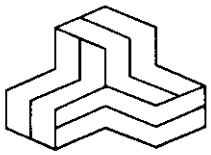


ENGINEERING TEST REPORT

CHANNEL MODULE (RADIO TRANSLATOR)
MODEL NO.: CM800HP

FCC ID: LO6-CM800HP806C

FCC PART 2
&
PART 22, SUBPART H
MOBILE CELLULAR RADIOTELEPHONE SERVICE

UltraTech's File No.: FSG-20F22H

TESTED FOR:

FUTURECOM SYSTEMS GROUP INC.
110 Snow Blvd., Unit #3
Concord, Ontario
Canada, L4K 4B8

TESTED BY:

UltraTech Engineering Labs Inc.
4181 Sladeview Crescent, Unit 33
Mississauga, Ontario
Canada L5L 5R2

DATE: Jan. 12, 1998

TABLE OF CONTENTS

1. EXHIBIT 1 - SUMMARY OF TEST RESULTS & GENERAL STATEMENT OF CERTIFICATION

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
22.913	Effective Radiated Power Limits	Yes
22.915	Modulation Requirements	Please refer to the test report.
22.917	Emission Masks	Yes
22.917(e)	Out of Band Emissions - Spurious Emissions at Antenna Terminal	Yes
22.917(e)	Out of Band Emissions - Field Strength of Spurious Emissions	Yes
22.355	Frequency Tolerance	Yes

CHANNEL MODULE (RADIO TRANSLATOR), Model No.: CM800HP, by **FUTURECOM SYSTEMS GROUP INC.** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices**. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.

TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY:

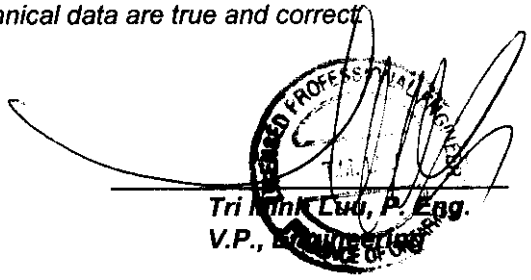
1) *THAT the application was prepared either by, or under the direct supervision of the undersigned.*

2) *THAT the measurement data supplied with the application was taken under my direction and supervision.*

3) *THAT the data was obtained on representative production units, representative.*

4) *THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.*

Certified by:



Tri Minh Luu, P. Eng.
V.P., Engineering

DATE: Jan. 12, 1998

1. EXHIBIT 2 - GENERAL INFORMATION

1.1. APPLICANT

FUTURECOM SYSTEMS GROUP INC.
110 Snow Blvd., Unit #3
Concord, Ontario
Canada, L4K 4B8

Applicant's Representative: Mr. Tony Bombera

1.2. MANUFACTURER

FUTURECOM SYSTEMS GROUP INC.
110 Snow Blvd., Unit #3
Concord, Ontario
Canada, L4K 4B8

1.3. DESCRIPTION OF EQUIPMENT UNDER TESTS

PRODUCT NAME:	CHANNEL MODULE (Radio Translator)
MODEL NO.:	CM800HP
SERIAL NUMBER:	Pre-production
TYPE OF EQUIPMENT:	Mobile Cellular Radio-telephone Service Transmitters
RF IN FREQUENCY BANDS:	824-851 MHz, single channel input
RF OUT FREQUENCY BANDS:	824-851 MHz, single channel output
CHANNEL SPACINGS	Not applicable for radio translator.
RF IN POWER RATING:	1 mili-Watt or 0 dBm
RF OUT POWER RATING:	7 Watts maximum
IN/OUT IMPEDANCE:	50 Ohms
DUTY CYCLE:	Continuous
99% BANDWIDTH:	Same as RF IN.
BAUD RATES:	Same as RF IN.

EMISSION DESIGNATION: F3E and F1D

The necessary bandwidth is not required for the radio translator since its bandwidth is the same as the RF input.

INPUT SUPPLY: 28 Vdc battery

ASSOCIATED DEVICES: N/A

FCC ID: LO6-CM800HP806C

INTERFACE PORTS:
(1) I/O and DC IN (Terminal Block)
(2) RS-232 Port (9 PIN DIN) – Only for factory use.
(3) RF IN (SMA)
(4) RF OUT (SMA)

1.4. RELATED SUBMITTALS)/GRANT

Not applicable

1.5. TEST METHODOLOGY

These tests were conducted on a sample of the equipment for the purpose of certification compliance with Code of Federal Regulations, Parts 2 & 22, Subpart H, Mobile Cellular Radiotelephone Service Operating in the Frequency Bands 824 - 851 MHz.

Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - 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.

1.6. TEST FACILITY

AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

Radiated Emissions were performed at the Ultratech's 3-to-30 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: July 16, 1997.

The above test site is also filed with Interference Technology International Ltd (ITI - An EC Directive on EMC).

1.7. UNITS OF MEASUREMENTS

Measurements of conducted emissions are reported in units of dB referenced to one microvolt [dB(uV)].

Measurements of radiated emissions are reported in units of dB referenced to one microvolt per meter [dB(uV)/m] at the distance specified in the report, wherever it is applicable.

2. EXHIBIT 3 - SYSTEM TEST CONFIGURATION

2.1. TEST SYSTEM DETAILS

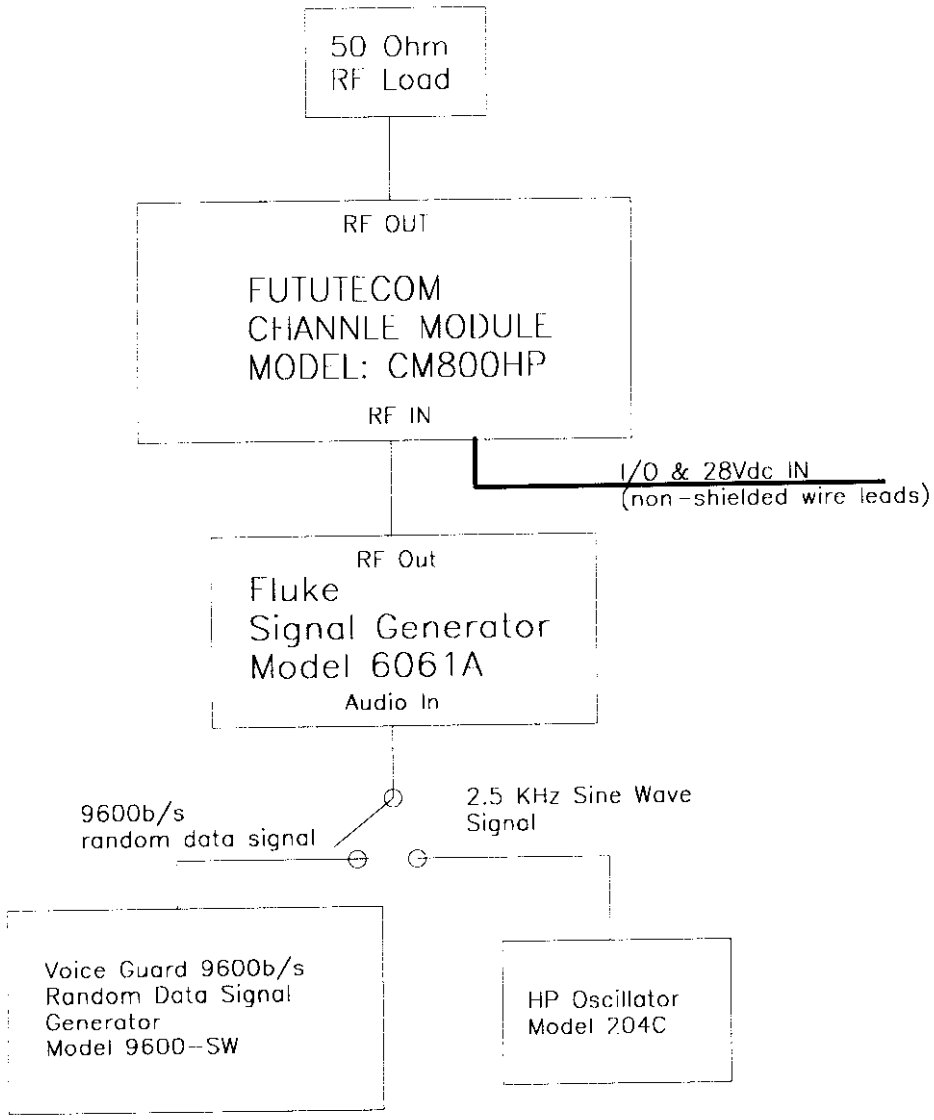
The following peripherals, FCC identifiers and types interconnecting cables were used with the EUT for testing:

EUT: FUTURECOM SYSTEMS GROUP INC., CHANNEL MODULE (Radio Translator), Model : CM800HP, S/N: Pre-production.
I/O Cable: All I/O cables were shielded
Power Supply Cable: Non-shielded

RF INPUT SIMULATING DEVICES:

1. **RF Synthesized RF Signal Generator**, Fluke, Model 6061A, frequency range 10KHz-1050MHz, power output 13dBm max.
2. **Audio Oscillator**, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.
3. **9600 b/s Random Data Generator (Digital Speech Encryption)**, Voice Guard, Model 9600-SW, P/N: 19A148909P, S/N: 9614517.

2.2. BLOCK DIAGRAMS OF TEST SET-UP



2.4. JUSTIFICATION

No deviation, in both configuration and operation manners, different from normal operation were required.

2.5. EUT OPERATING CONDITION

The translator was tested at lowest, middle and highest frequencies if the same maximum RF input level of 830 MHz, 0 dBm.

2.6. SPECIAL ACCESSORIES

No special accessories were required.

2.7. EQUIPMENT MODIFICATIONS

Not required.

3. EXHIBIT 4 - TEST DATA

3.1. EFFECTIVE RADIATED POWER LIMITS @ FCC 22.913

PRODUCT NAME: CHANNEL MODULE (RADIO TRANSLATOR), Model No.: CM800HP

FCC REQUIREMENTS:

FCC Part 22, Subpart H, Para. 22.913(a)

(1) **Transmitter Base and Cellular Repeater**: The maximum effective radiated power (ERP) of transmitters in the Mobile Cellular Radio-telephone Service must not 500 Watts.
(2) **Mobile Transmitters and Auxiliary Test Transmitters**: The maximum effective radiated power (ERP) of transmitters in the Mobile Cellular Radio-telephone Service must not 7 Watts.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

POWER INPUT:

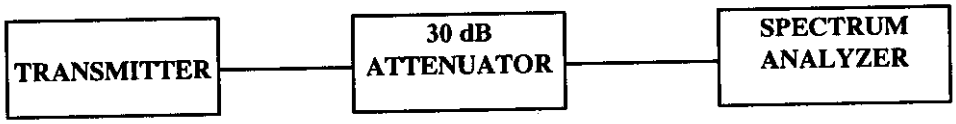
28 Vdc Battery.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Bird Attenuator, 50 Ohm IN/OUT

METHOD OF MEASUREMENTS: Refer to FCC @ 2.985

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TESTED PERSONNEL: Tri M. Luu, P.Eng.

DATE: July 06, 1998

MEASUREMENT DATA

PEAK POWER MEASUREMENT AT THE ANTENNA TERMINAL

TEST CONFIGURATION

- *The transmitter terminal was coupled to the Spectrum Analyzer through a 30 dB attenuator*
- *Power of the transmitter channel near the lowest, middle and highest of each frequency block/band were measured using the power meter, and the reading was corrected by added the calibrated attenuator's attenuation value and cable loss of 31 dB.*
- *The RF Output was turned on with no modulation.*

RF INPUT	FUNDAMENTAL FREQUENCY (MHz)	MEASURED PEAK POWER (Watts)	PEAK POWER RATING (Watts)
0 dBm @ 830 MHz	824.0000	7.0	7.0
0 dBm @ 830 MHz	837.0050	6.0	7.0
0 dBm @ 830 MHz	851.0000	5.7	7.0

ERP Measurements: -Appropriate antenna type, and adjustment of power output for effective radiated power (ERP) to meet FCC limits will be performed by the manufacturer at location of installation.

3.2. MODULATION REQUIREMENTS @ FCC 22.915

PRODUCT NAME: **CHANNEL MODULE (RADIO TRANSLATOR), Model No.: CM800HP**

FCC REQUIREMENTS: FCC Part 22, Subpart H, Para. 22.915

Cellular systems must be capable of providing service using the types of modulation described in the cellular system compatibility specification.

(a) **Non-voice modulating signals:-** Modulating signals other than voice, such as data signals, may be transmitted, provide the resulting modulated emission exhibits spectral characteristics not exceeding those resulting from voice modulation.

(b) **Modulation Levels:-** The levels of the modulating signal must be set to the values specified in this paragraph, and must be set to the values specified in this paragraph, and must be maintained within ±10%. Of those values.

(1) The instantaneous frequency deviation resulting from the main modulating signal must be ± 12 kHz
(2) The instantaneous frequency deviation resulting from the supervisory audio tones must be ± 2 kHz
(3) The instantaneous frequency deviation resulting from the signaling tone must be ± 8 kHz

(c) **Deviation Circuitry:-** Cellular transmitters must be equipped with circuitry that automatically prevents modulation levels for voice transmissions from exceeding the limits specified in this section.

(d) **Audio Filter Characteristics:-** Except provided in FCC 22.917, radio telephony signals applied to the modulator from the modulation limiter must be attenuated as a function of frequency as specified in this paragraph.

(1) **For Mobile Stations:-** these signals must be attenuated, relative to the level at 1 kHz, as follows:
(i) In 3.0 to 5.9 kHz and 6.1 to 15 kHz, signals must be attenuated at least 40log(f/3) dB { f in kHz }
(ii) In 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB
(iii) Above 15 kHz, signal must be attenuated at least 28 dB

(2) **For Base Stations:-** these signals must be attenuated, relative to the level at 1 kHz, as follows:
(i) In 3.0 to 15 kHz, signals must be attenuated at least 40log(f/3) dB { f in kHz }
(ii) Above 15 kHz, signal must be attenuated at least 28 dB

(3) Filter is not required for the supervisory audio tones, signaling tones or wideband data signals.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

POWER INPUT:

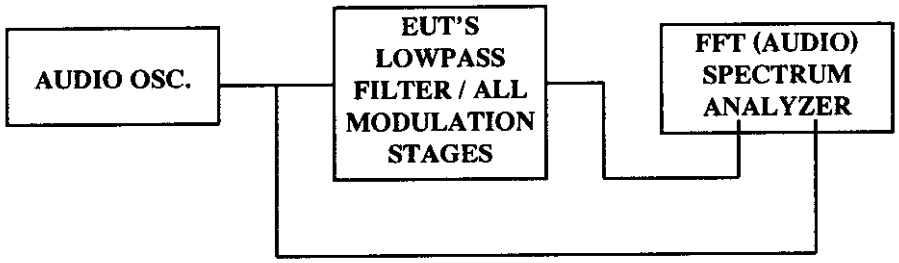
28 Vdc Battery.

TEST EQUIPMENT:

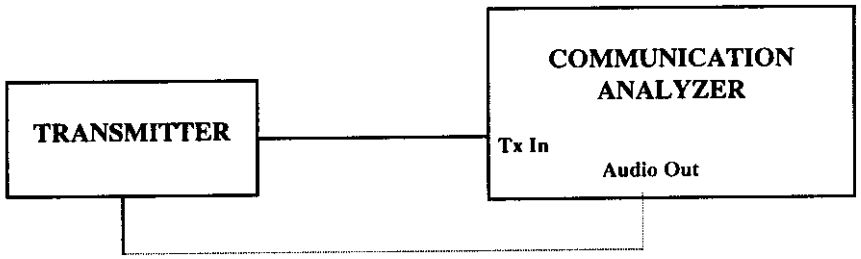
- Audio Oscillator, HP, Model 204C, OUT FREQ.: 0-1.2 MHz, S/N: 0989A08798
- FFT (Audio) Spectrum Analyzer, Advantest, Model R9211E, Input Impedance: 1M-Ohms, Freq. Range: 10 mHz - 100 kHz.
- Communication Analyzer, Rohde & Schawrz, Model SMFO2, S/N: 879988/057, 0.4 - 1000 MHz including AF & RF Signal Generators, SINAD, DISTORTION, DEVIATION meters and etc...

TEST ARRANGEMENT

- **AUDIO FREQUENCY RESPONSE**



- **MODULATION LIMITNG**



TEST RESULTS: Conforms.

TESTED PERSONNEL: Tri M. Luu, P.Eng.

DATE: July 06-7, 1998

MEASUREMENT DATA

Remarks: Since the radio has no audio or data input source, the frequency deviation measurements of RF IN and OUT signals were made for comparison of any variation after translation from RF input to RF output.

(a) **Non-voice modulating signals:-** Not applicbale, no data/voice input signal port is available for this radio translator.

(b) **Modulation Levels:**-. Not applicable, no data/voice input signal port is available for this radio translator.

(c) **Deviation Circuitry:-** Not applicable, no data/voice input signal port is available for this radio translator. The following measurement show no difference of the frequency deviations between input and output rf signals

MODULATION LIMITING FOR DATA TRANSMITTER

FREQ. DEVIATION FOR RF IN SIGNAL RF IN (KHz)	FREQ. DEVIATION FOR RF OUT SIGNAL RF IN (KHz)
0.1	0.2
0.5	0.6
1.0	1.0
2.0	2.0
2.5	2.5
3.0	2.8
4.0	3.8
5.0	4.7
10.0	9.9

MODULATION LIMITING FOR AN AUDIO TRANSMITTER

FREQ. DEVIATION FOR RF IN SIGNAL RF IN (KHz)	FREQ. DEVIATION FOR RF OUT SIGNAL RF IN (KHz)
0.1	0.1
0.5	0.5
1.0	1.0
1.2	1.4
1.5	1.5
2.0	2.1
3.0	2.9
4.0	3.9
10.0	10.3

(d) **Audio Filter Characteristics**:- Not applicable, no data/voice input signal port is available for this radio translator. Characteristics of the demodulated signals of the RF input and RF output were checked and found to be the same as intended.

3.3. EMISSION MASKS @ FCC 22.917

PRODUCT NAME: CHANNEL MODULE (RADIO TRANSLATOR), Model No.: CM800HP

FCC REQUIREMENTS:

FCC Part 22, Subpart H, Para. 22.917

F3E/F3D EMISSION MASK FOR USE WITH AUDIO FILTER @ FCC 22.917(b)		
FCC RULES	FREQUENCY RANGE (kHz)	ATTENUATION LIMIT (dBc)
22.917(b)	Fc-20 to Fc+20	0
	(Fc-45 to Fc-20) & (Fc+20 to Fc+45)	26
	(0 to Fc-45) & (Fc+45 to 10Fc)	60 dB or 43+10logP whichever is less

Alternative F3E/F3D EMISSION MASK FOR USE WITH AUDIO FILTER @ FCC 22.917(c)		
FCC RULES	FREQUENCY RANGE (kHz)	ATTENUATION LIMIT (dBc)
22.917(c)	Fc-12 to Fc+12	0
	(Fc-20 to Fc-12) & (Fc+12 to Fc+20)	117log(fd/12)
	(0 to Fc-20) & (Fc+20 to 10Fc)	100log(fd/11) or 60 dB or 43+10logP whichever is less

F1D EMISSION MASK @ FCC 22.917(d)		
FCC RULES	FREQUENCY RANGE (kHz)	ATTENUATION LIMIT (dBc)
22.917(b)	Fc-20 to Fc+20	0
	(Fc-45 to Fc-20) & (Fc+20 to Fc+45)	26
	(Fc-90 to Fc-45) & (Fc+45 to Fc+90)	45
	(0 to Fc-90) & (Fc+90 to 10Fc)	60 dB or 43+10logP whichever is less

CLIMATE CONDITION: Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

POWER INPUT: 28 Vdc Battery.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Bird Attenuator, 50 Ohm IN/OUT
- Audio Oscillator, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.

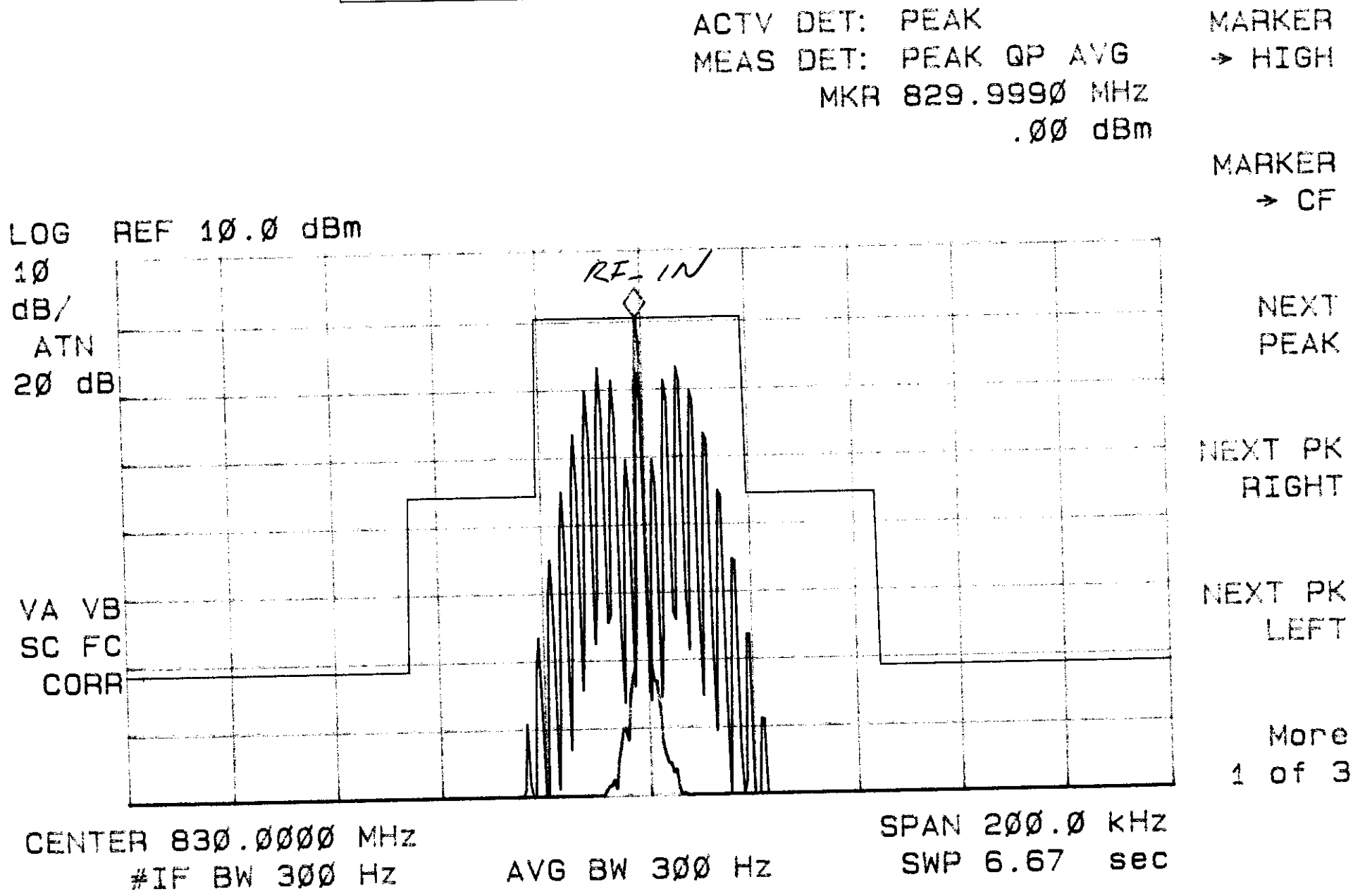
UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 2.5 KHz Sine Wave Signal, Freq. Dev.: 12 KHz

Tested by: Tri Luu

17:59:57 JUL 13, 1998

RF IN SIGNAL

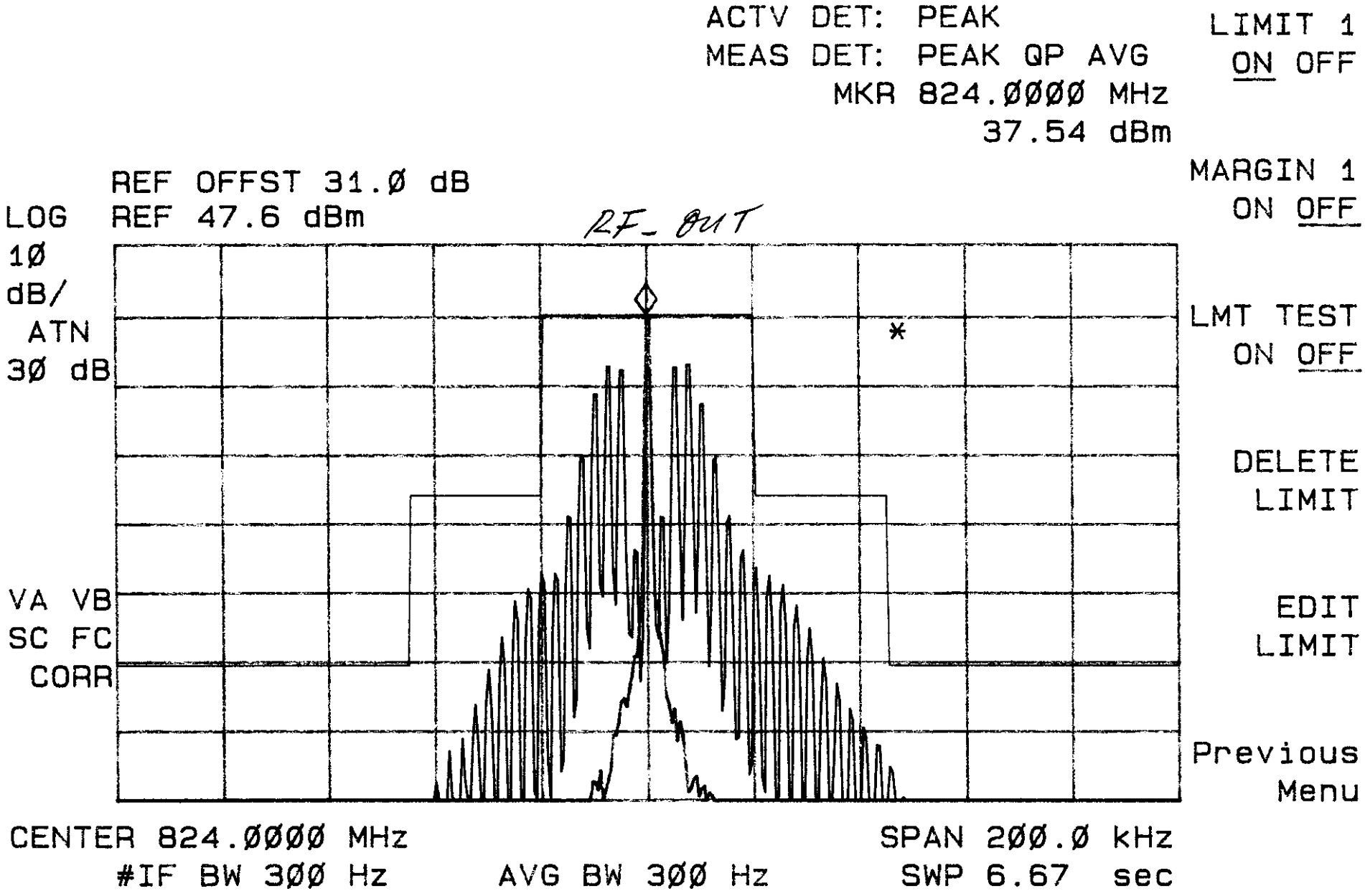


UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 2.5 kHz Sine Wave Signal, Freq. Dev.: 12 KHz
RF OUT @ Freq.: 824 MHz, RF Ouput Power: 7 Watts
Modulation: Same as RF IN signal

Date: July 13/98
Tested by: Tri Luu

16:20:35 JUL 13, 1998

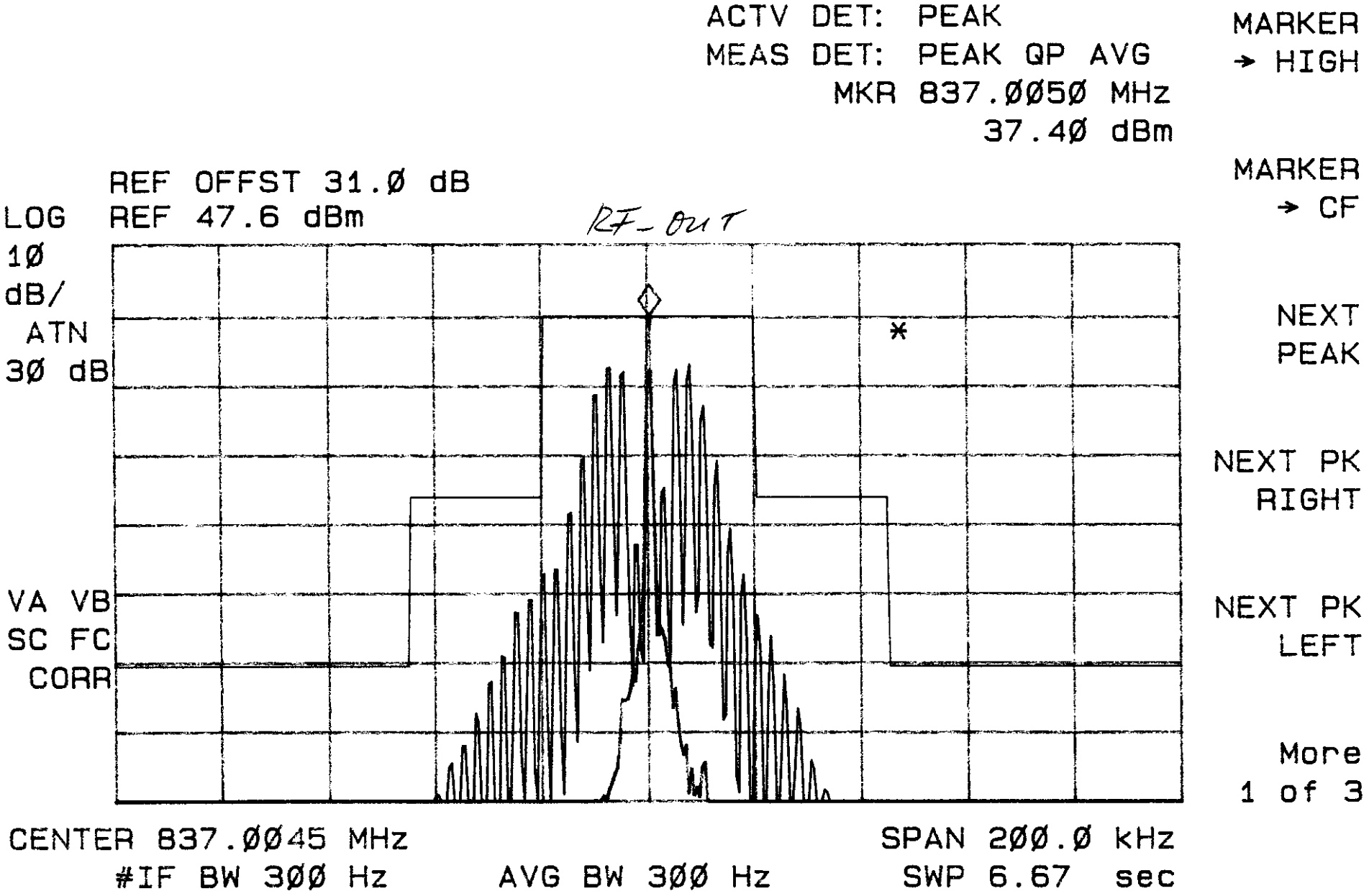


UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 2.5 kHz Sine Wave Signal, Freq. Dev.: 12 KHz
RF OUT Freq.: 837.0045 MHz, RF Ouput Power: 6 Watts
Modulation: Same as RF IN signal

Date: July 13/98
Tested by: Tri Luu

16. 52. 39 JUL 13, 1998
HP



UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 2.5 kHz Sine Wave Signal, Freq. Dev.: 12 KHz
RF OUT: Freq.: 851 MHz, RF Ouput Power: 1 Watts
Modulation: Same as RF IN signal

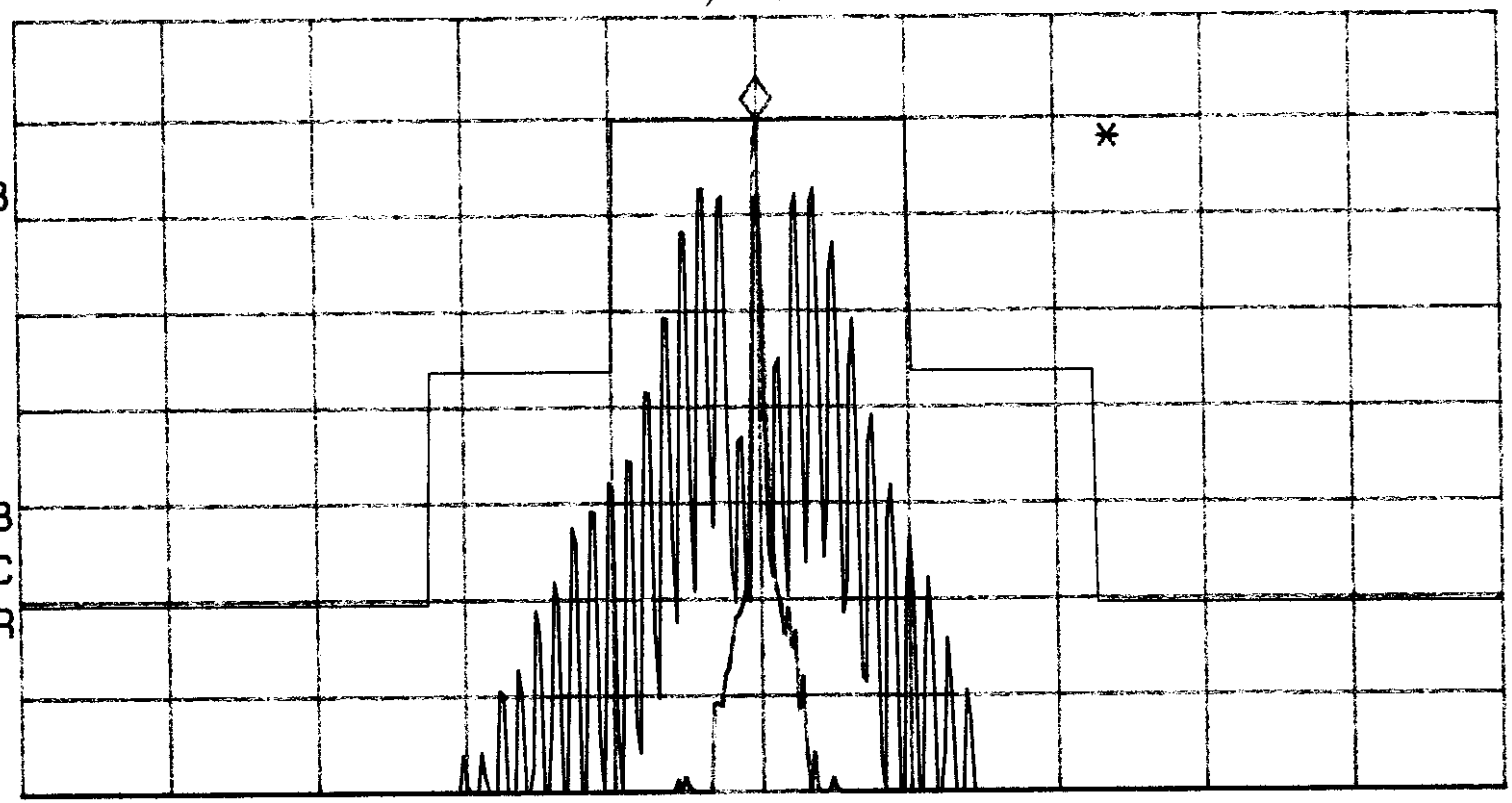
Tested by: Tri Luu

16: 59: 30 JUL 13, 1998

HP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 850.9995 MHz
36.98 dBm

REF OFFST 31.0 dB
LOG REF 47.6 dBm
RF_OUT
10 dB/
ATN 30 dB



VA VB
SC FC
CORR

MARKER → HIGH
MARKER → CF
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 3

CENTER 850.9995 MHz
#IF BW 300 Hz
AVG BW 300 Hz
SPAN 200.0 kHz
SWP 6.67 sec

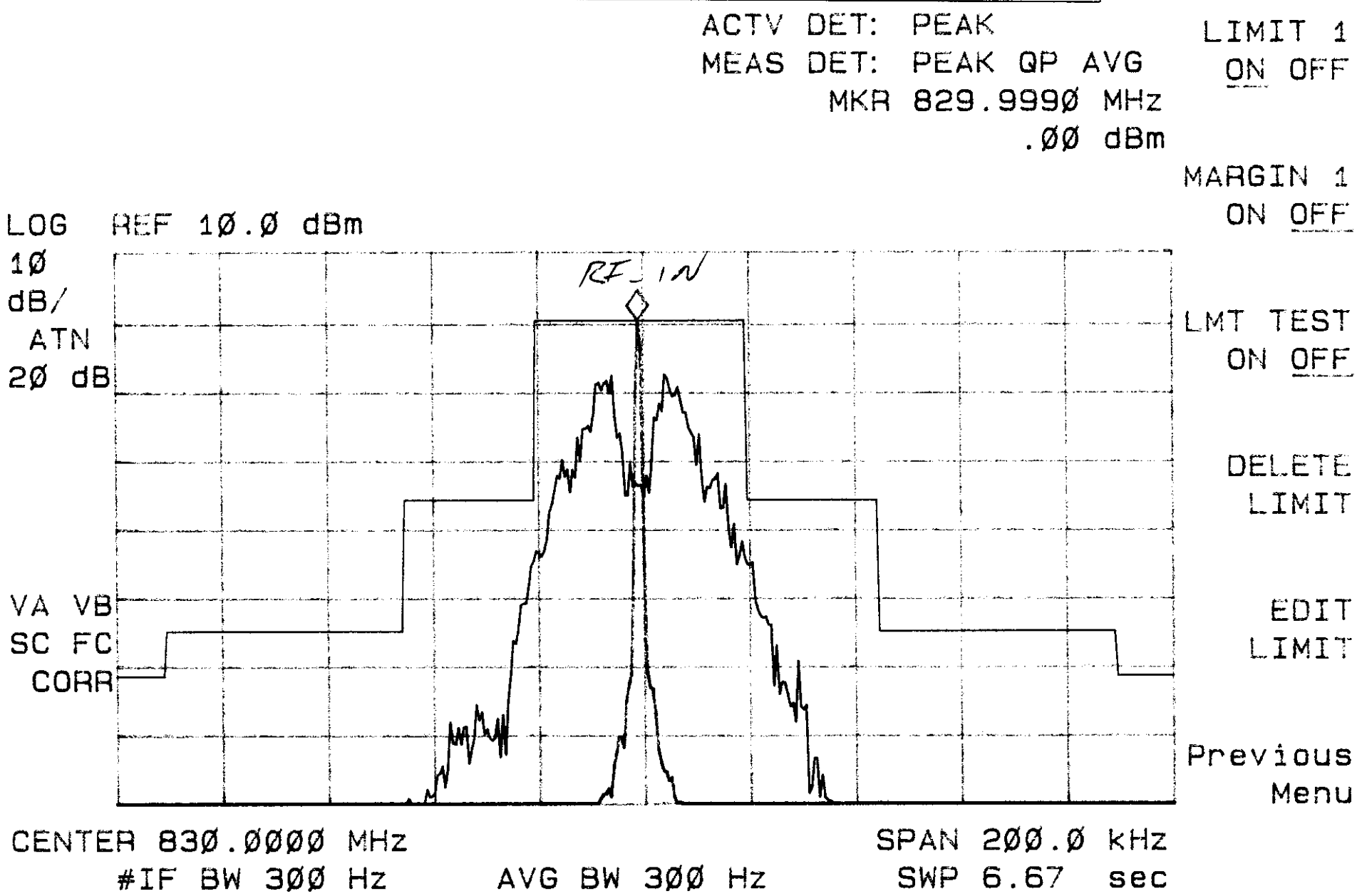
UltraTech
Engineering Labs Inc.

17:54:14 JUL 13, 1998

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 9600 b/s randon data, Freq. Dev.: 12 KHz

RF IN SIGNAL

Date: July 13/98
Tested by: Tri Luu

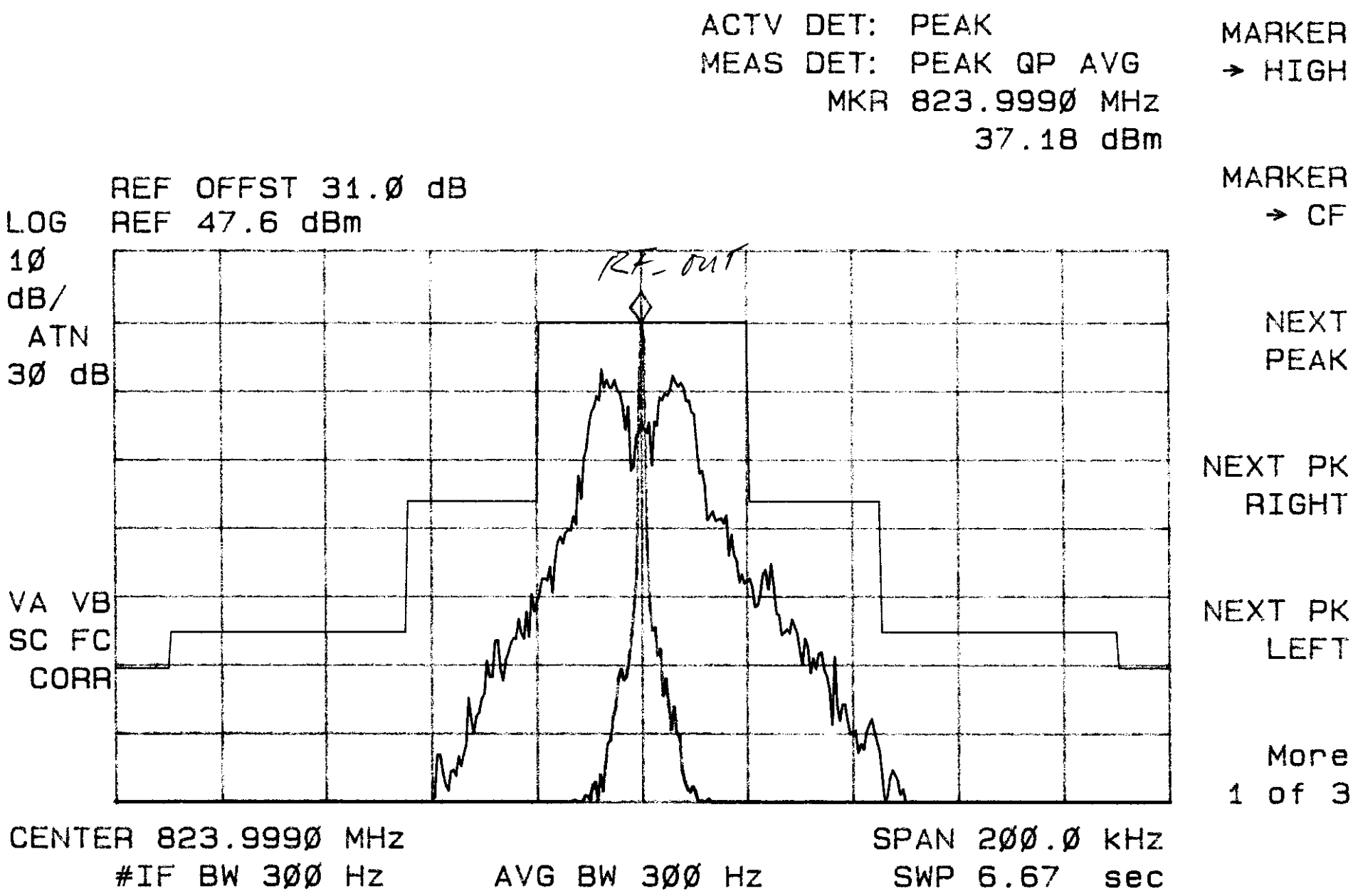


UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 9600 b/s randon data, Freq. Dev.: 12 KHz
RF OUT: Freq.: 824 MHz, RF Ouput Power: 7.0 Watts
Modulation: Same as RF IN signal

Date: July 13/98
Tested by: Tri Luu

17:42:49 JUL 13, 1998



UltraTech
Engineering Labs Inc.

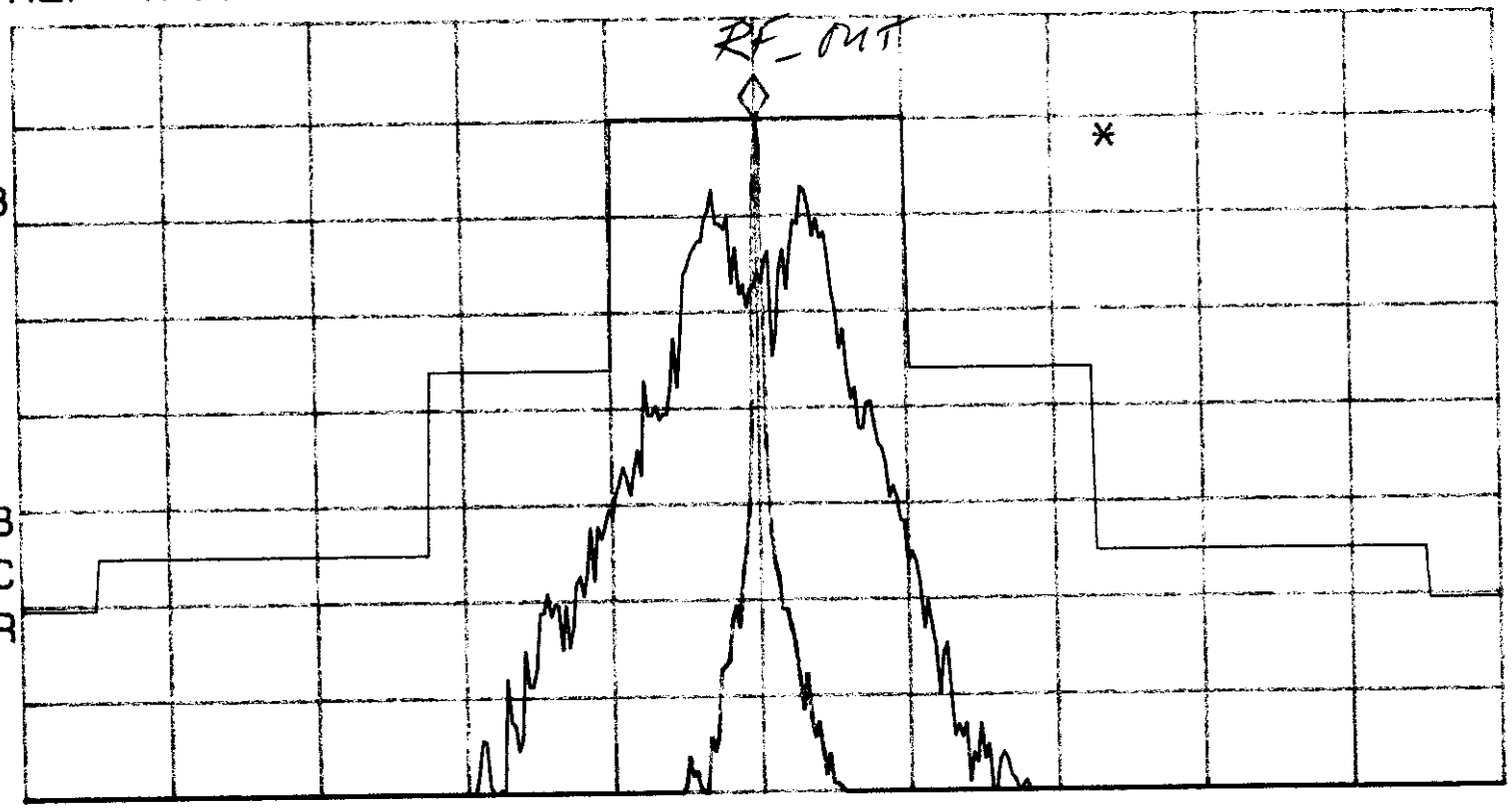
17: 28: 10 JUL 13, 1998

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 9600 b/s randon data, Freq. Dev.: 12 KHz
RF OUT: Freq.: 837.005 MHz, RF Ouput Power: 6.0 Watts
Modulation: Same as RF IN signal

Tested by: Tri Luu

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 837.ØØ4Ø MHz
37.28 dBm

REF OFFST 31.Ø dB
LOG REF 47.6 dBm
1Ø dB/
ATN 3Ø dB



VA VB
SC FC
CORR

MARKER → HIGH
MARKER → CF
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 3

CENTER 837.ØØ4Ø MHz
#IF BW 3ØØ Hz
AVG BW 3ØØ Hz
SPAN 2ØØ.Ø kHz
SWP 6.67 sec

UltraTech
Engineering Labs Inc

17:19:32 JUL 13, 1998

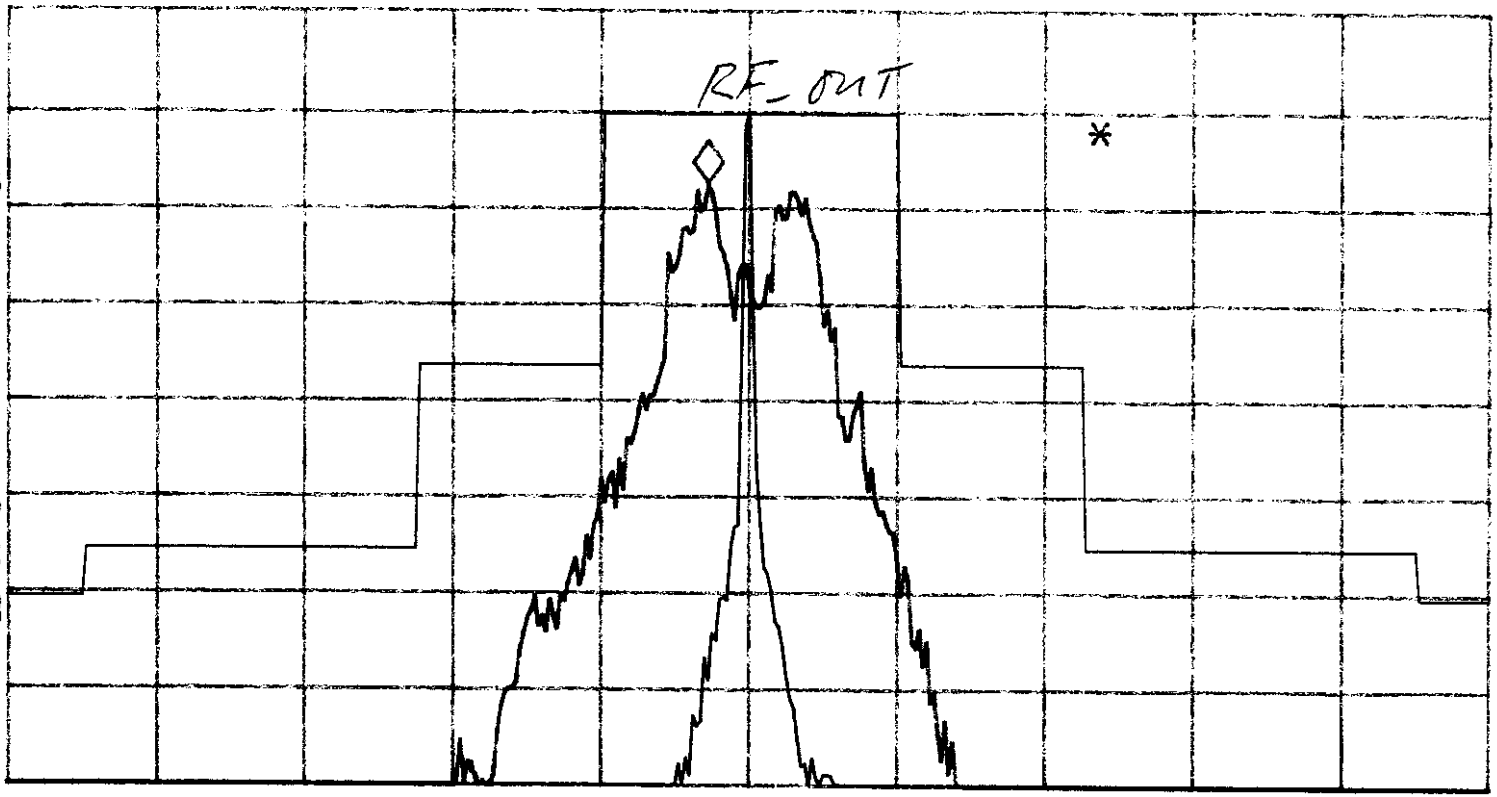
FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
RF IN: 0 dBm @ 830 MHz, FM modulated with 9600 b/s randon data, Freq. Dev.: 12 KHz
RF OUT Freq.: 851 MHz, RF Ouput Power: 5.7 Watts
Modulation: Same as RF IN signal

Date: July 13/98
Tested by: Tri Luu

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 85Ø.994Ø MHz
29.82 dBm

LIMIT 1
ON OFF

REF OFFST 31.Ø dB
LOG REF 47.6 dBm
1Ø dB/
ATN 3Ø dB



MARGIN 1
ON OFF

LMT TEST
ON OFF

DELETE
LIMIT

VA VB
SC FC
CORR

EDIT
LIMIT

Previous
Menu

CENTER 85Ø.9995 MHz
SPAN 2ØØ.Ø kHz
#IF BW 3ØØ Hz
AVG BW 3ØØ Hz
SWP 6.67 sec

METHOD OF MEASUREMENTS: @ FCC CFR 47, Para. 22.917(h)

The following spectrum analyzer bandwidth settings should be used for measurement of spurious emissions:

(1) When operating in the radiotelephony mode or the supervisory audio tone mode:

- For any emission not more than 45 kHz removed from the carrier frequency: 300 Hz
- For any emission more than 45 kHz removed from the carrier frequency: 30 kHz

(2) When operating in the wideband data mode or signaling tone mode:

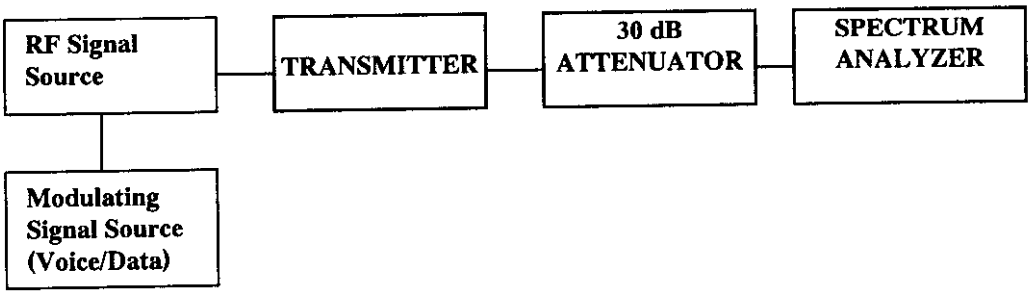
- For any emission not more than 60 kHz removed from the carrier frequency: 300 Hz
- For any emission more than 60 kHz removed from the carrier frequency: 30 kHz

Since this radio translator has no voice or data inputs/outputs and the RF output spectrum is designed to have the same characteristics with the RF input signal but its center frequency and power level, the comparison test was performed between the input and output signal.

RF INPUT SIGNAL:- The RF-IN connector (SMA) was connected to a RF signal source. The RF signal was adjusted to provide the maximum RF input signal rated by the manufacturer (0 dBm) at 830.0 MHz. This RF-IN signal was FM modulated as follows:

- **For Voice Operation (F3E)**: FM modulated with 2.5 kHz Sine Wave signal, this modulating signal is adjusted to provide ±12 kHz frequency deviation.
- **For Data Operation (F1D)**: FM modulated with a 9600 b/s random data source, this modulating signal is adjusted to provide ±12 kHz frequency deviation.

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TESTED PERSONNEL: Tri M. Luu, P.Eng.

DATE: July 09, 1998

MEASUREMENT DATA
The RF-OUT signal was found to have the same characteristics with RF-IN signal. *Please see attached plots for detailed measurements.*

3.4. OUT-OF-BAND EMISSIONS (TRANSMITTER ANTENNA CONDUCTED POWER SPURIOUS/HARMONIC) @ FCC 22.917(E)

PRODUCT NAME: **CHANNEL MODULE (RADIO TRANSLATOR), Model No.: CM800HP**

FCC REQUIREMENTS:

FCC Part 22, Subpart H, Para. 22.917(e)

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by: 43+10log(P) dB or –13 dBm.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

POWER INPUT:

28 Vdc Battery.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Bird Attenuator, 50 Ohm IN/OUT
- Hihpass Filter, Microphase, P/N: CR220HIB, S/N: IITI11000AB, cut-off freq.: 600 MHz.
- Audio Oscillator, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.

METHOD OF MEASUREMENTS:

The following spectrum analyzer bandwidth settings should be used for measurement of spurious emissions:

(3) When operating in the radiotelephony mode or the supervisory audio tone mode:

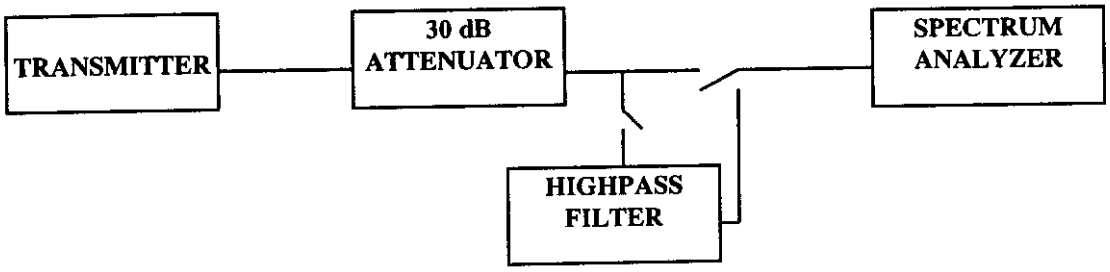
- For any emission not more than 45 kHz removed from the carrier frequency: 300 Hz
- For any emission more than 45 kHz removed from the carrier frequency: 30 kHz (at least)

(4) When operating in the wideband data mode or signaling tone mode:

- For any emission not more than 60 kHz removed from the carrier frequency: 300 Hz
- For any emission more than 60 kHz removed from the carrier frequency: 30 kHz (at least)

Voice & Data FM Modulation:- Same as Sec. 3.3 of this report

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TESTED PERSONNEL: Tri M. Luu, P.Eng.

DATE: July 07, 1998

MEASUREMENT DATA

SPURIOUS & HARMONIC EMISSIONS AT THE TRANSMITTER ANTENNA TERMINAL

TEST CONFIGURATION

- *The transmitter was coupled to the Spectrum Analyzer through a 30 dB attenuator.*
- *The insertion loss between the transmitter output terminal and the spectrum analyzer was measured to be 31 dB*
- *The channel frequencies (Low, Middle and High) was established on the extreme edges of the operating band, both upper and lower at its full rated output power. The emissions was investigated up to the tenth harmonic of the fundamental emissions in each case.*

Fundamental Frequency: 824 .000 MHz
RF Output Power: 7.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF LEVEL 100 kHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1648.0	-27.1	-13.0	-14.1	PASS
2472.0	-27.2	-13.8	-13.4	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 837.005 MHz
RF Output Power: 6.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF LEVEL 100 kHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2511.0	-27.1	-13.8	-13.3	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 851.000 MHz
RF Output Power: 5.7 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	RF LEVEL 100 kHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2553.0	-24.8	-13.8	-11.0	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 824.000 MHz
RF Output Power: 7.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 9600 b/s random data source.

FREQUENCY (MHz)	RF LEVEL 100 kHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
1648.0	-27.0	-13.0	-14.0	PASS
2472.0	-26.4	-13.8	-12.6	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 837.005 MHz
RF Output Power: 6.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 9600 b/s random data source.

FREQUENCY (MHz)	RF LEVEL 100 kHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2511.0	-26.9	-13.8	-13.1	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 851.000 MHz
RF Output Power: 5.7 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 9600 b/s random data source.

FREQUENCY (MHz)	RF LEVEL 100 kHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2553.0	-24.3	-13.8	-10.5	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 824 MHz, Measured RF Output @ Antenna: 7.0 Watts
Modulation: RF IN at max. level of 0 dBm FM modulated with 2.5 kHz Sine Wave, ± 4 kHz Freq. Dev.

Date: July 07 1998
Tested by: Tri Luu

16: 36: 52 JUL 07, 1998

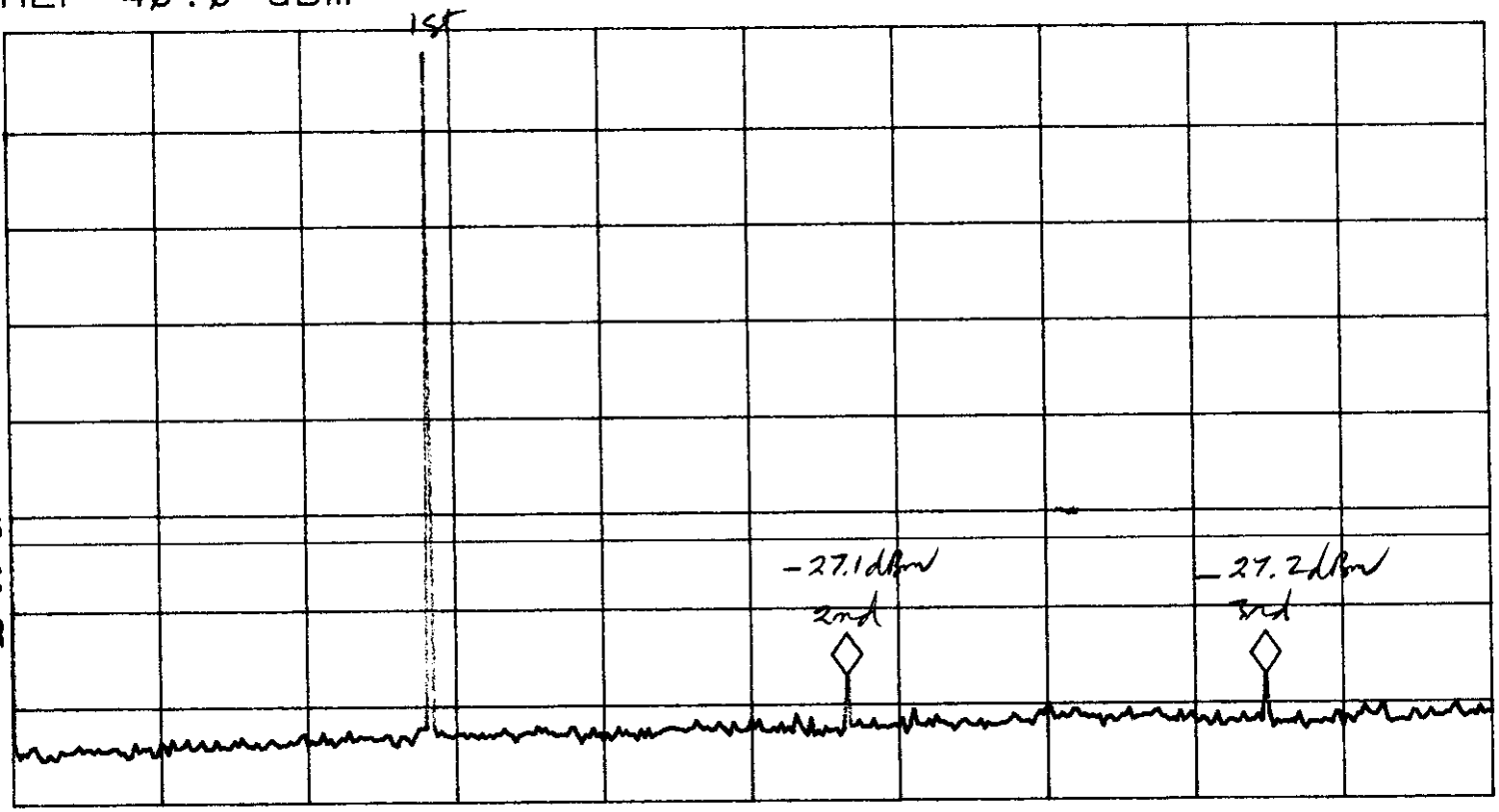
hp

MARKER
1.655 GHz
-27.13 dBm

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.655 GHz
-27.13 dBm

MARKER
NORMAL

REF OFFST 31.Ø dB
LOG REF 4Ø.Ø dBm
1Ø
dB/
ATN
2Ø dB



MARKER
△

MARKER
AMPTD

SELECT
1 2 3 4

VA SB
SC FC
CORR

MARKER 1
ON OFF

More
1 of 3

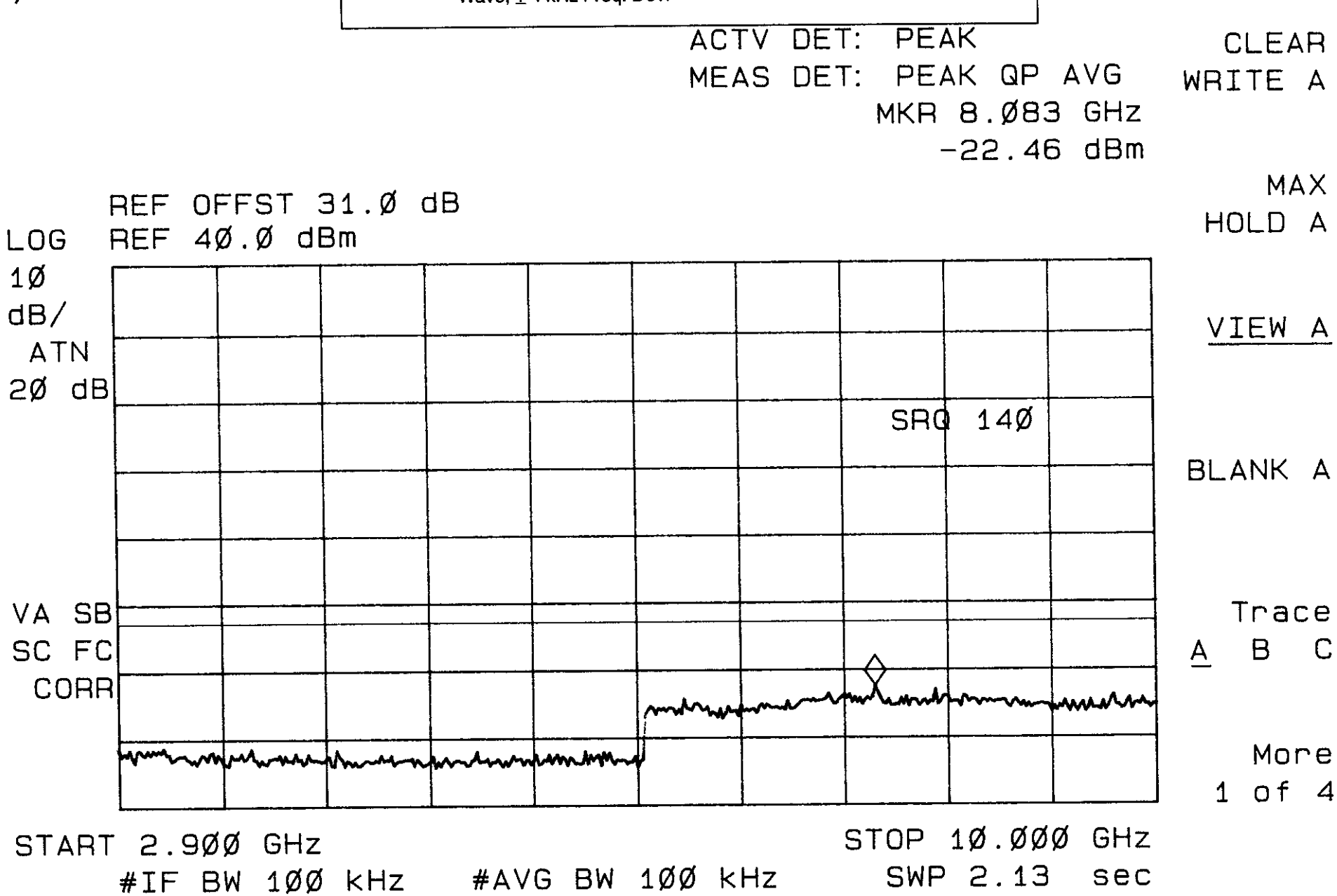
START 1Ø MHz
#IF BW 1ØØ kHz
#AVG BW 1ØØ kHz
STOP 2.921 GHz
SWP 873 msec

UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 1990824 MHz, Measured RF Output @ Antenna: 7.0 Watts
Modulation: RF IN at max. level of 0 dBm FM modulated with 2.5 kHz Sine Wave, ± 4 kHz Freq. Dev.

Date: July 07 11/98
Tested by: Tri Luu

16. 40. 49 JUL 07, 1998

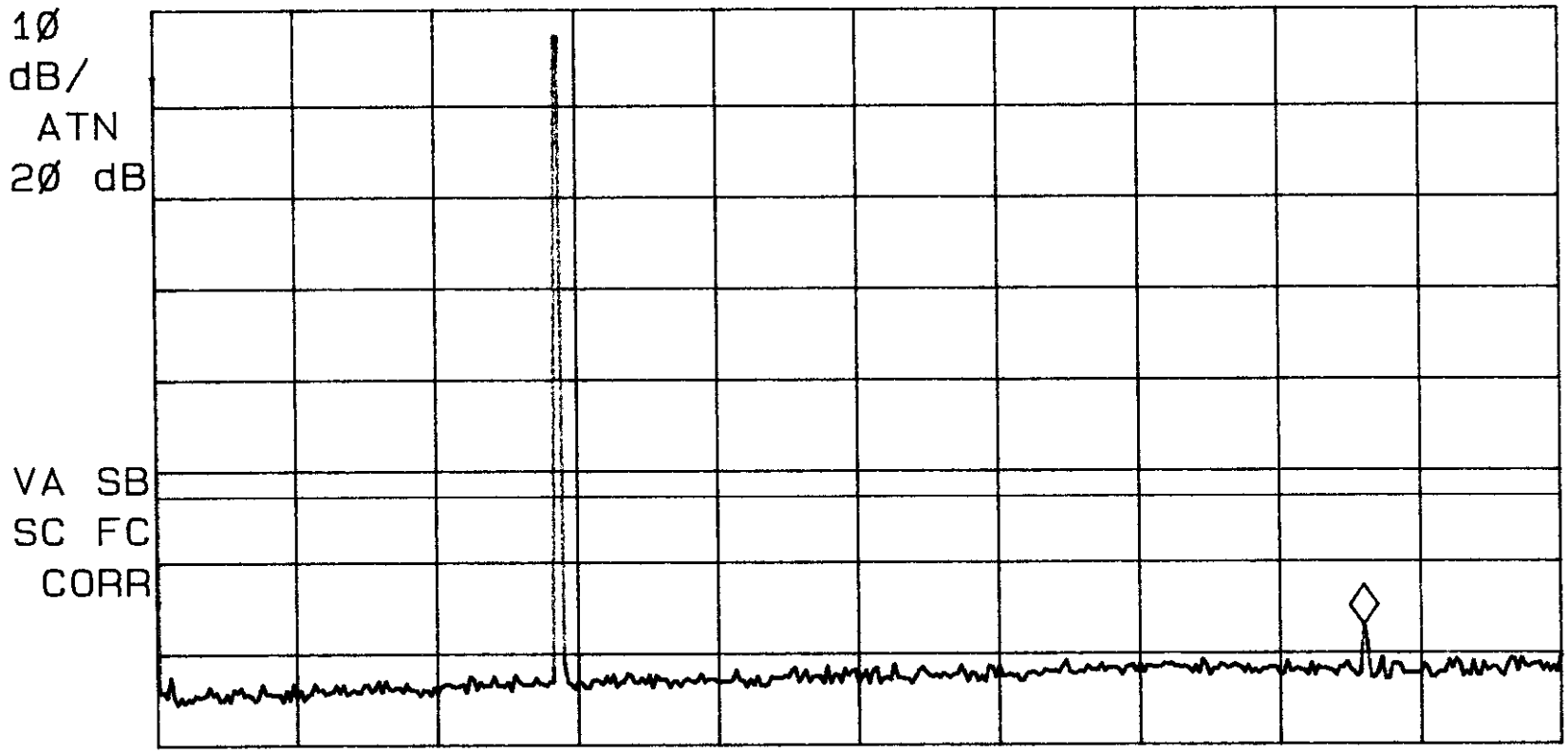


UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 837.005 MHz, Measured RF Output @ Antenna: 6.0 Watts
Modulation: RF IN at max. level of 0 dBm FM modulated with 2.5 kHz Sine Wave, ± 4 kHz Freq. Dev.

Date: July 07 1998
Tested by: Tri Luu

16:55:08 JUL 07, 1998



CLEAR
WRITE A

MAX
HOLD A

VIEW A

BLANK A

Trace
A B C

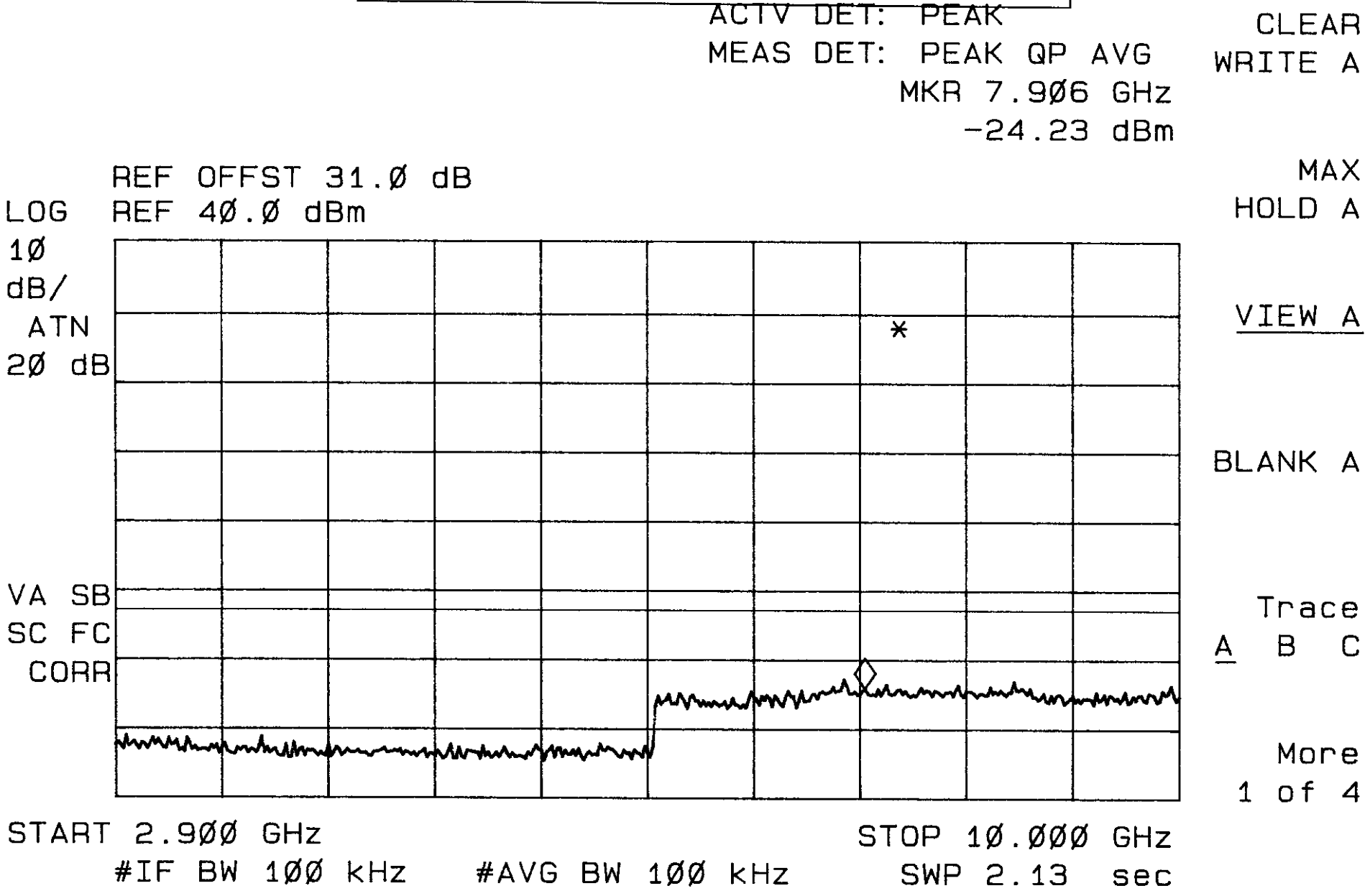
More
1 of 4

UltraTech
Engineering Labs Inc.

16. 52. 27 JUL 07, 1998

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq @ 837.005 MHz, Measured RF Output @ Antenna: 6.0 Watts
Modulation: RF IN at max. level of 0 dBm FM modulated with 2.5 kHz Sine Wave, ± 4 kHz Freq. Dev.

Date: July 07 11/98
Tested by: Tri Luu



UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 1998857 MHz, Measured RF Output @ Antenna: 5.7 Watts
Modulation: RF IN at max. level of 0 dBm FM modulated with 2.5 kHz Sine Wave, ± 4 kHz Freq. Dev.

Date: July 07 11/98
Tested by: Tri Luu

17. 03. 37 JUL 07. 1998

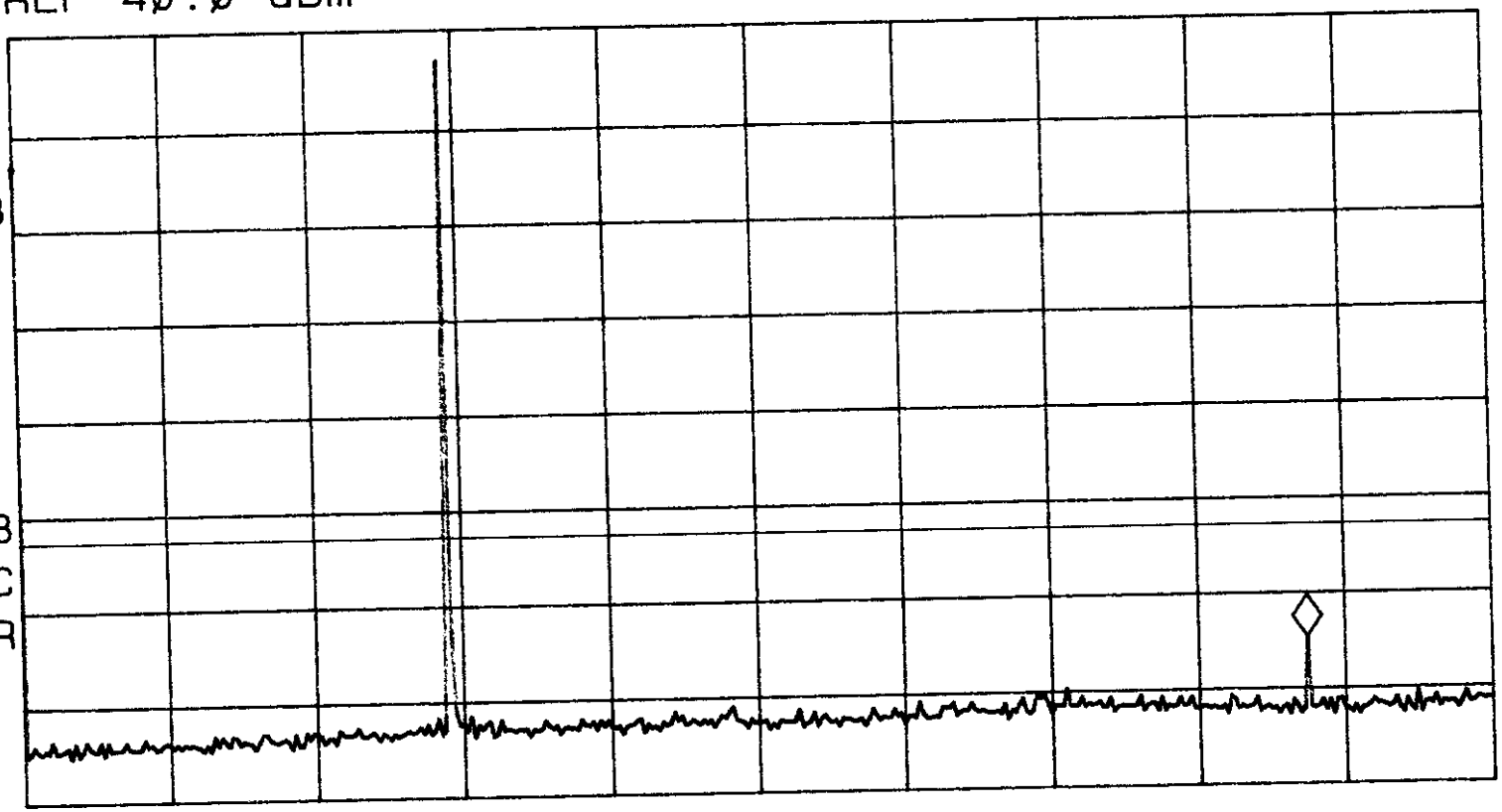
hp

SWEEPTIME
873 msec

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.557 GHz
-24.77 dBm

No user Menu

REF OFFST 31.Ø dB
LOG REF 4Ø.Ø dBm
1Ø dB/
ATN 2Ø dB



VA SB
SC FC
CORR

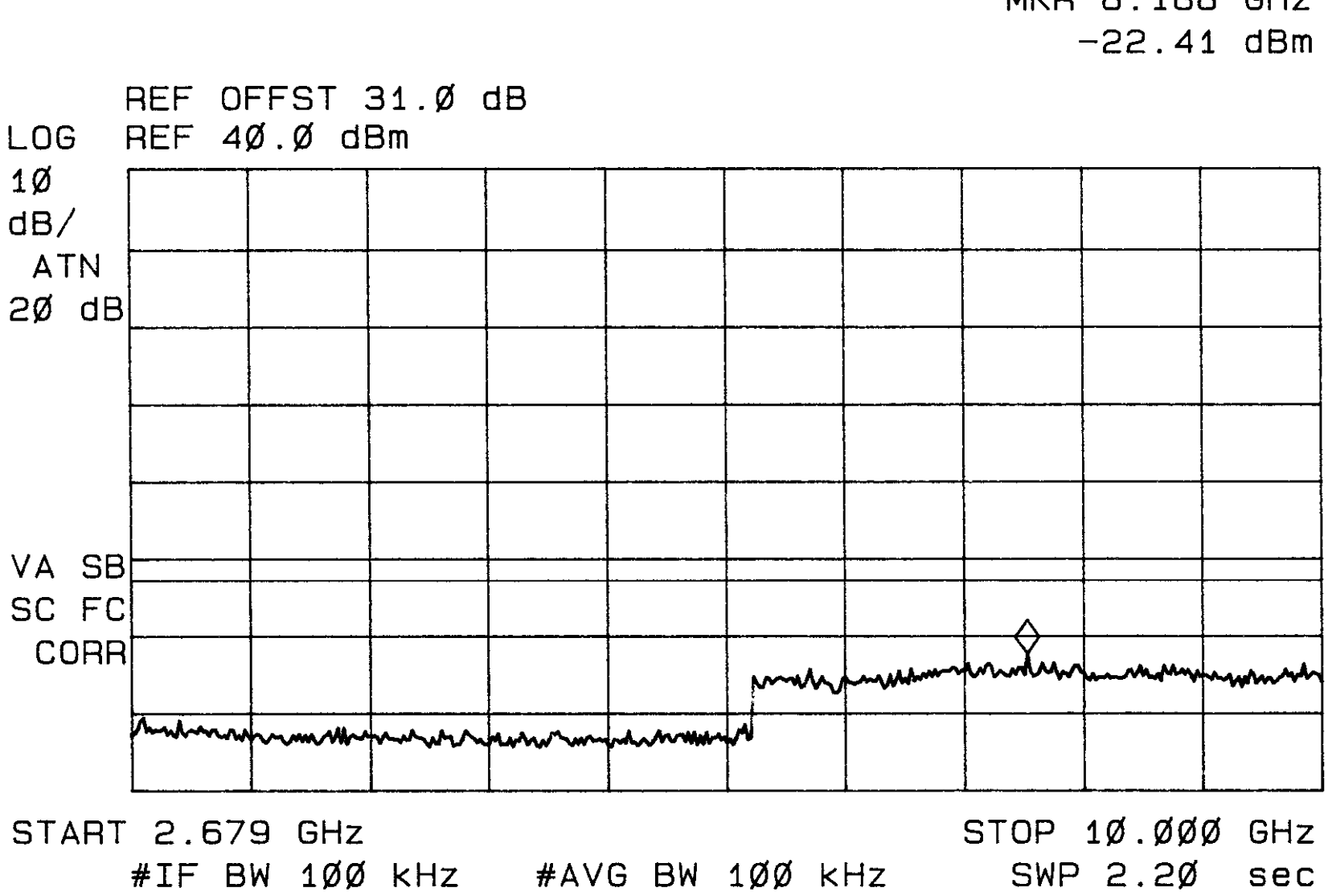
START 1Ø MHz
#IF BW 1ØØ kHz
#AVG BW 1ØØ kHz
STOP 2.921 GHz
SWP 873 msec

UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq.: 851 MHz, Measured RF Output @ Antenna: 5.7 Watts
Modulation: RF IN at max. level of 0 dBm FM modulated with 2.5 kHz Sine Wave, ± 4 kHz Freq. Dev.

Date: July 07/11/98
Tested by: Tri Luu

17:09:17 JUL 07 1998



UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq 824 MHz, Measured RF Output @ Antenna: 7.0 Watts
Modulation: Modulation: [ ] RF IN at max. level of 0 dBm FM modulated with 9600 b/s random data.

Date: July 07 11/98
Tested by: Tri Luu

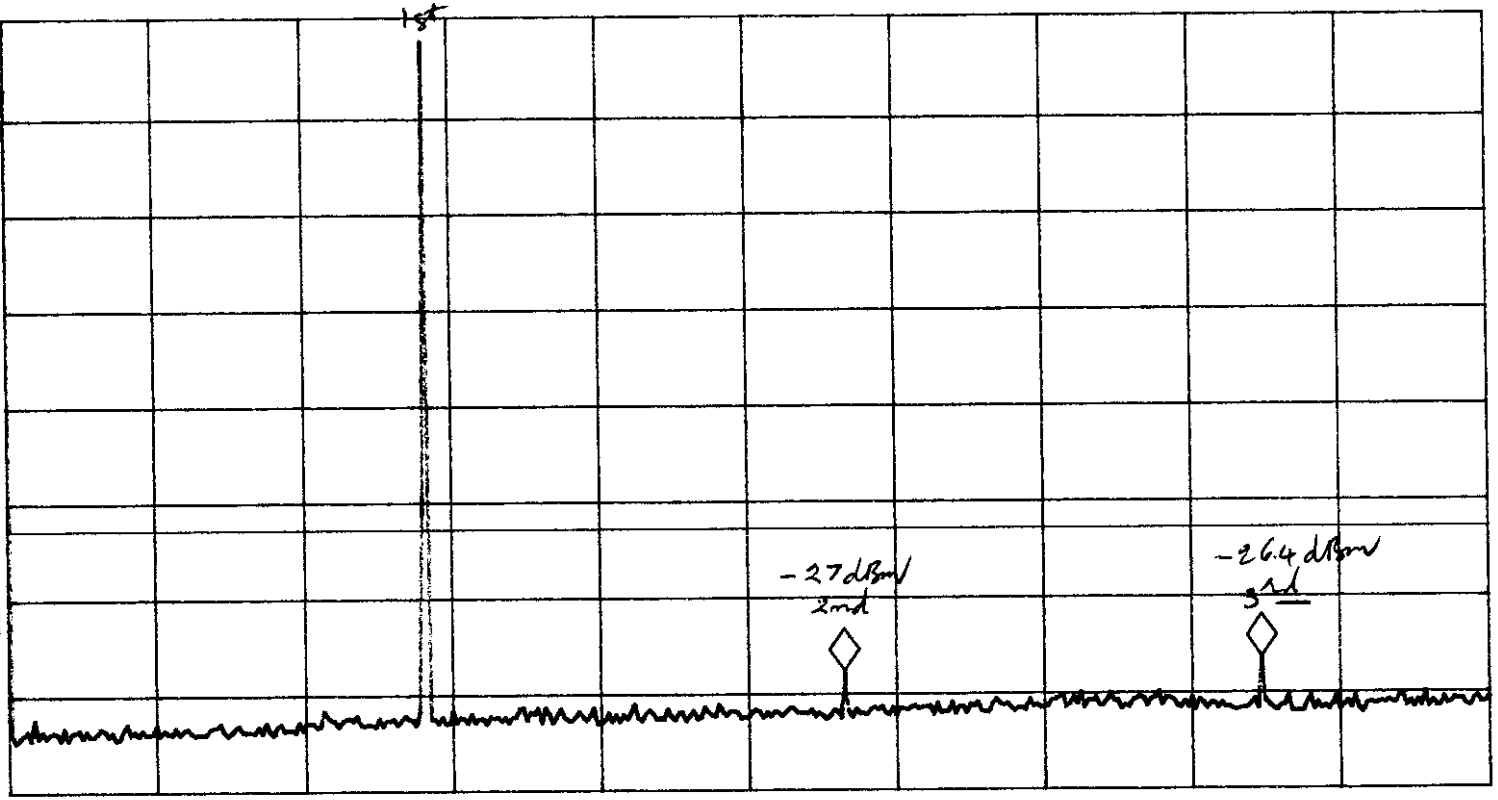
16. 32. 48 JUL 07, 1998

MARKER
2.477 GHz
-26.39 dBm

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.477 GHz
-26.39 dBm

MARKER
NORMAL

REF OFFST 31.Ø dB
LOG REF 4Ø.Ø dBm
1Ø dB/
ATN 2Ø dB



MARKER
△

MARKER
AMPTD

SELECT
1 2 3 4

VA SB
SC FC
CORR

MARKER 2
ON OFF

More
1 of 3

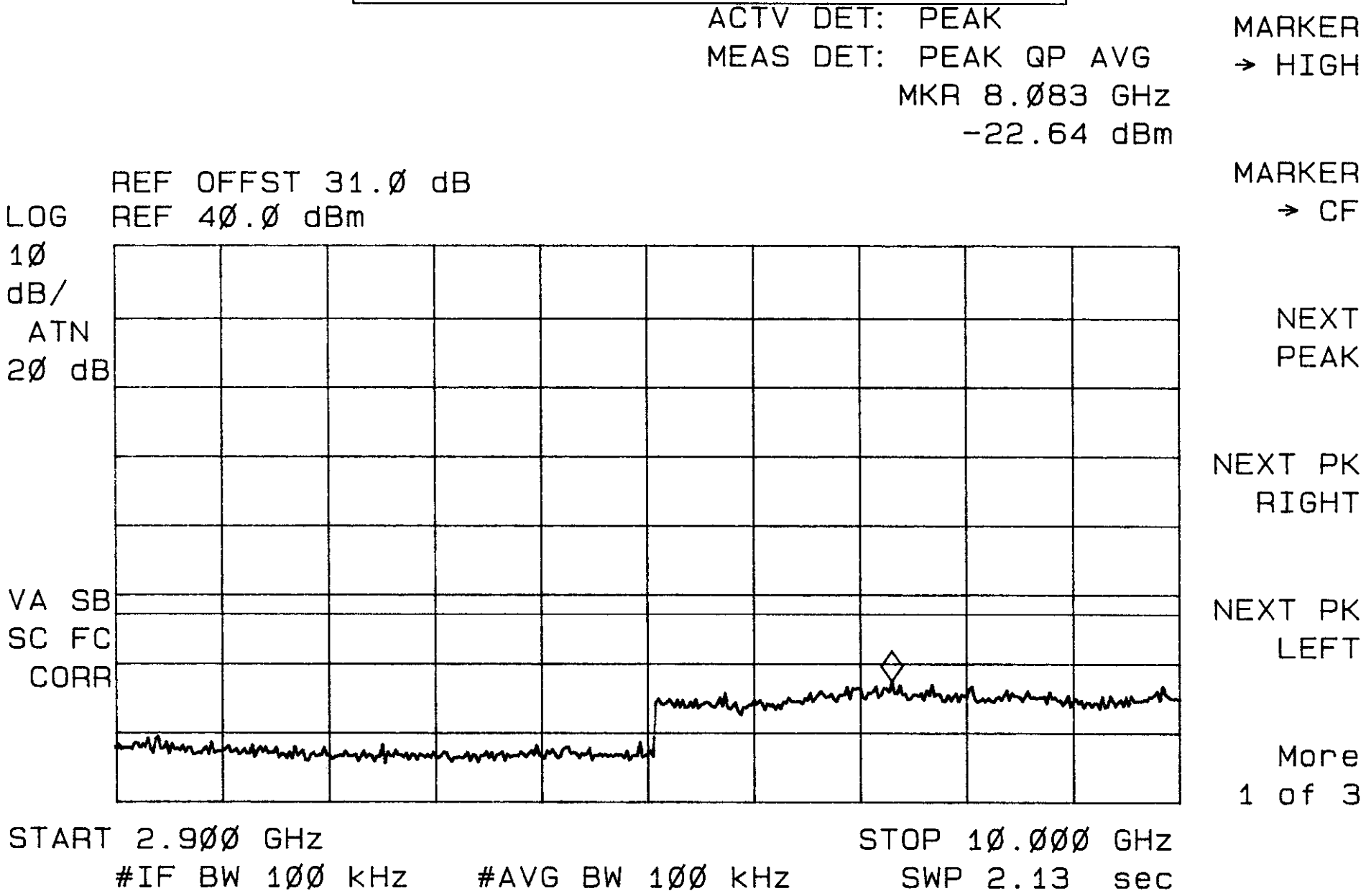
START 1Ø MHz
#IF BW 1ØØ kHz
#AVG BW 1ØØ kHz
STOP 2.921 GHz
SWP 873 msec

UltraTech
Engineering Labs Inc.

16:47:20 JUL 07, 1998

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 824 MHz, Measured RF Output @ Antenna: 7.0 Watts
Modulation: Modulation: [ ] RF IN at max. level of 0 dBm FM modulated with 9600 b/s random data.

Date: July 07 11/98
Tested by: Tri Luu

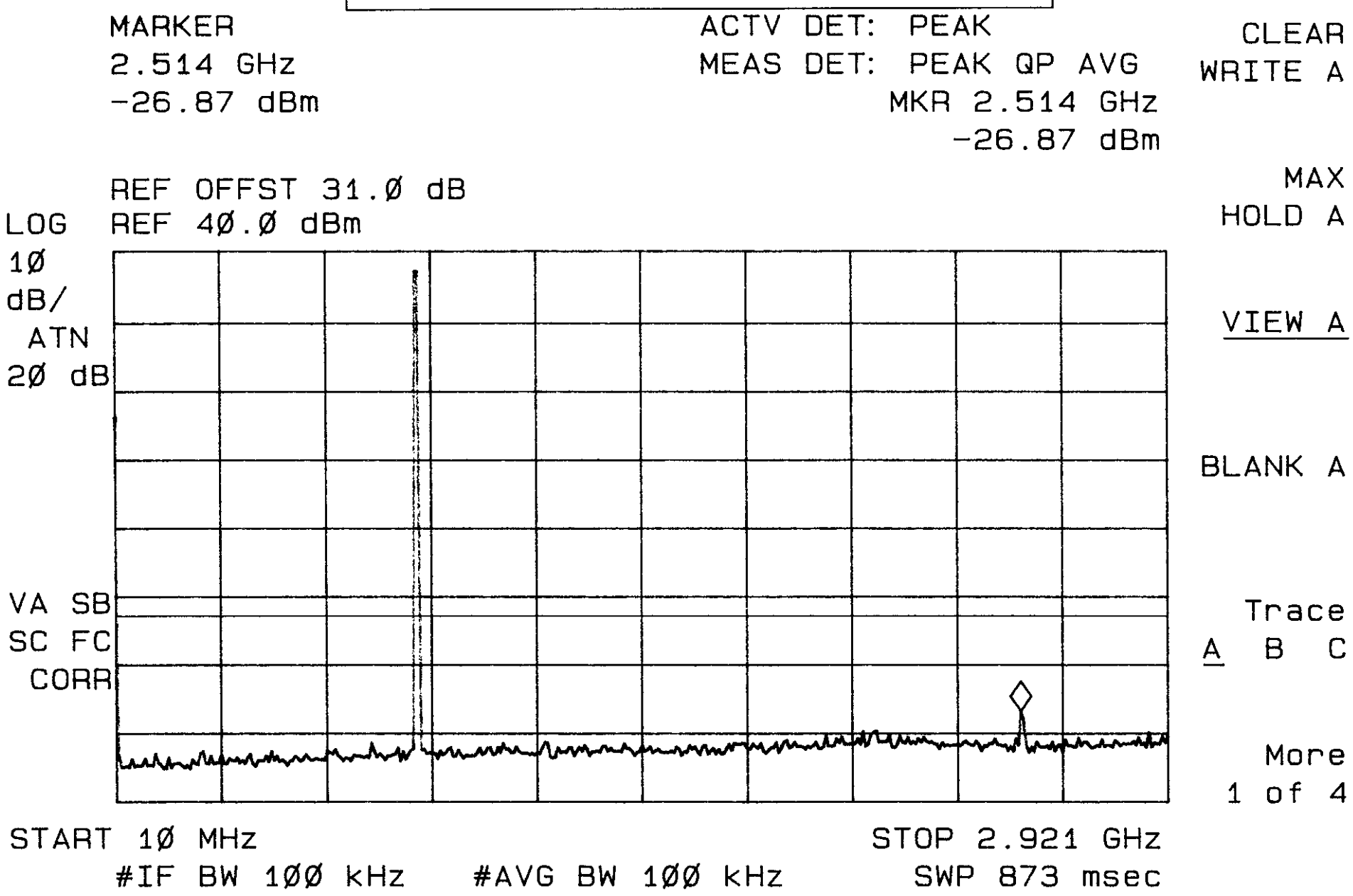


UltraTech
Engineering Labs Inc.

16:37:18 JUL 07, 1998

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 637.005 MHz, Measured RF Output @ Antenna: 6.0 Watts
Modulation: Modulation: [ ] RF IN at max. level of 0 dBm FM modulated with 9600 b/s random data.

Date: July 07 11/98
Tested by: Tri Luu

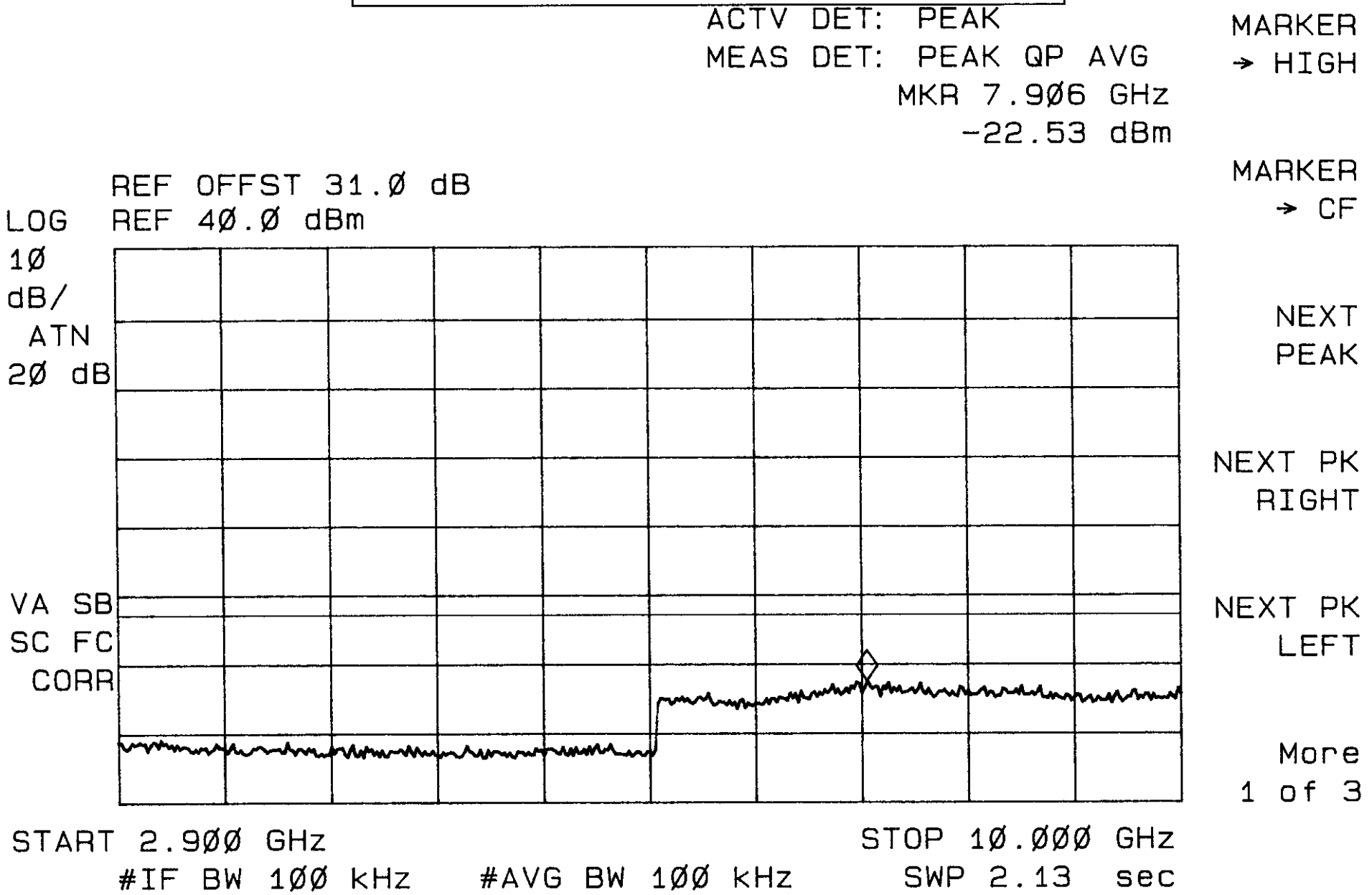


UltraTech
Engineering Labs Inc.

16:30:21 JUL 07, 1998

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 837.005 MHz, Measured RF Output @ Antenna: 6.0 Watts
Modulation: Modulation: [ ] RF IN at max. level of 0 dBm FM modulated with 9600 b/s random data.

Date: July 7 11/98
Tested by: Tri Luu



UltraTech
Engineering Labs Inc.

17:01:31 JUL 07, 1998

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 851 MHz, Measured RF Output @ Antenna: 5.7 Watts
Modulation: Modulation: [ ] RF IN at max. level of 0 dBm FM modulated with 9600 b/s random data.

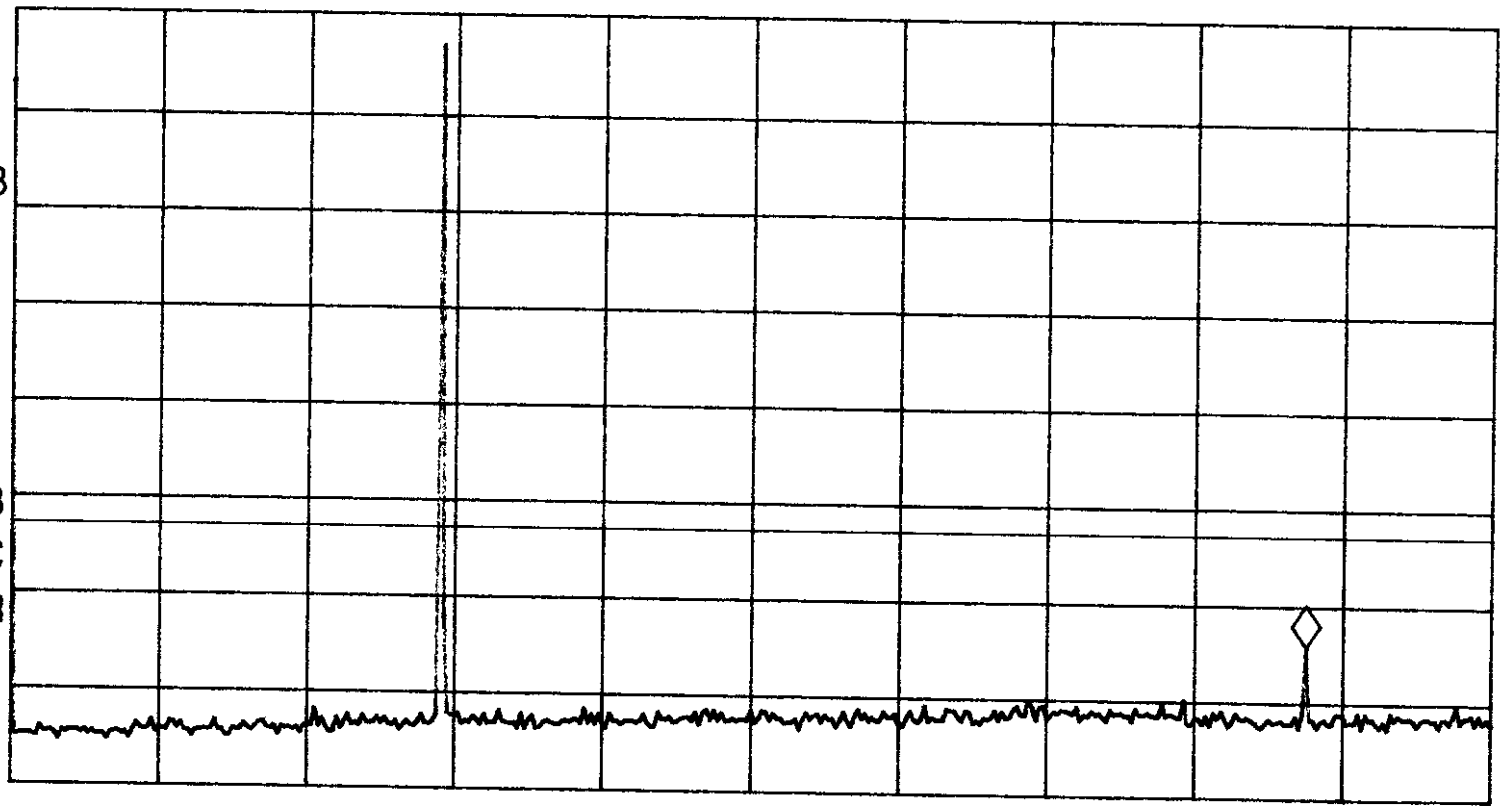
Date: July 07 11/98
Tested by: Tri Luu

MARKER
2.557 GHz
-24.29 dBm

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.557 GHz
-24.29 dBm

No user Menu

REF OFFST 31.Ø dB
LOG REF 4Ø.Ø dBm
1Ø dB/
ATN 2Ø dB



VA SB
SC FC
CORR

START 1Ø MHz
#IF BW 1ØØ kHz
#AVG BW 1ØØ kHz
STOP 2.921 GHz
SWP 873 msec

UltraTech
Engineering Labs Inc.

FUTURECOM SYSTEMS GROUP INC.
CHANNEL MODULE (RADIO TRANSLATOR), MODEL CM800HP
Tx Freq: 1998.857 MHz, Measured RF Output @ Antenna: 5.07 Watts
Modulation: Modulation: [ ] RF IN at max. level of 0 dBm FM modulated with 9600 b/s random data.

Date: July 07 11/98
Tested by: Tri Luu

17:07:02 JUL 07, 1998

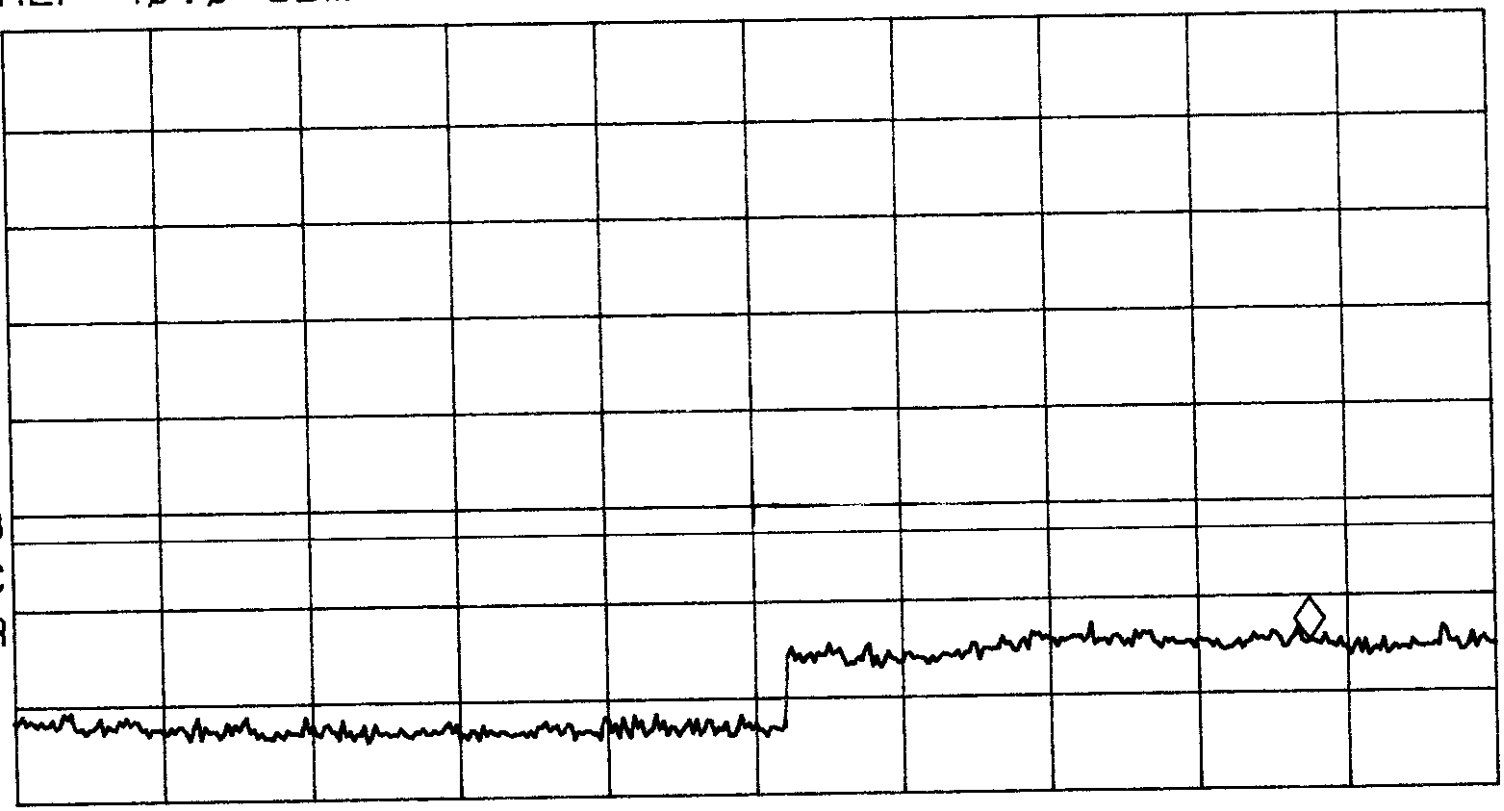
hp

STOP
10.000 GHz

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.085 GHz
-24.78 dBm

No user Menu

REF OFFST 31.0 dB
LOG REF 40.0 dBm
10 dB/
ATN 20 dB



VA SB
SC FC
CORR

START 2.679 GHz
#IF BW 100 kHz #AVG BW 100 kHz
STOP 10.000 GHz
SWP 2.20 sec

3.5. OUT OF BAND EMISSIONS (TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ 3 METERS) @ FCC 22.917(E)

PRODUCT NAME: **CHANNEL MODULE (RADIO TRANSLATOR), Model No.: CM800HP**

FCC REQUIREMENTS:

FCC Part 22, Subpart H, Para. 22.917(e)

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by: 43+10log(P) dB or –13 dBm.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 21 °C
- Relative humidity: 43%

POWER INPUT:

28 Vdc Battery.

TEST EQUIPMENT:

1. EMI Receiver System/Spectrum Analyzer, Hewlett Packard, Model 8546A, Input +25dBm max., 9KHz-5.6GHz, 50 Ohms, built-in Peak, Quasi-Peak & Average Detectors, Pre-Amplifier and Tracking Signal Generator. This System includes: (1) HP 85460A RF Filter Section, S/N: 3448A00236 and (2) HP 85462A Receiver RF Section/Display, S/N: 3520A00248.
2. Spectrum Analyzer, Advantest, Model R3271, S/N: 15050203, 100 Hz to 32 GHz)
3. Microwave Amplifier, HP, Model 83017A, Frequency Range 1 to 22GHz, 30dB gain nominal, low noise floor type.
4. Active Loop Antenna, Emco, Model 6502, SN 9104-2611, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms.
5. BiconiLog Antenna, Emco, Model 3142, SN 10005, 30-2000 MHz @ 50 Ohms.
6. Log Periodic Antenna, AH System, Model SAS-200/518, SN: 343, Frequency Range: 1GHz-18GHz.
7. FCC Listed Open Field Test Site.
8. Audio Oscillator, HP, Model 204C, SN: 0989A08798, Output: 0-1.2 MHz, 5 Vrms.

METHOD OF MEASUREMENTS:

Refer to **ANSI 63.4**, Para. 8 for detailed radiated emissions measurement procedures.

The following spectrum analyzer bandwidth settings should be used for measurement of spurious emissions:

(1) When operating in the radiotelephony mode or the supervisory audio tone mode:

- For any emission not more than 45 kHz removed from the carrier frequency: 300 Hz
- For any emission more than 45 kHz removed from the carrier frequency: 30 kHz

(2) When operating in the wideband data mode or signaling tone mode:

- For any emission not more than 60 kHz removed from the carrier frequency: 300 Hz
- For any emission more than 60 kHz removed from the carrier frequency: 30 kHz

METHOD OF CALCULATION FOR TRANSMITTED POWER (P) FROM THE MEASURED FIELD STRENGTH LEVEL (E):

According to IEC 801-3, the power density can be calculated as follows:

$S = P / (4xPIxD^2)$ Where: S: Power density in watts per square feet
P: Transmitted power in watts
PI: 13.1415
D: Distance in meters

The power density S (W/m^2) and electric field E (V/m) is related by:

$$S = E^2/(120xPI)$$

Accordingly, the field intensity of isotropic radiator in free space can be expressed as follows:

$$E = (30xP)^{1/2}/D = 5.5x(P)^{1/2}/D$$

For Halfwave dipole antenna or other antennas correlated to dipole in direction of maximum radiation:

$$S = (1.64xP)/(4xPIxD^2)$$
$$E = (49.2xP)^{1/2}xD = 7.01x(P)^{1/2}/D$$

$$P = (ExD/7.01)^2$$

Calculation of transmitted power P (dBM) given a measured field intensity E (dBuV/m):

$P(W) = [E(V/m)xD/7.01]^2$
$P(mW) = P(W)x1000$
=> $P(dBm) = 10logP(mW)$
$= 20logE(V/m) + 20log(D) - 20log(7.01) + 10log1000$
$= E(dBV/m) + 20logD + 13$
$= E(dBuV/m) - 120 + 20log(D) + 13$
$= E(dBuV/m) + 20log(D) - 107$

The Transmitted Power @ D = 3 Meters

P(dBm) = E(dBuV/m) - 97.5

TEST RESULTS: Conforms.

TESTED PERSONNEL: Tri M. Luu, P.Eng.

DATE: July 05, 1998

MEASUREMENT DATA

RADIATED EMISSIONS MEASUREMENTS @ 3 METERS

TEST CONFIGURATION

- *The channel frequencies (Low, Middle and High) was established at its full rated output power. The emissions was investigated up to the tenth harmonic of the fundamental emissions in each case. the measured level of the carrier was recorded and compared to the level of the emissions as required in Part 22, Subpart H. The absolute level of each emission shall not be greater than -13 dBm.*
- *For measuring radiated emissions at frequencies below 1 GHz, the Spectrum Analyzer was set as 100 kHz RBW, 100 KHz VBW, SWEEP TIME: AUTO, PEAK DETECTOR.*
- *All rf emissions from the lowest frequency generated by the transmitter (...) upto the 10th harmonic of fundamental were scanned, and only emissions less than 20 dB below the limits (-13 dBm) were recorded.*

Fundamental Frequency: 824 .000 MHz
RF Output Power: 7.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	FIELD LEVEL (dBuV/m)	POWER LEVEL (dBm)	ANTENNA PLANE (H/V)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2472.0	38.0	-59.5	V	-13.0	-46.5	PASS
2472.0	34.0	-63.5	H	-13.0	-50.5	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 837.005 MHz
RF Output Power: 6.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 2.5 kHz Sine Wave Signal

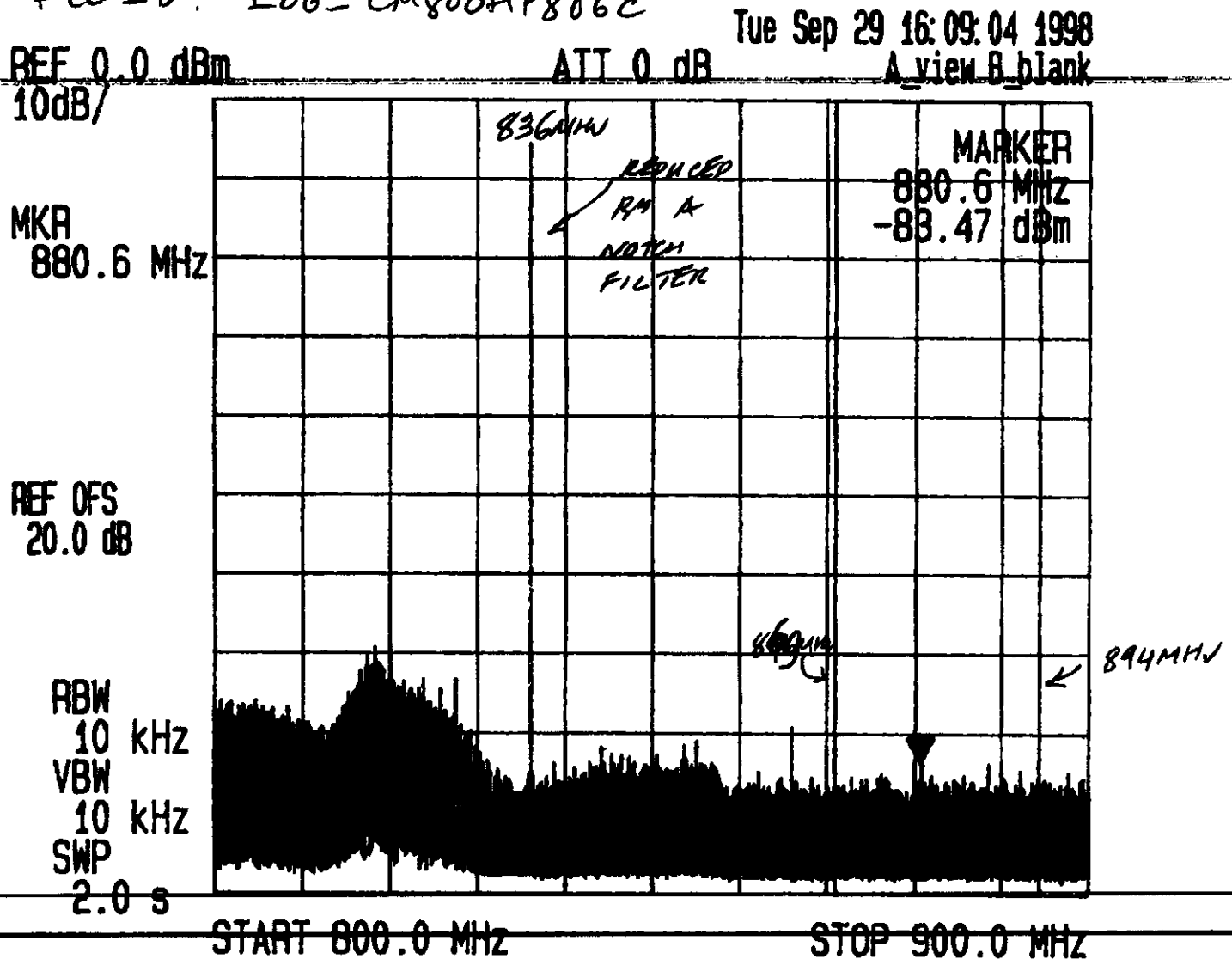
FREQUENCY (MHz)	FIELD LEVEL (dBuV/m)	POWER LEVEL (dBm)	ANTENNA PLANE (H/V)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2508.0	38.0	-59.5	V	-13.0	-46.5	PASS
2508.0	38.0	-59.5	H	-13.0	-46.5	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

SEP 30 '98 10:10

963 P03

TX @ 836MHz
FUTURECOM CM800 HP.
FCC ID: LOG_CM800HP806C



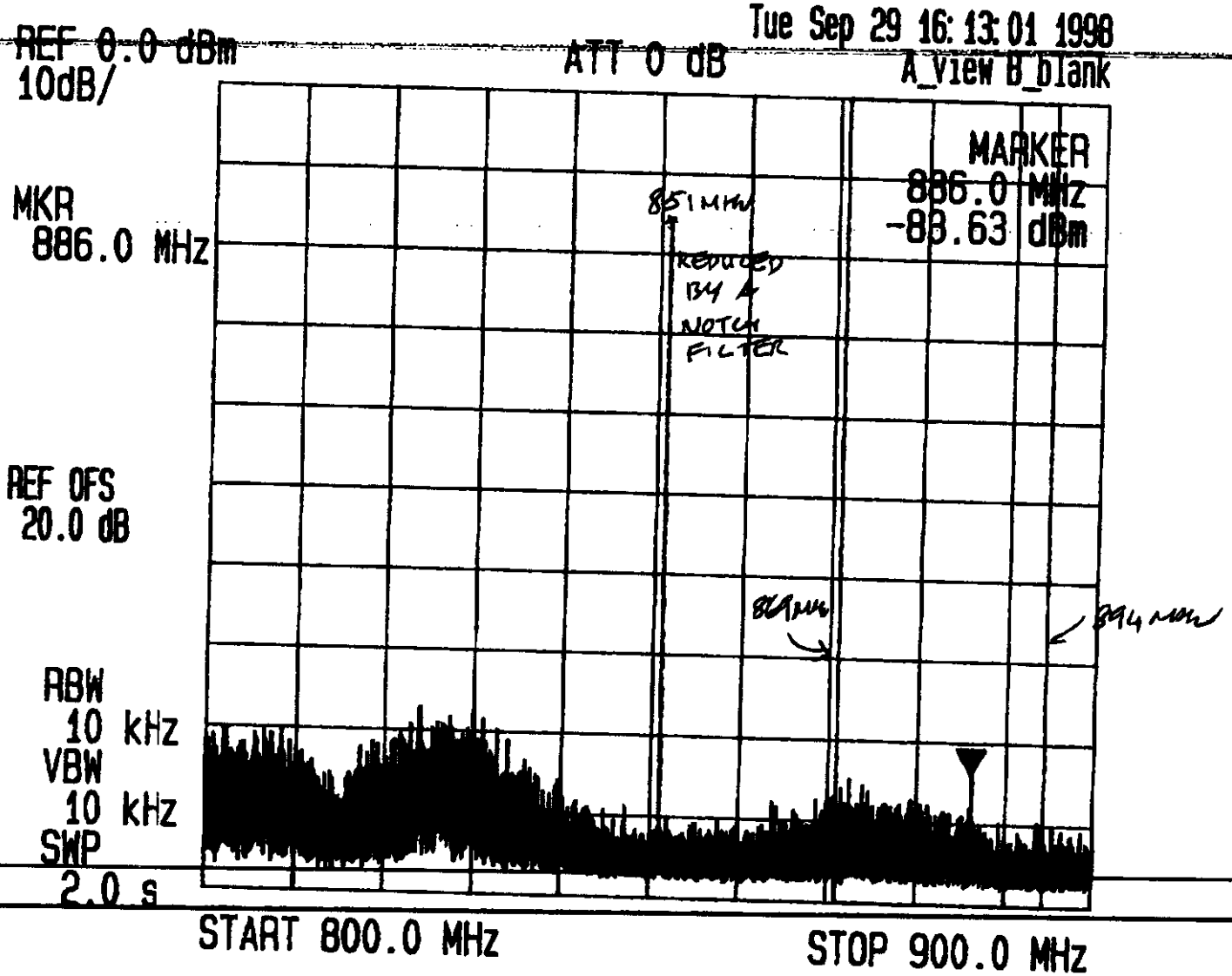
SEP 30 '98 10:11

963 P04

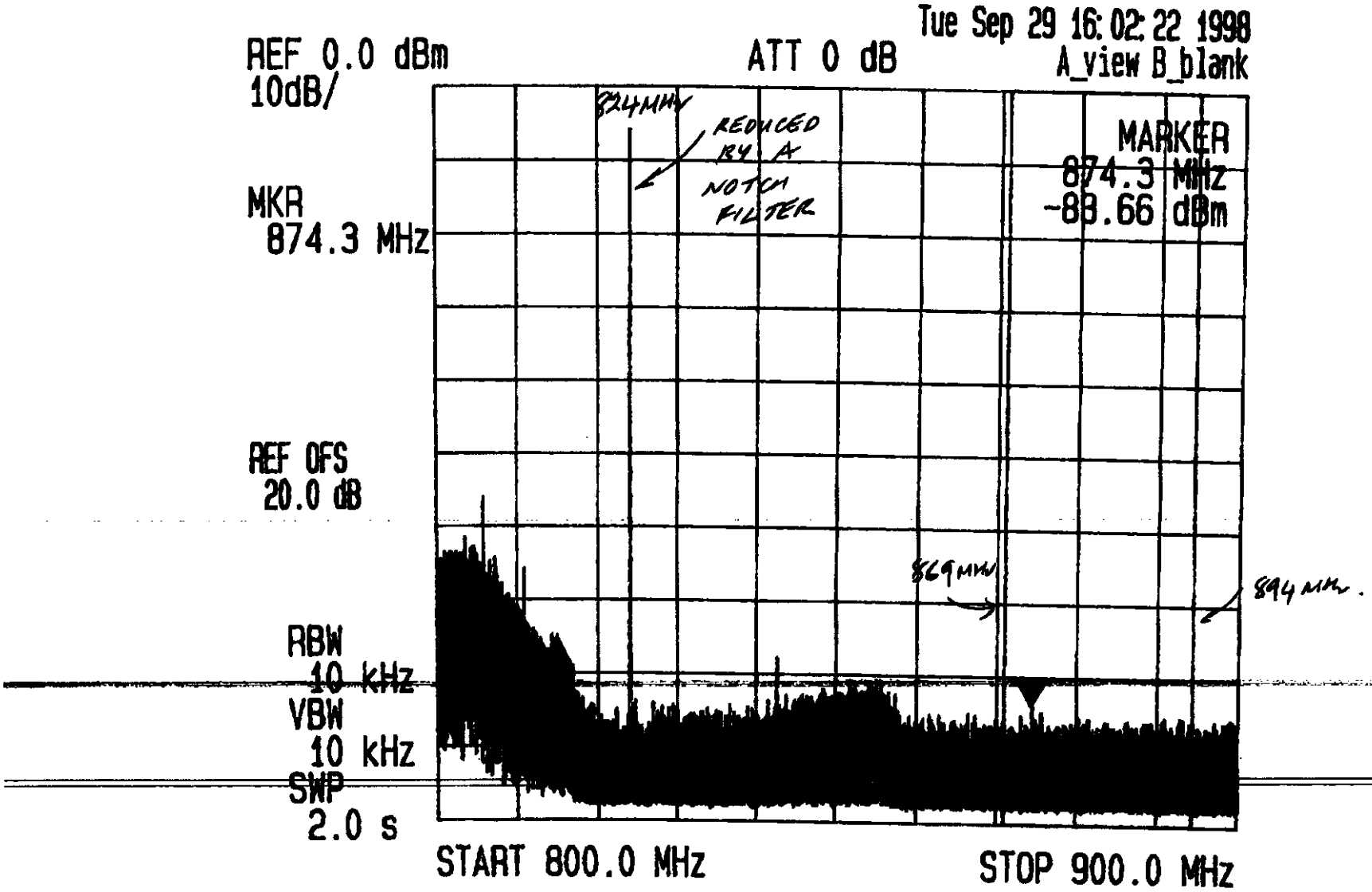
TX @ 851 MHz

FUTURECOM CM800HP

FCC ID: LO6-CM800HP806C



TX@ 824MHz
FUTURECOM CM800HP
FCCID: LO6-CM800HP806C



Fundamental Frequency: 851.000 MHz
RF Output Power: 5.7 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 2.5 kHz Sine Wave Signal

FREQUENCY (MHz)	FIELD LEVEL (dBuV/m)	POWER LEVEL (dBm)	ANTENNA PLANE (H/V)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2553.0	39.5	-58.0	V	-13.0	-45.0	PASS
2553.0	39.0	-58.5	H	-13.0	-45.5	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 824.000 MHz
RF Output Power: 7.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 9600 b/s random data source

FREQUENCY (MHz)	FIELD LEVEL (dBuV/m)	POWER LEVEL (dBm)	ANTENNA PLANE (H/V)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2472.0	38.6	-58.9	V	-13.0	-45.9	PASS
2472.0	38.0	-59.5	H	-13.0	-46.5	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 837.005 MHz
RF Output Power: 6.0 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 9600 b/s random data source

FREQUENCY (MHz)	FIELD LEVEL (dBuV/m)	POWER LEVEL (dBm)	ANTENNA PLANE (H/V)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2508.0	38.3	-59.2	V	-13.0	-46.2	PASS
2508.0	37.9	-59.6	H	-13.0	-46.6	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

Fundamental Frequency: 851.000 MHz
RF Output Power: 5.7 Watts
RF IN Signal Source: 0 dBm maximum at 830 MHz, FM modulation with 9600 b/s random data source

FREQUENCY (MHz)	FIELD LEVEL (dBuV/m)	POWER LEVEL (dBm)	ANTENNA PLANE (H/V)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2553.0	39.2	-58.3	V	-13.0	-45.3	PASS
2553.0	38.7	-58.8	H	-13.0	-45.8	PASS

The emissions were scanned form 10 MHz to 10 GHz and all emissions less 20 dB below the limits were recorded.

3.6. FREQUENCY TOLERANCE @ FCC 22.355

PRODUCT NAME: **CHANNEL MODULE (RADIO TRANSLATOR), Model No.: CM800HP**

FCC REQUIREMENTS:

FCC Part 22, Subpart H, Table C-1 of @ 22.357

The carrier frequency of each transmitter shall be maintain within the following tolerances from the assigned frequencies.

FREQUENCY RANGE (MHz)	FIXED & BASE STATIONS (ppm)	MOBILE STATIONS (ppm)
821 – 896	0.00015	0.00025

CLIMATE CONDITION:

Standard Temperature and Humidity: Please refer to Measurement Data

POWER INPUT:

28 Vdc Battery.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Tenney Temp. & Humidity Chamber, Model T5, S/N: 9723B
- Bird Attenuator, 50 Ohm IN/OUT

METHOD OF MEASUREMENTS:

Refer to FCC @ 2.995

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

- From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

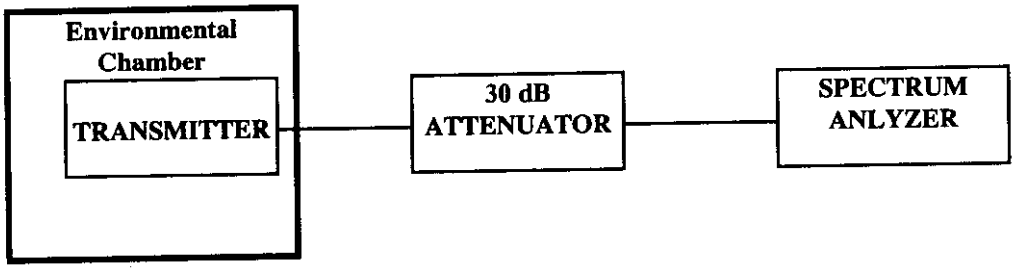
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TESTED PERSONNEL: Tri M. Luu, P.Eng.

DATE: July 10, 1998

MEASUREMENT DATA

FREQUENCY STABILITY

TEST CONFIGURATION

- *The transmitter was placed inside the environmental chamber, and its output terminal was coupled to the Spectrum Analyzer through a 30 dB attenuator.*
- *One transmitter channel frequency was tested.*
- *The DUT was supplied by a variable power supply.*
- *The environmental chamber was cycled down to -30° C. When the chamber reaches -30° C, the EUT was powered on with the nominal voltage level, with the transmitter keyed off. The terminal remained in the chamber at -30°C for a period of 1 hour. After 1 hour the transmitter was continuously keyed on, at full power. The transmitter frequency of the terminal was measured from the spectrum analyzer every minute for a period of 10 minutes.*
- *After 10 minutes the variable power supply was adjusted to supply the EUT with voltage of 85% nominal voltage level and measurement was repeated.*
- *After 10 minutes the variable power supply was adjusted to supply the EUT with voltage of 115% nominal voltage level and measurement was repeated,*
- *When the measurement complete, the transmitter was keyed off and the chamber was cycled up to 10° C steps. The EUT remained powered up (unkeyed) at -20° C for a minimum period of 1 hour, after which the measurements will be made as outlined above.*
- *The above was repeated for -10, 0, 20, 30, 40 and 50 degrees Celsius.*

Product Name **Model No.**	**CHANNEL MODULE (RADIO TRANSLATOR)** **CM800HP**
Centre Frequency	821 MHz
Full Power Level	7 Watts
Frequency Tolerance Limit	0.00015 % or 1231.5 Hz at 821 MHz
Max. Frequency Tolerance Measured	201.5 Hz or 0.000003%
Input Voltage Rating	28 Vdc nominal

		CENTRE FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (°C)	KEYED-ON TIME (Minutes)	Supply Voltage (Nominal) 28 Volts dc		Supply Voltage (85% of Nominal) 23.8 Volts dc		Supply Voltage (115% of Nominal) 32.2 Volts dc	
		Hz	dB	Hz	dB	Hz	dB
-30	0	-2	+0.8	N/A	N/A	N/A	N/A
	1	+6	+0.8	N/A	N/A	N/A	N/A
	2	+10	+0.8	N/A	N/A	N/A	N/A
	3	+1	+0.8	N/A	N/A	N/A	N/A
	4	0	+0.8	N/A	N/A	N/A	N/A
	5	+4	+0.8	N/A	N/A	N/A	N/A
	6	-3	+0.8	N/A	N/A	N/A	N/A
	7	+7	+0.8	N/A	N/A	N/A	N/A
	8	-4	+0.8	N/A	N/A	N/A	N/A
	9	+3	+0.8	N/A	N/A	N/A	N/A
	10	+7	+0.8	N/A	N/A	N/A	N/A
-20	0	-6	+0.5	N/A	N/A	N/A	N/A
	1	+7	+0.5	N/A	N/A	N/A	N/A
	2	+3	+0.5	N/A	N/A	N/A	N/A
	3	+10	+0.5	N/A	N/A	N/A	N/A
	4	+8	+0.5	N/A	N/A	N/A	N/A
	5	+7	+0.5	N/A	N/A	N/A	N/A
	6	+7	+0.5	N/A	N/A	N/A	N/A
	7	-3	+0.5	N/A	N/A	N/A	N/A
	8	+6	+0.5	N/A	N/A	N/A	N/A
	9	+1	+0.5	N/A	N/A	N/A	N/A
	10	+6	+0.5	N/A	N/A	N/A	N/A
-10	0	-3	+0.3	N/A	N/A	N/A	N/A
	1	-2	+0.3	N/A	N/A	N/A	N/A
	2	+1	+0.3	N/A	N/A	N/A	N/A
	3	+1	+0.3	N/A	N/A	N/A	N/A
	4	+4	+0.3	N/A	N/A	N/A	N/A
	5	+3	+0.3	N/A	N/A	N/A	N/A
	6	+3	+0.3	N/A	N/A	N/A	N/A
	7	0	+0.3	N/A	N/A	N/A	N/A
	8	+1	+0.3	N/A	N/A	N/A	N/A
	9	+1	+0.3	N/A	N/A	N/A	N/A
	10	0	+0.3	N/A	N/A	N/A	N/A
0	0	+13	-0.1	N/A	N/A	N/A	N/A
	1	+16	-0.1	N/A	N/A	N/A	N/A
	2	+16	-0.1	N/A	N/A	N/A	N/A
	3	+17	-0.1	N/A	N/A	N/A	N/A
	4	+17	-0.1	N/A	N/A	N/A	N/A
	5	+14	-0.1	N/A	N/A	N/A	N/A
	6	+14	-0.1	N/A	N/A	N/A	N/A
	7	+7	-0.1	N/A	N/A	N/A	N/A
	8	+20	-0.1	N/A	N/A	N/A	N/A
	9	+3	-0.1	N/A	N/A	N/A	N/A
	10	+21	-0.1	N/A	N/A	N/A	N/A

		CENTRE FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (°C)	KEYED-ON TIME (Minutes)	Supply Voltage (Nominal) 28 Volts dc		Supply Voltage (85% of Nominal) 23.8 Volts dc		Supply Voltage (115% of Nominal) 32.2 Volts dc	
		Hz	dB	Hz	dB	Hz	dB
+10	0	+16	-0.4	N/A	N/A	N/A	N/A
	1	+11	-0.4	N/A	N/A	N/A	N/A
	2	+20	-0.4	N/A	N/A	N/A	N/A
	3	+24	-0.4	N/A	N/A	N/A	N/A
	4	+21	-0.4	N/A	N/A	N/A	N/A
	5	+14	-0.4	N/A	N/A	N/A	N/A
	6	+17	-0.4	N/A	N/A	N/A	N/A
	7	+14	-0.4	N/A	N/A	N/A	N/A
	8	+13	-0.4	N/A	N/A	N/A	N/A
	9	+10	-0.4	N/A	N/A	N/A	N/A
	10	+8	-0.4	N/A	N/A	N/A	N/A
+25	0	+3	0	N/A	N/A	N/A	N/A
	1	+4	0	N/A	N/A	N/A	N/A
	2	+3	0	N/A	N/A	N/A	N/A
	3	+4	0	N/A	N/A	N/A	N/A
	4	+4	0	N/A	N/A	N/A	N/A
	5	+3	0	N/A	N/A	N/A	N/A
	6	+4	0	N/A	N/A	N/A	N/A
	7	+4	0	N/A	N/A	N/A	N/A
	8	+2	0	N/A	N/A	N/A	N/A
	9	+3	0	N/A	N/A	N/A	N/A
	10	+3	0	N/A	N/A	N/A	N/A
+30	0	+14	+0.8	N/A	N/A	N/A	N/A
	1	+16	+0.8	N/A	N/A	N/A	N/A
	2	+11	+0.8	N/A	N/A	N/A	N/A
	3	+16	+0.8	N/A	N/A	N/A	N/A
	4	+20	+0.8	N/A	N/A	N/A	N/A
	5	+10	+0.8	N/A	N/A	N/A	N/A
	6	+14	+0.8	N/A	N/A	N/A	N/A
	7	+7	+0.8	N/A	N/A	N/A	N/A
	8	+11	+0.8	N/A	N/A	N/A	N/A
	9	+6	+0.8	N/A	N/A	N/A	N/A
	10	+8	+0.8	N/A	N/A	N/A	N/A
+40	0	+7	-0.5	N/A	N/A	N/A	N/A
	1	+8	-0.5	N/A	N/A	N/A	N/A
	2	+6	-0.5	N/A	N/A	N/A	N/A
	3	+10	-0.5	N/A	N/A	N/A	N/A
	4	+16	-0.5	N/A	N/A	N/A	N/A
	5	+7	-0.5	N/A	N/A	N/A	N/A
	6	+8	-0.5	N/A	N/A	N/A	N/A
	7	+11	-0.5	N/A	N/A	N/A	N/A
	8	+14	-0.5	N/A	N/A	N/A	N/A
	9	+8	-0.5	N/A	N/A	N/A	N/A
	10	+7	-0.5	N/A	N/A	N/A	N/A

		CENTRE FREQUENCY & RF POWER OUTPUT VARIATION					
AMBIENT TEMP. (°C)	KEYED-ON TIME (Minutes)	Supply Voltage (Nominal) 28 Volts dc		Supply Voltage (85% of Nominal) 23.8 Volts dc		Supply Voltage (115% of Nominal) 32.2 Volts dc	
		Hz	dB	Hz	dB	Hz	dB
+50	0	+4	-0.7	N/A	N/A	N/A	N/A
	1	+8	-0.7	N/A	N/A	N/A	N/A
	2	+11	-0.7	N/A	N/A	N/A	N/A
	3	+13	-0.7	N/A	N/A	N/A	N/A
	4	+15	-0.7	N/A	N/A	N/A	N/A
	5	+14	-0.7	N/A	N/A	N/A	N/A
	6	+13	-0.7	N/A	N/A	N/A	N/A
	7	+14	-0.7	N/A	N/A	N/A	N/A
	8	+16	-0.7	N/A	N/A	N/A	N/A
	9	+16	-0.7	N/A	N/A	N/A	N/A
	10	+14	-0.7	N/A	N/A	N/A	N/A
+60	0	+14	-0.7	N/A	N/A	N/A	N/A
	1	+10	-0.7	N/A	N/A	N/A	N/A
	2	0	-0.7	N/A	N/A	N/A	N/A
	3	+16	-0.7	N/A	N/A	N/A	N/A
	4	-2	-0.7	N/A	N/A	N/A	N/A
	5	+1	-0.7	N/A	N/A	N/A	N/A
	6	+11	-0.7	N/A	N/A	N/A	N/A
	7	+1	-0.7	N/A	N/A	N/A	N/A
	8	+3	-0.7	N/A	N/A	N/A	N/A
	9	+3	-0.7	N/A	N/A	N/A	N/A
	10	+7	-0.7	N/A	N/A	N/A	N/A

4. EXHIBIT 5 - GENERAL TEST PROCEDURES

4.1. ELECTRICAL FIELD RADIATED EMISSIONS MEASUREMENTS - GENERAL TEST METHOD

- The radiated emission measurements were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC.

- Radiated emissions measurements were made using the following test instruments:

  1. Calibrated EMCO biconilogl antenna in the frequency range from 30 MHz to 2000 MHz.
  2. Calibrated A.H. Systems log periodic antenna in the frequency range above 1000 MHz (1GHz - 18 GHz).
  3. Calibrated Advantest spectrum analyzer and pre-selector. In general, the spectrum analyzer would be used as follows:

     – The rf electric field levels were measured with the spectrum analyzer set to PEAK detector (100 KHz RBW and 100 KHz VBW).

     – If any rf emission was observed to be a broadband noise, the spectrum analyzer's CISPR QUASI-PEAK detector (120 KHz RBW and 1MHz VBW) was then set to measure the signal level.

     – If the signal being measured was narrowband and the ambient field was broadband, the bandwidth of the spectrum analyzer was reduced.

- The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.

- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.

- During this process, cables and peripheral devices were manipulated within the range of likely configuration.

- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement (each variable within bounds specified elsewhere) were explored to produce the highest amplitude signal relative to the limit.

  The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

  Step1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.

  Step2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

  Step3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.

Step4: Move the antenna over its full allowed range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.

Step5: Change the polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.

Step6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.

Step7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.

Calculation of Field Strength:

The field strength is calculated by adding the calibrated antenna factor and cable factor, and subtracting the Amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength
RA = Receiver/Analyzer Reading
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Example: If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:.

Field Level = 60 + 7.0 + 1.0 - 30 = 38.0 dBuV/m.

Field Level = $10^{(38/20)}$ = 79.43 uV/m.

Notes: The frequency and amplitude of at least six highest conducted emissions relative to the limit are recorded unless such emissions are more than 20 dB below the limit. If less than six emissions are within 20dB of the limit, the background or receiver noise level shall be reported at representative frequencies.