MEASUREMENT AND TECHNICAL REPORT

VEGA WIRELESS
9900 East Baldwin Place
El Monte, CA 91731-1342

DATE: 5 May 2001

This Report Concerns:	Original Grant: X Class II Change:
Equipment Type:	Belt Pack, BP-700 (Splits: TX8, RX4; TX12, RX8; and TX4, RX12
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: No: X **Defer until:**
Company Name **agrees to notify the Commission by:** **of the intended date of announcement of the product so that the grant can be issued on that date.**	N/A
Transition Rules Request per 15.37?	Yes: *No: X
(*) FCC Part 2, Paragraphs 2.1046; 2.1047(a);(b); 2.1049; 2.1051; 2.1053; 2.1055; Part 74, Paragraph 74.861(e)(1); (e)(3); (e)(5); and (e)(6)	

Report Prepared by:

TÜV PRODUCT SERVICE
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 546 3999
Fax: 858 546 0364

TABLE OF CONTENTS

TÜV PRODUCT SERVICE 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 546 3999 FAX 858 546 0364

1 GENERAL INFORMATION

1.1 Product Description

EUT Description: Wireless Intercom Beltpack

EUT Name: BP-700 Beltpack

Model No.: BP-700 Serial No.: 002

Product Options: Nine Frequency Splits for North America, Splits 4 through 12

Configurations to be tested: Frequency Split TX8 and RX4

Power Requirements

Voltage: Battery (If battery powered, make sure battery life is sufficient to complete testing.)

Typical Installation and/or Operating Environment

Sound Stage, Theater, Film Set, News Set, Sporting Events, Venues

EUT Interface Ports and Cables

Interface				Shielding							
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable / Permanent
EXAMPLE:											
RS232	☐	☒	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒ / ☐
RS232	☐	☒	1	☒	☐	Braid		2.5 mm		1	☒ / ☐
Head Set	☒	☐	1	☒	☐	Braid		XLR		1	☒ / ☐

EUT Operating Modes to be Tested

	1.	RX continuous on. TX, modes PTT, PTM

EUT System Components -

Description	Model #	Serial #	FCC ID #
Wirless Intercom Beltpack	BP-700	002	BFDQ700BP8

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Support Equipment

Description	*Model #*	*Serial #*	*FCC ID #*
Interface Program Box	QPA-1	001	N/A
PC	DOS version S/W	N/A	N/A

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
4.9152 Mhz	4.9152 Mhz	Y1, U1 on Beltpack Microcontroller PWB Schematic 072-0183	Microcontroller Clock
275.6-335.6 Mhz	275.6-335.6 Mhz	Z2, Q3,Q4 on TX PWB Schematic 072-0185 Pg 1	TX Modulator VCO
775.6-1045.6 Mhz	775.6-1045.6 Mhz	Z1, Q1, Q2 on TX PWB Schematic 072-0185 Pg 1	TX UHF VCO
10 Mhz	10 Mhz	Y1, U1 on TX RF PWB Schematic 072-0185 Pg 1	TX Synthesizer Reference
32 Khz	32 Khz	U4-A, U4-B on PWB Schematic 072-0182 Pg 1	TX Sub carrier Oscillator
540-810 Mhz	540-810 Mhz	Z1, Q4, Q5 on Receiver PWB Schematic 072-0181 Pg 1	RX VCO for 1 st LO
10 Mhx	10 Mhz	Y2, U4 on Receiver PWB Schematic 072-0181 Pg 1	RX PLL Reference
59.3 Mhz	59.3 Mhz Subcarrier	Y1, U12 RX PWB RF PWB Schematic 072-0181 Pg 1	RX 2 nd LO

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*		
VEGA	9 V to 5 V reg	N/A	☒ Switched-mode:	(Frequency)	Approximately 300 Khz

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*
N/A		

EMC Critical Detail -

Complete ground planes on PWBs, Ferrite beads, RF bypass capacitors

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1 GENERAL INFORMATION (continued)

1.2 Related Submittal/Grant

None

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the ANSI C63.4 setup.

Test Performed:

X 1. 1051Radiated Emission per FCC Part 2, Paragraph 2.1053
X 2. Conducted Emissions, FCC Part 2, Paragraphs 2.
X 3. RF Power Output, Part 2, Paragraph 2. 1046
X 4. Occupied Bandwidth, Part 2, Paragraph 2.1049
X 5. Modulation Characteristics, Part 2, Paragraph 2.1047 and Part 74, Paragraph 74.861(a) and (b)
X 6. Frequency Stability, Part 2, Paragraph 2.1055, and Part 74, Paragraph 74.861(e)(4)

Both Conducted and radiated testing were performed according to the procedures in FCC/ANSI C63.4 and CSA 108.8 - M1983. Radiated testing was performed at an antenna-to-EUT distance of 3 meters (1 - 10 GHz).

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV PRODUCT SERVICE
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 858 546 3999
Fax: 858 546 0364

The Test Site Data and performance comply with ANSI 63.4 and are registered with the FCC, 7435 Oakland Mills Rd, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

1.6 Part 2 Requirements

BP-700
Terse Specifications

Frequency Range:	470 – 740 MHz, in nine 30 MHz ranges
Rated RF Power Output:	50 mw minimum (70 mw, +/- 1.5 dB)
Frequency Tolerance:	+/- 0.0025 %
Emission Designator:	130F8E
Control microprocessor:	Microchip 16C62B

Range of operating power values - 50 mw
DC voltages applied to and dc currentes - 5 Vdc, <100 ma
Equipment employing digital modulation techniques - N/A
Equipment is an AM broadcast sterophonic exciter-generator - N/A

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was initially tested for FCC emission in the following configuration:

See Block Diagram.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Modification

None

2.5 Configuration of Tested System

See Block Diagram.

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3 RADIATED EMISSION EQUIPMENT/DATA

The following data lists the significant emission frequencies, measured levels, correction factor (which includes cable and antenna corrections), the corrected reading, and the limit.

See following page(s).

Low, mid and high channels tested. All emissions (spurious and harmonics) were greater than 20 dB below the limit. Frequency range investigated from lowest RF frequency generated up to the 10th harmonic.

RBW and VBW = 1 MHz for peak for fundamental and harmonics.
RBW and VBW = 30 kHz 20 video samples for average for fundamental.

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Field Strength Calculation

If a preamplifier was used during the Radiated Emission Testing, it is required that the amplifier gain must be subtracted from the Spectrum Analyzer (Meter) Reading. In addition, a correction factor for the antenna , cable used and a distance factor, if any, must be applied to the Meter Reading before a true field strength reading can be obtained. In the automatic measurement, these considerations are automatically presented as a part of the print out. In the case of manual measurements and for greater efficiency and convenience, instead of using these correlation factors for each meter reading, the specification limit was modified to reflect these correlation factors at each frequency value so that the meter readings can be compared directly to the modified specification limit. This modified specification limit is referred to as the "Corrected Meter Reading Limit" or simply the CMRL, which is the actual field strength present at the antenna. The quantity can be derived in the following manner:

Corrected Meter Reading Limit (CMRL) = SAR + AF + CL - AG - DC

Where, SAR = Spectrum Analyzer Reading
AF = Antenna Factor
CL = Cable Loss
AG = Amplifier Gain (if any)
DC = Distance Correction (if any)

Assume the following situation: A meter reading of 29.4 dBuV was obtained from a Class A computing device measured at 83 MHz. Assume an antenna factor of 9.2 dB, a cable loss of 1.4 dB and amplifier gain of 20.0 dB at 83 MHz. The final field strength would be determined as follows:

CMRL = 29.4 dBuV + 9.2dB = 1.4 dB - 20 dB/M - 0.0 dB

CMRL = 20.0 dBuV/M

This result is well below the FCC and CSA Class A limit of 29.5 dbuV/m at 83 MHz.

For the manual mode of measurement, a table of corrected meter reading limit was used to permit immediate comparison of the meter reading to determine if the measure emission amplitude exceeded the specification limit at that specific frequency.

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4 CONDUCTED EMISSION EQUIPMENT/DATA

See following page(s).

TÜV PRODUCT SERVICE 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 546 3999 FAX 858 546 0364

Emissions Test Conditions: CONDUCTED EMISSIONS; RF POWER OUTPUT; OCCUPIED BANDWIDTH; MODULATION CHARACTERISTICS AND FREQUENCY STATILITY: FCC Part 2, Paragraphs 2.1046; 2.1047(a);(b); 2.1049; 2.1051; 2.1055; Part 74, Paragraphs 74.861(e)(1); (e)(3); (e)(5); and (e)(6)(i)(ii)

The measurements were performed at the following test location :

☐ **- Test not applicable**

■ - SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used :

Spectrum Analyzer, Hewlett Packard, Model 8566B, S/N 2618A02913, Prop # 744, Cal 09/01
Spectrum Analyzer, Hewlett Packard, Model 8568B, S/N 2304A02500, Prop #: 187, Cal 11/01
Modulation Meter, Cal 12/01
Peak Power Meter, Hewlett Packard, Model 8900D, S/N 3607U00653, Prop # 802,Cal 03/01
Oscillator, Cal 12/01

Remarks: _____

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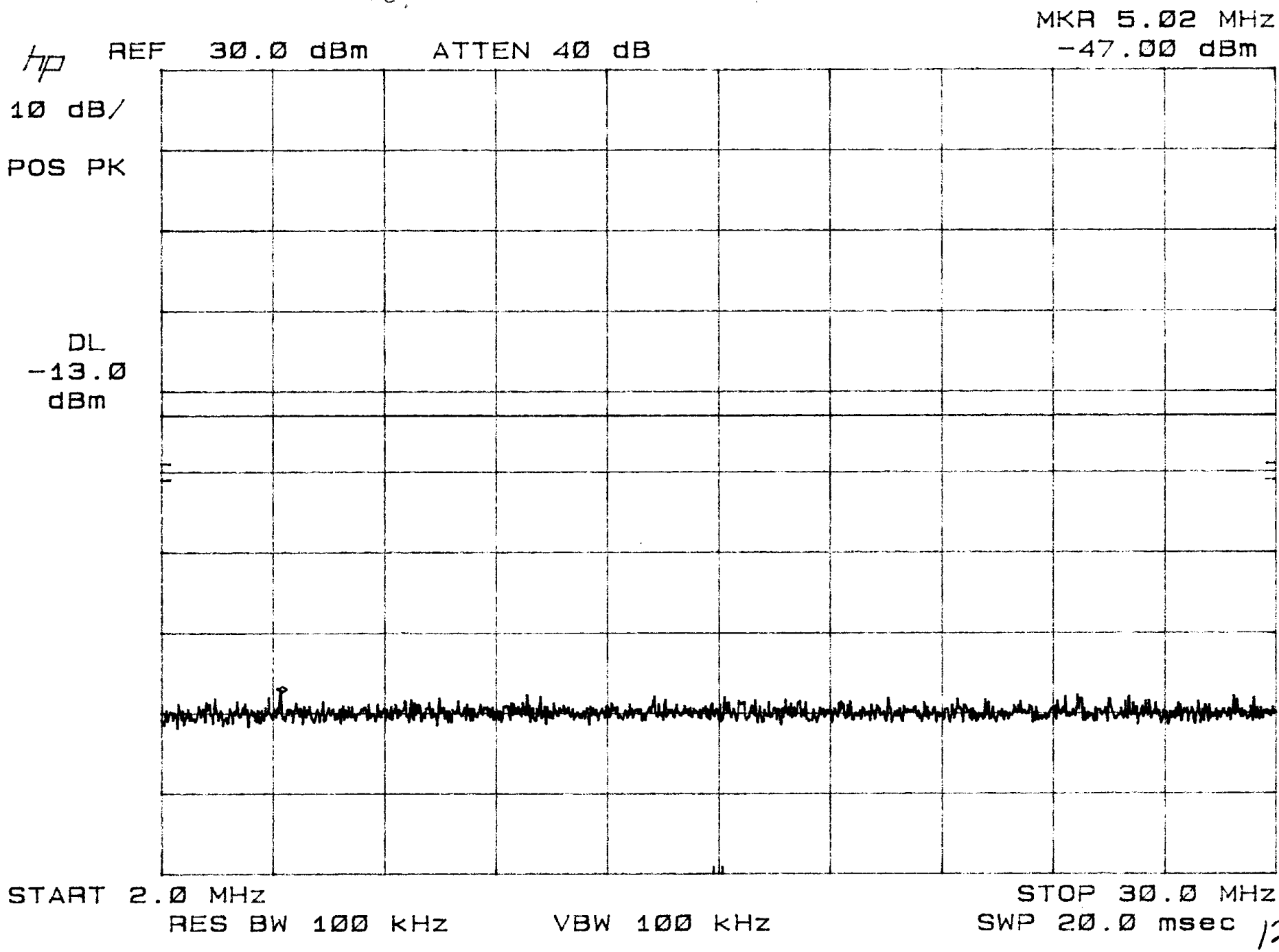
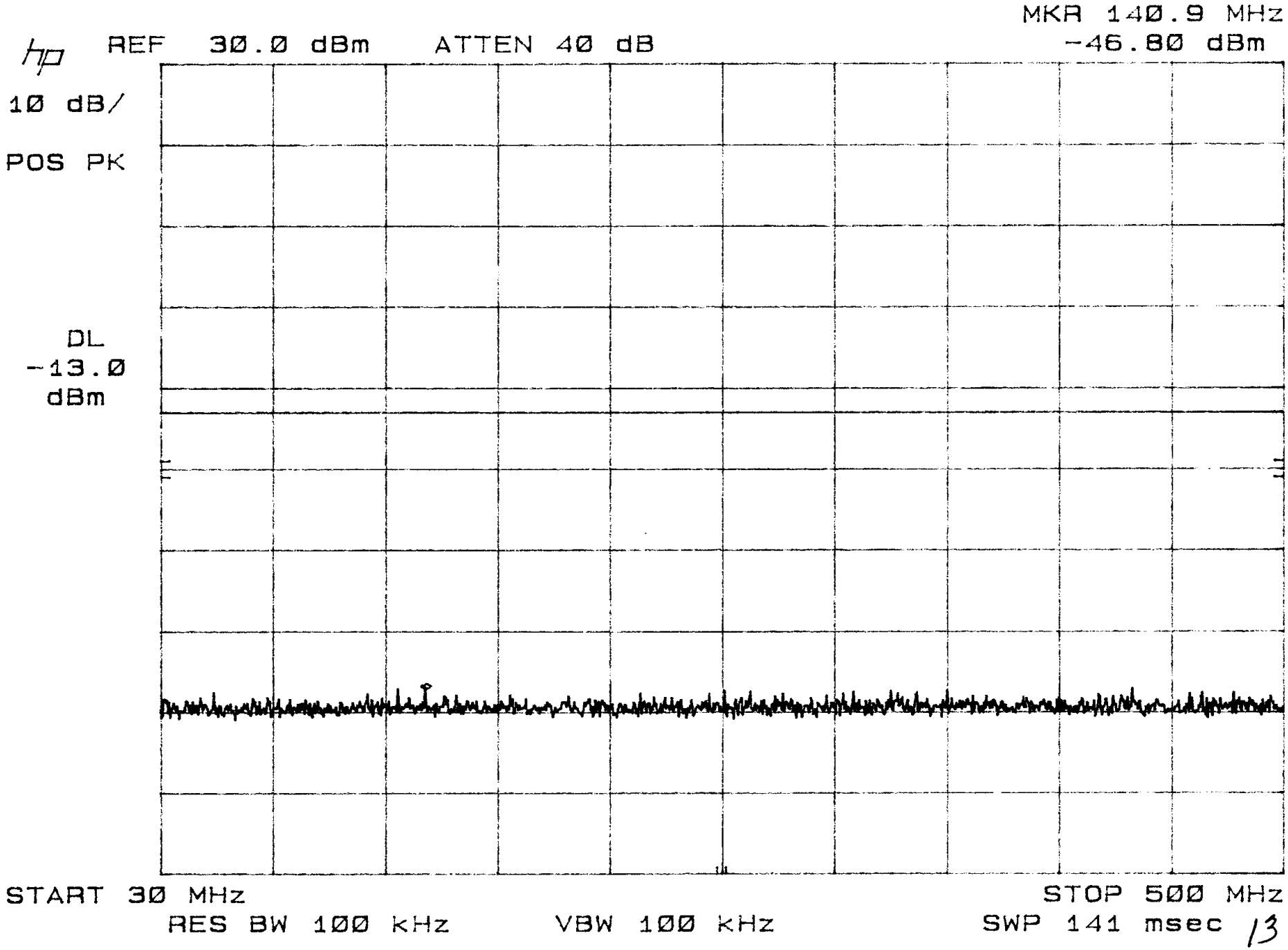
CONDUCTED SPURIOUS
570.025 MHz TRANSMIT (CW) TR, RX

2.1051 + 74.861(e)(6)



CONDUCTED SPURIOUS
5900.025 MHz TRANSMIT (LOW) T8.R4

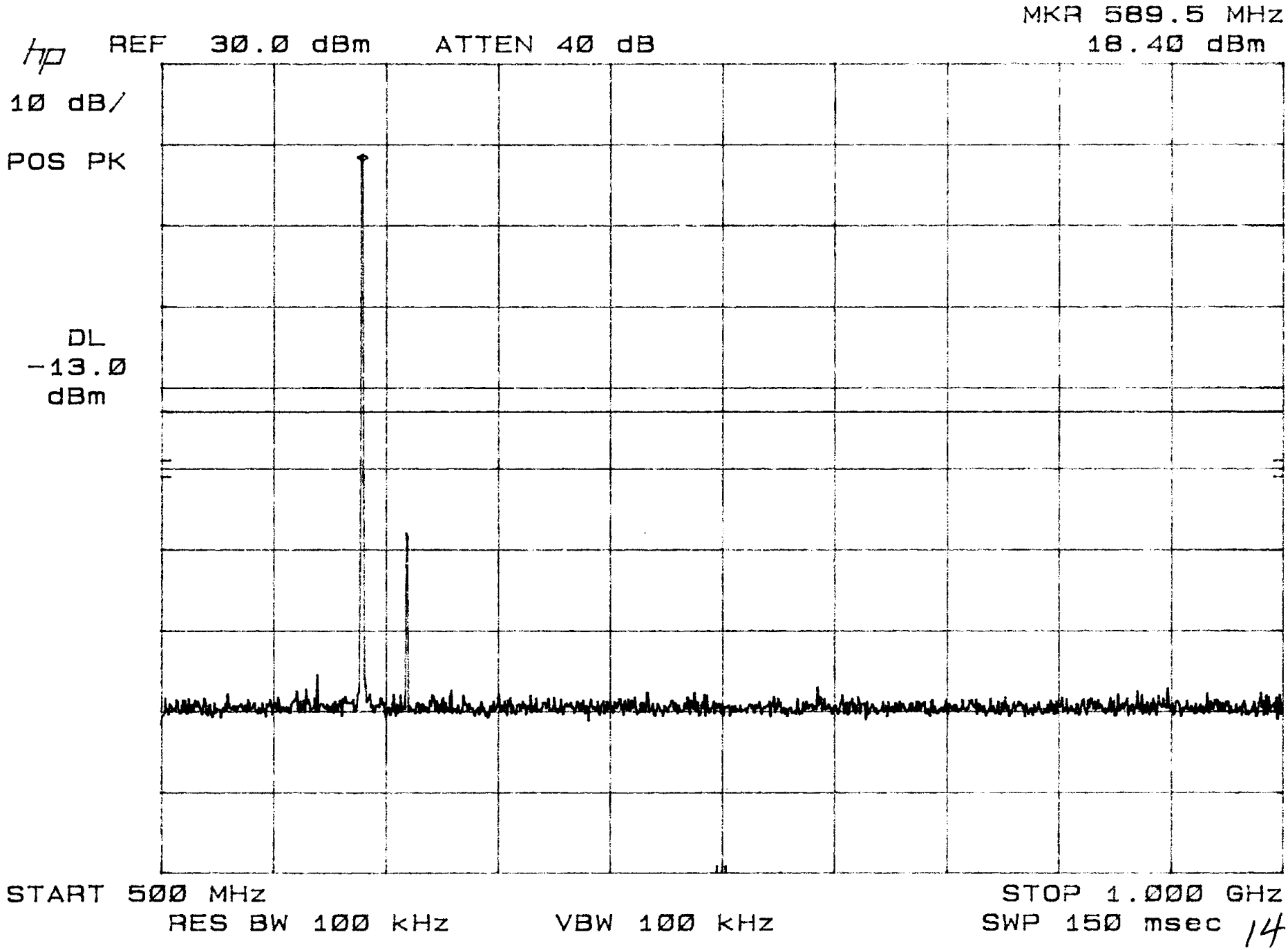
2.1051 + 74.861(e)(6)



CONDUCTED SPURIOUS

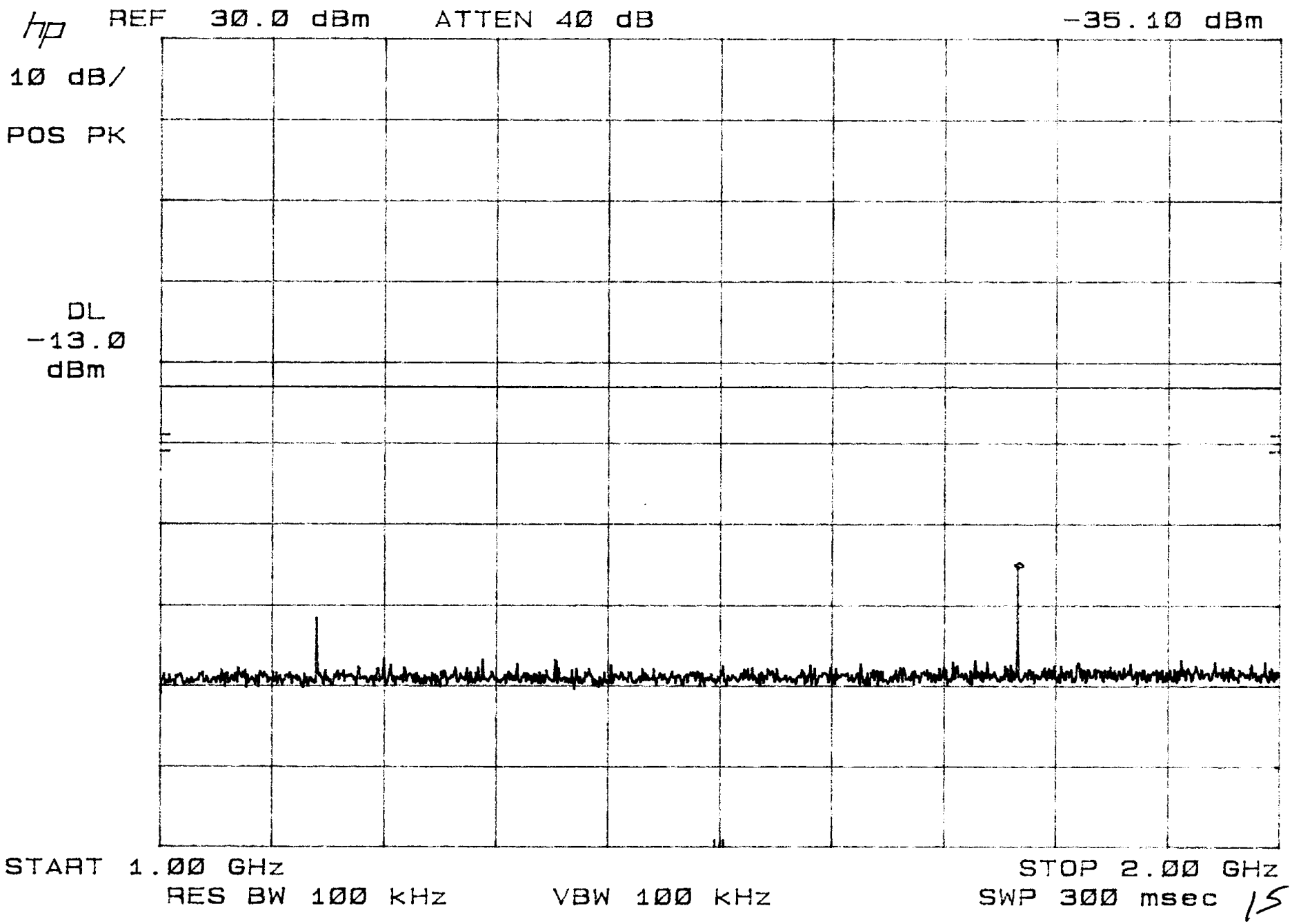
890.025 MHz TRANSMIT (LOW) TO PA

2.1051 +74.861(e)(6)



CONDUCTED SPURIOUS
SPKR.025 MHz TRANSMIT (LOW) T8, C4

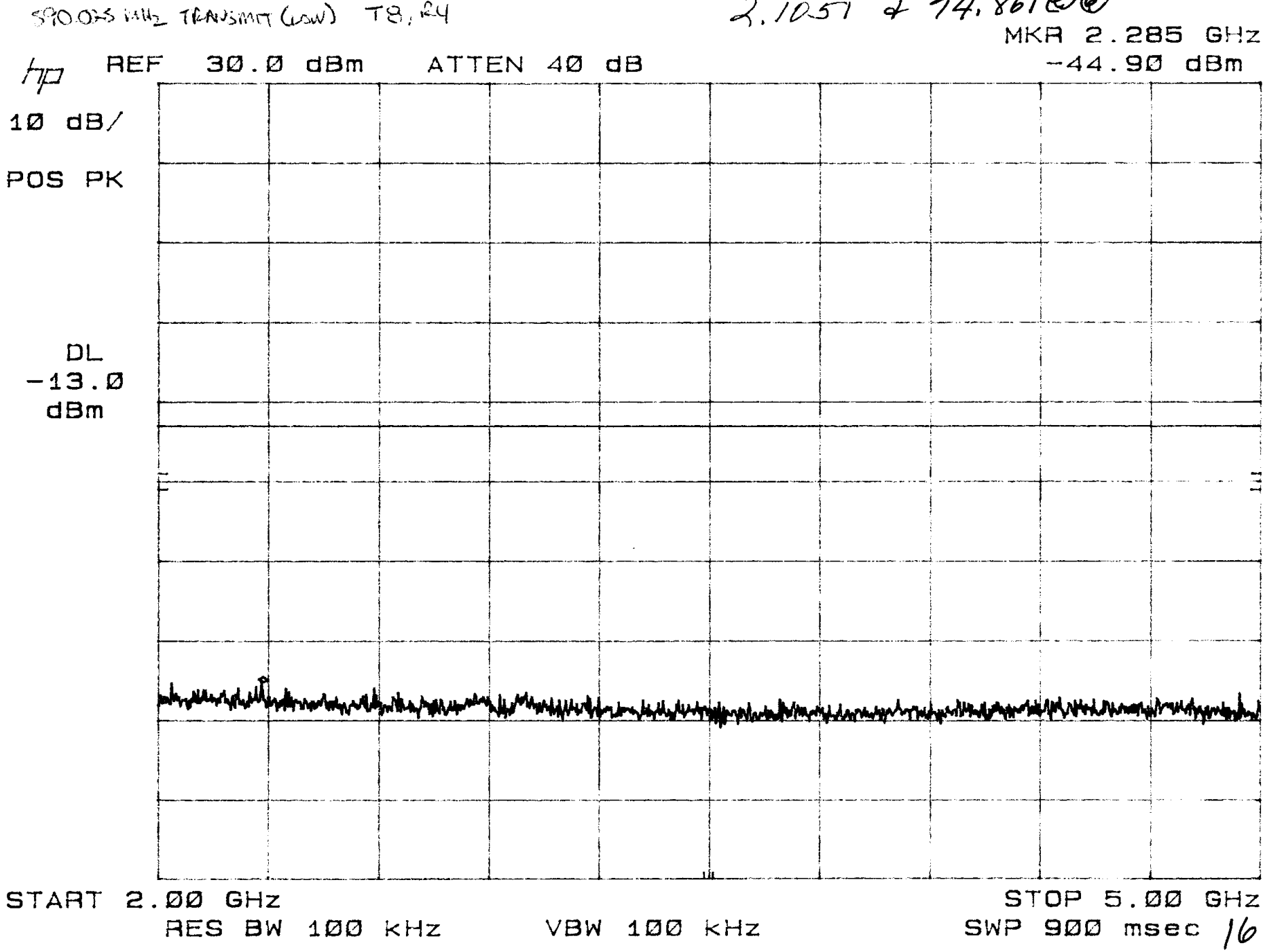
2.1051 & 74.861(e)(6)



15

CONDUCTED SPURIOUS
890.025 MHz TRANSMIT (LOW) T8, R4

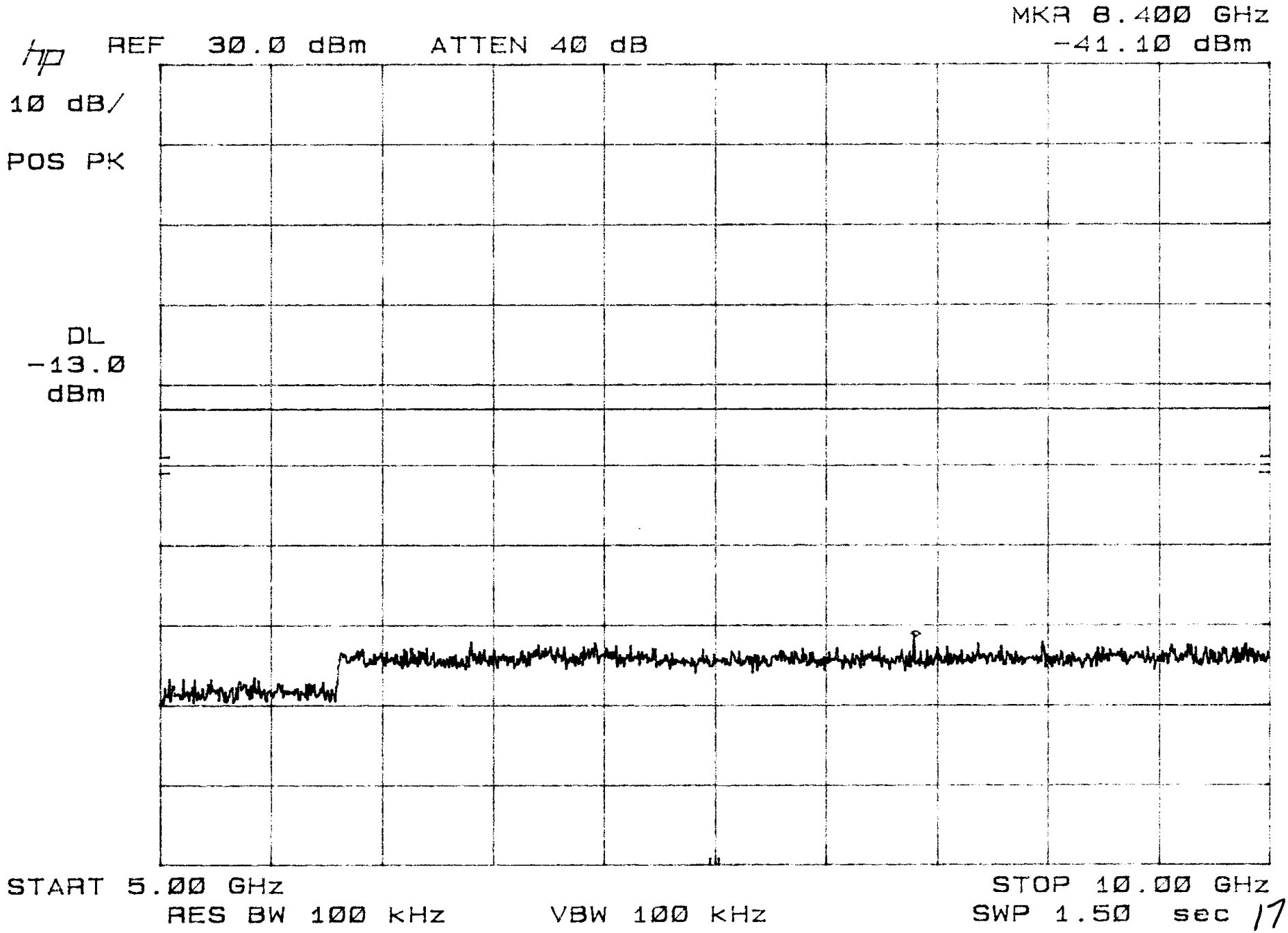
2.1051 & 74.861(e)(6)



16

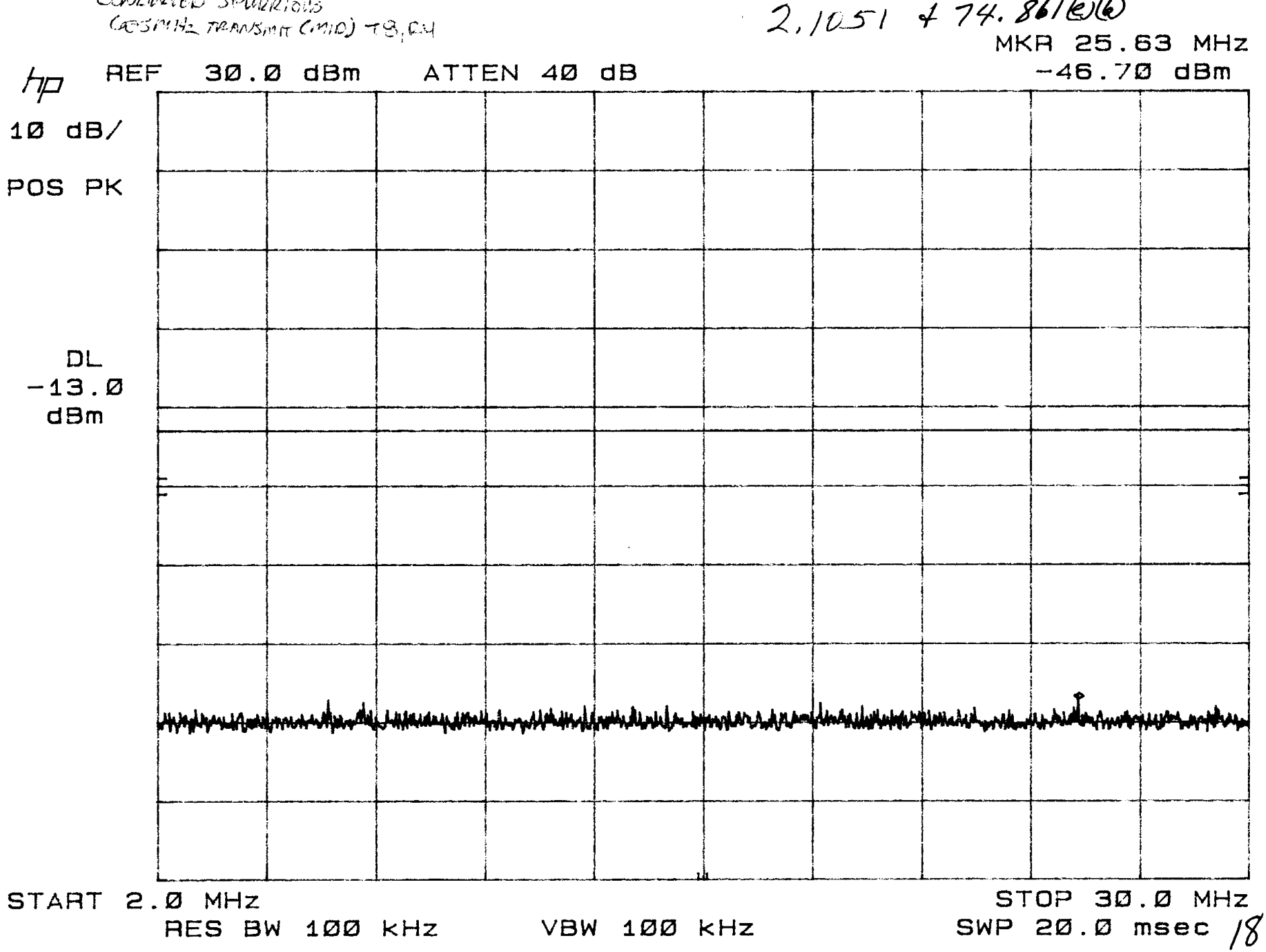
CONDUCTED SPURIOUS
590.025 MHz TRANSMIT (LOW) T8.P4

2.1051 & 74.861(e)(6)



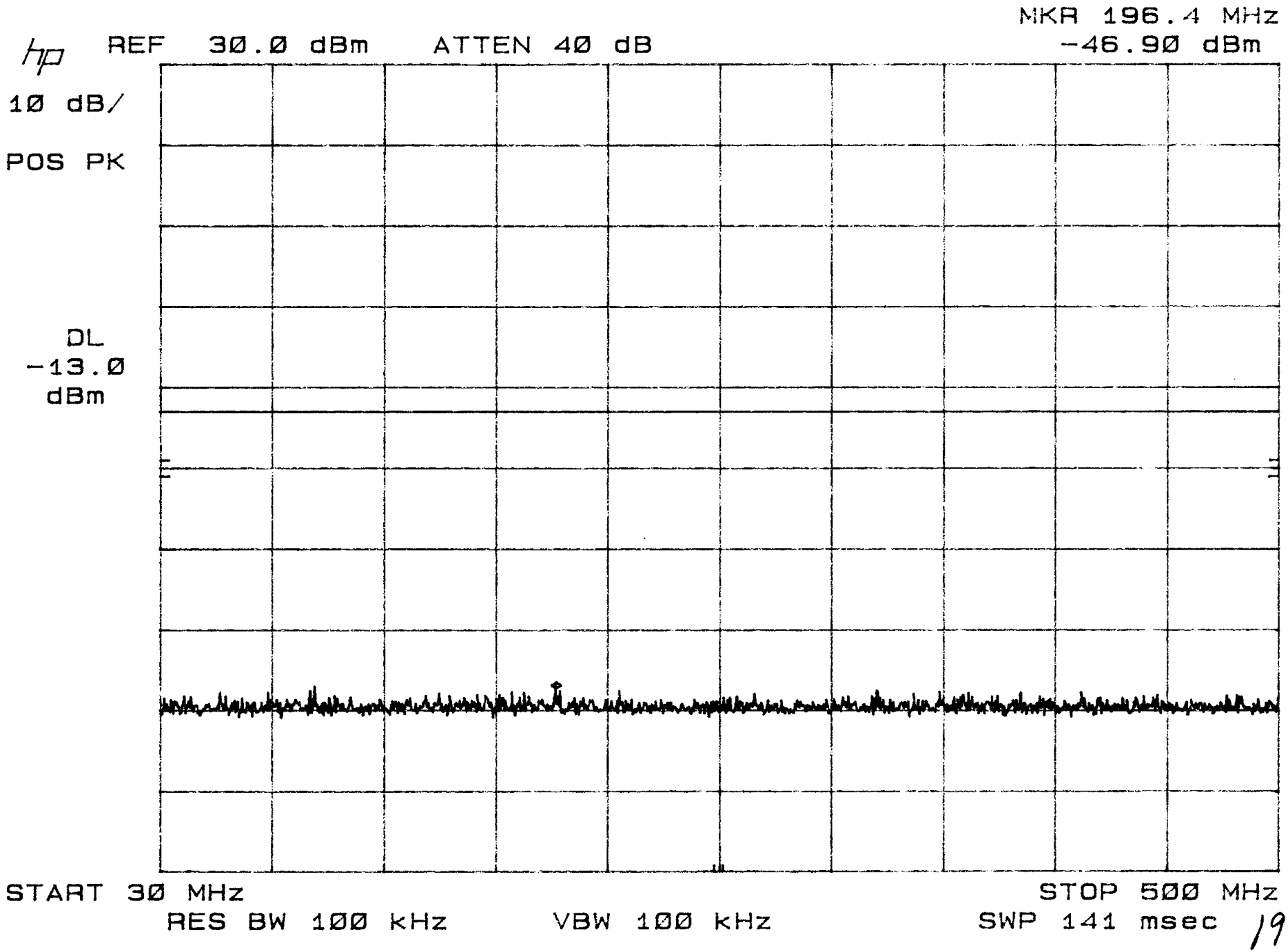
CONDUCTED SPURIOUS
CC5MHz TRANSMIT (MID) T8,RH

2.1051 & 74.861(e)(6)



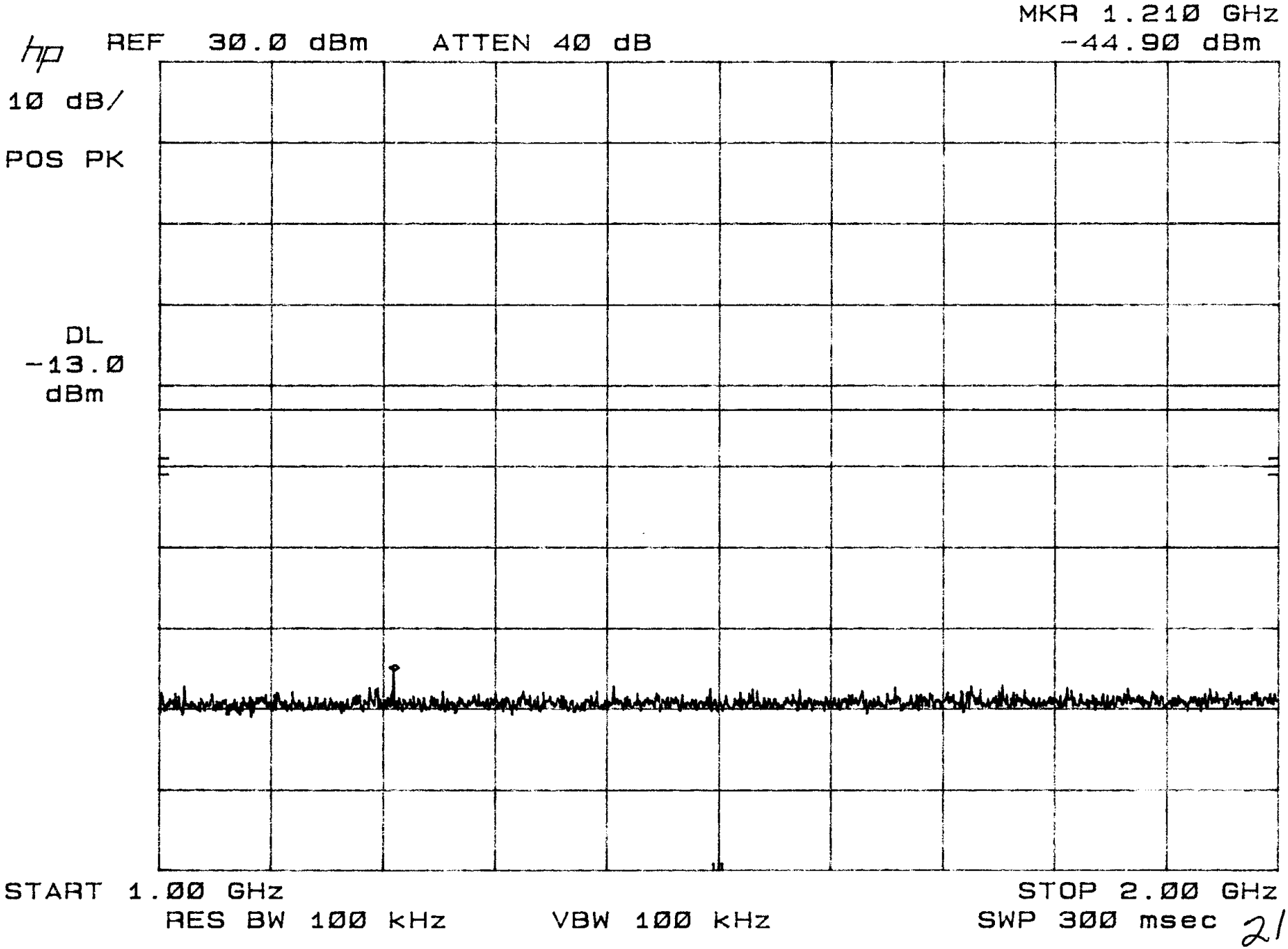
CONDUCTED SPURIOUS
605 MHz TRANSMIT (MID) T8,R4

2.1051 & 74.861(e)(6)



CONDUCTED SPURIOUS
GOSMAS TRANSMIT (MID) T8.R4

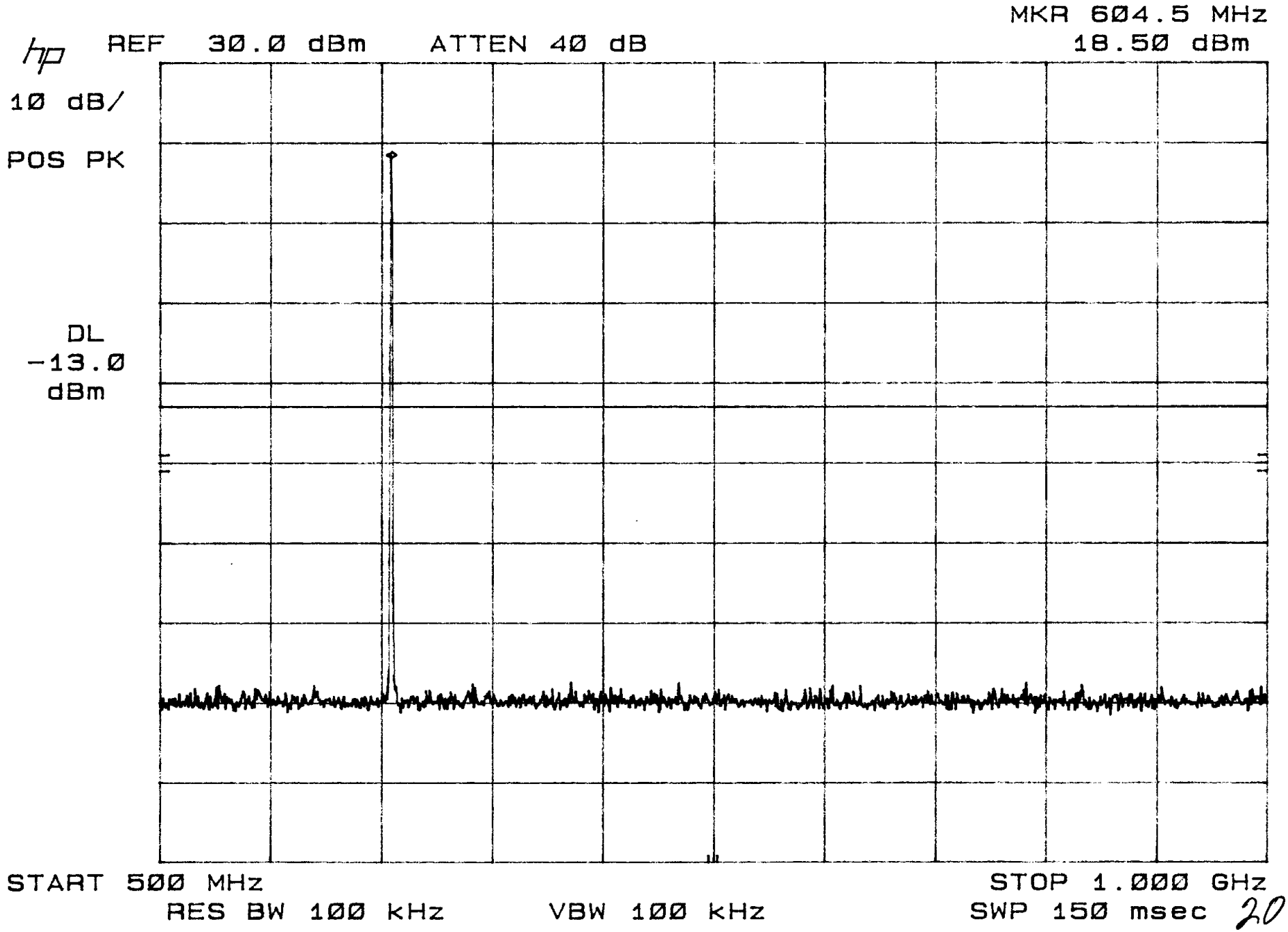
2.1051 & 74.861(e)(4)



21

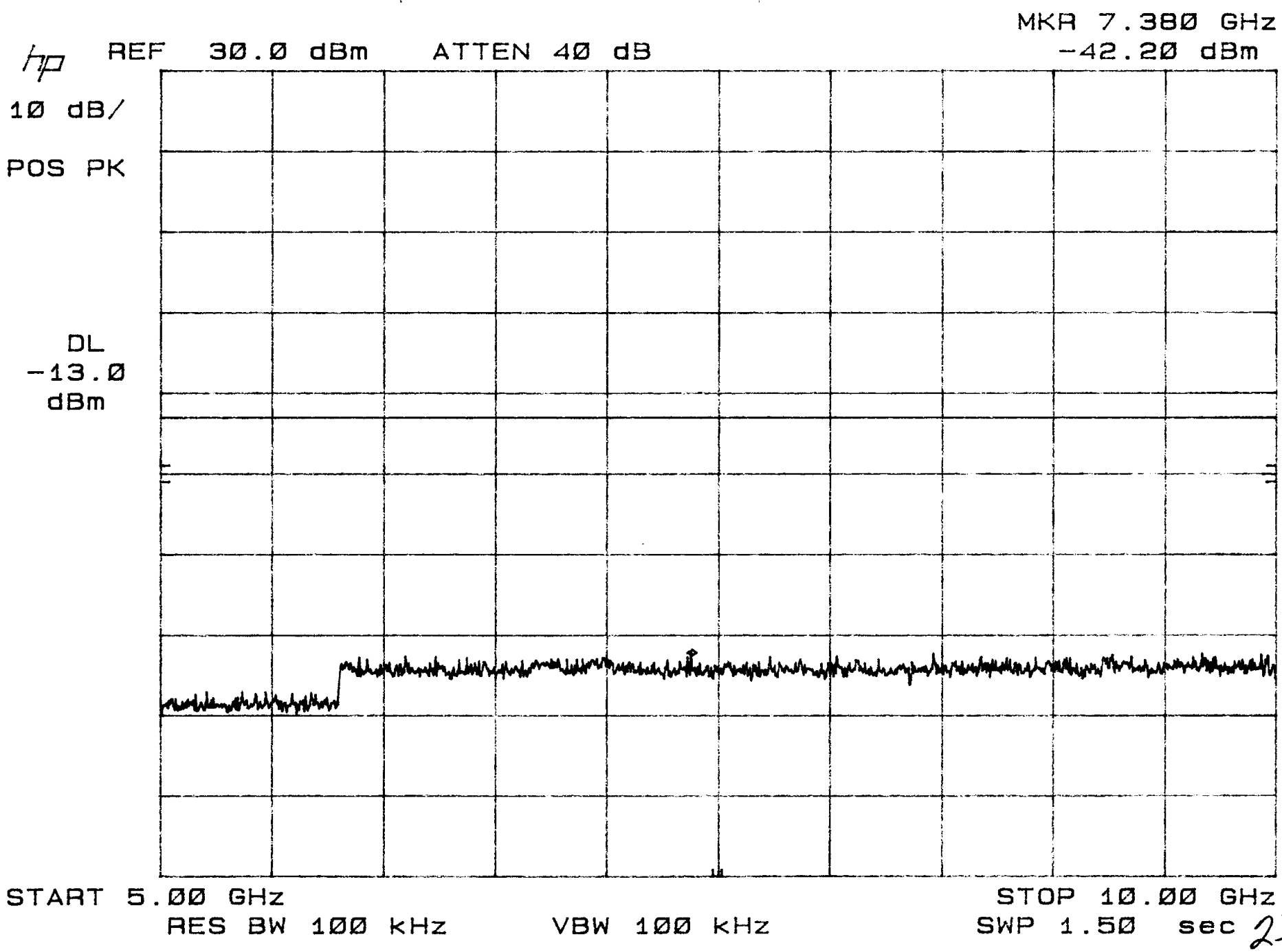
CONDUCTED SPURIOUS
605MHz TRANSMIT CH(10) TB:R4

2.1051 + 74.861(e)(6)



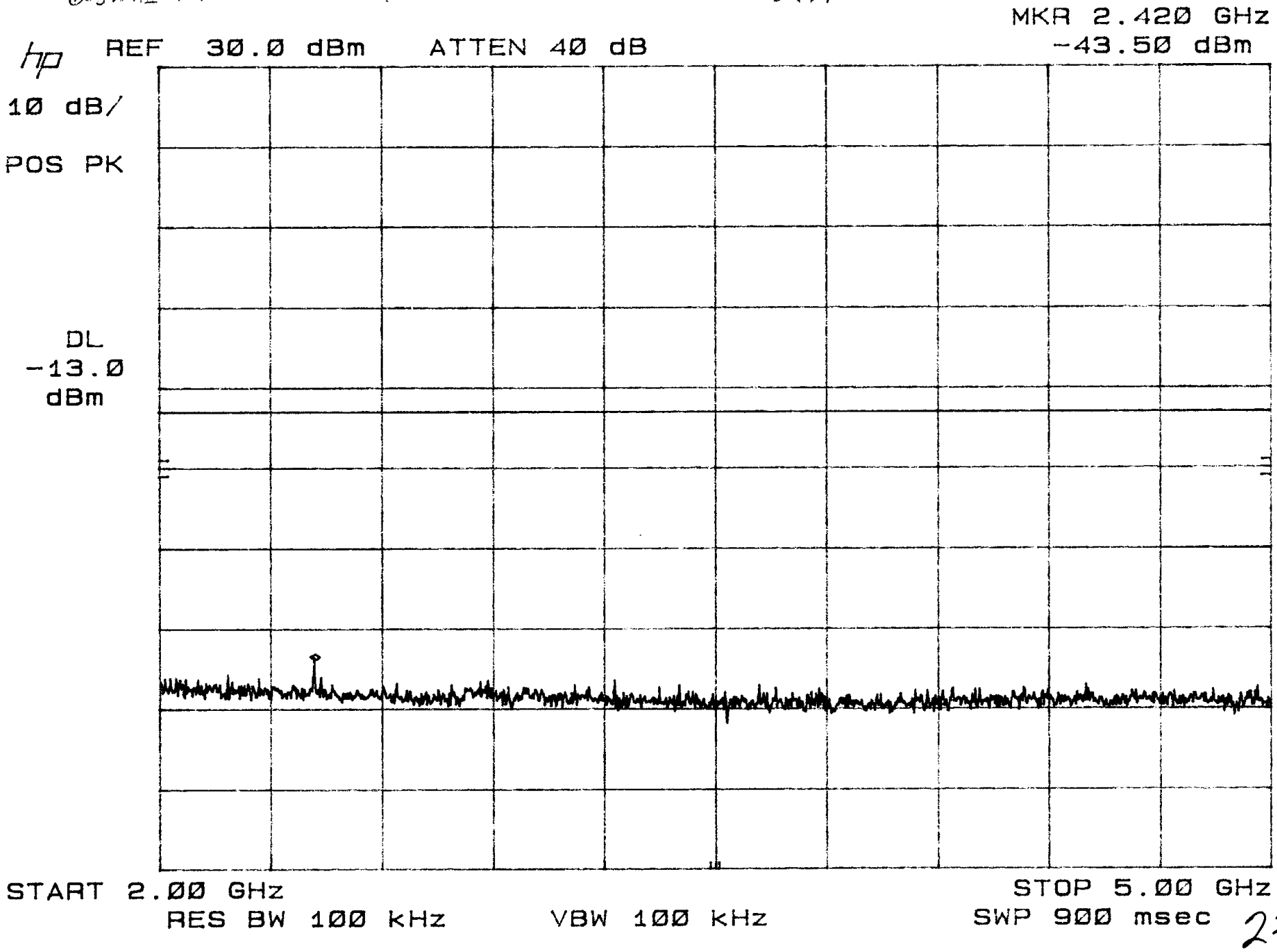
CONDUCTED SPURRIOUS
603 MHz TRANSMIT (MID) T8, R4

2.1051 & 74.861(e)(6)



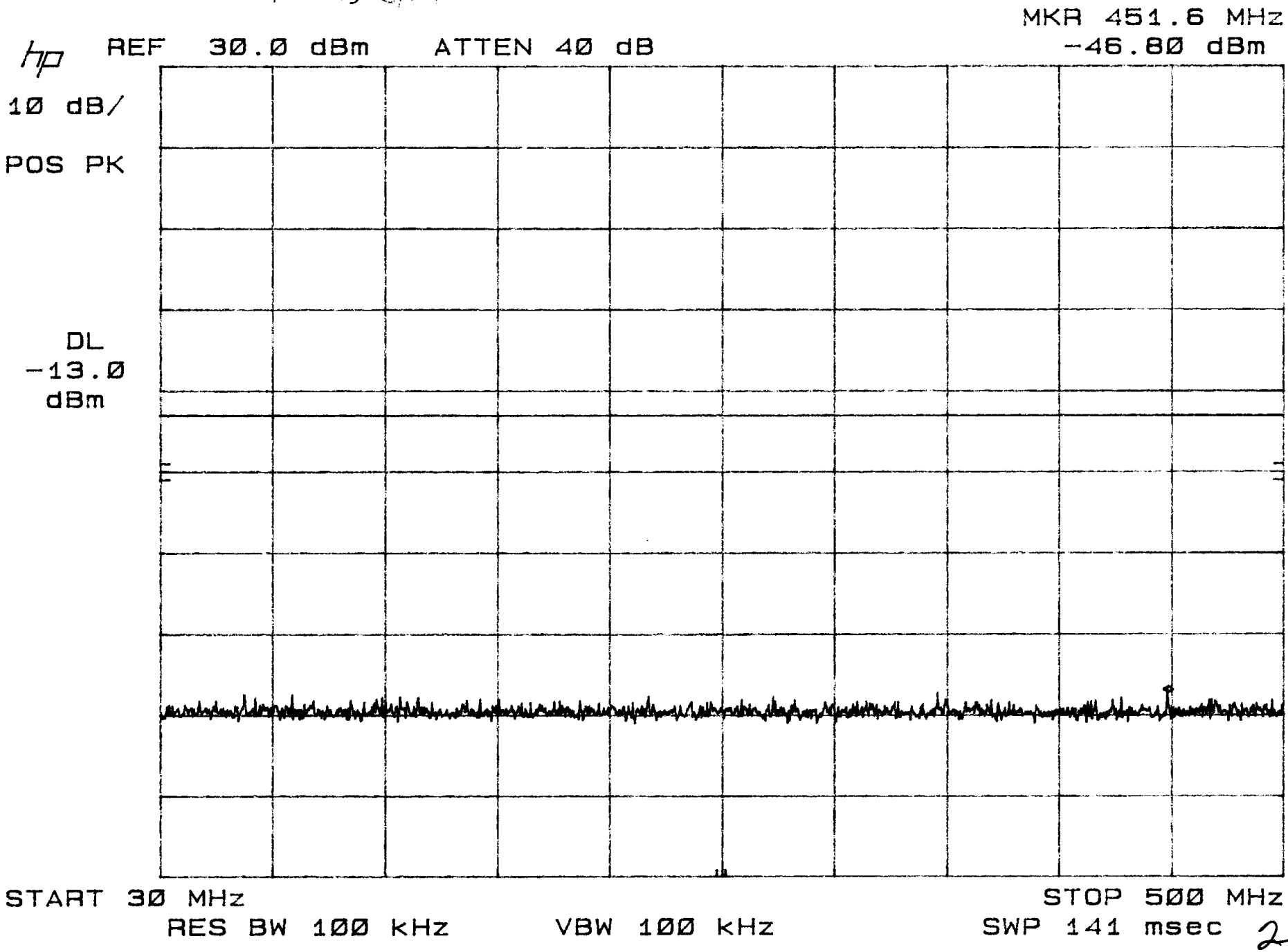
CONDUCTED SPURIOUS
605 MHz TRANSMIT (MID) T8, R4

2.1051 + 74.861(e)(6)



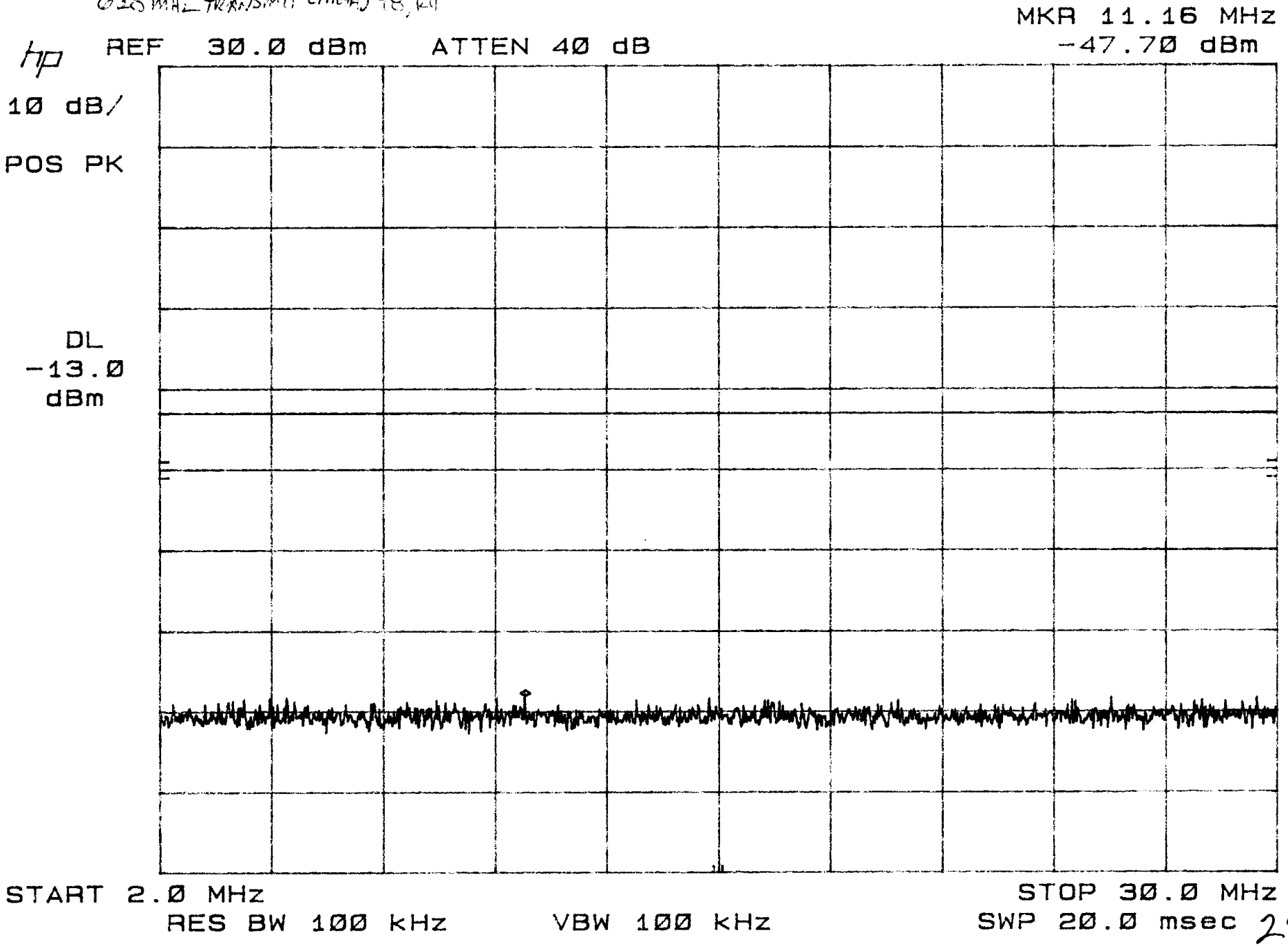
CONDUCTED SPURIOUS
620 MHz TRANSMIT CHAN (HIGH) T&R

2.1051 & 74.861(e)(6)



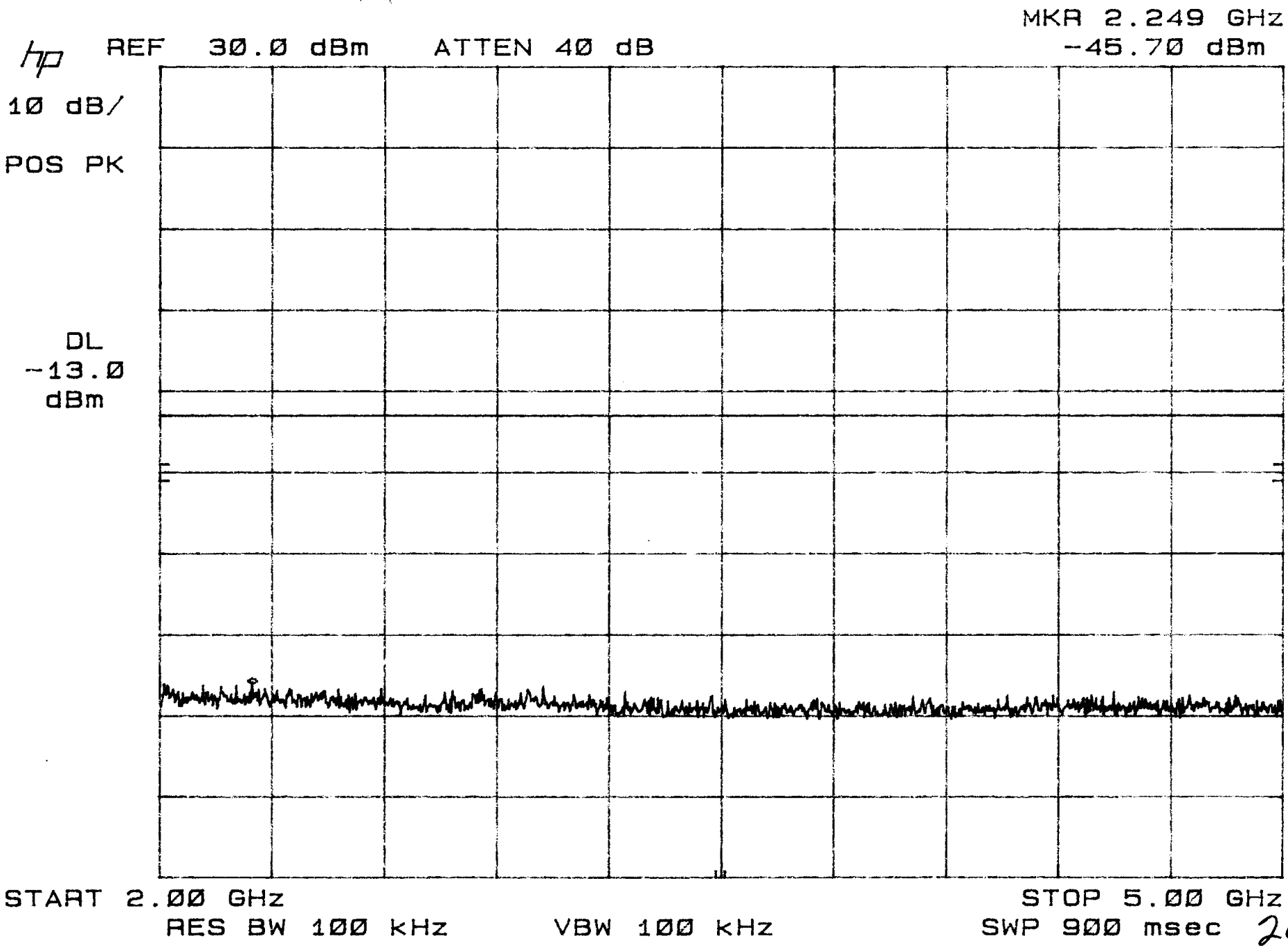
CONDUCTED SPURIOUS
620 MHz TRANSMIT (HIGH) T8, R4

2.1051 & 74.861(e)(6)

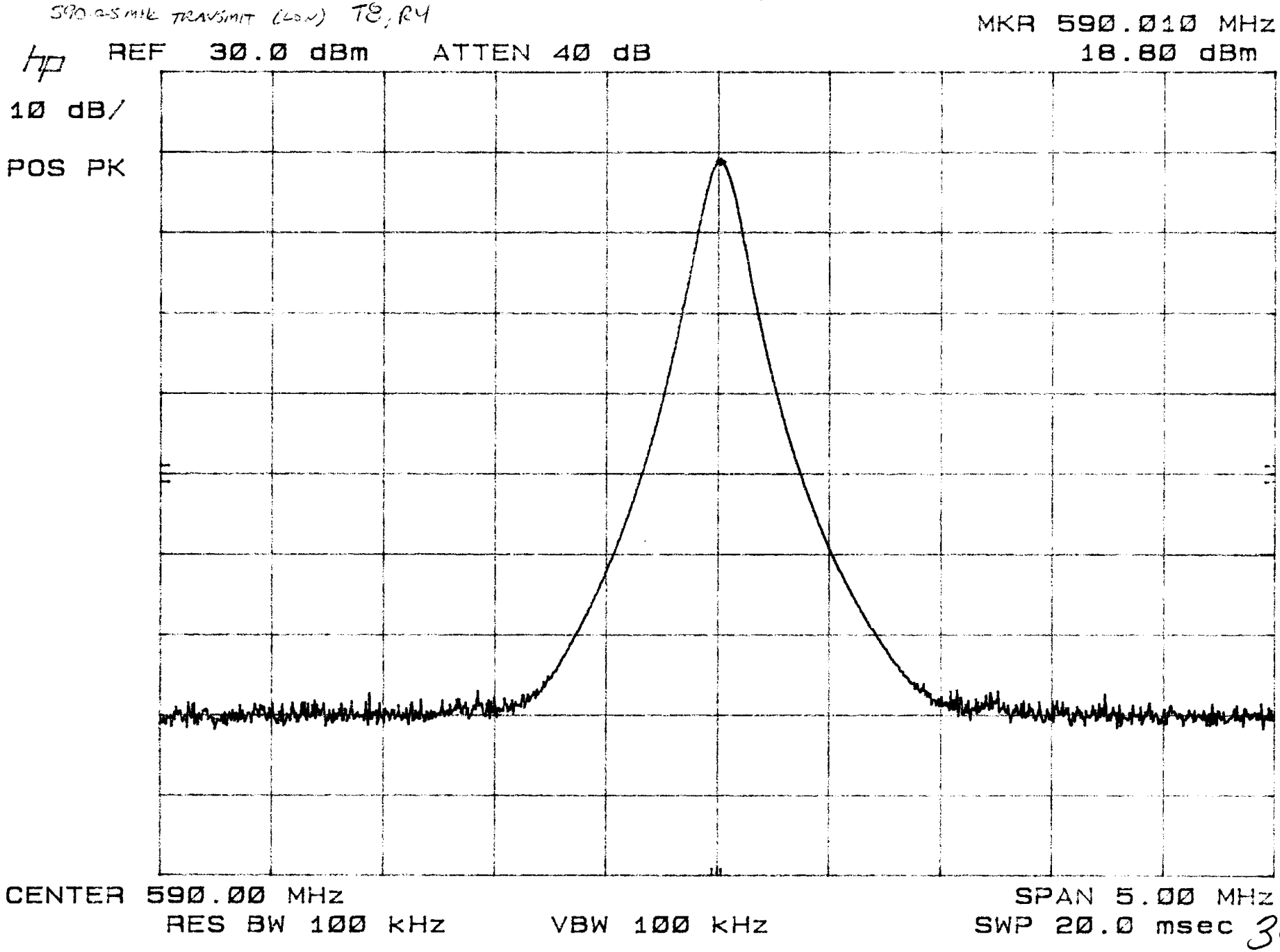


CONDUCTED SPURIOUS
820 MHz TRANSMIT CHAN'S TB, R4

2.1051 & 74.861(e)(6)



PEAK POWER OUTPUT 75.9 mW = .0759 W 2.1046 + 74.861@1
590.0-5 MHz TRANSMIT (LOW) T8, R4

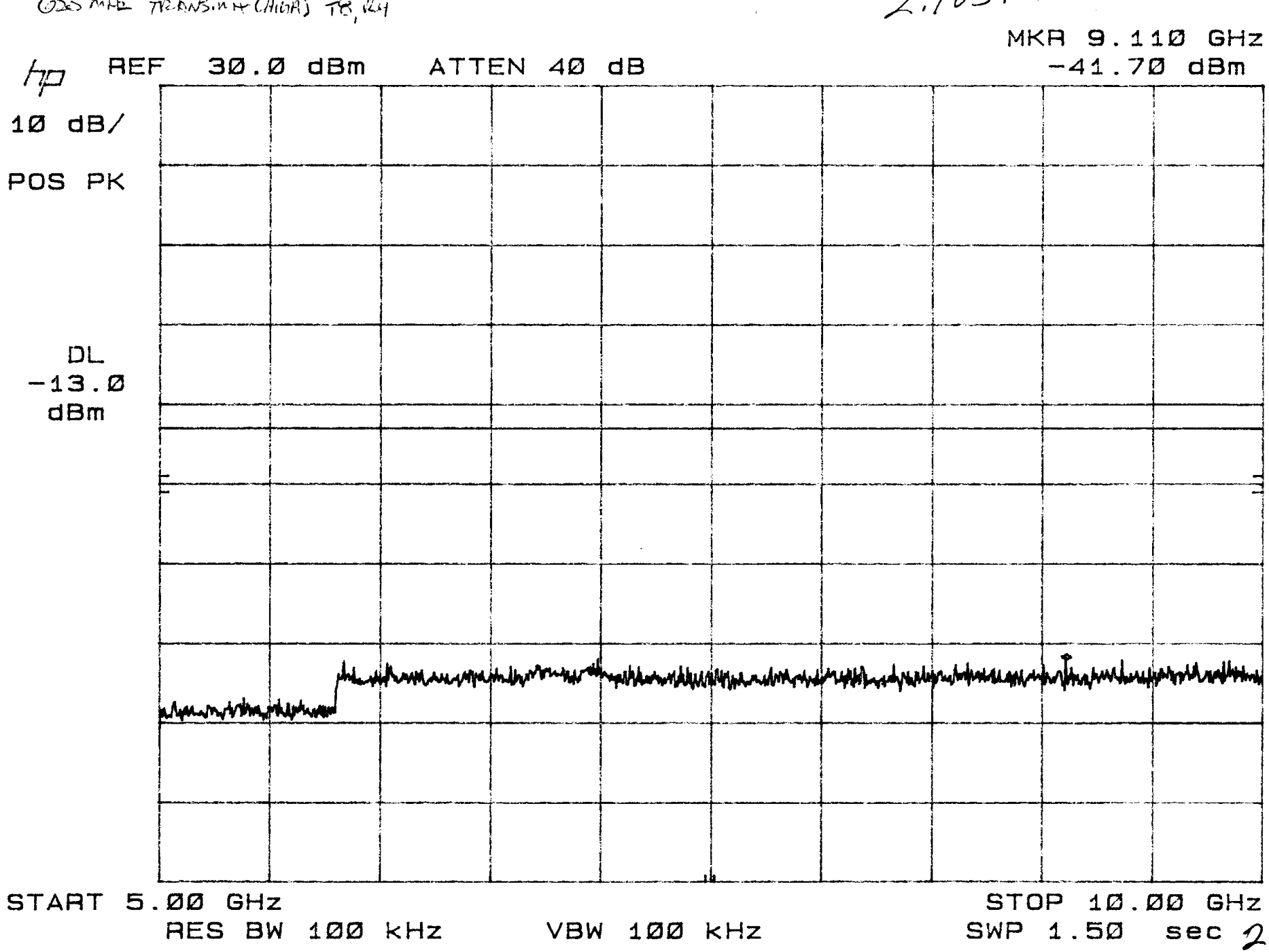


30

CONDUCTED SPURIOUS

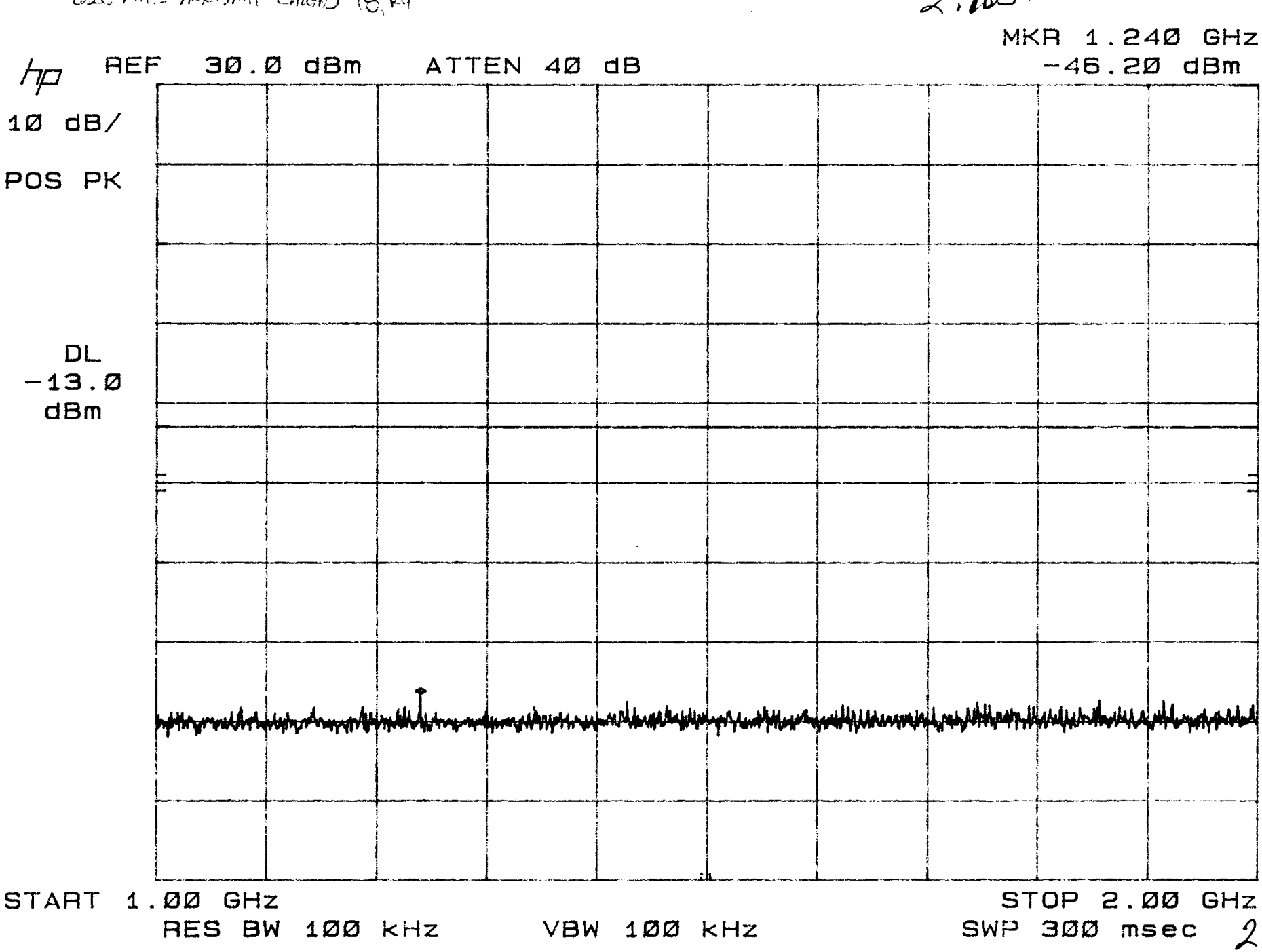
@ 2ND HARM TRANSMITTER (HIGH) TX, RX

2.1051 & 74.861 (e)(6)



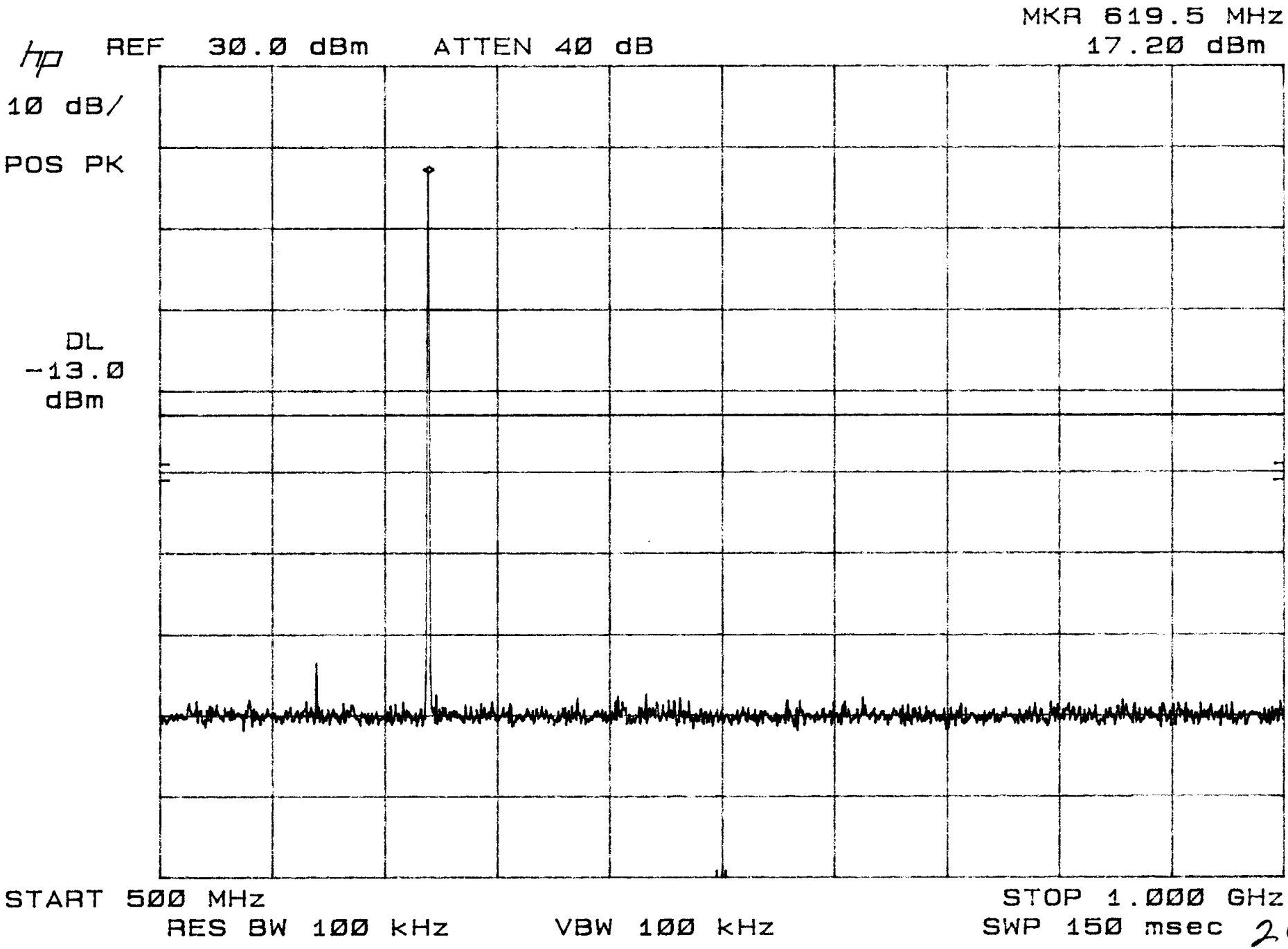
CONDUCTED SPURIOUS
(820 MHz TRANSMIT CHAN) TX, RX

2.1051 & 74.861(e)(6)



CONDUCTED SPURIOUS
620 MHz TRANSMIT (HIGH) T8, R4

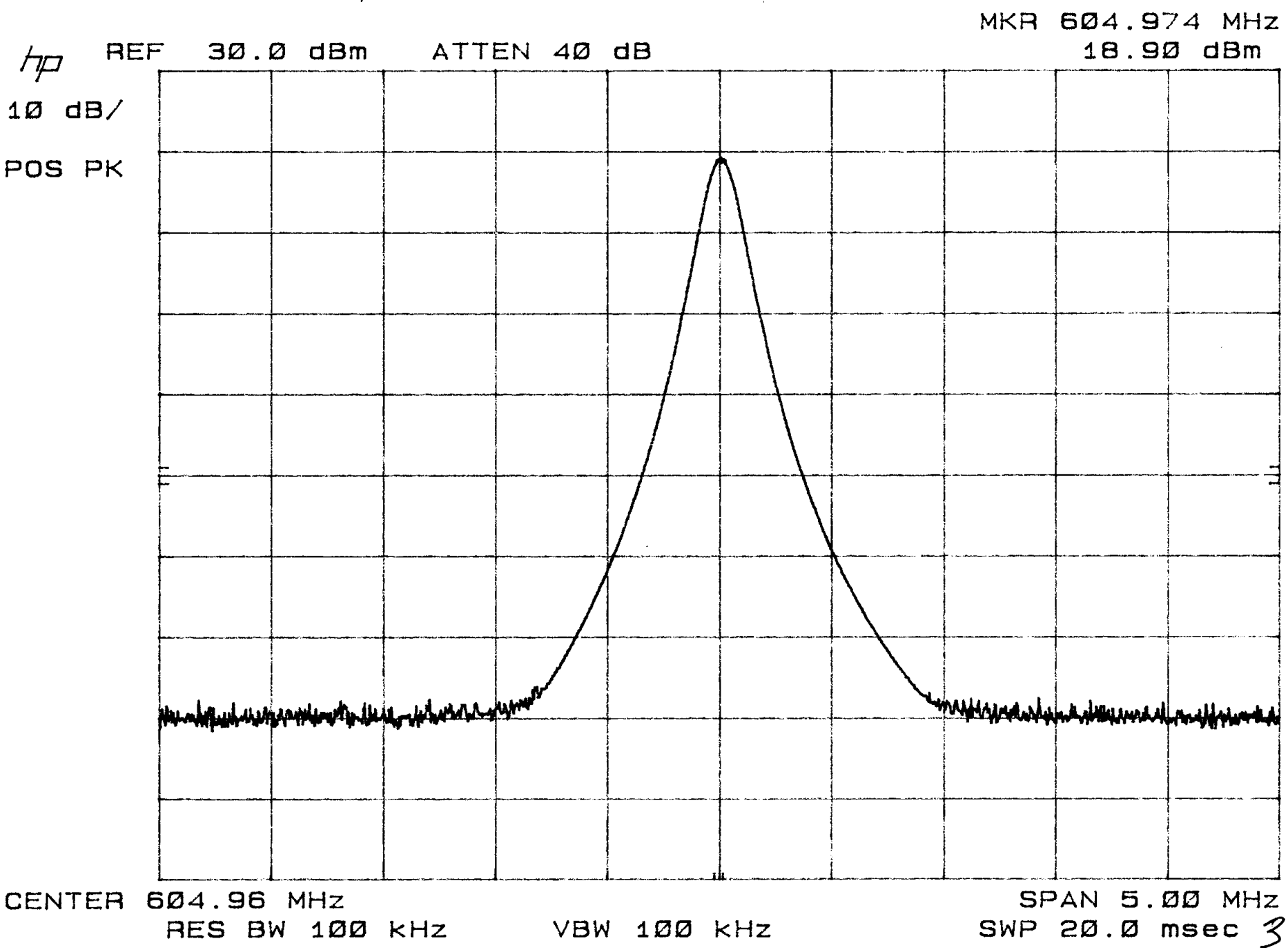
2.1051 & 74.861 @ (6)



PEAK POWER OUTPUT:
605 MHz TRANSMIT (MIC) T8, R4

77.6 MW = .0776 W

2.1046 & 74.8616 (J)

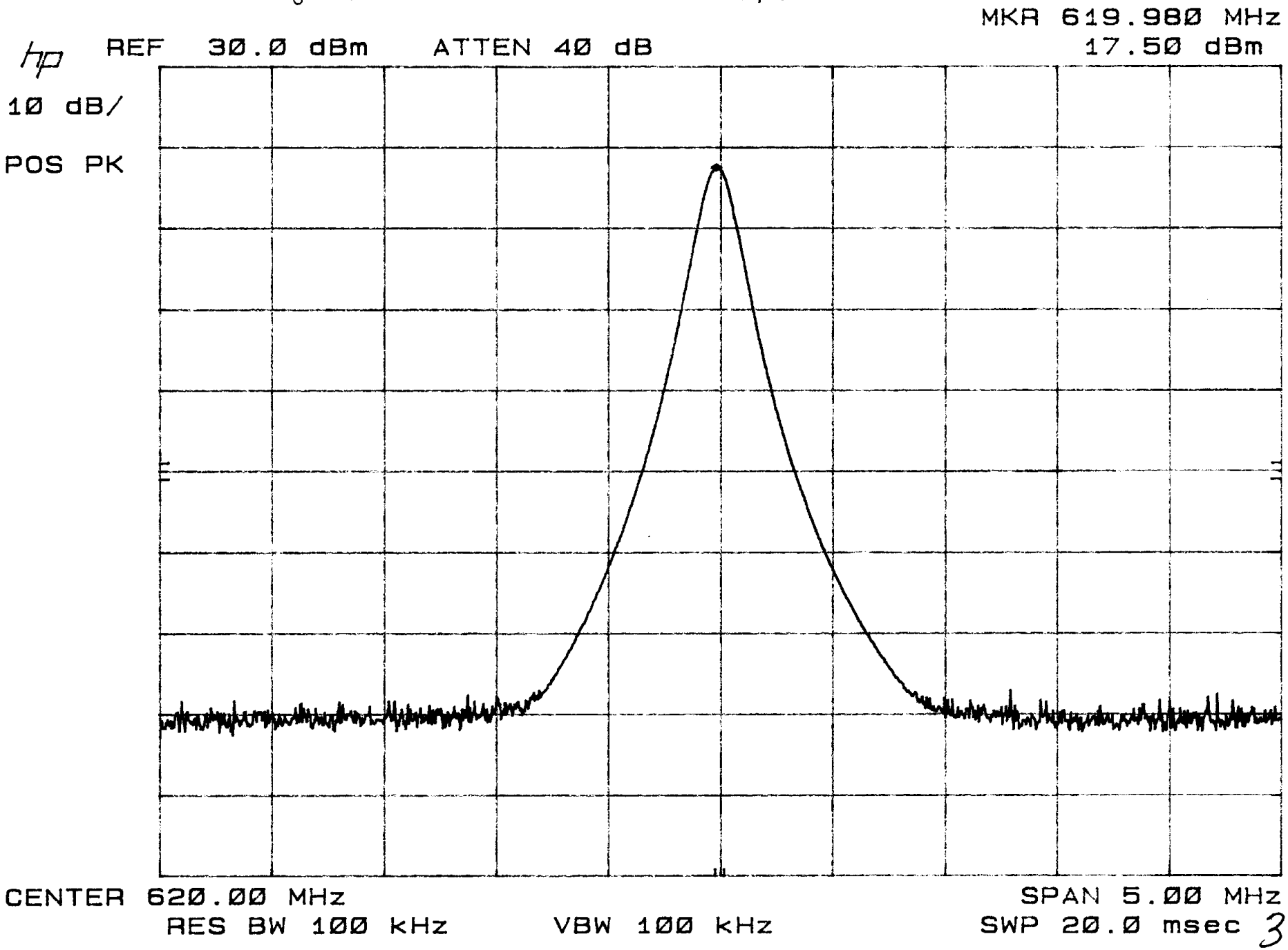


31

PEAK POWER OUTPUT: 56.2 mW = .0562 W

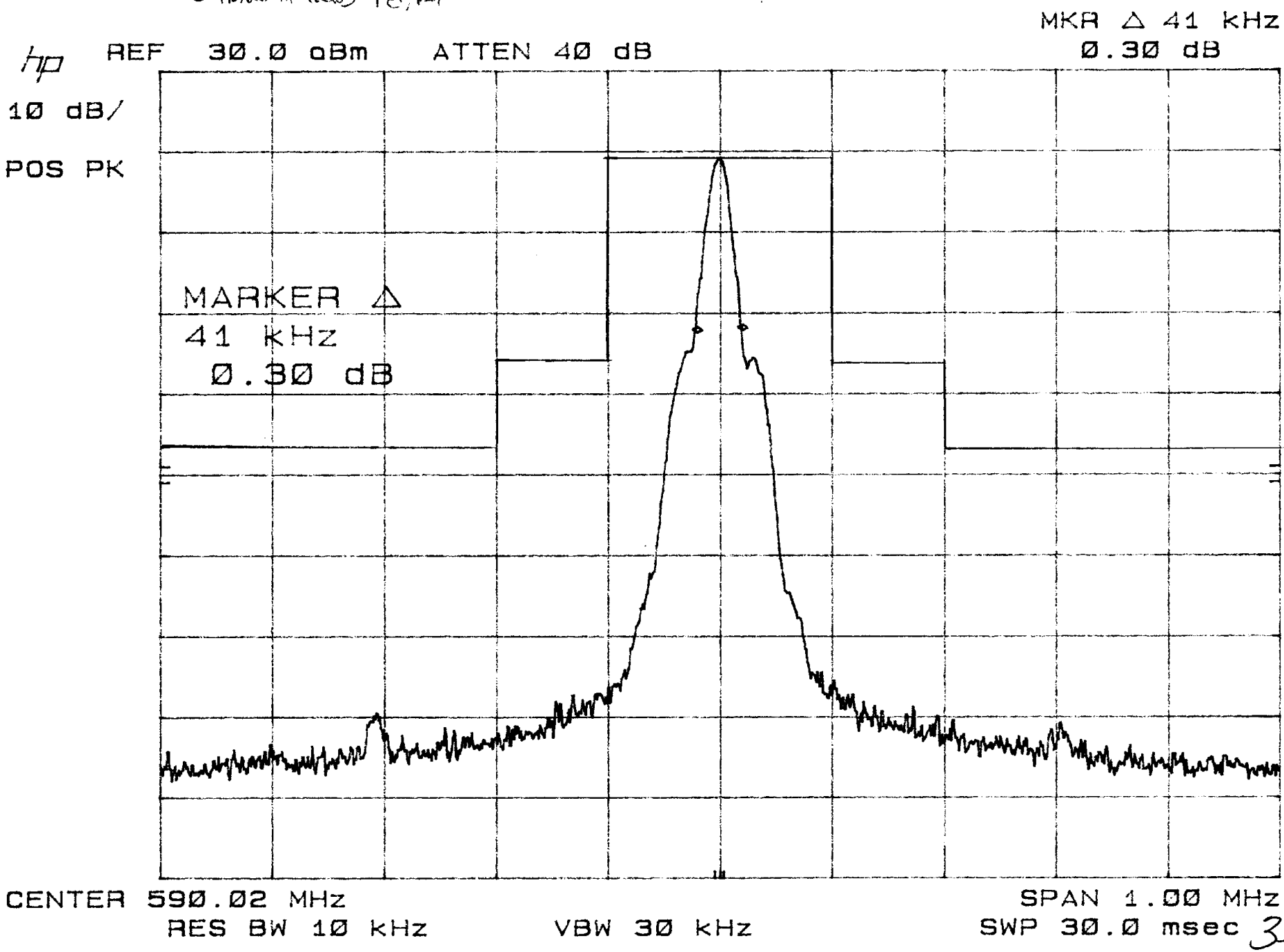
620 MHz TRANSMIT (HIGH) TR, RU

2.1046 + 74.861(e)W



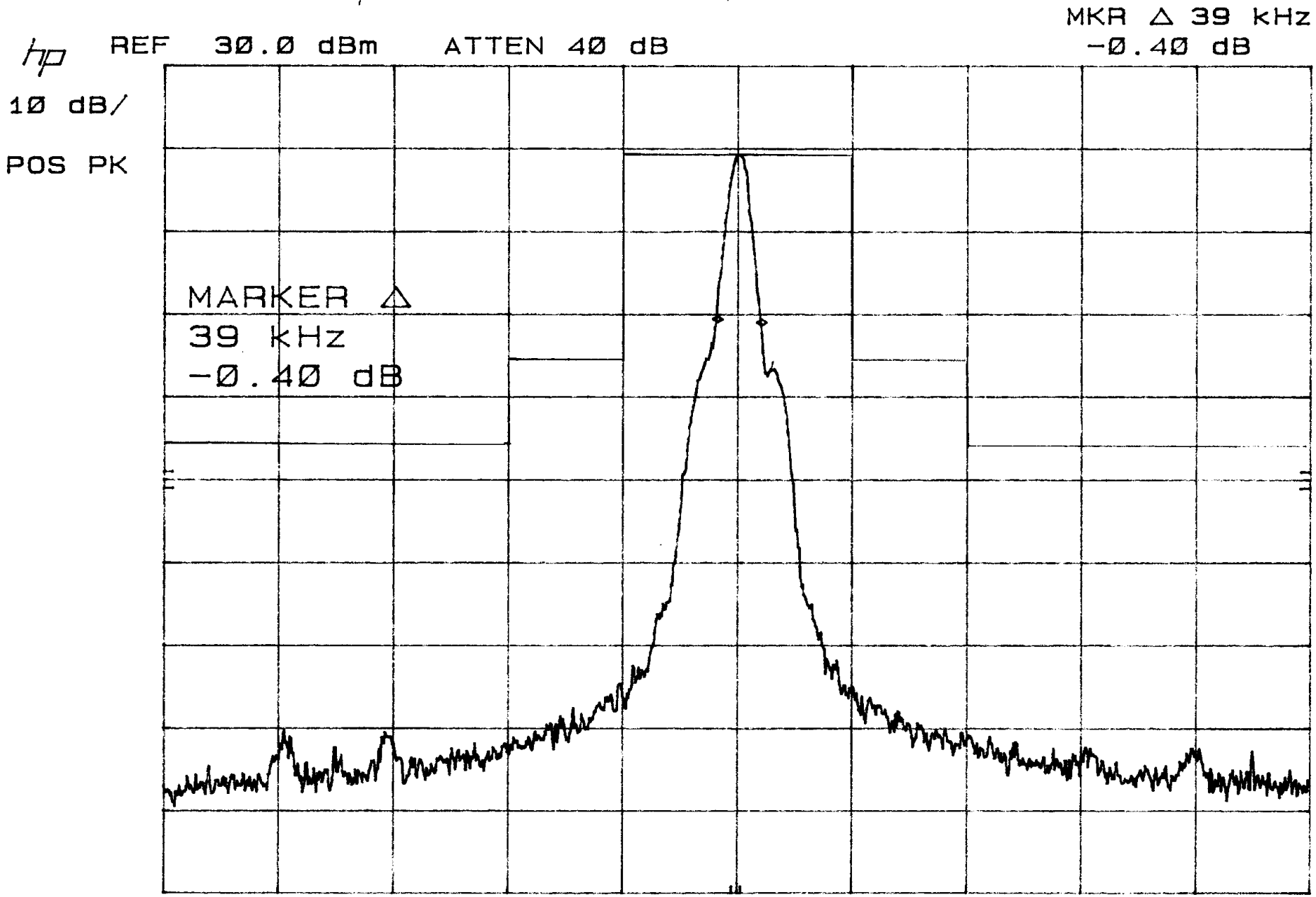
OCCUPIED BANDWIDTH
590.025 MHz TRANSMIT (GAIN) TB, RH

2.1049 & 74.861(d)5 + (e)(6)(i)(ii)



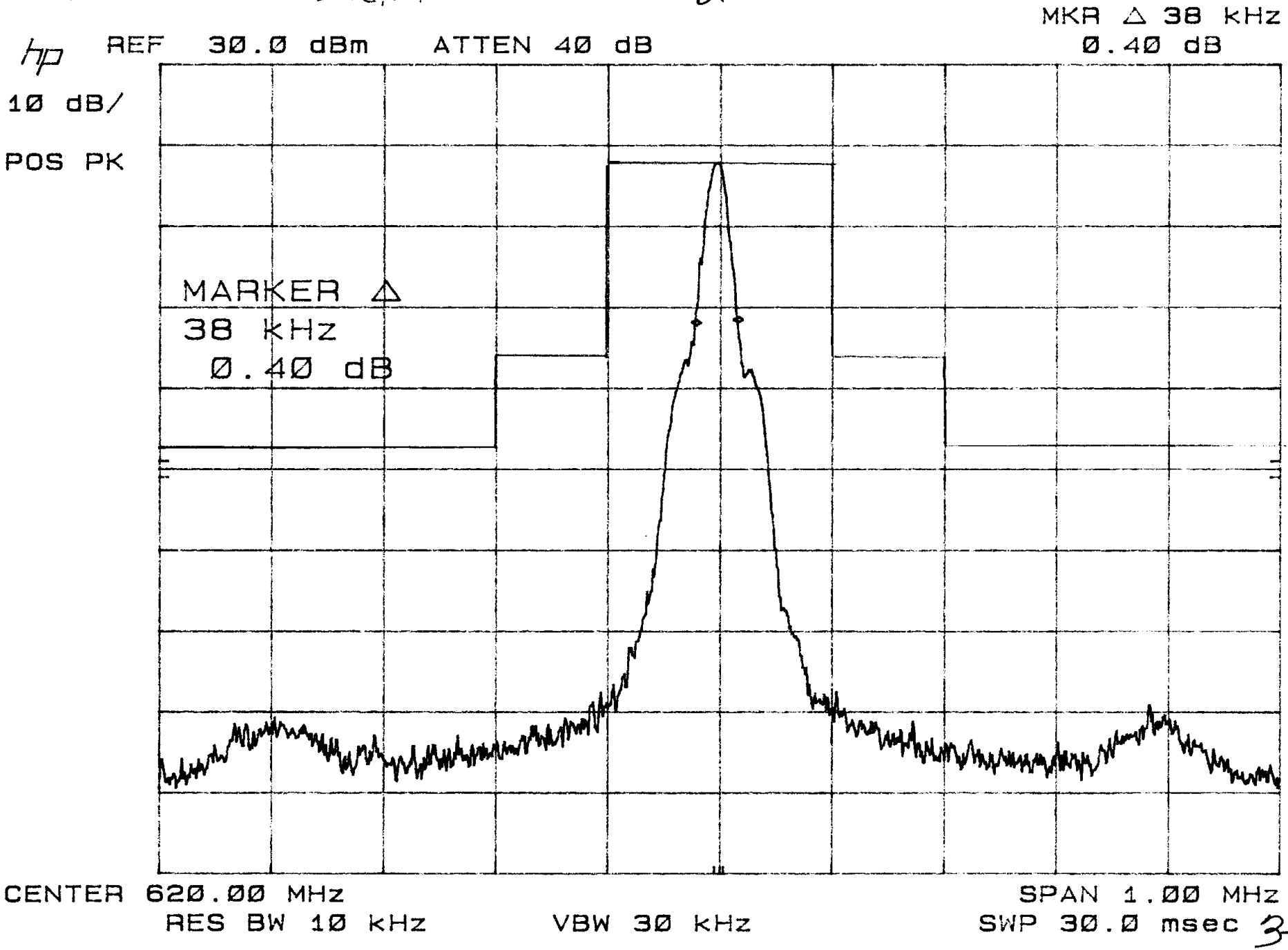
OCCUPIED BANDWIDTH
605 MHz TRANSMIT (MID) TS, RX

2.1049 & 74.861(e)(5) & (e)(6)(i)(ii)



OCCUPIED BANDWIDTH
620 MHz TRANSMIT (HIGH) T8, RU1

2.1049 & 74.861(e)(5) & (e)(6)(i)(ii)



Modulation Characteristics

Modulation Limiting

Test Report #: 50519

Test Area: SR 3

Test Method: FCC Part 2, Section 2.1047(d) Part 74, Section 74.861(e)(3)

Date: 01/11/01

EUT Model #: BP 700

EUT Power:
☐ 230 Vac/50 Hz ☐ 120 Vac/60 Hz
☒ Other: 9 Vdc

EUT Description: Belt Pack T8,R4

NOTES: 605 MHz (MID)

Audio Input Level (dBm)	Audio Input Frequency (Hz) 300 Hz		1.0 K		2.0 K		3.0 K	
	+ Peak	- Peak	+ Peak	- Peak	+ Peak	- Peak	+ Peak	- Peak
+16	15.5	16.5	17.5	18	19.5	19.5	20.5	20.5
+10	14	15	17	18	19.5	19.5	20	20.5
0	8.5	9	12	12.5	15	15.5	18	18.5
-10	6	6	7.5	7.5	9.5	9.5	11	11
-20	5.5	5.5	5.5	5.5	6	6	7.5	7.5
-30	3.5	3.5	3.5	3.5	4	4	4	4
-40	3.5	3	3.5	3	3.5	3	3.5	3.5

Reviewed By: Mary Washington
Printed

Mary Washington
Signature

Frequency Stability
Part 2, Para. 2.1055
Part 74, Para. 74.861(e)(4)

Vega Wireless Beltpack - 605.0000MHz Reference
February 16, 2001
TUV Product Service

TIME	Delta Frequency	Temperature
1:00:11	-400	-30
1:01:16	-272	-30
1:02:20	-512	-30
1:03:25	-384	-30
1:04:30	-512	-30
1:05:35	-512	-30
1:06:39	-576	-30
1:07:44	-704	-30
1:08:49	-576	-30
1:09:54	-704	-30
2:10:08	-1600	-20
2:11:13	-1600	-20
2:12:18	-1408	-20
2:13:23	-1408	-20
2:14:27	-1280	-20
2:15:32	-1280	-20
2:16:37	-1216	-20
2:17:42	-1088	-20
2:18:47	-1216	-20
2:19:52	-1088	-20
3:20:06	-128	-10
3:21:11	-128	-10
3:22:16	128	-10
3:23:20	0	-10
3:24:25	0	-10
3:25:30	128	-10
3:26:35	128	-10
3:27:39	128	-10
3:28:44	192	-10
3:29:49	192	-10
4:30:04	832	0
4:31:08	896	0
4:32:13	832	0
4:33:18	832	0
4:34:22	896	0
4:35:27	832	0
4:36:32	832	0
4:37:37	896	0
4:38:42	896	0
4:39:46	896	0
5:40:01	1024	10
5:41:06	1024	10
5:42:11	896	10
5:43:16	1024	10
5:44:20	1088	10
5:45:25	896	10
5:46:30	896	10
5:47:35	896	10
5:48:39	896	10

Modulation Characteristics

Frequency Response

Test Report #: 50519 Test Area: SR 3

Test Method: FCC Part 2, Section 2.1047(d) Date: 01/11/01

EUT Model #: BP 700 EUT Power:
☐ 230 Vac/50 Hz ☐ 120 Vac/60 Hz
☒ Other: _____

EUT Description: Belt Pack T8, R4

NOTES: 605 MHz (MID)

Audio Frequency (Hz)	Deviation in (kHz)
10	6
20	6
30	6
40	6
50	6
60	6
70	6.5
80	6.5
90	7
100	7
200	7.5
300	8
400	8
500	8
600	8
700	8.5
800	8.5
900	8.5
1000	9
2000	11
4000	16.5
6000	21
8000	21
10000	21
12000	20.5
14000	19.5
16000	15
18000	11
20000	8.5
25000	12.5

Reviewed By: Mary Washington
Printed

Mary Washington
Signature

Vega Wireless Beltpack - 605.0000MHz Reference
February 16, 2001
TUV Product Service

Frequency Stability
Part 2, Para. 2.1055
Part 74, Para. 74.861 (e)(4)

TIME	Delta Frequency	Temperature
5:49:44	896	10
6:49:59	576	20
6:51:04	512	20
6:52:08	320	20
6:53:13	384	20
6:54:18	512	20
6:55:23	384	20
6:56:27	512	20
6:57:32	320	20
6:58:37	384	20
6:59:42	384	20
7:59:56	-384	30
8:01:01	-512	30
8:02:06	-320	30
8:03:11	-576	30
8:04:16	-512	30
8:05:20	-384	30
8:06:25	-704	30
8:07:30	-576	30
8:08:35	-704	30
8:09:39	-576	30
9:09:54	-1024	40
9:10:59	-1216	40
9:12:04	-1216	40
9:13:09	-1280	40
9:14:13	-1280	40
9:15:18	-1088	40
9:16:23	-1408	40
9:17:27	-1216	40
9:18:32	-1408	40
9:19:37	-1472	40
10:19:52	-1472	50
10:20:56	-1408	50
10:22:01	-1472	50
10:23:06	-1472	50
10:24:11	-1408	50
10:25:15	-1728	50
10:26:21	-1728	50
10:27:25	-1792	50
10:28:30	-1408	50
10:29:35	-1600	50

5. ATTESTATION STATEMENT

SUMMARY:

All tests per CFR 47, *FCC Part 2, Paragraphs 2.1046; 2.1047(a);(b); 2.1049; 2.1051; 2.1053; 2.1055; Part 74, Paragraph 74.861(e)(1); (e)(3); (e)(5); and (e)(6)* were

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of CFR 47, *FCC Part 2, Paragraphs 2.1046; 2.1047(a);(b); 2.1049; 2.1051; 2.1053; 2.1055; Part 74, Paragraph 74.861(e)(1); (e)(3); (e)(5); and (e)(6).*

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:

Jim Owen
(EMC Engineer)

TÜV PRODUCT SERVICE 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone 858 546 3999 FAX 858 546 0364

2.1055
74.861(e)(4)

3/29/01

Q700 BELTPACK FREQUENCY STABILITY TEST
VERSUS POWER SUPPLY VARIATIONS

~~Unit #1~~ Beltpack TX 12/RX8

Nominal Operating Frequency = 725.000000 MHz

(2) Tolerance is.005%=.00005=+/-36.25kHz

85%	DC 6.5V	724.998620 MHz
100% Nominal Voltage	DC 9.0V	724.998629 MHz
115%	DC 10.3V	724.998611 MHz

~~UNIT #2~~ Beltpack TX8/RX4

Nominal operating frequency= 605.000000 MHz

(1) Tolerance is .005%=.00005=+/-30.25kHz

85%	DC 6.5V	605.000018 MHz
100% Nominal Voltage	DC 9.0V	605.000025 MHz
115%	DC 10.3V	605.000009 MHz

~~UNIT #3~~ Beltpack TX4/RX12

Nominal operating frequency= 485.000000 MHz

(3) Tolerance is .005%=.00005=+/-24.25kHZ

85%	DC 6.5V	485.000282 MHz
100%	DC 9.0V	485.000310 MHz
115%	DC 10.3V	485.000261 MHZ

I certify that the above frequency measurements were made on the Beltpacks with a calibrated HP53131A Frequency Counter.

James E. Pigg

Director of Engineering VEGA Holdings, Inc.