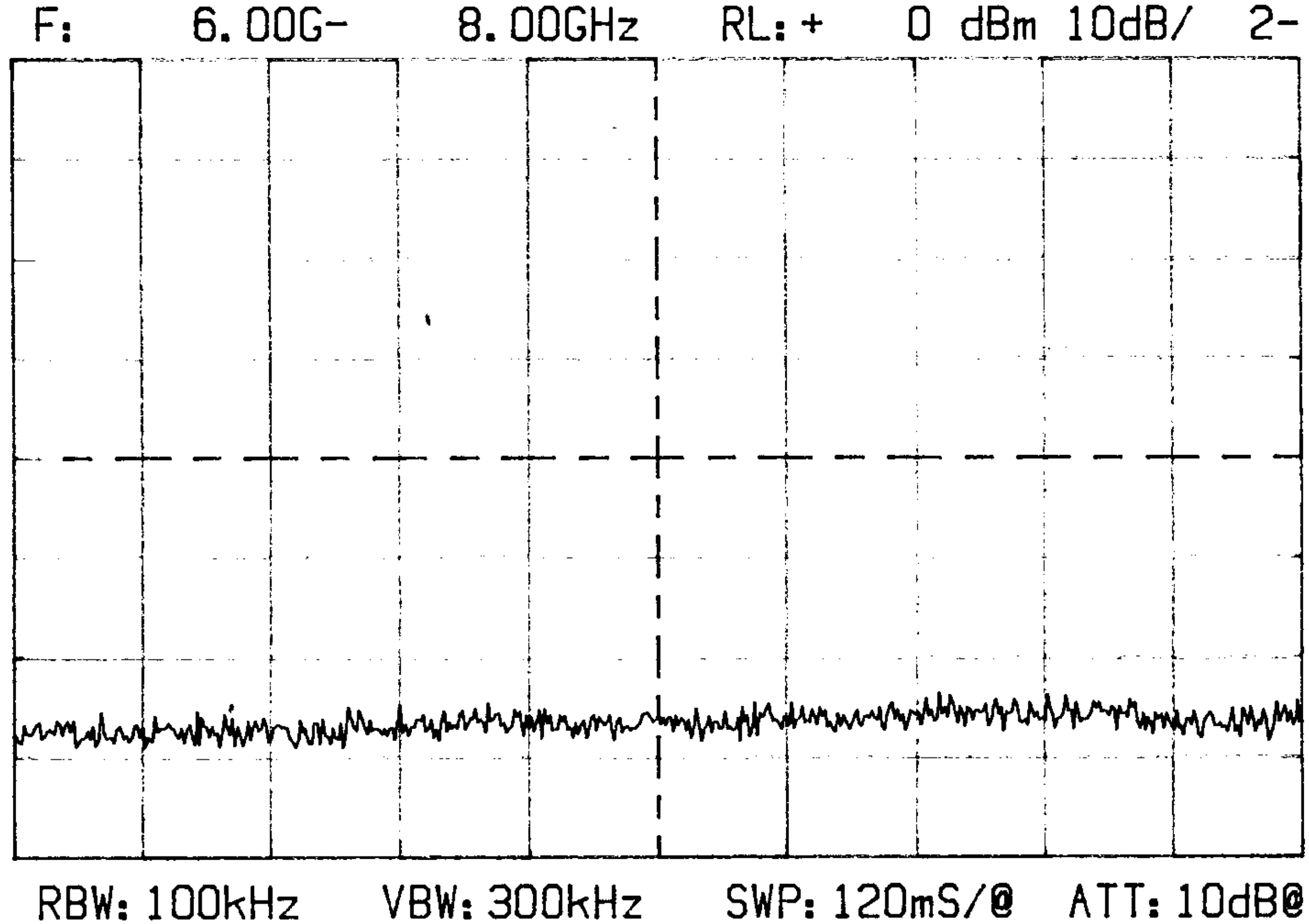


Plot 3.5.2

Pr. 12864 TADIRAN Out of band test

f - 2.401 GHz

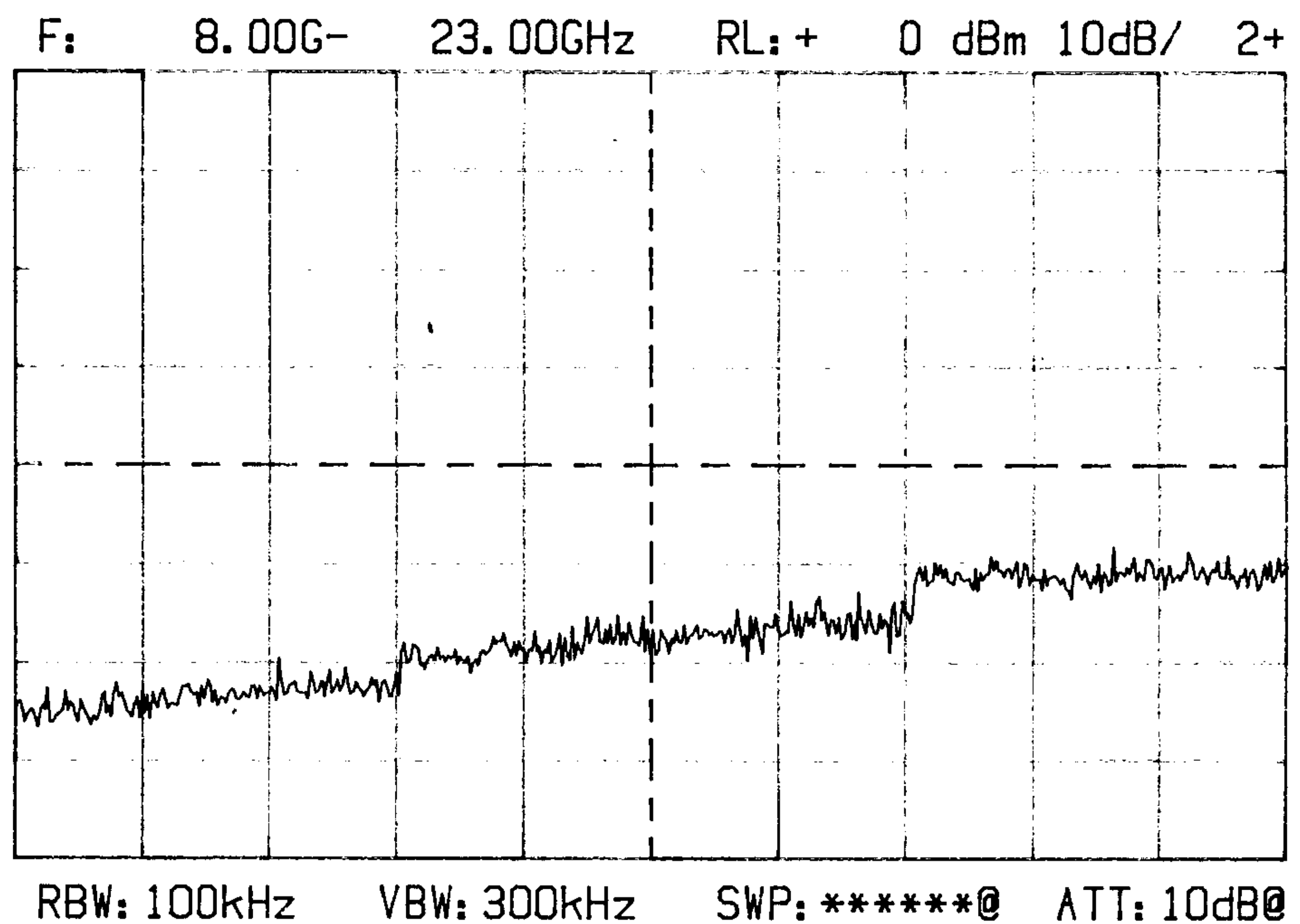
№ 12864



Plot 3.5.3

Pr. 12864 TADIRAN Out of band test
f-2,401 GHz

№ 12864

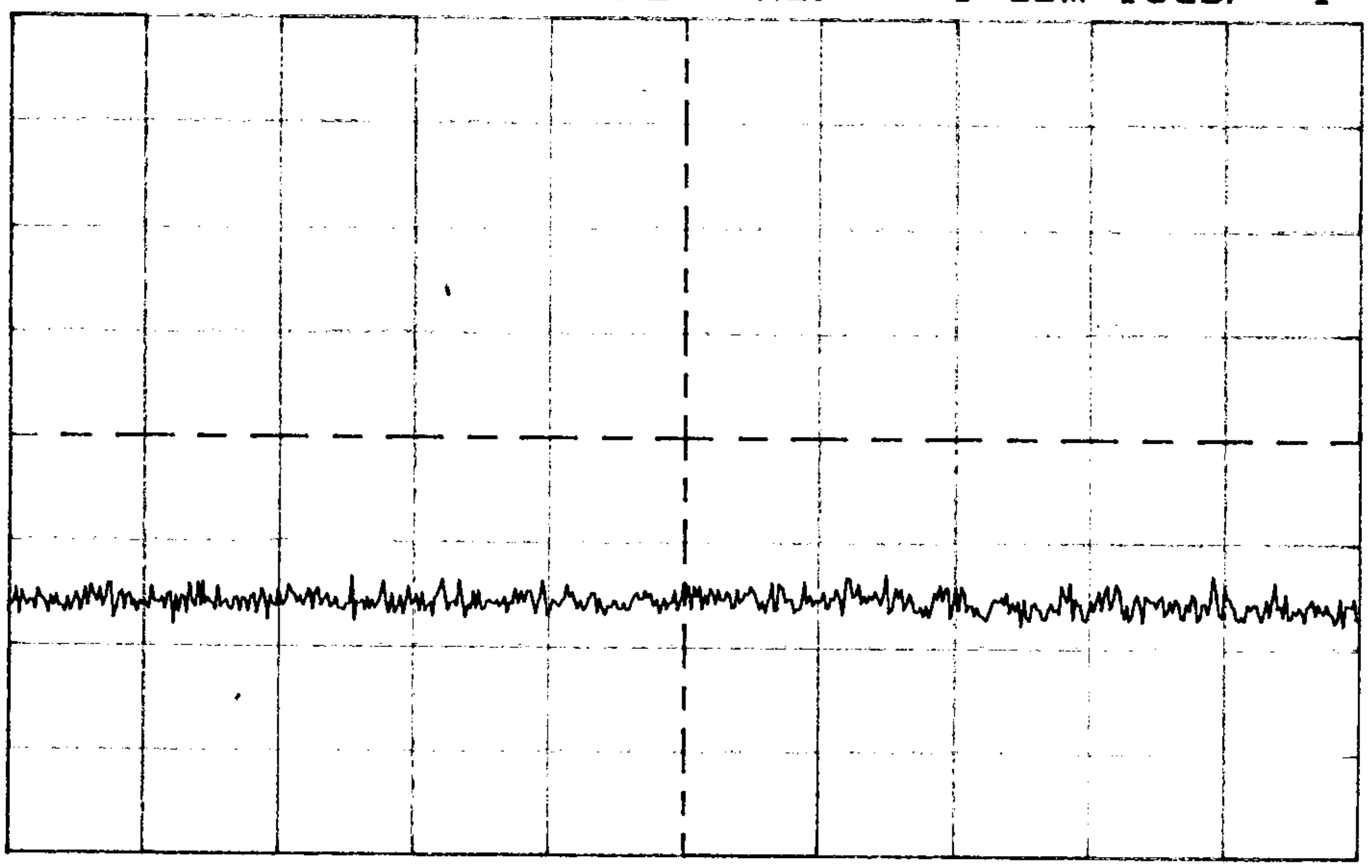


Plot 3.5.4

Pr. 12864 TADIRAN Out of band test

18.05.98 f - 2.440GHz

№ 12864



Plot 3.5.5

Pr. 12864
f-2.440GHz

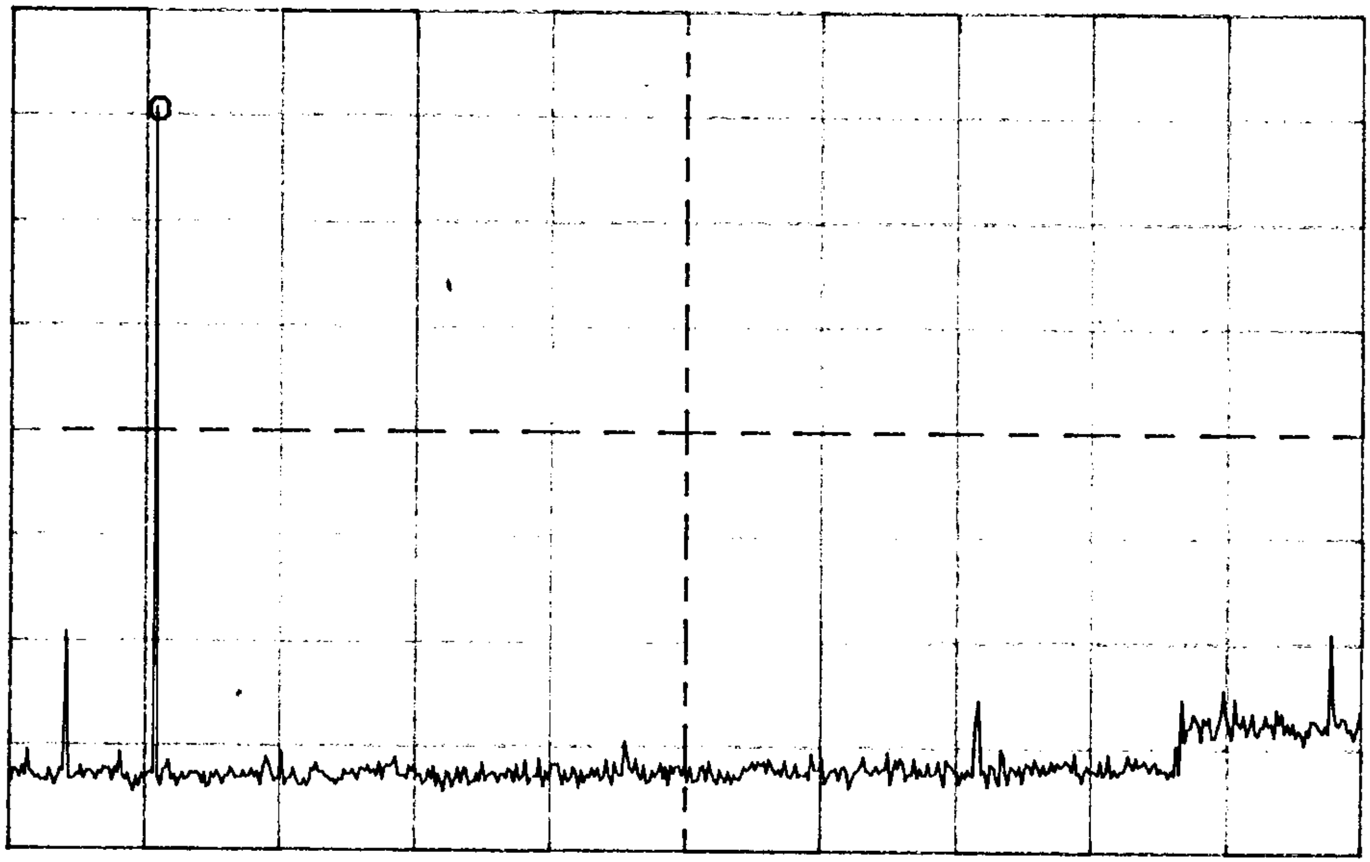
TADIRAN

Out of band test

№ 12864

MK: 2.4320GHz - 9.3dBm

F: 2.00G- 6.00GHz RL: + 0 dBm 10dB/ 1-



RBW: 100kHz VBW: 300kHz SWP: ******@ ATT: 10dB@

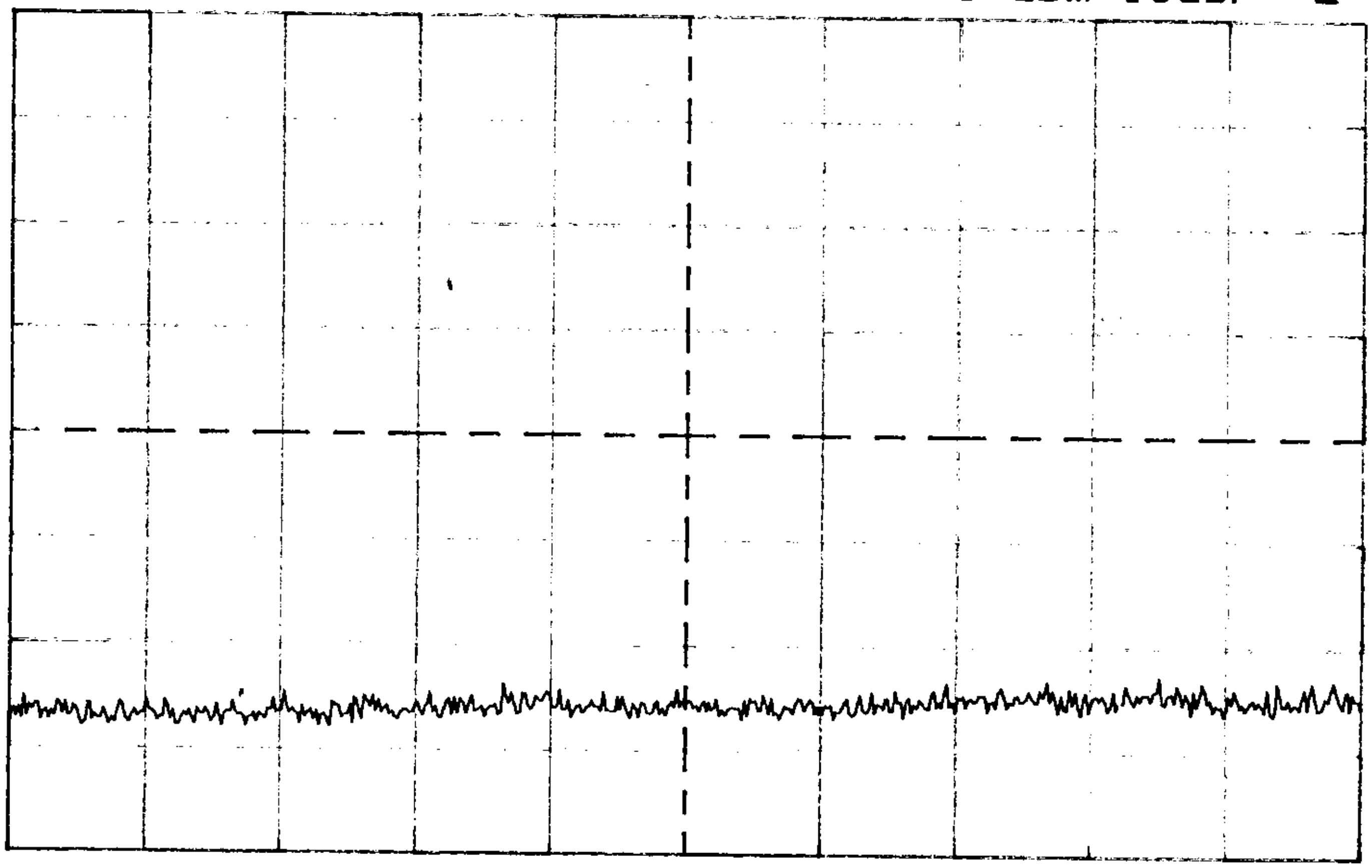
Plot 3.5.6

Pr. 12864
f - 2.44 GHz

TADIRAN Out of band test

№ 12864

F: 6.00G- 8.00GHz RL: + 0 dBm 10dB/ 2-



RBW: 100kHz VBW: 300kHz SWP: 120mS/@ ATT: 10dB@

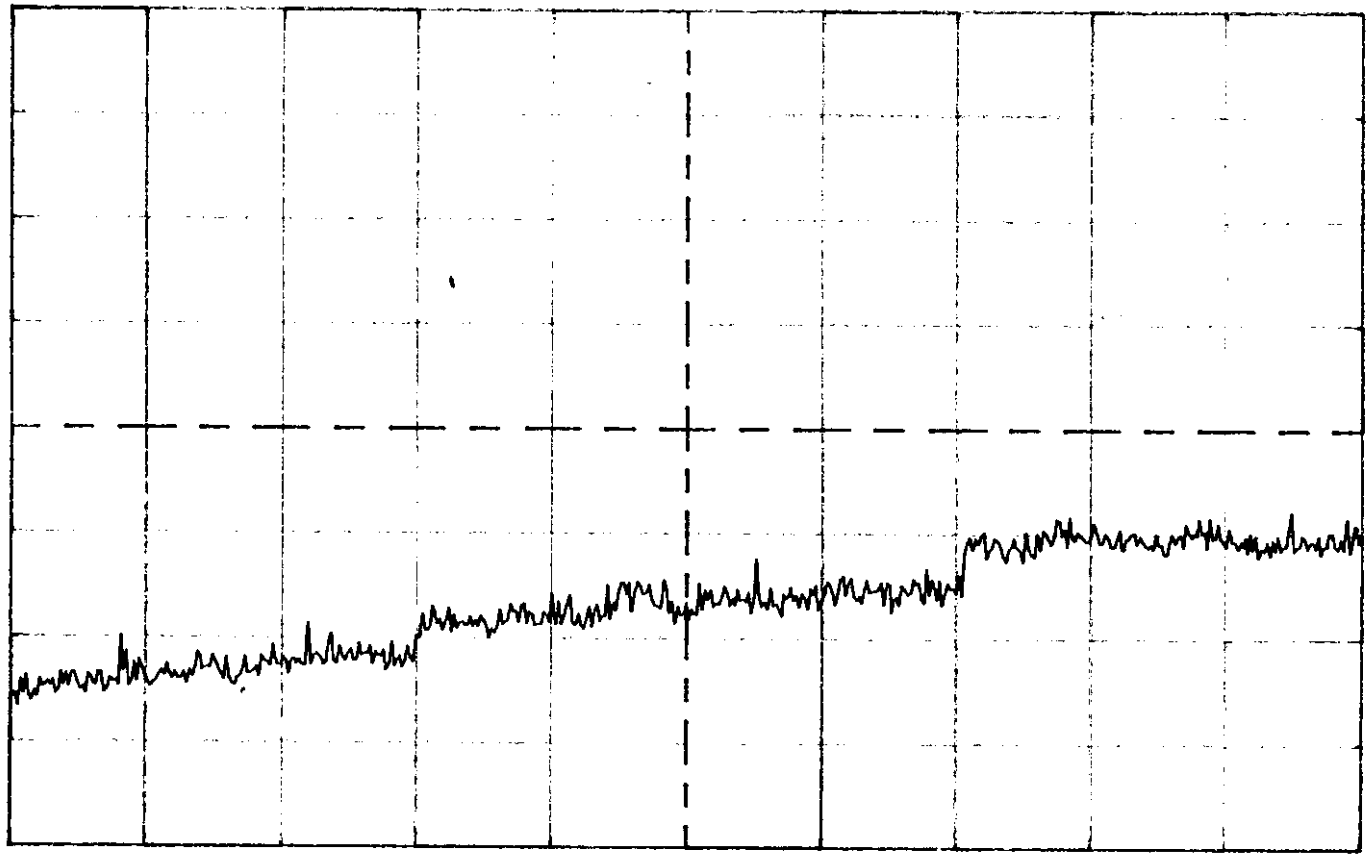
Plot 3.5.7

Pr. 12864 TADIRAN Out of band test

f - 2,440 GHz

№ 12864

F: 8.00G- 23.00GHz RL: + 0 dBm 10dB/ 2+



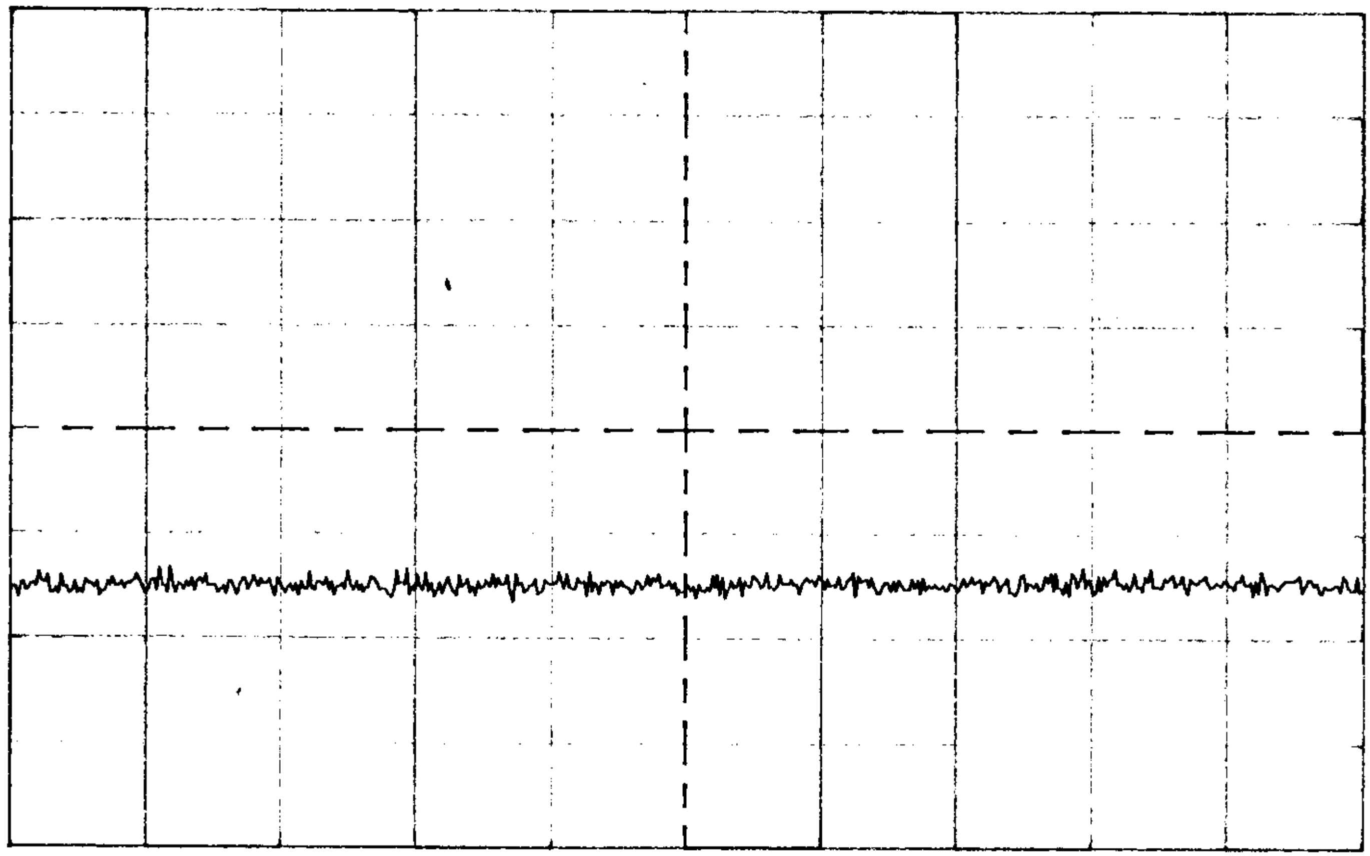
RBW: 100kHz VBW: 300kHz SWP: ******@ ATT: 10dB@

Plot 3.5.8

18.05.98
fr. 2.480GHz TADIRAN Out of band test
Pr. 12864

№ 12864

F: 30M- 2000MHz RL: + 0 dBm 10dB/ 1-



RBW: 100kHz VBW: 100kHz SWP: 118mS/@ ATT: 30dB@

Plot 3.5.9

Pr. 12864

f - 2.480GHz

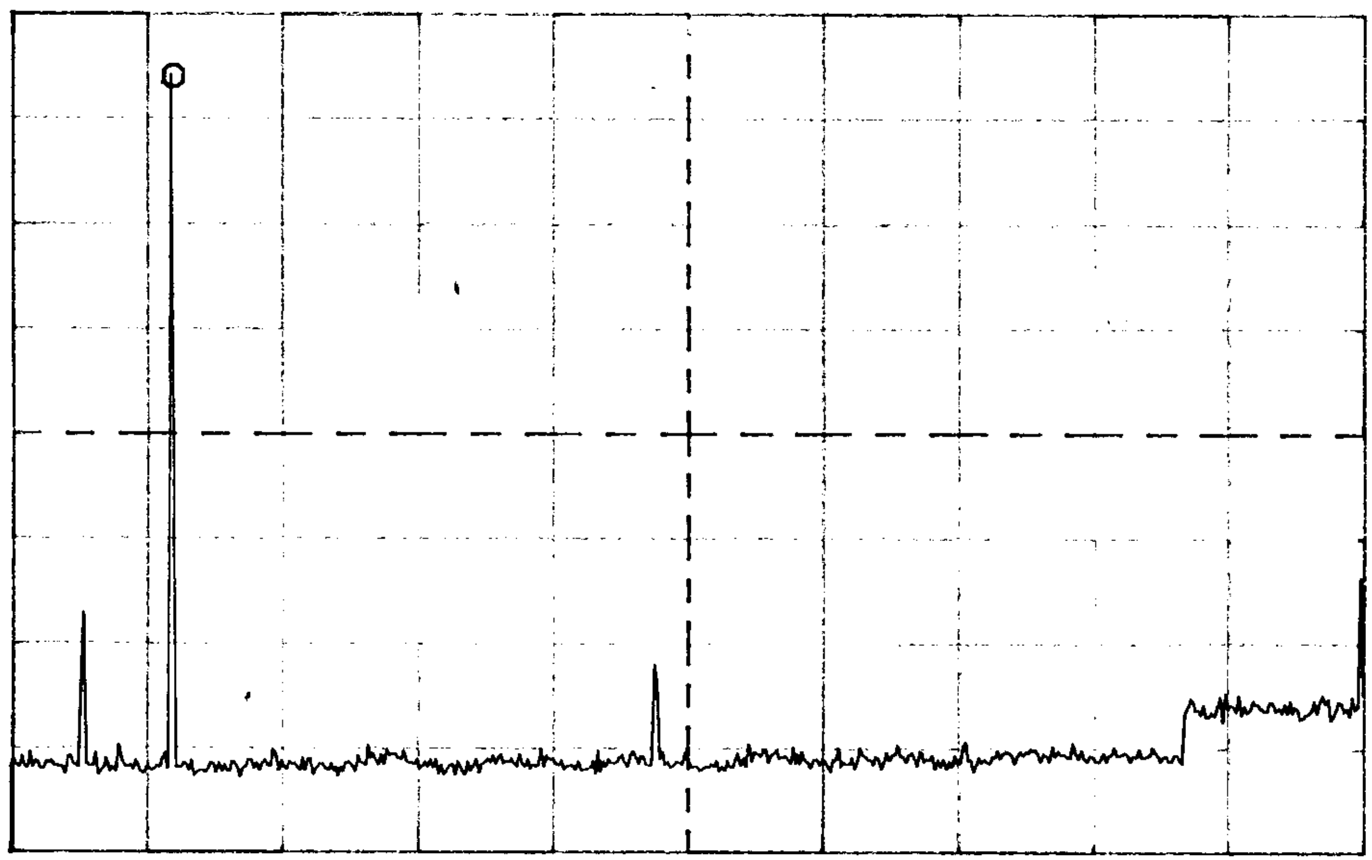
TADIRAN

Out of band test

№ 12864

MK: 2.4720GHz - 5.8dBm

F: 2.00G- 6.00GHz RL: + 0 dBm 10dB/ 1-



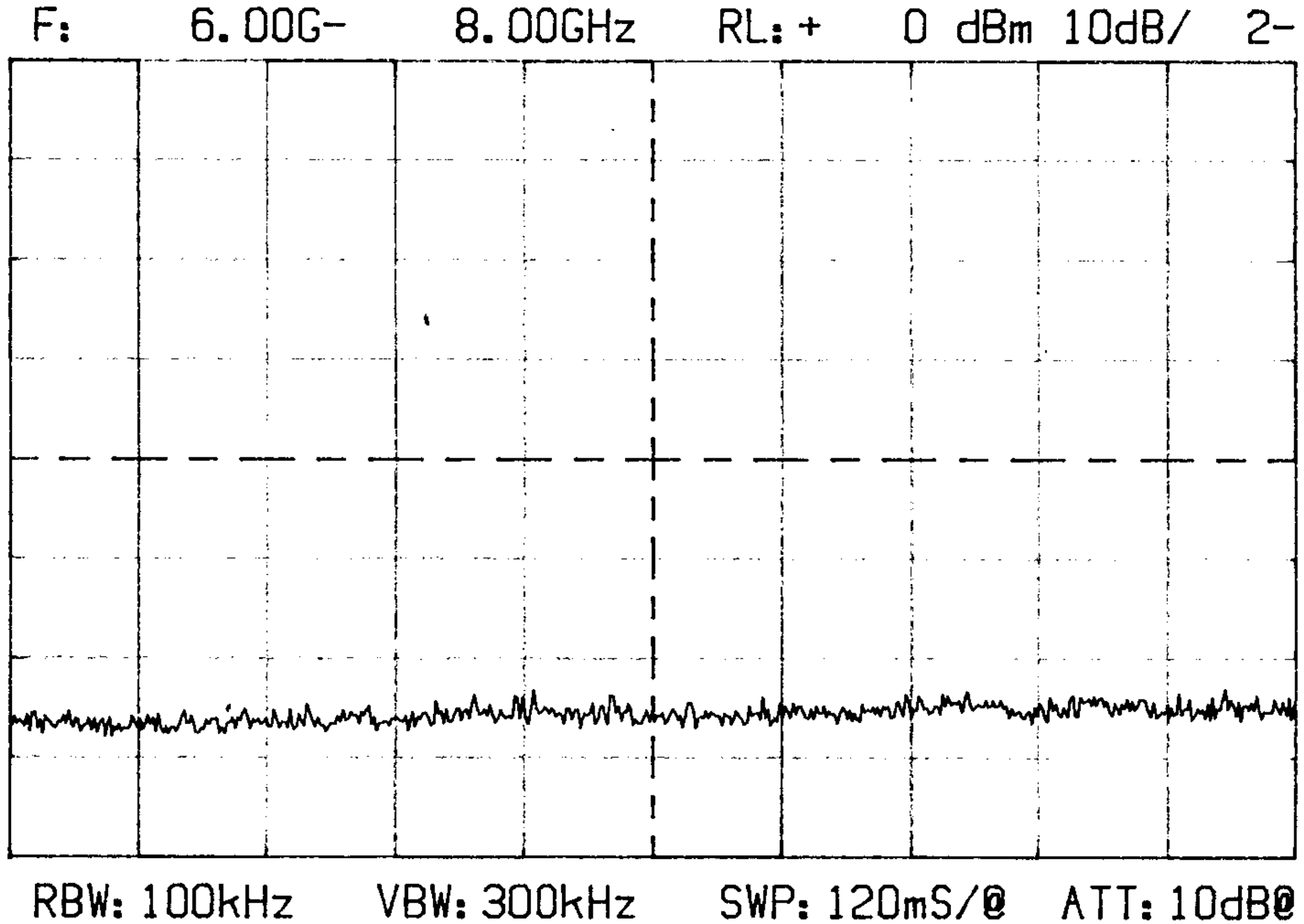
RBW: 100kHz VBW: 300kHz SWP: ******@ ATT: 10dB@

Plot 3.5.10

Pr. 12864 TADIRAN
f. 2,480GHz

Out of band

№ 12864

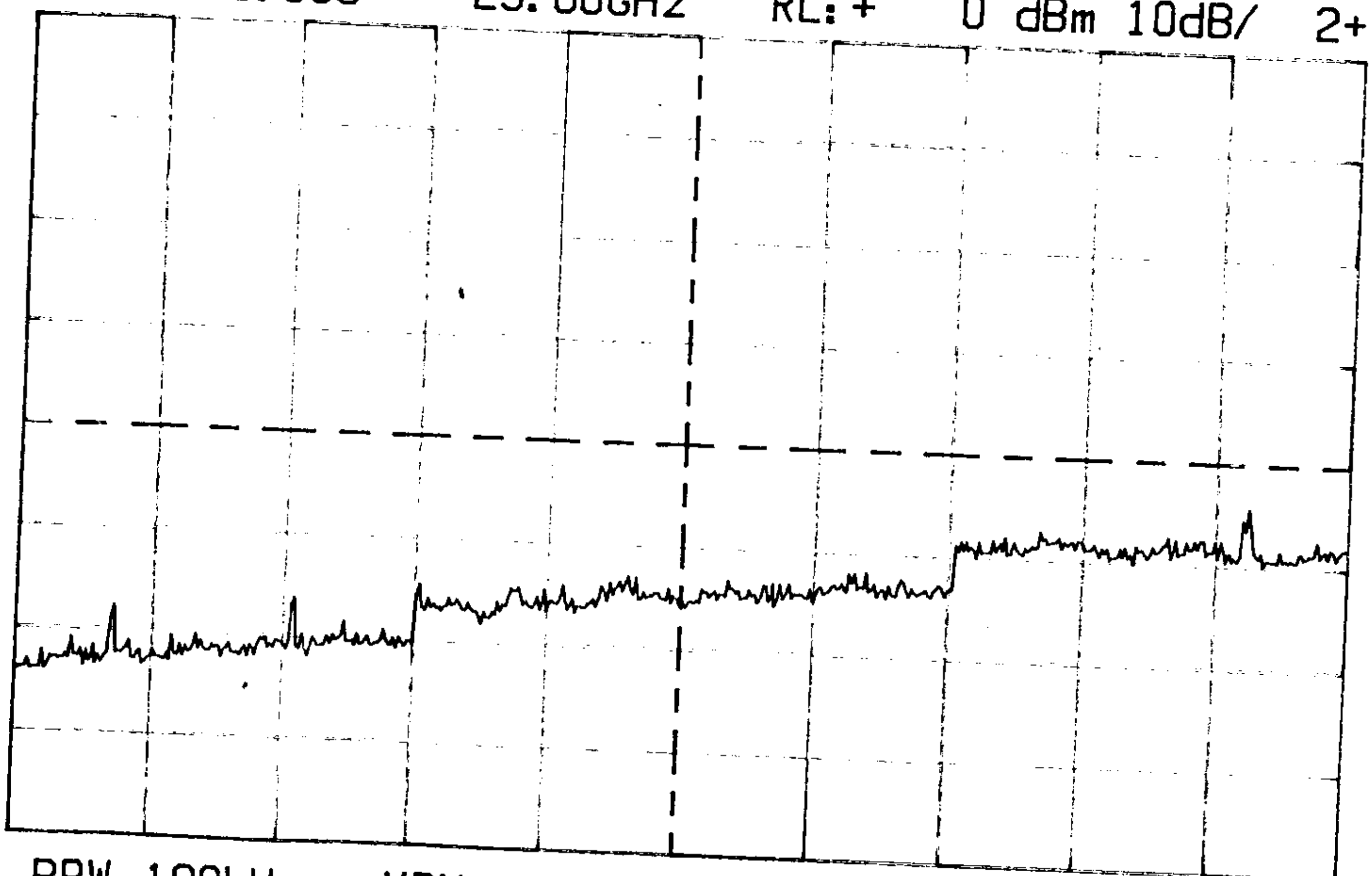


Plot 3.5.11

...3.98
12 864
-2.480 GHz

TADIRAN Out of band test

F: 8.00G- 23.00GHz RL: + 0 dBm 10dB/ 2+



RBW: 100kHz VBW: 300kHz SWP: ******@ ATT: 10dB@

Plot 3.5.12

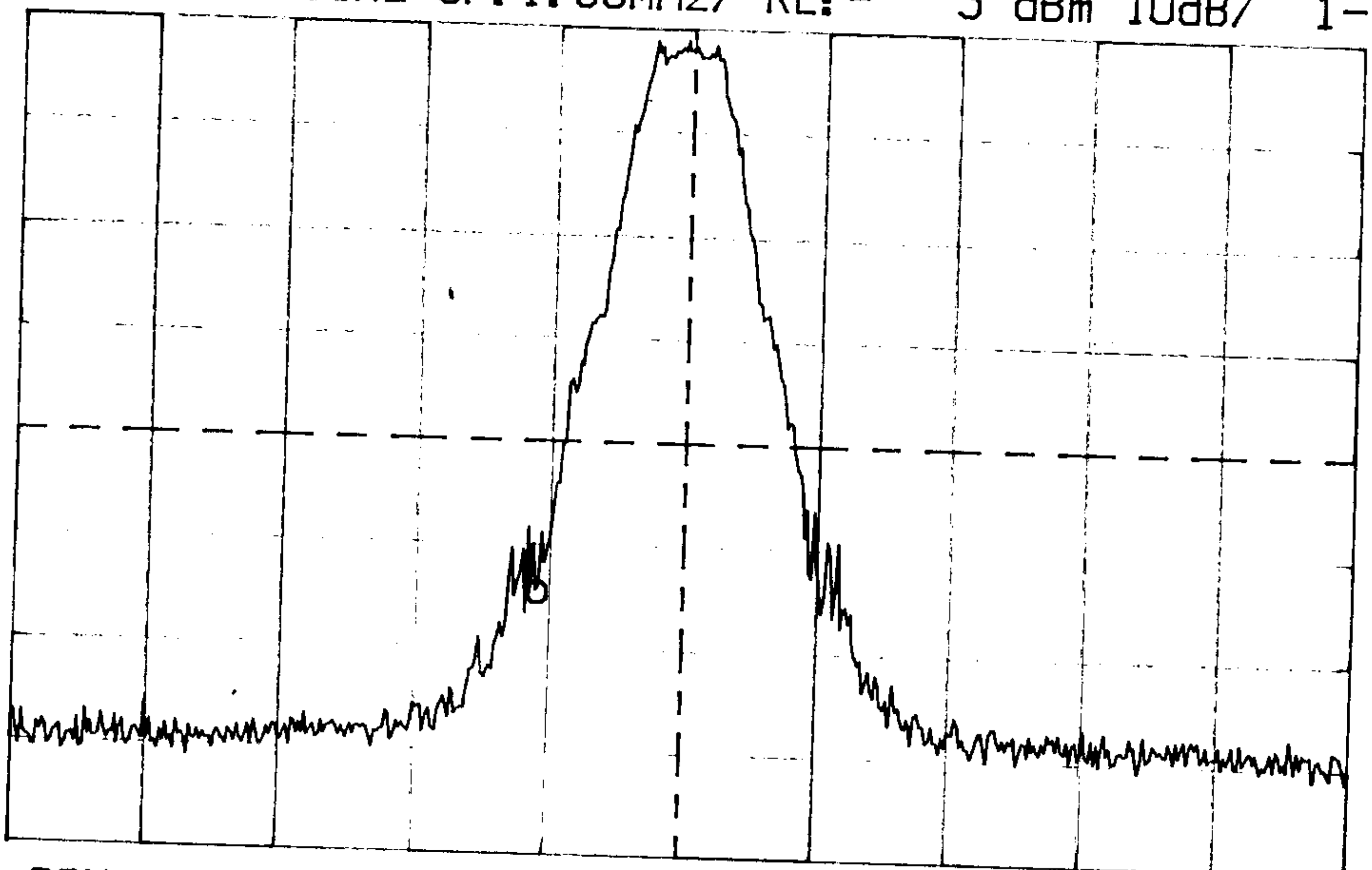
18.05.98
Pr. 12864

TADIRAN
Out of band test

№ 12864

MK: 2.399900GHz - 59.4dBm

F: 2.40100GHz SP: 1.00MHz/ RL: - 5 dBm 10dB/ 1-



RBW: 100kHz VBW: 300kHz@ SWP: 10mS/@ ATT: 10dB@

Plot 3.5.13

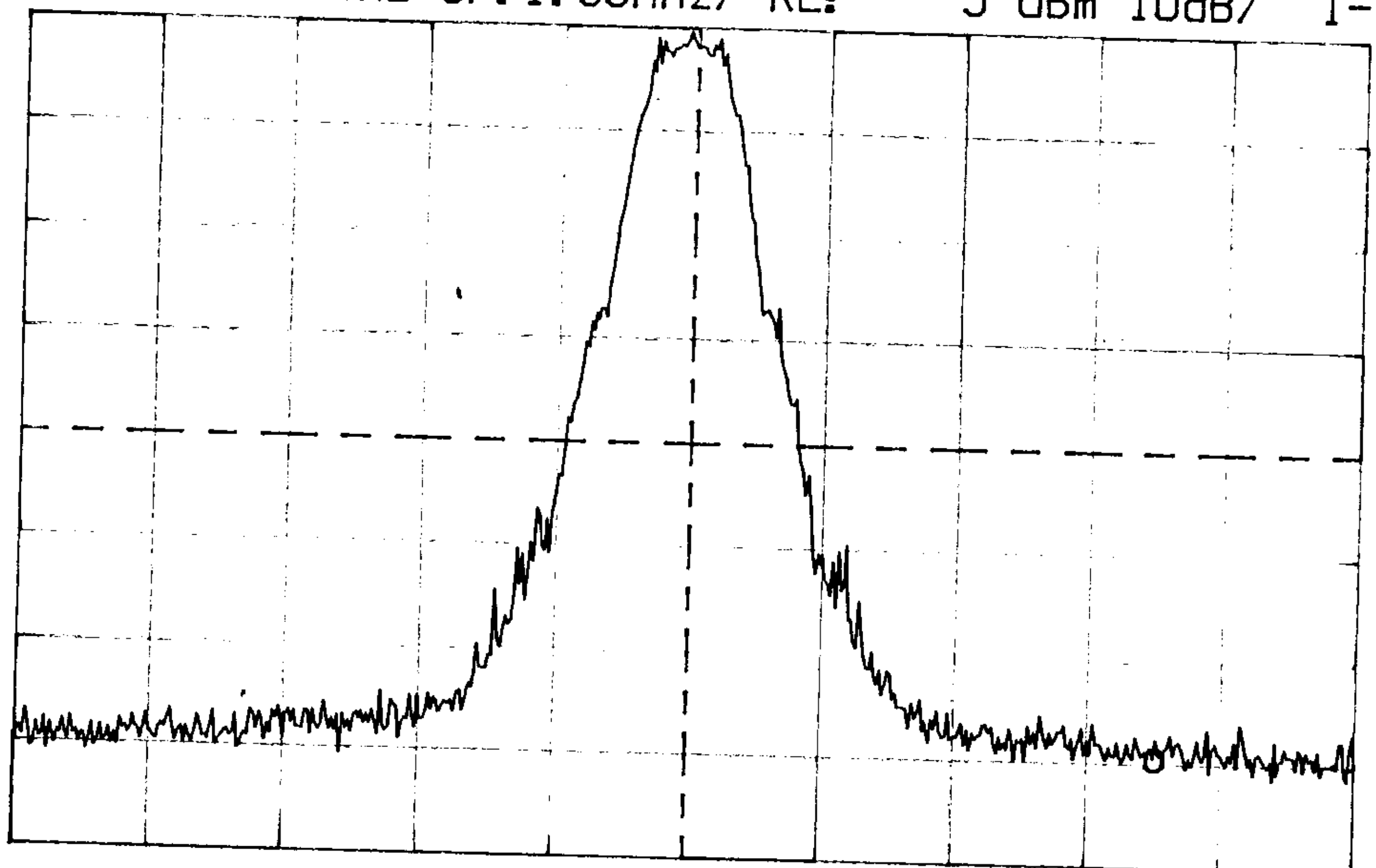
18.05.98
Pr. 12864

TADIRAN
Out of band test

№ 12864

MK: 2.483500GHz - 74.3dBm

F: 2.48000GHz SP: 1.00MHz/ RL: - 5 dBm 10dB/ 1-



RBW: 100kHz VBW: 300kHz@ SWP: 10mS/@ ATT: 10dB@

Plot 3.5.14

11.05.98. A. 12864 TADIRAN FAU-Y FCC p. 15.247.

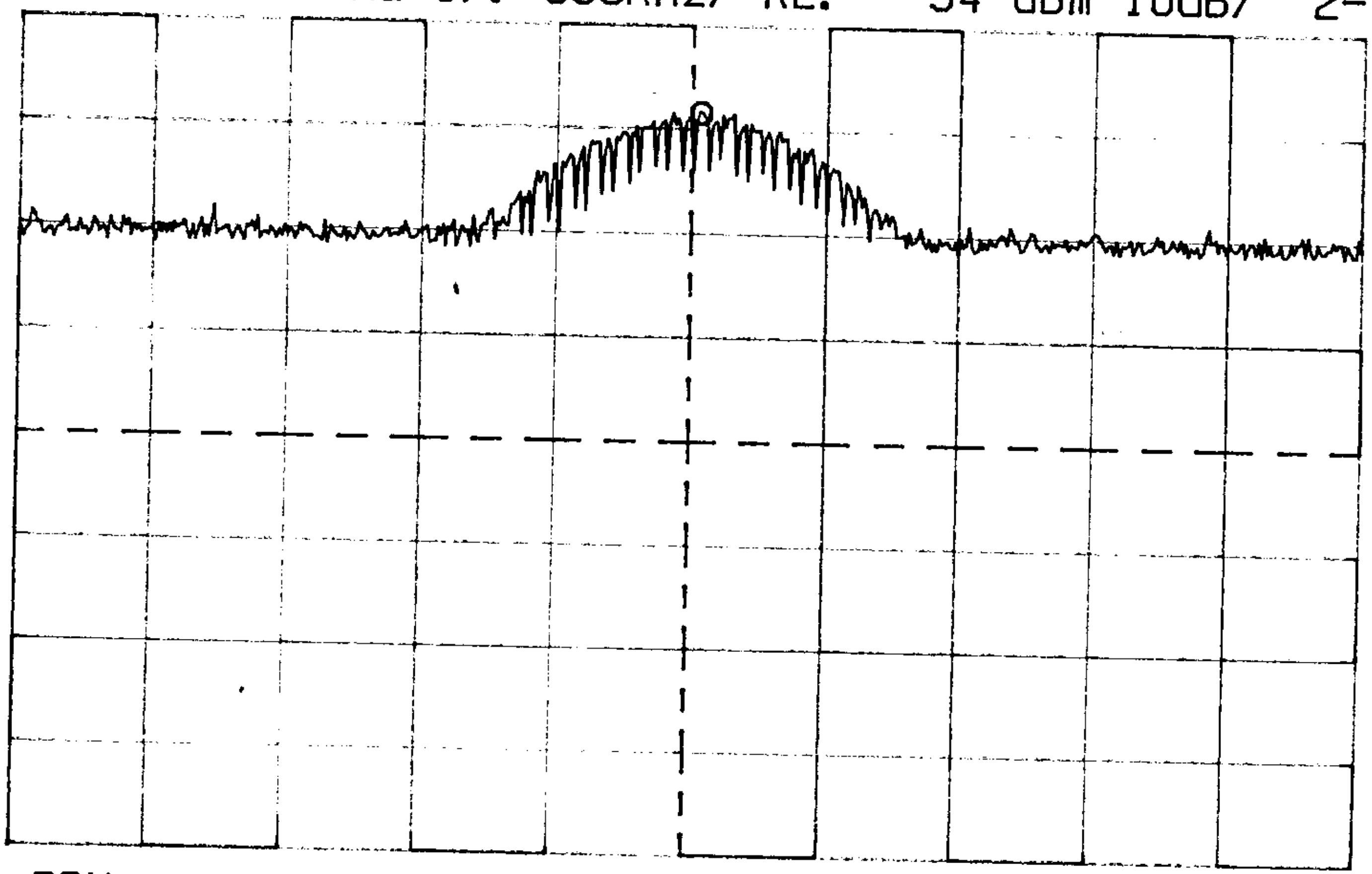
Spurious emission

D = 1m

Ampl. gain = 35 dB

MK: 7.320030GHz - 42.2dBm

F: 7.32000GHz SP: 500kHz/ RL: - 34 dBm 10dB/ 2-



RBW: 1MHz VBW: 1MHz SWP: 10mS/@ ATT: 0dB

Plot 3.6.1

№ 12864

11.05.98 Pr. 12864 TADIRAN FAU-Y FCC p.15.247

Spurious emission

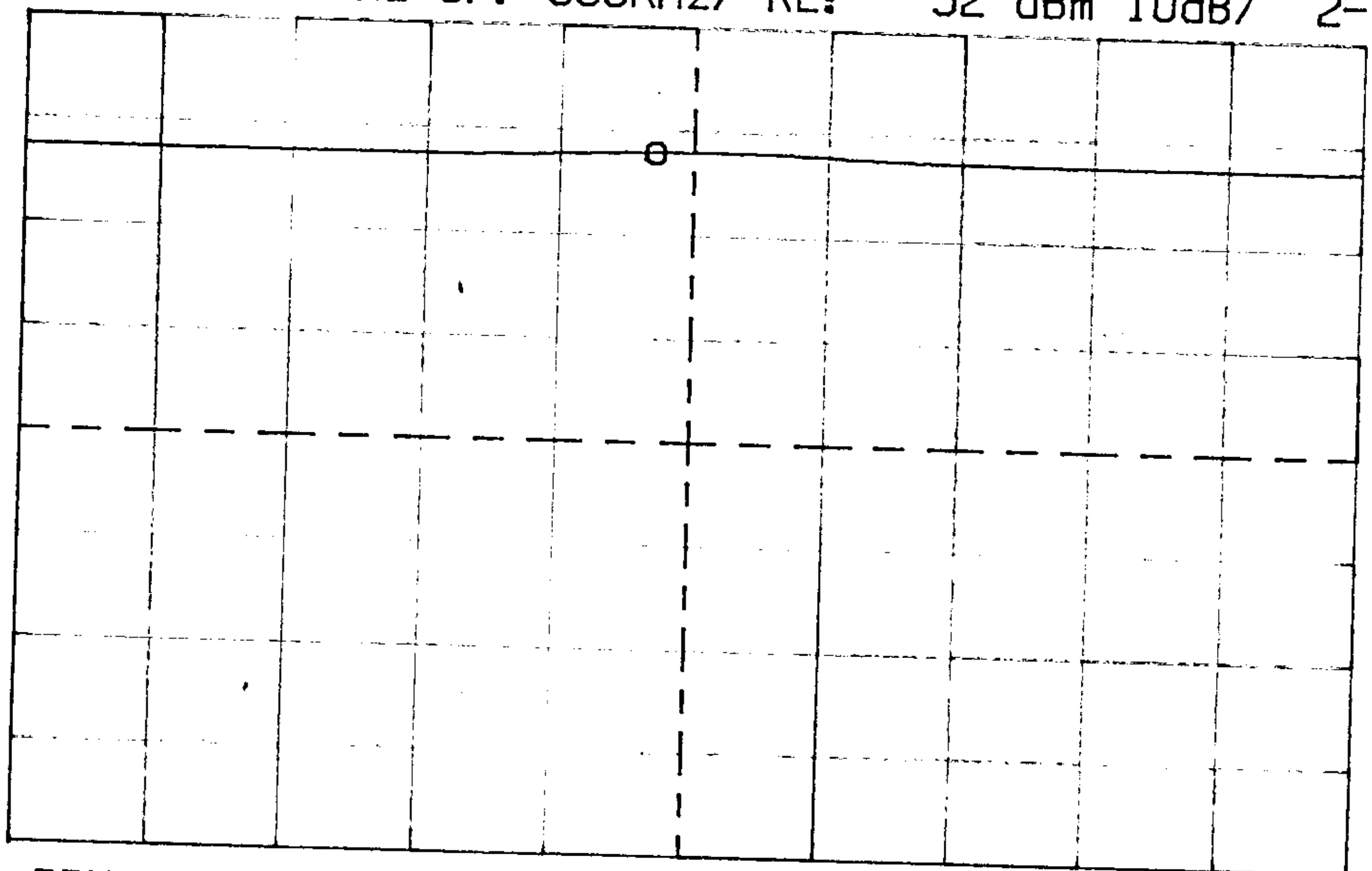
D = 1m

Ampl. gain = 35 dB

№ 12864

MK: 7.319850GHz - 63.9dBm

F: 7.32000GHz SP: 500kHz/ RL: - 52 dBm 10dB/ 2-



RBW: 1MHz VBW: 10 Hz SWP: 300mS/@ ATT: 0dB

Plot 3.6.2

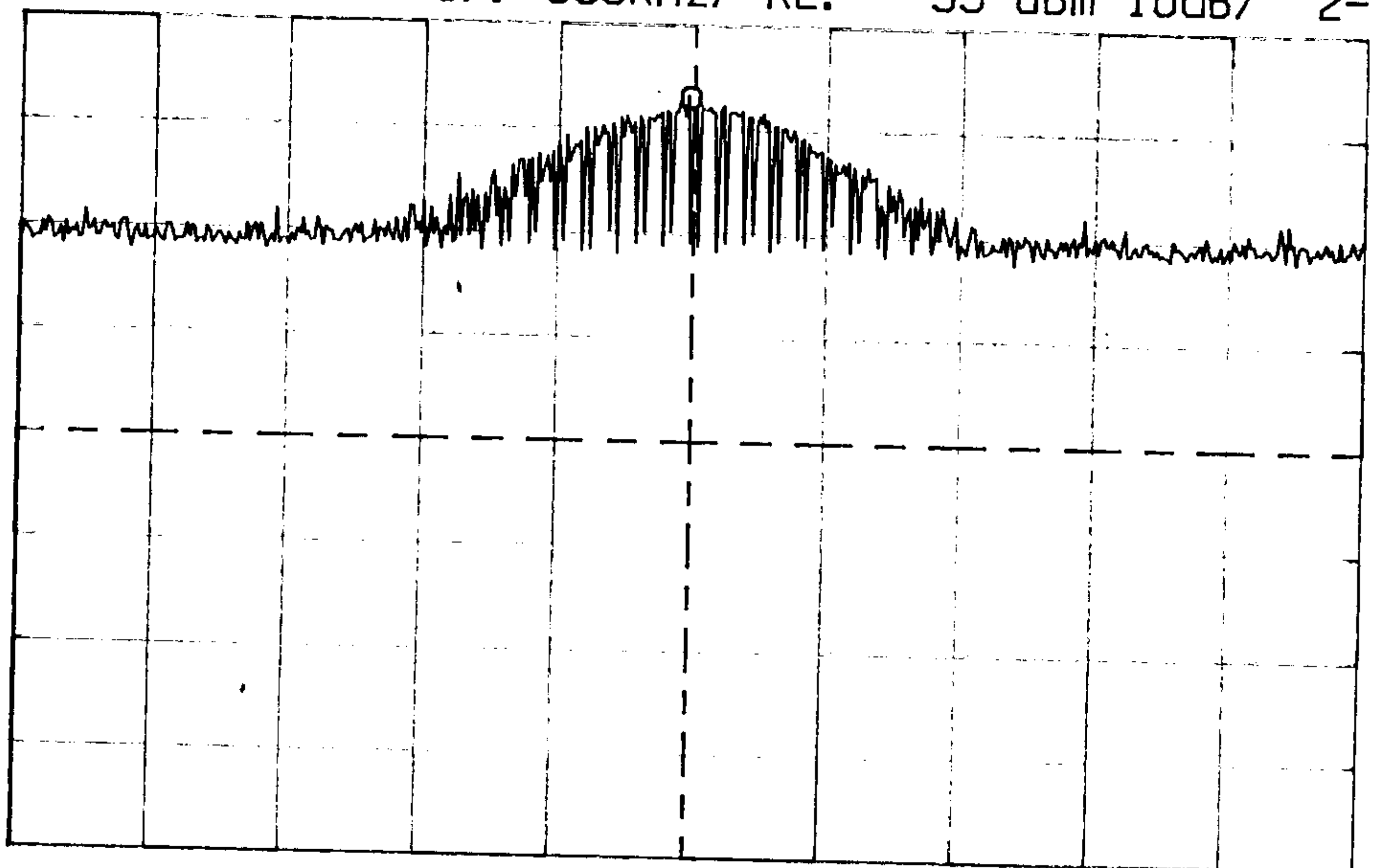
11.05.98 Pr. 12864 TADIRAN FAU-4 FCC p. 15.247.

Spurious emission

D = 1m
Ampl. gain = 35 dB

MK: 7.439980GHz - 41.7dBm

F: 7.44000GHz SP: 500kHz/ RL:- 35 dBm 10dB/ 2-



RBW: 1MHz VBW: 1MHz SWP: 10mS/@ ATT: 0dB

Plot 3.6.3

№ 12864

DL

11.05.98 Pr. 12864 TADIRAN FAU-4 FCC p. 15.247

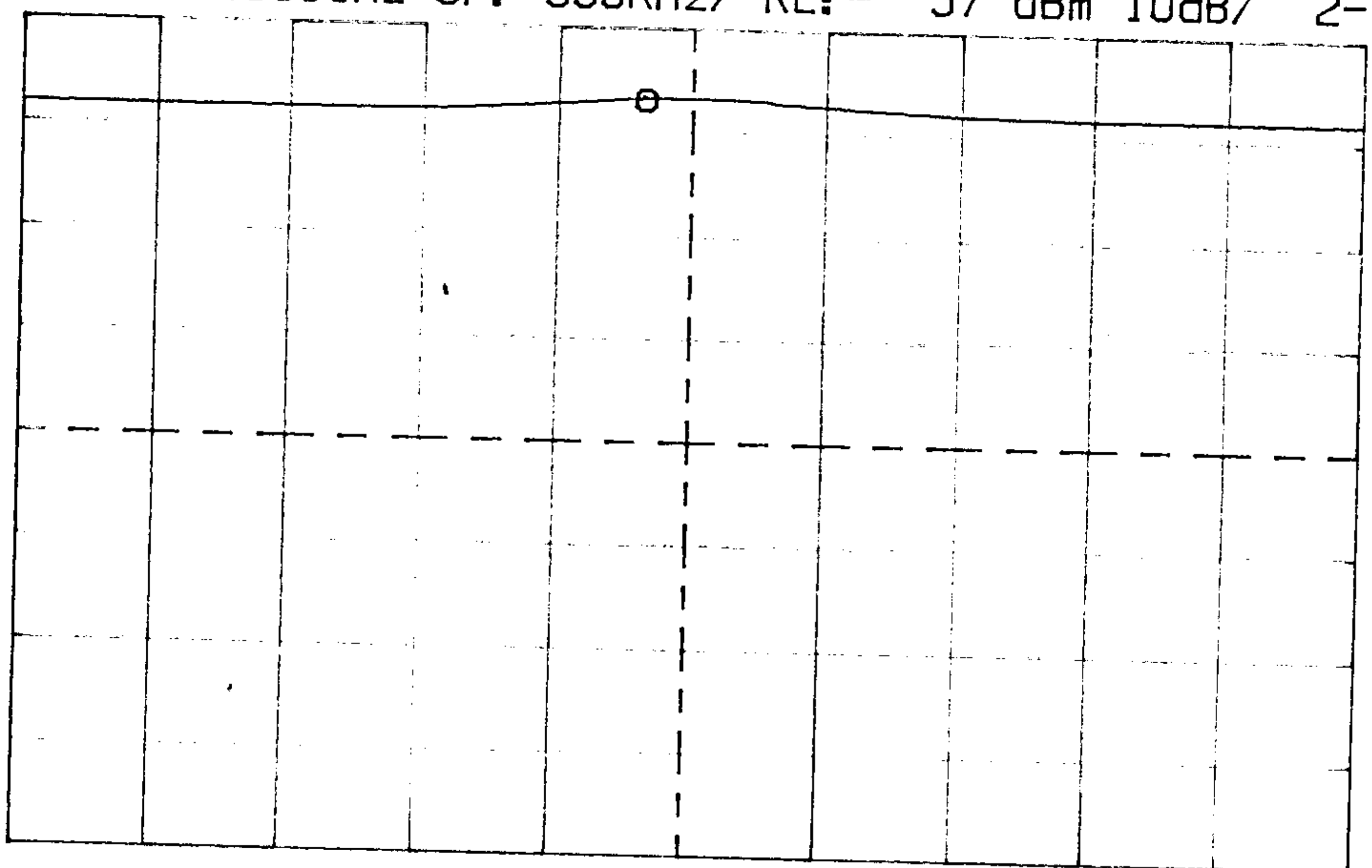
Spurious emission

D= 1m

Ampl. gain = 35 dB

MK: 7.439820GHz - 63.7dBm

F: 7.44000GHz SP: 500kHz/ RL:- 57 dBm 10dB/ 2-



RBW: 1MHz VBW: 10 Hz SWP: 300mS/@ ATT: 0dB

plot 3.6.4

№ 12864

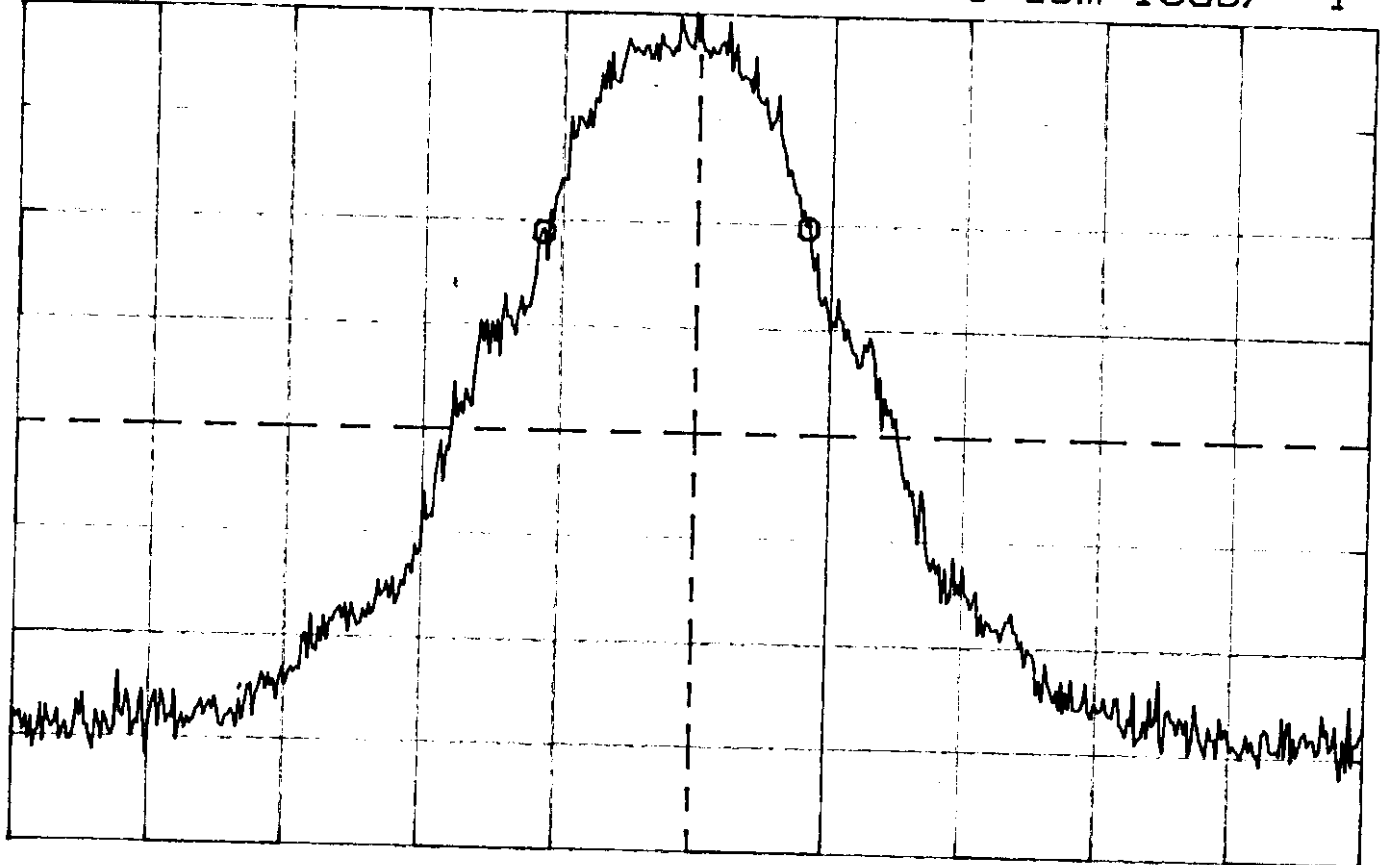
5.98
12864

TADIRAN

Occupied Bandwidth test

dM: + 0.980MHz + 0.8dB

F: 2.44000GHz SP: 500kHz/ RL: - 9 dBm 10dB/ 1-



RBW: 30kHz VBW: 100kHz@ SWP: 10mS/@ ATT: 10dB@

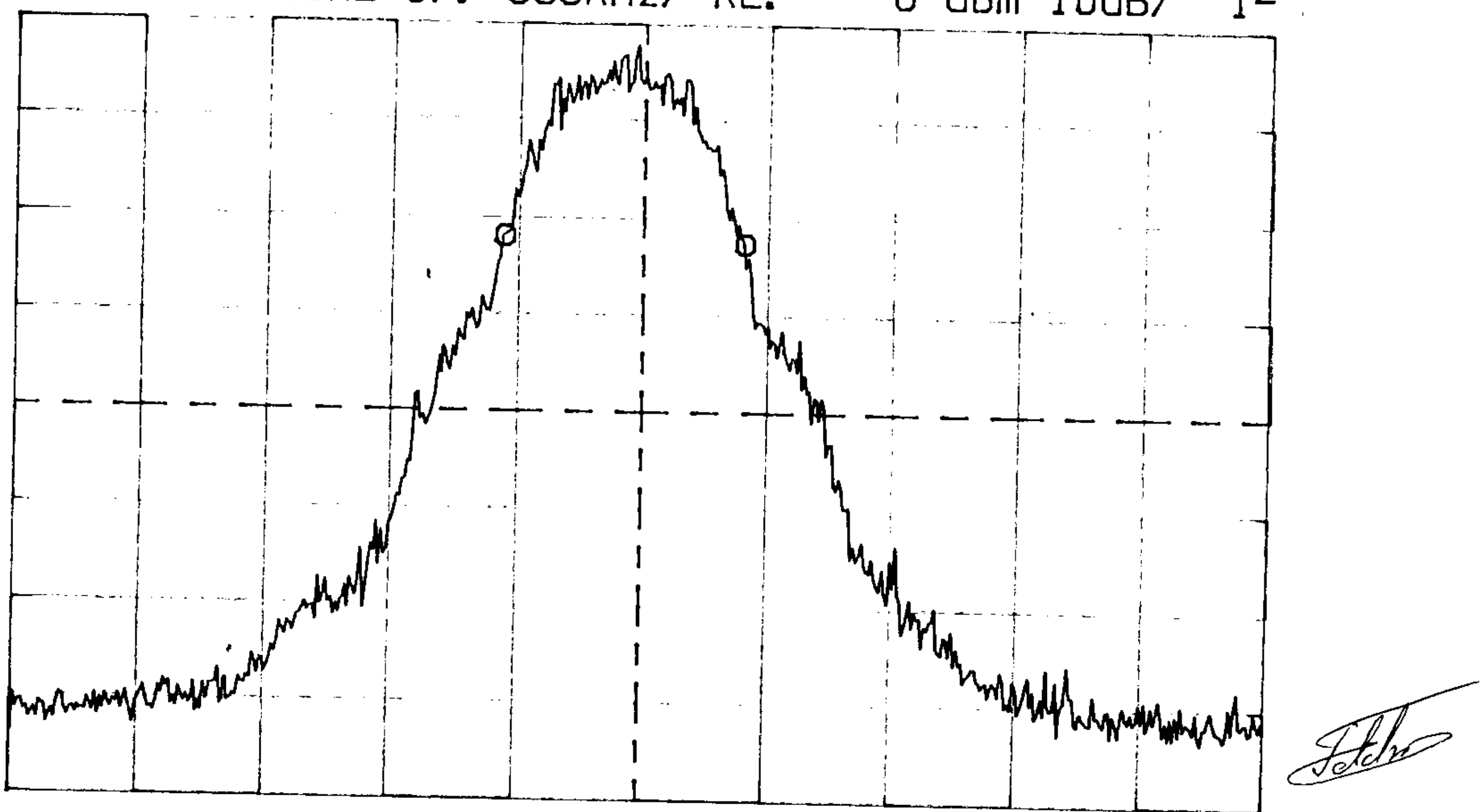
Plot 3.2.2

ADIRAN
12864

Occupied Bandwidth test

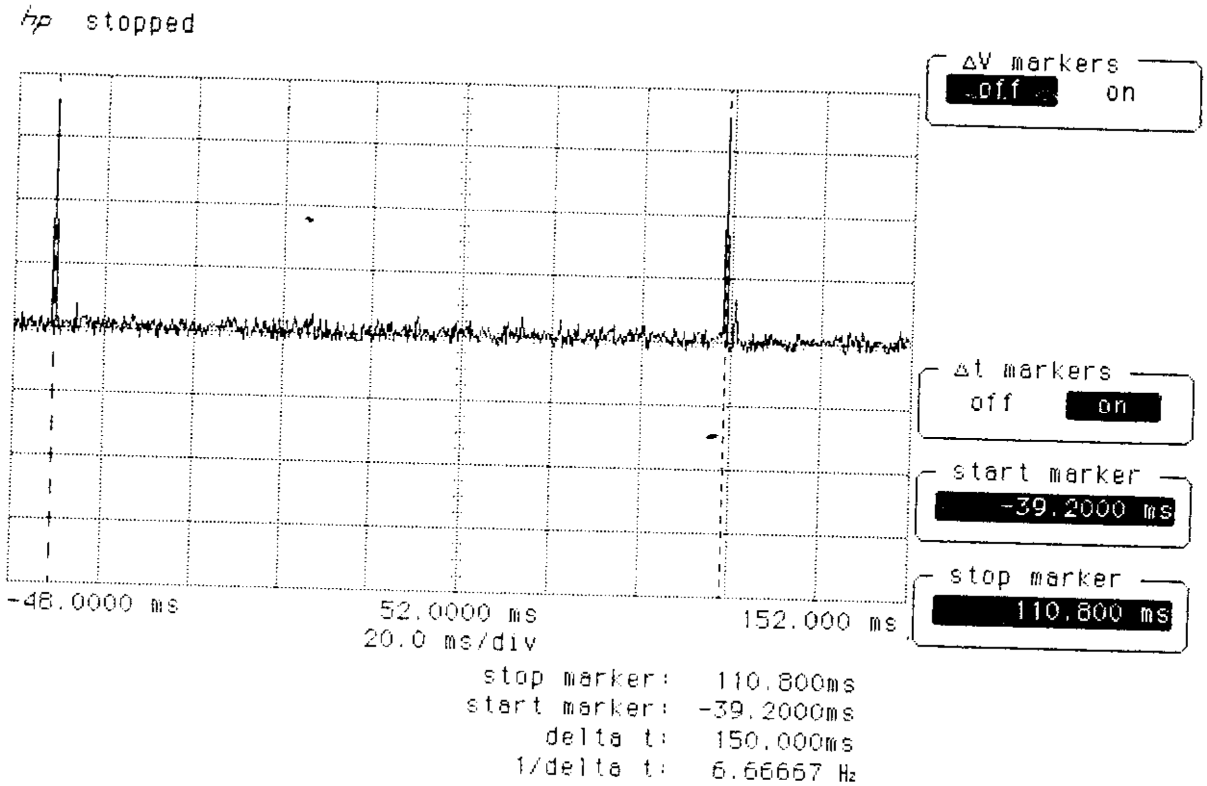
dM: + 0.960MHz - 0.6dB

F: 2.48000GHz SP: 500kHz/ RL: - 6 dBm 10dB/ 1-



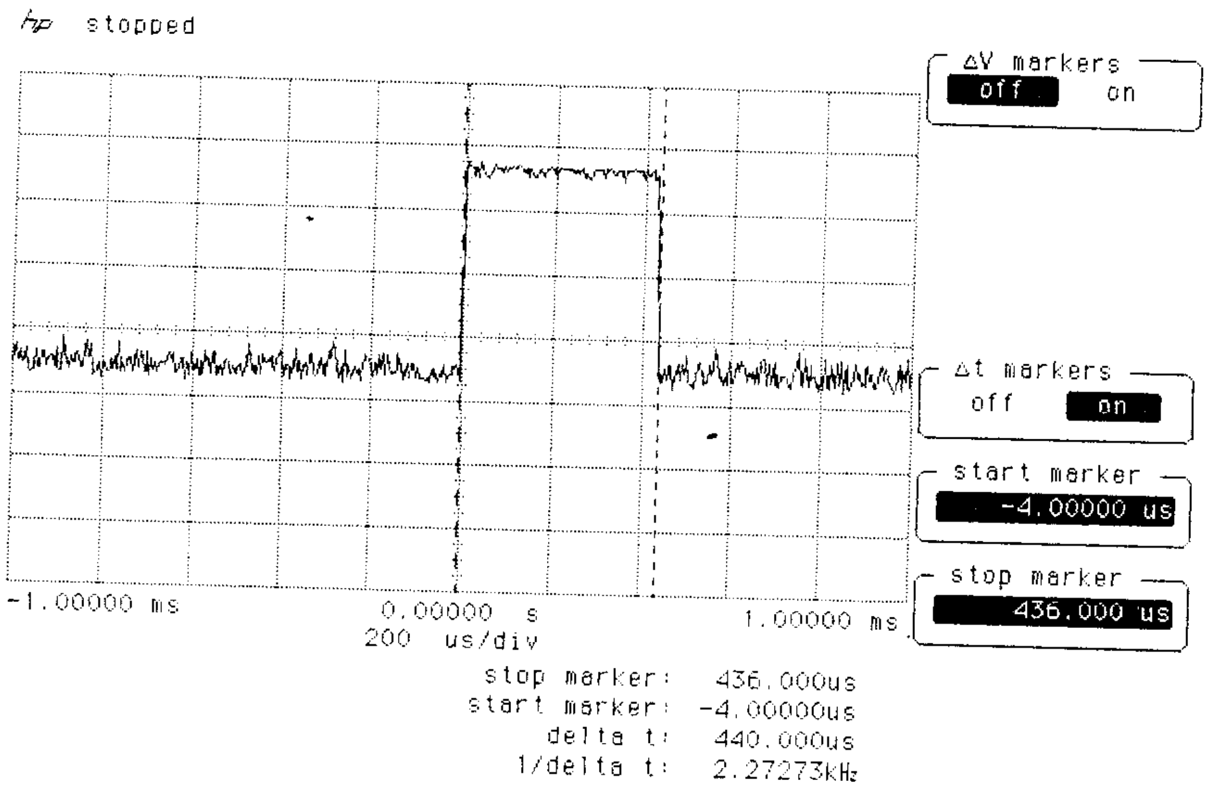
RBW: 30kHz VBW: 100kHz@ SWP: 10mS/@ ATT: 10dB@

Plot 3.2.3



Plot 3.3.1

1pulse duration – 0,44 ms
1pulse – 150 msek
Average time of occupa
88 msek <400 msec


stopped
ΔV markers
off
on
Δt markers
off
on
start marker
-4.00000 us
stop marker
436.000 us
-1.00000 ms
0.00000 s
200 us/div
1.00000 ms
stop marker: 436.000us
start marker: -4.00000us
delta t: 440.000us
1/delta t: 2.27273kHz

Plot 3.3.2

98
864

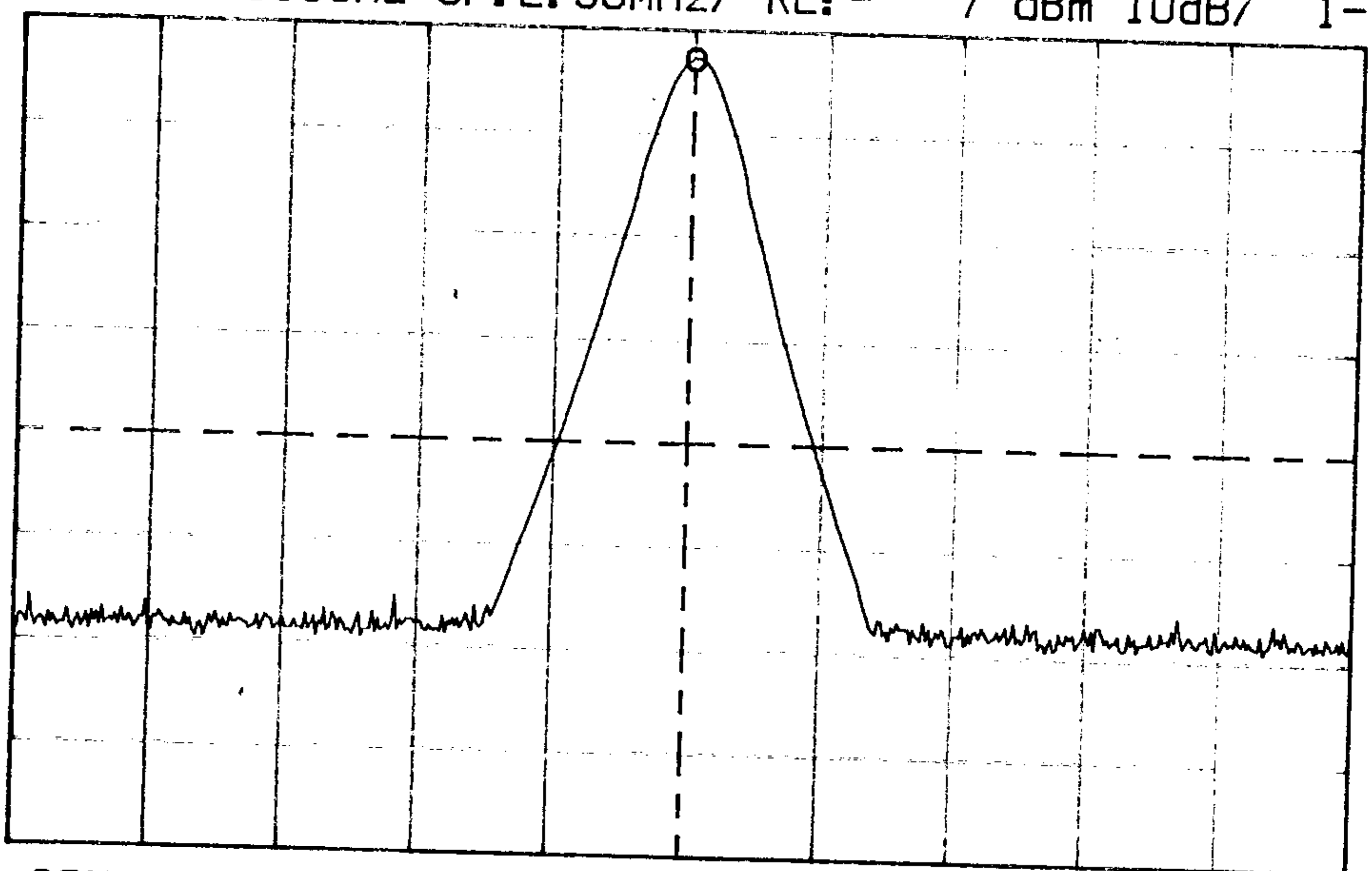
TADIRAN

Peak Output power test

with att. -30dB
Output power = 20.4 dBm

MK: 2.401000GHz - 9.6dBm

F: 2.40100GHz SP: 2.00MHz/ RL: - 7 dBm 10dB/ 1-



RBW: 1MHz VBW: 1MHz SWP: 10mS/@ ATT: 10dB@

Plot 3.4.1

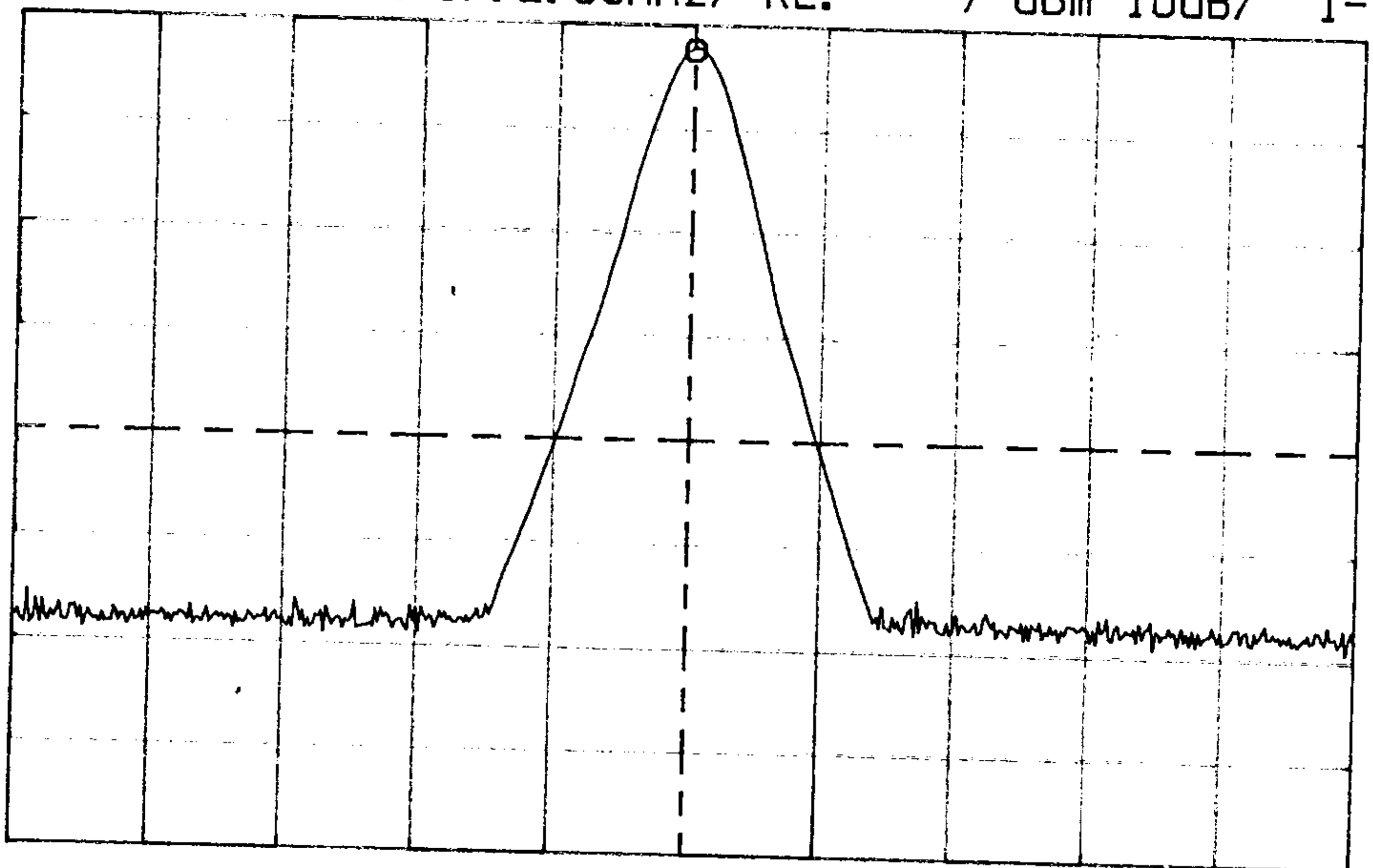
.98 FADIRAN
864

Peak Output power test

with att. -30dB
Output power = 20.8dBm

MK: 2.440000GHz - 9.2dBm

F: 2.44000GHz SP: 2.00MHz/ RL: - 7 dBm 10dB/ 1-

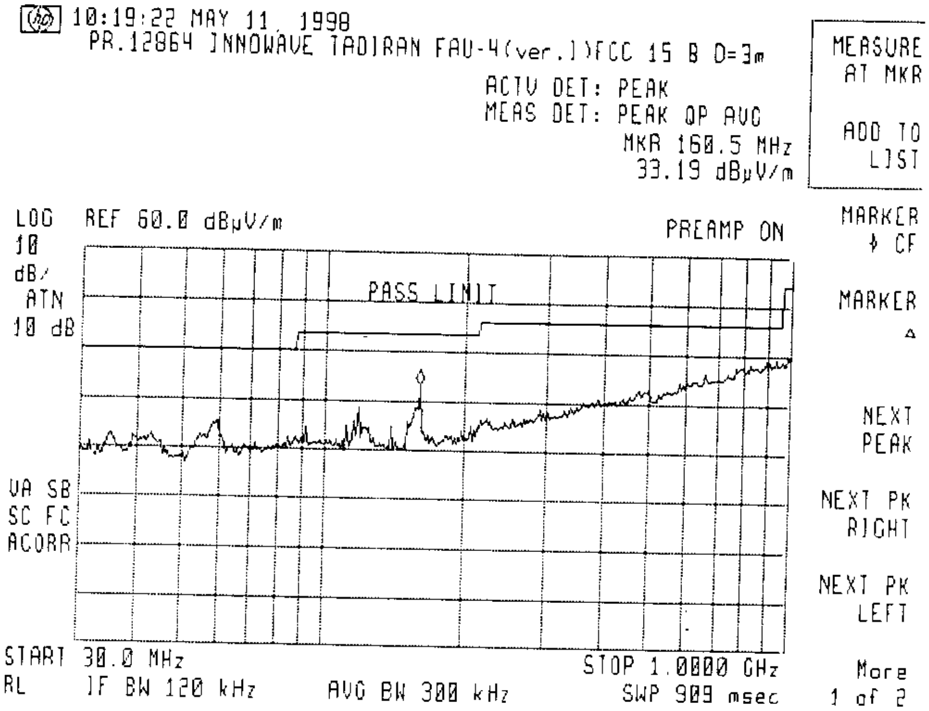


RBW: 1MHz VBW: 1MHz SWP: 10mS/@ ATT: 10dB@

Plot 3.4.2

Screen Capture - captured on 5/11/98 10:19:21 AM

Vert. pol.

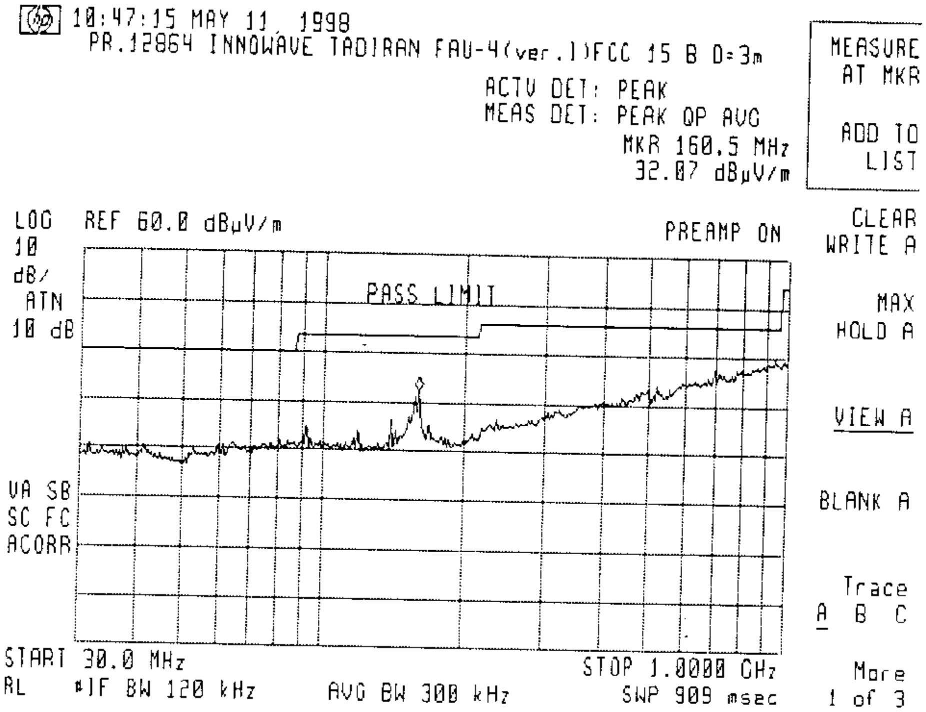


Plot 3.7.1

RH

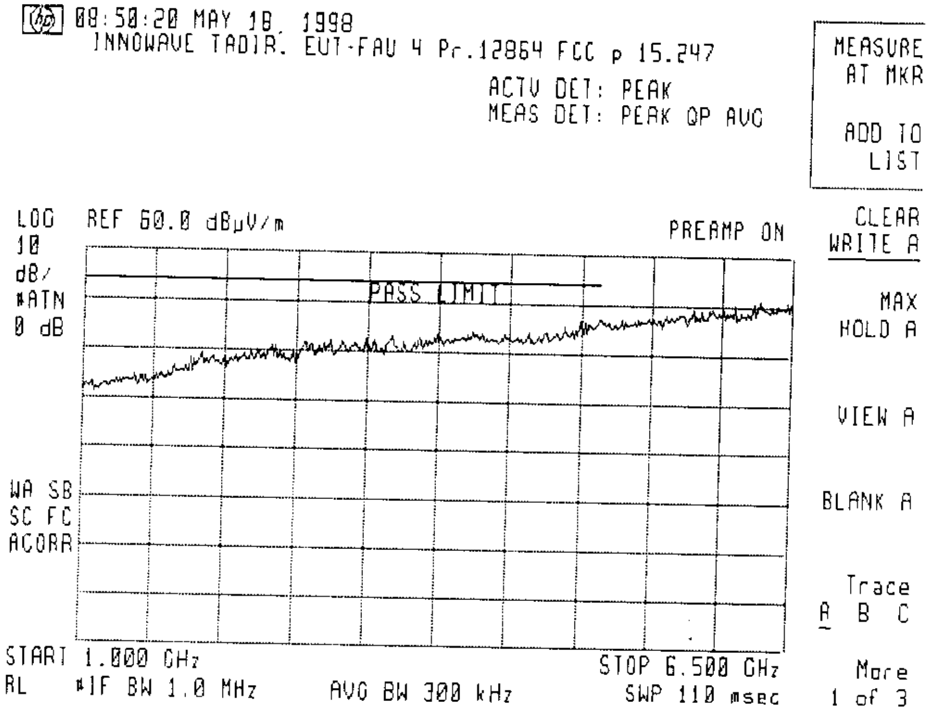
Screen Capture - captured on 5/11/98 10:47:14 AM

Hor. pol.



Plot 3.7.2

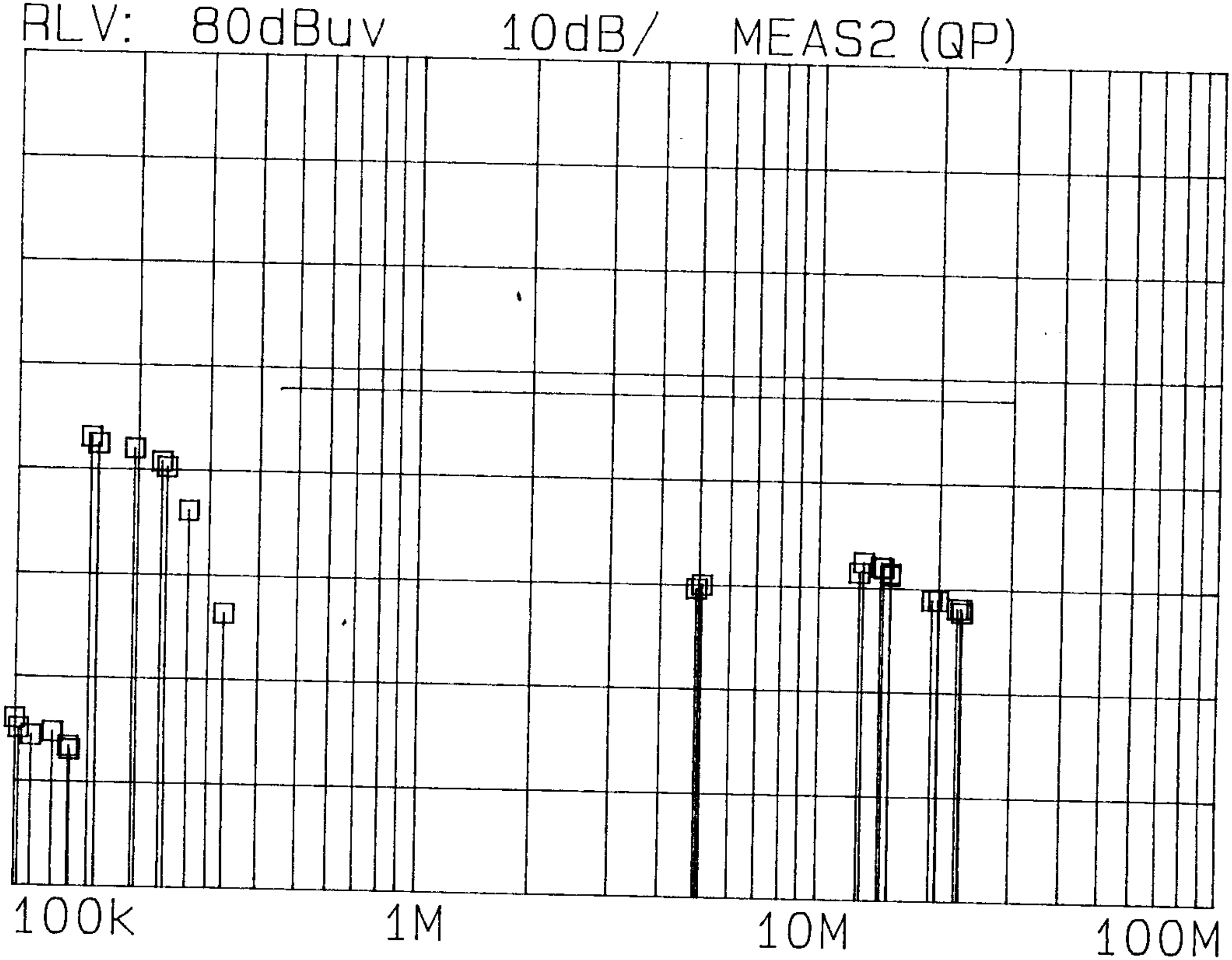
Screen Capture - captured on 5/18/98 8:50:19 AM



Plot 3.7.3

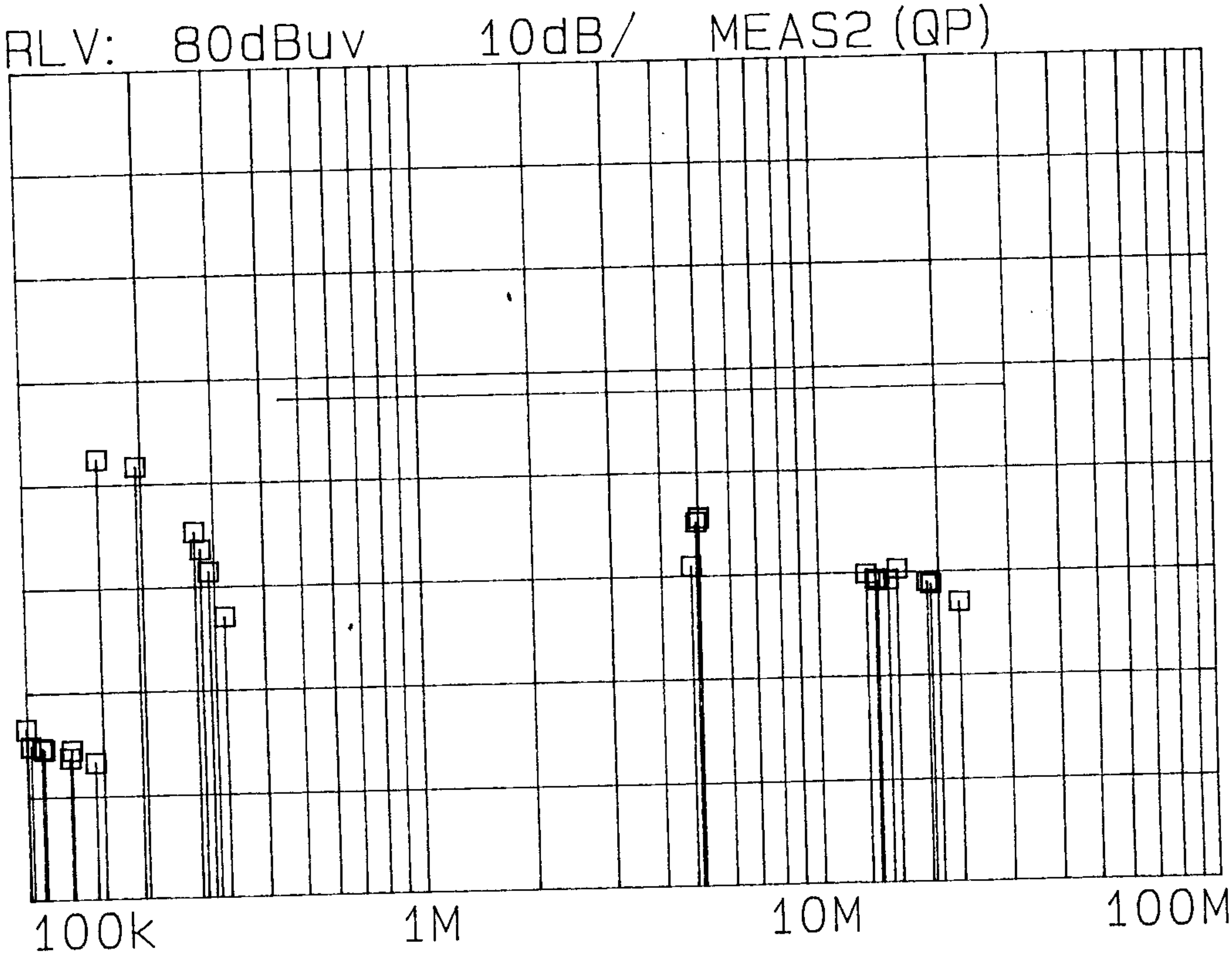
9.98 TADIRAN FAU-4
2864

Ph



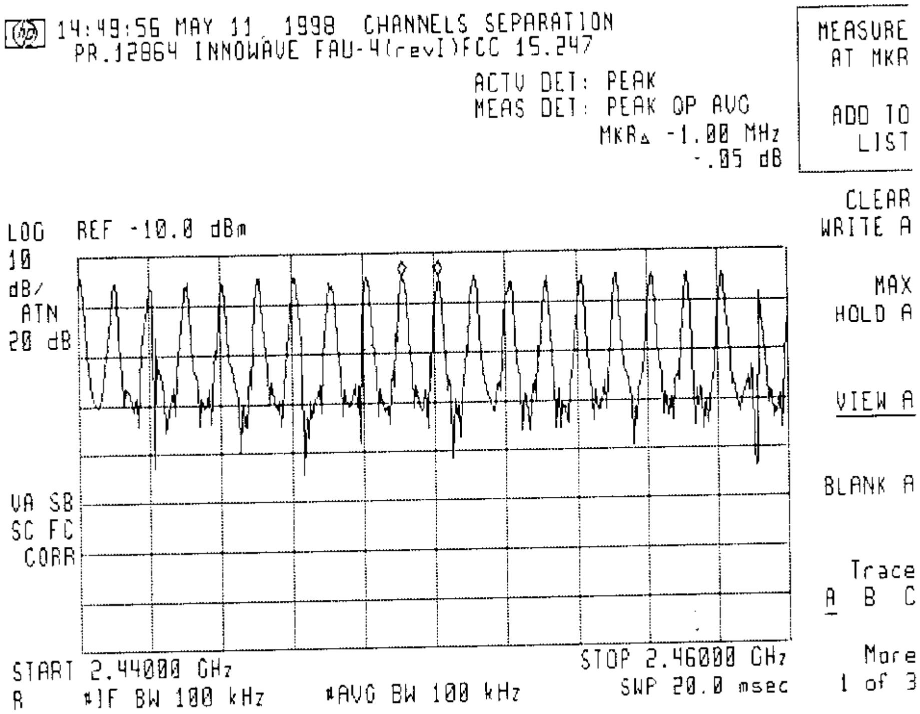
Plot 3.8.1

98
864 TADIRAN FAU-4



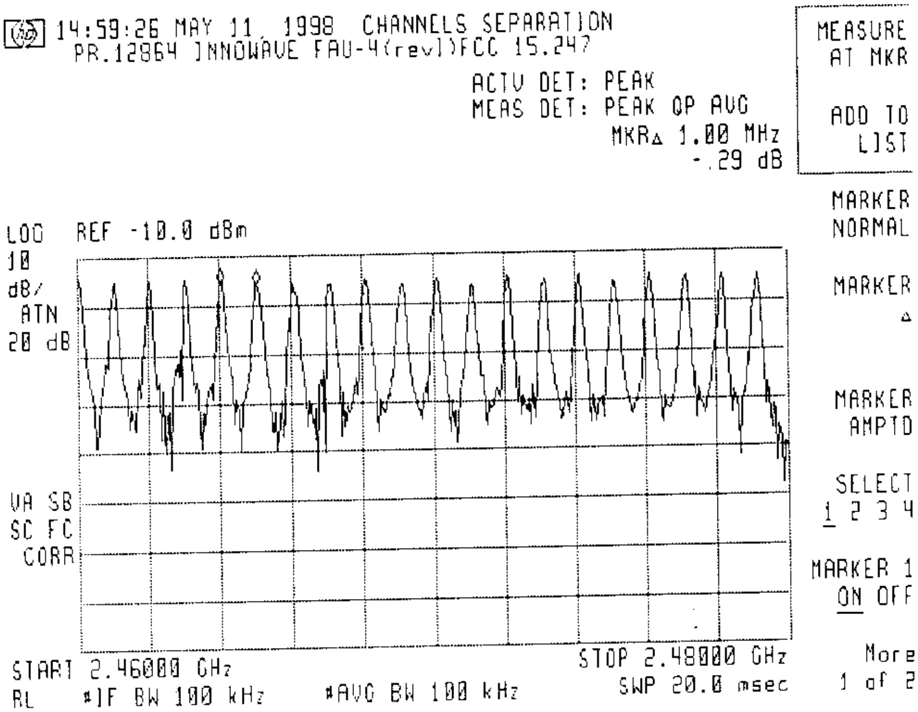
Plot 3.8.2

Screen Capture - captured on 5/11/98 2:49:55 PM



Plot 3.1.3

Screen Capture - captured on 5/11/98 2:59:26 PM



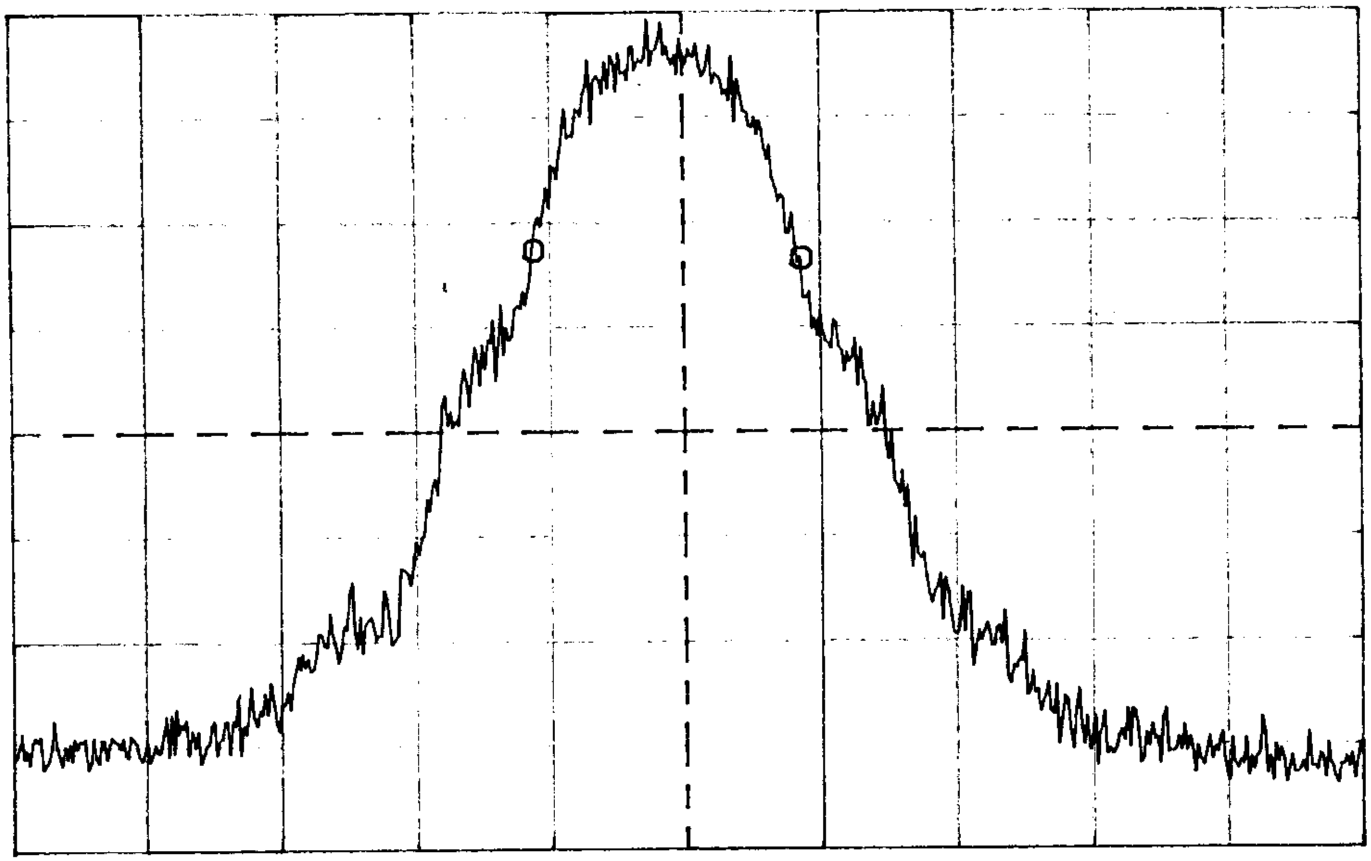
Plot 3.1.4

98
864

TADIRAN
Occupied Bandwidth test

dM: + 0.990MHz - 0.8dB

F: 2.40100GHz SP: 500kHz/ RL: - 8 dBm 10dB/ 1-



RBW: 30kHz VBW: 100kHz@ SWP: 10mS/@ ATT: 10dB@

Plot 3.2.1

FCC requirements § 2.1033 (b)(6)

TEST MEASUREMENT REPORT

Contains 37 pages and follows this page.

InnoWave
WIRELESS SYSTEMS

1. Equipment under test - FAU-4 (Fixed Access Unit) is a part of the Wireless Local Loop system (see Figure 1). This equipment, which incorporates an internal antenna, serves as the subscriber radio providing up to 4 telephone lines. Upon Powerup (via a Power & Charger Unit - PCU), this unit enters a *Span* Mode whereby it seeks out a Radio Port Unit (RPU) servicing its sector. If the link is of acceptable quality, the FAU begins *Tracking* the RPU. This simplex mode of operation implies that the FAU "hears" the RPU on the Downlink and has synchronized itself to the RPU in both the time and frequency domains. This is the normal mode of operation for the FAU- ready and waiting to enter the *Active* Mode when a line is requested.

The FAU-4 unit enables four independent users to get service from one FAU. The FAU-4 consists also of a common software and hardware platform, but three assemble options are available. It is available to configure the FAU for one, two or four subscribers by assembling at production one, two or four subassemblies on the same PCB. Each subassembly for each subscriber interface. Since FAU-4 configuration with all four subscriber interfaces is the worst case for emission, and since all other parameters are the same, only this configuration was tested and the FAU-1 and FAU-2 configuration are also covered by this test and should be included in the test report and in the approval certificate.

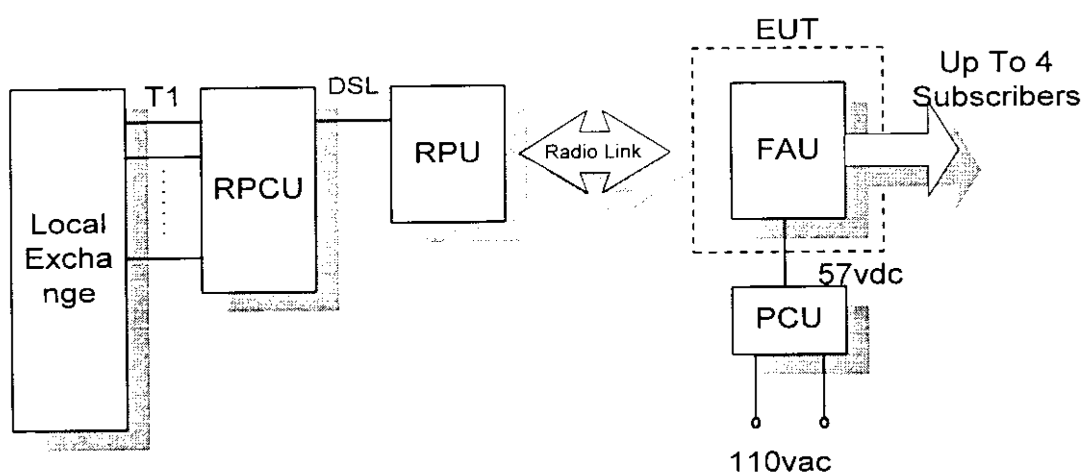
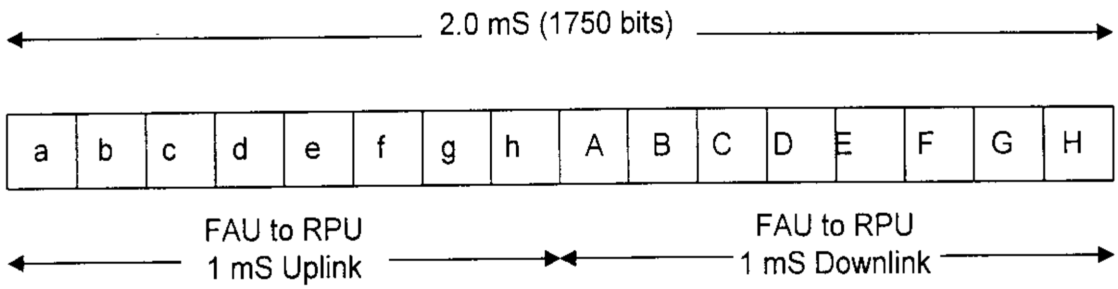


Figure 1.

2. The TDMA scheme works as depicted below:



The FAU transmits on the uplink divided into 8 timslotes with each slot occupying approximately 125 us (a-h depicted above) only when a call (diagnostic or customer initiated) is in process. The FAU responds to the RPU in the same timeslotes (up to 4) in which the RPU addressed it.

3. Design of the frequency sequence.

The design of the frequency sequence is based on Reed - Solomon sequences. The generation of such sequences is based upon m-sequence shift registers theory, which is also used for pseudo random sequence generation (see Simon et. al. Spread Spectrum Techniques, section 5.8.3).

The actual sequence is composed of two such sequences, with 40 terms each. The frequency sequences $f_n^{(1)}$ and $f_n^{(2)}$ are given by:

$$f_n^{(i)} = (\beta + \alpha^n) \bmod 41$$

As an example, we can generate one sequence using $\alpha = 7$, $\beta = 0$ and the other $\alpha = 11$, $\beta = 20$. The final sequence is finally formed by shifting the second sequence by 41 and then taking the terms alternatively from each sequence:

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$$f = \{ f_{1}^{(1)},41 + f_{1}^{(2)},41, f_{2}^{(1)},41 + f_{2}^{(2)},41, ...$$

The resulting sequence is:

1 60 7 70 8 58 15 78 23 63 38 62 20 52 17 54 37 75 13 71 9 68 22 76 31
42 12 66 2 55 14 46 16 69 30 47 5 80 35 45 40 59 34 49 33 61 26 41 18 56
3 57 21 67 24 65 4 44 28 48 32 51 19 43 10 77 29 53 39 64 27 73 25 50 11
72 36 79 6 74 1 60 7 ....

It is our understanding that the sequence described above meets the FCC Part 15 requirements for frequency hopping system.

4. The FAU Block Diagram.

Figure 4.1 depicts a block diagram of the FAU which shows the Antenna Board, including the built-in directional antenna, the Subscriber Radio Module (SRM) which performs RF, IF and base band signal processing in additional to clock generation, and the Subscriber Interface Module (SIM) which handles the interface to the customer premises equipment.

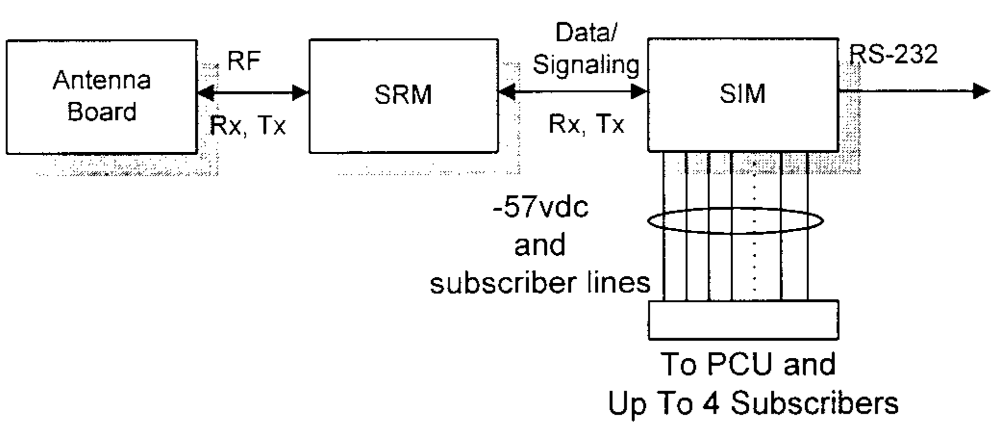

Figure 4.1

4. 1. The SRM Block Diagram.

Figure 4.2 shows a block diagram of the SRM board.

The Block Diagram demonstrates all the frequencies which are generated and used in the device, as well all the signals circulating in the FAU.

The analog voice information is digitized, filtered, scrambled and reconverted to analog as modulation applied to a 333 Mhz IF. The 'mask' of the carrier is controlled at the production level. The 333 Mhz information signal is unconverted by a frequency hopping Local Oscillator, filtered, amplified and switched to the antenna port. On the Rx side the signal is filtered, amplified, downconvertered with same LO and passed through the channel defined SAW filter. A second downconversion (using the 5th harmonic of the 56.238 Mhz VCXO) and filtering precedes recovery of the data stream.

The Block Diagram indicates that the Transmitter and Receiver share a Local Oscillator which is used for unconversion/downcoversion with an IF of 333 Mhz. The LO frequency is synthesized to 333 Mhz below the desired channel according to a table, stored in memory. Each of the 75 (or more) frequencies listed on the table is utilized per hop cycle. After the unit transmits a burst at the given frequency, it switches to receive IF 20 dB BW (determined by the SAW filter) nominally equal to 1 Mhz.

The FAU specifications are given below.

- Aggregate Bit Rate - 875 Kbps.
- Modulation Type - Frequency Hopping Spread Spectrum, TDMA, TDD.
- Number of Hopping Channels = pool of 80. From 2401 to 2480 Mhz (for a given system, 75 or more are selected).
- Dwell Time for each channel = 1mS(Tx) + 1mS(Rx) = 2mS. In practice, the FAU is "keyed up" for a maximum portion ~ 440 uS of allotted 1 mS transmit time.
- Maximum Revisit Interval = every channel is visited per hop cycle. Thus in any 100 mS interval, the UUT will transmit a maximum of 1mS per channel.
- Duty Cycle Correction Factor - Given the above parameter, the FAU may utilize the full 20 dB averaging factor for all spurious radiations associated with carrier hopping

(LO and harmonics) that fall in one of the restricted bands, i.e. the specification becomes 54 dBuV + 20 dB = 74 dBuV.

- Operating Frequency Range = 2401 - 2480 Mhz.
- Antenna Gain = 13.5 dB. The Antenna is a printed circuit board using patch antenna technology. The ground plane is provided by the chassis to which the antenna and other PCB's are mounted. Antenna is integral to device package and thus complies with 15.203.

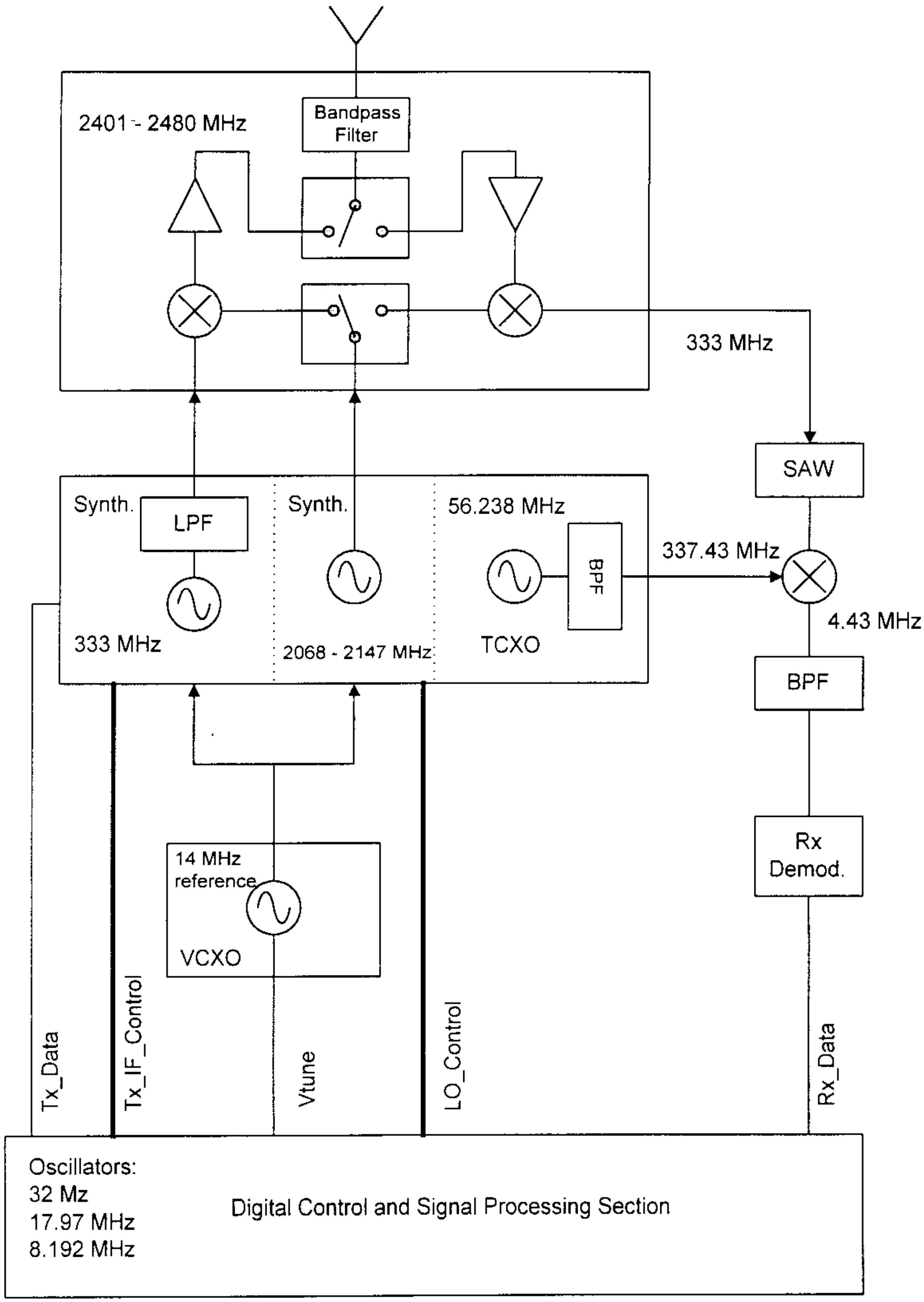

Figure 4.2 SRM Block Diagram

4. 2. The SIM Block Diagram.

Figure 4.3 shows a block diagram of the SIM board.

The Control Block is linked to the ADPCM/PCM codec and multiplexer, via a control bus, contains input and output lines for the ADPCM data and signaling information from the SRM and to the SRM. The block is also linked to the subscriber interfaces via signaling bus, which carry reports from dialing, off hook, tax and disconnect detectors. The control block also controls congestion tone, ring and tax generators.

The subscriber interfaces require a PCM format 64 kbps signal and the SRM board processes a ADPCM format 32 kbps signal. The ADPCM/PCM codec and multiplexer undertake the function of signal interconversion, under control by the control block, which connects to it via control bus. The block also receives frame synchronization pulses from the clock and timing generator of SRM, passes a 512 kbps data clock to the SRM and is linked to each subscriber interface.

A TAX tone is generated in each subscriber interface, at a frequency of 16 kHz (optional 12 kHz), in accordance with the telephone exchange signaling. The signal is detected on the telephone exchange side by a pulse detector, comprising a ban-pass filter tuned to the tax pulse frequency and a comparator and is connected to a frequency meter.

The SIM board's Ring Generator emits a tone which informs the subscriber that there is an incoming call being received by the FAU unit from the RPU unit. The Ring Generator generates signals (20, 25 or 50 Hz) for all subscriber interfaces. The ring voltage is applied to the subscriber's telephone line via a switch which in one state selects ring and in a second state selects line feed.

A Congestion Tone Generator generates a congestion tone which indicates to the subscriber that no channel to the RPU is available or as a consequence of congestion tone sent by the Local Exchange.

The Subscriber Interface provides the subscriber with an interface to the system. The block receives PCM encoded digital information from the ADPCM/PCM codec and multiplexer and interfaces the telephone subscriber's analog equipment. The subscriber interface is controlled by the control block via the signaling bus and performs the following functions:

- The unit detects if a subscriber telephone is present or disconnected and reports to the control line.
- The unit contains a sensor which detects any unwanted voltages which appear on a subscriber telephone line and reports to the control line.

In addition, dialing information and a generated TAX tone are also passed along the signaling bus, to the control block.

The Internal Power Supply receives an unregulated -57vdc from the PCU and regulates and transforms this voltage to the +5 v, -5 v and 5.75 v levels required by the SIM and SRM boards.

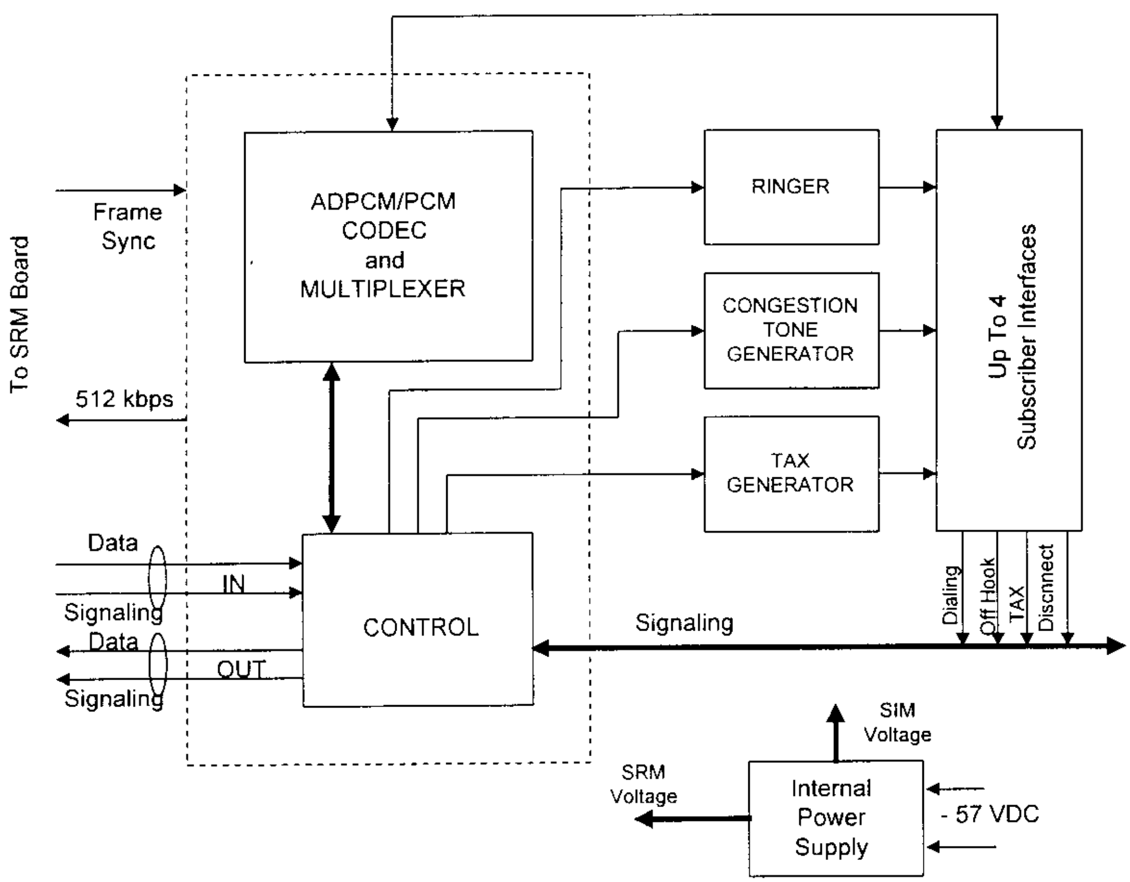

Figure 4.3 The SIM Block Diagram

FCC requirements § 2.1033 (b)(7)

DEVICE PHOTOGRAPHS

Photograph No.1
FAU-1, FAU-2 and FAU-4 general view

Photograph No.3
FAU rear view

Photograph No.4
FAU bottom view with lid removed

Photograph No.5
FAU with plastic cover removed

Photograph No.6
FAU with patch antenna dismounted

Photograph No.7
FAU with chassis removed

Photograph No.8
FAU internal view

Photograph No.9
FAU SR24 (RF) board component side view

Photograph No.10
SR24 board print side view

Photograph No.11
FAU SIM4 component side view

Photograph No.12
SIM4 print side view

FCC requirements § 2.1033 (b) (8), (9), (10), (12), c.

FCC requirements mentioned above are not applicable to this application for certification.