1.0 **Summary of Tests**

Glenayre Western Multiplex - Model: 32000

TEST	REFERENCE	RESULTS
Max. Output power	15.247(b)	Pass
6 dB Bandwidth	Not 15.247(a)(2)	Pass
Max. Power Density	15.247(d)	Pass
RF Antenna Conducted Emission	15.247(c)	Pass
Radiated Emission in Restricted Bands	15.247(c), 15.209(a)	Pass
AC Conducted Emission	15.207	Pass
Radiated Emission from Digital Part	15.109	Pass
Radiated Emission from Receiver L.O.	15.109	Not Applicable
Processing Gain Measurements	15.247(e)	Provided by applicant
Antenna Requirement	15.203	Pass

EMC Site Mgr.: David Chernomordik Date: 7/28/98
David Chernomordik

Engineering Manager: _____ Date: 7/28/98
C.K. Li

2.0 General Description

2.1 Product Description

The Glenayre Western Multiplex LYNX.mini2 Model 32000 is a 2.4 GHz Fractional Spread Spectrum Digital Microwave Radio.

Overview of Glenayre Western Multiplex LYNX.sc2 (2T)Model 31650

Applicant	Glenayre Western Multiplex
Trade Name & Model No.	Glenayre Western Multiplex, Mode 32000
FCC Identifier	HZB-LYNX72
Use of Product	Point-to-Point Wireless Interconnect
Manufacturer & Model of Spread Spectrum Module	Glenayre Western Multiplex LYNX.mini2
Type of Transmission	Direct Sequence
Rated RF Output (mW)	190
Frequency Range (MHz)	2412 -2470
Number of Channel(s)	From 4 to 12
Antenna(s) & Gain, dBi	Comsat RSI, 27.5 dBi
Processing Gain Measurements	[x] Will be provided to ITS for submission with the application [ ] Will be provided directly to the FCC reviewing engineer by the client or manufacturer of the spread spectrum module
Antenna Requirement	[ ] The EUT uses a permanently connected antenna. [ ] The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but DOES NOT use a standard antenna jack or electrical connector. [x] The EUT requires professional installation (attach supporting documentation if using this option).
Manufacturer name & address	Glenayre Western Multiplex 1196 Borregas Ave. Sunnyvale, California 94089

2.2 Related Submittal(s) Grants

None.

2.3 Test Methodology

AC mains line-conducted, antenna terminal conducted, and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Data Sheet"** of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

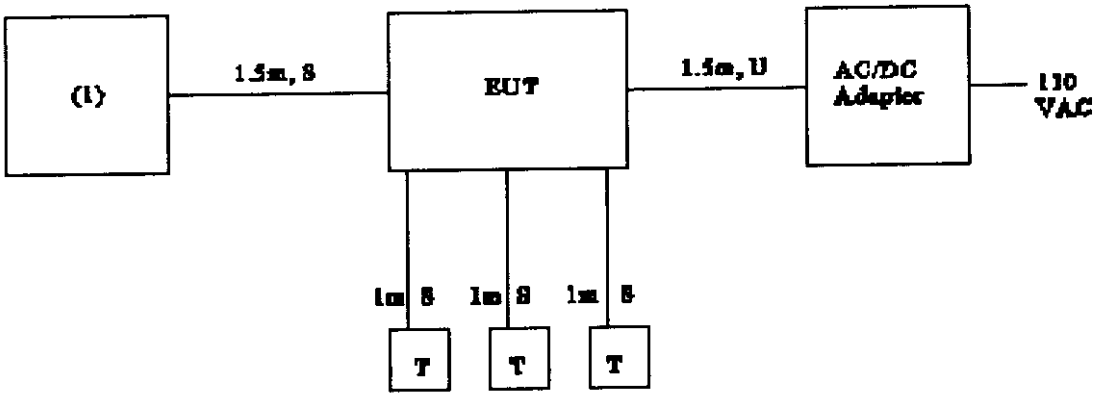
The open area test site and conducted measurement facility used to collect the radiated data is located at Menlo Park. This test facility and site measurement data have been fully placed on file with the FCC.

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.	Serial No.	FCC ID
1	Comsat Antenna	P-24A48G	Not Labeled	N/A

3.2 Block Diagram of Test Setup



* = EUT	S = Shielded;	F = With Ferrite
** = No ferrites on video cable	U = Unshielded	T - Termination

3.3 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

The signal is maximized through rotation on the turntable. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of Operation During Test

Transmitting and Receiving modes

3.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Glenayre Western Multiplex prior to compliance testing):

No modifications were made to the EUT by Intertek Testing Services.

4.0 Measurement Results

4.1 Maximum Conducted Output Power at Antenna Terminals:

Requirement:

Maximum allowed transmitter peak output power is 30 dBm - (G - 6)/3, where G - is an antenna gain.

Procedure:

[ ] The antenna port of the EUT was connected to the input of a power meter. Power was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

[X] The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for maximun RES BW and power was read directly in dBm. External attenuation and cable loss were compensated for using the OFFSET function of the analyzer.

Result:

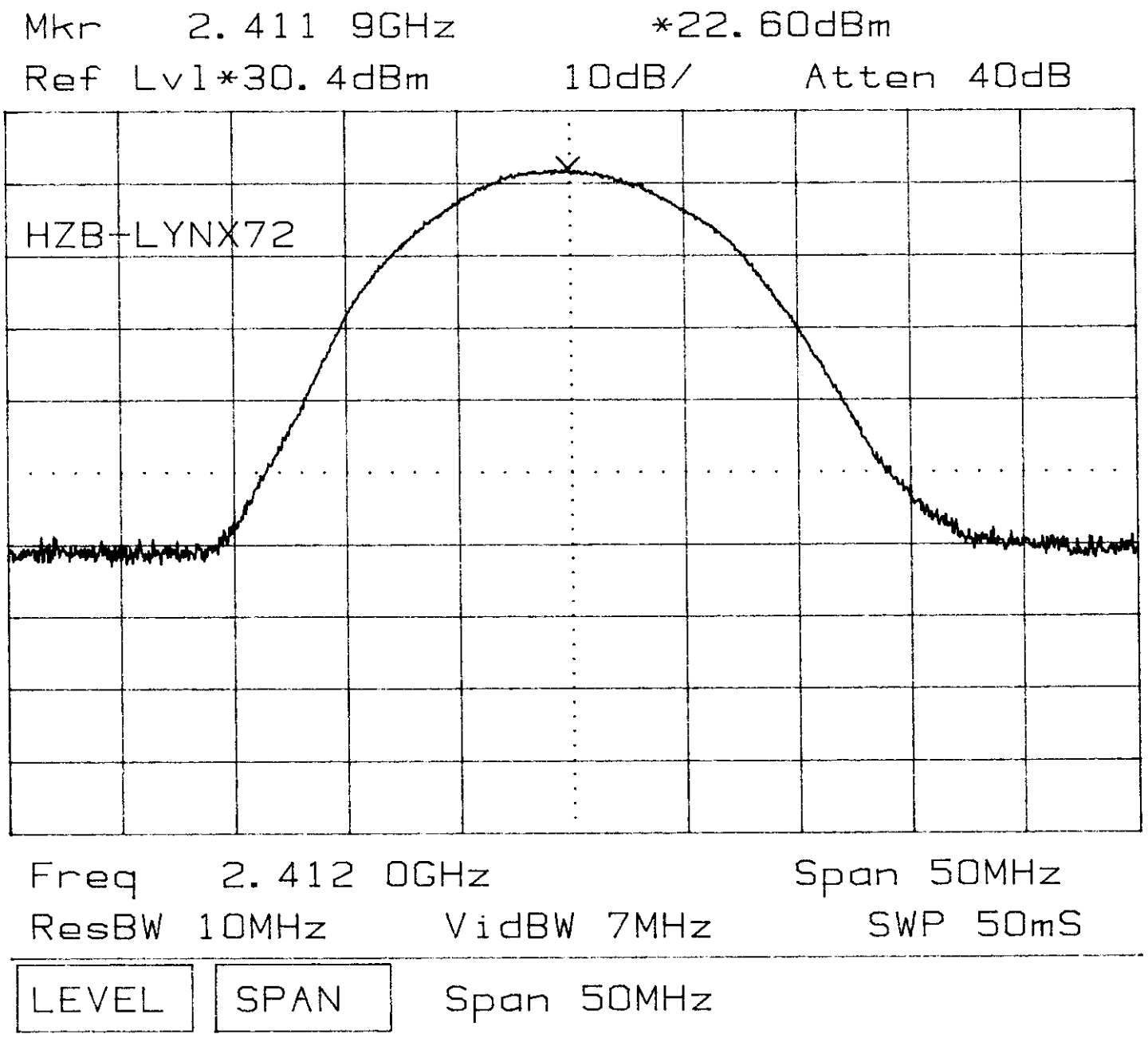
Refer to the attached plots and data table below.

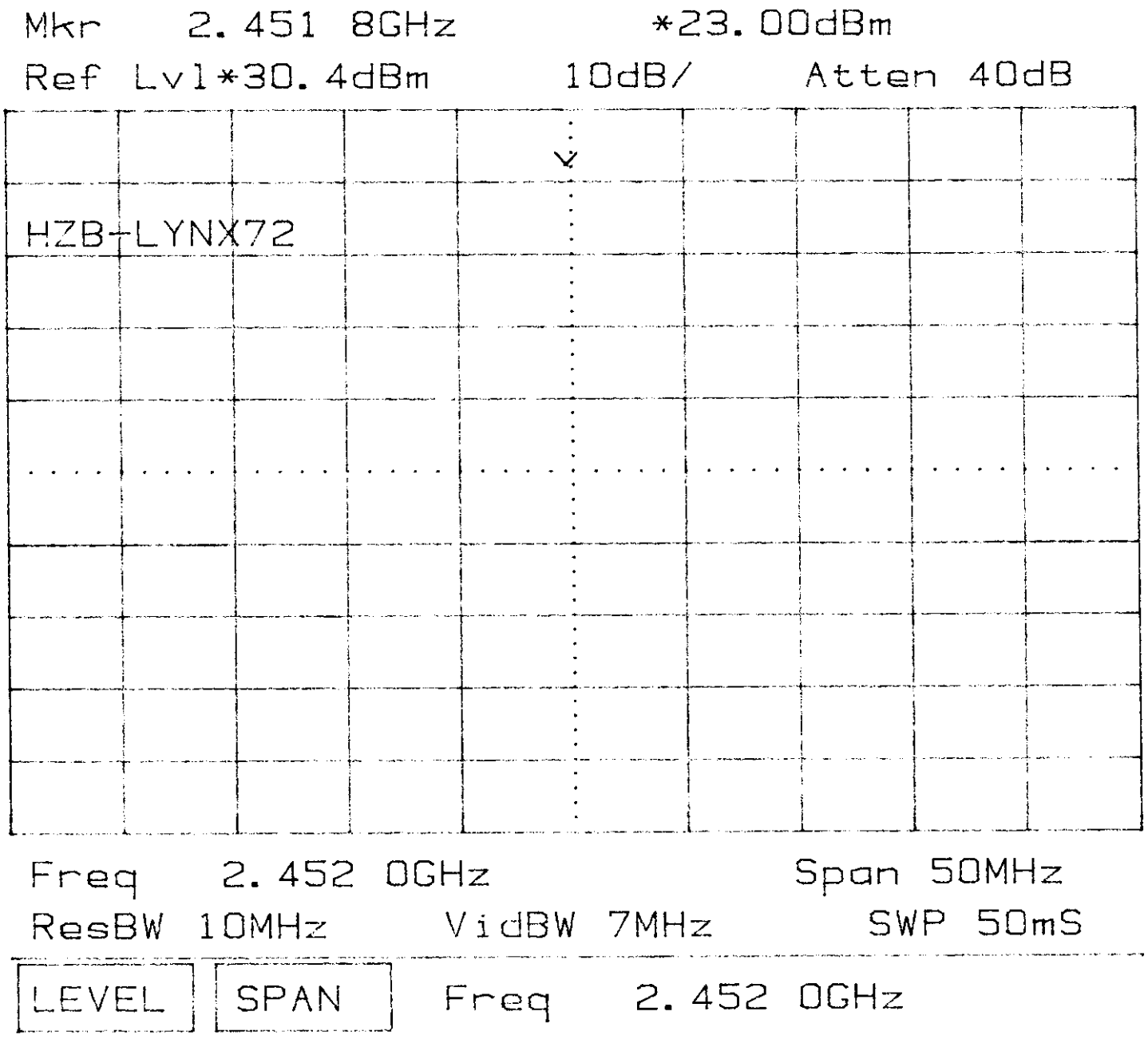
Max. antenna gain = 27.5 dBi		
Frequency (MHz)	Output in dBm	Output in mWatt
2412	22.6	182
2452	23.0	200
2470	22.6	182

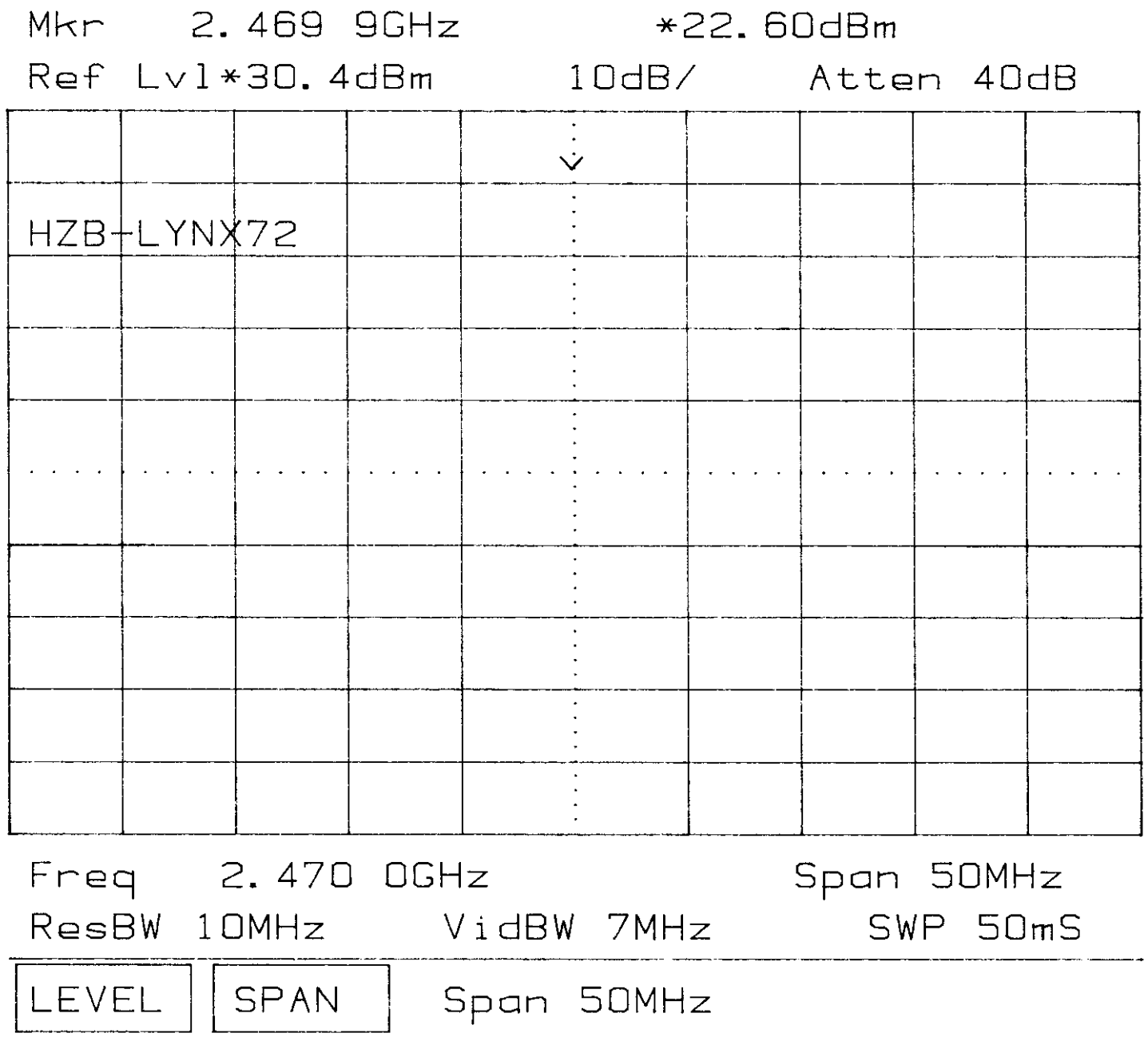
Cable loss: 0 dB External Attenuation: 0 dB

Cable loss, external attenuation: [X] included in OFFSET function

EUT maximum allowed peak output power = 30 - (27.5 -6) 3 = 22.8 dBm


Mkr 2.411 9GHz *22.60dBm
Ref Lvl*30.4dBm 10dB/ Atten 40dB
HZB-LYNX72
Freq 2.412 0GHz Span 50MHz
ResBW 10MHz VidBW 7MHz SWP 50mS
LEVEL
SPAN
Span 50MHz


Mkr 2.451 8GHz
*23.00dBm
Ref Lvl*30.4dBm
10dB/
Atten 40dB
HZB-LYNX72
Freq 2.452 0GHz
Span 50MHz
ResBW 10MHz
VidBW 7MHz
SWP 50mS
LEVEL
SPAN
Freq 2.452 0GHz


Mkr 2.469 9GHz *22.60dBm
Ref Lvl*30.4dBm 10dB/ Atten 40dB
HZB-LYNX72
Freq 2.470 0GHz Span 50MHz
ResBW 10MHz VidBW 7MHz SWP 50mS
LEVEL
SPAN
Span 50MHz

4.2 Minimum 6 dB RF Bandwidth:

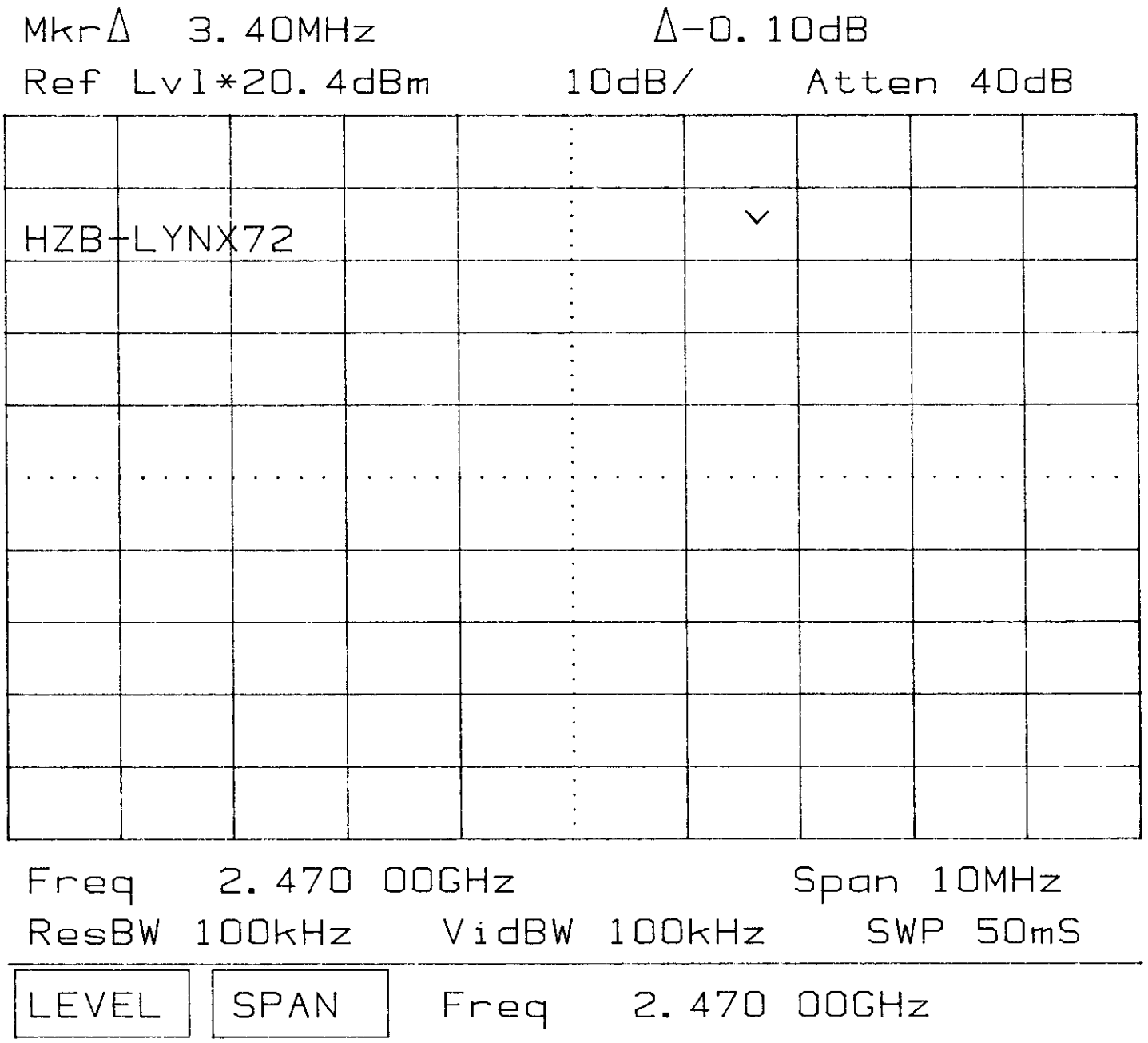
The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RES BW was set to 100 kHz. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. A PEAK output reading was taken, a DISPLAY line was drawn 6 dB lower than PEAK level. The 6 dB bandwidth was determined from where the channel output spectrum intersected the display line.

Frequency (MHz)	Min. 6 dB Bandwidth (kHz)
2470	3400

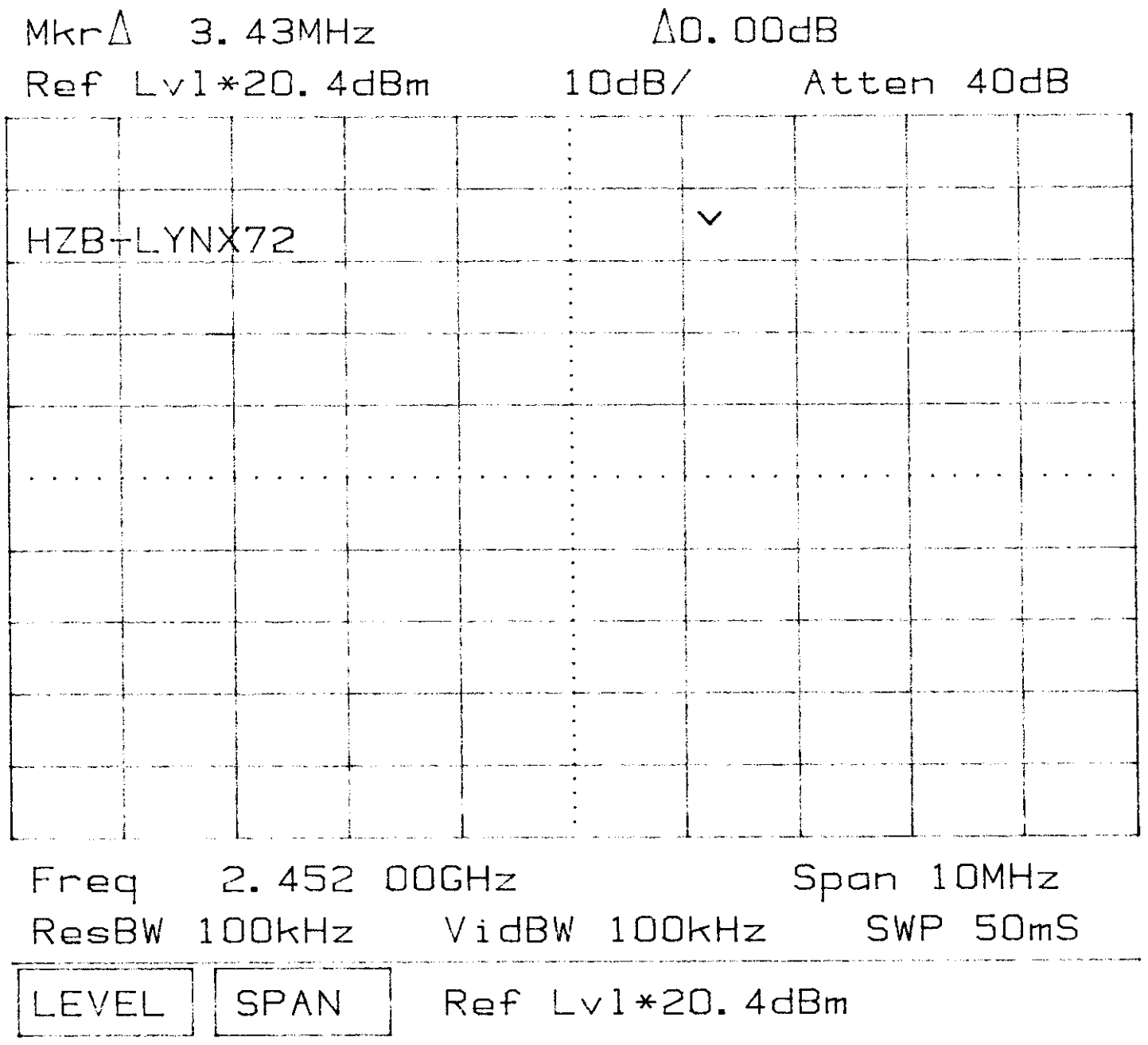
Plots attached:

Plot 2a: Low Channel 6 dB RF Bandwidth
Plot 2b: Middle Channel 6 dB RF Bandwidth
Plot 2c: High Channel 6 dB RF Bandwidth

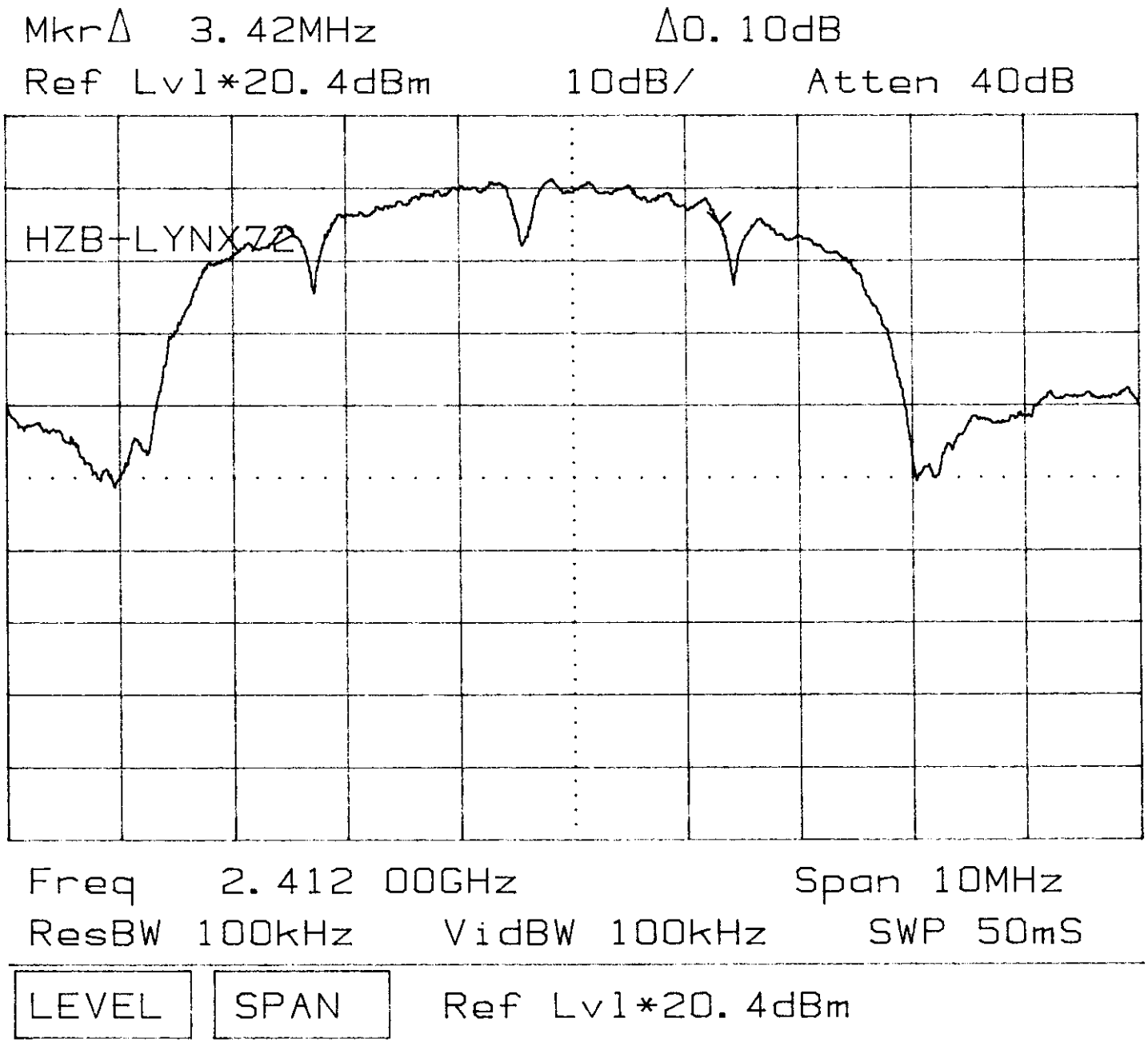
PLOT# 2a


MkrΔ 3.40MHz
Δ-0.10dB
Ref Lvl*20.4dBm
10dB/
Atten 40dB
HZB-LYNX72
Freq 2.470 00GHz
Span 10MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Freq 2.470 00GHz

PLOT# 2b


MkrΔ 3.43MHz
ΔO.OOdB
Ref Lvl*20.4dBm
10dB/
Atten 40dB
HZB+LYNX72
Freq 2.452 OOGHz
Span 10MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Ref Lvl*20.4dBm

PLOT# 2c


MkrΔ 3.42MHz
Δ0.10dB
Ref Lvl*20.4dBm
10dB/
Atten 40dB
HZB-LYNX22
Freq 2.412 00GHz
Span 10MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Ref Lvl*20.4dBm

4.3 Maximum Power Density Reading:

The spectrum analyzer RES BW was set to 3 kHz. The START and STOP frequencies were set to the band edges of the maximum output passband. If there is no clear maximum amplitude in any given portion of the band, it may be necessary to make measurements at a number of bands defined by several START and STOP frequency pairs. The specification calls for a 1 second interval at each 3 kHz bandwidth; total SWEEP TIME is calculated as follows:

SWEEP TIME (SEC) = (Fstop, kHz - Fstart, kHz)/3 kHz

Antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

Frequency (MHz)	Power Density (dBm) Limit 8 dBm
2412	-1.5

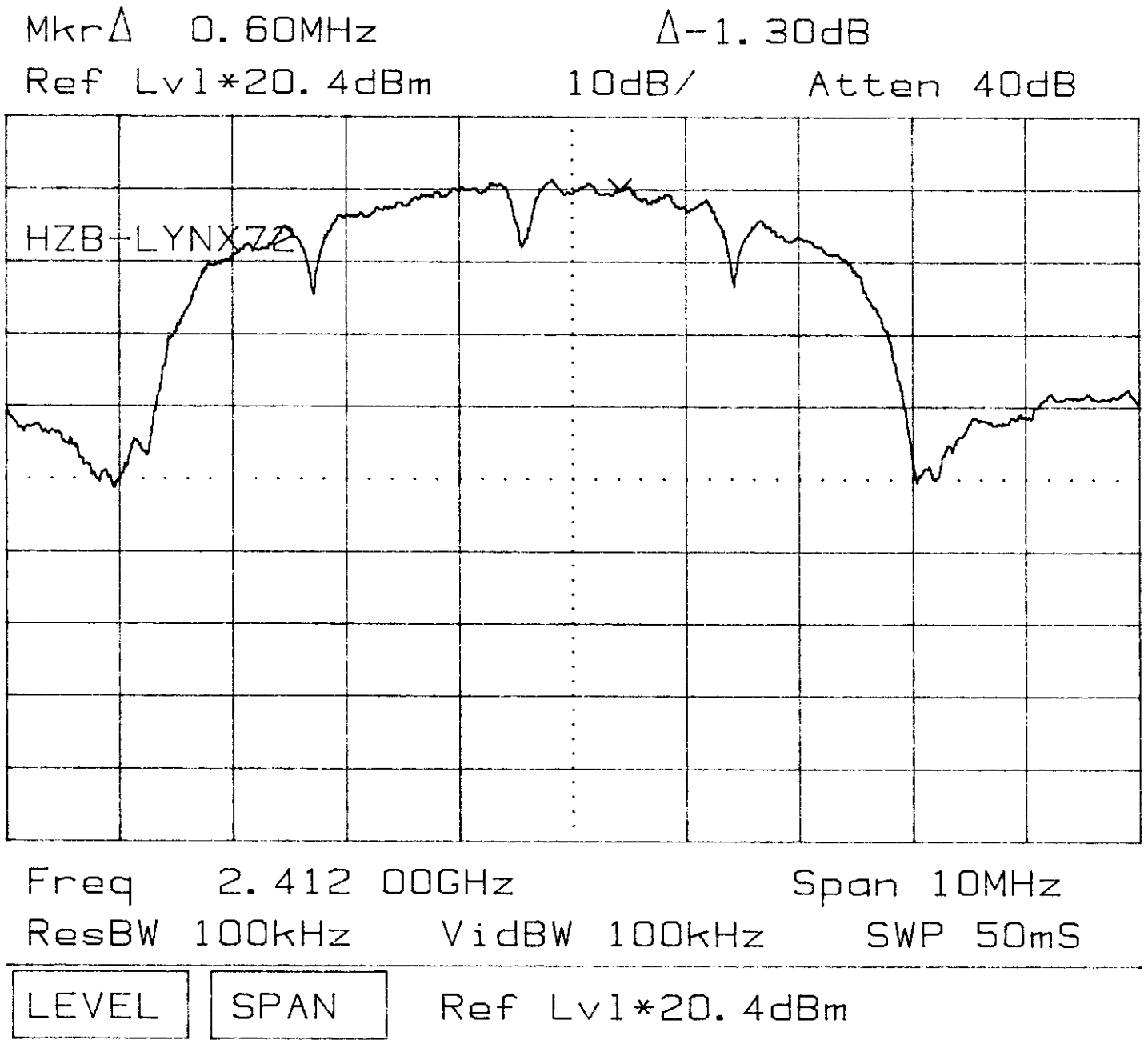
Frequency Span = 600 Khz

Sweep Time = Frequency Span/3 kHz = 200 seconds

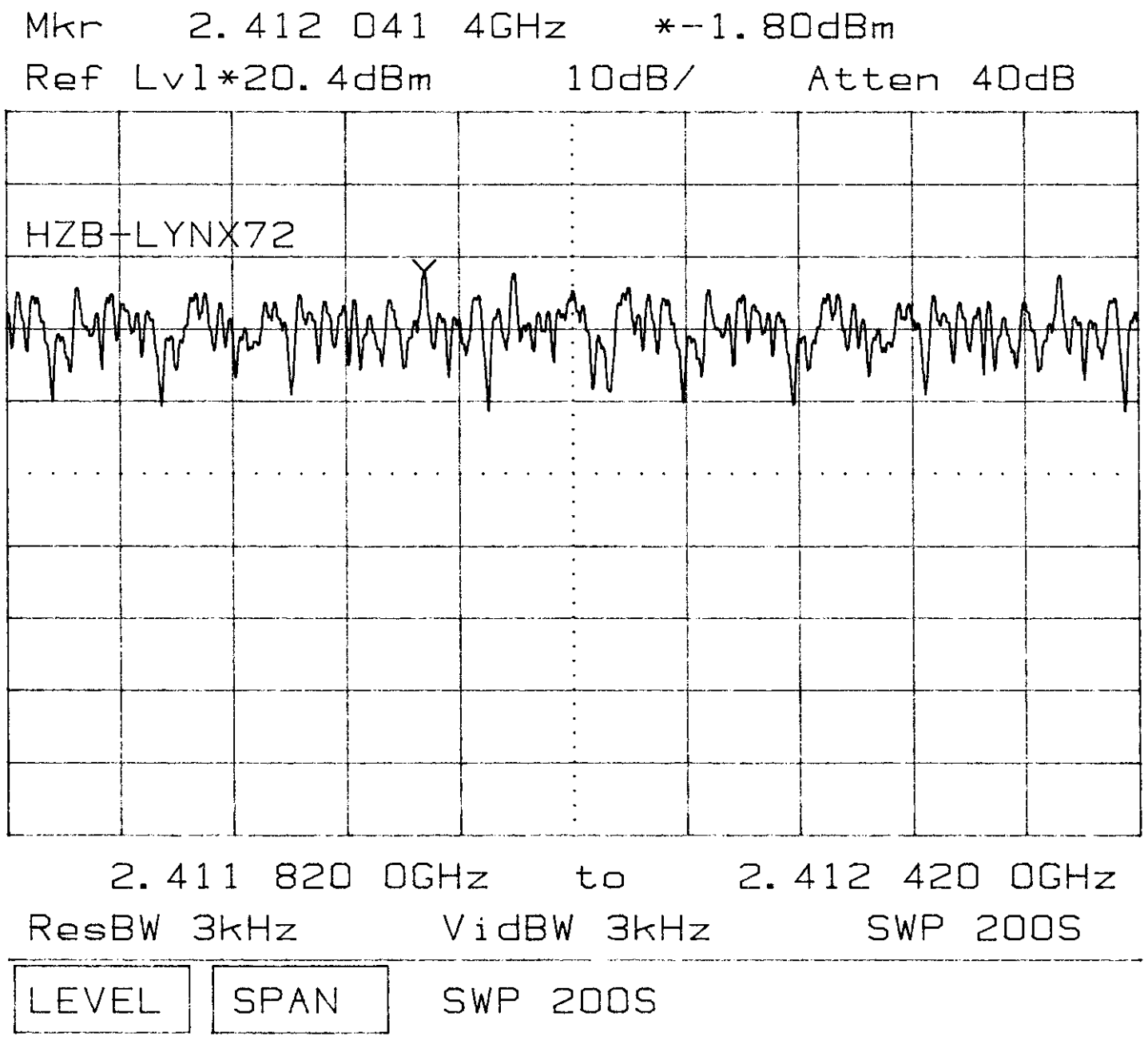
Plots attached:

Plot 3a1-3a2: Low Channel Power Density
Plot 3b1-3b2: Middle Channel Power Density
Plot 3c1-3c2: High Channel Power Density

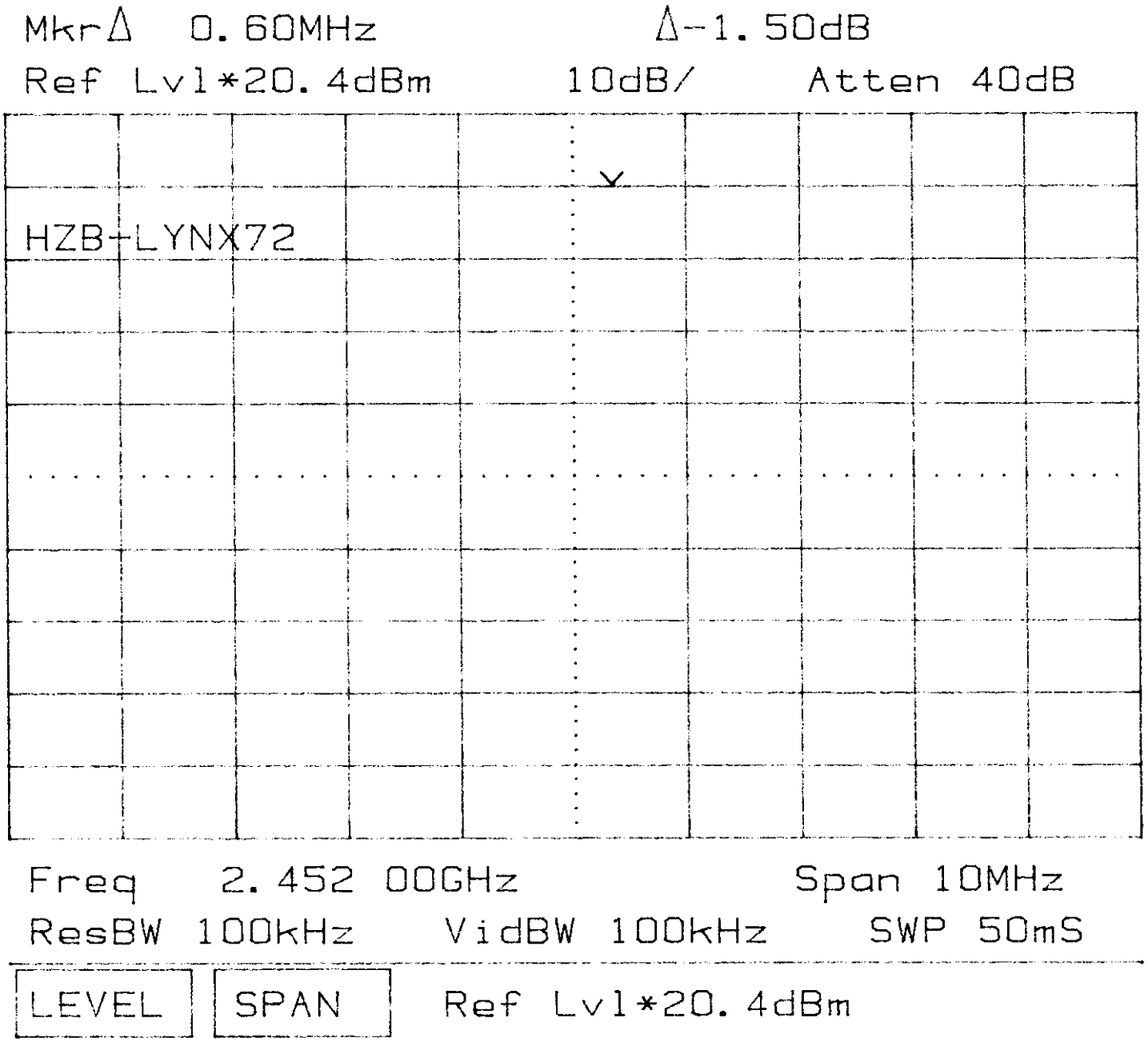
PLOT# 3a1


MkrΔ 0.60MHz
Δ-1.30dB
Ref Lvl*20.4dBm
10dB/
Atten 40dB
HZB-LYNX22
Freq 2.412 00GHz
Span 10MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Ref Lvl*20.4dBm

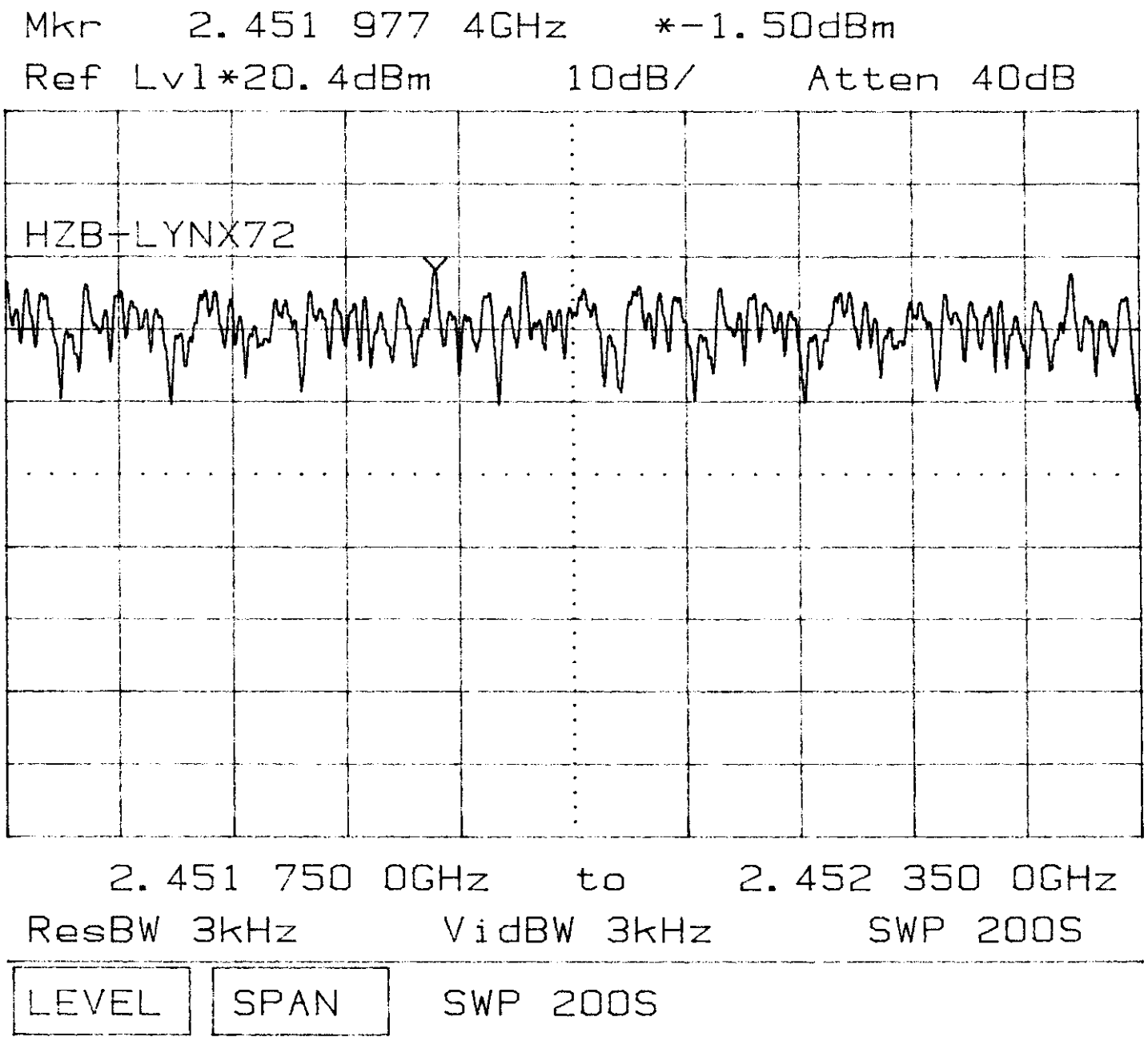
PLOT# 3a2


Mkr 2.412 041 4GHz *-1.80dBm
Ref Lvl*20.4dBm 10dB/ Atten 40dB
HZB-LYNX72
2.411 820 0GHz to 2.412 420 0GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL
SPAN
SWP 200S

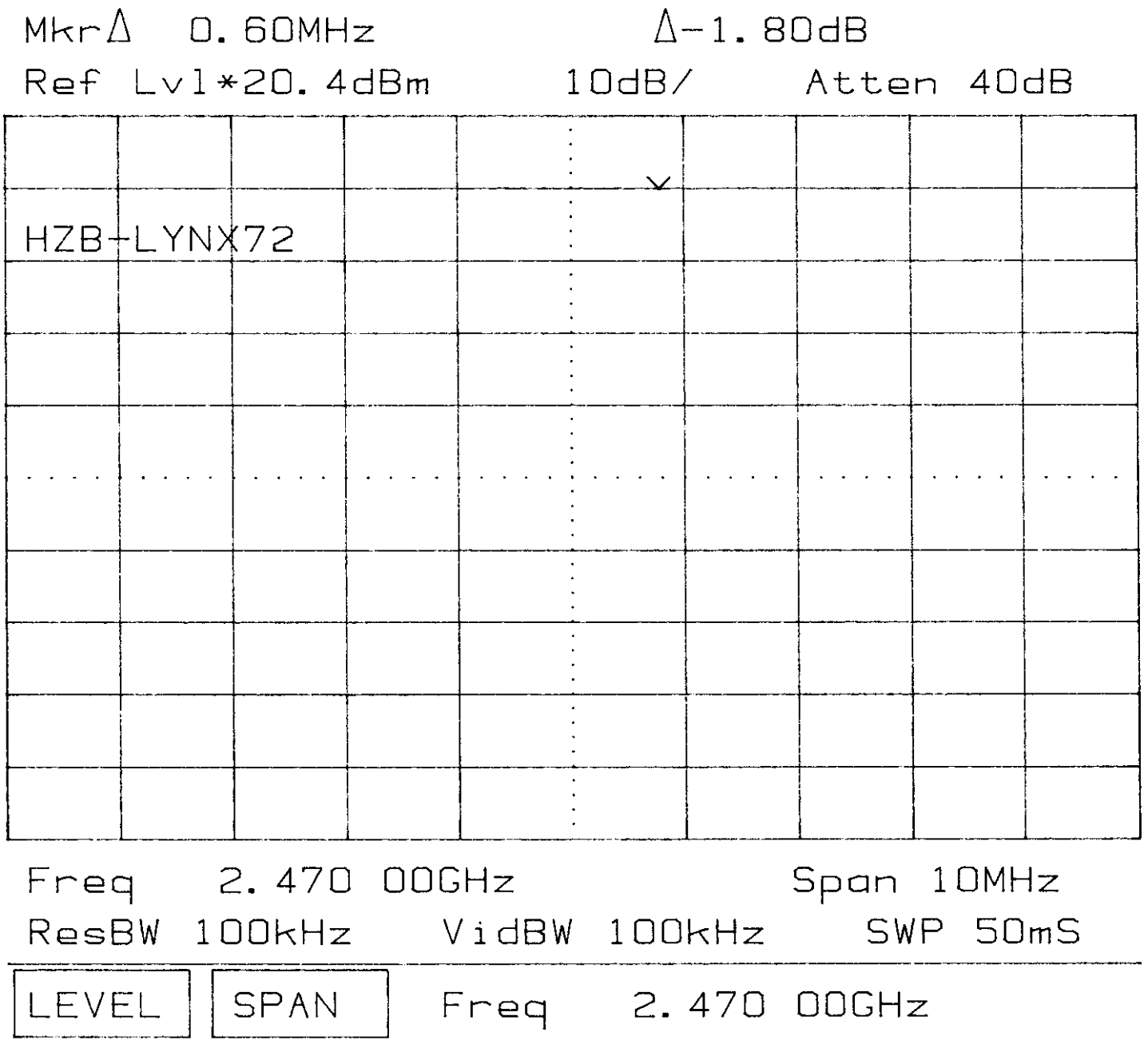
PLOT# 3b1


MkrΔ 0.60MHz
Δ-1.50dB
Ref Lvl*20.4dBm
10dB/
Atten 40dB
HZB-LYNX72
Freq 2.452 00GHz
Span 10MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Ref Lvl*20.4dBm

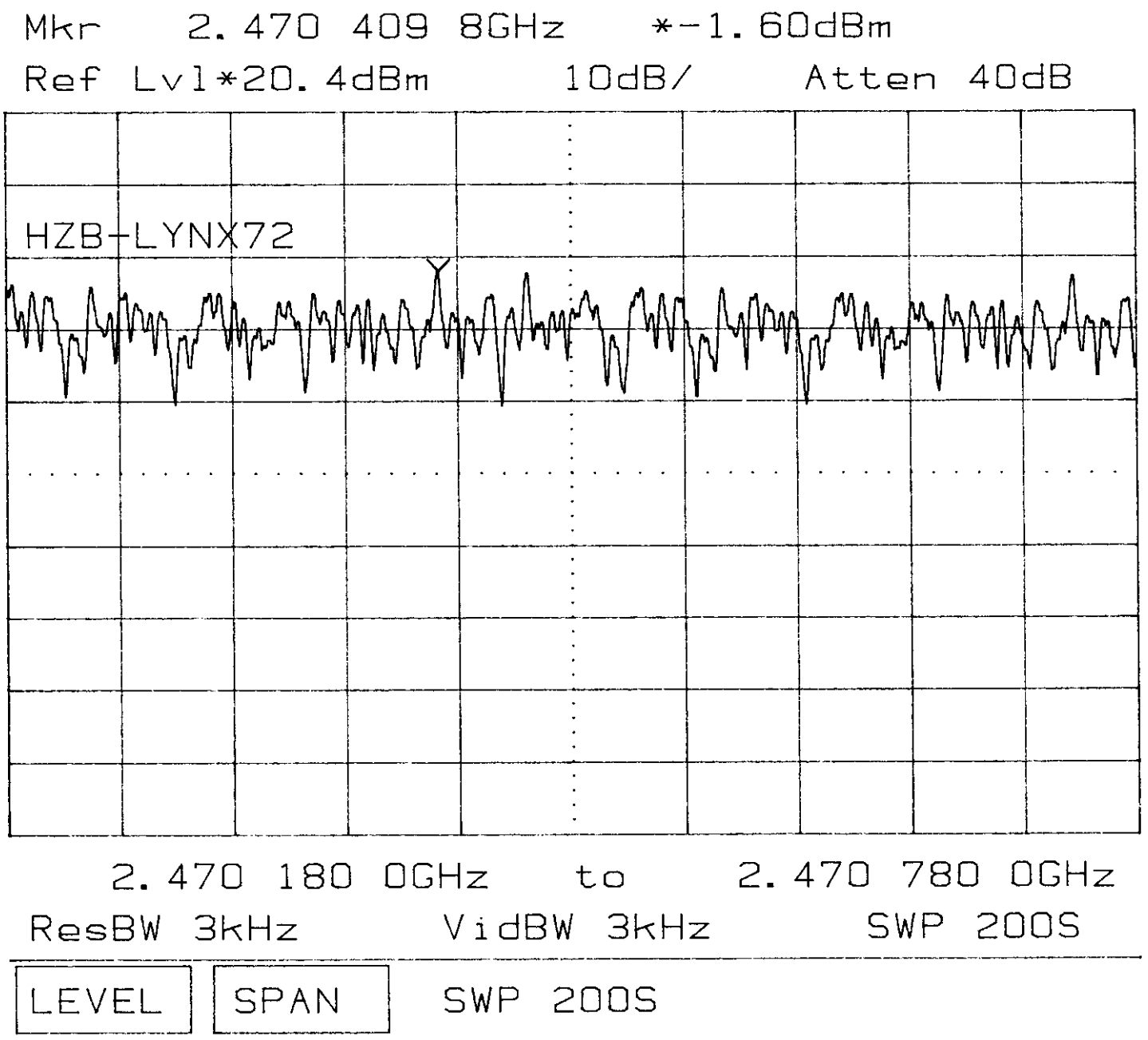
PLOT# 3b2


Mkr 2.451 977 4GHz *-1.50dBm
Ref Lvl*20.4dBm 10dB/ Atten 40dB
HZB+LYNX72
2.451 750 0GHz to 2.452 350 0GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL
SPAN
SWP 200S

PLOT# 3c1


MkrΔ 0.60MHz
Δ-1.80dB
Ref Lvl*20.4dBm
10dB/
Atten 40dB
HZB-LYNX72
Freq 2.470 00GHz
Span 10MHz
ResBW 100kHz
VidBW 100kHz
SWP 50mS
LEVEL
SPAN
Freq 2.470 00GHz

PLOT# 3c2


Mkr 2.470 409 8GHz *-1.60dBm
Ref Lvl*20.4dBm 10dB/ Atten 40dB
HZB-LYNX72
2.470 180 0GHz to 2.470 780 0GHz
ResBW 3kHz VidBW 3kHz SWP 200S
LEVEL
SPAN
SWP 200S

4.4 Out of Band Conducted Emissions:

In any 100 kHz bandwidth outside the EUT passband, the RF power shall be at least 20 dB below that of the maximum in-band 100 kHz emission.

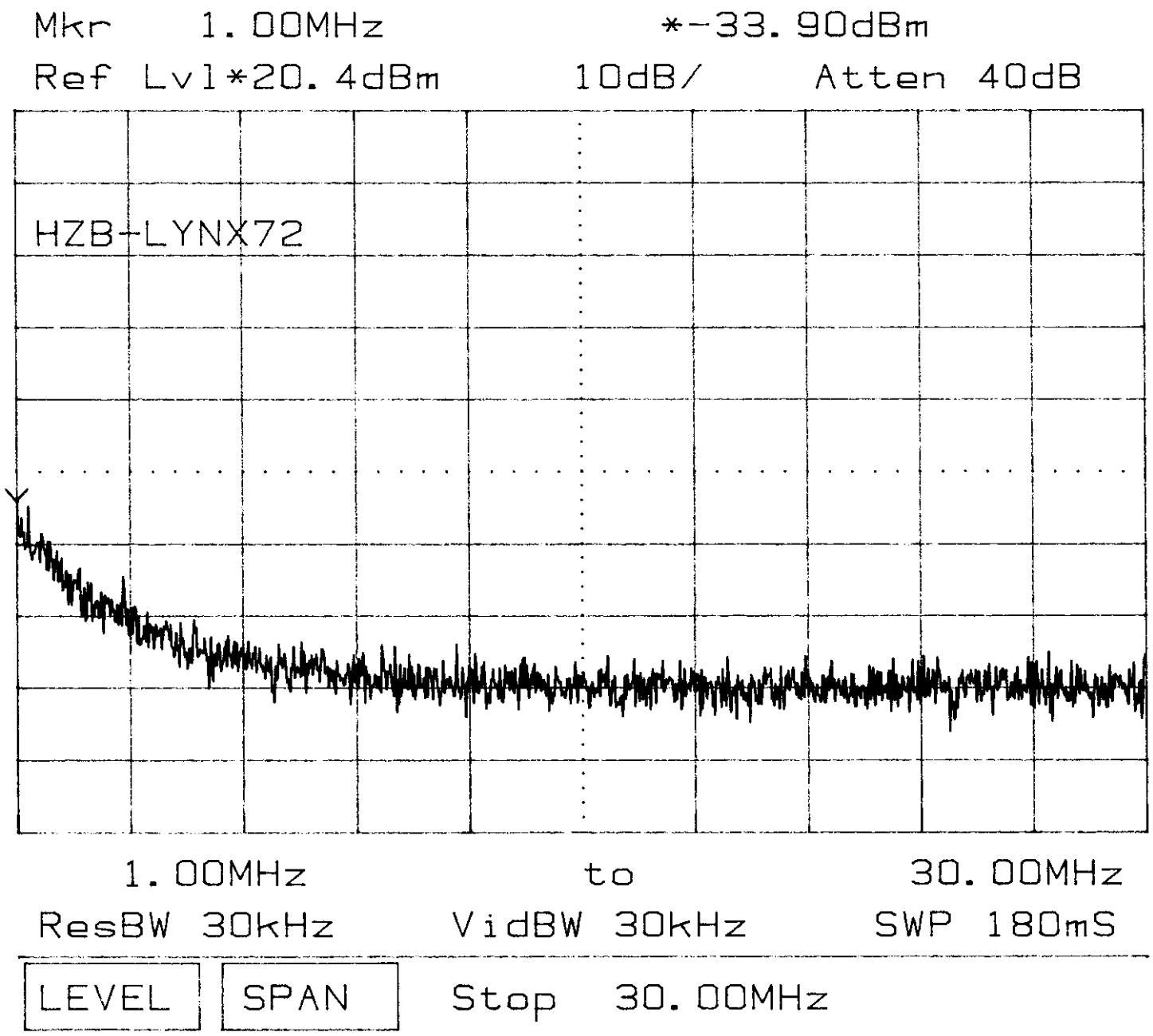
Test Results:

Refer to the following plots for out of band conducted emissions data:

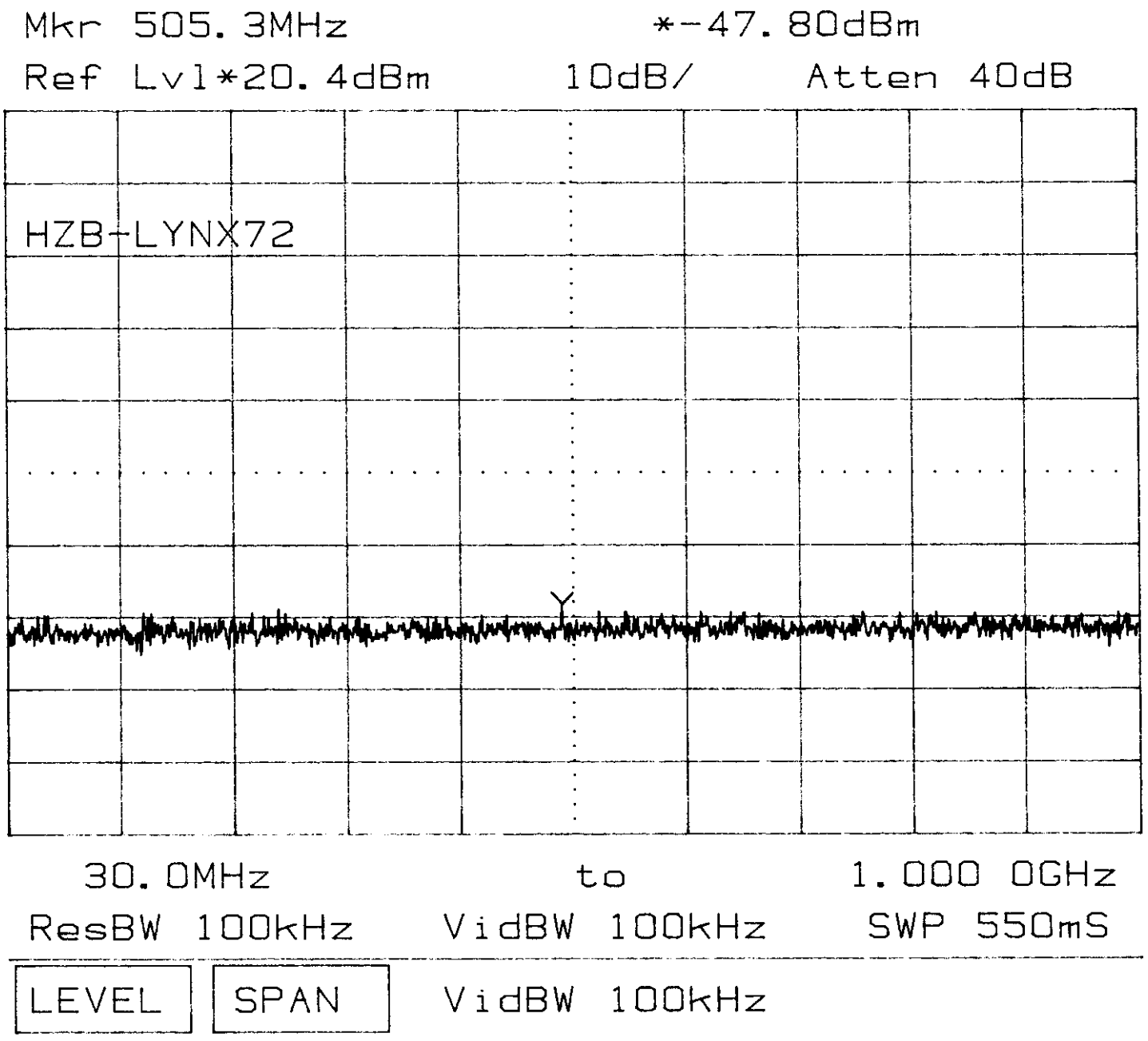
Plot 4a1 - 4a4: Low Channel Emissions
Plot 4b1 - 4b5: Middle Channel Emissions
Plot 4c1 - 4c4: High Channel Emissions

PLOT# 4a1

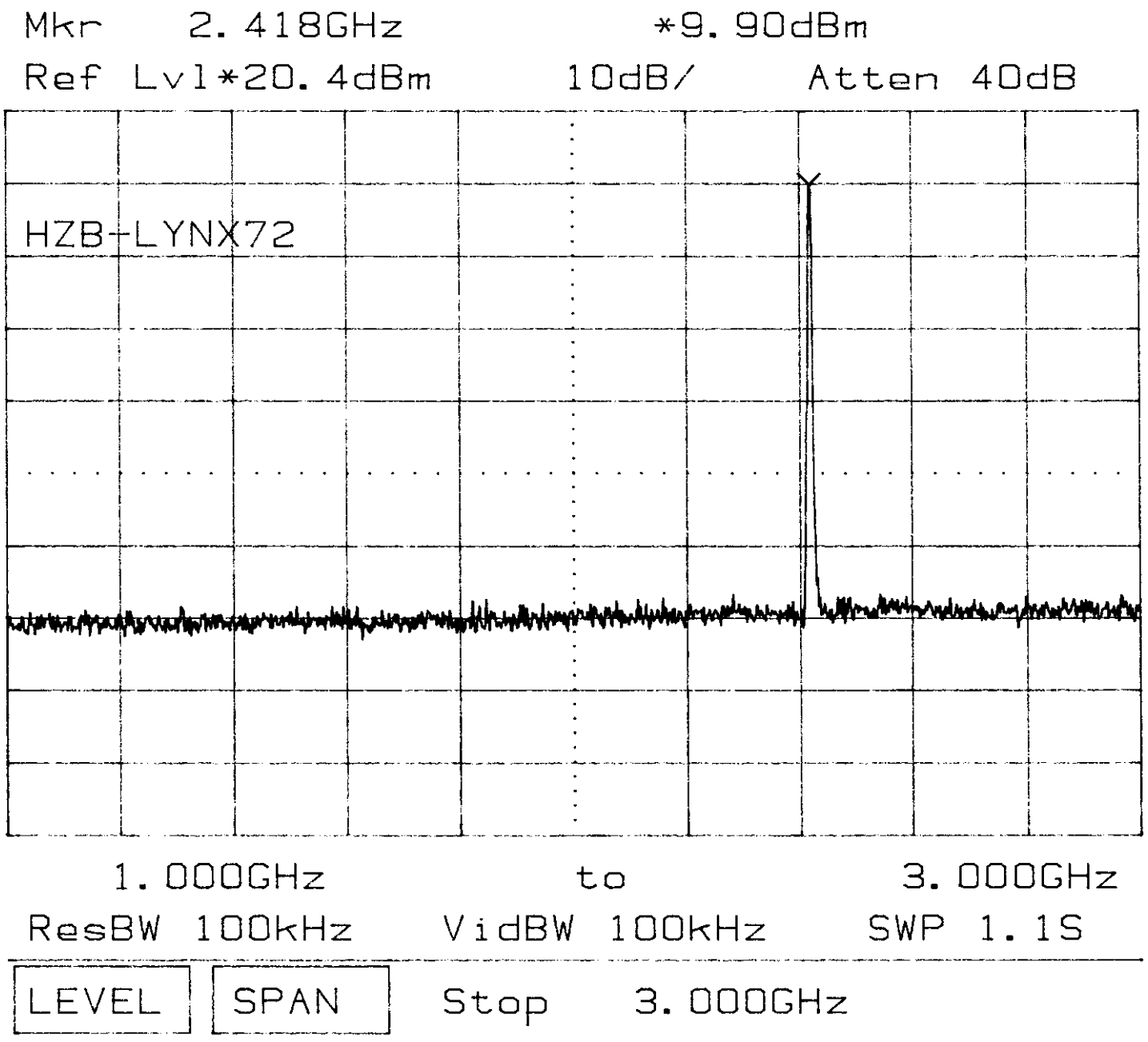
LOW CHANNEL 2412 MHz



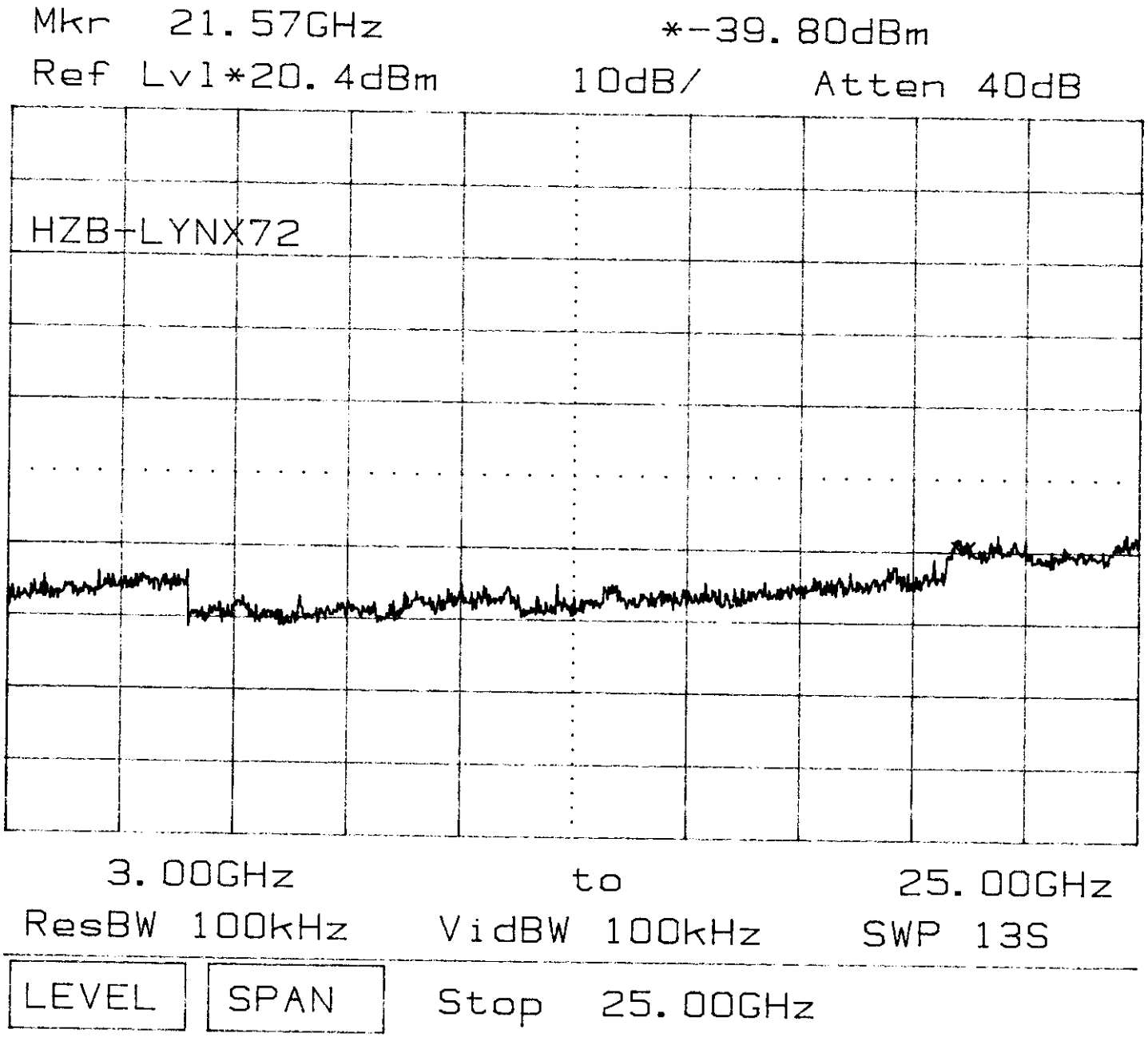
PLOT# 4a2
LOW CHANNEL 2412 MHz



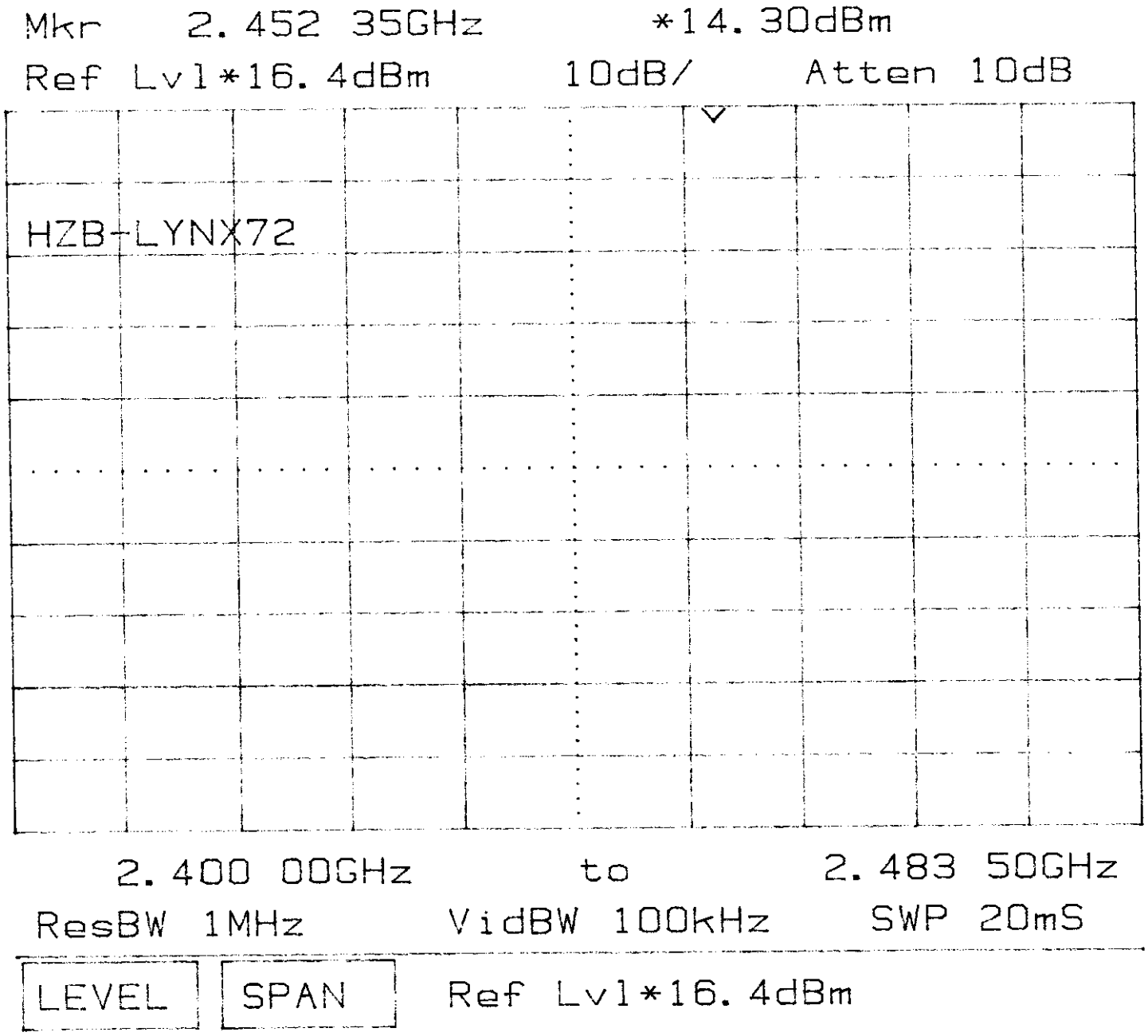
PLOT# 4a3
LOW CHANNEL 2412 MHz



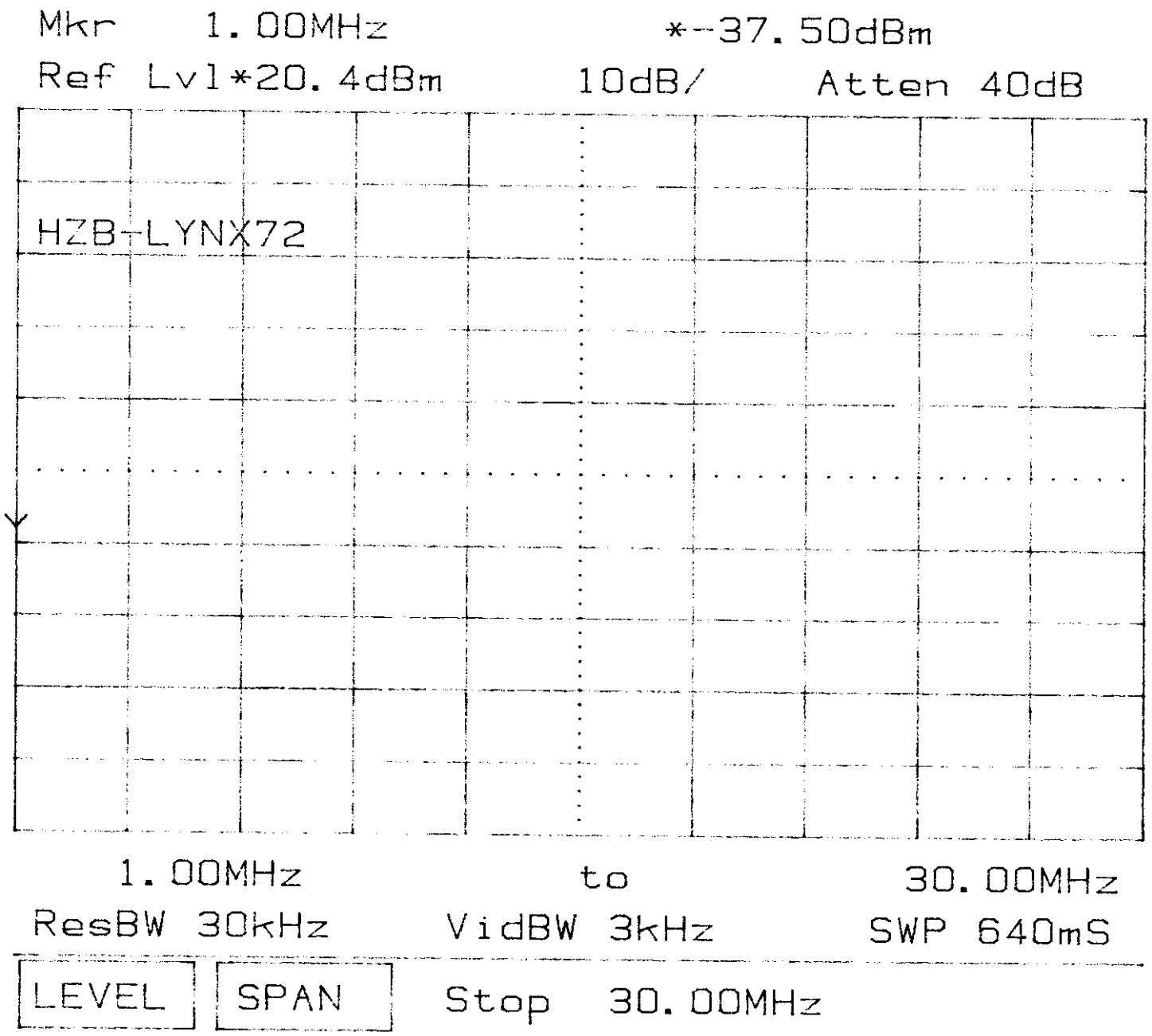
PLOT# 4a4
LOW CHANNEL 2412 MHz



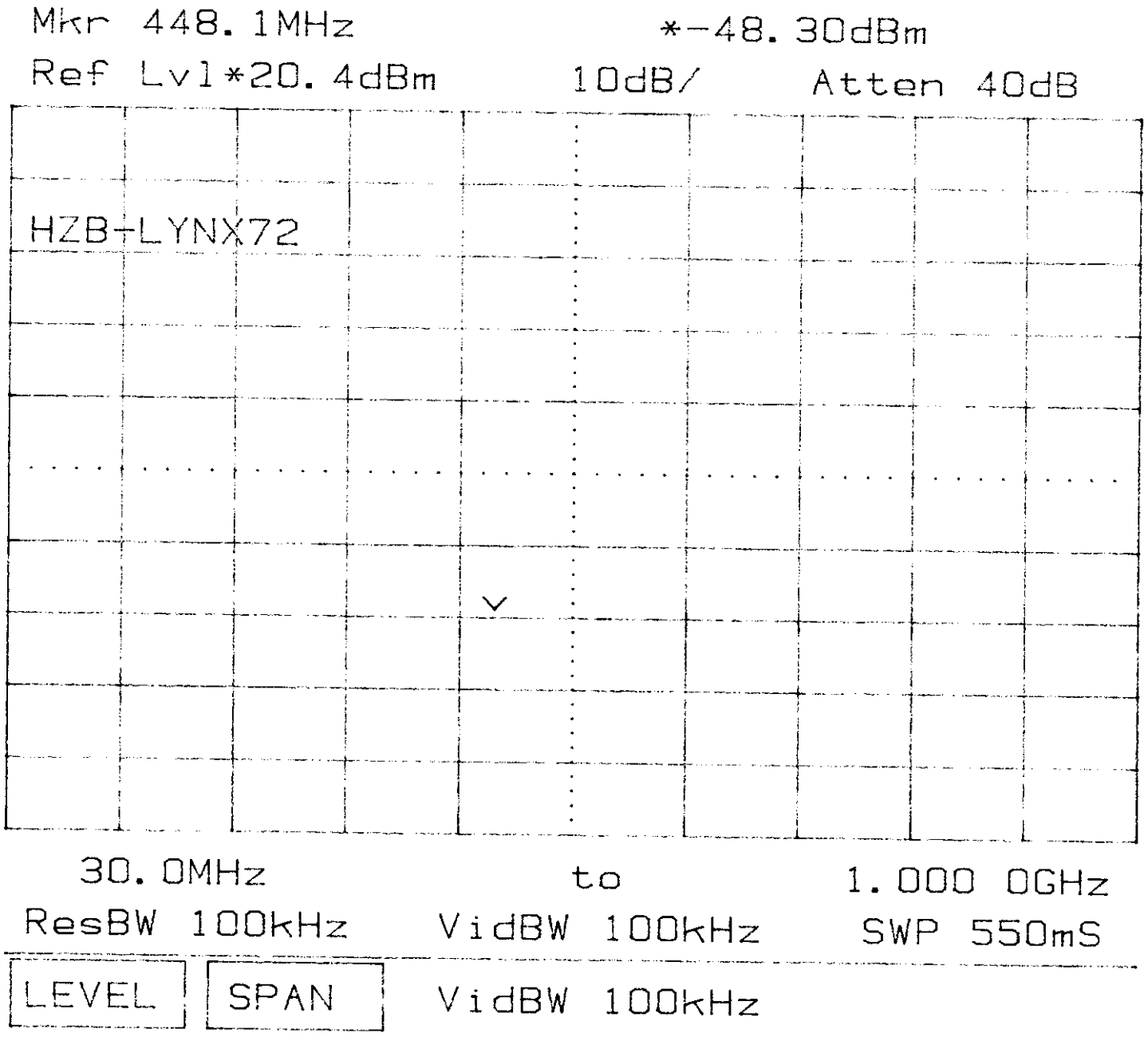
PLOT# 4b4
MIDDLE CHANNEL 2452 MHz



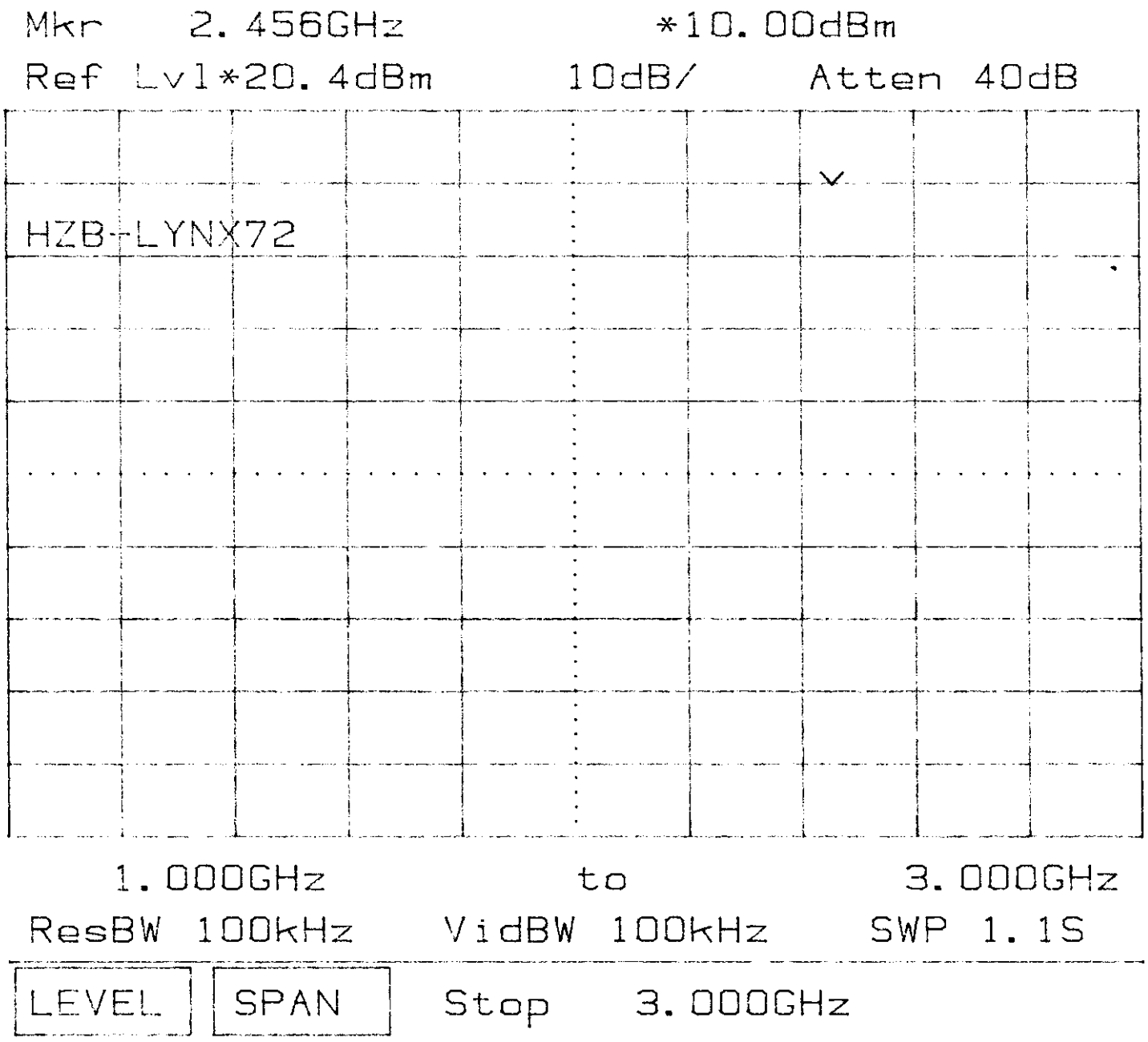
PLOT# 4b1
MIDDLE CHANNEL 2452 MHz



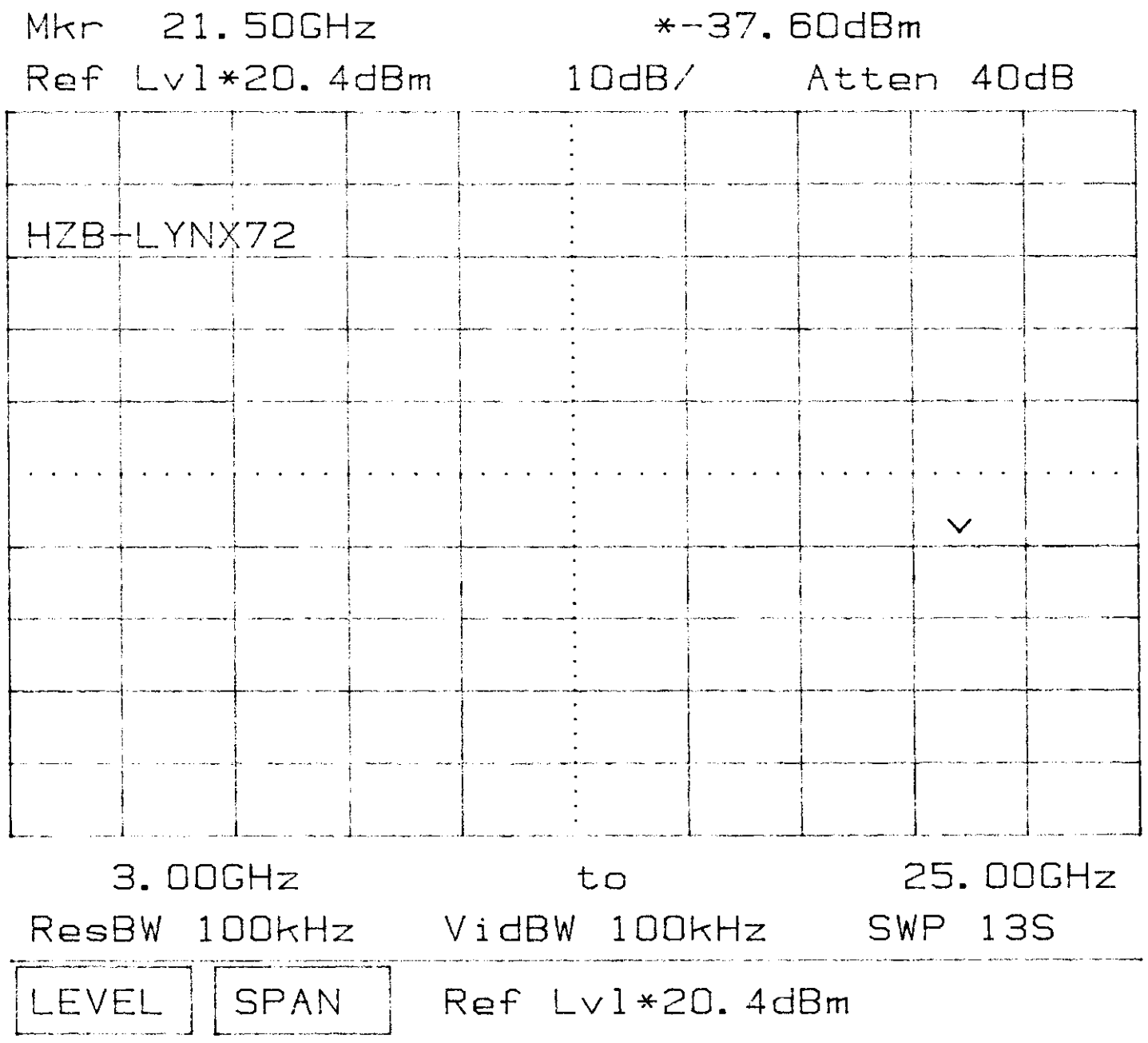
PLOT# 4b2
MIDDLE CHANNEL 2452 MHz



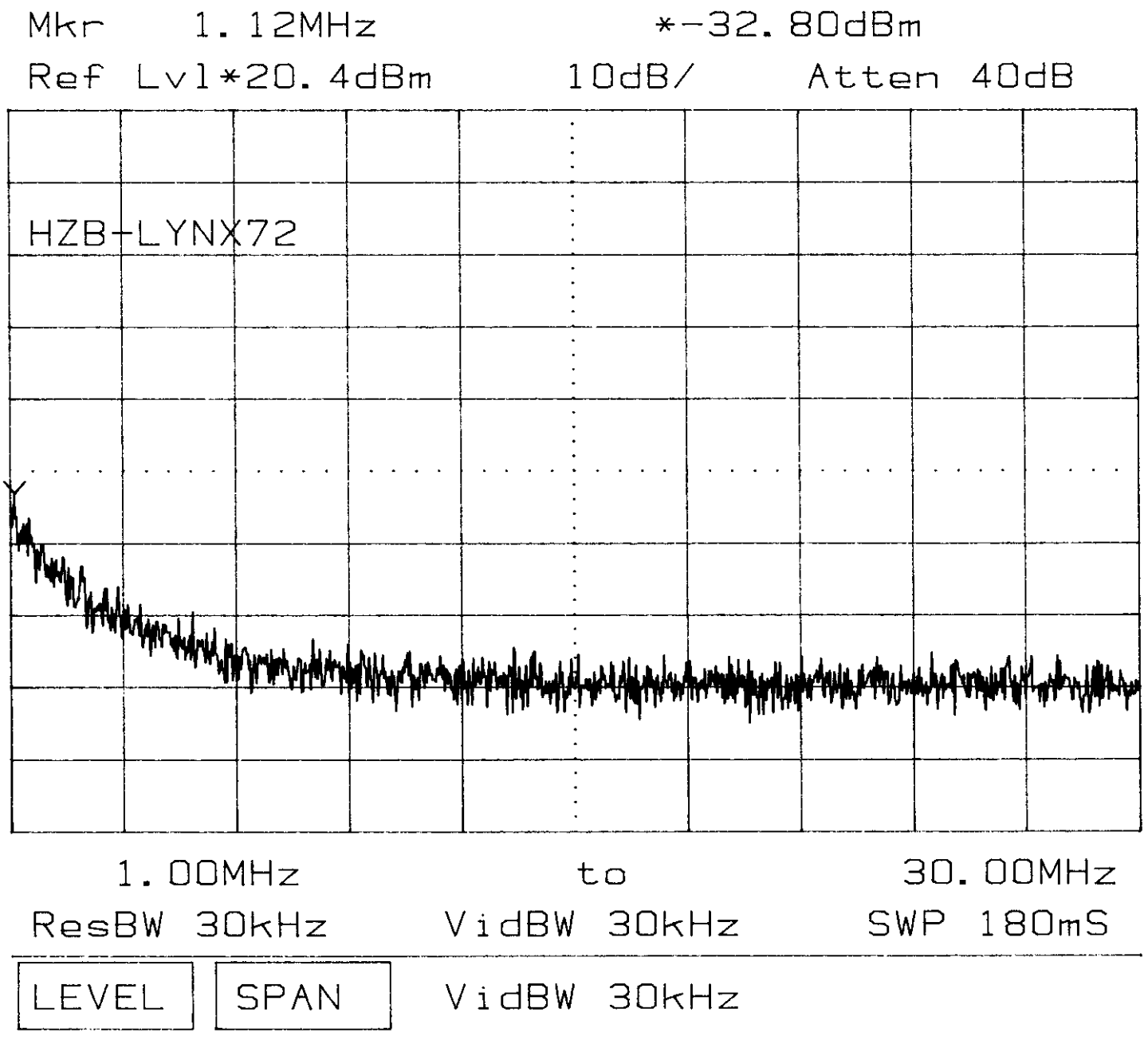
PLOT# 4b3
MIDDLE CHANNEL 2452 MHz



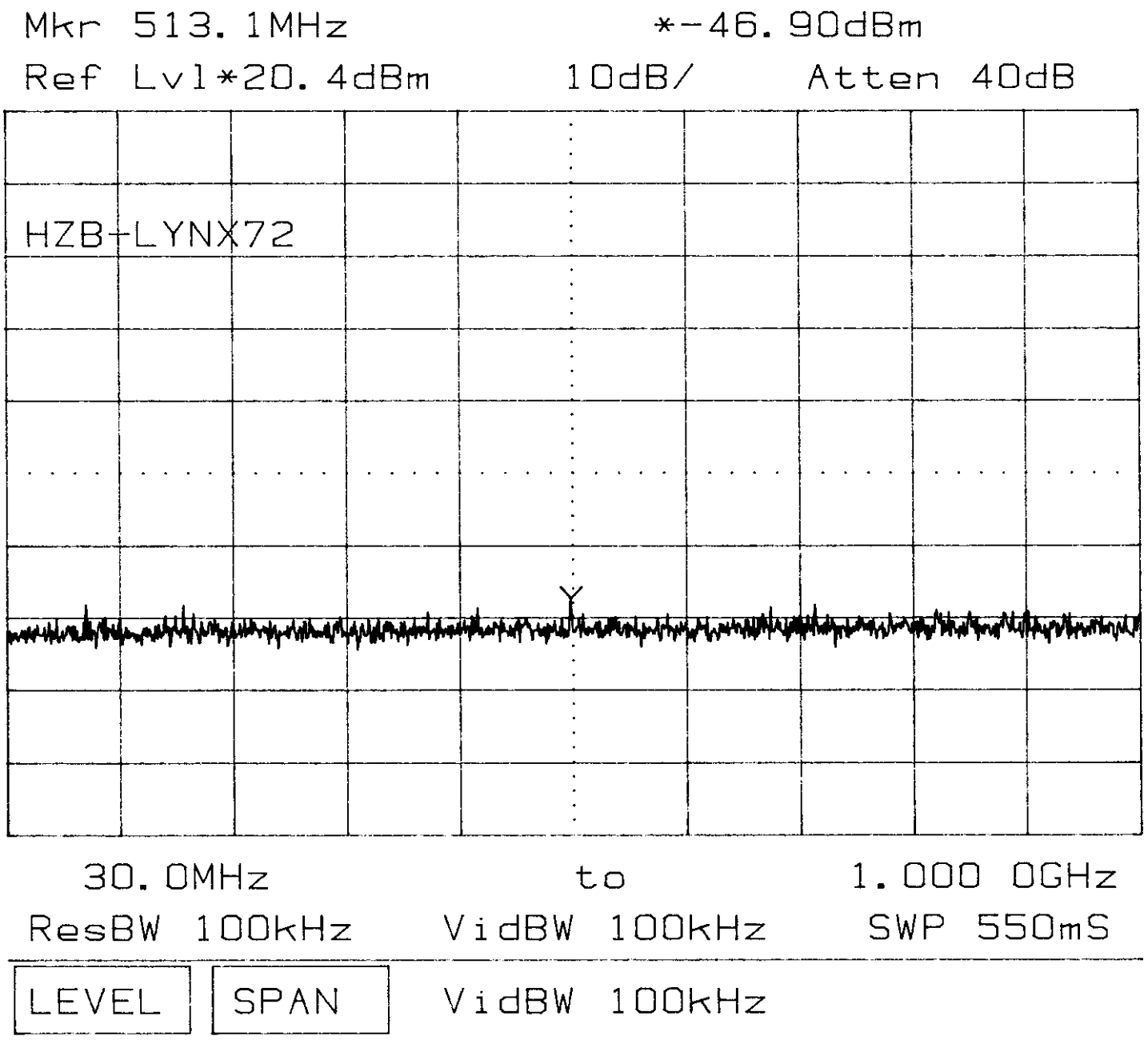
PLOT# 4b5
MIDDLE CHANNEL 2452 MHz



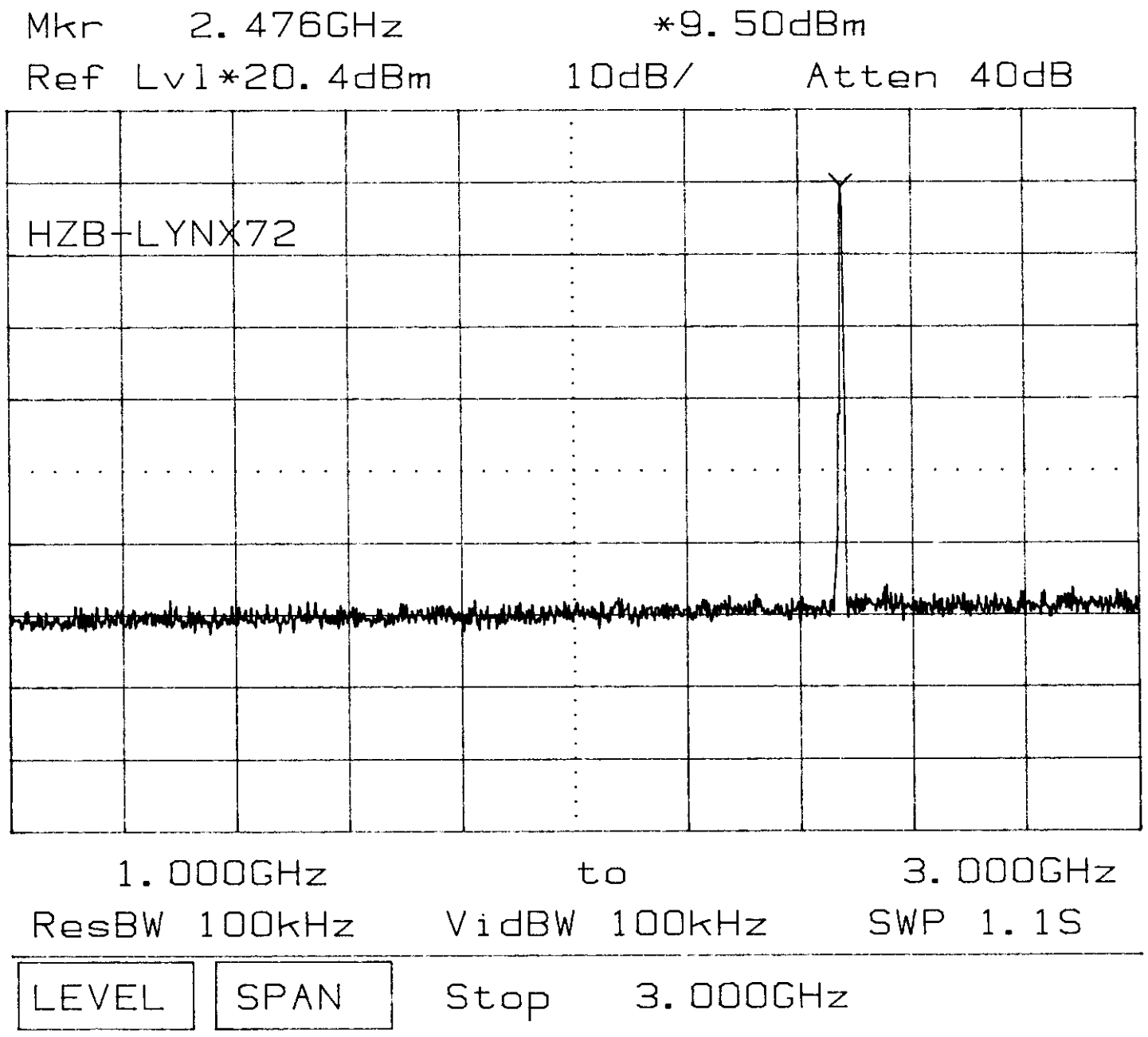
PLOT# 4c1
HIGH CHANNEL 2470 MHz



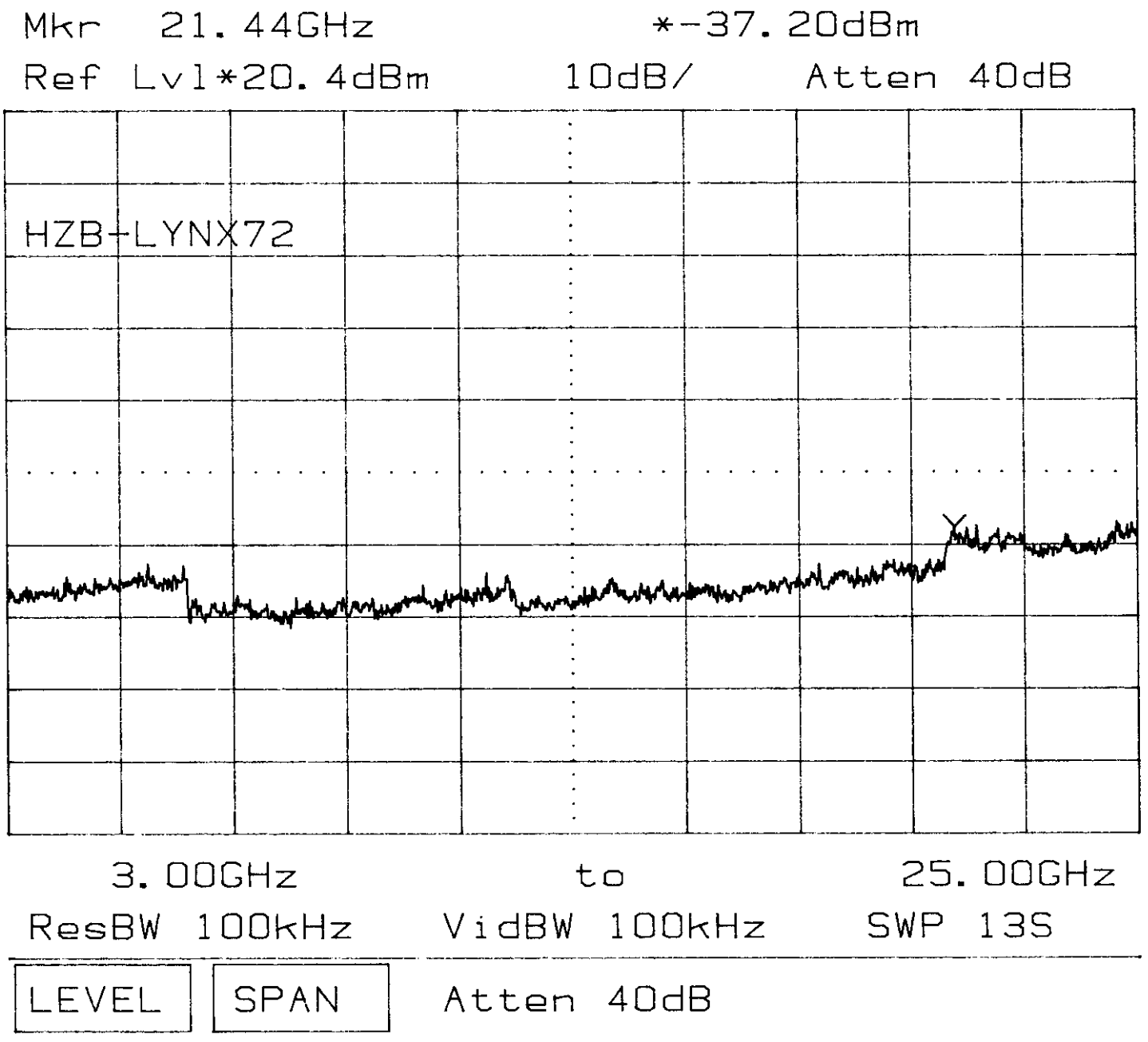
PLOT# 4c2
HIGH CHANNEL 2470 MHz



PLOT# 4c3
HIGH CHANNEL 2470 MHz



PLOT# 4c4
HIGH CHANNEL 2470 MHz



4.5 Transmitter Radiated Emissions in Restricted Bands:

Radiated emission measurements were performed from 30 MHz to 24000 GHz. Analyzer resolution is 100 kHz or greater for frequencies from 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection and average detection (above 1 Ghz) unless otherwise specified.

On the following pages, the emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter is in full radiated power.

The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz.

The transmitter was setup to transmit at the highest channel. The spectrum analyzer with resolution bandwidth 1 MHz was connected to the antenna terminal of the transmitter. The antenna conducted emissions in the band 2400 - 2483.5 MHz were measured and ploted. The difference (delta) between the levels on fundamental frequency and on the frequency 2483.5 MHz was determined. Then the field strength E_0 in dBuV/m) of radiated emission at the fundamental frequency at 3m was measured.

The radiated emission (E_1 in dBuV/m) at 2483.5 MHz was calculated as follows:

$$E_1 = E_0 - \text{delta}$$

The same procedure was used to measure the radiated emissions at the frequency 2390 MHz and down to 2310 MHz.

For the test results, refer to the attached data sheets and plots.

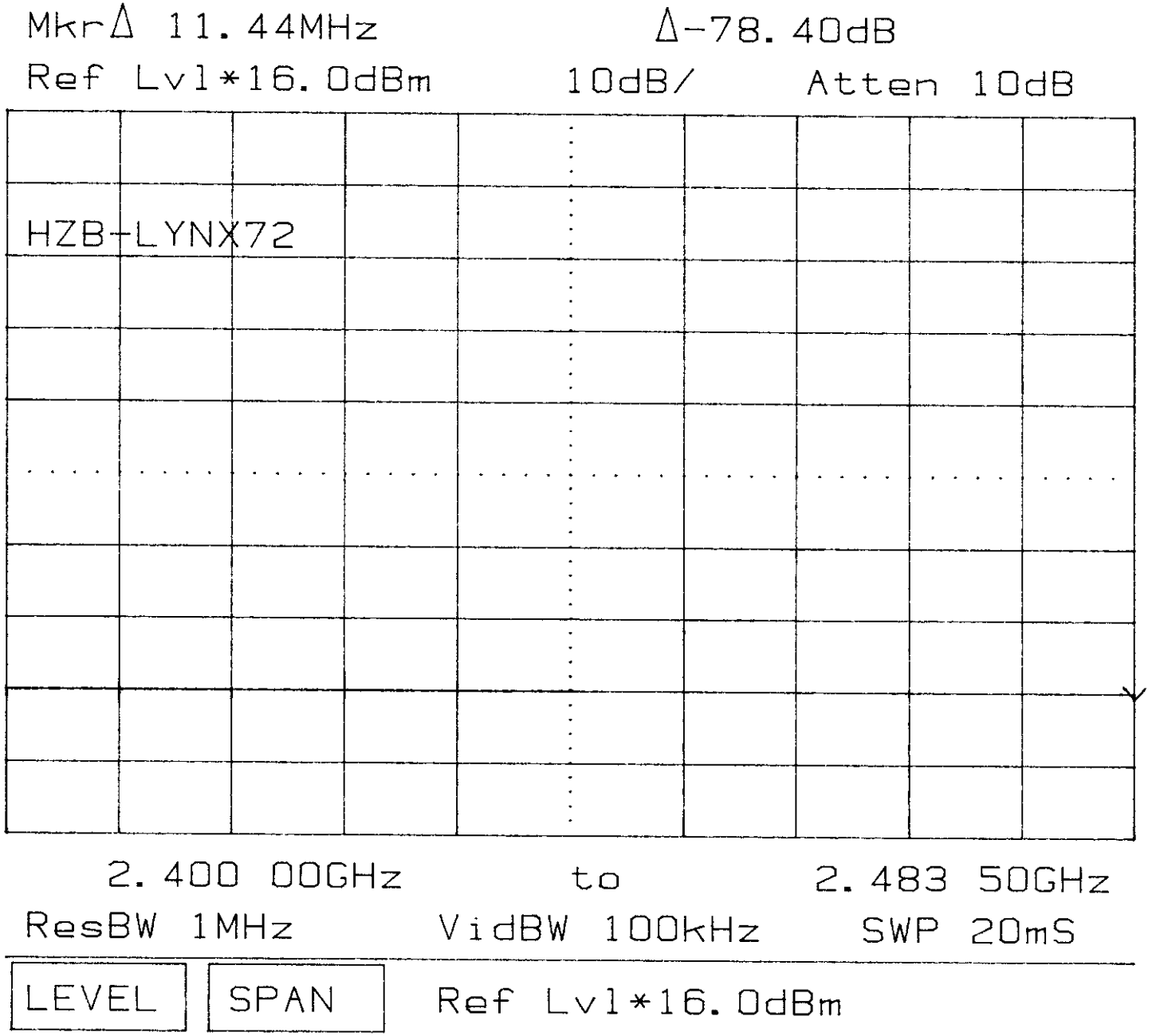
ITS Intertek Testing Services

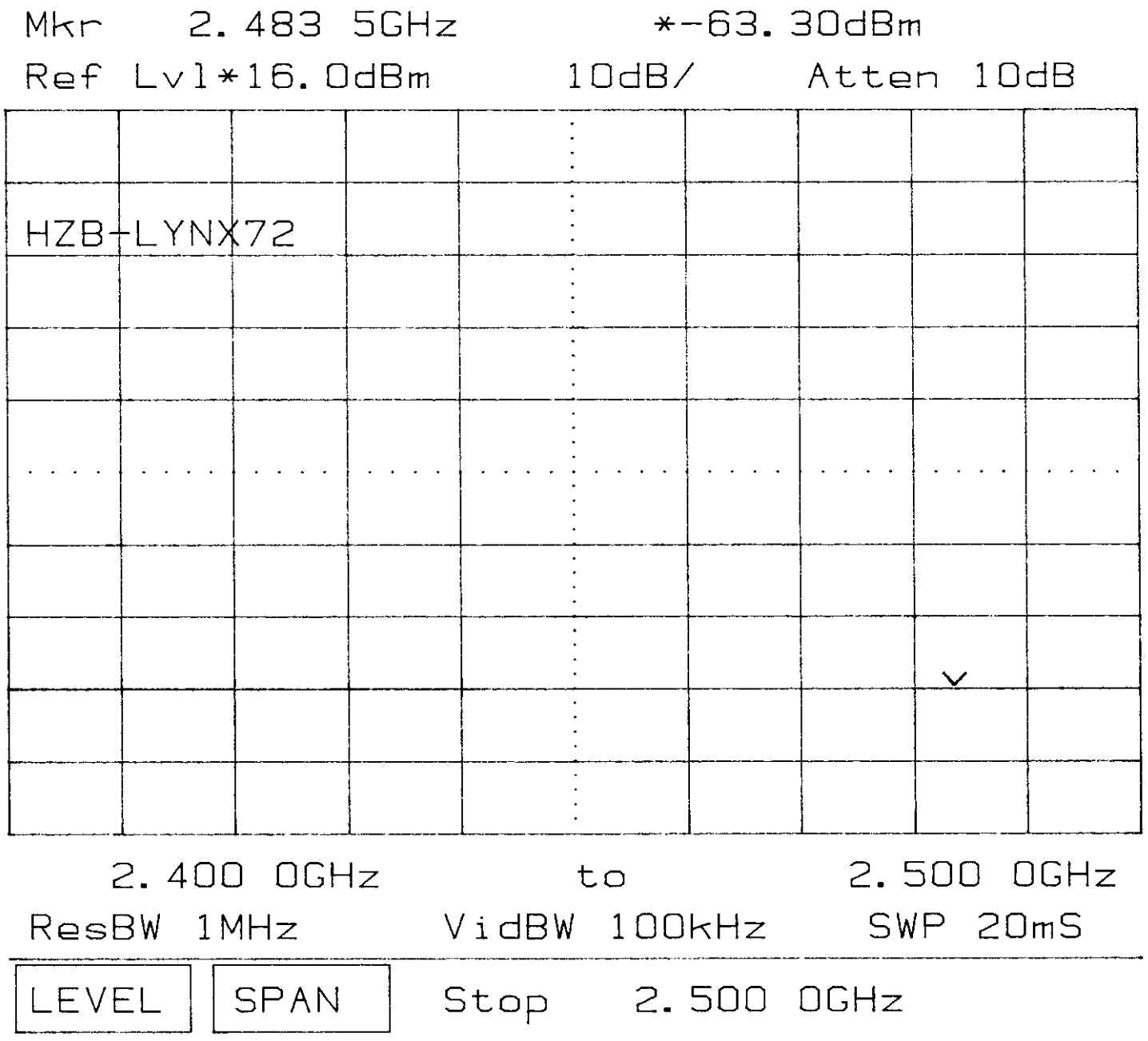
Company: GLENAYER WESTERN MULTIPLEX
Project #: J98016754
Model: LYNX 2.4 GHz (High ch 2470 MHz)
Engineer: Xi-Ming Yang

FCC 15.247 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
2471.0	V	104.4*	27.8	2.3	0.0	0.0	134.5		
2471.0	V	99.5	27.8	2.3	0.0	0.0	129.6		
2483.5							*56.1!	74.0	-17.9
2483.5							51.2!	54.0	-2.8
4942.0	V	50.5*	34.6	3.0	-38.0	0.0	50.1	74.0	-23.9
4942.0	V	47.2	34.6	3.0	-38.0	0.0	46.8	54.0	-7.2
7413.0	V	43.7*	37.5	4.2	-38.7	0.0	46.7	74.0	-27.3
7413.0	V	35.4	37.5	4.2	-38.7	0.0	38.4	54.0	-15.6
12355.0	V	39.0*	40.7	5.8	-39.0	0.0	46.5	74.0	-27.5
12355.0	V	29.0	40.7	5.8	-39.0	0.0	36.5	54.0	-17.5
17297.0	V	37.0*	43.2	7.2	-38.0	0.0	49.4	74.0	-24.6
17297.0	V	28.0	43.2	7.2	-38.0	-9.5	30.9	54.0	-23.1
19768.0	V	37.0*	40.2	8.4	-23.5	-9.5	52.6	74.0	-21.4
19768.0	V	28.0	40.2	8.4	-23.5	-9.5	43.6	54.0	-10.4
22239.0	V	37.0*	40.3	9.2	-24.2	-9.5	52.8	74.0	-21.2
22239.0	V	28.0	40.3	9.2	-24.2	-9.5	43.8	54.0	-10.2

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Reading with * were peak-reading.**
4. **Number with ! was made by subtract 78.4 dB (see attached plots) from fundamental**


MkrΔ 11.44MHz
Δ-78.40dB
Ref Lvl*16.0dBm
10dB/
Atten 10dB
HZB-LYNX72
2.400 00GHz
to
2.483 50GHz
ResBW 1MHz
VidBW 100kHz
SWP 20mS
LEVEL
SPAN
Ref Lvl*16.0dBm


Mkr 2.483 5GHz
*-63.30dBm
Ref Lvl*16.0dBm
10dB/
Atten 10dB
HZB-LYNX72
2.400 0GHz
to
2.500 0GHz
ResBW 1MHz
VidBW 100kHz
SWP 20mS
LEVEL
SPAN
Stop 2.500 0GHz

ITS Intertek Testing Services

Company: GLENAYER WESTERN MULTIPLEX
Project #: J98016754
Model: LYNX 2.4 GHz (Mid ch 2452 MHz)
Engineer: Xi-Ming Yang

FCC 15.247 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
4900.0	V	40.0*	34.6	3.0	-38.0	-9.5	30.1	74.0	-43.9
4900.0	V	37.0	34.6	3.0	-38.0	-9.5	27.1	54.0	-26.9
7350.0	V	42.5*	40.7	5.8	-39.0	-9.5	40.5	74.0	-33.5
7350.0	V	35.3	40.7	5.8	-39.0	-9.5	33.3	54.0	-20.7
1225.0	V	37.0*	40.2	8.4	-23.5	-9.5	52.6	74.0	-21.4
1225.0	V	26.0	40.2	8.4	-23.5	-9.5	41.6	54.0	-12.4
19600.0	H	39.0*	40.2	8.4	-23.5	-9.5	54.6	74.0	-19.4
19600.0	H	28.0	40.2	8.4	-23.5	-9.5	43.6	54.0	-10.4
22050.0	H	38.0*	40.3	9.2	-24.2	-9.5	53.8	74.0	-20.2
22050.0	H	29.0	40.3	9.2	-24.2	-9.5	44.8	54.0	-9.2

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Reading with * were peak-reading.**

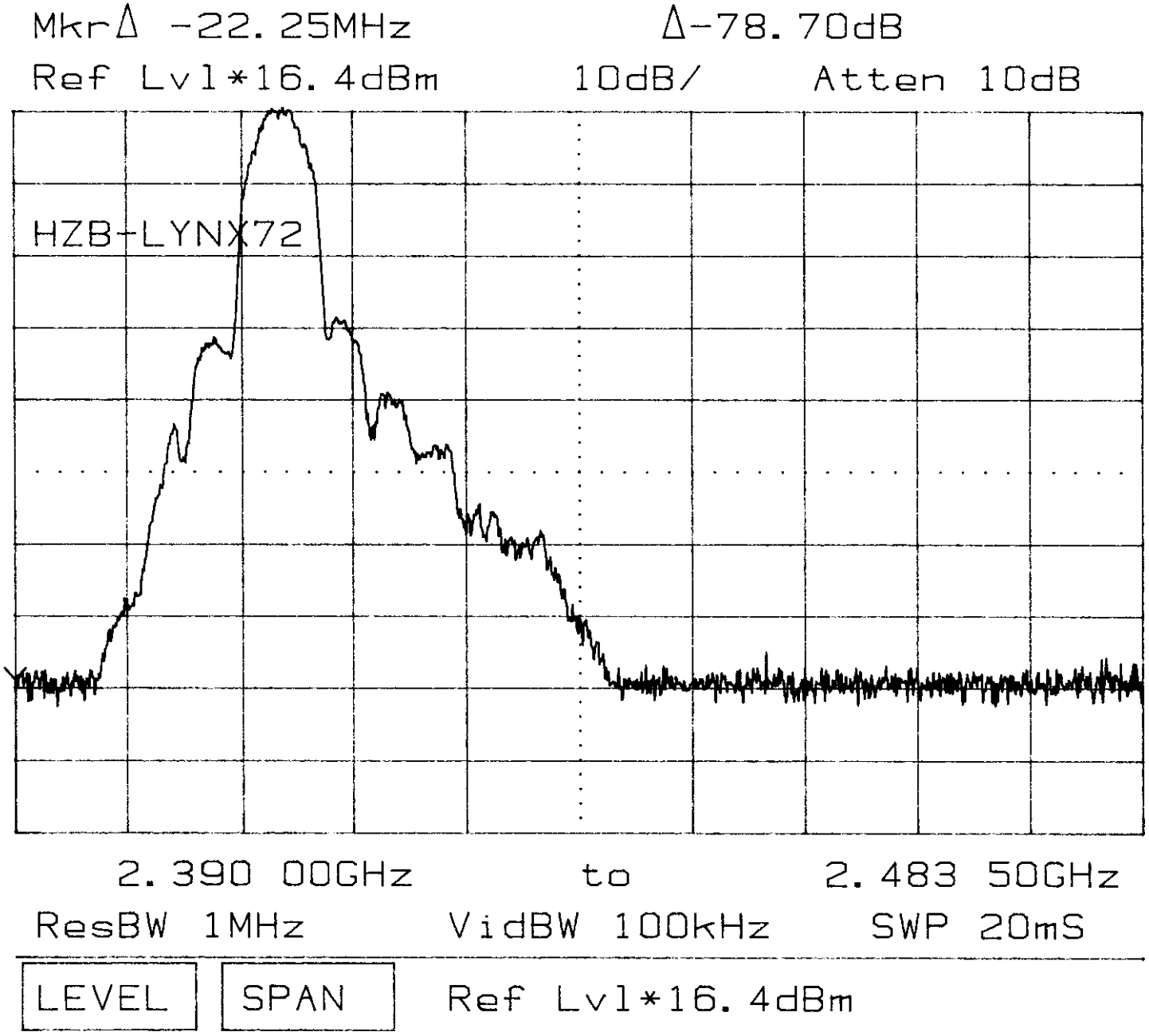
ITS Intertek Testing Services

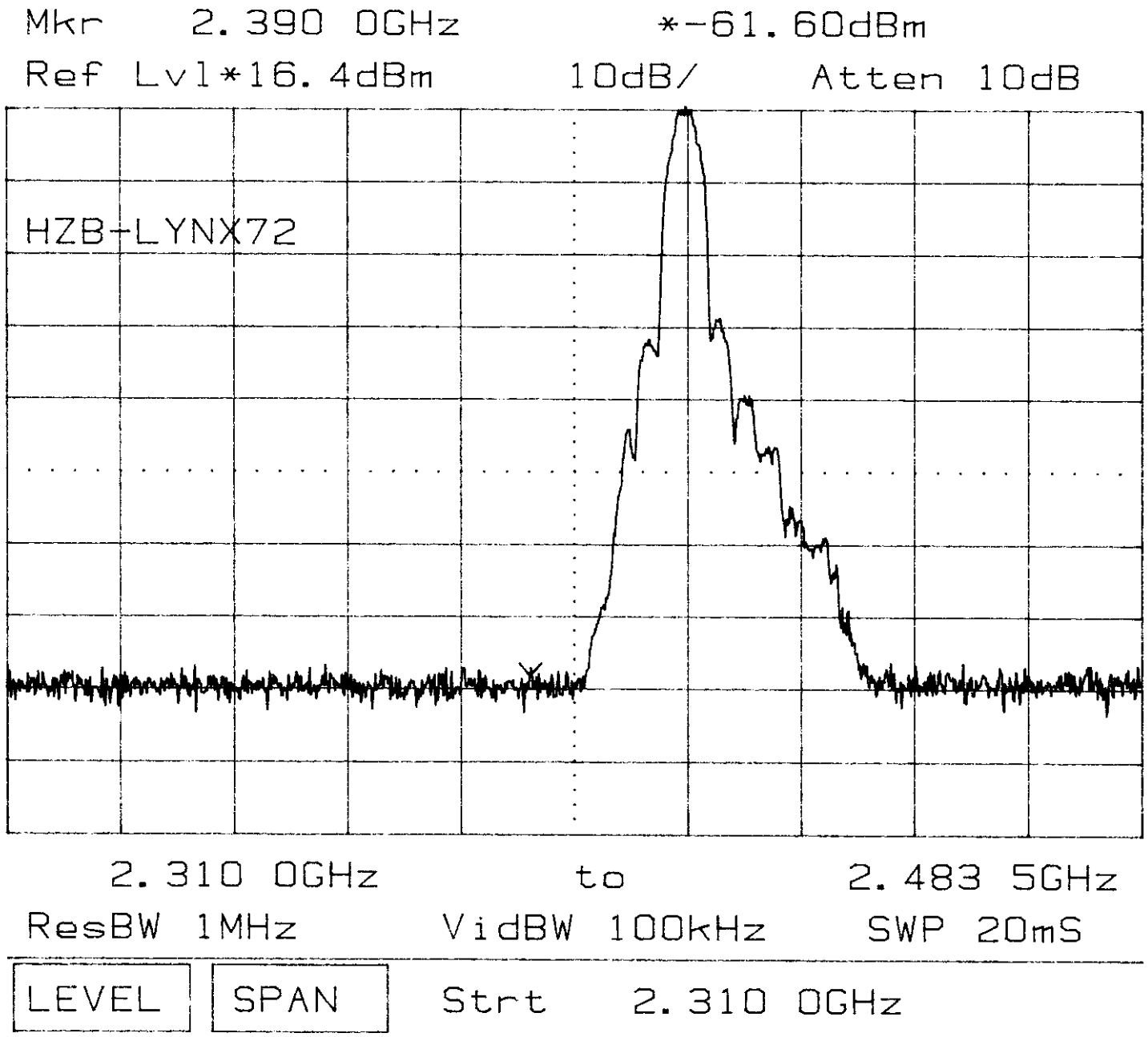
Company: GLENAYER WESTERN MULTIPLEX
Project #: J98016754
Model: LYNX 2.4 GHz (Low ch 2412 MHz)
Engineer: Xi-Ming Yang

FCC 15.247 Radiated Emissions

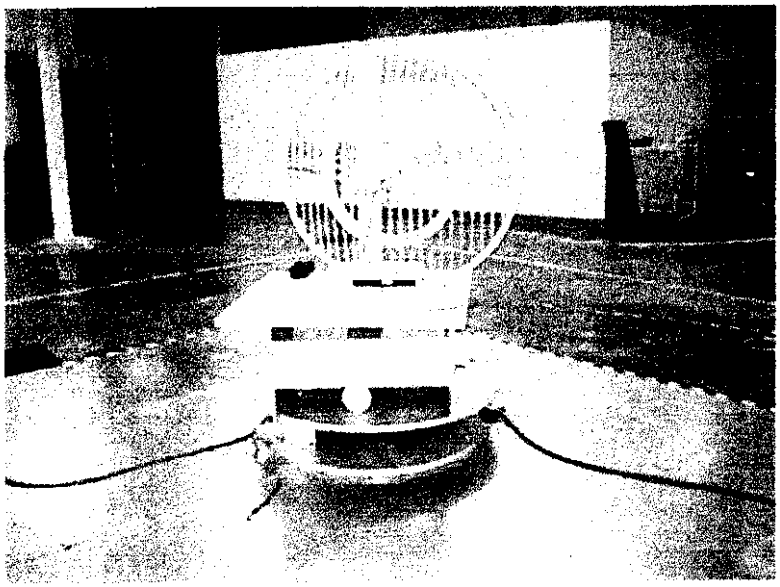
Frequency	Antenna Polarity	Reading	Antenna Factor	Cable Loss	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
2412.0	V	105.2*	27.8	2.3	0.0	0.0	135.3		
2412.0	V	100.3	27.8	2.3	0.0	0.0	130.4		
2390.0	V						*56.6!	74.0	-17.4
2390.0	V						51.7!	54.0	-2.3
4824.0	V	53.2*	34.6	3.0	-38.0	-9.5	43.3	74.0	-30.7
4824.0	V	49.2	34.6	3.0	-38.0	-9.5	39.3	54.0	-14.7
12035.0	V	42.0*	40.7	5.8	-39.0	-9.5	40.0	74.0	-34.0
12035.0	V	31.0	40.7	5.8	-39.0	-9.5	29.0	54.0	-25.0
19256.0	V	38.0*	40.2	8.4	-23.5	-9.5	53.6	74.0	-20.4
19256.0	V	27.0	40.2	8.4	-23.5	-9.5	42.6	54.0	-11.4

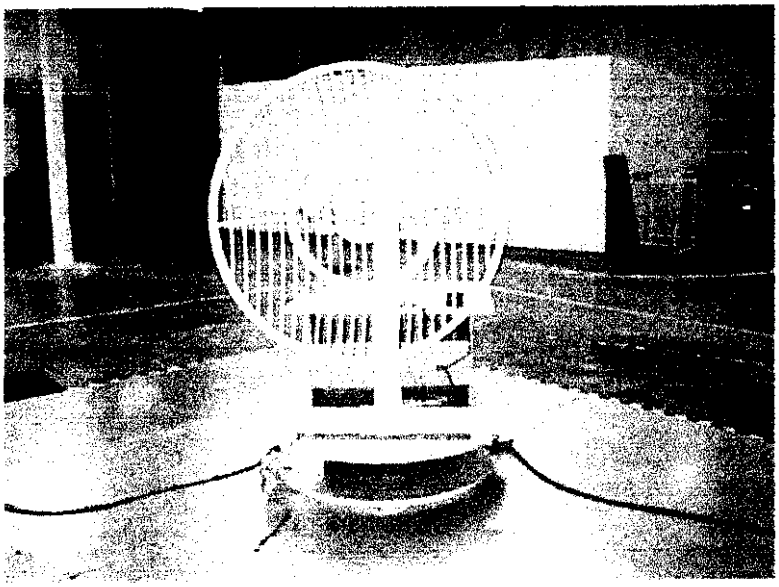
Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**
3. **Reading with * were peak-reading.**
4. **Number with ! was made by subtract 78.7 dB (see attached plots) from fundamental**


MkrΔ -22.25MHz
Δ-78.70dB
Ref Lvl*16.4dBm
10dB/
Atten 10dB
HZB-LYNX72
2.390 00GHz
to
2.483 50GHz
ResBW 1MHz
VidBW 100kHz
SWP 20mS
LEVEL
SPAN
Ref Lvl*16.4dBm


Mkr 2.390 0GHz
*-61.60dBm
Ref Lvl*16.4dBm
10dB/
Atten 10dB
HZB-LYNX72
2.310 0GHz
to
2.483 5GHz
ResBW 1MHz
VidBW 100kHz
SWP 20mS
LEVEL
SPAN
Strt 2.310 0GHz

4.6 Radiated Emission Configuration Photograph

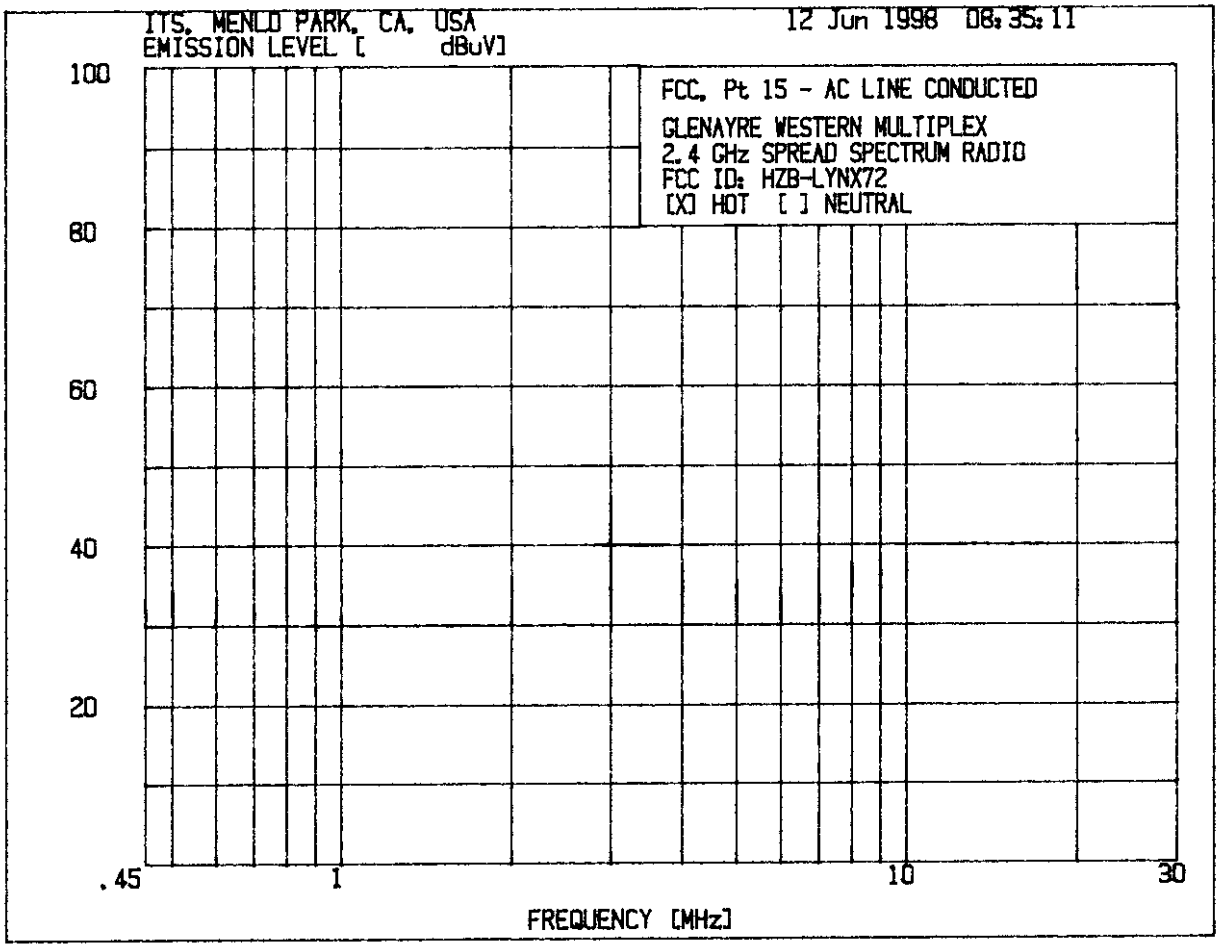


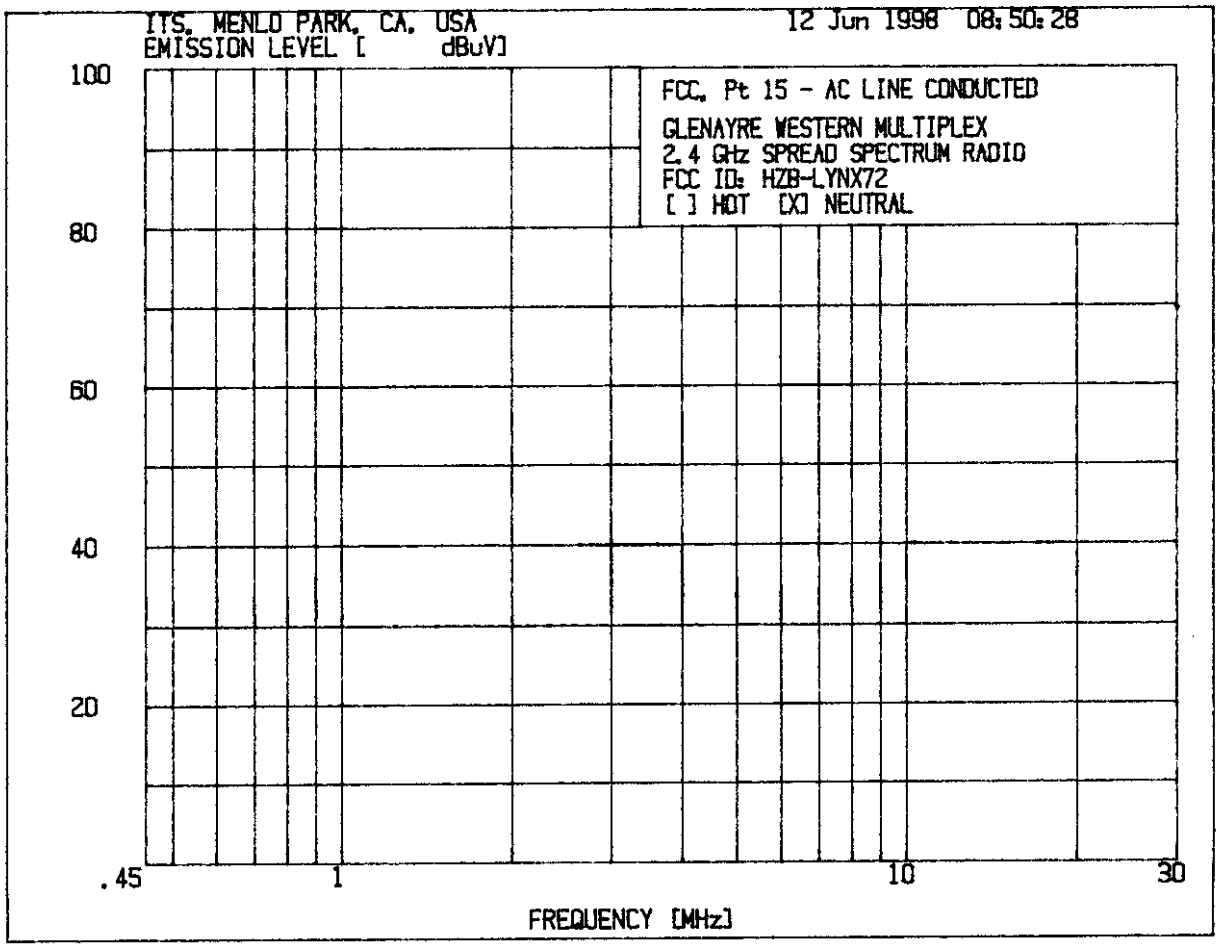


4.7 AC Line Conducted Emission:

[ ] Not required; battery operation only

[x] Test data attached


ITS, MENLO PARK, CA, USA
12 Jun 1998 08:35:11
EMISSION LEVEL [dBuV]
100
80
60
40
20
.45
1
10
30
FCC, Pt 15 - AC LINE CONDUCTED
GLENAYRE WESTERN MULTIPLEX
2.4 GHz SPREAD SPECTRUM RADIO
FCC ID: HZB-LYNX72
[X] HOT [ ] NEUTRAL
FREQUENCY [MHz]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EMISSION LEVEL [dBuV]
100
80
60
40
20
.45
1
10
30
FCC, Pt 15 - AC LINE CONDUCTED
GLENAYRE WESTERN MULTIPLEX
2.4 GHz SPREAD SPECTRUM RADIO
FCC ID: HZB-LYNX72
[ ] HOT [X] NEUTRAL
FREQUENCY [MHz]

ITS, MENLO PARK, CA, USA 12 Jun 1990 08:28:11

3. FCC CFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

GLENAYRE WESTERN MULTIPLEX
2.4 GHz SPREAD SPECTRUM RADIO
FCC ID: HZB-LYNX72
[X] HOT [ ] NEUTRAL

PEAKS FOUND ABOVE 44 dBuV

PEAK#	FREQ (MHz)	AMPL (dBuV)
1	2.886	44.2
2	3.010	45.1
3	3.061	43.5
4	3.135	44.7
5	3.182	45.0
6	3.315	44.7
7	3.501	44.6
8	10.497	44.0

ITS, MENLO PARK, CA, USA 12 Jun 1990 09:54:39

3. FCC CFR 47, Pt 15
3.1 FCC, Pt 15 - AC LINE CONDUCTED

GLENAYRE WESTERN MULTIPLEX
2.4 GHz SPREAD SPECTRUM RADIO
FCC ID: HZB-LYNX72
[ ] HOT [X] NEUTRAL

PEAKS FOUND ABOVE 44 dBuV

PEAK#	FREQ (MHz)	AMPL (dBuV)
1	2.880	44.2
2	3.139	44.4
3	10.449	44.8
4	15.417	45.1

4.9 Radiated Emissions from Digital Section of Transceiver (Transmitter)

[ ] Not required - No digital part

[x] Test results are attached

ITS Intertek Testing Services

1365 Adams Court, Menlo Park CA 94025

Radiated Emissions Test Data

Company: Glenayre Western Multiplex
EUT:
Project #: J798016754
Test Mode:

Model #: LYNEX 2.4 GHz
S/N or FCC# Not labelled
Engineer: Ahmad
Date of Test: Initial: _____

	Antenna	Pre-Amp	Cable A	Cable B	OCF
Number:	2	5	12	0	0
Model:	EMCO 3143	CDI_P950	Green_M+L	None	None

Standard_ FCC Part 15B
Limits_ 2
Test Distance_ 3 meters

Frequency	Reading	Det.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. F.	Net	Limit @3m	Margin
MHz	dB(uV)	P/A/Q	H/V	dB(1/m)	dB	dB	dB	dB(uV/m)	dB(uV/m)	dB
215.0	40.0	P	H	11.3	18.5	0.0	0.0	32.8	43.5	-10.7
291.8	42.8	P	H	13.8	17.8	0.0	0.0	38.8	46.0	-7.2
307.1	41.6	P	H	13.9	17.9	0.0	0.0	37.6	46.0	-8.4
353.2	37.9	P	H	15.3	17.4	0.0	0.0	35.8	46.0	-10.2
368.6	41.9	P	H	16.1	17.4	0.0	0.0	40.6	46.0	-5.4
522.2	38.8	P	H	18.4	16.6	0.0	0.0	40.6	46.0	-5.4
552.9	35.0	P	H	19.6	15.8	0.0	0.0	38.8	46.0	-7.2
583.6	37.8	P	H	19.5	15.8	0.0	0.0	41.5	46.0	-4.5
645.2	34.1	P	H	20.5	15.7	0.0	0.0	38.9	46.0	-7.1
706.0	35.7	P	H	20.9	14.7	0.0	0.0	41.9	46.0	-4.1

Notes: a) P: Peak; A: Average; Q: Quasi Peak; H: Horizontal; V: Vertical; OCF:Other Correction Factor; DF:Distance Factor
b) Insert. Loss = Cable A + Cable B + OCF.
c) Negative signs (-) in Margin column signify levels below the limits.
d) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

4.10 Radiated Emissions from Receiver Section of Transceiver (L.O. Radiation)

[X] Not required - EUT operation above 960 MHz only

[ ] Not required - EUT is transmitter only

[ ] Not performed; exempt until June 1999

[ ] Test results are attached

4.11 Processing Gain Measurements

The processing gain shall be determined from the ratio in dB of the signal to noise ratio with the system spreading code turned OFF, to the signal to noise ratio with the system spreading code turned ON, as measured at the demodulated output of the receiver. The processing gain shall be at least 10 dB for a direct sequence spread spectrum system.

[X] Refer to attached test procedure and data sheets.

[ ] Refer to circuit analysis and processing gain calculations provided by manufacturer.

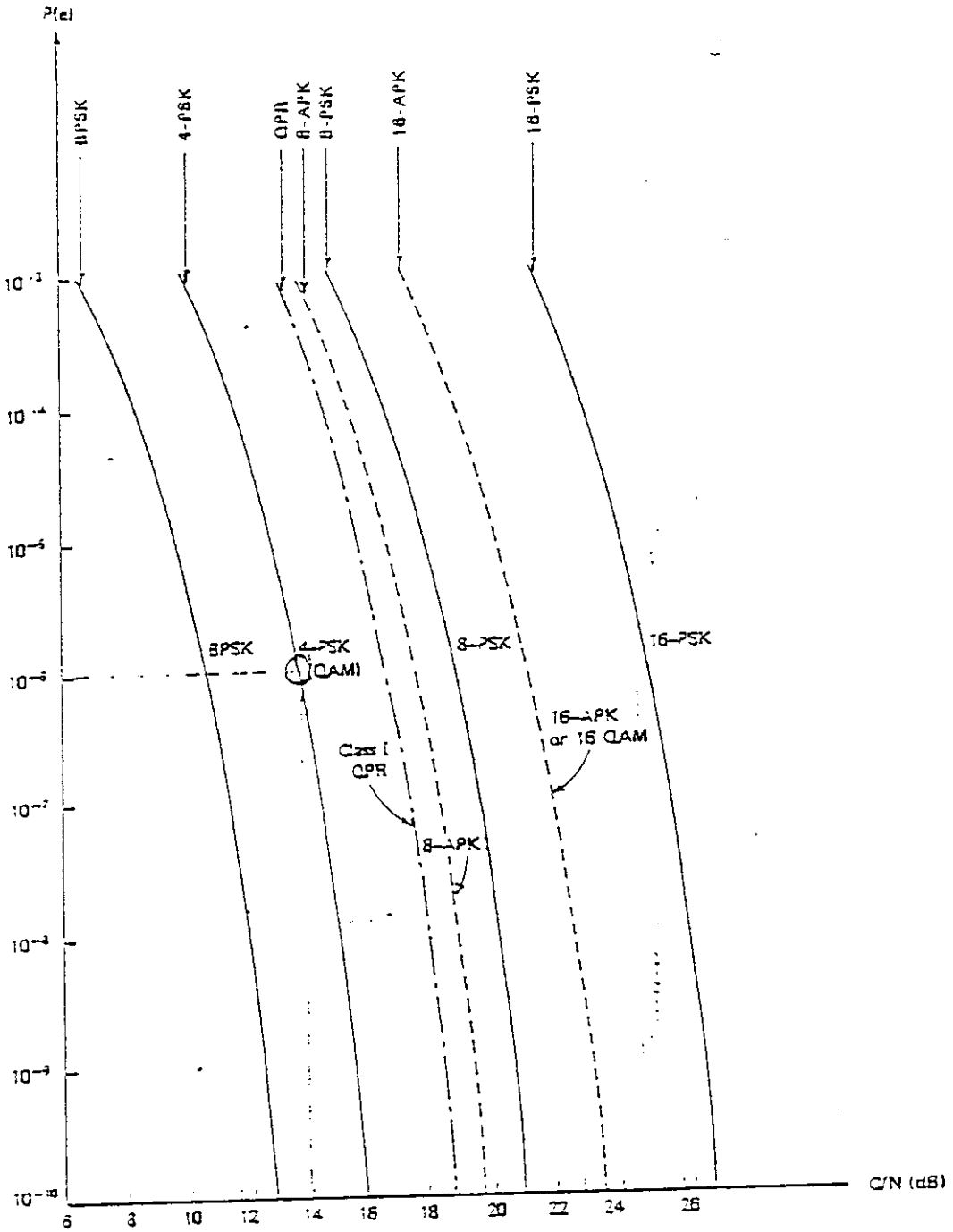


Fig. 5.22. $P(e)$ performance of M-ary PSK, QAM, QPR, and M-ary APK coherent systems. The true C/N is specified in the double-sided Nyquist bandwidth.

Figure showing offset for QPSK (4-PSK) modulation C/N offset (14 dB).
(Obtained from DIGITAL COMMUNICATIONS: Microwave Applications, by Kamilo Feher, Prentice-Hall Inc., 1981)

June 16, 1998

Processing Gain Test for LYNX.mini2 (Model 32000, 2.4GHz Fractional)

Test Setup:
The processing gain was measured using the CW jamming margin method described by the FCC recommended test procedure, as described FCC-97-114. The specific test diagram is illustrated below.

All test equipment and the EUT were allowed to warm up for four hours prior to start of test to minimize drift over time. All test equipment had valid calibration. Calibration of carrier and interferer levels was performed several times during testing with no observed changes.

The measurements were performed at the upper center channel at 2460.672 MHz, over a range of 2457 - 2464.5 MHz. The measurements made across the center ± 3.5 MHz should be used for calculation of Gp since that bandwidth represents the receiver passband.

A signal level 30 dB above threshold was chosen so that thermal noise would not effect the processing gain measurements. The measured threshold of the radio was –90dBm BER = 1 x 10^{-6}, therefore the signal level was -60 dBm. The measured signal level at the output of the 6 dB splitter was **–29.7 dBm** (Ps), used for calculating C/I and Gp.

For the jammer signal, 0 dBm at the generator corresponds to **–10.7dBm** (Pj) at the 6 dB splitter output. This figure is also used for calculating C/I and Gp.

Test Equipment:

Signal Generator	HP 8648C
Power Meter	HP437B/8484A
BER Test Set	Fireberd 6000

Explanation of Results:
The following notations are used on the spreadsheet data:

Pg: Power at Generator in dBm (as indicated by generator display).

Pj: Power of interferer:

Ps: Power of carrier at power meter test port. (initial calibration)

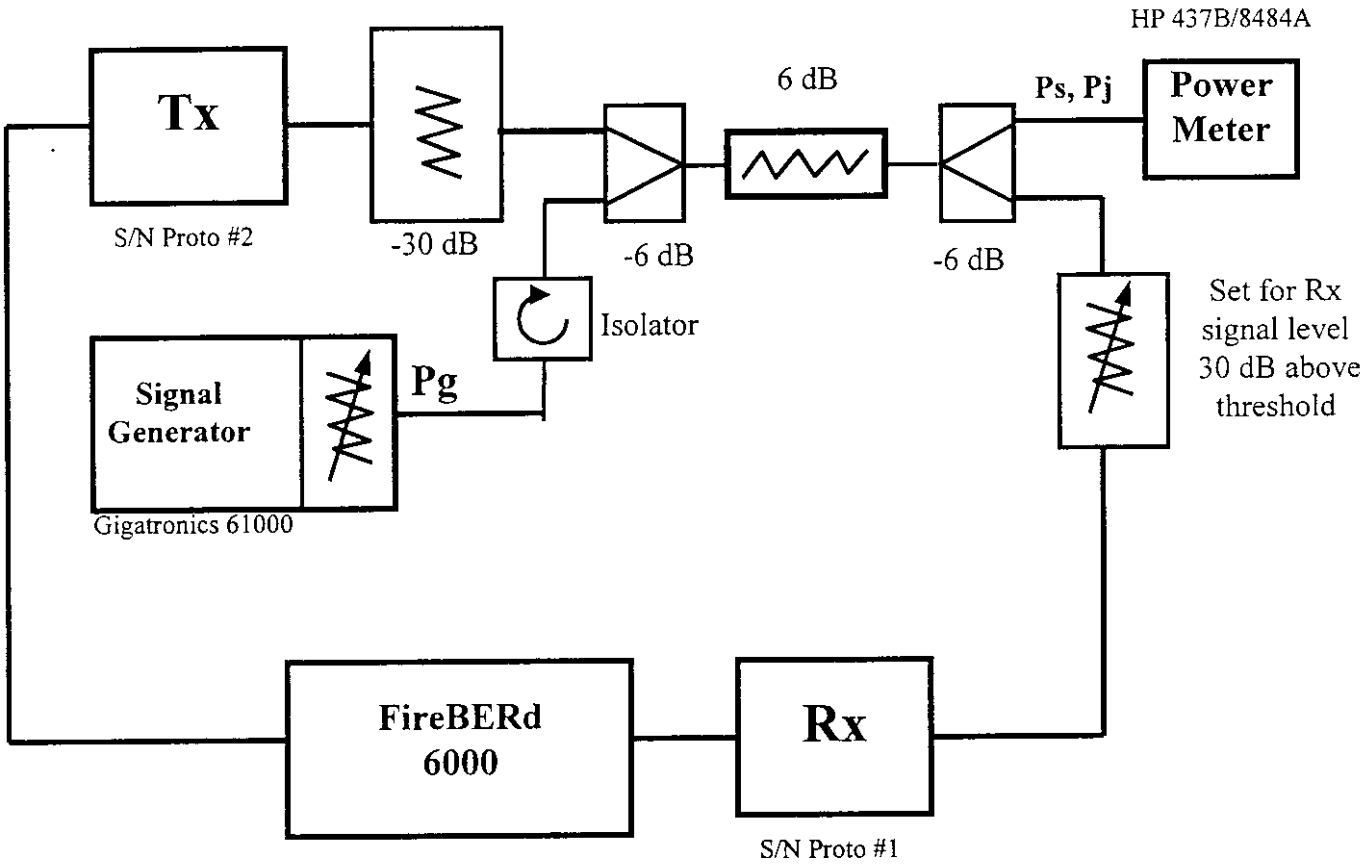
J/S: Jammer to Signal ratio, Pj-Ps (dB) (calculated in spreadsheet)

Gp: Processing Gain: (S/N)o + J/S + Lsys where:

Lsys = 2 dB
(S/N)o = 14.0 dB for QPSK and BER = 10^{-6} (see curve provided)
therefore: Gp = 14 + 2 + J/S = 16.0 + J/S (calculated in spreadsheet)

All measurements inside the ± 3.5 MHz passband of the receiver give Gp results that exceed the minimum required value of 10 dB. Elimination of the worst 20% measurements was therefore not needed in order to meet the requirements. (see spreadsheet and plotted results).

Processing Gain Test Equipment Setup



Processing Gain

7/22/98

LYNX.mini2 (Model 32000)

meas #	f MHz	Gp dBm	Pg dBm	Pj dBm	Ps dBm	J/S dB
1	2457	36.5	1.5	-9.2	-29.7	20.5
2	2457.05	36.6	1.6	-9.1	-29.7	20.6
3	2457.1	36.1	1.1	-9.6	-29.7	20.1
4	2457.15	35.3	0.3	-10.4	-29.7	19.3
5	2457.2	34.1	-0.9	-11.6	-29.7	18.1
6	2457.25	32.5	-2.5	-13.2	-29.7	16.5
7	2457.3	31.1	-3.9	-14.6	-29.7	15.1
8	2457.35	29.6	-5.4	-16.1	-29.7	13.6
9	2457.4	28.6	-6.4	-17.1	-29.7	12.6
10	2457.45	28	-7	-17.7	-29.7	12
11	2457.5	27.7	-7.3	-18	-29.7	11.7
12	2457.55	27.9	-7.1	-17.8	-29.7	11.9
13	2457.6	27.7	-7.3	-18	-29.7	11.7
14	2457.65	27.3	-7.7	-18.4	-29.7	11.3
15	2457.7	26.5	-8.5	-19.2	-29.7	10.5
16	2457.75	25.4	-9.6	-20.3	-29.7	9.4
17	2457.8	24.3	-10.7	-21.4	-29.7	8.3
18	2457.85	23.2	-11.8	-22.5	-29.7	7.2
19	2457.9	22.3	-12.7	-23.4	-29.7	6.3
20	2457.95	21.8	-13.2	-23.9	-29.7	5.8
21	2458	21.6	-13.4	-24.1	-29.7	5.6
22	2458.05	21.7	-13.3	-24	-29.7	5.7
23	2458.1	21.7	-13.3	-24	-29.7	5.7
24	2458.15	21.7	-13.3	-24	-29.7	5.7
25	2458.2	21.4	-13.6	-24.3	-29.7	5.4
26	2458.25	21.1	-13.9	-24.6	-29.7	5.1
27	2458.3	20.7	-14.3	-25	-29.7	4.7
28	2458.35	20.2	-14.8	-25.5	-29.7	4.2
29	2458.4	19.8	-15.2	-25.9	-29.7	3.8
30	2458.45	19.4	-15.6	-26.3	-29.7	3.4
31	2458.5	19.2	-15.8	-26.5	-29.7	3.2
32	2458.55	19.1	-15.9	-26.6	-29.7	3.1
33	2458.6	19	-16	-26.7	-29.7	3
34	2458.65	18.8	-16.2	-26.9	-29.7	2.8
35	2458.7	18.6	-16.4	-27.1	-29.7	2.6
36	2458.75	18.2	-16.8	-27.5	-29.7	2.2
37	2458.8	17.9	-17.1	-27.8	-29.7	1.9
38	2458.85	17.5	-17.5	-28.2	-29.7	1.5
39	2458.9	17.2	-17.8	-28.5	-29.7	1.2
40	2458.95	16.9	-18.1	-28.8	-29.7	0.9
41	2459	16.7	-18.3	-29	-29.7	0.7
42	2459.05	16.6	-18.4	-29.1	-29.7	0.6
43	2459.1	16.4	-18.6	-29.3	-29.7	0.4
44	2459.15	16.2	-18.8	-29.5	-29.7	0.2
45	2459.2	15.9	-19.1	-29.8	-29.7	-0.1
46	2459.25	15.6	-19.4	-30.1	-29.7	-0.4
47	2459.3	15.4	-19.6	-30.3	-29.7	-0.6

Processing Gain

LYNX.mini2 (Model 32000)

48	2459.35	15.3	-19.7	-30.4	-29.7	-0.7
49	2459.4	15.2	-19.8	-30.5	-29.7	-0.8
50	2459.45	15.2	-19.8	-30.5	-29.7	-0.8
51	2459.5	15.1	-19.9	-30.6	-29.7	-0.9
52	2459.55	15.1	-19.9	-30.6	-29.7	-0.9
53	2459.6	15	-20	-30.7	-29.7	-1
54	2459.65	14.8	-20.2	-30.9	-29.7	-1.2
55	2459.7	14.6	-20.4	-31.1	-29.7	-1.4
56	2459.75	14.2	-20.8	-31.5	-29.7	-1.8
57	2459.8	14	-21	-31.7	-29.7	-2
58	2459.85	13.8	-21.2	-31.9	-29.7	-2.2
59	2459.9	13.6	-21.4	-32.1	-29.7	-2.4
60	2459.95	13.6	-21.4	-32.1	-29.7	-2.4
61	2460	13.7	-21.3	-32	-29.7	-2.3
62	2460.05	13.8	-21.2	-31.9	-29.7	-2.2
63	2460.1	13.8	-21.2	-31.9	-29.7	-2.2
64	2460.15	13.8	-21.2	-31.9	-29.7	-2.2
65	2460.2	13.7	-21.3	-32	-29.7	-2.3
66	2460.25	13.6	-21.4	-32.1	-29.7	-2.4
67	2460.3	13.3	-21.7	-32.4	-29.7	-2.7
68	2460.35	13.1	-21.9	-32.6	-29.7	-2.9
69	2460.4	12.9	-22.1	-32.8	-29.7	-3.1
70	2460.45	12.8	-22.2	-32.9	-29.7	-3.2
71	2460.5	12.7	-22.3	-33	-29.7	-3.3
72	2460.55	12.7	-22.3	-33	-29.7	-3.3
73	2460.6	12.8	-22.2	-32.9	-29.7	-3.2
74	2460.65	13	-22	-32.7	-29.7	-3
75	2460.7	13.2	-21.8	-32.5	-29.7	-2.8
76	2460.75	13.3	-21.7	-32.4	-29.7	-2.7
77	2460.8	13.4	-21.6	-32.3	-29.7	-2.6
78	2460.85	13.5	-21.5	-32.2	-29.7	-2.5
79	2460.9	13.4	-21.6	-32.3	-29.7	-2.6
80	2460.95	13.3	-21.7	-32.4	-29.7	-2.7
81	2461	13.2	-21.8	-32.5	-29.7	-2.8
82	2461.05	13	-22	-32.7	-29.7	-3
83	2461.1	13	-22	-32.7	-29.7	-3
84	2461.15	13	-22	-32.7	-29.7	-3
85	2461.2	13.2	-21.8	-32.5	-29.7	-2.8
86	2461.25	13.4	-21.6	-32.3	-29.7	-2.6
87	2461.3	13.6	-21.4	-32.1	-29.7	-2.4
88	2461.35	13.7	-21.3	-32	-29.7	-2.3
89	2461.4	13.9	-21.1	-31.8	-29.7	-2.1
90	2461.45	13.9	-21.1	-31.8	-29.7	-2.1
91	2461.5	13.8	-21.2	-31.9	-29.7	-2.2
92	2461.55	13.7	-21.3	-32	-29.7	-2.3
93	2461.6	13.6	-21.4	-32.1	-29.7	-2.4
94	2461.65	13.5	-21.5	-32.2	-29.7	-2.5
95	2461.7	13.6	-21.4	-32.1	-29.7	-2.4
96	2461.75	13.8	-21.2	-31.9	-29.7	-2.2
97	2461.8	14	-21	-31.7	-29.7	-2

Processing Gain

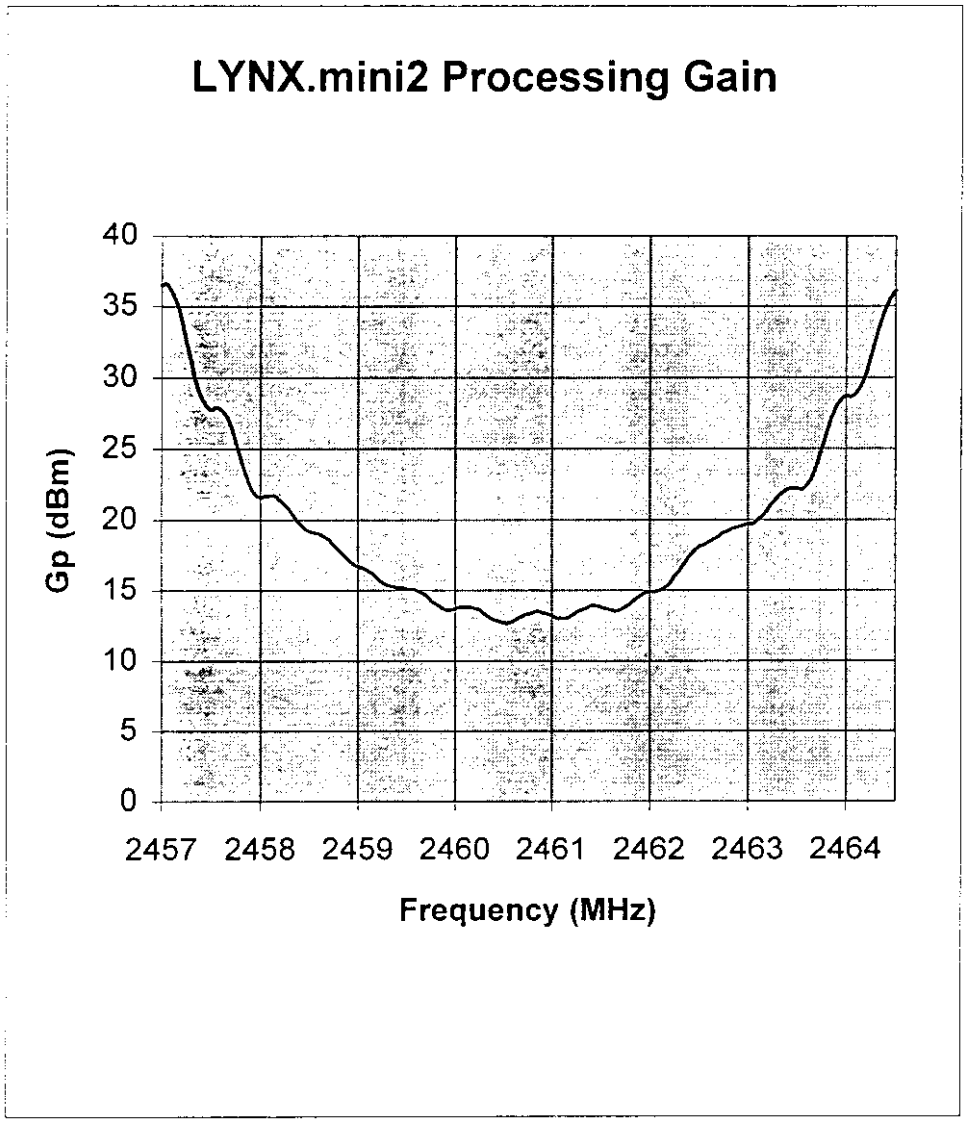
LYNX.mini2 (Model 32000)

98	2461.85	14.3	-20.7	-31.4	-29.7	-1.7
99	2461.9	14.6	-20.4	-31.1	-29.7	-1.4
100	2461.95	14.8	-20.2	-30.9	-29.7	-1.2
101	2462	14.9	-20.1	-30.8	-29.7	-1.1
102	2462.05	14.9	-20.1	-30.8	-29.7	-1.1
103	2462.1	15	-20	-30.7	-29.7	-1
104	2462.15	15.2	-19.8	-30.5	-29.7	-0.8
105	2462.2	15.5	-19.5	-30.2	-29.7	-0.5
106	2462.25	16	-19	-29.7	-29.7	0
107	2462.3	16.4	-18.6	-29.3	-29.7	0.4
108	2462.35	16.9	-18.1	-28.8	-29.7	0.9
109	2462.4	17.4	-17.6	-28.3	-29.7	1.4
110	2462.45	17.8	-17.2	-27.9	-29.7	1.8
111	2462.5	18.1	-16.9	-27.6	-29.7	2.1
112	2462.55	18.2	-16.8	-27.5	-29.7	2.2
113	2462.6	18.4	-16.6	-27.3	-29.7	2.4
114	2462.65	18.6	-16.4	-27.1	-29.7	2.6
115	2462.7	18.8	-16.2	-26.9	-29.7	2.8
116	2462.75	19.1	-15.9	-26.6	-29.7	3.1
117	2462.8	19.2	-15.8	-26.5	-29.7	3.2
118	2462.85	19.4	-15.6	-26.3	-29.7	3.4
119	2462.9	19.5	-15.5	-26.2	-29.7	3.5
120	2462.95	19.6	-15.4	-26.1	-29.7	3.6
121	2463	19.7	-15.3	-26	-29.7	3.7
122	2463.05	19.7	-15.3	-26	-29.7	3.7
123	2463.1	20	-15	-25.7	-29.7	4
124	2463.15	20.3	-14.7	-25.4	-29.7	4.3
125	2463.2	20.7	-14.3	-25	-29.7	4.7
126	2463.25	21.2	-13.8	-24.5	-29.7	5.2
127	2463.3	21.6	-13.4	-24.1	-29.7	5.6
128	2463.35	21.9	-13.1	-23.8	-29.7	5.9
129	2463.4	22.1	-12.9	-23.6	-29.7	6.1
130	2463.45	22.2	-12.8	-23.5	-29.7	6.2
131	2463.5	22.2	-12.8	-23.5	-29.7	6.2
132	2463.55	22.1	-12.9	-23.6	-29.7	6.1
133	2463.6	22.4	-12.6	-23.3	-29.7	6.4
134	2463.65	22.9	-12.1	-22.8	-29.7	6.9
135	2463.7	23.8	-11.2	-21.9	-29.7	7.8
136	2463.75	24.9	-10.1	-20.8	-29.7	8.9
137	2463.8	26	-9	-19.7	-29.7	10
138	2463.85	27.1	-7.9	-18.6	-29.7	11.1
139	2463.9	27.9	-7.1	-17.8	-29.7	11.9
140	2463.95	28.4	-6.6	-17.3	-29.7	12.4
141	2464	28.7	-6.3	-17	-29.7	12.7
142	2464.05	28.6	-6.4	-17.1	-29.7	12.6
143	2464.1	28.9	-6.1	-16.8	-29.7	12.9
144	2464.15	29.4	-5.6	-16.3	-29.7	13.4
145	2464.2	30.2	-4.8	-15.5	-29.7	14.2
146	2464.25	31.4	-3.6	-14.3	-29.7	15.4
147	2464.3	32.6	-2.4	-13.1	-29.7	16.6

Processing Gain

LYNX.mini2 (Model 32000)

148	2464.35	33.8	-1.2	-11.9	-29.7	17.8
149	2464.4	34.9	-0.1	-10.8	-29.7	18.9
150	2464.45	35.6	0.6	-10.1	-29.7	19.6
151	2464.5	36.1	1.1	-9.6	-29.7	20.1



4.12 Transmitter Duty Cycle Calculation and Measurements

The EUT antenna output port was connected to the input of the spectrum analyzer. The analyzer center frequency was set to EUT RF channel carrier. The SWEEP function on the analyzer was set to ZERO SPAN. The transmitter ON time was determined from the resultant time-amplitude display:

Duty cycle = Maximum ON time in 100 msec/100

Duty cycle correction, dB = 20 * log(DC)

[ ] See attached spectrum analyzer chart(s) for transmitter timing

[ ] See transmitter timing diagram provided by manufacturer

[X] No duty cycle correction was used

5.0 Equipment Photographs

Photographs of the EUT are attached.

7.0 Technical Specifications

7.1 Circuit Diagram

See the enclosed confidentiality package.

7.2 Block Diagram

See the enclosed confidentiality package.

7.3 Antenna gain and Mounting Information

See the attached pages.

(Comsat RSI Mark)

GRID ANTENNAS

1990-2700 MHz

SPECIFICATIONS

- Wind loading characteristics to 45% of comparable size solid parabolas.
- Cross polarization discrimination response better than solids.
- Survival: 125 MPH with 1/2 inch radial ice.

Diameter	Model Number	U.S. FCC Category	Gain - dBi Low	Gain - dBi Mid	Gain - dBi High	Half Power B/W	F/B Ratio	Max VSWR Std.	Max VSWR Low	Windthrust 100 MPH
Dual Band Antennas 1990-2110 & 2450-2500 MHz			@2050	@2475	@2050					
4'	P-22WA48G		26.0	27.6	8.0		34	1.3	-	250
6'	P-22WA72G		29.5	31.0	5.4		38	1.3	-	500
8'	P-22WA96G		31.9	33.6	4.1		40	1.25	-	800
10'	P-22WA120G		33.8	35.5	3.3		44	1.25	-	1300
12'	P-22WA144G		35.5	37.0	2.7		46	1.25	-	1500
15'	P-22WA180G		37.2	38.9	2.2		46	1.25	-	2700
2200-2300 MHz										
4'	P-23A48G		26.4	26.6	26.8	7.6	36	1.3	1.15	250
6'	P-23A72G		29.9	30.1	30.3	5.1	38	1.3	1.10	500
8'	P-23A96G		32.2	32.4	32.6	3.8	40	1.1	1.06	800
10'	P-23A120G		34.4	34.6	34.8	2.8	42	1.1	1.06	1300
12'	P-23A144G		35.9	36.1	36.3	2.5	44	1.1	1.06	1500
15'	P-23A180G		37.9	38.1	38.2	2.0	46	1.1	1.06	2700
2290-2450 MHz										
4'	P-24LA48G		26.7	27.0	27.3	7.0	34	1.3	1.15	250
6'	P-24LA72G		30.2	30.5	30.8	4.7	37	1.3	1.10	500
8'	P-24LA96G		32.7	33.0	33.3	3.5	38	1.1	1.08	800
10'	P-24LA120G		34.7	35.0	35.3	2.8	42	1.1	1.08	1300
12'	P-24LA144G		36.3	36.6	36.9	2.4	40	1.1	1.08	1500
15'	P-24LA180G		38.2	38.5	38.8	1.9	48	1.1	1.08	2700
2300-2500 MHz										
3'	P-24A36G		25.3	25.7	26.0	8.4	28	1.5	—	97
4'	P-24A48G		26.8	27.5	27.7	6.7	34	1.3	1.15	250
6'	P-24A72G		30.1	30.8	31.1	4.4	37	1.3	1.10	500
8'	P-24A96G		32.6	33.5	33.6	3.5	38	1.1	1.08	800
10'	P-24A120G		34.7	35.1	35.6	2.8	42	1.1	1.08	1300
12'	P-24A144G		36.1	36.8	37.3	2.4	40	1.1	1.08	1500
15'	P-24A180G		38.1	38.6	39.1	1.9	48	1.1	1.08	2700
2480-2700 MHz										
4'	P-25A48G		27.6	28.0	28.3	6.0	27	1.3	1.15	250
6'	P-25A72G		31.0	31.4	31.8	4.2	38	1.3	1.10	500
8'	P-25A96G		33.5	33.9	34.3	3.3	36	1.1	1.06	800
10'	P-25A120G		35.5	35.8	36.2	2.7	42	1.1	1.06	1300
12'	P-25A144G		37.0	37.4	37.8	2.7	42	1.1	1.06	1500
15'	P-25A180G		38.9	39.3	39.6	1.8	47	1.1	1.06	2700

2300-2700 MHz On Application

Model used for testing

PLEASE USE PROPER SUFFIX WHEN ORDERING.

G = Pressurized, 7/8" EIA Termination
GL = Pressurized, 7/8" EIA Termination, Low VSWR
GF = Non Pressurized, 7/8" EIA Termination
GN = Non Pressurized, N Female Termination