MEASUREMENT AND TECHNICAL REPORT

HITECH EQUIPMENT CORPORATION
9672 Via Excelencia, Suite 1001
San Diego, CA 92126

DATE: 02 May 2002

This Report Concerns:	Original Grant: X	Class II Change:
Equipment Type:	Low Power Inventory Transmitter, Model LPX2A	
Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?	Yes: **Defer until:**	No: X
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 15.231(a); (b); (c); 15.107(a); 15.109(a)

Report Prepared by:

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

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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: Low Power Inventory Transmitter, Model LPX2A

Power Requirements

Voltage: Battery -3V (If battery powered, make sure battery life is sufficient to complete testing.)

EUT Power Cable: Not Applicable

EUT Software.

Revision Level: LPX2
Description: Two-button communication protocol

EUT Operating Modes to be Tested -

1. Take button pressed
2. Return button pressed
3. Both take and return buttons pressed.

EUT System Components

Description	Model #	Serial #	FCC ID #
Inventory Transmitter	LPX2A	N/A	

Oscillator Frequencies

Frequency MHz	*Derived Frequency*	*Component # / Location*	*Description of Use*
315	--	SAW Y1	Local Oscillator
433.92	--	SAW Y2	Local Oscillator
4	--	NC U1	Processor clock internal

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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	FCC CFR 47 #	PASS/FAIL
Radiated	15.231(b)	Pass
Deactivation	15.231(a)	Pass
Emission Bandwidth	15.231(c)	Pass
Conducted Emissions	15.107(a)	Battery
Radiated Emissions	15.109(a)	Pass - no detectable emissions
Duty Cycle	15.231	Calculated worst-case of 50% used for measurement (see page 10 and 11)

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 - 25 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.

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).

See test setup photos for radiated emissions test setup.

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Emissions Test Conditions: SPURIOUS RADIATED EMISSIONS

Roof (small open area test site)

The *Spurious Radiated Emissions* measurements were performed using the following equipment:

Test Equipment Used :

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
8566B	721	Spectrum Analyzer	Hewlett Packard	2542A12089	06/02
PreAmp 2 - 20 GHz	752	PreAmp	TUV PS	--	N/A*
3115	251	Antenna, Horn	Electro Mechanics Co	2595	06/02
Cable 1	733	30' cable	Universal Microwave Prod	--	N/A*
Cable 2	655	6" cable	Universal Microwave Prod	--	N/A*
FF 6549-1	778	900 MHz High Pass Filter	Sage	5	N/A*
FF 6548-2	782	2000 MHz High Pass Filter	Sage	007	N/A*
		For Substitution			
Cable 3	732	30' cable	Universal Microwave Prod	--	N/A*
Cable 4	657	6" cable	Universal Microwave Prod	--	N/A*
HP83640B	791	Signal Generator	Hewlett Packard	3844A00726	03/02
3115	453	Antenna, Horn	Electro Mechanics Co	3564	12/02

Remarks: (*) Verified

REPORT No: SC201639 TESTER: Alan Laudani SPEC: FCC Part 15 para 15.231(b)

CUSTOMER: HiTech Equipment Corporation TEST DIST: 3 Meters

E U T: LPX2A Low Power Inventory Transmitter TEST SITE: Roof

EUT MODE: Continuous Transmit BICONICAL: N/A

DATE: June 12, 2002 LOG: 244

NOTES: Duty Cycle= 50% OTHER: 251

above 1GHz: RBW & VBW 1 MHz for Pk; AVG = PK - 20LOG(Duty Cycle)

below 1GHz: RBW & VBW 100 kHz for Pk; AVG = PK - 20LOG(Duty Cycle)

CF = Antenna Factor + Cable Loss - Preamplifier Gain + Preselector Loss

v.beta231

FREQ (MHz)	VERT. (dBuv) pk	VERT. (dBuv) DCav	HORIZ (dBuv) pk	HORIZ (dBuv) DCav	CF (dB/m)	MAX LEVEL (dBuV/m) pk	MAX LEVEL (dBuV/m) av	SPEC LIMIT (dBuV/m) pk	SPEC LIMIT (dBuV/m) av	MARGIN (dB) pk	MARGIN (dB) av	EUT Rotation	Antenna Height	Notes
314.920	36.9	30.9	52.1	46.1	15.2	**67.3**	**61.3**	95.6	75.6	-28.3	-14.3	30	1.2	
629.840	32.3	26.3	1.0	-5.0	19.6	**51.9**	**45.9**	75.6	55.6	-23.7	-9.7			
944.760	19.4	13.4	18.2	12.2	23.2	**42.6**	**36.6**	75.6	55.6	-33.0	-19.0	0	1	
1259.680	56.6	50.6	57.1	51.1	-12.1	**45.0**	**39.0**	75.6	55.6	-30.6	-16.6			
1574.600	42.7	36.7	41.6	35.6	-9.8	**32.9**	**26.9**	74.0	54.0	-41.1	-27.1			Restricted Band
1889.520	33.4	27.4	40.7	34.7	-7.6	**33.1**	**27.1**	75.6	55.6	-42.5	-28.5			
2204.440	43.5	37.5	42.5	36.5	-5.9	**37.6**	**31.6**	74.0	54.0	-36.4	-22.4			Restricted Band
2519.360	44.3	38.3	44.0	38.0	-4.4	**39.9**	**33.8**	75.6	55.6	-35.8	-21.8			
2834.280					-3.4			74.0	54.0					Restricted Band
3149.200					-2.3			75.6	55.6					

(*) SEE PAGE 10 & 11.

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

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above 1GHz: RBW & VBW 1 MHz for Pk; AVG = PK - 20LOG(Duty Cycle)

below 1GHz: RBW & VBW 100 kHz for Pk; AVG = PK - 20LOG(Duty Cycle)

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v.beta231

FREQ (MHz)	VERT. (dBuv) pk	VERT. (dBuv) DCav	HORIZ (dBuv) pk	HORIZ (dBuv) DCav	CF (dB/m)	MAX LEVEL (dBuV/m) pk	MAX LEVEL (dBuV/m) av	SPEC LIMIT (dBuV/m) pk	SPEC LIMIT (dBuV/m) av	MARGIN (dB) pk	MARGIN (dB) av	EUT Rotation	Antenna Height	Notes
433.920	51.9	45.9	58.7	52.7	16.4	**75.1**	**69.1**	100.8	80.8	-25.7	-11.8	220	1	
867.840	16.0	10.0	26.9	20.9	22.7	**49.6**	**43.6**	80.8	60.8	-31.2	-17.2	0	1	
1301.760	46.6	40.6	47.7	41.7	-11.8	**35.9**	**29.9**	74.0	54.0	-38.1	-24.1	205	1.3	Restricted Band
1735.680	44.0	38.0	52.0	46.0	-8.7	**43.3**	**37.3**	80.8	60.8	-37.5	-23.5	250	1.1	
2169.600	50.6	44.6	49.0	43.0	-6.0	**44.6**	**38.6**	80.8	60.8	-36.2	-22.3	220	1	
2603.520	59.8	53.8	55.2	49.2	-4.1	**55.7**	**49.6**	80.8	60.8	-25.2	-11.2	160	1.1	
3037.440	64.8	58.8	66.2	60.2	-2.7	**63.5**	**57.5**	80.8	60.8	-17.3	-3.3	160	1.2	
3471.360					-1.1			80.8	60.8					
3905.280					0.1			74.0	54.0					Restricted Band
4339.200					-0.3			74.0	54.0					Restricted Band

(*) SEE PAGE 10 & 11

HiTech Equipment Corporation Proprietary Data

Theory of Operation and Operating Procedures

LPX2

Designed and Developed by

HiTech Equipment Corporation
9672 Via Excelencia
San Diego, California 92126
(619) 566-1892

Introduction

The **LPX2** is a wireless supply-monitoring transmitter that can be used for the collection of business supply data. This document outlines the principles of operation of this transmitter, and provides information necessary to aid in Federal Communications Commission Certification Procedures. Any questions that are not adequately addressed in this document should be directed to Mr. Ken Arnold HiTech Equipment Corporation at phone # (858) 566-1892.

Modulation Format

The transmitter data is sent utilizing a Manchester Coding (state change modulation) in which, a zero (0) is represented as a transition from High to Low and a one (1) is represented as a transition from Low to High. Representing a zero (0) is a High time of 250us followed by a Low time of 250us. Representing a one (1) is a Low time of 250us followed by a High time of 250us. Shown in Figure-1.

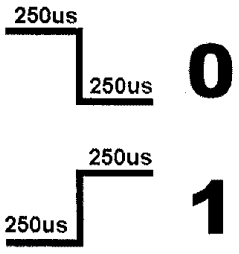

Figure-1 Manchester Coding

LPX2 message consists of 10 preamble bits followed by a Sync-to-Follow period of ~ 1ms on High state. The Sync bit is a one (1). This is followed with 64 information bits. One entire packet is sent in approximately 38ms. Shown in Figure-2.

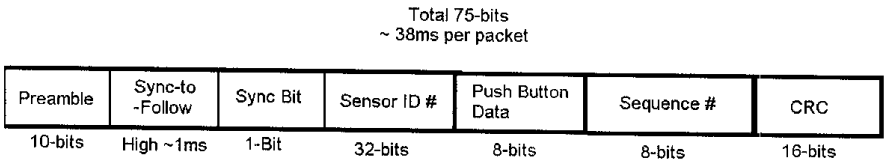

Figure-2 Packet Structure

This packet of bits transmitted alternates twice between 315MHz and 433.92MHz. Thus the total resulting time of transmission for the four packets is ~155ms. Shown in Figure-3.

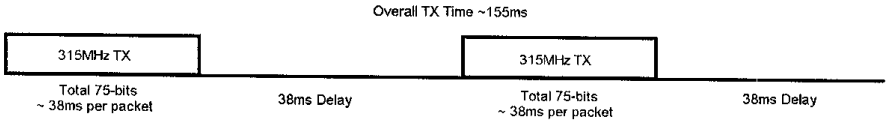

Figure-3 315MHz Transmission Sequence

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.

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

4 DEACTIVATION & BANDWIDTH EQUIPMENT/DATA

HP Spectrum Analyzer, Model 8566B, Prop. # 721, Cal Date: 08/22/02
Cable, Prop. # 787, Cal Date: N/A

See following page(s).

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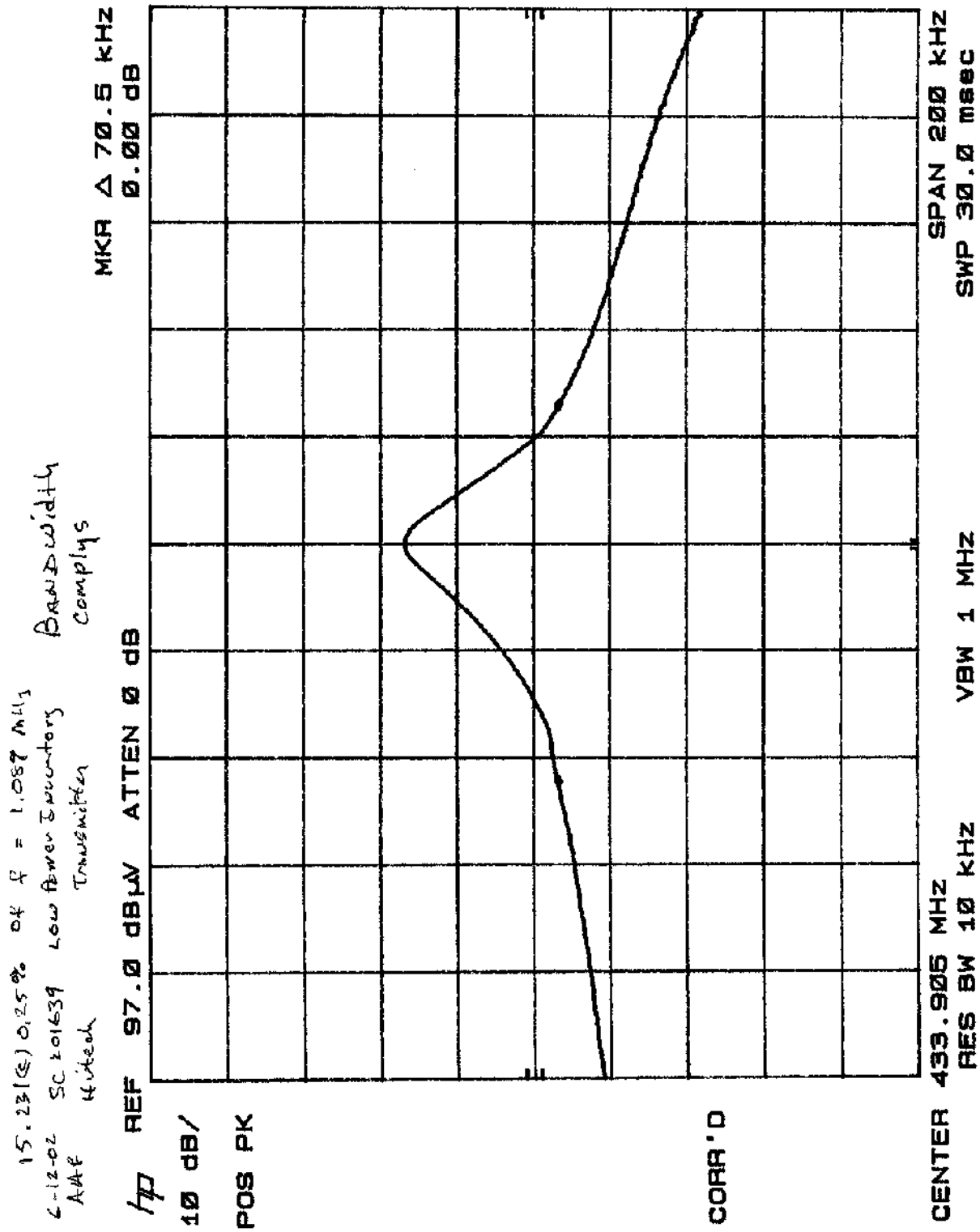
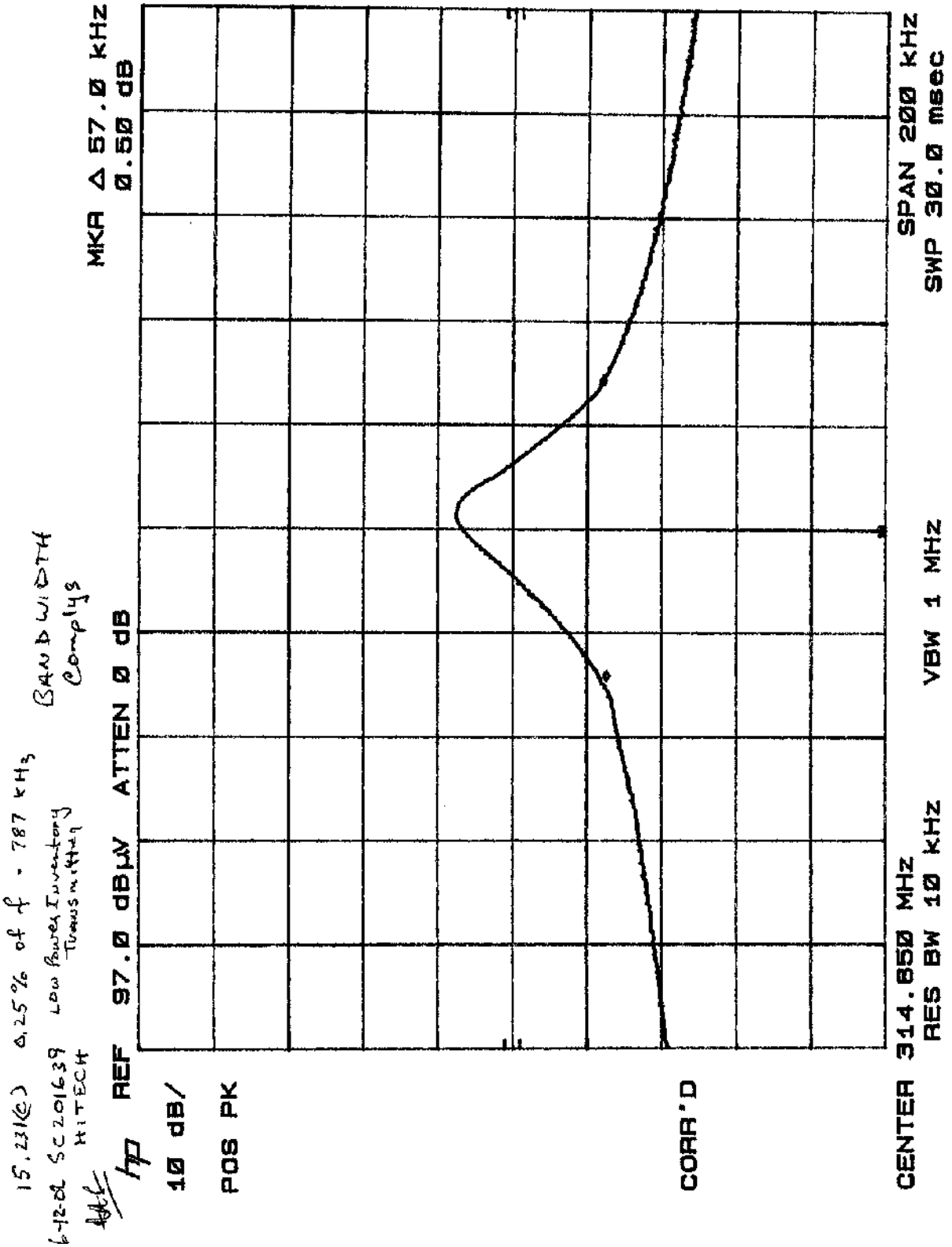
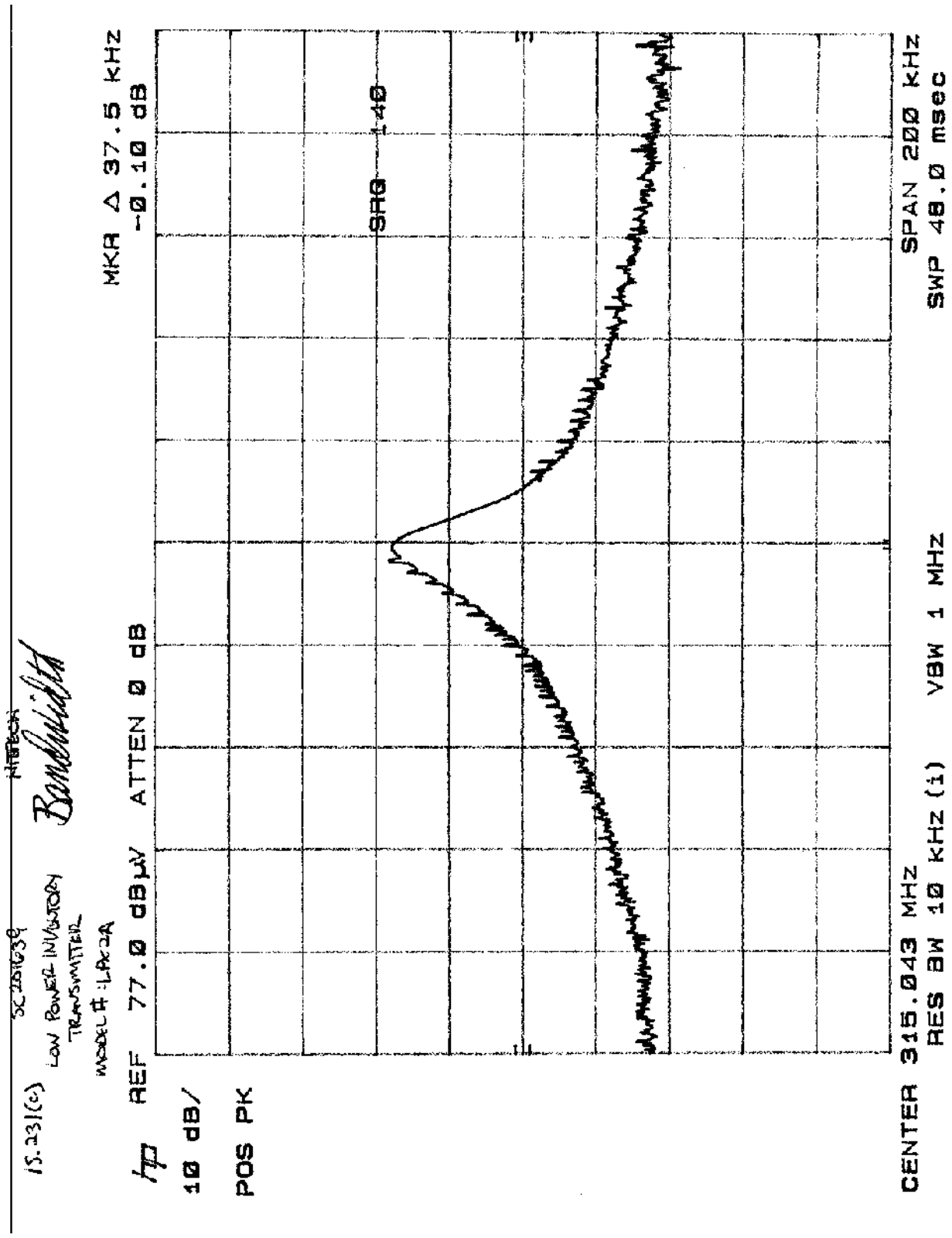
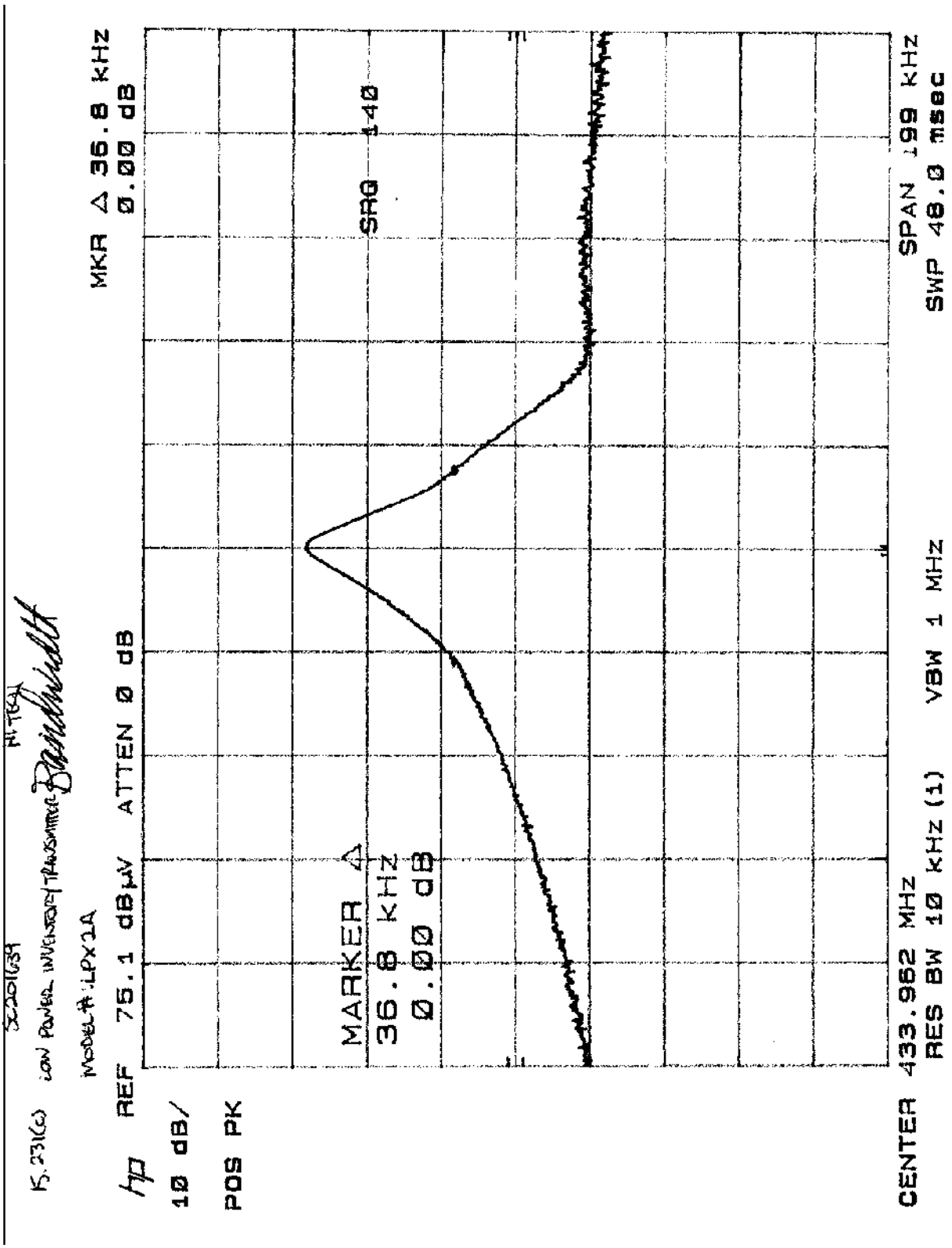

15.231(e) 0.25% of F = 1.087 MHz
7-12-02 SC 201639 Low Power Emissions
AMF Ultech Transmitter
Bandwidth Complies
MKR Δ 70.5 kHz
0.00 dB
SPAN 200 kHz
SWP 30.0 msec
REF 97.0 dBµV ATTEN 0 dB
10 dB/
POS PK
CORR'D
CENTER 433.905 MHz
RES BW 10 kHz
VBW 1 MHz


MKR Δ 57.0 kHz
0.50 dB
REF 97.0 dBµV ATTEN 0 dB
10 dB/
POS PK
COR'D
CENTER 314.850 MHz
RES BW 10 kHz
VBW 1 MHz
SPAN 200 kHz
SWP 30.0 msec
15.23(c) 0.25% of f - 787 kHz
6-12-01 SC 201639 Low Power Inventory
HITECH
Tuesday
BANDWIDTH
Complys


15.231(e)
SC 201639
Low Power Intentional Transmitter
Model #: LAR2A
MKR Δ 37.5 kHz
-0.10 dB
SRQ
-40
REF 77.0 dBµV
ATTEN 0 dB
10 dB/
POS PK
CENTER 315.043 MHz
RES BW 10 kHz (i)
VBW 1 MHz
SPAN 200 kHz
SWP 48.0 msec


15.231(c) Low Power Intentional Transmitter
Model #: LPX1A
hp
10 dB/
POS PK
REF 75.1 dBµV ATTEN 0 dB
MKR Δ 36.8 kHz
0.00 dB
SR0 140
MARKER Δ
36.8 kHz
0.00 dB
CENTER 433.962 MHz
RES BW 10 kHz (1) VBW 1 MHz
SPAN 199 kHz
SWP 48.0 msec

ATTESTATION STATEMENT

GENERAL REMARKS:

([1])Conducted Emissions not tested - unit battery operated.
([2])Radiated Emissions 30 - 1000 MHz - no detectable emissions.

SUMMARY:

All tests were performed per *FCC Part 2, Paragraphs 15.231(a); (b); (c); 15.107(a)[1]; 15.109(a)[2]*.

■ - Performed

The Equipment Under Test

■ - **Fulfills** the requirements of *FCC Part 2, Paragraphs 15.231(a); (b); (c); 15.107(a); 15.109(a).*

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:

Rodel Resolme
(EMC Engineer)

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