ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test report file number	**: E022R-001**
Applicant	**: SHINCHANG ELECTRICS CO., LTD.**
Address	**: 734-2, Wonshi-Dong, Ansan-Si, Gyungki-Do, 425-090, Korea**
Manufacturer	**: SHINCHANG ELECTRICS CO., LTD.**
Address	**: 734-2, Wonshi-Dong, Ansan-Si, Gyungki-Do, 425-090, Korea**
Type of Equipment	**: REMOTE KEYLESS ENTRY SYSTEM**
FCC ID	**: NYOSKS-005Tx**
Model / Type No.	**: SKS-005Tx**
Serial number	**: N/A**
Total page of Report	**: 17 pages (including this page)**
Date of Incoming	**: January 25, 2002**
Date of issuing	**: February 5, 2002**

SUMMARY

The equipment complies with the regulation; FCC PART 15 SUBPART C §15.231

This test report contains only the result of a single test of the sample supplied for the examination. It is not a general valid assessment of the features of the respective products of the mass-production.

Prepared by:
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EMC Testing Dept : 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-860 Korea. (TEL:82-31-765-8289 FAX: 82-31-766-2904)

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1. VERIFICATION OF COMPLIANCE

APPLICANT	: SHINCHANG ELECTRICS CO., LTD.
ADDRESS	: 734-2, Wonshi-Dong, Ansan-Si, Gyungki-Do, 425-090, Korea
CONTACT PERSON	: Joon-Young, Jung / R&D Center. Research Engineer
TELEPHONE NO	: 82-31-4904-526
FCC ID	: NYOSKS-005Tx
MODEL NO/NAME	: SKS-005Tx
SERIAL NUMBER	: N/A
DATE	: February 5, 2002

DEVICE TYPE	REMOTE KEYLESS ENTRY SYSTEM - INTENTIONAL RADIATOR
E.U.T. DESCRIPTION	RF REMOTE KEYLESS ENTRY SYSTEM FOR VEHICLE - TRANSMITTER
THIS REPORT CONCERNS	ORIGINAL GRANT
MEASUREMENT PROCEDURES	ANSI C63.4/1992
TYPE OF EQUIPMENT TESTED	PRE-PRODUCTION
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	CERTIFICATION
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C 15.231
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 METER OPEN AREA TEST SITE

The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

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2. GENERAL INFORMATION

2.1 Product Description

The SHINCHANG ELECTRICS CO., LTD., Model SKS-005Tx (referred to as the EUT in this report) is a transmitter that it controls locking and unlocking the door of a vehicle by wireless remote controller. The associated receiver is manufactured by Shinchang Co., Ltd, Model No: SKS-005Rx, FCC ID: NYOSKS-005RX. The product specification described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	Plastic
TX FREQUENCY	315.00 MHz
MODULATION	AM
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1MHz)	315.00 MHz
ANTENNA TYPE	Built-in on the PCB in the EUT
CODE	Rolling Code (Hopping Algorithm)
TRANSMISSION TIME	Not longer than 1 sec
RATED SUPPLY VOLTAGE	DC 3V (Lithium cell)
OPERATING VOLTAGE RANGE	DC 2.5 ~ 3.2V
NUMBER OF LAYERS	2 LAYERS
FUNCTION OF BUTTON	Doors Lock and Doors Unlock

* Remark: This equipment automatically deactivates the transmitter within not more than 1 second of being released.

Model Differences:

-. No other model differences have been mentioned

2.2 Related Submittal(s) / Grant(s)

-. None

2.3 Test System Details

The EUT was tested with the following all equipment used in the tested systems are:

Model	Manufacturer	FCC ID	Description	Connected to
SKS-005Rx	SHINCHANG ELECTRICS CO., LTD.	NYOSKS-005Rx	RECEIVER	N/A

2.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4/1992. Radiated testing was performed at a distance of 3 meters from EUT to the antenna.

2.5 Test Facility

The open area test site and conducted measurement facilities are located on at 426-1 Daessangryung-Ri, Chowol-Myun, Kwangju-Kun, Kyunggi-Do 464-080 Korea. Description details of test facilities were submitted to the Commission on January 18, 2002. (Registration Number: 92819)

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
MAIN BOARD	SHINCHANG ELECTRICS CO., LTD..	325600-2500	N/A

3.2 EUT exercise Software

To get a maximum radiated emission from the EUT, the button on the EUT was continuously pressed to transmit the signal. To activate continuous transmission, place a small plastic block between rubber band and the push button on the EUT.

3.3 Equipment Modifications

None

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3.4 Configuration of Test System

Line Conducted Test: It needs not to test this requirement, because the EUT supplies from a DC battery.

Radiated Emission Test: Preliminary radiated emissions test were conducted using the procedure in ANSI C63.4/1992 8.3.1.1 and 13.1.4.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3meter open area test site.

The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

Occupied Bandwidth Measurement:

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer. The plot is taken at 20kHz/division frequency span, 10kHz resolution bandwidth and 5dB/division logarithmic display from an 8568B spectrum analyzer.

3.5 Antenna Requirement

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The transmitter antenna of the EUT is built-in on the PCB in the EUT, no consideration of replacement by the user.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
N/A	N/A
It is not need to test this requirement, because the power of the EUT is supplied from a DC battery.	

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
TX mode	X

5. FINAL RESULT OF MEASURMENT

5.1 Field Strength of the Carrier Test

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 49 % Temperature : 13°C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)

Type of Test : Intentional Radiator

Result : PASSED BY –27.92 dB

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 1, 2002

Operating Condition : TX mode

Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors			Total	FCC Limit	
Carrier Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dBuV/m)	Cable (dB)	Average Level Factor	Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
315.00	43.60	Peak	H	14.37	2.09	-12.36	60.06	75.62	-27.92
315.00	39.2	Peak	V	14.37	2.09	-12.36	55.66	75.62	-32.32

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

5.2 Maximum Modulation Percentage (MMP)

In order to determine possible Maximum Modulation Percentage from the EUT, we measured the duty cycle according to the clause I4.(10) in ANSI C63.4/1992.

The pulse train from the EUT was consisting of long and short pulse. The measured values are as follows.

Long Pulse (LP1)	Long Pulse (LP2)	Short Pulse (SP)	Total sum of LP1	Total sum of LP2	Total sum of SP	Pulse Width
4.36ms	0.76ms	0.34ms	1	17	20	111.8
Duty Cycle			(1 X 4.36 + 17 X 0.76 + 20 X 0.34) / 100 = 0.2408			
Maximum Modulation Percentage(MMP)			Duty Cycle X 100 % = 24.08 %			
Average Level Factor			-12.36 dB			

Remark: Please refer to Plotted Data #1 for test data.

Tested by: Young-Min, Choi / Project Engineer

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5.3 Spurious Emission Test

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 49 % Temperature : 13°C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231(b)
Type of Test : Intentional Radiator
Result : PASSED BY –14.68dB at 945.00 MHz

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 1, 2002
Operating Condition : TX mode
Distance : 3 Meter

Radiated Emissions			Ant	Correction Factors		Total(dBuV/m)	FCC Limit(dBuV/m)	
Freq. (MHz)	Amp. (dBuV)	Detect Mode	Pol.	Ant. (dBuV/m)	Cable (dB)	Peak	Limit	Margin(dB)
630.00	16.20	Peak	V	19.31	3.02	38.53	55.62	-17.09
945.00	13.90	Peak	H	22.95	4.09	40.94	55.62	-14.68
1260.00	8.60	Peak	H	25.20	5.26	39.06	55.62	-16.56
1575.00	5.30	Peak	H	27.80	5.94	39.04	55.62	-16.58

Other spurious frequencies were not found up to 3000 MHz.

*Remark: To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes.

Tested by: Young-Min, Choi / Project Engineer

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5.4 Bandwidth of the operating frequency

Humidity Level : 49 % Temperature : 13°C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.231 (c)
Type of Test : Intentional Radiator
Result : PASSED

EUT : REMOTE KEYLESS ENTRY SYSTEM Date: February 1, 2002
Operating Condition : TX mode
Minimum Resolution Bandwidth : 10 kHz

Carrier Freq. (MHz)	Bandwidth of the emission. (kHz)	Limit (kHz)	Remark
315.00	33.6	787.5	The point 20dB down from the modulated carrier

Remark: Please refer to Plotted Data #2 for test data.

Tested by: Young-Min, Choi / Project Engineer

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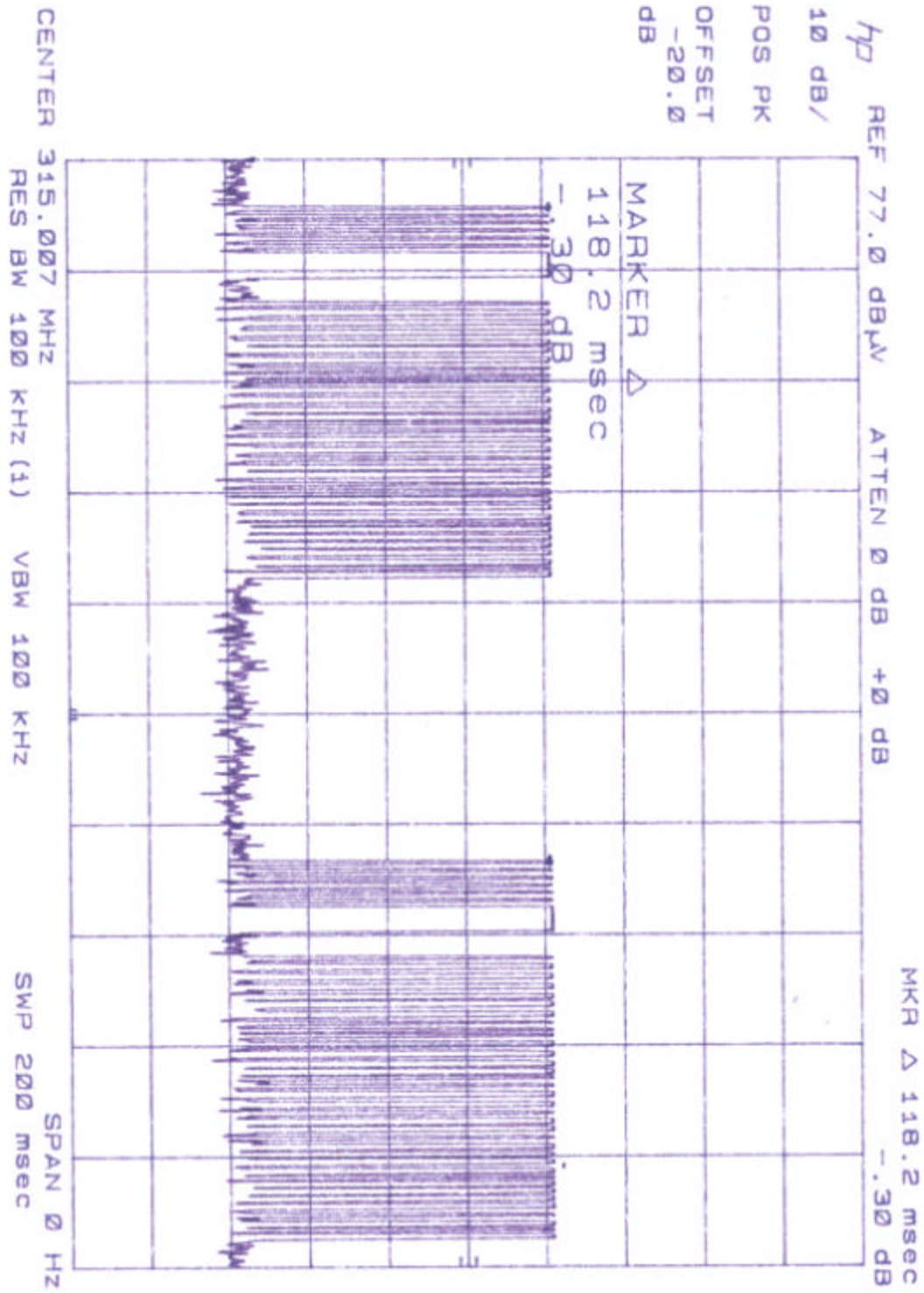
Plotted Data #1.



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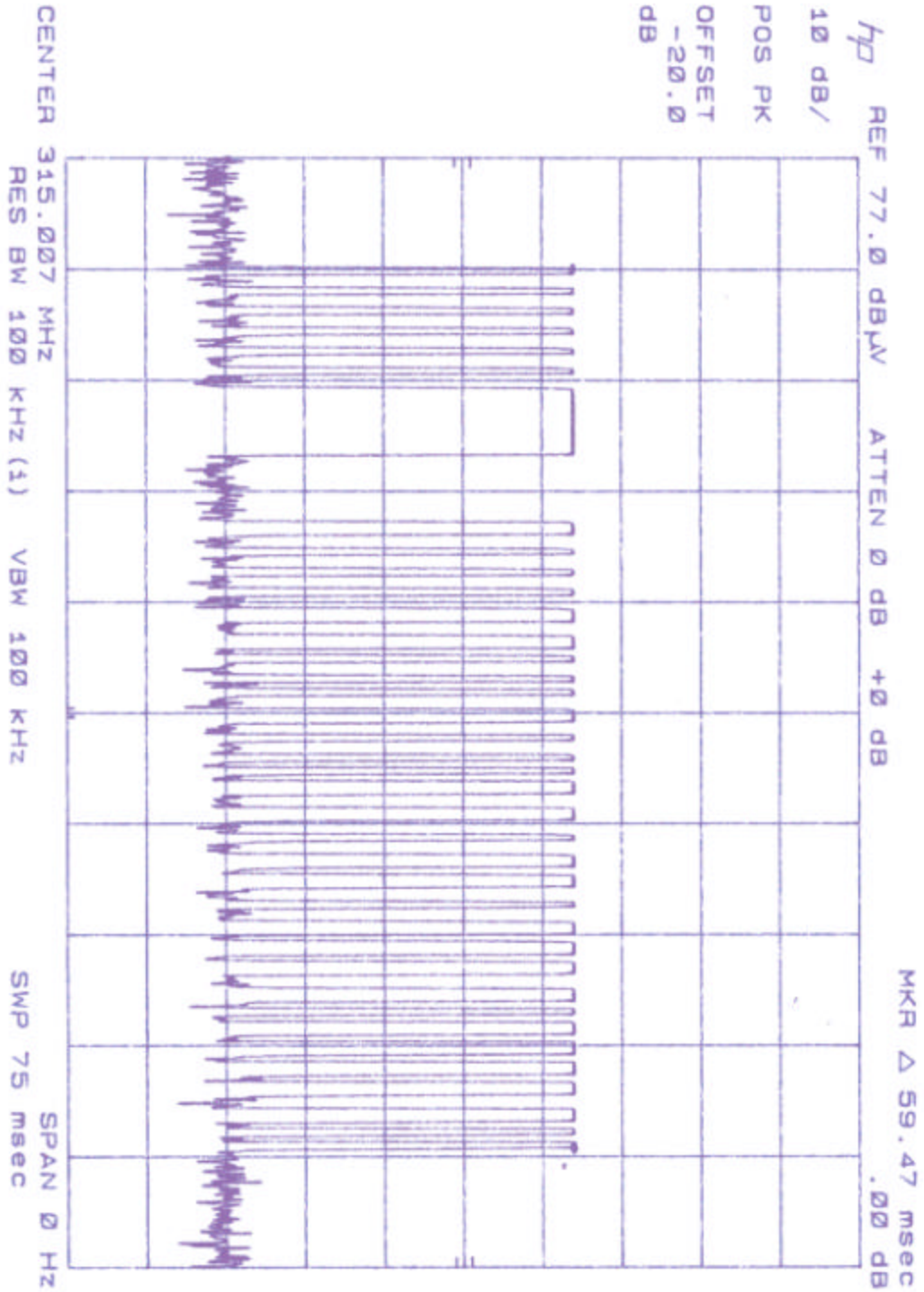

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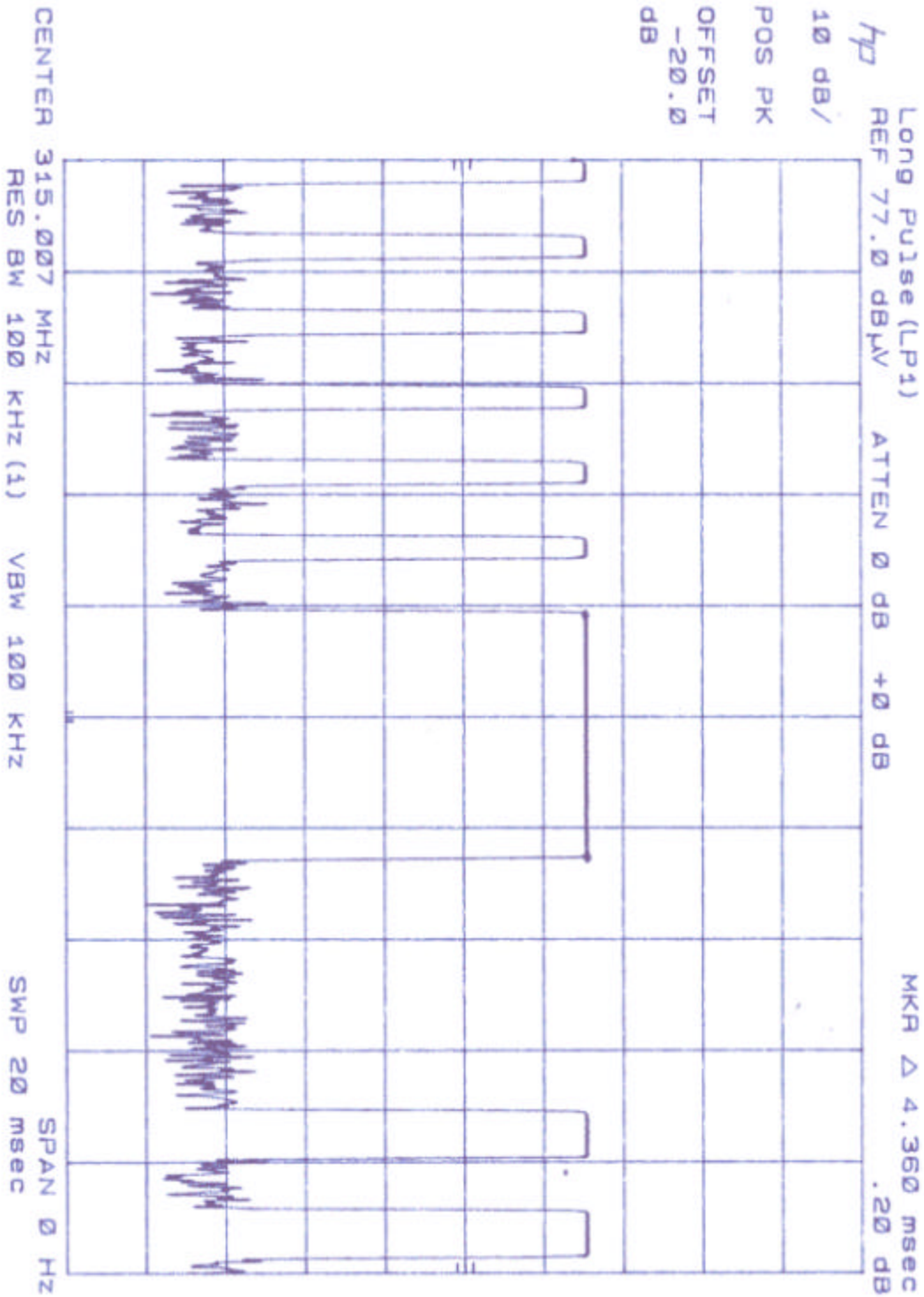

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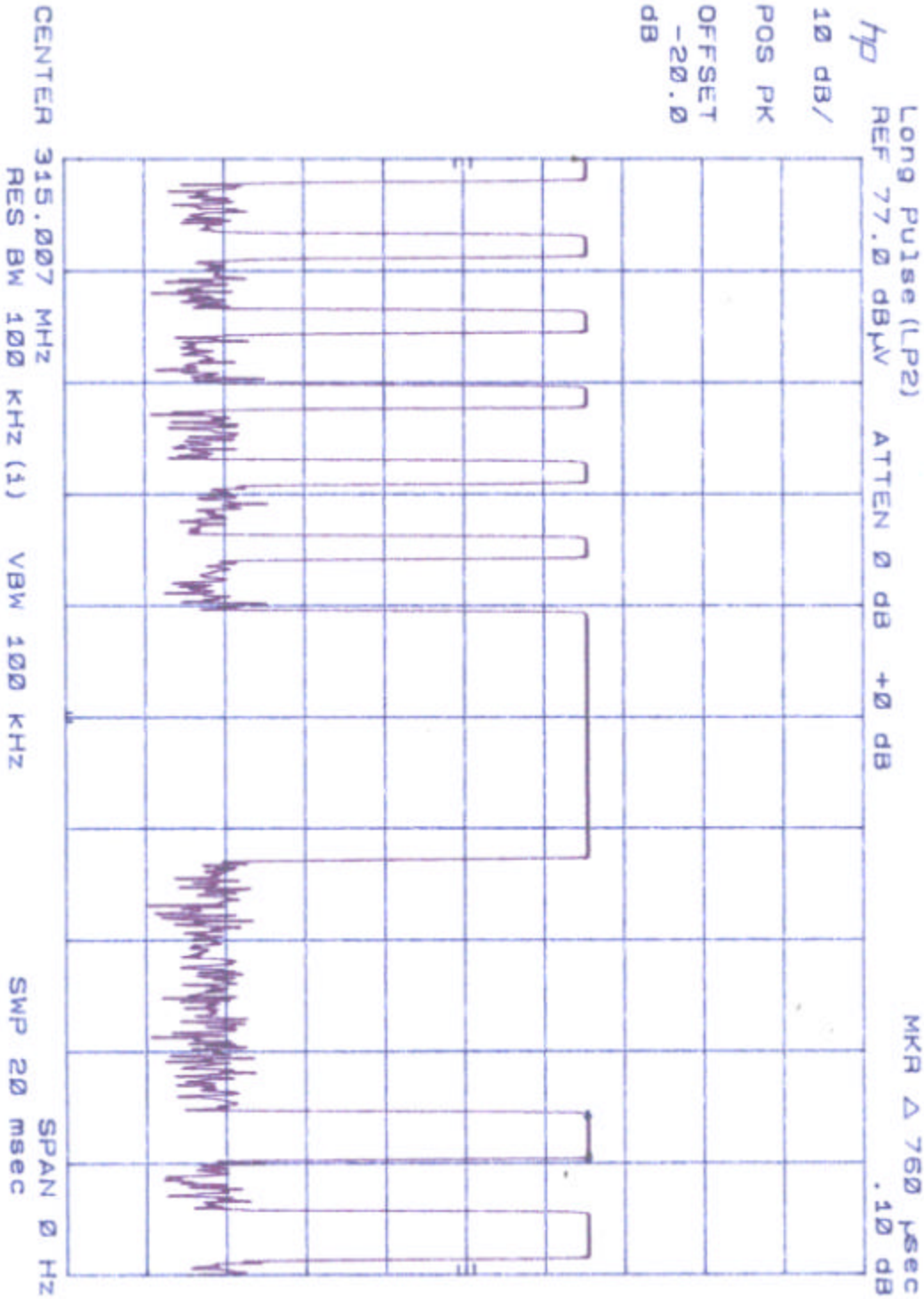

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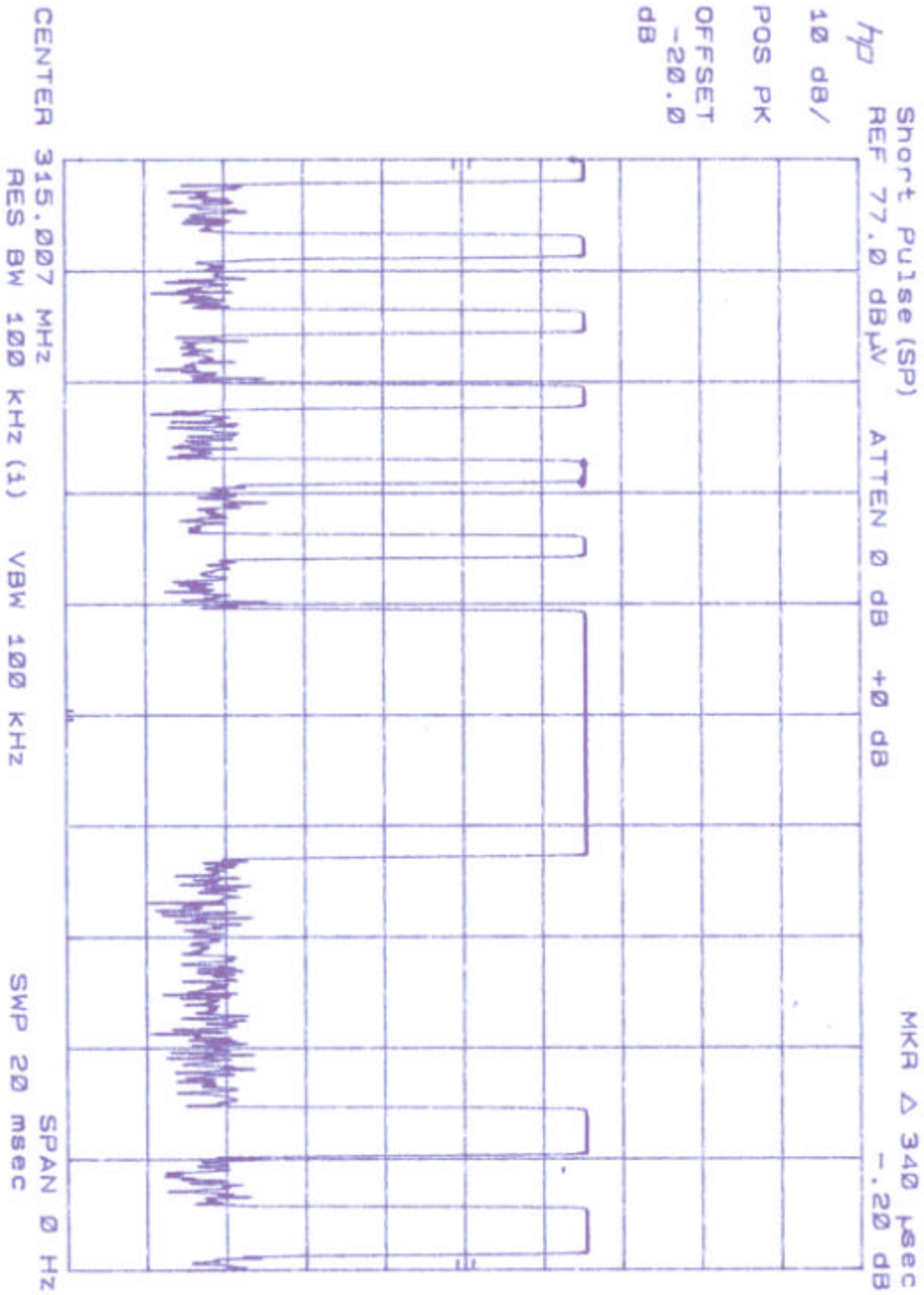

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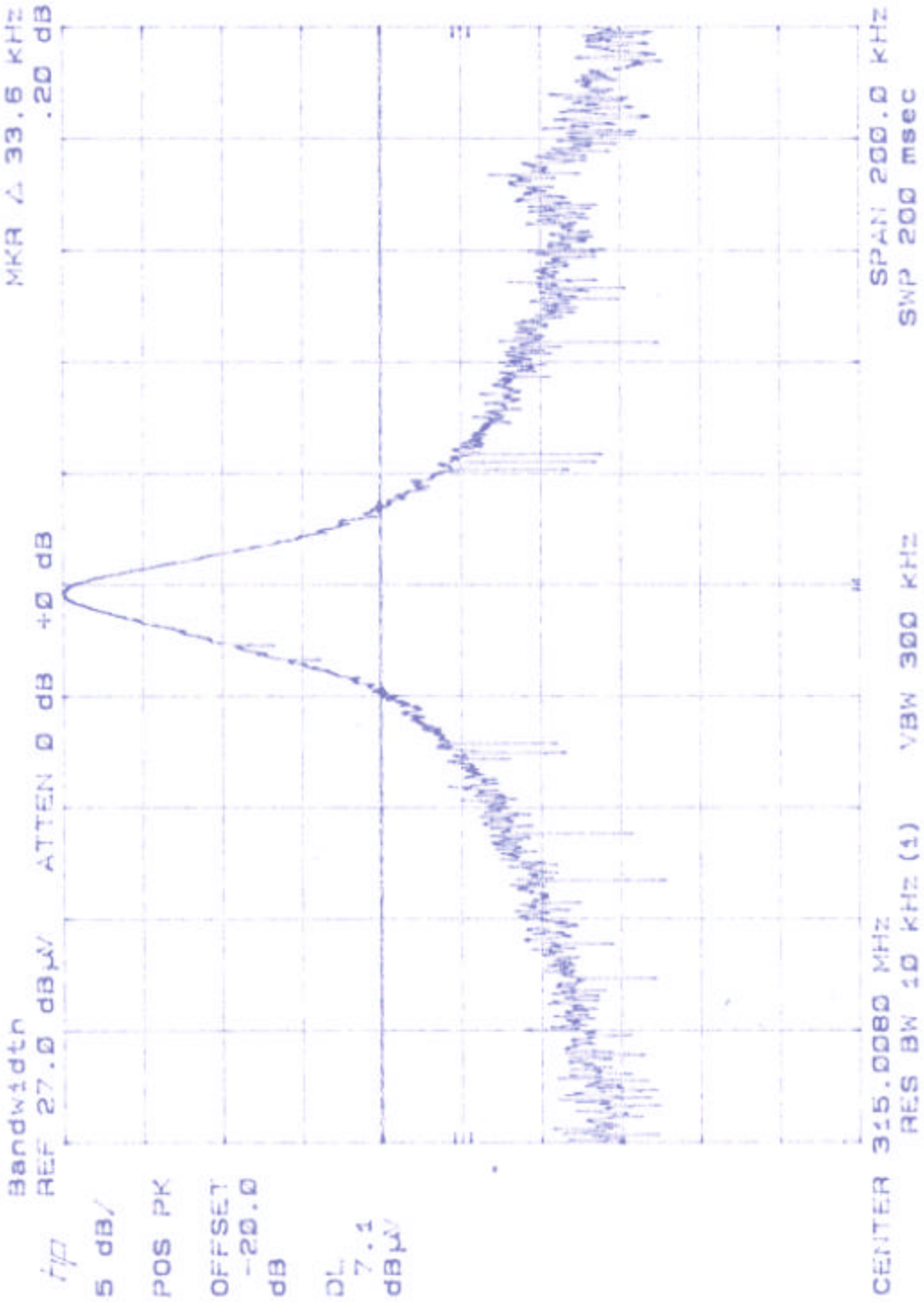
Plotted Data #2.



6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

+	Meter reading	(dBuV)
+	Cable Loss	(dB)
+	Antenna Factor (Loss)	(dB/meter)
=	Corrected Reading	(dBuV/meter)
-	Specification Limit	(dBuV/meter)
=	dB Relative to Spec	(+/- dB)

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7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESVS 10	827864/005	SEP/01	12MONTH	■
2.	Test receiver	R/S	ESHS10	834467/007	APRIL/01	12MONTH	
3.	Spectrum analyzer	HP	8568B	3026A0226	SEP/01	12MONTH	■
4.	RF preselector	HP	85685A	3107A01264	SEP/01	12MONTH	■
5.	Quasi-Peak Adapter	HP	85650A	3107A01542	SEP/01	12MONTH	■
6.	Dipole Antenna	EMCO	3121C	9107-745	JUN/01	12MONTH	
7.	Biconical antenna	EMCO	3104C	9109-4441 9109-4443 9109-4444	MAR/01	12MONTH	■
8.	Log Periodic antenna	EMCO	3146	9109-3213 9109-3214 9109-3217	MAR/01	12MONTH	■
10.	Horn Antenna	EMCO	3115	9509-4563	MAR/01	12MONTH	■
11.	LISN	EMCO	3825/2	9109-1867 9109-1869	FEB/01	12MONTH	
12.	RF Amplifier	HP	8447F	3113A04554	JUN/01	N/A	
13	Spectrum Analyzer	HP	8561E	3350A00546	SEP/01	12MONTH	■
14.	Spectrum Analyzer	HP	8591A	3131A02312	APR/01	12MONTH	
15.	Computer System Hard disk drive	HP	98581C 9153C	98543A CMC762Z9153	N/A N/A	N/A N/A	■ ■
16.	Plotter	HP	7475A	30052 22986	N/A	N/A	■
17.	Position Controller	EMCO	1090	9107-1038	N/A	N/A	■
18.	Turn Table	EMCO	1080-1.21	9109-1576	N/A	N/A	■
19.	Antenna Master	EMCO	1070-1	9109-1624	N/A	N/A	■

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